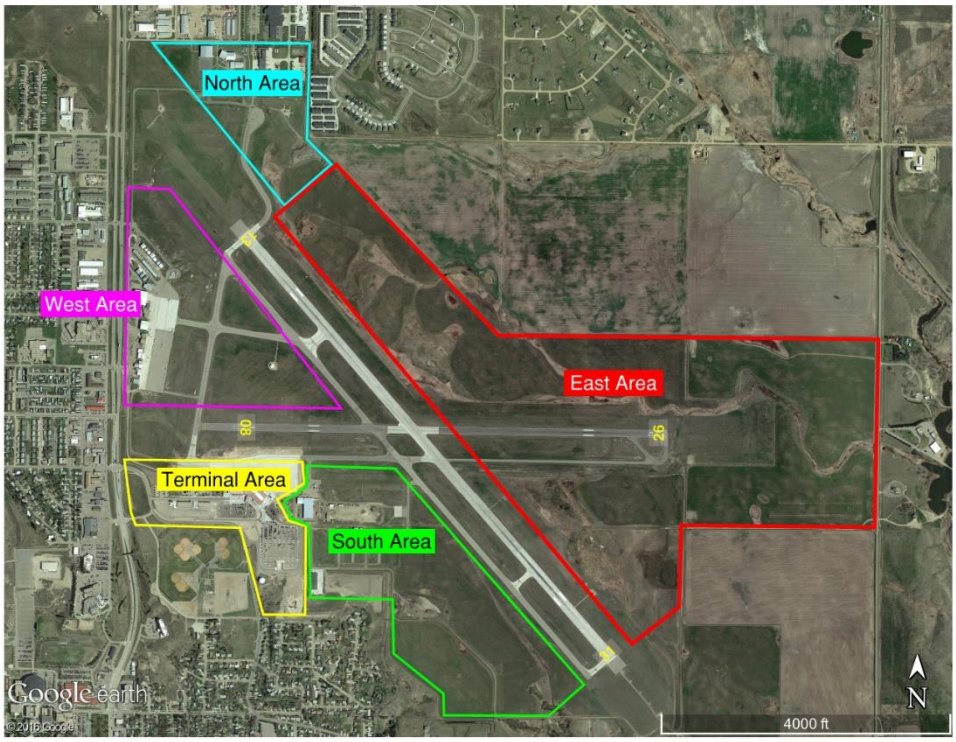
APPENDIX R – ALTERNATIVES

Introduction

Because there were a substantial number of alternatives prepared for the Minot International Airport Master Plan process, this appendix provides a copy of those alternatives by area and time sequence. The analysis and decisions related to alternatives are provided in **Chapter 5: Alternatives Analysis**.

For analysis purposes, the areas of the airport were divided into regions based on geography and similar uses. The diagram below is a general layout of these prescribed areas.



The alternatives are provided as follows:

June 2016 (presented to Airport Staff)

pages R-3 to R-19

Airfield 1, 2, 3, 4, 4a, 4b, 5, 5a, 5b
East 1, 2, 3
South 1, 2, 3, 4, 5, 5a
Terminal 1, 2, 3, 4, 4b, 5
West 1, 2, 3, 4, 4a, 4b, 5, 5a, 5b

August 2016 (presented to Advisory Committee)
pages R-20 to R-29

Airfield 1, 2, 3, 4, 5
East
South 1, 2, 3, 4
Terminal 1, 2, 3, 4
West 1, 2, 3, 4, 5, 5e

October 2016 (Public Open House)
pages R-30 to R-35

East
South 1, 3, 4
Terminal 2, 4
West 1, 4, 5e

June 2017 – Preferred Alternative (Airport Staff notes)
pages R-36 to R-37

East
South
West

October 2017 Preferred Alternative (Public Open House in December)
pages R-38 to R-39

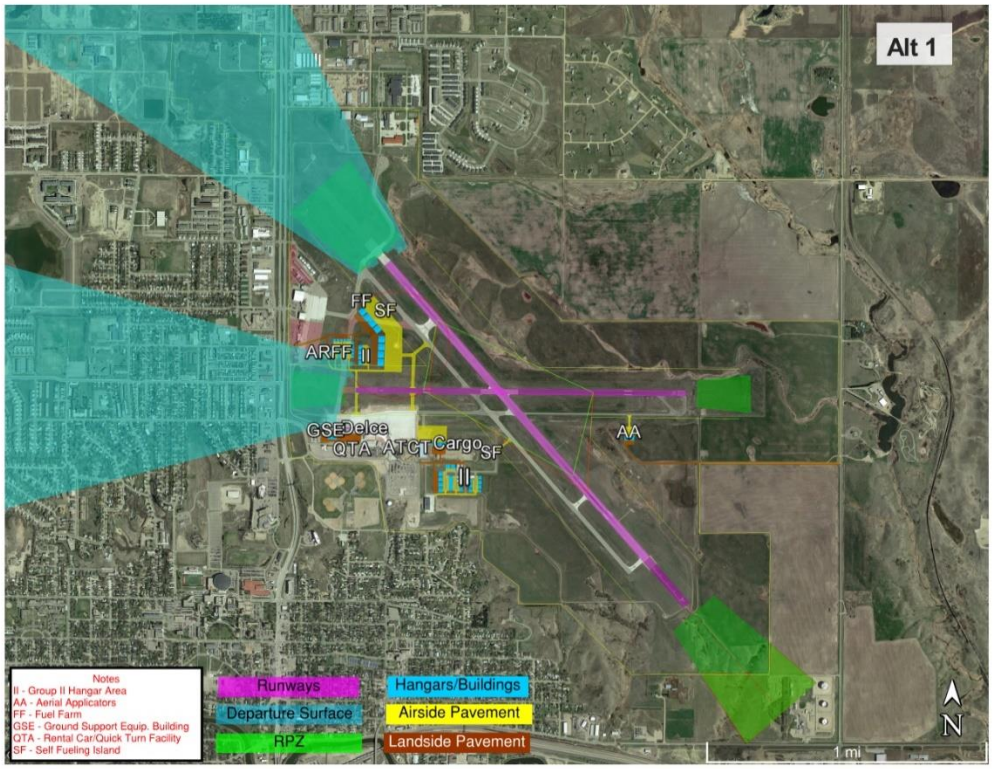
Airfield
East
South
West

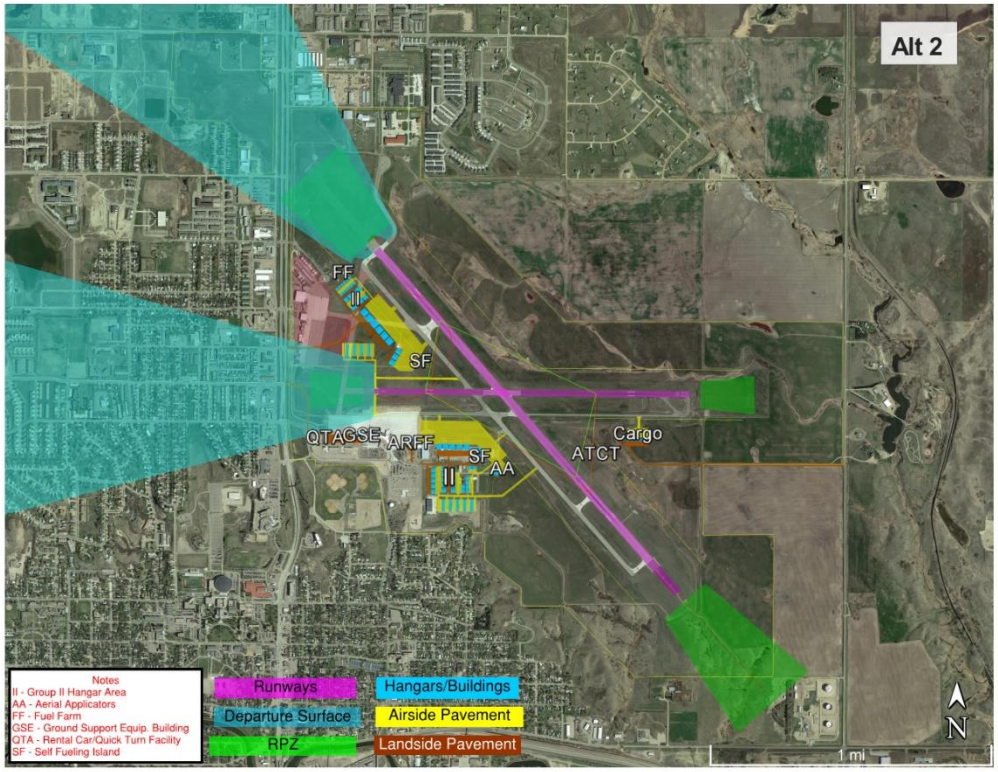
January 2018 (Final Airport Staff edits)
pages R-40 to R-42

Airfield
East
North
Terminal
West

April 2017 FAA Safety Risk Management Meeting Report and Findings
A meeting was conducted with the FAA to look in detail at Runway 8 and Taxiway B. The meeting was part of the alternatives analysis that was completed for Minot and affected the preferred alternative. The reports and findings (47 pages) from that meeting are provided at the end of this appendix.

June 2016 Alternatives





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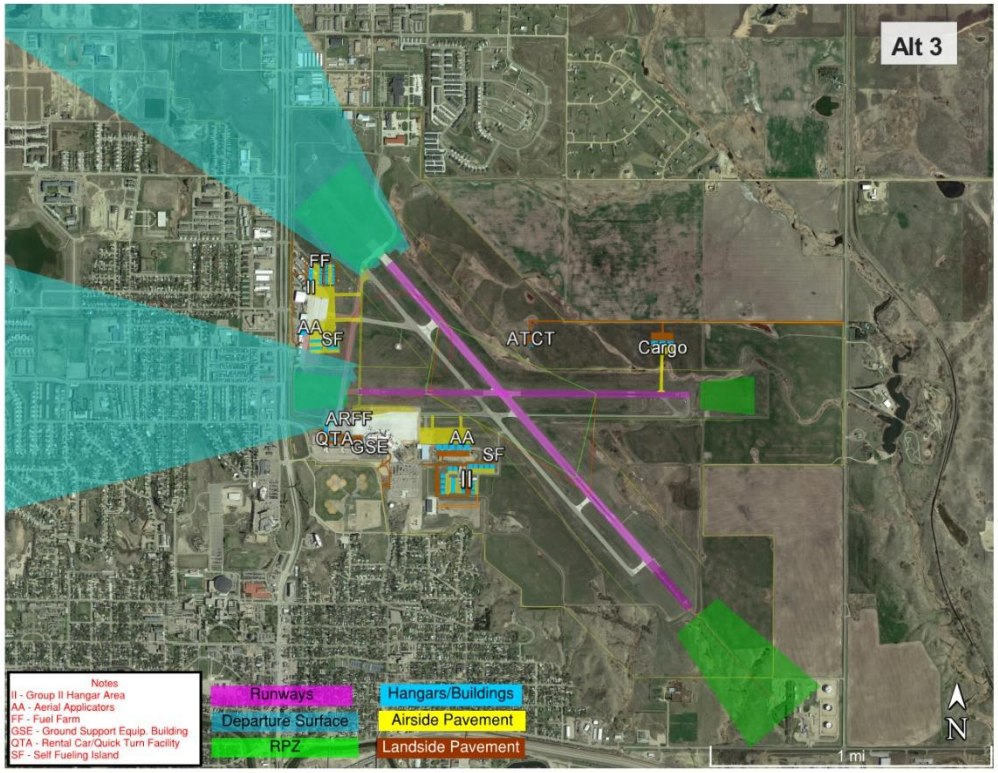
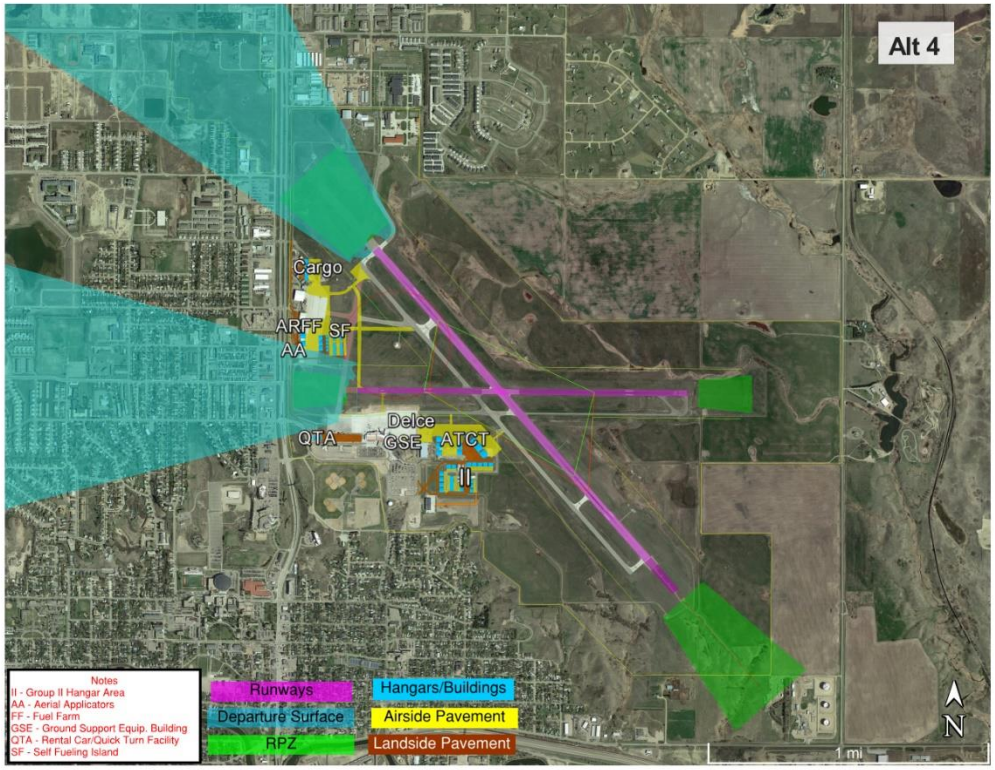
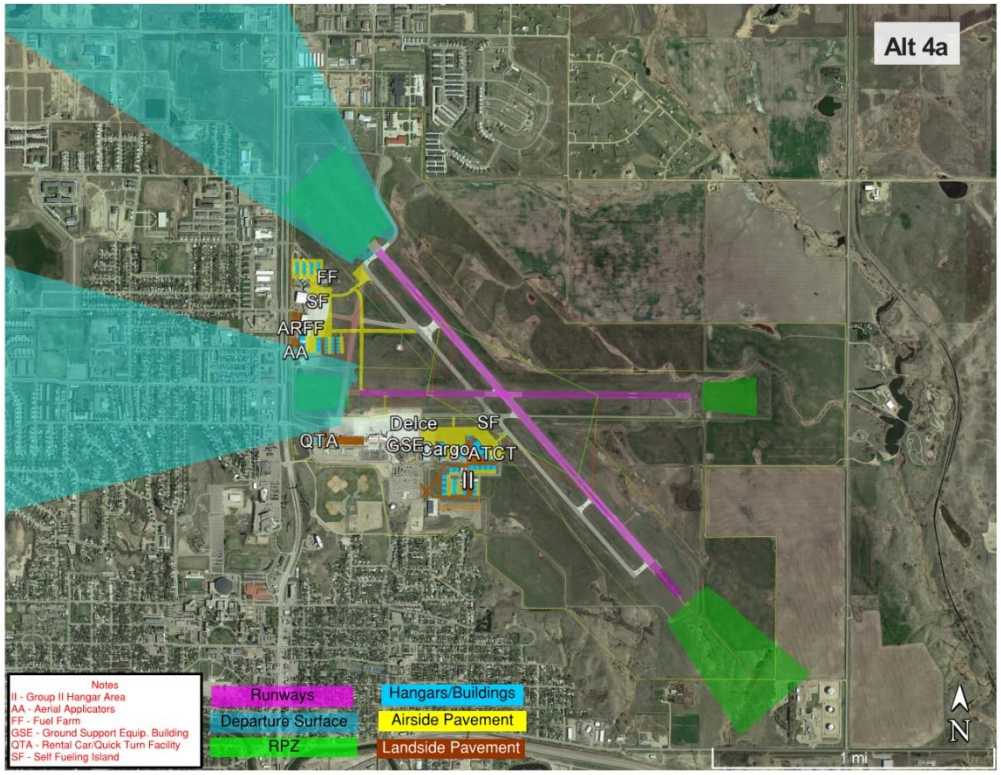
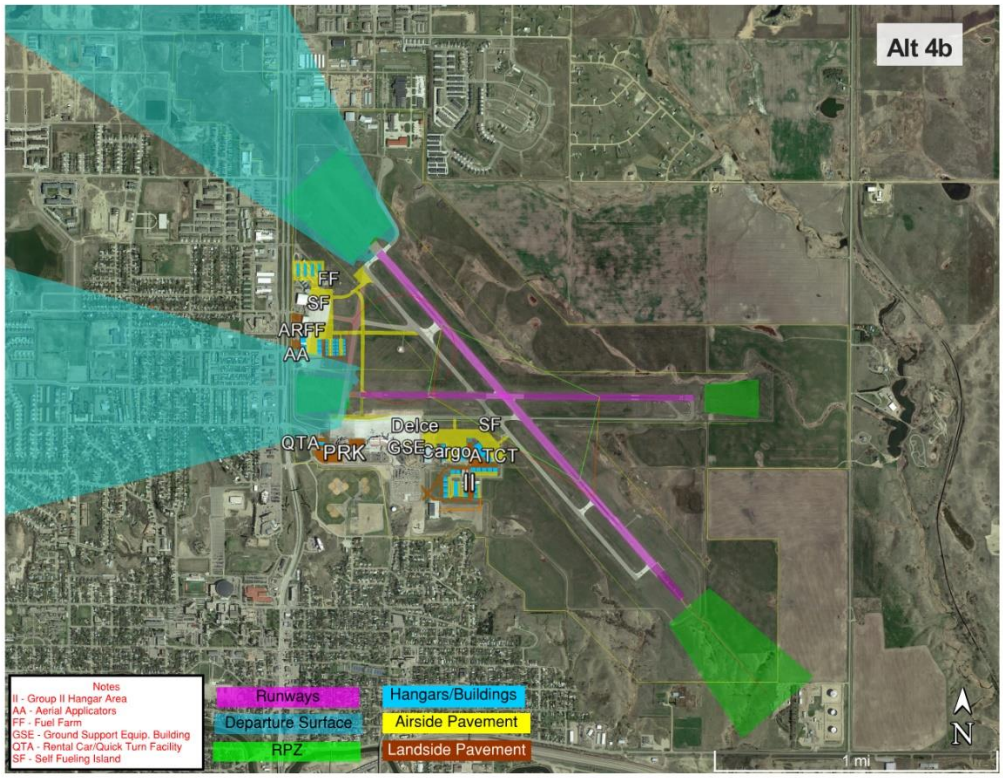




June 2016 Alternatives (cont.)





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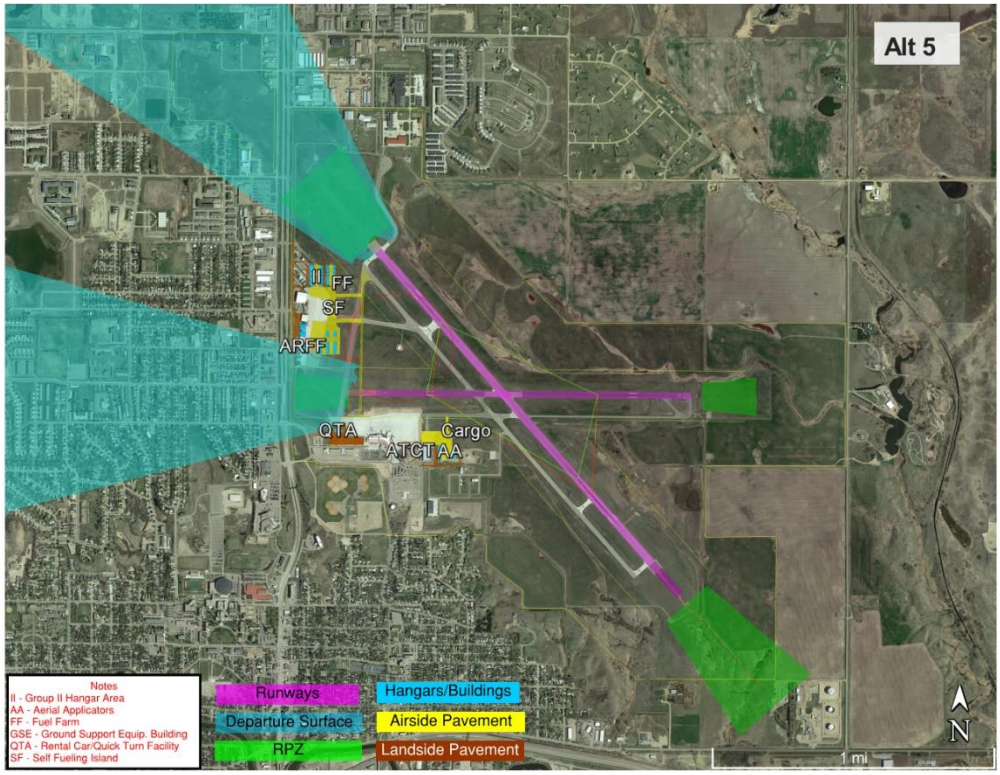
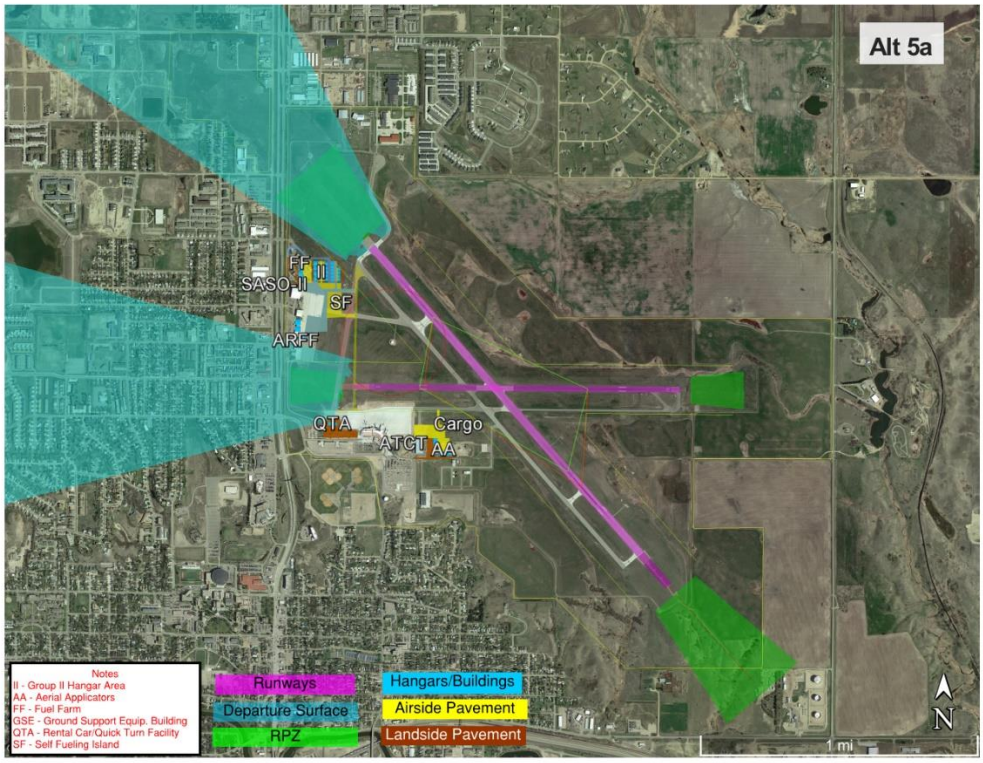
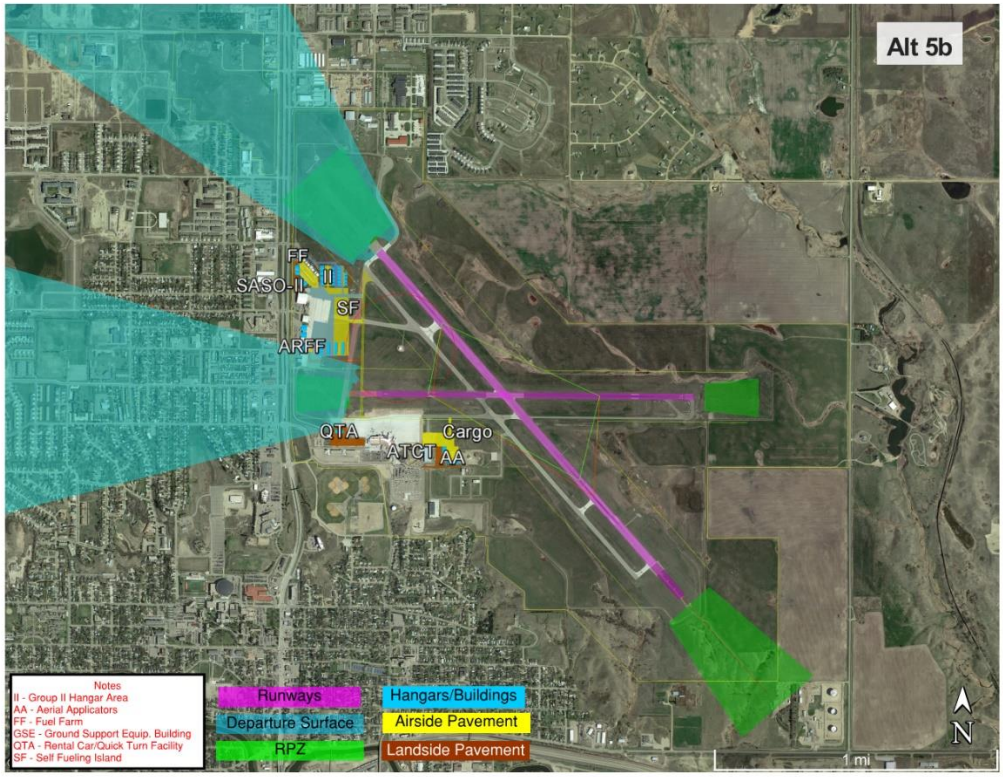
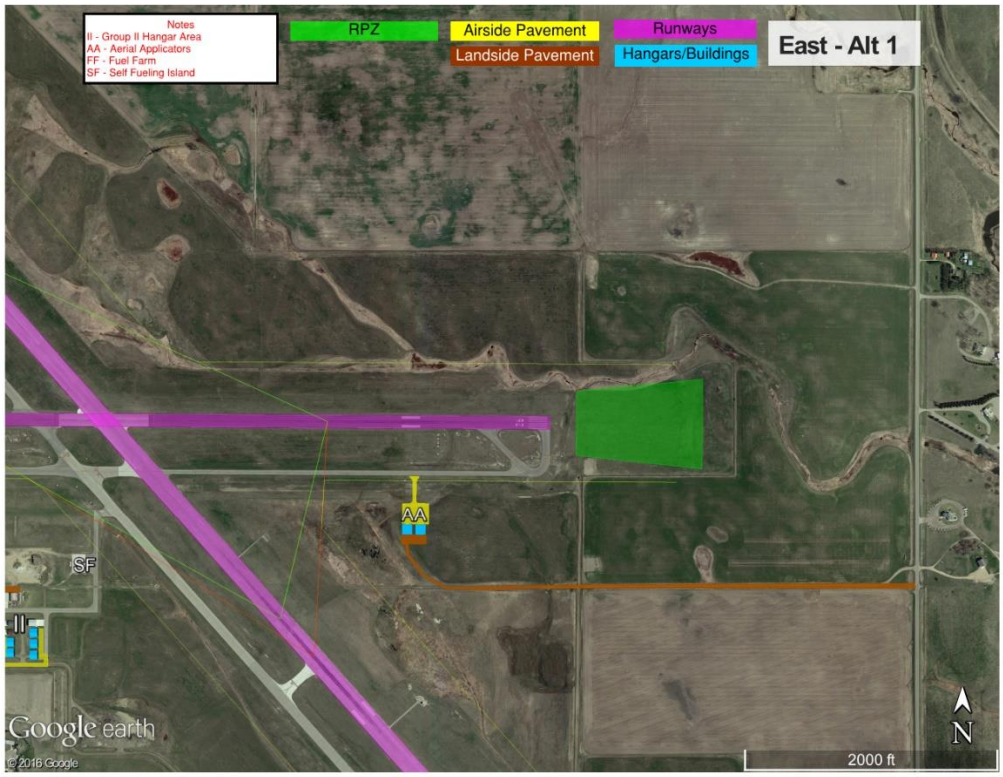


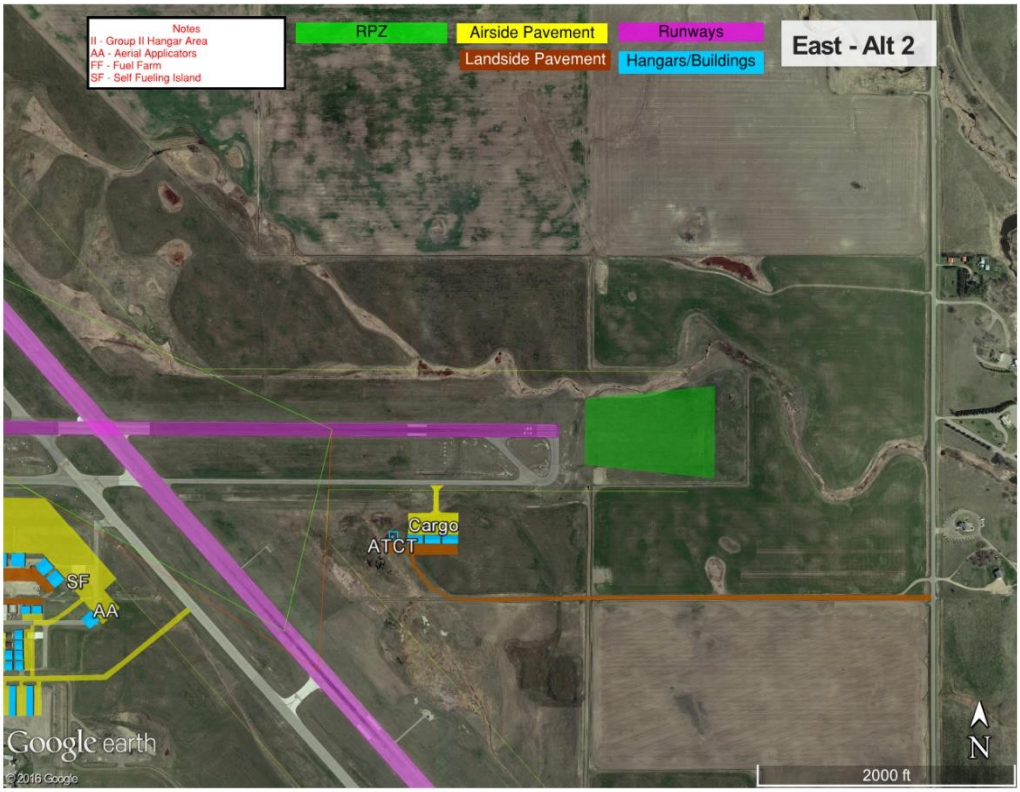


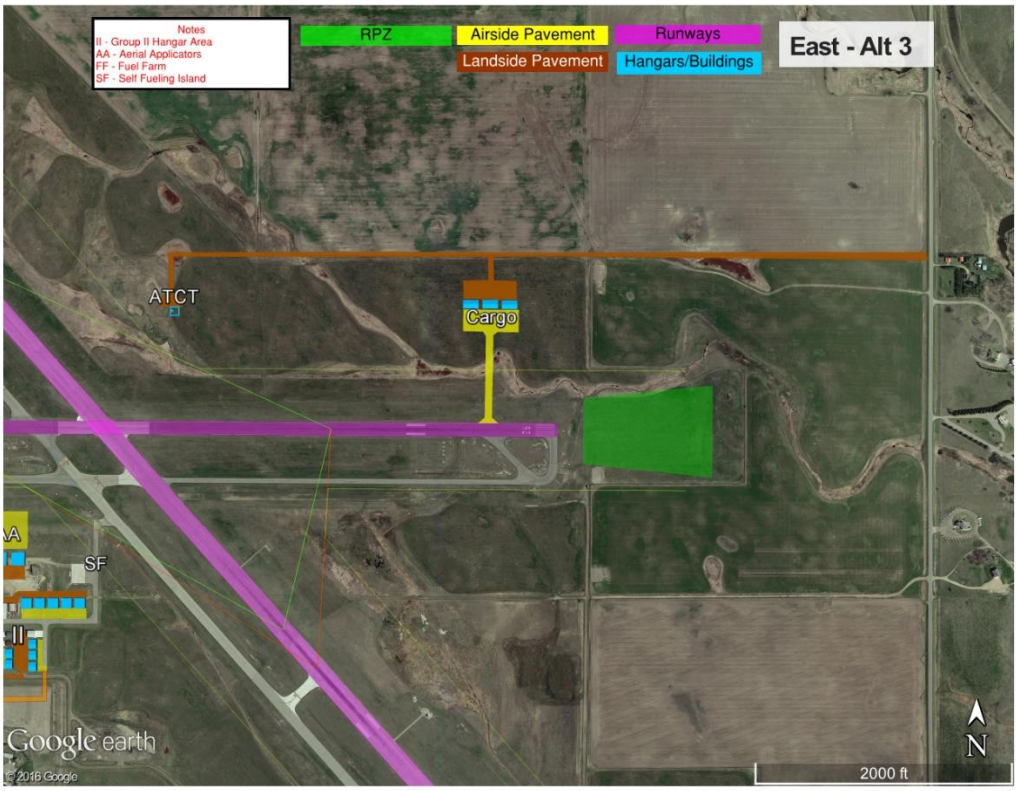
June 2016 Alternatives (cont.)



