



To: El Paso County
Planning & Development

From: Brian Horan, PE, PTOE
Cooper Riddell-Brosig
Galloway

Date: May 27, 2026
Revised: July 9, 2026

Re: **The Markets at Bent Grass
Roundabout Analysis Memorandum**



INTRODUCTION

The intent of this memorandum is to respond to a comment provided by El Paso County on The Markets at Bent Grass Master Traffic Impact Study (MTIS) completed in March 2026 by SM Rocha. The comment provided by El Paso County stated “provide roundabout parameters table and exhibits including fastest path speeds and differentials, dimensions, widths, view angles, etc. Discuss specific needs and examples with staff. Include design vehicle and WB-67 tracking exhibits.” The following memorandum will address this comment with a roundabout analysis provided herein.

BACKGROUND

This memorandum provides the results of a roundabout analysis performed in support of the MTIS for The Markets at Bent Grass. MTIS excerpts are provided in Attachment I. The proposed roundabout is located approximately 400 feet north of Woodmen Road along the future Switchgrass Drive. Figure 1 shows the location of this roundabout with a star. The site plan along with roundabout design exhibits are provided in Attachment II.

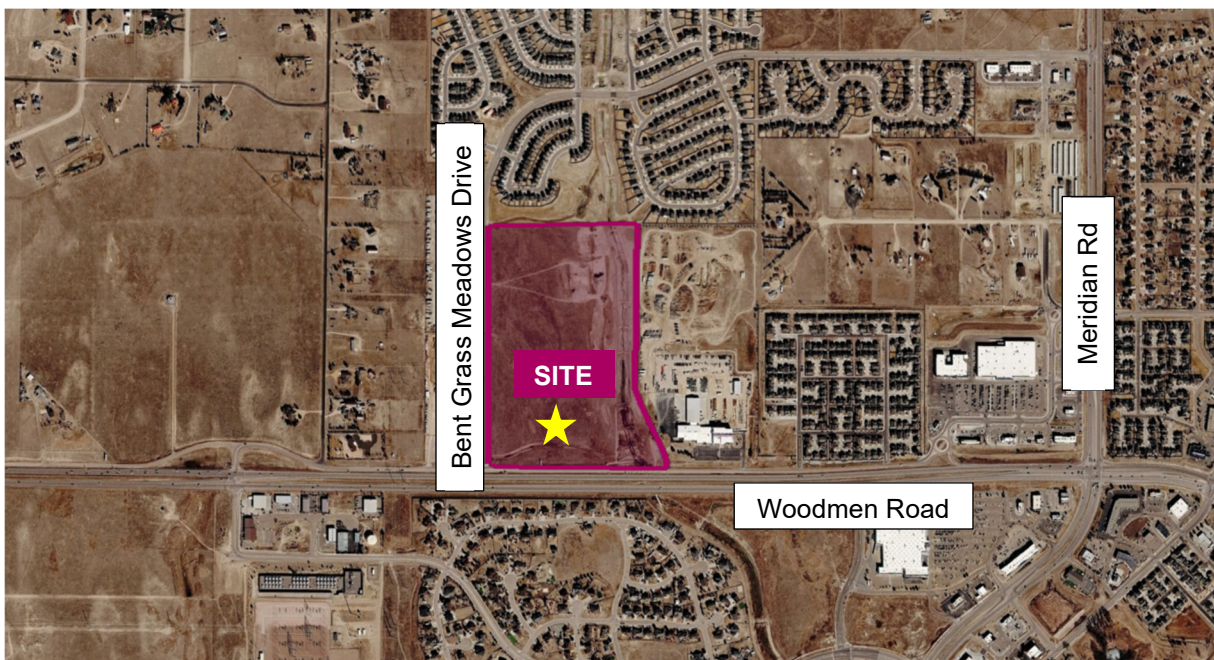


Figure 1 – Site Location

ROUNABOUT ANALYSIS

Roundabout operations have been confirmed via Sidra and can be seen in Table 1. Sidra results sheets have been provided in Attachment III. The roundabout parameters, fastest path diagrams, and vehicle tracking diagrams are provided in Attachment IV as requested. The roundabout has been evaluated using the WB-67 design vehicle to confirm adequate operations for heavy vehicles within this roundabout for all directions of travel.

Table 1
The Markets at Bent Grass Roundabout Analysis - El Paso County, CO
Total Future Intersection Level of Service Summary ⁽¹⁾

Intersection	Operating Condition	Street Name	Approach/ Movement	Total Future 2030		Total Future 2045	
				AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
1 Bent Grass Meadows Drive & Switchgrass Drive	ROUNABOUT	Bent Grass Meadows Drive	EBLTR	A [8.8]	B [12.0]	B [10.5]	A [6.8]
		Bent Grass Meadows Drive	WBLTR	A [7.3]	B [11.6]	A [8.3]	B [14.5]
		Switchgrass Drive	NBLT	A [4.9]	A [6.2]	A [5.2]	A [6.8]
		Switchgrass Drive	NBR	A [0.0]	A [0.0]	A [0.0]	A [0.1]
		Switchgrass Drive	SBLTR	A [6.0]	A [9.8]	A [6.6]	B [11.6]
		Overall	A [6.2]	A [7.9]	A [7.0]	A [7.5]	

Notes : (1) Numbers in brackets [] represent delay at unsignalized intersections in seconds per vehicle.

CONCLUSION

As shown in Table 1, the proposed intersection of Bent Grass Meadows Drive & Switchgrass Drive is expected to operate with acceptable overall level of service "A" during the 2030 and 2045 weekday AM and PM Peak hours. The proposed roundabout would accommodate the anticipated demand and operate adequately as designed.

We trust that the information contained herein satisfies the comment from El Paso County, CO. If you have any questions or need further information, please contact Brian Horan at BrianHoran@gallowayus.com or 303-770-8884.

The Markets at Bent Grass
El Paso County, CO

Attachment I

MTIS Excerpts

MASTER TRAFFIC IMPACT STUDY

For

The Markets at Bent Grass
El Paso County, Colorado
(EPC No.: CR-26-01, SP-26-02)

March 2026
Revised: May 2026

Prepared for:

Evergreen
2390 East Camelback Road, Suite 140
Phoenix, AZ 85016

Prepared by:



