

# TURN LANE STUDY

## US 52 (RP 103.3) & Co 16 (79<sup>th</sup> Ave SE)

## US 52 (RP 104.3) & Co 19

### HSIP 441802



Prepared By:  
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION  
PROGRAMMING DIVISION  
TRAFFIC OPERATIONS SECTION

Principal Author:  
Christopher L. Holzer, P.E.

May 2014

**INTRODUCTION:**

The NDDOT Minot District submitted an HSIP project request to install EB to NB left turn lanes at the two intersections shown on the cover. The project request application is in **Appendix A**. For study purposes, US 52 is considered E/W and the cross streets are considered N/S.

**INFORMATION/ANALYSIS:**

Intersection Sight Distance Analysis

The intersection sight distance is adequate at both intersections. Calculations and figures are in **Appendix B**.

Crash Analysis

A 5 year study period was used, 4/1/09 – 3/31/14, and detailed crash information is in **Appendix C**.

There was 1 reported crash at the US 52 (RP 103.3) & Co 16 (79<sup>th</sup> Ave SE) intersection. A vehicle attempted to make a left turn from EB US 52 onto NB Co 16 and was hit by a vehicle WB on US 52.

There was 1 reported crash at the US 52 (RP 104.3) & Co 19 intersection. A vehicle WB on US 52 lost control on icy road and slid into a vehicle that was stopped facing SB at the stop sign.

Traffic Volumes

Traffic volumes were obtained from NDDOT’s Traffic Data Section. Volume info is in **Figures 1 and 2** below and in **Appendix D**.

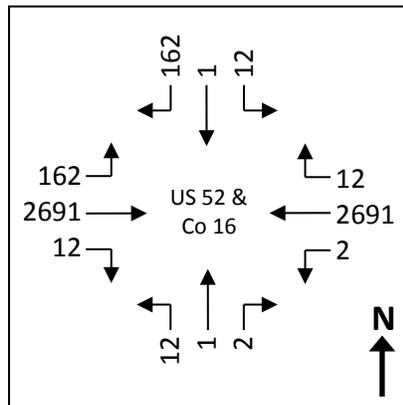


Figure 1 – 2014 AADT Volumes  
US 52 RP 103.3 & Co 16 (79<sup>th</sup> Ave SE)

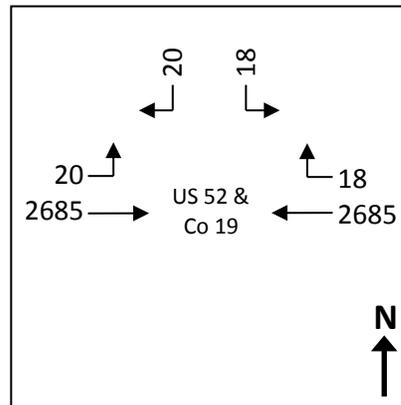


Figure 2 – 2014 AADT Volumes  
US 52 RP 104.3 & Co 19

Turn Lane Criteria

Turn lane criteria are included in NDDOT’s Guidelines for the Installation of Turn Lanes Along State Highways (2011 Edition). **Table 1** shows volume criteria are satisfied only for the EB to NB left turn movement at the Co Rd 16 (US 52 RP 103.3) intersection.

Table 1 - Turn Lane Info						
Intersection	Movement	Volume Criteria	2013 AADT	2013 % Trucks	2013 PCE	Volume Criteria Met?
US 52 RP 103.3 & Co 16 (79th Ave SE)	Major Road AADT	Mainline AADT ≥ 750	5570	---	---	Yes
	EB to NB Left Turn	Left Turn PCE ≥ 125	162	6%	177	Yes
	EB to SB Right Turn	Right Turn PCE ≥ 125	12	8%	13	No
	WB to SB Left Turn	Left Turn PCE ≥ 125	2	50%	4	No
	WB to NB Right Turn	Right Turn PCE ≥ 125	12	92%	29	No
US 52 RP 104.3 & Co 19	Major Road AADT	Mainline AADT ≥ 750	5408	---	---	Yes
	EB to NB Left Turn	Left Turn PCE ≥ 125	20	5%	22	No
	WB to NB Right Turn	Right Turn PCE ≥ 125	18	22%	24	No
Notes: PCE = Passenger Car Equivalent Rolling Terrain (>2%) was used to calculate PCE.						

Capacity Analysis for US 52 RP 103.3 & Co Rd 16 (79<sup>th</sup> Ave SE)

To determine the L4 storage length for the proposed EB to NB left turn lane at the US 52 RP 103.3 & Co 16 intersection, a capacity analysis was performed using future 2034 volumes. For the capacity analysis, the 10% peak hour was analyzed, the peak hour factor was assumed to be 0.88, and HCS 2010 software was used. The capacity worksheet is in **Appendix E**.

The capacity results show an EB to NB left turn lane would have a 95<sup>th</sup> percentile queue length of zero feet, which is less than NDDOT’s default minimum L4 storage length of 100ft.

