

# Appendix



## A – Synchro Report

US20/OR34 and 26<sup>th</sup> Street (with Clemens Mill Road Realignment)

## B – Preliminary Signal Warrant Worksheet

US20/OR34 and 26<sup>th</sup> Street (with Clemens Mill Road Realignment)





















# A – Synchro Report

US20/OR34 and 26<sup>th</sup> Street (with Clemens Mill Road Realignment)

# HCM Signalized Intersection Capacity Analysis

## 9: 26th Street & US 20/OR 34






















2015 Philomath TSP Update  
Project Performance - Future (2040) Conditions

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	705	20	45	860	15	15	5	25	75	30	20
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flt	1.00	1.00		1.00	1.00		1.00	0.87		1.00	0.94	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1554	1678		1662	1677		1662	1513		1554	1538	
Flt Permitted	0.22	1.00		0.30	1.00		0.72	1.00		0.74	1.00	
Satd. Flow (perm)	360	1678		531	1677		1264	1513		1205	1538	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	5	742	21	47	905	16	16	5	26	79	32	21
RTOR Reduction (vph)	0	1	0	0	1	0	0	22	0	0	18	0
Lane Group Flow (vph)	5	762	0	47	920	0	16	9	0	79	35	0
Heavy Vehicles (%)	7%	4%	0%	0%	4%	7%	0%	7%	0%	7%	7%	7%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	37.0	37.0		37.0	37.0		7.4	7.4		7.4	7.4	
Effective Green, g (s)	37.8	37.8		37.8	37.8		7.4	7.4		7.4	7.4	
Actuated g/C Ratio	0.71	0.71		0.71	0.71		0.14	0.14		0.14	0.14	
Clearance Time (s)	4.8	4.8		4.8	4.8		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	255	1192		377	1191		175	210		167	213	
v/s Ratio Prot		0.45			c0.55			0.01				0.02
v/s Ratio Perm	0.01			0.09			0.01			c0.07		
v/c Ratio	0.02	0.64		0.12	0.77		0.09	0.04		0.47	0.16	
Uniform Delay, d1	2.3	4.1		2.4	4.9		20.0	19.8		21.1	20.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.0	1.1		0.1	3.2		0.2	0.1		2.1	0.4	
Delay (s)	2.3	5.2		2.6	8.1		20.2	19.9		23.2	20.5	
Level of Service	A	A		A	A		C	B		C	C	
Approach Delay (s)		5.2			7.9			20.0			22.1	
Approach LOS		A			A			C			C	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			8.1			HCM 2000 Level of Service			A			
HCM 2000 Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			53.2			Sum of lost time (s)			8.0			
Intersection Capacity Utilization			68.0%			ICU Level of Service			C			
Analysis Period (min)			15									

c Critical Lane Group

Lanes, Volumes, Timings  
9: 26th Street & US 20/OR 34

2015 Philomath TSP Update  
Project Performance - Future (2040) Conditions

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	705	20	45	860	15	15	5	25	75	30	20
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.997			0.874			0.941	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1554	1678	0	1662	1677	0	1662	1512	0	1554	1539	0
Flt Permitted	0.220			0.303			0.722			0.737		
Satd. Flow (perm)	360	1678	0	530	1677	0	1264	1512	0	1205	1539	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			3			26			21	
Link Speed (mph)		40			40			25			25	
Link Distance (ft)		1565			2679			936			394	
Travel Time (s)		26.7			45.7			25.5			10.7	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	7%	4%	0%	0%	4%	7%	0%	7%	0%	7%	7%	7%
Adj. Flow (vph)	5	742	21	47	905	16	16	5	26	79	32	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	763	0	47	921	0	16	31	0	79	53	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	2	2		2	2		2	2		2	2	
Detector Template	Side St	Det35		Side St	Det35		Side St	Side St		Side St	Side St	
Leading Detector (ft)	78	223		78	223		78	78		78	78	
Trailing Detector (ft)	2	107		2	107		2	2		2	2	
Detector 1 Position(ft)	2	107		2	107		2	2		2	2	
Detector 1 Size(ft)	16	16		16	16		16	16		16	16	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)	72	217		72	217		72	72		72	72	
Detector 2 Size(ft)	6	6		6	6		6	6		6	6	
Detector 2 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	

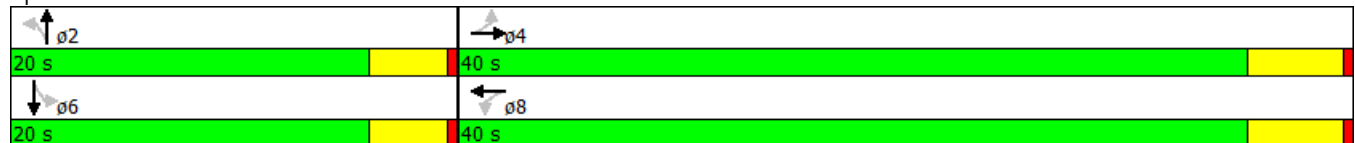
Lanes, Volumes, Timings  
 9: 26th Street & US 20/OR 34