SM ROCHA, LLC

TRAFFIC & TRANSPORTATION ENGINEERING CONSULTANTS

8700 Turnpike Drive, Suite 240
Westminster, Colorado 80031
(303) 458-9798

6 South Tejon Street, Suite 618
Colorado Springs, Colorado 80903
(719) 203-6639

Project Manager/Engineer:
Mike Rocha, Principal
Brandon Wilson, PE

Engineer in Responsible Charge:
Fred Lantz, PE



25-022358

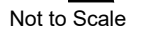


Not to Scale



Figure 1
SITE LOCATION

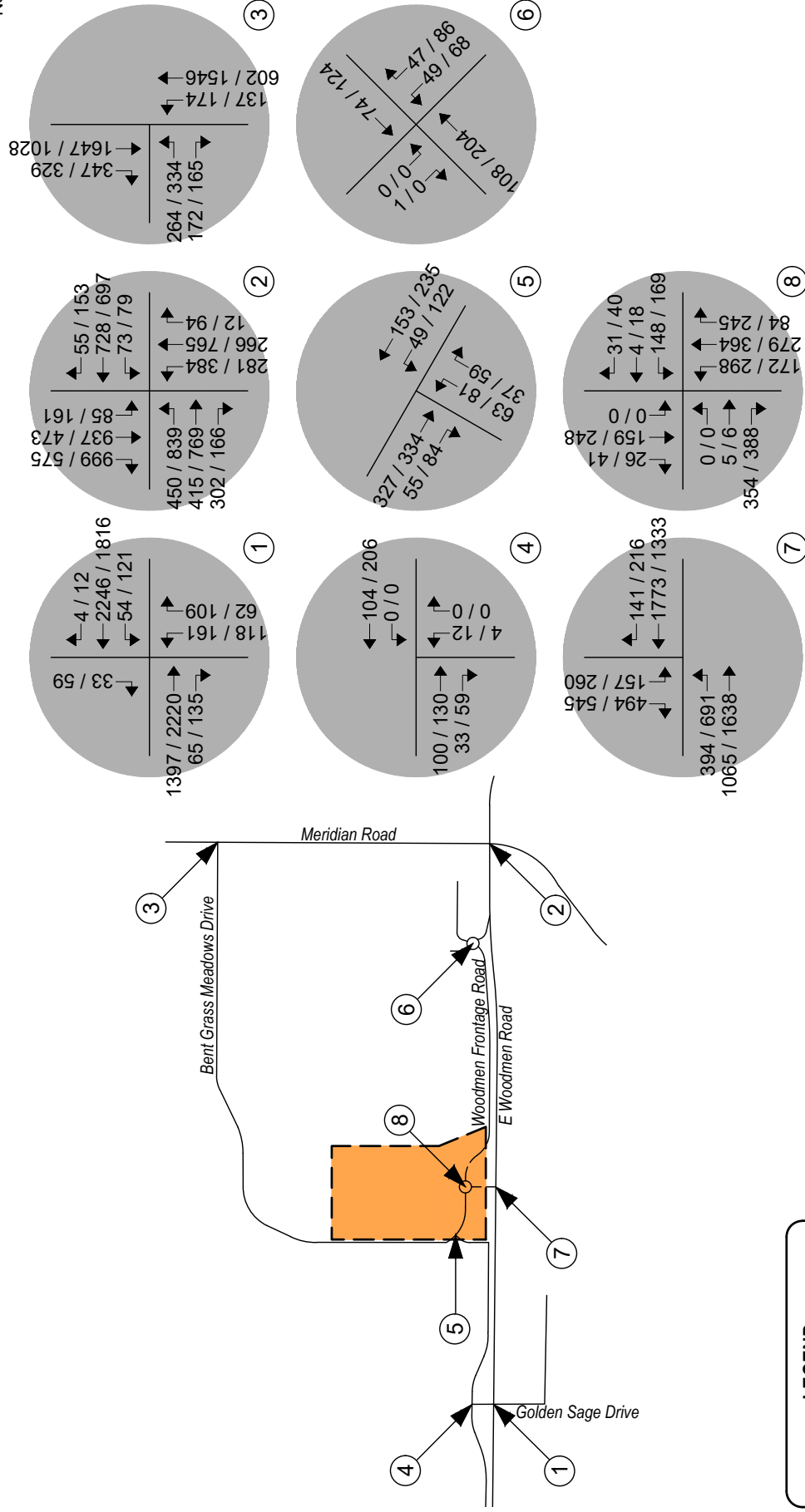




May 2026
Page 4



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LEGEND

- Study Intersection Volumes
- Development Site

Figure 7A
TOTAL TRAFFIC - YEAR 2030
Intersection Volumes
AM / PM Peak Hour

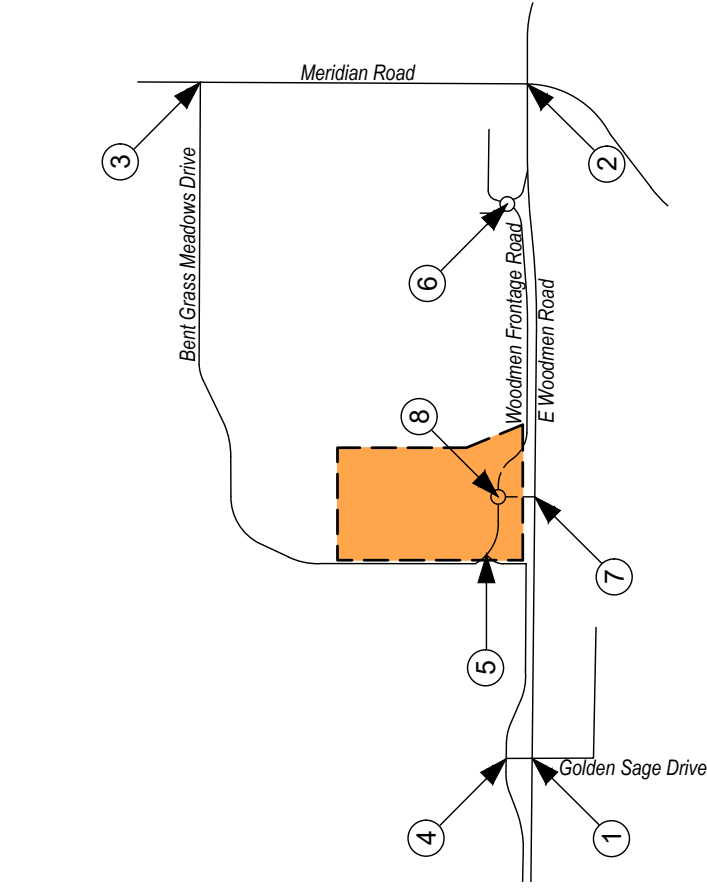
THE MARKETS AT BENT GRASS
Traffic Impact Study



SM ROCHA, LLC
Traffic & Transportation Engineering Consultants



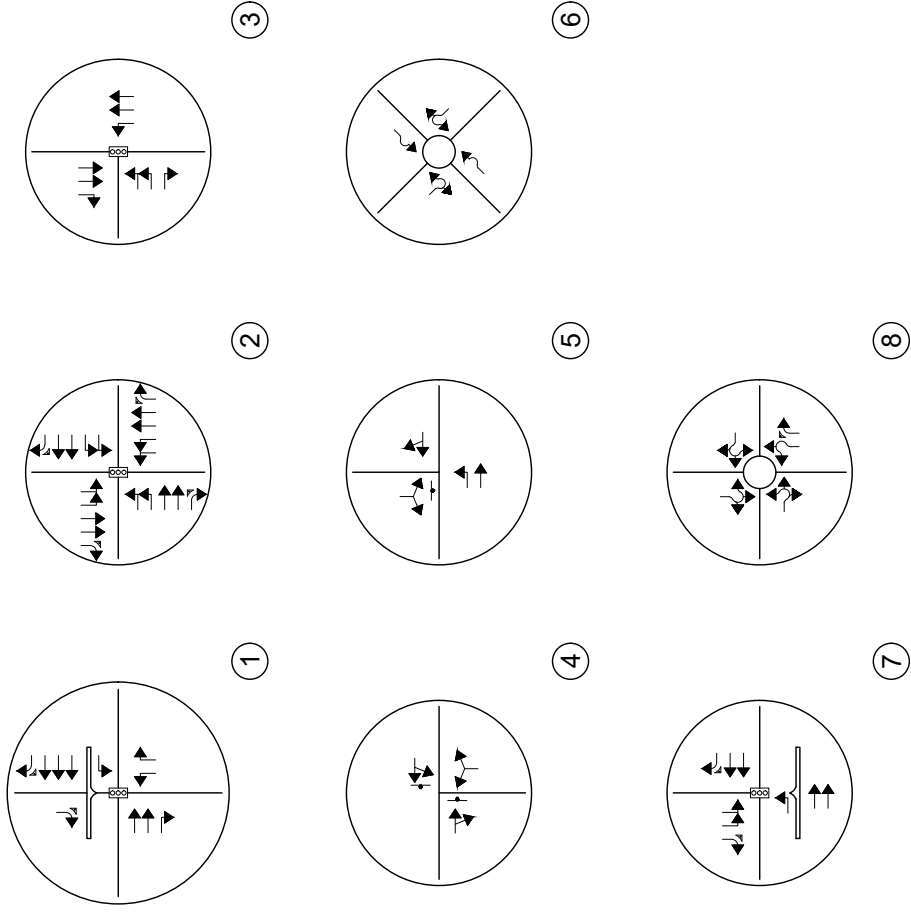
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LEGEND

