

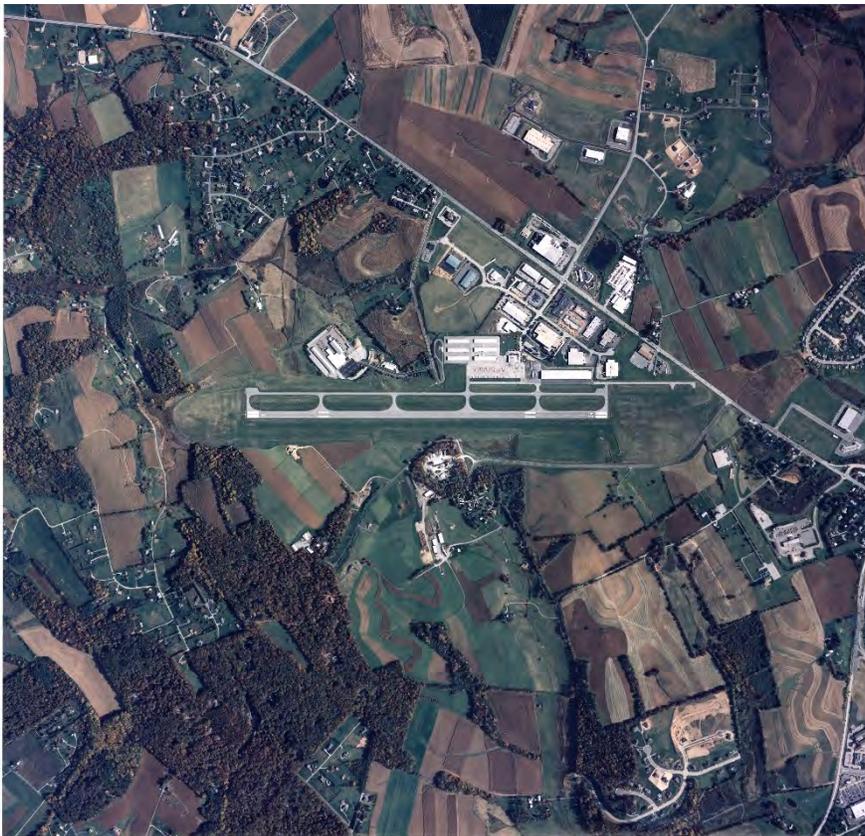
APPENDIX H

Preliminary Engineering Report (PER)

CARROLL COUNTY REGIONAL AIRPORT

Westminster, MD

Preliminary Engineering Report for Supplemental Environmental Assessment



FINAL



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Delta Airport Consultants, Inc.

**PRELIMINARY DESIGN REPORT
SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT**

CARROLL COUNTY REGIONAL AIRPORT

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**PRELIMINARY DESIGN REPORT
SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT**

**CARROLL COUNTY REGIONAL AIRPORT
WESTMINSTER, MARYLAND**

**AIP PROJECT NO. 3-24-0028-029-2015
MAA GRANT NO. MAA-GR-020
DELTA PROJECT NO. 13064**

Revised March 2017

I. PROJECT SUMMARY

As part of the Supplemental Environmental Assessment (EA) for the proposed Runway 16-34 development and related capital improvements at the Carroll County Regional Airport (DMW), this task involves conducting preliminary design engineering for the Preferred Alternative from the 2015 Airport Master Plan Update (MPU), which is also the Proposed Action evaluated within the Supplemental EA.

The County conducted an Airport MPU in 2007. An Environmental Assessment (EA) was completed for the projects recommended in the MPU in 2009, and included a Preliminary Design effort. The EA and Preliminary Design Report (PER) were approved by FAA in 2009 and a Finding of No Significant Impact (FONSI) was issued by FAA on April 30, 2009.

The 2009 PER evaluated five alternatives, summarized below. Alternative Four was recommended as the Preferred Alternative.

- ➔ Alternative One – No Build
- ➔ Alternative Two – 1,300' Runway 16 Extension
- ➔ Alternative Three – Replacement Runway 16-34
375' west of the existing runway
- ➔ Alternative Four – Replacement Runway 16-34
250' west of the existing runway
- ➔ Alternative Five – Replacement Runway 16-34
275' west of the existing runway

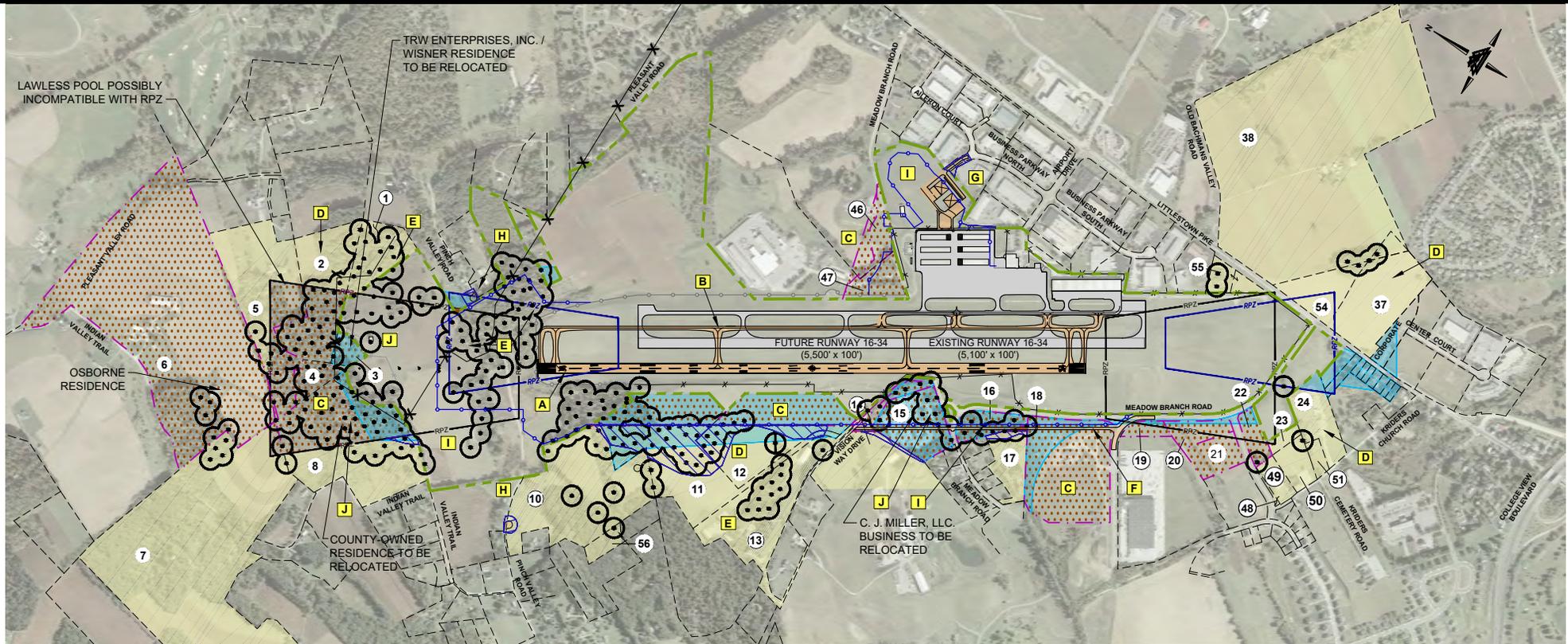
Following the 2009 EA, the anticipated design aircraft did not locate at the Airport as was anticipated by the 2007 MPU. The County prepared a new MPU in 2015, which was accepted by FAA in July 2015. The purpose of this preliminary design task is to update the Preferred Alternative from the 2009 MPU with that of the 2015 MPU. The remainder of the alternatives considered in the 2009 EA/ PER have not changed.

This preliminary engineering scope includes the reevaluation of the Preferred Alternative (Alternative Four) to reflect the recommendations of the 2015 MPU. Differences between the Preferred Alternative/Proposed Action in the 2009 EA/PER and in this 2017 EA/PER include



a shorter replacement runway length, revised runway profile, and revised Airport Reference Code (ARC). The proposed project is depicted in Figure 1.





LAWLESS POOL POSSIBLY INCOMPATIBLE WITH RPZ

TRW ENTERPRISES, INC. / WISNER RESIDENCE TO BE RELOCATED

OSBORNE RESIDENCE

COUNTY OWNED RESIDENCE TO BE RELOCATED

C. J. MILLER, LLC. BUSINESS TO BE RELOCATED

ENVIRONMENTAL ASSESSMENT ITEMS

- A** CONSTRUCT REPLACEMENT RUNWAY
- B** CONSTRUCT FULL-LENGTH TAXWAY
- C** ACQUIRE 185± ACRES FEE SIMPLE
- D** ACQUIRE 312± ACRES AVIGATION EASEMENTS
- E** REMOVE OBSTRUCTIONS ON 63± ACRES
- F** REALIGN MEADOW BRANCH ROAD
- G** CONSTRUCT 2 HANGARS AND AUTOMOBILE PARKING
- H** CUL-DE-SAC PINCH VALLEY ROAD AT AIRPORT PROPERTY LINE
- I** INSTALL PERIMETER / SECURITY FENCE
- J** RELOCATE 3 RESIDENCES, 2 BUSINESSES, POSSIBLY 1 SWIMMING POOL

NOTE: SOME PARCEL LINES DERIVED FROM CARROLL COUNTY GIS, DATA OBTAINED ONLINE NOVEMBER 2015.

PROPOSED PROPERTY INTEREST ACQUISITIONS				
PARCEL ID	MAP/ PARCEL	PROPERTY OWNER	ACREAGE	
			FEE SIMPLE	AVIGATION EASEMENT
1	30 / 74	RICHARDSON	0.1±	6.6±
2	30 / 20	ABDELMOMIN	7.7±	7.7±
3	30 / 394	WISNER, THOMAS ROBERT	1.8±	
4	30 / 276	PATTERSON	2.9±	
5	30 / 482	LAWLESS	11.1±	10.5±
6	30 / 573	OSBORNE	79.24±	
7	30 / 258	TANSILL	0.7±	78.4±
8	30 / 35	COMMISSIONERS OF CARROLL COUNTY	13.8±	14.3±
10	30 / 101	COMMISSIONERS OF CARROLL COUNTY	0.1±	25.6±
11	38 / 676	JRP VISION, LLC	7.5±	11.6±
12	38 / 676	JRP VISION, LLC	6.6±	5.4±
13	38 / 676	JRP VISION, LLC	0.3±	15.6±
14	38 / 798	JRP VISION, LLC	1.7±	11.9±
15	38 / 197	TRIPLE M. LLC	8.4±	
16	38 / 759	TRIPLE M. LLC	3.4±	
17	38 / 462	WETZEL	0.2±	4.9±
18	114 / 6784	TRIPLE M. LLC	19.7±	

PROPOSED PROPERTY INTEREST ACQUISITIONS				
PARCEL ID	MAP/ PARCEL	PROPERTY OWNER	ACREAGE	
			FEE SIMPLE	AVIGATION EASEMENT
19	114 / 6784	DLH, LLC	1.4±	
20	114 / 6784	TRIPLE M. LLC	2.9±	
21	114 / 6784	TRIPLE M. LLC	3.9±	
22	114 / 6784	TRIPLE M. LLC	2.5±	
23	38 / 661	BENJAMIN KRIDERS UNITED CHURCH OF CHRIST	0.1±	1.0±
24	38 / 646	CARROLL COUNTY ASSOC. FOR RETARDED CITIZENS, INC.		5.6±
37	114 / 4966	R & E I, LLC		12.7±
38	39 / 312	BISH		69.8±
46	30 / 36	COMMISSIONERS OF CARROLL COUNTY	2.7±	
47	38 / 600	COMMISSIONERS OF CARROLL COUNTY	4.1±	
48	114 / 6784	JACOBS RIDGE, LLC		0.2±
49	38 / 460	EMMERT		2.0±
50	38 / 817	BENJAMINS REFORMED CHURCH OF CARROLL COUNTY		3.2±
51	38 / 646	COMMISSIONERS OF CARROLL COUNTY		1.2±
54	114 / 4966	COMMISSIONERS OF CARROLL COUNTY		6.5±
55	114 / 6801	KBTC, INC.		2.7±
56	38 / 555	LAURENCE D. KLEIN, AND KIMBERLEY KALETA		1.6±

OBSTRUCTION REMOVAL
EXISTING = 25± ACRES
PROPOSED = 38± ACRES

LEGEND		
DESCRIPTION	EXISTING	PROPOSED
AIRPORT PROPERTY		
ADJACENT PARCEL LINE		NA
FENCE		
RUNWAY PROTECTION ZONE (RPZ)		
AVIGATION EASEMENT		
GRADING EASEMENT	NA	
LAND ACQUISITION	NA	
LIMITS OF OBSTRUCTIONS		SAME



Figure 1, Proposed Action
 Carroll County Regional Airport
 Supplemental Environmental Assessment



Per the approved scope of work for the project, the Preferred Alternative from the 2015 MPU has been designed to what is representative of a 30% design milestone, including the necessary design to meet current Maryland Stormwater and Erosion Control standards.

This preliminary design includes the following:

- Design Elements
- Program Phases
- Environmental Impacts
- Permitting Issues
- Program Costs

Within these sections' parameters, design and construction challenges, and recommendations for final design are discussed.

