



SR 166 - Bay Street/Bethel Avenue/ Maple Avenue Intersection Pre-Design Study

Prepared by WSDOT Olympic Region Multimodal Planning Office, June 2020



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Background and Purpose

In December 2019, the Washington State Department of Transportation (WSDOT) began a pre-design study of the intersection of State Route (SR) 166 and Bay Street, Bethel Avenue, and Maple Avenue in Port Orchard. The current signal system at the intersection has become obsolete with increasing maintenance costs and is in need of replacement. A map of this location is shown in Exhibit 1.

Exhibit 1: Study Area Map



This pre-design study began with two preliminary options to consider for replacing the traffic signal at the intersection of SR 166 and Bethel Avenue. The preliminary options were:

- Install a new traffic signal with existing channelization.
- Construct a single-lane, 4-legged roundabout.

The purpose of this study is to develop a solution for replacing the obsolete traffic signal with the most optimum solution (e.g., signal replacement, roundabout), with available resources and an emphasis on low-cost investments.

Project Criteria

Established criteria was outlined in the beginning of the study to help guide decision making. The criteria included:

- 1) Project cost must be equal to or less than 125% of the cost of a new traffic signal for the specific location.
- 2) Recommendation must be ready for project design beginning fall of 2020.
- 3) Project must improve safety.
- 4) Project must improve operations at the intersection.

Benefits of Roundabouts¹

When comparing the differences between roundabouts and traffic signals, roundabouts are safer than traditional traffic signals and accommodate vehicles of various sizes, including emergency vehicles, buses, semi-trucks with trailers, agricultural, and logging equipment. Roundabouts reduce injury crashes by 75% at intersections where stop signs or traffic signals previously existed. Roundabouts improve the flow of traffic because users don't have to wait for a green light to proceed through the intersection. Other benefits of a roundabout include vehicles moving in the same direction which helps improve traffic flow. Crosswalks are located further back from vehicle traffic, allowing drivers more time to see pedestrians before merging into or out of the roundabout. Roundabouts also reduce maintenance and repair costs when compared to traffic signals.

Study Timeline

The study took approximately seven months to complete, beginning December 2019 and ending June 2020. Exhibit 2 shows the SR 166 pre-design study timeline, which describes the scope of the study from start to finish.

