SAFETY PROJECT EXPERIENCE

CURVE SIGNING ON CR 426

By

Dickinson County Road Commission


PROJECT AREA
MARQUETT
R O N
D I C K I N S O N
M E N O M I N E E

Upper Peninsula Traffic Safety Plan

November 2016

Acknowledgments

Thank you to our many stakeholders who provided input to develop the Upper Peninsula Traffic Safety Plan, including the Traffic Safety Stakeholder Group.

Member agency:

Bay Mills Emergency Connection
Bay Mills Indian Community
Bay Mills Police Dept.
Central U.P. Planning and Development Region
Chippewa Co Health Dept
Chippewa Co Sheriff Dept
Chippewa County Administrator
Chippewa County Central Dispatch
Chippewa County EMS
Chippewa County Road Commission
Chippewa County Sheriff Dept
Chippewa Road Commission
Chocolay Township Police Department
City of Escanaba
City of Gladstone
City of Marquette
City of Menominee
City of Sault Ste. Marie
City of St Ignace PD
City of St. Ignace
Delta County
Delta County Road Commission
Delta County Sheriff's Department
Dickinson County Road Commission
Eastern U.P. Planning and Development Region
Escanaba Public Safety Department
EUP ISD
EUPTA
Forsyth Township
Gogebic County Board of Commissioners
Gogebic County Bd
Gogebic County Sheriff
Governor's office
Hannahville Indian Community
Helen Newberry Joy Hospital
Houghton County Road Commission HCRC
Ironwood Public Safety
Keweenaw Bay Indian Community KBIC
Kinross Twp. EMS
Lake Superior State University
Luce-Mackinac-Alger,-Schoolcraft District Health Dept.
Luce Co. Sheriff Dept
Luce County Ambulance
Luce County Emergency Services
Luce County Road Commission
Mackinac Bridge Authority
Mackinac Co Road Comm
Mackinac Co Sheriff Dept
Mackinac County E911
Mackinac County OES
Marquette City Police Department
Marquette County Resource Management Department
Marquette County Road Commission
Marquette County Sheriff's Department
MDOT - Central Communications
Michigan Center for Truck Safety
Michigan Department of State
Michigan Department of Transportation
Michigan State Police
Michigan Technological University- Tribal Technical Assistance Program MTU TTAP
Negaunee Township
Office of Highway Safety Planning
Region 8 Medical Control
Sault Area Schools
Sault Ste Marie
Sault Tribe of Chippewa Indians
SSM EDC
SsMART Group
War Memorial Hospital
Western U.P. Planning and Development Region

The emphasis areas were selected based on the crash data trends and stakeholder input. The Traffic Safety Stakeholder Group prioritized five traffic crash emphasis areas for the Upper Peninsula, including:

- Lane departure
- Speed management
- Winter weather
- Impaired driving

This RTSP includes a list of strategies that are focused on addressing each of the emphasis areas. Strategy selection was also based on stakeholder input, with special consideration for their effective and validated practices. This plan also includes lists of key locations (corridors and intersections) that will benefit from both systemic and spot safety improvements to achieve the RTSP goals.

Regional Traffic Safety Policies

In addition to the specific four E's mitigating strategies included in this plan, several regional safety policies have been developed to guide plan implementation.

