

Roundabout Solution for Oversized Vehicles

From Concept to Reality



Junction of US 52, US 281 and ND 200 at Carrington, ND
NDDOT Project: SNH-3-052(042)198

Project Development Conference

November 2017



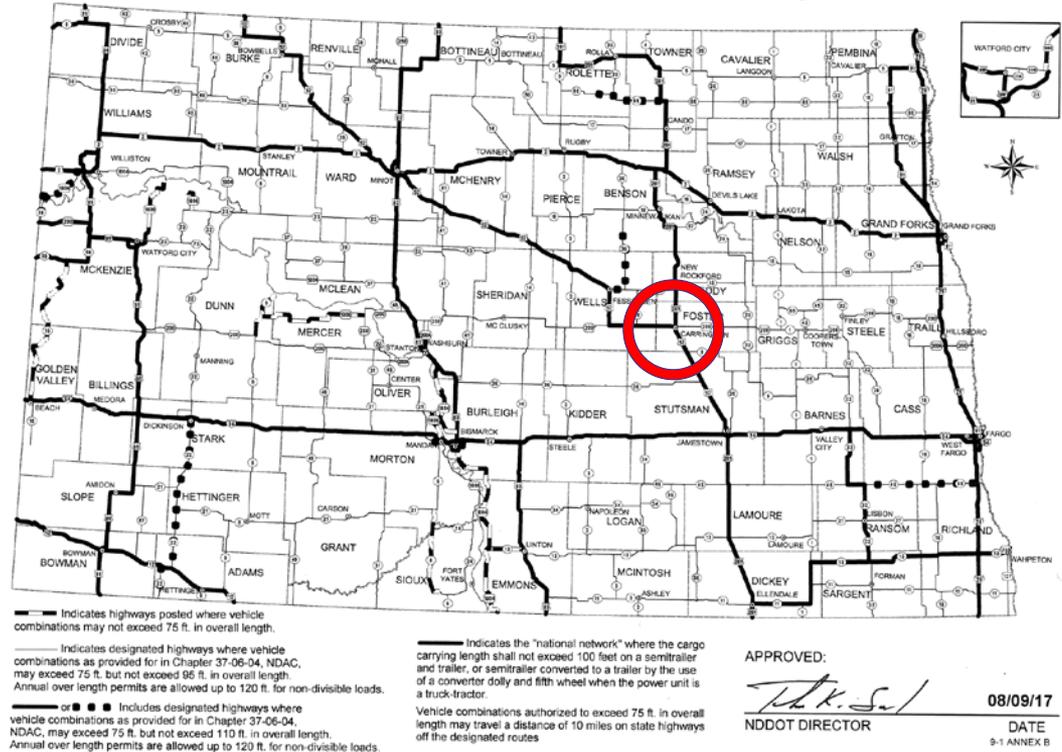
Evolution of an Intersection

Improving a vital intersection to positively affect the local, regional, and national economy

Outline

- Oversized and/or Overweight (OSOW)
- Existing and Future Conditions
- Roundabout Elements
- Peer Review
- Public and Industry Input
- OSOW Permit History
- Design Vehicle
- OSOW Modifications
- Horizontal and Vertical Evaluation
- Construction and Design Recommendations

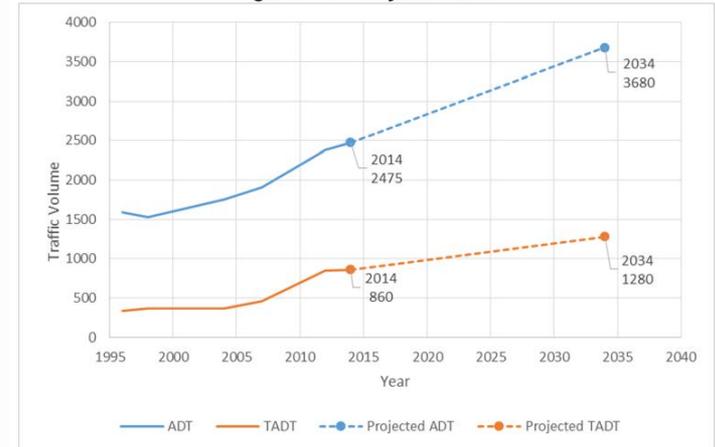
VEHICLE COMBINATIONS EXCEEDING 75 FEET IN OVERALL LENGTH
ON DESIGNATED NORTH DAKOTA STATE HIGHWAYS



Existing Conditions



Figure 3.1 - Projected ADT



Traffic Operations Analysis
US 52 Major Rehabilitation
W Jct 200 E to E Jct 200
SNH-3-052(042)198; PCN 18878

- EB and WB stop control
- Span wire mounted overhead flashing beacon
- Adjacent local access
- Existing utility and drainage features

Future Conditions

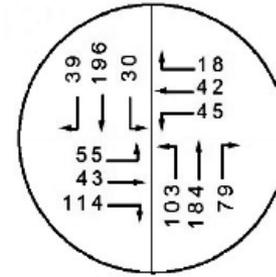
Table 3.1 - 2034 Signal Warrant Analysis

Intersection		Warrant 1: 8-Hour Vehicular Volume	Warrant 2: 4-Hour Vehicular Volume
US 52 & E Jct ND 200 (US 281)	2034	Yes	No
	2034 (Minor RTs excluded)	No	No

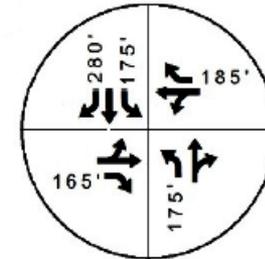
Table 3.2 - 2034 Intersection Capacity Analysis

Intersection	Lane Geometry	Traffic Control	Level of Service/ Delay (seconds)				
			Overall	EB	WB	NB	SB
			-	C	D	A	A
US 52 & E Jct ND 200	Proposed	EB/WB Stop	-	21.1	29.9	8.4	8.3
			C	B	B	C	C
	Proposed	Multi-way Stop	15.6	13.1	13.4	17.7	15.4
			B	B	B	B	B
Single Lane	Roundabout	13.3	12.8	10.3	14.8	12.7	

