DSM

Des Moines International Airport

Future Terminal Program Definition Manual
Supplemental Update

APRIL 15, 2022

DES MOINES
International Airport

MC Feldmann, Chair 5.10.22

Mark Feldmann Date

Board Chairperson

Des Moines Airport Authority

Board No. A22 - 075

Contract No. 2022-13-10

Chapter 1

Executive Summary of Supplemental Update

1.0 Introduction

1.1 Background

Anser Advisory, LLC (Anser) and its team of six subconsultants was hired by the Des Moines Airport Authority (Authority) on December 14, 2021 to provide Owner's Representative (OR) Services in support to the New Airport Terminal Project. The first task in providing those services was preparing an updated to the "Future Terminal Design Program Definition Manual" (PDM) dated May 25, 2018, by HNTB. The Supplemental PDM Update to the original PDM document was updated with current scope information, budget estimates, and phasing plans necessary to use in the negotiations with the A/E design team which will be selected by the Des Moines Airport Authority Board of Directors in April 2022.

A fundamental goal of the 12-week effort to prepare the PDM Supplement was to align the initial budget and funding for the program in order that a realistic, executable plan could be advanced to meet current and future forecast demand. This document recommends a phased plan to achieve the Authority's goal.

1.2 Approach to the PDM Supplemental Update

The subsequent Chapters of this Supplemental Update are organized to match the Chapters of the 2018 PDM. Based on the 12 weeks of work in early 2022, each Chapter either describes what has changed, or indicates that there is no change to the 2018 information.

1.3 Recommendations Summary

The OR team made high-level conceptual updates to all site areas and levels of the Terminal building by updating the 2018 PDM to meet requirements of the Owner. These updates are found in more detail in Chapters 4-6. The OR team recommends that these detail be validated from the selected A/E firm as well as validation of 2018 PDM to ensure the correct requirements of the Owner. The entire program should be reviewed and validated by the selected A/E team. This Supplemental Update is a guide to preparing a scope of work for the design consultant.

1.3.1 Plan Overview

During the 12 week period to prepare the PDM Supplemental Update, the OR team proposed several ideas that were included in the final presentation at the Board Workshop on April 5, 2022. The most significant ideas that influenced the concept evolution are summarized and recommended as follows:

1. Updated forecast recommending demand for 17 gates by 2032, instead of 14 gates and increased peak hour demand requiring upsizing of key terminal capacity components.
2. Respecting the existing airfield geometry and separation requirements, the concourse was converted from curved to linear to parallel Runway 5-23 and Taxiway P. The aircraft gate positions and building were shifted north closer to the airfield to achieve three objectives:
    - Allow for more processor building depth
    - Substantially increase spacing of "canyon" dimension between the face of new terminal and new parking garage expansion to support more flexible and enlarged curb operations
    - Increase the developable area adjacent to new terminal for future terminal expansion alternatives and recaptured real estate for more revenue opportunities.
3. In support of item 2 above, relocate and reduce the size of the existing deicing tank to reduce operating costs associated with the larger catchment area currently in use for deicing operations.
4. Phase the project into smaller increments that could support lower cost options to allow the first phase to adapt in size to fit available funding while still addressing most of the airport's critical capacity constraints.
5. Consider the extended use of existing facilities including concourses A and C and the south end of the existing processor (current baggage claim areas).
6. Move select functions such as new CEP and Authority offices outside of new terminal for ease of access and expansion
7. Eliminate the basement to simplify the building and reduce costs
8. Eliminate future expansion space in the first phase processor building but provide space for the logical and simple expansion of the building to meet future demand requirements beyond 17 gates.

The site plan and building concepts described in future chapters have been developed in accordance with the ideas outlined above.

1.3.2 Terminal

Based on the updated forecast prepared during the PDM Supplement effort, the number of gates in the new terminal in 2032 was increased from 14 to 17 gates. The 2042 forecast projected the need for at least 19 gates and the goal was discussed and included in this document to allow for additional future expansion to maximize the available gate count based on site conditions. The inital Phase 1 includes a plan for build to 17 gates. The OR team developed a concept for Phase 2 which will expand the gate capacity from 17 gates to 22 gates.

The PDM Supplement recommends that the new terminal be shifted closer to the airfield after the relocation of the existing 4 million deicing storage tank. The shift will allow for the terminal configuration to deepen and rotate functions within the terminal such as the TSA passenger screening checkpoint to a more intuitive orientation. The shift also allows for the "canyon" between the face of the parking garage expansion and new terminal to expand from 105 to 174 feet. Additional recommendations include the following:

- Eliminate the basement. Place the building service corridor connecting on the first level loading dock and commissary storage areas. This change will assist to reduce cost and provide for ease of access to areas relocated from the basement to level 1.
- Place primary ticket lobby on level 2 adjacent to TSA security check point. Provide self-service baggage kiosks and bag drop on level 1. The logic behind this move of ticketing to level 2 is caused by the elimination of the basement and the need to provide sufficient space on level 1 for baggage operations. This approach also anticipates the anticipated technology changes to the ticketing and baggage check functions as much more of the operation is dedicated to self-service options.
- Only construct the initial spaces and equipment for baggage claim and baggage make-up to meet the 17-gate program requirement. This approach will provide three baggage claim and three baggage make-up units in the initial phase of the processor building.
- Provide terminal expansion area to the southwest of the terminal processor. This valuable real estate will still have direct frontage on the extended length curbs to service public and commercial vehicle requirements.

Finally, the placement of the terminal has been shifted to the southwest to support the alignment of the new pedestrian bridge between the midpoint of the processor and the parking garage expansion. In the design phase, consideration should be given to shifting the processor further to the southwest to centralize its location relative to most of the gates in the ultimate plan, subject to creating conflicts with the existing facilities and still maintaining ample space for future processor building expansion.

1.3.3 Landside

The PDM Supplement recommends that the fundamental approach to the roads and curbs already adopted by the Authority remain the same. The primary change to the concept is to widen the "canyon" dimension between the new terminal and parking garage expansion to provide more and wider drive and drop-off lanes and passenger island and curb areas for ease of circulation and larger waiting areas. A secondary change is to lengthen the curb in front of the terminal for building expansion and added curb length for peak operations.

Based on the configuration of the ultimate Cowles Drive, additional developable real estate is being created near the terminal for a range of Authority potential uses including the expansion of baggage make-up, security, a potential Customs and Board Protection, valet or VIP parking, premium ground transportation services, targeted art and landscape features and many more ideas yet to be conceived.

1.3.4 Airside

The PDM Supplement recommends several important refinements to the original PDM concept beginning with the relocation of the 4-million-gallon deicing tank. This move creates the opportunity to shift the terminal processor and gates closer to the airfield and deepen the terminal site with benefits described in the earlier sections. Commensurate with the shift in building position is the straightening of the gate concourse from gently curved to linear with the result of added developable real estate adjacent to the new alignment of Cowles Drive.

A second refinement is the shifting of the position of the deicing pads and hardstands to meet near and long-term requirements. A benefit of the deicing pad layout will be to limit the size of the catchment area and reduce flow discharge with a drop in operating costs and utility fees.

During the design phase, consideration should be given to the creation of remote boarding gate positions in the area of the Green Lot. These remote gates could benefit the Authority during construction phasing and provide back-up capacity during peak season operations.

1.3.5 Program Phasing

An important consideration for this PDM Supplement update was how to phase the program so it could achieve several key objectives as follows:

- Align with available funding
- Meet forecast gate and hardstand requirements
- Avoid interference with existing operations, or provide interim solutions to meet demands
- Simplify the phasing plan to reduce the number of phases

In order to align with projected available funding, two ideas were proposed including 1) breaking the 17 gate program into smaller subsequent phases with the first phase, Phase1A, only including a new processor to handle the majority of the primary operational concerns as well as provide DSM a new "front door" experience, five new gates and 2) using existing assets such as the existing concourse A and C gates for an extended duration to meet overall airport demand. The result of these ideas was a reduction in new building square footage for the first phase from approximately 295,000 SF to 265,000 SF.

Phase 1B will add four (4) more gates to the new terminal building and match the terminal requirements for gate design and layout. Phase 1C will add eight (8) new gates and will require the demolishing of the original Concourses A and C. With completion of Phase 1C there will be 17 gates available.

Phase 2 will add the final 5 gates to give the airport a total of 22 gates as the ultimate buildout.

An added consideration for the phasing plan was to identify program elements that could be built outside the terminal to facilitate ease of access and future expansion. The Central Energy Plant (CEP) and Authority offices were identified as components that could be considered for this approach. The CEP and offices are proposed to be located to the northeast of the terminal processor in an area that should be protected from future growth pressure and can be accessed from non-secure road and parking areas.

1.3.6 Rough Order of Magnitude Cost Estimates

The total Program Cost for the Des Moines New Terminal is summarized on **Table 1.2** and detailed in Chapter 8. The program costs include the new terminal (and associated projects), landside, airside and enabling projects directly related to the new terminal.

Table 1.2 - Program Cost Estimate Summary

Category	Cost To Owner (Incl. CMAR Fees)	Contingency	Soft Cost	Escalation (To Midpoint Construction)	Total
New Terminal (incl. Demo)					
Phase 1A	$236,524,185	$28,974,213	$53,217,942	$35,470,001	$354,186,341
Phase 1B	$55,136,810	$6,754,259	$12,405,782	$13,543,770	$87,840,621
Phase 1C	$113,762,880	$13,935,953	$25,596,648	$38,628,625	$191,924,106
Subtotal	**$405,423,875**	**$49,664,425**	**$91,220,372**	**$87,642,396**	**$633,951,068**
Landside					
Phase 1A	$17,109,482	$1,882,043	$1,710,948	$2,790,694	$23,493,167
Subtotal	**$17,109,482**	**$1,882,043**	**$1,710,948**	**$2,790,694**	**$23,493,167**
Airside					
Phase 1A	$25,081,221	$2,758,934	$2,508,122	$3,362,590	$33,710,867
Phase 1C	$29,316,053	$3,224,766	$2,931,605	$6,466,623	$41,939,047
Subtotal	**$54,397,274**	**$5,983,700**	**$5,439,727**	**$9,829,213**	**$75,649,914**
Misc/Enabling Projects					
Apron A	$22,862,479	$ -	$3,429,372	$ -	$26,291,851
Apron B	$8,407,489	$ -	$1,261,123	$773,489	$10,442,101
Subtotal	**$31,269,968**	**$ -**	**$4,690,495**	**$773,489**	**$36,733,952**
TOTAL PROGRAM COST	**$508,200,599**	**$57,530,168**	**$103,061,542**	**$101,035,792**	**$769,828,101**

** Phase 2, future expansion to 22 gates was not included in this estimate.*

Chapter 2 | Forecast

2.0 Forecast

The purpose of the 2022 L&B Forecast Update in this section is to present the forecasts of aviation demand and the impact of the future demand on the facilities at the Des Moines International Airport (DSM or the Airport) as part of the Terminal Program Definition Manual (PDM). This section will review the prior 2014 Leigh Fisher forecast (and subsequent 2017 HNTB forecast) and illustrate why an updated forecast was needed. It will subsequently present the methodologies and assumptions used in developing the forecasts. The aviation activity forecast includes annual enplaned passengers and annual passenger aircraft operations through 2042. Projections for passenger and passenger aircraft operations were also developed on a peak period basis.

2.1 Forecast Update Overview

The previous PDM[1] concluded that the economic assumptions used in the 2014 Terminal Area Concept Plan were still applicable. Therefore, the previous PDM adopted any forecast segments that were within a 5% tolerance of the previous activity levels and adopted the growth rates applied to the current activity level for any forecast that exceeded the 5% of tolerance. Since 2016, the Des Moines area economy has been much stronger than the earlier forecast appears to have assumed. A brief overview on the strength of the local economy is in the following paragraphs, followed by identifying specific factors that have changed, which results in the previous PDM forecast not being applicable at this time.

The Des Moines area economy has benefited from an abundance of young college graduates, with a cluster of financial firms located in Des Moines area. 32% of the jobs in Des Moines require at least a college degree, a similar share as compared to Chicago. There is a significant number of actuaries, finance and investment professionals in the Des Moines area. Some 14% of the area's jobs are in finance – a higher percentage than for New York City. While the finance industry generates the most jobs from the area, it is the software/technology sector that is the fastest growing. Between 2013 and 2018 (most current available), software/technology jobs grew 56.7%. These jobs proved resilient during COVID, as Des Moines employment bounced back to pre-COVID levels by the end of 2021.

Des Moines area employment grew 13.0% between 2010 and 2020. This compared favourably to other Midwest cities: Kansas City (8.6%), Minneapolis-St. Paul (7.8%), Omaha (5.6%), Chicago (3.9%), St. Louis (3.1%) and Milwaukee (1.2%).

The Des Moines area population was also among the fastest growing in the Midwest, growing at roughly 2x the U.S. rate of growth and much faster than all other larger cities in the Midwest (this will be looked at more closely below). Finally, this relative population growth should continue for at least a few more years: Suburbs in the Des Moines MSA have recently reported record construction of new homes, condos and apartments.

2.1.1 DSM Traffic Growth: 2017-2019

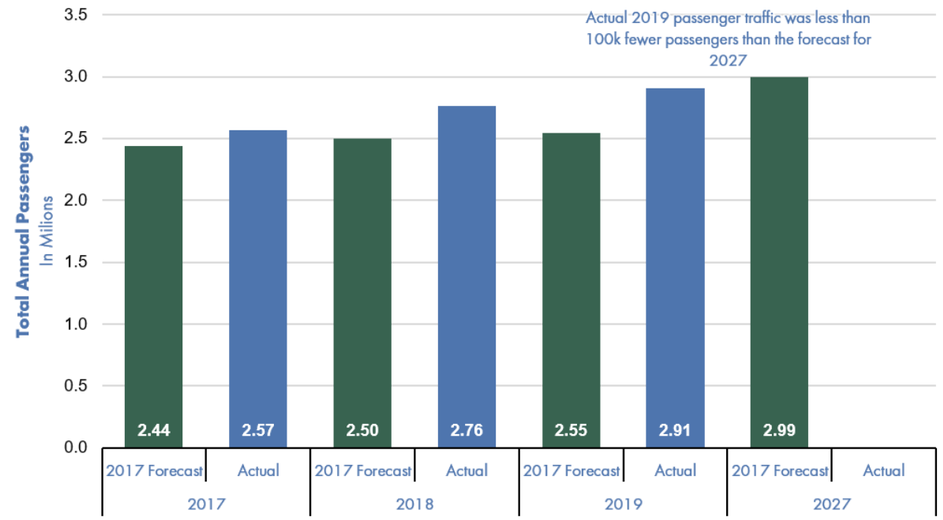
As the Des Moines area economy has prospered, so has air travel demand, with the Airport experiencing stronger than anticipated growth from 2016 through 2019. During this period, enplanements increased at an average rate of 5.7% per annum as American Airlines and Allegiant Airlines expanded their offerings at the Airport. The previous forecast had an estimated 2.3% average annual growth in the same three-year period. By 2019 DSM passenger volumes were almost equivalent to the prior forecast's 2027 forecast. See **Figure 2.1** below.

2.1.2 Des Moines Area Population Growth

When the prior forecast was originally completed in 2014 (and updated in 2017), the Des Moines area's population growth was possibly not reflected in that forecast. Population growth for the Des Moines Metropolitan Statistical Area (MSA) and the U.S. is shown below in **Figure 2.2**. As shown, the Des Moines MSA grew at a 1.5% Compounded Annual Growth Rate (CAGR) over the past decade, more than doubling the U.S. rate of growth of 0.7%.

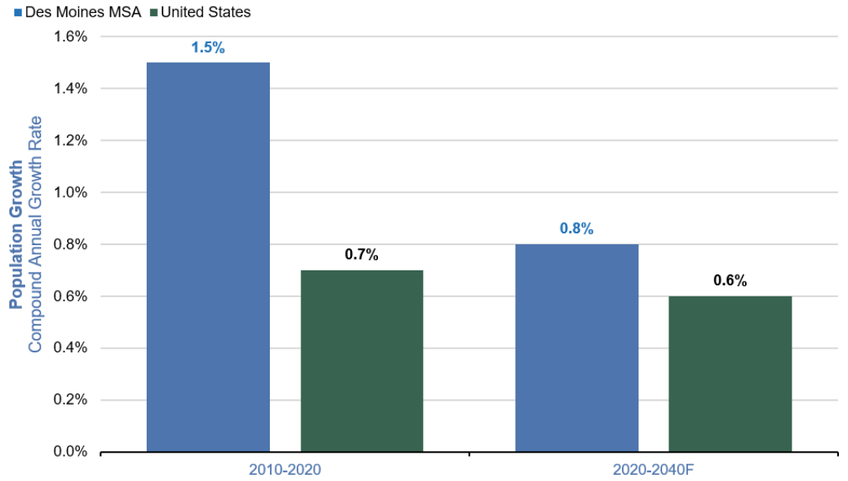
The prior forecast estimated DSM passenger volumes growing at a 2.1% CAGR throughout the forecast period. The FAA forecasted the U.S. to grow at a 2.0% CAGR during this same time period. In other words, the Des Moines MSA's population was growing 2x the U.S. rate of growth, yet the forecasted traffic growth rate was very similar to the U.S. forecasted rate of growth.

Figure 2.1: DSM Total Passengers: Actual versus Prior Forecast



Source: Des Moines Airport Authority, Monthly Activity Report

Figure 2.2: Population Growth (CAGR): Des Moines M.S.A. versus U.S.



Source: U.S. Census Bureau, Woods & Poole

1 Des Moines International Airport, Future Program Definition Manual, May 25, 2018

Going forward, the FAA forecasts U.S. passenger traffic to grow at a 2.3% CAGR through 2040, while the prior forecast had DSM passenger traffic growing at a slower 2.1% CAGR. Yet, as shown in **Figure 2.2**, while the Des Moines MSA population growth rate is expected to slow versus the last decade, it is still expected to grow 25% faster than for the U.S.

2.1.3 Strength of DSM's Post-COVID Recovery

Starting in mid-March 2020, airlines in the United States reported unprecedented downturns in passenger volumes as a result of the Coronavirus disease 2019 (COVID-19) pandemic. Passenger volumes at the Airport in March 2020 were down 47.1% from the previous year. The decline continued into April 2020 when enplanements were 95.8% lower than April 2019. For all of 2020, enplanements were down 55.7% compared to 2019. Since April 2020, enplanements have recovered each month. In December 2021, enplanements were only down 11.5% when compared to December 2019. Despite still being below 2019 enplanement levels, DSM has fared better in recent months than most of the airports in the United States. Nationally for 2021, U.S. enplanements are estimated to be down 35%-40% versus 2019, while DSM was only down 25%. See **Figure 2.3** below. Going into 2022, based upon published airlines schedules (as of January 26, 2022), DSM's airline seat capacity is expected to be well above 2019 levels by summer, with July 2022 seat capacity being 13% above July 2019.

Figure 2.3: DSM Departing Seat Capacity by Month (2022 versus 2019)

Airline	July 2022		July 2019		Percent Change	
	Flights	Seats	Flights	Seats	Flights	Seats
American Airlines	594	50,476	584	50,506	1.7%	-0.1%
Allegiant Air	213	39,279	91	15,180	134.1%	158.8%
Delta Air Lines	360	29,547	448	40,277	-19.6%	-26.6%
United Airlines	419	28,060	391	35,450	7.2%	-20.8%
Southest Airlines	150	25,930	88	12,584	70.5%	106.1%
Frontier Airlines	27	5,022	18	2,700	50.0%	86.0%
Total	**1,763**	**178,314**	**1,620**	**156,697**	**8.8%**	**13.8%**

Source: Diio Mi, Schedule

As shown, DSM's July capacity growth is being driven by Allegiant and Southwest Airlines, while DSM's network airlines exhibit flat-to-declining capacity. These relative airline growth rates are a microcosm of larger U.S. trends, where lower-cost carriers are growing and network airlines have not been (or pre-COVID, exhibiting limited growth). These relative trends are only expected to widen going forward.

2.1.4 Allegiant Airlines Base of Operations

On July 1, 2021, Allegiant Airlines officially opened a base of operations at DSM. This means that Allegiant will now base aircraft and crews in Des Moines, in addition to conducting some aircraft maintenance at the Airport. As of now, the operating base includes locating two Airbus A320 aircraft at the Airport. Currently, as shown in **Figure 2.4**, Allegiant operates 23 bases across the U.S., with 9 of those in markets focused upon origin traffic such as DSM (relative to destination market bases like Orlando-Sanford, Phoenix-Mesa, Las Vegas, Punta Gorda and Tampa-St. Petersburg, among others).

Figure 2.4: Allegiant Airlines Bases of Operation

Source: Allegiant Airlines

Being a base of operation indicates that Allegiant believes that there is significant growth potential at DSM. It also allows for much more flexibility for Allegiant to add new service (given that crews & aircraft are already based there). Historically when Allegiant announces a new base, that market typically experiences significant new service in the coming months and years. For example, Allegiant's seat capacity at DSM in July 2022 is 159% greater than it was in July 2019, including new service to Austin, Nashville, Fort Lauderdale, Houston, Portland, San Diego and Sarasota. It is anticipated that the operating base will help to not only allow the Airport to continue to recover from the COVID-19 pandemic but will help to spur future growth at DSM.

2.1.5 Potential New Routes

The Airport actively recruits new air service and is in regular communications with airlines from around the country. Tied to this, airlines have expressed interest in adding additional nonstop service to DSM. **Table 2.1** below illustrates DSM's top origin-destination (O&D) markets. For example, DSM's top market is Phoenix (PHX), which generates 211 passengers daily each way (PDEW), with an average one-way fare paid of $149 (net of taxes). Additionally, there are 369 nonstop seats offered daily each way between DSM and PHX. It is expected that Southwest Airlines will add new nonstop service to PHX in the coming months.

The markets highlighted in yellow are markets that have recently garnered new nonstop service but had no nonstop service in 2019. Those in green are expected new Alaska Airlines markets over the next few years. In addition, it is expected that Breeze Airways will likely add new service into some of these larger, coastal markets that have limited-to-no nonstop service today. Demand to these markets is estimated to be sufficient to support targeted, nonstop service.

Table 2.1: Top DSM Origin-Destination (O&D) Markets for CY 2019

DSM Top O&D Markets: CY 2019

Rank	Market	PDEWs	Avg Fare	Seats/Day	Rank	Market	PDEWs	Avg Fare	Seats/Day
1	PHX	211.4	148	369	26	AUS	38.6	199	0
2	LAS	185.5	130	239	27	BNA	36.9	172	0
3	DEN	176.9	137	502	28	PDX	36.2	231	0
4	ORD	135.5	193	828	29	CUN*	33.3	231	0
5	LGA	113.2	202	114					
6	DFW	109.7	219	416					
7	DCA	109.1	211	111					
8	MCO	107.1	147	34					
9	ATL	96.6	213	34					
10	LAX	75.0	191	0					
11	AZA	66.6	72	0					
12	SFB	65.7	86	74					
13	PHL	64.1	222	122					
14	IAH	61.8	209	191					
15	CLT	57.7	241	208					
16	SAN	57.7	198	0					
17	PIE	55.7	82	63					
18	SEA	53.7	206	0					
19	SFO	53.5	227	0					
20	BOS	51.1	223	0					

*Did 60 PDEWs in 1Q19

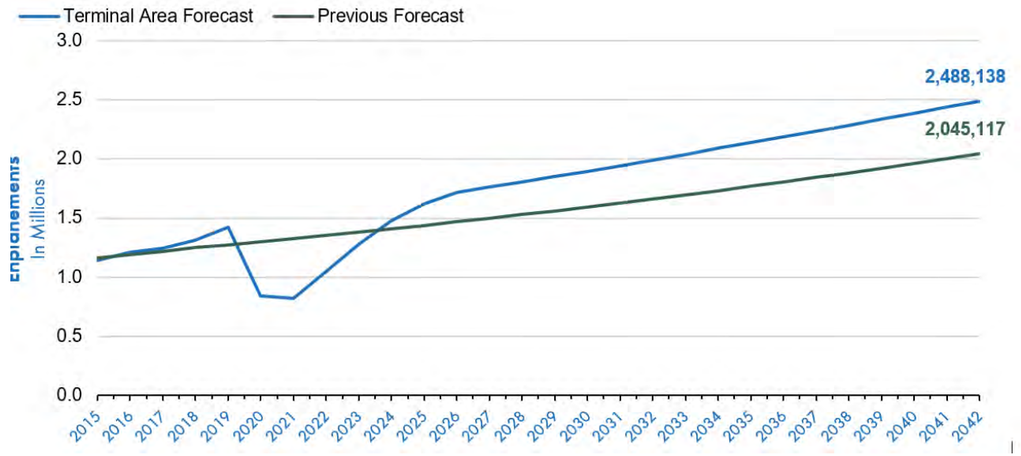
Source: Diio Mi, O&D

In addition, with the new terminal DSM will also offer an international arrival facility that can accommodate and process international passengers. With this, airlines have also expressed an interest in service to vacation destinations in Mexico and the Caribbean. Specifically, the DSM-Cancun (CUN) market generates enough demand to support nonstop service seasonally and eventually year-round nonstop service is a possibility.

2.1.6 Assessment of Current DSM Air Service

Significant, short-term capacity growth in the airline industry is sometimes associated with low yields and unprofitable air service. Such has not been the case at DSM. Despite relative fast growth since 2016, DSM's air service has been profitable, First, an analysis of DSM's mileage-adjusted Revenue per Available Seat Mile (RASM) by carrier/route (not shown), illustrates that all DSM routes were operating above carrier system averages – indicative of relative profitability. Second, carrier load factors have also been high at DSM as illustrated in **Figure 2.5** below. This shows that much of DSM's air service is poised for additional capacity, whether it be in the form of larger aircraft gauge, more frequency or new routes.

Figure 2.5: DSM Load Factors by Airline (CY 2019)



Source: Diio Mi, O&D

2.1.7 Summary

The prior DSM forecast was understated due to the factors illustrated above, including stronger than expected traffic growth, which was a function of the Des Moines regions' relatively vibrant economic and population growth. Both before and after COVID. This has been and will continue to be the driver of DSM's traffic growth.

As will be the case throughout the U.S., most of DSM's growth will be in the form of ULCC service. Specifically, Allegiant Airlines and their new base of operations at DSM will drive a significant portion of DSM's growth. In addition, DSM can expect to experience incremental growth from network airlines as it pertains to larger aircraft gauge and additional frequency, in addition to selective growth from Southwest Airlines.

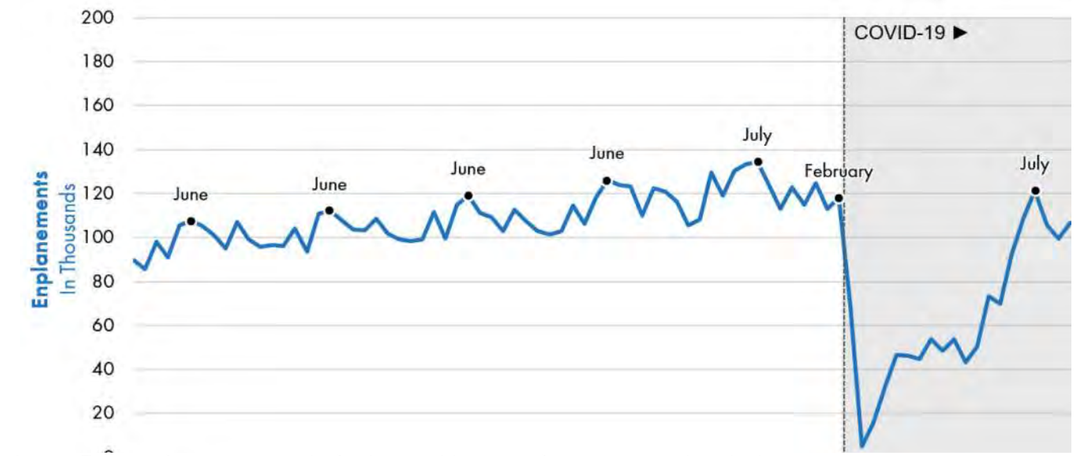
2.2 Annual Forecasts

The FAA publishes its own annual forecast for all active airports in the National Plan of Integrated Airport Systems (NPIAS), including DSM. The Terminal Area Forecast (TAF) is "prepared to assist the FAA in meeting its planning, budget, and staffing requirements. In addition, state aviation authorities and other aviation planners use the TAF as a basis for planning airport improvements."[2]

The TAF was adopted for the annual passenger and aircraft operations forecast. The TAF is presented in a Federal fiscal year (FY) basis.[3] The annual forecasts provided in the previous PDM are in calendar year while the TAF is presented in fiscal year. However, given the relatively close traffic in 2015 for both forecasts, comparisons are still considered valid. The TAF includes the growth at the Airport from FY 2016 through FY 2019 with the subsequent decline due to the COVID-19 pandemic which were absent from the previous forecast.

The TAF projects that enplanements at the Airport will recover to FY 2019 levels by FY 2024 with the full recovery of lost traffic occurring by FY 2027. According to the TAF, enplanements at DSM are projected to increase from 823,487 in FY 2021 to approximately 2.5 million in 2042, representing a compound annual growth rate (CAGR) of 5.4% (2.5% versus 2019). In comparison, the forecast in the previous PDM forecast projected 2.0 million enplanements in 2042. **Figure 2.6** presents the TAF for DSM in comparison to the previous PDM forecast.

