# SR 16, Tacoma Narrows Bridge to SR 3, Congestion Study


## FINAL

December 28, 2018

WSDOT

Olympic Region Planning
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Olympia, WA 98504-7440

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**Washington State Department of Transportation**
**Olympic Region**
**Tumwater, Washington**

# SR 16 Tacoma Narrows Bridge to SR 3 Congestion Study

**Project Limits:**

SR 16 MP 8.0 to 29.1

SR 3 MP 30.4 to 38.9

SR 304 MP 0.0 to 1.6

December 2018

John Wynands, P.E.
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**Washington State Department of Transportation**
**Olympic Region**

# SR 16 Tacoma Narrows Bridge to SR 3 Congestion Study

Approved by:

2/8/19

John Wynands — Date

WSDOT Olympic Region Administrator

Concurrence:

Kerri Woehler 2-7-2019

Kerri Woehler — Date

Director, Multimodal Planning

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# Acronyms and Abbreviations

| | |
|---|---|
| EJ | Environmental Justice |
| FAST | Freight Action Strategy |
| FHWA | Federal Highway Administration |
| HCM | *Highway Capacity Manual* |
| HCS | Highway Capacity Software |
| HOV | high-occupancy vehicle |
| HSP | Washington State Highway System Plan |
| I- | Interstate |
| ITE | Institute of Transportation Engineers |
| ITS | Intelligent Transportation System |
| LOS | level of service |
| mph | miles per hour |
| NCHRP | National Cooperative Highway Research Program |
| PBPD | Performance-Based Practical Design |
| PSIC-B | Puget Sound Industrial Complex - Bremerton |
| PTR | permanent traffic recorder |
| RMSE | root mean square error |
| SMTP | Washington State Multimodal Transportation Plan |
| SR | State Route |
| TAG | Technical Advisory Group |
| TAZ | traffic analysis zone |
| TDM | Travel Demand Management |
| TNB | Tacoma Narrows Bridge |
| WSDOT | Washington State Department of Transportation |

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# Participating Agencies and Individuals

The following individuals participated in the creation of the SR 16, Tacoma Narrows Bridge to SR 3, Congestion Study as Study Stakeholder Committee members (stakeholder representative of their jurisdictions) and study staff:

Kitsap County
- Commissioner Charlotte Garrido
- David Forte, Policy and Planning Manager
- Jeff Shea, Traffic Engineer

Pierce County
- Councilmember Derek Young

Pierce County Planning and Land Services
- Jesse Hamashima, Transportation Planning Supervisor
- Gary Hendricks, Senior Planner

City of Bremerton
- Mayor Greg Wheeler
- Thomas Knuckey, City Engineer
- Shane Weber, Engineering Manager

City of Port Orchard
- Mayor Robert Putaansuu
- Councilmember Bek Ashby
- Mark Dorsey, Director of Public Works

City of Gig Harbor
- Mayor Kit Kuhn
- Steve Misiurak, City Engineer
- Aaron Hulst, Senior Engineer
- Dave Rodenbach, Finance Director

Kitsap Transit
- John Clauson, Executive Director
- Edward Coviello, Transportation Planner

Pierce Transit
- Sue Dreier, Chief Executive Officer
- Jason Kennedy, Planner Analyst

Port of Bremerton
- Axel Strakeljahn, Commissioner
- Fred Salisbury

Naval Base Kitsap-Bremerton
- Captain Edward Shrader
- Lynn Wall

WSDOT
- Steve Roark, Assistant Region Administrator
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WSDOT Olympic Region, Traffic Operations
- Joseph Perez, Traffic Design Engineer

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- Dennis Engel
- Nazmul Alam
- Theresa Turpin

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# Executive Summary

The purpose of the State Route 16, Tacoma Narrows Bridge to State Route 3, Congestion Study is to identify corridor strategies and solutions to address congestion and traffic operational issues on State Route (SR) 16 between the Tacoma Narrows Bridge (TNB) and SR 3, and along SR 3 between the City of Bremerton and Bremerton Airport, including the SR 16/SR 3 interchange at Gorst. Interchanges on both corridors have high levels of congestion during peak travel times.

SR 16 provides access from Tacoma and the surrounding area to the Olympic Peninsula and the cities of Gig Harbor, Port Orchard, and Bremerton. Commuter traffic originating in the study area uses SR 16 and the TNB to reach employment in the Tacoma area and other south Puget Sound destinations. At the north end of the corridor is the Naval Base Kitsap-Bremerton. The Navy attracts commuter traffic from throughout the study area.

The SR 16 TNB to SR 3 Congestion Study is a Washington State Department of Transportation (WSDOT) Connecting Washington funded project. The project was guided by the WSDOT, an Executive Committee, and Technical Advisory Group representing local jurisdictions and transportation agencies in the corridor. Participants are listed in the preceding pages.

A Gorst Planning Study was initiated in 2015 by the Kitsap Regional Coordinating Council, using the WSDOT Practical Solutions approach to evaluate potential solutions to improve mobility issues in the Gorst vicinity; SR 3/SR 16 between Bremerton and Port Orchard. There is significant local concern about traffic in the Gorst area. Travel through the Gorst vicinity is an important regional connection for Naval Base Kitsap-Bremerton, which is one of the five largest employers in Washington State. In the event of an emergency, there is no good alternate route into Bremerton. A key outcome of the Gorst study was to consider the Gorst needs in the context of an overall corridor study area incorporating SR 16 and SR 3 operations. Prior to its completion, the Gorst Planning Study was integrated with this SR 16 Congestion study.

This report presents the results of a highly technical and robust analysis of the SR 16 and SR 3 study area to identify the most promising and practical solutions to the congestion and operational issues in the SR 16 and SR 3 corridors. The report provides stakeholders the tools to identify and prioritize the improvements needed to realize the corridor vision.

### Corridor Vision

To initiate this study, a corridor vision was prepared by the Technical Advisory Group (TAG) and Executive Committee with input from corridor stakeholders. The corridor vision guided the preparation of study goals, performance measures, performance metrics, recommendations, and prioritization of solutions.

The TAG envisions the SR 16 and SR 3 transportation corridors will:

- ✓ Operate efficiently with reliable travel times
- ✓ Serve regional travel and connect local communities
- ✓ Support business and residential growth in the local communities
- ✓ Enhance multimodal access and mobility; improve public and environmental health
- ✓ Strengthen connections between major economic and job centers and accommodate fluctuating workforces

# Study Approach

This study employed the Federal Highway Administration (FHWA) and WSDOT Practical Solutions approach to planning. This approach encourages system performance management through cost-effective operational improvements first, by considering demand management opportunities and second, after exhausting other options, by considering capacity expansion. Central to Practical Solutions planning is a process that identifies regional and corridor performance, engages communities to ascertain local contexts and needs, and applies methods to evaluate and implement phased near-term, mid-term, and long-term solutions. The Practical Solutions approach is to engage the community and local stakeholders at the earliest stages of scope definition to ensure their input is included at the right stage of the solution development process. The TAG and Executive Committee developed the corridor vision, provided feedback on performance gaps to ensure the evaluation aligned with the corridor vision, and provided local expertise to the review of study findings. The outcome of Practical Solutions planning is a recommended set of multimodal strategies that are cost-effective and balance the goals and objectives of state and local needs.

WSDOT's Practical Solutions approach is being applied at the direction of the Washington State Legislature and is consistent with the FHWA Performance-Based Practical Design process. With the Practical Solutions approach, collaborative decisions contribute to success in project delivery, and are emphasized through the context-sensitive design approach in WSDOT's practical design policies. Convening a Multiagency, Interdisciplinary and Stakeholder Advisory (MAISA) Team is an accepted approach to meet the intent of these policies. The advisory team in the Practical Solutions approach is a collaborative body that provides recommendations to the WSDOT project manager and engineer of record, specifically in these areas:

- Need identification
- Context identification
- Design control selection
- Alternative Formulation
- Performance Trade-off Decision Preferences (including weighing environmental constraints and regulatory issues)
- Alternative Evaluation

Key to the Practical Solutions approach is a robust technical analysis of corridor conditions for existing conditions and three horizon years. Future year analysis established the baseline conditions to evaluate performance measures that were prepared relative to the study vision and goals. The analysis was then applied to measure the performance gap. Solutions were developed to close the performance gap between baseline performance and desired performance. The solutions were tested in alternative packages of solutions framed by level of investment over time. The results of the alternative packages were used to prepare a set of recommendations consistent with the Practical Solutions methodology. The recommendations include over 150 total solutions, with 76 solutions recommended and the remaining solutions not recommended for programming within the 20-year planning horizon.

Figure ES-1 presents the structure for proposed new investment of the recommended strategies phased by level of investment over time.

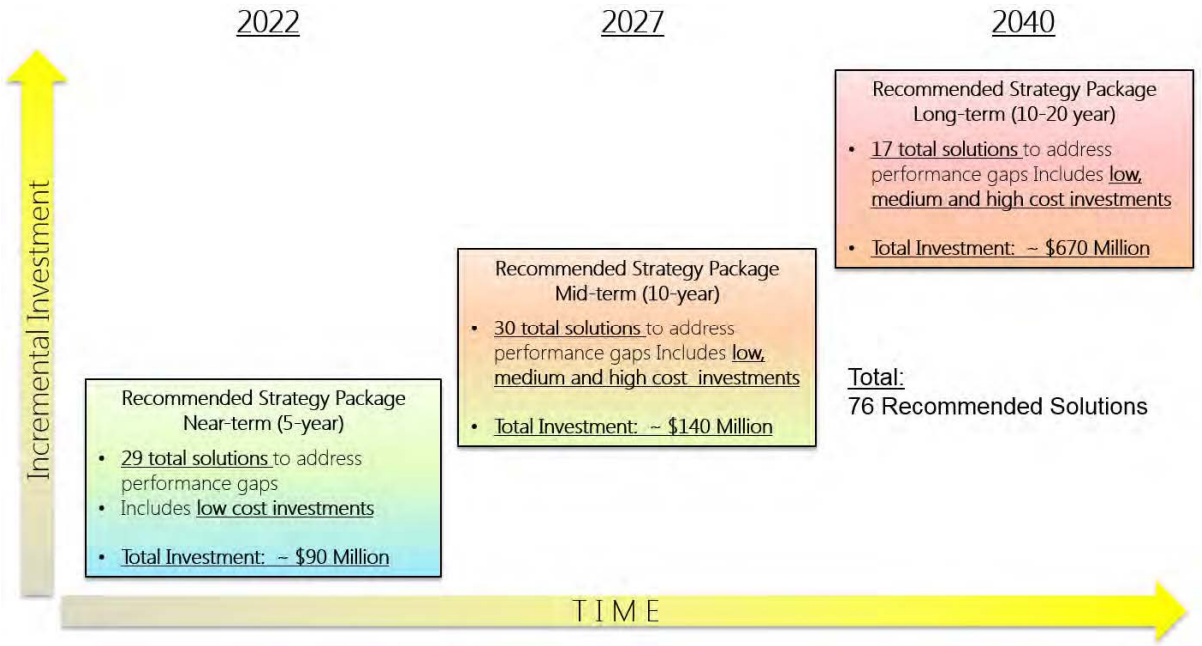



**Figure ES-1. Recommended Strategy Packages by Incremental Investment and Timeframe**

Recommended solutions by corridor sub-areas are shown in Figures ES-2, ES-3, ES -4, and ES-5.