1. Apply a comprehensive, integrated approach when addressing highway safety problems that include the vehicle, driver, other road users, and roadway elements through a combination of engineering, education, enforcement, and emergency services solutions.
2. Focus safety funding on high-priority road segments, intersections, and initiatives as identified in the *Upper Peninsula Traffic Safety Plan*.
3. Educate road users on their role and responsibilities in traffic safety, including distracted driving.
4. Promote and educate residents on safe walking and bicycling as a means to improve the health of residents, reduce traffic congestion, and provide viable alternatives to driving.
5. Incorporate elements of complete streets and green streets to holistically manage the transportation system for all users and reduce conflicts between vehicles, transit, rail, and non-motorized modes of travel.
6. Increase connectivity and accessibility for all modes of the transportation system to core services in the Upper Peninsula, including hospitals, educational institutions, job centers, grocery stores, downtowns, and parks as a mechanism of improving safety,
7. Coordinate with stakeholders, including the Governor's Traffic Safety Advisory Commission (GTSAC), local government, road agencies, advocacy groups, and other public and private entities, on safety implementation activities.
8. Support and promote the use of transportation-related technologies and travel demand management techniques that lead to safer, more efficient, and more economical highway systems in the region.
9. Support traffic incident management that is designed to facilitate the safety of motorists and first responders as well as the expeditious restoration of traffic flow stemming from both major and minor traffic incidents back to normal conditions.

Chapter 3. Emphasis Areas

An emphasis area is an area of opportunity to improve safety through a comprehensive four E approach, where appropriate. The emphasis areas are consistent with trends identified by data analysis and the stakeholder working group.

Four E's of Safety:

1. **Education:**
   - Provide drivers with information about making good choices, such as not texting while driving, avoiding alcohol or medications affecting level of consciousness, wearing a seatbelt, or informing people about the rules of the road.
2. **Enforcement:**
   - Deter motorists from risky driving behavior with traffic laws and a visible police presence.
3. **Engineering:**
   - Address roadway infrastructure improvements to prevent crashes or reduce the severity of crashes when they occur.
4. **Emergency services:**
   - Provide rapid response and quality of care when responding to collisions causing injury by stabilizing victims and transporting them to the proper facility.

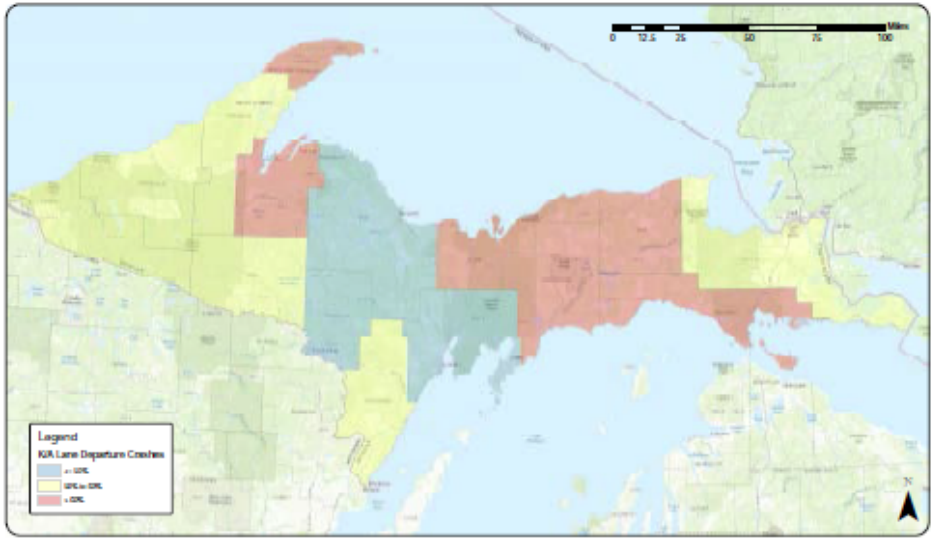
Table 3: Emphasis Areas Crash Percent, 2010-2014

Crashes by Involvement	Percent Crashes		Percent K+A	
	Upper Peninsula	Michigan	Upper Peninsula	Michigan
Lane Departure	24%	19%	29%	40%
Alcohol	4%	3%	12%	19%
Drugs	1%	1%	4%	6%
Intersection	22%	29%	12%	32%
Drivers age 24 and Younger	27%	33%	17%	34%
Pedestrian	0%	1%	3%	10%
Bicycle	1%	1%	1%	3%
Commercial Truck/ Bus	3%	4%	3%	6%
Motorcycle	1%	1%	8%	12%
Senior Driver (65 and older)	18%	14%	11%	16%