- Signal warrants not fully met
- Turn lane revisions needed
- WB approach degrades
- Future? Traffic Signal? Multi-way Stop?
- Roundabout approved on September 9, 2015
- Bid opening April 8, 2016



2034 Peak Hour Volumes



or Roundabout

Recommended Lane Configuration

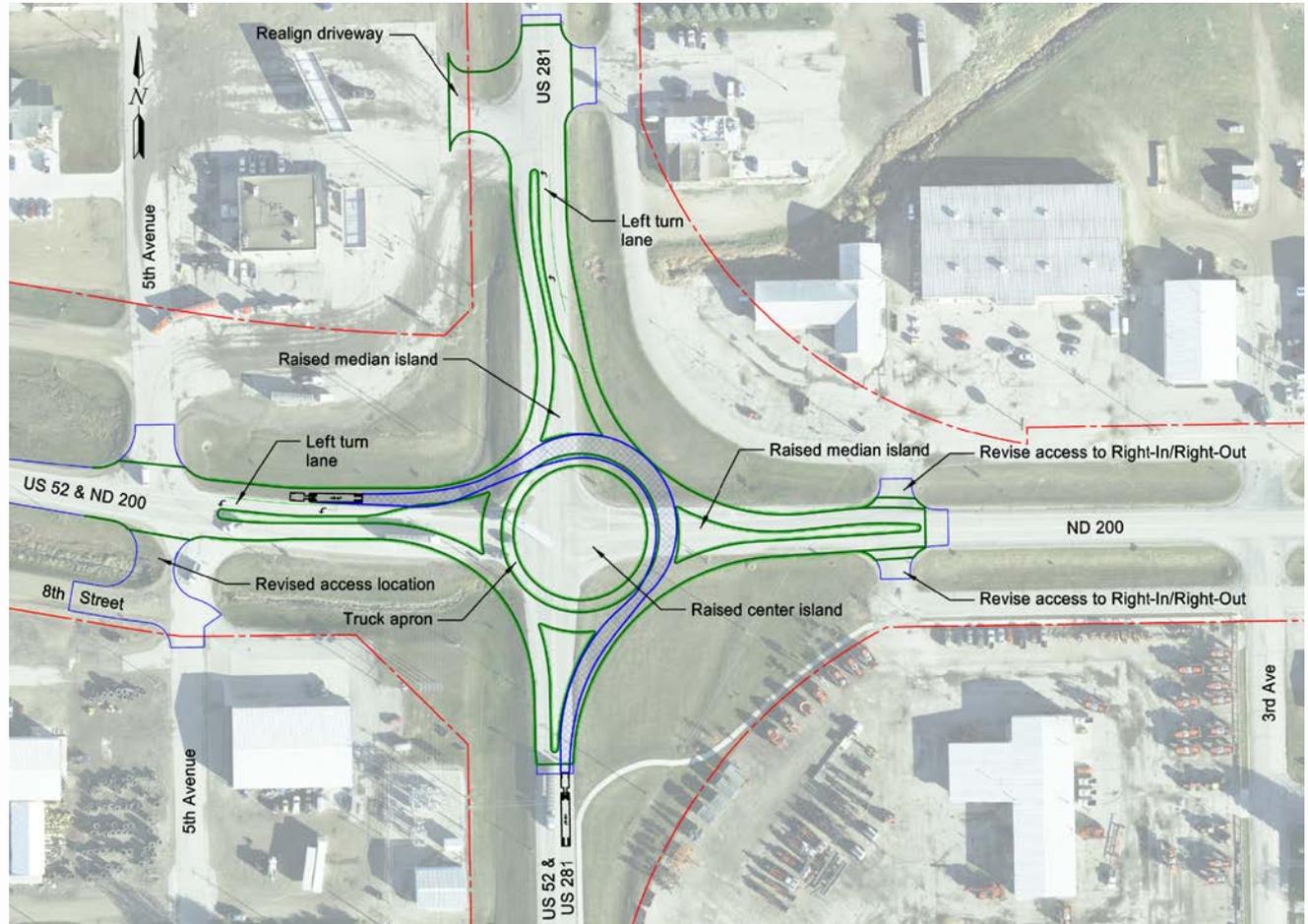
Peer Review

- Thirteen initial horizontal alignments developed; four more later for blisters
- Vertical profile need – improved definition and smooth transitions
- Coded geometry input files for multiple modeling runs and quality control
- Design contract included a design peer review due to unique challenges
- Prepared a design protocol document and layout for review
- Adjacent turn lanes and access changes
- KLJ design checklist and review
- NDDOT review