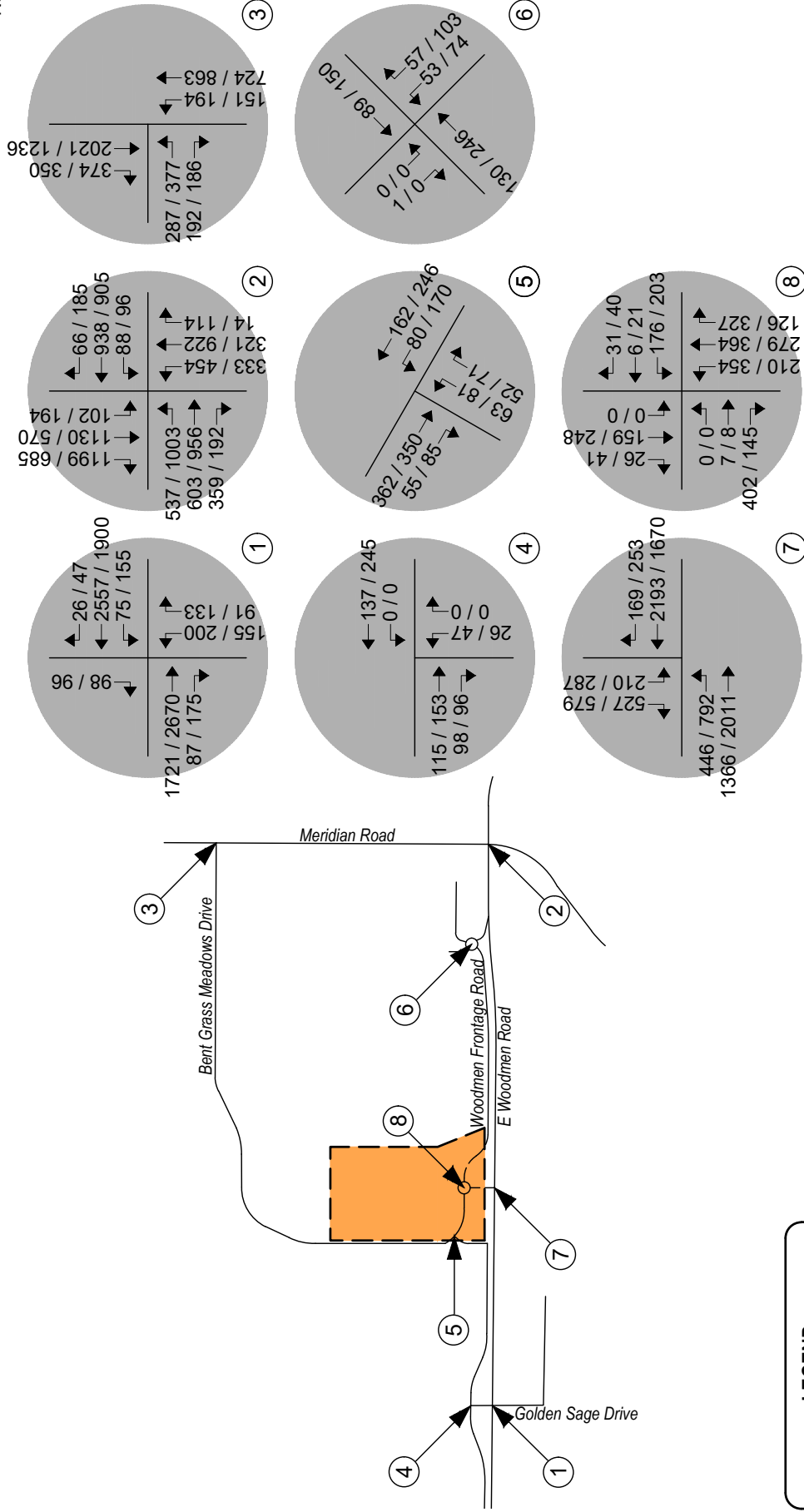
○ Study Intersection Lane Geometry

■ Development Site



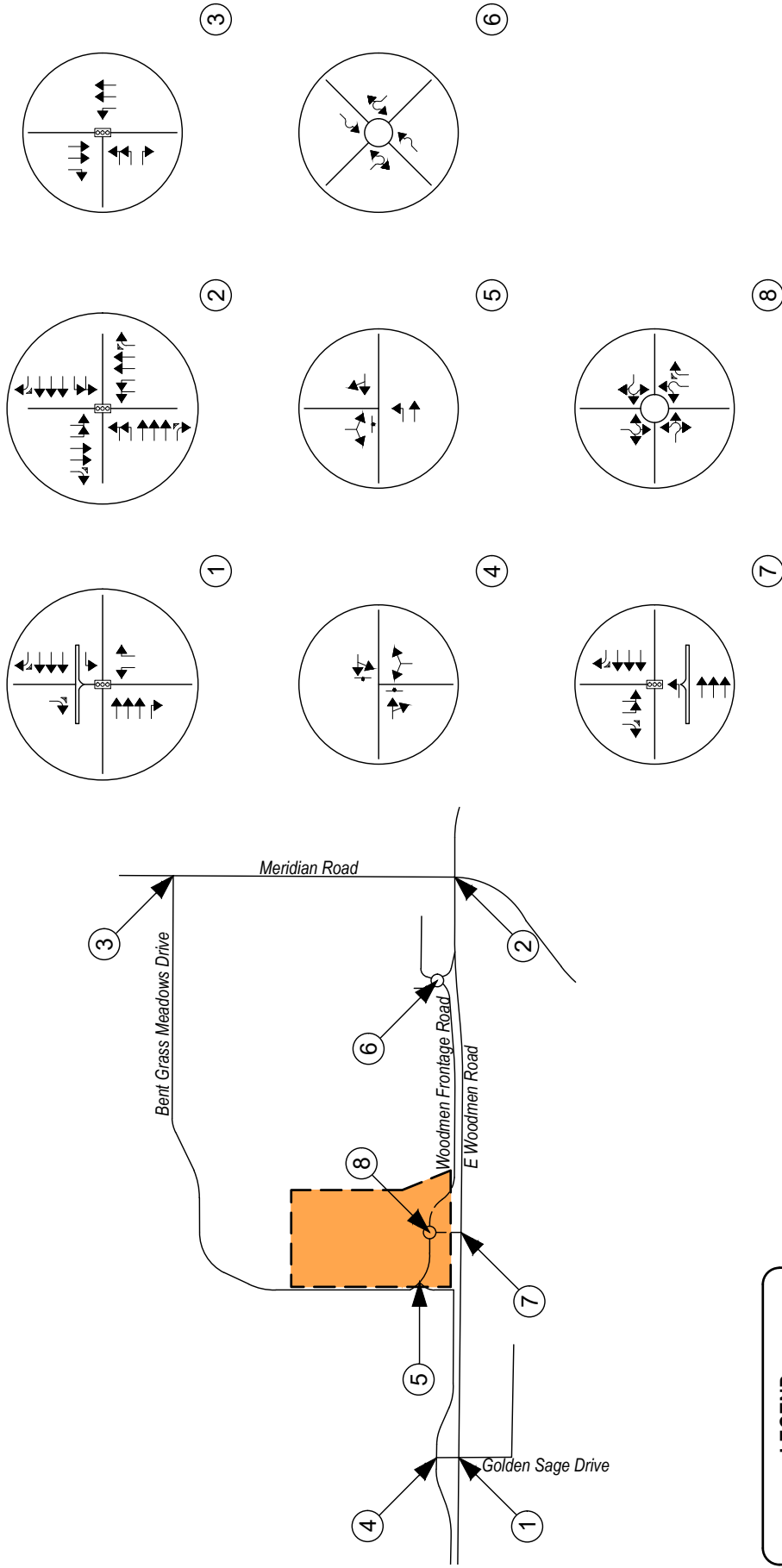


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LEGEND

- Study Intersection Volumes
- Development Site



LEGEND

- Study Intersection Lane Geometry
- Development Site

Attachment II

Site Plan & Roundabout Design Excerpts

THE MARKETS AT BENT GRASS

A PORTION OF THE SOUTHWEST QUARTER OF SECTION 1 TOWNSHIP 13 SOUTH,
RANGE 65 WEST OF THE 6TH PRINCIPAL MERIDIAN, EL PASO COUNTY, COLORADO

