Washington State Department of Transportation

SR 20 Swantown Road to Barrington Drive
Corridor Pre-design Analysis, Technical Update, April 2012

PURPOSE:
This technical paper summarizes additional analysis prepared by WSDOT subsequent to the completion, in 2005, of the State Route 20 Swantown Road to Cabot Drive Corridor Pre-Design Analysis (hereinafter referred to as the Pre-design Analysis).

KEY FINDINGS:
The following key findings are covered in more detail later in this technical paper.

- Traffic volumes along SR 20 have seen little change since 1999. The study intersections continue to operate well within the adopted level of service standard. Traffic would need to grow 40 percent or more over 2011 peak hour volumes before the intersections begin to fall below the level of service concurrency standard of LOS E.
- WSDOT recently updated the cost estimate for the improvements recommended in the Pre-design Analysis. The 2011 scoping estimate is $29.9 million (Swantown to Barrington).
- Coupled with more modest growth in traffic volumes, some lower cost alternatives would improve westbound traffic flow between Pioneer and Swantown, but there are trade-offs.

BACKGROUND:
WSDOT and the city of Oak Harbor completed a Pre-design Analysis in 2005 in order to:

- Examine existing (2004) and future (2030) no-build intersection traffic operations.
- Evaluate future (2030) intersection traffic operations for a set of improvement alternatives.
- Recommend corridor improvements, provide conceptual drawings, planning-level cost estimates and a project phasing plan.

Recommendations from the Pre-design Analysis included the following phased implementation:

- Phase One – two-lane roundabouts at Swantown and at Erie; convert the two-way-left-turn lane to a second westbound through lane from Erie to Swantown; restrict turns at Scenic Heights to right-in/right-out only
- Phase Two – Two-lane roundabouts at Pioneer Way and at Barrington Dr.
- Phase Three – Widen SR 20 to four lanes from Swantown to Pioneer, plus a landscaped median, bike lanes and new sidewalks from Swantown to Barrington
- Phase Four – Two-lane roundabouts at 8th Ave, and at 3rd Ave/Cabot, along with a landscaped median, bicycle lanes and new sidewalks from Barrington to 3rd Ave/Cabot

2011 WSDOT SCOPING DESIGN ESTIMATE:
In 2011 WSDOT updated the layouts and cost estimates from the 2005 pre-design analysis for the section of SR 20 from Swantown to Barrington. WSDOT's 2011 estimate is double what was estimated in 2005, as shown in Table 1.

Table 1

	2005 Pre-design	2011 Scoping
Pre-design Analysis, Phases 1, 2 and 3	$15.5 Million	$29.9 Million
Pre-design Analysis, Phase 4	$7 Million	not estimated
Cost basis	2005 dollars	2011 dollars

Reasons for the increased cost include the following:

- 2011 "scoping" estimate is at five percent design completed; the 2005 "planning" estimate was less than one percent design completed. The higher the percent design completed, the better the reliability and accuracy of the estimate.
- We know a lot more about roundabout design and costs in 2011 than we did in 2005. Very few roundabouts had been constructed statewide prior to 2006. Since 2007 twenty roundabouts have been built in Whatcom and Skagit Counties and more are coming.
- The 2011 estimate includes the latest standards and requirements for protection of sensitive areas and treatment of storm water runoff.

ADDITIONAL ANALYSIS COMPLETED BY WSDOT:

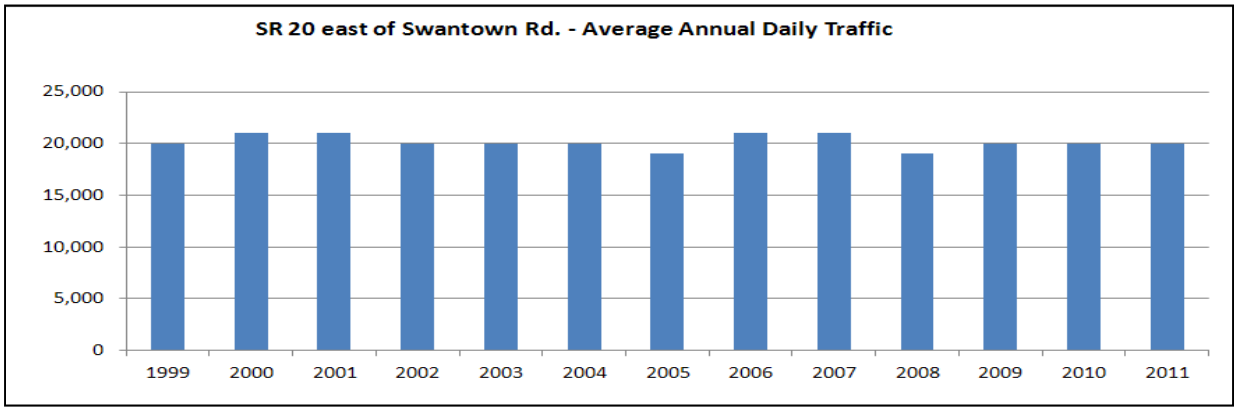
WSDOT investigated a number of potential lower cost alternatives to the improvements recommended in the Pre-design Analysis for the section of SR 20 from Swantown to Barrington. We also gathered and evaluated current traffic information that provides context for evaluating alternatives.

Our analysis shows that traffic volumes along SR 20 have varied little in the past 12 years. The leveling of traffic volumes has enabled the signalized intersections to continue to operate at or near the same level of service during that time. Over the past five years the frequency of traffic collisions has not significantly changed from year to year, and most importantly, there were no serious injury or fatality collisions during that time.

Average Annual Daily Traffic

There has been little or no growth in average annual daily traffic volumes along SR 20 in the past 13 years, as shown in Table 2.

Table 2



Intersection level of service

The traffic forecasts used for the 2005 pre-design analysis determined that traffic growth would degrade intersection level of service as early as 2010. The forecasted growth did not happen. WSDOT's updated traffic analysis, recently completed for 2011 peak hour volumes, indicates that all of the study intersections are operating at an acceptable level of service (LOS C). Table 3 provides a comparison of the Pre-design Analysis level of service projected for 2010 versus 2011 actual.

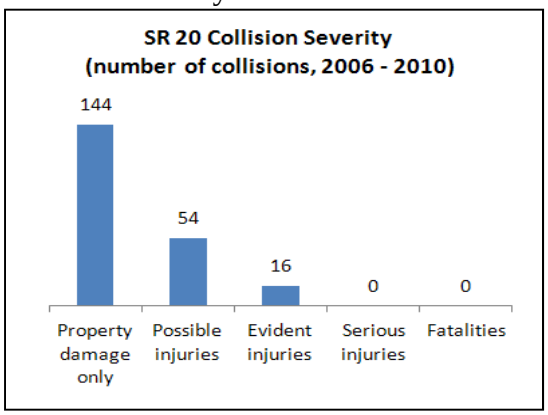
Table 3

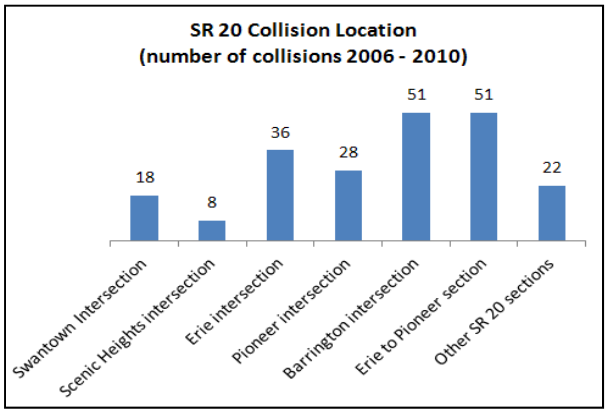
	2010 Projected		2011 Actual	
	LOS	Delay	LOS	Delay
SR 20/Swantown	F	82.9 sec	C	21.0 sec
SR 20/Scenic Heights	E	38.2 sec	C	18.4 sec
SR 20/Erie	E	59.2 sec	C	22.2 sec
SR 20/Pioneer	E	60.2 sec	C	26.7 sec
SR 20/Barrington	D	43.9 sec	C	28.5 sec

Traffic collisions

There were 214 collisions along SR 20 from Swantown to Barrington over a five year period (2006-2010). Collision frequency per year has been relatively consistent, not showing a trend up or down. The most frequent types of collisions were; rear-end collisions (43 percent of all collisions), opposite direction collisions (14 percent), and enter at angle collisions (12 percent). Only three collisions can be directly attributed to SR 20 westbound traffic merging at the lane drop between Erie and Scenic Heights.

