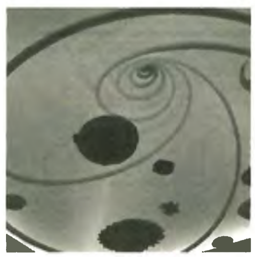
MASTER PLAN

May 2014

THE EASTERN IOWA AIRPORT CEDAR RAPIDS



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Preface

Chapter One – Inventory of Existing Conditions

Chapter Two – Aviation Activity Forecasts

Chapter Three – Airside & Landside Facility Requirements

Chapter Four – Terminal Area Facility Requirements

Chapter Five – Airside/Landside Alternatives

Chapter Six – Passenger Terminal Area Alternatives

Chapter Seven – Environmental Overview & Land Use Plan

Chapter Eight – Financial Analysis

Appendices

List of Tables

List of Figures

List of Charts

THE EASTERN IOWA AIRPORT CEDAR RAPIDS

MASTER PLAN

Preface

Introduction

The Federal Aviation Administration (FAA) has developed the airport master planning process to assist the nation's airports with expansion and improvement plans that meet aviation demand and safety requirements. This Airport Master Plan Update provides a development and expansion framework for The Eastern Iowa Airport over the next 20 years using 2011 as a base year. The last Master Plan was completed in 2005. Recommendations in this document are based on historical activity at the Airport, existing facilities and condition of those facilities, and projected levels of aviation-related activity. The goal of the Master Plan is to provide an outline for satisfying aviation demand in a financially feasible and sustainable manner, while taking into account environmental, socioeconomic, and other impacts associated with the Airport.

This Master Plan follows processes identified in FAA Advisory Circular 150-5070-6B, *Airport Master Plans*, which provides a flexible framework for the preparation of planning documents that will aid in the efficient use of funds for improvement of public-use airports.

Plan Goals and Objectives

According to the FAA, the goal of an airport master plan is to provide the structure needed to guide future airport development that will cost-effectively satisfy aviation demand, and that considers potential environmental and socioeconomic impacts.

To achieve that goal, this document includes the following general elements:

- *Inventory* – In order to determine future infrastructure demands, an inventory of existing facilities must be completed. This step examines existing airside and landside infrastructure to determine present condition and adequacy to accommodate current and future demand, as well as compliance with FAA design requirements. Airside facilities include runways, taxiways, aprons, aircraft parking and storage areas, airfield lighting, navigational aids, and airspace. Landside components include the airport terminal building, vehicle access, automobile parking and support facilities.

- *Aviation Activity Forecasts* – This element of the study focuses on factors that influence aviation demand, and presents projections that reflect local and national trends. Factors that can affect demand include income, employment, population, market share, and aviation industry trends. The components of aviation demand considered in this study include enplaned passengers, aircraft operations, based aircraft, and peaking characteristics.

- *Facility Requirements* – Based on the aviation activity forecasts, facility needs are determined and compared to the existing capacity of the various airport facilities described in the inventory element. This analysis results in recommendations that provide the basis for development of alternatives related to Airport needs, facilities, staffing, and funding.

- *Alternatives Analysis* – After facility needs are determined, alternatives are developed to meet those needs. The alternatives presented in this Master Plan consider various improvement scenarios that meet the facility requirements, and are evaluated against operational, financial, environmental, and other feasibility-related criteria. "Preferred" alternatives for each facility category are then identified.

- *Environmental Overview and Land Use Plan* – This element of the study presents an overview of environmentally sensitive features and land uses on and surrounding the Airport, and identifies potential impacts to these features and land uses resulting from the recommended development plan. The intent is to provide information regarding environmental resources for general airport planning purposes.

- *Financial Analysis* – The financial plan evaluates the Airport's capability to fund the recommended projects and other items which comprise the six-year capital improvement program (CIP, FY2013-2018). A preliminary funding scenario is presented for each project from FAA Airport Improvement Program (AIP), Passenger Facility Charge (PFC), Iowa DOT, local, and other funding sources, based in part on a detailed cash flow analysis conducted specifically for the Master Plan.

This Master Plan follows FAA guidelines as described above, but also focuses on operational and functional topics of unique interest to The Eastern Iowa Airport given local circumstances. These areas of emphasis include:

- **Terminal space assessment.** An inventory of current terminal space allocations by category (e.g. rental cars, circulation, baggage claim, etc.) was created based on existing floor plans, visual inspection, and discussions with Airport and tenant staff. This detailed assessment is presented in Chapter 4. This terminal space inventory was compared to the peak passenger activity forecasts presented in Chapter 2 to determine existing deficiencies and surpluses in square footage, as well as future square footage needs.

- **Gate capacity analysis.** A gate capacity analysis was prepared for the purpose of providing information on improving performance at the Concourse C gates and holdrooms, and for assessing the role of ground boarding in the future. Using historical and forecasted daily departures per gate, the analysis found that Concourse C currently requires one additional passenger boarding bridge and will require eight total boarding bridges within the 20-year planning period. The analysis also recommends that the future concourse layout allow for continued, limited use of ground boarding at Concourse B, and that the design of several parking positions allow for access by narrow-body jets such as the Airbus A320, the Boeing 737, and the McDonnell Douglas MD-83.

- **Terminal expansion scenarios.** Chapter 6 of the Master Plan identifies recommended concepts for the terminal curbside, public entries, non-secure area, security checkpoint, and secure area. The recommended conceptual layout for the interior non-secure area suggests regrouping passenger amenities by function; closing the existing west entrance; widening queuing and circulation areas near ticketing; providing new finishes and improved lighting in the public waiting area; moving the waiting area closer to the security checkpoint; and expanding and renovating the restaurant and baggage claim area. The recommended near-term conceptual layout for the interior secure area includes an expanded security checkpoint; seven total passenger boarding bridges with enhanced parking capability for larger aircraft; expanded hold room capacity; intuitive and unimpeded passenger circulation; and continued ground boarding capability. A more generalized long-term layout was also developed that will accommodate the future addition of passenger boarding bridges to Concourse C, which provides ten total passenger boarding bridges and associated holdroom, circulation, and concessions space.

- **Terminal area vehicle parking, circulation, and signage.** Based on discussion with Airport staff and information collected during the Inventory portion of the Master Plan, seven primary functional issues were identified with vehicle access and circulation in the terminal area. Parking requirements forecasts were also developed based on historical ratios of parking occupancy to enplanement activity during the typical month of peak enplanement activity (March). A recommended conceptual layout for vehicle access, circulation, and parking is presented in Chapter 6 of the Master Plan.

- **Airfield demand/capacity analysis.** The Airport has historically reserved space north of Wright Brothers Blvd SW for future construction of a third runway parallel to Runway 9/27. The purpose and need for this parallel runway is to increase airfield capacity when aircraft operations reach a level at which aircraft delays become unacceptable. Based on the activity forecasts and a detailed demand/capacity analysis presented in Chapter 3, aircraft operations are not expected to reach these capacity-constrained levels within the 20-year planning period. However, prudent planning dictates that space should continue to be reserved for this runway in the event that operations increase at a more rapid rate than anticipated by the activity forecasts.

- **Runway 13/31 extension scenarios.** A runway length analysis presented in Chapter 3 indicates that an additional 1,200 feet of takeoff runway length would be beneficial to air carriers and business jets currently using and anticipated to use the Airport's crosswind runway (Runway 13/31) in the future. A number of alternatives were considered for extending the runway as presented in Chapter 5. Given existing constraints surrounding the runway, the Master Plan recommends 1,000-foot extensions to each end of the runway. These runway extensions would be available for takeoff only by implementing declared distances.

- **Special Authorization Category II (CAT-II) Instrument Landing System (ILS).** To improve all-weather approach capability, the Airport should pursue implementation of a Special Authorization CAT-II instrument approach to Runway 9/27. The Airport should also plan for ground equipment requirements associated with a conventional CAT-II system, in the event that future operations justify the implementation of such an approach. These requirements are discussed in Chapters 3 and 5.

- **Aircraft deicing.** The capacities of the Airport's deicing basins were evaluated to determine whether proposed apron expansions and/or operational changes required for the preferred alternatives will necessitate the expansion of deicing runoff management facilities.

- **Real Estate Study.** In the interest of maximizing potential revenue streams, a commercial real estate development strategy was developed for Airport property that is suitable for non-aeronautical land uses. This study included a review and analysis of the Airport's real estate portfolio; a local market assessment including industry benchmarking; interviews with local stakeholders; and positioning/prioritization of real estate assets. The study is included as an appendix to the Master Plan.

Stakeholder Outreach and Involvement

Airport officials, community leaders, and the general public all play an important role in the Master Planning process. Airport staff and Commission officials were closely involved in the development of this Master Plan. A Master Plan Advisory Committee (MPAC) was also appointed to assist in the preparation of this Plan and met regularly throughout the study period to ensure a comprehensive, community-based perspective. Two public open houses were also held during the process to inform and engage the public. Airport staff, officials, and MPAC members who provided critical input are listed below.

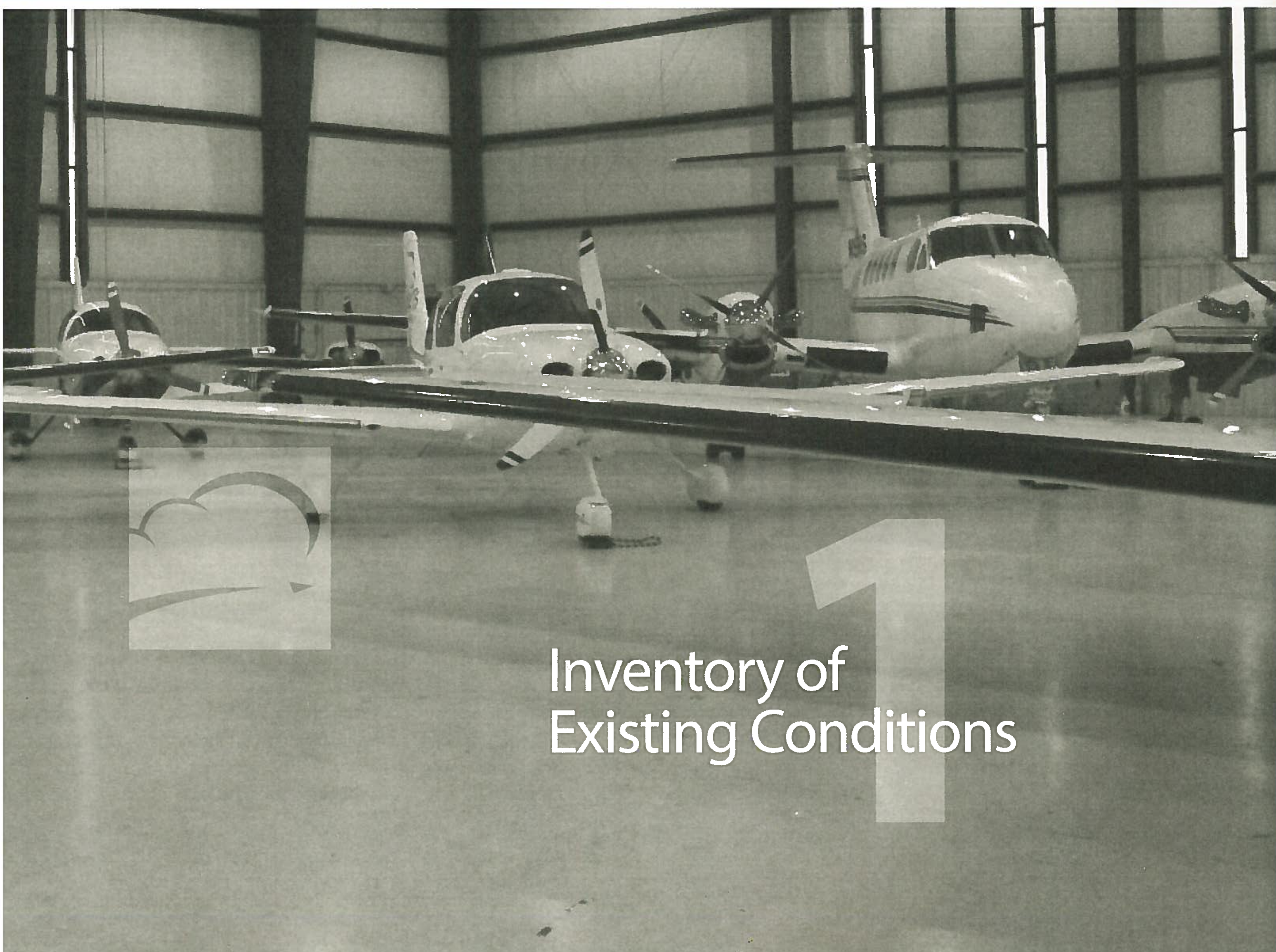
Airport Staff
Tim Bradshaw, A.A.E. – *Airport Director*
Sara Freese, A.A.E. – *Director of Operations*
Don Swanson – *Director of Finance and Administration*
Heather Wilson – *Director of Marketing and Communications*

Cedar Rapids Airport Commission – Operations Committee
Carroll Reasoner – *Cedar Rapids Airport Board Chair*
Tom Hobson – *Cedar Rapids Airport Board Commissioner*

Master Plan Advisory Committee
Dennis Jordan – *Cedar Rapids Metro Economic Alliance*
Marilee Fowler – *Cedar Rapids Area Convention & Visitors Bureau*
John Lohman – *Corridor Business Journal*
Adam Lindenlaub – *City of Cedar Rapids Community Development Department*
Dave Yeoman, Sr. – *Rockwell Collins*
Monica Vernon –*Vernon Research Group; City of Cedar Rapids Council*
Steve West – *West Music*

MASTER PLAN

THE EASTERN IOWA AIRPORT CEDAR RAPIDS



1 Inventory of Existing Conditions

CHAPTER 1

Inventory of Existing Conditions

As outlined in the Federal Aviation Administration (FAA) Advisory Circular 150/5070-6B, *Airport Master Plans*, the initial step in the Master Plan processes for The Eastern Iowa Airport (referred to as CID or Airport in this document) is the collection and evaluation of information about the Airport and the area it serves. The inventory task involves physical inspection of the facilities, field interviews and surveys, telephone conversations, review of previous Airport studies, and review of appropriate Airport management records.

The objective of the inventory task is to document existing conditions and provide background information essential to the completion of the Master Plan Update. Much of the detailed information is presented and supplemented in subsequent chapters of this Master Plan Update, as appropriate, to support the various technical analyses required as part of this project. The inventory information covers a broad spectrum and is presented in the following sections:

- Airport Description, Location, and Role
- Regional Socioeconomic Trends
- Climate and Topography
- Aviation Activity
- Airside Facilities

- Landside Facilities
- Passenger Ground Vehicle Access, Circulation, and Parking
- Passenger Terminal Building
- Inventory Summary

1.1. Airport Description, Location, and Role

CID is a publicly-owned facility located in Cedar Rapids, Iowa. The city of Cedar Rapids is found in southwestern Linn County, which is located in the east-central portion of the state. The Airport is located approximately two miles west of Interstate 380. Wright Brothers Boulevard (also referred to as State Highway 84/County Highway E70) is the major arterial road connecting the Airport and the Interstate. CID is bounded to the east by 18th Street Southwest, to the south by Walford Road, and to the west by Cherry Valley Road Southwest. Edgewood Road Southwest intersects Wright Brothers Boulevard near the northern end of Runway 13/31. **Figure 1.1** indicates CID's location within Linn County and Eastern Iowa.

Initial construction and paving of two 5,400-foot long runways was competed in 1947, which were later expanded to their current lengths and widths. The first commercial flight at the Airport was celebrated in 1947. In 1986, a new commercial terminal building replaced the original 1953 terminal. In 2011, the terminal building was named in honor of Donald J. Canney, a former Cedar Rapids mayor.

Airfield c.1960, facing northeast
Historic photograph from The Eastern Iowa Airport

CID serves commercial and passenger airlines as well as private general aviation (GA) activities. Charter flights are based out of the Fixed Base Operator (FBO), Landmark Aviation, and occur occasionally throughout the year.

Figure 1.1
Airport Location

Source: Google Earth, Bing Maps.

THE
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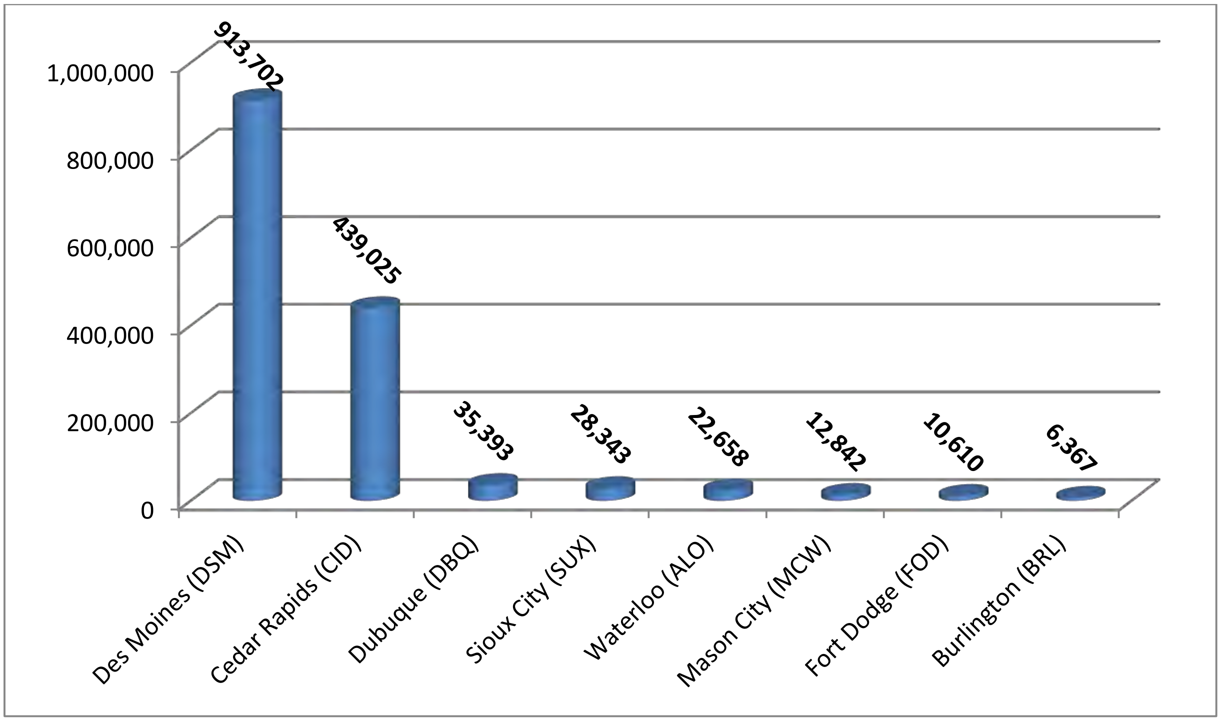
The FAA has identified CID as a small hub, primary airport, serving between 0.005 and 0.25 percent of all U.S. passenger enplanements. The Airport serves the eastern portion of the state and is second to Des Moines in the State of Iowa in terms of passenger enplanements, offering non-stop flights to several destinations on numerous carriers (see **Chart 1.1**). Six other commercial service airports in the state offer more limited services with the closest airports at Waterloo, Dubuque, and Burlington. Due to its size and number of enplanements, the Airport is also eligible for federal primary passenger and cargo entitlement funding under the FAA's National Plan of Integrated Airport Systems (NPIAS).

Chart 1.1: Annual Passenger Enplanements at Iowa Airports, 2011



Source: FAA Terminal Area Forecast, 2012

1.2. Regional Socioeconomic Trends

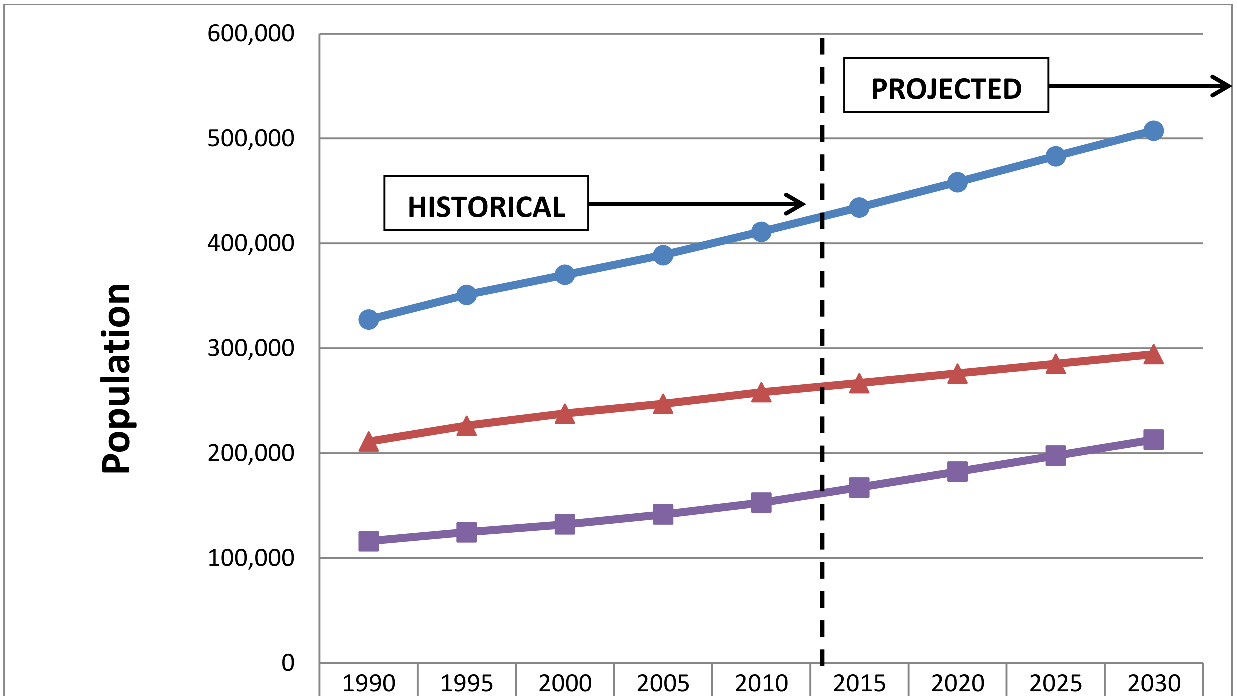
In order to determine the needs of an airport, it is important to understand the community and surrounding area it serves. Socioeconomic information in this document provides a statistical snapshot of the community and identifies trends that may impact current and future aviation operations. Specific elements described in this section include population, employment, and income.

1.2.1. Population

CID serves aviation demand for a wide geographic area, but primarily serves air transportation needs for the areas surrounding Cedar Rapids and Iowa City. This section presents historical and forecasted regional population information provided by Woods & Poole Economics, Inc. (Woods & Poole), a firm that specializes in economic and demographic projections. Population data was analyzed for the Cedar Rapids Metropolitan Statistical Area (MSA), which consists of Linn, Benton and Jones Counties as well as the Iowa City MSA, which consists of Johnson and Washington Counties.

According to the 2010 U.S. Census, the Cedar Rapids MSA had a population of 258,223, and the Iowa City MSA had a population of 152,918. In the 20 years prior to 2010, total population of the Cedar Rapids MSA increased by 22 percent from 211,200 in 1990, and total population of the Iowa City MSA increased by 32 percent from 116,212 in 1990. Woods & Poole projects that the population of the Cedar Rapids MSA will increase by 14 percent to 294,512 by 2030 and that the population of the Iowa City MSA will increase by 39 percent to 213,047 by 2030. **Chart 1.2** presents projected population growth for the Cedar Rapids and Iowa City MSAs.

Chart 1.2: Historical and Projected Regional Population Growth



	1990	1995	2000	2005	2010	2015	2020	2025	2030
Cedar Rapids MSA	211,200	226,357	237,950	247,265	258,223	266,827	275,988	285,312	294,512
Iowa City MSA	116,212	124,733	132,173	141,650	152,918	167,496	182,524	197,774	213,047
Total	327,412	351,090	370,123	388,915	411,141	434,323	458,512	483,086	507,559

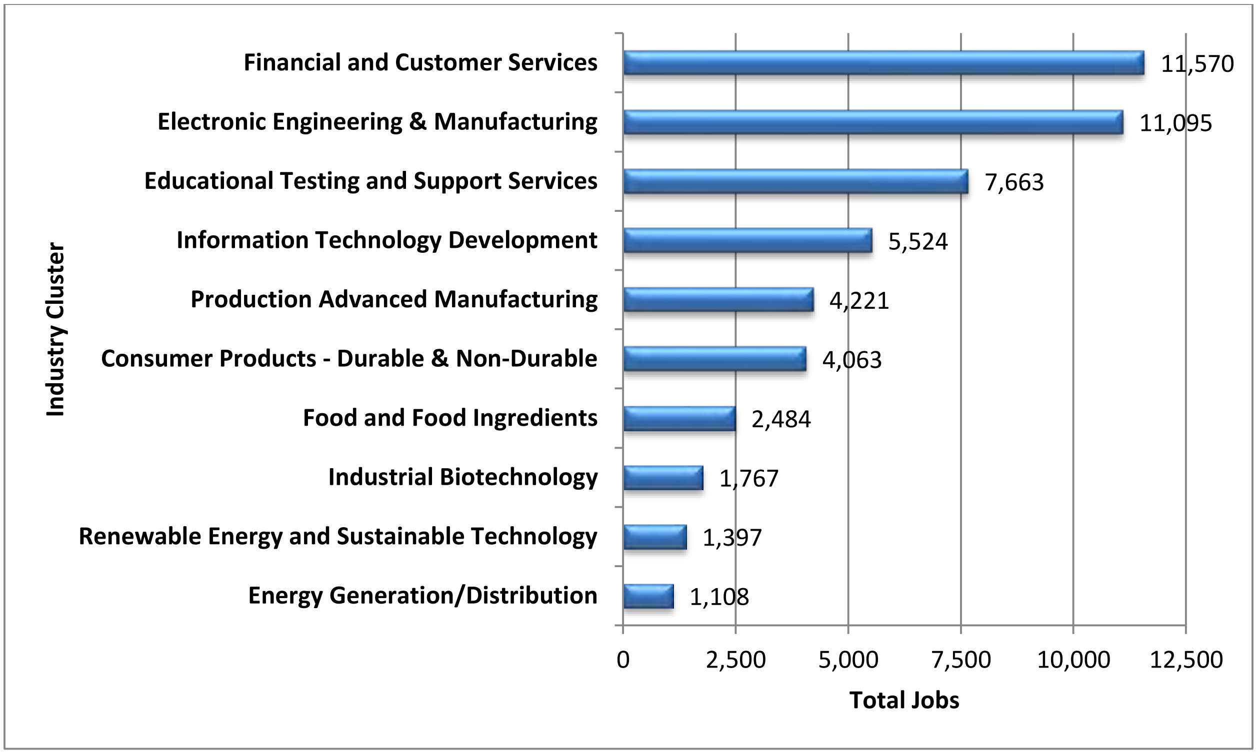
Source: Woods & Poole Economics, Inc., 2011

Projected population increases for the Cedar Rapids and Iowa City area will have a measurable impact on operations at CID. Population increases are likely to result in greater use of the Airport by passenger airlines, general aviation users, and cargo operators.

1.2.2. Employment and Income

CID is situated in the center of the Cedar Rapids/Iowa City Technology Corridor, which supports a wide range of industries. Predominant job sectors in the Technology Corridor include electronic equipment and design, insurance/finance, health care, process manufacturing, bioprocessing and biotechnology, food processing, publishing, and education. Total regional jobs within prominent Technology Corridor industry clusters are summarized in **Chart 1.3**.

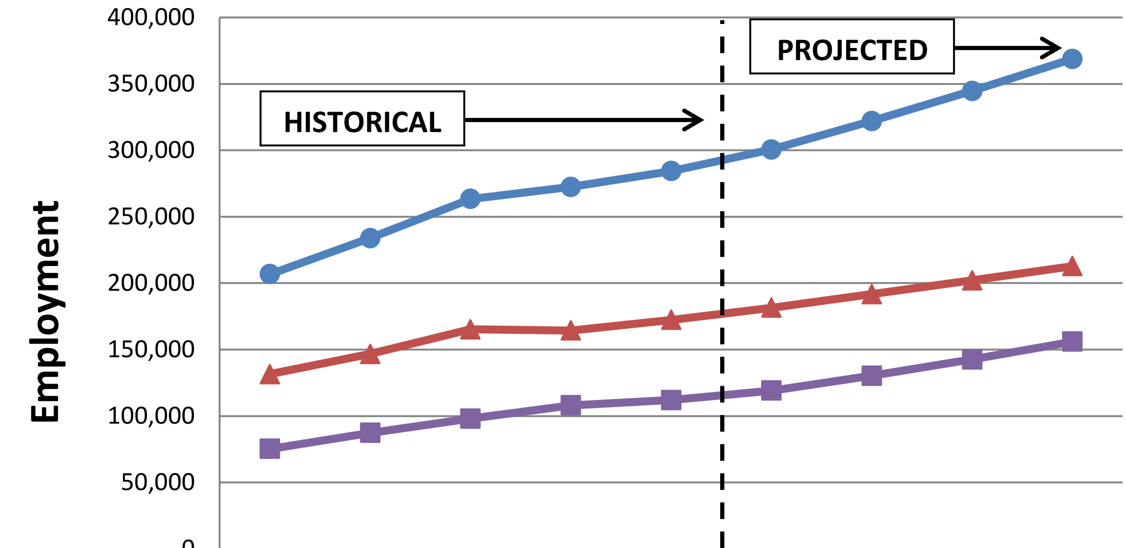
Chart 1.3: Employment in Technology Corridor Industries, 2012



Source: Cedar Rapids Metro Economic Alliance, 2012

Chart 1.4 presents historic and projected regional employment growth within the Cedar Rapids and Iowa City MSAs. **Chart 1.5** presents historic and projected gross regional product in both MSAs. Both MSAs have shown strong growth in employment and total economic output over the last 20 years. Based on projections developed by Woods & Poole, this growth is expected to continue well into the future.

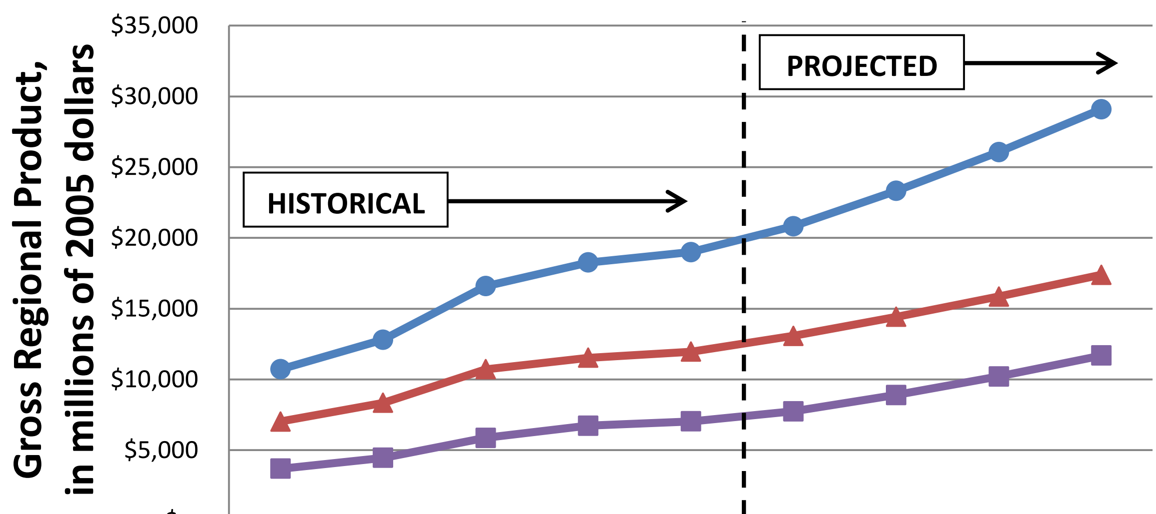
Chart 1.4: Historical and Projected Regional Employment Growth



	1990	1995	2000	2005	2010	2015	2020	2025	2030
Cedar Rapids MSA	131,539	146,630	165,253	164,397	172,285	181,517	191,730	202,143	212,752
Iowa City MSA	75,272	87,277	98,088	108,041	112,022	119,105	130,364	142,542	155,969
Total	206,811	233,907	263,341	272,438	284,307	300,622	322,094	344,685	368,721

Source: Woods & Poole Economics, Inc., 2012

Chart 1.5: Historical and Projected Gross Regional Product



	1990	1995	2000	2005	2010	2015	2020	2025	2030
Cedar Rapids MSA	$7,032	$8,348	$10,717	$11,527	$11,960	$13,079	$14,420	$15,858	$17,397
Iowa City MSA	$3,693	$4,465	$5,879	$6,736	$7,041	$7,750	$8,902	$10,211	$11,696
Total	$10,725	$12,813	$16,597	$18,264	$19,000	$20,829	$23,322	$26,069	$29,092

Source: Woods & Poole Economics, Inc., 2012

1.3. Climate and Topography

The Cedar Rapids area experiences a continental climate with warm, humid summers and cold, dry winters. The hottest month of the year is typically July with an average maximum temperature of 85.3 degrees Fahrenheit; the coldest month of the year is typically January with an average minimum temperature of 9.6 degrees Fahrenheit. Total annual precipitation in Linn County averages approximately 33 inches with June being the wettest month of the year. Total annual snowfall averages approximately 30 inches with December and January being the snowiest months of the year. Typical wind and visibility conditions at CID are discussed in greater detail in Chapter 3, Facility Requirements.

Airport property consists of gently rolling terrain with elevations ranging from approximately 790 to 880 feet above mean sea level (MSL). However, CID's terrain is generally flat on the landing surfaces. The established Airport elevation, or "field elevation" as defined by the FAA as the highest point on an airport's paved landing surface, is 869 feet MSL. This elevation occurs near the northwestern end of Runway 13/31.

The Airport is surrounded by undeveloped land that is used primarily for agriculture. The growing season generally lasts from April to October. A soil survey conducted by the USDA Natural Resource Conservation Service reveals that soil types located on and adjacent to CID consist primarily of silt, clay, and loam variations. Farmlands are discussed in greater detail in Chapter 7.

1.4. Aviation Activity

Plans to modify air service or improve CID's facilities are based on current and projected aviation demand. Examination of current and historic aviation activity can reveal local and national trends that may impact an airport and dictate necessary accommodations. Projections of aviation demand are presented in Chapter 2. Historical information related to the following activity indicators are discussed in this section:

- Airport Tenants
- Passenger Enplanements
- Aircraft Operations
- Based Aircraft

1.4.1. Airport Tenants

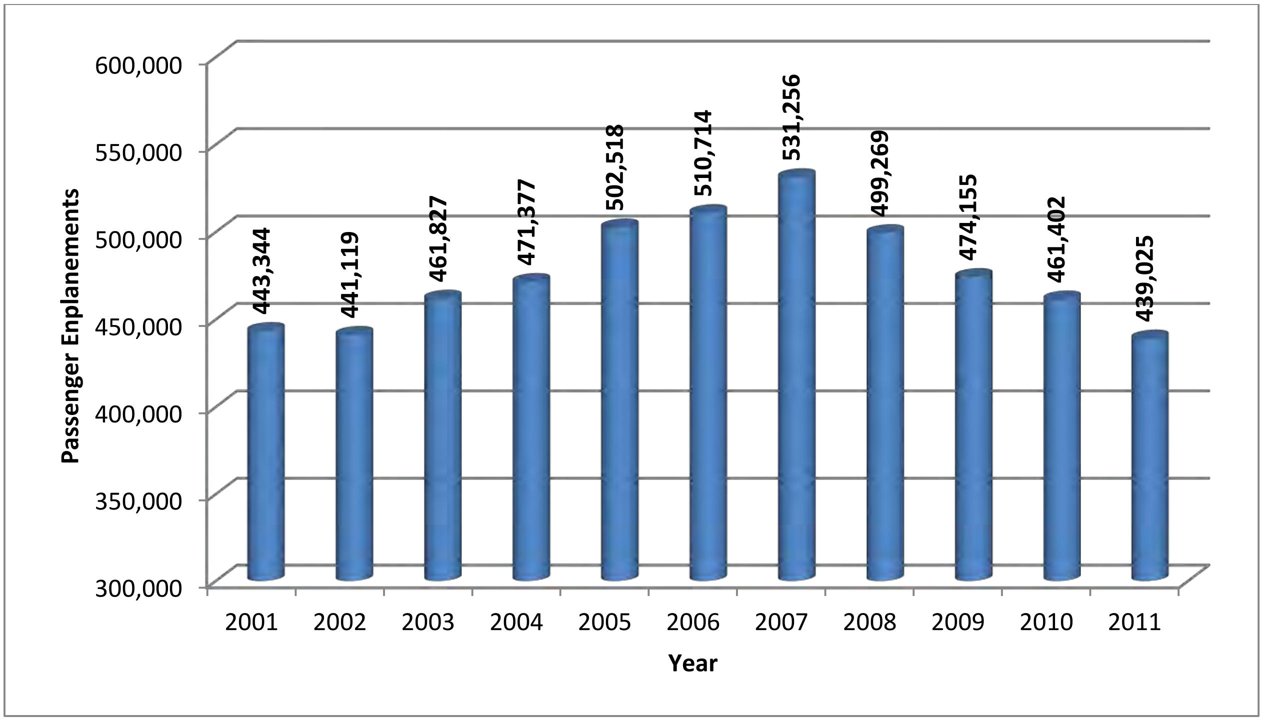
CID is home to one FBO (Landmark Aviation), five airlines (Delta, United, American Airlines, Frontier Airlines, and Allegiant Air), the Transportation Security Administration (TSA), four rental car companies (Avis/Budget, Enterprise, Hertz, and Alamo/National), two restaurants, and two gift shops. Located outside of the terminal on Airport property are a number of businesses, including Nordstrom, FedEx, UPS, and the USPS. Tenant facilities are described in greater detail in subsequent sections of this chapter.

1.4.2. Passenger Enplanements

CID has both scheduled and unscheduled passenger air service. The number of people that board a commercial aircraft, referred to as passenger enplanements, is recorded by CID and sent to the FAA. This information informs Airport administration and planners on the use of the airport and help project future growth needs.

The number of enplanements in a given year depends on several elements including socioeconomic factors, aviation trends, ticket prices, and other causes. Nationally, passenger enplanements have fluctuated in recent years due, in part, to the economic downturn beginning in late 2008. Enplanement activity at CID follows this trend as shown in **Chart 1.6**. Passenger enplanements peaked in 2007 at 531,256, and fell to 439,025 by 2011.

Chart 1.6: Historic CID Enplanement Data



Source: Airport Records

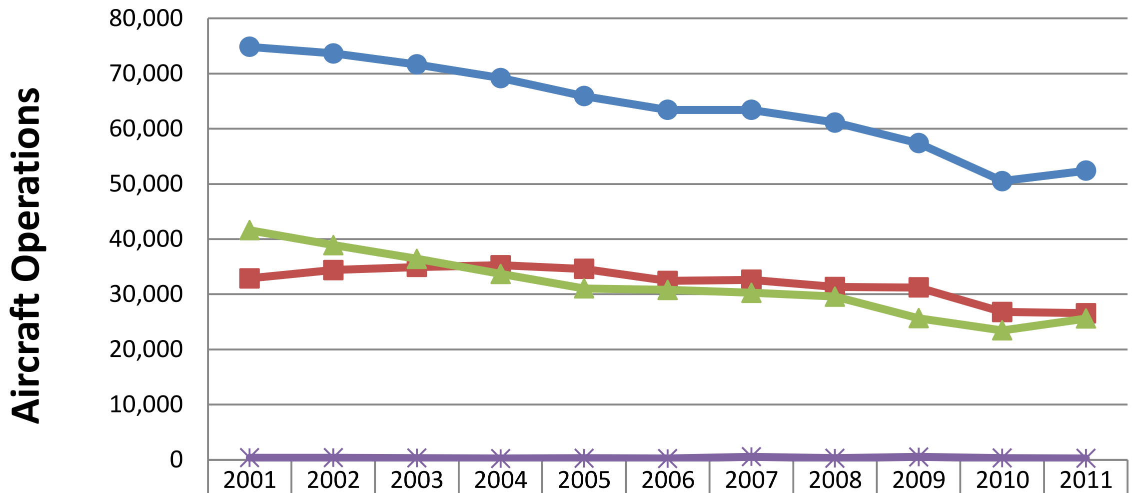
1.4.3. Aircraft Operations

An aircraft operation is the departure or landing of an aircraft. One operation is counted for each landing, and one operation is counted for each departure such that a touch-and-go-flight is counted as two operations. There are two basic types of operations that are typically considered in a demand analysis: local and itinerant. Local operations are conducted by aircraft operating in the traffic pattern within sight of the air traffic control tower; aircraft departing or arriving from flight in local practice areas; or aircraft executing practice instrument operations at the Airport. All operations other than local operations are defined as itinerant operations, which are operations between different airports. Local operations are typically conducted by users based at the Airport, while itinerant operations are conducted by both based and transient users. As a result, the two types of operations have different implications for required airport facilities.

Total aircraft operations include commercial air carrier operations, general aviation operations, and military operations. The total number of commercial operations peaked in 2004 and has declined thereafter as airlines began replacing local fleet with increasingly larger aircraft with reduced flight frequencies.

General aviation activity has generally declined over the entire period. Military operations significantly increased between 2006 and 2007, and then peaked again in 2009. Generally, the total number of operations has continuously declined from 2001 as shown in **Chart 1.7**.

Chart 1.7: Historic Aircraft Operations



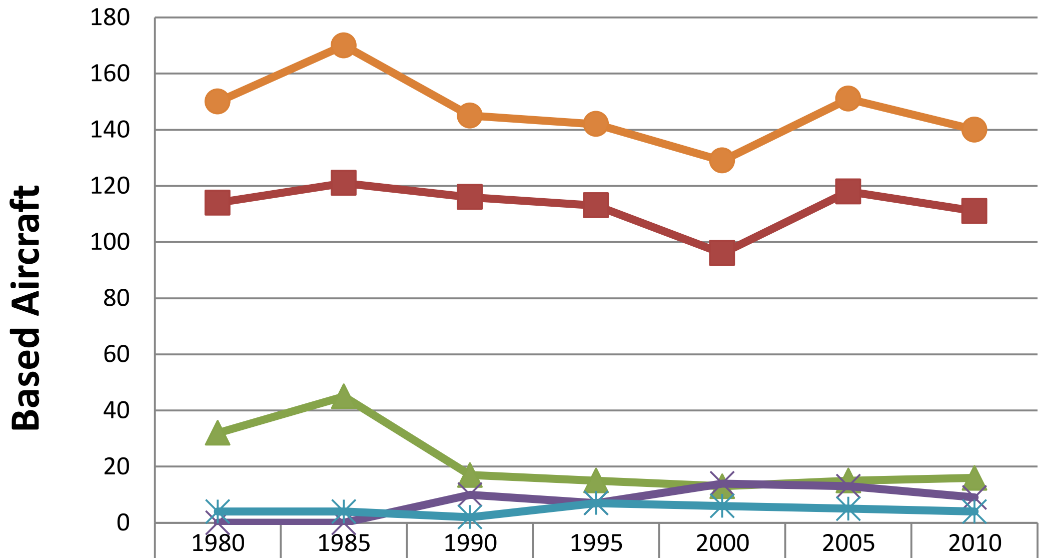
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Commercial	32,889	34,388	34,932	35,266	34,591	32,402	32,624	31,301	31,226	26,789	26,561
General Aviation	41,613	38,906	36,425	33,696	31,050	30,797	30,265	29,558	25,647	23,439	25,585
Military	355	366	300	215	269	215	538	277	512	294	243
Total	74,857	73,660	71,657	69,177	65,910	63,414	63,427	61,136	57,385	50,522	52,389

Source: Air Traffic Activity System; FAA Terminal Area Forecast

1.4.4. Based Aircraft

Based aircraft are aircraft stationed at an airport on a long-term basis. The number of aircraft based at an Airport is dependent on several factors including airport radio communications, available facilities, airport operator services, proximity and access to the airport, availability of facilities nearby an airport, and local socioeconomic factors such as population and income. **Chart 1.8** shows historic based aircraft at CID by aircraft type from 1980 to 2010. Based aircraft have fluctuated over this period, but have generally remained within the range of 130 to 170 total aircraft.

Chart 1.8: Historic Based Aircraft



	1980	1985	1990	1995	2000	2005	2010
Single-Engine Piston	114	121	116	113	96	118	111
Multi-Engine Piston	32	45	17	15	13	15	16
Jet	0	0	10	7	14	13	9
Helicopter	4	4	2	7	6	5	4
Total Based Aircraft	150	170	145	142	129	151	140

Source: FAA Terminal Area Forecast

1.5. Airside Facilities

Current airside facilities at CID are depicted in **Figure 1.2** and described in the following sections:

- Runways
- Taxiways
- Aircraft Apron and Ramp Areas
- Pavement Strength
- Instrument Approaches
- Runway Protection Zones
- Obstructions
- Perimeter Fencing
- Airside Facilities Summary

1.5.1. Runways

CID has two runways, Runway 9/27 and Runway 13/31. Runway 9/27 is constructed of grooved concrete and Runway 13/31 is constructed of grooved asphaltic concrete. Both runways are operated with standard left-hand traffic patterns. Runway 9/27 is considered the primary runway due to its longer length, superior lighting, and more precise instrument approach procedures. However, given its favorable wind coverage and preferred traffic flow, Runway 13/31 is utilized by commercial and cargo air carriers when weather and aircraft performance conditions allow. Both runways have identical pavement weight-bearing capacities.

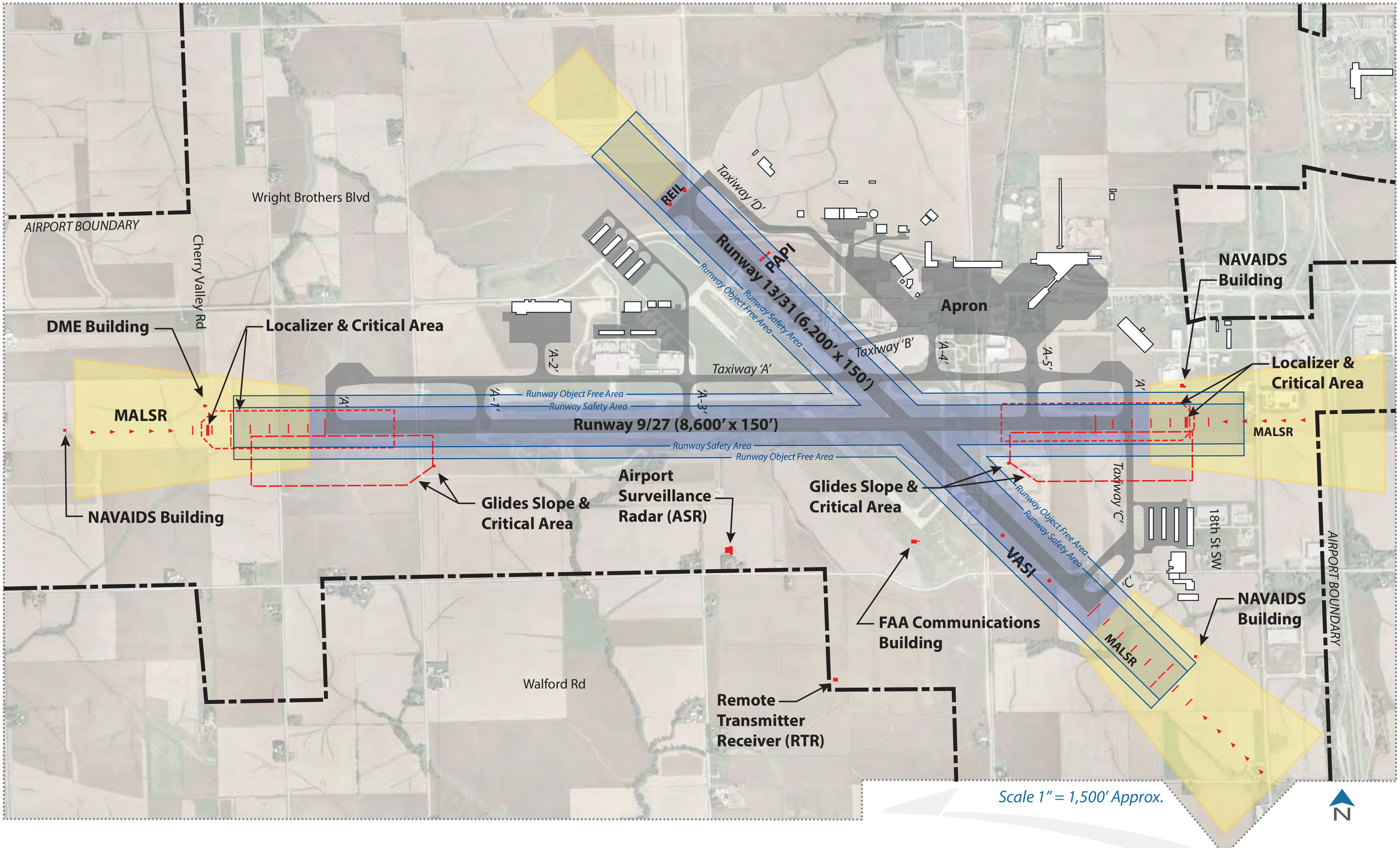


Figure 1.2
Airside Facilities

Source: Airport Layout Plan and Mead & Hunt, Inc.

THE EASTERN IOWA AIRPORT CEDAR RAPIDS

Table 1-1 lists characteristics of each runway, including length, width, lighting, visual glide slope indicator types, weight-bearing capacities, and runway gradients.

Table 1-1: CID Runway Information

Runway	Length x Width	Lighting	Visual Glide Slope Indicator	Weight-Bearing Capacity (hundreds of pounds)	Effective Gradient
9	8,600' x 150'	MALSR, HIRL	PAPI	S100, D174, ST175, DT300	0.00%
27		MALSR, HIRL	PAPI		
13	6,200' x 150'	REIL, MIRL	PAPI	S100, D174, ST175, DT300	0.40%
31		MALSR, MIRL	VASI		

HIRL = High Intensity Runway Edge Lights
MIRL = Medium Intensity Runway Edge Lights
REIL = Runway End Identifier Lights
MALSR = Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights
PAPI = Precision Approach Path Indicator
VASI = Visual Approach Slope Indicator
Weight-Bearing Capacity: S-Single Wheel, D-Dual Wheel, ST-Single Tandem, DT-Dual Tandem

Source: FAA Airport Facility Directory, 7 Mar 2013 to 2 May 2013

Runway 9/27 also has touchdown and rollout Runway Visual Range (RVR) equipment serving each end, and has a displaced threshold at the approach end of Runway 27. The landing threshold is displaced by approximately 425 feet and the runway has published declared distances appropriate for the displacement. The current Runway 9/27 declared distances as of April 2013 are presented in **Table 1-2**.

Table 1-2: Runway 9/27 Declared Distances

Runway	TORA	TODA	ASDA	LDA
9	8,600	8,600	8,175	8,175
27	8,600	8,600	8,600	8,175

Note: All distances listed in feet.
TORA = Takeoff Run Available
TODA = Takeoff Distance Available
ASDA = Accelerate Stop Distance Available

Source: FAA Airport Facility Directory, 7 Mar 2013 to 2 May 2013

1.5.2. Taxiways

CID is served by an efficient taxiway system that provides access between the runway surfaces and the landside aviation use areas. Runway 9/27 is served by a full-length parallel taxiway (Taxiway “A”) and its six connectors, which provide access to the north side of the runway and connect with the passenger terminal apron, the air cargo aprons and general aviation facilities. This taxiway is equipped with Medium Intensity Taxiway Lights (MITLs) and in most places has a width of 75 feet. A few of the exit taxiways are wider than 75 feet; the widest being “A-3”, which is 115 feet wide.

Taxiway “B” is a partial parallel taxiway serving the approach end of Runway 13. Taxiway “C” extends from the exit taxiway serving the approach end of Runway 31 to the departure threshold of Runway 27.

1.5.3. Aircraft Apron and Ramp Areas

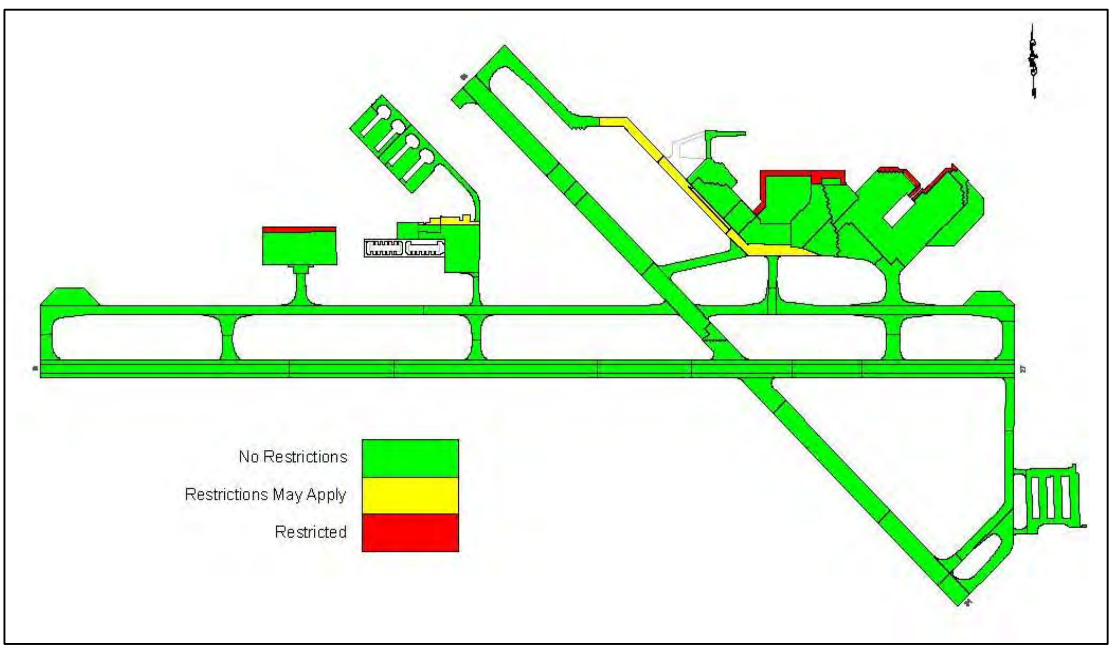
There are five major apron areas at the Airport utilized for parking and storage for commercial, cargo, and general aviation aircraft. These aprons are connected to one another by the taxiway system and a number of taxilanes. The aprons include the Passenger Terminal Apron, the East Cargo Apron, the East FBO Apron, the West FBO Apron, and the West Cargo Apron.

The Passenger Terminal Apron, consisting of approximately 148,109 square yards, is located south of the terminal building. This apron is used by commercial airlines for circulation, parking, and concourse gate access. The East Cargo Apron is located adjacent to the west end of the Passenger Terminal Apron, consists of approximately 67,778 square yards, and provides access and parking for UPS and DHL air cargo aircraft. The third apron area, consisting of approximately 36,764 square yards, is located immediately west of the East Cargo Apron and is associated with the FBO Landmark Aviation. The fourth apron area is located near the midfield between the approach ends of Runways 9 and 13, and consists of approximately 21,132 square yards. This apron is used for access and parking for the West FBO Campus, and also serves general aviation T-hangars. The fifth apron area is located immediately west of the West FBO Campus and serves FedEx air cargo aircraft. This apron consists of approximately 12,108 square yards. Each of these five apron areas has pavement that is in good condition and existing strengths that are comparable to the various aircraft they serve. In addition to these five apron areas, there are a number of taxilanes that extend from taxiways and serve various corporate and general aviation hangar areas at the Airport.

1.5.4. Pavement Strength

The most recent Pavement Capacity Analysis for the airfield at CID was completed in March 2012. This analysis determined the load-carrying capacity of all airfield pavement sections on the airfield and evaluated the ability of the pavement sections to accommodate the aircraft traffic mix currently using the Airport. The results of the pavement study are presented in **Figure 1.3**.

Figure 1.3: Pavement Capacity Analysis



Source: Airfield Pavement Capacity Analysis Final Report, March 2012

Portions of Taxiway D and a few apron pavement sections shown in yellow or red in Figure 1.3 are the only areas that do not have adequate load-carrying capacity for all aircraft in the traffic mix expected to use these areas. Restrictions may apply to the areas shown in yellow, specifically Taxiway D and the apron sections near the West FBO. For Taxiway D, the only airplane that uses the area but exceeds the pavement classifications is the Boeing 767. For the apron sections near the West FBO, the aircraft that use the area but exceed the pavement classifications are the Gulfstream G-III, G-IV, and G-V. However, in both cases these aircraft represent a small minority of the overall traffic mix expected to use these areas. The majority of aircraft in the traffic mix are restricted from using the areas indicated in red due to inadequate pavement structure needed to support these aircraft.

1.5.5. Instrument Approaches

The existing instrument approach procedures available for Runways 9/27 and 13/31 provide approach capability under a variety of wind conditions and operational circumstances. The Airport has eight published instrument approach procedures: three each for both ends of Runway 9/27 and one each for both ends of Runway 13/31. The visibility minimums and decision heights for the procedures are presented in **Table 1-3**.

Table 1-3: Instrument Approach Procedures

Approach Name	TCH	GSA	Visibility Minimum	Decision Height
ILS or LOC RWY 9	49'	3.00°	0.5 Mile	200' AGL
ILS or LOC RWY 27	49'	3.00°	0.5 Mile	200' AGL
RNAV (GPS) RWY 9	49'	3.00°	0.5 Mile	200' AGL
RNAV (GPS) RWY 13	40'	3.00°	1 Mile	300' AGL
RNAV (GPS) RWY 27	49'	3.00°	0.5 Mile	300' AGL
RNAV (GPS) RWY 31	43'	3.00°	0.5 Mile	300' AGL
VOR/DME RWY 9	60'	2.92°	0.5 Mile	400' AGL
VOR RWY 27	46'	3.30°	0.5 Mile	400' AGL

Source: FAA Terminal Procedures 04 APR 2013 to 02 MAY 2013
Notes: Alternate minimums may apply under instrument meteorological conditions (IMC). Minimums listed are for Category C aircraft.

ILS = Instrument Landing System
LOC = Localizer
RNAV = Area Navigation
GPS = Global Positioning System
VOR = Very High Frequency Omnidirectional Range
DME = Distance Measuring Equipment
TCH = Threshold Crossing Height
GSA = Glideslope Angle
AGL = Above Ground Level

1.5.6. Runway Protection Zones

A runway protection zone (RPZ) is a trapezoidal area located beyond a runway end and centered on the runway centerline; its function is to enhance protection of people and property on the ground. Airport owner control over the RPZ is emphasized by the FAA to achieve the desired protection of people and property on the ground, and the FAA expects airport sponsors to take all possible measures to protect against and remove or mitigate incompatible land uses within the RPZ. The RPZ dimensions are functions of the type of aircraft operating at the Airport and the approach visibility minimums associated with each runway end. Future changes in runway ends resulting from runway extensions or the relocation/displacement of landing thresholds may result in the shifting of RPZs into areas that are not currently owned or controlled by the Airport.

With the exception of public right-of-ways for Cherry Valley Road SW and Wright Brothers Boulevard, respectively, the Airport currently owns the property within the Runway 9 and Runway 13 approach RPZs. The Runway 27 RPZ is partially owned in fee and the un-owned portion is controlled with an RPZ easement; however, this RPZ also has right-of-ways for 18th Street SW and the Cedar Rapids and Iowa City (CRANDIC) Railroad within it. The Runway 31 RPZ is partially owned. The portion of the RPZ extending across 18th Street SW is currently un-owned and uncontrolled; this RPZ has public right-of-ways for 18th Street SW, Walford Road and the CRANDIC Railroad within it. The dimensions of the various RPZs are presented in **Table 1-4**.

Table 1-4: Runway Protection Zone Dimensions and Land Uses

Runway	Inner Width	Outer Width	Length	Roads and Railroads in RPZ
Runway 9 (Approach)	1,000'	1,750'	2,500'	Cherry Valley Road SW
Runway 9 (Departure)	500'	1,010'	1,700'	18th Street SW, CRANDIC Railroad
Runway 27	1,000'	1,750'	2,500'	18th Street SW, CRANDIC Railroad
Runway 13	1,000'	1,510'	1,700'	Wright Brothers Boulevard
Runway 31	1,000'	1,750'	2,500'	18th Street SW, Walford Road, CRANDIC Railroad

1.5.7. Obstructions

Given the relatively flat topography in the vicinity of the Airport, there are few identified obstructions or hazards to air navigation in general. There are seven known obstructions to the north and east of the Airport that penetrate Federal Aviation Regulations (FAR) Part 77 imaginary surfaces and are depicted on various aeronautical charts and instrument procedure plates. Five of these obstructions are antenna towers and are currently obstruction lighted. There is also one obstruction-lighted radio transmission tower and one obstruction-lighted communication tower in the vicinity of CID. Finally, the airport service road is also listed as an obstruction because it penetrates Part 77 surfaces in various places. However, the service road is restricted to radio-equipped authorized vehicles operating under positive control from the ATCT.

1.5.8. Perimeter Fencing

The perimeter fencing surrounding Airport property to the south, east, and west consists of an eight-foot tall chain link fence with three strands of barbed wire above. In the vicinity of the Airport's terminal area, the fence typically extends between buildings and other aviation-related facilities. The fencing meets current FAA requirements.

1.5.9. Airside Facilities Summary

The airside facilities at CID are described in the preceding sections and are illustrated in **Figure 1.2.** The airfield is generally well-designed and adequately serves commercial, cargo and general aviation traffic.

1.6. Landside Facilities

Landside facilities directly support aircraft operations, and are generally accessible by the public and adjacent to public parking lots and roads. Such facilities generally include the Airport terminal, ground access and circulation, automobile parking, cargo distribution centers, and support facilities. Current landside facilities are depicted in **Figure 1.4** and vehicle access roads to landside facilities are shown in **Figure 1.5**. These facilities are described in the following sections:

- Administration Building
- Fixed Base Operator (FBO)
- Cargo Distribution Facilities
- Aircraft Fueling Facilities
- Aircraft and Pavement Deicing
- Aircraft Hangars
- Ground Service Equipment (GSE) Storage
- Snow Removal Equipment (SRE) Building
- Aircraft Rescue and Firefighting (ARFF)
- Air Traffic Control Tower (ATCT)
- Former ARFF

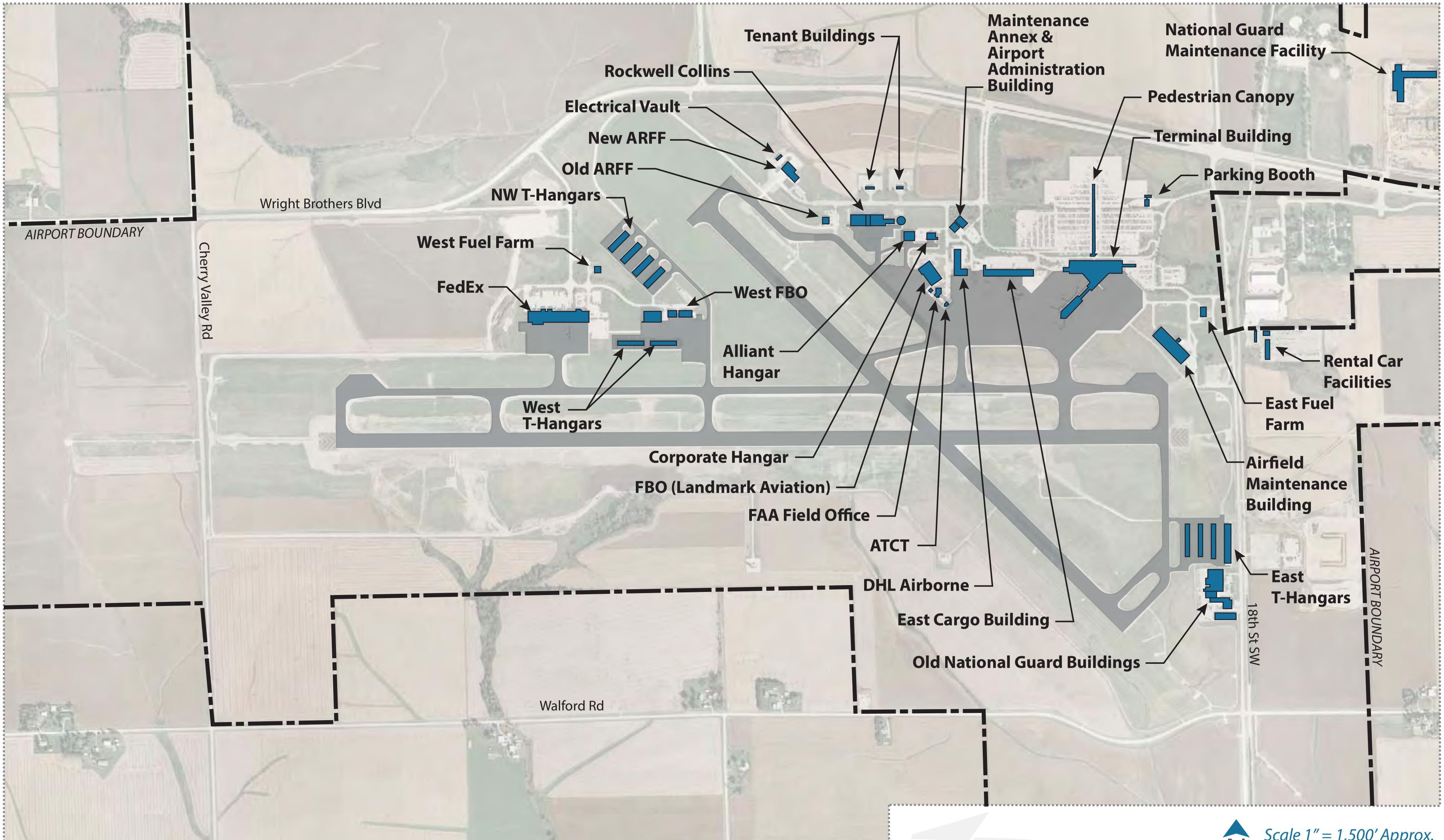


Figure 1.4
Landside Facilities

THE EASTERN IOWA AIRPORT CEDAR RAPIDS

Source: Airport Layout Plan and Mead & Hunt, Inc.

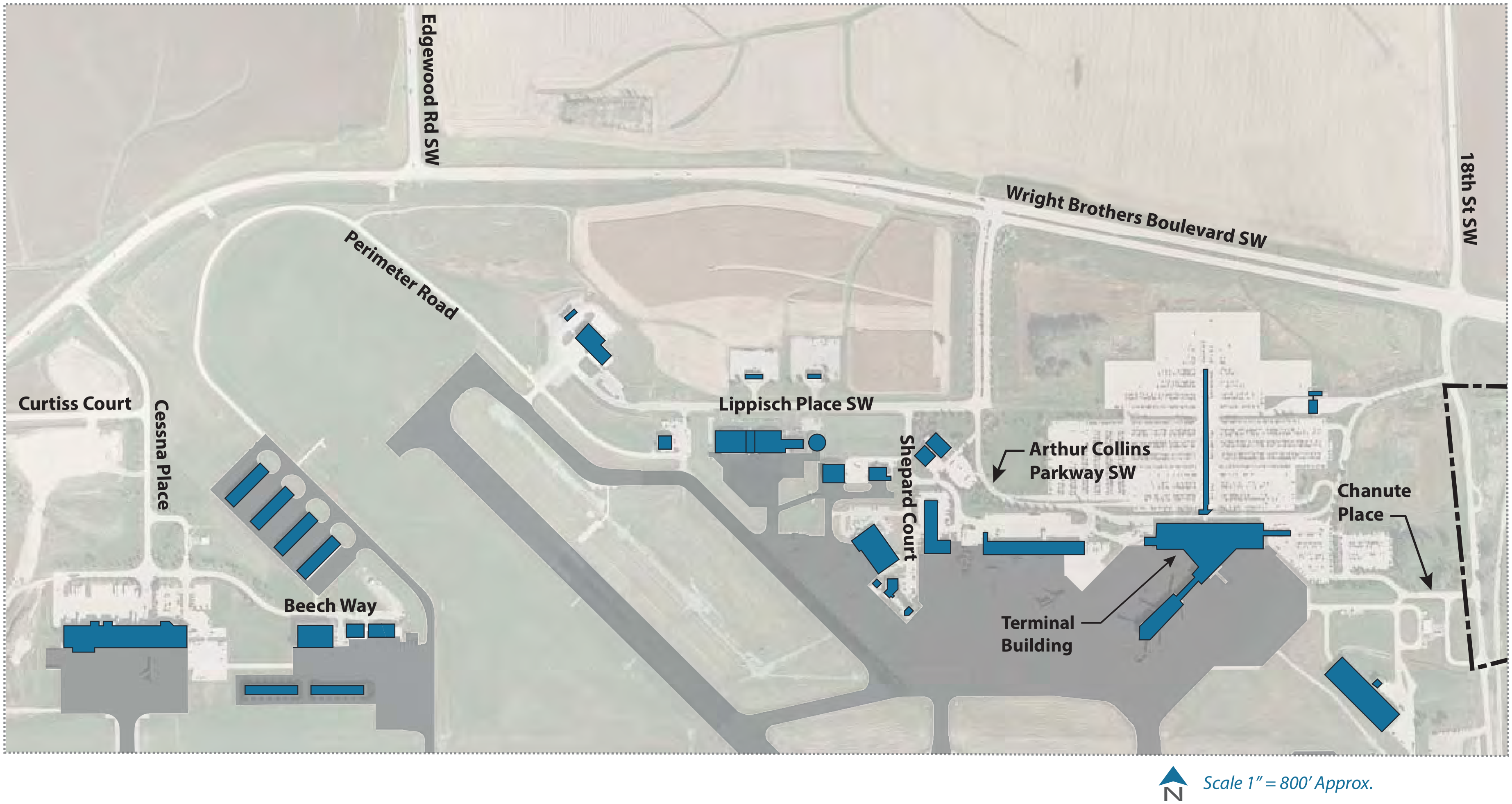


Figure 1.5
Airport Vehicle Circulation

Source: Airport Layout Plan and Mead & Hunt, Inc.

1.6.1. Administration Building

The Airport's administration building is located to the northwest of the passenger terminal building and houses all administration functions. Currently the building is home to six staff members including administrative assistants, the operations manager, the Airport director, the marketing director, and the finance director. The Administration Building currently meets the staffing and administrative needs of the Airport.

The building includes a large, 40-person capacity commission room, where Airport Commission meetings as well as various community and public meetings are held. The administrative building is heated by separately-zoned gas-fired furnaces and has a hypo-long roof, which will need updating in the near future. In general the building has enough office and storage space to meet current needs. However, staff indicates they would like to see a larger area for IT equipment, updated finishes, and better environmental temperature control between the zones.

A maintenance garage is attached through a breezeway to the west of the building. The maintenance garage has four bays and houses miscellaneous landscape-related equipment. An interior mezzanine provides additional storage space and space for a small office. The garage is heated with infrared heating. The maintenance garage appears to be appropriately sized to meet the current maintenance needs of the Airport property.

Access to the administration building is provided by Arthur Collins Parkway SW. Staff and visitors can also enter or exit from Lippisch Place, thus eliminating the need to drive around the Airport on the one-way Arthur Collins Parkway. A parking lot is adjacent to the building and serves not only as the administrative building parking lot but also as a cell phone waiting area. This parking area currently meets parking needs for Airport staff.

Administration building
Photograph by Mead & Hunt, Inc. (2011)

Commission meeting room
Photograph by Mead & Hunt, Inc. (2011)

1.6.2. Fixed Base Operator (FBO)

CID has one Fixed Base Operator (FBO), Landmark Aviation, but has two separate FBO campuses located on Airport property. The largest FBO campus is located to the northwest of the Runway 13/31 and Runway 9/27 intersection. The West FBO consists of a two-story administrative center with an attached hangar and two associated freestanding hangars to the east. Although the building finishes are dated, the 34-foot x 120-foot FBO office building appears to be adequate to support the current lessees and consists of a general passenger waiting area, office spaces, a pilot's lounge, and main hangar.

Attached to the West FBO office building is a 145-foot x 120-foot main hangar featuring a sliding multi-leaf track door, radiant floor heating and day lighting supplied by narrow fixed vertical windows. To the east is a smaller 90-foot x 70-foot freestanding hangar with sliding doors. This hangar also appears to meet the needs of the FBO. The third and final hangar has been separated into a maintenance bay to the west, a central screening and avionics center in the middle, and additional hangar to the east.

Passenger access to the West FBO is provided by roads connected to Wright Brothers Boulevard. From the boulevard, visitors travel south on Cessna Place Southwest and east on Beech Way Southwest. A small parking lot with approximately 20 parking spaces between the hangars is provided for visitors. There is ample apron space for aircraft surrounding the West FBO.

The main hangar for Landmark Aviation, the Airport's FBO
Photograph by Mead & Hunt, Inc. (2011)

The smaller FBO campus is located on the northeast side of the Airport, to the immediate northwest of the air traffic control tower. The East FBO features a one-story terminal and office space with the hangar attached to the southeast elevation. The attached 150-foot x 120-foot hangar consists of a large open space with a forced air system and an approximate 26-foot multi-leaf track slider door. The present lessees have adequate space for current office and aircraft operations.

Access to the East FBO is made from Wright Brothers Boulevard to Arthur Collins Parkway. From the parkway, visitors turn west onto Lippisch Place and then south on Shepard Court. There is ample parking in front of the FBO, with approximately 50 parking spaces dedicated for passengers and staff. There also appears to be ample apron space associated with the FBO.

East FBO passenger waiting area
Photograph by Mead & Hunt, Inc. (2011)

East FBO hangar with track doors to the left
Photograph by Mead & Hunt, Inc. (2011)

1.6.3. Cargo Distribution Facilities

CID has two large cargo distribution facilities on Airport property. The largest and newest distribution facility is located on Beech Way Southwest, on the west side of the Airport. FedEx operates ground and air cargo distribution from this facility. The second cargo distribution facility is a freestanding structure located directly west of the Airport terminal. This facility supports air and ground distribution for UPS and USPS. Additional descriptions of both cargo distribution facilities are found below**.**

- Air Cargo Overview: Three integrated ground and air express carriers lease space in the Airport cargo distribution facilities, including FedEx, UPS, DHL, and USPS. These tenants serve the primary markets of Cedar Rapids, Iowa City, Waterloo, Dubuque, and the Quad-Cities. Secondary markets include Burlington and Decorah, Iowa, and portions of southwest Wisconsin and northwest Illinois. Between 1998 and 2004, total deplaned and enplaned tonnage declined. This was primarily due to the nationwide recession and 9/11 terrorist attacks. In contrast to U.S trends, from 2004 to 2008 enplaned and deplaned air cargo traffic at CID increased. This is likely due to FedEx utilizing the Airport as its main shipment center and the Airport's geographic location between two UPS hubs. Air cargo traffic at the Airport is poised to continue growing in the coming years, primarily due to its strategic location in eastern Iowa, the large number of nearby industries, and the Airport's ability to support cargo jet operations.

- FedEx Cargo Distribution Facility: The largest cargo distribution, sorting, and cargo facility is located northwest of the Runway 9/27 and Runway 13/31 intersection. This industrial building was constructed in 1997 and serves as the eastern Iowa distribution center for FedEx. A small customer service area is located near the primary public entrance. The building also has administrative and office space for approximately 60 employees and staff. However, the largest portion of the building is dedicated to the unloading, sorting, and distribution of cargo.

  Landside access is configured so that delivery trucks enter and exit the facility on Cessna Place to Wright Brothers Boulevard. Twenty-one semi-truck loading docks are configured to allow semi-trucks to back up into them. Twenty-seven parking stalls are located directly north of the loading docks. As a result, there is a large pavement area in front of the building that is dedicated to parking and maneuvering.

  To the south, four aircraft parking spaces for Boeing 757s sit on a large apron. There is ample apron to allow for aircraft maneuverability. FedEx aircraft use Taxiway A2 to access the airfield from the West Cargo Apron. According to FedEx staff, the company is expecting future operations growth but the current building is sufficient to meet their projected needs.

Interior of the FedEx distribution center warehouse and sorting bay
Photograph by Mead & Hunt, Inc. (2011)

- UPS/USPS Cargo Distribution Facility: A second, smaller, distribution center is located immediately west of and adjacent to the passenger terminal building. The building contains approximately 18 truck loading bays. The USPS currently leases three bays for use as part of the Cedar Rapids sorting facility.

  Landside access is configured such that delivery trucks enter Airport property on Arthur Collins Parkway, turn onto Lippisch Place, and access the distribution center on Lindbergh Way. Trucks can return this same way and access Wright Brothers Boulevard without needing to drive in front of the passenger terminal. Each bay is configured to allow semi-trucks to back up into them. As a result, much of the pavement behind the distribution center is devoted to truck circulation. There are 48 automobile parking spaces on the north side of the lot.

Exterior of UPS/USPS Cargo Distribution Facility
Photograph by Mead & Hunt, Inc. (2012)

The distribution facility has a large amount of apron on the airside of the building. However, indoor storage is minimal, resulting in the use of the apron to store shipping containers. Two or three bays are vacant and without tenants. Additionally, there is little visual screening of the distribution building and it is the first building an Airport visitor sees on the way to the terminal drop-off area.

1.6.4. Aircraft Fueling Facilities

Available aircraft fuel storage includes 80,000 gallons of Jet-A and 24,000 gallons of 100LL. Fuel is kept in large storage tanks at the East Fuel Farm located northeast of the SRE/maintenance building and the West Fuel Farm located north of the West Cargo Area. Transfer operations at the facilities include:

- Transfer of fuel from delivery trucks into fixed aboveground storage systems.
- Filling of mobile refueling trucks.
- Filling ground support vehicles at the East Fuel Farm and FedEx.
- Filling of rental cars at the Rental Car Facility.

All outdoor fixed storage containers are made of double-wall steel construction. Any releases from the primary tank are contained by secondary tanks equipped with overfill prevention devices that include a direct reading level gauge, an audible high-level alarm, and an automatic flow restrictor or flow-shutoff.

Aircraft fueling operations are performed on the Passenger Terminal apron, on the apron south of the Air Cargo Building, on the apron south of the West Cargo facility, and on the apron south of the West FBO.

When not in use, airport fuel service trucks are staged on concrete containment pads situated at each FBO. The containment pads slope toward intakes that drain fluids into underground concrete storage vaults. The storage vaults are capable of containing the aggregate volume of fuel in the service trucks.

Fueling of support vehicles is conducted at two dispenser pumps located near the Airfield Maintenance facility. The concrete surrounding the dispensers is sloped to a trench drain that routes fluids to an oil/water separator system. An aboveground storage tank and dispenser pumps are located at the Rental Car facility. The tank is double-walled, equipped with an interstitial monitor, and spill/overfill prevention devices. The tank loading/unloading area is constructed with a sloped concrete containment system. A trench drain along the dispenser islands routes any fluids to an oil/water separator system.

1.6.5. Aircraft and Pavement Deicing

Aircraft deicing is currently conducted in four apron locations on the Airport: the Terminal Apron, the East Cargo Apron, the West FBO Apron, and the West Cargo Apron. All aircraft deicing is conducted by aircraft operators or FBOs using only Type I and Type IV propylene glycol-based aircraft deicing fluids (ADFs). ADF application reported by the aircraft operators and FBOs for the past four deicing seasons is summarized in **Table 1-5**.

Table 1-5. Total Type I and IV ADF reported used by air carrier and FBOs for deicing seasons between 2009 and 2013 (gallons reported as applied).

Airline/ FBO	Type	2009-2010 Gallons	2010 - 2011 Gallons	2011 - 2012 Gallons	2012 - 2013 Gallons	Total by Type	Location of Use
American Eagle	I	15,877	13,061	8,186	10,272	47,396	Terminal
	IV	2,666	1,279	1,241	1,065	6,251	
Landmark	I	12,316	4,577	1,685	13,180	31,758	99% @ Terminal 1% at E. Cargo
	IV	2,155	497	171	1,700	4,523	
PS Air	I	475	5,825	3,144	-	9,444	Terminal
	IV	0	1,514	555	-	2,069	
Regional Elite	I	16,754	19,775	12,731	-	49,260	Terminal
	IV	2,580	2,040	2,296	-	6,916	
UPS	I	5,505	4,205	3,910	4,560	18,180	E. Cargo
	IV	1,482	190	450	670	2,792	
Federal Express	I	15,095	7,490	4,280	9,985	36,850	W. Cargo
	IV	2,570	1,030	390	610	4,600	
Delta Global Services	I	-	-	-	11,220	11,220	Terminal
	IV	-	-	-	1,625	1,625	
Totals	I	66,022	54,933	33,936	49,217	204,108	
	IV	11,453	6,550	5,103	5,670	28,776	

Airfield pavement deicing is conducted by airport maintenance staff. Mechanical methods are primarily used for removing snow and ice inside the AOA. Potassium acetate and sodium acetate pavement deicers are only used when necessary, with an estimated average of 1,500 to 2,000 gallons used per year.

Discharges of runoff from deicing activities to surface waters are regulated under provisions of the Clean Water Act. In 2012, the U.S. Environmental Protection Agency promulgated national technology-based effluent limitations guidelines and new source performance standards to control discharges of pollutants from airport deicing operations. The only requirements in these guidelines that apply to the Airport relate to the use of urea for airfield pavement deicing. Specifically, the use of urea is discouraged and numeric limitations on ammonia concentrations in all airfield storm water discharges are required if urea is used.

Discharges of storm water associated with industrial activities, including deicing operations at the Airport are authorized under National Pollutant Discharge Elimination System (NPDES) permit 57-15-1-45 issued by the Iowa Department of Natural Resources (IDNR). The current permit was issued on September 1, 2011 and expires June 8, 2014.

The NPDES permit stipulates a range of compliance requirements for the control and management of runoff from deicing activities. The use of Type II ADF and airfield pavement deicers containing urea is prohibited by the permit. Aircraft deicing is only allowed in areas where the drainage is contained and discharged to the Cedar Rapids wastewater treatment facility. The permit prohibits the discharge of storm water containing glycol or glycol decomposition products to waters of the state unless it's impossible to send the runoff to the wastewater treatment facility. In addition, compliance with numerical limitations on concentrations of water quality constituents related to deicers and their breakdown products is required at storm water outfalls. Outfall 003, which receives the majority of aircraft deicing runoff, also has limitations on daily mass loads of 5-day carbonaceous biochemical oxygen demand ($CBOD_5$).

The Airport's strategy for controlling the impact of deicing operations on storm water and complying with the requirements of the NPDES permit is based on a system of best management practices and structural controls.

Use of ethylene glycol-based ADF and urea-based pavement deicers is prohibited at the Airport to reduce sources of stormwater contamination. In addition, aircraft deicing personnel are trained and knowledgeable of techniques to prevent excessive application.

All ADF is stored in a 4,000-gallon double-walled aboveground storage tank (AST) at the East Fuel Farm. Tanker trucks deliver ADF to the tanks from the loading area containment pad situated outside the Airport Operations Area (AOA) fence, and flight service trucks then offload tanks while on the unloading containment pad inside the AOA fence. The concrete loading and unloading pads are sloped and drained to concrete vaults with valves that are normally closed until the collected stormwater can be inspected for indications of pollutants. Stationary tanks and totes of various capacities are also utilized for ADF storage at the Terminal Apron, East Cargo Apron, and West Cargo Apron. These tanks and totes are positioned in areas that either drain to the deicing basins or concrete vaults.

Potassium acetate pavement deicer is stored in a 10,000-gallon tank inside the snow removal equipment (SRE) and airfield maintenance building just south of the East Fuel Farm. Loading and unloading operations are conducted inside the building.

Runoff from the Terminal Apron and East Cargo Apron aircraft deicing areas is collected by storm sewer intakes and routed via underground piping to a 51.7 acre-foot Deicing Basin located across 18th Street SW approximately one-half mile to the southeast of the deicing areas. Fluids are pumped from the Deicing Basin into the City of Cedar Rapids sanitary sewer system for treatment.

Runoff from the West Cargo Apron and West FBO Apron aircraft deicing areas is collected by intakes on the apron and routed via underground piping to a 5.6 acre-foot Deicing Basin located north of Beech Way SW approximately 1,000 feet from the cargo building. Construction of the West Cargo Deicing Basin was completed on November 1, 2012, to comply with Part II.E of the amended IDNR NPDES Permit. A force main system pumps the stormwater and deicing fluids from the West Cargo Deicing Basin into the City of Cedar Rapids sanitary sewer system for treatment.

An Industrial Waste Discharge Permit issued by the Cedar Rapids Water Pollution Control Facilities authorizes discharges of storm water runoff from aircraft deicing areas to the sanitary sewer system. Maximum allowable discharges under the permit are 33,000 gallons per hour and 800,000 gallons per day, with no limitations on pollutant concentrations or loads in the discharges. These maximum discharge flows may be reduced in the future if the airport's land bounded by Wright Brothers Blvd., Edgewood Road, 76th Avenue, and 18th Street is ever sold for commercial development.

1.6.6. Aircraft Hangars

Three separate groupings of T-hangars are located on Airport property. The hangars range in dates of construction, size, and condition. According to Airport staff, all of the hangars are filled to capacity, have about a 5% annual turnover rate, and have a waiting list for vacancies.

The oldest set of nested hangars on Airport property is the West T-hangars. Two buildings, with fourteen hangar spaces each are located south of the West FBO. These hangars have gravel floors and house privately-owned single-engine piston aircraft. Access to these hangars is provided from Wright Brothers Boulevard on Cessna Place. There are no dedicated automobile parking spaces for these hangars.

The West T-hangars
Photograph by Mead & Hunt, Inc. (2011)

Interior of one of the West T-hangars. Note the gravel floors and tarp covering a leaky roof.
Photograph by Mead & Hunt, Inc. (2011)

To the north of the West FBO are the Northwest T-hangars. These four buildings each have ten hangar spaces and are the newest hangars on Airport property. These hangars feature concrete floors and steel-frame construction, and house privately-owned single-engine piston aircraft. Heaving concrete is placing stress on the steel-frame construction and roof. Access to the hangars is also provided on Cessna Place. There appears to be plenty of apron between the buildings.

The last set of T-hangars, the East hangar area, is located north of the former Iowa Army National Guard site. This set of four buildings has a total of 60 nested hangar spaces, which feature concrete floors and steel frame construction. These hangars also house privately-owned single-engine aircraft. Access to the East hangars is made from 18th Street Southwest. There is no dedicated automobile parking at these hangars. There does appear to be adequate apron and space between each of the hangars to allow for the movement of aircraft.

The Airport also hosts several large corporate hangars located south of Lippisch Place and north of the East FBO. These include two hangars occupied by Alliant Energy, and three hangars occupied by Rockwell Collins. These hangars accommodate many of the Airport's based jet fleet.

1.6.7. Ground Service Equipment (GSE) Storage

Individual airlines are responsible for the maintenance and storage of all of their ground service equipment (GSE), which includes tugs/tractors, baggage carts, and belt loaders, among other items. Typically, GSE is stored under the elevated walkway between Concourses B and C. However, there is no dedicated storage area on site for GSE, and the area under the walkway is not striped. As a result, equipment is often parked on apron pavement, near boarding bridges and the in-line baggage system, and at various other locations around the Airport.

Area under the Concourse 'C' walkway that is currently used for GSE storage
Photograph by Mead & Hunt, Inc. (2011)

1.6.8. Snow Removal Equipment (SRE) Building

Designed and constructed in 2001 and located southeast of the Passenger Terminal Apron, the SRE building serves as the base of operations for maintenance and storage of snow removal equipment. The 117-foot x 401-foot building is constructed of pre-engineered steel, fully sprinklered, and uses an infrared heating system. Three oversized bays are located at the rear and one at the front of the building. A salt and sand shed is attached to the east elevation of the building.

According to Airport staff the building is nearing storage capacity. However, the building will be difficult to expand in width due to its architectural and structural design. Additionally, the location of the building currently inhibits future expansion of the apron. Access to the SRE building is provided from 18th Street Southwest.

SRE Building
Photograph by Mead & Hunt, Inc. (2011)

Interior of the SRE Building
Photograph by Mead & Hunt, Inc. (2011)

1.6.9. Airport Rescue and Firefighting (ARFF)

In 2009, the Airport Rescue and Firefighting (ARFF) was moved from its historic location to a new building located northeast of Runway 13/31. The new building consists of a large garage area, offices, a fitness center, kitchen, day room, training room, meeting room, and dorm rooms for the 13 ARFF staff.

Access to the ARFF building is located at the end of Lippisch Place. There are 30 dedicated parking spaces associated with this building for visitors and staff. This building currently meets the needs of the occupants.

Interior of the ARFF Building
Photograph by Mead & Hunt, Inc. (2011)

1.6.10. Air Traffic Control Tower (ATCT)

Located west of the terminal, the air traffic control tower (ATCT) overlooks the Airport runways. Constructed in 1979, the tower is approximately 106-feet tall with a central stair and elevator leading to the control tower viewing cab. The tower appears to be in good condition, and is managed and staffed by the FAA. The ATCT location and height provides controllers with sufficient visibility of all controlled movement areas, including the runways, taxiways, terminal area, and airspace in the Airport vicinity. The tower is operated daily from 5:00 AM to 11:30 PM. Air traffic controllers located in the tower provide instructions to aircraft operating in the air and on the ground.

Air Traffic Control Tower
Photograph by Mead & Hunt, Inc. (2011)

1.6.11. Former ARFF

Constructed in the 1960s, the former ARFF building served as the emergency response headquarters until 2009 when the new ARFF building was constructed. The building has a large, open bay accessed by four overhead doors. Two small offices, a kitchen, workout room, and storage room are located to the south and west. The building is heated and cooled with a forced air system. Interior finishes are dated, but intact. The former ARFF building is situated near the north end of Runway 13/31 on Taxiway D, adjacent to the east FBO building. Because of its location, the building could be repurposed as an executive hangar or storage space.

Former ARFF building, now vacant
Photograph by Mead & Hunt, Inc. (2012)

1.7. Passenger Ground Vehicle Access, Circulation, and Parking

This section discusses passenger ground vehicle access, circulation, and parking facilities within the current terminal area road network. These facilities are described in the following sections:

- Airport Access and Signage
- Passenger Vehicle Parking
- Rental Car, Taxi, and Shuttle Parking

1.7.1. Airport Access and Signage

Passenger terminal access roads and parking lots are depicted in **Figure 1.6**. Along Wright Brothers Boulevard, Airport signage directs visitors to the passenger terminal and parking lots. The terminal building and parking lots are accessed by turning south onto Arthur Collins Parkway, which is the terminal area road that passes in front of the main terminal and exits onto 18th Street Southwest. Lippisch Place bisects the parkway near the entrance and provides access to the East FBO, Rockwell Collins, the ATCT, the ARFF building, and other interior access roads. North of the intersection with Lippisch Place, Arthur Collins Parkway is a four-lane street with two lanes in either direction. South of Lippisch Place, Arthur Collins Parkway becomes a one-way road and narrows to two lanes. The right lane flows into the curbside passenger pick-up and drop-off locations in front of the terminal and the left lane accesses the short- and long-term parking lots.

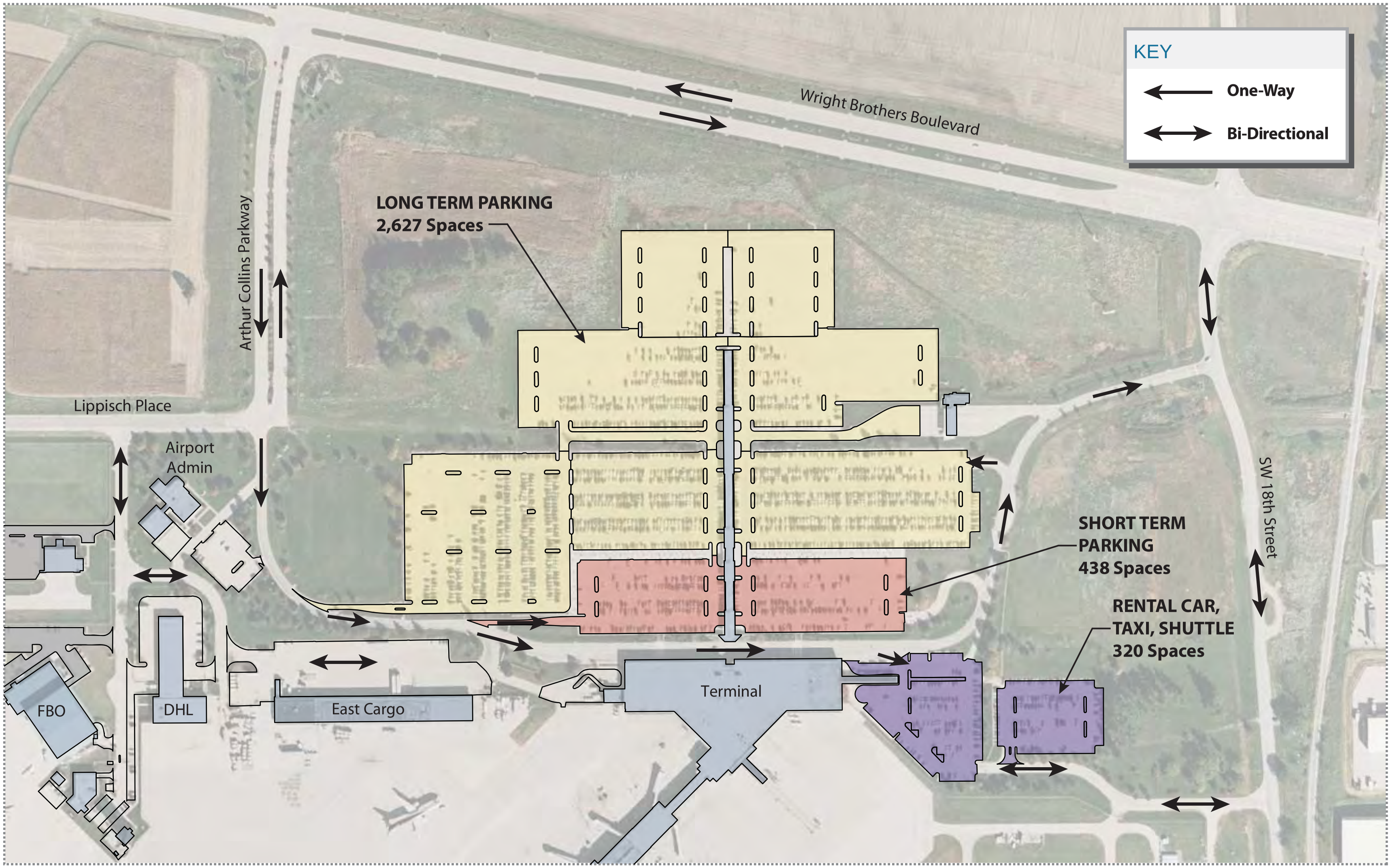


Figure 1.6
Terminal Area Vehicle Circulation

Source: Airport Layout Plan and Mead & Hunt, Inc.

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Arthur Collins Parkway curves to the south and east, past the UPS/USPS cargo distribution center and to the main terminal. Here the road widens into four lanes at the curbside, including one drop-off/pick-up lane (nearest to the terminal entrance) and three other drive through lanes. Two standard crosswalks and sets of exterior stairs connect the passenger terminal with the parking lot, which is located on the other side of Arthur Collins Parkway. Signs hanging from the terminal building's canopy indicate the locations of airline ticketing and baggage claim inside the building. These signs are small and generally difficult to read from a vehicle approaching the terminal building. Few traffic calming measures have been implemented that indicate to drivers that they need to reduce speed in front of the passenger terminal. This situation can sometimes cause the curbside area to be unsafe for pedestrians and for the loading and unloading of vehicles.

After leaving the terminal, traffic continues to move east on Arthur Collins Parkway. The rental car return parking lot, shuttle parking, and a taxi waiting area are directly adjacent to, and immediately after, the baggage claim entrance and passenger pick-up portion of the curbside. This area is not directly visible from Arthur Collins Parkway, and is only indicated by a sign located adjacent to the entry point. After the sign, Arthur Collins Parkway curves to the north and east, until it reaches 18th Street Southwest. At the intersection, drivers can choose to turn north or south.

Terminal passenger drop-off and pick-up in front of the main terminal on Arthur Collins Parkway
Photograph by Mead & Hunt, Inc. (2011)

Recently constructed monument signs direct passengers traveling on Wright Brothers Boulevard to essential Airport facilities and other landside buildings. On Arthur Collins Parkway, the signs direct visitors to parking lots, the main terminal, and rental car return. The signs on the monuments are color-coded to convey information to drivers quickly: blue signs direct vehicles to passenger-related buildings such as parking, rental car return, and the terminal; green signs indicate non-passenger related buildings such as the administration building and cargo center or give directions to surrounding cities; and white signs located above the directional information provide general names and lane directions.

In general, the signs along both Arthur Collins Parkway and Wright Brothers Boulevard are large enough for visitors to read and provide ample opportunity for drivers to move into appropriate lanes. The only exceptions are the rental car return sign, which is located almost adjacent to the return lot, and signs directing visitors to the short- and long-term parking lots, which are located at the junction between lanes leading to the respective lots. The color-coding of the signs is helpful, although differentiation between colors is somewhat difficult, and the white lettering on light green signs can be challenging to read in weather conditions with low visibility. Additionally, accumulating snow will sometimes obscure the signs in the winter. The overall appearance of the signs reflects the current Airport logo and is visually appealing to visitors.

Problematic parking sign located at the junction between long-term and short-term parking
Photograph by Mead & Hunt, Inc. (2011)

Signage obscured by snow.
Photograph by Mead & Hunt, Inc. (2011)

1.7.2. Passenger Vehicle Parking

A parking study was prepared for the Airport in 2006, which determined that there was a parking shortage in the short-term, long-term, and rental car ready/return lots. At the time the study was conducted, there were 348 short-term and 1,863 long-term parking spaces provided at the Airport. The authors projected that 784 short-term and 3,135 long-term spaces were necessary for further Airport growth and expansion.

To meet these projections, the study recommended a parking lot reconfiguration, the relocation of entry and exit lanes, the addition of an economy long-term lot, the construction of a canopy over the central walkway through the lots, and the creation of a “cell phone” lot for individuals waiting to pick-up arriving passengers. All of these recommendations were implemented by 2010.

CID's short-term and long-term parking lots with central canopy
Photograph by Mead & Hunt, Inc. (2011)

The existing Airport parking lots are configured in such a way that short-term parking is located immediately north of the terminal and adjacent to curbside passenger drop-off. The long-term lot is located north of the short-term lot, with an economy long-term lot beyond the long-term lot. Currently, there are 438 stalls in the short-term parking lot and 2,627 stalls in the long-term parking lot. Parking rates range from $5 per day for long-term parking to $7 per day for short term parking. A parking revenue control building with manned pay-booths is located at the parking lot exit. The building features limestone veneer and a similar design aesthetic to the covered canopy. A diagram of automobile parking is shown in **Figure 1.6**.

While the number of parking stalls in the public lots is generally sufficient during most conditions, the pedestrian and vehicle circulation within the parking lots has, in practice, proven to be unsatisfactory. The vehicle circulation has blind corners and the configuration of the through lanes encourages high driving speeds, making the parking lot sometimes unsafe for pedestrians and vehicles alike. In addition, aside from the sidewalk and canopy that lead to the passenger terminal, pedestrian circulation is not well defined. The central canopy, while assisting to define the main pedestrian path to the passenger terminal, does not provide shelter from the weather when strong winds are blowing, which occurs frequently.

1.7.3. Rental Car, Taxi, and Shuttle Parking

The ground transportation lot – home for rental cars, taxis, and shuttle parking – is located east of the terminal building. The rental car parking facilities at the Airport include both a ready/return lot and service facilities that support the rental car agencies. A shared service garage for refueling, storage, maintenance, and cleaning of rental cars is located south of the terminal on the east side of 18th Street Southwest. The vehicle return area is located to the east of the terminal in the ground transportation lot, and service counters for each of the rental car agencies are located inside the passenger terminal. In the summer of 2013, the ground transportation lot will be reconfigured and expanded to accommodate the growing needs of the rental car fleet. The expansion and reconfiguration project planned for this area will result in a total of 227 regular rental car stalls, 8 premium rental car stalls, and 189 employee parking stalls.

The primary public access to rental car pick-up and drop-off lots is located on 18th Street Southwest. Signage directing rental car returns to 18th Street is provided east of the Airport on Wright Brothers Boulevard. However, returns can also be made from Arthur Collins Parkway. Access to the lots from two directions, poor signage and patterns of vehicle circulation contribute to congestion for passenger drop-off at the curbside and make access to the lot from Arthur Collins Parkway challenging. See **Figure 1.7** for the circulation pattern in front of the Airport terminal and within the ground transportation lot. Airport administration would like to limit rental car returns to 18th Street Southwest only and eliminate the use of Arthur Collins Parkway for returns, which will occur as part of the upcoming lot reconfiguration project.

A long metal-clad canopy with wide concrete columns extends east from baggage claim to the ground transportation lot. Twelve shuttles are allowed to park along the north side of the canopy and three taxi cabs along the south. An additional six taxi car spaces are located within the interior parking areas; however, these spaces are unsigned and often misused by rental car customers.

In general, the ground transportation lot is inadequate in size, function, and layout, and access to this area from Arthur Collins Parkway is cumbersome and confusing. The eastern canopy, while providing shelter from the elements except in strong winds, is dated and unwelcoming. Poor signage of parking stalls and lack of policing of the area have resulted in the misuse of the shuttle and taxi waiting areas by passengers and rental car customers returning vehicles. The rental car parking lot is adequate in size for days of average use; however, Airport staff has indicated that the lot is overflowing with vehicles during peak seasons and after heavy snowfalls.

Taxi Waiting Area

Canopy

Shuttle Waiting Area

Passenger Drop-Off/Pick-Up

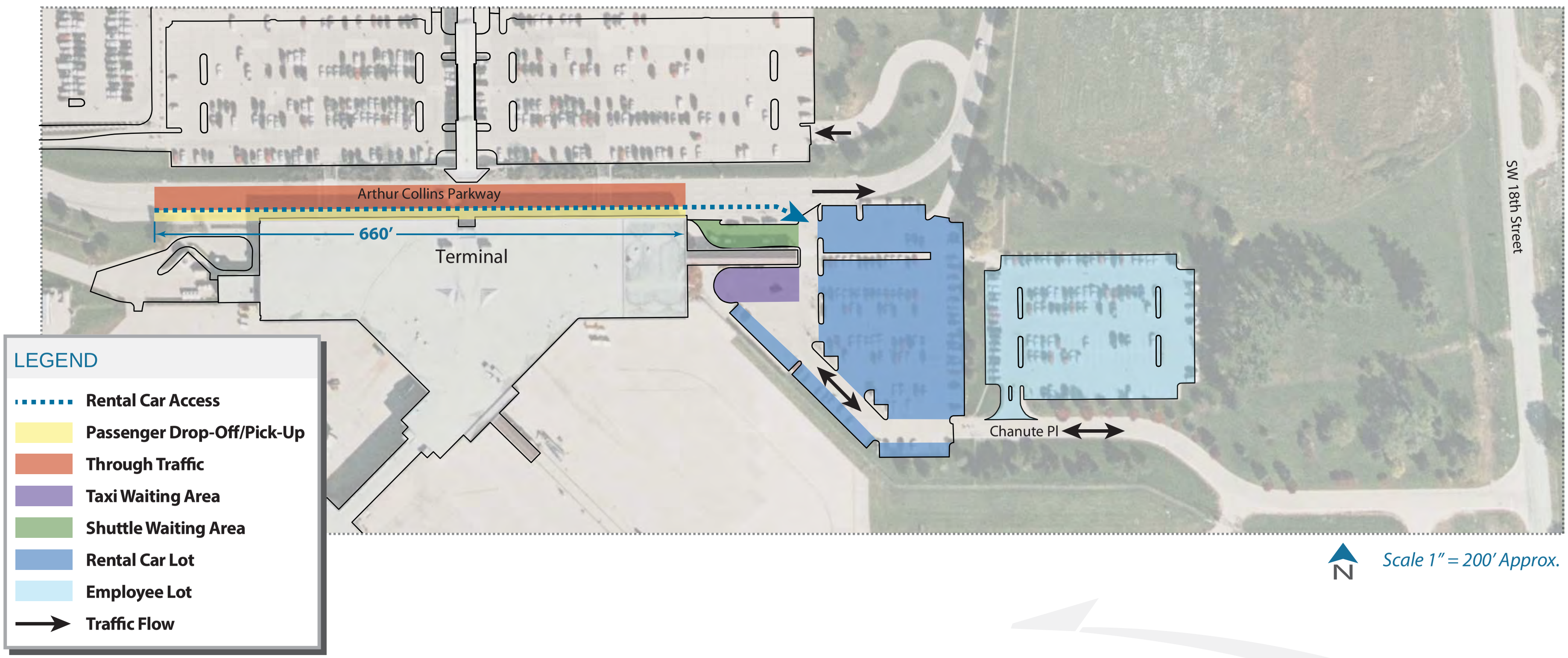

Figure 1.7
Detail of Terminal Curbside Circulation

Source: Airport Layout Plan and Mead & Hunt, Inc.

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Taxi and shuttle waiting areas adjacent to rental car return parking lot and eastern canopy
Photograph by Mead & Hunt, Inc. (2011)

The eastern canopy toward baggage claim
Photograph by Mead & Hunt, Inc. (2011)

1.8. Passenger Terminal Building

The Airport terminal building is located at 2515 Arthur Collins Parkway Southwest. Upon turning onto Arthur Collins Parkway from Wright Brothers Boulevard, incoming visitors are greeted by a non-descript, horizontal building having a distinct late 20th-century design aesthetic. The building was constructed in 1986, replacing the original Airport terminal that was constructed in 1953. Terminal expansion projects were completed in 1997, 2009, and 2012. **Figure 1.8** illustrates the layout of the passenger terminal building.

The passenger terminal facility is a one-story building connected to a two-story pier-style concourse, which is accessed by a second-story pedestrian bridge. The terminal building is clad in beige metal panels with vertical and horizontal metal banding. It has uniform height across the front façade, with a small break in the attached canopy over the primary entry door. The canopy overhangs the passenger drop-off/pick-up lane in front of the terminal. The ticketing and bag claim areas as well as public amenities such as car rental offices, restaurants, vending, and a retail store are located in the public portion of the terminal building. The security checkpoint is located in the “throat” of the terminal building, where it connects to the concourse. Concourse C has six gates with boarding bridges and dedicated hold rooms located on the second floor, and Concourse B has seven gates with a single, shared hold room located on the ground floor. A metal clad canopy with wide concrete columns similar to the eastern rental car canopy extends southeast from the ground boarding hold room to the apron. Similar to the terminal, the second floor of the concourse is clad in metal panel, while the first floor and two stair towers are clad in brick. The first floor of the concourse houses the concourse building systems and airline operations areas. The basement level of the terminal building houses a majority of the terminal building systems and storage areas as well as a corridor that connects the restaurant with the loading dock area. The building systems include a boiler with heat pumps, cooling tower, HVAC, and pneumatic compressor. The roof of both the terminal and concourse consists of rolled asphalt roofing with two triangular skylights in the center of the terminal lobby, and a linear skylight above the circulation spine at the end of the concourse. The different functional areas of the passenger terminal building are discussed in the following sections:

- Passenger Terminal Entries
- Terminal Lobby
- Ticketing
- Baggage Claim
- Security Checkpoint
- Concourse B
- Concourse C

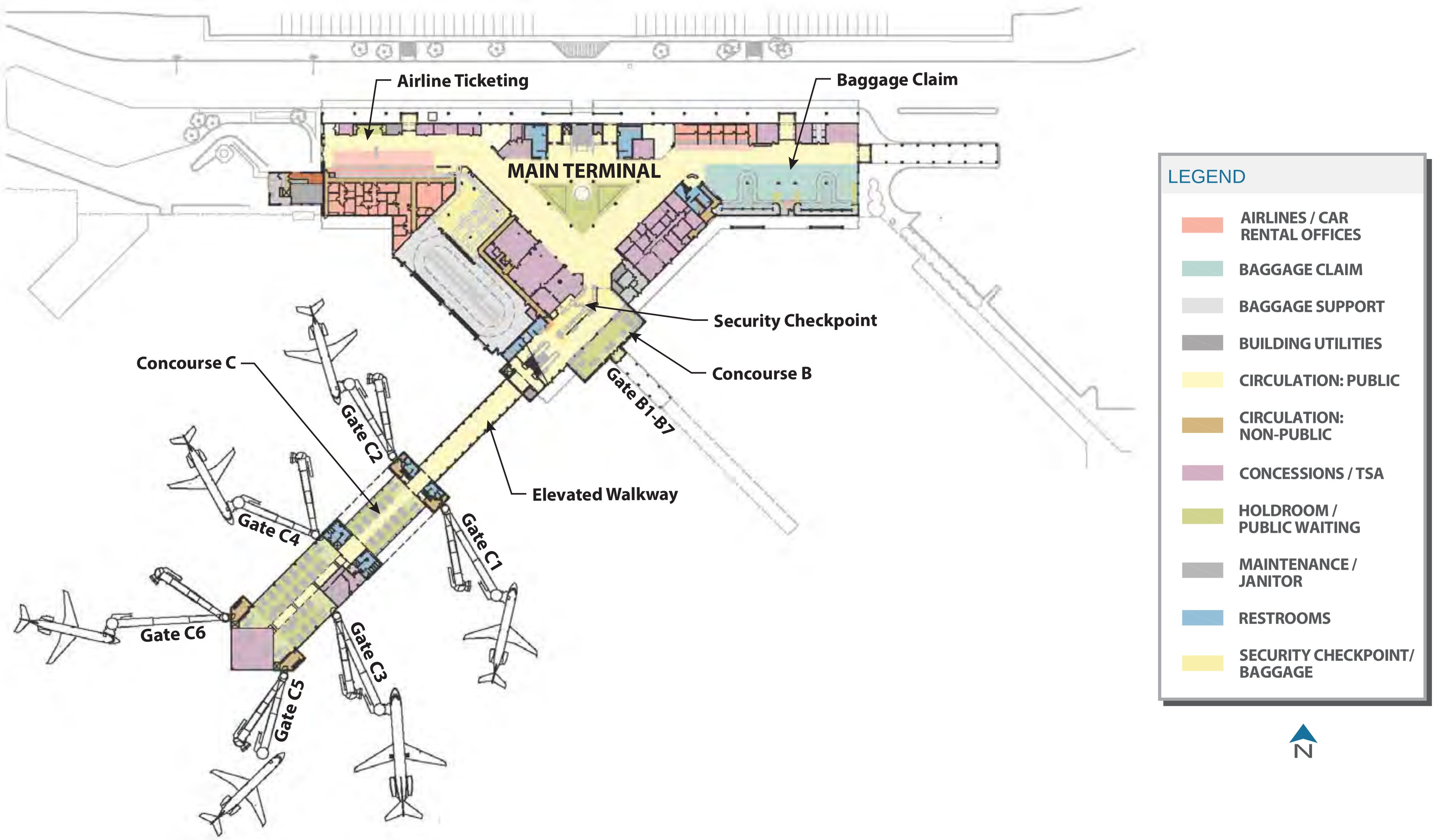


Figure 1.8
Passenger Terminal Floor Plan

Source: Airport Records and Mead & Hunt, Inc.