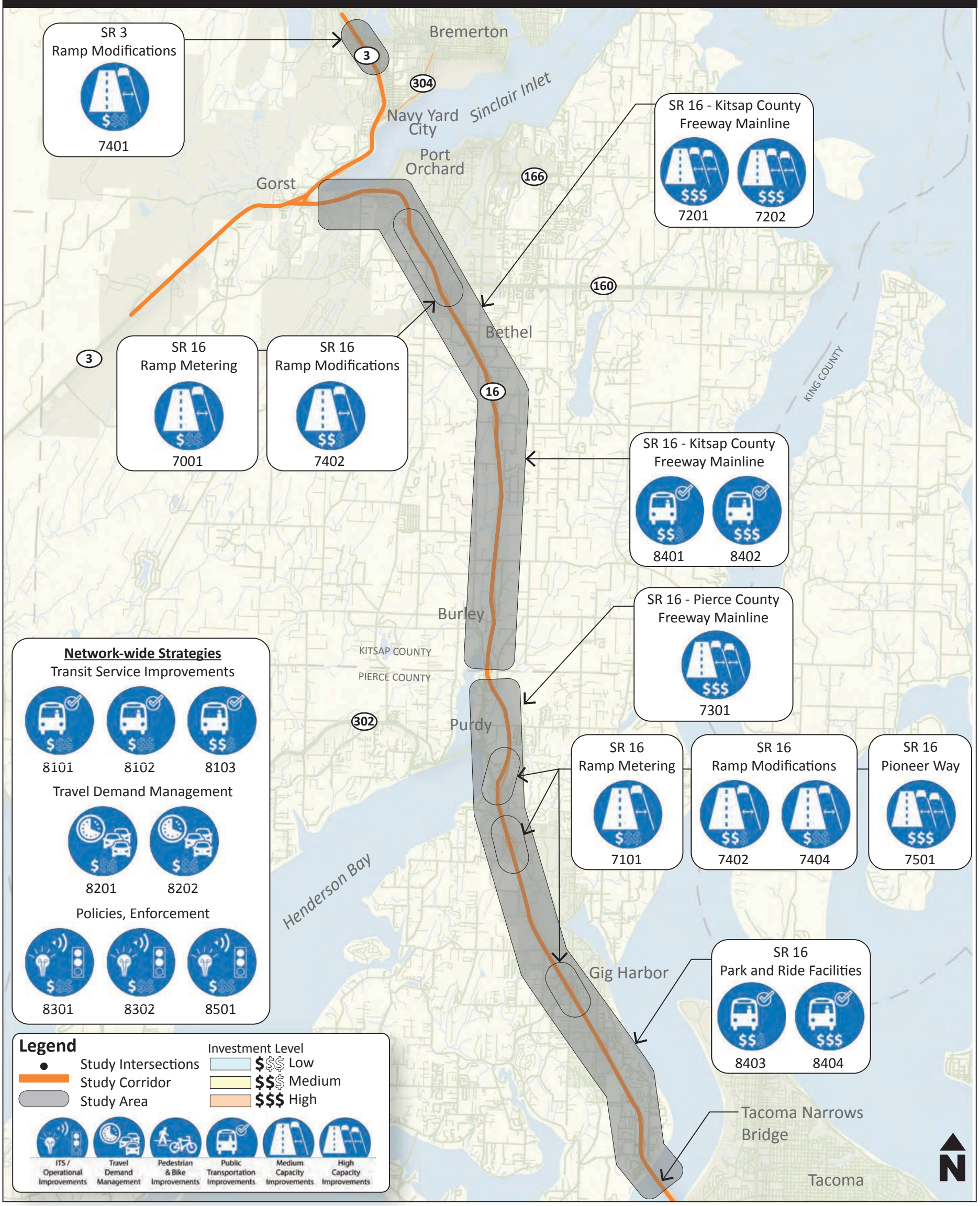
Appendix A includes a complete list of recommended solutions. Highlights of these recommendations includes:

- Operational, channelization, and signal/ITS improvements at key local and state locations
- Capacity improvements at key local and state facilities by widening, roundabout, or signal installations
- Improving pedestrian and bicycle facilities by the extension of the Cushman Trail, new facilities between Bremerton and Port Orchard, and additions or enhancement to bike lanes along corridor
- SR 3 and SR 16 capacity improvements by peak-use shoulder lanes and widening
- SR 304/Naval Base Kitsap-Bremerton area improvements at Farragut Avenue and Charleston Beach Road
- SR 3/SR 16 interchange access control, intersection improvements, and grade separation
- Tremont Street and Sedgwick Road interchange capacity improvements at key intersections
- SR 302 and Borgen Boulevard Interchange capacity, operational, and queue storage improvements
- Olympic Drive, Wollochet Drive, and Hunt Street crossing operational and capacity improvements

Corridor-wide recommendations include:

- Travel Demand Management strategies
- Increased coordination of incident response
- Plans for addressing resiliency and climate change
- Additional park and ride capacity and coordination between agencies

## Figure ES.2 Network-Wide




## Recommended Solutions

| ID | Recommended Solution | Horizon |
|---|---|---|
| 7001 | Ramp metering at Tremont St, Sedgwick Rd interchanges | Mid-term (10 yrs) |
| 7201 | Peak-use shoulder lanes, Sedgwick Rd to SR 166 | Mid-term (10 yrs) |
| 7202 | Widen SR 16 mainline, Mullenix Rd to SR 166 | Long-term (20 yrs) |
| 7101 | Ramp metering at SR 302, Borgen Blvd, Pioneer Way | Mid-term (10 yrs) |
| 7404 | Extend on-ramp lengths, SR 16/Wollochet-Pioneer interchange | Mid-term (10 yrs) |
| 7501 | Reconstruct SR16/Wollochet-Pioneer interch. to full Diamond | Long-term (20 yrs) |
| 7301 | Peak-use shoulder lanes, SR 302 to Olympic Dr | Long-term (20 yrs) |
| 7401 | Extend off-ramps, Loxie Eagans Blvd, Kitsap Way | Mid-term (10 yrs) |
| 7402 | Extend off-ramps, Tremont St, SR 302, Burnham, Pioneer | Mid-term (10 yrs) |

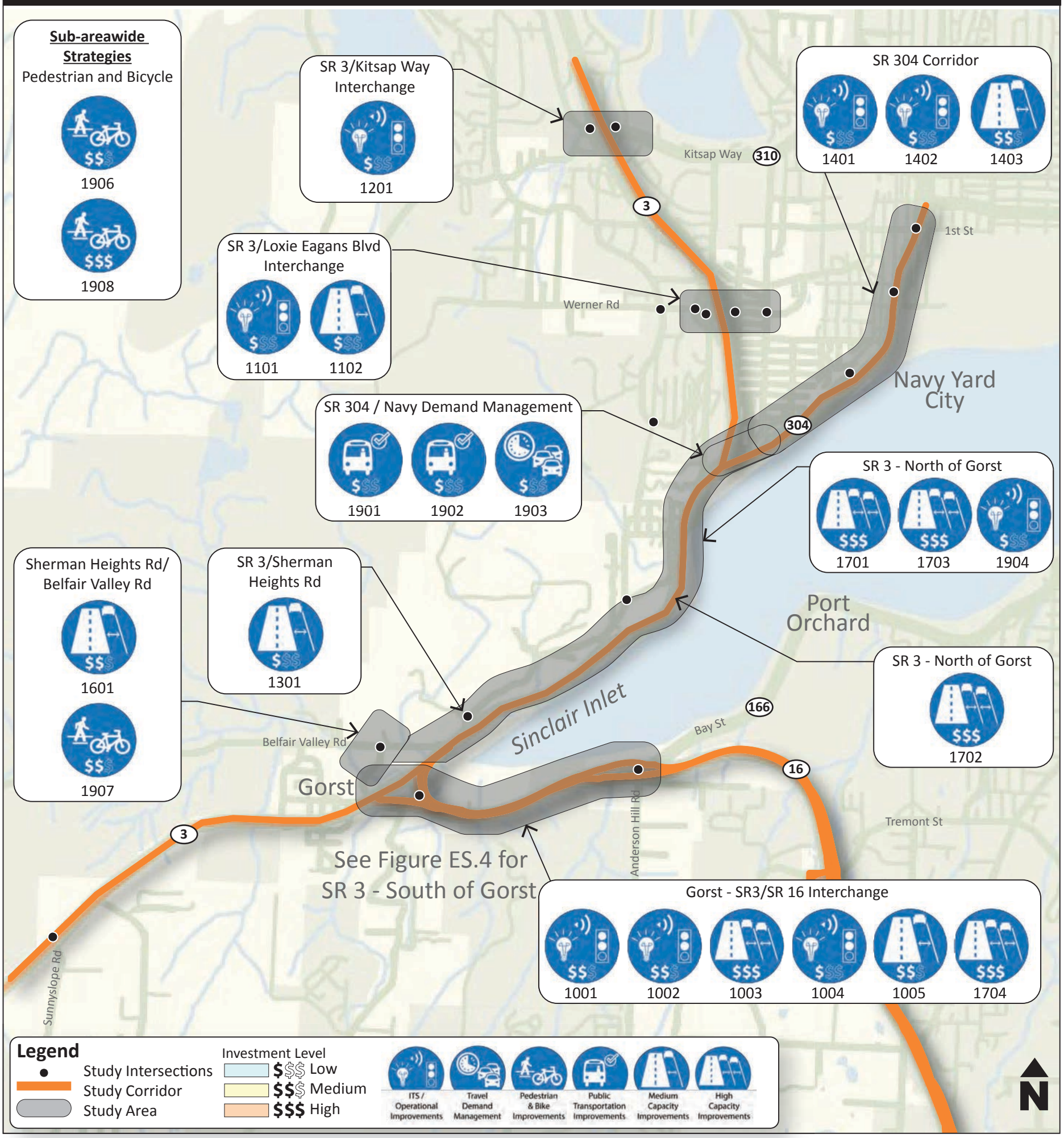
**Network-wide Strategies**

| ID | Recommended Solution | Horizon |
|---|---|---|
| ***Transit Service*** | | |
| 8101 | Improve access to make transit more attractive for riders | Near-term (5 yrs) |
| 8102 | Enhance regional transit agency coordination through Interagency Transit Implementation Plan | Near-term (5 yrs) |
| 8103 | Enhance regional transit agency coordination from Bremerton to Tacoma Dome Station | Near-term (5 yrs) |

**Network-wide Strategies**

| ID | Recommended Solution | Horizon |
|---|---|---|
| ***Travel Demand Management*** | | |
| 8201 | Implement TDM via carpool, vanpool incentives | Near-term (5 yrs) |
| 8202 | Implement TDM via community-wide information | Near-term (5 yrs) |
| ***Policy/Enforcement*** | | |
| 8301 | Improve cross agency coordination for work on roadways | Near-term (5 yrs) |
| 8302 | Additional incident response teams (IRT) | Near-term (5 yrs) |
| ***Park and Ride Lots*** | | |
| 8401 | Convert existing lot or add capacity to existing park and ride facilities in Kitsap County | Mid-term (10 yrs) |
| 8403 | Convert existing lot or add capacity to existing park and ride facilities in Pierce County | Mid-term (10 yrs) |
| 8402 | Construct new park and ride facility in Kitsap County | Long-term (20 yrs) |
| 8404 | Construct new park and ride facility in Pierce County | Long-term (20 yrs) |
| ***Ferries*** | | |
| 8501 | Explore modifying Washington State Ferry schedules | Near-term (5 yrs) |

## Figure ES.3 Bremerton/Gorst Sub-Area




## Recommended Solutions

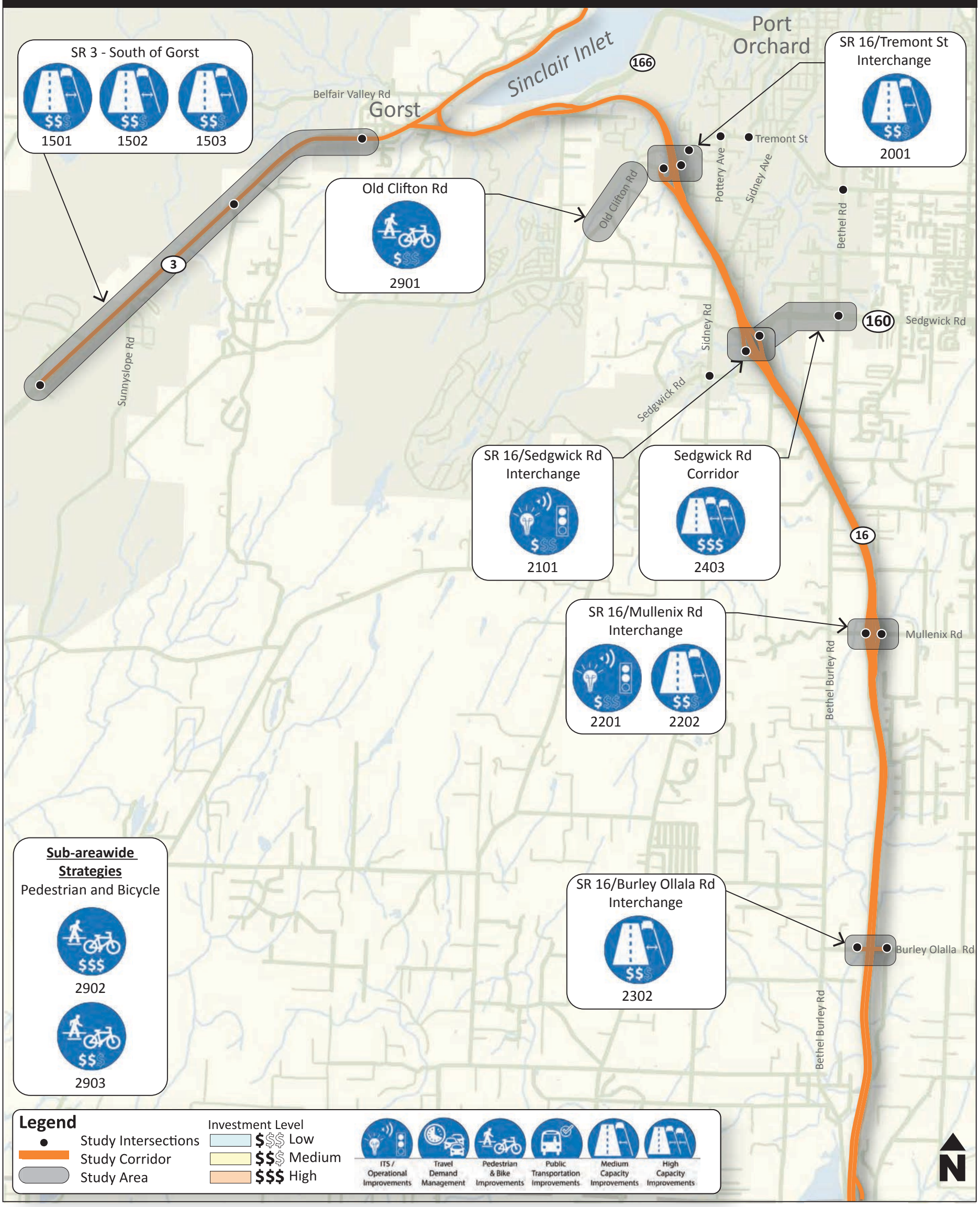
| ID | Recommended Solution | Horizon |
|---|---|---|
| 1002 | Implement access management strategies through Gorst | Near-term (5 yrs) |
| 1004 | Traffic signal operations improvements, SR 3 at Sam Christopherson Ave | Near-term (5 yrs) |
| 1001 | Restriping/rechannelization to maintain SR 16 lane continuity through Gorst | Mid-term (10 yrs) |
| 1005 | Construct roundabout, SR 3 at Sam Christopherson Ave | Mid-term (10 yrs) |
| 1003 | Reconstruct SR 16/SR 3 interchange | Long-term (20 yrs) |
| 1101 | Intersection capacity and traffic signal improvements, Loxie Eagans Blvd at National Ave | Near-term (5 yrs) |
| 1102 | Install traffic signal or roundabout, SR 3 SB off-ramp to Loxie Eagans Blvd | Mid-term (10 yrs) |
| 1201 | Traffic signal operations improvements, SR 3 SB off-ramp to Kitsap Way | Near-term (5 yrs) |
| 1301 | Install traffic signal or roundabout, SR 3 SB off-ramp to Sherman Heights Rd | Mid-term (10 yrs) |
| 1401 | Traffic signal operations improvements, SR 304 at Charleston Beach Rd | Near-term (5 yrs) |
| 1402 | Traffic signal operations improvements, SR 304 at Cambrian Ave/Farragut Ave | Mid-term (10 yrs) |
| 1401 | Traffic signal operations improvements, SR 304 at Charleston Beach Rd | Long-term (20 yrs) |
| 1403 | Intersection capacity and traffic signal improvements, SR 304 at Cambrian Ave/Farragut Ave | Long-term (20 yrs) |