Collision severity and location are shown in the charts below.

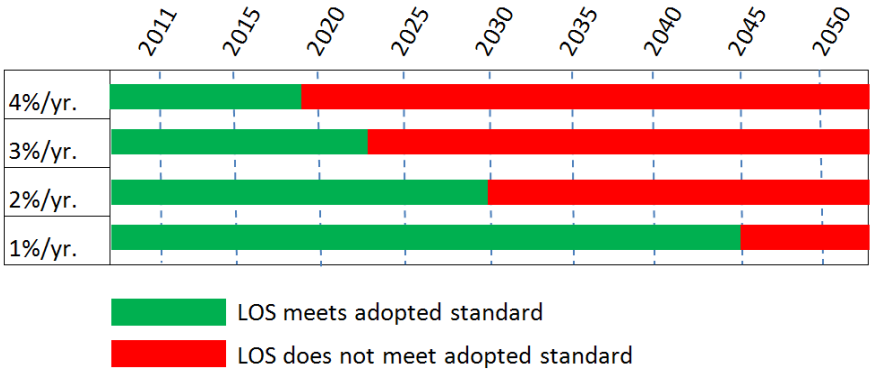




Additional Alternatives

Over the past several years a number of lane and intersection configurations have been reviewed, in varying degrees of detail, to determine if there are additional lower cost alternatives to the recommendations made in the 2005 Pre-design Analysis. With traffic growing at a much slower rate than originally forecasted, the need for more costly improvements may be delayed further into the future than initially thought.

How far into the future? For an example let's look at the SR 20/Barrington intersection, which had the highest average vehicle delay during peak hour of any of the study intersections in 2011. Traffic would need to grow by over 40 percent for the intersection to fall below the level of service standard for concurrency. At one percent traffic growth per year, it would take about 35 years for the SR 20/Barrington intersection to fall below the concurrency standard. The 40 percent threshold would be reached sooner at higher traffic growth rates, as shown in the chart below.



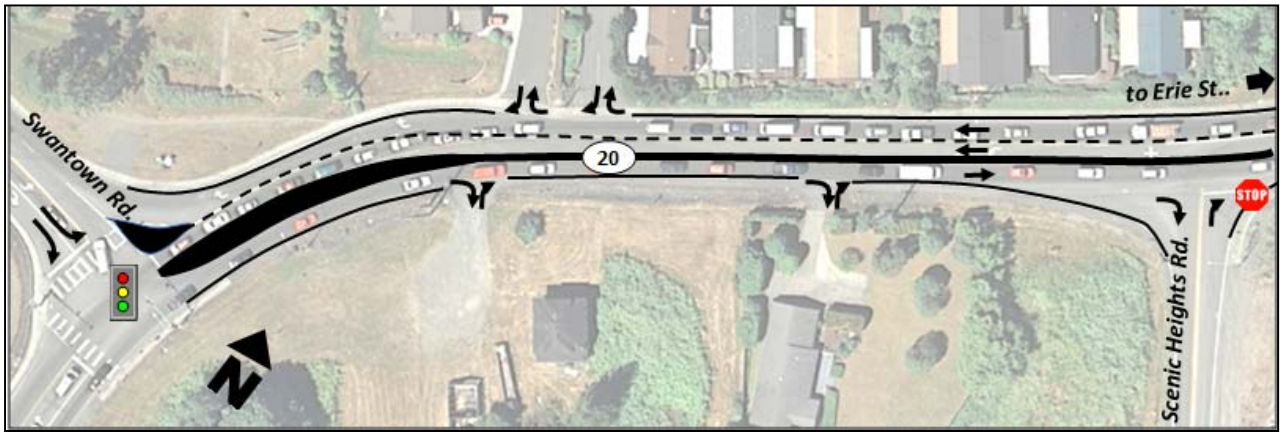
Compare this to a nearly flat growth rate in SR 20 traffic since 1999 and indications are that major improvements are not needed anytime soon in order to remain within the adopted intersection level of service (LOS E) at the study intersections. Even so, congestion and vehicle delay will increase as traffic grows. Again, using the SR 20/Barrington intersection as an example, the average delay in 2011 pm peak hour conditions was 28.5 seconds per vehicle (LOS C). Average vehicle delay could worsen to 79 seconds per vehicle and still meet the far limit of the LOS E standard. The good news is, there is time to plan and seek funding for incremental improvements in the corridor.