Table 4: Percentage Distribution of Lane Departure Crashes by County, 2010-2014

Location	Crashes	Fatalities	A-injuries	K&A
Alger	34%	100%	63%	69%
Baraga	24%	100%	54%	61%
Chippewa	27%	67%	58%	59%
Delta	16%	40%	50%	49%
Dickinson	14%	75%	41%	45%
Gogebic	32%	50%	58%	57%
Houghton	25%	82%	47%	51%
Iron	23%	60%	54%	55%
Keweenaw	40%	100%	57%	64%
Luce	26%	71%	71%	71%
Mackinac	30%	70%	60%	61%
Marquette	24%	33%	41%	40%
Menominee	18%	58%	53%	54%
Ontonagon	20%	50%	52%	52%
Schoolcraft	23%	100%	63%	68%
Upper Peninsula	**23%**	**62%**	**53%**	**54%**
Michigan	**19%**	**47%**	**38%**	**40%**

Upper Peninsula - Lane Departure Crash Percentage (K/A) per County



Report summary

- Road run offs are a major accident type
  - Both in total number of accidents and in number of fatalities (K)
- There are things that can be done to help reduce these accidents
  - Shoulder & centerline rumble strips
  - Improved clear zones
  - paved shoulder widening
  - High friction surface treatments
  - **Improved signing**


PROJECT AREA
DICKINSON
MENOMINEE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SEGMENT CRASH REDUCTION FACTORS		
Proposed Improvement	**% Reduction**	**Associated Crash Types**
Geometric Safety Enhancements		
Center Left-Turn Lane - *Construct*	80%	Rear-End Left-Turn
	50%	Head-On Left-Turn
	20%	Head-On, Sideswipe Opposite, Other*
	15%	Non Left-Turn Rear-End, Other Applicable Crashes*
Horizontal Curve Flattening	30%	Lane Departure***
Curve Superelevation Modification	20%	Lane Departure***
Widen Pavement (Lane Plus Paved Shoulder)	5% per foot**	Lane Departure***
Vertical Curve Flattening	20%	All Applicable Crash Types
General Segment Enhancements		
Access Management - *Improve*	15%	Driveway Related Crashes
Lighting - *Install on segment*	20%	Dark Unlighted Crashes
High Friction Surface Treatment - *Install*	35%	Wet Crashes
	20%	All Applicable Crash Types
Pedestrian Refuge Island- *Install*	50%	Pedestrian Crashes
Recessed Durable Pavement Markings	5%	All Applicable Crash Types
Road Diet (4-3 Lane Conversion) - *Install*	50%	Suburban - All Crash Types
	30%	Urban - All Crash Types
Centerline Rumble Strips - *Install*	44%	K and A injury Applicable Crashes
	46%	Single Vehicle Run off Road Left Crashes
	43%	Sideswipe Same Crashes
	55%	Sideswipe Opposite Crashes
Shoulder Rumble Strips/Stripes - *Install*	20%	Run-Off the Road Right Crashes
Signing/Delineation on Horizontal Curves (Including Recessed Durable Pavement	20%	Lane Departure***
Roadside Enhancements		
Fixed Objects From Clear zone (Trees, Culverts, Headwalls, Etc.) - *Removal*	75%	Fixed-Object
Slope Flattening	15%	Fixed-Object, Overturn
Guardrail - *Install*	55%	Lane Departure*** Related Fatalities and A Injuries
Sidewalk for Pedestrians - *Install*	85%	Pedestrian Crashes
Bicycle Lanes	50%	Bicycle Related Crashes
Shared Use Path - *Install*	33%	Bicycle and Pedestrian Related Crashes