Main terminal façade and entry at the passenger terminal drop-off and pick-up area
Photograph by Mead & Hunt, Inc. (2011)

1.8.1. Passenger Terminal Entries

The primary entries to the terminal building are located at the curbside drop-off/pick-up area outside of the terminal. Though the color of the metal panel changes at the building entries, the continuous nature of the attached canopy makes these entries difficult to distinguish from a moving vehicle. As a result, vehicles often change positions several times as they are dropping off or picking up passengers, increasing the amount of disorder at the curbside. At peak times, SkyCap employees will often assist with bringing order to the curbside.

The surface parking lot is located roughly 10 feet below the curbside/roadway grade. Visitors arriving from the parking lot use either an exposed exterior concrete stairway to access the roadway where they can cross Arthur Collins Parkway SW to the terminal at cross walks, or they can use a pedestrian tunnel under the roadway that has an interior stair/escalator set which takes them directly into the terminal lobby. In general, the tunnel connecting the parking lot to the escalators and stairs is a dark space devoid of natural light and a comforting color pallet.

Central canopy and entry vestibule from the parking lot, which is below the grade of the main terminal access road
Photograph by Mead & Hunt, Inc. (2011)

Entry tunnel below Arthur Collins Parkway
Photograph by Mead & Hunt, Inc. (2011)

Escalators and stairs from the tunnel to the passenger terminal
Photograph by Mead & Hunt, Inc. (2011)

1.8.2. Terminal Lobby

The lobby is a large space with cool-tone finish colors, continuous maroon soffits, and acoustic tile ceiling with fluorescent lighting. Horizontal silver metal slatwall is used in the skylights and above the soffits for accent. Immediately in front of the tile landing for the escalator/stair connection from the parking lots is an information booth and a general seating area. The lobby is divided into three areas: ticketing and a gift shop to the west, rental car offices and baggage claim to the east, and security checkpoints and two restaurants in the central area, directly opposite the escalators. A small freestanding sign at the top of the landing and adjacent to the information booth directs visitors to each of these areas.

Two restaurants, one gift shop, restrooms, and TSA offices are located within the main lobby. The gift shop is located along the curbside exterior wall near the ticketing area. The restaurants are located on the opposite side of the lobby from the escalators adjacent to the security checkpoint. The restaurants and gift shop are well utilized by waiting passengers and visitors. A set of men's and women's restrooms flank the escalators. These restrooms have dated furnishings and finishes, but are generally sized appropriately for the space. A second set of restrooms was recently constructed in the baggage claim area across from the car rental counters. Large-scale public art is located on some of the walls in the lobby.

Several of the former tenant spaces located between the main circulation corridor and the curbside wall that are no longer occupied. One of these spaces formerly occupied by the information desk has new finishes, lighting, and display cases, and is currently being used as an informal business center. Other uses of this space include a vending area, a gallery that displays aircraft and airport history, a conference room, a baggage service office, and a display area. Lastly, TSA offices are located in the terminal lobby adjacent to the security check-point and opposite the restaurants. These offices were constructed recently and contain approximately four offices, a break room, a storage room, and other multi-purpose spaces.

Main terminal lobby and information desk - view from the escalator
Photograph by Mead & Hunt, Inc. (2011)

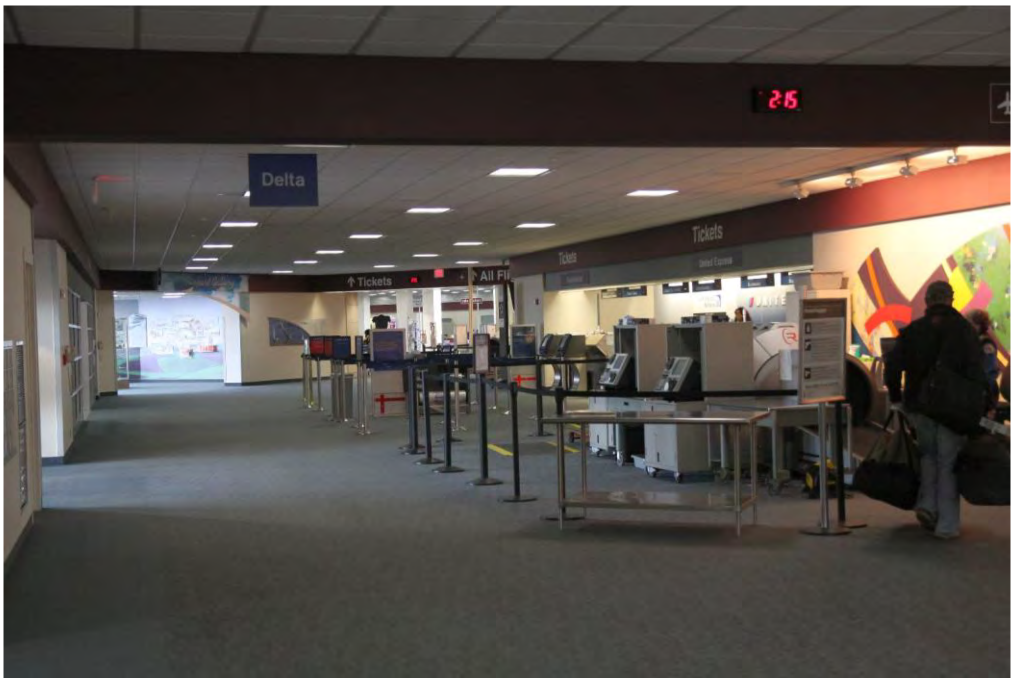
Interior of the main lobby area c.1986
Photograph courtesy of The Eastern Iowa Airport

Interior finishes and organization of the lobby space are similar to the c.1986 photograph
Photograph by Mead & Hunt, Inc. (2011)

Vacated information booth currently used as a business center
Photograph by Mead & Hunt, Inc. (2011)

1.8.3. Ticketing

The commercial airline ticketing area is located on the west side of the lobby. This area was recently reconfigured to allow for the installation of an in-line baggage system, which was completed in the fall of 2012. Ticketing counters, kiosks and queuing are located on the south side of the main circulation corridor. Airport staff reports that approximately half of passengers receive their boarding passes at the counter and half check in via kiosks or remotely. An exit door is located to the far west end of the circulation portion of the ticket lobby, although this door is not used by passengers.

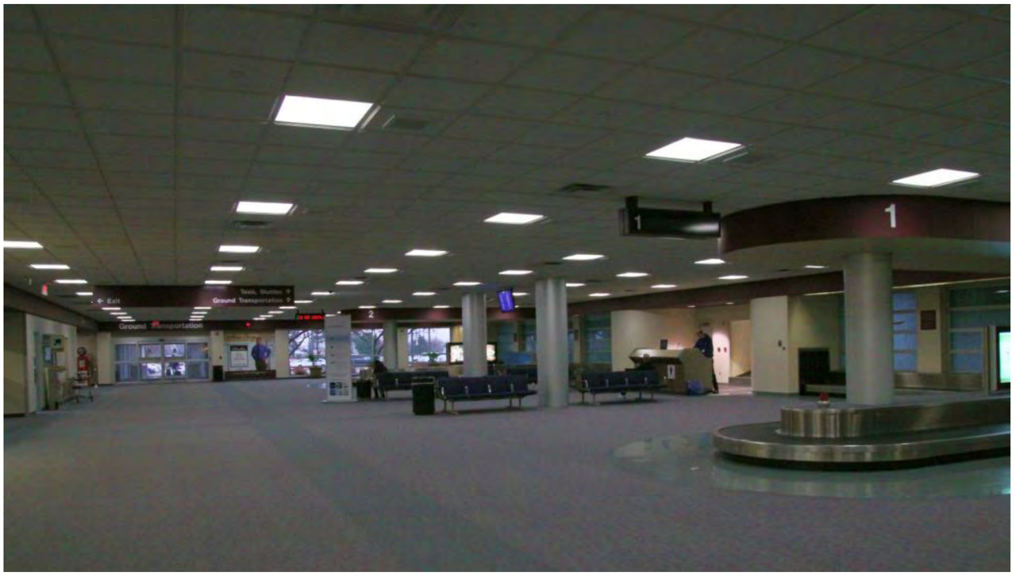


Ticketing area, looking east
Photograph by Mead & Hunt, Inc. (2011)

1.8.4. Baggage Claim

The baggage claim area is located east of the main lobby. This area contains rental car service counters, baggage claim devices, a conference room, and a space currently being used for display and a small amount of vending.

Two flat-plate baggage carousels with 100 linear feet of public claim frontage are located on the south side of the baggage claim room. Currently, baggage carousel usage appears to be light, though this may be due, in part, to the implementation of airline baggage services fees. In a survey of the use of the baggage claim area, about 15 passengers per flight picked up baggage at the carousel. The approximate wait time for baggage was less than 10 minutes, and it was rare for both baggage carousels to be used at the same time. The baggage claim area is spacious, though there is not sufficient seating to accommodate all waiting visitors and passengers.



Baggage claim area
Photograph by Mead & Hunt, Inc. (2011)

Car rental service counters are located along the north exterior wall of the baggage claim area on the opposite side of the circulation area from the claim devices. Car rental staff reports that the counter area provides ample space for individual business needs. There are no dedicated queuing areas for the individual rental businesses, leading to occasional confusion for customers.

On the far east end of the building are two exits, one leading to the curbside outside the terminal and the other leading to ground transportation lots located on the east side of the building. Similar to other exits along the curbside, these exits are configured with two sets of automatic sliding doors with the intent of reducing heat gain/loss. However, the vestibules do not have an adequate space between the sets of doors to create an airlock, and there is not sufficient walk-off area to clean shoes in snowy weather.

1.8.5. Security Checkpoint

Passengers access the security checkpoint at the far south side of the terminal lobby from the curbside. An etched glass wall separates the passenger screening lanes from the exit lane which is, in turn, located directly adjacent to the Concourse B hold room.

There is no dedicated queuing area on the non-secure side of the security checkpoint. At busy times, a line extends into the terminal lobby and blocks the adjacent restaurant entry or exit lane. While the exit lane is generous, the remainder of the checkpoint is too small to efficiently manage the number of passengers seen at peak times. The security area consists of two screening lanes, both of which are shorter than recommended in TSA's Checkpoint Design Guide, and jog to one side in order to follow a turn in the building. The divesting areas are constrained, with inadequate space for organized removal of necessary articles of clothing, placement of bags, and screening bins. Passengers are also required to move bins from a single table to the X-ray machine. A private screening room is located behind a stairway, a short distance beyond the security checkpoint near the end of the right-most security lane. The checkpoint currently has two metal detectors. Plans for the addition of a full body scanner are underway; however, this will require structural reinforcement of the floor and an upgrade of ventilation and cooling in this area. The addition of larger equipment in the existing space will be challenging because the space is already inadequate for screening.

A small recomposure area is located beyond the screening area where a few benches and chairs have been provided for passengers to dress and repack their bags. This space is small and the seating insufficient for this purpose. Often, passengers resort to utilizing other spaces such as the exit lane or hallway for recomposure.

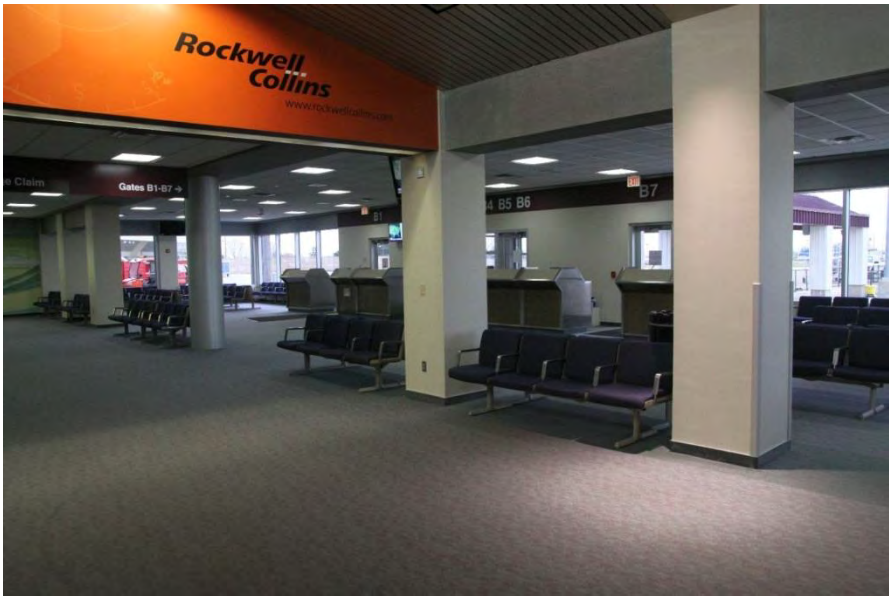
Security checkpoint (left) and exit (right), from the secure side facing the terminal lobby
Photograph by Mead & Hunt, Inc. (2011)

Security checkpoint (right) adjacent to bar/restaurant and exit (left)
Photograph by Mead & Hunt, Inc. (2011)

1.8.6. Concourse B

Concourse B is located directly adjacent to the security checkpoint exit lane. This ground level concourse has seven ground-boarding gates with a single, shared hold room. According to Airport staff, this concourse is used infrequently and is reserved either for back-up if the gates in Concourse C are full or for honor flights. The hold room for Concourse B has approximately 100 seats. Gates B2 through B6 utilize a small vestibule, while Gates B1 and B7 open directly to the apron. A 50-foot long canopy projects from the terminal protecting passengers from the elements, and a 180-foot long fenced area projects beyond the canopy. At-grade aircraft parking surrounds the canopy and fenced area. Restrooms are located on the opposite side of the escalators adjacent to the security checkpoint. These restrooms have dated finishes, but appear to be adequate in size.

Concourse B, exterior with canopy, facing south
Photographs by Mead & Hunt, Inc. (2011)



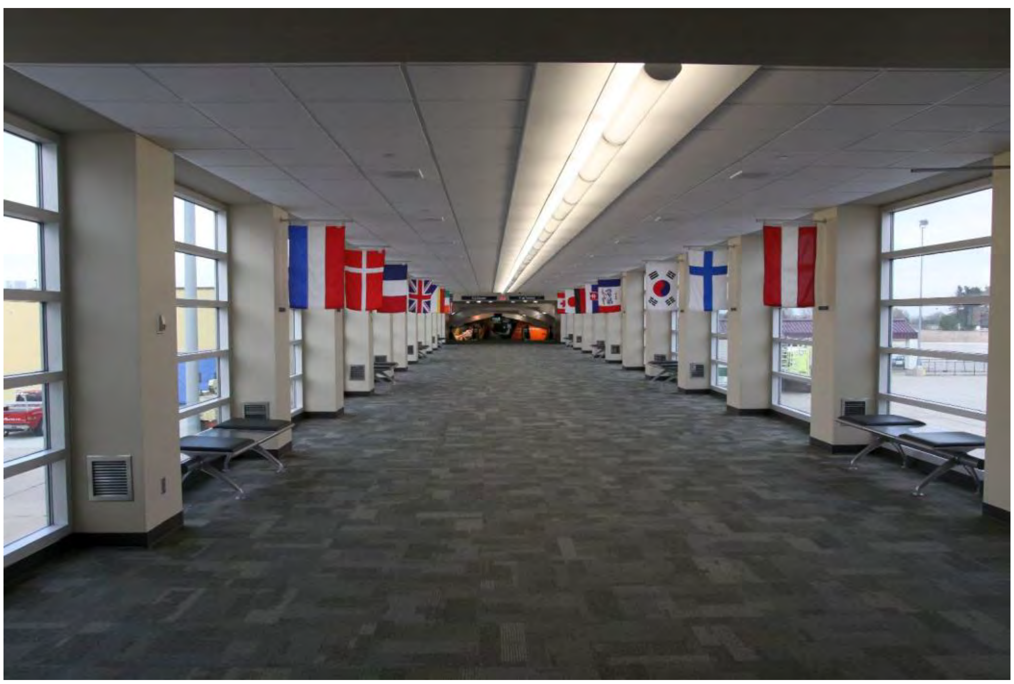
Concourse B with shared hold room and Gates B1- B7
Photographs by Mead & Hunt, Inc. (2011)

1.8.7. Concourse C

Concourse C is located on the second level of the secure portion of the passenger terminal and is the primary concourse for the terminal. This concourse has six gates with passenger boarding bridges, a news and gift stand, a bar/restaurant, and restrooms arranged along a central circulation corridor. From the security checkpoint, access to the upper level concourse is provided by escalator, elevator or stairs. A pedestrian bridge between the escalators and concourse has about 20 feet of effective width, a few seats, and is decorated with national flags. This walkway is used by passengers for additional seating when gates C1 and C2 are congested, as an aircraft viewing area, or as an area to walk through while on cell phones.

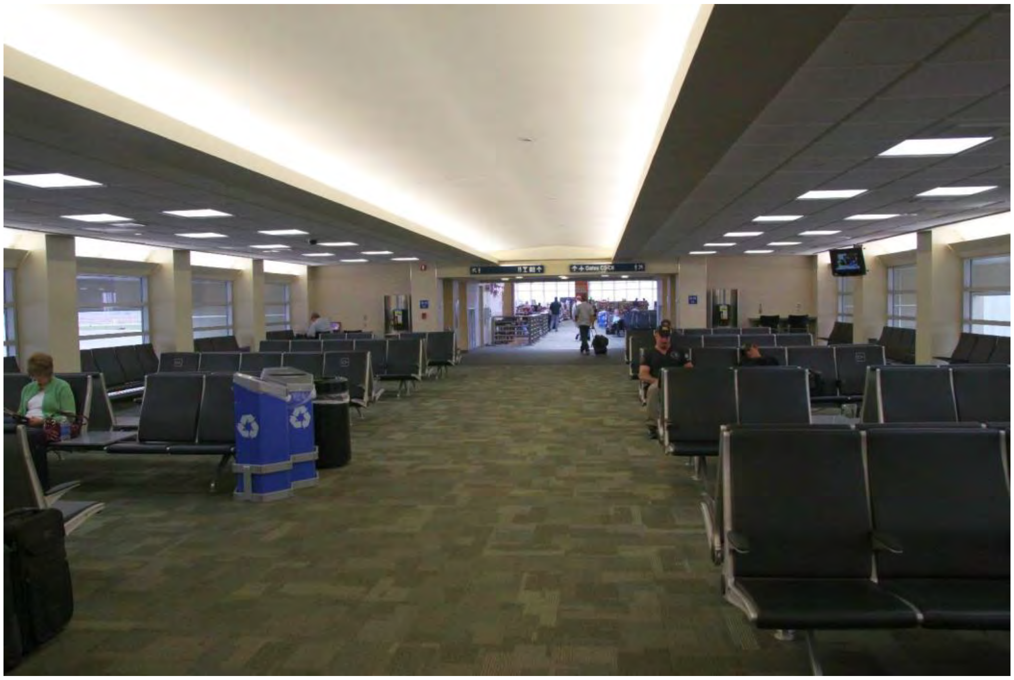
CID terminal building C Concourse
Photographs by Mead & Hunt, Inc. (2011)

Escalators and stairs provide access to upper level and Concourse C
Photographs by Mead & Hunt, Inc. (2011)

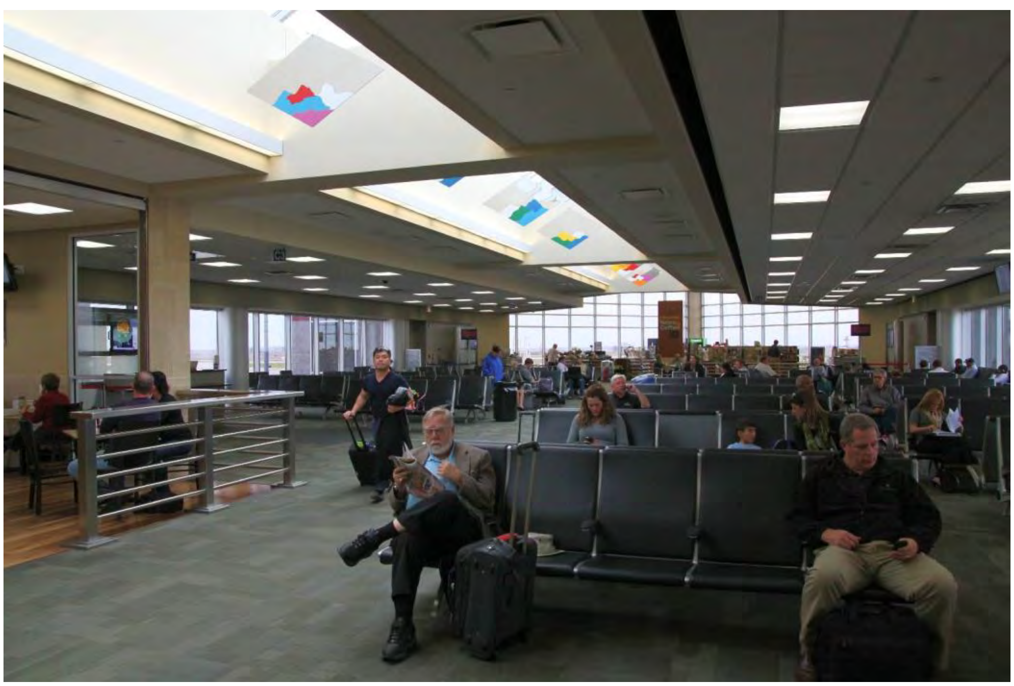


Pedestrian bridge between stairwell and Concourse C
Photographs by Mead & Hunt, Inc. (2011)

Concourse C is the most recently constructed concourse and features contemporary finishes, beam seating, and abundant natural light. There are approximately 380 seats in the concourse, some of which offer power connections for charging electronic devices. A large art installation located at the far end of the concourse adds a whimsical element to the open space. There are two sets of restrooms and drinking fountains located along the main circulation walkway gates, though there are no companion care restrooms in the secure area.



Gates C1 and C2
Photographs by Mead & Hunt, Inc. (2011)



Gates C3-C6, bar (left), and café (background)
Photographs by Mead & Hunt, Inc. (2011)

A small bar/restaurant is located between the restrooms and Gate C5 and features approximately six tables and a bar. At the far end of the concourse is a news and gift shop. This location is not ideal because it is not in a high-traffic area, which is generally beneficial to both the shop and passengers.

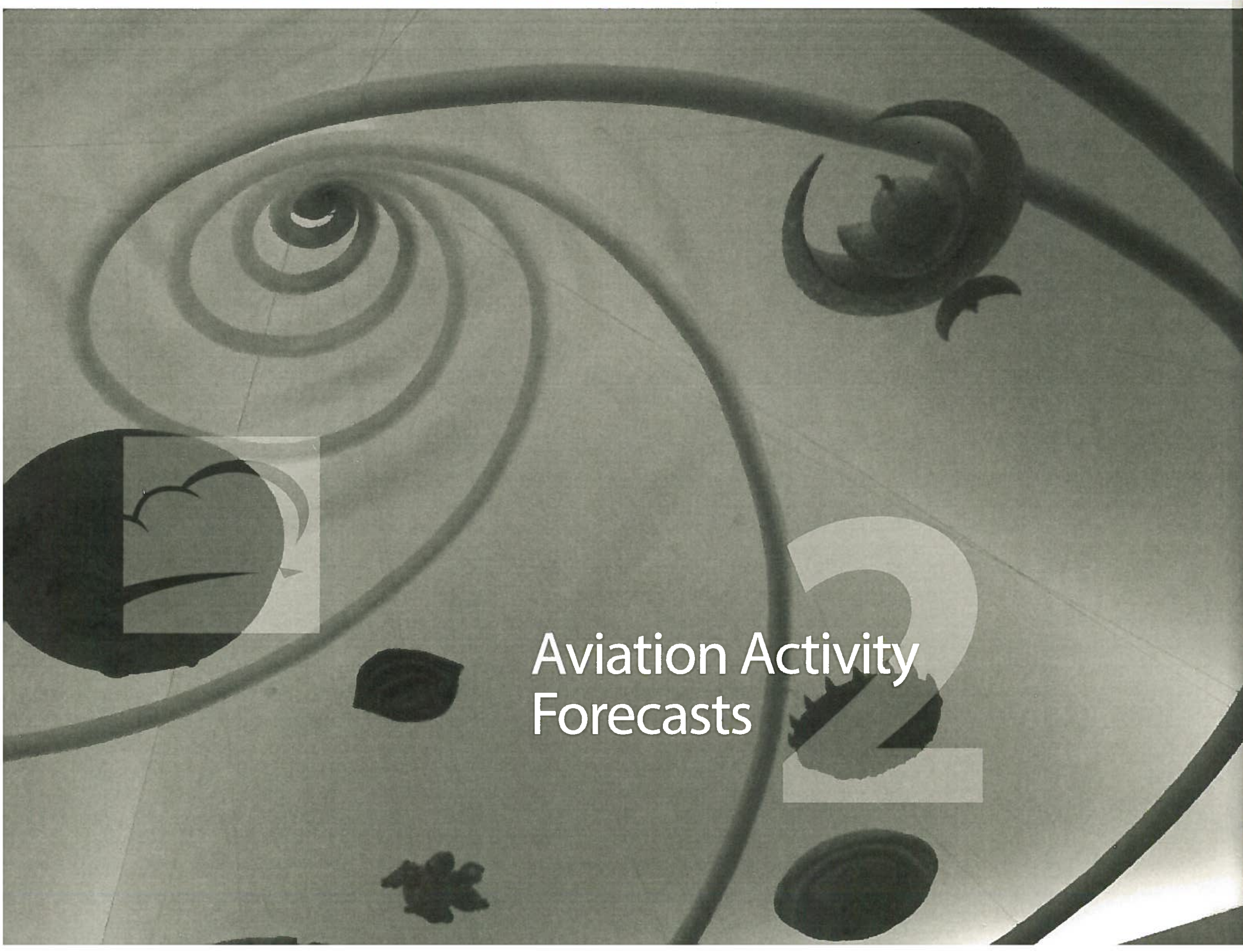
There are no dedicated gates at the Airport; however, larger airlines such as Delta and United have preferential use, as established by Airport policy. Of the six C gates, five bridges are apron drive and one is a teleradial bridge with valet baggage lift.

1.9. Inventory Summary

The facilities described in this inventory chapter will be evaluated in terms of existing conditions and ability to accommodate current levels of demand. They are analyzed in conjunction with projections for future aviation-related demand, which is presented in Chapter 2. Chapters 3 and 4 discuss current and future facility requirements. Finally, alternatives for Airport development that consider sustainability, operational, economic, environmental, and implementation feasibility are presented in Chapters 5 and 6.

MASTER PLAN

THE EASTERN IOWA AIRPORT CEDAR RAPIDS



2

Aviation Activity Forecasts

CHAPTER 2

Aviation Activity Forecasts

This chapter presents aviation activity forecasts for The Eastern Iowa Airport (referred to as CID or Airport) over the 20-year planning horizon. Aviation demand forecasts are an important step in the master planning process. Ultimately, they form the basis for future demand-driven improvements at the Airport, provide data from which to estimate future off-airport impacts such as noise and traffic, and are often incorporated by reference into other studies and policy decisions. The forecasts contained herein project activity through 2031 using 2011 as a baseline year. These forecasts received official approval from the Federal Aviation Administration (FAA) Central Region in June 2013. This chapter is organized as follows:

- Support Documents
- Forecast Methodologies
- Passenger Enplanement Forecasts
- Aircraft Operations and Based Aircraft Forecasts
- Air Cargo Tonnage and Fleet Mix
- Peak Activity Forecasts
- Design Aircraft
- Forecast Summary and FAA TAF Comparison

2.1. Support Documents

In late 2011, Mead & Hunt produced two documents in support of the Master Plan aviation forecasts: an *Air Service Market Research* report and a *Passenger Demand Analysis* report. The *Air Service Market Research* report presents data to help understand the air service market for CID, including identifying the threat of potential air service reductions and defining future potential air service improvements. The *Passenger Demand Analysis* describes travel patterns of local passengers who reside in the Airport's geographic area, including the amount of passenger diversion to other airports.

The Federal Aviation Administration's (FAA) 2011-2015 *National Plan of Integrated Airport Systems* (NPIAS) categorizes The Eastern Iowa Airport as a "Primary Small Hub Airport." The NPIAS defines a Small Hub Primary Airport as a commercial service airport that enplanes 0.05 percent to 0.25 percent of total U.S. Passengers enplanements. The plan reported that there are 72 small hub airports that together account for eight percent of all enplanements nationwide.

The FAA's **Terminal Area Forecasts** (TAF) is the official forecast of aviation activity at Airports nationwide. Part of the Master Plan process is to develop independent forecasts and compare them to the TAF.

The *Air Service Market Research* report for CID documented the following:

- Airlines serving the Airport's market and its historical passenger load factor trends.
- Top origin and destination markets for local passengers.
- A comparison of the local air service market to other markets throughout the region and nation.
- Comparison of airline financial performance among those airlines serving the Airport.
- Airlines with potential to initiate service to the Airport.
- Other market considerations such as air travel demand and the competitive environment.

Among the main points detailed in the *Air Service Market Research* report:

- For the year ended June 30, 2011, four airlines provided direct service from the Eastern Iowa Airport to 11 destinations nationwide.
- The Airport's overall load factor dropped in 2009 but recovered in 2010 and 2011, averaging above 80 percent (in terms of revenue seat miles divided by available seat miles) for the 12 months ending June 30, 2011.
- The Airport ranks 124th nationally in terms of enplaned/deplaned passengers, and ranks sixth out of 34 commercial service airports in the FAA's Central Region.
- The Airport's percentage of international passengers is equal to the national average and is higher than average when compared to other airports with comparable passenger levels.
- The Airport ranks high in a national comparison of fares and yield for airlines, surpassing the national average.

The *Passenger Demand Analysis* report examined the following for the Airport's catchment area:

- The originating airports used by air travelers.
- Diversion of airline passenger traffic to competing airports.
- Regional distribution of travelers in terms of final destination.
- An estimate of total airline passengers in the catchment area and related destinations.
- Airlines and aircraft type used by local air travelers at the Airport and its regional competitors.

- Average airfares by origin and destination airport.
- Capacity analysis in the Cedar Rapids market.

Among the more significant findings of the *Passenger Demand Analysis* report were the following:

- CID has a catchment population of approximately 475,000 people covering approximately 5,300 square miles.
- From July 2010 through June 2011, 64 percent of catchment area travelers used CID with 18 percent using Quad Cities International Airport, 11 percent using Chicago O'Hare International Airport, and 7 percent using Des Moines International Airport. By comparison, The Eastern Iowa Airport retained 75 percent of its market demand in 2008.
- The Airport's total air service market, called the "true market", is estimated at nearly 1.4 million total passengers (enplaning and deplaning), with approximately 500,000 travelers using an alternate airport.
- The most popular destinations for passengers taking off from the Airport are Las Vegas, Denver, Phoenix, Atlanta, and Dallas.
- From July 2010 through June 2011, approximately 28 percent of passengers at the Airport flew United Airlines, 26 percent flew American Airlines, 21 percent of passengers flew Delta Airlines, and 19 percent flew Allegiant Airlines.

2.2. Forecast Methodologies

The goal of this chapter is to identify the most reasonable and practical forecasts of aviation demand to assist the Airport in long-term planning. This entails identification local and national trends in commercial and general aviation, socioeconomics, FAA policies and funding, and overall integrity of the Airport and its facilities. There is no one "correct" or "best" way to create forecasts for a given airport. Just as historic trends, national activity levels, and local demographics all influence current CID activity levels, all of these factors will play a role in determining future activity. Given the many different factors that influence aviation activity, variations of three broad forecasting methodologies were used to create a series of scenarios for CID. The three methodologies are:

- Time-Series (assumes that historic trends will continue into the future).
- Market Share (assumes that the local share of national aviation activity levels will remain largely constant).
- Socioeconomic (assumes that aviation activity will change at the same rate as population and/or personal income).

2.2.1. Time-Series Methodology

Time-series methodologies create forecasts by assuming patterns that have occurred in the past will continue into the future. These methodologies are most useful for a pattern of demand that demonstrates a historical relationship with time. Two different time-series methodologies are used in this chapter – growth rate and linear trend line. Both of these methodologies assume that future trends will continue to mimic past trends and that the factors that affected those trends in the past will continue to do so in the future. However, they differ in weight that is given to significant changes in activities from year to year.

- Time-Series: Growth Rate Method: The growth rate variation is straightforward. It uses historical compounded annual growth rates (CAGR) for a selected period of time and extrapolates future data values by assuming the same CAGR will occur throughout the forecast period.
- Time-Series: Linear Trend Line Method: The linear trend line is similar to the growth rate methodology in that it uses historical activity levels to forecast future activities. However, the formula used in a "trending" forecast puts more weight on variations from average activity levels. The results of the linear trend line methodology take into account abrupt changes in available service or aircraft fleet that frequently occur in the airline industry.

2.2.2. Market Share Methodology

Market share methodologies look at the national quantity of a given activity (such as enplanements and aircraft operations) and determine what percentage of these activities occurs at CID. This percentage is the Airport's "market share" of the activity in question. The methodology then assumes that this market share will remain constant throughout the forecast period. The market share analysis implies the local proportion of activity is regular and predictable. Because many aspects of an airport (location, type of facilities, and appeal for travelers) remain relatively constant over time, market share methodologies are used extensively in the aviation industry.

2.2.3. Socioeconomic Methodology

Though time-series and market share analysis may provide mathematical and formulaic justification for demand forecasts, there are other factors that may impact local aviation demand. The socioeconomic factors examined in this chapter are population and per capita income trends. Based upon the observed and projected correlation between historical aviation activity and the socioeconomic data sets, future aviation activity forecasts can be developed. Local population and per capita income can be a strong indicator of commercial aviation demand, particularly at small hub and non-hub airports. The socioeconomic methodologies compare historical population and per capita income figures to passenger enplanements and based aircraft at CID.

2.3. Passenger Enplanement Forecasts

Enplanements are defined as the activity of passengers boarding commercial service aircraft departing an airport. Enplanements include passengers on scheduled commercial service aircraft or un-scheduled charter aircraft, but not the airline crew. Forecasting future passenger enplanements is an important part of the Master Planning process. Passenger enplanements are the driver for many internal terminal and external Airport improvements, and also impact overall Airport finances.

2.3.1. Recent Enplanement History

National trends in aviation demand have been volatile in recent years. The events that occurred on September 11, 2001 had a significant impact on collective national travel behavior. The economic recession that began in 2008 also resulted in fewer passenger enplanements at several U.S. airports. Passenger enplanement data is provided to Airport management by commercial passenger airlines. Between 2001 and 2011, passenger enplanements at CID fell slightly from 443,344 to 439,025, a Compounded Annual Growth Rate (CAGR) of -0.10 percent (see **Table 2-1**).

Table 2-1. Passenger Enplanement History

Year	Passenger Enplanements
2001	443,344
2002	441,119
2003	461,827
2004	471,377
2005	502,518
2006	510,714
2007	531,256
2008	499,269
2009	474,155
2010	461,402
2011	439,025
CAGR 2001-2011	*-0.10%*

CAGR=Compounded Annual Growth Rate
Source: Airport Records

2.3.2. FAA Terminal Area Forecast (TAF)

The FAA records passenger enplanements for all commercial service airports and releases its TAF annually. It should be noted that annual data is based on the federal fiscal year (October through September) rather than the calendar year, so historical figures associated with specific years differ slightly from the Airport's records. As shown in **Table 2-2**, the FAA projects strong, steady growth in passenger enplanements at CID through 2031. The TAF predicts a steady increase in passenger enplanements, rising from 438,608 in 2011 to 674,960 in 2031; a CAGR of 2.17 percent.

Table 2-2. Passenger Enplanements – FAA Terminal Area Forecast

Year	Passenger Enplanements
2001	467,357
2002	413,019
2003	468,427
2004	475,130
2005	495,524
2006	510,861
2007	531,654
2008	508,688
2009	482,504
2010	461,180
2011	438,608
CAGR 2001-2011	*-0.63%*
2016	487,003
2021	541,920
2026	604,238
2031	674,960
CAGR 2011-2031	*2.17%*

CAGR=Compounded Annual Growth Rate
Source: FAA Terminal Area Forecast

2.3.3. Growth Rate Methodology

The enplanement forecast methodologies presented in this and following sections were developed specifically for this Master Plan. Forecasts are evaluated with current and projected trends and the likelihood of occurrence, from which a preferred methodology will be selected.

The first of these methodologies is the growth rate methodology. As mentioned previously, the growth rate methodology examines the percent change in activity between two points in time and assumes that future activity will change at this rate throughout the forecast period. Between 2001 and 2011, annual passenger enplanements decreased from 443,344 to 439,025, a CAGR of -0.10 percent. This CAGR is applied using the growth rate methodology and predicts a slight decline in passenger enplanements, decreasing from 439,025 in 2011 to 430,513 in 2031 (see **Table 2-3**).

Table 2-3. Passenger Enplanement Forecasts – Growth Rate Methodology

Year	Passenger Enplanements	Growth Rate
2001	443,344	
2002	441,119	-0.50%
2003	461,827	4.69%
2004	471,377	2.07%
2005	502,518	6.61%
2006	510,714	1.63%
2007	531,256	4.02%
2008	499,269	-6.02%
2009	474,155	-5.03%
2010	461,402	-2.69%
2011	439,025	-6.15%
CAGR 2001-2011	*-0.10%*	
2016	436,881	*-0.10%*
2021	434,748	*-0.10%*
2026	432,625	*-0.10%*
2031	430,513	*-0.10%*
CAGR 2011-2031	*-0.10%*	

CAGR=Compounded Annual Growth Rate
Source: Airport Records, Mead & Hunt, Inc.

2.3.4. Linear Trend Line Methodology

As mentioned previously, the linear trend methodology is similar to the growth rate methodology in that it uses historical activity levels to forecast future activities, but it also puts more weight on variations from average activity levels. The linear trend line methodology results in a steady increase in passenger enplanements, from 439,025 in 2011 to 517,147 in 2031; a CAGR of 0.82 percent (see **Table 2-4**). The reason for the increase is that CID experienced strong enplanement growth from 2001 through 2007. From 2008 to 2011, enplanements decreased annually to the point where 2011 levels basically equaled 2001. Although there was a slight overall decrease in passenger enplanements from 2001 to 2011, the trend line methodology adjusts for the increase in activity that occurred prior to 2008 and results in a positive forecast. Therefore, the linear trend line shows stronger growth than the more straightforward growth rate methodology.

Table 2-4. Passenger Enplanement Forecasts – Linear Trend Line Methodology

Year	Passenger Enplanements
2001	443,344
2002	441,119
2003	461,827
2004	471,377
2005	502,518
2006	510,714
2007	531,256
2008	499,269
2009	474,155
2010	461,402
2011	439,025
CAGR 2001-2011	*-0.10%*
2016	492,459
2021	500,688
2026	508,917
2031	517,147
CAGR 2011-2031	*0.82%*

CAGR=Compounded Annual Growth Rate
Source: Airport Records, Mead &Hunt, Inc.

2.3.5. Market Share Methodology (2011 Market Share)

As mentioned previously, market share methodologies compare activity levels at an airport to a larger geographical region as a whole over a given length of time. For the purposes of this Master Plan, two market share enplanement forecasts have been developed that compare activity at CID with total U.S. domestic enplanements. The first market share methodology applies the Airport's actual 2011 market share, not an average market share over time, to FAA forecasts for total U.S. domestic enplanements.

As shown in **Table 2-5**, the first market share methodology predicts a steady increase in passenger enplanements, rising from 439,025 in 2011 to 730,925 in 2031; a CAGR of 2.58 percent.

Table 2-5. Passenger Enplanement Forecasts – Market Share Methodology (2011 Market Share)

Year	Passenger Enplanements	Total U.S. Domestic Enplanements (Millions)	CID Market Share
2001	443,344	641.2	0.0691%
2002	441,119	625.8	0.0705%
2003	461,827	575.1	0.0803%
2004	471,377	587.8	0.0802%
2005	502,518	628.5	0.0800%
2006	510,714	669.5	0.0763%
2007	531,256	668.4	0.0795%
2008	499,269	690.1	0.0724%
2009	474,155	680.7	0.0697%
2010	461,402	630.8	0.0731%
2011	439,025	635.3	0.0691%
CAGR 2001-2011	-0.10%	-0.90%	
2016	520,016	752.5	0.0691%
2021	598,658	866.3	0.0691%
2026	667,556	966.0	0.0691%
2031	730,925	1,057.7	0.0691%
CAGR 2011-2031	*2.58%*	*2.58%*	

CAGR=Compounded Annual Growth Rate
Source: Airport Records, FAA Terminal Aerospace Forecasts 2011-2031, Mead & Hunt, Inc.

2.3.6. Market Share Methodology (2001-2011 Average Market Share)

A second market share forecast was developed utilizing an average of the Airport's national market share from 2001 to 2011. This second forecast was developed because the Airport's 2011 market share represents the lowest market share ebb during this period. As a result, this second market share methodology also takes into account some of the higher market share years during this period. Between 2001 and 2011, CID's enplanement market share ranged from a minimum of 0.0691 percent in 2001 and 2011 to a maximum of 0.0803 percent in 2003, with an average 0.0727 percent. As shown in **Table 2-6**, applying this average market share to TAF forecasts results in a steady passenger enplanement increase from 439,025 in 2011 to 769,454 in 2031; a CAGR of 2.85 percent.

Table 2-6. Passenger Enplanement Forecasts – Market Share Methodology (2001-2011 Average Market Share)

Year	Passenger Enplanements	Total U.S. Domestic Enplanements (Millions)	CID Market Share
2001	443,344	641.2	0.0691%
2002	441,119	625.8	0.0705%
2003	461,827	575.1	0.0803%
2004	471,377	587.8	0.0802%
2005	502,518	628.5	0.0800%
2006	510,714	669.5	0.0763%
2007	531,256	668.4	0.0795%
2008	499,269	690.1	0.0724%
2009	474,155	680.7	0.0697%
2010	461,402	630.8	0.0731%
2011	439,025	635.3	0.0691%
CAGR 2001-2011	*-0.10%*	*-0.90%*	
2016	547,427	752.5	0.0727%
2021	630,214	866.3	0.0727%
2026	702,744	966.0	0.0727%
2031	769,454	1,057.7	0.0727%
CAGR 2011-2031	*2.85%*	*2.85%*	

CAGR=Compounded Annual Growth Rate
Source: Airport Records, FAA Terminal Aerospace Forecasts 2011-2031, Mead & Hunt, Inc.

2.3.7. Socioeconomic Methodology (Population Variable)

Local population and per capita income can be strong indicators of commercial aviation demand, particularly at small hub and non-hub airports. This socioeconomic methodology compares historical population figures to passenger enplanements at the Eastern Iowa Airport. Between 2001 and 2011, the population of the Cedar Rapids Metropolitan Statistical Area (MSA) increased from 237,835 to 259,618. The average number of annual enplanements per person in the MSA from 2001-2011 was 1.919. For purpose of this analysis, this ratio of flights per person was held constant throughout the planning period.

The ratio of 1.919 flights per person was applied to population forecasts created by the economic forecasting firm Woods and Poole, Inc. This methodology forecasts a steady increase in passenger enplanements, rising from 439,025 in 2011 to 584,468 in 2031; a CAGR of 1.44 percent (see **Table 2-7**).

Table 2-7. Passenger Enplanement Forecasts – Socioeconomic Methodology (Population Variable)

Year	Passenger Enplanements	Cedar Rapids MSA Population	Enplanements Per Capita
2001	443,344	237,835	1.864
2002	441,119	240,072	1.837
2003	461,827	242,033	1.908
2004	471,377	243,098	1.939
2005	502,518	245,006	2.051
2006	510,714	247,151	2.066
2007	531,256	249,383	2.130
2008	499,269	252,472	1.978
2009	474,155	255,452	1.856
2010	461,402	257,525	1.792
2011	439,025	259,618	1.691
Average (2001-2011)			*1.919*
2016	518,860	270,332	1.919
2021	540,334	281,520	1.919
2026	562,307	292,968	1.919
2031	584,468	304,514	1.919
CAGR (2011-2031)	*1.44%*	*0.80%*	

CAGR=Compounded Annual Growth Rate
Source: Airport Records, Woods & Poole, Inc., Mead & Hunt, Inc.

2.3.8. Socioeconomic Methodology (Per Capita Income Variable)

A second socioeconomic forecast was developed utilizing an average of the Airport's enplanements per $1 of per capita income in the Cedar Rapids MSA from 2001 to 2011. This second forecast was developed because per capita income in the Cedar Rapids MSA is expected to increase at a faster rate than population over the next 20 years. As a result, this methodology takes into account the increased ability of local residents to afford commercial service at the Airport.

According to Woods & Poole, between 2001 and 2011 per capita income in the Cedar Rapids MSA increased from $32,412 to $34,862. It should be noted that income figures represent 2004 dollar values. These are "constant" dollars and are used to measure the "real" change in earnings and income when inflation is taken into account. The average number of annual enplanements per $1 of per capita income between 2001 and 2011 was 14.468.

The ratio of 14.468 enplanements per $1 of per capita income was applied to Woods & Poole income forecasts. This methodology projects a steady increase in passenger enplanements, rising from 439,025 in 2011 to 674,894 in 2031; a CAGR of 2.17 percent (**Table 2-8**).

Table 2-8. Passenger Enplanement Forecasts – Socioeconomic Methodology (Income Variable)

Year	Passenger Enplanements	Cedar Rapids MSA Per Capita Income	Enplanements Per $1 Per Capita Income
2001	443,344	$32,412	13.678
2002	441,119	$31,711	13.911
2003	461,827	$31,733	14.554
2004	471,377	$31,627	14.904
2005	502,518	$32,129	15.641
2006	510,714	$32,294	15.815
2007	531,256	$32,789	16.202
2008	499,269	$33,976	14.695
2009	474,155	$34,472	13.755
2010	461,402	$34,427	13.402
2011	439,025	$34,862	12.421
Average (2001-2011)			*14.468*
2016	540,457	$37,355	14.468
2021	580,591	$40,129	14.468
2026	625,254	$43,216	14.468
2031	674,894	$46,647	14.468
CAGR (2011-2031)	*2.17%*	*1.47%*	

CAGR=Compounded Annual Growth Rate
Source: Airport Records, Woods & Poole, Inc., Mead & Hunt, Inc.

2.3.9. Preferred Forecast Methodology

A comparison of the passenger enplanement forecasts resulting from the methodologies described in the previous sections is shown in **Chart 2-1** and **Table 2-9**.

Chart 2-1: Passenger Enplanement Forecast Methodology Comparison

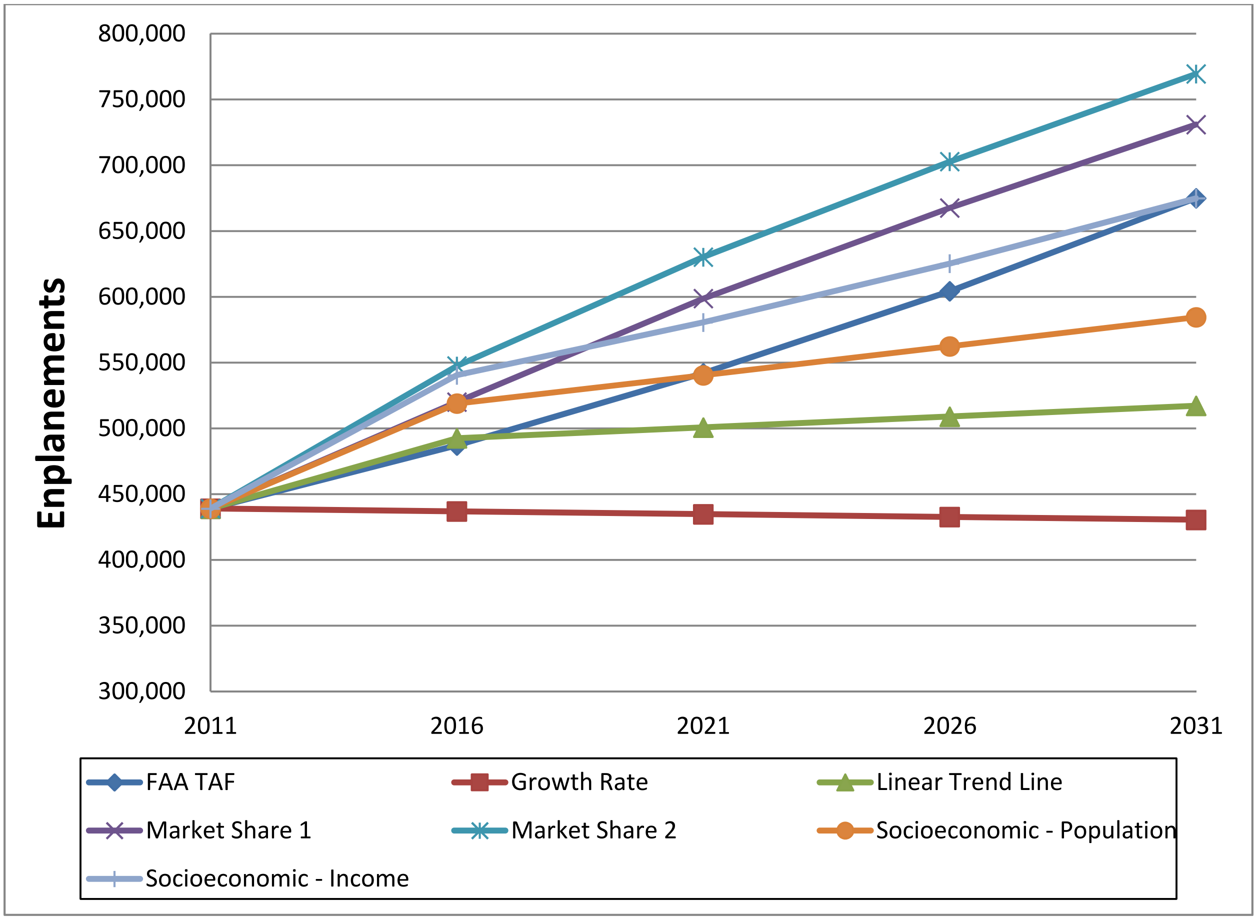


Table 2-9. Passenger Enplanement Forecasts – Forecast Comparison and Preferred Methodology

Year	FAA TAF	Growth Rate Methodology	Linear Trend Line Methodology	Market Share Methodology 1	Market Share Methodology 2	Population Variable	Income Variable
2011	438,608	439,025	439,025	**439,025**	439,025	439,025	439,025
Projected							
2016	487,003	436,881	492,459	**520,016**	547,427	518,860	540,457
2021	541,920	434,748	500,688	**598,658**	630,214	540,334	580,591
2026	604,238	432,625	508,917	**667,556**	702,744	562,307	625,254
2031	674,960	430,513	517,147	**730,925**	769,454	584,468	674,894
CAGR (2011-2031)	*2.17%*	*-0.10%*	*0.82%*	***2.58%***	*2.85%*	*1.44%*	*2.17%*

CAGR=Compounded Annual Growth Rate
Source: Airport Records, Terminal Aerospace Forecasts 2011-2031, Woods & Poole, Inc. Mead & Hunt, Inc.

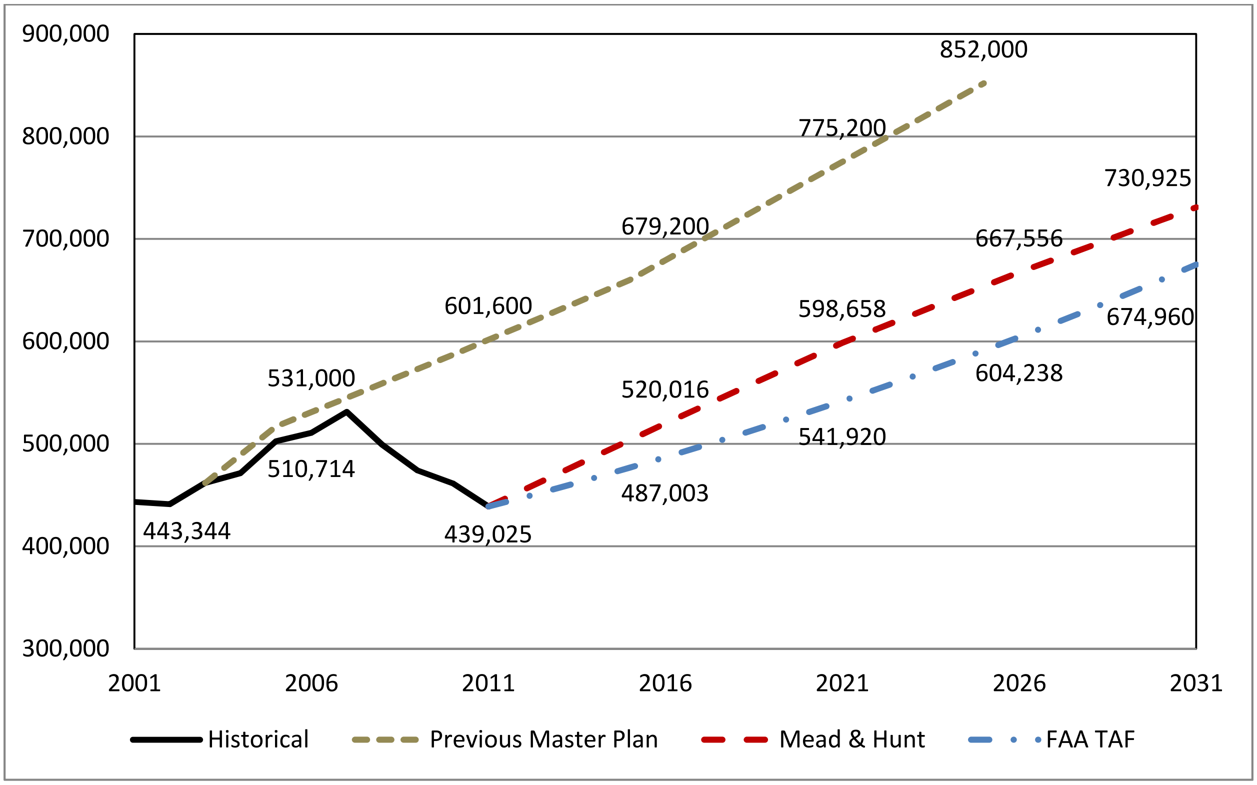
With the exception of the growth rate methodology, all of the methodologies anticipate that there will be an increase in passenger demand over the next 20 years at the Airport.

The number of annual passenger enplanements has fluctuated significantly between 2001 and 2011. Such fluctuation is inconsistent with local and national socioeconomic trends, as well as "snapshot" forecast methodologies that calculate trend-line and growth rate. In addition, the Airport's market share has fluctuated by more than 16 percent during that time period from 0.0691 (2001 and 2011) to 0.0803 (2003). This variability lends less credence to the second Market Share methodology as it accounts for the Airport's average market share between 2001 and 2011.

Based on historical fluctuation in both annual passenger enplanements at CID, as well as the Airport's market share compared with total U.S. domestic enplanements, the first market share methodology is the preferred forecast for passenger enplanements. It is reasonable to assume that future trends in local passenger enplanement activity will roughly mimic those that occur nationally.

The preferred passenger enplanement forecast is compared with the TAF and previous master plan enplanement forecasts in **Chart 2-2**.

Chart 2-2: Preferred Passenger Enplanement Forecast Comparison



The preferred passenger enplanement forecast projects that enplanements at CID will grow by approximately two-thirds over the planning period from 439,025 enplanements in 2011 to 730,925 in 2031. The preferred passenger enplanement forecast will be used to inform possible improvements to the Airport terminal and airside facilities in subsequent chapters of this Master Plan.

2.4. Aircraft Operations and Based Aircraft Forecasts

Aircraft operations include both aircraft takeoffs and landings. Aircraft operations forecasts are directly tied to the expected demand for overall aviation activity at an Airport and have implications for whether an airport has adequate capacity in place to accommodate this activity. The following sections describe aircraft operation forecasts. As with passenger enplanements, several factors are taken into account when assessing demand in both commercial and non-commercial operations. Forecasts have been developed for the following categories:

- Commercial Fleet Mix and Operations Forecasts
- Based Aircraft
- General Aviation Operations
- Local/Itinerant General Aviation Operations
- Military Operations
- Instrument Operations

2.4.1 Commercial Fleet Mix and Operations Forecasts

This section presents commercial fleet mix and operations forecasts for CID. The FAA TAF separates commercial operations into three distinct categories: 1) air carrier operations, 2) commuter operations, and 3) air taxi operations. The first, air carrier operations, are defined as takeoffs and landings by commercial aircraft with seating capacity of more than 60 seats. Air carrier operations can be either scheduled or non-scheduled. The second category, commuter operations, is defined as takeoffs and landings by commercial aircraft with 60 or fewer seats that transport regional passengers on scheduled commercial flights. The third category, air taxi operations, are defined as takeoffs and landings by aircraft with 60 or fewer seats on un-scheduled and on-demand flights, which are typically conducted by charter companies such as the local FBO and fractional ownership aircraft operators such as NetJets. Passengers on air carrier and commuter flights are counted by the FAA as passenger enplanements, but passengers on air taxi flights are not.

Because all commuter and air taxi operations are conducted by aircraft with 60 or fewer seats, the TAF combines commuter and air taxi operations into a single category, referred to as commuter/air taxi. This Master Plan for CID, however, combines air carrier and commuter operations into a single category called passenger airline operations; it considers air taxi operations separately. The reason for this re-categorization is that the air carrier and commuter operations forecasts are derived from the preferred passenger enplanement forecast presented in the previous section, and passengers on air taxi flights are not reflected in the reported passenger enplanement figures (see **Table 2-10)**.

Table 2-10. FAA Aircraft Classification

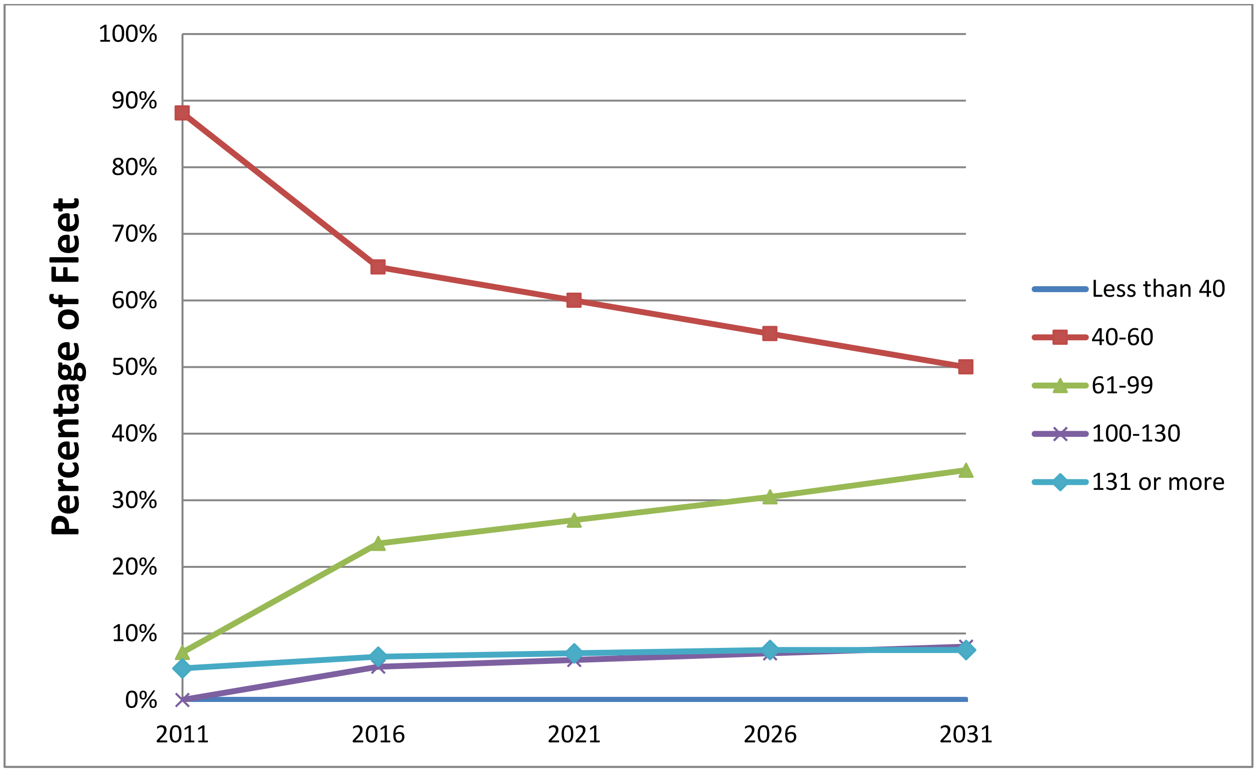
Aircraft Classification	Number of Seats	Do Passengers Count as Enplanements?
Air Carrier	More than 60	Yes
Commuter	60 or Less	Yes
Air Taxi	60 or Less	No

With recent increases in aircraft operating costs, passenger airlines have been forced to maximize fleet efficiency. In many markets, airlines are reducing or retiring less fuel-efficient aircraft and replacing them with larger regional and narrow-body jets that have more seats and lower operational costs per passenger. In many markets, the use of larger aircraft is reducing the frequency of particular routes. Because of increasing fuel and operational costs, airlines must maintain higher passenger load factors to remain profitable. Changes to the passenger airline fleet mix are an important factor in forecasting passenger airline operations. As a result, passenger airline fleet mix was considered prior to deriving the passenger airline operations forecasts.

2.4.1.1. Passenger Airline Fleet Mix (Air Carrier and Commuter)

In general, passenger airlines are moving away from using smaller aircraft with fewer seats and are beginning to use larger aircraft to reduce operational costs. This Master Plan projects that commercial operations at CID will follow national commercial carrier trends and move towards larger aircraft with more seats (see **Chart 2-3**).

Chart 2-3: Passenger Airline Fleet Mix Forecast (by number of seats)

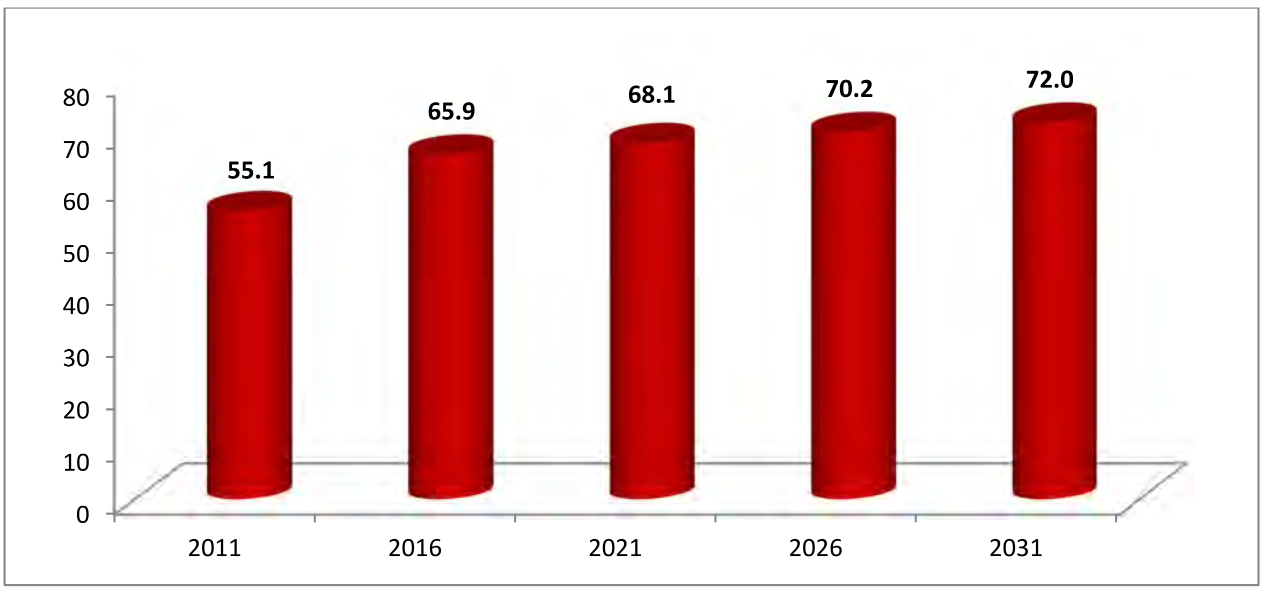


The smallest passenger airline aircraft used at the Airport was the 40-seat Saab 340, which has been phased out of operation. The CRJ 100/200 series aircraft is anticipated to cede a portion of its operating share to the larger 70-seat CRJ 700. This Master Plan projects that between 2011 and 2031, the CRJ 700 will increase its use by 27 percent. Even larger aircraft, such as the 100-seat Bombardier CS 100 and the 130-seat CS 300 will likely become popular at the Airport (see **Table 2-11**).

Table 2-11: Scheduled Passenger Airline Departures Fleet Mix Forecasts					
	Seat Range/Example Aircraft				
Year	**Less than 40 seats (Saab 340)**	**40-60 seats (CRJ 100/200)**	**61-99 seats CRJ 700/900**	**100-130 seats (Bombardier CS 100/300)**	**131 seats or more (MD80, B737)**
2008	*5.6%*	*75.5%*	*15.4%*	*0.3%*	*3.2%*
2009	*1.7%*	*83.9%*	*10.0%*	0.0%	*4.4%*
2010	*0.4%*	*82.2%*	*11.4%*	0.0%	*6.0%*
2011	*0.0%*	*88.1%*	*7.1%*	0.0%	*4.7%*
Projected					
2016	0.0%	*65.0%*	*23.5%*	*5.0%*	*6.5%*
2021	0.0%	*60.0%*	*27.0%*	*6.0%*	*7.0%*
2026	0.0%	*55.0%*	*30.5%*	*7.0%*	*7.5%*
2031	0.0%	*50.0%*	*34.5%*	*8.0%*	*7.5%*

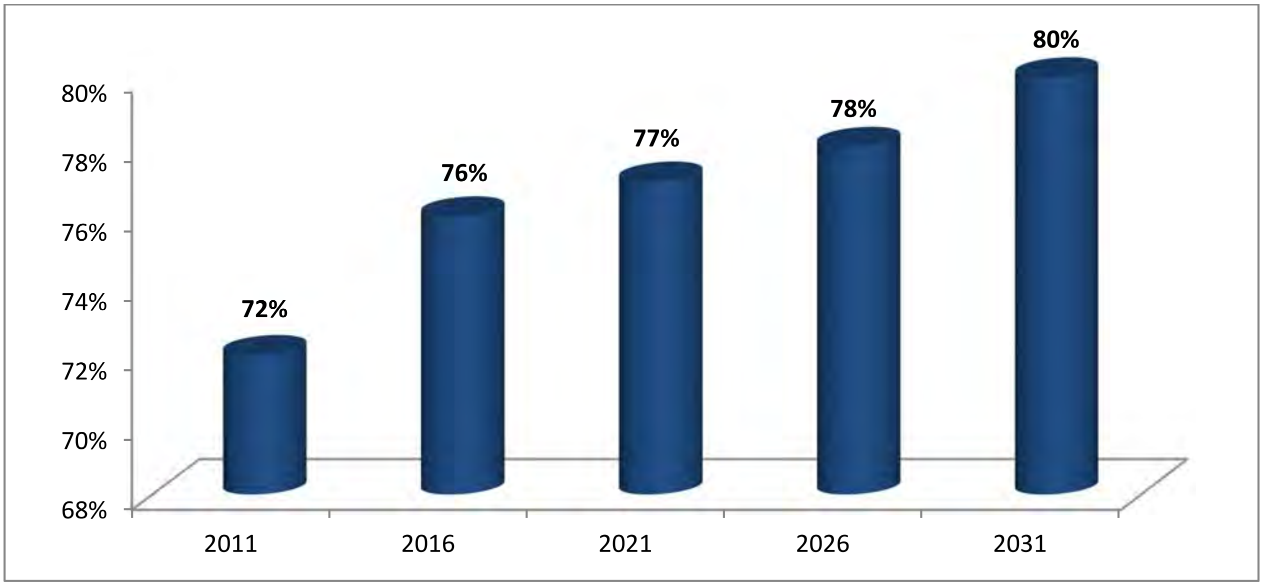
The available seats per flight are directly tied to the type of aircraft used by passenger airlines at the Airport. The forecasted shift towards larger aircraft will directly impact the number of available seats. This Master Plan projects that between 2011 and 2031 the average available seats per flight will increase from 55.1 to 72.0, as shown in **Chart 2-4.**

Chart 2-4: Available Seats per Flight Forecast



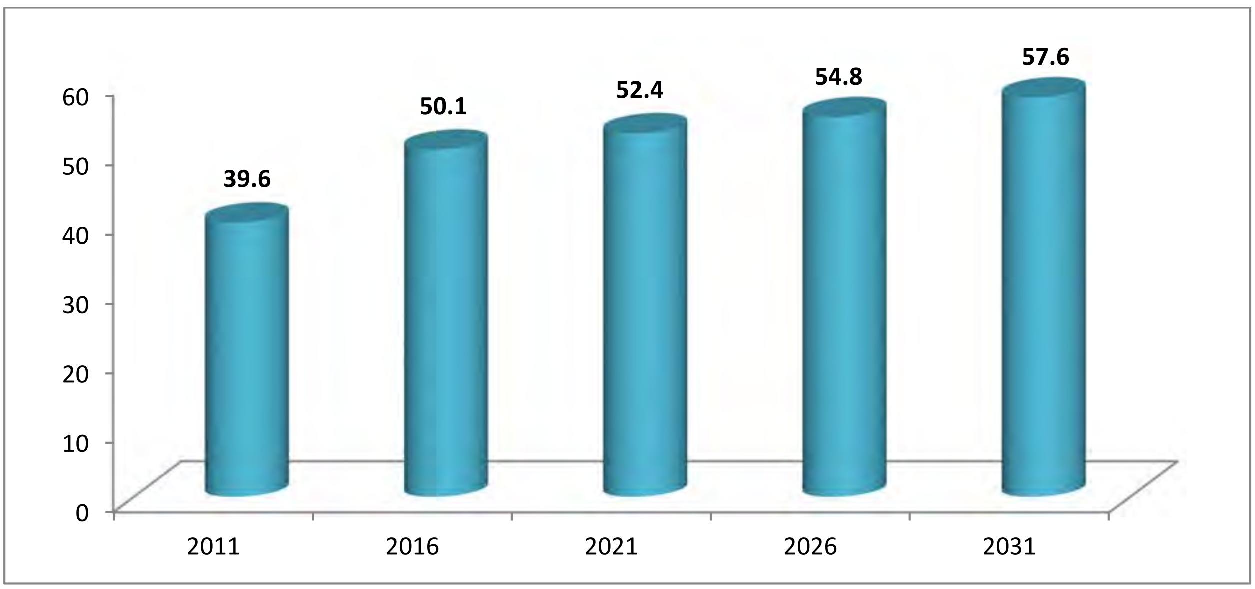
Another factor that is important in forecasting is the load factor of the flight. For the purpose of this Master Plan, load factor reflects the number of seats filled with passengers compared to the total number of seats available on a given flight. Because the national commercial aviation trend is to use larger aircraft with more available seats, the commercial carrier will attempt to fill as many seats on an aircraft as possible. The result is a projected increase in the Airport's average load factor from 72 percent in 2011 to 80 percent by 2031 (see **Chart 2-5**).

Chart 2-5: Load Factor Forecast



The combination of larger aircraft and higher load factors ultimately results in an increase in overall number of passengers per flight. It is estimated that the number of passengers per flight will increase from 39.6 in 2011 to 57.6 by 2031 (see **Chart 2-6**).

Chart 2-6: Passengers per Flight Forecast



2.4.1.2. Passenger Airline Operations Forecast (Air Carrier and Commuter)

This passenger airline operations forecast is based on enplanement forecasts described in the previous section. To calculate future scheduled commercial operations, the preferred passenger enplanement forecast was divided by the forecasted passengers per flight described in the previous section. It is assumed that the number of annual commercial departures and arrivals will be the same; departures are multiplied by two to calculate projected scheduled commercial operations (see **Table 2-12**).

Table 2-12. Passenger Airline Operations Forecast				
Year	**Enplanements**	**Passengers Per Flight**	**Passenger Airline Departures**	**Total Passenger Airline Operations**
2011	439,025	*39.6*	11,085	22,170
Projected				
2016	520,016	50.1	10,383	20,766
2021	598,658	52.4	11,417	22,833
2026	667,556	54.8	12,191	24,387
2031	730,925	57.6	12,690	25,379
CAGR (2010-2031)	*2.58%*		*0.68%*	*0.68%*

CAGR=Compounded Annual Growth Rate
Sources: Historical Enplanements - Airport Records, Historical Scheduled Air Carrier Dep's and Avg Seat Data - OAG Airline Schedules form apgDat (Nov. 2011), Forecasts - Mead & Hunt, Inc.

The fleet mix percentages described in the previous section were applied to the passenger airline operations forecast to derive the split between air carrier operations and commuter operations. The split between air carrier and commuter operations is shown in **Table 2-13**.

Table 2-13. Air Carrier and Commuter Operations Forecast					
Year	**Passenger Airline Operations**	**Air Carrier %**	**Air Carrier Operations**	**Commuter %**	**Commuter Operations**
2011	22,170	11.9%	2,632	88.1%	19,538
Projected					
2016	20,766	35.0%	7,268	65,0%	13,498
2021	22,833	40.0%	9,133	60.0%	13,700
2026	24,387	45.0%	10,972	55.0%	13,410
2031	25,379	50.0%	12,690	50.0%	12,689
CAGR (2011-2031)	*0.68%*		*8.18%*		*-2.14%*

CAGR=Compounded Annual Growth Rate
Sources: Historical Enplanements - Airport Records, Historical Scheduled Air Carrier Dep's and Avg Seat Data - OAG Airline Schedules form apgDat (Nov. 2011), Forecasts - Mead & Hunt, Inc.

Air carrier operations are forecasted to increase in the next five years from 2,632 operations in 2011 to 12,689 in 2031, a CAGR of 8.18 percent. This trend will also lead to reduction in annual commuter operations, decreasing from 19,538 in 2011 to 12,689 in 2031, a CAGR of -2.14 percent.

2.4.1.3. Air Taxi Operations Forecast

Demand for air taxi flights can hinge on several factors and can be difficult to project. The overall proportion of air taxi operations to total commercial operations at CID increased from 15.1 percent in 2008 to 16.5 percent in 2011. However, annual air taxi operations at the Airport decreased from 4,711 to 4,391 during this same period. According to the FAA Aerospace Forecasts 2011-2031, the projected annual growth rate of the national general aviation and air taxi fleet is expected to be 0.90 percent. It is assumed that air taxi operations at CID will reflect this national trend; therefore, this growth rate is applied to the 2011 level of 4,391 operations and held constant throughout the forecast period, resulting in 5,253 air taxi operations in 2031.

2.4.1.4. Commercial Operations Forecast Summary

The commercial operations forecasts presented in the previous sections are summarized in **Table 2-14**.

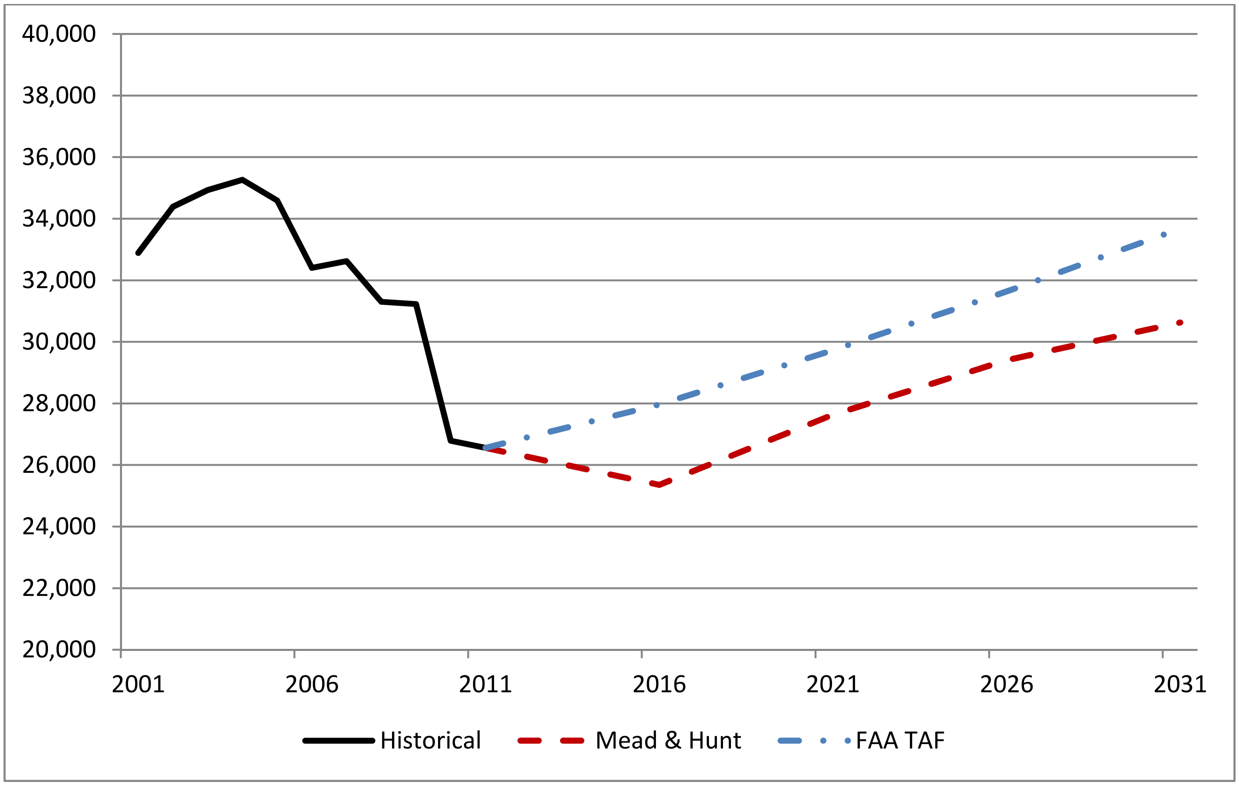
Table 2-14. Commercial Operations Forecast Summary				
Year	**Total Commercial Operations**	**Air Carrier Operations**	**Commuter Operations**	**Air Taxi Operations**
2011	26,561	2,632	19,538	4,391
Projected				
2016	25,358	7,268	13,498	4,592
2021	27,636	9,133	13,700	4,803
2026	29,406	10,972	13,410	5,023
2031	30,632	12,690	12,689	5,253
CAGR (2011-2031)	*2.58%*	*8.18%*	*-2.14%*	*0.90%*

CAGR=Compounded Annual Growth Rate
Source: Airport Records, Official Airline Guide (OAG), Air Traffic Activity Data System (ATADS), FAA Aerospace Forecasts 2011-2031 Mead & Hunt, Inc.

Total commercial operations are forecasted to decline in the next five years as larger aircraft are used with higher load factors, which will significantly reduce annual commuter operations. Air carrier operations will increase as a result of this trend. Air taxi operations, which are not tied to this commercial aviation trend, are also forecasted to increase in the next five years. Total commercial operations are forecasted to increase in the 10-year and 20-year period as economic conditions improve and smaller aircraft are phased out.

Chart 2-7 compares the FAA TAF to the Master Plan commercial operations forecast for 2011 to 2031.

Chart 2-7: Preferred Commercial Operations Forecast Comparison



Steady increases in both passenger enplanements and commercial operations indicate that future planning is necessary for Airport facilities. The forecasts will be used to assess commercial facility needs in Chapter 3, Facility Requirements.

2.4.2. Based Aircraft

This Master Plan also reviews based aircraft statistics in order to forecast future based aircraft at CID. Based aircraft forecasts are used to determine future needs for items including, but not limited to, hangars, tie-downs, and FBO services. These based aircraft forecasts will also be used in one of the methodologies that will forecast general aviation operations.

There are several factors that affect the number of aircraft based at an airport. The overall cost to own and operate an aircraft has increased significantly in recent years, which has contributed to a slight decline in the U.S. general aviation fleet since 2007. However, based aircraft at CID have increased overall in recent years from 132 in 2001 to 144 in 2011. Four of the methodologies used for passenger enplanement forecasts are also used for these based aircraft forecasts, including the linear trend line, market share, socioeconomic per capita income variable and socioeconomic population variable methodologies. These methodologies, but not the growth rate methodology, were used to forecast based aircraft because the number of based aircraft at an Airport is more susceptible to shifts in both the national and local socioeconomic conditions than passenger enplanements.

2.4.2.1 Linear Trend Line Methodology

The linear trend line methodology assumes that historic trends will continue in the future and more heavily weights variations than the growth rate methodology. This methodology projects a steady decrease in based aircraft declining from 144 in 2011 to 120 in 2031; a CAGR of -0.92 percent (see **Table 2-15**).

Table 2-15. Based Aircraft Forecasts - Trend Line Methodology

Year	Based Aircraft
2001	132
2002	151
2003	153
2004	151
2005	151
2006	141
2007	128
2008	140
2009	140
2010	140
2011	144
CAGR (2001-2011)	*0.87%*
2016	133
2021	129
2026	124
2031	120
CAGR (2011-2031)	*-0.92%*

CAGR=Compounded Annual Growth Rate
Source: FAA TAF, Mead & Hunt, Inc.

2.4.2.2 Market Share Methodology

CID's market share of the total U.S. general aviation fleet fluctuated by more than 30 percent between 2001 and 2011, although it increased by approximately 5.7 percent overall during that timeframe. The Market Share Methodology assumes that the Airport's average 0.06482 percent market share of total active U.S. aircraft from 2001 to 2011 will remain constant throughout the forecast period. This percentage was applied to the total number of aircraft in the U.S. fleet forecasted by the FAA Aerospace Forecasts FY2011-2031 (see **Table 2-16**). This methodology predicts a steady increase in based aircraft, rising from 144 in 2011 to 181 in 2031; a CAGR of 1.14 percent.

Table 2-16. Based Aircraft Forecasts - Market Share Methodology			
Year	**CID Based Aircraft**	**Total U.S. Active Aircraft**	**CID Market Share**
2001	132	217,533	0.06068%
2002	151	211,446	0.07141%
2003	153	211,244	0.07243%
2004	151	209,606	0.07204%
2005	151	224,350	0.06731%
2006	141	221,939	0.06353%
2007	128	231,606	0.05527%
2008	140	228,668	0.06122%
2009	140	223,920	0.06252%
2010	140	224,172	0.06245%
2011	144	224,475	0.06415%
Average (2001-2011)			*0.06482%*
2016	155	239,522	*0.06482%*
2021	162	249,440	*0.06482%*
2026	170	262,772	*0.06482%*
2031	181	278,723	*0.06482%*
CAGR (2011-2031)	*1.14%*	*1.09%*	

CAGR=Compounded Annual Growth Rate
Source: FAA TAF, FAA Aerospace Forecasts 2011-2031, Mead & Hunt, Inc.

2.4.2.3. Socioeconomic Methodology – Income Variable

Income can often be a strong indicator of one's ability to own an aircraft. The socioeconomic income variable methodology compares historical based aircraft at CID to per capita income in the Cedar Rapids MSA. According to data obtained by Woods & Poole, Inc. per capita income in the Cedar Rapids MSA increased from $32,412 in 2001 to $34,862 in 2011. It should be noted that income from these figures are presented in 2004 dollars. These are "constant" dollars and are used to measure the "real" change in earnings and income when inflation is taken into account. From 2001 to 2011, based aircraft per $100 in per capita income increased overall from 0.40726 to 0.41306. The average ratio from 2001 to 2011 of 0.43435 based aircraft per $100 of income is applied to Woods & Poole forecasts and shown in **Table 2-17**. This methodology predicts a steady increase in based aircraft, rising from 144 in 2011 to 203 in 2031; a CAGR of 1.72 percent.

Table 2-17. Based Aircraft Forecasts – Socioeconomic Methodology (Income Variable)

Year	Based Aircraft	Cedar Rapids MSA Per Capita Income ($2004)	Based Aircraft Per $100 Per Capita Income
2001	132	$32,412	0.40726
2002	151	$31,711	0.47618
2003	153	$31,733	0.48215
2004	151	$31,627	0.47744
2005	151	$32,129	0.46998
2006	141	$32,294	0.43661
2007	128	$32,789	0.39037
2008	140	$33,976	0.41206
2009	140	$34,472	0.40613
2010	140	$34,427	0.40666
2011	144	$34,862	0.41306
Average (2001-2011)			*0.43435*
2016	162	$37,355	0.43435
2021	174	$40,129	0.43435
2026	188	$43,216	0.43435
2031	203	$46,647	0.43435
CAGR (2011-2031)	*1.72%*	*1.47%*	

CAGR=Compounded Annual Growth Rate
Source: FAA TAF, Mead & Hunt, Inc., Woods & Poole, Inc.

2.4.2.4. Socioeconomic Methodology – Population Variable

The socioeconomic population variable methodology is another way to forecast based aircraft at an airport. This methodology compares historical based aircraft at CID with the population of the Cedar Rapids MSA. Between 2001 and 2011, the population of the Cedar Rapids MSA increased from 237,835 to 259,618. During that same timeframe, based aircraft per capita fluctuated from 0.00051 to 0.00056. However, fluctuations in reported based aircraft can be attributed to the sudden arrival or departure of based users to or from the Airport, and by simple reporting errors. Because based aircraft only decreased slightly overall from 0.00056 to 0.00055, it is clear that based aircraft per capita is fairly consistent over the long-term. The 2001-2011 average figure of 0.00053 based aircraft per capita was applied to population forecasts of the Cedar Rapids MSA (see **Table 2-18)**. This methodology predicts a steady increase in based aircraft, rising from 144 in 2011 to 175 in 2031, a CAGR of 0.99 percent.

Table 2-18. Based Aircraft Forecasts - Socioeconomic Methodology-Population Variable

Year	Based Aircraft	Cedar Rapids MSA Population	Based Aircraft Per Capita
2001	132	237,835	0.00056
2002	151	240,072	0.00063
2003	153	242,033	0.00063
2004	151	243,098	0.00062
2005	151	245,006	0.00062
2006	141	247,151	0.00057
2007	128	249,383	0.00051
2008	140	252,472	0.00055
2009	140	255,452	0.00055
2010	140	257,525	0.00054
2011	144	259,618	0.00055
Average (2001-2011)			*0.00058*
2016	156	270,332	0.00058
2021	162	281,520	0.00058
2026	169	292,968	0.00058
2031	175	304,514	0.00058
CAGR (2011-2031)	*0.99%*	*0.80%*	

CAGR=Compounded Annual Growth Rate
Source: FAA TAF, Mead & Hunt, Inc., Woods & Poole, Inc.

2.4.2.5. Preferred Based Aircraft Forecast Methodology

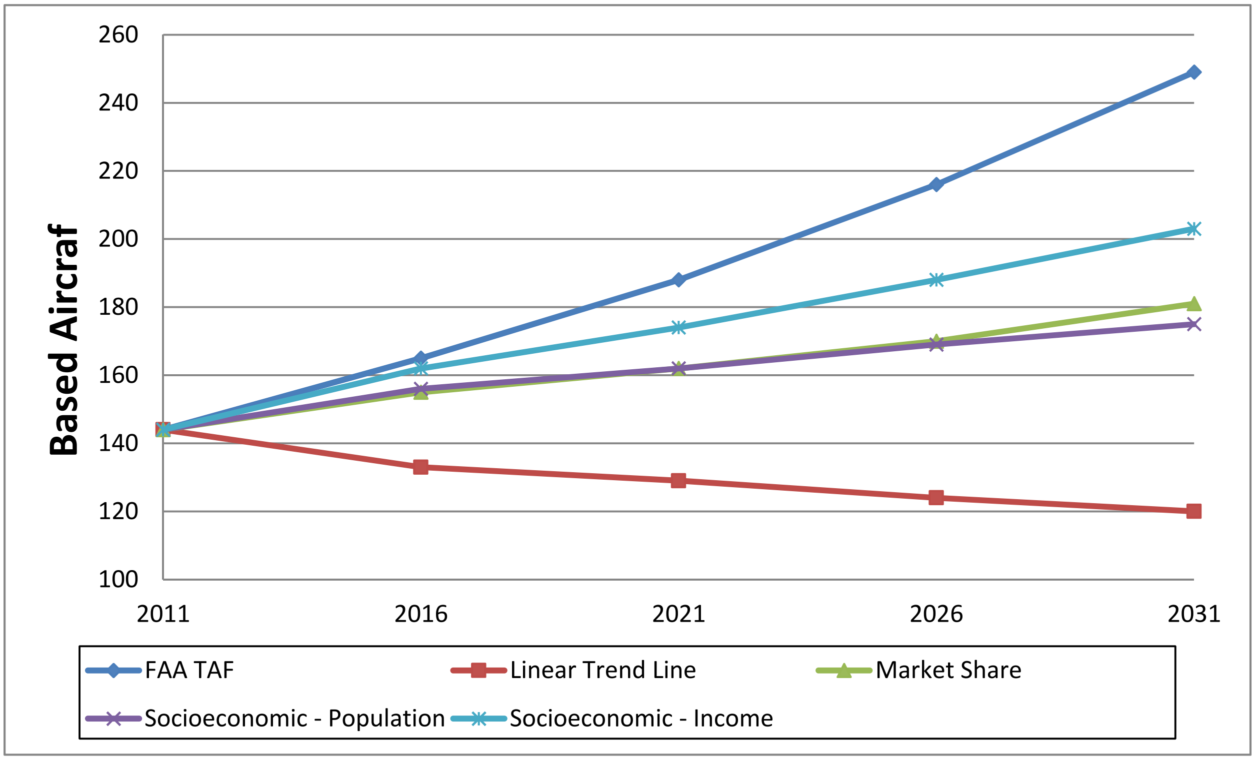
A comparison of the based aircraft forecasts produced using the methodologies described in previous sections is shown in **Table 2-19** and **Chart 2-8**.

Table 2-19. Based Aircraft Forecasts – Forecast Comparison and Preferred Methodology

Year	FAA TAF Summary	Trend Line Methodology	Market Share Methodology	Socioeconomic Methodology-Population Variable	Socioeconomic Methodology-Income Variable
2011	**144**	144	144	144	144
2016	**165**	133	155	156	162
2021	**188**	129	162	162	174
2026	**216**	124	170	169	188
2031	**249**	120	181	175	203
CAGR (2011-2031)	***2.78%***	*-0.92%*	*1.14%*	*0.99%*	*1.72%*

CAGR=Compounded Annual Growth Rate
Source: FAA TAF, FAA Aerospace Forecasts 2011-2031, Mead & Hunt, Inc.

Chart 2-8. Based Aircraft Forecast Comparison



In its Terminal Area Forecasts, the FAA projects that the economy will recover and that the total U.S. general aviation fleet will increase by 0.9 percent annually throughout the forecast period. An increase in fuel prices and an economic downturn that began in 2008 has not had a major impact on the number of based aircraft at the Airport. Because of the significant fluctuation in the Airport's market share of the total

U.S. active fleet, and the lack of correlation between the number of local based aircraft and socioeconomic factors, it is recommended that the FAA TAF be the recommended forecast methodology for long-term planning. This preferred forecast predicts a strong increase in based aircraft, rising from 144 in 2011 to 249 in 2031; a CAGR of 2.78 percent.

2.4.2.6. Based Aircraft Fleet Mix

The FAA TAF distinguishes between five categories of based aircraft: single-engine piston, multi-engine piston, jet, helicopter, and other aircraft (such as gliders or military aircraft). In general, these aircraft categories have different dimensions and performance characteristics and as a result have different requirements in terms of airport facilities. Therefore, it is important to determine the breakdown of aircraft within these categories for the based aircraft forecast.

In 2011, 79 percent of the based fleet at CID was comprised of single engine piston aircraft, 13 percent multi-engine piston aircraft, six percent jet aircraft, and three percent helicopter aircraft. This approximate breakdown has been relatively stable over the years 2001 to 2011, with the exception of the jet aircraft category, which decreased from 16 to 8 aircraft. However, based on national trends described in the FAA Aerospace Forecasts, it is expected that the proportion of jet aircraft will stabilize during the 20-year planning period. For these reasons, the preferred forecast for this Master Plan anticipates that the 2011 based aircraft fleet mix percentages will remain consistent with trends throughout the forecast period. The historical and forecasted based aircraft fleet mix for the Airport is shown in **Table 2-20**.

Table 2-20. Based Aircraft Fleet Mix Forecasts

	Single Engine		Multi Engine		Jet		Helicopter		Other		
Year	#	%	#	%	#	%	#	%	#	%	Total
2001	95	72%	15	11%	16	12%	6	5%	0	0%	132
2002	114	75%	18	12%	13	9%	6	4%	0	0%	151
2003	117	76%	18	12%	12	8%	6	4%	0	0%	153
2004	118	78%	15	10%	13	9%	5	3%	0	0%	151
2005	118	78%	15	10%	13	9%	5	3%	0	0%	151
2006	115	82%	11	8%	11	8%	4	3%	0	0%	141
2007	103	80%	10	8%	11	9%	4	3%	0	0%	128
2008	111	79%	16	11%	9	6%	4	3%	0	0%	140
2009	111	79%	16	11%	9	6%	4	3%	0	0%	140
2010	111	79%	16	11%	9	6%	4	3%	0	0%	140
2011	114	79%	18	13%	8	6%	4	3%	0	0%	144
Projected											
2016	131	79%	21	13%	9	6%	5	3%	0	0%	165
2021	149	79%	24	13%	10	6%	5	3%	0	0%	188
2026	171	79%	27	13%	12	6%	6	3%	0	0%	216
2031	197	79%	31	13%	14	6%	7	3%	0	0%	249
CAGR (2011-2031)	*2.78%*		*2.78%*		*2.78%*		*2.78%*		*2.78%*		*2.78%*

CAGR=Compounded Annual Growth Rate
Source: FAA TAF, FAA Aerospace Forecasts 2011-2031, Mead & Hunt, Inc.

Using the anticipated fleet mix forecasted by the TAF for based aircraft, it is anticipated that all categories of based aircraft at CID will experience a gradual increase over the 20-year planning period. This based aircraft forecast will be reviewed in Chapter 3 to ensure that future planning needs will be met.

2.4.3. General Aviation Operations

General aviation operations are those that are not categorized as either commercial or military and include both local and itinerant operations. General aviation includes a variety of users and activities including corporate and business operators, recreational users, flight training, agricultural applications, and law enforcement and other government uses. Historically, general aviation operations account for approximately 49 percent of total aircraft operations at CID. It is important to forecast general aviation operations because these users have a variety of needs related to aircraft storage facilities, aircraft parking aprons, FBO facilities, ground access facilities, and automobile parking lots.

General aviation activity can be affected by many variables such as the cost of ownership and operation of an aircraft and available hangar space for lease at a particular airport. As was the case nationally, general aviation activity at the Airport steadily declined between 2001 and 2011. This trend can be largely explained by the economic downturn that began in 2008 and the rise in fuel prices that occurred during this period. Two methodologies were used to determine forecasts of general aviation demand, the operations per based aircraft and market share methodologies. These are industry-standard general aviation operations methodologies for reasons described in the following sections.

2.4.3.1. Operations per Based Aircraft Methodology

The operations per based aircraft methodology is a common way to calculate general aviation operations because a large portion of general aviation operations are typically conducted by based aircraft. As mentioned previously, the number of based aircraft at CID increased steadily from 2001 to 2011. However, during the same timeframe, the number of general aviation operations decreased (see **Table 2-21**). The number of annual operations per based aircraft was 178 in 2011. This figure is applied to the future numbers of based aircraft projected by the preferred based aircraft forecast. This methodology results in a steady increase in general aviation operations, rising from 25,585 in 2011 to 44,241 in 2031; a CAGR of 2.78 percent.

Table 2-21. General Aviation Operations Forecasts – Operations Per Based Aircraft Methodology			
Year	**Based Aircraft**	**GA Operations**	**Operations Per Based Aircraft**
2001	132	41,613	315
2002	151	38,906	258
2003	153	36,425	238
2004	151	33,696	223
2005	151	31,050	206
2006	141	30,797	218
2007	128	30,265	236
2008	140	29,558	211
2009	140	25,647	183
2010	140	23,439	167
2011	144	25,585	178
Average (2001-2011)			*221*
2016	165	29,316	178
2021	188	33,403	178
2026	216	38,378	178
2031	249	44,241	178
CAGR (2011-2031)	*2.78%*	*2.78%*	

CAGR=Compounded Annual Growth Rate
Source: Airport Records, FAA TAF, Mead & Hunt, Inc.

2.4.3.2. Market Share Methodology

The second methodology examined is the market share methodology. The market share methodology compares the trend in GA operations at a particular airport to trends in national or regional general aviation operations. In general, this share is consistent over time for airports serving mostly general aviation operations. Between 2001 and 2011, CID's market share of total U.S. general aviation operations remained relatively steady at an average of approximately 0.1 percent. It is anticipated that the Airport's 2011 market share of 0.0994 percent will remain constant throughout the forecast period. This figure is applied to total the number of projected total U.S. general aviation operations described in the FAA Terminal Aerospace Forecasts 2011-2031 and shown in **Table 2-22**. The market share methodology projects a steady increase in general aviation operations rising from 25,585 in 2011 to 34,841 in 2031; a CAGR of 1.56 percent.

Table 2-22. General Aviation Operations Forecasts – Market Share Methodology

Year	CID GA Operations	Total U.S. Operations	Market Share
2001	41,613	39,878,536	0.1043%
2002	38,906	37,626,472	0.1034%
2003	36,425	37,652,701	0.0967%
2004	33,696	35,524,020	0.0949%
2005	31,050	34,146,800	0.0909%
2006	30,797	33,072,500	0.0931%
2007	30,265	33,132,000	0.0913%
2008	29,558	31,573,800	0.0936%
2009	25,647	27,999,600	0.0916%
2010	23,439	26,571,400	0.0882%
2011	25,585	25,749,500	0.0994%
Average (2001-2011)			*0.10%*
2016	28,649	28,833,363	0.0994%
2021	30,533	30,728,860	0.0994%
2026	32,595	32,804,953	0.0994%
2031	34,841	35,064,533	0.0994%
CAGR (2011-2031)	*1.56%*	*1.56%*	

CAGR=Compounded Annual Growth Rate
Source: Airport Records, FAA Aerospace Forecast 2011-2031, Mead & Hunt, Inc.

2.4.3.3. Preferred General Aviation Operations Forecast Methodology

Both the operations per based aircraft and market share methodologies were examined to predict future general aviation operations. The operations per based aircraft methodology draws on the low end of the significant decline in operations per based aircraft from 2001 and 2011, while the market share methodology relies on an average market share that has remained relatively consistent during this same period. It is expected that the market share will remain relatively stable in the future. Therefore, the market share methodology is the preferred forecast methodology for general aviation operations (see **Table 2-23**).

Table 2-23. General Aviation Operations Forecasts – Forecast Comparison and Preferred Methodology

Year	FAA TAF Summary	Operations Per Based Aircraft Methodology	Market Share Methodology
2011	25,585	25,585	**25,585**
Projected			
2016	23,295	29,316	**28,649**
2021	25,122	33,403	**30,533**
2026	26,373	38,378	**32,595**
2031	27,683	44,241	**34,841**
CAGR 2009-(2031)	*0.39%*	*2.78%*	***1.56%***

CAGR=Compounded Annual Growth Rate
Source: Airport Records, FAA TAF, ATADS, FAA Aerospace Forecasts 2011-2031, Mead & Hunt, Inc.

General aviation operations are an important part of the planning process, because these operations represent almost half of all aircraft operations at CID. Using the market share methodology it is forecasted that general aviation operations including local operations will increase over the planning period. Understanding general aviation operations will help inform facility requirements at CID as these operations often use local fuel sources, hangars, and runways.

2.4.4. Local/Itinerant General Aviation Operations

The TAF distinguishes between two categories of general aviation operations, local and itinerant. Local operations are conducted by aircraft operating in the traffic pattern within sight of the air traffic control tower, aircraft departing or arriving from flight in local practice areas, or aircraft executing practice instrument operations at the Airport. All general aviation operations other than local operations are defined as itinerant operations. Local operations are typically conducted by users based at the Airport, while itinerant operations are conducted by both based and transient users. As a result, the two types of general aviation operations have different implications for required airport facilities.

Over the past 10 years, itinerant operations have comprised the majority of total general aviation operations at CID. Between 2001 and 2011, itinerant general aviation operations were approximately 72 percent of total general aviation operations, while local operations have accounted for approximately 28 percent of total general aviation operations. It is anticipated that this split will remain constant throughout the forecast period. A summary of projected local and itinerant general aviation operations is shown in **Table 2-24**.

Table 2-24. Local/Itinerant General Aviation Operations Forecast					
	Total GA	Itinerant GA		Local GA	
Year	Operations	Operations	%	Operations	%
2001	41,613	30,432	73%	11,181	27%
2002	38,906	28,078	72%	10,828	28%
2003	36,425	26,131	72%	10,294	28%
2004	33,696	25,278	75%	8,418	25%
2005	31,050	22,962	74%	8,088	26%
2006	30,797	22,765	74%	8,032	26%
2007	30,265	21,277	70%	8,988	30%
2008	29,558	19,976	68%	9,582	32%
2009	25,647	18,460	72%	7,187	28%
2010	23,439	17,731	76%	5,708	24%
2011	25,585	18,022	70%	7,563	30%
Average (2001-2011)			*72%*		*28%*
2016	28,649	20,728	72%	7,921	28%
2021	30,533	22,091	72%	8,441	28%
2026	32,595	23,584	72%	9,012	28%
2031	34,841	25,208	72%	9,633	28%
CAGR (2011-2031)	*1.56%*	*1.69%*		*1.22%*	

CAGR=Compounded Annual Growth Rate
Source: Air Traffic Activity Data System, (ATADS), Mead & Hunt, Inc.

Using the average local/itinerant split from 2001 to 2011, it is anticipated that both local and itinerant general aviation operations at CID will experience a gradual increase over the 20-year planning period. This forecast will be considered to ensure that future planning needs will be met.

2.4.5. Military Operations

Military operations are also an important forecast, although to a lesser extent than other operations at the Airport. Historically, military operations have comprised less than one percent of total operations at CID. Local military operations have consisted mostly of training and reconnaissance flights, while itinerant military operations have consisted mostly of those required for special events and emergencies. Between 2001 and 2011, the number of annual military operations fluctuated from a low of 215 in 2004 to a high of 538 in 2007. Military operations are driven more by Federal policy decisions than by economic conditions; therefore, the preferred forecast methodology for military operations is the FAA TAF Forecasts (see **Table 2-25**). The number of military operations at the Airport is anticipated to remain flat throughout the forecast period.

Table 2-25. Military Operations Forecasts					
Year	Total Military Operations	Itinerant		Local	
		Operations	%	Operations	%
2001	355	179	50%	176	50%
2002	366	280	77%	86	23%
2003	300	180	60%	120	40%
2004	215	125	58%	90	42%
2005	269	269	100%	0	0%
2006	215	183	85%	32	15%
2007	538	478	89%	60	11%
2008	277	263	95%	14	5%
2009	512	378	74%	134	26%
2010	294	280	95%	14	5%
2011	243	213	88%	30	12%
AVG. (2001-2011)	*326*	*257*	*79%*	*69*	*21%*
2016	243	213	88%	30	12%
2021	243	213	88%	30	12%
2026	243	213	88%	30	12%
2031	243	213	88%	30	12%
CAGR (2011-2031)	*0.00%*		*0.00%*		*0.00%*

CAGR=Compounded Annual Growth Rate
Source: Air Traffic Activity Data System, (ATADS), Mead & Hunt, Inc.

2.4.6. Instrument Operations

Instrument flight rules (IFR) apply in the airspace surrounding the Airport when visibility is less than three miles and/or the cloud ceiling is less than 1,000 feet. Pilots conducting operations during IFR conditions must have an instrument rating and file an IFR flight plan. Instrument operations can be conducted in any type of aircraft equipped with appropriate instruments, whether commercial, general aviation, or military. Commercial operators typically require that flight crews file IFR flight plans for operations in all weather conditions. Any operations conducted under an IFR flight plan are considered instrument operations. Forecasting instrument operations will help the Airport ensure that future airport facilities comply with equipment needs and standards associated with instrument approach and departure procedures.

Between 2001 and 2011, approximately 70 percent of all operations at CID were instrument operations. This figure is applied to the number of total projected aircraft operations and results in a steady increase in instrument operations from 35,869 in 2011 to 45,699 in 2031; a CAGR of 1.22 percent (see **Table 2-26**).

Table 2-26. Instrument Operations Forecasts					
	Total	Instrument Operations		Visual Operations	
Year	Operations	Operations	%	Operations	%
2001	74,893	50,553	68%	24,340	32%
2002	73,642	49,702	67%	23,940	33%
2003	71,625	48,440	68%	23,185	32%
2004	69,184	48,210	70%	20,974	30%
2005	65,939	46,950	71%	18,989	29%
2006	63,387	44,498	70%	18,889	30%
2007	63,421	44,541	70%	18,880	30%
2008	61,137	42,309	69%	18,828	31%
2009	57,426	40,881	71%	16,545	29%
2010	50,490	36,427	72%	14,063	28%
2011	52,384	35,869	68%	16,515	32%
AVG. (2001-2011)			*70%*		*30%*
2016	54,250	37,726	70%	16,524	30%
2021	58,412	40,620	70%	17,792	30%
2026	62,244	43,285	70%	18,959	30%
2031	65,716	45,699	70%	20,016	30%
CAGR (2011-2031)	*1.14%*	*1.22%*		*0.97%*	

CAGR=Compounded Annual Growth Rate
Source: Air Traffic Activity Data System, (ATADS), Mead & Hunt, Inc.

2.5. Air Cargo Tonnage and Fleet Mix

Another forecast that informs the Master Plan process is air cargo. Air cargo is typically categorized as either mail or freight. Air cargo is carried by both commercial passenger airlines as “belly cargo”, and by commercial air cargo carriers that do not carry passengers. Air cargo operators at the Airport include Federal Express (FedEx), United Parcel Service (UPS), and to a lesser extent, DHL. Operations by these carriers are classified by the TAF as a subset of commercial and/or general aviation operations. The U.S. Postal Service also utilizes commercial airline belly space for shipping mail.

Airport master plans should assess the capacity of existing cargo processing facilities and determine future requirements for buildings, aircraft parking aprons, ground access facilities, and security equipment and personnel. Air cargo forecasts are needed to determine an airport’s ability to accommodate expected air cargo operator needs. The following sections present forecasts for air cargo tonnage and aircraft fleet mix for the Airport.

2.5.1. Air Cargo Tonnage Forecasts

According to recent FAA Aerospace Forecasts, domestic air cargo revenue ton miles (RTM) decreased by 17.7 percent in 2009, increased by 15.7 percent in 2010, and then declined by 6.1 percent in 2011. Air cargo tonnage at CID followed a similar trend in 2009 and 2010, decreasing by 16.2 percent in 2009, and then increasing by 9.3 percent in 2010. However, air cargo tonnage continued to increase at the Airport in

2011, when it climbed an additional 4.4 percent. Overall, the total tonnage of annual cargo at the Airport decreased slightly between 2008 and 2011. Despite recent declines, the FAA Aerospace Forecast projects that domestic RTMs will increase by 2.7 percent from 2011 through 2031.

During the 2008 to 2011 timeframe, the Airport's average market share of domestic air cargo was 0.4479 percent. This average percentage was fairly steady during this period. As a result, this average market share percentage is held constant throughout the forecast period. Total U.S. cargo forecast data are obtained from the FAA Aerospace Forecast 2011-2031. This forecast projects a steady increase in annual air cargo from 50,846,891 pounds in 2011 to 91,248,145 pounds in 2031; a CAGR of 2.97 percent (see **Table 2-27**).

Table 2-27. Air Cargo Forecasts

Year	Total Air Cargo at CID (pounds)	Total U.S. Air Cargo (revenue ton miles)	CID Market Share
2008	55,187,914	12,257,700,000	0.4502%
2009	47,191,324	10,266,100,000	0.4597%
2010	50,292,912	11,225,300,000	0.4480%
2011	50,846,891	11,721,500,000	0.4338%
		Average 2008-2011	*0.4479%*
2016	64,430,349	14,383,900,000	0.4479%
2021	72,536,159	16,193,500,000	0.4479%
2026	81,694,613	18,238,100,000	0.4479%
2031	91,248,145	20,370,900,000	0.4479%
CAGR 2011-2031	*2.97%*	*2.80%*	

CAGR=Compounded Annual Growth Rate
Source: Airport Records, FAA Aerospace Forecasts 2011-2031, Mead & Hunt, Inc.

2.5.2 Air Cargo Fleet Mix

FedEx, UPS, and DHL are the three primary cargo carriers at The Eastern Iowa Airport. Other cargo carriers operate irregularly at the Airport on an as-needed basis. As described in the previous section, air cargo tonnage is anticipated to nearly double by 2031. Over the past 10 years, air cargo operators have generally been phasing out smaller aircraft for larger, more fuel efficient aircraft.

In 2011, FedEx's operating cargo fleet at the Airport consisted of Aerospatiale/Alenia ATR-72s and Boeing 727-200s. It is anticipated that the FedEx will gradually begin phasing out the B727 in favor of the B757-200s and that the B727 will be completely phased out by 2021. It is also anticipated that there will be an additional 624 cargo operations conducted by FedEx (12 weekly) beginning in 2021 that will be proportionally split between the ATR-72 and the B757 throughout the remainder of the forecast period.

In 2011, the UPS cargo fleet consisted of the Airbus A300-600, the Boeing 757-200, and the Boeing 767-300. It is anticipated that there will be an even split in operations between the B757 and the A300 in 2016, and that UPS will incrementally increase use of the B767 as cargo volumes increase over the next 20 years. It is also expected that UPS will similarly include 624 additional operations starting in 2021 to accommodate increases in cargo volumes. From 2026 to 2031, the B757, the A300, and the B767 are expected to each conduct one third of total UPS cargo operations.

In 2011, the operating cargo fleet for DHL and other irregular cargo operators consisted mainly of the Swearingen Merlin Metro 2, Embraer Brasilia EMB 120, Beech 1900/C-12J, and the ATR-72. It is anticipated that these aircraft (or similar model types) will continue to operate at the Airport throughout the forecast period. It is anticipated that DHL cargo operations will increase approximately 2.9 percent annually, which corresponds with the increase in domestic Revenue Ton Miles listed in the 2011-2031 FAA Aerospace Forecasts for All-Cargo Carriers. Air cargo fleet mix is detailed in **Table 2-28**.

