

MEMORANDUM

To: El Paso County

From: Sean Hays, PE
Kimley-Horn and Associates, Inc.

Date: August 12, 2022

Subject: Design Documentation - Proposed Roundabout at Constitution Ave and Akers Dr

A new roundabout is proposed at the intersection of Akers Dr and Access Rd in El Paso County, Colorado. This memo summarizes the design criteria and critical design parameters for the proposed roundabout.

The design of this roundabout is based upon the criteria established in the Wisconsin Department of Transportation Facilities Development Manual, Chapter 11 Section 26 (Wisconsin DOT FDM 11-26).

Lane Configuration and Geometrics

The Caliber at Constitution Traffic Study Letter (dated 4-8-2022) prepared by Kimley-Horn recommends a roundabout with a single circulatory lane and one lane entering on each approach at the project intersection. The report shows that the roundabout will operate at a Level of Service (LOS) of A in design year 2045. Refer to the traffic impact study for additional details.

To meet the criteria in the Wisconsin DOT FDM 11-26, the proposed roundabout was designed with the geometry displayed in Table 1. A graphical representation of the roundabout with supporting dimensions, is included as Exhibit 2 at the end of this memo.

TABLE 1 ROUNDABOUT GEOMETRICS

Inscribed Circle Diameter (ICD)	120 feet
Minimum Lane Width (on approach)	16 feet
Entry Width	19 feet
Circulatory Roadway Width	20 feet
Truck Apron Width	15.5 feet
SB Entry Angle, PHI	16.2 deg
WB Entry Angle, PHI	24.7 deg
NB Entry Angle, PHI	17.3 deg

Fastest Path Speeds

Fastest path performance is an evaluation of the geometric elements that control driver negotiation speeds. Two primary elements were evaluated to determine the fastest path speed:

- Estimated vehicle speeds at critical path radii on the fastest path
- Speed consistency between the critical path radii

Fastest paths were reviewed in CADD with spline curves based on a technique described in the Wisconsin DOT FDM 11-26 Attachment 50.2.

Estimated vehicle speeds for entry, circulating, exit, left turn and right turn paths were calculated using standard estimation of +2%/-2% cross slope / superelevations for vehicles traveling on the estimated fastest path.

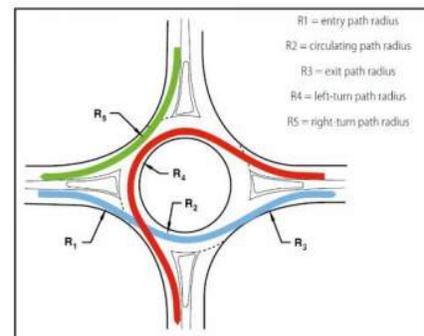
Graphical representations of the estimated fastest paths and the locations of the critical path radius used to calculate R1 thru R5 speeds, are included as Exhibits 16-18 at the end of this memo.

Table 2 below summarizes the results of the fastest path evaluation. Table 3 and Figure 1 provide additional information on the design criteria used for the calculation of the fastest paths.

TABLE 2 – FASTEST PATH RESULTS	LEG 1		LEG 2		LEG 3	
	SB		WB		NB	
R ₁ , Radius/Speed, FT/MPH	135	23	NA	NA	108	22
R ₂ , Radius/Speed, FT/MPH	123	23	NA	NA	105	21
R ₄ , Radius/Speed, FT/MPH	42	14	43	14	NA	NA
R ₅ , Radius/Speed, FT/MPH	NA	NA	71	19	68	18

TABLE 3 FASTEST PATH PERFORMANCE CRITERIA

Path offset from curb face	5 feet
Path offset from centerline	5 feet
Path offset from painted edge of travel way	3 feet
Single lane entry (maximum)	25 mph
Speed consistency	10-15 mph



Design Vehicle

Design vehicle paths were evaluated for likely design vehicles and their associated path required to navigate the roundabout. Vehicle profile, path and tire tracking offsets are shown in Exhibits 5-15 included at the end of this memo. The following design vehicles and design criteria were used to evaluate the tire tracking offsets:

Vehicle	Category	Notes
WB-50	Design – North/South Accommodate - West	Full Access
SU-40	Design	Full Access
WB-67	Accommodate – North/South	North and South Legs
Snow Plow	Design	Navigate with Plow Down

Category and case shown above refer to criteria established in the Wisconsin DOT FDM 11-26. Information is provided below on the criteria. For additional details refer to the Wisconsin DOT FDM 11-26.

- Category – Accommodate: is used for low percentage of design vehicles of this type. Preferable in low speed, urban environments where pedestrian and bike traffic is prevalent. The vehicle will be able to navigate the roundabout but may do so at reduced speeds and/or encroach on the gutter. Tire tracking offsets should not encroach on non-mountable curb.
- Category – Design: is used for higher percentages of design vehicles of this type. The vehicle will be able to navigate the roundabout without encroaching on the gutter. Tire tracking offset should not encroach on gutter pan, or non-mountable curb.

The southbound U-Turn maneuver was evaluated for all design vehicles in the event that a driver mistakenly turns from Constitution Ave onto Akers Dr. All design vehicle are able to make this maneuver within the limits of the proposed roundabout with use of the truck apron, and at reduced speeds. The largest design vehicle (WB-67) is displayed making this maneuver in Exhibit 12.

Sight Distance

Sight line determination is an evaluation of the driver’s sight line to navigate the roundabout. Per Wisconsin DOT FDM 11-26 guidance the distance for approach and conflicting vehicles are calculated using fast path and posted design speed. Table 5 below summarizes the minimum sight parameters as defined by AASHTO and NCHRP 672. Sight lines are broken into the following components:

Stopping Sight Distance (SSD)

SSD is evaluated for approach speeds to the pedestrian crosswalk and critical path speeds for circulating vehicles. SSD distances are based on the current American Association of State Highway and Transportation Officials (AASHTO) Green Book recommendations. See Exhibits 22 and 23 for approximate location of sight lines for SSD, for the circulatory roadway and pedestrian crosswalk.

Intersection Sight Distance (ISD)

ISD is evaluated for the critical path speeds to a vehicle stopped behind the pedestrian crosswalks for each approach. ISD distances are based on the recommendations in NCHRP 672, which includes evaluating the sight distance for vehicles entering and circulating within the roundabout. Entering sight

distance (d1) is provided for the southbound and westbound legs as these legs have adjacent entries. The northbound leg does not have an adjacent entry and was not evaluated for entering sight distance. Circulating sight distance (d2) is provided for all legs of the roundabout. See Exhibits 19-21 for approximate location of sight lines for ISD.

Circulating Sight Distance

Circulating sight distance was evaluated for vehicles circulating through the roundabout to evaluate drivers ability to see other vehicles circulating roundabout. See Exhibit 24 for approximate location of sight lines for circulating vehicles.

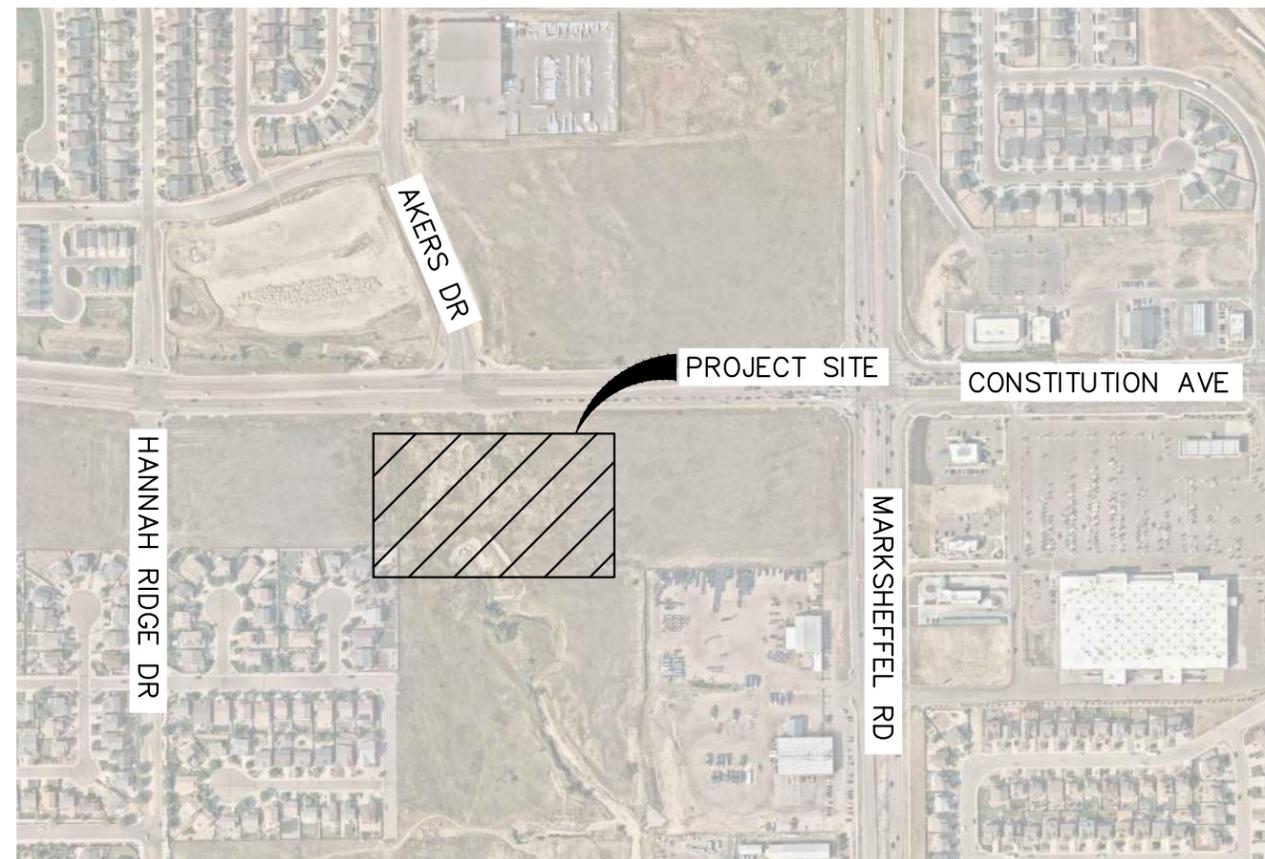
Composite Sight Distance

Exhibit 25 illustrates the composite of sight lines calculated for SSD, ISD, and circulating sight distance. Areas indicated as low growth landscaping should be free from vertical obstructions greater than 30” that may hinder the ability for a driver to recognize an obstruction and stop. Considerations should be given to limit the driver sight lines in areas outside those identified as low growth.

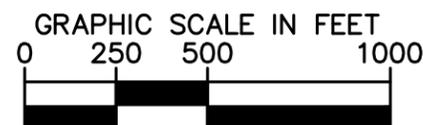
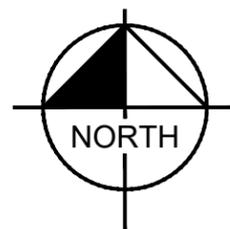
TABLE 5 – MINIMUM SIGHT PARAMETERS	LEG 1		LEG 2		LEG 3	
	SB		WB		NB	
Intersection Sight Distance (MPH/FT) (d1, Entering)	25	185	25	185	--	--
Intersection Sight Distance (MPH/FT) (d2, Circulating)	14	105	14	105	14	105
Stopping Sight Distance – Ped Crossing (MPH/FT)	40	305	25	155	40	305
Circulating Sight Distance – Circulating Roadway (MPH/FT)	14	115	14	115	14	115

AKERS DR & ACCESS RD ROUNDABOUT
EL PASO COUNTY, COLORADO

August 11, 2022

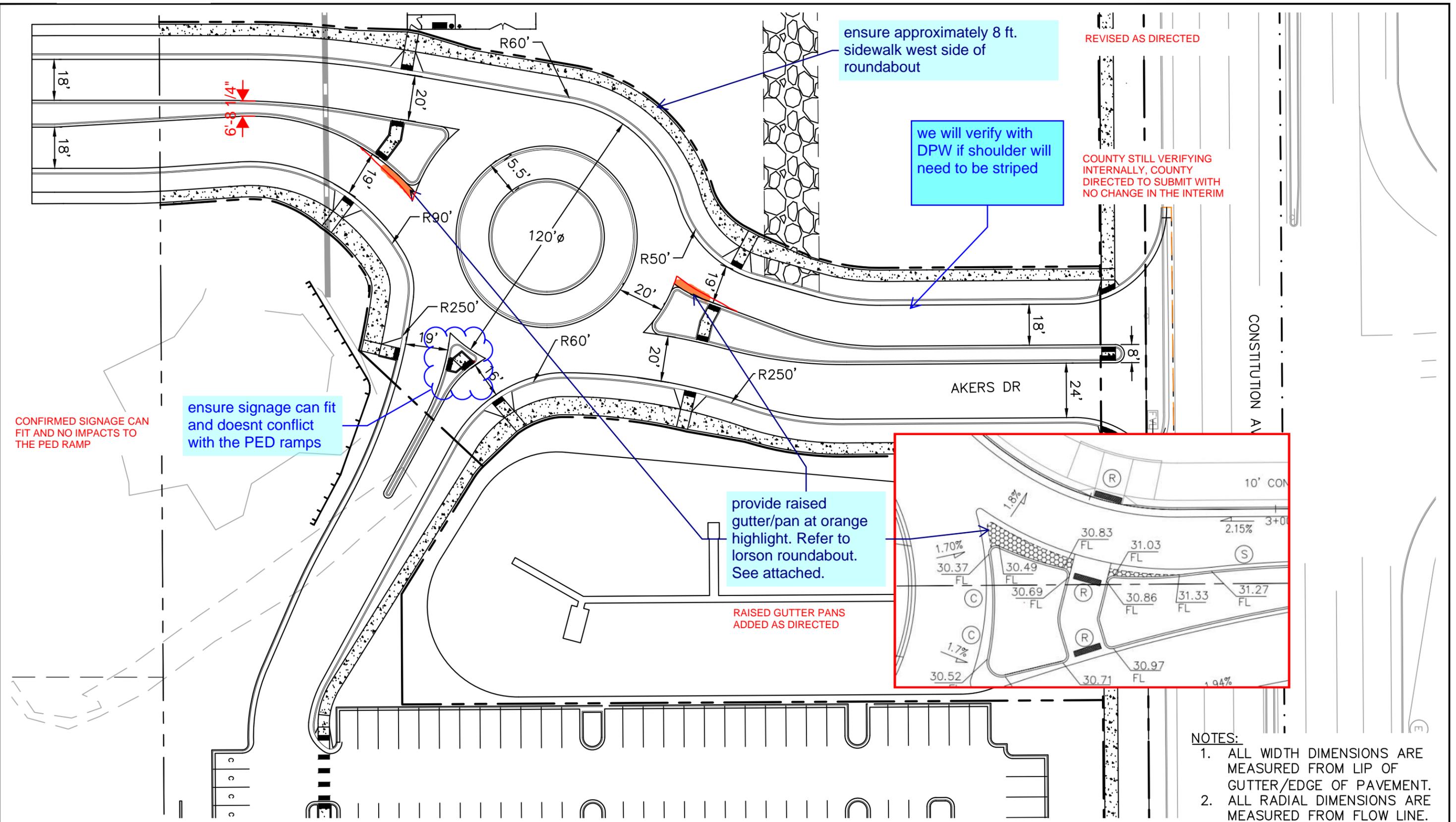


LOCATION MAP



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25	<u>COMPOSITE SIGHT DISTANCE</u>



CONFIRMED SIGNAGE CAN FIT AND NO IMPACTS TO THE PED RAMP

ensure signage can fit and doesn't conflict with the PED ramps

ensure approximately 8 ft. sidewalk west side of roundabout

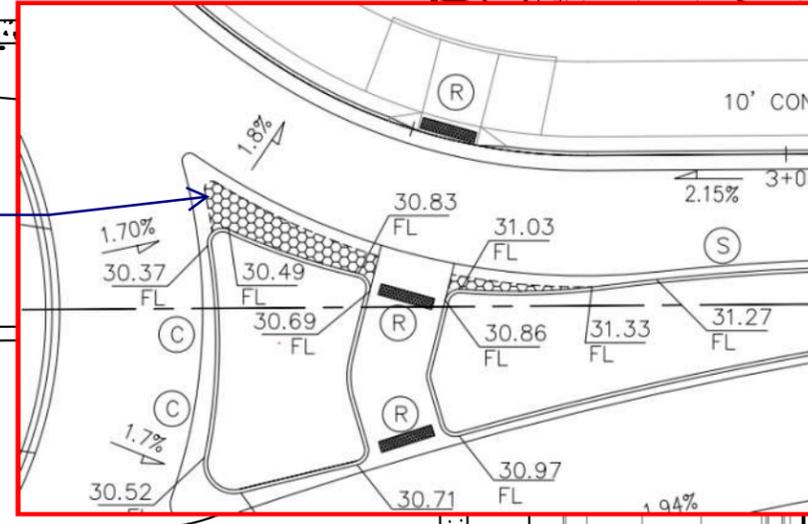
we will verify with DPW if shoulder will need to be striped

REVISED AS DIRECTED

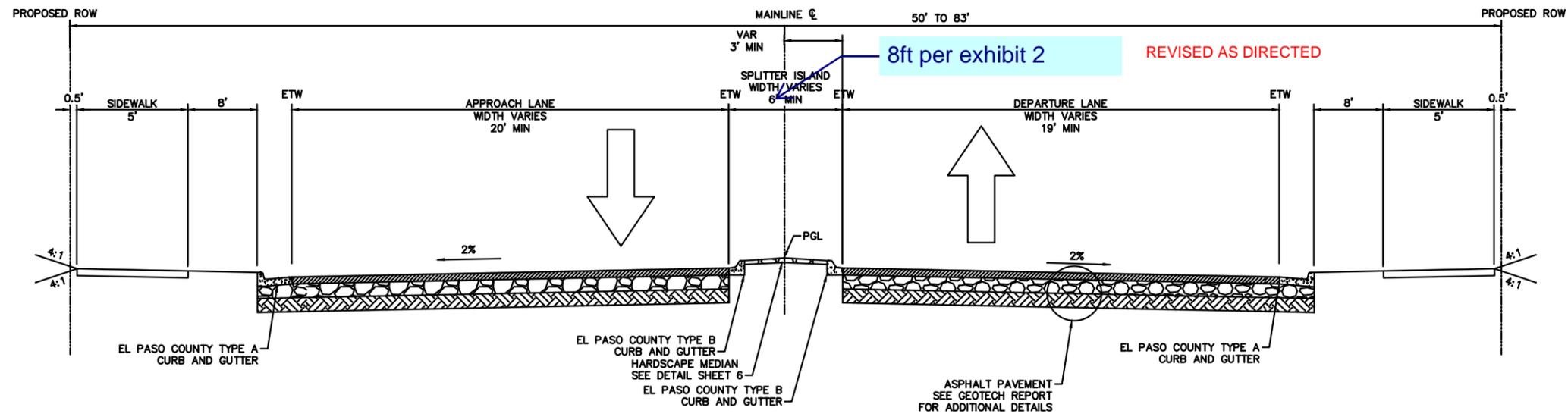
COUNTY STILL VERIFYING INTERNALLY, COUNTY DIRECTED TO SUBMIT WITH NO CHANGE IN THE INTERIM

provide raised gutter/pan at orange highlight. Refer to lorson roundabout. See attached.

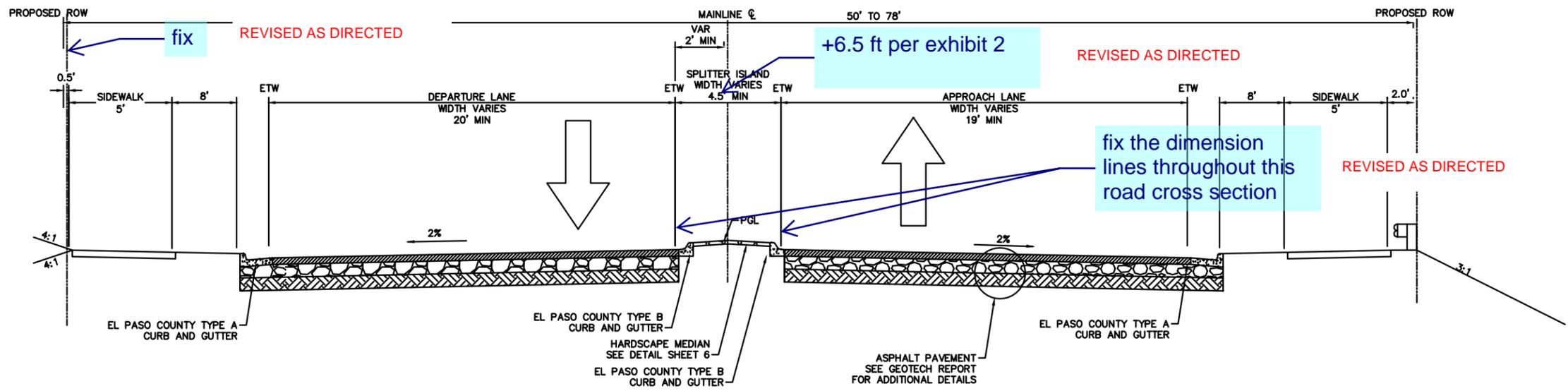
RAISED GUTTER PANS ADDED AS DIRECTED



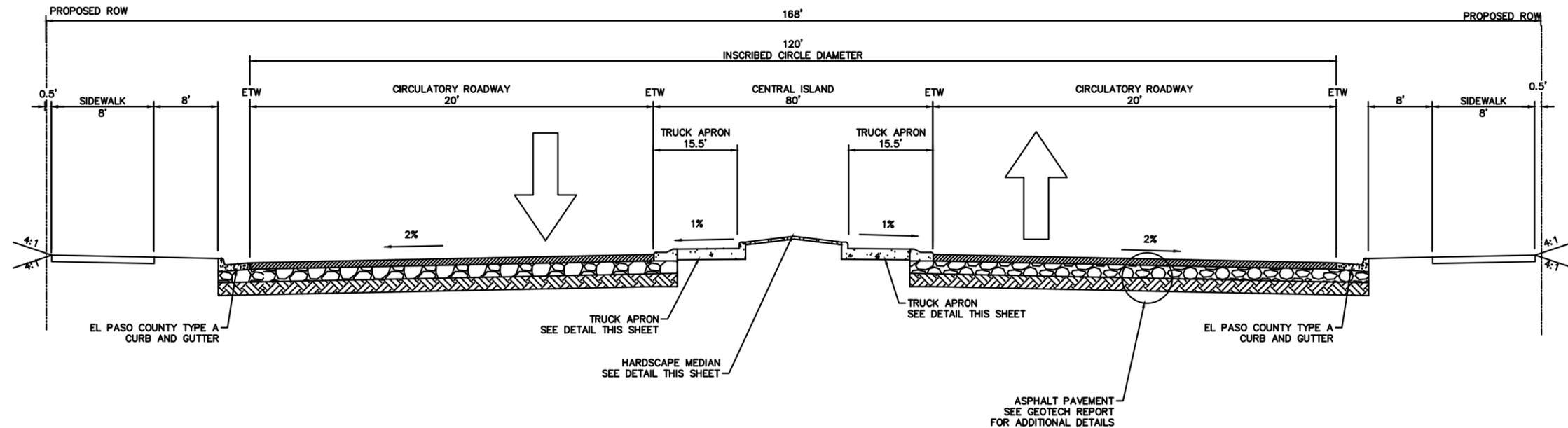
- NOTES:
1. ALL WIDTH DIMENSIONS ARE MEASURED FROM LIP OF GUTTER/EDGE OF PAVEMENT.
 2. ALL RADIAL DIMENSIONS ARE MEASURED FROM FLOW LINE.