COMPUTED BENEFITS DERIVED THROUGH CRASH REDUCTION

TOR FY 2018 (Local Agency) Date: **1-Sep-16**

Proj: **CR 426 Sigenge** City/Twp.: **West Branch**

Prepared by: **Lance Melburg** County: **Dickinson**

PR Number: **0** PR MP: **7.5**

The method of evaluating crash costs, used below, is given on page 67 of Roy Jorgensen's report of Highway Safety Improvement Criteria 1966 edition. This same method is given in the Bureau of Public Roads IM21-3-67. In 1994 we have adapted the Q formula to blend Fatalities and A-injuries only. In the following analysis the costs provided by the National Safety Council (NSC) are:

2014 NSC VALUES:

Death	$1,512,000	=FATCOST
Disabling (A) injury:	$88,500	=ACOST
B-Injury	$25,600	=BCOST
PDO and/or Minor Injury Crash:	$11,300	=PDOCCST

BTOTAL = ADTa/ADTbx(QxR1+(BCOSTxR2)+(PDOCCSTxR3))

WHERE:

BTOTAL=	Total Benefit in Dollars Over Years Used	70060
ADTa =	Average traffic volume after the improvement	274.0
ADTb =	Average traffic volume before the improvement	274.0
R1 =	Reduction in fatalities and A-Injuries Combined.	0.2
R2 =	Reduction in B-injury crashes:	0.0
R3 =	Reduction in PDO and C-injury crashes	0.4
Q =	[FATCOST+((I/F)xACOST)]/[1+(I/F)]	
=	[1,210,000+(4.85 x 62,500)] / [1+4.85]	331,700.0
	for AREA TYPE ERR	
I/F =		4.85

Q-Reference	Q	A-Injuries	Fatalities	I/F
RURAL	331700	6034	1243	4.85
URBAN	270000	9226	1348	6.84
BETWEEN	295100	15260	2591	5.89

Data from Safety Programs Unit, E. Line 5-Year Statewide, Non-Trunkline crash figures. (From 1-1-11 through 12-31-15) used.

Time of Return (T.O.R.) is based on .... 5.0 years of data.

NOINFB =No-Inflation Annual Benefit=BTOTAL/years 14012

With an inflation rate of 2.50%

B=Annual Benefit=Present Value (with Inflation) $17,987

C = Project Cost $17,000

TOR=C/B=COST/ANNUAL BENEFIT= 0.9478

Engineer's Opinion of Costs

Project Number: HRRR Project
Estimate Number: 1: Contactor work Estimate
Project Type: Miscellaneous
Location: CR 426
Description: curve signing from Fillis Rd to Marquette County Line

Project Engineer: Lance Malburg
Date Created: 5/24/2017
Date Edited: 6/12/2017
Fed/State #:
Fed Item:
Control Section:

Line	Pay Item	Description	Quantity	Units	Unit Price	Total
Category: 0000						
0001	1500001	Mobilization, Max 10%	1.000	LSUM	$3,600.00	$3,600.00
0002	8100371	Post, Steel, 3 lb	1,904.000	Ft	$6.75	$12,852.00
0003	8100403	Sign, Type III, Rem	9.000	Ea	$18.00	$162.00
0004	8100405	Sign, Type IIIB	577.000	Sft	$17.42	$10,051.34
0005	8100616	Reflective Panel for Permanent Sign Support, 6 foot	136.000	Ea	$35.00	$4,760.00
0006	8120030	Channelizing Device, 42 inch, Furn	10.000	Ea	$11.00	$110.00
0007	8120031	Channelizing Device, 42 inch, Oper	10.000	Ea	$1.00	$10.00
0008	8120170	Minor Traf Devices	1.000	LSUM	$2,000.00	$2,000.00
0009	8120350	Sign, Type B, Temp, Prismatic, Furn	120.000	Sft	$4.00	$480.00
0010	8120351	Sign, Type B, Temp, Prismatic, Oper	120.000	Sft	$45.00	$5,400.00
					Category 0000 Total:	**$39,425.34**
					Estimate Total:	**$39,425.34**