**RECOMMENDATIONS:**

For the US 52 (RP 103.3) & Co 16 (79<sup>th</sup> Ave SE) intersection, it is recommended to advance the EB to NB left turn lane project request forward to the HSIP project prioritization process. If selected for funding, then it is recommended the L4 storage length be 100ft.

For the US 52 (RP 104.3) & Co 19 intersection, it is recommended to deny the turn lane project request.

Appendices

- A – HSIP Safety Project Application
- B – Intersection Sight Distance Information
- C – Crash Information
- D – Traffic Volume Information
- E – Capacity Analysis Worksheet

Appendix A – HSIP Safety Project Application

**Slag, Donovan M.**

**From:** Kuntz, Shawn P.  
**Sent:** Wednesday, November 13, 2013 3:32 PM  
**To:** Slag, Donovan M.  
**Subject:** FW: Solicitation Memorandum for 2015-18 Highway Safety Improvement Program  
**Attachments:** 2015-18 Solicitation for Safety Projects.docx

**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

FYI  
4 turn lane projects for HSIP.  
S.K.

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**From:** Redding, Jim L.  
**Sent:** Friday, November 08, 2013 8:25 AM  
**To:** Kuntz, Shawn P.  
**Subject:** FW: Solicitation Memorandum for 2015-18 Highway Safety Improvement Program

Shawn,

Minot District recommendations for 2015-2018 HSIP.

- US 52 RP 103.32 West Logan intersection, add EB left turn lane
- US 52 RP 104.24 East Logan intersection, add EB left turn lane
- US 83/ND 5/ND 256 US 83 RP 237.02 intersection improvements to include left turn lanes for NB and WB traffic
- East Jct US 83 /ND 5 US 83 RP 253.62 intersection improvements to include EB left turn lane

Will HSIP funding be available for funding safety improvements such as signals and street lighting? For example, US 2 & 42<sup>nd</sup> St, US 83 Bypass & 21<sup>st</sup> Ave NW, etc?

Jim

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**From:** Kuntz, Shawn P.  
**Sent:** Tuesday, October 29, 2013 11:24 AM  
**To:** Levi, Kevin J.; Gangl, Larry J.; Peterson, Walt A.; Redding, Jim L.; Semenko, Greg J.; Noehre, Les W.; Walton, Bob R.; Thompson, John E.; Mongeon, Karin L.  
**Cc:** Slag, Donovan M.; Berger, Jane E.; Orn, Chad M.  
**Subject:** Solicitation Memorandum for 2015-18 Highway Safety Improvement Program

## Appendix B – Intersection Sight Distance Information

Calculations.....	7
Intersection Sight Triangles for US 52 (RP 103.3) & Co 16 (79 <sup>th</sup> Ave SE).....	8
Intersection Sight Triangles for US 52 (RP 104.3) & Co 19.....	9

# Intersection Sight Distance Calculations

$ISD = 1.47 \times V_{major} \times t_g$       <-- Equation 9-1 from 2011 AASHTO Green Book.  
 $V_{major} = 65$       mph

**23 USC § 409 Documents  
NDDOT Reserves All Objections**

<b>Case B1 (left turn from stop)</b>			
<b>Vehicle Type</b>	<b><math>t_g</math></b>	<b>ISD (ft)</b>	<b>ISD (rounded)</b>
PC	7.5	717	720 ft
SU	9.5	908	910 ft
COMB	11.5	1099	1100 ft

Base  $t_g$  values for Case B1 from 2011 AASHTO Green Book Table 9-5.

