9-MILE SMART WORK ZONE SYSTEM
FREEWAY (2 LANES): SINGLE LEFT LANE CLOSURE
NOT TO SCALE

Top diagram spacing labels: 0.1± MILE (repeated across top between PCMS units)

DOWNSTREAM TAPER

Bottom distance labels (left to right):
SEE NOTE 6 — TTS1
PCMS8 — 9 MILES
1.5± MILES
PCMS7 — 7.5 MILES — G
1.5± MILES
PCMS6 — 6 MILES — F
1.5± MILES
PCMS5 — 4.5 MILES — E
1.5± MILES
PCMS4 — 3 MILES — D
1± MILE
PCMS3 — 2 MILES — C
1± MILE
PCMS2 — 1 MILE — B
0.9± MILE
PCMS1 — A
0.1± MILE
LEFT LANE CLOSURE TAPER
SEE NOTE 7 — SFTS
SEE NOTE 6 — TTS2

QUEUE LOCATION MEASURED FROM HERE

NOTES:

1. THIS PLAN IS USED IN CONJUNCTION WITH A LONG-TERM 2-LANE FREEWAY SINGLE LEFT LANE CLOSURE STAGED TRAFFIC PLAN.

2. SEE SMART WORK ZONE SYSTEM (SWZS) SPECIAL PROVISION OR RFP FOR DETAILS.

3. MODIFICATIONS TO PCMS MESSAGES SHALL BE ACCEPTED BY THE ENGINEER. "##" ARE CHANGEABLE VALUES BASED ON REAL-TIME TRAVEL DELAY TIMES IN MINUTES.

4. ADJUST SWZS COMPONENTS LOCATION TO AVOID CONFLICTS WITH TRAFFIC CONTROL DEVICES, NARROW SHOULDERS, AND RAMPS. SWZS COMPONENTS MAY BE POLE-MOUNTED. WHEN LOCATED BEHIND BARRIER/GUARDRAIL OR WITHIN LANE CLOSURE, TRANSVERSE TRAFFIC DRUMS OPTIONAL.

5. LOCATE PCMSs PER STANDARD SPECIFICATION 1-10.3(3)C. PCMS MAY BE PLACED ON OPPOSITE SHOULDER BUT AVOID RAMP GORES. MINIATURE PCMSs (~6'WIDE, 12+ INCH CHARACTERS) ALLOWED FOR ALL PCMSs.