CR 426 Signing
COMPLETE PROJECT COSTS

Date: 6-8-2017

CR 426 East of ralph
1500 Ft

Equipment	NUMBER	HOURS EACH	RATE	Estimated COST
SIGN TRUCK	1	80	$9.14	$731.20
			EQUIP SUBTOTAL	$731.20

LABOR & FRINGES	HOURS	RATE	COST
EQUIPMENT OPERATORS	160	$19.98	$3,196.80
FOREMAN	5	$23.80	$119.00
		LABOR	$3,315.80
		FRINGES (103.06%)	$3,417.26
		L & F SUBTOTAL	$6,733.06

MATERIALS	QUANTITY	UNIT	UNIT RATE	COST
Chevron (18x24)	44	Each	$ 18.00	$ 792.00
Arrow Board (24x48)	32	Each	$ 45.00	$ 1,440.00
Curve sign (30x30)	26	Each	$ 37.00	$ 962.00
Speed advisory (18x18)	6	Each	$ 11.90	$ 71.40
Several curves sign (30x30)	2	Each	$ 37.00	$ 74.00
Post Reflector (2x72")	136	Each	$ 15.00	$ 2,040.00
Sign posts	136	Each	$ 42.00	$ 5,712.00
			MATERIALS SUBTOTAL	$11,091.40