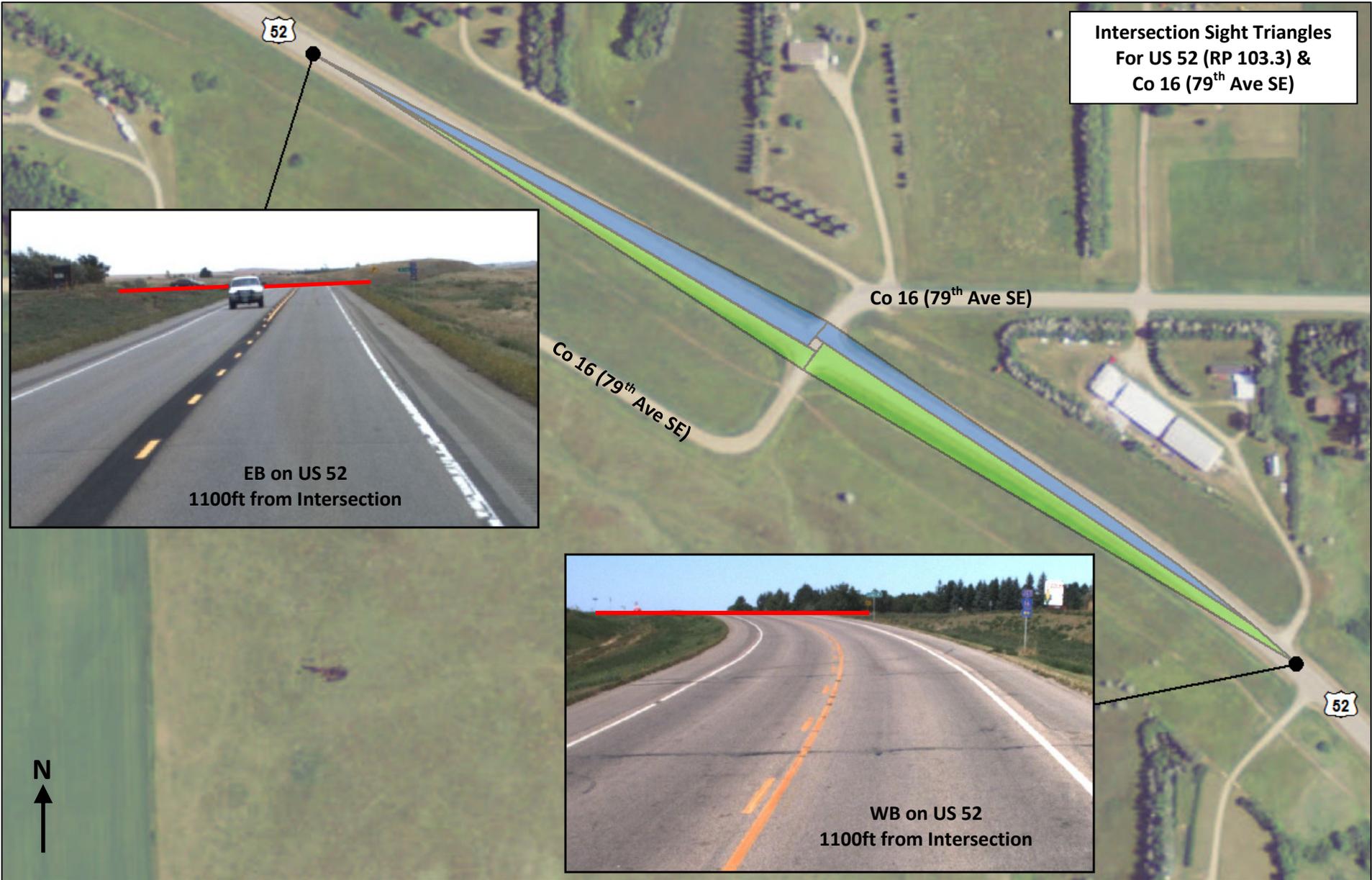
<b>Case B2 (crossing) and B3 (right turn from stop)</b>			
<b>Vehicle Type</b>	<b><math>t_g</math></b>	<b>ISD (ft)</b>	<b>ISD (rounded)</b>
PC	6.5	621	625 ft
SU	8.5	812	815 ft
COMB	10.5	1003	1005 ft

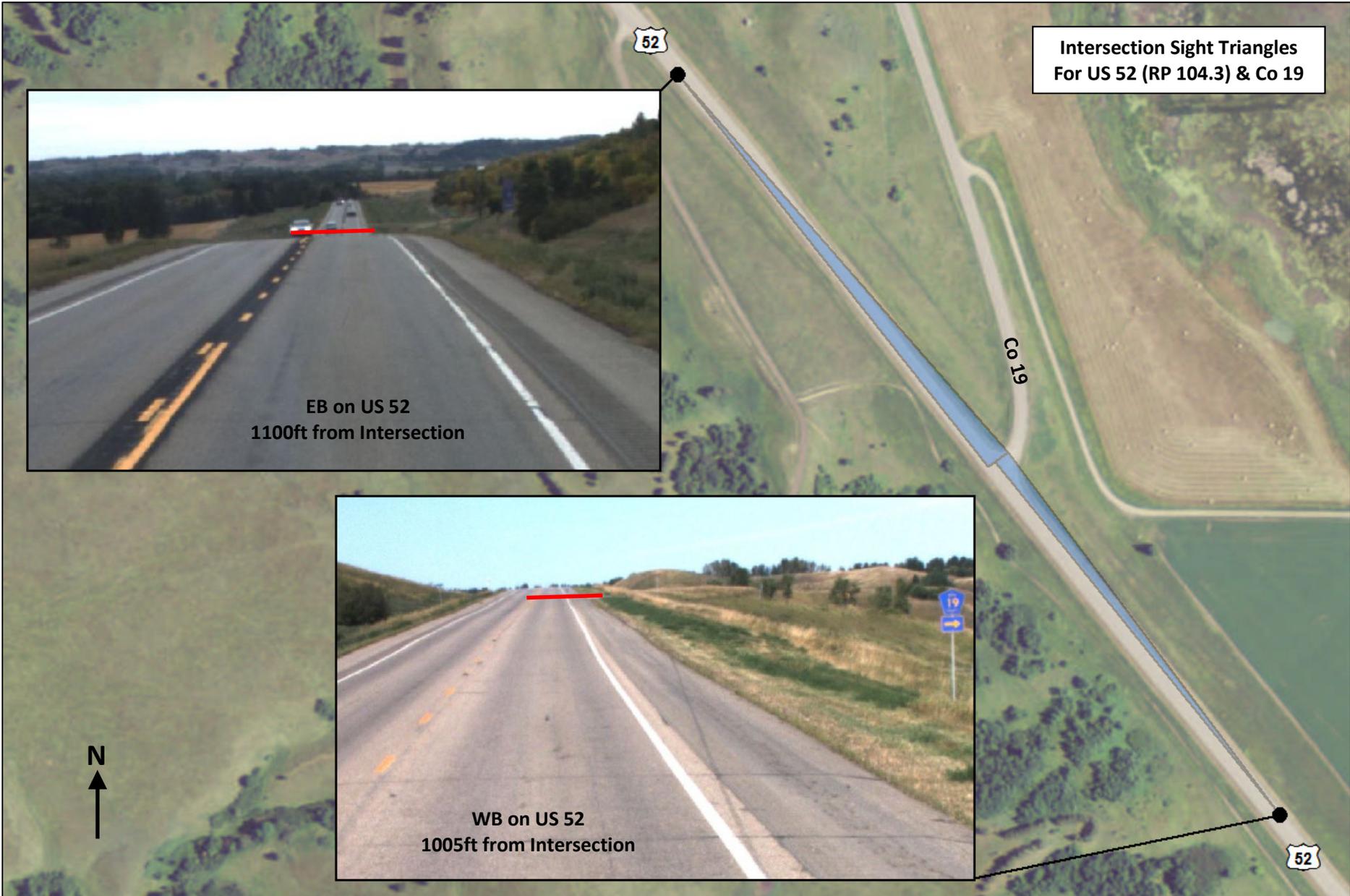
Base  $t_g$  values for Cases B2 and B3 from 2011 AASHTO Green Book Table 9-7.