Table 2-28. Air Cargo Fleet Mix

Operator / Aircraft	Avg. Payload	Historical Operations 2008	2009	2010	2011	Projected Operations 2016	2021	2026	2031
FedEx									
Aérospatiale/Alenia ATR-72	18,286	3	181	336	198	198	294	294	294
Boeing 727-200	57,038	1,419	964	1,058	1,084	542	0	0	0
Boeing 757-200	77,818					542	1,612	1,612	1,612
FedExTOTALS		*1,433*	*1,222*	*1,398*	*1,282*	*1,282*	*1,906*	*1,906*	*1,906*
UPS									
Airbus A300-600	102,712		702	342	391	382	562	468	468
Boeing 757-200	77,818	579	218	348	377	382	562	468	468
Boeing 767-300	125,343	74	18	4	12	16	281	468	468
UPS TOTALS		*656*	*938*	*694*	*780*	*780*	*1,404*	*1,404*	*1,404*
DHL/Other									
Swearingen Merlin 4/4A Metro2	5,600	6	16	145	51	52	54	55	57
Embraer Brasilia EMB 120	7,319	8	997	905	783	804	827	851	876
Beech 1900/C-12J	4,300	2			53	54	56	58	59
Aérospatiale/Alenia ATR-72	18,286				192	197	203	209	215
DHL/Other TOTALS		*28*	*1,019*	*1,054*	*1,084*	*1,113*	*1,146*	*1,179*	*1,213*
TOTAL CARGO OPERATIONS		**3,100**	**3,179**	**3,146**	**3,146**	**3,175**	**4,456**	**4,489**	**4,523**

Note: Not all carrier totals add up as carriers sometimes operate with aircraft not usually in the fleet mix
Sources: T-100 Database, Enhanced Traffic Management System Counts

This air cargo fleet mix forecast predicts an overall increase in air cargo aircraft operations at CID, rising from 3,146 in 2011 to 4,523 in 2031; a CAGR of 1.83 percent.

2.6. Peak Activity Forecasts

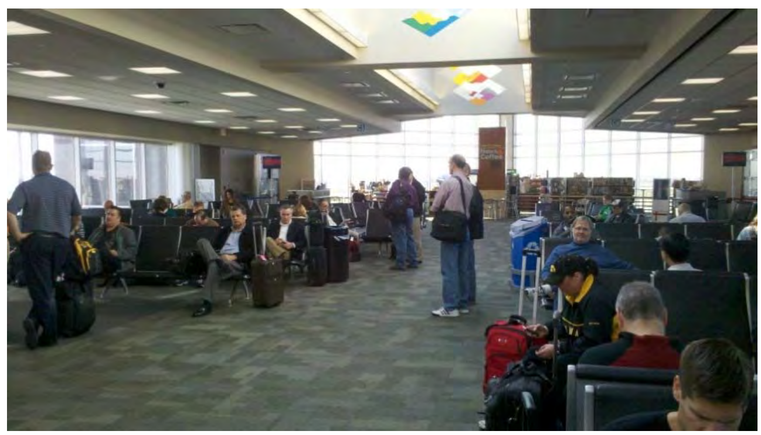
Forecasts of annual passenger activity or aircraft operations may not adequately describe the complex needs of airport facilities. Annual metrics are only useful when activity tends to be evenly distributed over the hours, days, and months of the year. However, most airports have peak periods where demand far surpasses annual averages. As a result, it is important to identify existing peak period activity levels and to forecast future peak period activity levels.

Existing and expected peak volumes of both passengers and aircraft operations have important implications for airport facility and equipment planning. The peak activity forecasts presented in the following sections will be assessed in Chapters 3 and 4 to ensure that the Airport has adequate facilities and equipment to handle peak volumes. However, it should be noted that planning for facility and equipment requirements is based on the probable demand that may occur over time. If planning is contingent on the absolute busiest periods of activity, it can lead to overestimation, overspending, and inefficiencies. As a result, these peak activity forecasts focus on the ***average*** day during the peak months for passenger and aircraft activity rather than the ***peak*** day of the peak months.

This section identifies monthly, daily, and hourly peaking characteristics for passenger and aircraft activity at The Eastern Iowa Airport. Peak activity forecasts are presented in the following subsections:

- Peak Month Passenger Activity
- Peak Day Passenger Activity
- Peak Hour Passenger Activity
- Peak Aircraft Operations

2.6.1. Peak Month Passenger Activity



The typical approach to developing peak activity forecasts is to identify the "design hour" flows of passengers and aircraft. The design hour is the estimate of the peak hour of the average day of the busiest month. This approach provides sufficient facility capacity for most days of the year, but recognizes that facilities should be neither underbuilt nor overbuilt. This section identifies the peak month of the year for passenger activity at CID, and presents passenger activity forecasts for the peak month over the next 20 years. Subsequent sections will use this monthly forecast as a basis for identifying and forecasting average day and peak hour volumes for the peak month.

Monthly passenger enplanement data were obtained from the Airport and shown in **Table 2-29**.

Table 2-29. Historical Peak Month Passenger Enplanements						
Month	**2009 Enplanements**	**%**	**2010 Enplanements**	**%**	**2011 Enplanements**	**%**
Jan	36,049	7.6%	35,860	7.8%	34,081	7.8%
Feb	37,067	7.8%	34,221	7.4%	31,698	7.2%
Mar	45,646	9.6%	43,597	9.4%	40,516	9.2%
Apr	37,564	7.9%	37,104	8.0%	32,504	7.4%
May	42,309	8.9%	39,590	8.6%	37,170	8.5%
Jun	45,337	9.6%	40,999	8.9%	38,873	8.9%
Jul	43,462	9.2%	39,817	8.6%	39,039	8.9%
Aug	38,080	8.0%	37,846	8.2%	34,885	7.9%
Sep	35,157	7.4%	36,984	8.0%	35,308	8.0%
Oct	38,319	8.1%	39,922	8.7%	38,114	8.7%
Nov	37,229	7.9%	37,997	8.2%	37,702	8.6%
Dec	37,936	8.0%	37,465	8.1%	39,135	8.9%
Totals	474,155		461,402		439,025	

Source: Airport Records

This analysis indicates that the peak month for passenger enplanements has historically been March, corresponding to student spring breaks. From 2009 through 2011, an average of 9.4 percent of annual enplanements occurred during March. However, peak activity forecasts should include both enplanements and deplanements, as airport facilities must be able to handle the co-mingled needs of passengers that are both arriving and departing during the "design hour." It is assumed that peak monthly enplanements and deplanements will be equal, and that peak month enplanements will continue to be 9.4 percent of annual activity. This percentage was applied to the annual forecasts of passenger enplanements described in a previous section as shown in **Table 2-30**. This forecast projects a steady increase in peak month passenger enplanements, rising from 40,516 in 2011 to 68,691 in 2031.

Table 2-30. Peak Month Passenger Enplanement Forecasts					
			Peak Month		
Year	**Projected Annual Enplanements**	**Peak Month % Total**	**Enplanements**	**Deplanements**	**Total Activity**
2016	520,016	9.4%	49,062	49,062	98,124
2021	598,658	9.4%	56,482	56,482	112,964
2026	667,556	9.4%	62,982	62,982	125,964
2031	730,925	9.4%	68,961	68,961	137,922

Source: Airport Records, OAG, Mead & Hunt, Inc.

2.6.2. Peak Day Passenger Activity

As mentioned previously, the typical approach to peak activity forecasting is to identify the "design hour" flows of passengers and aircraft. This section identifies the historic average daily activity at CID during its peak month and applies it to the peak month passenger activity forecast to develop a peak day forecast. This forecast will be used in a subsequent section to determine the "design hour" for passenger activity.

The average weekday during the peak month for passenger activity at the Airport typically has 32 commercial departures and 32 commercial arrivals, with approximately 15.5 percent of available weekly seats either departing or arriving at the Airport. **Table 2-31** presents the peak month activity for each day of the week at the Airport, including total passenger airline departures and departing seats, and total passenger airline arrivals and arriving seats.

Table 2-31. Peak Month Daily Activity

Day	Departures	Departing Seats	% Weekly Total	Arrivals	Arriving Seats	% Weekly Total
Mon	32	1,916	15.6%	32	1,916	15.4%
Tue	30	1,766	14.4%	30	1,766	14.2%
Wed	31	1,766	14.4%	32	1,916	15.4%
Thu	30	1,616	13.2%	31	1,766	14.2%
Fri	31	1,766	14.4%	31	1,766	14.2%
Sat	26	1,644	13.4%	24	1,524	12.3%
Sun	30	1,796	14.6%	25	1,766	14.2%
Total	210	12,270		205	12,420	

Sources: Official Airline Guide (OAG) August, 2012 Schedule, Mead & Hunt, Inc.

This analysis indicates that Mondays are the busiest days of the week during the peak month, with 15.5 percent of weekly activity. The peak month for passenger activity, which has typically been March, is 31 days long (4.4 weeks). The sum of forecasted peak month enplanements and deplanements presented in the previous section was divided by the average number of weeks in the peak month to determine the average number of weekly passenger enplanements and deplanements that occur in the peak month. This number was then divided by the percent of weekly activity that occurs on a Monday (15.6 percent enplanements, 15.4 percent deplanements) to yield the average number of daily enplanements and deplanements that occurs during the peak month (see **Table 2-32**). This forecast projects a steady increase in average peak day enplaning and deplaning passengers, rising from 2,858 in 2011 to 4,834 in 2031.

Table 2-32. Peak Month Average Day Passenger Activity

Year	Peak Month Enpl/Depl	Weeks in Peak Month	Average Weekly Enpl/Depl	% of Weekly Activity on Typical Weekday		Average Weekday Passengers		
				Enplaning	Deplaning	Enplanements	Deplanements	Total
2011	40,516	4.4	9,208	15.6%	15.4%	1,438	1,421	2,858
2016	49,062	4.4	11,151	15.6%	15.4%	1,741	1,720	3,461
2021	56,482	4.4	12,754	15.6%	15.4%	1,992	1,968	3,959
2026	62,982	4.4	14,222	15.6%	15.4%	2,221	2,194	4,415
2031	68,961	4.4	15,572	15.6%	15.4%	2,432	2,402	4,834

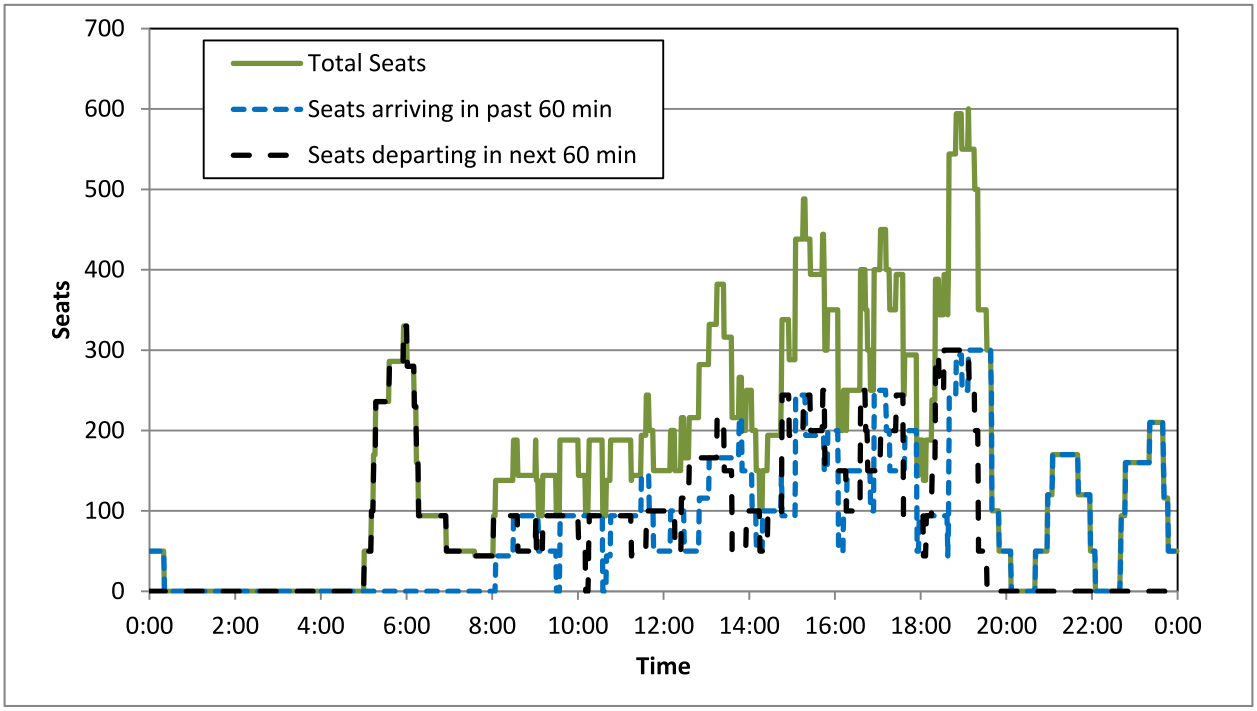
Sources: Airport Records, Official Airline Guide (OAG) August, 2012 schedule, Mead & Hunt, Inc.

2.6.3. Peak Hour Passenger Activity

As mentioned previously, the typical approach to peak activity forecasting is to identify the "design hour" flows of passengers and aircraft. This section identifies the number of arriving and departing airline seats during the peak hour at CID, and divides the peak day passenger activity forecast presented in the previous section by this number to develop a peak hour, or "design hour", passenger activity forecast.

The number of hourly arriving and departing seats during a typical weekday during the peak month is shown in **Chart 2-9**.

Chart 2-9. Peak Month Typical Weekday – Arriving and Departing Seats



The peak hour for departing seats typically occurs between 5:00 p.m. and 6:00 p.m., the peak hour for arriving seats typically occurs between 6:38 p.m. and 7:38 p.m., and the peak hour for total arriving and departing seats occurs between approximately 6:15 p.m. and 7:15 p.m. (see **Table 2-33**).

Table 2-33. Peak Hour Seats

Time of Day	# of Seats	Total Daily Seats	% of Daily Seats in Peak Hour
Peak Hour Departing Seats (Enplanements)			
5:00 pm to 6:00 pm	330	1,916	17.2%
Peak Hour Arriving Seats (Deplanements)			
6:38 pm to 7:38 pm	300	1,916	15.7%
Peak Total Passengers			
6:15 pm to 7:15 pm	600	3,832	15.7%

Sources: Official Airline Guide (OAG) November 2011 Schedule, Mead & Hunt, Inc.

The percentages of daily seats during each of the three peak hours identified in Table 2-34 were applied to the peak day passenger forecast described in the previous section to develop the peak hour, or "design hour", passenger activity forecast (see **Table 2-34**). This forecast projects a steady increase in total peak hour passenger activity, rising from 448 in 2011 to 757 in 2031.

Table 2-34. Peak Hour Passenger Activity

	Average Day Passengers		Peak Hour Passengers		
			Enplanements	Deplanements	Total Passengers
Year	Enplanements	Deplanements	15.7%	15.7%	15.6%
2011	1,438	1,421	248	222	448
2016	1,741	1,720	300	269	542
2021	1,992	1,968	343	308	620
2026	2,221	2,194	382	344	691
2031	2,432	2,402	419	376	757

Sources: Airport Records, Official Airline Guide (OAG) July, 2012 Schedule, Mead & Hunt, Inc.

A summary of the passenger activity peaking forecasts described in the previous sections is presented in **Table 2-35**, including the peak month, peak day, and peak hour passenger activity forecasts. These forecasts will be used to assess the appropriate capacity for facilities in the passenger terminal area. Among the key findings of this peak passenger activity analysis:

- The peak month for passenger activity at the Airport is March, with an average of 9.4 percent of annual passenger activity;
- The busiest day at the Airport during the peak month is Monday, with 15.5 percent of weekly activity;
- The peak hour for departing seats during the peak day is 5:00 p.m. to 6:00 p.m.; the peak hour for arriving seats during the peak day is 6:38 p.m. to 7:38 p.m.; and the peak hour for total passenger activity during the peak day is 6:15 p.m. to 7:15 p.m.; and
- The Airport should plan for a peak hour of 757 total arriving and departing passengers by 2031.

Table 2-35. Passenger Peaking Characteristics Summary				
Year	**Peak Factor**	**Enplanements**	**Deplanements**	**Total Passenger Activity**
2011	Annual	439,025	439,025	878,050
	Peak Month	40,516	40,516	81,032
	Peak Day	1,438	1,421	2,858
	Peak Hour	248	222	448
2016	Projected			
	Annual	520,016	520,016	
	Peak Month	49,062	49,062	98,124
	Peak Day	1,741	1,720	3,461
	Peak Hour	300	269	542
2021	Projected			
	Annual	598,658	598,658	1,197,316
	Peak Month	56,482	56,482	112,964
	Peak Day	1,992	1,968	3,959
	Peak Hour	343	308	620
2026	Projected			
	Annual	667,556	667,556	1,335,111
	Peak Month	62,982	62,982	125,964
	Peak Day	2,221	2,194	4,415
	Peak Hour	382	344	691
2031	Projected			
	Annual	730,925	730,925	1,461,850
	Peak Month	68,961	68,961	137,922
	Peak Day	2,432	2,402	4,834
	Peak Hour	419	376	757

Sources: Airport Records, Official Airline Guide (OAG) July, 2012 Schedule, Mead & Hunt, Inc.

2.6.4. Peak Aircraft Operations

Like peak passenger activity forecasts, the typical approach to peak aircraft operations forecasting is to identify the “design hour” flows of aircraft operations, which is the estimate of the peak hour of the average day of the busiest month. This forecast will allow the Airport to assess the expected peak demand for airside facilities such as runways and aircraft parking aprons and to compare these demands to existing facility capacities. Historical monthly operations for the year 2011 at CID are shown in **Table 2-36**.

Table 2-36. Historical Peak Month - Aircraft Operations		
Month	**2011 Aircraft Operations**	**% Annual**
Jan	3,525	6.73%
Feb	3,050	5.82%
Mar	3,792	7.24%
Apr	4,076	7.78%
May	4,352	8.31%
Jun	4,938	9.43%
Jul	5,248	10.02%
Aug	5,829	11.13%
Sep	4,682	8.94%
Oct	4,934	9.42%
Nov	4,138	7.90%
Dec	3,820	7.29%
Totals	52,384	

Source: Air Traffic Activity Data System, (ATADS), Mead & Hunt, Inc.

This analysis indicates that the peak month for aircraft operations at CID is August. In 2011, 11.13 percent of annual aircraft operations occurred during August. It is expected that this peak hour percentage will remain constant throughout the forecast period. To forecast peak month operations, the 11.13 peak month percentage for total aircraft operations was applied to annual operations forecasts described in previous sections of this chapter. This peak month aircraft operations forecast was then divided by the number of days in the peak month (31) to determine the average number of daily operations during the peak month. This average number of daily operations was then divided by 14.1 percent, the average number of operations during the typical peak hour for aircraft operations according to Airport records, to determine the peak hour operations at CID (see **Table 2-37**).

Table 2-37. Peak Aircraft Operations Forecasts						
Year	**Annual Operations**	**Peak Month %**	**Peak Month Operations**	**Peak Month Avg. Day Operations**	**Peak Hour %**	**Peak Hour Operations**
2011	52,384	11.13%	5,829	188	13.1%	25
2016	54,250	11.13%	6,037	195	13.1%	27
2021	58,412	11.13%	6,500	210	13.1%	30
2026	62,244	11.13%	6,926	223	13.1%	32
2031	65,716	11.13%	7,312	236	13.1%	33
CAGR (2011-2031)	*1.14%*		*1.09%*	*1.09%*		*1.09%*

CAGR=Compounded Annual Growth Rate
Sources: Airport Records, FAA Enhanced Traffic Management Systems Counts (ETMSC), Mead & Hunt, Inc.

This forecast projects a steady increase in peak hour aircraft operations, rising from 25 in 2011 to 33 in 2031. This forecast will be used to assess the appropriate capacity for airside facilities such as runways and aircraft parking aprons.

2.7. Design Aircraft

It is important to determine the most demanding aircraft operating at an airport, or "design aircraft", as these aircraft have a direct influence on airfield geometric design standards and safety criteria. The design aircraft for an airport are identified by a Runway Reference Code (RRC) and Runway Design Code (RDC). The RRC signifies the current operational capabilities of a runway and its associated parallel taxiway, and the RDC signifies the standards to which the runway is to be built. The RRC and RDC for a particular aircraft consist of two components: approach category (based on approach speed) and design group (based on wingspan and tail height). FAA standard definitions for aircraft approach categories and design groups are listed in **Table 2-38**.

Table 2-38: Aircraft Approach Category and Design Group Definitions

Approach Category	Approach Speed (knots)	
A	Less than 91 knots	
B	91 or greater, but less than 121	
C	121 or greater, but less than 141	
D	141 or greater, but less than 166	
E	166 or greater	
Design Group	**Wingspan (feet)**	**Tail Height (feet)**
I	<49	<20
II	49 - <79	20 - <30
III	79 - <118	30 - <45
IV	118 - <171	45 - <60
V	171 - <214	60 - <66
VI	214 - <262	66 - <80

Source: FAA Advisory Circular 150/5300-13A, Airport Design

The most demanding aircraft that currently use CID are large commercial jet and business jet aircraft. Large commercial jet aircraft regularly operating at CID include the Airbus A300-600, the Boeing 727-200 and 757-200, the Bombardier CRJ-200 and CRJ-700, the Embraer ERJ135 and ERJ145, the Embraer 170, and the Boeing MD-80 Series. Large business jet aircraft regularly operating at CID include all Cessna Citation models, the Bombardier Challenger 600/601/604, the Bombardier CRJ-100, the Hawker 800, all Gulfstream models, and all Learjet models.

According to the most recent Airport Layout Plan (ALP) for CID, the RRC for both Runway 9/27 and Runway 13/31 is C-III. However, there are aircraft with more demanding approach categories and design groups currently using CID on a regular basis. The group of design aircraft for CID determined by this Master Plan Update is shown in **Table 2-39**. The most demanding aircraft in terms of approach speed include the Boeing MD-83 and MD-88; the Gulfstream II, IV, and V; and the Boeing 737-800. These aircraft belong to Approach Category "D", with approach speeds greater than 141 knots, but less than 166 knots. The most demanding aircraft in terms of wingspan include the Airbus A300-600, the Boeing 757-

200, and the Boeing 767-300. These aircraft belong to Design Group "IV", with wingspans greater than 118 feet but less than 171 feet. All of these aircraft use both Runway 9/27 and Runway 13/31.

Table 2-39: CID Design Aircraft		
Most Demanding Approach Speeds (Approach Category D)		
Aircraft	***Approach Speed***	***Annual Operations (2007-2011)***
Boeing MD-83	144 knots	900
Boeing MD-88	144 knots	150
Gulfstream II	141 knots	50
Gulfstream IV	149 knots	50
Gulfstream V	160 knots	25
Boeing 737-800	142 knots	100
Most Demanding Wingspans (Design Group IV)		
Aircraft	***Wingspan***	***Annual Operations (2007-2011)***
Airbus A300-600	147 feet	400
Boeing 757-200	125 feet	500
Boeing 767-300	156 feet	50

Sources: FAA Enhanced Traffic Management System Counts (ETMSC);
FAA Advisory Circular 150/5300-13A, Airport Design

The design aircraft listed in Table 2-39 are expected to continue to operate at CID throughout the 20-year planning period. Based on the forecasts presented in previous sections of this chapter, these aircraft are also expected to increase their use of the Airport in the future, and no aircraft with more demanding approach speeds or wingspans are expected to start using the Airport on a regular basis during the 20-year planning period.

Based on the design aircraft identified above, D-IV is the appropriate RDC for both Runway 9/27 and Runway 13/31 throughout the 20-year planning period. However, it is important to note that many aircraft operating at the Airport fit into smaller RRC/RDC categories. Because the Airport is utilized regularly by all sizes and types of aircraft, the facility requirements and alternatives analyses will consider the needs of all user groups and not just the design aircraft identified above.

2.8. Forecast Summary and FAA TAF Comparison

Based on the historic aviation activity information presented in this chapter, it is clear that passenger and aircraft activity at CID has fluctuated in recent years. However, this has not been uncommon at airports throughout the U.S. as economic uncertainty and increased travel costs have impacted travel behavior. Despite rapid increases in fuel cost, airline bankruptcies, system-wide route restructuring, and aircraft fleet overhauls, the forecasts developed for this Master Plan suggest positive growth in passenger enplanements, in the number of based aircraft, and in total aircraft operations at the Airport over the next 20 years. The following forecasts were identified in this chapter as the preferred forecasts for facility planning at CID:

- For passenger enplanements, the market share methodology was chosen as the preferred forecast methodology. This methodology assumes that the Airport's share of total U.S.

domestic passenger enplanements in 2011 (0.0691 percent) will remain constant throughout the planning period. The preferred passenger enplanement forecast projects that enplanements at The Eastern Iowa Airport will grow by approximately two-thirds over the planning period, from 439,025 enplanements in 2011 to 730,925 in 2031.

- For passenger airline operations, the preferred passenger enplanement forecast was divided by the expected average passengers per flight over the next 20 years. Average passengers per flight is expected to increase in the future as airlines phase out smaller aircraft and seek to increase passenger load factors to the maximum extent possible. For air taxi operations, the preferred forecast assumes that the FAA's projected annual growth rate for the national general aviation and air taxi fleet (0.90 percent) will also apply at the Airport. These preferred forecasts result in slow but steady growth in overall commercial aircraft operations, rising from 26,561 in 2011 to 30,632 in 2031.

- For based aircraft, the TAF was chosen as the preferred forecast methodology. This preferred forecast predicts strong growth in based aircraft, rising from 144 in 2011 to 249 in 2031.

- For general aviation operations, the market share methodology was chosen as the preferred forecast methodology. This methodology assumes that the Airport's share of total U.S. general aviation operations in 2011 (0.0994 percent) will remain constant throughout the planning period. This preferred forecast projects steady growth in general aviation operations, rising from 25,585 in 2011 to 34,841 in 2031.

- For air cargo tonnage, a market share methodology was chosen as the preferred forecast methodology. This methodology assumes that the Airport's average share of total U.S. air cargo from 2008 to 2011 (0.4479 percent) will remain constant throughout the planning period. This preferred forecast predicts strong growth in annual air cargo, rising from 50,846,891 pounds in 2011 to 91,248,145 pounds in 2031. Increases in cargo aircraft operations, as well as transitions to larger cargo aircraft, are expected to accommodate future increases in cargo volumes.

- For peak passenger and aircraft operations, the preferred forecast identified the "design hour" flows of passengers and aircraft, which are estimates of the peak hour of the average day of the busiest month. The peak passenger activity forecast predicts steady growth in total peak hour passengers, rising from 448 in 2011 to 757 in 2031. The peak aircraft operations forecast predicts slower growth in peak hour operations, rising from 25 in 2011 to 33 in 2031.

- Based on the most demanding aircraft currently using the Airport and expected to use the Airport in the future, the runway reference code (RDC) should be D-IV for both Runway 9/27 and Runway 13/31.

The FAA templates for summarizing and documenting airport planning forecasts and for comparing forecasts with the FAA TAF Forecasts are presented in **Table 2-40** and **Table 2-41**. These forecasts will be used to determine facility requirements at the Airport.

Table 2-40. FAA Template for Comparing Airport Planning and TAF Forecasts

	Year	Airport Forecast	TAF	AF/TAF (% Difference)
Passenger Enplanements				
Base Yr. Level	2011	439,025	438,608	0.1%
Base Yr. + 5yr.	2016	520,016	487,003	6.8%
Base Yr. + 10yrs.	2021	598,658	541,920	10.5%
Base Yr. + 15yrs.	2026	667,556	604,238	10.5%
Base Yr. + 20yrs.	2031	730,925	674,960	8.3%
Commercial Operations				
Base Yr. Level	2011	26,561	26,327	0.9%
Base Yr. + 5yr.	2016	25,358	27,970	-9.3%
Base Yr. + 10yrs.	2021	27,636	29,732	-7.0%
Base Yr. + 15yrs.	2026	29,406	31,638	-7.1%
Base Yr. + 20yrs.	2031	30,632	33,681	-9.1%
Total Operations				
Base Yr. Level	2011	52,389	51,500	1.7%
Base Yr. + 5yr.	2016	54,250	52,148	4.0%
Base Yr. + 10yrs.	2021	58,412	55,097	6.0%
Base Yr. + 15yrs.	2026	62,244	58,254	6.8%
Base Yr. + 20yrs.	2031	65,716	61,607	6.7%

Notes: TAF data is on a U.S. Government fiscal year basis (October through September).
Airport Forecast is on a calendar year basis.

Table 2-41: FAA Template for Summarizing and Documenting Airport Planning Forecasts

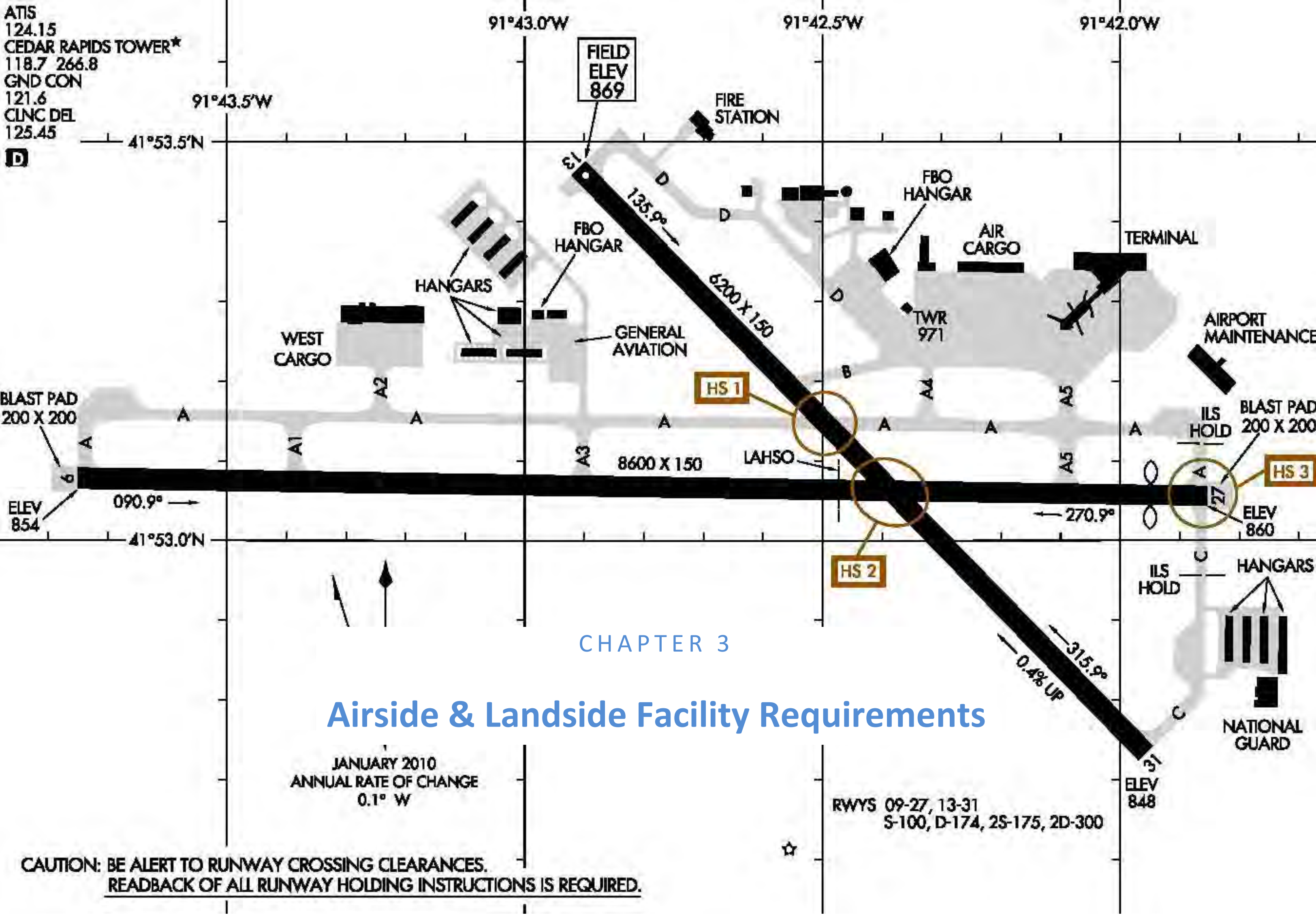
The Eastern Iowa Airport									
A. Forecast Levels and Growth Rates									
		Specify base year:	2011						
	2011	2016	2021	2026	2031	Average Compound Annual Growth Rates			
	Base Yr. Level	Base Yr.+5yrs	Base Yr.+10yrs	Base Yr.+15yrs	Base Yr.+20yrs	Base Yr. to +5	Base Yr. to +10	Base Yr. to +15	Base Yr. to +20
Passenger Enplanements									
TOTAL Air Carrier & Commuter	439,025	520,016	598,658	667,556	730,925	3.44%	1.42%	0.73%	0.45%
Operations									
Itinerant									
Air Carrier	2,632	7,268	9,133	10,972	12,690	22.53%	2.31%	1.23%	0.73%
Commuter/air taxi	23,929	18,090	18,503	18,433	17,942	-5.44%	0.23%	-0.03%	-0.13%
Total Commercial Operations	26,561	25,358	27,636	29,406	30,632	-0.92%	0.86%	0.41%	0.20%
General aviation	18,022	20,728	22,091	23,584	25,208	2.84%	0.64%	0.44%	0.33%
Military	213	213	213	213	213	0.00%	0.00%	0.00%	0.00%
Local									
General aviation	7,563	7,921	8,441	9,012	9,633	0.93%	0.64%	0.44%	0.33%
Military	30	30	30	30	30	0.00%	0.00%	0.00%	0.00%
TOTAL OPERATIONS	52,389	54,250	58,411	62,245	65,716	0.70%	0.74%	0.42%	0.27%
Instrument Operations	35,869	37,726	40,620	43,285	45,699	1.01%	0.74%	0.42%	0.27%
Peak Hour Operations	25	27	30	32	33	1.55%	1.06%	0.43%	0.15%
Cargo/mail (enplaned + deplaned tons)	25,423	32,215	36,268	40,847	45,624	4.85%	1.19%	0.80%	0.55%
Based Aircraft									
Single Engine (Nonjet)	114	131	149	171	197	2.82%	1.30%	0.92%	0.71%
Multi Engine (Nonjet)	18	21	24	27	31	3.13%	1.34%	0.79%	0.69%
Jet Engine	8	9	10	12	14	2.38%	1.06%	1.22%	0.77%
Helicopter	4	5	5	6	7	4.56%	0.00%	1.22%	0.77%
Other	0	0	0	0	0	0.00%	0.00%	0.00%	0.00%
TOTAL	144	166	188	216	249	2.88%	1.25%	0.93%	0.71%
B. Operational Factors									
	Base Yr. Level	Base Yr.+1yr.	Base Yr.+5yrs.	Base Yr.+10yrs.	Base Yr.+15yrs.				
Average aircraft size (seats)									
Air Carrier & Commuter	55.1	65.9	68.1	70.2	72				
Average enplaning load factor									
Air Carrier & Commuter	71.9%	76.0%	77.0%	78.0%	80.0%				
GA operations per based aircraft	178	174	162	151	140				

MASTER PLAN

THE EASTERN IOWA AIRPORT CEDAR RAPIDS

3

Airside & Landside Facility Requirements



CHAPTER 3

Airside & Landside Facility Requirements

This chapter presents requirements for airside and landside facilities to meet aviation demand at The Eastern Iowa Airport (referred to as CID or the Airport) over the next 20 years. For those components determined to be deficient, the type and size of facility required to meet future demand is identified. Airside facilities examined include runways, taxiways, runway protection zones, and navigational aids. Landside facilities include such facilities as hangars, aircraft apron areas, and airport support facilities. Requirements for terminal area facilities such as the terminal building and passenger parking lots will be considered in Chapter 4.

This analysis uses the preferred growth scenarios presented in Chapter 2 to establish future development needs at the Airport. This is not intended to dismiss that either accelerated growth or consistently higher or lower levels of activity may occur due to the unique circumstances in the region. Aviation activity levels should be monitored for consistency with the forecasts. In the event that changes inconsistent with the activity forecasts occur, the schedule of development should be adjusted to correspond to the demand for facilities rather than set to pre-determined dates of development, avoiding over-building or under-building. Airside and landside facility requirements are presented in the following sections:

- Airside and Landside Planning Considerations and Goals
- Environmental Conditions and Implications for Airfield Facilities
- Airfield Demand/Capacity Analysis

- Airside Facility Requirements
- Landside Facility Requirements
- Facility Requirements Summary

3.1. Airside and Landside Planning Considerations and Goals

3.1.1. Planning Considerations

Several planning considerations and goals were established early in the development of this Master Plan. The intent of explicitly acknowledging these considerations is to provide a basis that will direct development of airside and landside facilities in the future.

- Consideration One: Compliance: The Airport will be developed and operated in a manner that is consistent with local ordinances and codes, federal and state statutes, federal grant assurances, and Federal Aviation Administration (FAA) regulations.

- Consideration Two: Airport Role: The Airport will continue to serve as a facility that accommodates commercial passenger service and cargo activity, along with general aviation activity and a small amount of military activity.

- Consideration Three: Runway Usage: This consideration recognizes the fact that both Runway 9/27 and Runway 13/31 are heavily utilized by air carriers and are of similar operational importance.

- Consideration Four: Aircraft Design Standards: This consideration relates to the size and type of aircraft that utilize the Airport and the resulting setback and safety criteria used as the basis for the layout of associated airport facilities. These include:

    - *Runway 9/27.* As discussed in Section 2.7, the "Design Aircraft" for this runway is a combination of aircraft, specifically the Boeing MD-83 and the Boeing 757-200. The MD-83 has an approach speed of 144 knots and the B-757-200 has a wingspan of 135 feet. This indicates that the appropriate Aircraft Approach Category (AAC) for Runway 9/27 is D, the appropriate Aircraft Design Group (ADG) for Runway 9/27 is IV, and the appropriate Taxiway Design Group (TDG) for Runway 9/27 is 5.

    - *Runway 13/31.* Commercial and large general aviation jet aircraft that regularly use Runway 9/27 also regularly use Runway 13/31. However, Runway 13/31 is considered the Airport's "crosswind runway" because there are no existing or forecasted capacity concerns associated with Runway 9/27, and as such Runway 13/31 should be designed for the most demanding aircraft for which Runway 9/27 does not provide 95 percent wind coverage. The wind coverage analysis described in Section 3.2.2 of this Chapter shows that Runway 9/27 has adequate wind coverage for all aircraft with an AAC of D or greater and all aircraft with an ADG of III or greater. This indicates that the appropriate AAC for Runway 13/31 is C and the appropriate ADG for Runway 13/31 is II. In order to support the landing gear types of aircraft greater than Runway Reference Code (C-II) that use the runway on a regular basis, the TDG for Runway 13/31 should be the same as that for Runway 9/27.

  - *Future Runway 9L/27R.* Historically, this runway has been shown on the Airport Layout Plan. While not considered necessary for capacity purposes within the 20-year planning period, it is expected that space will continue to be reserved for this post-planning period runway facility. Consideration will be given to the development of this runway with a phased approach allowing for an initial construction of a small, general aviation capable runway with a RRC of B-II and visual approaches with a long-term upgrade of this runway to a commercial service runway with a RRC of D-IV and precision approach capabilities.

- Consideration Five: Accessibility and Approach Capability: This consideration relates to the need for the Airport to accommodate aircraft operations safely and reliably. The Airport's runway system should be developed with instrument approach guidance capabilities to accommodate forecasted operations as safely as possible under most weather conditions. The Airport currently has precision approach minimums down to ILS Category I (decision height not lower than 200 feet above touchdown zone elevation and visibility not less than 2,400 feet); however, there are still a few days each year that the Airport experiences dense fog and weather reported below CAT I minimums resulting in airport closure and canceled flights. Consequently, alternatives to provide the necessary equipment for ILS Category II and/or III (CAT II/III) minimums should be considered.

- Consideration Six: Landside Development: Because the amount of landside development area at any airport is at a premium, the sixth consideration is to plan for future airport development that strives to make the most efficient use of the available area for aviation-related activities, including general aviation facilities and passenger terminal facilities. Aviation use areas should be developed to be compatible with surrounding land uses on the Airport.

- Consideration Seven: Land Use Compatibility: The seventh consideration focuses on the relationship of the Airport to off-airport land uses and the compatible and complementary development of each. To the maximum extent possible, future facilities will be designed to enhance the compatibility of the operation of the Airport with the environs.

3.1.2. Planning Goals

The considerations presented in the previous section were established for the purpose of directing the plan and establishing continuity in future development of the Airport. The planning goals presented in this section take into account the considerations relating to the needs of the Airport in both the short-term and the long-term including safety, noise, capital improvements, land use compatibility, financial and economic conditions, public interest and investment, and community recognition and awareness. While all are project-oriented, some represent more tangible activities than others; however, all are deemed important and appropriate to the future of the Airport.

The following goals are intended to guide the preparation of development alternatives for this Master Plan Update and direct the future expansion at CID:

- Provide effective direction for the future development of the Airport through the preparation of a rational, reasonable, and implementable plan.
- Prepare a plan that allows the Airport to fulfill its mission to facilitate and enhance regional aviation services.
- Accommodate the forecasted aviation activity levels in a safe and efficient manner by providing the necessary airport facilities and services.
- Ensure that future development of the Airport will accommodate a variety of general aviation activities ranging from small general aviation users to corporate aviation operators.
- Plan and develop the Airport to be capable of accommodating the future needs of the City of Cedar Rapids, Linn County and the larger surrounding service area, and capable of supporting regional economic development activity.
- Plan for potential property acquisition for approach protection and land use compatibility purposes.
- Encourage and protect the public and private investment in land and facilities.

3.2. Environmental Conditions and Implications for Airfield Facilities

Climatological conditions specific to the location of an airport not only influence the layout of the airfield, but also impact the use of the runway system. Variations in the weather resulting in limited cloud ceilings and reduced visibility typically lower airfield capacity and usability, while changes in wind direction and velocity typically dictate runway usage and also influence runway capacity.

The arrangement and interaction of airfield components (runways, taxiways, and ramp entrances) refers to the layout or “design” of the airfield. As described in Chapter 1, CID is served by two runways, Runway 9/27 and Runway 13/31. The east/west runway (Runway 9/27) is located south and west of the terminal complex and is served by a full parallel taxiway (Taxiway A) on its north side. Runway 9/27 connects to Taxiway A via five exit taxiways. The northwest/southeast runway (Runway 13/31) is also located south and west of the terminal complex and is served by a partial parallel taxiway on its east side (Taxiway D) and a connector taxiway at the approach end of Runway 31 (Taxiways C). Taxiway C connects the approach end of Runway 31 to the approach end of Runway 27. In addition, Taxiway B extends east from near the midpoint of Runway 13/31 to the primary aircraft parking apron.

The following sections describe historical ceiling, visibility, and wind conditions, and their implications for required airfield facilities at CID.

3.2.1. Ceiling and Visibility

Runways provide maximum utility when they can be used in less than ideal weather conditions, which for runways translate to visibility in terms of the distance required to see and identify prominent unlighted objects by day and prominent lighted objects by night. In order to land during periods of limited visibility, pilots must be able to see the runway or associated lighting at a certain distance from and height above the runway. If the runway environment cannot be identified at the minimum visibility point on approach, FAA regulations do not authorize pilots to land.

Runways 9 and 27 at the Eastern Iowa Airport are equipped with Category-I (CAT-I) Instrument Landing Systems (ILS) which allow precision instrument approach and landing with a decision height not lower than 200 feet above touchdown zone elevation and a visibility not less than one half statute miles. The ILS procedure to Runway 9 also allows for approaches for visibility as low as 1800 runway visual range (RVR) using an aircraft flight director (FD) or autopilot with an approach coupler or head-up display (HUD) to the decision altitude (DA). These instrument approach capabilities minimize times when the Airport must cease operations due to poor visibility and adverse weather conditions.

However, there is potential for improving the visibility minimums to either runway end through implementation of a Category-II (CAT-II) or Category-III (CAT-III) ILS approach procedure. These types of procedures would require navigational equipment upgrades for which a Benefit Cost Analysis (BCA) would have to be completed. A BCA is a planning tool that the FAA uses to determine whether navigational aid improvements are justified by weighing perceived benefits of the improvements against societal costs. It is a standardized tool appropriate for some commercial service airports, but it is not a representative model for all situations.

Hourly weather data collected by the CID Automatic Surface Observation System (ASOS) was analyzed to determine the frequency of Instrument Flight Rules (IFR), CAT-I, CAT-II, and CAT-III conditions at CID. Definitions for these four weather condition categories are described in **Table 3-1**.

Table 3-1: Weather Condition Definitions

Weather Conditions	Ceiling		Visibility
Instrument Flight Rules (IFR)	Less than 1,000 feet above ground level	or	Less than three miles
Category I (CAT I)	Greater than or equal to 200 feet, but less than 1,000 feet	or	Greater than or equal to one-half mile, but less than one mile
Category II (CAT-II)	Greater than or equal to 100 feet, but less than 200 feet	or	Greater than or equal to one-quarter mile, but less than one-half mile
Category III (CAT-III)	Greater than zero, but less than 100 feet	or	Greater than zero, but less than one-quarter mile

The use of a CAT-II/III approach requires special aircrew and aircraft certification. Most air carrier aircraft and crews have the equipment, training, and certification for CAT II/III approaches, but typical general aviation aircraft and pilots do not. Typically, only major hub airports or commercial service airports with extenuating weather conditions have CAT II/III ILS equipment and approaches due to the high costs associated with the additional lighting and equipment required. CAT II/III approaches are most useful at airports that experience a significant amount of weather below CAT I minimums resulting in a significant number of air carrier cancellations during these conditions.

A 10-year history of weather data (2000-2009) for CID was obtained from the National Climatic Data Center (NCDC) for this analysis. The data is recorded by the Automated Surface Observation Station (ASOS) located on the airfield. **Table 3-2** presents an annual summary of the frequency of IFR, CAT-I, CAT-II, and CAT-III weather observations at CID from 2000 through 2009 based on this data.

Table 3-2: CID Ceiling and Visibility Analysis (2000 to 2009)

Weather Condition Category	Hourly Observations	Percentage of Total	Hours in a Typical Year	Days in a Typical Year
Total Observations	83,725	100.00%	8,760	365
Visual Flight Rules (VFR)	75,076	89.67%	7,855	327.3
Instrument Flight Rules (IFR)	8,637	10.32%	904	37.7
Category I (CAT I)	7,515	8.98%	786	32.8
Category II (CAT II)	773	0.92%	81	3.4
Category III (CAT III)	349	0.42%	37	1.5

Sources: National Climatic Data Center; Mead & Hunt, Inc.

In an average year during this period, IFR conditions occurred 10.3 percent of the time, with CAT-I conditions occurring 9.0 percent of the time, CAT-II conditions occurring 0.9 percent of the time, and CAT-III conditions occurring 0.4 percent of the time. The cumulative average annual time that recorded visibility minimums are lower than the lowest CID approach minimums (CAT-I) is approximately 118 hours (about 5 days). During this time, the airport is considered closed. Without taking wind coverage into account, a CAT-II approach could lower this to approximately 37 hours (about a day and a half), allowing for an additional 81 hours of airport operations. **Table 3-3** summarizes wind coverage for each individual runway end in both CAT-II and CAT-III weather conditions as well as the average number of additional hours each runway end would be available with CAT-II or CAT-III systems based on those wind coverage percentages.

Table 3-3: CAT-II/CAT-III Wind Coverage Analysis

	CAT-II		CAT-III	
Runway	Wind Coverage	Additional Hours Available Versus Existing CAT-I Approach	Wind Coverage	Additional Hours Available Versus Existing CAT-I Approach
Runway 9	89.95%	73	93.52%	110
Runway 27	77.23%	63	74.51%	88
Runway 13	82.34%	67	87.11%	103
Runway 31	71.29%	58	71.97%	85

Sources: NCDC; FAA Wind Rose Tool; Mead & Hunt, Inc.
Note: This wind coverage analysis utilizes a 20-knot crosswind component, which only applies to large commercial and military aircraft. For smaller aircraft, wind coverage is slightly less in all cases; however, the 20-knot component provides a useful measure of runway availability in CAT-II/III conditions.

When taking wind coverage into account, a CAT-II approach would provide between 58 and 73 additional hours of approach capability, and a CAT-III approach would provide between 85 and 110 additional hours of approach capability. This depends on which runway end the approach is designed for. Based on historical wind conditions during CAT-II and CAT-III conditions, Runway 9 appears to be the best candidate for an improved ILS approach followed by Runway 13, Runway 27, and Runway 31 in descending order. Equipment requirements for upgrading to a CAT-II or CAT-III approach are highlighted in Section 3.3.5.

3.2.2. Wind Coverage

Surface wind conditions have a direct effect on the operation of an airport. Runways not oriented to take the fullest advantage of prevailing winds will restrict the capacity of the Airport to varying degrees. When landing and taking off, aircraft are able to properly operate on a runway as long as the wind component perpendicular to the direction of travel (defined as a crosswind) is not excessive. The determination of the appropriate crosswind component for a runway is dependent upon the Runway Reference Code (RRC) for the type of aircraft that use the Airport on a regular basis. The RRC is determined based on the approach speed and wingspan of the “Design Aircraft” (the most critical aircraft that will regularly use a runway).

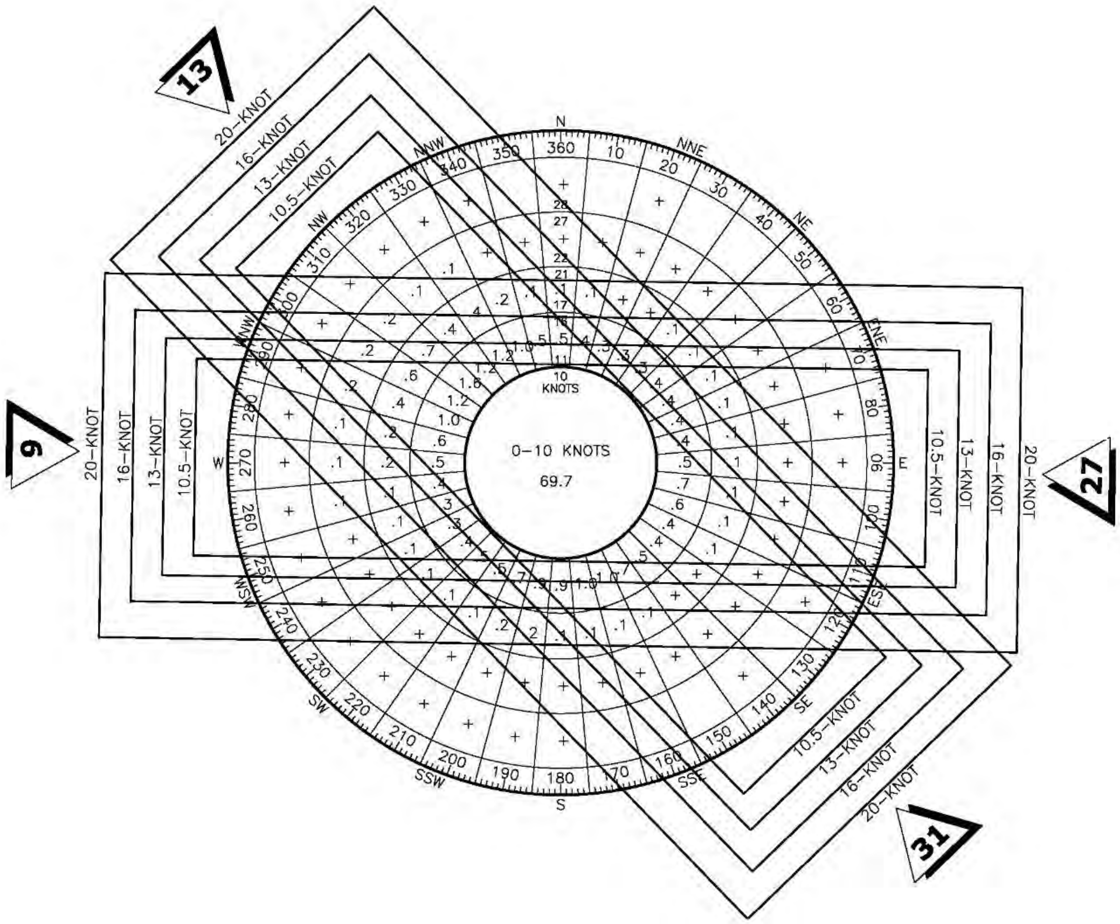
Based on the design aircraft identified in Chapter 2, D-IV is the appropriate RRC for Runway 9/27 throughout the 20-year planning period. Because it is considered the Airport’s “crosswind runway”, the appropriate RRC for Runway 13/31 should be based on the most demanding aircraft for which Runway 9/27 does not have 95 percent wind coverage. However, it is important to note that many aircraft operating at the Airport fit into smaller RRC categories. Because all sizes and types of aircraft use the Airport, the facility requirements and alternatives analyses will consider the needs of all user groups and not just the design aircraft.

Another consideration is that many aircraft operating at the Airport fit into the smaller RRC categories (A-I, B-I, B-II, C-I, and C-II). According to FAA AC 150/5300-13A, *Airport Design*, for RRC A-I and B-I runways, the maximum crosswind component is 10.5-knots. For RRC A-II and B-II runways, the maximum crosswind component is 13-knots. For RRC C-I through D-III runways, the maximum crosswind component is 16-knots. Finally, for RRC A-IV through D-VI runways, the maximum crosswind component is 20-knots. Because all sizes and types of aircraft with various RRC categories use CID, the wind coverage analysis will consider all four crosswind components.

To determine wind velocity and direction at CID, wind data was obtained and an all-weather wind rose was constructed (see **Figure 3.1**). The wind data used to construct the wind rose was obtained from the National Climatic Data Center for the period January 2000 through December 2009, collected by a weather station located at the Airport.

The desirable wind coverage for an airport is 95 percent. This means that the runway(s) should be oriented so that the maximum crosswind component is not exceeded more than five percent of the time when considering the full runway configuration. Based on the all-weather wind analysis for CID (see **Table 3-4**) the runways provide the desirable 95 percent wind coverage.

Figure 3.1: All Weather Wind Rose: 10.5-, 13-, 16-, and 20-Knot Crosswind Components



Source: National Oceanic and Atmospheric Administration, National Climatic Data Center Station # 131314 – Cedar Rapids, Iowa. Period of Record – January 2000 – December 2009.

Table 3-4: All Weather Wind Coverage: 10.5-, 13-, 16-, and 20-Knot Crosswind Components				
Runway Designation	Wind Coverage Provided Under All-Weather Conditions			
	10.5-Knot Cross-wind	13-Knot Crosswind	16-Knot Cross-wind	20-Knot Crosswind
Runway 9/27	**85.22%**	**91.83%**	**97.57%**	**99.46%**
Runway 9	64.86%	68.63%	72.41%	73.37%
Runway 27	68.99%	74.34%	79.25%	80.92%
Runway 13/31	**90.42%**	**94.88%**	**98.30%**	**99.55%**
Runway 13	63.90%	66.97%	69.58%	70.49%
Runway 31	66.88%	69.60%	71.97%	72.78%
Combined	**95.30%**	**98.10%**	**99.46%**	**99.90%**

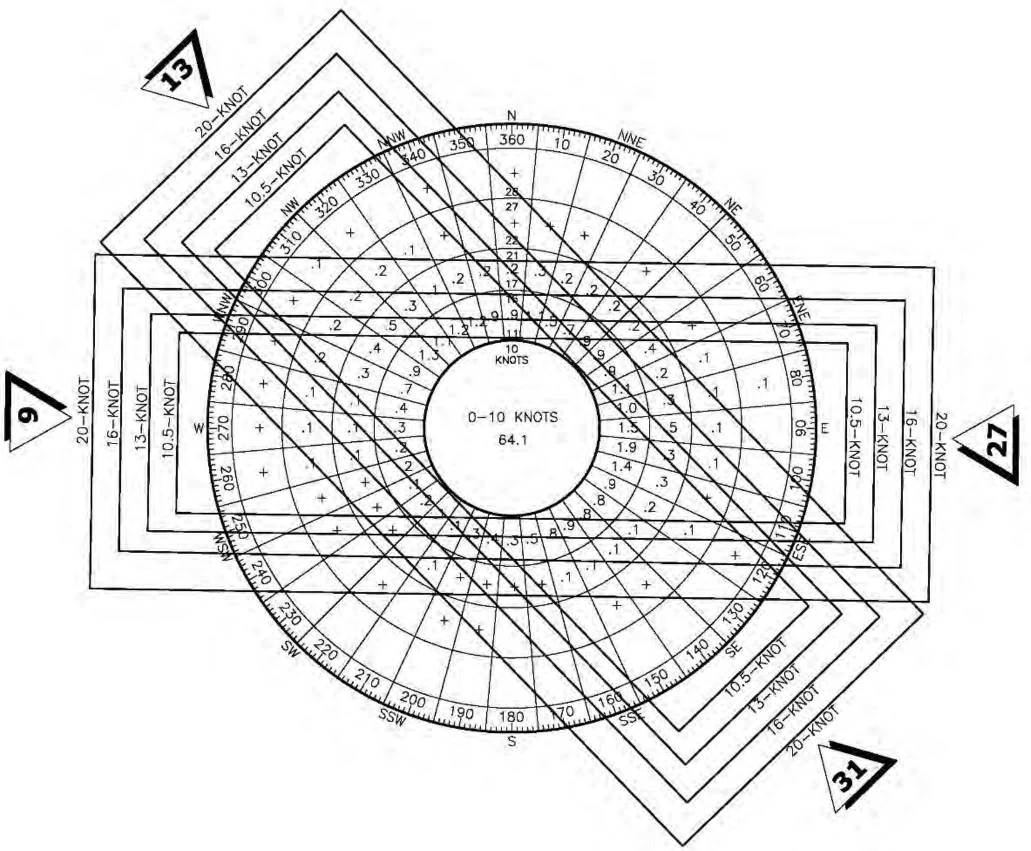
Source: Mead & Hunt, Inc. utilizing FAA's online wind analysis tool at https://airports-gis.faa.gov/public/

As stated previously, the Airport currently has Category I (decision height of 200 feet, visibility minimums of ½ mile) instrument approach procedures to Runway ends 9 and 27 as well as approach procedures with slightly higher minimum approaches to Runway ends 13 and 31. In an effort to analyze the effectiveness of these approaches, an Instrument Flight Rules (IFR) wind rose was constructed (see **Figure 3.2**). Wind data from the National Climatic Data Center was used in the construction of the IFR wind rose.

Table 3-5 quantifies the wind coverage offered by each runway end in consideration of the Category I precision approach minimums (ceiling less than 1,000 feet and/or visibility less than three statute miles, but ceiling equal to or greater than 200 feet and visibility equal to or greater than ½ mile). However, it should be recognized that all the approaches play an important role in facilitating aircraft operations during IFR conditions.

This IFR wind coverage analysis finds that the runways' existing instrument approach capabilities provide excellent wind coverage during IFR conditions. The runway ends with the best wind coverage during typical IFR weather conditions are Runway ends 9 and 13. However, because the VFR and IFR wind roses show that Runway 9/27 has adequate wind coverage for all aircraft with an AAC of D or greater and all aircraft with an ADG of III or greater, the design aircraft for Runway 13/31 should be RRC C-II aircraft.

Figure 3.2: IFR Wind Rose: 10.5-, 13-, 16-, and 20-Knot Crosswind Components



Source: National Oceanic and Atmospheric Administration, National Climatic Data Center Station # 131314 – Cedar Rapids, Iowa. Period of Record – January 2000 – December 2009.

Table 3-5: IFR Weather Wind Coverage: 10.5-, 13-, 16-, and 20-Knot Crosswind Components				
Runway Designation	Wind Coverage Provided Under IFR Conditions[1/]			
	10.5-Knot Crosswind	13-Knot Crosswind	16-Knot Crosswind	20-Knot Crosswind
Runway 9/27	**85.15%**	**91.97%**	**97.40%**	**99.39%**
Runway 9	72.24%	76.92%	80.94%	82.24%
Runway 27	55.46%	59.94%	64.12%	65.70%
Runway 13/31	**86.91%**	**92.64%**	**97.28%**	**99.27%**
Runway 13	64.27%	68.26%	71.80%	73.20%
Runway 31	59.02%	62.55%	65.77%	67.13%
Combined	**94.82%**	**97.95%**	**99.41%**	**99.94%**

Source: Mead & Hunt, Inc. utilizing FAA's online wind analysis tool at https://airports-gis.faa.gov/public/

[1/] Ceiling of less than 1,000 feet, but equal to or greater than 200 feet and/or visibility less than three statute miles, but equal to or greater than ½ statute mile. 5-knot tailwind to maximum headwind.

3.3. Airfield Demand/Capacity Analysis

The capacity of an airfield is primarily a function of the major aircraft operating surfaces that compose the facility and the configuration of those surfaces (runways and taxiways). However, it is also related to and considered in conjunction with wind coverage, airspace utilization, and the availability and type of navigational aids. Capacity refers to the number of aircraft operations that a facility can accommodate on either an hourly or yearly basis, not to the size or weight of the aircraft.

This section is divided into three parts. The first determines the airfield's operational capacity, the second compares that capacity to forecast growth under three different scenarios, and the third discusses the timing of any improvements needed to accommodate the forecast growth. This analysis is more detailed than is typical for an airport with similar characteristics to CID. The primary reason for this extra attention is to develop a clearer picture of potential uses for the airport-owned land north of Wright Brothers Boulevard which is currently reserved for a third runway. The airfield demand/capacity analysis for CID is presented in the following sections:

- Capacity Definitions
- Factors Affecting Runway Capacity
- Peak Hour Airfield Capacity
- Annual Service Volume
- Peak Hour Operations Scenarios
- Relationship of ASV to Airfield Improvements
- Recommendations

3.3.1. Capacity Definitions

The Federal Aviation Administration (FAA) has provided Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay* for use in airport capacity analysis. Airfield capacity is the maximum number of aircraft operations that a specific airfield configuration can accommodate during a specified time interval of continuous demand (i.e. an aircraft is always waiting to depart or land). This theoretical level of capacity is influenced by weather conditions, number and configuration of exit taxiways, types of aircraft that use a facility, when and how that use occurs, and air traffic control/airspace handling procedures. The following measurements of airfield capacity are calculated and evaluated as part of this study:

- **Peak hour capacity** – The maximum number of aircraft operations that can occur in one hour under specific operating conditions assuming a continuous demand for service.
- **Annual Service Volume (ASV)** – Used by the FAA as an indicator of relative operating capacity, ASV is an estimate of an airport's annual capacity that accounts for differences in runway use, aircraft mix, weather conditions, etc. encountered over a year's time. ASV assumes an acceptable level of aircraft delay as described in FAA AC 150/5060-5, *Airport Capacity and Delay*. This level of delay was held constant throughout this analysis.

AC 150/5060-5 is dated and in the process of being re-written. The Airport Cooperative Research Project (ACRP) currently has new draft capacity analysis guidelines under final review, but these guidelines are not yet publicly available. It is possible that portions of the ACRP guidelines will form the basis for a new demand capacity Advisory Circular. Until publication of the new AC, AC 150/5060-5 is the only approved guidance for calculating the type of capacity analysis appropriate for CID. The FAA Central Region approved the use of the current AC for this CID analysis in July 2012.

3.3.2. Factors Affecting Runway Capacity

Several factors have an impact on hourly runway capacity. These factors are described in this section and include:

- Ceiling and Visibility (VFR/IFR)
- Runway Use Configuration
- Aircraft Mix Index
- Percent Arrivals
- Percent Touch-and-Go Operations
- Exit Taxiway Locations

3.3.2.1. Ceiling and Visibility (VFR/IFR)

Weather conditions can affect an airport's capacity by causing conditions that require the facility to close or greatly stagger aircraft operations. There are two categories for weather conditions related to operating aircraft, instrument flight rules (IFR) and visual flight rules (VFR). VFR weather conditions exist when the cloud ceiling is greater than or equal to 1,000 feet above ground level (AGL) and visibility is greater than or equal to three miles. IFR conditions are those below the stated VFR minimums.

It is important to differentiate IFR and VFR conditions because greater separation distances (which reduce capacity) are required under IFR conditions. According to the most recent weather data available through the National Climatic Data Center (NCDC) that is compatible with existing FAA wind analysis software, the Automated Surface Observation System (ASOS) unit located on the Airport observed the following weather conditions for the period from 2000 to 2009:

- 89.7% of the total hourly observations reported VFR weather conditions, of which 69.7% occurred during calm wind conditions (<10.5 knots).
- 10.3% of the total hourly observations reported IFR weather conditions, of which 64.1% occurred during calm wind conditions (<10.5 knots).
- 1.4% of the total hourly observations reported weather conditions below CAT-I instrument approach minimums (200-foot cloud ceiling and/or one-half mile visibility).

3.3.2.2. Runway Use Configuration

Runway use configuration is the number, location, and orientation of active runways; the type and direction of operations; and the flight rules in effect at a particular time. AC 150/5060-5 includes a series of schematic diagrams of various airport runway use configurations. The AC instructs capacity analysts to select the runway use configuration diagram that best represents the use of the airport during the hour of interest. CID has two intersecting runways, Runway 9/27 and Runway 13/31. The distance from the Runway 9 end to the runway intersection is approximately 6,200 feet, while the distance from the Runway 31 end to the runway intersection is approximately 2,800 feet. Based on these distances, the appropriate runway use configuration diagram from the AC is Diagram Number 51 when winds allow use of both runways. For the purpose of this analysis, it is assumed that the Airport operates with a single runway use configuration when winds are greater than 10.5 knots.

3.3.2.3. Aircraft Mix Index

The aircraft mix is the relative percentage of operations conducted by four categories of aircraft that operate at an airport. The mix index has a significant impact on airfield capacity. As the diversity of approach speeds and aircraft weights increase, airfield capacity decreases. This is due to differences in the approach speed of successive aircraft as well as a safety issue referred to as wake vortices or wake turbulence. A wake vortex is a phenomenon that creates air turbulence behind an airplane due to its movement through the air. Heavier aircraft cause more severe wake vortices than smaller aircraft. Although it is more prevalent during departure operations than arrivals, wake vortices are considered a significant safety hazard during any operation.

In order to alleviate the hazards of wake vortices, aircraft are spaced according to the difference in their airspeeds and weight. Lighter aircraft are more susceptible to damage from wake vortices than heavy aircraft. Therefore, light aircraft are typically required to wait up to two minutes before operating on a runway after a heavy aircraft. This delay results in a loss in airfield capacity. The greater the size and weight differential of the aircraft fleet the greater the separation required between successive aircraft operations.

Aircraft are categorized by their physical aspects and their relationship to terms used in wake turbulence standards (see **Table 3-6** for aircraft mix index category definitions). It is important to note that the aircraft categories used in evaluating the aircraft mix index for capacity purposes in FAA AC 150/5060-5, *Airport Capacity and Delay*, varies from the Aircraft Approach Categories (AACs) identified in FAA AC 150/5300-13, *Airport Design*. The aircraft categories listed in Table 3-6 are based on the takeoff weight and wake turbulence factor of an aircraft, while the AAC is based upon the approach speed of an aircraft.

Table 3-6: Aircraft Mix Index Categories			
Category	**Maximum Takeoff Weight (pounds)**	**Aircraft Type**	**Wake Turbulence Factor**
A	12,500 or less	Small Single-Engine	Small
B	12,500 or less	Small Multi-Engine	Small
C	12,500 - 300,000	Large	Large
D	300,000 or more	Heavy	Heavy

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

The aircraft mix index for CID was determined based upon FAA operational data for the year 2011. ATCT records obtained through the FAA Air Traffic Activity Data System (ATADS) provided the annual number of local and itinerant operations. Local operations are conducted primarily by general aviation and military aircraft conducting training and touch-and-go operations. Local general aviation operations are assumed to be nearly all small aircraft in categories A and B. For itinerant operations, aircraft weight class information was obtained through the FAA's Enhanced Traffic Management System Counts (ETMSC), which provides traffic counts by airport from pilot flight plans and radar track information. **Table 3-7**presents the percentage of operations by aircraft category for purposes of mix index determination.

Table 3-7: Aircraft Mix Index Estimates for CID (VFR/IFR)						
	VFR Conditions			**IFR Conditions**		
Year	**Class A & B**	**Class C**	**Class D**	**Class A & B**	**Class C**	**Class D**
2011	48%	51%	1%	20%	79%	1%
2016	47%	52%	1%	18%	81%	1%
2021	46%	53%	1%	18%	81%	1%
2026	46%	53%	1%	17%	83%	1%
2031	45%	54%	1%	17%	83%	1%

Source: FAA Enhanced Traffic Management System Counts (ETMSC), FAA Air Traffic Activity System (ATADS), Mead & Hunt, Inc.

The aircraft mix index for an airport is defined by AC 150/5060-5 as the percentage of C aircraft plus three times the percentage of D aircraft. Using this definition, the 2011 aircraft mix index for CID was 54 percent in VFR conditions and 82 percent in IFR conditions. Based on the forecast for 2031, the aircraft mix index will increase to 57 percent in VFR conditions and 86 percent in IFR conditions.

3.3.2.4. Percent Arrivals

The percent of arrivals is the ratio of arrivals to total operations. Because aircraft on final approach are typically given absolute priority over departures, higher percentages of arrivals during peak periods reduce the Annual Service Volume (ASV). Percent arrivals is computed as follows:

$$\text{Percent arrivals} = \frac{A + \frac{1}{2}(T\&G)}{A + DA + T\&G} \times 100, \text{ where:}$$

A = number of arriving aircraft in the hour
DA = number of departing aircraft in the hour
T&G = number of touch-and-go operations in the hour

According to the peak aircraft operations analysis presented in Chapter 2, there were 25 operations during the peak month average day at CID in 2011. Of these 25 operations, it was estimated that there were 10 arriving aircraft, 10 departing aircraft, and five touch-and-go operations. Using these estimates and the equation above, the percent of arrivals during the peak hour is 50 percent.

3.3.2.5. Percent Touch-and-Go Operations

Touch-and-go operations are defined as those conducted by a single aircraft that lands and departs on a runway without taxiing. Such operations are typically associated with training or recurrence exercises. According to the air traffic control tower (ATCT) staff, touch-and-go operations account for approximately 20 percent of total aircraft operations at CID.

3.3.2.6. Exit Taxiway Locations

The taxiway intersection distances from the runway end listed in **Table 3-8** were used in this peak hour airfield capacity analysis. It should be noted that intersection distances listed are rounded down to the nearest 50 feet and are not the actual distance from the intersection to the end of the runway. This is done in accordance with air traffic procedures to provide a margin of safety when pilots inquire about intersection distances from air traffic control.

Table 3-8: Runway Exit Intersection Distances from Runway End

	Taxiway Intersection Distance from Runway End (feet)				
Runway	**A (west)**	**A1**	**A3**	**A5**	**A (east)**
9	8,550	6,950	4,750	1,050	0
27	0	1,650	3,800	7,500	8,550
Runway	**D**	**B**	**A**	**C1**	**C**
13	6,150	3,850	3,450	250	0
31	0	2,300	2,700	5,900	6,150

3.3.3. Peak Hour Airfield Capacity

Peak hour airfield capacity is defined as the maximum number of aircraft operations that can be completed on a runway system in one hour. Utilizing guidelines contained in AC 150/5060-5, hourly capacities for the airfield were computed under both VFR and IFR conditions. Peak hour runway capacity is computed as follows:

Hourly capacity = C* x T x E, where:

C* = Hourly capacity base
T = Touch-and-go factor
E = Exit factor

The hourly capacity base (C*) is determined based on performance curves specific to the runway use configuration at the airport. As shown in **Charts 3-1 and 3-2**, C* is determined by identifying the aircraft mix index and percent arrivals at the airport, which at CID are 54%/82% (VFR/IFR) and 50%, respectively. Using these inputs, C* is 73 operations per hour in VFR conditions and 58 operations per hour in IFR conditions when winds allow use of both runways.

Chart 3-1: VFR Hourly Capacity Base

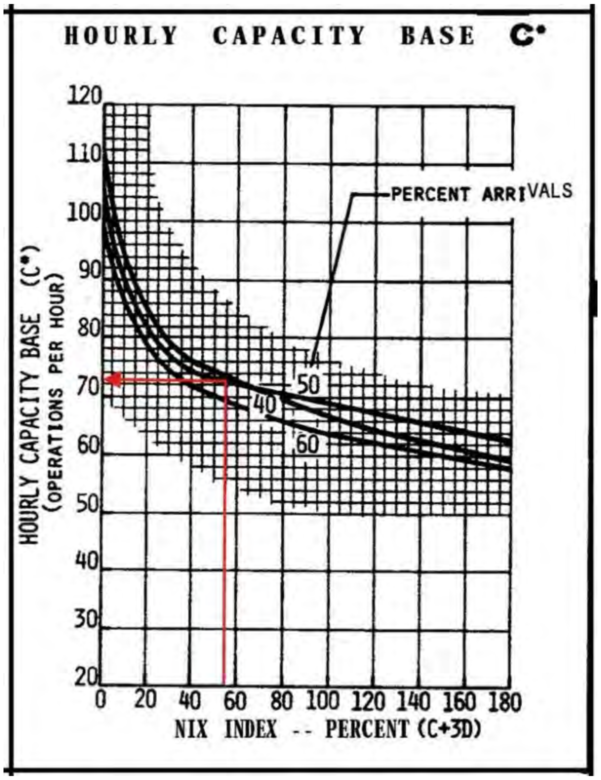
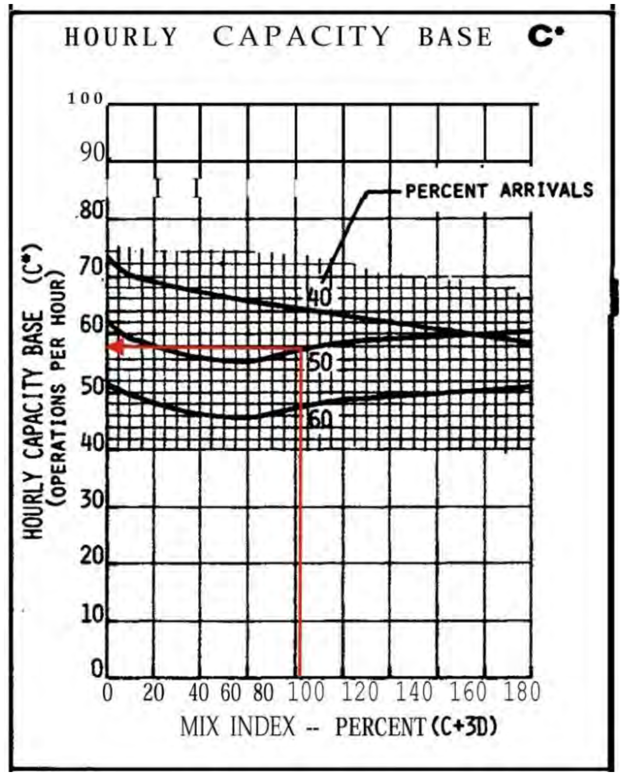


Chart 3-2: IFR Hourly Capacity Base



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

The touch-and-go factor (T) is determined based on the aircraft mix index and percent touch-and-go, which at CID are 54%/82% (VFR/IFR) and 20%, respectively. A table in the AC specific to the runway use configuration identifies T based on pairing these two factors. For the runway use configuration at CID, T is 1.10 in VFR conditions and 1.00 in IFR conditions.

The exit factor (E) is determined based on the aircraft mix index, percent arrivals, and the average number of exits (N) which are: a) within appropriate exit range and b) separated by at least 750 feet. Based on the taxiway intersection distances shown in **Table 3-8**, the average number of exits (N) for Runways 9/27 and 13/31 is 2.0. Using these inputs, E is 1.00 for both VFR and IFR conditions.

Using the hourly capacity bases (C*), touch-and-go factors (T), and exit factors (E) described above, the hourly capacities of the airfield at CID when winds allow use of both runways are as follows:

VFR Hourly Capacity = C* x T x E = 73 x 1.10 x 1.00 = 80 operations
IFR Hourly Capacity = C* x T x E = 58 x 1.00 x 1.00 = 58 operations

As stated previously, it is assumed that the Airport operates with a single runway use configuration when winds are greater than 10.5 knots. Hourly capacity is reduced under these conditions. Based on tables in AC 150/5060-5, the VFR hourly capacity for the single runway use configuration at CID is 63 operations, and IFR hourly capacity is 53 operations.

3.3.4. Annual Service Volume

Annual Service Volume (ASV) is an estimate of an airport's annual practical capacity that accounts for differences in runway use, aircraft mix index, weather conditions, and pattern of operational demand. The formula for calculating ASV contains three variables: weighted hourly capacity (C_w); the ratio of annual demand to average daily demand in the peak month (D); and the ratio of average daily demand to average peak hour demand during the peak month (H).

Weighted hourly capacity, C_w, was calculated in accordance with AC 150/5060-5. **Table 3-9** summarizes the hourly capacity for the airfield's operating configurations. Based on formulas contained in AC 150/5060-5, weight hourly capacity of the airfield at CID is 60 operations.

Table 3-9: Weighted Hourly Capacity (C_W)

Configuration	Description	Occurrence Rate	Hourly Capacity
VFR 1	Dual Runway Use	62.5%	80
VFR 2	Single Runway Use	27.2%	63
IFR 1	Dual Runway Use	5.7%	58
IFR 2	Single Runway Use	3.2%	53
IFR 3	Below Arrival Minimums	1.4%	0
		Weighted Hourly Capacity (C_W)	**60**

Source: FAA Advisory Circular 150/5060-5, Mead & Hunt, Inc.

The Daily Demand Ratio (D) is the ratio of annual demand to average daily demand in the peak month. Using 2011 operational levels, this ratio was calculated as follows:

D = Annual Demand / Peak Month Average Daily Demand
D = 52,384 / 188
D = 278.6

The Hourly Demand Ratio (H) is the ratio of average daily demand to average peak hour demand during the peak month. Using 2011 operational levels, this ratio was calculated as follows:

H = Peak Month Average Day Demand / Peak Hour Demand
H = 188 / 25
H = 7.5

Finally, the Annual Service Volume (ASV) is calculated as follows:

ASV = C_w* D * H
ASV = 60 * 278.6 * 7.5
ASV = 125,722 operations

The AC does not provide any direct guidance on how the ASV may change over time. Therefore, a typical airfield capacity analysis fixes the ASV at a given number (in this case 125,722 operations) throughout the planning period, rather than allowing for changes in operational demand. Aircraft operations growth forecasts are then compared to the static ASV to determine when and if the airport will need additional airfield capacity. The weakness of this approach is that changes in operational behavior on the airfield affect the ASV. Because of this, it is likely that if an ASV were to be calculated annually using the method outlined above, each year would produce a different ASV. The next section discusses this point in more detail.

3.3.5. Peak Hour Operations Scenarios

A runway configuration similar to that at CID can typically accommodate over 200,000 annual aircraft operations. The ASV calculated in the previous section for CID (125,722 annual aircraft operations) is below this typical capacity. The lower than typical ASV is primarily driven by the airport's operational peaking characteristics. A high percentage of the daily activity occurs during the peak hour at CID (13.3 percent was the average peak hour percentage for each day in August 2011), which results in a relatively low hourly demand ratio of 7.5. The FAA methodology results in a low hourly demand ratio with higher percentages of activity during the peak hour because delays increase rapidly as demand nears capacity.

Because of this, changes in peak hour operations can have a dramatic impact on ASV. For example, if CID's peak hour operations were to change from 25 to 20, the ASV would increase from approximately 125,000 to approximately 160,000. Likewise, if the peak hour operations were to change from 25 to 30, the ASV would drop to around 105,000.

To account for the variability of peak hour operations, the following three scenarios were developed:

- Peak Hour Scenario 1: No Growth in Peak Hour Operations
- Peak Hour Scenario 2: Standard Peak Hour Operations Forecast
- Peak Hour Scenario 3: Reduced Growth in Peak Hour Operations Forecast

3.3.5.1. Peak Hour Scenario 1: No Growth in Peak Hour Operations

Because the formula in the AC does not account for changes over time, the operational factors in the formulas are inflexible. As a result, even though overall operations at CID are projected to grow from 52,384 to 65,716 over the next 20 years, the peak hour in this scenario is held steady at 25. However, because peak day operations continue to rise, the ratio of peak day to peak hour demand would increase year-over-year, and the ASV would rise to 157,718 by 2031. Operations in the year 2031 would remain at 42% of ASV under a no-growth scenario.

The underlying assumption is that operations would be managed in such a way that all additional operations would occur at a different time of day than the peak hour. Given the variety of different aviation-related schedule needs, this scenario is not likely to occur because as activity grows it is likely to grow in all hours of the day.

3.3.5.2. Peak Hour Scenario 2: Standard Peak Hour Operations Forecast

In this scenario, peak hour operations are assumed to grow at the same rate as operations. Using this methodology, the peak hour represents a constant 13 percent of average day activity and grows from 25 to 33 over the planning period and the ASV falls from 125,722 to 119,484. Operations in the year 2031 would reach 55 percent of ASV.

The underlying assumption here is that if overall operations grow by 5 percent, the peak hour operations would also grow by 5 percent. This scenario is unlikely to occur as additional frequency by existing carriers would likely occur outside hours with existing service. Also, as activity and congestion grows, new and existing operators that have flexibility in their schedule would change their behavior to avoid a peak hour that has grown increasingly busy.

3.3.5.3. Peak Hour Scenario 3: Reduced Growth in Peak Hour Operations Forecast

In this scenario, the peak hour is assumed to grow at half of the overall operations growth rate. Using this assumption, peak hour operations would grow from 25 to 29 and the ASV would rise from 125,722 to 135,964. Operations in the year 2031 would reach 48 percent of ASV.

The underlying assumption for this scenario is that while some new operations would occur in the current peak hour, others would occur at other times. This assumed change in behavior would come from a percentage of new (and current) operators changing the timing of their operations to avoid the "busy time" or the current peak hour, and from the fact that as additional flight frequency is added by existing carriers it would likely occur outside of hours with existing service.

3.3.5.4. Peak Hour Scenario Summary

The peak hour scenarios and their relationship to ASV are summarized in **Table 3-10**.

Table 3-10: Peak Hour Scenario Comparison

Scenario	2031 Operations	2031 Peak Hour Operations	2031 Annual Service Volume	Operations/ASV
Peak Hour Scenario 1	65,716	25	157,718	42%
Peak Hour Scenario 2	65,716	33	119,484	55%
Peak Hour Scenario 3	65,716	29	135,964	48%

3.3.6. Relationship of ASV to Airfield Improvements

Current FAA guidelines in the National Plan of Integrated Airport Systems (NPIAS) call for beginning to plan capacity improvements when actual operations reach 60 percent to 75 percent of the ASV. This conservative percentage gives airports adequate time to plan for improvements, complete environmental review, and purchase land prior to construction, which should occur before 80 percent of ASV is reached. In CID's case, the planning timeline (from 60 percent to 75 percent) is generous, given that land suitable for a potential third runway has been purchased and preliminary plans for such a runway are on file with the FAA. Therefore, there is more emphasis on reaching the 80 percent threshold.

3.3.6.1. Capacity Improvements within the Planning Period

None of the peak hour scenarios presented above result in 60 percent of ASV being reached within the 20-year planning period.

3.3.6.2. Capacity Improvements Beyond the Planning Period

As the planning period increases in length, the certainty of recommendations decreases. In general, facility requirements forecasted to occur within one to five years should result in immediate action; those forecasted for five to 10 years into the future should be in an initial design process; and those forecasted for 10 to 20 years into the future should be in a general planning framework. Beyond 20 years, it is difficult to make valid conclusions regarding capacity-related facility needs.

However, an asset like the land reserved for the third runway merits some long-term thinking, especially given that it was initially purchased for that purpose. This land currently generates revenue for the airport through agricultural leases, but with development continuing southward from the City of Cedar Rapids, a new look at potential uses for the land is warranted. Against this backdrop, the planning team proceeded to carry the three peak hour scenarios out another 80 years into the future (from 2011) and to see if a trigger for construction of the third runway could be identified. The results are described in **Table 3-11**.

Table 3-11: Peak Hour Scenario Planning Thresholds

Scenario	60% of ASV Reached	80% of ASV Reached
Peak Hour Scenario 1	More than 100 Years in the Future	More than 100 Years in the Future
Peak Hour Scenario 2	2036	2066
Peak Hour Scenario 3	2066	More than 100 Years in the Future

3.3.7. Recommendations

Within the traditional 20-year timeline, none of the scenarios presented here indicate a need for a third runway. By extending the timeline from 20 to 100 years, the scenario with the most rapid growth in peak hour operations indicates a need to start the third runway construction in the late-2060s. Based on these scenarios, this Master Plan Update concludes that there is no capacity-related need for the Airport to plan on a third runway construction within the 20-year planning period and construction could be 50 years or more into the future.

The Master Planning team presented this information to the FAA in August 2012. Following the presentation, all parties agreed that the timing of the third runway construction is so far into the future that no additional planning beyond what is already on file is necessary. However, the FAA did recommend that plans officially submitted to the FAA depict a runway in the near future. This would best reflect the original intent of the land purchase and serve as reserve capacity for the Airport in the event of future changes. Within this context; however, the FAA does encourage airports to explore new ways to generate revenue and does not want to hinder efforts at creative initiatives in this area.

The combination of no foreseeable need for capacity improvements and the need to keep a runway on FAA plans results in the following recommendations. The Airport should:

- Continue depicting a third runway on plans submitted to the FAA.
- Continue to explore ways to increase revenue generation on this land.

The need to fix an exact location of the runway to meet the FAA's requirements may be incompatible with needing to stay flexible to adjust to the needs of potential developers. Ways to resolve this incompatibility are discussed in Chapter 5.

3.4. Airside Facility Requirements

The types of aircraft that currently use CID and those aircraft that are projected to use the Airport in the future will affect the planning and design of airport facilities. Knowledge of the aircraft using the Airport is translated to dimensional standards concerning minimum clearances and design criteria for runways, taxiways, safety areas, object free areas, aprons, and other physical airport features. It also provides input into determining adequate runway length and pavement strength. Airside facility requirements at CID are described in the following sections:

- Dimensional Criteria
- Runway and Taxiway Pavement Strength
- Runway Length Requirements
- Line-of-Sight
- Instrumentation and Lighting
- Runway Protection Zones

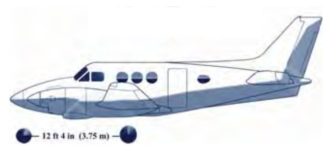
3.4.1. Dimensional Criteria

Dimensional standards are predicated on the Runway Reference Code (RRC) and availability and type of approach instrumentation. In the past, an RRC classification of C-III was assigned to both Runways 9/27 and 13/31. However, the current and forecasted commercial fleet mix indicates that Runway 9/27 should be planned for RRC D-IV dimensional criteria, and the wind coverage and airfield capacity analyses described in previous sections indicate that Runway 13/31 should be planned for RRC C-II dimensional criteria. Each individual runway system, along with the associated taxiway and apron system, should be designed accordingly. Representative aircraft and their corresponding RRC are illustrated in **Figure 3.3**. Existing RRC dimensions and corresponding design criteria applicable to each runway at the Airport are described in the following tables, some of which are depicted in **Figure 3.4**.

- Runway 9/27:
  Runway 9/27 is the longest runway at CID and is often utilized by the ATCT for commercial aircraft departures. Existing conditions are compared to RRC C-III and D-IV criteria in **Table 3-12**. As identified in the table, the only dimensional standard associated with Runway 9/27 not met or exceeded is the Taxiway "A" shoulder width. Furthermore, the majority of the taxiway meets the standard, with only one small portion currently lacking shoulders.

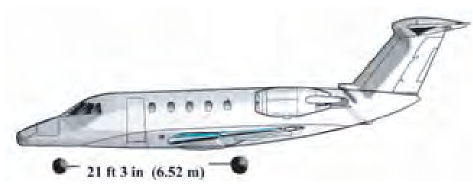
- Runway 13/31:
  Runway 13/31 is the shorter runway at CID but is often utilized for arrivals by the same aircraft types using Runway 9/27 on a regular basis. However, Runway 13/31 is considered the Airport's crosswind runway because there are no existing or forecasted capacity concerns related to Runway 9/27, and as such Runway 13/31 should be designed for the most demanding aircraft for which Runway 9/27 does not provide 95 percent wind coverage. The VFR and IFR wind roses shown in Section 3.2.2 indicate that Runway 9/27 has adequate wind coverage for all aircraft with an AAC of D or greater and all aircraft with an ADG of III or greater. For these reasons, the design aircraft for Runway 13/31 should be RRC C-II aircraft. Existing conditions are compared to RRC C-II and D-IV criteria in **Table 3-12**. As identified in the table, the only C-II dimensional standards associated with Runway 13/31 not met or exceeded are the runway and Taxiway "E" shoulder widths.

RRC A-I
Single-Engine Aircraft - 2 to 6 Seats
Beech Bonanza
deHaviland DHC-2 Beaver
Cessna-150



RRC B-I
Twin-Piston Aircraft - 4 to 10 Seats
Beech King Air B100
Piper 31-310 Navajo
Beech Baron 58

RRC B-I
Very Light Jet/Small Cabin 4-6 Seats
Eclipse 500
Citation Mustang
Adam Aircraft A700



RRC B-II
Twin-Turboprop/Business Jet/Small Cabin Aircraft
6 to 12 Seats - *Includes most commercial turboprop aircraft.*
Cessna Citation II/III/VII
Dassault Falcon 50
Dassault Falcon 900

RRC C/D-II
Commercial/Business Jet - 6 to 70 Seats
Bombardier CRJ-700
Bombardier CL-600 Challenger
Embraer ERJ-145

RRC C/D-III & C/D-IV
Large Commercial/Business Jet - 14 to 150 Seats
Boeing 757-200 (C-IV)
Boeing 727-200 (C-III)
Bombardier BD-700 Global Express (C-III)
McDonnell Douglas MD-83 (C-III)

Figure 3.3
Representative Aircraft

Source: Aircraft Ground Service Guide, 2002 and Aircraft Manufacturer.
Note: Representative Aircraft not to scale.

- Conclusion:
  In consideration of how FAA standards have evolved in recent years, CID is remarkably close to full compliance. In fact, the Airport is fully compliant with all RRC D-IV standards related to the runway system. The only non-standard conditions identified in previous tables are related to taxiway shoulders that require improvements on a portion of Taxiway "A" and a portion of Taxiway "E". One of the important goals for any Airport Master Plan process is to understand any dimensional standard deficiencies and identify potential remedies.

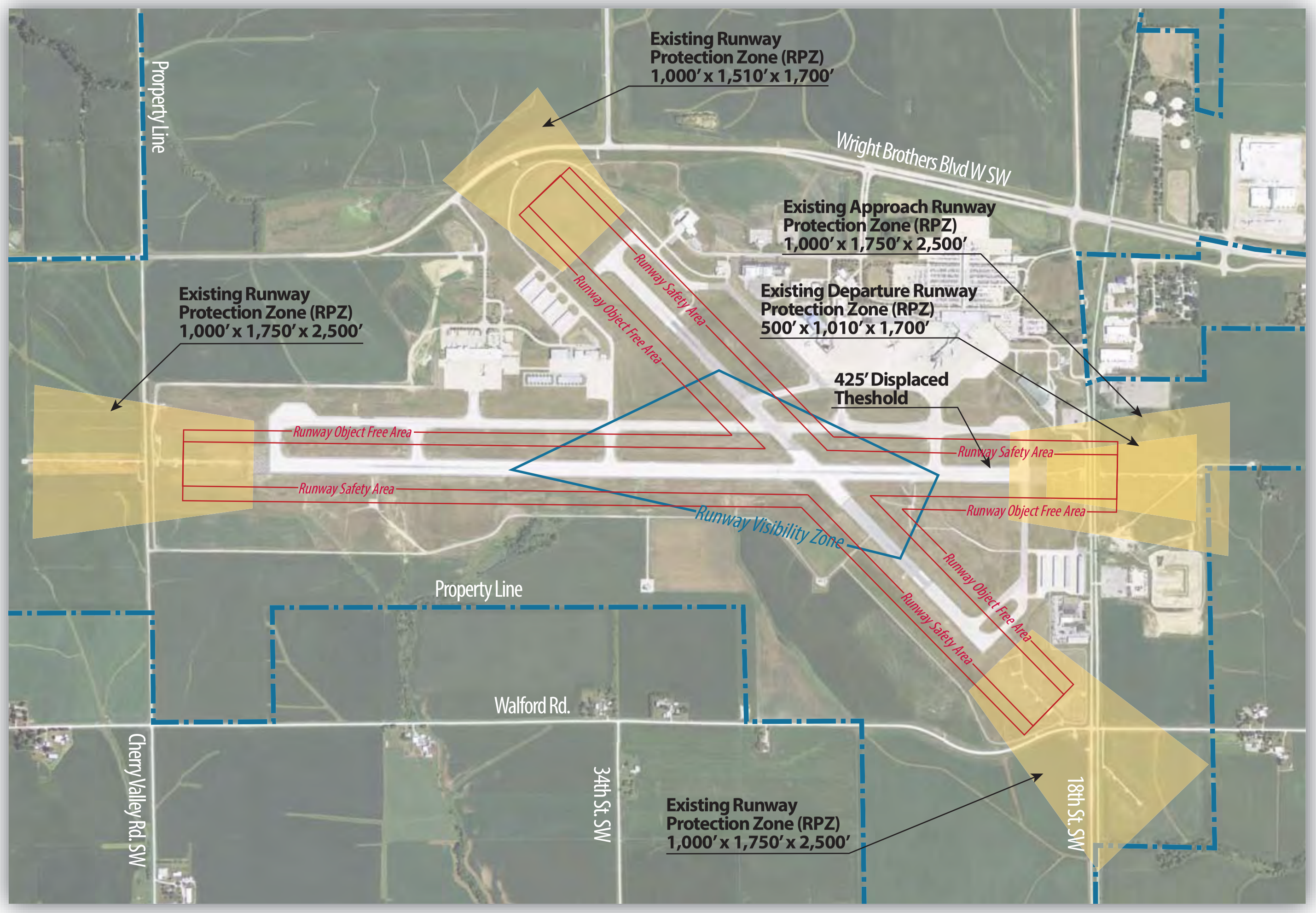
Table 3-12: Runway 9/27 Dimensional Standards (in feet)

Runway 9/27 Item	Existing Dimension	ARC C-III with < ¾ Mile[1] Vis. Minimums	ARC D-IV with < ¾ Mile[1] Vis. Minimums
Runway Width	150	100	150
Runway Shoulder Width	25	20	25
Runway Centerline to Parallel Taxiway (Taxiway "A")	400	400	400
Runway Centerline to Aircraft Parking	800	500	500
Runway Centerline to Holdline	260	250	258.7[4]
Runway Safety Area Width	500	500	500
Runway Safety Area Length Beyond Runway End			
Runway 9	1,000	1,000	1,000
Runway 27	1,000	1,000	1,000
Runway Safety Area Length Prior to Landing Threshold			
Runway 9	600	600	600
Runway 27	600	600	600
Runway Object Free Area Width	800	800	800
Runway Object Free Area Length Beyond RW End			
Runway 9	1,000	1,000	1,000
Runway 27	1,000	1,000	1,000
Runway Obstacle Free Zone Width[2]	400	400	400
Runway Obstacle Free Zone Length Beyond Runway End	200	200	200
Threshold Siting Surface Criteria			
Runway 9[3]	Criteria Met	Criteria Met	Criteria Met
Runway 27[3]	Criteria Met	Criteria Met	Criteria Met
Taxiway A Width	75	50	75
Taxiway A Shoulder Width	25[5]	20	25
Taxiway Safety Area Width	N.D.	118	171
Taxiway Object Free Area Width	N.D.	186	259
Taxilane Object Free Area Width	N.D.	162	225

Source: AC 150/5300-13A, Airport Design.
Notes: Existing dimensions delineated in bold text reflect potential non-standard criteria. N.D. = Not Designated
[1] Existing runway approach visibility minimums = ½ Mile
[2] Inner-approach OFZ, Inner-transitional OFZ and Precision OFZ standards verified on Inner Approach Drawings in Chapter E.
[3] Applies existing runway type 9 criteria for Appendix 2, AC 150/5300-13A
[4] The standard 250 foot separation is increased 1 foot for each 100 feet above sea level.
[5] A portion of Taxiway A does not have shoulders.

Table 3-13: Runway 13/31 Dimensional Standards (in feet)			
Runway 13/31 Item	**Existing Dimension**	**ARC C-II with < ¾ Mile[1] Vis. Minimums**	**ARC D-IV with < ¾ Mile[1] Vis. Minimums**
Runway Width	150	100	150
Runway Shoulder Width	**0**	10	25
Runway Centerline to Parallel Taxiway (Taxiway “A”)	400	400	400
Runway Centerline to Aircraft Parking	750	500	500
Runway Centerline to Holdline	260	250	258.7[4]
Runway Safety Area Width	500	500	500
Runway Safety Area Length Beyond Runway End			
Runway 13	1,000	1,000	1,000
Runway 31	1,000	1,000	1,000
Runway Safety Area Length Prior to Landing Threshold			
Runway 13	600	600	600
Runway 31	600	600	600
Runway Object Free Area Width	800	800	800
Runway Object Free Area Length Beyond RW End			
Runway 13	1,000	1,000	1,000
Runway 31	1,000	1,000	1,000
Runway Obstacle Free Zone Width [2]	400	400	400
Runway Obstacle Free Zone Length Beyond Runway End	200	200	200
Threshold Siting Surface Criteria			
Runway 13[3]	Criteria Met	Criteria Met	Criteria Met
Runway 31[3]	Criteria Met	Criteria Met	Criteria Met
Taxiway E Width	75	50	75
Taxiway E Shoulder Width	0	20	25
Taxiway Safety Area Width	N.D.	79	171
Taxiway Object Free Area Width	N.D.	131	259
Taxilane Object Free Area Width	N.D.	115	225

Source: AC 150/5300-13A, Airport Design
Notes: Existing dimensions delineated in bold text reflect potential non-standard criteria. N.D. = Not Designated
[1] Existing runway approach visibility minimums = ½ Mile
[2] Inner-approach OFZ, Inner-transitional OFZ and Precision OFZ standards verified on Inner Approach Drawings in Chapter E.
[3] Applies existing runway type 9 criteria for Appendix 2, AC 150/5300-13A
[4] The standard 250 foot separation is increased 1 foot for each 100 feet above sea level.



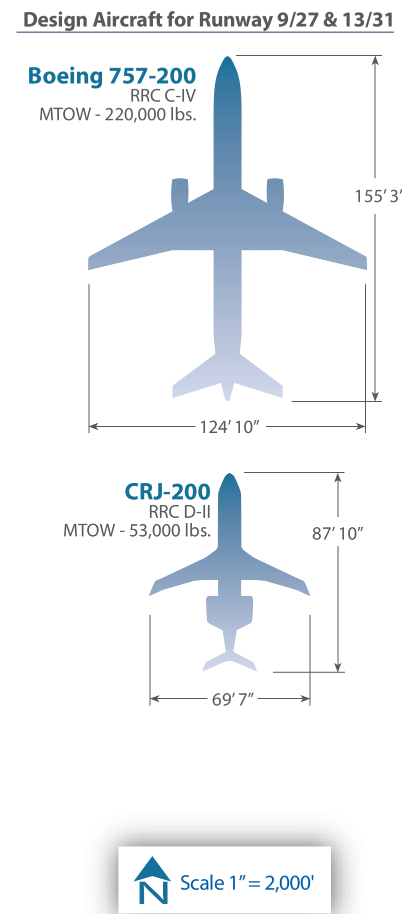


Figure 3.4
Dimensional Criteria

THE EASTERN IOWA AIRPORT CEDAR RAPIDS

3.4.2. Runway and Taxiway Pavement Strength

The runway pavement associated with both Runways 9/27 and 13/31 at CID can support the regular use of aircraft with gross weights of 100,000 pounds single wheel, 174,000 pounds dual-wheel, and 300,000 pounds dual tandem wheel main landing gear configuration. The runway pavement strengths are adequate for the duration of the planning period. For the most part, the taxiway pavement strengths match the runway pavement strength with only two exceptions: Taxiway “D” in the non-movement area and connector Taxiway “A4”. Both of these taxiway segments are scheduled for rehabilitation and strengthening in the Airport’s current Capital Improvement Plan.

The Airport should continue to plan for rehabilitation and strengthening projects for Taxiways “D” and “A4”. The remaining runway and taxiway pavement strengths are adequate to accommodate the existing and forecast aircraft fleet, although routine pavement maintenance and rehabilitation will be required during the course of the planning period.

3.4.3. Runway Length Requirements

The determination of runway length requirements for an airport is based on several factors. These include airport elevation, normal mean maximum daily temperature of the hottest month, maximum difference in the runway elevation at the centerline, critical aircraft type expected to use the airport, and stage length of the longest non-stop destination. The calculations for runway length requirements at CID are based on an airport elevation of 869 feet AMSL, 85° Fahrenheit NMT (normal mean maximum temperature), and a maximum difference in the runway centerline elevation of 22 feet.

3.4.3.1. Generalized Runway Length Assessment

As required for all airport projects receiving Federal funding, FAA Advisory Circular 5325-4B, *Runway Length Requirements for Airport Design,* was utilized for this runway length analysis. This AC provides a procedure and rationale for determining recommended lengths for runways and includes airplane performance data curves and tables for use in airport planning. The AC uses a five-step procedure to determine recommended runway lengths for airport planning purposes. The information derived from this five-step procedure is for airport design only and is not to be used for flight operations. The AC also states that the recommended length for the crosswind runway at an airport, where scheduled airlines use both the primary runway and the crosswind runway, should equal 100 percent of the primary runway. Consequently, the same five-step process was used to determine a recommended runway length for both Runway 9/27 and 13/31 at CID. The five steps are first described and then applied to this runway length assessment in the next section.

- *Step #1: Identify the list of critical design airplanes that will make regular use of the runway for an established planning period of at least five years. For Federally-funded projects, the definition of the term “substantial use” quantifies the term “regular use” (i.e. 500 annual operations).*
    - Step #1 Application: The list of critical design airplanes for CID includes a number of business jet aircraft and commercial aircraft that are regular users of the Airport. This overall commercial list includes the Boeing 727, the Bombardier CRJ-200 and CRJ-700, the Embraer ERJ135 and ERJ145, the Embraer 170, and the Boeing (McDonnell Douglas) MD 83.

The overall business jet list includes the Cessna Citation V/Encore, the Bombardier Challenger 600/601/604 and CRJ-100, and the BAe HS 125/Hawker 800. There are a number of other business jets that use The Eastern Iowa Airport that do not meet the 500 annual operation threshold to be considered *regular* users, but are still included in the same "family" of aircraft as the business jets mentioned previously.

- *<u>Step #2:</u> Identify the airplanes that will require the longest runway lengths at maximum certificated takeoff weight (MTOW). This will be used to determine the method for establishing the recommended runway length. Except for regional jets, when the MTOW of listed airplanes is 60,000 pounds (27,200 kg) or less, the recommended runway length is determined according to a family grouping of airplanes having similar performance characteristics and operating weights. Although a number of regional jets have an MTOW less than 60,000 pounds (27,200 kg), the exception acknowledges the long range capability of the regional jets and the necessity to offer regional jet operators the flexibility to interchange regional jet models according to passenger demand without suffering operating weight restrictions. When the MTOW of listed airplanes is over 60,000 pounds (27,200 kg), the recommended runway length is determined according to individual airplane performance requirements. The recommended runway length in the latter case is a function of the most critical individual airplane's takeoff and landing operating weights, which depend on wing flap settings, airport elevation and temperature, runway surface conditions (dry or wet), and effective runway gradient. The procedure assumes that there are no obstructions that would preclude the use of the full length of the runway.*

    - <u>Step #2 Application</u>: Given the fact that the MTOW of a number of the aircraft identified as regular users of The Eastern Iowa Airport is over 60,000 pounds, this step directs the airport designer to utilize a methodology that focuses on runway length according to *individual airplane performance requirements*. However, recognizing that there are a number of business jet aircraft (weighting between 12,500 pounds and 60,000 pounds) that make regular use of the Airport, consideration will also be given to the runway length requirements of this *family grouping of airplanes*.

- *<u>Step #3:</u> Use Table 1-1 in the AC and the airplanes identified in Step #2 to determine the method that will be used for establishing the recommended runway length. Table 1-1 in the AC categorizes potential design airplanes according to their MTOWs. MTOW is used because of the significant role played by airplane operating weights in determining runway lengths. As seen from Table 1-1, the first column separates the various airplanes into one of three weight categories. Small airplanes, defined as airplanes with MTOW of 12,500 pounds (5,670 kg) or less, are further subdivided according to approach speeds and passenger seating as explained in Chapter 2. Regional jets are assigned to the same category as airplanes with a MTOW over 60,000 pounds (27,200 kg). The second column identifies the applicable airport design approach (by airplane family group or by individual airplanes) as noted previously in Step #2. The third column directs the airport designer to the appropriate chapter for design guidelines and whether to use the referenced tables contained in the AC or to obtain airplane manufacturers' airport planning manuals (APM) for each individual airplane under evaluation. In the latter case, APMs provide the takeoff and landing* *runway lengths that an airport designer will in turn apply to the associated guidelines set forth by this AC to obtain runway lengths.*

The airport designer should be aware that APMs go by a variety of names. For example, Airbus, the Boeing Company, and Bombardier respectively title their APMs as “Airplane Characteristics for Airport Planning,” “Airplane Characteristics for Airport Planning,” and “Airport Planning Manuals.” For the purpose of this AC, the variously titled documents will be referred to as APMs. Appendix 1 lists the websites of the various airplane manufacturers to provide individuals a starting point to retrieve an APM or a point of contact for further consultation.

- Step #3 Application: Many of the airplanes that utilize the runway system at CID are included in the *Over 12,500 pounds but less than 60,000 pounds* category and as such, Chapter 3 is the appropriate location of design guidelines specific to these aircraft. Chapter 3 directs the airport designer to Tables 3-1 and 3-2 in the AC. Table 3-1 provides the list of those airplanes that comprise the “75 percent of the fleet” category and therefore can be accommodated by the runway lengths resulting from Figure 3-1. Of the three business jets mentioned previously, the Cessna Citation V is included in Table 3-1 and the Bae 800 and the Challenger are included in Table 3-2.

  Figure 3-1 in the AC includes two design curves, one for 75 percent of the fleet at 60 percent useful load, and one for 75 percent of the fleet at 90 percent useful load. Using the mean daily maximum temperature of the hottest month and the airport elevation for CID, the first curve (at 60 percent useful load) produces a recommended runway length of approximately 4,800 feet while the second curve (at 90 percent useful load) produces a recommended runway length of approximately 6,450 feet.

  Figure 3-2 in the AC also includes two design curves, one for 100 percent of the fleet at 60 percent useful load, and one for 100 percent of the fleet at 90 percent useful load. Using the mean daily maximum temperature of the hottest month and the airport elevation for CID, the first curve (at 60 percent useful load) produces a recommended runway length of approximately 5,500 feet while the second curve (at 90 percent useful load) produces a recommended runway length of approximately 8,100 feet.

  Also, in accordance with Step #3, individual APM’s for the commercial aircraft were utilized to provide aircraft specific runway length recommendations. This assessment is presented in the following section entitled *Aircraft Specific Runway Length Assessment*.

- *<u>Step #4:</u> Select the recommended runway length from among the various runway lengths generated by Step #3 per the process identified in Chapters 2, 3, or 4 of the AC, as applicable.*

  - <u>Step #4 Application:</u> Paragraph 302 of Chapter 3 instructs the airport designer to then select either the "60 percent useful load" curves or the "90 percent useful load" curves on the basis of the haul length and service needs of the critical design airplanes. Due to CID's location in the Midwest, many business jet aircraft fly stage lengths in excess of 1,000 miles to reach the east and west coasts. Consequently, the 90 percent useful load curve was selected in an effort to allow the aircraft operators to maximize fueling and load capabilities.

- *<u>Step #5:</u> Apply any necessary adjustment to the obtained runway length, when instructed by the applicable chapter of this AC, to the runway length generated by Step #4 to obtain a final recommended runway length. For instance, an adjustment to the length may be necessary for runways with non-zero effective gradients. Chapter 5 provides the rationale for these length adjustments.*

  - <u>Step #5 Application:</u> The recommended runway length from **Figures 3-1** and **3-2** in the AC must be adjusted at the rate of 10 feet for each foot of elevation difference between the high and low points of the runway centerline. Given that the elevation difference at CID is approximately 22 feet, the adjustment is 220 additional feet, or a recommended runway length of 6,670 feet in Figure 3-1 and 8,320 feet in Figure 3-2.

    Based solely on the previous analysis, it would appear that at 8,600 feet, Runway 9/27 provides adequate runway length for existing and future airport users and that consideration should be given to an extension of Runway 13/31 beyond the currently provided 6,200 feet. Again, it is important to note that additional analysis and consideration of runway length requirements of specific aircraft types is necessary due to the number of commercial aircraft weighing over 60,000 pounds MTOW that use CID on a *regular* basis.

3.4.3.2. Commercial Aircraft Specific Runway Length Assessment

For the aircraft-specific runway length assessment for commercial aircraft, the procedures described in AC 150/5325-4B, Chapter 4 were followed. The design procedure for this weight category of aircraft requires the following information: the critical design airplanes under evaluation and their APMs, the maximum certificated takeoff weight or takeoff operating weight for short-haul routes, airport elevation above mean sea level, effective runway gradient, and the mean daily maximum temperature of the hottest month at the airport. The airport designer is then instructed to apply the procedures in the chapter to each APM to obtain runway length requirements. The final recommended runway length is the longest resulting length after any adjustments for all the critical design airplanes under evaluation.

Each airplane manufacturer's APM provides performance information for different airplane operating weights, airport elevations, flap settings, engine types, and other parameters. It should be noted that airplane manufacturers do not present the data in a standard format. For instance, some APMs provide payload/range charts that allow the airport designer to determine a design weight (or mission weight) depending on the nautical mile distance to the planned destination. Other APMs do not provide such information, and as such, the airport designer must use other methods to arrive at an appropriate design weight or mission weight for the airplane in question.

Eight specific commercial aircraft were considered for the purposes of this runway length assessment. Seven of the aircraft meet the critical aircraft criteria of 500 annual operations at CID including the MD-83, ERJ135, ERJ145, E170, CRJ-200, CRJ-700, and B-727.