6. ESTIMATED TRAVEL DELAY TIMES SHALL BE ACCURATE WITHIN 5 MINUTES.

7. WHEN FEASIBLE, LOCATE SIDE FIRE TRAFFIC SENSOR PRIOR TO ANY OPEN RAMPS.

8. IF SYSTEM FAILS SEE "SMART WORK ZONE SYSTEM FAILURE PROTOCOL" PROVISION.

9. IF TRAFFIC QUEUES REACH 8.5 MILES, PLACE ADDITIONAL PCMS AT 11± MILES. RELOCATE FARTHER BACK AS NEEDED TO REMAIN IN ADVANCE OF QUEUE. TRUCK-MOUNTED PCMS WITH 10+ INCH CHARACTERS ACCEPTABLE. TRANSVERSE TRAFFIC SAFETY DRUMS OPTIONAL. REMOVE PCMS WHEN DISSIPATING QUEUES ARE LESS THAN 8 MILES. ADDED PCMS MESSAGE: TRAFFIC BACKUPS PRESENT / SLOW TRAFFIC AHEAD
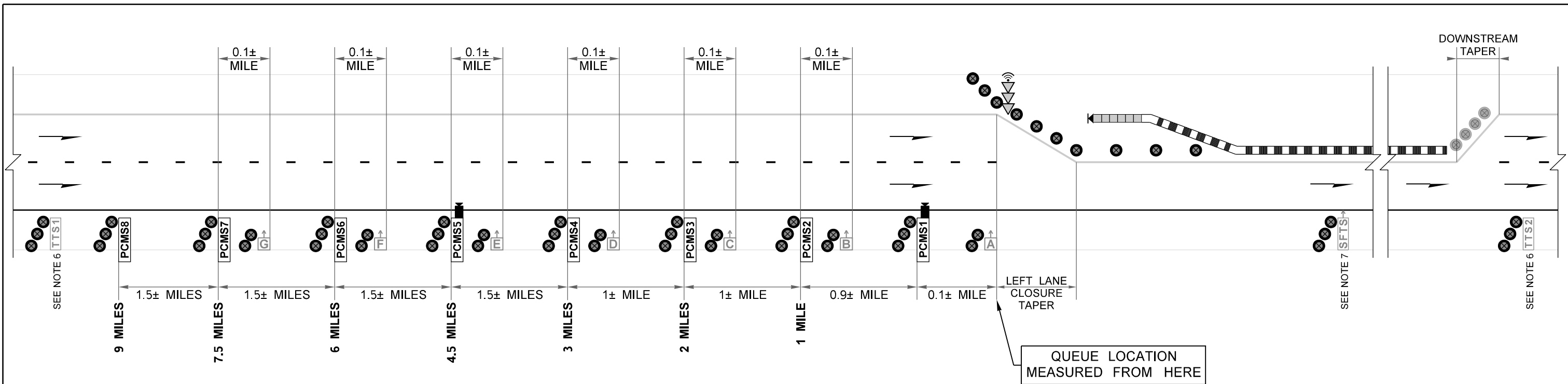
LEGEND:
- ⊗ TRAFFIC SAFETY DRUM
- #↑ TRAFFIC SENSOR
- TTS# PORTABLE TRAVEL TIME SENSOR (SEE NOTE 6)
- SFTS→ SIDE FIRE TRAFFIC SENSOR (SEE NOTE 7)
- ((•))▶▶▶ SMART SEQUENTIAL ARROW SIGN (CONNECTED)
- PCMS PORTABLE CHANGEABLE MESSAGE SIGN (SEE NOTE 5)
- ▬ PAN-TILT-ZOOM CAMERA