ROUNDBABOUT DESIGN CHECKLIST							
PROJECT MANAGER: Eric Molbert					DATE: 11/13/15		
PREPARED BY: Sambatek					REVIEWER: Scott Fanning, KLJ		
LOCATION: Carrington Roundabout							
	DESIRED VALUE	REFERENCE	CALCULATIONS PROVIDED	MEETS DESIRED VALUE	EXPLANATION PROVIDED	REMARKS	
1	Meets Queue Length Threshold	Approach Geometry matches dimensions included in capacity analysis.	Y	N	Y	North Leg: Is there adequate storage for the left turn lane? West Leg: Is there adequate storage for the left turn lane? Three trucks will cause traffic to back up into the roundabout. East Leg: Are you comfortable with R/RO access for the nearest approach?	
2	Speeds Appropriate / Fastest Paths	Mini - 20mph Single Lane - 25mph Multi-Lane - 25mph - 30mph	NCHRP 6.7.1, 6.7.2	N	N	N	Fastest paths are slightly above the suggested speed of 25 mph for a single lane roundabout in the WB, EB and NB directions, NB being the worst at 26.7 mph. Does not meet desired value but likely OK.
3	Speed Differential / Consistency	10mph - 15mph	NCHRP 6.7.1.3	N	Y	N	All fastest paths appear to be within 8.5 mph of each other.
4	Stopping Sight Distance		NCHRP 6.7.3.1	N	INC.	N	SSD checked at two of the three critical locations purely from a 2D perspective. Sight distance on oscillatory roadway not checked due to not knowing what is planned in center of RA. SSD will need to be checked again when vertical alignments have been designed.
5	Intersection Sight Distance		NCHRP 6.7.3.2	N	INC.	N	ISD should be checked when vertical alignments have been designed. From a 2D perspective ISD looks good.
6	Design Vehicle Path		NCHRP 6.2.4	Y	Y	Y	Reviewed the one vehicle path provided and did not create any other design vehicle paths. Design appears to be adequate for a WB-67 design vehicle.
7	Inscribed Circle Diameter	Single Lane - 90' - 180' Two Lane - 150' - 220' Three Lane - 200' - 300'	NCHRP 6.3.1	Y	N	Y	Inscribed Circle Diameter is larger than standard for a single lane roundabout.
8	Approach Alignment Offset Left or Centered	Right offset should be avoided, Left offset preferred	NCHRP 6.3.2	N/A	Y	Y	Left offset typically provides better deflection and reduces speeds more effectively. EB leg is nearly centered and could be offset further left to possibly reduce entry speed.
							I usually calculate the width from face of mountable curb to face of median curb.

Public Input

- Public information meeting saved the day
- Good support from general public
- Local access revisions
- Left turn lanes
- Have we considered all vehicles?



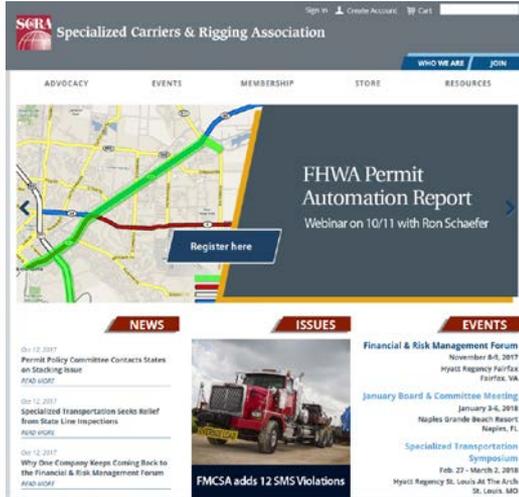
Industry Input

- Bob Fleming from Mullen Trucking noticed the roundabout advertisement and sent one of their drivers to the public info meeting
- Design team “informed” on the unique vehicle characteristics
- Oversized loads are often very low profile loads
- Cross slopes that are considered normal for a tangent path may be excessive in a curved roundabout path
- Vertical profile of the path as important as the horizontal path



OSOW Experts

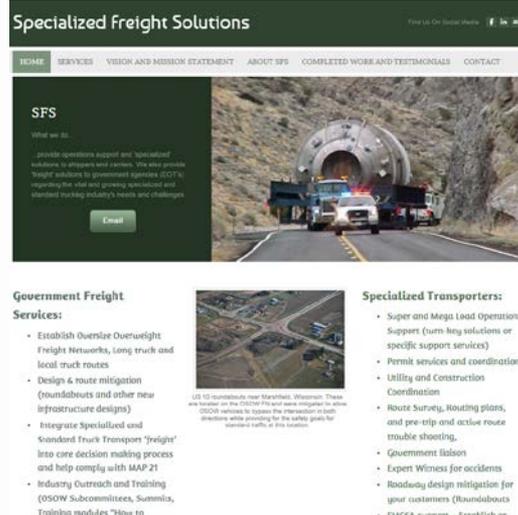
Our design team evolves to include peer review by industry experts



Specialized Carrier & Rigging Association

<http://www.scranet.org/>

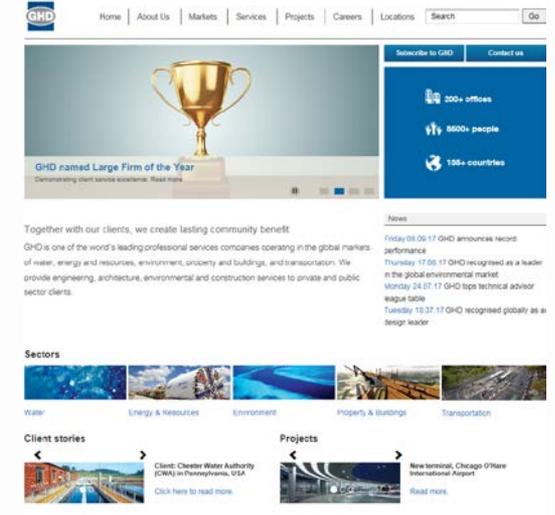
Steven Todd – Vice President
Transportation