| ID | Recommended Solution | Horizon |
|---|---|---|
| 1601 | Install traffic signal or roundabout, Sherman Heights Rd at Belfair Valley Rd | Mid-term (10 yrs) |
| 1701 | Implement peak-use shoulder lanes along SR 3 between Gorst and SR 304 | Near-term (5 yrs) |
| 1702 | Implement peak-use shoulder lanes along SR 3 between railroad trestle and SR 304 | Mid-term (10 yrs) |
| 1703 | Add capacity on SR 3 between Gorst and SR 304 | Long-term (20 yrs) |
| 1704 | Elevated roadway though Gorst | Long-term (20 yrs) |

**Sub-Areawide Strategies**

| ID | Recommended Solution | Horizon |
|---|---|---|
| ***Travel Demand Management and Policy*** | | |
| 1901 | Increase or improve HOV enforcement on SR 304 HOV lane | Near-term (5 yrs) |
| 1903 | Explore opportunities to enhance high-performing TDM strategies at the Naval Base | Near-term (5 yrs) |
| 1904 | Increase redundancy/resiliency between Naval Base and Gorst | Near-term (5 yrs) |
| 1902 | Increase vanpool occupancy requirements | Mid-term (10 yrs) |
| ***Pedestrian and Bicycle*** | | |
| 1907 | Add/enhance pedestrian and bicycle facilities along Sam Christopherson Ave to Otto Jarstad Park | Mid-term (10 yrs) |
| 1906 | Add/enhance pedestrian and bicycle facilities along Sherman Heights Rd between Bremerton and Gorst | Near-term (5 yrs) |
| 1908 | Add/enhance pedestrian and bicycle facilities between Bremerton and Port Orchard | Mid-term (10 yrs) |

## Figure ES.4 Port Orchard Sub-Area



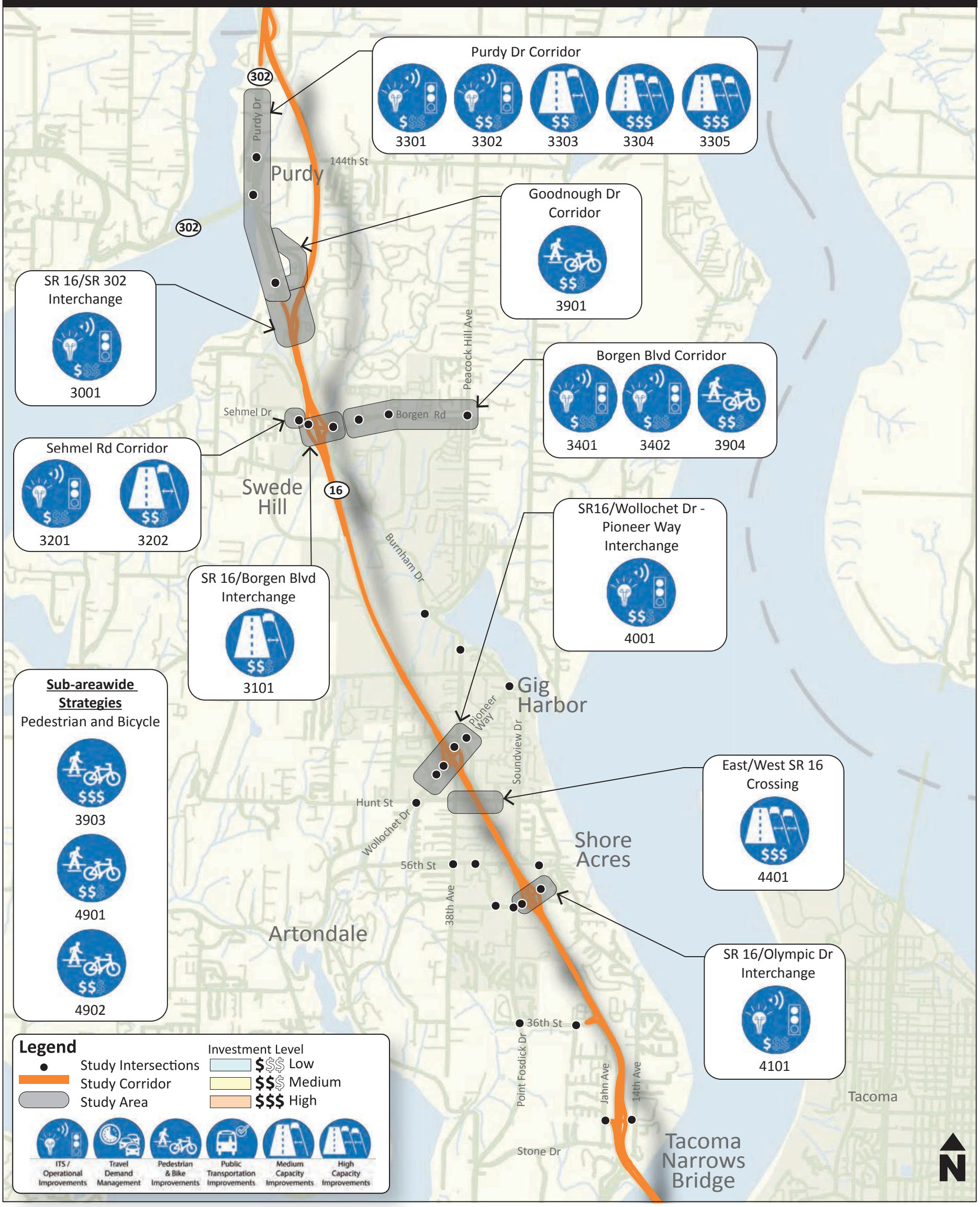

## Recommended Solutions

| ID | Recommended Solution | Horizon |
|---|---|---|
| 1501 | Install traffic signal or roundabout, SR 3 at Division Ave | Mid-term (10 yrs) |
| 1502 | Install traffic signal or roundabout, SR 3 at Sunnyslope Rd | Mid-term (10 yrs) |
| 1503 | Install roundabout, SR 3 at Imperial Way | Long-term (20 yrs) |
| 2001 | Install traffic signal or roundabout, SR 16 EB ramp to Old Clifton Rd, SR 16 WB ramp to Tremont St | Mid-term (10 yrs) |
| 2101 | Intersection capacity improvements, SR 16 WB ramp and Sedgwick Rd | Near-term (5 yrs) |
| 2201 | Intersection capacity improvements, SR 16 EB ramp and Mullenix Rd | Near-term (5 yrs) |
| 2202 | Install traffic signal or roundabout, SR 16 EB at Mullenix Rd | Mid-term (10 yrs) |
| 2202 | Install traffic signal or roundabout, SR 16 WB at Mullenix | Long-term (20 yrs) |
| 2302 | Install traffic signal or roundabout, SR 16 EB and SR 16 WB at Burley Olalla Rd | Long-term (20 yrs) |
| 2403 | Implement arterial widening improvements, traffic signal timing improvements | Long-term (20 yrs) |

**Sub-Areawide Strategies**

| ID | Recommended Solution | Horizon |
|---|---|---|
| ***Pedestrian and Bicycle*** | | |
| 2901 | Add/enhance pedestrian and bicycle facilities along Old Clifton Rd west of SR 16 to city limits | Mid-term (10 yrs) |
| 2902 | Extend the Cushman Trail to Port Orchard, improve/add regional trails | Long-term (20 yrs) |
| 2903 | Add/enhance pedestrian and bicycle facilities along Bethel Rd and along Sidney Rd | Mid-term (10 yrs) |

## Figure ES.5 Purdy / N. Gig Harbor Sub-Area




## Recommended Solutions

| | | |
|---|---|---|
| 3001 | Implement WSDOT "Zipper Merge" signage at SR 16 WB off-ramp to SR 302 | Near-term (5 yrs) |
| 3101 | Intersection capacity improvements, SR 16 WB ramp and Borgen Blvd | Long-term (20 yrs) |
| 3201 | Intersection capacity improvements, Burnham Dr at Sehmel Dr | Near-term (5 yrs) |
| 3202 | Install roundabout, Burnham Dr at Sehmel Dr | Mid-term (10 yrs) |
| 3301 | Traffic signal operations improvements along Purdy Dr at SR 302 Spur and at 144th St | Long-term (20 yrs) |
| 3302 | Intersection capacity and traffic signal improvements, SR 302 at Purdy Dr | Near-term (5 yrs) |
| 3303 | Install signal or roundabout, Purdy Dr at Goodnough Dr | Mid-term (10 yrs) |
| 3304 | Implement arterial widening improvements, SR 302/Purdy Dr between SR 16 interchange ramps | Long-term (20 yrs) |
| 3305 | Complete the SR 302 EIS as a part of SR 302, Elgin Clifton Rd to SR 16, Congestion Study | Long-term (20 yrs) |
| 3401 | Int. capacity improvements, Borgen Blvd. at Harbor Hill | Mid-term (10 yrs) |
| 3402 | Int. capacity improvements, Brogen Blvd at Peacock Hill | Near-term (5 yrs) |

| ID | Recommended Solution | Horizon |
|---|---|---|
| 3901 | Add/enhance pedestrian and bicycle facilities between Burnham Dr and PHS | Long-term (20 yrs) |
| 4001 | Intersection capacity, traffic signal improvements at SR 16 EB and SR 16 WB ramp terminals | Near-term (5 yrs) |
| 4101 | Traffic signal operations improvements, SR 16 EB and SR 16 WB at Olympic Dr | Near-term (5 yrs) |
| 4401 | Add grade separated crossing at SR 16/Hunt St | Long-term (20 yrs) |

**Sub-Areawide Strategies**

| ID | Recommended Solution | Horizon |
|---|---|---|
| ***Pedestrian and Bicycle*** | | |
| 3903 | Extend the Cushman Trail to Kitsap County, improve/add regional trails | Mid-term (10 yrs) |
| 3904 | Add/enhance pedestrian and bicycle facilities along Peacock Hill Ave, Harbor Hill Dr, Canterwood Blvd | Mid-term (10 yrs) |
| 4901 | Complete gaps in Cushman Trail and Scott Pierson Trail | Mid-term (10 yrs) |
| 4902 | Add/enhance bicycle facilities along Harborview Dr, Soundview Dr | Mid-term (10 yrs) |

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# Chapter 1 Introduction

## 1.1 Introduction

The purpose of the State Route (SR) 16, Tacoma Narrows Bridge (TNB) to SR 3, Congestion Study is to identify corridor strategies to address congestion and traffic operational issues on SR 16 between the TNB and SR 3, and along SR 3 between the City of Bremerton and Bremerton Airport. The corridor is 31 miles long, with 61 local intersections, and 16 interchanges, including the SR 16/SR 3 interchange at Gorst. Interchanges in the study area experience high levels of congestion during peak travel times.

The study area as shown in Figure 1-1 includes the SR 16 mainline from the TNB (milepost 8) to its terminus in Gorst (milepost 29.1), SR 3 between the Bremerton Airport (milepost 30.4) and the SR 310 interchange (milepost 38.9), and SR 304 (S. Charleston Boulevard) between SR 3 (milepost 0) and 1st Street in Bremerton (milepost 1.6). The Gorst Planning Study was integrated with this SR 16 Congestion Study prior to completion of the Gorst Planning Study.

Regional and local traffic is served by the primary and connecting roadways in the study area. SR 16 provides access from Tacoma and the surrounding area to the Olympic Peninsula and the cities of Gig Harbor, Port Orchard, and Bremerton. Commuter traffic originating in the study area uses SR 16 and the TNB to reach employment in the Tacoma area and other south Sound destinations. At the north end of the corridor is the Naval Base Kitsap-Bremerton. The Navy attracts commuter traffic from throughout the study area. Sixteen interchanges are present along the SR 16 and SR 3 study corridors.