II. DESCRIPTION OF WORK

The Preferred Alternative/Proposed Action includes the following:

- Construct new (replacement) Runway 5,500' x 100'
- Construct full length taxiway 5,500' x 35' and connector taxiways
- Meadow Branch Road Realignment
- Pinch Valley Road Removal
- Corporate Hangar Site
- Obstruction Removal
- Security Fencing
- Land Acquisition

These key work items represent the major elements of the runway replacement program and have been dispersed among the four project categories detailed below.

1. Replacement Runway

The replacement of Runway 16-34 is proposed to accomplish the primary goal of a new 5,500' x 100' runway, offset 250' west of the existing runway. Itemized tasks for the runway replacement are as follows:

- Grading of runway, Runway Safety Area (RSA), 14 CFR Part 77 penetrations, and supporting infrastructure
- Drainage Conveyance systems for stormwater
- Stormwater quality and quantity control
- Airfield pavements
- Airfield marking
- Airfield electrical, lights and signs



- ➔ Relocation of wind cones, Precision Approach Path Indicator (PAPI) system, segmented circle
- ➔ Demolition of existing runway
- ➔ Temporary connection of proposed runway to existing taxiway
- ➔ Environmental Mitigation of streams and wetlands
- ➔ Land acquisition and grading easements
- ➔ Installation of approach lighting system (MALSR)
- ➔ Security fencing

2. Replacement Taxiways

The replacement of the taxiway system accompanies the runway replacement. The taxiway-centerline to replacement runway-centerline will be 400', per FAA design standards for C-II runways. Also included are connector taxiways from the proposed parallel taxiway to the proposed runway, and from the proposed parallel taxiway to the existing apron. Itemized tasks for the taxiway replacement are as follows:

- ➔ Grading of taxiway, future apron area, and supporting infrastructure
- ➔ Drainage Conveyance systems for stormwater
- ➔ Stormwater quality and quantity control
- ➔ Airfield pavements
- ➔ Airfield marking
- ➔ Airfield electrical, lights and signs
- ➔ Demolition of existing taxiway

3. Meadow Branch Road Realignment

Meadow Branch Road is to be realigned outside of the Runway Object Free Area (ROFA) for the replacement runway. This new location maintains local access to residents and businesses along the new proposed property line. Itemized tasks for the road are as follows.

- ➔ Meadow Branch Road realignment
- ➔ Vision Way Drive realignment
- ➔ Pinch Valley Road Removal (cul-de-sacs)
- ➔ Grading of roadways and supporting infrastructure
- ➔ Drainage conveyance systems for stormwater
- ➔ Stormwater quality and quantity control
- ➔ Highway pavements
- ➔ Highway marking
- ➔ Highway signage
- ➔ Demolition of existing roads
- ➔ Land acquisition and grading easements
- ➔ Security fencing



4. Corporate Hangar Site

The corporate hangar site is the first of the future corporate development on the airport's existing apron access, on the east side of the airfield. This location includes two hangar spots for development and opens the area for future expansion to the east. This development also includes an entrance road from existing Aileron Court. Itemized tasks for the corporate hangar site are as follows.

- Grading of apron, hangar area, and supporting infrastructure
- Drainage Conveyance systems for stormwater
- Stormwater quality and quantity control
- Airfield pavements
- Roadway pavements
- Airfield marking
- Roadway marking
- Grading easements
- Security fencing

Detailed design elements and preliminary engineering recommendations and analysis follow in this report.

III. DESIGN ELEMENTS

The following sections apply specifically to the replacement of Runway 16-34. This scope includes all elements of the runway, taxiways, road realignments/closures, and supporting infrastructure.

A. GEOMETRIC DESIGN

All airfield infrastructure is designed in accordance with the Airport Design Advisory Circular, FAA AC 150/5300-13A, Change 1.

1. Replacement Runway

The proposed replacement runway is located in accordance with the current Airport Layout Plan (ALP), 250' offset from existing Runway 16-34. The 250' offset allows for development of the east side while maintaining adequate separation distances to meet FAA standards. The replacement runway is also proposed to be shifted 600' to the north (600' from the Runway 34 end) to eliminate incompatible land uses to the south. The proposed length of the replacement runway is 5,500'; an ultimate buildout length of 6,400' has been shown on the approved ALP, to be constructed as demand indicates.

As previously stated, the Runway 16-34 is proposed to meet the standards of the ARC C-II. There are currently RNAV (GPS) approaches to both RW 16 and RW 34, each with approach visibility minimums of not lower than one mile. There is also currently a VOR approach to Runway 34. The approved ALP depicts future visibility minimums for RW 16 of $< \frac{3}{4}$ Mile, and to RW 34 of not lower than $\frac{3}{4}$ mile. Reference Figure 2 for a full list of FAA design standards for C-II runways.



Figure 2 - Runway Design Standards (Source: Table 3-5, FAA AC 150/5300-13A)

Aircraft Approach Category (AAC) and Airplane Design Group (ADG):
(select from pull-down menu at right)

C - II

ITEM	DIM ¹	Visibility Minimums			
		Visual	Not Lower than 1 mile	Not Lower than 3/4 mile	Lower than 3/4 mile
Runway Design					
Runway Length	A	<i>Refer to paragraphs 302 and 304</i>			
Runway Width	B	100 ft	100 ft	100 ft	100 ft
Shoulder Width		10 ft	10 ft	10 ft	10 ft
Blast Pad Width		120 ft	120 ft	120 ft	120 ft
Blast Pad Length		150 ft	150 ft	150 ft	150 ft
Crosswind Component		16 knots	16 knots	16 knots	16 knots
Runway Protection					
Runway Safety Area (RSA)					
Length beyond departure end ^{9,10}	R	1000 ft	1000 ft	1000 ft	1000 ft
Length prior to threshold ¹¹	P	600 ft	600 ft	600 ft	600 ft
Width ¹³	C	500 ft	500 ft	500 ft	500 ft
Runway Object Free Area (ROFA)					
Length beyond runway end	R	1000 ft	1000 ft	1000 ft	1000 ft
Length prior to threshold ¹¹	P	600 ft	600 ft	600 ft	600 ft
Width	Q	800 ft	800 ft	800 ft	800 ft
Runway Obstacle Free Zone (ROFZ)					
Length	<i>Refer to paragraph 308</i>				
Width	<i>Refer to paragraph 308</i>				
Precision Obstacle Free Zone (POFZ)					
Length		N/A	N/A	N/A	200 ft
Width		N/A	N/A	N/A	800 ft
Approach Runway Protection Zone (RPZ)					
Length	L	1700 ft	1700 ft	1700 ft	2500 ft
Inner Width	U	500 ft	500 ft	1000 ft	1000 ft
Outer Width	V	1010 ft	1010 ft	1510 ft	1750 ft
Acres		29.465	29.465	48.978	78.914
Departure Runway Protection Zone (RPZ)					
Length	L	1700 ft	1700 ft	1700 ft	1700 ft
Inner Width	U	500 ft	500 ft	500 ft	500 ft
Outer Width	V	1010 ft	1010 ft	1010 ft	1010 ft
Acres		29.465	29.465	29.465	29.465
Runway Separation					
<i>Runway centerline to:</i>					
Parallel runway centerline	H	<i>Refer to paragraph 316</i>			
Holding position		250 ft	250 ft	250 ft	250 ft
Parallel Taxiway/Taxilane centerline ²	D	300 ft	300 ft	300 ft	400 ft
Aircraft parking area	G	400 ft	400 ft	400 ft	500 ft
Helicopter touchdown pad		<i>Refer to AC 150/5390-2</i>			
Notes:					
<ul style="list-style-type: none"> Appendix 7 contains non-interactive tables for all RDCs. Values in the table are rounded to the nearest foot. 1 foot = 0.305 meters. 					

Blast pads and paved shoulders are not proposed at this time; however, geometric and grading design has been laid out to accommodate these features should they be necessary in the future.

All runway geometry is consistent with the approved ALP.



2. Replacement Taxiways

The proposed taxiway system has been designed to meet the standards for Airplane Design Group (ADG) II and Taxiway Design Group (TDG) 2. The proposed taxiway width is 35' (see Figure 4, below). Reconfiguration of the existing taxiway provides the airport sufficient room for apron expansion and improving safety in realigning connectors between the existing apron and the new runway.

Figure 3- Taxiway Design based on ADG (Source: FAA AC 150/5300-13A, Table 4-1)

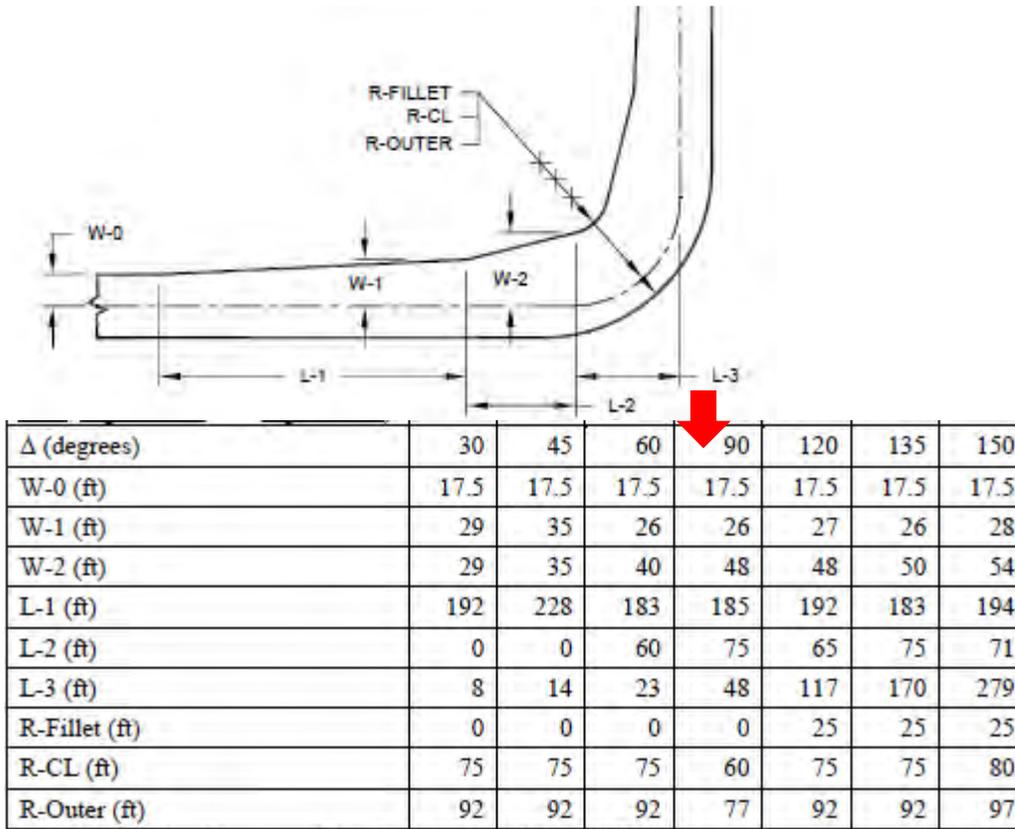
ITEM	DIM (See Figure 3-26)	ADG					
		I	II	III	IV	V	VI
TAXIWAY PROTECTION							
TSA	E	49 ft (15 m)	79 ft (24 m)	118 ft (36 m)	171 ft (52 m)	214 ft (65 m)	262 ft (80 m)
Taxiway OFA		89 ft (27 m)	131 ft (40 m)	186 ft (57 m)	259 ft (79 m)	320 ft (98 m)	386 ft (118 m)
Taxilane OFA		79 ft (24 m)	115 ft (35 m)	162 ft (49 m)	225 ft (69 m)	276 ft (84 m)	334 ft (102 m)
TAXIWAY SEPARATION							
Taxiway Centerline to Parallel Taxiway/Taxilane Centerline ¹	J	70 ft (21 m)	105 ft (32 m)	152 ft (46.5 m)	215 ft (65.5 m)	267 ft (81 m)	324 ft (99 m)
Taxiway Centerline to Fixed or Movable Object	K	44.5 ft (13.5 m)	65.5 ft (20 m)	93 ft (28.5 m)	129.5 ft (39.5 m)	160 ft (48.5 m)	193 ft (59 m)
Taxilane Centerline to Parallel Taxilane Centerline ¹		64 ft (19.5 m)	97 ft (29.5 m)	140 ft (42.5 m)	198 ft (60 m)	245 ft (74.5 m)	298 ft (91 m)
Taxilane Centerline to Fixed or Movable Object		39.5 ft (12 m)	57.5 ft (17.5 m)	81 ft (24.5 m)	112.5 ft (34 m)	138 ft (42 m)	167 ft (51 m)
WINGTIP CLEARANCE							
Taxiway Wingtip Clearance		20 ft (6 m)	26 ft (8 m)	34 ft (10.5 m)	44 ft (13.5 m)	53 ft (16 m)	62 ft (19 m)
Taxilane Wingtip Clearance		15 ft (4.5 m)	18 ft (5.5 m)	27 ft (6.5 m)	27 ft (8 m)	31 ft (9.5 m)	36 ft (11 m)

Figure 4- Taxiway Design based on TDG (Source: FAA AC 150/5300-13A, Table 4-2)

ITEM	DIM (See Figure 4-6)	TDG							
		1A	1B	2	3	4	5	6	7
Taxiway Width	W	25 ft (7.5 m)	25 ft (7.5 m)	35 ft (10.5 m)	50 ft (15 m)	50 ft (15 m)	75 ft (23 m)	75 ft (23 m)	82 ft (25 m)
Taxiway Edge Safety Margin	TESM	5 ft (1.5 m)	5 ft (1.5 m)	7.5 ft (2 m)	10 ft (3 m)	10 ft (3 m)	15 ft (4.6m)	15 ft (4.6m)	15 ft (4.6m)
Taxiway Shoulder Width		10 ft (3 m)	10 ft (3 m)	15 ft (3 m)	20 ft (6 m)	20 ft (6 m)	30 ft (9 m)	30 ft (9 m)	40 ft (12 m)



Figure 5 - Taxiway Fillet Design (Source: FAA AC 150/5300-13A, Table 4-5)



All taxiway geometry is consistent with the approved ALP.

