

HSM Urban/Suburban Case Study

Pacific Ave SE in Thurston County, WA



Learning Outcomes:

Apply the HSM

- ▶ Urban Multilane Roadway Segments
- ▶ Urban Multilane Intersections

Pacific Avenue SE Project

Location: Lacey city limits to Steilacoom Ave SE

Length: Mp 3.528 to Mp 4.383 = 0.855 mi (4,514 ft)

Five-lane including a center TWLTL (5T) with curbs

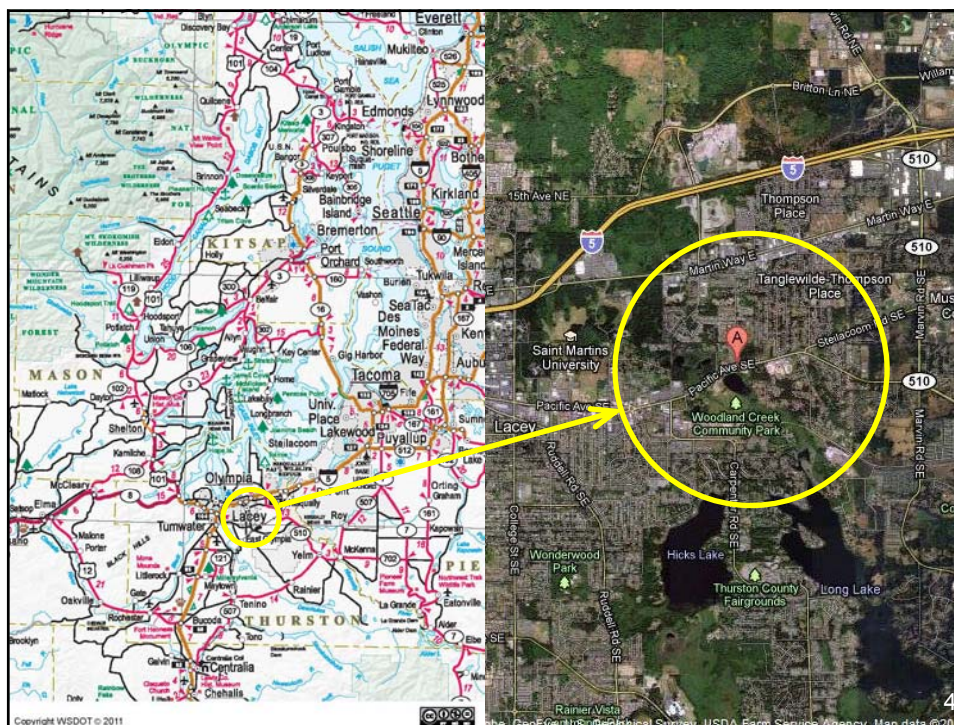
5-ft bike lanes and sidewalks on both sides

