APPENDICES

Appendix A—TMP Strategy Cross-reference Matrix.

Appendix A—Strategy Cross-reference Matrix

	Strategy	Cost	Cross Reference Type										Potential Benefit				Notes
			High Traffic Volume	Low Traffic Volume	Interstates /Freeways	Multi-lane Divided Facilities	Two-lane, two-way	Urban Areas	Rural Areas	Planning and Design Stage	Contract Stage	In-Construction	M*	S*	CS*	PE*	
Work Zone Safety Management Strategies	Work Zone Posted Speed Limit Reduction	$	X		X	X	X	X		X		X		√			Relationship between speed limits and safety is not well defined. Effect on safety will typically be measurable through safety surrogates.
	Portable Variable Speed Limit System	$$	X		X	X		X		X	X		√	√			Hypothesized to have potential effects on crash reductions, and possibly throughput.
	Temporary Rumble Strips	$	X	X	X	X	X	X	X	X	X	X		√			Encourage safer driving behavior
	Sequential Flashing Warning Lights	$	X		X	X		X		X	X	X		√			Effect on safety will typically be measurable through safety surrogates.
	Automated Flagger Assistance Devices	$$		X			X		X	X	X	X		√		√	Productivity and efficiency effects would occur if the number of flaggers used can be reduced.
	Work Zone Intrusion Alarms	$	X	X	X	X	X	X	X	X	X	X		√			False alarms have limited the effectiveness of this strategy in past assessments. Potential exists to possibly improve worker safety.
	Movable Traffic Barrier Systems	$$$$	X		X	X		X	X		X	X	√	√		√	Effects would be computed relative to a barrier use to no barrier.
Corridor/Network Management Strategies	Lane Merge Systems	$$	X		X	X		X	X	X	X	X	√	√			Mobility and safety effects dependent upon operating condition at lane closure prior to change (extent to which queue jumping occurs).
	Reversible Lanes	$$$	X		X	X		X		X	X		√√				Mobility effects depend on whether positive effects from improving peak direction capacity are offset or exceeded by negative effects of capacity loss in off-peak direction.

	Strategy	Cost	Cross Reference Type									Potential Benefit				Notes
			High Traffic Volume	Low Traffic Volume	Interstates /Freeways	Multi-lane Divided Facilities	Two-lane, two-way	Urban Areas	Rural Areas	Planning and Design Stage	Contract Stage	In-Construction	M*	S*	CS*	PE*	
	Ramp Metering	$$	X		X			X		X	X	X	√√			√	Effects on customer satisfaction could be positive (for main lane drivers) or negative (for entering drivers). Reduction in vehicle demand could yield reduction in crashes, but could also increase those on other routes if diversion occurs.
	Truck Restrictions	$	X		X	X		X	X	X	X	X	√	√			Customer satisfaction effects may be positive or negative depending on user group considered (passenger vehicle drivers versus truck drivers).
Traffic Incident Management and Enforcement Strategies	Queue Warning System (QWS)	$$$	X		X	X		X		X	X	X	√	√√	√		Mobility maintained as safety is improved.
	Work Zone Incident Management Plan	$$	X	X	X	X	X	X	X	X	X		√	√√	√	√	Effects dependent on how much strategy improves response time.
	Temporary Incident Detection and Surveillance System	$$	X		X	X		X	X			X	√	√√	√		Effects dependent on how much strategy improves response time and reduction in secondary crashes.
	Tow/Freeway Service Patrols	$$	X		X	X		X				X	√	√√	√		Possible reduction in secondary crashes
	Traffic Screens (aka Glare Screens aka Gawk Screens)	$	X		X	X		X				X	√	√			Potential to reduce driver distraction.
	Automated Speed Enforcement	$$	X		X	X		X		X				√√			Limited applicability to due legislative changes required.
	Police Enforcement	$$	X		X	X		X		X	X	X		√√			Effects on mobility, customer satisfaction, productivity and efficiency may be positive if presence leads to more consistent speeds and improved driving behavior around work zone, or negative if enforcement efforts are too aggressive.

	Strategy	Cost	Cross Reference Type									Potential Benefit				Notes
			High Traffic Volume	Low Traffic Volume	Interstates /Freeways	Multi-lane Divided Facilities	Two-lane, two-way	Urban Areas	Rural Areas	Planning and Design Stage	Contract Stage	In-Construction	M*	S*	CS*	PE*	
Demand Management Strategies	Strategies to Shift Mode of Travel	$$$$	X		X	X		X		X	X		√	√	√	√	Mobility effects dependent on ability to shift mode choice. Reduction in vehicle demand could yield reduction in crashes. Productivity and efficiency effects would exist if mobility improvements assist materials and equipment delivery.
	Strategies to Shift Time of Travel	$	X		X	X		X		X	X		√√	√	√	√	Mobility effects dependent on ability to shift departure times. Productivity and efficiency effects would exist if mobility improvements assist materials and equipment delivery.
Control Strategies	Full Road Closure	$$		X		X	X	X	X	X						√√	Impacts of full closures on mobility and safety measures throughout corridor may be positive or negative, and would need to be measured against other traffic-handling options available. Strategy would be expected to improve worker safety.
	Night Work	$$	X	X	X	X	X	X	X	X			√√		√	√	Working at night can have negative worker and productivity/efficiency effects if not performed correctly.
	Two-way traffic on one side of divided facility (crossover)	$$	X	X	X	X	X	X	X	X	X			√		√	Effects evaluated relative to part-width construction on each side of facility.
Project Coordination	Project Coordination	$	X	X	X	X	X	X	X	X	X	X	√√	√	√√		Effects depend on how coordination affects duration of conditions impacting mobility and safety.
Innovative Contracting and Construction Strategies	Design-Build Contracting Method	$$$	X	X	X	X		X	X		X					√√	Effects on safety, mobility, and customer satisfaction depend on quality of other TMP strategies implemented.
	Construction Manager / General Contractor (CMGC)	$$	X		X	X		X			X					√	Allow for fast tracking of design and construction activities.
	Cost-Plus-Time (A+B) Selection Method	$$	X		X	X		X			X		√√	√√	√	√√	Allows for innovation, shorter delivery time.
	Incentive / Disincentive Clauses	$$	X		X	X		X			X		√√	√√	√	√√	Minimizes impacts, earlier completion date.
	No Excuse Incentive (NEI)	$$	X		X	X		X			X		√√	√√	√	√√	Minimizes impacts, earlier completion date.

	Strategy	Cost	Cross Reference Type									Potential Benefit				Notes
			High Traffic Volume	Low Traffic Volume	Interstates /Freeways	Multi-lane Divided Facilities	Two-lane, two-way	Urban Areas	Rural Areas	Planning and Design Stage	Contract Stage	In-Construction	M*	S*	CS*	PE*	
	Lane Rental	$$	X		X	X		X			X		√√	√√	√		Effects on productivity and efficiency may be negative if contractor is not able to efficiently fit tasks within allowable work windows.
	Value Engineering		X	X	X	X	X	X	X		X					√	Improve value of project.
Innovative Construction Strategies	Accelerated Construction	$$$$	X		X	X		X			X		√	√	√	√√	Reduce project construction time, cost, and RUC.
Traffic Control Devices	Smart Arrow Boards	$$	X	X	X	X	X	X	X	X	X	X	√	√	√	√√	Potential to provide real time information to public and DOT.
	Lighting Devices	$$	X		X	X	X	X	X	X	X	X	√	√			Effect on safety will typically be measurable through safety surrogates.
Motorist Information Strategies	Speed Feedback Signs	$$	X	X	X	X	X	X	X	X	X	X	√√	√	√√	√	Ability to estimate what would happen if signs are not used. Productivity and efficiency effects would exist if mobility improvements assist materials and equipment delivery.
	Construction Truck Entering and Exit System	$$	X		X	X		X		X	X	X		√			Effect on safety will typically be measurable through safety surrogates.
	Real-time Travel System	$$$	X		X	X		X	X	X	X	X	√√		√	√	Effect on safety and mobility will typically be measurable through related surrogates.
Public Awareness Strategies	Program-level Public Information and Outreach Campaigns	$$	X	X	X	X	X	X	X	X		X	√	√	√		Effect on safety will typically be measurable through surrogates.
	Project-Level Public Information Strategies	$$	X	X	X	X	X	X	X	X		X	√	√	√√		Effect on safety will typically be measurable through surrogates.

* M: Mobility; S: Safety; CS: Customer Satisfaction; PE: Agency/Contractor Productivity and Efficiency Cost: Low ($) to High ($$$$)

Appendix B—UDOT Portable Variable Speed Limit (PVSL) Standard Drawing.

TAPER, BUFFER ZONE & SIGN SPACING CHART

ROAD TYPE	POSTED SPEED MPH (S)	MINIMUM TAPER LENGTH(L)	LENGTH OF BUFFER(BZ)	MINIMUM SIGN SPACING (SS)				ONE LANE TWO-WAY FLAGGING
		12 FT LANE CLOSURE	DESIREABLE	A	B	C	D	TAPER LENGTH
		FT	FT	FT	FT	FT	FT	FT
CONVENTIONAL	30 AND LOWER	180	200	100	100	100	100	50
	35	245	250	350	350	350	175	
	40	320	305					
	45	540	360	500	500	500	250	100
	50	600	425					
	55	660	495					
	60	720	570					
	65	780	645					
FREEWAY/ EXPRESSWAY	65	780	645	1000	1640	2640	500	
	70	840	730					
	75	900	820					
	80	960	910					

1- TAPER LENGTH FORMULAS

SPEED	FORMULA
FOR SPEEDS OF 40 MPH AND LESS	$L=\frac{WS^2}{60}$
FOR SPEEDS OF 45 MPH AND GREATER	L= WS

WHERE:

L = TAPER LENGTH IN FEET
W = WIDTH OF OFFSET IN FEET
S = SPEED IN MPH

⅓ L = FOR SHOULDER CLOSURE TAPER
½ L = FOR LANE SHIFT TAPER

2- CHANNELIZING DEVICES

A) MERGING AND SHIFTING TAPERS: USE A MINIMUM OF 1 DEVICE PER FT OF LANE CLOSURE WIDTH, PLUS 1 ADDITIONAL DEVICE TO START.

B) SHOULDER, ONE-LANE TWO-WAY, AND DOWNSTREAM TAPERS: USE A MINIMUM OF 1 DEVICE PER 3 FT OF WIDTH (OR PORTION THEREOF), PLUS 1 ADDITONAL DEVICE TO START.

C) ON TANGENT: S x 2 = SPACING UP TO 120 FT MAXIMUM.

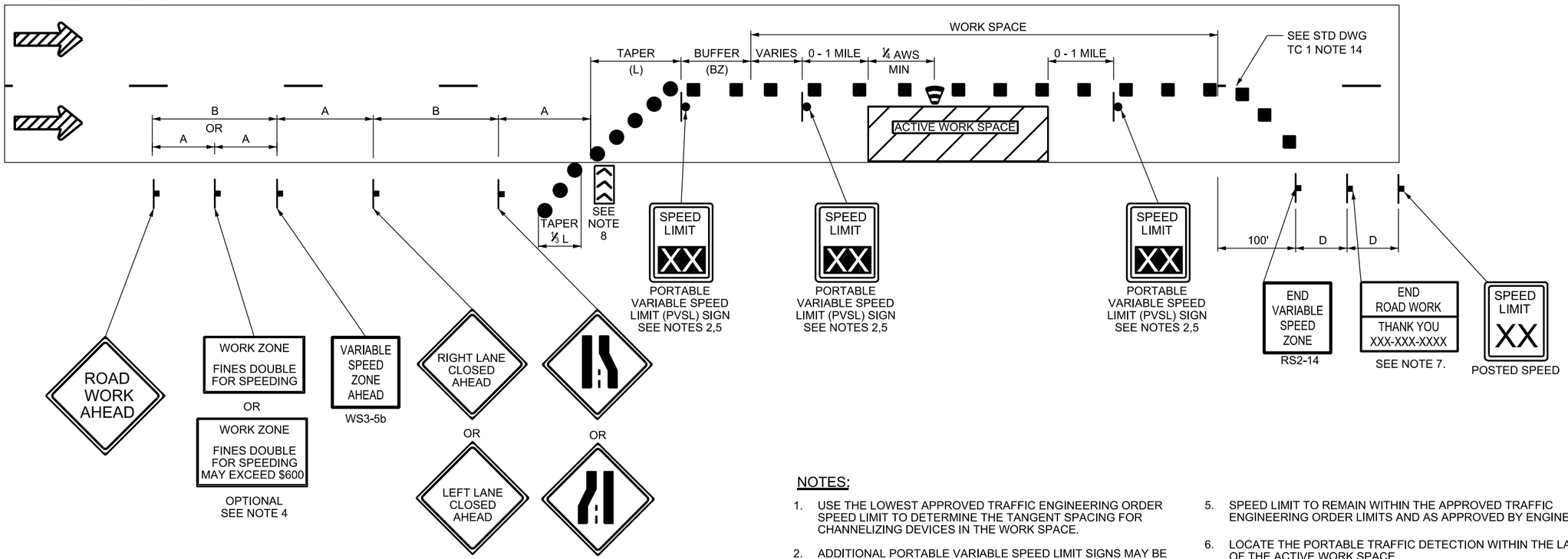
D) LENGTH OF BUFFER ZONE (BZ) IS THE DISTANCE FROM END OF LANE CLOSURE TAPER TO WORK SPACE, OR ANY OBSTRUCTION PRIOR TO WORK SPACE.

TRAFFIC CONTROL DEVICE LEGEND

- PORTABLE VARIABLE SPEED LIMIT SIGN WITH DETECTOR
- SIGN
- CHANNELIZING DEVICE (SEE STD DWG TC 2A)
- DRUMS OR DIRECTIONAL INDICATOR BARRICADE
- ARROW BOARD
- DIRECTION OF TRAFFIC
- PORTABLE TRAFFIC DETECTION SEE NOTE 6

SEE STD DWG TC 4C FOR PROJECT LIMIT SIGNING

EXAMPLE ONLY - NOT TO SCALE
SETUP TO BE SITE SPECIFIC



PORTABLE VARIABLE SPEED LIMIT (PVSL) WORK ZONE SIGNING

NOTES:

1. USE THE LOWEST APPROVED TRAFFIC ENGINEERING ORDER SPEED LIMIT TO DETERMINE THE TANGENT SPACING FOR CHANNELIZING DEVICES IN THE WORK SPACE.
2. ADDITIONAL PORTABLE VARIABLE SPEED LIMIT SIGNS MAY BE USED IN THE WORK ZONE FOR SUPPLEMENTAL NOTIFICATION OF THE WORK ZONE SPEED LIMITS.
3. SEE TC 4D SERIES STD DWGS FOR SIGN DESIGN AND LAYOUT.
4. FINES DOUBLE (RS2-6c) AND FINES DOUBLE WITH FINE NOTIFICATION (RS2-6d) SIGNS MAY BE USED INTERCHANGEABLY.
5. SPEED LIMIT TO REMAIN WITHIN THE APPROVED TRAFFIC ENGINEERING ORDER LIMITS AND AS APPROVED BY ENGINEER.
6. LOCATE THE PORTABLE TRAFFIC DETECTION WITHIN THE LAST ¾ OF THE ACTIVE WORK SPACE.
7. SEE TC 4D SERIES STD DWGS FOR SIGN DESIGN AND LAYOUT.
8. USE SHOULDER TAPER WHEN ARROW BOARD IS PLACED ON SHOULDER.

REVISIONS: NO. | DATE | APPROVED BY | REMARKS

UTAH DEPARTMENT OF TRANSPORTATION
REGION DESIGN
APPROVED
PROFESSIONAL ENGINEER
DRAWN BY ST
QC CHECKED BY BST
MM/DD/YY DATE

PORTABLE VARIABLE SPEED LIMIT WORK ZONE SIGNING GENERAL

SHEET NO. TC 4B5

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Appendix C1— MDOT Special provision for temporary rumble strips, March 2018.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
TEMPORARY PORTABLE RUMBLE STRIPS

OPR:RAL 1 of 2 APPR:MB:CRB:03-13-18

a. Description. This work consists of providing all materials, labor, and equipment required to furnish, install, maintain, relocate, and remove temporary portable rumble strips. Use these rumble strips on non-freeway projects only. These rumble strips should be used on all projects with traffic regulators and or temporary portable signal installations used to regulate traffic.

b. Materials. Provide temporary portable rumble strips in accordance with the following:

1. Construct the rumble strip from engineered polymers designed to maintain integrity for at least the 0 degree to 180 degree Fahrenheit (F) temperature range. Polymers are not to degrade due to weather or traffic conditions for the duration of use. The unit is to be black in color. The bottom side of the rumble strip must include a design feature that allows liquid drainage underneath without causing displacement of the unit. The leading and tail edges of the rumble strip are to be beveled, with a maximum thickness of 13/16 of an inch, designed to allow the safe passage of motorcycles over the unit. The rumble strip must provide an auditory and tactile response to vehicle crossing events, while minimizing any displacement. The rumble strip is not to require adhesives, nails, or any other “affixing” materials for installation.

2. The rumble strip must maintain acceptable performance when subjected to a variety of traffic conditions including roadways with normally posted speed limits up to 65 miles per hour (mph), and commercial heavy trucks.

3. Use the RoadQuake 2F, manufactured by Plastic Safety Systems Inc., 2444 Baldwin Rd, Cleveland, Ohio, 44104, (800)-662-6338.

c. Construction. Install the rumble strips in accordance with the manufacturer’s recommendations, and the following:

1. Ensure the pavement surface is clear of all foreign material such as gravel, sand, or other debris. Place each rumble strip on a uniform paved surface free of defects including: potholes, excessive rutting, separated transverse joints, and utility structures. Do not install rumble strips on horizontal curves.

2. Install each rumble strip perpendicular to the travel direction and ensure the strip is in complete contact with the road surface. Center the strip in the lane to maximize contact with traffic and minimize opportunities for motorists to maneuver around the rumble strips.

3. A rumble strip array consists of three rumble strips installed with spacing as described in Table 1, plus or minus 6-inch tolerance for adjusting due to inadequacies with the roadway. Place two rumble strip arrays on the mainline in each direction of approach to the work zone.

Table 1: Rumble Strip Spacing

Normally Posted Speed Limit	On Center Spacing
40 mph or Less	10 feet
45 to 55 mph	15 feet
60 to 65 mph	20 feet

4. Locate the arrays based on the following recommendations, unless field conditions prohibit, then locate as directed by the Engineer:

A. The first rumble strip array is recommended to be placed approximately 200 feet in advance of the Road Work Ahead (W20-1) sign.

B. The second rumble strip array is recommended to be placed approximately 200 feet in advance of the Traffic Regulator (W20-7a) sign.

5. Once properly installed, maintain the rumble strips as necessary throughout deployment. Re-adjustment is required if a rumble strip displaces such that: it is no longer perpendicular to the direction of travel, it is skewed by at least 6 inches, will not remain flat on the paved surface for any reason, or no longer satisfies the above conditions. Rumble strips with faulty connections, worn rubber, exposed metal, or torn material must be replaced as directed by the Engineer.

6. Remove the temporary rumble strips from the roadway simultaneously with the rest of the temporary traffic control devices (TTCD) on the project during all inactive periods or when no longer needed as directed by the Engineer. Rumble strips are to be placed flat on the ground, and not stacked, when stored on the roadside. Once removed, rumble strips may be stored on the jobsite outside of the clear zone.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

Pay Item **Pay Unit**

Rumble Strip, Temp, Portable, Furn ..... Each
Rumble Strip, Temp, Portable, Oper ..... Each

1. **Rumble Strip, Temp, Portable, Furn** will be measured by counting as a total quantity each rumble strip furnished and installed. Replacement of rumble strips damaged by vehicular traffic other than the Contractor's vehicles and equipment will be paid for as **Rumble Strip, Temp, Portable, Furn.**

2. **Rumble Strip, Temp, Portable, Oper** will be counted as a total quantity and includes operating, inspecting, maintaining, cleaning, relocating, and removing each rumble strip.

Appendix C2— MDOT Special provision for temporary rumble strips (orange) in advance of a stop condition, February 2012.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
TEMPORARY RUMBLE STRIPS (ORANGE) IN ADVANCE OF A STOP CONDITION

OPR:CRB 1 of 3 C&T:APPR:JJG:DBP:02-09-12

a. Description. This work consists of furnishing, installing, maintaining and removing temporary rumble strips, used in advance of a temporary stop sign. This work also includes traffic control while installing, maintaining and removing the temporary rumble strips

b. Materials. Provide temporary rumble strips in accordance with the following:

1. Rumble Strip:

Composition:	Polymer with pre-applied adhesive
Color:	Orange
Tensile Strength:	250 psi
Cross-section:	0.25 inch thick by 4 inches wide

2. Primer: Provide primer according to the manufacturer's recommendation.

c. Construction. Do not apply the rumble strips unless the pavement surface temperature is 40 degrees F and rising, and dry. Do not use artificial heat. Clean all foreign and contaminating material from the surface of the pavement prior to application of the rumble strips.

The Engineer will consider the pavement to be dry if the underside of small sheet of black plastic taped to the pavement has no visible condensation on the underside after 15 minutes.

Placement and spacing of the temporary rumble strips will be as shown on the detail included in this special provision.

The completed temporary rumble strip consists of one layer of the 0.25 inch by 4 inch material.

Apply the primer to the surface of the pavement only if recommended by the manufacturer. Place the pre-adhesive surface of the rumble strip on the primer or directly on the pavement surface, as recommended by the manufacturer. Seat the rumble strips with a minimum of three passes of a 200 pound weighted roller.

If the temporary rumble strips lose their adhesion to the pavement during the life of the project, replaced or re-adhere them, as directed by the Engineer.

Upon completion of the project, or as directed by the Engineer, entirely remove the temporary rumble strips using a method that will not permanently damage the pavement surface.

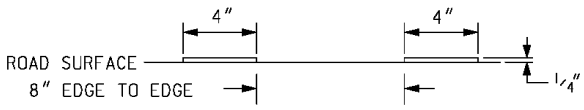
d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

Pay Item **Pay Unit**

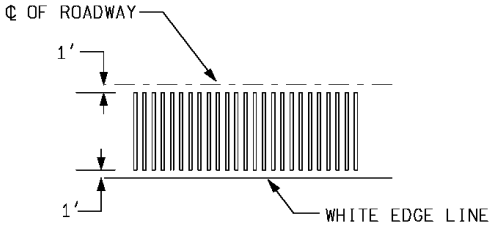
Temp Rumble Strips (Orange), Stop Condition .....Foot

1. **Temp Rumble Strips (Orange), Stop Condition** includes all labor, equipment, and material required to furnish, install, maintain, and remove the rumble strips. **Temp Rumble Strips (Orange) , Stop Condition** includes replacing or re-adhering strips, as directed by the Engineer, and providing traffic control while installing, maintaining, re-adhering and removing the strips.

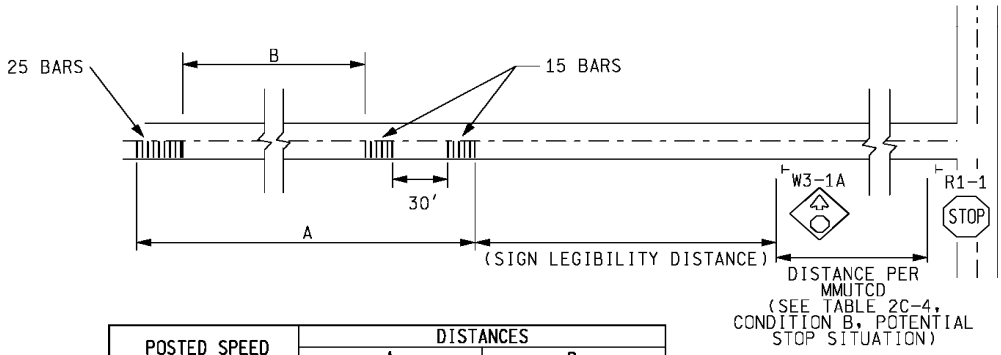
The Engineer will measure the cumulative length of the individual 4 inch strips, perpendicular to the pavement centerline, to determine the quantity for payment.



PROFILE VIEW



PLAN VIEW



POSTED SPEED	DISTANCES	
	A	B
45 MPH	200 FT	115 FT
50 MPH	230 FT	145 FT
55 MPH	245 FT	160 FT

LOCATION

NOTE: DISTANCES GIVEN ARE MINIMUM VALUES

TEMPORARY RUMBLE STRIPS FOR USE IN ADVANCE OF A STOP

Appendix C3—MDOT Special provision for temporary rumble strips (orange) in advance of a work zone, February 2012.

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
TEMPORARY RUMBLE STRIPS (ORANGE) IN ADVANCE OF A WORK ZONE

OPR:CRB 1 of 2 C&T:APPR:JJG:DBP:02-09-12

a. Description. This work consists of furnishing, installing, maintaining and removing temporary rumble strips, used at the approach to the work zone to alert motorists of construction ahead. This work also includes providing traffic control while installing, maintaining and removing the temporary rumble strips.

b. Materials. Provide temporary rumble strips in accordance with the following:

1. Rumble Strip:

Composition:	Polymer with pre-applied adhesive
Color:	Orange
Tensile Strength:	250 psi
Cross-section:	0.25 inch thick by 4 inches wide

2. Primer: Provide primer according to the manufacturer's recommendation.

c. Construction. Do not apply the rumble strips unless the pavement surface temperature is 40 degrees F and rising, and dry. Do not use artificial heat. Clean all foreign and contaminating material from the surface of the pavement prior to application of the rumble strips.

The Engineer will consider the pavement to be dry if the underside of small sheet of black plastic taped to the pavement has no visible condensation on the underside after 15 minutes.

Place 3 sets of 9 rumble strips in advance of the lane closure in each direction of the roadway for a total of 6 sets of 9 rumble strips. Ensure that the rumble strips cover the entire width of the roadway from edge of metal to edge of metal. Each temporary rumble strip consists of one layer of the 0.25 inch by 4 inch material.

Place the temporary rumble strips as follows:

1. Apply one set of 9 rumble strips, each spaced 1.5 feet apart from edge to edge, placed approximately 700 feet upstream of the beginning of the taper.

2. Apply one set of 9 rumble strips, each spaced 5 feet apart from edge to edge, placed approximately 1400 feet upstream of the beginning of the taper.

3. Apply one set of 9 rumble strips, each spaced 10 feet apart from edge to edge, placed approximately 2800 feet upstream of the beginning of the taper.

The completed temporary rumble strip must consist of one layer of the 0.25 inch by 4 inch material.

Apply the primer to the surface of the pavement only if recommended by the manufacturer. Place the pre-adhesive surface of the rumble strip on the primer or directly on the pavement surface, as recommended by the manufacturer. Seat the rumble strips with a minimum of three passes of a 200 pound weighted roller.

If the temporary rumble strips lose their adhesion to the pavement during the life of the project, replace or re-adhere them, as directed by the Engineer.

Upon completion of the project, or as directed by the Engineer, entirely remove the temporary rumble strips using a method that will not permanently damage the pavement surface.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

Pay Item	**Pay Unit**
Temp Rumble Strips (Orange)	Foot

1. **Temp Rumble Strips (Orange)** includes all labor, equipment, and material required to furnish, install, maintain, and remove the rumble strips. **Temp Rumble Strips (Orange)** includes replacing or re-adhering strips, as directed by the Engineer, and providing traffic control while installing, maintaining, re-adhering and removing the strips.

The Engineer will measure the cumulative length of the individual 4 inch strips, perpendicular to the pavement centerline, to determine the quantity for payment.

Appendix C4—UDOT Standard Drawings for use of temporary rumble strips for freeway/divided highway lane and shoulder closures, June 2018.

TABLE I
TAPER, BUFFER ZONE & SIGN SPACING CHART

ROAD TYPE	POSTED SPEED MPH (S)	MINIMUM TAPER LENGTH (L)	LENGTH OF BUFFER (BZ)*	MINIMUM SIGN SPACING (SS)**			
		12 FT LANE CLOSURE		A	B	C	D
		FT	FT	FT	FT	FT	FT
FREEWAY/ EXPRESSWAY	65	780	645	1000	1640	2640	500
	70	840	730				
	75	900	820				
	80	960	910				

* THE LENGTH OF BUFFER (BZ) MAY BE REDUCED WITH THE APPROVAL OF THE ENGINEER
** MAXIMUM SPACING IS THE GIVEN VALUE (SS) MULTIPLIED BY 1.5

1- TAPER LENGTH FORMULAS

SPEED	FORMULA
FOR SPEEDS OF 45 MPH AND GREATER	L= WS

L = TAPER LENGTH IN FEET
W = WIDTH OF OFFSET IN FEET
S = SPEED IN MPH
⅓ L = FOR SHOULDER CLOSURE TAPER
½ L = FOR LANE SHIFT TAPER

CHANNELIZING DEVICES

A) MERGING AND SHIFTING TAPERS: USE A MINIMUM OF ONE DEVICE PER FT OF LANE CLOSURE WIDTH, PLUS ONE ADDITIONAL DEVICE TO START.

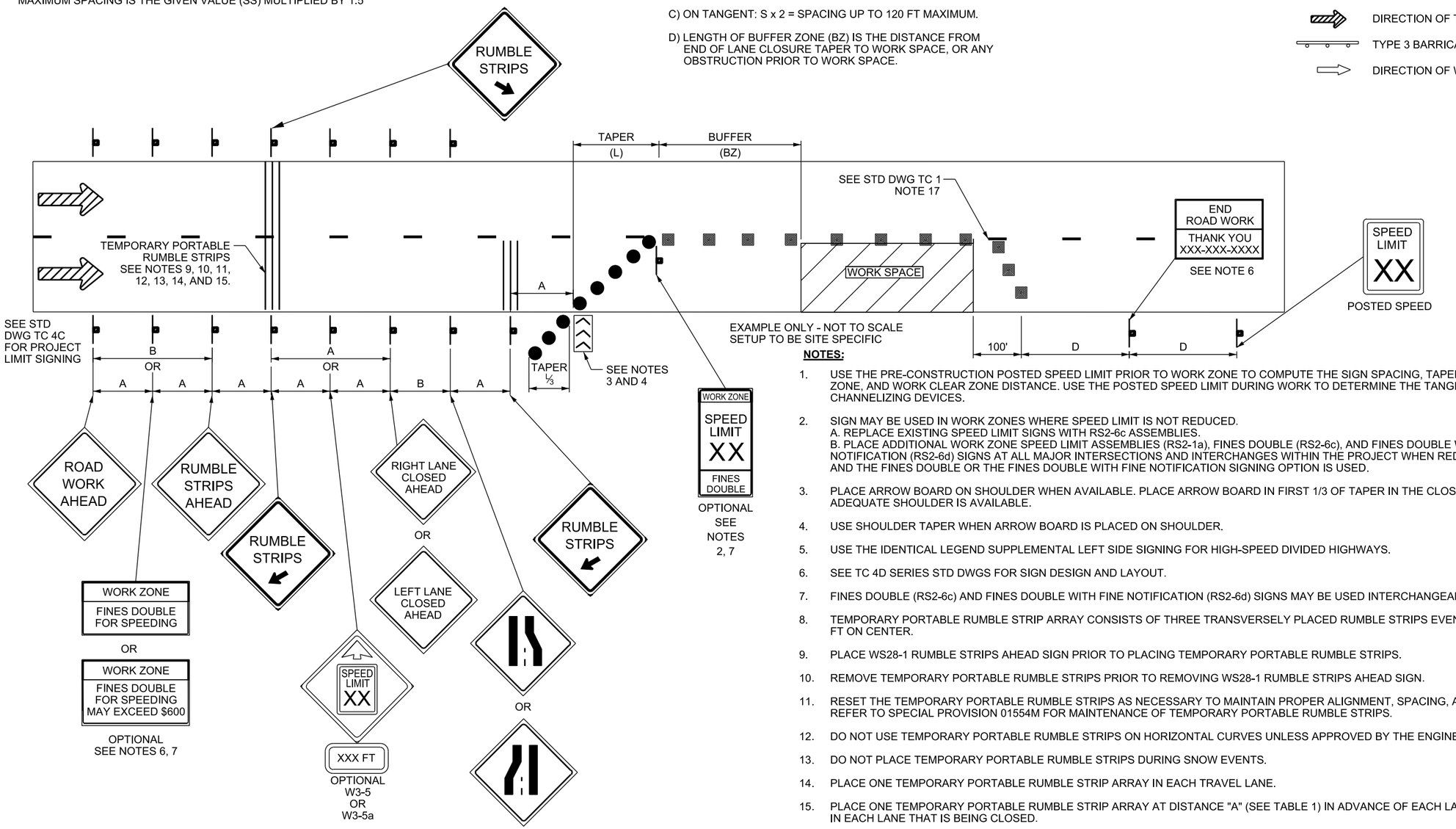
B) SHOULDER, ONE-LANE TWO-WAY, AND DOWNSTREAM TAPERS: USE A MINIMUM OF ONE DEVICE PER 3 FT OF WIDTH (OR PORTION THEREOF), PLUS ONE ADDITIONAL DEVICE TO START.

C) ON TANGENT: S x 2 = SPACING UP TO 120 FT MAXIMUM.

D) LENGTH OF BUFFER ZONE (BZ) IS THE DISTANCE FROM END OF LANE CLOSURE TAPER TO WORK SPACE, OR ANY OBSTRUCTION PRIOR TO WORK SPACE.

TRAFFIC CONTROL DEVICE LEGEND

- SIGN (FIXED OR PORTABLE)
- CHANNELIZING DEVICE (SEE STD DWG TC 2A)
- DRUMS OR DIRECTIONAL INDICATOR BARRICADE
- FLAGGING STATION
- ARROW BOARD
- BARRIER
- DIRECTION OF TRAFFIC
- TYPE 3 BARRICADE
- DIRECTION OF WORK VEHICLE



NOTES:

1. USE THE PRE-CONSTRUCTION POSTED SPEED LIMIT PRIOR TO WORK ZONE TO COMPUTE THE SIGN SPACING, TAPER LENGTH, BUFFER ZONE, AND WORK CLEAR ZONE DISTANCE. USE THE POSTED SPEED LIMIT DURING WORK TO DETERMINE THE TANGENT SPACING FOR CHANNELIZING DEVICES.
2. SIGN MAY BE USED IN WORK ZONES WHERE SPEED LIMIT IS NOT REDUCED.
   A. REPLACE EXISTING SPEED LIMIT SIGNS WITH RS2-6c ASSEMBLIES.
   B. PLACE ADDITIONAL WORK ZONE SPEED LIMIT ASSEMBLIES (RS2-1a), FINES DOUBLE (RS2-6c), AND FINES DOUBLE WITH FINE NOTIFICATION (RS2-6d) SIGNS AT ALL MAJOR INTERSECTIONS AND INTERCHANGES WITHIN THE PROJECT WHEN REDUCED SPEEDS AND THE FINES DOUBLE OR THE FINES DOUBLE WITH FINE NOTIFICATION SIGNING OPTION IS USED.
3. PLACE ARROW BOARD ON SHOULDER WHEN AVAILABLE. PLACE ARROW BOARD IN FIRST 1/3 OF TAPER IN THE CLOSED LANE WHEN NO ADEQUATE SHOULDER IS AVAILABLE.
4. USE SHOULDER TAPER WHEN ARROW BOARD IS PLACED ON SHOULDER.
5. USE THE IDENTICAL LEGEND SUPPLEMENTAL LEFT SIDE SIGNING FOR HIGH-SPEED DIVIDED HIGHWAYS.
6. SEE TC 4D SERIES STD DWGS FOR SIGN DESIGN AND LAYOUT.
7. FINES DOUBLE (RS2-6c) AND FINES DOUBLE WITH FINE NOTIFICATION (RS2-6d) SIGNS MAY BE USED INTERCHANGEABLY.
8. TEMPORARY PORTABLE RUMBLE STRIP ARRAY CONSISTS OF THREE TRANSVERSELY PLACED RUMBLE STRIPS EVENLY SPACED AT 40 FT ON CENTER.
9. PLACE WS28-1 RUMBLE STRIPS AHEAD SIGN PRIOR TO PLACING TEMPORARY PORTABLE RUMBLE STRIPS.
10. REMOVE TEMPORARY PORTABLE RUMBLE STRIPS PRIOR TO REMOVING WS28-1 RUMBLE STRIPS AHEAD SIGN.
11. RESET THE TEMPORARY PORTABLE RUMBLE STRIPS AS NECESSARY TO MAINTAIN PROPER ALIGNMENT, SPACING, AND LOCATION. REFER TO SPECIAL PROVISION 01554M FOR MAINTENANCE OF TEMPORARY PORTABLE RUMBLE STRIPS.
12. DO NOT USE TEMPORARY PORTABLE RUMBLE STRIPS ON HORIZONTAL CURVES UNLESS APPROVED BY THE ENGINEER.
13. DO NOT PLACE TEMPORARY PORTABLE RUMBLE STRIPS DURING SNOW EVENTS.
14. PLACE ONE TEMPORARY PORTABLE RUMBLE STRIP ARRAY IN EACH TRAVEL LANE.
15. PLACE ONE TEMPORARY PORTABLE RUMBLE STRIP ARRAY AT DISTANCE "A" (SEE TABLE 1) IN ADVANCE OF EACH LANE CLOSURE TAPER IN EACH LANE THAT IS BEING CLOSED.
16. RELOCATE THE TEMPORARY PORTABLE RUMBLE STRIPS AND ASSOCIATED SIGNING WHEN VEHICLE QUEUES ARE EXPECTED OR OCCUR IN ADVANCE OF TEMPORARY PORTABLE RUMBLE STRIPS.
17. REDUCED SPEEDS WILL NOT BE ALLOWED WITHOUT THE APPROVAL OF THE ENGINEER. USE THE REDUCED SPEED LIMIT AHEAD SIGN, THE FINES DOUBLE SPEED LIMIT SIGN, AND THE SPEED LIMIT SIGN.
18. USE THE STANDARDS FOUND ON THIS DRAWING ON RURAL TWO LANE FREEWAYS.

NO.	DATE	APPR.	REMARKS
1	6/28/18	RT	REVISIONS REPLACED WS28-2 AND W16-7 ASSEMBLY WITH NEW WS28-2 SIGN.

UTAH DEPARTMENT OF TRANSPORTATION
STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION
SALT LAKE CITY, UTAH

RECOMMENDED FOR APPROVAL — JUNE 28, 2018 DATE — DEPUTY DIRECTOR
CHAIRMAN STANDARDS COMMITTEE APPROVED — JUNE 28, 2018 DATE

TEMPORARY PORTABLE RUMBLE STRIPS FREEWAY
STANDARD DRAWING TITLE

STD. DWG. NO. TC 4B2

DGN File: D:\Standards and Specs Section\2017 Section\All Supp Issues\Issue # 5 06-28-2018\Drawings\TC04B2.dgn
09-JUL-2018

TAPER, BUFFER ZONE & SIGN SPACING CHART

ROAD TYPE	POSTED SPEED MPH (S)	MINIMUM TAPER LENGTH (L)	LENGTH OF BUFFER (BZ)*	MINIMUM SIGN SPACING (SS)**				
		12 FT LANE CLOSURE		A	B	C	D	TAPER LENGTH
		FT	FT	FT	FT	FT	FT	FT
CONVENTIONAL	30 AND LOWER	180	200	100	100	100	100	50
	35	245	250	350	350	350	175	
	40	320	305					
	45	540	360	500	500	500	250	100
	50	600	425					
	55	660	495					
	60	720	570					
	65	780	645					
FREEWAY/ EXPRESSWAY	65	780	645	1000	1640	2640	500	
	70	840	730					
	75	900	820					
	80	960	910					

* THE LENGTH OF BUFFER (BZ) MAY BE REDUCED WITH THE APPROVAL OF THE ENGINEER
** MAXIMUM SPACING IS THE GIVEN VALUE (SS) MULTIPLIED BY 1.5

1- TAPER LENGTH FORMULAS

SPEED	FORMULA
FOR SPEEDS OF 40 MPH AND LESS	$L=\frac{WS^2}{60}$
FOR SPEEDS OF 45 MPH AND GREATER	L= WS

L = TAPER LENGTH IN FEET
W = WIDTH OF OFFSET IN FEET
S = SPEED IN MPH

⅓ L = FOR SHOULDER CLOSURE TAPER
½ L = FOR LANE SHIFT TAPER

2- CHANNELIZING DEVICES

A) MERGING AND SHIFTING TAPERS: USE A MINIMUM OF ONE DEVICE PER FT OF LANE CLOSURE WIDTH, PLUS ONE ADDITIONAL DEVICE TO START.

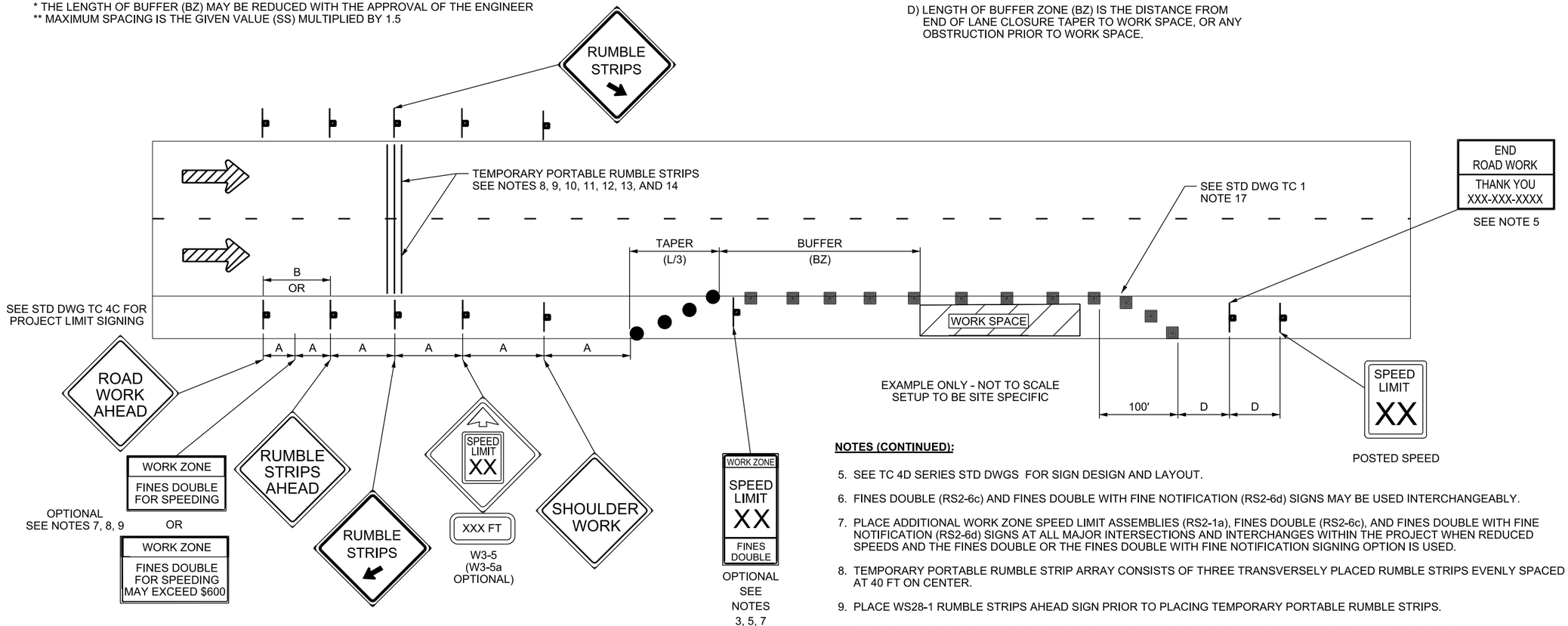
B) SHOULDER, ONE-LANE TWO-WAY, AND DOWNSTREAM TAPERS: USE A MINIMUM OF ONE DEVICE PER 3 FT OF WIDTH (OR PORTION THEREOF), PLUS ONE ADDITONAL DEVICE TO START.

C) ON TANGENT: S x 2 = SPACING UP TO 120 FT MAXIMUM.

D) LENGTH OF BUFFER ZONE (BZ) IS THE DISTANCE FROM END OF LANE CLOSURE TAPER TO WORK SPACE, OR ANY OBSTRUCTION PRIOR TO WORK SPACE.