<b>Case F (major road left turn)</b>			
<b>Vehicle Type</b>	<b><math>t_g</math></b>	<b>ISD (ft)</b>	<b>ISD (rounded)</b>
PC	5.5	526	530 ft
SU	6.5	621	625 ft
COMB	7.5	717	720 ft

$t_g$  values for Case F from 2011 AASHTO Green Book Table 9-13.

Intersection Sight Triangles  
For US 52 (RP 103.3) &  
Co 16 (79<sup>th</sup> Ave SE)





## Appendix C – Crash Information

US 52 (RP 103.3) & Co 16 (79 <sup>th</sup> Ave SE).....	11
US 52 (RP 104.3) & Co 19.....	12

**Crash Summary Sheets**

**Total Crashes:** 1  
**Sorted by:** Date

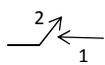
**City:** Logan  
**Location:** US 52 (RP 103.3) & Co 16 (79th Ave SE)

<b>M</b>	<b>D</b>	<b>Year</b>
4	1	2009
3	31	2014

**Notes:** For study purposes, US 52 is E/W and Co 16 (79th Ave SE) is N/S.

23 USC § 409 Documents  
 NDDOT Reserves All Objections

**Number of Years:** 5.00

Number	Date	Lighting	Veh # Age Sex	Address	Alcohol or Drugs	Contributing Factors	Unit Configuration	Dir. of Travel	Traffic Control	Manner of Collision	Shortened Narrative	Diagram	
	Severity	Day											Weather
	Constr.	Time											Surface Cond
1	299554 PDO No	2/24/2014 Monday 3:10 PM	Daylight Clear Dry	V1 63 F V2 29 M	Velva, ND Minot, ND	No No	Failed To Yield	Psg'r Car Psg'r Car	West East	None None	Left Turn	D2 attempted to make a left turn from EB US 52 onto NB Co 16, and was hit by V1 (WB on US 52). While turning D2 had been concentrating to avoid hitting a SB vehicle stopped at the stop sign.	
2													
3													
4													
5													
6													
7													
8													
9													
10													

**Crash Summary Sheets**

**Total Crashes:** 1  
**Sorted by:** Date

**City:** Logan  
**Location:** US 52 (RP 104.3) & Co 19

	<b>M D Year</b>		
<b>Start Date:</b>	4	1	2009
<b>End Date:</b>	3	31	2014

**Notes:** For study purposes US 52 is E/W and Co 19 is N/S.

23 USC § 409 Documents  
 NDDOT Reserves All Objections

**Number of Years:** 5.00

Number	Date	Lighting	Veh # Age Sex	Address	Alcohol or Drugs	Contributing Factors	Unit Configuration	Dir. of Travel	Traffic Control	Manner of Collision	Shortened Narrative	Diagram	
	Severity	Day											Weather
	Constr.	Time											Surface Cond
1	244387 InjC No	1/14/2012 Saturday 8:15 AM	Daylight Clear Ice / Snow	V1 18 M V2 51 M	Velva, ND Minot, ND	No No	Speed	PU/Van/Utility PU/Van/Utility	West South	None Stop Sign	Angle	D1 was WB on US 52, lost control on icy road, and slid into V2 (which was stopped facing SB at stop sign).	
2													
3													
4													
5													
6													
7													
8													
9													
10													

## Appendix D – Traffic Volume Information

US 52 (RP 103.3) & Co 16 (79 <sup>th</sup> Ave SE).....	14
US 52 (RP 104.3) & Co 19.....	16