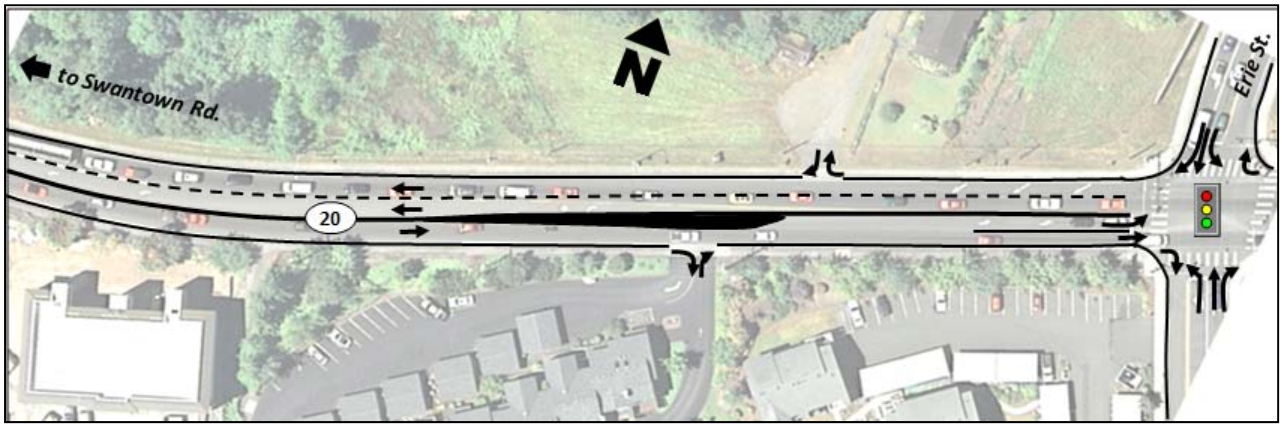
Table 4 on the next page provides a brief recap of eight additional lower cost intersection alternatives that were evaluated by WSDOT following the completion of the Pre-design Analysis. Three of the eight alternatives (alternatives one, seven and eight) were selected by WSDOT traffic engineers for additional traffic evaluation as they were likely to provide the highest benefit relative to their cost. Following Table 4 is a page each for alternatives one, seven and eight, showing the traffic results and a rough sketch layout of what they could look like.