TRAFFIC CONTROL DEVICE LEGEND

- SIGN (FIXED OR PORTABLE)
- CHANNELIZING DEVICE (SEE STD DWG TC 2A)
- DRUMS OR DIRECTIONAL INDICATOR BARRICADE
- FLAGGING STATION
- ARROW BOARD
- BARRIER
- DIRECTION OF TRAFFIC
- TYPE III BARRICADE
- DIRECTION OF WORK VEHICLE



NOTES:

1. USE THE PRE-CONSTRUCTION POSTED SPEED LIMIT PRIOR TO WORK ZONE TO COMPUTE THE SIGN SPACING, TAPER LENGTH, BUFFER ZONE, AND WORK CLEAR ZONE DISTANCES. USE THE WORK ZONE REDUCED SPEED LIMIT TO DETERMINE THE TANGENT SPACING FOR CHANNELIZING DEVICES.
2. REMOVE OR COVER ALL WORK ZONE REDUCED SPEED LIMIT ASSEMBLIES (RS2-1a) AND THE WORK ZONE REDUCED SPEED LIMIT AHEAD (W3-5 SERIES) SIGNS WHEN NO ONE IS WORKING, EXCEPT AS APPROVED BY THE REGION TRAFFIC ENGINEER. DO NOT COVER PRE-CONSTRUCTION POSTED SPEED LIMIT ASSEMBLIES (RS2-1a).
3. ADDITIONAL SIGNS MAY BE USED IN THE WORK ZONE FOR SUPPLEMENTAL NOTIFICATION OF THE WORK ZONE SPEED LIMITS.
4. USE SUPPLEMENTAL LEFT SIDE SIGNING FOR HIGH-SPEED DIVIDED HIGHWAYS.

NOTES (CONTINUED):

5. SEE TC 4D SERIES STD DWGS FOR SIGN DESIGN AND LAYOUT.
6. FINES DOUBLE (RS2-6c) AND FINES DOUBLE WITH FINE NOTIFICATION (RS2-6d) SIGNS MAY BE USED INTERCHANGEABLY.
7. PLACE ADDITIONAL WORK ZONE SPEED LIMIT ASSEMBLIES (RS2-1a), FINES DOUBLE (RS2-6c), AND FINES DOUBLE WITH FINE NOTIFICATION (RS2-6d) SIGNS AT ALL MAJOR INTERSECTIONS AND INTERCHANGES WITHIN THE PROJECT WHEN REDUCED SPEEDS AND THE FINES DOUBLE OR THE FINES DOUBLE WITH FINE NOTIFICATION SIGNING OPTION IS USED.
8. TEMPORARY PORTABLE RUMBLE STRIP ARRAY CONSISTS OF THREE TRANSVERSELY PLACED RUMBLE STRIPS EVENLY SPACED AT 40 FT ON CENTER.
9. PLACE WS28-1 RUMBLE STRIPS AHEAD SIGN PRIOR TO PLACING TEMPORARY PORTABLE RUMBLE STRIPS.
10. REMOVE TEMPORARY PORTABLE RUMBLE STRIPS PRIOR TO REMOVING WS28-1 RUMBLE STRIPS AHEAD SIGN.
11. RESET THE TEMPORARY PORTABLE RUMBLE STRIPS AS NECESSARY TO MAINTAIN PROPER ALIGNMENT, SPACING, AND LOCATION.
12. DO NOT USE TEMPORARY PORTABLE RUMBLE STRIPS ON HORIZONTAL CURVES UNLESS APPROVED BY REGION TRAFFIC ENGINEER.
13. REFER TO SPECIAL PROVISION 01554M FOR MAINTENANCE OF TEMPORARY PORTABLE RUMBLE STRIPS.
14. DO NOT PLACE TEMPORARY PORTABLE RUMBLE STRIPS DURING SNOW EVENTS.
15. RELOCATE THE TEMPORARY PORTABLE RUMBLE STRIPS AND ASSOCIATED SIGNING WHEN VEHICLE QUEUES ARE EXPECTED OR OCCUR IN ADVANCE OF TEMPORARY PORTABLE RUMBLE STRIPS.

NO.	DATE	APPR.	REMARKS
1	6/28/18	RT	REPLACED WS28-2 AND W16-7 ASSEMBLY WITH NEW WS28-2 SIGN.

REVISIONS

UTAH DEPARTMENT OF TRANSPORTATION
STANDARD DRAWINGS FOR ROAD AND BRIDGE CONSTRUCTION
SALT LAKE CITY, UTAH

RECOMMENDED FOR APPROVAL — JUNE 28, 2018 — DATE — DEPUTY DIRECTOR
CHAIRMAN STANDARDS COMMITTEE APPROVED — JUNE 28, 2018 — DATE

SHOULDER WORK ZONE TEMPORARY PORTABLE RUMBLE STRIPS FREEWAY/DIVIDED HIGHWAY

STANDARD DRAWING TITLE

STD. DWG. NO. TC 4B4

SUPPLEMENTAL DRAWING

DGN File: D:\StandardsandSpecsSection\2017Section\All Sup Issues\Issue # 5 06-28-2018\Drawings\TC04B4.dgn
09-JUL-2018

Appendix C5—CDOT temporary portable rumble strips Typical Applications for use with one lane, two-way operation using flaggers and for lane closures on multi-lane divided highway, Revised May 2018.

COLORADO
Department of Transportation
Transportation Systems
Management & Operations

MEMORANDUM

TO: ALL HOLDERS OF STANDARD PLANS

FROM: K.C. MATTHEWS, TRAFFIC STANDARDS AND SPECIFICATIONS ENGINEER

DATE: AUGUST 12, 2015

SUBJECT: REVISIONS OF STANDARD PLANS S-630-5 "PORTABLE RUMBLE STRIPS (TEMPORARY)"

With this memorandum, the Safety and Traffic Engineering Branch is issuing revisions to the S-630-5 standard plan set.

The Revised Standard Plan S-630-5, Sheets 1 and 2, supersedes the current Standard Plans sheet of the same title and sheet number.

Following is the change on the revised sheet:

- Sheet 1/2 and Sheet 2/2 -

  The mimimum required thickness of a temporary portable rumble strip array as shown in the "DETAIL – TEMPORARY PORTABLE RUMBLE STRIP ARRAY" is reduced from 15/16-in to ¾-in.

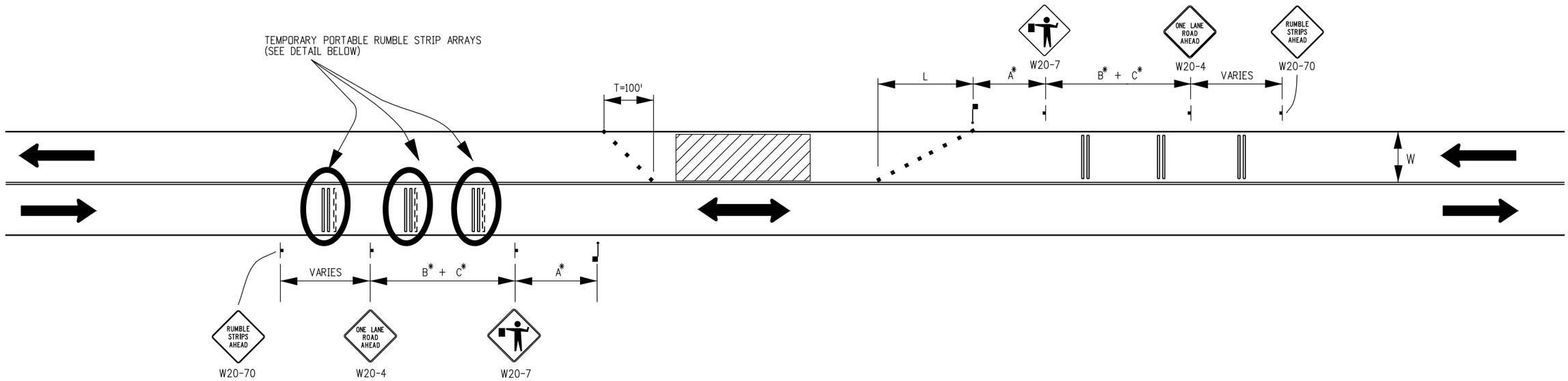
  The max operating speed of a facility using temporary rumble strips is 75-mph.

The designer should be sure that there are no other plan requirements or special provisions that conflict with these standards.

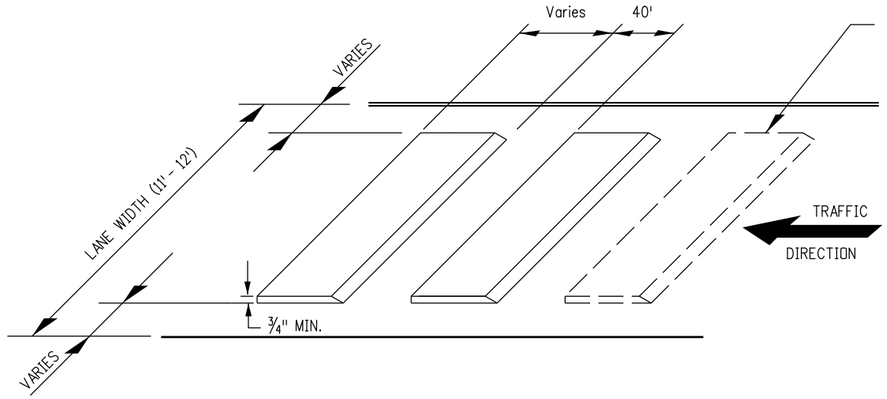
To obtain a print copies of this standard please check Traffic Engineering Standards and Specifications web site:

https://www.codot.gov/library/traffic/traffic-s-standard-plans

4201 E Arkansas Ave, 3rd Floor, Denver, CO 80222 P 303.757.9543 F 303.757.9219 www.codot.gov



CASE NO. 1
TYPICAL APPLICATION
TWO-LANE UNDIVIDED HIGHWAY



DETAIL - TEMPORARY PORTABLE RUMBLE STRIP ARRAY

GENERAL NOTES

1. TEMPORARY PORTABLE RUMBLE STRIP ARRAYS SHALL BE PLACED IN ADVANCE OF EACH FLAGGING STATION WHEN CALLED FOR IN THE PLANS.
2. TEMPORARY PORTABLE RUMBLE STRIP ARRAYS ARE USED TO SUPPLEMENT A SERIES OF ADVANCED WARNING SIGNS AND SHALL BE INSTALLED AND REMOVED WHEN THE SIGNS ARE INSTALLED AND REMOVED.
3. REMOVE THE TEMPORARY PORTABLE RUMBLE STRIPS PRIOR TO REMOVING THE ADVANCED WARNING SIGNS.
4. LANE WIDTHS SHOULD BE MAINTAINED THROUGH WORK ZONE TRAVEL LANES WHEREVER PRACTICAL.
5. DO NOT USE TEMPORARY RUMBLE STRIPS ON SLIPPERY SURFACES, SUCH AS WET OR SANDY PAVEMENT.
6. DO NOT USE TEMPORARY RUMBLE STRIPS ON HORIZTONAL CURVES.
7. USE TEMPORARY PORTABLE RUMBLE STRIPS ON ROADWAYS WITH POSTED WORK ZONE SPEED LIMITS OF 75 MPH OR LESS.
8. FOR THE LOWEST AIR TEMPERATURE TO APPLY THE TEMPORARY PORTABLE RUMBLE STRIPS ON ROAD PAVEMENTS, CONTACT THE TEMPORARY PORTABLE RUMBLE STRIP MANUFACTURER.
9. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
10. OPTIONAL RUMBLE STRIP TO INSTALL, AS DIRECTED BY THE ENGINEER.

LEGEND

- CHANNELIZING DEVICE: FOR TYPE OF DEVICE TO BE USED, SEE THE SCHEDULE OF CONSTRUCTION TRAFFIC CONTROL DEVICES INCLUDED IN PLANS.
- DIRECTION OF TRAVEL
- FLAGGER
- WORK AREA

T = TERMINATION TAPER = 100'
S = WORK ZONE SPEED LIMIT
W = LANE WIDTH
L = MERGING TAPER (S > 45 MPH) = WxS
L = MERGING TAPER (S < 45 MPH) = $(WxS^2)/60$
N = NUMBER OF DEVICES (L/S) + 1
N = NUMBER OF DEVICES AT TERMINATION TAPER = 5 (MIN.)

*KEY TO ADVANCE SIGNING DISTANCES

ROAD TYPE	DISTANCE BETWEEN SIGNS (FT.)		
	A	B	C
URBAN (S < 45 MPH)	100	100	100
URBAN (S ≥ 45 MPH)	350	350	350
RURAL	500	500	500

Computer File Information		Sheet Revisions	
Creation Date: 07/04/12 Initials: KEN		Date:	Comments
Last Modification Date: 05/22/18 Initials: DiNARDO	R-1	01/24/13	Made 3rd Rumble Strip Array Optional
Full Path: www.coloradodot.info/library/traffic/traffic-s-standard-plans	R-2	07/26/13	Corrected Sign Code Designation for Flagger (Symbol) Sign to W20-7
Drawing File Name: S-630-05_1of2.dgn	R-3	08/11/15	Modified Minimum Thickness to ¾" Modified Max Speed to 75 MPH
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	R-4	05/22/18	Modified "Varible" Spacing to a Defined 40 feet

Colorado Department of Transportation
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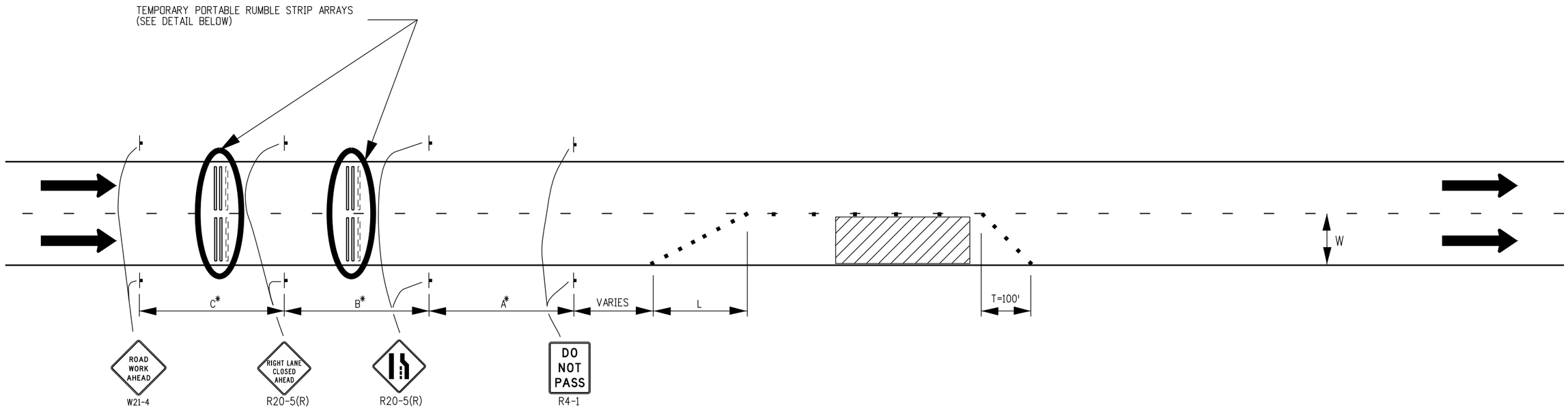
Phone: 303-757-9543 FAX: 303-757-9219
Safety & Traffic Engineering KCM

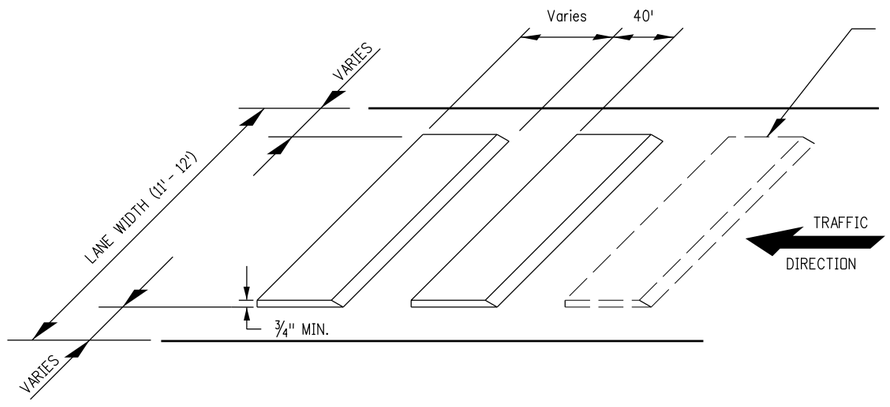
PORTABLE RUMBLE STRIPS (TEMPORARY)

Issued By: Safety & Traffic Engineering Branch July 4, 2012

STANDARD PLAN NO.
S-630-5
Sheet No. 1 of 2



CASE NO. 2
TYPICAL APPLICATION
MULTI-LANE DIVIDED HIGHWAY WITH RIGHT LANE CLOSED



DETAIL - TEMPORARY PORTABLE RUMBLE STRIP ARRAY

GENERAL NOTES

1. TEMPORARY PORTABLE RUMBLE STRIP ARRAYS ARE USED TO SUPPLEMENT A SERIES OF ADVANCED WARNING SIGNS AND SHALL BE INSTALLED AND REMOVED WHEN THE SIGNS ARE INSTALLED AND REMOVED.
2. REMOVE THE TEMPORARY PORTABLE RUMBLE STRIPS PRIOR TO REMOVING THE ADVANCED WARNING SIGNS.
3. LANE WIDTHS SHOULD BE MAINTAINED THROUGH WORK ZONE TRAVEL LANES WHEREVER PRACTICAL.
4. DO NOT USE TEMPORARY RUMBLE STRIPS ON SLIPPERY SURFACES, SUCH AS WET OR SANDY PAVEMENT.
5. DO NOT USE TEMPORARY RUMBLE STRIPS ON HORIZTONAL CURVES.
6. USE TEMPORARY PORTABLE RUMBLE STRIPS ON ROADWAYS WITH POSTED WORK ZONE SPEED LIMITS OF 75 MPH OR LESS.
7. FOR THE LOWEST AIR TEMPERATURE TO APPLY THE TEMPORARY PORTABLE RUMBLE STRIPS ON ROAD PAVEMENTS, CONTACT THE TEMPORARY PORTABLE RUMBLE STRIP MANUFACTURER.
8. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
9. OPTIONAL RUMBLE STRIP TO INSTALL, AS DIRECTED BY THE ENGINEER.

LEGEND

- ▪ CHANNELIZING DEVICE: FOR TYPE OF DEVICE TO BE USED, SEE THE SCHEDULE OF CONSTRUCTION TRAFFIC CONTROL DEVICES INCLUDED IN PLANS.
- → DIRECTION OF TRAVEL
- ▨ WORK AREA

T = TERMINATION TAPER = 100'
S = WORK ZONE SPEED LIMIT
W = LANE WIDTH
L = MERGING TAPER ($S \geq 45$ MPH) = WxS
L = MERGING TAPER ($S < 45$ MPH) = $(WxS^2)/60$
N = NUMBER OF DEVICES (L/S) + 1
N = NUMBER OF DEVICES AT TERMINATION TAPER = 5 (MIN.)

*KEY TO ADVANCE SIGNING DISTANCES

ROAD TYPE	DISTANCE BETWEEN SIGNS (FT.)		
	A	B	C
URBAN (S < 45 MPH)	100	100	100
URBAN (S ≥ 45 MPH)	350	350	350
RURAL	500	500	500
EXPRESSWAY/FREEWAY	1,000	1,500	2,640

Computer File Information	
Creation Date: 07/04/12	Initials: KEN
Last Modification Date: 05/22/18	Initials: DiNARDO
Full Path: www.coloradodot.info/library/traffic/traffic-s-standard-plans	
Drawing File Name: S-630-05_2of2.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	

Sheet Revisions		
	Date:	Comments
R-1	01/24/13	Made 3rd Rumble Strip Array Optional
R-2	08/11/15	Modified Minimum Thickness to ¾" Modified Max Speed to 75 MPH
R-3	05/22/18	Modified "Varible" Spacing to a Defined 40 feet

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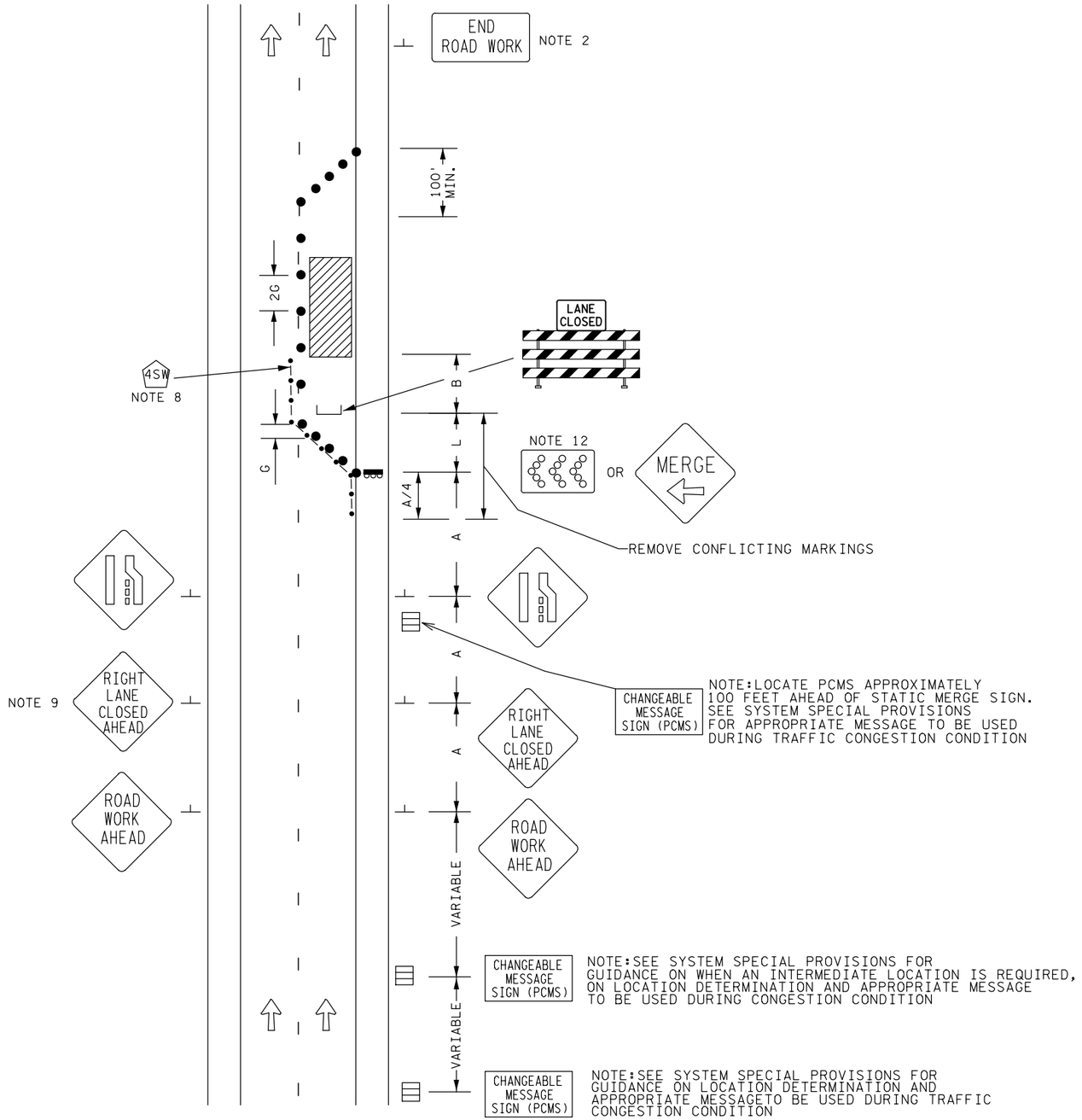
Safety & Traffic Engineering KCM

PORTABLE RUMBLE STRIPS (TEMPORARY)

Issued By: Safety & Traffic Engineering Branch July 4, 2012

STANDARD PLAN NO.
S-630-5
Sheet No. 2 of 2

Appendix D1—MnDOT Dynamic Lane Merge Layout.



ACTIVE ZIPPER MERGE SYSTEM
RIGHT LANE CLOSURE
MULTI-LANE DIVIDED ROAD
LONG TERM

1/26/18 LAYOUT 64

POSTED SPEED LIMIT PRIOR TO WORK STARTING	SPACING OF CHANNELIZING DEVICES (G)	SPACING OF ADVANCE WARNING SIGNS (A)	DECISION SIGHT DISTANCE	TAPER LENGTH (L)	BUFFER SPACE (B)
(MPH)	FEET	FEET	FEET	FEET	FEET
0 - 30	25	100	550	200	200
35 - 40		325	700	325	305
45 - 50	50	600	900	600	425
55		750	1200	700	500
60 - 65		1000	1400	800	650
70 - 75		1200	1600	900	820

NOTE:
NOT ALL INFORMATION IN THIS BOX MAY APPLY TO THIS DETAIL.

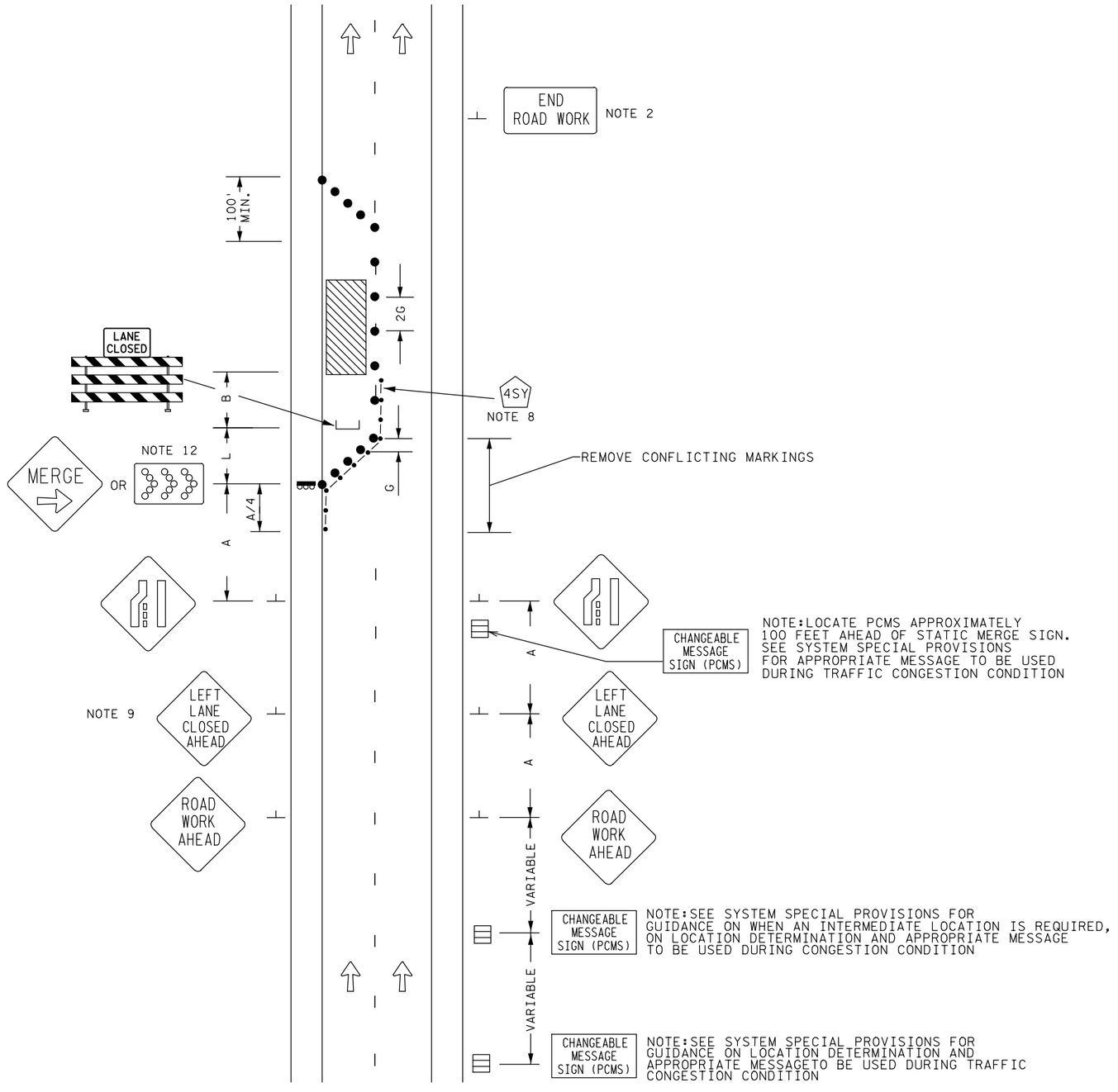
DESIGNER NOTES (REMOVE FROM LAYOUT BEFORE INSERTING IN PLAN):

1. INSERT SPACING CHART DISTANCES INTO LAYOUTS AND REMOVE CHART WHENEVER PRACTICAL.
2. DETERMINE IF "END ROAD WORK" SIGNS ARE NEEDED.
3. CONSIDER THE INSTALLATION OF A PCMS AND/OR G20-X2 OR SPECIAL SIGN, IF CONGESTION IS EXPECTED, IF ADVANCE SIGNING TO DIVERT TRAFFIC IS NEEDED OR OTHER CONDITIONS DETERMINED BY THE ENGINEER.
4. CONSIDER THE INSTALLATION OF A PCMS AND/OR G20-X1 SIGN (MODIFIED) OR G20-X2 SIGN FOR SEVEN DAY ADVANCE WARNING OF RESTRICTION.
5. FOR ANY EXCAVATION OR DROP-OFF IN EXCESS OF 12 IN., SEE THE MINNESOTA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES SECTION 6F.85, TEMPORARY TRAFFIC BARRIERS.
6. FOR CLOSURES GREATER THAN 1000 FT., SEE LAYOUT 70, "LANE CLOSURE EXTENSION".
7. ✳ - REQUIRED FOR SPEEDS GREATER THAN 45 MPH.
8. SELECT APPROPRIATE MATERIAL. SEE STRIPING KEY.
9. IF 48"x48" ADVANCE WARNING SIGNS WILL NOT FIT ON THE LEFT SIDE BECAUSE OF A NARROW MEDIAN (LESS THAN 6 FT.)
   A. REDUCE THE LEFT SIDE SIGN SIZES OR
   B. ELIMINATE THE LEFT SIDE SIGNING, USE AN ADDITIONAL "RIGHT LANE CLOSED AHEAD" SIGN ON THE RIGHT.
10. AN ADDITIONAL SET OF "RIGHT LANE CLOSED AHEAD" SIGNS MAY BE ADDED ON HIGH VOLUME ROADS.
11. REMOVE CONFLICTING MARKINGS. DETERMINE MATERIAL TYPE AND QUANTITY OF MARKINGS TO BE REMOVED OR COVERED FOR PAY ITEM QUANTITIES.
12. THE FLASHING ARROW BOARD SHALL BE USED WHEN THE POSTED SPEED LIMIT IS 45 MPH OR GREATER, AND SHALL BE PLACED FULLY ON THE SHOULDER. IF THERE IS NO SHOULDER, OR THE SHOULDER IS TO NARROW, PLACE THE FLASHING ARROW BOARD AT THE END OF THE TAPER IN LIEU OF THE TYPE III BARRICADE ASSEMBLY.

4SW — 4" SOLID WHITE REMOVEABLE PREFORMED PLASTIC MARKING

● — DRUMS, TYPE I OR TYPE II BARRICADE OR VERTICAL PANEL.

—•—•—•— SOLID LINE PAVEMENT MARKING WITH TEMPORARY RAISED PAVEMENT MARKERS AT 10' SPACING OR WET REFLECTIVE TAPE.



ACTIVE ZIPPER MERGE SYSTEM
LEFT LANE CLOSURE
MULTI-LANE DIVIDED ROAD
LONG TERM

1/26/18 LAYOUT 65

POSTED SPEED LIMIT PRIOR TO WORK STARTING	SPACING OF CHANNELIZING DEVICES (G)	SPACING OF ADVANCE WARNING SIGNS (A)	DECISION SIGHT DISTANCE	TAPER LENGTH (L)	BUFFER SPACE (B)
(MPH)	FEET	FEET	FEET	FEET	FEET
0 - 30	25	100	550	200	200
35 - 40		325	700	325	305
45 - 50	50	600	900	600	425
55		750	1200	700	500
60 - 65		1000	1400	800	650
70 - 75		1200	1600	900	820

NOTE:
NOT ALL INFORMATION IN THIS BOX MAY APPLY TO THIS DETAIL.

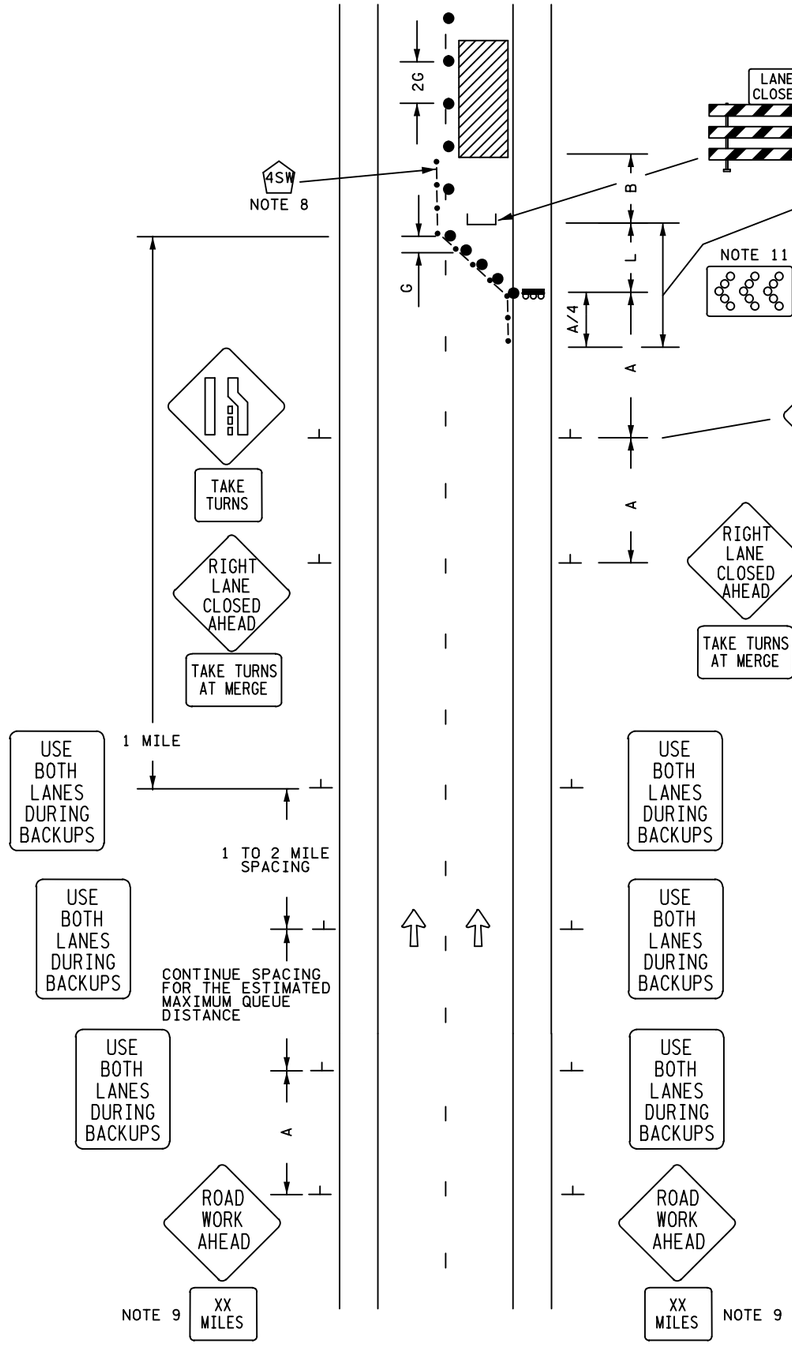
DESIGNER NOTES (REMOVE FROM LAYOUT BEFORE INSERTING IN PLAN):

1. INSERT SPACING CHART DISTANCES INTO LAYOUTS AND REMOVE CHART WHENEVER PRACTICAL.
2. DETERMINE IF "END ROAD WORK" SIGNS ARE NEEDED.
3. CONSIDER THE INSTALLATION OF A PCMS AND/OR G20-X2 OR SPECIAL SIGN, IF CONGESTION IS EXPECTED, IF ADVANCE SIGNING TO DIVERT TRAFFIC IS NEEDED OR OTHER CONDITIONS DETERMINED BY THE ENGINEER.
4. CONSIDER THE INSTALLATION OF A PCMS AND/OR G20-X1 SIGN (MODIFIED) OR G20-X2 SIGN FOR SEVEN DAY ADVANCE WARNING OF RESTRICTION.
5. FOR ANY EXCAVATION OR DROP-OFF IN EXCESS OF 12 IN., SEE THE MINNESOTA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES SECTION 6F.85, TEMPORARY TRAFFIC BARRIERS.
6. FOR CLOSURES GREATER THAN 1000 FT., SEE LAYOUT 70, "LANE CLOSURE EXTENSION".
7. ⚹ - REQUIRED FOR SPEEDS GREATER THAN 45 MPH.
8. SELECT APPROPRIATE MATERIAL. SEE STRIPING KEY.
9. IF 48"x48" ADVANCE WARNING SIGNS WILL NOT FIT ON THE LEFT SIDE BECAUSE OF A NARROW MEDIAN (LESS THAN 6 FT.)
   A. REDUCE THE LEFT SIDE SIGN SIZES OR
   B. ELIMINATE THE LEFT SIDE SIGNING, USE AN ADDITIONAL "LEFT LANE CLOSED AHEAD" SIGN ON THE RIGHT.
10. AN ADDITIONAL SET OF "LEFT LANE CLOSED AHEAD" SIGNS MAY BE ADDED ON HIGH VOLUME ROADS.
11. REMOVE CONFLICTING MARKINGS. DETERMINE MATERIAL TYPE AND QUANTITY OF MARKINGS TO BE REMOVED OR COVERED FOR PAY ITEM QUANTITIES.
12. THE FLASHING ARROW BOARD SHALL BE USED WHEN THE POSTED SPEED LIMIT IS 45 MPH OR GREATER, AND SHALL BE PLACED FULLY ON THE SHOULDER. IF THERE IS NO SHOULDER, OR THE SHOULDER IS TO NARROW, PLACE THE FLASHING ARROW BOARD AT THE END OF THE TAPER IN LIEU OF THE TYPE III BARRICADE ASSEMBLY.

4SY — 4" SOLID YELLOW REMOVEABLE PREFORMED PLASTIC MARKING

● — DRUMS, TYPE I OR TYPE II BARRICADE OR VERTICAL PANEL.

—•—•—•— SOLID LINE PAVEMENT MARKING WITH TEMPORARY RAISED PAVEMENT MARKERS AT 10' SPACING OR WET REFLECTIVE TAPE.



PASSIVE ZIPPER MERGE SYSTEM
RIGHT LANE CLOSURE
MULTI-LANE DIVIDED ROAD

1/26/18 LAYOUT 66

POSTED SPEED LIMIT PRIOR TO WORK STARTING	SPACING OF CHANNELIZING DEVICES (G)	SPACING OF ADVANCE WARNING SIGNS (A)	DECISION SIGHT DISTANCE	TAPER LENGTH (L)	BUFFER SPACE (B)
(MPH)	FEET	FEET	FEET	FEET	FEET
0 - 30	25	100	550	200	200
35 - 40		325	700	325	305
45 - 50	50	600	900	600	425
55		750	1200	700	500
60 - 65		1000	1400	800	650
70 - 75		1200	1600	900	820

NOTE:
NOT ALL INFORMATION IN THIS BOX MAY APPLY TO THIS DETAIL.

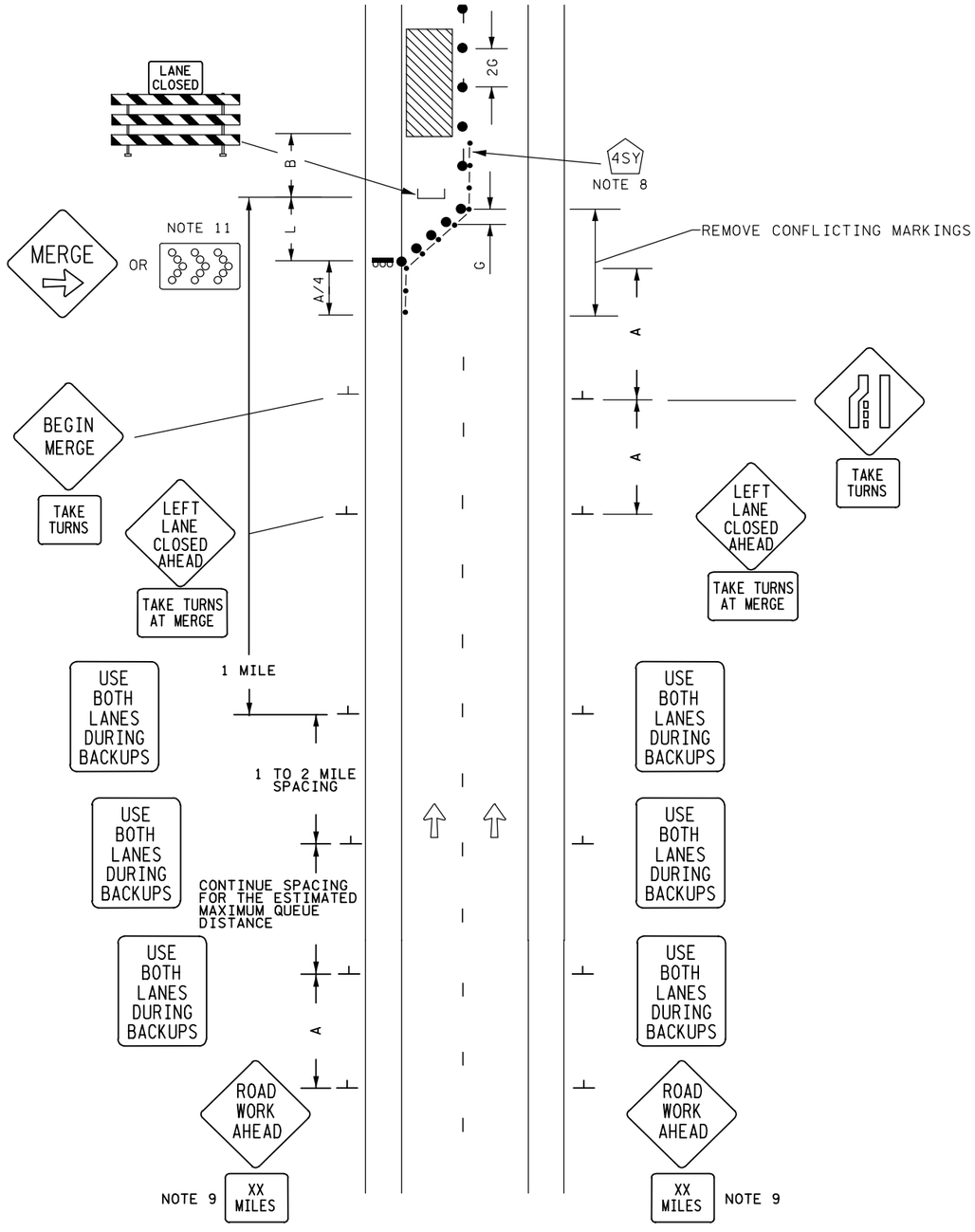
DESIGNER NOTES (REMOVE FROM LAYOUT BEFORE INSERTING IN PLAN):

1. INSERT SPACING CHART DISTANCES INTO LAYOUTS AND REMOVE CHART WHENEVER PRACTICAL.
2. DETERMINE IF "END ROAD WORK" SIGNS ARE NEEDED.
3. CONSIDER THE INSTALLATION OF A PCMS AND/OR G20-X2 OR SPECIAL SIGN IF ADVANCE SIGNING TO DIVERT TRAFFIC IS NEEDED OR OTHER CONDITIONS DETERMINED BY THE ENGINEER.
4. CONSIDER THE INSTALLATION OF A PCMS AND/OR G20-X1 SIGN (MODIFIED) OR G20-X2 SIGN FOR SEVEN DAY ADVANCE WARNING OF RESTRICTION.
5. FOR ANY EXCAVATION OR DROP-OFF IN EXCESS OF 12 IN., SEE THE MINNESOTA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES SECTION 6F.85, TEMPORARY TRAFFIC BARRIERS.
6. FOR CLOSURES GREATER THAN 1000 FT., SEE LAYOUT 70, "LANE CLOSURE EXTENSION".
7. ✳ - REQUIRED FOR SPEEDS GREATER THAN 45 MPH.
8. SELECT APPROPRIATE MATERIAL. SEE STRIPING KEY.
9. DISTANCE PLAQUES ARE RECOMMENDED WHEN THE DISTANCE IS 2 MILES OR MORE.
10. REMOVE CONFLICTING MARKINGS. DETERMINE MATERIAL TYPE AND QUANTITY OF MARKINGS TO BE REMOVED OR COVERED FOR PAY ITEM QUANTITIES.
11. THE FLASHING ARROW BOARD SHALL BE USED WHEN THE POSTED SPEED LIMIT IS 45 MPH OR GREATER, AND SHALL BE PLACED FULLY ON THE SHOULDER. IF THERE IS NO SHOULDER, OR THE SHOULDER IS TO NARROW, PLACE THE FLASHING ARROW BOARD AT THE END OF THE TAPER IN LIEU OF THE TYPE III BARRICADE ASSEMBLY.