Specialized Freight Solutions

<http://specialized-freight.com/>

Peter Lynch – CEO and Founder



GHD

<http://www.ghd.com/usa/>

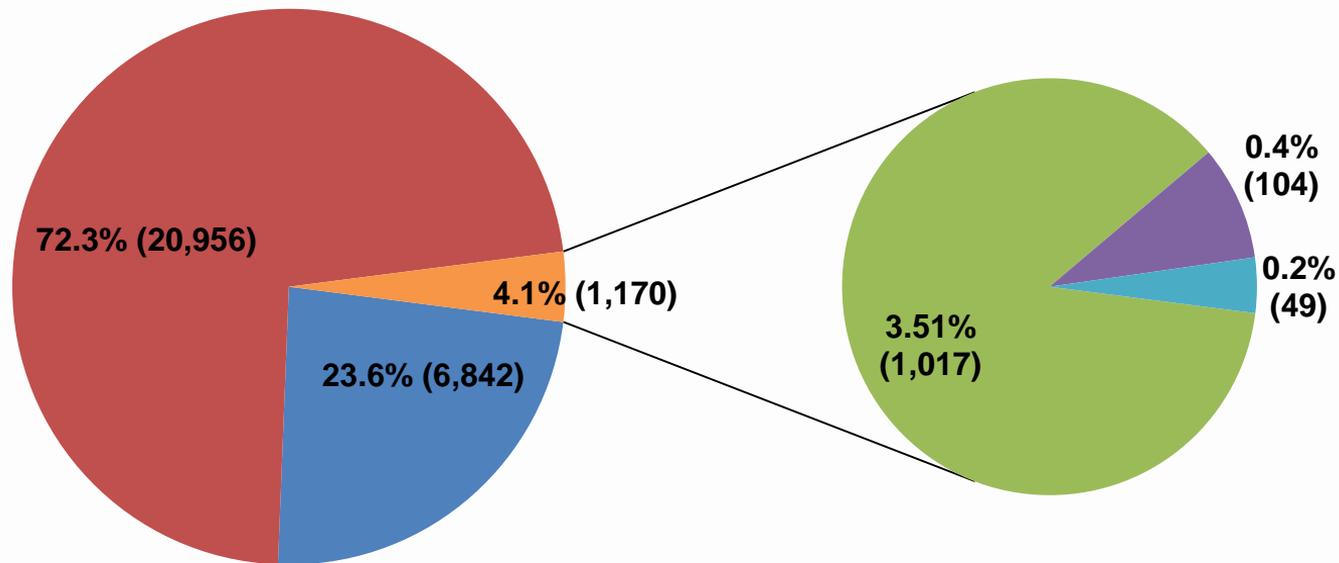
Mark Lenters – Principal
Ben Wilkinson – Project Engineer

OSOW Permit History

- What is the permit history?
- Highway Patrol Permit Office extracted the records and the numbers are significant
- From June 13, 2013 to November 30, 2015, **26,969** permits issued for the intersection
- Average of 32 per day
- Longest load was 215'
- Widest load was 38'
- Heaviest load was 384,000 GVW

Length of OSOW Truck Permits - Jct 52 & 200 (Carrington)

June 13, 2013 to November 30, 2015

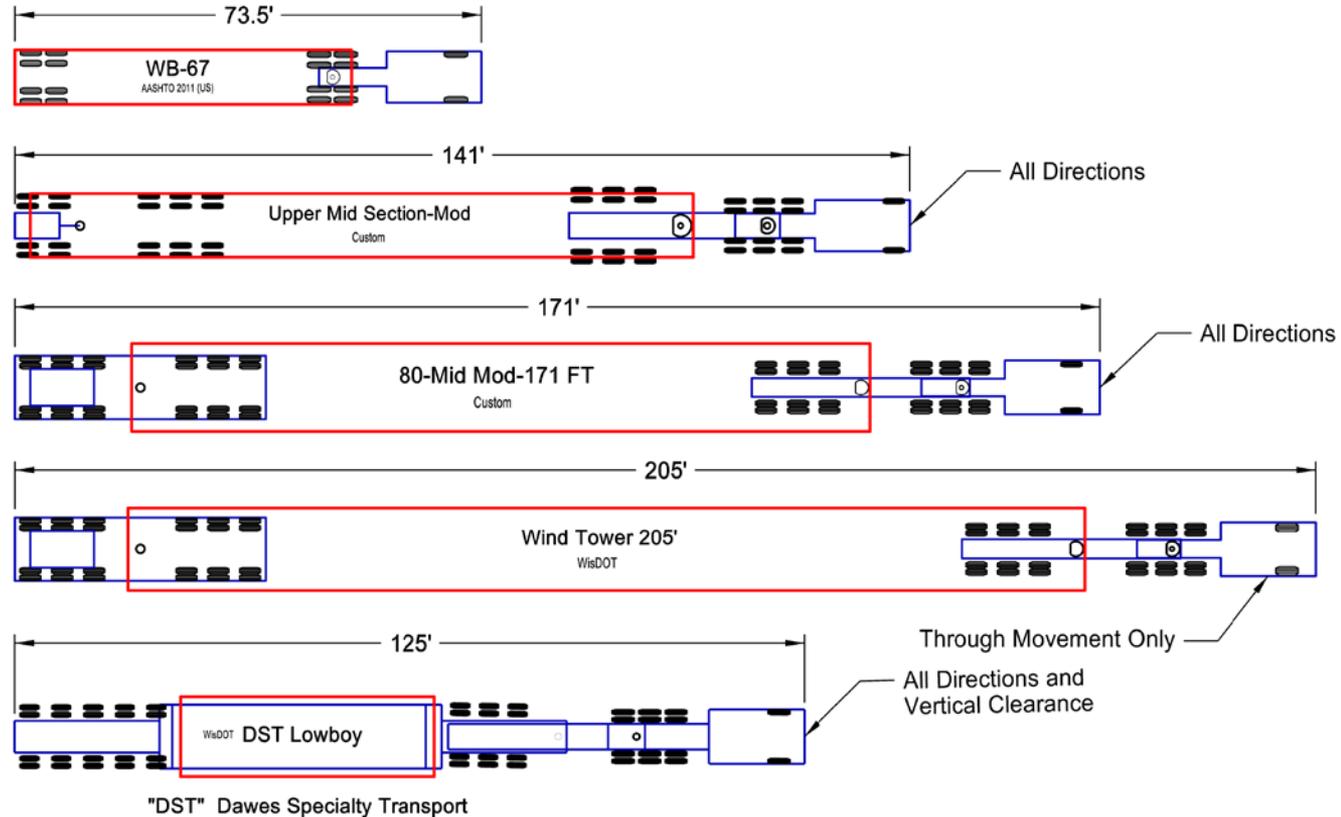


■ <75' ■ 75' - 110' ■ 111' - 150' ■ 151' - 200' ■ > 200'