Table 3-14: Commercial Aircraft Runway Takeoff Length Analysis

Aircraft/ Operator Data	Engine Type/Model	Destination (Range)	Mission Takeoff Weight (lbs) [1]	Maximum Takeoff Weight (lbs) [1]	Runway Length Required [2,3]
MD-83 (Allegiant)	JT8D-219	LAS (1,143 NM)	139,000 lbs	160,000 lbs	6,520 feet
ERJ135 ER (Express Jet)	AE3007 A3 with T/R	ATL (603 NM)	41,888 lbs[4]	41,888 lbs	6,320 feet
ERJ145 LR (American Eagle)	AE3007 A1/1	DFW (596 NM)	47,250 lbs[6]	48,501 lbs	7,300 feet
E170 (Shuttle America)	CF 34-8E5	DEN (600 NM)	82,012 lbs[4]	82,012 lbs	5,920 feet
E190 (Republic)	CF 34-10E5	DEN (600 NM)	105,359 lbs[4]	105,359 lbs	7,370 feet
CRJ200 (SkyWest)	CF34-3B1	DEN (600 NM)	47,450 lbs[4]	47,450 lbs	6,020 feet
CRJ700 (Go Jet)	CF34-8C1	DEN (600 NM)	72,750 lbs[4]	72,750 lbs	5,820 feet
B-727-200 (FedEx)	JT8D-7	MEM (418 NM)	165,000 lbs	195,500 lbs	8,620 feet
A300-600 (UPS)	GE CF6-80C2	BOI (1,081 NM)	320,000 lbs	363,760 lbs	6,220 feet
B-757-200 (FedEx)	PW2037	MEM (418 NM)	195,000 lbs	255,000 lbs	5,020 feet

Source: Airport Planning Manuals, Mead & Hunt, Inc.

1 Manufacturer specific Airplane Characteristics for Airport Planning documents.

2 With the exception of the Boeing 727 Manual and the E190 Manual, all Airport Planning Manuals considered for this analysis included runway length charts with a design temperature of standard plus 15ºC which equals 30ºC (86ºF). The Boeing 727 Manual includes a design temperature of standard plus 25ºC which equals 40ºC (104ºF) and the E190 Manual includes a design temperature of standard plus 10ºC which equals 25ºC (77ºF).

3 Runway length requirements based on Eastern Iowa Airport elevation of 869 feet Mean Sea Level (MSL) and Normal Mean Maximum Temperature of the hottest month of 85ºF.

4 All runway length requirements include a 220-foot correction based on the Runway 13/31 gradient.

5 The Bombardier manuals and the EMB 135 and 170 manuals do not include payload/range charts. For these aircraft models, the Maximum Takeoff Weight (MTOW) was used as the design weight or mission weight.

6 Per American Eagle Operations Engineering Department.

However, it is important to note that the B-727 is being phased out by FedEx and replaced with the B-757. Two additional aircraft were considered including the E190 which began service in 2012 by Frontier Airlines to Denver, CO and the A300-600 operated by UPS to both Louisville, KY and Boise, ID. The A300-600 conducted 391 operations at CID in 2011. The results of the APM runway length assessment for these aircraft are presented in **Table 3-14**. It is also important to note, that per FAA AC 150/5325-4B, Chapter 4, an analysis of commercial aircraft landing length requirements was also conducted; however, the landing length requirements of the majority of the commercial aircraft were shorter than the takeoff length required even when considering wet runway conditions.

3.4.3.3. Business Jet Aircraft Specific Runway Length Assessment

While not specifically recommended in AC 150/5325-4B, an aircraft specific runway length assessment was also conducted for a number of business jet aircraft. Again, only three of these aircraft meet the threshold of 500 annual operations to be considered a critical aircraft. The results of this business jet runway length assessment are presented in **Table 3-15**.

Table 3-15: Business Jet Aircraft Runway Takeoff Length Analysis

Aircraft	ARC	Maximum Takeoff Weight (lbs)[1]	Runway Length Required (ISO) [2]	Runway Length Required (Adjusted) [2]
Cessna Citation V/Encore	B-II	16,830 lbs	3,560 feet	4,546 feet
Cessna Citation X	C-II	36,100 lbs	5,140 feet	6,467 feet
Bombardier Challenger 604	C-II	47,600 lbs	5,700 feet	7,147 feet
Dassault Falcon 2000	B-II	35,800 lbs	5,240 feet	6,588 feet
Dassault Falcon 50	B-II	37,480 lbs	4,715 feet	5,950 feet
Gulfstream IV	D-II	71,780 lbs	5,450 feet	6,843 feet
BAe HS 125/Hawker 800	B-I	28,000 lbs	5,380 feet	6,758 feet

Source: Airport Planning Manuals, Mead & Hunt, Inc.

[1] *FAA Southern Region Airports Division, Regional Guidance Letter on Runway Length and Strength Requirements for Business Jet Aircraft. August 10, 2001.*

[2] *Runway length requirements based on Eastern Iowa Airport elevation of 869 feet Mean Sea Level (MSL) and Normal Mean Maximum Temperature of the hottest month of 85°F and 22-foot difference in runway end elevation.*

3.4.3.4. Conclusion

As at most airports, the determination of appropriate runway lengths for long-term planning space reservation at CID is a complex consideration. According to the analysis presented here, it appears that the existing 8,600-foot primary runway length is adequate to accommodate the existing and forecasted aircraft fleet. Given that both the commercial and business jet fleets also heavily utilize Runway 13/31, the Airport should consider the potential for extending Runway 13/31 to an ultimate length of 7,400 feet. However, based on the wind coverage and capacity analyses described in previous sections, such an extension will not be eligible for FAA Airport Improvement Program (AIP) funding assistance because the existing 6,200-foot length is adequate for most C-II aircraft.

3.4.4. Line-of-Sight

According to runway line-of-sight standards applicable to CID, any two points located five feet above the runway centerline must be mutually visible for the entire length of the runway. However, if the runway has a full-length parallel taxiway, the runway profile may be such that an unobstructed line of sight will exist from any point five feet above the runway centerline to another other point five feet above the runway centerline for one-half the runway length. CID has not requested any modification to standards regarding line-of-sight.

Additionally, intersecting runway line-of-sight standards indicate that an unobstructed line of sight must be established from any point five feet above the runway centerline to any other point five feet above the intersecting runway centerline within the visibility zone. The visibility zone at CID is established by four points located equidistant from the intersection point of Runways 9/27 and 13/31 and the four runway ends. The intersecting runway line of sight standard within this visibility zone is currently met.

Any proposed runway improvements or extensions will include further examination of this standard to ensure the compliance with line-of-sight criteria.

3.4.5. Instrumentation and Lighting

Existing electronic landing aids including instrument approach capabilities and associated equipment, airport lighting, and weather/airspace services were detailed in Chapter 1. The existing precision approach procedures available for Runways 9/27 and 13/31 provide instrument approach capabilities under a variety of wind conditions and operational circumstances and should be maintained. However, based on the ceiling and visibility analysis presented in Section 3.2.1, there are times when the Airport is considered “closed” due to weather conditions below current approach procedure minimums. Long-term instrument approach procedures with lower visibility minimums should be evaluated and programmed. This section provides an overview of the FAA Benefit Cost Analysis (BCA) process for justifying improved approaches below standard CAT-I approach minimums, and evaluates the feasibility of implementing either a conventional or special authorization CAT-II/III approach procedure at the Airport.

3.4.5.1. FAA Benefit Cost Analysis (BCA) Process

According to FAA Order 8400.13D, *Procedures for the Evaluation and Approval of Facilities for Special Authorization Category I Operations and All Category II and III Operations*, the airport sponsor must be demonstrate involvement in a request for a conventional or Special Authorization CAT-II/III approach procedure through a letter of concurrence. The letter of concurrence “must be submitted through the appropriate ADO or Airport Regional Office, as applicable.” Conditions for securing a conventional or Special Authorization CAT-II/III approach may include “willingness to remove obstacles, provide resources such as personnel and funding, and install additional equipment such as lights, markings, and signage.”

Once a formal request for a specific CAT-II/III system has been submitted, the FAA will conduct a Benefit-Cost Analysis (BCA) study for the proposed approach procedure. BCA studies are completed by economists in the FAA’s Washington, D.C. offices and are planning tools that the FAA uses to determine whether navigational aid improvements are justified by weighing perceived benefits of the improvements against societal costs. It is a standardized tool appropriate for some commercial service airports, but it is not a representative model for all situations. A BCA study is completed by building a mathematical model of historic and projected airport activity under weather conditions relevant to the specific type of approach requested.

The output of the BCA study is a benefit-cost ratio for the proposed procedure, which must exceed 1.0 in order for the project to be eligible for FAA funding. Costs considered include the capital, operation, and maintenance costs associated with implementing the proposed procedure, while benefits considered include reduced flight disruptions and added flight safety. Specific information required to complete a BCA study includes:

- Historical weather data consisting of cloud ceiling and visibility conditions
- Annual scheduled commercial aircraft instrument operation counts, hours, and passengers
- Annual non-scheduled air taxi aircraft instrument operation counts and passengers
- Annual local and itinerant general aviation aircraft instrument operation counts, hours, and passengers
- Annual military instrument operation counts and hours
- Aircraft utilization (the percentage of operations conducted at the Airport by aircraft and aircrews certified for the proposed procedure)

Airport activity modeling and evaluation for a BCA study can take between six and 12 months for the FAA to complete. This process can be expedited by producing a background data report and providing it to the FAA for their use in completing the BCA study. Letters of support from Airport operators are often helpful in generating momentum for a procedure request and substantiating the need for an improved approach. Other information that is helpful to provide are specific benefits related to unique local circumstances and users, particularly those involving regularly occurring, time-sensitive operations with quantifiable costs and benefits.

3.4.5.2. Conventional CAT II/III Requirements

Ground equipment requirements associated with CAT-II and CAT-III approach procedures are summarized in **Table 3-16**. As shown in Table 3-16, an improved ILS approach would require a number of navigational aid upgrades at the Airport, regardless of the runway end to which the procedure is designed. In the event that a conventional CAT-II/III system is not justified, it may be possible for the Airport to pursue implementation of a Special Authorization CAT-II approach using CAT-I equipment. However, the greatest number of airport users would benefit from the establishment of a full CAT-II system as a Special Authorization approach has more demanding aircraft and aircrew certification requirements.

Table 3-16: CAT-II and CAT-III Ground Equipment Requirements

Requirement	CAT-II Requirements	CAT-III Requirements	Eastern Iowa Airport Existing Conditions
Air Traffic Control Tower*	Required	Required	Yes
Approach Lights†	ALSF-2	ALSF-2	**MALSR (Runways 9, 27, and 31)**
Runway Edge Lights	HIRL	HIRL	HIRL
Touchdown Zone (TDZ) Lights†	Required	Required	**None**
Runway Centerline (RCL) Lights†	Required	Required	**None**
Runway Visual Range (RVR) Sensors†**	Touchdown, Midpoint, and Rollout	Touchdown, Midpoint, and Rollout	**Touchdown and Rollout (Runway 9/27 only)**
Approved Surface Movement and Ground Control System (SMGCS) Operation***	Not Required	Required	**None**
Critical Area Performance Classifications****	II/D/2	III/D/3 for RVR 700, III/E/3 for RVR 600, or III/E/4 for RVR 300	**Runway 9/27 critical areas unlikely to meet CAT-II/III Standards**
Special Localizer/Glideslope Requirements	Dual Transmitter and Dual Monitor Systems; Must be Remotely Monitored; Must Have Approved Backup Power Source; LOC far field monitor required	Dual Transmitter and Dual Monitor Systems; Must be Remotely Monitored; Must Have Approved Backup Power Source; LOC far field monitor required	**Runway 9/27 localizer and glideslope antennas unlikely to meet CAT-II/III standards; there is no existing localizer or glideslope to Runway 13/31**
Obstacle Free Zone	Must meet CAT II/III Standards	Must meet CAT II/III Standards	Presumed Clear††
Approach Light Plane	Must be clear	Must be clear	Presumed Clear††
Missed Approach Segment	Must meet TERPS CAT II/III Standards	Must meet TERPS CAT II/III Standards	Presumed Clear††

Source: FAA Order 8400.13D, Procedures for the Evaluation and Approval of Facilities for Special Authorization Category I Operations and All Category II and III Operations

Notes:
†Runway lights, approach lights, and RVR sensors must have standby power with a one second transfer in the event of a primary power source outage, and runway/approach lights must be remotely monitored so that aircraft can be notified immediately if they become inoperative.
††Preliminary airspace analysis indicates that the CAT-II/III obstacle free zone, approach light plane, and missed approach segment are clear for Runways 9, 27, and 31. It should be noted, however, that this analysis is only preliminary; the FAA conducts their own independent airspace analysis on all obstructions to determine whether or not they are considered a hazard to air navigation.
**If the ATCT does not provide continuous service, the procedure is not authorized when the tower is closed*
***Midpoint sensor only required for CAT-II operations when the runway is in excess of 8,000 feet long. AFS-400 may approve CAT-II on a runway in excess of 8,000 feet without a midpoint sensor on a case-by-case basis; AFS-400 may also approve CAT-III on any runway without a midpoint sensor on a case-by-case basis.*
****Although not specifically required for conventional CAT-II operations, a SMGCS plan would be required for instrument departures below RVR 1200, which operators with heads-up displays can request once runway centerline lights are in place. For CAT-III operations, the approved SMGCS operation must have an approved taxi routing from the landing runway to the non-movement area suitable for operations below RVR 1200 or RVR 600, as applicable to the landing minimums sought. SMGCS plans may require in-pavement stop bar lights, runway guard lights (elevated or in-pavement), in-pavement taxiway centerline lights, clearance bar lights, and/or taxiway reference point markings.*
*****The letter in the sequence refers to ILS performance standards, and the Arabic numeral refers to continuity of service requirements. See FAA Orders 8200.1, 6750.24, and 6750.57 for performance classification requirements.*

3.4.5.3. Special Authorization CAT-II

Based on the weather analysis presented in Section 3.1, the following conclusions were reached regarding the feasibility of implementing a conventional CAT-II/III approach procedure at CID:

- Weather conditions at CID are below ILS CAT-I minimums (200-foot ceiling and/or one-half-mile visibility) 1.3 percent of the time.
- Costs associated with CAT-II/III ILS implementation are very high in relation to the small percentage of time that weather is below CAT-I minimums at CID. Absent any unique local circumstances that may warrant an improved ILS approach at the Airport, it will be difficult for an improved ILS system to achieve a benefit-cost ratio of 1.0 or higher as required under FAA establishment criteria.
- Due to the relatively infrequent occurrence of weather below CAT-I minimums, it is anticipated that FAA support for a CAT-II/III approach would not be strong.
- In the event that FAA would support implementation of a CAT-II/III approach at CID, Runway 9 is likely to be the preferred runway end from a weather, ground equipment, and off-airport impact perspective.

Aircraft cockpit avionics technology has improved significantly over the past few decades. The FAA has been placing a growing emphasis on performance-based approach procedures. These allow specially-qualified and certified flight crews using specific avionics to take advantage of lower approach minimums than those associated with standard CAT-I ILS systems without requiring the installation of additional ground navigation equipment. FAA Order 8400.13D, *Procedures for the Evaluation and Approval of Facilities for Special Authorization Category I Operations and All Category II and III Operations*, establishes authorization criteria for CAT-I procedures with minimums below one-half mile visibility and/or 200-foot cloud ceiling. There are two different CAT-I approach procedures covered by Order 8400.13D:

- CAT-I 1800 runway visual range (RVR) procedures using an aircraft flight director (FD) or autopilot with an approach coupler or head-up display (HUD) to the decision altitude (DA); and
- Special Authorization CAT-I procedures with a DH as low as 150 feet and a visibility minimum as low as RVR 1400 using a HUD to DH.

At CID, Runway 9 is equipped with a CAT-I 1800 RVR procedure, while Runway 27 is equipped with a standard CAT-I ILS with a decision height not lower than 200 feet above touchdown zone elevation and visibility not less than one-half statute miles.

FAA Order 8400.13D, Chapter 5, also establishes authorization criteria for Special Authorization CAT-II approach procedures with a DH as low as 100 feet and a visibility minimum as low as RVR 1200 using aircraft Autoland or HUD to touchdown. This type of approach provides minima similar to a conventional CAT-II approach without costly ground equipment requirements; however, it has more stringent authorization requirements for aircraft and aircrew. Depending upon current flight schedules, airlines serving the airport, and crew flying the routes, the utilization of a Special Authorization CAT-II approach can vary between approximately 50 percent and 75 percent at most non-hub regional airports. As regional airlines continue to phase-out smaller regional jets and replace their fleet with larger aircraft, this percentage can be expected to increase modestly in future years.

The ground equipment requirements for a Special Authorization CAT-II are significantly different than those for a conventional CAT-II approach. The ground equipment requirements for conventional and Special Authorization CAT-II approaches are compared in **Table 3-17**.

Table 3-17: Conventional and Special Authorization CAT-II Ground Equipment Requirements Comparison

Requirement	Conventional CAT-II Requirements	Special Authorization CAT-II Requirements	CID – Existing Conditions (Runways 9 & 27 Only)
Air Traffic Control Tower*	Required	Required	Yes
Special Aircrew & Aircraft Certification	Required	Required	N/A
Approach Lights	ALSF-2	SSALR, MALSR, or ALSF-1/ALSF-2	MALSR
Runway Edge Lights	HIRL	HIRL	HIRL
Touchdown Zone (TDZ) Lights	Required	Not Required	None
Runway Centerline (RCL) Lights	Required	Not Required	None
Runway Visual Range (RVR) Sensors	Touchdown, Mid-point, and Rollout	Touchdown and Rollout	Touchdown and Rollout
Approved Surface Movement and Ground Control System (SMGCS) Operation	Not Required**	Not Required	None
Critical Area Performance Classifications***	II/D/2	II/D/2	**Does not currently meet all of these performance standards**
Special Localizer/Glideslope Requirements	Dual Transmitter and Dual Monitor Systems	Dual Transmitter Systems Preferred; Single Transmitter Systems Acceptable	**Does not currently meet all of these requirements**
	Must be Remotely Monitored	Must be Remotely Monitored	
	Must have Approved Backup Power Source	Must have Approved Backup Power Source	
	LOC far field monitor required	No LOC far field monitor required	

Source: FAA Order 8400.13D, Procedures for the Evaluation and Approval of Facilities for Special Authorization Category I Operations and All Category II and III Operations

Notes:
**If the ATCT does not provide continuous service, the procedure is not authorized when the tower is closed*
***Although not specifically required for conventional CAT-II operations, a SMGCS plan would be required for instrument departures below RVR 1200, which operators with heads-up displays can request once runway centerline lights are in place.*
****The letter in the sequence refers to ILS performance standards, and the Arabic numeral refers to continuity of service requirements. See FAA Orders 8200.1, 6750.24, and 6750.57 for performance classification requirements*

As discussed previously, a conventional CAT-II ILS would require a number of equipment upgrades for Runway 9/27, including an ALSF-2 approach lighting system, touchdown zone lights, runway centerline lights, and an additional runway visual range sensor. None of these upgrades would be required for a Special Authorization CAT-II approach. The only significant upgrade that would be required for a Special Authorization CAT-II approach would be new localizer and glideslope equipment that meets the critical area performance classifications and special localizer/glideslope requirements shown above.

3.4.5.4. Conclusion

The Airport should maintain the existing instrument approach capabilities on the both runways, while also protecting for and seeking ways to improve approach minimums. The benefit-cost ratio for a conventional CAT-II/III system at CID is likely to be significantly lower than the required 1.0. A Special Authorization CAT-II approach to Runway 9 offers an alternative for the Airport because it would require significantly less new ground equipment to achieve similar approach minima. This type of approach would be able serve the majority of Airport users certified to conduct conventional CAT-II approaches.

If the existing Airport ILS equipment is replaced in the near future as a result of its age and a subsequent deterioration in reliability, a new replacement system would allow for the establishment of a Special Authorization CAT-II approach. An Instrument Approach Procedure request would have to be filed with the FAA and an aeronautical survey would have to be conducted in order to establish the new approach.

3.4.6. Runway Protection Zones (RPZs)

The function of the RPZ is to enhance the protection of people and property on the ground beyond the runway ends, which is achieved through airport control of the RPZ areas. The RPZ is trapezoidal in shape and centered about the extended runway centerline. It begins 200 feet beyond the end of the area usable for takeoff or landing. The RPZ dimensions are functions of the type of aircraft operating at the Airport and the approach visibility minimums associated with each runway end.

On September 27, 2012, the FAA issued new interim guidance on land uses within an RPZ. This new guidance states that regional FAA staff must consult with the National Airport Planning and Environmental Division when specific incompatible land uses would enter the limits of the RPZ as a result of any of the following:

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

Land uses considered by this interim guidance to be incompatible with the RPZ include the following:

- Buildings and structures
- Recreational land uses
- Transportation facilities, including railroads, public roads/highways, and vehicular parking facilities
- Fuel storage facilities
- Hazardous material storage
- Wastewater treatment facilities
- Above-ground utility infrastructure

Although there are currently public roads, a railroad, and above-ground utility infrastructure within several of the Airport's RPZs, these are existing conditions that are commonly "grandfathered" by the FAA. However, the Airport should be cautious when considering airfield changes or new land uses that will affect its RPZs. Some FAA regions have begun to develop guidance forms that help airports ensure that they have considered all possible alternatives that avoid incompatible land uses in RPZs including roads.

In consideration of the existing instrument approach minimums and the type of aircraft each runway is designed to accommodate, **Table 3-18** lists existing RPZ dimensional requirements along with the requirements for improved approach capabilities.

The Airport should maintain the existing RPZ criteria and plan for a larger RPZ on the approach end of Runway 13 in consideration of an improved instrument approach procedures to this runway ends. Furthermore, it is important that CID properly plans for future RPZs in consideration of the potential runway extension projects.

Table 3-18: Runway Protection Zone Dimensions

Item	Inner Width (feet)	Length (feet)	Outer Width (feet)
Existing RPZ Dimensional Requirements:			
Runway 9	1,000	2,500	1,750
Runway 27	1,000	2,500	1,750
Runway 13	500	1,700	1,010
Runway 31	1,000	2,500	1,750
Required RPZ Dimensions for Various Visibility Minimums:			
Visual and not lower than one mile, Small Aircraft Only	250	1,000	450
Visual and not lower than one mile, Approach Categories A & B	500	1,000	700
Visual and not lower than one mile, Approach Categories C & D	500	1,700	1,010
Not lower than ¾ mile, all aircraft	1,000	1,700	1,510
Lower than ¾ mile, all aircraft	1,000	2,500	1,750

Source: FAA Advisory Circular 150/5300-13A, Airport Design

3.5. Landside Facility Requirements

This section presents requirements for the following landside aviation-related facilities, including general aviation aircraft storage, air cargo, and airport support facilities and activities such as the snow removal, aircraft rescue and firefighting (ARFF), the air traffic control tower, aircraft deicing, and aircraft fueling. Although typically considered “landside” facilities, requirements for the passenger terminal area including the terminal building and ground vehicle circulation/parking are considered in a separate chapter of this Master Plan.

3.5.1. General Aviation Aircraft Storage

General aviation aircraft based at CID are stored in hangar facilities located east of the approach end of Runway 31, and both east and west of the approach end of Runway 13. There are currently an estimated 144 total aircraft based at the Airport with 142 stored in hangars and two stored on tie-downs. The general aviation hangars are currently occupied at close to 100 percent capacity and the Airport maintains a wait list for hangar storage with approximately 10 to 15 names on six separate hangar amenity lists. Over the course of the 20-year planning period, the number of based aircraft at the Airport is forecasted to increase moderately. The trend of increasing general aviation aircraft size also plays a role in defining future development needs.

Perhaps the most important influence contributing to the need for a comprehensive analysis of the future development needs for general aviation is the configuration of the existing facilities in consideration of space currently available for development. There a limited amount of space available in the current aviation-related development areas that can be easily developed for general aviation needs. Following are several issues that will be considered in the development of a plan for the configuration of future general aviation facilities at the Airport.

3.5.1.1. Tie-down Storage Requirements/Based Aircraft

Aircraft tie-downs are provided for those aircraft that do not require or do not desire to pay the cost for hangar storage. Space calculations for these areas are based on 360 square yards of apron for each aircraft to be tied down. This amount of space allows for aircraft parking and circulation between the rows of parked aircraft. Past trends indicate that as more aircraft are based at the Airport, hangar storage capacity is surpassed before additional hangars are supplied. This indicates that increased tie-down space for based aircraft should be included in the development plan.

3.5.1.2. Tie-down Storage Requirements/Itinerant Aircraft

In addition to the needs of the based aircraft tie-down areas addressed in the preceding section, transient aircraft also require apron parking areas at CID. This storage is provided in the form of transient aircraft tie-down space. In calculating the area requirements for these tie-downs an area of 400 square yards per aircraft is typically used. The development plan for the Airport will designate adequate areas for apron development to satisfy this demand.

3.5.1.3. Hangars

The development plan for future general aviation hangars will focus on identifying potential parcels considering the ability to provide roadway and taxiway access.

The accompanying table shows the type of facilities and the number of units or square yards needed for that facility in order to meet the forecast demand for each development phase. It is expected that most of the owners of aircraft that will be newly based at the Airport will desire some type of indoor storage facility. The actual type of hangar storage facility to accommodate based aircraft has been identified as T-hangars/clear span hangars and larger corporate and/or executive type hangars, although the actual number, size, and location of these hangars will depend on user needs and financial feasibility.

Access and perimeter roadway locations, auto parking requirements and land requirements are not included in this tabulation because the amount of land necessary for these facilities will be a function of the location of other facilities as well as the most effective routing of roadways. **Table 3-19** presents the estimated number of general aviation aircraft storage facilities required for general aviation landside facilities throughout the 20-year planning period. This forecast will assist in the development of detailed facility staging discussed later. It is assumed that the majority of aircraft owners will desire indoor storage. This assumption leads to the conclusion that increased area for the construction of hangars will be critical and that the demand for additional aircraft parking apron will increase, but will not likely exceed the amount that is presently in place.

It is important to note that the distribution of itinerant aircraft parking has more square yardage available than the east side itinerant apron. Consideration should be given in the alternatives analysis of this Airport Master Plan to either reconfiguring the east side facilities or expanding the east side apron to accommodate additional itinerant aircraft parking.

Table 3-19: General Aviation Facility Requirements					
	Total Number Required				
Facility	**2011[1]**	**2016**	**2021**	**2026**	**2031**
Itinerant GA Apron (square yards)	--	11,400	12,150	12,970	13,860
Based Aircraft GA Apron (square yards) [2]	--	1,200	1,200	1,500	1,800
Total Apron (square yards)	57,896	12,600	13,350	14,470	15,660
Total Aircraft Tie Downs	19	31	33	36	38
Hangar Space	**2011[1]**	**2016**	**2021**	**2026**	**2031**
Number of Aircraft in T-Hangars	117	134	153	174	201
Number of Aircraft in Exec./Corp. Hangars	25	28	31	37	42
Total Aircraft in Hangars	142	162	184	211	243

Source: Mead & Hunt, Inc., projections based on FAA AC 150/5300-13, Airport Design
[1] Actual.
[2] Does not differentiate between based and/or itinerant apron.

3.5.2. Air Cargo

Air cargo at CID is transported in the belly compartments of passenger airline aircraft and on dedicated air cargo aircraft. As presented in Chapter 1, there are two air cargo distribution facilities located on airport property. The largest and newest distribution facility is located on Beech Way Southwest on the west side of the Airport. FedEx operates ground and air cargo distribution from this facility. The second cargo distribution facility is a freestanding structure located directly west of the Airport terminal. The facility supports air and ground distribution for UPS and USPS.

The quantity of air cargo passing through the Airport is anticipated to increase during the forecast period. Air cargo tonnage and peak day cargo fleet mix projections for the Airport are shown in **Table 3-20**.

Table 3-20: Air Cargo Tonnage and Peak Day Fleet Mix Forecasts						
		Year				
Activity Measure		**2011**	**2016**	**2021**	**2026**	**2031**
Total Cargo Tonnage		50,846,891	64,430,349	72,536,159	81,694,613	91,248,145
Fleet Mix (peak day)						
Carrier	***Aircraft***					
FedEx	ATR-72 (or similar)	1	1	1	1	1
FedEx	Boeing 757 (or similar)	2	2	3	3	3
UPS	Airbus 300	1	1	1	1	1
UPS	Boeing 757 (or similar)	1	1	2	2	2
DHL	Brasilia 120 (or similar)	2	2	2	2	2
Other	ATR-72 (or similar)	1	1	2	2	2

Source: Mead & Hunt,Inc.

The quantity of air cargo passing through the Airport is anticipated to increase during the forecast period. As stated previously, the Airport is poised to continue to grow in the percentage of air cargo traffic in the coming years, primarily due to its strategic location in eastern Iowa, the large number of nearby industries, and the Airport's ability to support cargo jet operations.

Although there is currently excess capacity in both the West Cargo and East Cargo Areas, consideration should be given to the reservation of additional space for future cargo facility expansion. The existing master plan shows cargo facility expansion west of the FedEx facility. The age of the cargo facility utilized by UPS as well as its proximity to the passenger terminal complex require the consideration of relocating this facility in the long term as indicated on the existing Airport Layout Plan (ALP).

3.5.3. Support Facilities Requirements

In addition to the aviation and airport access facilities described previously, there are several airport support facilities that have quantifiable requirements and are vital to the efficient and safe operation of the Airport. The support facilities at CID that require further evaluation include the Airport Traffic Control Tower (ATCT), the aircraft rescue and firefighting facility (ARFF), the fuel storage facility, the snow removal equipment (SRE)/Maintenance facility, and aircraft deicing and fueling infrastructure and facilities.

3.5.3.1. Air Traffic Control Tower (ATCT)

In its present location (northwest of the passenger terminal complex), the ATCT meets all requirements to enable it to properly function with the existing runway configuration. As the runway and taxiway system evolves in the future with potential runway extensions and taxiway additions to service new/reconfigured landside development areas, ATCT line-of-sight and viewing angle concerns will be important feasibility determinants.

3.5.3.2. Aircraft Rescue and Fire Fighting (ARFF) Facility

Constructed in 2009, the new ARFF facility is located northeast of Runway 13/31. Access to the ARFF facility is located at the end of Lippisch Place. According to Code of Federal Regulations (CFR) Part 139.317, ARFF equipment and staff requirements are based upon the length of the largest air carrier aircraft that serves the Airport with an average of five or more daily departures. **Table 3-21** presents the ARFF Index for air carrier/commuter aircraft currently serving the Airport.

Table 3-21: Representative Air Carrier/Commuter Aircraft Lengths and ARFF Index		
	Length (in Feet)	**ARFF Index**
Jet Aircraft		
MD-80	147.8	C
B727-200	153.2	C
CRJ-700	106.7	B
CRJ-200	87.8	A
ERJ-145	98.0	B
A320	123.3	B
E170	98.1	B
Turbo Prop Aircraft		
Dash 8-200	80.7	A
Dash 8-Q400	107.6	B
EMB 120 Brasilia	6.8	A

Sources: FAR Part 139 Certification and Operations: Land Airports Serving CAB-Certificated Scheduled Air Carriers Operating Large Aircraft (Other Than Helicopters).
FAA AC 150/5300-13 Airport Design.

The Airport currently maintains an ARFF Index B classification with ARFF Index C available upon request with 48 hours of notice. This ARFF Index classification adequately serves the existing and projected runway system and airline operational schedule. There are a couple of additional commercial service aircraft such as the Embraer 195 and the Boeing 737-800 and 900 series aircraft that if operated on a regular basis could necessitate that the Airport maintain ARFF Index B.

3.5.3.3. SRE/Maintenance Facility

The relatively new SRE building is located southeast of the main terminal apron. The facility serves as the base of operations for maintenance and storage of snow removal equipment. Access to the SRE building is provided from 18th Street Southwest. According to Airport staff, the building is nearing storage capacity. However, the building will be difficult to expand in width due to its architectural and structural design. Additionally, the location of the building currently inhibits future expansion of the apron. Additional areas for future SRE facilities and maintenance facilities should be considered in the Airport's development plan.

3.5.3.4. Aircraft Deicing Facilities and Infrastructure

Alternatives presented in subsequent chapters of this Master Plan will have implications for the adequacy of the existing deicing runoff management system. To comply with the requirements of the Airport's National Pollutant Discharge Elimination System (NPDES) permit, any new apron areas associated with the alternatives that will generate storm water containing glycol or the products of glycol decomposition must be designed such that drainage is contained and discharged to the Cedar Rapids wastewater treatment facility. The primary factors that affect the capacity requirements for the deicing runoff management system are deicing apron drainage area, amounts of aircraft deicers used, and aircraft deicing technology. These factors will be evaluated in Chapters 5 and 6 for alternatives that will involve changes to existing aircraft deicing practices and procedures.

Changes in the amounts of aircraft deicing fluid (ADF) used in the future were estimated based on recent records of ADF usage and forecast increases in passenger and air cargo operations presented in Chapter 2. Deicer usage is inherently variable from season-to-season, primarily because of variability in winter weather conditions. Other factors that may also result in differences in ADF usage from one deicing season to another include operations, fleet mix, and deicing practices and technologies. For the purposes of the master planning effort, the following assumptions were made in estimating future ADF usage:

- The average ADF usage reported between the 2009 – 2010 and 2012 – 2013 deicing seasons is representative of current operations and practices under "typical" winter weather conditions.
- The current average ADF usage per operation is representative of future deicing operations and ADF usage under "typical" winter weather conditions.

The average ADF usage reported for passenger and air cargo operations over the period between the 2009–2010 and 2012–2013 deicing seasons is presented in **Table 3-22**.

Table 3-22. Average annual ADF usage reported for passenger and air cargo operations during the 2009 – 2010 through 2012 – 2013 deicing seasons (volumes as applied).

Location of Aircraft Deicing Operations	Average Annual Type I Usage (Gallons)	Average Annual Type IV Usage (Gallons)
Terminal/ East Cargo	41,814	6,044
West Cargo	9,213	1,150
Totals	51,038	7,183

Table 3-23 summarizes the passenger and air cargo operations forecasts presented in Chapter 2.

Table 3-23. Passenger and Cargo Operations Forecasts.

Year	Passenger Operations	Relative Change		Air Cargo Operations	Relative Change	Comments
2011	22,170	0		3,146	0	Baseline
2016	20,766	-6.3%*		3,175	0.9%	
2021	22,833	3.0%		4,456	41.6%	
2026	24,387	10.0%		4,489	42.7%	
2031	25,378	14.5%		4,523	43.8%	

Note: Reduced passenger operations reflects move to larger regional jet and narrow-body aircraft.

Table 3-24 presents estimated ADF usage under forecast operations through 2031.

Table 3-24. Estimated average annual ADF usage in gallons by area under forecast operations (% change).

Year	Terminal / East Cargo				West Cargo			
	Type I		Type IV		Type I		Type IV	
2011	41,814	-	6,044	-	9,213	-	1,150	-
2016	39,166	(-6%)	5,661	(-6%)	9,297	(1%)	1,161	(1%)
2021	43,065	(3%)	6,225	(3%)	13,049	(42%)	1,629	(42%)
2026	45,996	(10%)	6,648	(10%)	13,145	(43%)	1,641	(43%)
2031	47,865	(14%)	6,919	(14%)	13,245	(44%)	1,653	(44%)

The forecasts in Table 3-24 show that the greatest relative impact of increased operations on glycol use and loading in runoff will be to the West Cargo Deicing Basin. Potential deicing infrastructure improvements required for future terminal and cargo apron development will be considered in Chapters 5 and 6.

3.5.3.5. Aircraft Fuel Storage Facilities

Fuel storage and sales at CID are conducted by the FBO. Available aircraft fuel storage includes 80,000 gallons of Jet-A and 24,000 gallons of 100LL AVGAS. Fuel is kept in large storage tanks at the East Fuel Farm located northeast of the SRE/maintenance building and the West Fuel Farm located north of the West Cargo Area. The Airport's fuel storage requirements are variable based upon individual supplier and distributor policies.

For these reasons, future fuel storage requirements will be dependent upon the individual distributors and space should be reserved for the expansion of existing fuel storage facilities as required. General aviation pilots have also expressed an interest in a self-service, credit card fuel system. Siting of this potential facility should be considered.

3.6. Facility Requirements Summary

The information provided in this chapter provides the basis for understanding what facility improvements at the Airport might help in the effort to accommodate future Airport demands efficiently and safely. Following are the major improvement considerations that identified in this chapter:

- Maintenance and rehabilitation of Runways 9/27 and 13/31.
- Evaluate improvements to the taxiway system layout that increase the safety and efficiency of the airfield system, improve aircraft movement patterns, and provide access to future development areas.
- The potential extension of Runway 13/31 to accommodate the runway length requirements of the commercial aircraft fleet.
- Improved instrument approach capabilities of both runways.
- Areas programmed for future general aviation development areas considering existing structures.
- Consideration for the re-use of the previous ARFF facility and/or the redevelopment of this land.

- Areas programmed for future air cargo development considering the projected increase in air cargo activity at the Airport.
- Areas programmed for future non-aviation related development.
- Potential deicing infrastructure requirements associated with future terminal and cargo apron development.
- Off-airport land use compatibility and zoning.

It is important to note that the recommendations in this Airport Master Plan are provided to understand what facilities improvements might be needed at the Airport and where those facilities might be best placed. In other words, the Master Plan provides recommendations on how various parcels of the Airport might be best developed, in consideration of potential demand and community/environmental influences. One of the basic assumptions for a master plan for a complex facility like an airport, is that if a future improvement is identified on the recommended development plan; it will only be built if there is actual demand, if the project is financial feasible, and if environment impacts are insignificant.

In summary, the facility needs information presented in this chapter will be used to develop alternatives for the configuration of future airport facilities.

MASTER PLAN

THE EASTERN IOWA AIRPORT CEDAR RAPIDS

4

Terminal Area Facility Requirements

CHAPTER 4

Terminal Area Facility Requirements

Assessing the capacity of passenger terminal facilities involves a qualitative as well as a quantitative analysis. The purpose of this analysis is to provide recommendations for future improvements to the passenger terminal facilities compared against aviation demand projections. Industry standards and FAA guidelines are used in the development of recommendations for facility improvements as well as the consultant’s observations of facility function. Terminal area facility requirements are presented in the following sections:

- Passenger Activity
- Terminal Area Planning Considerations and Goals
- Terminal Area Vehicle Circulation and Parking
- Passenger Terminal Curbside
- Overall Passenger Terminal Space
- Public Space
- Leased Space
- Non-Usable Space
- Passenger Amenities and Technology
- Energy Efficiency
- Passenger Terminal Summary

4.1 Passenger Activity

Currently, most legacy airlines have a hub-and-spoke route schedule structure, which optimizes the airline schedule and load factors by directing passenger traffic from smaller airports (spokes) to larger ones (hubs). The route structures of an airport's flight schedule will influence the peak use characteristics of the terminal facility, and in turn, will affect the facility's operational requirements. Peak use characteristics at The Eastern Iowa Airport (referred to as CID or the Airport) resemble hub activity in that flights are not concentrated into high usage time blocks, which typically occur at "spokes" early in the morning and late in the evening.

Characteristics of passenger activity influence how the terminal building functions. The historic and forecasted passenger activity discussed in Chapter 2 is used in this chapter to assess space needs within the terminal.

4.1.1 Design Level Passenger Activity

While the capacity of airfield facilities is directly linked to aircraft activity, the capacity of terminal facilities is largely dependent on passenger activity. In addition, the capacity of terminal facilities is also influenced by the configuration of the terminal and by passenger needs that are specific to the location. For example, because of schedule constraints, an airport with a majority of business travelers will have less tolerance for delays and congestion than an airport with a majority of leisure travelers. For these reasons, facility requirements for terminal facilities are a function of the unique characteristics of the airport. These characteristics include: the amount of passengers and aircraft activity, the proportion of business travelers to leisure travelers, the number and type of airlines operating, and the operating requirements of those airlines. In general, airport terminal planning is invariably affected by changing ticketing technology, by changes in airline industry operation, and by economic forces that change the number of passengers using the facilities. In addition, it is beneficial for the airport terminal configuration to have the ability to adapt to changes and to unexpected growth in order to extend the life of the facility in the future.

Most public facilities in the airport terminal are evaluated based on "peak hour" passenger activity, which is the time that the terminal building will experience the most concentrated public use. All terminal facilities must be capable of adequately meeting the demands of this point in time. In this document, some of the recommendations for changes to the facilities in this document are the result of shortfalls such as an area being too small to accommodate the expected amount of use, while other recommendations will improve operational performance. For example, building mechanical performance, can be improved by recent advancements in technology.

4.2 Passenger Terminal Planning Considerations and Goals

4.2.1 Terminal Area Planning Considerations

While passenger terminal facility requirements are based on peak hour passenger activity, they are also influenced by the past performance of the facility, which is learned through user interviews. In considering the feedback received from airport employees, terminal building tenants, and the community during the planning process, several considerations were established that are intended to direct the development of the Airport passenger terminal in the future.

- Consideration One: Compliance: The passenger terminal will be developed and operated in a manner that is consistent with local ordinances and codes, federal and state statutes, federal grant assurances, and Federal Aviation Administration (FAA) regulations.

- Consideration Two: Airport Terminal Role: The passenger terminal will continue to serve as a facility that accommodates commercial passenger activity, along with general public activity in the non-secure portion of the terminal.

- Consideration Three: The Connection between Ground and Air Transportation Systems: As the location of public interface between the ground and air transportation systems, the passenger terminal will continue to provide a safe, efficient and comfortable environment in which passengers and their baggage move between commercial aircraft and ground transportation.

- Consideration Four: Airport Terminal Design Standards: This consideration relates to the size and type of passenger terminal facilities and the design criteria used as references for recommendations for changes to the terminal. In terminal planning, it is important that the focus is on achieving an acceptable balance between passenger convenience, operating efficiency, cost, and aesthetics.

  The recommendations for changes to meet facility requirements have been developed using a reference for airport terminal design provided by the FAA:

  – FAA's Advisory Circular (AC) 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*

  AC 150/5360-13 was developed in the 1980s, and while some of the recommendations it provides are still useful today, some of the guidelines are no longer relevant. More recent references have been developed by various entities to address current airport terminal facility requirements. These references include:

  – Transportation Security Administration (TSA*) Checkpoint Design Guide*
  – Airport Cooperative Research Program (ACRP) *Report 25: Airport Passenger Terminal Planning and Design*
  – International Air Transport Association (IATA) *Airport Development Reference Manual*

  The approach of comparing several guidelines and the consultant's prior experience with other airport work, has led to the successful development of many airport terminal facilities.

- Consideration Five: Energy Efficiency: In the past, producing an airport terminal building project that is energy-efficient has typically been voluntary, but it is becoming increasingly common that a certain level of energy-efficiency in a project is required by federal, state, or local regulations. This not only benefits communities and the environment, it also makes good business sense since an energy-efficient facility will have reduced utility expenses and operational costs.

Examples of energy-efficiency in a building project includes managing energy use in the building systems and controlling heat gain or loss from the building through the walls, windows, doors, floors and roofs.

- Consideration Six: Terminal Landside Development: Because the amount of landside development area at any airport is at a premium, this consideration is to plan for future terminal building development that strives to make most efficient use of the available area for terminal landside activities including the terminal curbside, vehicle circulation and parking facilities associated with the passenger terminal. These areas should be developed in a manner that is compatible with the passenger terminal.

- Consideration Seven: Terminal Airside Development: Because the amount of terminal airside development area at any airport is at a premium, this consideration is to plan for future terminal building development that strives to make most efficient use of the available area for terminal airside activities including the commercial apron, aircraft circulation and aircraft parking facilities associated with the passenger terminal. The passenger terminal should be developed in a manner that is compatible with the airfield.

These considerations have been established for the purpose of directing the plan and establishing continuity in the future development of the passenger terminal.

4.2.2 Terminal Area Planning Goals

The following goals are intended to guide the preparation of development of the passenger terminal building alternatives for this Master Plan Update and to direct the future expansion of CID. These goals take into account needs of the Airport, both in the short-term and the long-term, and they include safety, financial and economic conditions, public interest and investment, and community recognition and awareness.

- Provide effective direction for the future development of passenger terminal building through the preparation of a rational, reasonable, and implementable plan.
- Prepare a plan that allows the Airport to fulfill its mission to facilitate and enhance passenger-related services.
- Accommodate the forecast aviation activity levels in a safe and efficient manner by providing the necessary passenger terminal facilities and services.
- Ensure that future development of the passenger terminal will accommodate a variety of passenger-related activities including the general public, business travelers and leisure travelers.
- Plan and develop the passenger terminal to be capable of accommodating the future needs and requirements of the City of Cedar Rapids, Linn County and the larger surrounding service area, and support regional economic development activity.
- Encourage and protect the public and private investment in the passenger terminal facilities.

Because passenger terminal functions are associated with not only the runway/taxiway and the public parking/roadway access system, but also land use and zoning, development alternatives of the terminal building must examined and evaluated in reference to the larger physical context. It is essential that the initial development recommendations for the passenger terminal be commensurate with the anticipated needs and requirements of airport users; however, long-term expansion of the terminal and concourses must also be considered to ensure the capability to accommodate potential passenger activity levels. The main objective of the planning recommendations presented in this section is to identify future development that will result in a passenger terminal that is capable of accommodating the forecast level of aviation activity in a manner that will not impede growth of the terminal facilities beyond the planning horizon.

The following analysis compares the existing amount of space for individual facilities in the terminal building with facility requirements that have been established by industry standards, with the intent of meeting both current usage and projected facility usage for the year 2031. Shortfalls are identified and recommendations are provided that will address both existing shortfalls and shortfalls expected over the planning period. The recommendations that are provided for facility improvements will consider the unique qualities of the airport, which were revealed through a review of the airport arrangement and the relationships between different functional areas, the observation of activity, and the feedback provided in tenant and user interviews. Together, these quantities and qualities are used to develop the terminal facility recommendations that are unique to the Airport. In addition, it should be noted that airport terminal planning is invariably affected by changing technology, by changes in airline industry operation, and by economic forces that affect passenger processing and terminal functions. In order to extend the life of the facility in the future, it is beneficial for the airport terminal design to have the ability to adapt to future changes and to unexpected growth.

Descriptions of the methodologies that were used to calculate space requirements are listed in separate sections of this chapter for each functional area, and a complete listing of all of the functional areas in the passenger terminal is found at the end of this chapter.

4.3 Terminal Area Vehicle Circulation and Parking

This section summarizes the results of a traffic study conducted as part of the Master Plan; identifies access and circulation problem areas associated with the current terminal area road network; and presents parking requirements forecasts developed for the short-term, long-term, and ground transportation parking lots.

4.3.1 Airport Traffic Study

A basic traffic study was conducted as part of the Master Plan. The study assessed quality of service at critical intersections within on and surrounding the Airport for the years 2012, 2022, and 2032. The following five intersections were analyzed:

- Wright Brothers Boulevard SW with Arthur Collins Parkway SW
- Wright Brothers Boulevard SW with 18th Street SW
- Arthur Collins Parkway SW with 18th Street SW
- Wright Brothers Boulevard SW with Interstate 380 Southbound Ramp Terminal
- Wright Brothers Boulevard SW with Interstate 380 Northbound Ramp Terminal

The traffic analysis was conducted at the planning level, where the main goal was to determine the overall quality of service and improvements needed. No data collection was conducted for the study; instead, annual average daily traffic for Wright Brothers Boulevard and Interstate 380 were obtained from the Iowa Department of Transportation (DOT) website; turning movements modeled were based on anecdotal observations; and passenger terminal trip generation rates were calculated based on the peak hour enplanement forecasts as well as rates published by the Institute of Transportation Engineers (ITE). The analysis outputs are not intended to be used to provide detailed information for design purposes such as length of turning bay lanes, signal phasing and times, queue lengths, and other design parameters. Rather, the purpose of the study is to determine existing roadway capacity and future improvements that may be required to keep the level of service (LOS) at or above desirable levels.

The primary metric by which transportation professionals assess quality of roadway operations is level of service (LOS). According to the Transportation Research Board's Highway Capacity Manual:

> "LOS is a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. Six LOS are defined for each type of facility that has analysis procedures available. Letters designate each level, from A to F, with LOS A representing the best operating conditions and LOS F the worst. Each level of service represents a range of operating conditions and the driver's perception of those conditions. Safety is not included in the measures that establish service levels. Most design or planning efforts typically use service flow rates of LOS C or D to ensure an acceptable operating service for facility users."

The Iowa DOT typically designates LOS D as the minimum acceptable LOS for intersection traffic operations. Intersections falling below this thresholds would require some type of corrective action (such as added turn lanes, signalization, or added travel lanes) to return to acceptable operations. The findings for each of the five intersections are summarized below:

- <u>Wright Brothers Boulevard SW with Arthur Collins Parkway SW</u>**:** This intersection is projected to operate at LOS equal to A until 2032, and therefore no improvements were recommended.
- <u>Wright Brothers Boulevard SW with 18th Street SW</u>: This intersection is projected to operate under acceptable LOS until 2022. In 2032, the northbound left turn movement is projected to operate at an unacceptable LOS of D in the AM peak hours. LOS D, although not desirable, may be acceptable, since that LOS is projected to occur for only one movement at one time during the day. Further analysis under traffic signal control was conducted, which found that signalized operations would improve the projected LOS to C or better for all intersection movements; however, this would also require geometric improvements such as additional right turn bay lanes on the eastbound, westbound, and southbound approaches. Another problem with this intersection is the short distance between this intersection and the one to its immediate south, which may cause northbound queues to extend beyond the upstream intersection. Installing traffic signals alone will not resolve this problem, which will require the reconstruction of the intersection of Arthur Collins Parkway SW with 18th Street SW further to the south. Before making such a recommendation, a more detailed design level analysis must be conducted.

- Arthur Collins Parkway SW with 18th Street SW: This intersection will operate under acceptable LOS until the year 2022. In 2032, the eastbound left turn movement will operate at an unacceptable LOS of E and F in the AM and PM peak hours, respectively. Further analysis under all-way stop control (AWSC) or traffic signal operation was conducted, which found that changing this intersection to AWSC would not improve the projected level of service and is not recommended. However, the analysis also found that signalized operations would improve the projected LOS to B or better for all intersection movements without any geometric improvements to the intersection.
- Wright Brothers Boulevard SW with Interstate 380 Southbound Ramp Terminal**:** This intersection is projected to operate at an acceptable LOS until 2032, and therefore no improvements were recommended.
- Wright Brothers Boulevard SW with Interstate 380 Northbound Ramp Terminal: This intersection is projected to operate at an acceptable LOS until 2022. In the year 2032, several movements are projected to operate at undesirable LOS in the AM peak hour. Further analysis under improved geometry was conducted, which found that an improved geometry with the addition of turning lanes at the westbound approach would result in improved operations.

The traffic study also analyzed the existing curbside length for passenger pick-up and drop-off, which is currently 535 feet. The study estimates that 60 percent of all vehicles use the curbside for pick-up and drop off. Approximately 35 percent are private vehicles or rental cars that do not utilize the parking area, 15 percent are private vehicles or rental cars that use the curbside for pick-up and drop-off and then park, and 10 percent are taxicabs or other commercial vehicles that do not utilize the parking area. Based on peak hour forecasts developed for the traffic study, the curbside pick-up/drop-off area will operate at level of service A from now until 2032, which indicates free-flow traffic. The maximum required length for the curbside under these forecasts will be 418 feet, which is below the current length. However, given the current issues with taxis, shuttles, and rental cars, space allocations for these airport users appears to be insufficient.

4.3.2 Vehicle Circulation Problem Areas

Based on discussion with Airport administration, information collected during the Inventory portion of the Master Plan, and the results of the traffic study discussed in the previous section, seven primary functional issues were identified with vehicle circulation in the terminal area. The general locations of these functional issues are depicted in **Figure 4.1**, and descriptions of the problems are summarized below.

- Problem Area #1 - *Short-term and long-term parking entrances are too close to one another and to the terminal curbside.*

  The entrances from Arthur Collins Parkway to the long-term and short-term parking lots are abrupt and confusing. This problem results from insufficient decision-making distance and directional information overload south of the intersection of Arthur Collins Parkway and Lippisch Place. The Airport would like to evaluate improvements for making these parking entrances more intuitive and generally safer.

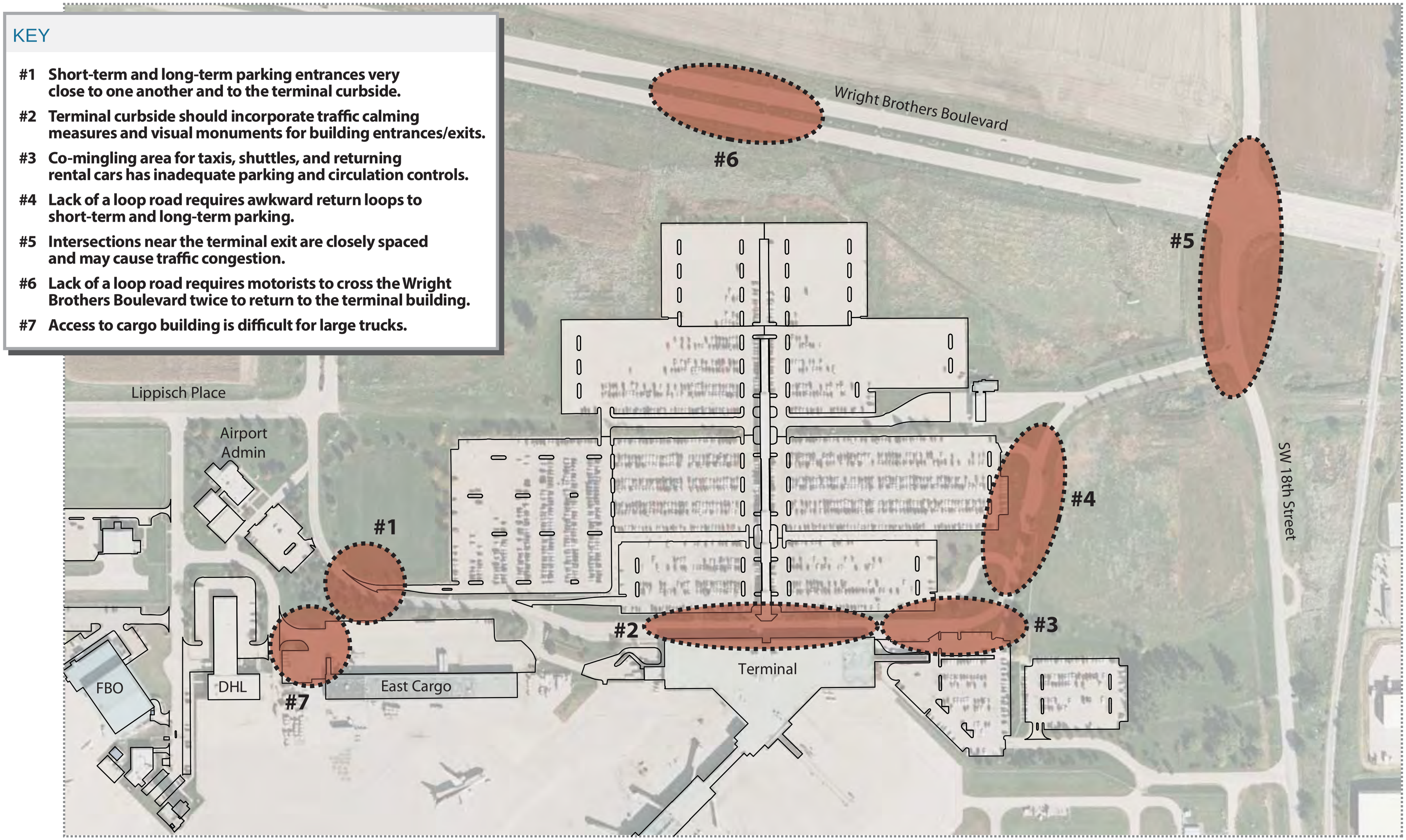


Figure 4.1
Vehicle Circulation Problems Areas

Source: Airport Layout Plan and Mead & Hunt, Inc.

THE EASTERN IOWA AIRPORT CEDAR RAPIDS

- Problem Area #2 - *Lack of traffic calming measures and visual monuments for terminal building entrances/exits at the curbside could contribute to higher-than-desired vehicle speeds and missed opportunities for passenger pick-up/drop-off.*
  Issues with the terminal curbside identified during the Inventory phase of the Master Plan included shallow curbside loading/unloading areas with lack of definition from through lanes; lack of well-marked crosswalks from the terminal building to the short-term/long-term parking lots; need for updated blast resistive barricades; and general deficiencies in wayfinding and clarity at entrances to various functional areas. These deficiencies are discussed in greater detail in Section 4.4.

- Problem Area #3 - *Curbside area for taxis, shuttles, and returning rental cars has inadequate parking and circulation controls.*
  In general, the ground transportation lot is inadequate in size, function, and layout, and access to this area from Arthur Collins Parkway is cumbersome and confusing. Poor signage of parking stalls and lack of policing of the area have resulted in the misuse of the shuttle and taxi waiting areas by passengers and rental car customers returning vehicles. Access to the ground transportation lots from two directions, poor signage, and patterns of vehicle circulation contribute to congestion for passenger drop-off at the curbside and make access to the lot from Arthur Collins Parkway challenging. Airport administration would like to limit rental car returns to 18th Street Southwest only and eliminate the use of Arthur Collins Parkway for returns. This new layout will more adequately separate general vehicle circulation from taxi/shuttle parking near the baggage claim area. However, the Airport would like further review of its current proposed layout for validation or suggestions. One issue the Airport has indicated is that the current proposed layout does not work well for taxi/shuttle staging because the cars face east and taxi patrons will naturally want to select the last taxi in the chute.

- Problem Area #4 - *Lack of a loop road requires awkwardly placed turnaround loops to the parking lots.*
  The Airport does not have a true “loop road”. As a result, access turnarounds were constructed east of the parking lots once vehicles pass the terminal curbside, which are not intuitively placed for passengers unfamiliar with the Airport. Removing the parking access turnarounds by providing a loop road may also allow for future minor expansions to the parking lots.

- Problem Area #5 - *Intersections near the terminal exit are closely spaced and may cause traffic congestion.*
  The traffic study conducted for the Master Plan found that traffic signal operations at the intersection of Wright Brothers Boulevard SW/18th Street SW may improve future level of service. Geometric improvements will be required for signalized operations, such as additional right turn bay lanes on the eastbound, westbound, and southbound approaches. The study also found that the short distance between the intersections of Arthur Collins Parkway/18th Street SW and Wright Brothers Boulevard SW/18th Street SW (300 feet) may cause northbound queues on 18th Street SW at Wright Brothers Boulevard to extend southward beyond the Arthur Collins Parkway exit. The study indicates that it will be necessary to reconstruct the intersection of Arthur Collins Parkway/18th Street SW further south to resolve this problem; however, more detailed analysis at the design level must be conducted prior to making a final recommendation.

- <u>Problem Area #6 - *Motorists wishing to return to the terminal once exiting Arthur Collins Parkway must make three left turns across traffic.*</u>
  At many airports like CID, motorists can proceed directly from the parking lots to the terminal curbside without leaving the terminal area. This desired travel path is not provided on the current road network, which requires vehicles to turn left onto 18th Street SW, then left onto Wright Brothers Boulevard and then left again onto Arthur Collins Parkway in order to access the curbside. The Airport would like to assess possible road configurations that would allow vehicles to return to the terminal without turning back out onto Wright Brothers Boulevard.

- <u>Problem Area #7 - *Access to cargo building is difficult for large trucks.*</u>
  The cargo building located directly west of the terminal building is difficult for large cargo trucks to access. Currently, trucks have to make several 90 degree turns in rapid succession to get around the Airport administration building or they must access the cargo building via a driveway near the terminal curbside, which is generally undesirable.

4.3.3 Parking Requirements Forecasts

As of 2011, the Airport had 438 total public parking stalls in the short-term lots, 2,627 total public parking stalls in the long-term lots, and 323 total parking stalls in the ground transportation lot (rental cars, taxis, shuttles, and employees). Parking stalls are summarized by specific lot in **Table 4-1**.

Table 4-1: Existing Parking Stall Supply (2011)

Parking Lot	Regular	Handicapped	Total
Short-Term Parking Lots			
Lot A	237	5	242
Lot B	190	6	196
Total Short-Term	**427**	**11**	**438**
Long-Term Parking Lots			
Lot C	464	14	478
Lot D	496	8	504
Lot E	500	0	500
Lot F	334	0	334
Lot G	387	0	387
Lot H	212	0	212
Lot I	212	0	212
Total Long-Term	**2,605**	**22**	**2,627**
Ground Transportation Lots			
Rental Car Lot	180	0	180
Employee Lot	140	0	140
Taxis	9	0	9
Shuttles	12	0	12
Total Ground Transportation Lot	**323**	**0**	**323**

Source: Airport Layout Plan

Vehicle parking projections were developed for these three general functional areas for the 20-year planning period. For short-term and long-term parking, enplanement data and overnight parking inventories were used to create a model that depicts the change in parking demand over time on the average day of the typical peak month (March). For the ground transportation parking lot, parking requirements are assumed to increase at the same rate as the preferred enplanement forecast.

4.3.3.1. Short-Term and Long-Term Parking Requirements

To project future parking demand, it is necessary to determine the rate at which enplaning passengers currently generate parking demand. Assuming basic transit mode choice remain constant in the future, the ratio of spaces to enplanements can be applied to future enplanement projections to arrive at an estimate of parking demand throughout the 20-year planning period.

Airport parking projections typically use the “average day peak month” (ADPM) as the design day to parking requirements. This assumes that parking should be planned to comfortably accommodate vehicle parking generated on a typical day of the busiest month. It is generally recommended that this approach be used to efficiently maximize parking supply for the vast majority of the year. The projections of short-term and long-term parking demand produced for this Master Plan Update used the ADPM as the design day. However, “peak day peak month” (PDPM) parking demand was also examined.

The ADPM parking projections also incorporate a parking space “supply cushion” beyond the actual forecasted demand to allow the parking system to operate with maximum efficiency. These empty spaces are needed to ensure good circulation, to protect against the inevitable loss of spaces due to incorrectly parked vehicles or occasional construction projects, and to absorb excess vehicles on the few “spike” days of the year that are busier than the design day. This also ensures that on most days customers will be able to find parking without searching for the last few spaces in the parking system, which is a particular issue for passengers anxious to board their flights.

Overnight short-term/long-term occupancy rates and average daily enplanements were compared to identify average day and peak day long-term parking requirements per enplanement for each month between 2009 and 2011. These ratios are shown in **Table 4-2**.

Table 4-2: Average Day and Peak Day Parking Lot Occupancy per Enplanement								
	Average Day Occupancy per Enplanement				Peak Day Occupancy per Enplanement			
Month	2009	2010	2011	Average	2009	2010	2011	Average
January	0.95	0.98	0.97	0.97	1.22	1.24	1.23	1.23
February	1.09	1.15	1.20	1.14	1.33	1.44	1.45	1.41
March	1.14	1.17	1.22	1.18	1.51	1.50	1.64	1.55
April	1.02	1.04	1.08	1.05	1.18	1.22	1.36	1.25
May	0.87	0.95	0.95	0.92	1.02	1.15	1.15	1.11
June	0.81	0.88	0.93	0.88	0.95	1.05	1.21	1.07
July	0.89	0.84	0.89	0.87	1.08	1.03	1.06	1.05
August	0.92	0.88	0.95	0.92	1.15	1.04	1.23	1.14
September	0.92	0.99	1.00	0.97	1.18	1.23	1.28	1.23
October	0.94	1.00	1.03	0.99	1.11	1.17	1.20	1.16
November	0.94	0.98	1.04	0.99	1.26	1.35	1.37	1.33
December	0.95	0.91	0.95	0.94	1.48	1.42	1.45	1.45

Sources: Airport Records; Mead & Hunt, Inc.

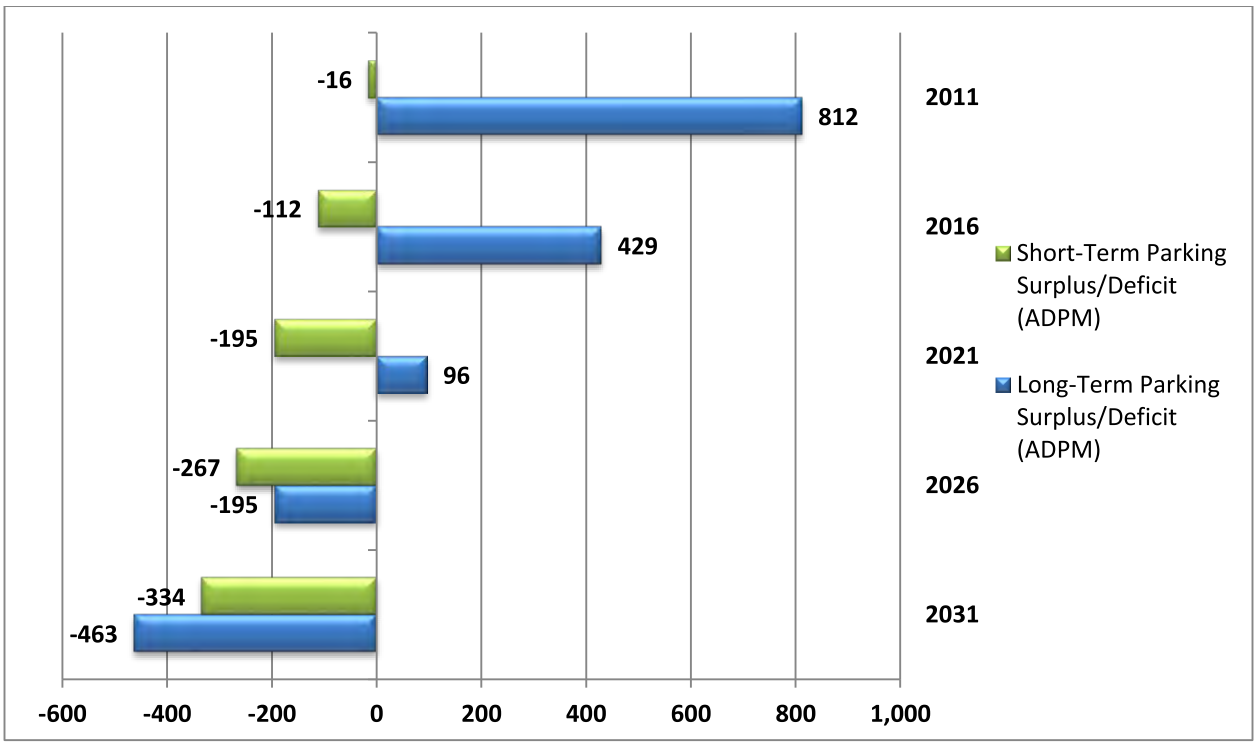
As discussed in Chapter 2, peak monthly and daily enplanement activity typically occurs during the month of March as the Airport. As shown in Table 4-2, the month of March also corresponds to the peak ratio of parking occupancy to enplanements, indicating that a larger proportion of enplaning passengers are parked at the Airport for an extended period of time during March. As a result, parking projections were developed based on these historical ratios of parking occupancy to enplanement activity for the month of March.

For the purpose of this analysis, combined overnight occupancy in the short-term and long-term parking lots on the ADPM is assumed to represent long-term parking requirements. Short-term parking requirements were then determined assuming that short-term parking stalls should represent 20 percent of the overall parking supply, which a general industry-standard rule of thumb. **Table 4-3** and **Chart 4-1** below shows the results of the ADPM parking requirements projection method. This analysis is based on parking inventory as of 2011 and does not take into account any planned or proposed changes to parking supply.

Table 4-3: Average Day Peak Month (ADPM) Long-Term/Short Term Parking Requirement Forecast						
		2011	**2016**	**2021**	**2026**	**2031**
Peak Month Enplanements		40,516	49,062	56,482	62,982	68,961
Average Day Enplanements		1,307	1,583	1,822	2,032	2,225
Average Day Long-Term Occupancy (1.25 per enpl)		1,634	1,978	2,278	2,540	2,781
Supply Cushion (10% of total)	+	182	220	253	282	309
Average Day Required Long-Term Parking		1,815	2,198	2,531	2,822	3,090
Long-Term Parking Inventory (2011)		2,627	2,627	2,627	2,627	2,627
Long-Term Parking Surplus(+) or Deficit (-)		**+812**	**+429**	**+96**	**-195**	**-463**
Average Day Required Short-Term Parking (20%)		454	550	633	705	772
Short-Term Parking Inventory (2011)		438	438	438	438	438
Short-Term Parking Surplus (+) or Deficit (-)		**-16**	**-112**	**-195**	**-267**	**-334**
Average Day Total Required Parking		**2,269**	**2,748**	**3,163**	**3,527**	**3,862**

Source: Mead & Hunt, Inc.

Chart 4-1: Long-Term/Short-Term Parking Surplus (+) or Deficit (-), Average Day Peak Month



As shown in Table 4-3 and Chart 4-1, the ADPM model indicates that the long-term parking lot currently has a surplus of 812 spaces, and that a long-term parking deficit will occur between 2021 and 2026 based on the preferred enplanement forecast. The ADPM model shows that there is currently a 16-space deficit in the short-term parking lot, which is projected to increase to a 334-space deficit in 2031.

Table 4-4 below shows the results of the PDPM parking requirements projection method, which does not include the 10 percent supply cushion.

Table 4-4: Peak Day Peak Month (PDPM) Long-Term/Short-Term Parking Requirements Forecast					
	2011	**2016**	**2021**	**2026**	**2031**
Peak Day Required Long-Term Parking (1.55 per enpl)	2,532	3,066	3,530	3,936	4,310
Long-Term Parking Inventory (2011)	2,627	2,627	2,627	2,627	2,627
Long-Term Parking Surplus(+) or Deficit (-)	**+95**	**-439**	**-903**	**-1,309**	**-1,683**
Peak Day Required Short-Term Parking (20%)	633	767	883	984	1,078
Short-Term Parking Inventory (2011)	438	438	438	438	438
Short-Term Parking Surplus (+) or Deficit (-)	**-195**	**-329**	**-445**	**-546**	**-640**
Peak Month Peak Day Total Required Parking	**3,165**	**3,833**	**4,413**	**4,920**	**5,388**

The PDPM model indicates that the long-term parking lot is appropriately sized for current peak day enplanement activity, but that any increase in peak day enplanements over existing levels will result in long-term deficiencies. The PDPM model also indicates that the short-term parking lot currently has a 195-space peak day deficit, which is projected to increase to a 640-space deficit in 2031.

Based on balanced consideration of the results of the ADPM and PDPM models shown above, this Master Plan Update recommends that the Airport consider approximately 1,000 additional long-term/short-term parking spaces within the next 10 years to accommodate projected enplanement activity. Alternatives for achieving this recommended parking space increase are analyzed in Chapter 6.

Expanding the existing parking lot is the clearest and most cost-effective strategy for accommodating future automobile parking needs. However, parking facilities near the terminal building provide the most convenient parking spaces for passengers. According to Transportation Research Board (TRB) Airports Cooperative Research Program (ACRP) Report 25, *Airport Passenger Terminal Planning and Design*, a typical maximum walk distance from aircraft gate to car door without mechanical assistance is between 900 and 1,000 feet. As shown in **Figure 4.2**, distances from the terminal entrance to the outer edges of the existing parking lot are in this general range. These distances do not include the additional distance from the aircraft gate to the terminal entrance. Because the existing walk distances from the aircraft gates to the outer edges of the parking lot exceed typical maximum walk distances, it was concluded that expansion of the existing parking lot without shuttle service is not a practical alternative for accommodating future growth in parking demand. Rather, future growth is recommended via either a parking structure near the terminal or shuttle service to a remote parking lot. Both of these alternatives are evaluated in Chapter 6.

4.3.3.2. Ground Transportation Parking Lot Requirements

Discussion with Airport staff indicates that the existing ground transportation lots located east of the terminal building near baggage claim were at capacity as of 2011. For the purpose of this Master Plan Update, future requirements for ground transportation lot parking are expected to increase at the same rate as annual passenger enplanements. The forecast for these requirements are summarized in **Table 4-5** and **Chart 4-2**.

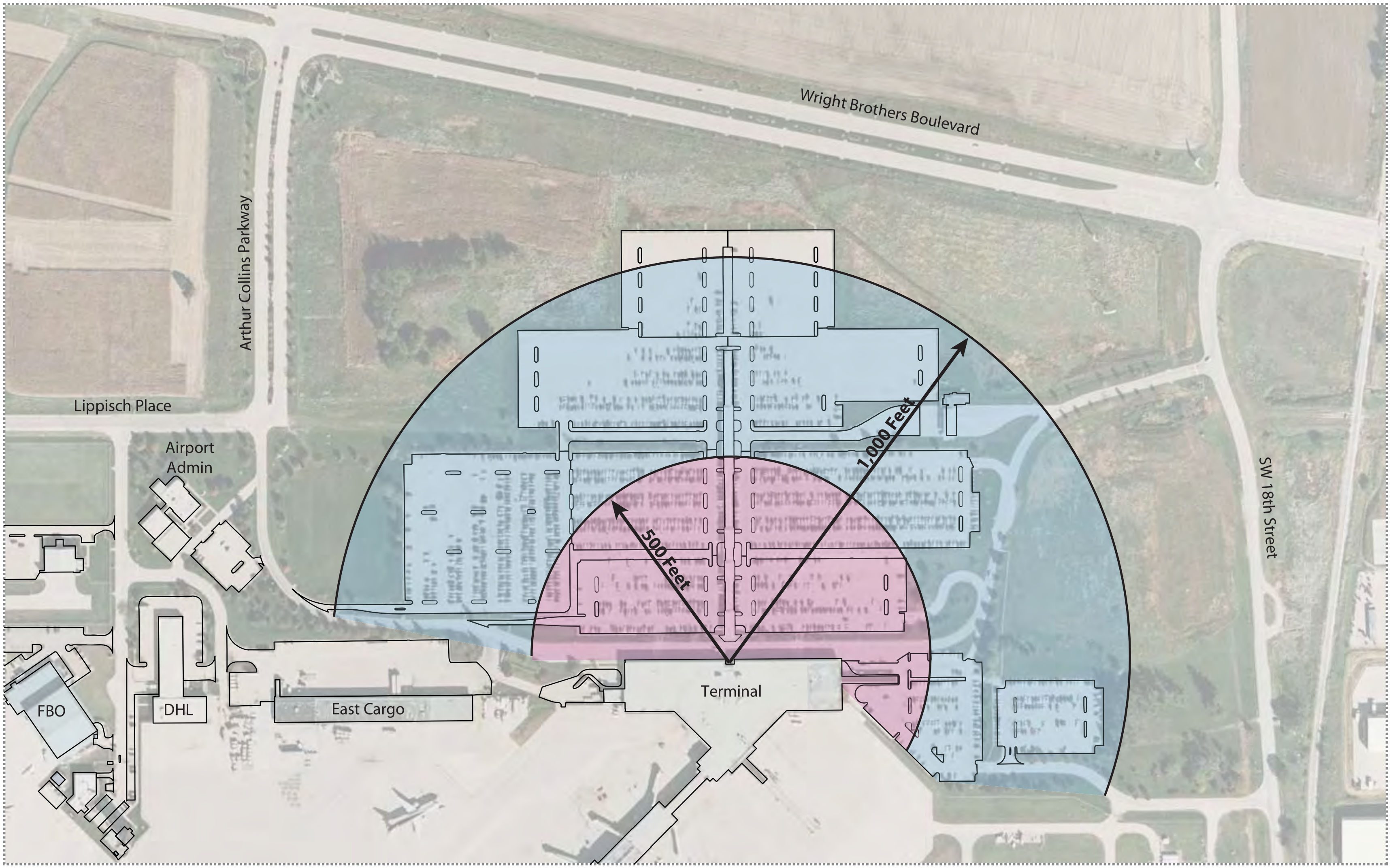


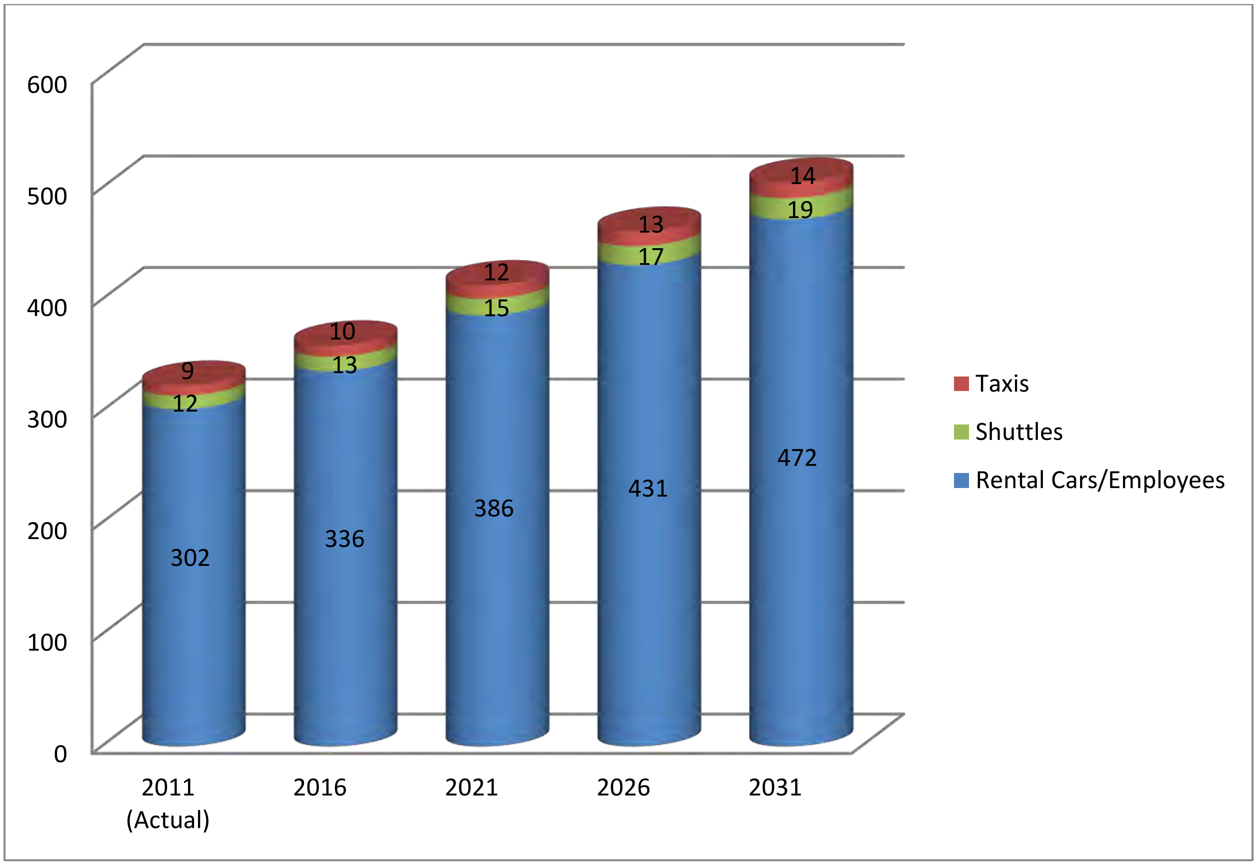
Figure 4.2
Parking Lot Walking Distances

Source: Airport Layout Plan and Mead & Hunt, Inc.

Table 4-5: Ground Transportation Parking Lot Requirements Forecast					
Parking Stall Type	**2011 (Actual)**	**2016**	**2021**	**2026**	**2031**
Rental Cars/Airport Employees	302	336	386	431	472
Taxis	9	10	12	13	14
Shuttles	12	13	15	17	19
Total Required Stalls	**323**	**359**	**413**	**461**	**505**

Source: Mead & Hunt, Inc.

Chart 4-2: Ground Transportation Parking Lot Requirements Forecast



In 2013, the ground transportation lots were expanded and reconfigured. The expansion includes 227 regular rental car stalls, 8 premium rental car stalls, and 189 employee parking stalls. This resulted in 424 parking stalls rental cars and employees, which will meet requirements through at least 2026. Taxi and shuttle space allocations associated with the 2013 ground transportation lot project had not yet been determined as of publication of this Master Plan. However it is expected that the final configuration for the ground transportation lot will also provide adequate taxi/shuttle spaces through at least 2026 as well.

The Eastern Iowa Airport passenger terminal curbside
Photograph by Mead & Hunt, Inc. (2011)

4.4 Passenger Terminal Curbside

The curbside of the airport terminal is the pedestrian area between the front of the terminal building and the drop-off/pick-up lanes of the access roadway. This is an active part of the passenger terminal where people and baggage transfer between vehicles and the terminal building. It includes the sidewalks, pedestrian crosswalks or grade-separated crossings, and sometimes curbside check-in or valet parking.

At CID, a canopy extends from the terminal building, covering the sidewalk and a portion of the drop-off/pick-up lane; however, users report that the canopy does not provide true shelter in inclement weather when there is wind associated with it. At 15 feet wide, the existing sidewalk is as wide as planning standards recommend, but the building entry vestibules protrude from the building and occupy 10 feet of the sidewalk width. A gable-roofed metal clad canopy extends from the terminal building to the east where the ground transportation lot is located, and west of the building is a loading dock area and a small, little-used parking lot. Visual cues that are intended to provide information to users are difficult to read from a moving vehicle: pedestrian crosswalks are poorly marked, entries to the building are difficult to distinguish from the building front due to the continuous nature of the canopy, and signage is hidden by shadows and too small to be effective.

While the pick-up/drop-off curb has sufficient length, the curbside area would benefit from a project that would address some of the parts of the terminal curbside that are underperforming. A renovation or addition to the front canopy that would improve shelter during inclement windy weather and extend shelter beyond half of the drop-off/pick-up lane would enhance the passenger experience.

The depth of the sidewalk should be increased near building entries so that pedestrians have sufficient space before encountering vehicle traffic. Improving wayfinding in this area would be also beneficial. This would include raising crosswalks above the roadways and using a pattern and contrasting color to make the crosswalks visually distinguishable from the roadway. In addition, it would make building entries and signage clearly visible from a distance, assisting drivers in making decisions on destinations in advance and would reduce traffic confusion in front of the terminal building.

East of the building, a project is currently under way, that will address some of the vehicle circulation and parking shortfalls in the ground transportation area; however, a renovation of the east canopy, extending it to the east would provide additional shelter to pedestrians as they make their way from the baggage claim area of the terminal building to the car rental lot or wait for taxis and airport shuttles.

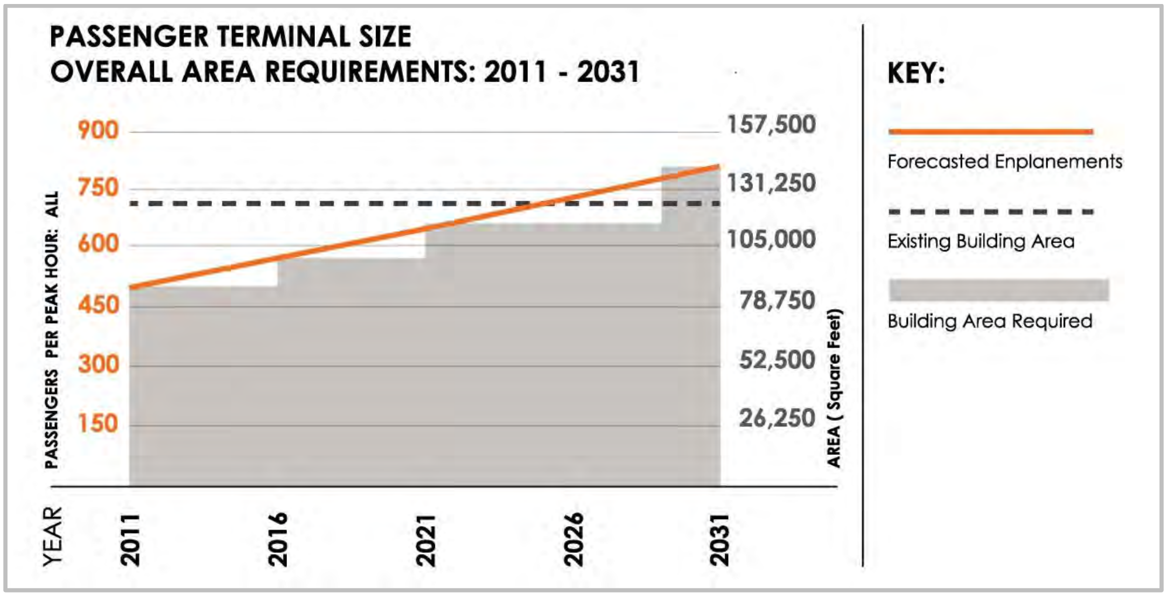
4.5 Overall Passenger Terminal Space

The existing passenger terminal was built in 1986. It received significant renovations in 1997 and 2009, and an addition/remodel was completed in 2012, which addressed deficiencies in the ticketing, bag screening and baggage make-up areas. Although the terminal is in good physical condition, several changes have occurred in passenger activity, to the commercial aircraft fleet mix, and security requirements, which have made some areas of the terminal functionally unsuitable.

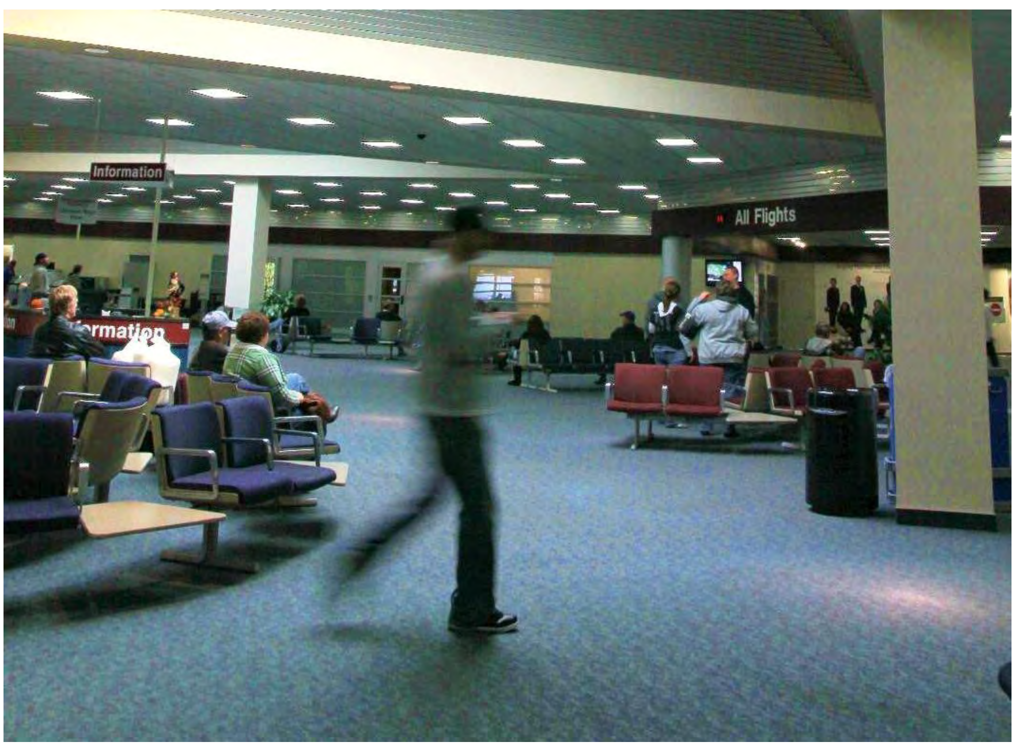
The passenger terminal facility is a one-story terminal connected to a two-story pier-style concourse by a second-story pedestrian bridge. Non-secure ticketing, baggage claim, and public amenities such as car rental offices, restaurants, vending and a retail store are located in the terminal building. The basement level, below a portion of the terminal building, houses mechanical and storage areas and a corridor that connects the restaurant with the loading dock area, and the first floor of the concourse houses airline operations and building support areas. The security checkpoint is located in the “throat” of the terminal building where it connects to the concourses. Concourse C has six gates with boarding bridges and dedicated holdrooms located on the second floor, while Concourse B, located on the ground floor, has seven gates with a single, shared holdroom. Refer to Section 1.8 for additional information that describes the existing passenger terminal.

Overall, the existing terminal is approximately 127,000 square feet (SF) in area. A preliminary analysis of the terminal building’s overall size can determine if it is adequate for the number of passengers it services today. A useful tool for estimating the overall passenger terminal size is a guideline that is provided in FAA Advisory Circular 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*, which estimates 150 square feet of terminal space for each peak hour enplaned passenger for airports with more than 250,000 annual enplanements. Applying this guideline to growth projections from Chapter 2, **Chart 4-3** shows the existing amount of overall area in the passenger terminal to be greater than the amount needed to meet current facility requirements and sufficient to meet requirements to the end of the planning period.

Chart 4-3: Overall Passenger Terminal Building Area Requirements Forecast



In order to perform efficiently, a successful passenger terminal building will keep the factors of size, functional space arrangement, and quality as it relates to the passenger experience, in balance. All of these factors should be considered throughout the planning process. While the overall amount of existing space at CID is greater than planning design standards recommend, a more detailed analysis is needed to determine if each of the functional areas within the passenger terminal is of the appropriate size.



The Eastern Iowa Airport passenger terminal non-secure public waiting area and circulation
Photograph by Mead & Hunt, Inc. (2011)

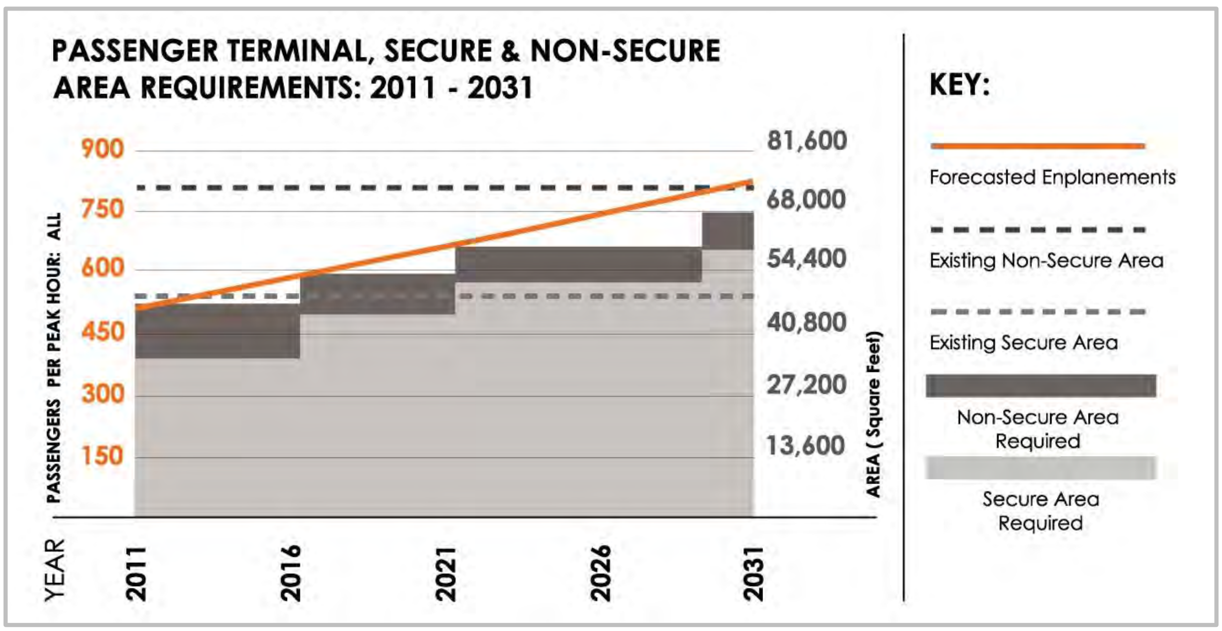
4.6 Public Space

In order to identify the facility requirements for each functional area and assess the ability of the area to meet the facility requirements, the space within the terminal building is divided into areas by type of use. The first division of space is between non-usable and usable areas. Parts of the building that are considered non-usable are those components that are required for the building to function but are not occupiable, such as building structure, mechanical chases and building utilities. The non-usable parts of the terminal are addressed at the end of this section. Usable areas are defined as those areas that comprise the occupiable parts of the facility, and they include the areas of the building that are accessible to the public as well as those areas that are only accessible to airport workers.

Additionally, an airport is divided by a security line into non-secure and secure areas. Non-secure areas are the parts of the building for which security clearance or screening is not needed, while the secure areas are those parts of the building that are accessible only to ticketed passengers who have been screened at a checkpoint and to authorized personnel with security clearance. **Figure 4-3** shows the non-secure and secure areas as well as the Security Identification Display Area (SIDA) line that separates them.

As shown in **Chart 4-4** below, the non-secure area is larger than planning standards recommend through the end of the planning period, while the secure area is nearing capacity and is already constrained during large flights. However, a more detailed analysis was conducted to determine if each of the functional areas within the non-secure and secure areas is of the appropriate size.

Chart 4-4: Non-Secure and Secure Total Area Requirements Forecast



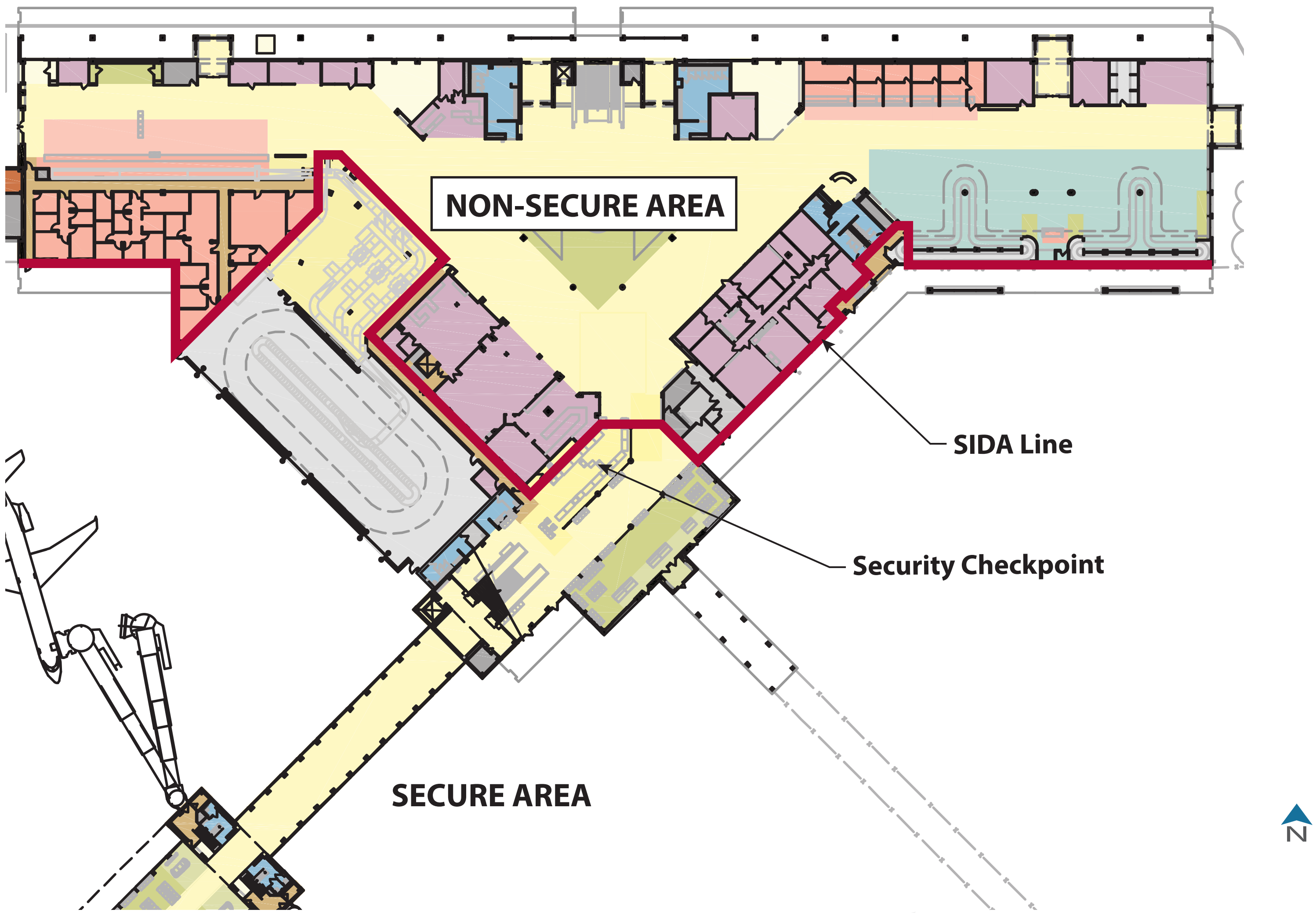


Figure 4.3
Passenger Terminal Functional Areas

Source: Airport Records and Mead & Hunt, Inc.

The Eastern Iowa Airport passenger terminal public circulation
Photograph by Mead & Hunt, Inc. (2011)

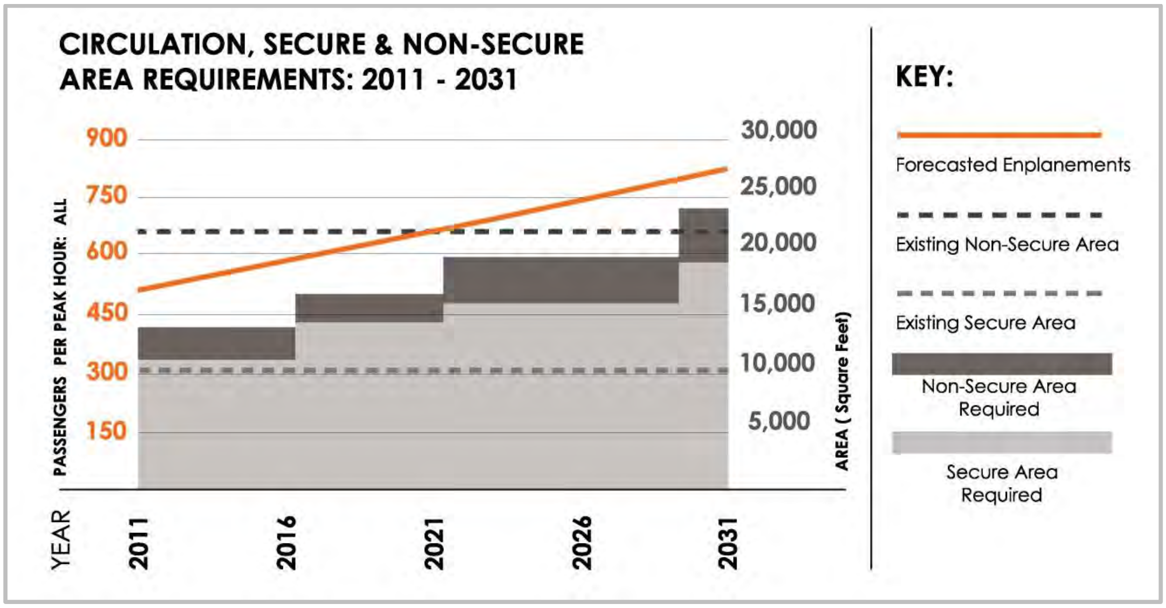
4.6.1 Circulation Space

Circulation areas are those that allow pedestrian access to each area within the building and tie the functional elements of the building together. They include building entries, hallways, corridors and vertical circulation elements, such as escalators or stairs. This section primarily addresses horizontal circulation at CID, while the following section will specifically address vertical circulation. Horizontal circulation areas in an airport terminal often have ancillary uses and share activities in adjacent spaces such as queuing, seating, drinking fountains, vending machines, and Flight Information Display System (FIDS) monitors; all of which can impede the flow of pedestrians through the area and reduce the effective width of the circulation area. For this reason, the width of main circulation areas should be generous enough to support both these ancillary activities and their primary function of allowing people to move through the building.

The need for general circulation space in an airport terminal building will be affected by the overall layout of the facility and by the flow of passengers through the various processing points. Advisory Circular 150/5360-9, *Planning and Design of Airport Terminal Building Facilities at Non-Hub Locations*, notes that 20 to 30 percent of overall terminal area is typically used for circulation. This high ratio for circulation space is common for airports since all of the corridors must be designed to accommodate times of peak usage even though high volume traffic is sporadic. Using lower ratios will compromise the efficiency of building egress and constrain circulation when the terminal is busy.

Similar to the amount of overall terminal space, the amount of existing circulation space at CID is greater than average for passenger terminals experiencing a similar amount of passenger activity. This is partially due to the layout of the passenger terminal with a large central lobby, a pedestrian bridge connecting concourses to the terminal, and two locations in which public vertical circulation occurs. The amount of existing circulation space in the non-secure part of the terminal is in excess for current usage, but will be required to accommodate the circulation needs near the end of the planning period, while amount of circulation space in the secure part of the terminal is already constrained.

Chart 4-5: Non-Secure and Secure Circulation Area Requirements Forecast



Despite the current surplus in circulation space in the non-secure area, this part of the terminal would benefit today from a reorganization of circulation space that would improve circulation flow in the vicinities of the ticketing and checkpoint queues where circulation is currently constrained during times of peak use. Near the ticketing queue, the adjacent circulation area is approximately 14 feet wide, which is narrower than the 20 foot minimum recommended amount. This condition can cause congestion in the ticketing lobby at peak times and restrict access to the western public entrances of the terminal. At the checkpoint, the queue interferes with access to the bar/restaurant. In the secure area, concourse circulation space is already constrained when large flights are scheduled, and will become more constrained by 2021. The ACRP guidelines recommend a 30 foot wide circulation corridor for double-loaded concourse areas, such as those in concourse C, where the effective width is as little as 10 feet wide. Providing more circulation in the secure area cannot be accomplished simply through a reorganization of holdroom/concession/circulation space in the secure area since additional space is also required in many of these critical areas.

The Eastern Iowa Airport passenger terminal lobby with unclear wayfinding
Photograph by Mead & Hunt, Inc. (2011)

A directional signage program, or *wayfinding*, is an important component of circulation, assisting the passenger in arriving at their intended destination within the terminal complex. Airport signage needs to be clear and intuitive since passengers are often in a hurry. A clear wayfinding program in the terminal will rely not only on signage, but also on visual cues, such as changes in flooring materials, changes in ceiling height, or the use of portals at destinations to orient the passenger. At CID, passengers are often perplexed when locating some of the major parts of the terminal, such as the baggage claim area, the curbside area when exiting the checkpoint, or the parking lots after leaving the baggage claim area. The wayfinding confusion at CID is not limited to the interior of the terminal building; it also occurs at the terminal connection to vehicle parking and at the curbside where the uninterrupted, linear nature of the canopy and the understated signage do not clearly indicate destinations for a moving vehicle. A reduction of this wayfinding confusion will improve movement through the circulation areas of the building, and the overall passenger experience at the Airport.

During user interviews, both passengers and airport employees commented that the state of finishes and lighting in the public circulation part of the terminal building were not of the quality expected for a small hub airport. While the finishes in the concourse are relatively new, the finishes in the non-secure area of the terminal building are older. As a result, they are showing signs of age and wear even though they have been well-maintained. The existing lighting in the same area also affects the passenger experience negatively. Comments expressed during user interviews describe the lighting as dim and repetitive. The quality of the passenger experience will be improved once upgrades of finishes and lighting have been completed.

The Eastern Iowa Airport passenger terminal stairway, escalator and elevator to C concourse
Photograph by Mead & Hunt, Inc. (2011)

4.6.2 Vertical Circulation

Vertical circulation in buildings allows occupants to access floors above or below the floor they currently occupy. For vertical circulation to be effective, destinations and routes as well as choices for moving vertically need to be clearly delineated. Vertical circulation at CID takes place in two locations: between the public parking lot and the first floor of the terminal and between the first floor of the concourse and the second floor. Each of these vertical circulation nodes includes a pair of escalators bracketing a staircase and a single elevator. Escalators are an efficient means of continuously conveying occupants from one floor to another, but they require a large amount of horizontal space, and their safety is a concern. A disadvantage of elevators is that they can only convey a limited number of people at a time, although new elevator design is reducing the amount of elevator cycle time. Advantages of using elevators for vertical movement include using a small amount of floor area and safety. Elevators are often the best choice for moving between floors for the elderly, people traveling with children, and people who have impaired movement.

The escalators at CID are the most commonly used choice for vertical movement; however, both law enforcement officers and airport employees commented on the high frequency of injuries associated with the escalators during user interviews. This is partially due to the relative obscurity and limited options associated with the elevators. Each vertical circulation node has only a single elevator, and while signage has been provided to assist occupants in locating the elevators, signs are not visually apparent. Future projects should be in conjunction with improvements to the vertical circulation system. The capacity and number of options available for vertical circulation should be increased, including elevators, escalators and passenger-friendly staircases. Increasing the availability and visual prominence of elevators will reduce the number of injuries associated with escalators.

4.6.3 Restrooms

In public buildings, restroom sizes are usually dependent on the number of plumbing fixtures (toilets and urinals) that are dictated by national and local building codes. Similar to other high-use public facilities such as stadiums and amusement parks, airports are now providing “companion care” restrooms in order to assist passengers traveling with medical needs or young children. Airport restrooms differ from restrooms in other public facilities as they are typically larger than code requires to accommodate carry-on bags and facilitate peak traffic occurrences. In addition, there is an increase in the number of plumbing fixtures due to the high intensity usage that occurs directly before and after flights. For example, when a flight arrives there is a concentrated usage of the first restrooms passengers encounter when they disembark. For ease of use, it is important to locate restrooms in close proximity to high-use areas such as holdrooms, the baggage claim area and the security checkpoint, and to provide restrooms in both secure and non-secure areas of the building.

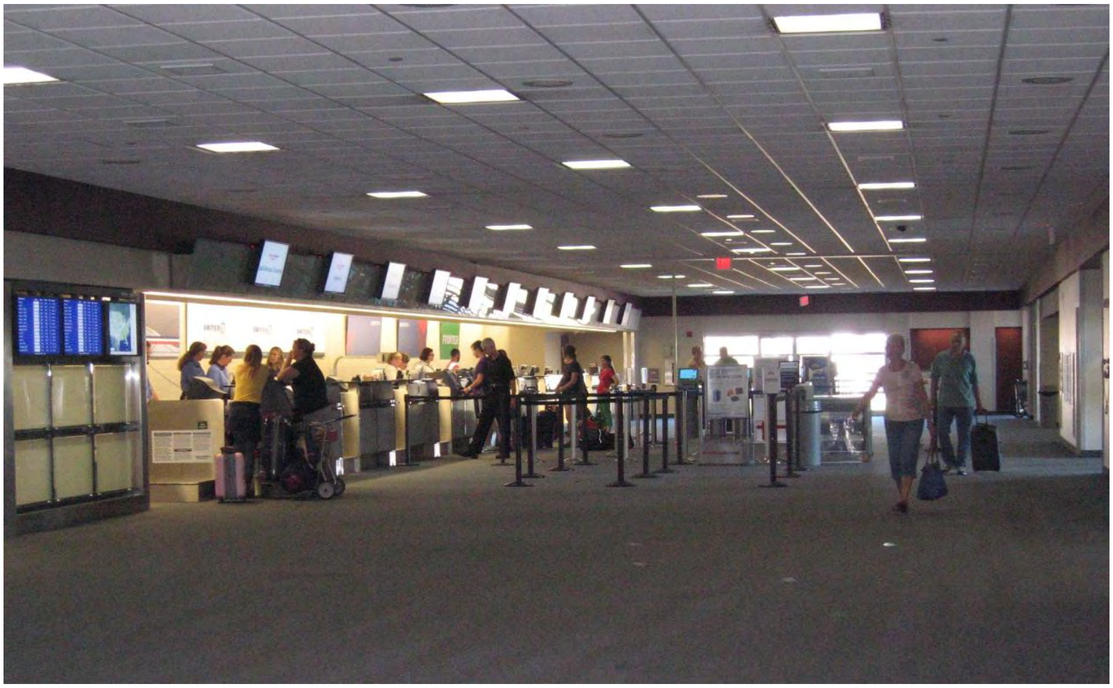
Currently, a restroom construction project is nearing completion in the non-secure portion of the passenger terminal, which adds restroom facilities and a companion care restroom near the baggage claim area. Once this project is complete, the locations and number of men’s and women’s restrooms in the terminal will be sufficient until 2021; however, the Airport should consider the addition of two to three companion care restrooms on the secure side of the checkpoint and one companion care restroom in the non-secure area. By the end of the planning period, both the secure and non-secure restrooms will be nearing capacity in respect to number of fixtures, and circulation area within these restrooms will be constrained. The existing non-secure public restrooms on either side of the central public entry would benefit from a renovation as fixtures, stalls and finishes in the existing non-secure public restrooms are showing signs of wear. The finishes of the existing secure restrooms, located near the security checkpoint, are also showing signs of wear and would also benefit from a renovation.

4.6.4 Airline Ticketing Lobby

Both the FAA Advisory Circular and industry standards emphasize the importance of providing adequate space in locations where passenger queuing occurs such as in front of the car rental counters, airline ticketing counters and the security checkpoint. Space for passenger queuing should be provided to prevent passenger queues from interfering with other terminal functions such as public seating and circulation. Recommendations for the amounts of queuing space in front of the car rental counters at CID are concurrent with FAA Advisory Circulars; however, changes in security checkpoint operations and ticketing technology since the Advisory Circular was written have led to changes in passenger queuing patterns in the ticket lobby.

In the past, the ticket lobby and queuing area were typically the most significant part of the public terminal building, encountering a high volume of passenger use. Today, the increasing use of online ticketing and automated ticketing kiosks is reducing the intensity of use in the ticket lobby and shifting the area of most significance to the security checkpoint and baggage claim. The changing role of the ticket lobby has been considered in generating the recommendations for facility requirements regarding the ticket lobby, ticket counter and airline spaces at CID. For future planning at the ticketing queue, kiosk and online (internet and mobile) check-in figures will approach much higher usage levels (25-35 percent) for kiosks, but will level off as online check-in takes hold (35 percent and up) due to greater use of mobile phones.

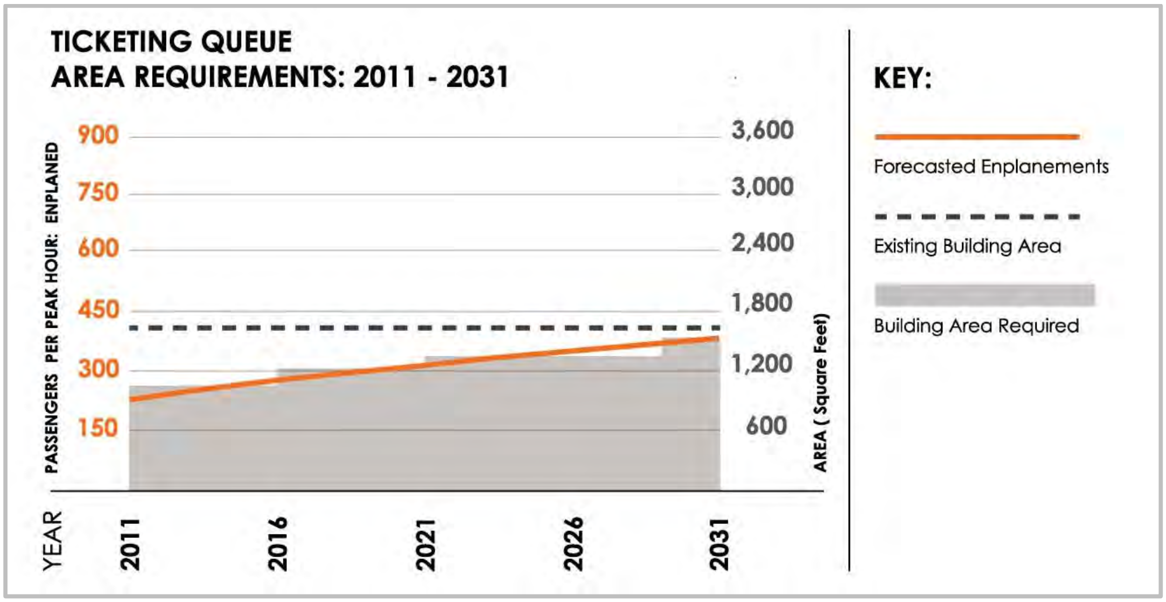
Self-checked baggage will become the norm for passengers who have either checked-in online or use a kiosk to check in for their flights and bags.