3. Meadow Bridge Road Realignment

Roadway geometry is based upon the American Association of State Highway and Transportation Officials (AASHTO) roadway standards. A design speed of 50 miles per hour (mph) is assumed for Meadow Branch Road, based on posted speed limits of 45 mph surrounding the project site. The design speed is the basis of horizontal and vertical curves, line of sight, and superelevation.

Meadow Branch Road is designed as a 24' paved surface with grass shoulders. This design provides two, 12' travel ways. Two stop-signed intersections are proposed at the intersections of the existing Meadow Branch Road and Vision Way Drive. It is recommended that in final design, the County analyze a new traffic circle intersection from existing Meadow Branch Road to the new Meadow Branch Road alignment. During preliminary analysis of the site, a traffic circle would be constructed within the same limits of disturbance for the project.

Cul-de-sacs at Pinch Valley Road are positioned outside of airport property, requiring construction easements to be acquired. These locations have been optimized to remove direct impacts to streams and wetlands. The radius of each cul-de-sac is 35', the minimum required for cul-de-sacs per the AASHTO manual.



4. Corporate Hangar Site

All geometry is consistent with the approved ALP, which has been designed to C-II standards.

B. GRADING DESIGN

The project site is challenging for the relocation of the runway. Approximately 2.8 million cubic yards of earthwork is required to complete the total project. This includes significant excavation and embankment, in some areas exceeding 40' in depth. These areas are primarily at the RW 16 RSA and the western Part 77 grading area. All embankment required for the project is within the project limits. Clean waste material shall be placed at the location of future corporate hangars and the Automated Weather Observation System (AWOS), east of the existing runway.

Proposed slopes in general are designed at a maximum 4:1 for maintenance and personnel safety outside of the safety areas. Minimum slopes are designed at 1.5%, except within stormwater facilities designed to specific performance related standards.

1. Replacement Runway

Grading within the RSA and ROFA must meet the design standards for C-II, outlined in Figure 6 and Figure 7. The runway cross slope is set at 1.25% to promote drainage. Grass shoulders at 5%, and RSA grading at 1.5% minimum slope is proposed, per FAA design standards.

The 14 CFR Part 77 and approach surfaces were also investigated. Significant grading is required west of the runway and at the RW 16 approach. This grading is designed to provide two feet of clearance below the controlling surfaces, in order to eliminate obstructions to the proposed runway. In all cases, 4:1 slopes are proposed for grass cover. Slopes steeper than 4:1 should be covered with riprap or other stabilizing materials.

Drainage grading is proposed to use open channels outside of the RSA. In many locations these channels are excavation, including future channel excavation at the existing runway footprint. Phasing of this grading will be critical to the final design.



Figure 6 - Runway Grade Standards (Source: Figure 3-23, FAA AC 150/5300-13A)

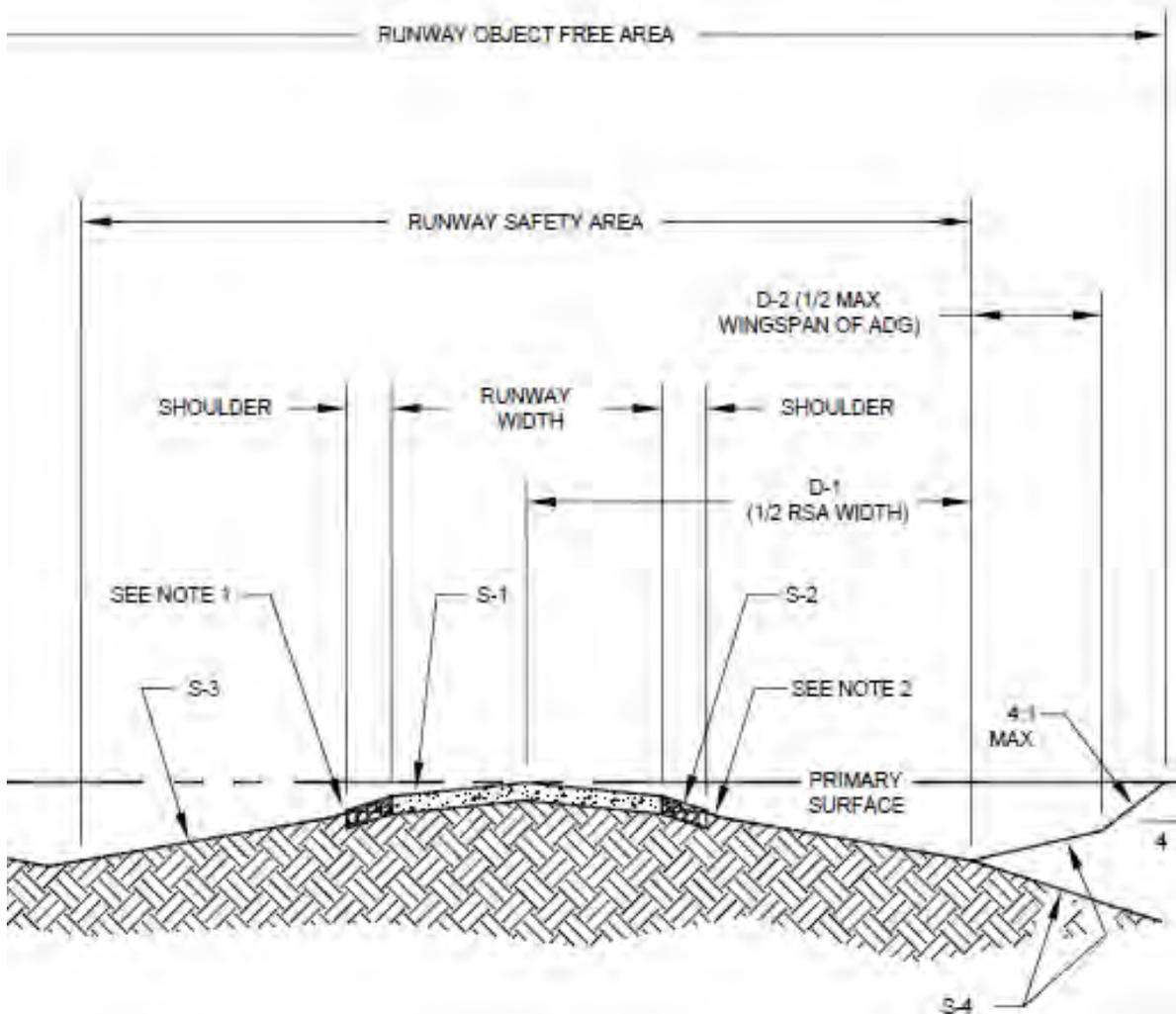


Figure 7 - Runway and Taxiway Grades (Source: FAA AC 150/5300-13A, Table 3-3)

Dimension	Approach Category	
	A & B	C, D, & E
S-1	1.0% - 2.0%	1.0% - 1.5%
S-2 (> S-1)	1.5% - 5.0%	1.5% - 5.0%
S-3	1.5% - 5.0%	1.5% - 3.0%

Dimension	ADG					
	I	II	III	IV	V	VI
D-1	D-1 is 1/2 of RSA width. See dimension C in interactive Table 3-5					
D-2	25	40	59	86	107	131
S-4 (max)	8:1		10:1		16:1	

Note: See Figure 3-23 and Figure 4-33.



2. Replacement Taxiways

Grading within the RSA and ROFA must meet the design standards for C-II, outlined in Figure 8. The taxiway cross slope is set at 1.25% to promote drainage. Grass shoulders at 5%, and TSA grading at 1.5% minimum slope is proposed.

Figure 8 - Taxiway Grade Standards (Source: Figure 4-33, FAA AC 150/5300-13A)

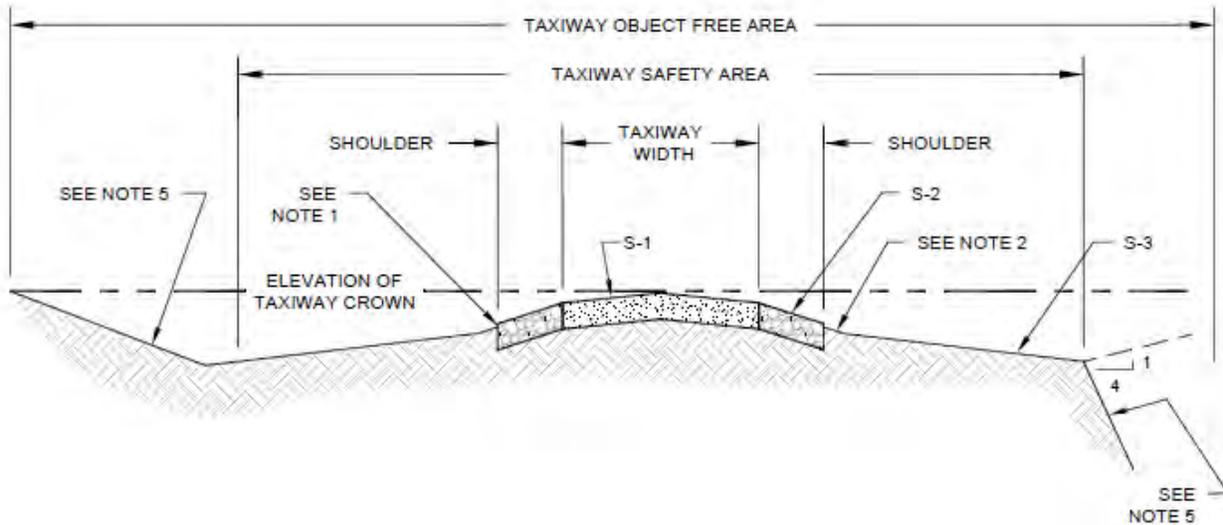


Figure 9 - Runway and Taxiway Grades (Source: FAA AC 150/5300-13A, Table 3-3)

Dimension	Approach Category	
	A & B	C, D, & E
S-1	1.0% - 2.0%	1.0% - 1.5%
S-2 (> S-1)	1.5% - 5.0%	1.5% - 5.0%
S-3	1.5% - 5.0%	1.5% - 3.0%

Dimension	ADG					
	I	II	III	IV	V	VI
D-1	D-1 is 1/2 of RSA width. See dimension C in interactive Table 3-5					
D-2	25	40	59	86	107	131
S-4 (max)	8:1		10:1		16:1	

Note: See Figure 3-23 and Figure 4-33.

Taxiway grades are proposed to tie into existing ground east of the existing taxiway. As the runway profile is lower than the existing infrastructure, taxiway grading must be phased appropriately. Approximately 600,000 CY of excavation is attributed to the taxiway grading portions of the runway program. At this time it is recommended that taxiway construction begin at the RW 16 threshold and move toward the existing terminal area, grading, paving, and installing supporting infrastructure along the way.



3. Meadow Branch Road Realignment

Roadway grades are proposed as a nominal 2% slope, with maximum 8% superelevation geometry. 5' shoulders are required at a nominal 5% slope. The grading concept of the road is intended to maintain a "recoverable slope" of 4:1. No guardrail is proposed at this time. Steeper slopes may be acceptable in final design and advisable along the roadway to reduce earthwork cost and total disturbance area.

Cul-de-sacs at Pinch Valley Road are designed to minimize impacts to surrounding streams and wetlands. Excavation from the eastern cul-de-sac is anticipated to be used as backfill for removed portions of the Pinch Valley Road pavement section.

Approximately 180,000 CY of earthwork is attributed to the roadway portions of the project, the majority of which is Meadow Branch Road. These portions are designed to balance between excavation and embankment to reduce the haul and stockpiling costs to the overall runway program.

4. Corporate Hangar Site

Apron grading is designed at a nominal 1%. This surface provides sufficient positive drainage. It also allows for sufficient tie in at the proposed hangars, ideally on a flat ground level.

Grades for the site are sloped towards the landside parking area. Landside grading is designed at a nominal 2% grade where possible. The intent of the design is to maintain ADA access within the majority of the site. Tie-in grading at the edges of the project site are a maximum 4:1 slope.

C. PAVEMENT DESIGNS

The pavement design for the replacement runway and taxiway systems has been computed in accordance with the advisory circular 150/5320-6F, using FAARFIELD software. The existing pavement section, constructed in the 1990s, was reviewed to provide a comparison. The existing pavement section is not known to have notable structural failure, and is provided below.