Design Vehicles

Designing for safe operation of all vehicles

- **NDDOT safety message:**
Primary design vehicle remains a WB-67 truck.
- How to accommodate OSOW vehicles within the established roundabout design?
- How do you select OSOW design vehicle to meet unique load combinations?
- Do you focus only on US 52 and US 281?
- We relied on our industry experts to establish that framework



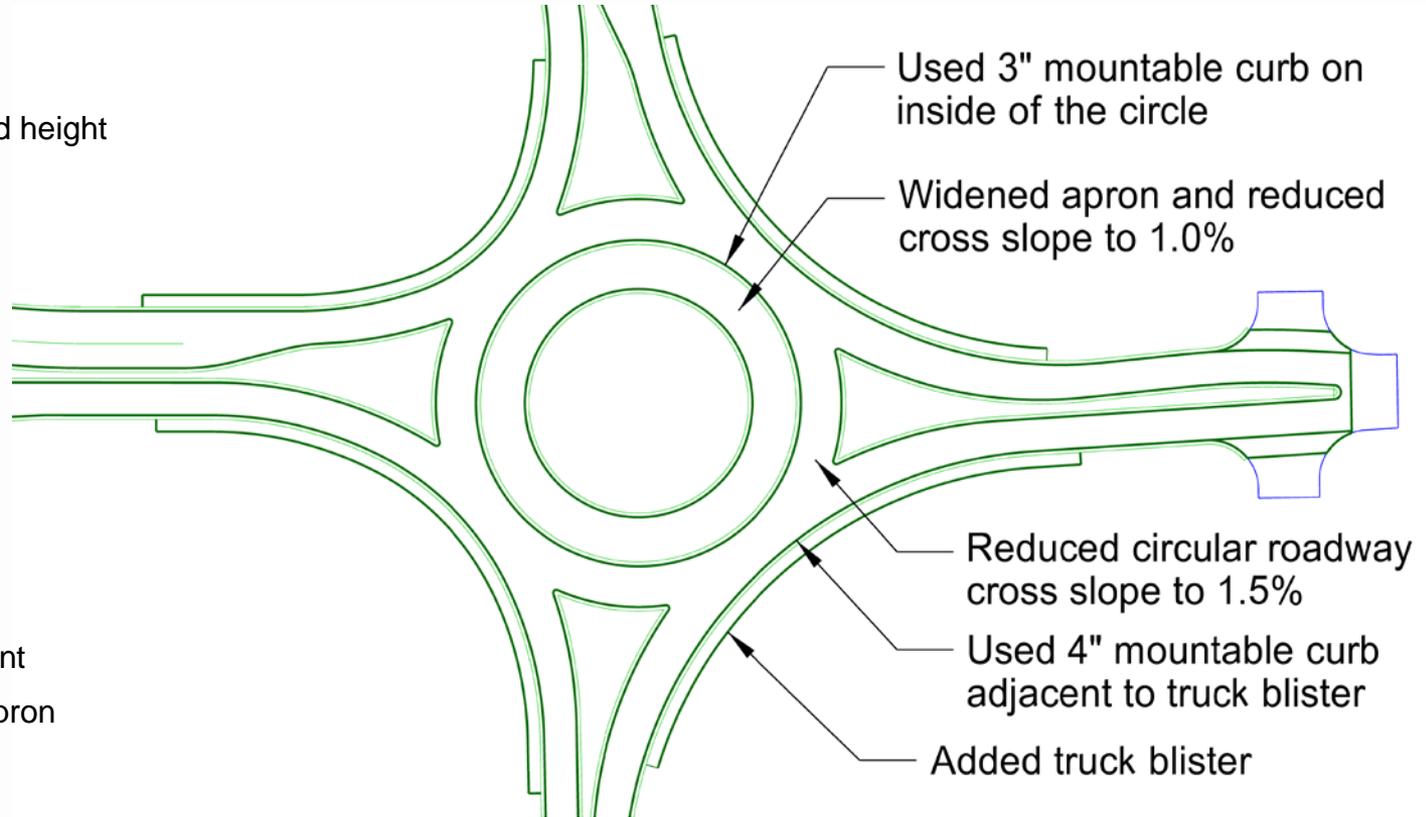
OSOW Modifications