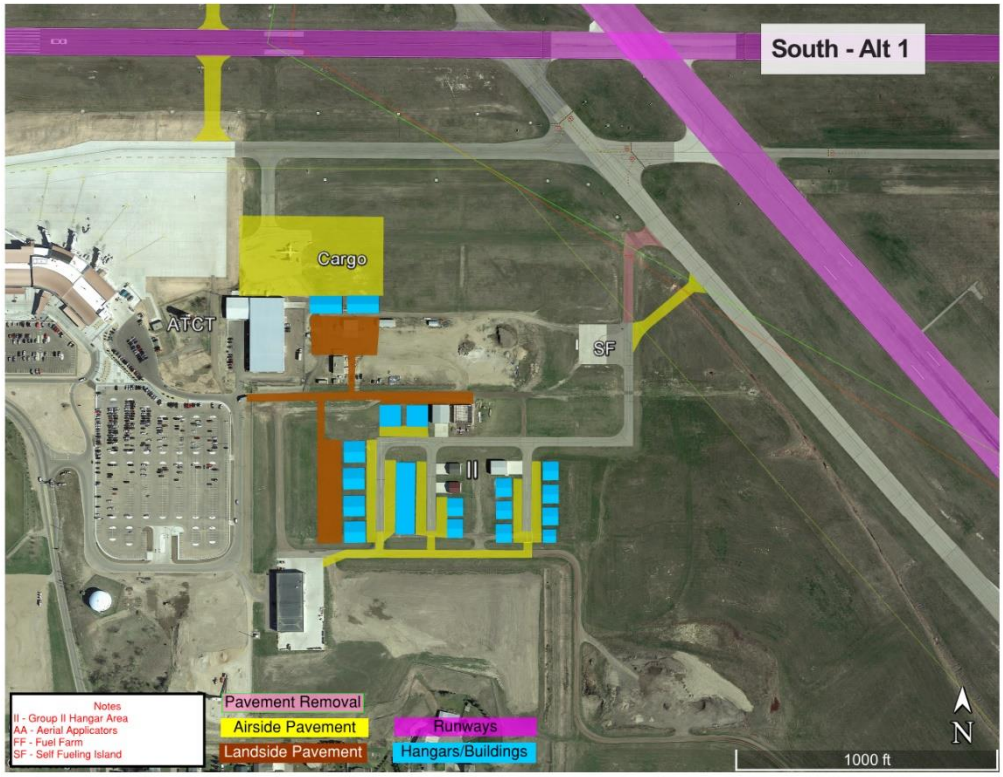


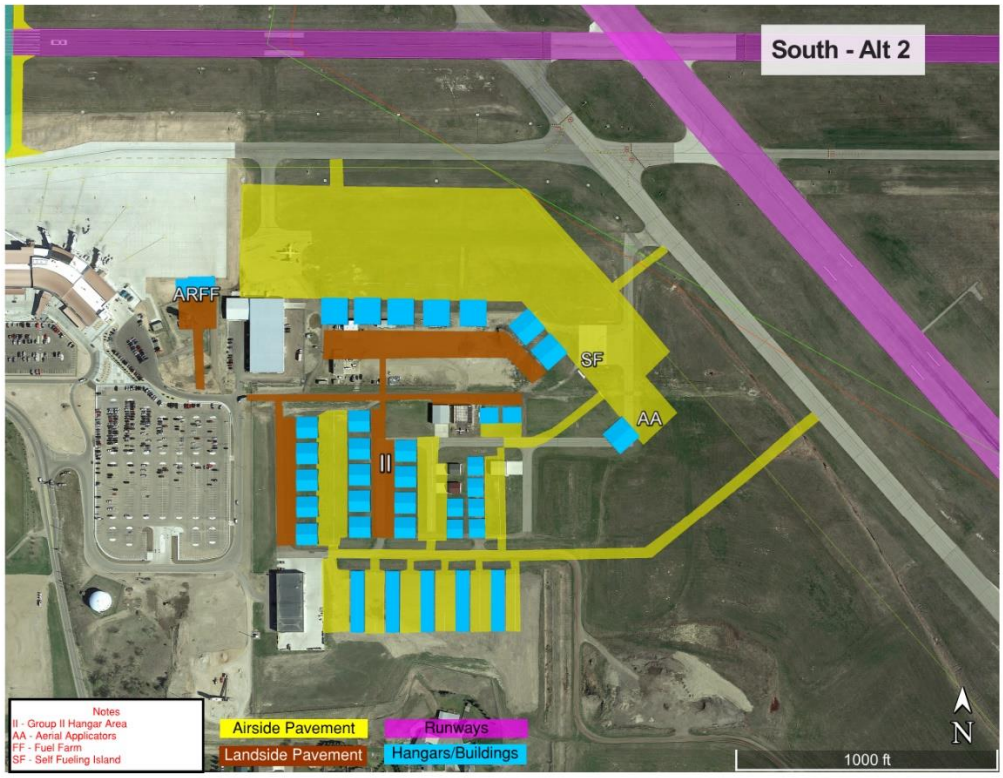
June 2016 Alternatives (cont.)

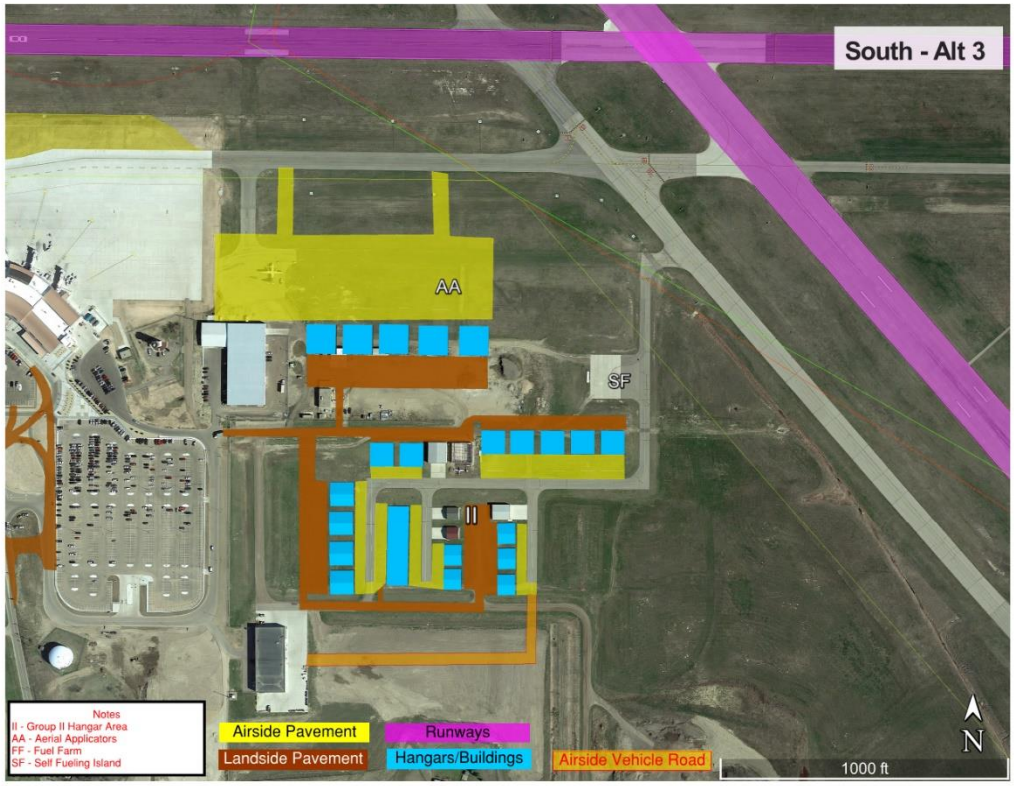


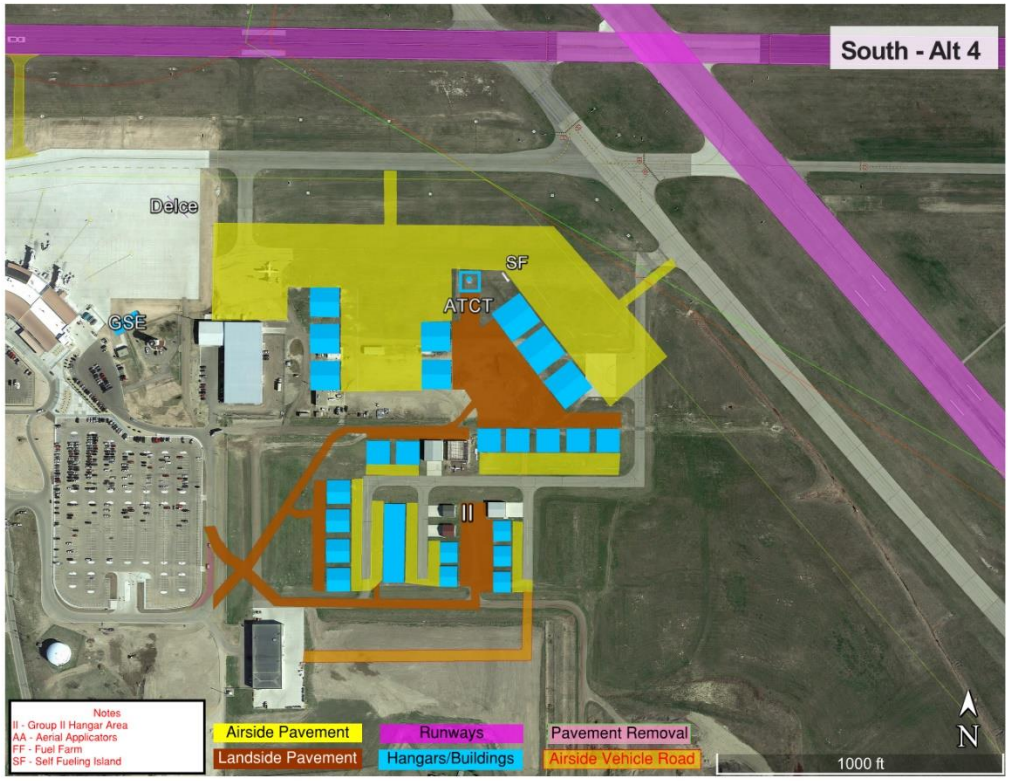


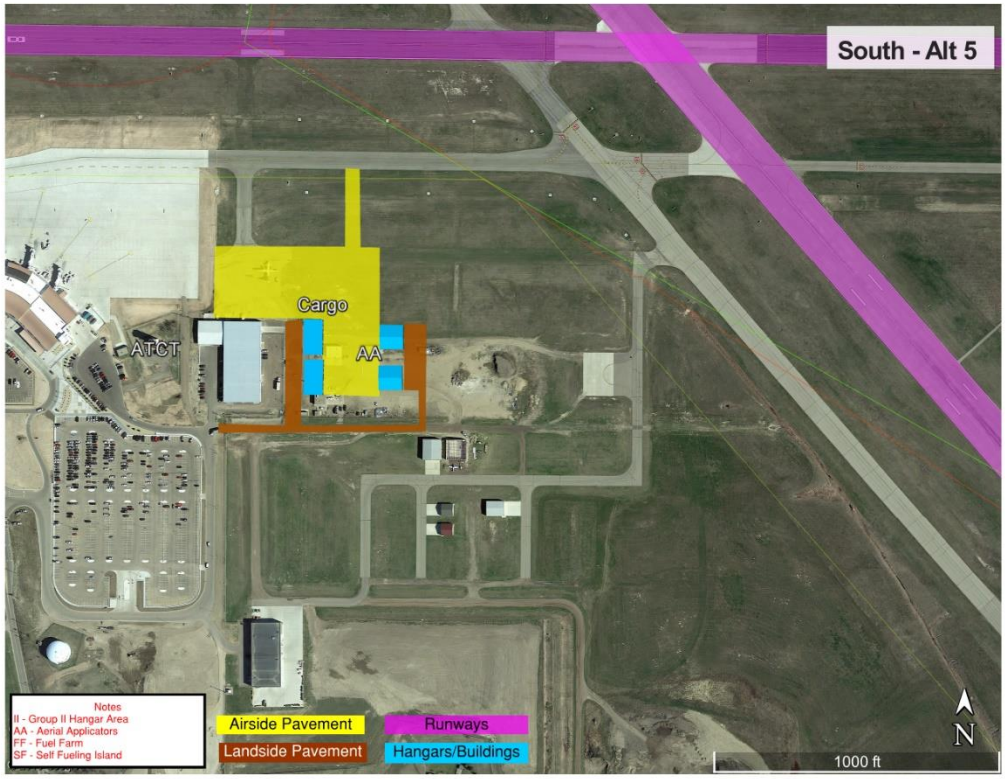
June 2016 Alternatives (cont.)

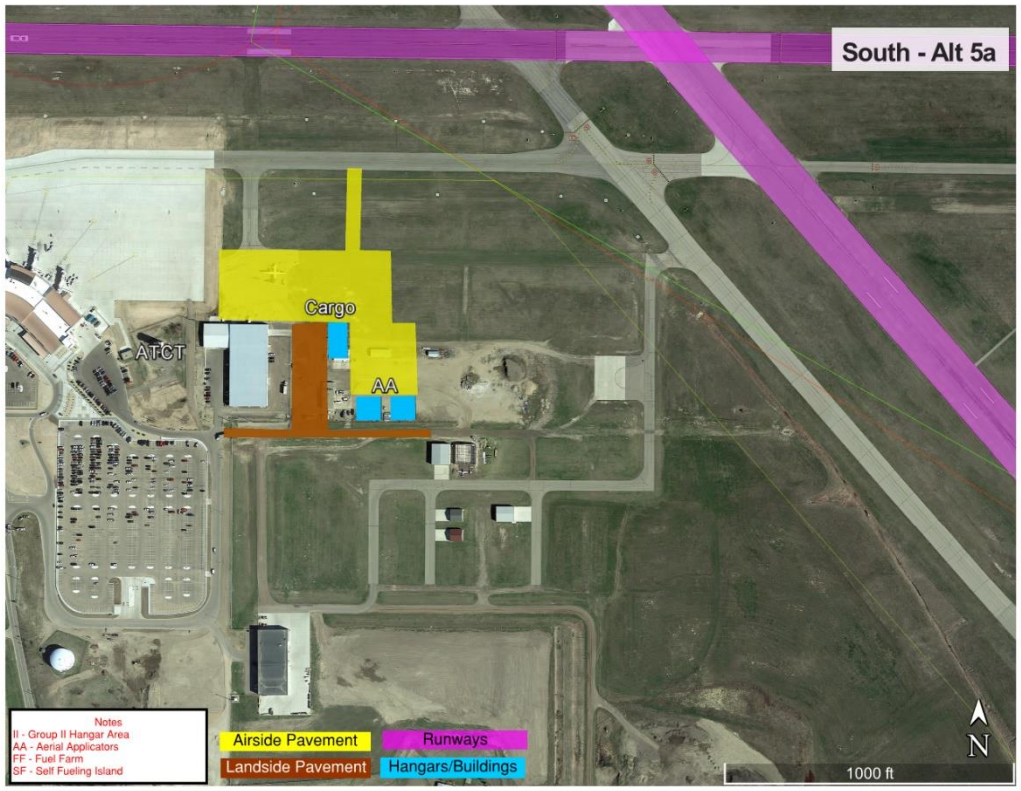




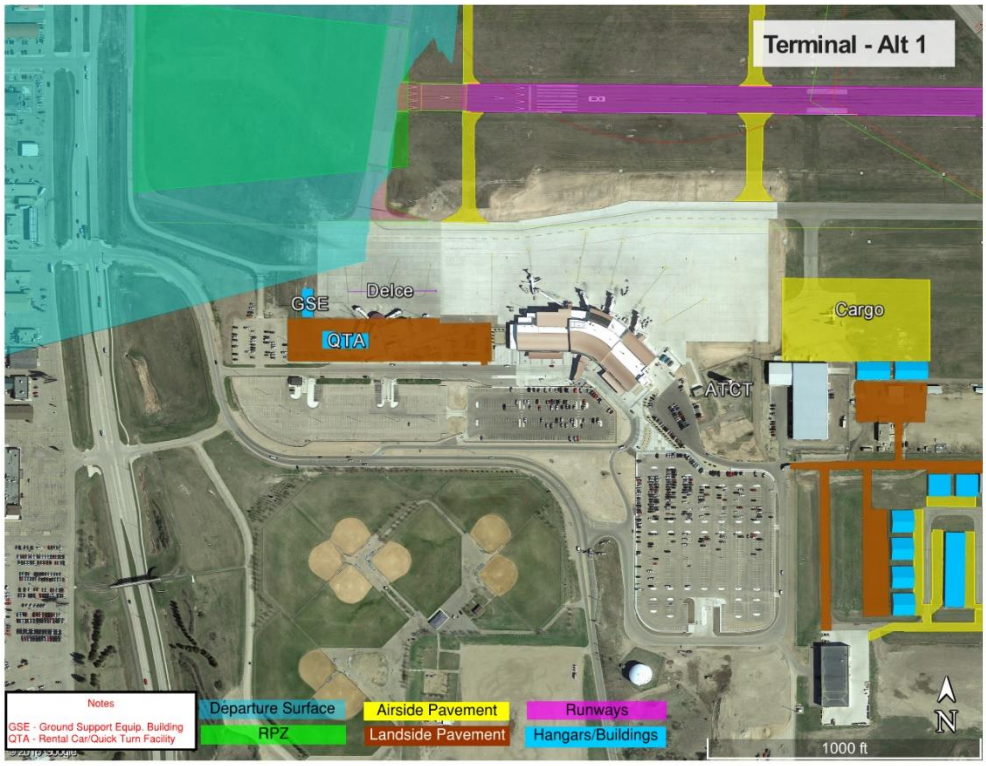

South - Alt 3
AA
SF
II
Notes
II - Group II Hangar Area
AA - Aerial Applicators
FF - Fuel Farm
SF - Self Fueling Island
Airside Pavement
Runways
Landside Pavement
Hangars/Buildings
Airside Vehicle Road
1000 ft
N

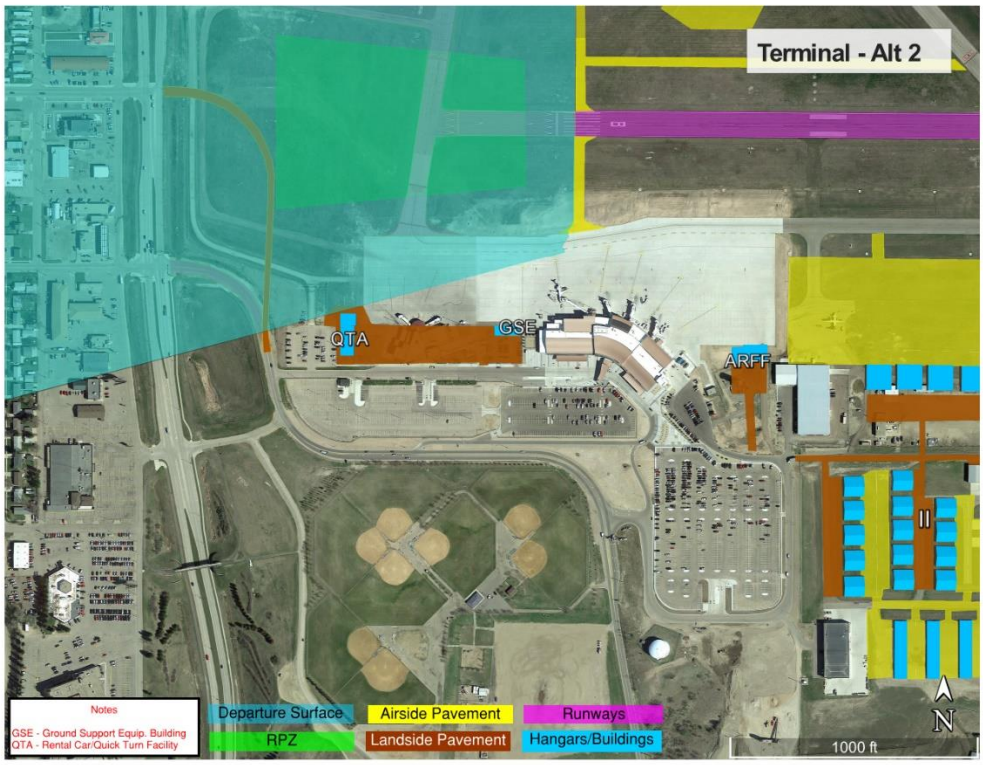

South - Alt 4
Delce
SF
ATCT
GSE
II
Notes
II - Group II Hangar Area
AA - Aerial Applicators
FF - Fuel Farm
SF - Self Fueling Island
Airside Pavement
Runways
Pavement Removal
Landside Pavement
Hangars/Buildings
Airside Vehicle Road
1000 ft
N

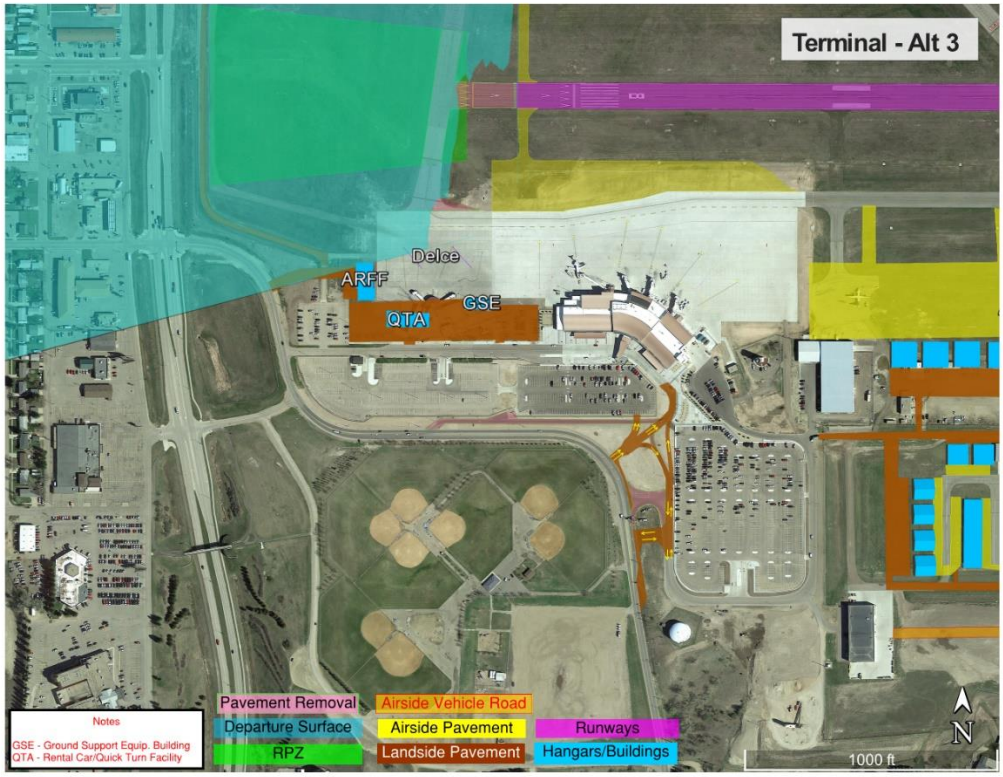

South - Alt 5
Cargo
ATCT
AA
Notes
II - Group II Hangar Area
AA - Aerial Applicators
FF - Fuel Farm
SF - Self Fueling Island
Airside Pavement
Runways
Landside Pavement
Hangars/Buildings
1000 ft
N

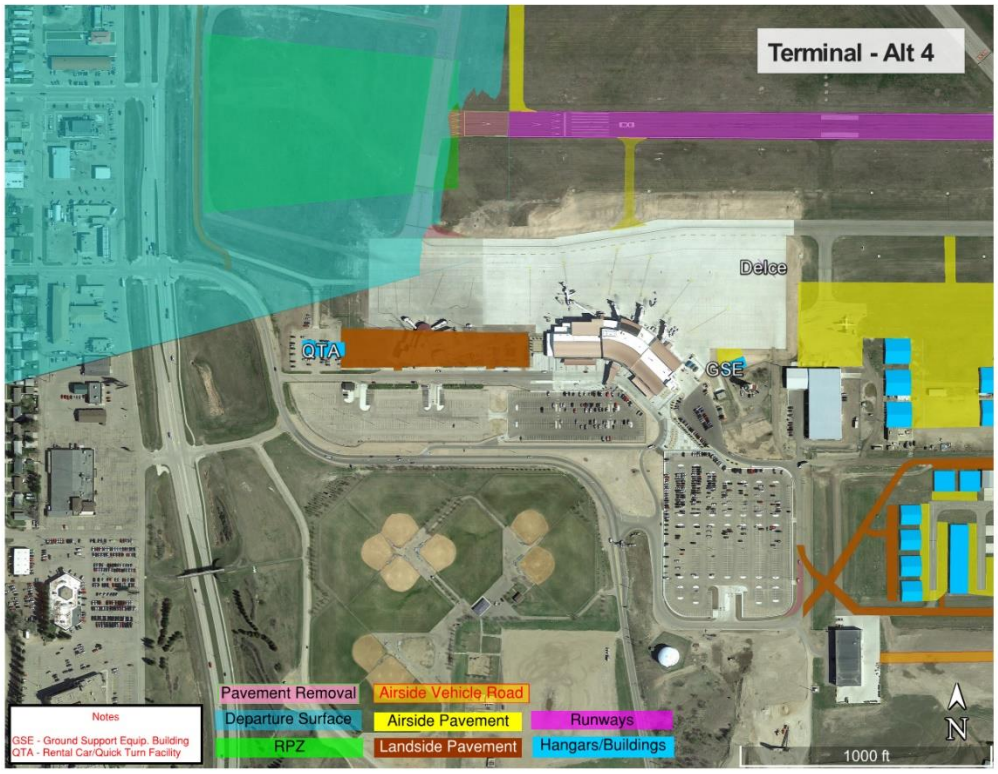

South - Alt 5a
Cargo
ATCT
AA
Notes
II - Group II Hangar Area
AA - Aerial Applicators
FF - Fuel Farm
SF - Self Fueling Island
Airside Pavement
Runways
Landside Pavement
Hangars/Buildings
1000 ft
N

June 2016 Alternatives (cont.)

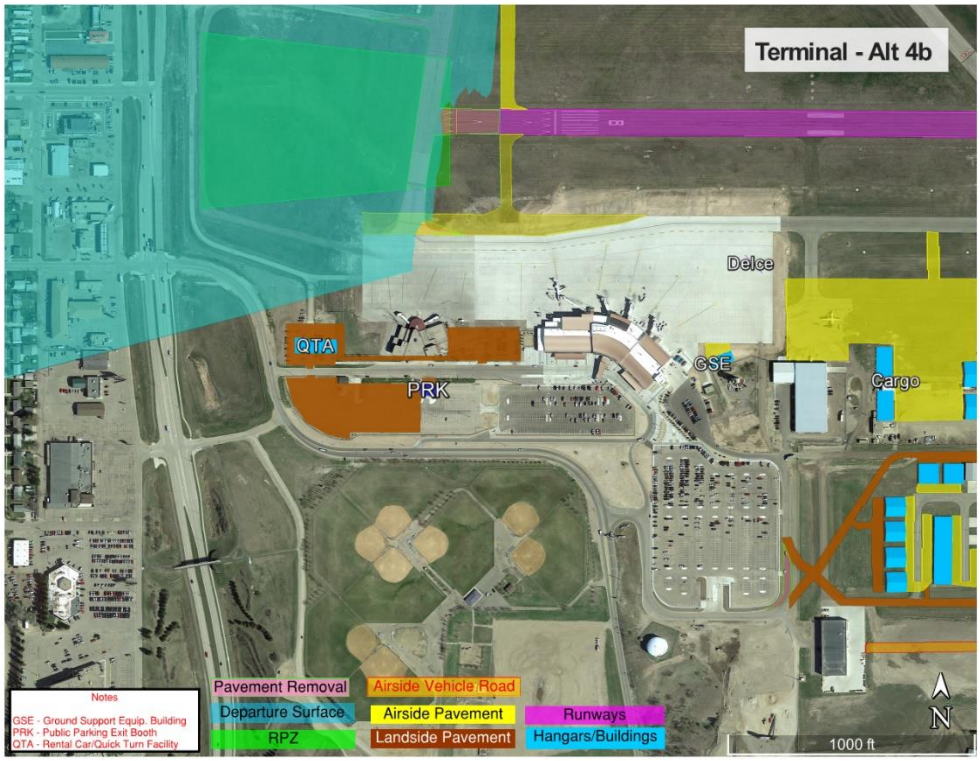


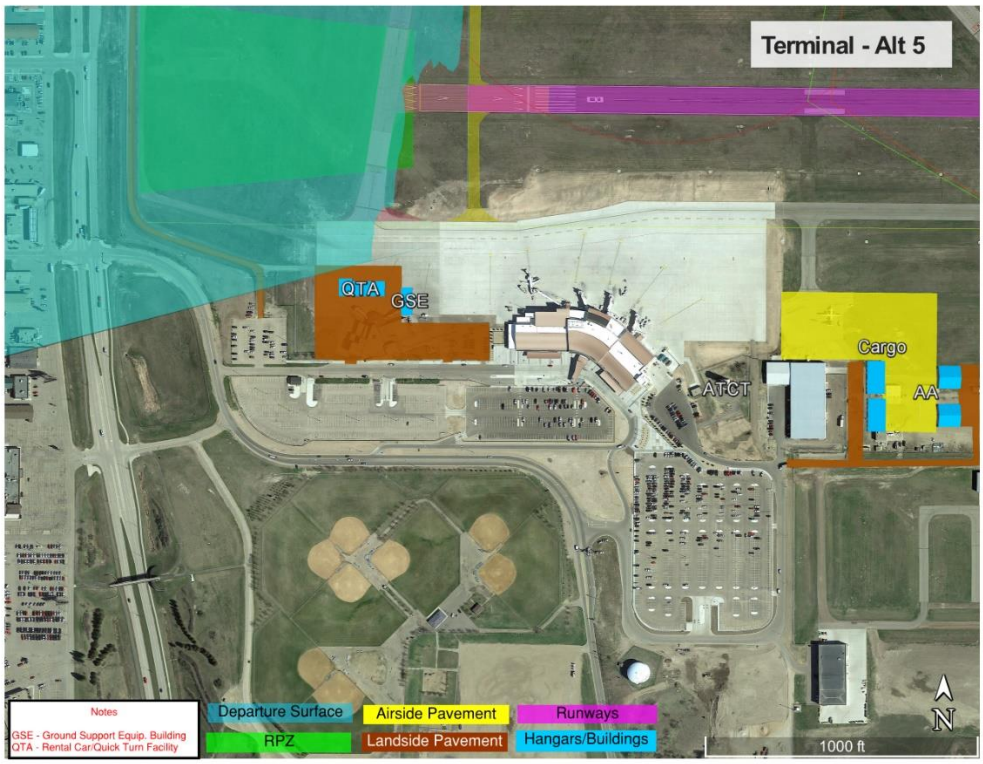


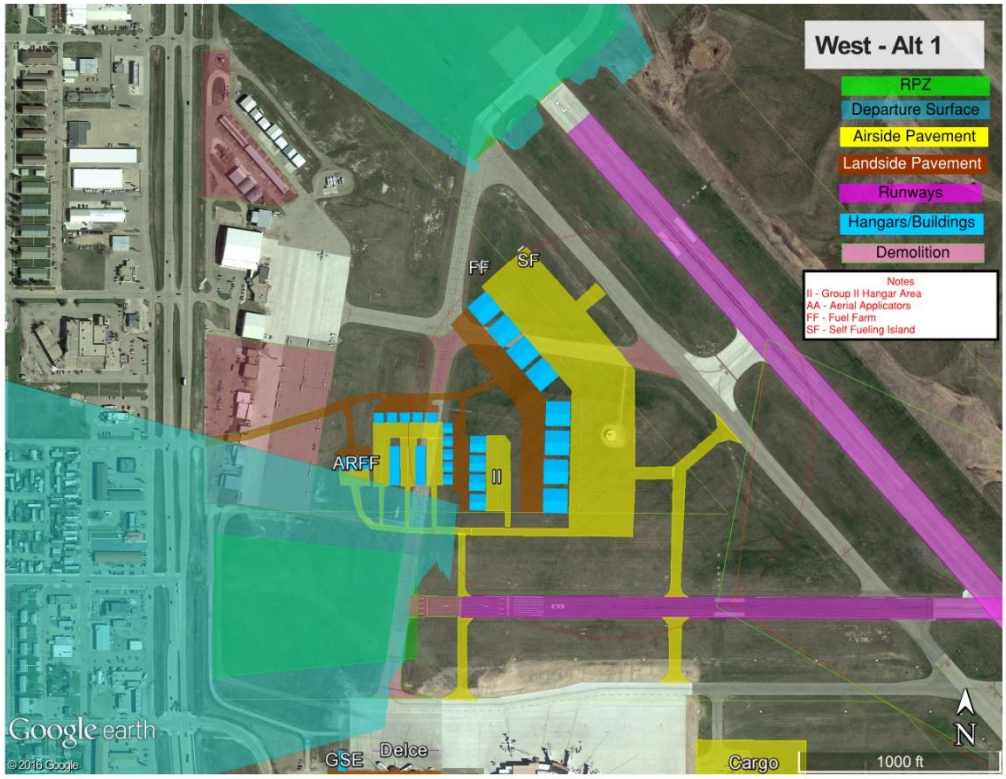

Terminal - Alt 3
Delce
ARFF
GSE
QTA
Pavement Removal
Airside Vehicle Road
Departure Surface
Airside Pavement
Runways
RPZ
Landside Pavement
Hangars/Buildings
Notes
GSE - Ground Support Equip. Building
QTA - Rental Car/Quick Turn Facility
1000 ft
N

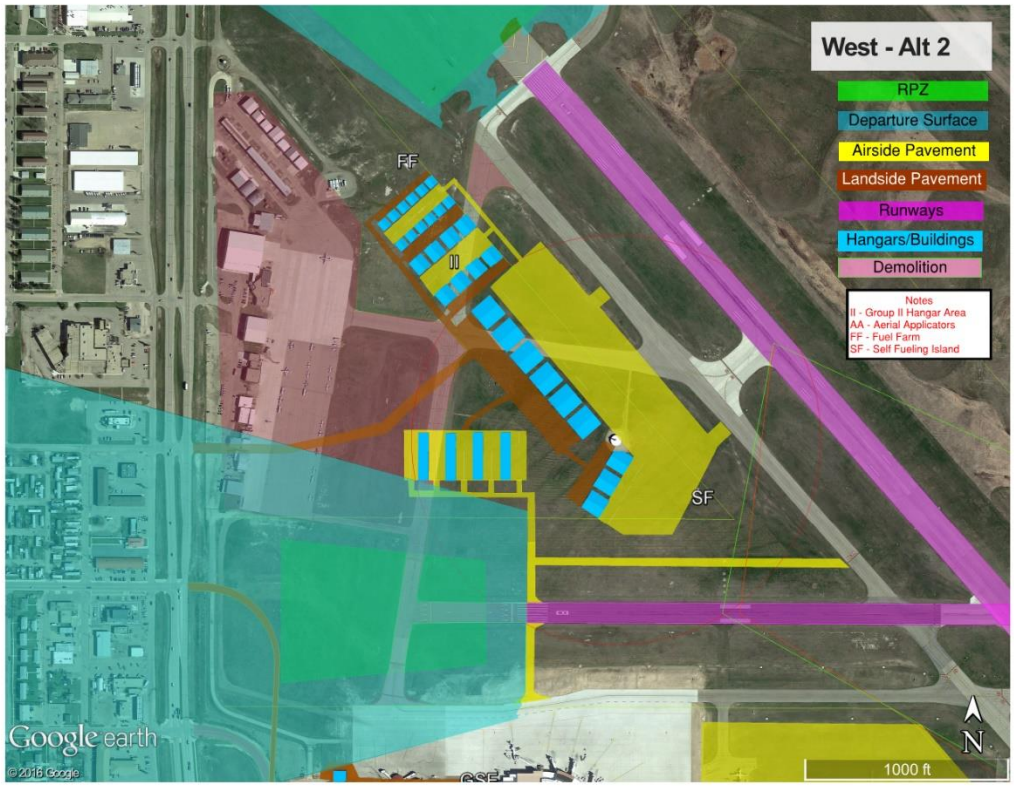

Terminal - Alt 4
Delce
QTA
GSE
Pavement Removal
Airside Vehicle Road
Departure Surface
Airside Pavement
Runways
RPZ
Landside Pavement
Hangars/Buildings
Notes
GSE - Ground Support Equip. Building
QTA - Rental Car/Quick Turn Facility
1000 ft
N

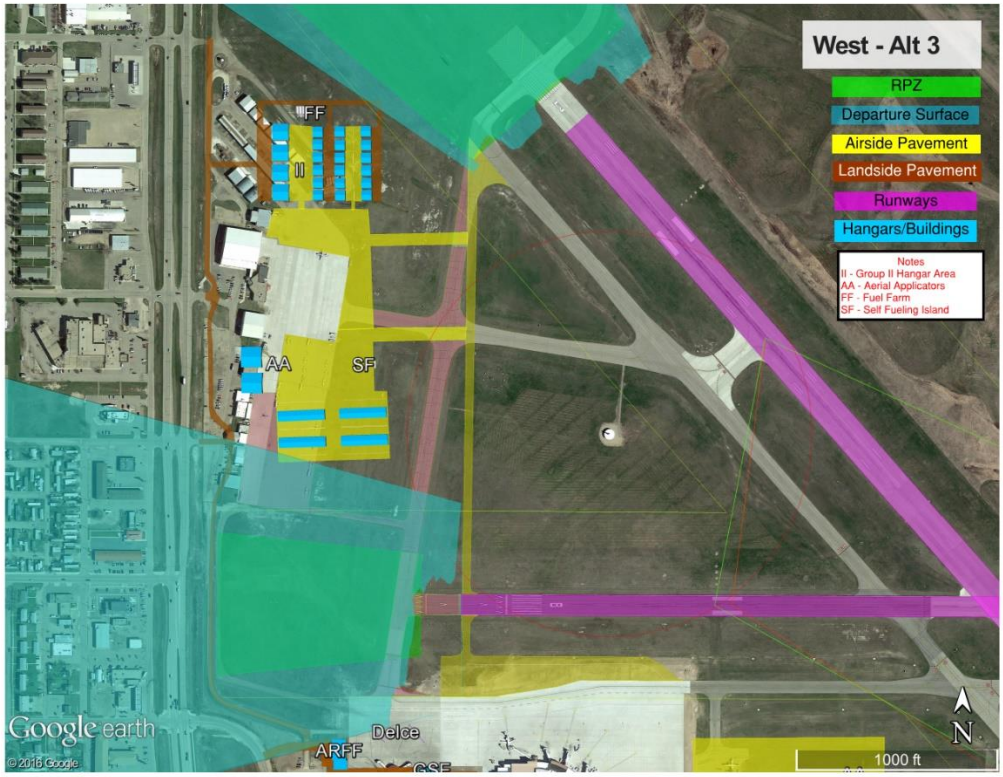
June 2016 Alternatives (cont.)