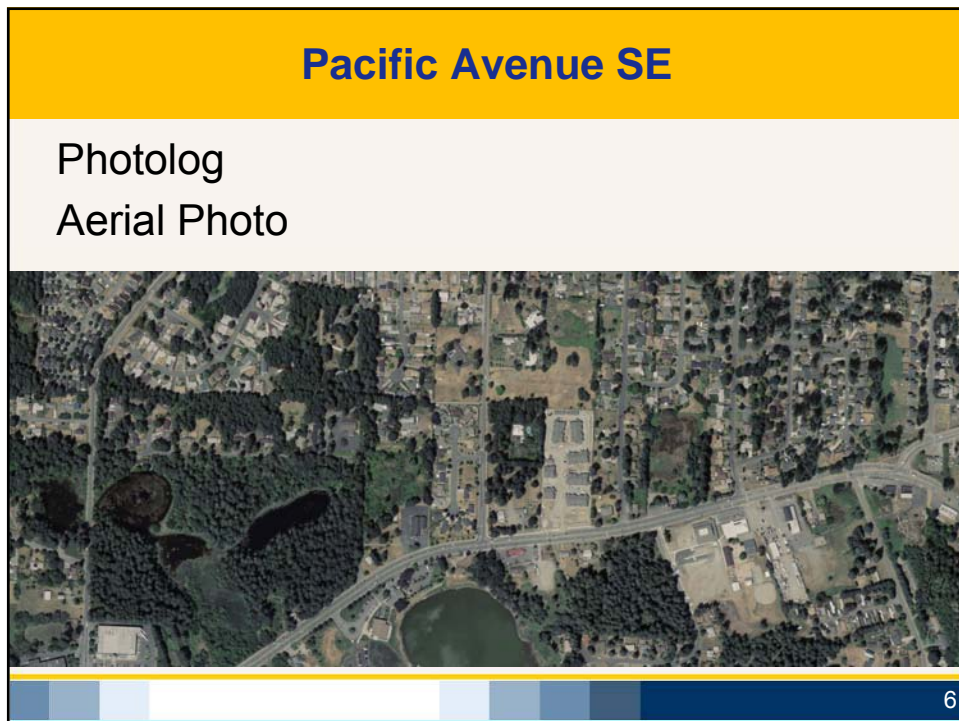
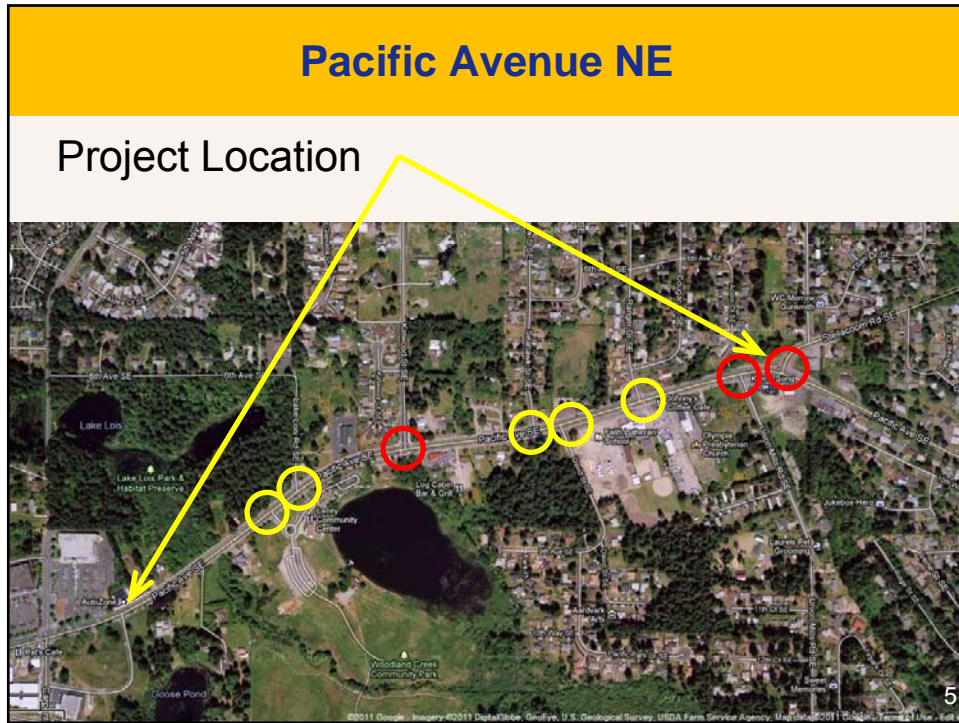
Posted speed limit = 40 mph

2010 AADT: 14,652 (just east of Ranger Dr SE)

2030 AADT: 18,000 (+/-)

3





Pacific Ave SE CMF Data:

- ▶ Lane width = 11 ft with 11 ft TWLTL
- ▶ No on-street parking or automated enforcement
- ▶ Roadside fixed object distance = 10 ft
- ▶ Roadway and intersection lighting (partial)
- ▶ All left turn lanes; no right turn lanes
- ▶ 36 Driveways (8 minor commercial; 2 major industrial; 2 minor indust.; 24 minor residential)
- ▶ 1 bus stop within 1,000 ft of all intersections
- ▶ School [Seahawk, David, Ranger, Union Mills]
- ▶ Alcohol [Lake Lois, Kinwood, Seahawk, David]