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Minimum Split (s)	20.8	20.8		20.8	20.8		20.0	20.0		20.0	20.0	
Total Split (s)	40.0	40.0		40.0	40.0		20.0	20.0		20.0	20.0	
Total Split (%)	66.7%	66.7%		66.7%	66.7%		33.3%	33.3%		33.3%	33.3%	
Maximum Green (s)	35.2	35.2		35.2	35.2		16.0	16.0		16.0	16.0	
Yellow Time (s)	4.3	4.3		4.3	4.3		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	-0.8	-0.8		-0.8	-0.8		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	39.0	39.0		39.0	39.0		9.1	9.1		9.1	9.1	
Actuated g/C Ratio	0.75	0.75		0.75	0.75		0.17	0.17		0.17	0.17	
v/c Ratio	0.02	0.61		0.12	0.74		0.07	0.11		0.38	0.19	
Control Delay	3.8	8.0		4.6	12.3		18.9	10.3		25.6	14.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	3.8	8.0		4.6	12.3		18.9	10.3		25.6	14.7	
LOS	A	A		A	B		B	B		C	B	
Approach Delay		8.0			11.9			13.2			21.2	
Approach LOS		A			B			B			C	

Intersection Summary

Area Type: Other  
 Cycle Length: 60  
 Actuated Cycle Length: 52.3  
 Natural Cycle: 65  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.74  
 Intersection Signal Delay: 11.0  
 Intersection Capacity Utilization 68.0%  
 Analysis Period (min) 15  
 Intersection LOS: B  
 ICU Level of Service C

Splits and Phases: 9: 26th Street & US 20/OR 34



## **B – Preliminary Signal Warrant Worksheet**

US20/OR34 and 26<sup>th</sup> Street (with Clemens Mill Road Realignment)

**Oregon Department of Transportation**  
**Transportation Development Branch**  
**Transportation Planning Analysis Unit**

**Preliminary Traffic Signal Warrant Analysis<sup>1</sup>**

<b>Major Street:</b> US 20 / OR 34	<b>Minor Street:</b> 26th Street
<b>Project:</b> Philomath TSP	<b>City/County:</b> Philomath
<b>Year:</b> 2040	<b>Alternative:</b> 2040 No-Build with re-alignme

**Preliminary Signal Warrant Volumes**

Number of Approach lanes		ADT on major street approaching from both directions		ADT on minor street, highest approaching volume	
Major Street	Minor Street	Percent of standard warrants 100	Percent of standard warrants 70	Percent of standard warrants 100	Percent of standard warrants 70

**Case A: Minimum Vehicular Traffic**

Major Street	Minor Street	Percent of standard warrants 100	Percent of standard warrants 70	Percent of standard warrants 100	Percent of standard warrants 70
1	1	8850	6200	2650	1850
2 or more	1	10600	7400	2650	1850
2 or more	2 or more	10600	7400	3550	2500
1	2 or more	8850	6200	3550	2500

**Case B: Interruption of Continuous Traffic**

Major Street	Minor Street	Percent of standard warrants 100	Percent of standard warrants 70	Percent of standard warrants 100	Percent of standard warrants 70
1	1	13300	9300	1350	950
2 or more	1	15900	11100	1350	950
2 or more	2 or more	15900	11100	1750	1250
1	2 or more	13300	9300	1750	1250

**X** 100 percent of standard warrants

70 percent of standard warrants<sup>2</sup>

**Preliminary Signal Warrant Calculation**

	Street	Number of Lanes	Warrant Volumes	Approach Volumes	Warrant Met
Case A	Major	2	10600	16500	N
	Minor	1	2650	1313	
Case B	Major	2	15900	16500	N
	Minor	1	1350	1313	

Analyst and Date: BLC 3/27/2017

Reviewer and Date:

<sup>1</sup> Meeting preliminary signal warrants does **not** guarantee that a signal will be installed. When preliminary signal warrants are met, project analysts need to coordinate with Region Traffic to initiate the traffic signal engineering investigation as outlined in the Traffic Manual. Before a signal can be installed, the engineering investigation must be conducted or reviewed by the Region Traffic Manager who will forward signal recommendations to headquarters. Traffic signal warrants must be met and the State Traffic Engineer's approval obtained before a traffic signal can be installed on a state highway.

<sup>2</sup> Used due to 85th percentile speed in excess of 40 mph or isolated community with population of less than 10,000.