Exhibit 2: SR 166 Study Timeline



¹ <https://www.wsdot.wa.gov/Safety/roundabouts/benefits.htm>

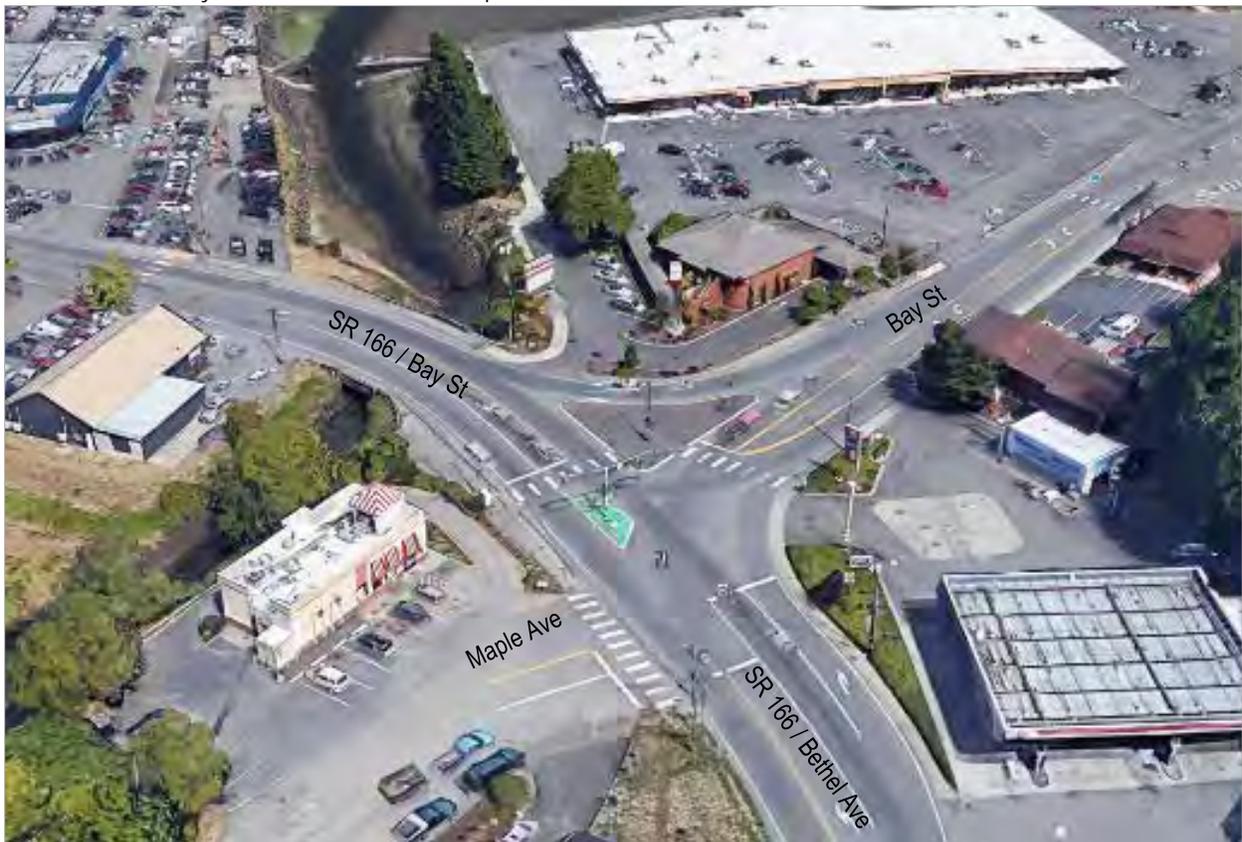
Study Area Context

SR 166 is a five-mile, east-west corridor located in Kitsap County that stretches from the SR 16 junction through the City of Port Orchard and ends at Mile Hill Road. The majority of the corridor travels adjacent to Sinclair Inlet. The highway functions as an urban principal arterial, undivided NHS highway. SR 166 is primarily a three-lane facility with a center two-way left turn lane. The area is predominately urban with a mix of commercial businesses including shopping plazas, restaurants, car and RV sales, a gas station, and various office buildings. Other land uses in the area include parks and marinas.

The limits of the pre-design study are the intersection of SR 166 (Milepost 3.40) at Bethel Avenue and its adjoining 2-lane streets, Maple Avenue and Bay Street. SR 166 on the north side of the intersection is also named Bay Street, while SR 166 on the south side of the intersection is locally named Bethel Avenue. Maple Avenue enters the intersection at an angle and is somewhat skewed due to the roadway alignment which places it slightly south and further away from the SR 166 intersection than the adjacent streets. At the intersection, Bay Street continues in a northeastern direction following along the waterfront toward the community of Annapolis.

Exhibit 3 shows the intersection as currently configured with a traffic signal mounted to a pole in the center island. There are dedicated left turn lanes on all legs of the intersection.

Exhibit 3: SR 166 Bay Street / Bethel Avenue / Maple Avenue Intersection



Traffic and Multimodal Transportation Analysis

Traffic Volumes and Turn Movements

Traffic volumes and vehicle turn movement data provide valuable information necessary for traffic operations analysis. WSDOT traffic data used in this analysis was collected on each of the four streets at the intersection in October and November of 2019. The SR 166 intersection carries average daily traffic of approximately 18,000 vehicles to the north and 14,000 vehicles to the south with a posted speed limit of 25 MPH.

The 2019 PM peak hour turning movements are shown in Exhibit 4, which shows the total number of vehicles during the busiest time of the afternoon, and the direction vehicles are heading. SR 166 southbound straight (516 vehicles) and northbound straight (374 vehicles) show the highest volumes. Maple Avenue has the least amount of traffic traveling in and out. The Annual Average Daily Traffic (AADT) for vehicles traveling in the north and south direction was approximately 17,000 with 4,000 AADT traveling east and west.