Figure 10 – Existing Airfield Pavement Section

Pavement Material	Pavement Thickness
P-401 Bituminous Surface Course	3"
P-304 Cement Treated Base	5"
P-154 Subbase Course	5"
Total Pavement Section	13"

A pavement design was completed as part of the 2009 Environmental Assessment, based upon a fleet mix developed in the previous Master Plan. This fleet mix included the Gulfstream V as the critical aircraft. Please see the previous pavement section below. Reference the 2009 Preliminary Design Engineering Report for additional details.



Figure 11 – 2009 Airfield Pavement Summary

Pavement Material	Pavement Thickness
P-401 Bituminous Surface Course	5''
P-304 Cement Treated Base	10''
P-154 Subbase Course	6''
Total Pavement Section	21''

The recent Master Plan update removed the Gulfstream V from the fleet mix. The aircraft forecast from the Master Plan was compared to database information for instrument flight rules operations via flightwise.com. The final fleet mix is included in Appendix D of the PER.

A California Bearing Ratio (CBR) of 3 was used to compute the revised pavement section. This design CBR is at the bottom of the range from the 1990s pavement design. Final design of the replacement runway project should update accordingly should the design CBR be changed at the recommendation of a geotechnical engineering investigation.

The pavement section for the revised fleet mix has decreased from the 2009 PER effort. The final airfield pavement design is provided below. See Appendix D for additional information.

Figure 12 – Final Airfield Pavement Summary

Pavement Material	Pavement Thickness
P-401 Bituminous Surface Course	4''
P-304 Cement Treated Base	6''
P-154 Subbase Course	6''
Total Pavement Section	16''

The roadway pavement section was reviewed from the 2009 preliminary design effort. Upon review of that design, no changes have been made. Please see the 2009 PER for design details. The resulting pavement section is provided below.

Figure 13 - Roadway Pavement Summary

Pavement Material	Pavement Thickness
Asphalt Surface Course	2''
Asphalt Base Course	3''
Aggregate Base Course	8''
Total Pavement Section	13''

For the Corporate Hangar Site, it is anticipated that the pavement section for the apron will be based upon specific usage during final design. The airfield pavement section should be used as the basis for this final design. Roadway pavement should be similar to that of the public roadway design.



D. STORMWATER

The stormwater concept for the program must meet the Maryland Department of the Environment's (MDE) guidance for development and design. Environmental Site Design (ESD) practices are to be implemented to the maximum extent practical, in accordance with MDE's Maryland Stormwater Handbook. These practices include minimizing impervious ground cover, reducing existing impervious cover, disconnecting impervious cover from channels and stormsewer systems, and implementing several best management practices (BMP).

In general, the goals for the final design of the total project site include routing stormwater runoff from the airfield and roadway surfaces, reducing volume and peak runoff to protect property and environmental resources, and minimizing pollutants, such as metals and sediment. During final design, the owner should anticipate preparing a Stormwater Management Concept Plan for the entire runway program. This plan should be discussed with stakeholders and reviewers as necessary to seek initial input and verify requirements, expectations, and goals.

1. Stormwater Conveyance

The airfield is proposed to incorporate grassed, flat bottom channel systems and closed stormsewer systems to route runoff from airfield pavements to stormwater facilities and their eventual outfalls. The project site is moderately sloped and provides adequate fall for this drainage concept. It is recommended that storm sewers be constructed of reinforced concrete pipe (RCP) or similar materials for durability and longevity.

A large culvert at the proposed future RW 16 threshold is proposed to connect upstream drainage along existing Pinch Valley Road. This area provides adequate slope, alignment, and elevations to properly route runoff under the proposed RSA. Culverts constructed in jurisdictional stream beds are required to have the upstream and downstream inverts set below the natural stream bed elevation, to stimulate natural stream bed establishment in the culvert. This countersinking should be planned, along with capacity for the 100 year storm event in final design.

Channels, storm sewers, and culverts are proposed to be designed based upon the consequences of failure, but in all cases, meet or exceed the 10-year capacity. It is recommended that overland flow relief be available for large storms, meeting or exceeding the 100-year storm event. This should include overflow channels or enlarged inlets and storm sewers at low points on the airfield, to ensure proposed and existing airfield infrastructure is protected.

Methods for sizing storm sewers, curb and gutter, channels, and inlets are based on guidance from the Federal Highway Administration's (FHA) Urban Drainage Design Manual, (HEC 22), and the Carroll County Manual for Roads and Storm Drains.



2. Stormwater Management

Stormwater facilities shall be sized according to the Maryland Stormwater Handbook's Environmental Site Design (ESD) criteria. The primary focuses for facilities include satisfying water quality and recharge volume requirements, providing channel protection storage for the one-year storm event and overbank flood protection for the 10-year storm event. Extreme flood protection must be provided for the 100-year storm event. Water quality volume and recharge volume should be treated inclusively, as permitted by state standards.

The primary control for stormwater quantity control is the five proposed, and additional existing basins at the perimeter of the airport (see Appendix B, Exhibits 1-4). These basins are proposed to be designed to draw down the contributing drainage volume over the course of 48 hours.

Secondary volume control is provided by additional stormwater facilities within the airfield. Facilities, such as grass swales and disconnections of impervious areas, are discussed further in the subsequent Water Quality section. The Maryland ESD guidance permits the reduction in contributing curve numbers (CN), resulting in reduced volume and peak runoff of the developed site.

Stormwater within the Corporate Hangar Site is anticipated to route runoff from the apron, towards the parking area. Bio retention, whether between the hangars and parking or beyond the parking area, should be sufficient to meet stormwater requirements. Other options include porous pavement, swales, filters, and underground infiltration. Future expansion of the apron and landside area is anticipated to be routed away from this project site.

3. Water Quality

Water quality design is based upon contributing drainage conditions to each drainage outfall. Pollutants, such as sediment, phosphorous, and nitrogen, are required to be removed through low impact development (LID) techniques and stormwater BMP facilities.

Water quality stormwater facilities must be tailored to the specific requirements of the airfield. Facilities should include underdrain systems to aid drawdown of runoff within the prescribed 48 hour period, reducing potential for wildlife hazards. Standing water is not acceptable within the airfield as it could attract wildlife. Landscaping should be designed to avoid potential for obstructions, minimize the potential for wildlife hazards, and require minimal maintenance.

The following BMPs have been installed at airports within the region and may be acceptable to meet the requirements for this project:

- Disconnection of Impervious Cover
- Grass Swale
- Bio retention
- Sand Filter
- Detention Basin



For the purpose of preliminary cost estimating, a square yardage has been estimated based upon typical BMPs above. This includes the disconnection of impervious surfaces from downstream channels, swales outside of the RSA, detention, and the potential for other facilities outside of the airfield. This estimated area is anticipated to adequately meet water quality requirements, pending final criteria and geometric and grading constraints.

4. Erosion and Sediment Control

Erosion and Sediment Control (ESC) shall be phased with construction. It is anticipated that early projects will lay out the perimeter controls of the project, starting with the relocation of Meadow Branch Road to the west. Sediment basins should be co-located with the final SWM basins to minimize disturbance, earthwork, labor time and cost. Temporary sediment traps are anticipated to be constructed to aid phasing of conveyances. Inlet protections, diversions, silt fence and other barrier protection, and other controls are anticipated to be included in final design. Temporary ESC measures shall be designed in accordance with the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control.

ESC in Maryland requires significant phasing constraints for this program. As defined in the Code of Maryland Regulations (COMAR) 26.17.01, active grading is limited to 20 acres at one time on a project site. Unless otherwise approved by the MDE, no more than 30 acres, cumulatively, may be disturbed at a given time. Justification for an exception to this regulation, according to the MDE, must demonstrate that a project cannot be phased or sequenced to meet the criteria due to uniqueness of the project or site. Due to the scope of this program, including the size, operating constraints, and phasing requirements, individual projects of the total program are a candidate for consideration. It is recommended in design that the owner and engineer plan to coordinate with MDE for justification for an exception to this regulation, where needed.

5. Wildlife Attraction Mitigation

The close proximity of five proposed stormwater basins and water quality BMPs, requires special consideration to mitigate the potential for wildlife attractants. The following design criteria are to be used during final design of the project elements, in accordance with Federal, State, and local requirements for stormwater and erosion and sediment control design.

- ➔ All drainage facilities are proposed to dewater within 48 hours.
- ➔ Bio retention and filtering practices are proposed to include underdrain systems to dewater the system regardless of infiltration capabilities.
- ➔ Plantings, if required during final stormwater review, are proposed to be selected from the MAA “Approved Plant List for BWI Airport”, or reviewed in final design by the USDA.
- ➔ All final design will be in accordance with the MDE manuals for Stormwater Management and Erosion and Sediment Control.
- ➔ Temporary sediment basins and sediment traps will be designed to dewater completely within 48 hours, using approved MDE design methods.

Correspondence with USDA is included in Appendix E regarding these mitigation strategies.



E. ELECTRICAL DESIGN

The proposed electrical airfield system is anticipated to integrate into the existing system on the airfield. The existing electrical system is constant current with based mounted, medium intensity lights and signs. The electrical vault, housing all constant current regulators, is anticipated to be adequate for this proposed work. Additional evaluation should be conducted during final design to verify the sufficient performance.

1. Airfield Lighting

The lighting system, in accordance with the ALP, is proposed to include Medium Intensity Runway Lights (MIRL) and Medium Intensity Taxiway Lights (MITL). Permanent light locations are recommended to be based mounted for flush mounted for runway lights within connector taxiway pavements. These lights are proposed to have conduit systems for pulling cable. Temporary taxiway connector MITLs are anticipated to be stake mounted, with direct buried cable.

In accordance with the previous preliminary engineering, edge lights should be 24" high. In final design, LED fixtures may be evaluated based on FAA funding and criteria at that time.

Final airfield lighting design shall be designed in accordance with FAA AC 150/5340-30C, *Design and Installation Details for Airport Visual Aids*.

2. Airfield Signage

Lighted airfield guidance signs are anticipated to be installed with the lighting system. Signage shall be designed in accordance with FAA AC 150/5345-44G, *Specification for Taxiway and Runway Signs*.

3. Precision Approach Path Indicator (PAPI)

The existing PAPI systems at both runway ends are proposed to be relocated with the runway. Four box PAPI systems are proposed to provide guidance for aircraft to the new runways. PAPI locations are shown preliminarily on the plans. Final locations should be determined in final design in accordance with the requirements of FAA AC 150/5340-30C, *Design and Installation Details for Airport Visual Aids*.

4. MALSR

The ALP shows a proposed MALSR approach lighting system for the new RW 16 approach as part of the phase 1 runway program. MALSR light locations are shown preliminarily on the plans. Final locations should be determined in final design in accordance with the requirements of FAA AC 150/5340-30C, *Design and Installation Details for Airport Visual Aids*.



F. HANGARS AND UTILITIES

Hangars and utilities have not been included in the cost estimate for this project as it is anticipated that these items will be funded by private investors. It is anticipated that two proposed corporate hangars will be constructed on the Corporate Hangar Site. Utilities may be constructed from the site entrance. Final design of the site should leave adequate corridor for these utilities.

G. PROGRAM PHASING

The total program duration, from start of design through construction, is anticipated to be 5 to 10 years, pending funding availability. This duration requires phasing, as described below, including major milestones for usable units of work. Unless otherwise noted, the project categories have been listed in the order of anticipated construction. The Corporate Hangar Site can be constructed at any time, as this project category is not dependent on other project phasing.

1. Roadway Relocations

The relocation of Meadow Branch Road and Vision Way Drive sets the eastern boundaries of the site. It is anticipated that all roadway work will be completed under this project to take advantage of similar work requirements. Combining all roadway work also removes most off site work from the remaining projects. Upon completion of this phase, the site will be clear of impediments to the location of the replacement Runway alignment.

Scope of Work

1. Construct new Meadow Branch Road
2. Demolish old Meadow Branch Road and Vision Way Drive
3. Construct cul-de-sacs at Pinch Valley Road
4. Demolish Pinch Valley Road within airport boundary

Key Numbers

1. Land Acquisition Required (Fee Simple) = 33.10± AC
2. Grading Easements = 4.1 AC
3. Earthwork = 200,000 CY
4. Pavement Area = 1.94 AC
5. Construction Cost = \$3,300,000
6. Stream Impacts = 0 LF
7. Wetland Impacts = 0 AC

Airfield Impacts

1. Minimum impacts anticipated

Anticipated Construction Duration

1. One construction season.
2. Approximately 180 calendar days



2. Replacement Runway

The replacement of RW 16-34 is anticipated to be a multi-year project schedule, potentially with multiple bid projects. This portion of the project includes all stream and wetland impacts and the majority of grading. Construction phasing is critical to minimizing impacts to the existing Runway 16-34. Note that the MALSR installation has been included as a separate project element in this section, for phasing purposes.