NORTH LEG TYPICAL SECTION APPROACH

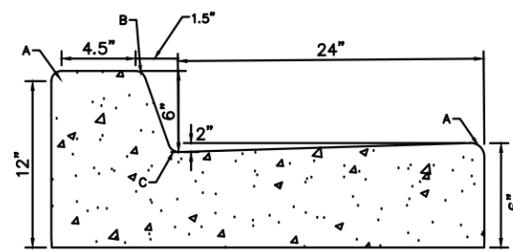


SOUTH LEG TYPICAL SECTION APPROACH

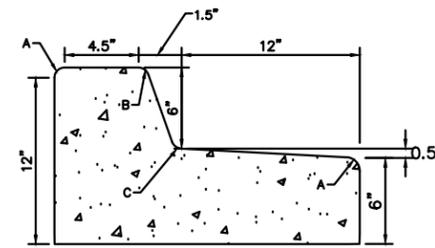


CIRCULATORY ROADWAY TYPICAL SECTION

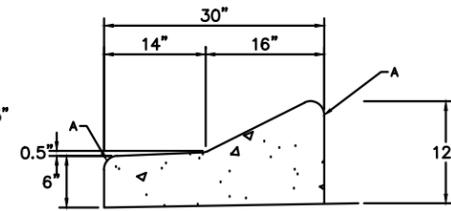
LEGEND FOR RADII	
A	= 1/8" TO 1/4"
B	= 1 1/2"
C	= 1 1/2" TO 2"



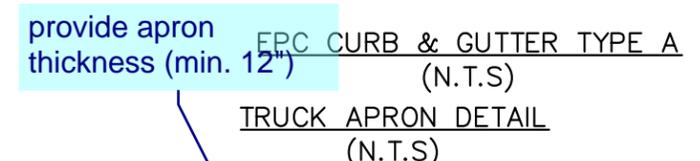
EPC CURB & GUTTER TYPE A (N.T.S)



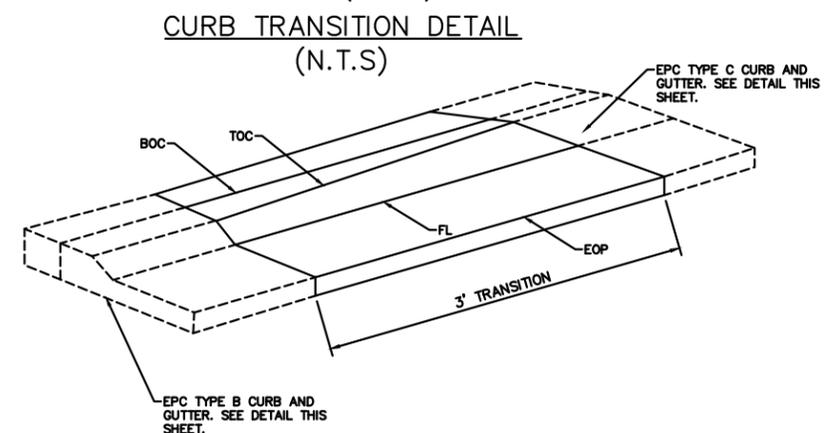
EPC CURB & GUTTER TYPE B (N.T.S)



EPC CURB & GUTTER TYPE C (N.T.S)



TRUCK APRON DETAIL (N.T.S)



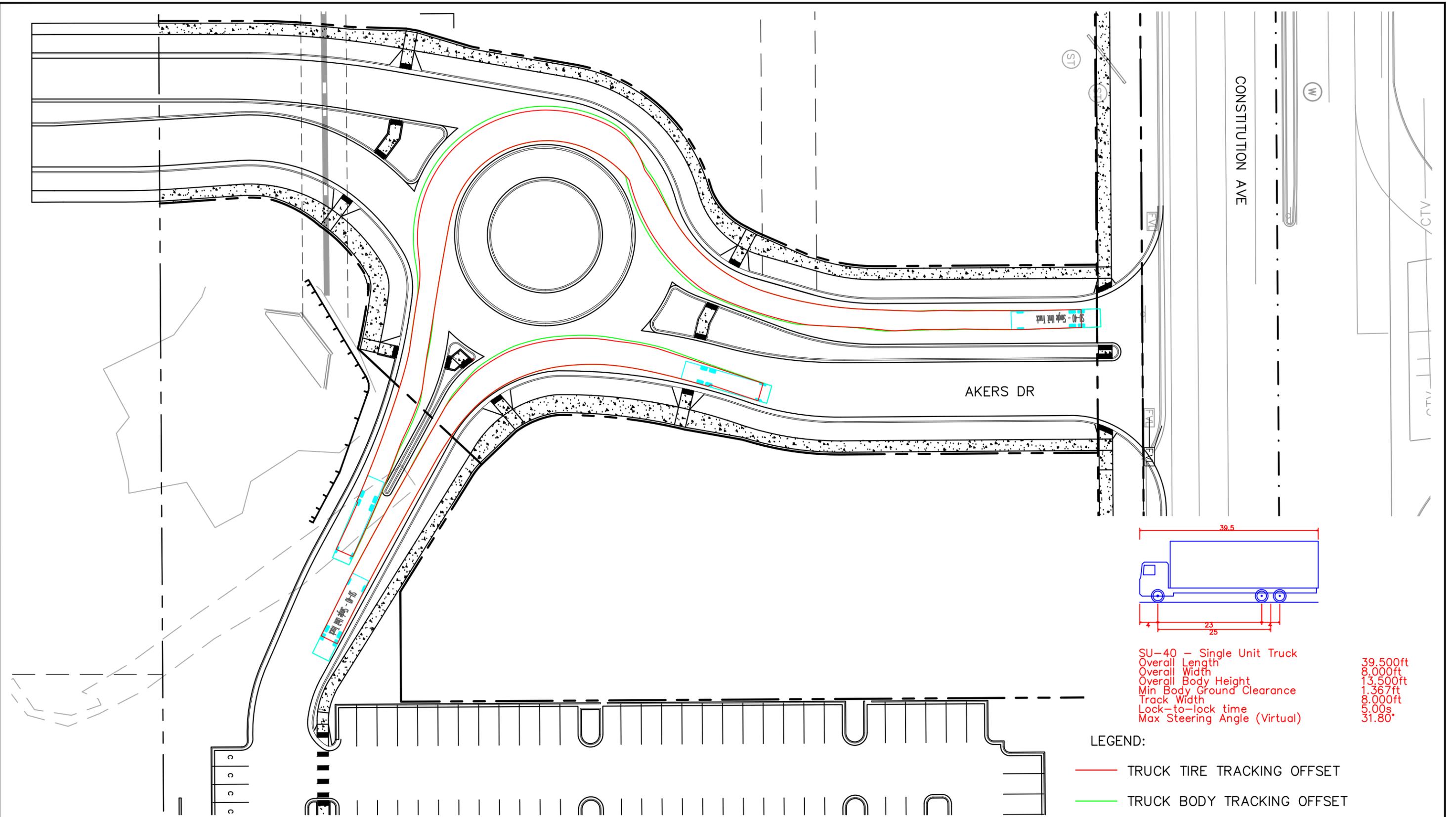
CURB TRANSITION DETAIL (N.T.S)

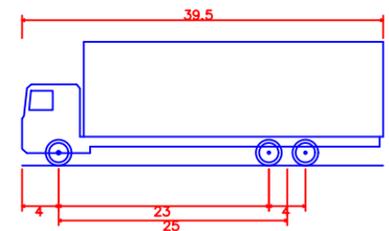
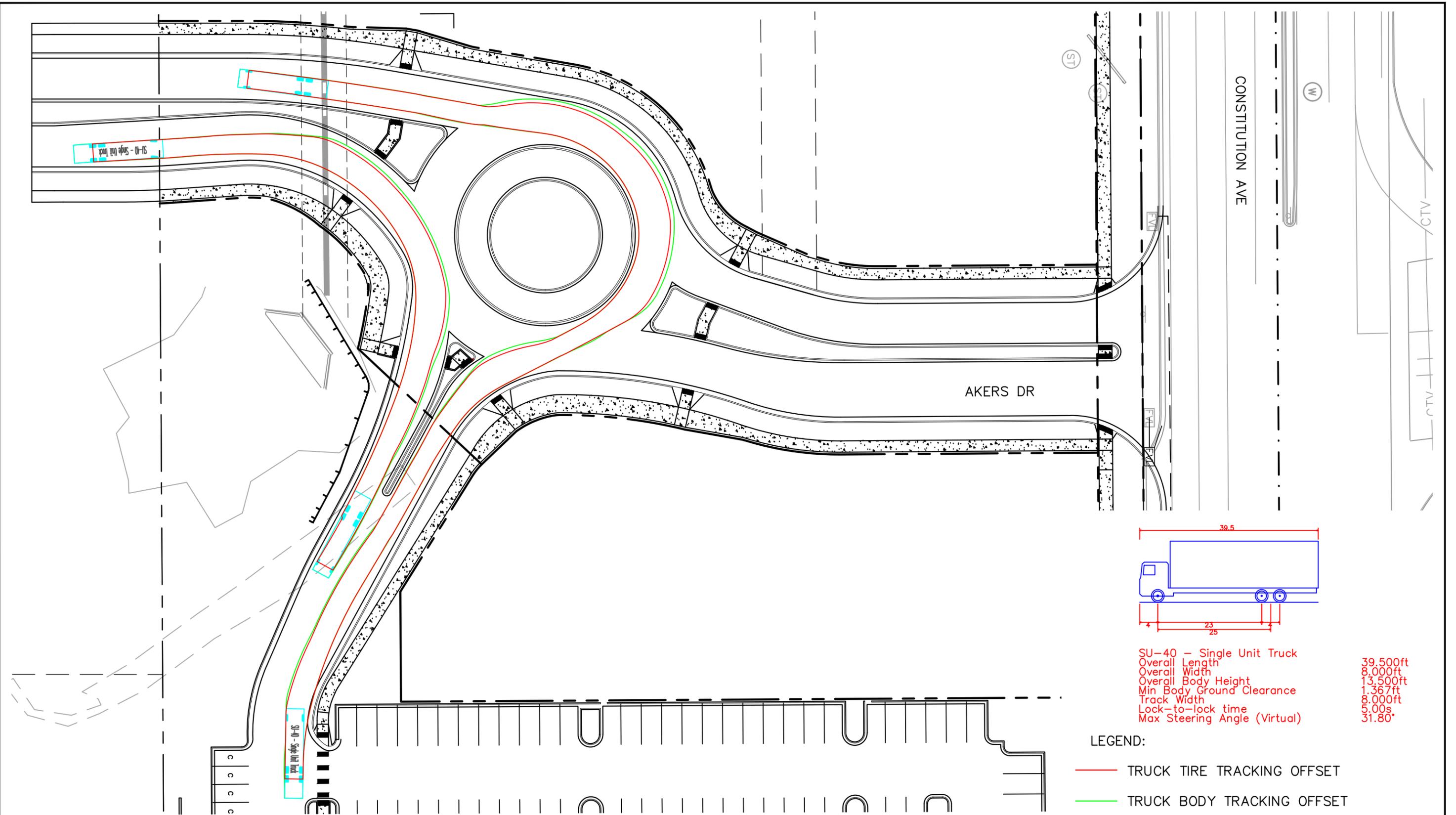
REVISED AS DIRECTED

provide apron thickness (min. 12")

Revise per the new length proposed at the central island

REVISED AS DIRECTED

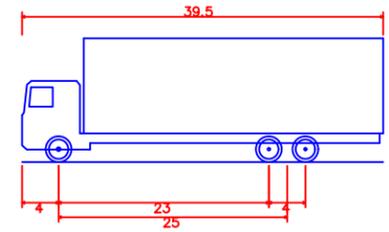
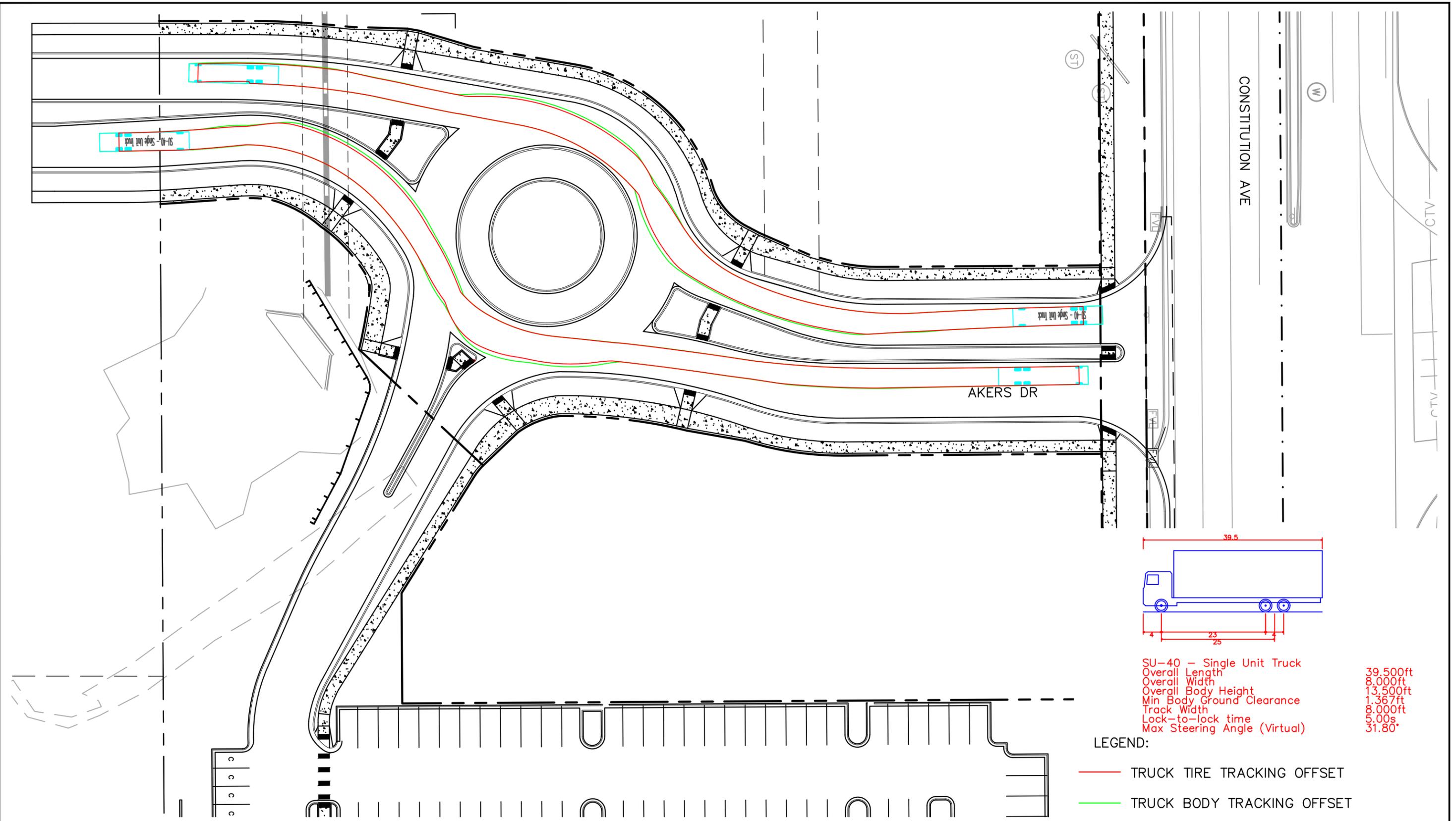




SU-40 - Single Unit Truck	
Overall Length	39.500ft
Overall Width	8.000ft
Overall Body Height	13.500ft
Min Body Ground Clearance	1.367ft
Track Width	8.000ft
Lock-to-lock time	5.00s
Max Steering Angle (Virtual)	31.80°

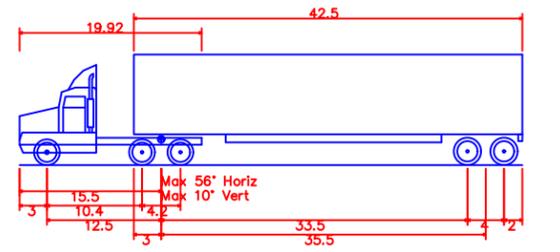
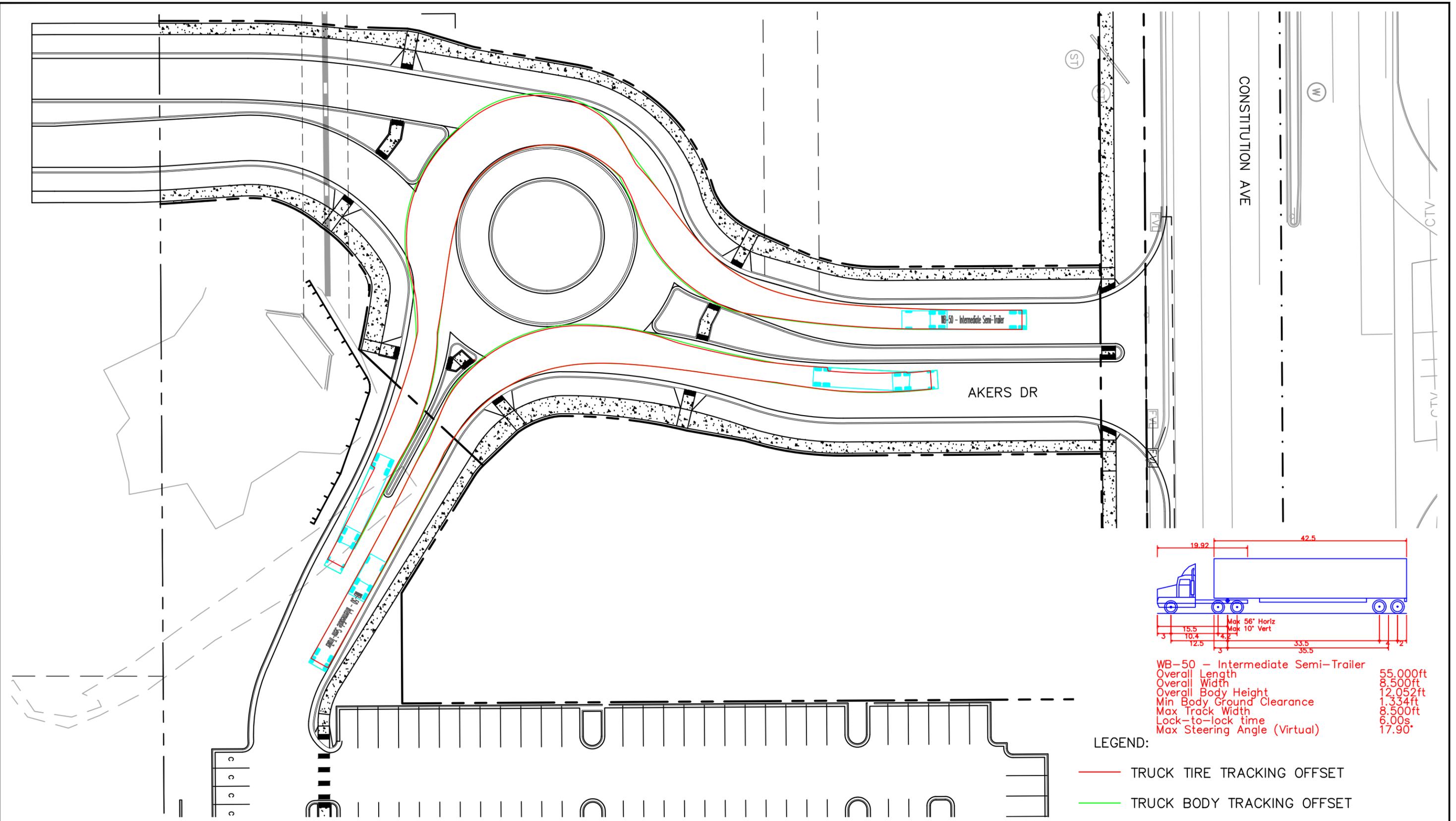
LEGEND:

- TRUCK TIRE TRACKING OFFSET
- TRUCK BODY TRACKING OFFSET



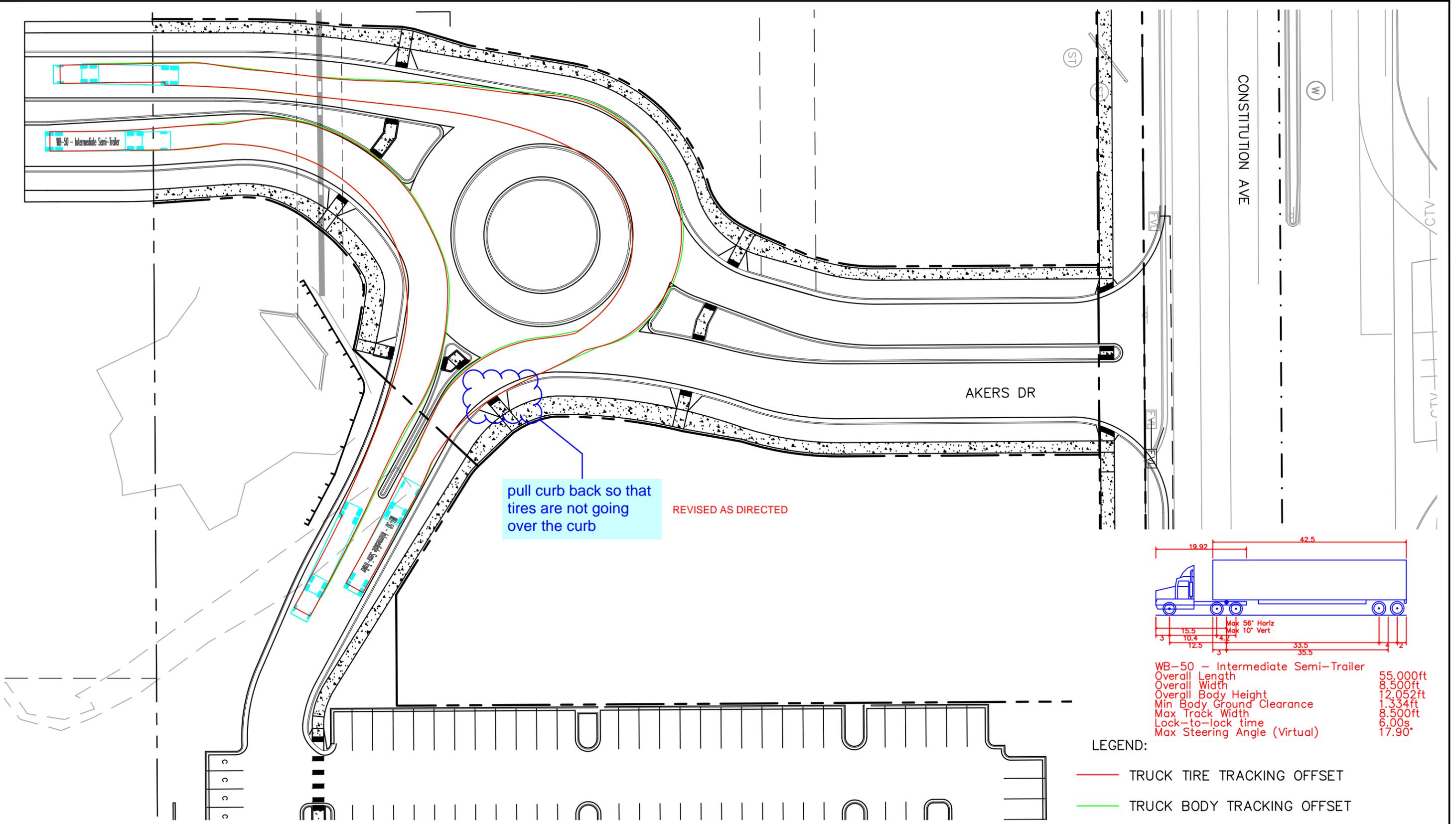
SU-40 - Single Unit Truck
 Overall Length 39.500ft
 Overall Width 8.000ft
 Overall Body Height 13.500ft
 Min Body Ground Clearance 1.367ft
 Track Width 8.000ft
 Lock-to-lock time 9.00s
 Max Steering Angle (Virtual) 31.80°