**Intersection Traffic Volumes**  
 North Dakota Department of Transportation  
 SFN 7921 (Rev. 4-85)

**23 USC § 409 Documents**  
**NDDOT Reserves All Objections**

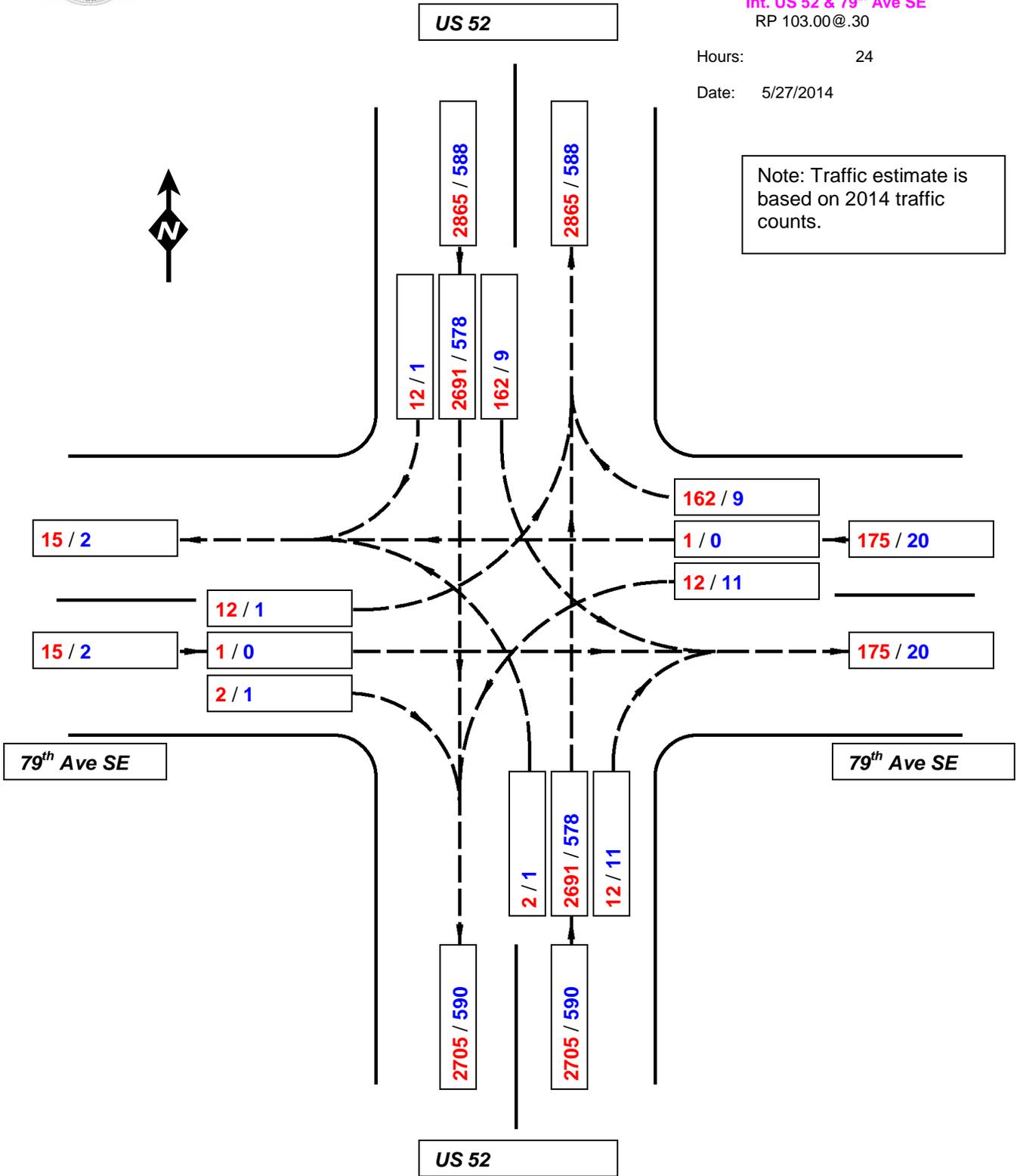
Intersection No: 1

Description  
**Int. US 52 & 79<sup>th</sup> Ave SE**  
 RP 103.00@.30

Hours: 24

Date: 5/27/2014

Note: Traffic estimate is based on 2014 traffic counts.