Table 4: Additional Alternatives Evaluated by WSDOT

	Alternatives	LOS (2011)	Estimated Cost	Benefits	Disadvantages	Notes
1	Convert SR 20 westbound two-way left-turn lane from Erie to Swantown into a second westbound through lane. Install median curbing on SR 20 and restrict turns at Scenic Heights to right-in/right-out only.	LOS C	no estimate available	The lowest cost alternative. Can be implemented quickly.	Eliminates left turns to and from SR 20 and Scenic Heights Dr. and driveways. Resulting in circuitous access for Scenic Heights via Waterloo Rd.	Future operational life of improvements has not been determined. See sketch page for more details.
2	Same as Alt.1 plus adds U-turn capability at SR 20/Swantown Rd and SR 20/Erie St intersections.	LOS not evaluated	no estimate available	U-turns at Swantown and Erie provide directional travel choices for Scenic Heights travelers.	Right of way, retaining walls and intersection modifications increase cost.	The cost to build a U-turns at Swantown and Erie would approach the cost of a roundabouts at those locations while not providing the same level of long term benefits roundabouts would provide.
3	Retain two way left-turn lane and all turning choices to/from Scenic Heights Dr. Widen SR 20 to add second westbound travel lane.	LOS not evaluated	no estimate available	Adds travel lane capacity without restricting turns at Scenic Heights and driveways.	Cost for right of way and construction for new westbound lane.	
4	Same as Alt.3 but eliminates left turn out from Scenic Heights in order to reduce the right-of-way required to widen SR 20 for the second travel lane.	LOS not evaluated	no estimate available	Less right of way needed versus Alt.3. Retains left turn in from SR 20 to Scenic Heights.	Cost for right of way and construction for new westbound lane.	
5	Same as Alt.4 plus adds U-turn capability at the SR 20/Erie St. intersection	LOS not evaluated	no estimate available	Compared to Alt.4, adding U-turn at Erie provides alternative for Scenic Heights drivers needing to travel west or south on SR 20.	Small number of left turns from Scenic Heights to SR 20 may not justify the expense.	
6	Same as Alt.1 plus adds a fourth leg to the SR 20/Swantown intersection to provide a new connection to Scenic Heights Dr. The existing intersection at SR 20/Scenic Heights could be closed or remain right-in/right-out only.	LOS not evaluated	no estimate available	Continues full turning access between SR 20 to/from driveways and to/from Scenic Heights. Could close existing access at SR 20/Scenic Heights.	Cost of right of way and cost to construct fourth leg of intersection.	
7	Same as Alt.1 except replaces the signal at SR 20/Swantown with a roundabout.	LOS B or C	no estimate available	SR 20/Swantown roundabout is first step in long-term vision for the corridor. Provides an alternative for left-turns in from SR 20 to Scenic Heights via the roundabout.	Cost for right of way and construction of Swantown roundabout is a lower cost, but not a low cost, alternative. Eliminates left turn outs from Scenic Heights to SR 20. Circuitous routing to Waterloo Rd. to make their turns.	See sketch page for more details.
8	Roundabouts at Swantown and Pioneer with uninterrupted median curb in between. Driveways and intersections between Swantown and Pioneer restricted to right-in/right-out turns only, including the SR 20/Erie-Bayshore intersection.	LOS B or C	no estimate available	Provides more capacity between Swantown and Pioneer. All turning movements between Swantown and Pioneer can be served. Room to make Erie to Pioneer 4 lanes.	Some of the left turns rerouted to the roundabouts increase trip length. Likely to induce some changes in trip patterns on local street system and at other intersections such as at SR 20/ Barrington.	Median the full length of SR 20 between Swantown and Pioneer would eliminate all left turns, including at Erie/Bayshore, redirecting those trips to the roundabouts. See sketch page for more details.

Sketch - Alternative 1: Restripe existing pavement to add a westbound drop lane on SR 20 from Erie St. to Swantown Rd. with a median curb that restricts access at driveways and at Scenic Heights Dr. to right-in/right-out turns only.
Location: SR 20 between Erie St and Swantown Rd.
Benefits/Disadvanatges: Lowest cost and can be implemented quickly, but eliminates all left turns to/from SR 20 between Erie and Swantown.





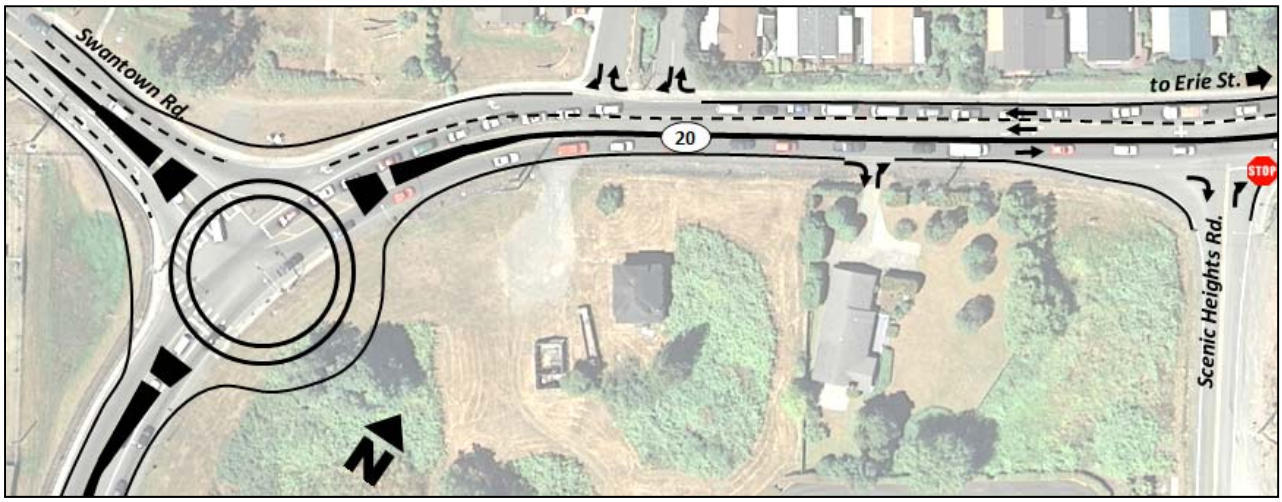
Intersection Traffic Analysis (2011 PM peak hour):