The SR 16 TNB to SR 3 Congestion Study is a Washington State Department of Transportation (WSDOT) Connecting Washington project. The 2015 Connecting Washington funding package is a $16 billion, 16-year investment that enhances the statewide transportation system and maintains critical infrastructure, primarily by an 11.9-cent gas tax increase that was fully phased-in on July 1, 2016. The Kitsap Regional Coordinating Council successfully applied and received the grant for this study.

The project was guided by the WSDOT, an Executive Committee, and Technical Advisory Group (TAG) representing local jurisdictions and transportation agencies in the corridor.

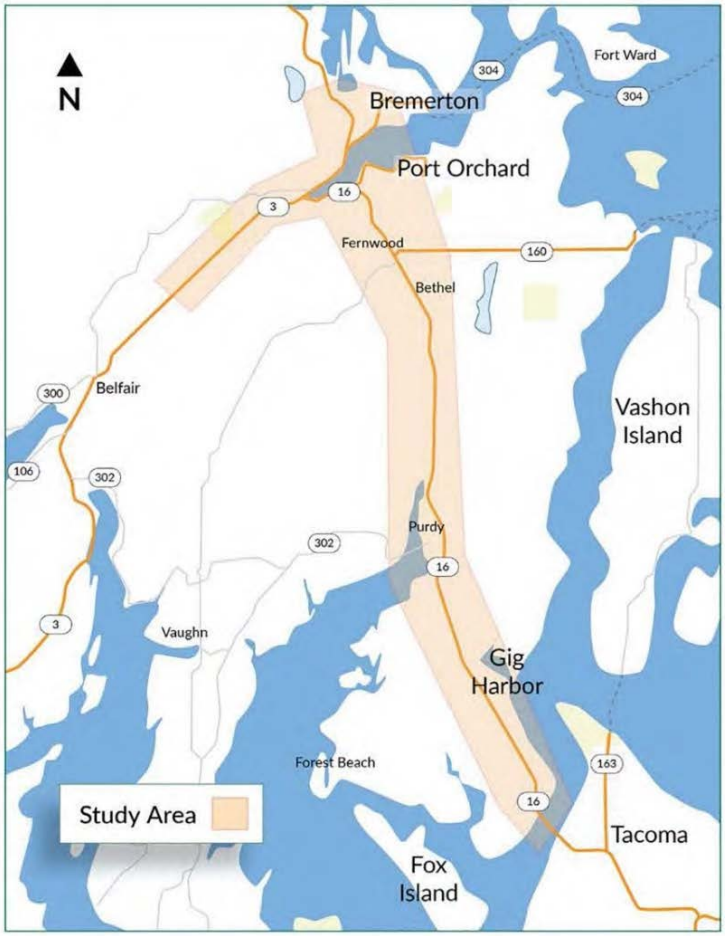


**Figure 1-1. Study Corridor**

## 1.2 Project Vision

A performance gap is the primary reason for an investment in a strategy, program, or project. At a high level, traffic congestion in the SR 16 to SR 3 study corridor is the performance gap that instigated the study. For the SR 16, TNB to SR 3, Congestion Study, the performance gap is rooted in the project description:

> The SR 16, TNB to SR 3, Congestion Study is a Connecting Washington funded project that examines congestion in the SR 16 corridor. The study provides a robust technical analysis of solutions to current and future congestion in the corridor by identifying strategies through the Practical Solutions approach.

Contextual needs reflect issues of interest beyond the performance gap and are important for discussing trade-offs during decision making. Study area examples of contextual needs include land use changes, changes in modal demands, addressing environmental concerns/goals, or maximizing benefits for cost.

The initial draft needs statement, provided below, encompassed the performance gap and contextual needs for the study area. As detailed below, a more concise, data-driven, performance-based statement was developed.

The needs statement addresses the following six questions, consistent with WSDOT's July 2017 *Guidance Documents – Information about WSDOT's Practical Design Procedures*.

1. What is the problem? / What is wrong?
2. Where is it happening?
3. When is it occurring?
4. To what extent? How bad is it? What is the magnitude of the problem?
5. Why is it important to solve it now?
6. What will be used to measure success? (what metric is involved?)

### 1.2.1 Needs Statement

Identifying needs is a key component of WSDOT's Practical Solutions data-driven approach. Development of the needs statement is documented in the technical memorandum*, SR 16, Tacoma Narrows Bridge to SR 3, Congestion Study: Needs Statement Approach and Needs Statement*, Final, March 2017 (Appendix B). The study team with input from the TAG and Executive Committee, prepared the corridor needs statement, as presented below.

> *SR 16 between the Tacoma Narrows Bridge and SR 3, and SR 3 between the City of Bremerton and Bremerton Airport, provide critical regional transportation connections for people who use vehicles, transit, bicycles, and walking to get to their jobs and other destinations. They are also vital links for people, businesses, industry, and the military who rely on freight and goods movement.*
>
> *These corridors currently experience high levels of vehicle traffic congestion at peak travel times throughout the corridor that create spillover traffic on local streets. A recent traffic analysis for the AM peak hour showed that 25 of 150 highway segments, and 9 of 61 intersections in the corridor area do not meet performance standards for a regional controlled access highway. In the PM peak hour, 22 highway segments and 17 intersections in the corridor area do not meet performance standards. Planned regional and local population and employment growth are expected to result in even more people and freight relying on the corridor for mobility. The PM traffic conditions in 2040*

*are forecasted to worsen so that up to 69 highway segments, and up to 31 of 61 intersections in the corridor area do not perform at expected levels.*

*People lack access to multimodal travel options such as walking, bicycling, or transit in some areas of the corridors, which can make it difficult for people without access to personal vehicles or who choose not to use personal vehicles to travel. The lack of facilities and connections for non-motorized travel modes can affect personal and environmental health.*

*In some parts of the corridor design, geometrics, and access management may create bottlenecks in the regional transportation network or impact community cohesion, and regional economic vitality. Additionally, some parts of the corridor are susceptible to floods during major storm events and are vulnerable to climate impacts; this results in a lack of resiliency to climate change which interrupts local and regional connections and access to Naval Base Kitsap-Bremerton, the Puget Sound Industrial Center – Bremerton (PSIC-B), and the Olympic Peninsula.*

### 1.2.2 Corridor Vision, Study Goals, Performance Measures, and Metrics

The TAG established the corridor vision and eight goals to guide the performance gap analysis and strategy development.

**Corridor Vision**
SR 16 and SR 3 are transportation corridors that:

- ✓ Operate efficiently with reliable travel times
- ✓ Serve regional travel and connect local communities
- ✓ Support business and residential growth in the local communities
- ✓ Enhance multimodal access and mobility; improve public and environmental health
- ✓ Strengthen connections between major economic and job centers and accommodate fluctuating workforces

**Study Goals**

- ✓ Relieve vehicle congestion and improve travel time reliability in the study corridor
- ✓ Coordinate with state and local agencies to minimize high levels of vehicle traffic congestion on the surrounding local roadway network
- ✓ Support existing and future planned business and residential growth
- ✓ Invest in strategies that improve multimodal travel options and advance public health
- ✓ Reduce transportation impacts on the environment
- ✓ Be consistent with the Target Zero Washington Strategic Highway Safety Plan
- ✓ Preserve or enhance critical connections to industrial and institutional facilities, such as Port of Bremerton, Naval Base Kitsap-Bremerton, and PSIC-B
- ✓ Provide strategies that maximize efficient and smart investments as defined by the Practical Solutions approach.

Each study goal has performance measures and for each measure the metric is identified. The performance measures and metrics were developed by the team in coordination with the data collection and study methodology, and with input from the TAG and Executive Committee. For example, Goal 1 is to “Relieve vehicle congestion and improve travel time in the study corridor.” There are three performance measures, one of which is the level of service (LOS) at interchange ramp terminals. The

metric is the percent of SR 16 and SR 3 ramp terminals that meet LOS standards during the AM and PM peak hours. This metric provides a method of evaluating entire strategy packages and a corridor level of benefit as the ramp terminal intersections, that fall below the LOS standard, are improved to meet the standard. Table 1-1 presents the study goals, performance measures, and performance metrics.

**Table 1-1. Study Goals, Performance Measures, and Metrics**

| Study Goal | Performance Measure | Performance Metric |
|---|---|---|
| Study Goal #1:<br>Relieve vehicle congestion and improve travel time in the study corridor | 1.1) LOS at state highway interchange ramp terminals | Percentage of SR 16 and SR 3 ramp terminal intersections meet LOS performance thresholds during AM and PM peak hours |
| | 1.2) Queuing at ramp terminal intersections | Percentage of queues at SR 16 and SR 3 ramp terminals do not spill back to mainline for during the AM and PM peak hours. |
| | 1.3) LOS at state highway mainline, merge, diverge, and weaving segments | Percentage of SR 16 and SR 3 highway segment meet LOS performance thresholds during the AM and PM peak hours |
| | 1.4) Corridor segment travel time along SR 16 and SR 3 | Travel time for the following segments:<br>• Port Orchard to/from Naval Base Kitsap-Bremerton<br>• Port Orchard to/from Bremerton (SR 3/Kitsap Way)<br>• TNB to/from Port Orchard |
| Study Goal #2:<br>Coordinate with state and local agencies to minimize high levels of vehicle traffic congestion on the surrounding local roadway network | 2.1) LOS at study area local intersections | Percentage of local study intersections meet LOS performance thresholds during AM and PM peak hours for the following sub-areas:<br>• Gorst/Bremerton<br>• Port Orchard<br>• North Gig Harbor/Purdy<br>• Gig Harbor |
| Study Goal #3:<br>Support existing and future planned business and residential growth | 3.1) Transportation and land use integration and efficiency | Percentage of key study intersections near the following large-scale developments meet LOS performance thresholds during AM and PM peak hours:<br>• Puget Sound Industrial Complex Bremerton (PSIC-B)<br>• Unincorporated growth surrounding PSIC-B<br>• Bremerton - Downtown Sub-area<br>• Bremerton - Industrial zoned area<br>• Gig Harbor - Industrial zoned area |

**Table 1-1. Study Goals, Performance Measures, and Metrics**

| Study Goal | Performance Measure | Performance Metric |
|---|---|---|
| | | • Gig Harbor – Commercial area between Olympic and Pioneer interchanges<br>• Port Orchard - SE Sedgwick Rd corridor |
| Study Goal #4:<br>Invest in strategies that improve multimodal travel options and advance public health | 4.1) Transit route travel time index | Aggregate transit route travel time index |
| | 4.2) Frequency of transit service | Buses per hour |
| | 4.3) Bicycle facility connectivity | Percent of missing bicycle facilities within 1/2 mile of the interchange |
| | 4.4) Pedestrian facility connectivity | Percent of missing (or hazard) pedestrian facilities within 1/2 mile of the interchange |
| | 4.5) Pedestrian crossings | Number of grade-separated pedestrian crossing per mile along SR 16 and SR 3 limited access corridors |
| Study Goal #5:<br>Reduce transportation impacts on the environment | 5.1) Potential permanent impacts on sensitive areas (wetlands, streams and waterbodies, floodplains, and geologic hazards) | Number of impacts that would increase project costs due to potential mitigation and/or design modifications/retrofits |
| | 5.2) Potential to improve wildlife connectivity across the corridor (fish passable culverts and/or wildlife crashes) | Level of potential improvement to wildlife connectivity categorized by Low, Medium, or High |
| Study Goal #6:<br>Be consistent with the Target Zero Washington Strategic Highway Safety Plan | 6.1) Potential to decrease fatal and serious injury crashes | Level of potential improvement to lower number of fatal and serious injury crashes categorized by “Improvement” or “No Improvement” over baseline scenario |
| Study Goal #7:<br>Preserve or enhance critical connections to industrial and institutional facilities, such as Port of Bremerton, Naval Base Kitsap-Bremerton, Puget Sound Industrial Center – Bremerton, and Pierce County industrial and institutional areas | 7.1) Freight and person-trip connections to Port of Bremerton, Naval Base Kitsap-Bremerton, Puget Sound Industrial Center – Bremerton, Pierce County industrial and institutional areas | For the following critical connections, number of alternative routes that exist that does not increase existing travel time by more than 200 percent:<br>• SR 3, between SR 304 and Gorst<br>• SR 16, west of Gorst<br>• SR 16 at Port Orchard<br>• SR 16 at Purdy/SR 302<br>• SR 16 at Gig Harbor |

**Table 1-1. Study Goals, Performance Measures, and Metrics**

| Study Goal | Performance Measure | Performance Metric |
|---|---|---|
| Study Goal #8:<br>Provide strategies that maximize efficient and smart investments as defined by the Practical Solutions approach | 8.1) Cost-Effectiveness | Cost-effectiveness ratio: Sum of the costs/sum of the benefit scores |

Source: Appendix B, *Needs Statement Approach and Needs Statement, Technical Memorandum*, March 2017

### 1.2.3 Practical Solutions Approach

The SR 16 Congestion Study incorporates performance-based Practical Solutions at the corridor level by developing packages of solutions as near term/low cost, medium term/medium cost, and long term/high cost. Each of these packages is modeled for performance and the outcome of the model is used to calculate performance metrics. The terminology used in this process for the SR 16 Congestion Study are provided below:

- **Performance measure:** Description of a category of performance metrics.
- **Performance metric:** Actual unit of measure used to calculate the performance; for example, "travel time by mode."
- **Performance gap:** The specified need at a location and by year as determined by the quantitative or qualitative analysis, defined by the performance metric, as the difference between the baseline and desired conditions. The performance metric is applied to existing and future baseline conditions to determine the performance gap.
- **Strategy package:** Grouping of solutions, based on performance gaps, level of investment and implementation timeframe. Several strategy packages were evaluated, and a preferred strategy package was developed based upon input from the public and stakeholders. Each of the packages has a mix of solutions and ideas from the public, the TAG, and planned future of local jurisdictions and agencies in the corridor.
- **Strategy:** Broad categories of similar solutions. For the *SR 16 Congestion Study* six strategies are used to categorize and evaluate solutions, as shown in Table 1-2.
- **Solution:** Transportation network improvement or demand management policy meant to solve a performance gap at a defined location and categorized by level of investment. Solutions are more detailed than an idea but broad enough to encompass multiple design and construction options. (i.e. a potential "intersection improvement" solution could include both a roundabout and signal design option).
- **Idea:** Suggestions collected from public comments, stakeholders, local agency plans and SR 16 team recommendations. Ideas were input to the development of solutions compatible with the local context.