4SW — 4" SOLID WHITE REMOVEABLE PREFORMED PLASTIC MARKING

● — DRUMS, TYPE I OR TYPE II BARRICADE OR VERTICAL PANEL.

—•—•—•— SOLID LINE PAVEMENT MARKING WITH TEMPORARY RAISED PAVEMENT MARKERS AT 10' SPACING OR WET REFLECTIVE TAPE.



PASSIVE ZIPPER MERGE SYSTEM
LEFT LANE CLOSURE
MULTI-LANE DIVIDED ROAD

1/26/18 LAYOUT 67

POSTED SPEED LIMIT PRIOR TO WORK STARTING	SPACING OF CHANNELIZING DEVICES (G)	SPACING OF ADVANCE WARNING SIGNS (A)	DECISION SIGHT DISTANCE	TAPER LENGTH (L)	BUFFER SPACE (B)
(MPH)	FEET	FEET	FEET	FEET	FEET
0 - 30	25	100	550	200	200
35 - 40		325	700	325	305
45 - 50	50	600	900	600	425
55		750	1200	700	500
60 - 65		1000	1400	800	650
70 - 75		1200	1600	900	820

NOTE:
NOT ALL INFORMATION IN THIS BOX MAY APPLY TO THIS DETAIL.

DESIGNER NOTES (REMOVE FROM LAYOUT BEFORE INSERTING IN PLAN):

1. INSERT SPACING CHART DISTANCES INTO LAYOUTS AND REMOVE CHART WHENEVER PRACTICAL.
2. DETERMINE IF "END ROAD WORK" SIGNS ARE NEEDED.
3. CONSIDER THE INSTALLATION OF A PCMS AND/OR G20-X2 OR SPECIAL SIGN IF ADVANCE SIGNING TO DIVERT TRAFFIC IS NEEDED OR OTHER CONDITIONS DETERMINED BY THE ENGINEER.
4. CONSIDER THE INSTALLATION OF A PCMS AND/OR G20-X1 SIGN (MODIFIED) OR G20-X2 SIGN FOR SEVEN DAY ADVANCE WARNING OF RESTRICTION.
5. FOR ANY EXCAVATION OR DROP-OFF IN EXCESS OF 12 IN., SEE THE MINNESOTA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES SECTION 6F.85, TEMPORARY TRAFFIC BARRIERS.
6. FOR CLOSURES GREATER THAN 1000 FT., SEE LAYOUT 70, "LANE CLOSURE EXTENSION".
7. ✳ - REQUIRED FOR SPEEDS GREATER THAN 45 MPH.
8. SELECT APPROPRIATE MATERIAL. SEE STRIPING KEY.
9. DISTANCE PLAQUES ARE RECOMMENDED WHEN THE DISTANCE IS 2 MILES OR MORE.
10. REMOVE CONFLICTING MARKINGS. DETERMINE MATERIAL TYPE AND QUANTITY OF MARKINGS TO BE REMOVED OR COVERED FOR PAY ITEM QUANTITIES.
11 THE FLASHING ARROW BOARD SHALL BE USED WHEN THE POSTED SPEED LIMIT IS 45 MPH OR GREATER, AND SHALL BE PLACED FULLY ON THE SHOULDER. IF THERE IS NO SHOULDER, OR THE SHOULDER IS TO NARROW, PLACE THE FLASHING ARROW BOARD AT THE END OF THE TAPER IN LIEU OF THE TYPE III BARRICADE ASSEMBLY.

4SY — 4" SOLID YELLOW REMOVEABLE PREFORMED PLASTIC MARKING

● — DRUMS, TYPE I OR TYPE II BARRICADE OR VERTICAL PANEL.

—•—•—•— SOLID LINE PAVEMENT MARKING WITH TEMPORARY RAISED PAVEMENT MARKERS AT 10' SPACING OR WET REFLECTIVE TAPE.

Appendix D2—KSDOT Dynamic Lane Merge Layout.

STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
KANSAS	69-46 KA-4163-01	2016	XXX	XXX

REFER TO STD. TE710 FOR ADDITIONAL INFORMATION ON TEMPORARY TRAFFIC CONTROL SIGNS AND SIGN SPACING.
REFER TO STD. TE704 FOR TYPE III BARRICADES.
REFER TO STD. TE702 FOR INFORMATION ON TAPERS AND CHANNELIZING DEVICES.
REFER TO STD. TE700 FOR LENGTH OF BUFFER SPACE.

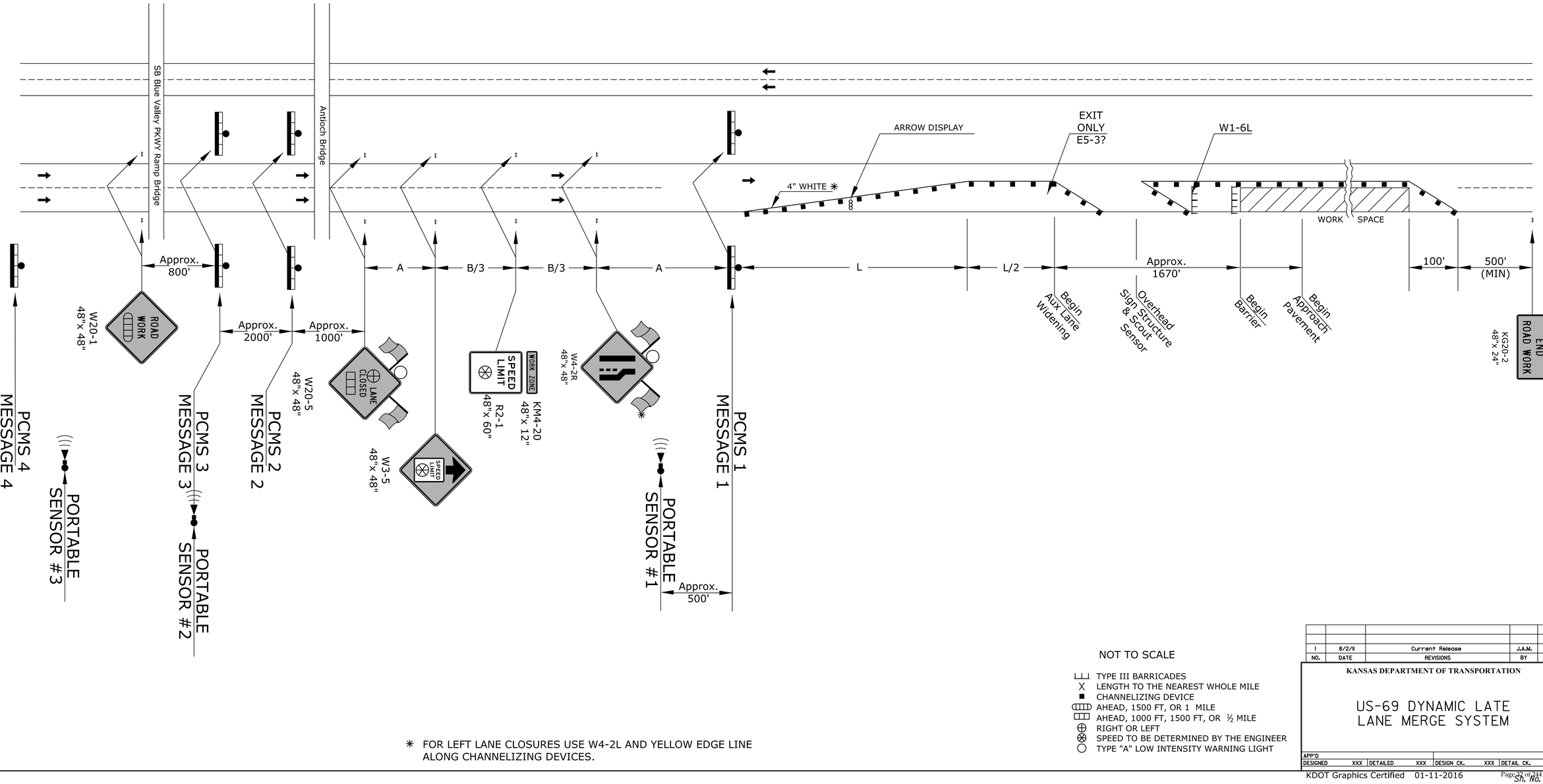
MESSAGE 1:	
MERGE HERE	TAKE TURNS

MESSAGE 2:	
MERGE AHEAD	USE BOTH LANES

MESSAGE 3:	
MERGE AHEAD	USE BOTH LANES

MESSAGE 4:	
SLOW/STOPPED TRAFFIC AHEAD	USE BOTH LANES

Notes:
1. See General Notes for PCMS/Modem information
2. Contractor MUST follow this Traffic Control Detail
3. Need to delineate around both sides of median devices for opposing traffic
4. Portable sensor #3 will collect data across the gore area of the Blue Valley exit to track diversion volumes
5. PCMS #4 will be located approx. 500' upstream of the NB US-69 to Blue Valley Exit



✳ FOR LEFT LANE CLOSURES USE W4-2L AND YELLOW EDGE LINE ALONG CHANNELIZING DEVICES.

NOT TO SCALE

- TYPE III BARRICADES
- X LENGTH TO THE NEAREST WHOLE MILE
- ■ CHANNELIZING DEVICE
- AHEAD, 1500 FT, OR 1 MILE
- AHEAD, 1000 FT, 1500 FT, OR ½ MILE
- RIGHT OR LEFT
- SPEED TO BE DETERMINED BY THE ENGINEER
- TYPE "A" LOW INTENSITY WARNING LIGHT

NO.	DATE	REVISIONS	BY	APP'D
1	8/2/11	Current Release	J.A.M.	K.P.

KANSAS DEPARTMENT OF TRANSPORTATION

US-69 DYNAMIC LATE LANE MERGE SYSTEM

APP'D							
DESIGNED	XXX	DETAILED	XXX	DESIGN CK.	XXX	DETAIL CK.	XXX

KDOT Graphics Certified

Drawn By : joycep Plotted : 11-JAN-2016 16:01
File : 119 & US-69 KC Dynamic Late Merge Traffic.dgn

Appendix D3—WisDOT Dynamic Lane Merge Outreach.

zoo interchange

ZIPPER MERGE
WHAT IS IT AND WHY IS IT EFFECTIVE?

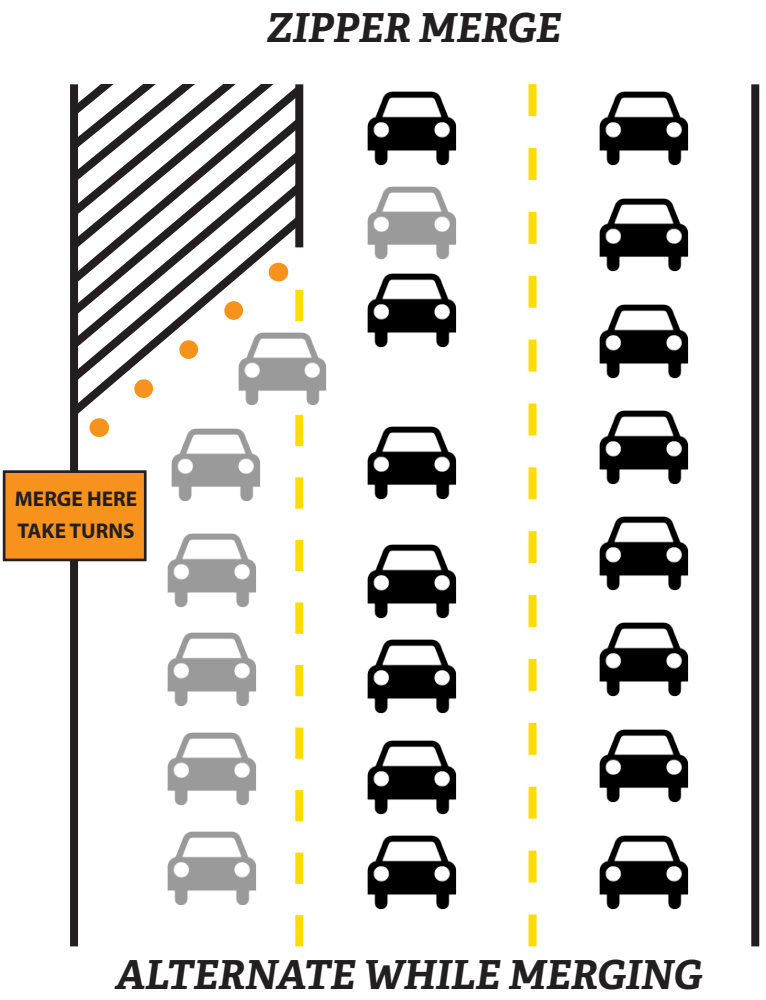
A dynamic late merge (*zipper merge*) allows drivers to utilize all lanes of traffic until the merge area is reached. At this point, motorists should merge in an alternating fashion, like a zipper.

What are the benefits of a zipper merge?
When a vehicle slows down to merge early in heavy traffic situations, it puts all drivers in danger, slowing traffic down too quickly, leading to unexpected crashes or angry motorists. These dangers are decreased using the zipper merge. Traffic backups can be reduced as much as 40 percent.

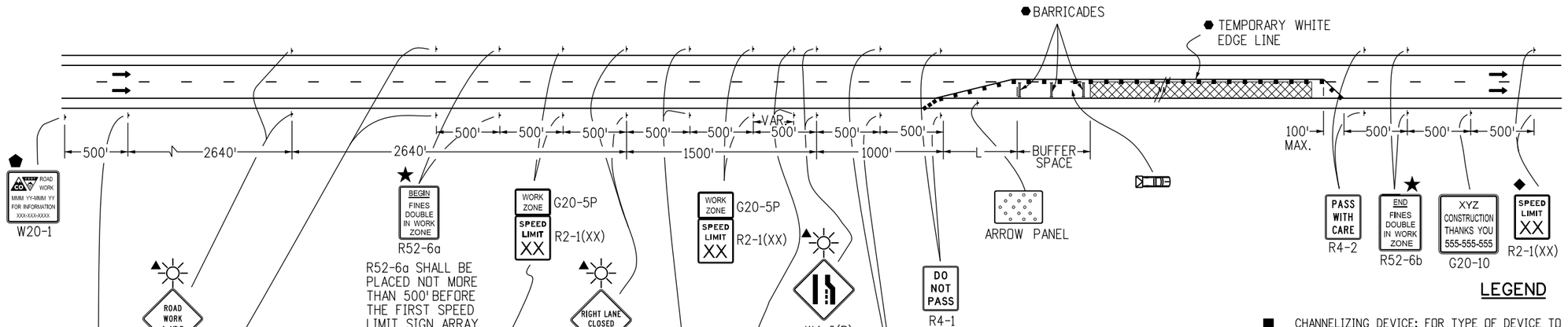
How does it all work?
When you see a *Lane Closed Ahead* sign, continue to drive in your lane until you are prompted to merge. When you reach this point, take alternating turns with other drivers to merge into the single lane of traffic.

Can we make it happen?
The only way this can be effective is if we are all aware of the zipper merge and follow its rules. When driving in this situation, slow down and alternate while merging. The zipper merge allows for everyone to move at the same rate, minimizing delays for all. When traffic is heavy and slow, it is much safer for motorists to remain in their current lane until the point where traffic can orderly take turns merging.

When not to do the zipper?
When traffic is moving at highway speeds and there are no backups, it makes sense to move sooner to the lane that will remain open through construction. The bottom line is to merge when it is safe to do so.



Appendix D4—CDOT Dynamic Lane Merge Layout.



CASE NO. 29
TYPICAL APPLICATION
LATE MERGING - ONE LANE CLOSED, 4-LANE DIVIDED HIGHWAY

LEGEND

- ■ CHANNELIZING DEVICE: FOR TYPE OF DEVICE TO BE USED, SEE THE SCHEDULE OF CONSTRUCTION TRAFFIC CONTROL DEVICES INCLUDED IN THE PLANS. IF PROJECT IS DESIGNATED AS A "SIGNIFICANT PROJECT" (SEE GENERAL NOTE 25), CONCRETE BARRIER SHALL BE USED FOR CHANNELIZATION DEVICES (TEMP) AS DETERMINED BY THE ENGINEER.
- TYPE III BARRICADE
- DIRECTION OF TRAVEL
- WORK AREA
- ADVANCE WARNING FLASHING OR SEQUENCING ARROW PANEL.
- ▲ THESE DEVICES ARE OPTIONAL. THEIR NEED SHALL BE DETERMINED BY DETOUR DESIGN AND/OR SCOPE OF CONSTRUCTION ACTIVITY, AND ARE REQUIRED WHEN THEY ARE INCLUDED IN THE SCHEDULE OF CONSTRUCTION CONTROL DEVICES.
- ◆ THESE DEVICES ARE NOT OPTIONAL IF THE POSTED SPEED LIMIT IN THE WORK ZONE IS REDUCED.
- ⬟ G20-11 SIGN IS REQUIRED WHEN SECTION 626 "PUBLIC INFORMATION INFORMATION SERVICES" PROJECT SPECIAL PROVISION WORKSHEET SPECIFICATION IS REQUIRED WITH PROJECT.
- FLASHING BEACON
- ⬟ REQUIRED WHEN WORK OCCUPIES THE LOCATION FOR MORE THAN 3 DAYS.
- ★ SEE FINES DOUBLE SIGNING NOTES ON SHEET 12.
- TRUCK MOUNTED ATTENUATOR (TMA)
- L TRANSITION TAPER LENGTH:

  L = MINIMUM LENGTH OF TAPER

  SPEED 45 MPH OR MORE: $L = S \times W$

  SPEED 40 MPH OR LESS: $L = \frac{WS^2}{60}$

  S = NUMERICAL VALUE OF SPEED LIMIT OR 85 PERCENTILE SPEED

  W = WIDTH OF OFFSET

  SHOULDER TAPER = 1/3 L
- BUFFER SPACE SEE GENERAL NOTE 21 ON SHEET 1.

Computer File Information		Sheet Revisions	
Creation Date: 07/04/12 Initials: RRR		Date:	Comments
Last Modification Date: Initials:	R-X		
Full Path: www.coloradodot.info/library/traffic/traffic-s-standard-plans	R-X		
Drawing File Name: S-630-01_16of24.dgn	R-X		
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	R-X		

Colorado Department of Transportation
4201 East Arkansas Avenue
Denver, Colorado 80222
Phone: (303) 757-9543
Fax: (303) 757-9219
Safety & Traffic Engineering Branch KCM/KEN

TRAFFIC CONTROLS FOR HIGHWAY CONSTRUCTION

Issued By: Safety & Traffic Engineering Branch July 4, 2012

STANDARD PLAN NO.
S-630-1
Sheet No. 16 of 24

-?-

Appendix E1—WisDOT Incident Management Plan (IMP) Example 1.

NOTE - This document is for SWIG example purposes ONLY.

It is Example #1 for the SWIG Work Zone Incident Management Plan

State Project ID 1001-00-64
Janesville – Portage
IH 39
USH 12/18 to STH 30
Dane County

Work Zone
Incident Management Plan

May 2015 – October 2015

Table of Contents

Appendices

I. Project Information

Project Summary

Project 1001-00-64, Janesville – Portage, US 12/18 to STH 30, IH 39, Dane County, Wisconsin begins approximately 0.9 miles North of the IH 39, STH 30, & IH 94 Interchange and ends approximately 0.8 miles South of the IH 39 & US 12/18 Interchange. IH 39 serves as a major North-South transportation corridor between Illinois and Wisconsin.

Within the project limits IH 39 carries three lanes of traffic in each direction. The project includes 5.79 miles of concrete pavement repair and replacement, precast concrete pavement replacement, and pavement marking. To minimize traffic impacts, the following work zone restrictions have been established:

--INSERT TABLE OF WORK TIMES HERE FROM ADVERTISED PLAN AND SPECIALS

Project Staging

Construction staging will be utilized to facilitate the construction process. The Traffic Control Staging will require the following:

Stage 1: UPDATE ONCE PLAN IS ADVERTISED

Stage 2:

Stage 3:

II. Extraordinary Traffic Surveillance and Enforcement

The Department of Transportation's Division of Transportation System Development (DTSD) and the Division of State Patrol (DSP) have entered into agreement wherein the DSP will provide extraordinary traffic surveillance and enforcement in the construction zone. A typical schedule for the additional State Patrol presence is as follows:

ENTER IN DAYS & TIMES IF DSP ENFORCMENT IS INCLUDED

The Division of State Patrol will continue to evaluate the zone and make adjustments to the schedule as traffic conditions dictate.

III. Project Lane Reduction Incident

Law Enforcement Checklist

- Contact dispatch to report any incident or backups:
  - Identify incident type
  - Location of incident – Note if incident is in the work zone
  - Indicate best route to incident
  - Extent of backup
  - Establish a field command post
  - Affected Lanes
- Identify Incident Classification:
  - Minor – Less than 30 minute incident duration
  - Intermediate – 30 minute to 2 hour incident duration
  - Major – Greater than 2 hour incident duration
- Initiate traffic control as appropriate:
  - If traffic message boards required, Contact:
    - 24 Hour Traffic Control – **UPDATE AFTER PROJECT LET**
- Inform media of freeway incident (TIA) – Note if incident is in the work zone
- XXXXX Dispatch will contact STOC ###-###-#### and advise of the above information
- If specialized equipment is needed, contact:
  - Contractor
  - Appropriate County Highway Department via 911 Dispatch
- At the conclusion of the incident make appropriate demobilization notifications

(See Appendix A for Emergency Contacts)

STOC Checklist

- When receiving a call from law enforcement ensure they provide the following:
  - Location of incident – Note if incident is in the work zone
  - Affected Lanes
  - Incident Type
  - Approximate incident duration
  - Extent of backup (Level 1, 2, or 3)
- Must have immediate contact with:
  - Regional Incident Management Coordinator (RIMC) for an incident blocking all lanes in one or both directions for 2 hours or more
  - Regional Incident Management Coordinator (RIMC) for backups with or without incidents greater than 3 miles
  - Public Information Officer (PIO), if available
  - SINS e-mail sent for any incident blocking 50% or more of the highway lanes and/or a system ramp
- Change traveler information in the following order:
  - Message Boards
  - Message on Highway Advisory Radio, Located approximately XX ## with message board at approximately XX ##
  - Place 511 message if necessary
- Once Alternate Routes are implemented, review the alternate route guides to determine who needs to be notified
- After incident and/or backup ensure message boards are returned to lower level or normal configuration

(See Appendix A for Emergency Contacts and Appendix B for Alternate Routes)

Regional Incident Management Coordinator (RIMC) Checklist

- RIMC will contact Project Leader as situation warrants (Contact information provided by STOC)
- RIMC will contact event incident commander or State Patrol Duty Sergeant as situation warrants
- RIMC will function as liaison for County Highway Departments
- RIMC will contact DTSD Regional Duty Officer at backups of 5 miles or as situation warrants

Project Leader Checklist

- Project Leader will contact event incident commander or State Patrol Duty Sergeant as situation warrants
- Project Leader will function as liaison for Contractors
- Project Leader will contact Project Manager and/or Project Supervisor at backups of 5 miles or as situation warrants

Regional Duty Officer Checklist

- RDO may coordinate project resources with Contractor or Regional Staff as situation warrants
- RDO will coordinate media release as situation warrants
- RDO will mitigate traffic delays if possible

(See Appendix A for Emergency Contacts)

IV. Project Lane Reduction Incident Levels

Backup Levels

Level 1 Incident: 5 mile or greater backup
Level 2 Incident: 3 – 4 mile backup
Level 3 Incident: 1 – 2 mile backup

V. Ramp Closure Locations for Incidents That Block Freeways

Ramp closures to be ordered by Incident Commander.

Ramp closure locations will be dependent on the location of the incident within the project work zone and the alternate route/routes chosen to be deployed. Please refer to Appendix B: XXXXX for additional guidance.

Barricades will be located at all interchange entrance ramps within the work zone. Barricades will be located at all maintenance crossovers that are within the work zone or within five miles of the work zone.

VI. Alternate Routes

Alternate route/routes will be dependent on the location of the incident within the project work zone and the alternate route chosen to be deployed. Please refer to Appendix B: XXXXXX for additional guidance.

(See Appendix B for Alternate Routes)

VII. Message Activation Plan for Operational Backups – No Incident

Portable Changeable Message Board Activation Contact: NAME HERE XXX-XXX-XXXX

Level 1 Backup: Activate Message Board
Level 2 Backup: Activate Message Board

- **Message Board:** Traffic Delay Ahead/ Alternate Route Exit **XX**
  - **XX** – Alternate Route Exit Location will depend on the location of the message board and alternate route chosen to be deployed

Level 3 Backup: Typically no message activation

Permanent Dynamic Message Sign Activation Contact: STOC 1-800-375-7302

Level 1 Backup: Activate Message Board
Level 2 Backup: Activate Message Board

- **Message Board:** Traffic Delay Ahead/ Alternate Route Exit **XX**
  - **XX** – Alternate Route Exit Location will depend on the location of the message board and alternate route chosen to be deployed

Level 3 Backup: Typically no message activation ITS will update drive times if times being displayed

VIII. Message Activation Plan for Operational Backups – Incident

Portable Changeable Message Board Activation Contact: NAME HERE XXX-XXX-XXXX

Level 1 Backup: Activate Message Board
Level 2 Backup: Activate Message Board
Level 3 Backup: Activate Message Board

- **Message Board:** Incident Ahead Use/ Alternate Route Exit **XX**
  - **XX** – Alternate Route Exit Location will depend on the location of the message board and alternate route chosen to be deployed

Permanent Dynamic Message Sign Activation Contact: STOC 1-800-375-7302

Level 1 Backup: Activate Message Board
Level 2 Backup: Activate Message Board
Level 3 Backup: Activate Message Board

- **Message Board:** Traffic Delay Ahead/ Alternate Route Exit **XX**
  - **XX** – Alternate Route Exit Location will depend on the location of the message board and alternate route chosen to be deployed

IX. Message Activation Plan for Operational Backups – Blocked Freeway

Portable Changeable Message Board Activation Contact: NAME HERE XXX-XXX-XXXX

Same as for Operational Backups - Incident

Permanent Dynamic Message Sign Activation Contact: STOC 1-800-375-7302

Notify STOC and work directly with State Patrol and RIMC to determine the alternate route that will be deployed

X. Traffic Impact Scenarios and Associated Message Board Activations

Note: These scenarios will be refined and messages developed for individual PCMS/DMS once the map of available signs and numbers are available

Westbound Traffic Impact Scenarios

Scenario 1: IH 39 WB south of USH 12/18

Scenario 2: IH 39 WB north of USH 12/18 and south of STH 30

Scenario 3: IH 39 WB north of STH 30

Scenario 4: IH 39 WB ramp to USH 12/18 WB

Scenario 5: USH 12/18 EB ramp to IH 39 WB

Scenario 5: USH 12/18 WB ramp to IH 39 WB

Scenario 7: IH 39 WB ramp to EB IH 94

Scenario 8: IH 94 WB ramp to IH 39 WB

Eastbound Traffic Impact Scenarios

Scenario 9: IH 39 EB north of STH 30

Scenario 10: IH 39 EB south of STH 30 and north of USH 12/18

Scenario 11: IH 39 EB south of USH 12/18

Scenario 12: STH 30 EB ramp to EB IH 39

Scenario 13: IH 39 EB ramp to USH 12/18 WB

Scenario 14: USH 12/18 EB ramp to SB IH 39

XI. Media Relations

The media can be an essential resource in informing the public of incidents that affect their travel. Broadcast media, such as radio and television, can provide real-time information to drivers in their car, or even before they get into their cars, allowing them to make informed decisions about their travel based on current conditions. Media sources such as the internet or paging services can also provide time sensitive information. Local media services have been identified in Appendix E.

When dealing with the media during a crisis, it is important to identify a spokesperson to help prevent conflict by providing a limited source of information to the scene. The designated spokesperson for the IH 39 project will be Michael Bie, DOT Public Information Officer. To ensure consistent and reliable communication takes place, the Public Information Officer has unlimited access to the project management team.

When a crisis situation requires a response to the media, the following guidelines are recommended:

- Disseminate only approved, verifiable information.
- Do not speculate about the cause or contributing factors in an emergency or accidents.
- Confirm only what is visible and apparent (fire, traffic accident, etc.). Questions about injuries and/or deaths should be referred to the designated spokesperson. It is important to not release the names of accident victims.
- Answer honestly and accurately. If you do not know the answer, say so. Confirm answers to your specific responsibilities.
- When a designated spokesperson arrives at the scene, he or she must be briefed about the situation, as well as inquiries from law enforcement officials and the media.

General Actions if Media is on Construction Site

If members of the media show up unannounced, the IH 39 project team Public Information Officer should be called immediately. The media should not be allowed direct access to the scene since construction projects present all types of safety hazards to visitors unfamiliar with the site and thus should not be allowed. In the event of a serious accident and or fatality, it is important for only the IH 39 project team Public Information Officer to talk to the press. Under no circumstances are the names of victims to be released. Law enforcement presiding at the scene will be responsible for handling this.

APPENDIX A

EMERGENCY CONTACT INFORMATION

EMERGENCY CONTACT LIST

AGENCY	CONTACT	OFFICE	CELL/OTHER
STATE TRAFFIC OPERATIONS CENTER (STOC)			
STOC		(414) 227-2166	(###) ###-#### (24 hour)
LAW ENFORCEMENT			
Wis. State Patrol Emergency			
State Patrol Dispatch			
State Patrol Officers			
State Patrol Mitigation Field Trooper			
Dane County Dispatch Center			
Madison Police Department			
SOUTHWEST REGION MANAGEMENT			
Regional Duty Officer			
Regional Incident Management Coordinator (RIMC)			
DOT Supervisor – PDS			
DOT Manager – PDS			
SW Regional Director			
Maintenance Supervisor			
Traffic Supervisor			
COUNTY PERSONNEL			
Dane County Commissioner			
PROJECT STAFF			
Project Field Office			
Project Leader	Doug Sina		(608) 216-3097
Project Manager			
PRIME CONTRACTOR			
TRAFFIC CONTROL – GENERAL			
TRAFFIC CONTROL – MESSAGE BOARDS			
OTHER DOT TRAFFIC/EMERGENCY CONTACTS			
Maintenance Dane County			
DOT Traffic			
DOT Public Information Officer			

CONSTRUCTION PROJECT CONTACT LIST

Project Description: 1001-00-64
Janesville – Portage
USH 12/18 – STH 30
IH 39
Dane County

Effective Dates: May 2015 – October 2015

DAYS AND WEEKENDS – EMERGENCIES

Traffic Control Disruptions:

Order	Title	Name	24 Hour Phone #
1st	24 Hour Traffic Control	Update After Project Let	(###) ###-####

Roadway Problem Affecting the Traveling Public:

Order	Title	Name	Home Phone #	Cell Phone #
1st	Prime Contractor Superintendent	Update After Project Let		
2nd	Prime Contractor Foreman	Update After Project Let		
3rd	Project Leader	Doug Sina		(608) 216-3097
4th	Project Manager	David Layton		
5th	PDS Supervisor	Brenda Schoenfeld		
6th	PDS Manager			
7th	Dane County Commissioner	Gerald Mandli		

STANDARD WORKING HOURS

Field Office Location: Enter Field Office Location

Order	Title	Name	Office Phone #	Home Phone #	Cell Phone #
1st	Project Leader	Doug Sina			(608) 216-3097
2nd	Prime Contractor Superintendent	Update After Project Let			
3rd	Prime Contractor Foreman	Update After Project Let			
4th	Project Manager	David Layton			
5th	PDS Supervisor	Brenda Schoenfeld			
6th	PDS Manager				

Copies to: __PDS Supervisor, __Maintenance Supervisor, ___County Commissioner, __State Patrol, __County Emergency Dispatch, __City Emergency Dispatch

Post one copy in Field Office window

APPENDIX B

ALTERNATE ROUTES

INSERT SOMETHING SIMILAR TO EXAMPLE INCIDENT MANAGEMENT PLAN PROVIDED BY DAVID for the Tomah – Portage project

APPENDIX C

EMERGENCY ACCESS POINTS
&
CHANGEABLE MESSAGE SIGN LOCATIONS

DEVELOP LIST OF MAINTENANCE CROSSOVER LOCATIONS AND PERMANENT MESSAGE SIGN LOCATIONS

APPENDIX D

LOCATION MAPS

INSERT PROJECT LOCATION MAPS

APPENDIX E

LOCAL MEDIA SERVICES

Will develop list of media with Michael Bie

Appendix E2—WisDOT Incident Management Plan (IMP) Example 2.

NOTE - This document is for SWIG example purposes only.

It is Example #2 for the SWIG Work Zone Incident Management Plan

State Project ID 1071-06-77

MN State LN – USH 53/35

(Round Lake BR to Black River Br/WB RDWY)

State Project ID 1071-06-78

USH 53/35 – Theater Rd
Black River Br to Theater Road/WB RDWY
IH 90

Work Zone Incident Manual

April – November 2015

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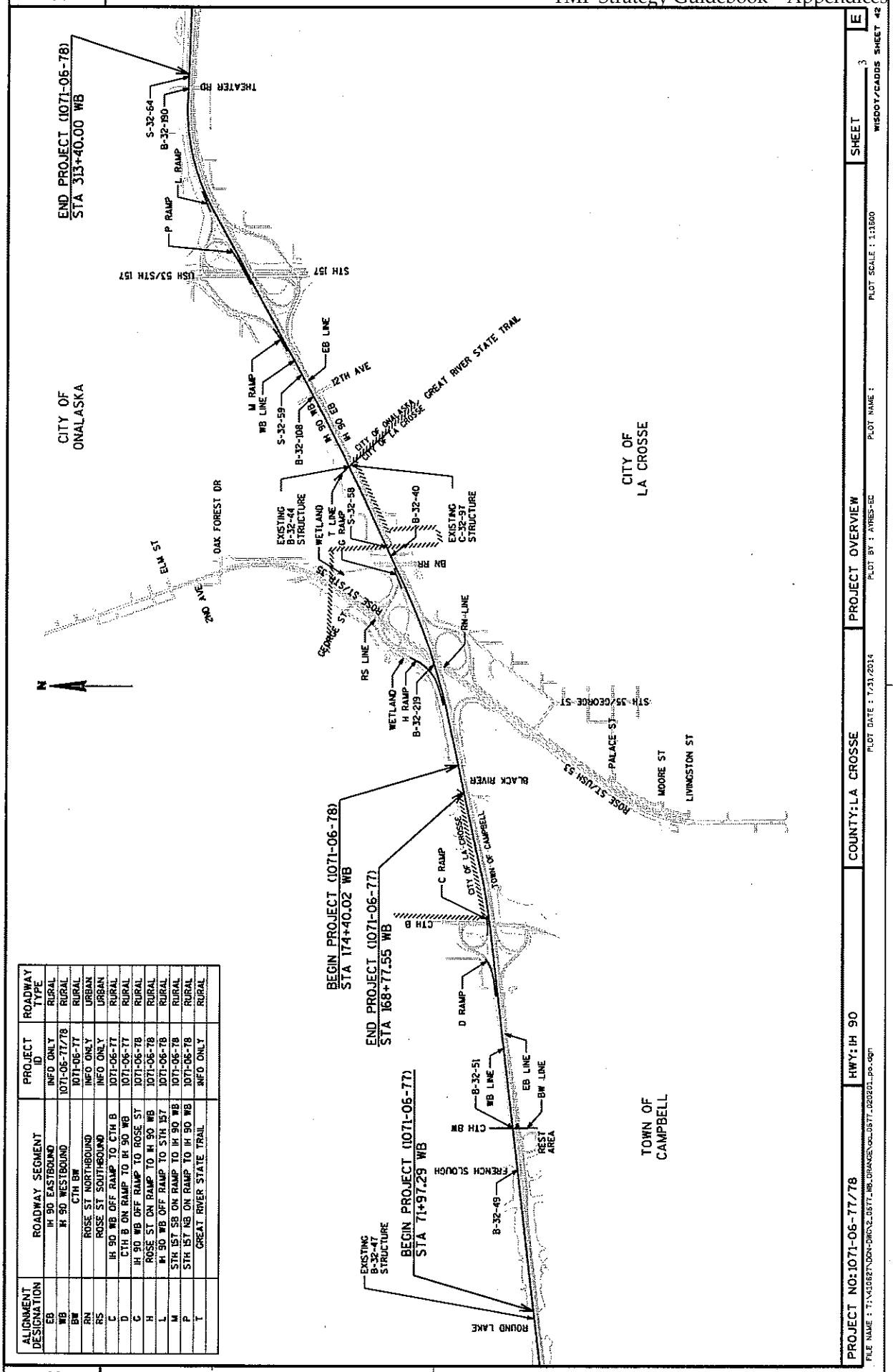
Appendices



ALIGNMENT DESIGNATION	ROADWAY SEGMENT	PROJECT ID	ROADWAY TYPE
EB	IH 90 EASTBOUND	INFO ONLY	RURAL
WB	IH 90 WESTBOUND	1071-06-77/78	RURAL
BW	CTH BW	1071-06-77	RURAL
RN	ROSE ST NORTHBOUND	INFO ONLY	URBAN
RS	ROSE ST SOUTHBOUND	INFO ONLY	URBAN
C	IH 90 WB OFF RAMP TO CTH B	1071-06-77	RURAL
D	CTH B ON RAMP TO IH 90 WB	1071-06-77	RURAL
G	IH 90 WB OFF RAMP TO ROSE ST	1071-06-78	RURAL
H	ROSE ST ON RAMP TO IH 90 WB	1071-06-78	RURAL
L	IH 90 WB OFF RAMP TO STH 157	1071-06-78	RURAL
M	STH 157 SB ON RAMP TO IH 90 WB	1071-06-78	RURAL
P	STH 157 NB ON RAMP TO IH 90 WB	1071-06-78	RURAL
T	GREAT RIVER STATE TRAIL	INFO ONLY	RURAL

Project Information

Project Summary:

1071-06-07(77) I-90 Project: Pavement replacement of the I-90 WB traffic lanes along with improved on-ramp and off-ramp geometrics. Also involves replacement of the deck, widening and raising of the CTH BW structure over I-90.A concrete overlay will be constructed on the I-90 WB structure over the French Slough.

1071-06-08(78) I-90 Project: Pavement replacement of the I-90 WB traffic lanes along with the construction of an auxiliary lane between Exit 3 and Exit 4.Improved on-ramp and off-ramp geometrics will also be included. The existing I-90 WB bridge over STH 35 will be removed and be replaced. Concrete overlays will be constructed on both the I-90 WB structures over 12th Ave and Theater Road will be done. 3 overhead sign structures will be included.

This project is scheduled for construction between April 2015 and November 15, 2015.

Anticipated Staging is as follows:

Stage 1

Maintain single lane bi-directional traffic from the Dresbach project on existing EB lanes to Rose Street. Maintain 2 lanes of traffic on IH 90 EB and WB from the East Rose Street ramps to West STH 157 ramps during peak hours. Switch WB traffic onto the TW line. Maintain a single lane bi-directional between the West and East ramps of STH 157 on existing EB lanes. Maintain 2 lanes EB and WB from STH 157 east ramps to end of project.

Switch traffic to the CT, DT, HT, HU, GT, JT, LT, and MT temporary ramps.

Close P ramp to traffic. Detour traffic on USH 53/STH 157 NB to Westbound Main Street to USH 53/STH 157 SB to the M Ramp.

Close STH 157 EB to I-90 EB ramp to traffic. Detour traffic on STH 157 EB to STH 16 EB to I-90 EB on ramp at Exit 5.

Close the rest area and rest area ramps.

Rolling stops will be required on Rose Street for the removal of the existing girders and the placement of the new girders for structure B-32-219.

Close CTH BW to traffic.

Stage 1A – Rose Street

Close the left or right shoulders on Rose Street Southbound lanes. Do not close both Rose Street Southbound shoulders at the same time. Use Off-Peak hour lane closures for construction activities.

Close the inside shoulder of the existing G Ramp.

All other Stage 1 traffic patterns remain.

Stage 1B/1C/1D – Rose Street

Shift Rose Street traffic onto the TS and TN lines. Shift traffic as necessary between layouts for Stage 1B/1C/1D for the removal of existing structure B-32-37 and the construction of Structure B-32-219. Maintain two lanes in each on Rose Street NB at all time during Peak Hours. Maintain one lane on Rose Street SB north of the GW ramp entrance and two lanes on Rose Street SB south of the GW ramp entrance during Peak Hours. Off-Peak lane closures will be allowed in Stage 1C and 1D.

All other Stage 1 traffic patterns remain.

Stage 2

Maintain single lane bi-directional traffic on EB lanes from the Dresbach project to Rose Street.

Keep WB lanes on the TW alignment.

Switch traffic to the CU, DU, HV, GU, LU, and MU temporary ramps.

Keep the P ramp closed to traffic using the same detour as Stage 1.

Keep rest area and rest area ramps closed.

Keep CTH BW closed to traffic.

Stage 3A/B

Switch IH 90 traffic to be a single lane of WB traffic on WB lanes and a single lane of EB traffic on EB lanes west of the Black River. Use the existing crossover on the west of the project if necessary to tie into the Dresbach Project traffic condition. Shift EB and WB traffic under CTH BW from outside to inside lane as necessary to complete overhead work. It is anticipated that traffic will need to shift under CTH BW multiple times during Stage 3A/B to accommodate work on the structure. Use existing cross over west of the Black River to switch traffic to single lane bi-directional on EB lanes. Maintain 2 lanes of traffic on IH 90 EB and WB from the east Rose Street ramps to west STH 157 ramps during peak hours. Switch WB Traffic onto the UW line.

Maintain 2 lanes on EB and one lane on WB from STH 157 east ramps to end of project during stage 3A.

Maintain 2 lanes EB and WB from STH 157 east ramps to end of project during stage 3B.

Keep traffic on the GU temporary ramps.

Close the HU ramp to traffic during stage 3A. Detour traffic via IH 90 EB to STH 157 NB to IH 90 WB. Reopen HU ramp to traffic during stage 3B.

Keep rest area and rest area ramps closed.

Keep CTH BW closed to traffic.

Rolling stops on IH-90 EB and IH-90 WB will be required for the placement of new beams at the BW structure.

Rolling stops on I-90 WB will be required for removing sign bridge Station 331+27 WB and the placement of new sign bridge S-32-64.

Stage 4A

Keep EB and WB traffic the same as in Stage 3A/3B from CTH B to the west. Switch WB lanes onto final WB lanes. Close the median lane of WB lanes from CTH B to the Railroad. Shift WB traffic from a median closure to an auxiliary lane closure west of the Great River State Trail. Open WB traffic to final condition east of STH 157 interchange. Keep EB traffic to one lane from beginning of the project to the east entrance ramp from Rose Street. Open EB traffic to final condition east of the Great River State Trail.

Open the H ramp, HW ramp, L ramp, and M Ramp to traffic.

Keep rest area and rest area ramps closed.

Stage 4B

Keep EB traffic the same as in Stage 4A from CTH B to the west. Switch EB traffic from a median lane closure to an outside lane closure west of the Black River. Keep EB traffic in final condition east of the Great River State Trail. Open WB traffic to final condition from the Railroad to the east.

Lane Closure Restrictions:

Peak and Off-Peak Hours are defined as follows:

IH 90 between STH 35 and STH 157

Peak Hours on WB lanes are from
Monday through Thursday - 2 PM to 6 PM
Friday 12 PM to Friday 7 PM
Sunday 12 PM to Sunday 5 PM

Peak Hours on EB lanes are from

Monday through Thursday - 2 PM to 6 PM
Friday 12 PM to Friday 7 PM
Sunday 12 PM to Sunday 5 PM
Off-Peak Hours are all other times.

IH 90 between STH 157 and STH 16

Peak Hours on WB lanes are from
Monday through Thursday - 2 PM to 6 PM
Friday 12 PM to Friday 7 PM
Off-Peak Hours are all other times.

IH 90: All other locations

Off-Peak Hours at all times.

Rose Street
Peak Hours on NB lanes are from
Monday through Friday - 5 AM to 9 AM
Monday through Friday 2 PM to 7 PM
Saturday and Sunday 5 AM to 7 PM

Peak Hours on SB lanes are from
Monday through Friday - 5 AM to 8 PM
Saturday and Sunday 5 AM to 8 PM
Off-Peak Hours are all other times.

There will be one traffic lane in each direction from the Dresbach Bridge project to Rose Street throughout the project. Contractor will maintain 2 lanes of traffic on IH 90 EB and WB from the East Rose Street ramps to West STH 16 ramps during peak hours.

Ramp P and STH 157 EB to I-90 EB on-ramp will be closed to traffic throughout project to reduce amount of merging traffic onto I-90 during construction.

