HECTOR INTERNATIONAL AIRPORT

FAR TERMINAL AREA STUDY

November 8, 2022 (FINAL—November 8, 2022)

MEADHUNT.COM

HECTOR INTL.

EXPERIENCE EXCEPTIONAL

AIRPORT MISSION

Our mission is to provide a safe, environmentally responsible and fiscally self-sustainable operation ensuring high quality services and facilities.

AIRPORT VISION

Our vision is to provide world class transportation service enhancing economic growth.

CONTENTS

SECTION 1: PROJECT OVERVIEW 6

1.1 Background 6
1.2 Terminal Area Study Organization 7
1.3 Terminal Area Study Objectives 8

SECTION 2: TERMINAL FACILITY INVENTORY 8

2.1 — TERMINAL BUILDING 8-9
2.1.1 Ticketing Area and Airline Ticket Offices 10
2.1.2 Outbound Baggage Screening and Make-up Area 11
2.1.3 Passenger Security Screening Checkpoint......................... 12
2.1.4 Inbound Baggage Make-Up Area 12
2.1.5 Baggage Claim Area 13
2.1.6 Rental Car Counters 13
2.1.7 Departure Lounges 13
2.1.8 Concessions... 14
2.1.9 Airport Administrative Areas 14
2.1.10 Restrooms 15
2.1.11 Initial Elements of Consideration 16
2.1.12 Building Systems 17-23
2.1.13 Code Review 24
2.1.14 Accessibility Review 24
2.1.15 Energy Audit 24-25

2.2 — AIRFIELD ELEMENTS 26
2.2.1 Terminal Apron Gates 26
2.2.2 Aircraft Ground Equipment... 26
2.2.3 Passenger Boarding Bridges 26

2.3 — LANDSLIDE ELEMENTS..27
2.3.1 Airport Access Road 27
2.3.2 Arrivals/Departures Curb 27
2.3.3 Loading Dock...27
2.3.4 Employee Parking Lot 27

CONTENTS continued

2.4 — UTILITIES **28**
- 2.4.1 Storm Sewer 28
- 2.4.2 Water 28
- 2.4.3 Sanitary Sewer 29
- 2.4.4 Lighting 29
- 2.4.5 Communication 30
- 2.4.6 Natural Gas 30
- 2.4.7 Pavement 30

2.5 — SUMMARY **30**

SECTION 3: AVIATION ACTIVITY FORECASTS **31**

3.1 — AVIATION TRENDS AND COVID IMPACTS **31-33**

3.2 — FORECASTS **34**
- 3.2.1 Enplanement Forecast 34
- 3.2.2 Commercial Aircraft Forecast 35

3.3 — PEAK ACTIVITY **36**
- 3.3.1 Peak Hour Passengers 36-39
- 3.3.2 Peak Hour Commercial Operations 39-40

SECTION 4: TERMINAL PROGRAMMING **41**

4.1 — AIRCRAFT GATE PARKING POSITIONS **41-44**
4.2 — AIRLINE CHECK-IN **45**
4.3 — CHECKED BAGGAGE SCREENING **46**
4.4 — OUTBOUND BAGGAGE MAKEUP **46**
4.5 — SECURITY SCREENING CHECKPOINT **47**
4.6 — DEPARTURE LOUNGES **47**
4.7 — BAGGAGE CLAIM/INBOUND BAGGAGE HANDLING **48**
4.8 — CONCESSIONS **48**
4.9 — RESTROOMS **49**
4.10 — CIRCULATION **49**
4.11 — SUPPORT AND BUILDING SYSTEMS **50**
4.12 — TERMINAL FACILITY REQUIREMENTS RESULTS **50**
4.13 — CURBSIDE REQUIREMENTS **51**

SECTION 5: IMPROVEMENT ALTERNATIVES **52**

5.1 — DEVELOPMENT GOALS **53**
5.2 — CONCOURSE EXPANSION ALTERNATIVES **54**
- 5.2.1 Concourse Expansion Alternative #1 54
- 5.2.2 Concourse Expansion Alternative #2 55
- 5.2.3 Concourse Expansion Alternative #3 56
- 5.2.4 Concourse Expansion Evaluation Matrix 57

5.3 — TICKETING AREA ALTERNATIVES **58-59**
- 5.3.1 Ticketing Area Alternative #1 60
- 5.3.2 Ticketing Area Alternative #2 60
- 5.3.3 Concourse Expansion Evaluation Matrix 61

5.4 — CONCEPT BUILDING SYSTEMS **61**
- 5.4.1 Structural 61
- 5.4.2 Mechanical 62-64
- 5.4.3 Fire Protection 65
- 5.4.4 Plumbing Systems 65-67
- 5.4.5 Electrical 67-72
- 5.4.6 Technology 72-75

SECTION 6: IMPLEMENTATION AND FINANCIAL FEASIBILITY **75**

6.1 — PROJECT PHASING **76-77**
6.2 — OVERALL APPROACH FOR FINANCIAL IMPLEMENTATION ANALYSIS **78**
6.3 — ORGANIZATION, ACCOUNTING, AND BUDGETING **78**
6.4 — AVIATION ACTIVITY FORECASTS **79**
6.5 — CAPITAL FUNDING SOURCES **79-82**
6.6 — FINANCIAL ANALYSIS AND IMPLEMENTATION PLAN FOR THE TERMINAL AREA PROJECT AND OTHER CAPITAL IMPROVEMENT PROJECTS **82-88**
6.7 —FINANCIAL IMPLEMENTATION SUMMARY **88-102**

FIGURES

FIGURE 1-1 Hector International Airport 6
FIGURE 1-2 FAR Terminal Area 6

FIGURE 2-1 Lower Level Floor Plan 9
FIGURE 2-2 Upper Level Floor Plan 9
FIGURE 2-3 Basement Level Floor Plan 9
FIGURE 2-4 FAR Airline Ticket Counter Positions 10
FIGURE 2-5 FAR Ticketing Area 10
FIGURE 2-6 ATO Space 11
FIGURE 2-7 Outbound Baggage 11
FIGURE 2-8 Security Screening Checkpoint Queuing 12
FIGURE 2-9 Inbound Baggage Area 12
FIGURE 2-10 Baggage Claim Area 13
FIGURE 2-11 Rental Car Companies 13
FIGURE 2-12 Departure Lounges and Secure Circulation 13
FIGURE 2-13 Pre-Security Concessions
(**TOP LEFT:** Subway/SkyDine Restaurant, **TOP RIGHT:** SkyDine Restaurant, **BOTTOM LEFT:**
Game Room, **BOTTOM RIGHT:** Gift Shop) 14
FIGURE 2-14 Post-Security Concessions (**TOP LEFT:** SkyDine Lounge,
TOP RIGHT: Coffee/Snack Bar, **BOTTOM LEFT:** Gift Shop Kiosk) 14
FIGURE 2-15 Nursing Mother Station 15
FIGURE 2-16 Initial Elements of Consideration 16
FIGURE 2-17 Heat Pump in Basement 18
FIGURE 2-18 Bi-Polar Plasma Ionization Systems 18
FIGURE 2-19 Boiler Water Pump System
(**TOP LEFT:** Primary pump, **BOTTOM LEFT:** Secondary Pump,
TOP RIGHT: Secondary Pump, **BOTTOM RIGHT:** Finned tube convectors) 19
FIGURE 2-20 Two Main Rooftop Intake Hoods 19
FIGURE 2-21 Basement Make-up Air Handling Unit 19
FIGURE 2-22 Rooftop Water Chiller 19
FIGURE 2-23 Heat Pump Water Loop 20
FIGURE 2-24 Heat Pump System Evaporate Fluid Cooler 20
FIGURE 2-25 Siemens Building Automation System 21

FIGURES continued

FIGURE 2-26 Rooftop Emergency
Generator Radiator System 21
FIGURE 2-27 Control System 22
FIGURE 2-28 Avigilon Server 23
FIGURE 2-29 FAR Apron Layout 26
FIGURE 2-30 Arrivals/Departures Curb 27
FIGURE 2-31 Loading Dock Route 27
FIGURE 2-32 Storm Sewer System 28
FIGURE 2-33 Water 28
FIGURE 2-34 Sanitary Sewer System 29
FIGURE 2-35 Electric 29
FIGURE 2-36 Communication Lines 30
FIGURE 2-37 Natural Gas Line 30

FIGURE 3-1 Historic Aviation Activity 31
FIGURE 3-2 Historic Commercial Operations 32
FIGURE 3-3 Year to Year Enplanements Comparison 33
FIGURE 3-4 Average Weekday Departing
Seats for March 2019 36
FIGURE 3-5 Departing Seats January 2019-February 2022 37
FIGURE 3-6 Hourly Seats 38
FIGURE 3-7 Hourly Operations 40

FIGURE 4-1 Existing Baseline Current Flight Schedule 42
FIGURE 4-2 Future Design Day Flight Schedule 44

FIGURE 5-1 Existing Circulation Conditions 53
FIGURE 5-2 Alternative 1 Upper Level 54
FIGURE 5-3 Alternative 1 Lower Level 54
FIGURE 5-4 Alternative 2 Upper Level 55
FIGURE 5-5 Alternative 2 Lower Level 55
FIGURE 5-6 Alternative 3 Upper Level 56
FIGURE 5-7 Alternative 3 Lower Level 56

FIGURE 5-8 Preferred Alternative Plain View 57
FIGURE 5-9 Preferred Alternative Looking Southwest 57
FIGURE 5-10 Existing Baseline Current Flight Schedule 58
FIGURE 5-11 Future Design Day Flight Schedule 58
FIGURE 5-12 Existing Circulation Conditions 58
FIGURE 5-13 Existing Ticketing Area Constraints 59
FIGURE 5-14 Ticketing Area Alternative 1 60
FIGURE 5-15 Ticketing Area Alternative 2 60

FIGURE 6-1 Phase 1 Enabling Projects 76
FIGURE 6-2 Phase 2 76
FIGURE 6-3 Phase 3 77
FIGURE 6-4 Phase 4 77
FIGURE 6-5 Terminal Development Eligibility Lower Level 83
FIGURE 6-6 Terminal Development Eligibility Upper-Level 83

TABLES

TABLE 2.1 — Far existing Space Program 10

TABLE 3.1 — FAA Commercial Operator Classification 32
TABLE 3.2 — 2021 Monthly Activity 33
TABLE 3.3 — Local Socioeconomics 34
TABLE 3.4 — Regression Analysis Variables 34
TABLE 3.5 — Enplanement Forecast 34
TABLE 3.6 — Commercial Operational Trends 35
TABLE 3.7 — Scheduled Air Service 35
TABLE 3.8 — Historic Monthly Passenger Enplanements Compared to Annual 36
TABLE 3.9 — Forecasted Peak Month Enplanements 36
TABLE 3.10 — Peak Hour Comparison (March 2019 Wednesday vs. March 2019 Thursday) 37
TABLE 3.11— Average And Selected Day Characteristics (March 2019) 37
TABLE 3.12 — Ranking of FAR's Busiest Days by Departing Seats in 2019 37

TABLES continued

TABLE 3.13 — Forecasted Peak Month Seats 38
TABLE 3.14 — March, 2019 Load Factor 38
TABLE 3.15 — Forecasted Peak Hour Enplanements And Deplanements 39
TABLE 3.16 — 2021 Terminal Departures Seats 39
TABLE 3.17 — Forecasted Peak Month Operations 39
TABLE 3.18 — Forecasted Peak Hour Operations 40
TABLE 3.19 — Forecasted Peak Hour Operations 40

TABLE 4.1 — Existing ADPM Flight Schedule Analysis 41
TABLE 4.2 — 2021 ADPM Design Day Schedule 43
TABLE 4.3 — Check-In Area Space Requirements 45
TABLE 4.4 — Baggage Screening Space Requirements 46
TABLE 4.5— Outbound Baggage Space Requirements 46
TABLE 4.6 — Security Screening Checkpoint 47
TABLE 4.7 — Departure Lounge Space Requirements 47
TABLE 4.8 — Baggage Claim And Inbound Baggage Space Requirements 48
TABLE 4.9 — Concessions Space Requirements 48
TABLE 4.10 — Restroom Space Requirements 49
TABLE 4.11 — Terminal Facility Requirements Results 50
TABLE 4.12 — Curbfront Length Requirements 51

TABLE 5.1 — Concourse Expansion Alternatives Evaluation Matrix 57
TABLE 5.2 — Concourse Expansion Alternatives Evaluation Matrix 61

APPENDICES

APPENDIX A — Existing Building Code Summary
APPENDIX B — Accessibility Assessment
APPENDIX C — Energy Audit Report
APPENDIX D — Optimal Concessions Demand
APPENDIX E — T100 Database Commuter And Air Carrier Operations
APPENDIX F — March 2019 Sampled Day
APPENDIX G — July 2021 Sampled Day

1.0 PROJECT OVERVIEW

1.1 Background

Hector International Airport (the Airport or FAR) is a small-hub primary airport and located approximately three miles northwest of the central business district of the City of Fargo in eastern North Dakota. The existing terminal building, constructed in 1986, has undergone many incremental improvements since then to address evolving industry standards and passenger demand. In 2008, the Airport completed a $15.5 million expansion that included adding a fifth gate, an expanded security screening checkpoint area, and baggage claim area. Since this major capital improvement, the Airport has experienced significant passenger growth requiring further evaluation of terminal expansion.

Figure 1-1 Hector International Airport

Figure 1-1 displays the terminal area at FAR. The terminal area as part of this study includes the apron, commercial terminal, arrivals/departure curb, employee parking, and loading dock as shown in **Figure 1-2**. The landside parking facilities and rental car parking facilities are within the vicinity of the terminal area, but they will not be evaluated for expansion as part of this study and are considered sufficient in size to accommodate future demand.

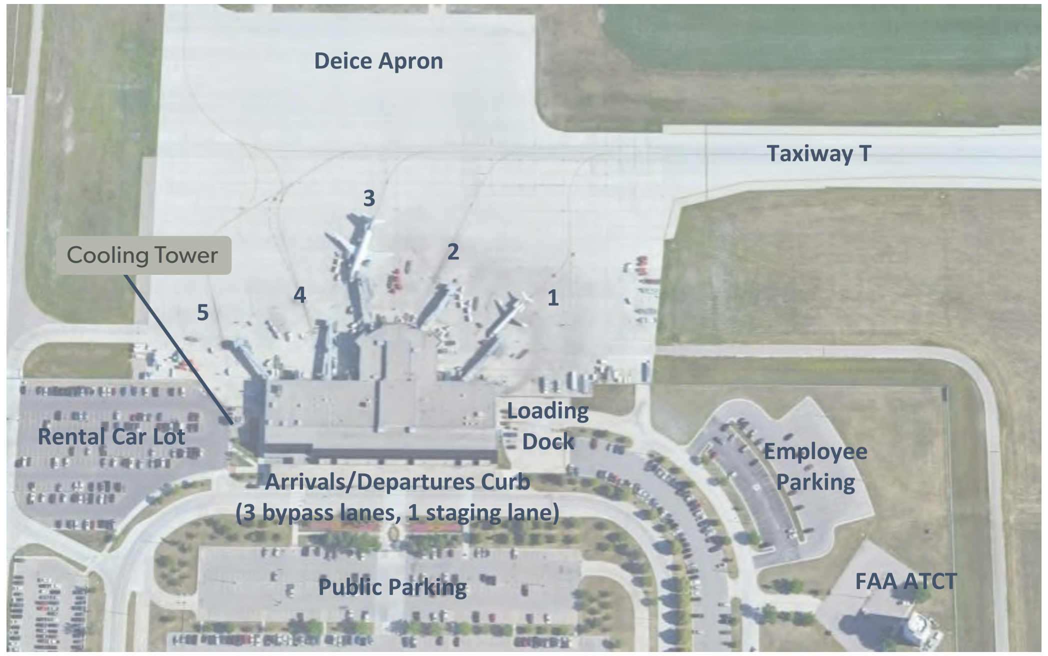


Figure 1-2 FAR Terminal Area

1.2 Terminal Area Study Organization

A TERMINAL AREA STUDY (TAS) is a comprehensive report that provides guidelines for improvement of the airport terminal building, the terminal apron, and vehicle access. The Federal Aviation Administration (FAA) has developed the airport planning process to assist the nation's airports in developing plans for expansion and improvement to facilities, with the goal of meeting both existing and future aviation demand and safety requirements. This TAS was completed with guidance from the FAA Advisory Circulars and industry references for airport terminal planning and design.

THE TAS IS ORGANIZED INTO FIVE SECTIONS:

- Project Overview (above)
- Data Collection
- Terminal Facility Requirements
- Alternatives
- Implementation

SECTION 2
TERMINAL FACILITY INVENTORY

The purpose of the terminal facilities inventory is to identify facilities and conditions that currently exist within the terminal area at FAR. An inventory of the existing facilities provides the baseline required to evaluate existing facility performance and anticipate future need.

SECTION 3
AVIATION ACTIVITY FORECASTS

The aviation forecast contains historic and forecasted aviation activity for FAR over the 20-year planning horizon. Aviation demand forecasts are an important step in the terminal planning process. Ultimately, they form the basis for determining future demand-driven improvements at FAR and the data from which to estimate future terminal area needs such as terminal building space and parking stall amounts.

SECTION 4
TERMINAL FACILITY REQUIREMENTS

This section identifies terminal facility requirements anticipated for FAR through the year 2041. The capacity of the existing terminal is described and assessed against aviation demand planning activity levels, providing the basis for making recommendations for appropriate sizes of terminal building components, and aircraft parking layout. This analysis determines requirements for future facility improvements based on industry standards and guidelines developed by the FAA.

SECTION 5
CONCEPT DEVELOPMENT

This section follows the development of alternative layouts for both the terminal complex and terminal building. The layouts are assessed for expected aeronautical utility, fiscal feasibility, and operational performance. A recommended alternative is indicated.

SECTION 6
IMPLEMENTATION

This section of the TAS demonstrates FAR's ability to finance the projects discussed in terms of funding sources and eligibility for FAA funding. A plan for implementation includes a project schedule, phasing plan, and opinion of probable construction cost.

1.3 Terminal Area Study Objectives

This TAS will address the following to provide a terminal that directly supports the passengers and commercial fleet that use it:

- Meet the needs of a commercial airport terminal in a manner that facilitates future expansion
- Improve the passenger experience
- Identify code deficiencies and life safety issues
- Right-sizing departure lounges
- Locate restrooms on the secure side
- Locate concessions in secure area
- Passenger security screening
- Baggage security screening
- Outbound baggage system
- Baggage claim and seating
- Tenant offices and operations areas
- Address airline ground service equipment (GSE) and deicing equipment maneuverability areas and storage
- Modernize the terminal to make it operate efficiently and lower ongoing operational cost
- Improve passenger flow
- Improve thermal envelope
- Increase natural light and views
- Provide efficient building systems
- Develop a design character for the airport that draws from the region's history, economy, and landscape.
- Provide interior design, exterior building elevations, renderings of select views, and site plans to represent the potential character of the terminal.
- Provide a project implementation plan including project phasing and an order-of-magnitude opinion of probable construction cost.

2.0 TERMINAL FACILITY INVENTORY

This section describes the terminal facility existing conditions. The terminal building was inventoried, and its layout was assessed for overall performance. Physical and operational deficiencies of the existing terminal building and its systems were identified. Additional references for this section include airport meetings, examinations of plans, and a review of previous planning documents.

2.1.1 Terminal Building

The inventory and evaluation occurred in January 2022 to determine the existing capacity and viability of potential expansions. The passenger terminal building consists of approximately 116,000 square feet on two levels—the lower level accommodates ticketing, airline ticket offices (ATO), baggage screening, baggage claim, and rental car services, and the upper level consists of passenger screening, administrative space, concessions, and gate departure lounges. The Airport does have a basement accommodating utility systems.

Figure 2-1 shows the terminal's lower level. The ticketing area, queuing space, ATOs, outbound baggage area, and baggage screening are on the eastern area. Baggage claim and rental car offices are on the western portion of the building. The building's center is a vertical circulation core with a two-sided staircase, two escalators, and an elevator. The lower level where check-in queuing and baggage claim dwelling occurs is open below the upper level. Most of the lower level is non-secure except the areas designated for baggage screening and baggage make-up.

Figure 2-2 shows the upper, or concourse, level. The concourse level consists of passenger screening, administrative offices, a post-security and pre-security concession area, a café, and departure lounges for each of the five contact gates. In the center on the concourse level is area used for meet-and-greeters and passenger screening queuing. The MAA administrative offices and the Transportation Security Administration (TSA) offices are in the western portion. A gift shop is just west of the vertical circulation core.

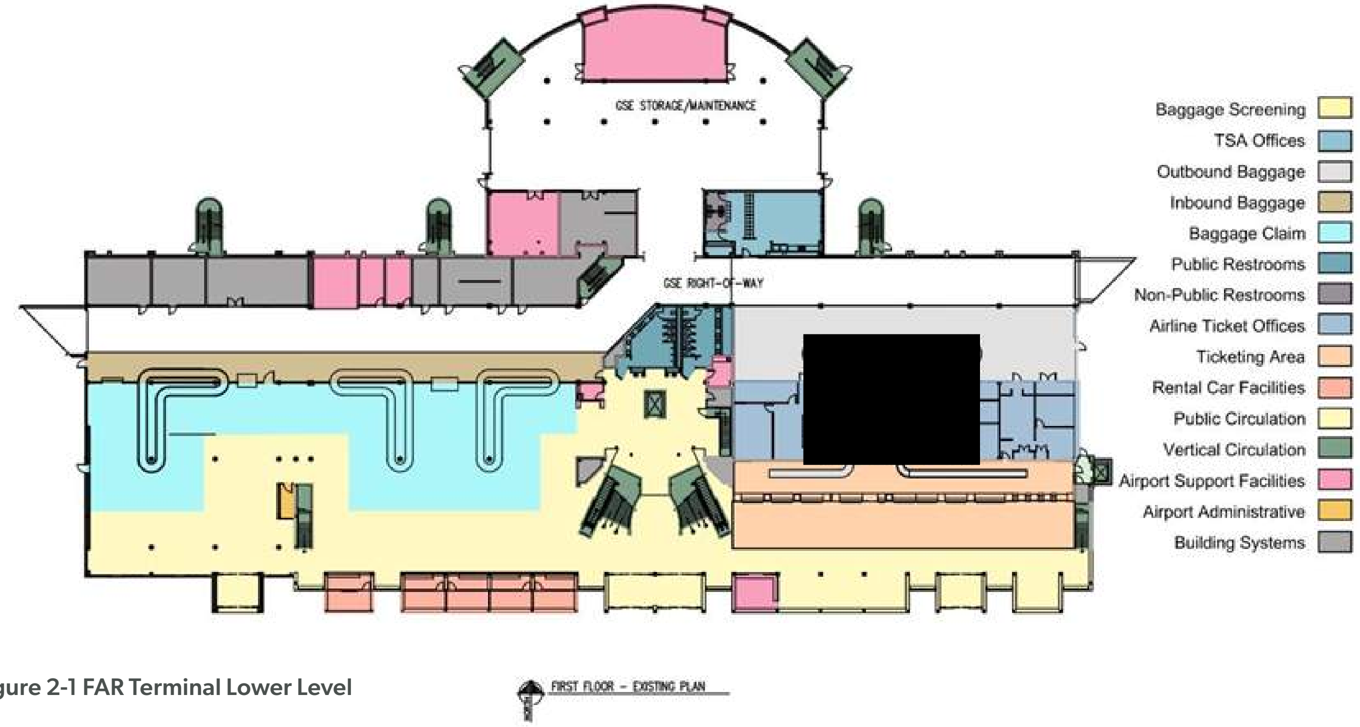


Figure 2-1 FAR Terminal Lower Level

The basement level accommodates utility systems and the elevator maintenance room **(Figure 2-3)**. The remainder of the basement area has not been excavated.

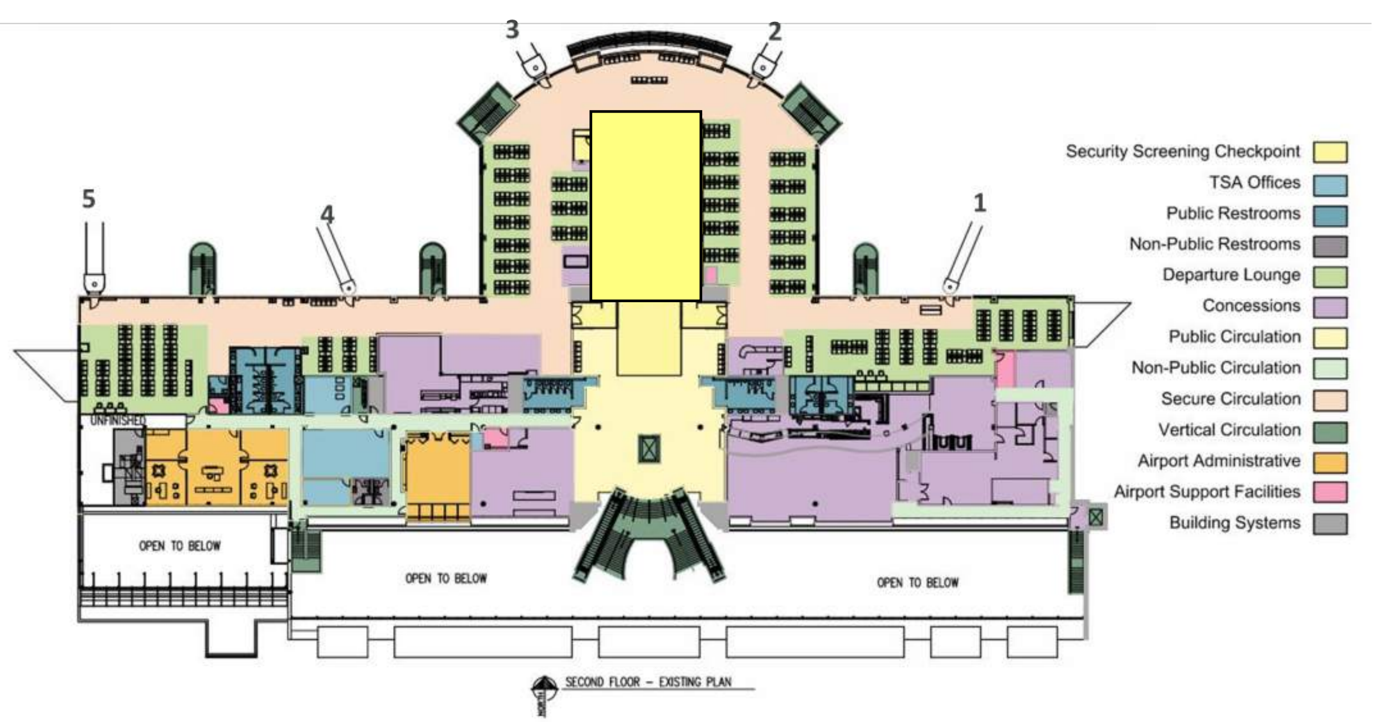


Figure 2-2 FAR Concourse Level

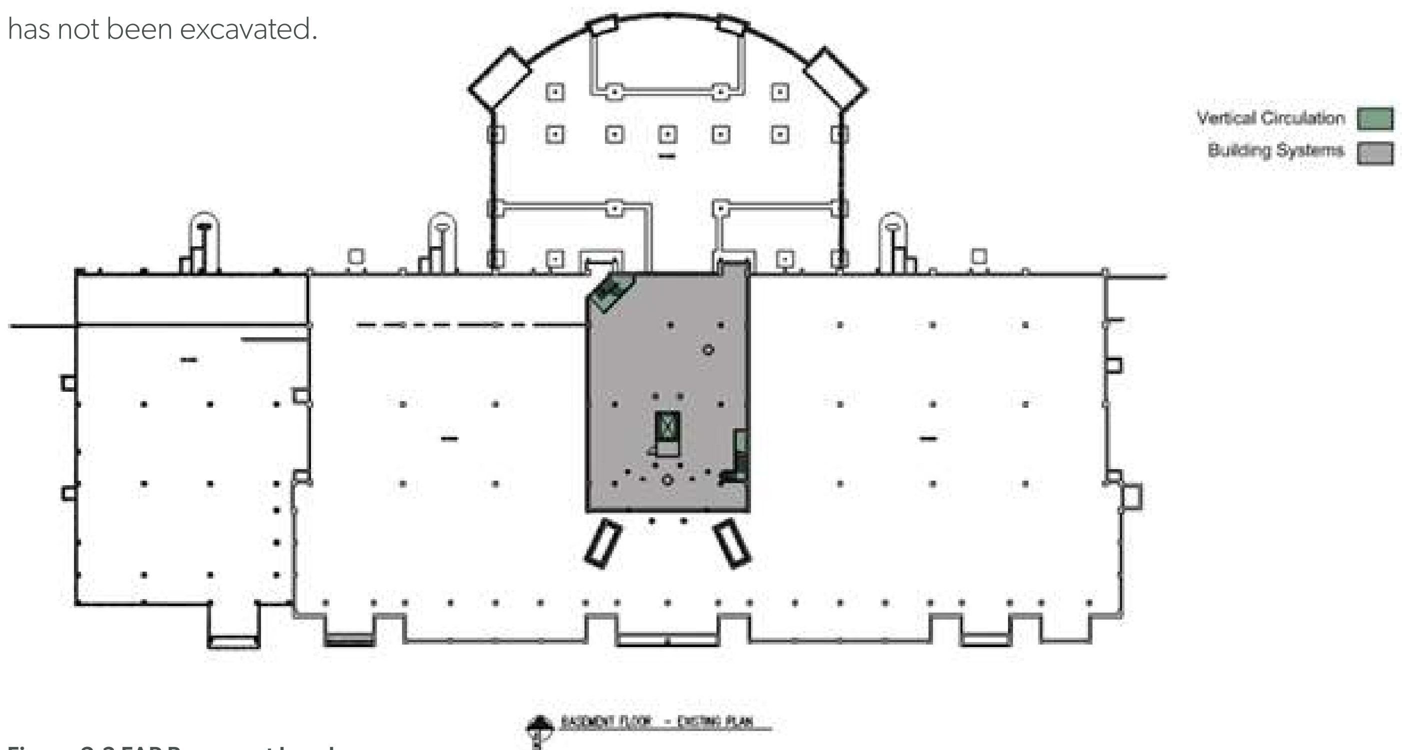


Figure 2-3 FAR Basement Level

2.1.1 Ticketing Area and Airline Ticket Offices

The Ticketing Area is on the southeast portion of the terminal on the first level. This area consists of 20 full-service ticket counters, 6 kiosks, and 2,469 square feet of queuing space. The breakdown of airline positions is shown in **Figure 2-4**.

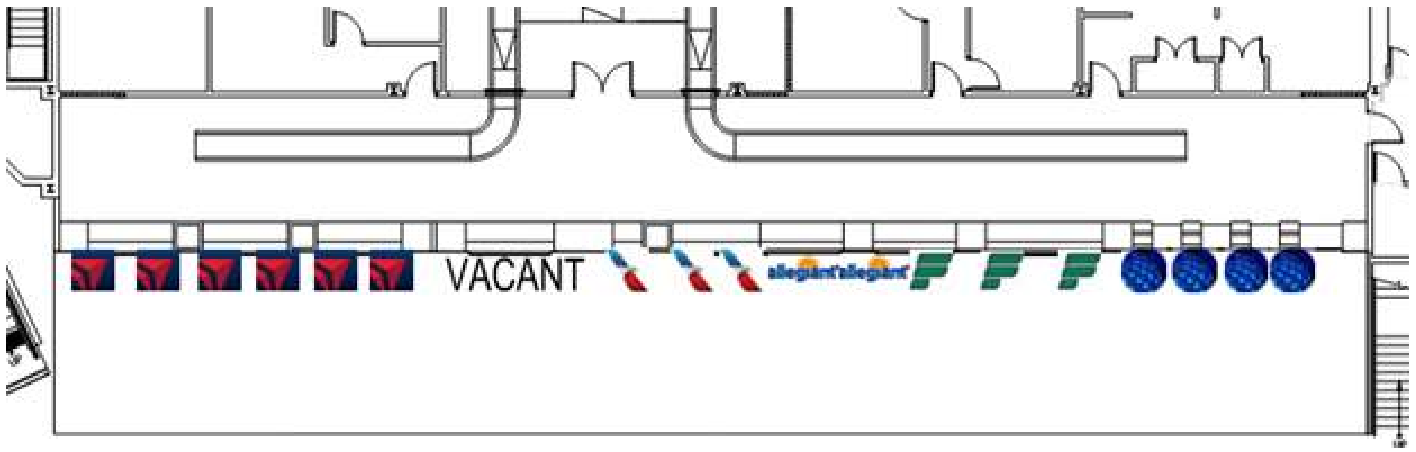


Figure 2-4 FAR Airline Ticket Counter Positions

Circulation space is approximately 8 feet wide between the queuing area and vestibules and is visibly insufficient as the queuing for passengers checking in block passengers flowing to the Security Screening Checkpoint (SSCP) from the ticketing area **(Figure 2-5).**

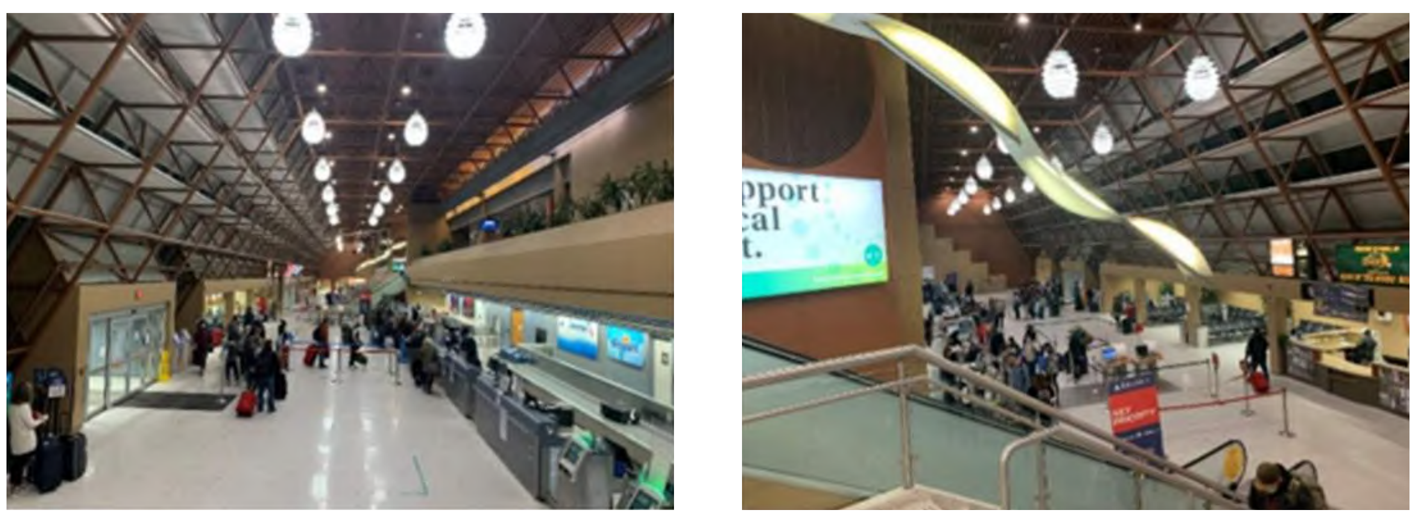


Figure 2-5 FAR Ticketing Area

FAR - Terminal Areas

Space Description	Level 1	Level 2
Security Screening Checkpoint		
Number of Lanes (w/PreCheck)	-	3
Checkpoint	-	3,056
Checkpoint Queue	-	737
Checkpoint Exit Lane	-	370
SubTotal SSCP Area	*0*	*4,163*
CONCOURSE		
Concourse (Public)		
Gates: Boarding Bridges	-	5
Bridge Gate Departure Lounge	-	8,666
Concession Public Space	-	2,305
Secure Circulation	-	8,780
Mother's Rm	-	31
Restroom Modules	-	2
Restroom Area (M+F)	-	1,242
M+F Restroom fixtures	-	7+7
SubTotal Concourse (Public)	**0**	**21,024**
Nonpublic Concourse Areas		
Concession Back of House (BOH)	-	27
SubTotal Nonpublic Concourse	-	27
CONCOURSE GRAND TOTAL	*0*	*21,051*
TERMINAL		
General Areas		
Public Circulation	13,030	3,216
Restroom Area (M+F)	841	1,102
M+F Restroom fixtures	7+6	7+6
SubTotal Non-Secure Public Areas	*13,871*	*4,318*
Departures Hall		
Public Seating / Lounge	1,112	-
Ticket Queue	2,469	-
Kiosks	6	-
SubTotal Ticketing	*3,581*	*0*
Arrivals Hall		
Public Seating / Lounge	6,074	-
Bag Claim Carousel, Floor Area & Oversize	1,448	-
Bag Claim Carousel Frontage	291	-
Bag Claim Carousel (Flat Plate)	3	-
SubTotal Public Baggage Areas	*7,522*	*0*
Ancillary Services		
Concession Public Space	-	5,318
SubTotal Ancillary Space	*0*	*5,318*
SubTotal Non-secure Public	*24,974*	*9,636*

Space Description	Level 1	Level 2	Basement
NONPUBLIC AREAS			
Baggage Areas			
EDS Devices	2	-	-
TSA Bag Screening Floor Area	1,088	-	-
Outbound Baggage	4,251	-	-
Inbound Baggage	2,398	-	-
SubTotal Baggage	*7,737*	*0*	*0*
Leased & Misc Space			
Ticket Agent Positions	20	-	-
Ticket Counter Length	135	-	-
Ticket Counter Area	1,911	-	-
Airline Offices & Operations	3,067	-	-
Car Rental Counter Area	630	-	-
Car Rental Office Area	765	-	-
Concession (BOH)	-	2,072	-
Airport Offices/Information Desk	279	2,580	-
Maintenance / Airport Storage	3,328	119	-
TSA Admin Offices	1,093	910	-
Police	94	-	-
Employee Facilities, (restrooms)	142	193	-
SubTotal Misc Space	*11,309*	*5,874*	*0*
Non-Public Areas			-
Training, Badging & Fingerprinting	-	281	-
SubTotal Misc Non-Public Space	-	*281*	-
SubTotal Non-secure Non-Public	*19,046*	*6,155*	*0*
TERMINAL GRAND TOTALS	*44,020*	*15,791*	*0*
PRORATED AREAS			
Building Support			
Building Systems and Major Chases	4,325	830	5,129
Vertical Circulation	2,924	272	-
Non-Public Circulation	79	2,091	-
Unfinished or GSE Right of Way	15,223	672	-
SubTotal Bldg Support Space	*22,551*	*3,865*	*5,129*
TOTAL TERMINAL FACILITY AREA	*66,571*	*44,870*	*5,129*

Table 2-1 FAR Existing Space Program

The breakdown of terminal space by functional category and elements is shown in **Table 2-1**.

2.1.2 Outbound Baggage Screening and Make-Up Area

Behind the ticket counters is a mini in-line baggage screening system that transfers checked baggage from the ticketing area to the TSA screening area. FAR has two explosive detection systems, REVEAL Imaging Technology, Inc. scanners, located in one baggage screening room that can each screen 200 bags per hour. Manual screening also occurs in this room when baggage is alarmed for secondary level screening. Once baggage is cleared, the screening system transfers baggage to the outbound baggage make-up area.

[redacted]

Figure 2-7 Outbound Baggage

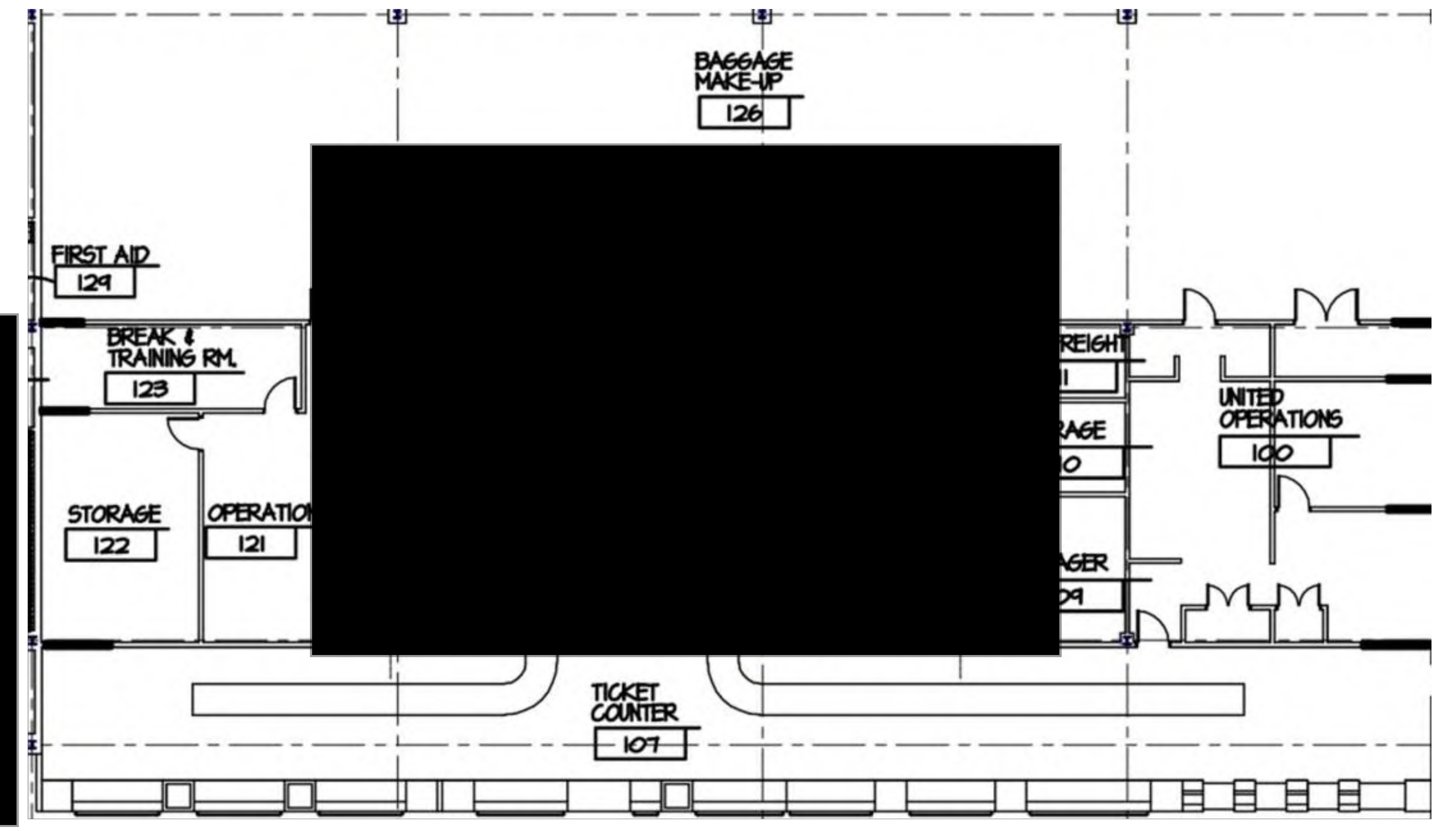


Figure 2-6 ATO Space

Oversized baggage is handled manually by the airlines. Once the oversized baggage is received, airline personnel manually carry it to the TSA screening room. Once screening is complete, TSA leaves the baggage near a door accessing the outbound baggage area and turns on a light notifying ground handlers that an oversized bag is waiting to be placed on the cart. During peak hours when outbound baggage handlers are busy, the oversized baggage can pile up within the TSA screening room causing operational issues for the TSA officers.

The outbound baggage make-up area is directly north of the ATOs and TSA screening area and has 145 lineal feet of baggage carousel. This length can accommodate approximately 8 baggage carts simultaneously (parked perpendicularly) for baggage to be loaded. Once carts are loaded, baggage carts use a single lane running west to east to exit the make-up area. During peak times, the outbound baggage carousel cannot handle the baggage demand and causes bags to back-up into the TSA screening room. **Figure 2-7** displays images of outbound baggage space.

FAR has two areas of ATOs between outbound baggage make-up and the ticket counters and separated by the TSA baggage screening room **(Figure 2-6)**. This space includes offices that the airlines use for storage, operations, and training. Delta Air Lines currently operates out of the west ATO space, and United, American, Frontier, and Allegiant operate out of the east ATO space.

2.1.3 Passenger Security Screening Checkpoint

Passengers access the SSCP using the vertical circulation core in the center of the building. The SSCP consists of two lanes, a private screening room on the northwest corner of the checkpoint, two travel document check (TDC) stations, one walk-through metal detector, one ProVision advanced imaging technology scanner, and two advanced technology, HI-SCAN 6060 CTIX X-Ray scanners. Employees and PreCheck passengers use the west lane for screening. Queuing is just south of the SSCP and often extends into the Meeter and Greeter area and vertical circulation core during peak hours causing challenges for passenger flow and circulation **(Figure 2-8)**.

Figure 2-8 Security Screening Checkpoint Queuing

FAR will add a third SSCP lane in July 2022 and replace the CTIX X-Ray scanners with three Analog Connect scanners. The revised SSCP layout will also include four TDC stations, two walk-through metal detectors, and one ProVision advance imaging technology scanner.

2.1.4 Inbound Baggage Make-Up Area

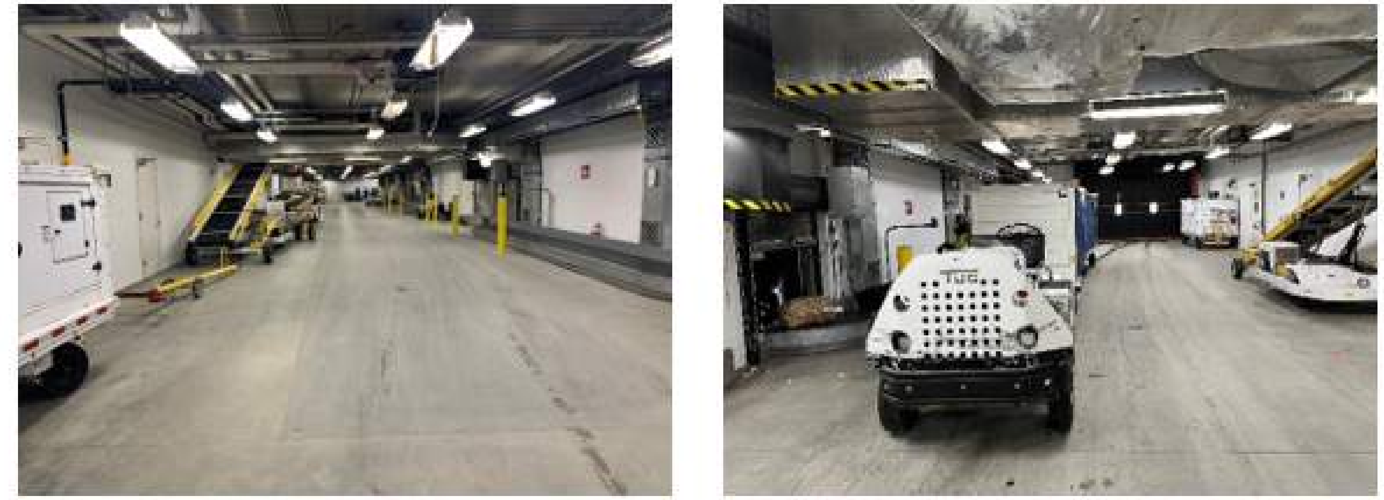


Figure 2-9 Inbound Baggage Area

Inbound baggage operations are on the west portion of the terminal on the apron level. Makeup area for inbound baggage is adjacent to the three baggage carousels and accessed by one GSE lane running west to east that is 18 feet, 6 inches wide. Baggage carts enter the area either on the west portion of the terminal or between Gates 4 and 5. Once baggage is unloaded, carts can exit through the east door or through the equipment storage area on the north portion of the terminal. Oversized baggage doors are adjacent to each carousel. **Figure 2-9** shows the existing inbound baggage area and the GSE lane. GSE often stages on the north wall of the inbound baggage area.

2.1.5 Baggage Claim Area

The baggage claim area consists of the baggage carousels, oversized baggage access doors, and dwelling areas for passengers. The baggage claim area at FAR has three L-shaped carousels. The east and center carousels are separated by 25 feet, while the west carousel and center carousel are separated by 87 feet. The west carousel was added in 2015 as part of the terminal expansion project. The original carousels consist of 96 feet of lineal frontage, while the west carousel consists of 99 feet of lineal frontage. According to ACRP standards, at least 30 feet should be provided for passenger dwelling, circulation, and baggage circulation between carousels at small-hub primary airports. The insufficient dwelling area between baggage carousels 1 and 2 causes congestive conditions during peak times **(Figure 2-10)**.

Figure 2-10 Baggage Claim Area

2.1.6 Rental Car Counters

Figure 2-11 Rental Car Companies

Seven companies operate from five rental car counters conveniently located directly south of the baggage claim area. The rental car companies are Alamo, Avis, Budget, Enterprise, Hertz, National, and Payless. Each company's administrative office is located behind the counter.

Since designated markings for queuing systems do not exist at the rental car counters, rental car queuing periodically disrupts passenger flow for arriving passengers trying to access the baggage claim area **(Figure 2-11)**.

2.1.7 Departure Lounges

Figure 2-12 Departure Lounges and Secure Circulation

Departure lounges include the areas where passengers dwell before boarding. These areas consist of seating, agent podiums, queuing space, baggage circulation, and passenger circulation. As previously mentioned, FAR has five contact gates where a passenger boarding bridge (PBB) connects to the aircraft from the terminal building. The departure lounges are consolidated with adjacent gates and circulation corridors causing significant challenges for passenger circulation during peak times. For instance, passengers who are queued for boarding at Gates 2 and 3 essentially block circulation for passengers leaving SSCP headed for Gates 1, 4, or 5, or passengers arriving at these gates headed to baggage claim. Additionally, the departure lounges are significantly undersized for the aircraft they serve. **Figure 2-12** displays congestion in the circulation and departure lounge areas.

2.1.8 Concessions

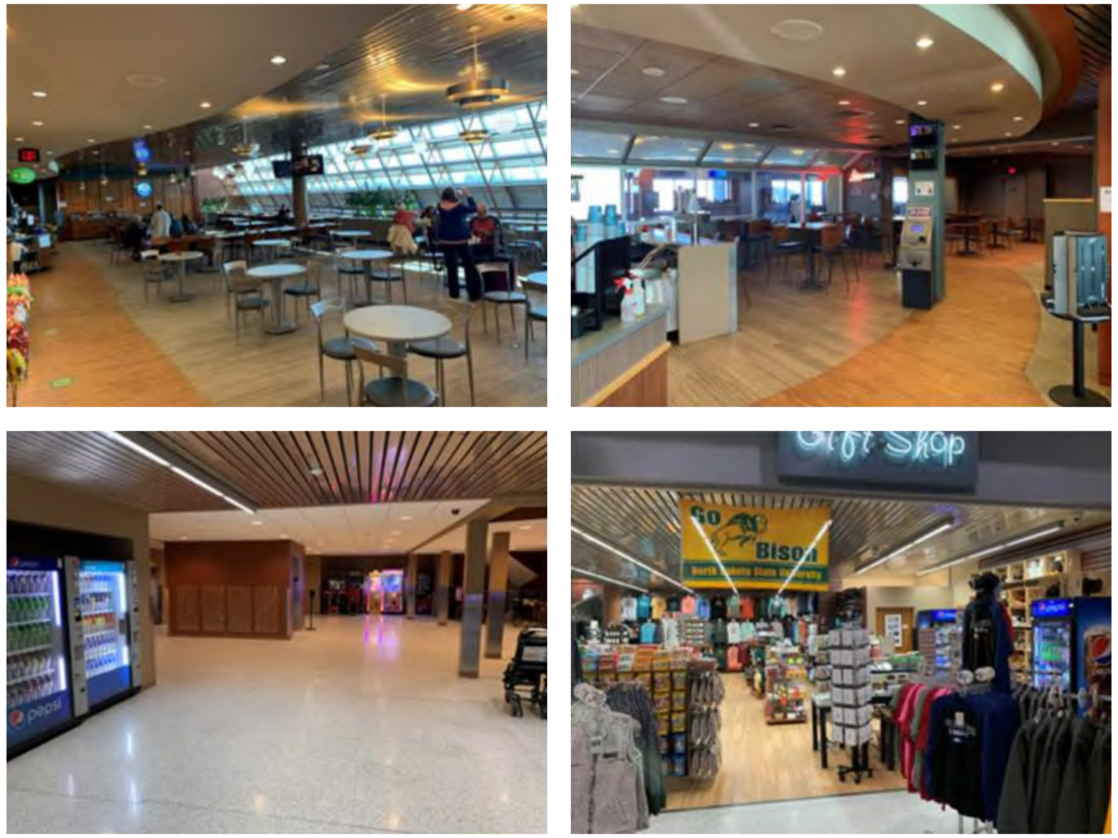


Figure 2-13 Pre-Security Concessions (Top Left: Subway/SkyDine Restaurant, Top Right: SkyDine Restaurant, Bottom Left: Game Room, Bottom Right: Gift Shop)

The concessions program at FAR consists of pre-security and post-security concessions. Pre-security concessions include all concessions located before the SSCP, while post-security concessions are located beyond the SSCP. FAR currently has 30 percent of passenger-facing concession space post-security, leaving 70 percent pre-security. Pre-security concessions include a game room on the lower level, a gift shop on the upper level to the left of the SSCP, and a Subway and SkyDine sit-down restaurant to the right. SkyDine is serviced with a connected, full-service kitchen, storage areas, and a cooler.

Post-security concessions **(Figure 2-14)**, include a SkyDine Lounge adjacent to Gate 4 with a grab-and-go counter, full-service bar, and seating; a snack/gift retail kiosk by Gate 3; and a coffee/snack bar at Gate 2.

Passengers are more willing to experience and airport's concessions program after they get processed through security. With the current concessions program split, FAR has opportunities to generate revenue through their concessions program as part of this TAS.

2.1.9 Airport Administrative Areas

Airport administrative offices include any space that airport staff uses to conduct daily job responsibilities. This space can include offices, conference rooms, office lobbies, storage for office supplies, and dispatch centers. Airport administrative offices at FAR are in the non-secure area on the concourse level west of the vertical circulation core. This area includes a board room and a non-public circulation corridor, which leads to another administrative pod that includes the office for the Airport Director, the office for the Deputy Airport Director, a workroom for operations personnel, and a room for files and storage. The offices currently overlook the baggage claim and rental car counters located on the first level. It is assumed that, as the Airport continues to grow and manage additional projects, additional staff will be hired requiring more administrative space.

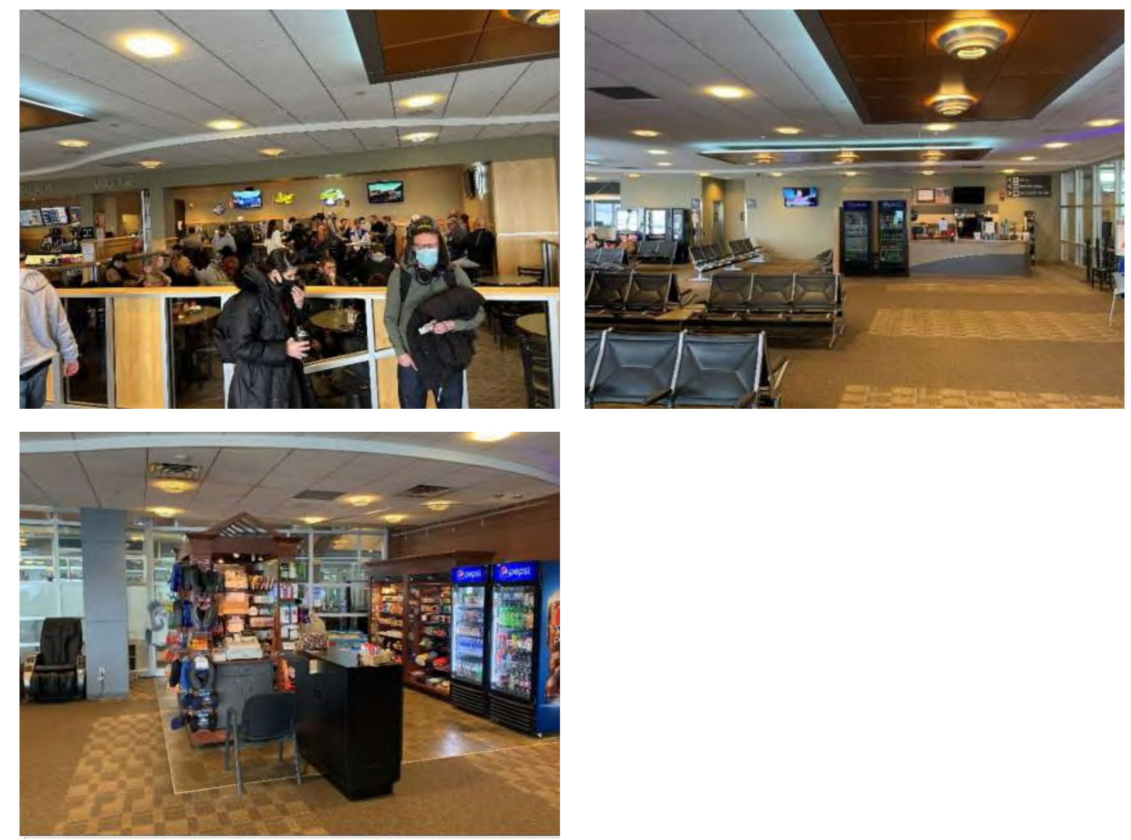


Figure 2-14 Post-Security Concessions (Top Left: SkyDine Restaurant, Top Right: Coffee/Snack Bar, Bottom Left: Gift Shop Kiosk)

2.1.10 Restrooms

Restrooms in an airport are typically divided into pre-security, post-security, and non-public. Additionally, restrooms also include Service Animal Relief Areas (SARA) and nursing mother stations. Restrooms are measured in modules or one restroom for men and one restroom for women. Within each module are fixtures, or the number of commodes, in each male, female, family, or all-gender restroom.

PRE-SECURITY RESTROOMS

Pre-Security restrooms are accessible to the public in a non-secure area before the SSCP. These restrooms are generally meant for passenger use; however, employees often use these facilities as well. FAR has two main restroom modules, male and female, pre-security. One module is on the first level north of the central elevator and arcade; it has seven fixtures in the male restroom and six fixtures in the female restroom. The second module is on the concourse level with the female restroom located west of the SSCP with six fixtures, and the male module located east of the SSCP with six fixtures.

POST-SECURITY RESTROOMS

Post-Security restrooms are accessible to the public in the secure area after the SSCP. FAR has two main restroom modules, male and female, post-security. One module is between Gates 4 and 5 and includes a family restroom with one fixture, a male restroom with five fixtures, and a female restroom with five fixtures. The significantly undersized second module is between Gates 1 and 2 and includes a male restroom with two fixtures and a female restroom with two fixtures. Passengers waiting for flights at Gates 1 and 2 often use the restroom between Gates 4 and 5 due to the common congestion that occurs at this module nearer Gates 1 and 2.

NON-PUBLIC RESTROOMS

Non-Public Restrooms are meant for employees and TSA officers. The non-public restrooms at FAR are in the administrative area, concessions storage area, and in the TSA/Employee Breakroom area north of the outbound baggage make-up area.

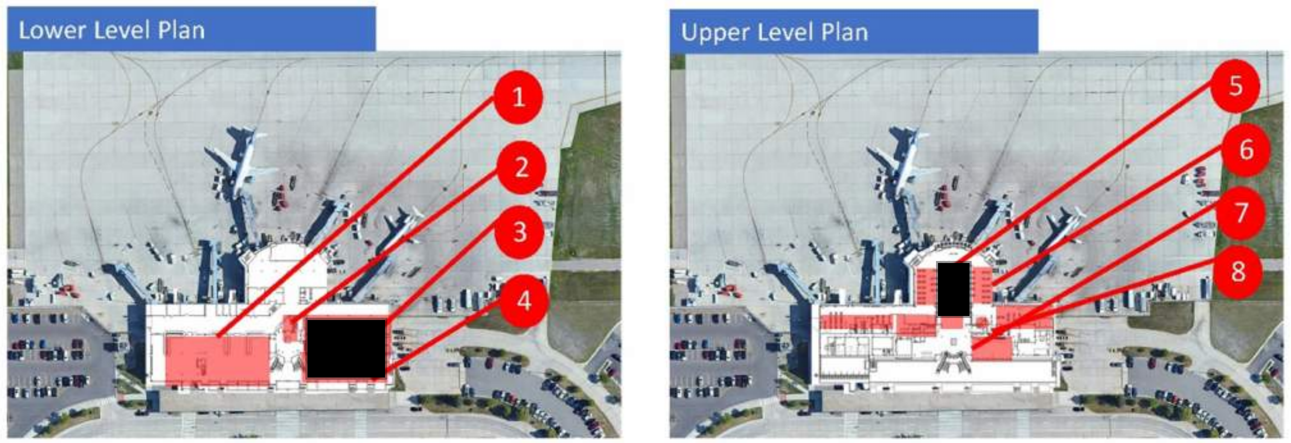
NURSING MOTHER STATIONS

FAR currently has one nursing mother station post-security in the departure lounge area of Gate 2 **(Figure 2-15)**.

Figure 2-15 Nursing Mother Station

2.1.11 Initial Elements of Consideration

The initial assessment of the facility resulted in the identification of several elements to be addressed as part of the TAS as indicated in **Figure 2-16**.



Architectural Considerations:

1. Baggage claim and rental car counter circulation undersized
2. Pre-security restrooms location are not visible to passengers.
3. Baggage screening and outbound baggage requires expansion to meet demand
4. Ticket queuing area and ticket count space stressed during peak times
5. Security screening location and size present safety and operational inefficiencies
6. Departure lounges sized for 50-seat regional aircraft
7. Concession locations and size impact airport revenue
8. Post-security restrooms size and location require evaluation due to over crowdedness.

Figure 2-16 Architectural Considerations

1. BAGGAGE CLAIM AND RENTAL CAR CIRCULATION:

The existing space allocated for passengers waiting for bags is undersized and conflicts with passengers queuing at the rental car counters. The design team will evaluate how designated queuing systems can be implemented and alternatives for expanding the baggage claim area.

2. PRE-SECURITY RESTROOMS:

Pre-security restrooms on the lower level are behind the central vertical circulation core posing wayfinding challenges for arriving passengers.

3. BAGGAGE SCREENING AND OUTBOUND BAGGAGE:

The amount of space currently allocated for outbound baggage presents operational challenges with baggage backflow during peak times and oversized baggage handling. The Airport desires to evaluate the space for these functions and see what expansion opportunities exist to meet demand.

4. TICKET COUNTER QUEUING AND TICKET COUNTER SPACE:

The ticket counters present challenges during peak times as queuing extends to the southern wall and entrance vestibules causing significant circulation issues. Additionally, interviews with airlines suggests additional full-service counter positions are required for future growth.

5. SECURITY SCREENING CHECKPOINT:

The security screening checkpoint is receiving a third lane in Summer 2022 increasing passenger flow rates from ~300 to ~540 passengers per hour. Although this is sufficient for short- to mid-term demand, more space may be required in the future for a fourth lane. Additionally, checkpoint queuing currently extends to the vertical circulation core during peak times causing a major safety concern as the passengers wait by moving escalators. In addition to the overall size of the security screening checkpoint, the general location of the checkpoint will be evaluated.

6. DEPARTURE LOUNGES AND SECURE SIDE CIRCULATION:

The current departure lounges were sized to accommodate regional aircraft and not intended to service 200 passenger aircraft. As airlines continue to service FAR with mainline aircraft, the existing departure lounge space becomes undersized very quickly. Additionally, existing passenger circulation on the secure side presents challengers during boarding procedures as the departure lounges and PBB door are separated by the primary passenger circulation corridor.

7. CONCESSIONS:

Currently, the largest concession offering is pre-security and underutilized. The size, location, and type of concessions will be evaluated as part of this study to determine how the Airport can maximize their concession revenue.

8. POST-SECURITY RESTROOMS:

This terminal expansion will require an evaluation on existing and proposed restroom facilities post-security. In addition to standard male, female, and family restrooms, the design team will also consider the location for SARA, all-gender restrooms, and nursing mothers' stations.

2.1.12 Building Systems

The building systems evaluated as part of the TAS include structural, Mechanical/Engineering/Plumbing (MEP), Fire Protection, Technology, and Security.

STRUCTURAL SYSTEMS

The existing structure was constructed in two previous projects. The original project was in 1984. The second project was a large expansion in 2006. The roof is enclosed with metal deck. The roof's primary framing is first, highly visible and memorable trusses over the landside, and second, bar joist bearing on steel beams over the other spaces. Steel columns support the structure throughout. The second floor of the original project is composite, concrete on metal deck on steel beams. The second floor of the expansion project is precast concrete. The lower level structure is flat slab on steel beams and concrete walls. The foundation system is shallow spread concrete footings.

On-site observation of the exposed structure was completed in February 2022. During the observation, the presence or absence of vertical components of the lateral force resisting system was noted where possible. In general, the bracing and shear walls appear to be present as designed. One exception is that bracing has been removed between grids G2 and J2 and between grids D2 and E2. This bracing was likely removed in the 2006 project.