SYMBOL	TRIGGER SPEED (mph)	TRAFFIC CONDITION
FF	35+	Free Flow
SL	<35	Slowed

QUEUE LOCATION (miles)	G	F	E	D	C	B	A	PCMS 8 — 1 (2.0 SEC)	PCMS 8 — 2 (2.0 SEC)	PCMS 7 — 1 (2.0 SEC)	PCMS 7 — 2 (2.0 SEC)	PCMS 6 — 1 (2.0 SEC)	PCMS 6 — 2 (2.0 SEC)	PCMS 5 — 1 (2.0 SEC)	PCMS 5 — 2 (2.0 SEC)	PCMS 4 — 1 (2.0 SEC)	PCMS 4 — 2 (2.0 SEC)	PCMS 3 — 1 (2.0 SEC)	PCMS 3 — 2 (2.0 SEC)	PCMS 2 — 1 (2.0 SEC)	PCMS 2 — 2 (2.0 SEC)	PCMS 1 — 1 (2.0 SEC)	PCMS 1 — 2 (2.0 SEC)
None	FF	FF	FF	FF	FF	FF	FF	■ ■	(Blank)	■ ■	(Blank)	■ ■	(Blank)	■ ■	(Blank)	■ ■	(Blank)	■ ■	(Blank)	LEFT LANE CLOSED	1 MILE AHEAD	■ ■	(Blank)
< 0.9	FF	FF	FF	FF	FF	FF	SL	■ ■	(Blank)	■ ■	(Blank)	■ ■	(Blank)	■ ■	(Blank)	SINGLE LANE CLOSURE	3 MILES AHEAD	TRAFFIC BACKUPS PRESENT	## MINUTE DELAY	SLOW OR STOPPED TRAFFIC	NEXT 1 MILE	■ ■	(Blank)
0.91 TO 1.9	FF	FF	FF	FF	FF	SL	SL	■ ■	(Blank)	■ ■	(Blank)	■ ■	(Blank)	SINGLE LANE CLOSURE	4.5 MILES AHEAD	TRAFFIC BACKUPS PRESENT	## MINUTE DELAY	SLOW OR STOPPED TRAFFIC	NEXT 2 MILES	ZIPPER MERGE 1 MILE	USE LEFT LANE TOO	ZIPPER MERGE HERE	TAKE TURNS
1.91 TO 2.9	FF	FF	FF	FF	SL	SL	SL	■ ■	(Blank)	■ ■	(Blank)	SINGLE LANE CLOSURE	6 MILES AHEAD	TRAFFIC BACKUPS PRESENT	## MINUTE DELAY	SLOW OR STOPPED TRAFFIC	NEXT 3 MILES	2 MILES TO MERGE POINT	USE BOTH LANES	ZIPPER MERGE 1 MILE	USE LEFT LANE TOO	ZIPPER MERGE HERE	TAKE TURNS
2.91 TO 4.4	FF	FF	FF	SL	SL	SL	SL	■ ■	(Blank)	SINGLE LANE CLOSURE	7.5 MILES AHEAD	TRAFFIC BACKUPS PRESENT	## MINUTE DELAY	SLOW OR STOPPED TRAFFIC	NEXT 4.5 MILES	3 MILES TO MERGE POINT	USE BOTH LANES	2 MILES TO MERGE POINT	USE BOTH LANES	ZIPPER MERGE 1 MILE	USE LEFT LANE TOO	ZIPPER MERGE HERE	TAKE TURNS
4.41 TO 5.9	FF	FF	SL	SL	SL	SL	SL	SINGLE LANE CLOSURE	9 MILES AHEAD	TRAFFIC BACKUPS PRESENT	## MINUTE DELAY	SLOW OR STOPPED TRAFFIC	NEXT 6 MILES	4.5 MILES TO MERGE POINT	USE BOTH LANES	3 MILES TO MERGE POINT	USE BOTH LANES	2 MILES TO MERGE POINT	USE BOTH LANES	ZIPPER MERGE 1 MILE	USE LEFT LANE TOO	ZIPPER MERGE HERE	TAKE TURNS
5.91 TO 7.4	FF	SL	SL	SL	SL	SL	SL	LANE CLOSURE 9 MILES	## MINUTE DELAY	SLOW OR STOPPED TRAFFIC	NEXT 7.5 MILES	6 MILES TO MERGE POINT	USE BOTH LANES	4.5 MILES TO MERGE POINT	USE BOTH LANES	3 MILES TO MERGE POINT	USE BOTH LANES	2 MILES TO MERGE POINT	USE BOTH LANES	ZIPPER MERGE 1 MILE	USE LEFT LANE TOO	ZIPPER MERGE HERE	TAKE TURNS
7.41+	SL	SL	SL	SL	SL	SL	SL	SLOW OR STOPPED TRAFFIC	NEXT 9 MILES	LANE CLOSURE 7.5 MILES	## MINUTE DELAY	6 MILES TO MERGE POINT	USE BOTH LANES	4.5 MILES TO MERGE POINT	USE BOTH LANES	3 MILES TO MERGE POINT	USE BOTH LANES	2 MILES TO MERGE POINT	USE BOTH LANES	ZIPPER MERGE 1 MILE	USE LEFT LANE TOO	ZIPPER MERGE HERE	TAKE TURNS

Traffic sensor columns G F E D C B A under header "TRAFFIC SENSORS / TRAFFIC CONDITION"

9-MILE SMART WORK ZONE SYSTEM
FREEWAY (2 LANES): SINGLE LEFT LANE CLOSURE
NOT TO SCALE

Top dimensions (left to right): 0.1± MILE, 0.1± MILE, 0.1± MILE, 0.1± MILE, 0.1± MILE, 0.1± MILE — DOWNSTREAM TAPER

