BETHEL ROAD AND SEDGWICK ROAD CORRIDOR PLAN

City of Port Orchard

October 2018

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Project Overview

The overarching objective of the study was to develop a long-range vision for two critical transportation corridors in the City of Port Orchard, Sedgwick Road (State Route 160) and Bethel Road. The two corridors represent major arterials serving the recently annexed portion of the city referred to as the Bethel/Sedgwick subarea which provide connections to SR 16, downtown Port Orchard, the Southworth Ferry Terminal, and large-scale commercial developments.

Port Orchard is a small but growing city located in the Central Puget Sound and adjacent to some of the region's largest employment centers. The population of Port Orchard more than doubled in the last twenty years. Between 2010 and 2016, after the most recent annexation, the population increased by an additional 14-percent and all signs point to continued growth in the future which means additional stress on existing services and infrastructure, like the transportation network. For a number of reasons, this study comes at an opportune time for the City of Port Orchard:

- Recent and proposed changes to the City's Zoning Code and Map have the potential to increase residential densities and encourage mixed-use development within the Bethel/Sedgwick subarea which will draw additional people to the area to live, work, and visit.
- As development occurs along these corridors, the City would like to be proactive in terms of the character of the corridors. Identifying the roadway cross section, right-of-way needs and multimodal facilities will aid the design of projects along both streets.
- As the economy in the Central Puget Sound continues to grow, increasing housing prices along the I-5 corridor are forcing residents to look toward communities like Port Orchard for more affordable housing.
- Kitsap Transit's plans to expand their Fast Ferry service and begin operating passenger-only ferry service between the Southworth ferry terminal and downtown Seattle by 2020 – creating a direct link between Port Orchard and the largest employment center in the state.

In preparing this plan, the City coordinated with various stakeholders, reached out to the public for input, evaluated safety and traffic count data, and weighed alternatives to come to the final plan. The conceptual design presented in this report aims to:

- Address existing deficiencies in the transportation network
- Support existing businesses and the anticipated economic growth
- Improve pedestrian and bicycle access and quality of life for residents
- Provide a blue-print for development opportunities and guide mitigation

Generally, the conceptual design takes a roundabout corridor approach to both corridors. Elements of the corridor design include:

- Intersection control improvements designed to meet future traffic needs
- Access management for driveways along the corridors, improving traffic flow and safety while ensuring adequate circulation
- Sidewalks, bicycle facilities, landscaping, and stormwater upgrades the length of the corridors
- Transit facilities and emergency service accommodations

The following report describes the existing conditions, considers future conditions, establishes a conceptual plan for both corridors, proposes project phasing, provides design guidance, and a strategy for implementing the plan.

Study Area

The study area consists of two corridor segments. The study area is illustrated in **Figure 1** and the existing conditions of each of the study corridors are described below.

Bethel Road at Lundberg Road looking south

Bethel Road

Bethel Road is a north-south arterial that connects Port Orchard's downtown waterfront to the southern city limits. To the south, Bethel Road crosses SR 16 and becomes Bethel-Burley Road SE which connects to Burly and Purdy. This study evaluated the 2.1-mile segment of Bethel Road between Mile Hill Drive (SR 166) and Sedgwick Road (SR 160). Within the study area, Bethel Road has a posted speed limit of 35 mph and carries approximately 1,400 vehicles during the PM peak hour. Most of the corridor is one-lane in each direction with a center turn lane north of Lund Ave. There is an existing one-lane roundabout intersection at Mile Hill Drive (SR 166) and three signalized intersections at Sedgwick Road, Walmart driveway, and Lund Avenue with a plan to install a temporary signal at Blueberry Road. In addition, there are a number of driveways, access points, and two-way, stop controlled intersections along the corridor.

Bethel Road looking north toward Vallair Court

Sedgwick Road

Sedgwick Road is an east-west arterial traversing Kitsap County and the City of Port Orchard and terminating at the Southworth Ferry Terminal. East of SR 16, Sedgwick Road is a state facility, SR 160. This study evaluated the 0.7-mile segment of Sedgwick Road between the SR 16 northbound ramps and Bethel Road. Within the study area, WSDOT classifies Sedgwick Road as a Principal Arterial with a Class Three access management designation which specifies 330-feet minimum spacing between access points[1].

Sedgwick Rd looking east toward Bravo Terrace

The study segment has a posted speed limit of 35 mph and carries approximately 1,900 vehicles during the PM peak hour. Most of the corridor is one-lane in each direction with a center turn lane in sections. The only signalized intersections are located at either end of the study segment. There are also two-way, stop controlled intersection at Bravo Terrace, Geiger Road, and Ramsey Road.

[1] WSDOT Olympic Region Development Services. *Highway Access Management Guidebook*. April 2002. <https://www.wsdot.wa.gov/NR/rdonlyres/F1CB0918-81F7-4127-85D5-0689D08C95CA/0/HAMGFinalMasterWeb.pdf>

Figure: 1 Study Area Map

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Planning Context

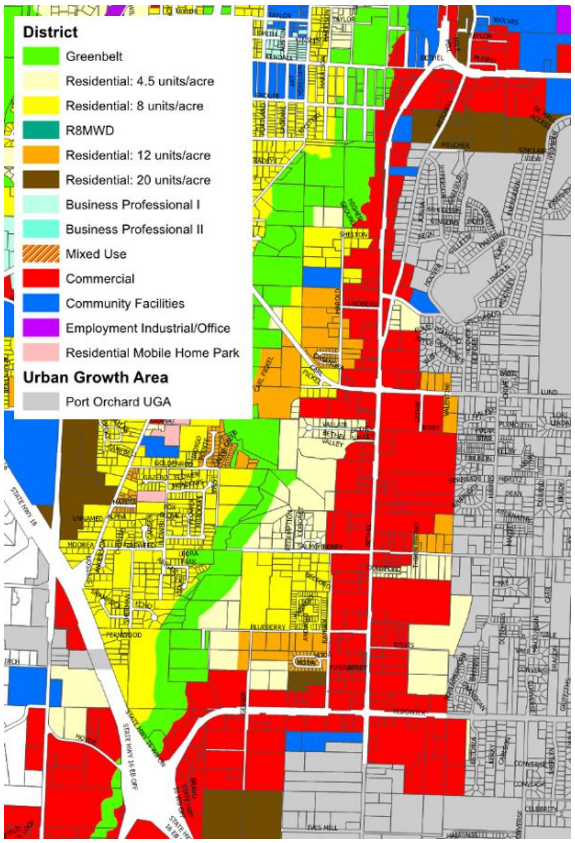
There are a number of planning documents and studies that have informed and influenced this effort. The following is a summary of previous or on-going plans and their relevance to this planning effort.

WSDOT SR 16 Congested Corridor Study

Concurrent with this study, Washington State Department of Transportation (WSDOT) conducted a study of SR 16 to address congestion issues along the highway and at interchanges between the Tacoma Narrows Bridge and Gorst, as well as portions of SR 3 and SR 304 in Pierce and Kitsap counties. The study will summarize existing and future conditions based on data and stakeholder input and propose near-, mid-, and long-term traffic management strategies to improve travel along the corridor. WSDOT had not yet released the findings of the study when our study was completed. Preliminary study results shared at a Technical Advisory Group meeting in September 2017 indicate that the Port Orchard interchanges, Tremont and Sedgwick, are expected to have significant performance gaps in the 2040 Baseline, worse than any other interchanges evaluated in terms of meeting LOS performance thresholds in the AM and PM peak periods.

Port Orchard Comprehensive Plan

Consistent with the requirements of Washington State's Growth Management Act (GMA), Port Orchard has adopted a Comprehensive Plan which establishes a framework for decision-making and development in the City by ensuring that ordinances, regulations, programs, and projects are carried out in accordance with the community values and goals. The most recent version of the Comprehensive Plan was adopted in June 2018.



Excerpt of the Zoning Map (July 25, 2018)

Land Use Chapter

The land use chapter identifies the Sedgwick/Bethel area and the Tremont/Lund/Bethel area as Centers of Local Importance. In 2017, the City adopted a new zoning map which increased the development potential along Sedgwick Road and Bethel Road, converting a number of low-density residential parcel to medium- and high-density residential zones.

At the same time that this corridor study was taking place, the City of Port Orchard was working on an update to the City's Zoning Code. The changes include adding new zoning designations for Residential Mixed Use and Neighborhood Mixed Use intended to be applied to the Bethel/Sedgwick area. As a conservative measure, the traffic forecast developed for this study assumed the adoption of the proposed zoning code changes. In June of 2018, Comprehensive Plan and Zoning Map Amendments were adopted. Additional zoning changes were under consideration at the time of this study which would move the City to a form-based zoning code.

Transportation Chapter

In the transportation chapter, both Sedgwick Road (SR 160) and Bethel Road within the study area are classified as principal arterials as well as T-3 freight facilities, meaning they carry between 300,000 and 4 million tons of freight annually. Both Bethel Road and Sedgwick Road are also identified as planned nonmotorized routes. The planned treatment is on-street bicycle lanes and sidewalks.

The Comprehensive Plan also sets the Level of Service (LOS) standard for City and State transportation facilities. Port Orchard has adopted a LOS standard of LOS D, based on the PM peak hour, for all segments and intersections within the arterial street system. The City's LOS standard does not apply to State facilities within the City of Port Orchard as minimum LOS for intersections on State facilities are set by WSDOT. SR 16 is designated by WSDOT as a Highway of Statewide Significance (HSS) and is assigned minimum LOS D. SR 160 is designated by Puget Sound Regional Council (PSRC) as a Tier 2 highway of regional significance with LOS D. The segment of Bethel Ave between Salmonberry Road and Lund Avenue is listed as a current system need because it has a LOS F which is below the City's minimum LOS D.

The City recognizes that as Port Orchard grows and becomes more urbanized, travel delay will become a reality, especially during peak periods. As such, the City Council, upon recommendation of the City Engineer, may determine the following three exemptions to the LOS standards:

- It is not practical to improve a specific intersection to achieve higher LOS standards, or
- Other improvements may be considered as equivalent mitigation in lieu of achieving the capacity LOS standards, or
- Exempt specific intersections or street segments from the LOS standards for a specific period of time.

Kitsap County Bicycle Facilities Plan

In 2001, Kitsap County published a Bicycle Facilities Plan which established facility design standards and prioritized future bicycle projects. In this plan, installing bicycle lanes on Sedgwick Road (SR 160) was identified as an Opportunity Project. Although, it was noted that a separate shared path, for bicycles and pedestrians, would be the preferred design depending on available right-of-way.

County Bethel Corridor Study

Prior to the annexation of this part of Port Orchard in 2009, Kitsap County carried out a Bethel Road Corridor Study, working closely with the community to define a future vision of the Bethel Road corridor and develop a design that supported that vision. The resulting design was a four-lane section, two travel lanes in each direction, and a 16-foot raised center median with left-turn access provided every 300-feet. The design also included 8-foot sidewalk, 5-foot bike lanes, and 7-foot landscaping strips on both sides of the corridor.

In some ways, things on Bethel Road haven't changed drastically since the County's study. The corridor profile and intersections are largely the same. A small number of parcels have been developed in the area. And the traffic issues that existed then, still exist today. However, in other ways, the field of transportation planning and engineering has changed significantly. In the last 10 years, there has been a shift toward complete streets designs that emphasize access and safety for all roadway users, regardless of mode. Roundabouts are now widely-recognized as viable alternatives to signalized intersection and public approval of them is growing. Additionally, new or updated traffic modeling tools allow for more refined analysis of alternatives.

The current planning effort was able to use and build upon some of the more static elements of the previous Kitsap County Bethel Road Corridor Study, such as stormwater and wetland analysis. However, the City's study expands the study area, revisits the community's vision for the corridors, and takes a fresh look at the design alternatives and operational analysis.

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Public Involvement

Public involvement is a critical component of any planning process – facilitating the exchange of information between the project team and the stakeholders. An effective plan must be informed by the people who will be most affected by its implementation and aim to accurately reflect their needs, priorities, and vision. Throughout the study, a variety of methods were used to share information with and gather feedback from community members, key stakeholders, and City leadership.

Open House

A public open house was held on October 23rd, 2017 to introduce community members to the study and give them an opportunity to share their ideas, concerns, and suggestions for both corridors. Notification of the open house was shared on social media, the project webpage, and through a direct mailer to property owners in the study area. Over 50 people attended the event and we received over 60 comments, both in person and via email. The open house consisted of staffed exhibit boards, a constraints and opportunities mapping exercise, and a 'build your own street section' station.

Comments focused on improving safety and reducing congestion along both corridors. The most shared comments included:

- Need for intersection control at Bethel Road and Salmonberry Road
- More capacity needed on Sedgwick Road, suggested two travel lanes in each direction
- More capacity on Sedgwick Road, east of the SR 16 interchange (outside of the scope of this study)
- More capacity needed on Bethel Road, suggested additional travel lanes and/or a two-way center turn lane
- Difficult to make turns and poor sight distance at Sedgwick Road and Bravo Terrace
- Many participants supported roundabouts with some people expressing caution regarding design
- Request for longer right-turn lanes at critical intersections
- Sidewalks and bike lanes needed on both corridors

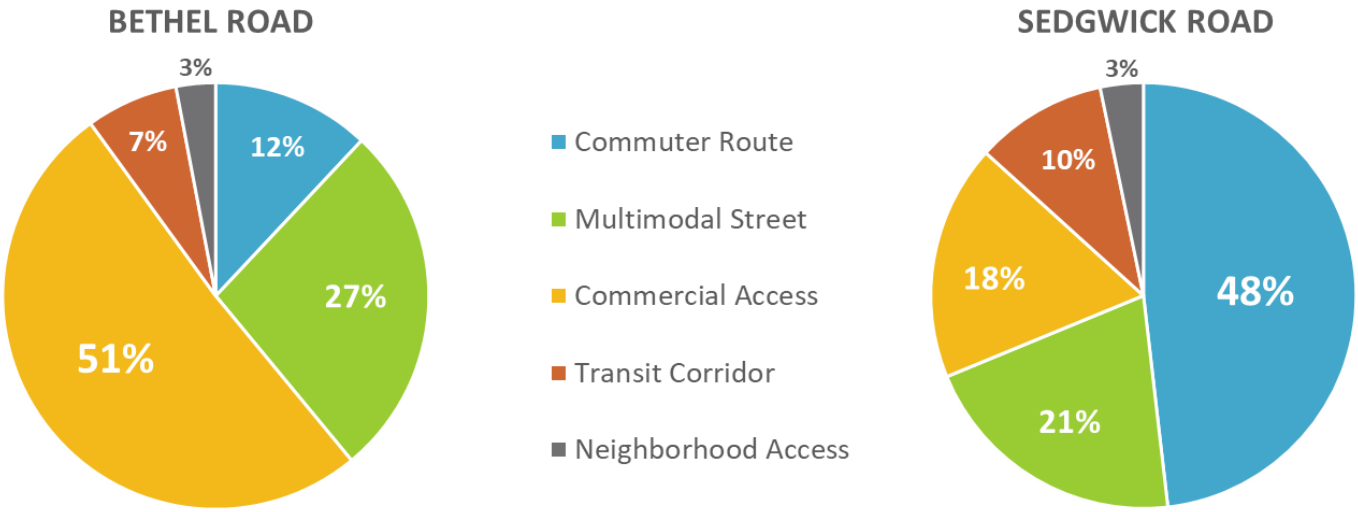
Mapping exercise at public open house on October 23rd, 2017

Community Survey

In February and March of 2018, an online community survey was conducted which gathered input to help shape the plan recommendations. The survey link was shared on social media, the project webpage, and e-mailed directly to participants of the public open house. Over 600 residents responded with nearly 500 responses received per corridor.