Galloway

1155 Kelly Johnson Blvd., Suite 305
Colorado Springs, CO 80920
719.900.7220
GallowayUS.com

Galloway & Company, LLC

Evergreen
Multi-family Retail Industrial



PARCEL AREA TABLE			
PARCEL	AREA (AC)	USE	OWNERSHIP & MAINTENANCE
LOT 1	11.89	COMMERCIAL DEVELOPMENT	LOT OWNER
LOT 2	10.33	COMMERCIAL DEVELOPMENT	LOT OWNER
LOT 3	1.29	COMMERCIAL DEVELOPMENT	LOT OWNER
LOT 4	1.45	COMMERCIAL DEVELOPMENT	LOT OWNER
LOT 5	0.94	COMMERCIAL DEVELOPMENT	LOT OWNER
LOT 6	0.86	COMMERCIAL DEVELOPMENT	LOT OWNER
LOT 7	0.89	COMMERCIAL DEVELOPMENT	LOT OWNER
LOT 8	1.26	COMMERCIAL DEVELOPMENT	LOT OWNER
LOT 9	1.10	COMMERCIAL DEVELOPMENT	LOT OWNER
LOT 10	0.78	COMMERCIAL DEVELOPMENT	LOT OWNER
LOT 11	0.72	COMMERCIAL DEVELOPMENT	LOT OWNER
LOT 12	2.46	COMMERCIAL DEVELOPMENT	LOT OWNER
LOT 13	1.71	COMMERCIAL DEVELOPMENT	LOT OWNER
LOT 14	1.37	COMMERCIAL DEVELOPMENT	LOT OWNER
TRACT A	10.94	DRAINAGE CHANNEL	EL PASO COUNTY
TRACT B	1.00	OPEN SPACE	BENT GRASS COMMERCIAL METRO DISTRICT
TRACT C	1.37	DRAINAGE	BENT GRASS COMMERCIAL METRO DISTRICT
TRACT D	0.44	DRAINAGE/PEDESTRIAN ACCESS	BENT GRASS COMMERCIAL METRO DISTRICT
TRACT E	0.36	PRIVATE ROADWAY	BENT GRASS COMMERCIAL METRO DISTRICT
PR PUBLIC R.O.W.	2.75	PUBLIC R.O.W.	EL PASO COUNTY
TOTAL ACERAGE	53.91		

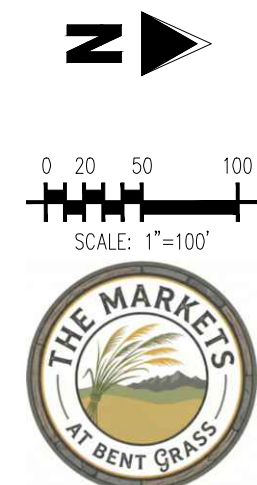
PROPOSED EASEMENT AREA TABLE		
TYPE	AREA (AC)	OWNERSHIP & MAINTENANCE
GENERAL UTILITY	11.89	BENT GRASS COMMERCIAL METRO DISTRICT
PUBLIC IMPROVEMENT	10.33	BENT GRASS COMMERCIAL METRO DISTRICT
PUBLIC ACCESS	1.29	BENT GRASS COMMERCIAL METRO DISTRICT
WATER UTILITY	1.45	WHAID
ELECTRIC UTILITY	0.94	MVEA

LEGEND	
	SIGHT DISTANCE LINE - 35 MPH (POSTED)
	SIGHT DISTANCE LINE - 25 MPH (POSTED)
	PROPERTY BOUNDARY LINE
	ADJACENT PROPERTY BOUNDARY LINE
	RIGHT OF WAY BOUNDARY LINE
	ROAD CENTERLINE
	EXISTING EASEMENT LINE
	PROPOSED EASEMENT LINE
	PROPOSED WATER EASEMENT LINE
	BUILDING SETBACK LINE
	LANDSCAPE SETBACK LINE
	EFFECTIVE 100 YEAR FLOOD PLAN
	CORRECTED 100 YEAR FLOOD PLAN
	PROPOSED PAN FLOWLINE
	PROPOSED CURB AND GUTTER
	EXISTING CURB AND GUTTER
	FUTURE CURB AND GUTTER FLOWLINE
	PUBLIC RIGHT-OF-WAY
	FUTURE SDP DRIVE AISLE

NOTES
TRACT A IS INCLUSIVE OF THE OF THE EXISTING CHANNEL. THIS DEVELOPMENT IS EXCLUSIVE OF ANY IMPROVEMENTS IN TRACT A, WITH THE EXCEPTION OF POTENTIAL STORM DRAIN DISCHARGE LOCATIONS. THIS DEVELOPMENT DOES NOT PROPOSE ANY CHANNEL IMPROVEMENTS OR SIGNIFICANT DISTURBANCE WITHIN THE CHANNEL (TRACT A).

OWNER OF RECORD	
LENA GAIL CASE 119 N. WASHATCH AVE COLORADO SPRINGS, CO 80903	
OWNER OF RECORD	
CYNTHIA DEYOUNG 10924 E HIGHWAY 24 Peyton, CO 80831	
APPLICANT	
EVERGREEN DEVCO, INC. 1873 SOUTH BELLAIRE ST., SUITE 1200 DENVER, CO 80222 TEL: (303) 757-0414	

PLAN PREPARER	
JEFFREY ODOR GALLOWAY & CO. LLC 1155 KELLY JOHNSON BLVD., SUITE 305 COLORADO SPRINGS, CO 80920 TEL: (719) 308-2519	
BASED ON SURVEY PERFORMED BY GALLOWAY & COMPANY, LLC ON 07/01/2025	



PRELIMINARY PLAN
THE MARKETS AT BENT GRASS
EVERGREEN DEVELOPMENT
EPC FILE #: SP262

NEC OF WOODMEN RD. & BENT GRASS MEADOWS DR.
FALCON, COLORADO

#	Date	Issue / Description	Init.
1	03/04/2026	1ST PRELIMINARY PLAN SUBMITTAL	
2	05/22/2026	2ND PRELIMINARY PLAN SUBMITTAL	

Project No: EDI02
Drawn By: ELB, AGC
Checked By: JAO, TJE, CMWJ
Date: 05/22/2026

LOT & TRACT PLAN

SP262

PP-3

3 OF 12

Attachment III

Sidra Results Pages

LANE SUMMARY

 **Site: [1] Total Future 2030 AM** (Bent Grass Meadows Drive & Switchgrass Drive)

Output produced by SIDRA INTERSECTION Version: 10.0.5.217

Roundabout
Site Category: (None)
Roundabout
Site Scenario: 1 | Local Volumes

Lane Use and Performance															
	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %	
South: Switchgrass Drive															
Lane 1 ^d	504	2.0	504	2.0	1383	0.364	100	4.9	LOS A	2.2	54.8	Full	1600	0.0	0.0
Lane 2	91	2.0	91	2.0	1642	0.056	100	0.0	LOS A	0.0	0.0	Full	1600	0.0	0.0
Approach	595	2.0	595	2.0		0.364		4.1	LOS A	2.2	54.8				
East: Bent Grass Meadows Drive															
Lane 1 ^d	199	2.0	199	2.0	792	0.251	100	7.3	LOS A	1.1	28.2	Full	1600	0.0	0.0
Approach	199	2.0	199	2.0		0.251		7.3	LOS A	1.1	28.2				
North: Switchgrass Drive															
Lane 1 ^d	202	2.0	202	2.0	932	0.217	100	6.0	LOS A	1.0	25.1	Full	1600	0.0	0.0
Approach	202	2.0	202	2.0		0.217		6.0	LOS A	1.0	25.1				
West: Bent Grass Meadows Drive															
Lane 1 ^d	418	2.0	418	2.0	950	0.440	100	8.8	LOS A	2.5	63.2	Full	1600	0.0	0.0
Approach	418	2.0	418	2.0		0.440		8.8	LOS A	2.5	63.2				
All Vehicles	1415	2.0	1415	2.0		0.440		6.2	LOS A	2.5	63.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c >1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)											
South: Switchgrass Drive											
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.	
From S						Cap. veh/h	v/c	%	%		
To Exit:	W	N	E								
Lane 1	187	317	-	504	2.0	1383	0.364	100	NA	NA	
Lane 2	-	-	91	91	2.0	1642	0.056	100	NA	NA	
Approach	187	317	91	595	2.0		0.364				
East: Bent Grass Meadows Drive											
Mov.	L2	T1	R2	Total	%HV		Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.	
From E						Cap. veh/h	v/c	%	%		
To Exit:	S	W	N								
Lane 1	161	4	34	199	2.0	792	0.251	100	NA	NA	

Approach	161	4	34	199	2.0		0.251			
North: Switchgrass Drive										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From N						Cap.	Satn	Util.	SL Ov.	Lane
To Exit:	E	S	W			veh/h	v/c	%	%	No.
Lane 1	1	173	28	202	2.0	932	0.217	100	NA	NA
Approach	1	173	28	202	2.0		0.217			
West: Bent Grass Meadows Drive										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From W						Cap.	Satn	Util.	SL Ov.	Lane
To Exit:	N	E	S			veh/h	v/c	%	%	No.
Lane 1	1	5	412	418	2.0	950	0.440	100	NA	NA
Approach	1	5	412	418	2.0		0.440			
Total %HV Deg.Satn (v/c)										
All Vehicles	1415	2.0		0.440						

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis														
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec	Merge Queue [Veh	Dist] ft
There are no Exit Short Lanes for Merge Analysis at this Site.														