LEGEND: **AA**DT / **TRUCKS** - 2014

**Completed by NR**



**Intersection Traffic Volumes**  
 North Dakota Department of Transportation  
 SFN 7921 (Rev. 4-85)

**23 USC § 409 Documents**  
**NDDOT Reserves All Objections**

Intersection No: 1

Description  
**Int. US 52 & 79<sup>th</sup> Ave SE**  
 RP 103.00@.30

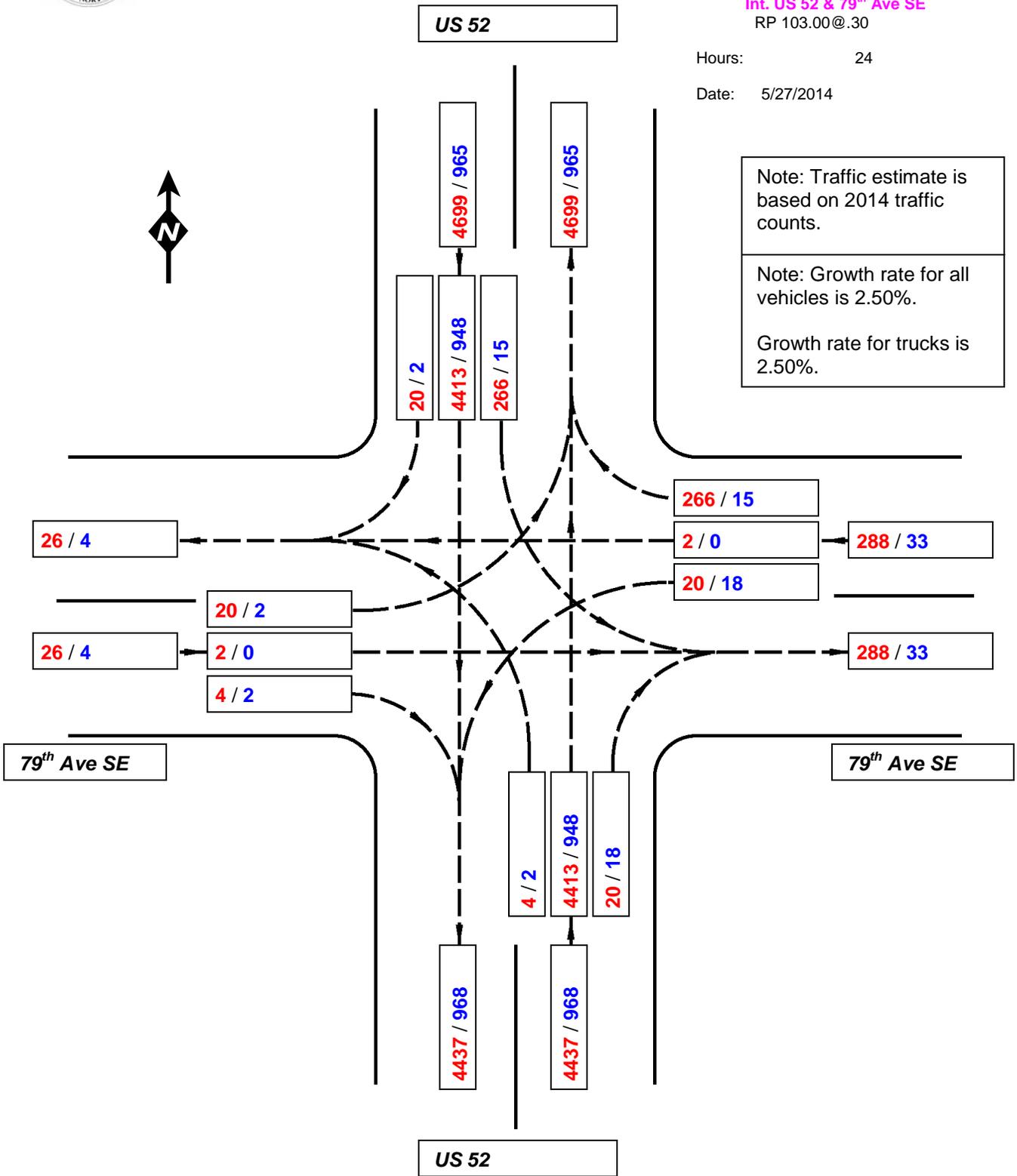
Hours: 24

Date: 5/27/2014

Note: Traffic estimate is based on 2014 traffic counts.

Note: Growth rate for all vehicles is 2.50%.

Growth rate for trucks is 2.50%.