As illustrated in **Figure 2**, the survey confirmed the City's understanding that Sedgwick Road is viewed as more of a commuter route while Bethel Road is characterized as a commercial access and circulation corridor. Compared to Sedgwick Road, more respondents felt that Bethel Road is more of a multimodal street, meant to move people safely and efficiently regardless of their travel choice.

Figure 2: Public Opinion of Street Character by Study Corridor



Nearly all respondents said they experience congestion on both corridors during the peak hours and feel the existing pedestrian and bicycle facilities are insufficient. The large majority of respondents felt that there was sufficient parking available for businesses on Bethel Road and did not identify the need for on-street parking along the corridor. On Bethel Road, pedestrian safety and improved vehicle access to commercial properties is more of a priority while on Sedgwick Road, keeping traffic flowing seems to be the greater priority. A more detailed summary of survey results is provided in **Appendix A**.

Project Website

A project-specific webpage was developed and maintained over the course of the project to share background information, keep a record of public meeting materials, solicit input from the community, and provide contact information.

Stakeholder Engagement

Throughout the planning process, we shared information and meet with key stakeholders to discuss the study recommendations including WSDOT, South Kitsap School District, Kitsap Transit, Puget Sound Energy, West Sound Utility District, and South Kitsap Fire and Rescue. Their review and comments were used to refine the corridor plan and ensure the design accommodates needs specific to their operations. As the project advances from conceptual design into preliminary and final design, further engagement with these and other key stakeholders will be required.

City Council Briefings

The project team presented to the City Council three times over the course of the study. A summary of each of these events is provided below.

September 7, 2017 – City Council Work Session

The project team shared the project scope, schedule, and outreach approach. Councilmembers were led through a mapping exercise to gather their initial thoughts on existing conditions, community needs, and their ideas related to the two study corridors.

January 16, 2018 – City Council Work Session

The project team presented some of the initial operational analysis findings and sought direction on the corridor sections. At this meeting, the Council supported the widening of Sedgwick Road to accommodate two lanes in each direction as it is a critical commute corridor and State Route providing access between SR 16 and the Southworth Ferry Terminal. However, the Council expressed a clear interest in keeping Bethel Road a narrower street with one lane in each direction to calm traffic and make it a safer, more inviting place for pedestrians and bicyclists.

August 14, 2018 – City Council Meeting

The project team made a presentation of the alternative evaluation methods and resulting preferred conceptual corridor design. Councilmembers and the Mayor asked questions of the project team but overall, the draft plan was well received. The draft was made available to the public via the project webpage for review and comment until the public hearing scheduled for September 25th, 2018. The project team sent notification of the public review and comment period via email to the project distribution list and posted to the City's Facebook page.

September 25, 2018 – City Council Meeting

The City Council held a public hearing at their meeting to hear from members of the public regarding the public review draft of the Bethel and Sedgwick Corridor Plan. Two members of the public spoke about the proposed access control and location of roundabouts. The Council and project team responded to the comments and provided clarifications.

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Crash History

Crash data along the study segments were analyzed to identify any safety issues or collision patterns. WSDOT provided crash data for the analysis period between January 2013 to June 2017[2]. **Table 1** is a summary of the number of crashes reported by intersection within the study area. Crashes that occurred at the intersection of Bethel Road and Sedgwick Road are shown in both tables depending on which corridor the crash actually took place.

Table 1: Crashes per Intersection by Study Corridor

January 2013 to June 2017

BETHEL ROAD	Number of Crashes Reported
Mile Hill Dr (SR 166)	8
SE Lincoln Ave	6
SE Lundberg Rd	2
Mitchell Rd SE	17
SE Lund Ave	40
SE Vallair Ct	5
Safeway/Rite Aide	12
SE Bethel Valley Ln	10
Walmart Signal	6
SE Salmonberry Rd	27
SE Blueberry Rd	2
SE Sylvin Lane	3
SE Piperberry Way	9
SE Sedgwick Rd	2
Midblock*	78
TOTAL	**227**
SEDGWICK ROAD	**Number of Crashes Reported**
SR 16 NB Ramps	16
Bravo Terrace	34
Geiger Rd SE	32
Ramsey Rd SE	26
Bethel Rd SE	33
Midblock*	83
TOTAL	**224**

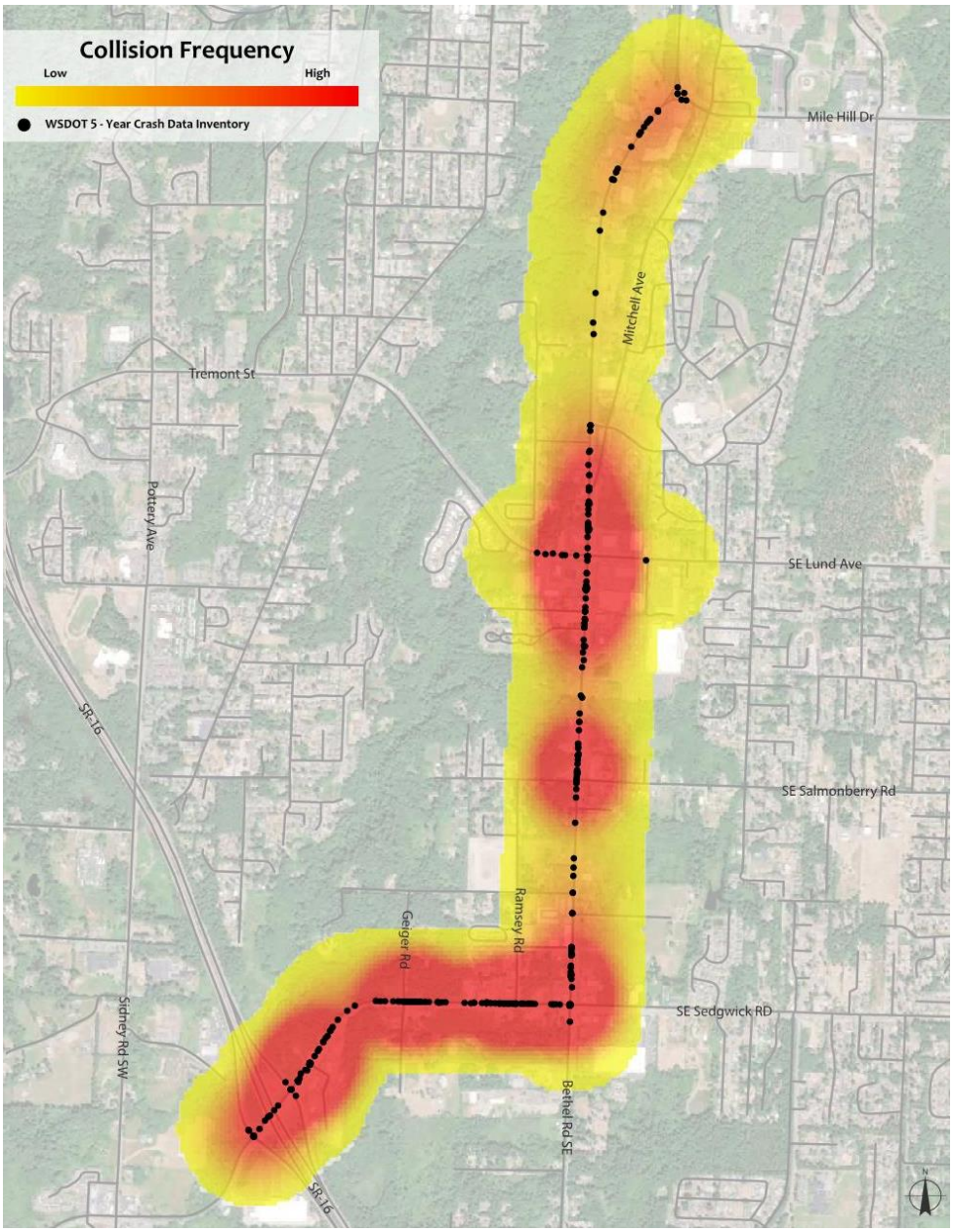
* Considered midblock if not reported to have occurred within 200-ft of an intersection

[2] Under 23 U.S. Code § 409 and 23 U.S. Code § 148, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

In total, there were 451 crashes within the study area over the period for which data was provided. When calibrated for road segment length and vehicle volumes, Sedgwick Road experiences over twice as many crashes compared to Bethel Road. Crashes on Sedgwick Road are fairly evenly distributed along the study segment while certain intersections on Bethel Road experienced more crashes than others, such as Lund Avenue, Salmonberry Road, and Mitchell Road. **Figure 3** is a heat map showing where all crashed reported in the last five years have occurred along the study segments. The black dots indicate each incident and the color gradient from yellow to red indicates the frequency of crashes.

Figure 3: Crash Frequency in Study Area

January 2013 to June 2017

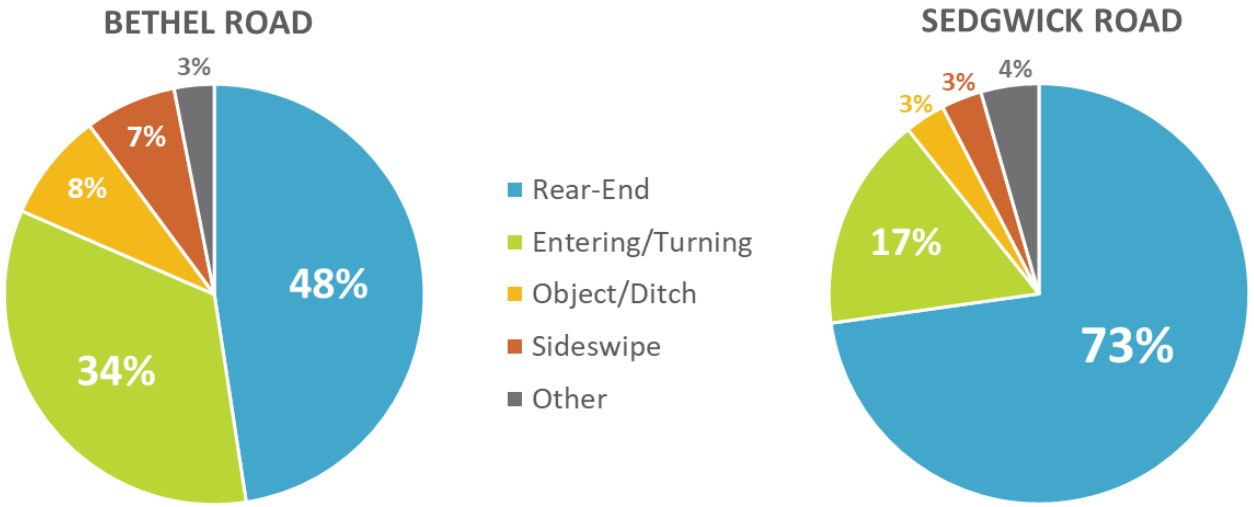


Types of Crashes

This study also considered the types of crashes that occurred on both of the study corridors within the analysis period. **Figure 4** summarizes the types of crashes common to each corridor. Within the 'Other' category are head on collisions, overturned vehicles, and pedestrian crashes.

Figure 4: Crash Types by Study Corridor

January 2013 to June 2017



Rear-end crashes were the most common crash type on both corridors but 73% of the crashes that occurred on Sedgwick Road were predominantly rear-end crashes while rear-end crashes made up 48% of the total crashes on Bethel Road. Rear-end crashes are often indicative of congested conditions and make the case for increasing corridor capacity, especially on Sedgwick Road.

Crashes related to vehicles turning either onto or off of the corridor were more common on Bethel Road. Entering or turning vehicle crashes made up 34% of the total crashes on Bethel Road whereas only 17% of the crashes on Sedgwick Road were of this type. This is partly explained by the fact that there are so many more driveways and intersections along Bethel Road when compared to Sedgwick Road. The amount of turning movement related crashes experienced on Bethel Road makes a case for access management along the corridor.

Crashes with Injuries

On Bethel Road, nine crashes with evident injuries and three crashes with serious injuries, two of which involved pedestrians, were documented within the analysis period. Sedgwick Road saw five crashes with evident injuries and two crashes with serious injuries, no pedestrian injuries were reported. There were no reported fatalities on either study corridor over the time period that was analyzed. In addition, there were no reported crashes involving bicyclists on either study corridor over the time period that was analyzed.

Table 2 on the following page provides a summary of all reported crashes that involved evident injuries and serious injuries.

Table 2: Summary of Evident and Serious Injury Crashes by Corridor

January 2013 to June 2017

Evident Injuries				
Bethel Road	**Type**	**Vehicle Action**	**No. Injuries**	**Contributing Factor**
Mid-Block (3000 block)	Vehicle	Rear-end	1	Speeding
Mid-Block (3400 block)	Vehicle	Object	1	Inattention
Mid-Block (4600 block)	Vehicle	Rear-end	1	Distraction (inside)
Bethel Valley Lane	Vehicle	Rear-end	1	Speeding
Lund Avenue	Vehicle	Left-turn	1	Inattention
Mitchell Road	Pedestrian	Right-turn	1	None (not listed)
Mitchell Road	Vehicle	Left-turn	1	Distraction (unknown)
Piperberry Way	Vehicle	Rear-end	1	Distraction (outside)
Vallair Court	Vehicle	Sideswipe	1	Did not yield to vehicle
Sedgwick Road	**Type**	**Vehicle Action**	**No. Injuries**	**Contributing Factor**
Mid-Block (0.31 mp)	Vehicle	Object	1	Inattention
Mid-Block (0.45 mp)	Vehicle	Object	2	Inattention / Speeding
Mid-Block (0.47 mp)	Vehicle	Overturn	1	Speeding
Mid-Block (0.68 mp)	Vehicle	Rear-end	2	Distraction (outside)
Bethel Road	Vehicle	Left-turn	2	Did not yield to vehicle
Serious Injuries				
Bethel Road	**Type**	**Vehicle Action**	**No. Injuries**	**Contributing Factor**
Lincoln Avenue	Vehicle	Left-turn	1	Improper turn
Lincoln Avenue	Vehicle	Object	2	Distraction (unknown)
Salmonberry Road	Pedestrian	Going Straight	1	Did not yield to vehicle
Sedgwick Road	**Type**	**Vehicle Action**	**No. Injuries**	**Contributing Factor**
Bravo Terrace	Vehicle	Left-turn	1	Did not yield to vehicle
Bethel Road	Vehicle	Rear-end	2	Inattention

Traffic Forecast

As a part of the corridor study, a traffic volume forecast was developed by the City's on-call traffic engineering firm, Transportation Solutions, Inc. (TSI), to understand what traffic volumes and patterns will look like in the horizon year of 2040. The travel demand model was based on the Port Orchard citywide planning model which included the 2017 zoning map designations. Further refinements to the network were based on direction from City staff to reflect the expected zoning code changes. The network was also updated to reflect all the projects identified in the City's 6-year Transportation Improvement Plan, which were assumed to be completed by the horizon year. Lastly, the travel demand model was calibrated using counts collected in January 2017, which were also used in the SR 16 corridor model as a part of WSDOT's SR 16 Congested Corridor Study.

The plan takes a conservative approach to the analysis and assumes that the development potential of the study area would be fully realized by 2040. Based on the traffic patterns and volumes, the study area was broken into the following three study segments:

- Bethel Road North – Mile Hill Drive to Lund Avenue
- Bethel Road South – Lund Avenue to Sedgwick Road
- Sedgwick Road – SR 16 to Bethel Road

These same study segments were used in the alternatives analysis.