Variable Demand Analysis				
	Initial Queued Demand	Residual Queued Demand	Time for Residual Demand to Clear	Duration of Oversatn
	veh	veh	sec	sec
South: Switchgrass Drive				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0
East: Bent Grass Meadows Drive				
Lane 1	0.0	0.0	0.0	0.0
North: Switchgrass Drive				
Lane 1	0.0	0.0	0.0	0.0
West: Bent Grass Meadows Drive				
Lane 1	0.0	0.0	0.0	0.0

LANE SUMMARY

 **Site: [1 (2)] Total Future 2030 PM** (Bent Grass Meadows Drive & Switchgrass Drive)

Output produced by SIDRA INTERSECTION Version: 10.0.5.217

Roundabout
Site Category: (None)
Roundabout
Site Scenario: 1 | Local Volumes

Lane Use and Performance															
	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %	
South: Switchgrass Drive															
Lane 1 ^d	738	2.0	738	2.0	1381	0.534	100	6.2	LOS A	4.3	108.9	Full	1600	0.0	0.0
Lane 2	266	2.0	266	2.0	1642	0.162	100	0.0	LOS A	0.0	0.0	Full	1600	0.0	0.0
Approach	1004	2.0	1004	2.0		0.534		4.6	LOS A	4.3	108.9				
East: Bent Grass Meadows Drive															
Lane 1 ^d	247	2.0	247	2.0	618	0.400	100	11.6	LOS B	2.0	51.7	Full	1600	0.0	0.0
Approach	247	2.0	247	2.0		0.400		11.6	LOS B	2.0	51.7				
North: Switchgrass Drive															
Lane 1 ^d	315	2.0	315	2.0	774	0.407	100	9.8	LOS A	2.2	57.0	Full	1600	0.0	0.0
Approach	315	2.0	315	2.0		0.407		9.8	LOS A	2.2	57.0				
West: Bent Grass Meadows Drive															
Lane 1 ^d	459	2.0	459	2.0	836	0.549	100	12.0	LOS B	4.4	112.5	Full	1600	0.0	0.0
Approach	459	2.0	459	2.0		0.549		12.0	LOS B	4.4	112.5				
All Vehicles	2025	2.0	2025	2.0		0.549		7.9	LOS A	4.4	112.5				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c >1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)											
South: Switchgrass Drive											
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From S						Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	W	N	E			veh/h	v/c	%	%	No.	
Lane 1	324	414	-	738	2.0	1381	0.534	100	NA	NA	
Lane 2	-	-	266	266	2.0	1642	0.162	100	NA	NA	
Approach	324	414	266	1004	2.0		0.534				
East: Bent Grass Meadows Drive											
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From E						Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	S	W	N			veh/h	v/c	%	%	No.	
Lane 1	184	20	43	247	2.0	618	0.400	100	NA	NA	

Approach	184	20	43	247	2.0	0.400				
North: Switchgrass Drive										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From N						Cap.	Satn	Util.	SL Ov.	Lane
To Exit:	E	S	W			veh/h	v/c	%	%	No.
Lane 1	1	270	45	315	2.0	774	0.407	100	NA	NA
Approach	1	270	45	315	2.0	0.407				
West: Bent Grass Meadows Drive										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From W						Cap.	Satn	Util.	SL Ov.	Lane
To Exit:	N	E	S			veh/h	v/c	%	%	No.
Lane 1	1	7	451	459	2.0	836	0.549	100	NA	NA
Approach	1	7	451	459	2.0	0.549				
Total %HV Deg.Satn (v/c)										
All Vehicles	2025	2.0	0.549							

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis														
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec	Merge Queue [Veh	Dist]	ft
There are no Exit Short Lanes for Merge Analysis at this Site.														

Variable Demand Analysis				
	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec
South: Switchgrass Drive				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0
East: Bent Grass Meadows Drive				
Lane 1	0.0	0.0	0.0	0.0
North: Switchgrass Drive				
Lane 1	0.0	0.0	0.0	0.0
West: Bent Grass Meadows Drive				
Lane 1	0.0	0.0	0.0	0.0

LANE SUMMARY

 **Site: [1 (3)] Total Future 2045 AM** (Bent Grass Meadows Drive & Switchgrass Drive)

Output produced by SIDRA INTERSECTION Version: 10.0.5.217

Roundabout
Site Category: (None)
Roundabout
Site Scenario: 1 | Local Volumes

Lane Use and Performance															
	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %	
South: Switchgrass Drive															
Lane 1 ^d	545	2.0	545	2.0	1380	0.395	100	5.2	LOS A	2.5	62.3	Full	1600	0.0	0.0
Lane 2	137	2.0	137	2.0	1642	0.083	100	0.0	LOS A	0.0	0.0	Full	1600	0.0	0.0
Approach	682	2.0	682	2.0		0.395		4.2	LOS A	2.5	62.3				
East: Bent Grass Meadows Drive															
Lane 1 ^d	232	2.0	232	2.0	758	0.305	100	8.3	LOS A	1.4	35.0	Full	1600	0.0	0.0
Approach	232	2.0	232	2.0		0.305		8.3	LOS A	1.4	35.0				
North: Switchgrass Drive															
Lane 1 ^d	202	2.0	202	2.0	862	0.235	100	6.6	LOS A	1.1	26.8	Full	1600	0.0	0.0
Approach	202	2.0	202	2.0		0.235		6.6	LOS A	1.1	26.8				
West: Bent Grass Meadows Drive															
Lane 1 ^d	476	2.0	476	2.0	920	0.518	100	10.5	LOS B	4.0	101.5	Full	1600	0.0	0.0
Approach	476	2.0	476	2.0		0.518		10.5	LOS B	4.0	101.5				
All Vehicles	1592	2.0	1592	2.0		0.518		7.0	LOS A	4.0	101.5				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c >1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)											
South: Switchgrass Drive											
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From S						Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	W	N	E			veh/h	v/c	%	%	No.	
Lane 1	228	317	-	545	2.0	1380	0.395	100	NA	NA	
Lane 2	-	-	137	137	2.0	1642	0.083	100	NA	NA	
Approach	228	317	137	682	2.0		0.395				
East: Bent Grass Meadows Drive											
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From E						Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	S	W	N			veh/h	v/c	%	%	No.	
Lane 1	191	7	34	232	2.0	758	0.305	100	NA	NA	

Approach	191	7	34	232	2.0		0.305				
North: Switchgrass Drive											
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From N						Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	E	S	W			veh/h	v/c	%	%	No.	
Lane 1	1	173	28	202	2.0	862	0.235	100	NA	NA	
Approach	1	173	28	202	2.0		0.235				
West: Bent Grass Meadows Drive											
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From W						Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	N	E	S			veh/h	v/c	%	%	No.	
Lane 1	1	8	467	476	2.0	920	0.518	100	NA	NA	
Approach	1	8	467	476	2.0		0.518				
Total %HV Deg.Satn (v/c)											
All Vehicles	1592	2.0		0.518							

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis														
	Exit	Short	Percent	Opposing		Critical	Follow-up	Lane	Capacity	Deg.	Min.	Merge	Merge	Queue
	Lane	Lane	Opng in	Flow Rate		Gap	Headway	Flow		Satn	Delay	Delay	[Veh	Dist]
	Number	Length	Lane					Rate						
		ft	%	veh/h	pcu/h	sec	sec	veh/h	veh/h	v/c	sec	sec		ft
There are no Exit Short Lanes for Merge Analysis at this Site.														