**Table 1-2. SR 16 TNB to SR 3, Congestion Study: Strategy Definitions**

| Strategy ID | Strategy | Level of Investment | Examples of Solutions |
|---|---|---|---|
| 1 | Operational Improvements/ITS | Low | Intersection turn pockets, signal optimization, variable message signs |
| 2 | Travel Demand Management | Low | Commute trip reduction strategies, telecommuting, etc. |
| 3 | Pedestrian and Bicycle Improvements | Low, Medium, or High | Bike lanes, at-grade pedestrian and bicycle crossing improvements, regional trail extensions |
| 4 | Public Transit Improvements | Low, Medium, or High | Transit route expansion, additional worker buses, enhanced amenities |
| 5 | Medium Capacity Improvements | Medium | Installation of signal or roundabout, enhance intersection channelization |
| 6 | High Capacity Improvements | High | Grade separated vehicle crossings, roadway extensions, new interchanges |

Throughout the study, a serious of technical memorandums were prepared to document study data collection, study methodologies, analyses, and findings. Technical information was provided to the TAG throughout the study process. The technical memorandums are listed below.

- *Needs Statement Approach and Needs Statement*, Technical Memorandum, Final, March 2017 (Appendix B)
- *Traffic Analysis Methods and Assumptions*, Technical Memorandum, Final, February 2017. (Appendix F)
- *Data Collection Methods*, Technical Memorandum, Final, December 2017 (Appendix G)
- *Existing Traffic Operations Analysis*, Technical Memorandum, Final, December 2017 (Appendix H)
- *Traffic Forecasting Model Review and Implementation Plan*, Technical Memorandum, Final, April 2017 (Appendix I)
- Existing Geometrics, Technical Memorandum, Final, December 2017
- *Travel Demand Forecasting*, Technical Memorandum, Final, March 2018 (Appendix J)
- *Future Baseline Traffic Operations Analysis*, Technical Memorandum, Draft, May 2018 (Appendix K)
- *Summary of Evaluation and Analysis Procedures*, Technical Memorandum, Final, September 2018 (Appendix L)
- *Evaluation of Strategy Packages,* Technical Memorandum, Draft, June 2018 (Appendix M)
- Environmental Scan, Technical Memorandum, Final, July 2018
- Land Use and Zoning, Technical Memorandum, Final, March 2018
- *Summary of Recommended Solutions*, Technical Memorandum, Draft, November 2018 (Appendix N)
- *Prioritization of Recommended Solutions*, Technical Memorandum, Draft, October 2018 (Appendix P)

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# Chapter 2 Public and Stakeholder Involvement/Outreach

As a central tenet of the Practical Solutions approach, collaboration between the Washington State Department of Transportation (WSDOT), regional stakeholders, citizens, and the project team are key. To ensure a deep understanding of the corridor needs and ongoing participation and buy-in throughout the process, WSDOT and the project team engaged with the community and stakeholders throughout the study in a series of meetings and outreach events. The process for public and stakeholder engagement on this study is summarized below.

## 2.1 Public and Stakeholder Engagement Process

Project stakeholders were engaged to help WSDOT and the study team to understand key issues and needs in the corridor, to identify solutions, to receive input on evaluation of solutions and recommendations. Public engagement included online surveys, and online and in-person open houses. Technical Advisory Group (TAG), safety support team, and focus groups at incremental study milestones provided input to Stakeholder Agencies including developing project goals, criteria, strategies, and solutions. An executive committee from the Stakeholder public agencies was continually briefed to keep them appraised on outcomes. Each set of stakeholders reviewed completed study materials and incremental recommendations at steps throughout the process, providing insight and advising on how to move forward. The final decision-making authority for improvements along SR 16 and SR 3 ultimately resides with WSDOT. The public agencies that were represented in stakeholder advisory groups included the following list.

**Stakeholder Agencies**

| | |
|---|---|
| City of Bremerton | Nisqually Tribe |
| City of Gig Harbor | Port Gamble S'Klallam Tribe |
| City of Port Orchard | Puyallup Tribe |
| Kitsap County | Squaxin Island Tribe |
| Kitsap Transit | Suquamish Tribe |
| Naval Base Kitsap-Bremerton | Port of Bremerton |
| Pierce County | Puget Sound Regional Council |
| Pierce Transit | WSDOT |

### 2.1.1 Executive Committee

The Executive Committee was comprised of elected officials and executive staff from entities with implementation authority in the SR 16/SR 3 area. Their role was to become familiar with the study

process and findings, provide input to WSDOT, and consider input from the TAG, focus groups, and the public. Table 2-1 provides the dates and topics for the Executive Committee meetings.

**Table 2-1. Executive Committee Meeting Dates and Topics**

| Date of Meeting | Primary Topics Addressed at Meeting |
|---|---|
| December 2016 | Project kickoff, process, charter, vision, and goals |
| March 2017 | Needs statement, evaluation criteria, and performance measures |
| December 2017 | Existing/future conditions, ideas and strategies, and public input |
| June 2018 | Recommendation solutions, analysis, and planning-level costs |
| October 2018 | Final recommendations and study plan |

### 2.1.2 Technical Advisory Group

The TAG was comprised of technical staff from stakeholder agencies representing interests within the Study area. TAG members include representatives from the cities, counties, Tribes, and transportation agencies within the study area. Their role was to provide input to WSDOT regarding study recommendations, particularly around evaluation criteria, development of strategies and solutions, and screening and recommendations of solutions. The TAG provided local knowledge and was expected to keep their elected officials or senior leadership up to date on the study. The TAG was convened to provide input at important steps in the Practical Solutions approach during 12 formal study meetings. These meeting are shown in Table 2-2. Additional meetings and discussions with TAG members were held to discuss issues specific to each agency based on their local knowledge.

**Table 2-2. Technical Advisory Group Meeting Dates and Topics**

| Date of Meeting | Primary Topics Addressed at Meeting |
|---|---|
| November 2016 | Project kickoff and introduction, process, and charter |
| December 2016 | Corridor vision and project goals |
| January 2017 | Needs statement and evaluation criteria |
| March 2017 | Evaluation criteria and performance measures |
| May 2017 | Existing conditions in corridor |
| July 2017 | Future forecasting and strategy approach |
| October 2017 | Public input, two open houses, and online open house |

**Table 2-2. Technical Advisory Group Meeting Dates and Topics**

| Date of Meeting | Primary Topics Addressed at Meeting |
|---|---|
| September 2017 | Draft strategies and scenario development |
| December 2017 | Summary of ideas/concepts and preliminary screening |
| March 2018 | Analysis and evaluation of strategy packages |
| May/June 2018 | Recommendation solutions, analysis, and planning costs |
| October 2018 | Final recommendations and study plan |

### 2.1.3 Focus Groups

Focus groups were used as "sounding boards" for the study, oriented around specific project issues. The following specific focus groups were convened during the study:

- **The Environmental Justice (EJ) Focus Group** reviewed data on EJ populations along the corridors along with survey results and guided the study regarding issues and evaluation criteria.
- **The Pedestrian and Bicycle Focus Group** helped to identify needs for pedestrian and bicycle facilities, potential performance measures, and solutions in local jurisdictions.
- **The Safety Support Team** met to define and analyze safety concerns for the study in accordance with WSDOT's Safety Guidance for Corridor Planning Studies. Safety concerns that have been identified will be addressed within WSDOT's Statewide Safety Program.
- **The Transportation Modeling Focus Group** reviewed traffic modeling and analysis data related to the study and provided guidance and comments on the results and scenarios to be analyzed.
- **The Climate Change and Resiliency Focus Group** provided guidance on WSDOT policies and standards related to the implementation of resilient transportation solutions that are consistent with WSDOT's Practical Solutions approach.
- **The Transit Focus Group** provided direction and input on transit-related solutions. This focus group primarily included input from Kitsap Transit and Pierce Transit.

A list of focus group members is listed in Appendix C.

## 2.2 Public Input

The public input was obtained at several points throughout the study. The project website allowed for public comments. Additional opportunities for public input included an online survey, an online open house, and two in-person public meetings.

### 2.2.1 Open Houses and Survey Results

An online public opinion survey was conducted for this corridor study in May 2017. Postcards with links to the survey were mailed to more than 15,000 addresses along the corridor. The survey measured public input regarding how they use the corridor, the amount of congestion they experience, what transportation issues matter most, and ideas on strategies and solutions. The survey received nearly 3,000 responses. Most of the respondents were regular users of SR 16/SR 3, both for work or non-work trip purposes. Most think the highways perform well; those who had delays were typically delayed 15 minutes or less. The most problematic locations were identified as SR 16 at SR 3, SR 3 at SR 304, and SR 3 at West Loxie Eagans Boulevard. Respondents provided ideas on highway, transit, pedestrian, and bike solutions.

A summary of the responses received from the online public opinion survey is included in Appendix D.

### 2.2.2 Online Open House

An online open house was conducted between October 25, 2017 and November 8, 2017. Of the 180 people who viewed the online open house, 61 people provided input on potential strategies for addressing congestion in the corridor. While there was no consensus on how to address the congestion problem, several themes emerged from the responses:

- Desire to expand SR 16
- Need for better public transit service
- Need to increase east-west access across SR 16
- Need to address congestion at Purdy Bridge, Wollochet exit, Purdy exit at SR 16, and 144th at 54th

### 2.2.3 In-person Open Houses

Two in-person open houses were held in the corridor in October 2017, one in Gig Harbor and one in Port Orchard. Ninety-nine community members attended the two open houses. The attendees were provided with an overview of the study, where congestion is happening, and why it is occurring. Meeting participants also provided input on strategies to address the congestion. Primary points from these meetings included:

- Desires to increase capacity of SR 16
- Need to increase capacity at SR 16 interchanges especially at the Wollochet exit
- Need for better public transit service and expanding the number of park and ride lots
- Need for better bicycle and pedestrian paths

A summary of community engagement and input received from the online and in-person open houses is included in Appendix E.

# Chapter 3 Transportation Performance Gap Summary

This chapter describes the existing transportation facilities, existing operating conditions, future operating conditions, and the future baseline performance of transportation facilities in the study area. The practical design methodology uses the data resulting from existing and future operations analysis to generate performance measures.

Appendix F, *Traffic Analysis Methods and Assumptions Memorandum,* Final, February 2017 provides traffic operations analysis methods and assumptions for this study. Documentation includes the analysis years, study limit boundaries, safety analysis methods, travel demand forecasting and operational assumptions, and background infrastructure improvements that were incorporated into the study. Defining and agreeing upon the traffic analysis methods and assumptions early in the process greatly minimized the risk of methodology changes and potential re-analysis later in the study.

Data used in the traffic analyses is described in Appendix G, the *Data Collection Methods* memorandum. Traffic operations on all freeway segment types – mainline, merge, diverge, and weaving – were analyzed for State Route (SR) 16 and SR 3 within the study area. On SR 16, 87 unique freeway segments, in both directions of travel, were analyzed. On SR 3, 63 freeway segments in both directions of travel were analyzed within the study area. A detailed list of freeway segment types is included in Appendix H, the *Existing Traffic Operations Analysis* memorandum.

Within the study area, a total of 16 interchanges exist along the SR 16 and SR 3 corridors. The study area includes 61 study intersections located within Bremerton, Gorst, Port Orchard, and Gig Harbor. Table 3-1 includes a list of study intersections, the existing type of control, and their city, county, or state jurisdiction.