- LEGEND:
- TRUCK TIRE TRACKING OFFSET
 - TRUCK BODY TRACKING OFFSET



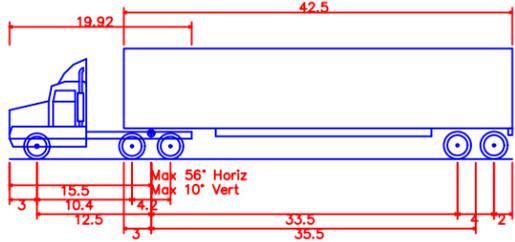
WB-50 - Intermediate Semi-Trailer	
Overall Length	55.00ft
Overall Width	8.50ft
Overall Body Height	12.05ft
Min Body Ground Clearance	1.33ft
Max Track Width	8.50ft
Lock-to-lock time	6.00s
Max Steering Angle (Virtual)	17.90°

- LEGEND:
- TRUCK TIRE TRACKING OFFSET
 - TRUCK BODY TRACKING OFFSET



pull curb back so that
tires are not going
over the curb

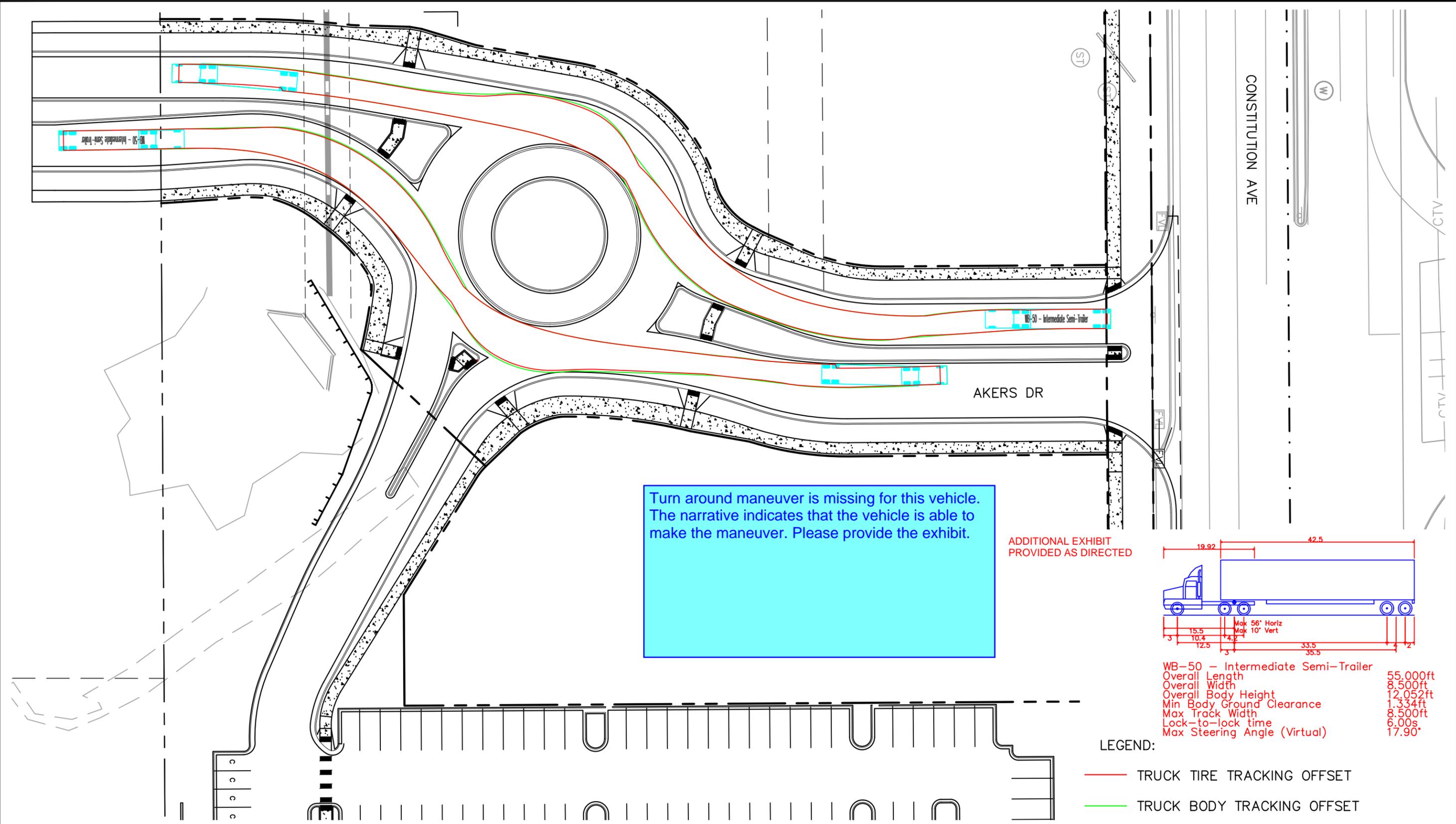
REVISED AS DIRECTED



WB-50 - Intermediate Semi-Trailer	
Overall Length	55.000ft
Overall Width	8.500ft
Overall Body Height	12.052ft
Min Body Ground Clearance	1.334ft
Max Track Width	8.500ft
Lock-to-lock time	6.00s
Max Steering Angle (Virtual)	17.90°

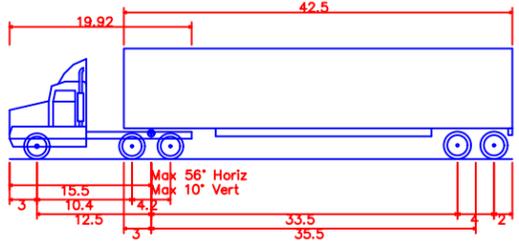
LEGEND:

- TRUCK TIRE TRACKING OFFSET
- TRUCK BODY TRACKING OFFSET



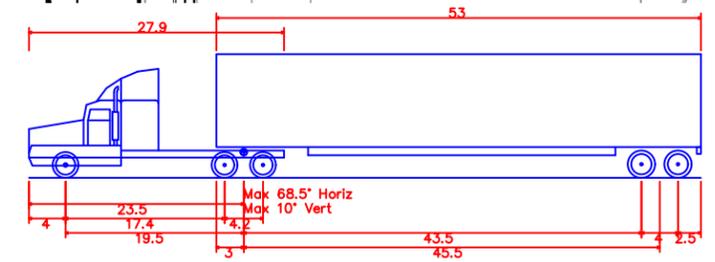
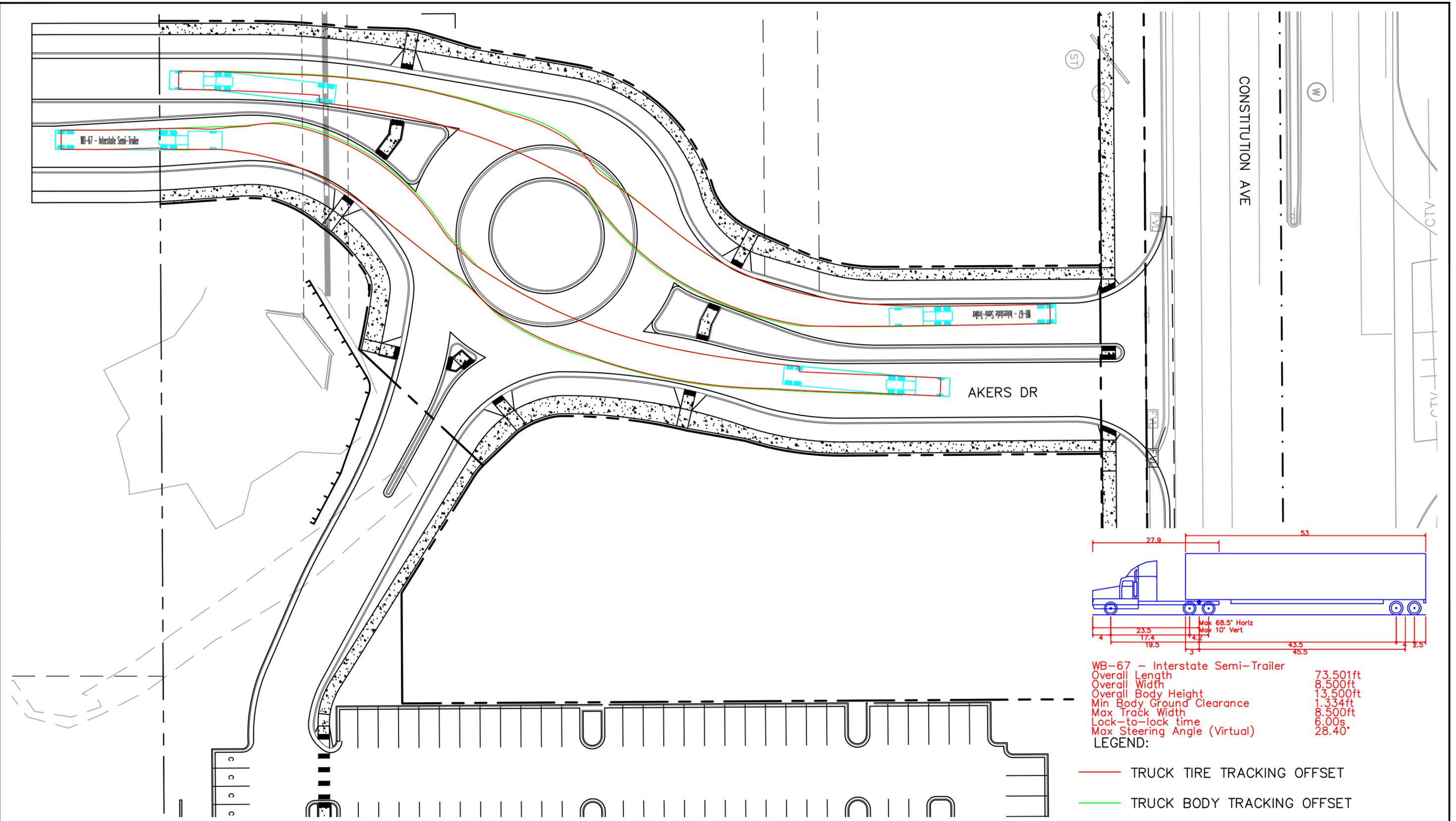
Turn around maneuver is missing for this vehicle. The narrative indicates that the vehicle is able to make the maneuver. Please provide the exhibit.

ADDITIONAL EXHIBIT PROVIDED AS DIRECTED



WB-50 - Intermediate Semi-Trailer	
Overall Length	55.000ft
Overall Width	8.500ft
Overall Body Height	12.052ft
Min Body Ground Clearance	1.334ft
Max Track Width	8.500ft
Lock-to-lock time	6.00s
Max Steering Angle (Virtual)	17.90°

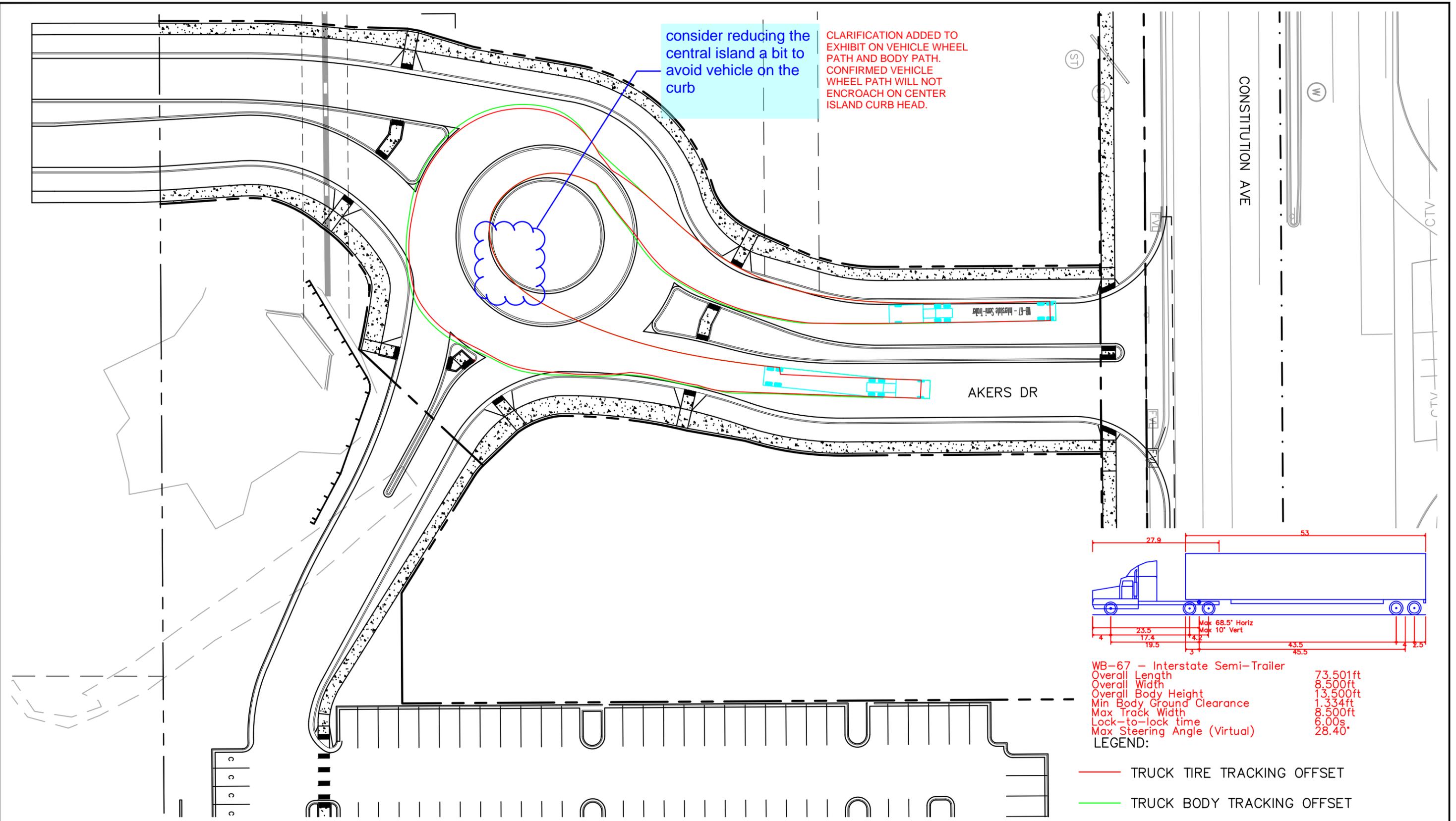
- LEGEND:
- TRUCK TIRE TRACKING OFFSET
 - TRUCK BODY TRACKING OFFSET



WB-67 - Interstate Semi-Trailer

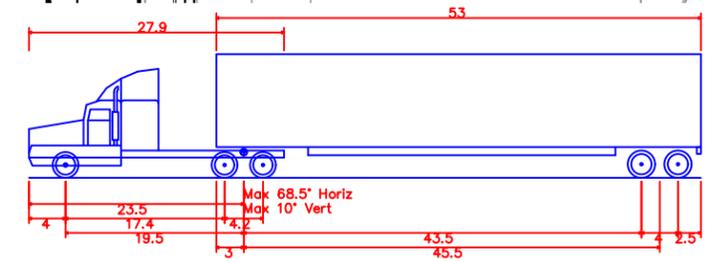
Overall Length	73.501ft
Overall Width	8.500ft
Overall Body Height	13.500ft
Min Body Ground Clearance	1.334ft
Max Track Width	8.500ft
Lock-to-lock time	6.00s
Max Steering Angle (Virtual)	28.40°

- LEGEND:
- TRUCK TIRE TRACKING OFFSET
 - TRUCK BODY TRACKING OFFSET



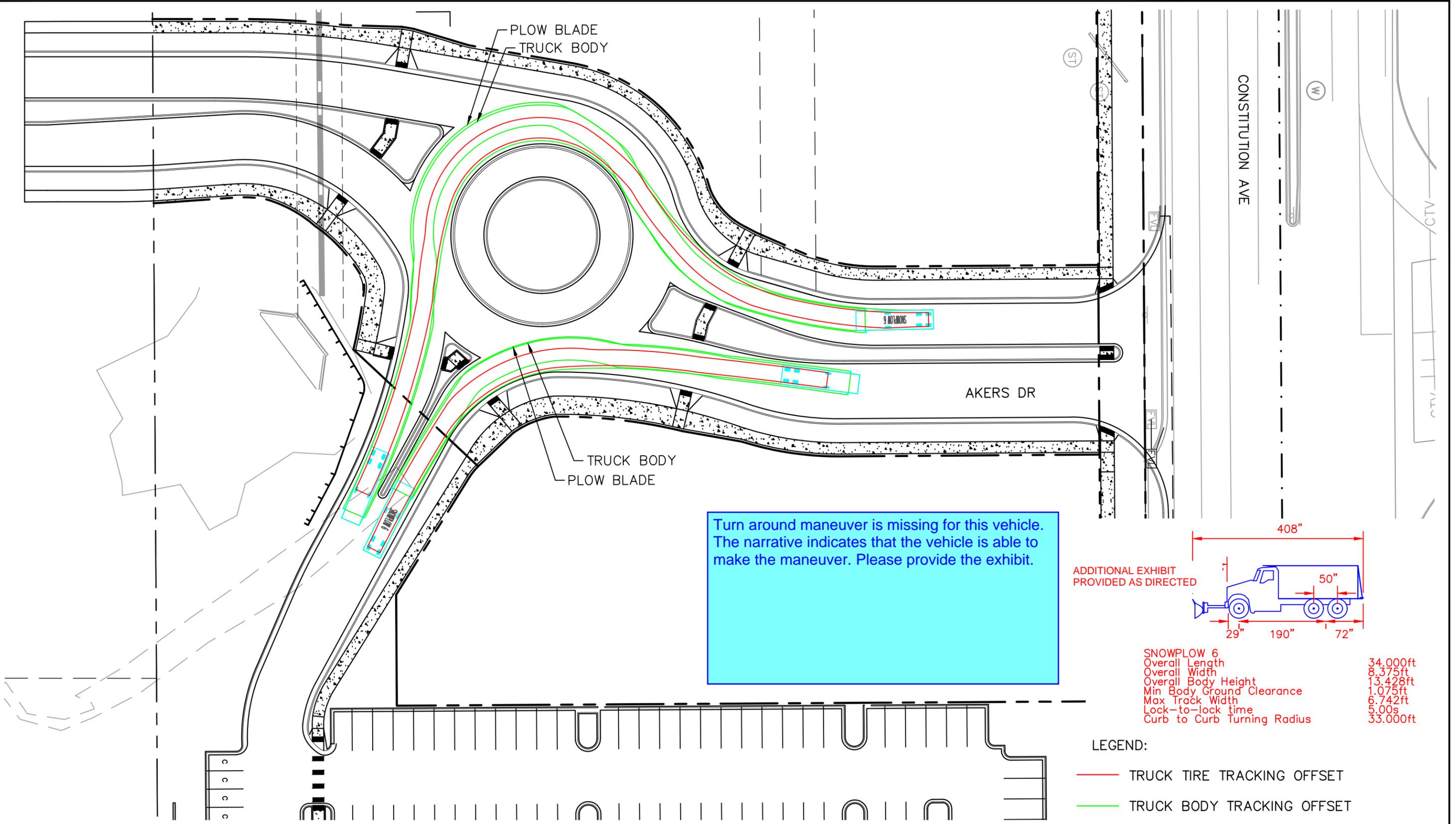
consider reducing the central island a bit to avoid vehicle on the curb

CLARIFICATION ADDED TO EXHIBIT ON VEHICLE WHEEL PATH AND BODY PATH. CONFIRMED VEHICLE WHEEL PATH WILL NOT ENCROACH ON CENTER ISLAND CURB HEAD.

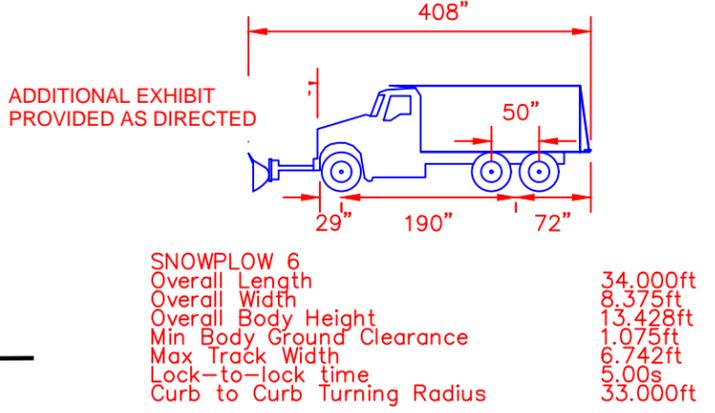


WB-67 - Interstate Semi-Trailer
 Overall Length 73.501ft
 Overall Width 8.500ft
 Overall Body Height 13.500ft
 Min Body Ground Clearance 1.334ft
 Max Track Width 8.500ft
 Lock-to-lock time 6.00s
 Max Steering Angle (Virtual) 28.40°
 LEGEND:

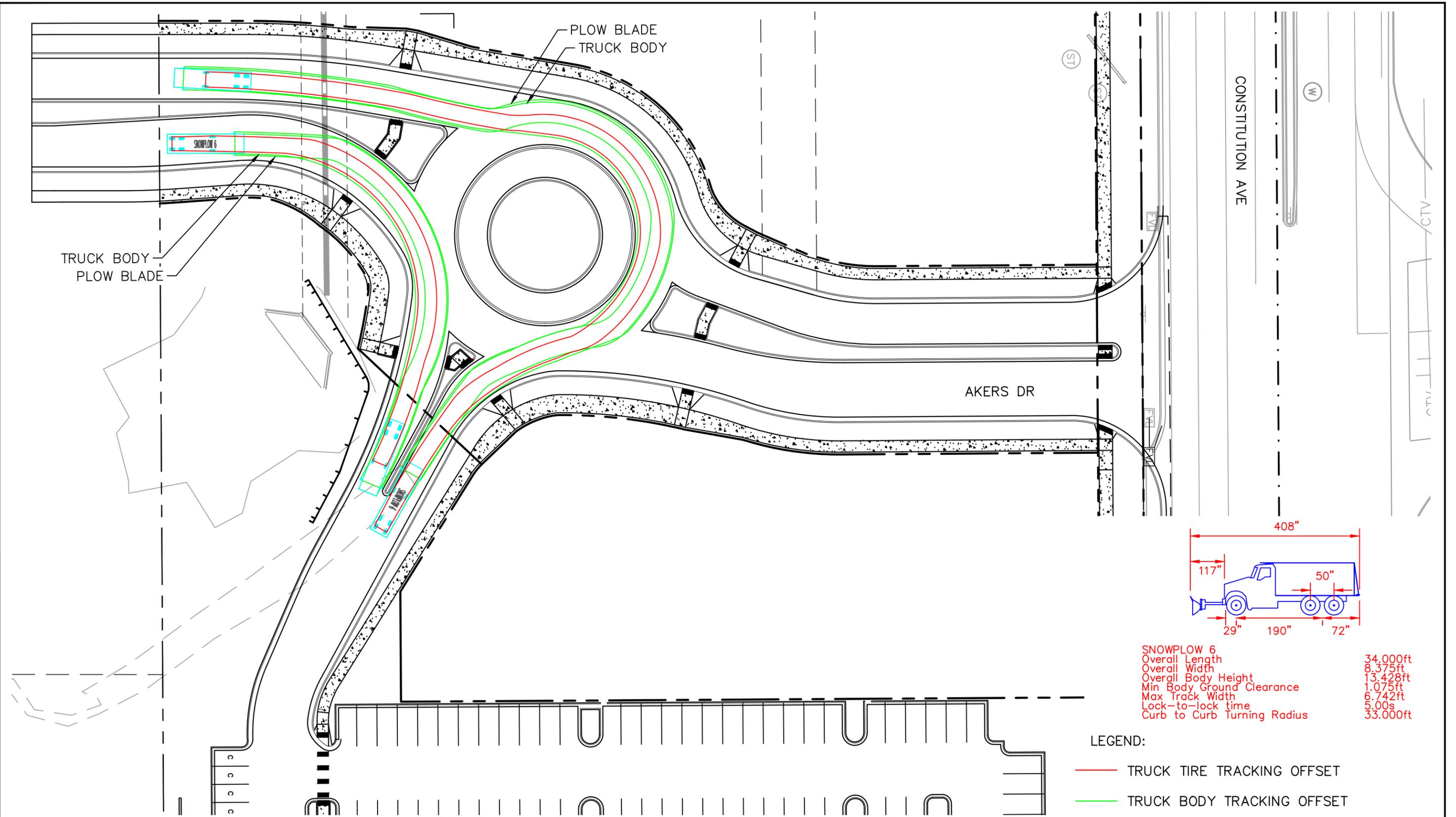
- TRUCK TIRE TRACKING OFFSET
- TRUCK BODY TRACKING OFFSET



Turn around maneuver is missing for this vehicle. The narrative indicates that the vehicle is able to make the maneuver. Please provide the exhibit.