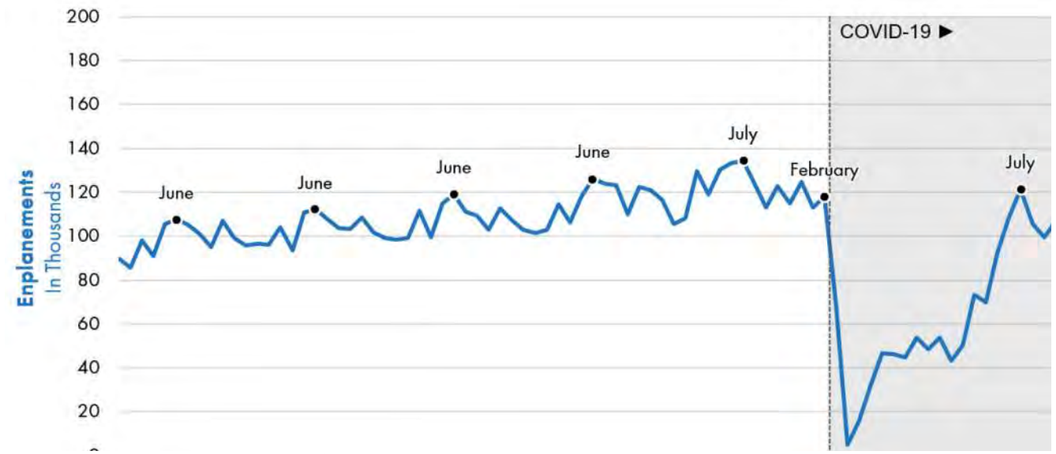
Figure 2.6: Enplaned Passenger Terminal Area Forecast (2015 - 2042)



Note: The current forecast is presented in fiscal year and the previous forecast is presented in calendar year.
Sources: Federal Aviation Administration, Terminal Area Forecast: Fiscal Years 2020-2045. HNTB, Des Moines International Airport: Future Terminal Program Definition Manual, May 2018.

The TAF does not distinguish passenger aircraft operations from other commercial aircraft operations (air carrier plus air taxi/commuter). Based on data from the Airport, it was determined that passenger aircraft operations have accounted for an average of 85.6% of all commercial aircraft operations at the Airport from FY 2018 through FY 2020. It was assumed that this rate would remain relatively consistent throughout the forecast period. Therefore, the commercial aircraft operations forecast provided in the TAF was multiplied by 85.6% to develop the passenger aircraft operations forecast. Passenger aircraft operations at DSM are projected to increase from 27,294 in FY 2021 to 60,611 in 2042, representing a CAGR of 3.9%. In comparison, the previous PDM forecast projected 50,252 passenger aircraft operations in 2042. **Figure 2.7** presents the passenger aircraft operations forecast for DSM in comparison to the previous PDM forecast.

Figure 2.7: Passenger Aircraft Operations Forecast (2015 - 2042)



Note: The current forecast is presented in fiscal year and the previous forecast is presented in calendar year.
Sources: Federal Aviation Administration, Terminal Area Forecast: Fiscal Years 2020-2045. HNTB, Des Moines International Airport: Future Terminal Program Definition Manual, May 2018. Landrum & Brown.

2 Federal Aviation Administration, Terminal Area Forecast Summary: Fiscal Years: 2018-2045, July 2019

3 Federal Fiscal Year is from October through September

A summary of the annual enplanement and passenger aircraft operations forecasts are provided in **Table 2.2**.

Table 2.2: Annual Enplanements and Passenger Aircraft Operations Forecast

	Year	Current Forecast		Previous Forecast	
		Enplanements	Passenger Aircraft Operations	Enplanements	Passenger Aircraft Operations
Actual	2015	1,142,750	32,626	1,162,448	31,860
	2016	1,209,487	32,297	1,191,298	32,440
	2017	1,246,447	32,828	1,218,600	33,020
	2018	1,311,091	33,242	1,248,997	33,600
	2019	1,421,270	36,536	1,273,681	34,078
	2020	838,568	27,038	1,298,853	34,562
	2021	823,487	27,294	1,324,523	35,054
Forecast	2022	1,043,154	29,091	1,350,700	35,552
	2027	1,765,758	43,549	1,497,064	37,994
	2032	1,989,887	48,834	1,660,300	42,080
	2037	2,236,325	54,646	1,842,690	45,985
	2042	2,488,138	60,611	2,045,117	50,252
Range		**Compound Annual Growth Rate**			
	2019 - 2027	2.7%	2.2%	2.0%	1.4%
	2019 - 2042	2.5%	2.2%	2.1%	1.7%
	2021 - 2042	5.4%	3.9%	2.1%	1.7%

Note: The current forecast is presented in fiscal year and the previous forecast is presented in calendar year
Sources: Federal Aviation Administration, Terminal Area Forecast: Fiscal Years 2020-2045. HNTB, Des Moines International Airport: Future Terminal Program Definition Manual, May 2018. Landrum & Brown.

2.3 Peak Period Forecasts

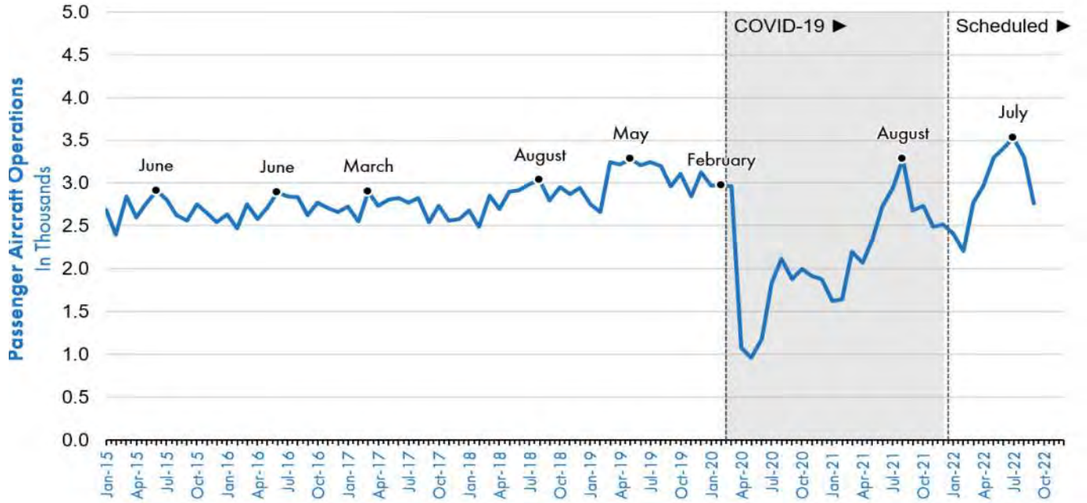
The monthly passenger data from the Airport was used to determine the peak month for passengers. The Airport's busy period for passengers occurs during the summer months of June and July. From 2015 through December 2018, June was the peak month for four years. July was the peak month for 2019 but June had more enplanements on a per day basis. February was the peak month for 2020 due to the sharp decline due to the COVID-19 pandemic beginning in March. July was the peak month for enplanements in 2021. **Figure 2.8** graphically depicts the monthly seasonality for passengers at the Airport.

The monthly passenger aircraft operations data from the Airport was used to determine the peak month for operations. The Airport's busy period for passenger aircraft operations is more random than enplanements due to fewer variations on a monthly basis. July is currently scheduled to be the peak month for 2022 in terms of both passenger aircraft operations and seating capacity. **Figure 2.9** graphically depicts the monthly seasonality for passenger aircraft operations at the Airport.

The FAA recommends the use of the average day of the peak month, typically referred to as the peak month average day (PMAD), for purposes of physical planning such as developing gate requirements. As an alternative, the peak month average weekday (PMAWD) can be used at airports that have domestic service as the predominant activity and at airports where weekend activity is consistently less than weekday activity.

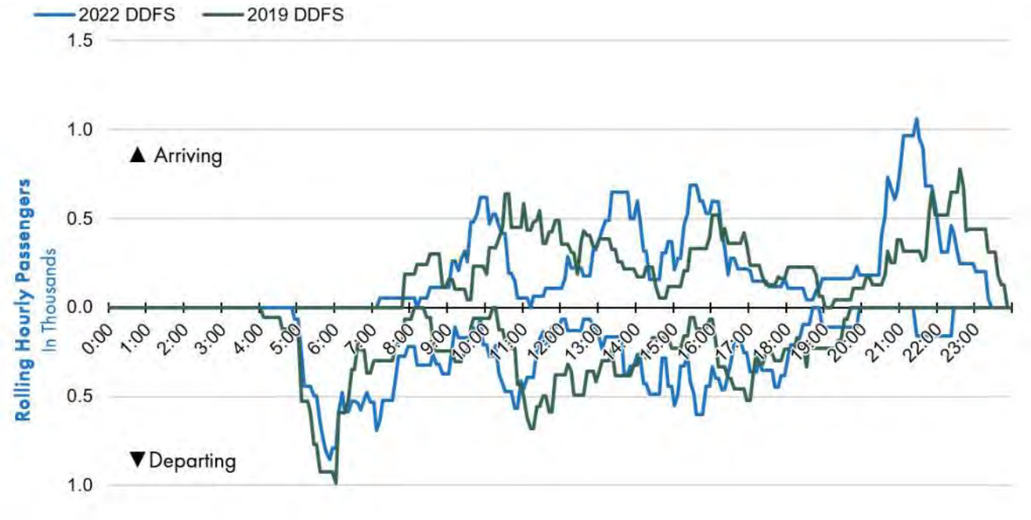
As demonstrated, June has been consistently ranked as the highest month for enplanements. However, current schedules indicate that July will be the peak month for 2022. Therefore, June was selected as the historical peak month, but July was selected as the peak month for future years for the purposes of physical planning at the Airport.

Figure 2.8: Monthly Enplanements (January 2015 - December 2021)



Source: Des Moines Airport Authority, Monthly Activity Report

Figure 2.9: Monthly Passenger Aircraft Operations (January 2015 - September 2022)



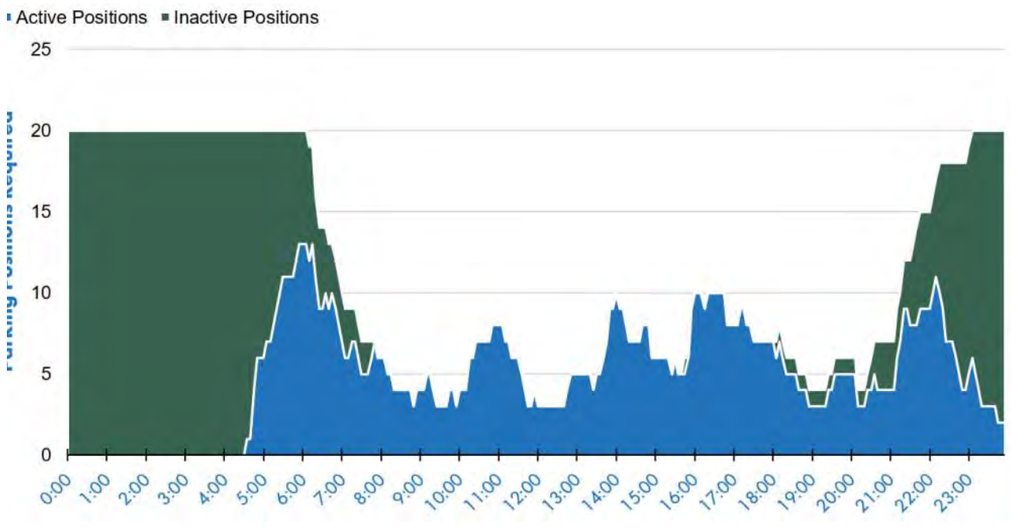
Source: Des Moines Airport Authority, Monthly Activity Report

Seating information from scheduling data was used as a proxy to determine the 2019 and 2022 PMAWD, as passenger data was not available at the daily level. PMAWD was used as the design day at DSM because the number of aircraft operations and seating capacity declined significantly on Saturdays. June 19, 2019 was selected as the 2019 PMAWD as it most closely resembles the average weekday. To account for changes to the flight schedules, including the continued recovery from the COVID-19 pandemic, the process was replicated for 2022 and July 20, 2022 was selected as the PMAWD.

Design day flight schedules (DDFS) for 2019 and 2022 were developed to determine the hourly profile of traffic at the Airport. Published flight schedules for the 2019 and 2022 design days were compiled. An 85% load factor was applied to the seating configuration to determine passenger traffic.

The DDFS for 2019 was analysed to determine the hourly profile at the Airport to identify the periods of time that traffic is most concentrated. Using a clock hour as the basis for peak periods does not allow for peak periods of traffic that occurs across clock hours to be identified, i.e. traffic occurring late in the first hour combined with the traffic at the beginning of the next hour. Therefore, a rolling 60-minute hour approach was used to determine the design day profile. In this case, aircraft operations were categorized into one of 288 five-minute buckets, or bins, that occur during the given day. The sum of twelve sequential buckets represents a rolling 60-minute hour. In both 2019 and 2022, the peak for departing passengers occurs during the morning departure peak while the arrival peak occurs at the end of the day. However, the arrival peak has become more pronounced and the schedule has a clearer banking structure. **Figure 2.10** graphically presents the rolling 60-minute hour profile for passengers in the DDFS for 2019 and 2022.

Figure 2.10: Rolling 60-Minute Passenger Profile (June 19, 2019 & July 20, 2022)



Source: Diio Mi, Schedule - Dynamic Table. Landrum & Brown.

Information regarding peak month, average day, and peak hour from the DDFSs was used to formulate factors to determine the peak period forecast. These factors include the peak month as a percent of the annual, the design day as a percent of the peak month, and the peak hour as a percent of the design day. The peak period factors from the DDFSs were applied to the annual forecast to obtain peak period aircraft operations targets. The peak period passenger targets were developed by applying appropriate load factor and aircraft size assumptions to the peak period aircraft operations targets. It was assumed that the peak month and design day factors would remain relatively unchanged through the forecast period. However, the expansion of service at the Airport to meet future demand would result in a more evenly distributed profile across the day. As a result, the peak hour factors were adjusted to account for these changes. These targets were used to guide the development of future DDFSs for 2027 and 2042. Anticipated changes to air service was also included in the development of the future DDFSs including the introduction of both Breeze Airways and Alaska Airlines service. Changes to fleets as older aircraft are retired were also considered and implemented when available replacements would become available. Any changes to the peaks based on the future flight schedules were adopted where appropriate. The peak hour aircraft operations forecasts are presented in **Table 2.3.**

Table 2.3: Peak Hour Passenger Aircraft Operations Forecast

	Current Forecast		
Year	Arrivals	Departures	Total
2019	7	10	14
2022	9	11	14
2027	10	13	16
2032	12	14	18
2037	12	15	19
2042	13	16	21

Source: Diio Mi, Schedule - Dynamic Table. Landrum & Brown.

Peak hour passengers were calculated using a similar methodology as peak hour aircraft operations. The annual and monthly passengers were determined from the Airport's records. The design day passengers are based on the scheduled seats for the design day as a share of the scheduled seats for the month. Peak hour passengers were calculated from the aircraft seating configurations in the DDFS and assumed load factors. **Table 2.4** presents the peak hour passenger forecasts for DSM compared to the previous forecast.

Table 2.4: Peak Hour Passengers Forecast

	Current Forecast			Previous Forecast			Variance		
Year	Enplanements	Deplanements	Total	Enplanements	Deplanements	Total	Enplanements	Deplanements	Total
2019	778	987	1,160						
2022	1,059	856	1,288	654	655	950	61.9%	30.7%	35.6%
2027	1,234	1,087	1,514	720	722	1,046	71.4%	50.6%	44.7%
2032	1,391	1,206	1,778	807	807	1,174	72.4%	49.5%	51.5%
2037	1,391	1,334	1,958						
2042	1,522	1,468	2,253	983	983	1,430	54.8%	49.3%	57.6%

Note: Current forecast assumes an 85% load factor through the forecast period.
Source: Diio Mi, Schedule – Dynamic Table. HNTB, Des Moines International Airport: Future Terminal Program Definition Manual, May 2018. Landrum & Brown.

2.3 Peak Period Forecasts

Aircraft parking capacity is impacted by several factors including the number of aircraft on the ground at any time during the day. There are two types of parking positions at the Airport: 1) parking positions connected to the terminal building, referred to as contact gates, and 2) stand parking positions that do not allow for active use, referred to as remain overnight (RON) parking positions.

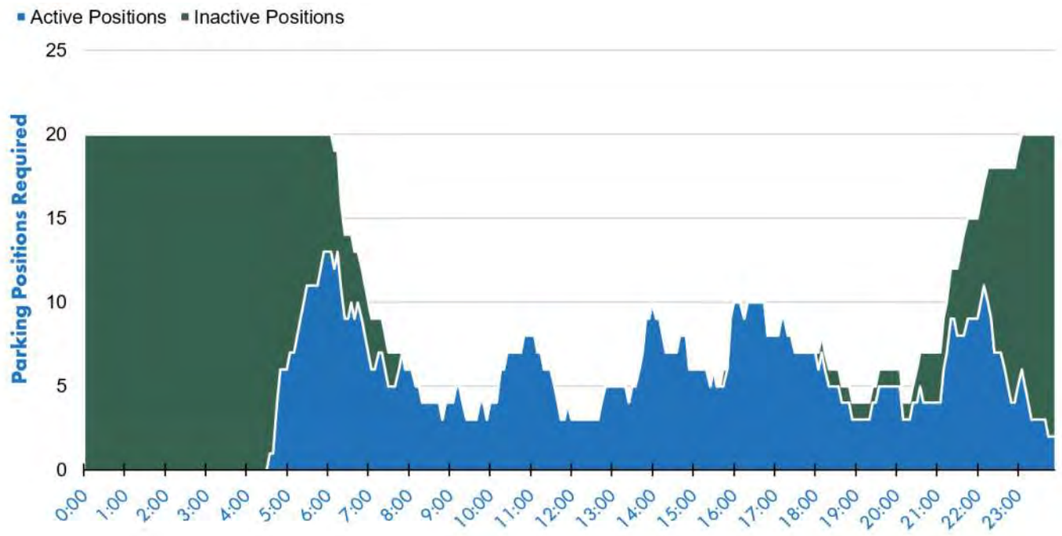
Contact gates and remote stand positions allow for the active loading and unloading of passengers. RON parking positions allow for efficient use of the contact gates and remote stands by towing aircraft that are not in use to these areas of the Airport to allow for the maximization of active aircraft to these parking positions.

To provide an estimate for the number of aircraft parking positions required at DSM, an aircraft on the ground analysis was conducted. This analysis was conducted by using the developed DDFSs. The time between an arrival and a departure for each aircraft is referred to as the time on the ground. All aircraft that both arrive and depart on the design day are considered active aircraft. However, any aircraft that remains on the ground overnight is subject to the following requirements to be considered an active aircraft:

- Aircraft on the ground 30 minutes after arrival
- Aircraft on the ground 60 minutes prior to departure

The sum of all aircraft on the ground for each 5-minute bucket across the day is calculated to provide an understanding of how many aircraft are on the ground at any time of the day. The same calculation is done for only active aircraft. **Figure 2.11** graphically depicts the total number of aircraft on the ground through the design day for 2022 by status.

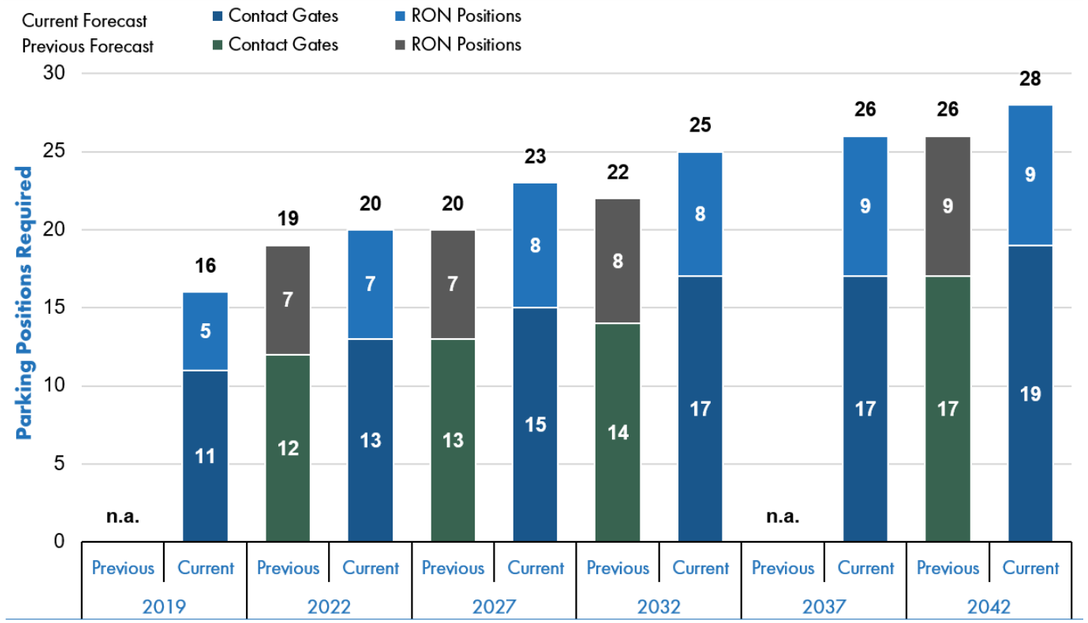
Figure 2.11: Active and Inactive Positions Required



Source: Diio Mi, Schedule - Dynamic Table. Landrum & Brown.

The maximum number of active aircraft represents the total number of contact gates required. The difference between the max total (active and inactive) aircraft on the ground and the number of contact gates required provides the required number of RON parking positions. For example, there is a peak of 13 active aircraft on the ground during the morning departure peak. Therefore, there are 13 required contact gates. There are total of 20 aircraft that are RON and 13 of those aircraft can park on contact gates while the other 7 need RON parking positions. This analysis was conducted for all the DDFSs developed and the results with comparisons to the previous PDM forecast are provided in **Figure 2.12**. It was assumed that gating at the Airport would utilize a common-use or preferential-use rather than providing exclusive-use gates. The use of exclusive-use gates would likely result in an increase in the number of required parking positions. By 2042, 28 gates would be required at the Airport to hand peak demand (19 contact and 9 RON positions). Future gate demand suggest that six additional contact gates and two additional RON positions are required to meet the 2042 needs, compared to the demand in 2022.

Figure 2.12: Comparison of Gate Requirements



Source: Diio Mi, Schedule - Dynamic Table. Landrum & Brown.

Chapter 3 | Existing Conditions

3.0 Existing Conditions

This chapter summarizes existing conditions for the Des Moines International Airport. For the purposes of this chapter, existing conditions and functional usage of the terminals are subdivided into four topical areas: Terminal Building, Airside, Site Utilities, and Landside.

Further detail regarding the existing conditions can be referenced in the 2014 Terminal Area Concept Plan Report.

Figures are included to show existing utilities and potential demolition required for the new terminal.

3.1 Terminal Building

The Des Moines International Airport opened its doors to commercial service in 1933 and has since been the primary, largest airport in Iowa, serving nearly all of Iowa's 3.1 million residents. The FAA ranked DSM as 83rd in number of passenger boardings across the US in 2014, serving nearly 2.5 Million Annual Passengers (MAP). Additionally, it is classified in the National Plan of Integrated Airport Systems as a primary commercial service airport, which identifies DSM as a key link in local and national air transportation. The airport's catchment area includes passengers across Iowa and parts of Missouri and Nebraska. Recently, DMAA identified that 87% of their passengers travel to fly out of DSM from within a 75-mile radius, but the remaining 13% come from the rest of Iowa. This is reflected in the airport's number of origination/destination flights, and the number of meeter/greeters that frequent the terminal. One of DMAA's main goals is to create a convenient, efficient experience for passengers, which includes providing more direct flights across the country. In 2018, the three mainline passenger airlines and three low-cost carrier airlines will offer nonstop service to 21 destinations across the nation. However, the aging terminal cannot sustain passenger growth rates because facilities are constrained and the concourse cannot expand to add more gates. Some of the constrained areas, including ticketing, security, baggage handling, holdrooms and the restrooms already constitute an inadequate level of service and will continue to decline as DSM reaches the 3.0 Million Annual Passenger (MAP) mark.

3.1.1 Space Utilization

NO UPDATE

3.1.1.1 Basement (Level 0)
NO UPDATE

3.1.1.2 Arrivals Level (Level 1)
NO UPDATE

3.1.1.3 Departure Level (Level 2)
NO UPDATE

3.1.2 Terminal Mechanical /Electrical /Plumbing (MEP) Systems

The following sections describe the existing MEP systems in the Terminal Building.

3.1.2.1 Electrical Systems
NO UPDATE

3.1.2.1.1 Power
The existing terminal electrical power is supplied from two separate MidAmerican Energy substations. Primary metered metal enclosed switchgear is located in the existing North Parking Garage with 13.2kV underground feeders looped to seven secondary unit substations ranging from 500kVA to 2500kVA. The substation switchboards supply power at 480/277V and 208/120V, 3 phase, 4 wire.

Two substations are located in the existing terminal processing area and five others are located in the stem and concourse areas on ground level. Of the five substations in the concourse area two are dedicated to boarding bridge power, aircraft ground power units (GPU), and aircraft pre-conditioned air units (PCA). The remaining three supply mechanical equip. and general power/lighting loads throughout the concourse and stem. Substation #1 in the terminal processing area supplies mechanical equip. and general power/lighting loads for ticketing, baggage and admin office areas. Subst. #5 in the terminal processing area supplies power for the chiller plant and baggage claim area. Subst. #5 also supplies power for a 250HP fire pump via a dual source ATS. The second source for the ATS originates from Subst. #3A located in the stem.

3.1.2.1.2 Emergency Power
There are three diesel 480/277V generators supplying backup power for the existing terminal and concourse. A 350kW generator provides emergency power for the main terminal processing area. A 250kW generator provides emergency power for the stem and concourse. Another 750kW generator is located in the stem area and is currently supplying optional standby power for the stem and concourse. The 750kW generator originally served airfield lighting, however, airfield lighting has been relocated to a remote building, allowing the generator to be repurposed.

3.1.2.2 Lighting Systems
NO UPDATE

3.1.2.3 Fire Alarm Systems
Existing fire alarm system is JCI (Simplex Grinnell) with voice annunciation. The main control panel is located in the basement of the main terminal with NAC panels and additional power supplies located throughout the facility. Partial smoke detection is installed to provide coverage in utility rooms and corridors.

3.1.2.4 Heating Systems
There are two fully independent heating water systems in the Terminal Building. Both systems were installed in 2011. The first system, located in the Basement, serves everything east of passenger screening. It contains three, 3000 MBH high-efficiency, condensing boilers and primary secondary pumping with three 30 HP variable speed distribution pumps. The system is designed for a supply temperature of 180°F and a return temperature of 155°F. DDC controls reset supply water temperature based on outside air.

The second system, located in a Ground Floor Mechanical Room near Gate C2, serves everything west of passenger screening. This system contains four 2000 MBH high-efficiency condensing boilers and primary secondary pumping with three 7-½ HP variable speed distribution pumps. The system is designed for a supply temperature of 180°F and a return temperature of 120°F. DDC controls reset supply water temperature based on outside air.

All heating water piping is routed internal to the building and is not buried. The systems are not interconnected.

Gas service is provided to each boiler room. The gas for the Boiler Rm near Gate C2 is buried under the apron, and follows a path similar to the Chilled Water piping. (see Section below for chilled water pipe routing.

3.1.2.5 Cooling Systems

Cooling for the majority of the Terminal building is provided by three, 350-ton, water-cooled chillers and three cooling towers. The chilled water plant is located above the Bag Claim Garage. Two of the chillers were installed in 1996 during the Bag Claim Expansion and the third was added in 2007. The cooling towers vary in age with one dating before 1996, as it was relocated during the Bag Claim project, one installed new in 1996 and one installed in 2007. The oldest cooling tower is counterflow style with two basins connected by equalizer piping. The towers installed in 1996 and 2007 are similar and are cross-flow design with basin heaters. Chilled water pumping is primary secondary. The chilled water plant is designed for a supply water temperature of 42°F and a return water temperature of 54°F.

Chilled water piping for all devices east of passenger screening is routed inside the building. Chilled water piping for all devices west of passenger screening is direct buried below the apron. 8" chilled water supply and return mains leave the chilled water plant and exit the building under Concessions, heading west parallel to the passenger screening portion of the building. At the Concourse, the piping tees and continues direct buried along the east face of the Concourses. Chilled water branch piping enters each Level 1 Mechanical Room in the Concourse (7 total) to provide chilled water for Air Handlers MZ-1 through MZ-9.

A handful of areas receive cooling by small DX systems where chilled water is not available or year-round cooling is required, such as the Data Center.

3.1.2.6 Ventilation Systems

Air Handling systems in the Terminal building are varied. Descriptions are given in the Table below for the main systems.

AHU	Location	Serves	Type
MVU-1	Basement	Ticketing	Dual duct with dual duct terminal boxes in the space
ACU-A thru H	Basement, Level 2 Admin and Level 3	Level 2 Administration Offices	Dual deck with mixing dampers at unit
AHU-3	Above Bag Claim Garage	Bag Claim	Multi-zone VAV with reheat at box.
MZ-1 thru MZ-9	Level 1 Concourse various locations	Level 1 and Level 2 of Concourses	Dual deck with mixing damper at unit
AHU-10	Level 1 near Gate A2	Airside Restaurant	Multi-zone VAV with reheat at box.

The majority of the Air Handling systems were installed in 1969. All air handlers listed above and their associated zone mixing dampers or boxes are on the Siemens DDC HVAC control system.

3.1.2.7 Plumbing Systems

The domestic water entrance is at Basement Level near the Mechanical Room.

Water heaters that serve the area east of passenger screening are located on the Basement Level, southwest corner and were installed in 2011. There are multiple water heaters that serve the areas west of passenger screening and are located on Level 1 below the Concourses.

Sanitary and storm for the areas east of passenger screening exits the building on the east side. Sanitary for the areas west of passenger screening flows to the north and then turns east. See Existing Sanitary Sewer Diagram in the original 2018 PDM.