Exhibit 4: 2019 PM Peak Hour Turning Movement

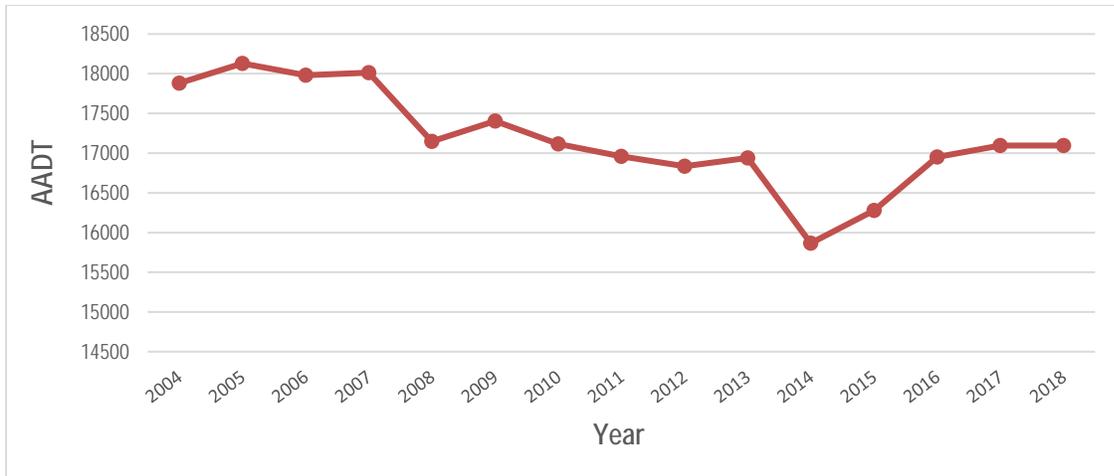


Traffic Forecast

The study team, WSDOT Headquarters, and WSDOT Olympic Region Traffic technical staff reviewed traffic data provided by the City of Port Orchard as well as WSDOT historical traffic count trends to determine a growth rate.

The year 2036 forecast traffic volume network was developed using historical volume growth recorded in WSDOT's Annual Traffic Report. The team selected to use the historic growth rates from 2004 to 2018, as shown in Exhibit 5. The annual average daily traffic volume over the years has decreased, leading to a future projection growth rate determination of 0.5%; this rate was used in the traffic operations analysis.

Exhibit 5: History of Annual Average Daily Traffic Volumes



Truck Traffic

Freight transportation is critical to supporting the economy as well as ensuring residents have the goods they need. SR 166 is classified by the Freight and Goods Transportation System as a T-3 truck route carrying 300,000 to 4 million tons per year. In 2018 the percentage of truck traffic on SR 166 was 3%.

Active Transportation

Sidewalks and crosswalks are present at the intersection, however, outside of the intersection, sidewalks only exist in some areas. To the south along the east side of Bethel Avenue, sidewalks exist but only appear in front of the 76 Station. No sidewalk exists on the southwest side of Bethel Avenue. Crosswalks are visible on Bay Street westbound and across SR 166 at Bethel Avenue. Two-foot wide shoulders are present in some areas where there are no sidewalks.

Slightly north of the intersection along the shoreline is a completed portion of the Bay Street Pedestrian Path; the City of Port Orchard is working to complete as part of an alternate non-motorized route. The path will be a 1-mile long, non-motorized, shared use facility that connects to the east with the Annapolis ferry facility and to the west where it becomes part of the Mosquito Fleet Trail. Additional construction work to complete the trail is planned for 2021.

Transit

Kitsap Transit's bus service routes 8 and 81 pass through the intersection with bus stops located to the east on Bay Street and south along Bethel Avenue. Local foot ferry service operated by Kitsap Transit is located half a mile west of the intersection and operates between the Port Orchard Ferry Dock and Bremerton weekdays and Saturdays.