Geotechnical investigations in the vicinity have reported that this location has deep deposits of fat clays. These fat clays are strength sensitive and compressible. The 2006 expansion is founded on shallow spread footings. Also, soil improvement or other remedial efforts are unknown. Depending on the forthcoming expansion layout, the use of shallow spread footing foundations could add loads to existing footings. This added load would cause new settlement within the existing facility. Since the new load would apply only to existing perimeter footings, any new settlement would be differential settlement with respect to the existing structure.

For these reasons deep foundations may be required. The fat clay layer is on the order of approximately 100 feet deep. Driven steel piles are typical in these conditions. Buildings over two stories high or heavy buildings in Fargo are typically founded on driven steel piles. An increase in cost can be expected for use of deep foundations. If possible, spread shallow foundations will be designed to alleviate the increase in expense.

The east to west building length is already close to the limit for length without an isolation joint for thermal expansion/contraction. To achieve standards for safety and stability, an isolation joint will be required between the existing building and any expansion project.

MECHANICAL

Primary building heating and cooling is accomplished by distributed water source heat pumps supplemented by a natural gas fired hot water boiler system. Summer cooling loads are rejected to outdoor atmosphere with a ground mounted evaporative fluid cooler.

The building contains 46 heat pumps located throughout. Some are floor mounted and others are suspended above ceilings. The largest units serve the building's center core (both floors) and are located in the basement. The rest are scattered throughout the facility close to or directly above the spaces they serve. **Figure 2-17** shows a heat pump in the basement.

The heat pumps have an internal air filtration and fan system to circulate heating or cooling air to the spaces served. The heat pumps also have an internal compressor/condenser system to cool or heat the air to the spaces as needed. During the coldest winter months when heating demand is highest, the supplemental boiler system can add heat to the heat pump systems when the heat pumps cannot provide enough heat on their own. This is common for heat pump systems in northern climates. The current heat pumps replaced the original building heat pumps in 2007. They appear to have been maintained in good working condition; however, the feedback received on site was that these units have trouble controlling humidity in the facility in the summer. During the site visit, bi-polar plasma ionization systems were observed to be in the process of being installed in each basement heat pump system **(Figure 2-18)**, presumably to assist in disinfecting the airstream and rooms served by these units.

The hot water heating system consists of four 2,000 MBH Thermal Solutions boilers arranged in a primary/secondary pumping system. Each boiler has a small pump (primary) to circulate hot water in a small loop through the boiler to the secondary loop nearby and back. There are two larger, floor-mounted, close-coupled, end suction pumps (secondary) that pump the hot water to the heat pumps and other terminal heating units, such as utility space unit heaters and finned tube convectors placed near large windows in the departure lounges western lobby area. The boiler pump system including primary and secondary boiler pumps and the finned tube convertors are shown in **Figure 2-19**. The 20 horsepower secondary pumps are rated for 540 gallons per minute (gpm) at a pressure drop of 75 feet of total developed head (TDH) pumping a 50 percent ethylene glycol solution. While on site, it appeared that only one of the four boilers was operating. Plant personnel told Mead & Hunt this is typical, even on the coldest days of winter. This indicates the system is significantly oversized, which can lead to excessive system cycling and shortened boiler lifespans.

Figure 2-17 Heat Pump in Basement

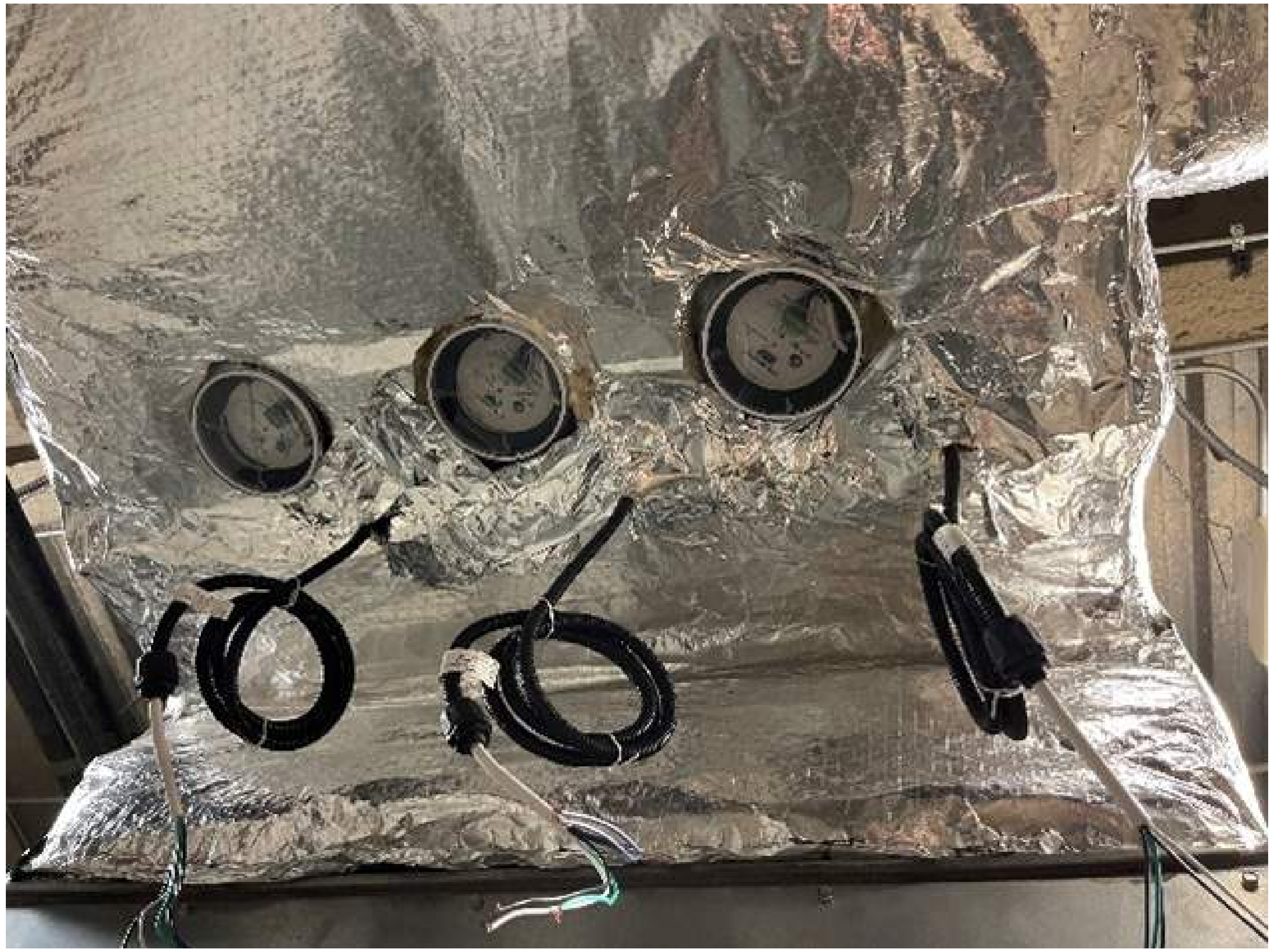


Figure 2-18 Bi-Polar Plasma Ionization Systems

Figure 2-19 Boiler Water Pump System

The primary source of fresh air for the building comes from two large intake hoods on the roof **(Figure 2-20)**, ducted to all the basement heap pumps and make up air handling units. Excess building air exits the building through rooftop relief hoods on the east and west ends of the building. These hoods are in good condition.

Figure 2-20 Two Main Rooftop Intake Hoods

There are two make up air units (MAUs) in the basement **(Figure 2-21)** that receive much of the untreated building ventilation air from the two large rooftop intake hoods, which is heated or cooled depending on the season, and then blown to various parts of the building to be used by the heat pumps. The MAUs have hot water heating coils and chilled water-cooling coils to temper outside air. A 50-ton, rooftop, air-cooled chiller **(Figure 2-22)** with scroll compressors cools the chilled water that the two MAUs use. The MAUs and the chiller look to be in good working order.

Figure 2-21 Basement Make-Up Air Handling Unit

Figure 2-22 Rooftop Water Chiller

A heat pump water loop provides supplemental heat or cooling for the heat pumps. This loop removes heat from the building heat pumps **(Figure 2-23)** when they are operating in cooling mode and adds heat to the heat pumps in heating mode. This dedicated heat pump water loop is connected to the hot water boiler system to receive supplemental heat when needed in the winter and is connected to an evaporative cooler to reject building heat to the outdoors in the summer. The pumps and their accessories serving this system appear to be in good working condition.

Figure 2-23 Heat Pump Water Loop

Figure 2-24 Heat Pump System Evaporate Fluid Cooler

A ground-mounted, evaporative fluid cooler adjacent to the facility on the east side of the site **(Figure 2-24)** rejects heat removed from the building during the summer cooling months to the outdoor atmosphere. According to facility personnel, the unit requires frequent maintenance. The airport is dissatisfied with its performance and would like to see it replaced or eliminated. The unit is sized to handle 450 tons of cooling at 1,100 gpm with a 50 percent ethylene glycol solution.

A 2 pounds per square inch gauge (psig) 5-inch natural gas main serves the building with the meter and service regulator located on the exterior of the building just north of the ground floor electrical room in the northwest corner of the building. This gas service primarily serves the hot water boiler system but also serves a small make up air handling unit and a packaged rooftop air conditioning unit.

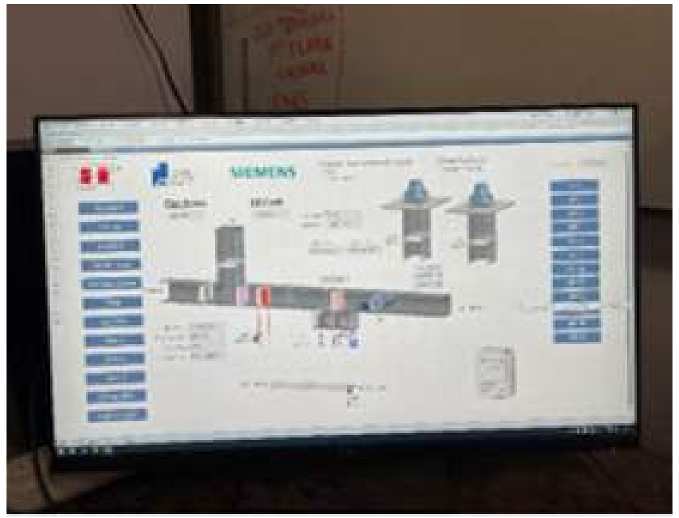


Figure 2-25 Siemens Building Automation System

The building mechanical systems are controlled by a Siemens building automation system **(Figure 2-25)**. This system provides centralized control of all the major building HVAC systems with a central PC-based user interface where building maintenance and operators can adjust system performance parameters, monitor system alarms, and collect trend data. The four Thermal Solutions hot water boilers are centrally controlled by a remote panel near the boilers that stages and modulates them to satisfy hot water temperature requirements and monitors and alarms performance and safety conditions.

A fuel oil system including an exterior underground fuel oil storage tank provides fuel oil for the emergency generator in the northwest corner of the building **(Figure 2-26)**. The storage tank is relatively close to the evaporative fluid cooler. In the generator room, a day tank stores a smaller amount of fuel oil for the generator. The heat rejection system for the generator consists of a rooftop unit as shown that is piped to the generator below. The heat rejection unit appears to be in satisfactory condition.

Figure 2-26 Rooftop Emergency Generator Radiator System

FIRE PROTECTION

The building is protected throughout with automatic sprinkler protection and a manual standpipe system. The building is fed from the site water main via an incoming service assembly located in Mechanical Room 157. The building is divided into two zones, a west zone that serves the upper and lower levels, and an east zone that serves the upper and lower levels. A fire hydrant flow test will be performed in the spring to evaluate if the site water is adequate for the anticipated building sprinkler demands.

The building's main fire alarm control panel is on the lower level in Electrical Room 146. The main fire alarm control panel was installed as part of the 2006 terminal additions and remodeling project. The main control panel is a noncoded, addressable panel with multiplexed signal transmission and voice/horn/strobe evacuation with one-way voice communication via firefighter microphone. The fire alarm/detection system consists of fire alarm manual pull stations, smoke detection, and monitoring of the fire suppression system. Alarms are through voice/horn/visual notification appliances. The system is monitored by Simplex for the terminal building and by on-site operations personnel at all times. The panel and system are nearing technical life expectancies; as parts fail, they will be difficult to obtain in the coming years and software updates will no longer be supported.

PLUMBING

The building is served by a 4" domestic water service entering the mechanical basement and distributed throughout the facility. The 4" domestic service water meter is on the wall in the mechanical basement at the service entrance. The 4" domestic water service does not have a backflow preventer at the service entrance. The building is served by a 6" sanitary service entering near the front center of the overall footprint and distributed throughout the facility. There is a 4" sanitary stub for future tie-in on the east side of the building. It is noted with an invert of 2'-0" below finish floor. The building is served by two 12" storm mains entering on east and west of the front center of the facility. The hot water is generated by a domestic tank water heater located in the mechanical basement and circulated throughout the facility. It is noted that some lavatory faucets at the end of a bank of lavatories did not seem to be getting adequate hot water circulated. There is a set of restrooms on the second floor west side that were added as part of an addition that are served by an additional tank water heater located in the janitors closet.

ELECTRICAL

The building is served from a main distribution switchboard (MDS) via underground service conductors from the utility owned pad mounted transformer. The MDS is on the first floor in Electrical Room 156. The switchboard consists of an incoming/power metering section and main breaker disconnect. The switchboard is rated for 2000 amperes (A) at 480/277 Volts (V), 3 Phase, 4 wire. The main breaker is an insulated case, 2500A, solid state electronic breaker with LSI functions. The switchboard is Siemens type SB3, manufactured in April 2007 and was installed as part of the 2008 project.

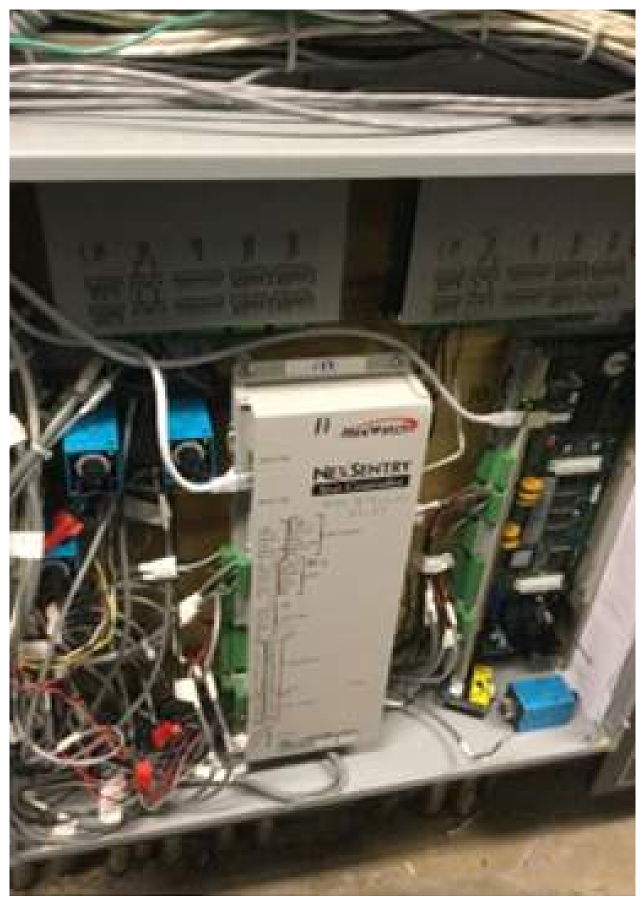


Figure 2-27 Control System

ELECTRICAL MAIN DISTRIBUTION SYSTEM

The buildings electrical distribution consists of a distribution switchboard (DS) on the lower level in Electrical Room 156, an existing house switchboard, and a tenant switchboard located in electrical room 146. Switchboard "DS" was installed as part of the 2008 project, and the house switchboard and the tenant switchboard are from the original 1986 terminal project. The DS is rated at 2000A at 480/277V, 3 Phase, 4 wire and consists of multiple sections with group mounted circuit breakers of various sizes and ratings. The house switchboard is rated at 1600A at 480/277V, 3 Phase, 4 wire. It consists of a main section with a 1600A main bolt-loc type BP switch and multiple sections with group mounted fusible switches of various sizes and ratings.

TECHNOLOGY

The existing cabling and network infrastructure is not unified. At one common existing service entrance two internet service providers enter the facility and have demark/protection equipment. From there, services are extended to different areas through different means.

There is not a common set of Telecom Rooms (TRs), nor common fiber optic backbone, or Cat 6 cabling to support all IT/BT systems. This was adequate to support systems that were all separate and where servers were located and maintained by the city IT department, but this does not meet BICSI standards or current airport design guidelines, and it is not adequate for airport owned and integrated systems such as:

- Airport financial and operations systems
- Building technology systems (security, building automation, paging, FIDS, etc.)
- Airline, rental agency, and retail tenants

SECURITY

The existing cabling system that supports the access control and video surveillance systems consists of coaxial and multi-pair cable and will not support IP based solutions.

The existing access control system is a NexWatch system with WYSE proximity readers using a Weigand interface, as shown in **Figure 2-27**. The system and cabling infrastructure was originally installed in 1991 and has been increasingly difficult to maintain due to lack of replacement parts. The system is no longer supported by its manufacturer and has reached the end of its useful life.

Both proximity cards and Weigand wiring are no longer secure technologies, nor are they FIPS-201 compliant. All airports, in fact most organizations in general, are replacing these technologies as rapidly as practicable.

The existing video surveillance system is a mixture of analog cameras connected with coaxial cable and remote power supplies to a Video Management System (VMS). The VMS was recently upgraded to an Avigilon server/VMS using encoders at the old matrix location **(Figure 2-28)**. The Avigilon server is approaching the end of its useful life as well.

The analog cameras were good cameras at the time that they were installed. They do not meet current standards and are analogous to the old-style tube televisions. They cannot provide what current cameras can provide, including:

- High-Definition picture resolution (720p, 1080p, 4k, and higher).
- High color contrast (bit depth) giving superior picture quality at any resolution.
- IP/POE connectivity and software integration into multiple VMSs.
- Video Analytics and Artificial Intelligence/Machine Learning (AI/ML) in the camera

Analog cameras will continue to be difficult to support and require replacement. New cameras will allow for better camera layouts and should reduce the number of cameras given the superior picture qualities involved.

Figure 2-28 Avigilon Server

2.1.13 Code Review

While the existing building was built in compliance with past code requirements, it is not fully compliant with current building codes. Future renovations will require that portions of the building affected by the project be brought into compliance with the current code. While many code issues, such as the requirement for tactile exit signs, can be remedied with little effort, other issues are more extensive to rectify and may affect the building's layout and/or construction. These will be identified in their respective section of the report (i.e. Accessibility, Mechanical, Plumbing, Electrical, Technology and Fire Protection).

The current governing building codes are as follows:

- Building / Structural Code: 2018 International Building Code as amended by the North Dakota State Building Code
- Plumbing Code: North Dakota Sewer and Water Service Code and latest ed. of the Uniform Plumbing Code as amended by the State of North Dakota
- Mechanical Code: 2018 International Mechanical Code as amended
- Boiler Code: 2018 International Fuel Gas Code as amended
- Electric Code: Latest ed. National Electrical Code, the rules, regulations and standards of the State of North Dakota and the Wiring Standards of North Dakota
- Fire/Life Safety Code: NFPA 13
- Energy Code: 2018 International Building Code as amended by the North Dakota State Building Code
- 2006 Architectural Barriers Act Accessibility Standard (ABAAS) and Americans with Disabilities Act (ADA)

Existing Building Code summary details are summarized in Appendix A.

2.1.14 Accessibility Review

A comprehensive accessibility review was completed as part of the site evaluation. Features of accessibility and universal design are provided throughout the FAR terminal building. An elevator provides an accessible route between levels and all multi-fixture toilet rooms provide accessible toilet compartments. While many features were provided, a number of items identified do not fully comply with current design requirements of the 2006 Architectural Barriers Act Accessibility Standard (ABAAS) and Americans with Disabilities Act (ADA) and opportunities for improved accessibility. **A summary of the accessibility review can be found in Appendix B.**

2.1.15 Energy Audit

A high-level energy audit was conducted identify potential Energy Efficiency Measures (EEMs) and Capital-Intensive Measures (CIMs). Energy Efficiency Measures are comprised of projects that would improve the operation of building systems while also having a simple payback of less than 7-years. The goal of EEMs is to improve operational efficiency of building systems by retrofitting equipment with sufficient remaining life or holistically replacing equipment that has a fast return on investment. Capital-Intensive Measures are comprised of projects that require considerably more upfront capital than EEMs, but result in improved equipment operation, energy efficiency, a longer equipment life expectancy. CIMs aim to replace existing, major equipment with new, higher efficiency equipment and thus should be considered when building systems are nearing end-of-life. This audit is based on existing systems. In the event a different system is designed and installed (such as a VAV system), that system will be evaluated and designed to meet or exceed current 2018 IECC standards. **Further information can be found in Appendix C of this report.**

ENERGY USE ANALYSIS

As part of the energy audit, utility bills were analyzed for the airport to understand the use profile, largest utility consumption, largest expenditure, and provide direction for identifying EEMs. For the analysis, the base-year includes the months of February 2021 through January 2022. The results of the utility bill audit indicated that the largest utility consumed by the airport is electricity at 71% with natural gas at 29%. Likewise, the per-unit cost of each energy source was analyzed for each utility resulting in approximately \$0.08/kWh blended rate for electricity and \$0.18/kWh for natural gas (converted from Therm to kWh). Since electricity accounts for the greatest use and cost for the airport, the electric end-uses were targeted to identify key EEMs to reduce consumption and cost.

ENERGY EFFICIENCY MEASURES

In review of the building operations, as-built documentation, and conducting a virtual walk-through, five EEMs were identified. Since the airport uses more electrical energy than natural gas, EEMs that reduce electrical energy were targeted and highlighted below.

- Replace the existing fluid cooler constant speed motor with a premium efficiency motor and adding variable frequency drive (VFD) to control the fan speed to maintain proper leaving water temperature
- Replace the existing pump motors with premium efficiency motors coupled with VFDs to control pump speeds to meet system flow demand
- Replace existing fluorescent lighting throughout the airport with LED lighting
- Add occupancy sensors and schedule controls for spaces with transient and scheduled occupancies
- Add photosensors to dim indoor lighting when sufficient ambient light is available at the entrance and ticketing/check-in areas.

CAPITAL INTENSIVE MEASURES

In addition to identified EEMs, three Capital-Intensive Measures were also noted. The goal of these CIMs is to improve building operations by replacing outdated equipment while updating equipment to industry standards for efficiency. Thus, CIMs should be undertaken for equipment that is reaching its end-of-life. The CIMs identified include the following:

- Install new water-source heat pumps with variable speed compressors
- Install a new fluid cooler with a VFD to control fan speed
- Install a new building automation system

Installing the new water-source heat pumps will replace the existing units with new, high efficiency units that will reduce electrical energy consumption and use newer refrigerants that aren't currently being phased out. Replacing the current fluid cooler with a VFD will increase operational efficiency and provide greater temperature control for the heat pump loop. Installing a new building automation system will provide maintenance staff the ability to visualize equipment operation, troubleshoot issues, and obtain alerts when there are equipment faults or alarms.

2.2 AIRFIELD ELEMENTS

Terminal concept development also considers the evaluation of existing and future airfield elements such as terminal apron gates, airspace clearances, aircraft ground equipment, and PBBs.

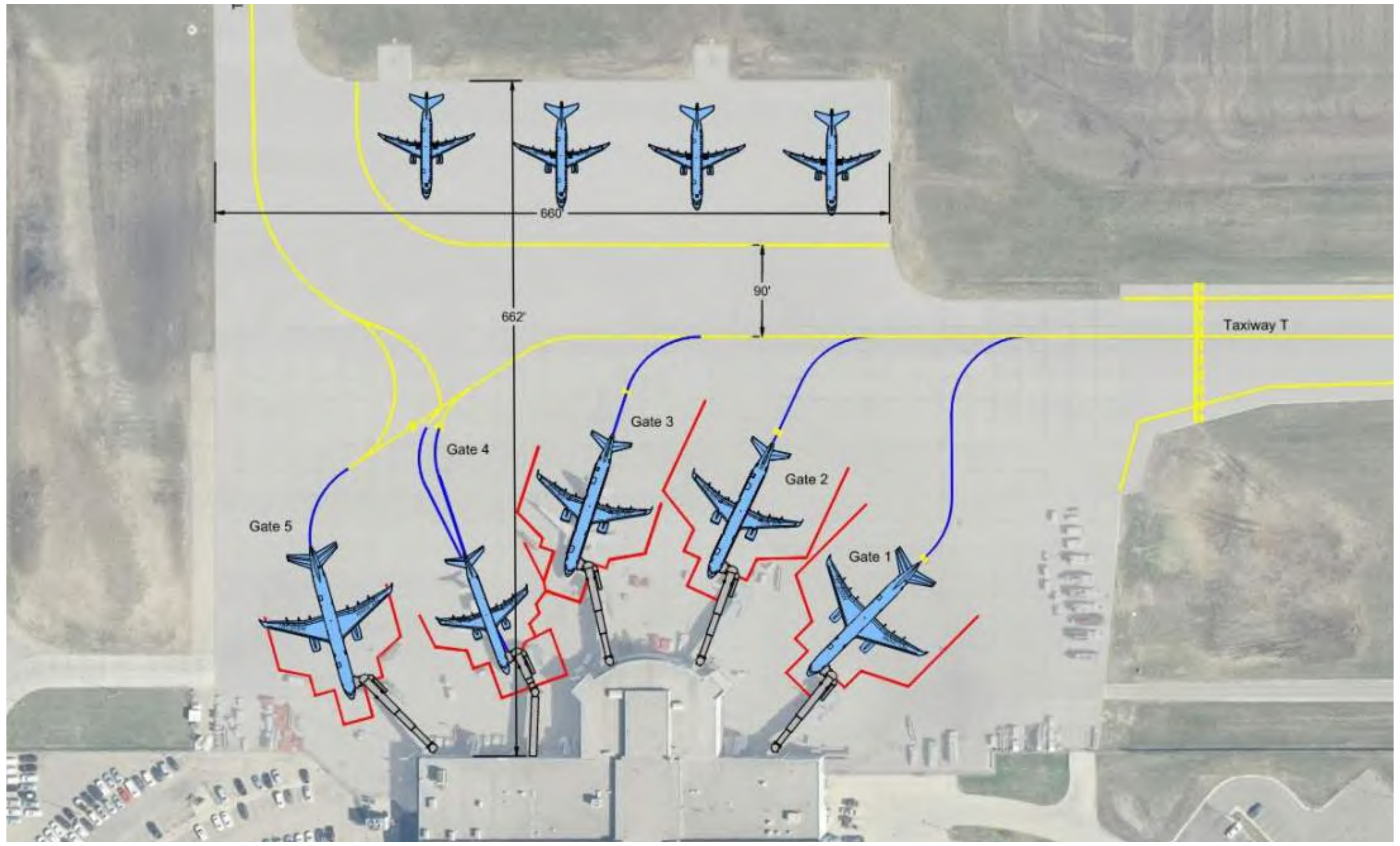


Figure 2-29 FAR Apron Layout

2.2.1 Terminal Apron Gates

FAR's commercial apron is located on the west portion of the airfield and connected to the airfield by Taxiways J and T. FAR terminal has five contact gates with four Remain Overnight (RON) positions located on the northern portion of the apron for a total capacity of nine aircraft **(Figure 2-29)**.

The current aircraft fleet mix used by the airlines operating at FAR is a mix regional and narrow body jet aircraft. FAR currently services a variety of types of aircraft ranging from the A321-Neo with a 118-foot wingspan to the CRJ-700 with a wingspan of 76 feet. Occasionally, FAR receives service from a B757-200W from Delta Air Lines.

The depth of the terminal ramp is limited by the taxilane north of the terminal that provides access to Taxiways J and T. An ADG III Object Free Area clearance of 81 feet must be maintained from this taxilane centerline to the edge of the RON Apron and aircraft tails parked at the terminal per separation standards mentioned in AC 150/5300-13A.

The airport expresses the need for more contact gates in the future to accommodate scheduling demand.

2.2.2 Aircraft Ground Equipment

A fuel farm is southwest of the existing terminal. The fuel trucks use a combination of service roads to access the terminal apron.

Currently, no marked service road for vehicles exists on the apron to provide a designated area for baggage carts to transport bags from the make-up areas to the gates, which creates potentially unsafe conditions on the apron.

2.2.3 Passenger Boarding Bridges

The existing terminal has five PBBs available in service. An on-site observation performed in January 2022, allowed visual inspection and operation of the PBBs to the extent possible. Due to snow accumulation and equipment stationed in areas, not all of the PBBs could be exercised to their full limits; however, it was determined that they could be operated enough to get a reasonable understanding of their conditions.

One of the existing PBBs (Gate 4) is significantly older than the others. It is a tele-radial style bridge that is now difficult (or impossible) to obtain parts for if something gets damaged or breaks. This bridge is by and large the highest priority for replacement out of all the existing PBBs. The other four PBBs are in similar, relatively good condition, compared to other bridges across the country of similar age. They are nearing the end of the typical operating life, however, so it is highly recommended that they each either undergo some refurbishments during this project, which will extend the operating life, or ideally be replaced with new PBBs.

Each of the PBBs are equipped with ground power units to supply 400Hz or 28VDC power to the aircraft, and Gates 1 and 4 have Pre-Conditioned Air units. It is recommended that this ancillary equipment be replaced by this project. A recommended replacement program will be developed and organized by priority for all PBBs and associated equipment.

2.3 LANDSIDE ELEMENTS

The landside components of the terminal area include access to the terminal building, the arrivals/departure curb, loading dock, and employee parking lot east of the existing terminal. These facilities service as the primary access point for passengers, employees, and concession goods to enter and exit the terminal facility.

2.3.1 Airport Access Road

Most access to the Airport is provided from Dakota Drive north from 19th Avenue and also from Old Highway 81 via County Road 20. Note that another access road is on the west side of the Airport via 32nd Avenue North from Old Highway 81. Access to this perimeter road is gated and is not available for public use; instead, it is intended for Airport and emergency vehicles to access locations on the north side of the airfield.

2.3.2 Arrivals/Departures Curb

The arrivals/departures curb, or the curbfront, is accessed by airport users via Dakota Drive. The curbfront, **(Figure 2-30)**, runs a length of 440 feet and consists of three, 13-foot-wide bypass lanes, and one, 13-foot-wide staging lane used for loading and unloading passengers. The first half of the curbfront, or approximately the first 220 feet of the curb, is for unloading departing passengers, while the second 220-foot section is for loading arriving passengers. The curbfront is currently only marked for ticketing and baggage claim facilities, and does not include specific signage for hotel shuttles, taxi cabs, and transportation network companies. Three crosswalks, separated evenly across the curbfront, exist for passengers to cross the curbfront to access public parking facilities.

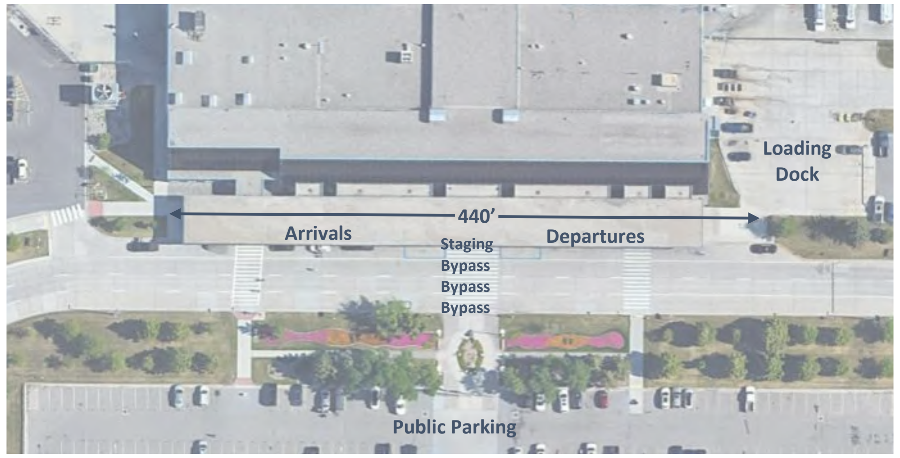


Figure 2-30 Arrivals/Departures Curb

2.3.3 Loading Dock

The loading dock is located on the eastern face of the terminal and is accessed via Dakota Drive and the access road **(Figure 2-31)** leading to the employee parking lot and Airport Traffic Control Tower (ATCT). Drivers enter the loading dock, turn the truck cab to the left, and reverse into the loading dock door. Goods are then transported through the door where TSA agents or public safety officers screen the goods prior to being transported and stored in the facility.

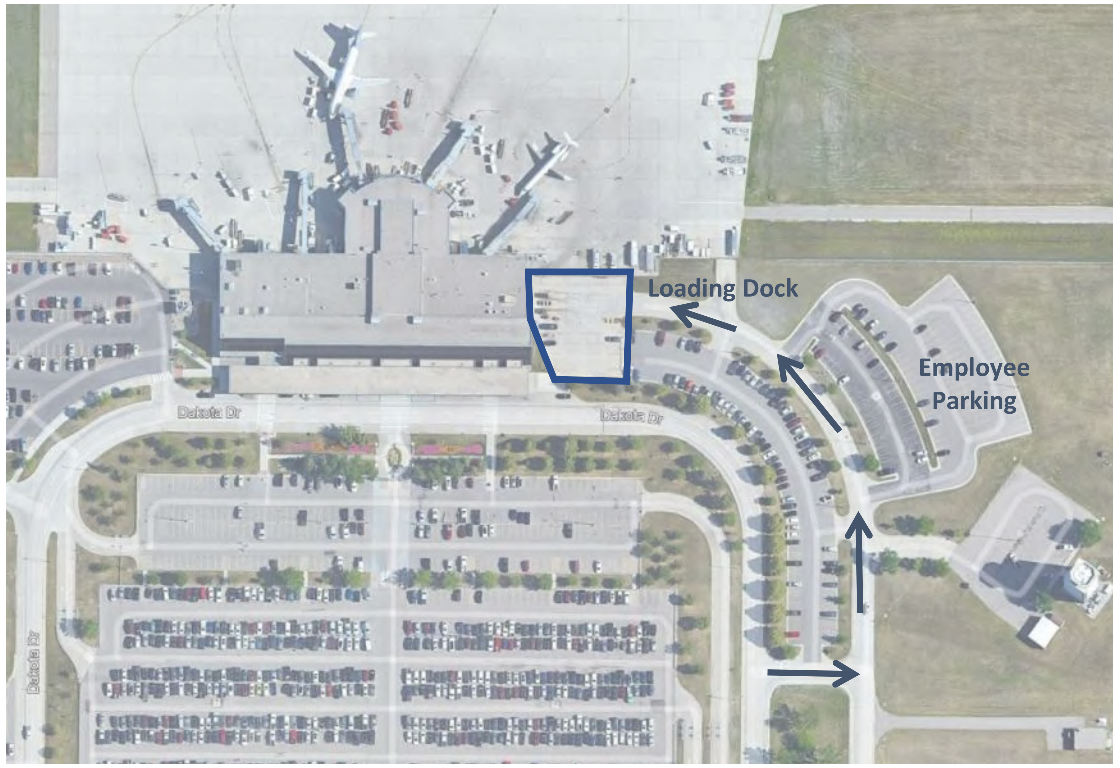


Figure 2-31 Loading Dock Route

2.3.4 Employee Parking Lot

The employee parking lot is east of the existing terminal and northwest of the ATCT. The parking lot originally had 158 parking stalls but was expanded to 238 stalls in 2017. This parking lot may be impacted with an east terminal expansion.

2.4 UTILITIES

The storm sewer, water, sanitary sewer, lighting, communications, natural gas, and pavement consist of the utilities that were evaluated as part of the TAS.

2.4.1 Storm Sewer

Figure 2-32 Storm Sewer System

The existing storm sewer, as shown in **Figure 2-32**, in the vicinity of the terminal is reinforced concrete pipe and discharges into Cass County Drain 10 located immediately west of the terminal. There are no known problems with the integrity of the storm sewer pipe and manhole structures. Presently, there is no storm water detention for the impervious surfaces adjacent to the terminal site except for FAR's deicing apron area. Site work for the terminal expansion project will need to account for additional capacity due to increased impervious surface and include detention to meet City of Fargo storm water requirements. Given the close proximity of the project to the airfield, the new storm water detention will have to be underground storage to avoid creating a wildlife attractant.

2.4.2 Water

Figure 2-33 Water

The watermain runs east/west parallel to the face of the terminal, as shown in **Figure 2-33**, and was constructed in 1985. The only domestic water service for the entire terminal comes off the main and enters the building on the south side. The water supply for the terminal's fire suppression system enters the building on the northwest corner. It was installed with the 2006 terminal expansion project. With the new terminal project, the existing water infrastructure will be evaluated for capacity to handle the expansion.

2.4.3 Sanitary Sewer

Figure 2-34 Sanitary Sewer Systems

Original sanitary sewer, shown in **Figure 2-34**, was constructed in 1985 and runs south from the terminal building to a sanitary sewer lift station located along on 19th Avenue North (800 feet east of Dakota Drive). There are no known problems with the integrity of pipe and manhole structures. The existing sanitary sewer will be evaluated during the terminal design to determine the if the capacity is sufficient to handle anticipated growth.

2.4.4 Lighting

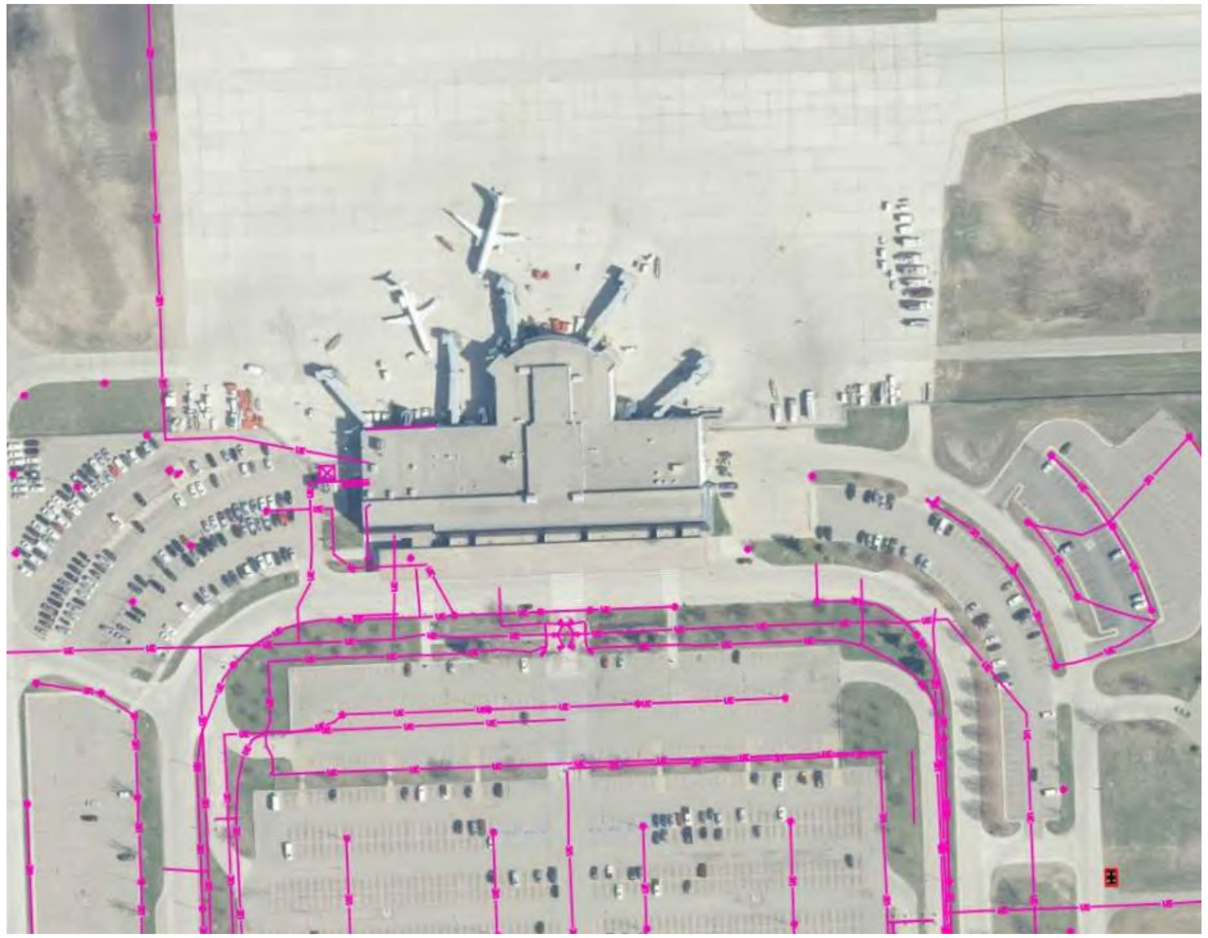


Figure 2-35 Electric

Original infrastructure (poles, fixtures, conduit, etc.) for street lighting surrounding the terminal as well as overhead lighting illuminating aircraft Gates 1-5 was installed in 1985. In 2019, existing street lighting fixtures were replaced with new LED fixtures. The existing fixtures for the high-mast overhead apron lighting were replaced with LED fixtures in 2021. Other original infrastructure remains. **Figure 2-35** shows the electrical infrastructure around the terminal.

2.4.5 Communication

Figure 2-36 Communication Lines

The existing communication cabling for FAR's access control system runs from the terminal out to airfield gates/ access points located at the cargo apron, north GA, and south GA, as shown in **Figure 2-36**. The existing cabling is copper wire and will be replaced with fiber optic cable by FAR with a project in 2022.

2.4.6 Natural Gas

Figure 2-37 Natural Gas Line

The natural gas line for the terminal enters the north side of the building adjacent to Gate 4, as shown in **Figure 2-37**.

2.4.7 Pavement

The typical section of the existing terminal apron (Gates 1-5) is 17-inch Portland cement concrete (PCC) and 6-inch bituminous base originally constructed in 1985. Inspections to assess the condition of airfield pavements are conducted every three years by North Dakota Aeronautics. These assessments document the type and severity of surface distresses and are used to formulate a Pavement Condition Index (PCI). The PCI is a numerical value ranging from 0 to 100 with 100 representing a flawless section of pavement. The assessments are incorporated into a pavement maintenance plan to determine the need for rehabilitation or reconstruction. The minimum required PCI for aprons is 65, and the 2021 PCIs for the terminal apron ranged from 31-34. Pavements with PCIs this low with the types of distress present need to be reconstructed.

FAR cannot be without any of the five existing gates for an extended period without causing major disruption to aircraft operations. As a result, completing new gate expansion on the east end of the terminal will provide sufficient gate capacity as the existing apron is reconstructed in a phased approach.

ROADWAYS

The existing in-bound/out-bound road (Dakota Drive) and secondary roads adjacent to the terminal building are 8- to 9-inch PCC originally constructed in 1985. Major rehabilitation was completed in 2019 (panel replacement, partial depth repairs, crack repairs and joint seal replacement).

EMPLOYEE PARKING

The employee parking lots are located east of the existing terminal and northwest of the ATCT. There were originally 158 stalls, but the lot was expanded to 238 stalls in 2017. It is anticipated the employee lots will be impacted with the easterly expansion of the terminal building.

2.5 SUMMARY

The terminal building both operationally, to meet trends, security requirements in aviation, and passenger amenities, and functionally, as far as building systems and building performance, is nearing the end of useful life. The following sections in this TAS will provide justification that the future demand and facility requirements at FAR will justify the need to expand and modify the existing facility.

3.0 AVIATION ACTIVITY FORECASTS

The Hector International Airport (Airport identified FAR) is currently conducting an evaluation of their terminal area. Like any planning effort, a crucial aspect of accurately identifying the needs of any area of an Airport is isolating and forecasting activity that it supports. This report will provide a focus on the terminal area and the aircraft that utilize it. This effort will be done in three parts:

- Aviation Trends and COVID Impacts: This section examines recent activity at the Airport, including historic activity, impacts to the Airport from the ongoing COVID health pandemic and the ongoing anticipated recovery beyond COVID.
- Enplanement and Operations Forecast: This section employs the efforts of the previously completed 2015 commercial aviation demand forecasts, which include both operations and enplanements. These forecasts were used in the 2018 Master Plan. Rather than reinvent the activity forecasts, this report will reevaluate the relevance of these previous forecast and update them to be concurrent with recent and projected trends.
- Peak Hour Forecast: While annual forecast meets many planning needs, the terminal area of an airport is often one of the busiest sections and requires a more granular method to evaluate needs. This final section will extract peak hour information from the annual forecasts determined in the previous section.

3.1 AVIATION TRENDS AND COVID IMPACTS

Forecasting airport activity levels must account for past, present, and future trends. These trends may be steady when examined on a macro level, such as steady enplanement growth on a national level, but may also experience systemwide shocks. These include the 2008 financial crisis and the 2020 COVID-19 pandemic. The impacts and recovery from these shocks must be incorporated into industry standard forecasting methodologies. The remainder of this section presents a high-level view of how these factors can be combined into a well-crafted forecast. Subsequent sections that focus on specific aviation activity metrics provide additional information as relevant.

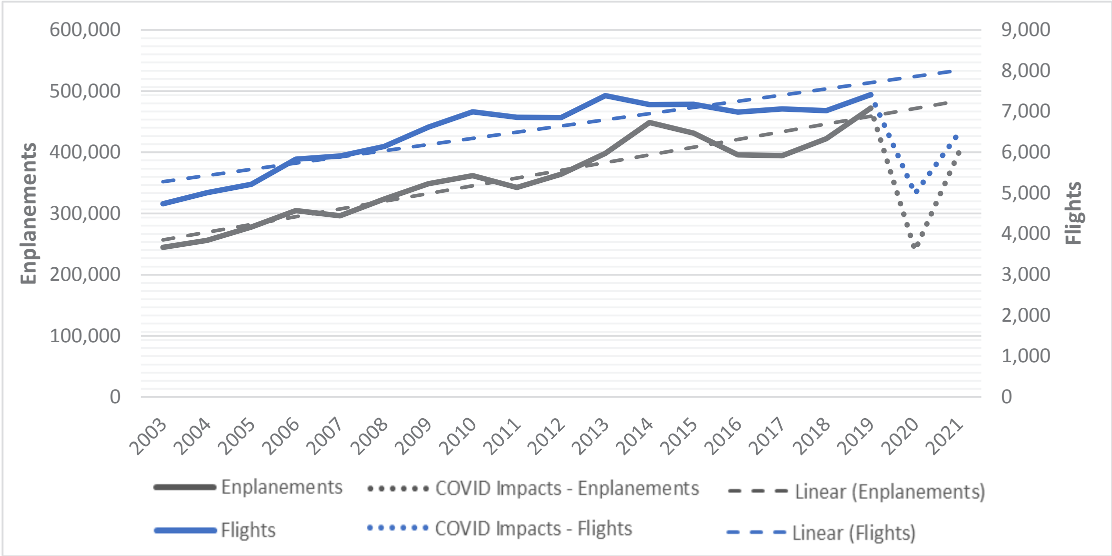
As current trends influence the approach to forecasting, it should be considered that this forecast was prepared at the same time as the evolving impacts of the COVID-19 pandemic. Forecast approval is based on the methodology, data, and conclusions concurrent with the document preparation.

However, consideration of the impacts of the COVID-19 pandemic on aviation activity is warranted to acknowledge the reduced confidence in growth projections using currently available data. Accordingly, Federal Aviation Administration (FAA) acceptance of this report does not constitute justification for future projects. Justification for future projects will be made based on activity levels at the time the project is requested for development. Documentation of actual activity levels meeting planning activity levels will be necessary to justify Airport Improvement Program (AIP) funding for eligible projects. With all of this in mind, industry standard approaches can still be employed to produce forecasts useful for planning purposes.

To develop forecasts from levels of activity that are derived from more usual conditions, and not impacted by a global pandemic, a base year of 2019 was used to project future activity but an estimate for 2021 activity levels have also been provided when possible. The years impacted by the pandemic, 2020 and 2021, are discussed as for both enplanements and commercial operations and the impacts of COVID from 2019 to present day are evaluated. In addition to capturing the impacts during the height of the pandemic, the ongoing recovery of each metric will be assessed before projecting future activity.

The Airport has historically shown consistent growth over the past two decades. The only significant dip in operations occurred in 2014 when Endeavor Air, Compass Airlines and Frontier Airlines reduced operations in the same short-term window. However, even with that brief reduction in activity, the Airport has maintained a strong CAGR of 4.19 percent from 2003 to 2019. **Figure 3-1** shows both enplanements and departing flights and that the linear trend since 2003 to 2019 indicates continued growth. More recently, the ongoing COVID health crisis has impacted the global standing of aviation and the return to pre-COVID levels of activity are considered later in this section.

Figure 3-1 Historic Aviation Activity



Source: T100 Database, Airport Records

Before analyzing the impacts and trends in commercial aviation, it should first be established what is considered commercial aviation, for planning purposes, by the FAA. The FAA TAF separates commercial operations into three distinct categories: air carrier operations, commuter operations, and air taxi operations, as defined in **Table 3-1**. The first category, air carrier operations, is defined by the TAF as any operation by a commercial aircraft with a seating capacity of more than 60 seats or a maximum payload of more than 18,000 pounds. Although both commuter and air taxi operations each consist of aircraft below this threshold, commuter operations are scheduled while air taxi operations are unscheduled, on-demand flights. Air taxi operations are typically conducted by charter companies such as local fixed based operators (FBO) and fractional ownership aircraft operators. Large charter operations would usually count as air carrier traffic due to the size of the aircraft. Cargo operations may also be classified as either air carrier or air taxi operations depending on the type of aircraft utilized.

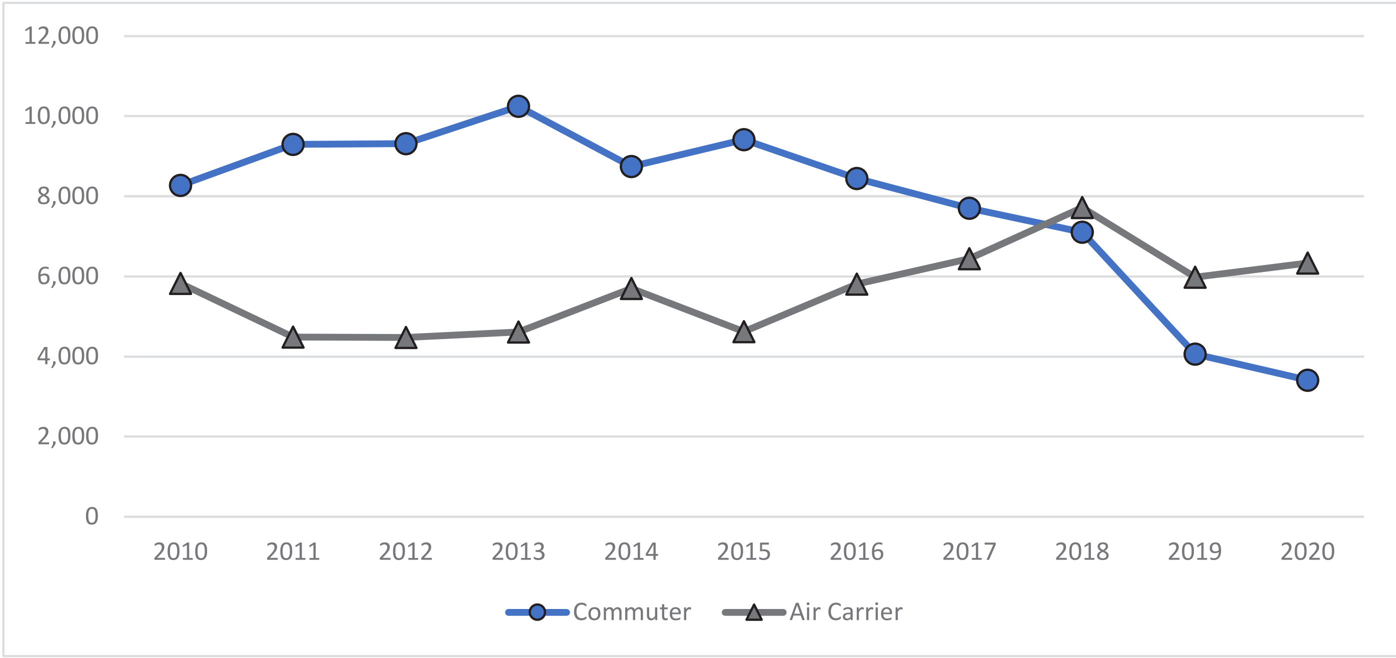
Table 3-1 FAA Commercial Operator Classification

Operation Categories	Commercial	Aircraft Capacity	Scheduled	Do Passengers Count as Enplanements?
Air Carrier	Yes	More than 60	Typically, Yes	Yes
Commuter	Yes	60 or Less	Yes	Yes
Air Taxi	Yes	60 or Less	Typically, No	No

Both air carrier and commuter operations are often scheduled operations and are therefore easier to determine. As air taxi operations may be either passenger or cargo operations, are generally unscheduled, and use similar aircraft to GA operations, establishing an accurate count of air taxi operations can be challenging. However, as the terminal area is the focus of this report, air taxi operations are not of consequence as they do not typically use the terminal.

To divide operations into these three categories several databases were reviewed. The Traffic Flow Management System Counts Database (TFMSC) records flight plans filed by pilots. Since most air carrier and commuter traffic file flight plans, this database accounts for nearly all air carrier and commuter operations. These operations were then manually divided into the commuter and air carrier categories based on the number of seats per aircraft. The results of this historic analysis can be seen in **Figure 3-2** while a breakdown of these operations by specific aircraft type is available in **Appendix E**. As the intent of this report is to isolate demand to the terminal area, the air taxi operations will largely be disregarded by the report to isolate aircraft the terminal area.

Figure 3-2 Historic Commercial Operations



Source: DOT T100 Database

Air carrier operations were more insulated from COVID related reductions in operations compared to commuter aircraft, as passenger flights were often consolidated onto larger aircraft. This can be seen in the increase in operations from 2019 to 2020, where air carrier operations decreased by 5.9 percent compared to the 16.0 percent reduction in commuter operations during the same period.

Commuter operations have been more heavily impacted by COVID. The FAR commuter fleet has become more homogenous in recent years as the Embraer 140, typically a 44-seat aircraft, has ceased operations at FAR since 2018 and has not had a consistent presence at the Airport since 2014. The commuter fleet now consists primarily of the CRJ200 and Embraer 145, with some operations by the relatively new aircraft, the CRJ550. This is an aircraft exclusively operated by United. Although this is a 50-seat aircraft, it is derived from a larger aircraft, a reconfigured CRJ700, to offer true first-class seating and other amenities not usually experienced in a 50-seat aircraft. Even as the commuter fleet continues to adjust and recover from COVID impacts, the air carrier fleet has grown and maintained diversity. From 2017 to 2019, over 12 types of different air carrier aircraft have conducted an average of at least 1 operation per week annually. Air carrier aircraft have increased their share in the local fleet mix in recent years, growing from a low of 30.8 percent of commercial operations in 2016 to 43.6 percent in 2020. This trend is expected to continue as the commuter fleet decreases in size and is redistributed to serve smaller markets, such as airports in the Essential Air Service program.

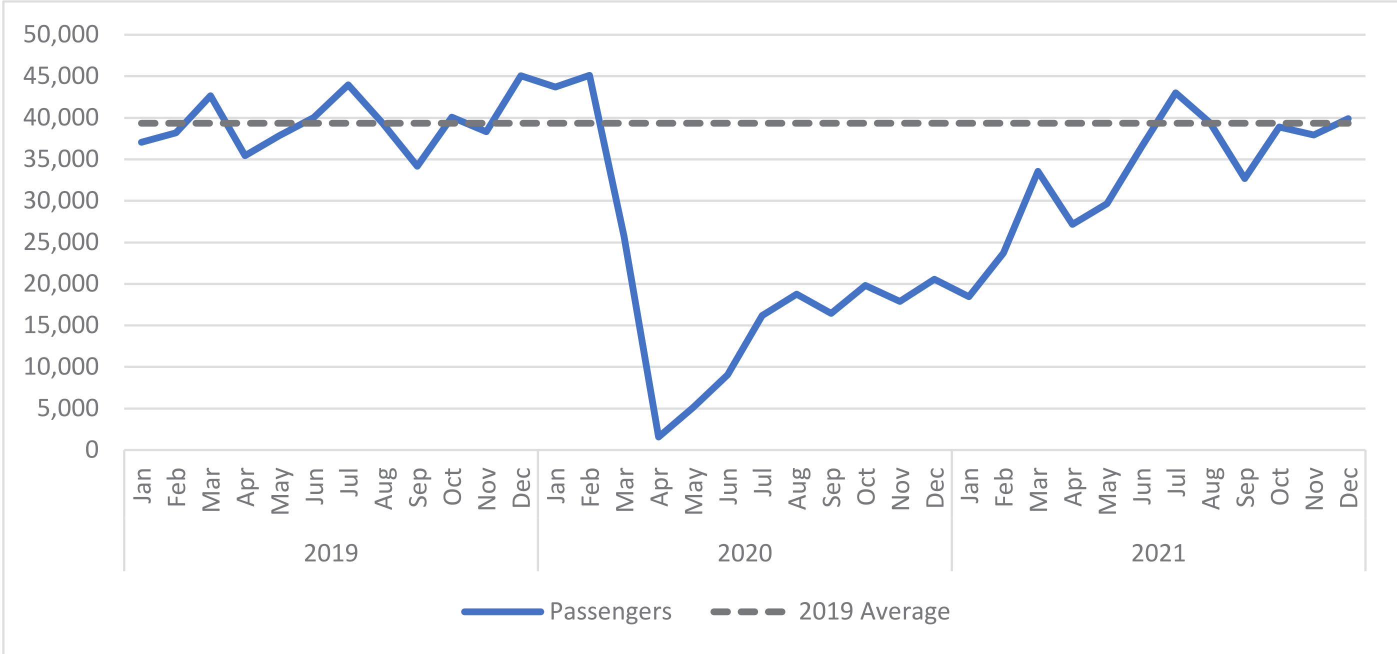
The decrease in commuter aircraft has been anticipated on a federal forecasting level and is supported by recent aircraft orders. In 2019 approximately 2,674 operations were conducted at FAR with the CRJ200, the dominant 50-seat aircraft. SkyWest is the top operator of CRJ200s in the nation with a fleet of 141 CRJ200s. However, these aircraft have finite lifetimes, and SkyWest has placed no new orders for them. Instead, the air carrier has ordered 16 Embraer 175s to prepare for the transition to larger aircraft. A brief period of growth is likely for the commuter aircraft as COVID impacts subside, before being allocated to smaller markets before retirement. Therefore, it is expected that air carrier aircraft will become more dominant as commuter aircraft are phased out of service.

Commercial aviation has experienced several ongoing trends over the past few years. Pilot shortages continue to drive some regional airlines to reduce the number of trips while increasing aircraft size. Meanwhile, the industry is adjusting for post-COVID demands and aircraft fleet mixes are evolving. The initial portion of this section will discuss these trends in greater detail.

Passenger enplanements were significantly impacted during the height of the COVID-19 pandemic. Total annual domestic enplanements in 2020 fell to 41.3 percent of 2019 levels, as reported by the DOT T100 database. Travel restrictions and reduced seat capacity contributed to fewer enplanements during the pandemic. In 2021, even as many air carriers have returned to normal capacities, recovery is still under way and national activity has not yet reached pre-pandemic levels. Recovery from industry-wide level shocks can often take place over several years.

Nationally, recent data reported for the DOT T100 database, July 2021, indicated that national domestic enplanements were 11.4 percent less than those in July of 2019. While this is a great improvement over earlier in the year, such as the 58.1 percent difference that occurred in January, it has not yet reached 2019 activity levels. However, recovery at FAR is occurring more quickly, as can be seen by examining the months of January 2019 to August 2021, in **Figure 3-3**. The 2019 monthly average of 239,346 enplanements fell off sharply during the onset of the COVID crisis. However, recovery since the low point in activity of April 2020 has occurred relatively smoothly. As of June 2021, the average number of monthly enplanements has exceeded the average of 2019, with July of 2021 being one the highest reported levels of activity in recent years. These strong enplanements levels have occurred while much of the country is still recovering, and it is anticipated that 2022 enplanements will continue demonstrated growth.

Figure 3-3 Year to Year Enplanements Comparison



Source: DOT T100 Database, Airport Records

A closer look at the 2021 levels of activity is shown in **Table 3-2**. For January through August of 2021, the DOT T100 Database was able to be used to determine historic information. However, this database often lags behind real time information by several months and at the time this report was initially written, this was all available data for 2021. For enplanements from September to December, Airport records were used to retrieve enplanements information. As discussed above, while these levels of activity have not yet returned to pre-pandemic levels, they are close. Enplanements for 2021 are shown to be 400,751 with 6,481 flights. This recovery can also be seen in the recent load factors. As early as July 2021, load factors were 85.9 percent which exceed 80 percent for the first time since February 2020.

Table 3-2 2021 Monthly Activity

Month	Enplanements	Flights
January	18,453	455
February	23,692	433
March	33,558	573
April	27,171	526
May	29,644	502
June	36,483	570
July	42,999	618
August	39,389	607
September	32,665	510
October	38,873	577
November	37,911	534
December	39,913	576
Total	**400,751**	**6,481**

Source: DOT T100 Database, Airport Records
Notes: Flights are departing flights only

3.2 FORECASTS

As the previous section examined existing and historic trends this section now looks to the future. In planning for future needs at any airport, a crucial aspect of that planning is to determine the types and levels of activity anticipated to occur. This section examines and determines forecasts for both. Although this report ties future activity to levels to specific years, this is only an estimate of future activity. The more relevant metric for the Airport's planning needs is the activity level itself, not the specific year in which it occurs. The levels of activity will be used in determining future needs for the Airport, such as terminal planning and the number of gates required. Even if these activity levels may not occur in the designated year, they remain a helpful planning metric.

3.2.1 Enplanement Forecast

Enplanement forecasts are a cornerstone of the master planning process as the number of passengers using an airport also influence operations, peak activity, and other metrics. This section summarizes and compares the preferred enplanement forecast developed in 2015 for the recently completed 2018 Master Plan. This forecast used a multivariate forecasting methodology, a type of regression analysis to determine future enplanement activity.

A regression analysis examines the direct relationship between two or more sets of historical data. This methodology calls for examining two or more variables to determine their relationship. For example, an airport activity, such as enplanements or operations, is selected as the dependent variable while an outside factor such as local socioeconomic conditions is selected as the independent, or predictive variable. Independent variables examined here include the population and employment for the Fargo-Moorhead metropolitan area, which includes Cass County, North Dakota, , as well as neighboring Clay County, Minnesota. Historical and forecasted socioeconomic statistics for these counties were obtained from the economic forecasting firm Woods & Poole Economics and are shown in **Table 3-3**.

The previous master plan's preferred enplanements forecast showed an increase from 454,060 enplanements in 2018 to 621,853 in 2033, an annual CAGR of 1.73 percent. This is a reasonable, though conservative, estimate given that the previous historical period examined in that master plan, 2000 through 2014, showed a CAGR of 4.86 percent. Likewise, the CAGR for 2003 through 2019 is 4.19 percent and FAR has shown a strong historical record of growth. If an updated multivariate forecast is generated for the Airport using data from 2003 to 2019, the previous forecast can be updated using a similar methodology.

The two variables used for this update are the population and employment trends for the Fargo-Moorhead metro area. If there is a high correlation between variables, then a forecast can be created which utilizes this relationship. The prediction ability of a given forecast is measured by the R2 value, where 0 indicates no relationship and 1 indicates a perfectly influential relationship. The historical passenger enplanements at FAR were compared to the independent variables shown in **Table 3-4**, along with their R2 values. These variables were compared to the T100 database records, as the reporting year is the same instead of the TAF, which reports the federal fiscal year. Each of these variables report a strong correlation between local socioeconomics and Airport activity with the multivariate having the strongest relationship.

When the multivariate variable is used to create an updated forecast, this shows a growth from 472,157 enplanements in 2019 to 748,738 enplanements in 2041. This is a CAGR of 2.12 percent which is considerably lower than historical trends would indicate. However, if the past decade is isolated, then the CAGR of 2009 to 2019 is revealed to be 3.08 percent. Therefore, while the updated multivariate forecast is more conservative than the past few decades may predict, the lower growth in the last ten years and the continued recovery from COVID related impacts are also considered in selecting this methodology of forecasting future activity. The projected number of enplanements for the planning period can be seen in **Table 3-5**.