7

Pacific Ave SE Crash Data, 2005 - 2009

Fatal = 0; Injury = 18 (18); PDO = 45; Total = 63
 12 SV; 48 MV; 3 Bicycle
 1 Semi-truck; 2 Motorcycle; 57 Car/Pickup
 19 Nighttime; 44 Daylight/Dusk/Dawn
 6 Alcohol; 4 Ice/Snow; 20 Wet; 39 Dry
 32 roadway segment related; 31 intersection related
 Segment Severity = 22% (29% for facility)
 Intersection Severity = 36%
 Weighted AADT = 14,106; Length = 0.855 mi
 Segment MVMT = 4.402; Crash Rate = 7.3 (14.3)

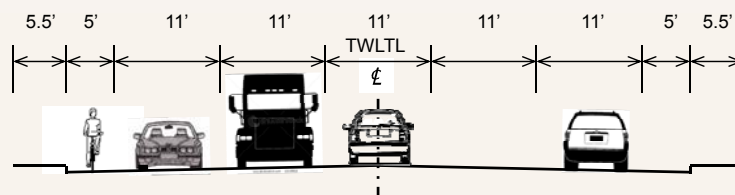
8

Summary of Crash Data (2005- 2009)

Pacific Ave SE, Case Study – Segment Length and Crash Calculations (Lacey City Limits to Steilacoom Ave)

Intersection	Segment	Begin MP	End MP	Length mi	Length ft	AADT vpd	SV Injury	SV PDO	MV Injury	MV PDO	Ped	Bike	Total
Woodland Park	1	3.528	3.720	0.192	1,014	14,106	0	2	0	1	0	0	3
	3ST	3.720	3.720										0
Lake Lois Rd	2	3.720	3.757	0.037	195			1		1			2
	3ST	3.757	3.757			100	0	0	0	1	0	0	1
Kinwood St	3	3.757	3.903	0.146	771	14,106	0	0	2	5	0	0	7
	3SG	3.903	3.903			5,239	0	1	3	10	0	0	16
Seahawk St	4	3.903	4.064	0.161	850	14,106	0	1	2	2	0	0	5
	3ST	4.064	4.064			240	0	0	0	0	0	0	0
David St	5	4.064	4.098	0.034	180	14,106	1	0	1	2	0	0	4
	3ST	4.098	4.098			240	0	0	1	1	0	0	2
Ranger St	6	4.098	4.203	0.105	554	14,106	0	4	0	2	0	0	7
	3ST	4.203	4.203			1,356	0	0	0	0	0	0	0
Union Mills Rd	7	4.203	4.328	0.125	660	14,106	0	1	0	1	0	0	2
	3SG	4.328	4.328			3,501	0	0	4	6	0	0	10
Steilacoom Ave	8	4.328	4.383	0.055	290	14,106	0	1	0	1	0	0	2
	3SG	4.383	4.383			7,195	0	0	1	1	0	0	2
Total				0.856	4,514		1	11	14	34	0	0	63

Existing Cross Section (5T)



Roadway Segment Alternatives

1. Raised median (convert 5T to 4D with left turn lanes)
2. Road diet (convert 5T to 2D with left and right turn lanes)
3. Full roadway lighting
4. Other roadway safety countermeasures