Geometry

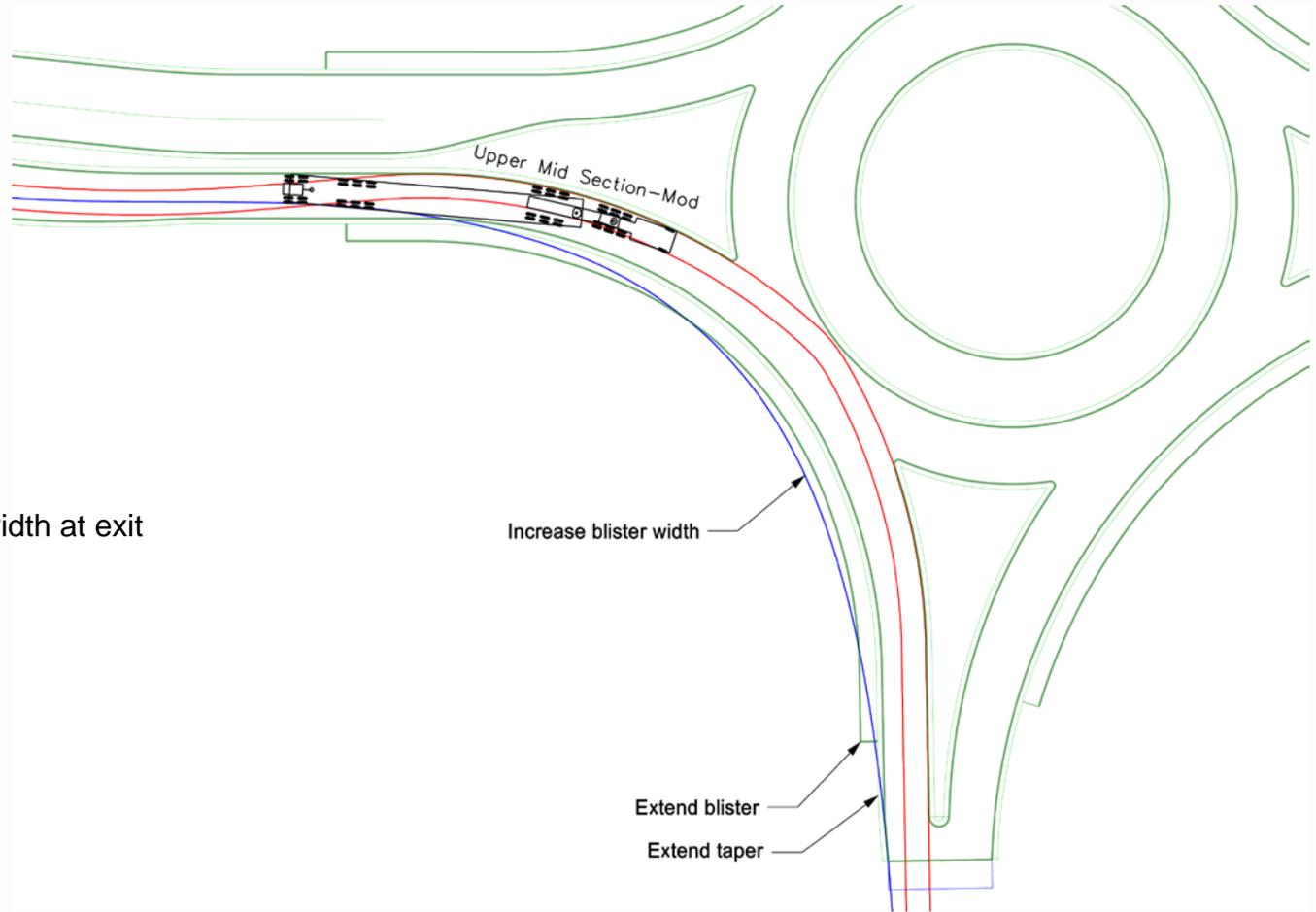
- Reduced cross slopes
- Revised curb shape and height
- Widened apron
- Added blisters

Other Considerations

- Removable signs
- Light standard placement
- Colored and textured apron and blister



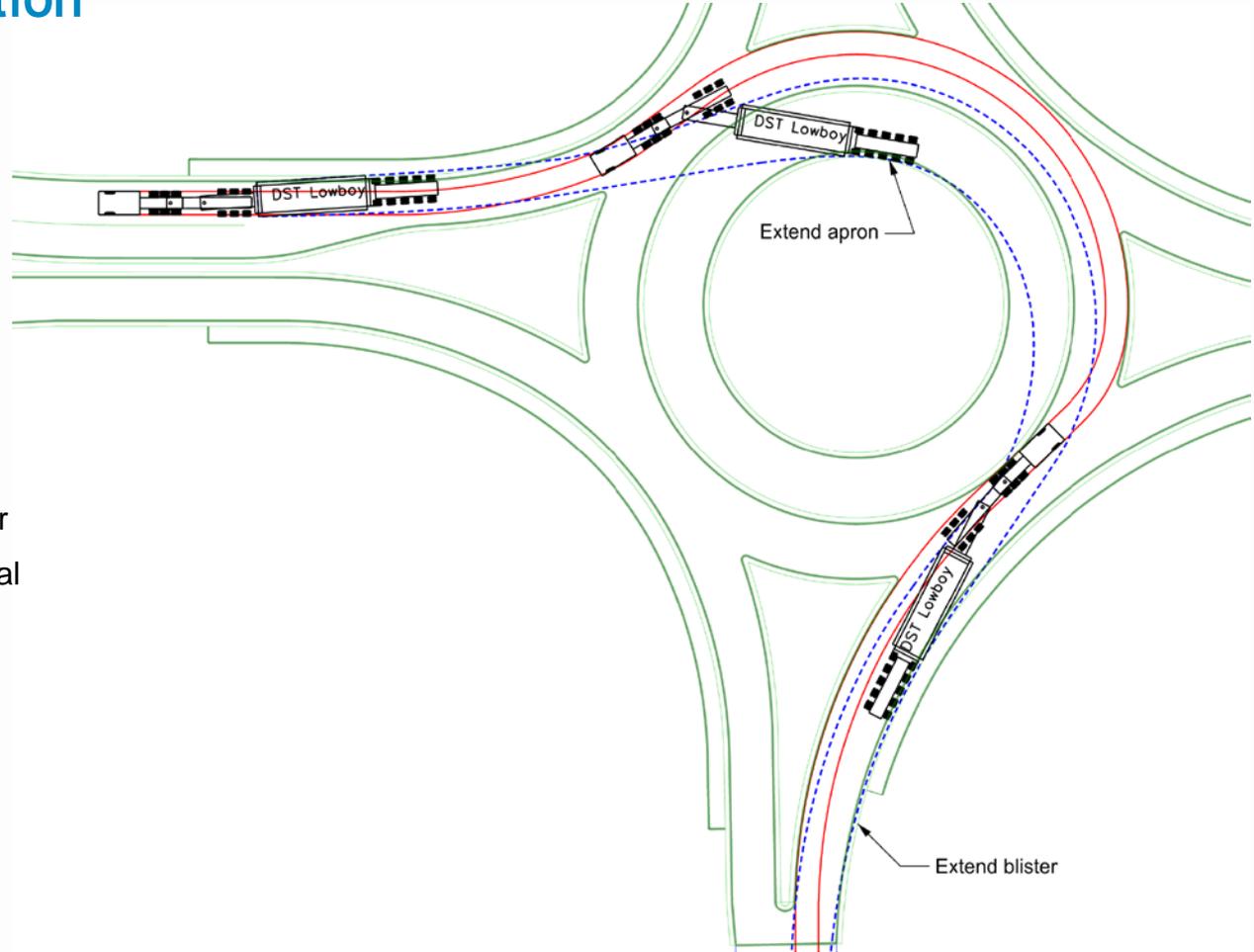
OSOW Turn Evaluation



Upper Mid Section – Mod EB to SB

- Need more blister width
- Blister needs extension
- Primary control on blister width at exit