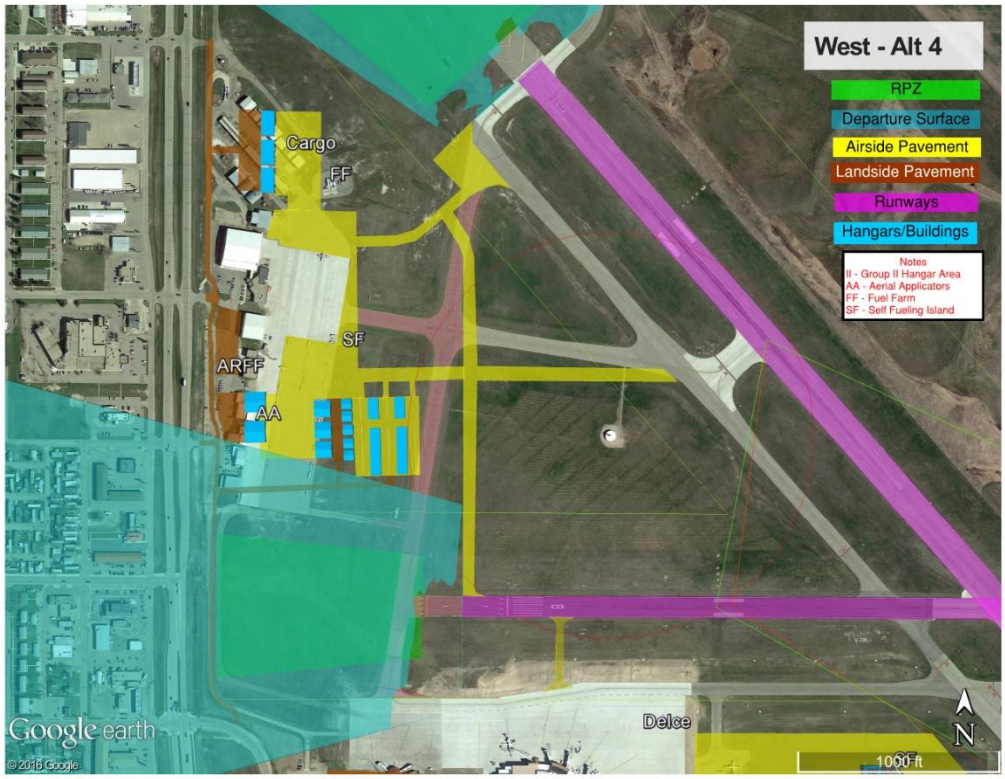




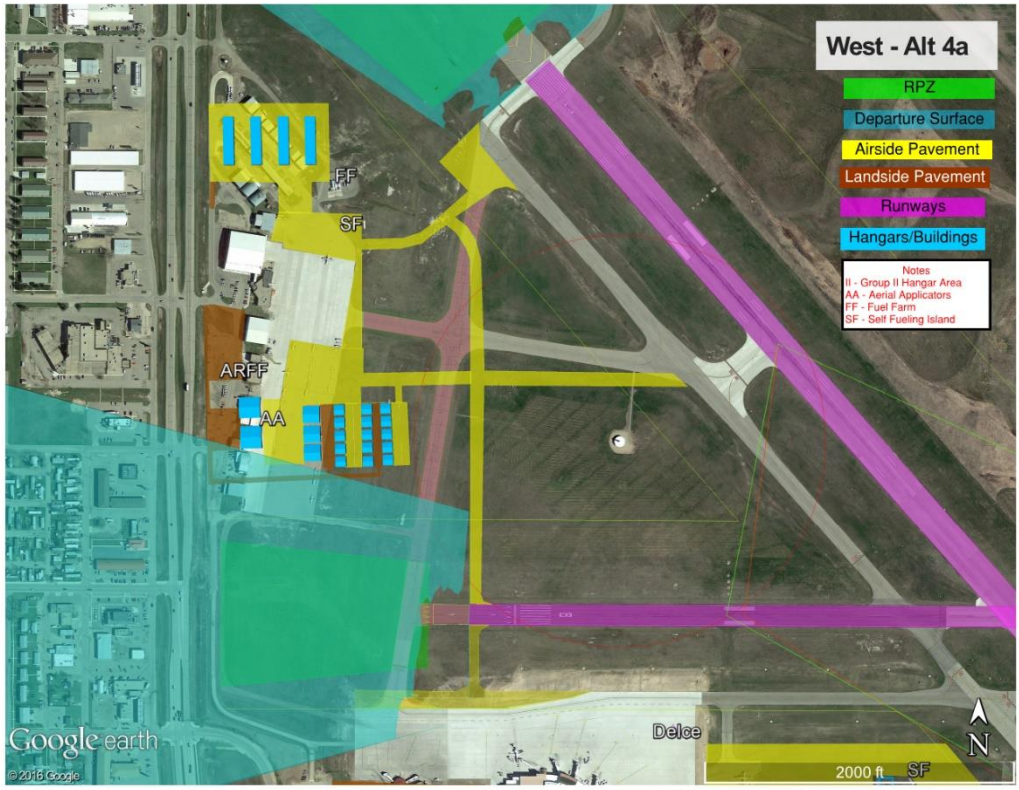

West - Alt 1
RPZ
Departure Surface
Airside Pavement
Landside Pavement
Runways
Hangars/Buildings
Demolition
Notes
II - Group II Hangar Area
AA - Aerial Applicators
FF - Fuel Farm
SF - Self Fueling Island
FF
SF
ARFF
II
GSE
Delce
Cargo
1000 ft
N
Google earth
© 2016 Google

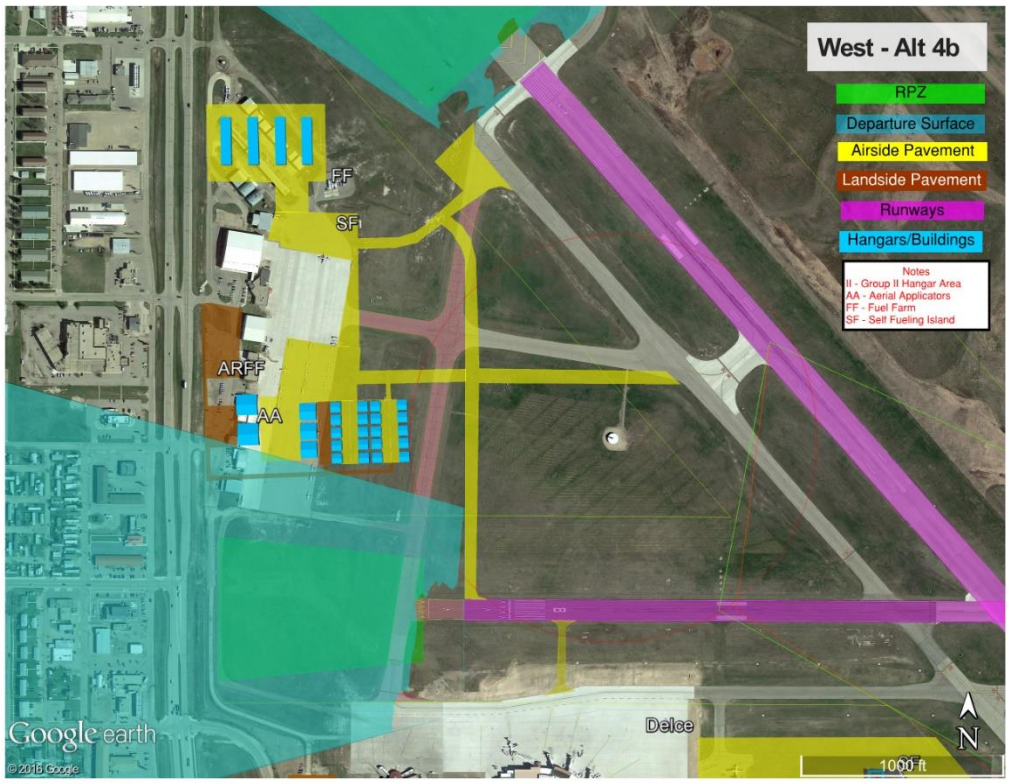

West - Alt 2
RPZ
Departure Surface
Airside Pavement
Landside Pavement
Runways
Hangars/Buildings
Demolition
Notes
II - Group II Hangar Area
AA - Aerial Applicators
FF - Fuel Farm
SF - Self Fueling Island
FF
II
SF
1000 ft
N
Google earth
© 2016 Google

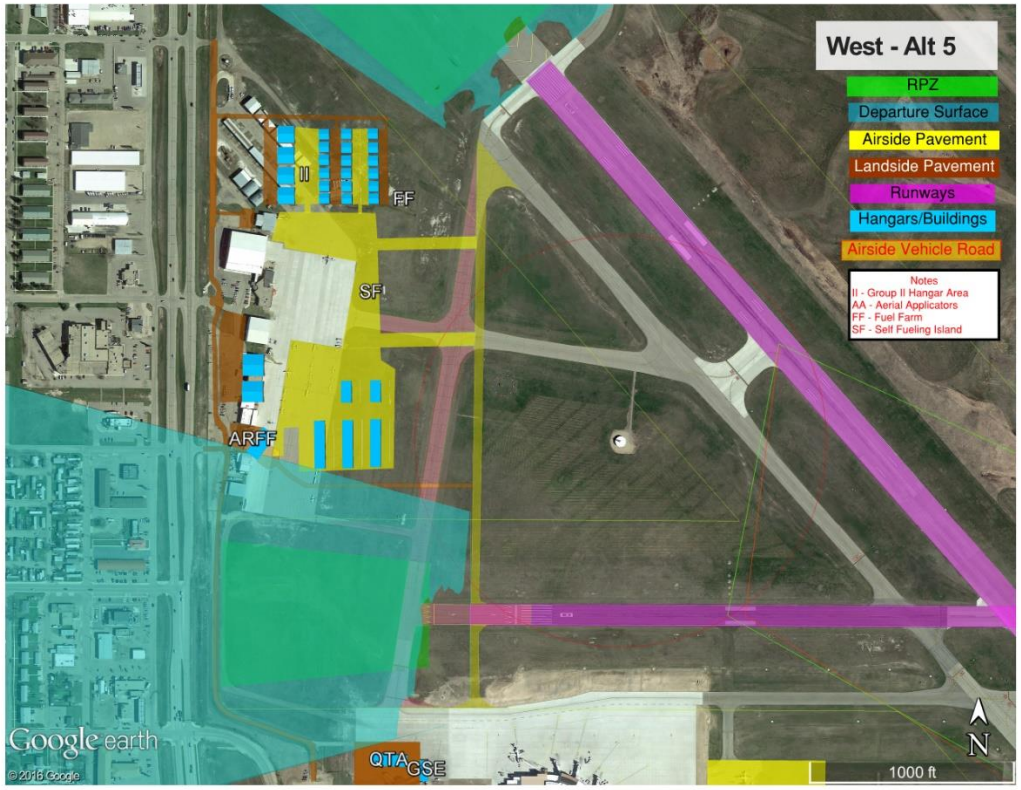

West - Alt 3
RPZ
Departure Surface
Airside Pavement
Landside Pavement
Runways
Hangars/Buildings
Notes
II - Group II Hangar Area
AA - Aerial Applicators
FF - Fuel Farm
SF - Self Fueling Island
FF
II
AA
SF
ARFF
Delce
Google earth
© 2016 Google
N
1000 ft

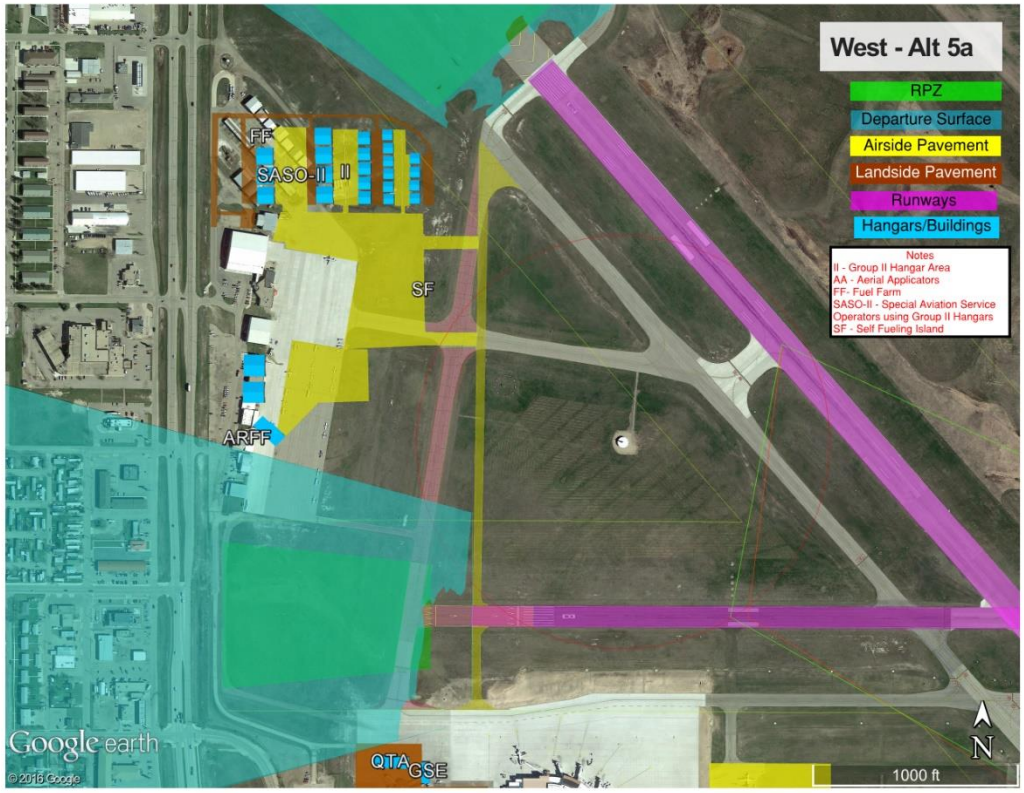

West - Alt 4
RPZ
Departure Surface
Airside Pavement
Landside Pavement
Runways
Hangars/Buildings
Notes
II - Group II Hangar Area
AA - Aerial Applicators
FF - Fuel Farm
SF - Self Fueling Island
Cargo
FF
SF
ARFF
AA
Delce
Google earth
© 2016 Google
N
1000 ft

June 2016 Alternatives (cont.)

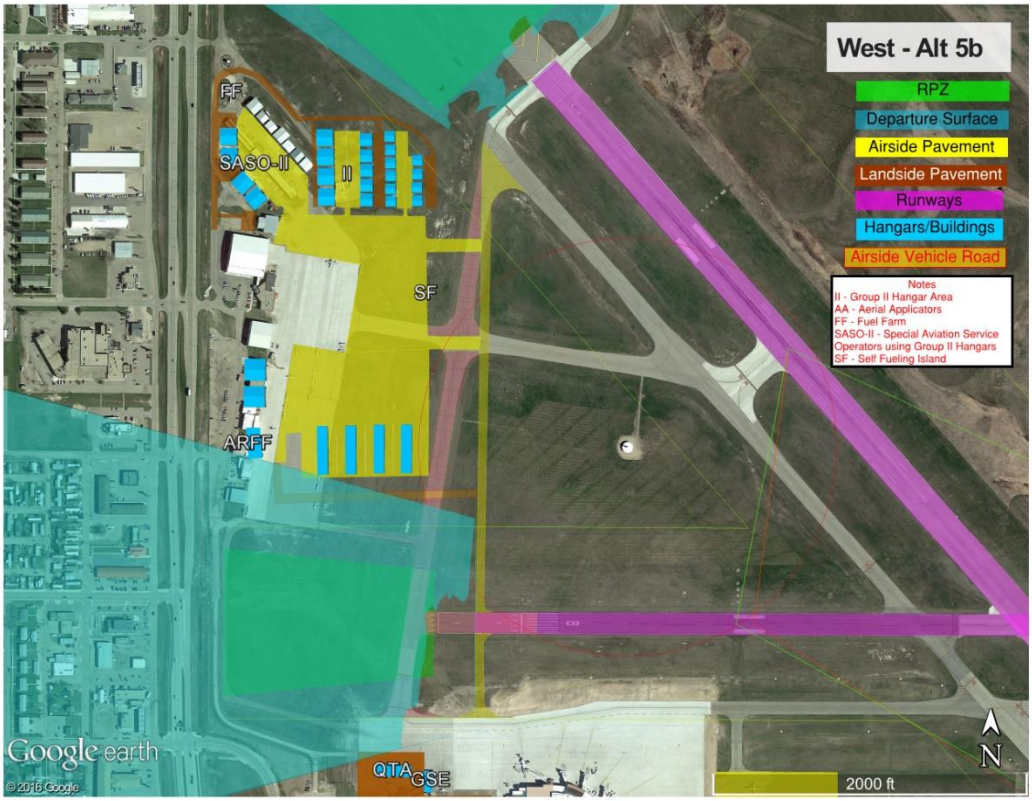




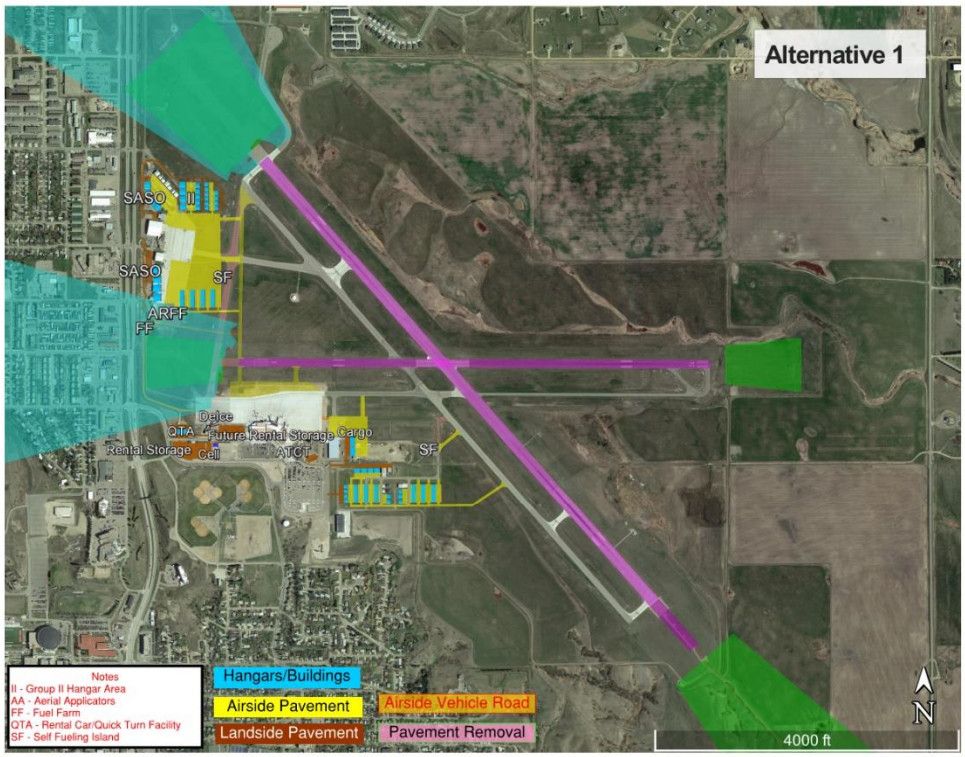

West - Alt 5
RPZ
Departure Surface
Airside Pavement
Landside Pavement
Runways
Hangars/Buildings
Airside Vehicle Road
Notes
II - Group II Hangar Area
AA - Aerial Applicators
FF - Fuel Farm
SF - Self Fueling Island
II
FF
SF
ARFF
QTA
GSE
Google earth
© 2016 Google
1000 ft
N

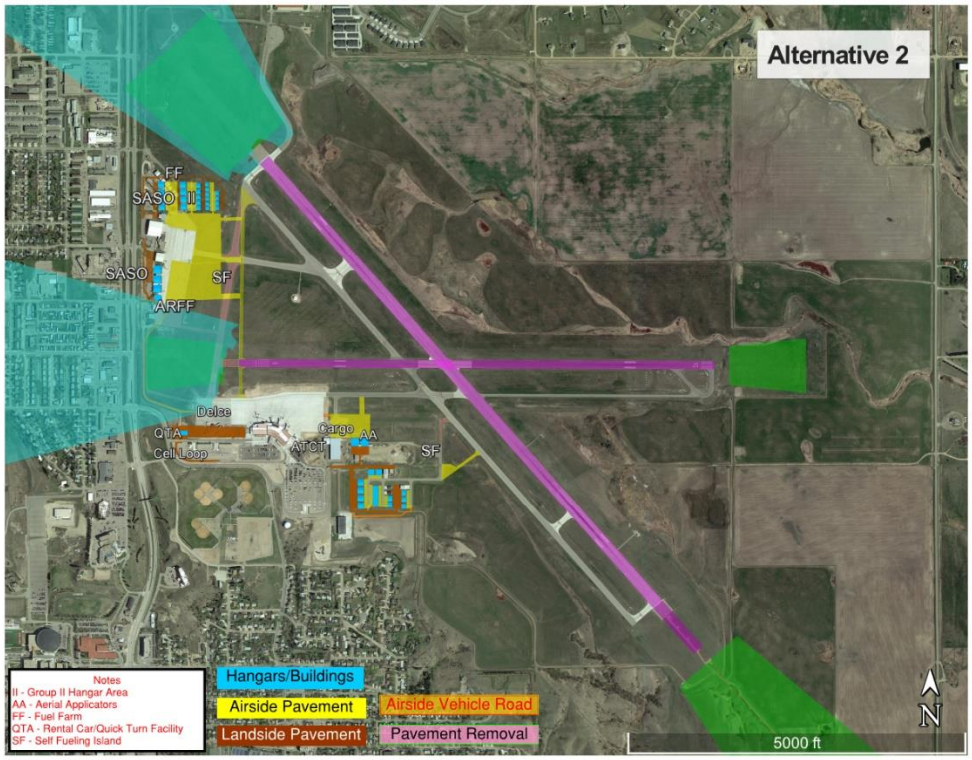

West - Alt 5a
RPZ
Departure Surface
Airside Pavement
Landside Pavement
Runways
Hangars/Buildings
Notes
II - Group II Hangar Area
AA - Aerial Applicators
FF- Fuel Farm
SASO-II - Special Aviation Service Operators using Group II Hangars
SF - Self Fueling Island
FF
SASO-II
II
SF
ARFF
QTA
GSE
Google earth
© 2016 Google
1000 ft
N

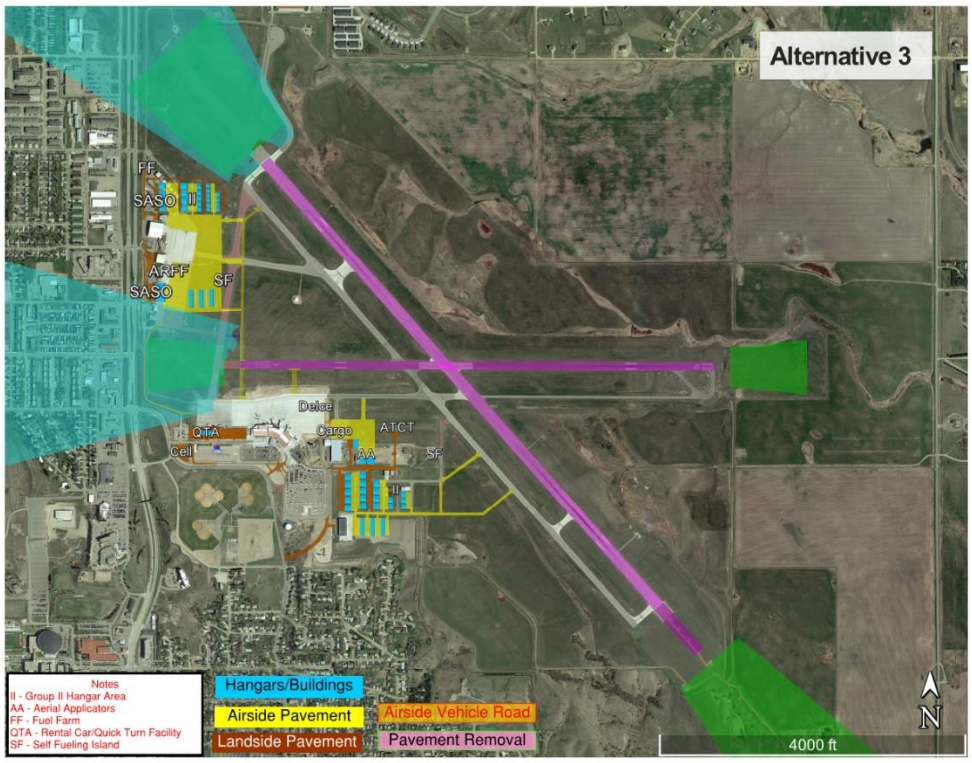
June 2016 Alternatives (cont.)

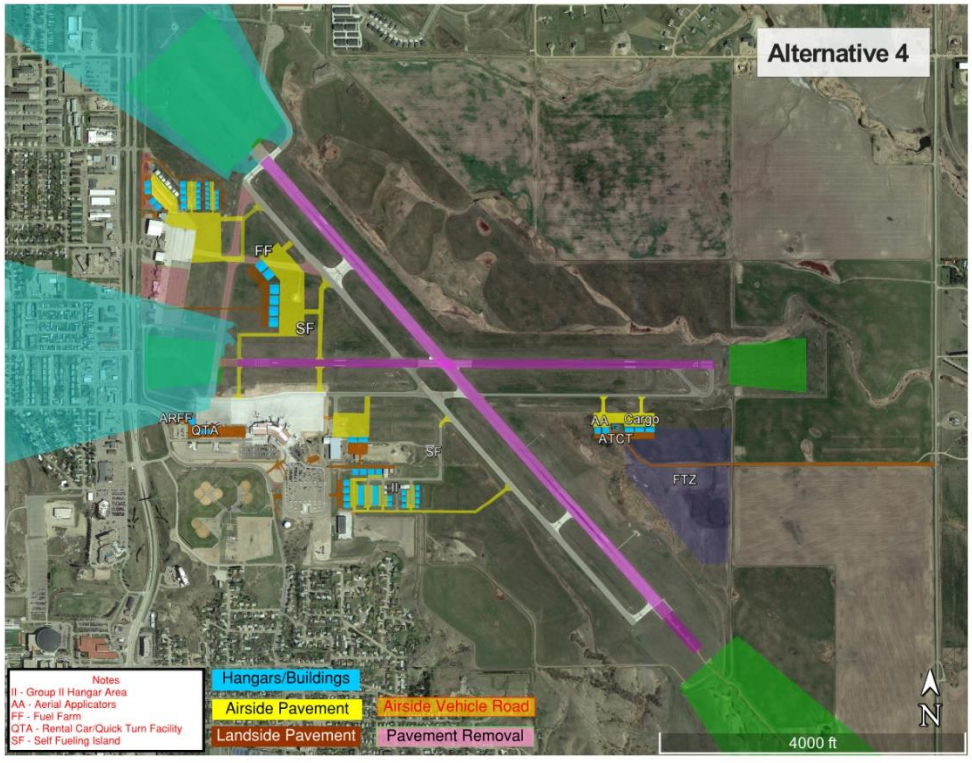


August 2016 Alternatives

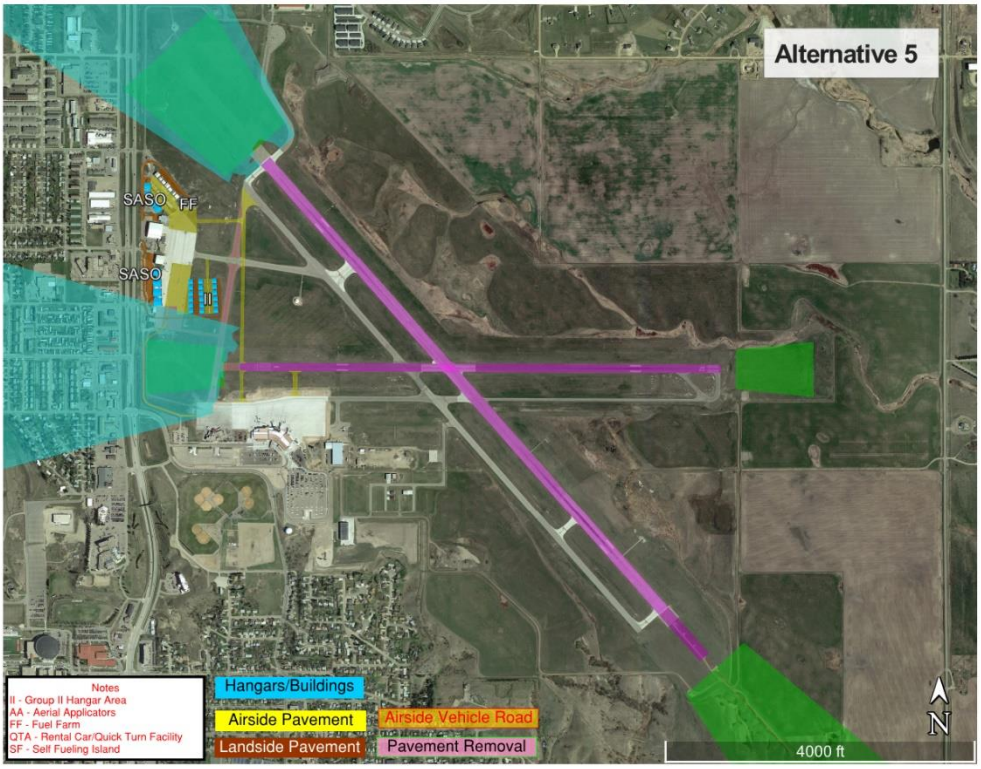


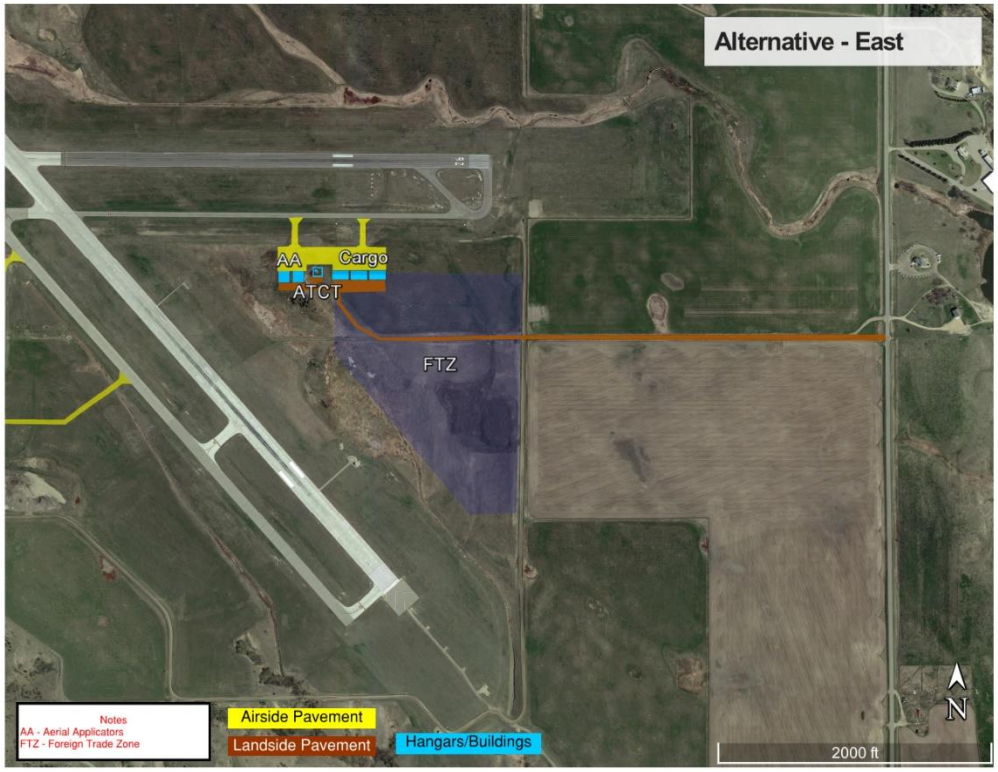



Alternative 3
FF
SASO
II
ARFF
SASO
SF
Delce
Cargo
ATCT
QTA
Cell
AA
SF
II
Notes
II - Group II Hangar Area
AA - Aerial Applicators
FF - Fuel Farm
QTA - Rental Car/Quick Turn Facility
SF - Self Fueling Island
Hangars/Buildings
Airside Pavement
Landside Pavement
Airside Vehicle Road
Pavement Removal
4000 ft
N

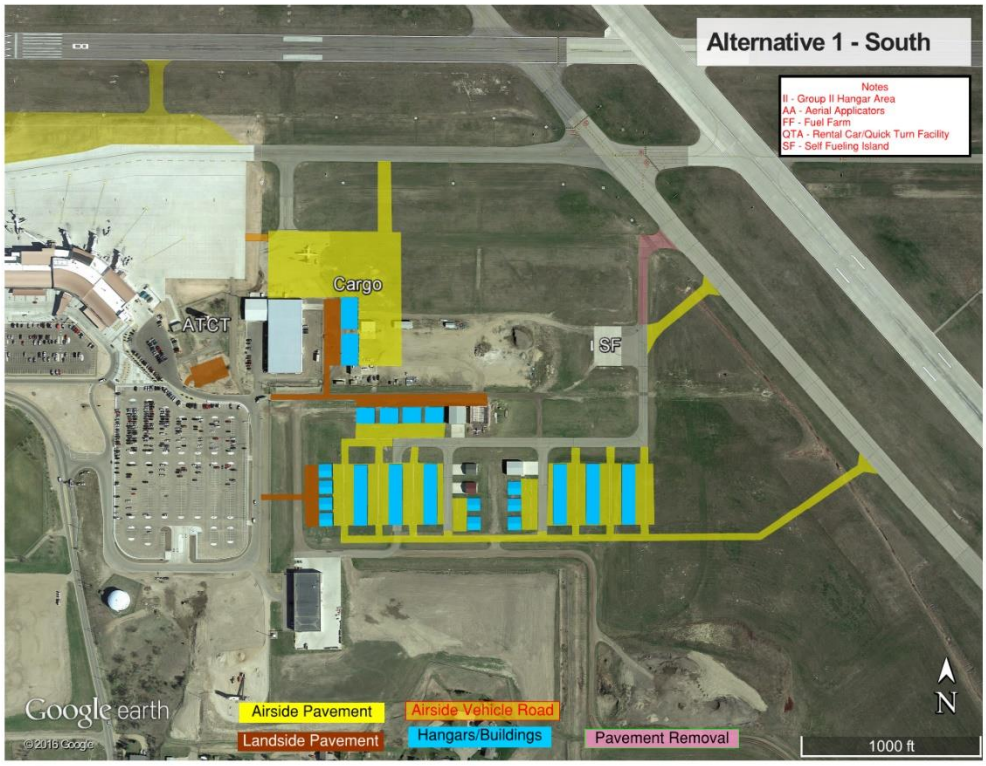

Alternative 4
FF
SF
ARFF
QTA
SF
AA
Cargo
ATCT
FTZ
II
Notes
II - Group II Hangar Area
AA - Aerial Applicators
FF - Fuel Farm
QTA - Rental Car/Quick Turn Facility
SF - Self Fueling Island
Hangars/Buildings
Airside Pavement
Landside Pavement
Airside Vehicle Road
Pavement Removal
4000 ft
N

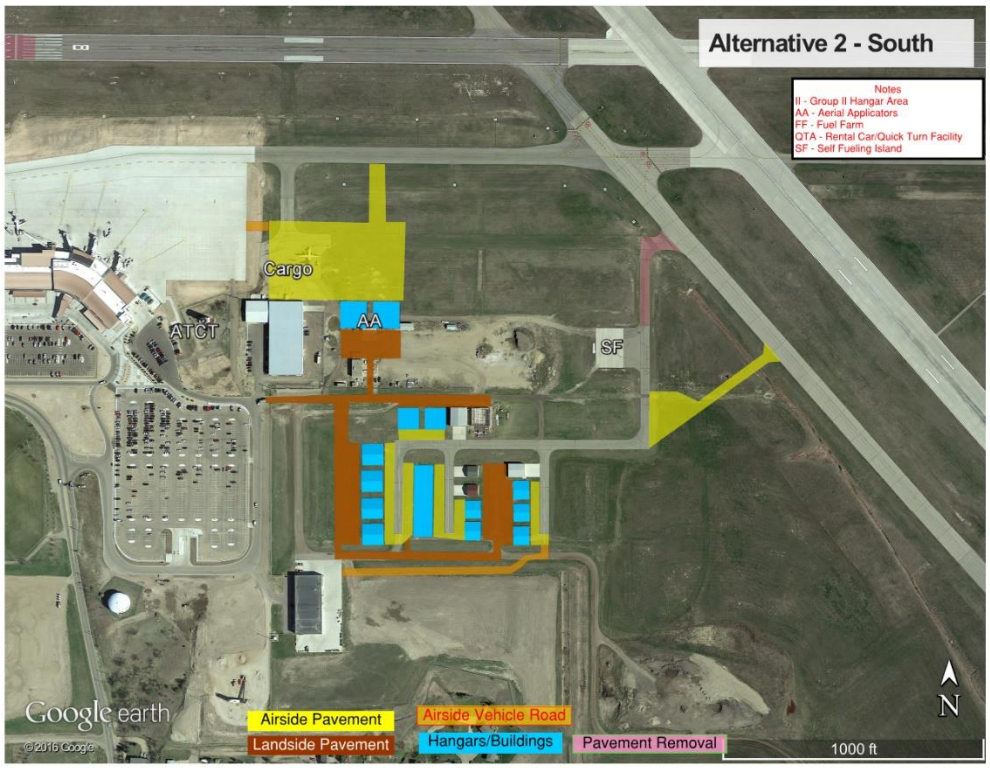
August 2016 Alternatives (cont.)