Table 3-3 Local Socioeconomics

Year	Population	Employment
2003	181,539	131,636
2004	186,448	135,324
2005	189,303	139,307
2006	193,412	144,065
2007	197,121	148,965
2008	201,346	151,714
2009	206,223	151,422
2010	209,450	152,300
2011	213,197	156,425
2012	217,592	161,528
2013	223,354	166,066
2014	227,791	171,337
2015	232,880	174,340
2016	237,254	176,228
2017	241,619	178,478
2018	245,471	180,613
2019	248,241	184,238

Source: Woods & Poole Economics, Inc.
Notes: Includes Cass County, ND and Clay County, MN

Table 3-4 Regression Analysis Variables

Independent Variable	R^2 Value
Population	0.863
Employment	0.883
Multivariate	0.886

Notes: 1: Includes the population and employment variables and the adjusted R^2 value is shown due to the use of multiple variables

Table 3-5 Enplanement Forecast

Year	Enplanements
2019	472,157
2021	482,252*
2026	549,930
2031	615,818
2036	681,781
2041	748,738
CAGR	2.12%

Notes: *This is the level of activity predicted by the regression model and does not reflect the actual enplanements, which were determined in the previous section.

3.2.2 Commercial Aircraft Forecast

Air carrier aircraft are expected to increase in use, becoming the dominate aircraft type for scheduled enplanements at busy airports like FAR. While it is expected that some commuter aircraft, like the popular 50-seat CRJ200, will remain in service for several years, they will be transitioned to smaller markets that better fit their capacity.

As shown in **Table 3-6**, load factors have remained near or above 80 percent while the average number of seats per aircraft have increased from around 70 at the beginning of the previous decade to above 80 in recent years. This, unsurprisingly, is due to the strong growth in enplanements seen in the past decade. The enplanements in 2019 are 30 percent greater than those experienced in 2010, which also reflects an annual Compound Annual Growth Rate (CAGR) of 3 percent. This supports continued growth of air carrier aircraft to become the dominant aircraft at FAR. This follows both local trends of passenger growth with fleet mix and national air carrier industry trends, which is reported in the 2021-2041 Aerospace Forecast to increase by 4.2 percent CAGR for the planning period.

Air carrier operations are expected to increase significantly in conjunction with the reduction of the commuter fleet. The common 50-seat aircraft such as the CRJ200 and Embraer 145 are expected to give way to larger aircraft that can carry more passengers. This means that even with the enplanement growth expected at the Airport, the number of aircraft that frequent the terminal will not experience a perfect correlation of growth. Instead, as the previous master plan projected, a modest increase in terminal operations is expected as this transition unfolds. The current high number of average seats serving the Airport coupled with existing strong load factors also suggest that the market can sustain this transition while keeping load factors satisfactory for air service providers. The growth rate projected by the 2018 MP shows a growth of 0.79 in the number of scheduled passenger operations. This same number can be applied to the activity isolated in 2018. In 2018, there were 7,108 commuter operations and 7,720 air carrier operations, for a total of 14,828 scheduled air service operations. Below, in **Table 3-7** the growth rate determined by the previous master plan is applied to these operations to determine future operational growth. Although charter operations are a consistent presence at the Airport, they do not drive the same level of consistent demand.

Table 3-6 Commercial Operational Trends

Year	Load Factor	Average Seats	Enplanements
2010	76.6%	72.5	361,850
2011	78.8%	69.5	342,704
2012	79.5%	71.4	364,382
2013	80.6%	68.6	398,101
2014	81.8%	74.0	448,844
2015	86.5%	73.6	431,085
2016	84.4%	74.4	395,911
2017	80.4%	75.5	394,473
2018	76.7%	78.0	422,112
2019	81.9%	82.1	472,157

Source: DOT T100 Database

Table 3-7 Scheduled Air Service

Year	Air Carrier
2018	14,828
2023	15,424
2028	16,044
2033	16,689
2041	17,775
CAGR	0.79%

Notes: CAGR is shown for 2019 to 2041

3.3 PEAK ACTIVITY

Annual forecasts and other broad-spectrum levels of airport activity 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 when demand surpasses annual averages. As a result, it is important to identify and forecast peak periods.

Peak activity forecasts are presented in the following section to help determine what facilities will be required to accommodate the peak demand, or the design hour of the design day. According to ACRP 82, Preparing Peak Period and Operational Profiles, there are several design day definitions in use including the average day of the peak month, the average weekday in the peak month (AWDPM), the 15th busiest day of the year, the 30th busiest day of the year, or the 36th busiest day of the year. If planning is contingent on the absolute busiest periods of activity, it can lead to overestimation, overspending, and inefficiencies.

Additionally, it may be appropriate to use a different methodology to determine peak hour if the airport experiences significant schedule changes throughout the average week of the peak month. As a result, as described in this section, these peak activity forecasts focus on the average peak weekday during the peak month for passenger activity, rather than the typical average day of the peak month. Using this methodology accounts for additional schedule flights offered on a certain day of the week which impacts peak hour passengers and facility requirements.

3.3.1 Peak Hour Passengers

Peak activity forecasts should identify the "design hour" flow of passengers and aircraft. This approach provides sufficient facility capacity for most days of the year. The first step in this process is to determine the peak month using data from the DOT T100 Database. From 2015 to 2019, the average peak month was March, which averaged 9.5 percent of annual enplanements. These years range are shown in **Table 3-8** with the monthly passengers as a percentage of annual enplanements. In **Table 3-9** this percentage is applied to the forecasted future enplanements from the passenger forecast to determine peak month passengers.

Once peak month enplanements were determined, the air carrier schedule from March 2019 was analyzed to determine how seats were distributed according to the day of the week. Due to weekend airline operation levels being less than weekday levels, the number of departing seats for weekdays in March were evaluated to define the peak weekday as shown in **Figure 3-4**.

Table 3-8 Historic Monthly Passenger Enplanements Compared to Annual

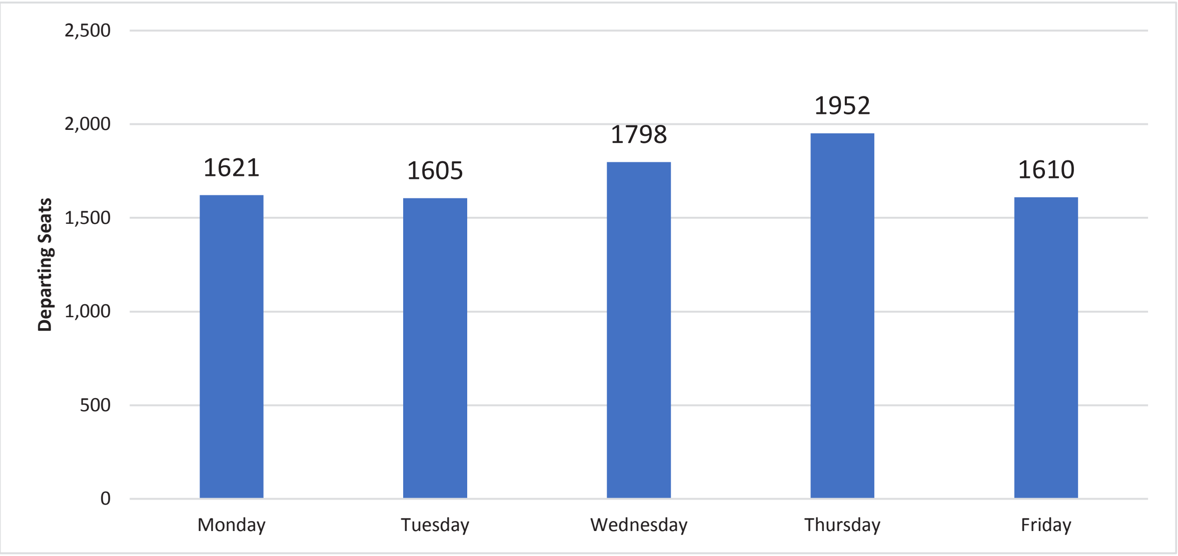
Variable	2015	2016	2017	2018	2019
Total	431,085	395,911	394,473	422,112	472,157
Monthly Average	35,924	32,993	32,873	35,176	39,346
Monthly Maximum	42,262	36,547	39,658	40,228	45,069
Peak Month	March	March	March	March	December
PM % of Year	9.8%	9.2%	10.1%	9.5%	9.5%

Table 3-9 Forecasted Peak Month Enplanements

Year	Annual Enplanements	Peak Month Percentage	Peak Month Enplanements
2019*	472,157	9.5%	44,855
2026	549,930	9.5%	52,243
2031	615,818	9.5%	58,503
2036	681,781	9.5%	64,769
2041	748,738	9.5%	71,130

Notes: 2019 is shown here as the base year as that was the most recent year to occur during normal conditions

Figure 3-4 Average Weekday Departing Seats for March 2019



Source: DOT T100 Database, March 2019

Typically, peak hours are determined by evaluating the peak hour of the average weekday of the peak month. However, since there was a significant 32% seat increase in the peak hour between the March 2019 Thursday schedule and March 2019 Wednesday schedule, as shown in **Table 3-10**, it was appropriate to use the Thursday schedule for this peak hour analysis to ensure the facility requirements captures this additional scheduled activity.

Table 3-10 Peak Hour Comparison (March 2019 Wednesday vs. March 2019 Thursday)

Criteria	Average Wednesday Peak Hour Departing Seats	Average Thursday Peak Hour Departing Seats
Seats	312	412

The peak hour increase between the Wednesday and Thursday was due to a 1x weekly Frontier Airlines flight to Denver, CO operated by a 186-seat aircraft, which remains in the February 2022 flight schedule. Following the peak weekday analysis, an average flight schedule of a Thursday in March 2019 was evaluated to determine the peak hour of the average peak weekday. The Thursday schedule that was evaluated was March 14, 2019. A summary of the average and selected day can be seen in **Table 3-11** and a copy of the selected day's schedule of March 14th can be found in Appendix F.

Table 3-11 Average and Selected Day Characteristics (March 2019)

Variable	Average Thursday		March 14, 2019	
	Departing	Arriving	Departing	Arriving
Passengers	1,952	1,952	1,953	1,953
Flights	24	24	24	24

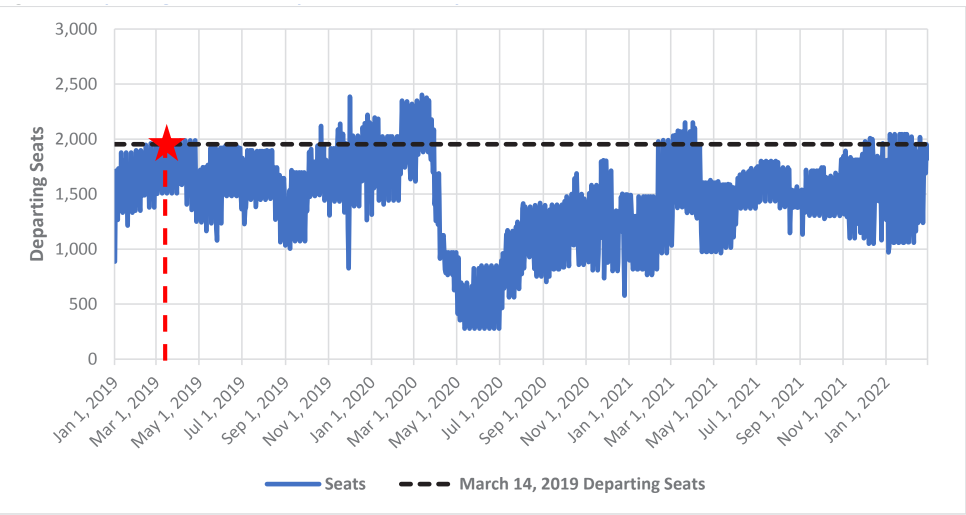
As previously mentioned, airline schedules have been deeply impacted throughout the pandemic and as the industry begins to experience a sense of recovery. To further justify using March 14, 2019 as the design day schedule for this peaking evaluation, the schedule impacts from COVID were considered by comparing the number of departing seats for this day with departing seats published in airlines schedules operating at FAR between January 2019 and March 2022. **Table 3-12** shows that March 14, 2019 was the 21st busiest day of the year by departing seats. Additionally, as shown in the results in **Figure 3-5**, right before the pandemic occurred between November 2019 and March 2020, FAR was consistently experiencing over 2,000 daily departing seats. This trend significantly dropped for the remainder of 2020, however, returned in the spring of 2021 when vaccines became more available. The airline schedules posted for January 2022 and February 2022 are also showing optimistic signs of recovery for FAR as daily departing seats are exceeding 2,000 seats—which is greater than January and February 2019 departing seats. The results of this analysis show that using March 14, 2019 with 1,953 departing seats for the design day schedule is appropriate as it's a valid average representation of activity in 2019 and early 2020 pre-pandemic, and the activity FAR is experiencing on its road to recovery.

Table 3-12 Ranking of FAR's Busiest Days by Departing Seats in 2019

Rank	Date	Seats	Rank	Date	Seats
1	Dec 1, 2019	2,385	19	Nov 24, 2019	1,963
2	Dec 26, 2019	2,220	20	Feb 21, 2019	1,962
3	Dec 29, 2019	2,150	21	Mar 14, 2019	1,953
4	Dec 22, 2019	2,144	21	Mar 21, 2019	1,953
5	Nov 17, 2019	2,139	21	Mar 28, 2019	1,953
6	Oct 21, 2019	2,118	24	Feb 14, 2019	1,948
7	Dec 19, 2019	2,105	25	Mar 7, 2019	1,947
8	Nov 14, 2019	2,087	25	Mar 31, 2019	1,947
9	Nov 21, 2019	2,046	27	Feb 28, 2019	1,941
10	Dec 30, 2019	2,037	27	Oct 16, 2019	1,941
11	Dec 5, 2019	2,031	29	Jun 7, 2019	1,939
11	Dec 12, 2019	2,031	30	Jun 10, 2019	1,938
13	Dec 23, 2019	2,016	30	Jun 14, 2019	1,938
13	Dec 27, 2019	2,016	30	Jun 17, 2019	1,938
15	Apr 4, 2019	1,988			
15	Apr 11, 2019	1,988			
15	Apr 18, 2019	1,988			
15	Apr 25, 2019	1,988			

Source: Diio Mi, FAR's 2019 Schedule

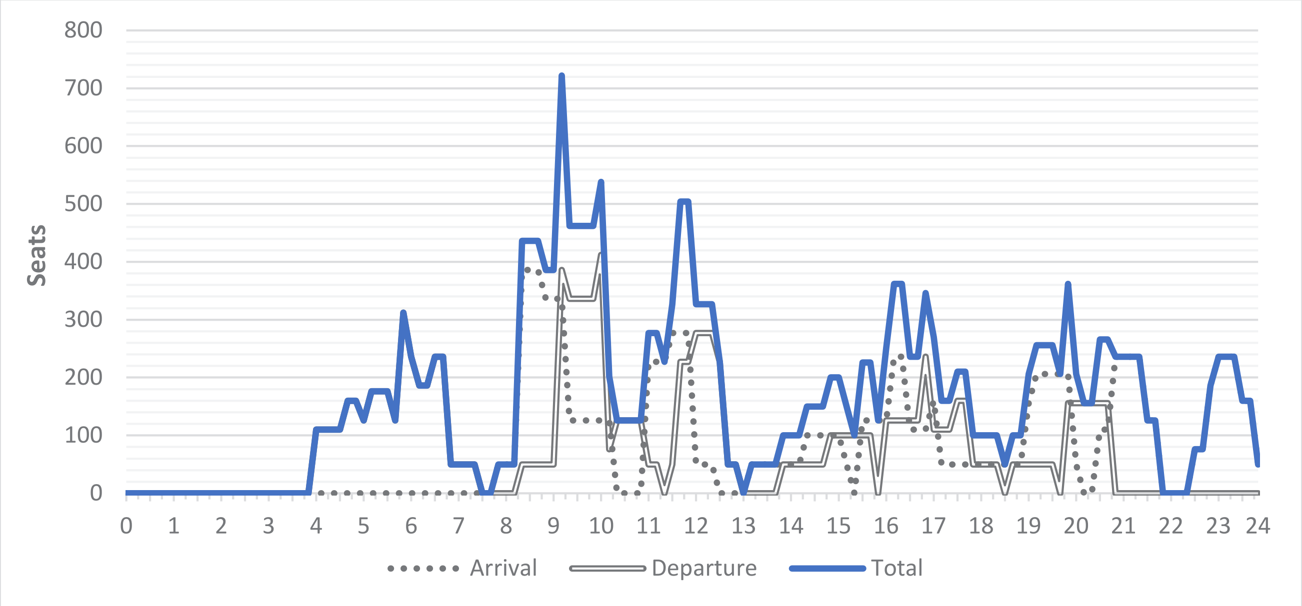
Figure 3-5 Departing Seats January 2019 - February 2022



Source: Diio Mi, January 1, 2019-February 28, 2022

To determine the peak hour characteristics at FAR, it was assumed that passengers arrive one hour prior to departure and remain at the Airport up to 60 minutes after arrival. The 60-minutes period was selected as it allows time for departing passengers to check in and make their way through security and navigate to their gate and for arriving passengers to navigate the airport, collect their baggage, and find or coordinate transportation from the Airport. Each hour was divided into 10-minute periods to evaluate the total number of passengers at the Airport at a given time. On the day selected, different types of operations were represented. These include the legacy carriers, such as Delta, United, and American, as well as some of the more intermittent weekly operations conducted by carriers such as Allegiant and Frontier but do not include charter operations due to their less frequent nature. **Figure 3-6** shows the hourly seats during this day.

Figure 3-6 Hourly Seats



Source: ACRP Report 25 Tool, Airport Records

The peak period for departing seats was found to be from 10:10 a.m. to 11:09 a.m., with departures from Allegiant, Frontier, and Delta. Arriving seats also peak in the morning from 8:30 a.m. – 9:29 a.m. with arrivals from Allegiant, Frontier, and Delta. The peak time of the day is between the 9:20 a.m. to 10:19 a.m. During this time, a total of 722 seats are considered active. As the selected day had a total of 3,906 arriving and departing seats, this means that 18.5 percent of daily seats were active during the peak hour, as shown in **Table 3-13**.

Table 3-13 Forecasted Peak Month Seats

Seat Type	Peak Hour Time	Peak Hour Seats	Seats Daily Total	% of Daily
Peak Arriving Seats	8:30 a.m. – 9:29 a.m.	386	1,953	19.8%
Peak Departure Seats	10:10 a.m. – 11:09 a.m.	412	1,953	21.1%
Peak Combined Seats	9:20 p.m. – 10:19 p.m.	722	3,906	18.5%

As stated, enplanements are typically more demanding on the facilities they use than arriving passengers. Enplanements were isolated and the future enplanements forecasted in **Section 2.2.1** can be used to forecast future peaking characteristics. For this peak hour forecast, the average departing load factors for March, 2019 were applied to the March 14, 2019 departing seats to estimate the number of daily enplanements. The load factors applied are shown in **Table 3-14**.

Table 3-14 March, 2019 Load Factor

Airline	March, 2019 Average Load Factor
American	77.97%
Delta	85.86%
Frontier	82.67%
Allegiant	90.02%
United	82.34%

Source: DOT T100 Database, March 2019

The estimated enplanements on March 14, 2019 were calculated to be 3.7% of the total peak month enplanements. This percentage was applied to the forecasted year to get the estimated peak day enplanements. On March 14, 2019, peak hour enplanements were 21.1% of the total day's enplanements. This percentage was applied to future years to determine the forecasted peak hour enplanements.

The estimated peak hour for deplanements was evaluated with a similar methodology. The estimated deplanements on March 14, 2019 were also calculated to be 3.7% of the total peak month deplanements. This percentage was applied to the forecasted year to get the estimated peak day deplanements. On March 24, 2019, peak hour deplanements were 19.8% of the total day's deplanements. This calculation was used for the forecasted period. The peak hour results are shown in **Table 3-15**.

Table 3-15 Forecasted Peak Hour Enplanements and Deplanements

Year	Peak Month Enplanements	Selected Day %	Selected Day Enplanements	Peak Hour % of Daily	Peak Hour Enplanements
2019	44,855	3.7%	1,666	21.1%	352
2026	52,243	3.7%	1,941	21.1%	410
2031	58,503	3.7%	2,173	21.1%	459
2036	64,769	3.7%	2,406	21.1%	508
2041	71,130	3.7%	2,642	21.1%	558

Year	Peak Month Deplanements	Selected Day %	Selected Day Deplanements	Peak Hour % of Daily	Peak Hour Deplanements
2019	44,797	3.7%	1,666	19.8%	333
2026	52,176	3.7%	1,931	19.8%	383
2031	58,428	3.7%	2,162	19.8%	429
2036	64,686	3.7%	2,394	19.8%	474
2041	71,039	3.7%	2,629	19.8%	521

Notes: 2019 is shown here as the base year as that was the most recent year to occur during normal conditions.
Source: Diio Mi, March 14, 2019 was used as the PMWD.

3.3.2 Peak Hour Commercial Operations

One of the primary reasons to consider peak hour operations is that if multiple aircraft intend to use facilities simultaneously beyond its capacity, this can lead to congestion and delays. The focal point of peaking operations is the terminal area, and its passenger boarding bridges. Currently, the Airport passenger terminal has five gates. It is important to consider that the peak number of operations that use the terminal may not be the same month where peak enplanements occur.

For the enplanements peak hour above, 2019 was used to reflect typically activity levels. For operations information, it was determined that 2021 could be used as flight schedules have begun to return to normal even as the passenger numbers are catching up. A key factor in detecting the most demanding peak hour period is to not look at the busiest overall days but how flights are scheduled during that day. Days may have overall similar level of activity, but airline scheduling needs and specific gate demand may influence peaking characteristics. Airport data from 2021 is shown in **Table 3-16**.

As the Airport reports terminal operations, it is easy to isolate the month with the greatest level of activity. In 2021, the Airport reported 6,396 departures with the peak number of operations occurring in July, which had 610 departures or 9.5 percent of the annual amount. This is consistent with a review of the past five years of flight operations from the DOT T100 database. In **Table 3-17**, this percentage can be applied to future levels of operations to determine the number of operations in the peak month.

Table 3-16 2021 Terminal Departures Seats

Year	Terminal Departures	Percentage of Annual
January	455	7.1%
February	432	6.8%
March	572	8.9%
April	525	8.2%
May	515	8.1%
June	565	8.8%
July	**610**	**9.5%**
August	575	9.0%
September	554	8.7%
October	532	8.3%
November	551	8.6%
December	510	8.0%
Total	**6,396**	**100%**

Table 3-17 Forecasted Peak Month Operations

Year	Annual Operations	Peak Month Percentage	Peak Month Operations
2018	14,828	9.5%	1,409
2026	15,424	9.5%	1,465
2031	16,044	9.5%	1,524
2036	16,689	9.5%	1,585
2041	17,775	9.5%	1,689

The average day during July was shown to have 20 arriving and 20 departing flights. To best match this level of demand the day July 11th, 2021 was selected, having the same number of operations. In addition, one departing charter flight was added to this day to capture the presence of these operations. A copy of the full schedule used for this day is available in **Appendix G**. Similar to passengers, air carrier aircraft must take time to prepare after arrivals and departures. This can include enplaning or deboarding passengers, cleaning the aircraft (which has grown more demanding since the enactment of COVID protocols), and aircraft fueling. When the schedules are considered with the hours divided into 10-minute increments, the peak hour was determined to occur at 5:20 p.m. The activity during that day can be seen in **Figure 3-7** and **Table 3-18**.

Figure 3-7 Hourly Operations

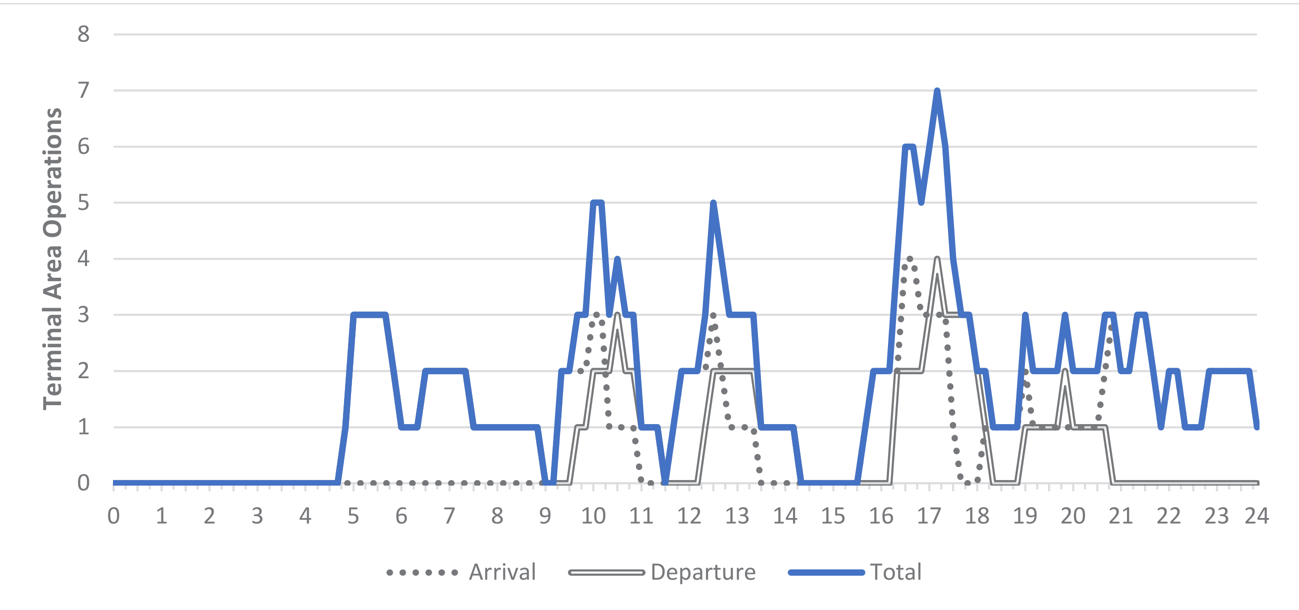


Table 3-18 Forecasted Peak Hour Operations

Operation Type	Peak Hour Time	Peak Hour Operations	Operations Daily Total	% of Daily
Peak Arriving Flight	4:40 p.m. – 5:39 p.m.	4	20	20.0%
Peak Departure Flight	5:20 p.m. – 6:19 p.m.	4	20	20.0%
Peak Combined Flight	5:20 p.m. – 6:19 p.m.	7	40	17.5%

These percentages can then be applied to the commercial operations forecast developed in **Section 2.2.2**. To plan for terminal area needs, the intent is to identify any aircraft expected to use the terminal gates. Air carrier aircraft, as categorized by the FAA, are those that have more than 60 seats or weight greater than 18,000 pounds. Similarly, air taxi aircraft are often small aircraft that may include business jets or smaller cargo aircraft. These aircraft will generally utilize private business hangars or the FBO instead of the terminal. With the focus being on terminal utilization, July was determined to be the peak month based on Airport records. This can then be divided by 31, as July has 31 days, and then the percentage of peak hour operations determined above can be applied. Shown in **Table 3-19**, this process projects a growth from the current peak hour activity to 10 peak hour operations.

Table 3-19 Forecasted Peak Hour Operations

Year	Peak Month	Average Day of Peak Month	Peak Hour % of Daily	Peak Hour Operations
2021*	1,409	45	17.5%	7
2026	1,465	47	17.5%	8
2031	1,524	49	17.5%	9
2036	1,585	51	17.5%	9
2041	1,689	54	17.5%	10

Notes: *2021 reflects recent data and is not calculated from the percentage shown

4.0 TERMINAL PROGRAMMING

The following section summarizes assumptions used to develop facility requirements for the key functional areas of the terminal building. Terminal facility requirements were developed based on meetings with FAR staff, TSA, concessionaires, airlines, and rental car companies, a walk-through site evaluation, knowledge of industry-wide trends, and published guideline including International Air Transport Association's (IATA) Airport Development Reference Manual (ADRM), FAA Advisory Circular (AC) 150/5360-13, Planning and Design Guidelines for Airport Terminal Facilities, and ACRP-25 Airport Passenger Terminal Planning and Design. Facility requirements were generated for aircraft parking positions/gates, ticketing area and airline ticket offices, passenger security screening, departure lounges, concessions, restrooms, baggage handling systems and baggage makeup areas, baggage claim, and airport administrative areas. Terminal facility requirements are developed for the peak hour, identified in the forecast section of this document to determine the Airport's needs to accommodate future growth. Secondary functions such as circulation and "back of house" space were also considered in the analysis.

4.1 AIRCRAFT GATE PARKING POSITIONS

The number of gates necessary to support forecast activity is a critical element in determining the overall size and configuration of the terminal complex. There are currently five gates at FAR, all of which have passenger boarding bridges. The only preferential-leased gate is Gate 2, held by Delta Air Lines. All other gates are common use. There are seven additional aircraft parking positions around the perimeter of the apron, which includes a recent apron expansion near the terminal building. However due to the inclement climate of Fargo, North Dakota and staffing issues, towing aircraft on and off the remote apron has remained a challenge.

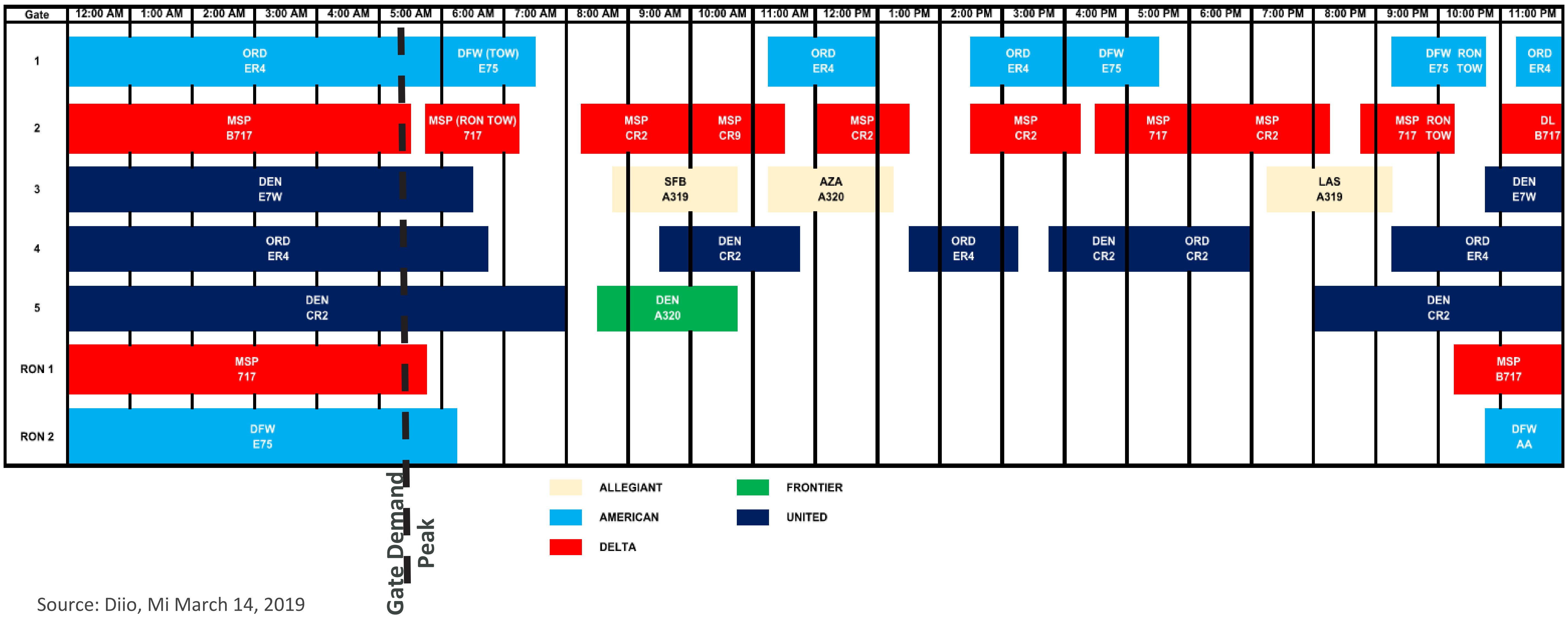
To forecast gating requirements for future activity at FAR, a design day schedule was developed based on an average peak weekday of the peak month in 2019. For the existing design day schedule, Thursday, March 14, 2019 was used, as discussed in **Chapter 3**. To consider the schedule impacts of COVID-19 and FAR's recovery, this day's schedule was compared to March 11 and March 18, 2021, also Thursdays in the peak month. Although the daily departures were 22 on these average days of the peak month in 2021, compared to 24 in 2019, the peak hour gate usage remained unchanged at five.

The peak hour on the existing design day at FAR occurred between 10:00 a.m.-11:00 a.m. As shown in **Table 4-1**, the existing design day's departures were 24 with peak hour departures being three. Additionally, as shown in both **Table 4-1** and **Figure 4-1**, the peak gate demand was seven with five aircraft being parked at the gates and two parked on the remain overnight (RON) apron.

		Existing (2021)		
Airlines	**Seats per aircraft**	**ADPM peak hour departures**	**ADPM departures**	**Remain overnight aircraft**
American Airlines				
ERJ-145	50	0	3	1
Embraer 175	76	0	2	1
Frontier Airlines				
Airbus A320	180	1	1	0
Delta Air Lines				
CRJ200	50	0	4	0
CRJ900	76	1	1	0
Boeing B717	110	0	3	2
Allegiant				
Airbus A319	156	1	2	0
Airbus A320	177	0	1	0
United Airlines				
ERJ-145	50	0	2	1
CRJ200	50	0	4	1
Embraer 175-EW	76	0	1	1
Total		**3**	**24**	**7**
Source: Schedule obtained from Diio Mi				

Table 4-1 Existing ADPM Flight Schedule Analysis

Figure 4-1 Existing Baseline Current Flight Schedule



Source: Diio, Mi March 14, 2019

To determine future gating requirements, a future design day schedule was developed based on operational growth rates defined in the forecasts and conversations with the air carriers. Using these sources, the following modifications and assumptions were made to the existing design day schedule to develop the future design day schedule:

OVERALL

1. 30-minute buffer before arrival time to allow for delay and 30-minute buffer following departure time to allow for flight delays.
2. No tow-on/tow-off operations.
3. Three gates were considered common-use, or first right-of-refusal, to accommodate new entrant carriers, Allegiant and Frontier.

ALLEGIANT

1. BNA, AZA, SFB, PIE, and LAS were served on the design day.

AMERICAN

1. Upgauge all ORD routes currently served by E45 and CR7 aircraft to E75 aircraft.
2. Upgauge all DFW routes to A319 aircraft.
3. An additional ORD route was added to capture a mid-day American departure bank at ORD.

DELTA

1. ATL was added with an A320 and considered a RON.
2. Upgauge all regional aircraft to either E75 or mainline aircraft except a CR9 route departing at 10:53.

FRONTIER

1. MCO was added and departed at 18:13.
2. DEN departed at 10:05.

UNITED

1. Upgauge all regional aircraft to an E7W or mainline aircraft.
2. An additional ORD route was added at 11:40 to align with a mid-afternoon United departures bank at ORD.

NEW ENTRANT CARRIER

1. This design day schedule added a new entrant carrier operating a mid-morning departure to PHX.

As shown in **Table 4-2**, the peaking activity for gate usage increased through the planning horizon by having 4 departures during the peak hour, 31 departures during the average day of the peak month, and 8 RON aircraft. **Figure 4-2** further shows the future design day schedule and how the future gate requirement increases to nine over the planning horizon with eight aircraft remaining overnight and one gate as a buffer for maintenance buffers or to accommodate an unscheduled charter.

		Proposed (2041)		
Airlines	Seats per aircraft	ADPM peak hour departures	ADPM departures	Remain overnight aircraft
American Airlines				
Airbus A319	128	0	1	1
Embraer 175	76	0	5	1
Frontier Airlines				
Airbus A320	186	1	2	0
Delta Air Lines				
CRJ900	76	0	1	0
Embraer 175	76	0	3	0
Airbus A319	132	1	2	0
Airbus A320	157	0	2	2
Airbus A321	191	0	1	1
Allegiant				
Airbus A319	156	1	2	0
Airbus A320	177	0	3	0
New Entrant				
Boeing 737-800	186	0	1	0
United Airlines				
Airbus A319	126	0	3	2
Embraer 175 EWT	76	1	5	1
Total		4	31	8

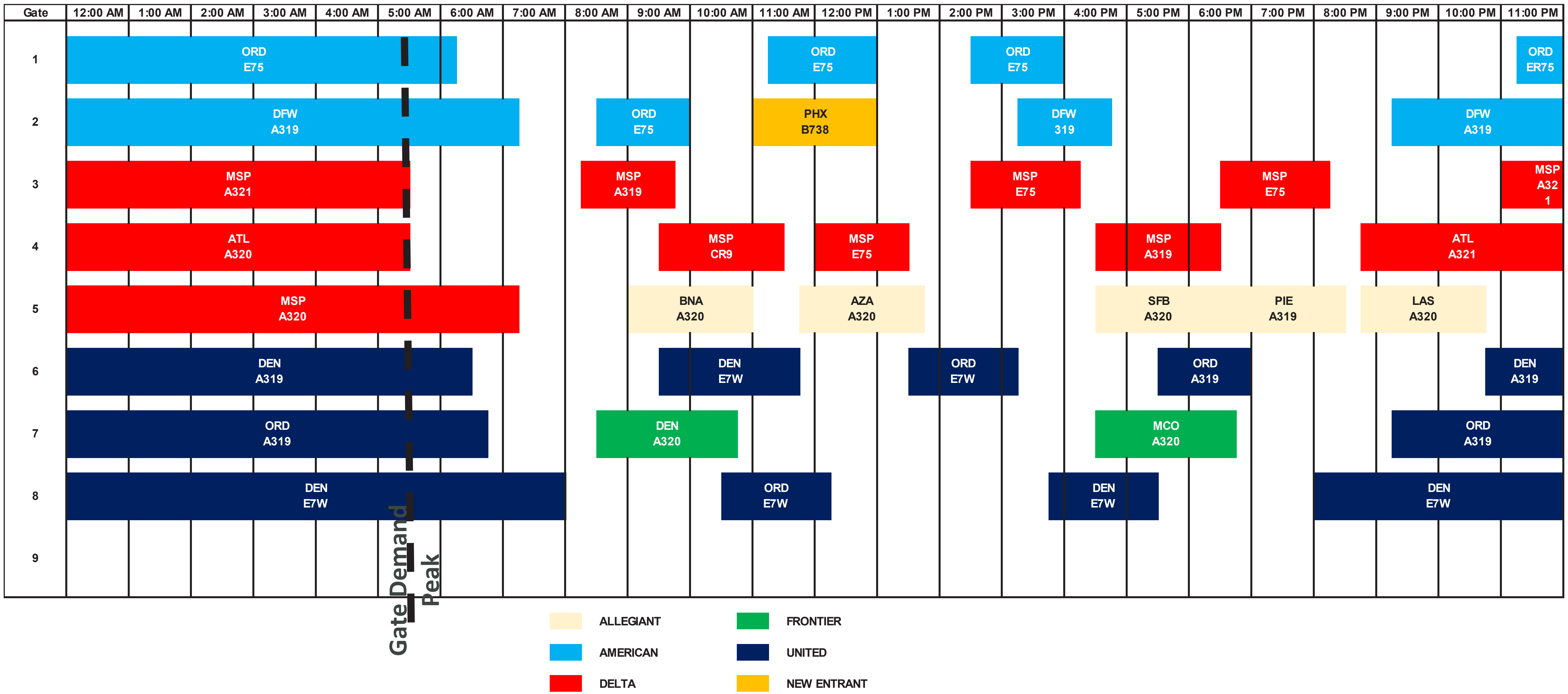
Note: Peak hours may occur at different times of the day, depending on the airline.
Source: Mead and Hunt, 2021

Table 4-2 2041 ADPM Design Day Schedule

To determine future gate demand during various airlines leasing environments, an evaluation was conducted for both common-use and preferential use scenarios. In the common-use scenario it was assumed that the gates were available to the airlines on a common-use basis, meaning that gates would not be assigned to a specific airline and would be allocated as needed. All airlines operating at FAR were included in the common-use scenario, in which eight gates would be required for the terminal program, as shown in **Figure 4-2**. This scenario has a new entrant operating at a gate primarily used by American, Delta parking an RON at a gate primarily used by Allegiant, and United parking an RON at a gate primarily used by Frontier.

In the preferential use scenario, it was assumed airlines with a preferential use agreement would be given priority for gates over other airlines for the processing of their flights. However, gates would not be exclusive to any airlines and airlines could still utilize preferential gates as needed. Utilizing the same schedule format as the common-use scenario, nine gates would be required. The new entrant and Frontier would be able to share the ninth gate, while Allegiant had their own gate, and United and Delta would have to park their third RON at a remote parking stand.

Figure 4-2 Future Design Day Flight Schedule



Source: Mead and Hunt, 2022

4.2 AIRLINE CHECK-IN

Currently, most passengers checking in at FAR use full-service counters. Six self-service kiosks are available; however, passengers still must go to a full-service counter if they want to check a bag. Over the planning period, it is assumed passengers will start using self-service kiosks with bag tagging capabilities. Once the bag is tagged by the passenger, they will drop the bag off at a full-service position or bag-drop station. As check-in technologies emerge, it is assumed over-time, more passengers will utilize mobile devices or check-in remotely prior to arriving at the Airport. These passengers can either bypass the check-in area and proceed to the security screening checkpoint directly if they do not have bags to check, or utilize the self-serve kiosk/bag-drop option. FAR currently does not offer curbside check-in services. It was assumed that such a service would not be introduced during the planning period.

Five airlines currently serve FAR (Allegiant, Frontier, American, United, and Delta). Airline check-in operations are exclusive to each airline. While programming for check-in facilities, conversations were held with Allegiant, Frontier, American, United and Delta to discuss their requirements in the check-in area during the planning period. The majority of Airlines favored an exclusive-use operation in the check-in area to maintain their proprietary systems, however, some were open to a common-use system if the Airport was equipped with the proper infrastructure. During these conversations, the airlines provided a defined number of full-service positions and kiosks that will be required to handle existing demand and future growth, in the event the Airport continues with an exclusive-use arrangement with the Airlines throughout the planning horizon. Check-in facility requirements for this study were calculated based on a combination of future space requirements provided by the airlines' explanation of potential future growth at FAR and queuing planning factors identified in IATA's ADRM.

Table 4-3 Check-In Area Space Requirements

	Exis.	2021	2026	2031	2036	2041
Units	ea	ea	ea	ea	ea	ea
Full-Service	21	24	26	26	26	26
Bag Drop	0	4	4	5	5	6
Self-Serve Kiosk	6	8	10	14	16	16
Area Totals						
Check-in counter area	1,911	1,670	1,810	1,810	1,810	1,810
Check-in queue area	2,469	3,108	3,621	4,054	4,489	5,740
Kiosk queue area	-	320	408	571	653	653
Ticket office area	3,067	3,312	3,588	3,588	3,588	3,588
Circulation (25% of total area)	1,095	1,275	1,460	1,609	1,738	2,051
Grand Total Area	**8,542**	**9,685**	**10,886**	**11,631**	**12,277**	**13,841**
Est. surplus/deficiency compared with existing	**-**	**1,143**	**2,344**	**3,089**	**3,735**	**5,299**

Notes:
1. Frontier stated their growth at FAR won't require more than 4 FSP.
2. Delta stated their growth at FAR won't require more than 6 FSP.
3. Allegiant stated their growth at FAR won't require more than 4 FSP.
4. American stated their growth at FAR won't require more than 4 FSP.
5. United stated their growth at FAR will include additional kiosks and bag-drop positions.
6. As more passengers utilize self-serve kiosks/bag-drop, full-servce positions can be reconfigured into bag-drop positions.

Table 4-3 identifies the check-in area space requirements for FAR based throughout the planning horizon. The existing check-in area comprises of 8,542 square feet and is currently undersized to accommodate existing and future demand. This is clearly visible as significant congestion occurs in the check-in area during peak hours, requiring queuing to overflow into circulation space or into the entrance vestibules. By the end of the planning period, 26 counters, 6 full-service bag drops, and 16 self-service kiosks will be required to support forecast enplanements, housed within a total of 13,841 square feet to accommodate check-in operations, airline ticket offices, and circulation.

4.3 CHECKED BAGGAGE SCREENING

Checked baggage screening accommodates the facilities and equipment used to transfer bags from the check-in area to the baggage screening area, and from the baggage screening area to the outbound baggage area. The baggage screening room accommodates explosive detection system (EDS) units, on-screen resolution stations, explosive trace detection stations, baggage circulation, storage for TSA supplies. The existing baggage screening room is located directly between the check-in counters and outbound baggage space.

Checked baggage screening space requirements for checked baggage screening considers the number of baggage screening devices and conveyor equipment system configuration, baggage processing rates, and clear and/or alarm bag rates. For FAR, the following parameters were obtained from TSA and the Airport, and were used to project future space requirements for checked baggage screening:

- Percent of passengers checking bags: 70 percent
- Average bags per passenger: 1.2 bags per passenger
- EDS screening equipment throughput rate: 200 bags per hour

Table 4-4 displays the results of the future space requirements for checked baggage screening. By 2041, the facility will need to be reconfigured or expanded to accommodate one additional EDS unit.

Table 4-4 Baggage Screening Space Requirements

Outbound Baggage Screening Requirements	Exis.	2021	2026	2031	2036	2041
Baggage						
Number of Bags Required Through EDS Units	368	368	287	467	512	558
Number of EDS Units	2	2	3	3	3	3
Number of Bags Required Through OSR Stations	92	92	105	117	128	139
Number of OSR Stations	2	1	1	1	2	2
Number of Bags Through ETD Units	30	30	35	38	42	46
Number of ETD Units	1	1	1	1	1	1
Peak Hour Passengers Checking-In	352	352	410	459	508	558
Total Bags to Process in Peak Hour	368	368	422	467	512	558
Area (Square Footage)						
Square Footage for Baggage Screening	-	1,740	2,540	2,540	2,580	2,580
Baggage Screening Circulation	1,088	435	635	635	645	645
Grand Total Area	**1,088**	**2,175**	**3,175**	**3,175**	**3,225**	**3,225**
Est. surplus/deficiency compared with existing	**-**	**1,087**	**2,087**	**2,087**	**2,137**	**2,137**

4.4 OUTBOUND BAGGAGE MAKEUP

Outbound baggage makeup consists of the areas designated for outbound bags to be sorted, handled, and placed on baggage carts for the departing flight following the baggage screen process. This area also consists of ground service equipment circulation. This function occurs just north of the ATO's and checked baggage screening areas. As mentioned in **Chapter 2**, the outbound baggage makeup area accommodates seven baggage carts staged perpendicular to the outbound baggage carousel. Staging carts perpendicular presents safety and operational challenges as a tug blocks the ground service equipment right-of-way while connecting carts. The number of gates, the number of departures per gate, and the number of carts per gate are evaluated to determine outbound baggage requirements. The following assumptions and space allowances were used in this analysis:

- Number of departures in a two-hour period the number of departures in a two-hour period determines how many carts are staged per departure and arrival.
- Number of carts per gate. Approximately three carts are required per turn was assumed.
- Space allowances. 600 SF was provided for each staged cart. An additional 10% of the entire outbound baggage space was added for GSE maneuverability

Outbound baggage make-up requirements are presented in **Table 4-5**. Baggage make-up functions are currently located in a 4,251 square-foot covered space. According to the future design day schedule, outbound baggage will need to accommodate enough space to handle 7 departures within the peak 2 hour period. Therefore, 17,820 square feet is required for outbound baggage facilities.

Table 4-5 Outbound Baggage Space Requirements

Outbound Baggage Makeup Area	Exist.	2021	2026	2031	2036	2041
Departures						
Expected # of Departures (Within a Two-Hour Staging Area)	-	6	7	7	8	9
# of Carts Staged (3 Per Departure)	-	18	21	21	24	27
Cart Staging SF (600 SF Per Cart)	-	10,800	12,600	12,600	14,400	16,200
Area Totals (Square Footage)						
GSE Maneuverability Allowance		1,080	1,260	1,260	1,440	1,620
Grand Total Area	**4,251**	**11,880**	**13,860**	**13,860**	**15,840**	**17,820**
Est. surplus/deficiency compared with existing	**-**	**7,629**	**9,609**	**9,609**	**11,589**	**13,569**

4.5 SECURITY SCREENING CHECKPOINT

FAR currently has a two-lane configuration and expected to receive a third lane in the summer of 2022 which will allow for two standard security lanes and one PreCheck lane. Programming space requirements for the security screening checkpoint includes evaluating existing and future peak hour demand, throughput rates, achieving optimal wait times, and screening equipment requirements.

The following assumptions were assumed with the Security Screening Checkpoint program:

- Passenger Demand: the peak 30-minute passenger demand was used for the future design day schedule.
- Additional Demand: A 12% factor was added to account for employees and crew going thought the checkpoint
- Type of Passengers: A 40%/60% split was used to determine Pre-Check/Standard passenger demand. Each lane type had its own processing rate and queue wait times.
- Passenger Throughput: A throughput of 150 passengers per hour per lane was used for standard lanes. A throughput of 240 passengers per hour per lane was used for PreCheck lanes.
- Maximum Wait Times: Passengers using standard lanes had a maximum wait time of 10 minutes while passengers using PreCheck lanes had five minutes. This wait time is consistent with the recommendation in IATA ADRM for an optimum level of service.
- Security equipment space requirements: standard space allowances from the Checkpoint Requirements and Planning Guide were used.

Table 4-6 Security Screening Checkpoint

Security Screening Checkpoint Requirements						
	Exis.	2021	2026	2031	2036	2041
Lanes						
Regular Checkpoint Lanes	2	2	2	2	2	2
Pre-Check Lanes	1	1	1	1	2	2
Total Checkpoint Lanes Required	3	3	3	3	4	4
Area Totals (Square Footage)						
Checkpoint Screening Area	3,056	3,600	3,600	3,600	4,800	4,800
Checkpoint Queue Area	737	1,800	1,800	1,800	2,400	2,400
Exit Lane	370	800	800	800	800	800
Grand Total Area	**4,163**	**6,200**	**6,200**	**6,200**	**8,000**	**8,000**
Est. surplus/deficiency compared with existing	-	**2,037**	**2,037**	**2,037**	**3,837**	**3,837**

The security screening checkpoints requirements are shown in **Table 4-6**. By the end of the planning period, the number of lanes will need to increase from three to four to handle expected passenger flows. Approximately 8,000 square feet of space will be allocated to passenger screening functions.

4.6 DEPARTURE LOUNGES

The basis for calculations of departure lounge requirements is the number of gates. Departure lounge space requirements are a function of the aircraft seating capacity per gate, average aircraft load factor, the physical layout of the departure lounge, and the number of seated vs. standing passengers. The departure lounge requirements are shown in **Table 4-7**.

Table 4-7 Departure Lounge Space Requirements

Departure Lounge	
Aircraft Seats	190
Load Factor (%)	85%
Design Passengers (pax)	162
Passengers @ 90% Seated (pax)	146
Passengers @10% Standing (pax)	16
Seating Area @ 19 SF Per Passenger (sf)	2,774
Standing Area @16 SF Per Passenger (sf)	258
Departure Lounge Depth (feet)	35
Gate Agent Positions (ea)	2
Two (2) Gate Agent Podium (sf)	195
Boarding/Egress Aisle (sf)	210
Waiting Area (sf)	2,729
Total Area Required Per Narrowbody Gate	3,135
Existing Holdroom Area	8,564
Area Required for Terminal Progam (9 Gates)	**28,215**
Est. surplus/deficiency compared with existing	**19,651**

A 190-seat aircraft requires 3,134 square feet of departure lounge space. This results in a total requirement of 28,215 square feet of departure lounge space by the end of the terminal planning period, an increase of 19,651 square feet over the existing terminal building.

4.7 BAGGAGE CLAIM AND INBOUND BAGGAGE HANDLING

Baggage claim requirements are a function of peak 20-minute for deplanements, number of passengers checking bags, number of bags per passenger, number of additional people in the claim area, lineal feet of carousel per carousel, and baggage service offices.

The current amount of linear feet of claim display at FAR will be sufficient through the planning period, however, circulation and additional space to account for baggage service offices should be added. The bag claim area will need to encompass 9,628 square feet, which includes space for baggage service offices, circulation, and meeter/greeter area.

Space designated for inbound baggage includes space used for GSE circulation and equipment facilitating the transfer of bags from the baggage carts to the carousel. Currently, FAR has three L-shaped carousels where ground operators pull the baggage carts parallel to the carousel and offload bags. This type of operations is assumed to continue throughout the planning horizon. **Table 4-8** shows the baggage requirements.

Table 4-8 Baggage Claim and Inbound Baggage Space Requirements

Baggage Claim and Inbound Baggage Makeup Area Requirements						
	Exis.	2021	2026	2031	2036	2041
Unit Totals						
Peak 20-Minute Terminating Passengers Checking Bags	128	128	147	165	182	201
Total Number of People at Claim	108	107	123	138	153	168
Total Claim Frontage Required	291	172	197	221	245	269
Number of claim units (100 lf/carousel)	3	2	3	3	3	3
Area Totals (Square Feet)						
Baggage Claim Area	7,521	4,600	4,600	6,900	6,900	6,900
Baggage Service Offices	-	400	400	480	480	560
Public Cirulcation in Claim Area	Incl.	1,250	1,250	1,845	1,845	1,865
Inbound Baggage Offload Area	2,398	3,700	4,300	4,700	5,200	5,600
Grand Total Area	**9,919**	**9,950**	**10,550**	**13,925**	**14,425**	**14,925**
Baggage Claim Area - Estimated surplus/deficiency (-) compared with existing facility	-	**1,271**	**1,271**	**1,704**	**1,704**	**1,804**
Inbound Baggage Area - Estimated surplus/deficiency (-) compared with existing facility	-	**1,302**	**1,902**	**2,302**	**2,802**	**3,202**

4.8 CONCESSIONS

A concessions program in includes food and beverage, retail, and concessions support space throughout the Airport. In general, the potential commercial demand at an airport is driven by the passenger characteristics and the travel profiles of enplaning passengers. Future required concession space is typically expressed in square feet per 1,000 annual enplanements. For this study, it was assumed that 10.2 to 12.6 SF per 1,000 annual enplanements was used throughout the planning horizon. Concession space requirements can be found in **Table 4-9**. A more detailed analysis of FAR's forecasted concession demand can be found in **Appendix D**.

Table 4-9 Concessions Space Requirements

Concessions							
		Exis.	2021	2026	2031	2036	2041
Pre-secure concessions							
Food & Beverage	sf	4,021	900	1,150	1,375	1,575	1,800
Retail	sf	1,297	175	250	325	425	550
Post-secure concessions							
Food & Beverage	sf	2,094	2,700	3,450	4,125	4,725	5,400
Retail	sf	211	525	750	975	1,275	1,650
Concessions support and storage							
Food & Beverage support	sf	2,099	900	690	825	945	1,080
Retail support	sf	0	105	100	130	170	220
Rental car concessions							
Rental car offices	sf	1,395	1,900	2,090	2,299	2,529	2,782
Queuing area	sf	0	400	400	400	400	400
Grand Total Area	**sf**	**11,117**	**7,605**	**8,880**	**10,454**	**12,044**	**13,882**
Est. surplus/deficiency compared with existing	**sf**		**3,512**	**2,237**	**663**	**927**	**2,765**

4.9 RESTROOMS

Programming for restroom spaces consists of defining the space required to accommodate demand for men's and women's fixtures, family restrooms, janitor closets, and mother's nursing stations. Programming for restroom facilities at FAR followed guidance from ACRP Report 130: Guidebook for Airport Terminal Restroom Planning and Design and used the following assumptions:

- 70 SF per fixture, 70 SF per family restroom, 100 SF per janitor's closet, 80 SF per nursing station
- Pre-security restroom requirements are based on the peak hour of passengers with a 1.25 visitor ratio.
- Post-security requirements are based on the peak 20-minute passenger demand assuming 60% of passengers are using the restrooms.
- Gender restroom splits include a proportion of 40 percent men to 60 percent women.
- The analysis included space for a janitor's closet and family restroom on the secure side.
- Projections included a mother's nursing station.

Table 4-10 Restroom Space Requirements

Restrooms							
		Exis.	**2021**	**2026**	**2031**	**2036**	**2041**
Pre-security men fixtures	fixtures	14	8	8	9	9	10
Pre-security women fixtures	fixtures	12	12	12	14	14	15
Pre-security restroom area	sf	1,760	1,400	1,400	1,610	1,610	1,750
Post-security men fixtures	fixtures	7	10	10	11	12	14
Post-security women fixtures	fixtures	7	15	15	17	18	21
Post-security restroom area	sf	1,116	1,750	1,750	1,960	2,100	2,450
Janitor closet area	sf	238	155	200	200	200	200
Family restroom module area	sf	71	280	280	280	280	280
Nursing room	sf	31	80	80	80	80	80
Animal service relief area	sf	0	0	200	200	200	200
Subtotal	**sf**	**3,216**	**3,665**	**3,910**	**4,330**	**4,470**	**4,960**
	men fixtures	**21**	**18**	**18**	**20**	**21**	**24**
	women fixtures	**19**	**27**	**27**	**31**	**32**	**36**

The results of the analysis are shown in **Table 4-10**. By the end of the planning, a total of 4,960 square feet of restroom space will be required.

4.10 CIRCULATION

Adequate circulation is critical to move passengers from one functional area to the next in an efficient and comfortable manner. Often times, circulation is based on available space created by another functional area or constraint such as concourse width or limited area adjacent to a check-in or passenger security screening functions due to changes in processes over the years. Circulation is typically split into two areas: secure and non-secure. Minimum clear circulation widths for public areas are 25 feet between major functional elements such as check-in. For a single-loaded concourse, 20 feet minimum is recommended. For non-public areas, such as back of house spaces, office space, etc. the width should be determined by the function (i.e. moving supplies in a corridor near a loading dock) like safety/egress, accessibility and local building codes.

4.11 SUPPORT AND BUILDING SYSTEMS

Support functions, such as operations, maintenance, building systems, and loading are typically based on a percentage of the overall facility. The following industry standard and guidelines were used for programming support spaces:

- Building Systems and Utilities: 13 percent of total area
- Maintenance and storage: 4 percent of total area
- Airport operations and maintenance: 4 percent of total area

4.12 TERMINAL FACILITY REQUIREMENTS RESULTS

The terminal space requirements are summarized in Terminal **Table 4-11.**

Terminal Functions	Units	Terminal Requirements					
		Exis.	2021	2026	2031	2036	2041
Check-In Hall							
Full-service counter positions	ea	21	24	26	26	26	26
Check-in area (includes active check-in)	sf	1,911	1,670	1,810	1,810	1,810	1,810
Check-in queue area	sf	2,469	3,108	3,621	4,054	4,489	5,740
Kiosks positions	ea	6	8	10	14	16	16
Kiosks footprint area	sf	(incl.)	320	408	571	653	653
Airline ticket office area	sf	3,067	3,312	3,588	3,588	3,588	3,588
Subtotal	**sf**	**7,447**	**8,410**	**9,427**	**10,023**	**10,539**	**11,790**
Outbound Baggage Screening and Baggage Make-up							
Number of Level 1 EDS units	ea	2	2	3	3	3	3
Level 1 EDS area	sf	(incl.)	1,600	2,400	2,400	2,400	2,400
Number of Level 2 OSR stations	ea	2	1	1	1	2	2
Level 2 OSR area	sf	(incl.)	40	40	40	80	80
Number of Level 3 ETD units	ea	(incl.)	1	1	1	1	1
Level 3 ETD area	sf	(incl.)	100	100	100	100	100
Baggage screening circulation	sf	(incl.)	435	635	635	645	645
TSA baggage screening room	sf	1,088	2,175	3,175	3,175	3,225	3,225
Outbound baggage make-up area	sf	4,251	11,880	13,860	13,860	15,840	17,820
Subtotal	**sf**	**5,339**	**14,055**	**17,035**	**17,035**	**19,065**	**21,045**
Security Screening Checkpoint							
Checkpoint lanes	ea	3	3	3	3	4	4
Checkpoint screening area	sf	3,056	3,600	3,600	3,600	4,800	4,800
Checkpoint queue area	sf	737	1,800	1,800	1,800	2,400	2,400
Checkpoint exit lane	sf	370	800	800	800	800	800
Subtotal	**sf**	**4,163**	**6,200**	**6,200**	**6,200**	**8,000**	**8,000**
Departure Lounge							
Equivalent gate (EQA)	EQA	5	9	9	9	9	9
Departure Lounge	sf	8,564	24,562	24,562	24,562	24,562	24,562
Podium and Queue Area	sf	(incl.)	1,755	1,755	1,755	1,755	1,755
Boarding Corridor Area	sf	(incl.)	1,890	1,890	1,890	1,890	1,890
Subtotal	**sf**	**8,564**	**28,207**	**28,207**	**28,207**	**28,207**	**28,207**
Baggage Claim and Inbound Baggage Handling							
Number of carousels	ea	3	2	2	3	3	3
Claim area (carousels)	sf	7,521	4,600	4,600	6,900	6,900	6,900
Baggage service offices	sf	0	400	400	480	480	560
Inbound baggage offload area	sf	2,398	3,700	4,300	4,700	5,200	5,600
Subtotal	**sf**	**9,919**	**8,700**	**9,300**	**12,080**	**12,580**	**13,060**
Concessions							
Pre-secure concessions							
Food & Beverage	sf	4,021	900	1,150	1,375	1,575	1,800
Retail	sf	1,297	175	250	325	425	550
Post-secure concessions							
Food & Beverage	sf	2,094	2,700	3,450	4,125	4,725	5,400
Retail	sf	211	525	750	975	1,275	1,650
Concessions support and storage							
Food & Beverage support	sf	2,099	900	690	825	945	1,080
Retail support	sf	0	105	100	130	170	220
Rental car concessions							
Rental car offices	sf	1,395	1,900	2,090	2,299	2,529	2,782
Queuing area	sf	0	400	400	400	400	400
Subtotal	**sf**	**11,117**	**7,605**	**8,880**	**10,454**	**12,044**	**13,882**
Check-In Hall							
Restrooms							
Pre-security men fixtures	fixtures	14	8	8	9	9	10
Pre-security women fixtures	fixtures	12	12	12	14	14	15
Pre-security restroom area	sf	1,760	1,400	1,400	1,610	1,610	1,750
Post-security men fixtures	fixtures	7	10	10	11	12	14
Post-security women fixtures	fixtures	7	15	15	17	18	21
Post-security restroom area	sf	1,116	1,750	1,750	1,960	2,100	2,450
Janitor closet area	sf	238	155	200	200	200	200
Family restroom module area	sf	71	280	280	280	280	280
Nursing room	sf	31	80	80	80	80	80
Animal service relief area	sf	0	0	200	200	200	200
Subtotal	**sf**	**3,216**	**3,665**	**3,910**	**4,330**	**4,470**	**4,960**
	men fixtures	**21**	**18**	**18**	**20**	**21**	**24**
	women fixtures	**19**	**27**	**27**	**31**	**32**	**36**
Support Functions							
TSA administration and staff support	sf	2,284	2,801	2,801	2,801	2,801	2,801
Operations and maintenance	sf	3,447	4,809	5,395	5,700	6,037	6,348
Airport administrative areas	sf	3,009	4,000	4,000	4,000	4,000	4,000
Information desk	sf	279	300	300	300	300	300
Lounge/Sensory Room/Coat Check	sf	0	750	750	750	750	750
Loading dock, trash/recycling	sf	(incl.)	1,464	1,581	1,680	1,809	1,920
Subtotal	**sf**	**9,019**	**14,124**	**14,827**	**15,231**	**15,697**	**16,119**
Circulation							
Public Circulation	sf	17,358	12,159	13,688	15,030	16,674	18,184
Secure Public Circulation	sf	8,780	14,200	14,200	14,200	14,200	14,200
Non-Public Circulation	sf	2,170	2,147	2,404	2,555	2,638	2,743
Meeters/Greeters	sf	(incl.)	1,320	1,320	1,980	1,980	1,980
Subtotal	**sf**	**28,308**	**29,826**	**31,612**	**33,765**	**35,493**	**37,107**
Other Areas							
GSE Right-of-Way	sf	12,170	11,440	18,304	18,304	18,304	18,304
GSE Storage and Maintenance	sf	3,053	4,832	5,176	5,493	5,844	6,167
Vertical circulation	sf	3,196	4,443	5,117	5,364	5,638	5,890
Building Systems and Utilities	sf	10,284	11,050	17,680	17,680	17,680	17,680
Subtotal	**sf**	**28,703**	**31,765**	**46,277**	**46,841**	**47,466**	**48,040**
TOTAL AREA		**115,795**	**152,558**	**175,675**	**184,166**	**193,561**	**202,211**
Estimated surplus/deficiency (-) compared with existing facility			36,763	59,880	68,371	77,766	86,416

Table 4-11 Terminal Facility Requirements Results

4.13 CURBSIDE REQUIREMENTS

Table 4-12 summarizes the curbside lane requirements for private and commercial vehicles: taxis, TNCs and shuttles. The existing curbfront length is sufficient throughout the planning horizon to meet existing and future demand. Curbside requirements were derived from the following assumptions:

- 60% of passengers will use the curbside over the planning period.
- The percentage of passengers hiring Transportation Network Company service (TNCs) would increase over the planning horizon.
- Each vehicle utilizing the curbfront carried 1.2 passengers on average.
- Dwell times for private vehicles, TNCs and Taxis were 2 minutes, while hotel shuttles were 4 minutes.