There are three buried grease interceptors that serve the Terminal. Once serves the Landside Restaurant, and was installed in 2016. It is precast construction, sized at 3000 gallons and is located directly west of the Landside Concessions. Two series piped grease interceptors serve the Airside restaurant. A 4000 gal. interceptor was installed in 2016 along with a 3000 gal. one installed in 2006. Both are located in the drive-through slab below the Airside Restaurant.

All roof areas have roof drains with multiple storm sewer outlets along the building.

3.1.2.8 Fire Protection Systems

The Terminal fire protection systems are served by a 250 HP, 2000 GPM fire pump installed in 2009. The fire pump is located on Level 1 directly east of the drive-through that goes under passenger screening. The fire pump is not on emergency power as the building is served by dual power feeds, and at the time of design the building had not experienced on outage of more than 4 hours in the last 12 months. The AHJ confirmed that relying on the dual feeds as a back-up power source was acceptable, however one of the power sources are located in the portion of the Terminal Bldg. to be demolished. This source will need to be replaced either with a secondary power supply. This fire pump serves all sprinkler systems and wet standpipes located in the stairwells. All areas of the Terminal are sprinklered with the exception of Baggage Claim, Level 2 Administration Offices and portions of the Level 1 Concourses.

3.2 Airside

The following subsections describe the current gate layout at DSM as well as information on ground service vehicle roads and aircraft circulation.

3.2.1 Gate Layout

The terminal is currently served by 12 aircraft contact parking positions; Gates A1 through A5 in Concourse A and Gates C1 through C7 in Concourse C. These positions allow parking for up to twelve narrow-body aircraft, as shown on **Figure 3.4**.

The terminal apron also provides off-gate aircraft parking directly adjacent to gate positions for remain-overnight (RON) aircraft (refer to **Figure 3.4)**.

3.2.2 Vehicle Service Road

NO UPDATE

3.2.3 Aircraft Flow

NO UPDATE

3.3 Landside

Existing landside facilities encompassing the roadways, curbside, parking and rental car facilities are summarized in this section.

3.3.1 Roadways

The terminal roadway network is depicted in **Figures 3.6**. As shown, the primary passenger terminal entrance is from Cowles Drive near Highview Drive at Fleur Drive, a major north-south arterial providing regional access to the airport. A signalized intersection is provided off Fleur Drive. This provides access to the terminal curbside and parking facilities. Cowles Drive is two lanes approaching and leaving the curbside and three lanes after the parking exit joins the outbound roadway.

Secondary access to Cowles Drive is provided from Duck Pond Road, which is a two-lane bi-directional roadway paralleling Fleur Drive from McKinley Drive on the north to Army Post Road on the South. To the South, the road becomes Leland Avenue, wraps around the Runway 31 threshold, and provides access to the Grey Lot, Cell Phone Lot and the rental car service area or quick-turnaround (QTA) facility. On the north side, the road wraps around the Runway 23 threshold and provides access to north general aviation complex.

3.3.2 Curbsides

NO UPDATE

3.3.3 Parking

Public parking is provided both within the terminal area and in remote facilities. As shown in **Figure 3.6**, two garages, a long-term surface lot and short-term surface lot are located within the terminal roadway loop. Two economy lots (Green and Blue Lots) are located just south of the terminal loop roadway, west of Fleur Drive. Additional remote Lots, requiring bussing, are located further south of the terminal. As shown in **Figure 3.6**, the Red Lot is located east of Fleur Drive near Army Post Road and the Grey Lot is located along Leland Avenue adjacent to Army Post Road. Public access is provided from the intersection of SW 28th Street and Army Post Road with direct access into the terminal along Leland Avenue. There is a 1,700 stall lot adjacent to the rental car QTA that is used for rental car storage. The lot has a direct connection to the rental car QTA facility. Employee parking is provided in the north end of the Blue Lot. Additional parking is provided by off-Airport private operators including Keck Parking, east of Fleur Drive. **Table 3.2** summarizes the number of parking spaces available in each airport operated lot.

Table 3.2 - Existing Parking Supply

Facility	Number of Spaces
Terminal Area	
Short-Term Surface (Hourly)	98
North Garage Short-Term (Level 1)	243
North Garage Long-Term (Levels 2-4)	699
South Garage Long-Term (Levels 1-4)	675
Garage Connectors	78
Long-Term Surface	280
Sub-Total Terminal Area	***2,073***
Economy Parking	
Red Lot	848
Blue Lot	400
Green Lot	379
Grey Lot	1,173
Sub-Total Economy Parking	***3,340***
Total Public	**5,413**
Employee	**224**
Cell Phone Lot	**38**

3.3.4 Rental Car

Table 3.3 - Existing Rental Car Facilities

Facility	Number of Spaces
Rental Lot 1	168
Rental Lot 2	99
South Garage Level 1	168
Total Ready-Return Stalls	**435**
Storage - Economy Lot 4	**1,700**

The rental car service area or QTA, which provides washing and fueling facilities, is located approximately ½ mile south of the terminal, as shown on **Figure 3.6**. The QTA contains five car wash bays, seven light maintenance bays, 20 fuel pumps, and approximately 95,000 sq. ft. of stacking and storage space. Each brand is assigned a light service bay while the car washes and fuel pumps are common-use. The stacking/storage space is allocated in accordance with revenue market share. The QTA is approximately four acres and an additional 1,700 storage spaces are leased in the adjacent surface parking lot. Stored vehicles are typically stacked nose-to-tail, allowing additional vehicles to be accommodated.

3.4 Site Utilities

This section reviews the existing site utilities servicing the Des Moines International Airport terminal. The preferred site location for a rental car facility was also reviewed. The utilities reviewed include site power, the domestic water supply, fire protection water supply, sanitary sewer, stormwater management infrastructure, natural gas, and fuel distribution system.

3.4.1 Site Power

NO UPDATE

3.4.2 Domestic Water Supply System

NO UPDATE

Refer to **Figure 3.10** for existing water distribution map.

3.4.3 Fire Protection Water Supply System

NO UPDATE

Refer to **Figure 3.10** for existing water distribution map.

Figure 3.5 - Des Moines Airport Diagram

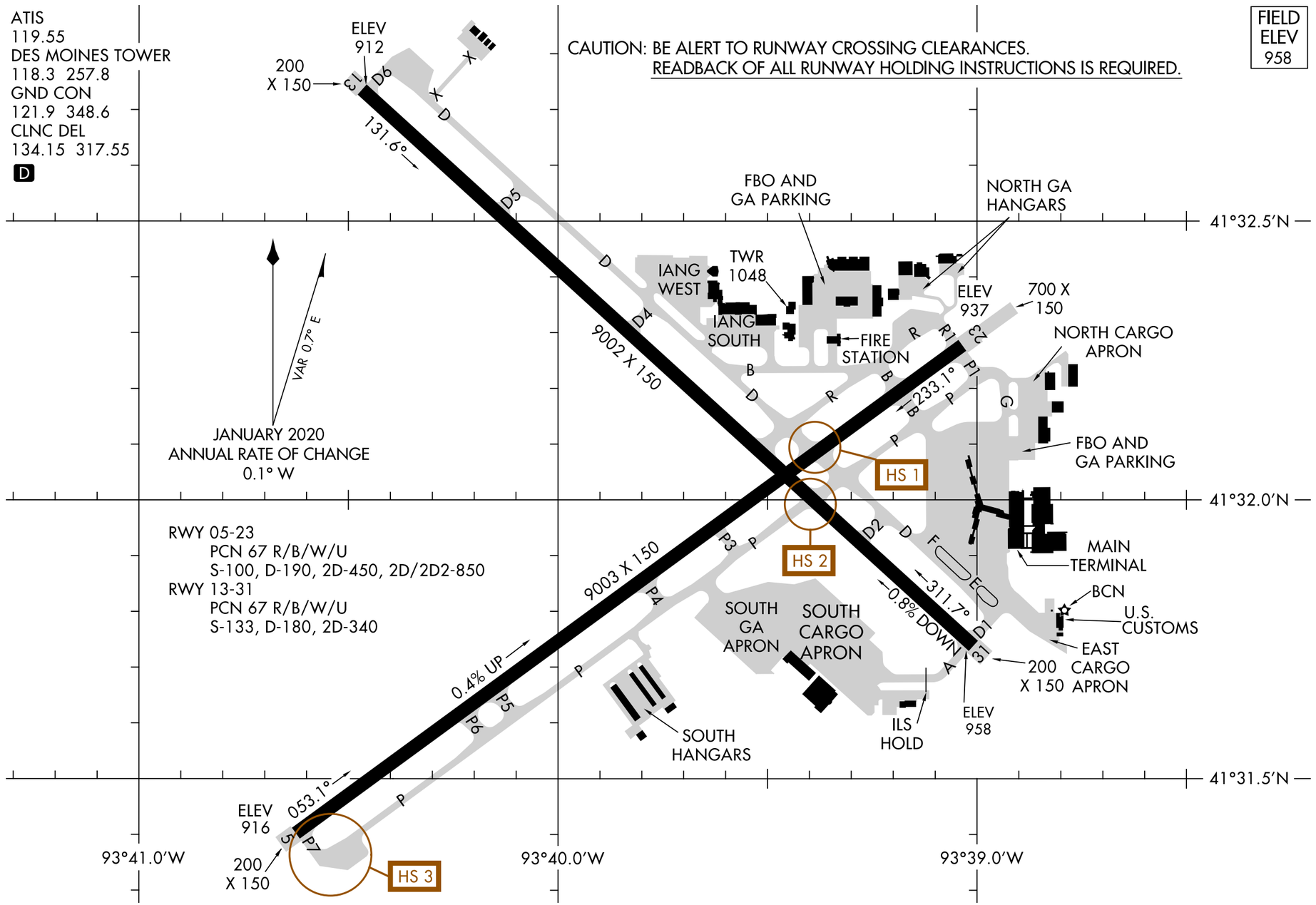


Figure 3.6 - Existing Terminal Roadway and Parking Network

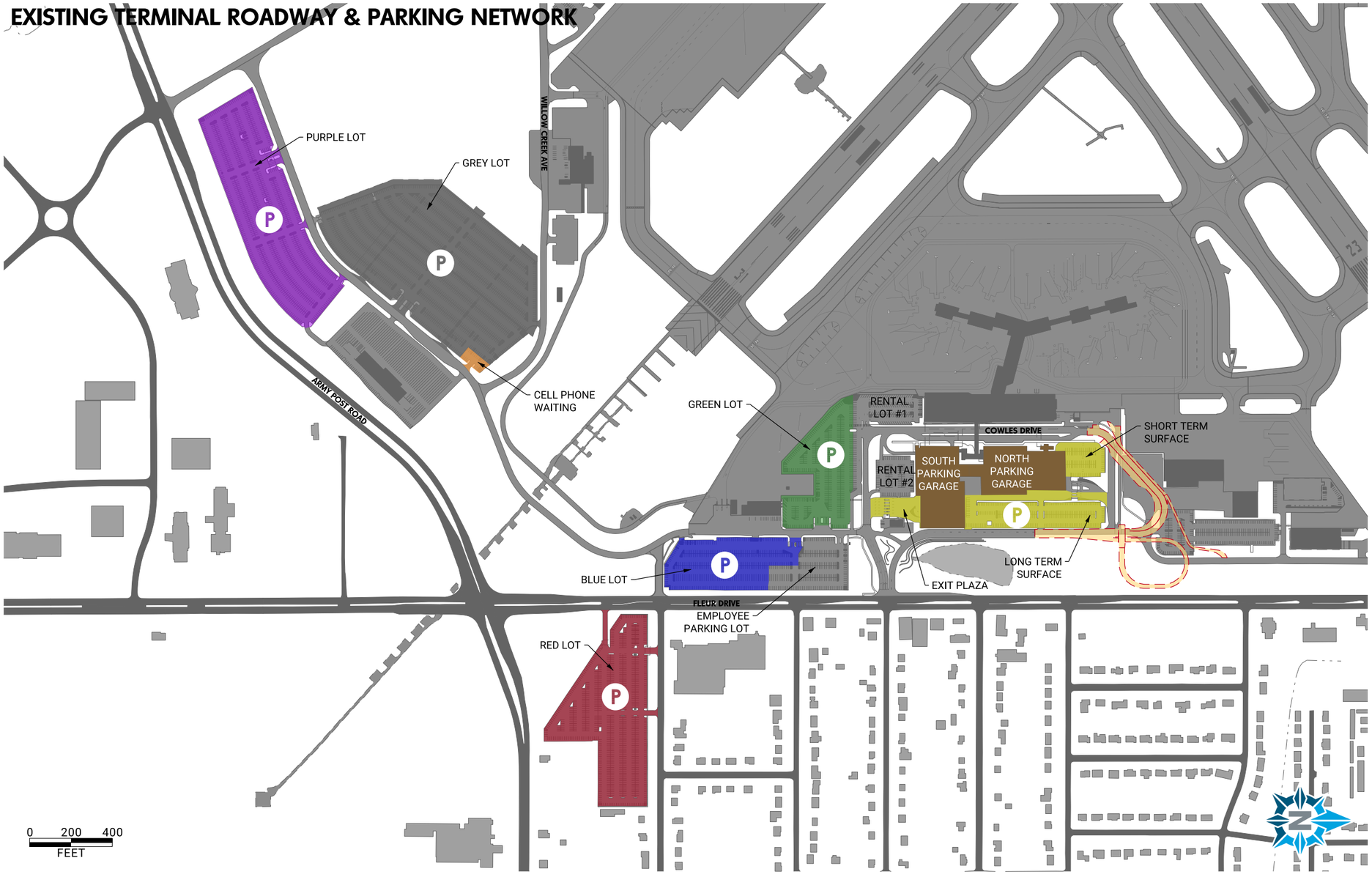


Fig 3.6 Existing Terminal - Roadway and Parking Network

3.4.4 Sanitary Sewer

NO UPDATE

Refer to **Figure 3.11** for existing sanitary sewer map.

3.4.5 Stormwater Management Infrastructure

NO UPDATE

3.4.5.1 Storm Sewer System - Airside System Operation During Deicing Season

During the existing deicing season, both the Terminal Tank and the South Cargo tank volumes are slowly released to the sanitary sewer system, to comply with pollutant loading requirements of the Iowa Department of Natural Resources and the Des Moines Water Reclamation Authority.

Terminal Area - Deicing operations on the Terminal Apron are restricted, meaning deicing may only occur in the location shown in green in **Figure 3.12**.

- Storm Runoff - typically from late October to early May the storm runoff from the Terminal pavement and snow dump areas are routed to the Terminal Tank.
- Pavement Underdrainage – from late October to early June the underdrainage from the Terminal pavement is routed through a diversion structure to the Terminal Tank.

South Cargo Area - Deicing operations on the South Cargo Apron are restricted to the locations shown in green in **Figure 3.12.**

- Storm Runoff – from late October to early May the storm runoff from the east area South Cargo pavement and adjacent snow dump areas are routed to the Terminal Tank. Previously the low flow was diverted to the north tank in the South Cargo area.
- Pavement Underdrainage – the pavement underdrainage piping coincides with the surface drainage runoff patterns and empties in the same inlets of the storm runoff.

3.4.5.2 Storm Sewer System - Airside System Operation During Non-Deicing Season

NO UPDATE

3.4.6 Natural Gas

NO UPDATE

Refer to **Figure 3.9** for existing natural gas lines map.

Figure 3.9 - Existing Electric & Gas Map

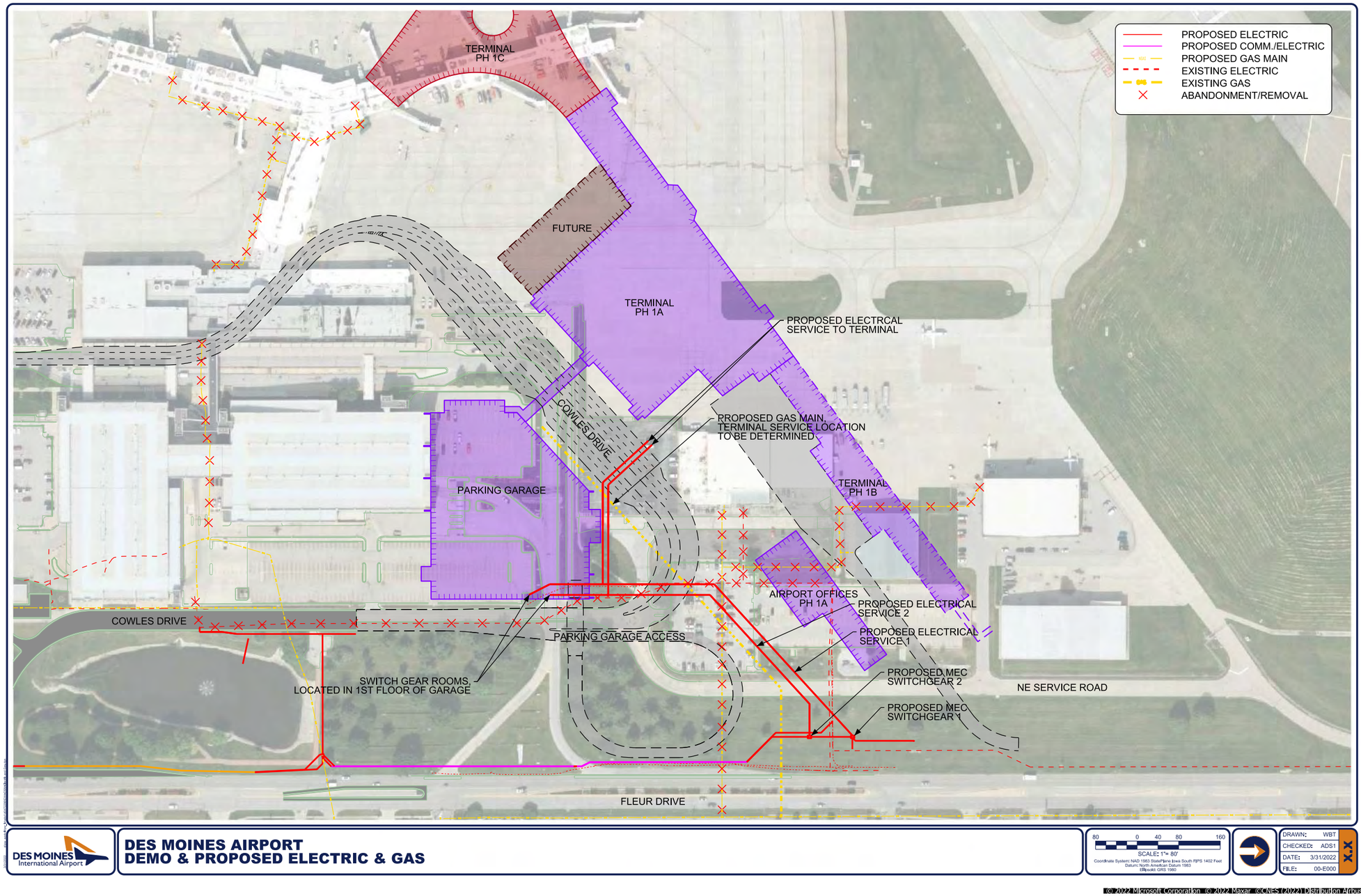


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Fig 3.9 Existing Terminal - Electric & Gas Map

Figure 3.10 - Existing Terminal - Water Distribution

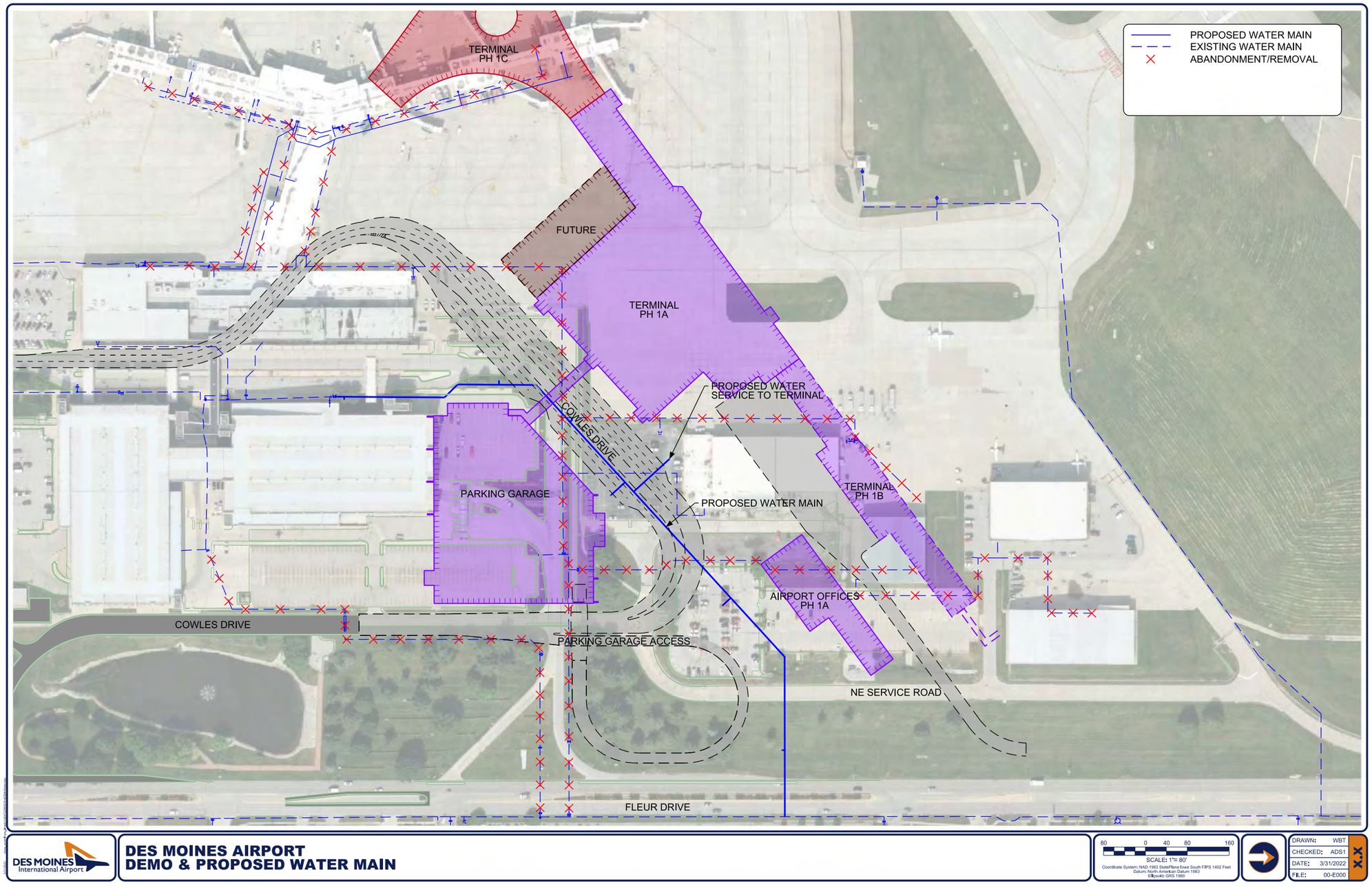

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Figure 3.11 - Existing Sanitary Swer

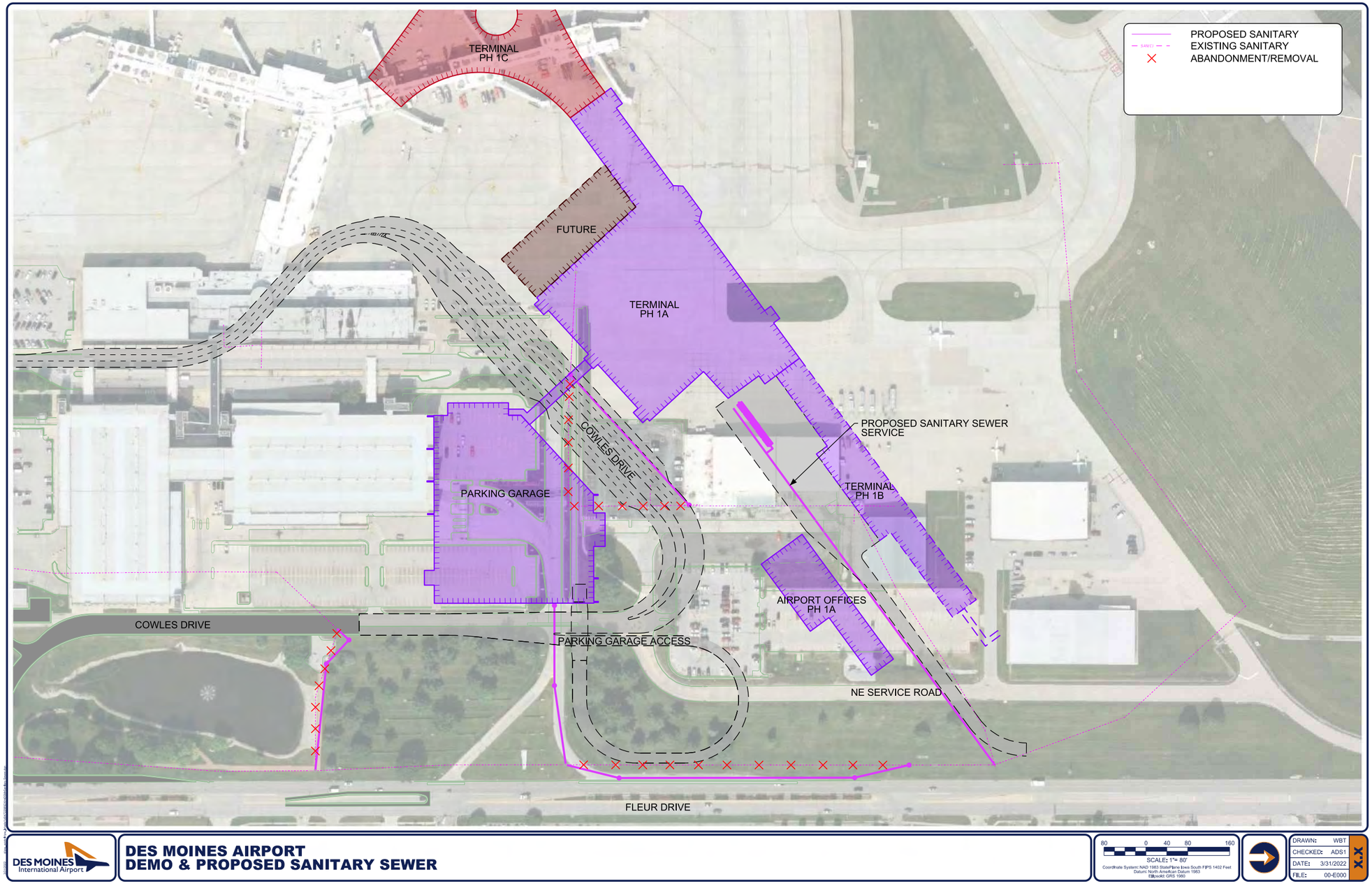

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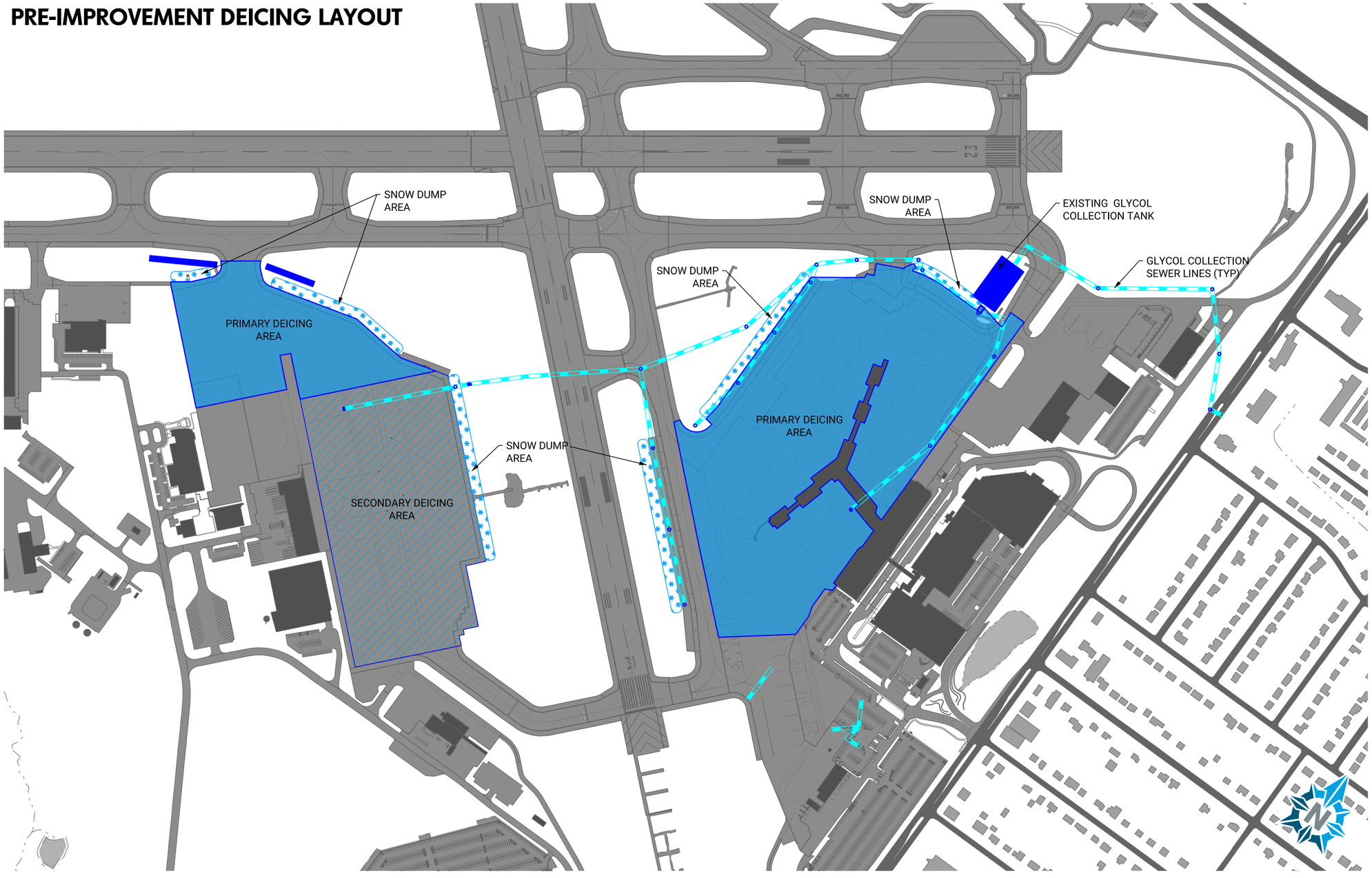
Fig 3.11 Existing Sanitary Sewer

Figure 3.12 - Existing Terminal - Deicing Operations



Chapter 4 | Program Requirements

4.0 Program Requirements

4.1 Overview

Program requirements for Des Moines International Airport (DSM) were developed using the 2018 planning requirements with revisions based on new forecast and budget considerations, and the consultant's planning data, and industry planning guidelines. The following summary outlines functional facility requirements for check-in and airline ticket offices, holdrooms, baggage claim and baggage offices, outbound baggage and inbound baggage make-up, and Department of Homeland Security (DHS) facilities including Transportation Security Administration (TSA) passenger security screening checkpoint and checked baggage screening facilities. Non-passenger processor facility requirements were developed for airport administration, restrooms, and other miscellaneous terminal areas.