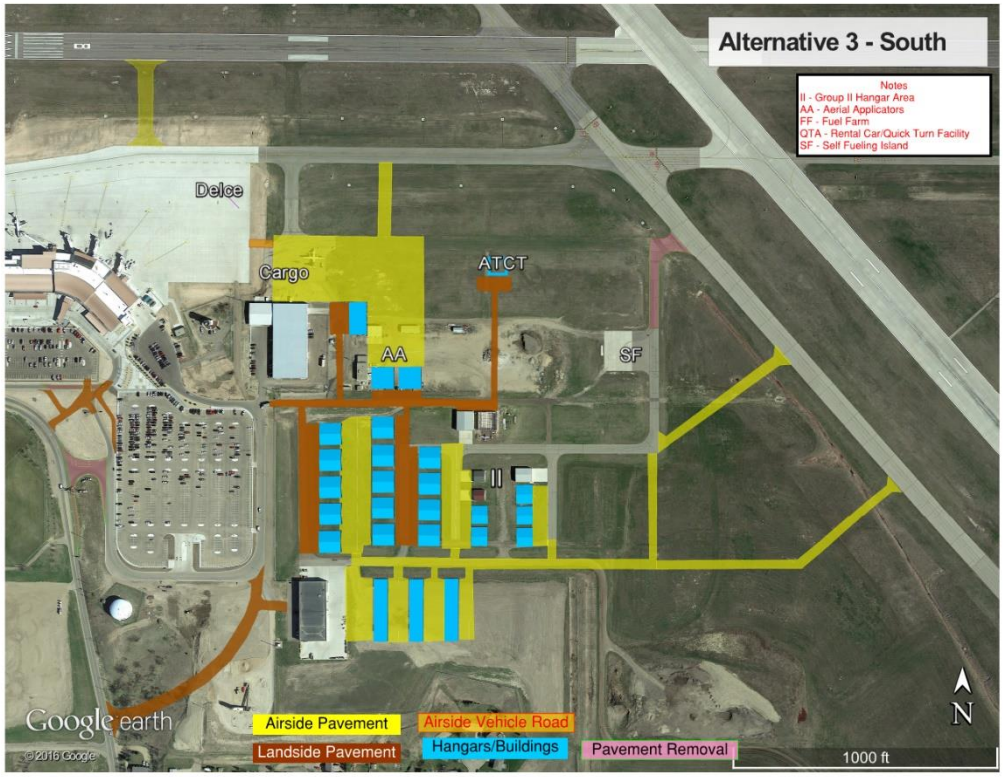


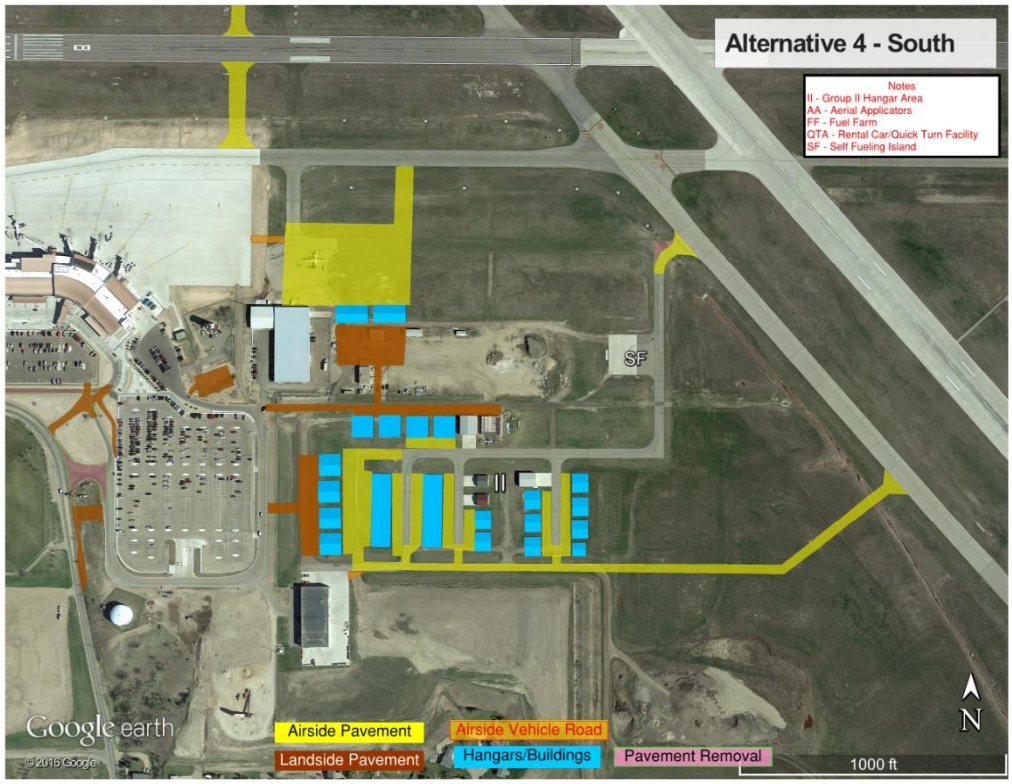


August 2016 Alternatives (cont.)

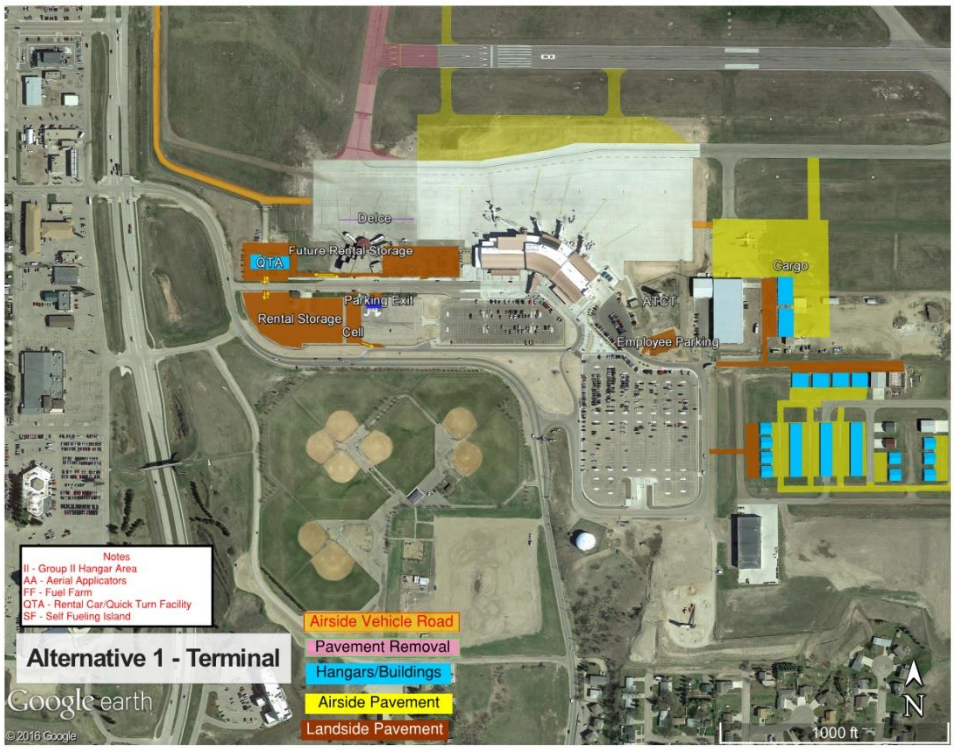


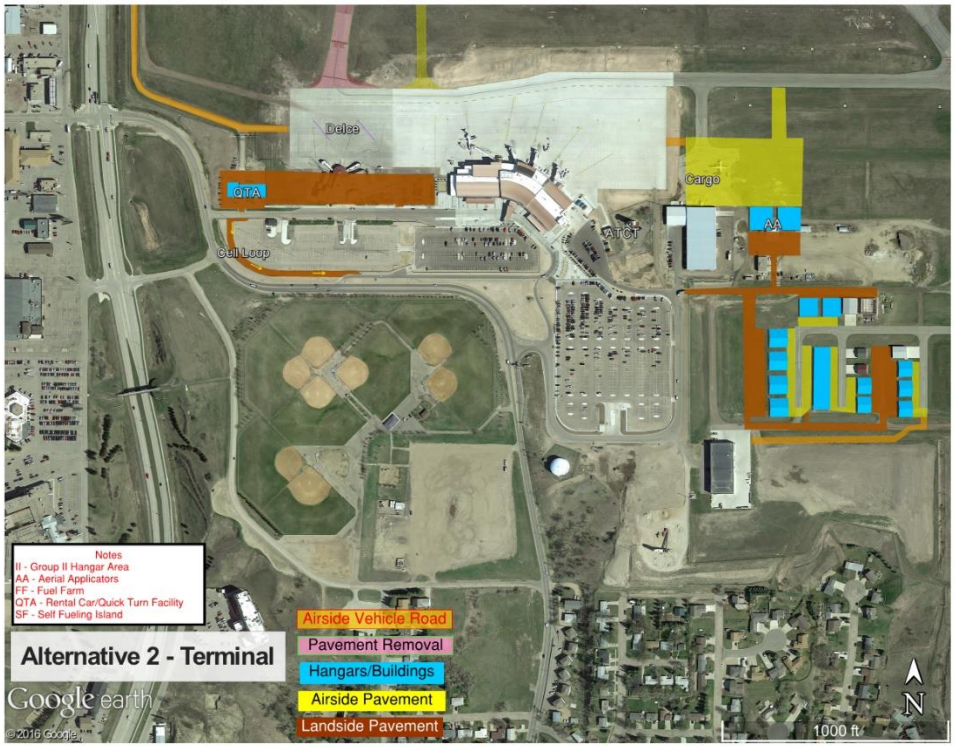



Alternative 3 - South
Notes
II - Group II Hangar Area
AA - Aerial Applicators
FF - Fuel Farm
QTA - Rental Car/Quick Turn Facility
SF - Self Fueling Island
Delce
Cargo
ATCT
AA
SF
II
Google earth
Airside Pavement
Airside Vehicle Road
Landside Pavement
Hangars/Buildings
Pavement Removal
1000 ft
N


Alternative 4 - South
Notes
II - Group II Hangar Area
AA - Aerial Applicators
FF - Fuel Farm
QTA - Rental Car/Quick Turn Facility
SF - Self Fueling Island
SF
II
Google earth
Airside Pavement
Airside Vehicle Road
Landside Pavement
Hangars/Buildings
Pavement Removal
1000 ft
N

August 2016 Alternatives (cont.)





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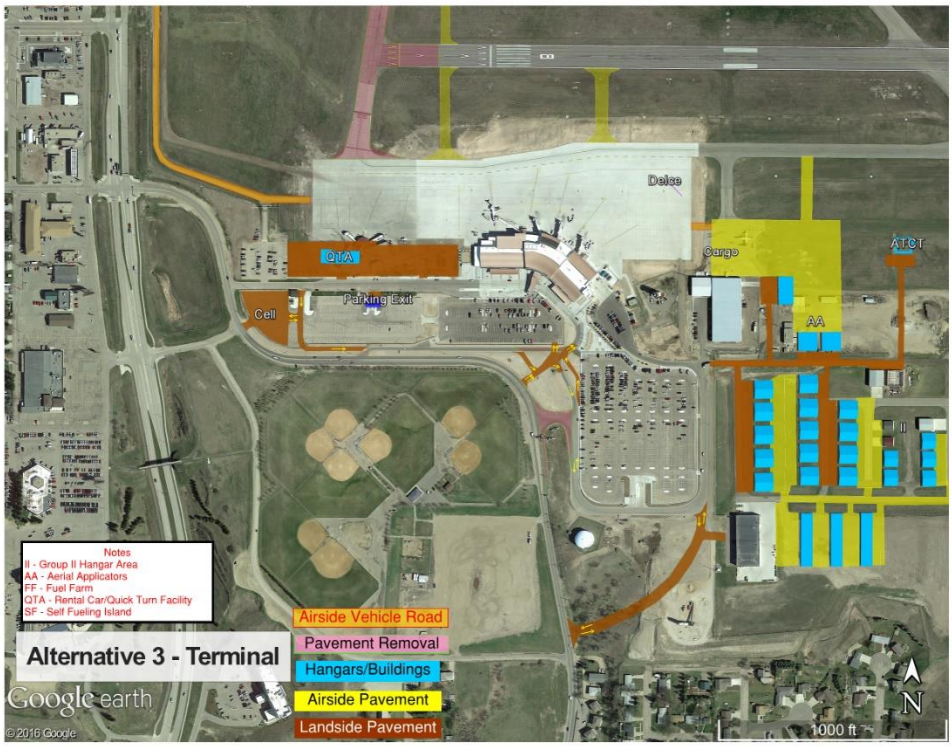

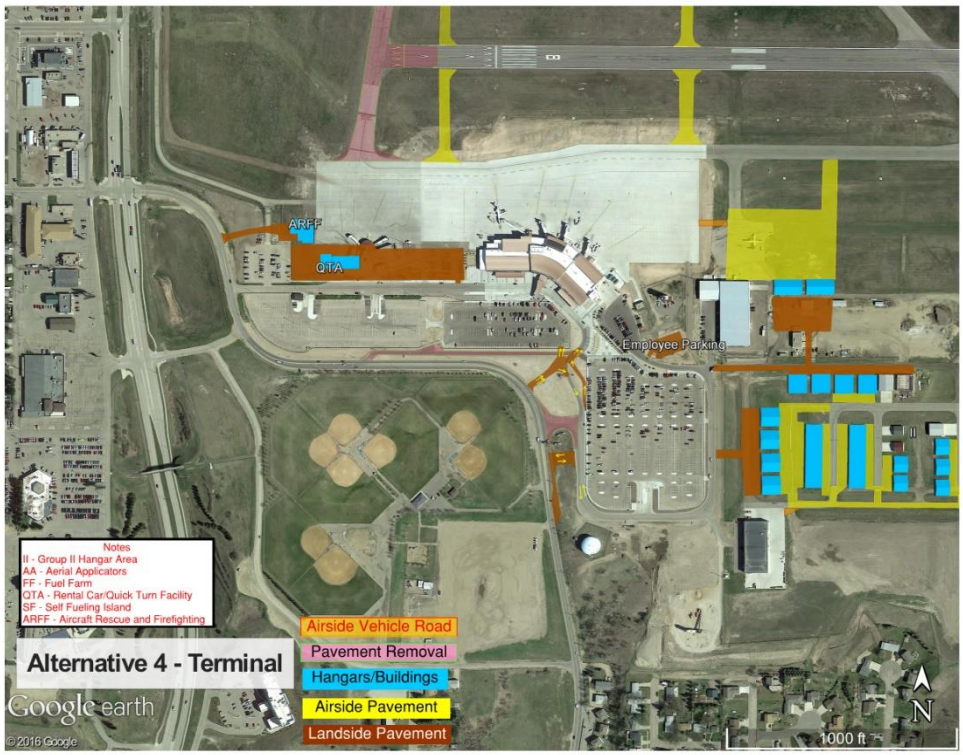

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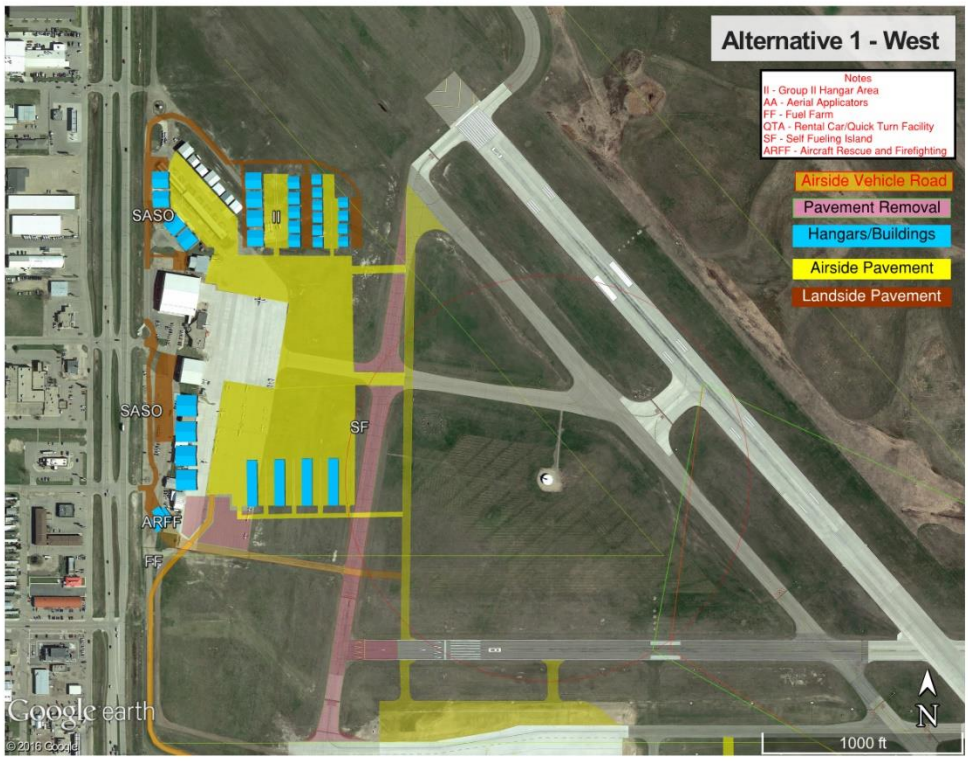

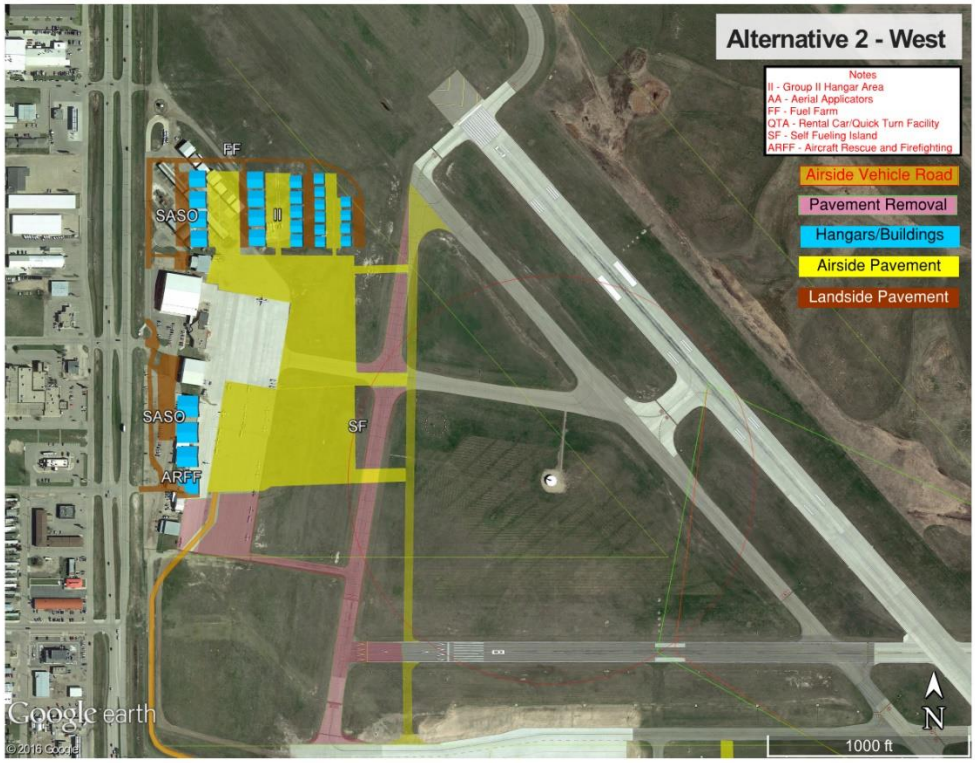

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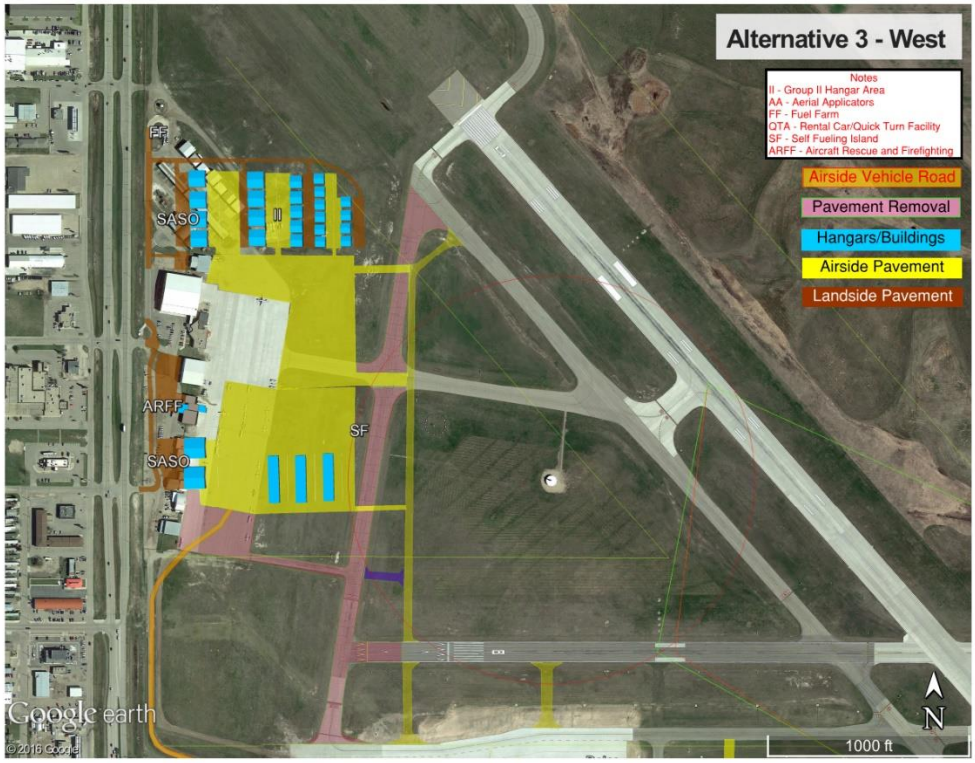

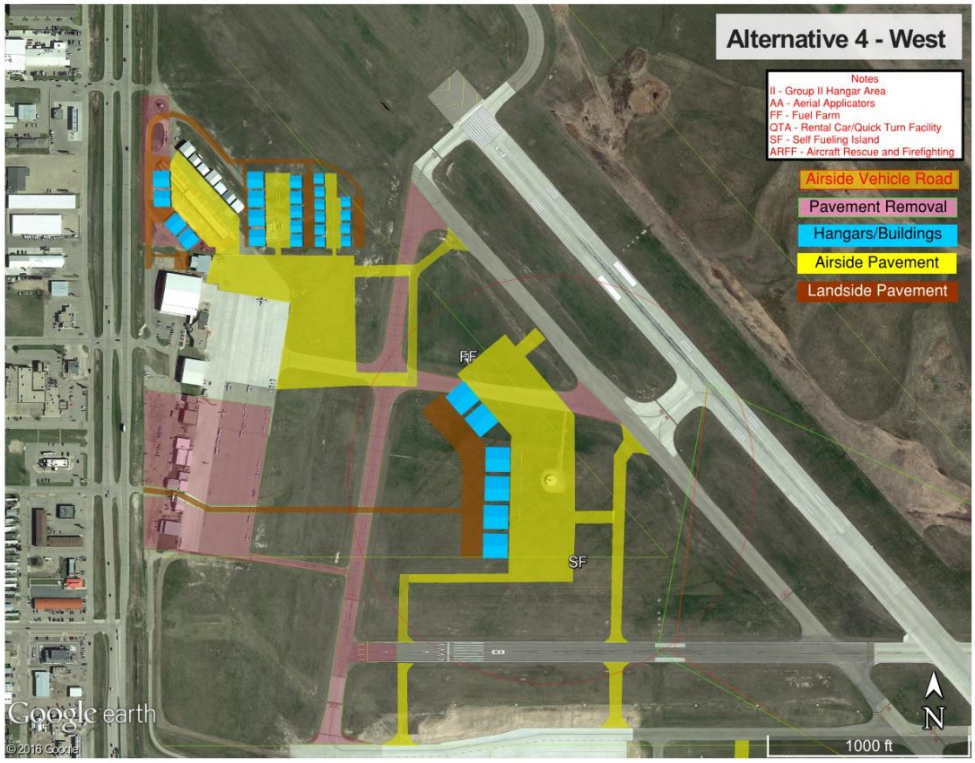

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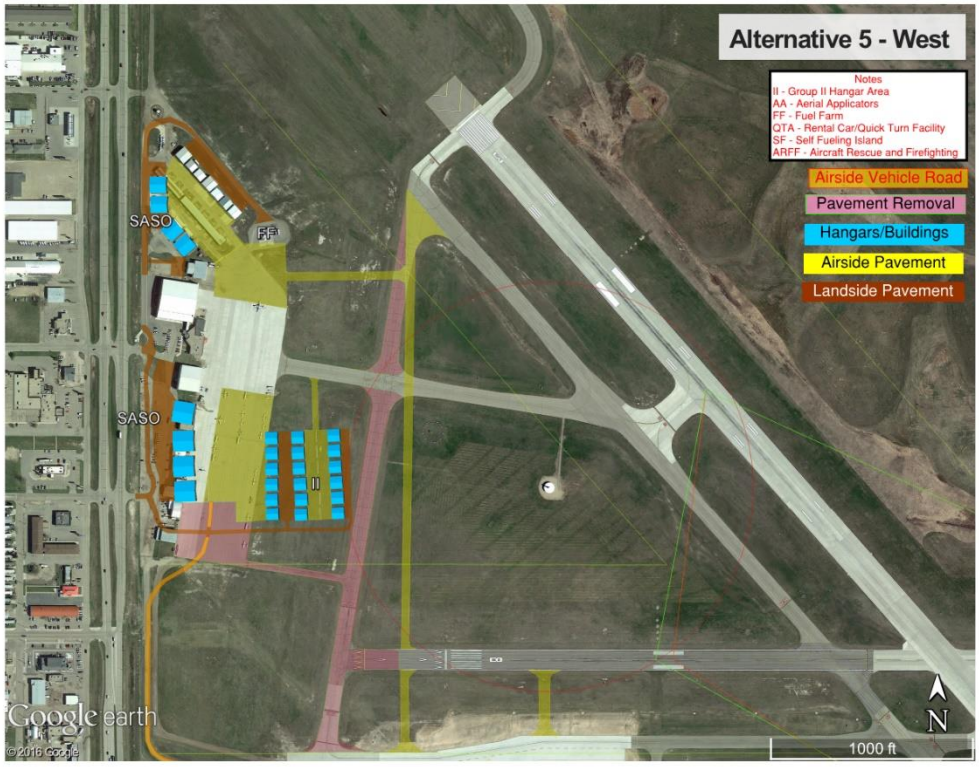
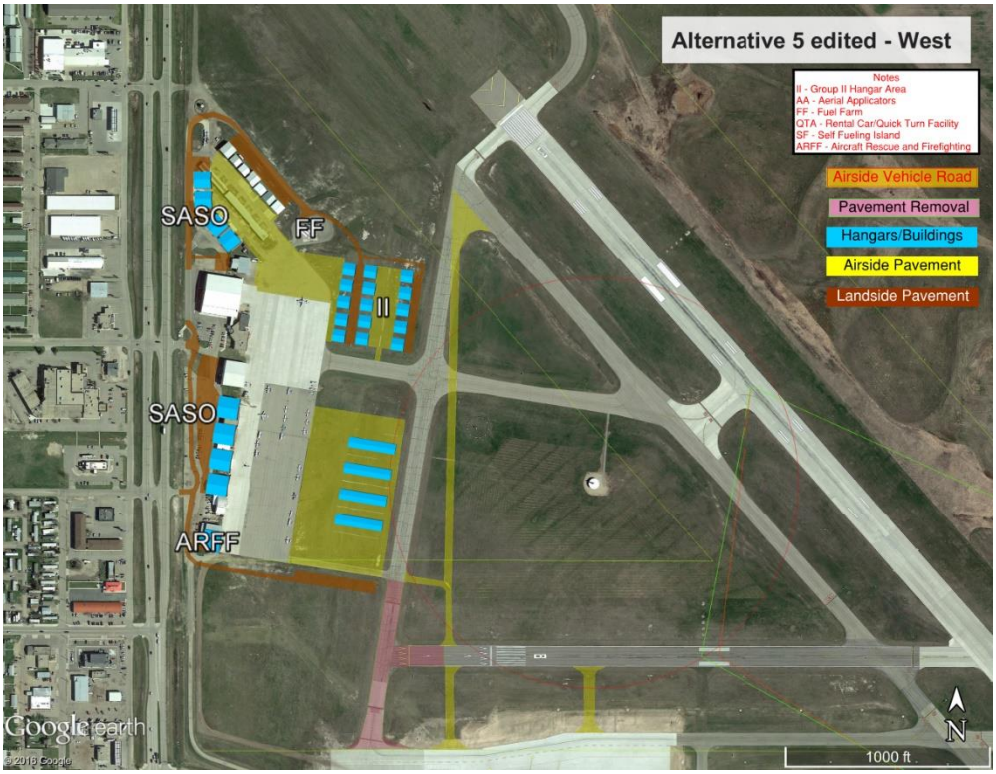




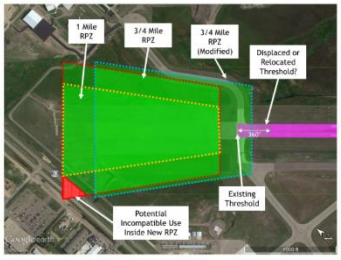
AIRPORT MASTER PLAN UPDATE

RUNWAY AND APPROACH ALTERNATIVES

Runway 13-31

- Runway 13 Approach Visibility Improvements—1 mile to 3/4 mile
- Runway Length—7,700' to 8,500'

Runway 13



Runway 31

Runway 8-26

- Design Aircraft from C-III to B-II
- Relocate Runway 8 Threshold to eliminate incompatible land uses in Runway Protection Zone