Scope of Work

1. Construct culvert near Pinch Valley Road
2. Construct earthwork for Runway 16-34
3. Construct drainage for Runway 16-34
4. Construct Runway 16-34 pavement
5. Construct Runway 16-34 electrical
6. Construct temporary taxiway connectors

Key Numbers

1. Land Acquisition Required (Fee Simple) = 66.04± AC
2. Grading Easements = 13.3 AC
3. Earthwork = 1,800,000 CY
4. Pavement Area = 12.6 AC
5. Construction Cost = \$36,000,000
6. Stream Impacts = 3660 LF
7. Wetland Impacts = 4.11 AC

Airfield Impacts

1. Reduction in RSA during critical construction periods.
2. Potential displacement of existing RW 34 threshold for ERSA.
3. Night time work is anticipated for taxiway connector work.
4. Critical earthwork between the existing and proposed runways may necessitate day time closures.

Anticipated Construction Duration

1. Six seasons, pending funding.

3. Replacement Taxiways

The relocation of taxiways is anticipated to be a multi-year project schedule, potentially with multiple bid projects. Construction phasing is critical to minimizing impacts to the proposed Runway 16-34, and ground traffic.

Scope of Work

1. Construct earthwork for taxiways
3. Construct drainage for taxiways
4. Construct taxiway pavements
5. Construct taxiway electrical
6. Demolish existing taxiways, temporary connectors, and remaining runway surface.



Key Numbers

1. Land Acquisition Required (Fee Simple) = 0 AC
2. Grading Easements = 0 AC
3. Earthwork = 800,000 CY
4. Pavement Area = 9.1 AC
5. Construction Cost = \$17,500,000
6. Stream Impacts = 0 LF
7. Wetland Impacts = 0 AC

Airfield Impacts

1. Reduction in RSA during critical construction periods.
2. Night time work is anticipated for taxiway connector work.

Anticipated Construction Duration

1. Three seasons, pending funding.

4. Install MALSR

The installation of a new MALSR system for the Runway 16 approach is proposed to be completed after completion of the runway and taxiway items. Based upon demand and usage, the owner may elect to install the MALSR with the runway construction. Construction phasing is critical to minimizing impacts to the proposed Runway 16-34.

Scope of Work

1. Construct towers and fixtures for MALSR
2. Construct shelter site for MALSR
3. Install electrical for MASR.

Key Numbers

1. Land Acquisition Required (Fee Simple) = 0 AC
2. Grading Easements = 0 AC
3. Earthwork = 0 CY
4. Pavement Area = 0 AC
5. Construction Cost = \$1,500,000
6. Stream Impacts = 0 LF
7. Wetland Impacts = 0 AC

Airfield Impacts

1. It is anticipated that this work be completed with a temporary displacement of RW 16, if completed as a separate phase.

Anticipated Construction Duration

1. One construction season.
2. Approximately 60 calendar days.



5. Corporate Hangar Site

The corporate hangar site will initiate the future development of this eastern portion of the airport property. It is anticipated that construction will continue as demand allows. One construction project to open this site is proposed. This piece of work may be completed at any time before, during, or after the other work sections, as this site is not dependent on the other work items.

Scope of Work

1. Construct grading and drainage for site
2. Construct entrance road and parking lot
3. Construct apron
4. Demolish and modify existing T-Hangars

Key Numbers

1. Land Acquisition (Fee Simple) = 6.80± AC
2. Grading Easements = 0.5 AC
3. Earthwork = 2,200 CY
4. Pavement Area = 2.2 AC
5. Construction Cost = \$1,800,000
6. Stream Impacts = 0 LF
7. Wetland Impacts = 0 AC

Airfield Impacts

1. It is anticipated that this work be completed with temporary closures of the existing taxi-lane ramp area.

Anticipated Construction Duration

1. One construction season.
2. Approximately 120 calendar days.



IV. LAND ACQUISITION

1. Replacement Runway

The runway infrastructure requires significant land acquisition for grading, drainage, and runway protection. All land within the RPZ, as well as RSA limits of disturbance, and areas of obstruction removal, are included in the figures below and in Figure 1. This includes land north, east, and west of the replacement runway. Additionally, temporary grading easements are proposed for parcels where only minor grading is required for construction.

- ➔ Fee Simple Acquisition: 66.04± AC
 - Parcel ID: 1-8, 10-14, 20-23
- ➔ Grading Easement Proposed: 13.30± AC

2. Replacement Taxiways

The taxiway system is within the existing airport property. No additional acquisition is required.

- ➔ Fee Simple Acquisition: 0 AC
- ➔ Grading Easement Proposed: 0 AC

3. Meadow Bridge Road Realignment

Several parcels of land are proposed to be acquired along Meadow Branch Road and Vision Way Drive. Fee Simple acquisition is proposed for total and partial parcels as shown on Figure 1. This acquisition includes parcels owned by the existing concrete plant. Additionally, temporary grading easements are proposed along Meadow Branch Road and Vision Way Drive for parcels where only minor grading is required for construction. The cul-de-sacs at Pinch Valley Road will also require grading easements.

- ➔ Fee Simple Acquisition: 33.10± AC
 - Parcel ID: 15-19
- ➔ Grading Easement Proposed: 4.10± AC

4. Corporate Hangar Site

The corporate hangar site is located within existing airport property. The owner will need to acquire grading easements for roadway connection to Aileron Court.

- ➔ Fee Simple Acquisition: 6.80± AC
 - Parcel ID: 46, 47
- ➔ Grading Easement Proposed: 0.50± AC



V. OBSTRUCTION REMOVAL

1. Replacement Runway

The following obstruction removal is required.

- ➔ Removal of Existing Obstructions: 25 AC
- ➔ Removal of Proposed Obstructions: 38 AC

2. Replacement Taxiways

No obstruction removal is associated with this work item.

3. Meadow Branch Road Relocation

No obstruction removal is associated with this work item.

4. Corporate Hangar Site

No obstruction removal is associated with this work item.

VI. ENVIRONMENTAL RESOURCES

Streams and wetlands are anticipated to be impacted by grading and development of the replacement runway. The assumptions for these effected areas are shown in the plan exhibits in this report. During construction, it is recommended that wetlands be marked in the field and bound by safety fence, in addition to requirements of the anticipated wetland mitigation permit.

1. Replacement Runway

The runway portion of the program effects the largest area of the project site. As a result, several impacts are anticipated. The following figures summarize the impacts to wetlands and streams. Please see Appendix B, Exhibit 6 for a depiction of these estimated impacts. The exact extent of impacts will be ascertained during final design, when permit applications are submitted.

Figure 14 – Estimated Wetland Disturbance Impacts

Area	Impact	Description
A	3.54 AC	Replacement Runway Grading
B	0.30 AC	Replacement Runway Grading
C	0.27 AC	Replacement Runway Grading
	4.11 AC	TOTAL WETLAND IMPACT



Figure 15 – Estimated Stream Disturbance Impacts

Area	Impact	Description
1	1,530 FT	Replacement Runway Grading
2	1,000 FT	Replacement Runway Grading
3	1,130 FT	Replacement Runway Grading
	3,660 FT	TOTAL STREAM IMPACT

Mitigation could be accomplished through either contribution to the state’s non-tidal wetland compensation fund (in-lieu of fee) or permittee responsible mitigation, in which the County selects a suitable mitigation site and creates new wetlands. The mitigation method is to be finalized during the permitting phase (anticipated 2019). Mitigation is to be accomplished before final design is initiated.

2. Taxiways

No wetland or stream impacts are anticipated based upon this preliminary design analysis.

3. Roadway

No wetland or stream impacts are anticipated based upon this preliminary design analysis.

4. Corporate Hangar Site

No wetland or stream impacts are anticipated based upon this preliminary design analysis.



VII. PERMITS, CHECKLISTS, AND OTHER LOCAL REGULATIONS

Operators of industrial plants, including airports, are required to obtain **stormwater permits** under the 1987 amendments to the Clean Water Act (CWA). The CWA provides the authority to establish water quality standards, control discharges into surface and subsurface waters, develop waste treatment management plans and practices, and issue permits for dredged or fill material.

The CWA specifically addresses both point source and non-point source discharges. Point sources are distinct entities that discharge wastewater with pollutants into rivers or lakes through distinct conveyances such as pipes, ditches, and canals. Non-point sources do not discharge wastewater from a discrete conveyance system such as agricultural lands, construction sites, parking lots or streets. Section 402 of the CWA establishes the National Pollutant Discharge Elimination System (NPDES). **NPDES permits** are required for all point source discharges to waters of the United States, including discharges of storm water associated with industrial and airport activities; however, this permit would not be required until the final design is completed and prior to construction.

Other permits and approvals anticipated to be required include the following:

- An **Environmental Site Delineation Plan** must be submitted with the Environmental Site Delineation Application for the Resource Management and Landscape/Forest Conservation agencies to review. It should be noted that this plan submittal must be done very early in the design process.
- A **grading permit**, which allows the contractor to disturb the land in the areas specified in the construction plans, will also be required.
- Along with the grading permit, several additional plans need to be submitted to the County and/or City for approval before construction can begin.
 - A **Forest Conservation Plan** must be prepared by a qualified professional documenting the forest stand delineation for the net tract. The scope of work for this Supplemental EA does not include the preparation and submittal of a FSD or FCP; these are to be prepared and submitted during the project design/permitting phase. The FCP must be resolved as part of the permitting phase.
 - A **Soil and Erosion Control plan** must be submitted to and approved by the District in accordance with COMAR 26.17.01.
 - A **Stormwater Management plan and report** must be submitted to the County with a review fee before construction may begin.

All of the above plans are outside of the scope of work for this Preliminary Design Report, and must be resolved as part of the permitting phase.

- A **joint permit from USACE/MDE** must be obtained for the stream/wetland impacts resulting from the runway extension. A draft permit application was prepared during the Supplemental EA; the permit will be finalized and submitted before final design is initiated.



VIII. ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COSTS

Cost estimates are categorized by the four project elements: Replacement Runway, Replacement Taxiway, Meadow Branch Road Realignment, and the Corporate Hangar Site. Additional estimates for the MALSR and AWOS systems, as well as land acquisition and environmental mitigation, is included for the total program total. In all categories, an engineering and inspection contract of 15% of probable construction costs are included. See Figure 16 below for a summary of this analysis.

Figure 16 - Program Cost Summary

Category	Probable Construction Cost
Replacement Runway	\$ 36,000,000
Replacement Taxiways	\$ 17,500,000
Realign Meadow Branch Road	\$ 3,300,000
Corporate Hangar Site	\$ 1,800,000
MALSR System	\$1,500,000
AWOS	\$300,000
Land Acquisition (fee simple and easement)	\$5,000,000
Environmental Mitigation	\$3,900,000
Total Project Cost	\$ 69,300,000

Final design will incorporate additional detailed pay items and additional design evolution changes. These may include, but are not limited to:

- Wind Cone relocation
- Duct banks and pullcan plazas
- Non-airfield lighting and security
- Earthwork related pay items.

A minor items cost has been included for each category to account for these additional items and design evolution during final design. To account for the phasing of these extensive projects, a phasing item has been included for the runway and taxiway portions of the project. This cost item may include contractor safety compliance plans, contractor coordination with airport operations, and general airfield phasing.

The Engineer's Opinion of Probable Construction Costs is included in Appendix C of this report.



IX. DESIGN REFERENCES

The following FAA Advisory Circulars were referenced and utilized during this preliminary design effort:

- FAA AC 150/5300-13A, Airport Design
- 150/5320-5C, Surface Drainage Design
- 150/5320-6E, Airport Pavement Design and Evaluation
- 150/5340-1K, Standards for Airport Markings
- 150/5340-18F, Standards for Airport Sign Systems
- 150/5340-30G, Design and Installation Details for Airport Visual Aids
- 150/5345-44J, Specifications for Taxiway and Runway Signs
- 150/5370-2F, Operational Safety on Airports During Construction
- 150/5370-10F, Standards for Specifying Construction of Airports
- 150/5370-2F, Operational Safety on Airports During Construction

The following other publications were referenced and utilized during this preliminary design effort:

- Urban Drainage Design Manual (Federal Highways Administration)
- Highway Drainage Manual (Maryland DOT, State Highways)
- Maryland Stormwater Design Manual (Maryland Dept. of the Environment)
- Carroll County Manual for Roads and Storm Drains
- Carroll County Code



APPENDIX A

ACRONYMS

Acronyms:

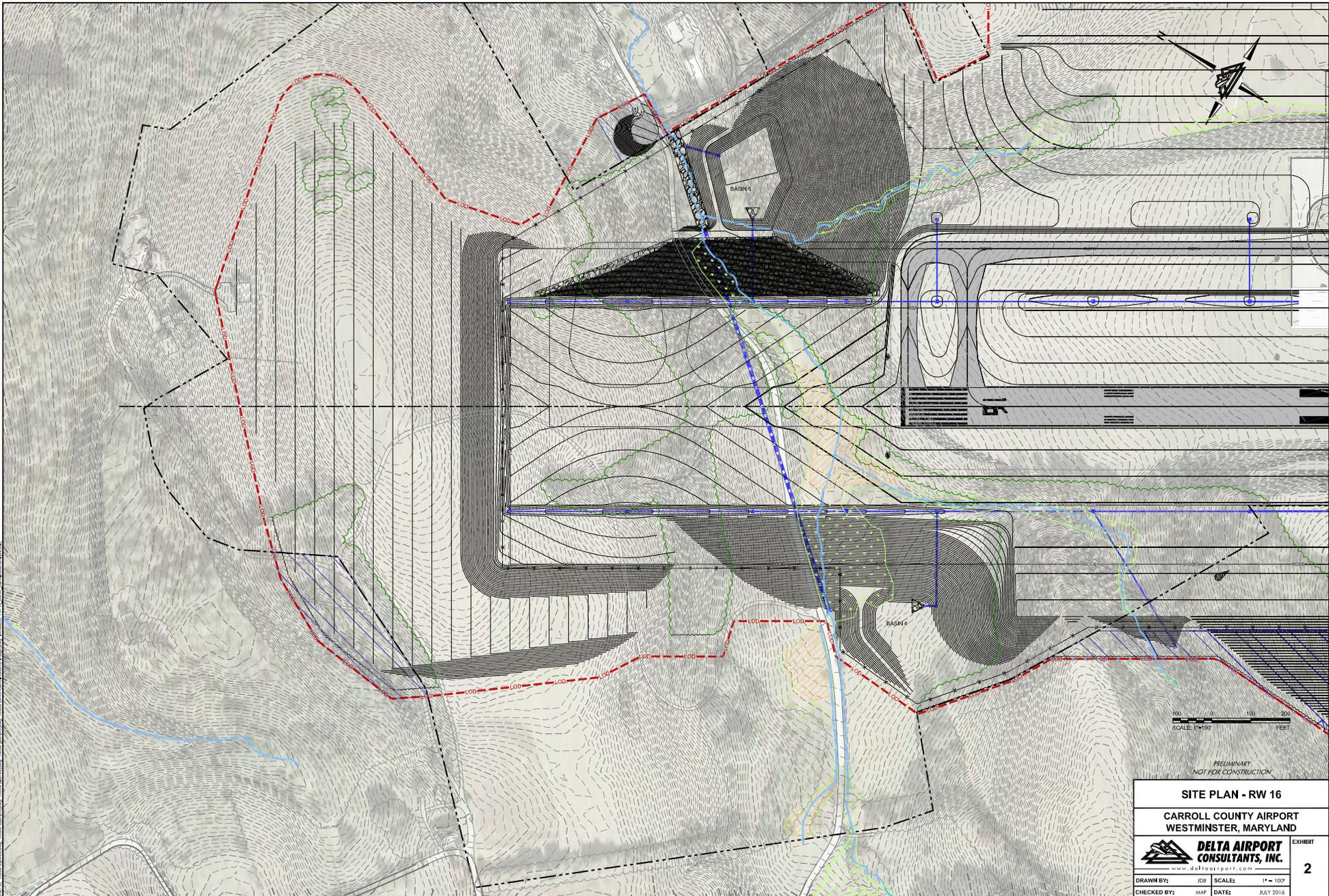
ACIP - Airport Capital Improvement Plan
ALP - Airport Layout Plan
APE - Area of Potential Effect
BMP - Best Management Practices
CIP - Capital Improvement Plan
CZM - Coastal Zone Management
DNL - Day Night Average Sound Level
DOT- Department of Transportation
EA - Environmental Assessment
EDDA - Environmental Due Diligence Audit
EDMS - Emissions and Dispersion Modeling System
EPA - Environmental Protection Agency
ESA - Endangered Species Act
E&SC - Erosion & Sediment Control
ESD - Environmental Site Design
FAA - Federal Aviation Administration
FEMA- Federal Emergency Management Agency
FIRM - Flood Insurance Rate Map
FPPA - Farmland Protection Policy Act
INM - Integrated Noise Model
JD - Jurisdictional Determination
MDE - Maryland Department of the Environment
MPU - Master Plan Update
MALSR - Medium-Intensity Approach Lighting System with Runway Alignment Indicator Lights
NEPA - National Environmental Policy Act
NPDES - National Pollutant Discharge Elimination System
PAPI - Precision Approach Path Indicator
PER - Preliminary Engineering Report
RSA - Runway Safety Area
SHPO - State Historic Preservation Office(r)
Supplemental EA – Supplemental Environmental Assessment
SWM - Stormwater Management
URARPAPA - Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970
USACE- United States Army Corps of Engineers
USDA-NCRS - U.S. Department of Agriculture- Natural Resource Conservation Service
USFWS – U.S. Fish and Wildlife Service

APPENDIX B

EXHIBITS

- Exhibit 1 - *Proposed Development Project*
- Exhibit 2 - *Site Plan – RW 16 Option A*
- Exhibit 3 - *Site Plan – Mid Field*
- Exhibit 4 - *Site Plan – RW 34*
- Exhibit 5 - *Site Plan – Corporate Hangar Site*
- Exhibit 6 - *Approximate Wetlands and Stream Impacts*
- Exhibit 7 - *Preliminary Project Profiles*

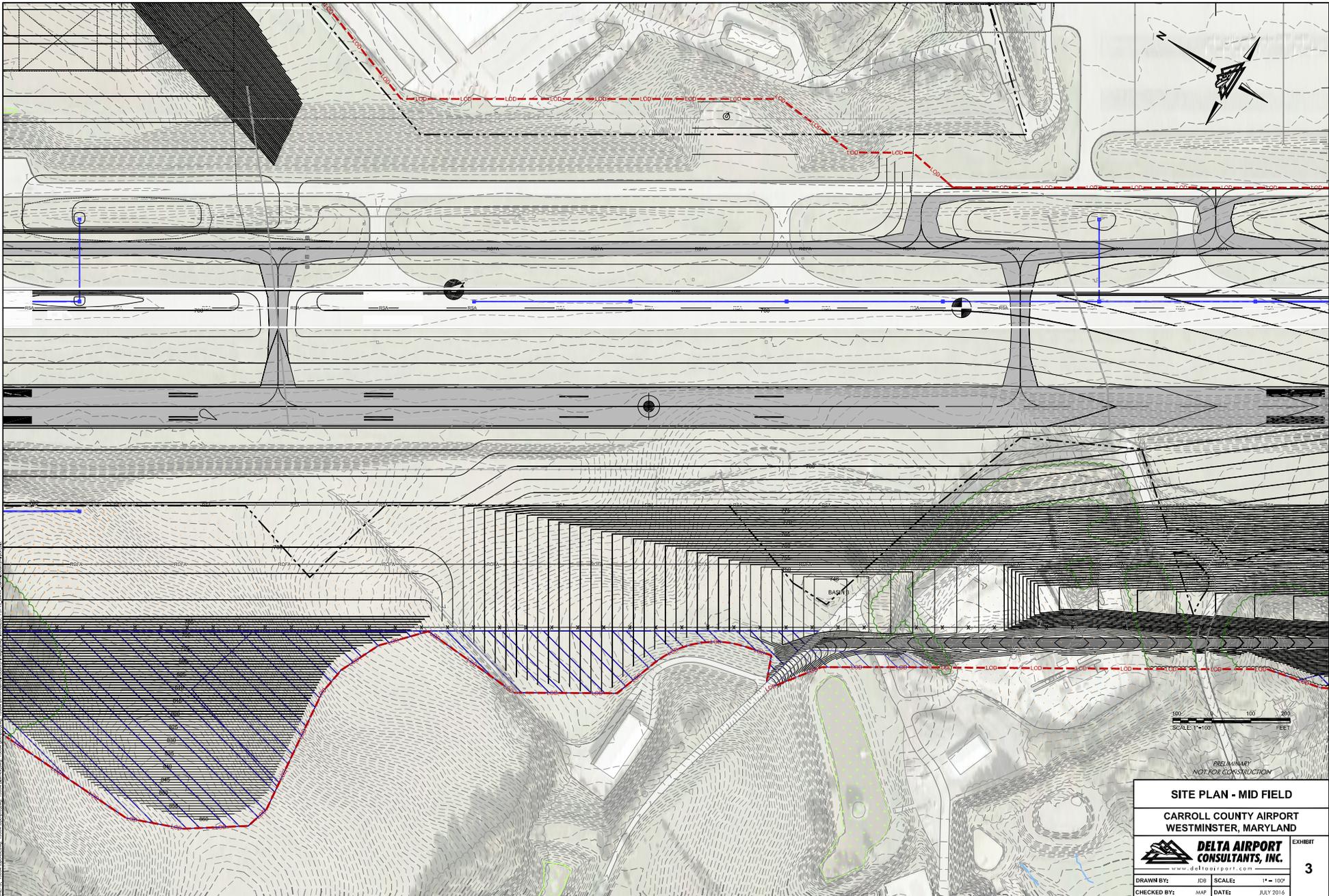
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SCALE: 1"=100' FEET

PRELIMINARY
NOT FOR CONSTRUCTION

SITE PLAN - RW 16			
CARROLL COUNTY AIRPORT WESTMINSTER, MARYLAND			
 DELTA AIRPORT CONSULTANTS, INC. www.deltaairport.com			EXHIBIT 2
DRAWN BY:	JDS	SCALE:	1" = 100'
CHECKED BY:	MAF	DATE:	JULY 2016



DRAWING: 15044-1-Project: Carroll County Airport, LAYOUTS
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SITE PLAN - MID FIELD

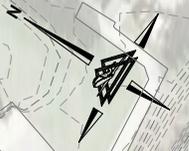
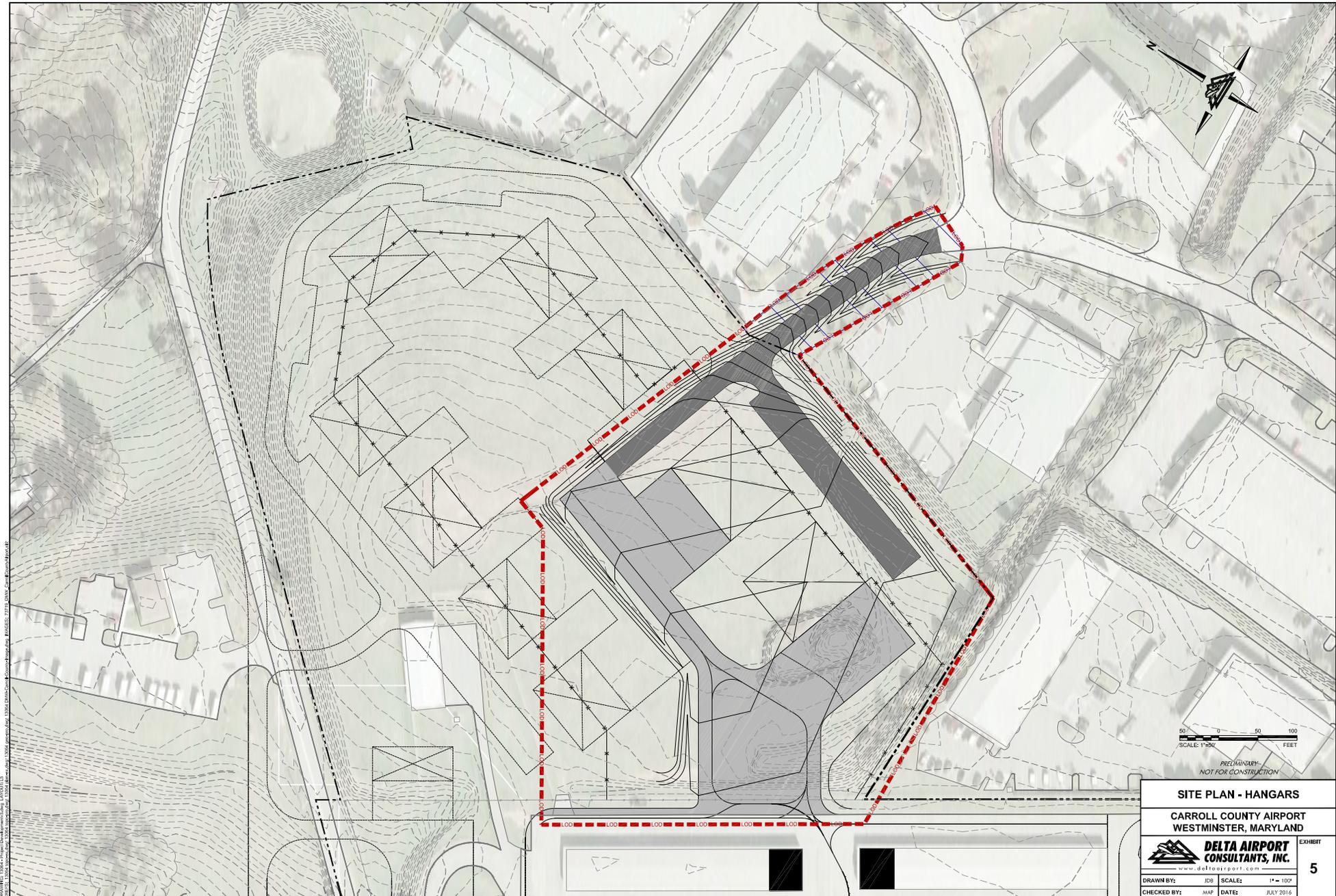
**CARROLL COUNTY AIRPORT
WESTMINSTER, MARYLAND**



**DELTA AIRPORT
CONSULTANTS, INC.**
www.deltairport.com

EXHIBIT
3

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CHECKED BY:	MAP:	DATE:	JULY 2016