Access Management

Managed access on state highways helps to maintain the safety and capacity of existing highways by establishing criteria ranging from Class 1 (most restrictive) to Class 5 (least restrictive) guidelines. SR 166 is designated a Class 5 access, in which the limitations are described as more than one access connection per ownership, where justification and access

needs may have priority over mobility. Since the intersection of SR 166 at Bethel Avenue is within the Port Orchard city limits and the state highway is also a city street, the city has access permitting authority. If there is a revision being made to any part of the state highway system, an engineering analysis and re-evaluation of access will be initiated.

Safety Analysis

WSDOT crash history data for a 5-year period, from 2014 to 2018, shows there were a total of 13 crashes that occurred at this intersection. The history of crashes in Exhibit 6 shows there were 25 vehicles involved in 13 crashes, indicating most crashes involved multiple vehicles. A majority of crashes involved rear ends resulting mostly in Property Damage Only (PDO). A roundabout provides continuous traffic flow instead of vehicles speeding to beat a red light. There were three incidences where it was determined there was a possible injury, but there were no fatal or serious injury crashes. In addition to the types of crashes that occurred, the most common contributing factor in most cases was speeding.

Exhibit 6: SR 166 Intersection Related Crashes, 2014 – 2018

Year	PDO	Possible Injury	No. of Vehicles Involved	Types of Crashes			Contributing Circumstances		
				Rear End Crashes	Hit Fixed Object	Sideswipe	Inattention	Speeding	Follow Too closely
2014	2	1	6	3			2	2	
2015	4	0	8	4			1	2	
2016	1	0	2	1				0	
2017	0	1	2	1				0	1
2018	3	1	7	2	1	1	1	1	3

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Environmental Analysis

Wildlife activity in the area is considered low, based on WSDOT’s statewide habitat connectivity analysis. The statewide climate impacts vulnerability assessment (CIVA) identifies WSDOT facilities that are vulnerable to the effects of climate change. The area along SR 166 at the Bethel Avenue intersection has a low rating of vulnerability. No fish passage barriers exist in the study area. A tribal staff and member of the study’s stakeholder committee shared during the meetings there’s potential cultural resources that may exist along Blackjack Creek which were identified during a different project in another area along the creek.

Level of Service Analysis

WSDOT Olympic Region Traffic Office conducted the traffic operations analysis for the study. In March 2020 they developed the SR 166 Bay Street, Maple Avenue Intersection Control Evaluation (ICE) report. An ICE report is required for intersection replacement preservation projects. The report evaluated and analyzed the intersection control at the SR 166 intersection using two traffic analyses software, SimTraffic and SIDRA.

WSDOT uses Level of Service (LOS) standards to measure roadway performance assigning letter grades A through F to a segment. LOS B, for example, is a reasonably free-flow condition where operating speeds begin to be restricted somewhat by traffic conditions. Drivers still have reasonable freedom to select their speed. With LOS C, speeds remain near free-flow, but freedom to maneuver is noticeably restricted. Exhibit 6 displays the 2019 and 2036 operations analysis results for a traffic signal replacement and for a single lane roundabout.

Exhibit 6: Existing and Future Traffic Analysis

SR 166 Intersection of Bay/Bethel/Maple	2019 PM Peak Hour	2036 PM Peak Hour
	Intersection LOS / Seconds of Delay	Intersection LOS / Seconds of Delay
Traffic Signal	LOS C 20 sec.	LOS C 22 sec.
Single Lane Roundabout	N/A	LOS B 12 sec.

The analysis results of a traffic signal at the intersection showed a LOS C in both years 2019 and 2036 during the peak hour. The seconds of delay represents the highest number of seconds of vehicle delay in the peak hour at the intersection. In 2019, the vehicle delay is 20 seconds which increased slightly to 22 seconds in 2036. The operations analysis results showed a single lane roundabout performed better with a 2036 future year forecast LOS B and 12 seconds of vehicle delay in the peak hour.

Community Engagement

Prior to project design work, WSDOT conducts pre-design efforts to revise or validate scope, schedule, and budget using a scalable multimodal, multi-discipline, and multi-agency (M3) process.