The results of the forecast predict a 45% increase in traffic volumes on Sedgwick Road, an 85% increase of traffic volume on Bethel Road between Sedgwick Road and Lund Avenue, and a 55% increase on Bethel Road north of Lund Avenue. **Table 3** summarizes the existing and future PM peak hour volumes for each study segment, combining both directions of traffic.

Table 3: Traffic Volume Forecast by Study Segment

	Existing Volumes *2017*	Forecasted Volumes *2040*	Percent Increase
Bethel Road North *(Mile Hill Dr to Lund Ave)*	1,420	2,175	55%
Bethel Road South *(Lund Ave to Sedgwick Rd)*	1,395	2,560	85%
Sedgwick Road *(SR 16 to Bethel Rd)*	1,915	2,780	45%

Forecasted volumes were used to analyze traffic operations, evaluate intersection control alternatives, perform a sensitivity analysis to establish phasing, and inform the roundabout design. Further details regarding the analysis can be found in **Appendix B**.

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Conceptual Design

The development of the preferred alternatives for both Bethel Road and Sedgwick Road came down to some important initial questions. What is the character of the street we are aiming to create? What type of intersection control will process traffic most efficiently and safely in the future? What is the best approach to access management? The answer to each of these questions comes with trade-offs related to multimodal access, project costs, and corridor operations that must be weighed and considered when developing and deciding between design alternatives.

Alternatives Analysis

Early in the planning process, we addressed three major alternatives related to street character, intersection control, and access management to advance our thinking and shape our approach to the alternatives analysis. A brief discussion of these key considerations is provided below.

Street Character

There are many design elements that make up the character, or feel, of a street. The number of vehicle lanes, presence of plantings, sidewalk width, on-street parking, building lines, and illumination are just some of the kind of things that effect how a person interacts with and experiences a corridor. There is rarely enough right-of-way available to easily accommodate every desired element so when allocating street space, difficult choices must be made.

Traditionally, the field of traffic engineering has focused on designing streets to move vehicles most efficiently using the peak hour as a measuring stick. More recently however, there has been a growing interest in designing streets that move people, not just cars. As a result, many jurisdictions are willing to accept lower levels of service during the peak period if it means a street functions better for everyone for the vast majority of time.

Designing streets for the busiest times of day often leads to overly wide roadways which encourages speeding behaviors off-peak and reduces corridor safety and walkability. While congestion or capacity issues can often be addressed by adding more vehicle lanes, doing so often comes at the expense of the human-scale amenities like comfortable sidewalks, street furniture, landscaping elements, bicycle facilities, and other qualities that encourage streets to be social places.

When surveyed about the character of the two study corridors, the majority of respondents shared that Sedgwick Road is seen as a critical commuter route, while Bethel Road is considered a commercial access corridor with a slightly greater need for multimodal considerations. During a public work session, Port Orchard's City Council expressed an interest in developing Bethel Road as a multimodal corridor and raised concerns about reduced safety and walkability if the corridor were to be wider than three lanes.

ALTERNATIVES: In terms of alternatives, the decision regarding street character can be distilled to whether the study segments have one vehicle lane in each direction or two vehicle lanes in each direction. The community's preference for providing multimodal elements (transit, bikes, pedestrians) were not considered optional.

Intersection Control

When intersection control is found to be warranted, traffic operations is often the first factor to consider when deciding between control types. A roundabout that operates within its capacity will generally perform better than a signalized intersection when processing the same traffic volume under the same right-of-way limitations.

Intersections with heavy left-turn movements or intersections that are closely spaced make particularly good candidates for roundabouts.[3]

Roundabout intersections have been proven to be safer than signalized intersections. Roundabouts are designed to keep speeds lower, prohibit dangerous behaviors (such as red-light running), and remove some of the most serious types of conflict points (including left-turn or head-on conflicts). All of these factors significantly reduce the occurrence of crashes involving serious or fatal injuries in roundabouts when compared to conventional signalized intersections. Collisions that do occur in roundabouts tend to be rear-ends or sideswipes which are generally less serious and result in fewer injuries.[4]

Another way to evaluate intersection control type is to compare their footprints or right-of-way impacts. For low-volume intersections, signals tend to require less right-of-way that roundabouts. In high-volume intersections or on corridors with access management where U-turns have to be accommodated, signalized intersections can take up a similar amount of space as roundabouts because they require additional lanes for vehicle storage and turning capacity.

Several publications by the Federal Highways Administration discuss the 'wide nodes, narrow roads' concept in relation to roundabout corridors. Signalized corridors operate best when they manage platoons of traffic which requires more through lanes between signals to keep the platoon traveling as a whole and to provide adequate storage when traffic is stopped. Whereas, roundabout corridors do not require platoon progression and actually operate better when traffic is dispersed more evenly. As a result, roundabouts can be made adequately large at the node, or intersection, to process traffic during the peak hour while maintaining a narrower roadway profile between intersections.[5] Reducing the number of travel lanes makes it feasible to reduce right-of-way impacts and accommodate other street elements such as wider sidewalks, bike lanes, and/or planted buffers or stormwater facilities. Narrow roads also have traffic calming benefits during the off-peak periods and allow for shorter, safer midblock crossings.

There isn't a clear winner when it comes to comparing signals and roundabouts in terms of cost. The reported costs of roundabout construction have been shown to vary significantly from location to location. For instance, if you are upgrading an unsignalized location, constructing a roundabout is likely to cost more than installing a signal which requires less modifications to the roadway area and curb lines. However, when comparing adding capacity to an existing signalized intersection versus converting it to a roundabout, the costs may be more even. In addition to capital construction costs, operation and maintenance costs, or life-cycle costs, should be considered. Signalized intersections and roundabout intersections have different types of O&M costs. Roundabouts often require more illumination than a signalized intersection when it is dark. Whereas, signals require electricity all day to manage traffic as well as illumination overnight. Most roundabouts require

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[3] Transportation Research Board of the National Academies. *NCHRP Report 672: Roundabouts: An information Guide (Second Edition)*. Washington, D.C., 2010. Page 3-32.
[4] Transportation Research Board of the National Academies. *NCHRP Report 672: Roundabouts: An information Guide (Second Edition)*. Washington, D.C., 2010. Page 3-33.
[5] Transportation Research Board of the National Academies. *NCHRP Report 672: Roundabouts: An information Guide (Second Edition)*. Washington, D.C., 2010. Page 2-7.

maintenance of landscaping and static signage while signals require periodic servicing to keep the signal systems in good working order (e.g., bulb replacement, detector maintenance, and signal re-timing).[6]

ALTERNATIVES: In terms of alternatives, the decision regarding intersection control boils down to whether the study intersections are designed as roundabouts or signalized intersections where stop-control is not sufficient.

Access Management

Development anticipated for both the Sedgwick Road and Bethel Road corridors will bring new residents, businesses, and services to the City of Port Orchard. With economic growth comes more people, generating new trips along the corridor and potential increasing conflicts among road users. Frequent curb cuts and unrestricted left turn movements create conflicts between vehicles. In addition, they interrupt the sidewalk and bike lanes and pose challenges for pedestrians and cyclists using the corridor.

The intent of access management is to mitigate those conflicts while maintaining the safety and efficiency of the arterial. There are a number of techniques that can be used to manage access including intersection and driveway spacing standards, center turn lanes, and median treatments.

Raised medians have many benefits including separating opposing flows of traffic which prevents head-on collisions. Studies have shown significant reductions in the number and severity of collisions on high-volume commercial corridors with raised medians. Median controlled corridors concentrate turning movement activity which makes drivers actions more predictable and keep traffic moving more smoothly and efficiently. Additionally, medians provide refuge and make it easier for pedestrians, of all ages and abilities, to safely cross the street.

As traffic volumes increase, left-turns in and out of driveways will become more difficult and dangerous for drivers to make. Many driveways will become default right-in/right-out access points and the intersections will have to be able to accommodate more U-turns. On signalized corridors, adequate width must be provided at the intersection to accommodate U-turns which can make streets unnecessarily wide and difficult to cross. Alternatively, roundabout intersections are always designed to allow U-turn movements.

Two-way left turn lanes allow drivers to make a two-stage turn when turning left onto the main arterial, meaning drivers can look for a gap in one direction of traffic to enter the median and then merge into the other direction of traffic. They also are helpful for keeping turning vehicles out of the through traffic which reduces the probability of rear-end crashes. However, if the demand for the left-turn lane is high and providing adequate storage is not possible or driveways are spaced too closely, left-turning vehicles may spill back into the through lane and cause congestion or a conflict point.

ALTERNATIVES: In terms of alternatives, the decision regarding access management focused on providing a raised center median or a two-way, left-turn lane.

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[6] Transportation Research Board of the National Academies. *NCHRP Report 672: Roundabouts: An information Guide (Second Edition)*. Washington, D.C., 2010. Page 3-33.

Preferred Alternative

Each of the three key considerations discussed above presents two alternative treatments to decide between:

- Street Character: One travel lane in each direction versus two travel lanes in each direction
- Intersection Control: Roundabout versus Signalized intersection
- Access Management: Two-way left-turn lane versus raised center median

To identify a preferred alternative, a decision was made for the three alternative treatments by study segment based on a combination of traffic data and operations, crash history, community input, adjacent land use and development potential, and right-of-way considerations. **Table 4** summarizes the results of our alternatives analysis followed by a detailed discussion for each of the three study segments.

Table 4: Alternative Analysis Results by Segment

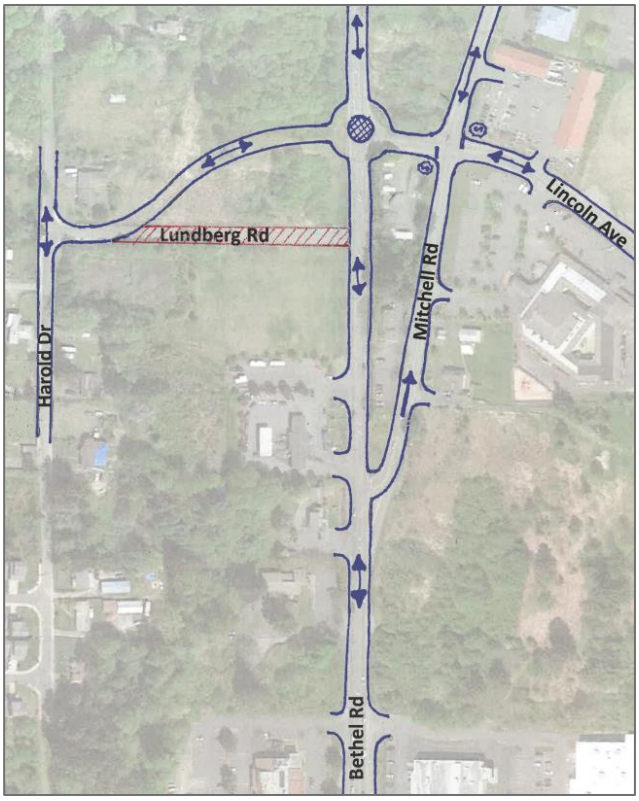
	Street Character	Intersection Control	Access Management
	One Travel Lane vs. Two Travel Lanes	*Roundabouts vs. Signalized Intersections*	*Raised Median vs. Two-way Left-turn Lane*
Bethel Road North *(Mile Hill Dr to Lincoln Ave)*	One lane in each direction	Roundabouts	Two-way Left-turn Lane
Bethel Road South *(Lund Ave to Sedgwick Rd)*	One lane in each direction	Roundabouts	Raised Median
Sedgwick Road *(SR 16 to Bethel Rd)*	Two lanes in each direction	Roundabouts	Raised Median

Bethel Road North – Mile Hill Drive (SR 166) to Lund Avenue

While volumes in this segment are forecasted to rise by 55% by the year 2040, most of the growth is related to development in other areas of the City and outside the City, not related to new trip generating uses along this particular segment. Traffic volumes for this study segment are the lowest among the three and the development potential of parcels along this segment are limited by Blackjack Creek to the west and Mitchell Road to the east. As a result, land use along this segment tends to be smaller footprint businesses as opposed to some of the high trip generating uses located in the southern segment of Bethel Road which require larger development sites. This type of land use pattern also means that turning movements are more evenly dispersed along the segment as opposed to concentrated at particular locations. As a result, driveways process less traffic but are more frequent. Access to these businesses would be difficult to consolidate and are best served by a two-way left-turn lane.

Additionally, the stretch of roadway between Lincoln Avenue and Mile Hill Drive (SR 166) represents the longest distance between intersections, over 4,000-feet, in the study area. If a raised median were constructed along this segment, drivers would potentially have to travel over a mile out of their way to get to a business or residence located on the opposite side of the street. The existing roadway is a three-lane section, with one travel lane in each direction and a center two-way left-turn lane, operates well now and is expected to operate will in the future. A three-lane profile is also consistent with the City Council's vision for the character of Bethel Road.

There is an existing safety issue in the area of Lincoln Avenue and Mitchell Road in this study segment. Of the twelve crashes reported to have evident or serious injuries in the last five years, two of them occurred at Lincoln Avenue and two of them occurred at Mitchell Avenue. One of which was a vehicle turning right onto Mitchell Road from northbound Bethel Road and striking a pedestrian crossing the street. Geometrically, the wye-intersection at this location creates an unsafe situation because right-turning vehicles are able to make the soft turn at higher speeds and the pedestrian crossing is very long. For this reason, the plan recommends converting Mitchell Road between Bethel Road and Lincoln Avenue from two-way to one-way northbound. At the intersection of Mitchell Road and Lincoln Avenue, two-way stop control on Lincoln Avenue is the recommended control. The one-way conversion could happen independently of the larger project.



Concept sketch at Mitchell Rd/Lincoln Ave/Lundberg Rd

In terms of intersection control in this segment, the plan recommends realigning Lundberg Avenue to create a four-leg intersection at Lincoln Ave and constructing a single-lane roundabout which is the safest and most efficient intersection control alternative. An illustration of this realignment concept is shown to the right.

Bethel Road South – Lund Avenue to Sedgwick Road (SR 160)

Based on input from the City Council, the vision for Bethel Road is a safe and walkable commercial street that includes comfortable bicycle and pedestrian facilities. The existing right-of-way on Bethel Road is limited, especially compared to most of the Sedgwick Road segment. Adding more travel lanes would have right-of-way impacts, require more land acquisition, increase costs, and potentially reduce the available space for pedestrian and bicycle amenities. One additional lane in each direction would also increase the roadway width by 22-feet which would drastically change the character of the corridor. A four-lane profile would double pedestrian exposure at midblock crossings locations and likely increase speeding behaviors off-peak. For these reasons, the corridor plan recommends a two-lane roadway with a raised median for the Bethel Road South study segment.

Traffic volumes on the Bethel Road South segment are forecasted to grow by 85% which is the largest increase anticipated in the study area. To process this amount of traffic with one-lane in each direction, the 'wide nodes, narrow roads' approach is recommended with roundabout intersections at all major intersections and a raised center median between intersections. The center median will prohibit turning movements between intersections, reducing friction and allowing traffic to flow more smoothly.

It should be noted, if traffic volumes ever reach the forecasted levels, it is likely this segment of Bethel Road will experience significant congestion and rolling queues during peak periods. However, an increase in vehicle delay during peak periods must be weighed against the benefits of constructing a street that moves people, not just cars, more safely and efficiently at all other times of the day. The City may choose to approve an exemption to the LOS standards if and when it ever becomes an issue.

Sedgwick Road (SR 160) – SR 16 to Bethel Road

The Sedgwick Road study segment currently carries the highest traffic volumes in the study area and is forecasted to carry 45% more traffic in the horizon year. Respondents to the community survey characterized Sedgwick Road as a commuter route and identified existing capacity issues as a top concern. The crash history also reflects the need to address congestion with rear-end collisions representing nearly three-quarters of those reported in the last five years. Considering the direct connection to the SR 16 interchange, traffic along this segment should process as efficiently as possible.