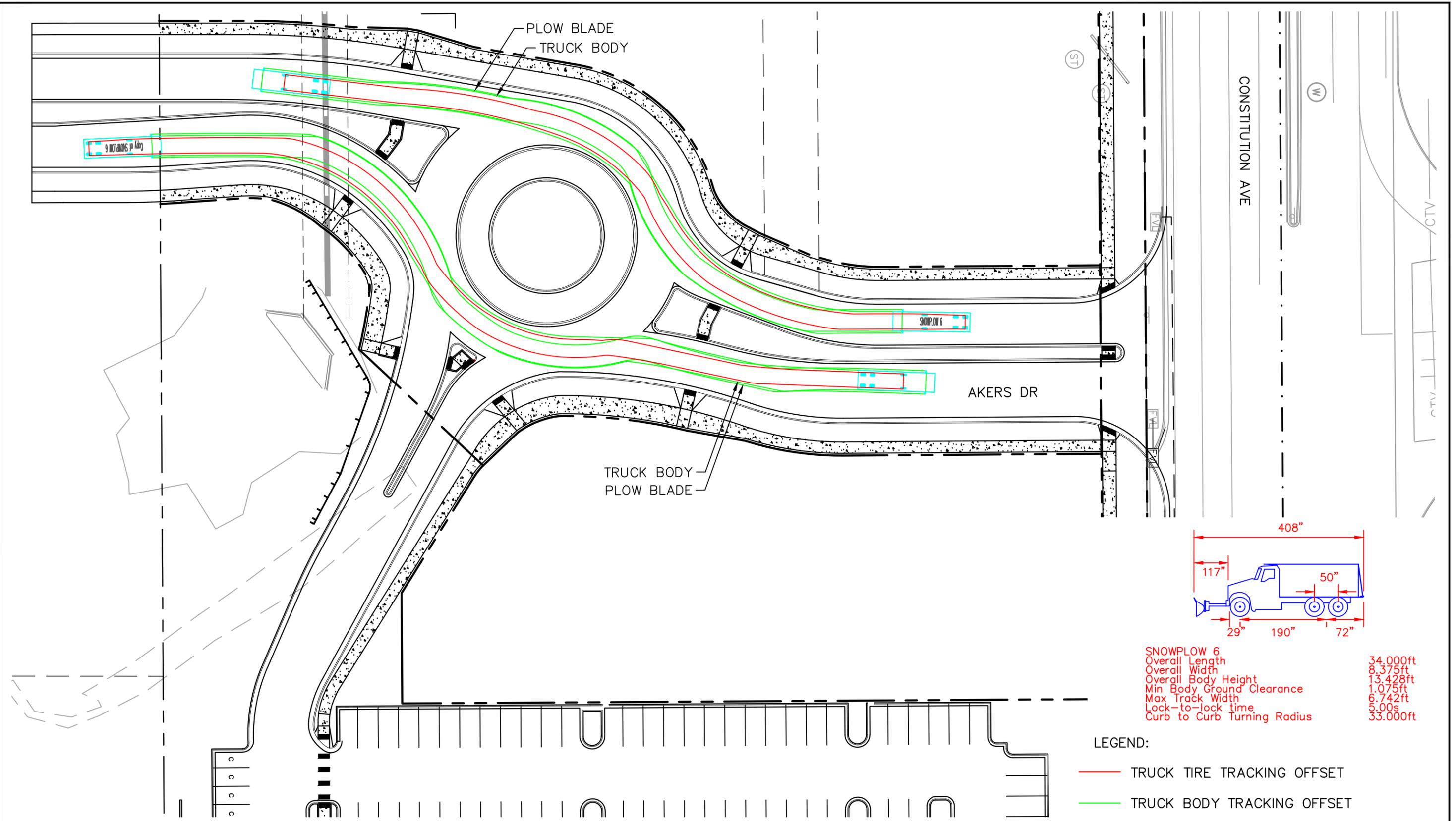


- LEGEND:
- TRUCK TIRE TRACKING OFFSET
 - TRUCK BODY TRACKING OFFSET



SNOWPLOW 6	
Overall Length	34.00ft
Overall Width	8.375ft
Overall Body Height	13.428ft
Min Body Ground Clearance	1.075ft
Max Track Width	6.742ft
Lock-to-lock time	5.00s
Curb to Curb Turning Radius	33.00ft

- LEGEND:
- TRUCK TIRE TRACKING OFFSET
 - TRUCK BODY TRACKING OFFSET



SNOWPLOW 6	
Overall Length	34.00ft
Overall Width	8.375ft
Overall Body Height	13.428ft
Min Body Ground Clearance	1.075ft
Max Track Width	6.742ft
Lock-to-lock time	5.00s
Curb to Curb Turning Radius	33.00ft