OSOW Turn Evaluation



DST Lowboy

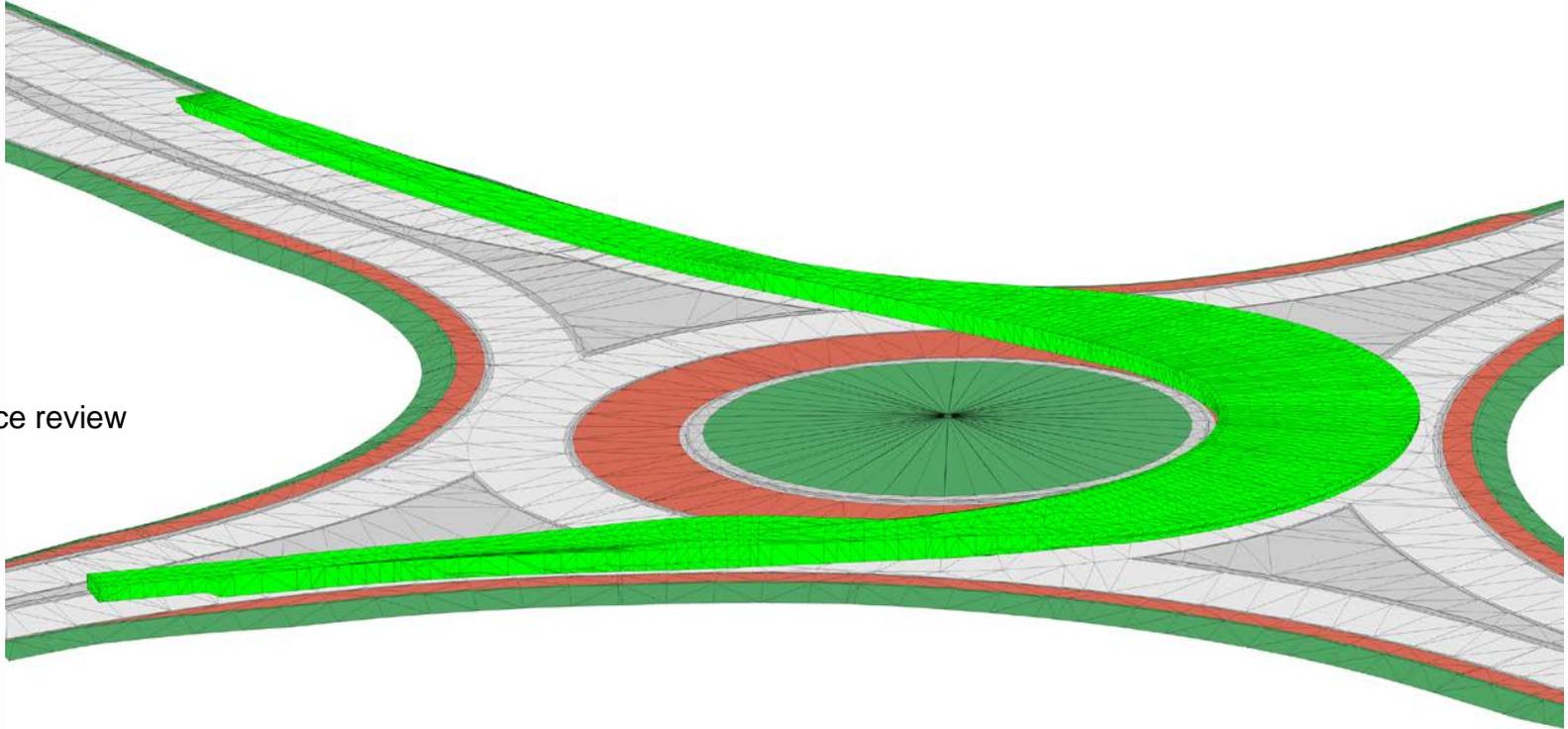
NB to WB

- Need more apron width
- Blister needs to start earlier
- Load path in blue for vertical clearance review