The Eastern Iowa Airport passenger terminal ticketing queue area
Photograph by Mead & Hunt, Inc. (2012)

Current operations and future trends continue to show kiosks for checking-in without bags in front of counters, while those requiring bag check-in to be embedded in the ticket counters. Airlines have been actively teaching passengers how to use their kiosks in an attempt to facilitate the process for their next flights. When self-checked baggage becomes available at CID, these counter positions may be modified first by retrofitting the counters to add printers so the agents can observe and assist passengers with the process. Counters that serve active baggage take-away belts will eventually be separate from the ticketing kiosks. Once this becomes an industry standard, potentially within the next five years, the need for queuing space in front of the ticket counters will be reduced. **Chart 4-6** shows the ticketing queue area requirements forecast.

Chart 4-6: Ticketing Queue Area Requirements Forecast



It is expected that the need for queuing space at the ticketing counters will grow with the number of enplaning passengers, though not at the pace seen in the past. The existing ticketing queue space is approximately 1,800 square feet. While this amount is more than currently needed, forecasted enplanement numbers are anticipated to cause crowded conditions in the ticket lobby during peak times by the time forecasted 2021 enplanement levels are reached. The area would benefit from approximately 400 square feet of additional space by the time 2031 enplanements are reached, though this increase is largely dependent on future electronic ticketing technology. A reorganization of space and amenities in the ticketing queue area that would accommodate future functions such as ticketing kiosks and a location for passenger baggage drop is recommended.

4.6.5 Baggage Screening and Handling Systems

The TSA requires that all baggage be screened before it is brought into the baggage make-up area and loaded onto an aircraft. For reasons of efficiency, this screening typically occurs in a single location in the terminal and has led to the widespread use of consolidated baggage handling systems at most airports. Once screened, baggage is conveyed to a baggage make-up area, where airline personnel load the baggage onto carts, which are then brought to the waiting aircraft. Since centralized bag screening was not generally required for airports in the past, FAA Advisory Circulars do not provide size recommendations for baggage screening rooms. Instead, the size for the TSA baggage screening room is based on the expected size of bag screening and conveying equipment.

A new baggage screening room, outbound baggage room and consolidated baggage handling system were constructed in 2012. The baggage screening room and conveyance system were designed for expandability, allowing additional future screening devices as needed. The baggage handling system, from the ticket counters to the baggage screening room, has sufficient capacity to process baggage past the planning horizon. However, once the TSA allows it, the airport should consider the implementation of a passenger baggage drop in the future as part of the checked baggage inspection and conveyance system.

The Eastern Iowa Airport passenger terminal public waiting area
Photograph by Mead & Hunt, Inc. (2011)

4.6.6 Waiting Area

An area for public seating is currently provided on the non-secure side of the checkpoint. The optimal locations for public waiting in an airport terminal are in close proximity to the checkpoint, concessions and bag claim areas. These waiting areas are provided for passengers and associated visitors, including well-wishers and meeters/greeters.

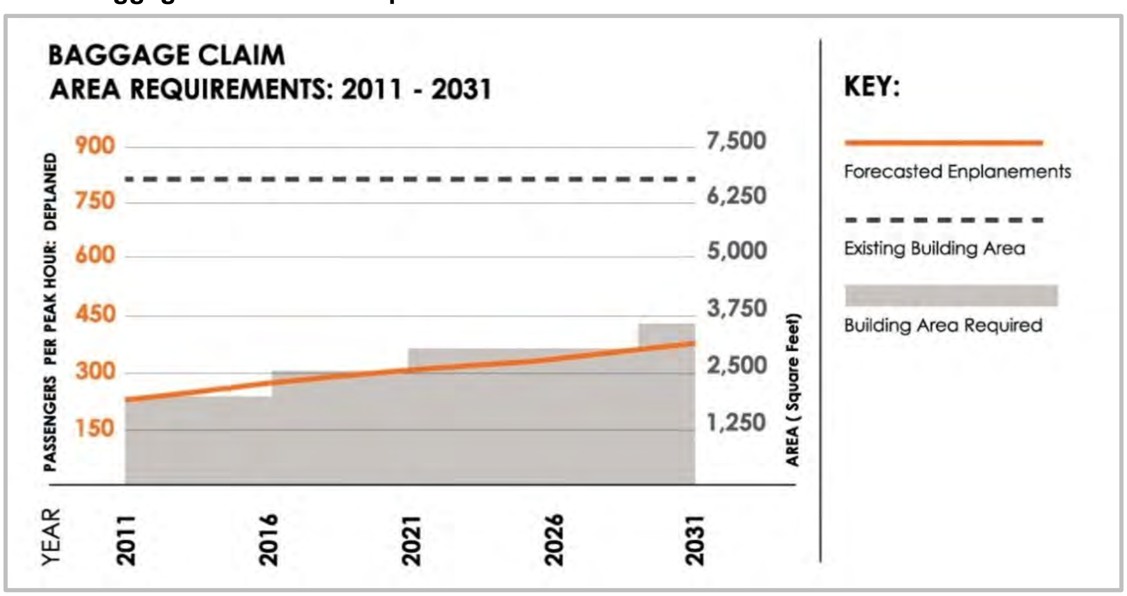
The existing amount of public seating space at the passenger terminal is 3,600 square feet. This includes a large amount of area in the center of the lobby and smaller areas in the baggage claim and ticketing areas. Guidelines in FAA Advisory Circulars recommend approximately 2,000 square feet for current facility requirements and 3,400 square feet for the year 2031 facility requirements. A rearrangement of waiting areas in the non-secure portion of the terminal would be beneficial in providing correctly-sized waiting areas in locations where they are most needed: near the checkpoint exit lane where meeter/greeters wait for arriving passengers, within view of the checkpoint where ticketing passengers monitor the queue, and near the baggage claim area where arriving passengers wait for their baggage.

The Eastern Iowa Airport passenger terminal baggage claim area
Photograph by Mead & Hunt, Inc. (2011)

4.6.7 Baggage Claim

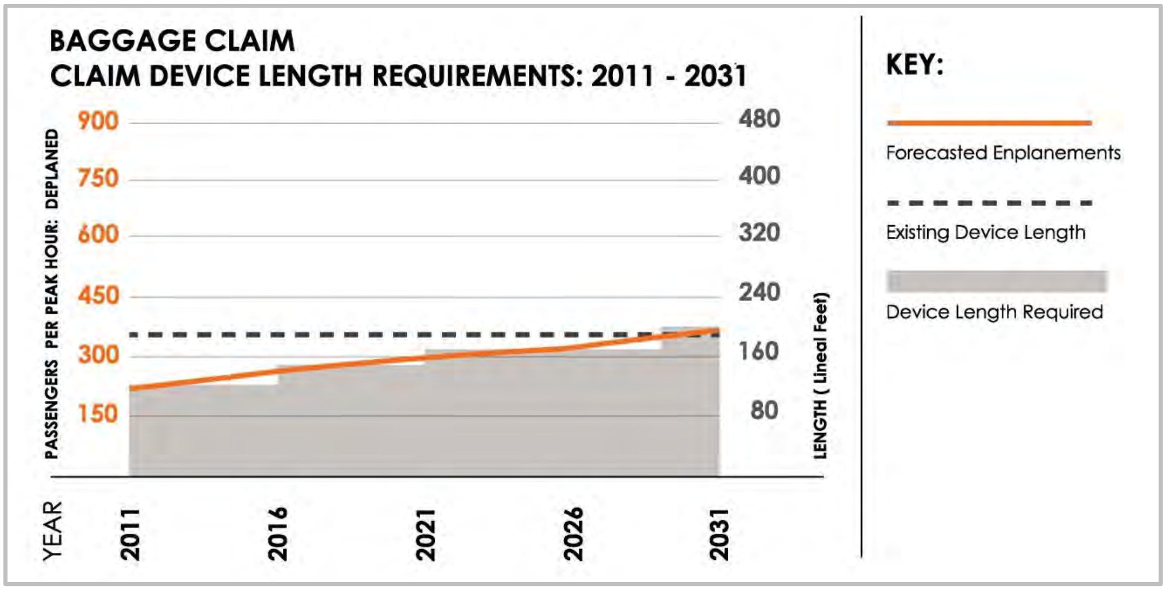
The baggage claim public area provides space for arriving passengers to retrieve their bags from the baggage carousels. This portion of the building also provides space for information kiosks, hotel boards and other related conveniences for passengers arriving on incoming flights. Sufficient space should be provided in this area for meeters/greeters, who will often arrange to meet passengers in the baggage claim area. In an airport of this size, passengers will generally arrive in the bag claim area before their baggage is off-loaded from the aircraft. As a result, it is important for passengers to have access to seating and restrooms in order to pass the wait time comfortably. Another consideration with baggage claim planning is the separation of the claim device from the main circulation corridor. Too often device ends are located adjacent to the corridor and cause congestion by both passengers congregating, and visitors awaiting their parties. A physical separation between the baggage claim area and the adjacent circulation corridor would provide a separation between the baggage claim and alleviate congestion.

Chart 4-7: Baggage Claim Area Requirements Forecast



The current baggage claim area occupies 6,645 square feet and has two flat-plate claim devices, each with 100 lineal feel of public access frontage. ACRP Report 25 recommends a space around the claim device that is approximately 15 feet wide to allow sufficient space for passengers to unload bags from the baggage claim device. While the existing amount of floor area is sufficient for passengers to retrieve their baggage, the seating is limited. Both meeter/greeters and passengers waiting for their baggage would benefit from more seating in this area.

Chart 4-8: Baggage Claim Device Length Requirements Forecast



Baggage claim device length requirements can vary from airport to airport, and are influenced by the types and numbers of baggage checked. While forecasted deplanement numbers are an important factor in determining the length of baggage claim device needed, the demand for additional claim devices will ultimately be driven by the characteristics of peak use of the baggage claim facilities. When peak hour passenger activity increases to the point where it is common for more than two flights to arrive at the same time, additional devices will be beneficial. The existing amount of baggage claim device length at CID is sufficient until the 2021 forecasted deplanement numbers are reached, at which time a third baggage claim device will be required to help alleviate congestion during multiple arrivals. This may involve the replacement of one of the existing claim devices with two smaller ones or the installation of a third device. Flat-plate claim devices such as those used at CID appear to be the norm even though these were recently thought destined to be phased out because of security concerns.

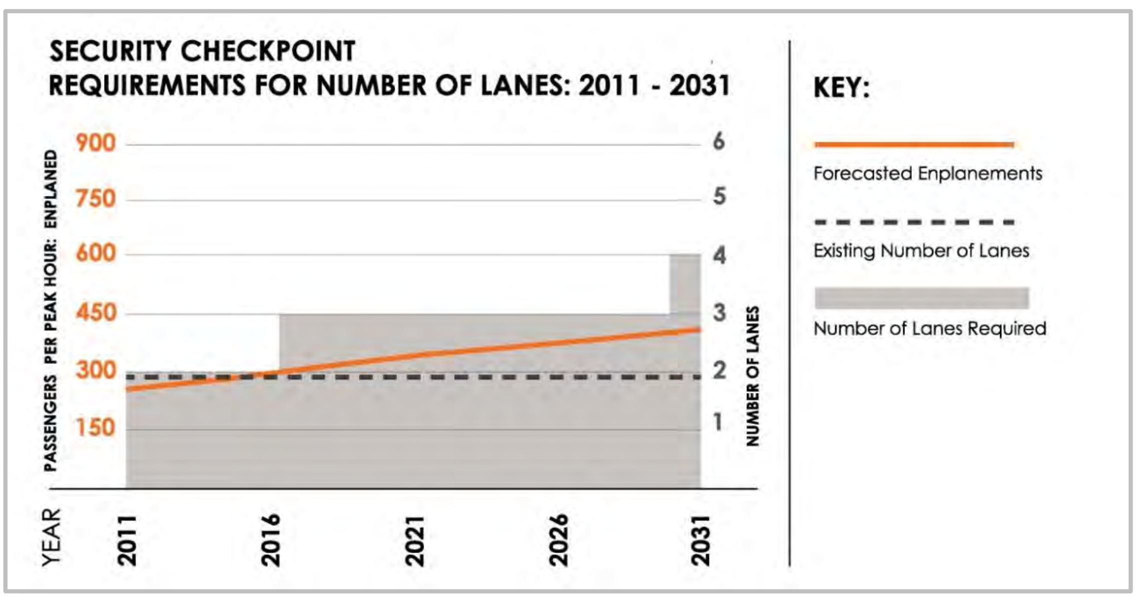
4.6.8 Security Checkpoint

Location and configuration are critical factors in the performance of a security checkpoint, and the efficiency with which it operates often leaves a lasting impression on passengers. The existing checkpoint has two lanes and occupies approximately 1,500 square feet; however, existing space limitations do not allow sufficient space for divesture and composure of personal belongings before and after the checkpoint.

The Eastern Iowa Airport passenger terminal security checkpoint
Photograph by Mead & Hunt, Inc. (2011)

The TSA's Checkpoint Design Guide shows a standard size for a two-lane checkpoint of about 2,500 square feet, though additional space at the divest area prior to screening and at the composure area following screening will assist to make the checkpoint run efficiently. In addition, space is required in the checkpoint area for a private search room and other screening functions. In the future, the installation of new checkpoint screening equipment will require more space and greater mechanical venting capabilities than the existing equipment currently occupies. In order to meet current requirements, a minimum of 2,500 square feet is recommended for a complete two-lane checkpoint, which includes space for divesture, composure, and a private screening room.

Chart 4-9: Security Checkpoint Lane Requirements Forecast



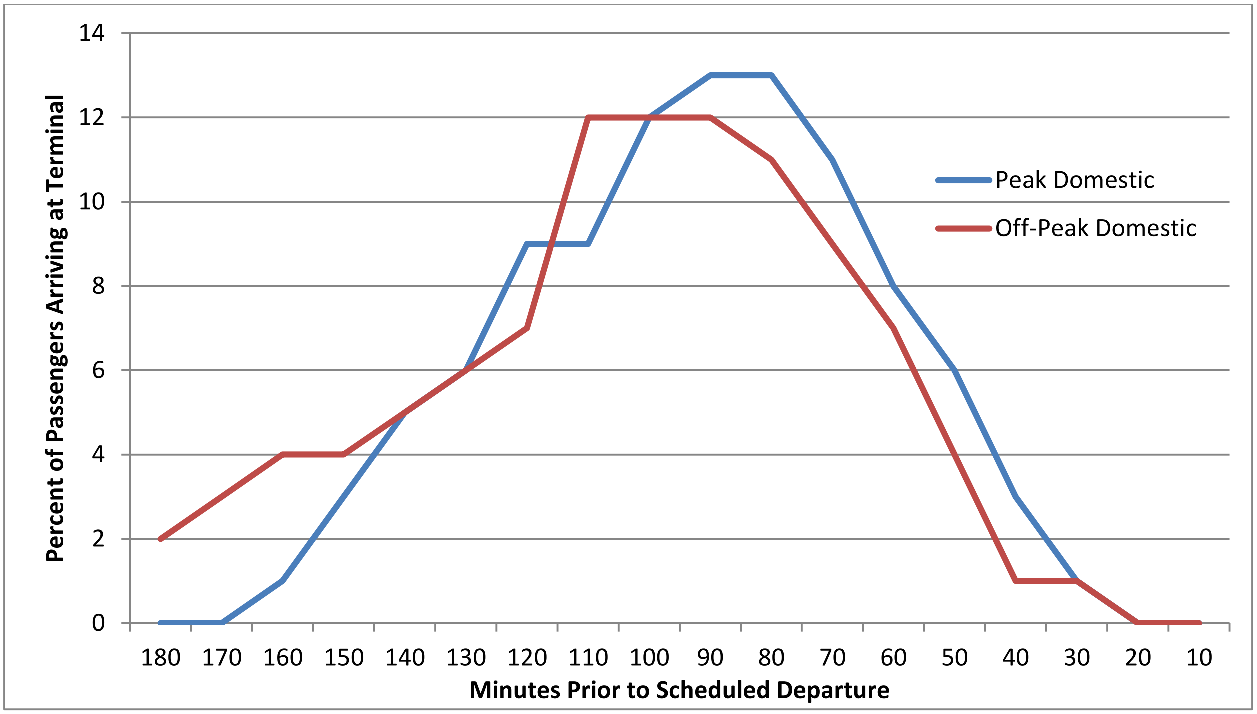
While two lanes are sufficient at current passenger levels, three lanes will be needed to handle forecasted peak passenger numbers beyond the year 2016. Additionally, it is recommended that the layout of the checkpoint area be designed to provide ample space and flexibility as projected year 2031 peak hour passenger numbers indicate that it is likely that a three-lane checkpoint will be nearing its maximum capacity at this time. If enplanements continue to rise beyond the number forecasted for the year 2031 and the technology of that time has not increased throughput rates at checkpoints, or if new screening technology requires additional space, a fourth lane will need to be considered.

The Eastern Iowa Airport passenger terminal security checkpoint queue
Photograph by Mead & Hunt, Inc. (2011)

4.6.9 Security Checkpoint Queue and Exit Lane Areas

While the existing area for the security checkpoint queue is sufficient for the amount of current usage, checkpoint queuing currently occurs in an open area that was originally intended for circulation and utilizes few stanchions to organize the queue. Since this queuing area is not currently well-defined, the form and location of checkpoint queue varies from peak time to peak time. As a result, queuing often occurs in a manner that effectively blocks the entries of the bar and restaurant. The distribution of passenger arrivals at the checkpoint will affect the amount of queuing space necessary. This typical passenger distribution tends to follow a standard bell-curve in both peak and off-peak periods as illustrated in **Chart 4-10**. A peak time interval will typically be balanced to either side although often skewed to drop-off at a higher rate than the intervals prior to the peak.

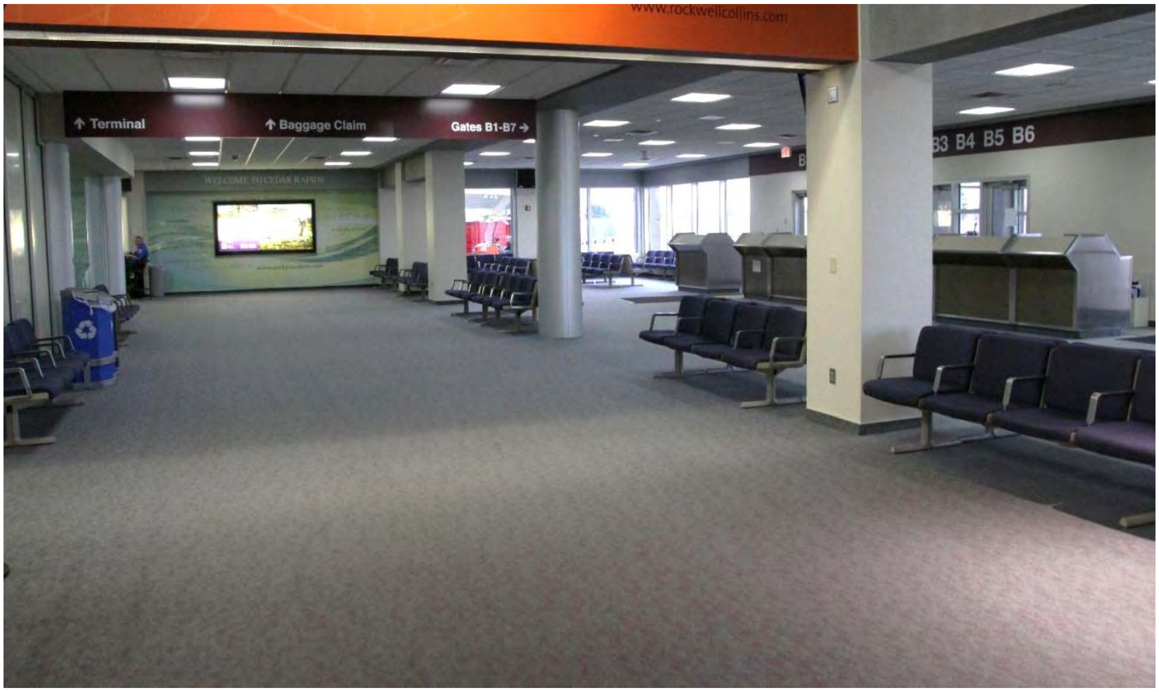
Chart 4-10: Example Passenger Arrivals Curves/Earliness Distributions



Source: TSA Planning Guidelines and Design Standards v4.1

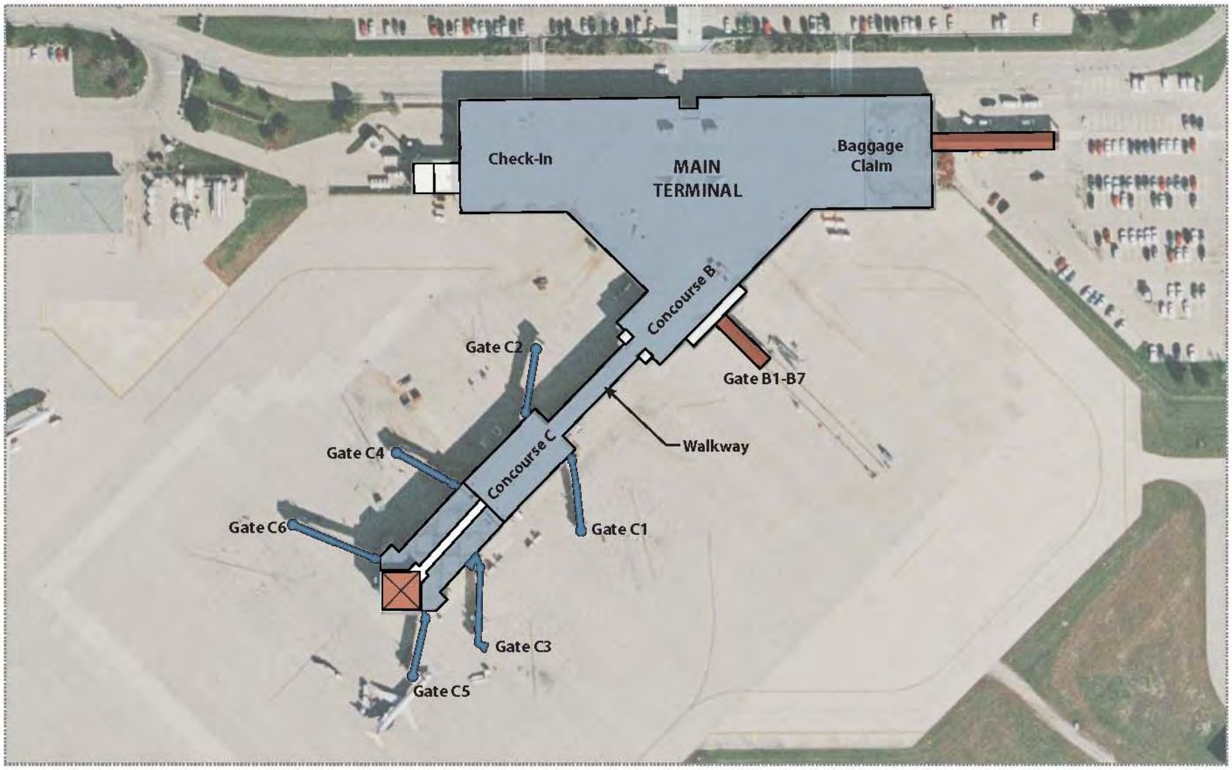
The Advisory Circular on airport terminal design provides a guideline for sizing the checkpoint queue area; however, the TSA Checkpoint Design Guide recommends a minimum of 300 square feet per checkpoint lane. These are the recommendations that are used today. In addition, the consultant's experience has shown that a minimum of 100 square feet for each checkpoint lane is required for the preparation/instruction zone for passenger staging and travel document display prior to their entry into the checkpoint. The recommended amount of floor area for queuing space at the CID security checkpoint for the year 2016 is approximately 1,250 square feet, and to meet the projected year 2031 space requirements approximately 1,650 square feet of queuing area will be needed. In a future remodel, adequate space for queuing should be provided in a manner that does not allow the queue to interfere with public circulation or access to concessions. In addition, the adjacent area for circulation should be generous enough to allow cross traffic and to absorb overflow queuing at times of peak usage.

The type and size of secure area concessions should be weighed against the amount of discretionary time passengers will have prior to their departure. The amount of time needed for TSA screening should be taken into account for its effect on concessions. The screening process can have a major impact on secure concessions since the checkpoint screening process may use discretionary time that passengers had planned for visiting concessions.



The Eastern Iowa Airport passenger terminal security exit lane and B holdroom
Photograph by Mead & Hunt, Inc. (2011)

In an airport of this size, it is recommended that the exit lane is co-located with the checkpoint in order to allow a visual connection for the TSA staff between the checkpoint and the exit lane. Exit lane operations should be coordinated with the TSA in the future remodel of the checkpoint since several breach-deterrence solutions are under consideration at this time. For planning purposes, a minimum of 120 square feet of area per checkpoint lane should be allowed for the exit lane.



The Eastern Iowa Airport general passenger terminal building layout
Graphic by Mead & Hunt, Inc. (2012)

4.6.10 Gates and Passenger Holdrooms

Airport gates are designated doors in the terminal concourses that passengers pass through in order to load and unload from aircraft parked on the apron. Holdrooms, or departure bars, are the principal areas of the secure portion of the passenger terminal. These are the locations where the passengers wait for flights after they have cleared the security checkpoint, but before boarding aircraft. It is important that the holdroom is sized correctly in order to accommodate all passengers during times of peak use or during irregular operations. Ancillary functions that support the holdroom include airline agent podiums for ticket collection and last minute baggage check-in as well as passenger deplaning and enplaning aisles. Space is also provided here for ancillary activities that support waiting passengers including circulation, concessions, and amenities such as restrooms and business bars.

CID currently has a total of 13 gates. Seven of these are the ground boarding Concourse B gates, though no more than two of the ground boarding gates are typically used at a time. The Concourse B gates share a single holdroom of approximately 1,700 square feet in area and can comfortably hold approximately 100 passengers at one time. There is an additional 840 square feet for the gate podiums and passenger deplaning aisles in Concourse B. These gates are used for smaller, propeller-driven aircraft or for large aircraft when irregular operations disrupt scheduled activity at the C concourse. The exit from the B holdroom to the apron has a canopy and fenced area for the protection and control of passengers as they move onto the apron while ground-boarding an aircraft. The shared B holdroom is located near the security checkpoint exit lane. When these gates are used for aircraft with more than 100 seats, waiting passengers often overflow into the adjacent circulation area, interrupting the path to the exit lane.

The Eastern Iowa Airport gate C5 with passenger boarding bridge
Photograph by Mead & Hunt, Inc. (2011)

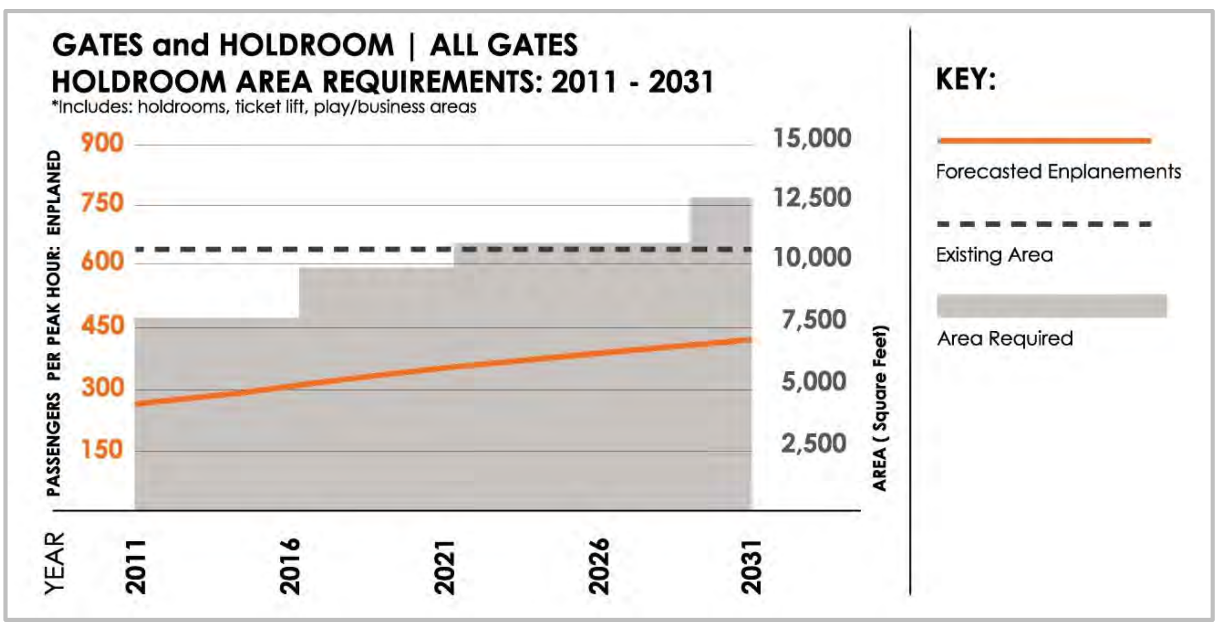
There are currently six gates located in the two-story C concourse, each with its own passenger boarding bridge. These gates and holdrooms are used by larger aircraft than those at the B gates. The total amount of holdroom space in C concourse is 5,653 square feet with an additional 2,302 square feet for gate podiums and passenger deplaning aisles. The combined total of C concourse holdroom areas provide space for approximately 325 passengers; 80 percent of which are seated while 20 percent are roaming or standing. The individual holdrooms are undersized for today's aircraft. Consequently, passengers spill out into the adjacent circulation corridor, impeding access to the remainder of the holdrooms, amenities and concessions in the C concourse.

The Eastern Iowa Airport passenger terminal C concourse holdroom and circulation
Photograph by Mead & Hunt, Inc. (2011)

Gate and holdroom requirements are influenced by the types and number of aircraft that require access to gates at a time. Growth in holdroom area requirements can occur as a result of using larger aircraft for existing flights or as a result of adding more flights to the schedule. One item missing from holdroom formulas in recent years is a circulation factor within the holdroom, accounting for carry-on baggage and circulation both at the ends of rows of chairs and surrounding clustered seating. In the past, a circulation factor of 1.2 was used to yield 18 square feet when applied to the 15 square foot per passenger airline industry standard for holdroom calculations. The IATA standard recommends 15 square feet without a circulation factor and 18 square feet including circulation. Also, a standard for passengers standing with luggage from J. Fruin, author of *Pedestrian Planning and Design,* is 13 square feet. This does not necessarily include circulation space between passengers although it does become a default value as a consequence in a congested holdroom. Thirteen square feet per standing passenger should be a minimum area for planning, and 15 should be if a circulation factor is not taken into account. The 15 and 18 square feet can be combined by calculating them as a weighted average. Fifteen square feet at 20 percent of the population, plus 18 square feet at 80 percent of the population is 17.4 square feet per departing passenger.

An analysis of the existing amount of overall holdroom space in both B and C concourses, summarized in in **Chart 4-11**, indicates that the holdrooms will be nearing capacity by the year 2021. However, an analysis of the C concourse only shows that these holdrooms will near capacity as soon as 2016. In March of 2011, peak hour passenger enplanements occurred when all six C gates were occupied by departing aircraft. A gate capacity analysis was prepared to provide information on improving performance at the C gates and holdrooms and to determine the role of ground boarding in the future**.**

Chart 4-11: Holdroom Area Requirements Forecast



As a component of this Master Plan Update, current airline gate configuration was examined in terms of the ability of both the airside and interior terminal facilities and spaces to meet current and projected aviation demand. For the purpose of this analysis, gates in Concourse B are considered to be secondary, and used primarily for overflow airline traffic. The most recently available schedule for CID (February 2013) does not show any scheduled commercial operations arriving at or departing from any gates in Concourse B. In order to project current and future gate demand, only Concourse C was evaluated. Concourse C gates are utilized by the airlines on a preferential use basis. **Table 4-6** presents preferential use arrangements for each of the six gates.

Table 4-6: Concourse C Gate Usage

Gate	Preferential Use	Age of Jet Bridge	If Available, Also Used By:	Notes
C1	Delta Airlines	26 years	United, Allegiant, Frontier	Can accommodate two aircraft for RONs
C2	American Eagle	27 years	None	Proximity of outbound baggage makes maneuvering difficult
C3	Delta Airlines	11 years	United, Allegiant, Frontier	Bridge has limited mobility, which complicates “power outs”
C4	American Eagle	27 years	None	
C5	United Airlines	27 years	Delta, Allegiant, Frontier	
C6	United Airlines	27 years	Delta, Allegiant, Frontier	Can accommodate two aircraft for RONs

Source: The Eastern Iowa Airport

During the mid-1990s, pilots taxied aircraft into the parking positions under their own power and then were pushed back out of the parking position by tug equipment when departing the gates. The push back operation would position the aircraft on an apron or taxilane area where the pilot could safely power up its engines and proceed under its own power. As of 2013, aircraft now “power out” of the parking positions by moving forward slightly under their own power and then turning to exit the gate position. This type of operation requires more space on the apron and limits the number of aircraft that can use the gates at any given time. As a result, overflow aircraft must use the ground boarding area at Concourse B during peak periods. In addition, “power out” operations introduce the potential for significant jet blast on surrounding areas and equipment. The Airport would like to return to “push back” operations in order to maximize use of the jet bridges before pursuing any concourse expansion.

Passenger-related peaking characteristics and forecasts are described in Chapter 2, which identify “design hour” flows of passengers and aircraft. This approach provides sufficient facility capacity for most days of the year, but recognizes that facilities should be neither underbuilt nor overbuilt. Aircraft gate capacity is best analyzed using a design day flight schedule (DDFS), the peak hour of which is the “design hour”. For most airports, an average day of the peak month is used to develop a DDFS. The design hour is not the absolute peak level activity, nor is it equal to the number of people occupying the terminal at a given time; it is simply a level of activity that has traditionally been used to size terminal facilities. A DDFS was not developed for this Master Plan because detailed airside simulation modeling was not conducted. Two alternate approaches that provide an estimate of future gate demand are the average passengers per gate method and the departures per gate method.

Peak hour passenger enplanements coincide with peak hour commercial aircraft departures. On a typical Monday in March 2011, there were 248 passenger enplanements aboard six commercial departures during the peak hour. Peak hour enplanements at CID are anticipated to increase from 248 in 2011 to 419 in 2031. Annual passenger load factor is projected to increase from 72 percent in 2011 to 80 percent in 2031, and the average number of seats per departing flight is projected to increase from 55 to 72 in that same timeframe. This is primarily due to domestic airlines' tendency toward operating larger aircraft that conduct fewer departures.

The average passengers per gate approach uses the current ratio of annual passengers per gate, adjusted for expected changes in airline fleet mix and load factors. **Table 4-7** presents a gate requirements forecast using this approach and the forecasts presented in Chapter 2. This method assumes that the pattern of commercial service at the Airport will remain relatively stable over time. Based on the enplaned passengers per gate approach, Concourse C will require one additional gate within the next 10 years.

Table 4-7: Commercial Aircraft Gate Requirements – Average Passengers Per Gate Method

Year	Annual Enplanements	Annual Scheduled Departures	Number of Gates	Enplaned Pax/Gate	Enplaned Pax/Dep
Historical					
2008	499,269	13,295	**6**	83,211.5	37.6
2009	474,155	12,920	**6**	79,025.8	36.7
2010	461,402	10,774	**6**	76,900.3	42.8
2011	439,025	11,085	**6**	73,170.8	39.6
Forecast					
2016	520,016	10,383	**6**	92,529.1	50.1
2021	598,658	11,417	**7**	96,874.9	52.4
2026	667,556	12,191	**7**	101,165.6	54.8
2031	730,925	12,690	**7**	106,413.2	57.6

The departures per gate approach uses the current ratio of daily departures per gate adjusted for expected changes in airline fleet mix and schedules. This method is better to use when commercial service patterns are expected to change such that additional departures are expected during the design hour. In order to determine the number of required gates, the number of peak hour departing seats was calculated by dividing peak hour enplanements by passenger load factor. For example, Chapter 2 determines peak hour enplanements in 2016 as 300 with a passenger load factor of 76 percent. This translates into 395 departing seats during the peak hour.

In March of 2011, peak hour passenger enplanements occurred when all six Concourse C gates were occupied by departing aircraft. Since this analysis is focused solely on Concourse C gate demand, it is assumed that the Airport boarding gates are at capacity in terms of departing aircraft when peak passenger enplanements occur. Projections of the average number seats per departing flight from

Chapter 2 are applied to projections of peak hour departing seats to determine the number of peak hour commercial departures, which indicates the number of required gates at the Airport (see **Table 4-8**). Based on the departures per gate approach, Concourse C currently requires one additional gate and will require eight total gates within the 20-year planning period.

Table 4-8: Commercial Aircraft Gate Requirements – Departures per Gate Method

Year	Peak Hour Enplanements	Passenger Load Factor	Peak Hour Departing Seats	Available Seats per Flight	Peak Hour Departures	Gates Required
2011	248	72%	345	55.1	6.3	**7**
2016	300	76%	395	65.9	6.0	**7**
2021	343	77%	446	68.1	6.6	**7**
2026	382	78%	490	70.2	7.0	**8**
2031	419	80%	524	72.0	7.3	**8**

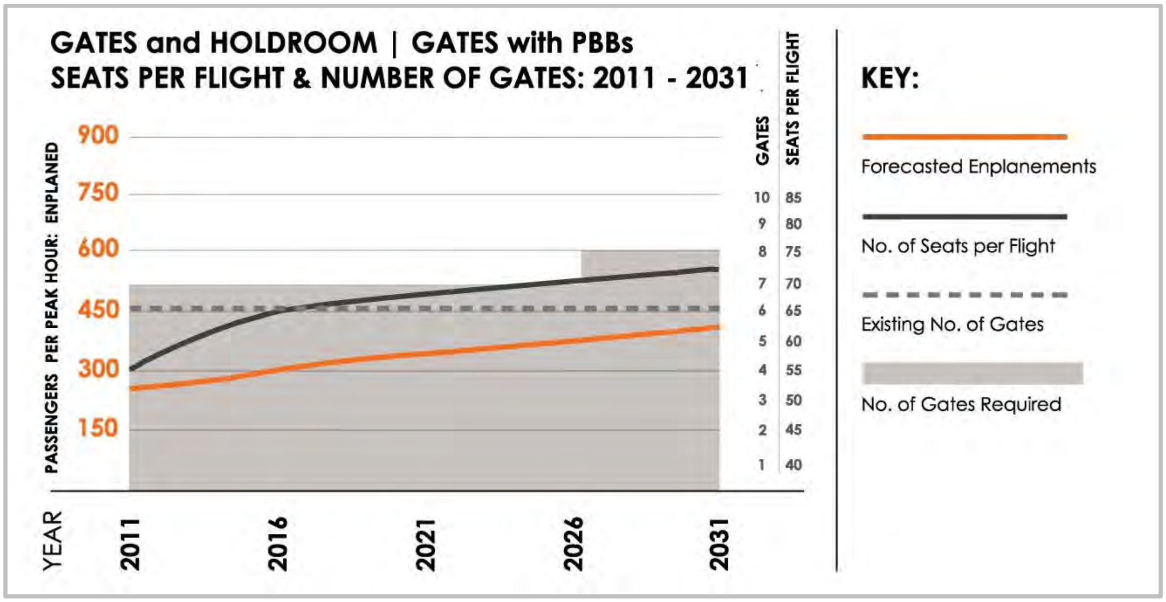
It should be noted that this analysis assumes that all boarding gates that are occupied during the peak hour of commercial departures are capable of accommodating demand with respect to aircraft type and size. As larger aircraft are anticipated to operate with greater frequency at CID in the future, boarding gates should be examined for their ability to accommodate the evolving aircraft fleet mix.

The gate capacity analysis described above concluded that ground boarding should be continued in the future in order to preserve flexibility during overflow operations and allow terminal access for propeller aircraft. In addition, the analysis determined that two additional gates with passenger boarding bridges (PBBs) will be needed in the next 20 years. For flexibility in planning, the capacity to add a total of four gates with bridges for a total of 10 passenger boarding bridge gates should be considered. Several of the gates should be designed to service most narrow-body jets including A320s, B737s, MD-83s.

During interviews, the airlines and Airport commented that aircraft circulation and access for gate C2 has been impacted by the recent building addition for the baggage screening project, making it difficult for aircraft to utilize this gate. The existing holdrooms for gates C1 and C2 were constructed in 1986 for much smaller aircraft than are used today and are undersized for accommodating seating for the 90-passenger aircraft that use these gates. Currently, aircraft at CID “power out” of parking positions when they leave the gate. This type of operation requires more space on the apron than if the aircraft were pushed back from the gate by a tug, limiting the number of aircraft that can use the gates at any given time and introducing the potential for jet blast on adjacent areas and equipment. The efficiency with which the existing gates operate would improve if aircraft were pushed back by tugs, but this change in aircraft maneuvering would also affect commercial airline operations.

Chart 4-12 shows the passenger boarding bridge gate requirements forecast.

Chart 4-12: Passenger Boarding Bridge Gate Requirements Forecast



Airline industry trends show that commercial aircraft are continuing to increase in both size and passenger capacity. Nationally, the number of seats per regional jet is expected to rise as carriers replace 50-seat aircraft with more cost-effective 70- to 90-seat aircraft. This trend is observable at CID, which no longer has any scheduled flights with 40-seat Saabs, and has fewer flights with 50-seat CRJs than it did in the past. As discussed in Chapter 2, the number of flights at CID with 70- or 90-seat CRJs, 110-seat Bombardier CS100, 130-seat CS300, and 142-seat MD80 are expected to continue to increase in the future. These changes in aircraft size will be experienced most in the near-term future. As a result of aircraft size increasing, more distance will be required between the gates to accommodate the larger aircraft, and more holdroom space will be required to accommodate the increased number of passengers. This situation already occurs during a regularly scheduled Allegiant flight.

4.7 Leased Space

There are many parts of the terminal building that are leased by tenants and provide necessary services that support commercial air traveler needs. ACRP Report 25 recommends that up to 35 percent of a passenger terminal facility's usable area be provided for these accessory services, though this proportion varies widely from location to location. The primary tenants in the passenger terminal building are the airlines. Other tenants include car rental agencies, TSA, and concessions that provide food, beverage and retail options to travelers.

4.7.1 Airline Space

Airline tenant space includes areas that are used by the airlines to provide passenger services as well as areas that are used for airline administrative and operational functions such as airline ticketing and baggage loading. Most administrative functions take place in the back of house area located behind the ticket counters, while some of the operations space is located below C concourse in close proximity to the C gates.

The Eastern Iowa Airport passenger terminal airline ticket counter
Photograph by Mead & Hunt, Inc. (2012)

4.7.2 Airline Ticket Counters and Offices

The amount of airline ticketing area and counter length are based on the number of airline ticket agent positions required. The number of agent positions is typically based on a number of factors including the number of peak hour enplaning passengers, the number of airlines operating at a specific location, the time distribution of departing flights, and the percent of passengers using the ticket counter instead of electronic check-in services. Airline ticketing offices (ATOs) are typically located behind the ticket counters and are used for other airline functions such as storage, IT, and break rooms. Recent changes in business operations in the airline industry as well as the increased use of online and kiosk ticketing options for passengers have resulted in a reduction of airline staff and a corresponding reduction in the amount of office space airlines need in terminal buildings.

The recently completed outbound baggage system project at the passenger terminal has removed the baggage screening function from the ticket lobby where it was temporarily located after the events of September 11, 2001. This building project restored the ticket counter area to the airlines, while renovating the airline ticket offices. The existing amount of airline office space at CID is approximately 4,600 square feet. Future requirements for airline ticket office space are dependent on airline operational requirements. As discussed earlier in this report, the increased use of ticketing technology is reducing the need for airline ticketing office space. As a result, the existing amount of airline office space will be sufficient beyond the year 2021. Calculations based on current airline office spatial needs show that more space will be needed beyond the year 2021; however, these needs are likely to be significantly less than today's needs and should be reevaluated as airline operational trends evolve.

The Eastern Iowa Airport passenger terminal airline baggage area
Photograph by Mead & Hunt, Inc. (2011)

4.7.3 Airline Baggage Areas

Prior to the security measures that were implemented nationwide after the events of September 11, 2001, baggage was manually carried or mechanically conveyed from the ticketing counter directly to the individual baggage make-up area of each airline. Currently, TSA requires that all baggage be screened before entering the baggage make-up area. This is generally accomplished through the use of a shared baggage handling system, which is often implemented in conjunction with baggage screening improvements. This practice results in a single outbound baggage room which is shared by all of the airlines instead of the individual baggage make-up areas in the ATOs that were used in the past. This shared baggage room provides a conditioned space for processing baggage, and functions as an airlock, preventing the loss of conditioned air from the building to the outside environment. The existing outbound baggage area of CID is larger than is required for current usage because the 2012 baggage addition was built to accommodate increased future use. As a result of this project, tug parking on the apron between the outbound baggage room and gate C2 occupies an increased amount of space on the apron.

The inbound baggage area is a back of house area used for the unloading of arriving baggage from baggage carts onto the baggage claim device. Once the baggage has been loaded onto the claim device, the claim device rotates the baggage from the back of house to the front where passengers are able to retrieve it. While outbound baggage arrives at the passenger terminal gradually and requires careful screening, inbound baggage arrives in groups with incoming flights and is discharged quickly to claim devices. For this reason, the amount of space required for the inbound baggage function is less than for the outbound baggage function. While outbound baggage make-up at the Airport occurs in an enclosed outbound tug drive, the inbound baggage area is sheltered, but not entirely enclosed. The Airport has found that this is an efficient arrangement that admits natural light into the baggage claim public area, while the system of baffles and doors provides partial weather protection. This arrangement is sufficient for current usage, but should be reviewed when baggage claim devices are added in the future.

The Eastern Iowa Airport passenger terminal inbound baggage area
Photograph by Mead & Hunt, Inc. (2011)

4.7.4 Airline Operations

The airline operations areas provide support for the servicing of aircraft and flight crews while aircraft are parked on the terminal apron. The demand for these areas is a function of the types and sizes of the aircraft in operation at a specific location. Planning-level estimates of space required for airline operations is based on the number of airlines and gates at the airport, while design-level amounts of space are coordinated with the airlines. At CID there is approximately 2,600 square feet of area in the terminal that is used for airline operations, a majority of which is located on the first floor of Concourse C, near the C gates. The amount of space needed for airline operations will increase as new gates are added, but at smaller a proportion than the existing proportion of operations space to number of gates since some of these functions will not need to be duplicated.

The Eastern Iowa Airport passenger rental car counters
Photograph by Mead & Hunt, Inc. (2011)

4.7.5 Car Rental Space

Car rental facilities in airport terminals generally include an office area with a front counter and sufficient space in front of counters for queuing. Car rental counters are typically located in close proximity to the baggage claim area, and in such a way as to provide easy access to the car rental parking area outside the building. The amount of space occupied by car rental and airport shuttle offices and counters at the passenger terminal is 1,774 square feet. Interviews with these tenants confirm that this amount of space will be sufficient to the end of the planning horizon.

4.7.6 Retail and Food Concession Space

Airport terminal concession services are defined as all commercial functions that serve the public other than airlines and rental car agencies. These services provide food, beverage and retail options for both passengers and non-passengers, located on both the secure and non-secure sides of the checkpoint. Prior to the security measures instituted after September 11, 2001, concessions were traditionally located close to the main public entry in the non-secure portion of the terminal building. At that time, passengers were allowed to leave the holdroom area to access the concessions and then return to the holdroom area. Now, the security checkpoint effectively divides the passenger terminal into two distinct parts, preventing passengers from returning through the checkpoint to access concessions in the non-secure area once they have been screened at the security checkpoint. Consequently, concession services on each side of the checkpoint are evaluated separately.

The Eastern Iowa Airport passenger terminal non-secure concessions
Photograph by Mead & Hunt, Inc. (2011)

At CID, concessions in the non-secure part of the terminal consist of a restaurant/bar/coffee shop, a gift shop and a vending room. The amount of existing space occupied by concessions in the non-secure area is 6,819 square feet, and the amount occupied by vending is 314 square feet. This amount of space is significantly higher than is generally seen at airports of this size; however, if the Airport and the concessionaires are in agreement on lease terms, then leased areas must be provided as agreed. The existing vending room is located near the ticketing area and may experience increased usage if it is relocated near the baggage claim, making it more visible to deplaning passengers.

The restaurant/bar/coffee shop, located adjacent to the checkpoint, is used not only by passengers, but also by members of the general public and by people dropping off or picking up passengers. This variety of use adds to the vitality of the concession businesses. Changes in usage patterns at the Airport have resulted in the existing non-secure concessions being located somewhat distant from each other. The concept of grouping these concessions together should be reviewed in the next significant terminal renovation project as it will add to the vitality of the terminal and increase traffic for concessions.

The Eastern Iowa Airport passenger terminal secure concessions
Photograph by Mead & Hunt, Inc. (2011)

Concessions on the secure side of the checkpoint occupy 2,840 square feet and include vending machines near the escalators and a restaurant/bar and retail shop in C concourse. This amount of space is sufficient for current usage, but more space for secure concessions will be required in the future. The existing amount of secure concessions will start to be constrained by 2016 and will benefit from an additional 500 square feet of space. In 2021, the recommended total amount of secure concessions is 3,860 square feet, and in 2031 the amount is 4,715 square feet. As with non-secure area, the amount of space necessary for concessions is influenced by the needs of the concessionaire; however, since current security measures restrict movement between the secure and non-secure areas, passengers depend on concessionaire services in these areas for food and drinks.

4.7.7 Transportation Security Administration (TSA) Office Space

Since the TSA was created after FAA Advisory Circulars were written, there is no FAA guidance provided for the required amount of TSA office area. TSA office space is used for classrooms, meeting rooms, offices, locker rooms and break rooms. The existing TSA office areas at CID are 4,815 in area, and the amount of space that has been negotiated with the TSA is understood to be sufficient until the end of the lease period.

4.8 Non-Usable Space

Non-usable areas support primary building services and are necessary for the building to function and be maintained. These areas include building components such as walls and structure, utilities such as electrical and mechanical systems, and functional support areas such as maintenance and janitor rooms.

4.8.1 Building Components

Building components including structure and wall thickness typically occupy about five percent of the gross terminal area. Space for these components is embedded in the recommendations for occupied space discussed previously in this chapter. Two multipliers, based on the proportion of open to enclosed space, have been used to estimate the amount of area needed for building components associated with the recommended functional areas so that sufficient space has been recommended for each functional area. A four percent multiplier was used for open areas, which are a majority of public spaces in the terminal building, and ten percent was used for enclosed areas. The design phases for subsequent projects will determine the actual building components required.

The Eastern Iowa Airport passenger terminal building utilities
Photograph by Mead & Hunt, Inc. (2011)

4.8.2 Building Utilities

Building systems such as heating, cooling, plumbing, electrical, and IT are required for the terminal to function. References on terminal planning and design state 10 to 15 percent of the total gross terminal area is normally occupied by building systems, but this amount can vary with the types and sizes of the heating and cooling systems required for the specific climate. These amounts refer to floor area only and not to the space for utilities that occurs above the ceiling or outside the building footprint.

4.8.3 Airport Storage/Janitor/Maintenance

In order to determine the unique needs of a facility, an effective airport terminal design will coordinate building support requirements with staff during the design phase. These support requirements include providing storage space for equipment such as lifts or floor buffers, which are required for maintenance of the building. In addition, maintenance and janitorial expectations for finish materials should also be closely coordinated with Airport staff, since they have long-reaching impacts on the performance of the facility in the future.

4.8.4 Receiving Area

The receiving area at an airport of this size serves both terminal maintenance and retail concessions. FAA Advisory Circulars advise the use of loading areas, but do not provide size recommendations. ACRP Report 25 recommends a designated loading area away from the front of the building in order to avoid adding delivery vehicle traffic to the terminal curb. In addition, the Report recommends that recycling and trash receptacles are co-located with the loading area.

The Eastern Iowa Airport passenger terminal receiving area
Photograph by Mead & Hunt, Inc. (2011)

The existing receiving area is located on the west side of the terminal and is accessible to delivery vehicles via Arthur Collins Parkway Southwest before it passes in front of the terminal curbside. The existing receiving area has approximately 600 square feet of area for vehicle parking and maneuvering, and it has a truck dock and lift. Roadway access and circulation for large trucks is constrained. Roadway circulation is such that a vehicle leaving the receiving area must then pass through the terminal curbside area, which is not recommended by reference documents. Additionally, a constrained pedestrian area between the loading dock and the trash and recycling area prevents trash carts from using the delivery door to remove trash from the building. Instead, large dumpsters are brought through one of the larger public entrances.

4.8.5 Severe Weather Shelter

CID is located in an area of the country that sometimes experiences severe weather. While building codes already address the integrity of buildings and paths of evacuation, it is recommended that a portion of the building be designed to protect building occupants from severe weather occurrences.

4.9 Passenger Amenities and Technology

While most of the recommendations for changes to terminal facilities are the result of existing shortfalls, others can improve the operational performance of the Airport and its tenants. For example, the operational performance of an airport can be improved by advancements in technology and energy efficient construction. Across the globe, new technology has been adopted at airports in order to optimize the daily function of airport terminals, and to communicate information to passengers that will affect their travel. Goals for adoption of technology in the airport environment include improving functional efficiency, making travel more efficient for passengers, and enhancing sustainability. Examples of technologies appropriate to airports of similar size to the Airport are listed below with brief discussions of their associated impacts.

4.9.1 Traveler Expectations

Many travelers expect electronic amenities at airport terminals. This includes charging stations for cell phones and computers, Wi-Fi access, a paging/visual paging system, and an internet interface that will enable passengers to access airport-specific information via portable electronic devices. While these technologies may not directly change the physical makeup of the terminal building, the expectations of travelers should be considered in upcoming projects.

4.9.2 Passenger Amenities

Because passengers spend more time in airport terminals due to new air travel and security procedures, passenger amenities such as an information kiosk, curbside assistance, courtesy phones, play areas for children, and business bars are necessary for travelers to pass time comfortably. In addition, it is beneficial to provide sufficient storage space for wheelchairs and baggage carts so that they do not encroach upon circulation areas. The continued development of these amenities will improve the passenger experience at CID.

4.9.3 Self-Serve Bag Check

A drop point that allows passengers arriving at the airport with tickets to check their baggage without standing in line at ticket counters is a growing trend. The main benefit of providing a self-bag check is the reduction of passenger queuing congestion in the ticket lobby. Self-serve bag checks are currently in use internationally and are in pilot programs at several locations in the U.S. A self-bag check may or may not need to be staffed and may function in a similar manner to curbside bag check, except that it occurs inside the airport terminal. A self-serve passenger bag check is best located in close proximity to the checkpoint and baggage screening area.

4.9.4 Common Use Facilities

Common use facilities may include facilities used by passengers or that service aircraft, including baggage claim devices, parking facilities, building physical plant, use of preconditioned air, and ground power at gates. Some of the existing airline facilities in the CID passenger terminal such as gates and ticket counters are currently utilized exclusively use by a single airline. Often, these facilities are not used continuously over the course of a day. Common use technology enables an airport operator to make these spaces and resources available for use by multiple airlines at different scheduled times. Shared or common facilities use allow a more efficient use of airport resources and increases the capacity of the airport without necessarily increasing the amount of gates, holdrooms, concourses, ticket counters or terminal space. Airline disadvantages related to common use facilities include less autonomy and more reliance on non-airline staff, a reduced opportunity for company branding, and a need to train airline staff to use the facilities. Airline advantages include cost savings related to renting facilities only when needed, and flexibility of facilities for new service and emergencies. ACRP Synthesis 8, *Common Use Facilities and Equipment at Airports*, describes the facilities that have the potential to be common use systems:

- An Advanced Flight Information Display System (FIDS) can list real time information pertaining to the flight including arrival/departure time, gate number, bag claim number, airline logos, and remarks pertaining to the flight such as delays or gate changes. This system allows for flight information to be displayed in different locations, and would dovetail well into a wayfinding and/or common use gate management project. It does not require a layout change to the airport, but would involve a significant information system upgrade. Potential locations for FIDS include public waiting areas, the ticket lobby, in the secure area directly after checkpoint, and via internet. In addition, this system can integrate visual paging and advertising programs.

- Gate Management System: A system that guides an aircraft to a gate, reports actual aircraft arrival and departure times, tracks gate utilization, and provides billing accordingly. This system reduces the need for marshallers and reduces congestion on the apron and at gates.

- CUSS (Common Use Self Service): An industry standard, airport-provided check-in kiosk system that allows access to multiple airlines, while preserving airline brand identity.

- CUTE (Common Use Terminal Equipment): Implementation of CUTE began at various airports in 1984. This system enables integration with airport systems such as FIDS and dynamic signage. Since a technical specification was not implemented, a number of proprietary operating platforms and implementation methods were developed, making the system inconvenient to both airlines and airports. CUTE is in the process of being replaced by CUPPS, described below.

- CUPPS (Common Use Passenger Processing System): This is a fully integrated common use system, for use with check-in kiosks, ticket counters, gates, boarding controls and information displays. CUPPS is similar to CUTE, except that it utilizes a standardized interface for common use platforms, which is accessible to all airlines. It simplifies procurement, installation, use and maintenance of the common use model.

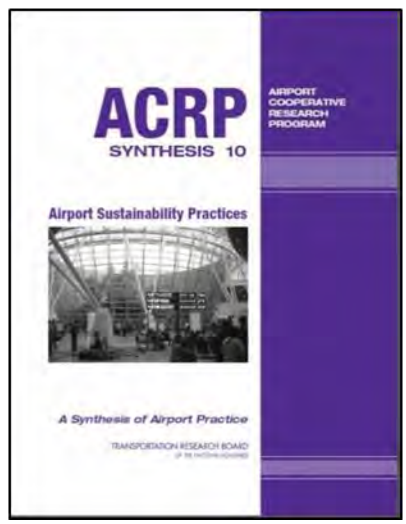
4.10 Energy Efficiency

In the past, producing an energy-efficient project was typically voluntary, but it is becoming increasingly common that a certain level of energy efficiency is required by federal, state, or local regulations. This not only benefits communities and the environment, it also makes good business sense because an energy-efficient facility experiences continued reduced utility expenses and operation costs. An example of energy-efficiency in a parking lot is to use lighting that requires less electricity than conventional lighting. In a building, examples include managing energy use in the building systems and controlling heat gain or loss through the walls, windows, doors, floors and roofs.

Many programs and resources exist to encourage the implementation of sustainable projects at airports. Examples of these are listed below.

- The National Energy Conservation Policy Act (NECPA), signed in 2009, recognized that the Federal Government is the single largest energy consumer in the United States, and that the cost of meeting the Federal Government's energy need is substantial. Significant opportunities exist for reducing the energy demand of these facilities by improving operations and maintenance, utilizing modern energy efficient technologies, and employing energy efficient design practices. When evaluated through the use of life-cycle analysis and using private investment capital, many of these measures can be implemented for little or no cost, resulting in a reduction of energy use and associated cost to the Federal Government. This Act established benchmarks for percentage reductions of energy use for Federal buildings from the years 2006-2013 based on consumption per gross square foot for the year 2003.

- The FAA's Voluntary Airport Low Emission (VALE) program provides Airport Improvement Program (AIP) funding and expedites the environmental review process for qualified projects that will result in a reduction of aircraft emissions or energy demand at a national level.



- The FAA Reauthorization and Reform Act of 2011 reauthorized FAA operations and programs for the next four years. This Act expanded the eligibility of AIP project costs to those that are justified through life-cycle costs analysis. The Secretary of Transportation is establishing a program to encourage airport sponsors to evaluate energy requirements for vehicles and buildings.

- The Energy Independence & Security Act of 2007 amended NECPA and established performance standards for energy use and reduction in the use of fossil fuels at new Federal buildings and major renovations. This Act established energy saving performance contracts and benchmarks for energy use in these buildings. In addition, these Federal buildings are monitored for energy use, and buildings leased by federal agencies are required to have an Energy Star label.

- Publications by the Transportation Research Board's Airport Cooperative Research Program, including *Airport Sustainability Practices* (Synthesis 10), *Guidebook for Improving Environmental Performance at Small Airports* (02-13) and *Sustainable Airport Construction Practices* (08-01) provide guidance on sustainable airport solutions.

- The Sustainable Aviation Guidance Alliance (SAGA) is a coalition of aviation interests formed to assist airport operators in planning, implementing, and maintaining a sustainability program. To this end, SAGA created the *Sustainable Aviation Resource Guide: Planning, Implementing, and Maintaining a Sustainability Program at Airports*. In addition, the SAGA website serves as a central repository for airport sustainability guidelines and documents.

4.11 Passenger Terminal Summary

When determining airport terminal facility requirements, it is important to balance the requirements of each component inside the terminal with the overall terminal space. As passenger enplanement numbers continue to grow, there will be increased pressure on facility performance. All of the areas in the terminal building were analyzed for their ability to meet both current and future requirements. Many of the terminal facilities are sized to manage the increase; however some facilities will benefit from further study, improving both terminal functions and the passenger experience.

Facilities in need of improvement at CID include:

- Curbside and public entrances: While the pick-up/drop-off curb has sufficient length, the curbside area would benefit from a project that addresses some of the portions of the terminal curbside that are underperforming. The existing building entrances do not have sufficient walk-off area or sufficient space between sets of doors at each entry to function as an airlock. Utility savings would be realized if the entry doors were replaced and a sufficient space between the doors was provided so that the entrance could function as an airlock. During the process of reviewing the doors, opportunities to improve circulation and make the entrances more visible should be evaluated. The depth of the curbside near the public entrances should be increased to allow circulation area on the sidewalk near the building entrances. An extension of the east canopy would be beneficial, improving shelter for pedestrians as they make their way to the car rental lot or wait for taxis or airport shuttles. A renovation or addition to the front canopy that would improve shelter during inclement windy weather and extended shelter beyond half of the drop-off/pick-up lane, would enhance the passenger experience. Crosswalks should be made more visible to increase pedestrian safety and to encourage slower traffic speeds.

- Wayfinding: Airport signage needs to be clear and intuitive in order to be effective. A clear wayfinding system in a passenger terminal not *only* relies on signage, but also employs visual cues to orient the passenger. These visual cues include items such as canopies at building entrances, which make the entries clearly visible from moving vehicles. Windows and natural light not only provide a visual connection from the terminal to the curbside, but will also improve the passenger experience. A project that reduces this wayfinding confusion both inside and outside of the passenger terminal at the Airport will improve passenger movement through the circulation areas of the building and at the curbside.

- Non-secure public space reconfiguration: The existing public space configuration in the non-secure part of the terminal is no longer functioning optimally. Improvements to the proportions and locations of passenger amenities such as waiting areas, public circulation, passenger queuing, ticketing kiosks, and non-secure concessions will benefit the Airport. A location should be identified for self-checked baggage to occur.

- Interior public finishes and lighting: The existing public finishes on the non-secure side of the checkpoint are showing signs of age and wear, even though they have been well-maintained, and the existing lighting in the same area affects the passenger experience negatively. The passenger experience will be improved when upgrades addressing deficiencies in the quality of finishes and lighting have been completed.

- Restroom renovation: The existing restrooms in the non-secure portion of the terminal building, located on either side of the main entry from the parking lots, would benefit from a renovation since finishes, stalls and fixtures are showing signs of wear. The existing restrooms in the secure portion of the terminal building, located adjacent to the escalators, would benefit from a renovation since finishes are showing signs of wear. When the checkpoint is reconfigured, these restrooms should be relocated to make them more visible to passengers leaving the checkpoint. In addition, the number of fixtures should be increased and a companion care restroom should be added.

- Security checkpoint: Three lanes will be required to handle the forecasted demand beyond the year 2016. The layout of the checkpoint area should provide ample space and flexibility since a three-lane checkpoint will near its maximum capacity at the end of the planning period. In addition, new Transportation Security Administration guidelines require more space per lane than the current configuration can accommodate.

- Secure circulation: Vertical circulation from floor to floor could be improved by providing options such as elevators, prominent staircases, and up-only and down-only escalators. Horizontal circulation could also be improved by providing sufficient space to separate the enplaning and deplaning passenger paths near the security checkpoint. Providing additional space for circulation in the C concourse will allow passengers to move freely between holdrooms and passenger amenities.

- Concourse reconfiguration and addition: It is recommended that CID continue to provide the capability for limited ground boarding. Additional holdroom and concession space in conjunction with the gates that utilize passenger boarding bridges are also suggested. All holdroom areas should increase in size to accommodate 70 to 90 passenger aircraft, and two to three holdrooms should have the capacity to accommodate 130 seats or more. Eight gates will be needed through the end of the planning period. However, gate and holdroom expansions should be provided in manner that will not prevent concourse expansion beyond the planning period.

- Building mechanical, plumbing and electrical systems: It is important to remember that a significant renovation provides the opportunity to not just replace building systems, but also to improve them and reduce ongoing utility expenses and operation costs.

4.11.1 Conclusion

The objective of establishing facility requirements is to determine the amount of space and type of facilities that are required for the airport to operate efficiently through the planning period. Time is an important factor in determining facility requirements as well since the amount of time required for the design and construction of a terminal renovation will typically take several years. Because an airport terminal is in continuous use, it would be beneficial for the airport to consider projects that will result in the improvements of facilities prior to the point at which a shortage is experienced. Facilities will be more easily improved upon before they are under strain from increased use as there will be more space available for staging of projects and relocation of passengers and tenants.

MASTER PLAN

THE **EASTERN IOWA AIRPORT** CEDAR RAPIDS

5 Airside/Landside Alternatives

CHAPTER 5

Airside & Landside Alternatives

The purpose of this chapter is to present airside and landside development alternatives and recommendations for The Eastern Iowa Airport (referred to as CID or the Airport) in terms of concepts and reasoning. This chapter provides a description of the various factors and influences on future airport development that will form the basis for the Airport's long-term development program. Because all other airport functions relate to and revolve around the basic runway/taxiway layout, airside development alternatives must first be carefully examined and evaluated. It is essential that the initial development recommendations for the Airport be commensurate with the anticipated needs and requirements of airport users; however, long-term expansion of the facility must also be considered to ensure the capability to accommodate potential activity levels. The main objective of the planning recommendations presented herein is to identify future development that will result in a runway/taxiway system capable of accommodating the forecast level of aviation activity.

First, a review of the airside development alternatives is discussed in this chapter, the purpose of which is to fulfill major facility requirements including basic runway/taxiway configuration. Second, recommendations for landside development are presented. For purposes of this chapter, landside facilities include the hangar development areas, air cargo areas, and support facilities. Alternatives for terminal area facilities such as the terminal building and passenger parking lots will be considered in Chapter 6. Following review of the alternatives by the Study Committee, Airport staff, other interested parties, and the FAA, the conclusion for this chapter will be revised to include a generalized conceptual airport development plan, recommendations for runway and taxiway improvements, and an on-airport land use plan.

Major airfield needs identified in Chapter 3 include consideration of improved instrument approach minimums, consideration of additional takeoff runway length for Runway 13/31, taxiway improvement associated with Runway 13/31, and consideration of a third runway parallel to Runway 9/27. Alternatives for meeting these primary airfield needs as well as alternatives for non-terminal landside and support facilities are analyzed in the following sections:

- Improved Instrument Approach Minimums
- Runway 13/31 Extension Alternatives
- Taxiway “E” and “D” Improvements
- Taxiway ”B” Concept
- Future Parallel Runway Alternatives
- General Aviation Aircraft Storage
- Air Cargo Facilities
- Support Facilities

5.1 Improved Instrument Approach Minimums

As discussed in Chapter 3, the benefit-cost ratio for a conventional CAT-II/III system at CID is likely to be significantly lower than the required 1.0. A Special Authorization CAT-II approach to Runway 9 offers an alternative for the Airport because it would require significantly less new ground equipment to achieve similar approach minima. This type of approach would be able serve the majority of Airport users certified to conduct conventional CAT-II approaches.

However, the Master Plan recommends that the Airport Layout Plan (ALP) continue to protect for a conventional CAT-II/III system in the event that future aviation activity exceeds the 20-year forecasts. There are several runway ends that are potential candidates for this system based on existing ground equipment, approaches and infrastructure. The merits of each runway end are considered and compared below.

Because Runway 13 does not currently have an approach with CAT-I minimums, it was eliminated from further consideration. Advantages and disadvantages of implementing a CAT-II/III approach to the remaining three runway ends (9, 27, and 31) are compared in **Table 5-1**.

Table 5-1: Conventional CAT-II/III Upgrade Comparison by Runway End			
Consideration	**Runway 9**	**Runway 27**	**Runway 31**
Approach Lighting System	Replace existing MALSR with ALSF-2		
Land Acquisition for ALSF-2	None	Minor	None
Existing Localizer/Glideslope and Critical Areas	Yes	Yes	No
Existing TDZ/RCL Lights	No	No	No
Existing RVR Sensors	Yes	Yes	No
Existing SMGCS	No	No	No
Landing Distance Available	8,175 feet	8,175 feet	6,200 feet
Additional Hours Provided (CAT-II)	73	63	58
Additional Hours Provided (CAT-III)	110	88	85

Runway 31 does not have any existing localizer, glideslope, or RVR equipment. In addition, Runway 31 provides almost 2,000 less feet of available landing distance when compared to Runway 9 or Runway 27, which is a major disadvantage because runway surface conditions during CAT-II/III weather are often wet or icy. For these reasons, Runway 31 was removed from further consideration.

When compared to Runway 9, a CAT-II system on Runway 27 would provide 10 fewer hours of availability and a CAT-III system would provide 37 fewer hours of availability. In addition, a small amount of land acquisition would be required on the Runway 27 end for installation of the ALSF-2, while there is already adequate space for the system on Runway 9 end. Furthermore, the approach to Runway 27 overflies several commercial/industrial land uses and critical transportation infrastructure, including the CRANDIC railroad and Interstate 380. For these reasons, Runway 9 appears to be a more viable candidate for a CAT-II/III system than Runway 27.

If the Airport wishes to pursue a CAT-II/III ILS approach, a full study of potential justification for the proposed system will need to undertaken. A justification study would develop a business case for establishment of a CAT-II/III system by modeling airport activity for a Benefit Cost Analysis (BCA) and identifying potential unique benefits based on specific local circumstances. In addition, a more detailed study of ground equipment requirements will be needed to verify existing equipment/critical area conditions and required upgrades, and an aeronautical survey will be needed to verify preliminary findings regarding clearance of obstacle free zone, approach light plane, and TERPS CAT-II/III approach and missed approach surfaces.

According to FAA Order 8400.13D, “to be eligible for Special Authorization CAT-II, a runway must have, or be qualified for, a part 97 CAT-I SIAP with a DH of 200 feet and a visibility minimum not more than RVR 1800.” As mentioned previously, Runway 9 is the only runway at CID that currently has this type of procedure. Therefore, Runway 9 is likely to be the most suitable runway for a Special Authorization CAT-II approach at CID.

Runway 9 is currently equipped with Mark 1E localizer and glideslope equipment. The localizer antenna array was commissioned in 1984 and the glideslope antenna was commissioned in 1989. Since that time, similar localizer and glideslope equipment at various airports throughout the country have been replaced with more sophisticated, next-generation Mark 20 equipment that was developed and tested during the mid-1990s. An even more recent advancement in equipment, the Mark 420 system, is currently under consideration for FAA certification. Both the Mark 20 and 420 ILS equipment systems include a universal interlock controller system that is required for Special Authorization CAT-II approaches. In 2009, an FAA Air Traffic Organization (ATO) Needs Assessment Program (NAP) entry was logged requesting an upgrade from Mark 1E to Mark 20 equipment to allow for the establishment of a Special Authorization CAT-II approach; however, this request has not yet been filled.

If existing Airport ILS equipment is replaced in the near future, as a result of its age and a subsequent deterioration in reliability, a new replacement system would allow for the establishment of a Special Authorization CAT-II approach. An Instrument Approach Procedure request would have to be filed with the FAA and an aeronautical survey would have to be conducted in order to establish the new approach.

This Master Plan recommends that the Airport pursue implementation of a Special Authorization CAT-II approach to Runway 9 in the near-term, and that the ALP continue to protect for a Conventional CAT-II/III system to this runway end.

5.2 Runway 13/31 Extension Alternatives

Chapter 3 identified the need for additional runway length for Runway 13/31 as air carriers operating at the Airport heavily utilize this runway. The runway length analysis determined that an additional 1,200 feet of takeoff runway length would be beneficial to air carriers and business jets both currently using and anticipated to use this runway in the future.

The initial options considered for extending Runway 13/31 were to add 1,200 feet of pavement and standard graded Runway Safety Area (RSA) to the northwest end of the runway or add 1,200 feet of pavement and standard graded RSA to the southwest end of the runway. Extending 1,200 feet to the northwest would require relocation or closure of Wright Brothers Blvd. SW, while extending 1,200 feet to the southeast would require relocation or closure of 18th Street SW, Walford Road, and the Cedar Rapids and Iowa City Railroad (CRANDIC) line. These alternatives are not considered practical or feasible for these reasons. A southeast extension was not considered further due to the number of road and railroad closures/relocations that would be required. However, a northwest extension is considered in Section 5.2.3 to provide a comparison to other, more practical and feasible solutions.

Another option for providing additional runway length for Runway 13/31 that avoids relocating/closing roads or railroads would be to install Engineered Materials Arresting Systems (EMAS) at each end of the runway in lieu of standard, traditional graded RSA. However, construction of EMAS beds designed to arrest the sizes and types of commercial aircraft currently using Runway 13/31 is estimated to exceed $20 million for the EMAS beds alone, and consequently, this option is considered cost-prohibitive. Furthermore, EMAS was primarily developed as a tool for addressing existing safety area deficiencies rather than a tool for achieving additional runway length.

The following sections present three detailed alternatives for extending Runway 13/31 with planning level cost estimates developed for each. Runway 13/31 Extension Alternative One includes a 1,200-foot extension to the northwest as well as the tunneling of Wright Brothers Blvd. SW to provide standard graded RSA rather than relocating or closing Wright Brothers Blvd. Runway 13/31 Extension Alternative Two includes 1,000-foot takeoff-only runway extensions at both runway ends, employing a process referred to as declared distances to achieve an increase in takeoff length. Runway 13/31 Extension Alternative Three includes a 1,200-foot extension to the northwest as well as the relocation of Wright Brothers Blvd. SW around the Runway 13 runway protection zone (RPZ).

5.2.1. Runway 13/31 Extension Alternative One

Alternative One includes a 1,200-foot extension to the north and the tunneling of Wright Brothers Blvd. SW. This alternative would provide additional length for Runway 13/31 without requiring the closure and/or relocation of any roads or railroads in the Airport vicinity. Total costs for implementing this alternative are estimated at $43.9 million. This alternative is presented in **Figure 5-1**.

- Alternative One Configuration and Requirements
  - Runways 13/31 and parallel Taxiway “E” would both be extended 1,200 feet to the north to provide the recommended runway length of 7,400 feet.
  - Approximately 1,225 linear feet of Wright Brothers Blvd. SW would be tunneled beneath the extended runway safety area (RSA) and runway object free area (ROFA).
  - The perimeter service road would be relocated around the extended RSA and ROFA.
  - The landing threshold and approach/departure runway protection zones (RPZs) for Runway 13 would both be relocated 1,200 feet to the north.

- Alternative One Advantages
  - Enhances runway safety and utility by providing the recommended runway length for Runway 13/31 operators.
  - Provides additional runway length with a standard runway extension, avoiding the use of declared distances.
  - Provides additional runway length without impacting the local roadway system or railroad line south of the Airport.
  - Does not require the acquisition of additional land for implementation.

- Alternative One Disadvantages
  - Requires a significant capital investment for the tunneling of 1,225 feet of Wright Brothers Blvd. SW.
  - Requires redevelopment of the RNAV GPS instrument approach procedure for Runway 13.
  - Results in portions of the preferred future third runway and parallel taxiway within the Runway 13 RPZ (see Section 5.5.6).

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Notes

Standard Extension of Runway 13/31 by 1,200 feet

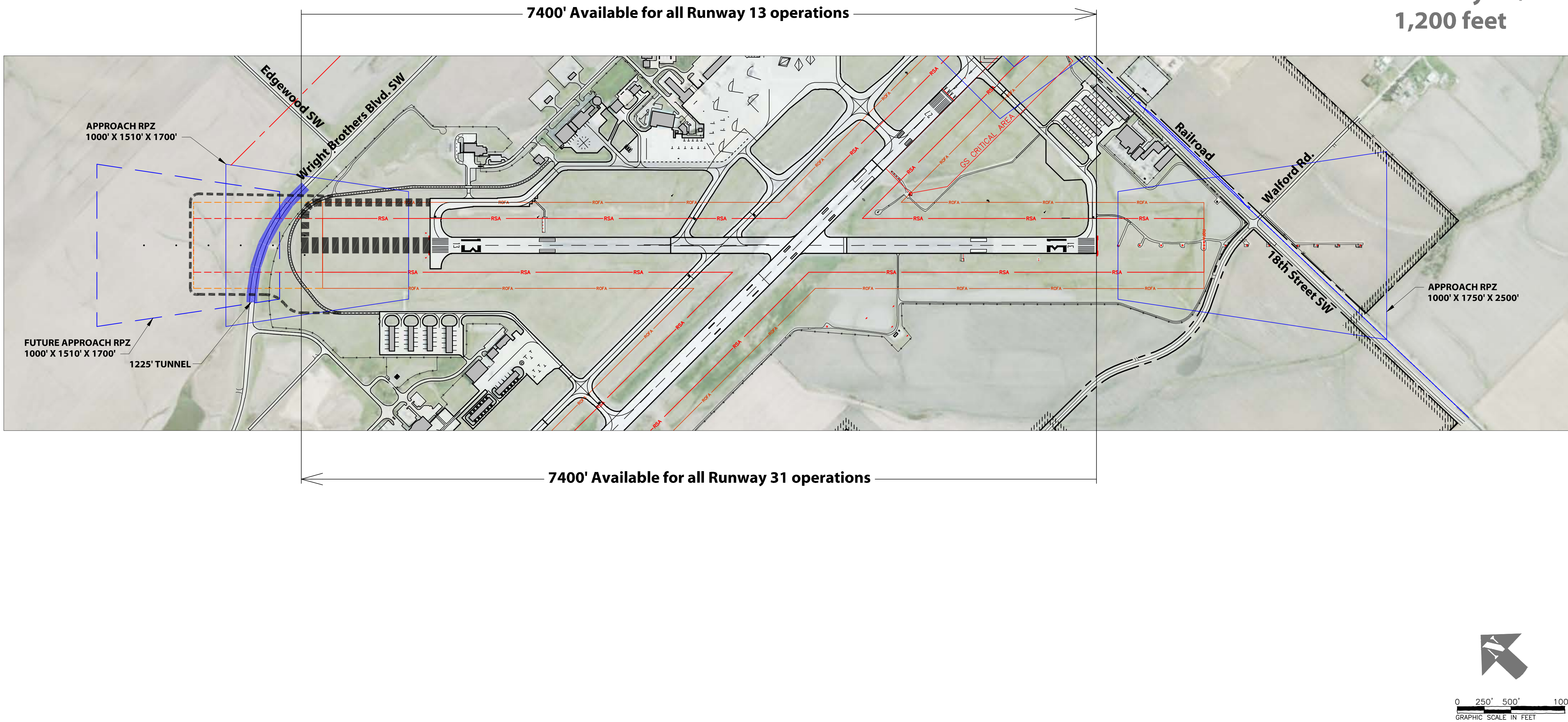

Figure 5.1
Runway 13/31 Extension Alternative One

Image Source: Bing Aerial 2012

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5.2.2. Runway 13/31 Extension Alternative Two

Alternative Two includes the use of declared distances to avoid constructing a tunnel for Wright Brothers Blvd. SW. This alternative would include 1,000 feet of additional pavement to the north and 1,000 feet of additional pavement to the south. The 1,000-foot extensions are the maximum practical runway extensions possible at each runway end without having to close and/or relocate roads. At both runway ends, the additional pavement would be designated for aircraft takeoff only, meaning the landing threshold for both Runway 13 and Runway 31 would remain in their existing locations. Total costs for implementing this alternative are estimated at $6.8 million. This alternative is presented in **Figure 5-2**.

- Alternative Two Configuration and Requirements
  - Runway 13/31 and parallel Taxiway "E" would both be extended 1,000 feet to the north.
  - Runway 13/31 and Taxiway "C" would both be extended 1,000 feet to the south. The extension of Taxiway "C" would be set at a 440-foot separation from the runway to avoid aircraft taxiing within the precision obstacle free zone (POFZ) for the approach to Runway 31.
  - The existing perimeter service road around the approach end of Runway 13 would be relocated around the future taxiway object free area (TOFA).
  - The landing threshold and approach RPZs for both runway ends would remain in the same location.
  - Published declared distances would provide additional takeoff length in each direction as indicated in **Table 5-2**.

- Alternative Two Advantages
  - Enhances safety by providing additional takeoff runway length for Runway 13/31 operators.
  - Provides additional runway length without impacting the local roadway system beyond either end of the runway or railroad line south of the Airport.
  - Does not require the acquisition of additional land for implementation.
  - Does not change the existing approach RPZs at each end of the runway.
  - The use of Declared Distances creates separate departure RPZs at each end of the runway; however, as shown in Figure 5-2, the departure RPZs are located entirely within the existing dimensions of the approach RPZs.
  - This alternative could be constructed in two phases. The recommended first phase would be the takeoff only extension on the Runway 13 end. Airport staff estimates that 14 percent of departures use Runway 13 while only 6 percent of departures use Runway 31.

- Alternative Two Disadvantages
  - Does not fully meet the recommended runway takeoff length of 7,400 feet.
  - Requires a significant capital investment in additional runway and taxiway pavement that will only be used for 20 percent of aircraft departures (or 10 percent of total airport operations), as approximately 14 percent of aircraft operations depart Runway 13 and six percent depart Runway 31.
  - Requires implementation, approval, and publication of declared distances, which can be confusing to aircraft operators and pilots.

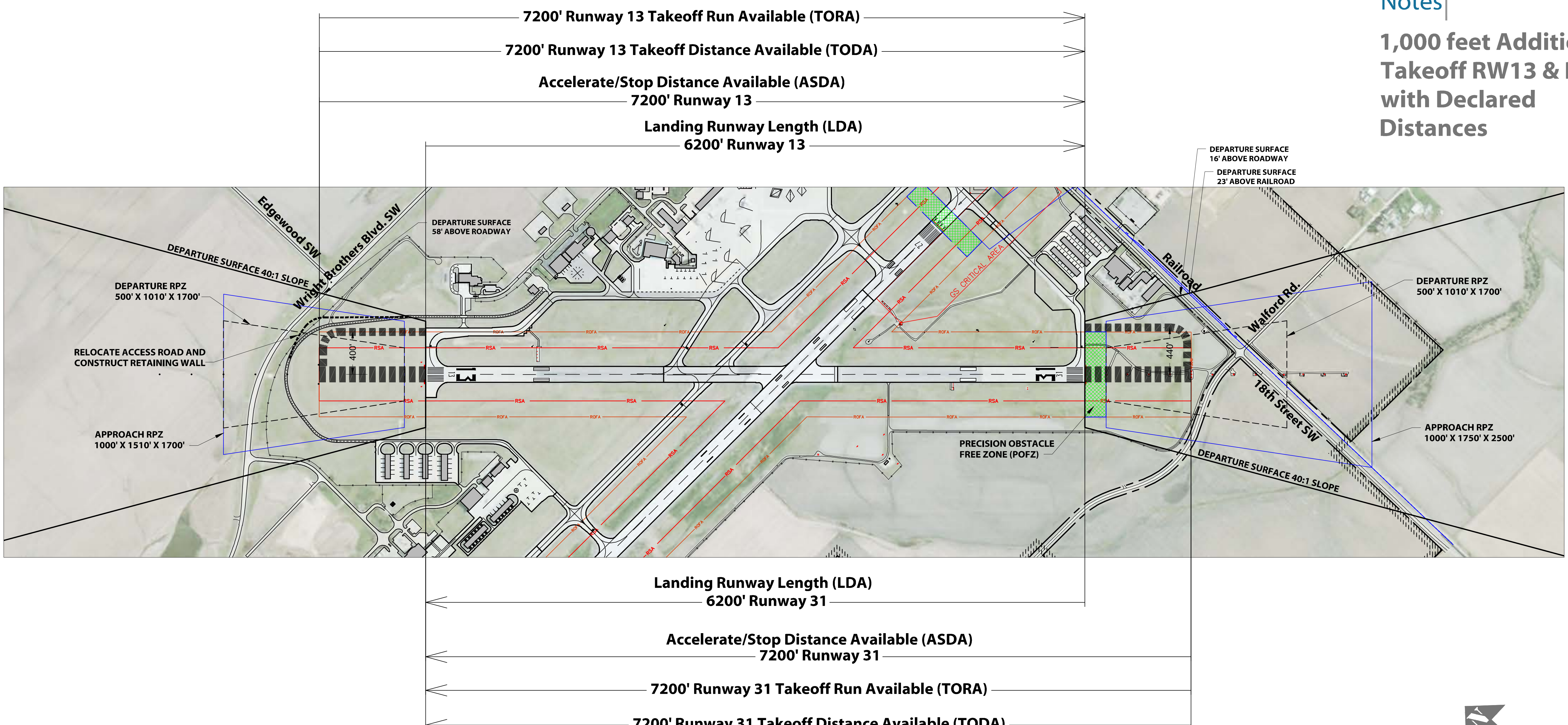
Table 5-2: Runway 13/31 Extension Alternative Two Declared Distances				
	Proposed Declared Distances (in feet)			
Runway	**Take-Off Run Available (TORA)**	**Take-Off Distance Available (TODA)**	**Accelerate Stop Distance Available (ASDA)**	**Landing Distance Available (LDA)**
Runway 13	7,200	7,200	7,200	6,200
Runway 31	7,200	7,200	7,200	6,200

Source: Mead & Hunt, Inc.

Notes: This alternative could potentially provide additional TORA and TODA in both directions up to the recommended takeoff length of 7,400 feet. This alternative could also provide additional LDA in both directions, however, the 6,200 feet is shown to reflect uncertainty with how the new FAA planning guidance on land uses (including roads) in RPZs will impact the ability to move the approach RPZ to accommodate the maximum LDA.

Notes

1,000 feet Additional Takeoff RW13 & RW31 with Declared Distances



Notes:
1. This option could potentially provide additional LDA, TORA & TODA in both directions. The estimated minimum LDA of 6,200 is shown to reflect uncertainty with how the new planning guidance will impact the ability to move the approach RPZ to accommodate the maximum LDA. In addition, approach obstruction could reduce the maximum LDA possible.

Figure 5.2
Runway 13/31 Extension Alternative Two

Image Source: Bing Aerial 2012

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5.2.3. Runway 13/31 Extension Alternative Three

Alternative Three includes a 1,200-foot extension to the north and the relocation of Wright Brothers Blvd. SW around the Runway 13 runway protection zone (RPZ). This alternative would provide additional length for Runway 13/31 without requiring the closure of any roads or railroads in the Airport vicinity. Total costs for implementing this alternative are estimated at $8.8 million. This alternative is presented in **Figure 5-3**.

- <u>Alternative Three Configuration and Requirements</u>
  - Runways 13/31 and parallel Taxiway "E" would both be extended 1,200 feet to the north to provide the recommended runway length of 7,400 feet.
  - A new relocated segment of Wright Brothers Blvd. SW, almost one mile in length, would be constructed around the Runway 13 RPZ.
  - The perimeter service road would be relocated around the extended RSA and ROFA.
  - The landing threshold and approach/departure RPZs for Runway 13 would both be relocated 1,200 feet to the north.

- <u>Alternative Three Advantages</u>
  - Enhances safety by providing the recommended runway length for Runway 13/31 operators.
  - Provides additional runway length with a standard runway extension, avoiding the use of declared distances.
  - Does not require the acquisition of additional land for implementation.

- <u>Alternative Three Disadvantages</u>
  - Requires a significant capital investment for the relocation of Wright Brothers Blvd. SW around the Runway 13 RPZ.
  - Requires redevelopment of the RNAV GPS instrument approach procedure for Runway 13.
  - Results in portions of the preferred future third runway and parallel taxiway within the Runway 13 RPZ (see Section 5.5.6).

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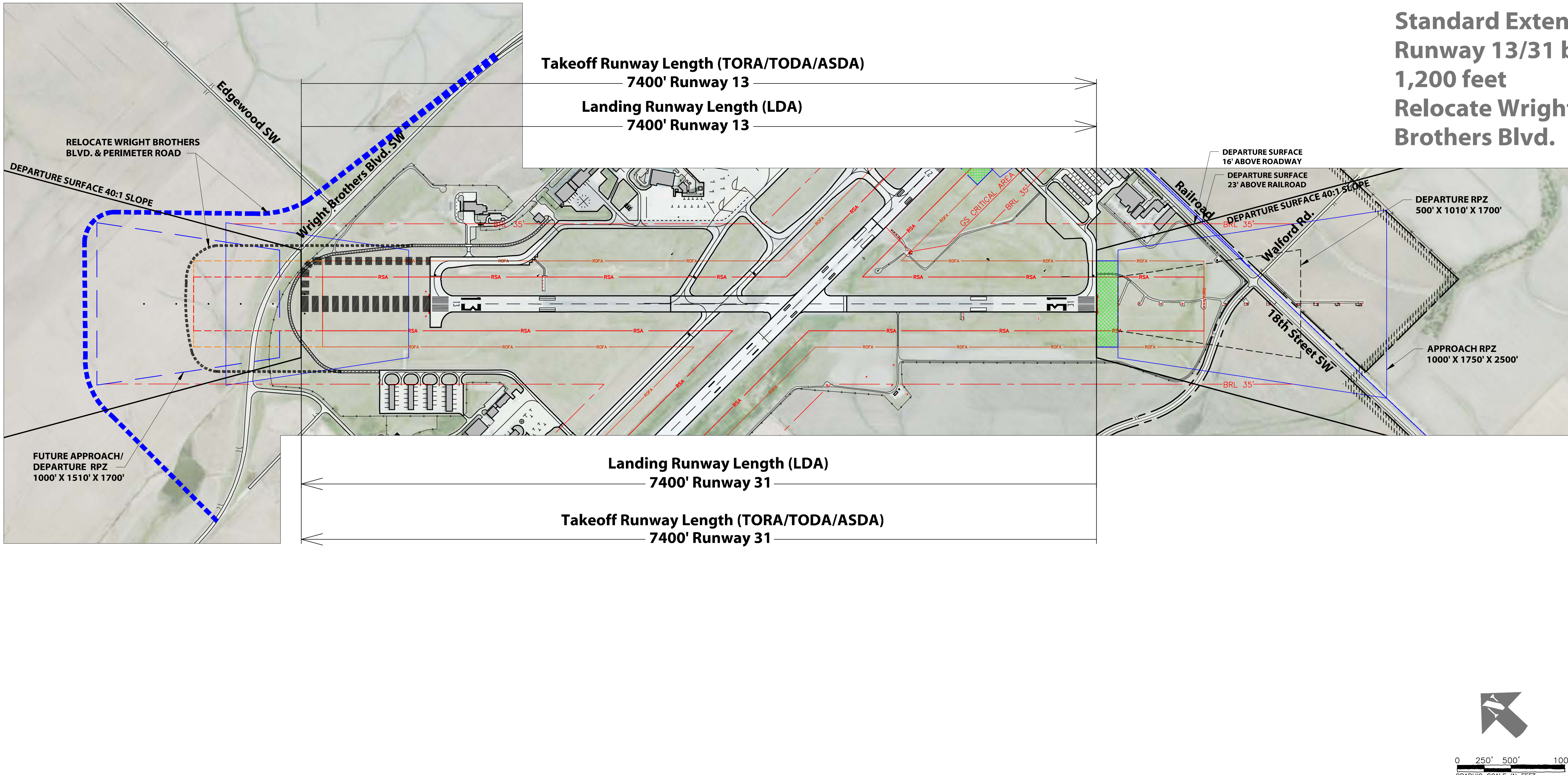

Notes

Standard Extension of Runway 13/31 by 1,200 feet
Relocate Wright Brothers Blvd.

Figure 5.3
Runway 13/31 Extension Alternative Three

Image Source: Bing Aerial 2012

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5.2.4. Runway 13/31 Extension Alternatives Comparison

Three alternatives for extending Runway 13/31 were considered in detail, and planning level cost estimates were developed for each. These three alternatives are compared in **Table 5-3**.

Table 5-3: Runway 13/31 Alternatives Comparison

Criterion	Alternative 1 Tunnel Wright Brothers	Alternative 2 Declared Distances	Alternative 3 Relocate Wright Brothers
Ultimate Runway Length	7,400 feet	8,200 feet	7,400 feet
Ultimate Takeoff Run and Takeoff Distance Available	7,400 feet	7,200 feet	7,400 feet
Ultimate Landing and Accelerate-Stop Distance Available	7,400 feet	6,200 feet	7,400 feet
Compatible with Future Parallel Runway (4,750' Separation)	No	Yes	No
Requires Redevelopment of RNAV GPS Approach	Yes	No	Yes
Planning-Level Cost Estimate	$43.9 million	$6.8 million	$8.8 million

Source: Mead & Hunt, Inc.

Alternatives 1 and 3 would provide the full 7,400-foot runway length recommended by the facility requirements analysis for both required takeoff and landing lengths, while Alternative 2 would not. However, Alternative 2 would provide almost as much runway length for takeoff; would not require the redevelopment of RNAV GPS approaches to either end of the runway; and would not result in the preferred future third runway and parallel taxiway within the Runway 13 RPZ (see Section 5.5.6).

Although there are currently public roads, a railroad, and above-ground utility infrastructure within several of the Airport's RPZs, these are existing conditions that are commonly "grandfathered" by the FAA. However, the Airport should be cautious when considering airfield changes or new land uses that will affect the size, shape, or location of its RPZs. Some FAA regions have begun to develop guidance that helps airports ensure that they have considered all possible alternatives that avoid incompatible land uses in RPZs, including roads.

Alternative 2 is recommended as the preferred Runway 13/31 extension alternative because it provides the greatest benefit in relation to its potential costs and impacts, and is the only alternative that is compatible with the preferred future third runway and parallel taxiway. Further discussion with FAA may reveal that longer declared distances than those depicted on Figure 5-2 may be possible in the future. However, based on the wind coverage analysis contained in Chapter 3, such an extension will not be eligible for FAA Airport Improvement Program (AIP) funding assistance because the existing 6,200-foot length is adequate for most C-II aircraft.

5.3 Taxiway "E" and "D" Improvements

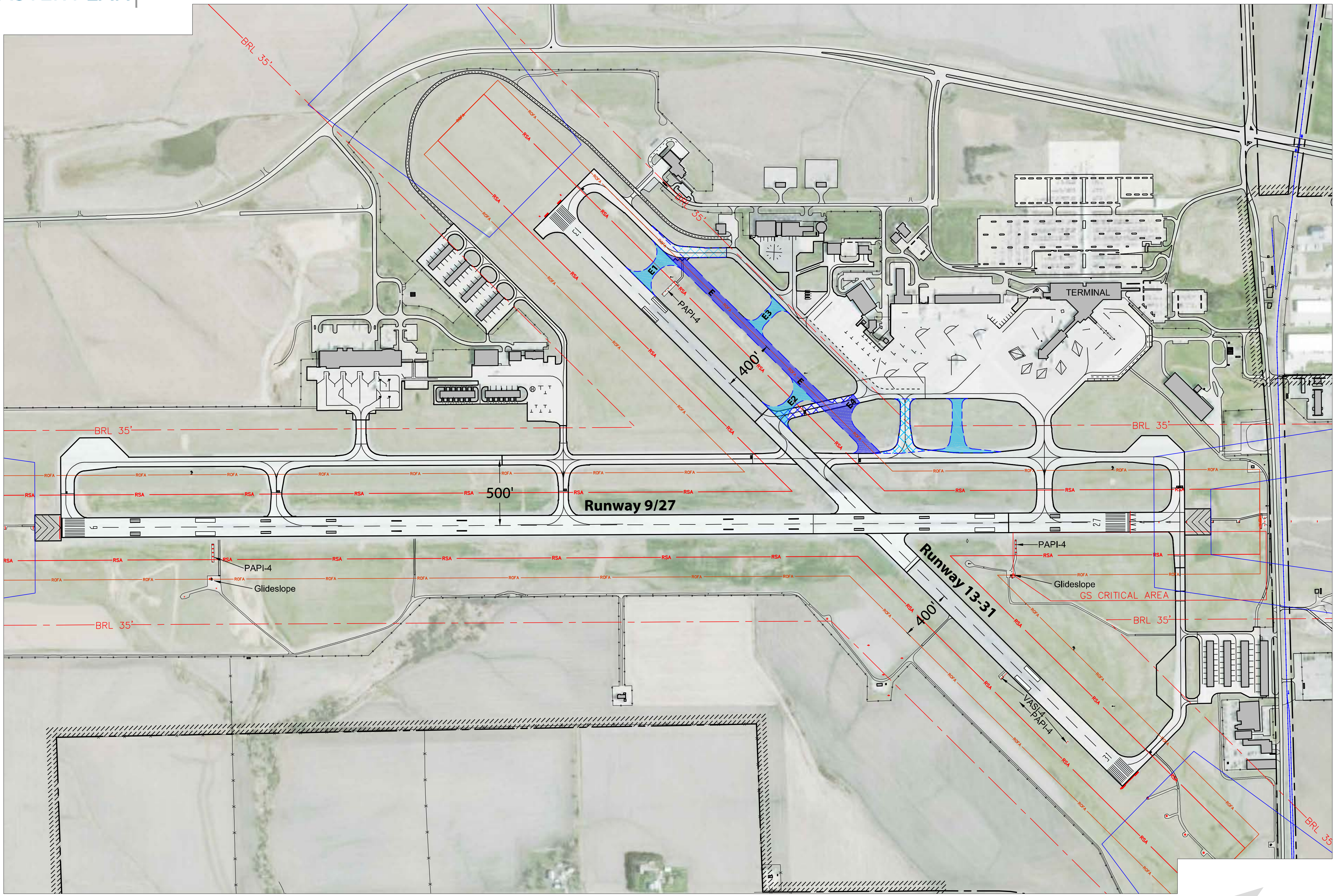
The Airport has previously identified improvements to Taxiways "E" and "D", which are the taxiways that serve the approach end of Runway 13, as a high priority short-term need. As part of the Master Plan process, improvements to taxiways were analyzed. The first option considered was an extension of Taxiway "E" running parallel to the full length of Runway 13/31. However, this option was considered unnecessary due to the geometric layout of the runway/taxiway system, which consists of an existing taxi route for commercial aircraft from the terminal apron to the departure end of Runway 31 by following Taxiway "A" and then Taxiway "C". Another consideration with the full parallel Taxiway "E" option is that the glideslope antenna for the ILS approach to Runway 27 would have to be relocated outside the Taxiway Object Free Area (TOFA).

Figure 5-4 presents the preferred configuration for these taxiways, as well as a phased approach to constructing these improvements.

- Taxiway Improvements - Phase 1
  - The existing portion of Taxiway "E", extending approximately 1,200 feet from the approach end of Runway 13, would be extended parallel to Runway 13/31 until the taxiway connects with Taxiway "A".
  - The existing connector taxiway labeled as Taxiway "B" would be removed and two new staggered 90 degree exit taxiway would be constructed connecting Runway 13/31 to Taxiway "E".
  - The two new staggered taxiways would be designated as "E2" and "E4".

- Taxiway Improvements - Phase 2
  - The existing pavement connecting Taxiway "E" and Taxiway "D" would be removed. Taxiway "D" would effectively become a "taxilane" for accessing general aviation hangars.
  - Connector Taxiway "A4" would be relocated approximately 500 feet to the east to minimize potential conflicts with the intersection of Taxiways "A" and "E".
  - A new exit taxiway labeled Taxiway "E1" would be constructed.
  - A new connector taxiway labeled Taxiway "E3" would be constructed.

These improvements would enhance safety by providing partial parallel taxiway to Runway 13/31 and requiring aircraft to make 90-degree turns per FAA geometric recommendations described in Advisory Circular (AC) 150/5300-13A, *Airport Design*. These improvements would also enhance safety by providing additional aircraft and vehicle routes, which would reduce the number of aircraft and vehicles crossing Hot Spot 1 as identified by the FAA Runway Safety Action Team (RSAT) at the intersection of Taxiway "A" and Runway 13/31.



Notes

Taxiway "E" and "D" Improvements

Phase 1

Phase 2

Figure 5.4
Taxiway "E" and "D" Improvements

Image Source: Bing Aerial 2012

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5.4 Taxiway “B” Concept

The Airport has previously identified the need for a full-length parallel taxiway on the southwest side of Runway 13/31. This taxiway has historically been labeled as Taxiway “B” on the Airport Layout Plan and shown at a 400-foot separation from Runway 13/31. It is recommended that consideration be given to the construction of this taxiway in two phases. Phase 1 would extend from the end of Runway 13 to the southeast until the taxiway intersects with Taxiway “A”. Phase 2 would then be the extension of the taxiway to the southwest, across Runway 9/27 to the end of Runway 31. Phase 2 of Taxiway “B” is likely a long-term need but would serve to open the south side of the Airport to aviation-related development as shown in **Figure 5-5**.

- Taxiway “B” Concept Phase 1
  - The initial phase of Taxiway “B” would extend from the future end of Runway 13 to Taxiway “A” with an increase in the runway/taxiway separation from 400 feet to 440 feet (see reasoning for increased separation under Phase 2 below).
  - This phase would also include construction of a connection to the general aviation apron designated as “B2” and one additional connector to Runway 13/31 designated as “B3”. Taxiway “B3” would serve as an exit taxiway for aircraft landing Runway 31 that need to access aircraft parking areas located to the west of Runway 13/31.

- Taxiway “B” Concept Phase 2
  - In the second phase, Taxiway “B” would be extended to the future end of Runway 31 with an increase in the runway/taxiway separation from 400 feet to 440 feet in order to avoid aircraft taxiing in the Precision Obstacle Free Zone (POFZ) for the instrument approach to Runway 13.
  - This phase would also include the construction of two additional connections to Runway 13/31 designated as “B4” and “B5”. Taxiway “B4” would serve as an exit taxiway for aircraft landing Runway 13 while Taxiway “B5” would provide access to the start of the take-off only portion of Runway 31.

The Phase 1 improvements would increase airfield capacity by providing two additional exit taxiway points for aircraft landing on Runway 31, thereby preventing these aircraft from having to taxi to the end of the runway in order to exit. According to FAA AC 150/5300-13A, Taxiways “B4” and “B5” will capture approximately 7 percent and 63 percent of large aircraft, respectively, under dry runway conditions. The combination of Phases 1 and 2 would also enhance operational safety by providing a full-length parallel taxiway to Runway 13/31. As mentioned previously, this concept would also allow for potential future aviation-related development on the south side of the Airport.

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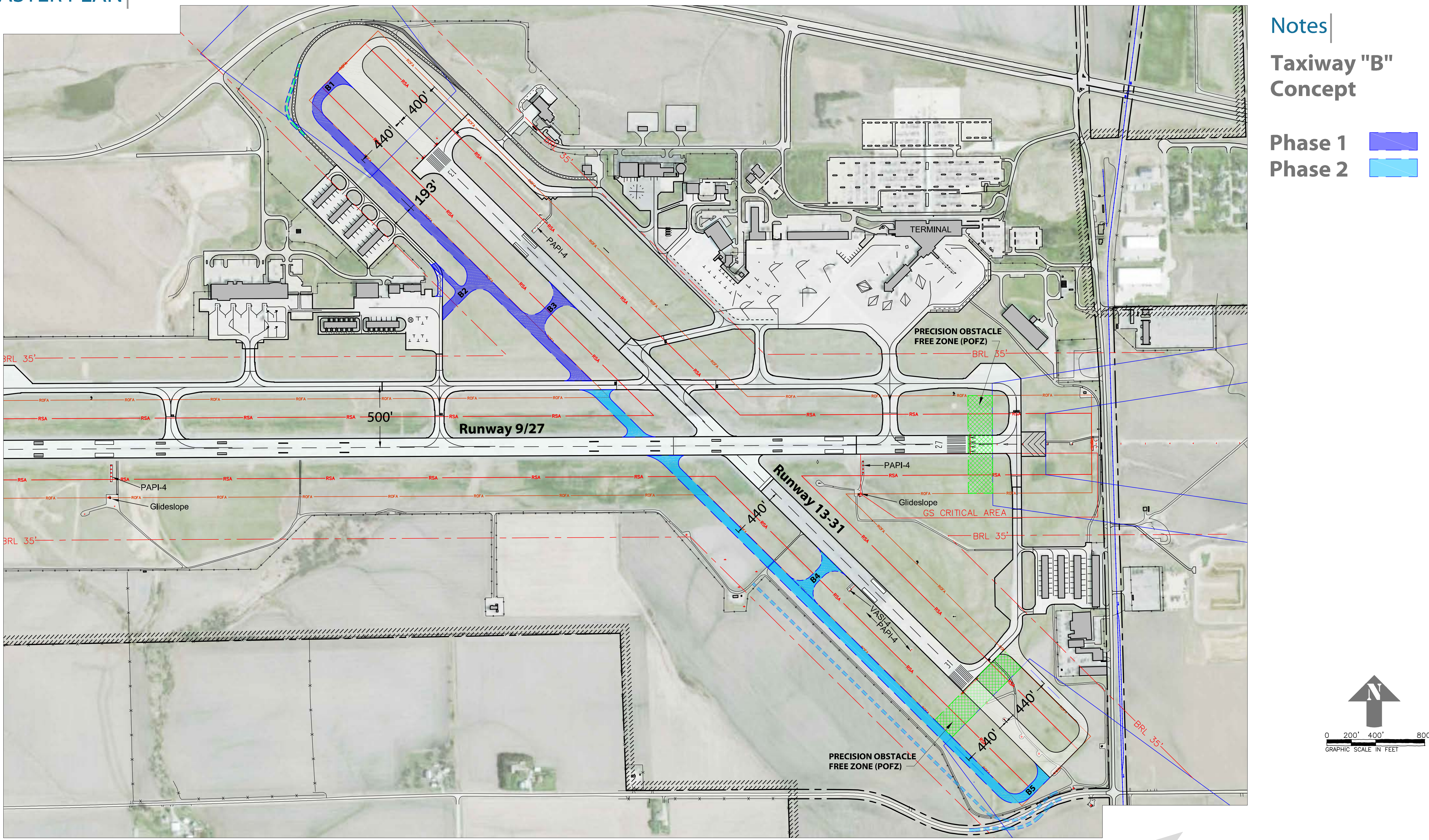

Figure 5.5
Taxiway "B" Concept

Image Source: Bing Aerial 2012

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5.5 Future Parallel Runway Alternatives

As explained in Chapter 3, CID has historically reserved space north of Wright Brothers Blvd. SW for the future construction of a parallel runway to Runway 9/27. The purpose and need for this parallel runway is to increase airfield capacity when aircraft operations reach a level at which aircraft delays become unacceptable. It is important to note that aircraft operations at the Airport are not expected to reach these capacity-constrained levels within the 20-year planning period. However, prudent planning principles dictate that the Airport should continue to reserve space for this runway in the event that operations increase at a more rapid rate than projected in the aviation activity forecasts.

Several alternatives for this third runway were developed, each of which considers a different runway-to-runway separation. The distance separating parallel runway facilities at an airport has a number of implications, as presented in **Table 5-4** below. Separations of less than 3,500 feet will be considered by FAA in some situations; however, given existing airfield equipment and facilities, forecasted aviation activity, and the purpose of past planning for a future parallel runway at the Airport, a separation of less than 3,500 feet is not considered practical or feasible for a future parallel runway.

Consideration was given to siting the third runway at four different separations from existing Runway 9/27 and the implications of each. In the following alternatives, separation distances of 5,000 feet, 4,300 feet 3,635 feet, and 4,750 feet are considered.

Table 5-4: Parallel Runway Separations and Implications

Separation Distance	Weather Conditions	Maximum Capacity		FAA Guidance
		Approaches?[1]	Departures?[2]	
5,000 feet	IFR/VFR	Yes	Yes	Preferred parallel runway separation, if practical
4,300 feet	IFR/VFR	Yes	Yes	Typical minimum approval threshold for "dual simultaneous precision instrument approaches"
3,500 feet	All	Potentially	Yes	Simultaneous non-radar departures.[3]
3,000 feet	IFR/VFR	Potentially	Yes	Special approval threshold for "dual simultaneous precision instrument approaches" (may require special high update radar, monitoring equipment, etc.)
2,500 feet	VFR Only	No	No	Avoids capacity inefficiencies when wake turbulence is a factor.
2,500 feet	All	No	No	Simultaneous radar departures.
2,500 feet	All	No	No	Simultaneous radar-controlled approaches and departures with non-staggered thresholds (separation requirement can vary depending on traffic flow.
1,200 feet	VFR Only	No	No	Recommendation for simultaneous landings and takeoffs on larger runways.
700 feet	VFR Only	No	No	Recommendation for simultaneous landings and takeoffs.