Device labels (left to right): TTS1, PCMS8, G, PCMS7, F, PCMS6, E, PCMS5, D, PCMS4, C, PCMS3, B, PCMS2, A, PCMS1, SFTS, TTS2

SEE NOTE 6 (TTS1), SEE NOTE 7 (SFTS), SEE NOTE 6 (TTS2)

Spacing (left to right): 1.5± MILES, 1.5± MILES, 1.5± MILES, 1.5± MILES, 1± MILE, 1± MILE, 0.9± MILE, 0.1± MILE, LEFT LANE CLOSURE TAPER

Mile markers: 9 MILES, 7.5 MILES, 6 MILES, 4.5 MILES, 3 MILES, 2 MILES, 1 MILE

QUEUE LOCATION MEASURED FROM HERE

NOTES:

1. THIS PLAN IS USED IN CONJUNCTION WITH A LONG-TERM 2-LANE FREEWAY SINGLE LEFT LANE CLOSURE STAGED TRAFFIC PLAN.

2. SEE SMART WORK ZONE SYSTEM (SWZS) SPECIAL PROVISION OR RFP FOR DETAILS.

3. MODIFICATIONS TO PCMS MESSAGES SHALL BE ACCEPTED BY THE ENGINEER. "##" ARE CHANGEABLE VALUES BASED ON REAL-TIME TRAVEL DELAY TIMES IN MINUTES.

4. ADJUST SWZS COMPONENTS LOCATION TO AVOID CONFLICTS WITH TRAFFIC CONTROL DEVICES, NARROW SHOULDERS, AND RAMPS. SWZS COMPONENTS MAY BE POLE-MOUNTED. WHEN LOCATED BEHIND BARRIER/GUARDRAIL OR WITHIN LANE CLOSURE, TRANSVERSE TRAFFIC DRUMS OPTIONAL.

5. LOCATE PCMSs PER STANDARD SPECIFICATION 1-10.3(3)C. PCMS MAY BE PLACED ON OPPOSITE SHOULDER BUT AVOID RAMP GORES. MINIATURE PCMSs (~6'WIDE, 12+ INCH CHARACTERS) ALLOWED FOR ALL PCMSs.

6. ESTIMATED TRAVEL DELAY TIMES SHALL BE ACCURATE WITHIN 5 MINUTES.

7. WHEN FEASIBLE, LOCATE SIDE FIRE TRAFFIC SENSOR PRIOR TO ANY OPEN RAMPS.

8. IF SYSTEM FAILS SEE "SMART WORK ZONE SYSTEM FAILURE PROTOCOL" PROVISION.

9. IF TRAFFIC QUEUES REACH 8.5 MILES, PLACE ADDITIONAL PCMS AT 11± MILES. RELOCATE FARTHER BACK AS NEEDED TO REMAIN IN ADVANCE OF QUEUE. TRUCK-MOUNTED PCMS WITH 10+ INCH CHARACTERS ACCEPTABLE. TRANSVERSE TRAFFIC SAFETY DRUMS OPTIONAL. REMOVE PCMS WHEN DISSIPATING QUEUES ARE LESS THAN 8 MILES. ADDED PCMS MESSAGE: TRAFFIC BACKUPS PRESENT / SLOW TRAFFIC AHEAD

LEGEND:

- ⊗ TRAFFIC SAFETY DRUM
- # TRAFFIC SENSOR
- TTS# PORTABLE TRAVEL TIME SENSOR (SEE NOTE 6)
- SFTS→ SIDE FIRE TRAFFIC SENSOR (SEE NOTE 7)
- (((•))) ▷▷▷ SMART SEQUENTIAL ARROW SIGN (CONNECTED)
- PCMS PORTABLE CHANGEABLE MESSAGE SIGN (SEE NOTE 5)
- ▬ PAN-TILT-ZOOM CAMERA