CONSTRUCTION TOTAL $18,555.66

Contractor $ 39,425.00

DCRC is -$20,869.34 than contractor
saving 53%

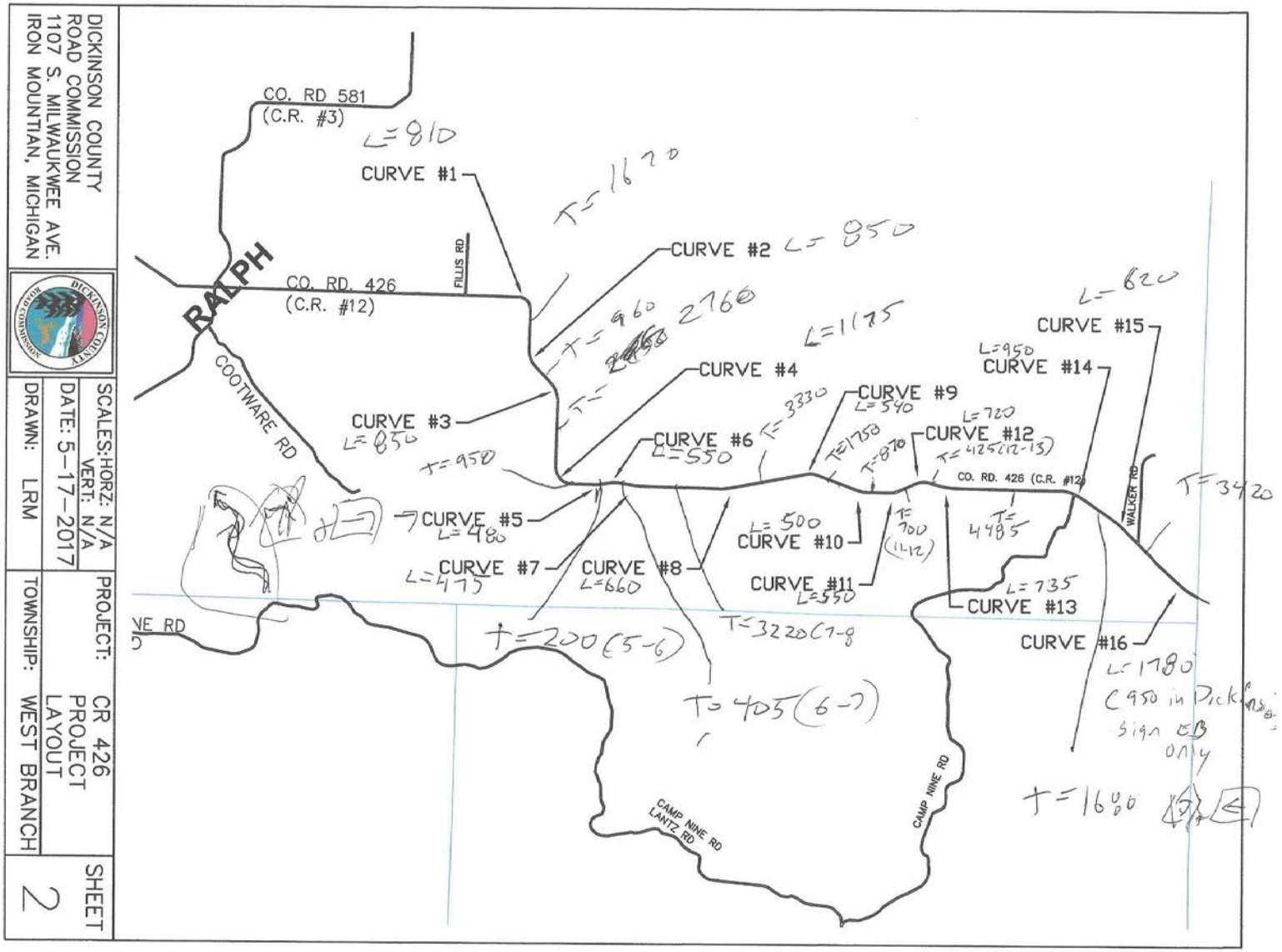
Project Design

- Not very difficult to design

Curve speeds

EB		WB	
1 - 40		1 - 40 - chev.	
2 - 55 ok		2 - 55	
3 - 55		3 - 55	
4 - 45		4 - 45 - chev.	
5 - 55		5 - 55	
6 - 55		6 - 55	
7 - 55		7 - 55	

EB	WB
8 - 55	8 - 55
9 - 50	9 - 50
10 - 55	10 - 55
11 - 55	11 - 55
12 - 50	12 - 50
13 - 55	13 - 55
14 - Bridge - 45 chev.	14 - 45
15 - 55	15 - 55
16 - 55	16 - 55