At the beginning of construction of Westbound lanes from Station 204+00 to Station 206+00 Westbound, close STH 35/Rose Street Northbound to IH 90 Westbound ramp to traffic for a maximum of 21 calendar days. Actual closure dates depending on contractor schedule.

At the beginning of Stage 3A, keep IH 90 Westbound traffic to a single lane for a maximum of 21 calendar days. Actual closure dates depending on contractor schedule.

Holidays called out in special provision:

To ensure delays are minimal for motorists traveling, construction will not be allowed during the following events:

- *Memorial Day Weekend*
  - *Noon, May 22, 2015 – 6 AM, May 26, 2015*
- *Independence Day Weekend*
  - *Noon, July 3, 2015 – 6 AM, July 6, 2015*
- *Labor Day Weekend*
  - *Noon, September 4, 2015 – 6AM, September 8, 2015*
- *Oktoberfest (approximate dates, dates to be determined once event is closer)*
  - *Noon, October 1, 2015 – 6 AM, October 5, 2015*

The engineer will have the authority to restrict lane and ramp closures for other special events, as appropriate.

Extraordinary Traffic Surveillance and Enforcement:

The Department of Transportation's Division of Transportation System Development (DTSD) and the Division of State Patrol (DSP) have entered into agreement wherein the DSP will provide extraordinary traffic surveillance and enforcement in the construction zone. A typical schedule for the additional State Patrol presence is as follows:

Sunday: 1 car 3 pm - 8 pm
Monday: 1 car 7 am – 9 am & 3 pm – 8 pm
Tuesday: 1 car 7 am – 9 am & 3 pm – 8 pm
Wednesday: 1 car 7 am – 9 am & 3 pm – 8 pm
Thursday: 1 car 7 am – 9 am & 3 pm - 8 pm
Friday: 1 car 7 am – 9 am & 3 pm - 8 pm

The Division of State Patrol will continue to evaluate the zone and make adjustments to the schedule as traffic conditions dictate.

The Department of Transportation's Division of Transportation System Development (DTSD) has coordinated to provide a Statewide Freeway Service Team (FST) for the project from May 7, 2015 to November 30, 2015.

Contact Information:

Prairie Land Towing FST Truck # 20:	(414) 840-9453
La Crosse County Sheriff's Dispatch:	(608) 785-5942
WI State Patrol Dispatch, Tomah Post:	(608) 374-0512
WisDOT FST Program Manager, Randy Hoyt	(414) 227-4671
WisDOT FST Program Support, Scott Kozlik	(414) 227-2161

The schedule for the FST presence is as follows:

Sunday: 12 pm - 7 pm
Monday: 7 am – 10 am & 3 pm – 6 pm
Tuesday: 7 am – 10 am & 3 pm – 6 pm
Wednesday: 7 am – 10 am & 3 pm – 6 pm
Thursday: 7 am – 10 am & 3 pm – 6 pm

Friday: 7 am – 7 pm
Saturday: 11 am – 5 pm

Anticipated Delay Periods:

No delay anticipated due to off peak lane closures.

Project Lane Reduction Incident

Law Enforcement Checklist

- Contact dispatch to report any incident or backups and report:
    - Identify incident type.
    - Location of incident– Note if incident is in the work zone.
    - Indicate best route to incident.
    - Extent of backup.
    - Establish a field command post.
    - Affected Lanes
- Identify Incident Classification.
    - Minor – Less than 30 min incident duration.
    - Intermediate – 30 min to 2 hour incident duration.
    - Major – Greater than 2 hour incident duration.
- Initiate traffic control as appropriate.
    - If traffic message boards required. Contact:
        - STOC 1-800-375-7302.
    - If construction traffic control modifications required. Contact: Central State Signing.
        - 24 Contact: 608-792-6839
- Inform media of freeway incident (TIA) – Note if incident is in the work zone.
- Tomah Dispatch will contact STOC 1-800-375-7302 and advise of the above information.
- If specialized equipment is needed, contact:
    - Contractor
    - La Crosse County Highway Department via 911 Dispatch.
- At the conclusion of the incident make appropriate demobilization notifications.
- After incident and/or backup ensure message boards are returned to lower level or normal configuration.

(See Appendix A for Emergency Contacts)

Project Lane Reduction Incident

STOC Checklist

- When receiving call from law enforcement ensure they provide the following:
    - Location of incident – Note if incident is in the work zone.
    - Affected lanes.
    - Incident Type.
    - Approximate incident duration.
    - Extent of backup (Level 1, 2 or 3)
- Must have immediate contact with:
    - Regional Incident Management Coordinator (RIMC) for an incident blocking all lanes in one or both directions for 2 hours or more.
    - Regional Incident Management Coordinator (RIMC) for backups with or without incidents greater than 3 miles.
    - Public Information Officer (PIO), if available.
    - SINS e-mail sent for any incident blocking 50% or more of the highway lanes and/or a system ramp.
    - Appropriate agencies per IH 90 Alternate Route Operations Guide.

(See Appendix A for Emergency Contacts)

- Change traveler information in the following order:
    - Message Boards.
    - Place 511 message if necessary.
- Once Alternate Routes are implemented, review the alternate route guides for additional notifications.

(See Appendix B for Alternate Routes)

- After incident and/or backup ensure message boards are returned to lower level or normal configuration.

Project Lane Reduction Incident

Regional Incident Management Coordinator (RIMC) Checklist

- RIMC will contact Project Leader as situation warrants. (Contact information provided by STOC.)
- RIMC will contact event incident commander or State Patrol Duty Sergeant as situation warrants.
- RIMC will function as liaison for County Highway Departments.
- RIMC will contact DTSD Regional Duty Officer at backups of 5 miles or as situation warrants.
- RIMC will perform regular check ins.

Project Leader Checklist

- Project Leader will contact event incident commander or State Patrol Duty Sergeant as situation warrants.
- Project Leader will function as liaison for Contractors.
- Project Leader will contact Project Manager and/or Project Supervisor at backups of 5 miles or as situation warrants.

Regional Duty Officer Checklist

- RDO may coordinate project resources with Contractor or Regional Staff as situation warrants.
- RDO will coordinate media release as situation warrants.
- RDO will mitigate traffic delays if possible.

(See Appendix A for Emergency Contacts)

Project Lane Reduction Incident Levels

Backup Levels

Level 1 Incident: 5 mile or greater backup.
Level 2 Incident: 3 – 4 mile backup.
Level 3 Incident: 1 – 2 mile backup.

Ramp Closure Locations For Incidents That Block Freeways

Ramp closures to be ordered by Incident Commander.

Ramp Closures Locations will be dependent on the location of the incident within the project work zone and the alternate route/routes chosen to be deployed. Please refer to Appendix B and the **I-90 Corridor – La Crosse Alternate Route Operations Guide** for additional guidance.

ALTERNATE ROUTES

Alternate route/routes will be dependent on the location of the incident within the project work zone and the alternate route chosen to be deployed. Please refer to Appendix B and the **I-90 Corridor – La Crosse Alternate Route Operations Guide** for additional guidance.

Please Note due to the length and location of potential construction zones it will be required at times to combine alternate routes from the guide.

(See Appendix B for Alternate Routes)

Note that there are 2 on ramps at Exit 4 that are being detoured. That would affect the Alternate Routes in Appendix B.

MESSAGE ACTIVATION PLAN FOR OPERATIONAL BACKUPS – no incident

Message Board Activation Contact STOC 1-800-375-7302

Level 1 Backup: Activate Message Board.
Level 2 Backup: Activate Message Board.
Level 3 Backup: Activate Message Board.

- **Message Board:** Traffic Stopped Ahead/Be Prepared to Stop

MESSAGE ACTIVATION PLAN FOR OPERATIONAL BACKUPS – Incident

Message Board Activation Contact STOC 1-800-375-7302

Level 1 Backup: Activate Message Board.
Level 2 Backup: Activate Message Board.
Level 3 Backup: Activate Message Board.

- **Message Board:** Incident Ahead Use/Alternate Route Exit **XX**
  - XX - Alternate Route Exit Location will depend on the location of the message board and alternate route chosen to be deployed.

MESSAGE ACTIVATION PLAN FOR INCIDENT – Blocked Freeway

Message Board Activation Contact STOC 1-800-375-7302

Same as for Operational Backups – Incident

APPENDIX A

EMERGENCY CONTACT INFORMATION

EMERGENCY CONTACT LIST

AGENCY	CONTACT	OFFICE	CELL/OTHER
STATE TRAFFIC OPERATIONS CENTER (STOC)			
STOC		800-375-7302 (24 hour)	414-227-2166 (Office)
	Connie Catterall		253-617-8049 (cell)
	Anne Reshadi	414-227-2149	414-750-7936 (cell)
LAW ENFORCEMENT			
State Patrol Dispatch - Tomah		608-374-0512	
La Crosse County Sheriff/Dispatch Center		608-785-9634	
La Crosse Police Department		608-785-9634	
Onalaska Police Department		608-785-9634	
West Salem Police Department		608-785-9634	
Town of Campbell/Dispatch		608-785-5942	
SOUTHWEST REGION MANAGEMENT			
Regional Duty Officer		608-516-6479 (24 hour)	
Regional Incident Management Coordinator (RIMC)		608-498-1859 (24 hour)	
DOT Supervisor - PDS	Jim Savoldelli	(608)-785-9063	(608)-792-2055
DOT Manager - PDS	Jim Rohe	(608)-785-9038	(608)-792-7125
SW Regional Director	Dave Vieth	(608)-246-5443	(608)-516-6323
Maintenance Supervisor	Rick Vydrzal	(608)-785-9043	(608)-792-5703
Traffic Supervisor	Karen Olson	(608)-785-9057	(608)-792-7479
COUNTY PERSONNEL			
La Crosse County Commissioner	Ron Chamberlain	608-786-3810	608-792-5260
PROJECT STAFF			
Project Field Office			
Project Leader	Chris Dahl		(608)-792-5809
Project Manager	Rob Winterton	(608)-789-7879	
PRIME CONTRACTOR			
Lunda Construction Co.	Dan Savoy		715-299-5659
	Jason Sterry		715-299-6820
TRAFFIC CONTROL - GENERAL			
Central State Signing	Brian		608-792-6839
Central State Signing	Michael		715-570-0321
TRAFFIC CONTROL - MESSAGE BOARDS			
STOC		1-800-375-7302	
OTHER DOT TRAFFIC/EMERGENCY CONTACTS			
DOT Maintenance	John Mueller	608-789-7877	608-792-3348
DOT Traffic	Andy Winga	608-785-9061	608-792-0563
DOT Public Information Officer	Michael Bie	608-246-7928	

CONSTRUCTION PROJECT CONTACT LIST

Project Description: 1071-06-77/78
MN State Line - Theater Road
IH 90
La Crosse County

Effective Dates: 3/23/2015 to 11/15/2015

NIGHTS AND WEEKENDS - EMERGENCIES

Traffic Control Disruptions:

Order	Title	Name	24 Hour Phone #
1st	24 Hour Traffic Control	*Central State Signing (Brian)*	*(608) 792-6839*
2nd	24 Hour Traffic Control	*Central State Signing (Michael)*	*(715) 570-0321*

Roadway or Bridge Problem Affecting the Traveling Public

Order	Title	Name	Home Phone #	Cell Phone # or Pager #
1st	Prime Contractor Superint.	*Dan Savoy*		*715-299-5659*
2nd	Prime Contractor Foreman	*Jason Sterry*		*715-299-6820*
3rd	Project Leader	*Chris Dahl*	*(608) 317-1296*	*(608) 792-5809*
4th	Project Manager	*Rob Winterton*	*(608)487-3562*	*(608) 487-3562*
5th	PDS Supervisor	*Jim Savoldelli*	*(608) 784-6710*	*(608) 792-2055*
6th	PDS Manager	*Jim Rohe*	*(608) 781-4672*	*(608) 792-7125*
7th	County Commissioner	*Ron Chamberlain*	*(608)786-3810*	*(608)786-3810*

STANDARD WORKING HOURS

Field Office Location:

Order	Title	Name	Office Phone #	Cell Phone #	Home Phone #
1st	Field Office Project Leader	Chris Dahl	(608) 789-5677	(608) 792-5809	(608) 317-1296
2nd	Prime Contractor Superint.	*Dan Savoy*	(715) 284-9491	715-299-5659	
3rd	Prime Contractor Foreman	*Jason Sterry*	(715) 284-9491	715-299-6820	
4th	Project Manager	*Rob Winterton*	(608) 789-7879	(608) 487-3562	*(608)487-3562*
5th	PDS Supervisor	*Jim Savoldelli*	(608) 785-9063	(608) 792-2055	(608) 784-6710
6th	PDS Manager	*Jim Rohe*	(608) 785-9038	(608) 792-7125	(608) 781-4672

Copies to: ___PDS Supervisor, ___Maintenance Supervisor, ___County Commissioner, ___State Patrol, ___City/County Emergency Dispatch, ___Grace Bernu

Post one copy in Field Office Window

5/1/2015

CONTACT FOR MESSAGE BOARDS:

Minnesota Department of Transportation

Memorandum

Construction Office
2900 – 48th St. N.W.
Rochester, MN 55901-5848

Mark Panek, ADE East District Operations– 507/446-5503
Gary L. Lovelace, East District Operations Resident Engineer - 507/286-7530
Construction Office - 507/286-7508
Office Fax - 507/285-7465

Date: April 10, 2013

To: Law Enforcement Officers
Kari Tompkins, Radio Communication Supervisor, State Patrol Office

From: Terry L. Ward
Project Engineer

Subject: **Maintenance of Traffic Control Devices**
S.P. 8580-149 (I90)
Dresbach Bridge Project
On Interstate 90 at the junction with Trunk Highway 61 at the Mississippi River in Winona and La Crosse Counties

Contract work on the above referenced project is starting in 2013 and is schedule to be completed in 2017. The Prime Contractor on this contract is Ames Construction. This work includes construction of two new Mississippi River Bridges, removal of the existing bridge and construction of the Minnesota and Wisconsin approach roadways.

Should any installation be damaged by traffic, weather, vandals or any other cause, please contact:

During working hours, week-ends and non-working hours, please contact:

Name	Phone Number
Grayson Awtry	(612) 387-3292
Gene Haaland	(612) 919-4522
Zach Huhmann	(612) 919-2677

Again, this project is expected to be completed by 2017.

Please notify your radio dispatchers and post this information on your bulletin boards.

cc: Captain Mark Holm, State Patrol District 2100 Rochester
Winona County Sheriff
La Crosse County Sheriff
Ames Construction
City of La Crosse
City of La Crescent
MnDOT District Traffic Office
MnDOT Permits Department
Tony VanderWielen, WISDOT Project Contact
File

APPENDIX B

ALTERNATE ROUTES

SEGMENT 275-3 – ORANGE ALTERNATE ROUTES

EB SEGMENT M.P. 275-3

WB SEGMENT M.P. 3-275

BACK | NEXT

HOME

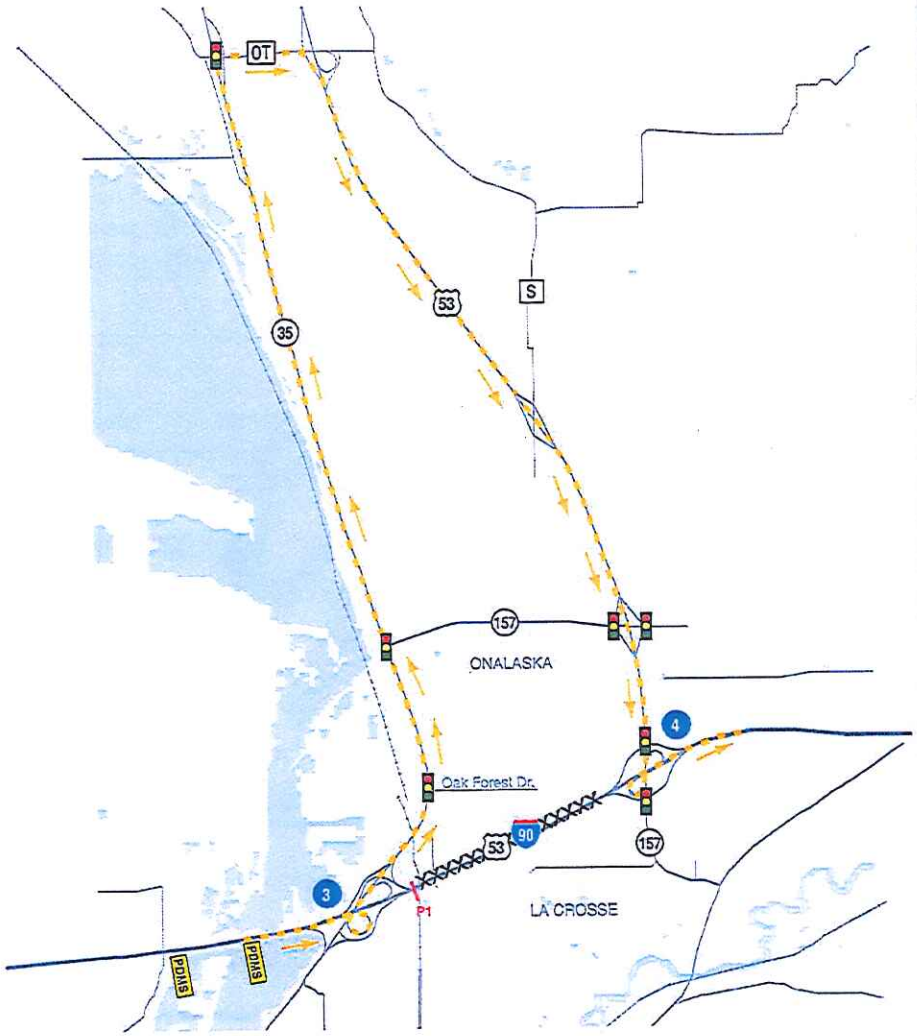
ROUTE DESCRIPTIONS

All Responders Use WISPERN/MARC 1

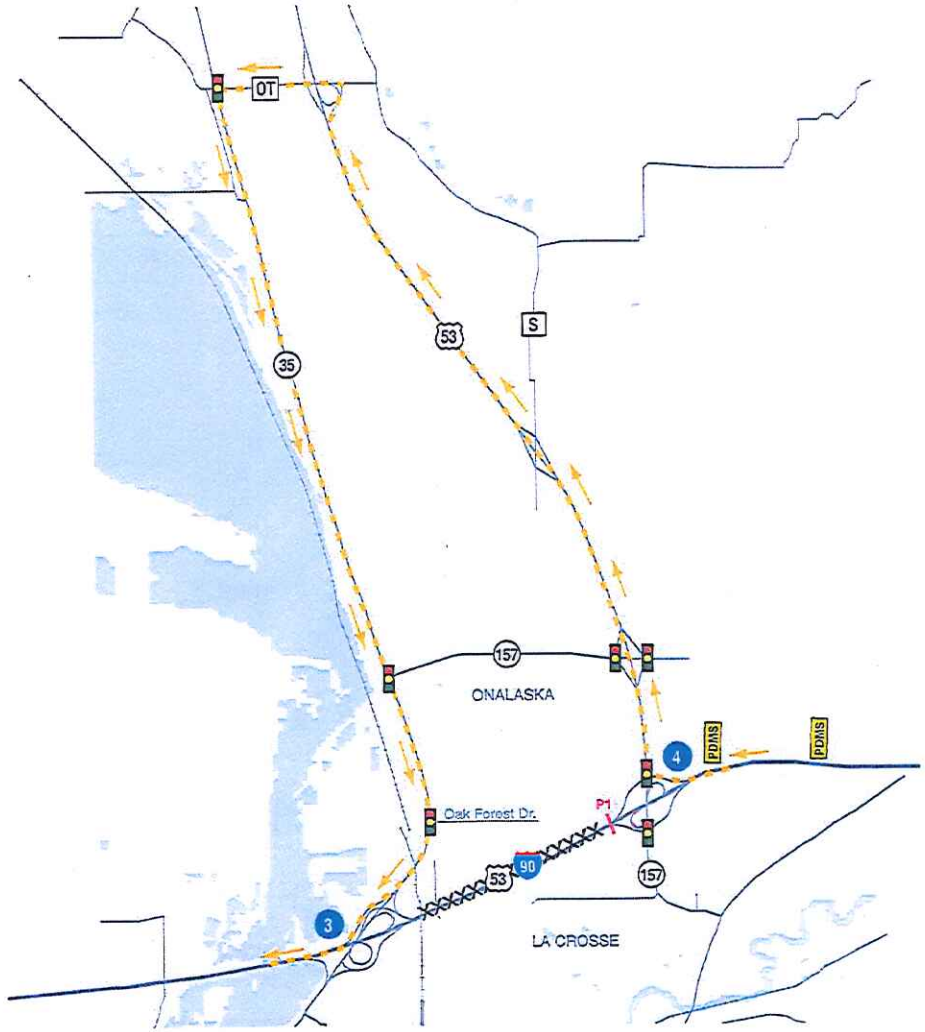
SmartWays

SEGMENT 3-4 – YELLOW ALTERNATE ROUTES

EB SEGMENT M.P. 3-4



WB SEGMENT M.P. 4-3



BACK | NEXT
HOME
ROUTE DESCRIPTIONS

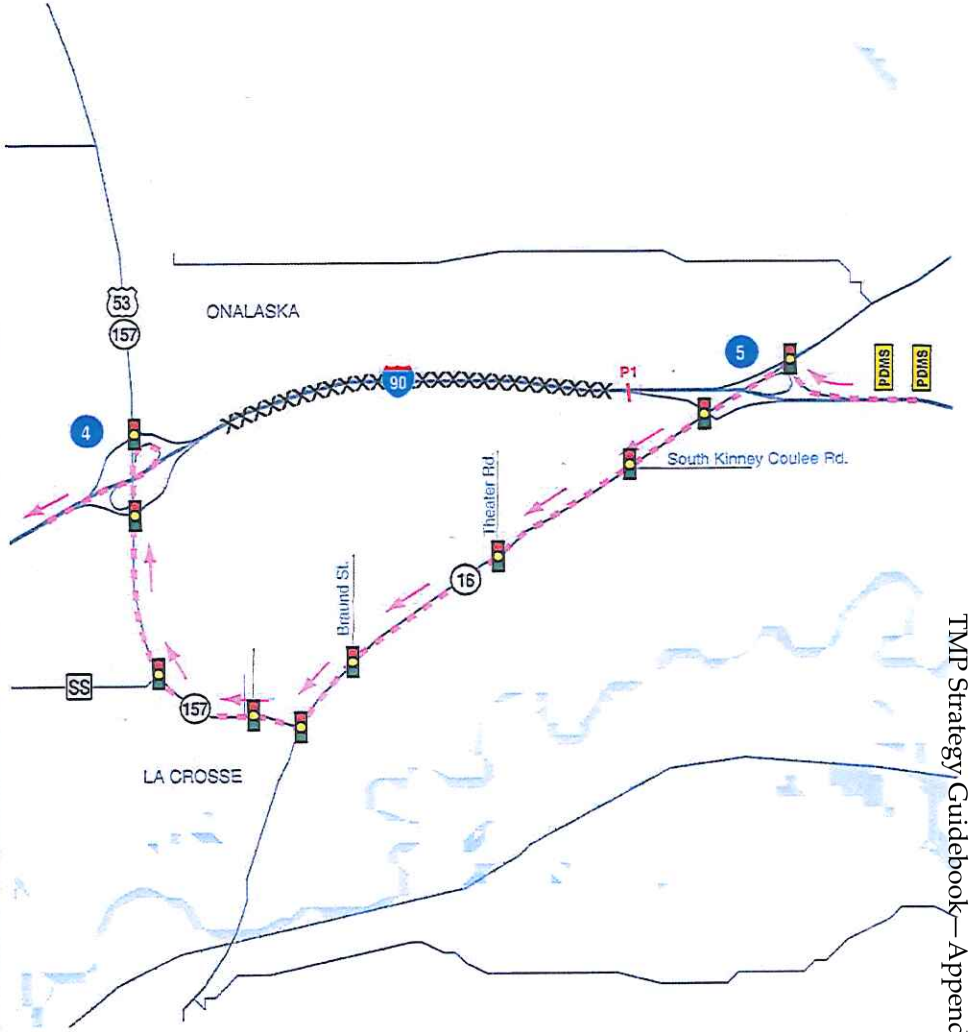
All Responders Use WISPERN/MARC 1

SmartWays

SEGMENT 4-5 – PINK ALTERNATE ROUTES

EB SEGMENT M.P. 4-5

WB SEGMENT M.P. 5-4

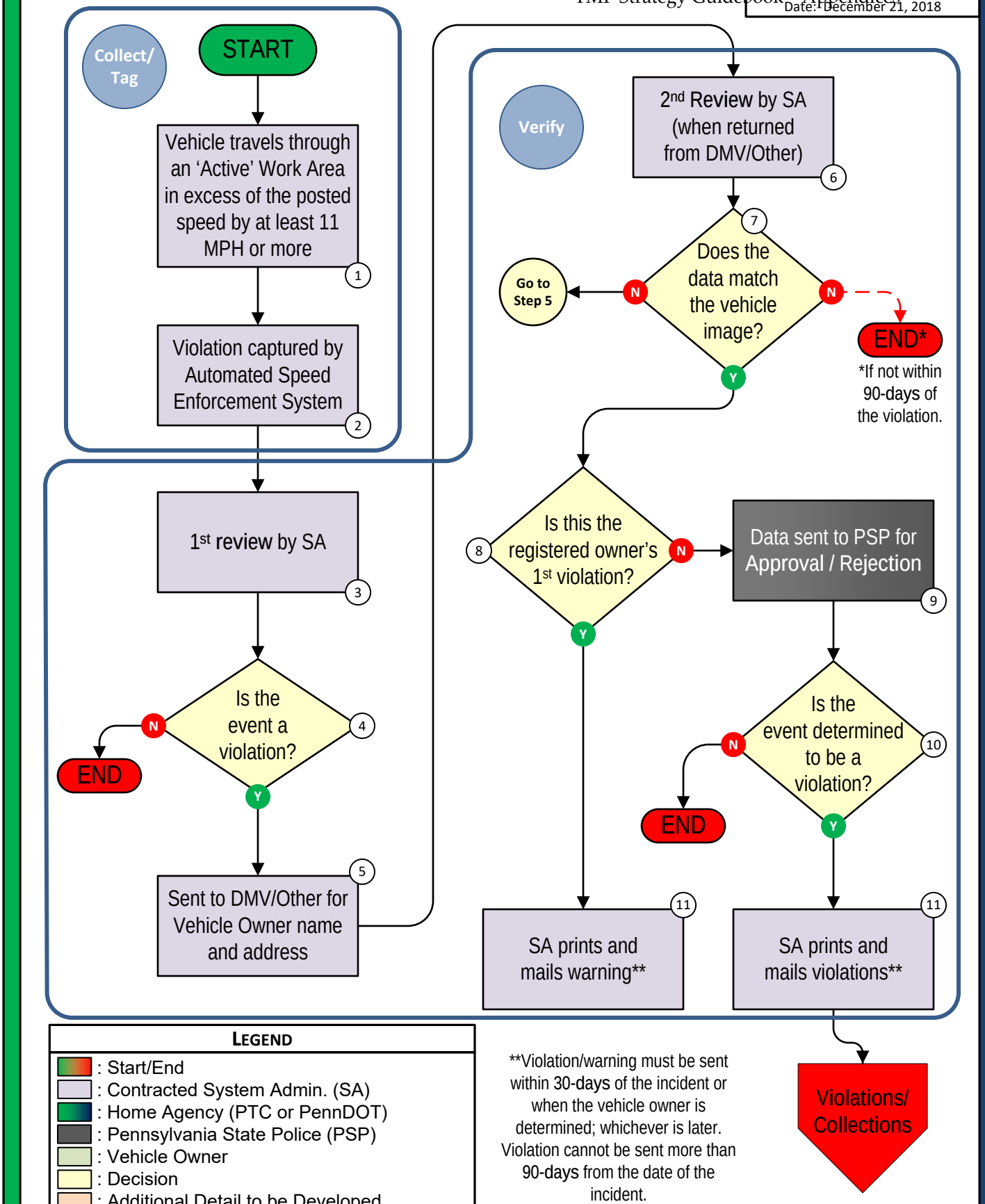


BACK | NEXT HOME ROUTE DESCRIPTIONS

All Responders Use WISPERN/MARC 1

SmartWays

Appendix F—PennDOT Automated Work Zone Speed Enforcement Program Operation Process Flow Chart.

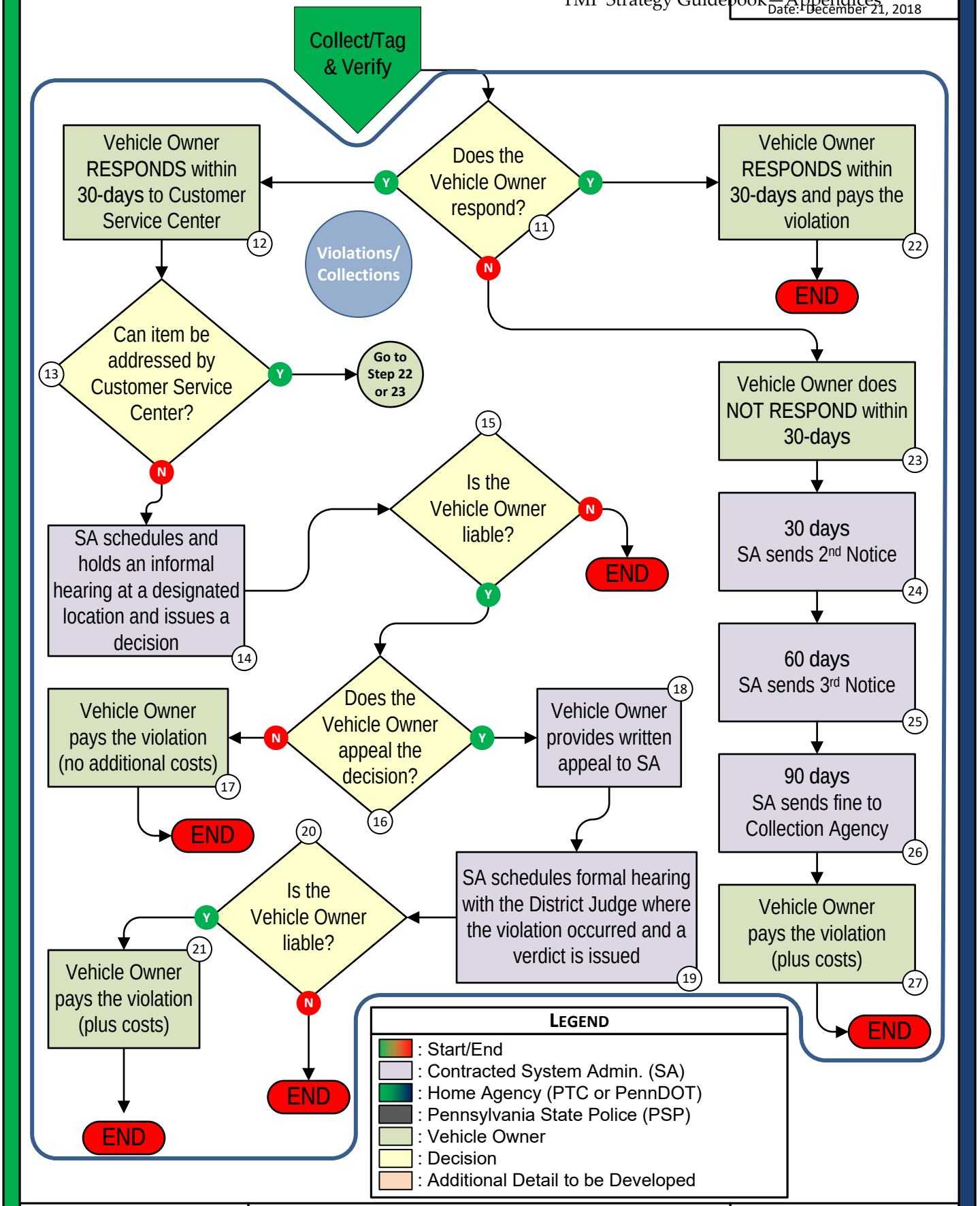


Michael Baker INTERNATIONAL

Michael Baker Project No.: 167168

OPERATIONS PROCESS
(COLLECT/TAG AND VERIFY)
Automated Work Zone Speed Enforcement Program

PENNA TURN PIKE



Michael Baker INTERNATIONAL

Michael Baker Project No.: 167168

OPERATIONS PROCESS (CONTINUED)

(VIOLATIONS/COLLECTIONS)

Automated Work Zone Speed Enforcement Program

PENNA TURN PIKE

Appendix G—CDOT Full Road Closure Worksheets.

Step 1 Worksheet
Full Closure

COLORADO
Department of Transportation

Closure Scenario

State Highway Number	
Milepoint Limits of section to be closed	
Physical length of closed section (miles)	
Direction of closed section (if divided highway)	
Number of Travel Lanes to be closed	
Average Annual Daily Traffic (AADT) – highest recorded within the closure area (vehicles per day)	
CDOT Access Category	
Statewide Functional Classification	
Current weekday lane closure allowed hours	

Type, Schedule and Duration of Closure

Date(s) of closure	
Hours of closure	
Number of exclusive private/business accesses to the highway within closed area	
Activities planned to take place within closed area:	

Proposed Detour Route(s)

Roads to be used:	
Functional Classification of Detour roads:	
Mileage of detour route:	
Will the detour route use local roadways (i.e., non-state highways)?	
Which agencies could be involved?	
Have the agencies been contacted?	

Map of state highway segment(s) to be closed (may also be provided as attachment):

Additional Questions

1. How many days in advance can the public be made aware of the closure?

< 1 week	☐
1-2 weeks	☐
>2 weeks	☐

2. How might the closure affect emergency response?

The comparable length detour onto a lower classification roadway could cause minor delays for emergency response.

BENEFITS OF CLOSURE

Please estimate the time and cost savings anticipated to occur with implementation of the proposed full closure:

Benefit Category	Without full closure	With full closure	Savings
Time			
Cost			

Describe any other benefits of the proposed full closure. Possible benefits for consideration include:

a) Reduced construction time
b) Avoiding night work
c) Better construction efficiency
d) Enhanced worker safety
e) Enhanced traveler safety
f) Reduced cost of construction/maintenance
g) Potential to accommodate additional projects and/or maintenance activities
h) Better quality product
i) Less time spent setting up and taking down traffic control devices

Description of benefits:

PROPOSED DETOUR MAP(S) (insert image(s) below)

ADDITIONAL INFORMATION

CDOT USE ONLY BELOW LINE:

Advance to Level 2? (Yes, No)

CDOT Step One Evaluation Form
Full Closure

COLORADO
Department of Transportation

CLOSURE SCENARIO:	CDOT TRAFFIC DECISION:

	Category	Favorable	Fair	Unfavorable	Notes
1	Impact to traffic	☐	☐	☐	
2	Functional equivalence of detour roadways	☐	☐	☐	
3	Use of state highways as detour routes	☐	☐	☐	
4	Impacts to businesses and local access	☐	☐	☐	
5	Travel distance added by detour	☐	☐	☐	
6	Local agency coordination	☐	☐	☐	
7	Advance public notice	☐	☐	☐	
8	Potential for diversion out of area	☐	☐	☐	
9	Construction time savings	☐	☐	☐	
10	Ability to do additional work	☐	☐	☐	
11	Other considerations	☐	☐	☐	

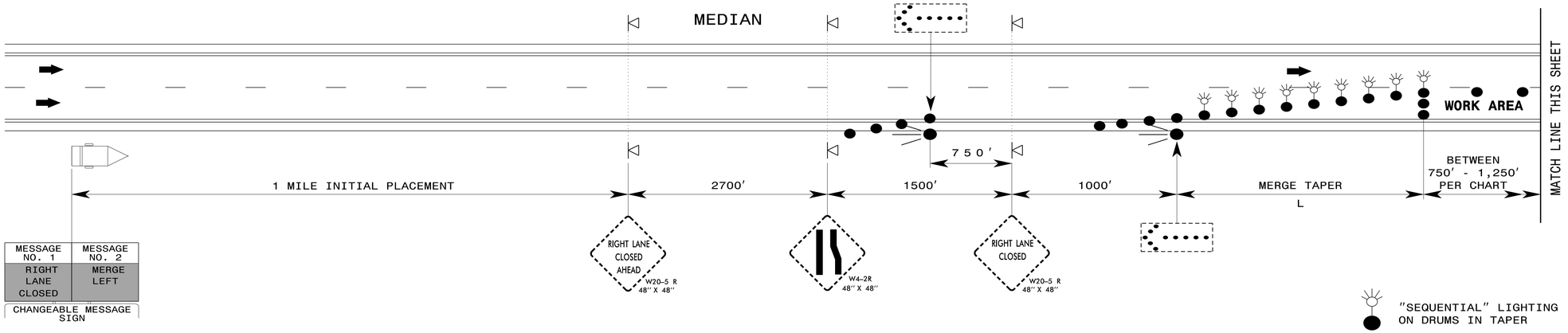
Step One Evaluation Form
Full Closure

Category	No Additional Analysis	Additional Analyses/ detail	If needed, nature of analyses/detail
1. Impact to traffic	☐	☐	
2. Functional equivalence of detour roadways	☐	☐	
3. Use of state highways as detour routes	☐	☐	
4. Impacts to businesses and local access	☐	☐	
5. Travel distance added by detour	☐	☐	
6. Local agency coordination	☐	☐	
7. Advance public notice	☐	☐	
8. Potential for diversion out of area	☐	☐	
9. Construction time savings	☐	☐	
10. Ability to do additional work	☐	☐	
OTHER INFORMATION	☐	☐	

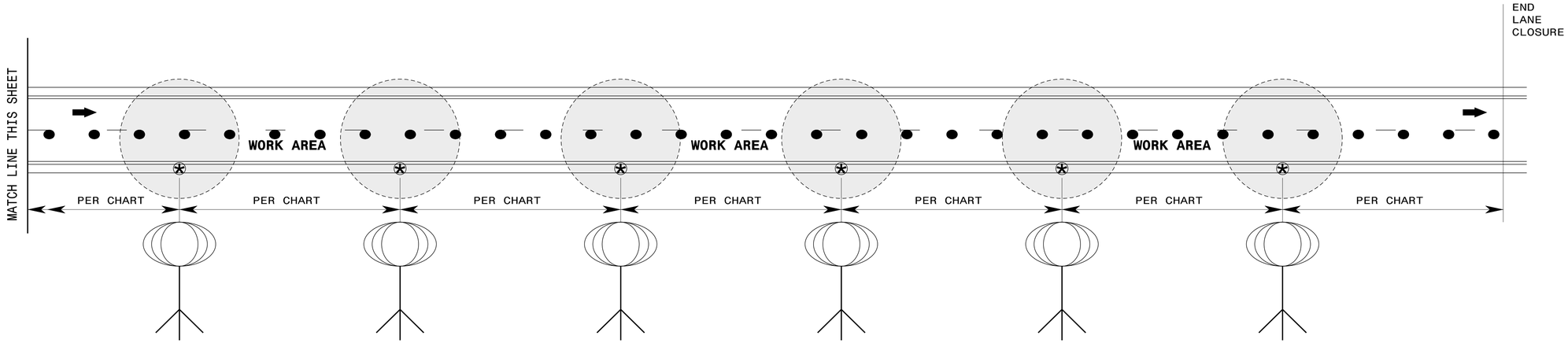
Appendix H—NCDOT Presence Lighting Standard Typical.

PROJ. REFERENCE NO.	SHEET NO.
I-5729	TMP-3

ADVANCE WARNING AREA



WORK ZONE AREA



LOCATE ON SHOULDERS

SPACING CHART

LIGHT OUTPUT (LUMENS)	MINIMUM LIGHTED FIXTURE AREA (SQUARE FEET)	MAXIMUM SPACING (FEET)	LIGHT UNITS (PER MILE)
50,000 TO 65,000	5.5	750'	6
66,000 TO 80,000	5.5	1,000'	5
81,000 TO 100,000	36	1,250'	4

NOTES

1) SPACE LIGHT UNITS ACCORDING TO THE CHART.

2) EACH LIGHT UNIT SHALL BE CAPABLE OF ELEVATING TO A MINIMUM HEIGHT OF 14' ABOVE THE PAVEMENT.

3) PLACE ON PAVED SHOULDER IF POSSIBLE.

DIVISION OF HIGHWAYS
STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
WORK ZONE TRAFFIC CONTROL

WORK ZONE "PRESENCE" LIGHTING

8/12/2016
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User:keddis

Appendix I1—Illinois DOT Special Provisions for Speed Display Trailer.

Illinois Department of Transportation

Memorandum

To:	Regional Engineers
From:	Maureen M. Addis MA
Subject:	Special Provision for Speed Display Trailer
Date:	September 30, 2016

This special provision was developed by the Bureau of Safety Programs and Engineering to enhance safety of the traveling public and workers in work zones by alerting drivers of their speed, thus deterring them from driving above the posted work zone speed limit. This special provision has been revised to allow the addition of speed display trailers to be specified in a contract.

This special provision should be inserted into all freeway and expressway projects involving Highway Standard 701400 and other contracts at the districts discretion requiring speed display trailers.

The districts should include the BDE Check Sheet marked with the applicable special provisions for the January 20, 2017 and subsequent lettings. The Project Development and Implementation Section will include a copy in the contract.

This special provision will be available on the transfer directory September 30, 2016.

80340m

SPEED DISPLAY TRAILER (BDE)

Effective: April 2, 2014
Revised: January 1, 2017

Revise the third paragraph of Article 701.11 of the Standard Specifications to read:

"When not being utilized to inform and direct traffic, sign trailers, speed display trailers, arrow boards, and portable changeable message boards shall be treated as nonoperating equipment."

Add the following to Article 701.15 of the Standard Specifications:

"(m) Speed Display Trailer. A speed display trailer is used to enhance safety of the traveling public and workers in work zones by alerting drivers of their speed, thus deterring them from driving above the posted work zone speed limit."

Add the following to Article 701.20 of the Standard Specifications:

"(k) When speed display trailers are shown on the Standard, this work will not be paid for separately but shall be considered as included in the cost of the Standard.

For all other speed display trailers, this work will be paid for at the contract unit price per calendar month or fraction thereof for each trailer as SPEED DISPLAY TRAILER."

Add the following to Article 1106.02 of the Standard Specifications:

"(o) Speed Display Trailer. The speed display trailer shall consist of a LED speed indicator display with self-contained, one-direction radar mounted on an orange see-through trailer. The height of the display and radar shall be such that it will function and be visible when located behind concrete barrier.

The speed measurement shall be by radar and provide a minimum detection distance of 1000 ft (300 m). The radar shall have an accuracy of ±1 mile per hour.

The speed indicator display shall face approaching traffic and shall have a sign legend of "YOUR SPEED" immediately above or below the speed display. The sign letters shall be between 5 and 8 in. (125 and 200 mm) in height. The digital speed display shall show two digits (00 to 99) in mph. The color of the changeable message legend shall be a yellow legend on a black background. The minimum height of the numerals shall be 18 in. (450 mm), and the nominal legibility distance shall be at least 750 ft (250 m).

The speed indicator display shall be equipped with a violation alert that flashes the displayed detected speed when the work zone posted speed limit is exceeded. The speed indicator shall have a maximum speed cutoff. On roadway facilities with a normal posted speed limit greater than or equal to 45 mph, the detected speeds of vehicles traveling more than 25 mph over the work zone speed limit shall not be displayed. On facilities with normal posted speed limit of less than 45 mph, the detected speeds of vehicles traveling more than 15 mph over the work zone speeds limit shall not be

displayed. On any roadway facility if detected speeds are less than 25 mph, they shall not be displayed. The display shall include automatic dimming for nighttime operation.

The speed indicator measurement and display functions shall be equipped with the power supply capable of providing 24 hours of uninterrupted service."

80340

Appendix I2—Iowa DOT Special Provisions for Speed Feedback Trailers.

SP-150166
(New)

SPECIAL PROVISIONS
FOR
SPEED FEEDBACK TRAILERS

Warren County
IM-NHS-035-2(378)54--03-91

Effective Date
December 20, 2016

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

150166.01 DESCRIPTION.

A. Scope of Work.
The work shall consist of installing, maintaining, and monitoring speed feedback trailers designated on the project drawings and as specified herein.

B. Definitions.

1. Speed Feedback Trailer.
Speed feedback trailers are mobile devices capable of capturing vehicle speed for oncoming traffic.

2. Display.
The Display is a device capable of connecting to the speed feedback trailer capable of broadcasting the speed of oncoming traffic captured by the speed feedback trailer. This device allows for vehicle speed feedback to the vehicle operator, allowing for speed adjustment throughout the remainder of the work zone.

150166.02 MATERIALS.

A. Power System.

1. Solar power system shall charge and maintain batteries automatically without intervention, designed for year round deployment in Iowa assuming minimal solar charging during winter months.