Facility and space requirements described in this section address passenger processing facilities for the forecast planning activity level (PAL) representative of demand for 3.3 million annual passengers (MAP) for forecast year 2032 and budget considerations. This milestone is known as PAL 3.0.

4.2 Program Requirements Summary

Area requirements were developed by applying generally accepted industry standards for desired level of service (LOS) and performance criteria to a level of demand, typically representing peak periods of activity at each individual facility processor component or subsystem and budget considerations. **Table 4.1** summarizes and compares the existing terminal inventory and forecast year 2032 PAL 3.0 program requirements. **Table 4.1** must be revalidated for current and future programming requirements. Assumptions shown may still be valid for future dates based on current emplacements and peak data. However, forecast timeframes may need to be adjusted.

Table 4.1 - Passenger Terminal Building - Facility Program Requirements - Total Area by Function

Space	Existing Terminal SF 2016*	Proposed New Terminal Program Year 2027**
Airline Functions		
Ticketing		
Ticketing (Counters, Queuing & Kiosks)	6,552	9,800
Kiosks (Self Check-in & Bag Drop Position @ Counter)	Included in SF above	Included in SF above
Ticket Counter Queuing	-	-
Lobby (Self Service Check-in) (2-Step Process)	-	Included in SF above
Remote (Self Service Check-in)	-	-
Airline Ticket Office	4,580	3,010
Curbside Baggage Check	-	-
Departure Lounge (Gates)	22,010	39,000
Baggage Claim (SF)	7,462	8,540
Baggage Service Office/Storage	-	1,380
Outbound Baggage	16,905	22,520
Inbound Baggage	3,313	8,730
Operations/Maintenance/Storage	8,419	17,230
Clubs/VIP Room/International VIP Lounge	-	-
Subtotal Airline Functions	**69,241**	**110,210**
Concessions Space		
Food & Beverage	12,305	16,500
Convenience Retail	Included in SF above	3,840
Specialty Retail	Included in SF above	1,840
Support/Storage	10,371	4,670
Other-Rental Car, etc.	4,080	To be Located in Garage
Subtotal Concessions Space	**26,756**	**26,850**
US Customs and Border Protection		
Customs/Immigrations/Support	-	-
Subtotal U.S. Customs and Border Protection (FIS)	**N/A**	**N/A**
Secure Public Area		
Security Screening Checkpoint (Includes Queuing Area)	10,205	11,820
Circulation - General	43,694	43,220
Restrooms	2,933	7,150
Subtotal Secure Public Area	**56,832**	**62,190**
Non-Secure Public Area		
Circulation		
Circulation - Ticketing	Included in SF below	Included in SF below
Circulation - Baggage Claim	Included in SF below	Included in SF below
Circulation - General	31,632	31,900
Vestibules	Included in SF above	Included in SF above
Restrooms	3,235	2,810
Others (Miscellaneous Areas)	-	-
Subtotal Non-Secure Public Area	**34,867**	**34,710**

Non-Public Area		
Airport Administration	15,023	9,320
Other (Loading Dock/Receiving/Mech. Exterior Support)	-	-
Airport - GSE/Vehicle Storage & Maintenance	29,457	8,880
TSA Offices/Support	3,723	6,410
Airport Police Station	805	250
CBIS (Checked Baggage Inspection System)	Incl'd in Outbound Bag.	23,200
Subtotal Non-Public Area	**49,008**	**48,060**
Airport Operations and Maintenance		
Airiport Operations and Maintenance	Included in SF above	Included in SF above
Mech./ Elect./IT-Comm./Plumb. & Fire Protection/Misc. Bldg Systs		
Mechanical	19,833	4,170
Electrical	5,129	5,610
IT-Communications	2,571	4,540
Plumbing & Fire Protection	Included in Mech. above	1,900
Subtotal Airport Operations, Maintenance & Misc.	**27,533**	**16,220**
Total All Areas	**264,237**	**298,240**

** HNTB analysis of DSM Programming Questionnaires and HNTB application of updated forecast*

*** Some terminal areas fulfill Year 2042 program requirements*

4.3 Level-of-Service Standards and Performance Criteria

4.3.1 Level of Service Standards

Level of Service (LOS) is an industry accepted value system of space standards and guidelines that are used to assess performance and congestion levels within terminal facilities. The International Air Transport Association (IATA), Airport Development Reference Manual, 9th Edition was used to define the recommended LOS C standards, unless superseded by DSM Authority, airline stakeholder preferences or budget constraints. LOS C is typically used as a performance criteria target for most airport terminals and is recommended by IATA as the minimum design objective, as it denotes good service. For purposes of this analysis, facility requirements have been calculated to achieve the LOS C goal during peak periods of passenger demand on facilities used to process passengers and baggage, including: check-in, security screening checkpoint, baggage handling and screening systems, and holdroom areas. The passenger queuing and circulation conditions are generally defined by the IATA LOS grades as listed below in **Table 4.2**.

Table 4.2 IATA Level of Service Grades

LOS A	Excellent level of service; condition of free flow; excellent level of comfort
LOS B	High level of service; condition of stable flow; very few delays; high level of comfort
LOS C	Good level of service; condition of stable flow; acceptable; good level of comfort
LOS D	Adequate level of service; condition of unstable flow; acceptable delays for short period of time; adequate level of comfort
LOS E	Inadequate level of service; condition of unstable flow; unacceptable delays; inadequate level of comfort
LOS F	Unacceptable level of service; condition of cross flows; system breakdown and unacceptable delays; unacceptable level of comfort

4.3.2 Performance Criteria

NO UPDATE

4.4 Terminal

4.4.1 Check-in

Check-in is the process by which passengers obtain their boarding pass and baggage tag, if they are checking in bags, prior to proceeding to the security checkpoint to be screened. Some DSM tenant airlines have indicated use of kiosk and two-step check-in (Kiosks and baggage drops) processes for future requirements while others recognize that future technologies may eliminate kiosks altogether as people continue to use their mobile devices. The methods and technologies for which passengers obtain boarding passes and baggage tags are defined as passenger check-in attributes and when associated with passenger show-up profiles and LOS performance criteria, form a basis for check-in facility requirements.

Performance of the check-in subsystems, such as the passenger queuing and the check-in process are analyzed by wait time goals for time in queue and average processing times by passenger type. The amount of time a passenger waits for service and the amount of time required to process each passenger type at a check-in position varies depending on the degree of assistance required. For this reason, passenger attributes or the methods and technologies are segmented into four categories, which include bypass, kiosk, mobile and agent. Each category utilizes various check-in equipment positions and are defined as follows:

- Bypass (Internet/Mobile Device) Check-in: Passengers who do not check bags and who are able to check-in remotely, prior to showing up at the terminal, and do not use the terminal facilities
- Mobile Check-in: Passengers who have printed their boarding pass off-site (home, hotel, office, etc.) or on their cell phone
- Kiosk Check-in: Stand-alone kiosks located in front of in line positions or remotely from the check-in counter, where passengers acquire boarding passes and/or print baggage tags
- Baggage Drop Positions: Airline staff tag and accept bags from passengers who checked in online (mobile) or at a kiosk for two-step check-in process, considerations need to be made for one-step process when accepted by TSA.
- Full Service (Agent) Check-in: Airline staff may assist passengers in acquiring boarding passes and where check-in bags are accepted

Check-in facilities in airport terminals range in configurations depending on airline operational preferences. Various configurations may include traditional linear agent counters with or without built-in self-service devices, island counters, or a mix of remote self-service devices and baggage tag check-in positions. Space requirements between these configurations may differ slightly depending on the size of equipment.

Areas that constitute the check-in area are described below:

- Check-in Position: The location where passengers are checked in by airline staff or kiosk in the check-in lobby. A single check-in counter position is assumed to be 5 feet wide, with 3' behind counter to bag belt for staff.It is anticipated that the take-away belt will be sized for odd side baggage acceptance.

4.4.2 Airline Support Spaces

NO UPDATE

4.4.2.1 Airline Offices

NO UPDATE

4.4.2.2 Airline Baggage Service Offices

The airline baggage service office (BSO) area is programmed to include passenger service counters, waiting areas, and storage for delayed or unclaimed baggage. The BSO area has been programmed to be common use.

4.4.2.3 Ramp Level Facilities

This area has been partially programmed based on airline and DSM input. The facilities contributing to the ramp level space are comprised of two types: covered enclosed area and covered unenclosed area. The covered unenclosed space is provided for various types of storage not requiring protection from the environment (i.e. equipment parts storage). Typical uses for covered enclosed spaces include offices, break rooms, lockers and storage areas for terminal service crews, maintenance offices, and workshops and storage areas, etc. Similar to programming of airline offices, the requirements for these areas generally based on existing carrier leased space or their projected future requirements. Further discussion with DSM and airline is required to determine exact airline space requirements.

4.4.3 Department of Homeland Security

The Department of Homeland Security (DHS) maintains in-terminal facilities such as the security screening checkpoint and the baggage screening areas to conduct airline security screening and screening of passenger baggage. The DHS terminal facility requirements are based on the following publications:

- Current Transportation Security Administration (TSA) Recommended Security Guidelines for Airport Planning, Design and Construction.
- Current Transportation Security Administration, Planning Guidelines and Design Standards (PGDS)
- Current Transportation Security Administration, Checkpoint Design Guide (CDG)

Computer modeling was utilized to developed passenger demand based on flight schedule analysis and application of growth factor for planning years 2027 and 2042.

4.4.3.1 Passenger Security Screening Checkpoint and TSA Support

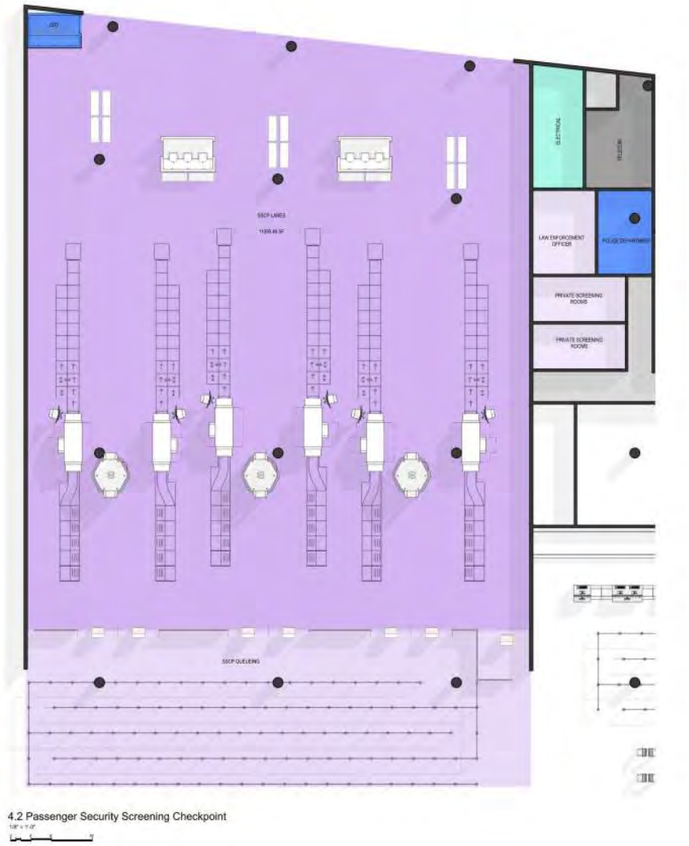
The security screening (SSCP) consists of baggage screening machines, magnetometers, advanced imaging technology (AIT) units and inspection areas. Placement of the SSCP delineates the secure and non-secure areas of the facility. While the TSA has direct responsibility for determining the size and configuration of the SSCP, TSA typically collaborates with the airport management and the management's design consultant to plan checkpoint locations and programs. The Checkpoint Requirements and Planning Guidelines (CRPG), September 30, 2021 provides guidelines for developing the requirements for checkpoints in the terminal, along with the following criteria:

- TSA prescribed planning screening rate of 150 passengers per hour per lane was used for standard lanes, while TSA Pre-Check lanes have a screening rate of 250 passengers per hour.
- The required number of checkpoint lanes were developed to provide the throughput needed to maintain the TSA wait time goal of 10 minutes during the peak 10-minute demand interval of the peak hour.
- The queue area assumes 10.8 sf per passenger in queue, and provides the capacity to hold passengers for 20 minutes.
- The SSCP should be designed to accommodate Automated Screening Lane (ASL) technology.

Figure 4.2 illustrates the proposed passenger security screening checkpoint programmed and based on the TSA Checkpoint Design Guide (CDG).

Figure 4.2 Passenger Security Screening Checkpoint

Figure 4.2 Passenger Security Screening Checkpoint



4.4.3.2 TSA Checked Baggage Inspection System (CBIS)

A Preliminary program and concept have been developed for the Checked Baggage Inspection System (CBIS). The planned location of the CBIS is adjacent to the proposed outbound area. At this juncture of completing this Program Definition Manual, the CBIS has been programmed and planned to satisfy baggage screening requirements based on the forecast activity levels of aircraft, passengers and baggage.

4.4.4 Baggage Claim

The claim devices shall be free-standing flat plate devices, completely positioned within the baggage claim hall. The devices will not penetrate the Terminal wall separating sterile from public area but fed by conveyors running in the basement to keep views open. Each conveyor feeding line has an automatic security door to prevent unauthorized access. The loading of bags onto the claim devices is controlled automatically by the baggage controls system in a safe manner.

4.4.5 Outbound /Inbound Baggage

The baggage handling system (BHS) shall at a minimum be based on U.S. standard BHS dimensions (i.e. 42-inch-wide belts) for standard bags. Overhead baggage shall have catwalks for servicing.

The checked bag screening inspection system (CBIS) shall be compliant with the latest TSA requirements, specifically follow TSA's Planning Guideline and Design Standard (PGDS) applicable at the time of design.

Tug and cart lanes shall be wide enough to navigate safely with a tug and three carts configuration.

The outbound baggage system shall at a minimum be redundant for all vertical transitions between the lobby/apron level. For all conveyance areas which require maintenance or operational access, maintenance catwalks shall be provided.

The BHS will be a common use system for all airlines operating at the airport. It shall comply to all applicable national and local codes and regulations. The BHS shall provide the required interfaces to other systems (e.g. fire alarm, card reader for to allow system operation by authorized personnel only).

Standard sized outbound baggage is checked at the two take-away ticketing conveyors in the Terminal lobby. To allow for redundant conveyance for the vertical transition, the two conveyor lines run separately from the ticketing lobby into the CBIS area where they merge.

The Baggage Handling System (BHS) distinguishes between Standard, Out-of-Gauge and Oversize bags. Out-of-Gauge bags are bags which can be transported with the conveyance system but cannot be screened by the installed automatic bag screening equipment (EDS machines). These bags can be inducted at the regular check-in desks and shall be automatically detected by the system and routed directly to the CBRA area for screening (by-passing the EDS machines).

Oversize checked items which cannot be transported with the conveyance system (more than 54 inches in length or 30 inches in width) shall be manually transported to the oversize screening area. Items which are not conveyable for other reasons (e.g. weight or fragile) will be transported manually as well.

The BHS Control room shall provide sufficient space for personnel and equipment to monitor the entire baggage handling system from one centralized location.

Monitor screens in the control room shall show a graphical representation of the baggage handling system. Each baggage equipment's status shall be easily identifiable and color coded.

The control room shall be equipped with screens large enough to read equipment identifiers from 8 feet without the need to be zoomed in to the lowest level. The control room should be equipped with a raised floor. At a minimum, the following items shall be coordinated during the design phase: layout, furniture, telephones, power outlets, desk lamps, conference table, book shelves for O&M Manuals and printers location.

From the control room the operators shall be capable to communicate via radios with staff in the field to direct them to areas within the system requiring attention.

Figure 4.3 Holdroom Configuration

No special provisions for transfer baggage must be made for the BHS. Domestic transfer bags will be handled tail-to-tail of directly loaded onto the make-up carousels for the connecting flight.

4.4.6 Holdrooms

The holdrooms or departure lounges are located at each aircraft gate and contain seating and standing areas, airline agent check-in podiums, and queuing and circulation aisles for passenger boarding and deplaning the aircraft. Holdroom areas are typically sized based on the seating capacity of the largest aircraft using the gate. Gate assumptions and the number of active gate positions needed to support the design day flight schedule are discussed under Aircraft Gate Requirements in Section 2 – Forecast.

There are two principal criteria which impact level of service in holdrooms. One is the area available per passenger, and the second is the proportion of passengers able to be seated. IATA identifies the area available per passenger and assumes an equal split of seated and standing. Other and more detailed standards are being used in recognition of increased numbers of passengers requiring seating due to changing demographics and increased amounts of carry-on baggage to be accommodated in holdroom areas. There is no universally accepted standard. We have used the approach which includes elements of space per passenger (distinguishing between seated and standing passengers), and the proportion of seated passengers.

The following selected parameters were used in programming the holdrooms:

- Aircraft Load Factor: 85% factor applied to the total number of aircraft seats to determine the number enplaning passengers within the pre-boarding area
- Seated vs Standing Passengers: 90% seated at 15 sf per passenger; 10% standing at 10 sf per passenger
- Airline Agent Gate Counter: The average area of an agent counter including counter/podium, back millwork and queue area is 562 sf. A minimum assumption was made for two agent counter positions
- Boarding and Deplaning Aisles: 4' wide aisles per holdroom.
- Holdroom Depth: 30 ft.

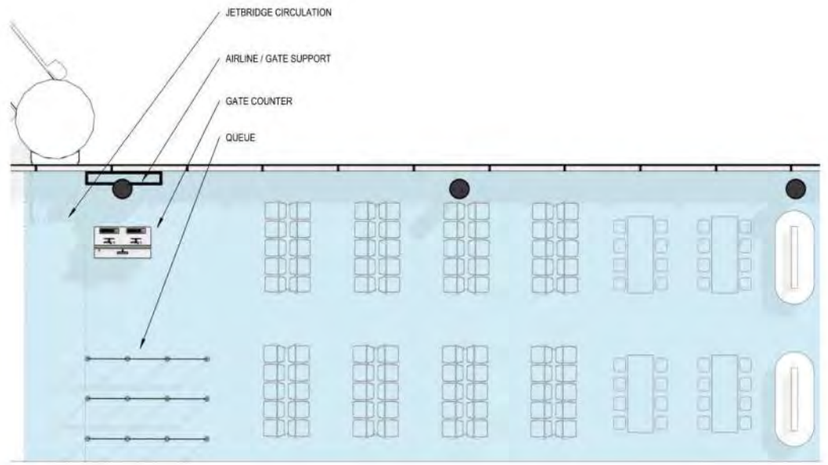
Based on the above parameters and the forecast of aircraft type (E175 up to the A320/B737), the holdrooms have been programmed at an average size of 2,535 sf. **Figure 4.3** illustrates a space template for the recommended holdroom configuration.

4.4.7 Concessions

Supportable concession space projections for the replacement terminal complex at Des Moines International Airport (the Airport) were based on 2018 information and additional space based on programming and budget considerations. Further review by the Airport concessionaire is required to complete sizing and retail/Food & Beverage mix.

The phasing of the new terminal anticipates three sequences. The 5-gate first Phase 1A includes the new processor and 5 new gates and connection to the existing Concourse A and C. This phase is anticipated to support 1.5 million enplanements at its opening increasing to 1.7 million enplanements by 2032. Phase 1B would add 4 new gates and 5 hold rooms, as the end gate would no longer share a holdroom. Phase 1C would demolish the old Concourses A and C and replace it with a new concourse for a total of 17 gates, Phase 1D would add more gates to Phase 1C for a total of 22 gates as the ultimate build out to support a forecast of 2.0 million total enplanements at the Airport.

Figure 4.3 Holdroom Configuration



The physical organization of the Airport's new terminal anticipates passengers moving through a central security screening checkpoint (SSCP) located on level 2 adjacent to ticketing. Passengers will emerge from the SSCP into the center of the departures level and then ultimately move either north or south to their respective departure gates.

4.4.8 Other Amenities

4.4.8.1 Des Moines Airport Authority Offices

The Airport Offices are to be located with the Central Utility Plant just outside the dock area and will have public access parking as indicated on the site plan.

4.4.8.2 Conference Center

NO UPDATE

4.4.8.3 Restrooms

Public restrooms have been planned throughout the facility. Each location has been programmed to include men's and women's restrooms, janitorial services, and a separate family of companion care restroom.

4.4.8.4 Loading Dock

The loading is an exterior support area and is part of the terminal processor.

4.4.8.5 Wheelchair Storage Areas

Wheelchair storage will need to be addressed by the final designer. Locations will need ot be at ticketing and possible two location on the concourse.

4.4.8.6 Electric Cart Storage

NO UPDATE

4.4.8.7 MEP and IT Services

MEP and IT spaces were sized and located based on preliminary design information such as equipment sizes, clearance requirements, and adjacency to areas served.

4.4.8.8 Public and Non-Public Circulation

Circulation areas are dependent upon building configuration and the final arrangement of the terminal. Total circulation includes public, non-public and secure circulation.

4.5 Site - Landside

NO UPDATE

4.5.1 Curbsides

Updated Requirements: As part of the parking garage expansion project, the Des Moines Airport Authority engaged with Bolton & Menk to evaluate the space required for commercial vehicle operations. Table 4.8, MAP 4 column reflects the findings of a memo dated October 12, 2021 which the commercial lane space needs for year 2043 are established.

Table 4.8 summarizes the requirements for the curbside by vehicle mode.

Table 4.8 Curbside Length Requirement (feet)

	Existing	MAP 3	MAP 4
Private Vehicle / Public Curb	**400**	**550**	**675**
Commercial Curb			
TNC	100	125	144
Taxicab	120	140	72
Limousines	60	60	60
Airport Shuttle	70	70	140
Hotel/Parking Lot Shuttles	175	175	245
Tour/Charter Bus Unloading	110	110	110
Rental Car Shuttles	N/A	100	N/A
Subtotal Commercial	**535**	**655**	**771**

If vehicle activity on the curb is restricted to active loading and unloading only through stricter enforcement the required curb length would be reduced. Future requirement with stricter enforcement and limited dwell times averaging a more typical 3-minutes for private vehicles, representing active loading and unloading only, would reduce the private vehicle curbside requirement to 325 and 400 feet in MAP 3 and 4 respectively.

4.5.2 Parking

NO UPDATE

4.5.2.1 Public Parking

NO UPDATE

4.5.2.2 Employee Parking

NO UPDATE

4.5.3 Rental Car

NO UPDATE

4.6 Site - Airside

NO UPDATE

4.6.1 Existing and Future Critical Aircraft

The FAA defines the critical aircraft for an airport as the aircraft representing a combination of the most demanding Airport Reference Code (ARC) with greater than 500 annual operations. DSM's existing critical aircraft is the Boeing 767-300, with an ARC passenger designation of D-IV and a Taxiway Design Group (TDG) of 5. The B767-300 has a maximum takeoff weight of 412,000 lbs and is primarily used for cargo operations at DSM. The terminal areaneeds to accomodate Airplane Design Group (ADG) IV standards at select gates, although at this time there is no regular service of ADG-IV aircraft. Irregular ADG-IV operations are due to diverts and charters. The primary basis of design aircraft for the terminal is a maximum sized narrow body aircraft, such as the Boeing 737-Max 10. There is no anticipated critical aircraft change expected in the future. **Table 4.14** summarizes the dimension standards of the critical aircraft.

Table 4.14 Critical Aircraft Characteristics

	B737 MAX 10 (Passenger)	B767-300 (Cargo)
Length	143.7'	180.1'
Wingspan	117.9'	156.2'
Tail Height	40.3'	52.6'
Maximum Take-off Weight	197,000 lbs	412,000 lbs
Approach Speed	140 kts	145 kts
Aircraft Approach Category	C	D
Airplane Design Group	III	IV
Taxiway Design Group	3	5

4.6.2 Runway Design Code

NO UPDATE

4.6.3 Taxiways

NO UPDATE.

4.6.4 Airspace Considerations/NAVAID Critical Areas

NO UPDATE

4.6.5 Deicing Pad

Based on discussions with the airport, it was determined that there is a future need for up to four deicing positions. These deicing pads should be able to accommodate three ADG-III aircraft and one ADG-IV aircraft simultaneously. From a demand/capacity standpoint, the alternative analysis will show a footprint for these four deicing positions. The following section explains the design criteria used to develop the template for these pads.

4.6.5.1 Design Criteria - Width of Deicing Positions

The width of each deicing position is based on Table 3-1 of Advisory Circular (AC) 150/5300-14C and assumes that the deicing area will be defined as a non-movement area during deicing events, meaning that the deicing pad will not be under direct Air Traffic control. According to the AC, the width of each parking position is dimensioned from centerline of aircraft deicing position to centerline of the adjacent aircraft deicing position. The separation distance provides for two Vehicle Maneuvering Areas (VMA) of 12.5 feet each and a Vehicle Safety Zone (VSZ) of 10 feet.

The VSZ is for parked vehicles before and after deicing operations and is defined by red crosshatched pavement markings. The VSZ is where deicing trucks would typically stage while an aircraft taxis into and out of a position. Ten feet is the minimum allowable width per the AC. A width of 10 feet allows vehicles to be parked end-to-end (based on an 8.5-foot-wide vehicle); however, a 10-foot-wide VSZ does not allow added space for error under potentially dark and inclement weather conditions that are likely to be experienced at the deicing pads. Because of this, HNTB recommends 12.5-foot-wide VSZ widths to provide an additional margin of safety during deicing operations.

The width of an ADG III pad is 187 feet which allows for the 12.5-foot-wide VMA's and VSZ's. The width for the ADG-IV pad is 252 feet.

4.6.5.2 Design Criteria - Length of Deicing Positions

NO UPDATE

Chapter 5

Preferred Development Plan

5.0 Preferred Development Plan

The 2018 preferred option was used as the starting point for further development with the goal of simplifying the processor and reducing the overall size of the facility to meet cost constraints. The approach was to seperate the facility development into four Phase 1A, 1B, 1C, and Phase 2. The development had to consider the following:

- Reuse of the existing A&C concourses
- Logical curbside operations
- Deicing capture
- Conformance with Part 77
- Flexibility of Landside and Airside structures
- Future expansion capabilities of Landside and Airside structures
- Ability to retain 10 contact gates and 9 RON positions throughout construction
- New terminal proximity to existing infrastructure
- Enhanced and intuitive wayfinding for vehicular circulation including longer decision points for safety purposes
- Least construction pain or interference with operations and passenger traffic

Phase 1A will include the main processor, with 5 new gates and attachment to the existing Concourse C to maintain a total of 13 gates. The Central Utility Plant and the Airport offices will be a separate building. A bridge will connect the second level of the garage to the new terminal. Curbside is four lanes wide for passenger pick up and drop off with three commercial lanes.

Phase 1B will add five more gates to the new terminal building and match the terminal requirements for gate design and layout.

Phase 1C will add 8 new gates and will require the demolishing of the original Concourses A and C. With completion of Phase 1C, there will be 17 gates available.

Phase 2 will add the final 5 gates to give the airport a total of 22 gates as the ultimate buildout.

5.1 Terminal Building

The new terminal programming should address 3.0 million Annual Passengers (MAP) opening day, with the ability to expand for 4.0 MAP. The terminal was developed as a two-level facility. Several functions have been removed from the main terminal to reduce cost. Those include the Central Utility Plant and the Airport Office spaces, including Airport Operations. Ticketing and TA passenger screening functions have been collocated to the second level. Level 1 supports inbound baggage, baggage screening by TSA and out-bound baggage functions. Future expansion is anticipated to the south and indicated on the plans. Rental Car operations are to be relocated to the garage.

5.1.1 - Basement Plan (Level 0)

The terminal's basement level has been eliminated to reduce the overall cost of construction. The programmatic elements that were previously located in the basement level have been relocated to Level 1 in the current concept plan.

5.1.1.1 - Checked Baggage Inspection System

All checked bags run through an automated bag screening system. Sufficient ramp level space is included in the program to allow for the installation of up to four bag screening machines. Bags shall be fully automatically fed into the screening machines and automatically sorted downstream of the bag screening machines based on the screening result. For bags alarmed in the screening machines, the program is providing space for operator viewing time as well as for the manual resolution of the bags. After bags have been cleared by TSA, they are conveyed to the apron space for make-up.

5.1.1.2 - Baggage Support

Baggage Services office shall be adjacent to the inbound baggage makeup unit for easy access to passenger and airline personnel.

5.1.1.3 Loading Dock

The loading dock has been relocated to Level 1 in the current concept plan.