	Peak Hour Passengers	Required Length (in feet)
Existing Private Vehicles	623	420
Existing Taxi/TNC	623	0
Existing Hotel Shuttle	623	0
Future Private Vehicles (2021)	623	143
Future Taxi/TNC (2021)	623	42
Future Hotel Shuttle (2021)	623	21
Future Private Vehicles (2026)	721	170
Future Taxi/TNC (2026)	721	65
Future Hotel Shuttle (2026)	721	26
Future Private Vehicles (2031)	807	192
Future Taxi/TNC (2031)	807	95
Future Hotel Shuttle (2031)	807	32
Future Private Vehicles (2036)	893	197
Future Taxi/TNC (2036)	893	121
Future Hotel Shuttle (2036)	893	36
Future Private Vehicles (2041)	982	198
Future Taxi/TNC (2041)	982	155
Future Hotel Shuttle (2041)	982	39

Source: FAR Airport Records, 2021
Notes: Over the forecast horizon, continued market penetration by TNCs, as well as, some level of adoption of autonomous vehicles (AVs) is projected to increase the relative number of passengers arriving/departing via curbside. Much of the increase will be driven by the adoption of AVs, which, in a private-AV model, will result in private AVs dropping off passengers curbside and then parking at the airport, assuming regulations are in place to prohibit significant amounts of deadheading (such as a private AV driving 20 miles home to park).

Table 4-12 Curbfront Length Requirements

5.0 IMPROVEMENT ALTERNATIVES

Planning airport terminal facilities involves many operational, financial, and environmental considerations. The arrangement of the terminal complex is based on functional relationships between its different components. These components include the landside (vehicle access and parking), the terminal building, and the airside (aircraft access and parking). Likewise, the arrangement of areas inside the terminal building is also based on functional relationships. The primary components of the terminal building include the non-secure area, security screening, and the secure area. Spaces within these components have interrelated functions. The planning process is iterative, and alternatives are generated to determine the most beneficial overall arrangement for the airport.

This section follows the process of developing alternative layouts for the terminal building, exploring and, finally, identifying the options that best meet the projected facility requirements. The layouts are assessed for expected aeronautical utility, operational performance, and construction feasibility. A recommended layout has been developed in detail.

5.1.1 Development Goals

To clearly define a project that will provide suitable facilities, goals are established for both the terminal building and terminal complex. The identified near-term goals pursue the objective of prioritizing needs and allowing additive expansion in the future. The goals for the terminal building design and construction include:

1. Add departure lounge seating
2. Expand post-security concessions program
3. Expand security screening checkpoint (SSCP) and provide more queuing space
4. Improve passenger experience by providing a better sense of place and more amenities
5. Add space for additional ticket counters and queuing space
6. Improve efficiency for outbound baggage make-up
7. Maintain operations at all gates during construction
8. Maintain a delivery route for concessions during construction

5.1.2 Concourse Expansion Alternatives

Three concourse expansion alternatives that met the development goals and achieved the proposer requirements mentioned in **Chapter 4**, Facility Requirements were developed for the concourse expansion. Additionally, two ticketing area alternatives were evaluated with the intent to incorporate the preferred ticketing area concept into the preferred expansion alternative. These alternatives were then evaluated against certain criteria defined by the Airport.

The concourse expansion alternatives had specific focus on secure passenger circulation, departure lounges, and the SSCP. As mentioned in previous chapters, the existing secure circulation corridor separates the departure lounges and the boarding area instead of the standard layout of having the circulation corridor behind the departure lounge space and boarding area. Additionally, the SSCP's recomposure area causes significant gridlock near Gates 2 and 3. This condition is amplified when these two gates are in the process of boarding. Before the Security Screening Checkpoint (SSCP), insufficient space for queuing creates congestion and safety hazards as queuing often extends to the vertical circulation core. **Figure 5-1** shows how the layout prevents smooth circulation beyond and before the checkpoint.

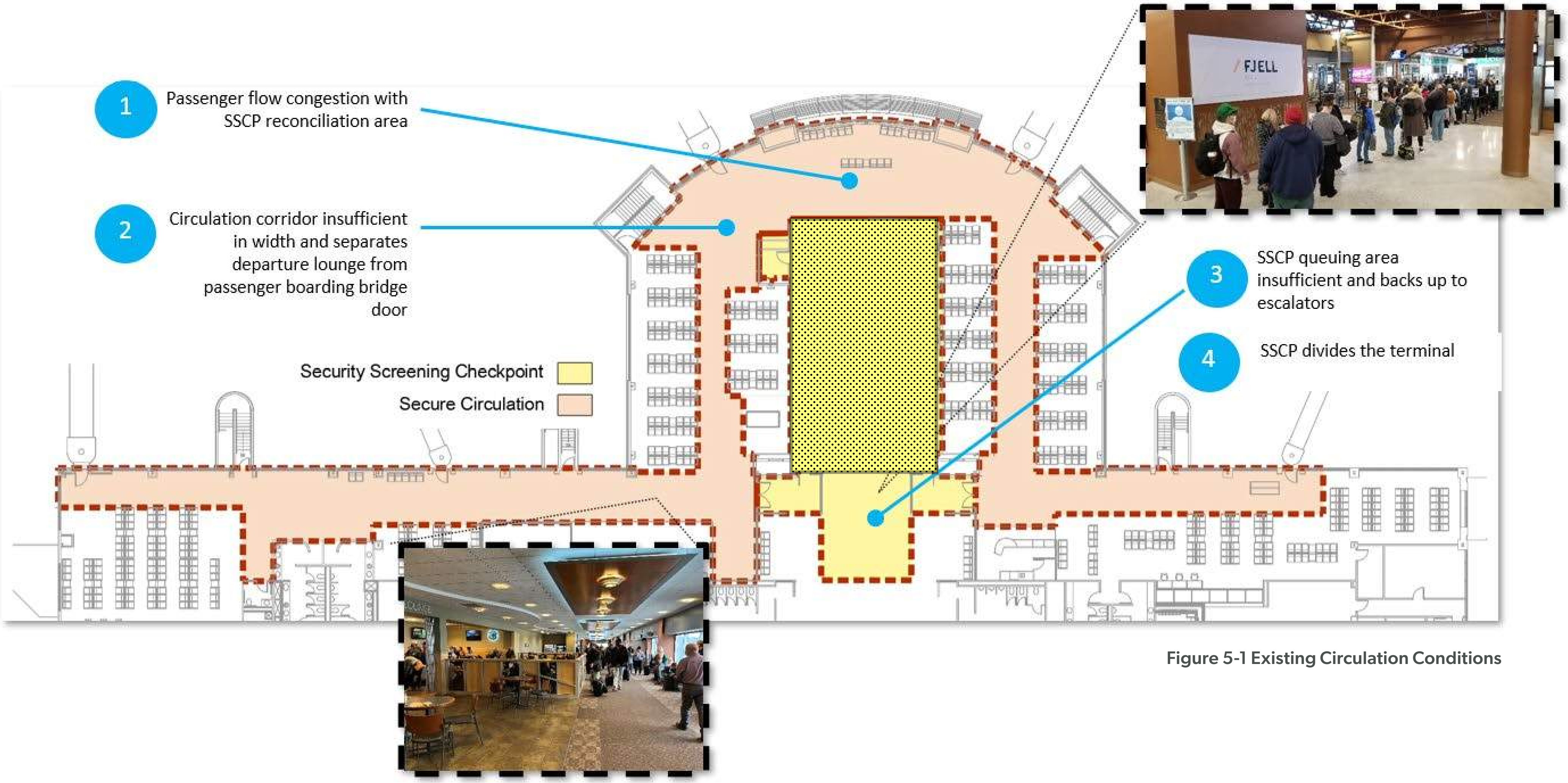


Figure 5-1 Existing Circulation Conditions

5.2.1 Concourse Expansion Alternative #1

The upper level for Alternative 1 maintains the existing location of the SSCP and provides space for expansion for a fourth lane in the future. By providing enough space for a fourth lane and sufficient circulation around the SSCP, the expanded concourse will connect into the existing concourse halfway between the most northern part of the arc at Gate 2 and the corner between Gate 1 and 2. This results in the departure lounges for existing Gates 1 and 2 to be relocated to the new concourse at the conclusion of construction. Sufficient SSCP queuing space is provided by expanding into the existing secure area. The existing pre-secure concessions space to the right of the SSCP becomes post-secure concessions as the secure/non-secure boundary is revised to allow for additional SSCP queuing. One exit lane is provided to the left of the SSCP meaning arriving passengers from the gates on the expanded part of the concourse will have to go around the SSCP to exit the concourse.

The layout for the new expanded concourse provides circulation beyond the departure lounges, a sensory room facing the airfield, two concession areas for food and beverage and retail, a restroom module with a service animal relief area (S.A.R.A.), and a concessions receiving freight elevator. Additionally, administrative offices are relocated to the southeast corner of the expanded headhouse. The existing administrative offices are converted into Transportation Security Administration (TSA) offices and departure lounge space. To improve the depth of the departure lounges at Gates 4 and 5, the existing restroom module is relocated to the existing administrative space. **Figure 5-2** shows the upper level for Alternative 1.

On the lower level, the ticketing area is expanded to the east to provide space for 10 additional ticket counters. The existing ticket counters and outbound baggage belts are pushed back to provide 5 feet of queuing space. Baggage screening is expanded to accommodate an additional explosive detection system (EDS) machine and oversize baggage. Airline ticket offices are also expanded to accommodate additional administrative space for existing airlines and any new entrants. Outbound baggage make-up is expanded to accommodate another baggage carousel and sufficient ground support equipment (GSE) maneuverability around the make-up area.

In the baggage claim area, a hybrid Federal Inspection Services (FIS) area is proposed on the western part of the terminal. This will include a vertical circulation area, two detaining rooms, and an FIS office. A movable partition wall will be constructed around carousel #3 to ensure the area remains sterile during FIS activities. Additionally, the existing restroom module on the lower level will be reconstructed to allow for easier accessibility and wayfinding to meeters/greeters and passengers.
Figure 5-3 shows the lower level for Alternative 1.

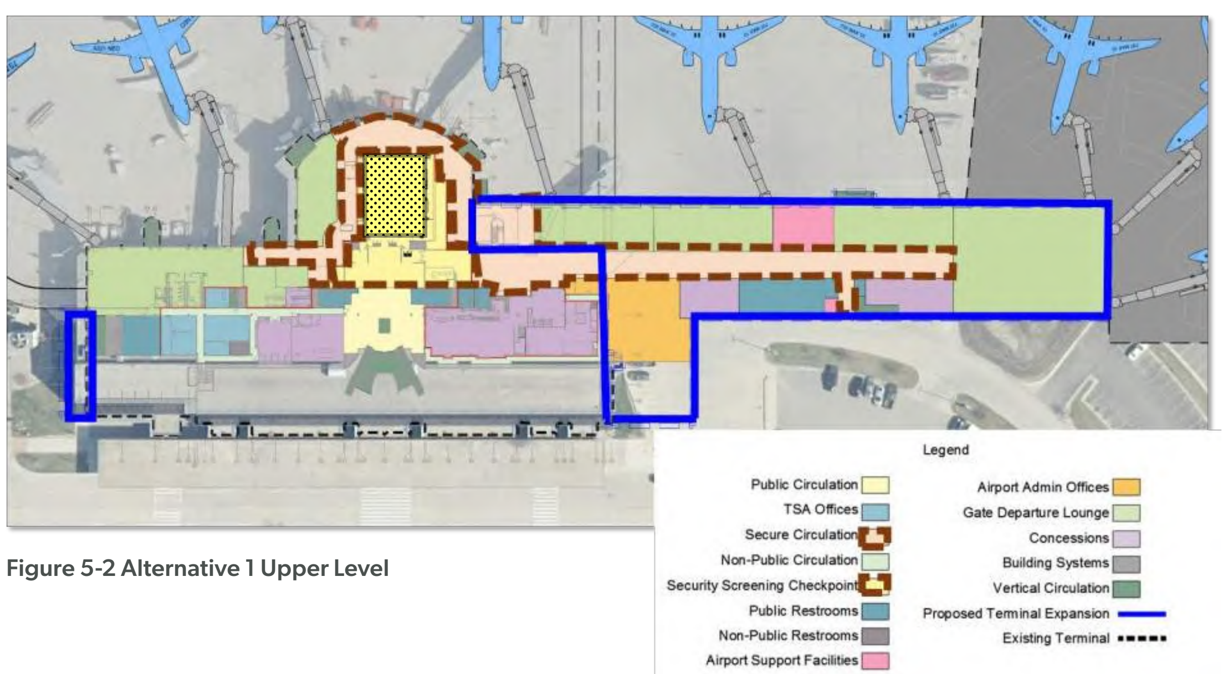


Figure 5-2 Alternative 1 Upper Level

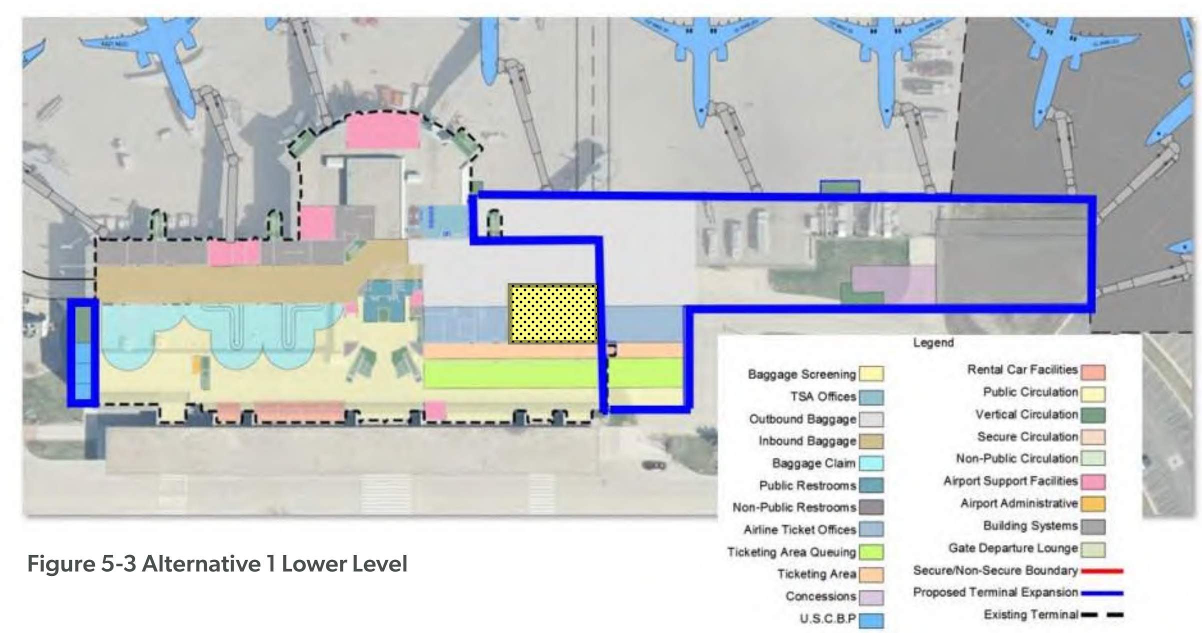


Figure 5-3 Alternative 1 Lower Level

5.2.2 Concourse Expansion Alternative #2

The upper level for Alternative 2 relocates the existing SSCP to the pre-secure concessions area to the right of the vertical circulation core. This relocation allows sufficient space for four lanes, queuing, and TSA administrative space adjacent to the SSCP. Relocating the SSCP also allows a secure circulation corridor that can run the entire length of the secure side of the concourse providing opportunities for clear passenger wayfinding. Additionally, the existing SSCP can be converted into a dedicated concessions area that can provide views to the airfield and be centrally located to the gates on the existing concourse. This alternative has the new expanded concourse maintaining the existing façade alignment at Gate 1 where the new concourse connects into the existing facility. By maintaining the existing façade alignment, the secure circulation corridor angles south after the SSCP to remain behind the 35-foot depth departure lounges.

Similar to Alternative 1, the new expanded concourse provides a layout where circulation is beyond the departure lounges, a sensory room facing the airfield, two concession areas for food and beverage and retail, a restroom module with a service animal relief area (S.A.R.A.), and a concessions receiving freight elevator. Additionally, administrative offices are relocated to the southeast corner of the expanded headhouse. The existing administrative offices are converted into TSA offices and departure lounge space. To improve the depth of the departure lounges at Gates 4 and 5, the existing restroom module is relocated to the existing administrative space. **Figure 5-4** shows the upper level for Alternative 2.

The lower level is the same as the previous alternative. **Figure 5-5** shows the lower level for Alternative 2.

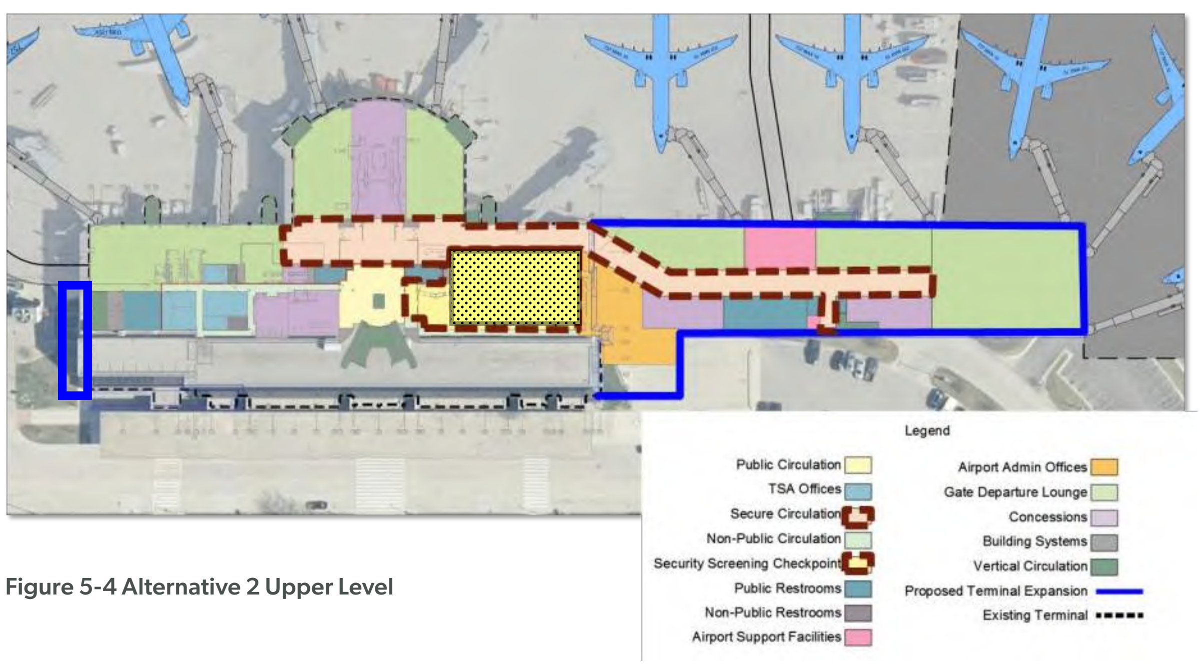


Figure 5-4 Alternative 2 Upper Level

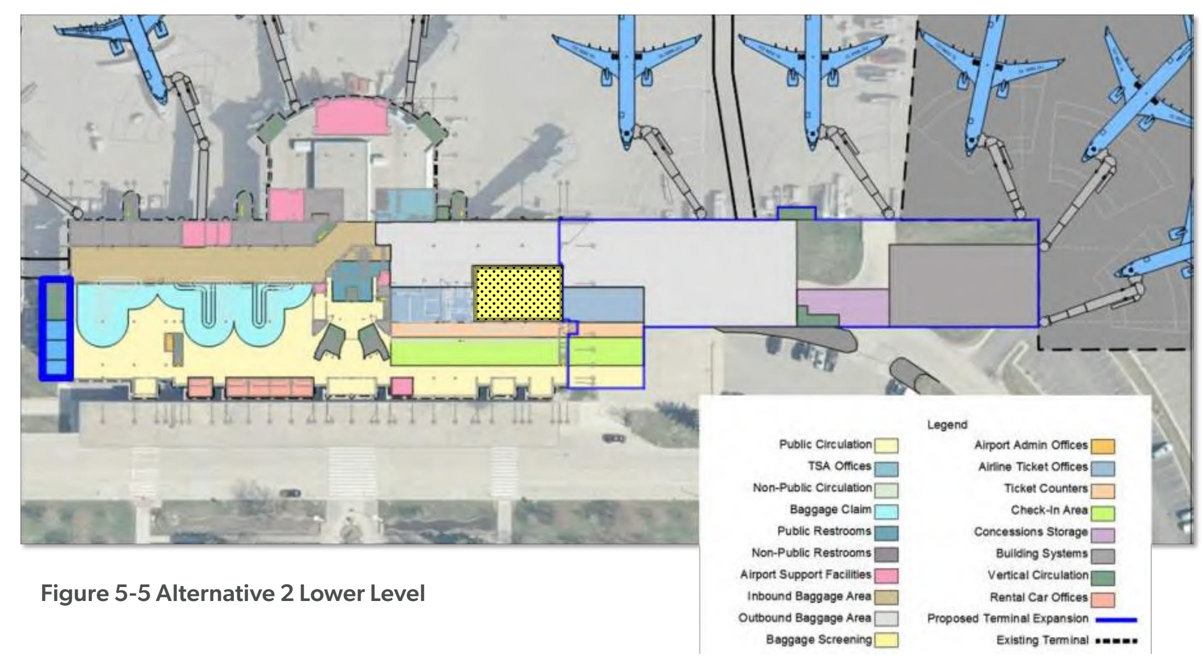


Figure 5-5 Alternative 2 Lower Level

5.2.3 Concourse Expansion Alternative #3

Similar to Alternative 2, the upper level for Alternative 3 relocates the existing SSCP to the pre-secure concessions area right of the vertical circulation core to improve passenger flow on the secure side and provide sufficient space for passenger screening activities. However, Alternative 3 proposes to bump-out the proposed concourse by 35 feet to provide a straight secure circulation corridor throughout the entire existing and proposed concourse, as shown in **Figure 5-6**. The straight alignment provides the passengers a clear view of each end of the concourse once they complete screening activities.

The expanded concourse floor plan provides a similar layout to the previous alternatives with the only difference being the entire concourse shifting north 35 feet. Similar to the previous alternatives, Alternative 3 proposes the existing SSCP space is converted into a concessions area, the departures lounges for existing gates are properly sized, the restrooms across from existing Gate 4 are relocated into existing administrative space to open the departure lounge space for existing Gates 4 and 5, and a hybrid FIS space is constructed on the west end of the facility.

The lower level reflects the previous alternatives but provides additional area for outbound baggage make-up and GSE maneuverability around two carousels, as shown in **Figure 5-7**.

Figure 5-6 Alternative 3 Upper Level

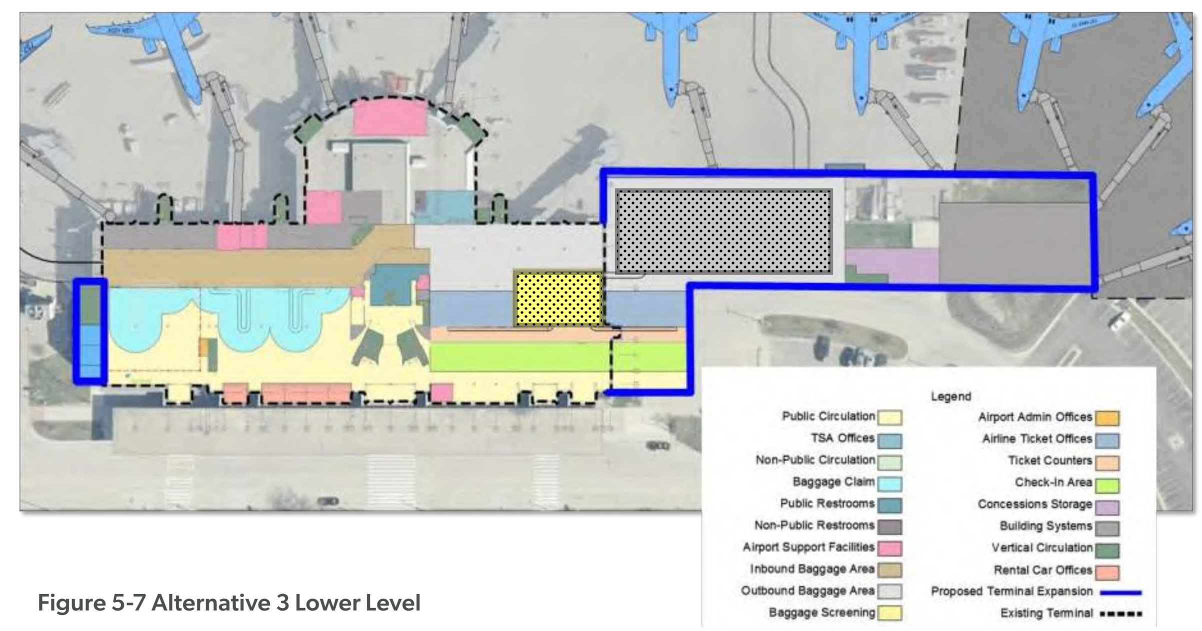


Figure 5-7 Alternative 3 Lower Level

5.2.4 Concourse Expansion Evaluation Matrix

To identify a preferred alternative, the three concourse expansion alternatives were evaluated against a set of criteria developed by the stakeholders. The criteria identified in **Table 5-1** shows what alternatives met each specific component that stakeholders considered important. Alternative 3 was selected as the preferred alternative as it provides the stakeholders with a functional terminal layout that can meet the passenger demand and tenants' facility needs. Additionally, the construction of this alternative will allow for existing operations to be minimally disrupted. Alternative 3 will be used to evaluate financial feasibility and implementation.

Evaluation Crititeria	Alternatives		
	1	2	3
Concourse			
New construction maintains some current gates	✓	✓	✓
Creates opportunity to expand concession operations	✓	✓	✓
Creates opportunity to improve passenger experience with flexible space	✓	✓	✓
Allows for future expansion	✓	✓	✓
Proposed expansion maintains existing façade alignment on north face of concourse		✓	
Departure lounges sufficient in size		✓	✓
TSA Security Checkpoint			
Configuration allows maximum passenger flow through TSA checkpoint		✓	✓
Provides adequate queueing for SSCP		✓	✓
Relocates current TSA offices	✓	✓	✓
Allows for future expansion		✓	✓
Exit lane separates deplaning passengers from enplaning passengers		✓	✓
Provides adequate recompose area		✓	✓
Long queuing lines will avoid backing-up on vertical circulation		✓	✓
Secure Circulation			
Circulation maximizes straight alignments throughout existing and new concourse			✓
Ease of wayfinding		✓	✓
Adequate space for meeter/greeter	✓	✓	✓
Circulation separates deplaning passengers from enplaning passengers		✓	✓
General Considerations			
Minimal impact to landside dock operations and parking	✓		✓
Improves ground service equipment maneueverability and baggage operations	✓	✓	✓
Targets long term goals		✓	✓
Ease of phasing of additions through time		✓	
Minimum construction impact to maintain operations		✓	✓

Table 5-1 Concourse Expansion Alternatives Evaluation Matrix

Figure 5-8 Preferred alternative plan view

Figure 5-9 Preferred alternative looking southwest

5.3 TICKETING AREA ALTERNATIVES

As mentioned in previous chapters, the ticketing area requires modifications to accommodate future demand and keep up with emerging technologies. Although the ticketing area consists of the primary check-in functional areas such as space for circulation, queuing, and passenger processing, this area impacts baggage screening, Airline Ticket Office (ATO) space, and outbound baggage make-up. Therefore, these areas were included into the alternatives analysis for the ticketing area. Currently, the ticketing area experiences long queues that overflow in front of the primary vertical circulation core during the peak hour due to the current depth available for passengers to queue in front of the counters shown in **Figure 5-8**. This is amplified when mainline aircraft are operating during the peak hour. Additionally, outbound baggage make-up and baggage screening often overflow with demand during peak times due to the short baggage belt runs between the ticketing area, baggage screening, outbound baggage area, and other various staffing challenges. Oversize baggage also overflows in the baggage screening room as no automation currently exists to place bags in the outbound baggage makeup area, and ground handling staff is responsible for retrieving the bags from the baggage screening room once TSA has cleared it.

Figure 5-10 Exiting the relocated SSCP, entering new concourse

Figure 5-12 At end of new concourse looking west

Figure 5-11 Looking east in new concourse

Two alternatives were developed for the ticketing area. The alternatives focused on increasing the depth of the queuing area to improve the queuing environment while preserving space for baggage screening, ATOs, and outbound baggage make-up expansion. Expansion alternatives also include the addition of up to five ticket counters and 10 kiosks to the west of the ticketing area. The goal of the ticket counter expansion is to also adapt to a two-step bag drop operation in the event carriers implement that operation at FAR.

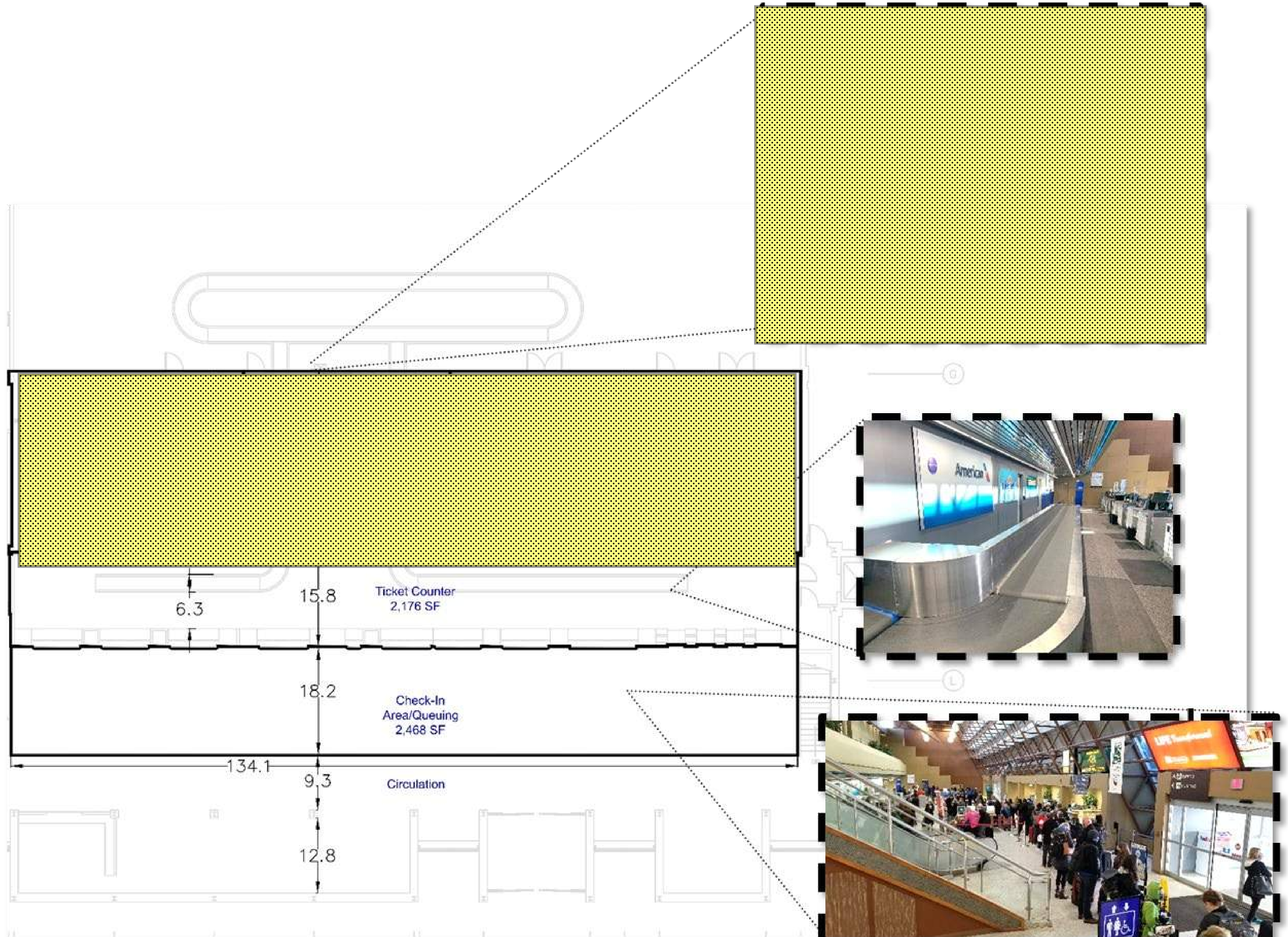


Figure 5-13 Existing Ticketing Area Constraints

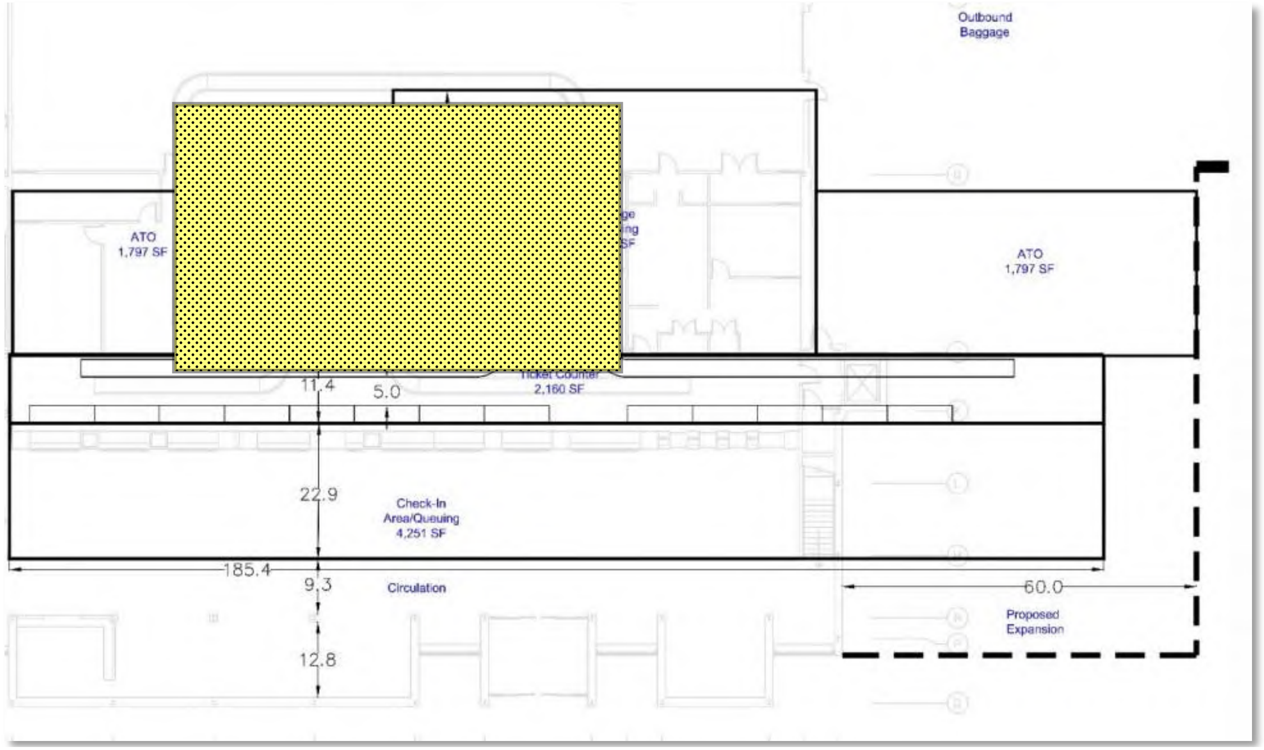


Figure 5-14 Ticketing Area Alternative 1

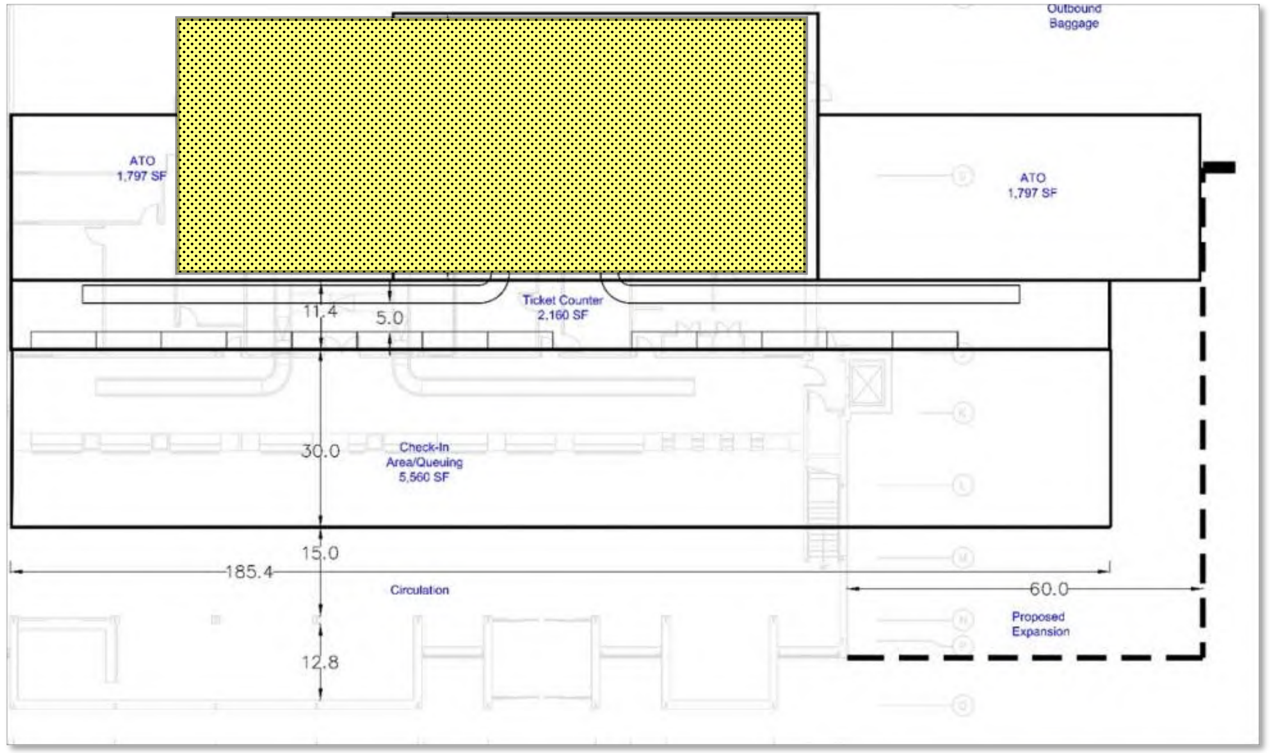


Figure 5-15 Ticketing Area Alternative 2

5.3.1 Ticketing Area Alternative #1

Alternative 1 proposes to shift the baggage belts in the ticketing processing area and ticket counters north so the baggage belts run in alignment with the existing wall that separates the ticketing area from the back-of-house operations, and shift ticket counters north so there is a 5-foot separation from the baggage belts for airline employee circulation shown in **Figure 5-9**. This layout provides an additional 5 feet of queuing space for passengers while maintaining the existing wall that currently separates the ticketing area, baggage screening room, and ATOs.

5.3.2 Ticketing Area Alternative #2

Alternative 2 proposes to shift the existing wall separating the ticketing area from back-of-house operations, bag belts, and ticket counters north 13 feet. The shift will provide 30 feet of queuing depth for passengers using the ticket counters and 15 feet of circulation beyond the queuing area shown in **Figure 5-10**. This layout provides industry recommended distances for ticketing queueing areas and circulation in public spaces. This alternative does present significant challenges with phasing and utility relocation as the wall houses multiple electrical panels and conduit that serve the terminal.

5.3.3 Concourse Expansion Evaluation Matrix

To identify a preferred alternative, the two ticketing area expansion alternatives were evaluated against a set of criteria developed by the stakeholders. The criteria identified in **Table 5-2** show what alternatives met each specific component that stakeholders considered important. Alternative 1 was selected as the preferred alternative as it provides an improvement to the queuing area while minimizing disruption to the current operation during construction and phasing. This option was incorporated into the preferred concourse alternative, and both will be carried forward for financial feasibility and project implementation.

Evaluation Crititeria	Alternatives	
	1	2
Targets long term goals	✓	✓
Ease of phasing of additions through time	✓	
Minimum construction impact to maintain operations	✓	
Improves queuing	✓	✓
Improves passenger circulation		✓
Adaptable to industry trends for ticketing areas such as two-step bag drop or common-use	✓	✓

Table 5-2 Concourse Expansion Alternatives Evaluation Matrix

5.4 CONCEPT BUILDING SYSTEMS

Each of the building systems must meet current code and operational requirements. The following text describes extents of building system work needed in order to remodel the existing building.

5.4.1 Structural

SYSTEM DESCRIPTION

- Superstructure: The roof will be metal deck. The metal deck will bear on bar joist. The bar joist will bear on hot rolled structural steel beams and columns. The steel beams and columns will be connected in moment frames to provide lateral force resistance. The second floor will be concrete on composite metal deck. The perimeter walls will be supported on concrete walls that extend to frost depth. The steel trusses of the existing facility will not be replicated in the expansion.
- Foundation: Geotechnical investigations in the vicinity have reported that this location has deep deposits of fat clays. These fat clays are strength sensitive and compressible. The 2006 expansion is founded on shallow spread footings. Currently, the geotechnical report for the 2006 expansion is not available to the writers. Also, soil improvement or other remedial efforts are unknown. Depending on the forthcoming expansion layout, if shallow spread footing foundations are used, there could be loads added to existing footings. This added load would cause new settlement within the existing facility. Since new load would only be added to existing perimeter footings any new settlement would be differential. For these reasons deep foundations may be required. The fat clay layer is on the order of 100ft deep. In these conditions driven steel piles are typical. Buildings over two stories in height or heavy buildings in Fargo are typically founded on driven steel piles. Certainly, deep foundations come with an increased price. For concept budgeting deep foundations must be apportioned. Spread shallow foundations will be designed if possible.
- The building length in the east-west direction is already close to the limit for length without an isolation joint for thermal expansion/contraction. Thus an isolation joint will be required. The east face of the existing building has a jog in it. Isolation joints with a jog are complicated to design and expensive to construct. Isolation joints with a jog are probably prone to premature failure in a roofing system. For these reasons there will be a straight isolation joint oriented near the existing building. The isolation line will be oriented north-south.

DESIGN CRITERIA

- Roof loading
- Snow per building code
- 20psf collateral load in addition to structural deal load
- Floor loading
- 100psf live load
- 20psf collateral load in addition to structural deal load
- Drift limit: H/600 for 10 year wind

5.4.2 Mechanical

The anticipated mechanical systems scope for this project will be to provide new HVAC and mechanical utility systems for the expansion of the terminal, and some remodeling of the existing terminal and at the intersection of the existing building and this project.

The following applicable Codes, Standards, Guidelines, and Criteria are intended to be used to determine acceptable design criteria, standard of performance, workmanship, etc. Based on industry best practice and owner's experience, system design criteria that exceed the minimum standards will be applied as appropriate.

- International Mechanical Code (IMC) – 2021
- International Energy Conservation Code (IECC) – 2021
- International Fuel Gas Code (IFGC) – 2021
- American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) – (latest versions)
- ASHRAE 55 - Thermal Environmental Conditions for Human Occupancy
- ASHRAE 62.1 - Ventilation for Acceptable Indoor Air Quality
- ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings
- National Fire Protection Association (NFPA)
- NFPA 54 - National Fuel Gas Code, 2015 Edition
- NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems, 2015 Edition
- NFPA 101 - Life Safety Code
- Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
- Occupational Safety and Health Administration (OSHA)

The following design conditions will be utilized in the mechanical systems design of the renovated and new areas:

- Outdoor Design Conditions
- Summer: 87.0° F DB / 70.4° F WB (ASHRAE 1%)
- Winter: -18.7° F DB (ASHRAE 99.6%)
- Ventilation Rates
- Building ventilation (outdoor air) will comply with ASHRAE standard 62.1 and the International Mechanical Code. Code minimum rates will be increased as necessary to account for building exhaust rates, maintaining pressure relationships between spaces, and minimizing infiltration at exterior access points.
- Room exhaust rates will comply with ASHRAE standard 62.1 and the International Mechanical Code.
- Seismic Criteria: Seismic bracing will not be provided for mechanical system components for this facility based on current codes.

VARIABLE AIR VOLUME SYSTEMS

Most air-conditioned occupied spaces within the building will be served by Variable Air Volume (VAV) air handling unit (AHU) systems located indoors. For small remote or special purpose areas where service by VAV systems is not feasible, constant volume fan coil units (FCU's) will be utilized.

Air will be supplied to all appropriate air-conditioned spaces. A portion of this air will be ducted back to the VAV AHU's. The remaining portion of air not returned to the AHU's shall be utilized as make-up air for exhaust systems and excess air for building pressurization. Air-conditioned spaces will be divided into air conditioning "zones". Each zone will have temperature control via a VAV terminal with a hot water reheat coil. Each VAV AHU system will have occupied, unoccupied, and morning warm-up control cycles. For systems with large amounts of outside air or as required by energy code, energy recovery will be considered to reduce energy consumption and reduce equipment size.
Air intakes will be located away from potential sources of contamination such as vehicles at the landside drop-off/pickup locations and aircraft on the secure side of the airport. If this cannot be achieved for some systems, carbon filtration will be considered to remove air contaminants.

Following is a list of typical VAV AHU components:

- Supply fan wall (multiple fans in parallel)
- Return fan wall (multiple fans in parallel)
- Double wall insulated casings
- Chilled water cooling and hot water heating coils
- Airside economizer sections
- MERV-13 filters
- Bi-polar ionization to match existing units mounted to existing heat pump supply ducts
- Direct digital controls to integrate into existing Siemens Building Automation System (BAS)

Ductwork will be constructed in accordance with SMACNA Standards for the appropriate pressure class. Ductwork will be sealed to meet SMACNA Seal Class A as a minimum and to limit ductwork leakage not to exceed 1% of the design flow rate for high pressure ductwork and 2% for low pressure ductwork. Supply air ductwork will be externally insulated with fiberglass insulation.

MAKE-UP AIR UNIT (MAU) SYSTEMS

Spaces requiring heating and ventilation only (no air conditioning) will be served by constant volume Make-up Air Units (MAU's), hot water fed unit heaters, and exhaust fans. Typical spaces include baggage handling. Air will be supplied to all appropriate spaces to satisfy space heating and make-up air requirements. Exhaust fans will exhaust spaces to satisfy code minimum requirements. Generally, these spaces will be neutral or negative relative to occupied air-conditioned spaces
Following is a list of typical MAU system components:

- Supply fan with VFD (for balancing)
- Double wall insulated casings for CV AHU's
- Hot water heating coils
- MERV-8 filters
- Direct digital controls to integrate into existing Siemens Direct Digital Control (DDC) Building Automation System (BAS)

Ductwork will be constructed in accordance with SMACNA Standards for the appropriate pressure class (similar to VAV system ducts). Supply air ductwork will be externally insulated with fiberglass insulation.

EXISTING HEAT PUMP WATER SYSTEM LOOP

The existing cooling/heating water loop serving the water-to-air heat pumps will remain in service and be modified to remove existing heat pumps being replaced by new VAV systems. The central system primary pumps will be re-balanced to new lower flow rates and the existing cooling tower will be cleaned and the associated pumps re-balanced for new lower flow rates.

HEATING HOT WATER SYSTEM

The heating hot water system consists of four existing high efficiency hot water boilers, existing primary boiler pumps (one at each boiler), secondary pumps, and distribution piping, AHU heating coils, and terminal heating devices such as reheat coils, unit heaters, cabinet unit heaters, convectors, finned tube baseboard radiation, etc. This system will be increased in size to accommodate the new facility addition. Additional ethylene glycol will be added to maintain a fixed 50% concentration.

The existing boiler system appears to be significantly oversized as only one of four boilers was energized on the day of our site visit in late January, 2022 when it was close to winter outdoor design temperature. The designer will need to verify whether additional boiler capacity is needed or not. If more hot water boiler capacity is required, sufficient boiler capacity will be added to achieve N+1 redundancy. Each boiler will be sized for equal capacity. If boiler capacity is increased, secondary pumps capacity will also have to be increased to achieve N+1 redundancy. System N+1 redundancy would result in one spare boiler and one spare secondary pump sitting idle, only being energized should a boiler or secondary pump fail.
Heating hot water piping will be sized for a maximum pressure drop of 4 ft. of water/100 ft. and a maximum velocity of 8 fps. If additional hot water boilers are required, the natural gas piping will be modified as necessary to accommodate increased natural gas loading. This includes the service meter and pressure regulator.

Following is a list of typical hot water system components:

- New hot water boilers (if required) will be Thermal Solutions Evolution Series high efficiency, gas-fired, condensing type to match existing
- Primary pumps for new boilers will be inline centrifugal constant volume type
- System secondary pumps will be base mounted end suction centrifugal type, each with a VFD. If additional boilers are added, secondary pumps will be replaced with similar larger pumps
- Direct digital controls to integrate into existing Siemens Direct Digital Control (DDC) Building Automation System (BAS)
- Heating hot water piping 2" and under will be Type L copper with soldered fittings or carbon steel with threaded fittings
- Heating hot water piping over 2" will be carbon steel with welded fittings
- Unions will not be provided at terminal heating devices in copper piping
- Heating hot water piping system will be insulated with rigid glass fiber type insulation with appropriate insulation jacket

CHILLED WATER SYSTEM

A new air-cooled chiller with associated variable speed primary pumps will provide chilled water to the new VAV AHU systems and fan coil units. The chiller and associated pumps will be selected to provide N+1 redundancy.

Following is a list of typical chilled water system components:

- New air-cooled chiller will have scroll or screw compressors and be multi-stage
- Primary pumps will be base mounted end suction type similar to hot water secondary pumps
- Direct digital controls to integrate into existing Siemens Direct Digital Control (DDC) Building Automation System (BAS)
- System will include typical hydronic specialties such as an expansion tank and air separator
- Chilled water piping 2" and under will be Type L copper with soldered fittings or carbon steel with threaded fittings (sized similar to hot water piping)
- Chilled water piping over 2" will be carbon steel with welded fittings (sized similar to hot water piping)
- Chilled water piping system will be insulated with closed cell type insulation (Elastomeric, polystyrene, or polyisocyanurate) with appropriate indoor/outdoor insulation jacket

TERMINAL HEATING UNITS

For spaces requiring supplemental heat or heating only, hot water terminal heating units such as unit heaters, cabinet unit heaters, and finned tube convectors, will be provided and tied into the DDC BAS (see below).

BUILDING CONTROLS

The existing Siemens Direct Digital Control (DDC) Building Automation System (BAS) will be expanded to serve the building expansion. System software and graphics will be updated to integrate new systems.

5.4.3 Fire Protection

Building hazard classifications are based on the following occupancies as found in NFPA 13:

NFPA 13	
Light	Unless Otherwise Noted
Ordinary Hazard Group 1	Mechanical rooms, Janitors closet

Overall fire sprinkler design is based demand values found in NFPA 13.

SYSTEM DESCRIPTION

- Automatic sprinklers are attached to piping containing water and that is connected to water supply through an alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hydraulic and electric sensors send alarms when water flows.
- Wet pipe fire sprinkler system will serve all building spaces unless noted otherwise.

DESIGN CRITERIA

- There will be a new 6-inch fire service entrance that will be dedicated to the fire sprinkler system.
- All fire suppression systems will be hydraulically calculated with a computer calculation system.

EQUIPMENT AND MATERIALS

- Fire sprinkler pipe shall be black steel. Pipe 2-inch and smaller will be Schedule 40 with threaded joints. Pipe larger than 2-inch shall be Schedule 10 with welded or roll groove joints, or Schedule 40 with welded, threaded, or cut groove joints.
- Sprinkler heads shall be quick response standard spray. Semi-recessed sprinklers shall be installed in areas with ceilings. Upright or pendant sprinklers shall be installed in areas without ceilings. Sprinkler guards shall be used in mechanical and storage rooms.

DISTRIBUTION

- All fire sprinkler pipe will be routed overhead and square to building structure.

5.4.4 Plumbing Systems

DOMESTIC WATER SUPPLY SYSTEM DESCRIPTIONS

- Plumbing fixtures are attached to a cold and hot water distribution system containing potable water that is connected to water supply through a water meter and backflow prevention device.
- Hot water is generated with one tank-type gas fired water heater. The new water heater will be located in the mechanical room.
- Hot water is continuously circulated through the system and returned back to the hot water source.
- Mechanical equipment is attached to a non-potable water distribution system that is connected to water supply through a backflow prevention device.

DOMESTIC WATER SUPPLY DESIGN CRITERIA

- The existing 4-inch water service entrance will be dedicated to the potable water supply. The domestic water service will be designed at 6 feet per second maximum allowable velocity. Velocity limitation is to provide capacity for future expansion of the system.
- The water distribution system will be designed by the segmented loss method. This method requires the following information: the load factor in water supply fixture units or gallons per minute flow rate, the minimum pressure available from the water source (water main or pressure tank), the pressure loss due to the difference in elevation between the water source and the controlling plumbing fixture, the pressure loss due to equipment (water softener, backflow prevention device, etc.), the minimum flow pressure required at the controlling fixture, and the pressure loss through piping, valves, fittings, and appurtenances. The maximum allowable velocity shall be 6 feet per second in cold water supply, 5 feet per second in hot water supply, and 4 feet per second in hot water recirculation. Velocity limitations are to reduce the potential for pipe wall erosion.
- The water heater will be selected based on the average hourly demand method. This method requires the following information: the average hourly use for each plumbing fixture type, the simultaneous usage factor based on facility type, and the storage factor based on facility type.

DOMESTIC WATER SUPPLY MATERIALS AND EQUIPMENT

- Domestic plumbing distribution pipe shall be type L Copper or schedule 10 stainless steel with solder joints, brazed pipe joints, welded joints, or press-fit joints. Pipe insulation shall be pre-formed fiberglass pipe insulation.
- Domestic plumbing valve intended for shut-off duty shall be two- piece, full port ball valves for pipe sizes 3" and smaller or butterfly valves for pipe sizes larger than 3". Hot water recirculation system shall include thermostatic balancing valves at each system branch connecting. Swing check valves shall be included to ensure proper direction of flow.
- The backflow prevention devices on the incoming water service shall be reduced pressure zone style backflow preventer. Hose thread style backflow preventers shall be provided for all loose hose connections, hose bibbs or wall hydrants, janitor's sinks and any hose threaded spout outlets.
- Circulation pumps shall be variable speed, electronically commutated motor (ECM) high efficiency pumps with integral thermal controls.
- Water heater shall be gas fired, tank type high efficiency sealed combustion water heater. The thermal expansion tank shall utilize a permanent bladder system.

PLUMBING FIXTURES MATERIALS AND EQUIPMENT

- Lavatories shall be vitreous china, undermount bowl and sensor faucet rated for 0.5 gallons per minute flow rate.
- Water closets shall be vitreous china, wall hung sensor flush valve style fixtures with 1.28 gallons per flush.
- Urinals shall be vitreous china, wall hung sensor flush valve style fixtures with 1.28 gallons per flush.
- Kitchen sink shall be two compartment stainless steel drop-in with two handle swing spout faucet rated for 2.2 gallons per minute flow rate. A commercial grade garbage disposal shall be provided for one sink compartment.
- Drinking fountain shall be wall hug stainless steel in high-low configuration, with bottle filler.
- Outlet boxes for icemakers, or dishwashers shall be powder coated steel.
- Hose bibbs shall be cast brass with rough bronze finish and wheel handle operation. Wall hydrants shall be freezeproof with loose key operation.
- Floor drains in finished areas shall be cast iron body with nickel bronze heel proof grate. Floor drains in mechanical rooms shall be cast iron body with heavy duty tractor grate.

SANITARY DRAIN AND VENT SYSTEM DESCRIPTION

- Plumbing fixtures are connected to a sanitary drain and vent collection system that is connected to a municipal sanitary sewer system.
- Grease producing fixtures in the kitchen are connected to a grease drain and vent system that is connected to a gravity grease interceptor. Grease separates from wastewater in the grease interceptor and is collected for future remediation. Grease free wastewater continues downstream from the grease interceptor and connects to the sanitary drain and vent collection system.
- Tug bay drains are connected to an oil waste and vent collection system that is connected to an oil interceptor. Flammable liquids separate from wastewater in the oil interceptor and is collected for future remediation. Oil free wastewater continues downstream from the oil interceptor and connects to the sanitary drain and vent collection system.
- Below grade and above grade drain waste and vent pipe shall be Sch 40 PVC DWV solid wall pipe and fittings.
- Above grade drain waste and vent pipe within a return air plenum shall be Cast Iron No Hub pipe and fittings.

SANITARY DRAIN AND VENT DESIGN CRITERIA

- The existing 6" sanitary service will be dedicated to the sanitary system. Drain and vent systems shall be designed using the fixture unit method. This method requires the following information; the load factor in drainage fixture units or gallons per minute flow rate and the slope of the connected drainage pipe. The drain and vent systems shall be designed with a minimum of 2 feet per second velocity to ensure solids remain suspended in the wastewater.
- A hydromechanical grease interceptor shall be required for on-site pretreatment of the grease laden wastewater from the kitchen. The interceptor shall be designed to provide a minimum of a one hour holding period to ensure separation of grease, and a 90-day cleaning cycle.
- A gravity oil interceptor shall be required for on-site pretreatment of flammable liquids that may be present in wastewater from the tug bay. The interceptor shall be designed to accommodate the discharge from hose bibbs, to ensure separation of flammable liquids from wastewater.

SANITARY DRAIN AND VENT EQUIPMENT AND MATERIALS

- Pipe – Schedule 40 DWV PVC
- Pipe – Cast Iron No Hub (within return air plenum)
- Trench Drains – Precast, with heavy duty cast iron grate
- Floor drains – Heavy duty cast iron in maintenance spaces, medium duty in public spaces
- Trap guard - waterless trap seal
- Interceptor – oil, sand/grit.
- Interceptor – grease.

STORM DRAIN SYSTEM DESCRIPTION

- Primary and secondary (overflow) roof drains will be collected via internal storm piping. Primary storm will be routed below grade and connect to the site storm system. Secondary storm will be routed to downspout nozzles.
- Below grade and above grade storm pipe shall be Sch 40 PVC DWV solid wall pipe and fittings.
- Above grade storm pipe within a return air plenum shall be Cast Iron No Hub pipe and fittings

STORM DRAIN DESIGN CRITERIA

- Storm systems are designed by calculating the projected square footage of roof area converted to GPM. This is a gravity system sloped at a minimum of 1/8"/FT.

STORM DRAIN EQUIPMENT AND MATERIALS

- Pipe – Schedule 40 DWV PVC
- Pipe – Cast Iron No Hub (within return air plenum)
- Roof drains – Heavy duty cast iron with dome strainers and 2" internal water dam for overflow drains.

5.4.5 Electrical

SYSTEM DESCRIPTION

- The anticipated electrical scope for this project will be to provide normal power, standby power, interior and exterior lighting, and fire alarm to the expansion of the terminal. and some remodeling of the existing terminal and at the intersection of the existing and new projects.
- It is anticipated that a new electrical main electrical room and several sub-electrical rooms will be necessary through the addition based on power, lighting and standby power needs.

ELECTRICAL DEMOLITION

- **Concourse Expansion Alternative #3 and Ticketing Area Alternative #1:** As construction requires removal of the electrical equipment, lighting, electrical devices, and fire alarm devices serving the current concourse building and in the location of the new addition. The existing electrical distribution system and existing 1200KW EPS located on the first floor of the existing concourse will remain. It is anticipated that some electrical work/ modifications will be necessary associated with the existing concourse electrical distribution system.
- **Existing terminal and Concourse:** Replacement of all the existing lighting with new energy efficient lighting system is desired. This will consist primarily of light emitting diode (LED) light sources. Fixture types and styles of the luminaires will need to be coordinated with the owner and architect based on the space functions, ceiling types, and building architectural elements.
- **Existing terminal building and concourse:** The existing lighting control systems will soon to be obsolete and no longer supported or have available replacement parts. All lighting control panels, and control stations will be removed and replaced with new lighting control(s) as described in the General Lighting Control section.
- **Outbound Baggage Screening and Baggage make-up expansion:** As required by construction removal of the electrical equipment, lighting, electrical devices, and fire alarm devices serving the current baggage screening space.

DESIGN CRITERIA

- **Electrical Quality Level**
    - Equipment selections will be from manufacturers whose products comply with current industry accepted design and testing standards.
- **Equipment selection, specification and installation practices will reflect a commitment to long- term longevity of system, ease of maintenance and energy efficiency.**
    - The intended level of quality of all wiring devices will be specification grade.
    - The intended level of quality of all lighting fixtures will be specification grade.
- **Energy conservation**
    - Electrical building systems shall be designed using sustainable energy efficiency goals. Meet the requirements of IECC 2021
- **Electrical Site Work**
    - The electrical site work will include work associated with the new concourse addition.
- **Service**
    - The building Electrical is served from a main distribution switchboard (MDS) via underground service conductors from the utility owned pad mounted transformer.
- **Normal Power Services and Distribution**
    - Secondary electric service at 480Y/277 volts 60 Hz .
    - The main switchboard MDS is on the first floor in Electrical Room 156. The switchboard consists of an incoming/power metering section and main breaker disconnect. The switchboard is rated for 2000 amperes (A) at 480/277 Volts (V), 3 Phase, 4 wire. The main breaker is an insulated case, 2500A, solid state electronic breaker with LSI functions.
    - Upon review of Xcel Energy electrical service load profile for the twelve months of 2021 the highest demand was 582 KW. Based on the service size the terminal is only using about 35% of the total service capacity. It would be anticipated that the existing service has adequate capacity to serve the new terminal expansion and renovations.
    - The West Terminal building electrical distribution consists of a distribution switchboard (DS) on the lower level in Electrical Room 156, an existing house switchboard, and a tenant switchboard located in electrical room 146. Switchboard "DS" was installed as part of the 2008 project, and the house switchboard and the tenant switchboard are from the original 1986 terminal project. The DS is rated at 2000A at 480/277V, 3 Phase, 4 wire and consists of multiple sections with group mounted circuit breakers of various sizes and ratings. The house switchboard is rated at 1600A at 480/277V, 3 Phase, 4 wire. It consists of a main section with a 1600A main bolt-loc type BP switch and multiple sections with group mounted fusible switches of various sizes and ratings.
    - The tenant switchboard has four sub-meters for tenant metering by the owner with four spare for future tenants .At the time of this report it is unknow what the load profiles are for each tenant. Further evaluation of the tenant service during the design period will needed to determine if the service has adequate capacity to serve any future tenants.
    - The main power distribution system for the terminal addition will be comprised of normal, emergency, legally required standby, and optional standby power systems. Major system components include switchboard, panelboards, transformers, and transfer switches. The main distribution will be in the main electrical room of the terminal addition. The switchboard will have a design bus rating as determined in the design phase with a main circuit breaker.
    - The Tenant (concessions) power distribution system will be comprised of normal, emergency and optional standby power. Major system components include panelboards, and transfer switches.
    - The switchboards distribute power to panelboards located throughout the facility. Electrical rooms will be located within the area of the new concourse. Locations will be determined during the design phase of the facility to minimize circuit lengths and the consequent need to increase conductor size required to overcome voltage drop. While most distribution panelboards are proposed to be in electrical rooms, it may be required to locate some panelboards in non-utility spaces to reduce the need for additional electrical room space and to reduce circuit lengths. Each tenant space (noted as concessions) will be provided with dedicated normal, emergency and optional standby panelboard(s).
- **Emergency Systems and Distributions**
    - The power distribution system is comprised emergency, and optional standby power systems. Major system components include switchboards, panelboards, generators and transfer switches.
    - The emergency/standby power source will be derived from the existing generator. The generator provides standby power to the entire building through an automatic, closed transition 4-pole, transfer switch (ATS-A) rated at 2000A, 480Y277V, 3 PHASE, 4 wire. In addition, the generator provides emergency power per NEC article 700 through an automatic, open transition, 4-pole transfer switch (ATS-B) rated at 260A, 480Y/277V, 3 phase, 4 wire. Transfer switch ATS-A is located in the same electrical room as main switchboard MDS and transfer switch ATS-B is located in the same room as the standby generator.

- It would be anticipated that the emergency/standby power will be distributed by utilizing existing distribution Switchboard DS3(served through ATS-A) and ATS-B transfer switches. The emergency loads consist of emergency egress lighting. Legally required standby loads consist of fire alarm system, telecommunication equipment i.e. public address, legally required lighting. and ventilation and smoke-removal systems. Optional Standby equipment loads include convenience receptacles in the hold rooms, include ticketing gate counters, flight information displays (FID), elevators, and selected control systems (access control, CCTV). Optional standby motor loads include AHU units, pumps necessary to maintain building functions and operations.
- The Tenant emergency/standby power source will be derived from the existing Tenant Switchboard which is served from ATS-A through distribution switchboard DS . The emergency/standby power will be distributed by 2 automatic transfer switches: one for emergency loads, and one for optional standby loads. The emergency loads consist of emergency egress lighting. Optional Standby equipment loads include lighting and selected kitchen equipment loads to maintain operations.
- The design criteria for the Emergency/Standby System will be like that for the normal power system. The capacity of the existing generator will need to be determined during the design phase to verify if sufficient to serve the facility.