- LEGEND:
- TRUCK TIRE TRACKING OFFSET
 - TRUCK BODY TRACKING OFFSET

Should be based on the west side going south

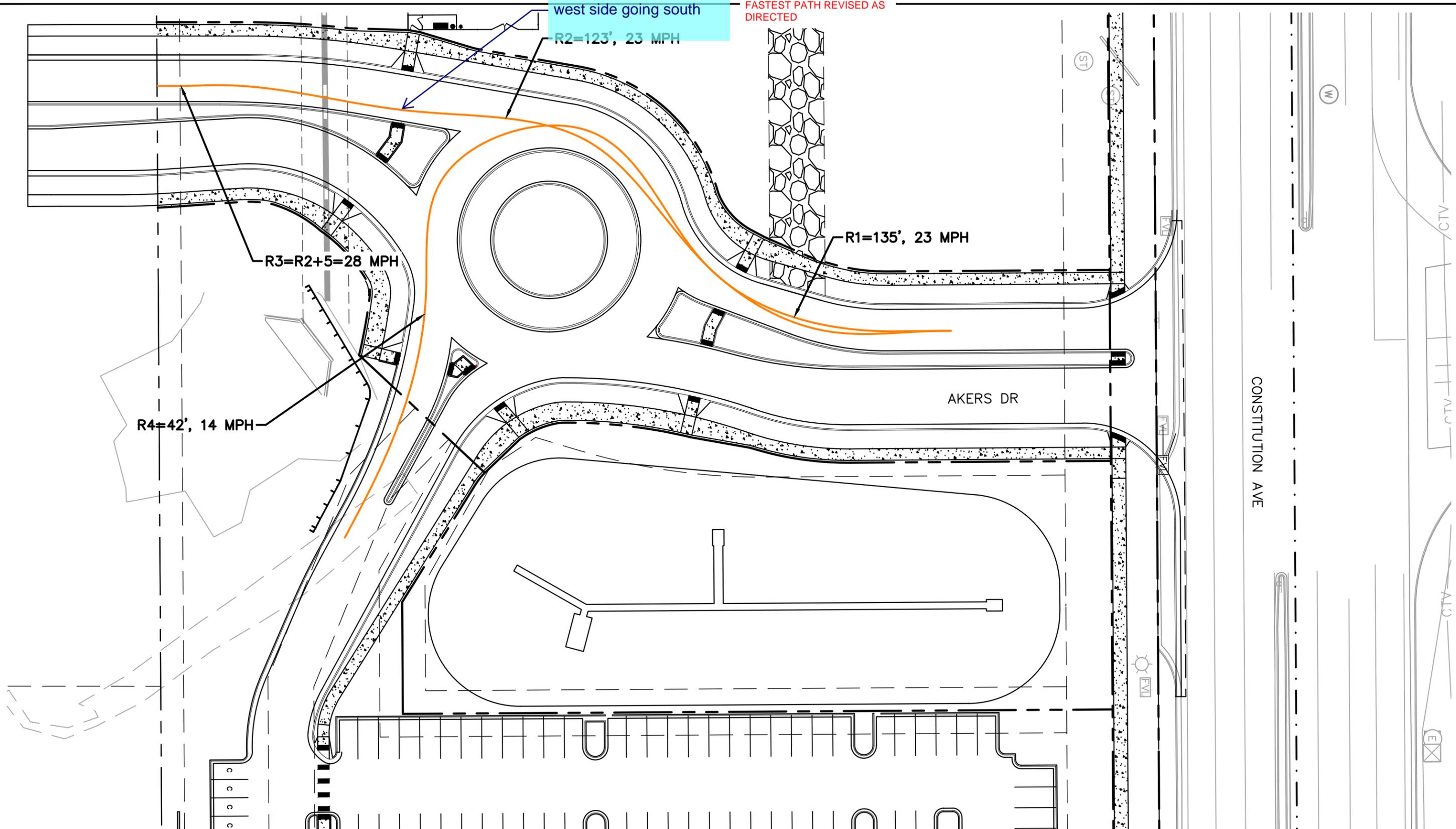
FASTEST PATH REVISED AS DIRECTED

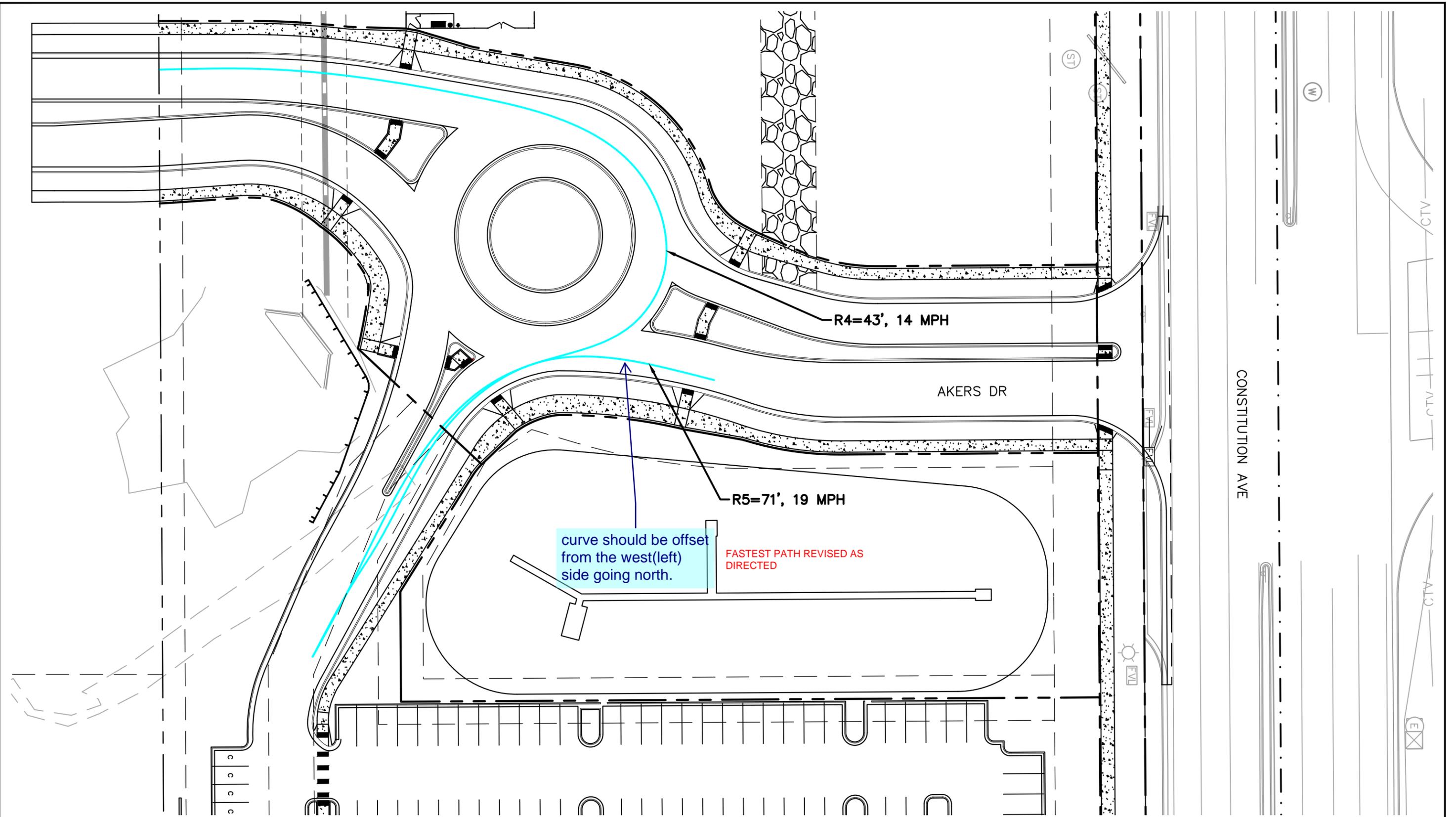
R2=123', 23 MPH

R1=135', 23 MPH

R3=R2+5=28 MPH

R4=42', 14 MPH





curve should be closer to the west side

FASTEST PATH REVISED AS DIRECTED

R1=108', 22 MPH

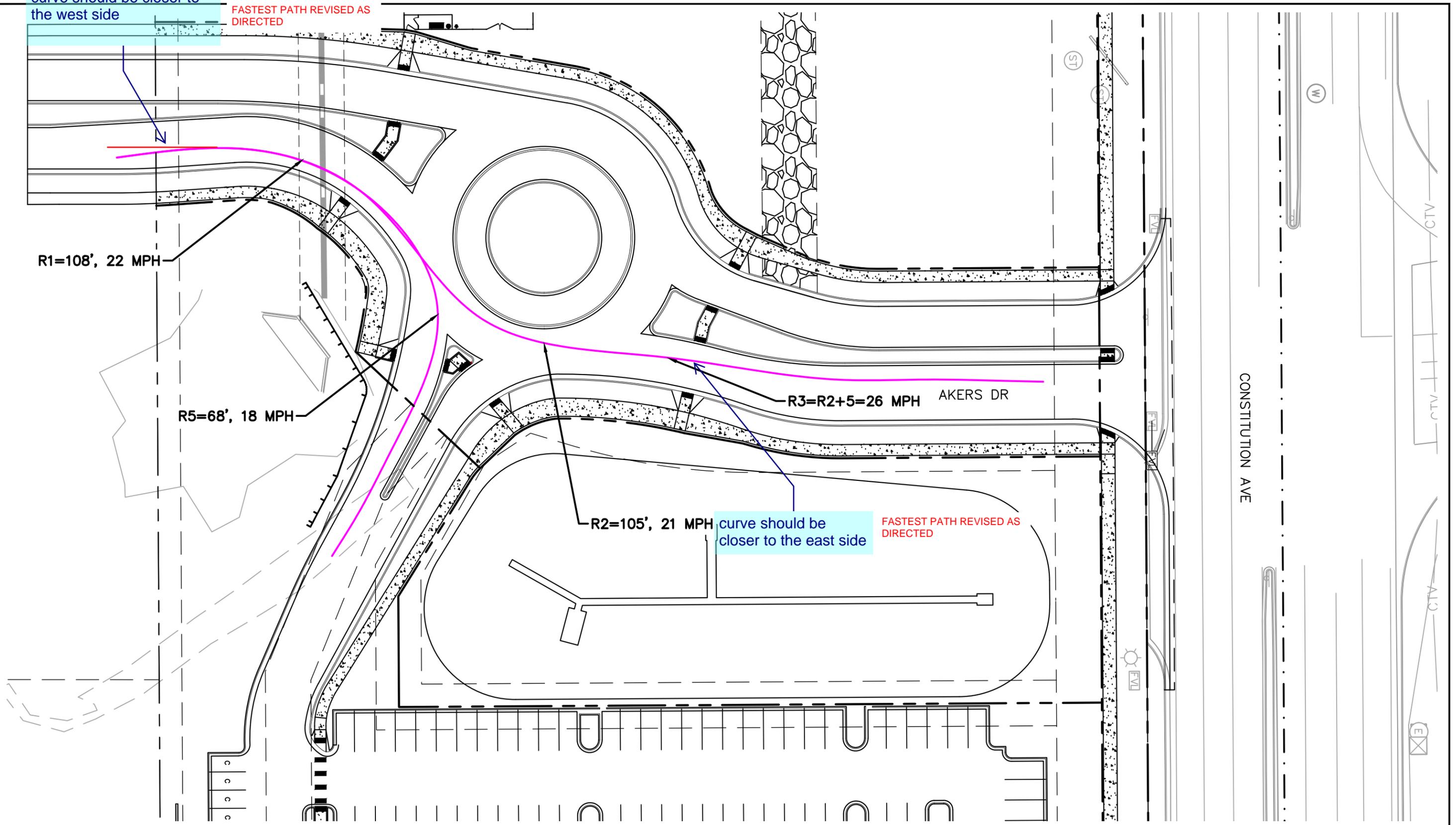
R5=68', 18 MPH

R2=105', 21 MPH

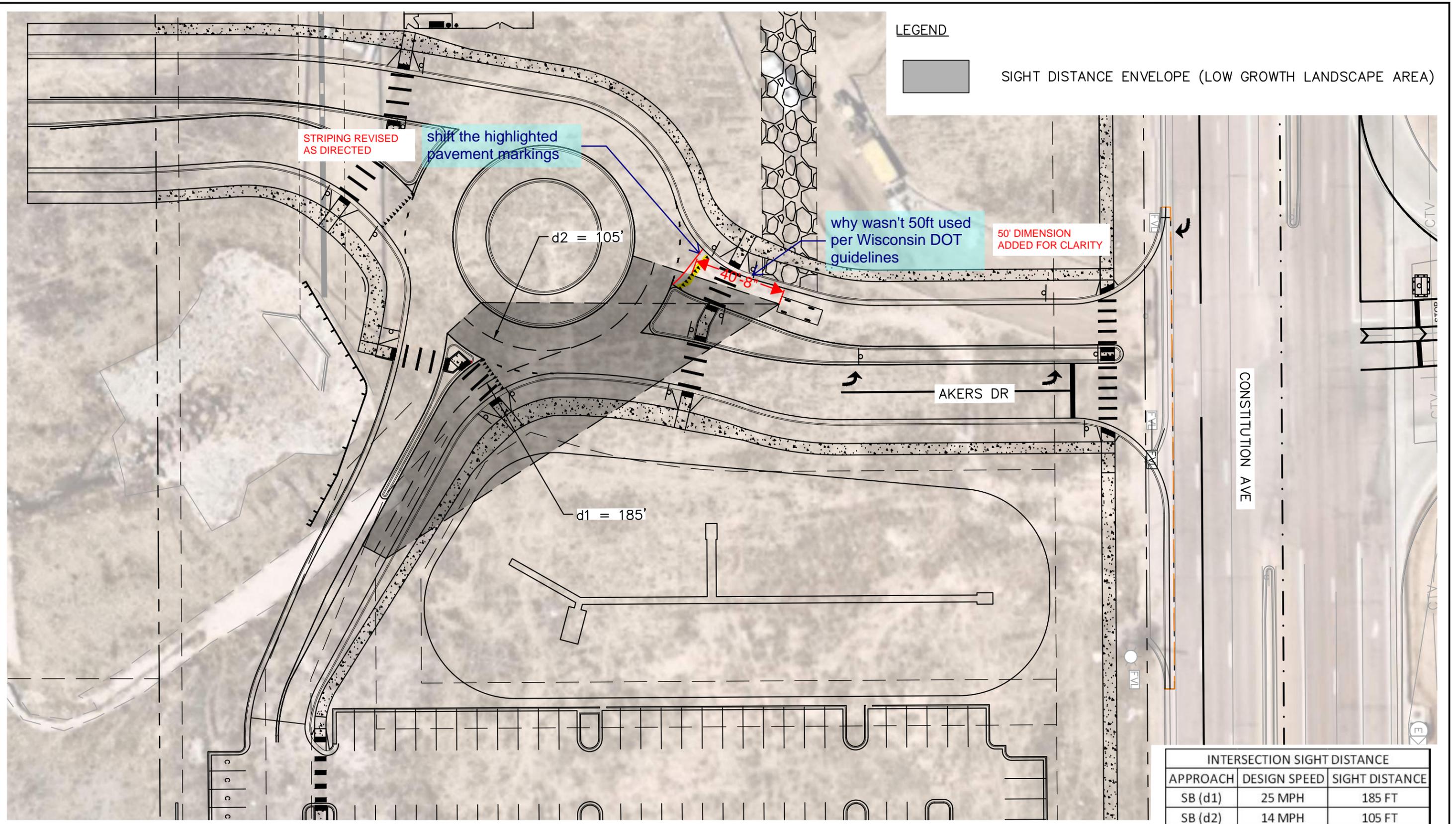
R3=R2+5=26 MPH AKERS DR

curve should be closer to the east side

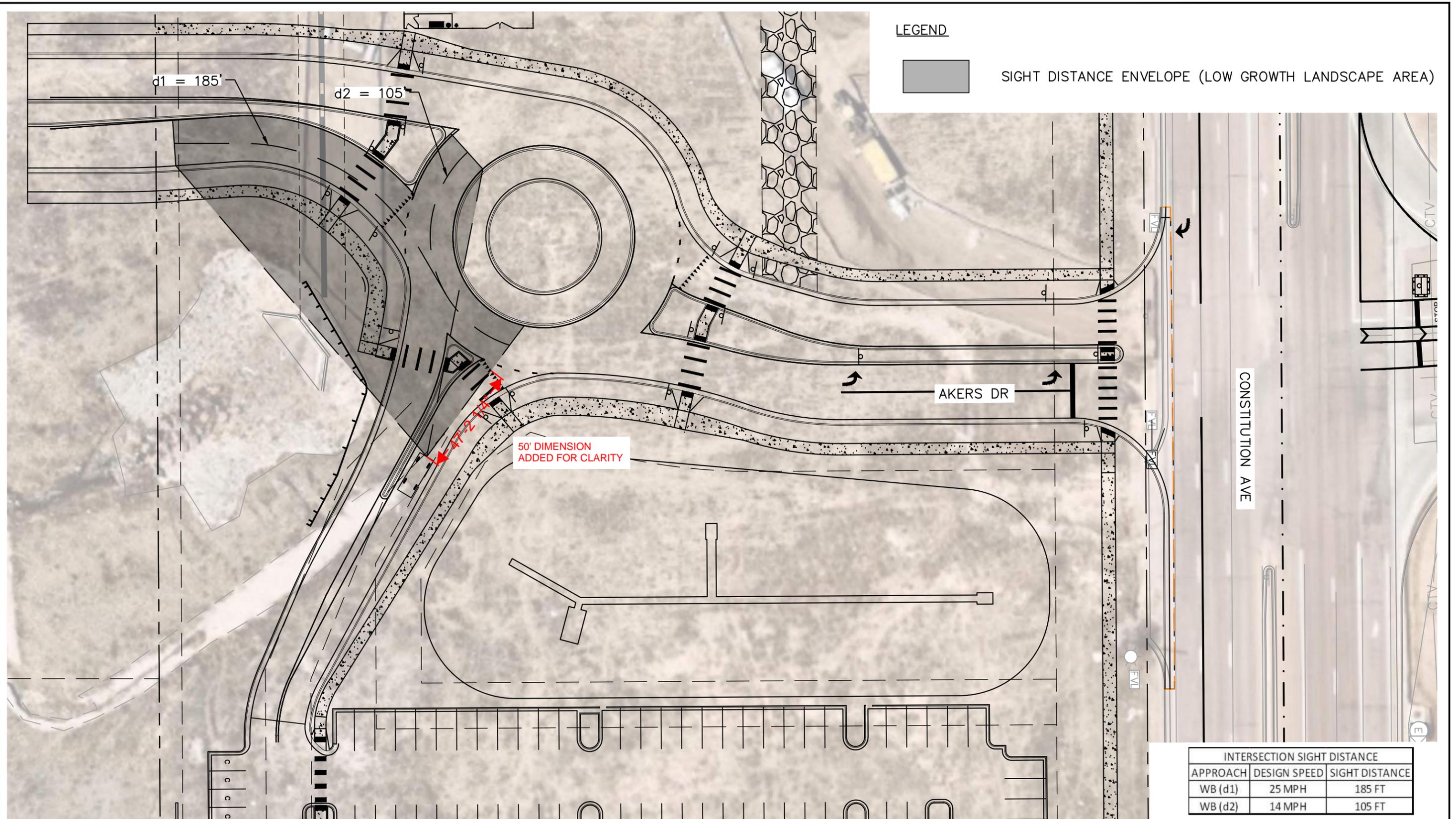
FASTEST PATH REVISED AS DIRECTED

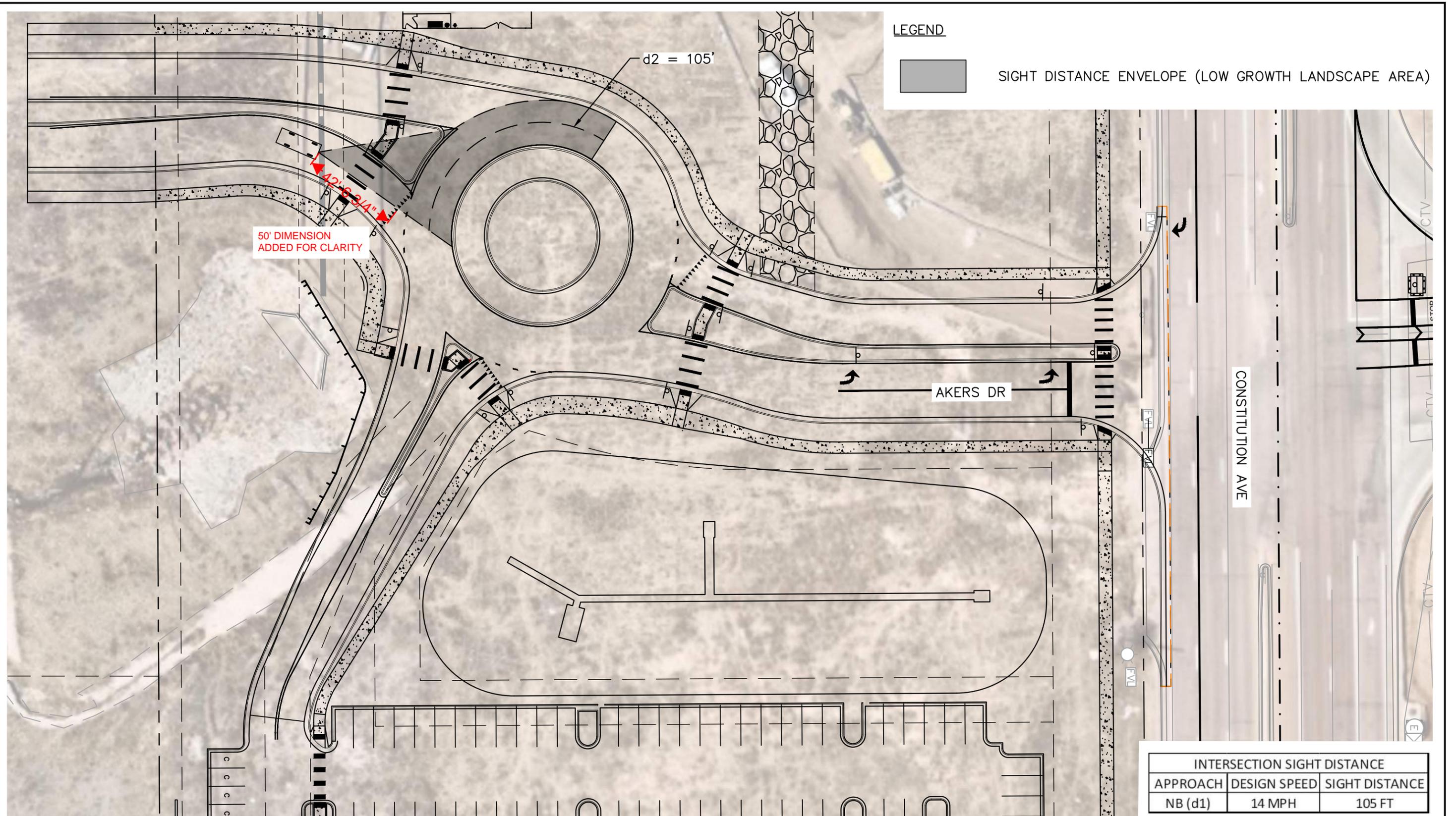


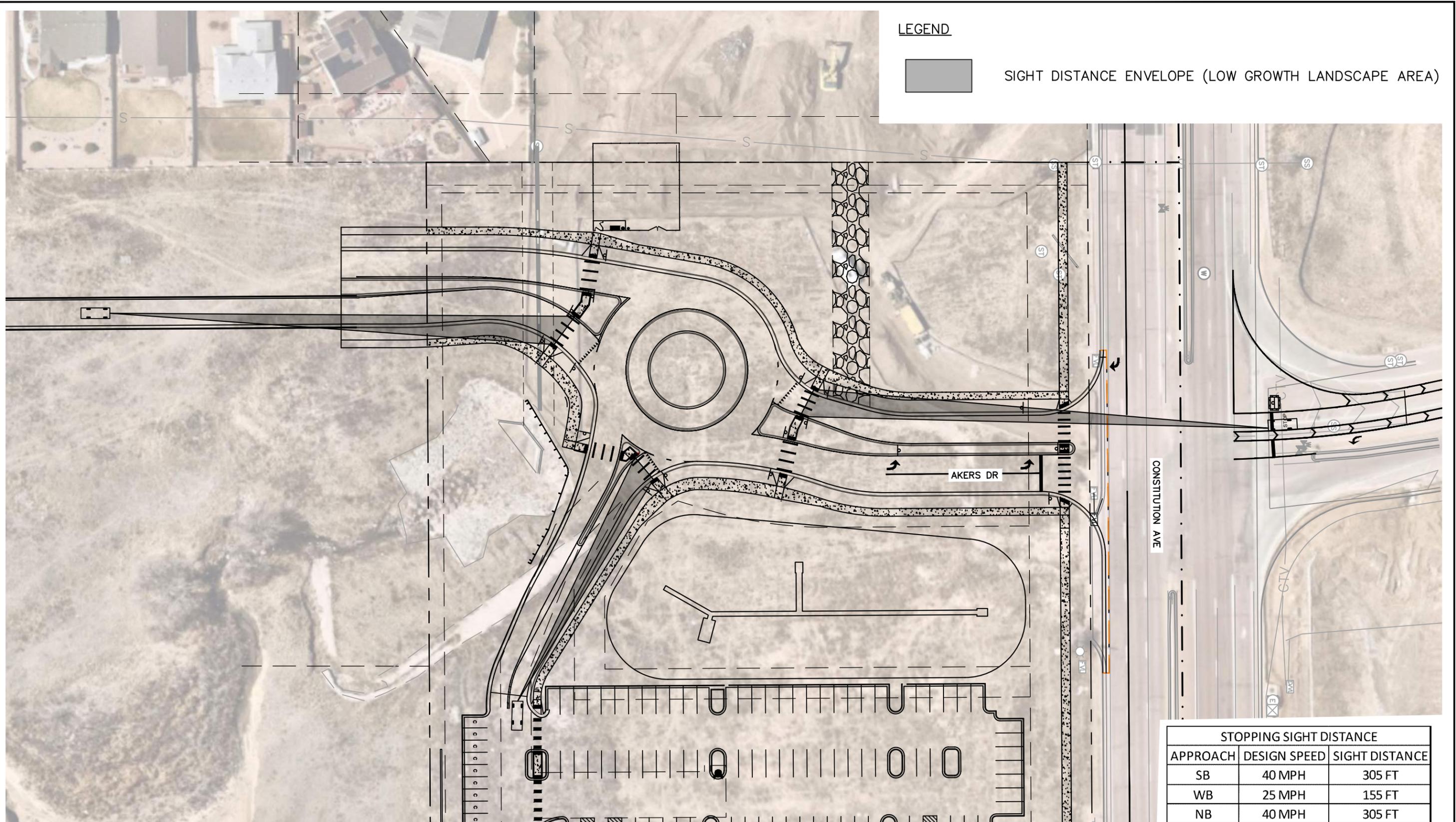
CONSTITUTION AVE

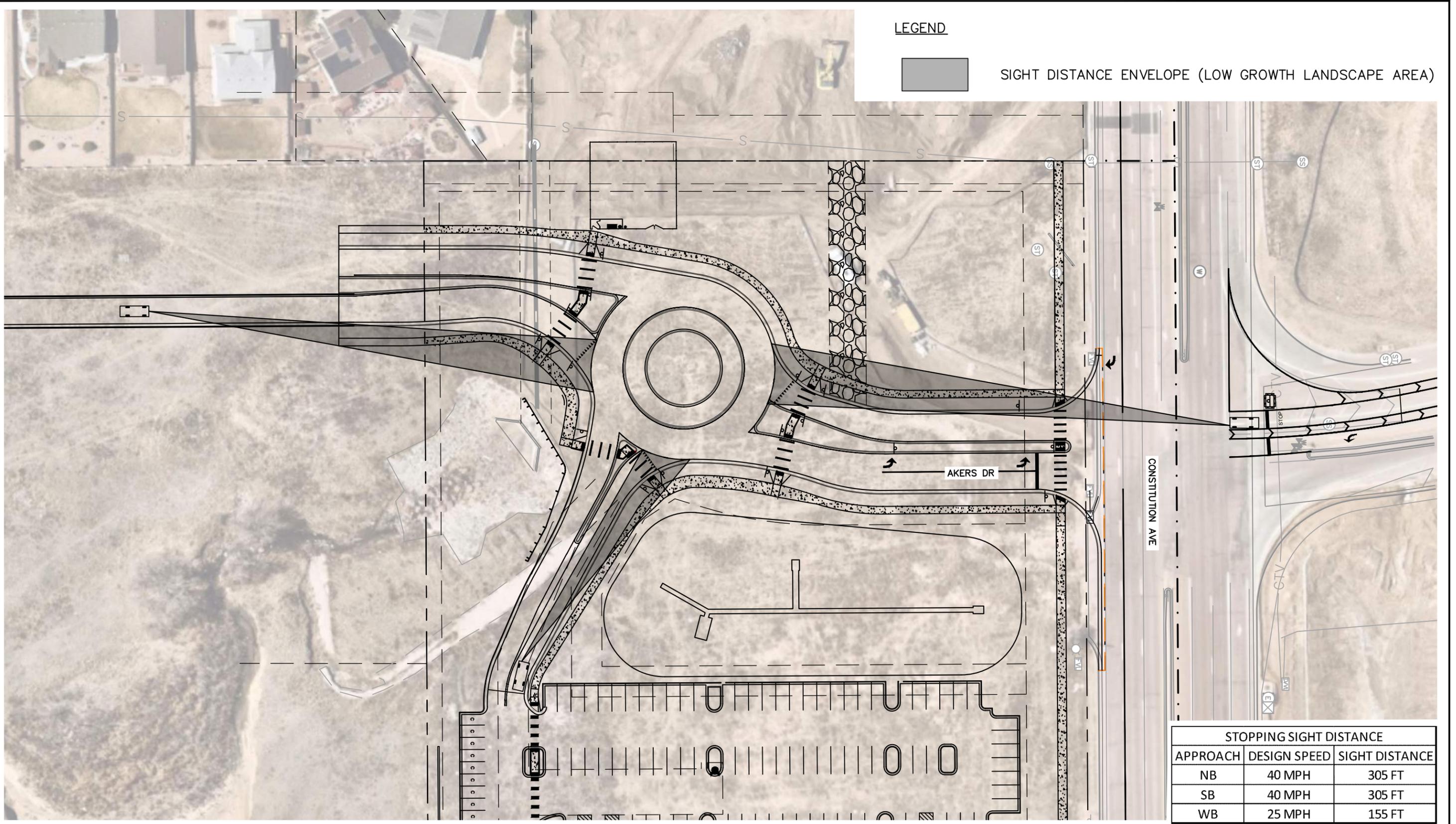


INTERSECTION SIGHT DISTANCE		
APPROACH	DESIGN SPEED	SIGHT DISTANCE
SB (d1)	25 MPH	185 FT
SB (d2)	14 MPH	105 FT







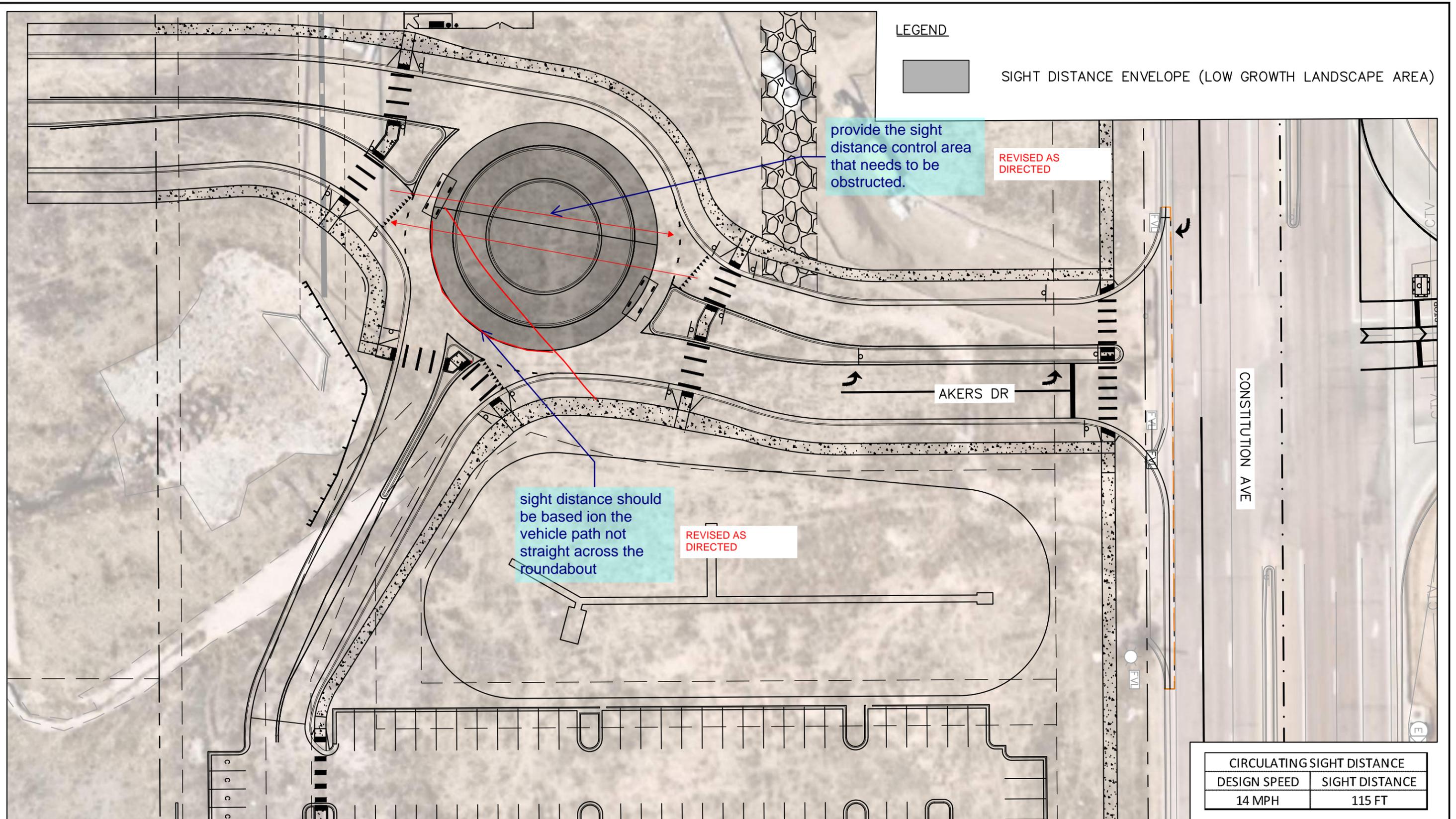


LEGEND



SIGHT DISTANCE ENVELOPE (LOW GROWTH LANDSCAPE AREA)

STOPPING SIGHT DISTANCE		
APPROACH	DESIGN SPEED	SIGHT DISTANCE
NB	40 MPH	305 FT
SB	40 MPH	305 FT
WB	25 MPH	155 FT



LEGEND



SIGHT DISTANCE ENVELOPE (LOW GROWTH LANDSCAPE AREA)

provide the sight distance control area that needs to be obstructed.

REVISED AS DIRECTED

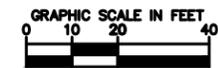
sight distance should be based on the vehicle path not straight across the roundabout

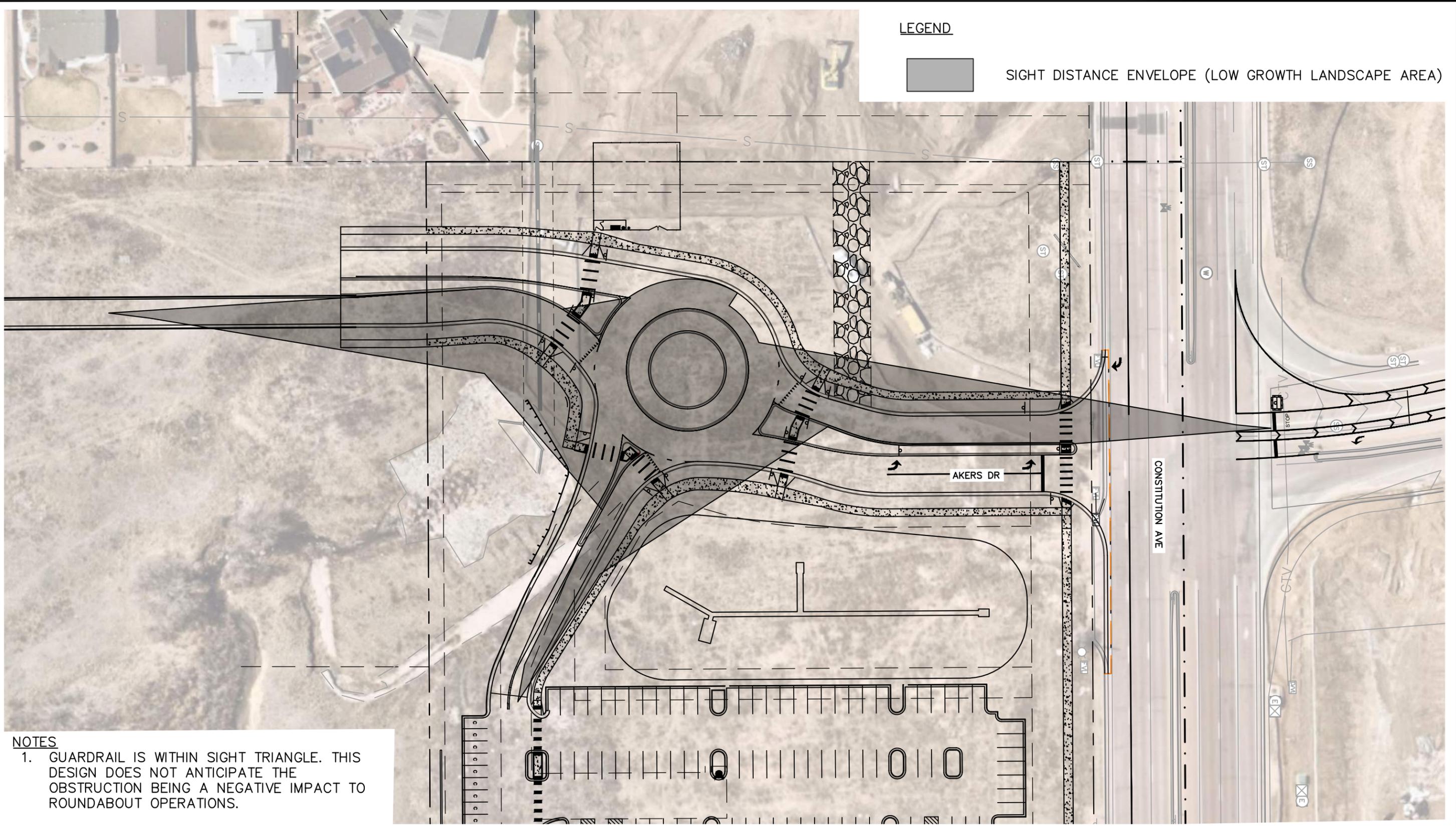
REVISED AS DIRECTED

AKERS DR

CONSTITUTION AVE

CIRCULATING SIGHT DISTANCE	
DESIGN SPEED	SIGHT DISTANCE
14 MPH	115 FT





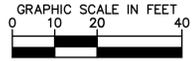
LEGEND



SIGHT DISTANCE ENVELOPE (LOW GROWTH LANDSCAPE AREA)

NOTES

1. GUARDRAIL IS WITHIN SIGHT TRIANGLE. THIS DESIGN DOES NOT ANTICIPATE THE OBSTRUCTION BEING A NEGATIVE IMPACT TO ROUNDABOUT OPERATIONS.



THE PHOTOMETRIC PLAN HAS BEEN INCLUDED AS PART OF THE SDP SUBMITTAL.
LIGHT LOCATIONS ARE CALLED OUT ON THE SDP SITE PLAN SHEETS. LIGHT LOCATIONS ARE ALSO SHOWN ON SHEET 10 OF THE ROADWAY PLANS.

Provide photometric plan and show light pole locations.
Lighting plan to meet CDOT Lighting Design Guidelines.

2.2.6 ROUNDABOUTS

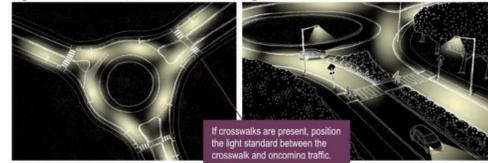
- When to Light**
- Lighting should be considered at all roundabouts with pedestrian usage and adjacent electrical service.
 - See ANSI/IES RP-8-18 Chapter 12 for additional roundabout design information.
 - See Section 2.2.9 for information about lighting crosswalks.

Lighting Criteria
Lighting levels will be considered as meeting the criteria if the calculated values are within ten percent (10%) of the criteria or do not exceed the criteria by more than two times (2x).