Source: FAA Advisory Circular 150/5300-13A, Airport Design

[1] *Allows for dual simultaneous precision instrument approaches.*

[2] *Allows for simultaneous non-radar departures.*

[3] *Requires further study by the FAA. The reduced separation may require special high update radar, monitoring equipment, etc.*

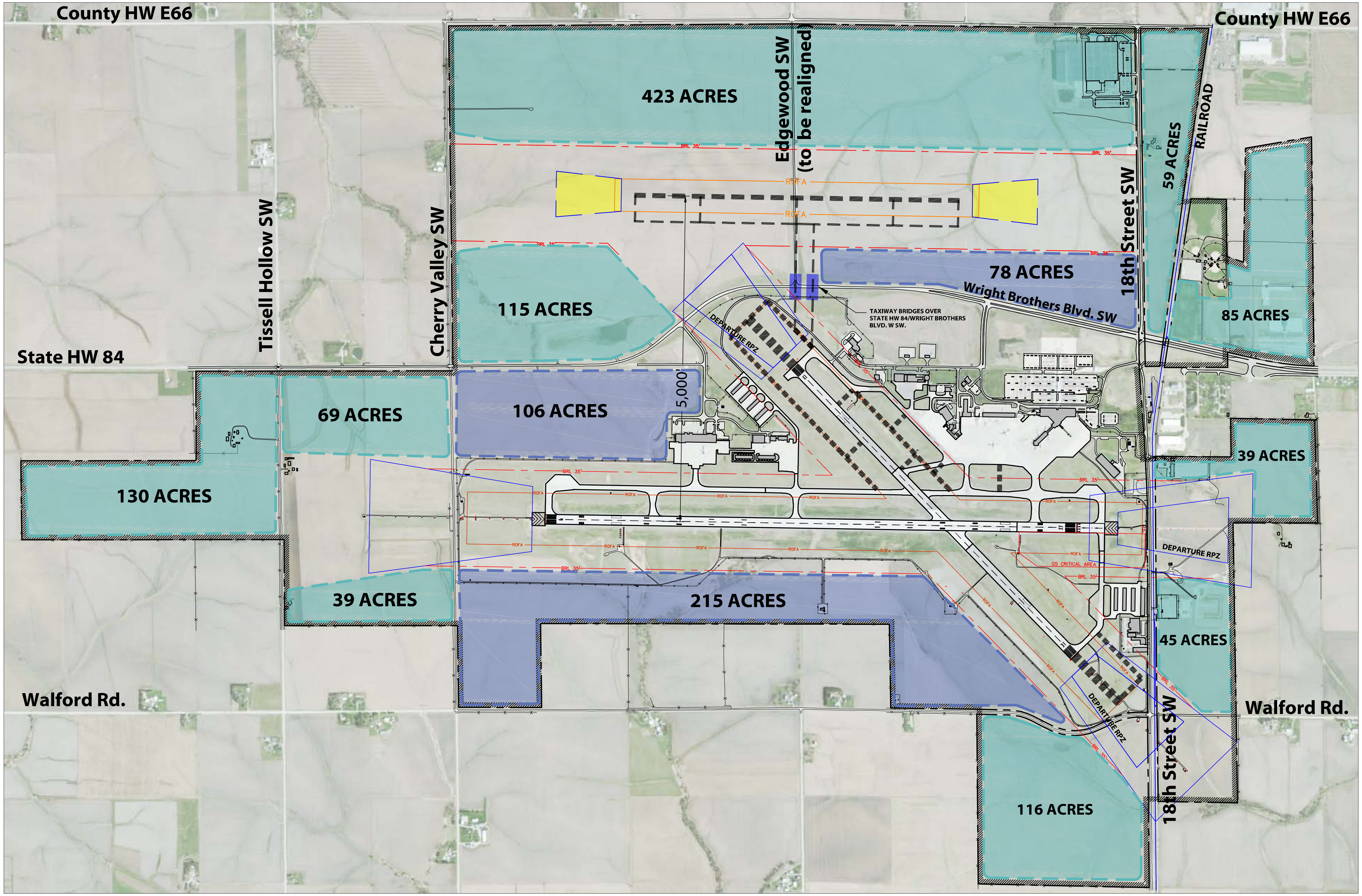
5.5.1. Third Runway Alternative 1A

Third Runway Alternative 1A includes a future 5,000-foot by 75-foot parallel runway with visual (or not lower than one-mile) instrument approach minimums to each end. The runway is sited at a runway-to-runway separation of 5,000 feet from existing Runway 9/27. This alternative is designed to relieve general aviation and corporate aviation traffic from the dual primary runway system that accommodates commercial service aircraft at the Airport. This alternative is presented in **Figure 5-6**.

- <u>Alternative 1A Configuration and Requirements</u>
  - Runway 9/27 would be maintained in its current configuration and re-designated as Runway 9R/27L.
  - Runway 13/31 would be improved as recommended in previous sections of this Chapter, with takeoff-only extensions at each end of the runway and the addition of Taxiway “E” and “B” improvements.
  - The new Runway 9L/27R would be designed as a *general aviation* type runway with a Runway Reference Code (RRC) of B-II and visual (or not lower than one-mile) approaches to both runway ends.
  - In accordance with FAA AC 5300-13A, the parallel runways would be separated by the recommended 5,000 feet to allow for future simultaneous IFR approaches.
  - The closure of Edgewood Road SW and taxiway bridges over Wright Brothers Blvd. SW would be required. Runway 9L/27R would also be served by a full-length parallel taxiway at a runway-to-taxiway separation of 400 feet.
  - Runway 9L/27R and its associated parallel taxiway would be sited to allow for a future lengthening, widening, and approach upgrade to accommodate large commercial service type aircraft.
  - Provides for approximately 423 acres of non-aviation related development area north of the third runway.

- <u>Alternative 1A Advantages</u>
  - Increases Airport capacity by providing a reliever runway for most general aviation and corporate aircraft.
  - Allows for a future lengthening, widening, and approach upgrade of Runway 9L/27R to accommodate large commercial service aircraft.
  - With the exception of the closure of Edgewood Road SW, all existing roadways in the Airport vicinity would be maintained in their current configuration.

- <u>Alternative 1A Disadvantages</u>
  - Requires a significant capital investment in a third runway and taxiway bridges over Wright Brothers Blvd. SW.
  - Runway length does not accommodate the performance requirements of large commercial service type aircraft.



Notes

Parallel Runway

- 5,000' x 75'
- RRC B-II
- Full Parallel Taxiway
- Visual or Not Lower Than 1-mile Approaches
- Roadway Tunnel at Connector Taxiways

AVIATION RELATED DEVELOPMENT AREA (399 acres)
NON-AVIATION RELATED DEVELOPMENT AREA (1120 acres)
BRL 35' BUILDING RESTRICTION LINE
ROFA RUNWAY OBJECT FREE AREA

N

Figure 5.6
Third Runway Alternative 1A

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5.5.2. Third Runway Alternative 1B

Third Runway Alternative 1B is essentially the same as Alternative 1A with one notable exception, which is that the runway would be designed as capable of accommodating large commercial service aircraft with precision approaches to both runway ends. The upgrade to a commercial service type runway would require the closure of a portion of Cherry Valley Road SW and the acquisition of an additional 94 acres of land for the approach RPZ to Runway 9L. This alternative is presented in **Figure 5-7**.

- Alternative 1B Configuration and Requirements
  - Runway 9/27 would be maintained in its current configuration and re-designated as Runway 9R/27L.
  - Runway 13/31 would be improved as recommended in previous sections of this Chapter, with takeoff-only extensions at each end of the runway and the addition of Taxiway "E" and "B" improvements.
  - The new Runway 9L/27R would be designed as a *commercial service* type runway upgrade with a Runway Reference Code (RRC) of D-IV and precision approaches to both ends.
  - In accordance with FAA AC 5300-13A, the parallel runways would be separated by the recommended 5,000 feet to allow for future dual simultaneous IFR approaches.
  - The closure of Edgewood Road SW and taxiway bridges over Wright Brothers Blvd. SW would be required. The closure of a portion of Cherry Valley Road SW would also be required to provide an FAA-compliant Runway 9L RPZ.
  - Runway 9L/27R would also be served by a full-length parallel taxiway at a runway-to-taxiway separation of 400 feet.
  - This alternative would require the acquisition of approximately 94 acres of land for the future Approach RPZ to Runway 9L.
  - Provides for approximately 423 acres of non-aviation related development area north of the third runway.

- Alternative 1B Advantages
  - Increases airport capacity by providing a reliever runway for both general aviation and commercial service aircraft.
  - Allows for dual simultaneous approaches to and departures from Runways 9R/27L and 9L/27R.
  - With the exception of the closure of Edgewood Road SW and a portion of Cherry Valley Road SW, all other existing roadways in the airport vicinity are maintained in their current configuration.

- Alternative 1B Disadvantages
  - Requires a significant capital investment in a third runway and taxiway bridges over Wright Brothers Blvd. SW.
  - Requires acquisition of 94 acres of land within the Runway 9L RPZ.

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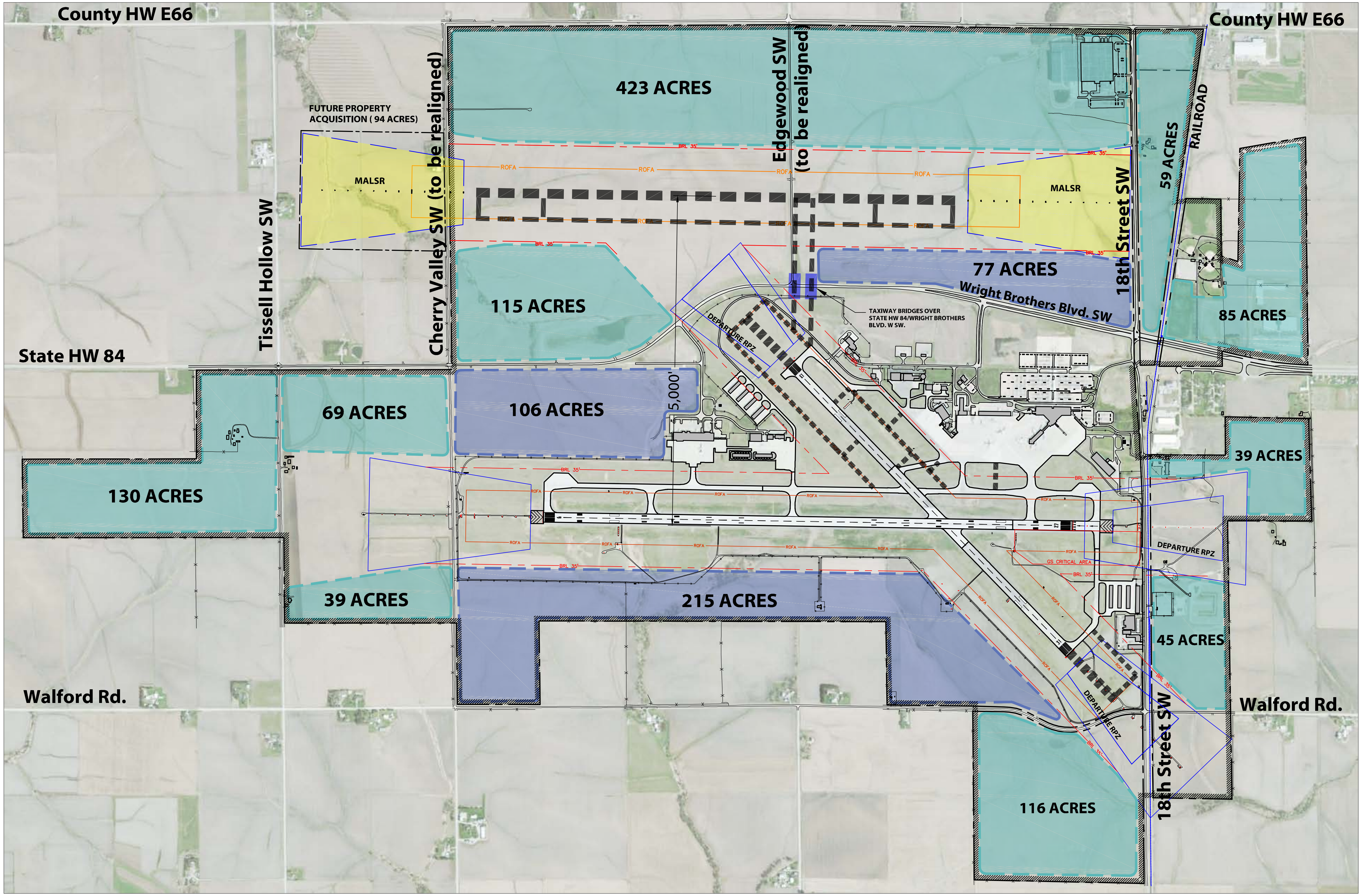

Notes

Parallel Runway

- 7,400' x 150'
- RRC C/D-IV
- Full Parallel Taxiway (400' Separation)
- Precision Approaches w/MALSR
- Roadway Tunnel at Connector Taxiways

Figure 5.7
Third Runway Alternative 1B

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5.5.3. Third Runway Alternative 2

Third Runway Alternative 2 includes a commercial service type parallel runway facility at a runway-to-runway separation of 4,300 feet from existing Runway 9/27. According to FAA AC 5300-13A, 4,300 feet is the minimum separation for dual simultaneous IFR approaches. This alternative is presented in **Figure 5-8**.

- Alternative 2 Configuration and Requirements
  - Runway 9/27 would be maintained in its current configuration and re-designated as Runway 9R/27L.
  - Runway 13/31 would be improved as recommended in previous sections of this Chapter, with takeoff-only extensions at each end of the runway and the addition of Taxiway “E” and “B” improvements.
  - The new Runway 9L/27R would be designed as a *commercial service* type runway with a Runway Reference Code (RRC) of D-IV and precision approaches to both ends.
  - In accordance with FAA AC 5300-13A, the parallel runways would be separated by the minimum 4,300 feet to allow for future dual simultaneous IFR approaches.
  - The closure of Edgewood Road SW and taxiway bridges over Wright Brothers Blvd. SW would be required. The closure of a portion of Cherry Valley Road SW would also be required for an FAA-compliant Runway 9L RPZ.
  - Runway 9L/27R would be served by a full-length parallel taxiway at a runway-to-taxiway separation of 400 feet.
  - This alternative would include the acquisition of approximately 94 acres of land within the Runway 9L RPZ.
  - Provides for approximately 595 acres of non-aviation related development area north of the third runway.

- Alternative 2 Advantages
  - Minimizes capital investment in the third runway by locating it as close to existing Runway 9/27 as possible while still allowing for dual simultaneous instrument approaches.
  - Increases airport capacity by providing a reliever runway for both general aviation and commercial service aircraft.
  - With the exception of the closure of Edgewood Road SW and a portion of Cherry Valley Road SW, all other existing roadways in the airport vicinity are maintained in their current configuration.

- Alternative 2 Disadvantages
  - Requires a significant capital investment in a third runway and taxiway bridges over Wright Brothers Blvd. SW.
  - Requires acquisition of 94 acres of land within the Runway 9L RPZ.
  - Results in portions of the third runway and parallel taxiway within the Runway 13 RPZ.

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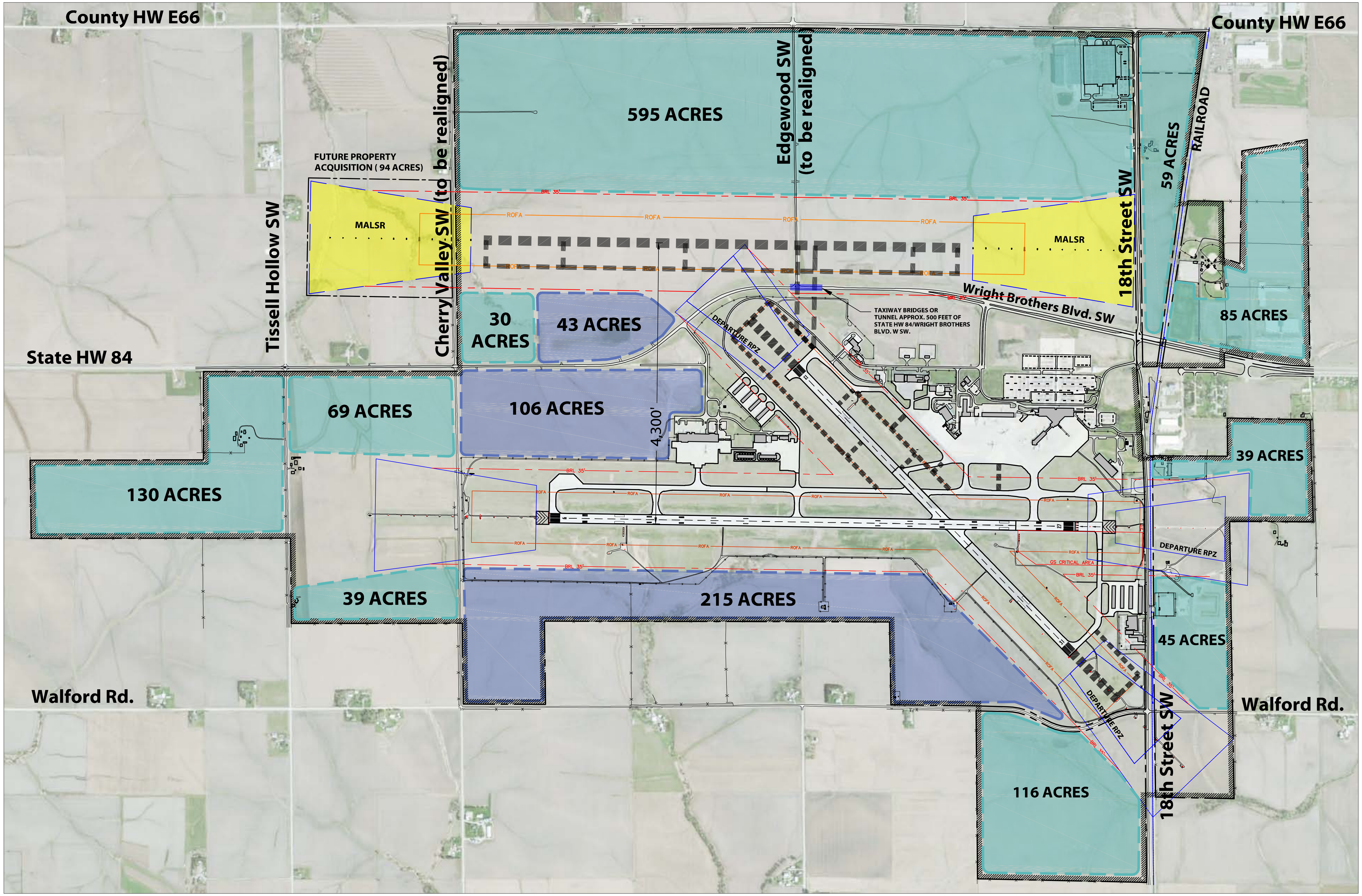

Notes

Parallel Runway
- 7,400 ' x 150'
- RRC C/D-IV
- Full Parallel Taxiway
- Precision Approaches w/MALSR

Figure 5.8
Third Runway Alternative 2

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5.5.4. Third Runway Alternative 3

Third Runway Alternative 3 is essentially the same as Alternative 2 except that the third runway would have a runway-to-runway separation of 3,635 feet rather than the FAA minimum required separation of 4,300 feet for dual simultaneous approaches. According to FAA AC 5300-13A, the FAA will consider on a case-by-case basis whether to allow dual simultaneous approaches utilizing separations down to a minimum of 3,000 feet where a 4,300-foot separation is impractical; however, the reduced separation requires special high update radar and monitoring equipment. The 3,635-foot separation would also exceed the FAA minimum of 3,500 feet for simultaneous non-radar departures. This alternative is presented in **Figure 5-9**.

- Alternative 3 Configuration and Requirements
  - Runway 9/27 would be maintained in its current configuration and is re-designated as Runway 9R/27L.
  - Runway 13/31 would be improved as recommended in previous sections of this Chapter, with takeoff-only extensions at each end of the runway and the addition of Taxiway "E" and "B" improvements.
  - The new Runway 9L/27R would be designed as a *commercial service* type runway with a Runway Reference Code (RRC) of D-IV and precision approaches to both ends.
  - In accordance with FAA AC 5300-13A, the parallel runways would be separated by 3,635 feet to potentially allow for future dual simultaneous IFR approaches. However, this reduced separation may require special radar/monitoring equipment if dual simultaneous IFR approaches are desired.
  - The closure of a portion of Edgewood Road SW would be required, and the closure of a portion of Cherry Valley Road SW is required.
  - The closure of a portion Wright Brothers Blvd. SW would also be required and approximately 3,800 feet of Wright Brothers Blvd. SW would have to be relocated to maintain access to the Airport's passenger terminal area.
  - Runway 9L/27R would be served by a full-length parallel taxiway at a runway/taxiway separation of 400 feet.
  - This alternative would include the acquisition of approximately 94 acres of land for the Runway 9L RPZ.
  - Provides for approximately 757 acres of non-aviation related development area north of the third runway.

- Alternative 3 Advantages
  - Increases Airport capacity by providing a reliever runway for both general aviation and commercial service aircraft.
  - Potentially allows for future dual simultaneous approaches and departures from Runways 9/27 and 9L/27.
  - Does not require the construction of a tunnel or taxiway bridges for taxiway access to the third runway.
  - Reduces the required taxiway length to connect the third runway to Taxiway "E" by approximately 1,365 feet compared to Alternative 2.

- Alternative 3 Disadvantages
  - Requires a closure of a portion of three roadways including Edgewood Road SW, Cherry Valley Road SW and Wright Brothers Blvd. SW as well as the relocation of 3,800 feet of Wright Brothers Blvd. SW to maintain access to the Airport's terminal area.
  - Significantly constrains the ability to expand vehicle parking in the airport passenger terminal area.
  - Requires a significant capital investment in a third runway and relocation of 3,800 feet of Wright Brothers Blvd. SW.
  - Requires acquisition of 94 acres of land within the Runway 9L RPZ.
  - May require special radar/monitoring equipment for dual simultaneous approaches.
  - Results in portions of the third runway and parallel taxiway within the Runway 13 RPZ.

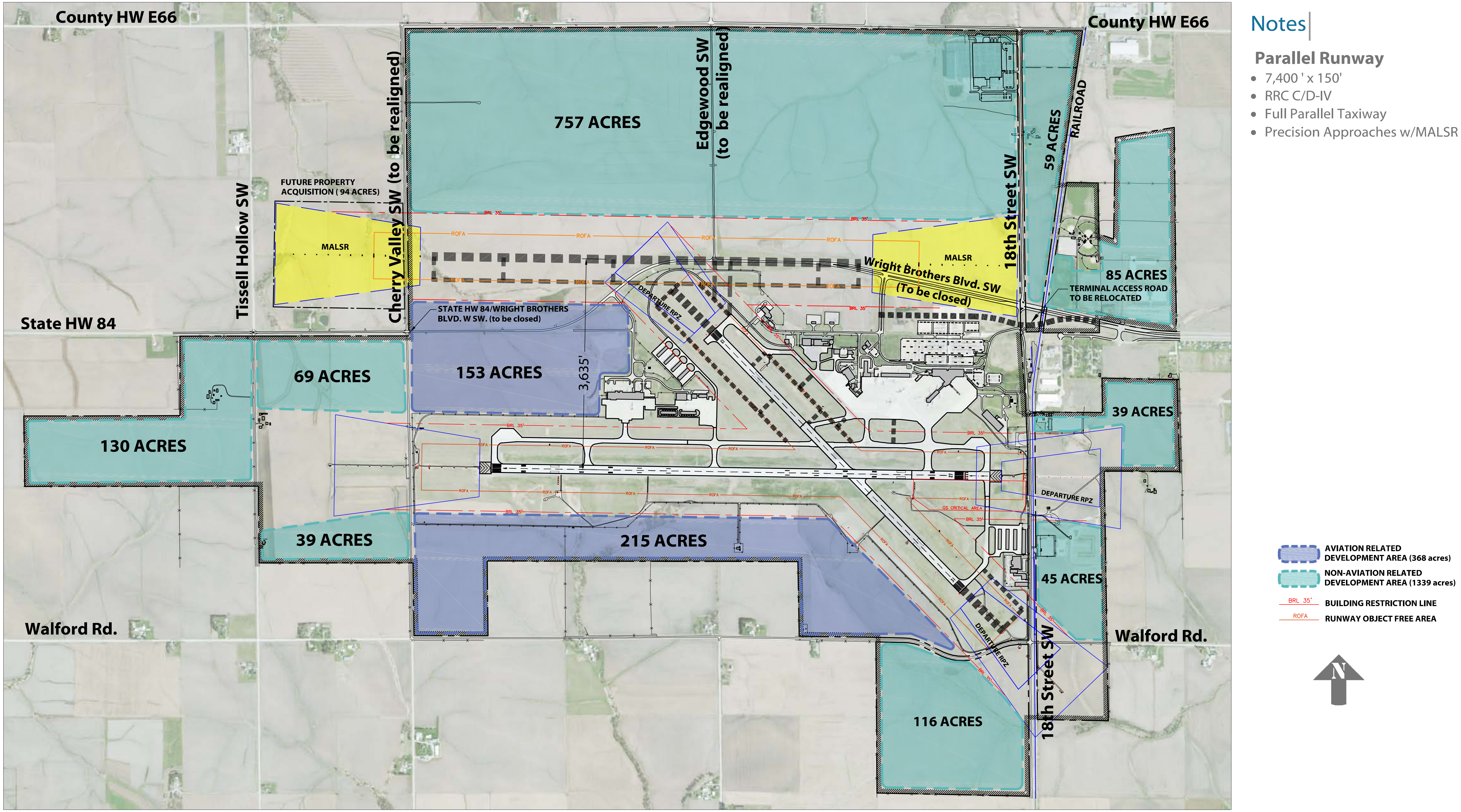

Figure 5.9

Third Runway Alternative 3

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5.5.5. Third Runway Alternative 4

Third Runway Alternative 4 is essentially the same as Alternative 2 except that the third runway would have a runway-to-runway separation of 4,750 feet from existing Runway 9/27. This is the minimum parallel runway separation distance that does not result in portions of the third runway and parallel taxiway within the Runway 13 RPZ. This alternative is presented in **Figure 5-10**.

- Alternative 4 Configuration and Requirements
  - Runway 9/27 would be maintained in its current configuration and re-designated as Runway 9R/27L.
  - Runway 13/31 would be improved as recommended in previous sections of this Chapter, with takeoff-only extensions at each end of the runway and the addition of Taxiway “E” and “B” improvements.
  - The new Runway 9L/27R would be designed as a *commercial service* type runway with a Runway Reference Code (RRC) of D-IV and precision approaches to both ends.
  - The parallel runways would be separated by more than the minimum 4,300 feet to allow for future dual simultaneous IFR approaches.
  - The closure of Edgewood Road SW and taxiway bridges over Wright Brothers Blvd. SW would be required. The closure of a portion of Cherry Valley Road SW would also be required for an FAA-compliant Runway 9L RPZ.
  - Runway 9L/27R would be served by a full-length parallel taxiway at a runway-to-taxiway separation of 400 feet.
  - This alternative would include the acquisition of approximately 94 acres of land within the Runway 9L RPZ.
  - Provides for approximately 497 acres of non-aviation related development area north of the third runway.

- Alternative 4 Advantages
  - Minimizes capital investment in the third runway by locating it as close to existing Runway 9/27 as possible while still allowing for dual simultaneous instrument approaches and not resulting in portions of the third runway and parallel taxiway within the Runway 13 RPZ.
  - Increases airport capacity by providing a reliever runway for both general aviation and commercial service aircraft.
  - With the exception of the closure of Edgewood Road SW and a portion of Cherry Valley Road SW, all other existing roadways in the airport vicinity are maintained in their current configuration.

- Alternative 4 Disadvantages
  - Requires a significant capital investment in a third runway and taxiway bridges over Wright Brothers Blvd. SW.
  - Requires acquisition of 94 acres of land within the Runway 9L RPZ.

5.5.6. Third Runway Alternatives Summary

The four parallel runway alternatives are compared in **Table 5-5**. Evaluation of each separation scenario presumes an ultimate parallel runway length of 7,400 feet, ultimate use by commercial service aircraft, and ultimate implementation of precision approaches to both runway ends.

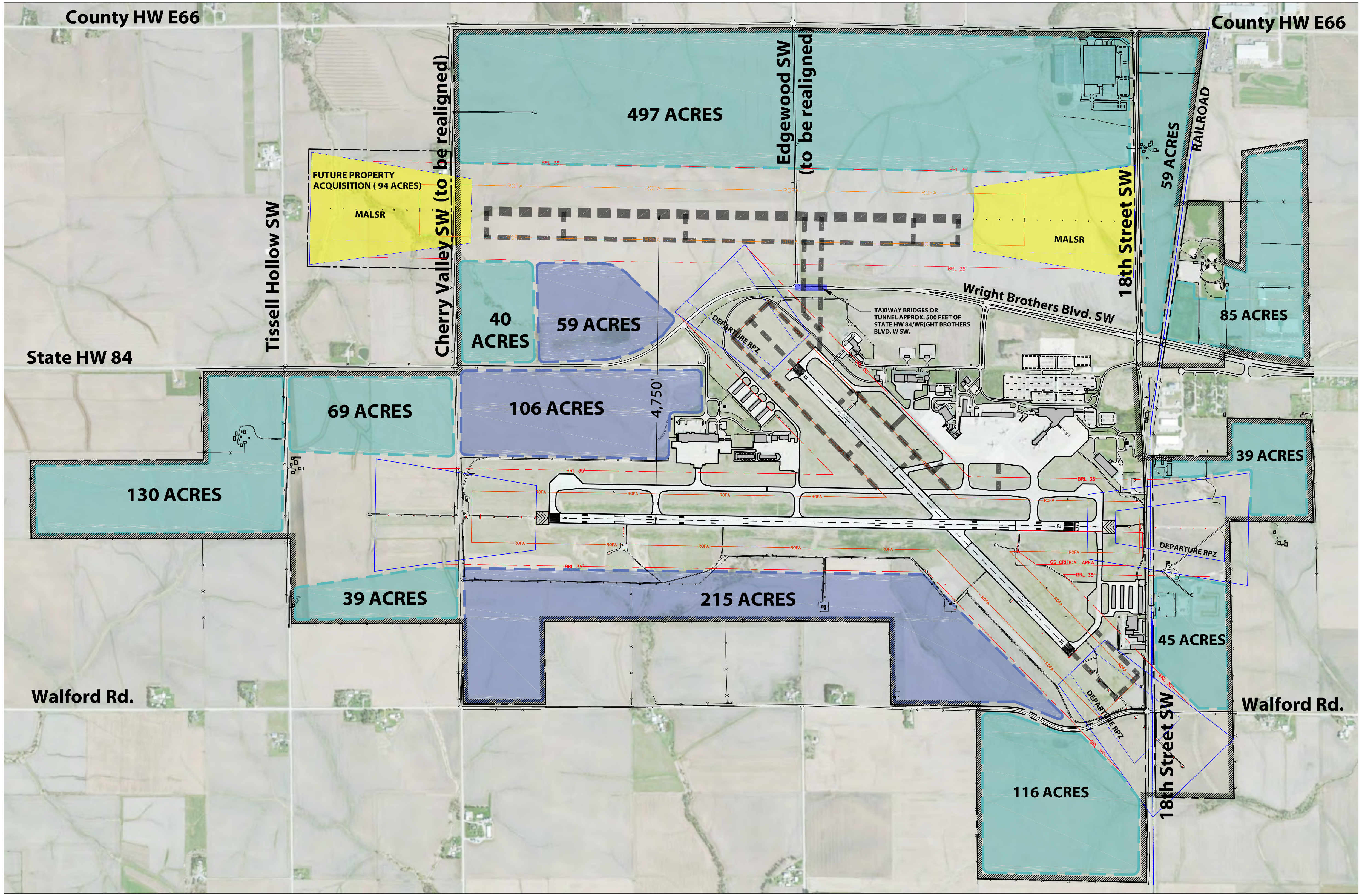
Table 5-5: Parallel Runway Alternatives Comparison

Criterion	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Parallel Runway Separation	5,000 feet	4,300 feet	3,635 feet	4,750 feet
Road Closures	Edgewood and Cherry Valley[1]	Edgewood and Cherry Valley	Edgewood, Cherry Valley, and Wright Bros	Edgewood and Cherry Valley
Taxiway Bridges over Wright Brothers	Required	Required	Not Required (Wright Bros Closed)	Required
Land Acquisition	94 acres[1]	94 acres	94 acres	94 acres
Non-Aviation Related Development Area north of third runway	423 acres	595 acres	757 acres	497 acres
Portions of Runway and Parallel Taxiway Within Runway 13 RPZ	No	Yes	Yes	No

Source: Mead & Hunt, Inc.

[1] *Closure of Cherry Valley Road and acquisition of 94 acres only required for Alternative 1B and not Alternative 1A.*

The recommended alternative for the provision of a third runway at CID is Third Runway Alternative 4 with a runway-to-runway separation of 4,750 feet. This alternative protects for dual simultaneous instrument approaches to existing Runway 9/27 and the future parallel runway, avoids portions of the runway and parallel taxiway within the Runway 13 RPZ, and provides the best balance of aviation and non-aviation related developable land.



Notes

Parallel Runway

- 7,400 ' x 150'
- RRC C/D-IV
- Full Parallel Taxiway
- Precision Approaches w/MALSR

AVIATION RELATED DEVELOPMENT AREA (364 acres)
NON-AVIATION RELATED DEVELOPMENT AREA (1109 acres)
BRL 35' BUILDING RESTRICTION LINE
ROFA RUNWAY OBJECT FREE AREA

N

Figure 5.10
Third Runway Alternative 4

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5.6 General Aviation Aircraft Storage

Table 5-6 below shows the type of tie-down and hangar facilities that will be needed to meet projected demand for aircraft storage in each five-year development phase. It is expected that most based aircraft owners will desire some type of indoor storage facility. The type of hangar storage facility is identified as either T-hangars/clear span hangars or larger executive/corporate hangars, although the actual number, size, and location of these hangars will depend on user needs and financial feasibility. However, it is assumed that increased area for the construction of based aircraft hangars will be critical and that the demand for additional aircraft parking apron will increase, but will not likely exceed the amount of parking apron currently in place.

Table 5-6: Aircraft Storage Requirements Forecast

Facility	Total Number Required				
	2011[1]	2016	2021	2026	2031
Total Aircraft Tie Downs	20	31	33	36	38
Additional Tie Downs Needed	**7**	**11**	**13**	**16**	**18**
Total Number of Aircraft in T-Hangars	116	134	153	174	201
Additional T-Hangars Needed	**0**	**18**	**37**	**58**	**85**
Total Number of Aircraft in Exec/Corp Hangars	25	28	31	37	42
Additional Exec/Corp Hangars Needed	**0**	**3**	**6**	**12**	**17**

Source: Mead & Hunt, Inc., Projections based on criteria from Advisory Circular 150/5300-13A, Airport Design. [1]Actual

Hangar expansion areas currently depicted on the Airport Layout Plan (ALP) include additional T-hangars in the existing Northwest T-hangar Area; a new area of T-hangars and corporate hangars to the immediate east of the new ARFF building; and a new area of T-hangars and corporate hangars north of Wright Brothers Boulevard SW and south of the future parallel runway. However, because this Master Plan Update is recommending a reduction in the separation of the future runway from existing Runway 9/27, the hangar expansion area shown south of the future parallel runway is no longer viable. In addition, discussion with Airport staff indicates that aircraft access to the hangar area depicted east of the ARFF building would be problematic. For these reasons, new hangar locations and layouts were developed to accommodate future hangar demand at CID.

Three distinct hangar expansion concept areas developed for this Master Plan are depicted in **Figure 5-11**. The approximate number of new hangar units that can be provided at each of these concept areas are summarized in **Table 5-7**.

Table 5-7: Future Hangar Expansion Area Capacities

Hangar Location	T-Hangar Units	Corporate Hangars
West GA Campus	42	5
Former ARFF Site	0	2
Long-Term Southeast GA Hangars	80	12
Total Hangar Capacity	**122**	**17**

By 2021, 37 additional T-hangar units and 6 additional executive/corporate hangars will be needed according to the based aircraft forecast. Reconfiguration and expansion of the West GA Campus, and redevelopment of the Former ARFF Site, will accommodate all of the growth expected in T-hangar and executive corporate/hangar demand between now and 2021.

During the 2021 to 2031 development phase, the West GA Campus and Former ARFF Site are expected to reach capacity and new hangar construction will need to begin at the future hangar area located in the southeast corner of Airport property near the approach to Runway 31. This future hangar area is expected to absorb the expected demand during this entire phase.

5.7 Air Cargo Facilities

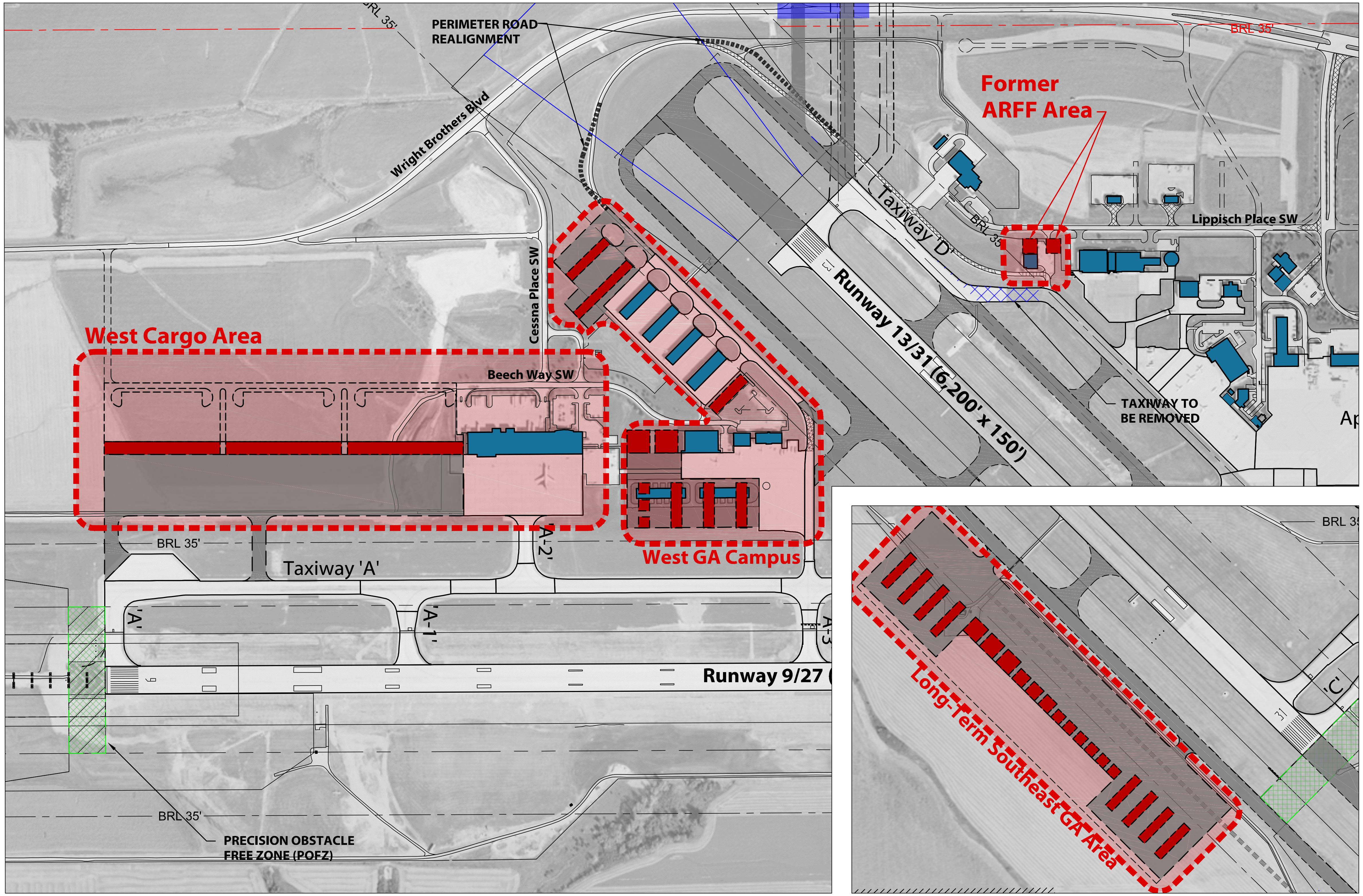
Air cargo tonnage and peak day cargo fleet mix projections presented in the Master Plan are shown in **Table 5-8**. These projections were used to develop conceptual future cargo facility space requirements for 5, 10, and 20 years, including building and apron requirements.

Table 5-8: Air Cargo Tonnage and Peak Day Fleet Mix Forecasts

Activity Measure		Year				
		2011	2016	2021	2026	2031
Total Cargo Tonnage		50,846,891	64,430,349	72,536,159	81,694,613	91,248,145
Fleet Mix (peak day)						
Carrier	***Aircraft***					
FedEx	ATR-72 (or similar)	1	1	1	1	1
FedEx	Boeing 757 (or similar)	2	2	3	3	3
UPS	Airbus 300	1	1	1	1	1
UPS	Boeing 757 (or similar)	1	1	2	2	2
DHL	Brasilia 120 (or similar)	2	2	2	2	2
Other	ATR-72 (or similar)	1	1	2	2	2

Source: Mead & Hunt, Inc.

The Airport is poised to continue to grow in the percentage of air cargo traffic in the coming years, primarily due to its strategic location in eastern Iowa, the large number of nearby industries, and the Airport's ability to support cargo jet operations. Although there is currently excess capacity in both the West Cargo and East Cargo Areas, consideration should be given to the reservation of additional space for a future cargo facility expansion. The age of the cargo facility utilized by UPS as well as its proximity to the passenger terminal complex require consideration of a long-term facility relocation as indicated on the existing Airport Layout Plan (ALP).



West Cargo Area

Can Accommodate Future Cargo Expansion if the Need Arises for:

- FedEx Expansion
- UPS/USPS/DHL Relocation
- New Cargo Carrier Facility

West GA Campus & Former ARFF Area

Can Accommodate for Projected Growth in Demand T-Hangars and Executive/Corporate Hangars Until 2021

Southeast GA Area

Can Accommodate Long-Term Growth in Demand for T-Hangars and Executive/Corporate Hangars Through 2031

FUTURE AIRFIELD PAVEMENT
FUTURE RUNWAY PROTECTION ZONE
BRL 35' BUILDING RESTRICTION LINE
ROFA RUNWAY OBJECT FREE AREA

N
0 150' 300' 600'
GRAPHIC SCALE IN FEET

Figure 5.11
Future Cargo and Hangar Development Areas

Image Source: Bing Aerial 2012

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The current ALP shows a cargo facility expansion west of the existing FedEx facility (see Figure 5-11). This future cargo development area is capable of accommodating one or more of the following:

- Organic expansion in FedEx operations.
- Relocation of UPS, USPS, and/or DHL once the east cargo building reaches the end of its useful life or its location is repurposed for another use.
- Addition of a new regular cargo carrier.

Given the forecasts presented in the previous section, the size of the cargo facility shown is more than adequate for accommodating the projected needs of cargo carriers over the 20-year planning period.

5.8 Support Facilities

The following sections summarize findings related to Aircraft Rescue and Firefighting (ARFF), Snow Removal Equipment (SRE)/Maintenance, aircraft fuel storage, and aircraft deicing facilities.

5.8.1. ARFF

The ARFF facility, constructed in 2009 and located northeast of Runway 13/31, currently meets the needs of the Airport. As of 2012, the Airport is classified as ARFF Index B with ARFF Index C available upon request with 48 hours of notice. Based upon the ARFF Index and length of the largest aircraft in service at the Airport averaging of five or more daily departures, current ARFF facilities, equipment, and staffing adequately serve the existing and projected runway system and airline operational schedule.

5.8.2. SRE/Maintenance

The SRE/maintenance facility, constructed in 2001 and located southeast of the terminal apron, serves as the base of operations for maintenance and storage of snow removal equipment. This building is nearing storage capacity, and potential expansion of the facility is limited due to its architectural and structural design and location near the terminal apron and Runway 9/27. There is currently space to the immediate east of the SRE/maintenance building within the Airport Support zone that could accommodate a future ancillary SRE/maintenance facility when future demand dictates. This area should be reserved for future SRE/maintenance use as part of the Airport's development plan.

5.8.3. Aircraft Fuel Storage

Available aircraft fuel storage includes 80,000 gallons Jet-A and 24,000 gallons 100LL. Fuel is kept in large storage tanks at the East Fuel Farm located northeast of the SRE/maintenance building and the West Fuel Farm located north of the West Cargo Area. Fuel storage requirements at the Airport are variable based upon individual supplier and distributor policies as well as military refueling contracts. For these reasons, future fuel storage requirements will be dependent upon the individual distributors and space should be reserved for the expansion of existing fuel storage facilities as required.

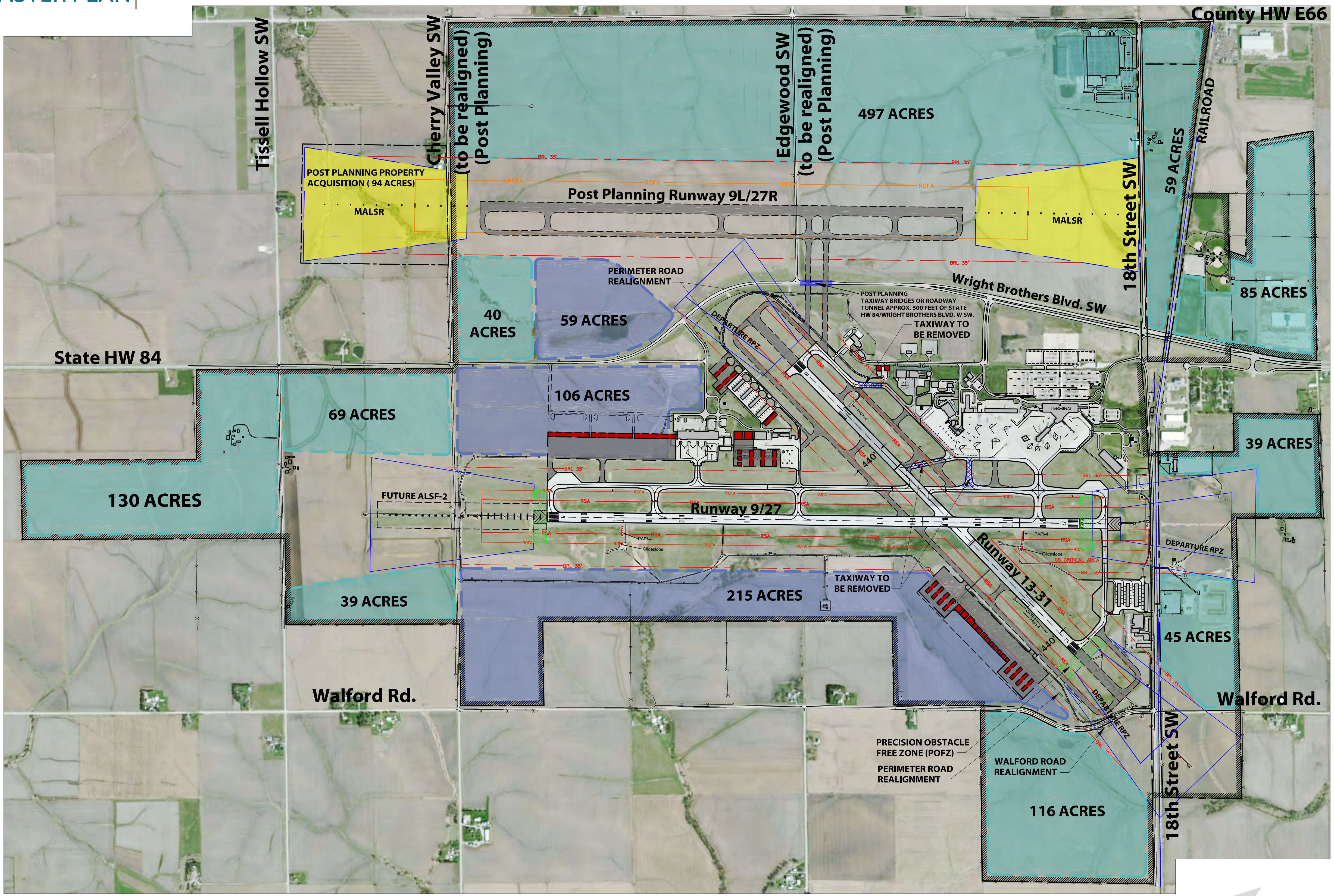
5.8.4. Aircraft Deicing Facilities

Aircraft deicing activities currently occur in four apron locations on the Airport: the Terminal Apron, the East Cargo Apron, the West FBO Apron, and the West Cargo Apron. Aircraft deicing fluid (ADF) is stored in above ground containers at the East Fuel Farm. Use of ethylene glycol-based ADF and urea-based pavement deicers is prohibited at the Airport as a means of reducing sources of stormwater contamination. In addition, aircraft deicing personnel are trained and knowledgeable of techniques to prevent excessive application. Once a preferred alternative is selected for the Passenger Terminal in Chapter 6, the capacities of the Deicing Basins will be evaluated to determine whether proposed apron expansions and/or operational changes required for the preferred alternatives will necessitate the expansion of deicing runoff management facilities.

5.9 Conclusions and Recommended Conceptual Development Plan

This Chapter recommends several improvements with regard to the future airside components, which are depicted in **Figure 5-12**, the Conceptual Airside Development Plan. Future improvements that appear to be appropriate at this stage include:

- Runway 9/27: This runway should be maintained in its current configuration, but the Airport should pursue the implementation of a Special Authorization CAT-II instrument approach to the runway in the near-term. The Airport should also plan for ground equipment requirements associated with a conventional CAT-II system in the event that future operations justify the implementation of such an approach.
- Runway 13/31: The Master Plan facility requirements analysis identified the need for additional length for this runway as it is heavily utilized by air carriers operating at the Airport. The runway length analysis determined that an additional 1,200 feet of takeoff runway length would be beneficial to air carriers and business jets currently using and anticipated to use this runway in the future. Given existing constraints surrounding this runway, 1,000-foot runway extensions to each end of the runway are recommended. These runway extensions would be available for takeoff only by implementing declared distances.
- Future Parallel Runway**:** The Airport has historically reserved space north of Wright Brothers Blvd. SW for the future construction of a third runway parallel to Runway 9/27. The purpose and need for this parallel runway is to increase airfield capacity when aircraft operations reach a level at which aircraft delays become unacceptable. Aircraft operations at the Airport are not expected to reach these capacity-constrained levels within the 20-year planning period. However, prudent planning dictates that space should continue to be reserved for this runway in the event that operations increase at a more rapid rate than projected by activity forecasts. The Master Plan recommends that the future parallel runway be located at a 4,750-foot separation from Runway 9/27. Non-aviation related development in the areas indicated on Figure 5-12 can be pursued without impacting the ability to construct the third runway.
- Taxiways**:** Improvements to partial parallel Taxiway "E" should be pursued and additional improvements to Taxiways "B" and "E" should be considered.
- Hangars and Air Cargo**:** Areas for future expansion in hangar and air cargo capacity should be reserved as depicted in Figure 5-12.



Notes

Runway 13/31

- 1,000 feet Additional Takeoff RW13 & RW31 with Declared Distances
- Full length Parallel Taxiway 'B'
- Taxiway 'D' & 'E' Improvements

Parallel Runway 9L/27R

(Post Planning Period Facility)

- 7,400 ' x 150'
- RRC C/D-IV
- Full Parallel Taxiway
- Precision Approaches w/MALSR

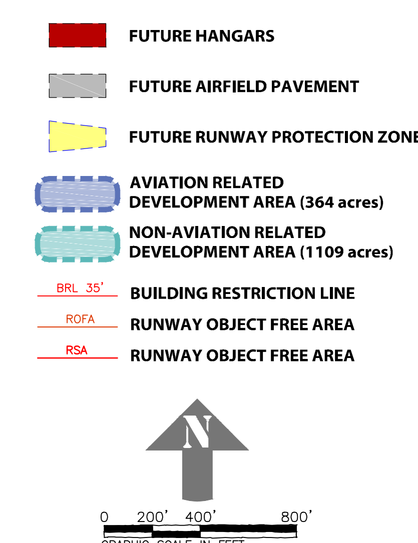


Figure 5.12
Airside Conceptual Development Plan

Image Source: Bing Aerial 2012

MASTER PLAN

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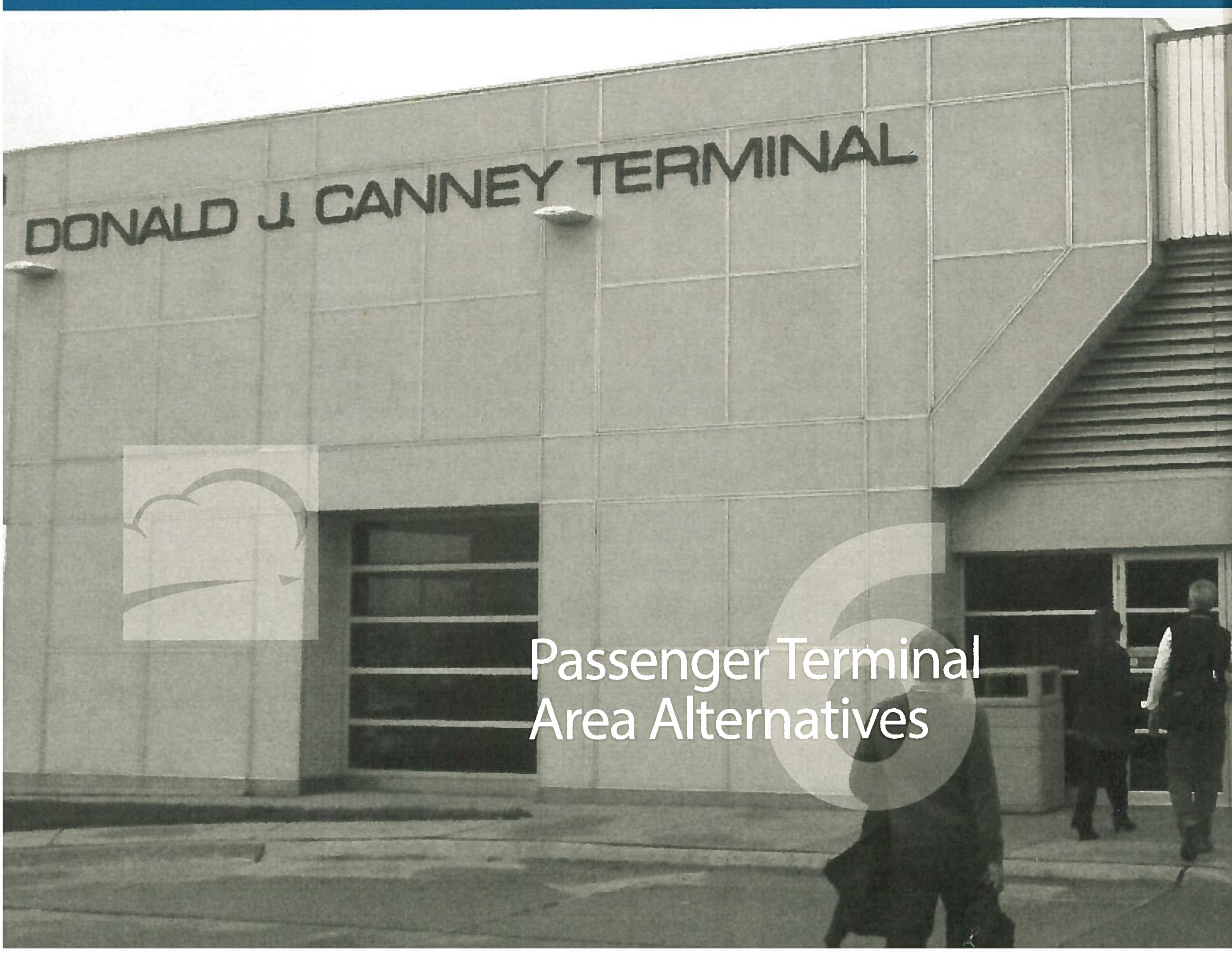

6

Passenger Terminal Area Alternatives

CHAPTER 6

Passenger Terminal Area Alternatives

Requirements for the types and sizes of terminal area facilities at The Eastern Iowa Airport (referred to as CID or the Airport) are presented in Chapter 4. This chapter considers alternative layouts that meet these requirements. The arrangement of the passenger terminal complex is based on functional relationships between different spaces. The primary spaces within the passenger terminal building include the non-secure area, security screening, and the secure area, while areas outside the terminal building include access roadways and parking facilities. Within these areas, spaces interact with adjacent spaces, which often have interrelated functions. As a result, it is important to generate and study alternative layouts in order to determine the most beneficial overall arrangement for the Airport. Alternative layouts for the CID terminal area are presented in the following sections:

- Passenger Terminal Complex: Context
- Passenger Vehicle Access and Parking Alternatives
- Passenger Terminal: Alternative Layout Development Overview
- Passenger Terminal: Initial Alternative Layouts
- Passenger Terminal: Intermediate Alternative Layouts
- Combined Intermediate Concepts: Security Checkpoint and Concourses
- Passenger Terminal: The Preferred Long-term Layout
- Aircraft Deicing Implications
- Conclusion

6.1. Passenger Terminal Complex: Context

The context of the terminal complex provides a background for making decisions and a reference point from which to begin exploring alternative layouts. This context was established through an existing conditions assessment, a review of record drawings and previous planning documents, and by considering local influences on the terminal complex site. Annual enplanement information was also used to provide a comprehensive overview of the specific needs of each area within the terminal complex. An assessment of existing conditions can be found in Chapter 1.

6.1.1. Previous Planning Documents

A review of previous planning documents provides a history of proposed changes to the passenger terminal complex that have been considered in the past, and also provides background information that led to these proposals. Two recent documents that presented passenger terminal development concepts include the 2007 Terminal Planning Study and the 2004 Airport Master Plan Update.

The 2007 Terminal Planning Study provided studies for several projects that could be completed independently or collectively. First on the list was a renovation to the existing security checkpoint that would increase the capacity of the checkpoint. Other projects followed, including an increase to gate capacity, enhancement of public restrooms, and improvements to the connection between the terminal building the public parking lots. In addition, it provided recommendations for improving the physical image of the Airport through overall continuity in design, forms, wayfinding, colors, and materials. Subsequent projects have provided new restrooms in the non-secure area and a canopy connecting the terminal building to the parking lots.

The 2004 Airport Master Plan Update determined that the passenger terminal will generally be adequate until CID experiences more than 600,000 annual passenger enplanements. As a result, while the document included an overview of the passenger terminal, the Plan focused mainly on the airfield and did not explore the specific needs of the terminal in great detail.

The 2004 Plan identified two items related to the terminal that needed to be addressed in the short-term: removing the baggage screening function from the public ticketing lobby and eliminating the opportunity for unauthorized vehicles to park within 300 feet of the passenger terminal. The Plan determined that the greatest terminal building need was improving the baggage screening function since it was occupying a large portion of the ticketing lobby at the time the Update was written. This situation was remedied in 2012 through a project that provided a significant back of house addition to the terminal for a consolidated in-line baggage handling and screening system. The Airport reduced unauthorized parking near the terminal by closing the parking lot on the west side of the building to the public.

The 2004 Master Plan Update developed several alternative layouts of the terminal complex for meeting long-term need. All of the alternatives showed terminal expansion opportunities at the concourse, ticket lobby and baggage claim areas. In addition, alternatives were provided for adding a parking garage, a passenger collector and baggage drop-off point, and a second terminal in the existing cargo location west of the passenger terminal.

6.1.2. Terminal Complex Location: Regional Access Considerations

When generating alternative layouts of the passenger terminal complex, it is important to first establish the location of the terminal complex in a regional sense. Once the optimal location of the terminal complex in reference to the region has been established, then the arrangement of the components within the terminal complex can be explored. The Airport's regional context is described in the Chapter 1, Inventory.

An analysis of optional regional sites for the CID terminal complex considered the following options:

- Construction of a new terminal complex in a different location on the Airport.
  This alternative was eliminated quickly, due to the following factors:
  - It would not be cost effective to relocate the terminal complex with its associated buildings, utilities, public roadway access and airfield access to another location on the Airport.
  - There is no other portion of the Airport that offers better access to both the public roadway system and airfield infrastructure than the existing location of the terminal complex.
  - The environmental impact of relocating the terminal complex would need to be determined with related environmental review process considered for schedule impacts.
- Alteration of the existing terminal complex.
  This alternative was considered, due to the following factors:
  - The existing site is the optimal location for the terminal complex due to its close proximity to both the public roadway system and airfield infrastructure.
  - Continuing use of the existing site including utilities, airfield infrastructure and roadway access is most efficient.

This exercise confirmed that the passenger terminal complex is in the optimal location with respect to the existing airfield and regional public roadway system.

6.1.3. Terminal Complex Location: Local Site Considerations

The passenger terminal complex is the primary point of interface between landside and airside activities at the Airport. As a result, any planning to meet the future facility needs of the terminal complex at CID must also include a review of the existing local site. This will not only determine the site-driven constraints that will limit expansion possibilities, but also reveal opportunities for cost savings in the continued use of existing facilities. The following local site considerations were identified at CID when considering the optimal configuration of the terminal complex:

- Terminal Complex Ground Access System**:** The airport access road system connects the interior airport roads to the local and regional roadway system. In addition, this system is the primary way the public arrives at the airport. It includes the access roadways and sidewalks as well as curbside loading and unloading lanes. At CID, the passenger terminal is accessed from Interstate 380 via Wright Brothers Boulevard SW, which is roughly parallel to Runway 9/27 and located north of the existing terminal building. Wright Brothers Boulevard, in turn, is connected to local and regional arterials and provides efficient access to the Airport from the surrounding area. As a result of the existing roadway system arrangement, the optimal vehicle access point to the airport terminal complex from the public roadway system is in its existing location.

- Public and Commercial Parking**:** Public terminal parking is located between Wright Brothers Boulevard and the passenger terminal curbside, and the commercial parking area for shuttles and rental cars is located east along the curbside, directly adjacent to the terminal building. These are the optimal locations for the vehicle parking lots. A project is currently underway that will provide improvements to commercial vehicle access and parking. Facility requirements show that there will be a demand for providing additional public parking in the future, and the opportunity exists to expand parking in its existing location. Such an expansion of parking and vehicle access should be accomplished with consideration to the distance passengers must walk after parking their vehicles. FAA Advisory Circular (AC) 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*, states and current industry standards concur that parking lots should be configured to “limit walking distances from parked automobiles to terminal to no more than 1,000 feet.” When the amount of parking needed is no longer possible through the use of a surface lot, remote parking facilities and parking structures with several floors should be considered. Additionally, the AC recommends that remote parking facilities should be served by shuttles or a people mover system. Alternative layouts of the passenger terminal need to be closely coordinated with pedestrian access to both public and commercial vehicle parking.

- Utility Connections**:** The locations of existing utilities including water, sewerage, natural gas, electric power and emergency generator offer both opportunities and constraints in a terminal building renovation. The location of the utility lines and connections should be considered in any Airport terminal complex renovation.

- Airfield Access**:** The relationship between the terminal building location and the airfield is the most critical of all relationships in the terminal complex. The airfield has specific spatial requirements and maneuvering clearances. As a result, it is beneficial for the terminal to be located in a way that provides an easy transition from the airfield to the building for commercial aircraft. The terminal proximity to the airfield will influence the length of time needed to taxi between the airfield and the terminal building and consequent travel time for passengers. In addition, the distance that an aircraft must travel to reach the terminal building will affect the amount of fuel consumed and resulting emissions produced. The existing relationship between the airfield and the terminal complex at CID is efficient. In the future, it will be beneficial to maintain this relationship.

- Site Limitations**:** Airports have restrictions on building heights and building locations in reference to runways, taxiways, and the control tower line of sight. Terminal building heights are often limited by vertical restrictions such as the control tower sight line and "view shadows" which must be coordinated with the FAA. Additionally, there are restrictions to building heights, due to their proximity to runways. Other limitations to the site that need to be considered in terminal building projects will include the location of the airport property line and local land use.

- Operational Viability**:** In an effort to serve the traveling public, it is necessary that CID remain fully operational while renovations are made to the terminal complex. In addition, it is required that the facility maintains security measures and follows proper airport operational procedures during construction. These requirements add cost and complexity to terminal building renovations or expansion projects.

6.1.4. Passenger Terminal: Layout Development Goals

This section presents goals for the future of the CID terminal complex. These goals are intended to guide the overall development of the passenger terminal layout alternatives for this Master Plan Update and to direct the future expansion of the Airport. These goals take both the short-term and the long-term needs of the Airport into account.

Overall goals for the development of passenger terminal alternative layouts include:

- Accommodate the forecast aviation activity levels in a safe and efficient manner by providing the necessary passenger terminal facilities and services.
- Meet facility requirements for quantities of space and types of facilities required through the planning period.
- Ensure that development of the passenger terminal will accommodate a variety of passenger-related activities, including the general public, business travelers and leisure travelers.
- Encourage and protect the public and private investment in the passenger terminal facilities.
- Improve the efficiency with which passenger's progress through the passenger terminal, which will have lasting impact on the long-term day-to-day use of the building.
- Make efficient use of available area.
- Provide today's growth in a manner that does not impede future expansion.
- Improve the operation of the passenger terminal by facilitating and enhancing passenger-related services.
- Implement changes in a manner that improves the quality of the area affected.
- Improve the passenger experience.
- Analyze the complexity of the resulting construction phasing. The arrangement of building space and structure should allow for expansion with minimal disruption of the space already constructed.

An efficient terminal layout is one where passenger facilities are located in a sequence or pattern that coincides with the passenger's natural movement through the terminal. Associated passenger services and amenities are grouped together as are airport operations that are functionally dependent on each other. Such a layout will minimize passenger walking distances and congestion caused by the intermingling of nonrelated or conflicting activities.

Many internal components of the terminal have functional relationships with other areas, and become more efficient in their operation when they are located in close proximity or adjacent to each other. These relationships, or "adjacencies," become evident when reviewing the passengers' paths through the terminal building. For example, when arriving passengers exit the secure area, their paths of travel will be more efficient when the routes to the baggage claim area, the car rental counters and the terminal building exit are straightforward and easily discerned. The overarching goal in the development of passenger terminal layouts is to enhance these relationships.

Key adjacency relationships in the terminal building include:

- Airline ticketing to the security checkpoint.
- Checkpoint to the secure holdroom.
- Secure area exit lane to the security checkpoint.
- Secure area exit lane to the baggage claim area.
- Public waiting area to secure area exit lane.

The goals presented in this section were established for the purpose of directing the overall development of alternative layouts of the passenger terminal. Subsequent sections of this Chapter will expand on goals or key adjacency relationships for specific areas as needed.

6.1.5. Passenger Terminal: Renovation and Expansion Considerations

Planning for changes to a terminal layout involve the consideration of both the constraints and opportunities that are present in the existing facilities as well as those that would result from an alteration of the existing facilities. These will include both physical constraints and opportunities such as the location of existing site utilities as well as non-physical constraints and opportunities, such as design guidelines or relationships between areas of use. Often, the understanding of the effects that constraints and opportunities have on the layout continues to develop as the layouts evolve and are evaluated.

Exterior site considerations at CID include evaluating the effects that an expansion to the passenger terminal facility may have on the existing apron, taxiway, snow removal equipment (SRE) building, cargo building and the ground transportation parking lot located east of the terminal building. At the curbside, site considerations include the effects of changes on the existing roadway and on the building relationship to the curbside.

Interior considerations for changes often pertain to the relationships between areas. In the non-secure area, these include the amenities that are located along the passenger path as well as the passenger path itself: from the curbside to ticketing and the security checkpoint, from the checkpoint to baggage screening, and the relationship of passenger amenities to the passenger path. Changes to the security checkpoint at CID will consider the effects on adjacent areas including the Concourse B holdroom, vertical circulation, non-secure public lobby, and non-secure concessions. In the secure area, the passenger path and amenities continue from the security checkpoint to the holdrooms and gates.

6.2. Passenger Vehicle Access and Parking Alternatives

Chapter 4 identified seven primary functional issues with the existing terminal area roadway network, and described terminal area parking requirements forecasts developed specifically for this Master Plan Update. This section presents two alternate long-term development concepts that seek to address vehicle circulation problems in the terminal area, and identifies alternate sizes and locations for a future remote parking lots and parking structures to meet long-term passenger parking demand.

6.2.1. Passenger Vehicle Access: Alternative 1

Passenger Vehicle Access Alternative 1 is presented with a conceptual two-phase implementation plan in **Figure 6.1**. This alternative involves constructing a roundabout north of the existing intersection of Arthur Collins Parkway and Lippisch Place; providing a new long-term parking entrance to the immediate south of the roundabout; and constructing a one-way loop road that would allow motorists to return to the terminal building without using Wright Brothers Boulevard.

- Alternative 1 Advantages:
  - Would "decouple" entry to the long-term parking lot from the curbside area, which would result in fewer choices and less confusion near the terminal building.
  - The proposed long-term parking lot entrance would utilize an abandoned roadbed. However this would unlikely offer significant cost savings when compared with constructing a new access alignment elsewhere.
  - The existing exit from Arthur Collins Parkway onto 18th Street SW would be closed to resolve the level of service issues associated with the short distance between this intersection and the intersection of 18th Street SW and Wright Brothers Boulevard. Consideration was given to the construction of a fly-over exit ramp to replace this exit road; however, preliminary analysis indicated that there would be insufficient space to construct such a ramp with adequate clearance over either 18th Street SW or the Cedar Rapids and Iowa City (CRANDIC) Railroad line.
  - The proposed loop road would not require navigating several intersections and twice crossing traffic on Wright Brothers Boulevard in order to return to the terminal building after passing the terminal curbside.
  - The roundabout for this alternative may allow cargo and general aviation traffic to spin off from passenger traffic more effectively that the existing intersection of Arthur Collins Parkway and Lippisch Place.

- Alternative 1 Disadvantages:
  - Signage and decision points for the roundabout may be confusing.
  - The long-term parking lot entrance is much further from the terminal building than the existing entry and may not be ideal.

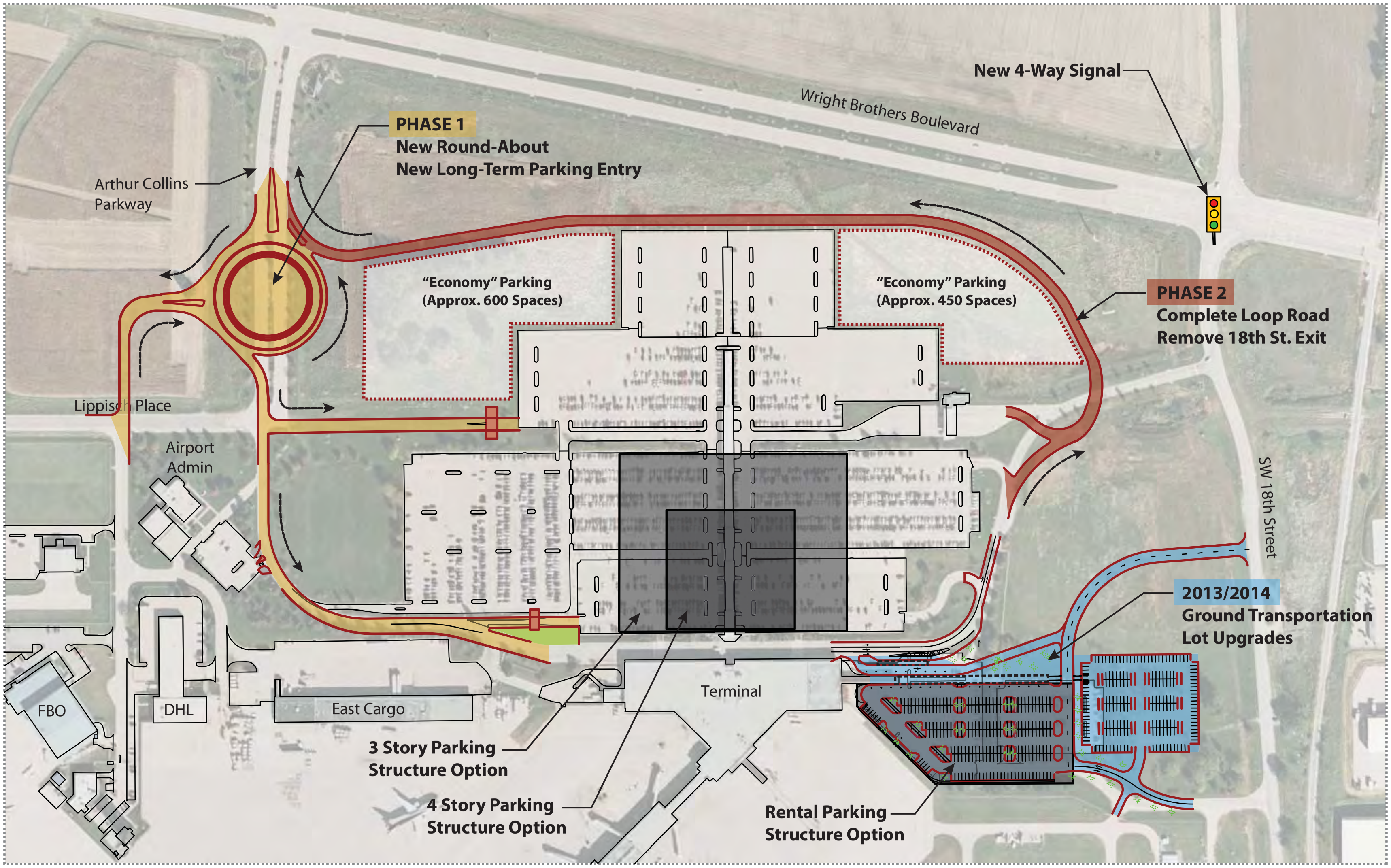

Figure 6.1
Vehicle Circulation Alternative 1

Source: Airport Layout Plan and Mead & Hunt, Inc.

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6.2.2. Passenger Vehicle Access: Alternative 2

Vehicle Circulation Alternative 2 is presented with a conceptual two-phase implementation plan in **Figure 6.2**. This alternative involves constructing a new dedicated entrance to the terminal area from Wright Brothers Boulevard, thereby “decoupling” ground access to the terminal from access to other functional areas on the Airport. It also includes providing a new long-term parking entrance at a location closer to the terminal building than under Alternative 1; constructing a new dedicated cell phone lot between the new loop road and the Airport administration building; and constructing a new two-way access road to the cargo building located west of the Airport. This alternative has many of the same advantages and disadvantages as Alternative 1, with the following differences:

- Alternative 2 Additional Advantages:
  - Decoupling ground access to the terminal from other functional areas would reduce or eliminate mixing of passenger traffic with other Airport user traffic.
  - This alternative would have the added benefit of a new direct access road to the east cargo area, which would not be possible with the existing circulation layout as it would require large cargo trucks to pass in front of the terminal (which is undesirable).

- Alternative 2 Additional Disadvantages:
  - Access from admin/GA/cargo area to the terminal, and vice versa, may be problematic.
  - New entrance road would negate existing investment in landscaping and marquee signage at the intersection of Wright Brothers Boulevard and Arthur Collins Parkway.
  - New entrance road would also bisect potentially developable real estate along the frontage of Wright Brothers Boulevard SW, which may reduce its marketability.

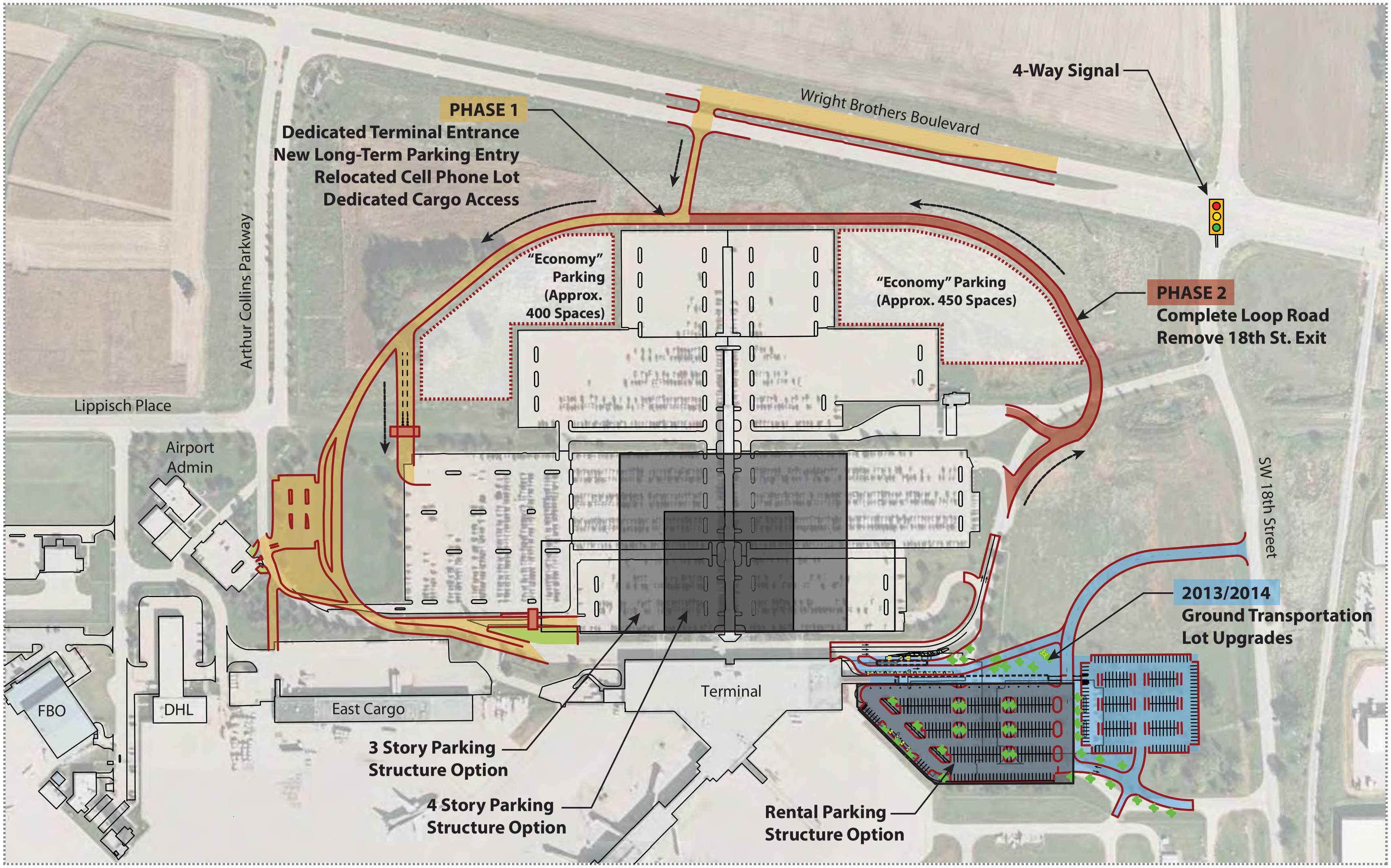

Figure 6.2
Vehicle Circulation Alternative 2

Source: Airport Layout Plan and Mead & Hunt, Inc.

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6.2.3. Economy Parking Lot and Parking Structure Alternatives

Based on balanced consideration of the results of the average day and peak day parking requirements forecasts presented in Chapter 4, the Master Plan recommends that the Airport consider the addition of approximately 1,000 additional long-term/short-term parking spaces within the next 10 years to accommodate projected enplanement activity. As discussed in Chapter 4, the distance between aircraft gates and the edges of the existing long-term parking lots would make expansion of surface parking onerous for travelers without the initiation of shuttle service or automated transportation to the outer reaches of the parking lot. Consideration was given to the amount of additional long-term surface parking that could be accommodated under the two vehicle access alternatives presented in the following sections. These surface parking expansion areas are depicted in Figures 6.1 and 6.2, and are labeled as future "Economy" parking. Approximately 1,050 total spaces could be accommodated in these parking areas under Vehicle Access Alternative 1, and approximately 850 additional spaces could be accommodated under Vehicle Access Alternative 2. If "Economy" parking were chosen as the preferred option for satisfying long-term parking demand, Vehicle Access Alternative 1 would offer a greater amount of space for this type of parking.

Consideration was given to parking structure sizing and location for accommodating these recommended additional 1,000 spaces with either three stories or four stories. The required building footprint for a three-story parking structure would be approximately 200,000 square feet, while the building footprint for a four-story parking structure would be approximately 135,000 square feet. Potential locations and dimensions for three-story and four-story parking structures are shown in the diagrams for each of the vehicle access alternatives. Either conceptual structure could be built in phases as parking demand dictates.

6.2.4. Conclusion

The passenger vehicle access and parking alternatives presented in the previous sections are meant to function as a conceptual options for future ground transportation projects when the demand arises. Preferred alternatives for passenger vehicle access and parking were not chosen as part of this Master Plan Update.

6.3. Passenger Terminal: Alternative Layout Development Overview

Prior to the development of alternative layouts for the Airport terminal building, the existing layout was inventoried and assessed for overall performance. In Chapter 4 it was determined that several of the spaces in the terminal building are deficient to varying degrees. For this chapter, terminal alternative layouts were developed with the intent of meeting both the current and forecasted future facility requirements, as identified in the passenger terminal facilities requirements chapter, and achieving overall layout efficiency and building constructability.

A terminal planning project typically consists of several rounds of layout concepts. These rounds typically consist of three basic steps: the generation of initial layouts, the development of selected layouts and refinement of the recommended layout. Review at the end of each round provides an opportunity for feedback that will inform the next generation of layout development and refine the understanding of the project's development goals. Subsequent sections of this Chapter present initial, intermediate and final alternative terminal building layouts to explain the rationale behind the various components of the preferred layouts, and to provide proof of the process.

In the development of alternative layouts, it is important to involve entities that represent different interests at the Airport. In order to encourage user input, meetings were held at CID, involving the Airport administration and maintenance staff, local stakeholders, and tenants including the TSA, airlines and rental car companies.

Through the assessment of facility requirements, it was determined that several of the existing spaces are inadequate for both current and forecasted operations; however, the deficiencies were more critical in some areas than others. Chapter 4 identified the following elements at CID as the most deficient:

- Curbside and Public Entrances
- Passenger Wayfinding
- Non-secure Area Configuration
- Interior Finishes and Lighting
- Restrooms
- Security Checkpoint
- Secure Area Circulation
- Concourse Configuration
- Gate and Holdroom Capacity
- Building systems

Note that this list includes both quantitative and qualitative items because the quality of the passenger experience is influenced by not only the amount of space provided for facilities but also by the quality of the space. Characteristics of the indoor environment not only contribute to the passenger's general level of satisfaction with an airport, but also impact the health and well-being of both passengers and Airport employees. Successful building projects balance cost and quality from the planning stage through design and construction.

6.4. Passenger Terminal: Initial Alternative Layouts

The objective of the initial round of alternative layouts is to generate a number of conceptual plans that can be used to determine what options are feasible within the project parameters. This typically results in a relatively large number of options that are revised or eliminated as the Master Plan evolves. Questions are generated, leading to more information being gathered, and the layouts are studied for their ability to meet goals and facility requirements. In addition, the initial round of alternative layouts serves as an opportunity for stakeholder feedback that will inform the direction of the following rounds of layouts.

Several initial layouts for alterations to the CID passenger terminal building were generated in order to study opportunities for the internal arrangement of the spaces within the terminal. These initial layouts considered the three main areas of the passenger terminal individually: 1) the non-secure area (including the curbside), 2) the security checkpoint, and 3) the secure area.

This allowed concepts for each major area to develop independently with the intent of combining them later during the planning process. The divisions of the areas are described in greater detail below:

- Non-Secure Area**.** The non-secure area is all of the non-secure public area including the pick-up/drop-off curb and curbside amenities, sidewalks and crosswalks, public entrances, wayfinding, circulation, waiting areas, concessions, vending, amenities, and restrooms.
- Security Checkpoint**.** The security checkpoint area includes the pre-screening preparation zone, the queuing area, the document checking area, the divestment area, checkpoint lanes and equipment, the composure area, and the exit lane.
- Secure Area**.** The secure area is all of the secure public area including circulation, passenger holding areas, concessions, vending, amenities, and restrooms.

After several reasonable concepts had been developed, the initial alternatives were evaluated based on the established goals for the project. Some of the options were eliminated, narrowing down the relatively large number of initial terminal concepts to a shortlist, while others were advanced to the next round of development. The initial alternatives were presented to the Airport in January 2013. The discussion that followed generated questions, producing additional options and leading to more gathering of information. The initial layout alternatives for the non-secure area, the security checkpoint and the secure area are presented in the following sections.

6.4.1. Initial Layouts: Non-Secure Area

While the passenger terminal curbside at CID has sufficient length, the curbside area and the building façade would benefit from a project that would address some areas that are underperforming. These include renovating the front canopy to improve shelter during inclement weather and extend this shelter beyond half of the drop-off/pick-up lane. Additionally, the project should improve wayfinding at the public face of the terminal.

The existing amount of non-secure public area in the passenger terminal is greater than planning design standards recommend until the last few years of the planning period. A majority of the individual functional spaces within the non-secure area are also of sufficient size until the end of the planning period. For these reasons, changes to the non-secure area will not require a significant addition of space. Instead, this portion of the passenger terminal would benefit from a remodel that rearranges the public area in order to group passenger amenities by the types of uses to create ‘nodes’ of similar activities, improve wayfinding, and address any shortfalls in functional spaces.

The existing non-secure area, showing the Security Identification Display Area, (SIDA), line

The initial layout of the curbside and non-secure public area leaves the existing terminal building largely intact, and is accomplished by making changes to the curbside, building façade, public entries, and rearranging the public area inside the terminal building. The proposed non-secure area layout is presented in **Figure 6.3**.

Wayfinding improvements would begin at the curbside, where building entries and signage should be made clearly visible from a distance, assisting drivers in making decisions on destinations in advance, and reducing traffic confusion in front of the terminal building. New canopies would bracket the roadway both to identify areas of importance and to improve weather protection for passenger pick-up and drop-off. These canopies would provide visual cues to drivers, differentiating the building entries from the rest of the facade. In addition, canopies on the opposite side of the roadway would show passengers the locations of stairways leading to the public parking area. Canopies indicating destinations should be substantial enough in size and lit at night in a way that will make them highly visible from the approach road. Improving wayfinding would also include raising crosswalks slightly above the roadways and using a surface pattern and contrasting color to visually distinguish them from the roadway. This treatment of the crosswalks would also have the effect of contributing to traffic-calming by encouraging drivers to reduce speed in the curbside area.

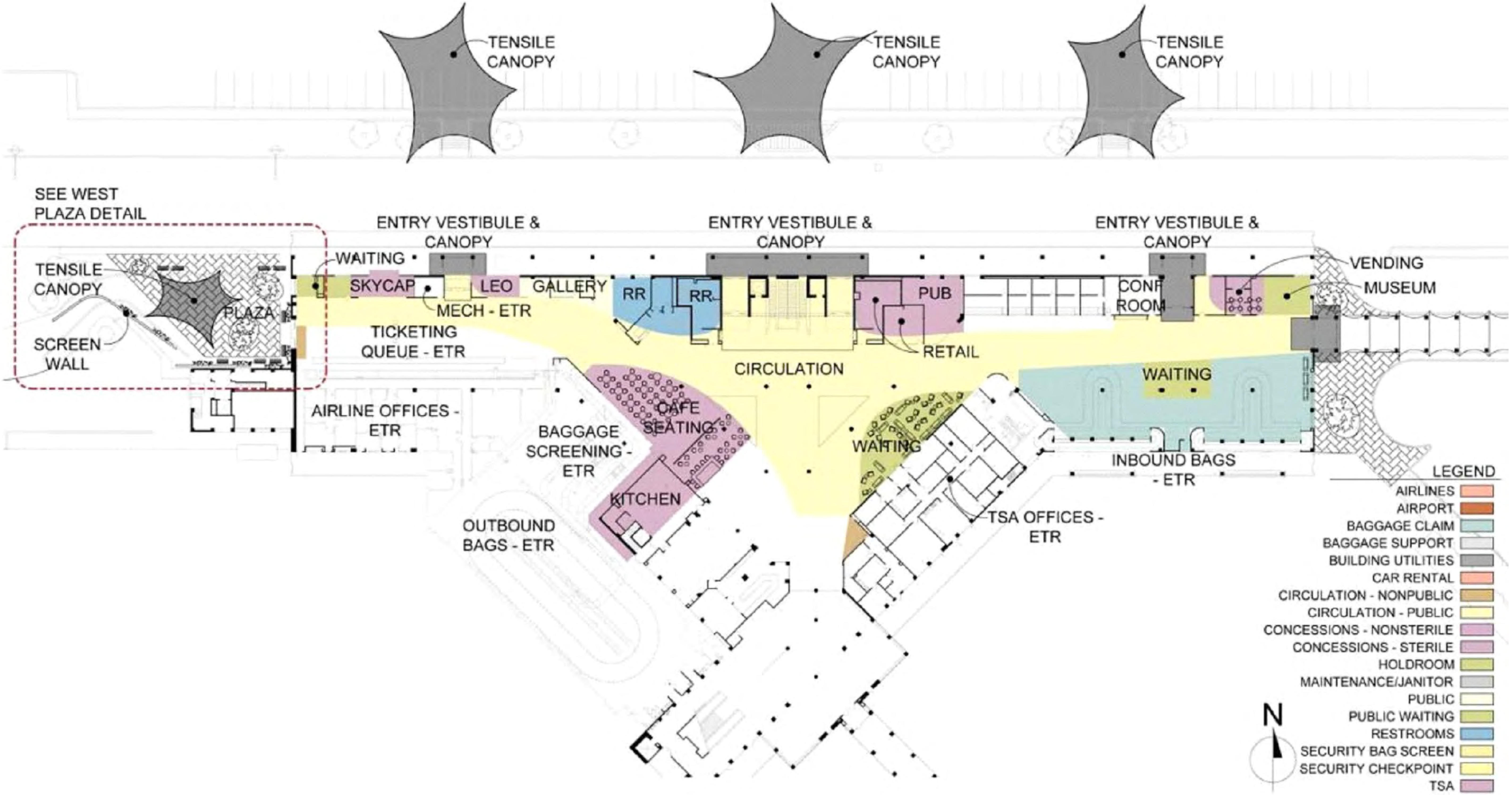

Figure 6.3

Proposed Non-Secure Area Layout, First Floor

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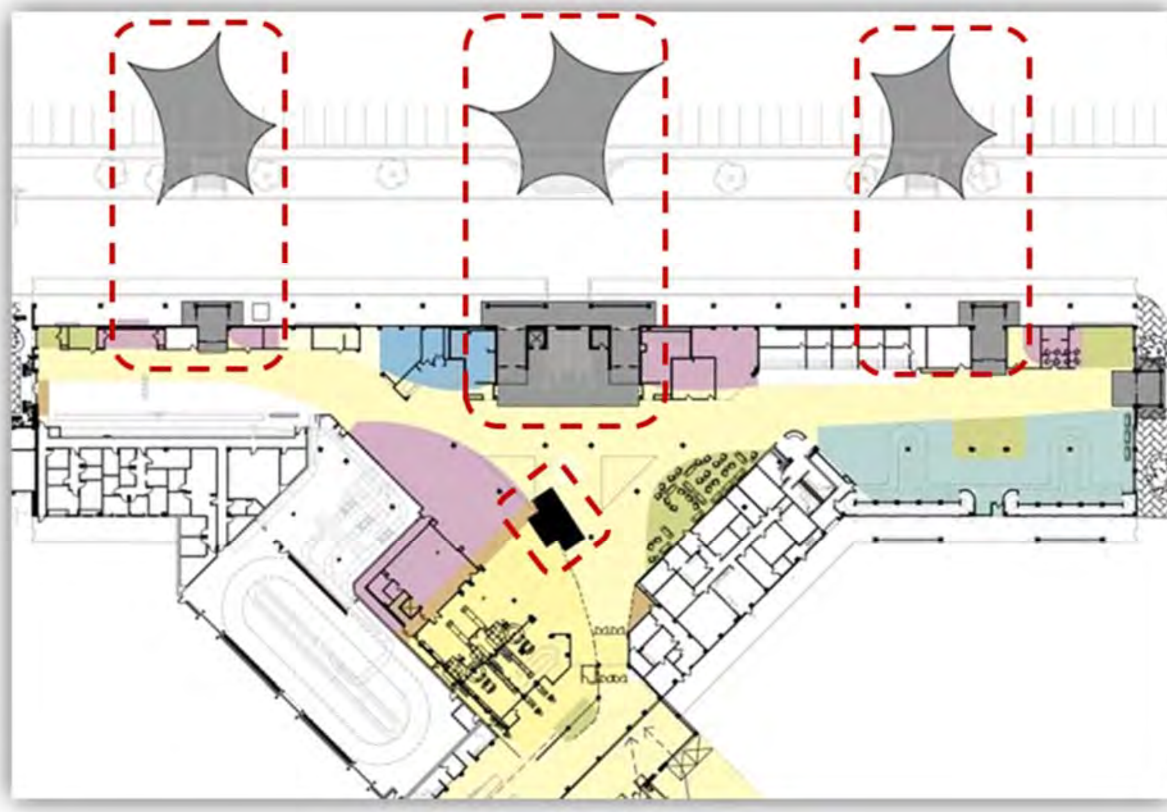
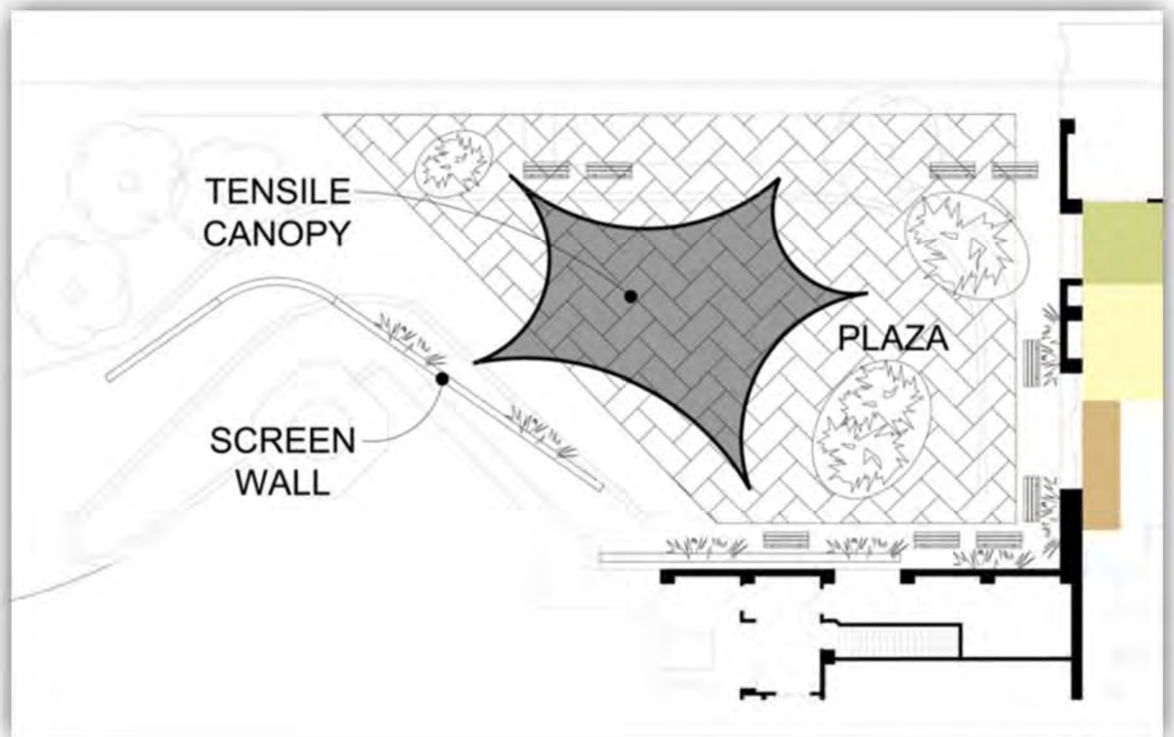


Initial Non-Secure Area Layout: Canopies at stairways and overhangs on exterior and interior of building entrances provide visual wayfinding cues for passengers and motorists.

Improvements at the pick-up / drop-off area to relieve congestion at busy times would include lengthening the curbside by providing plazas to the east and west of the existing curbside. The plaza added to the west of the existing curbside area would extend the amount of drop-off area near the ticketing lobby. This plaza would have a welcoming feel, softening the existing building face. A screen wall would obscure the existing generator and trash compactor area, while planters, benches, and canopy could provide a comfortable place for passengers to wait. This plaza would be visible from the ticketing lobby, providing a calming visual connection from inside to outside, while the plaza on the east side would be visible from the baggage claim area and connect the passenger terminal with the ground transportation parking lot.



Initial Non-Secure Area Layout: The proposed west plaza area

The wayfinding improvements that would begin at curbside would follow through into non-secure public area of the terminal building. The building entry expression on the interior of the building would be similar to the one used on the exterior, but built at a smaller scale to be appropriate for pedestrians. Windows would be added along the building façade with the intent of allowing visual connections between the public areas inside the terminal and the curbside. Destination points, such as building exits and the entrance to the security checkpoint, would be announced with visual elements, such as overhangs, and by changes in lighting, wall colors, and floor patterns. The width and configuration of the circulation areas connecting destinations would encourage a natural progression through the space. Successful visual cues at destination points, such as those described above, would naturally draw people toward them and reduce the need for signage.

Many spaces in the existing non-secure area are now vacant due to recent changes in security requirements and ticketing technology, and resulting changes in passenger behavior. The amenities that remain are distant from each other and in locations that are no longer advantageous for the current pattern of usage. The vending area, for example, is in a location near the ticketing area where it is not easily visible from the baggage claim area. Since passengers are no longer allowed to bring liquids through the security checkpoint, the vending would better serve the public if it was relocated to the baggage claim area, where it would be more visible and more likely to be used by members of the public waiting for passengers or by passengers waiting for baggage to arrive. Providing a waiting area between the checkpoint and the baggage claim area would reduce the number of meeters/greeters who stand at the mouth of the exit lane waiting for passengers to arrive. Café-style restaurant seating would enliven the main lobby area and provide another option for refreshments. The restrooms that were recently constructed near the baggage claim area make the women's restroom across the hall redundant. Passenger circulation would benefit from having two sets of restrooms: one near bag claim and one near the ticketing area that would also be used by passengers prior to entering the security checkpoint. All of the amenities should be in locations that are suited for today's usage pattern.

Initial Non-Secure Layout: Amenities in the proposed non-secure area are grouped together

Since the amount of non-secure public area in the existing passenger terminal is greater than planning design standards recommend until the last few years of the planning period, there is little justification to add space to the non-secure area in the near term. While the amount of existing area is sufficient, the non-secure area would benefit from a remodel that would rearrange the public space in order to group passenger amenities by the types of use. In addition, wayfinding should be improved, and any insufficiencies should be addressed.

Some of the passenger amenities and services in the initial proposed layout would be relocated so that they are adjacent to areas with associated uses, improving passenger experience. The reorganization of public space would be accomplished in a way that minimizes changes to adjacent tenant areas that should remain in place such as the TSA office area and the car rental area. These tenant areas are expected to have sufficient space until beyond the end of the planning period.

The concept of relocating amenities in the non-secure area was presented to the Airport in January 2013. The Airport's primary concern was to not disturb the restaurant and bar that is adjacent to the security checkpoint. In addition, the concept of adding an open seating area to the central lobby remains unresolved.

6.4.2. Initial Layouts: Security Checkpoint

For the security checkpoint to function efficiently, sufficient space needs to be provided to accommodate both the required equipment and to allow passengers to move through the checkpoint smoothly. While two lanes are sufficient for current passenger levels, three lanes will be needed to handle forecasted peak number of passengers beyond the year 2016. Additionally, the checkpoint area layout should provide ample space for flexibility and growth since projected peak hour passenger numbers in 2031 indicate that it is likely that a three-lane checkpoint will be nearing its maximum capacity. Not only will the number of lanes provided need to increase, but the amount of space allocated for each checkpoint lane needs to increase by a factor of nearly two in order to meet today's checkpoint design standards. A list of goals was established for the development of the initial checkpoint layout alternatives. These checkpoint changes must also consider the impact of checkpoint layout changes on adjacent areas with related functions.

- Security Checkpoint Goals:
  - Comply with current TSA guidelines for checkpoint functional areas such as queuing, divestiture, checkpoint lanes, equipment, and composure.
  - Allow sufficient space in the checkpoint layout for a third checkpoint lane and associated equipment to be added in the near future with flexibility for a fourth lane to be added when enplanement levels demand it.
  - Improve wayfinding within the checkpoint, by providing straight lanes and increasing the amount of space available for divesture and composure.
  - Separate the paths of arriving and departing passengers and provide them in a manner that reduces or eliminates crossings. This will reduce congestion, particularly at busy times.

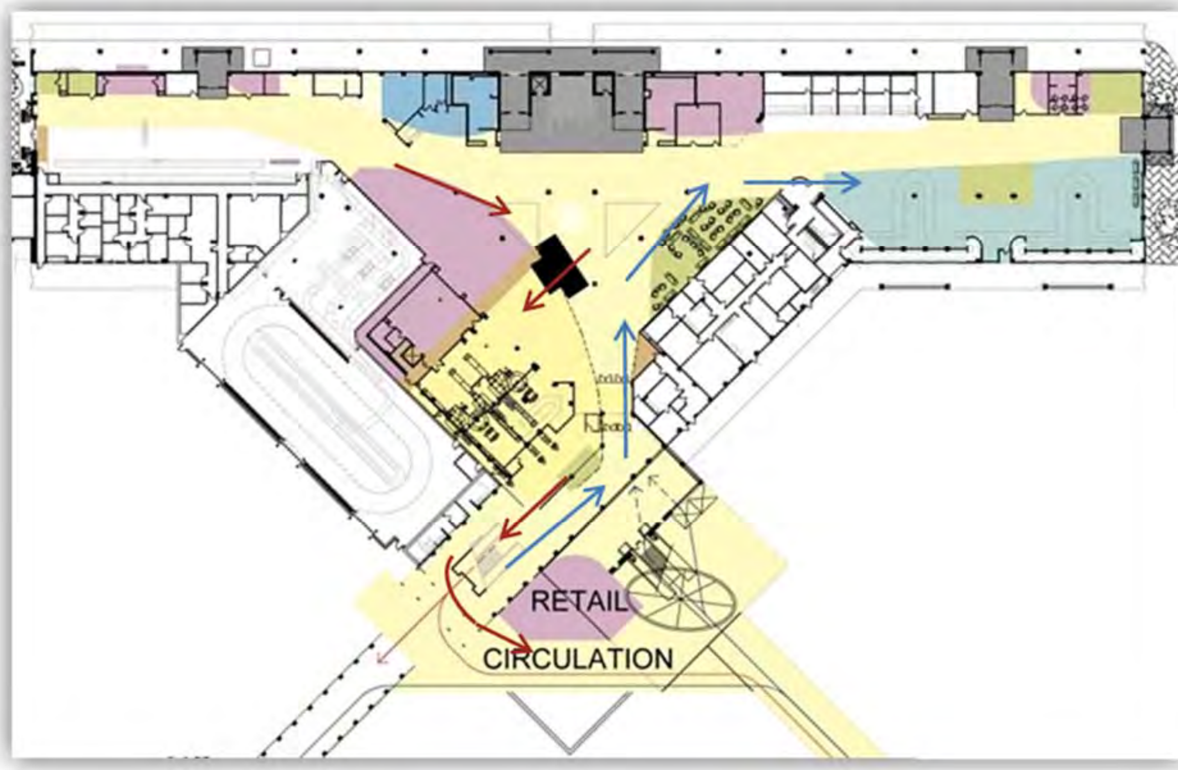
- Security Checkpoint Considerations:
  - Expanding the checkpoint may affect the non-secure areas including circulation, the lobby, restaurant/bar, and TSA offices.
  - A checkpoint expansion will affect the ground boarding area.
  - Changes to the orientation of the checkpoint will affect the checkpoint relationship with the existing escalators.

Changes to the security checkpoint should be accomplished in a way that provides free-flowing, intuitive pedestrian wayfinding and circulation.

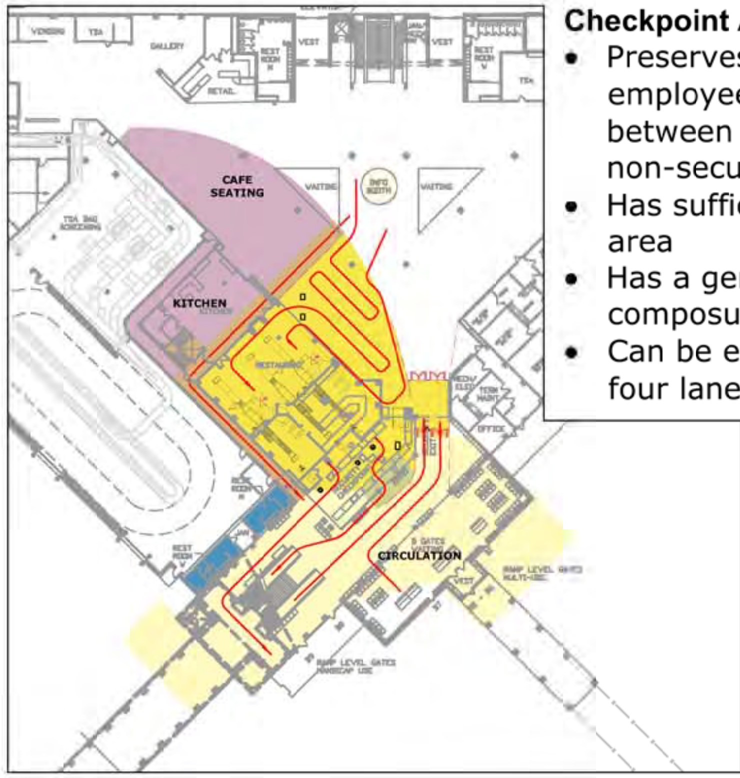
The existing security checkpoint and vertical circulation areas

Initial checkpoint layout alternatives consider options for the checkpoint to remain in the existing building footprint since the existing amount of area in the non-secure area is generally sufficient. Additional capacity at the existing checkpoint cannot be provided by simply remodeling the existing space. Instead, capacity must be added by relocating the checkpoint, expanding it into an adjacent area, and/or expanding it outside the existing building footprint. The checkpoint is currently located in the center of the terminal building, where growth is challenging because it will affect passenger circulation and tenants in adjacent spaces. Any changes made to the checkpoint should be provided to allow sufficient space for both horizontal circulation at checkpoint exit and vertical circulation for access to Concourse C. The initial round of security checkpoint layout alternatives investigated the opportunities for checkpoint growth within the existing building area. Five initial alternative security checkpoint layouts are presented in **Figure 6.4**.

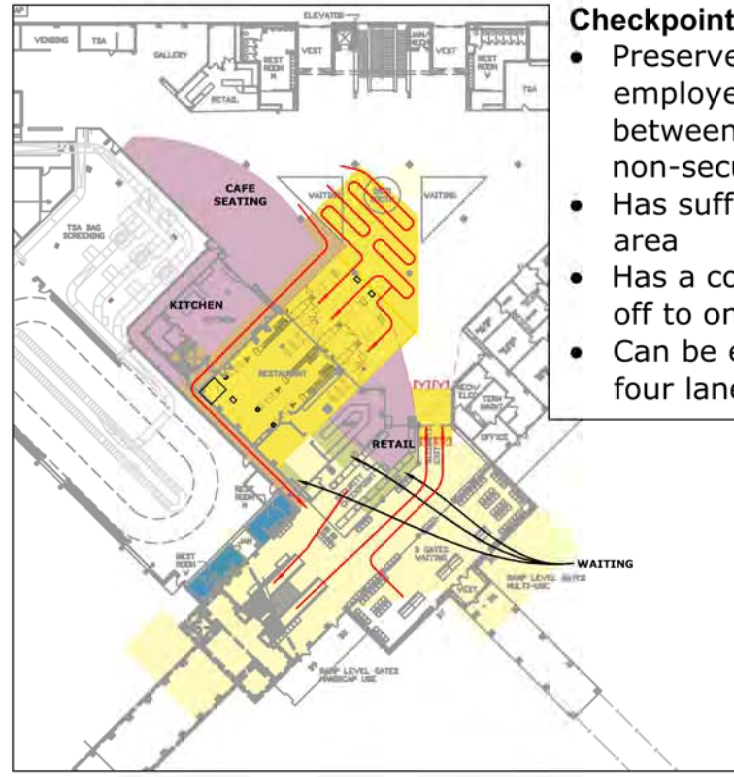
In January 2013, Checkpoint Alternative 1b was recommended as the preferred checkpoint configuration within the existing building footprint, although possible conflict with existing columns may make Alternative 1a more viable. In a meeting with the Airport held at that time, Airport staff discussed ongoing safety concerns with the existing escalators. For the next round of alternatives, the Airport expressed an interest in seeing checkpoint layout options that will not impact the non-secure restaurant, offer vertical circulation options that include a pedestrian ramp, and provide growth opportunities for the checkpoint outside the existing building footprint.