- **Power Monitoring**
  - Electrical loads shall be grouped according to load type in order to facilitate monitoring of power usage through an energy dashboard application or Building Automation System.
  - Comply with UL 845 and NEMA ICS 2.
- **Energy Conservation**
  - Electrical building systems shall be designed using sustainable energy efficiency goals.
- **Lightning Protection System**
  - A lightning protection system risk assessment will be performed per the requirements of NFPA 780 and determine if a lightning protection system (LPS) is required for this addition. The system would be an extension of the existing terminal buildings Lighting Protection System.
- **Lighting System**
  - The lighting system will be designed to provide average illuminance levels in compliance with IES Lighting Library recommendations.
  - All lighting design and fixture selection shall be coordinated with Architect/User Agency.
  - The lighting system will be designed to enhance visual quality while minimizing connected lighting power density and lighting energy use.
  - Illumination quality will enhance the visual experience of visitors and staff by providing orientation cues and addressing visual comfort needs.
  - Vertical surfaces will be accented where to encourage the sense of brightness and openness.
  - Manual switching/dimming in conjunction with advanced lighting controls will be used to minimize electric lighting energy through the use of occupancy/vacancy sensors, daylight harvesting, and programmable dimming.
  - Luminaires will use primarily high efficacy, long life, and high color rendering LEDs.
  - The vocabulary of lighting techniques will include ambient, task, and accent lighting using leading-edge technologies.
  - All luminaires will be high quality specification grade equipment by reputable manufacturers and CE/UL/IP- listed for the application, unless otherwise noted.
  - All LED lighting must adhere to the requirements and guidelines of the IESNA testing standards of LM-79 – IES Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products and LM-80 – Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and modules.
  - All LED luminaires shall meet or exceed 70% lumen output for a minimum of 50,000 hours. Overall lumen output shall not depreciate more than 20% after 10,000 hours of use.
  - All interior LED luminaires shall maintain color consistency utilizing a maximum 3-step MacAdam Ellipse binning process. Exterior fixtures shall maintain a maximum 5-step MacAdam Ellipse binning process.
  - Lighting levels will be in accordance with recommendations of the Illuminating Engineering Society (IES).
- **Emergency Lighting**
  - Emergency and exit/egress lighting will be provided in accordance with IBC 2021 and NFPA 101 and local codes. The required path of egress routes and location will be coordinated with Architect. Emergency egress illumination will be extended to the nearest public way.
  - Exit lighting will be provided as required to mark the designated path of egress.
- **General Lighting Control**
  - All lighting will be controlled to meet or exceed the local energy code listed in the basis of design.

- Total building lighting control shall be used. Low voltage control system may be distributed type or centralized or combination of both. All low voltage controls shall be by the same manufacturer and tied into a single head end.
- Lighting control panels or distributed control systems will include a digital time clock with capabilities to control individual relays based on digital inputs from accessory devices. Photocell will be installed on the roof and will be tied into lighting control system.
- Occupancy sensor will utilize passive infrared and/or ultrasonic or microphonic technologies. Dual technology occupancy sensors will be implemented in all public and staff restrooms. Ultrasonic sensors shall be utilized in stairwells and shall be equipped with fail-on technology.
- Combination manual dimmer/vacancy sensors will be utilized in the private offices.
- Interior lighting in the storage facility will utilize manual switching in conjunction with occupancy sensors, exterior lighting will implement Photocell on/off controls.
- For emergency lighting controlled by a wall switch or lighting control panel, a UL924 ELCU will be provided to automatically turn emergency lighting on in the event of loss of normal power. Device model shall be compatible with power supply control type.
- Occupancy and Vacancy sensors [] will not be tied into the building low voltage lighting control.
- All low voltage lighting control will be tied into the building BAS for individual relay control.

- **Exterior Lighting Control**
  - Exterior lighting shall be controlled through the digital lighting control system.
  - Photo sensors and programmable astronomical time clock shall control the lights in response to available daylight and seasonal changes.
- **Fire Alarm System**
  - The fire alarm system for the areas of the addition and renovation will consist of smoke detectors, heat detectors, duct smoke detectors, manual pull stations, water flow monitors, tamper switches, and visual/audible signaling devices.
  - The fire alarm system will comply with requirements of NFPA 72 and Life Safety Codes.
  - Audio/visual devices will be installed in all areas of the building in accordance with the NFPA and ADA guidelines. All areas of the building will be covered by audible device coverage as required by NFPA 72 and the International Building Code as adopted in Wisconsin. Visual devices will be installed in those public and shared areas as recognized by ADA such as corridors, bathrooms, conference rooms, waiting rooms, break areas, and lobbies. Visual devices will also be provided in mechanical areas as a supplement to the audible devices.
  - Smoke detectors will be installed as required by the National Fire Protection Association and the International Building Code. Smoke detectors will be installed in, but not limited to, the following locations: air handling units, elevator shafts, elevator lobbies, elevator machine rooms, and electrical equipment rooms.
  - Heat detectors will be installed in areas that are not feasible for smoke detectors.
  - Manual pull stations will be installed adjacent to all exit doors, in each elevator lobby, and at nurses' stations.
  - The fire alarm system will be able to communicate with the existing fire alarm control.
  - Beam type smoke detectors will be provided for smoke detection as required by International Building Code smoke evacuation of any atrium spaces. Detectors will be interfaced to smoke evacuation system air handling units.
  - All initiating and signaling devices will operate at 24VDC and will be installed in accordance with manufacturer's specifications.

EQUIPMENT AND MATERIAL

- The switchboard MDS is Siemens type SB3, manufactured in April 2007 and was installed as part of the 2008 project.
- Existing Cummins 1250KW/1562.5KVA,480Y/277V, 3 phase, 4 wire diesel generator located on the first floor in a dedicated room 103A.
- The storage tank is close to the evaporative fluid cooler on the site. In the generator room, a day tank stores a smaller amount of fuel oil for the generator. The storage tank size will need to be evaluated to determine if adequate to provide required generator runtime with the added terminal building loads.
- The diesel engine cooling system consists of a remote radiator with a motor-driven fan located on the site.
- Emergency/Standby distribution switchgear will be used to separate the generator power into separate sources: . The switchgear will be in the new terminal building. Metering will be provided to indicate various parameters including voltage, current, power, power factor, power demand, and energy.
- Automatic Transfer Switches (ATS) will be used to couple the generator power to the distribution system. The transfer switches will be in the new terminal building.

- An emergency power distribution panel will be in the new terminal building and will consist of fixed mount feeder circuit breakers to serve emergency lighting panelboards.
- 480:208Y/102V emergency power distribution transformers will be located in new terminal building to transform voltage from 480V to 208Y/120V between the emergency lighting panels and the emergency branch circuit panelboards.
- **Low Voltage Distribution Transformers**
    - Distribution, dry-type transformers with a nominal primary and secondary rating of 600 V and less, with capacities up to 1500 kVA.
    - Nema ST 20, Factory-assembled and -tested, air-cooled units for 60-Hz service.
    - Transformers Rated 15 kVA and Larger: Comply with 10 CFR 431 (DOE 2016) efficiency levels.
    - 480:208Y/102V power distribution transformers will be located in the new terminal building dedicated electrical room(s) to transform voltage from 480V to 208Y/120V branch circuit panelboards.
- **Distribution Panelboards**
    - Power and distribution panel boards shall be floor mounted or wall mounted, commercial grade with at least 42 circuits, double-hinged doors (door-in-door construction), and NEMA 1 type construction. Nema PB 1, distribution type
    - Large Distribution Panels can be mounted on housekeeping pads as required.
    - Panels shall be sized to manage all anticipated loads at worst case power densities plus 20 percent spare capacity.
    - Panels will serve large three phase mechanical equipment, elevator(s), large owner furnished equipment and branch appliance panelboards.
    - Shall be sized to manage all anticipated loads at worst case power densities plus 20 percent spare ampacity.
    - Future Capacity: Panel shall have a minimum of 20 percent spare breaker quantity capacity. Panel shall have mounting brackets, bus connections, filler plates and necessary appurtenances for future installation of devices.
    - Short Circuit current rating: Fully rated to interrupt symmetrical short circuit current available at terminals.
- **Lighting and Appliance Panelboards**
    - Lighting and Appliance panel boards shall be commercial grade, 480Y/277 Volt, or 208Y/120 Volt,3 phase, 4- wire, sized to manage all loads at worst case density including 20 percent spare capacity.
    - Lighting and Appliance panel boards shall be surface or flush mounted based on location. Enclosures shall be NEMA Type 1 for indoor dry locations, NEMA Type 3R for outdoor locations, NEMA Type 4X for other wet or damp indoor locations, NEMA Type 12 for indoor locations subject to dust, falling dirt, and dripping non-corrosive liquids. Comparable to Square D NF (480V) and NQOD (208V) style; rated for 3 phase, 4 wire, 60 Hz service.
    - Panelboards shall have bolt-on breakers, tin-plated copper bus, main mechanical type lugs only (MLO) or main circuit breakers (MCB) as required.
    - Short Circuit current rating: Fully rated to interrupt symmetrical short circuit current available at terminals.
    - All panelboards in public areas to be flush mounted. All panelboards in back of house areas shall be surface mounted unless subject to potential damage in which case they will be flush mounted.
    - Main circuit breakers will be provided as required by NEC in the 208 Volt panels located within 10' of the step-down transformers.
    - Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.
    - Main bus bars shall be tin-plated copper sized in accordance with UL standards to limit temperature rise on any current carrying part to a maximum of 65 degrees C above an ambient of 40 degrees C maximum.
    - Doors: Secured with vault-type latch with tumbler lock; keyed alike.
    - Conductor Connectors: Suitable for use with conductor material and sizes.
    - All circuit breakers will be provided with AL/CU listed connector lugs and will be bolt on type.
    - Phase, neutral and ground buses will be copper.
    - All panelboards will be provided with type written directory indicating loads served and room numbers where loads located.
    - All Panels will be provided with ARC flash labels.

- **Surge Protective Devices (SPDs)**
    - Surge protective devices (SPDs) protect against electrical surges and spikes in power distribution, communications systems, and other heavy industrial applications. IEEE C62.41 defines three operating locations designated as categories. Category C environments are located on the LINE side of the service disconnect. Category B are immediately adjacent on the LOAD side of the service disconnect. Category A have long branch circuits and outlets more than 30 feet from a Category B environment, or more than 60 feet from Category C locations. These environments encompass the following systems:
    - An SPD will be installed on the load side of the main disconnect of the service entrance.
    - In some cases, an SPD will be installed on the down-stream distribution panelboards. All devices shall comply with UL 1449 .
- **Lighting Fixtures**
    - All lighting will be of the LED type.
    - The target luminous efficacy shall be min of 100 Lumens/Watt for linear fixtures and 65 Lumen/Watt or greater for down-lighting.
    - All fixtures shall be provided with 0-10 Volt dimmable drivers, unless specifically required otherwise by the space application.
    - Dimming drivers shall be specified to dim to 10%, 5% or 1% light output or less and shall be fully compatible with dimming control equipment.
    - LED modules will have a minimum CRI of 80.

5.4.6 Technology

The technology scope for this project includes the creation of new Technology Spaces, including a Main Technology Room and Technology Rooms, as required for the remodeled and expansion areas as well as an updated Structured Cabling System. In addition, existing technology systems consisting of the Security, Paging, and Digital Display systems will be expanded as necessary to meet the current and future needs of the airport and its tenants.

DESIGN CRITERIA

- **Main Technology Room (MTR):** The MTR will house the base infrastructure for the facility including internet routers, firewalls, network distribution switches, and servers supporting the building services and applications.
- **Technology Rooms (TRs):** The TRs are defined as the interface between the backbone cabling system and the horizontal cabling system. The TRs accommodate necessary space and environmental considerations for all components necessary to provide final connectivity to end user devices through the horizontal cabling system.
    - Criteria established under TIA 568 set forth distance limitations on high performance cabling systems, which will be discussed in the Structured Cabling System (SCS) section below but has a direct effect on the placement of these distribution rooms. The MTR and TRs must be located so that installed and terminated horizontal cable lengths do not exceed 295 feet (90 meters).
    - Any entrance door should open outwards to increase the available usable space within the TRs.
    - The TRs will be arranged to accommodate the following systems and equipment:
        - Termination and patching facilities for horizontal cabling.
        - Termination and patching facilities for backbone cabling.
        - Hardware and racking for network switches and any other electronic components necessary to support the facility and users.
    - Power outlets for any electronic equipment located within the TR should be fed from an electrical panel dedicated to these loads, ideally located within each TR. Panels serving the TR should be on the building emergency power distribution system. Power accommodations should include both 120V and 208V to rack power distribution and UPS systems.
    - Dedicated cooling, electrical and fire suppression provisions are recommended for the TRs to allow the network and associated electronics to operate efficiently and reliably over the life cycle of the building. The installation shall be in accordance with TIA 569.
- **Structured Cabling System (SCS):** The SCS infrastructure is the cabling system that interconnects all technology spaces and devices in the FAR Airport Terminal from the BEF to the MTR, to the TR, and ultimately out to the technology outlets and subsequently to network-connected devices.
    - In conformance with the ANSI/TIA-568.0.E standard, the information technology cabling system should be designed in a hierarchical star topology in the following manner:
        - Horizontal cabling will be home run from each technology outlet to its respective TR.
        - No intermediate termination or patching facilities will be allowed.
        - Backbone optical fiber cabling shall be installed in a star topology from the fiber distribution panel in the MTR to each TR.
        - Backbone copper cabling shall be installed in a star topology from

the copper terminations field located in the MTR to each TR.

- All cable is to be of PVC, LSZH or Plenum construction depending on local codes, standards, and configuration of HVAC system installed.

- Cable length limitations should be as follows:
    - Horizontal Cabling – 295' feet (90 meters) from the technology outlet to the termination point located within the TRs.
- Fiber/Copper Backbone Cabling
    - The primary backbone infrastructure will be single-mode optical fiber cable installed from the BEF and MTR to the TRs in this building. This will provide the capability to extend the network services and allow capacity for other systems or network topology changes.
    - A limited traditional copper backbone will be installed to accommodate any copper reliant analog or digital voice grade services that are required in the new facility.
        - Internal copper backbone cables, consisting of a minimum of 25-pairs, shall be provided from the MTR to the TRs.
        - The copper backbone cables should be terminated on rack mounted "resource" patch panels in the MTR and TRs. Termination in the BEF should be on 110 type blocks.
- TV Cabling: Television (TV) service will be distributed throughout the facility via coaxial cabling and Category 6 cabling. End clients are used at displays where necessary, to convert signals for display on flat panels. Where technology permits, direct connection to displays may be an alternative for this project to obtain TV at selected displays.
    - A coaxial system consists of two basic elements:
        - **Distribution System**—a network of distribution media (e.g., coaxial cables) and local area taps and splitters.
        - Typical distribution coaxial cable consists of RG11 or .500" cables.
        - **Subscriber Drop**—coaxial cables, faceplates and "F" connector outlets where the user connects the TV set.
        - Typical subscriber drop coaxial cable consists of RG-6 or RG11.
- Horizontal Cabling
    - The horizontal cables connecting the end user device to the network at a minimum should consist of Category 6 (Cat6) 4-pair unshielded twisted pair (UTP) cables for technology outlets and Category 6a (Cat6a) for wireless access points (WAPs).
- Building Pathway Systems
    - Conduits, cable tray, non-linear cable supports and other fixed containment that support information technology cabling within the new facility are a key component in the information technology infrastructure. Design parameters established herein follow standards established in the TIA 569 Installation Practices within Buildings documents.
    - Backbone Cabling Pathways
        - The copper and optical fiber backbone cabling pathways will be accommodated in appropriate conduit pathways from the BEF and MTR to the TRs in this facility.
- Horizontal Cabling Pathways
        - The SCS horizontal cable distribution from the TR to each outlet position will require a flexible pathway of appropriate dimension to accommodate day one and future cabling installations to the SCS outlets. Also, ease of installation and cable maintenance are important in the selection of the appropriate pathway.
        - The horizontal pathway will be provided within the ceiling area. The provision of a properly sized conduit and cable tray system will provide flexibility in installing, modifying, adding, or deleting any portion of the cable plant.

BUILDING SYSTEMS

- **Wi-Fi:** Infrastructure for Wireless Access Points (WAPs) will be installed in a distributed design throughout the entire facility providing access in all areas for mobile devices. Cat6a cabling will be used to take advantage of the latest wireless technologies and provide the most bandwidth and throughput.
- **Public Address (PA):** The existing PA system will be expanded to accommodate the new areas. Conduit pathways and loudspeaker placement will be driven by code since the PA system also provides service as the Mass Communications platform for emergency announcements.
- **Digital Display Systems:** The current Electronic Video Information Display Systems (EVIDS) and digital signage solutions are vendor contracted and supported solutions.

- **Flight Information Display System (FIDS) / Gate Information Display System (GIDS) / Bag Information Display System (BIDS):** The current FIDS/GIDS/BIDS system will be expanded to accommodate the facility's expansion and renovation. The EVIDS vendor will maintain control of the media hardware and content. Connectivity will be provided through the SCS and space will be allocated in the MTR and TRs for any current or additional head-end and connectivity hardware.
- **Digital Signage:** The current digital signage platform will be expanded with new LED displays providing advertising content. The current digital signage vendor will maintain control of the media hardware and content. Connectivity will be provided through the SCS and space will be allocated in the MTR and TRs for any current or additional head-end and connectivity hardware.
- **Physical Security Systems**
    - Video Surveillance System (VSS): The existing Genetec Omnicast Video Management System (VMS) will be expanded as necessary to accommodate the additional coverage areas. Additional storage capacity for a minimum of 30 days retention of full resolution recording 24/7 at 15 frames per second (FPS) will be required as part of this project to accommodate the cameras in this facility.
    - Cameras: New IP cameras will be provided for coverage of all public, Sterile, SIDA and Secure areas. The new cameras will include a basic level of analytics with the ability to add more complex analytics as needed. A combination of fixed, multisensor, and pan-tilt-zoom (PTZ) cameras will be used to provide appropriate coverage. Enclosures will be required appropriate to the environment where the cameras will be installed to mitigate any potential physical damage and maintain operability in adverse weather conditions.
    - Access Control System (ACS). The existing Genetec Synergis system will be expanded to accommodate all secured doors from Public to Sterile/SIDA and Sterile to Secure/SIDA. Building operation spaces will also be access controlled. Access control specifics for this project include:
        - Mercury Access Control Panels (ACPs) and power supplies shall be remotely mounted in the TRs.
        - HID Credential readers will be smart card proximity reader in both configurations of either a reader only or a combined reader/keypad based off the access requirements of the secured area.
    - Security Screening Checkpoint (SSCP): Requirements and guidelines outlined in the latest version of the Checkpoint Requirements and Planning Guide (CPRG) will be followed for all the general connectivity and security requirements.
        - Additional cameras will be required to provide specific fields of view of all operational aspects of the checkpoint. These cameras will be part of the Airport's video surveillance system.
        - Access control will be required to secure the SSCP during non-operational hours; this will be part of the Airport's access control system.
        - All SSCP hardware Cat6 cabling will terminate in the existing TSA TR.
- Rental Car: Rental car renovation will necessitate updating the SCS for each location and adding them to the Common Cabling setup used in the rest of the facility.

EQUIPMENT AND MATERIALS:

Telecommunication rooms (TRs)

- A combination of standard and colocation network cabinets to house backbone cabling, horizontal cabling, and electronics.
- Plywood lined wall(s) for wall-field terminations.
- Wall-fields or rack space for copper backbone cabling.
- Rack space as required for public address (PA) system expansion.
- Wall field or rack space for television systems equipment.
- Wall field for access control systems (ACS).
- Overhead tray support system

COMPREHENSIVE FACILITY INFRASTRUCTURE

- The SCS for the FAR Terminal Remodel will be a common use system. All horizontal cabling will be terminated in a common secured airport cabinet in each TR regardless of cable destination; the only exception is for cabling designated for TSA. Each tenant will be allocated a secured rack compartment for all their electronics and a patch panel that connects back to the airport cabinet mentioned above. This will facilitate a managed cabling solution allowing a conformed horizontal cable plant while giving flexibility for moves, adds, and changes.

TECHNOLOGY OUTLETS

- Provide a minimum of two (2) Cat6 cables at each technology outlet.
- There will be two (2) such outlets on opposing or adjacent walls of each enclosed (office) work area.

WI-FI

- Provide two (2) Cat6a cables at each wireless access point location.

VIDEO SURVEILLANCE

- Provide one (1) Cat6 cable at each IP camera location.

TELEVISION (TV)

- Provide one (1) Cat6 and one (1) RG6 cable at each TV location.

COPPER BACKBONE CABLING

- Provide one (1) twenty-five (25) pair multi-pair Category 3 copper backbone cable from the MTR to the TRs in this facility.

OPTICAL FIBER BACKBONE CABLING

- Provide a minimum of one (1) twenty-four (24) strand of single-mode optical fiber backbone cable from the BEF and MTR to the TRs in this facility.
    - Optical fiber terminated in rack-mounted fiber enclosures with LC connectors.

HORIZONTAL CABLING PATHWAYS

- Minimum of 1" conduits shall feed wall boxes to support technology outlets.
- Minimum size technology outlet back box shall be 4-11/16" X 4-11/16" X 2 -1/8" complete with a single-gang reducer ring.
- Main pathway routing should be accomplished using cable tray and conduit.
- If conduits are not installed from the work area outlet, non-linear cable supports (j-hooks) shall be used to extend the horizontal cabling from the tray to the conduit wall stub.

6.0 IMPLEMENTATION AND FINANCIAL FEASIBILITY

The purpose of this analysis is to discuss project implementation and evaluate Hector International Airport's capability to fund the Terminal Area Development and other projects in its overall Capital Improvement Program (CIP) while also financing operations during a 10-year planning period from 2022 through 2031.

The analysis includes development of a detailed Financial Implementation Plan prepared annually for the 10-year planning period. Plan objectives include presenting the results of the implementation evaluation and providing practical guidelines for matching an appropriate amount and timing of financial resources with the planned use of capital funds. Detailed schedules of projections for the Terminal Area Development and other capital program projects, operating expenses, operating revenues, and cash flow are provided at the end of **Chapter 6**. These schedules support the Financial Plan Summary, which presents the overall results of this evaluation.

6.1 PROJECT PHASING

Phasing was developed with the intent of minimizing disruptions to existing operations and keeping all 5 gates open throughout construction. The plan below reflects a conceptual phasing plan. Phasing and implementation will be more clearly defined when a construction manager is brought onto the team.

Figure 6-1 Phase 1 Enabling Projects

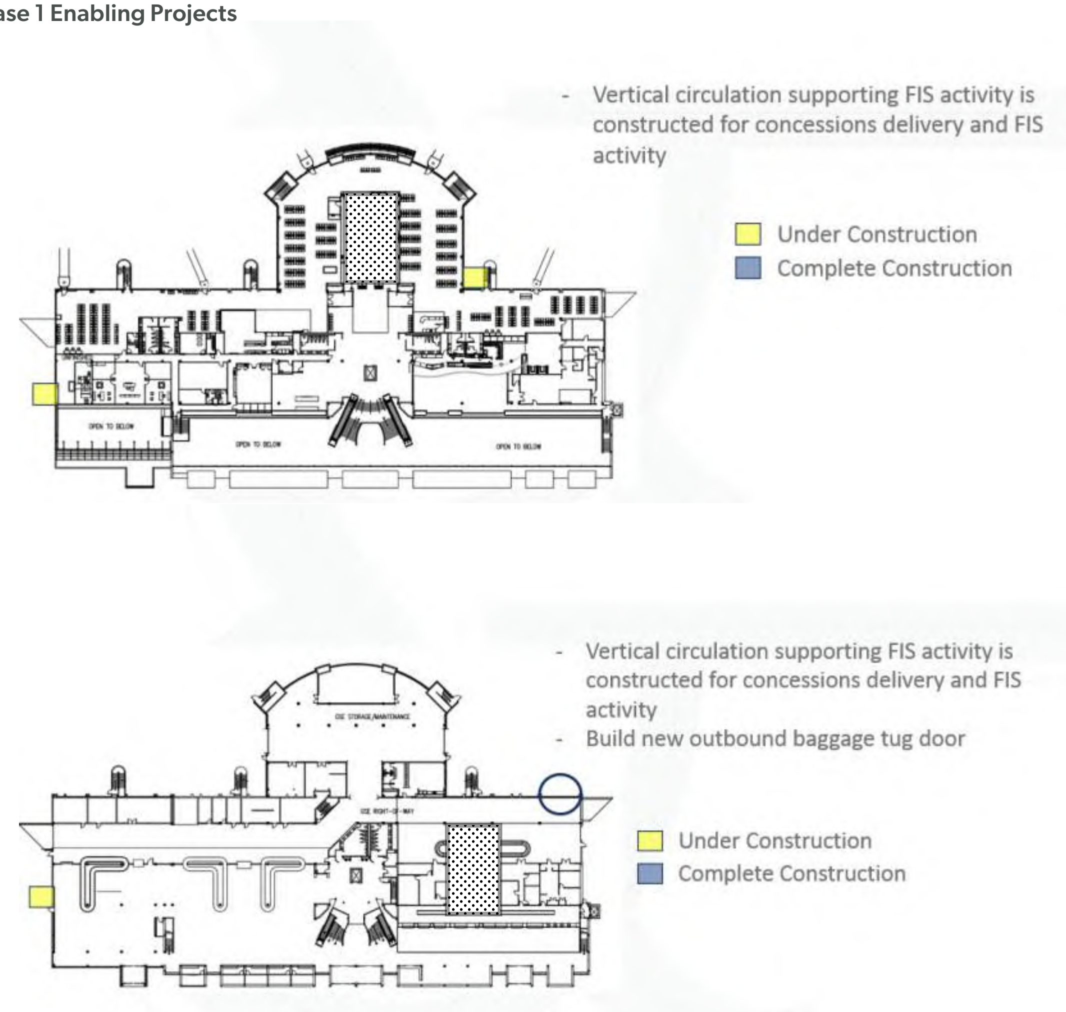
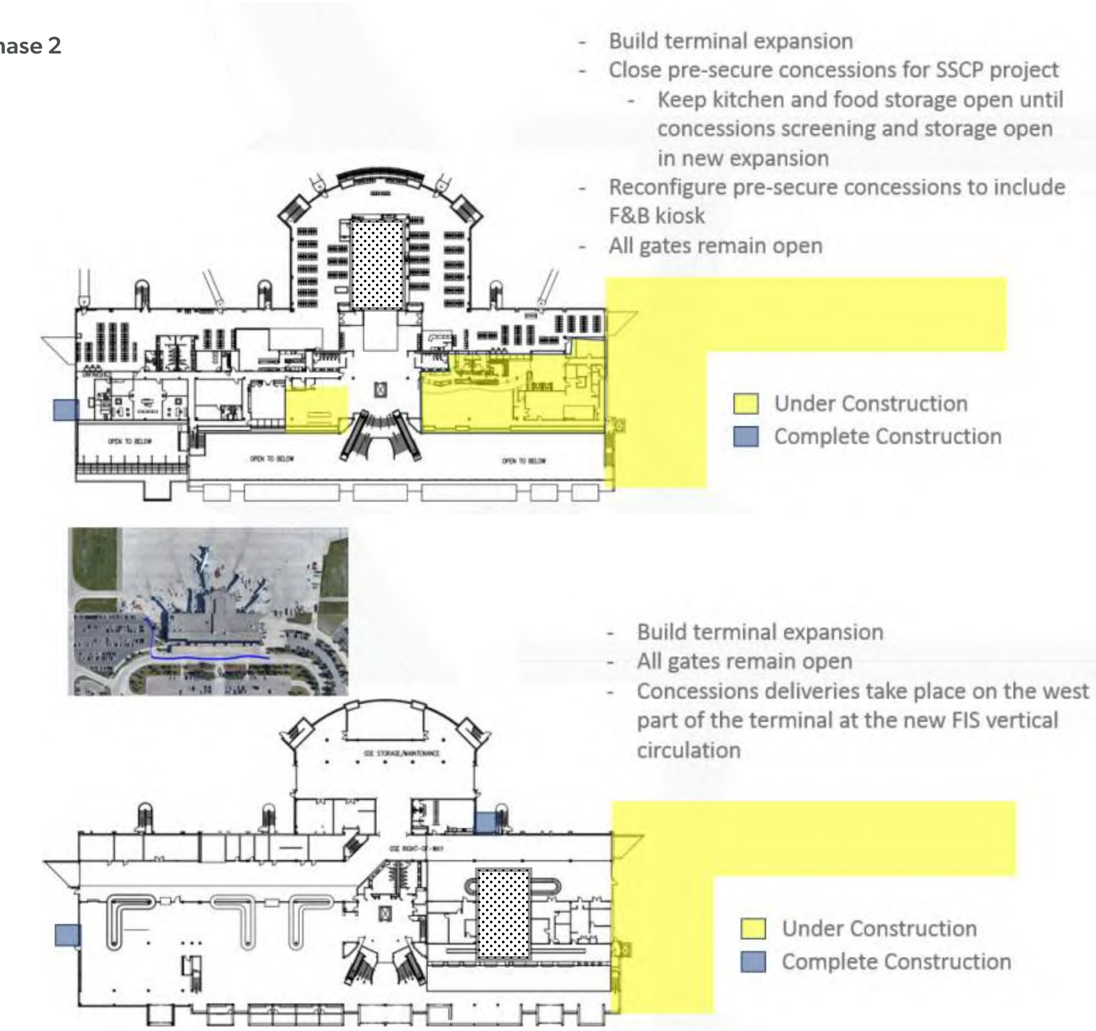


Figure 6-2 Phase 2



A major enabling project for the terminal redevelopment concept is the relocation of the freight elevator on the east end of the facility. An option for relocation is to construct the vertical circulation core on the west end of the facility that will ultimately act as the elevator serving any FIS activities. Another option is to bring deliveries airside via an escort and deliver them to a new vertical circulation core between existing Gates 1 and 2 **(Figure 6-1)**.

Phase 2 **(Figure 6-2)** includes the building of the terminal expansion. This phase will close the pre-secure concessions to the right of the vertical circulation core while keeping the kitchen and food storage open in the new expansion. The existing retail concessions space can be reconfigured to include a food and beverage kiosk. At the conclusion of Phase 2, the new expansion will be open.

Figure 6-3 Phase 3

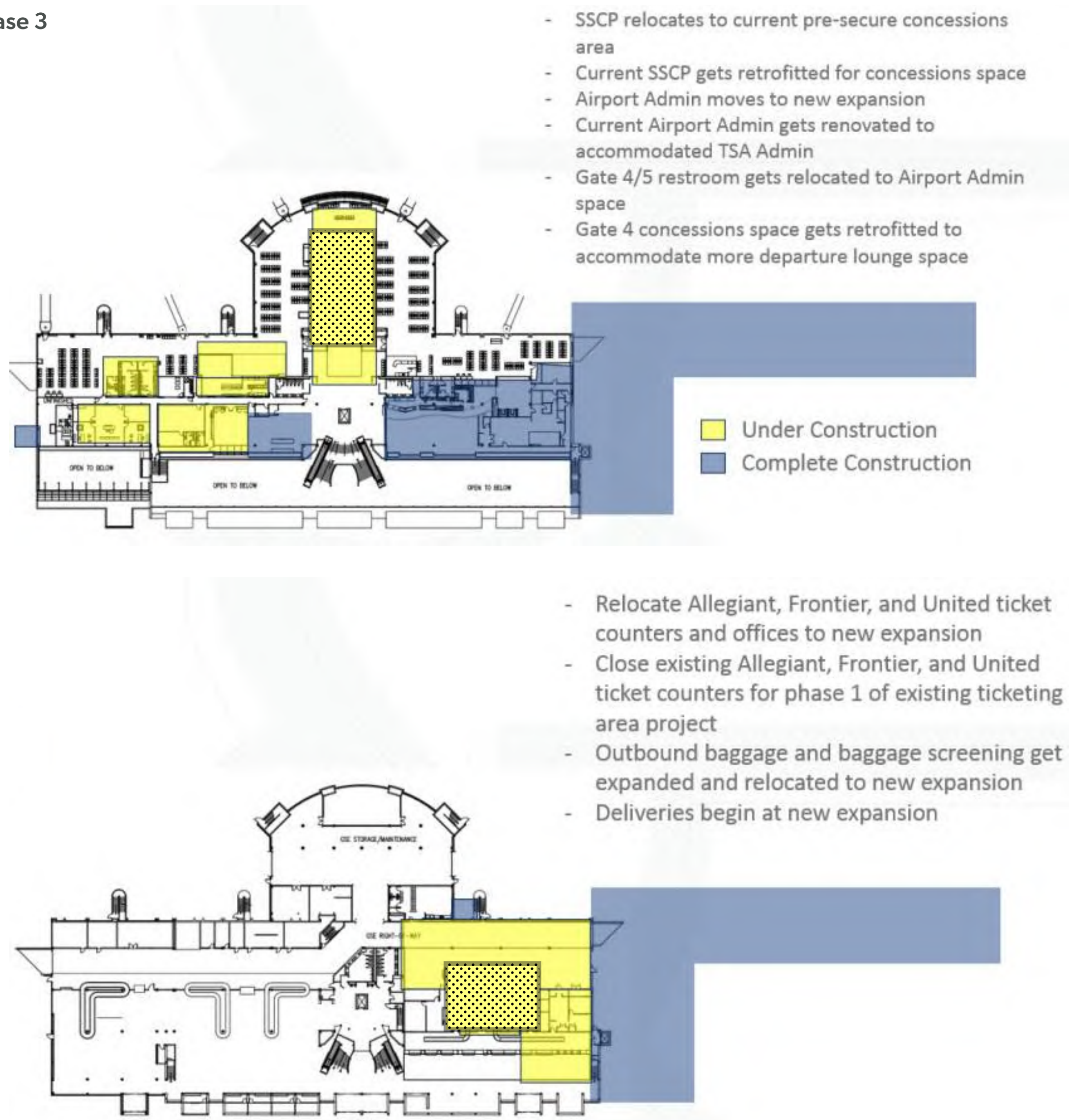
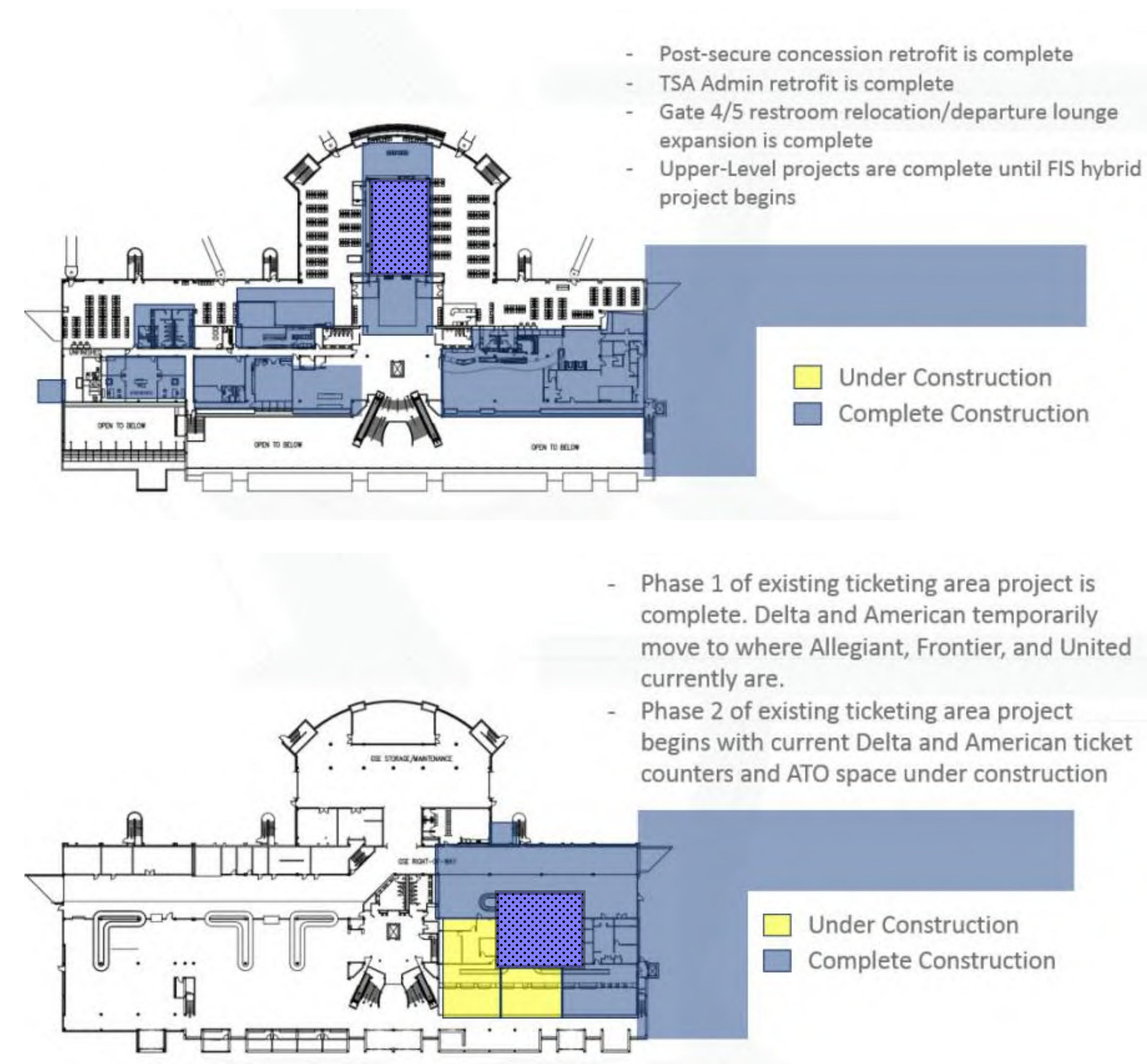


Figure 6-4 Phase 4



Phase 3 **(Figure 6-3)** includes the relocation of the security screening checkpoint (SSCP) to the existing pre-secure concessions space and retrofitting the existing SSCP to concessions space on the upper level. Additionally, existing admin space will be retrofitted to a combination of Transportation Security Administration (TSA) Admin space and gate departure lounge space at Gate 5. The upper level will be complete at the conclusion of Phase 3. On the lower level, the outbound baggage make-up area, ticketing area, and baggage screening areas are modified to connect into the terminal expansion. Temporary airline relocations in the ticketing area are required to modify the existing ticketing area. Additionally, concession deliveries are relocated to the loading dock at the new terminal expansion.

Phase 4 **(Figure 6-4)** includes the final phase of retrofitting the airline ticket counters and ticket offices. The terminal expansion will be complete at the conclusion of Phase 4.

6.2 OVERALL APPROACH FOR FINANCIAL IMPLEMENTATION ANALYSIS

The overall approach for conducting the Financial Implementation Analysis included the following steps:

- Gathering and reviewing key Airport documents related to historical financial results, capital improvement plans, operating budgets, regulatory requirements, City and Airport Authority policies, airline agreements, and other operating agreements with Airport users
- Interviewing Airport officials to gain an understanding of the existing operating and financial environment, relationships with airlines, and overall financial management philosophy
- Reviewing the Aviation Activity Forecasts previously developed in the Terminal Area Study
- Reviewing the detailed project components of the Terminal Area Development to obtain cost estimates and understand the preferred development schedule anticipated for the planning period
- Reviewing the Airport's existing CIP for non-terminal related projects to obtain cost estimates and understand the planned development schedule anticipated for the planning period
- Determining and analyzing the sources and timing of capital funds available to meet financial requirements for funding the capital program for terminal area improvements as well as other capital projects not related to the terminal
- Developing a financial plan that balances the anticipated overall need for capital funding with the practical availability of multiple funding sources including an assessment of the Airport's debt capacity to support the funding requirement within the preferred development time frame
- Analyzing historical and budgeted operating expenses, developing operations and maintenance expense assumptions, reviewing assumptions with Airport officials, and projecting future operating costs for the planning period
- Analyzing historical and budgeted operating revenue sources, developing revenue growth assumptions, reviewing assumptions with Airport officials, and projecting future revenues for the planning period
- Completing results of the analysis and evaluation in a Financial Plan Summary that provides conclusions regarding the Airport's capability to fund the planned CIP and finance Airport operations.

6.3 ORGANIZATION, ACCOUNTING, AND BUDGETING

GOVERNMENTAL ORGANIZATION AND ADMINISTRATION

Hector International Airport is owned by the Municipal Airport Authority of the City of Fargo, North Dakota. In 1969, the Fargo City Commission adopted a Resolution creating the Municipal Airport Authority as provided under North Dakota Century Code 2-06-02. City Ordinance 26-0102 provides that the care, management, supervision, and control of the Airport shall be under such rules and regulations as the Municipal Airport Authority of the City of Fargo shall, from time to time, prescribe. The Airport Authority is comprised of five members selected by the Mayor and ratified by the City Commission for five-year terms. The Airport Authority has hired an Executive Director as well as other staff to deal with the day-to-day operations of the Airport. A City Commissioner is appointed to serve as Liaison Commissioner to the Airport Authority.

ACCOUNTING AND BUDGETING PRACTICES

Historically, the Airport has been accounted for as an enterprise fund of the City of Fargo. This fund accounts for the operations and maintenance of the Airport facilities as well as capital investments and funding sources. As an enterprise fund, the Airport Fund uses the accrual basis of accounting in which revenues are recognized when earned and expenses are recognized when the liability is incurred. The Passenger Facility Charge Fund uses the cash basis of accounting. Pursuant to mutual agreement, the Airport Authority will be independent of the City and will be reported by the City as a component unit of its Annual Comprehensive Financial Report as of January 1, 2022.

Prior to 2022, the accounting records for the Airport were maintained by the City. The services provided by the City included accounts payable, accounts receivable, payroll processing, purchasing functions, monthly and annual financial reporting, and other services. Beginning in January 2022, the Airport has assumed responsibility for its accounting processes for which it uses internal staff and a third party provider.

The annual budget serves as the foundation for the Airport's financial planning and control. The Airport budget is developed by Airport and Authority officials on an accrual basis, exclusive of depreciation. Capital funding sources and uses are also budgeted annually.

6.4 AVIATION ACTIVITY FORECASTS

In **Chapter 3** of the Terminal Area Study, aviation activity forecasts were developed to determine if existing Airport facilities, specifically Terminal Area facilities, have the capacity to meet future demand or if facility modifications are needed. These forecasts, which include passenger enplanements, total aircraft operations, and commercial aircraft operations aid in the development and prioritization of the projects included in the Terminal Area Study.

This forecast was prepared at the same time as the evolving impacts of the COVID-19 pandemic. Additionally, the Airport is beginning to experience capacity changes by the airlines due to adjustments in routes, pilot staffing, and fuel costs. For purposes of the Financial Implementation Plan, the 2031 enplanements forecast was used, and a comprehensive annual growth rate was calculated to estimate the growth in enplanements from 2021 actuals to the 2031 forecast. Assumptions related to these forecasts are discussed in the last section of this chapter. Airport Improvement Program (AIP) entitlement funds, Passenger Facility Charges (PFCs), and net operating revenues described below are projected based on these forecasts.

6.5 CAPITAL FUNDING SOURCES

In the past, the Airport has used a combination of FAA AIP grants, PFCs, State Grants, and cash reserves/net operating revenues to fund capital improvements. These funding sources, as well as additional sources of capital funding, will continue to be important to finance the Airport's Terminal Area Development and other non-terminal capital projects during the 10-year planning period.

AIRPORT IMPROVEMENT GRANTS – ENTITLEMENT, CARGO, AND DISCRETIONARY FUNDING

The Airport receives grants from the Federal Aviation Administration (FAA) to finance the eligible costs of certain capital improvements. These federal grants are allocated to commercial passenger service airports through the AIP. AIP grants include passenger entitlement grants, which are allocated among airports by a formula that is based on passenger enplanements, and discretionary grants, which are awarded in accordance with FAA guidelines. After several years of continuing budget resolutions and other short-term legislative measures implemented by Congress, the FAA Reauthorization Act of 2018 was enacted on October 5, 2018. The Act authorized funding for the AIP through September 30, 2023.

Under current AIP authorization legislation, eligible projects are funded on a 90 percent AIP grant/10 percent local match basis for small and nonhub airports. Under this authorization, the Airport is projected to receive current entitlements of about $3.3 million in 2022 and future annual grants that are projected to grow to $3.5 million by 2031 – the end of the planning period. Small Hub airports (those which, in 2021, had annual enplanements between approximately 327,000 and 1,637,000) can accumulate and carry over up to three years of unspent entitlements plus the current year before the awards are revoked. In 2021, the Airport had approximately $3.5 million in unspent entitlements to carry over for use in 2022.

In addition to AIP passenger entitlement grants, Airports with more than one million pounds of landed all-cargo weight annually are also eligible to receive AIP cargo entitlements, based on the airport's pro rata share of total U.S. landed cargo weight. At FAR, the Airport was apportioned approximately $230,000 in cargo entitlements for 2022. The analysis assumes FAR's cargo entitlements will remain relatively flat at $230,000 per year for the remainder of the 10-year planning period. In total, the implementation analysis assumes the application of annual AIP passenger and cargo entitlement funds will be about $38.6 million during the 10-year planning period.

The approval of AIP discretionary funding is based on a project eligibility ranking method the FAA uses to award grants, at their discretion, based on a project's priority and importance to the national air transportation system. In recent years, the Airport has received discretionary funds to support runway, taxiway, and apron projects. It is reasonable to assume that the Airport will receive additional discretionary funding during the planning period for higher priority, eligible projects. The implementation analysis assumes that $91.3 million of AIP discretionary funds will be required during the 10-year planning period. Approximately $16.0 million of these discretionary grants would be used to support the Apron Expansion portion of the Terminal Area project from 2023 through 2024. Additional AIP discretionary grants of about $75.3 million are assumed during the 10-year planning period for terminal apron reconstruction and runway extension and widening projects. Since the future availability of AIP discretionary grants is not certain until an actual grant is awarded, it should be noted that any CIP projects that have discretionary funds indicated as a funding source in the implementation plan may need to be delayed until such funds actually become available.

The implementation analysis assumes that the current AIP program will continue to be extended through 2031. It also assumes that future program authorizations will provide substantially similar funding levels as it currently does and as it has historically provided since the program was established in 1982.

BIPARTISAN INFRASTRUCUTURE LAW – AIRPORT INFRASTRUTURE GRANTS (AIG) AND AIRPORT TERMINAL PROGRAM (ATP)

The Infrastructure Investment and Jobs Act of 2021, known as the Bipartisan Infrastructure Law (BIL), was signed into law on November 15, 2021. The legislation included $25 billion in funding for the FAA to invest in airport terminals, airport infrastructure, and air traffic facilities over the next five years. The BIL includes two programs that may provide capital funding to FAR.

The first is the AIG program. This program is similar to AIP Entitlements as funds are allocated to airports based on passenger enplanements. AIG funds are non-competitive and may be used for projects based on PFC eligibility requirements. FAR's 2022 AIG allocation was $3,766,182. The financial implementation analysis assumes the allocations in 2023 – 2026 will be approximately the same amount. This analysis assumes these AIG funds will be used toward the Terminal Expansion/Rehabilitation project, South GA Pavement Reconstruction/Rehabilitation, and the North GA Apron Expansion and Perimeter Road Reconstruction.

The second program, the ATP, is a discretionary grant program providing $1 billion per year to replace aging terminals and airport-owned towers, increase terminal energy efficiency and accessibility, and other terminal projects. These grants will be awarded through a competitive process based on a Notice of Funding Opportunity (NOFO) annually, and no more than $200 million per year may be allocated to Small Hub airports such as FAR. This analysis assumes the Airport will apply for and secure $20 million in ATP funding for the Terminal Expansion/Rehabilitation portion of the Terminal Area project.

COVID-19 RELIEF FUNDING – CARES, CRRSA, AND ARPA

On March 27, 2020, the Coronavirus Aid, Relief and Economic Security Act (CARES Act) was enacted and included $9.5 billion in supplemental funding for airports. The funds were allocated to airports based on formulas specified in the Act and calculated by the FAA. Under the Act, the funds can be used for any lawful purpose (in accordance with Airport Sponsor Grant Assurances and FAA policies), including capital and operating costs of the airport. FAR was allotted and awarded approximately $21.6 million in CARES funding of which $7.7 million was used in 2020 and 2021. The implementation analysis assumes that all of the Airport's remaining CARES Act award will be converted to development grants and utilized for capital projects.
On December 27, 2020, the Coronavirus Response and Relief Supplemental Appropriation Act (CRRSA) was enacted, providing another $2 billion in federal funds as economic relief to eligible U.S. airports and eligible concessions at those airports to prevent, prepare for, and respond to the ongoing coronavirus public health emergency. FAR was allotted approximately $3.6 million in CRRSA funding, which will be used for operational activities.

Finally, the American Rescue Plan Act of 2021 (ARPA) was signed into law on March 11, 2021. ARPA provided an additional $8 billion in funds to be awarded as economic assistance to eligible U.S. airports to prevent, prepare for, and respond to the COVID-19 pandemic. FAR was allotted approximately $6.1 million in ARPA funding, which it also plans to use for operational activities.

NORTH DAKOTA AERONAUTICS COMMISSION GRANTS

The North Dakota Aeronautics Commission (NDAC) disburses funding annually to public airports across the state for airport improvement projects. These grant funds are derived primarily through aviation fuel taxes, aircraft excise taxes, and aircraft registrations. For projects receiving federal financial aid, the Airport, and the NDAC typically share equally the non-federal costs. For projects not involving federal financial aid, the state normally provides 50 percent of the eligible costs. The Financial Implementation Plan assumes that numerous projects in the CIP are to be partially funded from NDAC Grants. For the Terminal Area project, it is assumed that NDAC will provide $6.1 million. During the 10-year planning period, it is assumed that additional NDAC grants will be needed in the amount of $11.5 million to provide NDAC's share of AIP grant local matches as well as 50 percent of costs of eligible projects such as pavement markings, pavement rehabilitation, and snow removal equipment.

During the 2019 Legislative Session, House Bill 1066, dubbed "Operation Prairie Dog," was passed. Operation Prairie Dog allocates up to $250 million of oil and gas tax revenue per biennium to infrastructure funds, including $20 million to the Airport Infrastructure Fund. These airport funds will be managed by NDAC. The Financial Implementation Plan assumes that approximately $4.3 million in Prairie Dog funds will be secured for the Runway 36 Special Authorization CAT III project. This project aids commercial aircraft operations, including those of the Airport's cargo operators, which bring cargo in and out of North Dakota via Fargo.

PASSENGER FACILITY CHARGES

The Aviation Safety and Capacity Expansion Act of 1990 established the authority for commercial service airports to apply to the FAA for imposing and using a PFC of up to $3.00 per eligible enplaned passenger. With the passage of AIR-21 in June 2000, airports could apply for an increase in the PFC collection amount from $3.00 per eligible enplaned passenger to $4.50. The proceeds from PFCs are eligible to be used for AIP eligible projects and for certain additional projects that preserve or enhance capacity, safety, or security; mitigate the effects of aircraft noise; or enhance airline competition. PFCs may also be used to pay debt service on bonds (including principal, interest, and issue costs) and other indebtedness incurred to carry out eligible projects. In addition to funding future planned projects, the legislation permits airports to collect PFCs to reimburse the eligible costs of projects that began on or after November 5, 1990.

FAR currently collects PFC revenues in an approved open application at the $4.50 collection level. It plans to submit a new application for additional PFC eligible capital projects identified in the Terminal Area Study and to continue collection without interruption of its collection authority. The implementation analysis assumes that the Airport will submit additional PFC applications and amendments, as required, to ensure that the collection of PFC revenues continues beyond the authorized expiration date through the end of the 10-year planning period in 2031.

At the beginning of fiscal year 2022, the Airport had no unliquidated PFCs. PFC collections at the $4.50 level are estimated to yield approximately $1.7 million in 2022 growing to approximately $2.4 million in 2031. Total PFC collections in the 10-year planning period are estimated to be approximately $20.3 million.

PFCs can be used to fund projects on a pay-as-you-go basis or to pay debt service on bonds or other indebtedness related to eligible projects. The implementation assumes $3.5 million of PFCs will be used on a pay-as-you-go basis on the Terminal Expansion/Rehabilitation project and that $7.7 million will be used to fund other projects in the CIP. This includes the local match on projects funded with federal funding or to fund eligible projects for which federal funds are not available, including snow removal equipment.

The implementation of Terminal Expansion/Rehabilitation Project will require the issuance of $40 million of long-term debt to fund a portion of the project, the assumptions for which are described further in this chapter. It is assumed that the debt service on these funds will be partially funded with PFCs. The implementation analysis assumes $8.9 million in PFCs will be used to service the debt during the 10-year planning period.

TAX LEVY / STATE AIRLINE CARRIER TAX

As permitted under Section 2-06-15 of the Airport Authorities Act of the North Dakota Century Code, a City supporting an airport or airport authority may levy up to four mills for airport or airport authority purposes. (One mill is one dollar per $1,000 of assessed value of a property). The City of Fargo currently collects two mills on behalf of the Airport. This mill levy is estimated to provide approximately $1.25 million in 2022, which is used for capital improvements at the Airport. The Airport also receives airline carrier tax proceeds through the State of North Dakota. These tax proceeds also provide funds for capital improvements which, in 2022, is estimated to be approximately $45 thousand per year. Together, it is estimated these funding sources will grow to approximately $1.9 million by 2031, the end of the 10-year planning period.

CASH RESERVES/AIRPORT NET OPERATING REVENUE

The Airport's cash reserves and future net operating revenues are an important source of funds for the implementation of the Terminal Area project as well as other non-terminal projects included in the CIP. Cash reserves are comprised of the Airport's beginning unrestricted cash balance, net operating revenues (operating revenues less operating expenses) and the tax levy less any debt service requirements of the Airport's debt obligations not funded through other sources such as PFCs. The projection of Operating Expenses and Operating Revenues is further discussed in chapter sections that follow.

At the beginning of 2022, the Airport had accumulated about $37.4 million in unrestricted cash reserves available for operations and capital project funding. During the 10-year planning period, an additional $40.2 million in net operating revenues are anticipated to be generated.

The implementation analysis assumes that Airport cash reserves/net operating cash flow will be used to fund approximately $22.5 million in costs related to the Terminal Area project. This includes funding for ineligible portions of the work as well as costs that would be AIP and/or PFC eligible but for which there is insufficient funding available from those sources. Net operating revenues are also assumed to fund a portion of the $40 million debt issue required for the project (discussed below). The implementation analysis also assumes approximately $19.8 million in cash reserves/net operating cash flow will be used for other projects during the 10-year planning period, which are ineligible for AIP or PFC funding or for which no such funding is available.

6.6 FINANCIAL ANALYSIS AND IMPLEMENTATION PLAN FOR THE TERMINAL AREA PROJECT AND OTHER CAPITAL IMPROVEMENT PROJECTS

This analysis, along with the schedules presented at the end of **Chapter 6**, provides the results of evaluating the financial reasonableness of implementing the Terminal Area Project and other non-terminal capital improvement projects during the 2022-2031 planning period.

ESTIMATED TERMINAL AREA PROJECT COSTS

A detailed capital cost estimate for the planned Terminal Area Project including the Terminal Expansion/Rehabilitation portion and the Apron Expansion portion of the Project is presented in Schedule 1 at the end of **Chapter 6**. The capital expenditure estimate provided in the schedule includes construction costs, a 20 percent planning contingency, design costs, and soft costs to include construction administration. Estimates are based on 2022 dollars with no adjustments for future inflation.

As shown in **Table 6-1** above, the implementation analysis indicates that approximately 86 percent of the total estimated Terminal Area Project costs are eligible for AIP and/or PFC funding while the remaining 14 percent is not eligible and would need to be funded from Airport cash reserves, tax levy, and/or other funding sources. This high percentage of eligibility is a result of the majority of the Terminal Expansion/Rehabilitation and Apron Expansion projects being public use space or space required for the movement of passengers and baggage. However, as described later in this chapter, while over 86 percent may be AIP or PFC eligible, there are insufficient AIP and PFC funds available during the planned time frame to fund those eligible costs. Therefore, such eligible costs must be funded with Airport cash reserves, tax levy, and net operating revenues. Figure 6-5 and Figure 6-6 show the eligible portions of the lower level and upper level, respectively.

Table 6-1 Estimated Terminal Area Development Costs (Base Year 2022)

Project Components	Construction Costs	Design/Soft Costs and Contingencies	Total Estimated Costs	Funding Eligibility	
				AIP/PFC	Ineligible
Terminal Expansion/Rehabilitation					
Airline Ticketing / Check-In	$3,963,420	$1,466,465	$5,429,885	$2,788,799	$2,641,086
Passenger & Baggage Screening/Security	4,060,620	1,502,429	5,563,049	4,069,886	1,493,163
Departure Areas	25,262,924	9,347,282	34,610,206	33,925,206	685,000
Concessions	4,905,870	1,815,172	6,721,042	0	6,721,042
Inbound Baggage	3,292,920	1,218,380	4,511,300	4,511,300	0
Outbound Baggage and Storage	5,476,470	2,026,294	7,502,764	7,502,764	0
Other Public Areas	17,068,560	6,315,367	23,383,927	23,383,927	0
Support Areas	4,775,700	1,767,009	6,542,709	2,340,326	4,202,383
Subtotal - Terminal Expansion/ Rehabilitation Estimated Costs	***$68,806,484***	***$25,458,399***	***$94,264,883***	***$78,522,209***	***$15,742,674***
Estimated Terminal Expansion/Rehabilitation Eligibility Percentages				***83.3%***	***16.7%***
Apron Expansion – North (Deicing)	$5,298,860	$1,960,578	$7,259,438	$7,259,438	$0
Apron Expansion – South (Expansion)	6,655,285	2,462,455	9,117,740	9,117,740	0
Subtotal – Apron Expansion Estimated Costs	***$11,954,145***	***$4,423,034***	***$16,377,178***	***$16,377,178***	***$0***
Total Terminal Area Development Costs	***$80,760,629***	***$29,881,433***	***$110,642,062***	***$94,899,388***	***$15,742,674***
Estimated Overall Terminal Area Project Eligibility Percentages				***85.8%***	***14.2%***

Source: Leibowitz & Horton, AMC, 2022.
Note: Addition errors are due to rounding of calculated amounts.

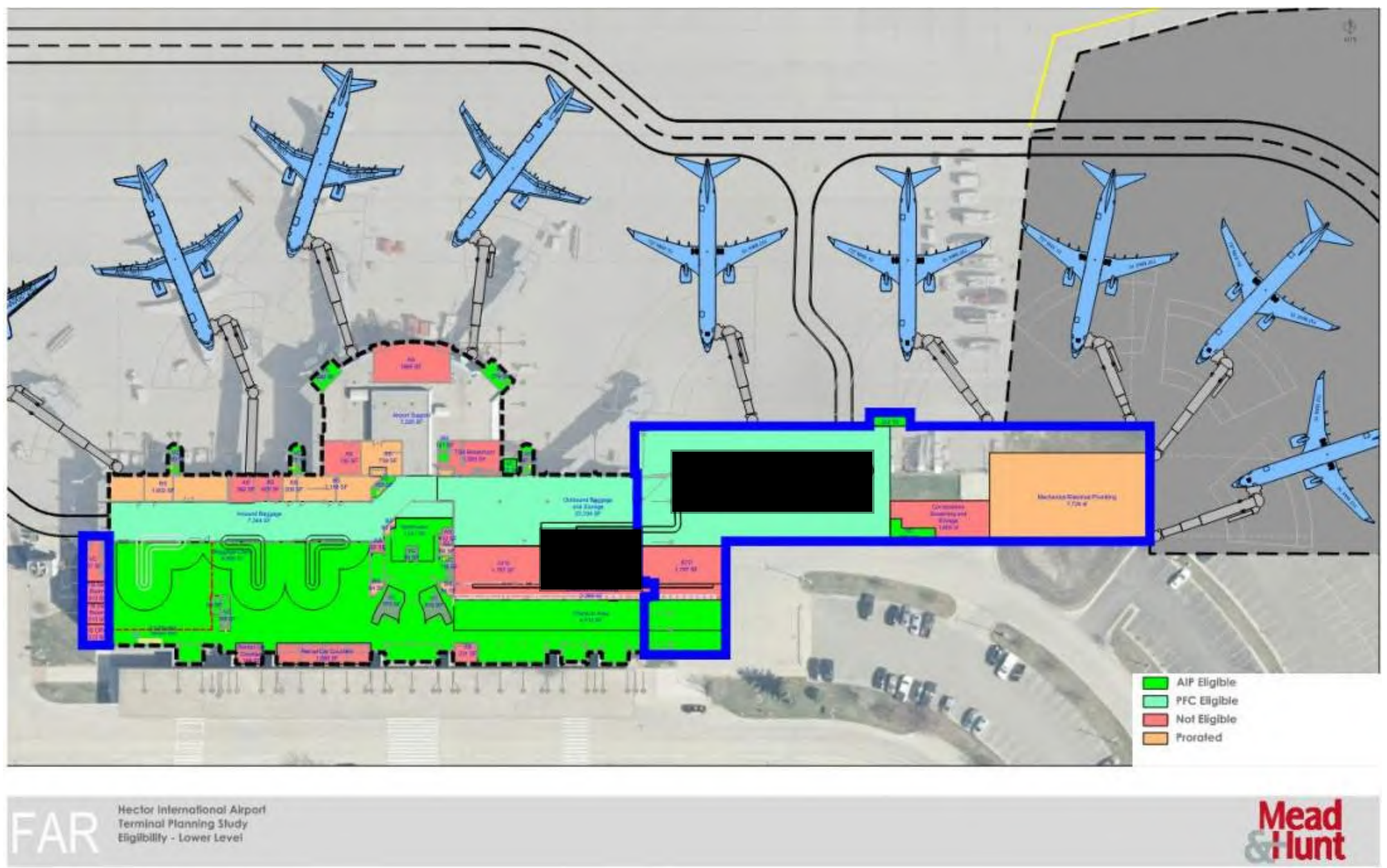


Figure 6-5 Terminal Development Eligibility Lower Level

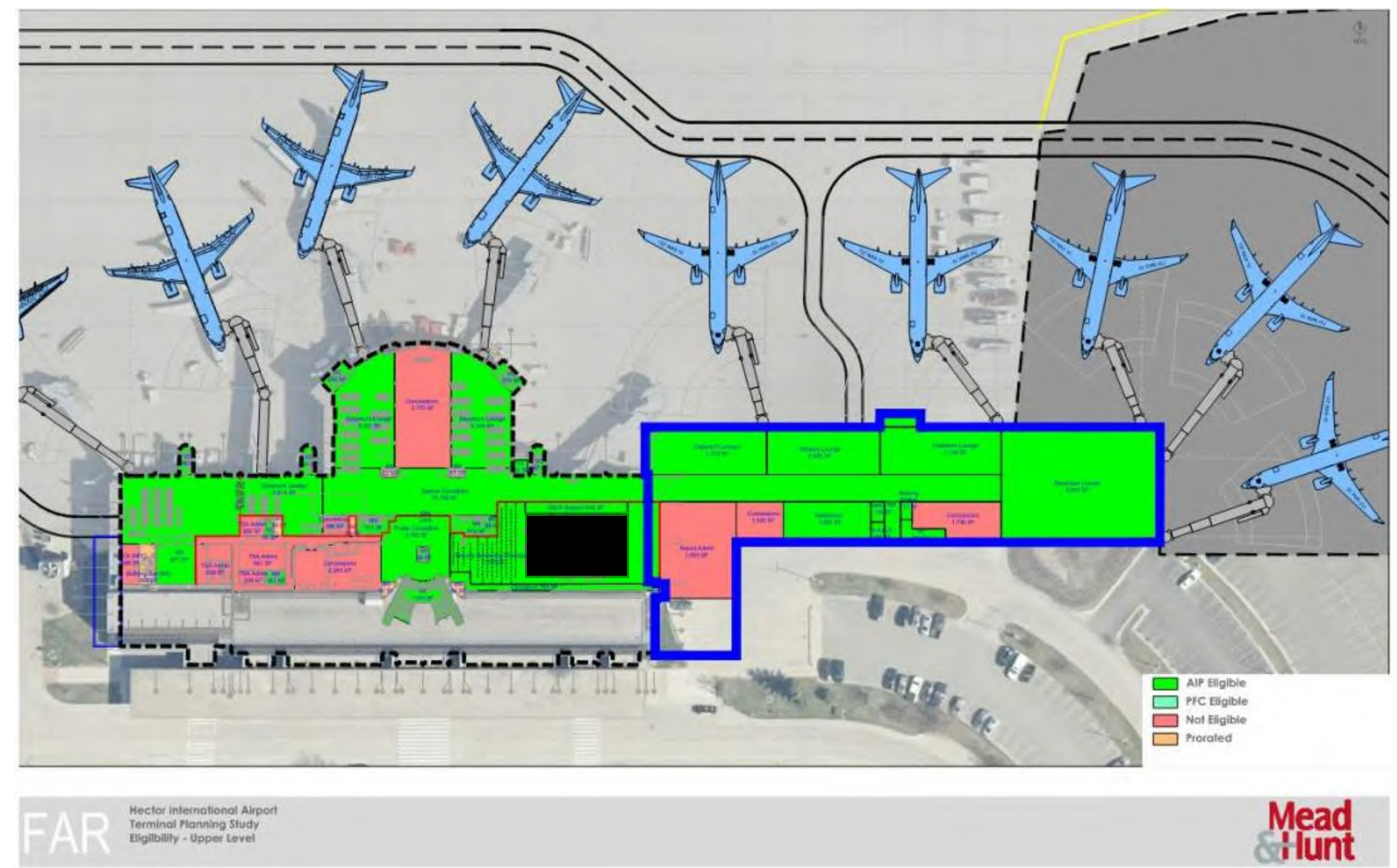


Figure 6-6 Terminal Development Eligibility Upper Level

ESTIMATED PROJECT COSTS AND DEVELOPMENT SCHEDULE

The Estimated Project Costs and Development Schedule (**Schedule 2** at the end of **Chapter 6**) is derived from previous results of the Terminal Area Study facilities analysis. The program for capital expansion and improvement is projected for the 10-year planning period for years 2022 through 2031. **Schedule 3** at the end of **Chapter 6** presents the Projected Capital Funding Sources for the identified projects. The estimated timing and costs of the overall capital development program are presented in these schedules along with the amounts and timing of the projected funding sources. The estimated costs for projects scheduled during the planning period are adjusted by an assumed 6 percent rate of annual inflation in 2023 and 2024, following by an assumed 3 percent rate of annual inflation for the remaining years of the planning period. **Table 6-2** provides a comparison of 2022 base year costs with escalated costs adjusted for inflation. As shown in the table, base year costs for the Terminal Expansion/Rehabilitation and Apron Expansion projects are estimated to be $110.6 million compared with about $123.0 million when inflation inherent in the future development period is considered. Base year costs for the Other Non-Terminal Capital Projects are estimated at about $145.0 million compared with about $175.0 million in inflated dollars.