Intersecting Roads	Average Illuminance with minimal pedestrian activity (fc)	Average Illuminance with anticipated pedestrian activity (fc)	Uniformity (avg.min)
Major/Major	1.7	2.4	3
Major/Collector	1.4	2.0	3
Major/Local	1.2	1.9	3
Collector/Collector	1.1	1.7	4
Collector/Local	0.9	1.5	4
Local/Local	0.7	1.3	6

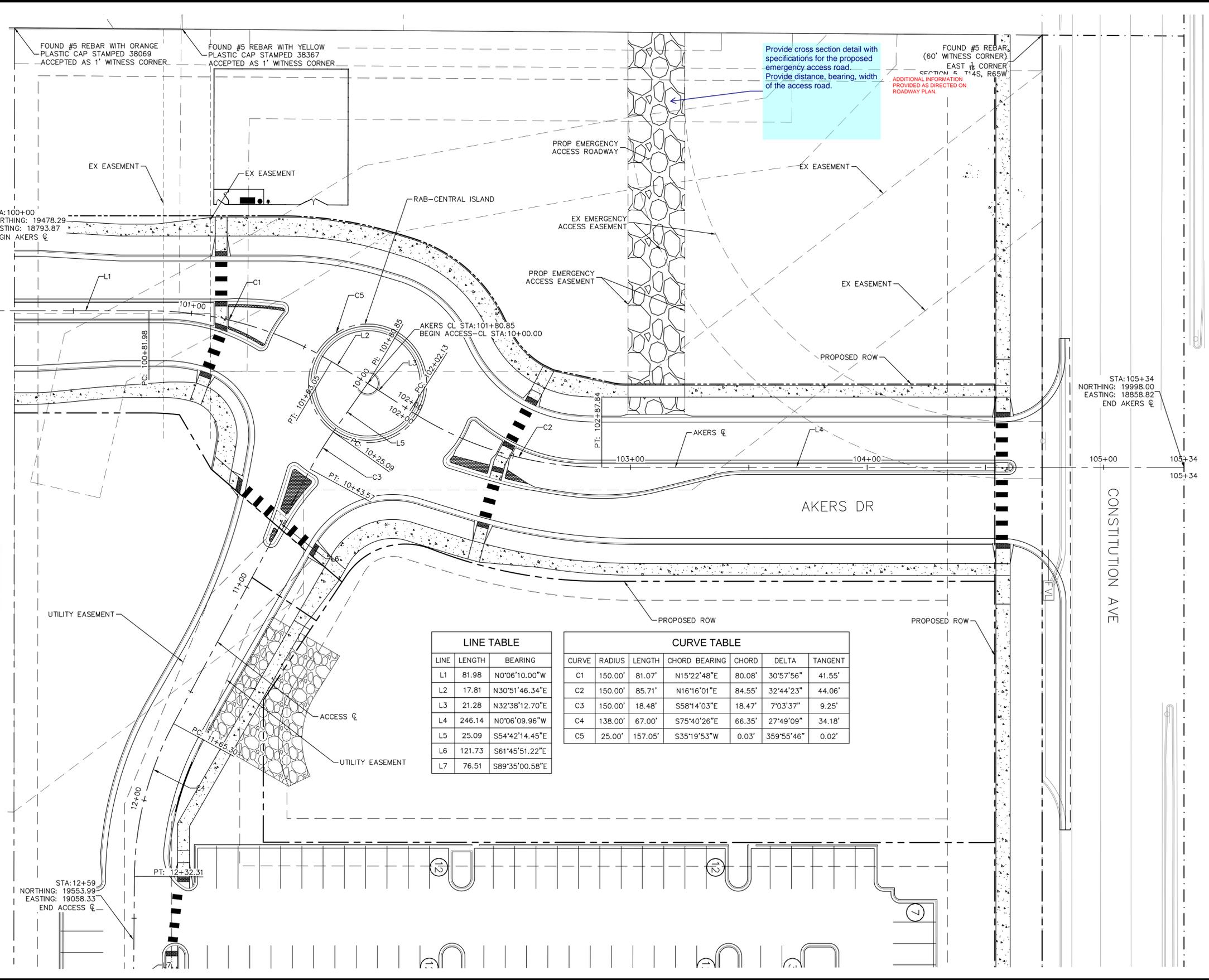
- Best Practices**
- Light standards should not be located in the center of the roundabout.
 - Locate light standards on the approach side of each entry such that the maximum amount of vertical light falls on vehicles entering the roundabout and on crosswalks when present.
 - Approach lighting should be considered for a minimum of 400 feet in front of the roundabout.
 - Light standards should be located at least 4 feet (6 feet is preferred) away from the front edge of the curb to minimize the chance of the pole being struck by a vehicle.
- Special Considerations**
- Lighted features in the center of the roundabout may increase the ambient brightness. Care must be given to not cause glare for any of the motorists.

DESIGN EXAMPLES



811 Know what's below. Call before you dig.

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1-800-922-1987
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Provide cross section detail with specifications for the proposed emergency access road.
Provide distance, bearing, width of the access road.

FOUND #5 REBAR (60' WITNESS CORNER) EAST CORNER SECTION # T14S, R65W
ADDITIONAL INFORMATION PROVIDED AS DIRECTED ON ROADWAY PLAN.

LINE TABLE

LINE	LENGTH	BEARING
L1	81.98	N0°06'10.00"W
L2	17.81	N30°51'46.34"E
L3	21.28	N32°38'12.70"E
L4	246.14	N0°06'09.96"W
L5	25.09	S54°42'14.45"E
L6	121.73	S61°45'51.22"E
L7	76.51	S89°35'00.58"E

CURVE TABLE

CURVE	RADIUS	LENGTH	CHORD BEARING	CHORD	DELTA	TANGENT
C1	150.00'	81.07'	N15°22'48"E	80.08'	30°57'56"	41.55'
C2	150.00'	85.71'	N16°16'01"E	84.55'	32°44'23"	44.06'
C3	150.00'	18.48'	S58°14'03"E	18.47'	7°03'37"	9.25'
C4	138.00'	67.00'	S75°40'26"E	66.35'	27°49'09"	34.18'
C5	25.00'	157.05'	S35°19'53"W	0.03'	359°55'46"	0.02'

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4582 South Uteer Street, Suite 1500
Denver, CO 80237 (303) 228-2300

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DRAWN BY: TL
CHECKED BY: CEH
DATE: 6/8/2022

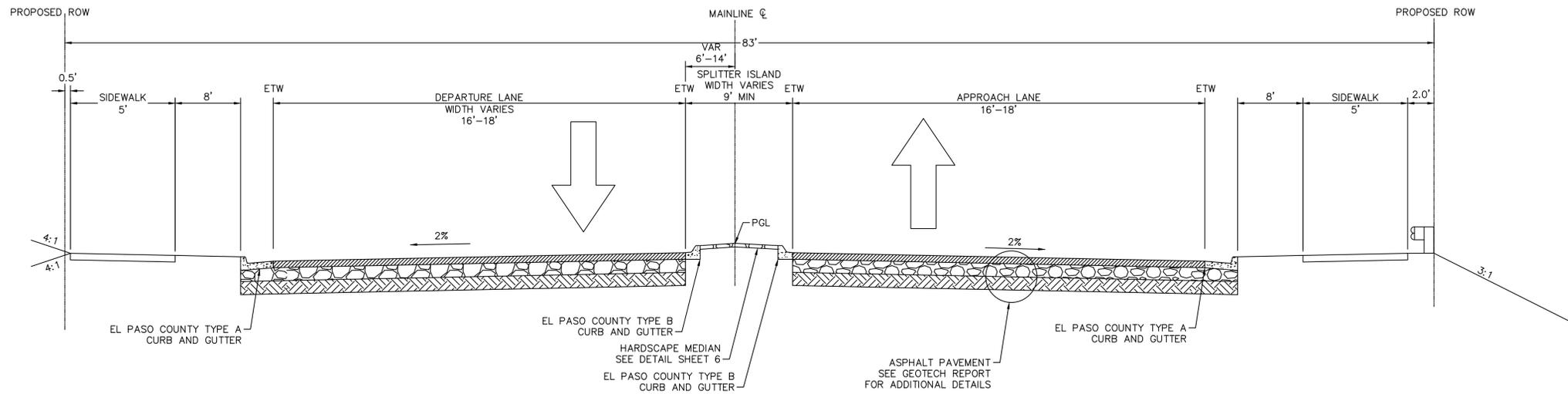
AKERS DR & ACCESS ROAD ROUNDABOUT
EL PASO COUNTY, COLORADO
ROADWAY CONSTRUCTION DOCUMENTS
HORIZONTAL CONTROL

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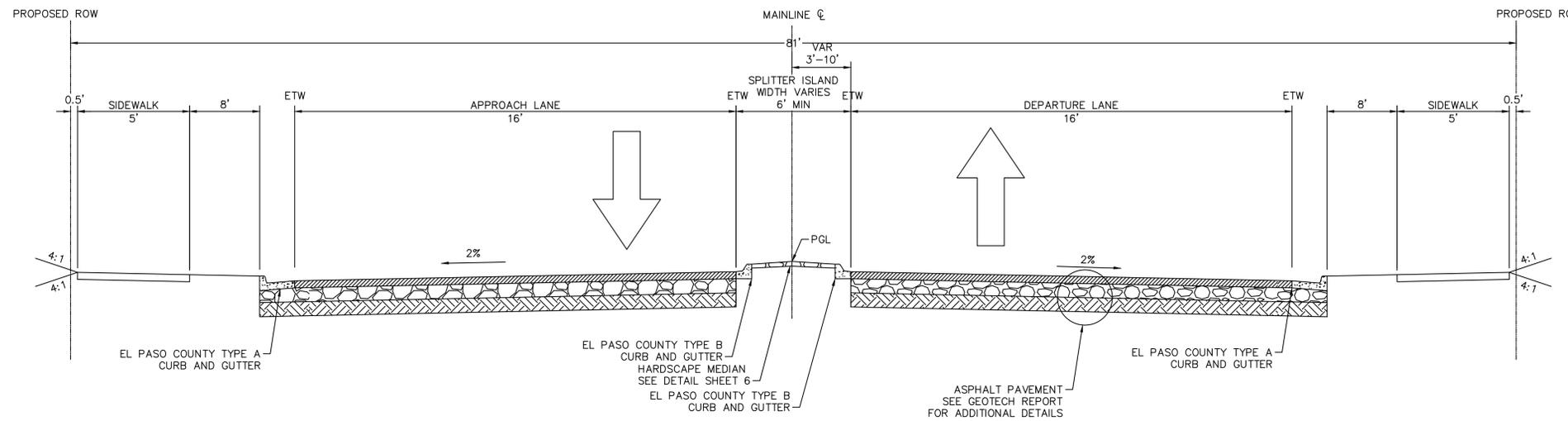
PROJECT NO.
096481004

SHEET
3

NO.	REVISION	DATE	APPR.



SOUTH LEG TYPICAL SECTION APPROACH
STA 100+25 - 101+34



NORTH LEG TYPICAL SECTION APPROACH
STA 102+27 - 102+73



ABBREVIATIONS:
ETW = EDGE OF TRAVELWAY
ROW = RIGHT OF WAY

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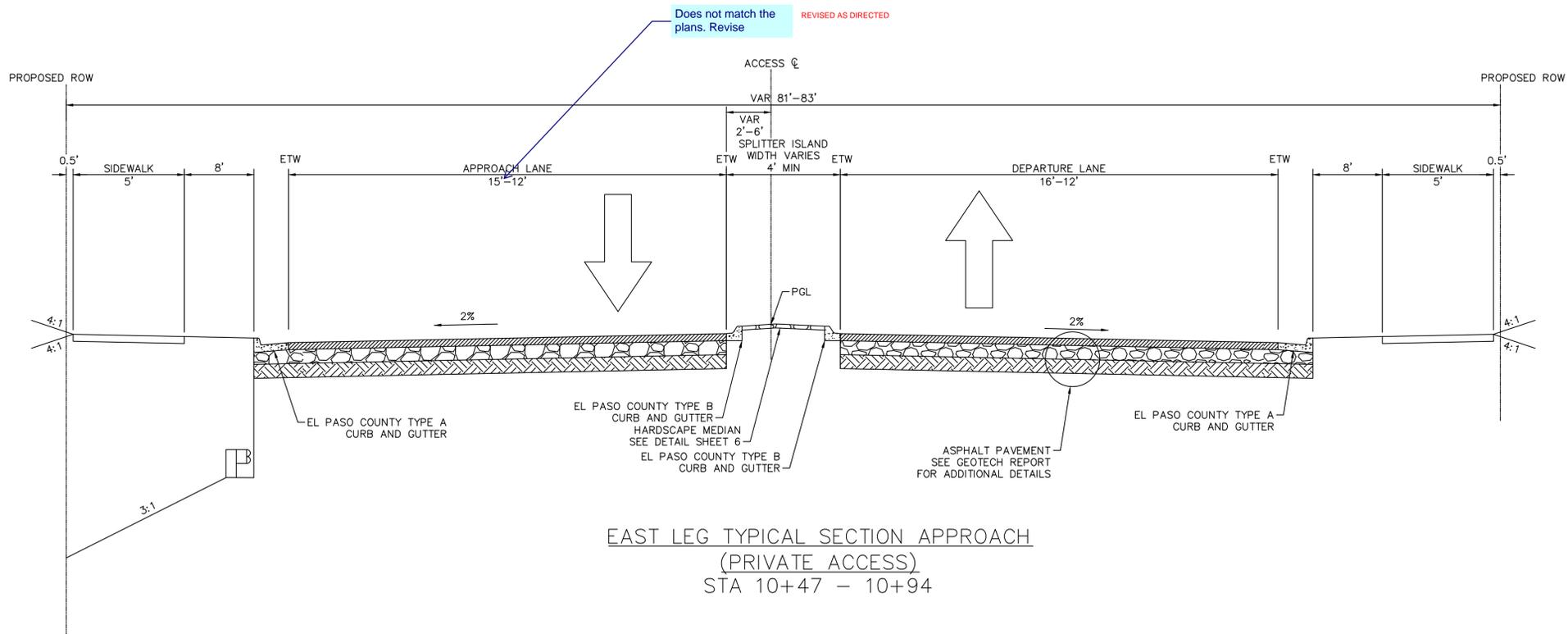
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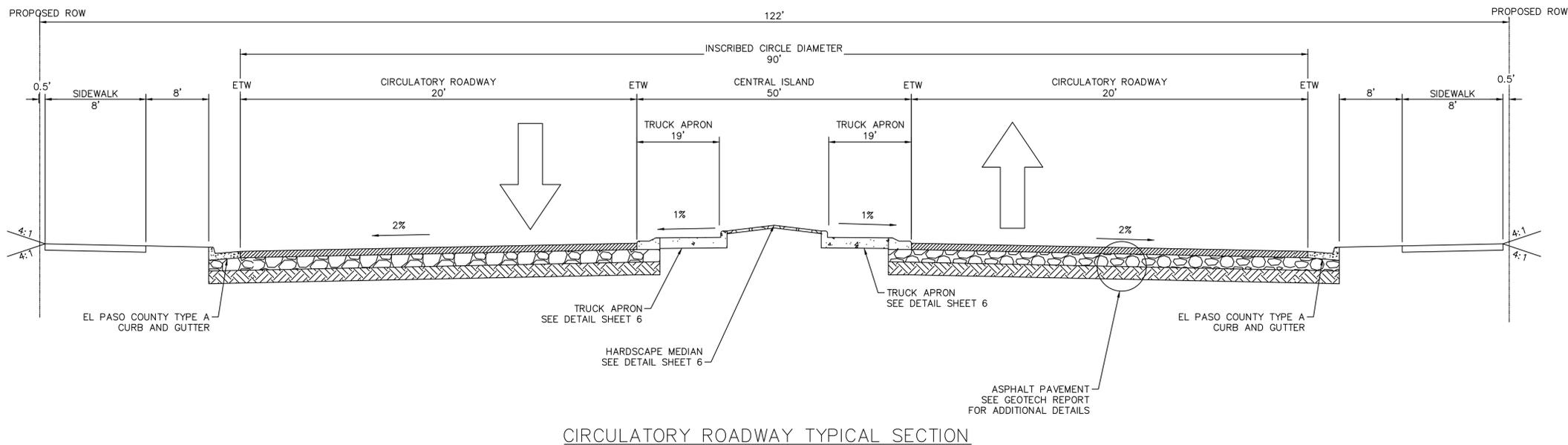
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4

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Does not match the plans. Revise
REVISED AS DIRECTED

Update the details per roundabout analysis comments provided
REVISED AS DIRECTED



CIRCULATORY ROADWAY TYPICAL SECTION

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DATE: 6/8/2022

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EL PASO COUNTY, COLORADO
ROADWAY CONSTRUCTION DOCUMENTS
TYPICAL SECTION

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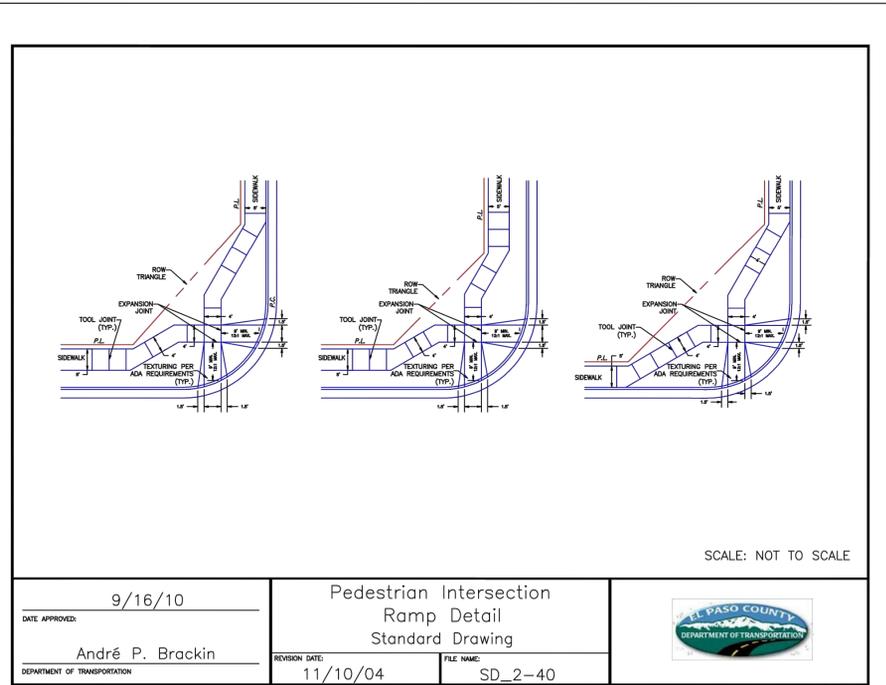
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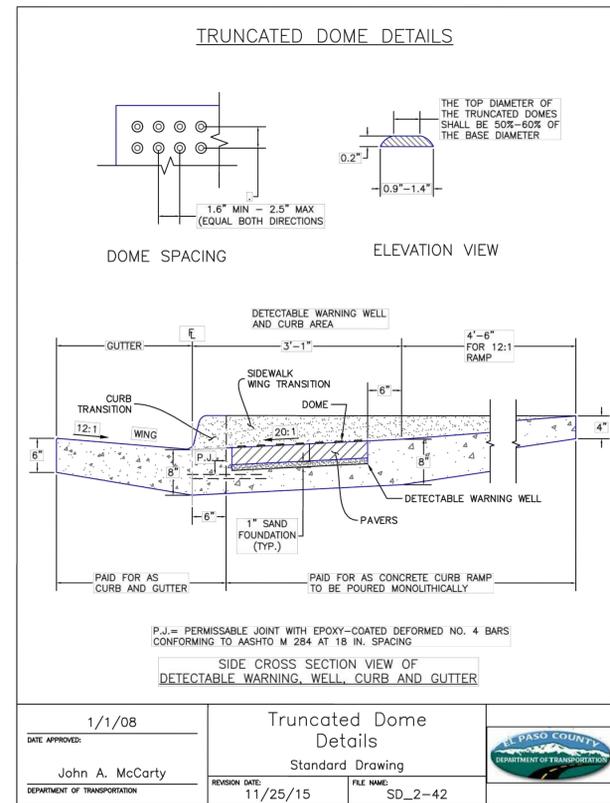
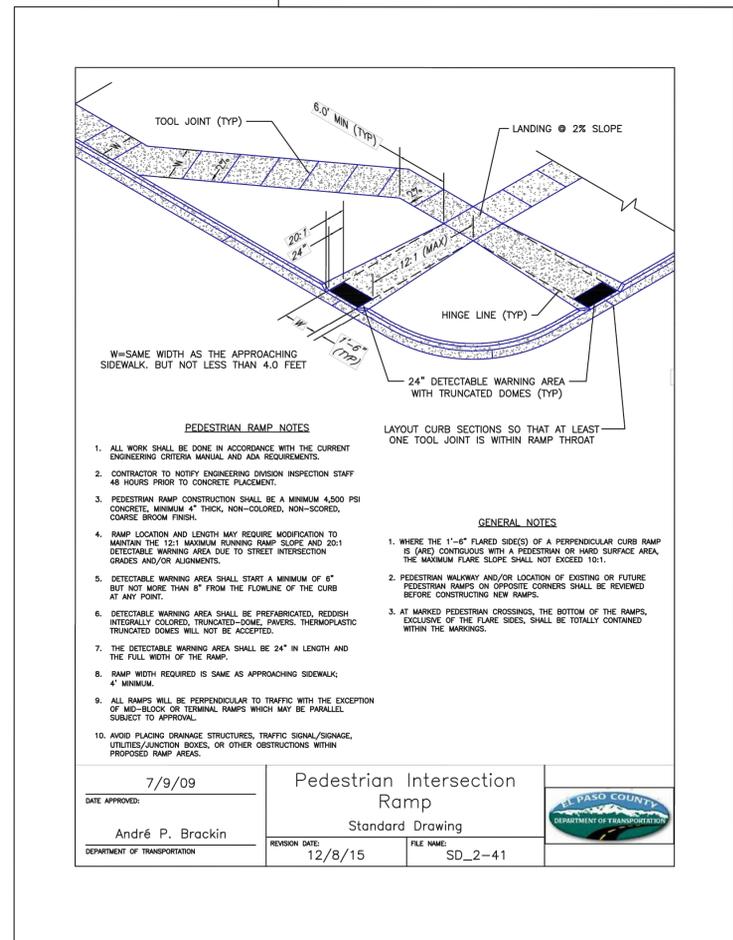
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Update to the latest standard County details

UPDATED TO LATEST AVAILABLE DETAILS AS DIRECTED



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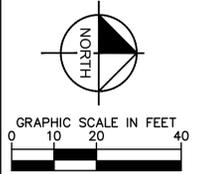
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DATE: 6/8/2022

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EL PASO COUNTY, COLORADO
ROADWAY CONSTRUCTION DOCUMENTS
ROADWAY DETAILS

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7



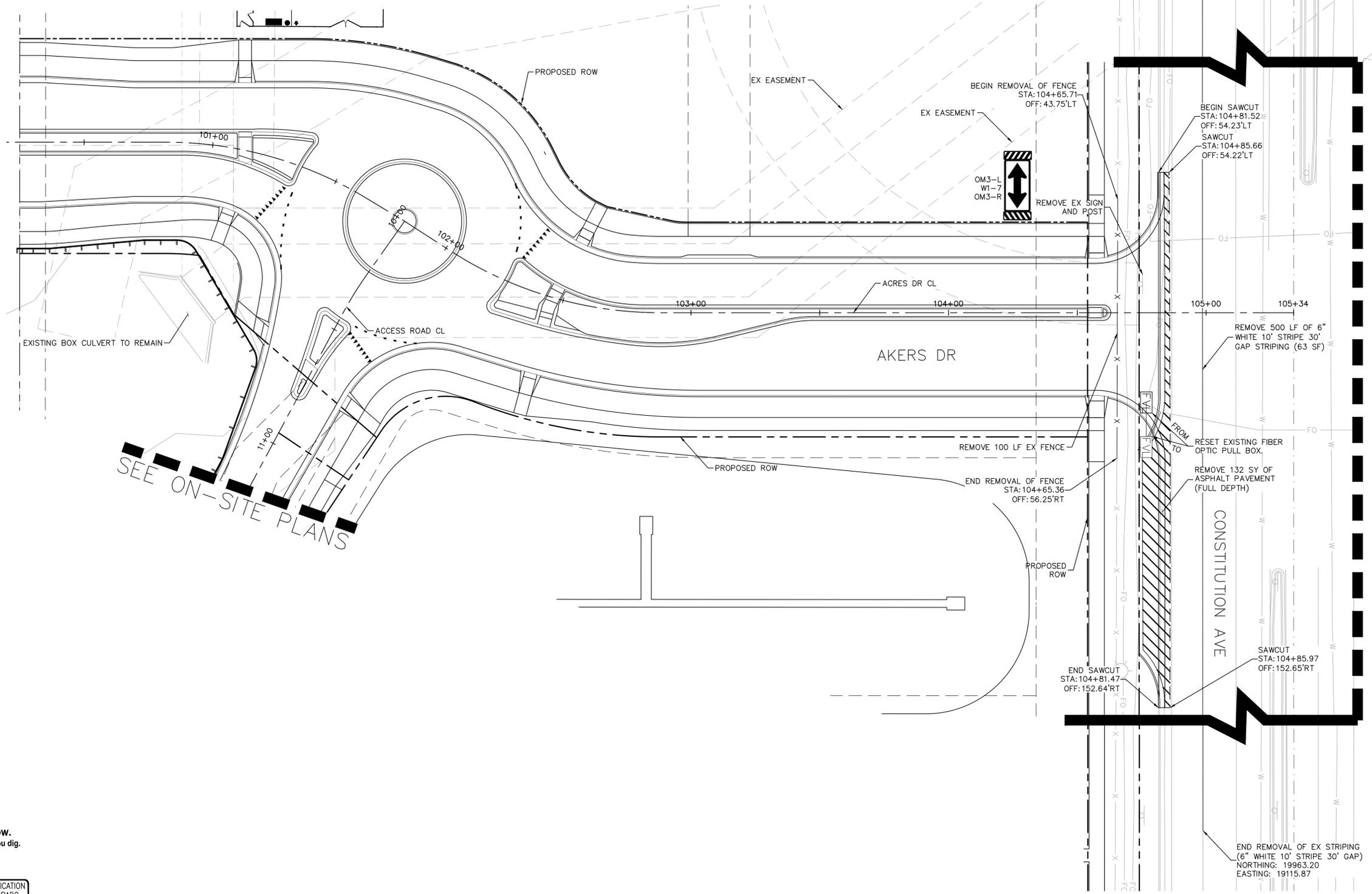
LEGEND

REMOVAL OF ASPHALT PAVEMENT (FULL DEPTH)

SAWCUT

NOTES

1. SEE ON-SITE PLANS FOR ADDITIONAL REMOVAL/RESET INFORMATION.
2. PAVEMENT MARKINGS SHALL BE REMOVED BY WATER BLASTING.
3. CONTRACTOR SHALL CONFIRM ADEQUATE SLACK EXISTS IN FIBER OPTIC PULL BOX PRIOR TO REMOVAL. CONTRACTOR SHALL PROTECT EXISTING SPLICES/EQUIPMENT IN REMOVED FIBER OPTIC PULL BOX UNTIL PLACED INTO PROPOSED FIBER OPTIC PULL BOX.