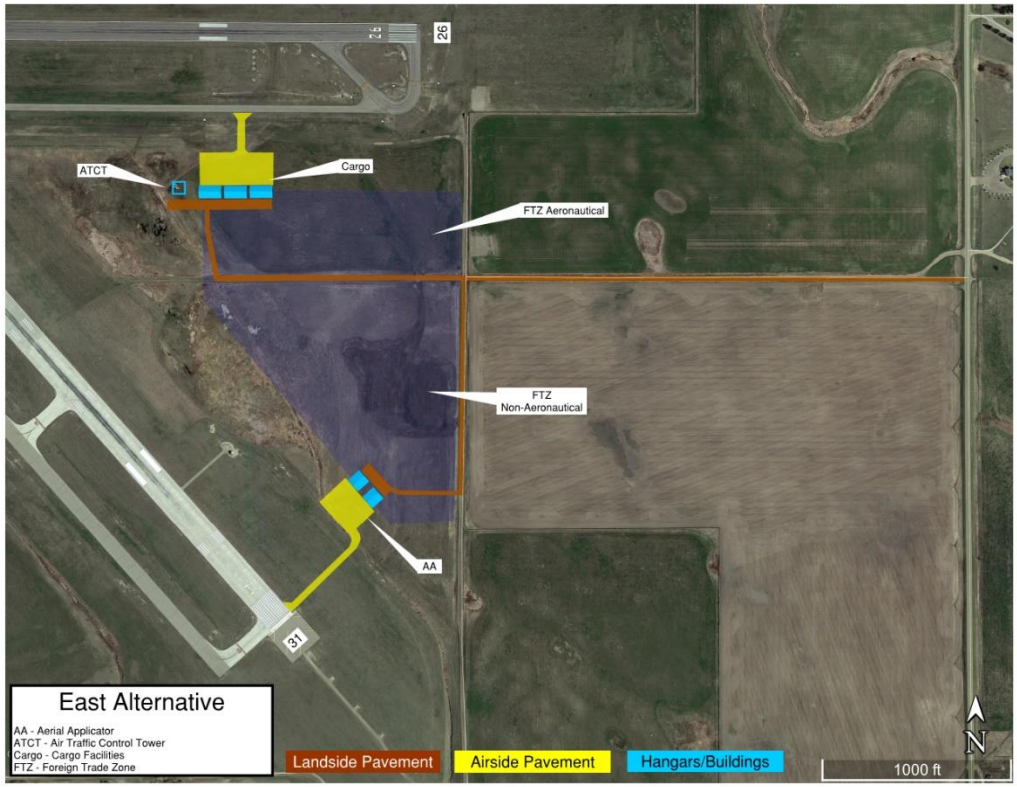
Runway 8 Existing

Runway 8 Proposed

MINOT INTERNATIONAL AIRPORT

OPEN HOUSE - OCT 19, 2016

KLJ



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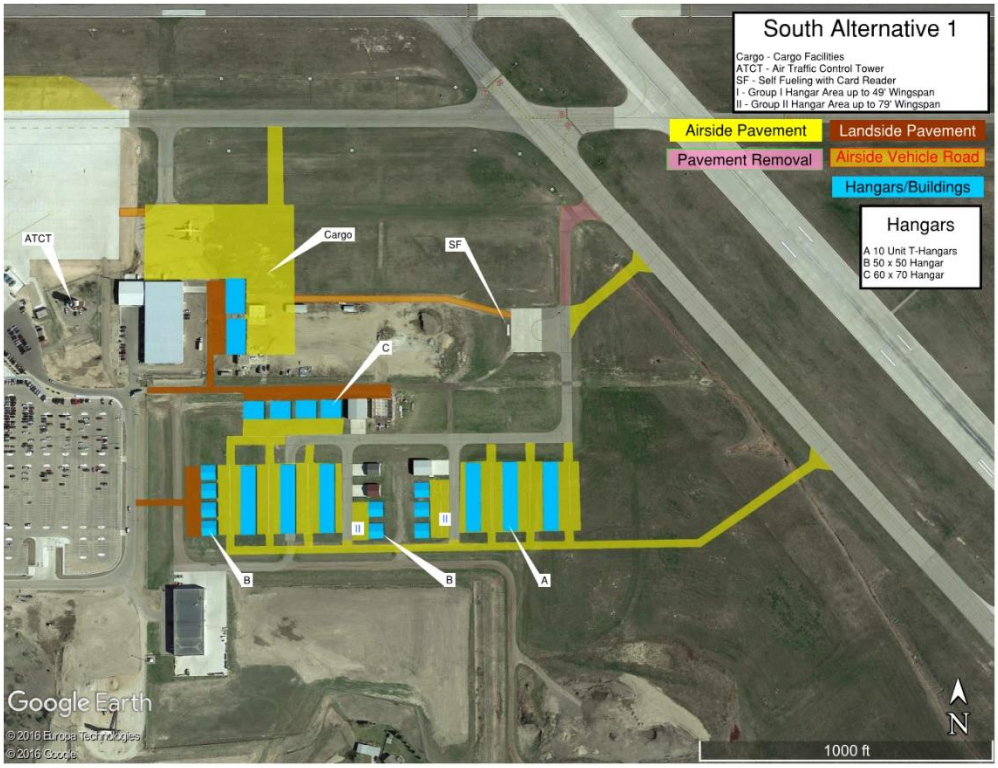
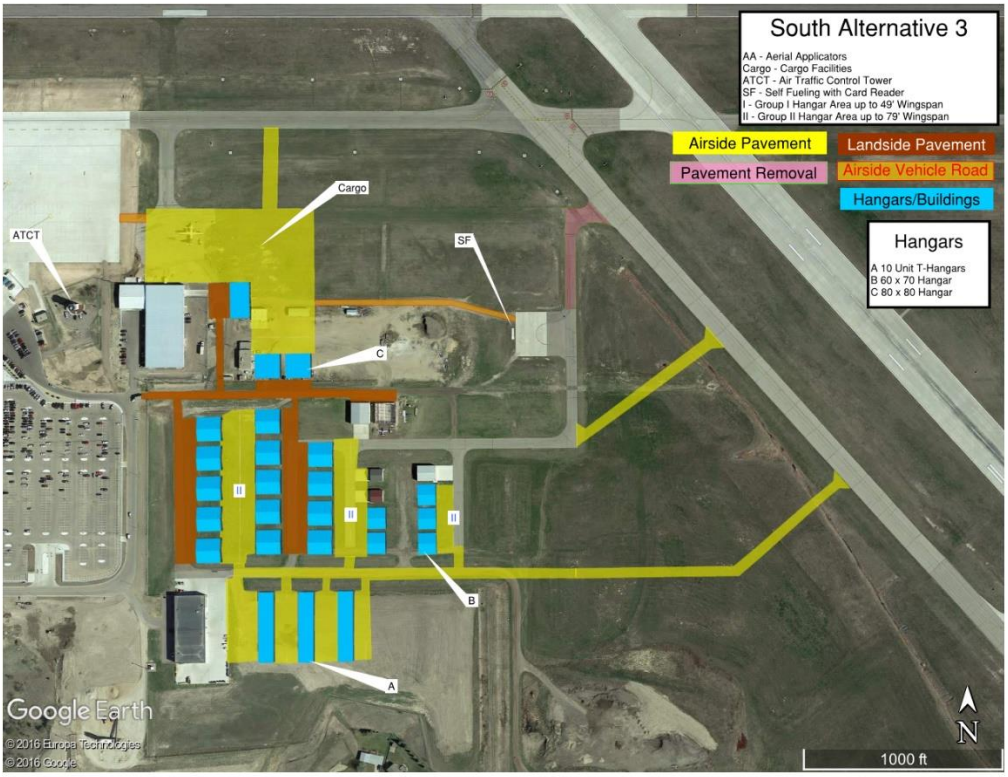
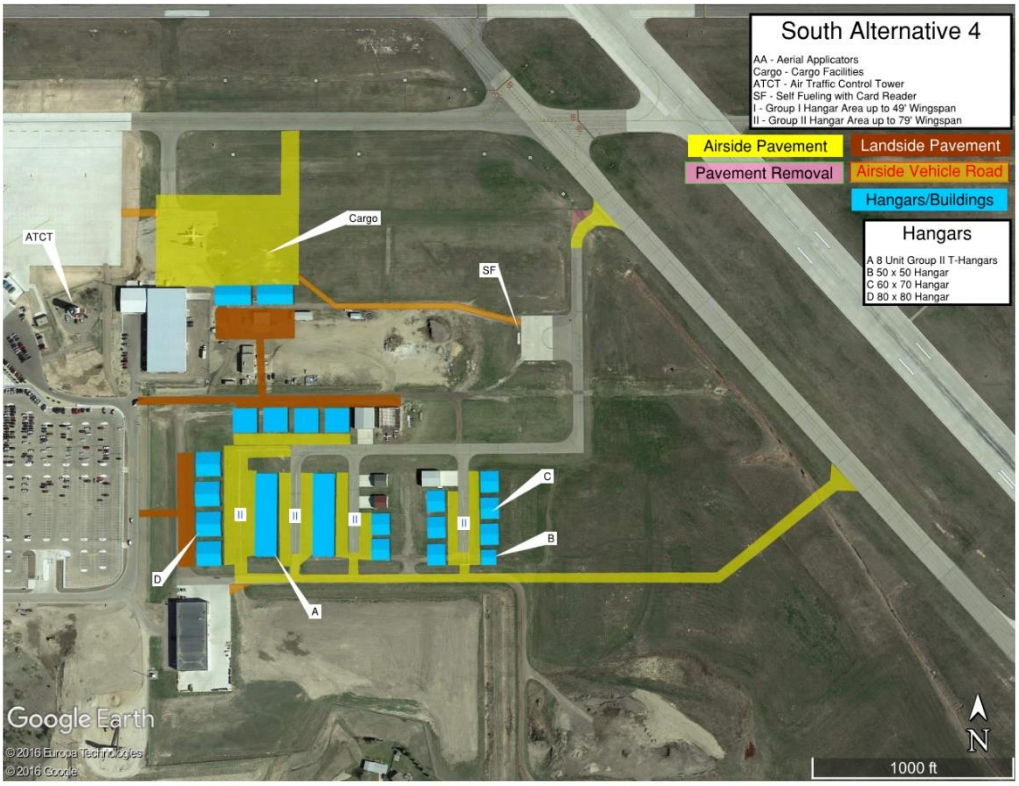
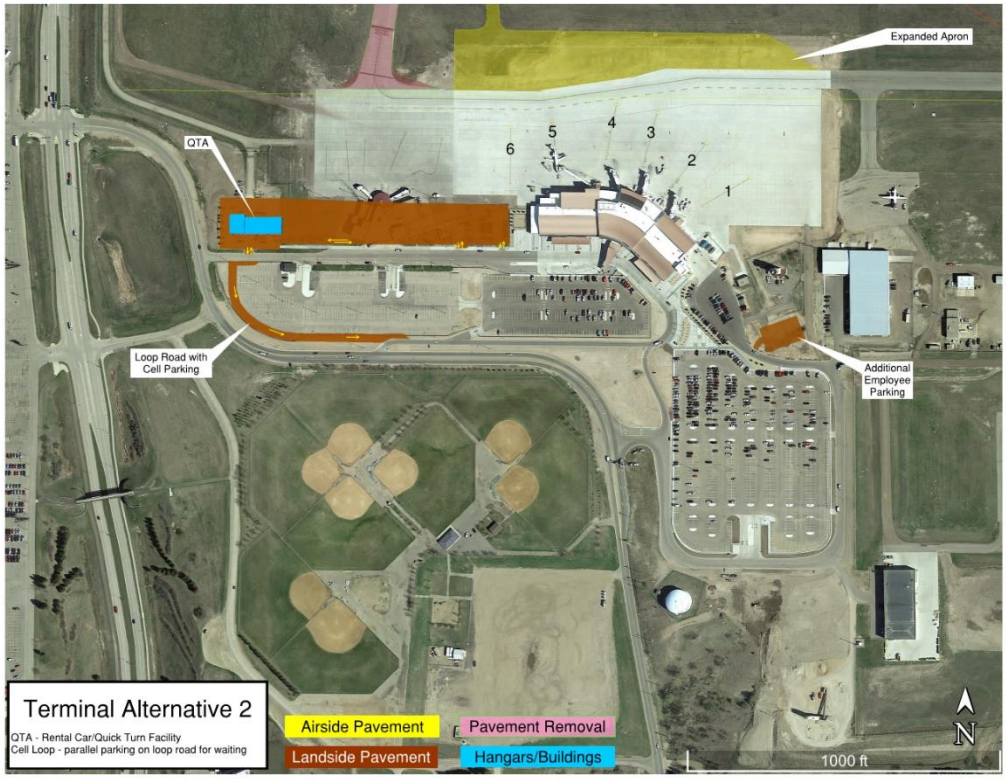
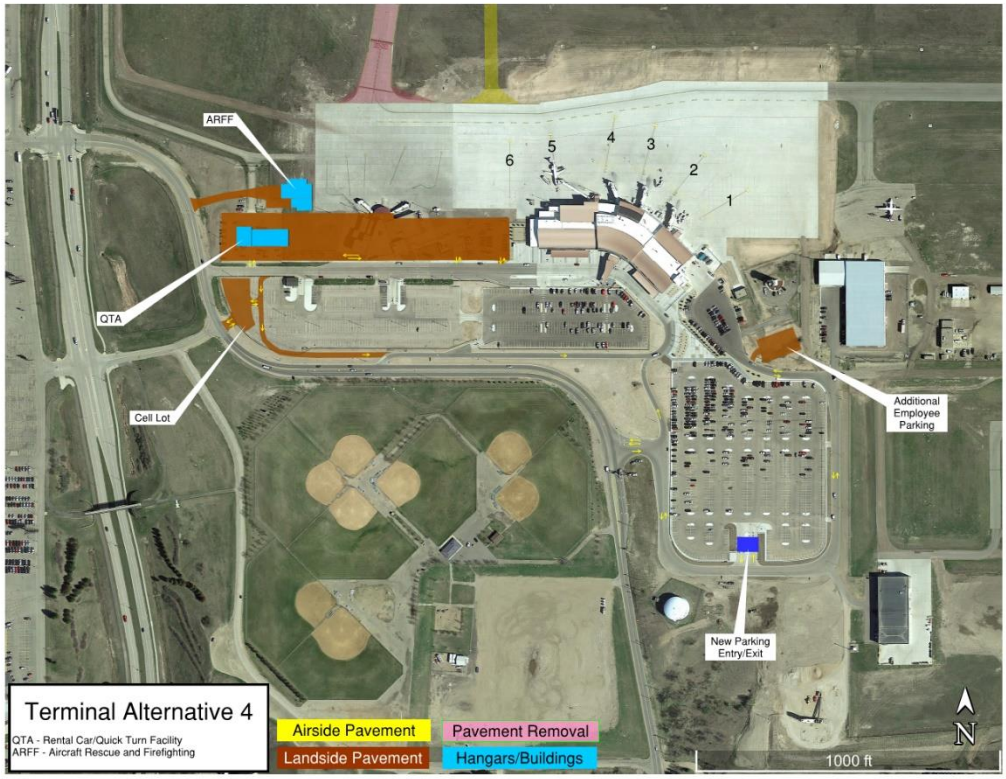


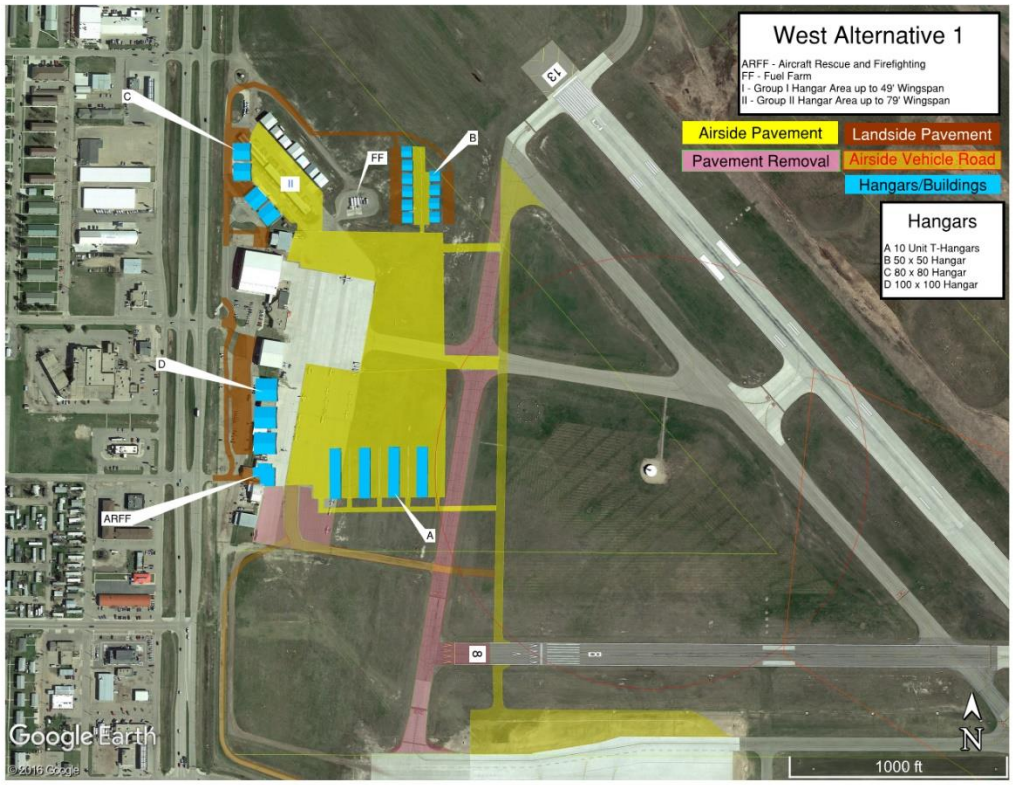


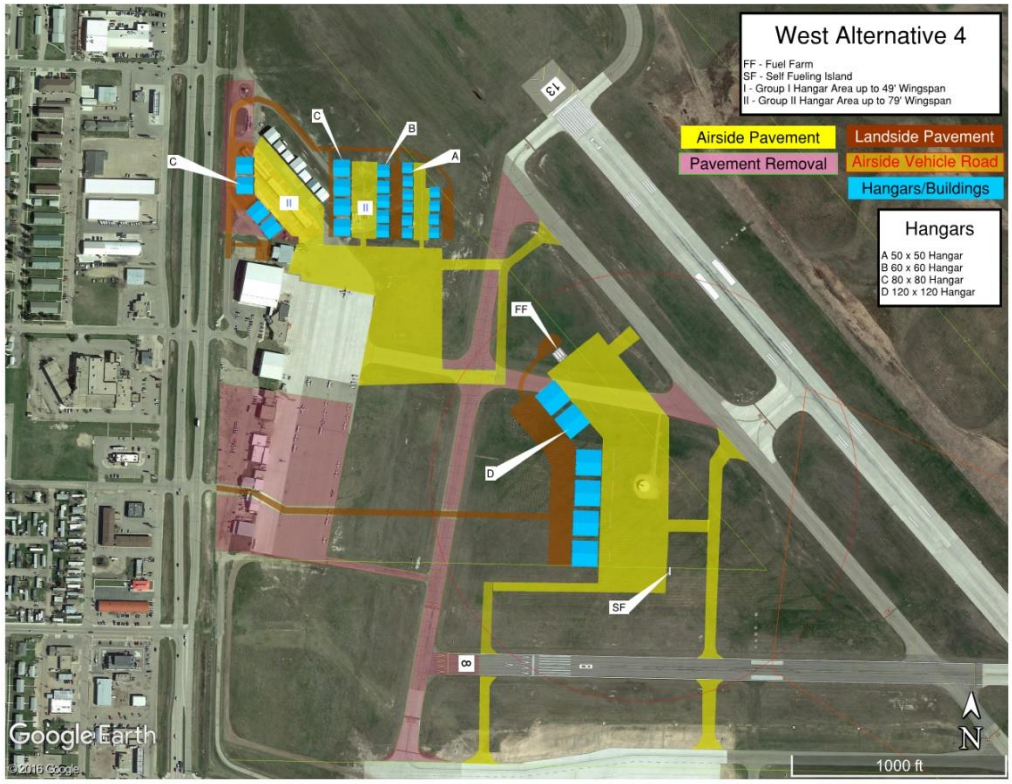

South Alternative 4
AA - Aerial Applicators
Cargo - Cargo Facilities
ATCT - Air Traffic Control Tower
SF - Self Fueling with Card Reader
I - Group I Hangar Area up to 49' Wingspan
II - Group II Hangar Area up to 79' Wingspan
Airside Pavement
Landside Pavement
Pavement Removal
Airside Vehicle Road
Hangars/Buildings
Hangars
A 8 Unit Group II T-Hangars
B 50 x 50 Hangar
C 60 x 70 Hangar
D 80 x 80 Hangar
ATCT
Cargo
SF
C
B
D
A
II
Google Earth
© 2016 Europa Technologies
© 2016 Google
1000 ft
N

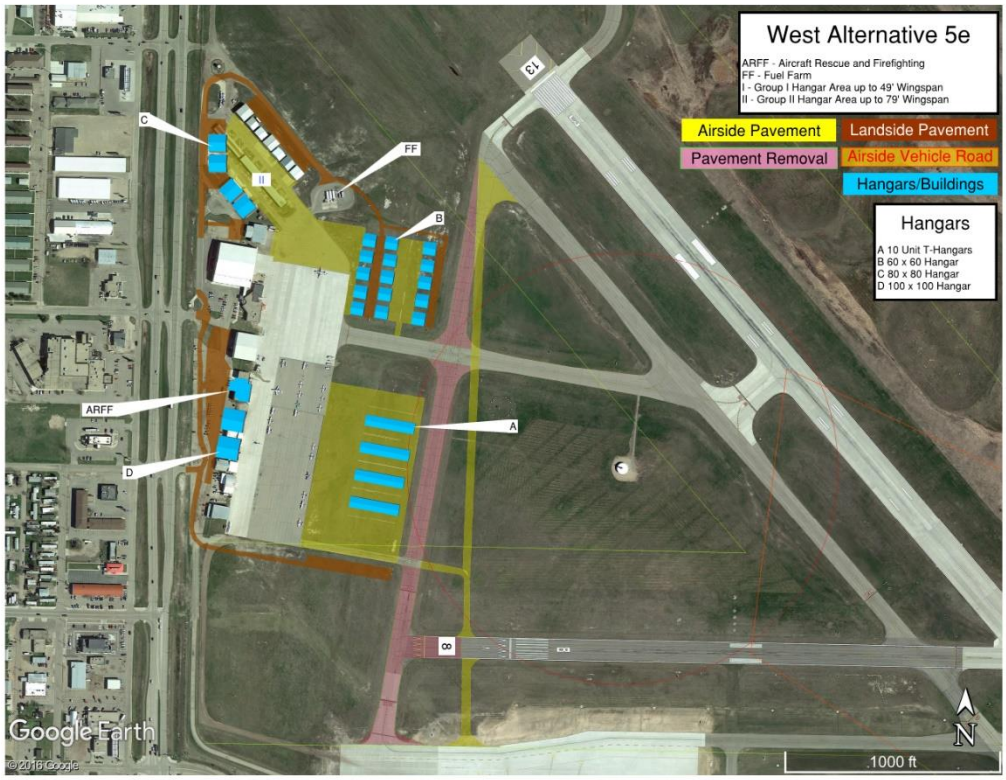

Expanded Apron
QTA
6
5
4
3
2
1
Loop Road with Cell Parking
Additional Employee Parking
Terminal Alternative 2
QTA - Rental Car/Quick Turn Facility
Cell Loop - parallel parking on loop road for waiting
Airside Pavement
Pavement Removal
Landside Pavement
Hangars/Buildings
1000 ft
N

October 2016 Alternatives (cont.)

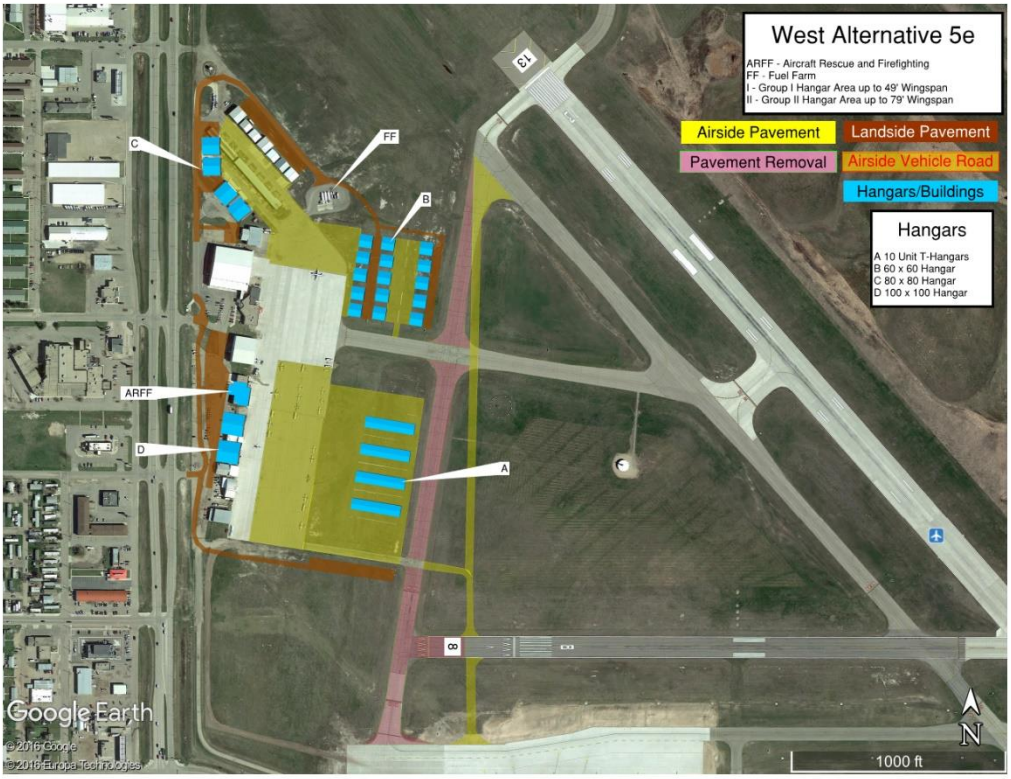




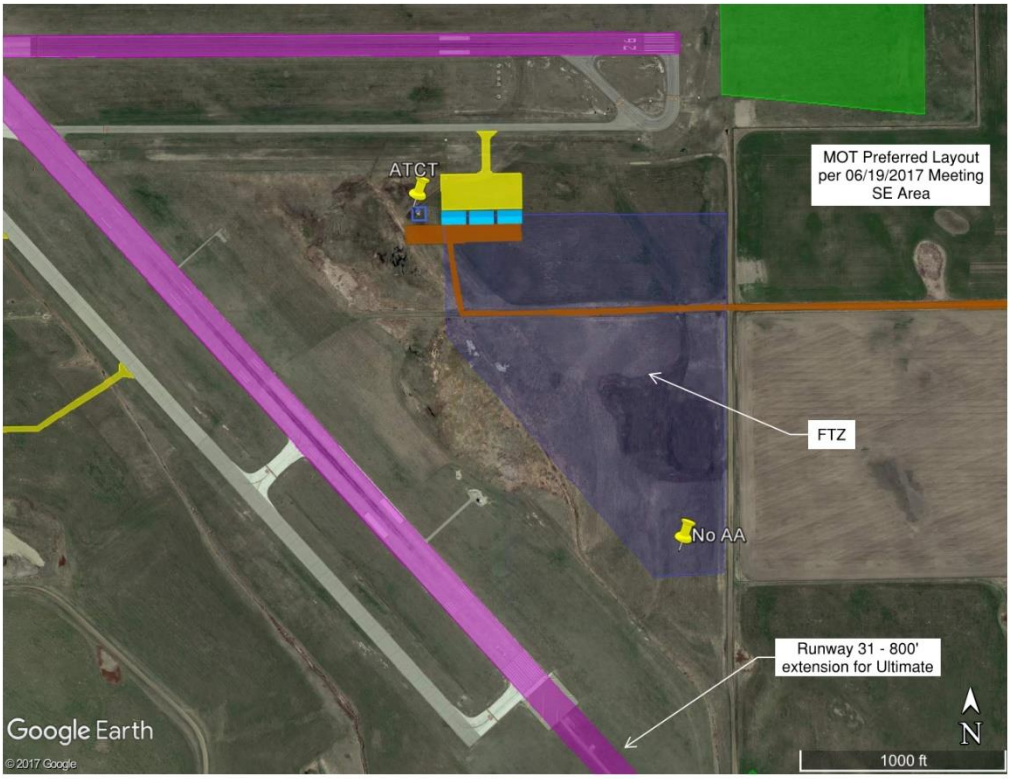

West Alternative 4
FF - Fuel Farm
SF - Self Fueling Island
I - Group I Hangar Area up to 49' Wingspan
II - Group II Hangar Area up to 79' Wingspan
Airside Pavement
Landside Pavement
Pavement Removal
Airside Vehicle Road
Hangars/Buildings
Hangars
A 50 x 50 Hangar
B 60 x 60 Hangar
C 80 x 80 Hangar
D 120 x 120 Hangar
13
C
B
A
C
II
II
FF
D
SF
I
8
Google Earth
© 2016 Google
N
1000 ft

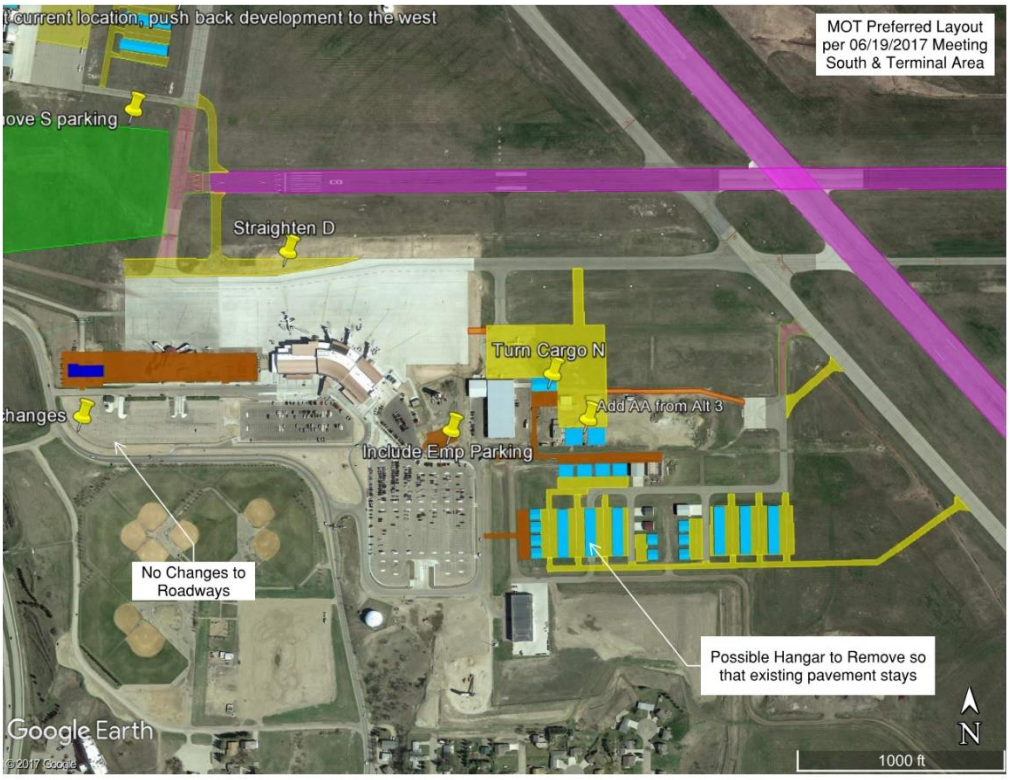

West Alternative 5e
ARFF - Aircraft Rescue and Firefighting
FF - Fuel Farm
I - Group I Hangar Area up to 49' Wingspan
II - Group II Hangar Area up to 79' Wingspan
Airside Pavement
Landside Pavement
Pavement Removal
Airside Vehicle Road
Hangars/Buildings
Hangars
A 10 Unit T-Hangars
B 60 x 60 Hangar
C 80 x 80 Hangar
D 100 x 100 Hangar
13
C
II
FF
B
ARFF
A
D
8
Google Earth
© 2016 Google
N
1000 ft

October 2016 Alternatives (cont.)



June 2017 Alternatives





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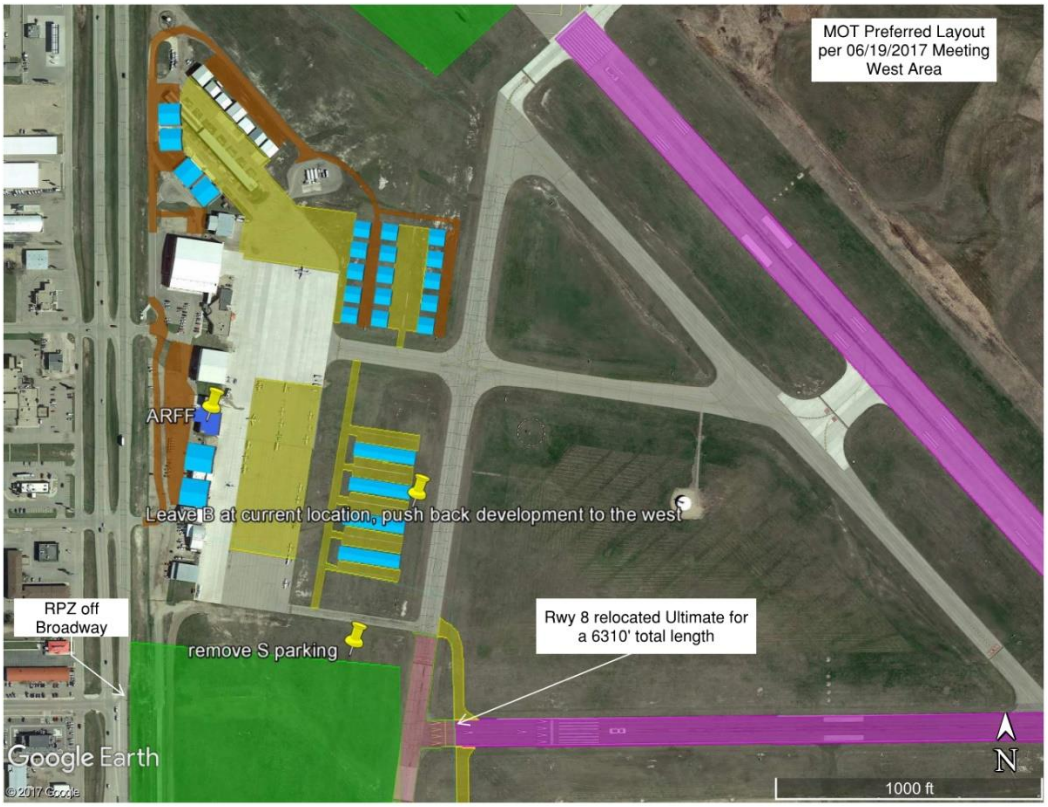
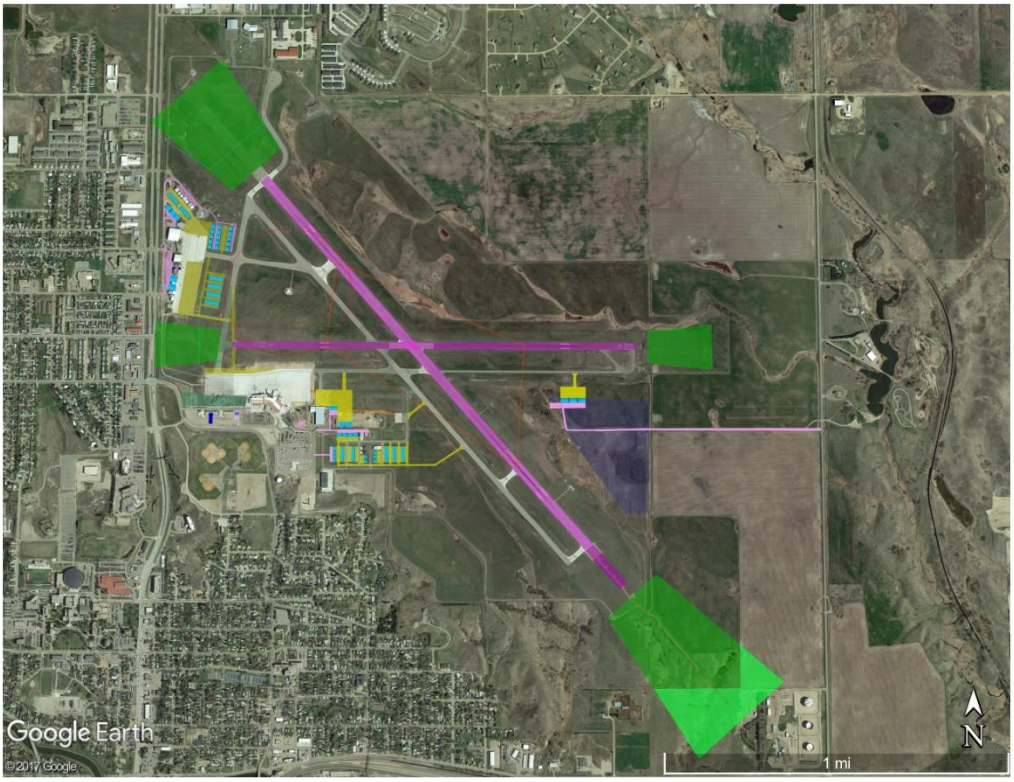
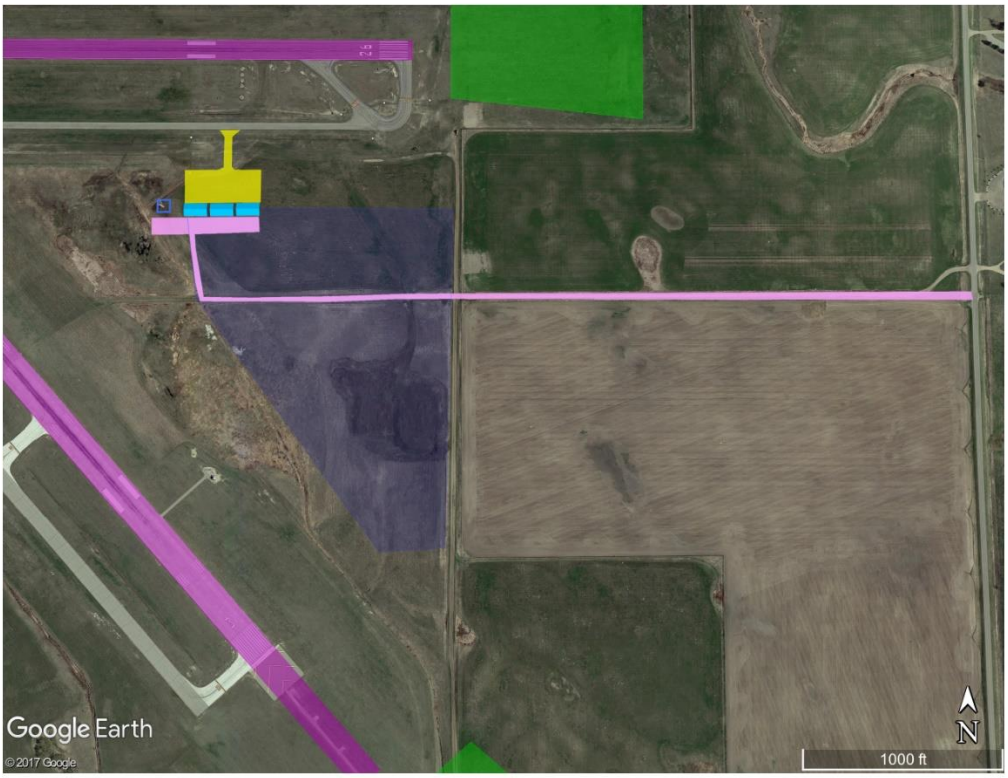