5.1.1.4 Concession Support

The concession program needs to be reviewed with the Airport and Concessionaire to determine final requirements including support.

5.1.1.5 Airport Support

NO UPDATE

5.1.1.6 Employee/Goods Screening

The new terminal has one Employee/Goods Screening area on Level 1 near the loading dock. The screening area on Level 1 is easily accessible from the loading dock and will provide the connection between the non-secure and secure support corridors.

5.1.1.7 Mechanincal/Electrical/Plumbing (MEP) Spaces

The Fire Pump and Water Entrance will be located on Level 1 of the Terminal.

The main primary switchgear for the airport will be located in the new parking garage. Feeder conduits will be extended from the new garage switchgear to an accessible location for extension to the new terminal secondary unit substation rooms. A new 13.2kV buried loop will be created to connect the new and existing terminal substations to the switchgear.

5.1.2 Check-in (Level 1 & 2)

Check-in is provided at two levels in the current concept plan. Level 1 has limited check-in for curbside passengers. Level 2 is the main check-in for all passengers from the parking garage and Level 1 curbside operations.

5.1.2.1 Ticket Lobby

The space behind the counters will operate similarly to the current terminal – the airline employee will place the checked bags onto a conveyor behind them, which will take the bags to the CBIS system located on Level 1. The flexibility of the layout will allow future the airport/airlines to move to self-bag drop as it becomes more common.

5.1.2.2 Airline Ticket Offices

NO UPDATE

5.1.2.3. Transportation Security Administration (TSA) Support

The TSA has a large, centrally located support space on Level 2 which connects their staff directly between their functions on Level 1 and Level 2.

Figure 5.3a - Floor Plan - Level 2 - Phase 1A

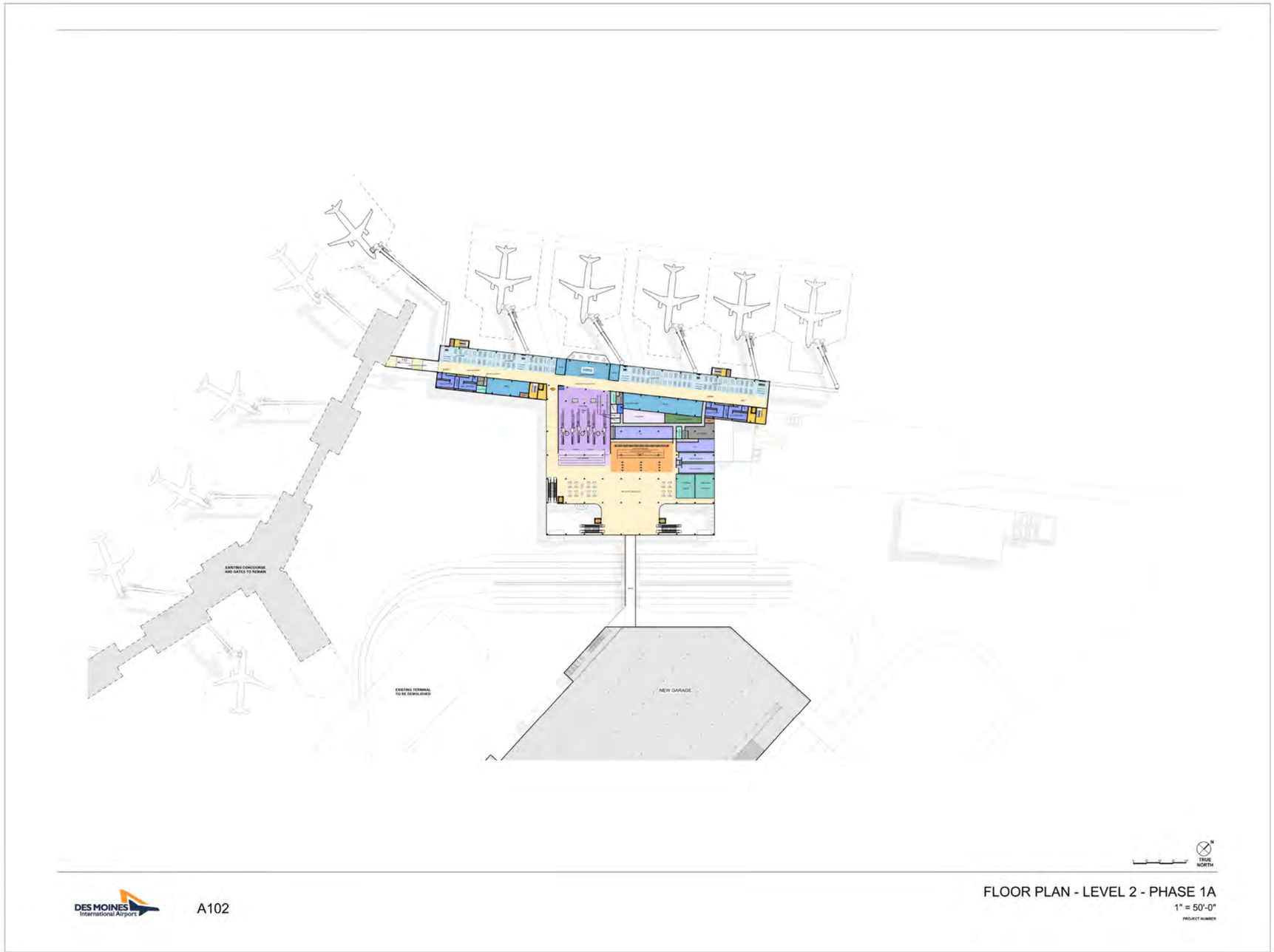


Fig 5.3a Floor Plan - Level 2 - Phase 1A

Figure 5.3b - Floor Plan - Level 2 - Phase 1B

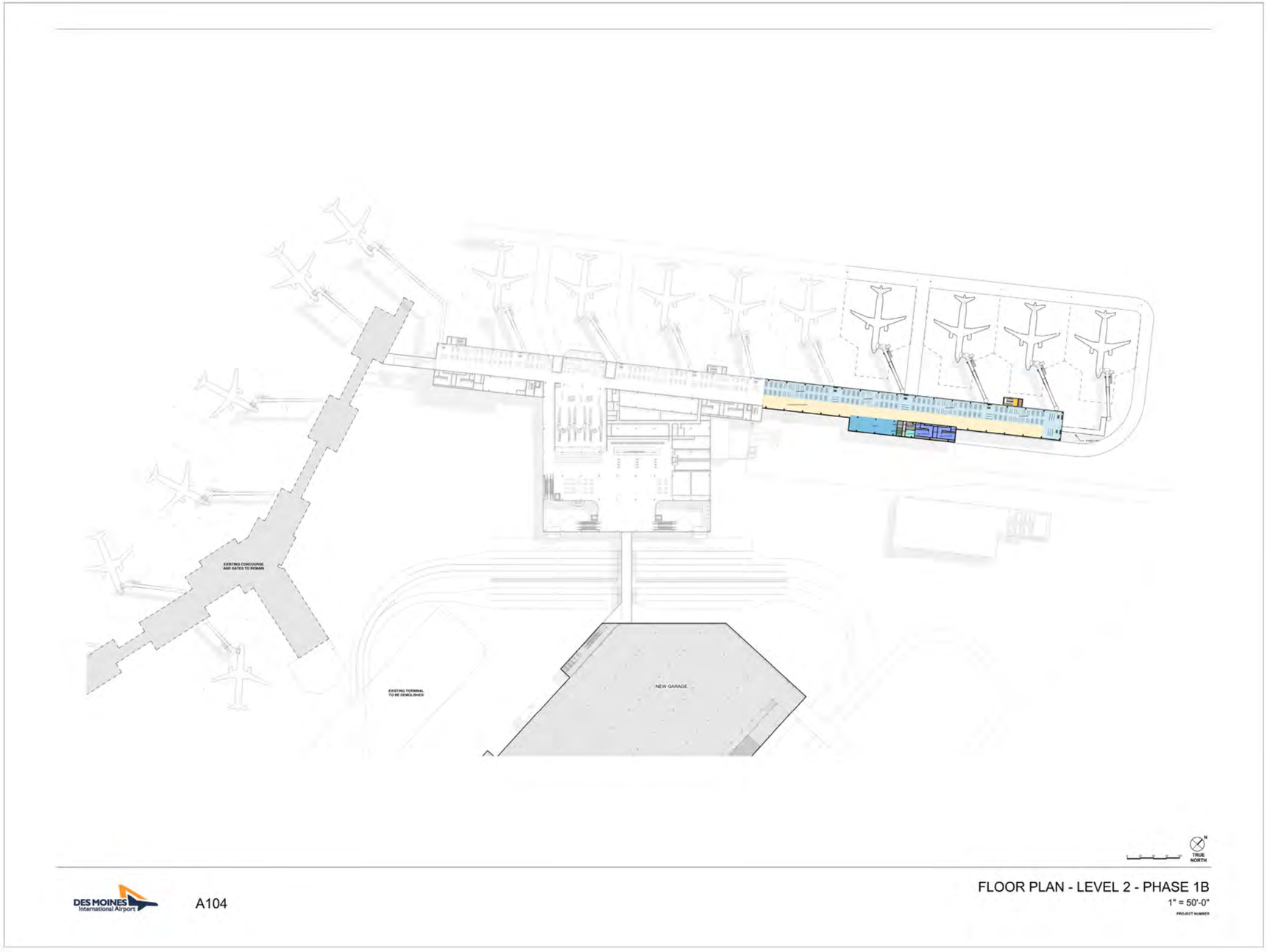


Figure 5.3c - Floor Plan - Level 2 - Phase 1C

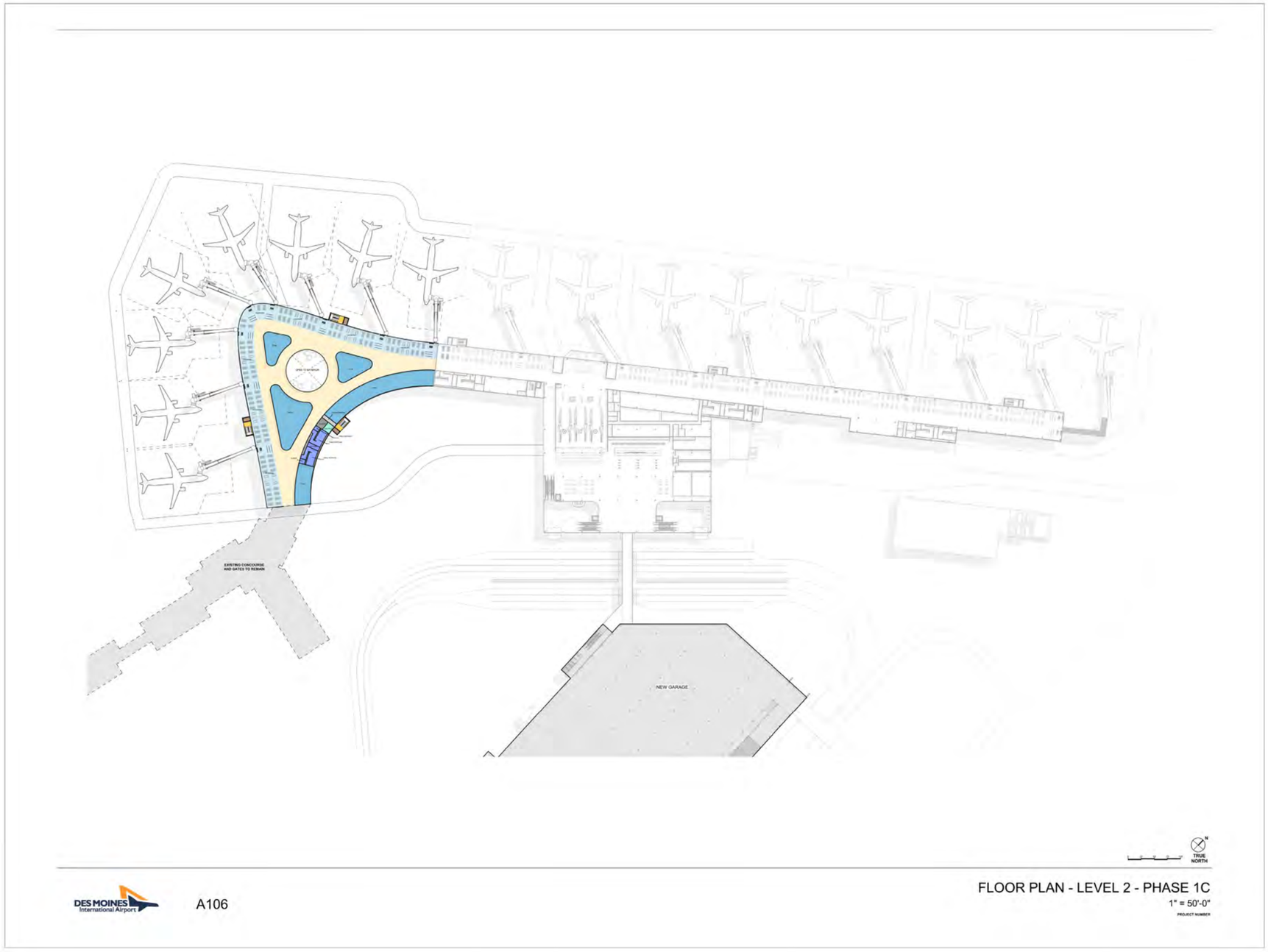


Fig 5.3c Floor Plan - Level 2 - Phase 1C

Figure 5.5a - Floor Plan - Level 1 - Phase 1A

Figure 5.5b - Floor Plan - Level 1 - Phase 1B

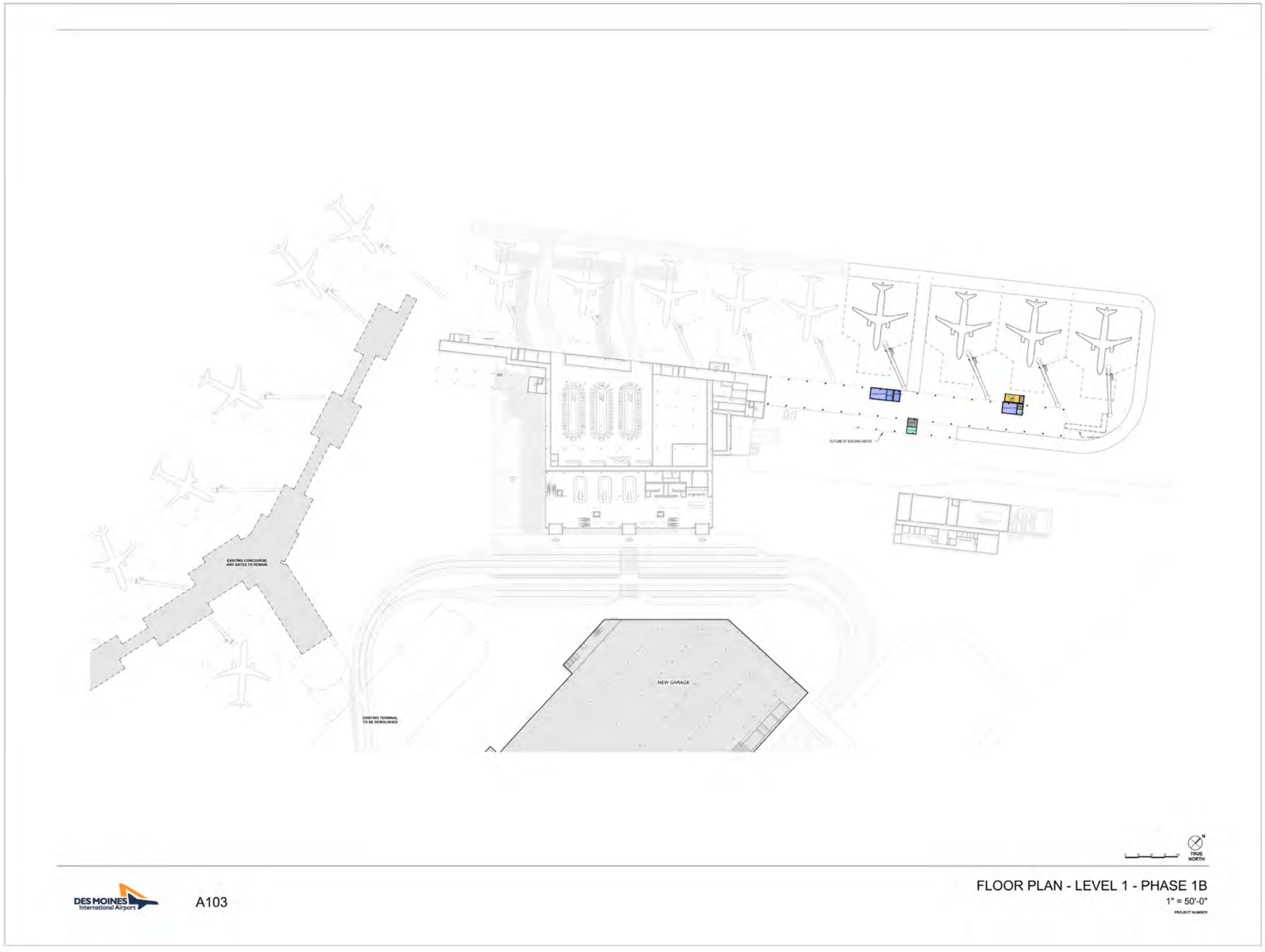
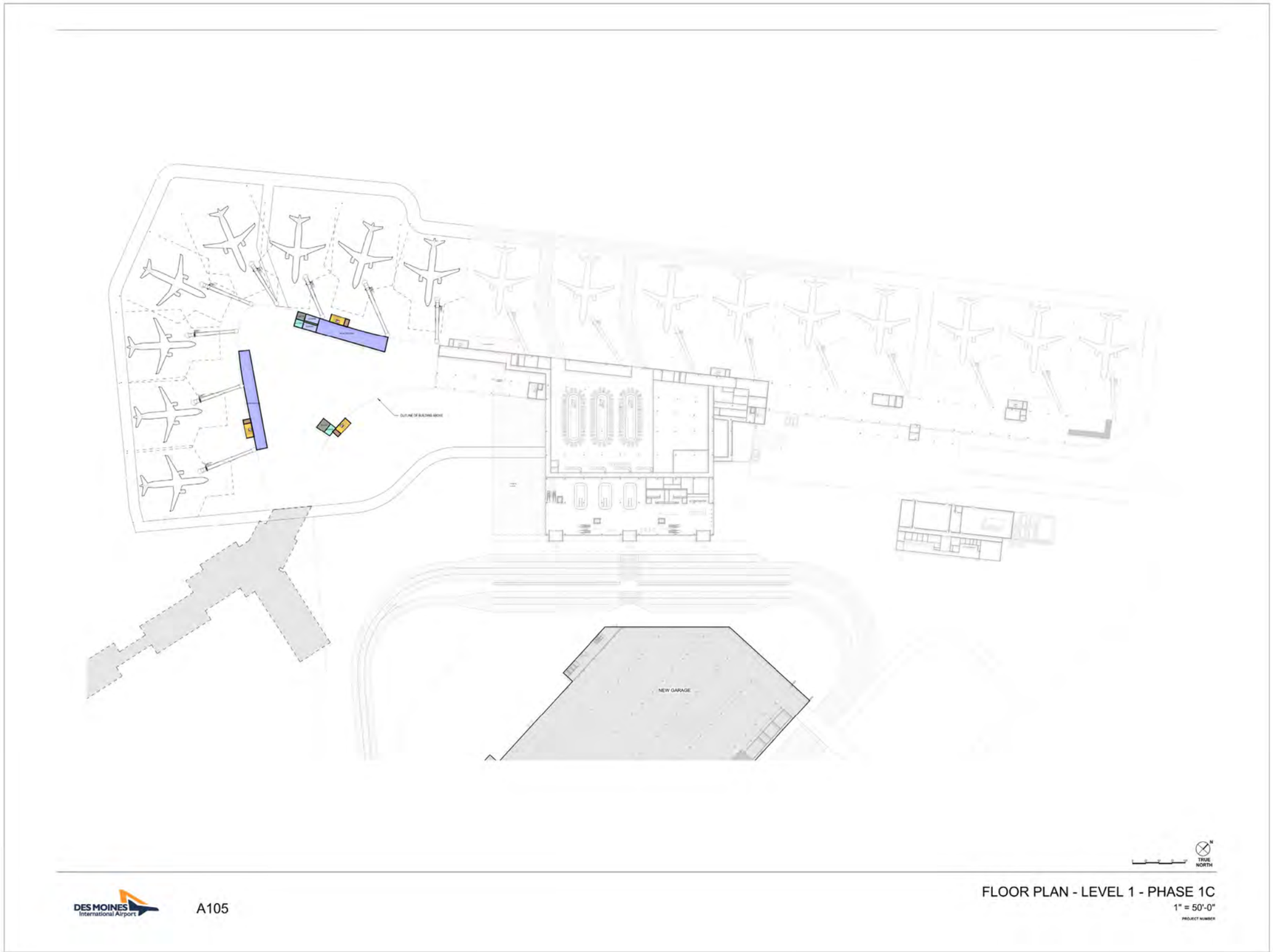


Fig 5.5b Floor Plan - Level 1 - Phase 1B

Figure 5.5c - Floor Plan - Level 1 - Phase 1C



5.1.2.4 Baggage Claim

The baggage claim area requires three carousels for opening day and will expand to four devices when the airport reaches 4.0 MAP.

The DMAA opted for flat-plate claim devices rather than sloped-plate, which constitutes a higher level of service for passengers because it is easier to pull bags off a level surface. Conveyors will feed the inbound devices from below.

5.1.2.5 Baggage Service Office

NO UPDATE

5.1.2.6 Des Moines Airport Conference Center

The DMAA Conference Center is located on level 2 near the ticketing operations. Its final location needs further review with airport staff during final design. Its divisible walls can divide the large room into three separate conference spaces, to accommodate more intimate meetings and provide more flexibility to the airport staff.

5.1.2.7 Outbound Baggage

The baggage room is located on the apron level adjacent to the baggage screening system. At least three make-up devices are to be provided. A fourth carousel can be added in the future.

The space between the make-up devices is sufficient to allow tugs to pass between them with carts staged on either carousel.

5.1.2.8 Inbound Baggage

Three baggage claim devices with individual baggage feed lines will be provided in the baggage claim hall. Each claim unit provide at least 100' of bag presentation length for passengers. Additional space and provisions are made to add a fourth claim unit in the future.

The loading conveyors are located on the apron level allowing adjacent to the baggage make-up room. The loading conveyors are placed so that each loading position can be reached by tug and cart without interference from adjacent baggage claim loading operation or traffic.

The claim devices shall be free-standing flat plate devices, completely positioned within the baggage claim hall. The devices will be fed by conveyors running in the basement to keep views open.

Oversize bags will be transported into the bag claim hall manually through a secured personnel access.

5.1.2.9 Oversize Baggage

A dedicated location for oversize bags is to be located near the TSA CBRA area. The necessary vertical transportation is to be located from ticketing to the CBRA area. Bags are manually transported to the dedicated oversize screening location where the bags are processed by the TSA. After TSA has cleared the bags, the cleared bags are manually transported to a oversize hand-over location at which airlines can pick-up the bags.

5.1.2.10 Restrooms (Public and Back of House)

The men's and women's restrooms have door-less portals that block visibility from general circulation outside the restroom through to the stalls, but allow passengers barrier-free navigation into and out of the restrooms. The stalls are six feet deep to accommodate passengers with bags and the circulation space beyond the stall is at least eight feet wide. This restroom core also includes one family restroom, a janitor's closet with a local water heater and a walk-in plumbing chase accessed through the janitor's closet.

Restroom are indicated per the revised pans. Ramp level restroom cores will include a men's and women's restroom including shower facilities, janitor's closet and walk-in plumbing chase.

5.1.2.11 Employee Offices/Airport Operations/Building Maintenance

The DMAA building engineers and technicians occupy an office space near the dock area This space has personal offices for the Airport Facilities Manager, Chief Building Engineer, and Technical Systems manager, with cubicle space for the building engineers and technicians. The patrons have access to secure and non-secure spaces and the north vertical circulation core, to quickly access the concourse. The custodial office space is to be adjacent to the airport engineering offices, accessed from the non-secure support corridor.

5.1.2.12 Mechanical/Electrical/Plumbing Spaces

Air Handlers will be roof-mounted, penthouse-style units, but will be accessible from the inside of the building. The stair towers on either side of the Central Processor and at the Holdrooms shall extend up to the roof. Air Handlers will be mounted in proximity to the stair towers and will connect to the stair. Service vestibules shall be provided along the length of the air handler to provide access to all air handler sections.

Up to seven new electrical rooms will be included for secondary unit substations throughout the new terminal and remote central plant. The substations will include 13.2kV switchgear, transformers and 277/480V switchboards. Additional 120/208V step down transformers will be provided in the electrical rooms as required.

Each restroom core is supplied with a janitor's closet that has access to walk-in plumbing chases. The janitor's closets are large enough to accommodate local water heaters.

5.1.2.13 Wheelchair Storage Areas

The Level 1 wheelchair storage area is located on the north side of the airline ticket offices for convenient access for ticketing agents and near the landside public elevator core.

5.1.2.14 Employee Screening

Employee Screening on Level 1 at the dock area and handles mostly employee screening and goods screening. This screening checkpoint processes Airline ramp employees, DMAA staff needing access to the airside, TSA employees, concession workers, and other contracted staff.

5.1.2.15 Trash Chutes

Airside trash will be collected at the dock level with trash & recycling dumpsters in the loading dock area.

5.1.2.16 Ground Service Equipment (GSE) Parking/Charging

NO UPDATE

5.1.3 Departure Concourse Plan (Level 2)

The departure concourse level incorporates many of the passenger functions, including concessions, the security screening checkpoint, departure lounges and restrooms as shown in **Figure 5.3**. These functions were planned to accommodate peak numbers of passengers, establish flexibility, enable future expansion and provide a good passenger level of service.

The concourse structure spans 50 feet from the curtain wall glass to the face of the hard-walled concessions (20' for circulation and 30' for seating). This open area creates an inherently flexible zone for the holdrooms, circulation and blended concessions, ensuring the airside is not physically constrained or restricted for future needs. The departure lounges are contiguous so that seating can overflow into adjacent holdrooms if one flight is particularly full. The space along the curtain wall is free from barri-

ers which allows for a clear line of sight from nearby concessions spaces and adjacent departure lounges to the gates. Patrons are free to keep shopping or dining before the boarding process begins, which helps reduce over-crowding in the holdrooms and generates more revenue for the concessions. Security screening, concessions and circulation areas also provide flexibility for future uses as described later in this section.

The concourse level has 4 gates with the possibility of a 5th and 6th gate on each end. The south end gate needs to be coordinated with the slopes between the new ramp and existing ramp. The gate is anticipated to serve an existing gate currently serviced by the old concourse. The north end additional gate will need to be served from the end of the building and be positioned so that the future north concourse expansion will not hamper operations. The concessions, restrooms, circulation, holdrooms, and ramp service spaces below have been sized appropriately to constitute a proficient level of service for all passengers, regardless of which gate they utilize. The main concession core is situated in the central node between the branching concourses.

5.1.3.1 Departure Lounges/Holdrooms

The new plan provides sufficient space in each departure lounge for passengers and locates blocks of holdrooms contiguously, so particularly full flights can spill over into adjacent holdrooms rather than blocking circulation traffic. Each holdroom, as shown in **Figure 4.3**, is sized to accommodate 140 seats, which is derived from a 180-passenger flight with a load factor of 90%, with 85% of the passengers seated and 15% standing. The final designer is encouraged to look at options which provide a high level of services for all types of passengers in the holdroom, including business, family and individual passengers. Arriving passengers proceed on a direct path from the jet bridge to the circulation space that is unobstructed by seating or other barriers. The gate counter is located adjacent to the jet bridge door so airline employees can efficiently scan tickets to expedite the boarding process.

The southern-most holdroom space can be segregated as a "divert holdroom" in the event of an emergency landing for international flights. The space can be divided from the rest of the concourse by a hung track-wall system that recesses into closets when not in use. The divert holdroom has direct access to two family restrooms. Diverts are commonplace at DSM with its close proximity to two hub airports, Minneapolis St. Paul (MSP) and Chicago O'Hare (ORD).

5.1.3.2 Meeter/Greeter

Meeter/Greeter areas on Lower 1 will need further development by the final designer. The goal of the Meeter/Greeter space is to provide a location where patrons can sit and freely view the exit circulation without disrupting the flow of exit circulation.

5.1.3.3 Des Moines Airport Authority Offices

The Des Moines Airport Authority staff members manage operations, oversee maintenance and handle financial aspects for the airport. The office space will be located as part of the CUP and remote from the main new terminal. Access between the terminal and the office space is required. A cover access is to be considered by the final designer.

5.1.3.4 Non-Secure Concessions

NO UPDATE

5.1.3.5 Secure Concessions

The final designer will need to work with the Airport and concession to determine storage and operational needs for all concession.

5.1.3.6 Balcony

The central airside restaurant has been shown and will need further development by the final designer.

5.1.3.7 Security Screening Checkpoint (SSCP)

The Security Screening Checkpoint (SSCP) requires six screening lanes opening day, with expansion to the south. The SSCP is per the latest PDGS, screening area is large enough to support TSA's automated screening lanes (ASL's) which require more length than the conventional screening machines, but process passengers at a much quicker rate. TSA has direct access to two private screening rooms. SSCP accommodates a Known Crew Member (KCM) lane to permit TSA to identify crewmembers and allow them to pass through security efficiently.

The queuing area incorporates abundant space for Economy, Pre-check and ADA lanes. Queuing is accessed from the Level 2 balcony which overlooks inbound baggage on Level 1. This area also acts as over-flow queue. Passengers who aren't checking a bag can by-pass ticketing on Level 2 and use the kiosks on Level 1 to print their tickets or check in. This streamlined process creates a better Level of Service for the travel-savvy passengers and helps reduce congestion on Level 2.