SEE ON-SITE PLANS

MATCHLINE A

NO.	REVISION	BY	DATE	APPR.

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 DATE: 6/8/2022

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 EL PASO COUNTY, COLORADO
 ROADWAY CONSTRUCTION DOCUMENTS
REMOVAL AND RESET PLAN

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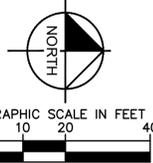
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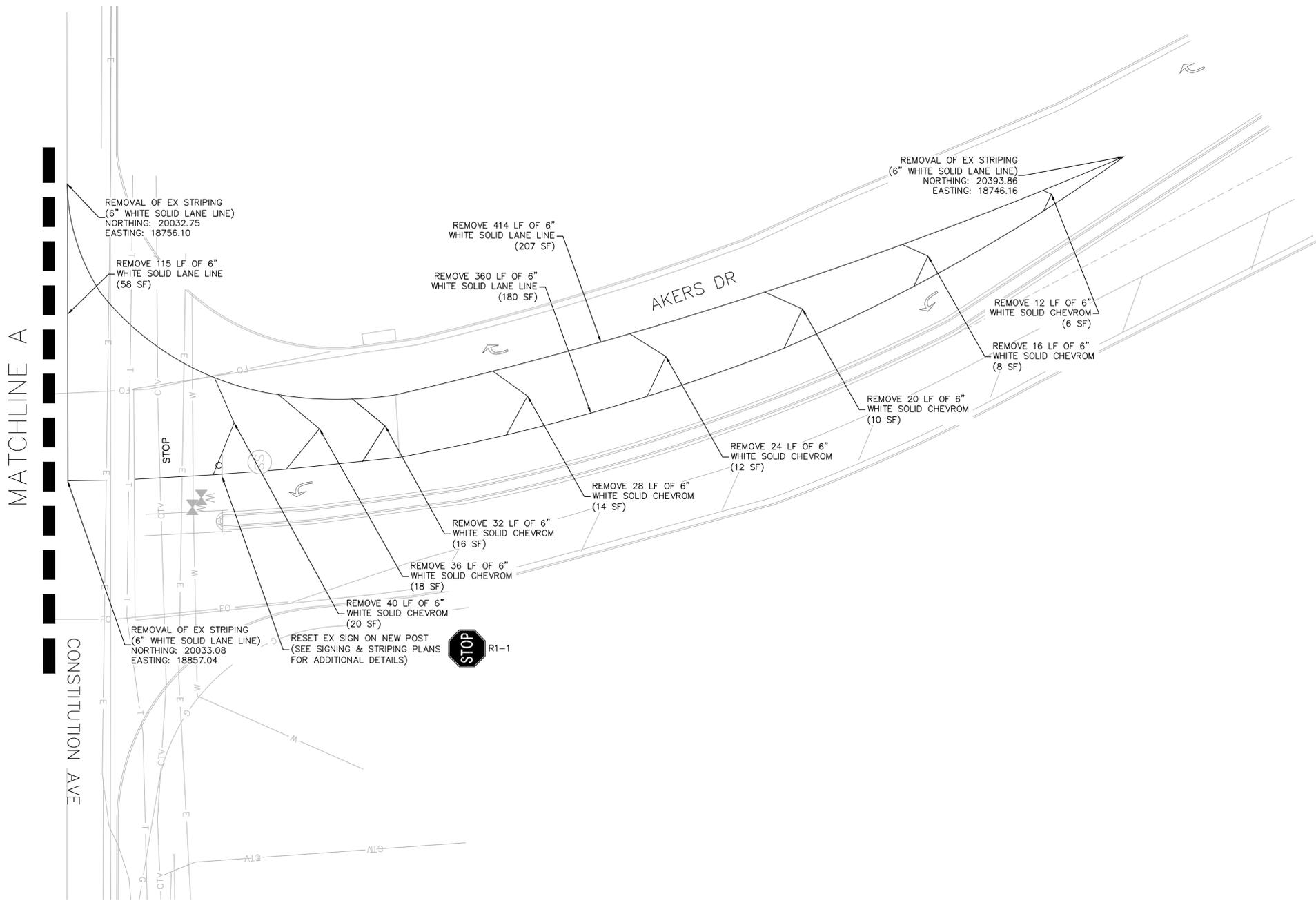


LEGEND

- REMOVAL OF ASPHALT PAVEMENT (FULL DEPTH)
- SAWCUT

NOTES

1. SEE ON-SITE PLANS FOR ADDITIONAL REMOVAL/RESET INFORMATION.
2. PAVEMENT MARKINGS SHALL BE REMOVED BY WATER BLASTING.



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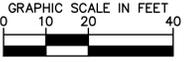
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EL PASO COUNTY, COLORADO
ROADWAY CONSTRUCTION DOCUMENTS
REMOVAL AND RESET PLAN**

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9



BEGIN W-BEAM GUARDRAIL
 BEGIN CDOT TYPE 3K TERMINAL END SECTION
 STA: 10+81.02
 OFF: 123.32'RT
 100+00

LINE	LENGTH	BEARING
1	168.85	S0°06'09.96"E
2	7.21	S16°39'36.82"W
3	66.66	S0°06'10.00"E
4	32.19	S3°10'06.41"W
5	7.70	S0°06'10.00"E
6	92.70	S0°06'10.00"E
7	63.09	S0°06'10.00"E
8	25.57	S12°10'45.51"W
9	17.65	S0°06'10.00"E
10	32.31	S3°22'26.41"E
11	24.16	N60°06'52.58"W
12	10.09	S60°06'52.58"E
13	91.60	S60°06'52.58"E
14	20.39	S16°50'08.69"W
15	53.13	S0°06'10.01"E
16	95.64	S89°57'38.64"W
17	5.00	S89°53'50.00"W
18	100.66	S0°06'10.00"E
19	177.72	N0°06'10.00"W
20	53.13	S0°06'10.01"E
21	12.53	S16°50'08.69"W
22	111.71	S0°06'10.00"E
23	25.34	S13°39'46.79"E
24	7.66	S89°30'22.16"W
25	5.23	S26°14'24.37"W
26	17.79	S5°48'44.44"E
27	24.40	S4°20'16.31"E
28	15.30	N40°39'45.73"E
29	10.03	N85°52'42.91"E
30	11.64	S0°06'10.00"E
31	10.21	S5°48'44.44"E
32	25.34	N4°55'15.36"E
33	26.47	S16°40'54.72"W
34	53.13	S0°06'10.01"E
35	13.42	N36°06'06.92"E
36	107.01	S89°53'50.00"W
37	112.02	N89°53'49.99"E
38	7.63	S60°06'52.58"E
39	24.61	S53°06'48.40"E
40	31.74	S16°24'09.66"W
41	7.21	N16°39'36.82"E
42	7.71	S0°06'10.00"E
43	20.83	N7°34'34.59"E
44	97.11	S60°06'52.58"E
45	129.49	S60°06'24.37"E
46	26.15	N89°55'54.53"E
47	27.48	S89°55'54.53"W

END CDOT TYPE 3K TERMINAL END SECTION
 STA: 10+75.09
 OFF: 112.32'RT
 W-BEAM GUARDRAIL
 STA: 10+54.88
 OFF: 80.75'RT

BEGIN CDOT TYPE 3J TRANSITION (R = 8.5')
 STA: 10+48.57
 OFF: 69.98'RT

END CDOT TYPE 3J TRANSITION
 STA: 10+48.79

BEGIN CDOT TYPE 3J TRANSITION (R = 8.5')
 STA: 10+71.89
 OFF: 23.81'RT

END CDOT TYPE 3J TRANSITION
 STA: 10+80.67
 OFF: 19.15'RT

BEGIN CDOT TYPE 3D TERMINAL END SECTION
 STA: 11+27.30
 OFF: 14.41'RT

END CDOT TYPE 3D TERMINAL END SECTION
 END W-BEAM GUARDRAIL
 STA: 11+39.80
 OFF: 14.44'RT

316 LF EL PASO COUNTY TYPE A CURB AND GUTTER

185 LF OF W-BEAM GUARDRAIL
 SEE NOTE 2&3 FOR ADDITIONAL DETAILS

W-BEAM GUARDRAIL
 STA: 11+14.80
 OFF: 14.39'RT

CONCRETE CURB RAMP PER EL PASO COUNTY SD_2-40

LINE	LENGTH	BEARING
48	104.07	N0°03'28.69"W
49	9.08	S0°06'10.00"E
50	5.00	N0°00'00.00"E
51	24.07	N6°52'00.88"W
52	12.56	S0°06'10.00"E
53	32.19	S3°10'06.41"W
54	7.70	S0°06'10.00"E
55	7.70	S0°06'10.00"E
56	32.19	S3°10'06.41"W
57	39.41	S0°06'10.00"E
58	22.25	N0°06'10.00"W
59	7.21	N16°39'36.82"E
61	6.38	S26°14'24.37"W
62	1.21	N63°31'57.81"E

CURVE TABLE

CURVE	RADIUS	LENGTH	CHORD BEARING	CHORD	DELTA	TANGENT
1	25.01'	39.87'	S45°47'59"E	35.78'	91°21'01"	25.61'
2	44.50'	13.33'	N13°33'07"E	13.28'	17°09'40"	6.71'
3	53.15'	52.72'	N33°26'59"E	50.58'	56°49'49"	28.76'
4	47.00'	38.45'	S40°05'47"W	37.39'	46°52'21"	20.37'
5	152.00'	44.47'	S8°16'43"W	44.31'	16°45'47"	22.40'
6	148.00'	20.54'	S3°52'23"W	20.52'	7°57'07"	10.29'
7	2.00'	4.28'	S69°05'38"W	3.51'	122°29'23"	3.64'
8	46.00'	15.99'	S59°37'02"E	15.91'	19°54'42"	8.07'
9	2.00'	3.53'	N19°02'33"W	3.09'	101°03'39"	2.43'
10	77.00'	42.45'	S15°41'33"W	41.92'	31°35'26"	21.78'
11	46.00'	2.63'	S1°44'18"E	2.63'	3°16'16"	1.31'
12	50.00'	2.85'	N1°44'18"W	2.85'	3°16'16"	1.43'
13	58.00'	16.82'	S8°12'11"W	16.76'	16°36'41"	8.47'
14	28.00'	40.14'	S57°34'24"W	36.79'	82°07'45"	24.40'
15	248.00'	91.97'	N7°04'18"W	91.44'	21°14'51"	46.52'
16	234.50'	12.66'	N79°48'57"W	12.66'	3°05'33"	6.33'
17	2.00'	5.98'	N25°34'07"E	3.99'	171°21'59"	26.50'
18	351.00'	30.74'	N71°15'25"W	30.73'	5°01'02"	15.38'
19	2.00'	3.97'	S16°49'54"E	3.35'	113°52'04"	3.07'
20	46.00'	7.98'	N35°07'46"E	7.97'	9°56'43"	4.00'
21	2.00'	3.61'	S81°48'11"W	3.14'	103°17'32"	2.53'
22	81.00'	19.18'	S53°19'58"E	19.13'	13°33'50"	9.63'
23	245.83'	11.80'	N79°48'57"W	11.79'	2°44'58"	5.90'
24	38.00'	51.04'	S21°38'22"E	47.29'	76°57'01"	30.20'
25	252.00'	74.50'	S8°21'59"E	74.23'	16°56'19"	37.52'
26	25.00'	39.27'	S44°53'50"W	35.36'	90°00'00"	25.00'
27	2.05'	7.37'	S89°41'03"W	4.00'	205°51'28"	8.94'
28	71.00'	51.12'	N20°31'27"E	50.02'	41°15'13"	26.73'
29	2.00'	3.85'	S13°57'57"E	3.28'	110°14'00"	2.87'

CURVE TABLE

CURVE	RADIUS	LENGTH	CHORD BEARING	CHORD	DELTA	TANGENT
30	46.00'	17.55'	N58°09'04"W	17.45'	21°51'45"	8.88'
31	2.00'	4.05'	N74°48'29"E	3.39'	115°56'40"	3.20'
32	233.00'	42.20'	S11°38'51"E	42.14'	10°22'36"	21.16'
33	98.85'	34.77'	N3°36'07"W	34.59'	20°09'11"	17.57'
34	51.00'	12.07'	S6°52'58"E	12.04'	13°33'37"	6.06'
35	129.00'	11.42'	N2°26'04"E	11.42'	5°04'27"	5.72'
36	15.00'	16.41'	N63°37'26"E	15.61'	62°41'16"	9.14'
37	120.50'	10.67'	N2°26'04"E	10.67'	5°04'27"	5.34'
38	58.50'	5.83'	N2°57'27"W	5.83'	5°42'34"	2.92'
39	189.50'	4.88'	S5°04'30"E	4.88'	1°28'28"	2.44'
40	89.96'	15.24'	S0°30'49"W	15.22'	9°42'26"	7.64'
41	22.53'	33.39'	S56°09'25"W	30.41'	84°54'16"	20.61'
42	152.00'	70.05'	S73°19'03"E	69.43'	26°24'20"	35.66'
43	124.00'	49.85'	S71°37'50"E	49.51'	23°01'55"	25.26'
44	14.50'	20.78'	S57°34'24"W	19.05'	82°07'45"	12.63'
45	44.50'	12.90'	S8°12'11"W	12.86'	16°36'41"	6.50'
46	184.50'	18.39'	S2°57'27"E	18.38'	5°42'34"	9.20'
47	217.24'	22.98'	N2°46'15"W	22.97'	6°03'35"	11.50'
48	29.54'	40.64'	S22°36'27"E	37.51'	78°49'58"	24.28'
49	264.26'	70.93'	S7°38'24"E	70.72'	15°22'42"	35.68'
50	25.00'	13.39'	N51°26'47"E	13.23'	30°41'21"	6.86'
51	60.50'	49.49'	S40°05'47"W	48.13'	46°52'21"	26.23'
52	23.00'	72.82'	N40°58'40"W	46.00'	181°24'23"	1873.84'
53	265.50'	42.24'	S4°27'18"E	42.19'	9°06'55"	21.16'
54	21.50'	28.88'	S21°38'22"E	26.75'	76°57'01"	17.09'
55	50.00'	2.85'	N1°31'58"E	2.85'	3°16'16"	1.43'
56	50.00'	2.85'	S1°31'58"W	2.85'	3°16'16"	1.43'
57	165.50'	46.91'	S8°32'24"W	46.75'	16°14'27"	23.61'
58	25.00'	3.12'	N3°59'52"E	3.12'	7°09'24"	1.56'

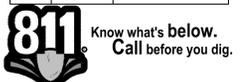
SEE ON-SITE PLANS

LEGEND:

- SAWCUT
- PROPOSED HOT MIX ASPHALT
- PROPOSED CONCRETE SIDEWALK
- PROPOSED CONCRETE CURB RAMP
- PROPOSED MEDIAN COVER
- PROPOSED CONCRETE TRUCK APRON
- PROPOSED CENTRAL ISLAND COVER
- PROPOSED SOD
- GRAVEL ACCESS (SEE ON-SITE PLANS FOR DETAILS)
- MOUNTABLE SPLITTER ISLAND

NOTES:

- LINE AND CURVE DATA PROVIDED FOR CURB IS AT THE FLOWLINE OF PROPOSED CURB.
- GUARDRAIL TO BE INSTALLED WITH 7' POST PER RESTRICTIVE ROADSIDE INSTALLATION CRITERIA PER CDOT M-606-1.
- ALONG THE ACCESS DRIVE, THE FACE OF GUARDRAIL SHALL BE PARALLEL TO THE FLOWLINE OF THE CURB, AND THE TOP OF GUARDRAIL SHALL BE 27" HIGHER THAN THE FLOWLINE OF URBAN ROADSIDE INSTALLATION WITH CURB & GUTTER CRITERIA PER CDOT M-606-1.
- SEE ON-SITE PLANS FOR ADDITIONAL INFORMATION ON SIDEWALK ALONG CONSTITUTION AVE.



review 2 comment: revise the sidewalk so that it is perpendicular to the lane and aligns with the PED ramps similar to the north end of the roundabout.
 Review 3: unresolved

ROUNDABOUT CONFIGURATION COMPLETELY CHANGED DUE TO LARGER ICD PER COUNTY DIRECTION. CROSSWALK UPDATED

provide lane widths at entry and exit of roundabout and at travel lane around the roundabout
 REVISED AS DIRECTED

revise per comments on the roundabout analysis
 REVISED AS DIRECTED

Identify the transition from type A curb to mountable curb. Please identify the type of mountable curb.
 Provide thickness of sidewalk at this location. It should be thicker to be able to handle the fire apparatus to be used.
 REVISED AS DIRECTED

Review 2 comment: Please extend construction drawings to where the sidewalk will tie into the adjacent properties sidewalk along Constitution.
 Review 3: Unresolved.

NORTHING: 19949.58
 EASTING: 18804.68

label the 6' wide sidewalk along Constitution

CONCRETE CURB RAMP PER EL PASO COUNTY SD_2-40

and detail SD_2-41

Per ECM table 2-31 the min. curb return radius shall be 40' for arterial/collector road intersections. please revise.

the truck apron path extends into the truncated dome. Please revise so that it doesn't. Additionally, show and identify the vertical curb beyond the proposed truck apron. Provide a detail of your intent.

This also applies to the splitter island at the south end.

ROUNDABOUT CONFIGURATION COMPLETELY CHANGED DUE TO LARGER ICD PER COUNTY DIRECTION. RAISED GUTTER PAN ADDED AS DIRECTED

and detail SD_2-41

Review 2 comment: Provide construction drawings of the sidewalk to where it ties into the existing sidewalk.
 Review 3: Unresolved

reference the County detail SD 2-21 at the median

AKERS DR & EL PASO COUNTY, COLORADO ROADWAY CONSTRUCTION DOCUMENTS RC ROADWAY PLAN

DESIGNED BY: SMH
 DRAWN BY: TL
 CHECKED BY: CEH
 DATE: 6/8/2022

PROJECT NO. 096481004
 SHEET 10

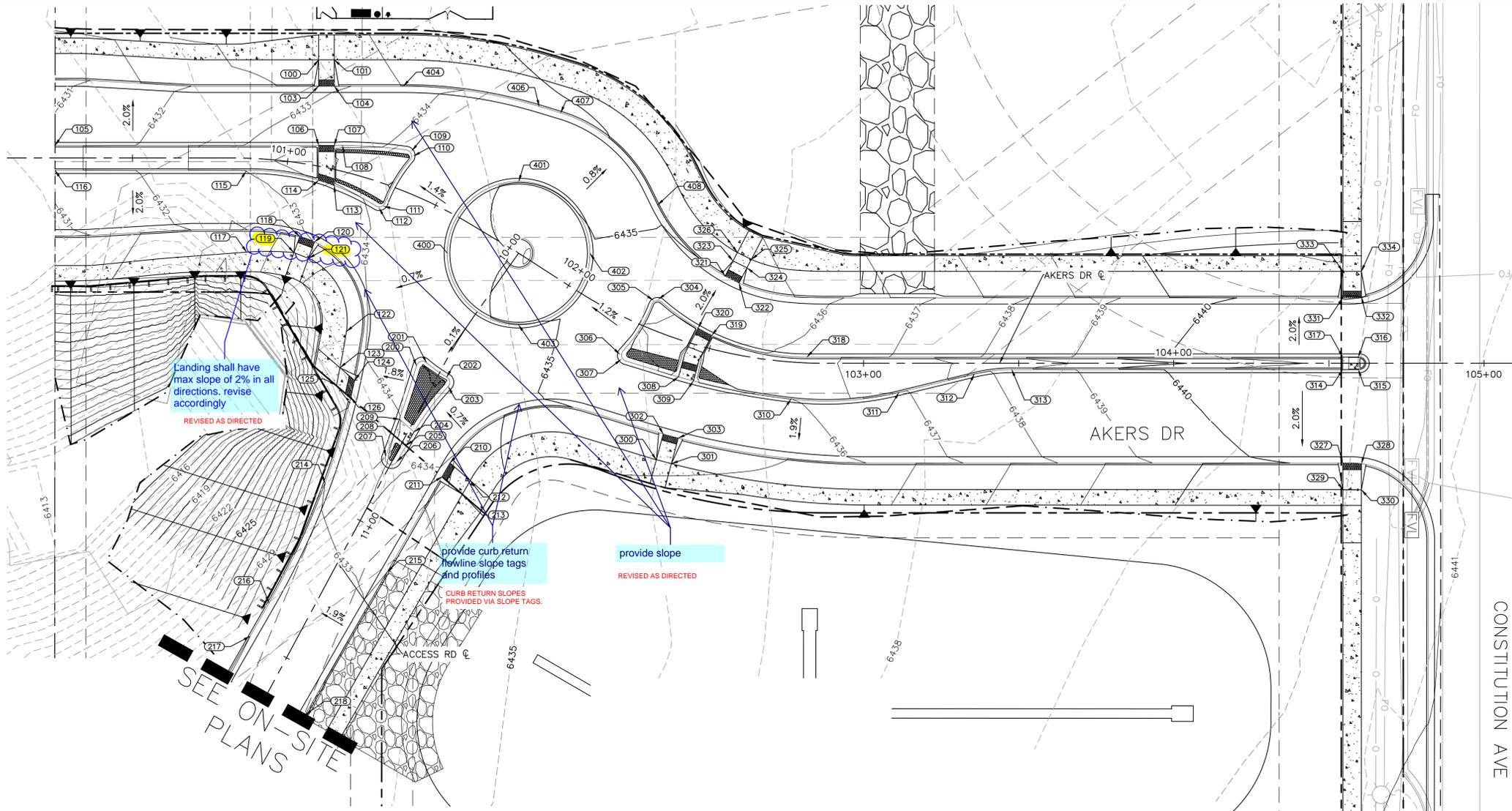
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 4882 South Ulster Street, Suite 1500
 Denver, CO 80237 (303) 228-2300