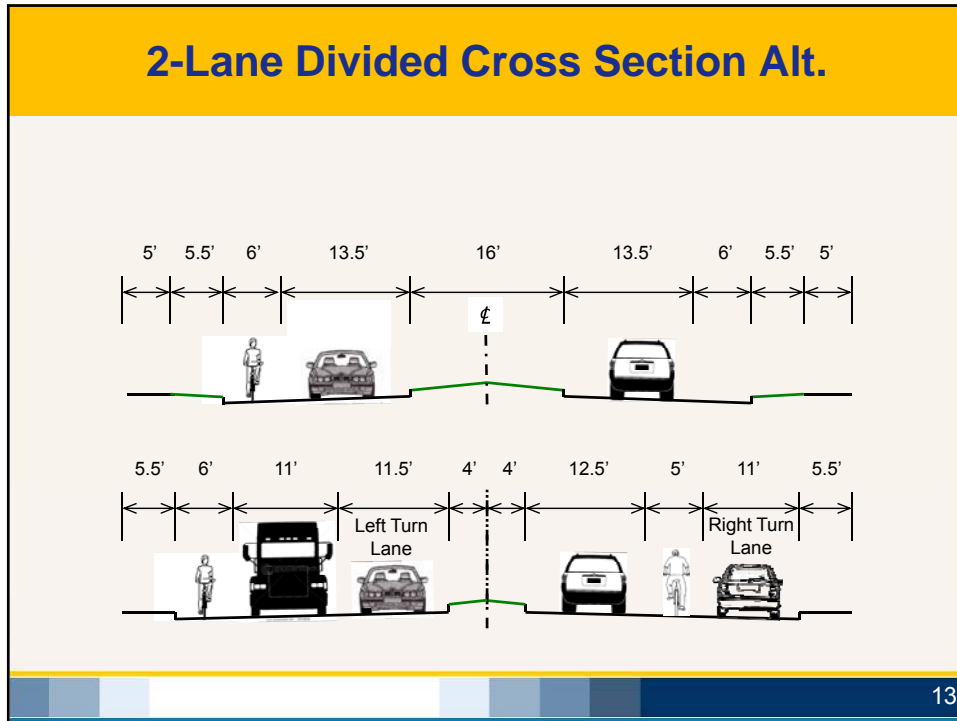
11

4-Lane Divided Cross Section Alt.

The diagram illustrates a 4-lane divided roadway cross-section with the following dimensions and components:

- Dimensions (from left to right):** 5.5', 5', 11', 12.5', 8', 12.5', 11', 5', 5.5'.
- Components:**
 - Left side: 5.5' sidewalk, 5' shoulder, 11' travel lane (with car icon), 12.5' travel lane (with truck icon).
 - Center: 8' median with a raised curb and a dashed centerline.
 - Right side: 12.5' travel lane (with car icon), 11' travel lane (with car icon), 5' shoulder, 5.5' sidewalk.
- Additional Labels:**
 - TWLTL:** Traffic Warning Line to Left Lane, shown as a dashed line between the 11' and 12.5' lanes on the right side.