5.1.3.8 Airport Police

NO UPDATE

5.1.3.9 Restrooms

The airside restrooms are distributed along the concourse so that passengers walk a maximum of 3 gates to access a restroom core. Door-less entries are provided for the men's and women's restrooms to provide a barrier free entry. The entry, the ample circulation space within the restroom and the 6' stalls help accommodate passengers with luggage. Each restroom core also includes a drinking fountain, mothers room and family restroom. The janitor's closet at each restroom core provides access to walk-in plumbing chases for easy maintenance.

5.1.3.10 Family Restrooms

Two family restrooms are located at each restroom and a mother's room are provided at each restroom core for passenger convenience. They are accessed from the general circulation instead of from within the men's or women's restrooms.

5.1.3.11 Pet Relief Areas

Two Service Animal Relief Areas (SARA) are provided in the terminal. The non-secure SARA is located outside, south of baggage claim on Level 1 and the secure SARA is situated adjacent to the central restroom core on the concourse.

5.1.3.12 Wheelchair Storage Areas

Three wheelchair storage areas are provided at the concourse level with easy staff access. The north and south storage areas are adjacent to the respective restroom cores, and the central location is near the SSCP exit.

5.1.3.13 Mechanical/Electrical/Plumbing (MEP) Systems

The mechanical spaces are located on the roof as package unit next to each exit stair.

Electrical rooms are dispersed throughout the concourse level to shorten conduit and cable lengths. Each restroom core is supplied with a janitor's closet that has access to walk-in plumbing chases. The janitor's closets are large enough to accommodate local water heaters.

5.1.3.14 Information Technology (IT) Spaces

Information Technology Intermediate Distribution Frame (IDF) rooms are strategically located throughout the terminal to ensure complete coverage by connecting telecommunication lines to each area. The size of the IT rooms are proportional to the amount of area they support.

5.1.3.15 Circulation

Circulation paths are identified on both sides of the Security Identification Display Area (SIDA) line to help passengers quickly navigate to and from their gates to all the critical passenger functions. Neighboring spaces to the main circulation path, such as the holdrooms, are sized appropriately so passengers do not block circulation during peak times. The concourse is only single loaded, so the circulation areas are 20' wide. A central secure circulation corridor is provided to move from one side of the terminal to another on Level 1.

5.1.4 Terminal Building Summary

The terminal layout has been updated to reflect on current passenger requirements and buget constraints. The terminal processor will handle all project operations and support the 5 new gate plus the 9 existing gates.

5.2 Terminal MEP Systems

This section presents the recommended terminal Mechanical/Electrical/Plumbing (MEP) system development for the Des Moines International Airport New Terminal Building. Equipment capacities and sizing are based on serving approximately 250,000 SF of conditioned space at the completion of Phase 1A.

General Building Design Criteria and Assumptions

- Building Code – International Building Code 2018
- National Electrical Code - 2020
- Mechanical Code - International Mechanical Code 2021
- Plumbing Code - Uniform Plumbing Code 2021
- Energy Conservation Code - ASHRAE 90.1 or International Energy Conservation Code 2015
- Fire Protection Code - International Fire Code 2018
- Fuel Gas Code - International Fuel Gas Code 2018

5.2.1 Cooling Systems

Based on the current plans, the peak cooling load for Phase 1A of the new terminal building is estimated to be 750 tons. The design professional shall perform load calculations to confirm cooling loads and sizing of systems and equipment.

A new chilled water system will be installed to serve the new Terminal. The chiller plant will consist of three (3) water-cooled chillers and one (1) air-cooled chiller. The water-cooled chillers will be magnetic bearing centrifugal machines with multiple compressors. Each of the water-cooled chillers will be sized for 250 tons (net output). The air-cooled chiller will be a screw machine with a remote evaporator bundle. The air-cooled chiller will be sized for 250 tons (net output). The inclusion of the air-cooled chiller in the plant will provide the staff with the flexibility to service small cooling loads in the building during winter, spring, or fall months when the condenser water system may be drained. The air-cooled chiller will have a minimum ambient design temperature of -10°F.

The chilled water system will be a variable-primary pumping system. The pumps will be base-mounted end suction type. Variable frequency drives will be provided to minimize pumping energy. There will be four primary pumps in the chilled water system, each sized to match each individual chiller's capacity and provide N+1 redundancy for the plant. Flow meters and control valves will be provided for each chiller. A minimum flow bypass and minimum flow control valve will be provided to ensure the minimum flow through each chiller while it is operating. Chillers and pumps will be in a manifold arrangement to allow any pump to operate with any chiller. The system fluid for chilled water shall be water.

A new condenser water system will be installed. The condenser water system will consist of (3) cooling towers, each sized for 250 tons. The cooling towers will be crossflow design with variable speed fans and will have independent basins and an equalizing line with isolation valves that interconnects them. The basins shall be welded stainless steel and basin heaters shall be provided. Access shall be provided to the fan motor and gearbox via a ladder and platform.

Chilled and condenser water supply and return temperatures shall be optimized during design.

The condenser water system will be configured for constant speed pumping. The pumps will be base-mounted end suction type. There will be four condenser water pumps, each sized to match each individual chiller's capacity and provide N+1 redundancy for the plant.

This chiller and cooling tower configuration will provide N+1 redundancy. In the event one of the water-cooled chillers is offline, the air-cooled chiller can be utilized in conjunction with the other water-cooled chillers to meet the full load of 750 tons. In the event the air-cooled chiller is offline, the three water-cooled chillers can meet the 750-ton load. In the event a cooling tower is offline, the air-cooled chiller can be used in conjunction with two water-cooled chillers and cooling towers to meet the 750-ton load. Chillers, cooling towers and pumps will be in a manifold arrangement to allow any operating configuration.

The terminal building will include several spaces that will require mechanical cooling all year round such as electrical rooms and IT rooms. These spaces will be provided with dedicated cooling units, either connected to the chilled water system or DX split system units, and may be served by both if required for redundancy in critical applications. Depending on the load of the dedicated cooling units operating during that winter that are connected to chilled water, a waterside economizer with a plate heat exchanger may need to be provided with the chilled water plant.

Chilled water piping 2" and smaller will be copper with soldered joints and fittings and shutoff valves will be ball type. Piping 2-1/2" and larger will be Schedule 40 black steel with butt-welded, mechanically coupled, or welded with flanged joints and shutoff valves will be butterfly type. Chilled water piping will be provided with flexible elastomeric insulation. Condenser water piping will be Schedule 40 black steel with butt-welded, mechanically coupled, or welded with flanged joints. Shutoff valves will be butterfly type. All piping systems and equipment will be labeled.

The Chiller Room shall be located in the remote central plant building. Two means of egress shall be provided for the room as required by code. The room shall be provided with an overhead door capable of allowing a full 250-ton chiller to be moved into the room.

Chilled water piping will be routed from the remote central plant to the main terminal building in a fully walkable utility tunnel, if budget allows. Otherwise, direct buried piping shall be provided. Direct buried piping shall be pre-insulated piping suitable for direct buried applications. Piping shall be A106B seamless black steel piping with welded joints. Chilled water piping mains shall be sized for the anticipated flow requirements for the ultimate build-out when Phases 1B, 1C, and 2 are completed. Anticipated capacity at the completion of Phase 2 is 1200 tons but shall be confirmed.

At the completion of Phase 1A, space shall be allocated in the chiller room for a future 250-ton chiller, chilled water pump and condenser water pump. This equipment would be installed during Phase 1B.

Ventilation shall be provided for the chiller room to meet ASHRAE Standard 15 requirements.

The air-cooled chiller shall be located on the roof of the remote central plant building. Screening shall be provided as required to meet City zoning requirements. Access to the air-cooled chiller on the roof shall be by a full-size stair from the Chiller Room to the roof.

The cooling towers shall be located in the MEP yard, adjacent to the remote central plant and mounted on a stand that elevates the bottom of the tower high enough to allow for sufficient positive suction head to the condenser water pumps.

As the Chiller Room will be located in proximity to the Airport Offices, considerations shall be made to mitigate sound including enhanced vibration isolation, independent inertia slabs and "quiet package" options for both the air-cooled and water-cooled chillers.

At the time this document was prepared, the intent is for Concourses A and C to continue to be served by the existing Terminal

chilled water system. The Baggage Claim building and existing buried chilled water mains would remain in place at the completion of Phase 1A.

5.2.2 Heating Systems

Based on the current plans, the peak heating load for Phase 1A of the new terminal building is estimated to be 15,000 MBTUH. This total includes the building heating load and the heating load associated with a snowmelt system serving 23,000 SF. The design professional shall perform load calculations to confirm heating and snow-melt loads and sizing of systems and equipment.

A new heating water boiler system will be installed to serve the new Terminal. The boilers will be natural gas fired and will be high-efficiency condensing type. The boiler plant will include three 6,000 MBH input condensing boilers and two 3,000 MBH input condensing boilers. This boiler configuration will provide N+1 redundancy. The boilers will not be dual fuel.

Flues for the boilers shall be double-wall AL-294C. Horizontal runs of flue piping shall be kept to a minimum. Each boiler shall be provided with an independent flue and they shall not be manifolded together.

The boilers will have modulating burner controls. ASME CSD-1 safety controls will be provided for remote shutdown. A boiler management system consisting of controllers capable of starting, stopping, and modulating all boilers will be provided to maximize the efficiency of the boiler plant. The system fluid for the heating water system shall be water.

Hot water supply and return temperatures shall be optimized during design to allow for the boilers to operate in a condensing mode for the majority of the time. Hot water temperature will be reset based on outdoor air temperature.

The heating water system will serve a snowmelt system that is provided for the front entry sidewalks and crosswalk. A heat exchanger, pumps, and separate glycol piping system will be provided to serve the snowmelt system and to isolate it from the heating water system.

The heating water system will be a variable-primary pumping system. The pumps will be base-mounted end suction type. Variable frequency drives will be provided to minimize pumping energy. There will be four primary pumps in the heating water system; three pumps sized at 50% of the full load to provide N+1 redundancy. A fourth pump sized at 25% of the load will be used for better turndown during reduced summer load conditions. Boilers and pumps will be in a manifold arrangement to allow any pump to operate with any boiler.

Heating water piping 2" and smaller will be copper with soldered joints and fittings and shutoff valves will be ball type. Piping 2-1/2" and larger will be Schedule 40 black steel, with butt-welded, mechanically coupled, or welded with flanged joints and shutoff valves will be butterfly type. Condensate drains for condensing type boilers will be neutralized before entering the sanitary waste system. Heating water piping will be provided with fiberglass insulation. All piping systems and equipment will be labeled.

The Boiler Room shall be located in the remote central plant building. Two means of egress shall be provided for the room as required by code. The room shall be provided with a double-door or overhead door capable of allowing a 6000 MBH boiler to be moved into the room.

Heating water piping will be routed from the remote central plant to the main terminal building in a fully walkable utility tunnel, if budget allows. Otherwise, direct buried piping shall be provided. Heating water piping mains shall be sized for the ultimate build-out when Phases 1B, 1C, and 2 are completed. Anticipated capacity at the completion of Phase 2 is 22,000 MBH but shall be confirmed.

Ventilation and heating shall be provided for the Boiler Room to keep the space at a comfortable temperature during the heating season.

At the completion of Phase 1A, space shall be allocated in the boiler room for a future 6000 MBH boiler, 3000 MBH boiler, and two heating water pumps. This equipment would be installed during Phase 1B or 1C.

Concourses A and C will continue to be served by the existing Concourse heating water plant.

5.2.3 HVAC Systems

The primary HVAC systems serving the new terminal building will be variable air volume (VAV) air handling units. The air handling units (AHUs) will provide supply air to VAV boxes with hot water reheat coils. Hot-water perimeter radiation shall be provided in spaces with large amounts of glazing where the VAV reheat box alone cannot meet the heating needs. In lieu of VAV, displacement ventilation systems can be considered for high-volume spaces such as Ticketing or Bag Claim.

The AHUs will be roof-mounted, custom penthouse style units and will be located on the roof above Level 2. AHUs shall be located in proximity to the stair towers and be provided with a walking connection to the stair to allow for access to the units without having to go outside. AHUs shall be provided with a heated, ventilated and lighted service vestibule. Minimum vestibule width shall be 6 feet. This vestibule will include the VFDs, control valves and shutoff valves and would allow access into all AHU sections including filters, coils, dampers and fans.

As design develops means shall be explored to move large components such as motors or boxes of filters up to the air handlers other than using the stairs. This could include extending a service elevator up to the roof level.

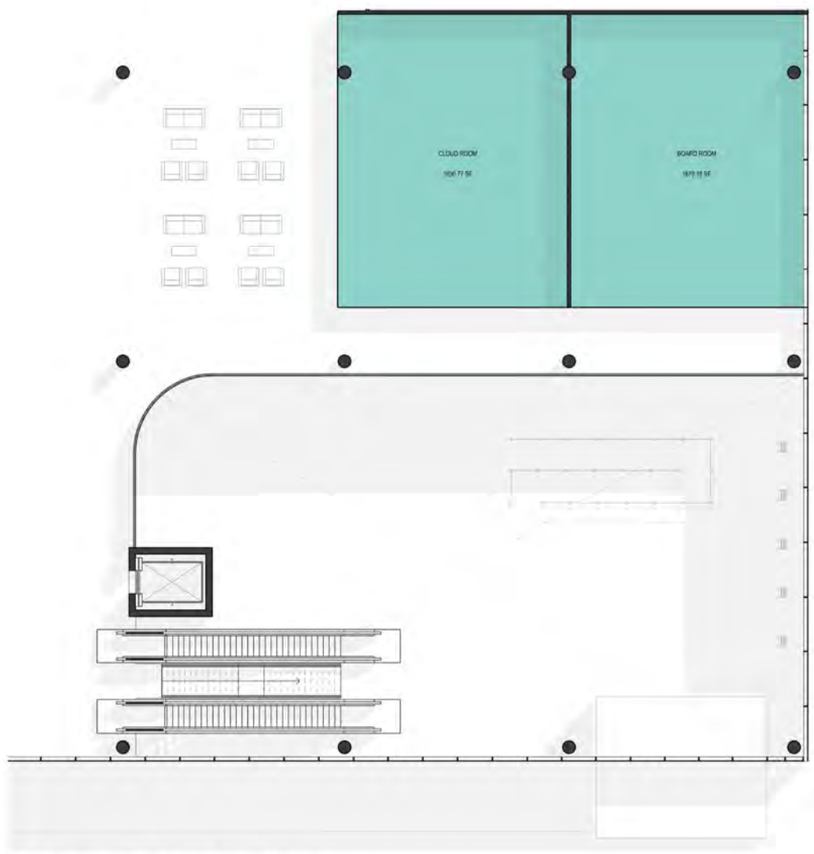
The AHUs shall be zoned so that they serve zones with similar functions and similar heating and cooling needs as much as possible. A proposed zoning scheme is given below. This shall be confirmed as design develops.

AHU #	Area Served
1	Level 1-CBIS/CBRA
2	Level 1- Bag Claim,Pre-Security Circulation
3	Level 2-Ticketing, Pre-Security Circulation, Board & Conf.
4	Level 2-SSCP
5	Level 1 and 2-Concourse West
6	Level 1 and 2-Concourse East
7	Remote Central Plant-Airport Offices

The AHUs will include the following components: return fans, pre-filters, final filters, gas phase filters, outside air damper, return air damper, exhaust air damper, total energy recovery wheel with bypass (if required by energy code), hot water heating coil, chilled water cooling coil, and supply fans. The supply and return fan sections will utilize fan arrays to provide N+1 redundancy. Each supply and return fan in the arrays will be provided with a VFD. The gas phase filters shall be capable of mitigating odors such as jet fumes. The heating coil shall be provided with a freeze protection pump if mixed air conditions are such that this would be required. The heating water coil and chilled water coil shall be sized assuming the energy recovery wheel is off.

A ducted return air system is preferred. Plenum return will be allowed if space needs dictate it and layout of the spaces allows for an adequate and balanced return air path from each space. A plenum return air system will be used as the design of the building allows to minimize space needs and cost while still providing for good air circulation in each space. Exhaust will be

Figure 5.12 - Administration Offices Plan



5.12 - Administration Offices Plan - Meeting Rooms

Figure 5.13 - Administration Offices Plan

5.13 - Administration Offices Plan

Fig 5.12 & 5.13 Administration Offices Level 1 Plan and Administration Offices Level 2 Plan

provided for code-required spaces such as toilet rooms, kitchen, and food service areas. Grease exhaust ductwork and fans will be provided where required for the restaurant, kitchen, and food court areas. All exhaust fans will be located on the roof. Make-up air for the kitchen exhaust hoods will be provided via the outside air supplied through the main air handling units as transfer air, where possible. Dedicated make-up air units will be provided in spaces where transfer air is not available or equipment operating schedules may not allow.

Supply ductwork will be galvanized steel and will be insulated with fiberglass insulation wrap. Return and transfer ductwork will be galvanized steel. General exhaust ductwork will be galvanized steel and will be insulated within 10' of roof penetrations with fiberglass insulation wrap. Grease-laden kitchen exhaust ductwork will be UL listed pre-manufactured ductwork system. Kitchen exhaust ductwork will be routed out of the building within 2-hour rated architectural enclosures or UL listed fire-wrap insulation. Dishwasher exhaust ductwork will be all-welded stainless steel. All equipment will be labeled.

Concourses A and C will continue to be served by their existing air-handlers. However, the AHUs or their components may need to be replaced to continue to provide reliable operation.

5.2.4 Temperature Control Systems

A new direct digital control (DDC) system will be provided for the new terminal building. All new HVAC and plumbing equipment will be connected to the DDC system. The DDC system will be BACnet open protocol. The existing campus system is Siemens. Siemens will be the basis of design for the DDC system, but other manufacturers will be considered as alternate bids. Alternate bids will need to be capable of tying into and bringing back all points back for the existing buildings at the Airport that are currently on the Siemens system.

5.2.5 Plumbing Systems

A new domestic water service will be provided for the terminal building. The domestic water service entrance will be in the water entrance room on Level 1. Dual water services shall be provided from the site, separated 10 ft apart. The entrances can combine ahead of the water meter, or dual meters may be required. This will need to be confirmed with Des Moines Water Works. Redundant backflow preventers shall be provided.

It shall be evaluated during design whether a water pressure booster pump is required. If so, the domestic water booster system will be a skid package with multiple booster pumps and VFDs and would be located in the water entrance room on Level 1.

Condensing-type natural gas-fired water heaters with storage will be installed in the Water Entrance Room. Hot water will be generated, stored, and distributed at 140°F. Remote anti-scald mixing valves will be provided at each fixture as required by code. The domestic hot water system will be recirculated throughout the entire facility. Public handwashing sinks and sensor operated faucets will have the recirculation piping routed down the wall and connected to the hot water piping within two feet of the fixture. Distributed point-of-use water heating systems may also be evaluated for potential improved energy efficiency and cost savings as compared to a central system with recirculation.

Plumbing fixtures (lavatories, water closets, urinals) will be porcelain type. Fixture colors and types will be selected with the Owner and Architect. Sensor-operated flush valves and sensor-operated faucets will be provided for public restrooms and will be battery-powered. Manual flush valves and manual faucets will be provided for private restrooms.

Plumbing chases shall be provided for all public toilets and shall be a minimum of 36" wide for walkable access and provided with a minimum 24" wide access door.

Cold, tempered, hot, and hot water recirculation piping above-ground will be Type L copper with 100% lead-free solder. Insulation will be glass-fiber with all-service jacket or flexible elastomeric. Shutoff valves will be located at all major branch and all final use locations. All piping systems and equipment will be labeled.

Sanitary piping will be routed from the new fixtures to mains routed below Level 1. The quantity, size, and location of the sanitary main exits from the building will be coordinated with the civil site engineer as the design progresses. It is anticipated that the main sanitary outfalls from the building will be located on the northeast portion of the building. It is anticipated that all sanitary drainage will flow by gravity to the mains outside of the building – no central sewage ejector pumps will be required (although elevator sump pumps will be required which will discharge to sanitary). Grease interceptors will be provided for the kitchen and concession areas as required per the Des Moines Metropolitan Waste Reclamation Authority. Sand interceptors will be provided for enclosed garages used by Airport Operations.

Above ground sanitary piping will be cast iron or DWV copper. Below ground sanitary piping will be cast iron or PVC. Grease-laden sanitary piping will be epoxy coated cast iron or stainless steel. Lengths of grease-laden sanitary piping shall be evaluated during design and if the lengths are such that grease could cool, heat trace and insulation shall be applied. All sanitary and vent piping and equipment will be labeled.

Storm piping will be routed from the new roof drains to mains routed below Level 1. The quantity, size, and location of the storm main exits from the building will be coordinated with the civil site engineer and building architecture as the design progresses. It is anticipated that the main storm outfalls from the building will be located on the east side of the building. Secondary roof overflow drains will be piped down inside chases to lambs' tongue fittings and will spill onto grade. Drain tile will be provided around the perimeter of the foundation. The drain tile will be connected to a duplex sump pump and discharged to the site storm system.

Above ground storm piping will be cast iron. Below grade storm piping will be cast iron or PVC. Roof drain bodies, and all horizontal portions of storm drain piping between the roof drain and first vertical drop shall be insulated with flexible elastomeric or glass-fiber with all-service jacket. All storm piping and equipment will be labeled.

A new gas service entrance will be provided for the terminal building and the remote central plant. Inside the Terminal building, natural gas will be r14" w.c. to serve food service equipment, water heaters and other gas fired equipment. In the Remote Central Plant, natural gas will be routed at 2.0 psig to serve the boilers.

Natural gas piping will be Schedule 40 black steel pipe. For 14" w.c. gas piping fittings shall be threaded for 2" and under sizes and butt-welded for 2-1/2" and larger sizes. For 2.0 psig, fittings shall be welded for all sizes. All natural gas piping and equipment will be labeled.

Domestic water services for Concourse A and C will be independent of the new terminal building. A new domestic water entrance will likely need to be re-established for Concourse A and C when the original terminal building is installed, likely near the existing fire pump under the existing passenger screening area.

5.2.6 Fire Protection Systems

The new Terminal building will be provided with an automatic sprinkler system per NFPA 13. The new Terminal will also be provided with Class I standpipes as it is classified as a Covered Mall Building by the building code. A new fire pump and fire protection entrance will be located on Level 1 in the Terminal Building adjacent to the water entrance. It will utilize the same dual feeds for the water service and will be a combined entrance. The fire pump will be electrically driven.

The new building will be light hazard classification in general, with areas of higher hazard classification such as storage rooms. Dry fire protection systems will be provided where sprinkler piping is subject to freezing (overhangs, canopies, etc.). Double interlock pre-action systems or clean agent fire suppression systems will be provided in the main IT rooms. Smaller satellite IT rooms will be provided with coverage via the wet pipe sprinkler system.

Wet piping 2" and smaller will be Schedule 40 black steel with screwed or flanged joints. Wet piping 2-1/2" and over will be Schedule 40 black steel with mechanically roll-grooved joints. For wet piping 2-1/2" and over, Schedule 10 black steel piping may be considered as a budgetary consideration as the design progresses. Dry piping will be Schedule 40 galvanized steel with screwed or flanged joints 2" and smaller, and screwed, flanged, or mechanically coupled grooved joints 2-1/2" and larger. All fire protection piping and equipment will be labeled.

Fire protection for Concourse A and C will be independent of the new terminal building. The existing fire pump located below passenger screening will remain in place.

5.2.7 Power Systems

5.2.7.1 Utility Service

A new 13.2kV automatic throw over (ATO) switch will be provided by the utility company. The ATO will be located in the new parking garage. The ATO will serve new medium voltage secondary unit substations located inside the new and existing terminal. The ATO will be served from two separate lines. One side of the ATO will be served from a new feeder originating along Fleur Drive from the north and the second feeder will be served from the south.

Medium voltage feeders from the new ATO switch will be routed underground in a looped fashion throughout the terminal to each new unit substation. New 13.2kV to 480 volt unit substations will be located on Level 1 to serve the 480 volt loads in that area. Refer to the conceptual **Figure 5.12, Electric One-Line** diagram for a potential layout. The unit substations will range in size from 500 kVA to 2000 kVA depending on the equipment and area being served. The utility company will provide the medium voltage automatic throw over switchgear and primary conductors. Additional unit substations will be provided during future phases as required to serve those areas. Include pathways and manholes are required to add these substations with minimal disruption to the 13.2kV loop.

All new conduits outside the limits of construction will be directionally bored and will be a minimum of 5" HDPE. Conduit within the limits of construction will be PVC, Schedule 40, reinforced, concrete encased and will be a minimum 4". Conduit routing requirements will be based on direction from the civil engineer to coordinate with other utilities. Manholes will be provided for all conduit runs in excess of 500' and where required by the utility company. 100% spare capacity will be provided for all primary conduits. Secondary service feeders will extend from the new automatic throw over switch to the new service-rated switchgear located in the main electrical room of the parking garage. Underground conduits will be installed in a concrete encased duct bank.

5.2.7.2 Main Distribution

The unit substations located in the electrical rooms on Level 1 will have 13.2 kV to 480 volt transformers with integral circuit breaker type switchboards rated at 480/277 volt, 3phase, 4wire with a main circuit breaker. On the medium voltage side, the feeders will be installed in a loop fashion.

The switchboards will use fixed-mounted power circuit breakers with a microprocessor-based breaker tripping system on breakers 400A and larger and electric metering capability on all mains. Spare spaces will be provided to accommodate future loads. The distribution panel switchboard switchgear will be provided with ground fault protection. A digital power meter will be provided on the load side of the main overcurrent protection device within each unit substation. The digital power meters will be connected to the BMS for centralized power monitoring.

5.2.7.3 Generator

Parallel 500kW generators rated at 480/277 volts, 3 phase, 4 wire to be provided. One generator to be diesel and the second to be natural gas. Generators will be located in weatherproof, sound-attenuated enclosures located at the remote central plant. Parallel feeders from generator mounted automatic circuit breakers to the switchboard located in the remote central plant main electrical room. A permanent switching means to connect a portable alternate source of power may be required as required by NEC. Feeders to terminal unit substation electrical rooms and fire pump will be required during Phase 1A. The paralleling switchboard to be sized as appropriate for additional 500kW parallel generator to serve future terminal construction. Provide spare conduits and manholes as required for future feeders to the switchboard and from the switchboard to Phases 1B, 1C and 2 unit substation electrical rooms. Remote generator annunciation will be provided in the main security room to allow 24/7 monitoring.

5.2.7.4 Emergency Distribution

The generator switchboard will be rated at 480/277 volt, 3phase, 4wire with a main circuit breaker. The generator switchboard will use fixed-mounted power circuit breakers with a microprocessor-based breaker tripping system on all breakers rated 400A or greater and electric metering capability. Spare spaces will be provided to accommodate future loads. Life safety and equipment loads will be served by separate automatic transfer switches. Transfer switches serving life safety and equipment loads will be 4-pole, open transition, by-pass isolation type.

Table 5.5 is intended to clarify what is required by code to be on backup power system and what additional building systems are recommended to be put on generators, without dramatically increasing cost, to allow the airport to operate albeit in a reduced level of service mode. The loads will be separated into life safety, priority and secondary standby systems.

Table 5.6 is intended to show what systems or areas will not have emergency power back up and which systems or areas not planned to have emergency power backup.

Finally, we will identify all other systems which would be supported from external generation systems for an extended emergency situation and would keep the airport in a fully functional mode. Each panel on the emergency distribution system will have surge suppression to meet National Electrical Code requirements.

Emergency generator(s) system will be located outside the building in a weather proof enclosure. The loads will be separated into 3 categories as follows:

- Priority 1: Life safety equipment - those required by code to have the backup supplied by the permanent generator. Power source within 10 seconds of utility failure.
- Priority 2: Priority power needs - those that assist in operating a facility and are powered by the permanent generator. Loads will have a power source in about 30 seconds of a utility failure.
- Priority 3: Secondary Standby needs - Items and equipment powered by one or more portable generators brought to the site during long term power outages and connected through the main switchgear.

5.2.7.5 Uninterruptible Power Supply (UPS)

NO UPDATE

5.2.7.6 Normal Distribution

New normal power branch receptacle and lighting loads will be served from new 208/120 volt and 480/277 volt, 3phase, 4wire branch circuit panels. These panels will be connected to new circuit breakers installed in the unit substations.

5.2.7.7 Main Distribution

Distribution equipment will be provided with dead front construction, copper bussing, and sized with a minimum of 15% spare circuits. Transformers will meet the 2016 Department of Energy efficiency standards. Transformers will have copper windings and will be rated for 115°C temperature rise over ambient. Transformers will be installed on concrete housekeeping pads. Variable

frequency drives will be provided with manual bypass to allow equipment to run in a manual fashion should the electronics fail.

Transfer switches will be automatically operated with microprocessor-based controls to start the generator, transfer loads, and exercise generator. Transfer switches will be four pole, with bypass isolation. A surge suppression system will be provided on each unit substation switchboard (Type 1 SPD), as well as on all branch and distribution panelboards (Type 2 SPD). All wire will be copper.

An electrical load study, including short circuit analysis, voltage drop, arc flash and selective coordination, will be required to be carried out on the entire power system. This study will be performed by the selected manufacturer of the distribution equipment. Feeder sizes will be increased as required to limit voltage drop from the service entrance to the branch circuit panel to not more than 2%.

5.2.7.8 Branch Distribution
NO UPDATE

5.2.7.9 Motor Connection and Control
NO UPDATE

5.2.7.10 Grounding System Requirements
NO UPDATE

5.2.7.11 Electronic Metering
NO UPDATE

5.2.7.12 Identification of Electrical System
NO UPDATE

5.2.8 Lighting Systems

NO UPDATE

5.2.8.1 Lighting System Components
NO UPDATE

5.2.9 Fire Alarm System

NO UPDATE

5.3 Terminal IT/Communication

This section presents the steps required to prepare for the general IT systems for the new Passenger Terminal Building (PTB) and recommendations for maintenance of existing Information and Communications Technology (ICT) Systems, Operational Systems, and Security Systems. The existing data center operations located in the existing terminal will be migrated to the new data center in the new PTB. The new data center will be built and operational prior to demolition of the existing, however, interconnecting communication links will be required during transition phases. Connectivity to the existing terminal telecom rooms and airport site facilities and systems will also be required.