LEGEND: **AA**DT / **TRUCKS** - 2034

**Completed by NR**



**Intersection Traffic Volumes**  
 North Dakota Department of Transportation  
 SFN 7921 (Rev. 4-85)

**23 USC § 409 Documents**  
**NDDOT Reserves All Objections**

Intersection No. 2

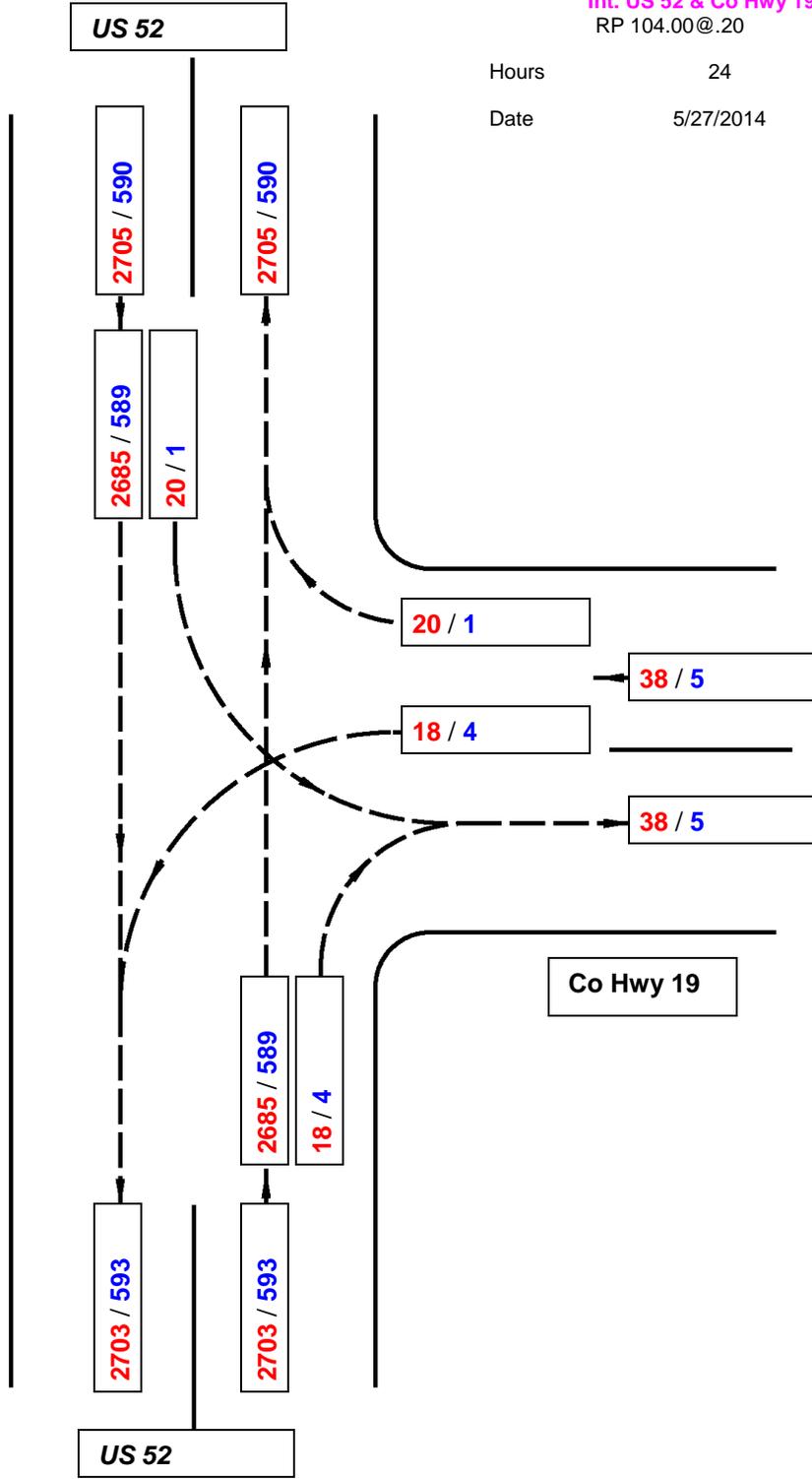
Description  
 Int. US 52 & Co Hwy 19  
 RP 104.00@.20

Hours 24

Date 5/27/2014



Note: Traffic estimate is based on 2014 counts.