**Table 3-1. Study Area Intersections**

| No. | Study ID | Intersection Name | Control[a] | Location | Jurisdiction |
|---|---|---|---|---|---|
| 1 | 101 | SR 3 SB Off Ramp & Kitsap Way | Signal | Bremerton | WSDOT |
| 2 | 102 | SR 3 NB On Ramp & Kitsap Way | Signal | Bremerton | WSDOT |
| 3 | 103 | Auto Center Way/Oyster Bay Ave. N & Werner Rd./W Loxie Eagans Blvd. | Signal | Bremerton | Bremerton |
| 4 | 104 | SR 3 SB Ramps & W Loxie Eagans Blvd. | OWSC | Bremerton | WSDOT |
| 5 | 105 | SR 3 NB Ramps & W Loxie Eagans Blvd. | Signal | Bremerton | WSDOT |
| 6 | 106 | SR 304/S Charleston Blvd. & 1st St. | OWSC | Bremerton | WSDOT |
| 7 | 107 | SR 304/S Charleston Blvd. & S Cambrian Ave./Farragut Ave. | Signal | Bremerton | WSDOT |
| 8 | 108 | SR 304/Navy Yard Hwy. & Charleston Beach Rd. W | Signal | Bremerton | WSDOT |
| 9 | 109 | Union Ave. W & Werner Rd. | Signal | Bremerton | Bremerton |
| 10 | 110 | Union Ave W/3rd Ave. W & Roosevelt Blvd. | TWSC | Bremerton | Bremerton |

**Table 3-1. Study Area Intersections**

| No. | Study ID | Intersection Name | Control[a] | Location | Jurisdiction |
|---|---|---|---|---|---|
| 11 | 111 | Kent Ave. W & Sherman Heights Rd. | OWSC | Gorst | WSDOT |
| 12 | 112 | W Sam Christopherson Ave. & W Belfair Valley Rd. | OWSC | Gorst | WSDOT |
| 13 | 113 | S National Ave. & W Loxie Eagans Blvd. | Signalized | Bremerton | Bremerton |
| 14 | 201 | SR 3 & W Sherman Heights Rd./W Belfair Valley Rd. | AWSC | Gorst | WSDOT |
| 15 | 202 | SR 3 & SR 16/W Sam Christopherson Ave. | Signal | Gorst | WSDOT |
| 16 | 203 | Anderson Hill Rd. SW & SR 16 | OWSC | Port Orchard | WSDOT |
| 17 | 204 | SR 16 EB Ramps & Old Clifton Rd. | OWSC | Port Orchard | WSDOT |
| 18 | 205 | SR 16 WB Ramps & Tremont St. | OWSC | Port Orchard | WSDOT |
| 19 | 206 | Canyon Ct. & Tremont St. | Signal | Port Orchard | Port Orchard |
| 20 | 207 | Pottery Ave. & Tremont St. | Signal | Port Orchard | Port Orchard |
| 21 | 208 | Port Orchard Blvd. & Tremont St. | Signal | Port Orchard | Port Orchard |
| 22 | 209 | Bethel Rd. & Lund Ave. | Signal | Port Orchard | Port Orchard |
| 23 | 210 | Sidney Rd. & Sedgwick Rd. | Signal | Port Orchard | Port Orchard |
| 24 | 211 | SR 16 EB Ramps & Sedgwick Rd. | Signal | Port Orchard | WSDOT |
| 25 | 212 | SR 16 WB Ramps & Sedgwick Rd. | Signal | Port Orchard | WSDOT |
| 26 | 213 | Bethel Rd. & Sedgwick Rd. | Signal | Port Orchard | Port Orchard |
| 27 | 214 | SR 16 EB Ramps & SE Mullenix Rd. | OWSC | Port Orchard | WSDOT |
| 28 | 215 | SR 16 WB Ramps & SE Mullenix Rd. | OWSC | Port Orchard | WSDOT |
| 29 | 216 | SR 3 & Imperial Way SW | Signal | Belfair | WSDOT |
| 30 | 217 | SR 3 & Sunnyslope Rd. SW | TWSC | Gorst | WSDOT |
| 31 | 218 | Division Ave & SR 3 | TWSC | Gorst | WSDOT |
| 32 | 301 | SR 16 EB Ramps & SE Burley Olalla Rd. | OWSC | Purdy | WSDOT |
| 33 | 302 | SR 16 WB Ramps & SE Burley Olalla Rd. | OWSC | Purdy | WSDOT |

**Table 3-1. Study Area Intersections**

| No. | Study ID | Intersection Name | Control[a] | Location | Jurisdiction |
|---|---|---|---|---|---|
| 34 | 303 | SR 302 Spur/Purdy Dr. NW & 144th St. NW | Signal | Purdy | WSDOT |
| 35 | 304 | SR 302 Spur/Purdy Dr. NW & SR 302 | Signal | Purdy | WSDOT |
| 36 | 305 | SR 302/Purdy Dr. NW & Goodnough Dr. NW | TWSC | Purdy | WSDOT |
| 37 | 306 | Burnham Dr. NW & Sehmel Dr. NW | AWSC | Gig Harbor | Gig Harbor |
| 38 | 307 | SR 16 EB Ramps & Burnham Dr. NW W | Roundabout | Gig Harbor | WSDOT |
| 39 | 308 | SR 16 WB Ramps & Borgen Blvd./Burnham Dr. NW | Roundabout | Gig Harbor | Gig Harbor |
| 40 | 309 | 51st Ave. NW & Borgen Blvd. | Roundabout | Gig Harbor | Gig Harbor |
| 41 | 310 | Harbor Hill Dr. & Borgen Blvd. | Roundabout | Gig Harbor | Gig Harbor |
| 42 | 311 | Peacock Hill Ave. NW & Borgen Blvd. | Roundabout | Gig Harbor | Gig Harbor |
| 43 | 401 | Pioneer Way & Grandview St. | Signal | Gig Harbor | Gig Harbor |
| 44 | 402 | Pioneer Way & Kimball Dr. | Signal | Gig Harbor | Gig Harbor |
| 45 | 403 | Stinson Ave./SR 16 WB Ramp & Pioneer Way | Signal | Gig Harbor | WSDOT |
| 46 | 404 | SR 16 EB Ramp & Pioneer Way | Signal | Gig Harbor | WSDOT |
| 47 | 405 | Wollochet Dr. NW & Hunt St. NW | Signal | Gig Harbor | Gig Harbor |
| 48 | 406 | 38th Ave. NW & 56th St. NW | Signal | Gig Harbor | Gig Harbor |
| 49 | 407 | 56th St. NW & Olympic Dr. NW | Signal | Gig Harbor | Gig Harbor |
| 50 | 408 | Olympic Dr. NW & Hollycroft St. | Signal | Gig Harbor | Gig Harbor |
| 51 | 409 | 50th St. NW & Olympic Dr. NW | Signal | Gig Harbor | Gig Harbor |
| 52 | 410 | Point Fosdick Dr. NW & Olympic Dr. NW | Signal | Gig Harbor | Gig Harbor |
| 53 | 411 | SR 16 EB Ramp & Olympic Dr. NW | Signal | Gig Harbor | WSDOT |
| 54 | 412 | SR 16 WB Ramp & Olympic Dr. NW | Signal | Gig Harbor | WSDOT |
| 55 | 413 | Point Fosdick Dr. NW & 36th St. NW | Roundabout | Gig Harbor | Gig Harbor |
| 56 | 414 | 22nd Ave. NW & 36th St. NW | Signal | Gig Harbor | Pierce County |
| 57 | 415 | SR 16 EB On-Ramp & 24th St. NW | OWSC | Gig Harbor | WSDOT |
| 58 | 416 | SR 16 WB Ramp & 24th St. NW | Signal | Gig Harbor | WSDOT |
| 59 | 417 | Harborview Dr. & N Harborview Dr. | OWSC | Gig Harbor | Gig Harbor |
| 60 | 418 | Harborview Dr. & Stinson Ave. | OWSC | Gig Harbor | Gig Harbor |
| 61 | 419 | Harborview Dr. & Pioneer Way | AWSC | Gig Harbor | Gig Harbor |

[a] Signal = signalized intersection; OWSC = one-way stop control; TWSC = two-way stop control; AWSC = all-way stop control

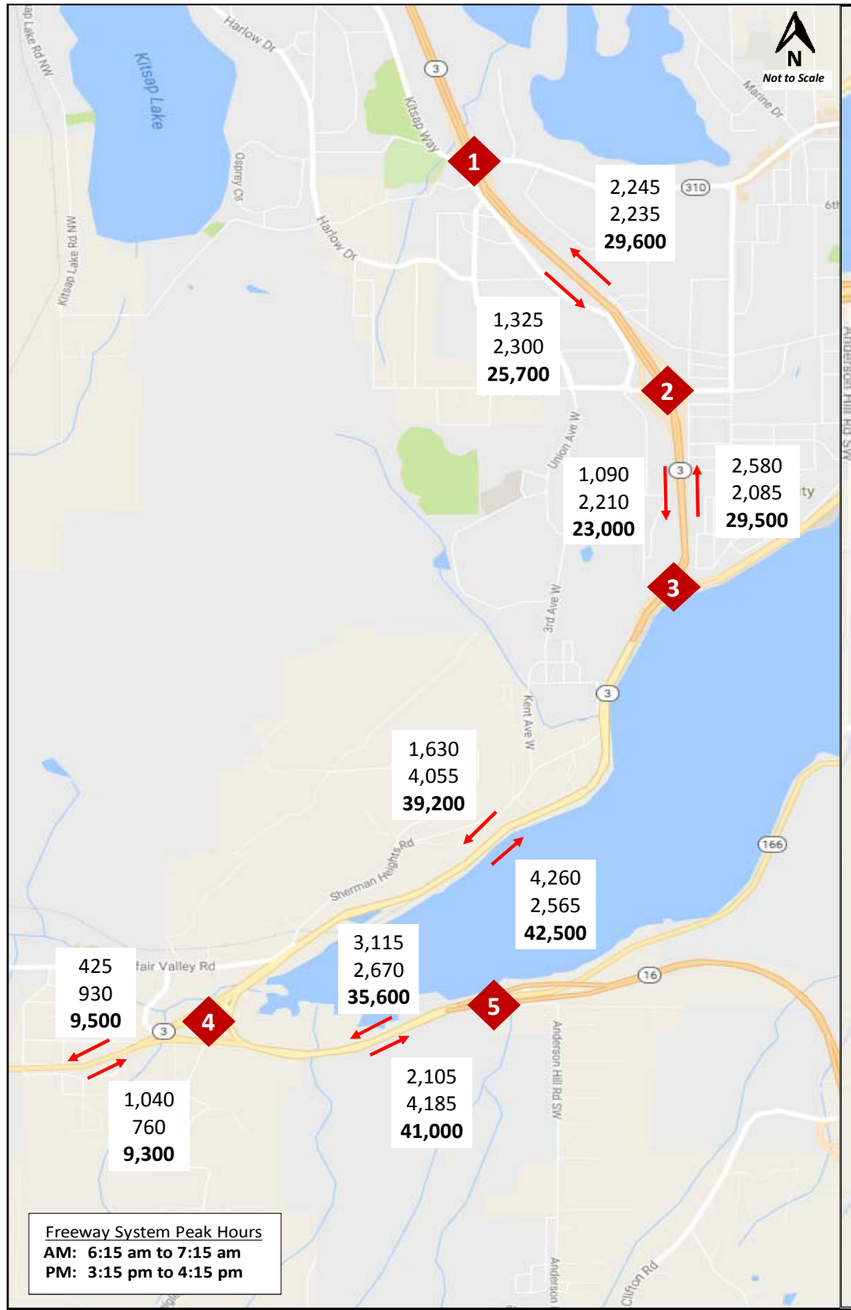
Section 3.1 presents the existing corridor mainline facilities; the infrastructure, vehicular traffic, truck traffic, transit service, and pedestrian and bicycle facilities. Appendix H, *Existing Traffic Operations Analysis*, September 2017 contains the technical memorandum with complete documentation of existing traffic conditions.

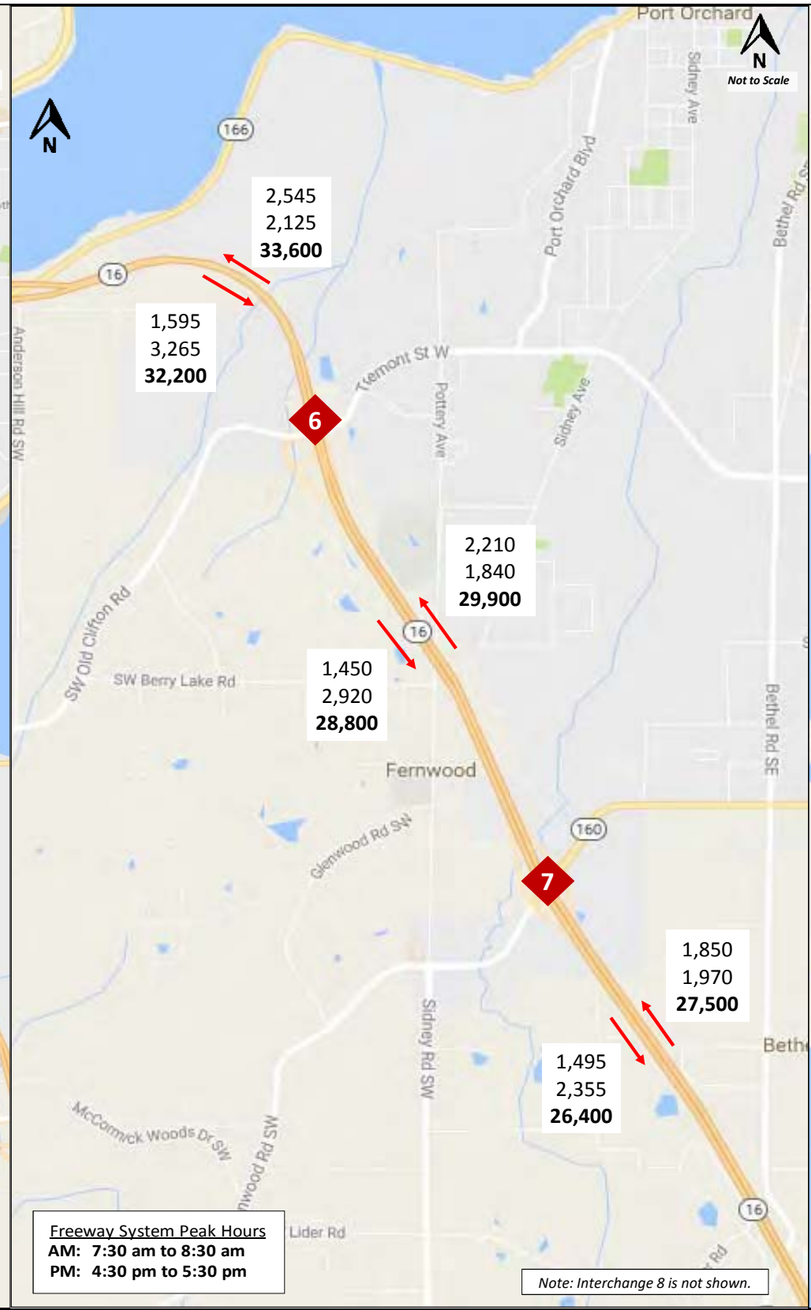
Section 3.2 presents the future corridor traffic operations conditions and analysis. Appendix I, *Traffic Forecasting Model Review and Implementation Plan,* April 2017 and Appendix J, *Travel Demand Forecasting*, March 2018 include information on traffic forecasting. Appendix K, *Future Baseline Traffic Operations Analysis*, May 2018 includes detailed information on the analysis results for the future baseline condition.