Variable Demand Analysis				
	Initial		Residual	
	Queued		Queued	
	Demand		Demand	
	veh		veh	
South: Switchgrass Drive				
Lane 1	0.0		0.0	0.0
Lane 2	0.0		0.0	0.0
East: Bent Grass Meadows Drive				
Lane 1	0.0		0.0	0.0
North: Switchgrass Drive				
Lane 1	0.0		0.0	0.0
West: Bent Grass Meadows Drive				
Lane 1	0.0		0.0	0.0

LANE SUMMARY

 **Site: [1 (4)] Total Future 2045 PM** (Bent Grass Meadows Drive & Switchgrass Drive)

Output produced by SIDRA INTERSECTION Version: 10.0.5.217

Roundabout
Site Category: (None)
Roundabout
Site Scenario: 1 | Local Volumes

Lane Use and Performance															
	Demand Flows [Total HV] veh/h %		Arrival Flows [Total HV] veh/h %		Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %	
South: Switchgrass Drive															
Lane 1 ^d	798	2.0	798	2.0	1378	0.579	100	6.8	LOS A	5.1	130.2	Full	1600	0.0	0.0
Lane 2	355	2.0	355	2.0	1642	0.216	100	0.1	LOS A	0.0	0.0	Full	1600	0.0	0.0
Approach	1154	2.0	1154	2.0		0.579		4.7	LOS A	5.1	130.2				
East: Bent Grass Meadows Drive															
Lane 1 ^d	287	2.0	287	2.0	579	0.496	100	14.5	LOS B	2.9	72.7	Full	1600	0.0	0.0
Approach	287	2.0	287	2.0		0.496		14.5	LOS B	2.9	72.7				
North: Switchgrass Drive															
Lane 1 ^d	315	2.0	315	2.0	695	0.454	100	11.6	LOS B	2.7	67.7	Full	1600	0.0	0.0
Approach	315	2.0	315	2.0		0.454		11.6	LOS B	2.7	67.7				
West: Bent Grass Meadows Drive															
Lane 1 ^d	178	2.0	178	2.0	804	0.222	100	6.8	LOS A	1.0	24.5	Full	1600	0.0	0.0
Approach	178	2.0	178	2.0		0.222		6.8	LOS A	1.0	24.5				
All Vehicles	1934	2.0	1934	2.0		0.579		7.5	LOS A	5.1	130.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c >1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

^d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)											
South: Switchgrass Drive											
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From S						Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	W	N	E			veh/h	v/c	%	%	No.	
Lane 1	385	414	-	798	2.0	1378	0.579	100	NA	NA	
Lane 2	-	-	355	355	2.0	1642	0.216	100	NA	NA	
Approach	385	414	355	1154	2.0		0.579				
East: Bent Grass Meadows Drive											
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.	
From E						Cap.	Satn	Util.	SL Ov.	Lane	
To Exit:	S	W	N			veh/h	v/c	%	%	No.	
Lane 1	221	23	43	287	2.0	579	0.496	100	NA	NA	

Approach	221	23	43	287	2.0		0.496			
North: Switchgrass Drive										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From N						Cap.	Satn	Util.	SL Ov.	Lane
To Exit:	E	S	W			veh/h	v/c	%	%	No.
Lane 1	1	270	45	315	2.0	695	0.454	100	NA	NA
Approach	1	270	45	315	2.0		0.454			
West: Bent Grass Meadows Drive										
Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.
From W						Cap.	Satn	Util.	SL Ov.	Lane
To Exit:	N	E	S			veh/h	v/c	%	%	No.
Lane 1	1	9	169	178	2.0	804	0.222	100	NA	NA
Approach	1	9	169	178	2.0		0.222			
Total %HV Deg.Satn (v/c)										
All Vehicles	1934	2.0		0.579						

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis														
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec	Merge Queue [Veh	Dist] ft
There are no Exit Short Lanes for Merge Analysis at this Site.														

Variable Demand Analysis				
	Initial Queued Demand	Residual Queued Demand	Time for Residual Demand to Clear	Duration of Oversatn
	veh	veh	sec	sec
South: Switchgrass Drive				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0
East: Bent Grass Meadows Drive				
Lane 1	0.0	0.0	0.0	0.0
North: Switchgrass Drive				
Lane 1	0.0	0.0	0.0	0.0
West: Bent Grass Meadows Drive				
Lane 1	0.0	0.0	0.0	0.0

Attachment IV

Roundabout Parameters, Fastest Path Diagrams, and Vehicle Tracking Exhibits

Roundabout Critical Design Parameters

Bent Grass Meadows Drive & Switchgrass Drive

El Paso County, Colorado

Design Parameters	N Leg	S Leg	E Leg	W Leg
Entry Width, ft *	20.4	16.8	18.4	18.3
Exit Width, ft *	20.4	17.3	18.4	18.3
Inscribed Circle Diameter, ft *	141.8	141.8	141.8	141.8
Circulating Roadway Width Upstream of Entry, ft *	22.0	22.0	22.0	22.0
Truck Apron Width Upstream of Entry, ft **	15.0	15.0	15.0	15.0

* Widths are measured from curb flange to curb flange

** Width is measured from back of circulatory roadway curb to face of central island curb

Fastest Speed Path

R ₁ , Radius/Speed, ft/mph	121	19	113	19	157	21	181	22
R ₂ , Radius/Speed, ft/mph	78	17	62	15	60	15	83	17
R ₃ , Radius/Speed, ft/mph	573	36	404	30	384	30	177	22
R ₄ , Radius/Speed, ft/mph	56	15	56	15	56	15	56	15
R ₅ , Radius/Speed, ft/mph	86	17	83	17	119	19	47	14

Stopping Sight Distance

Approach Design Speed, mph	30		30		30		30	
Approach, ft	195		195		195		195	
Circulating, ft/mph	75	15	75	15	75	15	75	15
Crosswalk on Exit, ft/mph	N/A		200	30	195	30	N/A	

Intersection Sight Distance

Vehicle at Entry								
Circulatory Roadway (b ₂), ft/mph	110	15	110	15	110	15	110	15
Vehicle 50' in Advance of Entry								
Immediate Upstream Entry, ft	132		126		134		145	

Additional Design Parameters

Design Vehicle	WB-67
Circulating Roadway Cross-Slope	-2%
Bicycle & Pedestrian Accommodations	Pedestrian ramps/crossings on north and west leg of roundabout

FASTEST PATH OFFSET MODEL DATA	
START DISTANCE FROM YIELD LINE	165 FT
START CENTERLINE OFFSET	5 FT
ENTRY OFFSET (FROM CURB FACE)	5 FT
ISLAND OFFSET (FROM CURB FACE)	5 FT
EXIT OFFSET (FROM CURB FACE)	5 FT
END CENTERLINE OFFSET	5 FT
END DISTANCE FROM EXIT LINE	165 FT

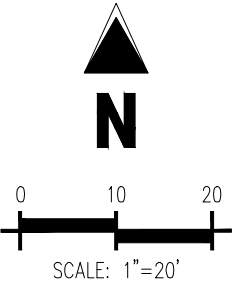
Arm 2 - WOODMEN ACCESS RD.
R1 / V1: 120.63 ft / 19.35 mph
R2 / V2: 77.73 ft / 16.51 mph
R3 / V3: 572.82 ft / 35.84 mph
R4 / V4: 56.32 ft / 14.71 mph
R5 / V5: 86.39 ft / 17.15 mph
FL : 86.39 ft / 17.15 mph
Deflection: 7.50 ft