PRELIMINARY
NOT FOR CONSTRUCTION

SITE PLAN - HANGARS

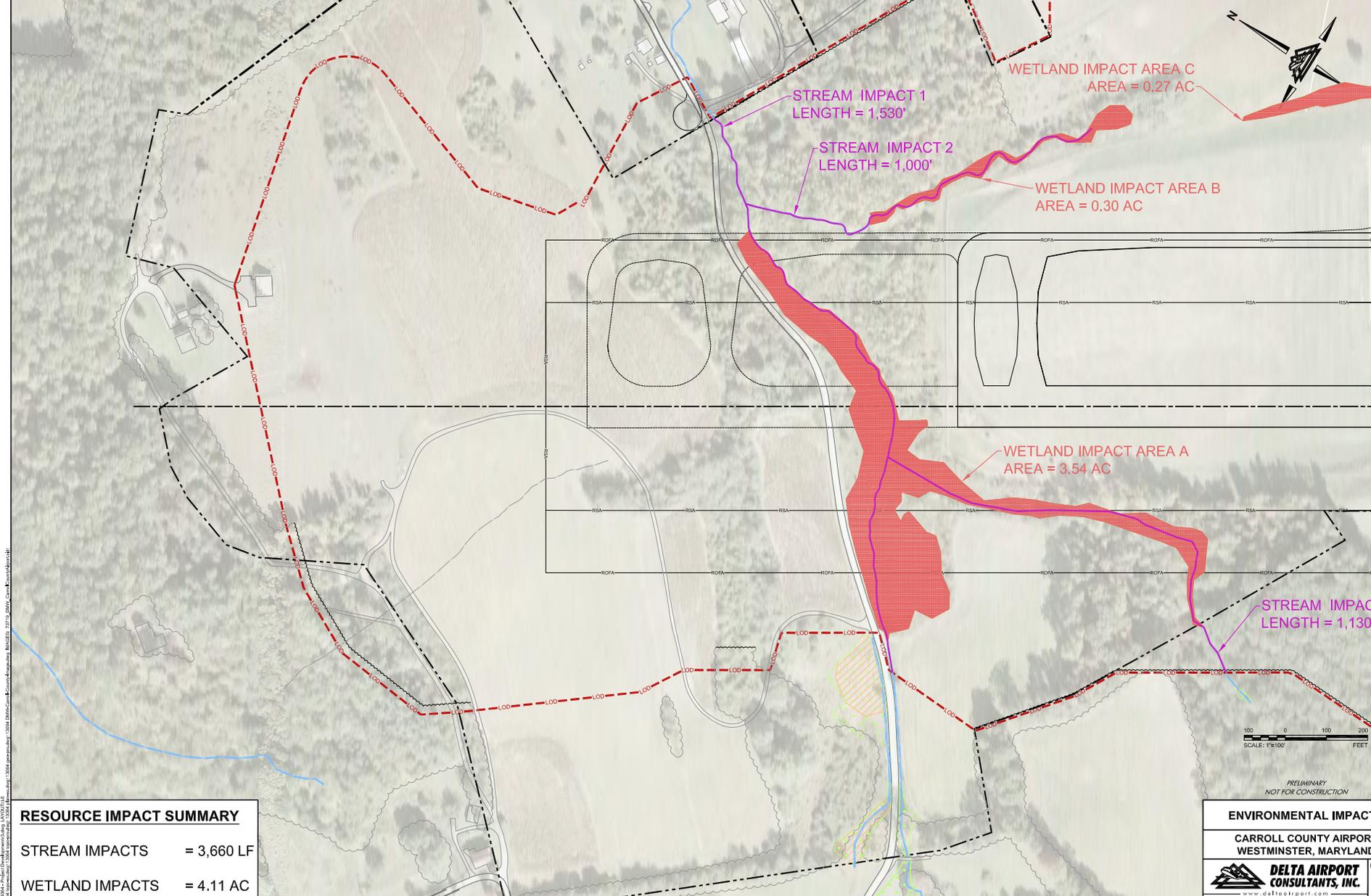
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WESTMINSTER, MARYLAND**



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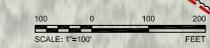
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 CHECKED BY: MAP
 DATE: JULY 2016



DRAWING: 1004 - Project Development/Utility - WVDOT/US
 CLIENT: 1004 - Project Development/Utility - WVDOT/US
 DATE: 10/04/2016
 PROJECT: 1004 - Project Development/Utility - WVDOT/US
 DRAWING: 1004 - Project Development/Utility - WVDOT/US
 CLIENT: 1004 - Project Development/Utility - WVDOT/US
 DATE: 10/04/2016
 PROJECT: 1004 - Project Development/Utility - WVDOT/US

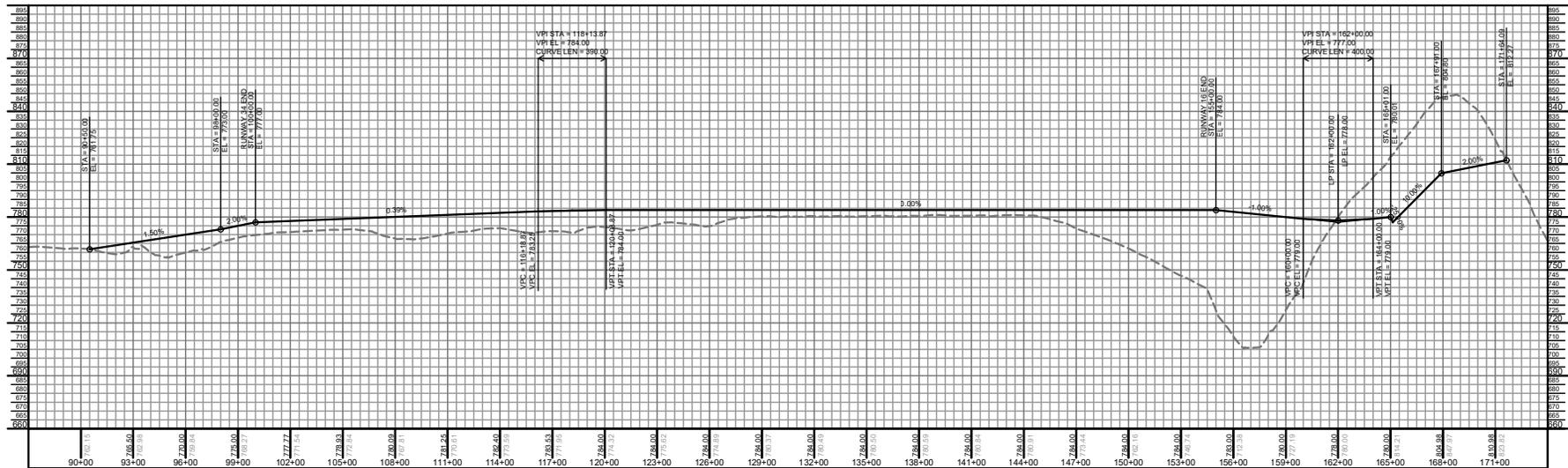
RESOURCE IMPACT SUMMARY

STREAM IMPACTS = 3,660 LF
 WETLAND IMPACTS = 4.11 AC

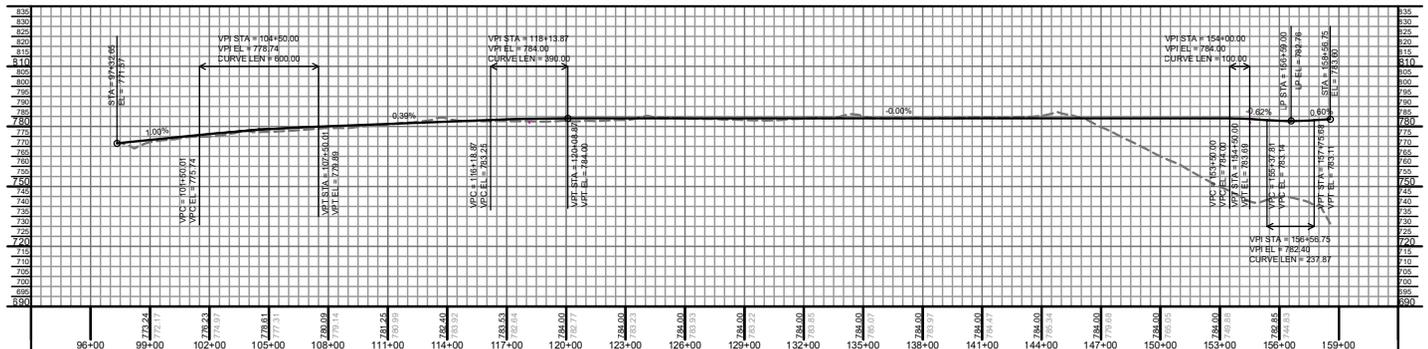


PRELIMINARY
NOT FOR CONSTRUCTION

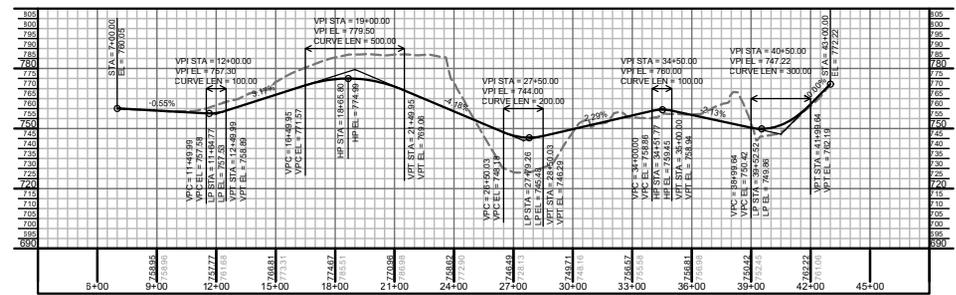
ENVIRONMENTAL IMPACTS			
CARROLL COUNTY AIRPORT WESTMINSTER, MARYLAND			
 DELTA AIRPORT CONSULTANTS, INC. <small>www.deltairport.com</small>			EXHIBIT 6
DRAWN BY:	JOB:	SCALE:	1" = 300'
CHECKED BY:	MAP:	DATE:	JULY 2016



RUNWAY 16-34



TAXIWAY



MEADOW BRANCH ROAD

PRELIMINARY
NOT FOR CONSTRUCTION

PROJECT PROFILES
CARROLL COUNTY AIRPORT
WESTMINSTER, MARYLAND

DELTA AIRPORT
CONSULTANTS, INC.
www.deltairport.com

EXHIBIT
7

DRAWN BY: JDS SCALE: 1"=300 H, 1"=30 V
CHECKED BY: MAP DATE: JULY 2016

20160720_10:51: Project Profiles.dwg LAYOUT: LT
 20160720_10:51: JDS

APPENDIX C

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

OPINION OF PROBABLE CONSTRUCTION COST
RELOCATE RUNWAY 16-34

CARROLL COUNTY REGIONAL AIRPORT
 Westminster, Maryland

AIP Project No. 3-24-0028-029-2015
 MAA Project No. PENDING
 Delta Project No. 13064

Supplemental Environmental Assessment
 January 20, 2017

RUNWAY RELOCATION					
Item	Description	Units	Quantity	Unit Price	Amount
1	Mobilization	LS	1	\$ 5,000,000	\$ 5,000,000
2	Pavement Removal	SY	70,000	\$ 10	\$ 700,000
3	Miscellaneous Demolition	LS	1	\$ 150,000	\$ 150,000
4	Clearing and Grubbing	AC	28	\$ 7,500	\$ 210,000
5	Earthwork	CY	1,800,000	\$ 6	\$ 10,800,000
6	Crushed Aggregate Base Course	CY	15,000	\$ 40	\$ 600,000
7	Erosion and Sediment Control	LS	1	\$ 1,000,000	\$ 1,000,000
8	Cement Treated Base	SY	50,000	\$ 35	\$ 1,750,000
9	Bituminous Surface Course	TN	17,000	\$ 135	\$ 2,295,000
10	Temporary Pavement Marking	SF	150,000	\$ 1	\$ 150,000
11	Permanent Pavement Marking	SF	150,000	\$ 2	\$ 300,000
12	Pavement Grooving	SY	55,000	\$ 2	\$ 110,000
13	Security Fence	LF	10,000	\$ 25	\$ 250,000
14	Security Gates	EA	4	\$ 10,000	\$ 40,000
15	Drainage Structures	EA	40	\$ 10,000	\$ 400,000
16	RCP, CLASS V (Size < 30")	LF	4,000	\$ 200	\$ 800,000
17	RCP, CLASS V (Size ≥ 30")	LF	600	\$ 300	\$ 180,000
18	RCP, Special Design, 96"	LF	1,200	\$ 700	\$ 840,000
19	6" Underdrain	LF	15,000	\$ 20	\$ 300,000
20	Stormwater Quality Facilities	SY	6,700	\$ 150	\$ 1,005,000
21	Seeding and Mulching	AC	200	\$ 2,500	\$ 500,000
22	#6 Bare Copper Counterpoise	LF	20,000	\$ 3	\$ 60,000
23	#8 5kV, FAA Type "C" Cable	LF	30,000	\$ 3	\$ 90,000
24	2" PVC Conduit	LF	14,000	\$ 10	\$ 140,000
25	Base Mounted HIRL	EA	72	\$ 2,500	\$ 180,000
26	Stake Mounted MITL (Temporary)	EA	30	\$ 2,000	\$ 60,000
27	REIL System	EA	4	\$ 7,500	\$ 30,000
28	PAPI System (4 Box)	EA	2	\$ 75,000	\$ 150,000
29	Riprap	SY	12,000	\$ 80	\$ 960,000
30	Project Phasing and CSPP		1	\$ 800,000	\$ 800,000
31	Minor Items (5%)		1	\$ 1,500,000	\$ 1,500,000
Estimated Construction Cost:					\$ 31,350,000
Estimated Engineering Cost:					\$ 4,650,000
Total:					\$ 36,000,000