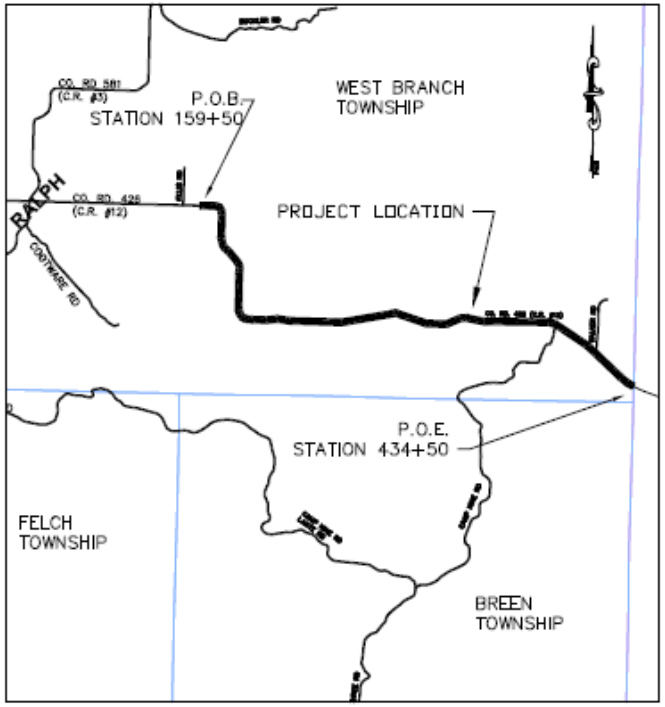

DICKINSON COUNTY
ROAD COMMISSION
1107 S. MILWAUKWEE AVE.
IRON MOUNTIAN, MICHIGAN
SCALES: HORZ: N/A
VERT: N/A
DATE: 5-17-2017
DRAWN: LRM
PROJECT: CR 426 PROJECT LAYOUT
TOWNSHIP: WEST BRANCH
SHEET 2
CO. RD 581
(C.R. #3)
CO. RD. 426
(C.R. #12)
RALPH
FLUS RD
COOTWARE RD
CAMP NINE RD
LANTZ RD
CAMP NINE RD
WALKER RD
CO. RD. 426 (C.R. #12)
CURVE #1
CURVE #2
CURVE #3
CURVE #4
CURVE #5
CURVE #6
CURVE #7
CURVE #8
CURVE #9
CURVE #10
CURVE #11
CURVE #12
CURVE #13
CURVE #14
CURVE #15
CURVE #16
L=810
T=1670
L=850
T=960
2760
L=1175
L=820
L=950
T=3330
L=540
L=720
T=1750
T=870
T=4125(12-13)
T=3420
T=950
L=480
L=475
L=660
L=500
T=700 (11-12)
T=4485
L=550
L=735
T=3220(7-8
T=200(5-6)
T=405(6-7)
L=1780
C950 in Dickinson
sign EB
only
T=1600

THE DICKINSON COUNTY ROAD COMMISSION
WITH THE MICHIGAN DEPARTMENT OF TRANSPORTATION
AND THE FEDERAL HIGHWAY ADMINISTRATION
PRESENT

COUNTY ROAD 426 CURVE SIGNING

JOB NUMBER: 200257A
CONTROL SECTION: HRRR 22000

FEDERAL ITEM:
FEDERAL PROJECT:



ADT= 274 (2017)
FUTURE ADT=300 (2037)
DESIGN SPEED=55 MPH
POSTED SPEED=55 MPH

INDEX OF SHEETS

NOT TO SCALE

CALL MISS DIG
3 DAYS BEFORE YOU DIG
1–800–482–7171

The improvements covered by these plans shall be done in accordance with the Michigan Department of Transportation 2012 Standard Specifications for Construction as ammended by the supplemental specifications and special provisions.

JUNE 2017

APPROXIMATELY 7.5 MILES OF CURVE SIGNING

APPROVED BY THE DICKINSON COUNTY ROAD COMMISSION

JAMES CAREY Chairman

PREPARED BY THE DICKINSON COUNTY ROAD COMMISSION

Lance Malburg No. 45260

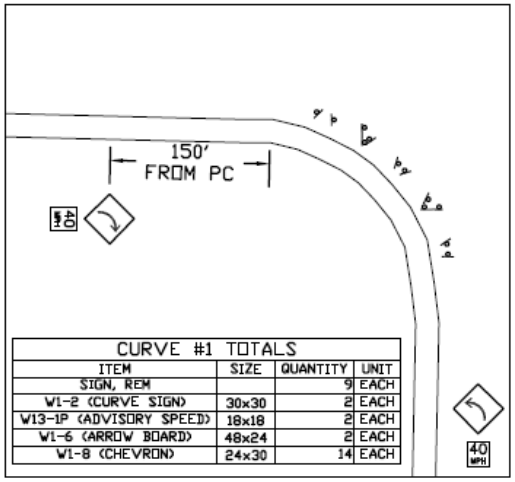
DICKINSON COUNTY
ROAD COMMISSION
1107 S. MILWAUKWEE AVE.
IRON MOUNTIAN, MICHIGAN