OSOW Turn Evaluation

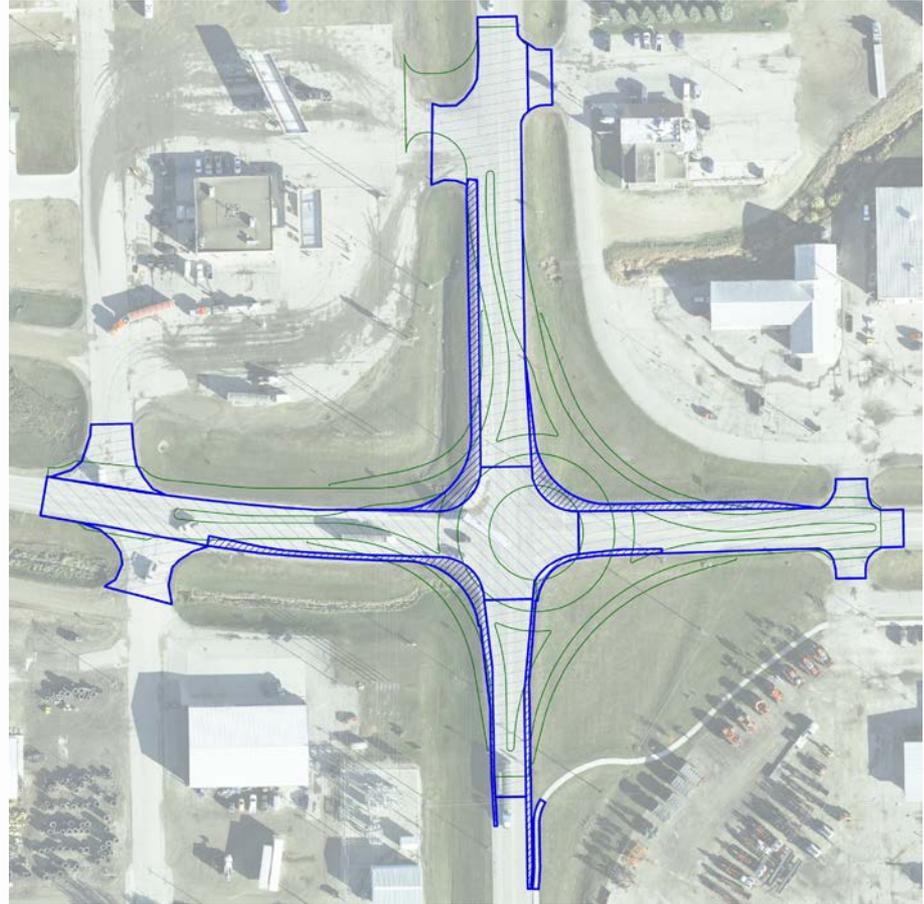
DST Lowboy
NB to WB

- Vertical clearance review



What would this cost?

- Cost comparison to turn lanes
- Turn lanes \$405,000
- Roundabout: \$1,873,000 including construction detour

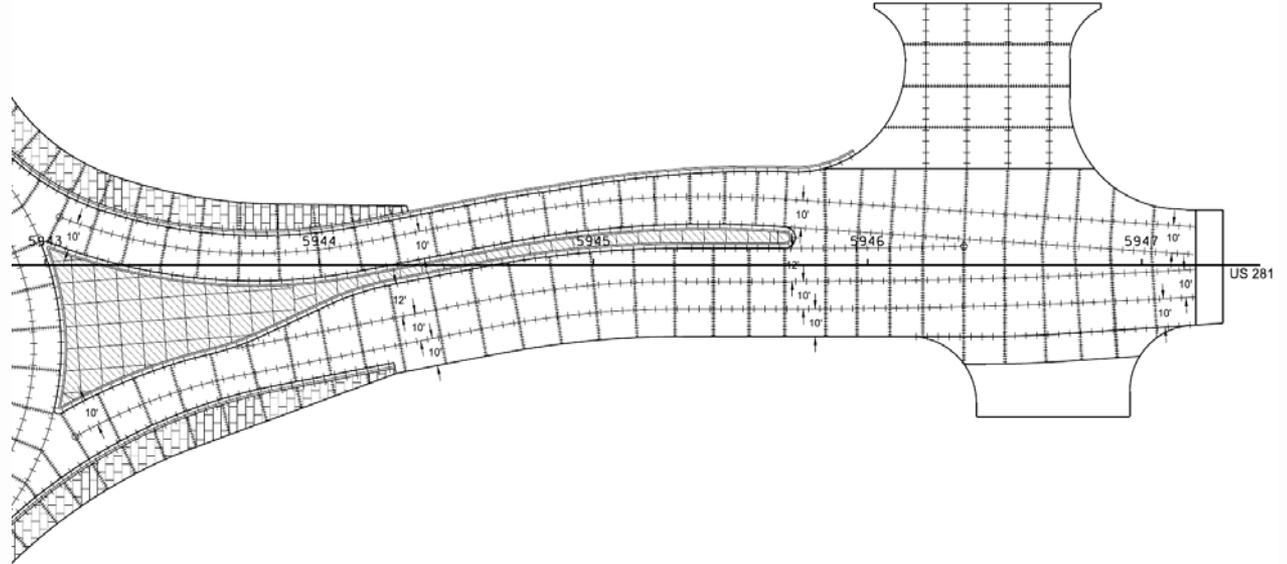


Construction and Design Roundtable

- Roundtable hosted by Construction Services in February 2016
- Special thanks to the Stantec group that participated

Discussion Items

- Promote slip form paving
- Full depth curb
- Tie bar details
- Improve surface drainage
- Dowel bars
- Expansion control



[Click this link to see the video shown during the presentation.](#) The link will take you to YouTube.

Recommendations

Scoping

- Consider Roundabouts
- Add OSOW route to scoping checklist

Design

- Standard roundabout layout
- Mountable curb
- Inlet structure and grate for mountable
- Jointing and tie bars
- Outside berm if OSOW blister is not needed.

Construction

- Detour
- Constructability and Phasing
- Geotextile fabric



Ribbon Cutting



“With the completion of this project, we have enhanced transportation safety by improving rural US Highway 52 and adding a roundabout to the intersection of Highway 52 and 200.”

-NDDOT Director Grant Levi

“The construction of the roundabout has been a very positive thing for the city of Carrington.”

-Mayor Neil Fandrich

Questions? Comments?

On behalf of the Sambatek team, we would like to personally thank the following people for their contribution to this project:

NDDOT Design

- Roger Weigel
- Derek Pfeifer
- James Rath
- Matt Gangness
- Amy Beise
- Brad Pfeifer

NDDOT Devils Lake District

- Greg Semenko
- Wyatt Hanson
- Nathan Haaland
- Denis Horn

ND Highway Patrol

- Jacqueline Darr

Sambatek, Inc.

- Miles Mehlhoff
- James Alber
- Brad Schaff
- Chris Schatz
- Kyle Fitterer
- Nick Flemming

KLJ, Inc.

- Gabe Schell
- Scott Fanning
- Patrick Gallagher

GHD, Inc.

- Mark Lenters
- Ben Wilkinson

Specialized Carrier and Rigging Association

- Steven Todd
- Bob Fleming
- Peter Lynch

City of Carrington ND

- Mayor Neil Fandrich
- Dan Trosen
- Heather Carr

Contractors

- Gratech Company
- Paras Contracting
- Mayo Construction
- Dallmann Services
- Moorhead Electric
- Pro Landscapers

Roundabout Solution for Oversized Vehicles

Eric Molbert, Project Manager
Sambatek, Inc.

emolbert@sambatek.com