LEGEND: **AA**DT / **TRUCKS** - 2014

**Completed by NR**



**Intersection Traffic Volumes**  
 North Dakota Department of Transportation  
 SFN 7921 (Rev. 4-85)

**23 USC § 409 Documents**  
**NDDOT Reserves All Objections**

Intersection No. 2

Description  
 Int. US 52 & Co Hwy 19  
 RP 104.00@.20

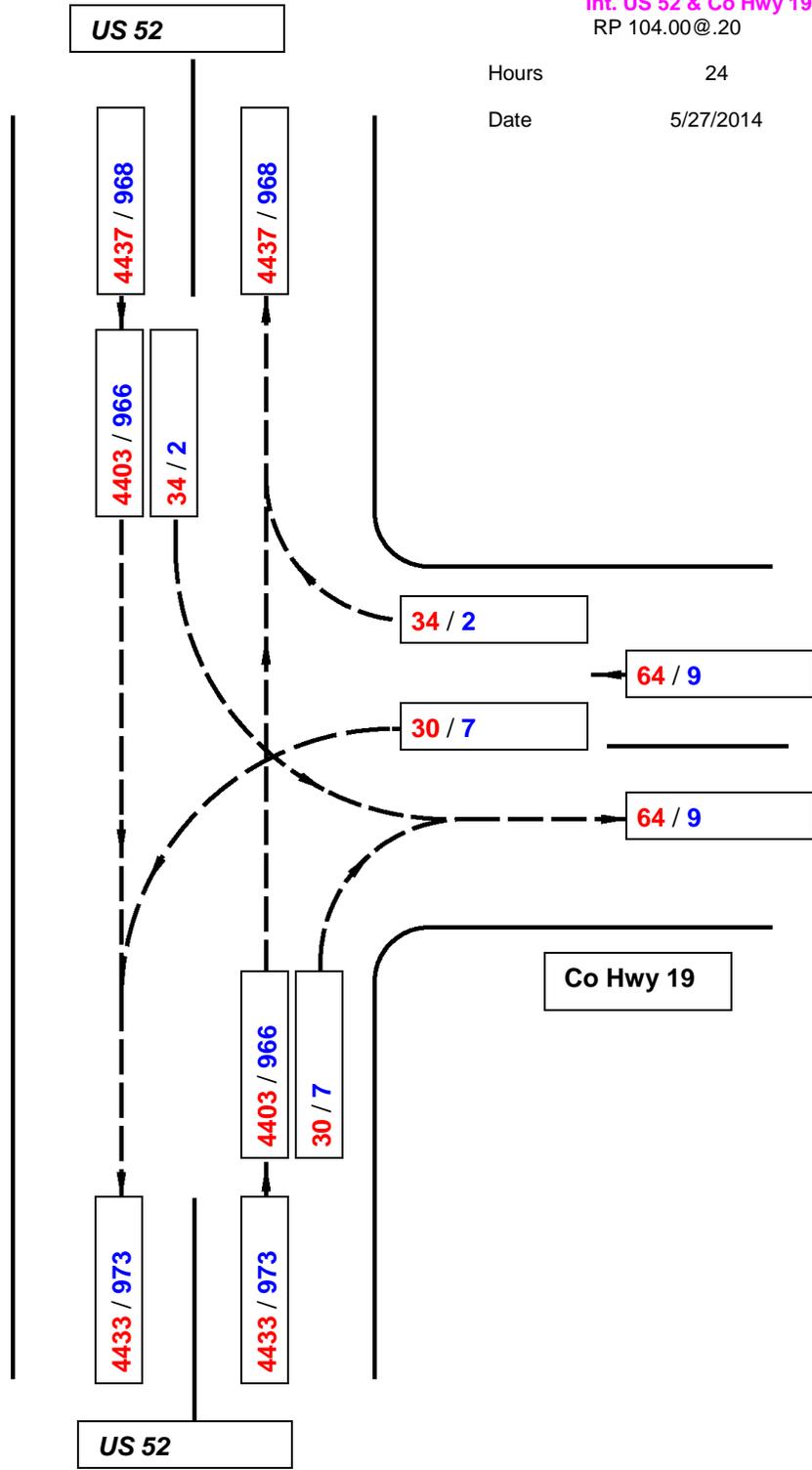
Hours 24

Date 5/27/2014



Note: Traffic estimate is based on 2014 counts.

Note: Growth rate for all vehicles is 2.50%.  
 Growth rate for trucks is 2.50%.



LEGEND: **AAADT** / **TRUCKS** - 2034

**Completed by NR**

Appendix E – Capacity Analysis Worksheet

TWO-WAY STOP CONTROL SUMMARY

Analyst: CLH  
 Agency/Co.: NDDOT  
 Date Performed: 5/28/2014  
 Analysis Time Period: 10% Peak  
 Intersection: US 52 (RP 103.3) & Co 16  
 Jurisdiction: Rural  
 Units: U. S. Customary  
 Analysis Year: 2034  
 Project ID: 2034 Traffic, Revised Geometry  
 East/West Street: US 52  
 North/South Street: Co 16 (79th Ave SE)  
 Intersection Orientation: EW

**23 USC § 409 Documents  
 NDDOT Reserves All Objections**

Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street:	Approach Movement	Eastbound				Westbound		
		1 L	2 T	3 R		4 L	5 T	6 R
Volume		27	441	2		1	441	2
Peak-Hour Factor, PHF		0.88	0.88	0.88		0.88	0.88	0.88
Hourly Flow Rate, HFR		30	501	2		1	501	2
Percent Heavy Vehicles		6	--	--		50	--	--
Median Type/Storage		Undivided						
RT Channelized?								
Lanes		1	1	0		0	1	0
Configuration		L		TR		LTR		
Upstream Signal?		No				No		

Minor Street:	Approach Movement	Northbound				Southbound		
		7 L	8 T	9 R		10 L	11 T	12 R
Volume		2	1	1		2	1	27
Peak Hour Factor, PHF		0.88	0.88	0.88		0.88	0.88	0.88
Hourly Flow Rate, HFR		2	1	1		2	1	30
Percent Heavy Vehicles		10	0	50		90	0	6
Percent Grade (%)		0				0		
Flared Approach: Exists?/Storage		No				No		
Lanes		0	1	0		0	1	0
Configuration		LTR				LTR		

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound				Southbound			
			7	8	9		10	11	12	
Movement	1	4		7	8	9		10	11	12
Lane Config	L	LTR		LTR	LTR	LTR		LTR	LTR	LTR
v (vph)	30	1		4				33		
C(m) (vph)	1041	855		219				452		
v/c	0.03	0.00		0.02				0.07		
95% queue length	0.09	0.00		0.06				0.24		
Control Delay	8.6	9.2		21.7				13.6		
LOS	A	A		C				B		
Approach Delay				21.7				13.6		
Approach LOS				C				B		