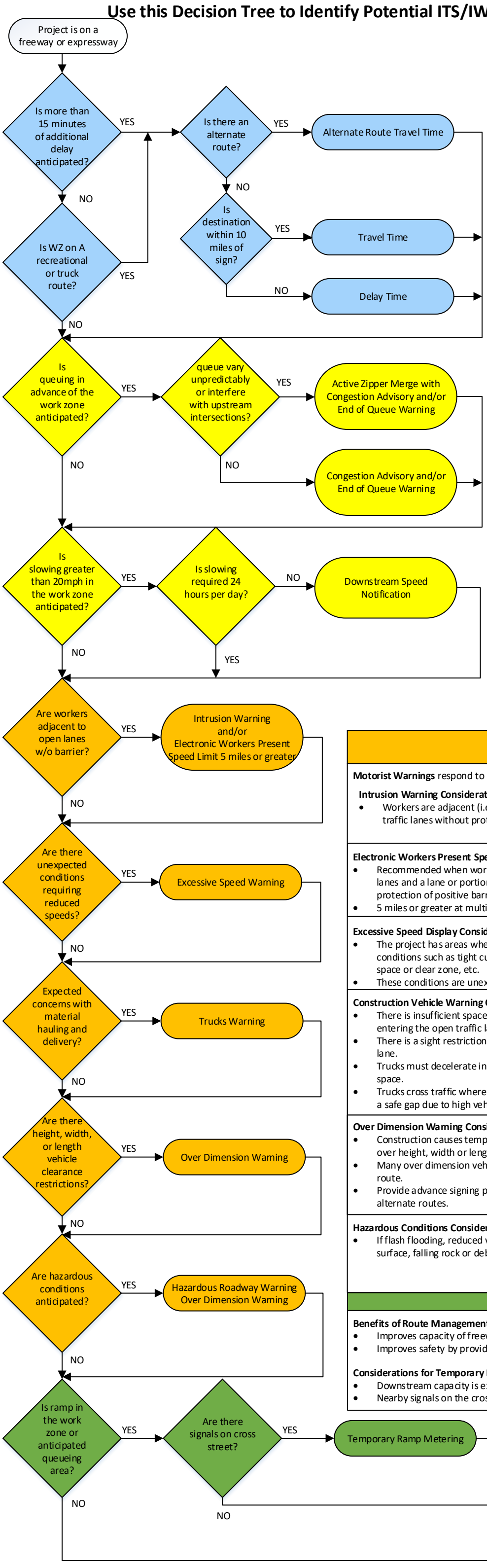
Use this Decision Tree to Identify Potential ITS/IWZ Scoping Needs – Draft April 1, 2019 Version 1 Revised



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.
- Lead to less diversion of traffic on to alternate routes when not wanted.

Options for Travel Time and Delay Time Information Displays:

- Static Guide Sign with DMS characters to display time.
- Consideration should be given to posting an alternate route and travel time for additional driver information
- The CMS may be supplemented with other informational devices

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 an End of Queue Warning System.
- Reduces queue lengths by 40%.
- Harmonizes speeds between lanes approaching the lane closure.
- Increases capacity through the work zone to 1500 vplph.
- 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.
- Alternate routes must have capacity to accept additional traffic.
- Is typically combined with End of Queue Warning Systems, Active Zipper Merge and/or Travel/Delay Time System as motorists approach the work zone.

End-of-Queue Warning:

- Is used to warn drivers of slow or stopped traffic ahead and that prompt action is required.

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.
- 5 miles or greater at multiple locations.

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.
- Facilitates speed limit adjustment.

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.

Construction Vehicle 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.

Vehicles 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.

Over Dimension 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 and shock 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

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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:	Note:
• Excessive Speed Display • Trucks Warning • Vehicle Restriction Warning • Hazardous Roadway Warning	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.**