2. No component shall create a shadow on any portion of the solar panels.

3. Battery box shall be lockable to prevent unauthorized access.

B. Speed Display and Behavior.

1. Display shall be two digits displayed in miles per hour.

2. Character units shall be of one font and a minimum of 24 inches in height.

3. Legibility, must be able to determine numbers from 1/4 mile.

4. Visibility, must be able to determine if the sign is on from 1/2 mile.

5. Display shall have the ability to:
- **a.** Continuously show the speed of an approaching vehicle and not flash regardless of speed limit or preset thresholds.
- **b.** 0 to 50% of speed limit setting –Display is blank.
- **c.** 50% to 130% of speed setting –Display shows vehicle speed.

C. LEDs.

1. Requirements.
- **a.** Color range, Amber, 589.5 to 592.0 nm.
- **b.** Operating temperature -20º to 212ºF.
- **c.** Viewing angle, minimum 30 degrees (15 degrees each side of the viewing axis).

2. Brightness shall vary for optimal viewing and power consumption based on ambient light. System will automatically adjust the brightness of the LEDs.

D. Controls.

1. System shall use an LCD display, keyboard, Rotary switches or other means to set and view operating modes, matrix displayed speed, error codes and other system information.

2. LED indicators (or similar) signify power is on, the solar charging system is active, activated alarms need for checking, battery charge is low, and power failure.

E. Operating Modes.

1. Off.
Except for the charging system the entire unit is off. Solar panels will continue to charge batteries in this position.

2. Run.
Normal operating mode.

3. Speed Limit Settings.
10 to 70 mph in 5 mph increments.

F. Radar.

1. K-Band, approach-only senses the largest, nearest mass moving toward it.

2. 10 to 99 mph speed range.

3. 1000 foot range.

4. Centered antenna head for maximum effectiveness regardless of which side of road the trailer is being used.

G. Regulatory Sign.

1. System shall include a regulatory speed limit sign with interchangeable speed limit numbers. Numbers shall be supplied in quantities necessary to display a speed range of 10 to 70 mph in 5 mph increments. Numbers not in use shall store in the trailer's battery box.

2. Sign Requirements.
- **a.** Size, 30 inches by 36 inches (W x H)
- **b.** Color, black characters on white background.
- **c.** Mounting Height, minimum 5 feet measured from ground to bottom of sign.
- **d.** Material, 0.063 inch minimum, tempered aluminum sheet with high-intensity reflective coating.

150166.03 CONSTRUCTION.
Furnish, place, operate (when specified), and maintain speed feedback trailer at locations shown on the plans. The Contractor maintains possession of speed feedback trailer upon completion of the project.

A. Testing and Configuration.

1. Physical and electronic access to speed feedback trailer shall be granted to the Engineer.

2. At least 1 week before speed feedback trailer is deployed to a project, a testing and configuration meeting with the Engineer shall be held.

3. The Engineer, in conjunction with the Contractor, will perform necessary configuration adjustments to the speed feedback trailer.

B. Direct Operation.
Speed feedback trailer will be operated directly by either the Contractor or the Engineer.

C. Maintenance.

1. Provide preventive maintenance necessary to achieve uninterrupted service.

2. Verify operational status each day as part of the daily diary and notify Engineer when a problem is detected.

3. Provide unscheduled maintenance or total replacement of sign when sign is unable to display a message adequately within 24 hours of notification. Action shall be taken to resolve the following problems if they have been visually observed or confirmed by self diagnostics by the speed feedback trailer for 3 continuous days or 7 intermittent days over a 2 week period.
- **a.** An entire pixel board is showing failure.
- **b.** Five or more pixel failures over entire message panel anytime while sign is deployed for use (blank or displaying a message).
- **c.** Two or more pixel failures in any character when displaying the speed.

4. If service is not restored within 24 hours, Engineer will cause such work to be performed as may be necessary to provide this service. The cost for this restoration shall be borne by the Contractor.

150166.04 METHOD OF MEASUREMENT.
The Engineer will count the number of days each Speed Feedback Trailer is required to be in place along a road and capable of displaying messages to the traveling public. Days when speed feedback trailer is blank and is in good working condition, will be measured. Days when speed feedback trailer is unable to display the speed due to mechanical problems will not be measured. Days when speed feedback trailer is on the roadway and not approved by the Engineer will not be measured.

150166.05 BASIS OF PAYMENT.

Payment will be at the contract unit price per calendar day for each Speed Feedback Trailer measured. Payment is full compensation for furnishing, placing, operation (when specified), and maintenance of speed feedback trailer. Payment includes the cost of preventative and unscheduled maintenance, on-board software, hardware, and power supply.

Appendix J1—CDOT Project Delivery Selection Matrix (PDSM).

Project Delivery Selection Process

The process is shown in the outline below and a flowchart on the next page. It consists of individual steps to complete the entire process. The steps should be followed in sequential order.

STAGE I - Project Attributes, Goals, and Constraints

A. Delivery methods to consider
    1. Design-Bid-Build
    2. Design-Build
    3. Construction Manager / General Contractor
B. Project Description/Goals/Constraints
    1. List known project attributes
    2. Set project goals
    3. Identify project dependent constraints

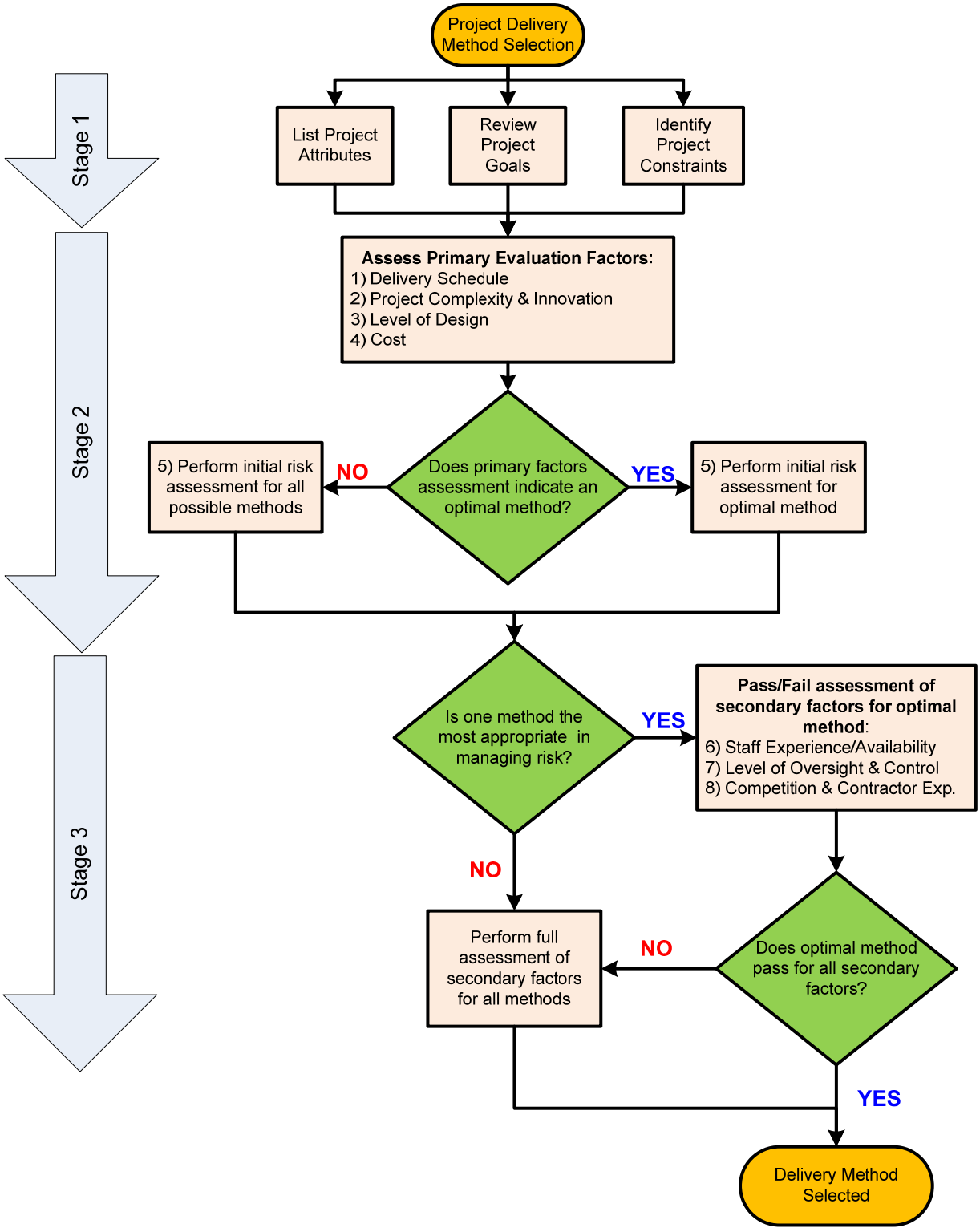
STAGE II – Evaluate primary selection factors

A. Assess the primary factors (these factors most often determine the selection).
    1. Delivery Schedule
    2. Complexity & Innovation
    3. Level of Design
    4. Cost
B. If the primary factors indicate there is a clear choice of a delivery method, then:
    5i. Perform a risk assessment for the desired delivery method to ensure that risks can be properly allocated and managed, and then move on to Stage III, Part A
C. If the primary factors do not indicate a clear choice of a delivery method, then:
    5ii. Perform a risk assessment for all delivery methods to determine which method can properly allocate and manage risks, and then move on to Stage III, Part A

STAGE III – Evaluate secondary selection factors

A. Perform a pass/fail analysis of the secondary factors to ensure that they are not relevant to the decision.
    6. Staff Experience/Availability (Agency)
    7. Level of Oversight and Control
    8. Competition and Contractor Experience
B. If the pass/fail analysis does not result in clear determination of the method of delivery, then perform a more rigorous evaluation of all eight factors against the potential delivery methods

NOTE: Typically, the entire selection process can be completed by the project team in a 3 hour workshop session, as long as each team member has individually reviewed and performed the assessment prior to the workshop.



Flowchart of the Project Delivery Selection Process

Project Delivery Selection Matrix Worksheets and Forms

The following forms and appendices are included to facilitate this process.

Project delivery description worksheet

Provide information on the project. This includes size, type, funding, risks, complexities, etc. All information should be developed for the specific project.

Project delivery goals worksheet – including example project goals

A careful determination of the project goals is an instrumental first step of the process that will guide both the selection of the appropriate method of delivery for the project.

Project delivery constraints worksheet - including example project constraints

Carefully review all possible constraints to the project. These constraints can potentially eliminate a project delivery method before the evaluation process begins.

Project delivery selection summary form

The Project Delivery Selection Summary summarizes the assessment of the eight selection factors for the three delivery methods. The form is qualitatively scored using the rating provided in the table below. The form also includes a section for comments and conclusions. The completed Project Delivery Selection Summary should provide an executive summary of the key reasons for the selection of the method of delivery**.**

Rating Key	
++	Most appropriate delivery method
+	Appropriate delivery method
–	Least appropriate delivery method
X	Fatal Flaw (discontinue evaluation of this method)
NA	Factor not applicable or not relevant to the selection

Workshop blank form

This form can be used by the project team for additional documentation of the process. In particular, it can be used to elaborate the evaluation of the *Assessment of Risk* factor.

Project delivery methods selection factor opportunities / obstacles form

These forms are used to summarize the assessments by the project team of the opportunities and obstacles associated with each delivery method relative to each of the eight Selection Factors. The bottom of each form allows for a qualitative conclusion using the same notation as described above. Those conclusions then are transferred to the **Project Delivery Selection Summary.**

Project delivery methods opportunities / obstacles checklists

These forms provide the project team with direction concerning typical delivery method opportunities and obstacles associated with each of the eight Selection Factors. However, these checklists include general information and are not an all-inclusive checklist. Use the checklists as a supplement to developing project specific opportunities and obstacles.

Risk assessment guidance form

Because of the unique nature of Selection Factor 5, *Assessment of Risk*, this guidance section provides the project team with additional assistance for evaluation of the risk factor including: Typical Transportation Project Risks; a General Project Risks Checklist; and a Risk Opportunities/Obstacles Checklist.

Project Delivery Description

The following items should be considered in describing the specific project. Other items can be added to the bottom of the form if they influence the project delivery decision. Relevant documents can be added as appendices to the final summary report.

Project Attributes
Project Name:
Location:
Estimated Budget:
Estimated Project Delivery Period:
Required Delivery Date (if applicable):
Source(s) of Project Funding:
Project Corridor:
Major Features of Work – pavement, bridge, sound barriers, etc.:
Major Schedule Milestones:
Major Project Stakeholders:
Major Obstacles (as applicable)
With Right of Way, Utilities, and/or Environmental Approvals:
During Construction Phase:
Main Identified Sources of Risk:
Safety Issues:
Sustainable Design and Construction Requirements:

Project Delivery Goals

An understanding of project goals is essential to selecting an appropriate project delivery method. Therefore, project goals should be set prior to using the project delivery selection matrix. Typically, the project goals can be defined in three to five items and need to be reviewed here. Example goals are provided below, but the report should include project-specific goals. These goals should remain consistent over the life of the project.

Project-Specific Goals
Goal #1:
Goal #2:
Goal #3:
Goal #4:
Goal #5:

General Project Goals (For reference)

Schedule
- Minimize project delivery time
- Complete the project on schedule
- Accelerate start of project revenue

Cost
- Minimize project cost
- Maximize project budget
- Complete the project on budget
- Maximize the project scope and improvements within the project budget

Quality
- Meet or exceed project requirements
- Select the best team
- Provide a high quality design and construction constraints
- Provide an aesthetically pleasing project

Functional
- Maximize the life cycle performance of the project
- Maximize capacity and mobility improvements
- Minimize inconvenience to the traveling public during construction
- Maximize safety of workers and traveling public during construction

Project Delivery Constraints

There are potential aspects of a project that can eliminate the need to evaluate one or more of the possible delivery methods. A list of general constraints can be found below the table and should be referred to after completing this worksheet. The first section below is for general constraints and the second section is for constraints specifically tied to project delivery selection.

General Constraints
Source of Funding:
Schedule constraints:
Federal, state, and local laws:
Third party agreements with railroads, ROW, etc:
Project Delivery Specific Constraints
Project delivery constraint #1:
Project delivery constraint #2:
Project delivery constraint #3:
Project delivery constraint #4:
Project delivery constraint #5:

General Project Constraints

Schedule

- Utilize federal funding by a certain date
- Complete the project on schedule
- Weather and/or environmental impact

Cost

- Project must not exceed a specific amount
- Minimal changes will be accepted
- Some funding may be utilized for specific type of work (bridges, drainage, etc)

Quality

- Must adhere to standards proposed by the Agency
- High quality design and construction constraints
- Adhere to local and federal codes

Functional

- Traveling public must not be disrupted during construction
- Hazardous site where safety is a concern
- Return area surrounding project to existing conditions

Project Delivery Selection Summary

Determine the factors that should be considered in the project delivery selection, discuss the opportunities and obstacles related to each factor, and document the discussion on the following pages. Then complete the summary below.

PROJECT DELIVERY METHOD OPPORTUNITY/OBSTACLE SUMMARY			
	D-B-B	**CM/GC**	**D-B**
Primary Selection Factors			
1. Delivery Schedule			
2. Project Complexity & Innovation			
3. Level of Design			
4. Cost			
5. Perform Initial Risk Assessment			
Secondary Selection Factors			
6. Staff Experience/Availability (Agency)			
7.Level of Oversight and Control			
8. Competition and Contractor Experience			

Rating Key	
++	Most appropriate delivery method
+	Appropriate delivery method
–	Least appropriate delivery method
X	Fatal Flaw (discontinue evaluation of this method)
NA	Factor not applicable or not relevant to the selection

Project Delivery Selection Summary Conclusions and Comments

Project Delivery Selection Matrix Primary Factors

1) Delivery Schedule

Delivery schedule is the overall project schedule from scoping through design, construction and opening to the public. Assess time considerations for starting the project or receiving dedicated funding and assess project completion importance.

DESIGN-BID-BUILD - Requires time to perform sequential design and procurement, but if design time is available has the shortest procurement time after the design is complete.

Opportunities	Obstacles	Rating

CM/GC - Quickly gets contractor under contract and under construction to meet funding obligations before completing design. Parallel process of development of contract requirements, design, procurements, and construction can accelerate project schedule. However, schedule can be slowed down by coordinating design-related issues between the CM and designer and by the process of reaching a reasonable Guaranteed Maximum Price (GMP).

Opportunities	Obstacles	Rating

DESIGN-BUILD - Ability to get project under construction before completing design. Parallel process of design and construction can accelerate project delivery schedule; however, procurement time can be lengthy due to the time necessary to develop an adequate RFP, evaluate proposals and provide for a fair, transparent selection process.

Opportunities	Obstacles	Rating

2) Project Complexity and Innovation

Project complexity and innovation is the potential applicability of new designs or processes to resolve complex technical issues.

DESIGN-BID-BUILD - Allows Agency to fully resolve complex design issues and qualitatively evaluate designs before procurement of the general contractor. Innovation is provided by Agency/Consultant expertise and through traditional agency directed processes such as VE studies and contractor bid alternatives.

Opportunities	Obstacles	Rating

CM/GC - Allows independent selection of designer and contractor based on qualifications and other factors to jointly address complex innovative designs through three party collaboration of Agency, designer and Contractor. Allows for a qualitative (non-price oriented) design but requires agreement on GMP.

Opportunities	Obstacles	Rating

DESIGN-BUILD - Incorporates design-builder input into design process through best value selection and contractor proposed Alternate Technical Concepts (ATCs) – which are a cost oriented approach to providing complex and innovative designs. Requires that desired solutions to complex projects be well defined through contract requirements.

Opportunities	Obstacles	Rating

3) Level of Design

Level of design is the percentage of design completion at the time of the project delivery procurement.

DESIGN-BID-BUILD - 100% design by Agency or contracted design team, with Agency having complete control over the design.

Opportunities	Obstacles	Rating

CM/GC - Can utilize a lower level of design prior to procurement of the CM/GC and then joint collaboration of Agency, designer, and CM/GC in the further development of the design. Iterative nature of design process risks extending the project schedule.

Opportunities	Obstacles	Rating

DESIGN-BUILD - Design advanced by Agency to the level necessary to precisely define contract requirements and properly allocate risk (typically 30% or less).

Opportunities	Obstacles	Rating

4) Cost

Project cost is the financial process related to meeting budget restrictions, early and precise cost estimation, and control of project costs.

DESIGN-BID-BUILD - Competitive bidding provides a low cost construction for a fully defined scope of work. Costs accuracy limited until design is completed. More likelihood of cost change orders due to contractor having no design responsibility.

Opportunities	Obstacles	Rating

CM/GC - Agency/designer/contractor collaboration to reduce risk pricing can provide a low cost project however non-competitive negotiated GMP introduces price risk. Good flexibility to design to a budget.

Opportunities	Obstacles	Rating

DESIGN-BUILD - Designer-builder collaboration and ATCs can provide a cost-efficient response to project goals. Costs are determined with design-build proposal, early in design process. Allows a variable scope bid to match a fixed budget. Poor risk allocation can result in high contingencies.

Opportunities	Obstacles	Rating

5) Initial Risk Assessment

Risk is an uncertain event or condition that, if it occurs, has an effect on a project's objectives. Risk allocation is the assignment of unknown events or conditions to the party that can best manage them. An initial assessment of project risks is important to ensure the selection of the delivery method that can properly address them. An approach that focuses on a fair allocation of risk will be most successful.

DESIGN-BID-BUILD - Risk allocation for design-bid-build best is understood by the industry, but requires that most design-related risks and third party risks be resolved prior to procurement to avoid costly contractor contingency pricing, change orders, and potential claims.

Opportunities	Obstacles	Rating

CM/GC - Provides opportunity for Agency, designer, and contractor to collectively identify and minimize project risks, and allocate risk to appropriate party. Has potential to minimize contractor contingency pricing of risk, but can lose the element of competition in pricing.

Opportunities	Obstacles	Rating

DESIGN-BUILD - Provides opportunity to properly allocate risks to the party best able to manage them, but requires risks allocated to design-builder to be well defined to minimize contractor contingency pricing of risks.

Opportunities	Obstacles	Rating

Project Delivery Selection Matrix Secondary Factors

6) Staff Experience and Availability

Agency staff experience and availability as it relates to the project delivery methods in question.

DESIGN-BID-BUILD - Technical and management resources necessary to perform the design and plan development. Resource needs can be more spread out.

Opportunities	Obstacles	Rating

CM/GC - Strong, committed Agency project management resources are important for success of the CM/GC process. Resource needs are similar to D-B-B except Agency must coordinate CM's input with the project designer and be prepared for GMP negotiations.

Opportunities	Obstacles	Rating

DESIGN-BUILD - Technical and management resources and expertise necessary to develop the RFQ and RFP and administrate the procurement. Concurrent need for both design and construction resources to oversee the implementation.

Opportunities	Obstacles	Rating

7) Level of Oversight and Control

Level of oversight involves the amount of agency staff required to monitor the design or construction, and amount of agency control over the delivery process

DESIGN-BID-BUILD - Full control over a linear design and construction process.

Opportunities	Obstacles	Rating

CM/GC - Most control by Agency over both the design, and construction, and control over a collaborative agency/designer/contractor project team

Opportunities	Obstacles	Rating

DESIGN-BUILD - Less control over the design (design desires must be written into the RFP contract requirements). Generally less control over the construction process (design-builder often has QA responsibilities).

Opportunities	Obstacles	Rating

8) Competition and Contractor Experience

Competition and availability refers to the level of competition, experience and availability in the market place and its capacity for the project.

DESIGN-BID-BUILD - High level of competition, but GC selection is based solely on low price. High level of marketplace experience.

Opportunities	Obstacles	Rating

CM/GC - Allows for the selection of the single most qualified contractor, but GMP can limit price competition. Low level of marketplace experience.

Opportunities	Obstacles	Rating

DESIGN-BUILD - Allows for a balance of price and non-price factors in the selection process. Medium level of marketplace experience.

Opportunities	Obstacles	Rating

Project Delivery Selection Factors Opportunities and Obstacles Checklists

(With project risk assessment and checklists)

1) Delivery Schedule Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Schedule is more predictable and more manageable ☐ Milestones can be easier to define ☐ Projects can more easily be "shelved" ☐ Shortest procurement period ☐ Elements of design can be advanced prior to permitting, construction, etc. ☐ Time to communicate/discuss design with stakeholders	☐ Requires time to perform a linear design-bid-construction process ☐ Design and construction schedules can be unrealistic due to lack industry input ☐ Errors in design lead to change orders and schedule delays ☐ Low bid selection may lead to potential delays and other adverse outcomes.
CM/GC	
Opportunities	**Obstacles**
☐ Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) ☐ More efficient procurement of long-lead items ☐ Early identification and resolution of design and construction issues (e.g., utility, ROW, and earthwork) ☐ Can provide a shorter procurement schedule than D-B ☐ Team involvement for schedule optimization ☐ Continuous constructability review and VE ☐ Maintenance of Traffic improves with contractor inputs ☐ Contractor input for phasing, constructability and traffic control may reduce overall schedule	☐ Potential for not reaching GMP and substantially delaying schedule ☐ GMP negotiation can delay the schedule ☐ Designer-contractor-agency disagreements can add delays ☐ Strong agency management is required to control schedule
DESIGN-BUILD	
Opportunities	**Obstacles**
☐ Potential to accelerate schedule through parallel design-build process ☐ Shifting schedule risk to D-B team ☐ Encumbers construction funds more quickly ☐ Industry input into design and schedule ☐ Fewer chances for disputes between agency and design-builders ☐ More efficient procurement of long-lead items ☐ Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) ☐ Allows innovation in resource loading and scheduling by D-B team	☐ Request for proposal development and procurement can be intensive ☐ Undefined events or conditions found after procurement, but during design can impact schedule and cost ☐ Time required to define technical requirements and expectations through RFP development can be intensive ☐ Time required to gain acceptance of quality program ☐ Requires agency and stakeholder commitments to an expeditious review of design

2) Project Complexity and Innovation Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Agencies can have more control of design of complex projects ☐ Agency and consultant expertise can select innovation independently of contractor abilities ☐ Opportunities for value engineering studies during design, more time for design solutions ☐ Aids in consistency and maintainability ☐ Full control in selection of design expertise ☐ Complex design can be resolved and competitively bid	☐ Innovations can add cost or time and restrain contractor's benefits ☐ No contractor input to optimize costs ☐ Limited flexibility for integrated design and construction solutions (limited to constructability) ☐ Difficult to assess construction time and cost due to innovation
CM/GC	
Opportunities	**Obstacles**
☐ Highly innovative process through 3 party collaboration ☐ Allows for agency control of a designer/contractor process for developing innovative solutions ☐ Allows for an independent selection of the best qualified designer and best qualified contractor ☐ VE inherent in process and enhanced constructability ☐ Risk of innovation can be better defined and minimized and allocated ☐ Can take to market for bidding as contingency	☐ Process depends on designer/CM relationship ☐ No contractual relationship between designer/CM ☐ Innovations can add cost or time ☐ Scope additions can be difficult to manage ☐ Preconstruction services fees for contractor involvement ☐ Cost competitiveness – single source negotiated GMP
DESIGN-BUILD	
Opportunities	**Obstacles**
☐ Designer and contractor collaborate to optimize means and methods and enhance innovation ☐ Opportunity for innovation through draft RFP, best value and ATC processes ☐ Can use best-value procurement to select design-builder with best qualifications ☐ Constructability and VE inherent in process ☐ Early team integration ☐ Sole point of responsibility	☐ Requires desired solutions to complex designs to be well defined through technical requirements (difficult to do) ☐ Qualitative designs are difficult to define (example. aesthetics) ☐ Risk of time or cost constraints on designer inhibiting innovation ☐ Some design solutions might be too innovative or unacceptable ☐ Quality assurance for innovative processes are difficult to define in RFP

3) Level of Design Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ 100% design by agency ☐ Agency has complete control over the design (can be beneficial when there is one specific solution for a project) ☐ Project/scope can be developed through design ☐ The scope of the project is well defined through complete plans and contract documents ☐ Well-known process to the industry	☐ Agency design errors can result in a higher number of change orders, claims, etc. ☐ Minimizes competitive innovation opportunities ☐ Can reduce the level of constructability since the contractor is not bought into the project until after the design is complete
CM/GC	
Opportunities	**Obstacles**
☐ Can utilize a lower level of design prior to selecting a contractor then collaboratively advance design with agency, designer and contractor ☐ Contractor involvement in early design improves constructability ☐ Agency controls design ☐ Design can be used for D-B-B if the price is not successfully negotiated ☐ Design can be responsive to risk minimization	☐ Teaming and communicating concerning design can cause disputes ☐ Three party process can slow progression of design ☐ If design is too far advanced it will limit the advantages of CM/GC or could require design backtracking
DESIGN-BUILD	
Opportunities	**Obstacles**
☐ Design advanced by the agency to level necessary to precisely define the contract requirements and properly allocate risk ☐ Does not require much design to be completed before awarding project to the design-builder (between ~ 10% - 30% complete) ☐ Contractor involvement in early design, which improves constructability and innovation ☐ Plans do not have to be as detailed because the design-builder is bought into the project early in the process and will accept design responsibility	☐ Must have very clear definitions and requirements in the RFP because it is the basis for the contract ☐ If design is too far advanced it will limit the advantages of design-build ☐ Potential for lacking or missing scope definition if RFP not carefully developed ☐ Over utilizing performance specifications to enhance innovation can risk quality through reduced technical requirements ☐ Less agency control over the design ☐ Can create project less standardized designs across agency as a whole

4) Cost Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Competitive bidding provides a low cost construction to a fully defined scope of work ☐ Increase certainty about cost estimates ☐ Construction costs are contractually set before construction begins	☐ Cost accuracy is limited until design is completed ☐ Construction costs are not locked in until design is 100% complete ☐ Cost reductions due to contractor innovation and constructability is difficult to obtain ☐ More potential of cost change orders due to Agency design responsibility
CM/GC	
Opportunities	**Obstacles**
☐ Agency/designer/contractor collaboration to reduce project risk can result in lowest project costs ☐ Early contractor involvement can result in cost savings through VE and constructability ☐ Cost will be known earlier when compared to D-B-B ☐ Integrated design/construction process can provide a cost efficient strategies to project goals ☐ Can provide a cost efficient response to the project goals	☐ Non-competitive negotiated GMP introduces price risk ☐ Difficulty in GMP negotiation introduces some risk that GMP will not be successfully executed requiring aborting the CM/GC process ☐ Paying for contractors involvement in the design phase may increase total cost
DESIGN-BUILD	
Opportunities	**Obstacles**
☐ Contractor input into design should moderate cost ☐ Design-builder collaboration and ATCs can provide a cost-efficient response to project goals ☐ Costs are contractually set early in design process with design-build proposal ☐ Allows a variable scope bid to match a fixed budget ☐ Potential lower average cost growth ☐ Funding can be obligated in a very short timeframe	☐ Risks related to design-build, lump sum cost without 100% design complete, can compromise financial success of the project

5a) Initial Risk Assessment Guidance

Three sets of risk assessment checklists are provided to assist in an initial risk assessment relative to the selection of the delivery method:

- Typical Transportation Project Risks
- General Project Risks Checklist
- Opportunities/Obstacles Checklist (relative to each delivery method)

It is important to recognize that the initial risk assessment is to only ensure the selected delivery method can properly address the project risks. A more detailed level of risk assessment should be performed concurrently with the development of the procurement documents to ensure that project risks are properly allocated, managed, and minimized through the procurement and implementation of the project.

Typical Transportation Project Risks

Following is a list of project risks that are frequently encountered on transportation projects and a discussion on how the risks are resolved through the different delivery methods.

1) Site Conditions and Investigations

How unknown site conditions are resolved. For additional information on site conditions, refer to 23 CFR 635.109(a) at the following link:

http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=91468e48c87a547c3497a5c19d640172&rgn=div5&view=text&node=23:1.0.1.7.23&idno=23#23:1.0.1.7.23.1.1.9

DESIGN-BID-BUILD

Site condition risks are generally best identified and mitigated during the design process prior to procurement to minimize the potential for change orders and claims when the schedule allows.

DESIGN-BUILD

Certain site condition responsibilities can be allocated to the design-builder provided they are well defined and associated third party approval processes are well defined. Caution should be used as unreasonable allocation of site condition risk will result in high contingencies during bidding. The Agency should perform site investigations in advance of procurement to define conditions and avoid duplication of effort by proposers. At a minimum, the Agency should perform the following investigations:

1) Basic design surveys
2) Hazardous materials investigations to characterize the nature of soil and groundwater contamination
3) Geotechnical baseline report to allow design-builders to perform proposal design without extensive additional geotechnical investigations

CM/GC

The STA, the designer, and the contractor can collectively assess site condition risks, identify the need to perform site investigations in order to reduce risks, and properly allocate risk prior to GMP.

2) Utilities

DESIGN-BID-BUILD

Utility risks are best allocated to the Agency, and mostly addressed prior to procurement to minimize potential for claims when the schedule allows.

DESIGN-BUILD

Utilities responsibilities need to be clearly defined in contract requirements, and appropriately allocated to both design-builder and the Agency:

Private utilities (major electrical, gas, communication transmission facilities): Need to define coordination and schedule risks, as they are difficult for design-builder to price. Best to have utilities agreements before procurement. Note – by state regulation, private utilities have schedule liability in design-build projects, but they need to be made aware of their responsibilities.

Public Utilities: Design and construction risks can be allocated to the design-builder, if properly incorporated into the contract requirements.

CM/GC

Can utilize a lower level of design prior to contracting and joint collaboration of Agency, designer, and contractor in the further development of the design.

3) Railroads (if applicable)

DESIGN-BID-BUILD

Railroad risks are best resolved prior to procurement and relocation designs included in the project requirements when the schedule allows.

DESIGN-BUILD

Railroad coordination and schedule risks should be well understood to be properly allocated and are often best assumed by the Agency. Railroad design risks can be allocated to the designer if well defined. Best to obtain an agreement with railroad defining responsibilities prior to procurement

CM/GC

Railroad impacts and processes can be resolved collaboratively by Agency, designer, and contractor. A lengthy resolution process can delay the GMP negotiations.

4) Drainage/Water Quality Best Management Practices (construction and permanent)

Both drainage and water quality often involve third party coordination that needs to be carefully assessed with regard to risk allocation. Water quality in particular is not currently well defined, complicating the development of technical requirements for projects.

Important questions to assess:

1) Do criteria exist for compatibility with third party offsite system (such as an OSP (Outfall System Plan))?
2) Is there an existing cross-drainage undersized by design Criteria?
3) Can water quality requirements be precisely defined? Is right-of-way adequate?

DESIGN-BID-BUILD

Drainage and water quality risks are best designed prior to procurement to minimize potential for claims when the schedule allows.

DESIGN-BUILD

Generally, the Agency is in the best position to manage the risks associated with third party approvals regarding compatibility with offsite systems, and should pursue agreements to define requirements for the design-builder.

CM/GC

The Agency, the designer, and the contractor can collectively assess drainage risks and coordination and approval requirements, and minimize and define requirements and allocate risks prior to GMP.

5) Environmental

Meeting environmental document commitments and requirements, noise, 4(f) and historic, wetlands, endangered species, etc.

DESIGN-BID-BUILD

Risk is best mitigated through design prior to procurement when the schedule allows.

DESIGN-BUILD

Certain environmental approvals and processes that can be fully defined can be allocated to the design-builder. Agreements or MOUs with approval agencies prior to procurement is best to minimize risks.

CM/GC

Environmental risks and responsibilities can be collectively identified, minimized, and allocated by the Agency, the designer, and the contractor prior to GMP

6) Third Party Involvement

Timeliness and impact of third party involvement (funding partners, adjacent municipalities, adjacent property owners, project stakeholders, FHWA, PUC).

DESIGN-BID-BUILD

Third party risk is best mitigated through design process prior to procurement to minimize potential for change orders and claims when the schedule allows.

DESIGN-BUILD

Third party approvals and processes that can be fully defined can be allocated to the design-builder. Agreements or MOUs with approval agencies prior to procurement is best to minimize risks.

CM/GC

Third party approvals can be resolved collaboratively by the Agency, designer, and contractor.

5b) General Project Risk Checklist (Items to consider when assessing risk)

Environmental Risks	External Risks
☐ Delay in review of environmental documentation ☐ Challenge in appropriate environmental documentation ☐ Defined and non-defined hazardous waste ☐ Environmental regulation changes ☐ Environmental impact statement (EIS) required ☐ NEPA/ 404 Merger Process required ☐ Environmental analysis on new alignments required	☐Stakeholders request late changes ☐Influential stakeholders request additional needs to serve their own commercial purposes ☐Local communities pose objections ☐Community relations ☐Conformance with regulations/guidelines/ design criteria ☐Intergovernmental agreements and jurisdiction
Third-Party Risks	**Geotechnical and Hazmat Risks**
☐ Unforeseen delays due to utility owner and third-party ☐ Encounter unexpected utilities during construction ☐ Cost sharing with utilities not as planned ☐ Utility integration with project not as planned ☐ Third-party delays during construction ☐ Coordination with other projects ☐ Coordination with other government agencies	☐Unexpected geotechnical issues ☐Surveys late and/or in error ☐Hazardous waste site analysis incomplete or in error ☐Inadequate geotechnical investigations ☐Adverse groundwater conditions ☐Other general geotechnical risks
Right-of-Way/ Real Estate Risks	**Design Risks**
☐ Railroad involvement ☐ Objections to ROW appraisal take more time and/or money ☐ Excessive relocation or demolition ☐ Acquisition ROW problems ☐ Difficult or additional condemnation ☐ Accelerating pace of development in project corridor ☐ Additional ROW purchase due to alignment change	☐ Design is incomplete/ Design exceptions ☐ Scope definition is poor or incomplete ☐ Project purpose and need are poorly defined ☐ Communication breakdown with project team ☐ Pressure to delivery project on an accelerated schedule ☐ Constructability of design issues ☐ Project complexity - scope, schedule, objectives, cost, and deliverables - are not clearly understood
Organizational Risks	**Construction Risks**
☐ Inexperienced staff assigned ☐ Losing critical staff at crucial point of the project ☐ Functional units not available or overloaded ☐ No control over staff priorities ☐ Lack of coordination/ communication ☐ Local agency issues ☐ Internal red tape causes delay getting approvals, decisions ☐ Too many projects/ new priority project inserted into program	☐ Pressure to delivery project on an accelerated schedule. ☐ Inaccurate contract time estimates ☐ Construction QC/QA issues ☐ Unclear contract documents ☐ Problem with construction sequencing/ staging/ phasing ☐ Maintenance of Traffic/ Work Zone Traffic Control

5c) Assessment of Risk Project Delivery Selection Opportunities/Obstacles Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Risks managed separately through design, bid, build is expected to be easier ☐ Risk allocation is most widely understood/used ☐ Opportunity to avoid or mitigate risk through complete design ☐ Risks related to environmental, railroads, & third party involvement are best resolved before procurement ☐ Utilities and ROW best allocated to the agency and mostly addressed prior to procurement to minimize potential for claim ☐ Project can be shelved while resolving risks	☐ Agency accepts risks associated with project complexity (the inability of designer to be all-knowing about construction) and project unknowns ☐ Low-bid related risks ☐ Potential for misplaced risk through prescriptive specifications ☐ Innovative risk allocation is difficult to obtain ☐ Limited industry input in contract risk allocation ☐ Change order risks can be greater ☐ Contractor may avoid risks
DESIGN-BUILD	
Opportunities	**Obstacles**
☐ Performance specifications can allow for alternative risk allocations to the design builder ☐ Risk-reward structure can be better defined ☐ Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing) ☐ Opportunity for industry review of risk allocation (draft RFP, ATC processes) ☐ Avoid low-bid risk in procurement ☐ Contractor will help identify risks related to environmental, railroads, ROW, and utilities ☐ Designers and contractors can work toward innovative solutions to, or avoidance of, unknowns	☐ Need a detailed project scope, description etc., for the RFP to get accurate/comprehensive responses to the RFP (Increased RFP costs may limit bidders) ☐ Limited time to resolve risks ☐ Additional risks allocated to designers for errors and omissions, claims for change orders ☐ Unknowns and associated risks need to be carefully allocated through a well-defined scope and contract ☐ Risks associated with agreements when design is not completed ☐ Poorly defined risks are expensive ☐ Contractor may avoid risks or drive consultant to decrease cost at risk to quality
CM/GC	
Opportunities	**Obstacles**
☐ Contractor can have a better understanding of the unknown conditions as design progresses ☐ Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing) ☐ Opportunities to manage costs risks through CM/GC involvement ☐ Contractor will help identify and manage risk ☐ Agency still has considerable involvement with third parties to deal with risks ☐ Avoids low-bid risk in procurement ☐ More flexibility and innovation available to deal with unknowns early in design process	☐ Lack of motivation to manage small quantity costs ☐ Increase costs for non-proposal items ☐ Disagreement among Designer-Contractor-Agency can put the process at risk ☐ If GMP cannot be reached, additional low-bid risks appear ☐ Limited to risk capabilities of CM/GC ☐ Designer-contractor-agency disagreements can add delays ☐ Strong agency management is required to negotiate/optimize risks ☐ Discovery of unknown conditions can drive up GMP, which can be compounded in phased construction

6) Staff Experience and Availability Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Agency, contractors and consultants have high level of experience with the traditional system ☐ Designers can be more interchangeable between projects	☐ Can require a high level of agency staffing of technical resources ☐ Staff's responsibilities are spread out over a longer design period ☐ Can require staff to have full breadth of technical expertise
CM/GC	
Opportunities	**Obstacles**
☐ Agency can improve efficiencies by having more project managers on staff rather than specialized experts ☐ Smaller number of technical staff required through use of consultant designer	☐ Strong committed agency project management is important to success ☐ Limitation of availability of staff with skills, knowledge and personality to manage CM/GC projects ☐ Existing staff may need additional training to address their changing roles ☐ Agency must learn how to negotiate GMP projects
DESIGN-BUILD	
Opportunities	**Obstacles**
☐ Less agency staff required due to the sole source nature of D-B ☐ Opportunity to grow agency staff by learning a new process	☐ Limitation of availability of staff with skills, knowledge and personality to manage D-B projects ☐ Existing staff may need additional training to address their changing roles ☐ Need to "mass" agency management and technical resources at critical points in process (i.e., RFP development, design reviews, etc.)

7) Level of Oversight and Control Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Full agency control over a linear design and construction process ☐ Oversight roles are well understood ☐ Contract documents are typically completed in a single package before construction begins ☐ Multiple checking points through three linear phases: design-bid-build ☐ Maximum control over design	☐ Requires a high-level of oversight ☐ Increased likelihood of claims due to agency design responsibility ☐ Limited control over an integrated design/construction process
CM/GC	
Opportunities	**Obstacles**
☐ Preconstruction services are provided by the construction manager ☐ Getting input from construction to enhance constructability and innovation ☐ Provides agency control over an integrated design/construction process	☐ Agency must have experienced staff to oversee the CM/GC ☐ Higher level of cost oversight required
DESIGN-BUILD	
Opportunities	**Obstacles**
☐ A single entity responsibility during project design and construction ☐ Continuous execution of design and build ☐ Getting input from construction to enhance constructability and innovation ☐ Overall project planning and scheduling is established by one entity	☐ Can require high level of design oversight ☐ Can require high level of quality assurance oversight ☐ Limitation on staff with D-B oversight experience ☐ Less agency control over design ☐ Control over design relies on proper development of technical requirements

8) Competition and Contractor Experience Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Promotes high level of competition in the marketplace ☐ Opens construction to all reasonably qualified bidders ☐ Transparency and fairness ☐ Reduced chance of corruption and collusion ☐ Contractors are familiar with D-B-B process	☐Risks associated with selecting the low bid (the best contractor is not necessary selected) ☐No contractor input into the process ☐Limited ability to select contractor based on qualifications
CM/GC	
Opportunities	**Obstacles**
☐ Allows for qualifications based contractor procurement ☐ Agency has control over an independent selection of best qualified designer and contractor ☐ Contractor is part of the project team early on, creating a project "team" ☐ Increased opportunity for innovation due to the diversity of the project team	☐ Currently there is not a large pool of contractors with experience in CM/GC, which will reduce the competition and availability ☐ Working with only one contractor to develop GMP can limit price competition ☐ Requires a strong project manager from the agency ☐ Teamwork and communication among the project team
DESIGN-BUILD	
Opportunities	**Obstacles**
☐ Allows for a balance of qualifications and cost in design-builder procurement ☐ Two-phase process can promote strong teaming to obtain "Best Value" ☐ Increased opportunity for innovation possibilities due to the diverse project team	☐ Need for D-B qualifications can limit competition ☐ Lack of competition with past experience with the project delivery method ☐ Reliant on D-B team selected for the project ☐ The gap between agency experience and contractor experience with delivery method can create conflict

Project Delivery Selection Workshop Summary

Workshop Summary	
Project Name:	TH52/CSAH9 Interchange and safety improvements project
Workshop Date:	July 25, 2013
Workshop Location:	MnDOT Regional Office 6B – Owatonna, MN
Facilitator:	Keith Molenaar
Delivery Method Selected:	Design-Build

Workshop Participants	
Name	**Email**
Heather Lukes	
Matt Rottermond	
Kevin Kosobud	
Mike Kempinger	

Project Delivery Description

The following items should be considered in describing the specific project. Other items can be added to the bottom of the form if they influence the project delivery decision. Relevant documents can be added as appendices to the final summary report.

Project Attributes
Project Name: Trunk Highway (TH)52/County State-Aid Highway (CSAH)9 Interchange and Safety Improvements
Location: Goodhue County (rural interchange)
Estimated Budget: $8,900,000 (includes cost for construction, utility relocations, ROW acquisition, and extra budget for potential D-B delivery)
Estimated Project Delivery Period: Design and construction complete by November 2014
Required Delivery Date (if applicable): November 2014 open to traffic
Source(s) of Project Funding: Local and state public funds
Project Corridor: 3.25 miles of TH 52 from approximately 0.10 miles north of CSAH1 north to 1.1 miles south of CSAH 9 in Goodhue County
Major Features of Work – pavement, bridge, sound barriers, etc.: Grading, surfacing, bridge, drainage/storm water management, lighting and signing
Major Schedule Milestones: Environmental documentation completed. RFQ released on July 9th to perform pre-qualifications of potential bidders
Major Project Stakeholders: MnDOT, Goodhue County
Major Obstacles (as applicable) Utility relocation and completing ROW acquisition
With Right of Way, Utilities, and/or Environmental Approvals: No issues noted at this time
During Construction Phase: Detouring CSAH 9 traffic and local agricultural traffic during summer months
Main Identified Sources of Risk: Right of way acquisition, utility relocation
Safety Issues: Intersection in its current form identified as one of the most dangerous rural intersection in Minnesota
Sustainable Design and Construction Requirements: Completed within proposed RWO footprint; Maintain CSAH 9 design speed of 60 mph; No impacts to waterways north and south of preliminary interchange footprint; Open to traffic by November 2014.