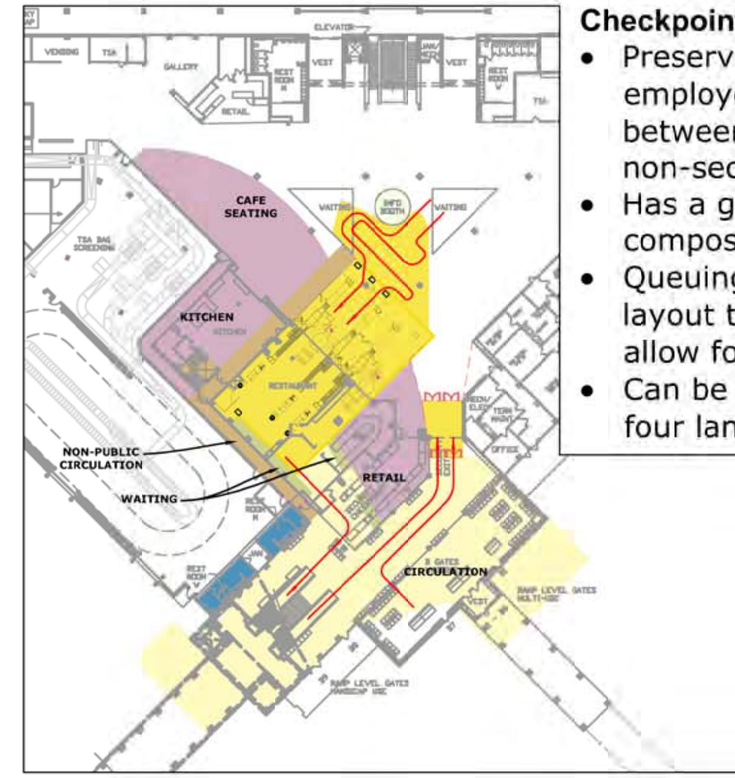
Initial Layout: Recommended Security Checkpoint Alternative, secure vertical circulation and non-secure public area



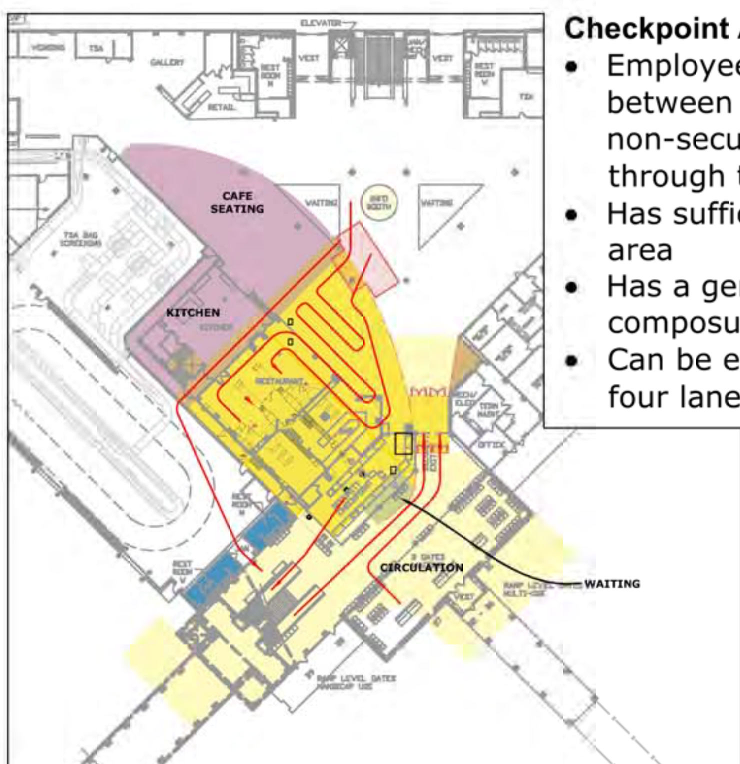
Checkpoint Alternative 1a
- Preserves existing employee access between secure and non-secure areas
- Has sufficient queuing area
- Has a generous composure area
- Can be expanded to four lanes



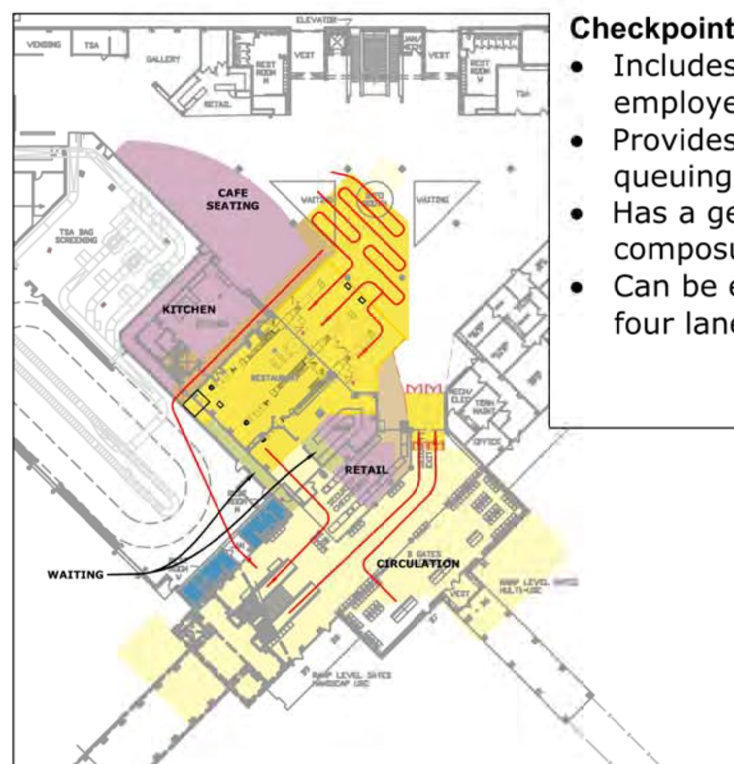
Checkpoint Alternative 2a
- Preserves existing employee access between secure and non-secure areas
- Has sufficient queuing area
- Has a composure area off to one side
- Can be expanded to four lanes



Checkpoint Alternative 2c
- Preserves existing employee access between secure and non-secure areas
- Has a generous composure area
- Queuing area has poor layout that does not allow for future growth
- Can be expanded to four lanes



Checkpoint Alternative 1b
- Employee access between secure and non-secure areas is through the tug drive
- Has sufficient queuing area
- Has a generous composure area
- Can be expanded to four lanes



Checkpoint Alternative 2b
- Includes options for employee access
- Provides adequate queuing area
- Has a generous composure area
- Can be expanded to four lanes

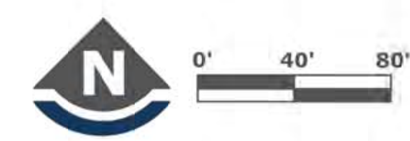


Figure 6.4 **Initial Security Checkpoint Alternatives (1a, 1b, 2a, 2b & 2c)**

THE EASTERN IOWA AIRPORT CEDAR RAPIDS

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6.4.3. Initial Layouts: Secure Area

Beyond the security checkpoint, the secure area of the passenger terminal building features seven ground-boarding gates with a shared holdroom in Concourse B. Other areas include: vertical circulation via escalators, stairs, and elevators for access to a pedestrian bridge; passenger amenities; holdrooms; and six aircraft gates with passenger boarding bridges in Concourse C. Below Concourse C, the ground floor is occupied by an airline operations and Airport support area.

The initial determination of need for these areas indicate that the existing overall number of gates is adequate for the short-term, but that the holdroom, concessions and circulation areas in the C concourse will be nearing capacity by the year 2021. Additionally, the existing holdrooms at Gates C1, C2, and C3 are undersized for holding the number of passengers in today's aircraft, causing waiting passengers to spill into the adjacent circulation area at busy times. Not only is the hold room at Gate C2 undersized, aircraft access to Gate C2 is constricted due to the recent construction of a shared outbound baggage room to its immediate north. For these reasons, future changes to Concourse C should allow for abandoning Gate C2 in the future. The seven existing Concourse B ground boarding gates are used intermittently, usually as overflow when the Concourse C gates are occupied. National trends indicate that ground boarding commercial aircraft is used less often now than in the past. In the future, ground boarding at CID will be reduced or may be phased out once more gates with passenger boarding bridges are provided.

Similar to the non-secure area, the secure area would benefit from a reorganization of amenities and concessions. The restaurant has only six tables, which fill fast at peak times. The effective width of the circulation area is narrower than recommended and should be widened in order to accommodate passenger flow at peak times. The retail area is not in a location that lends itself to this type of use, and display shelving obscures the view to outside. Passenger amenities should be improved to allow more areas for small meetings and cell phone conversations by providing booths or alcoves to provide acoustic separation from the ambient environment.

6.4.3.1. Concourse B Improvements

The initial alternative layouts for the secure area involved exploring an option for expanding the B holdroom (B Holdroom Alternative 1) as well as an option for building a pier-style concourse in the current B holdroom location. This concourse would include passenger boarding bridges and hold rooms large enough to accommodate today's larger aircraft (B Holdroom Alternative 2). For these reasons, the initial layout alternatives for the secure area considered minor changes and additions for Concourse C and its concessions areas, and an expansion to the Concourse B ground boarding area. Once the preferred concourse expansion alternative is determined, these changes should be coordinated with the security checkpoint reconfiguration, and with horizontal and vertical circulation. The two initial Concourse B Holdroom alternative layouts are presented in **Figure 6.5**.

6.4.3.2. Concourse C Improvements

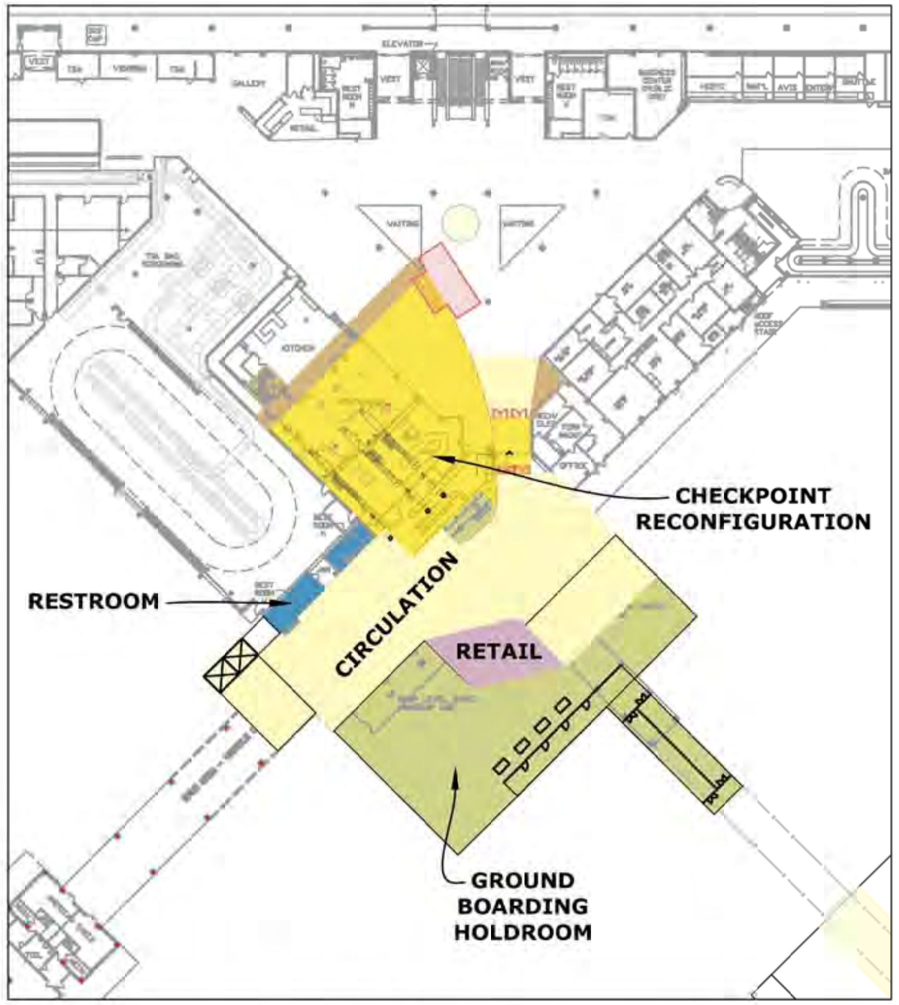
Initial proposed Concourse C Improvements are shown in **Figure 6.5**. Similar to the non-secure area, Concourse C would benefit from a project that focused on relocating and grouping amenities by types of usage to create a retail / concession node, offering several options for passengers in a single area. More private options would be offered for cell phone conversations and small group meetings by providing furniture groupings or alcoves with less public exposure. The holdrooms at Gates C1 and C3 would be expanded to provide capacity for seating 70-90 passengers, the number of typically seen on regional flight today. This would prevent passengers spilling over into circulation areas and impeding circulation to the rest of Concourse C. The effective width of the central Concourse C circulation corridor would be widened to allow efficient movement and provide space to absorb overflow, diffusing concentrated usage at the holdrooms.

6.4.4 Combined Initial Layouts

After studying each area independently, the initial preferred alternatives were combined so that the overall layout could be reviewed for efficiencies and inefficiencies (see **Figure 6.6**). While the amount of existing area in the non-secure area is sufficient, the initial non-secure area layout rearranges the public area in order to group passenger amenities by the types of use. Amenities and services are provided in locations that have associated uses, and passenger wayfinding is improved. This rearrangement is accomplished in a way that minimizes changes to adjacent tenant spaces which are expected to have sufficient space beyond the end of the planning period, such as the TSA office area and car rental area,.

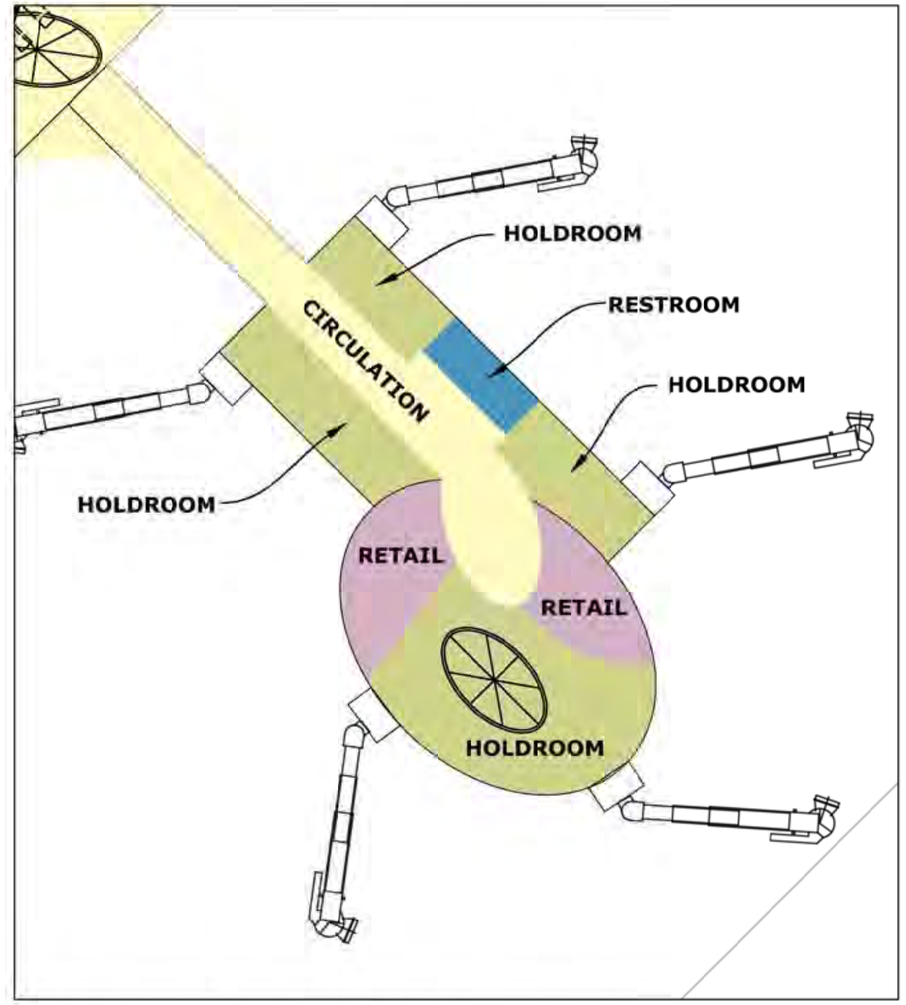
Security Checkpoint Alternative 1b provides an effective option in comparison to the existing checkpoint configuration while remaining in the existing building footprint. However, the Airport expressed an interest in developing additional layouts for the security checkpoint that do not impact the non-secure restaurant and provide growth to the checkpoint outside the existing building footprint. In the secure area of the passenger terminal, Concourse B Holdroom Alternative 2 provides a pier-style concourse in the current B holdroom location, with boarding bridges and hold rooms large enough to accommodate the number of passengers on smaller regional jet aircraft. Similar to the non-secure area, the initial Concourse C layout alternatives consider minor changes and additions to the concourse that relocate and group amenities by types of usage and offer areas for cell phone conversations and small group meetings to take place. The holdrooms at Gates C1 and C3 would be expanded to provide capacity for seating 70-90 passengers, and the circulation corridor would be widened to allow efficient movement, reducing passenger “spill over” from holdrooms into circulation areas and opening up circulation to the rest of Concourse C.

In January 2013, the Airport reported that typically during a large flight from a carrier such as Allegiant Air, Concourse C already nears passenger capacity. In addition, the Airport reported that there have been occasions in the recent past when all six of the C gates were occupied by departing aircraft at the same time, causing overflow aircraft to be redirected to the ground boarding area. For these reasons, it was determined that a gate capacity analysis should be performed for the purpose of better understanding both Concourse C gate performance and the role of ground boarding in the future. Regarding future layouts for the security checkpoint, the Airport expressed an interest in seeing options for checkpoint that do not impact the non-secure restaurant, and provide growth to the checkpoint outside the existing building footprint. The planning team proposed that expansion opportunities should be reviewed next for impact on the apron and the aircraft movement area.



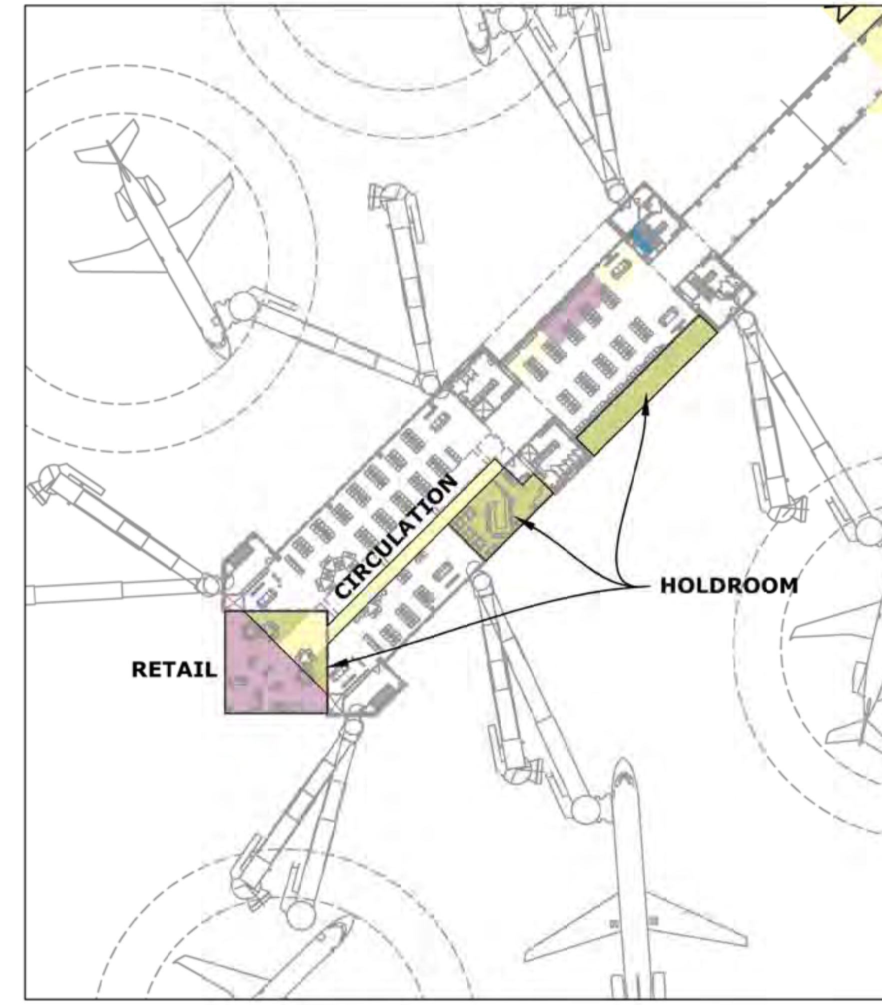
Concourse B Alternative 1

- ADVANTAGE: Allows space for checkpoint configuration and limited use of ground-boarding
- DISADVANTAGE: Does not increase the number of gates with passenger boarding bridges
- DISADVANTAGE: Use of the boarding bridges would be limited to small regional jet aircraft



Concourse B Alternative 2

- ADVANTAGE: Shape of retail/holdroom node allows the concourse to easily continue growth to the southeast
- DISADVANTAGE: Growth beyond footprint shown would affect the existing snow removal equipment/maintenance facility
- DISADVANTAGE: Use of the boarding bridges would be limited to small regional jet aircraft



Concourse C Alternative 1

- Widen circulation areas
- Relocate restaurant and retail areas
- Provide cell phone/meeting areas
- Expand holdrooms at gates C1 and C3
- Allow for abandoning gate C2 in the future

Figure 6.5 **Initial Concourse Alternatives (B1, B2 & C1)**

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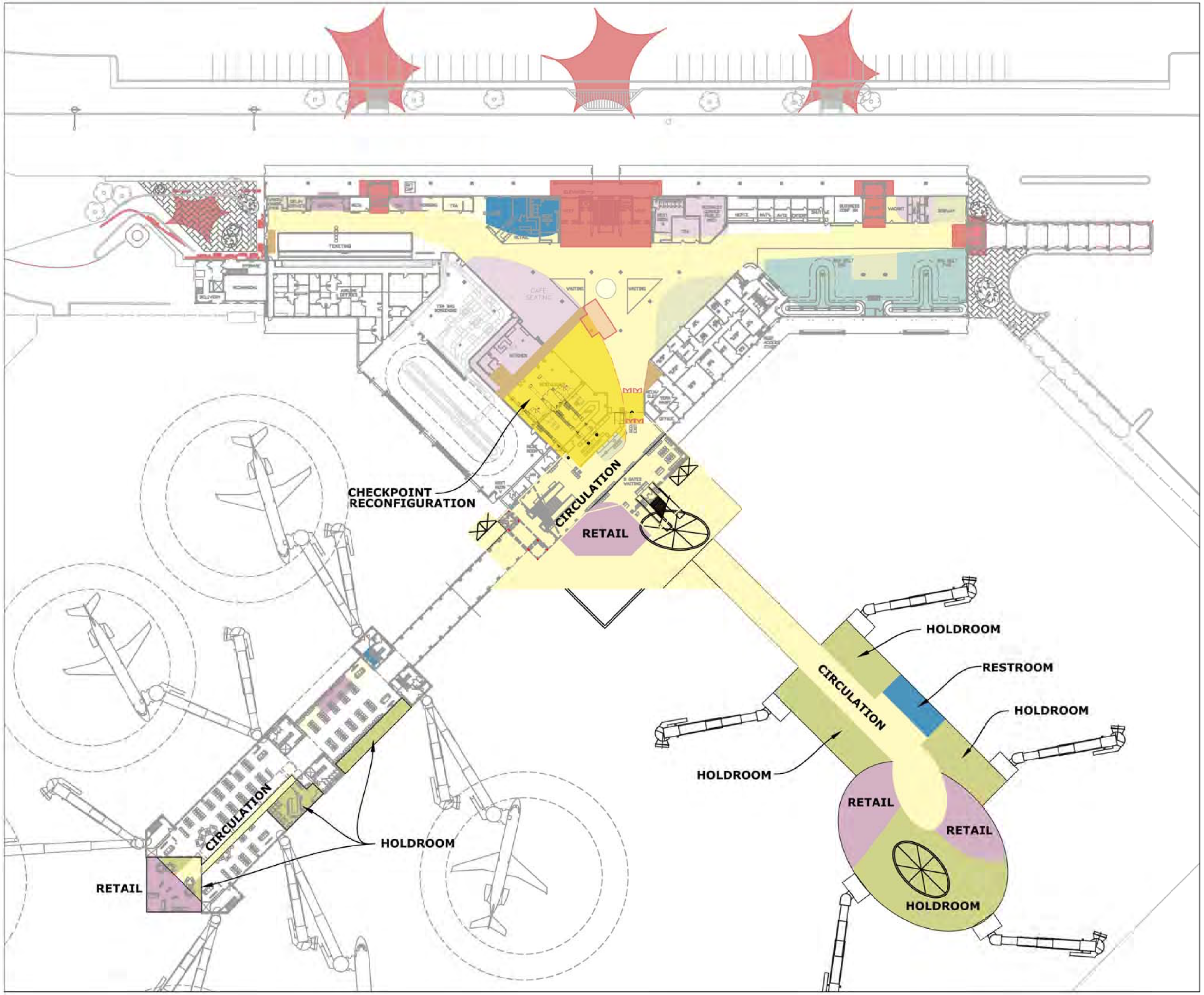

Figure 6.6 **Initial Combined Layout: Non-Secure Area, Security Checkpoint & Secure Area**

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6.5. Passenger Terminal: Intermediate Alternative Layouts

The second round of alternative layouts continued to generate conceptual plans and refine selected layouts by adding more detail. Concourse expansions were reviewed for their potential impact on adjacent facilities within the terminal complex. The project goals became more clearly defined as the alternatives evolved, and previous planning documents were referenced and discussed for their relevance at this point in time. Interrelationships between the major areas inside the passenger terminal were explored, resulting in layouts that improved passenger flow. Intermediate layout alternatives for the non-secure area, the security checkpoint, and the secure area are presented in the following sections.

6.5.1. Intermediate Layouts: Non-Secure Area

The initial layout of the non-secure area considered options for improvements while remaining within the existing building footprint because existing non-secure area space has been generally sufficient. At this point in the planning process; however, the focus of work in the terminal became the security checkpoint and concourse areas. Therefore the general space organization from the initial non-secure area layout will be carried forward as the preferred non-secure area layout for this Master Plan Update. However, further adjustments to functional area sizes may occur prior to final publication of the Master Plan.

6.5.2. Intermediate Layouts: Security Checkpoint and Circulation

In January 2013, the Airport expressed an interest in seeing options for security checkpoint layouts that do not impact the non-secure restaurant, and provide growth to the checkpoint outside the existing building footprint. In this intermediate round of alternative layouts, many options for the configuration of the security checkpoint were generated. In addition, a previous planning project that reviewed the security checkpoint was reviewed for its relevancy at this point in time.

The 2007 Terminal Planning Study proposed a realignment of the security checkpoint in a similar location to Checkpoint Alternative 1b presented under the initial checkpoint layouts in Section 6.4.2. The checkpoint layout proposed in 2007 included two checkpoint lanes and a fairly circuitous queuing path. This layout creates difficulties for dividing the queuing area by types of travelers as is now done for the TSA PreCheck program implemented in 2012. The 2007 layout also does not allow sufficient space for a third checkpoint lane, nor does it make use of the potential for expansion into a mechanical area to the east that would become available if the Concourse B holdroom were to be demolished, renovated or expanded.

The location and configuration of the security checkpoint are critical factors in the quality of its performance and the efficiency with which it operates. This often leaves a lasting impression on passengers as the quality of passenger flow in the vicinity of the checkpoint has an influence on how well the checkpoint functions. At CID, passenger flow upon exiting the checkpoint is affected by the existing set of stairways and escalators that provide access to Concourse C. For this reason, passenger circulation design was paired with the checkpoint layout for this round of layout development. Passenger paths are most efficient when there is sufficient horizontal space to allow decisions to be made while in motion and the paths of passengers with different destinations are kept separate. Instead, at CID, the passenger paths will diverge and rejoin with divergent paths advancing in the same direction. The checkpoint goals and considerations that were established in the initial round of alternatives are the same in this round, and the following circulation goals were added:

- Security Checkpoint Circulation Goals:
  - Provide sufficient space for horizontal circulation before and after the security checkpoint, to allow passengers to easily transition to and from the checkpoint.
  - Provide vertical circulation to encourage the separation of arriving and departing passenger paths, and prevent these paths from crossing
  - All circulation should be accomplished in a way that provides free-flowing, intuitive pedestrian wayfinding.

6.5.2.1. Intermediate Checkpoint Alternatives: Orientation Options

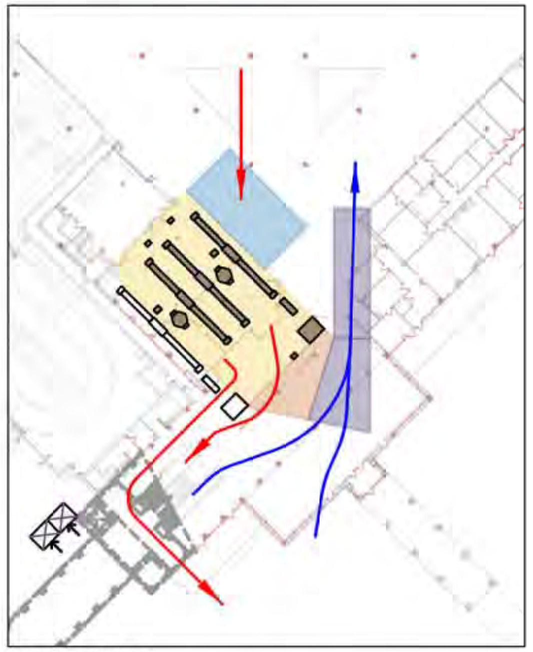
In this round of alternatives, three basic options for the general orientation of the security checkpoint are presented. These orientations include 1) a rotation of 45 degrees to the west, 2) a direct north-south orientation, and 3) a rotation of 45 degrees to the east, and are presented in **Figure 6.7**. All of these options illustrate the prospective arriving and departing passenger paths through the checkpoint using red arrows to represent the departing passenger paths and blue arrows to represent the arriving passenger paths.

- Intermediate Checkpoint Alternative 3: 45-Degree West Configuration:
  The first intermediate option includes variations on a checkpoint configuration that is rotated 45 degrees to the west of north. This option includes two different vertical circulation alternatives, both of which have the same general checkpoint orientation and layout. For vertical circulation, Checkpoint Alternative 3-1 uses the existing escalator and stairway, but adds elevators. Checkpoint Alternative 3-2 replaces the existing escalator and stairway with a pedestrian ramp.

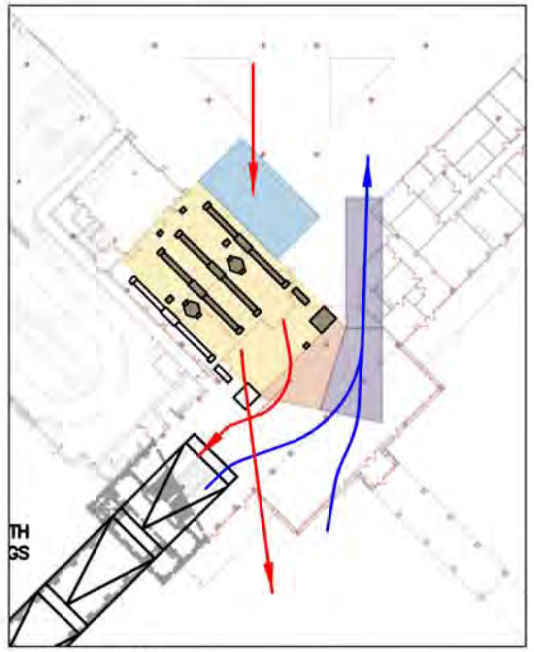
- Intermediate Checkpoint Alternative 4: North-South Configuration:

  The second intermediate option includes four variations on a checkpoint configuration that is oriented directly north-south as demonstrated in the layouts provided on the next two pages. The first three variations assess the impact of the checkpoint location relative to the non-secure lobby to the north and the secure area to the south. The fourth variation reduces the north-south length of the checkpoint by moving the queuing area to the west side of the checkpoint lanes.

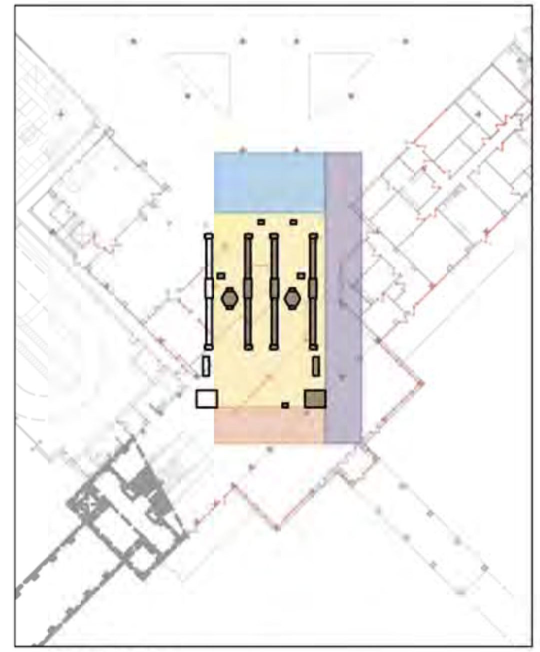
- Intermediate Checkpoint Alternative 5: 45-Degree East Configuration:
  The third intermediate option includes two variations on a checkpoint configuration that is rotated 45 Degrees to the east of north. Both alternatives require the removal of the existing escalators and stairway and a major reconfiguration of vertical circulation. The first option would make expansion to Concourse B more difficult. The second option would allow more space for vertical circulation and Concourse B expansion than the first option, but would impact the non-secure bar area.



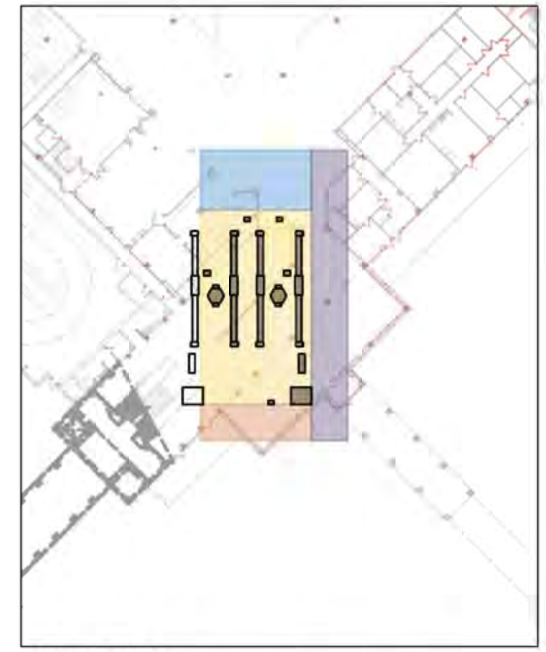
Alternative 3a
- Presented in January as the recommended preferred alternative
- Minimizes the size of building addition
- Queuing space in lobby does not impede access to the relocated restaurant
- If escalator remains two-way there will be traffic conflicts, unless passengers going to B gates are directed around the back of the escalators



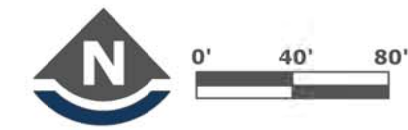
Alternative 3b
- Introduces the pedestrian ramp concept to replace escalators
- Ramp length complicates wayfinding to ground boarding for outbound passengers
- If escalator remains two-way, there will be traffic conflicts between passengers going to B gates and passengers exiting the secure area

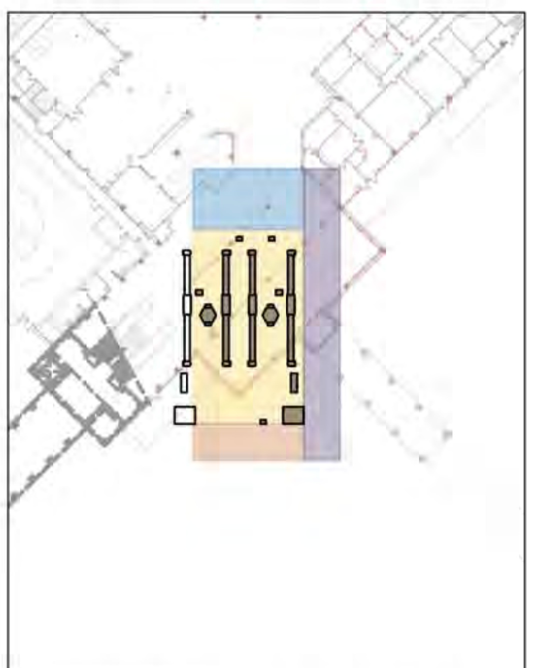


Alternative 4a
- Largest lobby impact among the North-South options
- The checkpoint width impacts the non-secure bar
- Ground boarding area is impacted
- Existing escalators are retained

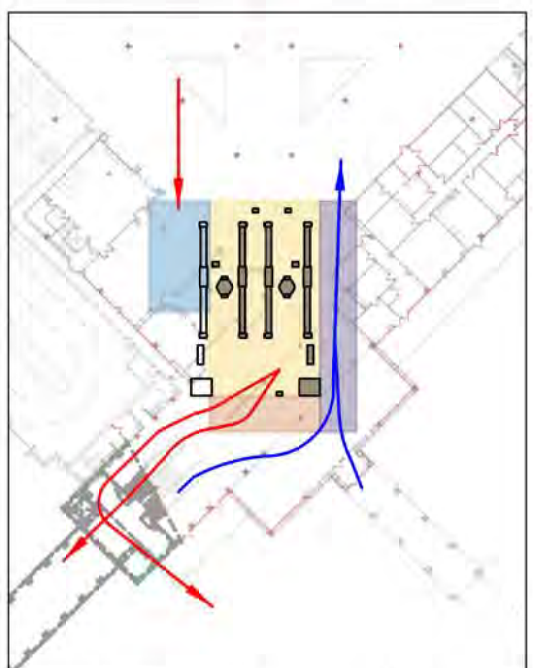


Alternative 4b
- Less lobby impact than Alternative 4a
- The checkpoint width impacts the non-secure bar
- Ground boarding area is impacted
- Vertical circulation modifications must be explored

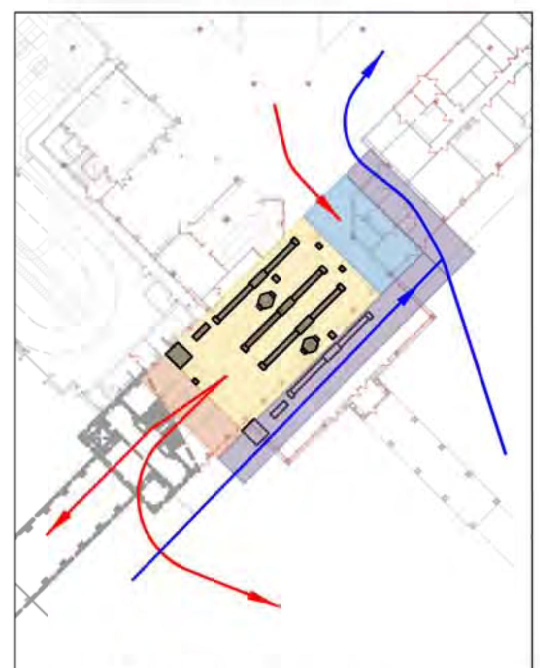




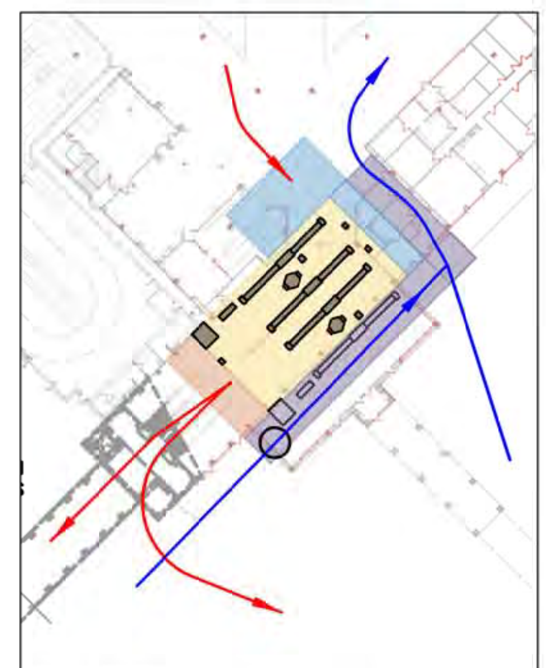
Alternative 4c
- Least lobby impact of the North-South options
- The bar area remains in place
- Largest impact to ground boarding area of the North-South options
- Vertical circulation options are limited
- Ground boarding area and terminal apron is impacted



Alternative 4d
- This "hybrid" option balances impacts to secure and non-secure areas
- Little lobby impact
- Largest impact to the non-secure restaurant and bar area among the North-South options
- Ground boarding area is impacted
- Existing escalators are retained



Alternative 5a
- No impact to the non-secure lobby
- The non-secure bar area remains in place
- Expansion of the ground boarding area is difficult
- Vertical circulation requires a major reconfiguration



Alternative 5b
- More lobby impact than Alternative 5a
- The checkpoint width impacts the non-secure bar area
- Expansion of the ground boarding area is difficult
- Vertical circulation requires a major reconfiguration

Figure 6.7 **Intermediate Checkpoint Alternatives (3a, 3b, 4a, 4b, 4c, 4d, 5a & 5b)**

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6.5.2.2. Intermediate Checkpoint Layout Alternatives: Vertical Circulation Options

Four basic options incorporating different vertical circulation methods were developed and evaluated. Most of these options can be used in conjunction with the checkpoint alternatives presented above. In January 2013, the Airport expressed concern with safety associated with the existing escalators. These escalators are the preferred passenger choice for vertical movement between Concourse C and the ground floor; however, there have been some passenger injuries associated with the escalators. This is due, in part, to the relative obscurity and limited options associated with the elevators.

The four options present several choices for vertical circulation in addition to or instead of escalators (see **Figure 6.8**). These choices allow passengers to choose their preferred mode of vertical circulation, thereby reducing safety concerns associated with the escalators. For the vertical circulation system to be effective, destinations and routes need to be clear, and choices for moving vertically need to be clearly delineated.

- <u>Vertical Circulation Alternative 1a: Escalators and Elevators:</u>
  This option pushes the 45-Degree East layout further to the southwest and splits the up and down escalators, allowing a substantial amount of horizontal separation between them. It relocates the up escalator to the north side of the Concourse C pedestrian bridge and the down escalator to the non-secure side of checkpoint. The passage below the pedestrian bridge for ground service equipment (GSE) would be impacted by the escalator relocation, allowing only single-lane GSE traffic to pass below the bridge. The second-floor arriving passenger path would allow arriving and departing passenger paths to be kept separate, with no crossing paths.

- <u>Vertical Circulation Alternative 1b: Escalators and Elevators</u>
  This option refines the 45-Degree West layout identified as the preferred alternative in the initial round of layouts. In this option, the existing escalators are kept in place, but both are used to go up only. New down only escalators are located directly opposite the checkpoint, and visually prominent pairs of elevators are located adjacent to both pairs of up and down escalators. This option would provide a better opportunity for a second floor Concourse B expansion to the southeast, currently occupied by the ground boarding holdroom. This option is non-directional in that the paths of passenger circulation would not favor either the C side or the B side. A layout such as this, that balances the passenger paths between the B and C directions, would be appropriate for a two-story Concourse B expansion since it allows equal access to both directions.

- <u>Vertical Circulation Alternative 2: Elevators Only</u>
  This option explores some of different locations and configurations that are feasible for the use of only elevators only for vertical circulation. However, in actual use, stairways will almost always be used in conjunction with elevator applications in which the vertical distance traveled is less than three floors. Elevators generally have fewer safety incidents than escalators or stairs, and are often the best choice for the elderly, for people traveling with children, and people who have impaired movement. While elevators typically occupy considerably less floor space than escalators or stairways, they can only convey a limited number of people at a time. For this reason, they are best used to augment vertical circulation provided by escalators and stairways.

- Vertical Circulation Alternative 3: Pedestrian Ramp
  Pedestrian ramps are a good choice for small vertical changes than for large changes as the proportion of run associated with the vertical change can be substantial. The Americans with Disabilities Act (ADA) requires a 20:1 slope for a ramp that has no landings and a 12:1 slope for a ramp with intermediate landings. At CID, the length of ramp required in order to achieve the vertical change from the ground floor to the second floor complicates the siting of the checkpoint in relationship to horizontal circulation and concourse expansions even when incorporating switchbacks. For these reasons, the use of a pedestrian ramp will not be considered in future terminal alternatives.

6.5.2.3. Intermediate Security Checkpoint and Passenger Circulation Layouts: Conclusion

The existing security checkpoint is undersized for the amount of use it experiences today. Both the amount of space for each security checkpoint lane as well as the number of lanes provided need to increase in order to meet today's checkpoint design standards. The final choice for the preferred layout of the security checkpoint will be affected by a number of factors including impacts to the following sets of adjacent areas:

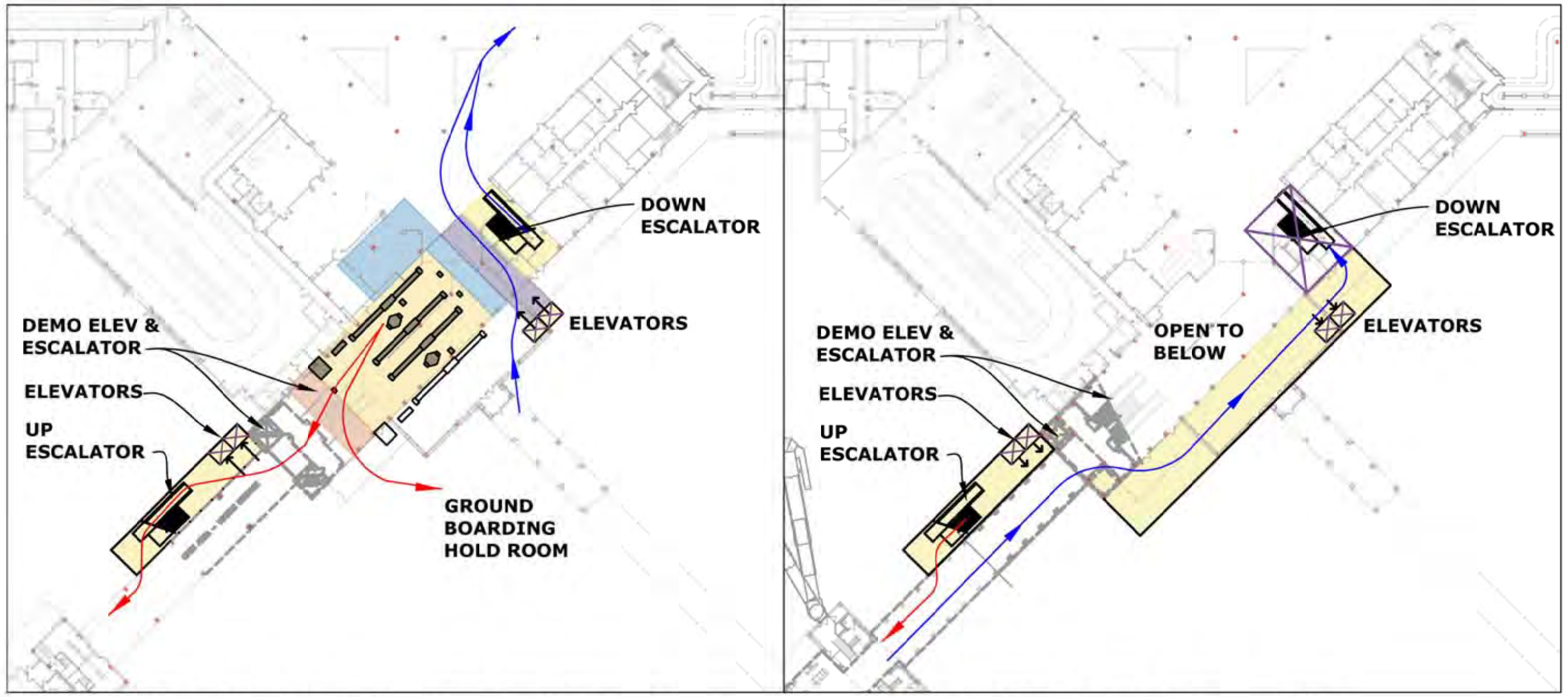
- Non-secure areas, including the lobby, restaurant/bar, and TSA offices
- Ground boarding and second floor concourse expansion scenarios
- Vertical and horizontal passenger circulation

The existing vertical circulation node between the checkpoint and Concourse C has a somewhat steep stairway bracketed by two escalators, and a single elevator that is not visually apparent to passengers leaving the checkpoint. While escalators are an efficient means of conveying passengers from one floor to another, and the preferred choice for most passengers nationally, their safety is a concern. Elevators are often the preferred choice for the elderly, for people traveling with children, and people who have impaired movement. Additionally, many regular passengers prefer to have the choice of using a gracious stairway instead of elevators and escalators. Increasing the visual prominence and availability of elevators will reduce the number of injuries associated with escalators by allowing passengers to choose the type of vertical circulation they use. Increasing the capacity and the number of options available for vertical circulation will improve passenger circulation.

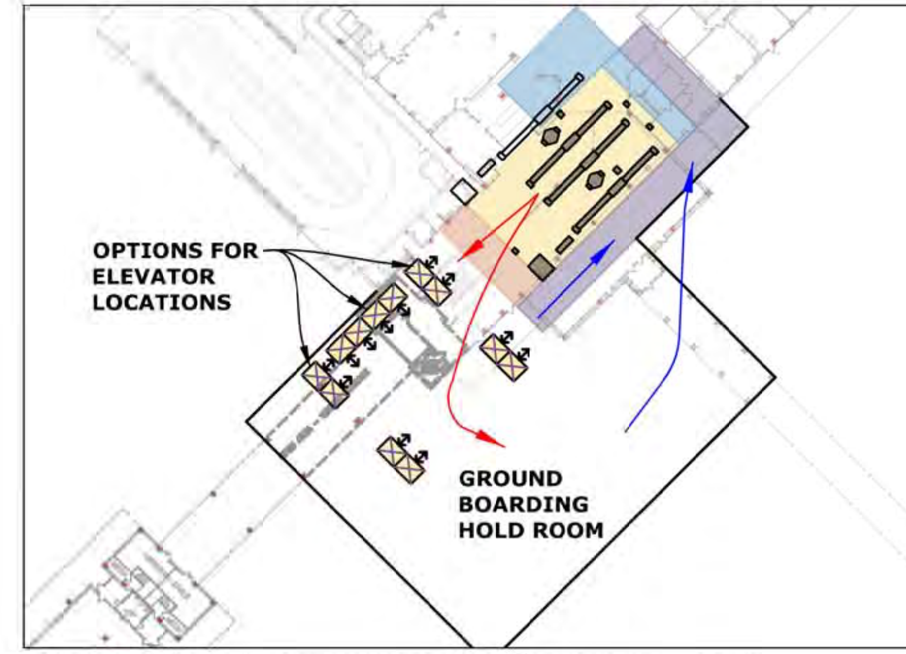
The choices for vertical circulation methods to be used in the future at CID should make efficient use of space and provide free-flowing, intuitive pedestrian circulation and wayfinding. These include:

- Escalators
- Visually prominent elevators
- High-profile stairways

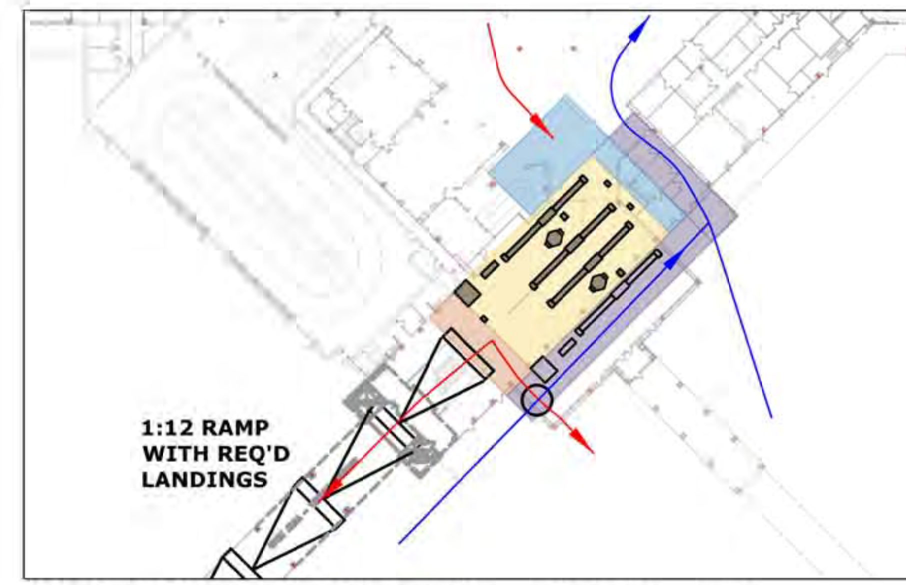
The security checkpoint and vertical circulation at CID are located directly adjacent to one another and are appropriate for the sequence of the passenger path. Additionally, both of these facilities are operating at or near capacity. For these reasons, future checkpoint changes should be made in conjunction with improvements to the existing vertical circulation system.



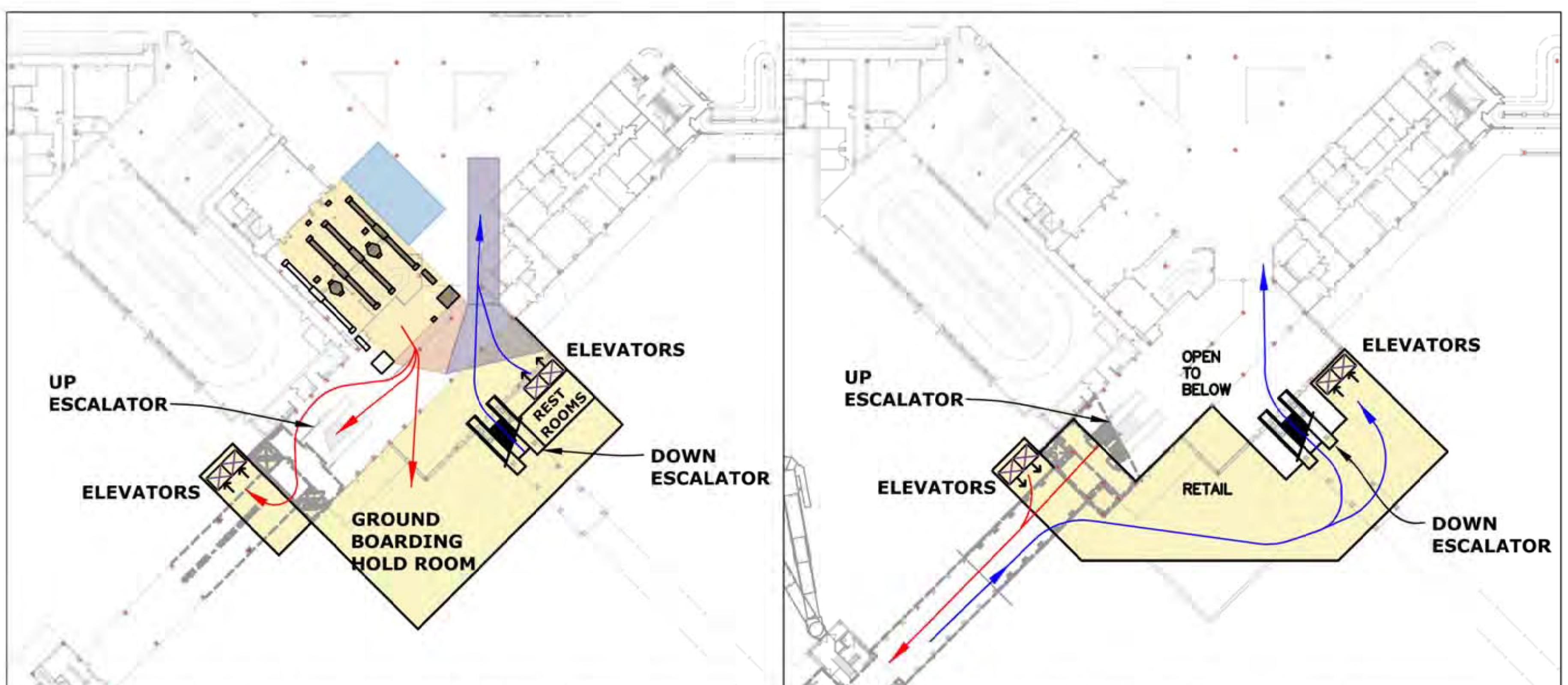
Vertical Circulation Alternative 1a: Escalators and Elevators (First Floor on Left, Second Floor on Right)



Vertical Circulation Alternative 2: Elevators Only



Vertical Circulation Alternative 3: Pedestrian Ramps



Vertical Circulation Alternative 1b: Escalators and Elevators (First Floor on Left, Second Floor on Right)

Figure 6.8 **Intermediate Vertical Circulation Alternatives (1a, 1b, 2 & 3)**

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6.5.3. Intermediate Layouts: Secure Area

The initial analysis of the existing amount of holdroom space in both Concourse B and Concourse C assumed that the overall amount of holdroom area will be nearing capacity by the year 2021. An analysis of Concourse C only; however, indicated that the Concourse C holdrooms would near capacity as soon as 2016, and that the holdrooms for Gates C1 and C2 are undersized to serve today's aircraft. Additionally, both the airlines and the Airport have reported that aircraft access to Gate C2 is constrained, which is partially due to the fact that aircraft currently "power out" rather than use tugs to push them back from the gate. In addition, the Airport reported that there have been occasions in the recent past when all six Concourse C gates are occupied by departing aircraft at the same time. It was determined that a better understanding of gate performance and the future role of ground boarding would be beneficial to the planning project. For this reason, a gate capacity analysis was performed as presented in Chapter 4.

The gate capacity analysis concluded the ability to accommodate ground boarding should be retained in a limited fashion, and that two additional gates with passenger boarding bridges (PBBs) will be needed in the next 20 years. For flexibility in planning, layout alternatives should have the capacity to add two additional PBB gates over and above the two PBB gates needed, for a total of ten PBB gates. Several of the gates should be designed to service narrow-body jets, such as A320s, B737s, and MD-83s, which are used increasingly today in passenger markets similar to CID.

- Secure Area Goals:

  The secure area goals in this round of alternatives development were more refined than the goals set for the initial alternative layouts. This is a result of gate capacity analysis recommendations, as well as lessons learned through the development and review of the initial round of alternatives development. Secure area goals for this round of analysis include:
  - Provide sufficient space, number of lanes and flexibility for future expansion for the checkpoint.
  - Provide sufficient space for horizontal and vertical circulation between the checkpoint and the second floor concourse.
  - Explore opportunities for concourse expansion in both the B and C directions.
  - Expand C1 and C2 holdrooms to accommodate 90-passenger aircraft, assuming airline operations will change to "push back" instead of "power out" for aircraft leaving the gate.
  - Provide the amount of space in each holdroom that is sufficient to hold the number of passengers on all aircraft that can access the gate.
  - Provide sufficient distance between gates as required by aircraft that will access the gates.
  - Determine the effects of concourse expansion options on the surrounding site and facilities.
  - Consider the options available for expansion beyond the requirements for the present planning window.

6.5.3.1. Intermediate Concourse B Alternatives

During this round of layouts, two alternatives were developed for a southeast expansion from the current Concourse B holdroom location. These include: 1) construction of a new second-floor pier-style concourse similar to existing Concourse C, and 2) expansion of the existing Concourse B holdroom and construction of a second-floor above the existing holdroom space. These alternatives are presented in **Figure 6.9**.

- Intermediate Layout: Concourse B Alternative 3

  The first Concourse B alternative developed in this round of layouts shows a pier-style concourse similar to the initial layout for Concourse B Alternative 2. Both provide four new gates with boarding bridges, limited ground boarding as well as expand the checkpoint and vertical circulation areas where the B and C piers meet. In this round of layouts; however, the holdrooms have increased in size and the gates have been located with an increased distance between them so that larger aircraft can utilize them. In addition, the potential effects on the surrounding site are noted. Apron added for aircraft circulation would impact the ground transportation parking lot on the east side of the terminal, and has the potential of affecting the snow removal equipment/maintenance (SRE) building, which is located southeast of the proposed expansion. Future growth of the secure area beyond the expansion shown is likely to take place from Concourse C, as the location of the SRE building would impede future Concourse B growth to the southeast.

- Intermediate Layout: Concourse B Holdroom Alternative 4

  The second Concourse B alternative developed in this round of layouts is sometimes called the “half-moon” option due to its shape. This option reconfigures existing Gate C1, while widening the existing pedestrian bridge that connects Concourse C to the security checkpoint area in order to accommodate future increased circulation to all of the C gates. It relocates the C1 boarding bridge and provides sufficient C1 holdroom space to service today’s larger aircraft. It adds two new gates with holdrooms in the ”half-moon” area that are also capable of servicing large aircraft. In addition, it offers several ground boarding gates as recommended in the gate capacity analysis and adds ample space in the most restricted part of the secure area, the location of the checkpoint and vertical circulation. Similar to Concourse B Holdroom Alternative 3, future growth to the secure area would likely come from the end of Concourse C as the location of the existing SRE building would impede concourse growth from the Concourse B holdroom to the southeast. The following alternatives explore expansion options for Concourse C.

6.5.3.2. Intermediate Concourse C Holdroom Alternatives

During this round of layouts, two alternatives were developed for expanding the area to the southwest of the existing Concourse C holdroom during this round of layouts. These include: 1) continued growth in the southwest direction axial to the existing C concourse, and 2) continued growth angled 45 degrees running parallel Taxiway "A". These alternatives are presented in **Figure 6.9**.

- <u>Intermediate Layout: Concourse C Holdroom Alternative 2 (Axial Growth):</u>

  The first Concourse C expansion alternative developed during this round of layouts shows concourse growth continuing to the southwest in an axial direction from the existing Concourse C. It demolishes one existing boarding bridge and provides five new bridges for a total of 10 second-floor gates, although it anticipates that gate C2 will be abandoned at some point in the future, thereby reducing the total number of gates to nine. An expansion to the B holdroom accommodates the security checkpoint, vertical circulation, and an expanded ground boarding holdroom. The pedestrian bridge that connects this area to Concourse C has been widened to accommodate increased circulation to all of the C gates. Apron expansion to accommodate aircraft parking and circulation on the east side of the new concourse would not affect either the ground transportation parking lot on the east side of the terminal or the SRE building. Apron use on the west side of the expansion may or may not impact the cargo aircraft parking positions located directly west of the passenger terminal. However, this alternative is likely to affect the taxilane located directly to southwest of the proposed Concourse C expansion.

- <u>Intermediate Layout: Concourse C Holdroom Alternative 3 (Angled Growth):</u>

  Similar to Concourse C Holdroom Alternative 2 (Axial Growth), the second Concourse C alternative developed during this round of layouts shows an expansion to the Concourse B holdroom that accommodates the security checkpoint, vertical circulation, and an expanded ground boarding holdroom. This option shows an expansion to the pedestrian bridge connecting this area to Concourse C that has been widened to accommodate increased circulation to all of the C gates, also similar to Concourse C Alternative 2. Concourse growth begins in the axial direction then angles so that the end of the concourse is oriented directly in the east-west direction. This option demolishes one existing boarding bridge and provides five new bridges for a total of 10 second-floor gates, although it anticipates that gate C2 will be abandoned in the future, thereby reducing the total number of gates to nine. Apron expansion is also similar to the axial growth option; however, the Concourse C angle would not impact the taxiway as much as axial growth. Instead, this alternative is likely to affect several cargo aircraft parking positions west of the terminal.

6.5.3.3. Intermediate Secure Area Layouts: Conclusion

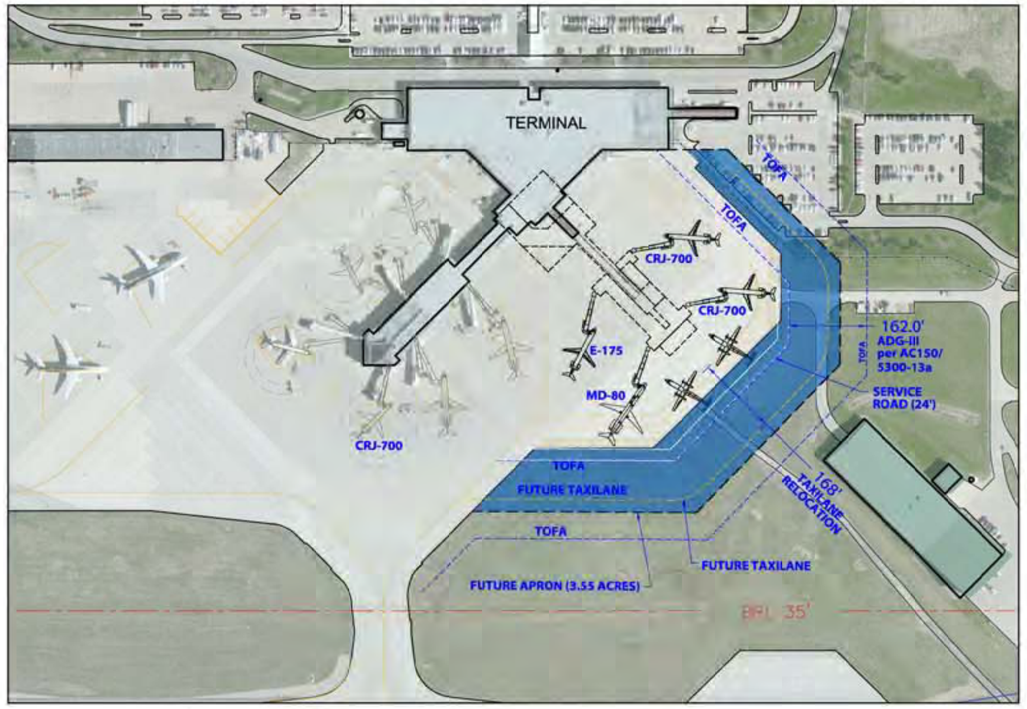
The second round of alternative layouts continued generating and refining layouts. Concourse expansions were produced and reviewed for their potential impact on adjacent facilities in the terminal complex. Interrelationships between the major areas inside the passenger terminal developed, resulting in layouts that improved passenger flow.

The intermediate alternative layouts for expansion to the security checkpoint and secure area were discussed with the Airport in March 2013. Airport comments included the following:

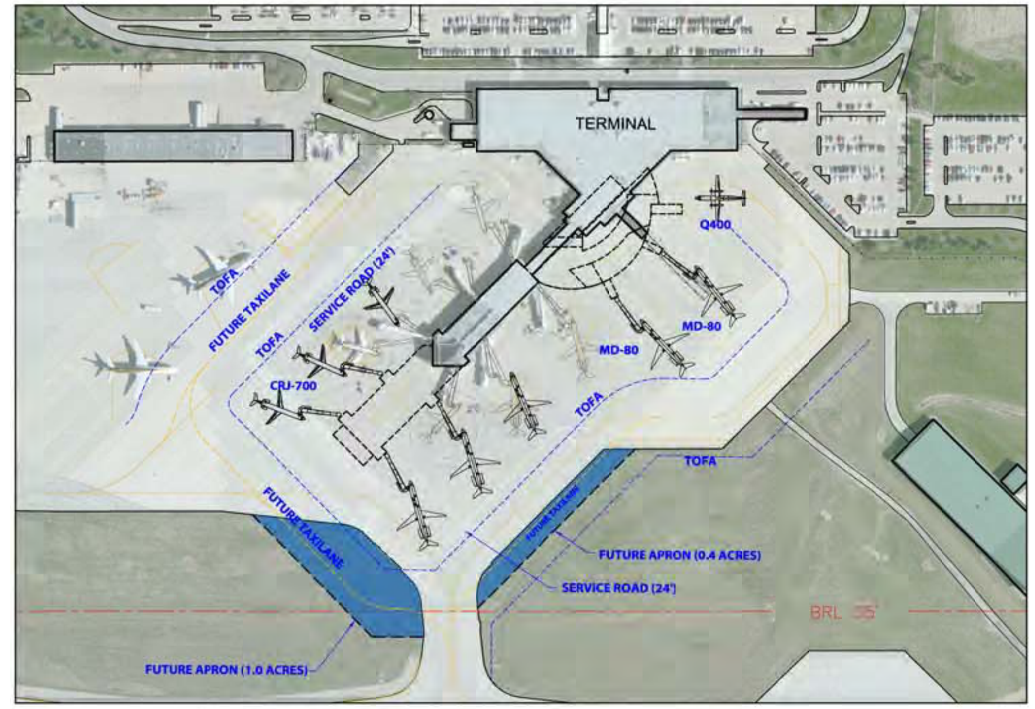
- The difficulty with aircraft access to Gate C2 is substantial enough that concourse expansion options should phase this gate out in the near future.
- The width of a concourse expansion should be spacious enough to support a retail component.
- Expansion options should not affect the car rental parking lot area to the east or SRE building to the southeast. The pull-through capacity of the SRE building is to be maintained.
- Consider using the portion of the cargo apron in which UPS has preferential use for commercial passenger aircraft movement in the future.
- There were divided opinions regarding the “half-moon” concept.

The Airport provided the following direction for next round of layout alternatives:

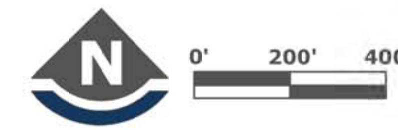
- Review past planning work including the concept of a second terminal for suitability of future expansion.
- Initial alternatives should focus on changes to the Concourse B holdroom area.
- No alternatives should prohibit future growth beyond the planning time period.
- Optimal layout for the checkpoint was unresolved.
- Optimal layout for vertical circulation was unresolved.

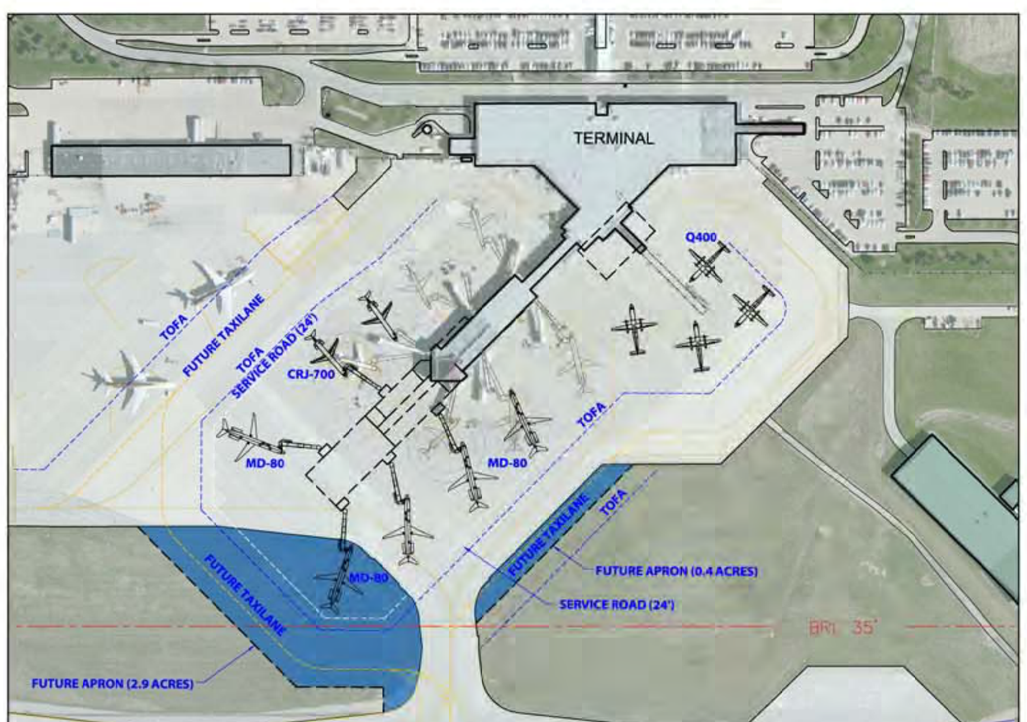


Intermediate Layout:
Concourse B Alternative 3

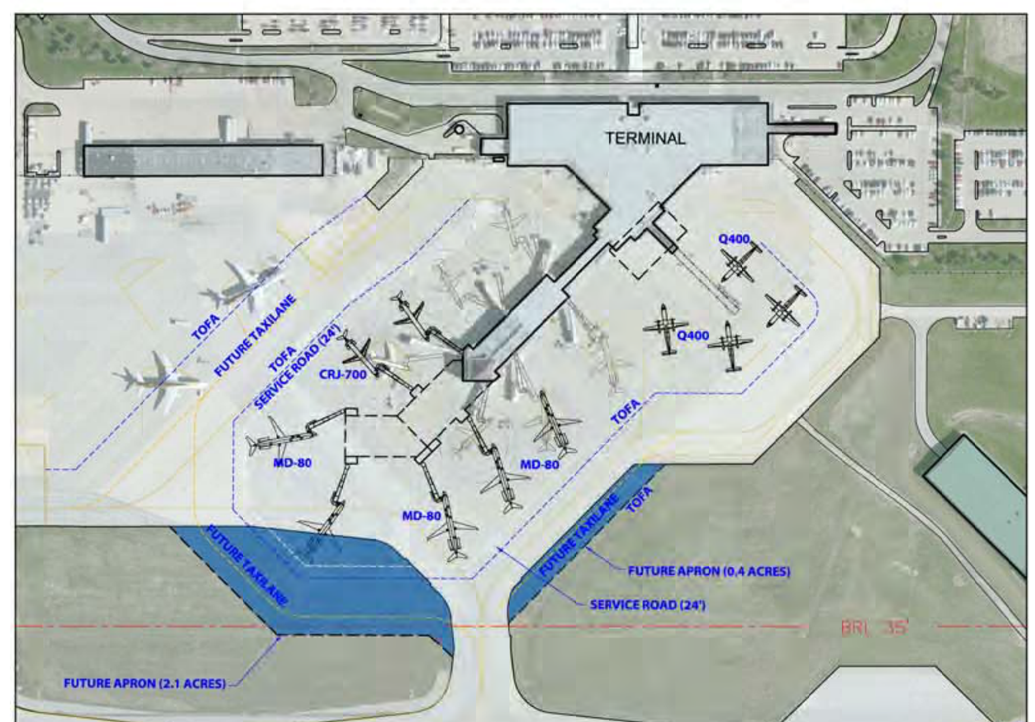


Intermediate Layout:
Concourse B Alternative 4





Intermediate Layout:
Concourse C Alternative 2



Intermediate Layout:
Concourse C Alternative 3

Figure 6.9 **Intermediate Concourse Alternatives (B3, B4, C2 & C3)**

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6.6. Combined Intermediate Concepts: Security Checkpoint and Concourses

This round of alternatives began with a review of previous planning work, and assessed recommendations regarding current concourse operations. Next, the layout options proposed earlier in the process were reviewed, and some of the most suitable options for the non-secure and security checkpoint areas were combined. Several of these combined layouts are evaluated in this section for the purpose of determining the optimal layout for the Airport. Finally, one of the combined concepts will emerge as the preferred future layout for the CID passenger terminal.

In order to gain a broader understanding of the concourse area at CID, previous planning work was reviewed for its relevancy at this point in time. As discussed in Section 6.2.1, there are two recent planning documents that address the secure area at CID: the 2004 Master Plan and the 2007 Terminal Planning Study.

- <u>2004 Master Plan:</u>

  The long-term concourse build-out presented in the 2004 Master Plan showed an option for a second passenger terminal located to the west of the existing terminal and linked to the existing terminal by a non-secure corridor. Upon review of the long-term concourse build-out presented in the 2004 Master Plan, the following discrepancies with existing and projected operations at CID were noted:

  – The 2004 Plan shows no future ground boarding area. While propeller aircraft are currently used infrequently at CID, the gate capacity analysis performed for the 2013 Master Plan Update indicated that limited ground boarding options would continue to be beneficial in the future since they offer flexibility in operations.
  – The 2004 Plan utilizes passenger boarding bridges (PBBs) with propeller aircraft at the future Concourse B gates. The gate capacity analysis performed for the 2013 Master Plan Update determined that the Airport should retain capacity for servicing propeller aircraft. However, the practice of using a PBB to service propeller aircraft is inefficient, as PBBs capable of accessing propeller aircraft are costly, difficult to operate, and time-consuming to use.
  – The 2004 Plan uses small propeller aircraft as the “design aircraft” for all future Concourse B gates and holdrooms. The airline fleet mix forecasts presented in Chapter 2 of the 2013 Master Plan Update show that the existing and projected future aircraft fleet mix consists of larger jet aircraft. These larger jet aircraft would require a larger amount of holdroom area, more space between the gates, and more aircraft taxiing space on the apron than the amounts shown in the 2004 Plan.
  – The operation of a second terminal building, as presented in the 2004 Plan, would require either a second checkpoint or a secure connection between concourses, consisting of a second floor bridge or a below-grade tunnel.

- 2007 Terminal Planning Study

  The Concourse B expansion layout proposed by the 2007 study includes a second floor concourse similar to the existing Concourse C. Upon review of the long-term concourse build-out presented in the 2007 Terminal Planning Study, the following discrepancies with existing and projected operations at CID were noted:

  - The 2007 Study shows limited capacity for ground boarding, with two gates located very close to the existing checkpoint. Aircraft access to these gates would be difficult, if not impossible, when adjacent PBB gates are in use.
  - The 2007 Study uses the CRJ-700 as the design aircraft for all future Concourse B gates with no capacity added for servicing larger aircraft. The projected fleet mix presented in Chapter 2 of this 2013 Master Plan Update; however, shows that aircraft using the Airport are expected to continue to grow in size. New holdroom and gates should have the capacity to service these larger aircraft.
  - The 2007 Study underestimates the amount of apron and taxiway expansion needed for aircraft circulation. There is insufficient space for aircraft circulation around aircraft parked at the future Concourse B gates as proposed.

6.6.1. Combined Security Checkpoint and Concourse Concepts

Because the most efficient passenger path tends to also be the most direct one, the direction in which concourse growth occurs at CID will have influence on the checkpoint alignment that is ultimately chosen. For this reason, the checkpoint layout was paired with a concourse layout in the following alternatives.

- Combined Security Checkpoint and Concourse Concept Goals:
  - The existing amount of space for each security checkpoint lane should increase by a factor of nearly two in order to meet today's checkpoint design standards.
  - The security checkpoint should add a third lane in the near future, and the checkpoint should be designed in such a way as to have the capacity for adding a fourth lane if needed in the future.
  - Additional holdroom and circulation space should be added to the secure area.
  - The secure area would benefit from a rearrangement of amenities and concessions.
  - Concourse expansions should be done in such a way as to allow sufficient airside space for aircraft parking and circulation.
  - Existing Gate C2 should be phased out in the near term future, as aircraft access to this gate is currently constrained.
  - Expansion options for the concourse should be accomplished in a way that does not affect the car rental parking lot area to the northeast or the SRE building to the southeast.
  - Concourse expansion options should include a portion of the cargo for commercial passenger aircraft movement in the long-term future.
  - Two additional gates with PBBs should be added in the next 20 years, with the option of adding two more gates with PBBs if demand outpaces forecasts presented in Chapter 2. Therefore, a total of 10 PBB gates should be considered as the ultimate build-out condition for the terminal building.

- Several gates and holdrooms should be designed to service narrow-body jets such as A320s, B737s, and MD-83s, which are used with increasing frequency today in markets similar to CID.
- Future projects affecting the checkpoint and concourses at CID should be done in conjunction with improvements to the vertical circulation system.
- The number of potential options for vertical circulation should be increased and expanded to include prominently-placed elevators, escalators, and passenger-friendly staircases.

6.6.1.1. Combined Concepts: Alternative B1

Alternative B1 is shown in **Figure 6.10** (First Floor) and **Figure 6.11** (Second Floor). Features of this alternative can be summarized as follows:

- Checkpoint:
  - The north-south hybrid configuration allows equal access to both Concourse B and Concourse C.

- Vertical Circulation:
  - Allows the use of up-only and down-only escalators, high-profile stairways, and visually prominent elevators.

- Horizontal Circulation:
  - Has efficient passenger paths with few crossings.

- Holdrooms:
  - Provides an increased ground boarding holding area.
  - Only one Concourse B gate accommodates a large aircraft; therefore, Concourse C holdrooms are expanded to accommodate large aircraft and passengers.

- Concourse Expansion:
  - Concourse B is shown the maximum build-out without affecting the SRE building.
  - Future expansion beyond 10 gates would take place from Concourse C.

- Apron:
  - Apron expansion affects the car rental lot, but not the cargo building or the taxiway located to the south.

- Gates:
  - Gate C2 is phased out.
  - Aircraft circulation on apron allows only one of the new Concourse B gates to accommodate large aircraft.

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Figure 6.10

Combined Concept Alternative B1, First Floor

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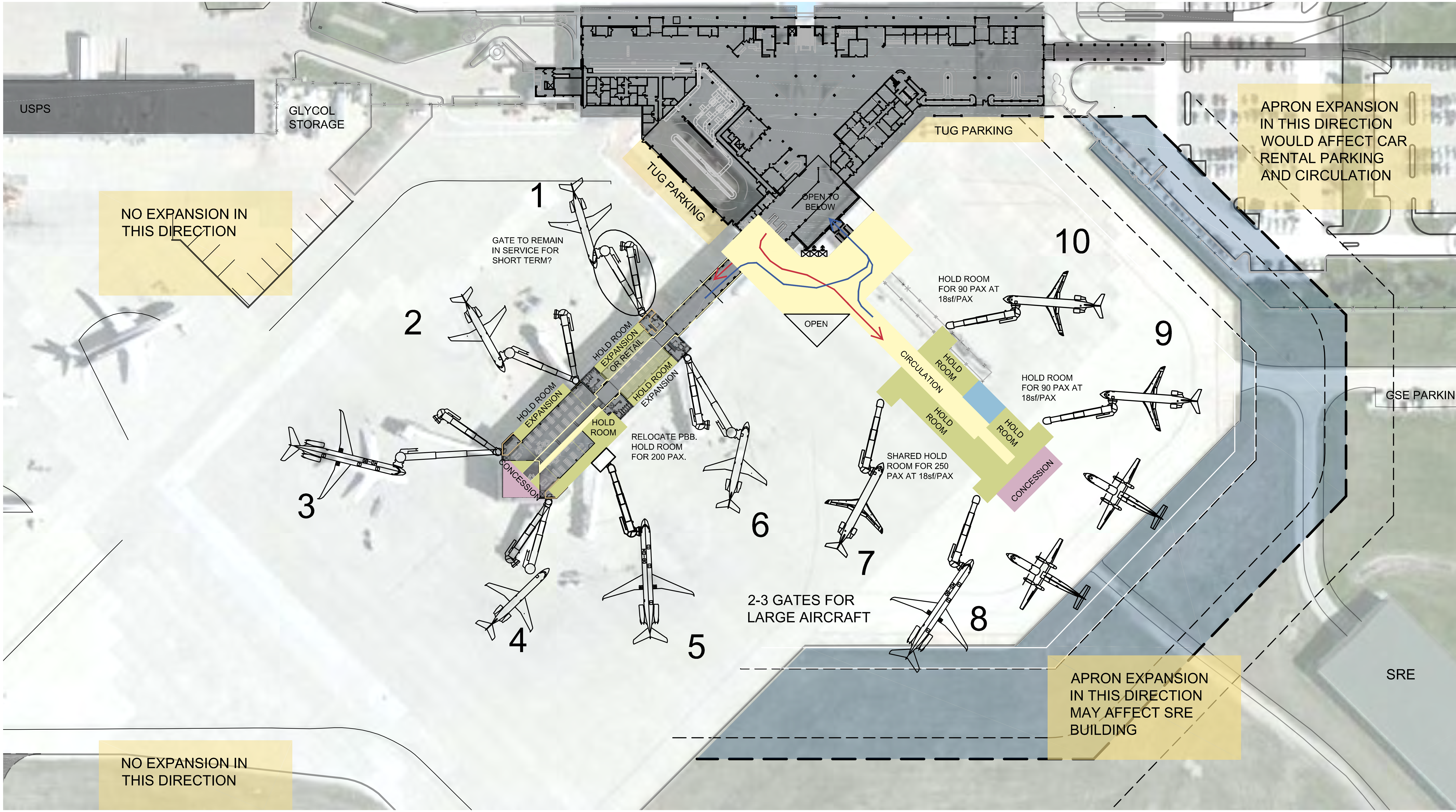

Figure 6.11

Combined Concept Alternative B1, Second Floor

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6.6.1.2. Combined Concepts: Alternative B2

Alternative B2 is shown in **Figure 6.12** (First Floor) and **Figure 6.13** (Second Floor). Features of this alternative can be summarized as follows:

- Checkpoint:
  - A 45-degree East configuration directs passengers toward gates.
- Vertical Circulation:
  - Allows the use of up-only and down-only escalators, high-profile stairways, and visually prominent elevators.
- Horizontal Circulation:
  - Has efficient passenger paths with few crossings.
- Holdrooms:
  - Provides an increased ground boarding holding area.
  - Both second floor Concourse B gates and holdrooms can accommodate large aircraft, so the need to expand Concourse C holdrooms is reduced.
- Concourse Expansion:
  - The Concourse B expansion provides circulation space to the existing pedestrian bridge to accommodate future expansion to Concourse C.
  - Future expansion beyond 10 gates would take place in Concourse C.
- Apron:
  - Apron expansion does not affect the car rental lot or the SRE building, and requires minimal changes at the cargo building and the taxiway located to the south.
- Gates:
  - Gate C2 is phased out.
  - Allows two gates at new Concourse B for use with large aircraft.
  - Allows a total of five gates for use by large aircraft in the future.

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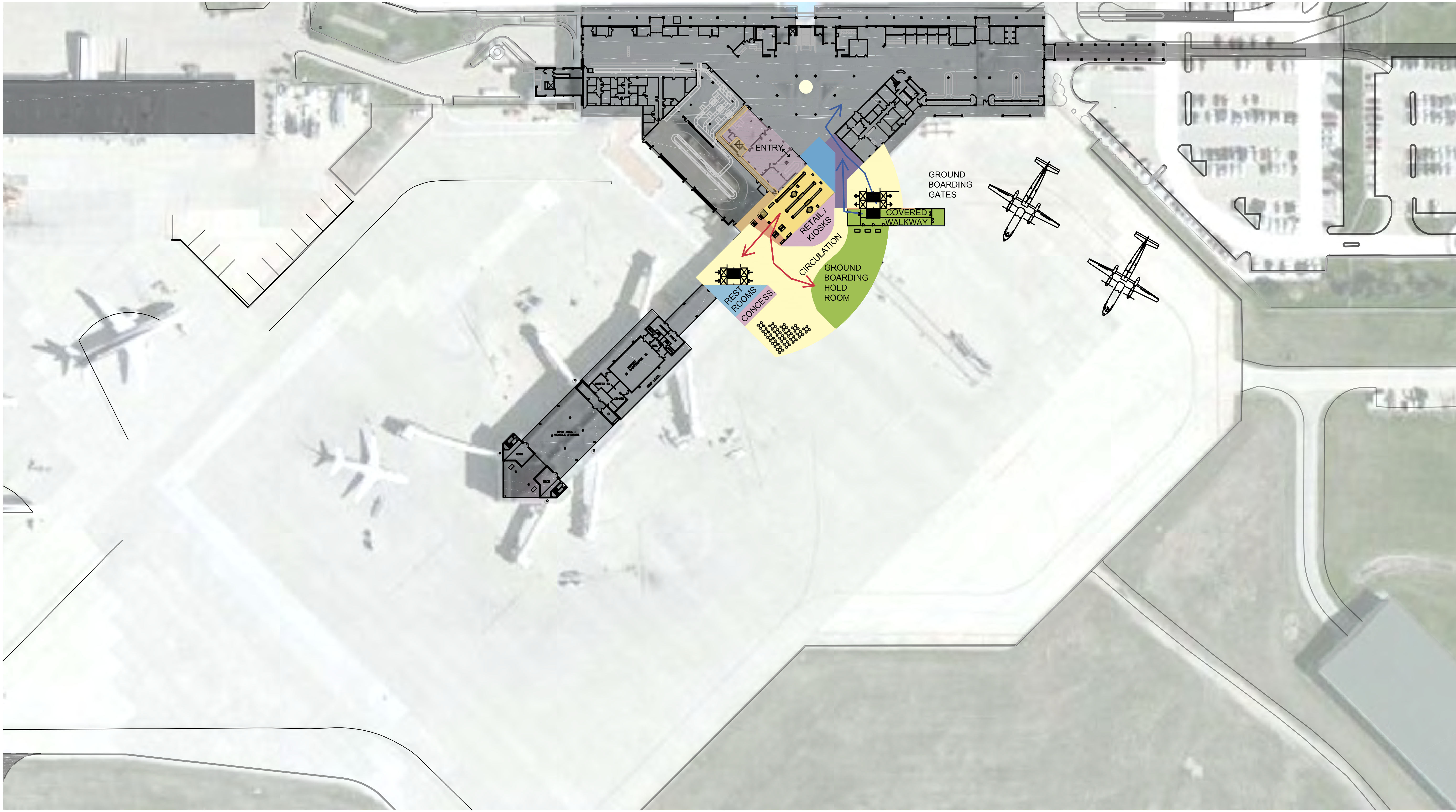

Figure 6.12

Combined Concept Alternative B2, First Floor

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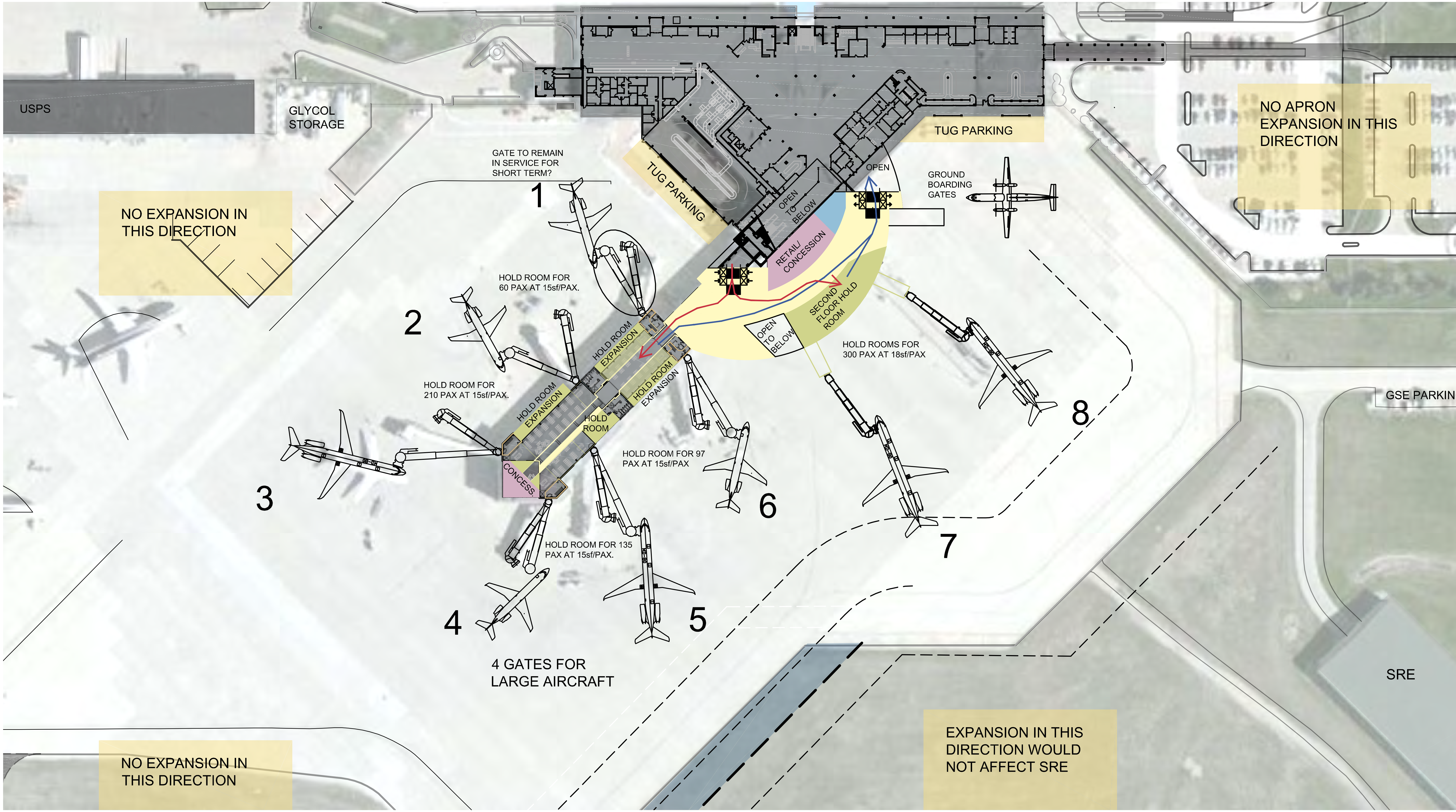

Figure 6.13

Combined Concept Alternative B2, Second Floor

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6.6.1.3. Combined Concepts: Alternative C1

Alternative C1 is shown in **Figure 6.14**. Features of this alternative can be summarized as follows:

- Checkpoint:
  - A 45-degree West configuration directs passengers to turn 90 degrees to go toward gates.
- Vertical Circulation:
  - Existing escalators remain in place.
  - New, more prominent elevators are added.
- Horizontal Circulation:
  - Has acceptable passenger paths, though path to ground boarding area crosses arriving passenger path unless ground boarding passengers are directed around the back of the escalators.
- Holdrooms:
  - Provides an increased ground boarding holding area.
  - Adds two holdrooms and relocates a third holdroom to Concourse C that can accommodate the number of passengers on a large aircraft.
- Concourse Expansion:
  - Concourse B expansion provides a large ground boarding area.
  - Future growth beyond 10 gates would take place from Concourse C in an angled or axial form.
- Apron:
  - Apron expansion does not affect the car rental lot or the SRE building, but does require changes at the cargo building and the taxiway located to the south.
- Gates:
  - Gate C2 is phased out in a future expansion.
  - Gates on the south side and end of the concourse are accessible to large aircraft.

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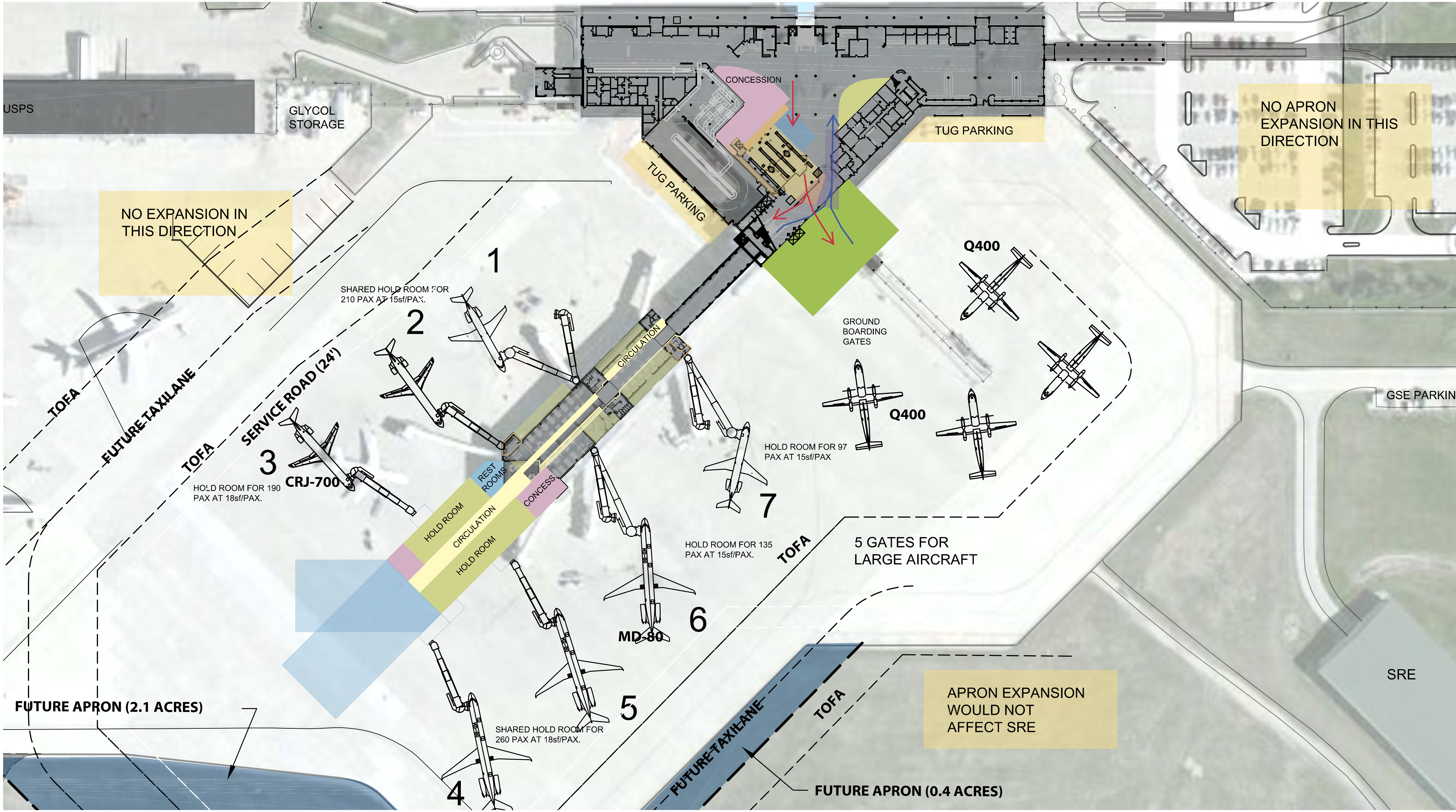

Figure 6.14
Combined Concept Alternative C1

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6.6.1.4. Combined Concepts: Alternative D1

Alternative D1 is shown in **Figure 6.15**. Features of this alternative can be summarized as follows.

- Non-Secure Area:
  - Adds more non-secure area than required.
- Checkpoint:
  - Adds a second checkpoint, which is inefficient for TSA at an airport of this size.
  - Passengers arriving in one terminal and leaving through the other must leave and re-enter the secure area if no secure connection is provided.
- Circulation:
  - Significantly increases the overall amount of circulation in the terminal buildings.
  - Optional tunnel or second floor would provide connection between concourses on the secure side.
- Holdrooms:
  - Adds holdrooms that will accommodate large aircraft.
- Apron:
  - Removes Cargo building.
- Gates:
  - Adds four gates that can accommodate large aircraft.

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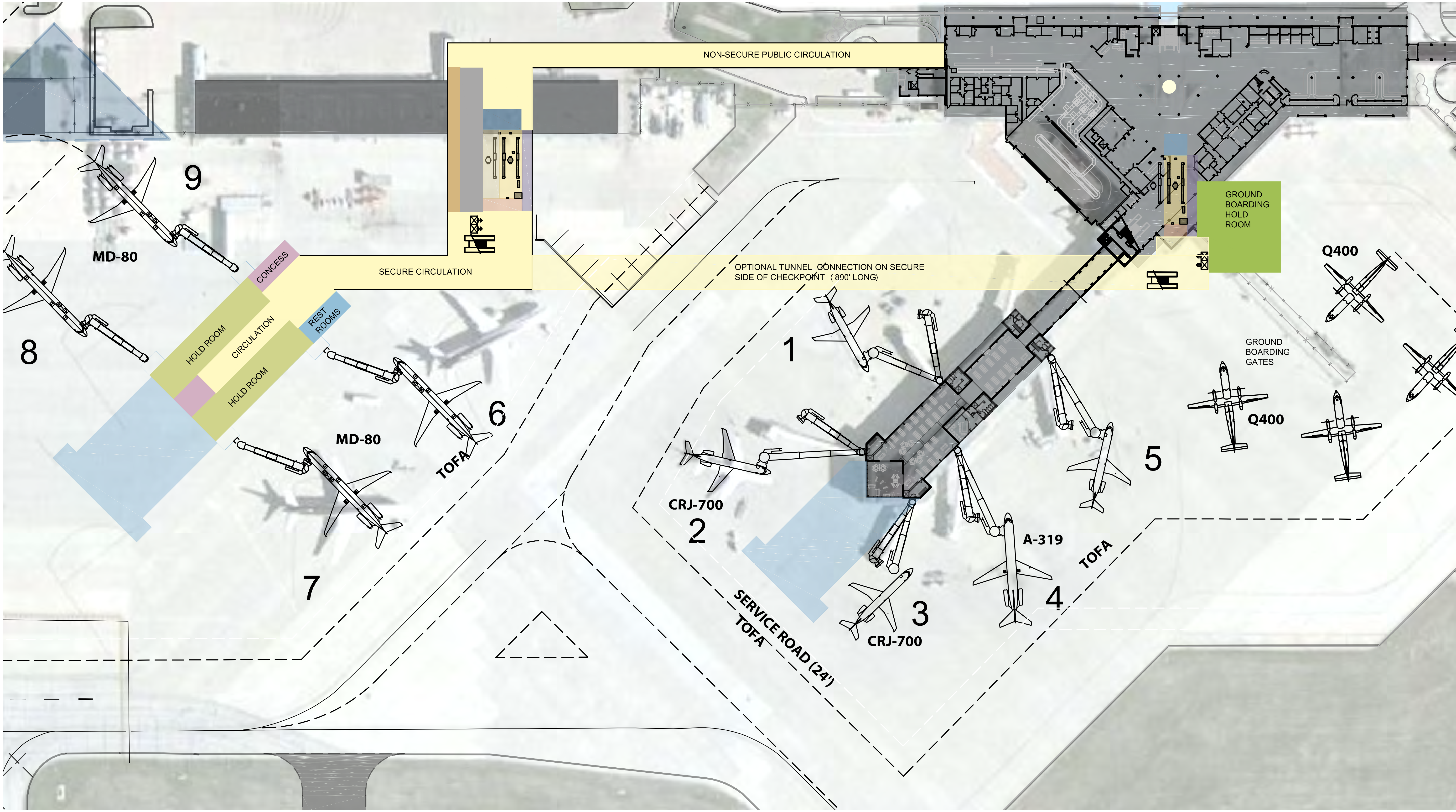

Figure 6.15
Combined Concept Alternative D1

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6.6.1.5. Combined Concepts: Conclusion

This round of alternatives began by reviewing previous planning work involving concourse layouts, and ultimately determined that the larger size of today's aircraft makes many of the layouts proposed in earlier planning exercises unsuitable for current use. Next, alternative layouts of the concourse and security checkpoint were combined and refined together as their functions interrelate. Several of these combined layouts were evaluated in order to determine the potential impact on adjacent facilities in the terminal complex, and to determine which layout was the optimal layout for the Airport. This exercise showed that the most favorable opportunities for expanding the secure area of the CID passenger terminal occur in the location of the existing B holdroom area and in extending Concourse C. As a result, Combined Concept Alternative B2, emerged as the preferred layout for expanding the secure area during the 20-year planning period. Adding new gates under Combined Concept Alternative B2 can occur in two phases; the first phase involving improvements to Concourse B and the second phase extending Concourse C in an axial direction.

A summary of the planning progress for the passenger terminal to date and the combined layout alternatives for expansion to the security checkpoint and concourses were presented to the Airport staff in April 2013.

6.7. Passenger Terminal: The Preferred Long-Term Layout

The terminal planning process included discussions among Airport staff, Airport tenants, and the planning consultant team. These discussions provided important information unique to operations at CID. Through these discussions, a refined preferred terminal layout was developed and is presented in this section. Initial planning for the non-secure area, including the curbside and public lobby, were built from the planning work accomplished for the security checkpoint and concourses. Internal relationships of functional areas were examined in greater detail during this process, resulting in the preferred interior space layout. The preferred long-term terminal layout is presented in **Figure 6.16** (First Floor) and **Figure 6.17** (Second Floor).

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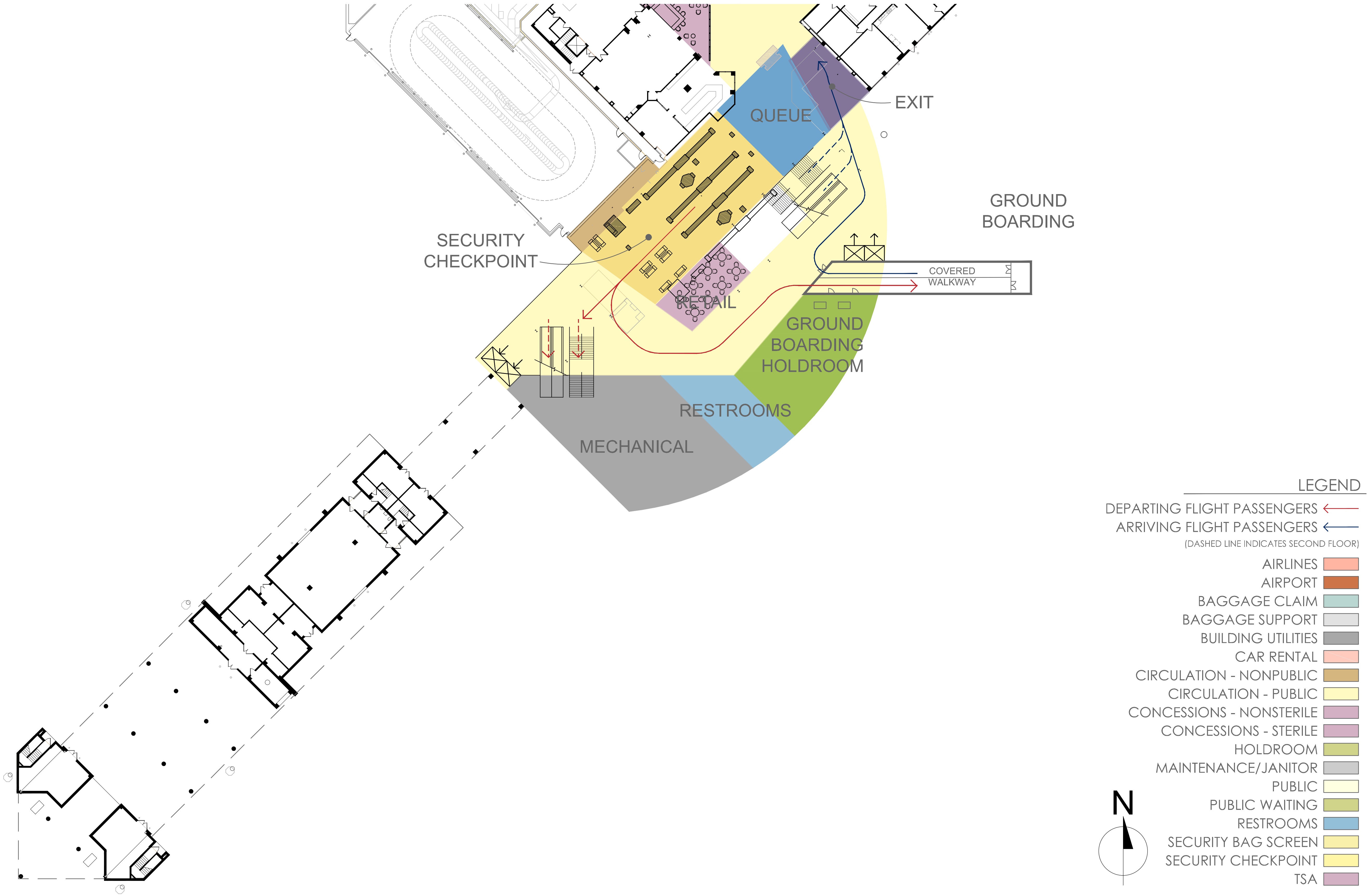

Figure 6.16
Preferred Secure Area Layout, First Floor

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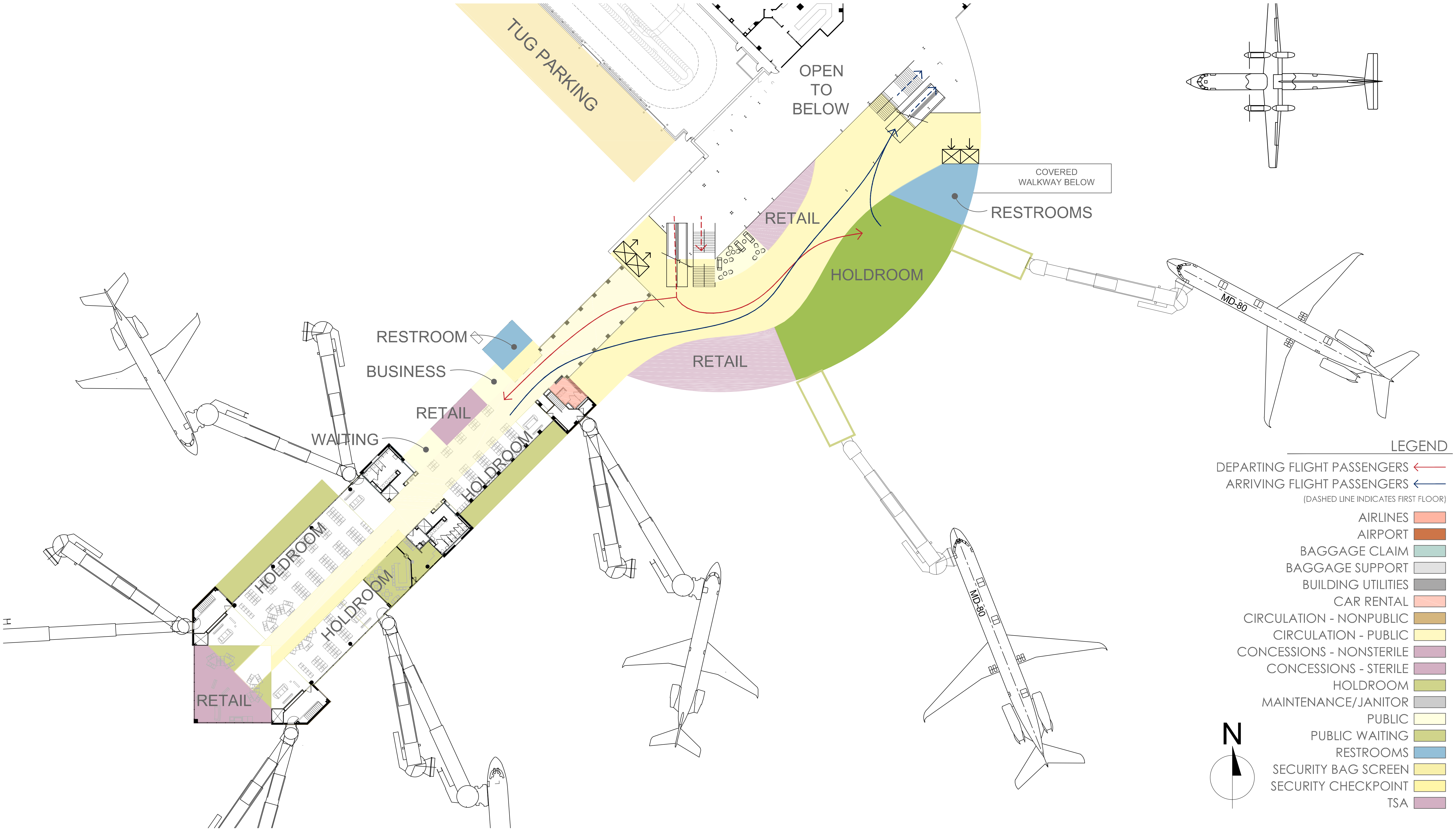

Figure 6.17
Preferred Secure Area Layout, Second Floor

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6.7.1. Non-Secure Area

Under the preferred layout the passenger terminal curbside has sufficient length, but the sidewalk near the building entrances needs to be widened to provide pedestrians exiting the building with additional space before encountering vehicle traffic. The building façade and entries would benefit from addressing underperforming elements including improving shelter for passengers during inclement weather and providing a visual connection between the curbside and non-secure lobby. Starting terminal improvements at the curbside allow for additional improvements to be carried through the passenger terminal and provide free-flowing, intuitive wayfinding throughout the building.

Because the existing amount of non-secure public area in the public lobby is greater than planning design standards recommend until the last few years of the 20-year planning period, changes to the non-secure area will not require a significant addition of space. Instead, the public portion of the passenger terminal benefits from a remodel that rearranges the public area, grouping passenger amenities and concessions to create 'nodes' of related activities. Restrooms are provided in two locations: one between the baggage claim and non-secure public waiting areas, and the other between ticketing and the security checkpoint. Airline and car rental leased areas remain undisturbed while the circulation area in the ticketing lobby is widened to accommodate passenger flow at peak times. Waiting and vending areas enhance the baggage claim area, and the passenger queuing area associated with the security checkpoint is provided in a way that allows subdividing by type of traveler as current TSA standards recommend.

6.7.2. Security Checkpoint and Passenger Circulation

Under the preferred layout the security checkpoint provides three lanes in order to accommodate the forecasted peak number of passengers for the year 2016, and the checkpoint layout provides flexibility for future growth. Not only is the number of lanes increased, but the amount of space allocated for each lane is also increased, thereby allowing the Airport to meet today's checkpoint design standards.

The security checkpoint improvements are made in conjunction with improvements to passenger vertical circulation since these two facilities are adjacent to each other and both nearing capacity. Options for vertical circulation are provided including up-only and down-only escalators, visually prominent elevators, and high-profile stairways. These changes increase vertical circulation capacity and provide free-flowing, intuitive pedestrian circulation and wayfinding.

6.7.3. Secure Area

The concourse expansion in the preferred layout has the least potential impact on adjacent facilities and the most organizational benefits of the alternatives presented. The apron expansion does not affect the car rental lot or the SRE building, and requires minimal changes to the cargo building and Taxiway 'A'. The main Concourse B expansion provides a generous ground boarding holdroom on the first floor as well as two new holdrooms and one reconfigured holdroom that can each accommodate 100 to 150 passengers on the second floor. Two new gates with boarding bridges are provided, and Gate C2 is phased out. The pedestrian bridge is widened, allowing sufficient space for the paths of arriving and departing passengers to be separated, improving passenger flow in the secure area. Concessions, amenities, and restrooms are provided in prominent, central locations within the concourses.