Based on these factors and the availability of existing right-of-way through this segment, the corridor plan recommends a four-lane roadway profile, two travel lanes in each direction, with a raised center median. The center median will prohibit turning movements between intersections, reducing friction and allowing traffic to flow more smoothly. Additionally, a raised center median will improve safety by removing the risk of head-on collisions. While only four head-on collisions were reported in the study area during the most recent 5-year period, all of them occurred on Sedgwick Road.

Steep slopes are an important feature of this roadway segment. Not only will they influence development patterns here, there is a considerable hill traveling eastbound on Sedgwick Road from SR 16 which can present a barrier for bicyclists, especially those who are less comfortable riding next to moving traffic. In addition, the high traffic volumes and recommended four-lane profile will make this segment more intimidating to cyclists. As a way to accommodate less experienced riders given these conditions, it is recommended the sidewalk on Sedgwick Road be widened by 2-feet to function more like a shared-use path.

Roundabouts are the recommended traffic control on Sedgwick Road because of their ability to process traffic most efficiently. Intersections with heavy left turns, such as eastbound Sedgwick Road at Bethel Road, make especially good roundabout candidates[7]. In addition, roundabouts are the preferred control on state facilities. According to the WSDOT Design Manual, "Due to the safety and operational performance record, a roundabout is the preferred intersection control type and is required to be evaluated."[8] The Bravo Terrace roundabout is located just east of the existing full-access intersection to maximize the distance between the SR 16 northbound ramps and the roundabout. Likewise, the existing full-access intersections at Geiger Road and Ramsey Road limited to right-in/right-out and the full-access intersection is consolidated in between the two at the crest of the hill to improve sight-lines and reduce upstream and downstream queuing conflicts.

Summary of Alternatives Analysis

Based on the results of the alternatives analysis, Sidra modeling software was used to design roundabouts that accommodate the horizon year volumes. Only the intersections of Bethel Road at Blueberry Road and Lincoln Avenue are designed as single-lane roundabout. **Figure 5** provides a schematic of the corridor plan while **Figures 6**, **7**, and **8** illustrate the typical street sections by study segment. As indicated by the dashed yellow line, the City recommends Bethel Road – Typical Section A to be applied on Bethel Road south of Sedgwick Road. Roll plots of the conceptual design and draft right-of-way plans are attached as **Appendices C** and **D.**

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[7] Transportation Research Board of the National Academies. *NCHRP Report 672: Roundabouts: An information Guide (Second Edition)*. Washington, D.C., 2010. Page 3-32.

[8] Washington Department of Transportation, *WSDOT Design Manual M 22.-01.14, Chapter 1300 Intersection Control Type*. July 2017. <http://www.wsdot.wa.gov/publications/manuals/fulltext/M22-01/1300.pdf>

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Figure 5: Corridor Plan Schematic

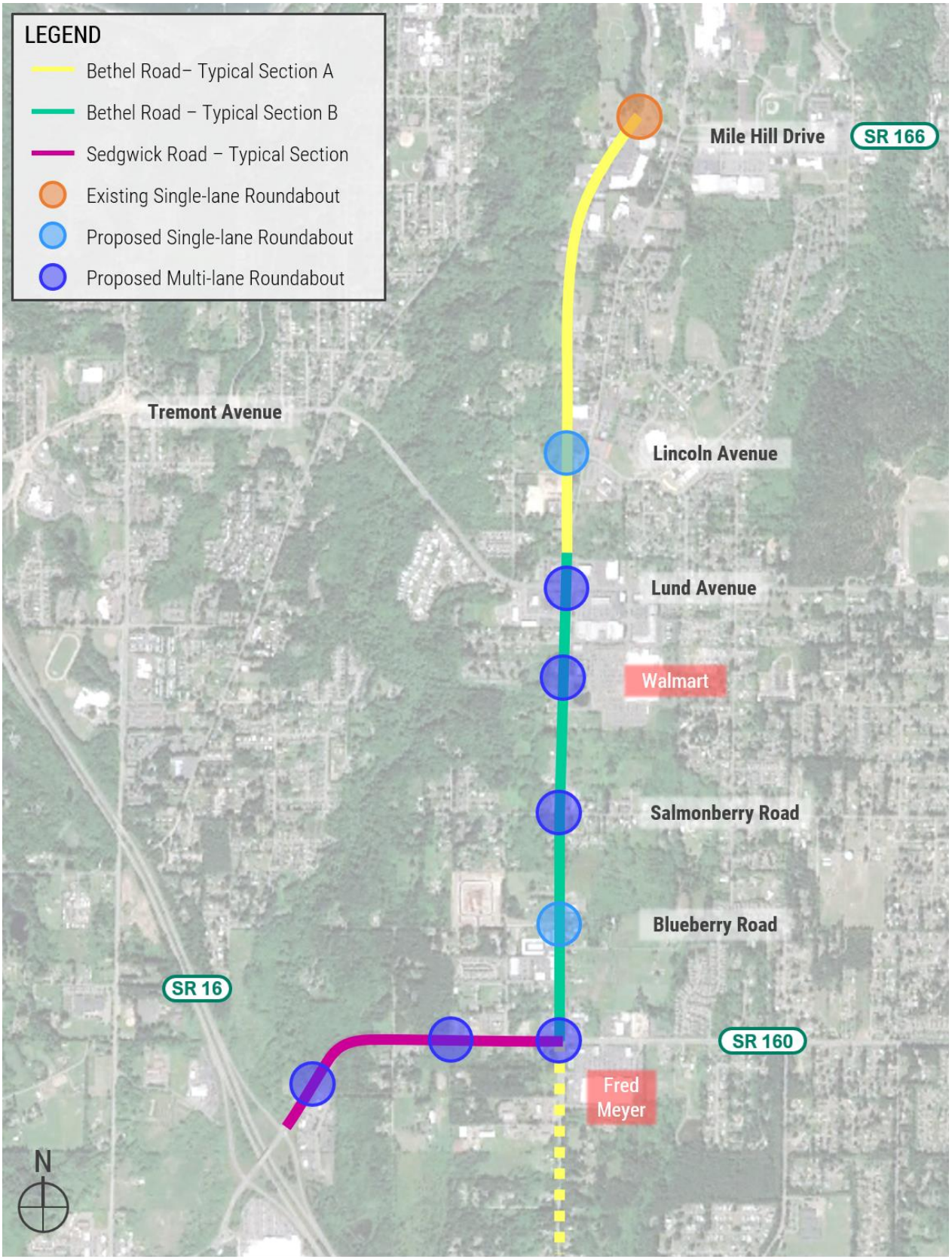


Figure 6: Bethel Road – Typical Section A

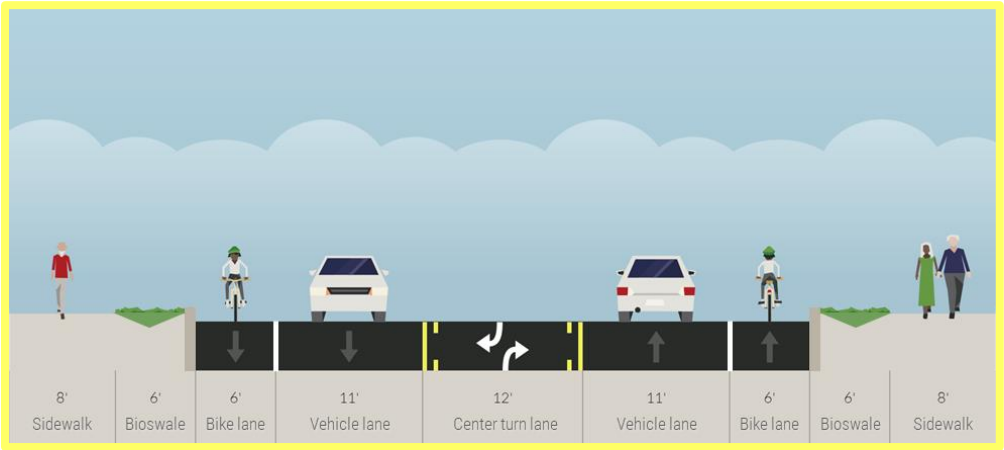


Figure 7: Bethel Road – Typical Section B

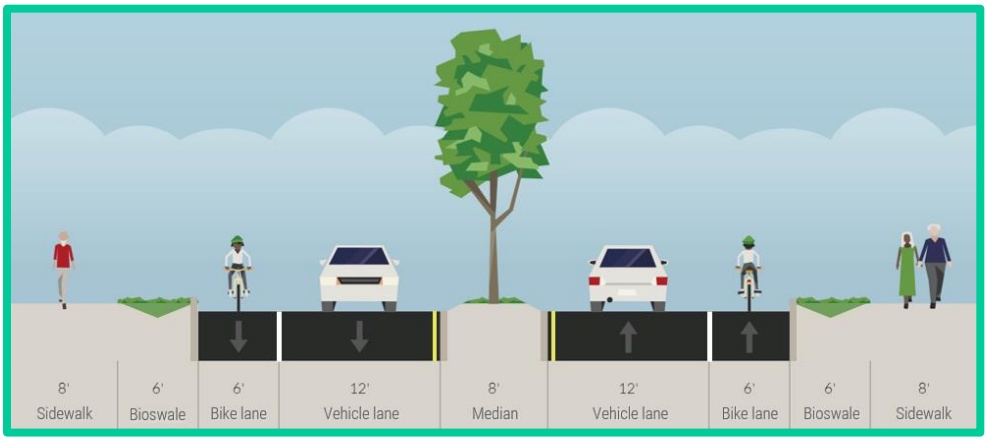
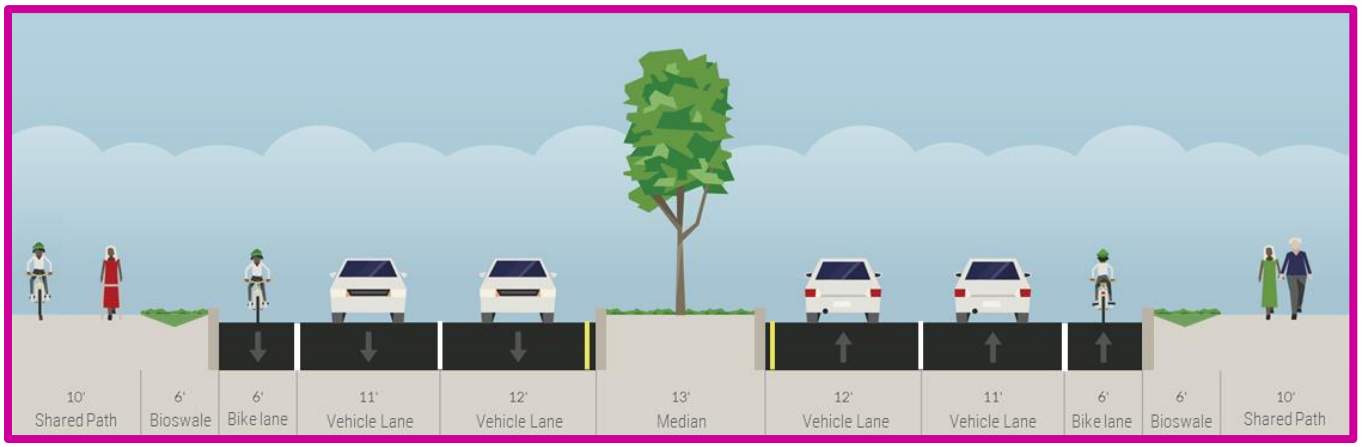


Figure 8: Sedgwick Road – Typical Section



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Project Phasing

Implementing the corridor improvements outlined in this plan as a single project would be unrealistic for many reasons. Given a constrained funding environment, phasing creates smaller projects that are easier implement projects and can compete for different funding opportunities. Phasing also allows the most critical needs to be addressed earlier rather than waiting until funding is lined up to complete the entire project, which may never happen. Lastly, implementing a project in phases minimizes construction impacts to the traveling public and better accommodates construction staging needs. A summary of the sensitivity analysis methodology and the resulting phasing strategy are discussed below. Further analysis details are provided in **Appendix E**.

Sensitivity Analysis

As a means of developing a project phasing strategy, a sensitivity analysis was conducted using roundabout modeling software (Sidra, Version 7). The analysis had a few different applications which included:

- Developing a project phasing and funding prioritization strategy
- Identifying potential interim roundabout designs for each intersection
- Refining the full-build design of each roundabout in the horizon year

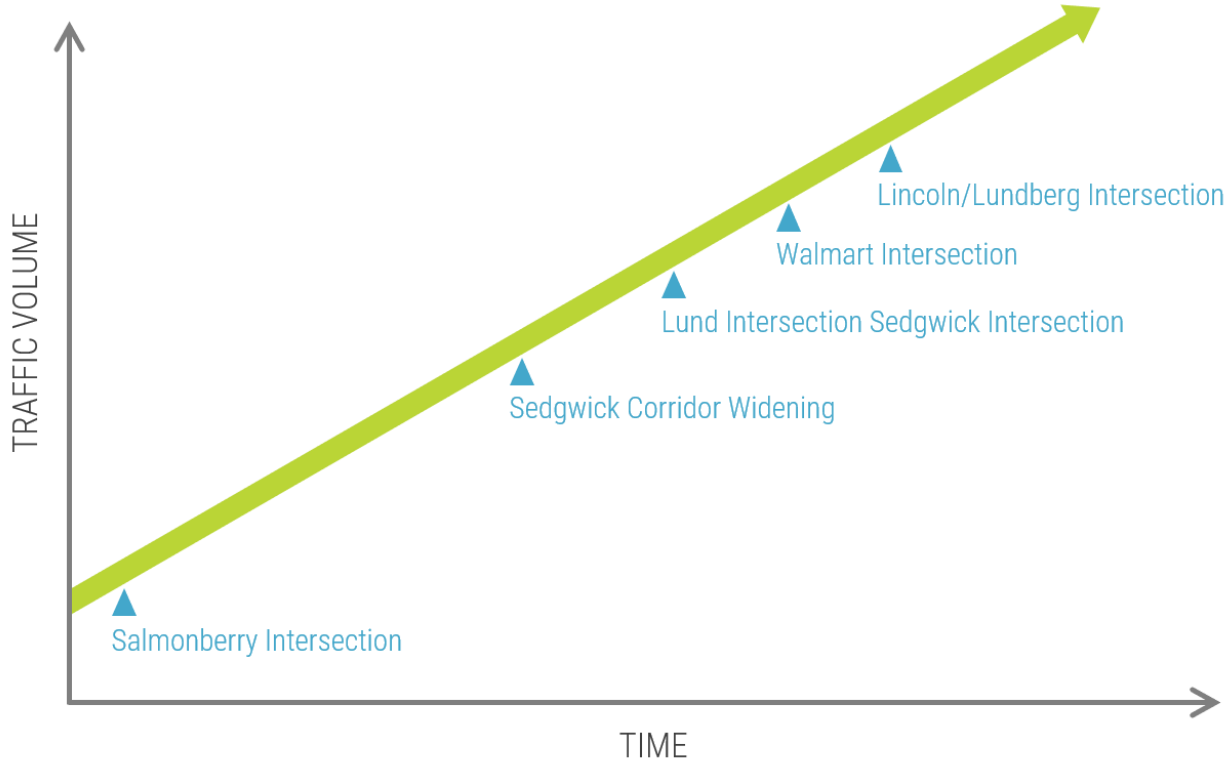
To prioritize the need for improvements along both study corridors, straight-line growth was assumed between existing conditions and the 2040 forecasted volumes. These yearly forecasted volumes were then plugged into the model at each intersection to identify when, or at what volume threshold, the intersection fails and an improvement project would be needed. For this analysis, intersection failure was defined as meeting one or more of the following conditions:

- For signalized or roundabout intersections, average intersection delay below LOS D
- For two-way stop-controlled intersection, delay on a minor-leg approach below LOS D with volumes that meet the Manual on Uniform Traffic Control Devises (MUTCD) signal warrants
- For any intersection type, queue lengths that exceed the distance to the next closest controlled intersection

Based on the sensitivity analysis, **Figure 9** shows the order in which the existing intersection configurations are expected to fail over time. The results of this analysis were used as the basis for the proposed phasing strategy. As the graph illustrates, and as identified in the City's Comprehensive Plan, the intersection of Bethel Road and Salmonberry Road is currently operating below the LOS standards and is very close to meeting the MUTCD peak hour signal warrant (see **Appendix E**).. Therefore, Salmonberry Road is recommended as the first project phase.