5.3.1 Recommended High-Level IT Objectives

All critical IT planning and development for preparation of the new Passenger Terminal Building (PTB) will be addressed in the design. This will include the Information and Communications Technologies (ICT) Systems & Infrastructure, Airport Operations Systems, Security & Life-Safety Systems and Facility Managements Systems.

5.3.1.1 IT Master Plan
NO UPDATE

5.3.1.2 Systems Secondary Backup
NO UPDATE

5.3.1.3 Fully Redundant Fiber Ring
NO UPDATE

5.3.1.4 Reduced Dependency on Main Terminal Data Center
NO UPDATE

5.3.1.5 New Primary Data Center (PDC)
Ultimately the primary IT systems supporting the airport and overall site will be migrated to the new Primary Data Center (PDC), shown in **Figure 5.16.** The new data center power will be backed up by generator power as well as a modular on-site uninterruptible power system (UPS) providing fully redundant power sources. Fully-redundant fiber ring and primary service entrance should be routed to this PDC. The fiber ring will also need to include connection to the existing terminal telecom rooms that will remain and Bldg. 5 Distributed Antenna System (DAS) equipment.

Figure 5.16 - Primary Data Center

5.3.2 Early-Works Phases

Terminal Phasing will need further development by the final designer. The early design phases includes planning required to coordinate relocation of the information technology operations from the existing terminal to the new terminal, including data center, airline and site operations. All systems identified in 5.3.3 Systems Overview will be migrated as necessary to allow for the demolition of the existing terminal processing center and data center (SCAN Rm). Coordination with the existing telecom service providers will also be required to relocate the service entrance from the existing terminal to the new terminal primary and secondary IT entrance rooms.

For planning purposes, the existing infrastructure is maintained during the initial planning stages associated with the PTD. It will be beneficial to the Authority during this stage to implement sections of an updated fiber ring to leverage available enabling opportunities where practical. The Authority should focus on the high-level objectives versus specifics. Therefore, the goal is to maintain existing telecom services and, where possible, plan and build new infrastructure to support PTB development. Initiatives for consideration include:

- Maintain existing service entrances and plan for new primary entrance to PTB once design is developed sufficiently
- Maintain existing fiber OSP through any impacting early works and implement sections of future fiber ring where possible.
- Reduce Authority dependency on the existing Data Center in the existing Main Terminal.

5.3.3 Systems Overview

NO UPDATE

5.3.4 Utilization of Existing Systems

NO UPDATE

5.3.5 System Migration

NO UPDATE

5.3.6 Network and Infrastructure Recommendations

NO UPDATE

Fig 5.16 Primary Data Center

5.4 Site Utilities

This section presents the recommended site utility development for the Des Moines International Airport.

5.4.1 Site Power

MidAmerican Energy owns and maintains the primary electrical distribution system that serves the airport property. Two new MidAmerican Energy main 13.2 kV electrical feeders from Fleur Drive, one from the south and one from the north, are proposed to serve the new terminal improvements. The feeders will be routed to the proposed switchgear room in the new parking garage. From the switchgear room in the garage, electrical power will be routed to the new terminal and other facilities for utilization.

Light poles and associated underground electrical lines will be demolished during construction activities at locations generally indicated on **Figure 5.18**. There are three buildings that are part of Signature Aviation that will be demolished along with associated electrical lines to the buildings.

Care should be taken during construction phasing so that utilities can be placed before concrete work to minimize concrete disturbance and lessen expense of replacing new concrete. Electrical lines to the existing terminal and other facilities should be protected during construction. Only demolish electrical lines once a building or the terminal is no longer in use.

Refer to **Figure 5.18** for proposed site power map.

5.4.2 Site Communication/IT

Please refer to Section 5.3 Terminal IT/Communication for detailed information on recommendations for utilizing existing pathways and locations of suggested new pathways in order to minimize disruption during construction activities. Existing private communication facilities that currently run through the airport campus will be relocated into new communications pathways installed with the Cowles Drive Phase 2 Project. Installation of new communication pathways to the new terminal will be accomplished upon completion of the Parking Garage Project.

5.4.3 Water System

There are four buildings that are part of Signature Aviation that will be demolished along with associated water distribution lines to the buildings. A new 12 inch water main is proposed to maintain the existing loop system by connecting to the existing 8 inch and 12 inch water mains. An 8 inch domestic water line and 8 inch fire protection water line will serve the new terminal building. A new fire protection water line will also service the expanded parking structure.

Care should be taken during construction phasing so that utilities can be placed before concrete work to minimize concrete disturbance and lessen expense of replacing new concrete. Water lines to the existing terminal and other facilities should be protected during construction. Only demolish water lines once a building or the terminal is no longer in use.

Refer to **Figure 5.19** for proposed water system map, which includes the water main to be installed as part of the Cowles Phase 2 project under construction in 2022.

5.4.4 Sanitary Sewer System

A temporary sanitary sewer main is required to maintain service to Concourse C during construction of the new terminal. The existing sanitary sewer main serving the Signature Aviation buildings and Concourse C will be demolished. Existing grease interceptors will be demolished.
The new terminal will be served with a new sanitary sewer service that will be routed from the loading dock area to the existing sanitary sewer main connection. Grease interceptors that will serve the terminal will be located in the loading dock area and be served with the new sanitary sewer service. A new sanitary sewer service will be extended to the parking garage expansion to serve a new sand and oil separator.

Care should be taken during construction phasing so that utilities can be placed before concrete work to minimize concrete disturbance and lessen expense of replacing new concrete. Sanitary sewer lines to the existing terminal should be protected during construction. Only demolish sanitary sewer lines once a building or the terminal is no longer in use.

Refer to **Figure 5.20** for proposed sanitary sewer lines map. Do not refer to tables 5.8 and 5.9 in the 2018 Program Definition Manual, as they are outdated.

5.4.5 Apron Grading and Drainage

The proposed relocation of the airport terminal will require a significant amount of the existing apron pavement to be removed and reconstructed. The existing apron pavement area drains via sheet flow from south to north, adjacent to the existing terminal. Runoff is collected at various intakes and trench drains and conveyed to the Terminal Tank just north of the existing apron.

Apron grading and drainage is governed by FAA and NFPA Design Criteria. FAA Advisory Circular 150/5300-13A "Airport Design" states that apron grades for aircraft approach category D apron pavement cannot exceed one percent, while maximum grade change cannot exceed two percent. In addition, the apron pavement grades are required to drain away from the terminal building especially in aircraft fueling areas.

NFPA Code 415 "Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways" requires that the minimum apron grade shall be 1%, the apron pavement needs to drain away from the building, and no drainage or collection structures can be located within 50 ft of the building face. The 50 ft collection structure criteria is in place to assure that there won't be any surface runoff collection points within 50 ft of any building face in the event of a fuel spill. Additionally, NFPA code specifies that use of open-grate drainage trenches as collection means shall not be over 125 ft in length with a minimum interval of 6 ft between sections to act as fire stops, and that each section shall be individually drained through underground piping.

Construction of the new terminal will impact the existing grading patterns, and drainage collection points on the apron. While the transition to a centralized deicing area on the west side of the apron adds to the complexity of the apron drainage, overall efforts were implemented to maintain as much of the existing grading patterns as possible.

The overall grading pattern will need to be altered slightly from the existing northerly direction to accommodate the geometry of the proposed terminal building. While generally flowing from south to north, the proposed grading pattern flows away from the newly aligned terminal to the northwest. In order to accommodate NFPA requirements. For the Phase 1a and 1b of the new terminal the apron drains away from the building towards Taxiway P at close to maximum allowable grades. A portion of Taxiway P at the intersection with Taxiway G must be reconstructed to the centerline in order to reverse the cross slope in order to keep longitudinal grades under 1.5% on Taxiway G as it heads towards the terminal face. At the southern edge of the initial terminal apron there will be a 5 foot elevation difference between the proposed and existing apron. With construction of Apron B (initial two deicing positions) a small area of the existing apron must be milled and overlaid in order to tie together the two aprons. Apron C will connect Apron A and Apron B together and allow aircraft to taxi from the C-concourse to the new terminal while remaining in the non-movement area. When Terminal Phase 1c is completed, and the existing concourse A and C are removed, a final portion of apron will be constructed

Figure 5.18 - Demo & Proposed Electric & Gas

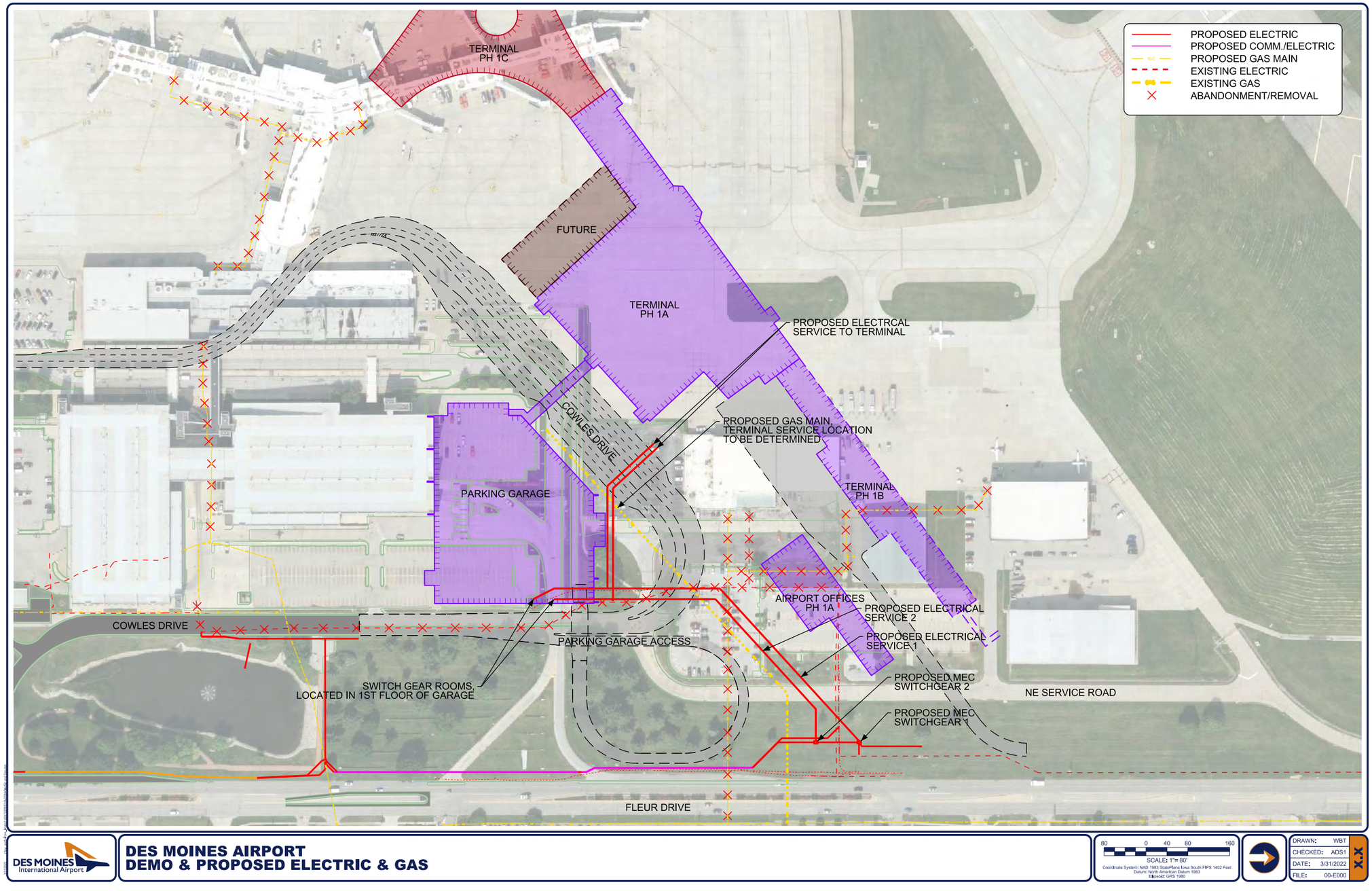
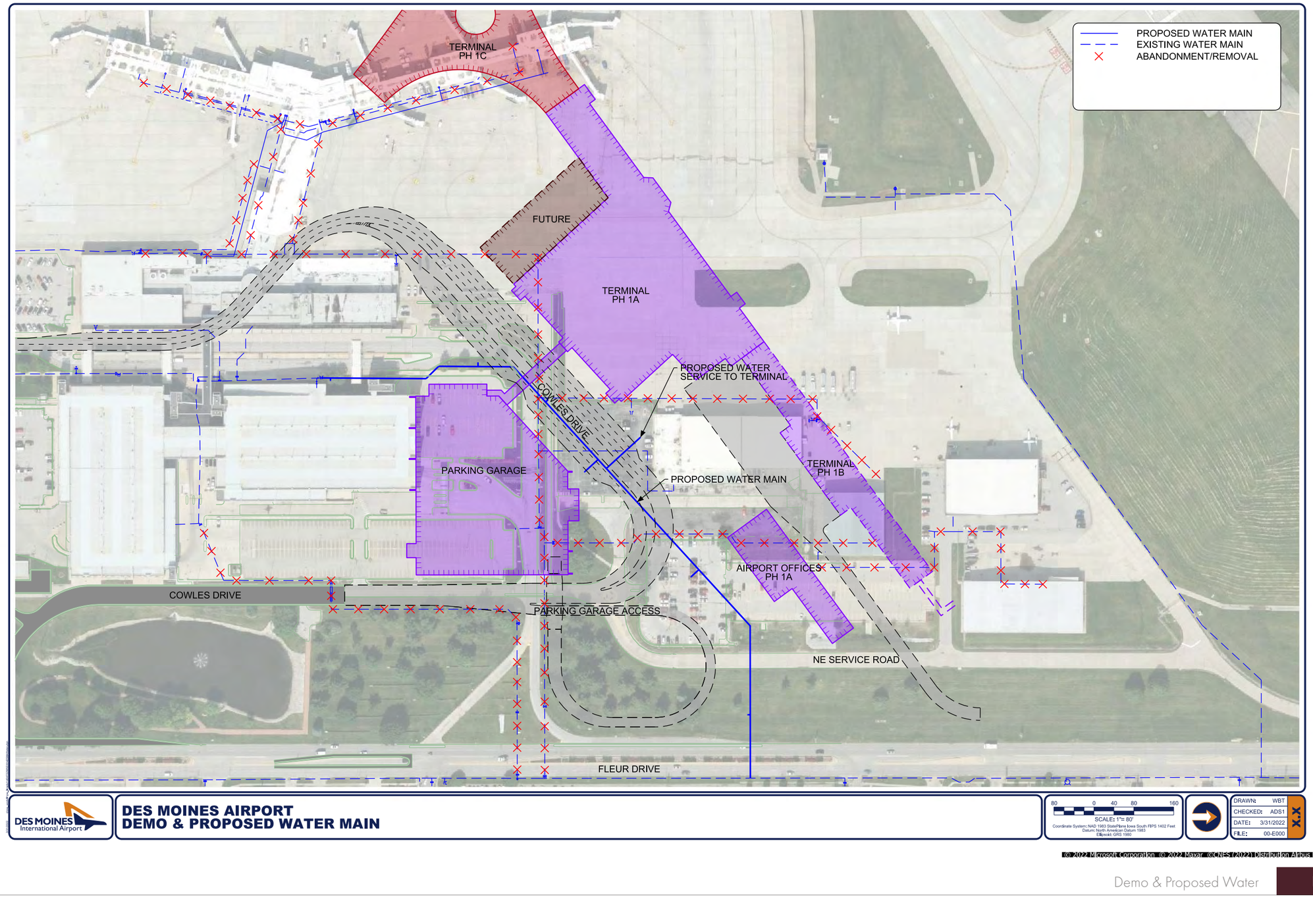


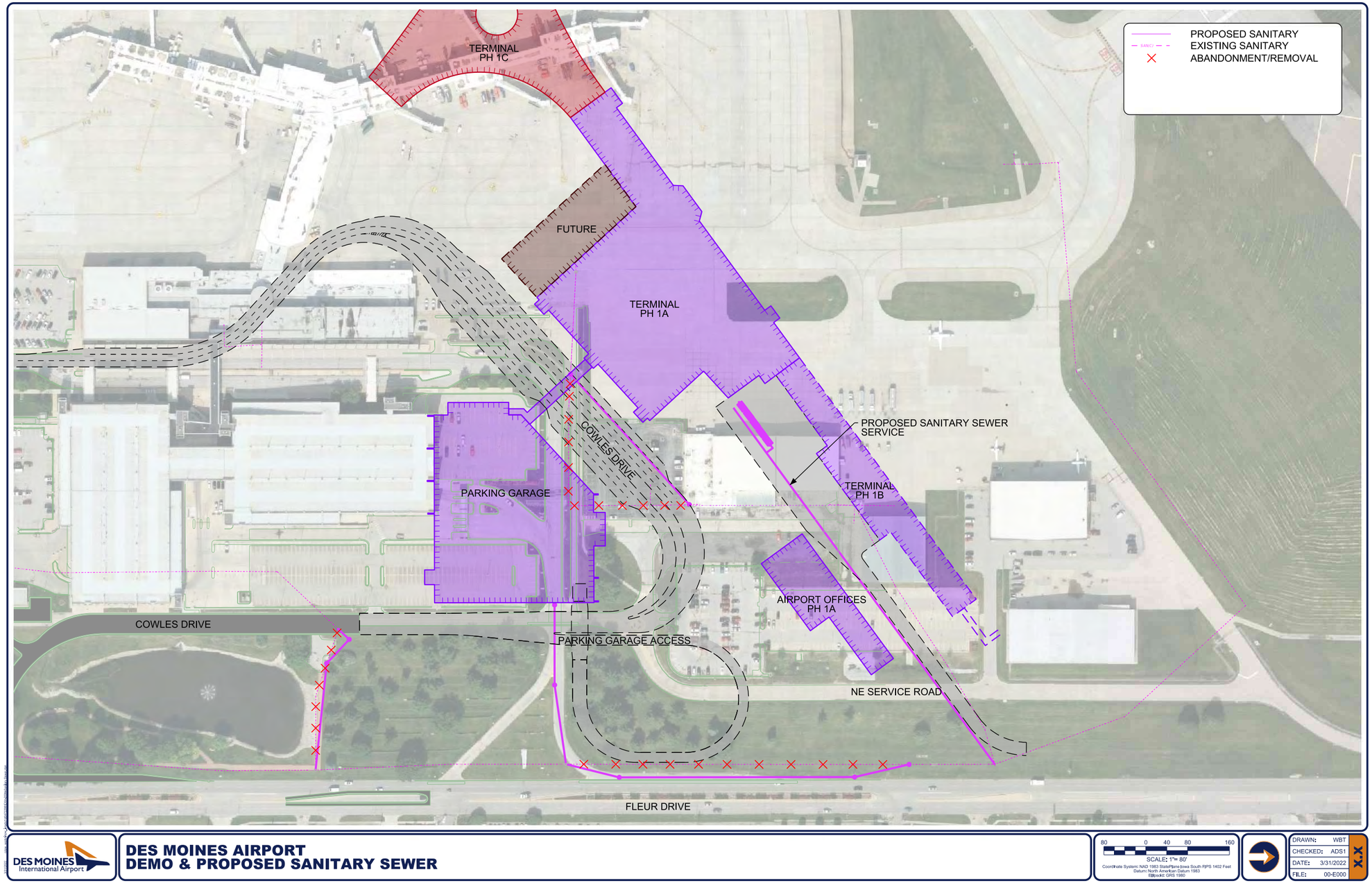
Fig 5.18 Demo & Proposed Electric & Gas

Figure 5.19 - Demo & Proposed Water



(c) 2022 Microsoft Corporation (c) 2022 Maxar (c) CNES (2022) Distribution Airbus DS

Figure 5.20 - Demo & Proposed Sanitary Sewer



(c) 2022 Microsoft Corporation (c) 2022 Maxar (c) CNES (2022) Distribution Airbus DS

Fig 5.20 Demo & Proposed Sanitary Sewer

Figure 5.21 - Proposed Drainage

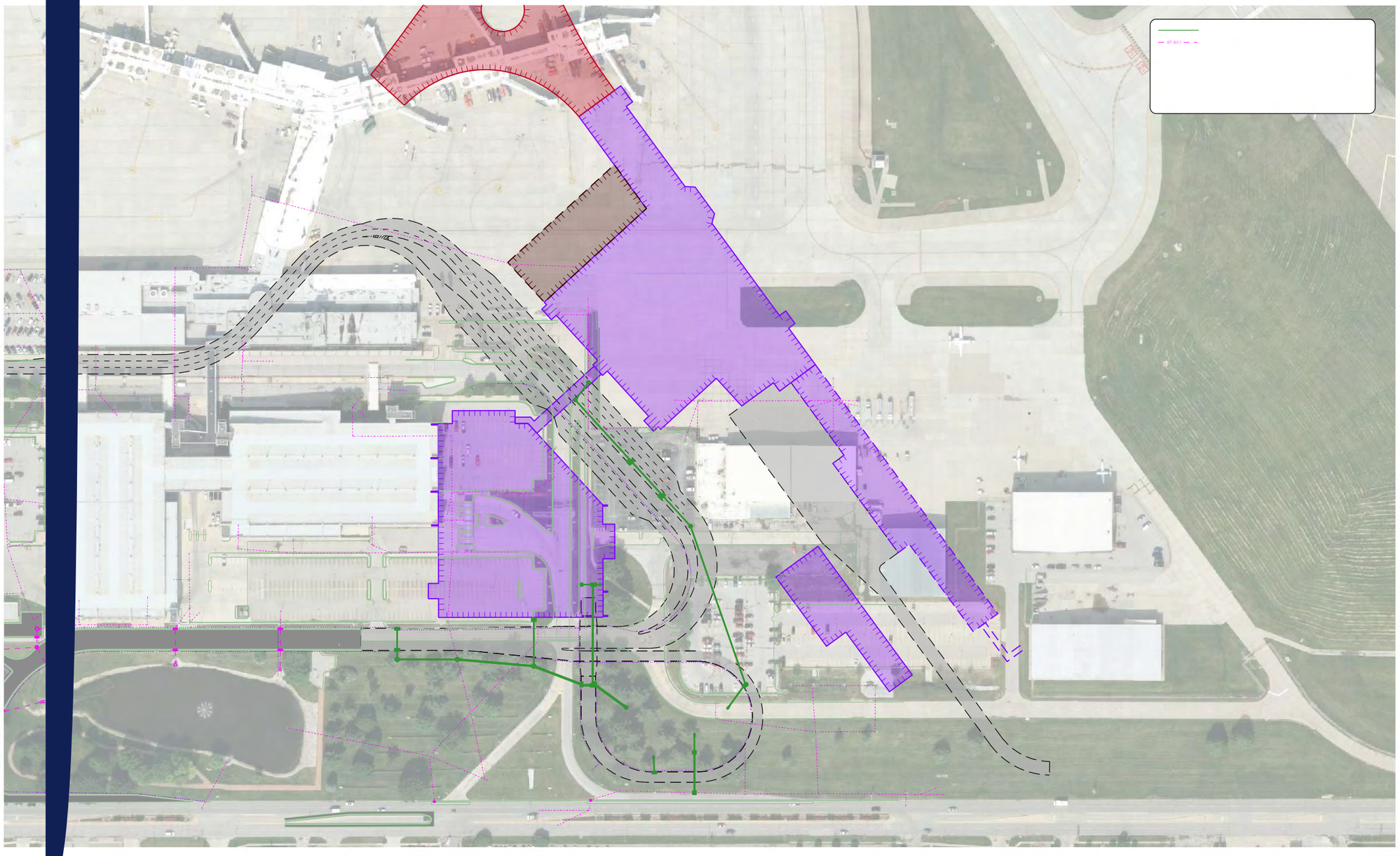


Exhibit 06 - Terminal Program 22 Gate Buildout

PHASE OVERVIEW

5 ADDITIONAL GATES WITH THE BUILDOUT OF PHASE 2.

KEY NOTES

1 FUTURE CONCOURSE AND APRON EXPANSION

AIRCRAFT POSITIONS

AIRCRAFT POSITIONS:
22 - GATES PHASE 2 TERMINAL COMPLETE
9 - REMOTE RON POSITIONS

*ALL DEICING OCCURS ON THE FOUR CENTRALIZED DEICING PADS.

DES MOINES International Airport | Foth | **TERMINAL PROGRAM 22-GATE BUILD OUT** | 150 0 75 150 300 SCALE: 1"= 150' | EXH06

4/18/2022 5:54:22 PM pw://foth-pw.bentley.com:foth-pw-01/Documents/Clients/Des Moines Airport Authority/Airport Owners Rep/Update Program Definition Manual/CAD/Desktop/2022 East Quadrant Overall Display/2022 Terminal Layout Phasing Exhibits.dgn

Exhibit 7.3.1 - Executive Level Schedule

DES MOINES International Airport

7.3.1 Executive Level Schedule

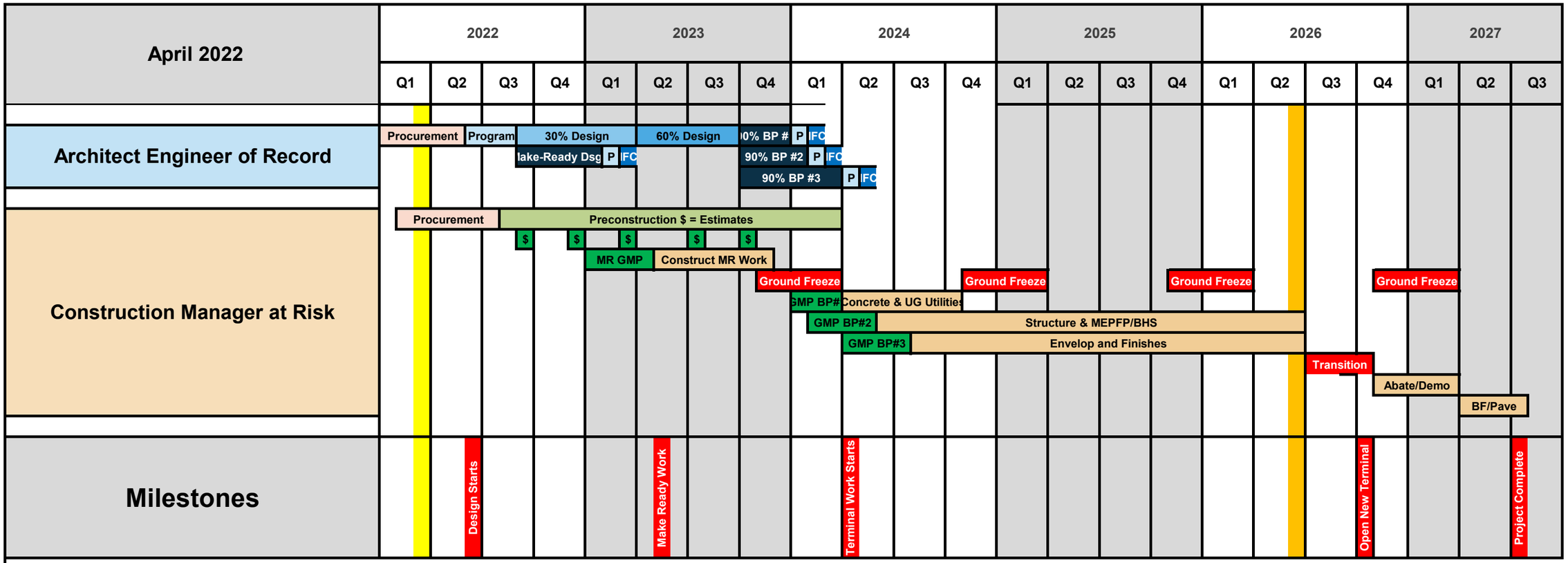


Exhibit 7.3.2 - Summary Level Schedule April 2022

DSM New Terminal Program **7.3.2 - Summary Level Schedule April 2022**

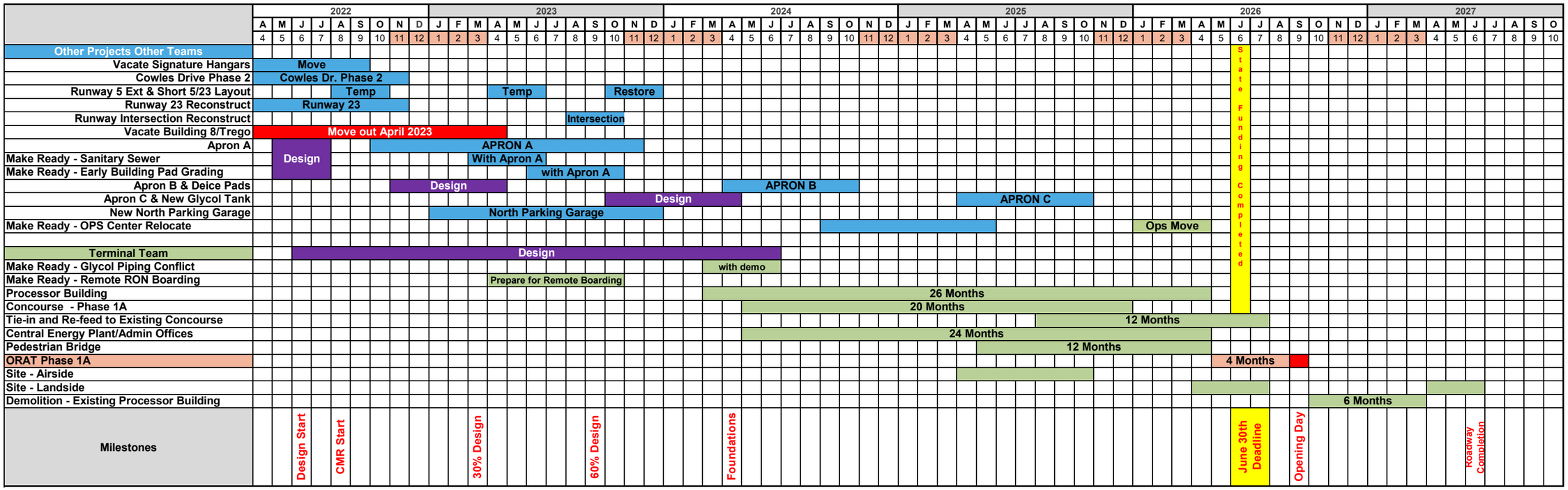


Exhibit 7.4.RR.002 - Meeting Minutes

bbs ARCHITECTS ENGINEERS

MEETING MINUTES

Project Name: DSM Airport New Terminal **Meeting Date:** 04/08/22

BBS Project #: 21045 **Date Issued:** 04/11/22

Meeting Location: Teams Meeting

Attendees:	Cody Christensen	City of Des Moines	P&D Administrator
	Brian Bishop	City of Des Moines	Deputy Building Official
	Terry Berk	City of Des Moines	Plans Examiner
	Adam Prilipp	City of Des Moines	Civil Engineer
	Jillian Sommer	City of Des Moines	Assistant Planner
	Patrick Phelan	City of Des Moines	Fire Protection Engineer
	Bryan Belt	Des Moines Airport	Director of Engineering
	Tim Bungert	Owner's Rep-BBS	Architect
	Holly Elbert	Owner's Rep-BBS	Mechanical Engineer
	Aaron Huisman	Owner's Rep-HOK	Architect

Purpose of meeting was to introduce Des Moines Permit and Development Group to the upcoming new Airport Terminal Project. Action Items appear in **Bold** text:

I. Tim gave an update on current project status.

A. BBS and HOK are on the Airport Owner's Rep Team led by Anser. We have been updating the Program Definition Manual, including building floor plans that were in the programming plan last completed in 2018.