Symbol / Trigger table

SYMBOL	TRIGGER SPEED (mph)	TRAFFIC CONDITION
FF	35+	Free Flow
SL	<35	Slowed

PCMS Message Table

QUEUE LOCATION (miles)	Sensor G	F	E	D	C	B	A	PCMS 8 - 1 (2.0 SEC)	PCMS 8 - 2 (2.0 SEC)	PCMS 7 - 1 (2.0 SEC)	PCMS 7 - 2 (2.0 SEC)	PCMS 6 - 1 (2.0 SEC)	PCMS 6 - 2 (2.0 SEC)	PCMS 5 - 1 (2.0 SEC)	PCMS 5 - 2 (2.0 SEC)	PCMS 4 - 1 (2.0 SEC)	PCMS 4 - 2 (2.0 SEC)	PCMS 3 - 1 (2.0 SEC)	PCMS 3 - 2 (2.0 SEC)	PCMS 2 - 1 (2.0 SEC)	PCMS 2 - 2 (2.0 SEC)	PCMS 1 - 1 (2.0 SEC)	PCMS 1 - 2 (2.0 SEC)
None	FF	FF	FF	FF	FF	FF	FF	■	(Blank)	■	(Blank)	■	(Blank)	■	(Blank)	■	(Blank)	■	(Blank)	LEFT LANE CLOSED	1 MILE AHEAD	■	(Blank)
< 0.9	FF	FF	FF	FF	FF	FF	SL	■	(Blank)	■	(Blank)	■	(Blank)	■	(Blank)	SINGLE LANE CLOSURE	3 MILES AHEAD	TRAFFIC BACKUPS PRESENT	## MINUTE DELAY	SLOW OR STOPPED TRAFFIC	NEXT 1 MILE	■	(Blank)
0.91 TO 1.9	FF	FF	FF	FF	FF	SL	SL	■	(Blank)	■	(Blank)	■	(Blank)	SINGLE LANE CLOSURE	4.5 MILES AHEAD	TRAFFIC BACKUPS PRESENT	## MINUTE DELAY	SLOW OR STOPPED TRAFFIC	NEXT 2 MILES	ZIPPER MERGE 1 MILE	USE LEFT LANE TOO	ZIPPER MERGE HERE	TAKE TURNS
1.91 TO 2.9	FF	FF	FF	FF	SL	SL	SL	■	(Blank)	■	(Blank)	SINGLE LANE CLOSURE	6 MILES AHEAD	TRAFFIC BACKUPS PRESENT	## MINUTE DELAY	SLOW OR STOPPED TRAFFIC	NEXT 3 MILES	2 MILES TO MERGE POINT	USE BOTH LANES	ZIPPER MERGE 1 MILE	USE LEFT LANE TOO	ZIPPER MERGE HERE	TAKE TURNS
2.91 TO 4.4	FF	FF	FF	SL	SL	SL	SL	■	(Blank)	SINGLE LANE CLOSURE	7.5 MILES AHEAD	TRAFFIC BACKUPS PRESENT	## MINUTE DELAY	SLOW OR STOPPED TRAFFIC	NEXT 4.5 MILES	3 MILES TO MERGE POINT	USE BOTH LANES	2 MILES TO MERGE POINT	USE BOTH LANES	ZIPPER MERGE 1 MILE	USE LEFT LANE TOO	ZIPPER MERGE HERE	TAKE TURNS
4.41 TO 5.9	FF	FF	SL	SL	SL	SL	SL	SINGLE LANE CLOSURE	9 MILES AHEAD	TRAFFIC BACKUPS PRESENT	## MINUTE DELAY	SLOW OR STOPPED TRAFFIC	NEXT 6 MILES	4.5 MILES TO MERGE POINT	USE BOTH LANES	3 MILES TO MERGE POINT	USE BOTH LANES	2 MILES TO MERGE POINT	USE BOTH LANES	ZIPPER MERGE 1 MILE	USE LEFT LANE TOO	ZIPPER MERGE HERE	TAKE TURNS
5.91 TO 7.4	FF	SL	SL	SL	SL	SL	SL	LANE CLOSURE 9 MILES	## MINUTE DELAY	SLOW OR STOPPED TRAFFIC	NEXT 7.5 MILES	6 MILES TO MERGE POINT	USE BOTH LANES	4.5 MILES TO MERGE POINT	USE BOTH LANES	3 MILES TO MERGE POINT	USE BOTH LANES	2 MILES TO MERGE POINT	USE BOTH LANES	ZIPPER MERGE 1 MILE	USE LEFT LANE TOO	ZIPPER MERGE HERE	TAKE TURNS
7.41+	SL	SL	SL	SL	SL	SL	SL	SLOW OR STOPPED TRAFFIC	NEXT 9 MILES	LANE CLOSURE 7.5 MILES	## MINUTE DELAY	6 MILES TO MERGE POINT	USE BOTH LANES	4.5 MILES TO MERGE POINT	USE BOTH LANES	3 MILES TO MERGE POINT	USE BOTH LANES	2 MILES TO MERGE POINT	USE BOTH LANES	ZIPPER MERGE 1 MILE	USE LEFT LANE TOO	ZIPPER MERGE HERE	TAKE TURNS