In reality, vehicle volumes will not grow uniformly along the corridors but instead it will spike at particular intersections as specific parcels are developed. While the straight-line growth analysis provides critical insights about emerging needs, the phasing strategy will need to be revisited as development in the area occurs and traffic patterns change.

Figure 9: Sensitivity Analysis Results



Interim and Full-Build Designs

Using the Sidra modeling software, the roundabouts were designed to accommodate the 2040 forecasted volumes. These designs are referred to as the 'full-build design'. The right-of-way plans and conceptual designs included in **Appendices C and D** show the roundabout design and right-of-way needs for the full-build design.

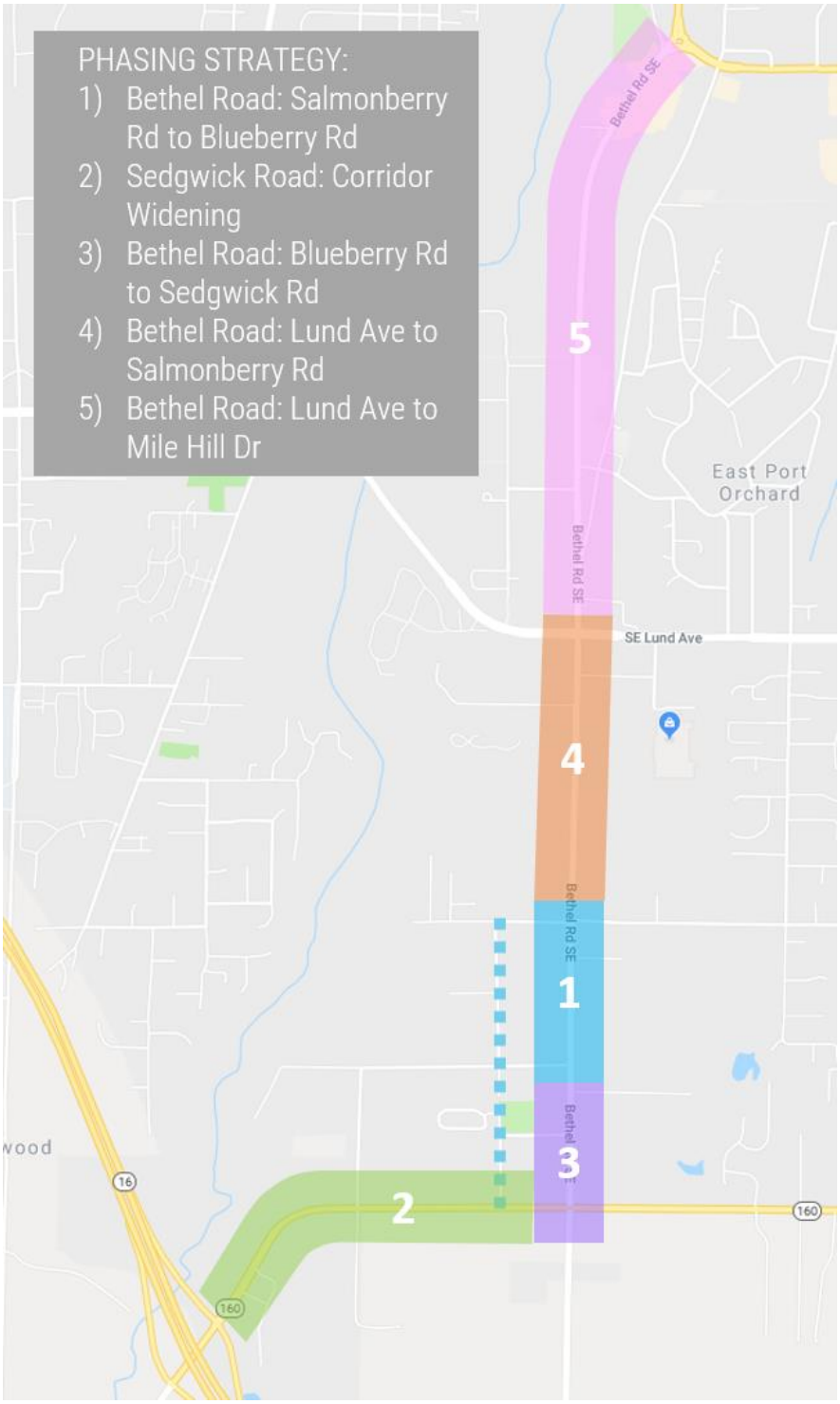
However, each intersection was evaluated to determine if there was a simpler roundabout design that would satisfy traffic conditions for a significant period of time to justify implementing an interim design between now and the horizon year. For instance, the existing roundabout at Bethel Road and Mile Hill Drive (SR 166) was designed to someday accommodate a second circulating lane but was initially built with only one-circulating lane. To this day, the single-lane roundabout operates above the LOS standards but if traffic volumes ever out grow the current design, the existing roundabout can be modified to accommodate a second circulating lane.

The analysis began by evaluating at what point the existing control, either signal or two-way stop control, would fail (as described about) based on the straight-line growth forecast. When the existing control dipped below acceptable LOS, a single-lane roundabout was evaluated to see if it would operate above the failure standards and for how long. If it was expected to operate above failure standard for more than 10 years without needing modifications, a single-lane roundabout was identified as an acceptable interim design. If a single-lane roundabout did not operate above the failure standard, then the roundabout design was modified until it performed at an acceptable level. The results of this analysis indicate that the intersection of Bethel Road and Salmonberry Road is the only intersection for which a single-lane roundabout would be an acceptable interim design.

Phasing Strategy

The proposed phasing strategy, based on the results of the sensitivity analysis, is illustrated in **Figure 10** and a detailed description of each phase is provided below.

Figure 10: Phasing Strategy Diagram



The project phasing strategy takes into consideration the impacts of access management. All phases consist of a roadway segment that is book-ended by roundabouts to ensure vehicles and trucks can turn around at the intersection to access properties on the opposite side of the street. The only exception being Phase 2 (Sedgwick Road - Corridor Widening) which does not assume the construction of the Bethel Road and Sedgwick Road roundabout. As an interim measure, the segment of Sedgwick Road between the new intersection roundabout and Bethel Road would be constructed as an eastbound left-turn only lane. When Phase 3 is implemented, the center turn lane would be removed and replaced with a raised, planted median.

Phase 1: Bethel Road – Salmonberry Rd to Blueberry Rd

- Construct two roundabouts on Bethel Road at both Salmonberry Road and Blueberry Road. While right-of-way should be acquired to accommodate the full build-out roundabout design for the 2040 horizon year volumes, the design and number of circulating lanes required to support opening day volumes will be determined during the design phase. At Salmonberry Road, our analysis identified a single-lane roundabout as an interim design. However, a two-lane roundabout with two-lane approaches southbound and northbound on Bethel Road is expected to be required to meet LOS standards in 2040. At Blueberry Road, our analysis did not identify an interim design and a single-lane roundabout is expected to meet LOS standards in 2040.
- Construct the Bethel Road segment between Salmonberry Road and Blueberry to the Bethel Road – Typical Section A specifications including sidewalk, bioretention swale, curb and gutter, bike lane, one travel lane in each direction, and a raised center median.
- In order to adequately accommodate detour traffic during construction, Ramsey Road between Sedgwick Road and Salmonberry Road will need to be improved to meet City standards prior to implementation of Phase 1, including resolving some existing right-of-way issues. A preliminary cost for this improvement has been included in the estimate for Phase 1.

Phase 2: Sedgwick Road (SR 160) – Corridor Widening

- Construct two roundabouts on Sedgwick Road at both Bravo Terrace and a new intersection located between Geiger Road and Ramsey Road. While our analysis did not identify an interim design for either roundabout, the final design and number of circulating lanes needed will be confirmed during the design phase.
- Construct the Sedgwick Road segment between SR 16 NB ramps and Bethel Road to the Sedgwick Road – Typical Section specifications including shared path, bioretention swale, curb and gutter, bike lane, and two travel lanes in each direction.
- Construct a raised center median on Sedgwick Road between the two roundabout intersections and an eastbound left-turn only lane between the new intersection to Bethel Road to allow access at Ramsey Road until a roundabout is constructed at the Sedgwick Road and Bethel Road intersection.

Phase 3: Bethel Road – Blueberry Rd to Sedgwick Rd (SR 160)

- Construct a roundabout at the intersection of Sedgwick Road and Bethel Road. While our analysis did not identify an interim design for this roundabout, the final design and number of circulating lanes needed will be confirmed during the design phase.
- Construct the Bethel Road segment between Blueberry Road and Sedgwick Road to the Bethel Road – Typical Section A standards including sidewalk, bioretention swale, curb and gutter, bike lane, one travel lane in each direction, and a raised center median.

- Convert the eastbound left-turn lane on Sedgwick Road between the new intersection to Bethel Road to a raised center median and convert Ramsey Road to right-in/right-out access only.

Phase 4: Bethel Road – Lund Ave to Salmonberry Rd

- Construct two roundabouts on Bethel Road at both Lund Avenue and Walmart Access Road. While our analysis did not identify an interim design for either roundabout, the final design and number of circulating lanes needed will be confirmed during the design phase.
- Construct the Bethel Road segment between Lund Avenue and Salmonberry Road to the Bethel Road – Typical Section A standards including sidewalk, bioretention swale, curb and gutter, bike lane, one travel lane in each direction, and a raised center median.

Phase 5: Bethel Road – Lund Ave to Mile Hill Dr (SR 166)

- Construct a single-lane roundabout at the intersection of Bethel Road and Lincoln Road/Lundberg Avenue. Lundberg Avenue is proposed to be realigned with Lincoln Avenue to create a four-leg intersection. Our analysis did not identify an interim design and a single-lane roundabout is expected to meet LOS standards in 2040.
- Construct the Bethel Road segment between Lincoln Avenue and Mile Hill Drive to the Bethel Road – Typical Section B standards including sidewalk, bioretention swale, curb and gutter, bike lane, one travel lane in each direction, and a two-way, left-turn lane.
- Construct the Bethel Road segment between Lund Avenue and Lincoln Avenue to the Bethel Road – Typical Section A standards including sidewalk, bioretention swale, curb and gutter, bike lane, one travel lane in each direction, and raised center median.
- Convert Mitchell Road between Bethel Road and Lincoln Road to a one-way street northbound, rerouting southbound vehicles on Mitchell Road to Lincoln Avenue and Bethel Road. The City may choose to implement this conversion at any time, unrelated to the Bethel Road improvements.

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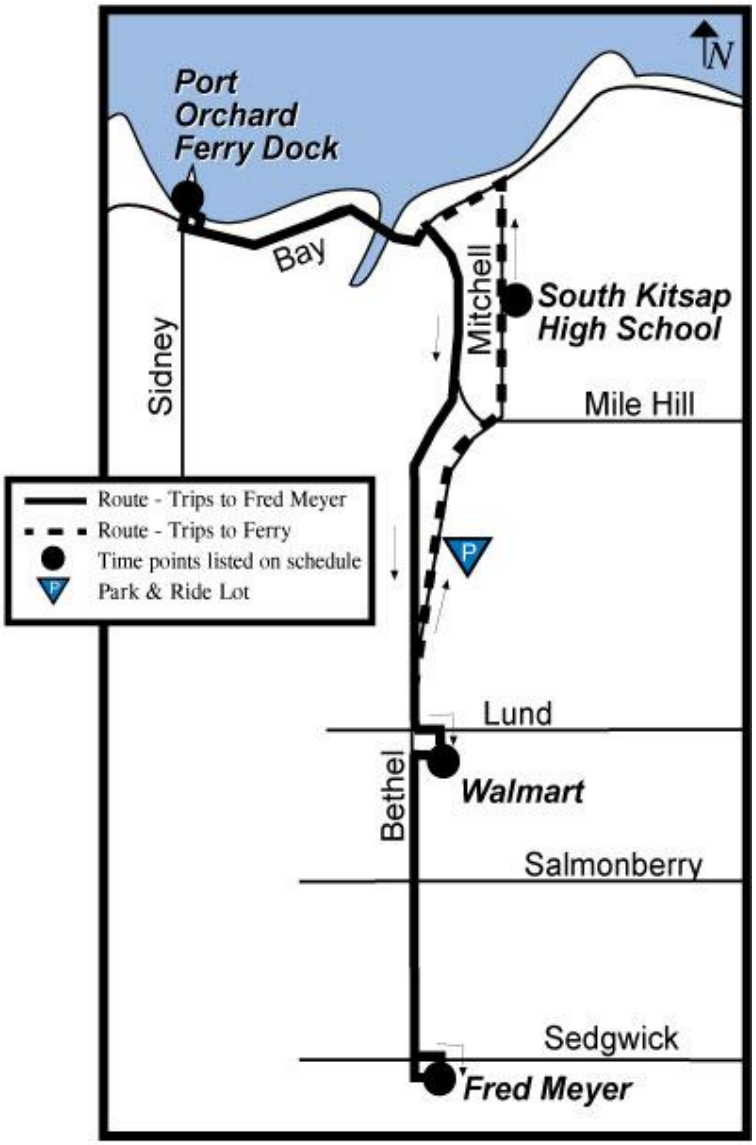
Design Considerations

The conceptual designs for Bethel Road and Sedgwick Road presented in this plan provide a solid foundation for the work that will follow. However, as projects identified in this plan move into preliminary and final design, there are a number of details that will need to be nailed down. The following section discusses some of the important design considerations and provides guidance on how to approach them.

Transit

Incorporating transit operations was an essential element of the corridor design. Kitsap Transit currently operates Route 8 along Bethel Road which provides fixed-route bus service between the Port Orchard Ferry Dock and the Fred Meyer at Sedgwick Road. The bus operates six days a week with half-hour headways from 5:00 AM to 7:30 PM. Currently, Route 8 operates one-way service between Lincoln Road and Bay Street, with northbound stops on Mitchell Road and southbound stops on Bethel Road. In addition to Route 8, worker/driver buses run on both Bethel Road and Sedgwick Road, making stops at existing bus stops as well as other locations as necessary.



Route map for Kitsap Transit's Route 8 bus in 2018

According to Kitsap Transit's Planning Department, they have plans to expand and improve their service delivery in Port Orchard. In the near-term, they plan to double bus frequency on Bethel Road, decreasing headways from 30-mintues to 15-minute headways. They are also considering providing bi-directional service on either Bethel Road or Mitchell Road between Lincoln Road and Bay Street.

Kitsap Transit is also interested in siting a new park-and-ride lot in the vicinity of the SR 16 interchange at Sedgwick Road (SR 160) and considering expanding bus service to include a route on Sedgwick Road. In the long-term, they have identified Bethel Road as a potential location for Bus Rapid Transit (BRT).