Project Delivery Goals

An understanding of project goals is essential to selecting an appropriate project delivery method. Therefore, project goals should be set prior to using the project delivery selection matrix. Typically, the project goals can be defined in three to five items and need to be reviewed here. Example goals are provided below, but the report should include project-specific goals. These goals should remain consistent over the life of the project.

Project-Specific Goals
Goal #1: Provide a safe geometric design
Goal #2: Obtain substantial completion prior to November 2014
Goal #3: Complete project within budget
Goal #4: Minimize impacts to the traveling public on TH 52
Goal #5: Provide a safe work environment for workers and traveling public

Project Delivery Constraints

There are potential aspects of a project that can eliminate the need to evaluate one or more of the possible delivery methods. A list of general constraints can be found below the table and should be referred to after completing this worksheet. The first section below is for general constraints and the second section is for constraints specifically tied to project delivery selection.

General Constraints
Source of Funding: State and local funds only (no federal funds)
Schedule constraints: Start construction by May 1, 2014 and complete construction by November 2014
Federal, state, and local laws:
Third party agreements with railroads, ROW, etc:
Project Delivery Specific Constraints
Project delivery constraint #1: RFQ process began on July 9th, 2013. RFP to be released by October 2013
Project delivery constraint #2:
Project delivery constraint #3:
Project delivery constraint #4:
Project delivery constraint #5:

Project Delivery Selection Summary

Determine the factors that should be considered in the project delivery selection, discuss the opportunities and obstacles related to each factor, and document the discussion on the following pages. Then complete the summary below.

PROJECT DELIVERY METHOD OPPORTUNITY/OBSTACLE SUMMARY			
	D-B-B	**CM/GC**	**D-B**
Primary Selection Factors			
1. Delivery Schedule	-	-	++
2. Project Complexity & Innovation	+	+	+
3. Level of Design	++	++	+
4. Cost	+	+	++
5. Perform Initial Risk Assessment	+	-	++
Secondary Selection Factors			
6. Staff Experience/Availability (Agency)	NA	NA	PASS
7.Level of Oversight and Control	NA	NA	PASS
8. Competition and Contractor Experience	NA	NA	PASS

Rating Key	
++	Most appropriate delivery method
+	Appropriate delivery method
–	Least appropriate delivery method
X	Fatal Flaw (discontinue evaluation of this method)
NA	Factor not applicable or not relevant to the selection

Project Delivery Selection Summary Conclusions and Comments

- The project delivery method selection found that Design-build is the most appropriate delivery method for the 52/9 Interchange Project.
- The project delivery method selection was performed to validate the decision to proceed with a Design-build delivery.
- Design-build is more appropriate for this project than CM/GC and D-B-B in the areas of Delivery Schedule, Cost, and Risk Assessment.
- When considering Project Complexity and Innovation, D-B is rated (+), the same as D-B-B and CM/GC.
- Design-build was rated (+) in Level of Design while D-B-B and CM/GC were both rated (++). The reason for this was MnDOT would not have full control over the design and the goal of providing a safe, geometric design would limit the innovation typically given to the Design-builder in a D-B scenario.
- After evaluating the project against the primary evaluation factors, Design-build was the most appropriate delivery method. Design-build was then evaluated against each of the secondary factors and rated as PASS for each.

Project Delivery Selection Matrix Primary Factors

1) Delivery Schedule

Delivery schedule is the overall project schedule from scoping through design, construction and opening to the public. Assess time considerations for starting the project or receiving dedicated funding and assess project completion importance.

DESIGN-BID-BUILD - Requires time to perform sequential design and procurement, but if design time is available has the shortest procurement time after the design is complete.

Opportunities	Obstacles	Rating
Lack of federal funds reduces the review time	Bridge team does not have the staff for design	–
	Road design staff shortage	
	Overall high risk schedule to meet deadline	

CM/GC - Quickly gets contractor under contract and under construction to meet funding obligations before completing design. Parallel process of development of contract requirements, design, procurements, and construction can accelerate project schedule. However, schedule can be slowed down by coordinating design-related issues between the CM and designer and by the process of reaching a reasonable Guaranteed Maximum Price (GMP).

Opportunities	Obstacles	Rating
Lack of federal funds reduces review time	Creates a higher schedule risk due to uncertainty of consultant selection	–
Meet schedule with design consultant using smaller construction packages and phasing	Creates a higher schedule risk due to negotiation of Guaranteed Maximum Price	
	Creates a higher schedule risk due to lack of staff experience	

DESIGN-BUILD - Ability to get project under construction before completing design. Parallel process of design and construction can accelerate project delivery schedule; however, procurement time can be lengthy due to the time necessary to develop an adequate RFP, evaluate proposals and provide for a fair, transparent selection process.

Opportunities	Obstacles	Rating
Can meet the Nov. 2014 completion date	Accelerated schedule may be burdened by RFP development and receiving responsive bids	++
Past project RFPs to help develop this project's RFP		
GEC already on board		
Lack of federal funds reduces the review time		

2) Project Complexity and Innovation

Project complexity and innovation is the potential applicability of new designs or processes to resolve complex technical issues.

DESIGN-BID-BUILD - Allows Agency to fully resolve complex design issues and qualitatively evaluate designs before procurement of the general contractor. Innovation is provided by Agency/Consultant expertise and through traditional agency directed processes such as VE studies and contractor bid alternatives.

Opportunities	Obstacles	Rating
Complexity is low – lends itself well to D-B-B	Proposals for bridge design	+
	Footprint is tight – could be a challenging bridge design	
	No contractor input to optimize costs	

CM/GC - Allows independent selection of designer and contractor based on qualifications and other factors to jointly address complex innovative designs through three party collaboration of Agency, designer and Contractor. Allows for a qualitative (non-price oriented) design but requires agreement on GMP.

Opportunities	Obstacles	Rating
Opportunity to generate innovative bridge design through contractor input	Proposals for bridge design	+
	Getting only one contractor's opinion/input on design	

DESIGN-BUILD - Incorporates design-builder input into design process through best value selection and contractor proposed Alternate Technical Concepts (ATCs) – which are a cost oriented approach to providing complex and innovative designs. Requires that desired solutions to complex projects be well defined through contract requirements.

Opportunities	Obstacles	Rating
Competition for innovative bridge designs	Industry thinks 'cookie cutter' projects should be D-B-B	+
Opportunity for innovation through draft RFP, best value and ATC processes	Proposals for bridge design	

3) Level of Design

Level of design is the percentage of design completion at the time of the project delivery procurement.

DESIGN-BID-BUILD - 100% design by Agency or contracted design team, with Agency having complete control over the design.

Opportunities	Obstacles	Rating
MnDOT has complete ownership of the design – especially considering the geometric design	Not internal staff available to advance design	++

CM/GC - Can utilize a lower level of design prior to procurement of the CM/GC and then joint collaboration of Agency, designer, and CM/GC in the further development of the design. Iterative nature of design process risks extending the project schedule.

Opportunities	Obstacles	Rating
Appropriate level of design to hire CM/GC		++
Opportunity to design early safety measures with contractor input		
MnDOT has complete ownership of the design – especially considering the geometric design		

DESIGN-BUILD - Design advanced by Agency to the level necessary to precisely define contract requirements and properly allocate risk (typically 30% or less).

Opportunities	Obstacles	Rating
	MnDOT does not have 100% control over design – particularly geometric design	+
	Geometric performance specifications will limit design-builder on innovation	

4) Cost

Project cost is the financial process related to meeting budget restrictions, early and precise cost estimation, and control of project costs.

DESIGN-BID-BUILD - Competitive bidding provides a low cost construction for a fully defined scope of work. Costs accuracy limited until design is completed. More likelihood of cost change orders due to contractor having no design responsibility.

Opportunities	Obstacles	Rating
Increased certainty about cost estimates	More potential of cost change orders due to MnDOT design responsibility	+
Construction costs are contractually set before construction begins		

CM/GC - Agency/designer/contractor collaboration to reduce risk pricing can provide a low cost project however non-competitive negotiated GMP introduces price risk. Good flexibility to design to a budget.

Opportunities	Obstacles	Rating
MnDOT/designer/contractor collaboration to reduce project risk can result in lowest project costs	Non-competitive negotiated GMP introduces price risk	+

DESIGN-BUILD - Designer-builder collaboration and ATCs can provide a cost-efficient response to project goals. Costs are determined with design-build proposal, early in design process. Allows a variable scope bid to match a fixed budget. Poor risk allocation can result in high contingencies.

Opportunities	Obstacles	Rating
Design-builder collaboration and ATCs can provide a cost-efficient response to project goals		++
Potential lower average cost growth		
Contractor input during design can moderate cost to increase likelihood of meeting budget goals		

5) Initial Risk Assessment

Risk is an uncertain event or condition that, if it occurs, has an effect on a project's objectives. Risk allocation is the assignment of unknown events or conditions to the party that can best manage them. An initial assessment of project risks is important to ensure the selection of the delivery method that can properly address them. An approach that focuses on a fair allocation of risk will be most successful.

DESIGN-BID-BUILD - Risk allocation for design-bid-build best is understood by the industry, but requires that most design-related risks and third party risks be resolved prior to procurement to avoid costly contractor contingency pricing, change orders, and potential claims.

Opportunities	Obstacles	Rating
MnDOT is most familiar with managing risks in D-B-B projects.	MnDOT takes ownership of more risks	+

CM/GC - Provides opportunity for Agency, designer, and contractor to collectively identify and minimize project risks, and allocate risk to appropriate party. Has potential to minimize contractor contingency pricing of risk, but can lose the element of competition in pricing.

Opportunities	Obstacles	Rating
Risk management plan and allocation begin earlier with MnDOT/designer/contractor collaboration.	MnDOT has less experience with risk management in a CM/GC setting.	–
	If GMP cannot be reached, additional low bid risks may appear and jeopardize the goal to keep project under budget.	

DESIGN-BUILD - Provides opportunity to properly allocate risks to the party best able to manage them, but requires risks allocated to design-builder to be well defined to minimize contractor contingency pricing of risks.

Opportunities	Obstacles	Rating
More risks transferred from MnDOT to design-builder	Risks must be well defined	++
Designers and contractors can work together to mitigate risks		
Project appears to present few risks to transfer to design-builder which will likely result in lower D-B costs.		

Project Delivery Selection Matrix Secondary Factors

6) Staff Experience and Availability

Agency staff experience and availability as it relates to the project delivery methods in question.

DESIGN-BID-BUILD - Technical and management resources necessary to perform the design and plan development. Resource needs can be more spread out.

Opportunities	Obstacles	Rating
		NA

CM/GC - Strong, committed Agency project management resources are important for success of the CM/GC process. Resource needs are similar to D-B-B except Agency must coordinate CM's input with the project designer and be prepared for GMP negotiations.

Opportunities	Obstacles	Rating
		NA

DESIGN-BUILD - Technical and management resources and expertise necessary to develop the RFQ and RFP and administrate the procurement. Concurrent need for both design and construction resources to oversee the implementation.

Opportunities	Obstacles	Rating
Size and complexity of the project provides an opportunity for staff to gain valuable D-B experience		PASS
Less staff required by MnDOT during design and construction		

7) Level of Oversight and Control

Level of oversight involves the amount of agency staff required to monitor the design or construction, and amount of agency control over the delivery process

DESIGN-BID-BUILD - Full control over a linear design and construction process.

Opportunities	Obstacles	Rating
		NA

CM/GC - Most control by Agency over both the design, and construction, and control over a collaborative agency/designer/contractor project team

Opportunities	Obstacles	Rating
		NA

DESIGN-BUILD - Less control over the design (design desires must be written into the RFP contract requirements). Generally less control over the construction process (design-builder often has QA responsibilities).

Opportunities	Obstacles	Rating
Project elements important to MnDOT can be requested in the RFP	Less MnDOT control over design	PASS
A single entity is responsible for project design and construction		

8) Competition and Contractor Experience

Competition and availability refers to the level of competition, experience and availability in the market place and its capacity for the project.

DESIGN-BID-BUILD - High level of competition, but GC selection is based solely on low price. High level of marketplace experience.

Opportunities	Obstacles	Rating
		NA

CM/GC - Allows for the selection of the single most qualified contractor, but GMP can limit price competition. Low level of marketplace experience.

Opportunities	Obstacles	Rating
		NA

DESIGN-BUILD - Allows for a balance of price and non-price factors in the selection process. Medium level of marketplace experience.

Opportunities	Obstacles	Rating
Substantial number of D-B contractors available that possess similar project experience		PASS
Allows for a balance of qualifications and cost in design-builder procurement		

Project Delivery Selection Factors Opportunities and Obstacles Checklists

(With project risk assessment and checklists)

1) Delivery Schedule Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Schedule is more predictable and more manageable ☐ Milestones can be easier to define ☐ Projects can more easily be "shelved" ☒ Shortest procurement period ☐ Elements of design can be advanced prior to permitting, construction, etc. ☐ Time to communicate/discuss design with stakeholders	☒ Requires time to perform a linear design-bid-construction process ☐ Design and construction schedules can be unrealistic due to lack industry input ☒ Errors in design lead to change orders and schedule delays ☒ Low bid selection may lead to potential delays and other adverse outcomes.
CM/GC	
Opportunities	**Obstacles**
☒ Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) ☐ More efficient procurement of long-lead items ☒ Early identification and resolution of design and construction issues (e.g., utility, ROW, and earthwork) ☒ Can provide a shorter procurement schedule than D-B ☐ Team involvement for schedule optimization ☐ Continuous constructability review and VE ☒ Maintenance of Traffic improves with contractor inputs ☒ Contractor input for phasing, constructability and traffic control may reduce overall schedule	☒ Potential for not reaching GMP and substantially delaying schedule ☒ GMP negotiation can delay the schedule ☐ Designer-contractor-agency disagreements can add delays ☐ Strong agency management is required to control schedule
DESIGN-BUILD	
Opportunities	**Obstacles**
☒ Potential to accelerate schedule through parallel design-build process ☒ Shifting schedule risk to D-B team ☐ Encumbers construction funds more quickly ☐ Industry input into design and schedule ☐ Fewer chances for disputes between agency and design-builders ☐ More efficient procurement of long-lead items ☒ Ability to start construction before entire design, ROW, etc. is complete (i.e., phased design) ☐ Allows innovation in resource loading and scheduling by D-B team	☒ Request for proposal development and procurement can be intensive ☐ Undefined events or conditions found after procurement, but during design can impact schedule and cost ☒ Time required to define technical requirements and expectations through RFP development can be intensive ☐ Time required to gain acceptance of quality program ☐ Requires agency and stakeholder commitments to an expeditious review of design

2) Project Complexity and Innovation Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☒ Agencies can have more control of design of complex projects ☐ Agency and consultant expertise can select innovation independently of contractor abilities ☐ Opportunities for value engineering studies during design, more time for design solutions ☒ Aids in consistency and maintainability ☐ Full control in selection of design expertise ☒ Complex design can be resolved and competitively bid	☒ Innovations can add cost or time and restrain contractor's benefits ☒ No contractor input to optimize costs ☐ Limited flexibility for integrated design and construction solutions (limited to constructability) ☐ Difficult to assess construction time and cost due to innovation
CM/GC	
Opportunities	**Obstacles**
☒ Highly innovative process through 3 party collaboration ☒ Allows for agency control of a designer/contractor process for developing innovative solutions ☐ Allows for an independent selection of the best qualified designer and best qualified contractor ☐ VE inherent in process and enhanced constructability ☒ Risk of innovation can be better defined and minimized and allocated ☐ Can take to market for bidding as contingency	☒ Process depends on designer/CM relationship ☒ No contractual relationship between designer/CM ☐ Innovations can add cost or time ☐ Scope additions can be difficult to manage ☒ Preconstruction services fees for contractor involvement ☐ Cost competitiveness – single source negotiated GMP
DESIGN-BUILD	
Opportunities	**Obstacles**
☒ Designer and contractor collaborate to optimize means and methods and enhance innovation ☒ Opportunity for innovation through draft RFP, best value and ATC processes ☐ Can use best-value procurement to select design-builder with best qualifications ☐ Constructability and VE inherent in process ☐ Early team integration ☒ Sole point of responsibility	☒ Requires desired solutions to complex designs to be well defined through technical requirements (difficult to do) ☒ Qualitative designs are difficult to define (example. aesthetics) ☐ Risk of time or cost constraints on designer inhibiting innovation ☐ Some design solutions might be too innovative or unacceptable ☐ Quality assurance for innovative processes are difficult to define in RFP

3) Level of Design Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ 100% design by agency ☒ Agency has complete control over the design (can be beneficial when there is one specific solution for a project) ☒ Project/scope can be developed through design ☐ The scope of the project is well defined through complete plans and contract documents ☐ Well-known process to the industry	☐ Agency design errors can result in a higher number of change orders, claims, etc. ☐ Minimizes competitive innovation opportunities ☒ Can reduce the level of constructability since the contractor is not bought into the project until after the design is complete
CM/GC	
Opportunities	**Obstacles**
☒ Can utilize a lower level of design prior to selecting a contractor then collaboratively advance design with agency, designer and contractor ☒ Contractor involvement in early design improves constructability ☒ Agency controls design ☐ Design can be used for D-B-B if the price is not successfully negotiated ☐ Design can be responsive to risk minimization	☒ Teaming and communicating concerning design can cause disputes ☒ Three party process can slow progression of design ☐ If design is too far advanced it will limit the advantages of CM/GC or could require design backtracking
DESIGN-BUILD	
Opportunities	**Obstacles**
☒ Design advanced by the agency to level necessary to precisely define the contract requirements and properly allocate risk ☒ Does not require much design to be completed before awarding project to the design-builder (between ~ 10% - 30% complete) ☒ Contractor involvement in early design, which improves constructability and innovation ☐ Plans do not have to be as detailed because the design-builder is bought into the project early in the process and will accept design responsibility	☒ Must have very clear definitions and requirements in the RFP because it is the basis for the contract ☐ If design is too far advanced it will limit the advantages of design-build ☐ Potential for lacking or missing scope definition if RFP not carefully developed ☐ Over utilizing performance specifications to enhance innovation can risk quality through reduced technical requirements ☒ Less agency control over the design ☐ Can create project less standardized designs across agency as a whole

4) Cost Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☒ Competitive bidding provides a low cost construction to a fully defined scope of work ☒ Increase certainty about cost estimates ☒ Construction costs are contractually set before construction begins	☐ Cost accuracy is limited until design is completed ☐ Construction costs are not locked in until design is 100% complete ☒ Cost reductions due to contractor innovation and constructability is difficult to obtain ☒ More potential of cost change orders due to Agency design responsibility
CM/GC	
Opportunities	**Obstacles**
☒ Agency/designer/contractor collaboration to reduce project risk can result in lowest project costs ☐ Early contractor involvement can result in cost savings through VE and constructability ☐ Cost will be known earlier when compared to D-B-B ☒ Integrated design/construction process can provide a cost efficient strategies to project goals ☐ Can provide a cost efficient response to the project goals	☒ Non-competitive negotiated GMP introduces price risk ☒ Difficulty in GMP negotiation introduces some risk that GMP will not be successfully executed requiring aborting the CM/GC process ☒ Paying for contractors involvement in the design phase may increase total cost
DESIGN-BUILD	
Opportunities	**Obstacles**
☒ Contractor input into design should moderate cost ☒ Design-builder collaboration and ATCs can provide a cost-efficient response to project goals ☒ Costs are contractually set early in design process with design-build proposal ☐ Allows a variable scope bid to match a fixed budget ☐ Potential lower average cost growth ☐ Funding can be obligated in a very short timeframe	☒ Risks related to design-build, lump sum cost without 100% design complete, can compromise financial success of the project

5a) Initial Risk Assessment Guidance

Three sets of risk assessment checklists are provided to assist in an initial risk assessment relative to the selection of the delivery method:

- Typical Transportation Project Risks
- General Project Risks Checklist
- Opportunities/Obstacles Checklist (relative to each delivery method)

It is important to recognize that the initial risk assessment is to only ensure the selected delivery method can properly address the project risks. A more detailed level of risk assessment should be performed concurrently with the development of the procurement documents to ensure that project risks are properly allocated, managed, and minimized through the procurement and implementation of the project.

Typical Transportation Project Risks

Following is a list of project risks that are frequently encountered on transportation projects and a discussion on how the risks are resolved through the different delivery methods.

1) Site Conditions and Investigations

How unknown site conditions are resolved. For additional information on site conditions, refer to 23 CFR 635.109(a) at the following link:

http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=91468e48c87a547c3497a5c19d640172&rgn=div5&view=text&node=23:1.0.1.7.23&idno=23#23:1.0.1.7.23.1.1.9

DESIGN-BID-BUILD

Site condition risks are generally best identified and mitigated during the design process prior to procurement to minimize the potential for change orders and claims when the schedule allows.

DESIGN-BUILD

Certain site condition responsibilities can be allocated to the design-builder provided they are well defined and associated third party approval processes are well defined. Caution should be used as unreasonable allocation of site condition risk will result in high contingencies during bidding. The Agency should perform site investigations in advance of procurement to define conditions and avoid duplication of effort by proposers. At a minimum, the Agency should perform the following investigations:

4) Basic design surveys
5) Hazardous materials investigations to characterize the nature of soil and groundwater contamination
6) Geotechnical baseline report to allow design-builders to perform proposal design without extensive additional geotechnical investigations

CM/GC

The STA, the designer, and the contractor can collectively assess site condition risks, identify the need to perform site investigations in order to reduce risks, and properly allocate risk prior to GMP.

2) Utilities

DESIGN-BID-BUILD

Utility risks are best allocated to the Agency, and mostly addressed prior to procurement to minimize potential for claims when the schedule allows.

DESIGN-BUILD

Utilities responsibilities need to be clearly defined in contract requirements, and appropriately allocated to both design-builder and the Agency:

Private utilities (major electrical, gas, communication transmission facilities): Need to define coordination and schedule risks, as they are difficult for design-builder to price. Best to have utilities agreements before procurement. Note – by state regulation, private utilities have schedule liability in design-build projects, but they need to be made aware of their responsibilities.

Public Utilities: Design and construction risks can be allocated to the design-builder, if properly incorporated into the contract requirements.

CM/GC

Can utilize a lower level of design prior to contracting and joint collaboration of Agency, designer, and contractor in the further development of the design.

3) Railroads (if applicable)

DESIGN-BID-BUILD

Railroad risks are best resolved prior to procurement and relocation designs included in the project requirements when the schedule allows.

DESIGN-BUILD

Railroad coordination and schedule risks should be well understood to be properly allocated and are often best assumed by the Agency. Railroad design risks can be allocated to the designer if well defined. Best to obtain an agreement with railroad defining responsibilities prior to procurement

CM/GC

Railroad impacts and processes can be resolved collaboratively by Agency, designer, and contractor. A lengthy resolution process can delay the GMP negotiations.

4) Drainage/Water Quality Best Management Practices (construction and permanent)

Both drainage and water quality often involve third party coordination that needs to be carefully assessed with regard to risk allocation. Water quality in particular is not currently well defined, complicating the development of technical requirements for projects.

Important questions to assess:

4) Do criteria exist for compatibility with third party offsite system (such as an OSP (Outfall System Plan))?
5) Is there an existing cross-drainage undersized by design Criteria?
6) Can water quality requirements be precisely defined? Is right-of-way adequate?

DESIGN-BID-BUILD

Drainage and water quality risks are best designed prior to procurement to minimize potential for claims when the schedule allows.

DESIGN-BUILD

Generally, the Agency is in the best position to manage the risks associated with third party approvals regarding compatibility with offsite systems, and should pursue agreements to define requirements for the design-builder.

CM/GC

The Agency, the designer, and the contractor can collectively assess drainage risks and coordination and approval requirements, and minimize and define requirements and allocate risks prior to GMP.

5) Environmental

Meeting environmental document commitments and requirements, noise, 4(f) and historic, wetlands, endangered species, etc.

DESIGN-BID-BUILD

Risk is best mitigated through design prior to procurement when the schedule allows.

DESIGN-BUILD

Certain environmental approvals and processes that can be fully defined can be allocated to the design-builder. Agreements or MOUs with approval agencies prior to procurement is best to minimize risks.

CM/GC

Environmental risks and responsibilities can be collectively identified, minimized, and allocated by the Agency, the designer, and the contractor prior to GMP

6) Third Party Involvement

Timeliness and impact of third party involvement (funding partners, adjacent municipalities, adjacent property owners, project stakeholders, FHWA, PUC).

DESIGN-BID-BUILD

Third party risk is best mitigated through design process prior to procurement to minimize potential for change orders and claims when the schedule allows.

DESIGN-BUILD

Third party approvals and processes that can be fully defined can be allocated to the design-builder. Agreements or MOUs with approval agencies prior to procurement is best to minimize risks.

CM/GC

Third party approvals can be resolved collaboratively by the Agency, designer, and contractor.

5b) General Project Risk Checklist (Items to consider when assessing risk)

Environmental Risks	External Risks
☐ Delay in review of environmental documentation	☐Stakeholders request late changes
☐ Challenge in appropriate environmental documentation	☐Influential stakeholders request additional needs to serve their own commercial purposes
☐ Defined and non-defined hazardous waste	☐Local communities pose objections
☐ Environmental regulation changes	☒Community relations
☒ Environmental impact statement (EIS) required	☐Conformance with regulations/guidelines/ design criteria
☐ NEPA/ 404 Merger Process required	☐Intergovernmental agreements and jurisdiction
☐ Environmental analysis on new alignments required	
Third-Party Risks	**Geotechnical and Hazmat Risks**
☒ Unforeseen delays due to utility owner and third-party	☐Unexpected geotechnical issues
☐ Encounter unexpected utilities during construction	☒Surveys late and/or in error
☐ Cost sharing with utilities not as planned	☐Hazardous waste site analysis incomplete or in error
☐ Utility integration with project not as planned	☐Inadequate geotechnical investigations
☒ Third-party delays during construction	☐Adverse groundwater conditions
☐ Coordination with other projects	☐Other general geotechnical risks
☒ Coordination with other government agencies	
Right-of-Way/ Real Estate Risks	**Design Risks**
☐ Railroad involvement	☐ Design is incomplete/ Design exceptions
☒ Objections to ROW appraisal take more time and/or money	☒ Scope definition is poor or incomplete
☐ Excessive relocation or demolition	☐ Project purpose and need are poorly defined
☒ Acquisition ROW problems	☐ Communication breakdown with project team
☐ Difficult or additional condemnation	☒ Pressure to deliver project on an accelerated schedule
☐ Accelerating pace of development in project corridor	☐ Constructability of design issues
☒ Additional ROW purchase due to alignment change	☐ Project complexity - scope, schedule, objectives, cost, and deliverables - are not clearly understood
Organizational Risks	**Construction Risks**
☒ Inexperienced staff assigned	☒ Pressure to deliver project on an accelerated schedule
☐ Losing critical staff at crucial point of the project	☐ Inaccurate contract time estimates
☐ Functional units not available or overloaded	☐ Construction QC/QA issues
☒ No control over staff priorities	☐ Unclear contract documents
☐ Lack of coordination/ communication	☐ Problem with construction sequencing/ staging/ phasing
☐ Local agency issues	☒ Maintenance of Traffic/ Work Zone Traffic Control
☐ Internal red tape causes delay getting approvals, decisions	
☐ Too many projects/ new priority project inserted into program	

5c) Assessment of Risk Project Delivery Selection Opportunities/Obstacles Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Risks managed separately through design, bid, build is expected to be easier ☒ Risk allocation is most widely understood/used ☐ Opportunity to avoid or mitigate risk through complete design ☐ Risks related to environmental, railroads, & third party involvement are best resolved before procurement ☐ Utilities and ROW best allocated to the agency and mostly addressed prior to procurement to minimize potential for claim ☐ Project can be shelved while resolving risks	☒ Agency accepts risks associated with project complexity (the inability of designer to be all-knowing about construction) and project unknowns ☒ Low-bid related risks ☐ Potential for misplaced risk through prescriptive specifications ☐ Innovative risk allocation is difficult to obtain ☐ Limited industry input in contract risk allocation ☒ Change order risks can be greater ☐ Contractor may avoid risks

CM/GC	
Opportunities	**Obstacles**
☒ Contractor can have a better understanding of the unknown conditions as design progresses ☒ Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing) ☐ Opportunities to manage costs risks through CM/GC involvement ☒ Contractor will help identify and manage risk ☒ Agency still has considerable involvement with third parties to deal with risks ☐ Avoids low-bid risk in procurement ☐ More flexibility and innovation available to deal with unknowns early in design process	☐ Lack of motivation to manage small quantity costs ☐ Increase costs for non-proposal items ☐ Disagreement among Designer-Contractor-Agency can put the process at risk ☒ If GMP cannot be reached, additional low-bid risks appear ☐ Limited to risk capabilities of CM/GC ☒ Designer-contractor-agency disagreements can add delays ☐ Strong agency management is required to negotiate/optimize risks ☐ Discovery of unknown conditions can drive up GMP, which can be compounded in phased construction

DESIGN-BUILD	
Opportunities	**Obstacles**
☒ Performance specifications can allow for alternative risk allocations to the design builder ☐ Risk-reward structure can be better defined ☒ Innovative opportunities to allocate risks to different parties (e.g., schedule, means and methods, phasing) ☒ Opportunity for industry review of risk allocation (draft RFP, ATC processes) ☒ Avoid low-bid risk in procurement ☐ Contractor will help identify risks related to environmental, railroads, ROW, and utilities ☐ Designers and contractors can work toward innovative solutions to, or avoidance of, unknowns	☒ Need a detailed project scope, description etc., for the RFP to get accurate/comprehensive responses to the RFP (Increased RFP costs may limit bidders) ☐ Limited time to resolve risks ☒ Additional risks allocated to designers for errors and omissions, claims for change orders ☐ Unknowns and associated risks need to be carefully allocated through a well-defined scope and contract ☐ Risks associated with agreements when design is not completed ☒ Poorly defined risks are expensive ☐ Contractor may avoid risks or drive consultant to decrease cost at risk to quality

6) Staff Experience and Availability Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Agency, contractors and consultants have high level of experience with the traditional system ☐ Designers can be more interchangeable between projects	☐ Can require a high level of agency staffing of technical resources ☐ Staff's responsibilities are spread out over a longer design period ☐ Can require staff to have full breadth of technical expertise
CM/GC	
Opportunities	**Obstacles**
☐ Agency can improve efficiencies by having more project managers on staff rather than specialized experts ☐ Smaller number of technical staff required through use of consultant designer	☐ Strong committed agency project management is important to success ☐ Limitation of availability of staff with skills, knowledge and personality to manage CM/GC projects ☐ Existing staff may need additional training to address their changing roles ☐ Agency must learn how to negotiate GMP projects
DESIGN-BUILD	
Opportunities	**Obstacles**
☒ Less agency staff required due to the sole source nature of D-B ☒ Opportunity to grow agency staff by learning a new process	☒ Limitation of availability of staff with skills, knowledge and personality to manage D-B projects ☐ Existing staff may need additional training to address their changing roles ☐ Need to "mass" agency management and technical resources at critical points in process (i.e., RFP development, design reviews, etc.)

7) Level of Oversight and Control Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Full agency control over a linear design and construction process ☐ Oversight roles are well understood ☐ Contract documents are typically completed in a single package before construction begins ☐ Multiple checking points through three linear phases: design-bid-build ☐ Maximum control over design	☐ Requires a high-level of oversight ☐ Increased likelihood of claims due to agency design responsibility ☐ Limited control over an integrated design/construction process
CM/GC	
Opportunities	**Obstacles**
☐ Preconstruction services are provided by the construction manager ☐ Getting input from construction to enhance constructability and innovation ☐ Provides agency control over an integrated design/construction process	☐ Agency must have experienced staff to oversee the CM/GC ☐ Higher level of cost oversight required
DESIGN-BUILD	
Opportunities	**Obstacles**
☒ A single entity responsibility during project design and construction ☒ Continuous execution of design and build ☒ Getting input from construction to enhance constructability and innovation ☐ Overall project planning and scheduling is established by one entity	☐ Can require high level of design oversight ☐ Can require high level of quality assurance oversight ☒ Limitation on staff with D-B oversight experience ☒ Less agency control over design ☐ Control over design relies on proper development of technical requirements

8) Competition and Contractor Experience Project Delivery Selection Checklist

DESIGN-BID-BUILD	
Opportunities	**Obstacles**
☐ Promotes high level of competition in the marketplace ☐ Opens construction to all reasonably qualified bidders ☐ Transparency and fairness ☐ Reduced chance of corruption and collusion ☐ Contractors are familiar with D-B-B process	☐Risks associated with selecting the low bid (the best contractor is not necessary selected) ☐No contractor input into the design process ☐Limited ability to select contractor based on qualifications
CM/GC	
Opportunities	**Obstacles**
☐ Allows for qualifications based contractor procurement ☐ Agency has control over an independent selection of best qualified designer and contractor ☐ Contractor is part of the project team early on, creating a project "team" ☐ Increased opportunity for innovation due to the diversity of the project team	☐ Currently there is not a large pool of contractors with experience in CM/GC, which will reduce the competition and availability ☐ Working with only one contractor to develop GMP can limit price competition ☐ Requires a strong project manager from the agency ☐ Teamwork and communication among the project team
DESIGN-BUILD	
Opportunities	**Obstacles**
☒ Allows for a balance of qualifications and cost in design-builder procurement ☒ Two-phase process can promote strong teaming to obtain "Best Value" ☒ Increased opportunity for innovation possibilities due to the diverse project team	☒ Need for D-B qualifications can limit competition ☐ Lack of competition with past experience with the project delivery method ☒ Reliant on D-B team selected for the project ☐ The gap between agency experience and contractor experience with delivery method can create conflict

Appendix J2—CDOT Procurement Procedure Selection Matrix (PPSM).

Procurement Procedure Selection Workshop Summary

Workshop Summary	
Project Name:	
Workshop Date:	
Workshop Location:	
Facilitator:	
Procurement Procedure Selected:	

Workshop Participants	
Name	**Email**

Procurement Procedure Selection Matrix

Overview

This document provides a project procurement procedure selection approach for highway projects. The information below lists the procurement procedures followed by an outline of the process, instructions, and general forms for use by transportation agency (Agency) staff and project team members. By using these forms, a brief Procurement Selection Report can be generated for each individual project. The primary objectives of this tool are:

- Present a structured approach to assist Agencies in making procurement procedure decisions;
- Assist Agencies in determining if there is a dominant or optimal choice of a procurement procedure; and
- Provide documentation of the selection decision.

Background

The procurement procedure is the process of selecting firms to purchase goods and services necessary to complete the various stages of design and construction of a project. The difference in the procurement procedures depends on whether quantitative factors, qualitative factors or a combination of the two are used to select a firm. Currently, there are many types and variations of procurement procedures available for publicly funded transportation projects. The most common systems are Low bid, Best Value, and QBS. No single procurement procedure method is appropriate for every project. Each project must be examined individually to determine how it aligns with the attributes of each available procurement procedure. The definitions below contain the three primary procurement procedures and a list of supplementary procurement procedures that are used in conjunction with one of the three primary procedures.

Primary Procurement Procedures

Low Bid is the most traditional selection methodology for construction services where contractors submit bids on a project and the lowest "responsible and responsive" bidder is then awarded the contract.

Best Value is a selection strategy used to choose contractors where price and other factors are used to determine which proposal or bid would bring the highest or best value to the Agency. Relative weights for the different factors vary from project to project as does the relationship between price and the other factors.

Qualifications-Based selection is a process whereby an Agency selects a design professional based on experience, expertise and overall credentials to procure the most qualified firm or individuals for a given project. There is no cost proposal associated with choosing a firm. Costs are negotiated with the selected firm after procurement is complete, but before the contract is signed.

Facilitation of the tool

When embarking on using the procurement procedure selection tool for the first time, it is recommended that a facilitator is brought in for the workshop. The facilitator will assist with working through the tool and provide guidance for discussing the project and selection of a procurement procedure. This individual should be knowledgeable about the

process and should be consistently used. The facilitator also helps to answer questions and make sure the process stays on track and the team moves towards a formal selection.

Participation

Using the procurement procedure selection matrix is only as good as the people who are involved in the selection workshop. Therefore, it is necessary to have a collection of different individuals to participate in the selection. The selection team needs to include the project manager, the project engineer, a representative of the procurement/contracting office, and any other STA staff that is crucial to the project. In addition, the selection team might want to consider including representatives from specialty units and from the local jurisdictions where the project is located. However, it is important to keep the selection team to a minimum amount of participants. Otherwise, the selection process can take a long time to complete. Normally, 3-7 people represent a selection team, but this number should be based on the specific project being analyzed.

Potential bias

The best approach for the participants of the workshop is to keep an open mind about procurement procedure to choose. However, there might be participants that have a preconceived notion about the procurement procedure to use on a project. When this occurs, it is best to discuss that person's ideas with the entire selection team at the beginning of the workshop. Putting that person's ideas on the table helps others to understand the choice that person has in mind. Then, it is important to acknowledge this person's ideas, but to remind that person to keep an open mind as the team works through the selection process.

Pre-workshop Tasks

Before conducting the selection workshop, a few tasks can be completed by the workshop participants. Preparing for the workshop prior to conducting it will result in a much more concise and informative session. It is advised that participants review all known project information, goals, risks, and constraints prior to the workshop. The best approach is to complete the *Procurement Procedure Description*, the *Procurement Procedure Goals*, and the *Procurement Procedure Constraints* worksheets before conducting the workshop. Completing the three worksheets will shorten the time needed to review the project and allows the workshop team to move right into the selection process.

Procurement Procedure Selection Process

The process is shown as an outline below and as a flowchart on the following page for reference. It consists of individual steps to complete the entire process. The steps should be followed in sequential order.

STAGE I – Project Attributes, Goals, and Constraints

A. Procurement procedures to consider
    1. Low Bid
    2. Best Value
    3. Qualifications-Based
B. Project Description/Goals/Constraints
    1. Describe the project
    2. State the project delivery method selected
    3. Set the project goals
    4. Determine and review project dependent constraints

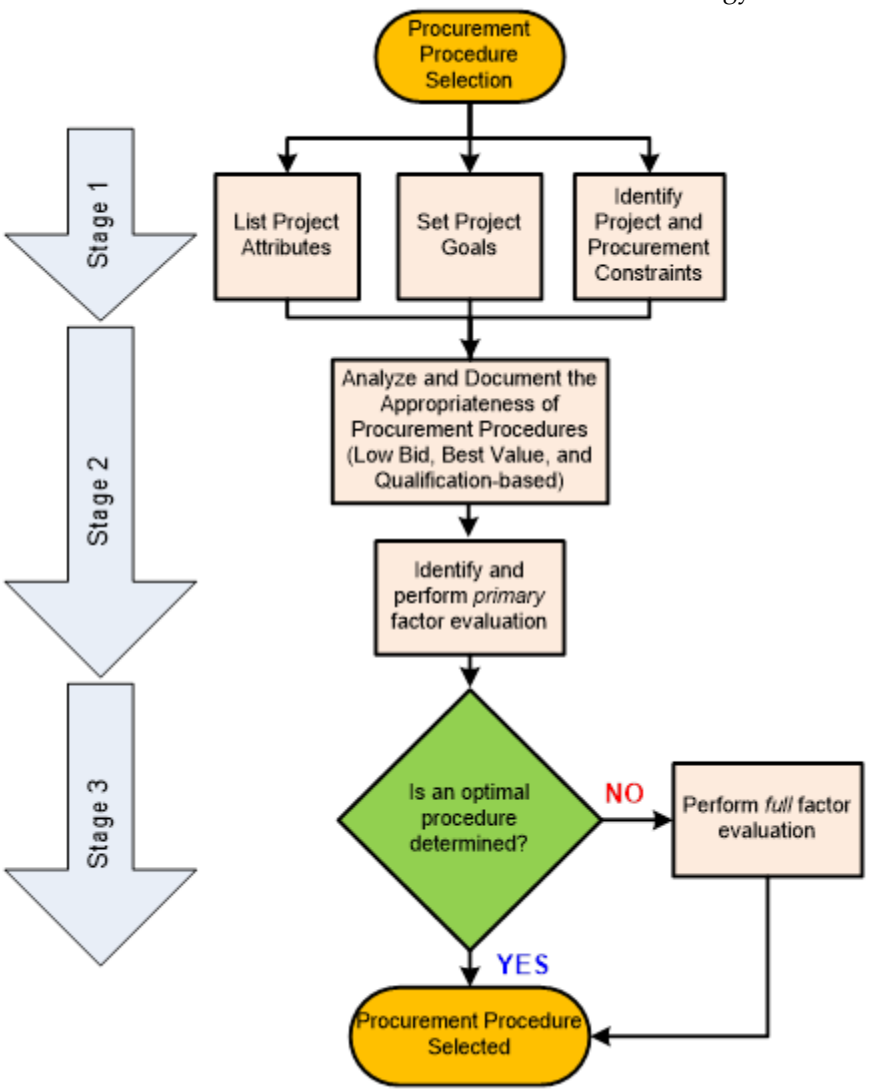
STAGE II – Determine Procurement Procedures and Selection Factors to Evaluate

A. Review each potential procurement procedure against the selected delivery method
    1. Eliminate procurement procedures that are inappropriate for the selected delivery method
B. Determine which of the eight factors need to be evaluated
    1. Delivery Schedule
    2. Complexity & Innovation
    3. Level of Design
    4. Cost
    5. Assessment of Risk
    6. Staff Experience and Availability
    7. Level of Oversight and Control
    8. Competition and Contractor Experience

STAGE III – Evaluate Factors

A. Assess each potential procurement procedure in regards to the factors determined to need evaluation
B. Review checklists for each factor being evaluated
C. If the above steps do not reveal an optimal procedure, proceed with evaluating remaining factors against all potential procurement procedures

NOTE: Typically, the entire selection process can be completed by the project team in a 2 hour workshop session, as long as each team member has individually reviewed and performed the assessment prior to the workshop.



Flowchart of the Procurement Procedure Selection Process

Procurement Procedure Selection Matrix Worksheets and Forms

The following forms and appendices are included to facilitate this process.

Project procurement description worksheet

Provide information on the project. This includes size, type, funding, risks, complexities, etc. All information should be developed for the specific project.

Project procurement goals worksheet – including example project goals

A careful determination of the project goals is an instrumental first step of the process that will guide both the selection of the appropriate procurement procedure for the project.

Project procurement constraints worksheet – including example project constraints

Carefully review all possible constraints to the project. These constraints can potentially eliminate a procurement procedure before the evaluation process begins.

Procurement procedure selection summary form

The procurement procedure selection summary form outlines the assessment of the eight selection factors for the three procurement procedures. The form is qualitatively scored using the rating provided in the table below. The form also includes a section for comments and conclusions. The completed procurement procedures selection summary should provide an executive summary of the key reasons for the selection of the chosen procedure.

Rating Key	
++	Most appropriate procurement procedure
+	Appropriate procurement procedure
–	Least appropriate procurement procedure
X	Fatal Flaw (discontinue evaluation of this procedure)
NA	Factor not applicable or not relevant to the selection

Workshop blank form

This form can be used by the project team for additional documentation of the process. In particular, it can be used to elaborate the evaluation of the *Assessment of Risk* factor.

Procurement procedure selection factor opportunities / obstacles form

These forms are used to summarize the assessments by the project team of the opportunities and obstacles associated with each procurement procedure relative to each of the eight Selection Factors. The bottom of each form allows for a qualitative conclusion using the same notation as described above. Those conclusions then are transferred to the **Procurement Procedure Selection Summary.**

Procurement procedure opportunities / obstacles checklists

These forms provide the project team with direction concerning typical procurement procedure opportunities and obstacles associated with each of the eight Selection Factors. However, these checklists include general information and are not an all-inclusive checklist. Use the checklists as a supplement to developing project specific opportunities and obstacles.

Project Procurement Description

The following items should be considered in describing the specific project. Other items can be added to the bottom of the form if they influence the procurement procedure decision. Relevant documents can be added as appendices to the final summary report.

Project Attributes
Project Name:
Location:
Estimated Budget:
Delivery Method Selected:
Estimated Project Delivery Period:
Required Delivery Date (if applicable):
Source(s) of Project Funding:
Project Corridor:
Major Features of Work – pavement, bridge, sound barriers, etc.:
Major Schedule Milestones:
Major Project Stakeholders:
Major Obstacles with Right of Way, Utilities, and/or Environmental Approvals:
Major Obstacles During Construction Phase:
Main Identified Sources of Risk:
Safety Issues:
Sustainable Design and Construction Requirements:

Project Procurement Goals

An understanding of project goals is essential to selecting an appropriate procurement procedure. Typically, the project goals can be defined in three to five items. Example goals are provided below, but the report should include project-specific goals. These goals should remain consistent over the life of the project.