October 2017 Alternatives





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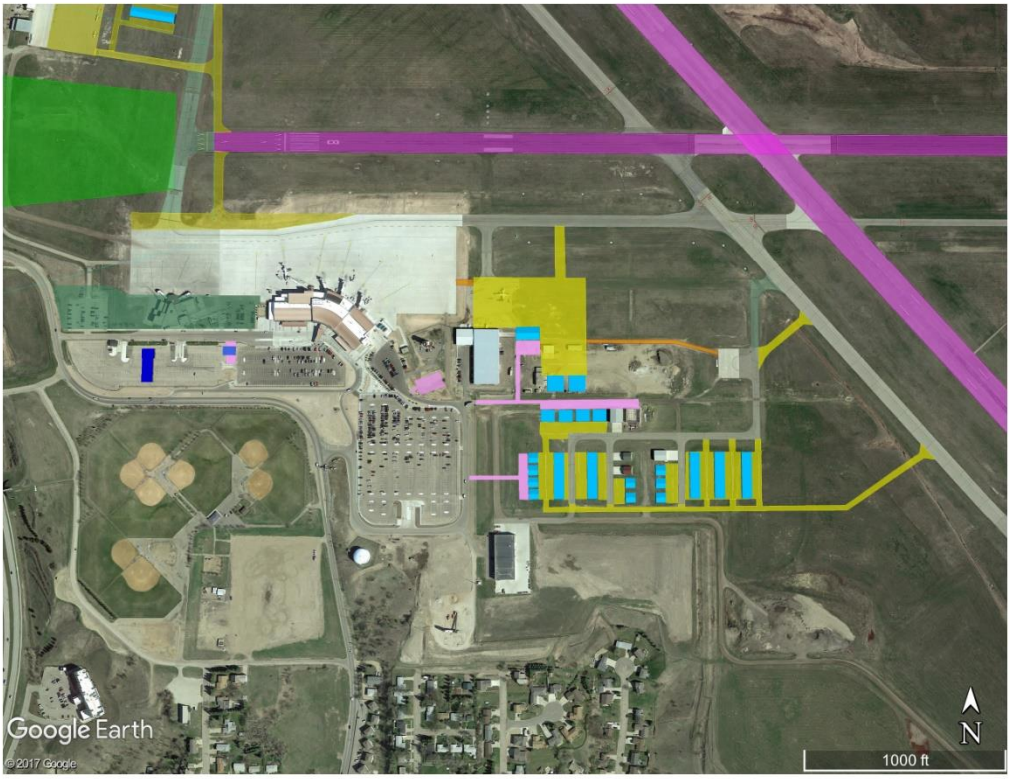
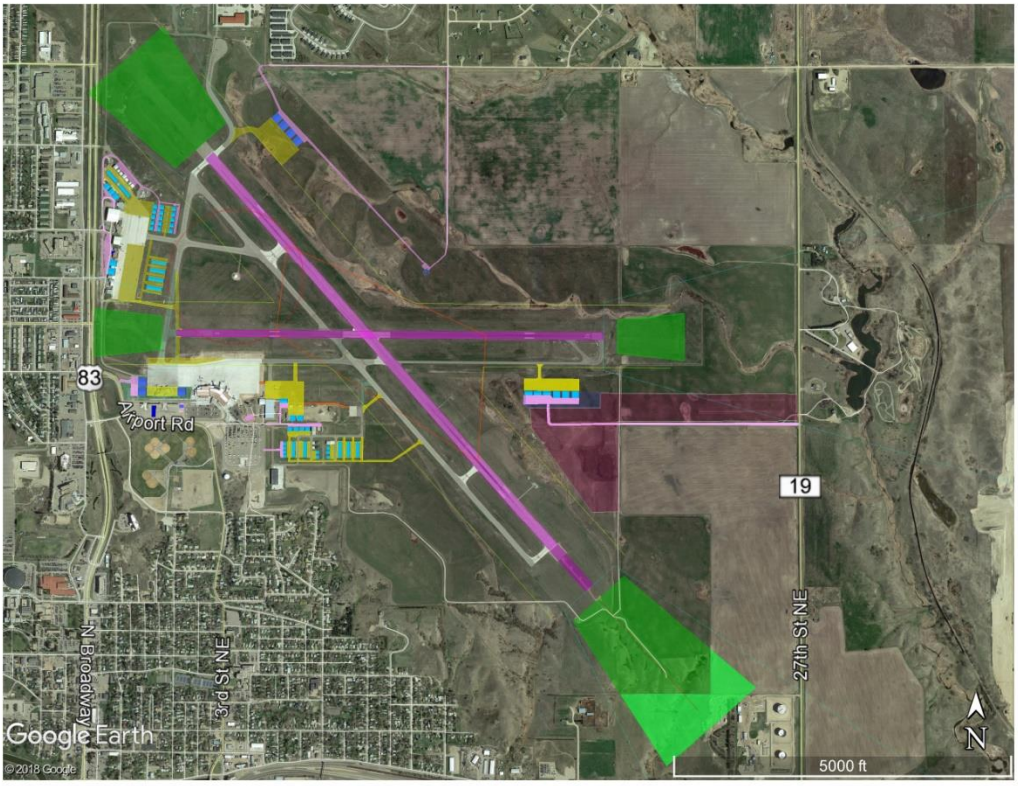
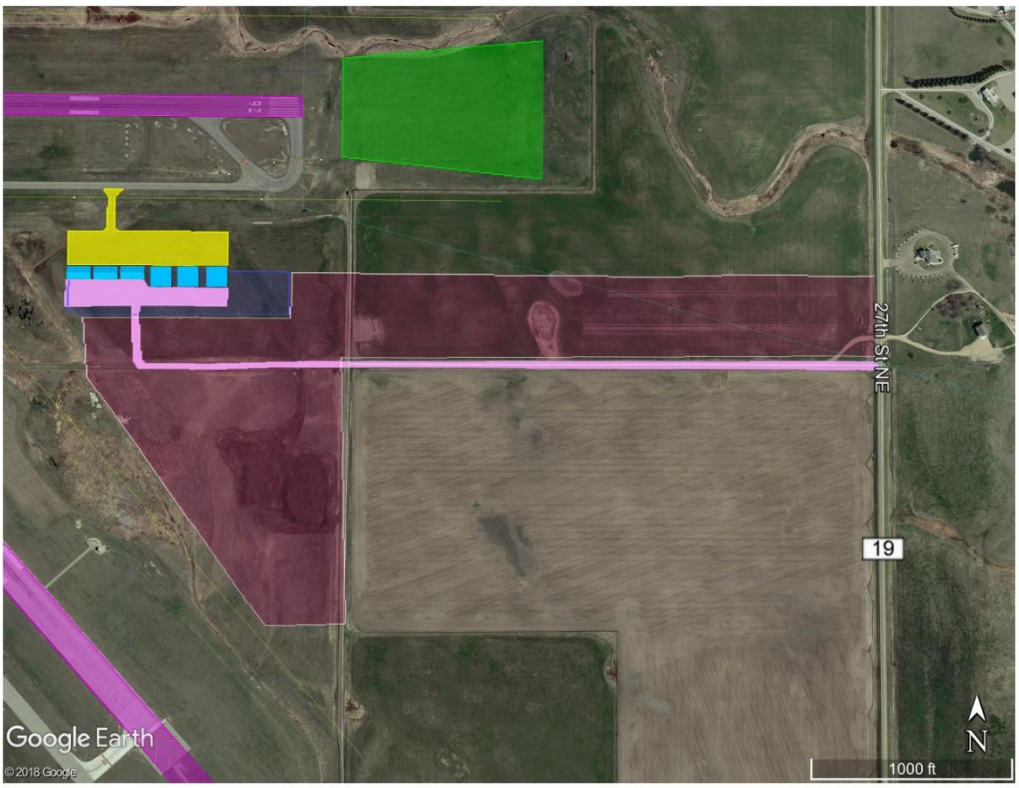


January 2018 Alternatives





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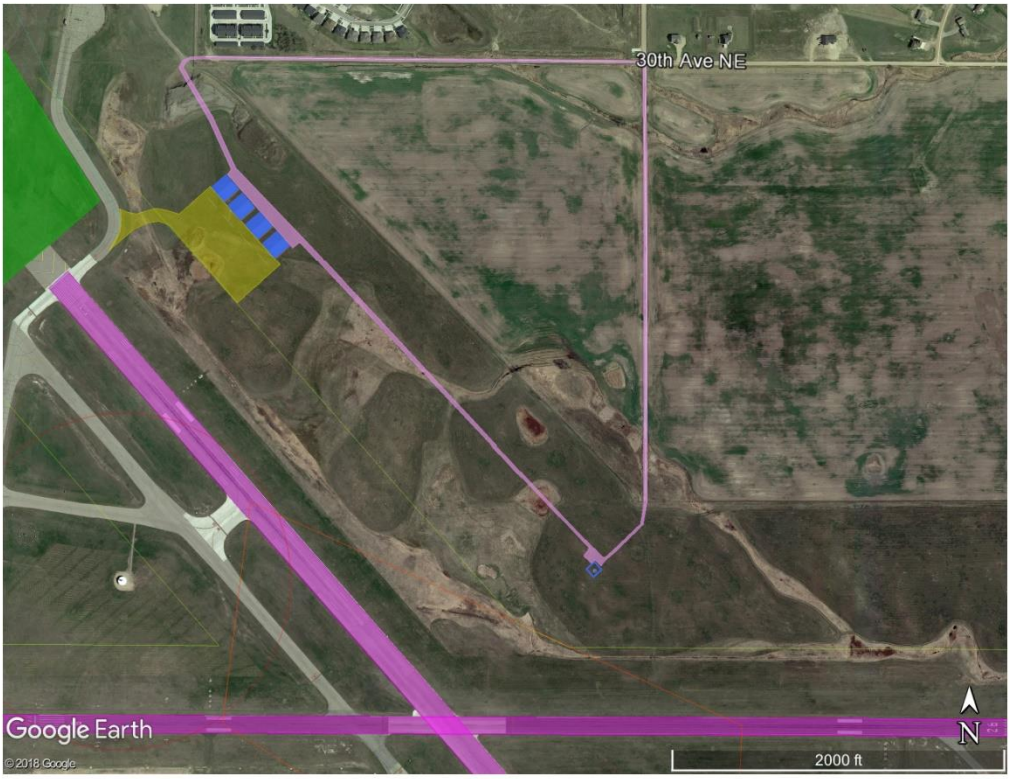
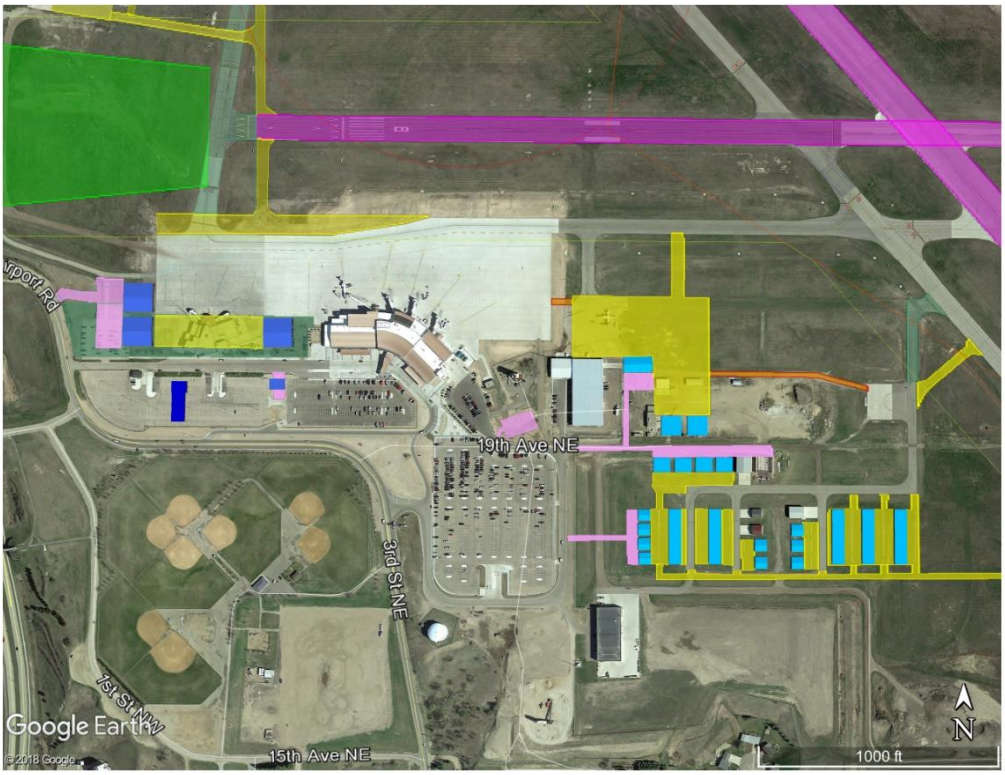
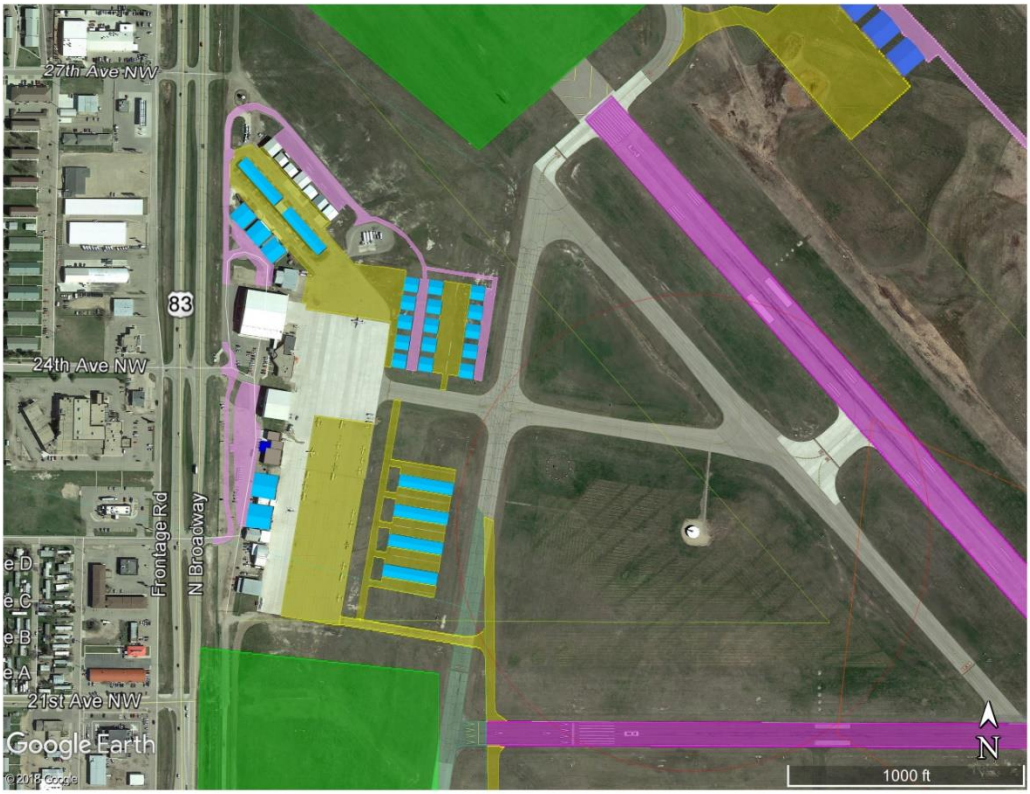




January 2018 Alternatives (cont.)



April 2017 FAA SRM Meeting Report and Findings

Minot International Airport - Taxiway B Design Discussion

April 5, 2017

Federal Aviation Administration, Airports Division, Great Lakes Region

Summary

The City of Minot (Sponsor) is preparing a draft Minot International Airport (MOT) Master Plan for FAA review and approval. The Sponsor is addressing geometry and configuration issues in an effort to meet design standards and optimize airport usability. Obstruction survey data has been collected, and design ideas are being prepared.

The FAA Dakota-Minnesota Airports District Office (DMA-ADO) and the Sponsor requested a facilitated meeting to formulate a plan or strategy for reviewing and assessing the collected data and developing design proposals for the draft Master Plan. The FAA Great Lakes Region agreed to facilitate a discussion of the Taxiway B design development (Appendix A). Factors considered in this decision included:

- A need to review current efforts.
- A need to exchange information among parties on airport development data and requirements.
- A need to identify any hazards early in the design, allowing MOT to design out any major hazards or issues prior to formal review through the FAA approval process.

A group of Subject Matter Experts (SMEs) met for a facilitated meeting at the DMA ADO office in Bismarck, ND on April 5, 2017 (Appendix B, C). The purpose of the meeting was to present current information on Taxiway B and Runway 8 design and develop a plan of action for proceeding with design proposals. The meeting was facilitated from the FAA Great Lakes Regional Office in Des Plaines, IL via VTC and telecon. Flight Standards did not attend the meeting but provided contact information for any questions that arose during the meeting. The representative will receive a copy of this report.

Assumptions established by the group include:

- Review and discussion during this meeting of potential activity does not constitute formal approval or justification by any party. The Sponsor must comply with all requirements of any design, review, approval and funding processes.
- The group would be presented with information from the FAA and Sponsor. They would discuss and document any additional information that may be helpful for the FAA's and Sponsor's consideration.
- The group may reconvene in the future as needed.
- The report generated from this meeting can serve as the basis for subsequent planning and development of the MOT Master Plan. As information is accumulated, it can be included via addendum to this report.

Proposed Project (Appendix D)

Deanna Stoddard, MOT Airport Operations Manager, presented the current Runway 8 / Taxiway B configuration and a number of proposed configuration alternatives (Appendix D). Background on the configuration alignment was included as a basis for discussion. Survey data and other criteria were provided to aid in the dialogue. The goal is to build a consensus for defining the current state, design requirements, and steps to develop a solution for inclusion to the daft Master Plan.

The presentation included 11 variations of pavement design options for Runway 8 and Taxiway B. Illustrations included overlays of protected surfaces and areas affecting the designs. MOT provided its observed positive and negative features for each option.

Discussion

The Following Points were discussed during and after the presentation:

- MOT Runway 8 is currently designed as an Aircraft Design Group (ADG) C-III runway with a displaced threshold. MOT intends to reclassify this Runway from ADG C-III to B-II as part of the updated Master Plan
- Taxiway B runs north-south past the runway end, and is potentially an end-around taxiway. Taxiway B is connected to Runway 8 by a small patch of pavement that is potentially an aligned taxiway
- The Taxiway B / Runway 8 Hot Spot (HS 1) stems from GA aircraft crossing the north runway hold position while travelling south on Taxiway B
- An east portion of the apron is not visible from the Air Traffic Control Tower (ATCT). A camera is installed to provide information on activity in this area
- The east portion of the apron is used as a deicing pad for aircraft during winter weather
- Cost is a consideration in selecting an option. The appropriate “Ultimate” design could be achieved through a combination of interim (short term) and long term projects
- In reference to direct access to Runway 8 from the apron, aircraft pushing back from terminal gates are oriented east-west, parallel to Runway 8. As a result, aircraft must always make a 90-degree turn toward the runway, and are not initially aligned north-south with Taxiway B as they leave the apron
- Runway 8 obstruction clearance can be revised using new survey data obtained in Fall 2016. The obstructions consist mainly of trees off the Runway 8 approach end
- The Runway 8 threshold displacement may be from an FAA (AFS) recommendation to maintain a 34:1 clearance.
    - Part 77 surfaces evaluate obstruction clearance from the runway end, not the displaced threshold
    - Threshold displacement may be influenced by ADG change from C-III to B-II

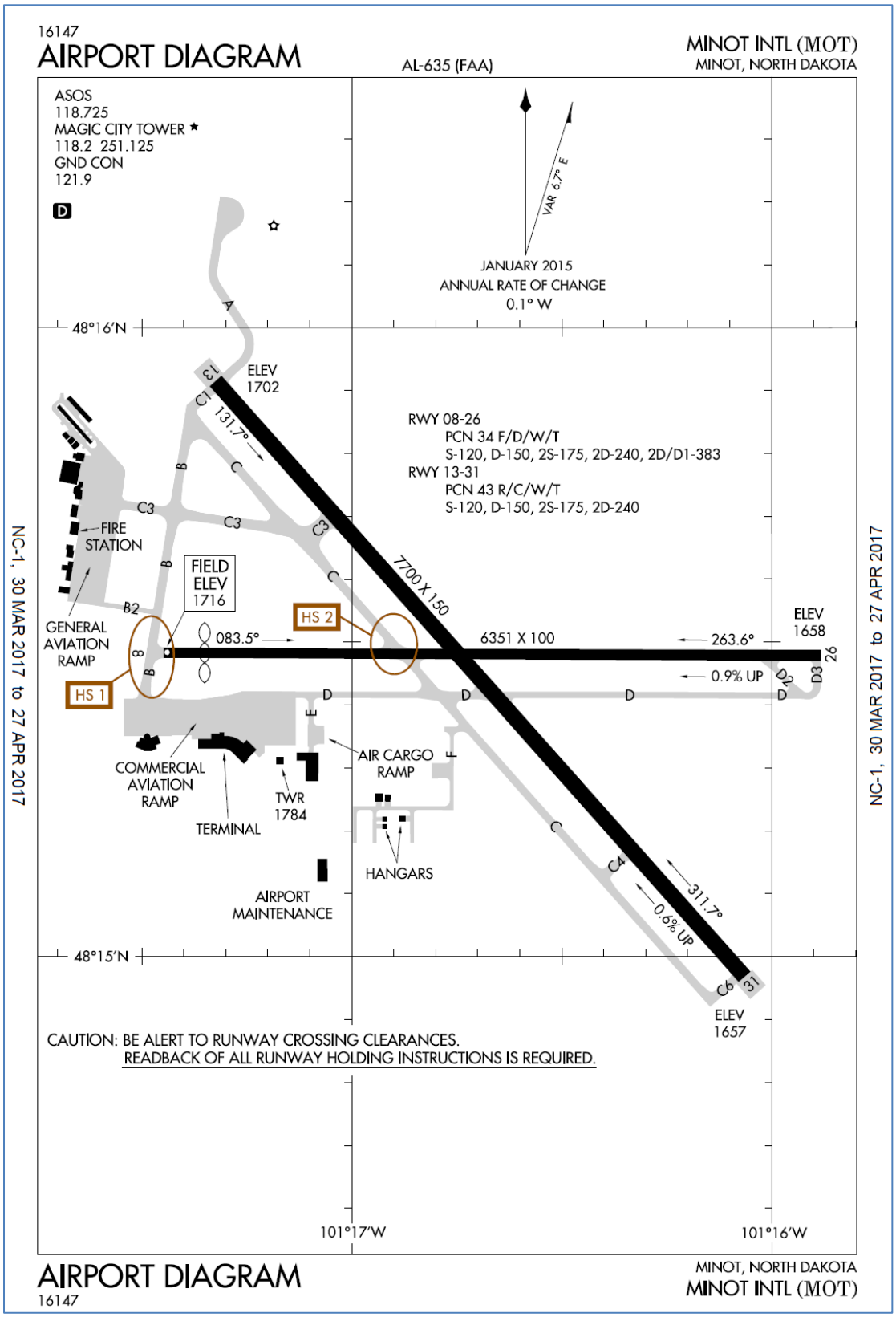
- The B-II ADG may allow moving the Runway 8 threshold to the west end of the runway
    - A shift will likely impact Runway 26 departure surface, and could affect development along the airport's west perimeter
    - A runway shift benefit/cost would be part of this option. Wetlands on the east side of the airport would be impacted as part of a shift that retains Runway 8's current length
    - Current air carrier fleet mix and activity is sufficient enough that MOT no longer must maintain Runway 8 length as a priority to sustain air carrier operations
- Runway ADG or length changes should be supported / justified by data
- Runway changes must also consider impacts to NAVAIDs on the airfield
- Safety hazard mitigation is the primary focus, but the SA process works to accommodate other considerations such as cost or operational impact
- Design standards are the baseline guidance for developing solutions. A mix of design and operational mitigations would be considered, with sufficient justification or supporting data
- Be aware of ripple effects created by changes such as ADG, runway length, runway end location, or instrument approach procedures
- Timeline: Master Plan draft should be prepared as soon as possible. MOT has a Part 139 corrective action for REIL power boxes due by 12/31/2018

Action Item List

The facilitator summarized the meeting's progress. Continued discussion raised recurring questions concerning background of the existing configuration and design requirements. The facilitator suggested an informal, general list of questions that need to be answered (Appendix E). The group agreed that answering these questions would help them "know what they don't know" and define the design parameters for proposed design options. Each question was assigned to a POC with a due date. The group concurred with the list, responsible parties, and due dates.

After a final review of the agenda, the group adjourned.

Appendix A- Minot International Airport (MOT)



Appendix B – Participants

Last Name	First Name	Organization	Phone #	Email Address
Holzer	Mark	FAA DMA ADO	701-323-7393	mark.holzer@faa.gov
Stoddard	Deanna	MOT	701-857-4725	deanna.stoddard@minotnd.org
Wanner	Kyle	NDAC	701-328-9651	kcwanner@nd.gov
Suttmeier	Laurie	FAA DMA ADO	701-323-7381	laurie.suttmeier@faa.gov
Peek	Andy	FAA DMA ADO	612-253-4631	andy.peek@faa.gov
DePottey	Sandy	FAA DMA-ADO	612-253-4642	sandy.depottey@faa.gov
Taira	Ken	FAA AGL-620	847-294-7519	kenneth.taira@faa.gov
Vainio	Curt	FAA AGL-620	847-294-7509	curt.vainio@faa.gov
Lo	Paul	FAA AGL-610	847-294-7529	paul.lo@faa.gov
Rhodes	Birke	FAA AGL-620	847-294-7387	birkely.m.rhodes@faa.gov
Currie	Roy	FAA FPO	817-222-5421	roy.e.currie@faa.gov
Penney	Kent	KLJ	605-721-5553	kent.penney@kljeng.com
Dumont	Chris	Ulteig	701-330-6737	chris.dumont@ulteig.com
Lauinger	Aaron	Ulteig	701-355-2329	aaron.lauinger@ulteig.com
Underwood	Lee	Ulteig	701-355-2329	lee.underwood@ulteig.com
Schauer	Tom	KLJ	701-250-5944	tom.schauer@kljeng.com
Watson	Marcus	KLJ	651-222-2176 x6913	marcus.watson@kljeng.com
Feltner	Rick	MOT	701-857-4724	rick.feltner@minotnd.org

Appendix C – Meeting Agenda

Agenda

- **Introduction**
  - Introduce Attendees
  - Administrative Items
  - Outline Meeting Objectives
- **FAA SMS Safety Assessment (SA) Overview**
- **Project Overview / Discussion**
  - Review of Current State
  - Sponsor presentation on Twy B existing and alternative design options
  - Discussion
  - Alternatives
  - Identify Action Items, timeframes
- Summary
- Review/Close

Appendix D – MOT / KLJ / Ulteig Presentation

Safety Risk Management Meeting

MINOT
INTERNATIONAL AIRPORT

KLJ

NORTH DAKOTA AERONAUTICS COMMISSION

Ulteig
We listen. We solve.™

FEDERAL AVIATION ADMINISTRATION

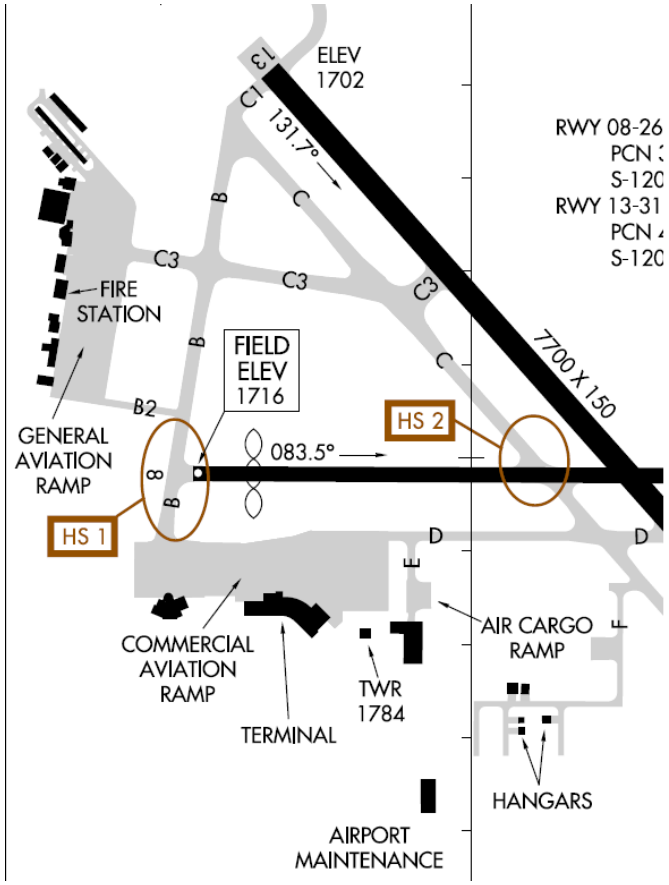
Federal Aviation Administration

Outline

- Existing TW Bravo Configuration
- Initial Memo Regarding Alignment
- Proposed TW Bravo Alternatives
  - Evaluative Criteria
  - Implications of Displaced Threshold
- Consensus Building
- Next Steps

Safety Risk Management Meeting

Existing TW Bravo Configuration



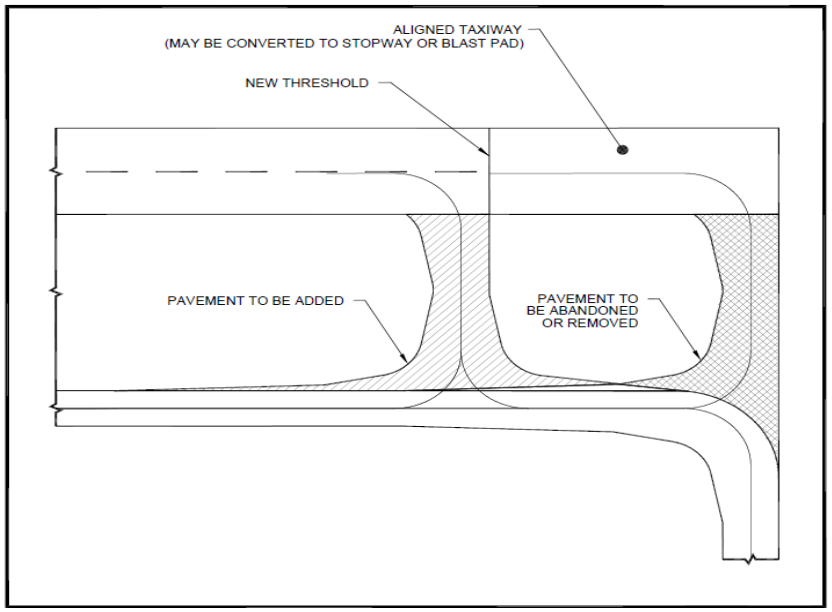
- Triangle Runway Configuration
- TW B and RW 8 Area Identified as Hot Spot
- RSAT Action Item to Pursue Runway Guard Lights
- Master Plan Identified as Aligned Taxiway Indicating Re-Configuration Required

Initial Memo Regarding Alignment

Respectfully Question the Aligned Taxiway Designation per AC 150/5300-13-A

416. Aligned taxiways prohibited.

An aligned taxiway is one whose centerline coincides with a runway centerline. Such taxiways have often been established due to the relocation of a runway end without constructing a new entrance taxiway at the new threshold. This places a taxiing aircraft in direct line with aircraft landing or taking off. The resultant inability to use the runway while the taxiway is occupied, along with the possible loss of situational awareness by a pilot, preclude the design of these taxiways. Existing aligned taxiways should be removed as soon as practicable. Any abandoned pavement should preferably be removed, but at a minimum appropriately marked. See Figure 4-32.

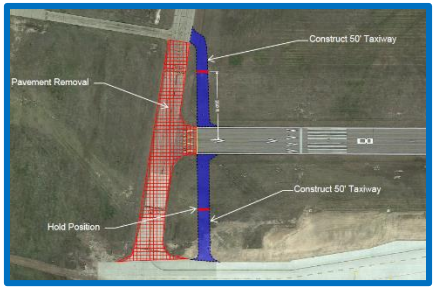


- TW centerline does not align with RW centerline
- Taxiing AC not in direct line with AC landing or taking off
- RW 8 may still be utilized per hold positions
- Limited loss of situational awareness due to turns pilots must make

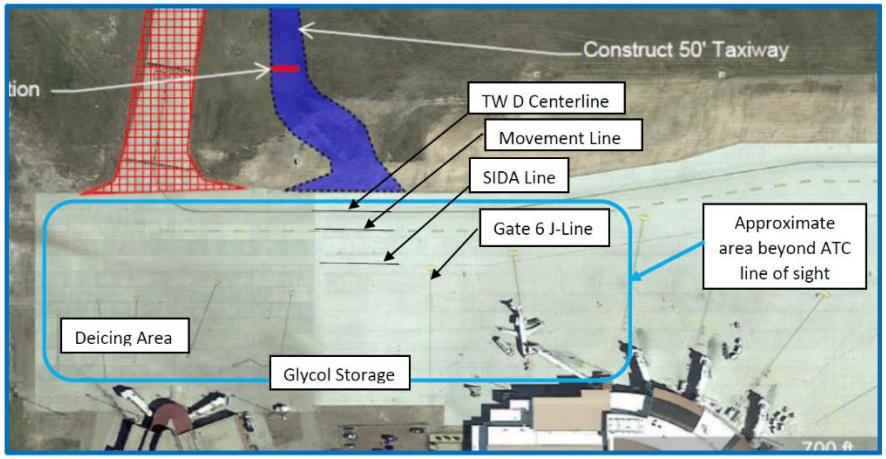
Initial Memo Regarding Alignment

- Direct Apron-To-Runway Access as a Solution

> **503. Apron layout and runway incursion prevention.**
>
> Apron locations that allow direct access onto a runway are not recommended. The apron layout should allow the design of taxiways in a manner that promotes good situational awareness by forcing pilots to consciously make turns (Figure 4-3). Taxiways originating from aprons and forming a straight line across runways are not recommended. Proper placement of aprons contributes to better accessibility, efficient aircraft movement and reduction in poor situational awareness conditions. Refer to Chapter 4 for a detailed discussion on taxiway designs that are not recommended, as discussed below, such as:



- Depth of Commercial Ramp Regarding Alternate Taxiway Configuration

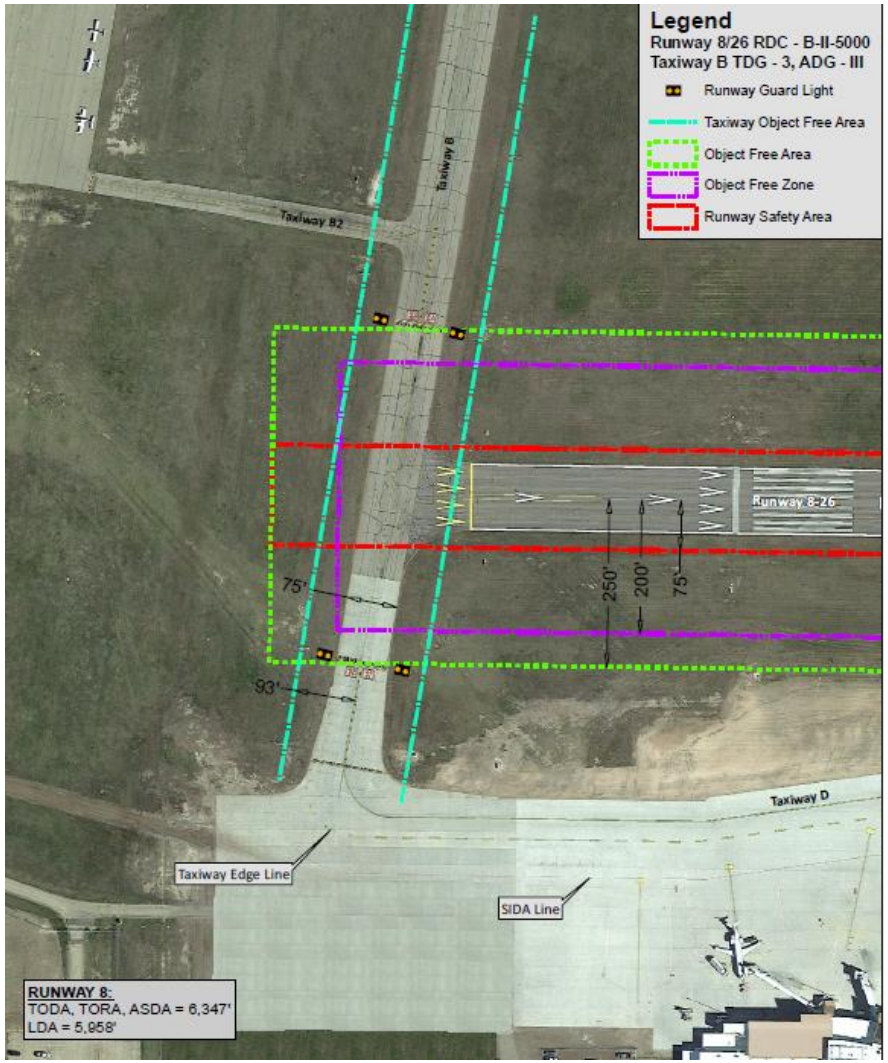


- Do these options provide a higher standard of safety compared to existing configuration? Do they resolve the Hot Spot Issue?