In developing the conceptual corridor plan for Bethel Road, the City worked with Kitsap Transit to determine the optimal bus stop treatment. According to Kitsap Transit, pullouts are generally undesirable because drivers have

difficulty re-entering the flow of traffic which causes service delays and increases the chance of collisions.[9] However, there are some circumstances where pullouts are necessary including at stops with longer than average bus dwell times, such as heavily used stops or those serving disabled or elderly populations that rely on the ramp to board the bus. Pullout bus stops may also be appropriate at layover or relief points along a bus route.

Bus Stops in Roundabouts

Federal Highway Administration's (FHWA) guidance on roundabout design[10] states that bus stops should be located sufficiently far from the roundabout entries and exits and should never be located in the circulating lane. Bus stops can be located on either on the approach (near-side) or the exit (far-side) and the report provides the following guidance for both treatments:

> *Near-side stops: If a bus stop is to be provided on the near side of a round-about, it should typically be located far enough away from the splitter island so that a vehicle overtaking a stationary bus is in no danger of being forced into the splitter island, especially if the bus starts to pull away from the stop. If an approach has only one lane and capacity is not an issue on that entry, the bus stop could be located at the pedestrian crossing in the lane of traffic. This is not recommended for entries with more than one lane because vehicles in the lane next to the bus may not see pedestrians. At multilane roundabouts, a nearside bus stop can be included in the travel lane (a bus bulb-out design), as long as it is set back at least 50 ft (15 m) from the crosswalk. Nearside stops provide the advantage of having a potentially slower speed environment where vehicles are slowing down, compared to a far-side location where vehicles may be accelerating upon exiting the roundabout.*
>
> *Far-side stops: Bus stops on the far side of a roundabout should be located beyond the pedestrian crossing to improve visibility of pedestrians to other exiting vehicles. Far-side stops result in the crosswalk being behind the bus, which provides for better sight lines for vehicles exiting the roundabout to pedestrians and keeps bus patrons from blocking the progress of the bus when they cross the street. The use of bus pullouts has some trade-offs to consider. A positive feature of a bus pullout is that it reduces the likelihood of queuing behind the bus into the roundabout. A possible negative feature is that a bus pullout may create sight line challenges for the bus driver to see vehicles approaching from behind when attempting to merge into traffic. It may also be possible at multilane roundabouts in slow-speed urban environments to include a bus stop without a bus pullout immediately after the crosswalk, as exiting traffic has an opportunity to pass the waiting bus.*

Proposed Bus Stop Treatment

Considering the guidance from both Kitsap Transit and FHWA, the conceptual design proposes three bus stop treatments as described below depending on the geometry of the street. In all cases, the curbside bioretention swale will be replaced by a concrete boarding area which will also provide a location for the bus stop sign. As warranted, Kitsap Transit will provide and install shelters require a 10-foot by 15-foot concrete pad which is typically located at the back of sidewalk.

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[9] Kitsap Transit. *Bus Stop Design Manual*.

[10] Transportation Research Board of the National Academies. *NCHRP Report 672: Roundabouts: An information Guide (Second Edition)*. Washington, D.C., 2010.

Bus Stop – Type A

In-lane bus stop located on a street with a center turn lane. When loading and unloading passengers, vehicles can use the center turn lane to get around the stopped bus. If the bus stop is located mid-block, a midblock crosswalk (as described in the Pedestrian section) should be considered. If a crosswalk is present, the bus stop should be located on the far-side of the crosswalk to keep sight lines of crossing pedestrians clear.

Bus Stop – Type B

In-lane bus stop located on a street with a center median and access control. When loading and unloading passengers, vehicles will be stopped behind the bus. At single-lane roundabout approaches, the bus stop should be located on the nearside of the roundabout before the pedestrian crossing. At mid-block locations, a midblock crosswalk (as described in the Pedestrian section) should be provided and the bus stop can either be located in front of or behind the crosswalk.

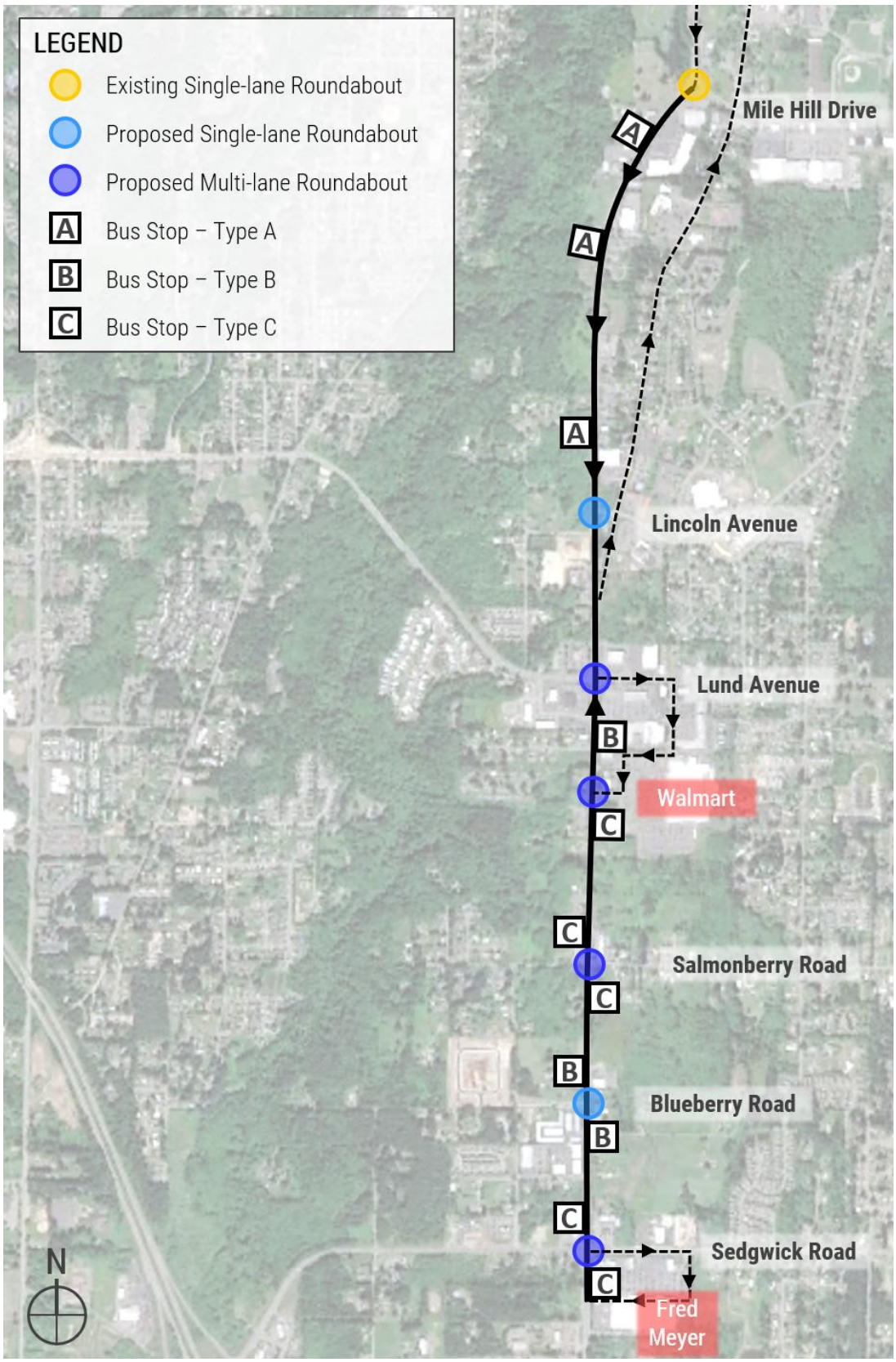
Bus Stop – Type C

In-lane bus stops located on the near side of a multi-lane roundabout. When loading and unloading passengers in the right lane of a multi-lane approach, vehicles can use the left lane to get around the stopped bus. The bus stop should be located at least 50-feet away from the pedestrian crossing to keep sight lines of crossing pedestrians clear. In addition, locating the bus stop further from the circulating lanes will reduce conflicts between buses traveling through the intersection and vehicles making right-turns.

Figure 11 illustrates where each of these three treatment types are proposed along the Bethel Road corridor. As Kitsap Transit expands, adjusts, and improves transit in the area, these design concepts will need to be revisited. When phases of the project move from conceptual design into preliminary and final design, further consultation with Kitsap Transit will be required to determine the best possible design given the specific location.

Conceptual rendering of a Type C bus stop treatment

Figure 11: Study Area Map



Pedestrians

Existing pedestrian facilities on both Bethel Road and Sedgwick Road are insufficient, especially in light of the multi-family residential and mixed-use development that is expected to occur within the subarea. Port Orchard has a commitment to provide facilities that accommodate pedestrians and cyclists in a safe, comfortable, and accessible way within the arterial street network.

Pedestrian Facility Design

The design of both Bethel Road and Sedgwick Road include sidewalks on both sides of the roadway. The design for Bethel Road includes 8-foot wide sidewalks while Sedgwick Road includes 10-foot sidewalks intended to be used as needed by cyclists. More details on this treatment are included in the Bicycles section of this chapter.

All sidewalks and ramps at crosswalks must be ADA compliant to safely accommodate users with vision-impairments and limited mobility. In following design phases, consideration will have to be given to the treatment at back-of-walk whether there the need for retaining walls, fencing, or a slope easement.

Midblock Crossings

Block length is a critical factor when evaluating walkability. Shorter block lengths, or distances between crosswalks, increase opportunities for crossing and allow for more direct pedestrian routes. Studies have shown that ideal block lengths to support walkable area are between 300-feet and 400-feet.[11] Crossing opportunities on both Bethel Road and Sedgwick Road are extremely limited. Distances between major intersections along Bethel Road are at least 1,000-feet apart, and often much longer.

To support walkability on Bethel Road, midblock crosswalks are recommended between every major intersection to provide a crossing opportunity at least every 500-feet. Midblock crossings should be located adjacent to pedestrian generators like transit stops, commercial or residential developments, or other minor intersections and must meet appropriate sight distance requirements. If a midblock crossing is installed on a roadway with a center turn lane, such as on Bethel Road north of Lund Avenue, a median refuge island should be considered.

When installing midblock crossings at uncontrolled locations, without traffic control like a stop sign or signal, special attention to design is required to ensure the safety of all road users. **Figure 12** provides guidance on installing uncontrolled, midblock crosswalks on roadways with one-lane in each direction. Further guidance on mid-block crossing siting and design is provided in the City's *Pedestrian Crossing Guidelines*.[12]

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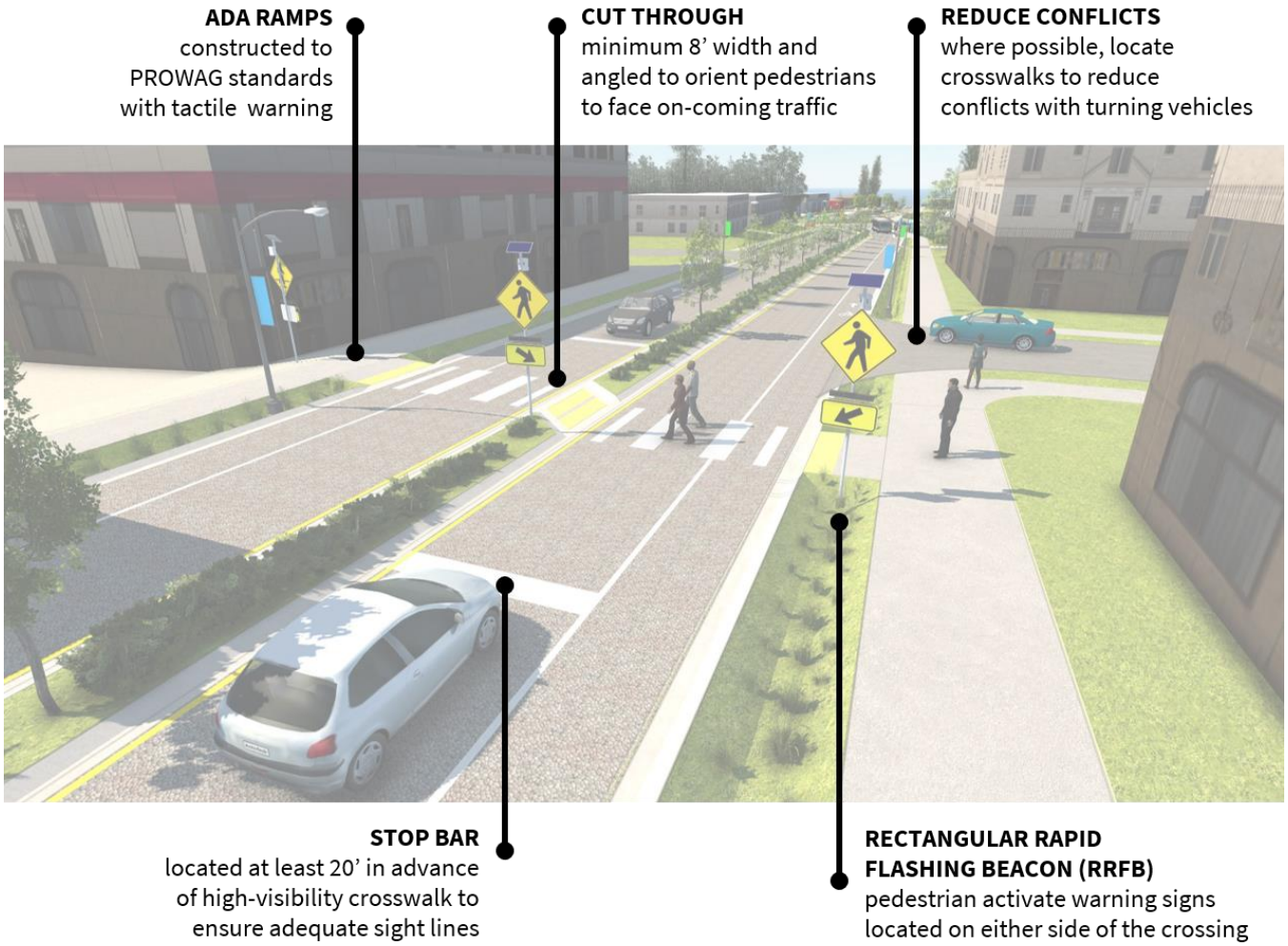
[11] Ewing, Reid. *Pedestrian- and Transit-Friendly Design: A Primer for Smart Growth*. Smart Growth Network Manual, 1999.
[12] Fehr & Peers on behalf of The City of Port Orchard. *Port Orchard Pedestrian Crossing Guidelines*. December 2016.

Figure 12: Midblock Crossing Design Guidance



Bicycles

There are no existing bicycle facilities on either Bethel Road or Sedgwick Road and the community has voiced an interest in providing access for cyclists on both corridors.

Bicycle Facility Design

The corridor design for both Bethel Road and Sedgwick Road include a 6-foot wide, curb-side bicycle lane. The National Association of City Transportation Officials (NACTO), states conventional bike lanes are appropriate for streets with greater than 3,000 daily vehicles and speeds between 25mph and 35mph which describes the conditions on both study corridors.[13] Further bicycle facility design guidance can be found in NACTO's *Urban Bikeway Design Guide (Second Edition)*.

[13] NACTO. *Urban Bikeway Design Guide, Second Edition*. New York: Island Press, 2014. Pages 4-8.