(TRAFFIC SENSORS header spans columns G F E D C B A; sub-header: TRAFFIC CONDITION)

WORK ZONE MICROSTATION CELLS: Updated work zone cells incorporated (December 2023).

WSDOT CAE automatically updates cell libraries on WSDOT and on-site consultant staff computers (no action needed); however, external users or off-site consultants must manually install them. For additional information email HQCAEHelpDesk@wsdot.wa.gov.

Division 4 in WSDOT Plans Preparation Manual, Section 400.06(29), provides updated work zone cell library policy and information for PS&Es.
See https://wsdot.wa.gov/engineering-standards/all-manuals-and-standards/manuals/plans-preparation-manual

TYPICAL TCP USAGE EXPLANATION:

Plot 1: Supplements long-term single left lane closures on 2-lane freeways.

DESIGNER NOTES:

A. **Region Transportation Operations will determine if and what queue mitigation system is needed** using work zone traffic analysis (Traffic Manual 5-9). For additional information, see Traffic Manual 5-17 or *Work Zone Traffic Control Fundamentals* presentation.

B. These typical traffic control plans may be modified for site-specific situations and/or WSDOT Region Transportation Operations standard practices. **Typical Traffic Control Plans are not "Standard Plans".**

C. If the long-term staged traffic control plan does not use temporary barriers, this Typical TCP can be modified to reflect channelization devices instead.

D. When used, include 3 of the following **Smart Work Zone System General Special Provisions** listed below:
1-10.3(3).OPT3.FR1 Specifications
1-10.4(2).OPT5.GR1 Measurement (Traffic Control as Bid Items)
1-10.5(2).OPT3.GR1 Payment

E. Except for projects requiring them in the Provisions, Pan-Tilt-Cameras (PTZ Cameras) are optional and may be mounted on different PCMSs as desired or deleted. PTZ Cameras are used remotely by Agency to monitor incidents and queues.

F. The side-fire radar is used to obtain traffic volume and speed data per GSP requirements.

G. These Smart Work Zone Systems are very adaptable for a variety of situations, including being used on multiple roadways concurrently leading into a queued work zone. Contact State Work Zone Engineers for guidance at HQWorkZone@wsdot.wa.gov.

9-MILE QUEUE WARNING SYSTEM
FREEWAY (2 LANES): SINGLE LEFT LANE CLOSURE

Plot 2

TC171

DESIGNER GUIDANCE