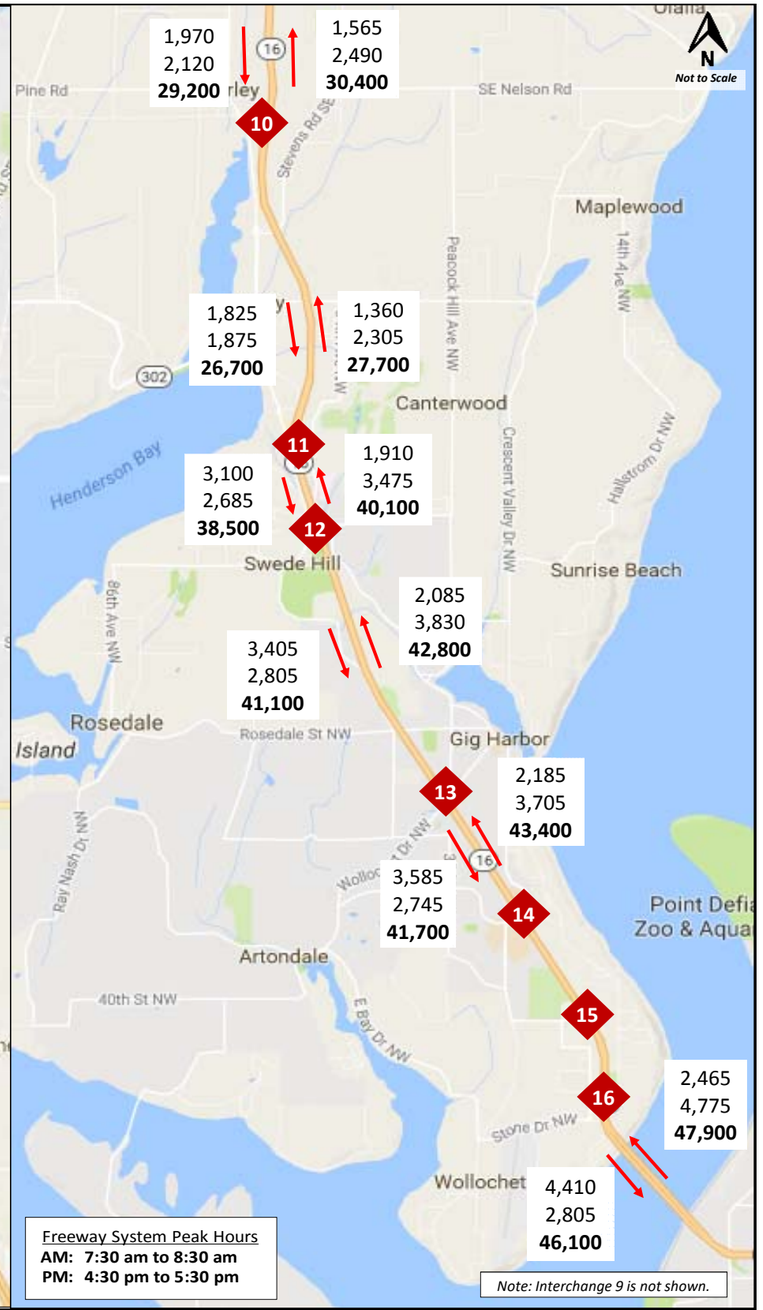
## 3.1 Existing Mainline Transportation Facilities

SR 16 is a limited-access freeway with a mainline speed limit of 60 miles per hour (mph). The electronic tolling system for the Tacoma Narrows Bridge (TNB) is on eastbound SR 16, north of the 24th Street NW on-ramp. In addition, the 24th Street NE on-ramp is an electronic toll-only on-ramp.

SR 3 is classified as a freeway with a mainline speed that varies from 40 mph in arterial segments to 60 mph in segments with limited access. Existing 2017 traffic volumes on SR 16 and SR 3 are shown on Figure 3-1.




**Legend**

AM Peak
PM Peak
**Average Daily Traffic**

X Interchange No.

Direction of Travel

**Study Interchanges**

1) SR 3 at SR 310/Kitsap Way
2) SR 3 at W Loxie Eagans Blvd
3) SR 3 at SR 304
4) SR 16 at SR 3
5) SR 16 at SR 166/SW Bay Street
6) SR 16 at Old Clifton Road/Tremont Street
7) SR 16 at SR 160/Sedgwick Road
8) SR 16 at SE Mullenix Road
9) SR 16 at Burley-Olalla Rd
10) SR 16 at SR 302 Spur/Purdy Dr NW
11) SR 16 at SR 302/Purdy Dr NW
12) SR 16 at Burnham Dr NW/Borgen Blvd
13) SR 16 at Wollochet Dr NW/Pioneer Way
14) SR 16 at Olympic Dr NW
15) SR 16 at 36th Street NW
16) SR 16 at 24th Street NW

**Notes**

- A seasonal adjustment of 7% has been included in the volumes shown.
- Freeway volume data was collected on weekdays (Tuesday through Thursday) in March, 2017.

WSDOT

ch2m

**Figure 3.1 - Existing (2017) Traffic Volumes**

*AM, PM Peak Hour and Daily Volumes*

**SR 16, TNB to SR 3, Congestion Study**

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### 3.1.1 Historical Traffic Growth

Historical traffic volume provides perspective on traffic growth rates given changes in land use, changes in residential to work trip making, and factors outside the study area. Historical traffic volume data show traffic growth at three locations on SR 16. There are three permanent traffic recorders (PTRs) along the SR 16 corridor that are operated by Washington State Department of Transportation (WSDOT). The locations of those PTRs are:

- R044 - Between TNB and 24th Street Ramps
- R088 - Between SR 302 bridge and Burley-Olalla bridge
- R116 - Between SR 160 and Anderson Hill Road (west of Old Clifton Road)

Historical traffic volumes are shown on Figure 3-2. The highest volumes within the study corridor occur at the west end of the TNB, reflecting the relatively large urban area of Gig Harbor. At this location, traffic growth was between 0.83 percent per year and 0.85 percent per year between 2008 and 2016. The historical trends also show flat to decreasing volume beginning in the 2008 recession and then increasing volume beginning in 2014. North of SR 302, historical traffic volumes were approximately half of the volume at the west end of the TNB. The overall average annual growth rate at this location was higher, due to an increase in traffic between 2008 and 2010, and a steady increase in traffic beginning in 2012. West of the Old Clifton Road interchange historical data were only available from 2014 to 2016. As shown on Figure 3-2, the growth rate at this location in recent years is comparable to the growth rate at the other locations.

At each location, the eastbound volume is lower than the westbound volume. This may be because of the toll collection eastbound. Eastbound travelers may choose to return to the east side of Puget Sound using the ferry rather than the TNB.

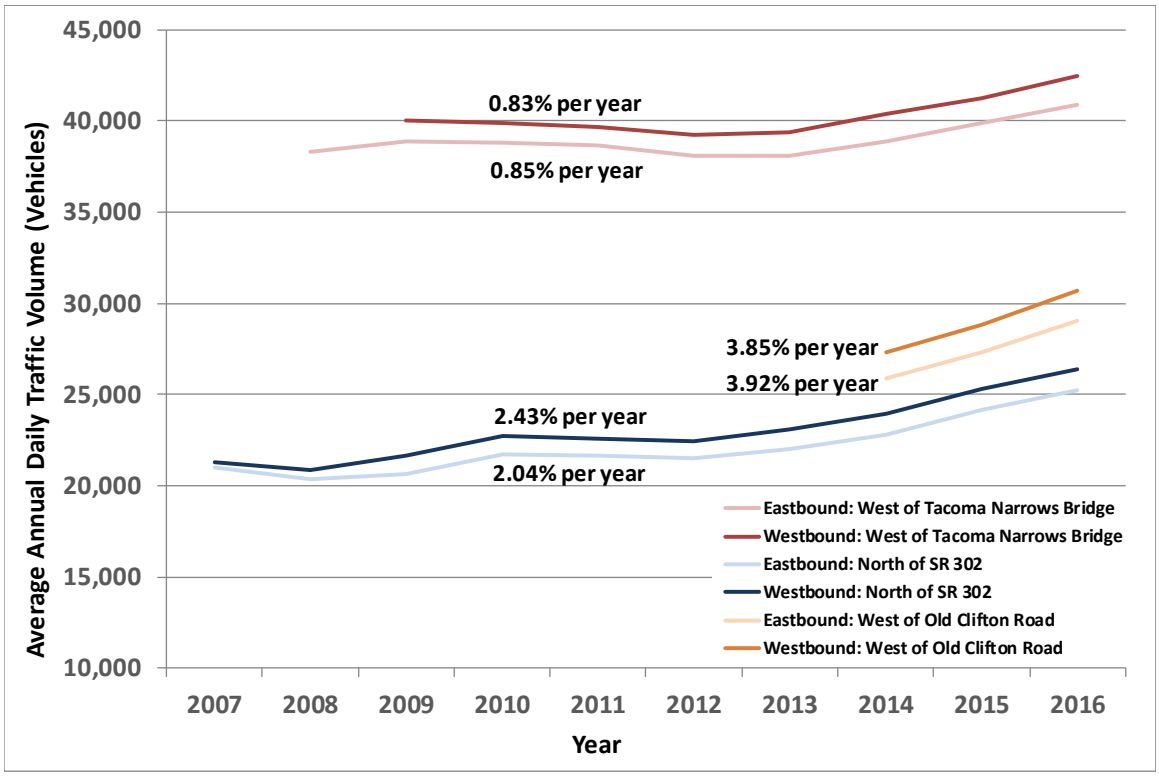


**Figure 3-2. SR 16 Historical Traffic Volume Data**

### 3.1.2 Bus Transit Service

Transit agencies serving the study corridor include Sound Transit, Pierce Transit, Kitsap Transit, and Mason Transit Authority. Appendix H provides a list of transit routes traveling within or connecting to the study corridor. Appendix H includes transit system maps for Pierce Transit, Central Kitsap Transit, and South Kitsap Transit.

Sound Transit provides regional service with Regional Express Route 595, which travels between the Purdy Park-and-Ride and downtown Seattle on SR 16 and Interstate 5. Stops in Pierce County also include the Kimball Park-and-Ride, Narrows Park-and-Ride, and the Tacoma Community College Transit Center.

Pierce Transit service includes paratransit and vanpool options in addition to fixed-route transit and Sound Transit Regional Express routes operated by Pierce Transit. Systemwide, approximately 58 percent of transit riders use Pierce Transit fixed-route service and approximately 34 percent of riders use Pierce Transit-operated Sound Transit routes. Roughly 6 percent of riders take vanpools and 2 percent use paratransit services. Pierce Transit provides service between Gig Harbor and Tacoma with one route to the Tacoma Community College Transit Center and an express route between the Purdy Park-and-Ride and downtown Tacoma. Pierce Transit also operates the seasonal Gig Harbor Trolley from early June to early September. The trolley travels between Point Fosdick Drive NW and Borgen Boulevard, connecting with the Kimball Drive Park-and-Ride and serving downtown Gig Harbor. Sound Transit and Pierce Transit use the eastbound high-occupancy vehicle (HOV) lanes on SR 16.

Kitsap Transit provides demand-response service, worker/driver service, vanpool options, and foot ferry service in addition to traditional fixed-route transit service. Systemwide, ridership is distributed among the services as follows:

- 62 percent – fixed-route service
- 14 percent – foot ferries
- 11 percent – worker/driver buses
- 8 percent – demand-response services
- 5 percent – vanpools

Kitsap Transit distinguishes service between South Kitsap County and Central Kitsap County. South Kitsap Transit service is focused in and around Port Orchard, with connections to the foot ferries at Port Orchard ferry dock and Annapolis ferry dock. South Kitsap service includes bus routes 85 and 86 to and from the Southworth Ferry Terminal. Route 85 travels between the Southworth Ferry Terminal and the Mullenix Park-and-Ride at SR 16. Route 86 travels between the Southworth Ferry Terminal and downtown Port Orchard. From Southworth, WSDOT operates ferry routes connecting Port Orchard, Vashon Island, and West Seattle at the Fauntleroy Ferry Terminal. South Kitsap Transit Route 4 Tremont and Route 5 Sidney cross SR 16.