On Sedgwick Road, in addition to the on-street bike lane, the design includes a 10-foot wide sidewalk or shared-use path on both sides of the roadway. When traveling eastbound on Sedgwick Road from SR 16, there is a considerable hill which can present a barrier for bicyclists, especially those who are less comfortable riding next to moving traffic. In addition, Sedgwick Road is forecasted to carry more traffic than Bethel Road with two lanes in each direction which makes it less bike-friendly. In order to accommodate less experienced riders given these conditions, the sidewalk on Sedgwick Road is designed to be 10-feet wide, 2-feet wider than on Bethel Road, which will allow it to function more like a shared-use path. During further design phases, consideration should be given to the path materials and signage to communicate to pedestrians and bicyclist that this is a shared space.

Bicycles in Roundabouts

At roundabouts, ramps are provided upon entering and exiting to transition cyclists between the roadway and a wide sidewalk. Cyclists are given the option to navigate the roundabout the same way a pedestrian would, using the crosswalks to make their way through the intersection, and reentering the on-street bike lane after the roundabout. However, more experienced cyclists may choose to merge into the traffic lane and use the circulating lane of the roundabout.

Bicycles at Bus Stops

Where possible, the City would like to provide bike facilities that wrap around bus stops to ensure that bicyclists can safely get around buses that are stopped at the curb, blocking the bike lane. NACTO's *Urban Bikeway Design (Second Edition)* provides guidance on this treatment.[14]

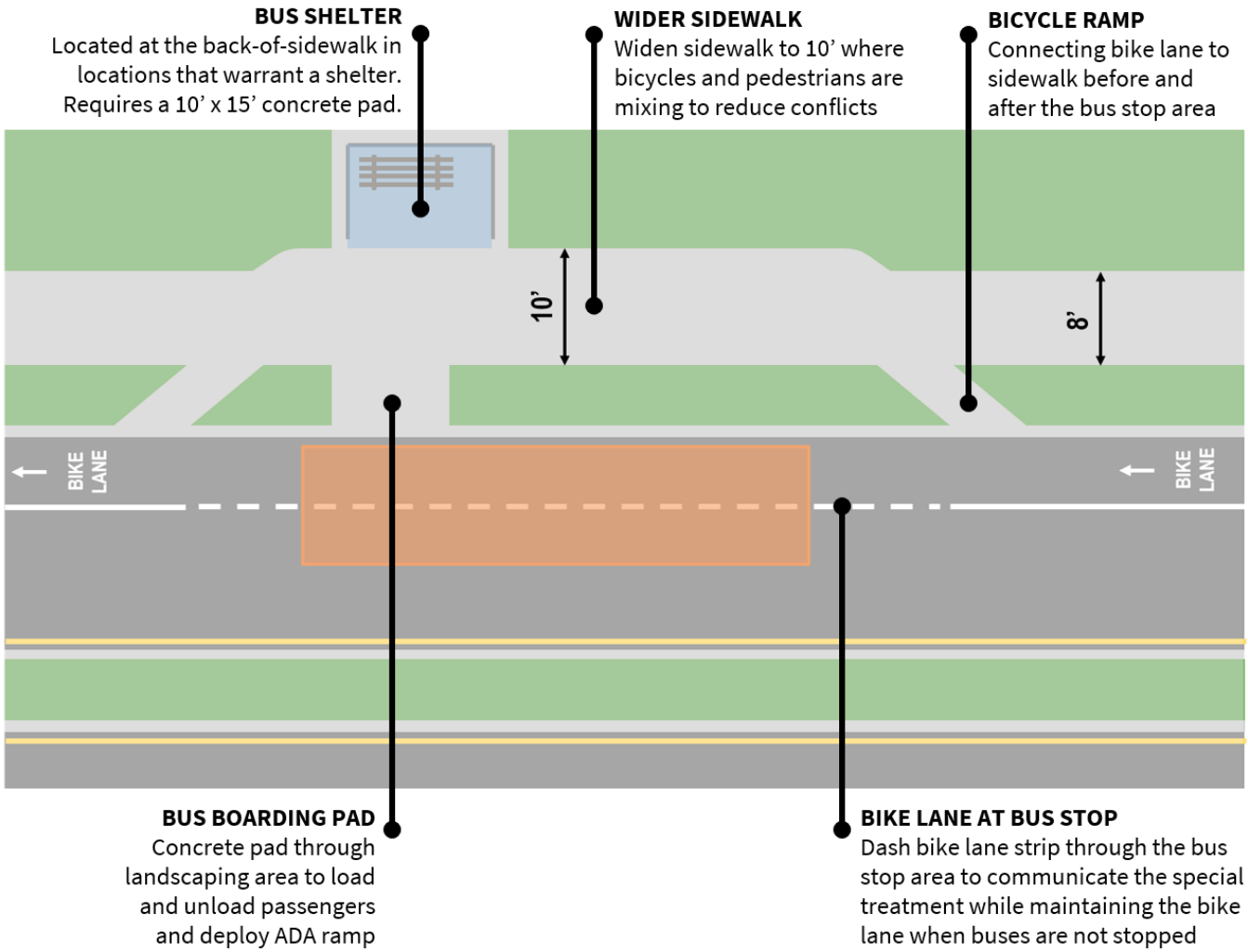
The majority of the time, a bus will not be present at the bus stop. For that reason, it is recommended that the on-street bike lane remain through the bus stop to allow bicyclists to use the bike lane when a bus is not present. Remaining in the on-street bike lane when it is available will reduce the conflicts between cyclists and pedestrians.

Figure 13 provides a possible design concept for the 'wrap around' treatment which would only be needed at Type A and Type B bus stop locations. At Type B bus stop locations, the City may also consider a 'bulb-out' at the bus stop to allow busses to stay in-lane while picking up or dropping off passengers and discourage vehicles from passing stopped buses on the left. However, this 'bulb-out' design would require bicyclists to either use the sidewalk or vehicle lane, even when a bus is not present.

At Type C locations, bicycle ramps are placed on the approach to the roundabout before the bus stop. If a 'wrap around' treatment is incorporated into the design, it will introduce additional right-of-way impacts that will need to be considered.

[14] NACTO. *Urban Bikeway Design Guide, Second Edition*. New York: Island Press, 2014. Pages 32-33.

Figure 13: Bike Lanes at Bus Stops Design Guidance

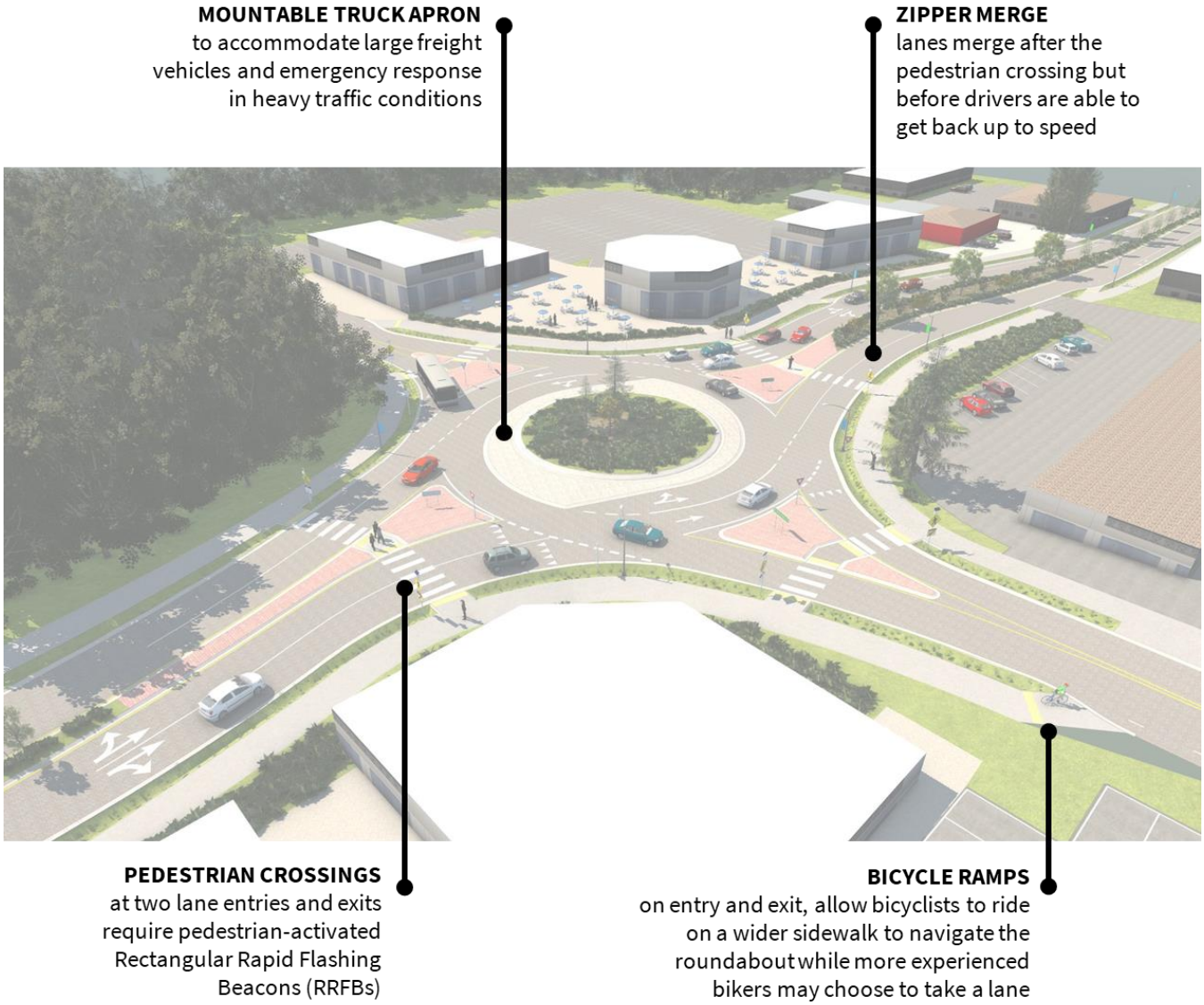


Roundabout Design

Whenever possible, single-lane roundabouts are preferred over multi-lane roundabouts. Single-lane roundabouts have fewer conflict points, use up less right-of-way, and are easier to navigate for vehicles, pedestrians, and bicycles alike. Of all eight roundabouts included in the corridor plan, only Blueberry Road and Lincoln Avenue/Lundberg Avenue are expected to process the 2040 forecasted volumes as single-lane roundabouts. A single-lane roundabout was also identified as an interim design for the Salmonberry Road intersection. All other roundabouts in the corridor plan are designed as multi-lane roundabouts.

All roundabouts in this corridor plan were designed to accommodate WB-67 on the major street and WB-40 on the side streets. In addition, fire trucks and busses will be able to navigate the roundabouts and stay within a single lane. **Figure 14,** which illustrates the full-build design of the Bethel Road and Salmonberry Road intersection, highlights roundabout design features, some of which apply to both single-lane and multi-lane roundabouts.

Figure 14: Roundabout Design Guidance



The planned multi-lane roundabouts have been designed to encourage a zipper merge when exiting the roundabout. When driving through multi-lane roundabouts, vehicles tend to stagger themselves because they do not like to travel directly next to another vehicle while turning. As a result, they exit the roundabout staggered and ready to merge. To improve safety, the merge point is purposely located after the pedestrian crossing but early enough that vehicles will not be back up to full speed. In addition, no indication is provided that one lane has right-of-way over the other (i.e. no 'merge left' or ‘right lane ends’ signs). Taking this design approach limits aggressive driving behaviors and encourages better ‘zippering’ upon exiting the roundabout.

Critical Areas

A preliminary review of critical areas within the study area revealed potential wetland and fish habitat impacts that will require further study in the following design phases. In accordance with Washington's State Environmental Policy Act (SEPA) and Kitsap County's Critical Areas Ordinance (COA), detailed analysis of the potential environmental impacts associated with the construction of the planned improvements will be performed. Any direct impacts to wetlands, steams, or their standard buffers will require a mitigation plan and related permitting.

The most notable potential wetland impact is located on the northeast corner of Bethel Road and Sedgwick Road. The construction of a roundabout at this intersection and/or the widening of Sedgwick Road east of Bethel Road is likely to encroach on a wetland area located between the existing Chevron gas station and Les Schwab Tire Center.

County-Owned Parcels

Following the County's Bethel Corridor Study in the early 2000's, several land parcels were purchased by the County to accommodate the stormwater retention facilities for the corridor improvement project that was never realized. Due to the Federal rules surrounding property acquisition, these parcels cannot be bought by the City for the same purpose unless the previous property owner provides written documentation that they were fairly compensated at the time of purchase.

In siting stormwater retention ponds, County-owned parcels should be avoided if there is another vacant parcel that can provide the same function. However, there are right-of-way impacts to County-owned parcels that will need to be resolved before construction can begin. The City is currently working to resolve these conflicts.

Emergency Response

During the planning process, the project team consulted with Kitsap Fire and Rescue to ensure that the conceptual design did not inhibit their emergency response operations or negatively impact response times. Emergency response shared concerns about the raised median. On Sedgwick Road and Bethel Road, the raised median limits access and could potentially increase response times if emergency vehicles were only able to make turns at the roundabout intersections. On Bethel Road, which only has one travel lane in each direction, the raised median also reduces the curb-to-curb width which limits the ability of emergency response vehicles to pass vehicles on the roadway when necessary.

In response to their concerns, the City has proposed to provide clear zones with a mountable curb at regularly spaced intervals along the Bethel Road and Sedgwick Road raised medians. These clear zones will be free of landscaping and wide enough to accommodate U-turns for emergency vehicles. Recommended spacing is a clear zone every 400-feet. On Bethel Road, to allow for emergency vehicles to pass stalled or pulled over vehicles, the City proposes to construct a 1-foot concrete apron with mountable curb around the center median instead of a typical curb which would widen the effective width of the street to 19.5-feet in each direction. Emergency vehicles would be able to mount the median and encroach on the landscaped area when necessary.

Speed Limit

The City may consider a speed limit reduction on Bethel Road to better align with the conceptual design which promotes walkability, bike-ability, and calmer traffic. When a significant portion of the corridor has been reconstructed, a reduction from the current posted speed of 35 mph to 25 mph may be appropriate. A

pedestrian hit by a car going 35mph is over twice as like to die from the impact when compared to a car going 25 mph.[15]

Parking

There are advantages and disadvantages to consider when thinking about whether or not to allow on-street, parallel parking on mixed-use and commercial corridors. When you think of your favorite, walkable downtown center, chances are it has on-street parking. On-street parking is often considered an asset in downtown environments because it buffers pedestrians from vehicle traffic, creates a more active street scape, and has a tendency to calm traffic.

However, there are downsides to on-street parking that must be considered as well. On-street parking can limit visibility and impact sight-lines at intersection and crossing locations. Bike lanes are often located next to parked cars which poses a door hazard for bicyclists. Parking lanes increase the amount of impervious surface which increases stormwater runoff. On constrained corridors, on-street parking also uses valuable right-of-way that could be allocated to other street scape amenities such as planting strips, bike lanes, or wider sidewalks. Lastly, parallel, and angled parking maneuvers on collector streets cause friction between vehicles which reduces corridor capacity and increases the opportunity for collisions.

Over 80% of survey respondents felt that there is currently enough parking available when visiting businesses on Bethel Road.

After weighing the pros and cons, the design decision for both Sedgwick Road and Bethel Road was to not include on-street parking. Many of the existing and planned developments along both corridors have off-street, or on-site, parking requirements which are expected to satisfy the parking needs of residents and visitors.

As residential and mixed-use development occurs in the Bethel/Sedgwick subarea, on-street parking should be considered for the lower volume side street network, such as Salmonberry Road and Blueberry Road.