6.7.4. Future Expansion

Future expansion beyond 10 gates takes place from Concourse C in either an axial or angled extension, as shown under Combined Concept Alternative C1.

6.7.5. Preferred Layout Conclusion

All of the passenger terminal layouts proposed in this planning exercise were developed and assessed for operational performance and ability to meet facility requirements. The preferred layout was chosen because it has less impact on adjacent facilities and more organizational benefits than the other the alternatives that were developed and evaluated. It has clear, efficient passenger paths through the passenger terminal, ample aircraft access on the airside of the terminal, and an improved connection to vehicle parking on the land side. Passenger services and amenities that have associated functions are grouped together, minimizing passenger walking distances and congestion caused by the intermingling of nonrelated or conflicting activities.

The layout of the passenger terminal will continue to develop and become more refined when the planning process ends and the design process begins.

6.8. Aircraft Deicing Implications

Table 6-1 presents a comparison of the changes in deicing apron drainage area under the three primary passenger terminal combined concepts. The current Outfall 003 drainage basin comprises 160 acres. Within that containment area, there are approximately 48 acres of impervious apron, taxiway, and runway pavement, 40.7 acres of which are captured by the Outfall 003 Deicing Basin.

Table 6-1. Changes in passenger terminal deicing apron drainage area

Alternative	Increase in Impervious Drainage Area	Relative Change in Impervious Drainage Area
Combined Concept B1	3.6 ac.	8.8%
Combined Concept B2	1.4 ac.	3.4%
Combined Concept C1	2.5 ac.	6.1%

In addition, the West cargo alternative described in Chapter 5 adds approximately 14 acres (126%) of impervious drainage to the 11.1 acres of existing impervious surface in the 34 acres that drain to the West Cargo Deicing Basin.

Increasing the impervious surface in the areas that drain to the deicing basins will increase the amount and rate at which runoff reaches the basins under any given runoff situation. During the deicing season, the basins discharge to the sanitary sewer at a flow rate that is limited by an Industrial Waste Discharge Permit issued by the City of Cedar Rapids. Under high runoff flow conditions, it may be possible for the basins to fill faster than they can be discharged to the sanitary sewer. If a basin reaches capacity under these conditions, the excess flow will be discharged via Outfall 003, in the case of the Outfall 003 Deicing Basin, or Outfall 010, in the case of the West Cargo Deicing Basin. Such discharges would be problematic relative to the language in the airport's NPDES permit which states: "*When deicing or anti-icing activities drain to this outfall, the storm water must be directed to the sanitary sewer."*

Runoff and basin discharge modeling analyses will quantitatively evaluate the impact of the alternatives on the frequency and magnitude of deicing season discharges. Such analyses will also provide the basis for estimating any increases in storage capacity that may be required to minimize discharges to comply with NPDES permit requirements.

Some initial implications can be identified at the current level of analysis. Based on relative changes in impervious area, the alternatives in the Outfall 003 drainage area are likely to require some additional storage to manage the increased deicing runoff flows. The West cargo alternative more than doubles the amount of impervious surface in the drainage area, and is likely to require a significant increase in storage capacity to prevent unauthorized deicing season discharges through Outfall 010.

6.8.1 Aircraft Deicing Technology Improvements

The technology and practices of aircraft deicing are evolving in response to demands for higher operational efficiencies and reduced discharges of spent deicing fluids to the environment. This trend has been strengthened by the Voluntary Pollution Reduction Program undertaken by the aviation industry in 2012 to continuing its progress in reducing pollution related to aircraft deicing activities. Among the recent advances include deicing trucks that use a stream of high velocity air to mechanically loosen and remove snow and ice from aircraft surfaces, coupled with low-flow ADF nozzles to assist in cleaning the surfaces and provide necessary anti-icing protection. ADF blending stations and revised criteria for the freezing point buffer allow ADF to be applied at mixtures that precisely match the ambient temperature. Although it is likely that there will be a continued industry-wide steady decrease in the relative volumes of glycol required for deicing aircraft in the future, it's impossible to quantitatively predict how this trend will affect the Airport. For that reason, there is no allowance for reductions in relative use of ADF in the future. This should be considered a conservative assumption in the analysis that provides a margin of safety in the analysis. The impacts of advances in deicing technologies and practices should be revisited periodically to ensure that the conclusions of this analysis are appropriately adjusted.

6.8.2 Aircraft Deicing Conclusions

- Any areas created in the future that generate storm water runoff containing aircraft deicing runoff will require containment and treatment of that runoff to meet the requirements of the NPDES permit.
- Increased ADF usage alone is not likely to affect the ability of the existing deicing runoff management system to maintain NPDES permit compliance as long as the runoff from deicing operations is adequately contained and treated.
- The West Deicing Basin is going to experience the greatest impact from the identified alternatives, with significant increases in both runoff flows and deicer loading. A modeling analysis of storm water flows and sanitary sewer discharge under appropriate wintertime design conditions will be required to estimate the additional storage capacity required to maintain NPDES permit compliance.

- A similar runoff and discharge analysis should be conducted of the Outfall 003 Deicing Basin to evaluate the incremental risk of deicing season discharges from Outfall 003 under the different alternatives, and estimate additional storage requirements that may be indicated by the analysis.
- Development and air carrier adoption of new aircraft deicing technologies and practices are likely to significantly reduce the volumes of ADF used in the future. Based on limited experience with new technologies at other airports, these reductions could balance out the forecast increases in ADF usage presented here.

6.9. Conclusion

The passenger terminal area is a complex environment with many interrelationships of operations. Similar to the construction process, the design process also requires a significant amount of time to complete. In order to prevent over-building, minimize impact on operations and reduce inconvenience for passengers, an extensive passenger terminal area project is often broken into smaller pieces, each piece or phase having a distinct scope. This type of phasing has triggering events that necessitate the start of the next stage of expansion. Examples of triggering events include the addition of airline service or the arrival of new checkpoint screening equipment. At the end of each phase, the terminal must be fully functional until the next triggering event occurs. While phasing adds an element of complication to a terminal renovation, it also adds the advantage of allowing the best use of available funding as it is revised annually.

MASTER PLAN

THE EASTERN IOWA AIRPORT CEDAR RAPIDS

Environmental Overview & Land Use Plan

CHAPTER 7

Environmental Overview & Land Use Plan

Previous chapters of this Master Plan presented inventory, forecasting, and facility requirement information that was used to develop alternatives that meet identified needs. This Chapter presents an overview of land uses and known environmentally sensitive areas on and around The Eastern Iowa Airport (referred to as CID or the Airport). It is based on readily available information obtained from existing reports, websites, and the Airport's Electronic Airport Layout Plan (eALP). The intent of this Chapter is to identify potential environmental and land use issues associated with the recommended development plan, which are discussed in the following sections:

- Airport Property Land Use Plan
- Airport Vicinity Land Use Plan
- Land Use Controls and Zoning
- Compatible Land Use
- Threatened and Endangered Species
- Architectural Resources
- Archaeological Resources
- Soils and Farmland
- Water Resources
- Stormwater Management
- Hazardous Materials
- Summary

7.1. Airport Property Land Use Plan

After selecting the preferred airside alternatives for the Master Plan, landside areas on Airport property were classified according to recommended long-term landside function. These functional classifications include Terminal Development, Aviation Related Development, Non-Aviation Related Development, and Airport Support. Protecting areas for these land uses will help the Airport achieve its long-term goals and objectives. The recommended classifications are presented in **Figure 7-1**, and total acreages for each functional classification are summarized in **Table 7-1**. Specific land uses for the Terminal Development, Aviation-Related Development, and Airport Support functional areas are recommended in Chapters 5 and 6. Potential Non-Aviation Related Development land uses are discussed in the Real Estate Market Study contained in **Appendix C**.

Table 7-1: Long-Term Land Use Plan Functional Areas

Land Use	Acreage
Terminal Development	112 acres
Aviation-Related Development	556 acres
Non-Aviation Related Development	1,312 acres
Airport Support	25 acres

7.2. Airport Vicinity Land Use Plan

The Airport is located on the southwest edge of the City of Cedar Rapids. Planned future land uses in the vicinity of the Airport obtained from the Airport's eALP are shown in **Figure 7-2**. This land use information is based on the Future Land Use Map contained in the City Comprehensive Plan. The majority of Airport property is designated as future Institutional/Public land use. Land immediately adjacent to the Airport to the north and east include commercial and industrial use. There is a large area adjacent to Airport property on the south and west that is currently outside the City limits, but is designated as a Future Growth Corridor by the City Comprehensive Plan. The Future Land Use Map also shows future lowa and medium density residential land use within the approaches to Runway 27 and Runway 31. However, residential land use within a runway approach is generally not considered compatible with airport operations. Much of the land further south, west, and east of the Airport is shown as future agricultural/conservation land use. These lands are well beyond those that would be affected by any projects proposed in the Master Plan. There are no City, County, or State Parks in the immediate vicinity of the Airport.

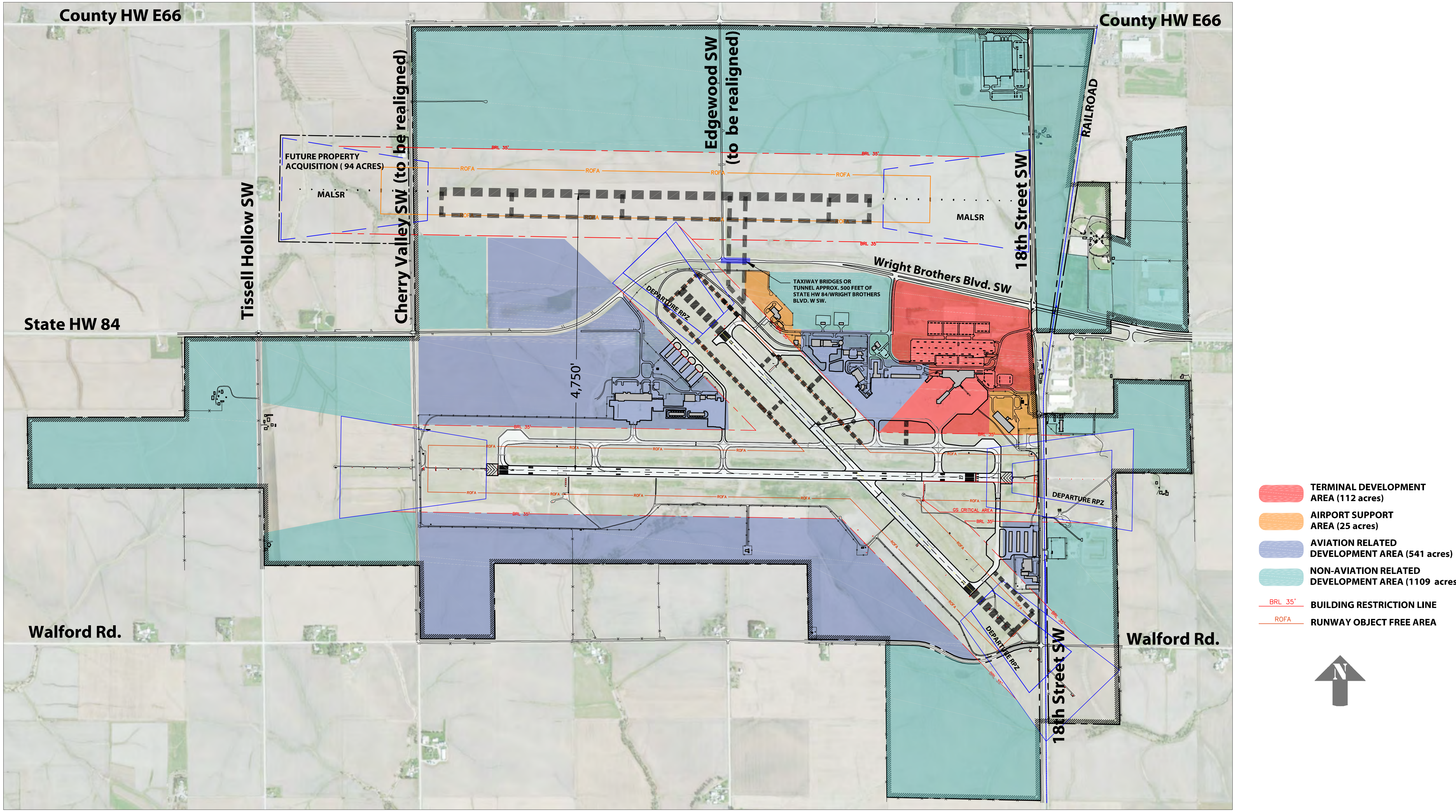

Figure 7.1
Airport Land Use Plan

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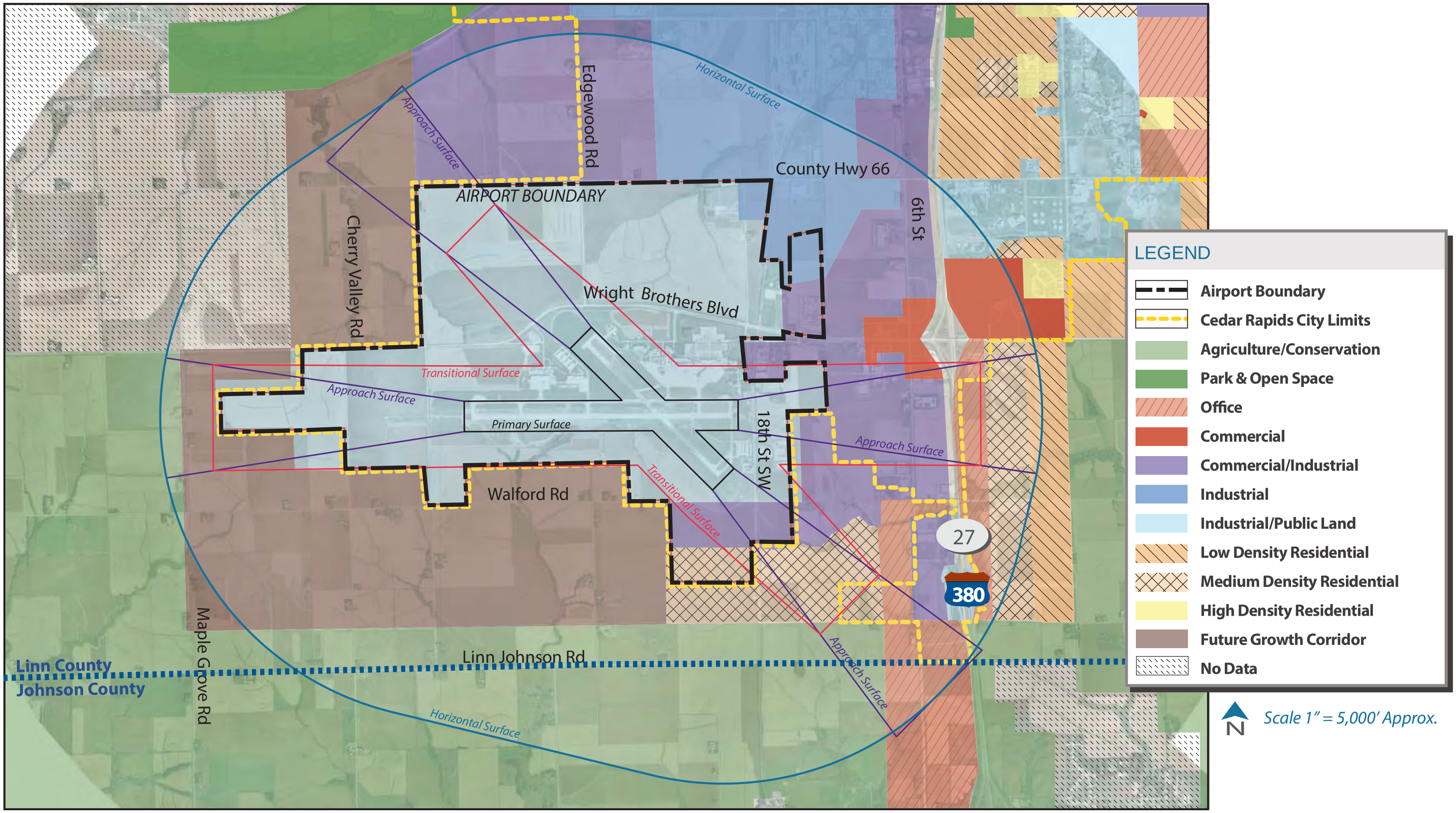

Figure 7.2
Planned Future Land Uses in the Airport Vicinity

Source: Airport Layout Plan (2011)

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7.3. Land Use Controls and Zoning

On a federal level, land use compatibility for airports is based on two primary sources:

1. Federal Aviation Administration (FAA) Advisory Circular (AC) 150- 5300-13A, *Airport Design,* specifically Runway Protection Zones (RPZs)
2. Federal Aviation Regulation (FAR) Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*, commonly known as the FAR Part 77 Surfaces

The State of Iowa has instituted state-level zoning for Airports. Runway Protection Zones and FAR Part 77 surfaces are used as the basis for the state land use zones. The state has designated Zones A to E as summarized below:

- Zone A – Runway Protection Zone
- Zone B – Approach surfaces
- Zone C – Transitional Zones
- Zone D – Horizontal Zone
- Zone E – Conical Zone

The Iowa Department of Transportation, Office of Aviation, has issued an Airport Land Use Guidebook for airports to use in establishing compatible land uses for their facilities. This guidebook can be found on IDOT's website at http://www.iowadot.gov/aviation/airports/IowaAirportLandUseGuidebook2008.htm.

7.3.1. City of Cedar Rapids Zoning

The Airport is located within Cedar Rapids city limits and is under the jurisdiction of the City's zoning ordinance. Chapter 32 of the City Code of Ordinances defines the Airport as a special purpose district entitled "AIR Airport Zone District". The district "is intended to accommodate those activities associated with the operation of the Airport or of smaller private or general aviation airports", and "permits the operation of an airport and all associated aviation-related activities and uses, specific uses compatible with and auxiliary to airport operations, accessory commercial and service uses, and agricultural uses compatible with airports."

Since 1998, the Airport has been regulated under an airport overlay zone (Chapter 39A of the Municipal Code). Chapter 39A contains regulations for the purpose of exercising to the fullest extent possible the power granted by Chapter 329 of the State Code of Iowa 199 pertaining to the restriction of airport hazards in the vicinity of airports and creating airport hazard zones. These zones include all of the land lying beneath the approach surfaces, transitional surfaces, horizontal surfaces, and conical surfaces as they apply to CID. These zones are consistent with the state zones B through E. The City Zoning Code also includes land use restrictions to limit or eliminate electrical interference with navigational signals or radio communication between the Airport and aircraft or uses that jeopardize pilot safety.

Existing zoning obtained from the eALP is shown in **Figure 7-3**. Approximately half of Airport-owned land is zoned by the City of Cedar Rapids as agricultural. The figure shows one industrial zoned area of approximately 90 acres within the Airport property along County Highway 66. An additional 27 acres on the eastern portion of the Airport and north of Wright Brothers Boulevard is zoned Public Zone District. Areas within the City surrounding the Airport are zoned primarily agricultural, industrial, or commercial; while areas outside the City limits are subject to Linn County Rural Zoning.

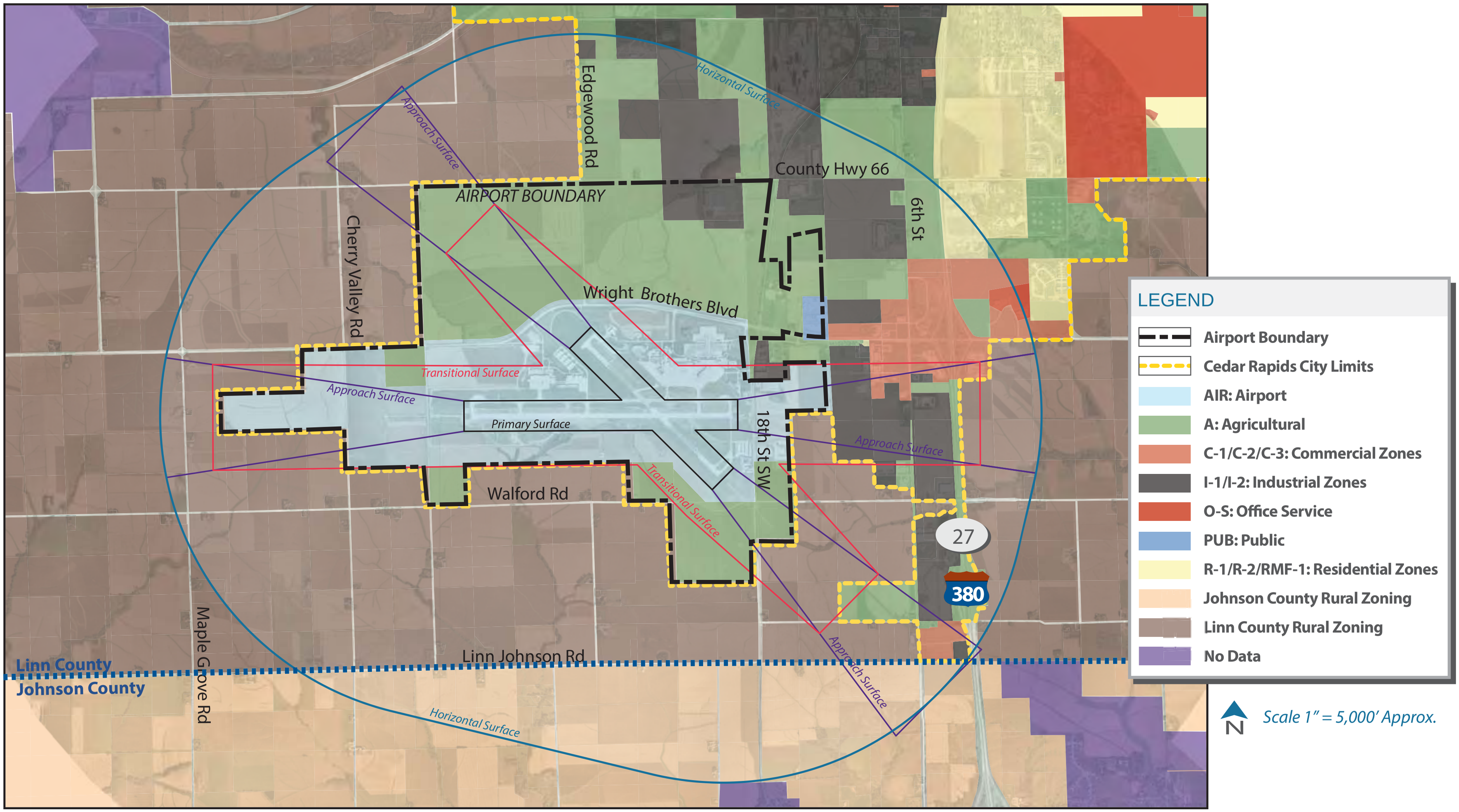

Figure 7.3
Existing Zoning

Source: Airport Layout Plan (2011)

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7.3.2. Linn County Zoning

Provisions included in the Linn County Development Code specific to the Airport are identical to that in the City of Cedar Rapids Code of Ordinances. Linn County includes the Airport Overlay Zones in the Airport Ordinance, Ordinance number 1A. The Airport Overlay Zones limit uses and height of structures within the overlay zones.

7.4. Compatible Land Use

In addition to the land use controls described in the previous sections, aircraft noise and wildlife attractants also need to be considered in compatible land use evaluations.

7.4.1. Aircraft Noise

Noise is generally defined as unwanted sound; therefore, the determination of acceptable levels is subjective. The day-night average sound level (DNL) methodology was used to determine noise levels for the previous Master Plan Update in 2005. Expressed in decibels (dB), DNL is the standard Federal metric for determining cumulative exposure of individuals to noise.

The DNL represents the average sound exposure during a 24-hour period rather than the sound level for a specific noise event. A 10 dB correction is applied to nighttime hours (from 10:00 p.m. to 7:00 a.m.) sound levels to account for increased annoyance due to noise during the night hours. There are many metrics that can be used to describe aircraft noise levels; however, DNL has been most widely accepted as the preferred metric for determining noise level exposure at airports.

The computation of DNL involves the weighting and averaging of each monitored noise event to achieve the DNL level in a particular location. DNL levels are typically depicted as contours. According to the FAA, U.S. Environmental Protection Agency (EPA), and Department of Housing and Urban Development (HUD), the threshold of significance is considered a significant impact when the noise exposures over sensitive areas are at or above 65 DNL. The compatibility of various land uses with yearly day-night average sound levels is summarized in **Table 7-2** on the next page.

The basic methodology used to identify aircraft noise levels surrounding an airport is to use the FAA's accepted mathematical model, called the Integrated Noise Model (INM). In this model, noise levels are indicated by a series of contour lines superimposed on a map of the Airport and its environs. By creating these contours, the Airport can identify areas that are most likely to be impacted by aircraft noise and can plan accordingly. These impact areas, referred to as noise corridor zones, can be defined as a severe noise impact area and a substantial noise impact area. The severe noise impact area includes areas contained within the 70 DNL and above, while the substantial noise impact area is defined by the areas of land impacted by the 65 DNL to the 70 DNL contour. From a noise perspective, areas exposed to 65 DNL or less are not considered to be significantly impacted.

Table 7-2: Land Use Compatibility with Yearly Day-Night Average Sound Levels

Land Use	Yearly Day-Night Average Sound Level (DNL) in decibels					
	Below 65	65-70	70-75	75-80	80-85	Over 85
Residential						
Residential, other than mobile homes and transient lodgings	YES	NO (1)	NO (1)	NO	NO	NO
Mobile home parks	YES	NO	NO (1)	NO	NO	NO
Transient lodgings	YES	NO (1)	NO (1)	NO (1)	NO	NO
Public Use						
Schools	YES	NO (1)	NO (1)	NO	NO	NO
Hospitals and nursing homes	YES	25	30	NO	NO	NO
Churches, auditoriums, and concert halls	YES	25	30	NO	NO	NO
Government services	YES	YES	25	30	NO	NO
Transportation	YES	YES	YES (2)	YES (3)	YES (4)	YES (4)
Parking	YES	YES	YES (2)	YES (3)	YES (4)	NO
Commercial Use						
Offices, business, and professional	YES	YES	25	30	NO	NO
Wholesale and retail building materials, hardware, and farm equipment	YES	YES	YES (2)	YES (3)	YES (4)	NO
Retail trade (general)	YES	YES	25	30	NO	NO
Utilities	YES	YES	YES (2)	YES (3)	YES (4)	NO
Communication	YES	YES	25	30	NO	NO
Manufacturing and Production						
Manufacturing (general)	YES	YES	YES (2)	YES (3)	YES (4)	NO
Photographic and optical	YES	YES	25	30	NO	NO
Agriculture (except livestock) and forestry	YES	YES (6)	YES (7)	YES (8)	YES (8)	YES (8)
Livestock farming and breeding	YES	YES (6)	YES (7)	NO	NO	NO
Mining and fishing, resource production and extraction	YES	YES	YES	YES	YES	YES
Recreational						
Outdoor sports arenas and spectator sports	YES	YES (5)	YES (5)	NO	NO	NO
Outdoor music shells and amphitheaters	YES	NO	NO	NO	NO	NO
Nature exhibits and zoos	YES	YES	NO	NO	NO	NO
Amusements, parks, resorts, and camps	YES	YES	YES	NO	NO	NO
Golf courses, riding stables, and water recreation	YES	YES	25	30	NO	NO

Source: FAA Environmental Desk Reference for Airport Actions
Note: Numbers in parentheses refer to notes; see continuation of Table 7-2 on the next page for notes and key.

Table 7-2: Notes and Key	
NOTE: The designations in this table do not constitute a Federal determination that any use of land is acceptable or unacceptable under Federal, State, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with local land use authorities. FAA determinations under Part 150 are guidelines and are not intended to substitute for land uses determined to be suitable by local authorities in response to locally determined needs and values in achieving noise compatible land uses.	
Key to Table 7-2	
YES	Land use and related structures compatible without restrictions.
NO	Land use and related structures are not compatible and should be prohibited.
NLR	Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
25, 30, or 35	Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure.
Notes for Table 7-2	
(1)	Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, use of NLR criteria will not eliminate outdoor noise problems.
(2)	Measures to achieve NLR of 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas or where the normal noise level is low.
(3)	Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas or where the normal noise level is low.
(4)	Measures to achieve NLR of 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas or where the normal noise level is low.
(5)	Land use compatible provided special sound reinforcement systems are installed.
(6)	Residential buildings require an NLR of 25.
(7)	Residential buildings require an NLR of 30.
(8)	Residential buildings not permitted.

The noise contours for CID were last developed in 2005 as part of a Master Plan Update and are shown in **Figure 7-4**. Although most of the area within the 65 DNL is confined to Airport property west of the airfield, there are portions of non-Airport owned property east of the airfield that fall within the 65-70 and 70-75 DNL contours. Within the 70-75 DNL contour, there is a small section of land that is currently zoned agricultural. Non-Airport properties that fall within the 65-70 DNL extend to just beyond I-380 and are primarily designated as Industrial. Based on review of the zoning maps and noise contours, there are no apparent noise sensitive zoned land uses that would result in non-compatible land use from a noise perspective.

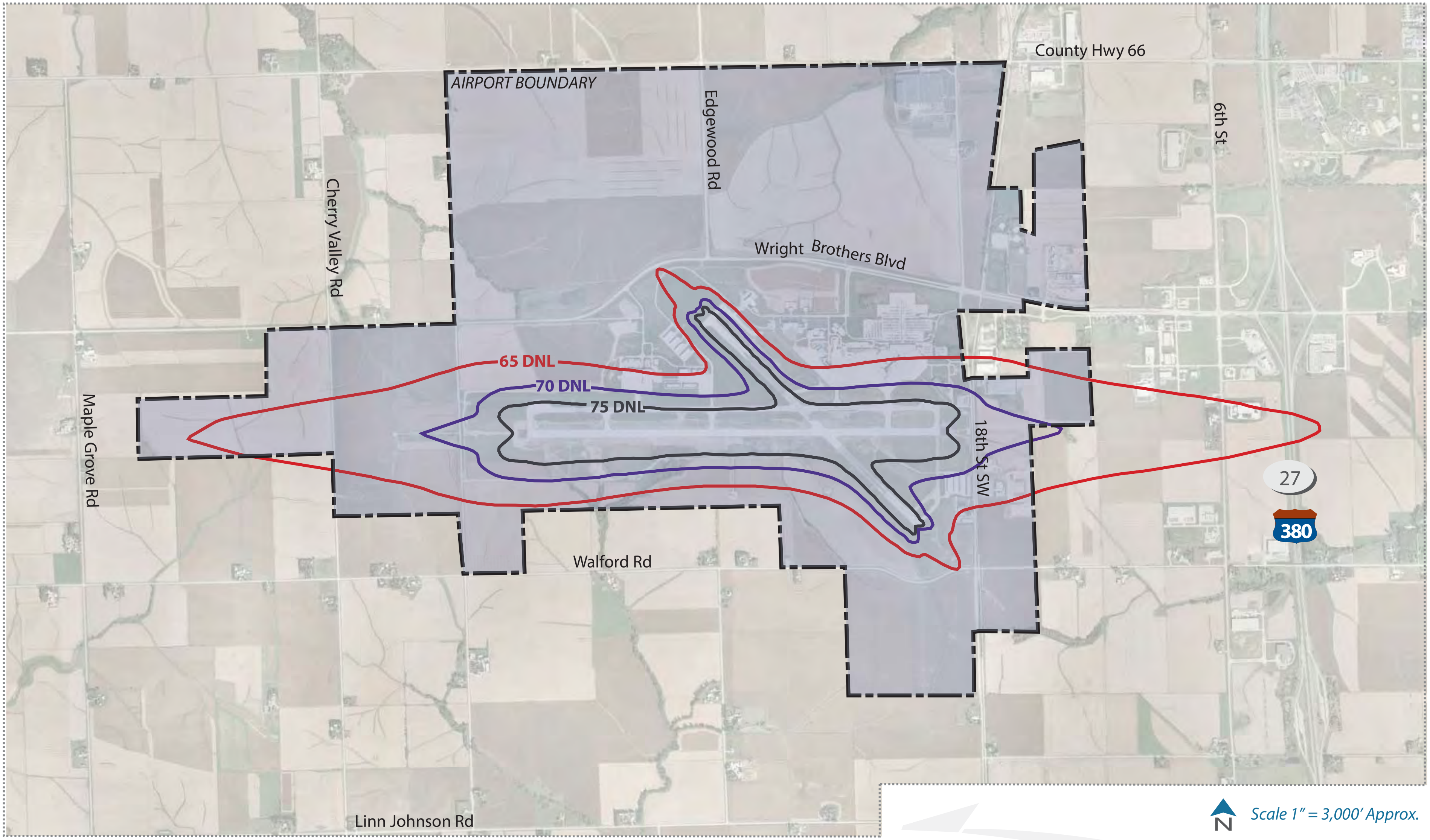

Figure 7.4
Noise Contours (2005)

Source: Airport Layout Plan (2011)

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7.4.2. Wildlife Hazards

Certain land uses and activities can create potential for wildlife attractants. These include solid waste landfills, sewage treatment plants, wet detention ponds, wetlands, and other habitats that attract wildlife. The FAA has issued guidance in its AC 150/5200-333B, *Hazardous Wildlife Attractants on or near Airports* regarding this issue including siting criteria from Aircraft Operating Areas (AOAs) to establish compatibility. The Cedar Rapids Wastewater Treatment Plant is located approximately eight miles northeast of the Airport, and the Cedar Rapids/Linn County landfill is located approximately 15 miles northeast of the Airport. As a result, there are no known landfills or wastewater treatment plants near the Airport that may cause wildlife hazards. However, there are several detention ponds and wetlands located on Airport property; these are discussed in further detail in Section 7.9.

Due to potential wildlife hazards and as a requirement of a Part 139 airport certification, CID completed a Wildlife Hazard Assessment in 2001. This yearlong study was completed by the U.S. Department of Agriculture Animal and Plant Inspection Service, Wildlife Services. The Assessment identified potential wildlife hazards at CID. The results and recommendations of the Assessment were incorporated into a Wildlife Hazard Management Plan (WHMP).

Recommendations from the WHMP included modifying habitat to reduce attractants including reducing farming operations on/adjacent to the airfield where feasible, constructing a chain link perimeter fence, mowing grass to a height of six to 12 inches (height most effective in discouraging habitat), and removing retention basins (the Airport removed two in the fall of 2005 northwest and northeast of terminal). The Airport continues to monitor and maintain its facilities by regular inspections to minimize potential for wildlife hazards. For example, the Airport routinely inspects all drainage structures and repairs or remedies any obstructions to prevent ponding.

The Airport has been granted a Federal Fish and Wildlife Permit that authorizes the taking, temporary possession, and transportation of migratory birds that may impact public safety. Species of birds that may be lethally taken include Canada Geese, herring gulls, ring-billed gulls, mallards, red-tailed hawks, great horned owls, American kestrels, killdeer, mourning doves, eastern meadowlarks, and swallows. The Permit also allows the Airport to live-trap and relocate red-tailed hawks if there is a need to protect safety that exceeds the limits for lethally taking.

The WHMP does not identify specific fish, wildlife, or plants related to Airport operations; rather, it describes policy recommendations pertaining to such topics as staff roles and responsibilities, inspections, and personnel training.

7.5. Threatened and Endangered Species

The Iowa Department of Natural Resources (DNR) maintains a list of state and federally protected species for all counties. There are 92 plant and animal species listed by the Iowa DNR for Linn County as being endangered, threatened, or a species of special concern. These 92 species include two amphibians, two birds, eight fish, nine freshwater mussels, seven insects, one mammal, 58 plants, four reptiles, and one snail. Only five of these 92 species are listed by the U.S. Fish & Wildlife Service as endangered or threatened. Federally-listed endangered species in Linn County include two freshwater mussel species: the Fat Pocketbook (*Potamilus capax*) and the Higgin's Eye Pearly Mussel (*Lampsilis higginsii*).

Federally-listed threatened species in Linn County include three plant species: the Prairie Bush Clover (*Lespedeza leptostachya*), the Eastern Prairie Fringed Orchid (*Platanthera leucophaea*), and the Western Prairie Fringed Orchid (*Platanthera praeclara*). There are no known occurrences of these five Federally-listed species on or in the vicinity of the Airport.

Most of the native habitat on the Airport has been eliminated by grading and making alterations associated with Airport projects and long standing agricultural use. Environmental review requests will be made to the Iowa Department of Natural Resources for any future projects that may affect threatened and endangered species.

7.6. Architectural Resources

In 2003, an intensive historical and architectural survey of four groupings of historic-aged farmsteads was undertaken as part of a Section 106 process involving the proposed demolition of the properties by the Airport. The resources inventoried included three farmsteads, two houses, and two barns located to the west and east of the Airport. Investigators concluded that the properties were not eligible for listing in the National Register of Historic Places (National Register), and the Iowa State Historic Preservation Office (SHPO) concurred. These resources have since been demolished.

In a separate survey undertaken in 2003, two additional historic resources were identified to the southwest of the Airport on Cherry Valley Road. Both are located between Walford Road and Linn Johnson Road. The first is the Joseph Cerveny House and Farmstead, which 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 farmstead was determined eligible for the National Register as an intact example of a Bohemian Immigrant Farmstead in Linn County. The second property is the Wesley Cerveny Farmstead, which was built circa 1900 and consists of a farmhouse, small gabled house, front gable barn, double corncrib, sheds, and outbuildings. The property was determined to be potentially eligible for listing on the National Register as an excellent example of a Bohemian Immigrant Farmstead in Linn County. SHPO concurred with this determination of eligibility in 2008.

The information provided by SHPO represents identified cultural resources as of October 2011. Additional historic resources may be located in the vicinity of the Airport. If any Airport development occurs, further historic surveys will be required.

7.7. Archaeological Resources

Several archeological resources were identified by the Office of the State Archaeologist located on or in the vicinity of Airport property. In a report provided by the State Archaeologist in 2011, five previously identified archaeological resources were reported on Airport-owned property. These resources include three Euro-American historic farm/residences, one Euro-American historic scatter, and one isolated Prehistoric find. Within the vicinity of the Airport are three additional previously identified Euro-American historic farm/residence archaeological sites.

Prior to any proposed work, additional archaeological studies should be undertaken to identify additional archaeological sites. Additional research may be necessary for previously identified and newly identified sites within a project area.

7.8. 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. Soil surveys contain information that affects land use planning because they highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. 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 Airport is located in an area with soils considered by the USDA as prime farmland soils. According to the USDA, prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods.

The USDA also classifies a significant amount of soil on the Airport property and nearby vicinity as “Prime if Drained”, meaning that if proper measures were taken to alleviate the land of standing water or temporary water resources, the land would be considered prime farmland.

A third category of land on or near Airport property is classified by the USDA as Farmland of Statewide Importance. This is land other than prime farmland that has a good combination of physical and chemical characteristics for the production of crops. It must have been used for the production of irrigated crops at some time and does not include publicly owned lands for which there is an adopted policy preventing agricultural use.

The Airport currently leases out a significant portion of its property for agricultural use. There are currently 14 areas leased for farming surrounding the airfield that encompass approximately 2,313 acres. Most of the leased property is zoned for Agricultural or Public land use by the City. USDA farmland designations (prime, prime if drained, statewide importance, and not prime) for agricultural land on Airport-owned property are shown in **Table 7-3** and **Figure 7-5**.

Table 7-3: Leased Agricultural Land Designations

Farmland Category	Acreage (Estimated)	Percent of Total
Prime	895	38.7%
Prime if Drained	773	33.4%
Statewide Importance	638	27.6%
Not Prime	7	0.3%
Total Agricultural Land	**2,313**	**100.0%**

Source: USDA Natural Resource Conservation Service; Airport Layout Plan (2011)

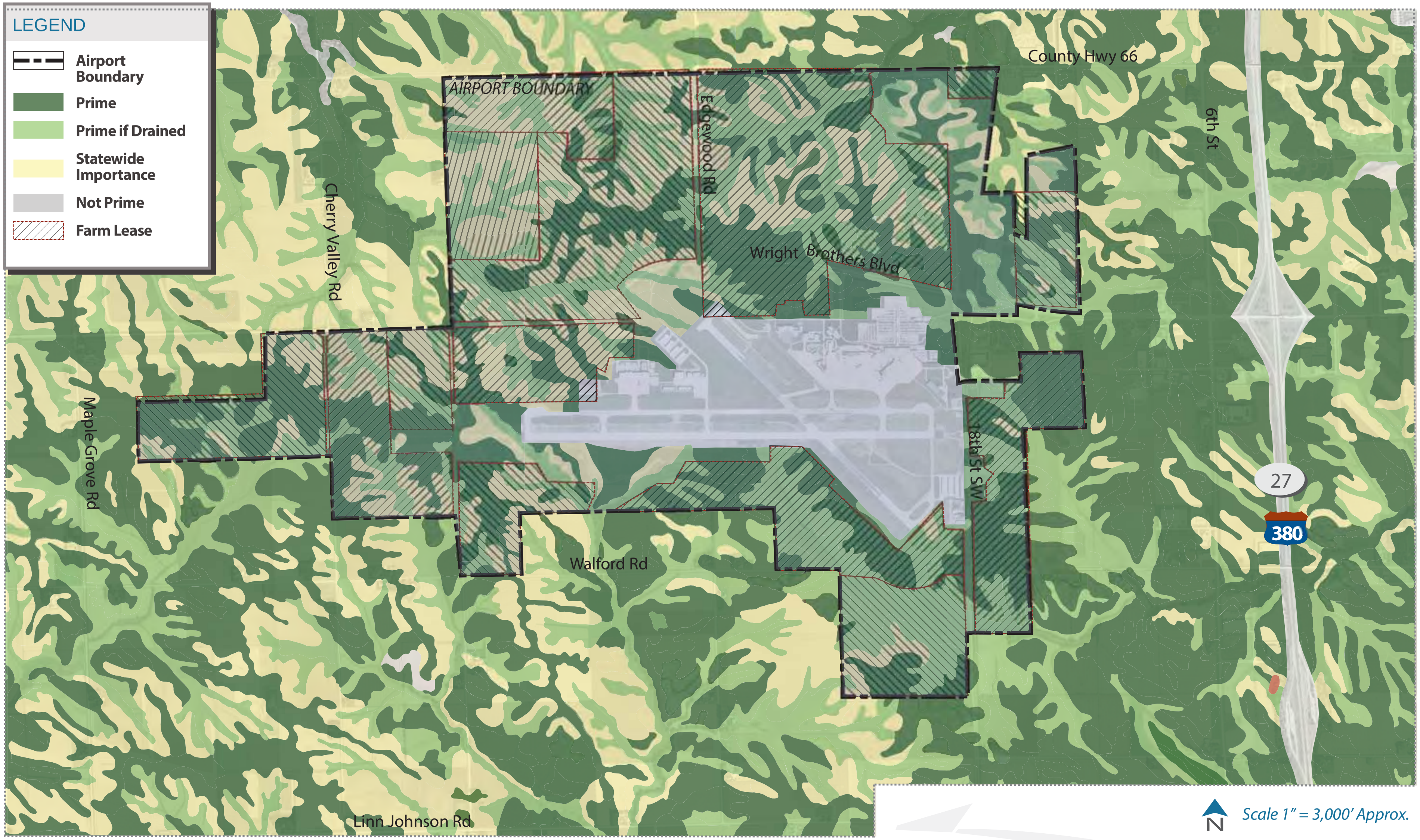

Figure 7.5
Farmland

Source: USDA Natural Resources Conservation Service; Airport Layout Plan (2011)

THE EASTERN IOWA AIRPORT CEDAR RAPIDS

Any Federal projects involving the conversion of farmland require coordination with the National Resource Conservation Service office with submittal of USDA Farmland Conversion Impact Rating Form AD-1006 in order to follow the guidelines set forth in the Farmland Protection Policy Act (FPPA) of 1984. FPPA is intended to minimize unnecessary and irreversible conversion of farmland to non-agricultural use by federal actions. Form AD-1006 requires the total acreage of land that is to be converted from agricultural use to another use either directly or indirectly. Indirect conversion refers to land that would no longer be used for actual agricultural purposes as a result of directly converted areas.

7.9. Water Resources

The Airport is located within both the Iowa and Cedar Rivers watersheds, both of which are major tributaries to the Mississippi River in eastern Iowa. Both the Iowa and Cedar flow in a southeasterly direction. **Figure 7-6** shows the water resources at and in the Airport vicinity. There are five larger creeks that drain Airport property. Tissel Hollow Creek and Willow Creek are within the Cedar River watershed and drain the north side of the Airport, while Hoosier Creek, Plum Creek, and Knapp Creek are within the Iowa River watershed and drain the south and east sides of the Airport. The floodplains associated with the creeks are also shown in Figure 7-6. Review of National Wetland Inventory Mapping shows limited wetlands on the Airport. The two wetland areas as shown in Figure 7-6 are located: 1) in the headwaters of Plum Creek on the south edge of the Airport, and 2) on the north side along Willow Creek. For any Airport project, a detailed field review would be completed to confirm if additional wetlands are present.

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. More detail regarding potential future revisions to the NPDES permit associated with the preferred alternatives presented in Chapters 5 and 6 will be included in the final version of the Master Plan.

In December 2012, the Airport updated its Storm Water Pollution Prevention Plan (SWPPP) following the construction of a new deicing collection facility in the West Cargo/GA area. This plan identifies existing Airport facilities and potential pollutant sources, as well as recommendations for storm water management. The following sections provide a summarization of the SWPPP and identify water resources located on or near Airport Property.

The drainage system at CID is divided into 13 drainage areas as shown in Figure 7-6. Industrial and/or Airport activities are conducted within six of these drainage areas. Storm water monitoring at the outfalls of these six drainage areas is conducted to evaluate compliance with the conditions established in the NPDES permit. The SWPPP includes a complete description of the 13 drainage areas. For purposes of this report, only descriptions of the two drainage areas with deicing activity (Areas 3 and 10) are included as follows:

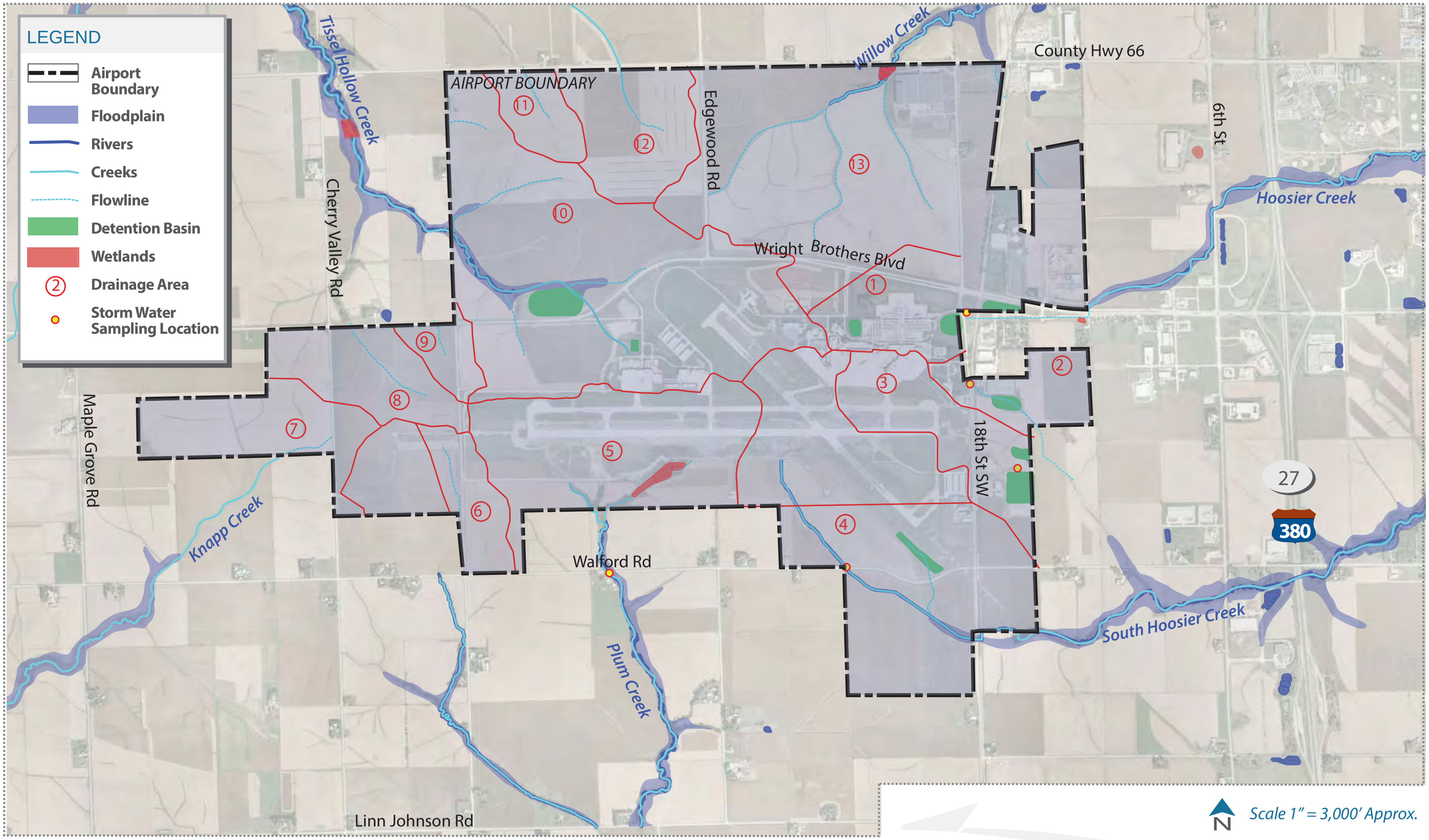

Figure 7.6
Water Resources

Source: Stormwater Pollution Prevention Plan (2012); Airport Layout Plan (2011)

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7.9.1. Outfall No. 3 Drainage Area

Drainage Area 3 is located in the east-central portion of the Airport property. This area is generally south of the Passenger Terminal and the Rental Car facility. The eastern portion of this drainage area is bisected by 18th Street SW. The area is approximately 160 acres in size. Approximately 50 acres are covered by impervious materials including paved aprons, taxiways, runways, and the poly-lined deicing basin. The remaining portion of land is grass-covered or cultivated agricultural land. Industrial activities conducted in this area mainly consist of aircraft fueling and deicing. Other activities include maintenance of runways, taxiways, aprons, and vegetated areas on the airfield.

Storm water runoff from areas used for aircraft deicing and fueling operations (Passenger Terminal and Air Cargo) is collected by a local storm sewer network and conveyed via underground piping to the poly-lined deicing basin located east of 18th Street SW. A force main system pumps the deicing fluids and storm water into the City of Cedar Rapids sanitary sewer system for treatment at the Cedar Rapids publicly-owned treatment works. At the end of the deicing season, an outlet valve on the north side of the deicing basin can be opened allowing storm water to travel northeast through a riprap lined channel to a detention basin. The detention basin outlets east off the property through Outfall 3A into an open channel. Storm runoff not collected by the intakes at the Passenger Terminal and Air Cargo apron is routed via overland flow to a system of storm sewers that convey the storm water east beneath 18th Street SW to an open drainage channel. The channel collects additional overland flow from the land east of 18th Street SW and routes storm water east toward a detention basin. The detention basin outlets east off of the property through Outfall 3A into an open channel.

7.9.2. Outfall No. 10 Drainage Area

Drainage Area 10 consists of approximately 687 acres located east of Cherry Valley Road. Wright Brothers Boulevard bisects this drainage area in an east-west direction. Approximately five percent of this drainage area is covered by buildings and pavement. Vegetation, two storm water basins, a deicing basin, and cultivated farmland occupy the remaining portion of the land surface.

Fixed operations in Drainage Area 10 include the West Cargo Facility (Federal Express), West FBO, West Fuel Farm, Airport Public Safety, Alliant Energy hangars, Rockwell Collins Hangar (privately owned property), West T-Hangars, Northwest T Hangars, and the Burlington Trailways bus stop.

Industrial activities within this area mainly consist of aircraft fueling and deicing. Aircraft fueling and deicing activities are conducted on the apron south of the West Cargo Facility. Fuel storage and loading/unloading operations are conducted at the West Fuel Farm. Storage of fuel in mobile refuelers, aircraft fueling, and aircraft washing activities occur on the apron at the West FBO.

Aircraft fueling and deicing occurs on the apron south of the West Cargo Facility. Intakes in the apron route storm water and deicing fluids into the West Cargo Deicing basin located north of the West Cargo Facility (across Beech Way SW). Construction of the West Cargo deicing basin was completed in September 2012. A force main system pumps fluids from the deicing basin into the City of Cedar Rapids sanitary sewer system for treatment at the Cedar Rapids publicly-owned treatment works (POTW). At the end of the deicing season, a bypass valve can be opened allowing storm water to travel northwest through a riprap lined channel, a vegetated channel, and into a 15-acre retention basin located north of Wright Brothers Boulevard. The runoff continues northwest where it flows off property at Outfall 10A.

Runoff from the apron at the West T Hangars, West FBO, parking lot of the West Cargo Facility, and Beech Way SW is collected by intakes and routed to Outfall 10 by a storm sewer system. The runoff continues northwest through a riprap lined channel, then a vegetated channel, to a 15-acre retention basin located north of Wright Brothers Boulevard. Runoff from the basin continues northwest where it flows off property at Outfall 10A.

7.10. Stormwater Management

The Airport has implemented both structural and non-structural control measures to contain and reduce potential pollutant discharges from Airport deicing and fueling activities. These include:

- Runoff from deicing areas at the Passenger terminal is collected by storm sewer intakes and routed via underground piping to the Deicing Basin (near Outfall 3). The fluids are pumped from the deicing basin into the City of Cedar Rapids sanitary sewer system for treatment.
- Runoff from the deicing area south of the West Cargo facility is collected by intakes in the apron and routed to the West Cargo deicing basin. In accordance with Part II. E. of the amended Permit, construction of the basin was completed prior to November 1, 2012.
- Snow plowing and stockpile placement are conducted to reduce the amount of aircraft deicing fluid (ADF) affected snow at deicing areas.
- Structural and non-structural controls in-place at the bulk fuel transfer and storage locations are outlined in the Airport's Spill Prevention, Control, and Countermeasure (SPCC) Plan. Controls include double-walled tanks, containment structures, oil/water separators, and maintenance and inspection procedures.
- In addition, existing traditional storm water management measures at the facility are continually maintained to reduce potential pollutants in storm water discharges. These measures include:
  - Storm water infiltration and retention/detention basins
  - Vegetated swales and diversion berms
  - Inlet filtration and riprap protection
  - Outlet sluice gate valves
  - Outlet letdown and riprap protection
  - Check dams and velocity dissipation structures
  - Silt fencing and straw bale filters
  - Oil-water separator systems
  - Silt fencing and straw bale filters

Monthly inspections of operational and inactive areas are conducted to ensure storm water management measures are effective in reducing pollutant loadings in storm water runoff and to identify any potential problems with procedures or controls. Tenants (co-permittees) are allowed to use inspection forms specific to their operations, provided the forms are approved by the Airport.

The Airport continually maintains vegetation on the property to reduce potential for erosion and enhance storm water filtration and infiltration. Monthly inspections include review of storm water conveyances and outfall locations to identify any erosion problems. Construction projects pose the greatest potential for erosion and mobilization of sediment. Project specific control measures are implemented during improvements that involve land disturbing activities and stockpiling of soil.

7.11. Hazardous Materials

In December 2011, CID updated its Spill Prevention, Control, and Countermeasure (SPCC) Plan to establish procedures, methods, and equipment to prevent the discharge of oil into or upon the navigable waters of the United States. The Plan provides a description of the Airport's compliance with the requirements of 40 CFR Part 112 and details the equipment, manpower, procedures and steps to prevent, control, and provide adequate countermeasures to an oil release.

The SPCC Plan 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 and focuses on the following elements:

- Facility changes affecting oil discharge potential
- Regulatory Agency request
- Oil discharge to navigable waters
- Spill events
- Ongoing maintenance and inspection
- Personnel training and record maintenance

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 SPCC Plan identifies 15 sites where oil, fuel, and lubricants are stored by various Tenants.

In addition, the electronic ALP identifies four hazardous material storage sites. These sites are described in **Table 7-4**.

Table 7-4: Hazardous Materials Storage Sites

Name/Location	Description
East 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

Source: Airport Layout Plan (2011)

7.12. Summary

7.12.1. Land Use Compatibility

The recommended development plan is consistent with existing zoning and land use, and is also consistent with federal and state land use zones. The recommended development plan does not change the location or size of the runway protection zones (RPZs) at the Airport; however, future development should seek to avoid land use conflicts with the RPZ criteria as outlined in Chapter 3, Section 3.4.6. There is a medium density residential area shown on the City Future Land Use Map south of the Runway 31 approach. Although not currently a conflict with land use compatibility guidance, it is recommended the Airport keep informed of zoning changes in the vicinity of the Airport to prevent the potential zoning/or rezoning of areas to incompatible land uses. Similarly, off-Airport development within the siting criteria identified in the FAA's Advisory Circular AC 150/5200-333B, *Hazardous Wildlife Attractants on or near Airports,* should be monitored by the Airport for creation of potential wildlife attractants such as wet detention ponds. The Airport's continued implementation of its Wildlife Hazard Management Plan should provide a safeguard against creating new wildlife attractants on-site. Noise is currently not an issue at CID, nor is it likely to be in the future based on review of the noise analysis completed as part of the 2005 Master Plan Update. Land use surrounding the Airport is primarily commercial and industrial. However, a noise analysis may be required as part of any future runway project to confirm the noise exposure associated with the project based on current forecasting and proposed runway use. Noise sensitive areas include schools and residential areas (refer to Table 7-1 for complete list). Planned low- and medium-density residential areas in the approaches to Runway 31 and Runway 27 may need to be considered for projects involving either of these runways.

7.12.2. Biotic Resources

CID is located south of the urbanized portion of the City of Cedar Rapids, with much of its land holdings that are not currently in Airport use being leased out for farming. The Iowa Department of Natural Resources maintains records of federally- and state-listed species and habitat. For Linn County, a total of 92 species are listed. The list reflects the diversity of Linn County with species associated with fresh water, prairie, wetlands and other native habitats. Although much of the Airport proper has been disturbed and is currently managed as mowed grass, prior to any project requiring physical disturbance the Airport will need to initiate an environmental review request with the Iowa DNR to determine the potential for presence of a listed species or habitat.

7.12.3. Farmland

As seen in Figure 7-5 and described in Section 7-8, much of the Airport property is in agricultural use. The USDA designation of CID farmlands includes "prime" farmland, "prime if drained" farmland, and farmland of "statewide importance". Conversion of land from farmland to aeronautical use will require coordination with the USDA.

7.12.4. Historical and Archaeological

Previous historical and archaeological investigations have occurred on and around the Airport. These studies have identified potentially eligible historic farmsteads off Airport property, on Cherry Valley Road between Walford and Linn Johnson Roads as well as archaeological sites in the vicinity of the Airport.

Projects involving federal actions will require consultation with the State Historic Preservation Office regarding the potential for eligible sites under Section 106 that may be impacted. Additional historic and archaeological surveys may be required to make these determinations. It is not anticipated that the proposed terminal renovation/expansion would be impacted due to its age (less than 50 years) and since it has already undergone alterations since its original construction.

7.12.5. Water Resources

An overview of water resources pertinent to the Airport, specifically water quantity and quality, were presented in Section 7.9. Figure 7-6 shows key surface water features. The Airport manages its storm water with its Stormwater Pollution Prevention Plan (SWPPP) and compliance with its NPDES permit. Any project that involves land disturbance, or changes in Airport operation will likely require review and possible modification to the SWPPP. These include changes in land cover (i.e. additional impervious cover), grading, and changes to drainage structures. Additionally, projects that could affect deicing operations will need to be evaluated in the context of the Airport's NPDES permit. More detail regarding potential future revisions to the NPDES permit associated with the preferred alternatives presented in Chapters 5 and 6 will be included in the final version of the Master Plan.

Mapped floodplains exist on Airport property as shown in Figure 7-6. The Tissel Howell Creek floodplain will likely be impacted with construction of a third runway as discussed in Chapter 5 as the Creek is located in the proposed runway's west safety area. Although this future runway is not planned for the foreseeable future, the floodplain impacts associated with it would need to be evaluated during the detailed planning and environmental process.

Review of the National Wetland Inventory (NWI) maps identified two wetlands on Airport property. Field reconnaissance by a qualified biologist would need to occur as part of any environmental review of any project with ground disturbance to confirm the presence of wetlands. If wetlands are present, sequencing of the impact would be required as well as a wetland permit if the impact could not be avoided.

7.12.6. Hazardous Materials

The Airport has developed a Spill Pollution Control and Countermeasure Plan. This plan includes an inventory of potential hazardous materials and a management plan of the same. According to information contained in the eALP, there are no known environmentally-contaminated sites that need to be addressed or remediated on Airport property. Due diligence will be conducted as part of any project to confirm the likelihood or presence of pollutants.

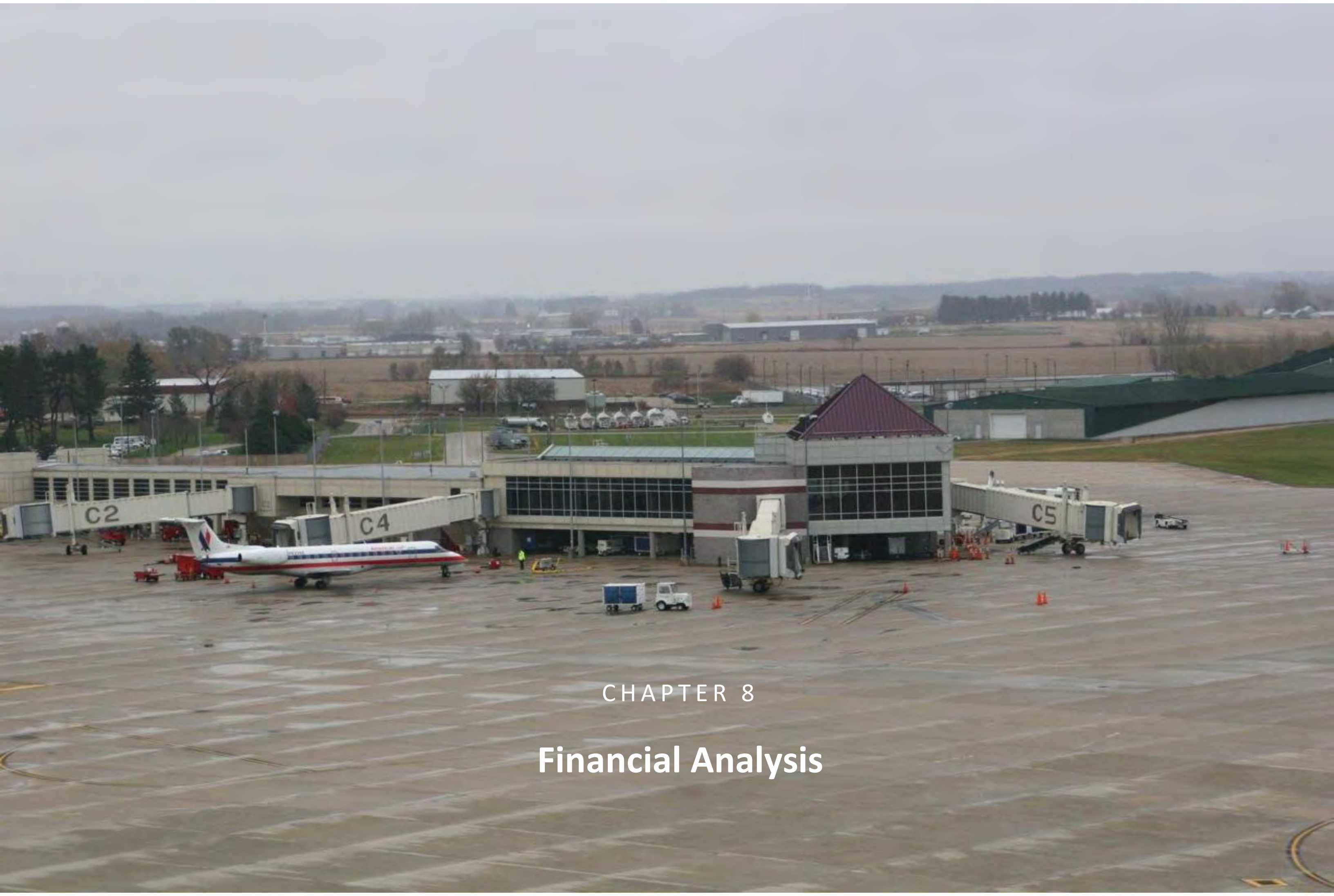
7.13. Conclusion

This overview identified potential environmental issues that will need to be addressed as the Airport moves forward with implementation of its plan. Any federal action will require completion of the National Environmental Policy Act (NEPA) process. The level of NEPA documentation, whether an Environmental Impact Statement, Environmental Assessment, or Categorical Exclusion will depend on the undertaking as it is better defined in the detailed project planning process. The NEPA process will identify required permits and mitigation activities.

MASTER PLAN

THE EASTERN IOWA AIRPORT CEDAR RAPIDS

8 Financial Analysis



CHAPTER 8

Financial Analysis

This Chapter presents financial projections for the Airport for 2015 through 2018. The 2013 and 2014 amounts are as presented in the Commission-approved budgets for those years. The Airport's Fiscal Year ends June 30.

8.1. Airport Financial Structure

This section discusses the Airport's accounting practices, including its cost center structure and airline agreements.

8.1.1 Commission Accounting

The Airport is owned by the City of Cedar Rapids (City) and is considered an Enterprise Fund of the City. The Cedar Rapids Airport Commission (Commission) is a policy-making body, which oversees Airport management and consists of five Commissioners appointed to three-year terms by the Mayor and approved by the City Council.

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. Seven cost centers are included in the financial reporting structure for the Airport, of which five are direct (airfield, terminal, cargo, general aviation, and other) and two are indirect (administration and safety/security).

8.1.2 Airline Agreements

The Commission has entered into signatory leases with Allegiant Air, American Eagle, Delta Air Lines, Frontier Airlines, and United Airlines. Chautauqua Airlines (American Connection), ExpressJet Airlines (Delta Connection, United Express), GoJet Airlines (United Express), Pinnacle Airlines (Delta Connection), Republic Airlines (Frontier), Shuttle America (United Express), SkyWest Airlines (Delta Connection, United Express), and Trans States Airlines (United Express) have entered into code-share agreements with the Airport. Code-share agreements are similar to airline agreements except that code-share agreements do not require the lease of exclusive-use space. Currently all of the airlines providing scheduled service at the Airport are signatory.

The airline agreements include a compensatory rate-setting methodology where the Airport assumes the majority of the financial risk and the airline rates and charges are set to recover the actual costs of the facilities and services they occupy and use. The airline agreements expire on June 30, 2016, which occurs during the projection period. The methodologies outlined in the current airline agreements are assumed to be in place throughout the projection period.

8.2. Capital Improvement Program

8.2.1. Project Costs

All airports receiving federal Airport Improvement Program (AIP) funding are required to maintain a current Capital Improvement Plan (CIP) with the FAA, which identifies projects to be undertaken at an airport over a specified period of time. This plan further estimates the order of implementation as well as total project costs and funding sources. It incorporates all projects recommended as part of this Master Plan from Fiscal Year (FY) 2013 through Fiscal Year 2018.

The recommended CIP and its corresponding cost estimates are based on a planning level of detail and are presented in **Table 8-1**. While accurate for master planning purposes, actual project costs will likely vary from these planning estimates once project design and engineering estimates are developed. The cost estimates presented in the table are in 2013 dollars inflated at 3 percent annually and also include contingencies, design costs, and construction management costs. As shown in the table, the CIP is estimated to cost approximately $59.9 million in inflated dollars.

Table 8-1 - Capital Improvement Program								
Year	Project	Project Costs[1]	Funding Sources				
			Federal[2]	Iowa DOT	PFC	CFC	Airport
2013	Reconstruct RW 13/31 PH 1 S & TW C	$5,508,760	$4,957,884	$0	$550,876	$0	$0
	Airport Master Plan Update	474,000	426,600	0	0	0	47,400
	Airfield Improvements - Pavement Joints Replacement	100,000	0	85,000	0	0	15,000
	Renovate Terminal Building - Public Restrooms	516,000	0	0	516,000	0	0
	Relocate CTX Machine	1,387,430	998,950	0	388,480	0	0
	Renovate Terminal Building - Public Address System	44,000	0	0	44,000	0	0
	Ground Transportation Parking Lot Improvements	212,000	0	0	0	212,000	0
	Construct Pavement Repairs - RCF - Phase 1	45,650	0	0	0	45,650	0
	Construct Outfall 10 Deicing Containment System	1,203,020	0	0	393,164	0	809,856
	Public Parking Lot Revenue Control System	400,000	0	0	0	0	400,000
	Farmland conservation (Tract E-1, E-2 + Tract A-1, A-2, A-4, A-5)	60,810	0	0	0	0	60,810
	Acquire Miscellaneous Capital Equipment	168,500	0	0	0	0	168,500
2014	Construct Taxiway E	5,746,597	5,171,937	0	574,660	0	0
	Airfield Improvements - Pavement Joints Replacement	100,000	0	70,000	0	0	30,000
	Reconstruct Building Roofs (66-Admn,67-Grounds,68-FAA,+76-Cargo)	315,000	0	315,000	0	0	0
	Ground Transportation Parking Lot Improvements	1,788,000	0	0	0	1,557,506	230,494
	Construct Pavement Repairs - RCF - Phase 2	80,000	0	0	0	80,000	0
	Lighting Improvements (40-Admn,41-Cargo,42-Rd,43-Pkg Lot,44-Term)	450,000	0	0	0	0	450,000
	Conduct ARC Flash Study - Terminal Building	100,000	0	0	0	0	100,000
	Farmland Conservation (Tract D-1, D-2, D-3, D-4)	25,000	0	0	0	0	25,000
	Develop Safety Management Systems (SMS)	100,000	0	0	0	0	100,000
	Acquire Miscellaneous Capital Equipment	234,200	0	0	0	0	234,200
2015	Renovate Terminal Bldg Public Lobby (YR 1)	4,043,500	3,025,000	0	0	0	1,018,500
	Construct Passenger Loading Bridges (2)	1,800,000	0	0	1,471,010	0	328,990
	Renovate Terminal Building - Public Restrooms	625,000	0	315,000	0	0	310,000
	CCTV System Upgrade - Terminal Building	250,000	0	0	250,000	0	0
	Instal Security Fence - West Cargo Apron Area	25,000	0	0	25,000	0	0
	Pavement Marking Improvement Project	125,000	0	87,500	0	0	37,500
	Airfield Improvements - Pavement Joints Replacement	100,000	0	70,000	0	0	30,000
	Replace Terminal Building Heat Pumps (10 units)	120,000	0	0	120,000	0	0
	Public Parking Lot West Long Term Pavement Repairs	500,000	0	0	0	0	500,000
	Construct Pavement Repairs - RCF - Phase 3	80,000	0	0	0	80,000	0
	Replace (1) Automated Car Wash Units	125,000	0	0	0	125,000	0
	Farmland Conservation	34,760	0	0	0	0	34,760
	Acquire Miscellaneous Capital Equipment	1,740,500	0	0	1,654,530	0	85,970
2016	Renovate Terminal Bldg Public Lobby (YR 2)	4,043,500	3,025,000	315,000	703,500	0	0
	Construct Passenger Loading Bridges (3)	2,700,000	0	0	1,351,500	0	1,348,500
	Airfield Improvements - Pavement Joints Replacement	100,000	0	70,000	0	0	30,000
	Lippisch Place Road Repairs	450,000	0	0	0	0	450,000
	Construct Pavement Repairs - RCF - Phase 4	150,000	0	0	0	150,000	0
	Construct Drainage Basin Repairs - RCF	50,000	0	0	0	50,000	0
	Construct Fuel Island Repairs - RCF	50,000	0	0	0	50,000	0
	Farmland Conservation	25,000	0	0	0	0	25,000
	Acquire Miscellaneous Capital Equipment	164,000	0	0	0	0	164,000
2017	Terminal Security Checkpoint & Concourse Improvements (YR 1)	15,518,250	3,025,745	315,000	1,911,387	0	10,266,118
	Construct Terminal Apron Expansion	350,000	315,000	0	35,000	0	0
	Reconstruct Terminal Roof	545,600	0	0	545,600	0	0
	Airfield Improvements - Pavement Joints Replacement	100,000	0	70,000	0	0	30,000
	Replace (1) Automated Car Wash Units	125,000	0	0	0	125,000	0
	Farmland Conservation	25,000	0	0	0	0	25,000
	Acquire Miscellaneous Capital Equipment	180,000	0	0	0	0	180,000
2018	Terminal Security Checkpoint & Concourse Improvements (YR 2)	5,181,750	3,025,745	0	1,586,013	0	569,992
	Replace Terminal Building Heat Pumps (20 units)	240,000	0	240,000	0	0	0
	Replace Airway Facilities Building, Admin, Cargo, HVAC	75,000	0	75,000	0	0	0
	Airfield Improvements - Pavement Joints Replacement	100,000	0	70,000	0	0	30,000
	Acquire Snow Removal Equipment (snow blower)	750,000	541,000	0	209,000	0	0
	Acquire Miscellaneous Capital Equipment	318,000	0	0	0	0	318,000
	Total	$59,868,827	$24,512,861	$2,097,500	$12,329,720	$2,475,156	$18,453,591

[1] Project Costs were inflated by the Airport at 3% annually.
[2] Federal funds include funds from FAA AIP (entitlement and discretionary) and TSA grants.
Source: Commission financial records

Table 8-2 presents the CIP's estimated funding sources. Potential funding sources for any proposed improvements at the Airport can be found at a variety of agencies, both federal and state. Many of the available funds will come in the form of grants should the project meet eligibility requirements. Additional financing options are available such as passenger facility charges (PFCs) and customer facility charges (CFCs).

Table 8-2 - Funding Sources of the CIP						
	Project	Funding Sources				
Year	Costs[1]	Federal[2]	Iowa DOT	PFC	CFC	Airport
2013	$10,120,170	$6,383,434	$85,000	$1,892,520	$257,650	$1,501,566
2014	8,938,797	5,171,937	385,000	574,660	1,637,506	1,169,694
2015	9,568,760	3,025,000	472,500	3,520,540	205,000	2,345,720
2016	7,732,500	3,025,000	385,000	2,055,000	250,000	2,017,500
2017	16,843,850	3,340,745	385,000	2,491,987	125,000	10,501,118
2018	6,664,750	3,566,745	385,000	1,795,013	0	917,992
Total	$59,868,827	$24,512,861	$2,097,500	$12,329,720	$2,475,156	$18,453,591

[1] Project Costs were inflated by the Airport at 3% annually.

[2] Federal funds include funds from FAA AIP (entitlement and discretionary) and TSA grants.

The following sections list available sources and detail the eligibility requirements for each. The amount of funding available from these sources will depend primarily on future levels of aviation activity at the Airport and future federal reauthorizations.

8.2.2. Federal Grants

Grants administered by the FAA through the AIP represent a critical capital funding source to implement the projects recommended in this Master Plan. Although the future status of the AIP is currently uncertain, for the purpose of this Master Plan it is assumed that the AIP will continue to be authorized and appropriated at levels consistent with H.R. 658, the FAA Modernization and Reform Act of 2012.

The U.S. DOT classifies the Airport as a small hub primary airport; therefore, the AIP formula stipulates that the Airport is entitled to receive 90% in federal funding for AIP-eligible projects. AIP funds can be used for most airport improvement needs but not operating costs. Note, however, that AIP funds are not available for revenue-generating projects.

As shown on Table 8-2, federal grants are estimated to be approximately $24.5 million from FY 2013 through FY 2018 to finance up to 90 percent of project costs on eligible projects in the CIP. Of this amount, approximately $20.4 million is assumed to be funded with entitlement grants, approximately $3.1 million with discretionary grants, and approximately $1.0 million with a Transportation Security Administration (TSA) grant, all of which are further described below.

- Entitlement Grants:

  The FAA's AIP consists of entitlement funds and discretionary funds. Entitlement funds are distributed through grants by a formula currently based on the number of enplanements and the amount of landed weight of arriving cargo at individual airports. **Table 8-3** presents the AIP entitlement calculation for the Airport based on the aviation activity forecasts presented in Table 2-40 of the Master Plan. As shown in the table, it is estimated that the Airport is eligible to receive approximately $24.8 million in entitlement AIP grants from FY 2013 through FY 2018.

Table 8-3 - AIP Entitlement Calculation

	2013	2014	2015	2016	2017	2018
Enplanements for Entitlement	487,500	517,600	518,800	520,016	534,900	550,200
FAA Formula [1]						
$7.80 for 1st 50,000 Enplanements	$390,000	$390,000	$390,000	$390,000	$390,000	$390,000
$5.20 for next 50,000 Enplanements	260,000	260,000	260,000	260,000	260,000	260,000
$2.60 for next 400,000 Enplanements	1,008,000	1,040,000	1,040,000	1,040,000	1,040,000	1,040,000
$0.65 for next 500,000 Enplanements	0	11,440	12,220	13,010	22,685	32,630
$0.50 for the remaining Enplanements	0	0	0	0	0	0
Total Calculated Entitlements	$1,658,000	$1,701,440	$1,702,220	$1,703,010	$1,712,685	$1,722,630
Total Calculated Entitlements x 2	$3,316,000	$3,402,880	$3,404,440	$3,406,021	$3,425,370	$3,445,260
Cargo Entitlements	214,000	214,000	214,000	214,000	214,000	214,000
Total Entitlements	$3,530,000	$3,616,880	$3,618,440	$3,620,021	$3,639,370	$3,659,260
2 Year Lag in Receipt of Grants [2]	$7,079,285	$3,357,159	$3,530,000	$3,616,880	$3,618,440	$3,620,021
Cumulative AIP Entitlement Grants		$10,436,444	$13,966,444	$17,583,324	$21,201,764	$24,821,785

[1] The FAA formula is defined in 49 United States Code § 47114.
[2] The grant amount presented in FY 2013 represents grants for which CID currently has LOI approval.

- Discretionary Grants:

  Each fiscal year, entitlement funds not used during the fiscal year are redistributed to other airport sponsors as discretionary funds. Discretionary funds are limited only to higher priority needs. The recommended CIP projects include runway reconstruction, construction of taxiways, apron expansion, and taxiway improvements. The Airport currently estimates that it will receive approximately $3.1 million in discretionary funding.

- TSA Grants:

  On February 17, 2009, the American Recovery and Reinvestment Act of 2009 was enacted to assist those most impacted by the recession by creating and preserving jobs and promoting economic recovery with funding specified for multiple areas. As part of that act, the TSA received $1 billion to invest in checked baggage explosives detection systems, checkpoint explosives detection equipment, and facility modifications including the construction of airport baggage handling systems to support optimized checked baggage screening solutions.

  In 2011, the Airport received a $2.9 million grant from TSA to relocate the existing Computer Tomography X-ray (CTX) machines located in the terminal lobby to new space constructed behind the airline ticket offices. Approximately $1.9 million of this grant has already been expended and an additional $1.0 million is assumed to fund this project in FY 2013.

Table 8-4 presents the federal grants that are assumed to fund the eligible portions of the CIP. As shown in the table available entitlement, discretionary, and TSA grants are sufficient to fund the eligible portions of the CIP in total; however, annual grant collections in certain years may not be sufficient to fund certain project costs requiring short-term funding until the project costs can be reimbursed.

Table 8-4 - Application of Federal Grants

	2013	2014	2015	2016	2017	2018	Total
Available Federal Grants[1]							
Entitlement Grants	$7,079,285	$3,357,159	$3,530,000	$3,616,880	$3,618,440	$3,620,021	$24,821,785
Discretionary Grants	1,113,175	1,971,080	0	0	0	0	3,084,255
TSA Grants	998,950	0	0	0	0	0	998,950
Total Federal Grants	$9,191,410	$5,328,239	$3,530,000	$3,616,880	$3,618,440	$3,620,021	$28,904,989
Federally Eligible Portion of CIP[2]	$6,383,434	$5,171,937	$3,025,000	$3,025,000	$3,340,745	$3,566,745	$24,512,861
Difference	$2,807,976	$156,302	$505,000	$591,880	$277,695	$53,276	$4,392,129
Cumulative		$2,964,278	$3,469,278	$4,061,158	$4,338,853	$4,392,129	

[1] *The 2013 amount represents the balance of the grant as of June 30, 2012.*
[2] *Represents federally eligible portion of the CIP as presented in Table 8-2.*

8.2.3. Iowa Department of Transportation (DOT)

Iowa DOT's Office of Aviation administers two major funding programs: the Airport Improvement Program and the Vertical Infrastructure Program. The Iowa Transportation Commission, the policy-making division of the Iowa DOT, approves annual funding allocations and project selection for the programs.

The Airport Improvement Program funds aviation safety programs and aviation planning and development projects. Aviation Safety includes Immediate Safety Enhancements and Wildlife Mitigation programs. Airports may apply for grants on an as-needed basis while funding is available. Aviation Planning and Development includes airport land use planning, airport development projects at public-owned airports, required match for federally funded statewide studies, and air service development funds for commercial service airports. Airport development projects include: land acquisition; runway, apron and taxiway preservation and construction; access control; planning studies; airport lighting; fuel facilities; and installation of visual navigational and communication aids. The percentage of local match required for projects varies depending on the type of project.

As shown on Table 8-2, approximately $2.1 million is assumed to be funded with Iowa DOT grants from FY 2013 through FY 2018.

8.2.4. Passenger Facility Charges (PFC)

PFCs are authorized by Title 14 of the Code of Federal Regulations, Part 158, and are administered by the FAA. PFCs collected from qualified enplaned passengers are used to fund eligible projects. An airport operator can impose a PFC of up to $4.50 per eligible enplaned passenger. Once a PFC is imposed, it is included as part of the ticket price paid by passengers enplaning at the airport, collected by the airlines, and remitted to the airport operator, less an allowance for airline processing expenses. The PFC legislation stipulates that if a medium- to large-hub airport institutes a PFC of up to $3.00, they must forego 50 percent of their AIP entitlement funds. This increases to 75 percent if they charge a $4.00 or $4.50 PFC. Since the Airport is a small hub airport, it does not have to forego any of its annual AIP entitlement funds.

Projects that are eligible for PFC funding are those that preserve or enhance the capacity, safety, or security of the air transportation system; reduce noise or mitigate noise effects; or furnish opportunities for enhanced competition between or among air carriers. PFCs cannot be used for revenue-generating facilities at airports such as restaurants and other concession space, rental car facilities, public parking facilities, or construction of exclusively leased space or facilities.

The Airport submitted its first PFC application in October 1994, receiving approval from the FAA to charge a PFC of $3.00 per enplaned passenger. Since that time, the Airport has received approval for four additional applications, with PFC Application #5 being the only active application. The Airport is currently in the process of preparing PFC Application #6 and intends on submitting it sometime in FY 2014. **Table 8-5** presents the PFC calculation for the Airport based on the aviation activity forecasts presented in Table 2-40 of the Master Plan.

Table 8-5 - PFCs

	2013	2014	2015	2016	2017	2018	Total
Forecast			518,800	520,016	534,900	550,200	
Enplanements for PFC (90%)			466,920	468,014	481,410	495,180	
PFC per Enplanement[1]			$4.50	$4.50	$4.50	$4.50	
Annual PFCs			$2,101,000	$2,106,000	$2,166,000	$2,228,000	
LESS: Carrier Compensation			($51,000)	($51,000)	($53,000)	($54,000)	
Total Calculated PFC Revenue[2]	$1,892,520	$2,045,200	$2,050,000	$2,055,000	$2,113,000	$2,174,000	
Cumulative PFC Revenue	$1,892,520	$3,937,720	$5,987,720	$8,042,720	$10,155,720	$12,329,720	
Total Calculated PFC Revenue[2]	$1,892,520	$2,045,200	$2,050,000	$2,055,000	$2,113,000	$2,174,000	$12,329,720
PFC Eligible Portion of CIP[3]	$1,892,520	$574,660	$3,520,540	$2,055,000	$2,491,987	$1,795,013	$12,329,720
Difference	$0	$1,470,540	($1,470,540)	$0	($378,987)	$378,987	$0

[1] The PFC formula is defined in 49 United States Code § 40117.
[2] FY 2013 and FY 2014 PFC amounts represent the amounts presented in CID's budget book.
[3] Represents PFC eligible portion of the CIP as presented in Table 8-2.

As shown in the table, the Airport is estimated to collect approximately $12.3 million in PFCs from FY 2013 through FY 2018, which is sufficient to fund the PFC-eligible portions of the CIP shown in Table 8-2 in total; however, annual PFC collections in certain years may not be sufficient to fund certain project costs requiring short-term funding until the project costs can be reimbursed.

8.2.5. Customer Facility Charges (CFC)

A CFC is a charge paid by the Airport's rental car customers per the number of contract days a vehicle has been rented. In September 1995, the Commission approved a resolution to impose a CFC at the Airport to recover maintenance, utility, and improvement costs along with amortization of rental car related projects. Annually, the Airport adjusts the CFC based on actual maintenance, utility, and improvement costs, amortization, rental days, and revenue collected.

As shown on Table 8-2, approximately $2.5 million is assumed to be funded with CFCs from FY 2013 through FY 2018. These project costs are initially funded with Airport funds and then recovered from the rental cars through an amortization charge, which is presented in **Table 8-6**. As shown in the table, recovery of project costs and maintenance, utility, and improvement costs equate to a CFC ranging from a low of $2.05 in FY 2018 to a high of $2.61 in FY 2015. The CFC increases approximately 26.5 percent in FY 2015 primarily due to the completion of ground transportation parking lot improvements and replacement of an automated car wash unit. The CFC decreases approximately 15 percent in FY 2017 due to the rental car service facility being fully amortized.

Table 8-6 - CFCs							
	Total	Amortization					
	Project Costs	2013	2014	2015	2016	2017	2018
Rental Car Service Facility	$2,343,715	$253,045	$253,045	$253,000	$189,800	$0	$0
Rental Car Ready Lot	382,681	41,317	41,317	41,300	31,000	0	0
Replace Car Wash Equipment	111,664	23,177	0	0	0	0	0
Fuel Island Improvements	77,076	19,200	19,200	19,200	0	0	0
Fuel Island Repair	80,000	6,435	8,015	19,236	19,236	19,236	19,236
Ground Transportation Parking Lot Improvements	212,000	0	0	19,200	19,200	19,200	19,200
Construct Pavement Repairs - RCF - Phase 1	45,650	0	0	5,600	5,600	5,600	5,600
Ground Transportation Parking Lot Improvements	1,557,506	0	48,672	116,813	143,074	221,856	221,856
Construct Pavement Repairs - RCF - Phase 2	80,000	0	0	9,900	9,900	9,900	9,900
Construct Pavement Repairs - RCF - Phase 3	80,000	0	0	9,900	9,900	9,900	9,900
Replace (1) Automated Car Wash Units	125,000	0	0	27,800	27,800	27,800	27,800
Construct Pavement Repairs - RCF - Phase 4	150,000	0	0	0	18,500	18,500	18,500
Construct Drainage Basin Repairs - RCF	50,000	0	0	0	11,100	11,100	11,100
Construct Fuel Island Repairs - RCF	50,000	0	0	0	8,300	8,300	8,300
Replace (1) Automated Car Wash Units	125,000	0	0	0	0	27,800	27,800
Total	$5,470,292	$343,174	$370,249	$521,949	$493,410	$379,192	$379,192
Maintenance, Utility, & Improvement Costs		$211,335	$224,255	$229,900	$235,600	$241,500	$247,500
Total Costs		$554,509	$594,504	$751,849	$729,010	$620,692	$626,692
Rental Days		266,863	287,105	287,800	288,500	296,800	305,300
CFC		$2.08	$2.07	$2.61	$2.53	$2.09	$2.05

8.2.6. Airport Funds

The Airport generates revenue through airline revenues, terminal concessions, ground and facility leases, fuel flowage fees, landing fees, ramp fees, and parking revenue. Typically, such revenues are used to cover operations and maintenance expenses along with debt service obligations. However, any surplus revenues can be applied directly to Airport projects. As shown on Table 8-2, approximately $18.5 million in local funding is required to fund the CIP from FY 2013 through FY 2018. This analysis assumes that all of the local funding requirement will be funded from Airport revenues; however, the Commission may consider issuing bonds to distribute the costs over multiple years.

8.3. Financial Feasibility

This section of the financial analysis presents the existing debt service, projected operating expenses, and projected revenues resulting from the daily operation of the Airport. In addition, the expense and revenue increases resulting from the implementation of the CIP are layered into the projections to determine if it is feasible for the Airport to undertake the program within the FY 2013 through FY 2018 planning period.

8.3.1. Debt Service

The Commission is responsible for one outstanding bond issuance, the Series 2011E Refunding Bonds issued by the City. These bonds refunded the Series 2003A Bonds and the Series 1995B Bonds, which were issued to fund the construction of a fixed based operator facility and rental car joint use facility. **Table 8-7** presents the Airport's debt service requirements for the Series 2011E issuance.

Table 8-7 - Debt Service

Year	Series 2003C AMT	Series 2007A Refunding (1998 & 2000)	Series 2011E Refunding (2003A/1995B)	Existing Debt Service
2012	$1,598,913	$358,626	$24,415	$1,981,954
2013	0	0	23,905	23,905
2014	0	0	23,390	23,390
2015	0	0	24,563	24,563
2016	0	0	0	0
2017	0	0	0	0
2018	0	0	0	0

Source: Commission Financial Records, existing debt service

The Debt Service Requirements are not allocated to the Airport's cost centers. Rather, Debt Service Requirements are paid through operating revenues.

8.3.2. Operating Expenses

Operating expenses at the Airport are assigned to seven cost centers as previously described. Expenses assigned to administration and safety/security, which are the two indirect cost centers, are allocated to direct cost centers based on the proportion of each direct cost center's share of expenses and based on fixed percentages set forth in the airline agreements. Within each cost center, line items to which the operating expenses are assigned include personal services, purchased services, supplies and materials, other, and capital outlay.

The FY 2012 operating expenses reflect the actual expenses presented in the City's Comprehensive Annual Financial Report For the Fiscal Year Ended June 30, 2012. The FY 2013 operating expenses reflect the amounts presented in the Airport's FY 2013 Annual Budget approved by the Commission in December 2011 and amended on April 17, 2013 (FY 2013 Budget). The FY 2014 operating expenses reflect the amounts presented in the Airport's FY 2014 Annual Budget as approved by the Commission in December 2012 (FY 2014 Budget).

Table 8-8 presents historical and projected operating expenses by line item and cost center for FY 2012 through FY 2018.

Table 8-8 - Operating Expenses	Actual 2012	Budgeted 2013	Budgeted 2014	Projected 2015	Projected 2016	Projected 2017	Projected 2018
By Line Item							
Personal Services	$2,944,484	$3,487,516	$3,736,422	$3,905,200	$4,002,900	$4,102,900	$4,205,500
Purchased Services	2,728,597	2,720,443	2,425,104	2,485,700	2,548,000	2,611,600	2,676,900
Supplies & Materials	1,002,029	1,032,900	1,065,825	1,092,600	1,119,800	1,147,700	1,176,400
Other	75,964	88,500	112,500	115,300	118,200	121,100	124,100
Capital Outlay	106,331	188,980	234,200	240,100	246,100	252,300	258,600
Total	$6,857,405	$7,518,339	$7,574,051	$7,838,900	$8,035,000	$8,235,600	$8,441,500
By Cost Center							
Airfield	$919,898	$1,056,834	$1,167,799	$1,272,526	$1,304,331	$1,336,906	$1,370,333
Terminal	1,454,456	1,765,487	1,867,323	1,914,000	1,961,891	2,010,884	2,061,165
Cargo	15,931	18,300	16,300	16,707	17,126	17,553	17,992
General Aviation	42,909	97,800	57,800	59,248	60,728	62,243	63,799
Other	1,277,176	1,411,250	1,128,200	1,156,454	1,185,357	1,214,921	1,245,300
Administration	2,007,326	1,749,576	1,913,447	1,961,237	2,010,343	2,060,522	2,112,026
Safety/Security	1,139,707	1,419,092	1,423,182	1,458,727	1,495,225	1,532,571	1,570,885
Total	$6,857,404	$7,518,339	$7,574,051	$7,838,900	$8,035,000	$8,235,600	$8,441,500
CAGR FY 2014 - FY 2018							2.7%
Total Operating Expenses	$6,857,404	$7,518,339	$7,574,051	$7,838,900	$8,035,000	$8,235,600	$8,441,500
Less: Machinery & Equipment	($91,088)	($168,500)	($223,000)	($228,600)	($234,300)	($240,200)	($246,200)
Plus: Master Plan	223,875	0	0	0	0	0	0
Adjusted Operating Exp	$6,990,191	$7,349,839	$7,351,051	$7,610,300	$7,800,700	$7,995,400	$8,195,300
Percent Increase		5.1%	0.016%	3.5%	2.5%	2.5%	2.5%

Source: Commission financial records, FY 2012 - FY 2014
MAC Consulting, LLC, FY 2015 - FY 2018

As shown in the table, operating expenses are budgeted to be approximately $7.6 million in FY 2014 and are forecast to be approximately $8.4 million in FY 2018, reflecting a compound annual growth rate of 2.7 percent. FY 2013 adjusted operating expenses are budgeted to increase approximately 5.1 percent over FY 2012 actuals primarily as a result of: hiring staff (filling vacant positions and one new position), accounting for projected pay increases, repair costs from wind and storm damage, and paying for an escalator step replacement. FY 2014 expenses are budgeted to only slightly increase over the FY 2013 budgeted amounts. FY 2015 through FY 2018 operating expenses are projected based on the following:

- Estimates of future operating expenses are based on a review of historical trends.
- The anticipated effects of inflation assumed at 2.5 percent annually, reflecting a 10-year average of the Consumer Price Index.
- Increase in staffing by an additional airfield maintenance worker in FY 2015 due to CIP projects.
- Increased terminal space resulting from the terminal improvement project included in the CIP.

8.3.3. Operating Revenues

Major sources of revenue at the Airport are derived from non-airline and airline sources. Non-airline revenues account for 76.8 percent of total revenue in the FY 2014 Budget. This revenue includes the operation of public parking facilities and other parking services; terminal concession revenues (generated from fees paid by concessionaires such as rental car, restaurant, news/gift shop, and advertising); ground rentals; and cargo and hangar rentals. A summary of major non-airline tenant leases is presented in **Table 8-9**.

Table 8-9 - Summary of Major Non-Airline Tenants

Lessee	Ending Date	Square Feet (SF) Ground	Square Feet (SF) Building	Annual Ground Rent Per SF	Annual Building Rent Per SF	Annual Ground Rent Payment	Annual Building Rent Payment	Minimum Annual Guarantee
Land Rental								
Marvin Trachta - Farm Tract C	2/28/14	177 acres	N/A	$400.00	N/A	$70,800	N/A	N/A
Rick Nolan - Farm Tract B	2/28/14	157.3 acres	N/A	$400.00	N/A	$62,920	N/A	N/A
Ron Nove - Farm Tract D	2/28/14	370.7 acres	N/A	$400.00	N/A	$148,280	N/A	N/A
Shawn Nove - Farm Tract E	2/28/14	422.2 acres	N/A	$400.00	N/A	$168,880	N/A	N/A
Verne Hosek - Farm Tract A	2/28/14	920 acres	N/A	$400.00	N/A	$328,000	N/A	N/A
Building Rental								
DHL Express	9/30/15	62,106	16,826	$0.22	$5.65	$13,943	$95,067	N/A
Eastern Iowa Delivery Service	Month-to-Month	N/A	338	N/A	$16.95	N/A	$5,729	N/A
Federal Aviation Administration	9/30/17	N/A	4,455	N/A	$14.08	N/A	$62,726	N/A
Federal Express Corporation	11/5/17	343,454	90,827	$0.29	$5.96	$99,430	$541,420	N/A
Landmark Aviation	Month-to-Month	4,632	1,203	$0.21	$10.16	$984	$209	N/A
Landmark Aviation	6/30/31	38,500	N/A	$0.29	N/A	$11,150	N/A	N/A
Landmark Aviation - Fuel Farm	8/31/15	2,657	N/A	$0.29	N/A	$769	N/A	N/A
Laurin, Inc. d/b/a Airport Shuttle Service	5/31/17	N/A	440	N/A	$27.63	N/A	$12,156	N/A
Nordstrom	7/14/16	48.33 acres	N/A	$472.05	N/A	$22,814	N/A	N/A
Qwest	12/31/15	510	260	$0.30	$10.18	$151	$44	N/A
Reliable Machine & Tool Co	Month-to-Month	N/A	5,250	N/A	$1.60	N/A	$8,400	N/A
United Parcel Service	6/30/17	22,698	6,370	$0.22	$9.10	$4,912	$1,063	N/A
United States Postal Service	12/31/22	31,557	13,176	$0.21	$8.58	$6,712	$113,024	N/A
US DOT - TSA	10/31/16	N/A	3,746	N/A	$37.11	N/A	$138,996	N/A
Other Rental								
Burlington Trailways	Month-to-Month	N/A	2,625	N/A	$1.60	N/A	$4,200	N/A
Quality Mechanical Services	Month-to-Month	N/A	760	N/A	$5.75	N/A	$4,370	N/A
Hangar Rent								
Landmark Aviation - Corporate Hangar	6/30/31	6,244	6,300	$0.29	$2.61	$1,839	$16,464	N/A
Various T-Hangar Tenants	Month-to-Month	N/A	Varies	N/A	Varies	N/A	$220,476	N/A
FBO Rent								
Landmark Aviation - FBO #1	10/21/29	98,767	26,600	$0.30	$8.78	$29,146	$233,548	N/A
Landmark Aviation - FBO #2	6/30/31	18,402	9,618	$0.29	$2.61	$5,419	$25,135	N/A
Parking Fees								
Republic Parking Systems	6/30/15	N/A	N/A	Gross Receipts	N/A	$3,356,000	N/A	N/A
Concession Fees - Restaurant (SSP America)	6/30/16	N/A	7,430	N/A	$47.23	N/A	MAG or %gross	$350,887
Concession Fees - Car Rental								
Enterprise d/b/a National/Alamo Car Rental	3/31/18	N/A	240	N/A	$37.95	$15,439	$9,109	$326,525
Enterprise Rent A Car	3/31/18	N/A	240	N/A	$37.95	$12,129	$9,109	$228,435
Hart Leasing, Inc. (Avis/Budget Rent A Car)	3/31/18	N/A	240	N/A	$37.95	$14,746	$9,109	$321,008
Hertz Corporation	3/31/18	N/A	450	N/A	$37.95	$18,266	$17,095	$398,800
Concession Fees - Advertising (Clear Channel)	5/31/15	N/A	N/A	N/A	N/A	N/A	MAG or %gross	$60,000
Concession Fees - Misc								
Airport Express/Express Limousine	6/30/13	N/A	N/A	per space	N/A	$7,200	N/A	N/A
Airport Shuttle Service	6/1/17	N/A	N/A	per space	N/A	$14,400	$4,550	N/A
American Class Taxi	10/31/15	N/A	N/A	per space	N/A	$8,400	N/A	N/A
Century Cab, Inc.	10/31/15	N/A	N/A	per space	N/A	$4,200	N/A	N/A
Eastern Iowa Delivery Service	Month-to-Month	N/A	N/A	N/A	% gross	N/A	$4,605	N/A
F & B Cab Co.	10/31/15	N/A	N/A	per space	N/A	$8,400	N/A	N/A
Marco's Taxi	10/31/15	N/A	N/A	per space	N/A	$4,200	N/A	N/A
Master Cab of Iowa	10/31/15	N/A	N/A	per space	N/A	$4,200	N/A	N/A
Yellow Cab Company - Iowa City	10/31/15	N/A	N/A	per space	N/A	$4,200	N/A	N/A

Source: Commission records

Airline revenues account for 23.2 percent of total FY 2014 budgeted revenues and include revenues generated from passenger airline and cargo landing fees, apron fees, and terminal rentals. These are projected based on the rate provisions provided in the airline agreements. As stated earlier, the airline agreements provide the basis for the annual recalculation of airline rates and charges, which are compensatory-based formulas that recover the costs of operating the airfield and terminal cost centers. For purposes of this analysis, it was assumed that similar methodologies for calculating airline rates and charges would be used by the Airport following the expiration of the leases. **Table 8-10** presents a summary of the airline rates and charges at the Airport and the resulting revenue for FY 2013 through FY 2018.

Table 8-10 - Summary of Airline Rates & Charges

	Budgeted 2013	Projected 2014	Projected 2015	Projected 2016	Projected 2017	Projected 2018
Signatory Rates:						
Landing Fee	$2.49	$2.74	$2.88	$2.82	$2.81	$2.81
Terminal	$18.63	$19.98	$20.32	$22.65	$22.78	$23.24
Cargo Apron	$83.05	$84.18	$91.36	$93.67	$96.03	$98.46
Passenger Airline Revenues						
Landing Fee	$1,529,268	$1,703,038	$1,815,902	$1,892,826	$1,957,846	$2,028,997
Terminal	1,619,779	1,815,071	1,852,223	1,981,831	2,010,244	2,054,313
Total	$3,149,047	$3,518,109	$3,668,126	$3,874,657	$3,968,090	$4,083,310
Enplanements	487,500	517,600	518,800	520,016	534,900	550,200
Cost Per Enplanement	$6.46	$6.80	$7.07	$7.45	$7.42	$7.42

Source: Airline Agreements
MAC Consulting, LLC

Table 8-11 presents historical and projected operating revenues for FY 2012 through FY 2018. As with operating expenses, FY 2013 revenues reflect the revenues presented in the FY 2013 Budget, and FY 2014 revenues reflect the revenues presented in the FY 2014 Budget. As shown in the table, operating revenues are budgeted to be approximately $15.2 million in FY 2014 and are forecast to be approximately $17.1 million in FY 2018, reflecting a compound annual growth rate of 3.1%.

Table 8-11 - Operating Revenue	Actual 2012	Budgeted 2013	Budgeted 2014	Projected 2015	Projected 2016	Projected 2017	Projected 2018
Licenses & Permits	$2,375	$1,700	$8,800	$9,000	$9,200	$9,400	$9,600
Percent Increase		-28.4%	417.6%	2.3%	2.2%	2.2%	2.1%
Charges for Services							
Other Charges for Services	$21,373	$15,025	$15,000	$15,300	$15,600	$15,900	$16,200
Admin Charges - External	10,000	12,500	12,500	12,800	13,100	13,400	13,700
Special Police Services	326,854	328,000	353,900	361,000	368,200	375,600	383,100
Daily Parking	47,700	47,700	56,700	57,800	59,000	60,200	61,400
Solid Waste Collection Fees	13,200	13,000	13,000	13,300	13,600	13,900	14,200
Common Use Janitorial, Mtc,	217,642	230,500	336,258	343,000	349,900	356,900	364,000
Common Use Electric	77,738	73,745	107,581	109,700	111,900	114,100	116,400
Terminal Service	50,509	82,500	32,500	33,200	33,900	34,600	35,300
Customer Facility Charge	469,890	400,800	456,400	751,849	729,010	620,692	626,692
Passenger Facility Charge	1,893,033	1,892,520	2,045,200	2,050,000	2,055,000	2,113,000	2,174,000
Fuel Flowage Fee	72,663	68,129	68,129	69,500	70,900	72,300	73,700
Fuel Sales - External	549,247	524,500	524,500	535,000	545,700	556,600	567,700
Subtotal	$3,749,849	$3,688,919	$4,021,668	$4,352,449	$4,365,810	$4,347,192	$4,446,392
Percent Increase		-1.6%	9.0%	8.2%	0.3%	-0.4%	2.3%
Use of Money & Property	$18,113	$5,000	$5,000	$5,100	$5,200	$5,300	$5,400
Percent Increase		-72.4%	0.0%	2.0%	2.0%	1.9%	1.9%
Rents & Royalties							
Land Rental	$719,787	$770,669	$769,810	$785,200	$800,900	$816,900	$833,200
Building Rental							
Airline	761,349	973,251	900,352	987,500	1,095,200	1,101,200	1,122,300
Nonairline	1,326,098	1,226,087	1,324,589	1,351,100	1,378,100	1,405,700	1,433,800
Other Rental	5,299	4,908	4,908	5,000	5,100	5,200	5,300
Landing Fees	2,350,115	1,988,650	2,041,470	2,529,100	2,591,900	2,655,900	2,726,200
Hangar Rent	219,300	220,476	220,476	224,900	229,400	234,000	238,700
FBO Rent	289,426	292,000	292,000	297,800	303,800	309,900	316,100
Parking Fees	3,259,905	3,356,000	3,411,200	3,419,100	3,427,100	3,525,200	3,626,000
Concession Fees - Restaurant	380,697	368,400	401,800	402,700	403,600	415,200	427,100
Concession Fees - Car Rental	1,461,289	1,440,960	1,403,334	1,406,600	1,409,900	1,450,300	1,491,800
Concession Fees - Advertising	60,559	60,000	60,000	60,100	60,200	61,900	63,700
Concession Fees - Misc	43,005	40,050	43,250	43,400	43,500	44,700	46,000
Airport Future Development Res	52,200	52,200	52,200	53,200	54,300	55,400	56,500
Noise Compatibility Res	38,200	38,200	38,200	39,000	39,800	40,600	41,400
Apron Use Fee	150,459	135,000	135,000	169,000	173,300	177,700	182,100
Subtotal	$11,117,688	$10,966,851	$11,098,589	$11,773,700	$12,016,100	$12,299,800	$12,610,200
Percent Increase		-1.4%	1.2%	6.1%	2.1%	2.4%	2.5%
Miscellaneous Revenues	$87,227	$18,081	$18,081	$18,400	$18,700	$19,000	$19,300
Percent Increase		-79.3%	0.0%	1.8%	1.6%	1.6%	1.6%
Total Operating Revenue	$14,975,252	$14,680,551	$15,152,138	$16,158,649	$16,415,010	$16,680,692	$17,090,892
Percent Increase		-2.0%	3.2%	6.6%	1.6%	1.6%	2.5%
CAGR FY 2014 - FY 2018							3.1%

Source: Commission financial records, FY 2012 - FY 2014
MAC Consulting, LLC, FY 2015 - FY 2018

As shown in the table, FY 2013 operating revenues are budgeted to decrease approximately 2.0 percent from FY 2012 actuals primarily as a result of decreasing landing fees to account for changes to the airlines' flight schedules and prior year's settlement. FY 2014 revenues are budgeted to increase approximately 3.2 percent over the FY 2013 budget primarily as a result of increases in CFC and PFC revenue as enplanements are projected to increase, and because of an anticipated increase in airline reimbursements from electricity and janitorial services due to the addition of a new baggage make-up area. In addition, FY 2015 through FY 2018 revenues are projected based on the following:

- Historical trends, lease provisions, and inflation.
- Revenues from parking, terminal concessions, and rental cars are projected to increase with prospective enplanement growth.
- Assumes the Airport will renegotiate concessions leases that expire during the planning period with terms and conditions that will implement changes in rate structures and business practices, as necessary, to maintain positive financial performance.
- CFC revenue is projected to increase with amortized costs of projects related to the rental car service facility.
- PFC revenue is projected to increase with prospective enplanement growth.

8.4. Pro Forma Cash Flow

Table 8-12 presents the pro forma cash flow of the Airport for FY 2012 through FY 2018 based on the projection of operating revenues and operating expenses discussed above. As a result of the analysis discussed herein, total income is anticipated to increase from approximately $8.1 million in FY 2012 to approximately $9.0 million in FY 2018.

Table 8-12 - Net Income/(Loss)

	Source Table	Actual 2012	Budgeted 2013	Budgeted 2014	Projected 2015	Projected 2016	Projected 2017	Projected 2018
Operating Revenue	Table 8-11	$14,975,252	$14,680,551	$15,152,138	$16,158,649	$16,415,010	$16,680,692	$17,090,892
LESS: Operating Expenses	Table 8-8	(6,990,191)	(7,349,839)	(7,351,051)	(7,610,300)	(7,800,700)	(7,995,400)	(8,195,300)
Operating Income		$7,985,061	$7,330,712	$7,801,087	$8,548,349	$8,614,310	$8,685,292	$8,895,592
Non-Operating Revenues (Expenses)		$105,951	$216,000	$139,278	$139,500	$133,700	$133,900	$90,300
Total Income (Loss)		$8,091,012	$7,546,712	$7,940,365	$8,687,849	$8,748,010	$8,819,192	$8,985,892
Flow of Funds								
Beginning Balance			$29,163,889	$37,451,179	$41,570,239	$43,697,053	$48,802,143	$42,114,725
Plus: Contribution from Operating			$7,546,712	$7,940,365	$8,687,849	$8,748,010	$8,819,192	$8,985,892
Plus: Entitlement Grants	Table 8-4		7,079,285	3,357,159	3,530,000	3,616,880	3,618,440	3,620,021
Plus: Discretionary Grants	Table 8-4		1,113,175	1,971,080	0	0	0	0
Plus: TSA Inline Baggage Grant	Table 8-4		2,917,250	0	0	0	0	0
Plus: State Grants			85,000	385,000	472,500	385,000	385,000	385,000
Less: CIP	Table 8-2		(10,120,170)	(8,938,797)	(9,568,760)	(7,732,500)	(16,843,850)	(6,664,750)
Less: Machinery & Equipment	Table 8-8		(168,500)	(223,000)	(228,600)	(234,300)	(240,200)	(246,200)
Less: Debt Service	Table 8-7		(23,905)	(23,390)	(24,563)	0	0	0
Less: Minimum Operating Reserve[1]			(4,120,031)	(4,469,389)	(5,211,000)	(4,889,000)	(7,315,000)	(4,925,000)
Plus: Prior Year Minimum Op Rsv			3,978,474	4,120,031	4,469,389	5,211,000	4,889,000	7,315,000
Ending Balance			$37,451,179	$41,570,239	$43,697,053	$48,802,143	$42,114,725	$50,584,688

[1] *The minimum operating reserve is calculated based on 25% of annual expenses, CIP requirements, depreciation, and debt service.*

The flow of funds for the Airport is also presented in the table. The ending balance reflects the Airport's unrestricted cash available to fund the local share of the CIP. As shown in the table, the Airport has sufficient funds to fund the local share of the CIP as presented in Table 8-2.

8.5. Summary

The financial feasibility of future projects will be determined by the provisions of existing and future leases, funding levels and participation rates of federal grant programs, the availability of PFC and CFC revenues, bonding capacity, and the ability to generate internal cash flow from Airport operations.

The financial projections were prepared on the basis of available information and assumptions set forth in this chapter. It is believed that such information and assumptions provide a reasonable basis for the projections to the level of detail appropriate for an airport master plan. Based on these assumptions, the CIP could be financed in the future by the Airport and result in key financial indicators that are consistent with the historical results of the Airport and industry comparables. However, some of the assumptions used to develop the projections may not be realized, and unanticipated events or circumstances may occur. Therefore, the actual results will vary from those projected, and such variations could be material.