Project-Specific Goals
Goal #1:
Goal #2:
Goal #3:
Goal #4:
Goal #5:

General Project Goals (For reference)

Schedule
- Minimize project delivery time
- Complete the project on schedule
- Accelerate start of project revenue

Cost
- Minimize project cost
- Maximize project budget
- Complete the project on budget
- Maximize the project scope and improvements within the project budget

Quality
- Meet or exceed project requirements
- Select the best team
- Provide a high quality design and construction constraints
- Provide an aesthetically pleasing project

Functional
- Maximize the life cycle performance of the project
- Maximize capacity and mobility improvements
- Minimize inconvenience to the traveling public during construction
- Maximize safety of workers and traveling public during construction

Project Procurement Constraints

There are potential aspects of a project that can eliminate the need to evaluate one or more of the possible procurement procedures. A list of general constraints can be found below the table and should be referred to after completing this worksheet. The first section below is for general constraints and the second section is for constraints specifically tied to procurement selection.

General Constraints
Source of Funding:
Schedule constraints:
Federal, state, and local laws:
Third party agreements with railroads, ROW, etc:
Procurement Specific Constraints
Procurement constraint #1:
Procurement constraint #2:
Procurement constraint #3:
Procurement constraint #4:
Procurement constraint #5:

General Project Constraints

Schedule
- Utilize federal funding by a certain date
- Complete the project on schedule
- Weather and/or environmental impact

Cost
- Project must not exceed a specific amount
- Minimal changes will be accepted
- Some funding may be utilized for specific type of work (bridges, drainage, etc)

Quality
- Must adhere to standards proposed by the Agency
- High quality design and construction constraints
- Adhere to local and federal codes

Functional
- Traveling public must not be disrupted during construction
- Hazardous site where safety is a concern
- Return area surrounding project to existing conditions

Procurement Procedure Selection Summary

Determine the factors that need to be evaluated in the procurement procedure selection, taking into account the project delivery method that will be used. Then, discuss the opportunities and obstacles related to each selection factor, and document the discussion on the following pages. At the conclusion of the evaluation, complete the summary table below.

PROCUREMENT PROCEDURES OPPORTUNITY/OBSTACLE SUMMARY					
	Evaluate Factor? (Circle One)		**Low Bid**	**Best Value**	**Qualifications-Based**
Selection Factors					
1. Delivery Schedule	Yes	No			
2. Project Complexity & Innovation	Yes	No			
3. Level of Design	Yes	No			
4. Cost	Yes	No			
5. Assessment of Risk	Yes	No			
6. Staff Experience and Availability	Yes	No			
7. Level of Oversight and Control	Yes	No			
8. Competition and Contractor Experience	Yes	No			

Rating Key	
++	Most appropriate procurement procedure
+	Appropriate procurement procedure
–	Least appropriate procurement procedure
X	Fatal Flaw (discontinue evaluation of this procedure)
NA	Factor not applicable or not relevant to the selection

Procurement Procedure Selection Summary Conclusions and Comments

Procurement Procedure Selection Matrix Factors

1) Delivery Schedule

Delivery schedule is the overall project schedule from scoping through design, construction and opening to the public. For procurement, consider the length of time needed to develop the RFP, proposal development, and evaluation. Assess time considerations for starting the project or receiving dedicated funding and assess project completion importance.

LOW BID – The shortest duration of competitive procurement methods. One factor to consider, cost, and this is the most traditional method that many understand.

Opportunities	Obstacles	Rating

BEST VALUE – Procurement period is the longest for this method. Additional time needed for bids to be prepared as well as evaluating and Rating proposals.

Opportunities	Obstacles	Rating

QUALIFICATIONS-BASED – Requires time to evaluate qualitative factors. Clarifications for some of the bids may be needed, which can extend the letting period.

Opportunities	Obstacles	Rating

2) Project Complexity and Innovation

Project complexity and innovation is the potential applicability of new designs or processes to resolve complex technical issues.

LOW BID – The traditional letting approach. Does not allow for additional factors to be considered such as innovative designs and alternative technical concepts. Useful for low complexity projects that do not need additional innovations to complete.

Opportunities	Obstacles	Rating

BEST VALUE – A quantitative and qualitative procurement method that allows for additional factors such as innovative designs and techniques to be provided in the proposals.

Opportunities	Obstacles	Rating

QUALIFICATIONS-BASED – Useful for projects that do not have a complete bid package or where a complete bid package cannot be feasibly developed due to complexities and necessary innovations.

Opportunities	Obstacles	Rating

3) Level of Design

Level of design is the percentage of design completion at the time of the project delivery procurement.

LOW BID – Design needs to be complete, or near complete, and accurate so that firms can responsibly prepare cost bids.

Opportunities	Obstacles	Rating

BEST VALUE – Very little design needs to be complete before advertising the RFP. Plans do not need to be fully detailed as the RFP requirements can include design alternatives.

Opportunities	Obstacles	Rating

QUALIFICATIONS-BASED – Very little or no design needs to be complete as firms are selected based on other factors besides cost and schedule.

Opportunities	Obstacles	Rating

4) Cost

Project cost is the financial process related to meeting budget restrictions, early and precise cost estimation, and control of project costs.

LOW BID – Competitive bidding on costs can provide for low construction costs based on a fully defined design and scope.		
Opportunities	**Obstacles**	**Rating**

BEST VALUE – Development of the RFP needs to be complete and accurate so that cost changes are minimized.		
Opportunities	**Obstacles**	**Rating**

QUALIFICATIONS-BASED – Procurement only evaluates factors such as past experience, reputation, financial stability, and does not include cost.		
Opportunities	**Obstacles**	**Rating**

5) Initial Risk Assessment

Risk is an uncertain event or condition that, if it occurs, has an effect on a project's objectives. Risk allocation is the assignment of unknown events or conditions to the party that can best manage them. An assessment of project risks is important to ensure the selection of a procurement procedure that can properly address them.

LOW BID – Evaluation of proposals only considers cost and does not include any information on how a bidding firm will address any risks. Agencies can allocate more risks to the contract, but that will be reflected in the bids.

Opportunities	Obstacles	Rating

BEST VALUE – The RFP can request risk management plan, which provides the agency with an understanding of how the project team will allocate and manage risks.

Opportunities	Obstacles	Rating

QUALIFICATIONS-BASED – Selection can consider past performances with project risks and can request information on how the qualifying firm plans to manage risks on the project.

Opportunities	Obstacles	Rating

6) Staff Experience and Availability

Agency staff experience and availability as it relates to the procurement procedure in question.

LOW BID – This is the traditional method that most Agencies have a plethora of experience and knowledge.

Opportunities	Obstacles	Rating

BEST VALUE – This is a more extensive process that Agencies may not have the experience or knowledge to use. Additional resources will be needed to develop the RFP and evaluate received proposals.

Opportunities	Obstacles	Rating

QUALIFICATIONS-BASED – This can be an unknown procedure in how to evaluate subjective factors. Experience by Agencies in this procedure is low.

Opportunities	Obstacles	Rating

7) Level of Oversight and Control

Level of oversight involves the amount of agency staff required to develop the procurement documents, and the amount of agency staff required to evaluate received proposals/bids.

LOW BID – Minimal amount of staff and time required to develop procurement documents and evaluation typically only requires reviewing the cost amount submitted by bidding firms.

Opportunities	Obstacles	Rating

BEST VALUE – Additional staff and time is required to develop the criteria for the RFP. Evaluation of proposals is extensive and requires additional resources that when evaluating cost alone. Agency does have more control over what to require of proposing firms.

Opportunities	Obstacles	Rating

QUALIFICATIONS-BASED – Minimal amount of staff and time required to create the RFQ. Additional staff and time is needed to evaluate the qualifications. Agency has control over what to require of qualifying firms.

Opportunities	Obstacles	Rating

8) Competition and Contractor Experience

Competition and availability refers to the level of competition, experience and availability in the market place and its capacity for the project and associated procurement procedure.

LOW BID – Firms are most familiar with this procedure and it promotes a high level of competition.

Opportunities	Obstacles	Rating

BEST VALUE – Provides a balance of qualifications and costs. Promotes fair competition among firms. However, many firms may not be familiar with this procedure and are unable to responsibly provide a proposal.

Opportunities	Obstacles	Rating

QUALIFICATIONS-BASED – Provides for qualifying firms in selection. This can lead to limited competition and unfamiliarity by firms.

Opportunities	Obstacles	Rating

Procurement Procedure Selection Factors Opportunities and Obstacles Checklists

(With project risk assessment and checklists)

1) Delivery Schedule Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Traditional method that requires the shortest procurement time ☐ Allows for projects to be more easily "shelved" ☐ Reduced time required to deliver project to advertisement ☐	☐ May lead to potential delays and other adverse outcomes ☐ Unreported design errors or omissions may lead to change orders and schedule delays ☐ Rebidding a project increases the procurement time and overall schedule may be delayed ☐
Best Value	
Opportunities	**Obstacles/Risks**
☐ Well developed and planned schedules are available if schedule is one of the parameters requested in the RFP ☐ Overall project schedule can be compressed ☐ Positive impact on cost, quality, schedule, and flexibility ☐ Shifts risks to awarded firm ☐ Helps to promote innovation, especially in project schedule	☐ Request for proposal development and procurement can be intensive ☐ Undefined events or conditions found after procurement can impact schedule and cost ☐ Requires agency and stakeholder commitments to an extensive review of proposals in a timely manner ☐ Time required to define technical requirements and expectations through RFP development can be intensive ☐ Bidding firms may utilize more resources to develop a complete project schedule, which could increase bid costs
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Overall project schedule can be compressed ☐ Less time required for procurement if firms are pre-qualified ☐ ☐ ☐	☐ Award process can be lengthy if negotiating with multiple firms ☐ Iterative process until an agreement is reached ☐ ☐ ☐

2) Project Complexity and Innovation Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Useful for projects that require little or no innovation ☐ Complex design can be resolved and competitively bid on cost ☐ Innovations can add cost or time ☐ ☐	☐ Diminishes innovation in design and construction ☐ ☐ ☐ ☐
Best Value	
Opportunities	**Obstacles/Risks**
☐ Greater opportunity for innovation and improvements in quality ☐ Can request solutions to project complexities in RFP ☐ Innovative opportunities to allocate risks to different parties in RFP requirements (e.g., schedule, means and methods, phasing) ☐	☐ Qualitative factors can be difficult to define and evaluate ☐ Some potential design solutions might be too innovative or difficult to evaluate properly ☐ Requires desired solutions to complex designs to be well defined through technical requirements (difficult to do) ☐ Innovations can add cost or time ☐ Over utilizing performance specifications to enhance innovation can risk quality through reduced technical requirements ☐ Complexity and subjectivity may increase opposition from unsuccessful bidders
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Works well will projects where complexity, technical risks and/or evolving scope make it difficult to prepare a clear and accurate bid package to procure using competitive pricing ☐ Risk of innovation can be better defined, minimized, and allocated during negotiations ☐ ☐	☐ ☐ ☐ ☐ ☐

3) Level of Design Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Traditional method requiring the design to be complete or near complete by the agency for accurate bidding ☐ Scope of the project is well defined with complete plans and specifications ☐ ☐	☐ Design must be complete and accurate as design errors or omissions may lead to change orders and schedule delays ☐ ☐ ☐ ☐
Best Value	
Opportunities	**Obstacles/Risks**
☐ Very little design needs to be complete ☐ Plans do not have to be as detailed because the RFP can request further design alternatives ☐ ☐ ☐	☐ Must have very clear definitions and requirements in the RFP because it is the basis for the contract ☐ Potential for lacking or missing scope definition if RFP not carefully developed ☐ Can create less standardized project designs across agency as a whole due to different design requirements ☐ The majority of the design to be completed by design-builder
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Can utilize a lower level of design prior to selecting a firm then collaboratively advance design with the agency and project team ☐ ☐ ☐ ☐	☐ Trust that the contractor will provide useful input during design ☐ ☐ ☐ ☐

4) Cost Project Procurement Procedure Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Competitive bidding provides low cost construction to a fully defined scope of work ☐ Low bid amount received is used as contract amount ☐ Can reduce overall engineering costs ☐ ☐	☐ Unreported design errors or omissions may lead to change orders and schedule delays ☐ Accuracy of bids is limited unless design is complete and accurate ☐ Increased risk to Agency that all received bids will exceed budget ☐ ☐
Best Value	
Opportunities	**Obstacles/Risks**
☐ Complete and accurate requirements in the RFP can help to reduce change orders in number and magnitude during construction ☐ Agency runs the risk of higher initial costs, but risk of poor quality is reduced ☐ Cost is not the only primary factor to consider in evaluating received proposals ☐ Can reduce engineering costs ☐	☐ Undefined events or conditions found after procurement can impact schedule and cost ☐ Increased cost to prepare proposal can limit responsive firms ☐ Cost to prepare proposal can be substantial, resulting in increased bid amounts ☐
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Agency does not have to award to lowest, responsive bidder ☐ Only evaluating qualitative factors, no cost to consider ☐ ☐ ☐	☐ Procurement does not include cost portion in proposals ☐Subjective selection based on qualitative factors only ☐ ☐ ☐

5a) General Project Risk Checklist (Items to consider when assessing risk)

Environmental Risks	External Risks
☐ Delay in review of environmental documentation ☐ Challenge in appropriate environmental documentation ☐ Defined and non-defined hazardous waste ☐ Environmental regulation changes ☐ Environmental impact statement (EIS) required ☐ NEPA/ 404 Merger Process required ☐ Environmental analysis on new alignments required	☐Stakeholders request late changes ☐Influential stakeholders request additional needs to serve their own commercial purposes ☐Local communities pose objections ☐Community relations ☐Conformance with regulations/guidelines/ design criteria ☐Intergovernmental agreements and jurisdiction
Third-Party Risks	**Geotechnical and Hazmat Risks**
☐ Unforeseen delays due to utility owner and third-party ☐ Encounter unexpected utilities during construction ☐ Cost sharing with utilities not as planned ☐ Utility integration with project not as planned ☐ Third-party delays during construction ☐ Coordination with other projects ☐ Coordination with other government agencies	☐Unexpected geotechnical issues ☐Surveys late and/or in error ☐Hazardous waste site analysis incomplete or in error ☐Inadequate geotechnical investigations ☐Adverse groundwater conditions ☐Other general geotechnical risks
Right-of-Way/ Real Estate Risks	**Design Risks**
☐ Railroad involvement ☐ Objections to ROW appraisal take more time and/or money ☐ Excessive relocation or demolition ☐ Acquisition ROW problems ☐ Difficult or additional condemnation ☐ Accelerating pace of development in project corridor ☐ Additional ROW purchase due to alignment change	☐ Design is incomplete/ Design exceptions ☐ Scope definition is poor or incomplete ☐ Project purpose and need are poorly defined ☐ Communication breakdown with project team ☐ Pressure to delivery project on an accelerated schedule ☐ Constructability of design issues ☐ Project complexity – scope, schedule, objectives, cost, and deliverables – are not clearly understood
Organizational Risks	**Construction Risks**
☐ Inexperienced staff assigned ☐ Losing critical staff at crucial point of the project ☐ Functional units not available or overloaded ☐ No control over staff priorities ☐ Lack of coordination/ communication ☐ Local agency issues ☐ Internal red tape causes delay getting approvals, decisions ☐ Too many projects/ new priority project inserted into program	☐ Pressure to delivery project on an accelerated schedule. ☐ Inaccurate contract time estimates ☐ Construction QC/QA issues ☐ Unclear contract documents ☐ Problem with construction sequencing/ staging/ phasing ☐ Maintenance of Traffic/ Work Zone Traffic Control

5b) Assessment of Risk Procurement Procedure Selection Opportunities/Obstacles Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Risk allocation is most widely used and understood ☐ When design is complete, opportunity to avoid or mitigate risks ☐ ☐	☐ Low bid related risks ☐ Agency needs to resolve risks related to environmental, railroads and third party involvement before procurement begins ☐ Agency responsible for addressing ROW and utilities risks before beginning procurement ☐ Contractor has the ability to avoid risks
Best Value	
Opportunities	**Obstacles/Risks**
☐ Innovative opportunities to allocate risks to bidding firms ☐ Eliminates low bid risks ☐ Can define risk/reward structure in RFQ/RFP ☐ Contractor can identify risks related to environmental, railroads, ROW, and utilities ☐Contractors can propose innovative solutions to eliminate or mitigate risks	☐ Need a detailed project scope, description and any other necessary information for the RFP so that accurate, complete, and comprehensive responses are received ☐ Introduces risks associated with the agreement when design is not complete or alternate solutions are to be used ☐ ☐ ☐
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Eliminates low bid risks ☐ Bidders can help to identify project risks ☐ ☐ ☐	☐ High cost risks, as no quantitative factors to base a selection on ☐ If an agreement cannot be negotiated, then low bid risks appear ☐ ☐ ☐

6) Staff Experience and Availability Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Traditional method that Agency staff knows and understands ☐ Less Agency resources needed for developing request for proposal and evaluating received bids ☐ Reduces Agency construction administrative staffing ☐	☐ Additional Agency administrative efforts needed to ensure compliance with documentation requirements ☐ ☐ ☐ ☐
Best Value	
Opportunities	**Obstacles/Risks**
☐ Provides Agency staff with experience in developing Best Value proposals and evaluating received proposals ☐ Opportunity to grow agency staff by learning a new process ☐ Ability to tailor the evaluation plan to the specific needs of a project ☐ ☐	☐ Agency staff may need training on how to evaluate proposals ☐ High amount of agency management and technical resources needed for RFP development ☐ Inexperienced agency staff can increase the organizational risk ☐ Legislation may need to be enacted to use best value legally
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Similar procurement procedure in selecting design professionals ☐ Works well for projects where Agency cannot develop full bid packages ☐ Provides for more interaction with bidding firms ☐ ☐	☐ Agency staff may be unfamiliar with this procedure for selecting contractors ☐ Additional Agency management is needed for negotiations and qualification factor development ☐ Additional Agency management is required ☐ ☐

7) Level of Oversight and Control Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Oversight roles well understood ☐ Few resources needed to evaluate and award project ☐ ☐ ☐	☐ Agency must select the lowest, responsive bid, regardless of other factors ☐ ☐ ☐ ☐
Best Value	
Opportunities	**Obstacles/Risks**
☐ Bidders provide input to enhance constructability and innovation ☐ Cost, schedule, and other factors determined by bidding firms ☐ Agency has full control over awarding project ☐ ☐	☐ Requires more Agency resources to develop RFP ☐ Requires more Agency resources to evaluate proposals ☐ Less Agency control over final design ☐ Control of design relies on the proper development of RFQ and RFP ☐
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Agency controls procurement process by evaluating qualitative factors ☐ Agency has full control over awarding project ☐ ☐ ☐	☐ Agency must have experienced staff to oversee the procurement process ☐ Agency cannot control negotiations with potential firms ☐ ☐ ☐

8) Competition and Contractor Experience Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Promotes high level of competition in the marketplace ☐ Opens construction to all reasonably qualified bidders ☐ Contractors are familiar with Low Bid process ☐ Definable and defensible (objective) award	☐ Risks associated with selecting the low bid (the best contractor is not necessary selected) ☐ Limited ability to select a contractor on qualifications ☐ Increased likelihood of disputes and claims by contractors
Best Value	
Opportunities	**Obstacles/Risks**
☐ Allows a balance of qualifications and cost ☐ Fair competition and performance-based accountability ☐ Helps to assure the Agency is selecting a capable and qualified firm ☐	☐ Less contractors are familiar with the qualitative aspects of proposals ☐ Increased cost to prepare proposal can limit responsive firms ☐ Complexity and subjectivity may increase opposition from unsuccessful bidders ☐ Difficult to use on public projects as objective competition is required to select contractor without additional legislation ☐ Smaller firms can be limited in participation ☐ Highly subjective evaluation of qualitative factors ☐ Qualitative factors leave room for human error or biases ☐ Lowest cost bidder may not receive award, resulting in opposition
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Allows for Qualitative procurement of contractors ☐ Focuses on contractor abilities ☐ Bid transparency ☐ Only have to negotiate with one firm on contract ☐	☐ Limited ability to select a contractor based on cost ☐ Qualifying firms can limit competition ☐ Difficult to use on public projects as objective competition is required to select contractor without additional legislation ☐ Potential for upset, non-awarded firms due to subjectivity evaluation of qualitative factors ☐ Smaller firms can be limited in participation

Procurement Procedure Selection Workshop Summary

Workshop Summary	
Project Name:	I-25 managed lanes project from 120th Ave to SH7
Workshop Date:	July 9, 2013
Workshop Location:	CDOT District 4 HQ – Greeley, CO
Facilitator:	Keith Molenaar
Procurement Procedure Selected:	Best value

Workshop Participants	
Name	**Email**
Dan Marcucci	
Ina Zisman	
Wes Goff	
Carol Parr	
Bob Grube	
Keith Schaeffer	

Project Procurement Description

The following items should be considered in describing the specific project. Other items can be added to the bottom of the form if they influence the procurement procedure decision. Relevant documents can be added as appendices to the final summary report.

Project Attributes
Project Name: I-25 Managed Lanes – 120th Ave to SH7
Location: Along Interstate 25 in north Denver from 120th Ave (SH 128) to SH7
Estimated Budget: $54,500,000
Delivery Method Selected: Design-Build. This project will consider Low Bid or Best Value for procuring a firm. Qualifications-based will not be evaluated.
Estimated Project Delivery Period: CDOT 30% design 10/2013 to 11/2014. Procurement 11/2014 to 5/2014. Construction 5/2015 to 6/2016.
Required Delivery Date (if applicable): Before January 1, 2017
Source(s) of Project Funding: RAMP
Project Corridor: I-25 NB and SB lanes in north Denver metro area
Major Features of Work – pavement, bridge, sound barriers, etc.: Bridge widening E-17-FH and E-17-FG, roadway widening, noise walls, asphalt paving, managed lanes implementation, ITS. The project will follow existing grade and alignment
Major Schedule Milestones: Opening of managed lanes from SH128 to SH7 – Summer 2016 Risk assessment – already started Design consultant selection – already started 30% plans – 11/2014 Project Delivery Selection – Design-Build July 2013 Construction RFP including shortlist and selection – 5/2014 FOR Begin construction – Summer 2015 Complete construction – Summer 2016
Major Project Stakeholders: CDOT, RTD, CDOT transit division, Broomfield County, Adams County
Major Obstacles With Right of Way, Utilities, and/or Environmental Approvals: Utilities, environmental approval, ROD2
Major Obstacles During Construction Phase: Traffic management, implementation of managed lanes, ITS
Main Identified Sources of Risk: ROD2 and funding
Safety Issues: Standard traffic issues
Sustainable Design and Construction Requirements: Provide for a more uniform traffic flow thereby saving on pollution and energy. Using existing roadway template with overlay

Project Procurement Goals

An understanding of project goals is essential to selecting an appropriate procurement procedure. Typically, the project goals can be defined in three to five items. Example goals are provided below, but the report should include project-specific goals. These goals should remain consistent over the life of the project.

Project-Specific Goals
Goal #1: Primary goal Schedule – Very aggressive with total completion by end of 2016. Need to minimize project delivery time, complete project on schedule, accelerate start of project revenue
Goal #2: Primary goal Cost – Funding through RAMP should be available. Need to make sure RAMP funded section is on or below budget as additional funds will not be available. Need to maximize project budget, complete the project on or below budget, and maximize the project scope and improvements within the project budget
Goal #3: Secondary goal Quality – Meet or exceed project requirements, select the best team, provide high quality design and construction constraints, provide aesthetically pleasing project, project is providing interim improvements with final improvements many years away
Goal #4: Secondary goal Functional – Maximize the life-cycle performance of the project, maximize the capacity and mobility improvements, minimize inconvenience to the traveling public during construction, maximize safety of workers and traveling public during construction, provide revenues for a future P3 project to the north along I-25
Goal #5:

Project Procurement Constraints

There are potential aspects of a project that can eliminate the need to evaluate one or more of the possible procurement procedures. A list of general constraints can be found below the table and should be referred to after completing this worksheet. The first section below is for general constraints and the second section is for constraints specifically tied to procurement selection.

General Constraints
Source of Funding: RAMP funds – Potential that these funds are not made available. State makes decision on funding at end of August 2013 (Assume for this selection tool that RAMP funds will be made available)
Schedule constraints: Complete project by 12/31/2016 based on current corridor schedule
Federal, state, and local laws: NA
Third party agreements with railroads, ROW, etc: Utility clearance for the project itself (scheduling), timely ROW plans by end of 2014 could be aggressive
Procurement Specific Constraints
Procurement constraint #1: ROD 2 – Record of decision to be complete by May 2014. Can be a risk if public involvement takes longer than planned. ROW plans depend on the ROD. Reduced risk for completing ROD 2 for 120th to SH7 section only
Procurement constraint #2: MS 4 (water quality) for the width that is added (the additional pavement). Impact should be minimal
Procurement constraint #3: Topography survey has not been completed and design cannot begin in earnest until this is complete
Procurement constraint #4:
Procurement constraint #5:

Procurement Procedure Selection Summary

Determine the factors that need to be evaluated in the procurement procedure selection, taking into account the project delivery method that will be used. Then, discuss the opportunities and obstacles related to each selection factor, and document the discussion on the following pages. At the conclusion of the evaluation, complete the summary table below.

PROCUREMENT PROCEDURES OPPORTUNITY/OBSTACLE SUMMARY				
	Evaluate this Factor? (Circle One)	**Low Bid**	**Best Value**	**Qualifications-Based**
Evaluation Factors				
Delivery Schedule	Yes (No)	**NA**	**NA**	**NA**
Project Complexity and Innovation	(Yes) No	**+**	**++**	**NA**
Level of Design	(Yes) No	**-**	**++**	**NA**
Cost	(Yes) No	**+**	**++**	**NA**
Assessment of Risk	(Yes) No	**-**	**++**	**NA**
Staff Experience and Availability	Yes (No)	**NA**	**NA**	**NA**
Level of Oversight and Control	Yes (No)	**NA**	**NA**	**NA**
Competition and Contractor Experience	(Yes) No	**-**	**++**	**NA**

Rating Key	
++	Most appropriate procurement procedure
+	Appropriate procurement procedure
–	Least appropriate procurement procedure
X	Fatal Flaw (discontinue evaluation of this procedure)
NA	Factor not applicable or not relevant to the selection

Procurement Procedure Selection Summary Conclusions and Comments

The procurement procedures selection workshop resulted in selecting Best Value for the Design-Build I-25 managed lanes project, from 120th Ave to SH7

In the workshop, the factors of project complexity, level of design, cost, risk and competition and contractor experience were evaluated for low bid and best value procurement.

It was determined before evaluating the factors to eliminate delivery schedule as the time needed to perform the procurement is not a constraint and there is time available to perform any procurement method

It was also determined to eliminate staff experience and availability and level of oversight and control factors as CDOT is in the process of hiring a consultant that will be available to assist CDOT with both of these situations, regardless of the procurement method selected

In evaluating complexity and innovation, it was determined that although this project is not very complex, it would be beneficial with the selected design-build delivery method to receive the best value available for this project and to allow for bidders to propose possible innovations to save cost and time

In evaluating level of design, it was determined that besides the ITS needing to be completely designed by CDOT, the rest of the project only needs to be developed to the 30% design complete range. This works well with best value. In low bid for design-build, the design would need to be advanced further than 30% to get more accurate bids

In evaluating cost, it was determined that the size of this project in terms of budget would make it one of the largest low bid design-build projects that CDOT has ever done. Also, the workshop participants were all in agreement that a technical portion in the RFP would provide a better value to CDOT, meaning best value is optimal for this factor.

In evaluating risk, the largest concern was the ITS design, which has to be completed by CDOT. Then, the discussion focused on the fact that in either procurement method, CDOT will pay for risks that are allocated to the bidding firm. Since that will occur, it makes more sense to use best value, which can then provide justification for how a risk will be handled by the awarded firm. This is not possible with low bid.

In evaluating competition and contractor experience, the location of the project will allow for high competition from responsive bidders who are familiar with design-build and preparing a best value proposal. Qualifications of the bidding firm can be a part of the technical portion of the RFP for best value, while low bid would still then need to conduct pre-qualifications before letting the project for bid.

Procurement Procedure Selection Matrix Factors

1) Delivery Schedule

Delivery schedule is the overall project schedule from scoping through design, construction and opening to the public. For procurement, consider the length of time needed to develop the RFP, proposal development, and evaluation. Assess time considerations for starting the project or receiving dedicated funding and assess project completion importance.

LOW BID – The shortest duration of competitive procurement methods. One factor to consider, cost, and this is the most traditional method that many understand.

Opportunities	Obstacles	Rating
Current corridor schedule provides enough time to use this procedure		NA
Schedule was not evaluated for Low Bid		

BEST VALUE – Procurement period is the longest for this method. Additional time needed for bids to be prepared as well as evaluating and Rating proposals.

Opportunities	Obstacles	Rating
Current corridor schedule provides enough time to use this procedure		NA
Schedule was not evaluated for Best Value		

QUALIFICATIONS-BASED – Requires time to evaluate qualitative factors. Clarifications for some of the bids may be needed, which can extend the letting period.

Opportunities	Obstacles	Rating
Not included in the evaluation		NA

2) Project Complexity and Innovation

Project complexity and innovation is the potential applicability of new designs or processes to resolve complex technical issues.

LOW BID – The traditional letting approach. Does not allow for additional factors to be considered such as innovative designs and alternative technical concepts. Useful for low complexity projects that do not need additional innovations to complete.

Opportunities	Obstacles	Rating
Project is not very complex and may not need innovative ideas and techniques to complete the project		
		+

BEST VALUE – A quantitative and qualitative procurement method that allows for additional factors such as innovative designs and techniques to be provided in the proposals.

Opportunities	Obstacles	Rating
Allow CDOT to introduce innovation request and requirements in technical portion of RFP	Innovations could add costs or time	
No constraint on procurement schedule and the added technical portion of RFP will allow for more innovative ideas		
		++

QUALIFICATIONS-BASED – Useful for projects that do not have a complete bid package or where a complete bid package cannot be feasibly developed due to complexities and necessary innovations.

Opportunities	Obstacles	Rating
Not evaluated		
		NA

3) Level of Design

Level of design is the percentage of design completion at the time of the project delivery procurement.

LOW BID – Design needs to be complete, or near complete, and accurate so that firms can responsibly prepare cost bids.

Opportunities	Obstacles	Rating
More of the design is controlled and completed by CDOT	Design will need to be developed by CDOT further for low bid over best value before releasing the RFP	–
ITS is completed by CDOT	With more complete design, difficult to make changes	

BEST VALUE – Very little design needs to be complete before advertising the RFP. Plans do not need to be fully detailed as the RFP requirements can include design alternatives.

Opportunities	Obstacles	Rating
Design does not need to be advanced beyond 30% before advertising the RFP	ITS needs to be completed by CDOT	++
Design does not have to be detailed as the RFP can request further design and technical alternates		

QUALIFICATIONS-BASED – Very little or no design needs to be complete as firms are selected based on other factors besides cost and schedule.

Opportunities	Obstacles	Rating
Not evaluated		NA

4) Cost

Project cost is the financial process related to meeting budget restrictions, early and precise cost estimation, and control of project costs.

LOW BID – Competitive bidding on costs can provide for low construction costs based on a fully defined design and scope.

Opportunities	Obstacles	Rating
Low bid amount in proposal us used as contract amount	The project would be the largest budget-wise to use Low Bid with Design-Build at CDOT	+

BEST VALUE – Development of the RFP needs to be complete and accurate so that cost changes are minimized.

Opportunities	Obstacles	Rating
The budget of the project fits better with best value		++
Allows for innovative ideas that may reduce costs		
Cost is not the only factor to consider in evaluating received proposals		

QUALIFICATIONS-BASED – Procurement only evaluates factors such as past experience, reputation, financial stability, and does not include cost.

Opportunities	Obstacles	Rating
Not evaluated		NA

5) Initial Risk Assessment

Risk is an uncertain event or condition that, if it occurs, has an effect on a project's objectives. Risk allocation is the assignment of unknown events or conditions to the party that can best manage them. An assessment of project risks is important to ensure the selection of a procurement procedure that can properly address them.

LOW BID – Evaluation of proposals only considers cost and does not include any information on how a bidding firm will address any risks. Agencies can allocate more risks to the contract, but that will be reflected in the bids.

Opportunities	Obstacles	Rating
More design complete and low bid is the contract amount	CDOT pays for risks in any procurement, but difficult to understand how bidder addresses risks with no technical portion in the RFP or received proposals	–

BEST VALUE – The RFP can request risk management plan, which provides the agency with an understanding of how the project team will allocate and manage risks.

Opportunities	Obstacles	Rating
Allows for more uncertainties to be addressed in technical portion	ITS needs to be completed by CDOT	++
CDOT pays for risk in any procurement, best value allows CDOT to see how a bidder will address a risk with the technical portion of the RFP		
Technical portion eliminates the risks associated with choosing the lowest bidder		
Allows for traffic management plan to be a part of RFP		

QUALIFICATIONS-BASED – Selection can consider past performances with project risks and can request information on how the qualifying firm plans to manage risks on the project.

Opportunities	Obstacles	Rating
Not evaluated		NA

6) Staff Experience and Availability

Agency staff experience and availability as it relates to the procurement procedure in question.

LOW BID – This is the traditional method that most Agencies have a plethora of experience and knowledge.

Opportunities	Obstacles	Rating
Not evaluated as third party consultant will assist CDOT		NA

BEST VALUE – This is a more extensive process that Agencies may not have the experience or knowledge to use. Additional resources will be needed to develop the RFP and evaluate received proposals.

Opportunities	Obstacles	Rating
Not evaluated as third party consultant will assist CDOT		NA

QUALIFICATIONS-BASED – This can be an unknown procedure in how to evaluate subjective factors. Experience by Agencies in this procedure is low.

Opportunities	Obstacles	Rating
Not evaluated		NA

7) Level of Oversight and Control

Level of oversight involves the amount of agency staff required to develop the procurement documents, and the amount of agency staff required to evaluate received proposals/bids.

LOW BID – Minimal amount of staff and time required to develop procurement documents and evaluation typically only requires reviewing the cost amount submitted by bidding firms.

Opportunities	Obstacles	Rating
Not evaluated as third party consultant will assist CDOT		NA

BEST VALUE – Additional staff and time is required to develop the criteria for the RFP. Evaluation of proposals is extensive and requires additional resources that when evaluating cost alone. Agency does have more control over what to require of proposing firms.

Opportunities	Obstacles	Rating
Not evaluated as third party consultant will assist CDOT		NA

QUALIFICATIONS-BASED – Minimal amount of staff and time required to create the RFQ. Additional staff and time is needed to evaluate the qualifications. Agency has control over what to require of qualifying firms.

Opportunities	Obstacles	Rating
Not evaluated		NA

8) Competition and Contractor Experience

Competition and availability refers to the level of competition, experience and availability in the market place and its capacity for the project and associated procurement procedure.

LOW BID – Firms are most familiar with this procedure and it promotes a high level of competition.

Opportunities	Obstacles	Rating
Location and size of project allows for many received proposals from responsive bidders	Need to pre-qualify bidders to avoid selecting the lowest bidder that is not qualified	–

BEST VALUE – Provides a balance of qualifications and costs. Promotes fair competition among firms. However, many firms may not be familiar with this procedure and are unable to responsibly provide a proposal.

Opportunities	Obstacles	Rating
Location and size of project allows for many potential proposals from responsive bidders		++

QUALIFICATIONS-BASED – Provides for qualifying firms in selection. This can lead to limited competition and unfamiliarity by firms.

Opportunities	Obstacles	Rating
Not evaluated		NA

Procurement Procedure Selection Factors Opportunities and Obstacles Checklists

(With project risk assessment and checklists)

1) Delivery Schedule Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Traditional method that requires the shortest procurement time ☐ Allows for projects to be more easily "shelved" ☐ Reduced time required to deliver project to advertisement ☐	☐ May lead to potential delays and other adverse outcomes ☐ Unreported design errors or omissions may lead to change orders and schedule delays ☐ Rebidding a project increases the procurement time and overall schedule may be delayed ☐
Best Value	
Opportunities	**Obstacles/Risks**
☐ Well developed and planned schedules are available if schedule is one of the parameters requested in the RFP ☐ Overall project schedule can be compressed ☐ Positive impact on cost, quality, schedule, and flexibility ☐ Shifts risks to awarded firm ☐ Helps to promote innovation, especially in project schedule	☐ Request for proposal development and procurement can be intensive ☐ Undefined events or conditions found after procurement can impact schedule and cost ☐ Requires agency and stakeholder commitments to an extensive review of proposals in a timely manner ☐ Time required to define technical requirements and expectations through RFP development can be intensive ☐ Bidding firms may utilize more resources to develop a complete project schedule, which could increase bid costs
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Overall project schedule can be compressed ☐ Less time required for procurement if firms are pre-qualified ☐ ☐ ☐	☐ Award process can be lengthy if negotiating with multiple firms ☐ Iterative process until an agreement is reached ☐ ☐ ☐

2) Project Complexity and Innovation Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☒ Useful for projects that require little or no innovation ☐ Complex design can be resolved and competitively bid on cost ☒ Innovations can add cost or time ☐ ☐	☒ Diminishes innovation in design and construction ☐ ☐ ☐ ☐
Best Value	
Opportunities	**Obstacles/Risks**
☒ Greater opportunity for innovation and improvements in quality ☒ Can request solutions to project complexities in RFP ☒ Innovative opportunities to allocate risks to different parties in RFP requirements (e.g., schedule, means and methods, phasing) ☐	☒ Qualitative factors can be difficult to define and evaluate ☐ Some potential design solutions might be too innovative or difficult to evaluate properly ☐ Requires desired solutions to complex designs to be well defined through technical requirements (difficult to do) ☒ Innovations can add cost or time ☐ Over utilizing performance specifications to enhance innovation can risk quality through reduced technical requirements ☐ Complexity and subjectivity may increase opposition from unsuccessful bidders
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Works well will projects where complexity, technical risks and/or evolving scope make it difficult to prepare a clear and accurate bid package to procure using competitive pricing ☐ Risk of innovation can be better defined, minimized, and allocated during negotiations ☐ ☐	☐ ☐ ☐ ☐ ☐

3) Level of Design Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☒ Traditional method requiring the design to be complete or near complete by the agency for accurate bidding ☒ Scope of the project is well defined with complete plans and specifications ☐ ☐	☒ Design must be complete and accurate as design errors or omissions may lead to change orders and schedule delays ☐ ☐ ☐ ☐
Best Value	
Opportunities	**Obstacles/Risks**
☒ Very little design needs to be complete ☒ Plans do not have to be as detailed because the RFP can request further design alternatives ☐ ☐ ☐	☒ Must have very clear definitions and requirements in the RFP because it is the basis for the contract ☐ Potential for lacking or missing scope definition if RFP not carefully developed ☐ Can create less standardized project designs across agency as a whole due to different design requirements ☐ The majority of the design to be completed by design-builder
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Can utilize a lower level of design prior to selecting a firm then collaboratively advance design with the agency and project team ☐ ☐ ☐ ☐	☐ Trust that the contractor will provide useful input during design ☐ ☐ ☐ ☐

4) Cost Project Procurement Procedure Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☒ Competitive bidding provides low cost construction to a fully defined scope of work ☒ Low bid amount received is used as contract amount ☐ Can reduce overall engineering costs ☐ ☐	☒ Unreported design errors or omissions may lead to change orders and schedule delays ☐ Accuracy of bids is limited unless design is complete and accurate ☒ Increased risk to Agency that all received bids will exceed budget ☐ ☐
Best Value	
Opportunities	**Obstacles/Risks**
☒ Complete and accurate requirements in the RFP can help to reduce change orders in number and magnitude during construction ☐ Agency runs the risk of higher initial costs, but risk of poor quality is reduced ☒ Cost is not the only primary factor to consider in evaluating received proposals ☐ Can reduce engineering costs ☐	☐ Undefined events or conditions found after procurement can impact schedule and cost ☒ Increased cost to prepare proposal can limit responsive firms ☒ Cost to prepare proposal can be substantial, resulting in increased bid amounts ☐
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Agency does not have to award to lowest, responsive bidder ☐ Only evaluating qualitative factors, no cost to consider ☐ ☐ ☐	☐ Procurement does not include cost portion in proposals ☐Subjective selection based on qualitative factors only ☐ ☐ ☐

5) General Project Risk Checklist (Items to consider when assessing risk)

Environmental Risks	External Risks
☒ Delay in review of environmental documentation ☐ Challenge in appropriate environmental documentation ☐ Defined and non-defined hazardous waste ☐ Environmental regulation changes ☒ Environmental impact statement (EIS) required ☐ NEPA/ 404 Merger Process required ☐ Environmental analysis on new alignments required	☐Stakeholders request late changes ☐Influential stakeholders request additional needs to serve their own commercial purposes ☐Local communities pose objections ☐Community relations ☐Conformance with regulations/guidelines/ design criteria ☐Intergovernmental agreements and jurisdiction
Third-Party Risks	**Geotechnical and Hazmat Risks**
☒ Unforeseen delays due to utility owner and third-party ☒ Encounter unexpected utilities during construction ☐ Cost sharing with utilities not as planned ☐ Utility integration with project not as planned ☐ Third-party delays during construction ☐ Coordination with other projects ☐ Coordination with other government agencies	☐Unexpected geotechnical issues ☒Surveys late and/or in error ☐Hazardous waste site analysis incomplete or in error ☐Inadequate geotechnical investigations ☒Adverse groundwater conditions ☐Other general geotechnical risks
Right-of-Way/ Real Estate Risks	**Design Risks**
☐ Railroad involvement ☐ Objections to ROW appraisal take more time and/or money ☐ Excessive relocation or demolition ☐ Acquisition ROW problems ☐ Difficult or additional condemnation ☐ Accelerating pace of development in project corridor ☐ Additional ROW purchase due to alignment change	☐ Design is incomplete/ Design exceptions ☐ Scope definition is poor or incomplete ☐ Project purpose and need are poorly defined ☐ Communication breakdown with project team ☐ Pressure to delivery project on an accelerated schedule ☒ Constructability of design issues ☐ Project complexity – scope, schedule, objectives, cost, and deliverables – are not clearly understood
Organizational Risks	**Construction Risks**
☐ Inexperienced staff assigned ☐ Losing critical staff at crucial point of the project ☐ Functional units not available or overloaded ☐ No control over staff priorities ☐ Lack of coordination/ communication ☐ Local agency issues ☐ Internal red tape causes delay getting approvals, decisions ☐ Too many projects/ new priority project inserted into program	☐ Pressure to delivery project on an accelerated schedule ☐ Inaccurate contract time estimates ☐ Construction QC/QA issues ☐ Unclear contract documents ☐ Problem with construction sequencing/ staging/ phasing ☒ Maintenance of Traffic/ Work Zone Traffic Control

5) Assessment of Risk Procurement Procedure Selection Opportunities/Obstacles Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☒ Risk allocation is most widely used and understood ☐ When design is complete, opportunity to avoid or mitigate risks ☐ ☐	☒ Low bid related risks ☐ Agency needs to resolve risks related to environmental, railroads and third party involvement before procurement begins ☒ Agency responsible for addressing ROW and utilities risks before beginning procurement ☐ Contractor has the ability to avoid risks
Best Value	
Opportunities	**Obstacles/Risks**
☒ Innovative opportunities to allocate risks to bidding firms ☒ Eliminates low bid risks ☒ Can define risk/reward structure in RFQ/RFP ☒ Contractor can identify risks related to environmental, railroads, ROW, and utilities ☒Contractors can propose innovative solutions to eliminate or mitigate risks	☒ Need a detailed project scope, description and any other necessary information for the RFP so that accurate, complete, and comprehensive responses are received ☐ Introduces risks associated with the agreement when design is not complete or alternate solutions are to be used ☐ ☐ ☐
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Eliminates low bid risks ☐ Bidders can help to identify project risks ☐ ☐ ☐	☐ High cost risks, as no quantitative factors to base a selection on ☐ If an agreement cannot be negotiated, then low bid risks appear ☐ ☐ ☐

6) Staff Experience and Availability Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☒ Traditional method that Agency staff knows and understands ☐ Less Agency resources needed for developing request for proposal and evaluating received bids ☐ Reduces Agency construction administrative staffing ☐	☐ Additional Agency administrative efforts needed to ensure compliance with documentation requirements ☐ ☐ ☐ ☐
Best Value	
Opportunities	**Obstacles/Risks**
☒ Provides Agency staff with experience in developing Best Value proposals and evaluating received proposals ☐ Opportunity to grow agency staff by learning a new process ☐ Ability to tailor the evaluation plan to the specific needs of a project ☐ ☐	☐ Agency staff may need training on how to evaluate proposals ☒ High amount of agency management and technical resources needed for RFP development ☐ Inexperienced agency staff can increase the organizational risk ☐ Legislation may need to be enacted to use best value legally
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Similar procurement procedure in selecting design professionals ☐ Works well for projects where Agency cannot develop full bid packages ☐ Provides for more interaction with bidding firms ☐ ☐	☐ Agency staff may be unfamiliar with this procedure for selecting contractors ☐ Additional Agency management is needed for negotiations and qualification factor development ☐ Additional Agency management is required ☐ ☐

7) Level of Oversight and Control Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Oversight roles well understood ☐ Few resources needed to evaluate and award project ☐ ☐ ☐	☐ Agency must select the lowest, responsive bid, regardless of other factors ☐ ☐ ☐ ☐
Best Value	
Opportunities	**Obstacles/Risks**
☐ Bidders provide input to enhance constructability and innovation ☐ Cost, schedule, and other factors determined by bidding firms ☐ Agency has full control over awarding project ☐ ☐	☐ Requires more Agency resources to develop RFP ☐ Requires more Agency resources to evaluate proposals ☐ Less Agency control over final design ☐ Control of design relies on the proper development of RFQ and RFP ☐
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Agency controls procurement process by evaluating qualitative factors ☐ Agency has full control over awarding project ☐ ☐ ☐	☐ Agency must have experienced staff to oversee the procurement process ☐ Agency cannot control negotiations with potential firms ☐ ☐ ☐

8) Competition and Contractor Experience Procurement Procedure Selection Checklist

Low Bid	
Opportunities	**Obstacles/Risks**
☐ Promotes high level of competition in the marketplace ☐ Opens construction to all reasonably qualified bidders ☒ Contractors are familiar with Low Bid process ☒ Definable and defensible (objective) award	☐ Risks associated with selecting the low bid (the best contractor is not necessary selected) ☒ Limited ability to select a contractor on qualifications ☒ Increased likelihood of disputes and claims by contractors
Best Value	
Opportunities	**Obstacles/Risks**
☒ Allows a balance of qualifications and cost ☐ Fair competition and performance-based accountability ☐ Helps to assure the Agency is selecting a capable and qualified firm ☐	☐ Less contractors are familiar with the qualitative aspects of proposals ☐ Increased cost to prepare proposal can limit responsive firms ☐ Complexity and subjectivity may increase opposition from unsuccessful bidders ☐ Difficult to use on public projects as objective competition is required to select contractor without additional legislation ☐ Smaller firms can be limited in participation ☐ Highly subjective evaluation of qualitative factors ☐ Qualitative factors leave room for human error or biases ☐ Lowest cost bidder may not receive award, resulting in opposition
Qualifications-Based	
Opportunities	**Obstacles/Risks**
☐ Allows for Qualitative procurement of contractors ☐ Focuses on contractor abilities ☐ Bid transparency ☐ Only have to negotiate with one firm on contract ☐	☐ Limited ability to select a contractor based on cost ☐ Qualifying firms can limit competition ☐ Difficult to use on public projects as objective competition is required to select contractor without additional legislation ☐ Potential for upset, non-awarded firms due to subjectivity evaluation of qualitative factors ☐ Smaller firms can be limited in participation

Appendix K1—WSDOT Project Delivery Method Selection Guidance (PDMSG) Checklist.