Table 6-2 Summary of Estimated Terminal Area Development Costs and Other Non-Terminal Capital Project Costs

Project Components	2022 Base Year Costs	Total Escalated Costs
Terminal Area Development Costs		
Terminal Expansion/Rehabilitation Costs	$94,264,883	$105,273,423
Apron Expansion Costs	16,377,178	17,750,957
Subtotal – Terminal Area Development Costs	**$110,642,062**	**$123,024,379**
Non-Terminal Capital Project Costs		
Runway/Taxiway Improvements	$67,249,070	$88,631,785
Terminal/Cargo Apron Improvements	25,572,822	29,896,821
Terminal Building Improvements	3,222,457	3,282,457
Roadway and Parking Improvements	4,979,671	4,979,671
General Aviation Facility Improvements	28,657,600	30,559,237
Pavement Maintenance/Markings	3,350,000	4,109,274
Equipment	3,750,000	4,343,664
Other Improvements	8,257,111	9,151,220
Subtotal – Non-Terminal Capital Project Costs	**$145,038,731**	**$174,954,131**
Total – All Capital Project Costs	**$255,680,793**	**$297,978,510**

Source: Leibowitz & Horton AMC Analysis, 2022
Note: Addition errors are due to rounding of calculated amounts.

DEBT CAPACITY AND DEBT FUNDING REQUIREMENTS

The funds flow section (upper section) of **Schedule 2** provides an overall analysis of the annual availability of the Airport's various funding sources along with an indication of the adequacy of cash flow (both capital and operating) to meet funding needs of the capital program. The preferred project development schedule presented in the lower section of **Schedule 2** indicates significant funding is needed to support the Terminal Area project in the 2022 to 2025 time period. Because the key funding sources are not available in the amounts needed to develop the project on a pay-as-you-go basis, the project cannot be achieved without debt financing. As the Airport currently has no existing, outstanding debt, the Airport's debt capacity is based on the Airport's level of cash flow available to service new debt while still maintaining a sound financial condition.

The Airport's cash flow sources available to pay debt service for these projects are future PFC revenue, future tax levy revenues and net operating revenue. In 2024, FAR's level of PFC revenue is projected to be approximately $1.8 million, tax levy revenue is projected to be $1.6 million, and net operating revenue is projected to be $4.2 million. These cash flows would thus provide a total of about $7.6 million in 2024 to be available to pay debt service. By 2031, these cash flows are projected to provide approximately $8.7 million per year available to pay debt service.

The analysis assumes that any debt undertaken by the Airport would be obtained through the North Dakota Legacy Infrastructure Loan Fund program. **Schedule 4** at the end of **Chapter 6** provides a summary level debt service schedule for the anticipated debt assuming a net proceeds requirement of $40.0 million, a January 2024 issue date, a 2.0 percent interest rate, a 30-year term, and level annual debt service payments. This would result in debt service payments of about $1.8 million per year compared with the availability of $7.6 million in cash flow from available sources starting in 2024. Under the loan program, the debt requires no issuance costs beyond attorney's fees, which are anticipated to be paid from operating and maintenance funds. Another significant benefit of the loan program is no pre-payment penalties are required so the loan can be paid off at any time when future funds are available. There is also no debt service coverage ratio required; however, for purposes of this analysis, a minimum debt service coverage ratio of 1.5 was established as a prudent goal. Additionally, the loan program allows the Airport to draw funds from the approved loan amount as the cash flow is required to fund the project. Therefore, rather than funding the entire $40 million loan in 2024, the Airport can draw from the approved loan amount similar to that of a line of credit. This will result in lower interest costs in the near term than what is conservatively estimated in this analysis.

Based on the projected amount of annual PFC collections and considering other Airport demands on PFC cash flows for other capital projects, this analysis has assumed that PFCs will provide approximately $1.1 million per year for debt service, which equates to $25 million of the $40 million debt issue. Airport net operating revenues are assumed to provide the remaining $700 thousand in annual debt service requirements, which equates to the remaining $15 million of the issue.

SOURCES AND USES OF CAPITAL FUNDING

As discussed in previous sections of this analysis, a variety of sources is available for funding capital improvements at the Airport. Funding sources for the Terminal Area project and other airport capital projects depend on many factors, including AIP and PFC project eligibility, the ultimate type and use of facilities to be developed, management's current and desired levels of the Airport's airline cost per enplaned passenger, the availability of other financing sources, and the priorities for scheduling project completion. For planning purposes, assumptions were made related to the funding source of each capital improvement.

Schedule 3a provided at the end of **Chapter 6** lists, in detail, each of the CIP projects, their estimated costs (escalated annually for inflation) and the assumed funding sources and amounts. A summary of the capital plan with project cost estimates and funding sources is presented below in **Table 6-3**.

Table 6-3 Summary of Funding Sources - Terminal Area and Other Non-Terminal Projects

Project Components	Estimated Capital Costs	Federal Funding	NDAC Grants / Prairie Dog	PFC Pay-as-you-go	Debt Proceeds	Net Operating Revenues
Terminal Area Development Funding						
Terminal Expansion/Rehabilitation	$105,273,423	$34,862,619	$5,275,131	$3,500,000	$40,000,000	$21,635,673
Apron Expansion	17,750,957	15,975,860	887,548	0	0	887,548
Total Terminal Area	**$123,024,379**	**$50,838,480**	**$6,162,679**	**$3,500,000**	**$40,000,000**	**$22,523,221**
Other Non-Terminal Capital Projects Funding						
Runway/Taxiway Improvements	$88,631,785	$78,006,570	$4,286,528	$4,286,528	$0	$2,052,160
Terminal/Cargo Apron Improvements	29,896,821	25,384,421	3,256,200	1,209,908	0	46,292
Terminal Building Improvements	3,282,457	2,222,457	0	0	0	1,060,000
Roadway and Parking Improvements	4,979,671	4,979,671	0	0	0	0
General Aviation Facility Improvements	30,559,237	19,677,600	67,082		0	10,814,555
Pavement Maintenance/Markings	4,109,274	0	1,604,137		0	2,505,137
Equipment	4,343,664	0	2,171,832	2,171,832	0	0
Other Improvements	9,151,220	1,505,383	4,291,298	0	0	3,354,539
Total Other Non-Terminal Projects	**$174,954,131**	**$131,776,102**	**$15,677,077**	**$7,668,268**	**$0**	**$19,832,684**
Total – All Projects	**$297,978,510**	**$182,614,582**	**$21,839,756**	**$11,168,268**	**$40,000,000**	**$42,355,905**

Source: Leibowitz & Horton AMC Analysis, 2022
Note: Addition errors are due to rounding of calculated amounts.

The Terminal Area project has an estimated total project cost of $123.0 million (as shown in **Table 6-3** above) exclusive of financing and interest costs. The table indicates that $50.8 million in federal funds are assumed to fund 41.3 percent of the total Terminal Area project costs. This represents a combination of AIP Entitlement funds, AIP Discretionary funds, BIL AIG funds and BIL ATP funds (all described in Section 6.4 above). Annual PFC revenues are assumed to pay debt service on $25 million of the $40 million debt issue (as shown in **Schedule 4**) as well as provide approximately $3.5 million in PFC Pay-as-you-go funds. These PFC funds will provide approximately 23.2 percent of the project. As reflected in **Schedule 1**, approximately 85.8percent of the costs included in project are eligible for AIP or PFC funding. However, there are insufficient AIP and PFC funds available to fund those eligible costs. Therefore, such eligible costs must be funded with State funds, tax levy, Airport cash, and net operating revenues. State funds of $6.1 million are anticipated to provide 5.0 percent of the capital costs. Cash reserves/net operating revenues and tax levy are estimated to fund the remaining capital costs of $22.5 million and provide the debt service on the remaining $15 million of debt. This represents 30.5 percent of the project's capital costs. Should PFC legislation change providing for an increase in the PFC collection level of $4.50 per enplaned passenger, the Airport's PFC collection capacity would increase, and it would be possible for the Airport to secure PFCs to reimburse eligible costs funded by the Airport.

Table 6-4 presented below provides a summary of the funding sources of the Terminal Area Project, as reflected in **Schedule 3b** provided at the end of **Chapter 6**.

Table 6-4 Summary of Projected Capital Funding Sources - Terminal Area Project

Funding Sources	Funding Timeline				Totals
	Apron Expansion		Terminal Expansion/Rehabilitation		
	2022 Design	2023-2024 Construction	2023 Design	2024-2025 Construction	
AIP Entitlement/BIL AIG Funds	$0	$0	$9,639,000	$5,223,619	$14,862,619
AIP Discretionary Funds	720,000	15,255,861	0	0	15,975,861
BIL Airport Terminal Program (ATP) Funds	0	0	0	20,000,000	20,000,000
North Dakota State Aviation Grants	40,000	847,548	$535,500	$4,739,631	6,162,679
PFC Pay-Go Funds	0	0	0	3,500,000	3,500,000
Debt Proceeds	0	0	0	40,000,000	40,000,000
Airport Cash Reserves	40,000	847,548	$535,500	$21,100,173	$22,523,220
Total Capital Funding Sources	***$800,000***	***$16,950,957***	***$10,710,000***	***$94,563,423***	***$123,024,379***

Source: Leibowitz & Horton, AMC, 2022.
Note: Addition errors are due to rounding of calculated amounts.

PROJECTED OPERATIONS AND MAINTENANCE EXPENSES

Operations and maintenance expense projections for 10-year planning period are based on FAR's current budget, the anticipated impacts of inflation, aviation traffic increases, facility improvements, and the recent experience of other similarly sized airports.

OPERATIONS AND MAINTENANCE EXPENSE PROJECTION ASSUMPTIONS

Operations and maintenance expense growth assumptions, as reflected in **Schedule 5** were developed to project FAR's operating expenses during the planning period. Actual amounts for 2019, 2020, and 2021, estimated amounts for 2022, and budgeted amounts for 2023 provide a comparison with expenses that are projected for the period 2024 through 2031. Beginning in 2024, the projection for most expense categories is based on the Airport's budgeted expenses for 2023 and an annual inflation growth rate of 6 percent. For subsequent years, the annual inflation growth rate of 3 percent is assumed. Additionally, certain categories of expenses have been increased during the 10-year planning period based on additional costs anticipated as a result of new airport infrastructure, including the Terminal Area Project. These categories include salaries and benefits, repairs and maintenance, insurance, utilities, and snow removal services.

PROJECTION OF OPERATIONS AND MAINTENANCE EXPENSES AND OPERATING EXPENSES PER ENPLANED PASSENGER

The projection of operations and maintenance expenses is provided in **Schedule 5**. As shown in the schedule, total operating expenses are expected to increase from $7,266,632 estimated in 2022 to $10,009,818 by the end of the ten-year planning period. The overall growth rate of expenditures during the projection period is 3.6 percent per year.

Schedule 5 also provides a comparison of the Airport's total operating expenses per enplaned passenger versus the industry average for small hub airports. The Airport's operating expenses per enplaned passenger are projected to decrease from $17.16 in 2022 to $16.25 by 2031. During the same period, the industry average for small hub airports ranges from $29.54 in 2022 to $29.08 by 2031. [Sources: FAA Air Carrier Activity Information System (ACAIS) enplanement database and small hub airport annual financial report #127 from the FAA Compliance Activity Tracking System (CATS)]. These decreases are a result of 2022 operating expenses per enplaned passenger being higher than historically experienced (in 2019 and earlier years) because enplanement numbers have been depressed due to the impact of the pandemic. As enplanements recover to pre-pandemic levels and then continue to grow based on increased activity, this growth outpaces the anticipated inflation growth and other increases in expenses resulting in slight declines to operating expenses per enplanement. This comparison with industry statistics shows that FAR's operating expenses are significantly lower than those of other similarly sized airports during the planning period. The statistical results further indicate that FAR's operating expenses demonstrate effective cost controls and a very cost-efficient operation compared with other similarly sized small hub airports currently as well as for the long-term future.

PROJECTED OPERATING REVENUES

Operating revenue projections for the planning period are based on FAR's current budget, the anticipated impacts of inflation, aviation traffic increases, anticipated user fee and tenant rental adjustments, facility improvements, and the recent experience of other similarly sized airports.

OPERATING REVENUE PROJECTION ASSUMPTIONS

Schedule 6 presents actual, estimated, budgeted, and projected operating revenues for FAR for the period 2019 through 2031. Actual amounts for 2019, 2020, and 2021, estimated amounts for 2022 and budgeted amounts for 2023 provide a comparison with revenues that are projected for the period 2024 through 2031. Annual growth assumptions from 2024 through 2031 for the following revenue categories are as follows:

AIRLINE OPERATING REVENUES

Landing fee projections are based on the 2023 budget plus increases in aircraft landed weight assuming one half the annual growth rate of forecast passenger enplanements thereafter.
Projections for terminal rents, ARFF and security expenses reimbursed from the airlines are based on the 2023 budget, a 6 percent inflation adjustment in 2024, and then a 3 percent annual inflation rate for the remainder of the planning period. No additional airline revenues have been assumed for this analysis. However, upon completion of the terminal expansion, Airport management may want to consider renegotiating rate increases with the airlines to reflect the increased cost impact of the new, expanded terminal and apron space.

NON-AIRLINE OPERATING REVENUES AND NON-OPERATING REVENUES

Non-airline revenue projections beginning in 2024 for the following categories are based on the Airport's 2023 budget plus increases in aircraft landed weight assuming one half the annual growth rate of forecast passenger enplanements:

- Landing Fees – Cargo & Others
- Fuel Flowage Fees

Non-airline revenue projections for the revenues listed below are based on the 2023 budget, an inflation adjustment (6 percent in 2024 and then 3 percent for the remainder of the planning period) plus the annual rate of forecast enplanement growth:

- Rental Car Concessions
- Restaurant Concessions
- Gift Shop/Vending Concessions

Parking fees budgeted for 2023 include a rate increase adopted by the Authority in August 2022. Beginning in 2024, the annual growth projections are based on the 2023 budget with an increase based only on the annual rate of forecast enplanement growth as Airports do not typically increase parking fees annually.
The remaining non-airline revenue projections are based on the 2023 budget, a 6 percent inflation adjustment in 2024, and then a 3 percent annual inflation rate for the remainder of the planning period.
The TSA Law Enforcement Grant is anticipated to remain flat for the planning period.

NON-OPERATING REVENUES

Non-operating revenues represent interest income, gains and losses from the disposal of assets, and COVID relief funds. Interest income projections beginning in 2024 are based on the Airport's 2023 budget and are assumed to remain flat throughout the planning period. No future projections are assumed for the gains or losses from the disposal of assets.

As previously described, the Airport was allotted approximately $31.5 million in COVID relief funding. The Airport anticipates using $13.9 million in CARES funds as development grants to fund capital projects (as previously discussed). The remaining COVID relief funds of $7.0 million (after accounting for funds utilized in 2020 and 2021) are anticipated to be used on operations and maintenance expenses between 2022 and 2024.

PROJECTION OF OPERATING REVENUES, AIRLINE COST PER ENPLANED PASSENGER, AND OPERATING REVENUES PER ENPLANED PASSENGER

The projection of operating revenues is provided in Schedule 6. As shown in the schedule, airline revenues are expected to grow from $2,180,207 in 2022 to $3,045,425 for 2031. The overall annual growth rate for airline revenues is 3.8 percent. Non-airline revenues are expected to grow from $6,282,827 in 2022 to $10,829,516 in 2031. The overall annual growth rate for non-airline revenues is 6.2 percent. Non-operating revenues are expected to remain flat for the majority of the 10-year planning period, which only includes interest income and excludes gains and losses on the disposal of assets and COVID relief funds. Total airport revenues are expected to grow from $9,859,601 in 2022 to $14,450,015 projected for 2031. The overall annual growth rate for total revenues is 4.3 percent.

Schedule 6 also provides a comparison of the Airport's airline cost per enplaned passenger (CPEP) versus the industry average for small hub airports. The airline cost per enplaned passenger (airline fees and rentals divided by enplaned passengers) is a measure that airlines use to compare their cost of operations among the airports they serve. FAR's airline cost per enplaned passenger is projected to range from $5.15 in 2022 to $4.95 by 2031. During the same period, the industry average for small hub airports ranges from $10.10 in 2022 to $9.95 by 2031 (Sources: FAA Air Carrier Activity Information System (ACAIS) enplanement database and small hub airport annual financial report #127 from the FAA CATS). Similar to the previously discussed operating expenses per enplaned passenger, these decreases are a result of 2022 airline revenues per enplaned passenger being higher than historically experienced because enplanement numbers have been depressed due to the impact of the pandemic. As enplanements recover to pre-pandemic levels and then continue to grow based on increased activity, this growth outpaces the anticipated inflation growth resulting in slight declines to CPEP. This result shows that current and projected airline rates and charges at FAR are significantly lower than other similarly sized small hub airports throughout the 10-year planning period. FAR management closely monitors its CPEP in comparison with the small hub industry average and its comparable peer airports in the regional area in order to remain competitive in its air service development initiatives. The Airport should continue to manage future airline rates and charges that reasonably cover airport costs and are competitive in the regional commercial aviation market environment.

Schedule 6 also provides a comparison of the Airport's total operating revenue per enplaned passenger versus the industry average for small hub airports. FAR's total operating revenue per enplaned passenger is projected to grow from $19.98 in 2022 to $22.53 by 2031. During the same period, the industry average for small hub airports ranges from $34.45 in 2022 to $33.91 by 2031. (Sources: FAA ACAIS enplanement database and small hub airport annual financial report #127 from the FAA CATS). These statistics show that total operating revenues per enplaned passenger at FAR are anticipated to grow more quickly than the small hub average during the 10-year planning period. This is indicative of the Airport's initiatives to grow non-airline revenues.

6.7 FINANCIAL IMPLEMENTATION SUMMARY

The Financial Plan Summary presented in **Schedule 7** includes projection totals for Operating Cash Flow and Capital Cash Flow. In the Operating Cash Flow section, revenues and expenses are summarized from **Schedules 5** and **6**. As shown in **Schedule 7**, cash flow from operations is positive for every period of the projection. The Capital Cash Flow section provides the matching of capital project expenditures with the availability of capital funds so that positive cash flows result throughout the 10-year planning period.

The Capital Cash Flow section of **Schedule 7** summarizes the results of analysis from **Schedules 2** and **3**. In **Schedule 2**, an approach was provided for scheduling capital expenditures to match the availability of capital funding. **Schedule 3** provided an approach for matching specific capital funding sources for the Terminal Area project and other non-terminal CIP projects. Based on the assumptions (as noted below) which underly the Financial Plan summarized in **Schedule 7**, implementation of the Terminal Area Project and other non-terminal capital expenditures is financially reasonable and achievable.

ASSUMPTIONS RELATED TO CAPITAL FUNDING SOURCES

Several key assumptions supporting the Financial Plan relate to the availability and timeliness of the funding sources that have been identified.

Specifically for the Terminal Area Project (Terminal Expansion/Rehabilitation and Apron Expansion), the Airport must secure approval for the AIP discretionary and BIL ATP funds from the FAA. Those approvals need to come in both the amount of funds available and the anticipated timing of those funds. Additionally, the Airport must apply for and receive approval from the FAA for PFC impose and use authority to support the debt issue required to fund a portion of the project, and that debt must be issued based on terms similar to those assumed in previous sections of this Financial Implementation Analysis chapter.

In addition to the Terminal Area Project, a number of the projects identified in the ten-year CIP rely on AIP discretionary funds or NDAC funds to execute the project. If the identified portion of these funding sources is not awarded by the respective agency, then these projects may need to be modified or delayed until funding is available or until alternative funding is identified.

Should the Airport experience funding shortfalls, it would need to pursue alternative funding for its capital program. One possible source of alternative funding that the Airport could consider is Rental Car Customer Facility Charges (CFCs). CFCs have become common financing tools for landside improvements at airports in the U.S. Such charges are collected by rental car companies that provide services to commercial passengers at the airports they serve. CFCs are collected by the rental car companies on behalf of, and for the benefit of, the airports where they operate. The charge is typically based on a fee per rental car transaction day that is added to rental car contracts.

ASSUMPTIONS RELATED TO AVIATION ACTIVITY FORECASTS

The COVID-19 outbreak in the United States has caused significant business as well as tourism disruption to the aviation industry through travel restrictions, stay-at-home orders, quarantine requirements, and an increased reliance on teleconferencing. While the disruption may be short-term, there is considerable uncertainty around the duration and longer term impacts on the aviation industry. Additionally, recovery to pre-pandemic passenger enplanement levels has been impacted by airline capacity constraints resulting from pilot and other labor shortages, as well as increased fuel costs. While we expect these matters to negatively impact the Airport's operations in the short term, the related long-term financial impacts and duration cannot be reasonably estimated at this time.

The forecasts prepared for this Terminal Area Study **(Chapter 3)** were approved by the FAA and are considered reasonable for the purposes of this study. The Financial Implementation Analysis relies on achievement of the aviation activity and passenger enplanement forecasts. If the actual aviation activity varies temporarily from the projected levels of activity, the adverse impact on the capital program may not be significant. However, if decreased traffic levels occur and persist, implementation of all the proposed projects may not be financially feasible. It should also be noted, however, that if the forecast activity levels are not met, then a number of the planned capital improvements may be canceled or deferred as necessary.

FINANCIAL ANALYSIS SCHEDULES

Financial analysis **Schedules 1** through **7** are presented on the following pages.

SCHEDULE 1

Estimated Terminal Area Project Costs

This schedule presents the estimated costs of the Terminal Area Project broken down by the Terminal Expansion/Rehabilitation components and functional areas as well as the aircraft Apron Expansion components. This schedule provides estimates of those costs that are AIP and PFC eligible, costs that are only PFC eligible, and those costs that are not eligible for either AIP or PFC funding.

SCHEDULE 2

Estimated Project Costs and Development Schedule

This schedule presents the overall CIP including estimated costs and anticipated development schedule for individual projects in the program. The schedule provides practical approaches for matching capital expenditure amounts with capital funding availability in the 10-year planning period. This schedule also applies inflation adjustments to provide escalated development costs for projects implemented throughout the 10-year planning period.

SCHEDULES 3A AND 3B

Projected Capital Funding Sources

Schedule 3a lists each of the CIP projects, their estimated costs (escalated for inflation), and the assumed funding sources and amounts. The schedule applies specific capital funding sources to each individual project in the capital program. **Schedule 3b** provides a summary of the funding sources and timing of those funding sources of the Terminal Area Project.

SCHEDULES 4

Debt Issue

Schedule 4 provides the details of the debt issue, which is expected to be required in 2024 to partially fund the Terminal Expansion/Rehabilitation Project. This schedule includes the anticipated terms of the loan and the resulting annual debt service requirements including associated interest costs. Debt service is planned to be funded with PFCs, tax levy, and airport net operating revenues.

SCHEDULE 5

Actual, Estimated, Budgeted, and Projected Operations and Maintenance Expenses

This schedule reflects the past three years of actual operations and maintenance expenses, estimated 2022, budgeted 2023 operations and maintenance expenses, and projections of these expenses through the remainder of the 10-year planning period. This schedule also provides a comparison of FAR's annual expenses per enplaned passenger with the average of other small hub airports.

SCHEDULE 6

Actual, Estimated, Budgeted and Projected Operating Revenues

This schedule reflects the past three years of actual operating revenues, estimated 2022, budgeted 2023 operating revenues, and projections of these revenues through the remainder of the 10-year planning period. These revenues are organized into categories for airline revenues, non-airline revenues, and non-operating revenues, and provide statistical comparisons of FAR's airline cost per enplaned passenger and total revenue per enplaned passenger with other small hub airport averages.

SCHEDULE 7

Estimated, Budgeted and Projected Net Revenues, Capital Funding, and Capital Expenditures

This Financial Plan Summary includes a Capital Cash Flow section that presents a summary of projected capital funding (from **Schedule 3a**) and scheduled capital expenditures (from **Schedule 2**) with the cash flow that results from implementing the overall CIP. It also includes an Operating Cash Flow section that summarizes totals for operating revenues (from **Schedule 6**) and operating expenses (from **Schedule 5**) with the addition of beginning cash reserve balances to provide the cash flow that results from these activities.

HECTOR INTERNATIONAL AIRPORT
Fargo Municipal Airport Authority

FAR TAP - V7

Schedule 1

Terminal Area Study - Financial Analysis
Estimated Terminal Area Project Costs

26-Oct-22

Terminal Area Project Components	Square Feet	Construction Costs (1)	Design Costs	Construction Admin. Costs	Subtotal Costs	Contingency Costs (2)	Total Costs	AIP/PFC Eligible	PFC Only Eligible	Ineligible
Airline Ticketing/Check-In						20%				
Airline Ticket Offices/Counters	5,983	$1,927,800	$283,085	$44,641	$2,255,526	$385,560	$2,641,086			$2,641,086
Ticketing Check In Area	4,512	2,035,620	298,917	47,138	2,381,675	407,124	2,788,799	2,788,799		
Total Airline Ticketing/Check-In	10,495	$3,963,420	$582,002	$91,780	$4,637,201	$792,684	$5,429,885	$2,788,799	$0	$2,641,086
Passenger and Baggage Screening/Security										
Security Screening Checkpoint	7,177	$2,583,720	$379,402	$59,830	$3,022,952	$516,744	$3,539,696	$3,539,696		
Outbound Baggage Screening	3,225	387,000	56,828	8,962	452,790	77,400	530,190		530,190	
TSA Offices	3,918	470,160	69,040	10,887	550,087	94,032	644,119			644,119
FIS Offices	939	619,740	91,005	14,351	725,096	123,948	849,044			849,044
Total Passenger and Baggage Screening/Security	15,259	$4,060,620	$596,275	$94,030	$4,750,925	$812,124	$5,563,049	$3,539,696	$530,190	$1,493,163
Departure Areas										
Departure Lounges	32,463	$17,432,580	$2,559,858	$403,680	$20,396,119	$3,486,516	$23,882,635	$23,882,635		
Boarding Bridges (4 New)		5,600,000	822,323	129,677	6,552,000	1,120,000	7,672,000	7,672,000		
Public Holdroom Furniture		1,730,344	254,089	40,069	2,024,502	346,069	2,370,571	2,370,571		
Other Furniture		500,000	73,422	11,578	585,000	100,000	685,000			685,000
Total Departure Areas	32,463	$25,262,924	$3,709,692	$585,005	$29,557,621	$5,052,585	$34,610,206	$33,925,206	$0	$685,000
Concessions										
Rental Car Counter/Offices	1,395	$167,400	$24,582	$3,876	$195,858	$33,480	$229,338			$229,338
Concessions - Non-Public Areas	12,173	$4,738,470	695,813	109,727	5,544,010	947,694	6,491,704			6,491,704
Total Concessions	13,568	$4,905,870	$720,394	$113,604	$5,739,868	$981,174	$6,721,042	$0	$0	$6,721,042
Inbound Baggage Claim										
Baggage Claim	6,699	$2,411,640	$354,133	$55,846	$2,821,619	$482,328	$3,303,947	$3,303,947		
Inbound Baggage	7,344	881,280	129,410	20,408	1,031,098	176,256	1,207,354		1,207,354	
Total Baggage Claim	14,043	$3,292,920	$483,543	$76,253	$3,852,716	$658,584	$4,511,300	$3,303,947	$1,207,354	$0
Outbound Baggage and Storage										
Outbound Baggage and Storage	28,667	$5,476,470	$804,183	$126,817	$6,407,470	$1,095,294	$7,502,764		$7,502,764	
Total Outbound Baggage and Storage	28,667	$5,476,470	$804,183	$126,817	$6,407,470	$1,095,294	$7,502,764	$0	$7,502,764	$0
Other Public Areas										
Public Circulation	29,286	$12,576,960	$1,846,843	$291,240	$14,715,043	$2,515,392	$17,230,435	$17,230,435		
Vertical Circulation	7,210	2,292,420	336,627	53,085	2,682,131	458,484	3,140,615	3,140,615		
Restrooms - Public	3,893	2,027,580	297,737	46,952	2,372,269	405,516	2,777,785	2,777,785		
Nursing Room	110	72,600	10,661	1,681	84,942	14,520	99,462	99,462		
Service Animal Relief Area	150	99,000	14,537	2,293	115,830	19,800	135,630	135,630		
Total Other Public Areas	40,649	$17,068,560	$2,506,404	$395,251	$19,970,215	$3,413,712	$23,383,927	$23,383,927	$0	$0
Support Areas			Support Space Eligibility Allocation %s (Based on square footage)>>					53.2%	22.8%	24.0%
Mech/Elec/Jan/Bldg Maint Area	12,938	$2,247,720	$330,063	$52,050	$2,629,832	$449,544	3,079,376	$1,638,228	$702,098	$739,050
Airport Administration	4,067	787,380	115,622	18,233	921,235	157,476	1,078,711			1,078,711
Airport Support Facilities	10,966	1,315,920	193,234	30,472	1,539,626	263,184	1,802,810			1,802,810
Restrooms - Non-Public	302	36,240	5,322	839	42,401	7,248	49,649			49,649
Circulation - Non-Public	2,445	388,440	57,040	8,995	454,475	77,688	532,163			532,163
Total Support Areas	30,718	$4,775,700	$701,280	$110,589	$5,587,569	$955,140	$6,542,709	$1,638,228	$702,098	$4,202,383
Total Terminal Building Costs	185,862	$68,806,484	$10,103,774	$1,593,329	$80,503,586	$13,761,297	$94,264,883	$68,579,804	$9,942,405	$15,742,674
		73.0%	10.7%	1.7%		14.6%	100.0%	72.8%	10.5%	16.7%
			Total Estimated Terminal Building Cost per Square Foot =				$507.18			
Aircraft Apron										
Airside Apron Expansion - North (Deicing)		$5,298,860	$354,612	$546,194	$6,199,666	$1,059,772	$7,259,438	$7,259,438		
Airside Apron Expansion - South (Expansion)		6,655,285	445,388	686,011	7,786,683	1,331,057	9,117,740	9,117,740		
Total Aircraft Apron Costs		$11,954,145	$800,000	$1,232,205	$13,986,350	$2,390,829	$16,377,179	$16,377,179	$0	$0
Total Terminal Area Costs		$80,760,629	$10,903,774	$2,825,533	$94,489,936	$16,152,126	$110,642,062	$84,956,983	$9,942,405	$15,742,674
		73.0%	9.9%	2.6%		14.6%	100.0%	76.8%	9.0%	14.2%

Notes:
(1) Estimated costs are based on 2022 dollars with no adjustment for escalation.
(2) Owner's Project Contingency (20%)

HECTOR INTERNATIONAL AIRPORT
Fargo Municipal Airport Authority

Terminal Area Study - Financial Analysis
Estimated Project Costs and Development Schedule

26-Oct-22

	Funding Schedule										
Capital Improvement Program	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**Total Funding**
Funds Used for Capital Projects											
AIP Entitlement Grants - Passenger	$3,280,035	$3,280,035	$2,982,610	$3,076,123	$3,173,607	$3,275,229	$3,380,291	$3,407,900	$3,436,680	$3,466,683	$32,759,194
AIP Entitlement Grants - Cargo	230,353	230,000	230,000	230,000	230,000	230,000	230,000	230,000	230,000	230,000	2,300,353
BIL Airport Infrastructure Grants (AIG)	3,766,182	3,760,000	3,760,000	3,760,000	3,760,000	0	0	0	0	0	18,806,182
AIP Entitlements carryover from the prior years	3,519,355	10,688,806	(61,159)	(88,548)	(1,718,306)	2,041,694	0	0	0	0	3,519,355
AIP Entitlement unspent current year + carryover	(10,688,806)	61,159	88,548	1,718,306	(2,041,694)	0	0	0	0	0	0
AIP Discretionary/BIL Airport Terminal Grants (ATP)	0	8,674,273	7,301,587	20,000,000	7,324,639	9,370,702	2,080,506	15,118,969	26,520,156	14,958,782	111,349,614
CARES Development Grants	13,879,884	0	0	0	0	0	0	0	0	0	13,879,884
North Dakota Aeronautics Grants / Prairie Dog Fund	2,375,000	1,417,548	5,556,031	46,292	5,483,325	1,135,704	316,155	1,042,048	3,085,765	1,381,886	21,839,756
Passenger Facility Charges	1,673,560	1,744,612	1,818,681	1,895,894	1,976,385	2,060,294	2,147,765	2,238,949	2,334,005	2,433,097	20,323,243
PFC beginning year unliquidated balance	0	1,298,560	2,513,172	1,215,605	495,251	163,361	278,650	994,011	1,074,664	(55,444)	0
PFC unspent current year + carryover	(1,298,560)	(2,513,172)	(1,215,605)	(495,251)	(163,361)	(278,650)	(994,011)	(1,074,664)	55,444	(224,990)	(224,990)
ND Legacy Infrastructure Loan Proceeds	0	0	40,000,000	0	0	0	0	0	0	0	40,000,000
Less PFC Funded Debt Service Payments	0	0	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(8,929,984)
Less Airport Funded Debt Service Payments	0	0	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)	(5,357,991)
Tax Levy / State Airline Carrier Tax	1,301,570	1,475,000	1,563,500	1,610,405	1,658,717	1,708,479	1,759,733	1,812,525	1,866,901	1,922,908	16,679,737
Projected Net Operating Cash Flow	2,592,969	7,471,114	4,159,601	3,276,134	3,193,997	3,410,204	3,641,841	3,889,958	4,155,677	4,440,197	40,231,692
Funds Available Current Year	20,631,542	37,587,935	66,910,970	34,458,964	21,586,563	21,331,019	11,054,933	25,873,700	40,973,296	26,767,122	307,176,045
Funds Carried Over from Prior Year	37,443,417	39,886,228	23,386,469	34,021,506	20,272,912	23,979,067	28,121,054	32,852,878	37,885,612	41,293,068	37,443,417
Funds Used Current Year	(18,188,731)	(54,087,694)	(56,275,934)	(48,207,558)	(17,880,409)	(17,189,033)	(6,323,108)	(20,840,966)	(37,565,840)	(21,419,237)	(297,978,510)
Funds Carried Over to Next Year	$39,886,228	$23,386,469	$34,021,506	$20,272,912	$23,979,067	$28,121,054	$32,852,878	$37,885,612	$41,293,068	$46,640,952	$46,640,952
Estimated Debt Service Coverage >>	-	-	4.22x	3.80x	3.82x	4.02x	4.23x	4.45x	4.68x	4.93x	
Estimated Days Unrestricted Cash on Hand >>	2,003	1,151	1,565	914	1,014	1,154	1,309	1,466	1,551	1,701	

		Estimated Project Costs and Development Schedule										
Capital Project Descriptions	**Base Year Costs**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**Total Escalated Costs**
TERMINAL AREA PROJECT COMPONENTS	**2022 Base**		Design	50%	50%	Assumes all work contracted in 2024 with costs locked at 2024 inflation						
28 Airline Ticketing/Check-In	$5,429,885	$0	$616,922	$2,723,541	$2,723,541	$0	$0	$0	$0	$0	$0	$6,064,004
28 Passenger and Baggage Screening/Security	5,563,049	0	632,051	2,790,334	2,790,334	0	0	0	0	0	0	6,212,719
28 Departure Areas	34,610,206	0	3,932,274	17,359,909	17,359,909	0	0	0	0	0	0	38,652,091
28 Concessions	6,721,042	0	763,618	3,371,164	3,371,164	0	0	0	0	0	0	7,505,946
28 Inbound Baggage Claim	4,511,300	0	512,556	2,262,794	2,262,794	0	0	0	0	0	0	5,038,144
28 Outbound Baggage and Storage	7,502,764	0	852,434	3,763,263	3,763,263	0	0	0	0	0	0	8,378,959
28 Other Public Areas	23,383,927	0	2,656,789	11,728,992	11,728,992	0	0	0	0	0	0	26,114,773
28 Support Areas	6,542,709	0	743,356	3,281,715	3,281,715	0	0	0	0	0	0	7,306,786
Total Estimated Terminal Building Costs	$94,264,883	$0	$10,710,000	$47,281,711	$47,281,711	$0	$0	$0	$0	$0	$0	$105,273,423
29 Airside Apron Expansion - North (Deicing)	7,259,438	354,612	0	7,758,262	0	0	0	0	0	0	0	8,112,875
22 Airside Apron Expansion - South (Expansion)	9,117,740	445,388	9,192,694	0	0	0	0	0	0	0	0	9,638,082
Total Terminal Area Costs Before Financing	$110,642,062	$800,000	$19,902,694	$55,039,974	$47,281,711	$0	$0	$0	$0	$0	$0	$123,024,379
OTHER CAPITAL PROJECTS	**2022 Base**											
Other Capital Projects 2022												
1 o Terminal Area Study	$584,131	$584,131										$584,131
3 x Security Access Control System - Design	87,980	87,980										87,980
4 x Security Access Control System - Construction	1,829,702	1,829,702										1,829,702
5 t East Economy Lot	2,401,475	2,401,475										2,401,475
6 t Parking Lot Exit Plaza	2,578,196	2,578,196										2,578,196
7 g South GA Pavement Reconstruction/Rehabilitation - Design	837,700	837,700										837,700
8 g North GA Apron Expansion - Design	819,900	819,900										819,900
9 a Terminal Apron Expansion - Design	800,000	800,000										800,000
11 o SRE Building (previously unfunded balance)	1,090,575	1,090,575										1,090,575

HECTOR INTERNATIONAL AIRPORT
Fargo Municipal Airport Authority

Terminal Area Study - Financial Analysis
Estimated Project Costs and Development Schedule

26-Oct-22

Capital Improvement Program	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total Funding
	Funding Schedule										
Funds Used for Capital Projects											
AIP Entitlement Grants - Passenger	$3,280,035	$3,280,035	$2,982,610	$3,076,123	$3,173,607	$3,275,229	$3,380,291	$3,407,900	$3,436,680	$3,466,683	$32,759,194
AIP Entitlement Grants - Cargo	230,353	230,000	230,000	230,000	230,000	230,000	230,000	230,000	230,000	230,000	2,300,353
BIL Airport Infrastructure Grants (AIG)	3,766,182	3,760,000	3,760,000	3,760,000	3,760,000	0	0	0	0	0	18,806,182
AIP Entitlements carryover from the prior years	3,519,355	10,688,806	(61,159)	(88,548)	(1,718,306)	2,041,694	0	0	0	0	3,519,355
AIP Entitlement unspent current year + carryover	(10,688,806)	61,159	88,548	1,718,306	(2,041,694)	0	0	0	0	0	0
AIP Discretionary/BIL Airport Terminal Grants (ATP)	0	8,674,273	7,301,587	20,000,000	7,324,639	9,370,702	2,080,506	15,118,969	26,520,156	14,958,782	111,349,614
CARES Development Grants	13,879,884	0	0	0	0	0	0	0	0	0	13,879,884
North Dakota Aeronautics Grants / Prairie Dog Fund	2,375,000	1,417,548	5,556,031	46,292	5,483,325	1,135,704	316,155	1,042,048	3,085,765	1,381,886	21,839,756
Passenger Facility Charges	1,673,560	1,744,612	1,818,681	1,895,894	1,976,385	2,060,294	2,147,765	2,238,949	2,334,005	2,433,097	20,323,243
PFC beginning year unliquidated balance	0	1,298,560	2,513,172	1,215,605	495,251	163,361	278,650	994,011	1,074,664	(55,444)	0
PFC unspent current year + carryover	(1,298,560)	(2,513,172)	(1,215,605)	(495,251)	(163,361)	(278,650)	(994,011)	(1,074,664)	55,444	(224,990)	(224,990)
ND Legacy Infrastructure Loan Proceeds	0	0	40,000,000	0	0	0	0	0	0	0	40,000,000
Less PFC Funded Debt Service Payments	0	0	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(8,929,984)
Less Airport Funded Debt Service Payments	0	0	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)	(5,357,991)
Tax Levy / State Airline Carrier Tax	1,301,570	1,475,000	1,563,500	1,610,405	1,658,717	1,708,479	1,759,733	1,812,525	1,866,901	1,922,908	16,679,737
Projected Net Operating Cash Flow	2,592,969	7,471,114	4,159,601	3,276,134	3,193,997	3,410,204	3,641,841	3,889,958	4,155,677	4,440,197	40,231,692
Funds Available Current Year	20,631,542	37,587,935	66,910,970	34,458,964	21,586,563	21,331,019	11,054,933	25,873,700	40,973,296	26,767,122	307,176,045
Funds Carried Over from Prior Year	37,443,417	39,886,228	23,386,469	34,021,506	20,272,912	23,979,067	28,121,054	32,852,878	37,885,612	41,293,068	37,443,417
Funds Used Current Year	(18,188,731)	(54,087,694)	(56,275,934)	(48,207,558)	(17,880,409)	(17,189,033)	(6,323,108)	(20,840,966)	(37,565,840)	(21,419,237)	(297,978,510)
Funds Carried Over to Next Year	$39,886,228	$23,386,469	$34,021,506	$20,272,912	$23,979,067	$28,121,054	$32,852,878	$37,885,612	$41,293,068	$46,640,952	$46,640,952
Estimated Debt Service Coverage >>	-	-	4.22x	3.80x	3.82x	4.02x	4.23x	4.45x	4.68x	4.93x	
Estimated Days Unrestricted Cash on Hand >>	2,003	1,151	1,565	914	1,014	1,154	1,309	1,466	1,551	1,701	

No.		Capital Project Descriptions	Base Year Costs	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total Escalated Costs
				Estimated Project Costs and Development Schedule										
11a	o	Fueling System - SRE Building	282,405	282,405										282,405
12	a	Cargo Apron Expansion - Phase IV (previously unfunded balance)	3,972,822	3,972,822										3,972,822
13	o	Glycol Pump Station & Forcemain (North Cargo Apron Disposal) - Design	200,000	200,000										200,000
16	r	Long Term Parking Lot Expansion (Old Exit Booth) & Pavement Rehabilitation - Design	50,000	50,000										50,000
17	x	Security Checkpoint Expansion	304,775	304,775										304,775
18	r	PARCS System	799,070	799,070										799,070
19	e	SRE Acquisition	750,000	750,000										750,000
		Total Other Capital Projects 2022	$17,388,731	$17,388,731	$0	$0	$0	$0	$0	$0	$0	$0	$0	$17,388,731
		Other Capital Projects 2023												
20	g	South GA Pavement Reconstruction/Rehabilitation - Construction	$12,000,000		$12,720,000									$12,720,000
21	g	North GA Apron Expansion/Perimeter Road Reconstruction - Construction	14,000,000		14,840,000									14,840,000
2	x	Boarding Bridge	1,000,000		1,060,000									1,060,000
14	p	Pavement Rehabilitation - Cargo Apron	100,000		106,000									106,000
15	p	Pavement Rehabilitation - Terminal Apron	750,000		795,000									795,000
23	r	Long Term Parking Lot Expansion (Old Exit Booth) & Pavement Rehabilitation - Construction	1,300,000		1,378,000									1,378,000
25	o	Runway 9-27 Extension & Widening Justification Study	100,000		106,000									106,000
26	o	Glycol Pump Station & Forcemain (North Cargo Apron Disposal) - Construction	2,000,000		2,120,000									2,120,000
27	e	SRE Acquisition	1,000,000		1,060,000									1,060,000

HECTOR INTERNATIONAL AIRPORT
Fargo Municipal Airport Authority

Terminal Area Study - Financial Analysis
Estimated Project Costs and Development Schedule

26-Oct-22

Capital Improvement Program	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total Funding
	Funding Schedule										
Funds Used for Capital Projects											
AIP Entitlement Grants - Passenger	$3,280,035	$3,280,035	$2,982,610	$3,076,123	$3,173,607	$3,275,229	$3,380,291	$3,407,900	$3,436,680	$3,466,683	$32,759,194
AIP Entitlement Grants - Cargo	230,353	230,000	230,000	230,000	230,000	230,000	230,000	230,000	230,000	230,000	2,300,353
BIL Airport Infrastructure Grants (AIG)	3,766,182	3,760,000	3,760,000	3,760,000	3,760,000	0	0	0	0	0	18,806,182
AIP Entitlements carryover from the prior years	3,519,355	10,688,806	(61,159)	(88,548)	(1,718,306)	2,041,694	0	0	0	0	3,519,355
AIP Entitlement unspent current year + carryover	(10,688,806)	61,159	88,548	1,718,306	(2,041,694)	0	0	0	0	0	0
AIP Discretionary/BIL Airport Terminal Grants (ATP)	0	8,674,273	7,301,587	20,000,000	7,324,639	9,370,702	2,080,506	15,118,969	26,520,156	14,958,782	111,349,614
CARES Development Grants	13,879,884	0	0	0	0	0	0	0	0	0	13,879,884
North Dakota Aeronautics Grants / Prairie Dog Fund	2,375,000	1,417,548	5,556,031	46,292	5,483,325	1,135,704	316,155	1,042,048	3,085,765	1,381,886	21,839,756
Passenger Facility Charges	1,673,560	1,744,612	1,818,681	1,895,894	1,976,385	2,060,294	2,147,765	2,238,949	2,334,005	2,433,097	20,323,243
PFC beginning year unliquidated balance	0	1,298,560	2,513,172	1,215,605	495,251	163,361	278,650	994,011	1,074,664	(55,444)	0
PFC unspent current year + carryover	(1,298,560)	(2,513,172)	(1,215,605)	(495,251)	(163,361)	(278,650)	(994,011)	(1,074,664)	55,444	(224,990)	(224,990)
ND Legacy Infrastructure Loan Proceeds	0	0	40,000,000	0	0	0	0	0	0	0	40,000,000
Less PFC Funded Debt Service Payments	0	0	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(8,929,984)
Less Airport Funded Debt Service Payments	0	0	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)	(5,357,991)
Tax Levy / State Airline Carrier Tax	1,301,570	1,475,000	1,563,500	1,610,405	1,658,717	1,708,479	1,759,733	1,812,525	1,866,901	1,922,908	16,679,737
Projected Net Operating Cash Flow	2,592,969	7,471,114	4,159,601	3,276,134	3,193,997	3,410,204	3,641,841	3,889,958	4,155,677	4,440,197	40,231,692
Funds Available Current Year	20,631,542	37,587,935	66,910,970	34,458,964	21,586,563	21,331,019	11,054,933	25,873,700	40,973,296	26,767,122	307,176,045
Funds Carried Over from Prior Year	37,443,417	39,886,228	23,386,469	34,021,506	20,272,912	23,979,067	28,121,054	32,852,878	37,885,612	41,293,068	37,443,417
Funds Used Current Year	(18,188,731)	(54,087,694)	(56,275,934)	(48,207,558)	(17,880,409)	(17,189,033)	(6,323,108)	(20,840,966)	(37,565,840)	(21,419,237)	(297,978,510)
Funds Carried Over to Next Year	$39,886,228	$23,386,469	$34,021,506	$20,272,912	$23,979,067	$28,121,054	$32,852,878	$37,885,612	$41,293,068	$46,640,952	$46,640,952
Estimated Debt Service Coverage >>	-	-	4.22x	3.80x	3.82x	4.02x	4.23x	4.45x	4.68x	4.93x	
Estimated Days Unrestricted Cash on Hand >>	2,003	1,151	1,565	914	1,014	1,154	1,309	1,466	1,551	1,701	

Capital Project Descriptions	Base Year Costs	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total Escalated Costs
		Estimated Project Costs and Development Schedule										
Total Other Capital Projects 2023	$32,250,000	$0	$34,185,000	$0	$0	$0	$0	$0	$0	$0	$0	$34,185,000
Other Capital Projects 2024												
30 p Pavement Marking	$500,000			$561,800								$561,800
31 r Runway 9-27 Environmental Assessment	600,000			674,160								674,160
Total Other Capital Projects 2024	$1,100,000	$0	$0	$1,235,960	$0	$0	$0	$0	$0	$0	$0	$1,235,960
Other Capital Projects 2025												
32 a Terminal Apron Reconstruction - Design	$800,000				$925,846							$925,846
Total Other Capital Projects 2025	$800,000	$0	$0	$0	$925,846	$0	$0	$0	$0	$0	$0	$925,846
Other Capital Projects 2026												
34 a Terminal Apron Reconstruction (w/Glycol Capture & Disposal) - Phase I - West Side	$10,000,000					$11,920,272						$11,920,272
35 o Runway 36 Special Authorization CAT III	4,000,000					4,768,109						4,768,109
36 e SRE Acquisition	1,000,000					1,192,027						1,192,027
Total Other Capital Projects 2026	$15,000,000	$0	$0	$0	$0	$17,880,409	$0	$0	$0	$0	$0	$17,880,409
Other Capital Projects 2027												
37 a Terminal Apron Reconstruction (w/Glycol Capture & Disposal) - Phase II - East Side	$10,000,000						$12,277,881					$12,277,881
38 p Pavement Marking	500,000						613,894					613,894
39 r Rwy 9-27 Extension & Widening / Twy C Reconstruction - Design	3,500,000						4,297,258					4,297,258
Total Other Capital Projects 2027	$14,000,000	$0	$0	$0	$0	$0	$17,189,033	$0	$0	$0	$0	$17,189,033
Other Capital Projects 2028												
40 r Rwy 9-27 Extension & Widening / Twy C Extension (west end earthwork)	$5,000,000							$6,323,108				$6,323,108

HECTOR INTERNATIONAL AIRPORT
Fargo Municipal Airport Authority

FAR TAP - V7

Schedule 2

Terminal Area Study - Financial Analysis
Estimated Project Costs and Development Schedule

26-Oct-22

Capital Improvement Program	Funding Schedule 2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total Funding
Funds Used for Capital Projects											
AIP Entitlement Grants - Passenger	$3,280,035	$3,280,035	$2,982,610	$3,076,123	$3,173,607	$3,275,229	$3,380,291	$3,407,900	$3,436,680	$3,466,683	$32,759,194
AIP Entitlement Grants - Cargo	230,353	230,000	230,000	230,000	230,000	230,000	230,000	230,000	230,000	230,000	2,300,353
BIL Airport Infrastructure Grants (AIG)	3,766,182	3,760,000	3,760,000	3,760,000	3,760,000	0	0	0	0	0	18,806,182
AIP Entitlements carryover from the prior years	3,519,355	10,688,806	(61,159)	(88,548)	(1,718,306)	2,041,694	0	0	0	0	3,519,355
AIP Entitlement unspent current year + carryover	(10,688,806)	61,159	88,548	1,718,306	(2,041,694)	0	0	0	0	0	0
AIP Discretionary/BIL Airport Terminal Grants (ATP)	0	8,674,273	7,301,587	20,000,000	7,324,639	9,370,702	2,080,506	15,118,969	26,520,156	14,958,782	111,349,614
CARES Development Grants	13,879,884	0	0	0	0	0	0	0	0	0	13,879,884
North Dakota Aeronautics Grants / Prairie Dog Fund	2,375,000	1,417,548	5,556,031	46,292	5,483,325	1,135,704	316,155	1,042,048	3,085,765	1,381,886	21,839,756
Passenger Facility Charges	1,673,560	1,744,612	1,818,681	1,895,894	1,976,385	2,060,294	2,147,765	2,238,949	2,334,005	2,433,097	20,323,243
PFC beginning year unliquidated balance	0	1,298,560	2,513,172	1,215,605	495,251	163,361	278,650	994,011	1,074,664	(55,444)	0
PFC unspent current year + carryover	(1,298,560)	(2,513,172)	(1,215,605)	(495,251)	(163,361)	(278,650)	(994,011)	(1,074,664)	55,444	(224,990)	(224,990)
ND Legacy Infrastructure Loan Proceeds	0	0	40,000,000	0	0	0	0	0	0	0	40,000,000
Less PFC Funded Debt Service Payments	0	0	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(8,929,984)
Less Airport Funded Debt Service Payments	0	0	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)	(5,357,991)
Tax Levy / State Airline Carrier Tax	1,301,570	1,475,000	1,563,500	1,610,405	1,658,717	1,708,479	1,759,733	1,812,525	1,866,901	1,922,908	16,679,737
Projected Net Operating Cash Flow	2,592,969	7,471,114	4,159,601	3,276,134	3,193,997	3,410,204	3,641,841	3,889,958	4,155,677	4,440,197	40,231,692
Funds Available Current Year	20,631,542	37,587,935	66,910,970	34,458,964	21,586,563	21,331,019	11,054,933	25,873,700	40,973,296	26,767,122	307,176,045
Funds Carried Over from Prior Year	37,443,417	39,886,228	23,386,469	34,021,506	20,272,912	23,979,067	28,121,054	32,852,878	37,885,612	41,293,068	37,443,417
Funds Used Current Year	(18,188,731)	(54,087,694)	(56,275,934)	(48,207,558)	(17,880,409)	(17,189,033)	(6,323,108)	(20,840,966)	(37,565,840)	(21,419,237)	(297,978,510)
Funds Carried Over to Next Year	$39,886,228	$23,386,469	$34,021,506	$20,272,912	$23,979,067	$28,121,054	$32,852,878	$37,885,612	$41,293,068	$46,640,952	$46,640,952
Estimated Debt Service Coverage >>	-	-	4.22x	3.80x	3.82x	4.02x	4.23x	4.45x	4.68x	4.93x	
Estimated Days Unrestricted Cash on Hand >>	2,003	1,151	1,565	914	1,014	1,154	1,309	1,466	1,551	1,701	

Estimated Project Costs and Development Schedule

		Capital Project Descriptions	Base Year Costs	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total Escalated Costs
		Total Other Capital Projects 2028	$5,000,000	$0	$0	$0	$0	$0	$0	$6,323,108	$0	$0	$0	$6,323,108
		Other Capital Projects 2029												
41		Rwy 9-27 Extension & Widening / Twy C												
	r	Extension (west end site work/paving)	$16,000,000								$20,840,966			$20,840,966
		Total Other Capital Projects 2029	$16,000,000	$0	$0	$0	$0	$0	$0	$0	$20,840,966	$0	$0	$20,840,966
		Other Capital Projects 2030												
42		Rwy 9-27 Extension & Widening / Twy C												
	r	Extension (east end Rwy)	$25,000,000									$33,540,929		$33,540,929
43	g	North GA Taxilane Extensions	1,000,000									1,341,637		1,341,637
44	p	Pavement Rehabilitation	500,000									670,819		670,819
45	p	Pavement Marking	500,000									670,819		670,819
46	e	SRE Acquisition	1,000,000									1,341,637		1,341,637
		Total Other Capital Projects 2030	$28,000,000	$0	$0	$0	$0	$0	$0	$0	$0	$37,565,840	$0	$37,565,840
		Other Capital Projects 2031												
47		Rwy 9-27 Extension & Widening / Twy C												
	r	Extension (east end Twy C)	$15,000,000										$20,728,294	$20,728,294
48	p	Pavement Rehabilitation	500,000										690,943	690,943
		Total Other Capital Projects 2031	$15,500,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$21,419,237	$21,419,237
		Other Capital Project Costs	$145,038,731	$17,388,731	$34,185,000	$1,235,960	$925,846	$17,880,409	$17,189,033	$6,323,108	$20,840,966	$37,565,840	$21,419,237	$174,954,131
		Total Terminal and Other Capital Project Costs	$255,680,793	$18,188,731	$54,087,694	$56,275,934	$48,207,558	$17,880,409	$17,189,033	$6,323,108	$20,840,966	$37,565,840	$21,419,237	$297,978,510

HECTOR INTERNATIONAL AIRPORT
Fargo Municipal Airport Authority

Terminal Area Study - Financial Analysis
Projected Capital Funding Sources

26-Oct-22

Capital Improvement Projects	Total Costs	AIP Entitlement and BIL-AIG Funding	AIP Discretionary/ BIL-ATP Funding	CARES Development Funding	Total Federal Funding	Passenger Facility Charges (Debt)	Passenger Facility Charges (PAYG)	ND Aeronautics Grants / Prairie Dog Fund	Cash Reserves/ Net Op Cash Flow	Total Funding
					41.3%	20.3%	2.8%	5.0%	30.5%	
TERMINAL BUILDING PROJECT COMPONENTS										
28 Airline Ticketing/Check-In	$6,064,004				$0			$303,200	$5,760,804	$6,064,004
28 Passenger and Baggage Screening/Security	6,212,719				0	595,721		310,636	5,306,362	6,212,719
28 Departure Areas	38,652,091	14,862,619	20,000,000		34,862,619	1,845,407		1,944,065	0	38,652,091
28 Concessions	7,505,946				0			375,297	7,130,648	7,505,946
28 Inbound Baggage Claim	5,038,144				0	1,356,583		251,907	3,429,654	5,038,144
28 Outbound Baggage and Storage	8,378,959				0	7,960,011		418,948	0	8,378,959
28 Other Public Areas	26,114,773				0	13,242,277	3,500,000	1,305,739	8,066,758	26,114,773
28 Support Areas	7,306,786				0			365,339	6,941,447	7,306,786
Total Estimated Terminal Building Costs	$105,273,423	$14,862,619	$20,000,000	$0	$34,862,619	$25,000,000	$3,500,000	$5,275,131	$36,635,673	$105,273,423
29 Airside Apron Expansion - North (Deicing)	8,112,875		7,301,587		7,301,587			405,644	405,644	8,112,875
22 Airside Apron Expansion - South (Expansion)	9,638,082		8,674,273		8,674,273			481,904	481,904	9,638,082
Total Terminal Area Costs Before Financing	$123,024,379	$14,862,619	$35,975,861	$0	$50,838,480	$25,000,000	$3,500,000	$6,162,679	$37,523,220	$123,024,379
Financing Costs for Debt Serviced with PFCs	0					0				0
Total Terminal Area Costs	$123,024,379	$14,862,619	$35,975,861	$0	$50,838,480	$25,000,000	$3,500,000	$6,162,679	$37,523,220	$123,024,379
OTHER CAPITAL PROJECTS										
Other Capital Projects 2022										
1 Terminal Area Study	$584,131				$0				$584,131	$584,131
3 Security Access Control System - Design	87,980			87,980	87,980				0	87,980
4 Security Access Control System - Construction	1,829,702			1,829,702	1,829,702				0	1,829,702
5 East Economy Lot	2,401,475			2,401,475	2,401,475				0	2,401,475
6 Parking Lot Exit Plaza	2,578,196			2,578,196	2,578,196				0	2,578,196
7 South GA Pavement Reconstruction/Rehabilitation - Design	837,700			837,700	837,700				0	837,700
8 North GA Apron Expansion - Design	819,900			819,900	819,900				0	819,900
9 Terminal Apron Expansion - Design	800,000			800,000	800,000				0	800,000
11 SRE Building (previously unfunded balance)	1,090,575	107,119		915,859	1,022,978				67,597	1,090,575
11a Fueling System - SRE Building	282,405			282,405	282,405				0	282,405
12 Cargo Apron Expansion - Phase IV (previously unfunded balance)	3,972,822			1,972,822	1,972,822			2,000,000	0	3,972,822
13 Glycol Pump Station & Forcemain (North Cargo Apron Disposal) - Design	200,000			200,000	200,000				0	200,000
16 Long Term Parking Lot Expansion (Old Exit Booth) & Pavement Rehabilitation - Design	50,000			50,000	50,000				0	50,000
17 Security Checkpoint Expansion	304,775			304,775	304,775				0	304,775
18 PARCS System	799,070			799,070	799,070				0	799,070

HECTOR INTERNATIONAL AIRPORT
Fargo Municipal Airport Authority

Terminal Area Study - Financial Analysis
Projected Capital Funding Sources

26-Oct-22

	Capital Improvement Projects	Total Costs	AIP Entitlement and BIL-AIG Funding	AIP Discretionary/ BIL-ATP Funding	CARES Development Funding	Total Federal Funding	Passenger Facility Charges (Debt)	Passenger Facility Charges (PAYG)	ND Aeronautics Grants / Prairie Dog Fund	Cash Reserves/ Net Op Cash Flow	Total Funding
19	SRE Acquisition	750,000				0		375,000	375,000	0	750,000
	Total Other Capital Projects 2022	$17,388,731	$107,119	$0	$13,879,884	$13,987,003	$0	$375,000	$2,375,000	$651,728	$17,388,731
	Other Capital Projects 2023										
20	South GA Pavement Reconstruction/Rehabilitation - Construction	$12,720,000	$10,500,000			$10,500,000				$2,220,000	$12,720,000
21	North GA Apron Expansion/Perimeter Road Reconstruction - Construction	14,840,000	7,520,000			7,520,000				7,320,000	14,840,000
2	Boarding Bridge	1,060,000				0				1,060,000	1,060,000
14	Pavement Rehabilitation - Cargo Apron	106,000				0				106,000	106,000
15	Pavement Rehabilitation - Terminal Apron	795,000				0				795,000	795,000
23	Long Term Parking Lot Expansion (Old Exit Booth) & Pavement Rehabilitation - Construction	1,378,000				0				1,378,000	1,378,000
25	Runway 9-27 Extension & Widening Justification Study	106,000				0				106,000	106,000
26	Glycol Pump Station & Forcemain (North Cargo Apron Disposal) - Construction	2,120,000				0				2,120,000	2,120,000
27	SRE Acquisition	1,060,000				0		530,000	530,000	0	1,060,000
	Total Other Capital Projects 2023	$34,185,000	$18,020,000	$0	$0	$18,020,000	$0	$530,000	$530,000	$15,105,000	$34,185,000
	Other Capital Projects 2024										
30	Pavement Marking	$561,800				$0			$280,900	$280,900	$561,800
31	Runway 9-27 Environmental Assessment	674,160				0				674,160	674,160
	Total Other Capital Projects 2024	$1,235,960	$0	$0	$0	$0	$0	$0	$280,900	$955,060	$1,235,960
	Other Capital Projects 2025										
32	Terminal Apron Reconstruction - Design	$925,846	$833,262			$833,262			$46,292	$46,292	$925,846
	Total Other Capital Projects 2025	$925,846	$833,262	$0	$0	$833,262	$0	$0	$46,292	$46,292	$925,846
	Other Capital Projects 2026										
34	Terminal Apron Reconstruction (w/Glycol Capture & Disposal) - Phase I - West Side	$11,920,272	$3,403,607	$7,324,639		$10,728,245		$596,014	$596,014	$0	$11,920,272
35	Runway 36 Special Authorization CAT III	4,768,109				0			4,291,298	476,811	4,768,109
36	SRE Acquisition	1,192,027				0		596,014	596,014	0	1,192,027
	Total Other Capital Projects 2026	$17,880,409	$3,403,607	$7,324,639	$0	$10,728,245	$0	$1,192,027	$5,483,325	$476,811	$17,880,409
	Other Capital Projects 2027										
37	Terminal Apron Reconstruction (w/Glycol Capture & Disposal) - Phase II - East Side	$12,277,881	$1,679,391	$9,370,702		$11,050,093		$613,894	$613,894	$0	$12,277,881
38	Pavement Marking	613,894				0			306,947	306,947	613,894
39	Rwy 9-27 Extension & Widening / Twy C Reconstruction - Design	4,297,258	3,867,532			3,867,532		214,863	214,863	0	4,297,258

HECTOR INTERNATIONAL AIRPORT
Fargo Municipal Airport Authority

FAR TAP - V7

Schedule 3a

Terminal Area Study - Financial Analysis
Projected Capital Funding Sources

26-Oct-22

	Capital Improvement Projects	Total Costs	AIP Entitlement and BIL-AIG Funding	AIP Discretionary/ BIL-ATP Funding	CARES Development Funding	Total Federal Funding	Passenger Facility Charges (Debt)	Passenger Facility Charges (PAYG)	ND Aeronautics Grants / Prairie Dog Fund	Cash Reserves/ Net Op Cash Flow	Total Funding
	Total Other Capital Projects 2027	$17,189,033	$5,546,923	$9,370,702	$0	$14,917,625	$0	$828,757	$1,135,704	$306,947	$17,189,033
	Other Capital Projects 2028										
40	Rwy 9-27 Extension & Widening / Twy C Extension (west end earthwork)	$6,323,108	$3,610,291	$2,080,506		$5,690,798		$316,155	$316,155	$0	$6,323,108
	Total Other Capital Projects 2028	$6,323,108	$3,610,291	$2,080,506	$0	$5,690,798	$0	$316,155	$316,155	$0	$6,323,108
	Other Capital Projects 2029										
41	Rwy 9-27 Extension & Widening / Twy C Extension (west end site work/paving)	$20,840,966	$3,637,900	$15,118,969		$18,756,869		$1,042,048	$1,042,048	$0	$20,840,966
	Total Other Capital Projects 2029	$20,840,966	$3,637,900	$15,118,969	$0	$18,756,869	$0	$1,042,048	$1,042,048	$0	$20,840,966
	Other Capital Projects 2030										
42	Rwy 9-27 Extension & Widening / Twy C Extension (east end Rwy)	$33,540,929	$3,666,680	$26,520,156		$30,186,836		$1,677,046	$1,677,046	$0	$33,540,929
43	North GA Taxilane Extensions	1,341,637				0			67,082	1,274,555	1,341,637
44	Pavement Rehabilitation	670,819				0			335,409	335,409	670,819
45	Pavement Marking	670,819				0			335,409	335,409	670,819
46	SRE Acquisition	1,341,637				0		670,819	670,819	0	1,341,637
	Total Other Capital Projects 2030	$37,565,840	$3,666,680	$26,520,156	$0	$30,186,836	$0	$2,347,865	$3,085,765	$1,945,374	$37,565,840
	Other Capital Projects 2031										
47	Rwy 9-27 Extension & Widening / Twy C Extension (east end Twy C)	$20,728,294	$3,696,683	$14,958,782		$18,655,465		$1,036,415	$1,036,415	$0	$20,728,294
48	Pavement Rehabilitation	690,943				0			345,472	345,472	690,943
	Total Other Capital Projects 2031	$21,419,237	$3,696,683	$14,958,782	$0	$18,655,465	$0	$1,036,415	$1,381,886	$345,472	$21,419,237
	Total Other Capital Project Costs	$174,954,131	$42,522,465	$75,373,754	$13,879,884	$131,776,102	$0	$7,668,268	$15,677,077	$19,832,684	$174,954,131
	Total Terminal and Other Capital Project Costs	$297,978,510	$57,385,084	$111,349,614	$13,879,884	$182,614,582	$25,000,000	$11,168,268	$21,839,756	$57,355,904	$297,978,510

HECTOR INTERNATIONAL AIRPORT
Fargo Municipal Airport Authority

Summary of Stakeholders' Participation to the Terminal Expansion/Rehabilitation Project

26-Oct-22

Year Available	2022	2023	2024	2023	2024-2025		
Funding Sources	Apron Design	South Apron (Expansion)	North Apron (Deicing)	Terminal - Design	Terminal - Construction	Total Participation	% Part.
Federal Funds							
AIP Entitlements / AIG Funds (90%/10%)	$ -	$ -	$ -	$ 9,639,000	$ 5,223,619	$ 14,862,619	12.1%
AIP Discretionary (90%/10%)	720,000	8,273,425	6,982,436	-	-	15,975,861	13.0%
Airport Terminal Program (ATP) Grants (95%/5%)	-	-	-	-	20,000,000	20,000,000	16.3%
Subtotal - AIP/AIG/ATP Funds	$ 720,000	$ 8,273,425	$ 6,982,436	$ 9,639,000	$ 25,223,619	$ 50,838,480	41.3%
State Funds							
ND Aeronautics	$ 40,000	$ 459,635	$ 387,913	$ 535,500	$ 4,739,631	$ 6,162,679	5.0%
Prairie Dog Funds	-	-	-	-	-	-	0.0%
Subtotal - State Funds	$ 40,000	$ 459,635	$ 387,913	$ 535,500	$ 4,739,631	$ 6,162,679	5.0%
PFC Funds							
PFC Serviced Debt Proceeds	$ -	$ -	$ -	$ -	$ 25,000,000	$ 25,000,000	20.3%
PFC Pay-Go Funds	-	-	-	-	3,500,000	3,500,000	2.8%
Subtotal - PFC Funds	$ -	$ -	$ -	$ -	$ 28,500,000	$ 28,500,000	23.2%
Airport Funds							
Airport Serviced Debt Proceeds	$ -	$ -	$ -	$ -	$ 15,000,000	$ 15,000,000	12.2%
Cash Reserves / Net Operating Revenues	40,000	459,635	387,913	535,500	21,100,173	22,523,220	18.3%
Subtotal - Airport Funds	$ 40,000	$ 459,635	$ 387,913	$ 535,500	$ 36,100,173	$ 37,523,220	30.5%
Total Terminal/Apron Capital Costs Funding	**$ 800,000**	**$ 9,192,694**	**$ 7,758,262**	**$ 10,710,000**	**$ 94,563,423**	**$ 123,024,379**	**100.0%**

Passenger Facility Charges (30 yrs, 2%, 1/1/2024):	
PFC Serviced Debt Proceeds	$ 25,000,000
PFC Funded Financing & Interest Costs	8,487,442
Total PFC Debt Service	$ 33,487,442
Airport Serviced Debt (30 yrs, 2%, 1/1/2024):	
Airport Serviced Debt Proceeds	$ 15,000,000
Airport Funded Financing & Interest Costs	5,092,465
` Total Airport Debt Service	$ 20,092,465

HECTOR INTERNATIONAL AIRPORT
Fargo Municipal Airport Authority

Terminal Area Study - Financial Analysis
Debt (PFC and Airport Serviced)

26-Oct-22

Debt Issue Structure

Issue Date:	01-Jan-24
Interest:	2.0%
Term:	30 Years
Project Funding Requirement:	$40,000,000
Debt Service Reserve Fund Requirement (MADS):	-
Total Debt Requirement:	$40,000,000

Notes:

(1) Assumes no interest earnings on Construction Fund balance or Debt Service Reserve Fund deposit.
(2) Does not account for any DSRF requirement.
(3) Assumes PFCs fund $25,000,000 of the principal and Airport Cash funds $15,000,000 of the principal.
PFC funded debt service is limited due to the timing of PFC receipts and other demands. PFC eligible costs funded through Airport funded debt service could be reimbursed with PFC funds to the extent PFC funds are available and authorization is provided in a PFC application.