OPINION OF PROBABLE CONSTRUCTION COST
RELOCATE RUNWAY 16-34

CARROLL COUNTY REGIONAL AIRPORT
 Westminster, Maryland

AIP Project No. 3-24-0028-029-2015
 MAA Project No. PENDING
 Delta Project No. 13064

Supplemental Environmental Assessment
 January 20, 2017

RELOCATE TAXIWAY					
Item	Description	Units	Quantity	Unit Price	Amount
1	Mobilization	LS	1	\$ 1,255,000	\$ 1,255,000
2	Pavement Demolition	SY	35,000	\$ 10	\$ 350,000
3	Miscellaneous Demolition	LS	1	\$ 150,000	\$ 150,000
4	Earthwork	CY	800,000	\$ 6	\$ 4,800,000
5	Crushed Aggregate Base Course	CY	12,250	\$ 40	\$ 490,000
6	Erosion and Sediment Control	LS	1	\$ 600,000	\$ 600,000
7	Cement Treated Base	SY	40,000	\$ 35	\$ 1,400,000
8	Bituminous Surface Course	TN	12,000	\$ 135	\$ 1,620,000
9	Drainage Structures	EA	26	\$ 10,000	\$ 260,000
10	RCP, CLASS V (Size < 30")	LF	5,000	\$ 200	\$ 1,000,000
11	Stormwater Quality Facilities	SY	6,100	\$ 150	\$ 915,000
12	6" Underdrain	LF	8,400	\$ 20	\$ 168,000
13	#6 Bare Copper Counterpoise	LF	35,000	\$ 3	\$ 105,000
14	#8 5kV, FAA Type "C" Cable	LF	45,000	\$ 3	\$ 135,000
15	2" PVC Conduit	LF	25,000	\$ 10	\$ 250,000
16	Base Mounted MITL	EA	162	\$ 2,500	\$ 405,000
17	Seeding and Mulching	AC	70	\$ 2,500	\$ 175,000
18	Riprap	SY	500	\$ 80	\$ 40,000
19	Project Phasing and CSPP		1	\$ 400,000	\$ 400,000
20	Minor Items (5%)		1	\$ 700,000	\$ 700,000
				Estimated Construction Cost:	\$ 15,218,000
				Estimated Engineering Cost:	\$ 2,282,000
				Total:	\$ 17,500,000

OPINION OF PROBABLE CONSTRUCTION COST
RELOCATE RUNWAY 16-34

CARROLL COUNTY REGIONAL AIRPORT
 Westminster, Maryland

AIP Project No. 3-24-0028-029-2015
 MAA Project No. PENDING
 Delta Project No. 13064

Supplemental Environmental Assessment
 January 20, 2017

RELOCATE MEADOW BRANCH ROAD					
Item	Description	Units	Quantity	Unit Price	Amount
1	Mobilization	LS	1	\$ 200,000	\$ 200,000
2	Pavement Removal	SY	9,300	\$ 10	\$ 93,000
3	Miscellaneous Demolition	LS	1	\$ 100,000	\$ 100,000
4	Clearing and Grubbing	AC	6	\$ 7,500	\$ 45,000
5	Earthwork	CY	200,000	\$ 6	\$ 1,200,000
6	Erosion and Sediment Control	LS	1	\$ 250,000	\$ 250,000
7	Drainage Structures	EA	6	\$ 10,000	\$ 60,000
8	RCP, CLASS V (Size < 30")	LF	300	\$ 200	\$ 60,000
9	Stormwater Quality Facilities	SY	700	\$ 150	\$ 105,000
10	Roadway Asphalt Surface Course	TN	1,250	\$ 120	\$ 150,000
11	Roadway Asphalt Base Course	TN	1,850	\$ 100	\$ 185,000
12	Roadway Crushed Aggregate Base	TN	3,400	\$ 60	\$ 204,000
13	Roadway Signs	EA	20	\$ 900	\$ 18,000
14	Seeding and Mulching	AC	24	\$ 2,500	\$ 60,000
15	Minor Items (5%)		1	\$ 140,000	\$ 140,000
				Estimated Construction Cost:	\$ 2,870,000
				Estimated Engineering Cost:	\$ 430,000
				Total:	\$ 3,300,000

OPINION OF PROBABLE CONSTRUCTION COST
RELOCATE RUNWAY 16-34

CARROLL COUNTY REGIONAL AIRPORT
 Westminster, Maryland

AIP Project No. 3-24-0028-029-2015
 MAA Project No. PENDING
 Delta Project No. 13064

Supplemental Environmental Assessment
 January 20, 2017

CORPORATE HANGAR SITE					
Item	Description	Units	Quantity	Unit Price	Amount
1	Mobilization	LS	1	\$ 200,000	\$ 200,000
2	Miscellaneous Demolition	LS	1	\$ 25,000	\$ 25,000
3	T-Hagar Demolition/Modification	EA	4	\$ 25,000	\$ 100,000
4	Earthwork	CY	2,200	\$ 25	\$ 55,000
5	Crushed Aggregate Base Course	CY	1,800	\$ 40	\$ 72,000
6	Erosion and Sediment Control	LS	1	\$ 75,000	\$ 75,000
7	Cement Treated Base	SY	7,000	\$ 35	\$ 245,000
8	Bituminous Surface Course	TN	2,000	\$ 135	\$ 270,000
9	Drainage Structures	EA	6	\$ 10,000	\$ 60,000
10	RCP, CLASS V (Size < 30")	LF	300	\$ 200	\$ 60,000
11	Stormwater Quality Facilities	SY	200	\$ 150	\$ 30,000
12	Security Fence	LF	2,100	\$ 25	\$ 52,500
13	Security Gates - Automatic Vehicle	EA	1	\$ 20,000	\$ 20,000
14	Roadway Asphalt Surface Course	TN	400	\$ 120	\$ 48,000
15	Roadway Asphalt Base Course	TN	600	\$ 100	\$ 60,000
16	Roadway Crushed Aggregate Base	TN	1,000	\$ 60	\$ 60,000
17	Seeding and Mulching	AC	9	\$ 2,500	\$ 22,500
18	Minor Items (5%)		1	\$ 70,000	\$ 70,000
				Estimated Construction Cost:	\$ 1,525,000
				Estimated Engineering Cost:	\$ 225,000
				Total:	\$ 1,750,000

OPINION OF PROBABLE CONSTRUCTION COST
RELOCATE RUNWAY 16-34

CARROLL COUNTY REGIONAL AIRPORT
Westminster, Maryland

AIP Project No. 3-24-0028-029-2015
MAA Project No. PENDING
Delta Project No. 13064

Supplemental Environmental Assessment
January 20, 2017

RUNWAY PROGRAM SUMMARY

Relocate Runway	Use:	\$	36,000,000
Relocate Taxiway	Use:	\$	17,500,000
Relocate Meadow Branch Road	Use:	\$	3,300,000
Corporate Hangar Site	Use:	\$	1,800,000
MALSR System	Use:	\$	1,500,000
AWOS	Use:	\$	300,000
Land Acquisition	Use:	\$	5,000,000
Environmental Mitigation	Use:	\$	3,900,000

FINAL TOTAL \$69,300,000

APPENDIX D
PAVEMENT DESIGN

FAARFIELD - Airport Pavement Design (V 1.305, 9/28/10 64-bit)

Section P-401-3 in Job 13064.
Working directory is C:\Program Files (x86)\FAA\FAARFIELD\

The structure is New Flexible. Asphalt CDF was not computed.
Design Life = 20 years.
A design for this section was completed on 01/20/17 at 08:22:56.

Pavement Structure Information by Layer, Top First

No.	Type	Thickness in	Modulus psi	Poisson's Ratio	Strength R,psi
1	P-401/ P-403 HMA Surface	4.00	200,000	0.35	0
2	P-304 CTB	6.00	500,000	0.20	0
3	P-154 UnCr Ag	5.81	9,594	0.35	0
4	Subgrade	0.00	4,500	0.35	0

Total thickness to the top of the subgrade = 15.81 in

Airplane Information

No.	Name	Gross Wt. lbs	Annual Departures	% Annual Growth
1	SuperKingAir-B200	12,590	5,510	1.76
2	Stationair-206	3,612	29,109	0.97
3	Dual Whl-50	50,000	90	0.00
4	Challenger-CL-604	48,200	226	6.70
5	Gulfstream-G-IV	75,000	10	6.70
6	Gulfstream-G-III	70,200	10	6.70
7	Citation-X	36,000	100	6.70
8	Falcon-900	45,500	100	6.70
9	Falcon-2000	35,000	100	6.70
10	Hawker-800XP	28,120	100	6.70

Additional Airplane Information

Subgrade CDF

No.	Name	CDF Contribution	CDF Max for Airplane	P/C Ratio
1	SuperKingAir-B200	0.00	0.00	2.48
2	Stationair-206	0.00	0.00	3.72
3	Dual Whl-50	0.02	0.03	1.80
4	Challenger-CL-604	0.16	0.18	2.00
5	Gulfstream-G-IV	0.46	0.46	2.04
6	Gulfstream-G-III	0.27	0.27	2.04
7	Citation-X	0.00	0.01	2.37
8	Falcon-900	0.09	0.09	2.17
9	Falcon-2000	0.00	0.00	2.28
10	Hawker-800XP	0.00	0.00	2.29

Dual Whl-50 is representing 90 Departures for Military Category

USE:

- 4" P-401
- 6" P-304
- 6" P-154

APPENDIX E
USDA CORRESPONDENCE

John D. Borgie

From: Sullivan, Kevin - APHIS <Kevin.Sullivan@aphis.usda.gov>
Sent: Tuesday, January 17, 2017 2:22 PM
To: John D. Borgie
Cc: Healey, Ronald S - APHIS
Subject: RE: Carroll County Airport - Wildlife regarding Stormwater Facilities

John,

I have reviewed the plans and proposed locations of the Stormwater Facilities at the Carroll County Airport. At this preliminary point we would not have concerns if the steps listed below (1-5) are met and the any open water in temporary sediment ponds is drained within 48 hours as well. Also we would recommend that the Airport Personnel monitor the ponds during rain/snow melt events to make sure wildlife is not utilizing any open water.

If you have any questions or need more information please do not hesitate to contact me.

I cc' Scott Healey in my office on this in case he needs to be contacted or conduct a site visit.

Thank you

Kevin

Kevin J Sullivan
State Director MD/DE/DC
USDA, APHIS Wildlife Services
Certified Wildlife Biologist
Ph 410 349-8055
Fax 410 349-8258

From: John D. Borgie [mailto:JBorgie@deltaairport.com]
Sent: Monday, January 09, 2017 5:14 PM
To: Sullivan, Kevin - APHIS <Kevin.Sullivan@aphis.usda.gov>
Subject: Carroll County Airport - Wildlife regarding Stormwater Facilities

Mr. Sullivan,

I worked with Terry Page on a project for the St. Mary's County Regional Airport, that you assisted with about 18 months ago. I have a second project that the FAA is asking for us to get feedback from the USDA. I'm hopeful you can offer some help.

I am working on a project for the Carroll County Airport in Maryland. The project consists of relocating the existing runway and shifting airport infrastructure to improve aircraft safety. As part of the project, 5 new detention basins are proposed for long term stormwater control and temporary sediment control. Additionally, to meet the Maryland Department of the Environment's water quality standards, BMPs such as grass swales, filters, and disconnection of impervious surfaces are conceptually proposed. I should note that at this stage detailed design of these facilities are not planned. The final design for the project is still potentially a couple of years away.

Attached are four exhibits of our preliminary grading and layout. The five basins are shown on exhibit 1 for overview, and on the three following grading plans.

As part of our Environmental Assessment, the FAA has requested that we coordinate guidance from the USDA to prevent wildlife hazards. All proposed facilities are within 10,000 feet of the runway.

I'd like to lay out our standard design concepts for these basins and BMPs for your critique.

1. All drainage facilities are proposed to dewater within 48 hours.
2. Bioretention and filtering practices are proposed to include underdrain systems to dewater.
3. Plantings, if required for stormwater review, are proposed to be based on the MAA "Approved Plant List for BWI Airport", or reviewed in final design by the USDA.
4. All design will be in accordance with the MDE manuals for Stormwater Management and Erosion and Sediment Control.
5. Temporary sediment basins and sediment traps will be designed to dewater completely using approved methods.

Any input or review of our preliminary plan will be helpful. I am available tomorrow in our office to discuss further if you have time. Please give me a call at (804) 275-8301 at your convenience.

Thank you,

John D. Borgie, PE
Lead Engineer
DELTA AIRPORT CONSULTANTS, INC.
9711 FARRAR COURT, SUITE 100, RICHMOND, VIRGINIA, 23236
B. 804.275.8301 C. 540.843.3653 | WWW.DELTAIRPORT.COM

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