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SOUTH RAB POINT TABLE				
POINT #	MAINLINE CL STATION	OFFSET	ELEVATION	DESCRIPTION
100	101+04.95	-33.65'	6433.4'	RAMP
101	101+08.97	-34.48'	6433.5'	RAMP
103	101+06.05	-25.32'	6433.0'	RAMP
104	101+10.30	-26.17'	6433.0'	RAMP
105	100+25.03	-4.00'	6431.2'	PI
106	101+08.97	-6.53'	6433.6'	RAMP
107	101+13.66	-7.50'	6433.7'	RAMP
108	101+16.16	-8.09'	6433.7'	PC
109	101+36.59	-12.99'	6434.2'	PCC
110	101+37.65	-11.65'	6434.3'	PCC
111	101+34.36	6.90'	6434.3'	PCC
112	101+33.08	7.89'	6434.1'	PCC
113	101+16.44	5.04'	6433.8'	RAMP
114	101+11.03	4.46'	6433.6'	RAMP
115	100+86.69	4.18'	6433.0'	PT
116	100+25.03	4.00'	6431.2'	PI
117	100+88.00	30.12'	6432.6'	SWK
118	101+08.07	23.29'	6432.8'	RAMP
119	101+06.87	28.71'	6433.4'	RAMP
120	101+13.93	24.08'	6433.0'	RAMP
121	101+12.97	29.63'	6433.7'	RAMP
122	101+37.95	48.70'	6434.7'	SWK
123	101+41.79	60.24'	6434.6'	RAMP
124	101+51.98	61.97'	6434.1'	RAMP
125	101+43.67	65.83'	6434.6'	RAMP
126	101+54.41	67.39'	6434.0'	RAMP

EAST RAB POINT TABLE				
POINT #	MAINLINE CL STATION	OFFSET	ELEVATION	DESCRIPTION
200	10+47.63	7.61'	6434.3'	PC
201	10+45.25	5.24'	6434.6'	PCC
202	10+46.21	-2.68'	6434.7'	PCC
203	10+48.72	-4.58'	6434.8'	PCC
204	10+66.70	-1.77'	6434.2'	RAMP, PT
205	10+71.79	-1.62'	6434.2'	RAMP, PC
206	10+77.75	-1.45'	6434.6'	PCC
207	10+77.93	2.54'	6433.8'	PCC
208	10+70.66	3.51'	6433.9'	RAMP, PT
209	10+65.35	4.20'	6434.0'	PC
210	10+69.99	-16.68'	6433.9'	RAMP
211	10+75.07	-16.53'	6433.8'	RAMP
212	10+71.85	-25.14'	6434.5'	RAMP
213	10+76.94	-24.98'	6434.4'	RAMP
214	10+94.80	15.69'	6433.0'	FL
215	11+10.38	-15.51'	6433.0'	FL
216	11+37.19	13.27'	6432.1'	FL
217	11+49.52	13.63'	6432.0'	FL
218	11+63.28	-13.99'	6432.5'	FL
219	11+73.49	14.05'	6432.0'	FL



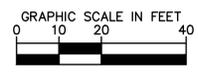
NORTH RAB POINT TABLE				
POINT #	MAINLINE CL STATION	OFFSET	ELEVATION	DESCRIPTION
300	102+43.86	39.04'	6435.9'	RAMP
301	102+47.83	38.88'	6435.9'	RAMP
302	102+43.65	30.47'	6435.2'	RAMP
303	102+47.80	30.38'	6435.3'	RAMP
304	102+28.57	-9.78'	6435.4'	PC
305	102+27.15	-8.78'	6435.3'	PCC
306	102+24.23	11.40'	6435.4'	PCC
307	102+25.22	12.75'	6435.9'	PCC
308	102+43.08	11.48'	6435.6'	RAMP
309	102+47.73	11.38'	6435.6'	RAMP
310	102+77.47	11.86'	6436.1'	PCC
311	103+11.43	9.31'	6437.0'	PT
312	103+35.69	3.43'	6438.0'	PC
313	103+47.77	2.00'	6438.3'	PT
314	104+54.48	2.00'	6440.8'	RAMP
315	104+59.48	2.00'	6440.9'	RAMP
316	104+59.49	-2.00'	6440.9'	RAMP
317	104+54.48	-2.00'	6440.8'	RAMP
318	102+81.68	-1.88'	6436.2'	PC
319	102+49.61	-4.26'	6435.7'	RAMP

NORTH RAB POINT TABLE				
POINT #	MAINLINE CL STATION	OFFSET	ELEVATION	DESCRIPTION
320	102+44.56	-5.30'	6435.6'	RAMP
321	102+48.85	-23.72'	6435.2'	RAMP
322	102+54.63	-22.63'	6435.4'	RAMP
323	102+50.36	-29.08'	6435.6'	RAMP
324	102+56.37	-27.96'	6435.7'	RAMP
325	102+57.41	-30.88'	6435.8'	RAMP
326	102+51.25	-32.05'	6435.8'	RAMP
327	104+54.48	32.00'	6440.1'	RAMP
328	104+60.48	32.23'	6440.1'	RAMP
329	104+54.48	40.50'	6440.1'	RAMP
330	104+60.48	40.58'	6440.2'	RAMP
331	104+54.48	-21.00'	6440.0'	RAMP
332	104+60.48	-21.29'	6440.0'	RAMP
333	104+54.48	-29.50'	6440.4'	RAMP
334	104+60.48	-29.50'	6440.4'	RAMP

CENTER RAB POINT TABLE				
POINT #	MAINLINE CL STATION	OFFSET	ELEVATION	DESCRIPTION
400	101+60.94	11.79'	6434.5'	PCC
401	101+69.05	-19.74'	6434.8'	PCC
402	102+00.22	-12.40'	6435.1'	PCC
403	101+93.26	19.37'	6434.9'	PCC
404	101+28.36	-31.61'	6433.5'	PC
406	101+62.50	-43.80'	6434.4'	PT
407	101+69.32	-45.56'	6434.4'	PC
408	102+12.85	-36.92'	6434.8'	PC

NOTES:
1. ALL STATIONING IS FROM AKERS CL UNLESS OTHERWISE STATED.

LEGEND:
--- TOP OF SLOPE
--- TOE OF SLOPE



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EL PASO COUNTY, COLORADO
ROADWAY CONSTRUCTION DOCUMENTS
GRADING PLAN

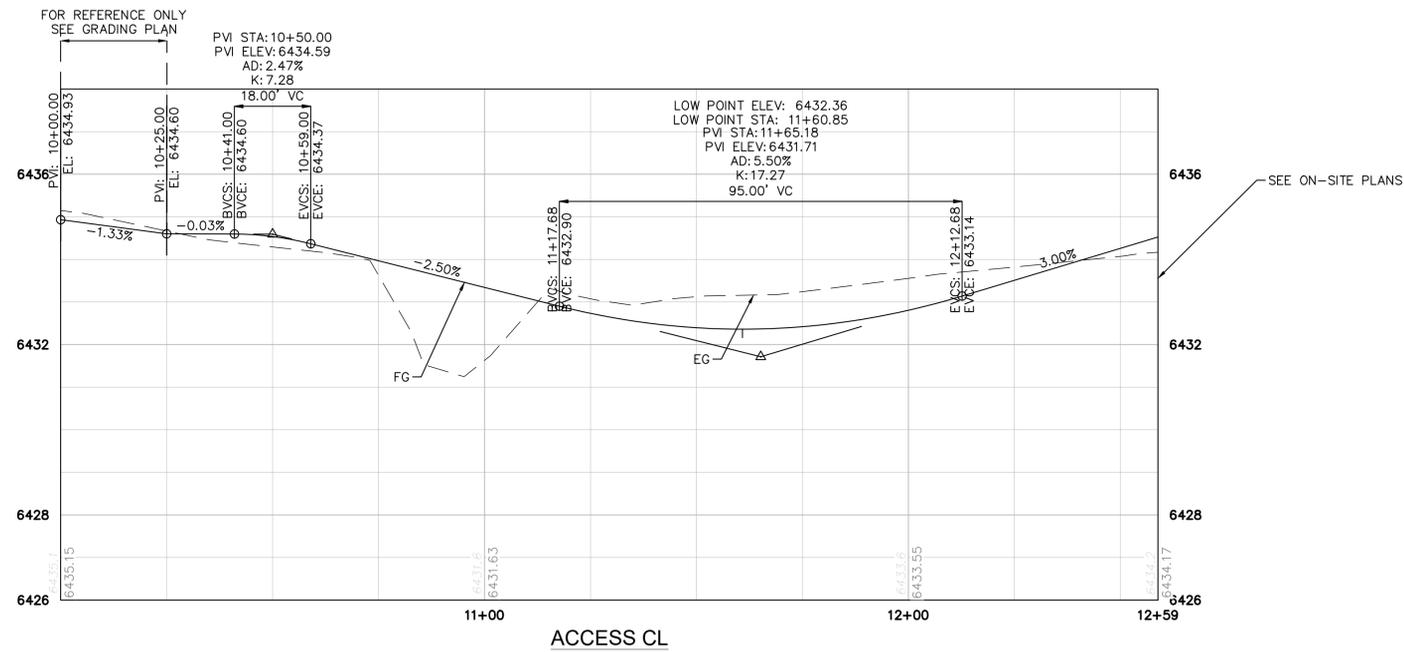
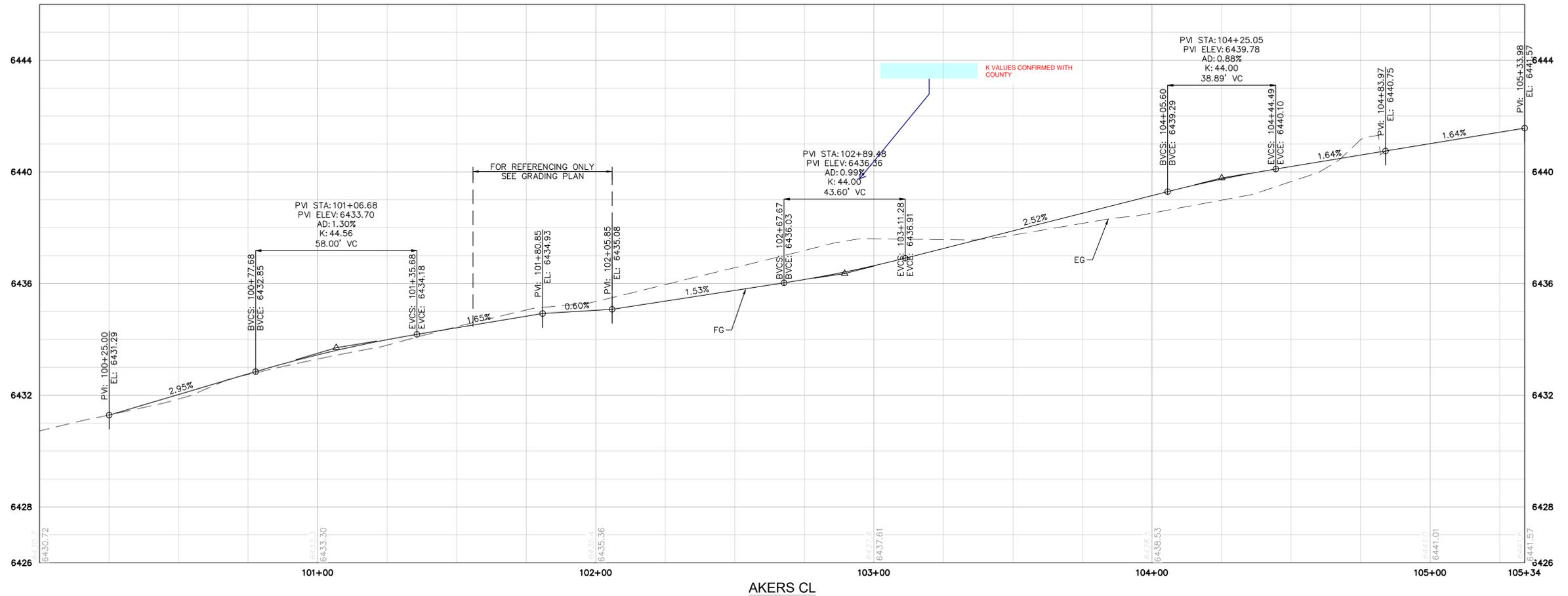
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DRAWN BY: TL
CHECKED BY: CEH
DATE: 6/8/2022

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Denver, CO 80237 (303) 228-2300

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EL PASO COUNTY, COLORADO
ROADWAY CONSTRUCTION DOCUMENTS
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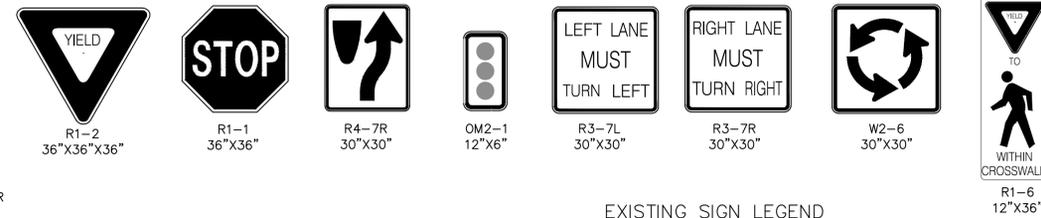
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096481004

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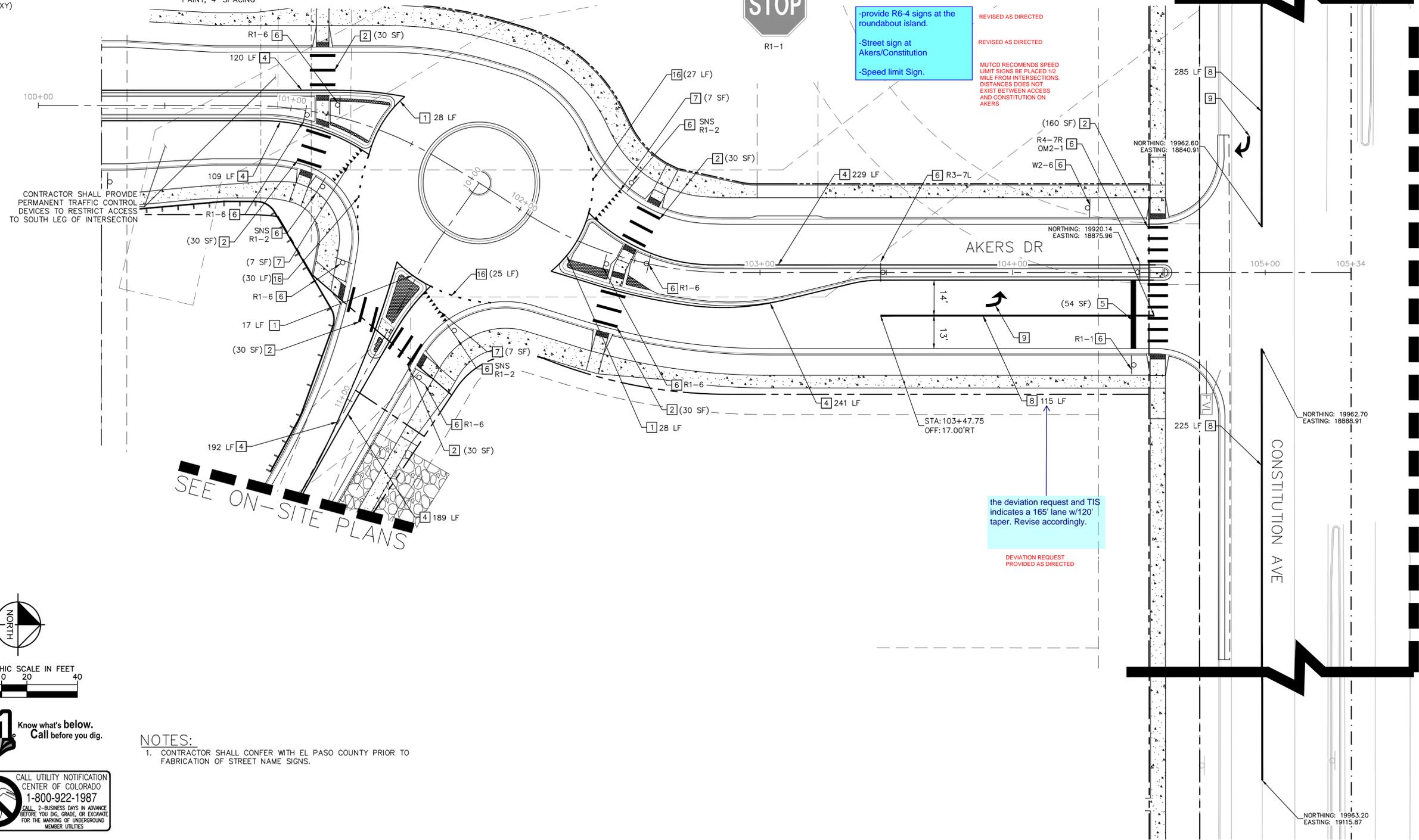
SIGNING AND STRIPING NOTES

- 1 EDGE LINE: SOLID WHITE, 4" WIDE (EPOXY)
- 2 CROSSWALK MARKING: 10 SF, 1"x10" SOLID WHITE, SPACING AS NEEDED PER AND WHEEL PATH (THERMOPLASTIC)
- 3 THRU-TURN ARROW: WHITE, 27.5 SF (PER CDOT S-627-1) (THERMOPLASTIC)
- 4 EDGE LINE: SOLID YELLOW, 4" WIDE (EPOXY)
- 5 STOP BAR: WHITE, 2' WIDE (THERMOPLASTIC)
- 6 NEW SIGN PANEL WITH NEW POST
- 7 YIELD TEETH: WHITE TRIANGLES, 1' WIDE AND 1.5' TALL, 0.75 SF (THERMOPLASTIC)
- 8 CHANNELIZING LINE: SOLID WHITE, 8" WIDE (EPOXY)
- 9 TURN ARROW: WHITE, 16.1 SF (PER CDOT S-627-1) (THERMOPLASTIC)
- 10 RESET SIGN ON NEW POST
- 11 EXISTING SIGN AND POST TO REMAIN
- 12 CHEVRON: WHITE, 8" WIDE, 5 SF, 25' SPACING (THERMOPLASTIC)
- 13 TURN ARROW: WHITE, 16.1 SF (PER CDOT S-627-1) (THERMOPLASTIC)
- 14 STOP MARKING: WHITE, 8' TALL, 7'-4" WIDE (PER CDOT S-627-1) (THERMOPLASTIC)
- 15 RUBBER CURB: 1' WIDE
- 16 ROUNDABOUT LINE: WHITE, 6" WIDE, 1 SF, 2' PAINT, 4' SPACING

PROPOSED SIGN LEGEND

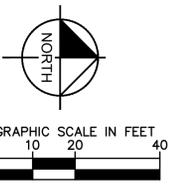


EXISTING SIGN LEGEND



CONTRACTOR SHALL PROVIDE PERMANENT TRAFFIC CONTROL DEVICES TO RESTRICT ACCESS TO SOUTH LEG OF INTERSECTION

SEE ON-SITE PLANS



NOTES:
1. CONTRACTOR SHALL CONFER WITH EL PASO COUNTY PRIOR TO FABRICATION OF STREET NAME SIGNS.

REVISAS AS DIRECTED
REVISAS AS DIRECTED
MUTCD RECOMMENDS SPEED LIMIT SIGNS BE PLACED 1/2 MILE FROM INTERSECTIONS. DISTANCES DOES NOT EXIST BETWEEN ACCESS AND CONSTITUTION ON AKERS

the deviation request and TIS indicates a 165' lane w/120' taper. Revise accordingly.
DEVIATION REQUEST PROVIDED AS DIRECTED

NO.	REVISION	DATE	APPR.

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2022 KIMLEY-HORN AND ASSOCIATES, INC.
4582 South Ulster Street, Suite 1500
Denver, CO 80237 (303) 228-2300

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DRAWN BY: TL
CHECKED BY: CEH
DATE: 6/8/2022

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EL PASO COUNTY, COLORADO
ROADWAY CONSTRUCTION DOCUMENTS
SIGNING AND STRIPING

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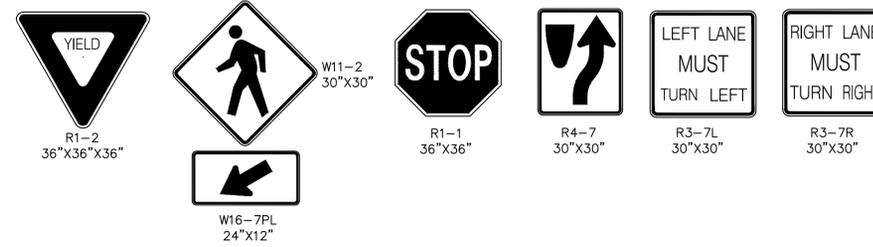
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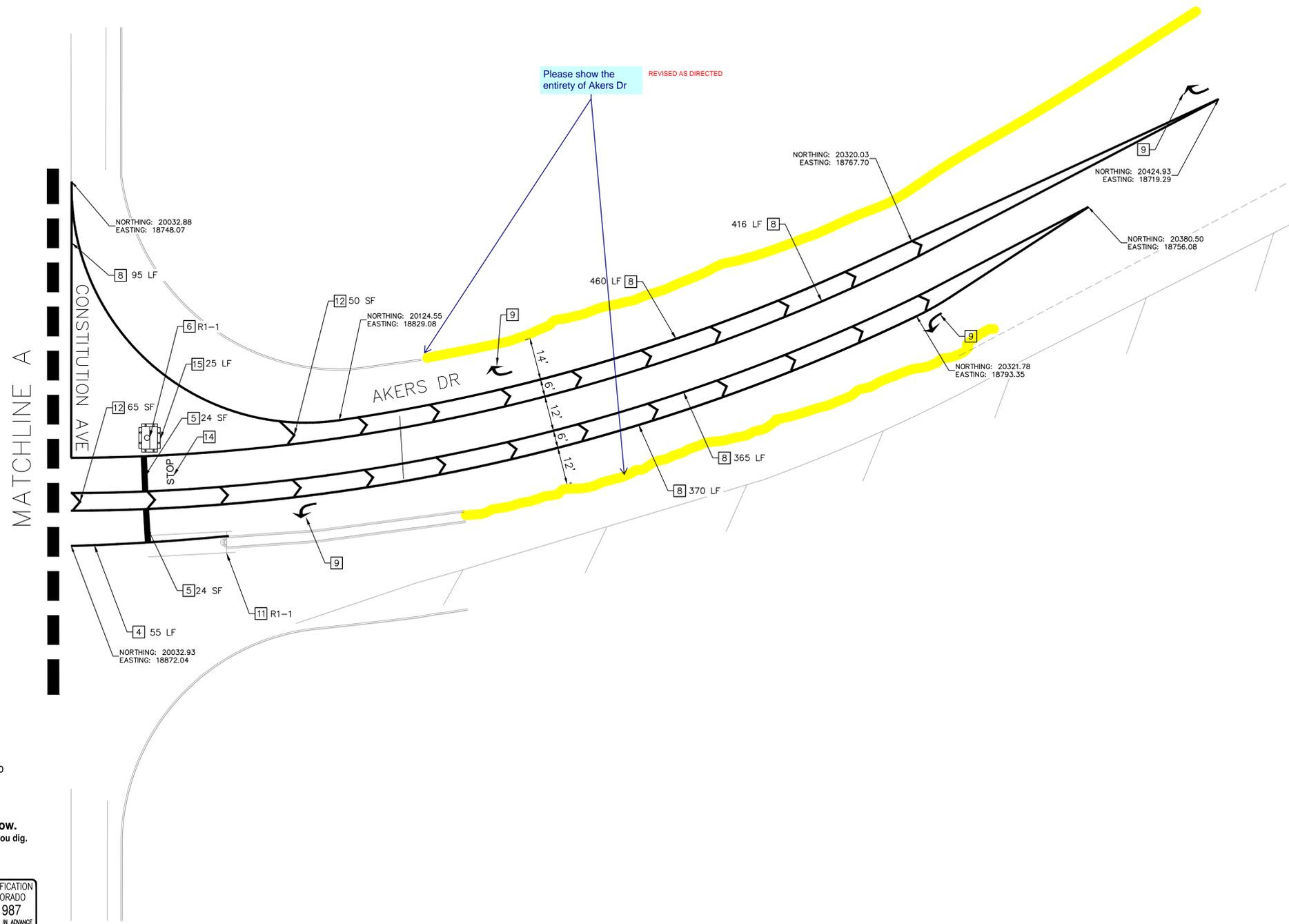
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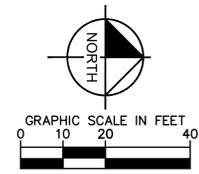
PROPOSED SIGN LEGEND



EXISTING SIGN LEGEND



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