Debt Service Schedule

			Total Debt Service			PFC Funded Debt Service (62.5%)			Airport Funded Debt Service (37.5%)			
Payment Number	Year	Beginning Principal	Annual Debt Service	Interest Payment	Principal Payment	Annual Debt Service	Interest Payment	Principal Payment	Annual Debt Service	Interest Payment	Principal Payment	Ending Principal
1	2024	$40,000,000	$1,785,997	$800,000	$985,997	$1,116,248	$500,000	$616,248	$669,749	$300,000	$369,749	$39,014,003
2	2025	39,014,003	1,785,997	780,280	1,005,717	1,116,248	487,675	628,573	669,749	292,605	377,144	38,008,286
3	2026	38,008,286	1,785,997	760,166	1,025,831	1,116,248	475,104	641,144	669,749	285,062	384,687	36,982,455
4	2027	36,982,455	1,785,997	739,649	1,046,348	1,116,248	462,281	653,967	669,749	277,368	392,380	35,936,107
5	2028	35,936,107	1,785,997	718,722	1,067,275	1,116,248	449,201	667,047	669,749	269,521	400,228	34,868,833
6	2029	34,868,833	1,785,997	697,377	1,088,620	1,116,248	435,860	680,388	669,749	261,516	408,233	33,780,212
7	2030	33,780,212	1,785,997	675,604	1,110,393	1,116,248	422,253	693,995	669,749	253,352	416,397	32,669,820
8	2031	32,669,820	1,785,997	653,396	1,132,600	1,116,248	408,373	707,875	669,749	245,024	424,725	31,537,219
9	2032	31,537,219	1,785,997	630,744	1,155,253	1,116,248	394,215	722,033	669,749	236,529	433,220	30,381,967
10	2033	30,381,967	1,785,997	607,639	1,178,358	1,116,248	379,775	736,473	669,749	227,865	441,884	29,203,609
11	2034	29,203,609	1,785,997	584,072	1,201,925	1,116,248	365,045	751,203	669,749	219,027	450,722	28,001,684
12	2035	28,001,684	1,785,997	560,034	1,225,963	1,116,248	350,021	766,227	669,749	210,013	459,736	26,775,721
13	2036	26,775,721	1,785,997	535,514	1,250,482	1,116,248	334,697	781,552	669,749	200,818	468,931	25,525,239
14	2037	25,525,239	1,785,997	510,505	1,275,492	1,116,248	319,065	797,183	669,749	191,439	478,310	24,249,747
15	2038	24,249,747	1,785,997	484,995	1,301,002	1,116,248	303,122	813,126	669,749	181,873	487,876	22,948,745
16	2039	22,948,745	1,785,997	458,975	1,327,022	1,116,248	286,859	829,389	669,749	172,116	497,633	21,621,723
17	2040	21,621,723	1,785,997	432,434	1,353,562	1,116,248	270,272	845,977	669,749	162,163	507,586	20,268,160
18	2041	20,268,160	1,785,997	405,363	1,380,634	1,116,248	253,352	862,896	669,749	152,011	517,738	18,887,527
19	2042	18,887,527	1,785,997	377,751	1,408,246	1,116,248	236,094	880,154	669,749	141,656	528,092	17,479,280
20	2043	17,479,280	1,785,997	349,586	1,436,411	1,116,248	218,491	897,757	669,749	131,095	538,654	16,042,869
21	2044	16,042,869	1,785,997	320,857	1,465,140	1,116,248	200,536	915,712	669,749	120,322	549,427	14,577,729
22	2045	14,577,729	1,785,997	291,555	1,494,442	1,116,248	182,222	934,026	669,749	109,333	560,416	13,083,287
23	2046	13,083,287	1,785,997	261,666	1,524,331	1,116,248	163,541	952,707	669,749	98,125	571,624	11,558,956
24	2047	11,558,956	1,785,997	231,179	1,554,818	1,116,248	144,487	971,761	669,749	86,692	583,057	10,004,138
25	2048	10,004,138	1,785,997	200,083	1,585,914	1,116,248	125,052	991,196	669,749	75,031	594,718	8,418,224
26	2049	8,418,224	1,785,997	168,364	1,617,632	1,116,248	105,228	1,011,020	669,749	63,137	606,612	6,800,592
27	2050	6,800,592	1,785,997	136,012	1,649,985	1,116,248	85,007	1,031,241	669,749	51,004	618,744	5,150,607
28	2051	5,150,607	1,785,997	103,012	1,682,985	1,116,248	64,383	1,051,865	669,749	38,630	631,119	3,467,622
29	2052	3,467,622	1,785,997	69,352	1,716,644	1,116,248	43,345	1,072,903	669,749	26,007	643,742	1,750,977
30	2053	1,750,977	1,785,997	35,020	1,750,977	1,116,248	21,887	1,094,361	669,749	13,132	656,617	0
	Totals		$53,579,907	$13,579,907	$40,000,000	$33,487,442	$8,487,442	$25,000,000	$20,092,465	$5,092,465	$15,000,000	

HECTOR INTERNATIONAL AIRPORT
Fargo Municipal Airport Authority

FAR TAP - V7 | Schedule 5

Terminal Area Study - Financial Analysis
Actual, Estiamted, Budgeted and Projected Operating Expenses

26-Oct-22

	Actual	Actual	Actual	Estimated	Budgeted	Projected							
Operating Expenses	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
								Expansion Open					
Salaries and Benefits	$2,810,485	$2,909,058	$2,930,039	$2,774,646	$3,526,615	$3,738,212	$3,850,358	$4,094,619	$4,217,458	$4,343,981	$4,474,301	$4,608,530	$4,746,786
Repairs and Maintenance	824,332	668,436	441,586	531,935	753,000	798,180	822,125	903,439	930,542	958,459	987,212	1,016,829	1,047,334
Insurance	107,455	123,384	159,026	157,997	168,500	178,610	183,968	194,637	200,476	206,491	212,685	219,066	225,638
Utilities	487,859	454,689	527,271	694,897	631,400	669,284	689,363	761,543	784,390	807,921	832,159	857,124	882,838
Travel and Education	46,626	30,822	27,772	73,526	88,700	94,022	96,843	99,748	102,740	105,823	108,997	112,267	115,635
Professional Services	75,695	52,073	107,699	150,167	110,000	116,600	120,098	123,701	127,412	131,234	135,171	139,226	143,403
Technical Services	45,694	42,209	57,290	122,281	98,539	104,451	107,585	110,812	114,137	117,561	121,088	124,720	128,462
Parking Management	0	221,953	521,566	611,301	584,415	619,480	638,064	657,206	676,922	697,230	718,147	739,691	761,882
Security Services	143,654	130,466	125,468	191,972	200,000	212,000	218,360	224,911	231,658	238,608	245,766	253,139	260,733
Other Services	51,885	113,821	165,366	160,677	214,500	227,370	234,191	241,217	248,453	255,907	263,584	271,492	279,636
Snow Clearing Services	62,941	15,096	17,658	23,465	65,000	68,900	70,967	124,596	128,334	132,184	136,149	140,234	144,441
Advertising, Printing and Publication	1,836	998	1,805	10,155	3,800	4,028	4,149	4,273	4,402	4,534	4,670	4,810	4,954
General Supplies	298,457	396,319	374,971	527,369	428,200	453,892	467,509	481,534	495,980	510,859	526,185	541,971	558,230
Clothing and Uniforms	13,080	11,707	7,938	11,090	18,500	19,610	20,198	20,804	21,428	22,071	22,733	23,415	24,118
Chemicals/Salt/Gravel	13,101	9,506	19,376	82,999	36,000	38,160	39,305	40,484	41,698	42,949	44,238	45,565	46,932
Communications	1,824	1,814	3,436	3,330	10,000	10,600	10,918	11,246	11,583	11,930	12,288	12,657	13,037
Miscellaneous	1,342	7,986	355	1,325	5,000	5,300	5,459	5,623	5,791	5,965	6,144	6,328	6,518
Special Assessments	129,585	62,542	53,632	100,000	100,000	106,000	109,180	112,455	115,829	119,304	122,883	126,570	130,367
City of Fargo	155,153	90,000	90,000	37,500	0	0	0	0	0	0	0	0	0
Capital - Minor Outlay	476,226	66,336	454,518	1,000,000	375,000	397,500	409,425	421,708	434,359	447,390	460,811	474,636	488,875
Bond Issue Costs	0	0	0	0	0	70,000	0	0	0	0	0	0	0
Operating Expenses	$5,747,231	$5,409,215	$6,086,770	$7,266,632	$7,417,169	$7,932,199	$8,098,065	$8,634,557	$8,893,594	$9,160,402	$9,435,214	$9,718,270	$10,009,818
Annual Growth Rate	-	-5.9%	12.5%	19.4%	2.1%	6.9%	2.1%	6.6%	3.0%	3.0%	3.0%	3.0%	3.0%
Operating Expenses Per Enplaned Passenger:													
Hector International Airport	$11.95	$22.17	$14.98	$17.16	$16.80	$17.23	$16.88	$17.26	$17.06	$16.85	$16.65	$16.45	$16.25
Small Hub Industry Average	$18.80	$29.64	$29.59	$29.54	$29.49	$29.44	$29.38	$29.33	$29.28	$29.23	$29.18	$29.13	$29.08

HECTOR INTERNATIONAL AIRPORT
Fargo Municipal Airport Authority

FAR TAP - V7

Schedule 6

Terminal Area Study - Financial Analysis
Actual, Estimated, Budgeted and Projected Operating Revenues

26-Oct-22

	Actual	Actual	Actual	Estimated	Budgeted	Projected							
Operating Revenues	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**
						LDW							
						ENP+INF							
Airline Revenues						ENP Only							
Landing Fees	$311,497	$217,098	$284,577	$277,710	$252,000	$257,349	$262,812	$268,391	$274,089	$279,907	$285,849	$291,917	$298,113
Terminal Rents	568,979	561,517	567,598	561,779	557,000	590,420	608,133	626,377	645,168	664,523	684,459	704,992	726,142
ARFF Costs	832,727	765,355	952,160	1,131,260	1,227,334	1,300,974	1,340,003	1,380,203	1,421,609	1,464,258	1,508,185	1,553,431	1,600,034
Security Costs	152,943	160,546	179,082	209,458	323,039	342,421	352,694	363,275	374,173	385,398	396,960	408,869	421,135
Total Airline Revenues	$1,866,146	$1,704,516	$1,983,417	$2,180,207	$2,359,373	$2,491,165	$2,563,642	$2,638,246	$2,715,039	$2,794,086	$2,875,453	$2,959,209	$3,045,425
Annual Growth Rate	-	-8.7%	16.4%	9.9%	8.2%	5.6%	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%	2.9%
Airline Cost Per Enplaned Passenger:													
Hector International Airport	$3.88	$6.99	$4.88	$5.15	$5.34	$5.41	$5.34	$5.27	$5.21	$5.14	$5.07	$5.01	$4.95
Small Hub Industry Average	$7.28	$10.14	$10.12	$10.10	$10.09	$10.07	$10.05	$10.03	$10.02	$10.00	$9.98	$9.96	$9.95
Non-Airline Revenues													
Landing Fees - Cargo & Others	$228,253	$243,636	$243,953	$250,090	$244,000	$249,180	$254,469	$259,871	$265,387	$271,021	$276,774	$282,649	$288,650
Fuel Flowage Fees	58,711	44,312	62,389	55,000	125,000	127,653	130,363	133,131	135,957	138,843	141,790	144,800	147,874
Rental Car Concession	1,248,686	658,091	1,288,186	1,294,567	1,285,000	1,419,929	1,524,619	1,637,028	1,757,725	1,887,321	2,026,471	2,175,882	2,336,308
Restaurant Concession	209,604	103,139	196,096	229,560	196,000	216,581	232,549	249,695	268,104	287,871	309,096	331,885	356,355
Gift Shop/Vending Concession	115,574	63,802	113,699	120,822	114,000	125,970	135,258	145,231	155,938	167,435	179,780	193,035	207,268
Advertising	47,987	52,910	46,336	45,571	50,000	53,000	54,590	56,228	57,915	59,652	61,442	63,285	65,183
Public Parking	3,217,666	1,586,338	3,158,789	3,100,000	4,200,000	4,378,313	4,564,197	4,757,973	4,959,976	5,170,554	5,390,073	5,618,912	5,857,466
Employee Parking	26,540	25,430	25,920	19,820	26,000	26,000	26,000	27,104	27,104	27,104	27,104	27,104	27,104
Rentals of Hangars and FBO	385,038	354,270	372,965	350,326	382,510	405,461	417,624	430,153	443,058	456,349	470,040	484,141	498,665
Other Building Rentals	184,333	180,223	188,872	184,728	199,793	211,781	218,134	224,678	231,418	238,361	245,512	252,877	260,463
Rental of Expansion Area	354,971	378,225	398,858	424,122	421,982	447,301	460,720	474,542	488,778	503,441	518,544	534,101	550,124
TSA LEO Grant	142,728	119,765	128,850	128,850	128,850	128,850	128,850	128,850	128,850	128,850	128,850	128,850	128,850
Operating Revenues - 7004	0	166,981	1,624	0	0	0	0	0	0	0	0	0	0
Miscellaneous Revenues	106,928	92,925	88,213	79,371	80,700	85,542	88,108	90,752	93,474	96,278	99,167	102,142	105,206
Total Non-Airline Revenues	$6,327,019	$4,070,047	$6,314,750	$6,282,827	$7,453,835	$7,875,560	$8,235,482	$8,615,234	$9,013,684	$9,433,081	$9,874,643	$10,339,663	$10,829,516
Annual Growth Rate	-	-35.7%	55.2%	-0.5%	18.6%	5.7%	4.6%	4.6%	4.6%	4.7%	4.7%	4.7%	4.7%
Non-Operating Revenues													
Interest Income	$731,598	$255,454	$106,835	$89,363	$575,075	$575,075	$575,075	$575,075	$575,075	$575,075	$575,075	$575,075	$575,075
Gain/Loss on Disposal of Assets	106,801	8,630	8,150	7,204	0	0	0	0	0	0	0	0	0
COVID Relief	0	4,972,277	5,341,899	1,300,000	4,500,000	1,150,000	0	0	0	0	0	0	0
Total Non-Operating Revenues	$838,399	$5,236,361	$5,456,884	$1,396,567	$5,075,075	$1,725,075	$575,075	$575,075	$575,075	$575,075	$575,075	$575,075	$575,075
Annual Growth Rate	-	524.6%	4.2%	-74.4%	263.4%	-66.0%	-66.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total Revenues	$9,031,564	$11,010,924	$13,755,051	$9,859,601	$14,888,283	$12,091,800	$11,374,200	$11,828,555	$12,303,798	$12,802,242	$13,325,171	$13,873,947	$14,450,015
Annual Growth Rate	-	21.9%	24.9%	-28.3%	51.0%	-18.8%	-5.9%	4.0%	4.0%	4.1%	4.1%	4.1%	4.2%
Operating Revenues Per Enplaned Passenger:													
Hector International Airport	$17.04	$23.66	$20.42	$19.98	$22.22	$22.52	$22.51	$22.50	$22.49	$22.49	$22.50	$22.51	$22.53
Small Hub Industry Average	$27.30	$34.57	$34.51	$34.45	$34.39	$34.33	$34.27	$34.21	$34.15	$34.09	$34.03	$33.97	$33.91

HECTOR INTERNATIONAL AIRPORT
Fargo Municipal Airport Authority

FAR TAP - V7

Schedule 7

Terminal Area Study - Financial Analysis
Financial Plan Summary
Estimated, Budgeted and Projected Net Revenues, Capital Funding and Capital Expenditures

26-Oct-22

	Estimated	Budgeted	Projected							
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Passenger Enplanements	423,579	441,562	460,309	479,852	500,224	521,461	543,600	566,679	590,738	615,818
Annual Growth Rates	-	4.25%	4.25%	4.25%	4.25%	4.25%	4.25%	4.25%	4.25%	4.25%
Operating Cash Flow										
Revenues:										
Airline Revenues	$2,180,207	$2,359,373	$2,491,165	$2,563,642	$2,638,246	$2,715,039	$2,794,086	$2,875,453	$2,959,209	$3,045,425
Non-Airline Revenues	6,282,827	7,453,835	7,875,560	8,235,482	8,615,234	9,013,684	9,433,081	9,874,643	10,339,663	10,829,516
Non-Operating Revenues	1,396,567	5,075,075	1,725,075	575,075	575,075	575,075	575,075	575,075	575,075	575,075
Total Revenues	$9,859,601	$14,888,283	$12,091,800	$11,374,200	$11,828,555	$12,303,798	$12,802,242	$13,325,171	$13,873,947	$14,450,015
Operating Expenses	(7,266,632)	(7,417,169)	(7,932,199)	(8,098,065)	(8,634,557)	(8,893,594)	(9,160,402)	(9,435,214)	(9,718,270)	(10,009,818)
Total Net Operating Cash Flow Available For Capital Expenditures	$2,592,969	$7,471,114	$4,159,601	$3,276,134	$3,193,997	$3,410,204	$3,641,841	$3,889,958	$4,155,677	$4,440,197
Capital Cash Flow										
Beginning Cash Balance	$37,443,417	$39,886,228	$23,386,469	$34,021,506	$20,272,912	$23,979,067	$28,121,054	$32,852,878	$37,885,612	$41,293,068
Other Capital Funding Sources:										
AIP Entitlement Grants - Passenger	$3,280,035	$3,280,035	$2,982,610	$3,076,123	$3,173,607	$3,275,229	$3,380,291	$3,407,900	$3,436,680	$3,466,683
AIP Entitlement Grants - Cargo	230,353	230,000	230,000	230,000	230,000	230,000	230,000	230,000	230,000	230,000
BIL Airport Infrastructure Grants (AIG)	3,766,182	3,760,000	3,760,000	3,760,000	3,760,000	0	0	0	0	0
AIP Entitlements carryover from the prior years	3,519,355	10,688,806	(61,159)	(88,548)	(1,718,306)	2,041,694	0	0	0	0
AIP Entitlement unspent current year + carryover	(10,688,806)	61,159	88,548	1,718,306	(2,041,694)	0	0	0	0	0
AIP Discretionary/BIL Airport Terminal Grants (ATP)	0	8,674,273	7,301,587	20,000,000	7,324,639	9,370,702	2,080,506	15,118,969	26,520,156	14,958,782
CARES Development Grants	13,879,884	0	0	0	0	0	0	0	0	0
North Dakota Aeronautics Grants / Prairie Dog Fund	2,375,000	1,417,548	5,556,031	46,292	5,483,325	1,135,704	316,155	1,042,048	3,085,765	1,381,886
Passenger Facility Charges	1,673,560	1,744,612	1,818,681	1,895,894	1,976,385	2,060,294	2,147,765	2,238,949	2,334,005	2,433,097
PFC beginning year unliquidated balance	0	1,298,560	2,513,172	1,215,605	495,251	163,361	278,650	994,011	1,074,664	(55,444)
PFC unspent current year + carryover	(1,298,560)	(2,513,172)	(1,215,605)	(495,251)	(163,361)	(278,650)	(994,011)	(1,074,664)	55,444	(224,990)
ND Legacy Infrastructure Loan Proceeds	0	0	40,000,000	0	0	0	0	0	0	0
Less PFC Funded Debt Service Payments	0	0	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)	(1,116,248)
Less Airport Funded Debt Service Payments	0	0	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)	(669,749)
Tax Levy / State Airline Carrier Tax	1,301,570	1,475,000	1,563,500	1,610,405	1,658,717	1,708,479	1,759,733	1,812,525	1,866,901	1,922,908
Total Other Capital Funding Sources	$18,038,573	$30,116,821	$62,751,369	$31,182,829	$18,392,566	$17,920,816	$7,413,093	$21,983,742	$36,817,619	$22,326,925
Total Funds Available for Capital Expenditures	58,074,959	77,474,163	90,297,440	68,480,470	41,859,476	45,310,086	39,175,987	58,726,578	78,858,908	68,060,189
Capital Improvement Program Expenditures	18,188,731	54,087,694	56,275,934	48,207,558	17,880,409	17,189,033	6,323,108	20,840,966	37,565,840	21,419,237
Ending Cash Balance	$39,886,228	$23,386,469	$34,021,506	$20,272,912	$23,979,067	$28,121,054	$32,852,878	$37,885,612	$41,293,068	$46,640,952

APPENDIX A

EXISTING BUILDING CODE SUMMARY

APPENDIX A

MEADHUNT.COM

APPENDIX A

FAR Terminal Area Study (TAS)
For Hector International Airport Fargo, North Dakota

Building Code – Existing Status:
The 2006 Remodeling and Additions to the Hector International Airport Terminal Expansion were constructed in compliance with the current building codes adopted at the time the modifications were designed which is indicated below:

Americans with Disabilities Act of 1990 "ADA"; Title II and III
ICC/ANSI A117.1-2003 Accessibility

Building Code Summary for Existing Terminal Facility, Hector International Airport

CODE: INTERNATIONAL BUILDING CODE (IBC) – 2003 Local Amendments
INTERNATIONAL MECHANICAL CODE (IMC) -2003
NATIONAL ELECTRICAL CODE
STATE PLUMBING CODE - CURRENT
INTERNATION FIRE CODE - 2003

Zoning: LC (Limited Commercial)
Occupant Load: 3,292 Total Building

Chapter 3 – Use and Occupancy Classification
302.1 General Classification:

A2 Assembly	Restaurants, Similar Dining Facilities
A3 Assembly	Waiting Areas in Transportation Terminals
M	Mercantile – Gift Shop
B	Business Office & Car Rentals
S-1	Storage (Tug Concourse)

Chapter 5 – General Building Heights and Areas

Maximum Basic Allowable Sq. Ft.:	Unlimited
Maximum Building Height:	55 Feet
Maximum Stories:	Two (2) Stories

Chapter 6 – Types of Construction
Type II-B (Fully Sprinklered) See Covered Mall Section 402

Chapter 9 – Fire Protection and Life Safety Systems
Fully Sprinklered – Automatic Sprinkler System and Stand Pipe System

Chapter 10 – Means of Egress
See Code Review Floor Plans with occupancy and egress calculations.
Exit Width Required: 540.55" @ Grade
Exit Width Provided: 1,003.125" @ Grade

Over the past several years small interior upgrades have been made with each upgrade being done under the current building codes in affect at the time of the upgrades. The overall Terminal Facility is in compliance with the codes that were in effect at the time of construction. Any future expansion projects within the Terminal Facility would need to be constructed under the Building Codes which will be in effect at the time of design for those future projects. Any portions of the facility that are not affected by any future expansion projects are grandfathered in and does not require that entire facility to be upgraded to the new building code requirements.

APPENDIX B

ACCESSIBILITY ASSESSMENT

APPENDIX B

2.1.4 Accessibility

Features of accessibility and universal design are provided throughout the FAR terminal building. An elevator provides an accessible route between levels and all multi-fixture toilet rooms provide accessible toilet compartments. While many features were provided, there were a number of items identified that do not fully comply with current design requirements of the Americans with Disabilities Act (ADA) as well as opportunities for improved accessibility.

Parking
Surface parking is provided for short term, long term and economy parking. Currently accessible parking spaces are located in the short term lot (11 spaces) and long term lot (32 spaces). This is a compliant quantity of accessible parking spaces.

- Restripe accessible parking spaces and adjacent aisles in the long term parking lot to provide compliant accessible parking. (Aisle are currently less than 5’ wide at multiple locations.)
- Create accessible parking spaces in the economy parking lot. While parking spaces are allowed to be located in an alternate facility if substantially equal or greater accessibility is provided in terms of distance to an accessible entrance or user convenience; the fee also needs to be considered. Currently accessible parking spaces are only available in the short & long term lots which charge a higher daily fee than the economy lot.

Exterior Route
The site is generally flat; pedestrian routes are provided throughout the exterior of the site.

- Patch along the accessible route from parking the terminal building, particularly where the concrete surface meets the asphalt.
- Replace and/or modify the paver surface material outside each of the 3 entries to the terminal building to eliminate the openings between pavers.
- Reconstruct the curb ramp at the terminal building outside the center entry to reduce the slope to 8.33% maximum (currently 10.4%).

Service Counters
A variety of service counters are provided throughout the building, including: ticketing, gate/podium, car rental, food service and retail.

- Create accessible ticketing counters at 36” maximum. Currently the Allegiant and Frontier ticketing counters are at 48”.
- Provide gate podiums that provides the customer side of the counter at 36” maximum, the existing counters are typically at 42” AFF.
- Create accessible car rental counters at 36” maximum AFF, located where the transaction typically occurs. Currently a flip-up section of counter is provide on the employee side of the entry door to each car rental company- the door needs to be in the open position for the accessible counter to be used. At the time of site visit multiple counters were being used for additional employee work surface and storage.
- Create retail service counters at 36” maximum AFF. Currently the counter at the gift shop (211) is at 42” and the retail kiosk near gate 3 (261A) is at 43 ½”.

Vending Machines
Vending machines are provided at multiple locations throughout the terminal building.

- Modify and/or replace the vending machines so all operable parts (including coin slot, product selection buttons and coin return) are located between 15” – 48” AFF.

Drinking Fountains
There are currently 4 drinking fountains provided (2 pre-security & 2 post-security); currently all drinking fountains have spouts at 36” maximum with a forward approach.

- Provide standing height drinking fountains with spouts at 38” – 43” (50% of the drinking fountains are to be at standing height with the other 50% at 36” maximum).

Dining
There are sit-down dining areas provided pre-security and post-security.

- Provide accessible dining tables with a forward approach with knee and toe clearance at the post-security dining area. Currently all of the dining tables are a pedestal style where the base of the table obstructs the clear floor space at the toe clearance. (Compliant tables are provided pre-security.)

Toilet Rooms
There are 2 multi-fixture men’s and women’s toilet rooms on the pre-security side and 2 multi-fixture men’s and women’s toilet rooms plus 1 single-user toilet room on the post-security side. All toilet rooms provide features of accessibility.

- At the multi-fixture toilet rooms: relocate toilet paper dispensers so they do not obstruct use of the grab bars, add pulls to both sides of the accessible stall door, adjust stall door to self-close, lower the paper towel dispensers, lower the sharps disposal container, lower the baby changing table and add a shelf at the accessible urinal.
- At the single-user toilet room: replace the vanity counter with a smaller style that does not overlap the required clearance at the toilet, lower the sharps disposal container, relocate the towel dispenser and lower the seat protectors.

Additional Features
The following features are not currently provided at FAR, providing them would improve accessibility and usability of the building for airport users:

- Service Animal Relief Area (SARA). An indoor SARA is not currently provided within the terminal. There are 2 outdoor areas that can be used by animals, but there are not currently signs directing to them and they are not fenced/contained. (Note: SARAs are required at airports with more than 10,000 enplanements per year based on 49 CFR Part 27 Subpart B § 27.71 (h).)
- Captioning. There were multiple televisions located throughout the gate waiting areas, at the time of site visit none of the televisions provided captioning. (Note: captioning is required at airports with more than 10,000 enplanements per year based on 49 CFR Part 27 Subpart B § 27.71 (i).)
- Adult Changing Tables. Although not currently required it is anticipated the future versions of the International Building Code will include requirements for the provision of adult changing tables.
- Single-User Toilet Room. There is not currently a single-user toilet room available on the pre-security side. A single-user toilet room allows for assisted use.
- Seating styles. Currently all of the seating in the gate waiting areas is the same style seat with armrests that allow for 20” clearance between. Providing a variety of seating options, including seats without arm rests or with increased clearance between armrests, accommodates travelers with different needs and body types.

Location	Recommendation	Quantity	Priority	Comments
Baggage Claim- 142	Lower object(s) so the highest operable part is no higher than 48" AFF. ADA 308	1	3	*The emergency stop buttons for the baggage carousel are currently at 63" AFF.*
Building Wide- Electric Receptacles		1	4	*Throughout the building electrical receptacles are located at 13 1/2" AFF. This is below the current minimum reach of 15" AFF. At the time of construction, the minimum reach was 9" so the receptacles were compliant at that time. ADA 205.1, 308*
Courtesy Phone- 133	Provide signage locating the TTY device (Text Telephone). ADA 216.9, 703.7.2.2	1	3	*A TTY is provided at this location. There is not currently a sign with the International Symbol of Access for a TTY.*
Courtesy Phone- 133	Lower the telephone so the highest operable part is no higher 48" above the floor. ADA 704.2.2, 308	1	4	*The highest control is currently at 49" AFF.*
Courtesy Phone- 210	Lower the telephone so the highest operable part is no higher 48" above the floor. ADA 704.2.2, 308	1	4	*Currently at 49" AFF.*
Departure Lounge 261 (adjacent to security)	Lower the AED so the pull to open the case is no higher than 48". ADA 308	1	3	*The AED is currently at 60" AFF.*
Departure Lounge 266 (adjacent to exit)	Remove, relocate or replace object so it does not protrude into the circulation path. ADA 307.1	1	4	*The "Welcome to Fargo" display screen mounted adjacent to the exit currently provides 5" at a height of 57".*
Departure Lounges		1	2	*The TVs did not display captioning at the time of site visit. 49 CFR Part 27 Subpart B Subsection 27.71 (i)*
Dining- 202A	Lower a 36" wide minimum section of counter to a height of 36" maximum above the floor. ADA 227.3, 904.4	1	4	*The counter at "Marlin's" is currently at 36 1/2" AFF.*
Dining- 202A	Modify the self-service shelves and dispensing devices for dishes, condiments, food and beverages to be within reach ranges. ADA 205.1, 227.4, 308	1	3	*The beverage dispensers are currently at 50" AFF and the ice dispenser is at 53" AFF.*
Dining- 214	Provide a table with knee and toe clearance below- 30" wide minimum, 27" high knee clearance and 9" high toe clearance that extends 17"-25". ADA 226.1, 902	1	3	*The tables are currently a pedestal style that obstructs the clear floor space.*
Dog Area (Exterior)	Lower object(s) so the highest operable part is no higher than 48" AFF. ADA 308	1	3	*The dispenser for dog waste bags is currently at 52" AFF.*
Drinking Fountains	Add a drinking fountain with a spout at 36" maximum and providing a forward approach in order to maintain a 50/50 ratio. ADA 211	1	3	*Currently all of the drinking fountains have spouts at 36" maximum; there are no drinking fountains for standing users with spouts at 38"-43" AFF.*
Exterior Route	Bevel abrupt rises in the sidewalk. ADA 303.3	1	3	*Repair the accessible route to eliminate rise greater than 1/4". Rises are common where surface materials meet, such as between asphalt and concrete.*

Location	Recommendation	Quantity	Priority	Comments
Exterior Route	Patch and repair along the accessible exterior route to provide a firm, stable and slip resistant surface as well as eliminate any abrupt rise greater than 1/4" or openings greater than 1/2". ADA 302.1, 303.3	1	3	*The pavers used at the terminal entry doors create openings greater than 1/2" and rises greater than 1/4".*
Exterior Route- Economy Parking	Modify walkway to provide a maximum 1:48 (2%) cross-slope. ADA 403.3	1	3	*The pedestrian route to the economy parking on the west side currently has up to 8% cross slope. Note: at this time there are no accessible parking spaces located in the economy lot so it is not necessary to use this route.*
Family Toilet Room- 250	Relocate the lavatory to provide a minimum 60" clearance for the water closet perpendicular from the side wall. ADA 604.3	1	3	*The lavatory reduces the clearance for the toilet to 55" (vs. 60" minimum). The lavatory currently has a large counter that could be made smaller.*
Family Toilet Room- 250	Relocate the water closet so it is centered 16"-18" from the side wall or partition. ADA 604.2	1	4	*Currently at 18 3/4".*
Family Toilet Room- 250	Lower the product dispenser(s) so the highest operable part is no higher than 48". ADA 308	1	3	*Currently at 51" AFF.*
Family Toilet Room- 250	Provide a product dispenser that provides controls that do not require grasping, pinching or twisting to operate. ADA 309.4	1	3	
Family Toilet Room- 250	Relocate the seat cover dispenser to a location where a clear floor space is provided and the outlet of the dispenser is at 48" maximum AFF. Note: if located above the grab bar the minimum spacing requirements of 609.3 must be maintained. ADA 308, 609.3	1	3	*Currently at 51" AFF.*
Family Toilet Room- 250	Relocate the sharps disposal container so the highest control is mounted no higher than 48" above the floor. ADA 308	1	2	*Currently at 60" AFF.*
First Aid- 129	Provide compliant raised and Braille permanent room identification signage. ADA 216.2	1	3	
Gate 1 / Departure Lounge 206	Lower a 36" wide minimum section of counter to a height of 36" maximum above the floor. ADA 227.3, 904.4	1	4	*The large multi-position counter is currently at 47 3/4" AFF. The podium is currently at 42 1/2" AFF.*
Gate 2 / Departure Lounge 266	Lower a 36" wide minimum section of counter to a height of 36" maximum above the floor. ADA 227.3, 904.4	1	4	*The podium is currently at 50" AFF.*
Gate 2 / Departure Lounge 266	Provide a TTY. ADA 217.4	1	4	*Delta provides 4 courtesy phones to communicate with customer service. There is currently no information about the availability of a TTY and it does not appear a TTY is available at this location.*

Location	Recommendation	Quantity	Priority	Comments
Gate 3 / Departure Lounge 261	Lower a 36" wide minimum section of counter to a height of 36" maximum above the floor. ADA 227.3, 904.4	1	4	*The large multi-position counter provides an accessible portion of the counter at 33 3/4" AFF. The accessible portion provides a 4" deep counter while the standard counter provides 6 1/2" dep counter.*
Gate 4 / Departure Lounge 214	Lower a 36" wide minimum section of counter to a height of 36" maximum above the floor. ADA 227.3, 904.4	1	4	*The podium is currently at 48" AFF. This podium style does not provide any counter surface for travelers; it is all part of the employee work area based on the location of the protective screen.*
Gate 5 / Departure Lounge 242	Lower a 36" wide minimum section of counter to a height of 36" maximum above the floor. ADA 227.3, 904.4	1	4	*The podium is currently at 42 1/2".*
Information Counter- 104A	Lower the AED so the pull to open the case is no higher than 48". ADA 308	1	3	*The AED is at 60" AFF.*
Mamava Pod (Departure Lounge 266)	Provide compliant informational and directional signage. Minimum character height is 5/8" for signs 40"-70" above the floor (measured to the baseline of the highest character); 2" minimum character height for signs 70"-120" above the floor. ADA 703.5.5	1	3	*The instructions for entering the Mamava Pod are mounted on the exterior of the unit with 1/4" tall characters (vs. 5/8" minimum).*
Men's Toilet Room- 132	Reconfigure (or replace) the partition opposite the toilet at the accessible toilet compartment so the door opening is located no more than 4" from the corner of the side wall or partition farthest from the water closet. See ADA Figure 604.8.1.2 ADA 604.8	1	4	*The stall door is currently located directly opposite the toilet.*
Men's Toilet Room- 132	Provide a fully compliant ambulatory accessible toilet stall. (In addition to the 5' wide wheelchair accessible stall.) ADA 213.3.1, 604.8.2	1	3	*The toilet room provides 8 fixtures (4 toilets and 4 urinals).*
Men's Toilet Room- 132	Install a self closure mechanism on the accessible stall door (or adjust the existing hinge system). ADA 604.8.1.2	1	2	
Men's Toilet Room- 132	Add a staple style pull where missing so pulls are provided on both sides of the accessible stall door near the latch. ADA 604.8.1.2	1	2	*Currently no pulls on the exterior side of the stall door.*
Men's Toilet Room- 132	Reconfigure stalls to provide a minimum 48" approach to the toilet stall door. If toilet stall approach is from the latch side of the stall door, clearance between the door side of the stall and any obstruction may be reduced to a minimum of 42". ADA 604	1	4	*The maneuvering clearance on the pull side of the accessible stall door is reduced to 39" due to the lavatory counter.*

Location	Recommendation	Quantity	Priority	Comments
Men's Toilet Room- 132	Reposition the toilet paper dispenser so it located 7"-9" in front of the toilet and 15" - 48" AFF. If the dispenser is mounted above the horizontal grab bar, ensure 12" minimum spacing provided above the grab bar. ADA 604.7, 609.3	1	2	*The toilet paper dispenser is mounted 2 3/4" above the horizontal grab bar.*
Men's Toilet Room- 132	Modify lavatory counter to provide compliant knee and toe clearances. ADA 606.3, 306	1	4	*The lavatory currently provides 7" deep knee clearance (vs. 8" minimum).*
Men's Toilet Room- 132	Lower the towel dispenser/dryer so the highest operable part is no higher than 48" (or 34"-46" maximum if located over an obstruction, see table). ADA 308	1	2	*The towel dispensers are all mounted above the counter at 50" AFF with a 12" deep reach.*
Men's Toilet Room- 132	Relocate the seat cover dispenser to a location where a clear floor space is provided and the outlet of the dispenser is at 48" maximum AFF. Note: if located above the grab bar the minimum spacing requirements of 609.3 must be maintained. ADA 308, 609.3	1	3	*Currently at 53" AFF.*
Men's Toilet Room- 132	Lower the existing changing table so the latching mechanism is 48" maximum above the floor. ADA 902.1, 308	1	2	*The pull for the changing table is currently at 57" AFF.*
Men's Toilet Room- 132	Lower the shelf so it is located 40" minimum and 48" maximum AFF. (Ensure it is located so it does not protrude more than 4" into the circulation route.) ADA 603.4	1	3	*The shelf located near the urinal is currently at 56" AFF.*
Men's Toilet Room- 132	Relocate the sharps disposal container so the highest control is mounted no higher than 48" above the floor. ADA 308	1	2	*Currently at 50" AFF.*
Men's Toilet Room- 205	Widen path around the obstruction where the route makes a 180* turn. ADA 403.5.2	1	4	*A serpentine style entry (no door) is provided at this toilet room; this creates a 180* turn around an obstruction. There is not currently sufficient space where the turn is made (40" vs. 48" minimum).*
Men's Toilet Room- 205	Modify the partitions to enlarge and provide a fully compliant 60" minimum wide toilet stall. ADA 604.3.1	1	4	*The accessible toilet compartment currently provides 59 1/2" wide clearance.*
Men's Toilet Room- 205	Provide a fully compliant ambulatory accessible toilet stall. (In addition to the 5' wide wheelchair accessible stall.) ADA 213.3.1, 604.8.2	1	3	*The toilet room provides 6 fixtures (3 toilets, 3 urinals).*
Men's Toilet Room- 205	Install a self closure mechanism on the accessible stall door (or adjust the existing hinge system). ADA 604.8.1.2	1	2	
Men's Toilet Room- 205	Add a staple style pull where missing so pulls are provided on both sides of the accessible stall door near the latch. ADA 604.8.1.2	1	2	*Currently no pulls on the exterior side of the stall door.*

Location	Recommendation	Quantity	Priority	Comments
Men's Toilet Room- 205	Reposition the toilet paper dispenser so it located 7"-9" in front of the toilet and 15" - 48" AFF. If the dispenser is mounted above the horizontal grab bar, ensure 12" minimum spacing provided above the grab bar. ADA 604.7, 609.3	1	2	*The toilet paper dispenser is mounted 3" above the horizontal grab bar.*
Men's Toilet Room- 205	Lower the towel dispenser/dryer so the highest operable part is no higher than 48" (or 34"-46" maximum if located over an obstruction, see table). ADA 308	1	2	*The towel dispensers are all mounted above the counter at 51" AFF with a 12" deep reach.*
Men's Toilet Room- 205	Relocate the seat cover dispenser to a location where a clear floor space is provided and the outlet of the dispenser is at 48" maximum AFF. Note: if located above the grab bar the minimum spacing requirements of 609.3 must be maintained. ADA 308, 609.3	1	3	*Currently at 53" AFF.*
Men's Toilet Room- 205	Lower the existing changing table so the latching mechanism is 48" maximum above the floor. ADA 902.1, 308	1	3	*The pull for the changing table is currently at 57" AFF.*
Men's Toilet Room- 205	Lower the shelf so it is located 40" minimum and 48" maximum AFF. (Ensure it is located so it does not protrude more than 4" into the circulation route.) ADA 603.4	1	3	*The shelf located near the accessible urinal is at 56 1/2" AFF.*
Men's Toilet Room- 205	Relocate the sharps disposal container so the highest control is mounted no higher than 48" above the floor. ADA 308	1	2	*Currently at 50" AFF.*
Men's Toilet Room- 205	Relocate the sign with raised and braille characters to 48" minimum to the baseline of the lowest Braille characters and 60" maximum to the baseline of the highest tactile character. ADA 703.4.1	1	3	*The bottom of the sign is currently at 64 1/2" AFF.*
Men's Toilet Room- 206B	Install a self closure mechanism on the accessible stall door (or adjust the existing hinge system). ADA 604.8.1.2	1	2	
Men's Toilet Room- 206B	Reposition the toilet paper dispenser so it located 7"-9" in front of the toilet and 15" - 48" AFF. If the dispenser is mounted above the horizontal grab bar, ensure 12" minimum spacing provided above the grab bar. ADA 604.7, 609.3	1	2	*The toilet paper dispenser is mounted 4 1/4" above the horizontal grab bar.*
Men's Toilet Room- 206B	Modify lavatory counter to provide compliant knee and toe clearances. ADA 606.3, 306	1	4	*The lavatory currently provides 7" deep knee clearance (vs. 8" minimum).*

Location	Recommendation	Quantity	Priority	Comments
Men's Toilet Room- 206B	Lower the towel dispenser/dryer so the highest operable part is no higher than 48" (or 34"-46" maximum if located over an obstruction, see table). ADA 308	1	2	*The towel dispensers are all mounted above the counter at 46" AFF with a 12" deep reach.*
Men's Toilet Room- 206B	Relocate the seat cover dispenser to a location where a clear floor space is provided and the outlet of the dispenser is at 48" maximum AFF. Note: if located above the grab bar the minimum spacing requirements of 609.3 must be maintained. ADA 308, 609.3	1	3	*Currently at 53" AFF.*
Men's Toilet Room- 206B	Modify / replace / relocate urinal shield(s) to provide a minimum 36" clear width to approach the urinal and provide compliant clear floor space (the privacy screens create an "alcove"). ADA 305.7.1, 605.3	1	4	*The partition and wall at the urinal reduce the route and clear floor space to 35" (vs. 36" minimum).*
Men's Toilet Room- 206B	Lower the shelf so it is located 40" minimum and 48" maximum AFF. (Ensure it is located so it does not protrude more than 4" into the circulation route.) ADA 603.4	1	3	*The shelf located near the urinal is currently at 56" AFF.*
Men's Toilet Room- 206B	Relocate the sharps disposal container so the highest control is mounted no higher than 48" above the floor. ADA 308	1	2	*Currently at 54" AFF.*
Men's Toilet Room- 252	Modify the partitions to enlarge and provide a fully compliant 60" minimum wide toilet stall. ADA 604.3.1	1	4	*The accessible toilet compartment currently provides 58 1/2" wide clearance.*
Men's Toilet Room- 252	Install a self closure mechanism on the accessible stall door (or adjust the existing hinge system). ADA 604.8.1.2	1	2	
Men's Toilet Room- 252	Lower the towel dispenser/dryer so the highest operable part is no higher than 48" (or 34"-46" maximum if located over an obstruction, see table). ADA 308	1	2	*The towel dispensers are all mounted above the counter at 47" AFF with a 12" deep reach.*
Men's Toilet Room- 252	Relocate the seat cover dispenser to a location where a clear floor space is provided and the outlet of the dispenser is at 48" maximum AFF. Note: if located above the grab bar the minimum spacing requirements of 609.3 must be maintained. ADA 308, 609.3	1	3	*Currently at 52" AFF.*
Men's Toilet Room- 252	Lower urinal so the lip is no higher than 17" above the floor. ICC / ANSI 605.2	1	4	*Currently at 17 1/2" AFF.*
Men's Toilet Room- 252	Provide a coat hook positioned so the highest operable part is no higher than 48". ADA 603.4	1	3	*Currently at 54". It appears a compliant hook had been provided but is currently broken.*

Location	Recommendation	Quantity	Priority	Comments
Men's Toilet Room- 252	Lower the shelf so it is located 40" minimum and 48" maximum AFF. (Ensure it is located so it does not protrude more than 4" into the circulation route.) ADA 603.4	1	3	*There is not currently a shelf located near the accessible urinal; the other urinals do provide a shelf.*
Men's Toilet Room- 252	Relocate the sharps disposal container so the highest control is mounted no higher than 48" above the floor. ADA 308	1	2	*Currently at 53" AFF.*
Men's Toilet Room- 252	Relocate the sign with raised and braille characters to 48" minimum to the baseline of the lowest Braille characters and 60" maximum to the baseline of the highest tactile character. ADA 703.4.1	1	3	*The bottom of the sign is currently at 61 1/2" AFF.*
Paging Phone - 214	Lower the telephone so the highest operable part is no higher 48" above the floor. ADA 704.2.2, 308	1	4	*The paging phone is currently at 49 1/2".*
Paging Phone- 142	Lower the telephone so the highest operable part is no higher 48" above the floor. ADA 704.2.2, 308	1	4	*Currently at 49 1/2" AFF.*
Parking		1	2	*The parking spaces and adjacent aisles were typically covered in snow and ice at the time of site visit. Thorough snow removal is necessary in order to ensure the availability of accessible features.*
Parking- Long Term	Create a van accessible parking space by increasing the aisle to 8' wide minimum or increasing the width of the parking space to 11' minimum. ADA 502.2	1	3	*There appears to be 2 parking spaces that are "van" accessible in the long term lot. Based on the number of accessible parking spaces required, a minimum of 6 van accessible parking spaces are required (2 spaces can share 1 aisle). Note: more "van" access*
Parking- Long Term	Enlarge the aisle serving the accessible parking so it is 5' wide minimum (measured centerline of stripe to centerline of stripe). ADA 502.3.1	8	3	*It appears that 8 of the aisles serving accessible parking spaces in the long term lot are less than 5' wide. They appear to be 3' - 4' wide. Exact measurements were not possible due to snow and ice covered surfaces.*
Parking- Short Term	Create/designate an aisle adjacent to the accessible parking space that is 5' wide minimum (measured centerline of stripe to centerline of stripe). ADA 502.3	1	3	*The east parking space in the short term lot does not currently have an adjacent aisle. (It is possible the aisle was covered by snow/ice at the time of site visit.)*
Parking- Short Term	Alter the slope of the accessible parking space and / or access aisle to be no greater than 1:48 (2%) in any direction. ADA 502.4	1	3	*The SE accessible parking space in the short term lot currently has up to 3.5% slope within the space.*
Photo Kiosk (near Gate 3 / Departure Lounge 261)	Lower object(s) so the highest operable part is no higher than 48" AFF. ADA 308	1	4	*The photo kiosk (airport promotion) has an activation button at 53" AFF.*

Location	Recommendation	Quantity	Priority	Comments
Rental Car Counters- 136, 137, 138, 139, 158	Lower a 36" wide minimum section of counter to a height of 36" maximum above the floor. ADA 227.3, 904.4	6	3	*The rental counters are currently at 48" AFF. A small foldable shelf has been installed on the employee side of the door; this shelf is intended to be the accessible counter. The folding shelf is not located where the transaction typically occurs and at t*
Retail- 211	Lower a 36" wide minimum section of counter to a height of 36" maximum above the floor. ADA 227.3, 904.4	1	3	*Currently at 42" AFF.*
Retail- 261A (at Gate 3)	Lower a 36" wide minimum section of counter to a height of 36" maximum above the floor. ADA 227.3, 904.4	1	3	*The counter is currently at 43 1/2" AFF.*
Terminal Entry- Center	Modify curb cut / ramp to provide a maximum 1:12 (8.33%) slope. ADA 406.1, 405.2	1	4	*The curb ramp that aligns with the center entry door currently has up to 10.4% slope.*
Ticketing- 109		1	4	*The Delta self-serve kiosks currently have the highest operable control at 49 1/2" AFF. The American kiosks include override buttons that can be used within reach range.*
Ticketing- 109	Lower a 36" wide minimum section of counter to a height of 36" maximum above the floor. ADA 227.3, 904.4	1	3	*The standard ticketing counter is currently at 48" AFF. Individual airlines have modified/replaced their ticket counters. Currently American and Delta provide accessible counters while the United counter does not provide a counter service for any user.*
Vending- 133	When renegotiating with product vendors, request vending machines with controls located no higher than 48" above the floor. ADA 228.1, 308	1	3	*Controls at the food vending machine are currently at 53 1/2" AFF.*
Vending- 206	When renegotiating with product vendors, request vending machines with controls located no higher than 48" above the floor. ADA 228.1, 308	3	3	*The beverage vending machine is currently at 52" AFF, food at 54 1/2" AFF and change dispenser at 62 1/4" AFF.*
Vending- 214	When renegotiating with product vendors, request vending machines with controls located no higher than 48" above the floor. ADA 228.1, 308	1	3	*The beverage vending machine is currently at 52" AFF.*
Women's Toilet Room- 128	Provide a fully compliant ambulatory accessible toilet stall. (In addition to the 5' wide wheelchair accessible stall.) ADA 213.3.1, 604.8.2	1	3	*The toilet room provides 6 toilet fixtures.*
Women's Toilet Room- 128	Install a self closure mechanism on the accessible stall door (or adjust the existing hinge system). ADA 604.8.1.2	1	2	
Women's Toilet Room- 128	Add a staple style pull where missing so pulls are provided on both sides of the accessible stall door near the latch. ADA 604.8.1.2	1	2	*Currently no pulls on the exterior side of the stall door.*

Location	Recommendation	Quantity	Priority	Comments
Women's Toilet Room- 128	Remove the existing grab bar configuration and replace with a compliant grab bar configuration. ADA 604.5.1	1	3	*The side horizontal grab bar currently extends to a point 48" from the rear wall (vs. 54" minimum).*
Women's Toilet Room- 128	Reposition the toilet paper dispenser so it located 7"-9" in front of the toilet and 15" - 48" AFF. If the dispenser is mounted above the horizontal grab bar, ensure 12" minimum spacing provided above the grab bar. ADA 604.7, 609.3	1	2	*The toilet paper dispenser is mounted 2" above the horizontal grab bar.*
Women's Toilet Room- 128	Modify lavatory counter to provide compliant knee and toe clearances. ADA 606.3, 306	1	4	*The lavatory currently provides 7" deep knee clearance (vs. 8" minimum).*
Women's Toilet Room- 128	Lower the towel dispenser/dryer so the highest operable part is no higher than 48" (or 34"-46" maximum if located over an obstruction, see table). ADA 308	1	2	*The towel dispensers are all mounted above the counter at 50" AFF with a 12" deep reach.*
Women's Toilet Room- 128	Provide a product dispenser that provides controls that do not require grasping, pinching or twisting to operate. ADA 309.4	1	3	*The sanitary product dispenser has twist style hardware.*
Women's Toilet Room- 128	Relocate the seat cover dispenser to a location where a clear floor space is provided and the outlet of the dispenser is at 48" maximum AFF. Note: if located above the grab bar the minimum spacing requirements of 609.3 must be maintained. ADA 308, 609.3	1	3	*Currently at 54" AFF.*
Women's Toilet Room- 128	Lower the existing changing table so the latching mechanism is 48" maximum above the floor. ADA 902.1, 308	1	2	*The pull for the changing table is currently at 57" AFF.*
Women's Toilet Room- 128	Relocate the sharps disposal container so the highest control is mounted no higher than 48" above the floor. ADA 308	1	2	*Currently at 50" AFF.*
Women's Toilet Room- 206A	Install a self closure mechanism on the accessible stall door (or adjust the existing hinge system). ADA 604.8.1.2	1	2	
Women's Toilet Room- 206A	Reposition the toilet paper dispenser so it located 7"-9" in front of the toilet and 15" - 48" AFF. If the dispenser is mounted above the horizontal grab bar, ensure 12" minimum spacing provided above the grab bar. ADA 604.7, 609.3	1	2	*The toilet paper dispenser is mounted 3" above the horizontal grab bar.*
Women's Toilet Room- 206A	Modify lavatory counter to provide compliant knee and toe clearances. ADA 606.3, 306	1	4	*The lavatory currently provides 7" deep knee clearance (vs. 8" minimum).*

Location	Recommendation	Quantity	Priority	Comments
Women's Toilet Room- 206A	Lower the towel dispenser/dryer so the highest operable part is no higher than 48" (or 34"-46" maximum if located over an obstruction, see table). ADA 308	1	2	*The towel dispensers are all mounted above the counter at 46" AFF with a 12" deep reach.*
Women's Toilet Room- 206A	Provide a product dispenser that provides controls that do not require grasping, pinching or twisting to operate. ADA 309.4	1	3	*The sanitary product dispenser has twist style hardware.*
Women's Toilet Room- 206A	Relocate the seat cover dispenser to a location where a clear floor space is provided and the outlet of the dispenser is at 48" maximum AFF. Note: if located above the grab bar the minimum spacing requirements of 609.3 must be maintained. ADA 308, 609.3	1	3	*Currently at 53" AFF.*
Women's Toilet Room- 206A	Relocate the sharps disposal container so the highest control is mounted no higher than 48" above the floor. ADA 308	1	2	*Currently at 54" AFF.*
Women's Toilet Room- 212	Modify the partitions to enlarge and provide a fully compliant 60" minimum wide toilet stall. ADA 604.3.1	1	4	*The accessible toilet compartment currently provides 59" wide clearance.*
Women's Toilet Room- 212	Provide a fully compliant ambulatory accessible toilet stall. (In addition to the 5' wide wheelchair accessible stall.) ADA 213.3.1, 604.8.2	1	3	*The toilet room provides 6 toilet fixtures.*
Women's Toilet Room- 212	Install a self closure mechanism on the accessible stall door (or adjust the existing hinge system). ADA 604.8.1.2	1	2	
Women's Toilet Room- 212	Add a staple style pull where missing so pulls are provided on both sides of the accessible stall door near the latch. ADA 604.8.1.2	1	2	*Currently no pulls on the exterior side of the stall door.*
Women's Toilet Room- 212	Remove the existing grab bar configuration and replace with a compliant grab bar configuration. ADA 604.5.1	1	4	*The rear grab bar currently extends 9" to the wall side (vs. 12" minimum).*
Women's Toilet Room- 212	Reposition the toilet paper dispenser so it located 7"-9" in front of the toilet and 15" - 48" AFF. If the dispenser is mounted above the horizontal grab bar, ensure 12" minimum spacing provided above the grab bar. ADA 604.7, 609.3	1	2	*The toilet paper dispenser is mounted 6" above the horizontal grab bar.*
Women's Toilet Room- 212	Lower the towel dispenser/dryer so the highest operable part is no higher than 48" (or 34"-46" maximum if located over an obstruction, see table). ADA 308	1	2	*The towel dispensers are all mounted above the counter at 50" AFF with a 12" deep reach.*

Location	Recommendation	Quantity	Priority	Comments
Women's Toilet Room- 212	Provide a product dispenser that provides controls that do not require grasping, pinching or twisting to operate. ADA 309.4	1	3	
Women's Toilet Room- 212	Relocate the seat cover dispenser to a location where a clear floor space is provided and the outlet of the dispenser is at 48" maximum AFF. Note: if located above the grab bar the minimum spacing requirements of 609.3 must be maintained. ADA 308, 609.3	1	3	*Currently at 56 1/2" AFF.*
Women's Toilet Room- 212	Lower the existing changing table so the latching mechanism is 48" maximum above the floor. ADA 902.1, 308	1	3	*The pull for the changing table is currently at 57" AFF.*
Women's Toilet Room- 212	Relocate the sharps disposal container so the highest control is mounted no higher than 48" above the floor. ADA 308	1	2	*Currently at 54" AFF.*
Women's Toilet Room- 212	Relocate the sign with raised and braille characters to 48" minimum to the baseline of the lowest Braille characters and 60" maximum to the baseline of the highest tactile character. ADA 703.4.1	1	3	*The bottom of the sign is currently at 64 1/2" AFF.*
Women's Toilet Room- 251	Modify the partitions to enlarge and provide a fully compliant 60" minimum wide toilet stall. ADA 604.3.1	1	4	*The accessible toilet compartment currently provides 59" wide clearance.*
Women's Toilet Room- 251	Install a self closure mechanism on the accessible stall door (or adjust the existing hinge system). ADA 604.8.1.2	1	2	
Women's Toilet Room- 251	Lower the towel dispenser/dryer so the highest operable part is no higher than 48" (or 34"-46" maximum if located over an obstruction, see table). ADA 308	1	2	*The towel dispensers are all mounted above the counter at 47" AFF with a 12" deep reach.*
Women's Toilet Room- 251	Lower the product dispenser(s) so the highest operable part is no higher than 48". ADA 308	1	3	*Currently at 51 1/2".*
Women's Toilet Room- 251	Provide a product dispenser that provides controls that do not require grasping, pinching or twisting to operate. ADA 309.4	1	3	*The sanitary product dispenser has twist style hardware.*
Women's Toilet Room- 251	Relocate the seat cover dispenser to a location where a clear floor space is provided and the outlet of the dispenser is at 48" maximum AFF. Note: if located above the grab bar the minimum spacing requirements of 609.3 must be maintained. ADA 308, 609.3	1	3	*Currently at 55 1/2".*

Location	Recommendation	Quantity	Priority	Comments
Women's Toilet Room- 251	Relocate the sharps disposal container so the highest control is mounted no higher than 48" above the floor. ADA 308	1	2	*Currently at 53" AFF.*
Women's Toilet Room- 251	Relocate the sign with raised and braille characters to 48" minimum to the baseline of the lowest Braille characters and 60" maximum to the baseline of the highest tactile character. ADA 703.4.1	1	3	*The bottom of the sign is currently at 61 1/2" AFF.*

Photo 1. Accessible parking spaces have been designated in the short term and long term parking lots. (There are no accessible spaces in the economy lot.)

Photo 2. In the long term parking lot many of the aisles serving accessible parking spaces were less than 5' wide.

Photo 3. Snow and ice covered may of the accessible parking spaces and aisles; making it difficult to see the surface markings.

Photo 4. The aisles adjacent to the accessible parking spaces in the short term lot also sever as the pedestrian route from the long term lot to the terminal entry.

Photo 5. There are many locations along the exterior route where the vertical rise is greater than ¼", particularly where different surface types meet.

Photo 6. The curb ramp that aligns with the center entry currently has a slope of 10.4% (vs. 8.33% maximum).

Photo 7. Pavers are used at the terminal entries. The pavers appear to have shifted, creating openings greater than ½" between pavers and vertical rises greater than ¼" between pavers.

