ENGINEERING REPORT

RED LIGHT RUNNING TRAFFIC MONITORING SYSTEM

Intersection of:

State Route 99/ Pacific Highway at S 216th Street City of Des Moines, WA

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I. INTRODUCTION

This engineering report is intended to provide justification for the installation of intersection safety cameras on State Route 99 (Pacific Highway) at the intersection of S 216th St, in Des Moines, Washington.

The intersection of SR 99/Pacific Highway and S 216th Street is located approximately 0.3 miles west of the Interstate-5 and one mile northeast of Junction SR 509. SR 99 & S 216th St are both classified as Principal arterials. SR 99 is a 7-lane highway (include transit lanes) divided by a raised median. The posted speed limit on SR 99 is 45mph. S 216th is an undivided 5-lane roadway with 35mph posted speed limit. A recent traffic count study was done in 2015 which reports an average weekday traffic of 13,000 vehicles per day on the westbound and 30,500 vehicles per day south of the intersection of SR 99 & S 216th St.

The area is generally urban with different government services, recreational facilities, employment centers and transit facilities. There is a traffic signal at 24th Ave S, approximately 0.2 miles to the west; and a traffic signal at Military Rd S to east. A Location map indicating the intersection is provided below.

Figure 1: SR 99/ Pacific Highway & S 216th Street Intersection Location

II. ENGINEERING REPORT

A. Intersection Crash History

The intersection crash history for the past 5 years is summarized in the table below. This information was provided by the City of Des Moines Police Department.

Table 1: City of Des Moines crash history at the intersection of SR 99 & S 216th St categorized in crash types and crash severity types from 2011 to 2015

Year	Crash Totals	Crash Types					Crash Severity Types		
		Angle	Rear-End	Approach Turning	Side-Swipe	Other	Fatal	Injury	Property Damage
2015	16	1	4	5	2	4	0	5	3
2014	7	0	4	2	0	1	0	1	0
2013	12	2	5	1	3	1	0	2	0
2012	9	0	3	3	1	2	0	8	1
2011	5	1	3	0	0	1	0	1	0
Total	49	4	19	11	6	9	0	17	4

There are a total of 49 crashes at the intersection as indicated on the summary table. This equals to an average of 9.8 crashes per year. 2015 had the highest annual amount in the last 5 years. 17 crash related injuries occurred in the 5 year time period.

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B. Evaluation of Existing Signal Timings

Table 2: Existing programmed change intervals vs. Calculated change intervals for the intersection of SR 99 & S 216th St

	Phase 8 (WB)	Phase 4 (EB)	Phase 2 (NB)	Phase 6 (SB)
Proposed Monitored Approach?	No	Yes	No	Yes
Existing Programmed Yellow Interval, Sec.	4.0	4.0	4.5	4.5
Calculated Yellow Interval, Sec		3.7		3

The existing programmed intersection timings from Table 2 were obtained from the Washington State Department of Transportation. A copy of the timing chart is included in the Appendix. In general, the existing Yellow programmed change interval and the calculated Yellow change intervals are summarized in Table 2. The change intervals at this intersection were calculated based on the formula 1 from *ITE's Determining Vehicle Signal Change and Clearance Intervals.*

Yellow Change Interval = $t + \left[\frac{v}{2(a + 32.2g)}\right]$

Where:
t= reaction time, seconds
v= approach speed, feet/second
a= deceleration rate, feet/second^2
g= approach grade, percent/100

Southbound approach:
The approach grade is measured to be a decreasing slope of 1.8%, reaction time of 1.0 second, deceleration rate of 10ft/s^2, vehicle approaching speeds is 50mph (5 mph over the speed limit). The calculated Yellow change interval equals 3s

Eastbound approach:
The approach grade is measured to be an increasing slope of 6.3%, reaction time of 1.0 second, deceleration rate of 10ft/s^2, vehicle approaching speeds is 40 mph (5 mph over the speed limit). The calculated Yellow change interval equals 3.7s.

D. Evaluation of Traffic Signal Visibility

There are no visual obstructions to the signal heads on the southbound direction of SR 99 and the signal heads on the eastbound direction of S 216th St. the approach grades are relatively flat on both approaches. The visibility to the signal meets the required MUTCD standards (Table 4D.12/ Section 4D.12)

Figure 2: Eastbound approach, looking east

Figure 3: Southbound approach, looking south

E. Review of Intersection Signs

The signs and markings at the intersection are in good condition and meet the required standards. No other conflicts exist.