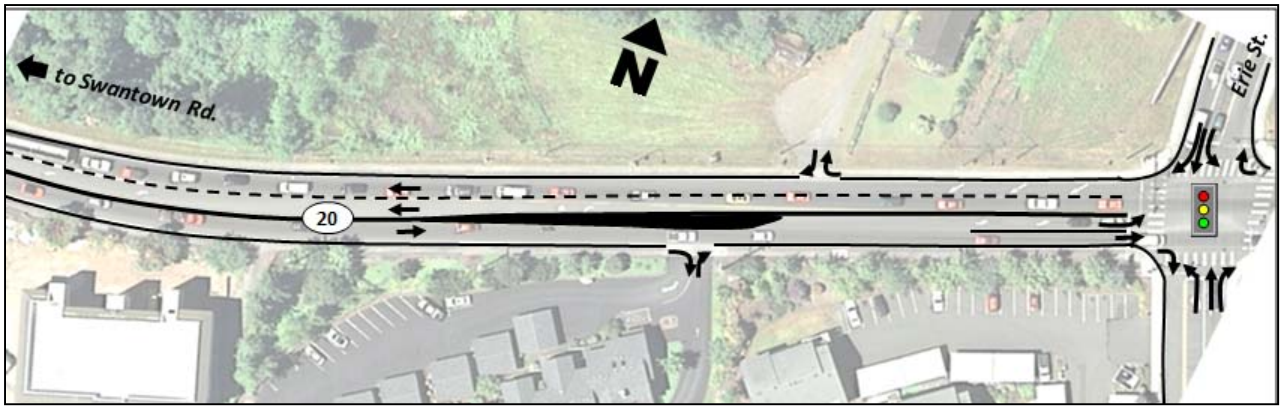
Assumptions:

- Left turns from Scenic Heights to SR 20 will reroute to Waterloo Rd
- Left turns from SR 20 to Scenic Heights will reroute to Waterloo Rd

	2011 Existing		2011 Alternative 1	
	LOS	Delay	LOS	Delay
SR 20/Swantown Rd.	C	21.0 sec	C	26.7 sec
SR 20/Scenic Heights Rd.	C	18.4 sec	C	17.8 sec
SR 20/Erie St.	C	22.2 sec	C	22.2 sec
SR 20/Pioneer Way	C	26.7 sec	C	26.7 sec
SR 20/Barrington Dr.	C	28.5 sec	C	28.5 sec

Sketch - Alternative 7: Add westbound drop lane on SR 20 from Erie St. to Swantown Rd. with a median curb that restricts access at driveways and at Scenic Heights Dr. to right-in/right-out turns only. Construct a roundabout at SR 20/Swantown Rd. intersection.
Location: SR 20 between Erie St and Swantown Rd.
Benefits/Disadvanatges: Roundabout services left turns from SR 20 into Scenic Heights and provides long-term corridor improvement, but at higher cost than Alternative 1. Unable to make left turns from Scenic Heights to SR 20, rerouting them to Waterloo Rd.





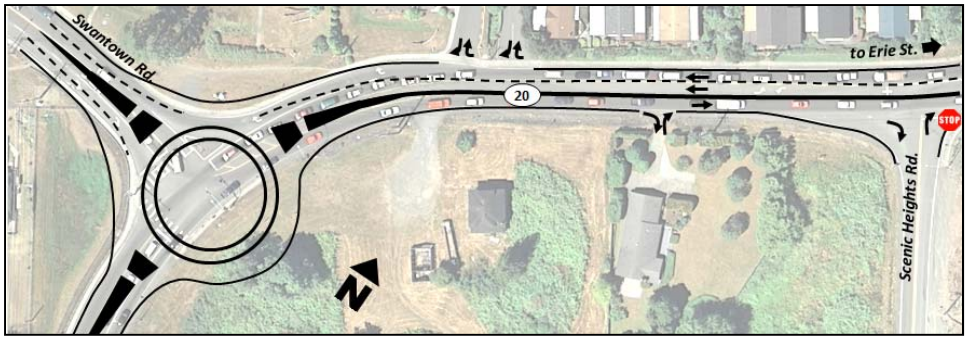
Intersection Traffic Analysis (2011 PM peak hour):