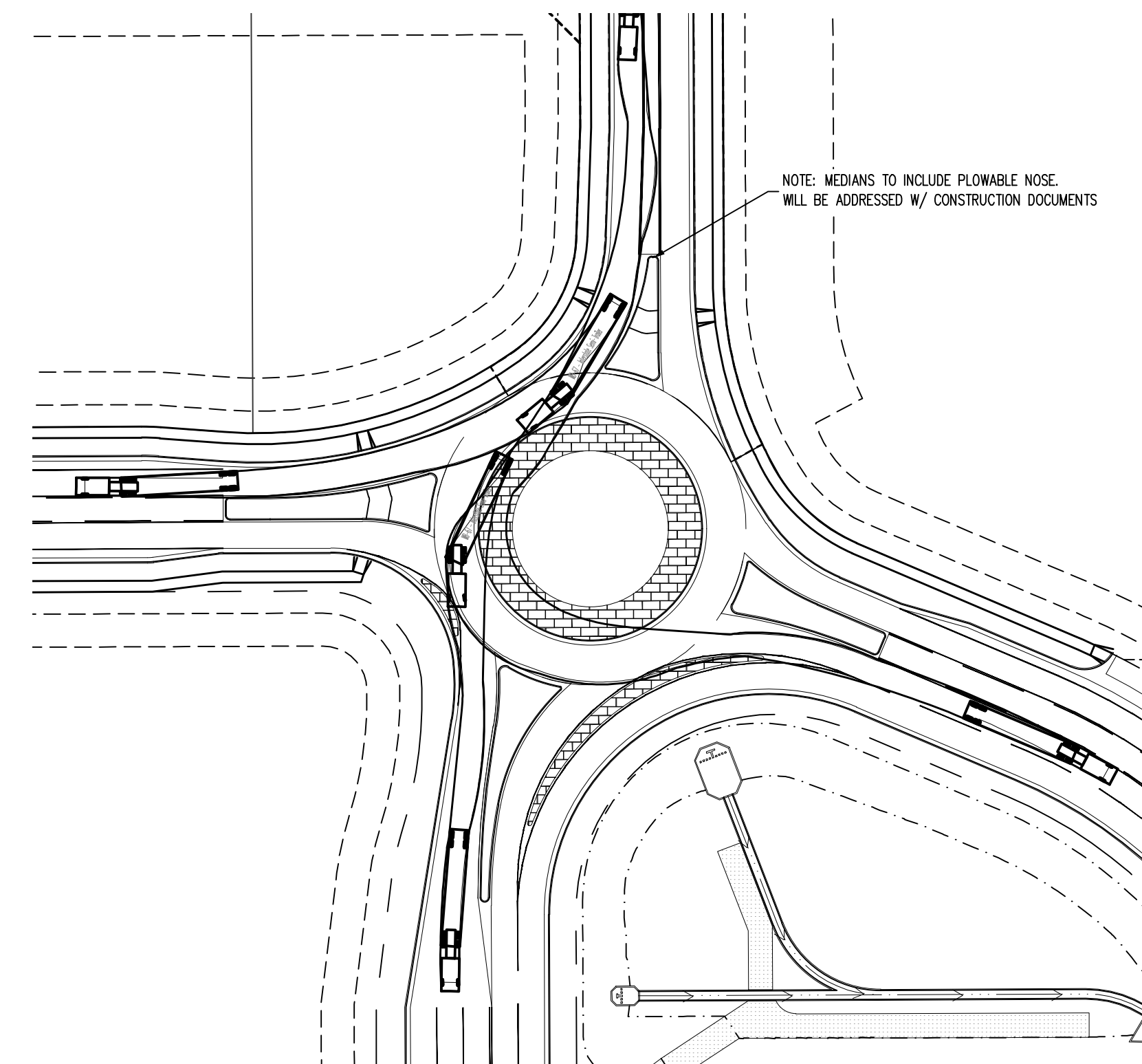
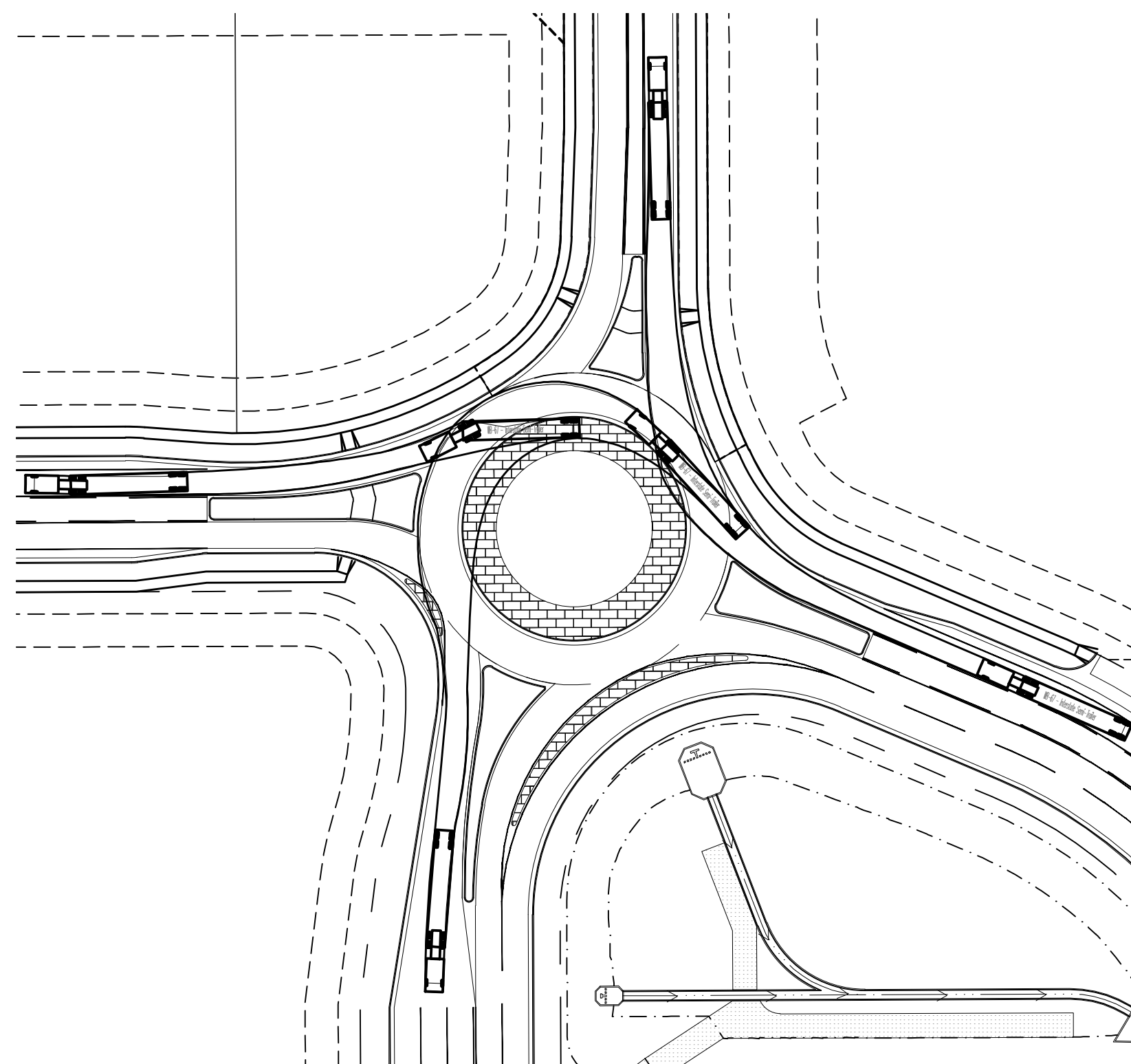
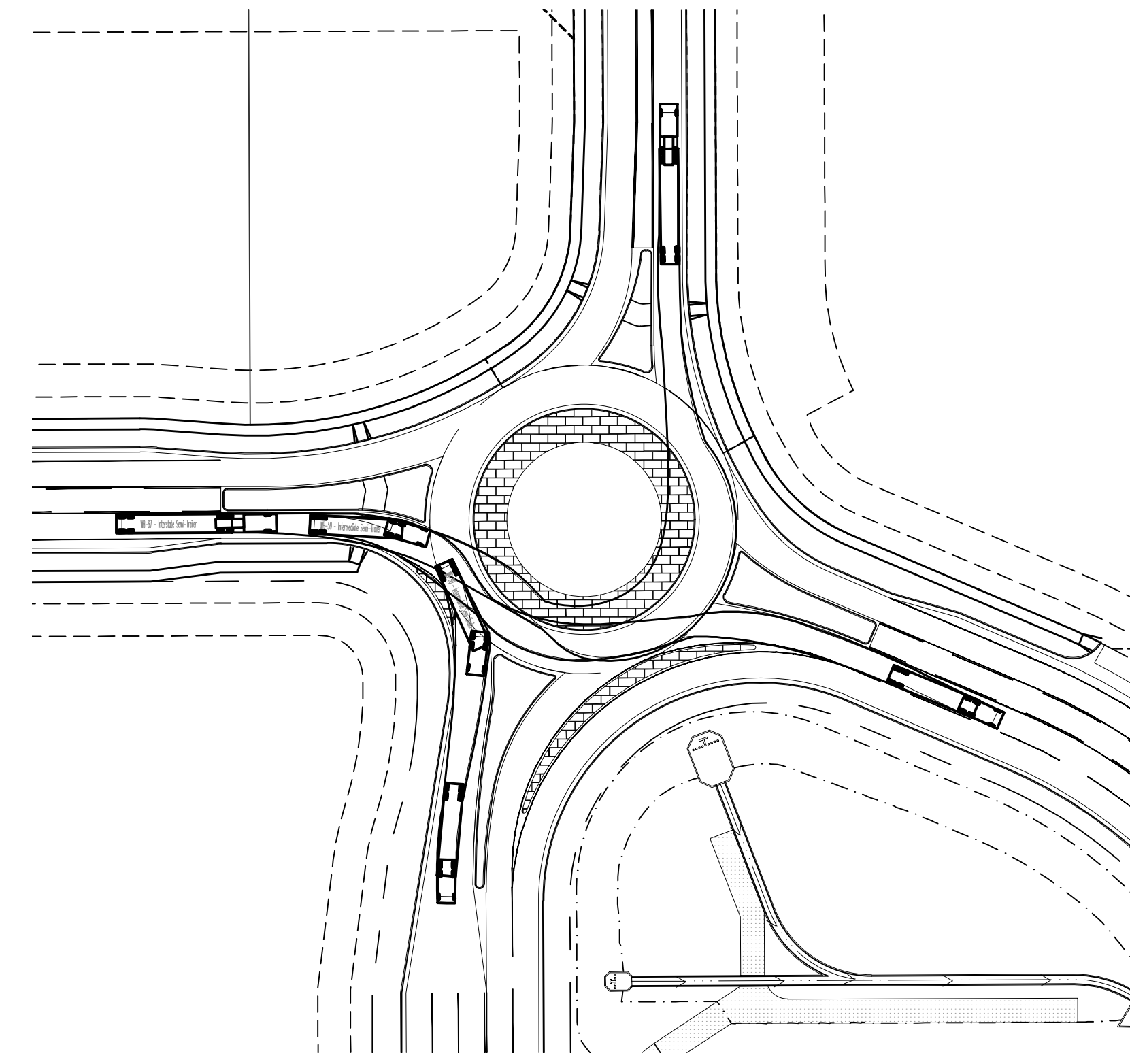
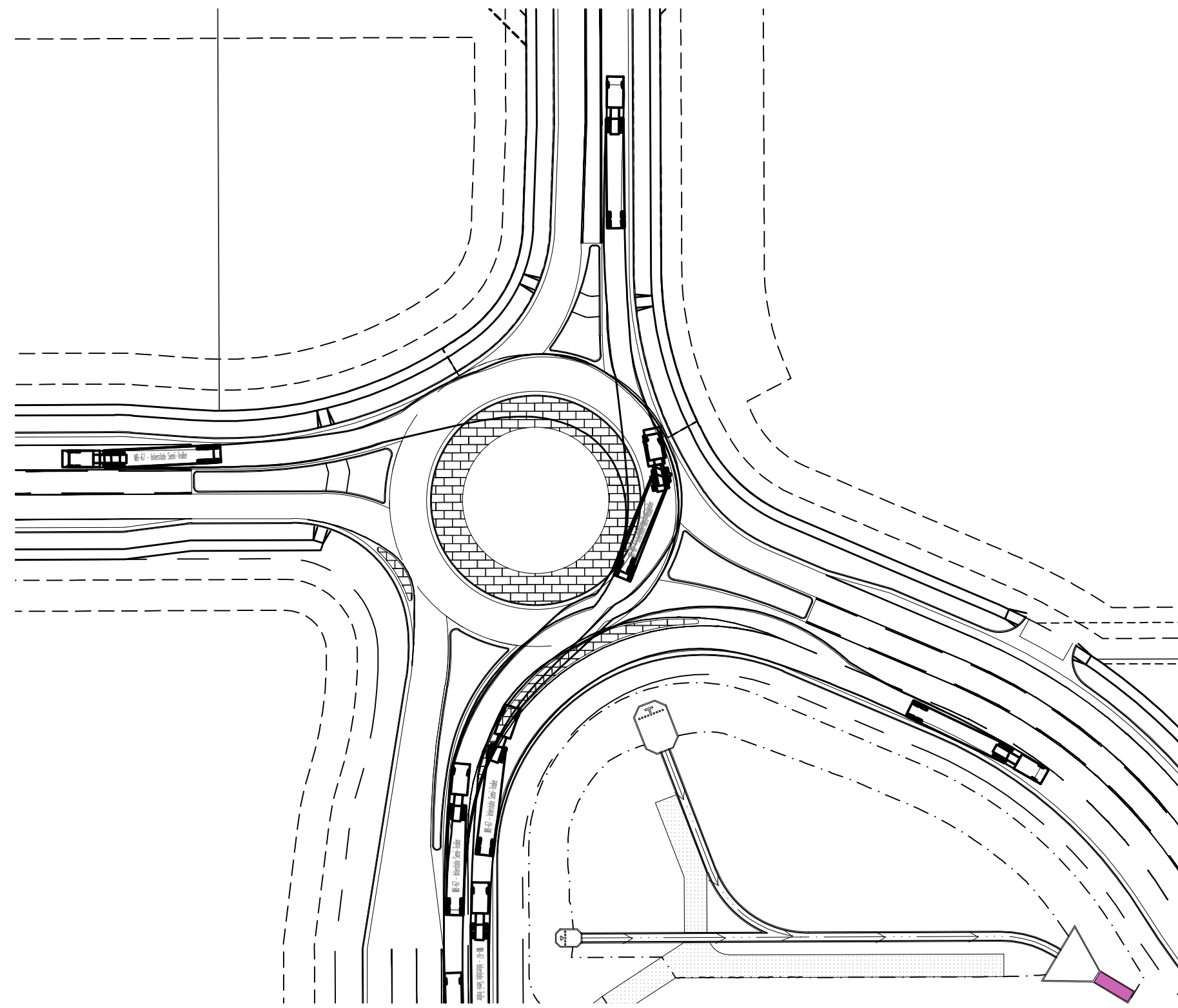
Arm 2 - BENTGRASS MEADOWS DR.
R1 / V1: 157.44 ft / 21.34 mph
R2 / V2: 60.34 ft / 15.08 mph
R3 / V3: 384.35 ft / 29.88 mph
R4 / V4: 56.17 ft / 14.70 mph
R5 / V5: 118.75 ft / 19.24 mph
FL : 118.75 ft / 19.24 mph
Deflection: 5.00 ft