Proposed TW Bravo Alternatives

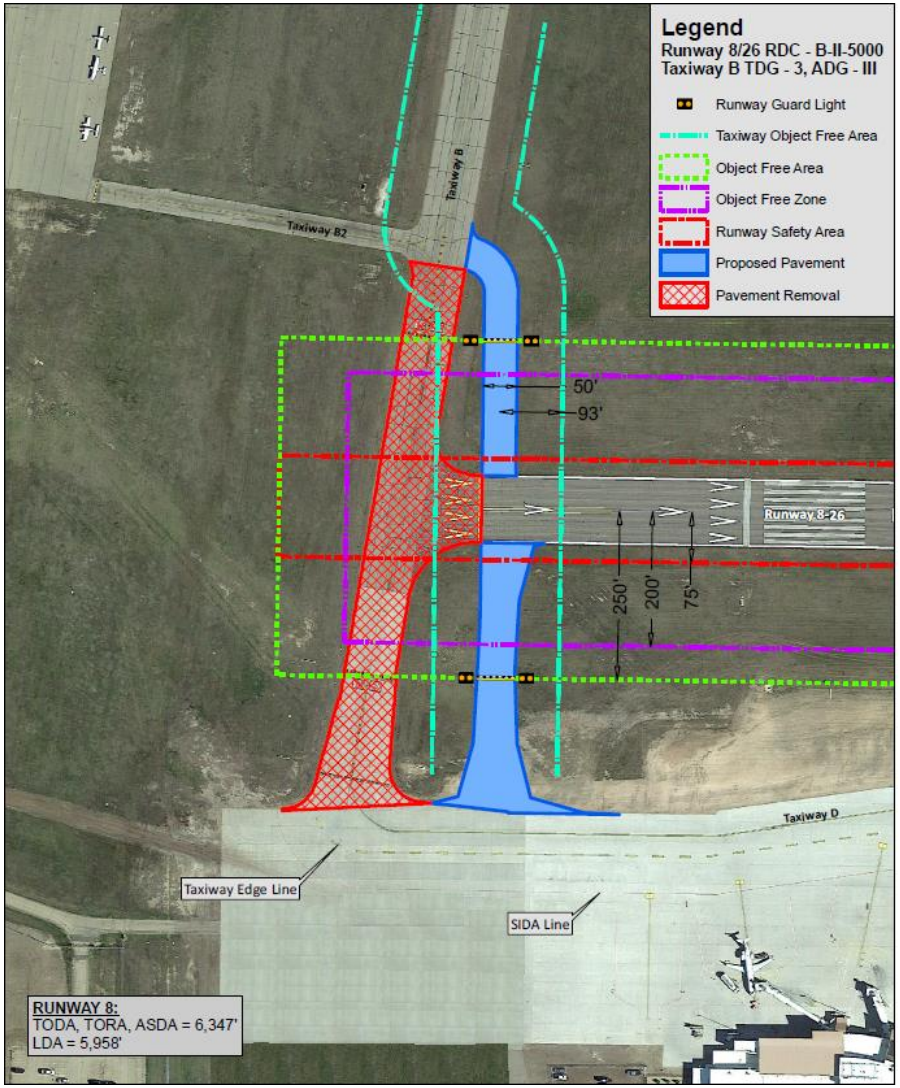
- Examined Changes to TW B and/or RW 8
- Included Impacts to RW 8 RPZ
- Considered Future Expansion of Apron
- Preliminary Cost Estimates Provided
- Evaluative Criteria Used:
  - FAA Design Standards
  - Increased Safety/Hot Spot Mitigation
  - Operational Efficiency
  - Cost

TW Bravo Option 1



- ✖ FAA Design Standards
  - Aligned Taxiway
- ◎ Increased Safety/Hot Spot Mitigation
  - Better Visibility
  - No Runway Crossing
- ◎ Operational Efficiency
  - TW Routes Maintained
  - No Impact to Ramp Operations
- ❑ Cost - $58,025

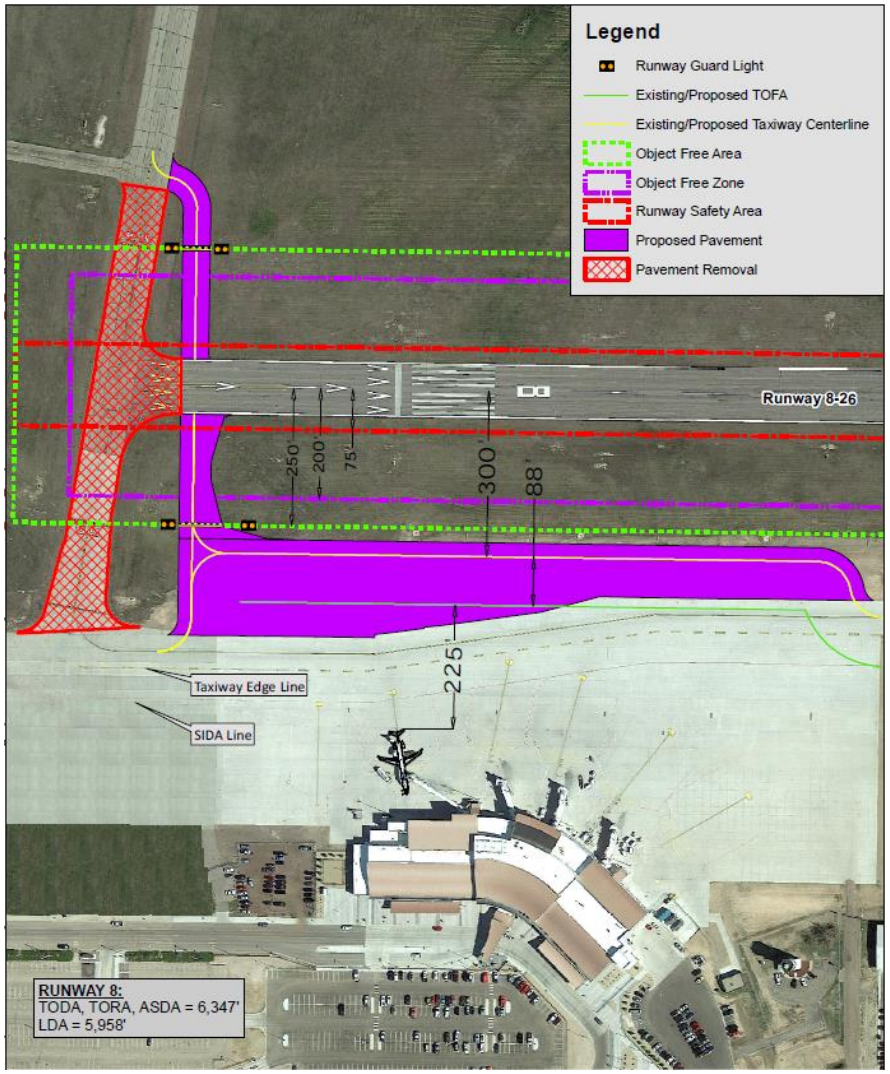
TW Bravo Option 2



- ✖ FAA Design Standards
  - Direct Access
- ✖ Increased Safety/Hot Spot Mitigation
  - Loss of Situational Awareness from Ramp
  - Creates Runway Crossing
- ✖ Operational Efficiency
  - Potential for Congested Ramp Operations (250' closer)
- ❑ Cost - $755,000

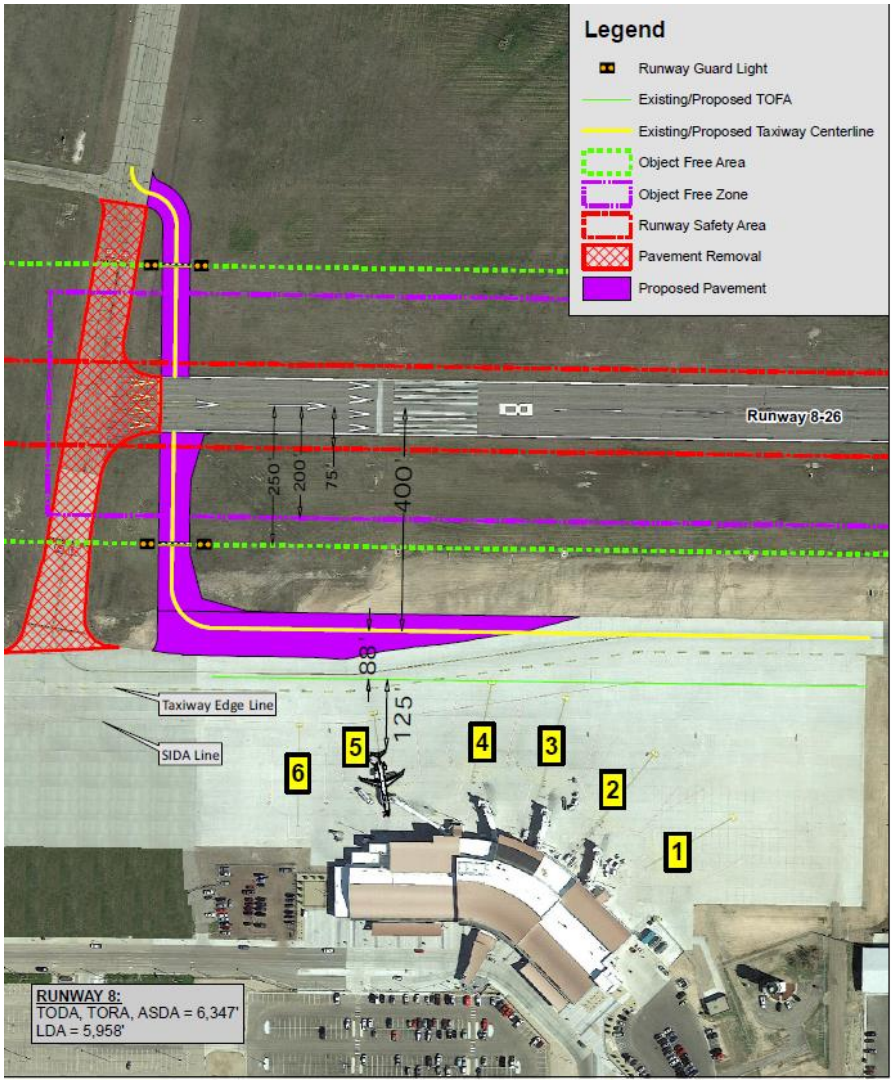
Safety Risk Management Meeting

TW Bravo Option 2 Large



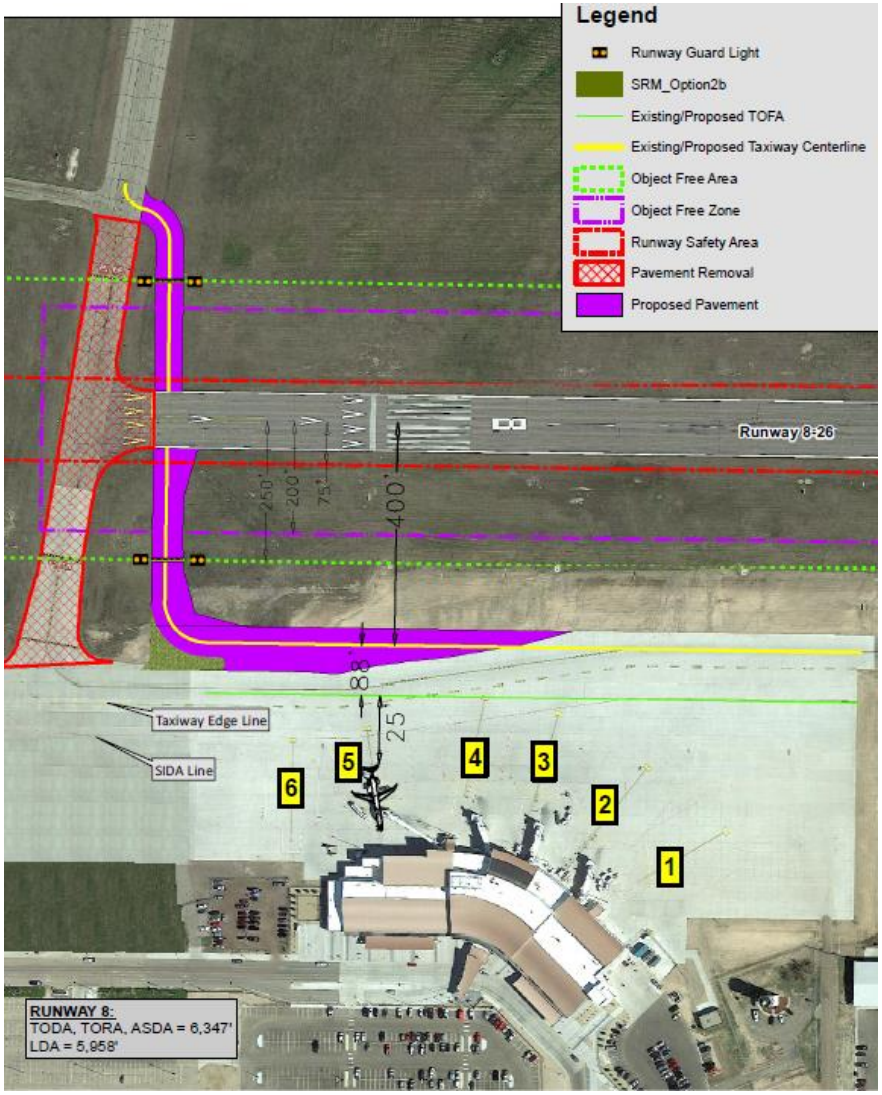
- FAA Design Standards
  - Direct Access
- Increased Safety/Hot Spot Mitigation
  - Potential Loss of Situational Awareness
  - Creates Runway Crossing
- Operational Efficiency
  - Allows Greater Maneuverability on Ramp

TW Bravo Option 2 Small



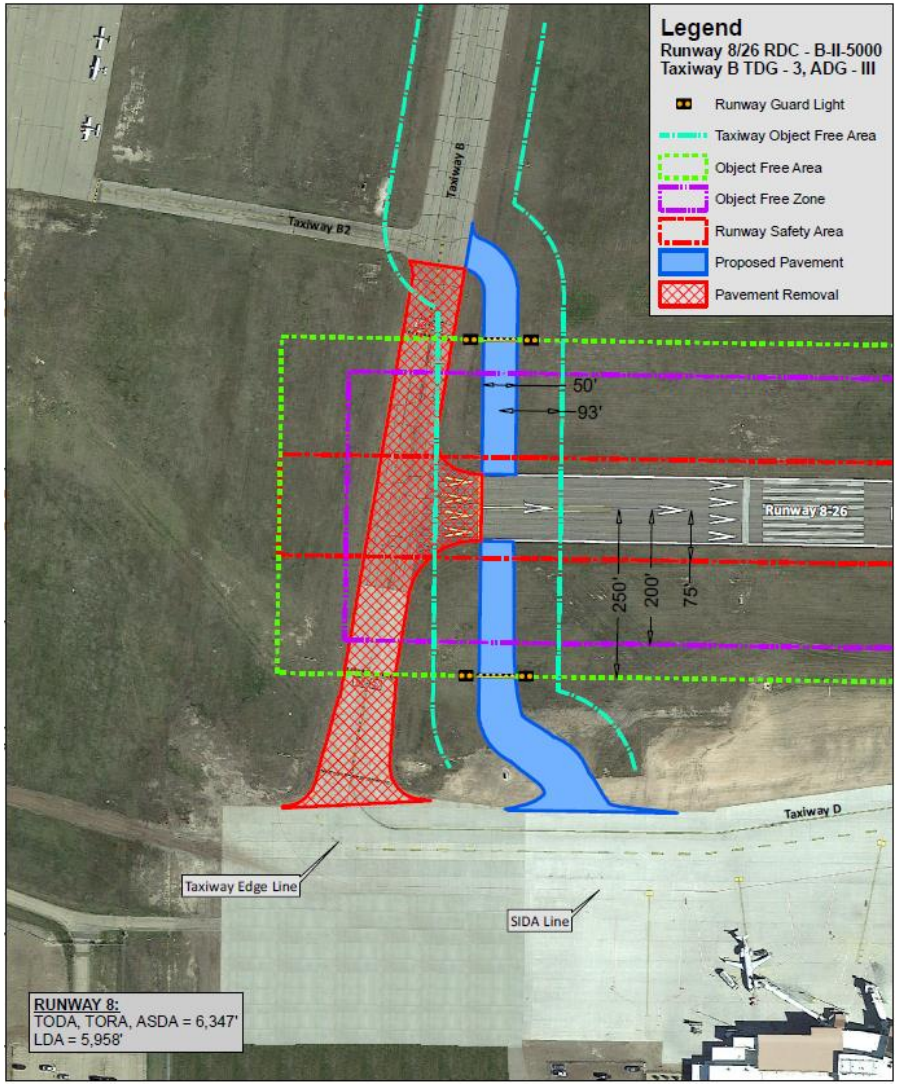
- ✖ FAA Design Standards
  - Direct Access
- ✖ Increased Safety/Hot Spot Mitigation
  - Potential Loss of Situational Awareness
  - Creates Runway Crossing
- ◎ Operational Efficiency
  - Allows Some Maneuverability on Ramp

TW Bravo Option 2b (FAA)



- FAA Design Standards
  - No Direct Access
- Increased Safety/Hot Spot Mitigation
  - Creates Runway Crossing
  - Head On Opposing Aircraft Taxiing
- Operational Efficiency
  - Congested Ramp Operations
  - Turn from West

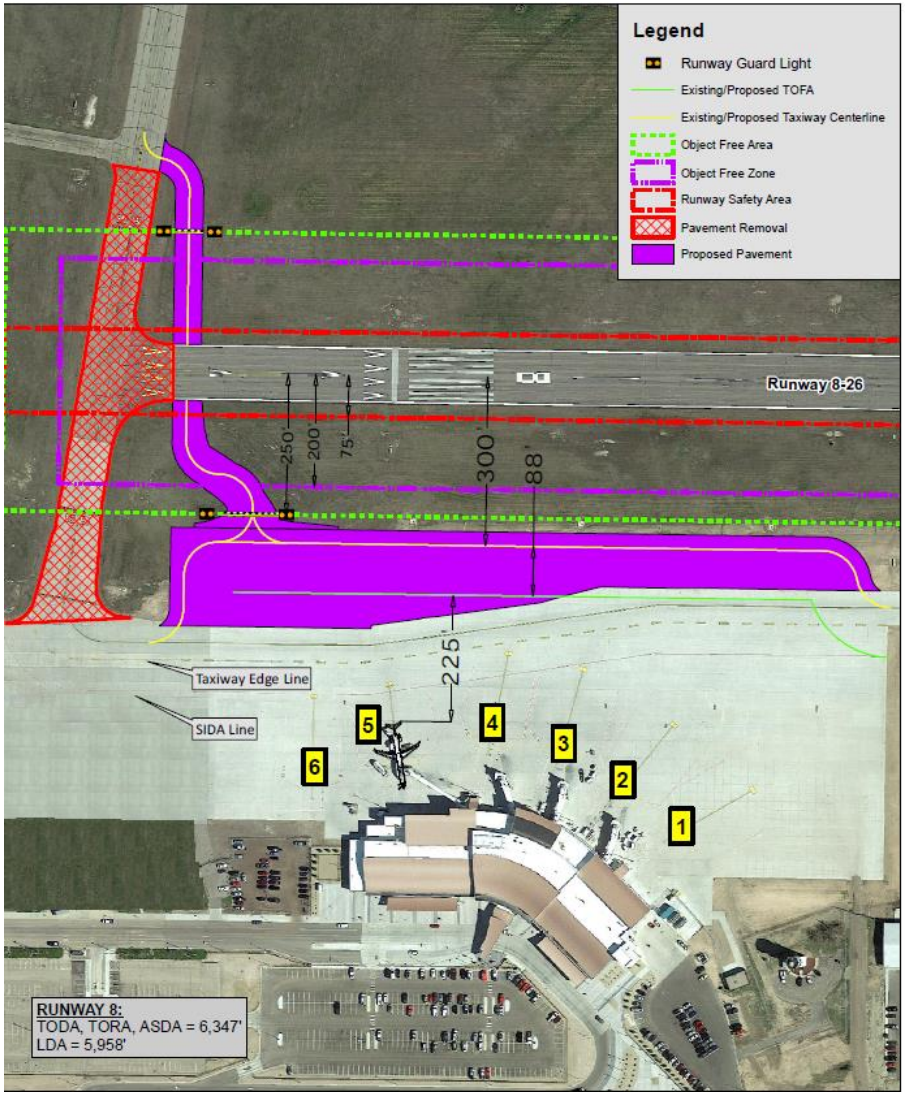
TW Bravo Option 3



- FAA Design Standards
  - No Direct Access
  - No Aligned TW
- ✖ Increased Safety/Hot Spot Mitigation
  - Creates Runway Crossing
- ✖ Operational Efficiency
  - Congested Ramp Operations (380' Closer)
- ❑ Cost - $910,800

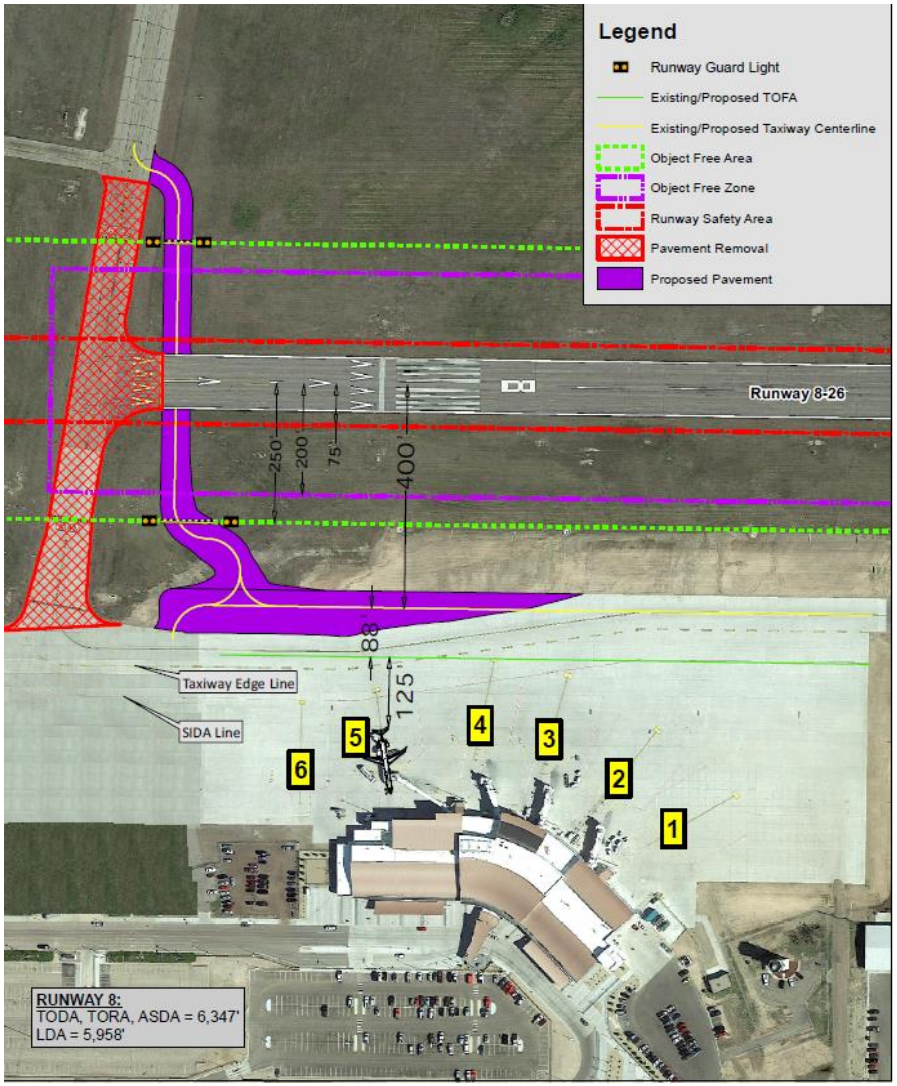
Safety Risk Management Meeting

TW Bravo Option 3 Large



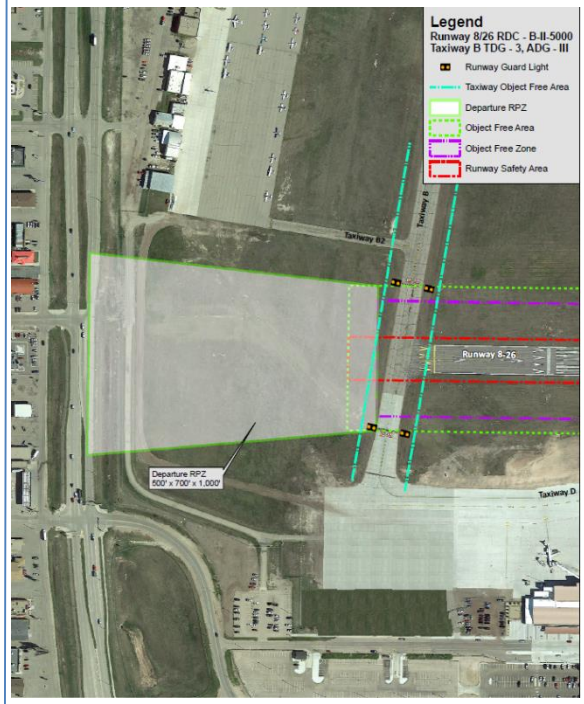
- FAA Design Standards
  - No Direct Access
  - No Aligned TW
- Increased Safety/Hot Spot Mitigation
  - Creates Runway Crossing
  - Potential Bottlenecking?
- Operational Efficiency
  - Allows Greater Maneuverability on Ramp

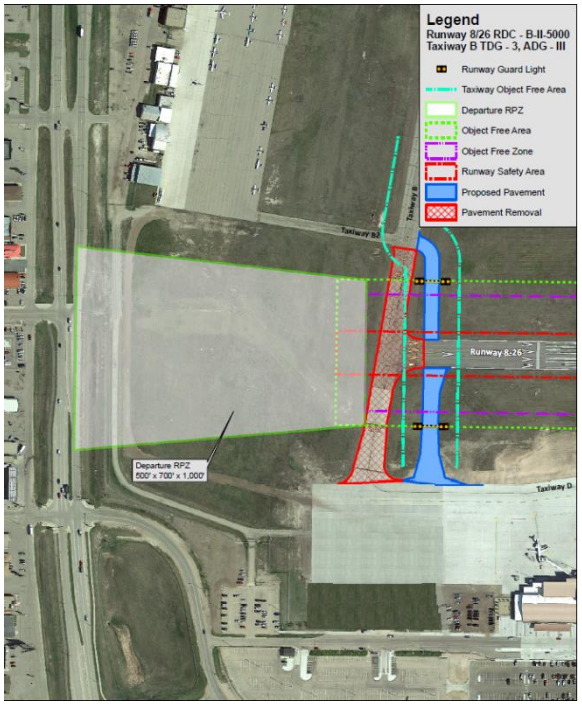
TW Bravo Option 3 Small

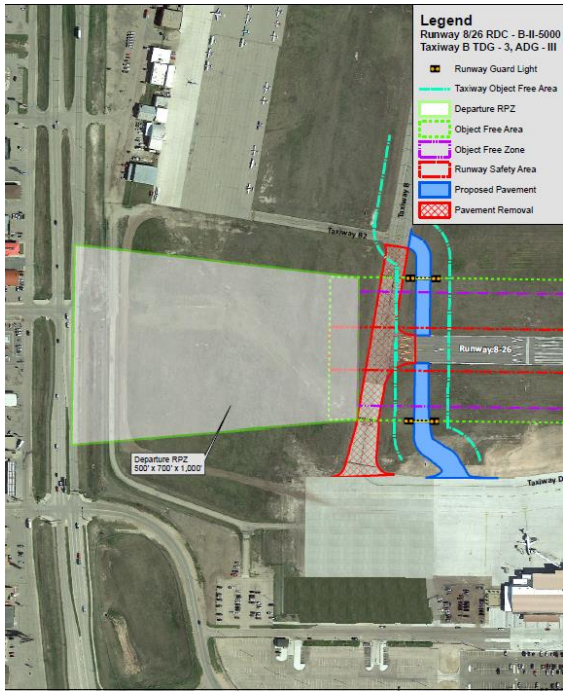


- FAA Design Standards
  - No Direct Access
  - No Aligned TW
- Increased Safety/Hot Spot Mitigation
  - Creates Runway Crossing
- Operational Efficiency
  - Allows Some Maneuverability on Ramp