SCALES: HORZ: N/A
VERT: N/A
DATE: 6-8-2017
DRAWN: LRM

PROJECT: CR 426 PROJECT LAYOUT
TOWNSHIP: WEST BRANCH

SHEET 2

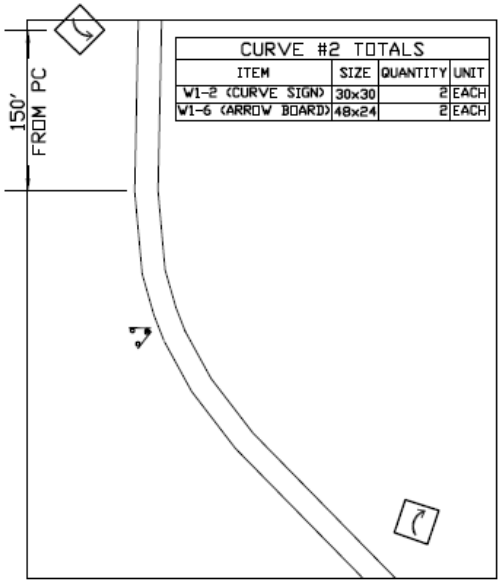
NOTES:
1. INSTALL ARROW BOARDS IN-LINE WITH ONCOMING TRAFFIC IN THE TANGENT.
2. SET CHEVRONS WHEN NEEDED, AT 120FT SPACING. START SPACING AT ARROW BOARD. SET AT LEAST 1 CHEVRON TOWARD THE PC.
3. ALL POSTS SHALL HAVE "LOLLI-POP" POST REFLECTORS.



CURVE #1 TOTALS			
ITEM	SIZE	QUANTITY	UNIT
SIGN, REM		9	EACH
W1-2 (CURVE SIGN)	30x30	2	EACH
W13-1P (ADVISORY SPEED)	18x18	2	EACH
W1-6 (ARROW BOARD)	48x24	2	EACH
W1-8 (CHEVRON)	24x30	14	EACH

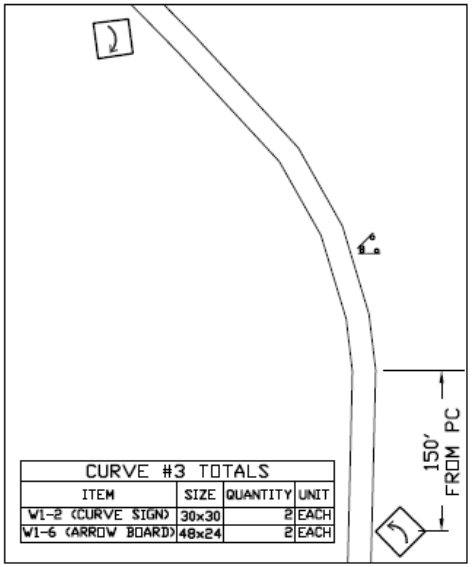
KEY

CURVE #1



CURVE #2 TOTALS			
ITEM	SIZE	QUANTITY	UNIT
W1-2 (CURVE SIGN)	30x30	2	EACH
W1-6 (ARROW BOARD)	48x24	2	EACH

CURVE #2



CURVE #3 TOTALS			
ITEM	SIZE	QUANTITY	UNIT
W1-2 (CURVE SIGN)	30x30	2	EACH
W1-6 (ARROW BOARD)	48x24	2	EACH

CURVE #3

DICKINSON COUNTY ROAD COMMISSION 1107 S. MILWAUKWEE AVE. IRON MOUNTIAN, MICHIGAN		SCALES: HORZ: N/A VERT: N/A DATE: 6-8-2017 DRAWN: LRM	PROJECT: CR 426 SIGN LAYOUT CURVES 1 - 3 TOWNSHIP: WEST BRANCH	SHEET 5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Google earth


40
M.P.H.

Total project cost

- Contractor estimate using published AUPs put project cost at $39,425.34
- Project was awarded at $18,555.66 for force account work.
  - Savings of $20,870 (53% savings)
- Actual cost of the construction (Force account) was $15,572.74
- Annual benefit from the T.O.R worksheet =$17,937
- Project paid for itself in less than a year.

Takeaways

- Curve signing is a good cheap project which has quickly pays for itself in benefit.
- Even lower volume roads show great benefits.
- Fairly easy design
- Your own crew can do the work

Questions?

Lance Malburg, P.E.
Engineer
Dickinson County Road Commission
P.O. Box 519
1107 S. Milwaukee Ave
Iron Mountain, MI 49801

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Fax : (906)774-7227