Access Management

Except for the section of Bethel Road between Lincoln Avenue and Mile Hill Drive, the long-term plan for both of the study corridors is to have an uninterrupted, raised median which prohibits left-turn movements except for at roundabout intersections. In terms of project phasing, corridor segments with a center median will only be constructed if the segment is book-ended by roundabout intersections to ensure U-turns are possible and that access to all existing and future properties is maintained.

Minimum Spacing Requirements

Going forward, the City wants to take a proactive and coordinated approach to approving access along both of these development corridors. Any new access request along the corridors will require review and approval from the City. Driveway consolidation and shared access along property lines is preferred and the following minimum spacing requirements between access points, driveways or intersections, will be adopted.

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[15] Tefft, Brian C. AAA Foundation for Traffic Safety. *Impact Speed and a Pedestrian's Risk of Sever Injury or Death.* Washington DC, 2011.

On Sedgwick Road, the City will maintain WSDOT's Class 3 access management designation which requires minimum spacing of 330-feet between access points. In the event WSDOT changes the access management designation of Sedgwick Road, the City will adopt the updated standard.

On Bethel Road, the City will implement a minimum spacing of 200-feet between access points, measured from centerline to centerline of the intersecting driveway or roadway. On road segments divided by a raised median, spacing minimums will only apply to access points on the same side of the road. On road segments with a two-way left-turn lane, spacing minimums will be applied to both sides of the street meaning off-set intersections or driveways must be meet the minimum spacing requirement. Deviations from the access spacing standards will require approval by Public Works.

Adjacent Street Connections

A more connected street grid adjacent to Bethel Road and Sedgwick Road will improve the efficiency of both corridors. Not only will a side street network dispurse traffic – reducing pressure on the arterial – they also provide important alternative routes in the event of an emergency or construction activity. A more complete 'street grid' also increases walkability and bikability by increasing route choice. As development occurs, every effort should be made to improve and create street connections along and/or within developed parcels. These connections are illustrated as dashed lines in **Appendix C**.

Vallair Court Connector

The Vallair Connector was identified as a potential developer-driven project that could relieve pressure at the access points at SE Vallair Court and SE Bethel Valley Lane which serve two single family home residential developments and a fast-food restaurant. These access points currently allow full access which creates safety and congestion issues at this busy location on the Bethel Road corridor. As a condition of any future development which adds vehicle trips to these access points, the impacted access point will be restricted to right-in/right-out. If necessary, the developer may opt to construct an additional full-access roadway that connects to the existing controlled intersection which provides access to Walmart on the east side of Bethel Road.

Bethel/Sedgwick Subarea Connectors

The parcels located north and south of Sedgwick Road between SR 16 and Bethel Road are well-poised for development, especially given the recent zoning code changes. As development occurs, it will be critical to construct alternate access and connecting streets to improve circulation and mobility. The City is looking for opportunities to add, complete, or improve parallel east-west connections north of Sedgwick Road between Geiger Road and Ramsey Road, north-south connections from Sedgwick Road to Sherman Avenue, and east-west connections south of Sedgwick Road between Bravo Terrace, Geiger Road, and Bethel Road.

Walmart Connector

Just south of Walmart, there is a large parcel which is likely to developed within the next 20 years. If and when that happens, a north-south connection between the Walmart site and Salmonberry Road should be constructed as a part of the site. An additional access on Salmonberry Road has the potential to divert traffic from Bethel Road and would be especially attractive to people that live or work to the east of the study area.

State Facilities

Washington State Department of Transportation (WSDOT) will require an Intersection Control Analysis (ICA) to support the proposed changes to intersections on Sedgwick Road (SR 160). The ICA is a 5-step process meant to screen and evaluate alternatives to determine the best possible intersection type and design. Based on feedback from stakeholder coordination meetings, WSDOT would prefer a single ICA for the Sedgwick Road study segment instead of ICA's for each of the proposed intersection locations. A combined ICA will be able to speak to the overall corridor approach and better explain the rationale for relocating intersection control to the roundabout locations.

Often an ICA is conducted by a private entity and initiated in relation to a specific development proposal. However, given the State's preference for a corridor-level ICA, the City may choose to take on the ICA effort using the analysis done as a part of this corridor study as a solid foundation. A City-initiated ICA will formally establish the City's vision for the Sedgwick Road corridor and more effectively guide future development opportunities.

Landscaping

Landscaping along a corridor does more than just look pretty. Street trees and planting strips improve the pedestrian experience by providing shade and adding visual interest. Plants also mitigate pollution from vehicle traffic, improve air quality, and help treat stormwater runoff. And streets trees can visually narrow the roadway, helping to calm traffic and reinforce speed limits.

All planting areas require maintenance, but some require more than others. WSDOT has indicated that they will not provide maintenance on any landscaped areas on a state facility, such as SR 160, and will require an agreement with the City to carry out the required maintenance. In choosing plants and other landscape materials, every effort should be made to limit maintenance needs by choosing those that are well-suited for the specific location and environment.

Street trees used in the median should be tolerant of compacted, infertile soils and drought-resistant. For medians with widths of 12-feet or less, trees that have a mature size of 30-feet or less are preferred. Larger trees tend to grow slowly due to confinement of the root system which makes them unstable and more likely to fall or the roots out-grow the space and break the curbs or roadway surface. Trees with columnar branching patterns are preferred to round branching patterns because they limit the need for pruning and reduce potential visibility issues. In Washington, good median street species include Amur Maackia, Adirondack Crabapple, Red Barron Crab Apple, Amanogawa Flowering Cherry, and Red Cascade Mountain Ash.[16] Additionally, Mount Vernon Laurel is a preferred shrub for median islands because it provides a dense groundcover that deters weed growth.

Plant species used in the landscaping strip along the sidewalk, which also acts a stormwater bioretention swale, should be tolerant to wet soils and flood conditions. Examples of good bioswale vegetation include the Juncus, Scirpus, and Carex. A valuable resource for bioswale vegetation is the Department of Ecology's *Rain Garden Handbook for Western Washington: A Guide for Design, Installation, and Maintenance (2013)*.

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[16] City of Seattle, *Master Tree List*, 2011. <https://www.seattle.gov/trees/docs/2011-Master_Tree_List.pdf>

Juncus acuminatus

Scirpus microcarpus

Carex oshimensis

Utilities

Stormwater

A high-level stormwater analysis was conducted to identify infiltration pond sizing requirements and preliminary locations. The proposed stormwater improvements were designs according to The City of Port Orchard Municipal Code Section 20.150 (POMC). Port Orchard has adopted the Washington State Department of Ecology Stormwater Manual for Western Washington (SWMMWW) and the Puget Sound Partnership Low Impact Development Technical Guidance Manual for Puget Sound.

The stormwater facilities are designed to treat, store, and discharge stormwater associated with the proposed roadway improvements. The facilities were sized to handle only the runoff associated with the improved roadways surfaces. The proposed ponds are not regional facilities designed to handle development outside of the right-of-way. As per Port Orchard development codes, development sites are required to provide their own site-specific stormwater facilities.

The stormwater concept design, on both Sedgwick Road and Bethel Road, consists of 6-foot wide biorientation swales on either side of the roadway, between the curb and the sidewalk. Curb cuts are located every 30 feet to allow runoff to enter the bioretention swale. Collected stormwater will be treated as it infiltrates the bioswale and conveyed by pipes and catch basins to a series of six (6) infiltration ponds. All the infiltration ponds, except for one, are planned to discharge into Blackjack Creek. The single pond that does not have direct access to Blackjack Creek is assumed to have 100% infiltration.

North of Lincoln Road on the east side of Bethel Road, there is a stormwater facility that is known to be failing. When that phase of the project is advanced, alternatives should be considered to decommission the existing drainage line and develop a drainage conveyance concept that will handle the bypass stormwater flow.

Details about the stormwater concept plan and the analysis can be found in **Appendix F**.

Electrical and Telecommunications

The City of Port Orchard, as stated in the municipal code, has a long-range goal that all electrical and telecommunication distribution lines shall be underground, with only transformers, switchgear splice pedestals and similar facilities extending above ground. A preliminary review of the corridor indicates that undergrounding is feasible according to the Schedule 74 cost-sharing agreement, however further analysis will be required to determine the estimated costs.

Puget Sound Energy (PSE) and West Sound Utility District (WSUD) were consulted during the study to get initial feedback on the conceptual design. PSE staff identified one utility pole located on the west side of Bethel Road just north of Salmonberry Road that would be difficult to relocate or underground because of the amount of fiber optic communication lines located on the pole.

As the project moves from preliminary design into final design and construction, two factors will have significant cost implications in relation to utility relocation and undergrounding:

- During preliminary design, the survey will determine if existing utility infrastructure is located on easements outside of the right-of-way or within the right-of-way under a franchise agreement. Utilities that are currently in easement that are anticipated to be acquired as right-of-way will pose the biggest challenges. New easements required for utility relocations along with temporary construction easements need to be determined prior to the right of way acquisition process.
- During final design, careful planning must be given to the staging of construction activities to limit the number of temporary relocations of utilities which is a cost that they City would be responsible for under the City's current Schedule 74 Agreement.

Illumination

Illumination is an important feature for every street. Not only does it provide for safer conditions for all road users, street lights with can help to create a sense of place and define the character of a particular area or district.

On Sedgwick Road (SR 160), as a state facility, the illumination will be installed per WSDOT standards. On Bethel Road, the City will explore the feasibility of installing street lights that are aligned with the desired street character. For instance, they may be heights more appropriate to the scale of the street, they may accommodate banners, or they may provide illumination for the sidewalk in addition to the street. The City will also explore opportunities for seamless integration of small cell antennae into street light design.

Street lights along both corridors are to be located in the bioretention area or landscaped buffer between the roadway and the sidewalk. Spacing will be consistent with existing conditions with adequate illumination at every marked crosswalk.

Costs & Funding

Cost Estimates

Planning-level cost estimates were developed for each of the project phases. The estimates included the following line items:

- Construction Cost (including 25% contingency)
- Utility Relocation/Undergrounding (2% of total construction cost)
- Preliminary Engineering (10% of total construction cost)
- Construction Engineering (15% of total construction cost)
- Right-of-Way Acquisition Cost (including 10% contingency)

Table 5 summarizes the preliminary cost estimate by phase. Detailed cost estimates, including all assumptions, are provided in **Appendix G**.

Table 5: Preliminary Cost Estimates by Project Phase

Project Phase	Estimated Cost *(2018 Dollars)*
Phase 1: Bethel Road – Salmonberry Rd to Blueberry Rd	$11,970,000
Phase 2: Sedgwick Road – SR 16 NB Ramps to Bethel Rd	$16,670,000
Phase 3: Bethel Rd – Blueberry Rd to Sedgwick Rd	$5,820,000
Phase 4: Bethel Rd – Lund Ave to Salmonberry Rd	$8,750,000
Phase 5: Bethel Road – Mile Hill Dr to Lund Ave	$10,540,000
Total Project Cost	**$53,740,000**

Funding Opportunities

We anticipate that the projects identified in this plan will be funded through a combination of City, State, and development-driven funding mechanisms. Phase 2 and Phase 3 are both located on a state facility, SR 160, and therefore it is expected that some amount of cost sharing will be involved. A few of the potential funding mechanisms are described below.

Local Funding Mechanisms

The City of Port Orchard has established a Transportation Impact Fee (TIF) system for collecting impact fees from developers based on the estimated traffic generation of the development activity. The City's impact fee is calculated based on an impact fee study that establishes which transportation projects are needed to support growth and determines what percent of each project cost is needed to support growth versus to correct existing deficiencies. Impact fees collected can be applied to cover the share of costs related to growth for projects included in the City's Transportation Improvement Program (TIP) list which is updated annually.

Grant Opportunities

There are a number of grant opportunities which would be applicable to the Bethel Road and Sedgwick Road corridor projects. Depending on the grant program, they can be administrated on the federal, state, or regional level. Kitsap County is unique in that it is represented by both the Peninsula Regional Transportation Planning Organization (PRTPO) and Puget Sound Regional Council (PSRC) but the City of Port Orchard works most closely with PSRC. Brief descriptions of potential grant opportunities are included below.

Better Utilizing Investments to Leverage Development (BUILD)

Administered by the US Department of Transportation (DOT), the BUILD grants replace the pre-existing Transportation Investment Generating Economic Recovery (TIGER) grant program. BUILD is a highly-competitive grant program that supports multi-modal, rail, road, transit and port projects that have a significant local or regional impact. Funding is available for both planning projects and capital projects. In contrast to other federal-aid programs, funds can be provided directly to any public entity, including municipalities. Projects are evaluated based on merit criteria related to safety, economic competitiveness, quality of life, environmental protection, state of good repair, innovation, partnership, and additional non-Federal revenue for future transportation infrastructure investments.

Surface Transportation Block Grant Program (STBG)

Administered by the Federal Highways Administration (FHWA), STBG is the most flexible of the federal-aid programs provided through the Fixing America's Surface Transpiration (FAST) Act. STBG funds can be applied to almost any transportation related planning, design or construction project. PSRC oversees the allocation of STBG funds to local jurisdictions.

Highway Safety Improvement Program (HSIP)

HSIP provides funding for projects that aim to reduce serious traffic injuries and deaths, consistent with Washington's Target Zero: Strategic Highway Safety Plan. WSDOT administers the program and makes a call for projects every two years. HSIP funding can be applied to design, right-of-way acquisition, and construction phases of eligible projects. Eligible projects include corridor or intersection improvements that use engineering countermeasures to reduce fatal and serious injury crashes, such as the construction of roundabouts and raised medians which are recommended on both Bethel Road and Sedgwick Road.

WSDOT Statewide Transportation Improvement Program (STIP)

Washington's STIP is a fiscally constrained plan that represents the highest priority transportation projects across local, regional, and state levels. Only projects on the STIP are authorized to access federal funds through the Federal Highway Administration (FHWA). To be incorporated into the STIP, projects must first be identified in the City's Transportation Improvement Program (TIP) as well as PSRC's Regional Transportation Improvement Program (RTIP). Projects are then forwarded to WSDOT using a web-based system for consultation and possible inclusion in the STIP, which is updated annually. Projects on the STIP usually have regional significance such as the Sedgwick Road widening (Phase 2).

Pedestrian and Bicycle Program

WSDOT administers the Pedestrian and Bicycle Program which provides grants for projects that that reduce collisions with pedestrians and bicyclists and increase walking and biking activity. Funding is can be used for construction as well as for design-only projects that lead to construction-ready pedestrian and bicycle improvement projects.

Safe Routes to School (SRTS)

WSDOT also oversees a competitive grant program to fund projects that increase the number of students walking and biking to school safely. SRTS funds can be used for infrastructure improvements located within two miles of a school and all public agencies responsible for administering local transportation safety programs are eligible to apply. The segment of Bethel Road north of Lund Avenue (Phase 5) may be a good candidate for this grant program due to its proximity to East Port Orchard Elementary School and the scope of work which is largely adding bike lanes, sidewalks, and a bioswale to the existing roadway profile.

Transportation Improvement Board (TIB) Grants

There are two TIB grant pools available to cities like Port Orchard with populations of 5,000 or greater. The Sidewalk Program (SP) supports transportation projects (not recreation) on a federally classified roadway to improve pedestrian safety, access, connectivity, and address system continuity. Funds can only be applied to sidewalk construction tasks. The Urban Arterial Program (UAP) supports roadway construction projects that score well in one of four bands: safety, growth and development, physical condition, or mobility. All projects must also be rated in sustainability and constructability categories.

Appendices

A) Community Survey Results Summary
B) Traffic Operations Analysis Memo
C) Conceptual Corridor Design Roll Plots
D) Draft Right-of-Way Plans
E) Sensitivity Analysis Results
F) Stormwater and Drainage Technical Memo
G) Preliminary Cost Estimates