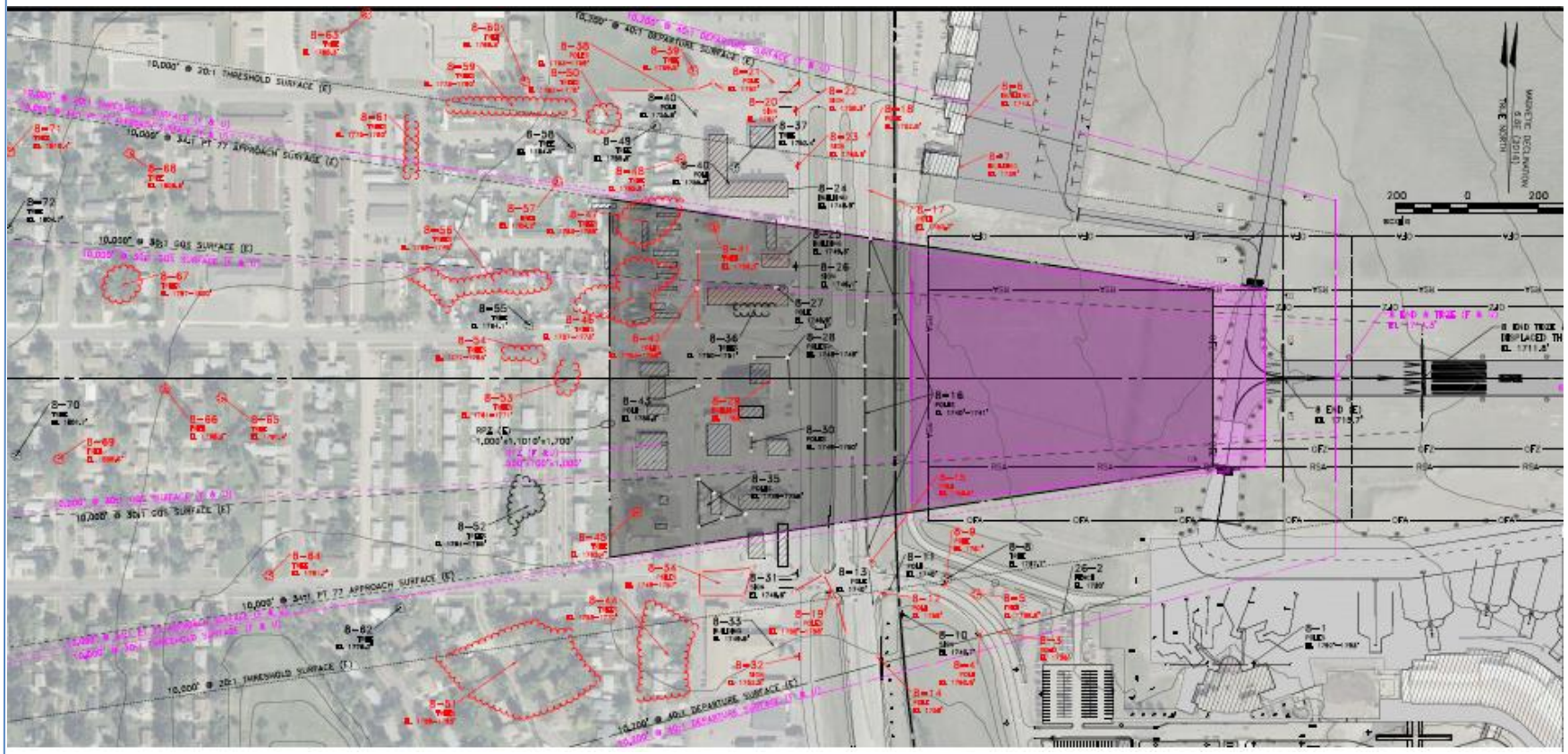
TW Bravo Option 1,2,3 RPZ



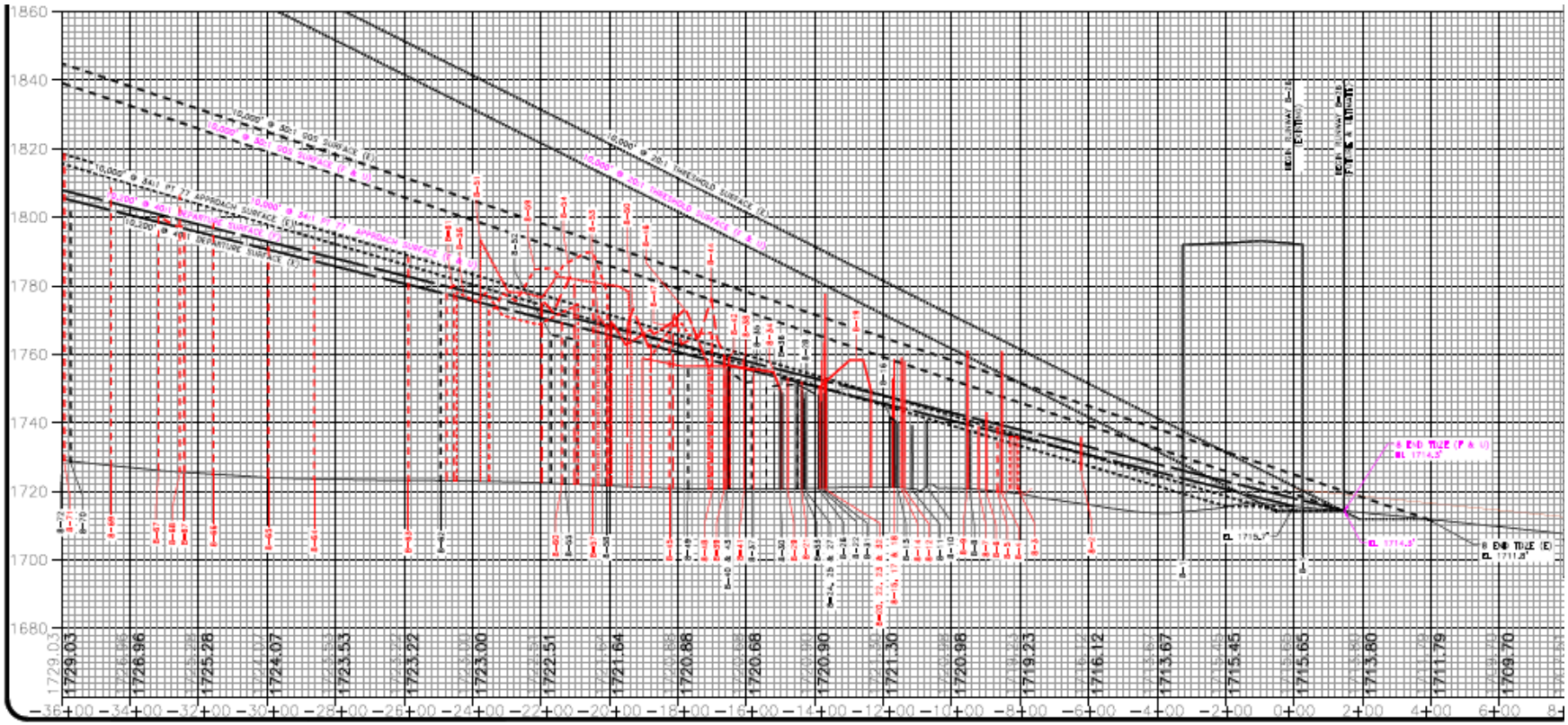




RW 8 Inner Approach View



RW 8 Inner Approach View



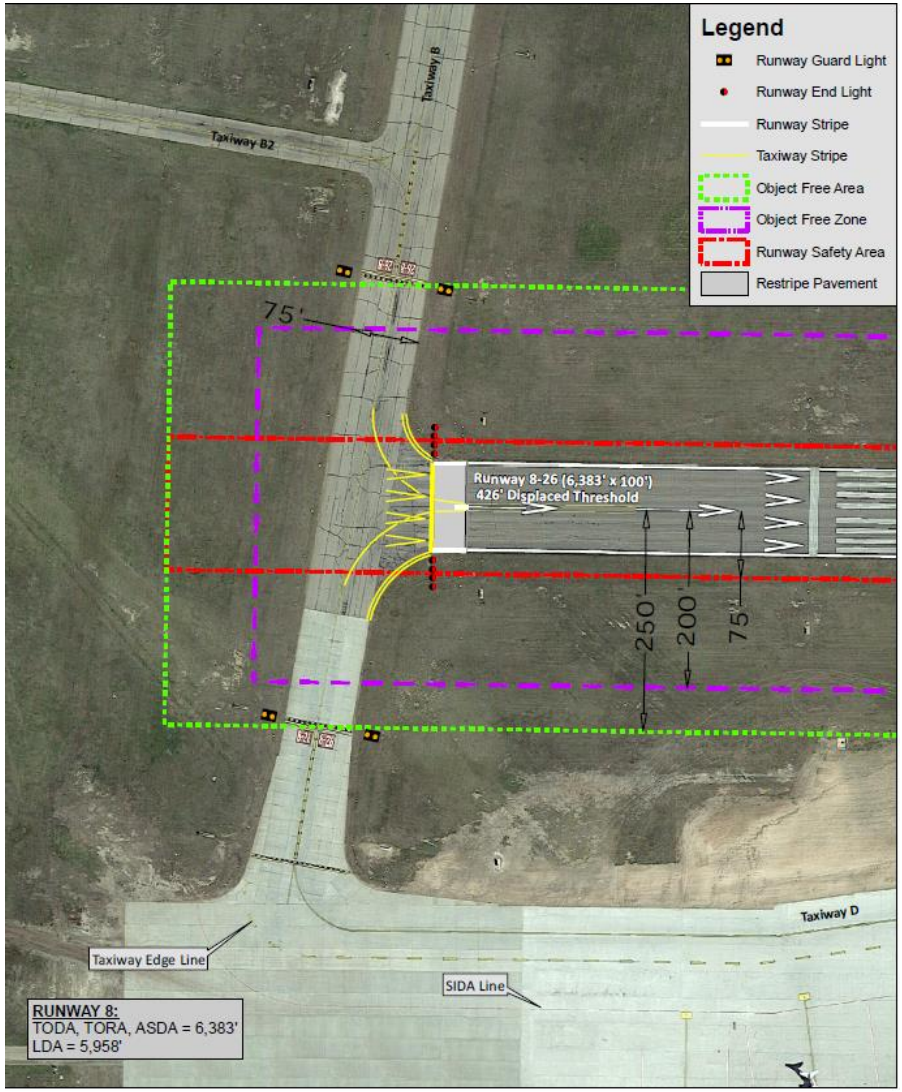
RW 8 Inner Approach Obstacle Table

Safety Risk Management Meeting

SCHEDULE OF OBSTACLES

		OPTION 1, 2 & 3			OPTION 4			OPTION 4B			OPTION 5		
ID	DESCRIPTION	AP 34:1	TH 20:1	GQS 30:1	AP 34:1	TH 20:1	GQS 30:1	AP 34:1	TH 20:1	GQS 30:1	AP 34:1	TH 20:1	GQS 30:1
8-16	POLE	(4.6)-(2.9)	(24.8)-(23.1)	(15.1)-(13.4)	(4)-(2.4)	(23.5)-(21.8)	(14.4)-(12.7)	(3.3)-(1.6)	(21.9)-(20.2)	(13.5)-(11.8)	(1.6)-0.1	(18.6)-(17)	(11.5)-(9.8)
8-25	BUILDING	(2.8)	(28.3)		(2.2)	(27.0)		(1.5)	(25.4)		0.2	(22.1)	
8-26	SIGN	(4.3)	(28.7)		(3.7)	(27.4)		(3.0)	(25.8)		(1.3)	(22.5)	
8-27	POLE	(5.0)	(30.4)		(4.4)	(29.1)		(3.7)	(27.5)		(2.0)	(24.2)	
8-28	POLE	(5)-(2.5)	(31.6)-(27)	(16.7)-(13.8)	(4.4)-(1.9)	(30.3)-(25.7)	(16)-(13.1)	(3.7)-(1.2)	(28.7)-(24.1)	(15.1)-(12.2)	(2)-0.5	(25.5)-(20.8)	(13.1)-(10.2)
8-29	SIGN	(0.4)	(26.8)	(12.1)	0.2	(25.5)	(11.4)	0.9	(23.9)	(10.5)	2.6	(20.6)	(8.5)
8-30	POLE	(4.6)-(3.9)	(31.4)-(30.7)	(16.4)-(15.6)	(4)-(3.3)	(30.1)-(29.4)	(15.7)-(14.9)	(3.3)-(2.6)	(28.5)-(27.8)	(14.8)-(14)	(1.6)-(0.9)	(25.3)-(24.5)	(12.8)-(12)
8-35	POLE	(5.6)-(2)	(34.4)-(31.9)		(5)-(1.5)	(33.1)-(30.6)		(4.3)-(0.7)	(31.5)-(29)		(2.6)-1	(28.3)-(25.8)	
8-36	TREE	(4.6)-(1.3)	(32.3)-(27.1)	(16.6)-(12.9)	(4.1)-(0.8)	(31)-(25.8)	(15.9)-(12.2)	(3.3)-0	(29.4)-(24.2)	(15)-(11.3)	(1.6)-1.7	(26.1)-(20.9)	(13)-(9.3)
8-41	TREE	1.0	(28.0)		1.6	(26.7)		2.3	(25.1)		4.0	(21.8)	
8-42	POLE	(4.5)-0.3	(34.5)-(29.5)	(16.9)-(16.2)	(4)-0.9	(33.2)-(28.2)	(16.2)-(15.5)	(3.3)-1.6	(31.6)-(26.6)	(15.3)-(14.6)	(1.5)-3.3	(28.4)-(23.4)	(13.3)-(12.6)
8-43	POLE	(2.2)	(32.2)	(14.6)	(1.6)	(30.9)	(13.9)	(0.9)	(29.3)	(13.0)	0.8	(26.0)	(11.0)
8-45	TREE	1.9	(31.6)		2.5	(30.3)		3.2	(28.7)		4.9	(25.4)	
8-46	TREE	(6.8)-10.9	(40.7)-(21.7)	(19.9)-(2.4)	(6.3)-11.4	(39.4)-(20.4)	(19.2)-(1.7)	(5.5)-12.2	(37.8)-(18.8)	(18.3)-(0.8)	(3.8)-13.9	(34.5)-(15.5)	(16.3)-1.2
8-47	TREE	0.1-6.4	(32.7)-(26.3)		0.7-7	(31.4)-(25)		1.4-7.7	(29.8)-(23.4)		3.1-9.4	(26.5)-(20.1)	
8-52	TREE	(8.1)-(7.2)	(48.6)-(46.2)	(22.3)-(22.3)	(7.5)-(6.7)	(47.3)-(44.9)	(21.6)-(21.6)	(6.8)-(5.9)	(45.7)-(43.3)	(20.7)-(20.7)	(5.1)-(4.2)	(42.5)-(40.1)	(18.7)-(18.7)
8-53	TREES	(7.3)-1.7	(44.5)-(36.1)	(21.1)-(12.2)	(6.8)-2.2	(43.2)-(34.8)	(20.4)-(11.5)	(6)-3	(41.6)-(33.2)	(19.5)-(10.6)	(4.3)-4.7	(38.4)-(29.9)	(17.5)-(8.6)
8-54	TREES	(1.4)-10.4	(41.8)-(29)	(15.8)-(3.8)	(0.8)-11	(40.5)-(27.7)	(15.1)-(3.1)	(0.1)-11.7	(38.9)-(26.1)	(14.2)-(2.2)	1.6-13.4	(35.7)-(22.9)	(12.2)-(0.2)
8-55	TREE	(8.3)	(48.1)	(22.6)	(7.7)	(46.8)	(21.9)	(7.0)	(45.2)	(21.0)	(5.3)	(41.9)	(19.0)
8-56	TREES	(8.6)-3.2	(51.8)-(35.8)	(23.5)-(10.9)	(8)-3.7	(50.5)-(34.5)	(22.8)-(10.2)	(7.3)-4.5	(48.9)-(32.9)	(21.9)-(9.3)	(5.6)-6.2	(45.7)-(29.6)	(19.9)-(7.3)
8-61	TREES	(4.6)-(4.1)	(51)		(4.1)-(3.6)	(49.7)		(3.3)-(2.8)	(48.1)		(1.6)-(1.1)	(44.9)	
8-64	TREE	(2.3)	(57.2)		(1.7)	(55.9)		(1.0)	(54.3)		0.7	(51.0)	
8-65	TREE	(6.6)	(64.2)	(24.2)	(6.0)	(62.9)	(23.5)	(5.3)	(61.3)	(22.6)	(3.6)	(58.0)	(20.6)
8-66	TREE	(4.4)	(65.3)	(22.6)	(3.8)	(64.0)	(21.9)	(3.1)	(62.4)	(21.0)	(1.4)	(59.1)	(19.0)
8-67	TREES	(8.5)-(7.1)	(71.7)-(70.8)	(27.2)-(26)	(7.9)-(6.5)	(70.4)-(69.5)	(26.5)-(25.3)	(7.2)-(5.8)	(68.8)-(67.9)	(25.6)-(24.4)	(5.5)-(4.1)	(65.5)-(64.6)	(23.6)-(22.4)
8-68	TREE	1.0	(62.0)		1.6	(60.7)		2.3	(59.1)		4.0	(55.8)	
8-69	TREE	(2.9)	(70.0)	(22.3)	(2.3)	(68.7)	(21.6)	(1.6)	(67.1)	(20.7)	0.1	(63.8)	(18.7)
8-70	TREE	(13.3)	(82.8)	(33.2)	(12.7)	(81.5)	(32.5)	(12.0)	(79.9)	(31.6)	(10.3)	(76.6)	(29.6)
8-71	TREE	2.9	(67.0)		3.5	(65.7)		4.2	(64.1)		5.9	(60.8)	
8-72	TREE	(11.0)	(81.0)		(10.4)	(79.7)		(9.7)	(78.1)		(8.0)	(74.8)	

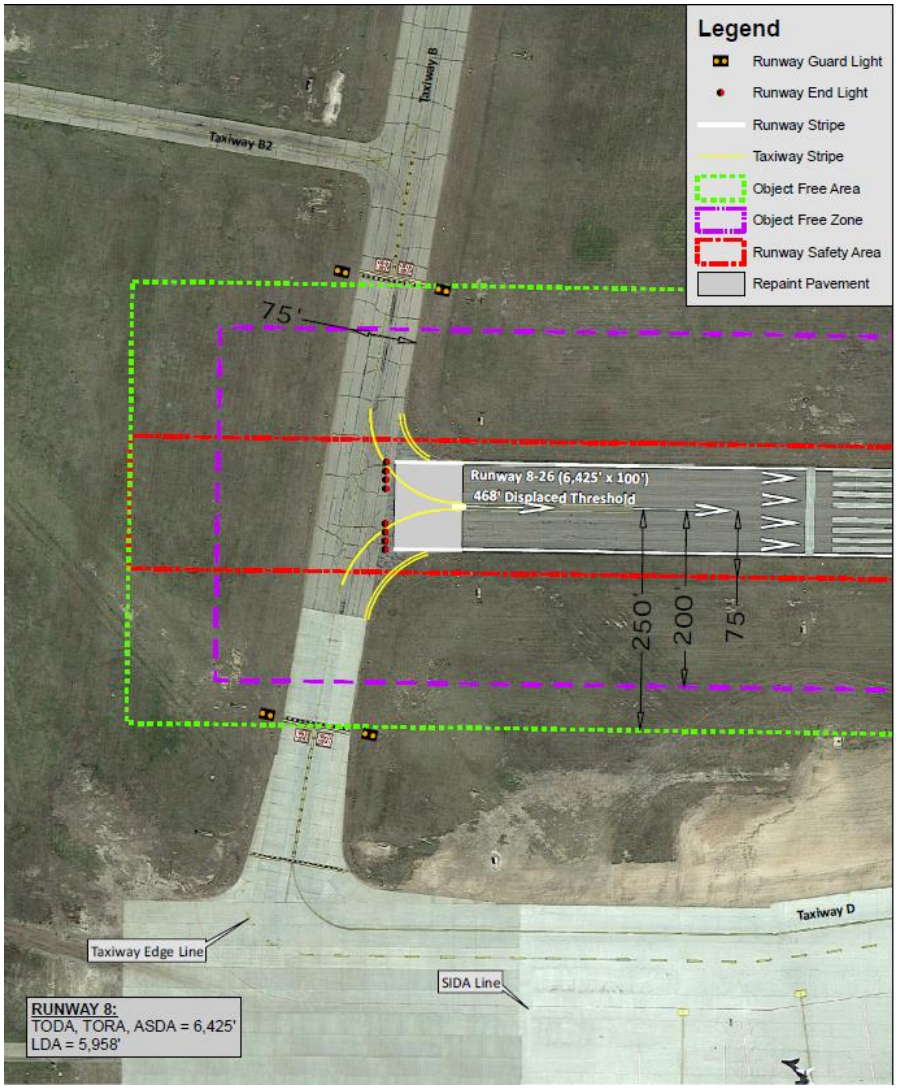
TW Bravo Option 4 with RPZ

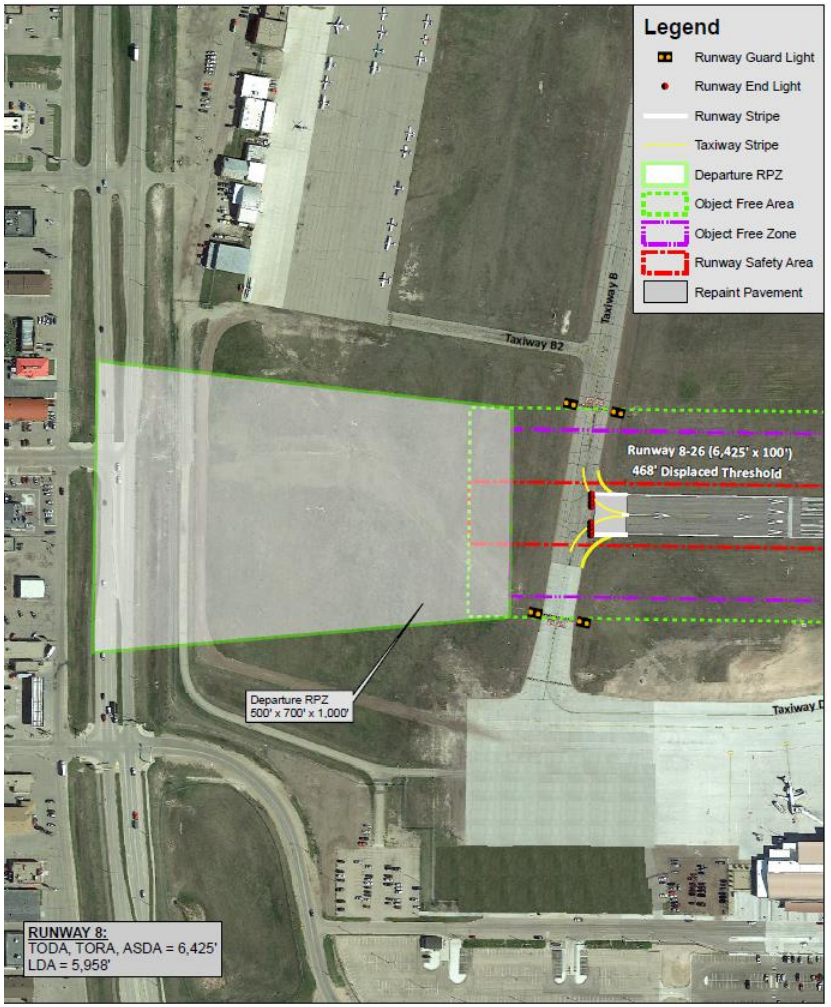


TW Bravo Option 4 (Standard)

- ✖ FAA Design Standards
  - Aligned Taxiway
  - Non-Perpendicular
- ◎ Increased Safety/Hot Spot Mitigation
  - Better Visibility
  - No Runway Crossing
- ◎ Operational Efficiency
  - TW Routes Maintained
  - No Impact to Ramp Operations
- ❑ Cost - $128,495

TW Bravo Option 4b with RPZ



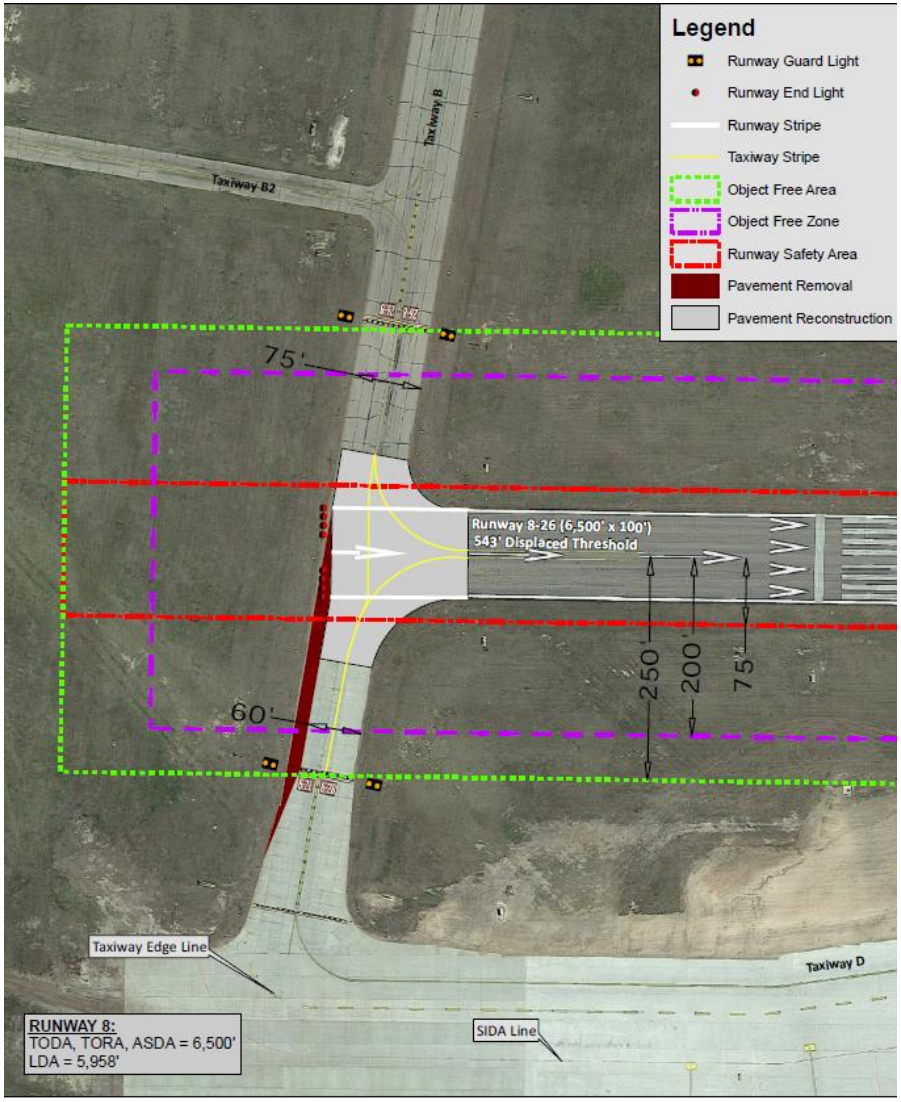


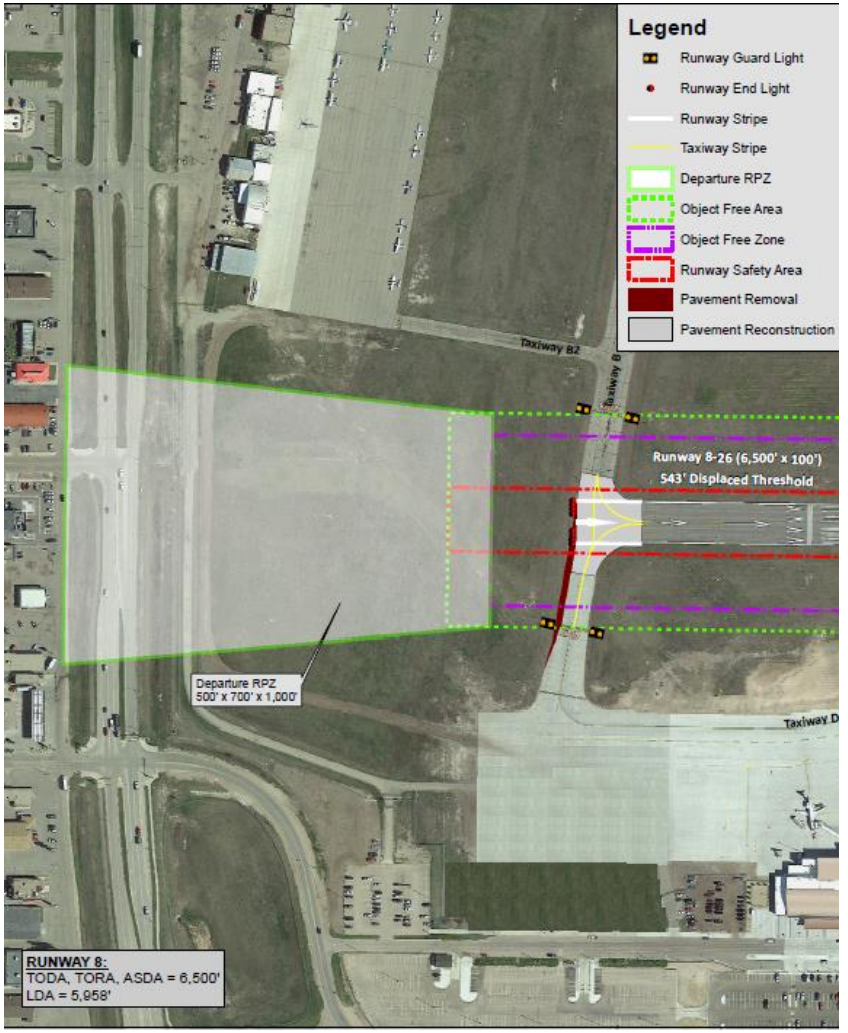
Safety Risk Management Meeting

TW Bravo Option 4b (In Pavement)

- ✖ FAA Design Standards
  - Aligned Taxiway
  - Non-Perpendicular
- ◎ Increased Safety/Hot Spot Mitigation
  - Better Visibility
  - No Runway Crossing
- ◎ Operational Efficiency
  - TW Routes Maintained
  - No Impact to Ramp Operations
- ❑ Cost - $135,495

TW Bravo Option 5 with RPZ





TW Bravo Option 5 with RPZ

- ✖ FAA Design Standards
  - Non-Perpendicular
  - RPZ Control
- ✖ Increased Safety/Hot Spot Mitigation
  - Creates Runway Crossing
- ◎ Operational Efficiency
  - TW Routes Maintained
  - No Impact to Ramp Operations
- ❑ Cost - $556,890

Consensus Building

- What is permissible to FAA Design Standards?
- Do these alternatives increase the level of safety compared to the existing configuration?

Next Steps

- Action Items
- Timeline

MOT Twy B Design Meeting

4/5/2017

List of I.O.U.s from the meeting discussion

Responsible parties identified below are asked to collect as much reference information as possible to answer their assigned question(s)

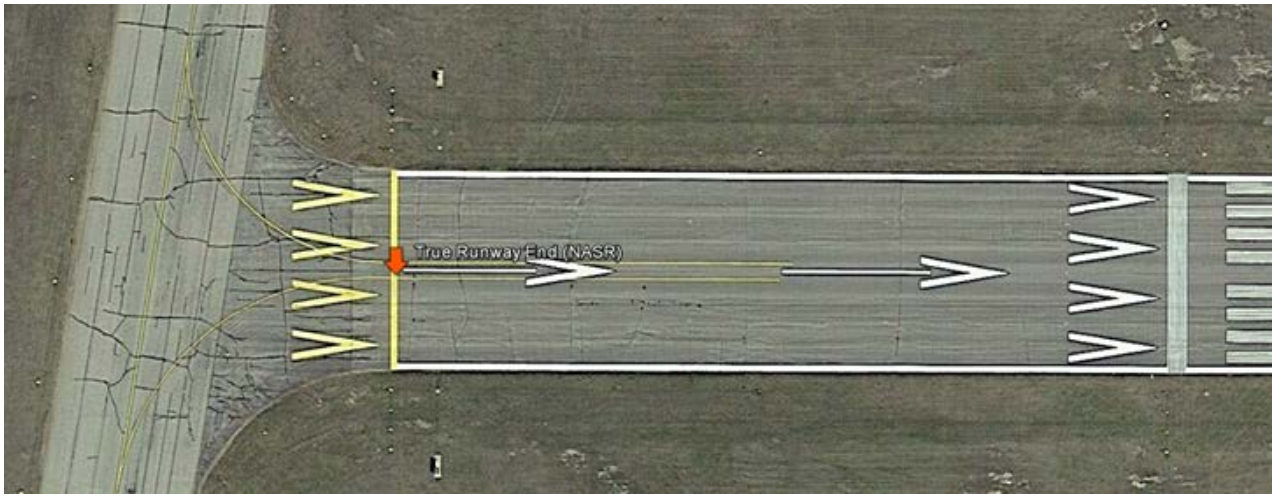
Action Item #	Responsible Party	Task Description	Due Date	Status
1	620 / DMA ADO	- What is the problem with the current configuration? - Is the Twy B / Rwy 8 intersection an end around taxiway? An aligned taxiway? - If neither, what is the design classification for this pavement?	4/30/2017	**Completed** - Attached as Appendix E.1
2	620 / FPO	- Are there any deadlines to meet? - LOC items? - Procedural requirements?	4/30/2017	**Completed -** • AGL-620 - No open LOC Items relative to Rwy 8 • FPO – o Any relocation of the Rwy 8 Threshold would require amendment to: RNAV (GPS) Rwy 8, ODP for Rwy 26, and perhaps the VOR Rwy 8. o Procedure amendments are scheduled approximately 24-30 months after the request is entered on the IFP Information Gateway.
3	MOT	- How do aircraft use the MOT apron configuration? - What are MOT's current operational requirements for the apron? - What is the background on the non-movement area along the apron? - What is the background on the line of sight issues on apron?	5/15/2017	
4	KLJ	- Who is doing the Pathfinder moves on the apron? - Provide information / data on tug movement and aircraft movement	4/30/2017	**Completed** - Attached as Appendix E.4 NOTE:Video files of the simulations are available online until May 26, 2017. See Appendix E.4 for the link.

Appendix E.1 - MOT Twy B and Ramp Geometry Analysis
Minot International Airport (MOT)
Current Design Issue with B Taxiway @ Runway 8 Approach Vicinity

As a follow up to the April 5, 2017 meeting, Airports Division took action to clearly identify the non-standard airfield geometry of Taxiway Bravo adjacent to the Terminal Ramp and the approach end of Runway 8. Below are the specific items that justify our position that planning efforts should be initiated to improve the geometric configuration of this particular location at the Minot International Airport. Below are the standards that FAA has found to be contrary to current FAA design standards.

1. <u>Aligned Taxiway</u>

With the re-write of AC 150/5300-13A, Airport Design, aligned taxiways are now prohibited and considered a non-standard airfield configuration. The FAA has found these conditions confusing to the pilots which may lead to the possible loss of situational awareness. The red arrow shown in the attached image is the true runway end based on current NASR data. The pavement prior to the runway end is considered an aligned taxiway.



2. **Runway End Taxiways**

Each runway end must be served by an entrance taxiway, which are connected to the runway at a right angle. The existing configuration at MOT does not have an entrance taxiway at the true runway end, and the taxiway used to access Runway 08 is non-perpendicular. It is important for entrance taxiways to connect to runways at right angles as it allows pilots to have a clear line of sight to both ends of the runway. Having the pilot canted in one direction will result in visibility limitations. **Meeting this standard is even more important at airports such as MOT that do not have a 24-hour ATCT.**

3. Departure Surface Penetrations

Runway 26 has a published departure procedure which triggers the protection of the 40:1 departure surface, shown below in blue. The departure surface begins at the end of the runway. Pavement prior to the runway end, as in this configuration, results in penetration to the departure surface when aircraft or vehicles are in that area. Removal and reconfiguration of these taxiways would ensure conformity to the standard.

4. End Around Taxiway

While this taxiway was not built or intended to be used as an end-around taxiway, it's configuration results in an EAT "like" scenario as aircraft are taxiing around the end of the runway. The larger concern is raised when the ATCT is closed. Also note, Hot Spot 1 exists because "Twy B crosses the approach end of Rwy 08."

5. <u>Indirect Access</u>

AC 150/5300-13A, titled "*Airport Design*" specifically states not to have taxiways which lead directly from an apron to a runway without requiring a turn. The existing configuration results in direct access to the runway.

Appendix E.4 - MOT Twy B PathPlanner Simulation

From: Kent Penney
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Cc: Tom Schauer; Matt Nisbet; Marcus Watson; Rick Feltner (rick.feltner@minotnd.org); Deanna Stoddard
Subject: Minot PathPlanner Simulation
Date: Tuesday, May 02, 2017 9:26:17 AM
Attachments: 1512103b_PathPlanner_TWY-B.PDF

Ken,

Per the April 5th SRM Meeting regarding Minot International Airport, KLJ was asked to run a PathPlanner simulation showing aircraft movement from the airline terminal building to Taxiway B. These simulations used the largest aircraft regularly operating from each of the respective gates. The typical push back was used which is north for most gates (except Gate 2 which is southeast). A simulation was also completed showing an aircraft taxiing to deice on the old terminal apron (west of existing terminal) and then taxiing to Taxiway B.

Attached is a copy of .pdfs of each scenario and the following link contains each of the 5 video files.

https://files.kljeng.com/?ShareToken=512538428A7DD9CF4C3221A445C28CAE876BF4FA

As is evident from the simulations, due to the narrow depth of the apron and the required east-west movement of all aircraft, there were no circumstances where an aircraft was able to taxi onto Taxiway B without making a 90 degree turn. It is true that AC 150/5300-13A includes 401 (b)(5)(g) Indirect Access, but in the circumstance at Minot a turn is required. It is not possible for a pilot to be 'heads-down' in the cockpit while on the apron and inadvertently enter the taxiway headed toward the runway. We would ask that when a long term solution is determined for Taxiway B that this simulation be considered.

Contact me as you have any questions.

Kent

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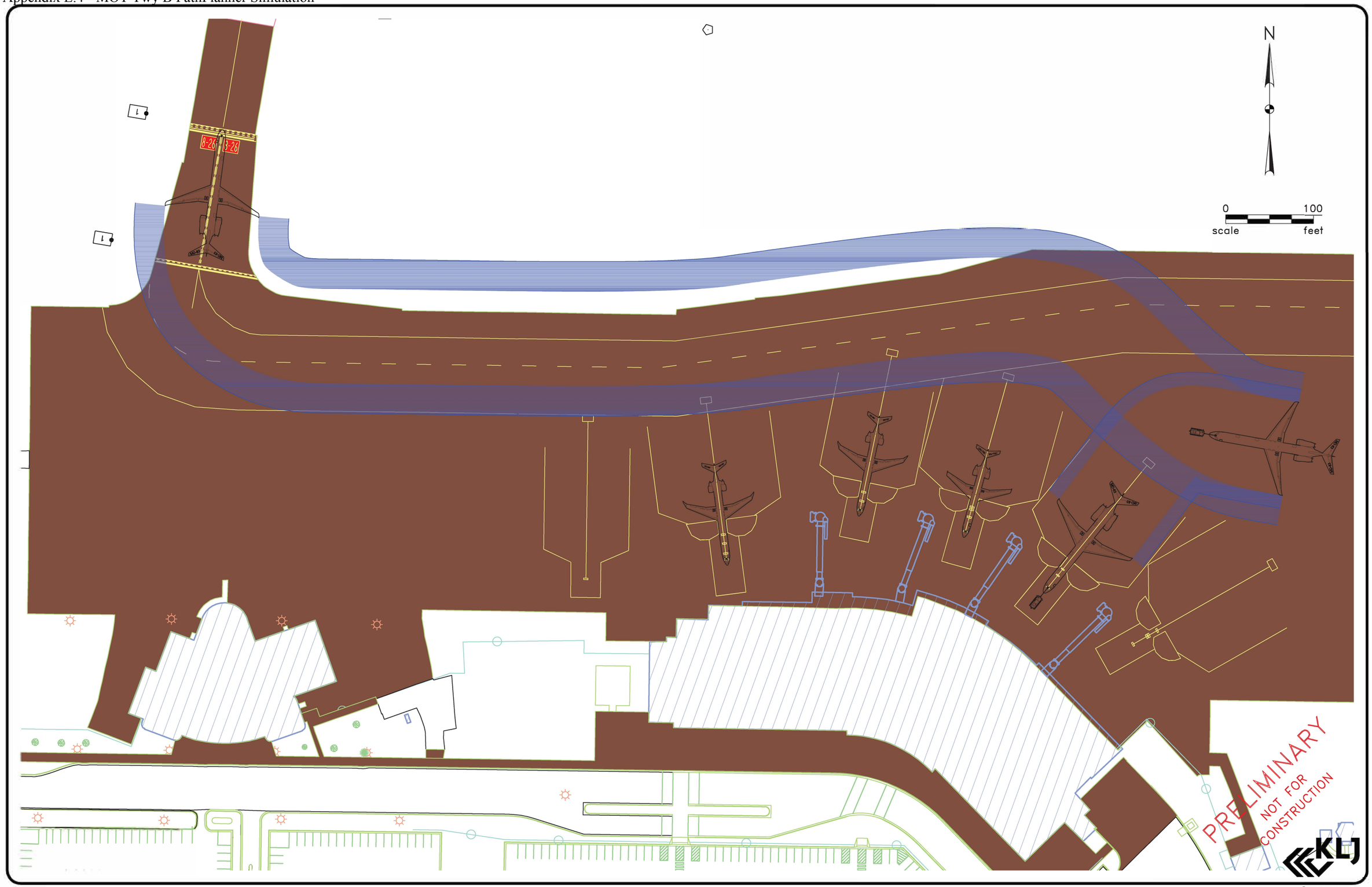
Appendix E.4 - MOT Twy B PathPlanner Simulation



Apr 27, 2017 – 4:39pm – P:\Airport\ND\Minot\Projects\1515107MasterPlanGeographicInformationSystem\GIS\GIS_MP_CAD\1512103b_PathPlanner_TWY-B.dwg (MOT Gate 2)