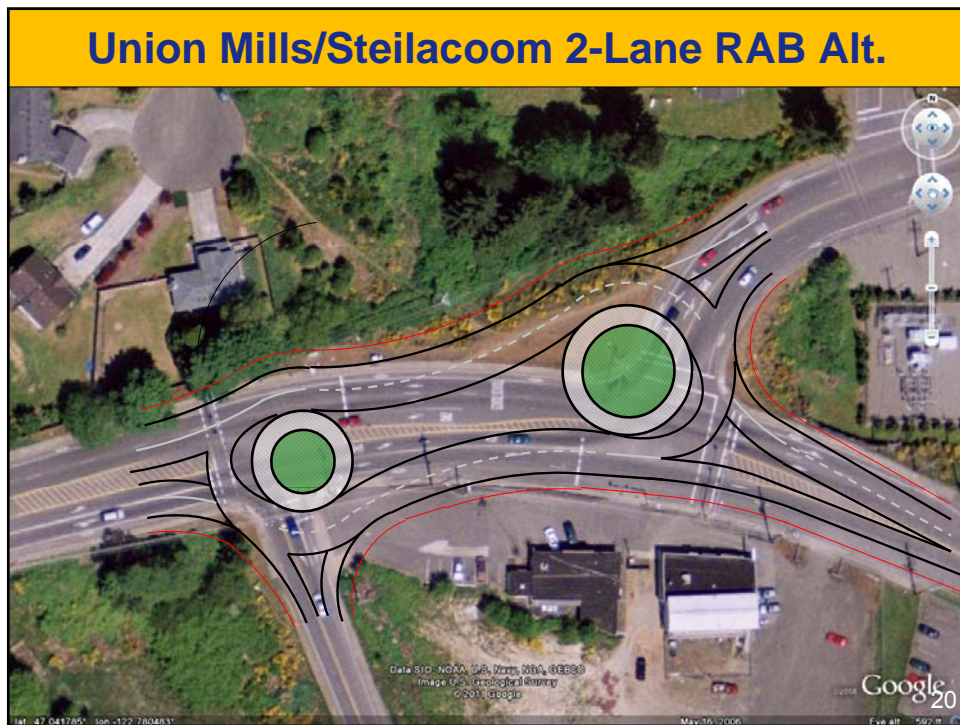
12



Pacific Avenue SE Intersection Traffic Data	
<p>Pacific Ave. Mainline $AADT_{major}$</p> <ul style="list-style-type: none"> ▶ Average 2005 – 2009 = 14,106 ▶ 2030 = 18,000 	<p>Lake Lois Rd. $AADT_{minor}$</p> <ul style="list-style-type: none"> ▶ 2009 = 240 ▶ 2030 = 300
<p>Kinwood St. $AADT_{minor}$</p> <ul style="list-style-type: none"> ▶ Average 2005 – 2009 = 5,239 ▶ 2030 = 6,700 	<p>Woodland Green Park $AADT_{minor}$</p> <ul style="list-style-type: none"> ▶ 2009 = 240 ▶ 2030 = 300
<p>Union Mills Rd. $AADT_{minor}$</p> <ul style="list-style-type: none"> ▶ Average 2005 – 2009 = 3,501 ▶ 2030 = 4,500 	<p>Seahawk St. $AADT_{minor}$</p> <ul style="list-style-type: none"> ▶ 2009 = 240 ▶ 2030 = 300
<p>Steilacoom Rd. $AADT_{minor}$</p> <ul style="list-style-type: none"> ▶ Average 2005 – 2009 = 7,195 ▶ 2030 = 9,200 	<p>David St. $AADT_{minor}$</p> <ul style="list-style-type: none"> ▶ 2009 = 240 ▶ 2030 = 300
<p>Pacific Ave. E. Appr. $AADT_{major}$</p> <ul style="list-style-type: none"> ▶ Average 2005 – 2009 = 7,362 ▶ 2030 = 9,400 	<p>Ranger St. $AADT_{minor}$</p> <ul style="list-style-type: none"> ▶ 2009 = 1,356 ▶ 2030 = 1,700

Intersection Alternatives
<ol style="list-style-type: none"> 1. Right-turn lane on Pacific WB at Kinwood 2. Right-turn lane on Pacific EB at Union Mills Rd 3. Replace Kinwood traffic signals with a modern roundabout 4. Replace Union Mills Rd & Steilacoom Ave traffic signals with a modern roundabout 5. Full intersection lighting 6. Ped-Activated Hybrid Beacon at Ranger 7. Other intersection safety countermeasures





Using Excel Spreadsheets for Roadway Segments Crash Frequency Prediction

Demonstration of Excel Spreadsheets

Group Exercise for HSM Crash Prediction

Alternatives Discussion

21

Pacific Ave SE Roadway Segments Crash Prediction Outcomes

Roadway Segments:

- ▶ $N_{predicted-2005-2009}$ (existing) =
- ▶ $N_{predicted-2030}$ (existing) =
- ▶ $N_{predicted-2030}$ [with alternative changes] =

22

Intersection Crash Prediction Outcomes:

Kinwood Avenue (3SG):

- ▶ $N_{\text{predicted-2005-2009}}$ (existing) =
- ▶ $N_{\text{predicted-2030}}$ (existing) =
- ▶ $N_{\text{predicted-2030}}$ [with alternative changes] =

23

Intersection Crash Prediction Outcomes:

Union Mills Road (3SG):

- ▶ $N_{\text{predicted-2005-2009}}$ (existing) =
- ▶ $N_{\text{predicted-2030}}$ (existing) =
- ▶ $N_{\text{predicted-2030}}$ [with alt. changes] =

Steilacoom (3SG):

- ▶ $N_{\text{predicted-2005-2009}}$ (existing) =
- ▶ $N_{\text{predicted-2030}}$ (existing) =
- ▶ $N_{\text{predicted-2030}}$ [with alt. changes] =

24

Learning Outcomes:

Apply the HSM to Local Agency Projects

- ▶ Urban Multilane Roadway Segments
- ▶ Urban Multilane Intersections

25

Questions and Discussion



26