Photo 8. Airlines have replaced their ticketing counters; at Delta an accessible counter has been provided.

Photo 9. The standard ticketing counters are too high at 49 ½" (vs. 36" maximum).

Photo 10. The rental car counters are too high at 48" (vs. 36" maximum). A flip-up counter (folding shelf) has been added on the employee side of the entry door and is intended to be the accessible counter.

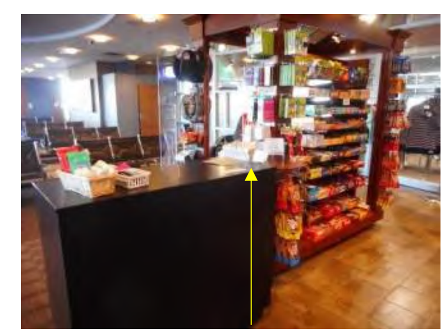


Photo 11. The retail counter near Gate 3 is currently hat 43 ½" AFF (vs. 36" maximum).

Photo 12. The large retail store (211) has a counter at 42" AFF (vs. 36" maximum).

Photo 13. The dining tables on the secure side of the terminal are high-top style in the bar or a pedestal style where the pedestal obstructs the clear floor space for a forward approach. There are no accessible dining tables provided on the secure side of the terminal.

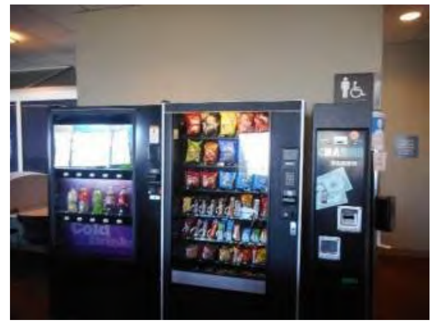


Photo 14. Vending machines are located throughout the airport. The controls are typically above the maximum reach of 48" AFF. Pictured above the beverage controls are at 52" AFF, food at 54 ½" AFF and change dispenser at 62 ¼" AFF.

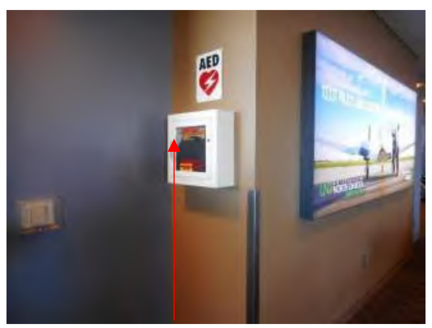


Photo 15. The AEDs are currently mounted at a height of 60" AFF to the latch/pull (vs. 48" maximum).

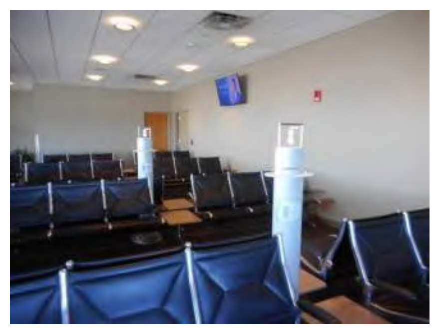


Photo 16. The departure lounges provide seating with adequate circulation, charging stations with outlets within reach range and televisions. The televisions were not showing captions at the time of site visit.

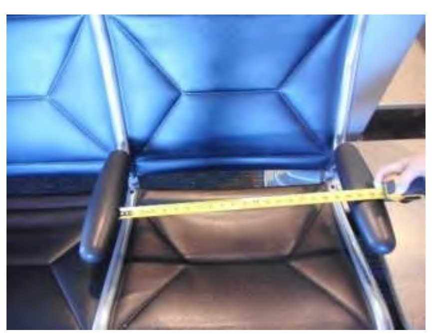


Photo 17. All of the seating is the same style that provides 20" clearance between the arm rests.

Photo 18. Typical gate podiums are taller than 36" AFF. Currently COVID related protocols have eliminated the counter for all users based on the placement of the screen.

Photo 19. The large multi-position counters are typically taller than 36" AFF.

Photo 20. The multi-fixture toilet rooms provide features of accessibility, but do not fully comply. The pull to the changing table is typically at 57" AFF; the sharps disposal container is typically at 50" AFF; and the towel dispensers are located above the counter at 50" AFF.

Photo 21. In the multi-fixture toilet rooms the toilet paper dispenser is typically mounted within the clearance zone for the horizontal grab bar (generally 4" above the bar vs. 12" minimum) and the seat protectors are mounted too high.

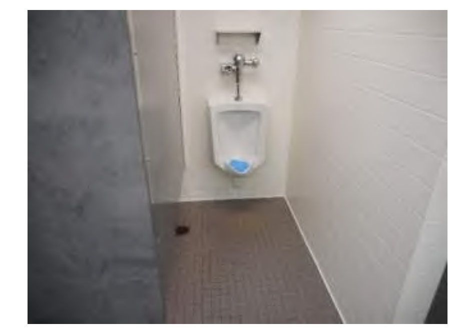


Photo 22. In men's toilet room 206B the stall partition and the wall reduce the clear floor space and the route to the urinal to 35" (vs. 36" minimum).

Photo 23. In men's toilet room 132 compliant maneuvering clearance is not currently provided at the door to the accessible toilet compartment and the door is not in the correct position based on toilet location.

Photo 24. The lavatory counter in the single-user toilet room reduces the clearance for the toilet to 55" (vs. 60" minimum).

APPENDIX C

ENERGY AUDIT REPORT

APPENDIX C

ambient energy
A Mead & Hunt Company

Hector International Airport, Fargo ND

Energy Audit Report

October 7, 2022

ambient energy
A Mead & Hunt Company

TABLE OF CONTENTS

Executive Summary **3**
Building Description 3
Documentation Review 3
Energy Efficiency Measures 3
Capital Intensive Measures 4
Background **5**
Building Description 5
Building Equipment 5
Building Audit Observations **5**
Building Virtual Walk-through Observations 5
Building Documentation Observations 6
Utility Data Analysis **6**
Energy & Demand Costs per Fuel Type 6
Energy Use Analysis 7
Electrical Use Analysis 8
Natural Gas Use Analysis 9
List of Practical Energy Efficiency Measures 10
List of Capital-Intensive Measures 11

EXECUTIVE SUMMARY

This energy audit report provides a summary of potential Energy Efficiency Measures (EEMs) to consider for implementation to reduce energy costs and Capital-Intensive Measures (CIMs) to improve system operations for the Hector International Airport. The scope of this report will cover a cursory assessment of the of the building's energy use along with a list of potential EEMs identified while reviewing plans, reports, utility bills, and a 3-D walk-through of the facility. If any of the identified EEMs or CIMs contained herein are considered, additional evaluation will be required to develop the scope, savings potential, and implementation costs.

Building Description

The Hector International Airport is located at 2801 32nd Street in Fargo, North Dakota. The facility is two-stories tall with a basement housing mechanical and electrical rooms, equipment storage, luggage conveyance systems, and tug passageways. The 1st floor of the airport contains the main entrance, airline ticketing, baggage claim, and car rental offices. The 2nd floor of the airport is comprised of a security checkpoint, food and lounge areas, a gift shop, airport offices, and gate holding areas.

Documentation Review

Through this preliminary energy audit, the as-built and renovation drawings were reviewed along with utility bills, test and balance reports, historical weather data, and building controls documentation in order to identify potential energy efficiency and capital intensive measures

Energy Efficiency Measures

In review of the building operations, as-built documentation, and conducting a virtual walk-through, the following EEMs were identified. The goal of the EEMs is to reduce energy use while maintaining a simple payback period less than 7 years. Through the audit five EEMs were identified that would reduce energy use of the airport terminal. The following table provides an overview of the identified EEMs.

Table 1: Energy Efficiency Measures

EEM #	Measure Name	Measure Description	Potential Savings
1	Fluid Cooler Premium Efficiency Motor and VFD	Install a new premium efficiency motor coupled with a VFD to control the speed of the fluid cooler fan when operational.	Up to 10% from baseline consumption
2	Hydronic Pump Premium Efficiency Motor and VFD	Install a new premium efficiency motor for the heating water and heat pump loops coupled with a VFD to control the speed of the pumps when operational.	Up to 10% from baseline consumption
3	Lighting Upgrade from CFL & Linear Fluorescent Light	Replace existing fluorescent lighting with LED lighting to reduce energy consumption and improve photometrics.	Up to 30 - 40% from baseline consumption
4	Lighting Controls for Schedule & Occupancy Control	Install a lighting control system with occupancy sensors to de-energize lights when spaces are unoccupied and schedule lights to turn off after business hours.	Up to 68% (based on EPA study) depending upon time-out delay
5	Lighting Controls for Daylight Harvesting	Install photosensors to dim LED lights in spaces with ample influx of ambient light to reduce energy consumption.	Up to 25% reduction (based on space and available ambient light)

Capital Intensive Measures

In addition to identified EEMs, Capital-Intensive Measures were also noted. The goal of these CIMs is to improve building operations by replacing outdated equipment while updating equipment to industry standards for efficiency. The following table briefly outlines the noted CIMs. Detailed information regarding the CIMs can be found in the body of the report.

Table 2: Capital-Intensive Measures

CIM #	Measure Name
1	New Water Source Heat Pumps
2	New Fluid Cooler with VFD Fan Speed Control
3	Building Controls Upgrade

BACKGROUND

Building Description

The Hector International Airport, located in Fargo, North Dakota is a two-story airport with below-grade facility equipment storage, mechanical and electrical rooms, luggage conveyance systems, and tug passageways. The 1st floor of the airport contains the main entrance, airline ticketing, baggage claim, and car rental offices. The 2nd floor of the airport is comprised of a security checkpoint, food and lounge areas, a gift shop, airport offices, and gate holding areas.

Building Equipment

The building equipment reviewed through this audit process included the following:

- Mechanical HVAC
  - Water-source heat pumps
  - Hydronic distribution pumps
  - Make-up air units
  - Heat pump loop fluid cooler
  - Energy Recovery Unit
- Electrical
  - Interior lighting
  - Lighting controls
  - Transformers
- Plumbing
  - Lavatory fixtures

BUILDING AUDIT OBSERVATIONS

Building Virtual Walk-through Observations

A virtual building walk-through of the Hector International Airport was conducted, via Matterport 3-D rendering, to identify potential EEMs. The spaces reviewed include the 1st floor public side, 1st floor secure side, the airport basement, the 2nd floor public side, 2nd floor admin, and the 2nd floor gates. Through this review the following observations were noted.

- T5/T8 fluorescent and compact fluorescent lighting is installed throughout the facility
  - Compact fluorescent lighting observed in the passenger gate holding areas
  - T5/T8 linear fluorescent lighting observed throughout the 1st and 2nd floor public spaces, admin spaces, mechanical and electrical rooms, IT rooms, restrooms, etc.
- IT room thermostat setpoint is set to 68°F
- Admin office space thermostat setpoints vary from 68°F to 73°F
- Hydronic pumps appear to be driven by motor starters
- Installed boilers appear to be Thermal Solutions high efficiency non-condensing boilers

Building Documentation Observations

In addition to conducting a virtual walk-through of the airport, as-built drawings, a test and balance report, and equipment and controls submittals were reviewed. Key observations noted in review of the documentation are listed below.

- The 2008 mechanical drawings renovation scheduled for Aerco benchmark condensing, natural gas boilers to be installed
  - Thermal Solutions non-condensing boilers appear to be installed
- The Energy Recovery Unit ERU-1 sequence of operation appears to have the total energy recovery wheel operating anytime the unit is in *occupied mode*
- The heating water system appears to be selected to deliver water at 180°F with a 30°F delta across heating coils.
  - Assuming there is no heating water supply temperature reset to prevent flue gas condensation within boiler heat exchanger
- Exhaust fans with motor sizes greater than 1 horsepower do not appear to have VFDs
- Fluid cooler does not appear to have a VFD
- Electrical lighting schedules appear to have mostly fluorescent lighting
- Electrical lighting does not appear to have any details regarding controls

UTILITY DATA ANALYSIS

Energy & Demand Costs per Fuel Type

Three years of natural gas and one year of electrical bills were provided for analysis. Since electrical bill data was only made available for one year, the utility unit cost break-down for both gas and electric is based on the bills for 2021 which will be considered the base year. This unit cost data for each energy source type can be found in Table 3.

Table 3: Utility Unit Cost (2021-2022)

Annual Utility Unit Cost				
Estimated Blended Electric Unit Cost	Estimated Electric Consumption Unit Cost	Estimated Electric Demand Unit Cost	Estimated Fuel Unit Cost	Estimated Water Unit Cost
$/kWh	$/kWh	$/kW	$/therm	$/kGal
$0.08	$0.03	$6.66	$0.75	-

The total cost for each energy source type was aggregated for the base year of 2021 and is listed in Table 4 below. This table details the total energy utility expenditure and breaks down the annual electrical costs into consumption and demand.

Table 4: Annual Site Utility Cost (2021-2022)

Annual Site Utility Cost						
Total Utility Costs	Total Electric Cost	Electric Consumption Cost	Electric Demand Cost	Total Natural Gas Cost	Total Water Cost	Energy Cost Index
$/yr	$/yr	$/yr	$/yr	$/yr	$/yr	$/sf-yr
$300,756	$266,338	$107,298	$40,907	$34,418	$0	$2.66

To further analyze energy utility costs, the monthly costs for both natural gas and electricity plotted in the figure below. As can be seen, the cost of electricity grossly outweighs the cost of natural gas and thus aids in targeting EEMs related to reducing electrical use.

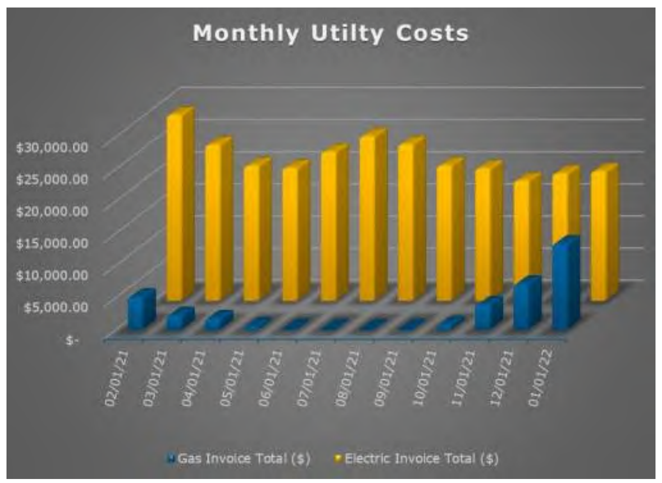


Figure 1: Monthly Energy Utility Costs

Energy Use Analysis

Energy use for the airport was analyzed for the base year of 2021. This energy use analysis included analyzing the electrical consumption, demand, and natural gas consumption throughout the year to identify possible outliers and end user targets for EEMs. Table 5, below, breaks out the annual electrical consumption and demand along with natural gas consumption.

Table 5: Annual Site Utility Use (2021-2022)

Annual Site Utility Use					
Total Energy Use	Electric Consumption	Total Estimated Electric Demand per Year	Fuel Use	Water Use	Energy Use Intensity
	kWh/yr	kW/yr	therms/yr	kGal/yr	kBtu/sf-yr
	3,367,322	6,142	45,957	0	142

For a better comparison, Figure 2 below illustrates the consumption of each energy source in equivalent units of measure (1000 British thermal units). As can be seen, the electrical use is almost 2 ½ times that of the natural gas thus warranting further investigation into electrical EEMs.

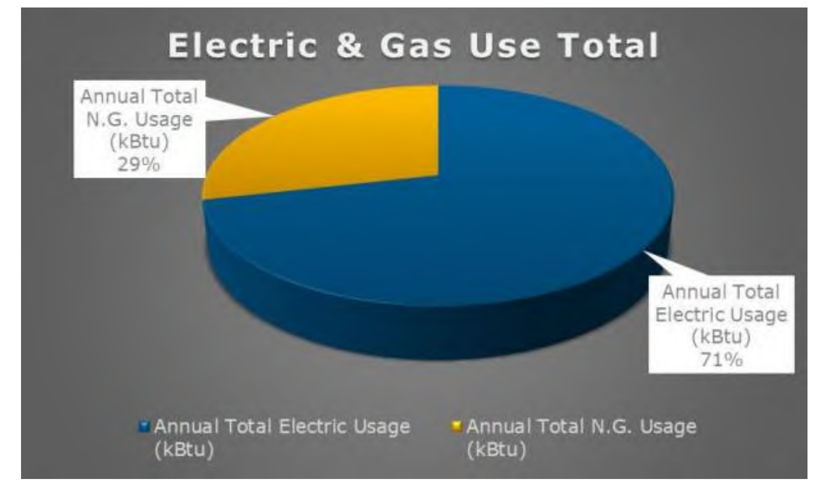


Figure 2: Electric and Gas Use

Electrical Use Analysis

Figure 3 illustrates both the electrical consumption (kWh) and demand (kW) for the airport on a monthly basis. This plot allows one to potentially identify any outliers in the data for further investigation. As can be seen, there is an increase in both consumption and demand during the summer months of June, July, and August which would align with an increase in cooling demand since the building relies on heat pumps. During January of 2021 there is a peak demand of 575 kW which seems like it may be an outlier when considered in isolation but could also be an uptick in travel or an increase in airport operations. Additional data would be required to further investigate this.

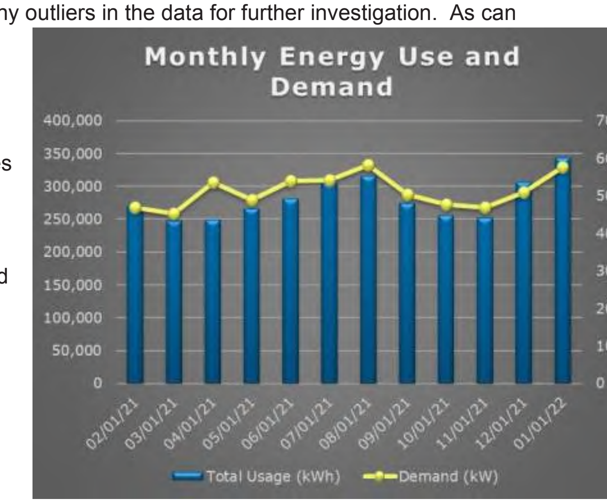


Figure 3: Monthly Electrical Consumption & Demand

The electrical energy data collected from the bills breaks down use by on peak and off-peak use.

Figure 4 illustrates the monthly, normalized on-peak and off-peak electrical use. The off-peak usage far surpasses daily on peak use. Depending on the tariff structure, this could be beneficial to the airport in that the utility rates for off-peak use are less than on peak.

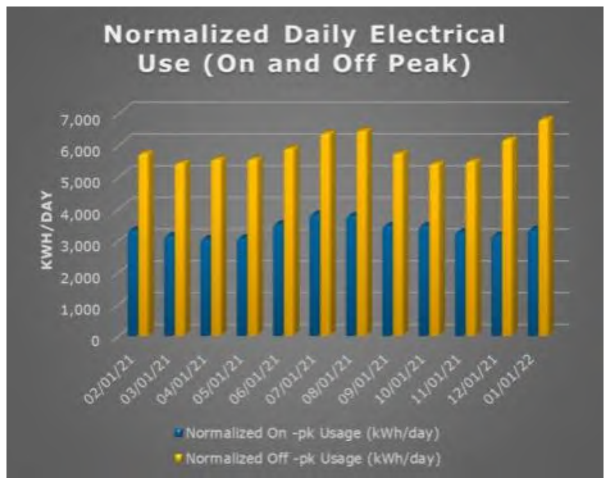


Figure 4: Normalized Electrical Use (On Peak & Off Peak)

Natural Gas Use Analysis

The natural gas use of the airport was analyzed to identify dependence on weather. Figure 5 illustrates the linear dependence on natural gas use with respect to decrease in outdoor air temperature. This plot shows that approximately 97% of the variance in gas use can be explained by increasing number of days requiring heating (decreasing outdoor air temperature).

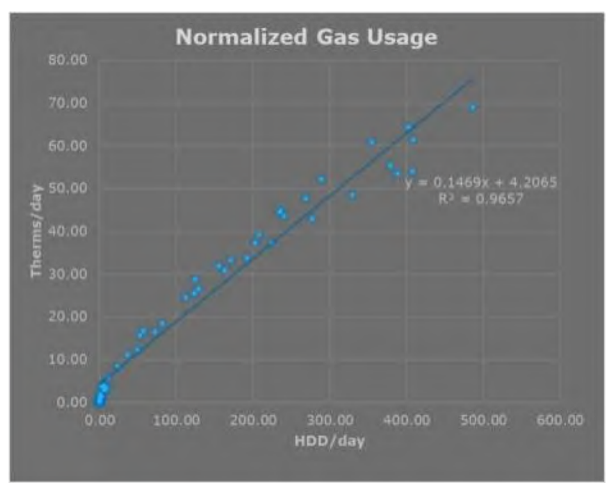


Figure 5: Normalized Gas Usage Regression

Figure 6, on the following page, details the same information but is categorized by years the data was collected. This data illustrates that, although there were many changes in travel due to the ongoing pandemic, the natural gas use of the airport facility did not vary considerably due to changes in occupancy and airport operations.

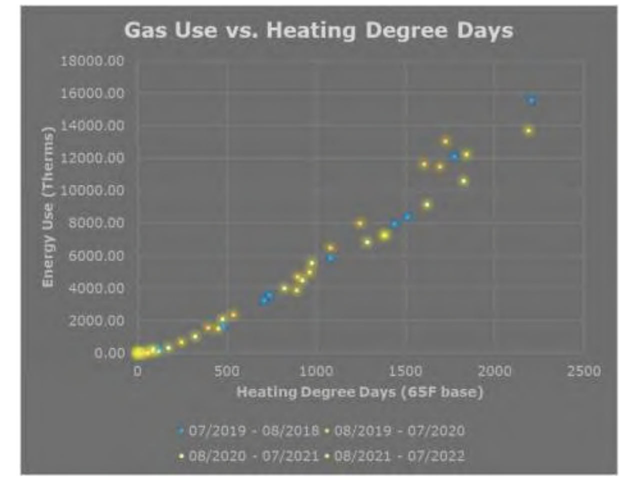


Figure 6: Gas Use vs. Heating Degree Days

List of Practical Energy Efficiency Measures

The following Energy Efficiency Measures were identified through the review of the facility operations alongside design drawings. The goal of these EEMs is to reduce overall utility costs and improve system operation.

<u>EEM 01 – Fluid Cooler Premium Efficiency Motor with Variable Frequency Drive</u>

This energy efficiency measure would replace the existing constant speed motor in the current fluid cooler with a new inverter duty, ac induction premium efficiency motor coupled with a variable frequency drive (VFD). This goal of this EEM is to reduce electrical consumption when the fluid cooler operates. There is potential for this EEM to reduce both electric consumption and demand.

<u>EEM 02 -- Hydronic Pump Premium Efficiency Motors with Variable Frequency Drives</u>

This energy efficiency measure would replace the existing pump motors with inverter duty, ac induction premium efficiency motors. These new premium efficiency motors would be coupled with variable frequency drives to modulate the speed of the pump to maintain system flow rates and reduce energy consumption during periods of low load. The goal of this EEM is to reduce electrical consumption of both the heating water and heat pump loops while maintaining the ability to achieve design flow rate under all load conditions.

<u>EEM 03 -- Lighting Upgrade from CFL and Linear Fluorescent Lights to LED</u>

This energy efficiency measure would replace the existing lighting and lighting controls system throughout the project area, removing all fixtures which have mainly T-5 fluorescent tubes and compact fluorescent lamps, and replacing them with an integrated, photometrically designed LED lighting system. This has the potential to greatly save on electricity cost and may also save on winter-season demand charges if these are experienced by the facility.

EEM 04 -- Lighting Controls for Schedule and Occupancy Control

This energy efficiency measure would build on EEM 03 by further replacing the existing lighting with an integrated lighting system that incorporates scheduled operation and occupancy control. The occupancy control would allow lights to turn off when occupancy is not detected after a specified time-delay. Areas observed where this could be beneficial include administrative offices, gate holding areas, ticketing, gift shop, and the maintenance and tug passageways.

EEM 05 -- Lighting Controls for Daylight Harvesting

This energy efficiency measure would build on EEM 03 and 04, further replacing the existing lighting with an integrated, photometrically designed LED lighting system that incorporates daylight harvesting and dimming technologies. These can be used in areas such as the main entrance and ticketing/check-in where sufficient outside light is enters the space. This EEM has the potential to further augment the electricity savings.

List of Capital-Intensive Measures

The following Capital-Intensive Measures (CIMs) were identified while conducting the virtual walk-through and reviewing facility as-built drawings. The goal of these CIMs is to improve building operations by replacing outdated equipment while updating equipment to industry standards for efficiency.

CIM 01 -- New Water-Source Heat Pumps with Variable Speed Compressors

This CIM would replace the existing water source heat pumps which are near median life expectancy according to ASHRAE. The aim of this CIM is to reduce the amount of electricity usage used for space conditioning by upgrading outdated heat pumps to the newest high-efficiency features like variable speed compressors, advanced refrigerants, and higher SEER and IPLV ratings. The main energy savings from this measure is from the higher efficiency ratings of the new equipment. Included in this measure would be the necessary upgrades to put each heat pump on the building automation system for remote monitoring and operator overrides.

CIM 02 – New Fluid Cooler with Variable Frequency Drive Fan Control

This CIM would replace the existing fluid cooler, at the end of its life, with a new fluid cooler coupled with a VFD for fan speed control. This will reduce energy use while the fluid cooler is operational and provide flexible control so that the fan can match the demand of the heat pump loop.

CIM 03 -- Building Controls Upgrade

This CIM would update the building controls by providing supervisory control over HVAC systems for maintenance staff to operate, maintain, and troubleshoot building systems. Additionally, adding a distributed control system can provide the ability to re-program, optimize, and tune building systems while adding flexibility for the addition and control of future equipment retrofits and upgrades.

ambient energy

A Mead & Hunt Company

APPENDIX D

OPTIMAL CONCESSIONS DEMAND

APPENDIX D

MEADHUNT.COM

1. Concessions Programming – Optimal Concessions Demand (ICF)

The following section summarizes ICF's methodology and assumptions utilized for concession program sizing for Hector International Airport (FAR). There are multiple factors that influence demand for concessions and ICF's optimal commercial demand model develops a target that will optimize both customer satisfaction and revenue to the airport.

In general, the potential commercial demand at an airport is driven by the passenger characteristics and the travel profiles of enplaning passengers. Long dwell times, long flight stage lengths, and international origin & destination-bound passengers, especially non-U.S. residents who are flying back to international destinations increase demand for retail and food service concessions.

Other travel profiles and segmentation data that influence demand include the percentage of leisure and business travel, the percentage of connecting traffic versus local passenger flow, and the overall enplanement volume at the Airport. However, ICF has not been provided with additional demographic data for analysis and these factors cannot be considered.

In terms of historical concession sales, total gross sales at FAR were $2.92 million in 2019, growing 17.1% over the prior year. In 2021, gross sales reached $2.77 million, recovering to 95% of 2019 levels. ***Table 1-1*** below displays key sales metrics for the Airport since 2017. Between 2017 to 2019, sales per enplanement (SEP) at the airport-wide level grew from $5.79 to $6.21, or on average 3.5% per year. During the first year of the COVID-19 pandemic in 2020, SEP levels remained constant, a considerable achievement for the airport commercial industry, and grew to $6.94 in 2021. This SEP growth is considerable and may be an indicator of the pent-up demand within this market.

Table 1-1: Annual Concession Sales and Traffic Performance at FAR

Year	Food & Beverage Sales	Convenience Retail Sales	Total Airport Sales	Enplaned Passengers (000s)	Sales per Enplanement
2017	$782,800	$1,492,300	$2,275,100	392.9	$5.79
2018	$877,800	$1,621,300	$2,499,100	422.2	$5.92
2019	$1,038,700	$1,887,000	$2,925,700	471.3	$6.21
2020	$566,100	$913,900	$1,480,000	238.5	$6.20
2021	$1,027,900	$1,741,400	$2,769,300	399.2	$6.94

Source: Data provided by concessionaires, Airport records.

Throughout this section of the report, ICF referenced the existing terminal square footage by Mead & Hunt (M&H), which totaled 7,624 square feet of concession space located on the 2nd floor of the Airport. Following conversations with M&H and referencing estimates found in Matterport virtual 3D tours and schematic software of the Airport, ICF adjusted the existing landside F&B space included as a baseline comparison in its sizing analysis space to discount the remote kitchen space found East of the pre-security cafeteria area. It was assumed that half of the kitchen space would be treated as storage support, resulting in 5,322 SF of F&B airport-wide, and 1,508 SF for retail/news & gift. The total square footage of 6,830 SF of space in 2022 is applied to all of ICF's analytical exhibits presented hereafter.

During the program planning stage, ICF utilized its most current concession planning principles which address issues that drive capture and sales. There are several principles that are addressed, as summarized below. These principles are updated as the underlying factors that cause demand to potentially expand or contract within the wider market.

Table 1-2: ICF Concession Planning Principles Applicable to Hector International

	Principle	Role
1	**Target known passenger segmentation/ profiles** by offering desired products, services, and menus in appropriate locations.	Provides incentive and opportunity for **all passengers and visitors to engage** with the commercial program.
2	**Showcase regional characteristics** with a memorable marketing theme that is reflected in concepts, products/menu mix, finishes and fixtures.	**Builds the airport brand**, captivates passengers, and provides a local experience.
3	**Ensure that all concessions are held to clear and articulated performance standards** in a manner that presents a superior image and opening-day fresh conditions by holding concessionaires.	**Maximizes passenger spending** by driving throughput and promoting customer service and unit cleanliness.

In order to drive sales, the Airport's commercial program must be designed to create an atmosphere that will reduce passenger anxiety and encourage impulse purchase decisions. The relationship between terminal space allocation and passenger traffic/density coupled with understanding passenger circulation patterns and performance at other like-sized airports will demonstrate how well a passenger interacts with the commercial program.

1.1. Select U.S. Airports For Benchmarking

ICF has reviewed FAR's enplanement forecast prepared by Mead & Hunt, which expects the level of enplaned passenger activity to grow from 471,300 in 2019 to 748,000 by 2041. In addition, ICF reviewed the Federal Aviation Administration's (FAA) Terminal Area Forecast (TAF), updated in March 2022, for the Airport on a federal fiscal year basis (FFY), year ending September 30. The TAF expects enplanements to reach 796,000 by FFY 2041. In addition, and barring any other shock to the system, given long-term passenger growth trends in the region and at FAR and ICF's perspective of the ongoing U.S. Airport recovery pattern, driven primarily by domestic passenger demand, ICF predicts FAR traffic to return to 2019 pre-pandemic enplanement levels in 2022.

Table 1-3: Enplaned Passenger Traffic Forecasts - Comparisons

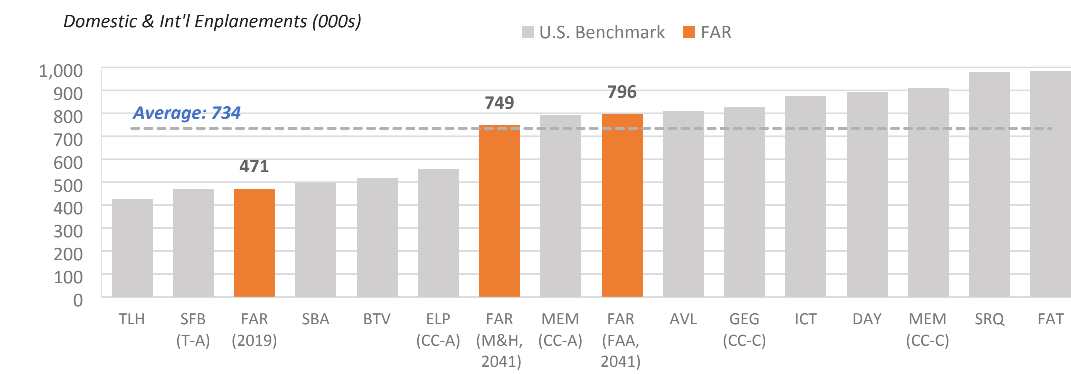
				% of 2019 levels		
Year	**ICF (2022)**	**Mead & Hunt**	**FAA, TAF (March 2022)**	**ICF (2022)**	**Mead & Hunt**	**FAA, TAF (March 2022)**
2019	471,333	472,157	461,119	100%	100%	100%
2021	399,172	482,252	422,325	85%	102%	92%
2022	471,300	N/A	522,887	100%	-	113%
2026	556,173	549,930	595,829	118%	116%	129%
2031	601,508	615,818	662,829	128%	130%	144%
2036	650,538	681,781	729,903	138%	144%	158%
2041	703,564	748,738	796,079	149%	159%	173%
CAGR 2021-2041	**2.9%**	**2.2%**	**3.2%**			

Note: Forecasts ordered left to right by 2041 enplanement volumes.
Source: M&H, FAA TAF, ICF forecast.

ICF utilized these enplanement levels as reference points to guide the selection of a list of U.S. Airports against which to benchmark concession sales data. It is worth noting that airports included were those that had reported 2019 data to the Airport Experience's Factbook (AXN Factbook) in 2020. AXN Factbook is a premier resource for North American concessions data. ICF referenced 2019 data points to reflect airport performances prior to the COVID-19 pandemic. In addition to the size of the airports, ICF took into consideration airports with little to no international nonstop commercial services and airports with a high proportion of origin & destination (O&D) passengers versus connecting traffic. The airports included in the benchmark are small-sized airports that are geographically distanced from other large metropolitan markets, with the exception of Memphis where particular Concourses were referenced independently.

Figure 1-1 displays the benchmarked U.S. airports and terminals/concourses considered for ICF's sizing analysis. The airports ranged between 425,000 and 990,000 enplaned passengers.

Figure 1-1: Select U.S. Benchmark Airports >425K and <990K Enplaned Passengers, 2019



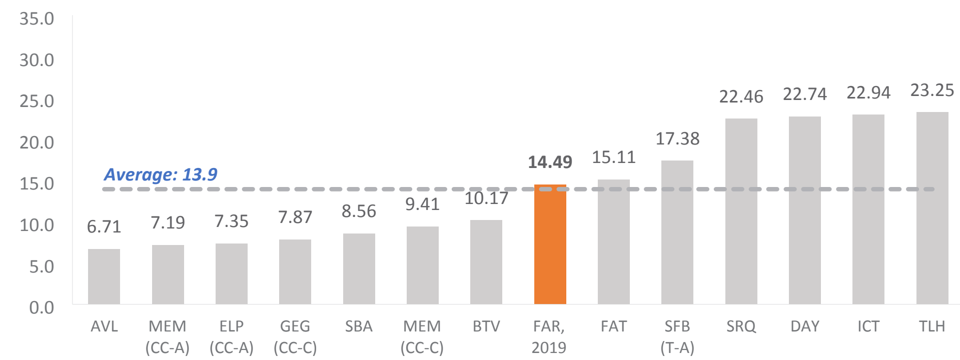
Note: T=Terminal; CC=Concourse.
*** referenced a particular terminal or concourse(s) located at the airport.**
Airport codes:

TLH = Tallahassee
SFB = Orlando Sanford*
SBA = Santa Barbara
BTV = Burlington
ELP = El Paso*
MEM = Memphis*
AVL = Asheville
GEG = Spokane*
ICT = Wichita
DAY = Dayton
SRQ = Sarasota
FAT = Fresno

Source: AXN Factbook, Mead & Hunt, FAA TAF (published March 2022), ICF analysis.

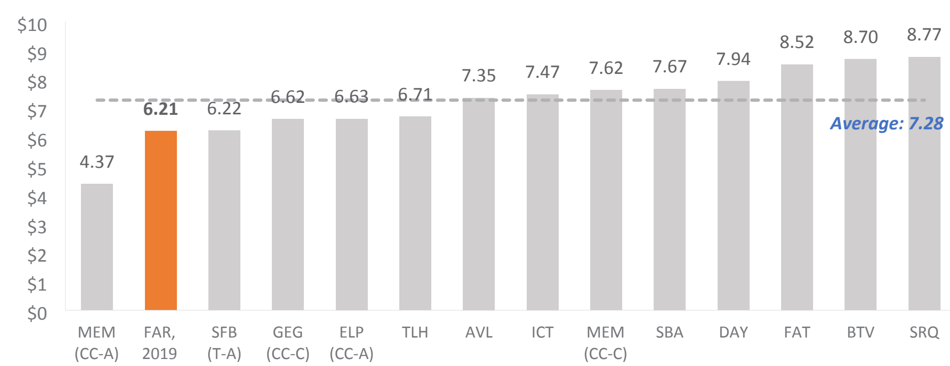
In terms of square footage per 1,000 enplanements, FAR's measure, 13.58 in 2019, placed it in the middle of the selected U.S. benchmark airports. These figures tend to be higher in smaller airports than they are in larger facilities, but this reflects the realities of operating in such an environment. A certain amount of space is required to operate a food service facility, and that minimum is not dependent on the number of passengers. A grill will take up so much room, a deep fryer so many square feet, etc. There are also potential differences in what space is included in the figures presented (for example, do they include all storage, do they include prep space, do they include all seating areas, etc.) or calculated differently, may exclude storage space that we have included in our calculations, Among the benchmarks in the remaining metrics analyzed, the airport also reflected slightly below average performance.

Figure 1-2: SF/1K Enplaned Passengers at Airports/Concourses >425,000 and <990,000 Epax, 2019



Note: ICF has not been provided detailed leasehold square footage data, and therefore FAR related square footage are based on Mead & Hunt Ch 4. Programming report provided. For SFB (in this figure and beyond), F&B square footage was estimated to be about 40% of what was published by AXN to accommodate front of house lease space, along with seating areas and a standard allowance for a kitchen only. This may be subject to change pending conversation with the concessionaire.
Source: AXN Factbook, Airport records, ICF analysis.

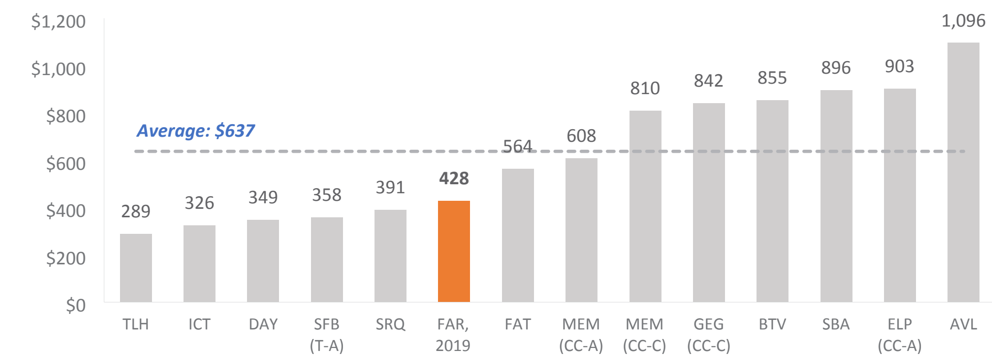
Figure 1-3: Sales per Enplaned Passenger (SEP) at Airports/Concourses >425,000 and <990,000 Epax, 2019



Source: AXN Factbook, Airport records, ICF analysis.

In the above chart, MEM (Concourse A) may have had such a low SEP due to a large influx of passengers who had formerly used Concourse B, which was closed at that time for renovation. These passengers, being introduced to a different space may not have made purchases (for a variety of reasons). This results in a larger denominator against which the numerator (sales) has not grown at the same rate. in the equation of sales over enplanements, if sales do not proportionally increase, the result is a lower dividend (sales per Epax).

Figure 1-4: Sales per Square Foot (Sales/SF) at Airports/Concourses >425,000 and <990,000 Epax, 2019



Source: AXN Factbook, Airport records, ICF analysis/estimates.
***** Square footage information pending contact responses with SRQ and ICT. Benchmark figures may be subject to change.**

All figures referenced in the benchmarks above will come into play as we continue our calculations to arrive at a sensible and optimal square footage program size.

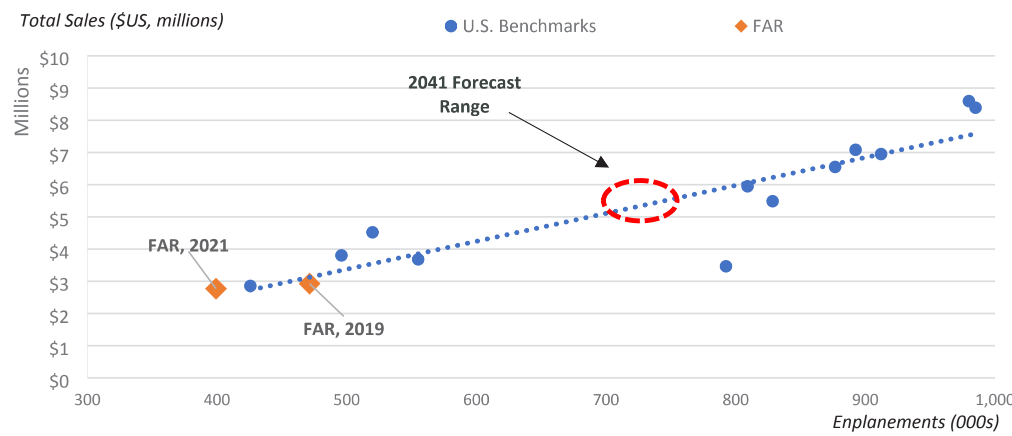
1.2. Relationship Behind Sales, Passengers, and Space

Given the benchmark set of airports referenced in the previous section with enplanements between 425,000 and 990,000, ICF performed regression analyses to determine the relationships among key sales metrics. In general, as the number of enplaning passengers grows, concessions sales tend to grow with it in a linear fashion. Similar to the fundamentals of off-airport retail sales, the more people exposed, the greater the volume of sales generated.

The projections for FAR's future concession sales, based on 2019 annualized concessions sales, were in line with the benchmarked productivity trend line, and its 2021 performance exceeded the trendline that airports ideally want to achieve (above and towards the left of the trend line). Referencing the trend line shown in

Figure 1-5, if FAR is projected to reach 749,000 enplaned passengers by 2041, total annual sales are expected to exceed $5.8 million, more than double FAR's recent annual gross sales performance.

Figure 1-5: Concession Sales vs Enplaned Passengers, 2019



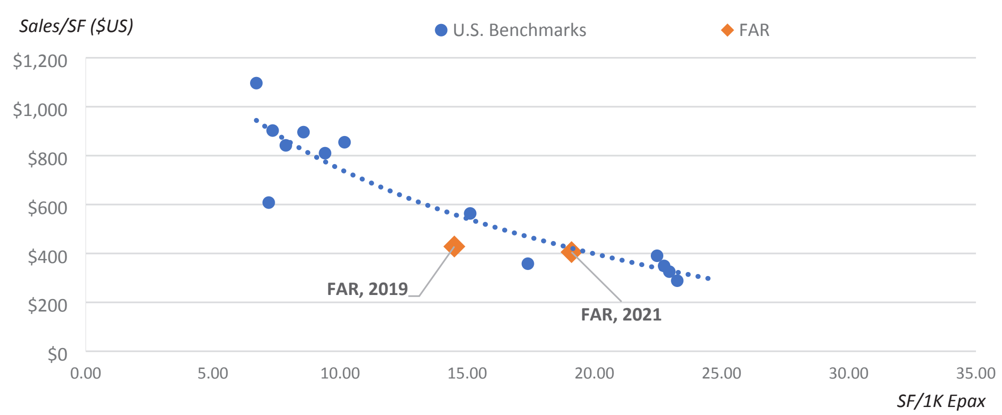
Source: AXN Factbook, Airport records, ICF analysis.

After determining potential sales estimates based on traffic forecasts and peer benchmark data, optimal square footage was measured according to the relationship of space productivity and sales per square foot efficiency at other benchmark airports. The benchmarked observations illustrate a strong correlation with an R-square value of 83% via a logarithmic regression as seen in

Mead &Hunt

Figure 1-6. In 2019 and 2021, the Airport is below the trendline determined, with relatively higher SF/1K enplanement ratios of between 14.0-18.0, which are commonly observed among smaller-sized U.S. airports. These figures are appropriate, given that the standard offerings of a retail store or the standard facilities needed for a food service location are required regardless of the size of the airport. Whether an airport enplanes 500,000 or 5,000,000 passengers, food service locations will need, at minimum, a grill, walk-in chilling, a ware-washing area, etc. While larger airports have a larger demand for these rudimentary facilities, there is a theoretical minimum amount of space that must be provided in order for the facility to function as a commercially viable location to fulfill basic travel needs and address their purpose for being.

Figure 1-6: Sales (excluding Duty Free)/SF vs SF/1K Enplaned Passenger, 2019

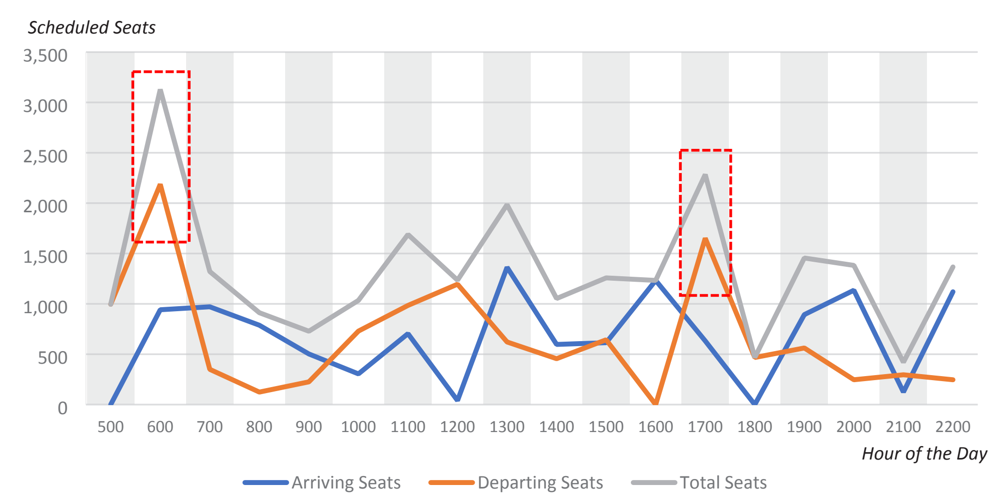


Source: AXN Factbook, Airport records, ICF analysis.

1.3. Considerations for Optimal Square Footage Requirements

According to OAG schedule data for FAR's peak travel month of March, the Airport on an average has a strong early morning departures peak between 6:00 am-7:00 am and another in the late afternoon between 5:00 pm-6:00 pm. It is worth noting that a consistent range of 1,100-1,350 scheduled seats arrives at the airport nearly every other hour after 1:00 pm to the end of the day.

Figure 1-7: Combined Distribution of Average Weekly Seats, Peak Month: March 2019



Source: OAG Analyzer, ICF analysis.

Generally, concession sales per passenger are weakest in the early morning for both food and retail concessions because these travelers often plan to have as little time as possible at the airport and are focused mostly on catching their flights, while maybe purchasing a cup of coffee and walkaway food to tide them over. To capture these passengers, food units must process transactions quickly with a wide selection of grab-n-go and quickly prepared items. The early morning is generally not a good time for retail shopping, except at convenience retail stores which is generally the categorization of the types of retail shops available (and expected to be available) at FAR.

There are other traffic factors that may suggest increased concession square footage is necessary to support optimization of sales and therefore concession revenue to the airport as the airport expands and grows.

- **Degree of day-hour peaking:** Significant
  - Strongly peaked usage suggests that it may be necessary to have space open and available during certain times of day to meet the demands of busier dayparts (i.e., the early morning departure peak).
- **Daypart peaks:** Early morning and late afternoon rounds of departing seats.
  - Although the most significant peak occurs in the morning, the usual requirement of more space for peaks is discounted if the peak is in the early morning when demand for retail is less and passengers tend to have shorter dwell times than the airport average.
- **Percentage of O&D:** 98.2% *(Source U.S. DOT O&D Survey)*
  - Grows the program as originating passengers are more likely to engage with concessions. Studies show connecting passengers spend less. They have an added amount of stress related to making their connection. However, there are, statistically, very few connecting passengers at FAR.
- **Local passengers/resident flow:** 62.0% *(Source: U.S. DOT O&D Survey)*
  - Local passengers, using the same facility repeatedly, will be more familiar with the airport's layout and locations of units within the commercial program.
- **Amount of long-haul stage lengths:** approximately 90% of departures are flown on routes less than 1,000 miles *(Source: OAG Analyzer)*
  - Shorter-haul passengers tend to have a lower demand for concessions, as they will have less of a need for food for mealtimes in-flight or on-plane entertainment. Smaller aircraft also offer less space making in-flight dining a much less enjoyable experience.

In addition, airport facility characteristics which may generally support the recommendation for greater amounts of space, would enable:

- the ability to create a concession node, and
- the ability to create concession-holdroom interaction

After analyzing multiple regressions of concession key performance indicators using the benchmark data, ICF assessed the best-fit trend line that yielded the highest statistical relationship between totals sales per square foot and square feet per 1,000 enplanements to optimize gross sales at the airport given a planning year of 2041. This was conducted after establishing the linear regression behind growth in sales and enplanements as mentioned in Section 1.2. ICF utilized the Mead & Hunt 2041 enplanement forecast as the established mid-case traffic scenario to support the optimal program sizing. ICF ran similar regression methodologies on the F&B and retail/new & gift segment with the same comparables, which yielded recommendations of the split of F&B vs retail. The outputs of our analysis are reflected in the tables below for the 5-year planning intervals specified.

Table 1-4: Optimal Square Footage Requirements, FAR Terminal, 2026, 2031, 2036, and 2041 (Mead & Hunt Epax = Mid-Case)

Year	2019	2026 - Low	2026 - Mid	2026 - High
Enplanements	471,333	495,000	550,000	605,000
F&B SF	5,322	3,900	4,600	5,300
Retail/N&G SF	1,508	700	1,000	1,200
Terminal Concession SF	6,830	4,600	5,600	6,500
Terminal SF/1K Epax	14.49	9.3	10.2	10.7
Year	2019	2031 - Low	2031 - Mid	2031 - High
Enplanements	471,333	554,400	616,000	677,600
F&B SF	5,322	4,600	5,500	6,300
Retail/N&G SF	1,508	1,000	1,300	1,700
Terminal Concession SF	6,830	5,600	6,800	8,000
Terminal SF/1K Epax	14.49	10.1	11.0	11.8
Year	2019	2036 - Low	2036 - Mid	2036 - High
Enplanements	471,333	613,800	682,000	750,200
F&B SF	5,322	5,400	6,300	7,200
Retail/N&G SF	1,508	1,300	1,700	2,300
Terminal Concession SF	6,830	6,700	8,000	9,500
Terminal SF/1K Epax	14.49	10.9	11.7	12.7
Year	2019	2041 - Low	2041 - Mid	2041 - High
Enplanements	471,333	674,100	749,000	823,900
F&B SF	5,322	6,200	7,200	8,600
Retail/N&G SF	1,508	1,600	2,200	2,700
Terminal Concession SF	6,830	7,800	9,400	11,300
Terminal SF/1K Epax	14.49	11.6	12.6	13.7

Note: N&G = news & gift
Source: ICF optimal concession demand analysis.

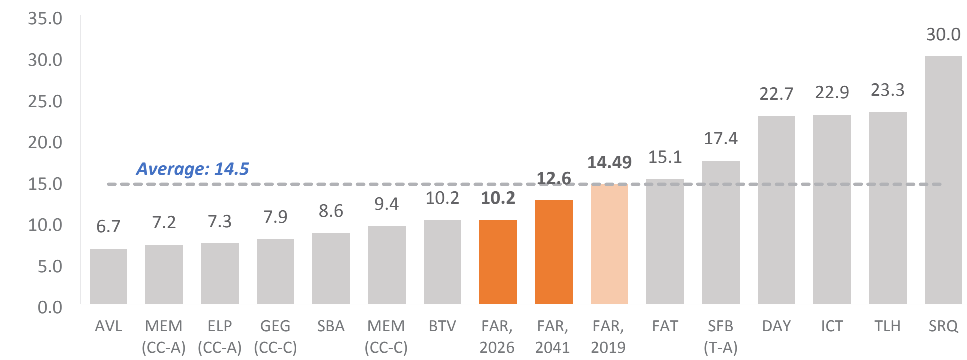
ICF's optimal commercial sizing analysis resulted in a SF/1K enplanement range of 10.2 to 12.6 between the planning years of 2026 to 2041 for an airport like Hector International that is expected to grow from 550,000 enplanements in 2026 to 749,000 enplanements by 2041, according to Mead & Hunt's FAA-approved forecast. Although the historical ratio at FAR was higher at 14.5, which is common at smaller-sized U.S. airports, the expected passenger growth in relation to the anticipated enhanced productivity of an optimized concession program will discount the amount of space required.

When comparing the SF/1K enplanement to the current benchmarks seen previously in ***Figure 1-2***, in 2041, FAR will fall within the benchmark shown in the figure. ***Figure 1-8*** and ***Figure 1-9*** both include the resulting sp

Mead &Hunt

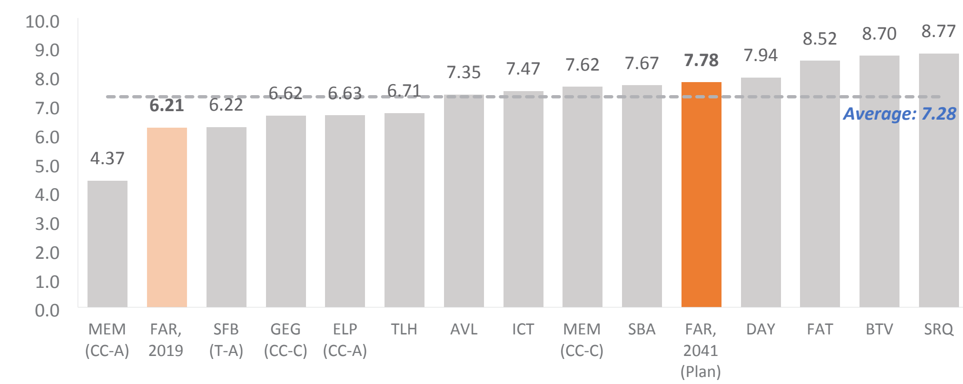
ace and sales metrics at FAR for the 2041 planning year compared to the benchmark airports used in this study.

Figure 1-8: SF/1K Enplaned Passengers at Airports/Concourses >425,000 and <990,000 Epax, with FAR Planning Year



Note: ICF has not been provided detailed leasehold square footage data, and therefore FAR related square footage is based on Mead & Hunt Ch 4. Programming report provided. For SFB (in this figure and beyond), F&B square footage was estimated to be about 40% of what was published by AXN to accommodate front-of-house lease space, along with seating areas and a standard allowance for a kitchen only. This may be subject to change pending conversation with the concessionaire.
Source: AXN Factbook, Airport records, ICF analysis.

Figure 1-9: Sales per Enplaned Passenger (SEP) at Airports/Concourses >425,000 and <990,000 Epax, with FAR Planning Year



Source: AXN Factbook, Airport records, ICF analysis

<<< ICF section Ends…>>>

APPENDIX E

T100 DATABASE COMMUTER AND AIR CARRIER OPERATIONS

APPENDIX E

Appendix A: T100 Database Commuter and Air Carrier Operations

Aircraft	Total Operations									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Saab-Fairchild 340/B	2	4	0	0	0	0	0	0	0	0
Embraer-135	4	18	2	4	0	0	0	0	0	0
Embraer-140	300	156	66	222	324	100	30	0	12	0
Canadair RJ-200ER /RJ-440	5,710	4,058	4,432	5,036	3,916	4,754	4,402	4,350	4,552	2,674
Bombardier CRJ550	0	0	0	0	0	0	0	0	0	48
Embraer-145	2,256	5,058	4,816	4,984	4,506	4,564	4,014	3,352	2,544	1,338
	8,272	**9,294**	**9,316**	**10,246**	**8,746**	**9,418**	**8,446**	**7,702**	**7,108**	**4,060**
Boeing 737-100/200	2	0	0	0	0	0	0	2	4	0
Canadair RJ-700	1,158	876	568	610	268	116	930	1,134	1,608	442
Embraer-Emb-170	0	6	238	52	524	182	14	6	70	276
De Havilland DHC8-400 Dash-8	344	0	0	0	0	0	0	0	0	0
Canadair CRJ 900	582	640	480	1,264	1,114	918	1,116	964	756	1,802
Embraer ERJ-175	1,050	700	888	574	1,202	344	988	1,722	2,312	1,376
McDonnell Douglas DC-9-30	98	0	4	2	0	0	0	2	4	0
Embraer 190	0	0	0	18	18	0	0	0	2	0
Boeing 717-200	0	0	0	0	0	718	528	246	546	52
McDonnell Douglas DC-9-40	18	0	0	0	0	0	0	0	0	0
Airbus Industrie A-318	0	0	0	2	0	0	0	0	0	0
Boeing 737-700/700LR/Max 7	8	8	6	14	8	22	14	18	4	0
McDonnell Douglas DC-9-50	950	692	110	0	0	0	0	0	0	0
Boeing 737-300	0	0	0	2	0	0	10	0	2	2
McDonnell Douglas DC9 Super 87	0	14	10	0	0	0	0	0	0	0
Airbus Industrie A319	304	150	262	690	902	786	516	918	816	854
Boeing 737-400	26	0	0	0	2	12	34	36	6	4
McDonnell Douglas DC9 Super 80/MD81/82/83/88	1,092	1,044	1,162	728	688	484	500	268	0	0
McDonnell Douglas MD-90	6	118	204	282	36	124	262	30	2	0
Boeing 737-800	56	92	80	56	62	104	196	202	164	50
Airbus Industrie A320-100/200	130	142	460	320	866	668	362	504	762	780
Boeing 737-900	2	0	0	0	0	0	0	0	0	0
Boeing 737-900ER	0	0	0	0	4	136	342	302	324	16
Airbus Industrie A320-200n	0	0	0	0	0	0	0	56	164	154
Airbus Industrie A321/Lr	0	0	2	0	0	0	0	30	168	174
Airbus Industrie A321-200n	0	0	0	0	0	0	0	0	0	0
Boeing 757-300	2	0	2	0	2	4	0	6	4	0
Airbus Industrie A330-300	0	0	0	0	0	0	0	0	2	0
Boeing 747-400	0	0	0	0	2	0	0	0	0	0
	5,828	**4,482**	**4,476**	**4,614**	**5,698**	**4,618**	**5,812**	**6,446**	**7,720**	**5,982**
	14,124	**13,794**	**13,806**	**14,880**	**14,476**	**14,790**	**18,888**	**19,246**	**20,314**	**16,020**

APPENDIX F

MARCH 2019 SAMPLED DAY

APPENDIX F

Appendix B: March 2019 Sampled Day

Sampled Day: March 14th, 2019

Airline	Flt No	Airport	Aircraft	Time	Type
Delta	2200	Minneapolis	717	5:00 AM	Departing
American	3654	Chicago - ORD	ER4	5:39 AM	Departing
United	5232	Denver	E7W	6:00 AM	Departing
United	4743	Chicago - ORD	ER4	6:08 AM	Departing
Delta	2248	Minneapolis	717	6:43 AM	Departing
American	3418	Dallas - DFW	E75	6:48 AM	Departing
United	5234	Denver	CRJ	7:30 AM	Departing
Delta	3832	Minneapolis	CRJ	9:20 AM	Departing
Allegiant	2135	Orland - SFB	319	10:04 AM	Departing
Frontier	491	Denver	320	10:05 AM	Departing
Delta	3424	Minneapolis	CR9	10:53 AM	Departing
United	5304	Denver	CRJ	11:15 AM	Departing
American	4126	Chicago - ORD	ER4	12:22 PM	Departing
Allegiant	537	Phoenix - Mesa	320	12:39 PM	Departing
Delta	3807	Minneapolis	CRJ	1:00 PM	Departing
United	4657	Chicago - ORD	ER4	2:45 PM	Departing
American	3738	Chicago - ORD	ER4	3:44 PM	Departing
Delta	4028	Minneapolis	CRJ	3:45 PM	Departing
American	3615	Dallas - DFW	E75	4:58 PM	Departing
United	5405	Denver	CRJ	5:00 PM	Departing
Delta	1131	Minneapolis	717	5:49 PM	Departing
United	5308	Chicago - ORD	CRJ	6:23 PM	Departing
Delta	3870	Minneapolis	CRJ	7:35 PM	Departing
Allegiant	31	Las Vegas	319	8:44 PM	Departing
Delta	3832	Minneapolis	CRJ	8:47 AM	Arriving
Frontier	490	Denver	320	9:15 AM	Arriving
Allegiant	2134	Orland - SFB	319	9:19 AM	Arriving
United	5284	Chicago - ORD	CRJ	10:11 AM	Arriving
Delta	3424	Minneapolis	CR9	10:18 AM	Arriving
Allegiant	536	Phoenix - Mesa	320	11:54 AM	Arriving
American	4126	Chicago - ORD	ER4	11:57 AM	Arriving
Delta	3807	Minneapolis	CRJ	12:30 PM	Arriving
United	4604	Denver	ER4	2:09 PM	Arriving
Delta	4028	Minneapolis	CRJ	3:06 PM	Arriving
American	3730	Chicago - ORD	ER4	3:15 PM	Arriving
American	4048	Dallas - DFW	E75	4:25 PM	Arriving
United	5400	Denver	CRJ	4:27 PM	Arriving
Delta	1131	Minneapolis	717	5:10 PM	Arriving
United	5434	Chicago - ORD	CRJ	5:53 PM	Arriving
Delta	3870	Minneapolis	CRJ	6:58 PM	Arriving
Allegiant	30	Las Vegas	319	7:59 PM	Arriving
United	5204	Denver	CRJ	8:07 PM	Arriving
Delta	2144	Minneapolis	717	9:28 PM	Arriving
American	3802	Dallas - DFW	E75	9:47 PM	Arriving
United	4612	Chicago - ORD	ER4	9:50 PM	Arriving
United	5632	Denver	E7W	11:28 PM	Arriving
Delta	2172	Minneapolis	717	11:43 PM	Arriving
American	3827	Chicago - ORD	ER4	11:52 PM	Arriving

APPENDIX G

JULY 2021 SAMPLED DAY

APPENDIX G

Appendix C: July 2021 Sampled Day

Sampled Day: July 11th, 2021

Airline	Flt No	Airport	Aircraft	Time	Type
Delta	1333	Minneapolis	321	5:48 AM	Departing
American	5847	Dallas - DFW	CR9	6:00 AM	Departing
United	5862	Denver	CRJ	6:00 AM	Departing
American	2999	Chicago - ORD	CR7	7:00 AM	Departing
United	3437	Chicago - ORD	E70	7:30 AM	Departing
Delta	3537	Minneapolis	CR9	8:00 AM	Departing
United	5414	Denver	CRJ	8:57 AM	Departing
American	3514	Chicago - ORD	ER4	10:37 AM	Departing
Delta	3623	Minneapolis	CR9	11:00 AM	Departing
United	3784	Chicago - ORD	CRJ	11:25 AM	Departing
Delta	3740	Minneapolis	CR9	1:18 PM	Departing
United	4737	Denver	CRJ	1:28 PM	Departing
American	5998	Dallas - DFW	CR9	2:11 PM	Departing
Delta	3800	Minneapolis	CR9	5:20 PM	Departing
United	4741	Denver	CRJ	5:20 PM	Departing
American	3116	Chicago - ORD	CR7	5:56 PM	Departing
United	3965	Chicago - ORD	CRJ	6:05 PM	Departing
Allegiant	527	Phoenix - Mesa	320	6:17 PM	Departing
Delta	3983	Minneapolis	CR9	7:51 PM	Departing
Allegiant	1038	Nashville Int'l	320	8:47 PM	Departing
American	3514	Chicago - ORD	ER4	10:12 AM	Arriving
Delta	3623	Minneapolis	CR9	10:15 AM	Arriving
United	3879	Chicago - ORD	CRJ	10:51 AM	Arriving
Delta	3740	Minneapolis	CR9	12:32 PM	Arriving
United	4681	Denver	CRJ	12:49 PM	Arriving
American	5998	Dallas - DFW	CR9	1:26 PM	Arriving
Delta	3800	Minneapolis	CR9	4:35 PM	Arriving
United	5612	Denver	CRJ	4:43 PM	Arriving
American	3116	Chicago - ORD	CR7	5:26 PM	Arriving
Allegiant	536	Phoenix - Mesa	320	5:27 PM	Arriving
United	3969	Chicago - ORD	CRJ	5:31 PM	Arriving
Delta	3983	Minneapolis	CR9	7:06 PM	Arriving
Allegiant	1019	Nashville Int'l	320	7:57 PM	Arriving
United	4736	Denver	CRJ	8:56 PM	Arriving
American	2998	Chicago - ORD	CR7	9:32 PM	Arriving
United	3533	Chicago - ORD	E70	9:48 PM	Arriving
American	5797	Dallas - DFW	CR9	10:20 PM	Arriving
Delta	3693	Minneapolis	CR9	10:59 PM	Arriving
United	4683	Denver	CRJ	11:48 PM	Arriving
Delta	2723	Minneapolis	321	11:59 PM	Arriving