A key component of this study was collaboration with local jurisdictions, local business and property owners, tribal staff, community members, and people who travel the route. WSDOT staff conducted this study in collaboration with the City of Port Orchard, Kitsap County, Kitsap Transit, the Suquamish Tribe, the Port Gamble S'Klallam Tribe, Washington Department of Fish and Wildlife, and several local property owners. This collaboration provided additional context as concepts were developed, ensuring the uses and needs of the community were more completely identified. Two stakeholder committee meetings were held, the first in Port Orchard, on February 24 and a virtual meeting on March 30, 2020. Additional methods of communication included the SR 166 study webpage and information shared through social media and the news media.

Stakeholder Committee Meeting 1

During the first stakeholder committee meeting, WSDOT presented information to the group, including existing roadway conditions, operations analysis, and two proposed options being considered. Also, committee members were asked to share their ideas about viable options and

about effective ways to inform the community about the pre-design study to learn their ideas. The committee shared with WSDOT the following information:

- Pedestrian amenities are desired in the area.
- Existing City of Port Orchard projects include a utility project on Maple Avenue and a shared use path north of the intersection along the waterfront.
- Blackjack Creek Bridge has potential for flooding because the bridge doesn't provide enough freeboard. Intersection improvement could include bridge replacement
- Potential cultural resources may exist along Blackjack Creek.
- City of Port Orchard would like to keep Maple Avenue access in the roundabout.
- Access revisions may be necessary for businesses who have accesses at the intersection
- Traffic analysis data

During the meeting, the committee proposed the following three options for WSDOT to consider:

- New signal expanded – concept includes signal replacement with additional pedestrian friendly amenities
- Roundabout expanded – concept shifts roundabout slightly south and replaces the existing Blackjack Creek Bridge located north of the intersection
- Southern roundabout – concept builds the roundabout slightly south for an improved alignment

WSDOT took the information shared at the meeting back to the study team to evaluate and analyze. A second meeting was held to share the results and some final concepts to be considered.

Stakeholder Committee Meeting 2

The second stakeholder committee meeting was conducted online using Skype as well as a phone in conference call line. All meeting materials were sent out in advance to committee members.

The WSDOT study team provided some follow-up information to the group as a result of concerns identified during the first stakeholder committee meeting, including:

- Status of the Blackjack Creek Bridge – The Bridge is in fair condition and WSDOT has no plans to replace the bridge over the next 10 years. A question was asked if a project is within 1,000 feet of a culvert, would it be required to address the culvert. The response from WSDOT staff was that if the culvert is not an injunction culvert or crossing, it is not required that it be addressed.
- Additional traffic analysis – During the 1st stakeholder committee meeting, the City of Port Orchard offered to provide WSDOT with future forecast data for the traffic analysis. The information was forwarded to WSDOT region traffic section who conducted the original analysis documented in the Intersection Control Evaluation (ICE) report for the study. Of the different types of data used in traffic analysis, the 4-year period of historic

average traffic volumes is what's used by WSDOT for this type of analysis work to determine the growth rate for a preservation project.

WSDOT evaluated the committee's three options from the first stakeholder meeting against the criteria. Based on the traffic analysis information and the established criteria, the study team concluded the options the committee proposed were not feasible. WSDOT considered the information gathered from the first meeting to develop the following three final alternatives for the study.

Roundabout Concept A

This concept was shown to the committee during the first stakeholder meeting. Shown in Exhibit 7, Concept A is a 3-leg single lane roundabout with single lanes in each direction entering and exiting the intersection. The concept includes Maple Avenue access located outside the roundabout to the south. The footprint of the roundabout is within the existing right of way.