Arm 1 - BENTGRASS MEADOWS DR.
R1 / V1: 181.29 ft / 22.48 mph
R2 / V2: 82.62 ft / 16.87 mph
R3 / V3: 176.86 ft / 22.27 mph
R4 / V4: 55.98 ft / 14.68 mph
R5 / V5: 47.32 ft / 13.83 mph
FL : 82.62 ft / 16.87 mph
Deflection: 7.00 ft

Arm 1 - WOODMEN ACCESS RD.
R1 / V1: 113.45 ft / 18.92 mph
R2 / V2: 62.43 ft / 15.26 mph
R3 / V3: 403.69 ft / 30.46 mph
R4 / V4: 56.42 ft / 14.72 mph
R5 / V5: 83.49 ft / 16.94 mph
FL : 83.49 ft / 16.94 mph
Deflection: 15.00 ft

Calculated Fastest Path Summary Table								
No.	Eastbound		Westbound		Southbound		Northbound	
	Radius (ft)	Speed (mph)	Radius (ft)	Speed (mph)	Radius (ft)	Speed (mph)	Radius (ft)	Speed (mph)
R1	181	22	157	21	121	19	113	19
R2	83	17	60	15	78	17	62	15
R3	177	22	384	30	573	36	404	30
R4	56	15	56	15	56	15	56	15
R5	47	14	119	19	86	17	83	17





NOTE: MEDIANS TO INCLUDE PLOWABLE NOSE.
WILL BE ADDRESSED W/ CONSTRUCTION DOCUMENTS