B. The Airport has recently interviewed A & E design teams and will formally announce the selected team at the Airport board meeting on April 12.

C. The Airport will likely be procuring the project through CMAR (Construction Manager at Risk) assuming that the governor signs the bill that has passed both State legislative bodies.

D. The project will be constructed in 3 phases, 1A, 1B and 1C. Tim showed preliminary site plans showing these phases and general shapes of the building. (See attached)

1. There is a remote building to the east of the new Terminal that will house the Central Utility Plant and possibly Admin Offices. This will be constructed in Phase 1A.
2. The existing A & C Concourses will continue to be used in 1A and 1B.
3. The existing Bag Claim area may be repurposed for Federal Inspection Services (FIS or Customs) in Phase 1A, 1B and 1C.
4. The existing Terminal Ticketing area would be demolished in Phase 1A after the new Terminal Construction is complete and operations are switched over.

E. The project will likely be procured with 3 different bid packages. Full scope of all bid packages will be determined once CMAR and design team are selected and under contract.

1. Bid Pack 1 –
   a) Tentative Issue Date - January 2024
   b) Tentative Scope: Sitework, Utilities, Footings, MEP equipment
2. Bid Pack 2
   a) Tentative Issue Date – Feb/March 2024
   b) Tentative Scope: Structure, Envelope, Conveyance

219 Eighth Street
Suite 100
Des Moines, IA 50309
515.244.7167

www.bbsae.com

MEETING MINUTES

3. Bid Pack 3
   a) Tentative Issue Date – April/May 2024
   b) Tentative Scope: Interiors, FF&E

II. Site Plan Submittal (Jillian Sommer)

A. Site Plan Submittal shall include the entire build-out: Phase 1A, 1B and 1C and notation of the phasing.

B. Per Jillian – site plan submittal will need to include building elevation views showing façade materials, glazing.

C. Cody asked if the design for forthcoming phases, such as 1B and 1C changes, will we need to do another site plan submittal. Bryan noted that the plan would be to submit 1A, 1B and 1C together. 1B will likely not change. Holly and Aaron noted that the shape of 1C could change but building materials and exterior should match 1A and 1B.

D. Tim noted that the Central Plant and Equipment Yard is close to Fleur Drive and we would expect some special design attention on materials and screening used for this building.

E. Holly and Bryan noted that the Central Plant building footprint will be such to support the build-out of Phases 1A, 1B, 1C, and a future Phase 1D.

F. Jillian suggested allowing 2-3 months for site plan review.

G. Planning and Zoning will likely classify as a "Civic Building" which has quite a bit of flexibility for design requirements under City of Des Moines Ordinance Chapter 135.

H. Jillian suggested any deviations requests should be submitted as a Type 2 Design Alternative, which would require review and approval by the Planning and Zoning Commission.

I. Tim asked if a 30% design completion of the building elevations would be adequate. Jillian noted that as long as they indicate materials of construction for the exterior, glazing and entrances that should be adequate.

III. Civil (Adam Prilipp)

A. There is a new storm water ordinance in effect which should benefit this project.

1. As long as the net impervious surfaces on the site is not changing, no analysis or calculations for storm water are required.

B. Adam does not see any concerning site issues with this project.

C. Bryan noted that the Airport has already coordinated with Des Moines Water Works on water mains as part of the Cowles Phase 2 work.

D. Bryan noted that the Airport has also coordinated with Mid-American for gas and electric services

E. Bryan noted that we are adding an additional drive lane. Currently have 6, will have 7. Kimley Horn and LT Leon have been working with the City of modeling and calculations related to this work.

IV. Building (Patrick Phelan and Terry Berk)

A. Patrick noted that they will want to be aware early on if any portion of the building is 30 ft above grade.

B. As the design develops we will want to review how the existing A&C Concourse sprinklers, standpipes and fire alarm tie-in with the new terminal.

C. Terry noted that the Central Plant will likely require its own building permit.

D. Terry noted he was accepting of reviewing the three bid packs and offered the following timelines for review periods.

Exhibit 7.4.RR.002 - Meeting Minutes

1. Bid Pack 1 – 15-20 working days
2. Bid Pack 2 – 30-45 working days
3. Bid Pack 3 – Hard to determine until they see what is included in the build-out.

E. Renovation of the existing A and C Terminals could be completed under the same permit as the new building or under a separate permit if needed.

F. Terry requested that the current building floor plans be emailed to him. Tim will send.

G. Holly and Tim indicated that the existing Bag Claim building may be re-purposed as a FIS (Federal Inspections Services) building with a new mezzanine with Airport Administration Offices.

1. This building would be stand-alone and no longer connected to the main Terminal or A&C Concourse. Construction would likely occur under a separate permit.
2. Building Occupancy Type will need to be reviewed. It could be covered mall or mixed use. P&D and design team would need to review.
3. Bryan Belt noted there would be no retail or food service.

H. Holly and Tim indicated there may be a walkable utility tunnel between the Central Energy Plant and the new Terminal building.

1. Terry will provide some guidance on exiting requirements.

V. Next Steps

A. Cody encouraged the Owner's Rep team and Design Team to reach out to Jillian, Patrick and Terry directly as we move forward.

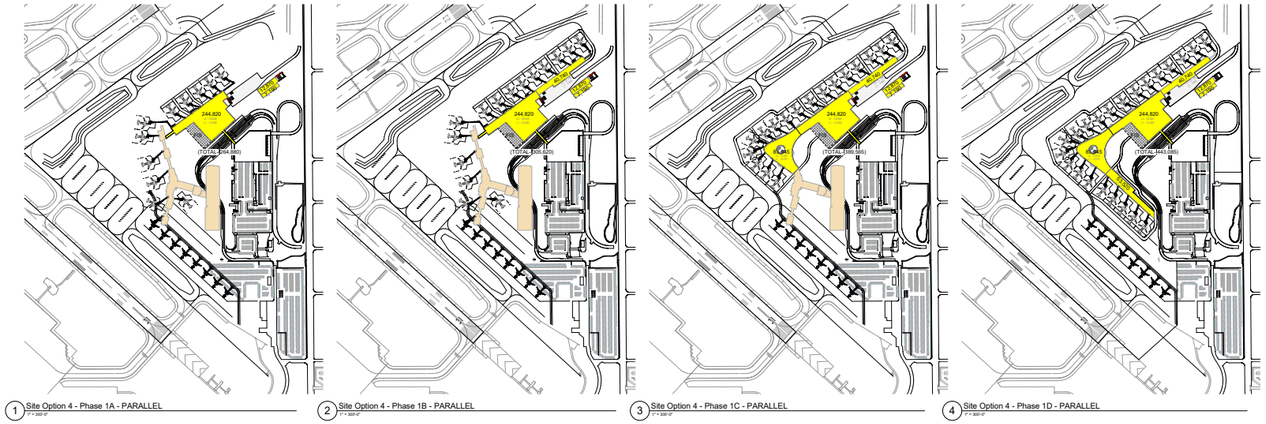
These meeting minutes are the writer's understanding of the discussion. Please submit additions or corrections in writing within seven (7) days of issuance. If none are received within that period, minutes will be assumed to be accurate and will be filed as a part of the project record.

Respectfully submitted,

BBS Architects | Engineers

Holly Elbert, P.E.
Mechanical Engineer, Partner

Cc: All attendees, Owner's Rep Team Members

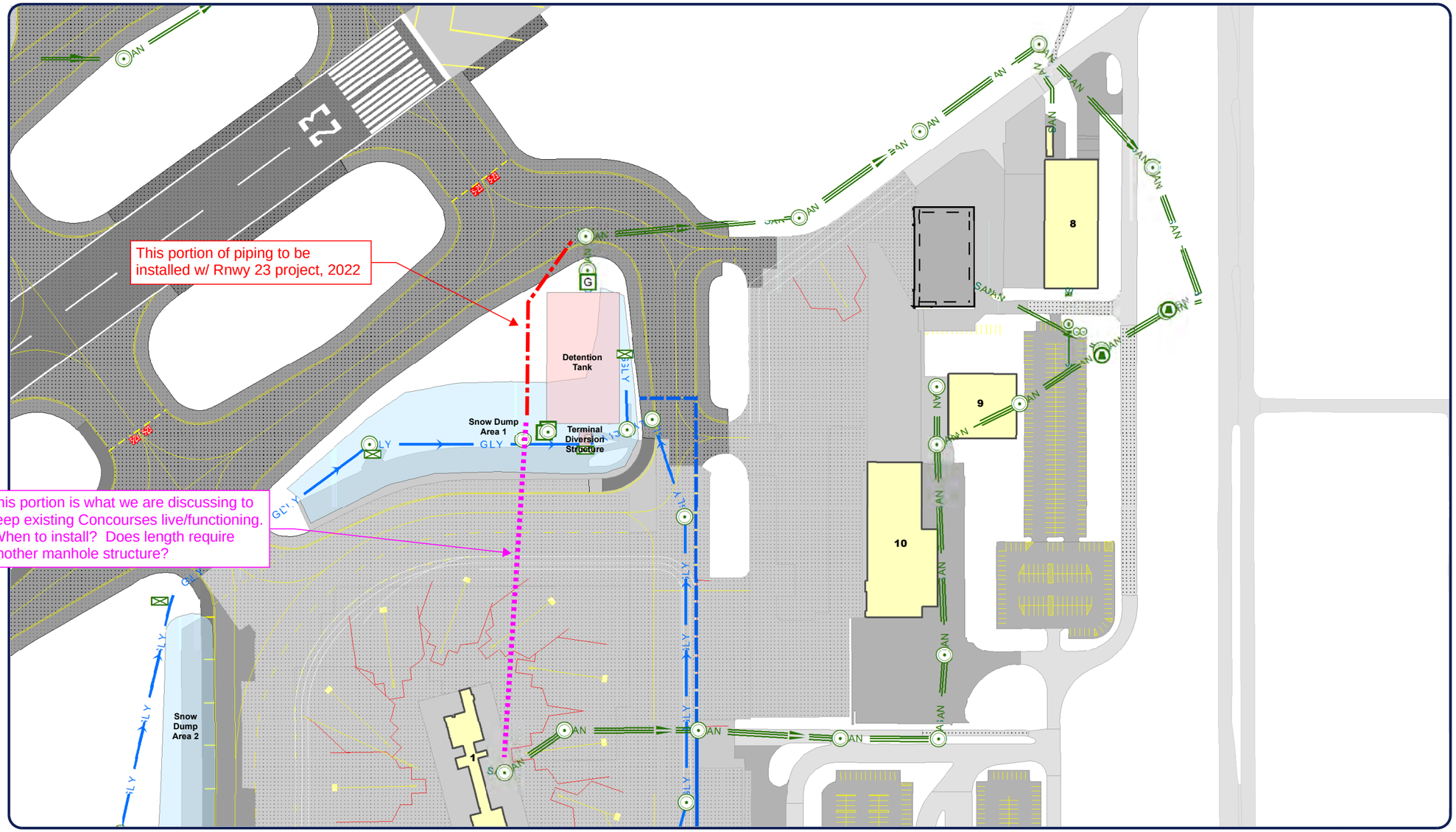


DES MOINES International Airport

S111

SITE PLAN PHASES
1" = 300'-0"
PROJECT NUMBER

Exhibit 7.4.RR.004 - Temporary Sanitary Connection



DES MOINES International Airport

Temp Sanitary Connection

1/24/2022

0 80 160 320 480
FEET

Coordinate System: NAD 1983 StatePlane Iowa South FIPS 1402 Feet
Datum: North American Datum 1983
Ellipsoid: GRS 1980

Chapter 8

Program Cost Estimates

8.0 Program Cost Estimates

NO UPDATE

8.1 Basis of Estimate

This estimate is based upon the programming level design information for each of the facilities included in the scope of this program. The estimate does not incorporate design and engineering changes occurring subsequent to this information.

The cost estimates prepared for the New Terminal program at DSM are not definitive. These estimates were prepared from programming and planning level design and engineering information which due to the early stage of requirements planning did not include all details and information from which deeper assessments of quantities and commodities could be identified. The estimates are based on the measurement of areas and/or quantities from the documents, where possible. For the remainder of the scope, parametric measurements were used in conjunction with references from other projects estimated by the project team cost estimator, Anser Advisory, and or historical information related to scope and cost routinely incorporated.

8.2 Basis of Pricing

This estimate reflects the fair market value for the construction of the individual projects within the overall scope of DSM program and should not be construed nor considered as a prediction of low bid. The unit costs include labor, material, and equipment costs plus subcontractors overhead and profit costs. To the extent possible, the estimators have endeavored to assess the identified design scope to the lowest singular commodity or assembly of materials for which costs could be assigned and or assembled. The depth to which the assessments and determinations of commodities and materials were made was dependent on the planning and programming information provided during this stage of planning.

The costs reflected in this estimate either in summary or in the Detail levels are priced at February 28, 2022 with escalation added to the midpoint of anticipated construction.

8.2.1 Procurement Method

Pricing assumes a procurement process with competitive and open bidding processes for every portion of the construction work within the scope of the program. The fees included in the estimate(s) also consider the Construction Managers At Risk (CMAR) firms are qualified through a best-cost competitive solicitation process in order to return the best value of the program to DSM.

This means a minimum of at least 3 competitive and responsible bids from all subcontractors for divisional work and a minimum of 3 written quotations for materials/equipment suppliers. If fewer bids are solicited or received, it is anticipated and reasonably expected that prices and costs will be higher.

Apron A and Apron B work is priced based on the traditional Design-Bid-Build delivery method.

8.2.2 Wage Rates

NO UPDATE

8.2.3 Phasing

Estimates have been based on the revised phasing outlined in Chapter 7.

8.2.4 Access and Security

The estimate anticipates that site access will be primarily from the Landside and that security requirements will be typical for this scale of project at an active airport facility. Construction access will be primarily from the north via McKinley Ave and then along the airport service road just west of Fleur Drive. All terminal, airside and most landside related work will have this access which is completely independent of passenger traffic. Landside work such as the pedestrian bridge from terminal to parking structure will be landside accessible but a dedicated pathway to minimize passenger disruption will be developed by the future design team and contractor.

8.2.5 Escalation

Escalation has been included in this estimate to the midpoint of construction. Estimate includes escalation percentage used per major component. See Section 8.8 for the escalation per component.

Table 8.0A - Yearly Escalation Values Assumed

December 31st, Year	Year Escalation	Percentage
2023	8.00%	8.00%
2024	2.00%	10.16%
2025	2.00%	12.36%
2026	2.00%	14.61%
2027	3.00%	18.05%
2028	3.00%	21.59%
2029	3.00%	25.24%
2030	3.00%	29.00%

Table 8.0B - Escalation per Component

Major Component	Midpoint Construction	Escalation %
Enabling Projects (Hard Bid) - Apron A	7/1/2023	0.00%
Enabling Projects (Hard Bid) - Apron B	7/1/2024	8.00%
Phase 1A - Terminal Bldg	4/1/2025	10.90%
Phase 1A - Site Airside	7/1/2025	11.08%
Phase 1A - Site Landside	7/1/2026	13.48%

Table 8.0B - Yearly Escalation Values Assumed (continued)

Major Component	Midpoint Construction	Escalation %
Phase 1A - Demolition Processor Bldg	1/1/2027	14.61%
Total Phase 1B - Complete	4/1/2028	18.23%
Total Phase 1 C - Site	4/1/2028	18.23%
Total Phase 1 C - Demolition Concourse	4/1/2029	21.81%
Total Phase 1 C - Concourse	4/1/2030	25.49%

8.3 Mark-Up and Contingency Assumptions

The following markups and margins have been added to the Direct Cost of Work.

Construction Manager at Risk (CMAR) fees are applied to the unit costs as shown in **Table 8.1**.

Table 8.1 - Construction Manager at Risk (CMAR) Fees

Category	Percentage
CMAR's General Conditions / General Requirements	11.00%
CMAR's Testing, Site Investigation, Survey, & Permits	1.75%
CMAR's Bonds & Insurance	3.60%
CMAR's Fee	4.00%
Total CMAR Fees & Markups	**20.35%**

CMAR Contingency is 5% outside of the costs of Construction Manager at Risk (CMAR) Fees.

Owner's Allowances, Contingencies & Soft Costs
The routine and customary costs associated with an Owners administration and execution of a development program or construction project are typically referred to as Soft Costs and will be appended to a construction cost estimate to include the Owners monetary obligation. The projected cost including Soft Costs is termed Program Cost. **Table 8.2** summarizes the soft costs and contingencies for the overall project.

Table 8.2 - Owner's Soft Costs & Contingencies

Category	Percentage
Architecture / Engineering Fees (includes CA services)	10.00%
Program Administration & Oversight	0.50%
Program & Project Management Services	3.00%
Preconstruction Services	1.25%
Legal Services	0.50%
Financial Management Services	2.00%
Insurance	1.20%
Inspection & QA/QC	2.00%
Terminal Operational/Occupancy	1.00%
Commissioning	0.75%
Public Art	0.30%
Total Soft Costs	**22.50%**
Owner Controlled Contingency	10.00%

Subcontractors' mark-ups have been included in each line item unit price. This covers the cost of field overhead, home office overhead, and subcontractors overhead and profit. Subcontractor's mark-ups typically range from 15% to 25% of the unit price, depending on trade requirements and market conditions.

8.4 Statement of Probable Cost of Construction

The ROM estimates are based upon 2022 US Dollars with escalation included to the anticipated midpoint construction per major component. The consultant team has many years of experience providing cost consulting services in the aviation construction industry. Historically, the deviation between construction estimates and the corresponding bid amounts is minimal, however, the consultant team has no control over the method of determining prices adopted by any individual general contractor, subcontractor or supplier. The consultant team cannot control the cost of labor and materials, the bidding environment or other market conditions, and it is not possible to provide any guarantee that proposals, bids, or actual construction costs will not deviate from this or subsequent cost estimates.

The consultant team has prepared this estimate in accordance with widely accepted principles and practices to reflect the fair market value of the project. This estimate is made on the basis of the experience, qualifications, and the best judgment of professional consultants who have gained an expertise in the aviation construction industry.

8.5 Project Scope Clarifications

The estimates include the program elements and scope described in the Supplement including the processor, gates, CEP, offices, sky bridge, connection to the existing concourse, demolition, related apron work, as well as a small allowance for renovation work to the existing concourse.

8.5.1 Foundations

NO UPDATE

8.5.2 Basement Construction

The project includes a utility corridor and three (3) baggage corridor tunnels. There is no basement (Level 0) in the estimate with the exception of these tunnels. For purposes of pricing, this is assumed to be a cast-in-place structure.

8.5.3 Superstructure

NO UPDATE

8.5.4 Exterior Enclosure

Exterior enclosure is assumed to be a combination of metal panels and concrete masonry (CMU) for the first floor and curtain wall and metal panel for the second floor. It is assumed that there will be limited areas of higher value exterior finishes. Public landside entrances are assumed to include vestibules.

8.5.5 Roofing

NO UPDATE

8.5.6 Interior Construction

Interior partitions are considered metal framing with drywall.

8.5.7 Stairs

NO UPDATE

8.5.8 Interior Finishes

Passenger circulation and gathering areas are assumed to have terrazzo flooring (or similar material), holdrooms are to have carpet. Other typical finishes in public areas include wall finishes of durable materials. Back-of-house areas are assumed to include areas with carpet tile (or similar) flooring, painted gypsum board walls and acoustical ceilings, and other areas with sealed concrete floors, painted CMU walls and painted exposed-structure ceilings. Concession have been estimated as shell construction. Future Tenants will provide interior design and construction of these spaces under separate leases, agreements and permits.

8.5.9 Converying Systems

This includes elevators and escalators. The costs for these systems are based on locations designated in the planning documents.

8.5.10 Plumbing

NO UPDATE

8.5.11 HVAC

NO UPDATE

8.5.12 Fire Protection

NO UPDATE

8.5.13 Electrical

NO UPDATE

8.5.14 Services

NO UPDATE

8.5.15 Equipment

NO UPDATE

8.5.16 Furnishings

NO UPDATE

8.5.17 Demolition

NO UPDATE

8.5.18 Airside Sitework

Sitework includes demolition of apron paving, utilities, and underground glycol storage tank. It also includes the new earthwork, site utilities, taxiway lighting and signage, paving, AOA fencing, retaining walls, and new underground glycol storage tank.

8.5.19 Landside Improvements

Landside improvements include new roadways from north side of new terminal , demolition of existing roadways, utilities, earthwork, lighting, and roadway signage.

8.6 Exclusions

This estimate specifically excludes the following items:

- Any non-competitive bid or restrictive contract conditions
- Unforeseen or unknown conditions
- Hazardous waste removal costs including asbestos abatement, contaminated soil, etc.. and related work, otherwise noted
- Any cost associated with the relocation of the employee parking lot or future long-term parking lot at existing terminal demolition location
- Feasibility and financing costs
- Land acquisition and real estate fees
- Moving or relocation costs
- Credit for recycling

8.7 Cost Summary

Table 8.3 summarizes the cost estimate for the New Terminal program. The cost estimate is broken into eight major components:

- Enabling Projects (Traditional Design-Bid-Build)
  1. Apron A – 2023 Apron Work north side of property in front of future Concourse Phase 1B
  2. Apron B – 2024 Apron Work and Glycol Pads adjacent to Taxiway D
- CMAR Projects (Construction Manager at Risk)

Phase 1A

3. Terminal Building – New processor building with 5 gate concourse, Central Energy Plant, Administrative Offices, Pedestrian Bridge to Garage, demolition necessary to provide the connection to existing concourse.
4. Site Airside – New and demolition of apron pavement, site grading, airside utilities/lighting/signage and underground glycol storage tank (2,000,000 gallon)
5. Site Landside - Landside improvements include roadways, demolition of existing roadways, utilities, earthwork, lighting, and roadway signage
6. Demolition – Demolition of the Processor Building, including the basement and backfill to grade

Phase 1B

7. Phase 1B – Concourse Addition of 4 Gates to the North of Phase 1A

Phase 1C

8. Phase 1C – Concourse Addition to the South of Phase 1A adding an additional 8 Gates, Demolition of existing Concourse and airside sitework necessary for the 17 gate buildout.

- *The estimate for 1A assumes a construction schedule from Q2 2024 through Q2 2026 (27 months) per Section 7.3.*
- *The estimate for Phase 1B assumes an overall construction schedule from Q3 2027 through Q4 2028 (18 months)*
- *The estimate for Phase 1C assumes a construction schedule from Q2 2028 through Q1 2030 (24 months)*

8.8 Cost Estimate Update

The full cost estimate performed for the Supplemental Update can be found in the Appendix.

Table 8.3 - Program Cost Estimate Summary

V1	DSM New Terminal Estimate April 5, 2022		Enabling Projects (Hard Bid)		CMAR Projects					Total	Total	Total
	Project Cost Component	**Mark-Up %**	**Apron A**	**Apron B**	**Terminal Bldg Phase 1A**	**Site Airside Phase 1A**	**Site Landside Phase 1A**	**Demolition Phase 1A**	**Total Phase 1A**	**Phase 1B**	**Phase 1C**	**All Phases (A-C)**
A	Total Construction Cost (Combination CMAR & Hard Bid)		$ 22,862,479	$ 8,407,489	$ 221,817,397	$ 25,081,221	$ 17,109,482	$ 14,706,788	$ 278,714,888	$ 55,136,810	$ 143,078,933	$ 508,200,599
B	Soft Costs	15%/10.0%/22.5%	$ 3,429,372	$ 1,261,123	$ 49,908,914	$ 2,508,122	$ 1,710,948	$ 3,309,027	$ 57,437,012	$ 12,405,782	$ 28,528,253	$ 103,061,543
C	Owner Contingency	10.0%	$ -	$ -	$ 27,172,631	$ 2,758,934	$ 1,882,043	$ 1,801,581	$ 33,615,190	$ 6,754,259	$ 17,160,719	$ 57,530,168
D	Total Cost (March 2022 Dollars)		$ 26,291,851	$ 9,668,612	$ 298,898,942	$ 30,348,278	$ 20,702,474	$ 19,817,396	$ 369,767,090	$ 74,296,852	$ 188,767,905	$ 668,792,309
E	Escalation to Estimated Midpoint of Construction	Varies	$ -	$ 773,489	$ 32,574,680	$ 3,362,589	$ 2,790,693	$ 2,895,322	$ 41,623,284	$ 13,543,770	$ 45,095,248	$ 101,035,792
F	**Grand Total with Escalation**		**$ 26,291,851**	**$ 10,442,101**	**$ 331,473,622**	**$ 33,710,867**	**$ 23,493,167**	**$ 22,712,718**	**$ 411,390,374**	**$ 87,840,622**	**$ 233,863,153**	**$ 769,828,101**
									With Enabling Projects (Hard Bid):	**$ 448,124,326**		

Chapter 9 Financial Analysis

9.0 Financial Analysis

The PDM Supplement was prepared during the period from mid-January to early April 2022. In November 2021, the Bipartisan Infrastructure Law (BIL) was enacted approving new sources of airport capital funding including both entitlement and discretionary sources. These funding opportunities, along with the Authority's success in obtaining $30 million in funding commitments from local city and county governments and the State of Iowa's commitment to grant $58.7 Million in 100% state infrastructure grant funds, provide new sources that be deployed to the deliver the new terminal program.

These once-in-a-generation funding sources outlined above provide the foundation of a funding plan to advance the new terminal program at DSM. The formula to be able to execute the program remains the same; program funding = program budget. The impacts of recent price escalation since the original PDM document was completed in 2018 steer the Authority to an approach that suggests that the project must be phased and use existing assets, to the extent reasonable, to satisfy the program formula. While the variables of available funding and required budget remain fluid in the near term, it is clear that the budget must be carefully managed to establish an executable program using all conventional and new funding sources.

In order to manage the budget, dividing the 17-gate program into three Phases; 1A, 1 B and 1C along with the extended use of most of the existing gates on concourse A and C provide an approach to achieve a viable financial plan. Considerations that should be evaluated in the financial analysis include the following, but not limited to:

1. Increase rates for parking and RAC activities to increase non-aviation revenue
2. Evaluate use of limited Authority capital funds for parking garage expansion over the new terminal expansion

9.1 Financial Framework

9.1.1 Airport Governance

NO UPDATE

9.1.2 Bond Resolutions

NO UPDATE

9.1.3 Airline Agreements

NO UPDATE

9.1.4 Passenger Facility Charges

NO UPDATE

9.1.5 Customer Facility Charges

NO UPDATE

9.1.6 Other Relevant Documents and Laws

NO UPDATE

9.2 Key Financial Metrics

9.2.1 Cost per Enplanement

NO UPDATE

9.2.2 Debt per Enplanement

NO UPDATE

9.2.3 Debt Service Coverage

NO UPDATE

9.2.4 Days Cash on Hand

NO UPDATE

9.3 Sources of Funds

NO UPDATE

9.3.1 Federal AIP Grants

NO UPDATE

9.3.2 Passenger Facility Charges

NO UPDATE

9.3.3 Customer Facility Charges

NO UPDATE

9.3.4 General Airport Revenue Bonds

NO UPDATE

9.3.5 Other Grants

NO UPDATE.

9.3.6 Authority Reserve Funds and Retained Surpluses

NO UPDATE

9.4 Capital Requirements

9.4.1 Capital Requirements by Funding Source

NO UPDATE

9.4.2 Capital Requirements by Project Type

NO UPDATE

9.5 Key Assumptions

NO UPDATE

9.6 Financial Metrics - Base Case

NO UPDATE

9.7 Scenario 1 - Funding Gap

NO UPDATE

9.8 Scenario 2 - PFC Increase and Further Value Engineering

NO UPDATE

9.9 Conclusion

NO UPDATE