Final Project Delivery Method Selection Checklist

Project Title:	Date:
	WIN:
Route:	PIN:
MP(s):	List any additional PINs at bottom or attached to this form.
Cost:	

Part I — Cost RCW 47.20.785 does not encourage Design-Build for a project contract cost (PE & Construction) less than $2 Million

Is the Project Estimate less than $2 Million?

☐ Yes — A selection process and authorization are not required — the delivery method is Design-Bid-Build.

☐ No — Continue to Part II

Part II — RCW 47.20.785 Project Qualifications for Design-Build Method

1. Are construction activities highly specialized?	☐ Yes	☐ No
2. Is a DB approach critical in developing the construction methodology?	☐ Yes	☐ No
3. Does the project provide opportunity for greater innovation & efficiencies between the designer & builder?	☐ Yes	☐ No
4. Would use of DB result in significant reduction to the overall project schedule or critical milestones?	☐ Yes	☐ No

If **Yes** was selected for any of questions 1 through 4 above, Design-Build is a viable PDM option. (Go to Part III)

If **No** was selected for all of the questions 1 through 4 above, it indicates Design-Bid-Build as the PDM — get authorization (end).

Part III — Project Questions

SCHEDULE	A. Are there 3rd party agreements with local government or agencies that require a full design before execution? (Is a significant portion of the project impacted?) Justification:	☐ Yes	☐ No
	B. Are there long lead, lengthy environmental permits or ROW issues that would delay start of Construction? (Is a significant portion of the project impacted?) Justification:	☐ Yes	☐ No
	C. Is early obligation of funds necessary? (Such as a deadline to obligate grant funding) Justification:	☐ No	☐ Yes
	D. Is there time to prepare 100% design? Justification:	☐ Yes	☐ No
	E. Is there a need to compress the schedule? Justification:	☐ No	☐ Yes
	F. Do funding limits restrict when the schedule can start? (Such as the Biennium) Justification:	☐ Yes	☐ No
& INNOVATION	G. Are there significant risks that could be better managed by others than WSDOT? Justification:	☐ No	☐ Yes
	H. Does the project involve specialty engineering or high-tech designs or have other opportunities for innovation? Justification:	☐ No	☐ Yes
	I. Does the project require complex phasing and staging with the possibility of high impacts to the public? Justification:	☐ No	☐ Yes

Final Project Delivery Method Selection Checklist

Part III — Project Questions			
COMPLEXITY &	J. Does an existing road or facility need to remain in service? (no options for detour, or no alternate facility available, and a significant portion of the project is impacted) Justification:	☐ No	☐ Yes
	K. Is WSDOT willing to give up control of design and/or construction on this project? Justification:	☐ No	☐ Yes
	L. Are critical 3rd party involvement and changes likely during design & construction? Justification:	☐ Yes	☐ No
COST	M. Is early certainty of the total project cost important? (Increased certainty of total cost early in the project needed due to funding or project constraints) Justification:	☐ No	☐ Yes
Sum each column to the right—a checked answer is worth one (1) point. The column with the most points indicates the recommended delivery method.		DBB	DB
Project Delivery Method indicated from the responses to the questions in Part III (above)		Score:	
☐ DBB ☐ DB ☐ Inconclusive			

The project cost is:

- ☐ **less than $25 million** — get Authorization Level 1 (below)
- ☐ **$25 million or greater, but less than $100 million** — get Authorization Levels 1 & 2 (below)
- ☐ **$100 million or greater** — apply Project Delivery Selection Matrix / Workshop

Final Project Delivery Method Selected	
☐ **Design-Bid-Build** ☐ **Design-Build**	
Authorization Level 1	
Project Engineer	
Name:	Signature: _____
PDE/EM Manager	
Name:	Signature: _____
Authorization Level 2	
ASCE/ASDE	
Name:	Signature: _____
Regional Administrator	
Name:	Signature: _____

Attach project information, assumptions and additional justification to Form

Appendix K2—WSDOT Project Delivery Method Selection Guidance (PDMSG) Matrix.

Final Project Delivery Method Selection Matrix

Project Title:	Date:
	WIN:
Route:	PIN:
MP(s):	List any additional PINs at bottom or attached to this form.
Cost:	

- Begin with the list of generic considerations offered below; modify or add entries as required. Indicate if the entry is a Project Delivery Goal by checking/selecting the Goal box; if not, leave blank.
- Weights: Enter numbers indicating the relative priority of each Project Delivery Goal (checked/selected)—higher numbers are higher priority—1 is the lowest.
- Ratings: Numbers from 1 to 10, with 1 lowest and 10 highest; a two point range is provided for the generic entries as given. Select the Rating that best fits the specifics of your Project Delivery Goal. If a Goal is modified or rewritten, confirm that the ratings are appropriate and revise them accordingly. Any new Goals added to the Matrix will need to have ratings provided based on the probability of each PDM to meet the Goal.
- Score: Multiply the selected Rating of each method by the priority Weight for each Goal. Total the scores for each method and compare.

	Consideration		Weight	DBB Rating	DBB Score	DB Rating	DB Score
SCHEDULE	☐ Goal	Minimize project delivery time		☐ ☐ 4 5		☐ ☐ 9 10	
	☐ Goal	Meet a specific critical Milestone or Completion date		☐ ☐ 4 5		☐ ☐ 9 10	
	☐ Goal	Utilize (federal) funding by a certain date		☐ ☐ 6 7		☐ ☐ 9 10	
	☐ Goal	Effectively manage weather, environmental and/or other construction windows		☐ ☐ 6 7		☐ ☐ 9 10	
	☐ Goal	Funding limitations impacts ability to compress the schedule and/or contract all the work early in the process (such as the biennium, grants, etc.)		☐ ☐ 9 10		☐ ☐ 6 7	
	☐ Goal			☐ ☐		☐ ☐	
	☐ Goal			☐ ☐		☐ ☐	
COST/FUNDING	☐ Goal	Minimize project cost		☐ ☐ 6 7		☐ ☐ 6 7	
	☐ Goal	Complete the project on budget		☐ ☐ 6 7		☐ ☐ 6 7	
	☐ Goal	Maximize the project scope and improvements within the budget		☐ ☐ 4 5		☐ ☐ 8 9	
	☐ Goal	Project cost must not exceed a specific amount		☐ ☐ 6 7		☐ ☐ 8 9	
	☐ Goal	Determine the total project cost as early as possible in the schedule		☐ ☐ 4 5		☐ ☐ 9 10	
	☐ Goal	Meet 3rd Party requirements with possible impacts in design and construction		☐ ☐ 6 7		☐ ☐ 4 5	
	☐ Goal			☐ ☐		☐ ☐	
	☐ Goal			☐ ☐		☐ ☐	
S	☐ Goal	Meet or exceed project quality/scope requirements —utilizing opportunities for innovation		☐ ☐ 6 7		☐ ☐ 9 10	

Final Project Delivery Method Selection Matrix

	Consideration	Weight	DBB Rating	DBB Score	DB Rating	DB Score
STANDARDS	☐ Goal Owner requires control of design to meet specific design and construction constraints and/or standards (such as aesthetics)		☐ ☐ 8 9		☐ ☐ 5 6	
	☐ Goal WSDOT maintains control of specific project elements (such as significant ROW or environmental impacts)		☐ ☐ 8 9		☐ ☐ 5 6	
	☐ Goal		☐ ☐		☐ ☐	
	☐ Goal		☐ ☐		☐ ☐	
FUNCTION/INNOVATION	☐ Goal Minimize maintenance and operations costs (assume maintenance and operations is not part of DB contract)		☐ ☐ 9 10		☐ ☐ 5 6	
	☐ Goal Maximize capacity and mobility of improvements		☐ ☐ 6 7		☐ ☐ 9 10	
	☐ Goal Minimize impacts to the public and/or local businesses during construction		☐ ☐ 6 7		☐ ☐ 9 10	
	☐ Goal Incorporate opportunities for innovation and efficiencies to meet specific requirements		☐ ☐ 4 5		☐ ☐ 9 10	
	☐ Goal Avoid or minimize impacts to the project through risk transfer and innovation (such as environmental risks)		☐ ☐ 4 5		☐ ☐ 9 10	
	☐ Goal Minimize project permanent area impact (footprint) (This would be project neutral unless the project is larger and more complex—then use the ratings ranges provided)		☐ ☐ 6 7		☐ ☐ 8 9	
	☐ Goal		☐ ☐		☐ ☐	
	☐ Goal		☐ ☐		☐ ☐	

Delivery method indicated by this matrix → → → _____ **Totals—**

Final Project Delivery Method Selected

☐ **Design-Bid-Build** ☐ **Design-Build**

Authorization

Project Engineer

Name: Signature: _____

PDE/EM Manager

Name: Signature: _____

ASCE/ASDE

Name: Signature: _____

Regional Administrator

Name: Signature: _____

Attach project information, assumptions and additional justification to Form

Appendix L—Wisconsin Work Zone Cell Phone Restrictions Bill (2015 Assembly Bill 198).

State of Wisconsin
2015 - 2016 LEGISLATURE

LRB-1161/2
EVM:wlj:wj

2015 ASSEMBLY BILL 198

May 5, 2015 - Introduced by Representatives SPIROS, BERCEAU, BILLINGS, E. BROOKS, EDMING, KAHL, KESSLER, KRUG, KULP, T. LARSON, MURPHY, OHNSTAD, PETRYK, QUINN, SPREITZER and SUBECK, cosponsored by Senators PETROWSKI, BEWLEY, CARPENTER, COWLES, GUDEX, MARKLEIN and OLSEN. Referred to Committee on Transportation.

AN ACT ***to amend*** 346.95 (1); and ***to create*** 346.89 (4m) of the statutes; **relating to:** the use of a cellular or other wireless telephone while driving a motor vehicle in a construction zone and providing a penalty.

Analysis by the Legislative Reference Bureau

Current law prohibits inattentive driving of a motor vehicle, which includes 1) being engaged or occupied with an activity, other than driving the vehicle, that interferes with the person's ability to drive the vehicle safely; 2) driving a motor vehicle while composing or sending an electronic text message or an e-mail message, subject to various exceptions; 3) a probationary license or instructional permit holder driving a motor vehicle while using a cellular or other wireless telephone; and 4) operating or being in a position to directly view an electronic device that provides visual entertainment, subject to various exceptions. Any person convicted of the first two forms of inattentive driving may be required to forfeit not less than $20 nor more than $400, and any person convicted of the third or fourth forms of inattentive driving may be required to forfeit not less than $20 nor more than $40 for a first offense and not less than $50 nor more than $100 for a second or subsequent offense within one year.

This bill prohibits a person from driving a motor vehicle while using a cellular or other wireless telephone in a construction zone, except to report an emergency. The prohibition does not apply to the use of a voice-operated or hands-free device if the person does not use his or her hands to operate the device, except to activate or deactivate a feature or function of the device. The prohibition includes using the

telephone for a purpose other than communication. Persons who violate this prohibition may be required to forfeit not less than $20 nor more than $40 for a first offense and not less than $50 nor more than $100 for a second or subsequent offense within one year.

The people of the state of Wisconsin, represented in senate and assembly, do enact as follows:

SECTION 1. 346.89 (4m) of the statutes is created to read:

346.89 **(4m)** No person may drive, as defined in s. 343.305 (1) (b), any motor vehicle while using a cellular or other wireless telephone, including using the telephone for a purpose other than communication, where persons engaged in work in a highway maintenance or construction area or in a utility work area are at risk from traffic, except to report an emergency. This subsection does not apply to the use of a voice–operated or hands–free device if the driver of the motor vehicle does not use his or her hands to operate the device, except to activate or deactivate a feature or function of the device.

SECTION 2. 346.95 (1) of the statutes is amended to read:

346.95 **(1)** Any person violating s. 346.87, 346.88, 346.89 (4), (4m), or (5), 346.90 to 346.92, or 346.94 (1), (9), (10), (11), (12), or (15) may be required to forfeit not less than $20 nor more than $40 for the first offense and not less than $50 nor more than $100 for the 2nd or subsequent conviction within a year.

SECTION 3. Effective date.

(1) This act takes effect on the first day of the 7th month beginning after publication.

(END)

Appendix M—TxDOT Go-NoGo Tool.

Appendix A. SWZ System Go/No-Go Decision Tool

Smart Work Zone

This Workbook is a Decision Tree for Smart Work Zone system selection.

TxDOT currently promotes the use of six SWZ systems that are addressed individually in the next six workbook tabs.
These Go/NoGo Decision trees produce planning level scores for each of those six SWZ systems. That score can be helpful for prioritizing and budgeting purposes.

Instructions :

For Go/NoGo Decision Tree

1- Insert the appropriate values for each criteria in the "Score" column.
2- On "Estimate Queue Length" use the"Max Queue Length" tab if a rigorous calculation is not available.
3- Once the scores are completed, the "Normalized Total" can be used to decide the Systems to use.
4- When the system selection is completed move on to the "System Cost Samples" to estimate if the projects can be funded.
5- All of the six systems scores are summarized in the "4 - Summary" tab.

For System Cost Examples

1- Examples of past projects costs are listed here.
2- Each system has a different example.
3- Select the Project Description that best fits the characteristics of the scored project.

Smart Work Zone
Go/No-Go Decision Tree - A criteria based tool for selecting Smart Work Zone Systems
Temporary Queue Detection System

Project Number:	
County:	
CSJ:	
Letting:	
Date Form Completed:	
Completed by:	

Scoring Factors	Scoring Range	Score
Impact from local traffic generators	Significant-local facilities are large enough to have official destination signs on the Interstate highway such as conference centers, sports arenas etc., so they produce large surges in traffic before/after large events (**20 points**) Moderate-Local businesses or public facilities generate traffic volumes that routinely backup the on/off ramps such as morning and evening rush hours (**10 points**) Minimal-Any circumstance that causes occasional backups on the on/off ramps such as congested local arterials or rail crossings (**5 points**) None (**0 points**)	
Estimated Queue Length (Calculated, or see Max Queue Length tab for rough estimate)	> 7 miles **(130 points)** 3.5 to 7 miles **(110 points)** 0 to 3.5 miles**(85 points)** None **(0 points)**	
Sight Distance at back of Queue	Sight distance issues exist where the back of queue will likely occur. **(30 points)**	
Existing traffic issues	Higher than normal crash rates, gridlock or frequent exit ramp backups**(30 points)** Not applicable **(0 points)**	
Availability of Alternate routes	Convenient alternate routes with capacity are available. (**3 points**) No alternate routes available **(0 points)**	
Merging conflict or hazards on the approach to work zone	External merging conflicts or hazards on the approach to or within the work zone. (**15 points**) Not applicable **(0 points)**	
Complex traffic control layout	Multiple crossovers, sharp curves or lane splits**(3 points)** Not applicable **(0 points)**	
Adjacent/consecutive project	There are adjacent active projects effectively creating a mega-project that totals... longer than 10 miles or longer than 2 years (**3 points**) between 5 to 10 miles or between 1 and 2 years (**2 points**) between 2 to 5 miles or between 6 months to 1 year (**1 point**) less than 2 miles or less than 6 months (**0 points**)	
Scattered/short term project	The project includes multiple short term lane restricting activities that are scattered across the state. (ex. bridge painting) **(3 points)** Not applicable **(0 points)**	
Extreme weather condition	Work zone has a known history of sudden extreme weather condition, sandstorm, etc. Or project duration covers several harsh weather season. **(3 points)** Not applicable **(0 points)**	
Connected vehicle	>5% (**3 points**) <5% (**0 points**)	
Existing ITS Systems	Project falls inside an existing Advanced Traffic Management System? The TMC has the intent to incorporate the travel time and delay estimating system into the TMC operations? The TMC can remotely control their existing advance traveler information systems? (**Each question worth 1 point**)	
Heavy vehicles	>12% (**3 points**) >9%(**2 points**) >6% (**1 point**) <=6% (**0 points**)	
Raw Scores		**0**
Max Possible score		249
Normalized Scores (0 to 100)*		**0**

*** Normalized Score is calculated by Raw Scores*100/Max Possible Score**

Smart Work Zone
Go/No-Go Decision Tree - A criteria based tool for selecting Smart Work Zone Systems
Temporary Speed Monitoring System

Project Number:	
County:	
CSJ:	
Letting:	
Date Form Completed:	
Completed by:	

Scoring Factors	Scoring Range	Score
Duration of the Work Zone	For projects with multiple work zones (ex. bridge painting or patching), score the duration of the longest work zone only. > 1 year (**10 points**) 1 - 10 months (**5 points**) < 1 months (**0 points**)	
Highway Function Class and ADT	See table below	
Impact from local traffic generators	Significant-local facilities are large enough to have official destination signs on the Interstate highway such as conference centers, sports arenas etc., so they produce large surges in traffic before/after large events (**10 points**) Moderate-Local businesses or public facilities generate traffic volumes that routinely backup the on/off ramps such as morning and evening rush hours (**6 points**) Minimal-Any circumstance that causes occasional backups on the on/off ramps such as congested local arterials or rail crossings (**3 points**) None (**0 points**)	
Estimated Queue Length (Calculated, or see Max Queue Length tab for rough estimate)	> 7 miles **(10 points)** **3.5 to 7** miles **(7 points)** 0 to 3.5 miles**(3 points)** None **(0 points)**	
Sight Distance at back of Queue	Sight distance issues exist where the back of queue will likely occur. **(3 points)** Not applicable **(0 points)**	
Existing traffic issues	Higher than normal crash rates gridlock or frequent exit ramp backups **(30 points)** Not applicable **(0 points)**	
Merging conflict or hazards on the approach to work zone	External merging conflicts or hazards on the approach to or within the work zone. (**3 points**)	
Complex traffic control layout	Multiple crossovers, sharp curves or lane splits **(3 points)** Not applicable **(0 points)**	
Chronic speeding issues	Work zones in the area have a history of chronic speeders >20 mph over speed limit. **(50 points)** Not applicable **(0 points)**	
Large speed variations	Work zone area has a history of unusually high average traffic speed variability. This is common on Interstate by-pass and outer rings. **(50 points)** Not applicable **(0 points)**	
Adjacent/consecutive project	There are adjacent active projects effectively creating a mega-project that totals... longer than 10 miles or longer than 2 years (**3 points**) between 5 to 10 miles or between 1 and 2 years (**2 points**) between 2 to 5 miles or between 6 months to 1 year (**1 point**) less than 2 miles or less than 6 months (**0 points**)	
Scattered/short term project	The project includes multiple short term lane restricting activities that are scattered across the state. (ex. bridge painting) **(3 points)** Not applicable **(0 points)**	
Heavy vehicles	>12% (**3 points**) >9%(**2 points**) >6% (**1 point**) <6% (**0 points**)	
Construction vehicle entering	Construction vehicles (material handling trucks) will enter/exit the main lanes traffic stream (**3 points**) Vehicles will be entering/exiting from outside the work zone (**0 points**)	
Raw Scores		**0**
Max Possible score		231
Normalized Scores (0 to 100)		**0**

*** Normalized Score is calculated by Raw Scores*100/Max Possible Score**

Functional Class	ADT			
	200,000+	100,000+	50,000+	20,000+
Interstate	50	50	50	30
Freeway/expressway	50	50	30	30
Major Aterial		30	30	10
Other			10	10

Smart Work Zone
Go/No-Go Decision Tree - A criteria based tool for selecting Smart Work Zone Systems
Temporary Construction Equipment Alert System

Project Number:	
County:	
CSJ:	
Letting:	
Date Form Completed:	
Completed by:	

Scoring Factors	Scoring Range	Score
Duration of the Work Zone	For projects with multiple work zones (ex. bridge painting or patching), score the duration of the longest work zone only. > 1 year (**10 points**) 1 - 10 months (**5 points**) < 1 months (**0 points**)	
Highway Function Class and ADT	Functional Class / ADT: 200,000+ / 100,000+ / 50,000+ / 20,000+ Interstate: 20 / 20 / 20 / 10 Freeway/expressway: 20 / 20 / 10 / 10 Major Aterial: 10 / 10 / 5 Other: 5 / 5	
Existing traffic issues	Higher than normal crash rates, gridlock or frequent exit ramp backups **(30 points)** Not applicable **(0 points)**	
Complex traffic control layout	Multiple crossovers, sharp curves or lane splits **(3 points)**	
Chronic speeding issues	Work zones in the area have a history of chronic speeders >20 mph over speed limit. **(3 points)**	
Large speed variations	Work zone area has a history of unusually high average traffic speed variability. This is common on Interstate by-pass and outer rings. **(3 points)** Not applicable **(0 points)**	
Connected vehicle	>5% (**3 points**) <5% (**0 points**)	
Heavy vehicles	>12% (**3 points**) >9%(**2 points**) >6% (**1 point**) <6% (**0 points**)	
Construction vehicle entering	Construction vehicles (material handling trucks) will enter/exit the main lanes traffic stream (**120 points**) vehicles will be entering/exiting from outside the work zone (**0 points**)	
Raw Scores		**0**
Max Possible score		195
Normalized Scores (0 to 100)		**0**

*** Normalized Score is calculated by Raw Scores*100/Max Possible Score**

Smart Work Zone
Go/No-Go Decision Tree - A criteria based tool for selecting Smart Work Zone Systems
Temporary Travel Time System

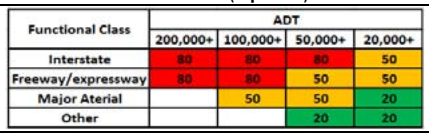
Project Number:	
County:	
CSJ:	
Letting:	
Date Form Completed:	
Completed by:	

Scoring Factors	Scoring Range	Score
Duration of the Work Zone	For projects with multiple work zones (ex. bridge painting or patching), score the duration of the longest work zone only. > 1 year (**10 points**) 1 - 10 months (**5 points**) < 1 months (**0 points**)	
Highway Function Class and ADT	Functional Class / ADT: 200,000+ / 100,000+ / 50,000+ / 20,000+ Interstate: 50 / 50 / 50 / 30 Freeway/expressway: 50 / 50 / 30 / 30 Major Aterial: 30 / 30 / 10 Other: 10 / 10	
Impact from local traffic generators	Significant-local facilities are large enough to have official destination signs on the Interstate highway such as conference centers, sports arenas etc., so they produce large surges in traffic before/after large events (**20 points**) Moderate-Local businesses or public facilities generate traffic volumes that routinely backup the on/off ramps such as morning and evening rush hours (**10 points**) Minimal-Any circumstance that causes occasional backups on the on/off ramps such as congested local arterials or rail crossings (**5 points**) None (**0 points**)	
Estimated Queue Length (Calculated, or see Max Queue Length tab for rough estimate)	> 7 miles **(80 points)** **3.5 to 7** miles **(70 points)** 0 to 3.5 miles**(60 points)** None **(0 points)**	
Existing traffic issues	higher than normal crash rates, gridlock or frequent exit ramp backups **(3 points)** Not applicable **(0 points)**	
Availability of Alternate routes	Convenient alternate routes with capacity are available. (**3 points**)	
Adjacent/consecutive project	There are adjacent active projects effectively creating a mega-project that totals... longer than 10 miles or longer than 2 years (**3 points**) between 5 to 10 miles or between 1 and 2 years (**2 points**) between 2 to 5 miles or between 6 months to 1 year (**1 point**) less than 2 miles or less than 6 months (**0 points**)	
Extreme weather condition	Work zone has a known history of sudden extreme weather condition, sandstorm, etc. Project duration covers several harsh weather season. **(3 points)**	
Connected vehicle	>5% (**3 points**) <5% (**0 points**)	
Existing ITS Systems	Project falls inside an existing Advanced Traffic Management System? The TMC has the intent to incorporate the travel time and delay estimating system into the TMC operations? The TMC can remotely control their existing advance traveler information systems? (**Each question worth 10 point**)	
Heavy vehicles	>12% (**3 points**) >9%(**2 points**) >6% (**1 point**) <6% (**0 points**)	
Raw Scores		**0**
Max Possible score		208
Normalized Scores (0 to 100)		**0**

*** Normalized Score is calculated by Raw Scores*100/Max Possible Score**

Smart Work Zone
Go/No-Go Decision Tree - A criteria based tool for selecting Smart Work Zone Systems
Temporary Incident Detection & Surveillance System

Project Number:	
County:	
CSJ:	
Letting:	
Date Form Completed:	
Completed by:	

Scoring Factors	Scoring Range	Score
Duration of the Work Zone	For projects with multiple work zones (ex. bridge painting or patching), score the duration of the longest work zone only. > 1 year (**10 points**) 1 - 10 months (**5 points**) < 1 months (**0 points**)	
Highway Function Class and ADT		
Impact from local traffic generators	Significant-local facilities are large enough to have official destination signs on the Interstate highway such as conference centers, sports arenas etc., so they produce large surges in traffic before/after large events (**10 points**) Moderate-Local businesses or public facilities generate traffic volumes that routinely backup the on/off ramps such as morning and evening rush hours (**6 points**) Minimal-Any circumstance that causes occasional backups on the on/off ramps such as congested local arterials or rail crossings (**3 points**) None (**0 points**)	
Sight Distance at back of Queue	Sight distance issues exist where the back of queue will likely occur. **(50 points)**	
Existing traffic issues	higher than normal crash rates, gridlock or frequent exit ramp backups **(50 points)** Not applicable **(0 points)**	
Merging conflict or hazards on the approach to work zone	External merging conflicts or hazards on the approach to or within the work zone. **(3 points)** Not applicable **(0 points)**	
Complex traffic control layout	multiple crossovers, sharp curves or lane splits **(3 points)** Not applicable **(0 points)**	
Navigating constraints for emergency responders	Construction activity will impose significant constraints for emergency responders to access incidents. (ex. narrow lanes or no shoulders) **(50 points)** Not applicable **(0 points)**	
Chronic speeding issues	Work zones in the area have a history of chronic speeders >20 mph over speed limit. **(3 points)** Not applicable **(0 points)**	
Large speed variations	Work zone area has a history of unusually high average traffic speed variability. This is common on Interstate by-pass and outer rings. **(50 points)** Not applicable **(0 points)**	
Adjacent/consecutive project	There are adjacent active projects effectively creating a mega-project that totals... longer than 10 miles or longer than 2 years (**3 points**) between 5 to 10 miles or between 1 and 2 years (**2 points**) between 2 to 5 miles or between 6 months to 1 year (**1 point**) less than 2 miles or less than 6 months (**0 points**)	
Scattered/short term project	The project includes multiple short term lane restricting activities that are scattered across the state. (ex. bridge painting) **(3 points)** Not applicable **(0 points)**	
Extreme weather condition	Work zone has a known history of sudden extreme weather condition, sandstorm, etc. Project duration covers several harsh weather season. **(3 points)** Not applicable **(0 points)**	
Connected vehicle	>5% (**3 points**) <5% (**0 points**)	
Heavy vehicles	>12% (**60 points**) >9%(**40 points**) >6% (**20 point**) <6% (**0 points**)	
Raw Scores		**0**
Max Possible score		381
Normalized Scores (0 to 100)		**0**

***Normalized Score is calculated by Raw Scores*100/Max Possible Score**

Functional Class	ADT			
	200,000+	100,000+	50,000+	20,000+
Interstate	80	80	80	50
Freeway/expressway	80	80	50	50
Major Aterial		50	50	20
Other			20	20

Smart Work Zone
Go/No-Go Decision Tree - A criteria based tool for selecting Smart Work Zone Systems
Temporary Over-height Vehicle Warning System

Project Number:	
County:	
CSJ:	
Letting:	
Date Form Completed:	
Completed by:	

Scoring Factors	Scoring Range	Score
Over-height vehicle/Low Clearance Structure	Low structures are over mainline traffic **(100 points)** Low structures are located on adjoining roadways such as ramps **(75 points)** Low structures are located on nearby alternate routes (local or state owned) **(45 points)** There are no low structures **(0 points)**	
Raw Scores		**0**
Max Possible score		100
Normalized Scores (0 to 100)		**0**

*** Normalized Score is calculated by Raw Scores*100/Max Possible Score**

Decisions:

Is strongly recommended if the score is greater than 65
Should be given consideration if score is between 33 and 65
Is probably not recommended if the score is below 33

System	Total Score
Temporary Queue Detection System	
Temporary Speed Monitoring System	
Temporary Construction Equipment Alert System	
Temporary Travel Time System	
Temporary Incident Detection & Surveillance System	
Temporary Over-height Vehicle Warning System	

Appendix B. Maximum Queue Length Estimator

Estimated Queue Factor Scoring (based on AADT)(24-hour lane closure)									
AADT values are 2 directional counts. Queue length values represent one direction only.									
Queue Length Categories >>>		Approx. maximum AADT values per queue length category							
# Lanes Pre-Work Zone	# Lanes during Work Zone	No significant queuing	AADT	Mild Queing < 3.5 miles	AADT	Moderate Queing 3.5 to 7.5 miles	AADT	Heavy Queuing > 7.5 miles	AADT
2	1	Score 0	40,000	Score 3	46,000	Score 7	52,000	Score 10	> 52,000
3	2		82,000		92,000		102,000		> 102,000
3	1		40,000		50,000		56,000		>56,000

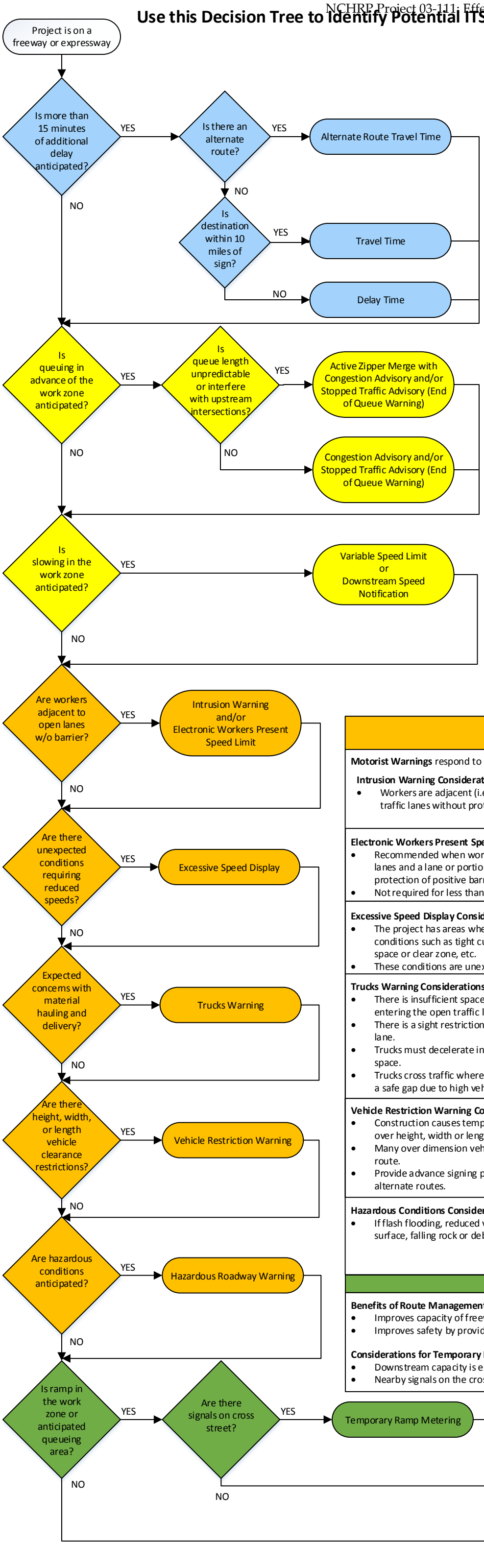
Estimated Queue Factor Scoring (based on AADT)(9PM to 5AM lane closure)									
AADT values are 2 directional counts. Queue length values represent one direction only.									
Queue Length Categories >>>		Approx. maximum AADT values per queue length category							
# Lanes Pre-Work Zone	# Lanes during Work Zone	No significant queuing	AADT	Mild Queing < 3.5 miles	AADT	Moderate Queing 3.5 to 7.5 miles	AADT	Heavy Queuing > 7.5 miles	AADT
2	1	Score 0	52,000	Score 3	84,000	Score 7	108,000	Score 10	> 108,000
3	2		100,000		138,000		200,000		> 200,000
3	1		54,000		98,000		132,000		> 132,000

How to use this Table: Identify lane closure hours during a day (24 hour or 9PM to 5 AM) to determine which table to use.
Find an approximate 2 directional AADT for your Work Zone from TxDOT's Traffic Count Website or some other source.
On the table above, enter the row that describes your project's lane usage (one directional). (ex. 3 lanes to 2)
Proceed to the right on that row until you locate the first AADT value higher than your project's AADT
If your project's AADT is greater than the value in the last column to the right, use a score of 10
The Estimated Queing Factor score is then found in the yellow box immediately to the left of that AADT.
The queing range for your project is in the cell immediately above the yellow box with the score.

Limitations of this Table: These two tables were developed based on a single case study and a single day traffic count.
The look-up tables are intended to only provide an approximate queue length.

Appendix N—MnDOT Work Zone ITS Scoping Decision Tree.

Use this Decision Tree to Identify Potential ITS/IWZ Scoping Needs - January 31, 2018 Version 1



Mobility and Traveler Information

Considerations for Alternate Route Travel Times:
- Alternate route travel times are calculated and displayed for selected alternate route(s) and the main route through the work zone to provide options to drivers.
- Travel times on the main route and alternate route(s) vary independently, i.e. one route changes while the other does not.
- Care should be taken to determine proximity to other projects when selecting alternative routes to display travel times.

Considerations to Ensure Times Displayed are Accurate:
- Maximum detector spacing is ½ mile.
- Travel Time is used when the time display is within 10 miles of the destination shown on the sign.
- Delay Time is used when the time display is more than 10 miles from the destination shown on the sign.

Benefits of Mobility and Traveler Information:
- Allows drivers to decide whether to change routes.
- Provides opportunities to notify others of estimated arrival times.
- Provides sufficient information to calm tempers.

Options for Travel Time and Delay Time Information Displays:
- Dynamic Message Sign (DMS), both portable or permanent.
- Static Guide Sign with DMS characters to display time.

Motorist Advisory

Considerations for Motorist Advisory Systems:
- Queue lengths are anticipated to be unpredictable because they vary greatly daily and/or hourly.
- The end of queue encroaches upstream beyond drivers' expectations or are obscured by roadway geometry.
- Queues are expected to encroach on upstream intersections or interchanges.

Benefits of Motorist Advisory:
- Alert drivers they are approaching slow or stopped traffic.
- Reduce frequency and severity of rear-end crashes.
- May reduce demand by diverting traffic.

Active Zipper Merge:
- Typically includes a Congestion Advisory and/or Stopped Traffic Advisory.
- Reduces queue lengths by 40%.
- Harmonizes speeds between lanes approaching the lane closure.
- Increases capacity through the work zone.
- Reduces driver frustration and decreases aggressive driving behavior.

Congestion Advisory:
- Is used when the congested traffic message can be far enough away that motorists can select alternate routes.
- Is typically combined with a Stopped Traffic Advisory (End of Queue Warning Systems) as motorists approach the work zone.

Stopped Traffic Advisory (End-of-Queue Warning):
- Is used to warn drivers of slow or stopped traffic ahead and that prompt action is required.

Variable Speed Limit:
- Authorized speed limit for driver safety, to navigate the work zone.

Downstream Speed Notification:
- Gives drivers an appropriate speed to travel through the work zone with minimal braking by providing notification ½ mile ahead of slower moving traffic.
- Smooths the transition between faster and slower moving traffic.
- Increases capacity through the work zone.

Motorist Warning

Motorist Warnings respond to individual conditions, i.e. vehicle speed, dimension, weather, etc. that require drivers to take immediate action.

Intrusion Warning Considerations:
- Workers are adjacent (i.e. within 12 feet) to open high-speed traffic lanes without protection of positive barrier.

Intrusion Warning Benefits:
- Alerts drivers and workers that a vehicle is entering the work space giving enough time for workers and drivers to take evasive action to avoid a crash or reduce severity.

Electronic Workers Present Speed Limit Considerations:
- Recommended when workers are directly adjacent to travel lanes and a lane or portion thereof is closed to traffic without protection of positive barrier.
- Not required for less than 24 hours.

Electronic Workers Present Speed Limit Benefits:
- Regulatory speed limits to improve worker safety, intended that the speed limit reduces speed such that the majority of hazards can be safely negotiated.

Excessive Speed Display Considerations:
- The project has areas where reduced speed is indicated for conditions such as tight curves, rough surfaces, reduced buffer space or clear zone, etc.
- These conditions are unexpected by the driver.

Excessive Speed Display Benefits:
- Warns driver to reduce speed to safely travel through the work zone.

This is not a work zone speed limit.

Trucks Warning Considerations:
- There is insufficient space for a truck acceleration lane prior to entering the open traffic lane.
- There is a sight restriction where trucks must enter the open traffic lane.
- Trucks must decelerate in the open lane before entering the work space.
- Trucks cross traffic where it is difficult for truck drivers to recognize a safe gap due to high vehicle volumes or sight restrictions.

Truck Warning Benefits:
- Drivers are able to adjust speed and lane position to facilitate safe operation of construction vehicles.
- Drivers are less likely to follow vehicles into the work zone.
- Drivers are aware of the presence of slow moving construction vehicles.

Vehicle Restriction Warning Considerations:
- Construction causes temporary reduction in vehicle clearance for over height, width or length vehicles.
- Many over dimension vehicles are anticipated to be using the route.
- Provide advance signing prior to major junctions that could serve as alternate routes.

Vehicle Restriction Warning Benefits:
- Alerts drivers of over dimension vehicles to stop and seek alternate routes.
- Warns workers that an over dimension vehicle is approaching.

Hazardous Conditions Considerations:
- If flash flooding, reduced visibility (fog, smoke), slippery or rough surface, falling rock or debris, etc. are anticipated.

Hazardous Conditions Benefits:
- Drivers are alerted to condition and can take corrective action.
- Project personnel can be immediately alerted to the condition so they may take correction action.

Route Management Systems

Benefits of Route Management Systems:
- Improves capacity of freeway by reducing turbulence and shockwaves caused by entering traffic
- Improves safety by providing uniform traffic speeds.

Considerations for Temporary Ramp Metering:
- Downstream capacity is exceeded reducing the maximum volume on the freeway.
- Nearby signals on the cross street or ramp terminals create platoons of vehicles entering the freeway creating turbulence andshock waves.

Cost Estimates for ITS/IWZ Scoping

June 6, 2018 Version 2

ASSUMPTIONS AND BASIS FOR COST ESTIMATES FOR ITS/IWZ SCOPING

- These ITS/IWZ cost estimates are based on current MnDOT rental prices.
- All assumptions included below should be used while developing estimates for planning purposes.

High Level Cost Estimate for Mobility and Traveler Information Systems	
High level cost estimates may be used if the duration of the ITS/IWZ need is unknown.	
$140,000 for a system with NO alternate route	$280,000 for a system with one alternate route

A more accurate estimate can be made if the project duration and the availability of an alternate route are known.

Detailed Estimate for Mobility and Traveler Information Systems

Assumptions for these system estimates:
- Project and alternate routes are 10 miles long.
- Detectors are placed every ½ mile.
- Travel/delay time will be provided for both directions in the work zone.
- One PCMS is used for each direction.
- Additional mile cost is for one direction only.

System Control and Management	**Contractor Provided***		
Duration	**1 week**	**4 weeks**	**6 months**
Travel/Delay Time (NO alternate route)	$16,000	$35,000	$145,000
Travel/Delay Time (one alternate route)	$31,000	$70,000	$290,000
Cost per additional mile per direction	$1,300	$ 3,500	$13,000

***Contact the RTMC Freeway Operations Engineer @ (651)234-7022 to determine feasibility of using the RTMC and IRIS for ITS/IWZ system.**

High Level Cost Estimate for Motorist Advisory Systems
High level cost estimates may be used if the duration and number of directions for the ITS/IWZ need is unknown.
$75,000 for each system

Each of the suggested motorist advisory systems have similar costs:
- Active Zipper Merge
- Congestion Advisory
- Stopped Traffic Advisory (End of Queue Warning)
- Variable Speed Limit or Downstream Speed Notification

A more accurate estimate can be made if the number of directions and duration of the deployment are known.

Detailed Estimate for Motorist Advisory Systems (cost per system)

Assumptions for these systems:
- Anticipated queue is three (3) miles.
- Detectors are placed every ½ mile.
- PCMS are placed every 2 miles (mile 1 and 3 in advance of lane closure taper).
- Additional mile cost is for one direction only.

System Control and Management	**Contractor Provided***		
Duration	**1 week**	**4 weeks**	**6 months**
One Direction	$7,000	$13,000	$58,000
Two Directions	$13,000	$25,000	$115,000
Cost for each mile of additional queue length	$1,700	$4,200	$15,000

***Contact the RTMC Freeway Operations Engineer @ (651)234-7022 to determine feasibility of using the RTMC and IRIS for ITS/IWZ system.**

High Level Cost Estimate for Motorist Warning Systems
High level cost estimates may be used if the duration for the ITS/IWZ need is unknown.
$13,000 for each system

Each of the suggested motorist warning systems have similar costs: • Excessive Speed Display • Trucks Warning • Vehicle Restriction Warning • Hazardous Roadway Warning	Note: MnDOT is currently evaluating various systems and has not selected a final technology or design for Intrusion Warning and Electronic Workers Present Speed Limit systems.

A more accurate estimate can be reached if the duration of the ITS/IWZ need is known.

Detailed Estimate for Motorist Warning Systems (cost per system per site)

Assumptions for these systems:
- There is a single system at a single site within the project.
- RTMC and IRIS cannot be used for control, therefore all control and system management is Contractor provided.

Duration	1 week	4 weeks	6 months
Single Site – Excessive Speed Display	$1,000	$2,200	$6,000
Single Site – All Others	$2,000	$3,500	$13,000

Route Management Systems
All Route Management Systems are controlled by the RTMC and IRIS*.

***Contact the RTMC Freeway Operations Engineer @ (651)234-7022 to determine feasibility and cost for these systems.**