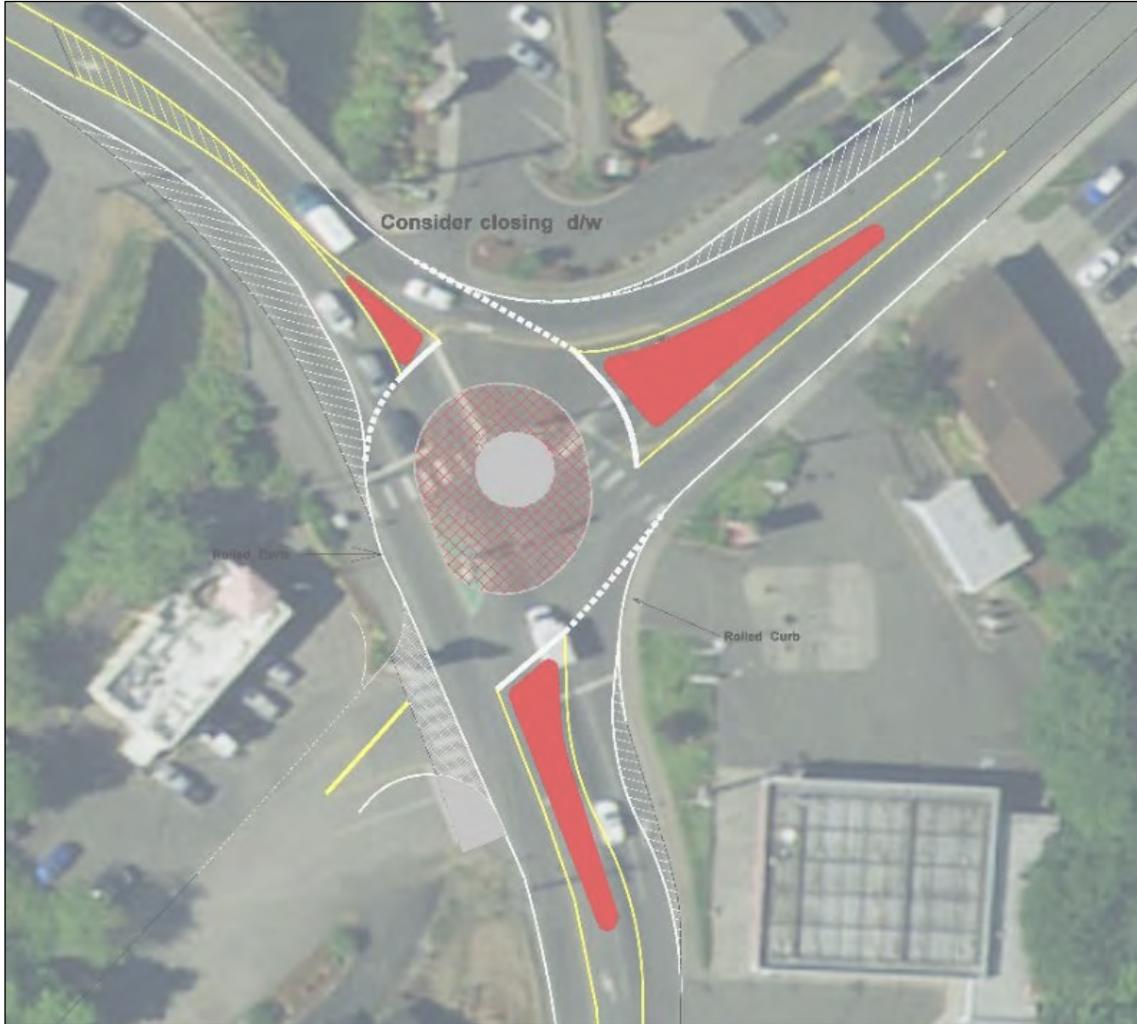
Exhibit 7: Roundabout Concept A



Roundabout Concept B

This concept is a 4-leg single lane roundabout. The concept includes Maple Avenue access located inside the roundabout with full turning movement. The footprint of the roundabout is within the existing right of way. Concept B is shown in Exhibit 8.