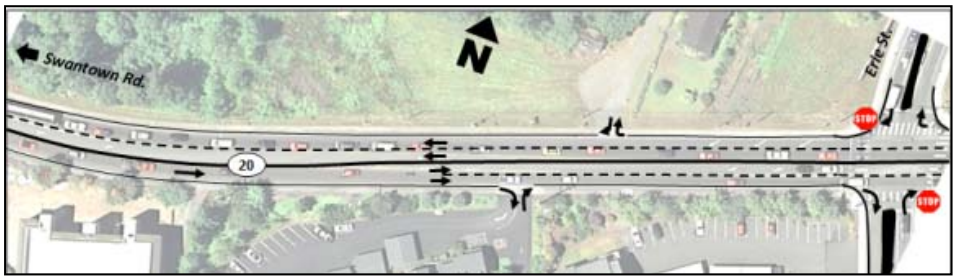
Assumptions:

- Left turns from Scenic Heights to SR 20 reroute to Waterloo Rd
- Left turns from SR 20 to Scenic Heights reroute to Swantown roundabout

	2011 Existing		2011 Alternative 7	
	LOS	Delay	LOS	Delay
SR 20/Swantown Rd.	C	21.0 sec	B	10.4 sec
SR 20/Scenic Heights Rd.	C	18.4 sec	C	17.8 sec
SR 20/Erie St.	C	22.2 sec	C	22.2 sec
SR 20/Pioneer Way	C	26.7 sec	C	26.7 sec
SR 20/Barrington Dr.	C	28.5 sec	C	28.5 sec

Sketch - Alternative 8: Roundabouts at Swantown and Pioneer with an uninterrupted median curb on SR 20 between Swantown and Pioneer, with right-in/right out access at all driveways and intersections in between, including at the SR 20/Erie-Bayshore intersection.
Location: SR 20 between Pioneer Way and Swantown Rd.
Benefits/Disadvantages: All restricted left turns can be accommodated at the Swantown and Pioneer roundabouts. Adds key long-term corridor improvements. SR 20 would be four lanes between Erie and Pioneer without adding pavement. Disadvantages are cost for R/W and construction, longer trip lengths for some left turns, and diversion of trips to SR 20/Barrington.





Intersection Traffic Analysis (2011 PM peak hour):

Assumptions:

- Left turns from Scenic Heights to SR 20 reroute to Pioneer roundabout
- (continued on page 9)

	2011 Existing		2011 Alternative 8	
	LOS	Delay	LOS	Delay
SR 20/Swantown Rd.	C	21.0 sec	B	11.9 sec
SR 20/Scenic Heights Rd.	C	18.4 sec	C	21.0 sec
SR 20/Erie St.	C	22.2 sec	C	24.2 sec #
SR 20/Pioneer Way	C	26.7 sec	B	10.7 sec
SR 20/Barrington Dr.	C	28.5 sec	C	28.5 sec

- delay is for worst movement (northbound right turn)

Assumptions for Alternative 8 traffic analysis (continued from page 8)

- Left turns from SR 20 to Scenic Heights reroute to Swantown roundabout
- Left turns from Erie to SR 20 reroute to Swantown roundabout
- Left turns from SR 20 to Erie reroute to Pioneer roundabout
- Remove signal at SR 20/Erie-Bayshore
- Left turns from Bayshore to SR 20 reroute to Pioneer roundabout
- Left turns from SR 20 to Bayshore reroute to Swantown roundabout

Contact information

Tom Stacey
Transportation Planner
WSDOT Northwest Region/Mount Baker Area
360.757.5982 or staceyt@wsdot.wa.gov

Dina Swires
Mount Baker Area Traffic Engineer
WSDOT Northwest Region/Mt. Baker Area
206-276-5763 or swiresd@wsdot.wa.gov