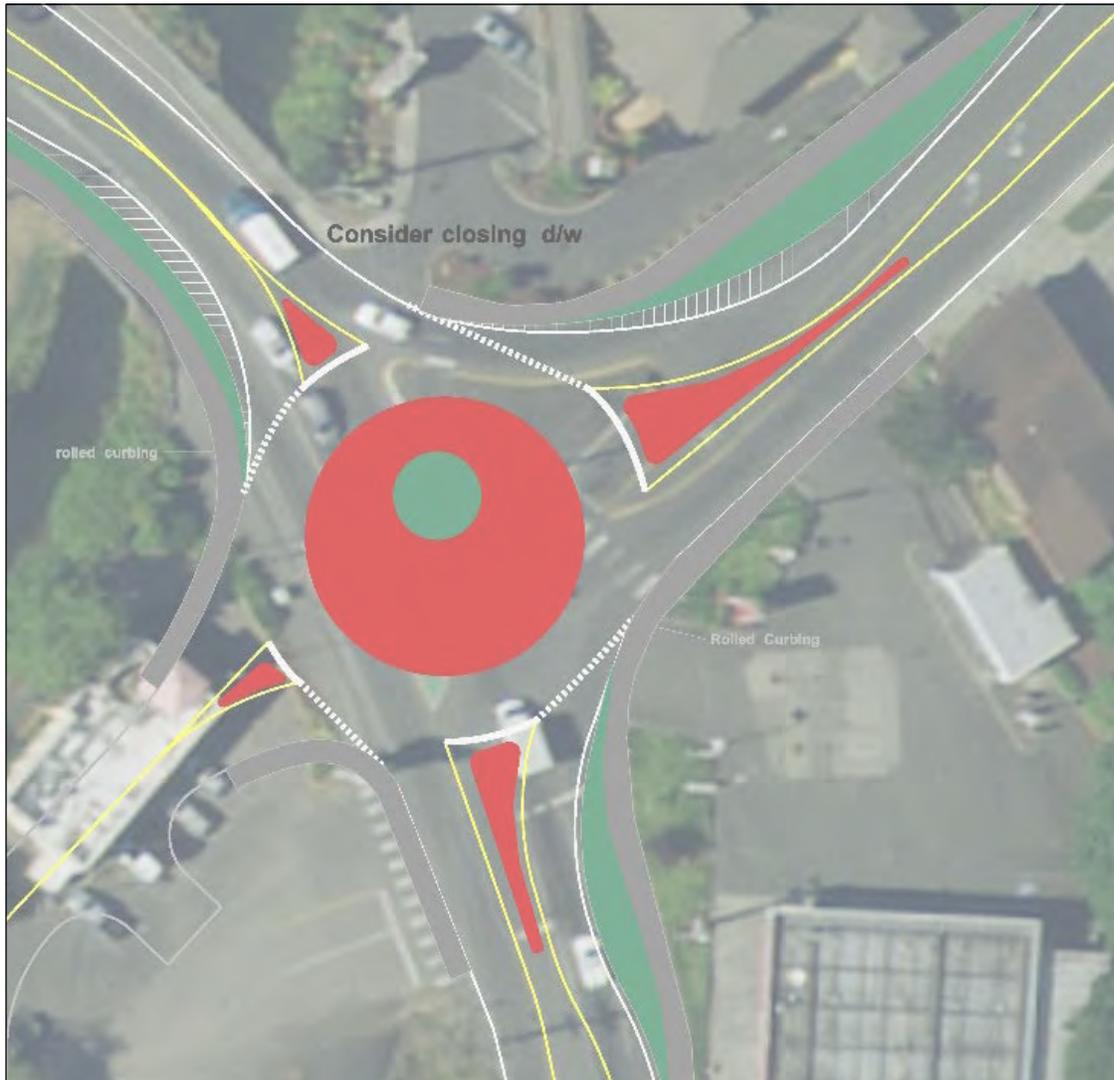
Exhibit 8: Roundabout Concept B



Roundabout Concept C

This concept is a 4-leg single lane roundabout with a Maple Avenue re-alignment connecting to the roundabout. The concept includes shifting Maple Avenue to where the KFC restaurant is currently located, which would require additional right of way purchase. The cost and time to realign Maple Avenue did not fit the scope, schedule, or budget of this project. Concept C is shown in Exhibit 9.

Exhibit 9: Roundabout Concept C



As an outcome of the discussion at the second stakeholder committee meeting, the committee agreed to move forward with Concept B as the preferred option, a 4-leg single lane roundabout that includes Maple Avenue access from inside the roundabout with full turning movement.

Online Community Outreach

WSDOT held online community outreach for the pre-design study on WSDOT's SR 166 study website between April 28 and May 12. The community was able to view visualizations of what

the recommended concept would look like at the intersection, and were encouraged to submit comments. WSDOT received 46 total comments with 27 in support of the recommended roundabout, 14 did not support a new roundabout, 2 in favor of a new traffic signal, and 2 with concerns about the construction detour. Although there were some objections from the general public to the recommended roundabout, there was overall support for it.

Community support of roundabout improvement:

- Total of 27 comments were submitted in support of a new roundabout.
- City of Port Orchard submitted to WSDOT a letter of support for the roundabout.
- Port Orchard Chamber of Commerce submitted an email in support of a new roundabout.
- Straighten crosswalks to make it easier for visually impaired pedestrians.
- Suggest bike sharrows symbol marking on the roadway and street signage in support of bicycles taking the lane in the roundabout as a way to move bicycles safely through the roundabout.
- Keep local businesses informed of construction schedule and make every effort to identify detours that have least amount of impact.
- Better pedestrian island needed on the west leg of the roundabout and narrow lanes across the bridge.
- Safety and access benefits of a roundabout are clear and the benefit to pedestrian connections from surrounding properties to existing pedestrian pathway and surface/ferry transit hub just a few blocks away is a bonus.
- The roundabout will be a valuable asset for traffic flow, the environment and for downtown Port Orchard.

Community concerns of roundabout improvement:

- Total of 16 comments submitted did not support a new roundabout.
- Not building the roundabout will save taxpayer money.
- The intersection doesn't need improving. There's no traffic flow issue.
- People don't know how to use roundabouts properly and they don't work.
- There's not enough space to build a roundabout.
- The intersection needs minimal modernization like a new traffic signal instead of a roundabout.
- Funds would be better spent on a multi-use path along the waterfront.

The stakeholder committee conducted a review of the draft SR 166 study report and provided the following comments:

- *City of Port Orchard encouraged preservation of shoulders for bicyclists at both ends of SR 166 roundabout including providing transitions to sidewalks for bicyclists.*
- *Puget Sound Energy informed WSDOT of their desire to coordinate on their upcoming electrical system project in the area that is scheduled for construction in 2022. Puget Sound Energy will send a letter to WSDOT outlining the project route.*

Recommended Concept and Next Steps

The purpose of the pre-design study was to collaborate with local community members to develop a solution for replacing the traffic signal at the intersection of SR 166 at Bethel Avenue, Bay Street and Maple Avenue. Based on analysis and community engagement undertaken as part of this study, a 4-leg single lane roundabout is the recommended alternative for this intersection. A preliminary drawing of the recommended alternative is shown in Exhibit 10.

Exhibit 10: Recommended Alternative



Key benefits of the recommended alternative include:

- Replaces outdated traffic signal system.
- Improves vehicle safety by potentially reducing the number of crashes at the intersection by slowing traffic coming into and out of the roundabout.
- Improves pedestrian and bicycle safety by slowing traffic and adding accessible pedestrian crosswalks.
- Designed for all vehicles types including trucks and buses.
- Supports transit routes that serve area residents.

A planning level scoping estimate was developed for the recommended single lane roundabout. Conceptual information about the roundabout was used to generate the cost. The preliminary cost of the recommended alternative is \$911,500 which is within the 125% of the cost of a new traffic signal. Because this study was funded through WSDOT's Preservation Program (P3), it requires that the cost of the recommendation stay within 125% of the cost of replacing the current, obsolete signal with a new signal system.

The next steps following the conclusion of this study are:

- Project design, scheduled for fall 2020.
- Construction, anticipated to begin summer of 2022.