Central Kitsap Transit primarily provides service in and around Bremerton, with connections to Silverdale and Poulsbo. Routes connecting to the study corridor travel between the Bremerton Transportation Center, adjacent to the ferry dock, and the West Bremerton Transfer Center on Auto Center Way on the west side of SR 3. The only connection between South Kitsap and Central Kitsap Transit service is via the foot ferry between the Port Orchard and Annapolis ferry docks and the Bremerton Ferry Terminal.

Kitsap Transit also offers last-route-of-the-day ferry-take-home routes. Ferry-take-home buses drop passengers at or near their homes by operating a modified route that may vary daily.

The Purdy Connection is an unnumbered route deviation service provided by Kitsap Transit that connects the Port Orchard Foot Ferry Dock, Mullenix Park-and-Ride, and Purdy Park-and-Ride making

connections to Pierce Transit. The Purdy Connection offers weekday service excluding major holidays. The average weekday ridership in 2016 was 26 riders. The Purdy Connection makes scheduled stops at the Port Orchard Foot Ferry Dock and the Purdy Park-and-Ride. The bus will also stop at the Mullenix Park-and-Ride as scheduled or on request with 24-hour call-in-advance notice. Riders who board at the Port Orchard Foot Ferry Dock or the Purdy Park-and-Ride can request a stop anywhere in the service area by notifying the driver when they board. Riders wishing to begin their ride inside the service area can pre-arrange a pickup with Kitsap Transit by calling with at least 24 hours notice, up to 7 days in advance.

Mason Transit Authority operates on Route 3 within the study corridor traveling between Belfair and the Bremerton Transportation Center on SR 3 and SR 304. Mason Transit Authority service includes dial-a-ride, worker/driver, vanpool, and volunteer drivers and special events in addition to fixed-route transit. Approximately 70 percent of riders systemwide use fixed-route service. Roughly 11 percent use worker/driver options, 9 percent use dial-a-ride transit, 7 percent use vanpools, and 3 percent use other types of services provided by Mason Transit Authority.

A unique transit service in the study area is the “worker/driver” buses that travel between adjacent neighborhoods and the Naval Base Kitsap-Bremerton on SR 16, SR 3, and SR 304. Workers at the naval base also serve as drivers of these buses. Each bus operates with one AM route to the base and one PM route from the base. Kitsap Transit and Mason Transit Authority also provide worker/driver buses. All but two of the worker/driver buses serve the Naval Base Kitsap-Bremerton.

### 3.1.3 Ferry Service

Ferry service is provided by Washington State Ferries (WSDOT) and Kitsap Transit. A summary of existing ferry service, as of spring 2017, is provided in Appendix H. Kitsap Transit foot ferry service provides a faster trip between Bremerton and downtown Seattle than car ferry service. Kitsap Transit foot ferry service between Bremerton and Port Orchard provides connections between the South Kitsap and Central Kitsap bus service areas.

### 3.1.4 Park-and-Ride Lots

Appendix H lists the park-and-ride lots in the study area**.** Park-and-ride capacity at lots serving Pierce Transit and Sound Transit service is 506 parking spaces. These spaces are approximately 74 percent utilized based on data provided on the WSDOT park-and-ride map. In addition to park-and-ride facilities along the corridor, Kitsap Transit operates five park-and-ride lots in Bremerton/Central Kitsap and seven park-and-ride lots in South Kitsap, including the Burley Bible Church lot and the Mullenix lot.

### 3.1.5 Non-Motorized Facilities

Pedestrian and bicycle facilities in the corridor are provided by the adjacent arterial system, crossings of SR 16, and multi-use trails. Crossings of SR 16 are important for circulation in the urbanized areas where demand for non-motorized mobility is highest. These crossings are the only locations pedestrians and bicycles can travel east-west. Appendix H provides an inventory of the SR 16 crossings from the TNB to Gorst, the distances between crossings, and the presence of sidewalks or paved shoulders. The width of the sidewalk or shoulder is estimated from Google Earth.

Three crossings are more than 1 mile apart within the city of Gig Harbor. Sidewalks are present on these crossings. Although SR 302 does not provide local arterial-to-arterial access across SR 16, bicycles are allowed to use the SR 302 interchange ramps. Through Gorst, SR 16 is not a limited-access roadway, but there are no designated pedestrian or bicycle crossing locations through this area. On SR 3, between Gorst and SR 304, there are no pedestrian crossing locations because there is limited land development on either side of the highway and limited demand for crossings due to the

adjacent Sinclair Inlet and steep grade on SR 3 north of SR 304. North of SR 304, pedestrians and bicycles can cross SR 3 at the Loxie Eagans Boulevard and the SR 310/Kitsap Way interchanges. Bicycles are allowed to use the shoulder of SR 16 from the west end of the TNB to Bremerton, and on SR 3 and SR 304 into Bremerton.

### 3.1.6 Multi-use Trails

The Cushman Powerline Trail is approximately 6.2 miles of non-motorized public trail on the east side of SR 16 from 14th Avenue NW near the TNB to Borgen Boulevard. The trail is a 16-foot-wide asphalt-paved pedestrian route and bike trail. There are several trail heads with parking and restrooms located along the route. The north section of the trail has numerous sections with over 5 percent grade. The trail has been managed and operated by PenMet Parks since 2011 in partnership with the City of Gig Harbor.

The Scott Pierson Trail is approximately 6.1 miles long, beginning at South 25th Street just west of State Street in Tacoma. The trail continues along the west side of the TNB and follows the alignment of the eastbound 24th Street NW on-ramp, separated from traffic by a concrete barrier, ending at 24th Street NW. The multi-use trail is approximately 10 feet wide across the TNB and adjacent to the 24th Street NW on-ramp. From 24th Street NW, pedestrians and bicyclists can use 24th Street NW to cross SR 16 to 14th Avenue NW to access the Cushman Powerline Trail near 32nd Street NW.

### 3.1.7 Freight and Truck Movement

SR 16 is classified as a T-1 freight corridor carrying over 10 million tons of freight per year according to the *Washington State Freight and Goods Transportation System (FGTS) 2017 Update* (WSDOT, 2017b). The electronic tolling system for the TNB is on eastbound SR 16, north of the 24th Street NW on-ramp. In addition, the 24th Street NE on-ramp is an electronic toll-only on-ramp. SR 3 is classified as a T-1 freight corridor from Gorst to SR 308 (north of the study area), and a T-2 facility from Gorst to Sunnyslope Road. A T-2 facility carries from 4 million to 10 million tons per year. SR 304 is classified as a T-3 freight corridor.

The Federal Highway Administration (FHWA) has established a vehicle classification system that uses 13 vehicle types distinguished by the number of axles. When describing trucks for transportation planning or traffic operations analysis, the 13 classifications are often grouped into three primary categories: light (small), medium, and heavy (large). Oversize loads are trucks that are over-length, over-height, over-width, and/or over-weight. The mobility of an oversize load is more restricted than either the medium or heavy trucks. Oversize loads require a permit and may also require a lead- or follow-car to warn and provide a buffer for other motorists.

#### Truck Volumes

Truck volumes were evaluated for each roadway segment that has vehicle classification data. Segments with more than 500 daily heavy truck trips were evaluated in greater detail. Segments with more than 500 heavy truck trips per day were identified within the study corridor as follows:

- SR 16 eastbound from SW Sedgwick Road to the TNB carries between 715 and 789 daily heavy truck trips.
- SR 16 westbound from the TNB to SW Sedgewick Road carries between 631 and 748 daily heavy truck trips.
- SR 3 northbound between SR 310 and Austin Drive carries 539 daily heavy truck trips.
- SR 3 southbound between SR 310 and Austin Drive carries 506 daily heavy truck trips.

Appendix H, *Existing Traffic Operations Analysis,* includes detailed information on AM and PM weekday peak hour truck volumes. Heavy truck volumes have a greater impact on the evaluation and design process because of their large size and their operating characteristics. Medium trucks generally reflect economic activity in an urban area.

On SR 16 westbound between Pioneer Way and Burnham Drive NW, the peak hours of heavy truck travel occur between 7 AM and 10 AM, with truck traffic accounting for approximately 4 percent of all traffic. Eastbound between Pioneer Way and Burnham Drive NW, the peak of heavy truck volume occurs at 11 AM and accounts for approximately 4 percent of all traffic. This is typical of heavy truck traffic in areas away from heavy industrial land uses.

On SR 16 westbound, heavy truck volumes can reach 50 trucks per hour at 6:30 AM and remain above 50 trucks per hour until 12 PM. On eastbound SR 16, there are over 50 heavy trucks per hour between 10 AM and 2:30 PM. Heavy trucks traveling mid-day appear to be avoiding the eastbound morning congestion.

On SR 3, heavy truck volumes between SR 310 and Austin Drive are lower than heavy truck volumes on SR 16, which is similar to the total vehicle volume trend, showing higher volumes on SR 16 and lower volumes on SR 3.

Medium trucks are primarily two-axle, six-tire trucks such as commercial delivery trucks, but also include three-axle and four-axle single-unit (medium) trucks, which are typically dump trucks or garbage trucks. The total volume of medium trucks is higher than heavy trucks, with westbound medium truck volumes being higher earlier in the morning and eastbound medium truck volumes higher mid-day. The operating characteristics of medium trucks are closer to passenger vehicles, and therefore the volume has less significance related to capacity analysis and design. However, these volumes also reflect general economic activity.

SR 3 shows relatively high medium-truck volumes on SR 3 just west of Gorst between Riverside Avenue W and Division Avenue W, reflecting the commercial/industrial activity along this segment.

### Rail and Air

BNSF Railway provides rail service to Kitsap County. Freight use is restricted to the U.S. military by agreement. The U.S. Navy owns the rails from Shelton to Naval Base Kitsap-Bremerton and on to Bangor. BNSF provides one train per day. The railroad right-of-way passes through the community of Gorst and follows SR 3 between the SR 3 right-of-way and Sinclair Inlet.

There are three airports in the study corridor. Port Orchard Airport is a privately owned general aviation facility about 5 miles southwest of Port Orchard along Sidney Road SW. Bremerton National Airport is owned and operated by the Port of Bremerton. The Bremerton National Airport is a general aviation facility located on SR 3 about 3 miles west of Gorst. The Tacoma Narrows Airport is located approximately 1 mile southwest of the TNB. Pierce County owns and operates the airport.

## 3.1.8 Other Transportation Operations Data

Electronic tolls are collected on the TNB in the eastbound direction of travel as vehicles pass through Gig Harbor to Tacoma. This system is facilitated by WSDOT's Good To Go! program and allows drivers to cross the bridge without stopping to pay a toll. The electronic toll system is equipped with both photographic monitoring (to identify the vehicle and send the toll fee to the registered owner) and in-vehicle payment transponders (linked to an online payment account) to automatically administer tolls. Traditional toll booths, where vehicles must stop and pay the toll before proceeding across the bridge, are also in use near the 24th Street NW interchange.

Ramp metering infrastructure is installed at multiple interchanges along the SR 16 corridor. The single-lane general-purpose eastbound on-ramps from the SR 302, Burnham Drive NW/Borgen Boulevard NW, and Wollochet Drive NW interchanges are equipped with ramp meter signals. No bypass lanes are provided at these eastbound on-ramps. The eastbound on-ramp from Olympic Drive NW and the eastbound on-ramp from 36th Street NW are equipped with two metered general-purpose lanes and one HOV bypass lane (not metered). At the 24th Street NW interchange, the single-lane eastbound on-ramp is equipped with a ramp meter, but no HOV bypass lanes are provided at this access ramp.

## 3.2 Existing Traffic Forecasting Model

Existing operating conditions along the entire freeway mainline were evaluated by entering existing traffic data into the travel demand model and performing a calibration. This section provides an overview of the model development and calibration. Study area intersections are included in the model. Appendix I, *Traffic Forecasting Model Review and Implementation Plan*, Final, April 2017, provides documentation of the research and steps to develop a project area-wide forecast model. Visum is the model software. The SR 16 corridor Visum model includes all roadways classified as a major collector or above, per WSDOT's Functional Classification Map roadway types (WSDOT, 2018c).

AM and PM peak hour models were developed for the SR 16 corridor Visum model. Peak hours of 7:30 to 8:30 AM and 4:30 to 5:30 PM were determined based on systemwide tube counts and turning movement counts. The models are calibrated to a base year of 2017 using traffic counts collected in February and March of 2017. In addition, three future model years were forecasted: a 5-year short-range horizon for the year 2022, a 10-year mid-range horizon for the year 2027, and a long-range planning horizon of 2040.

### 3.2.1 Existing Model Data

#### Land Use Data

Land use data were compiled by traffic analysis zones (TAZs) for input to the existing travel demand model. The TAZs were determined by combining areas from various jurisdictions: Kitsap County, Pierce County, Puget Sound Regional Council, the City of Port Orchard, and the City of Gig Harbor. The aggregated TAZs by sub-area are shown in Figure 3-3.

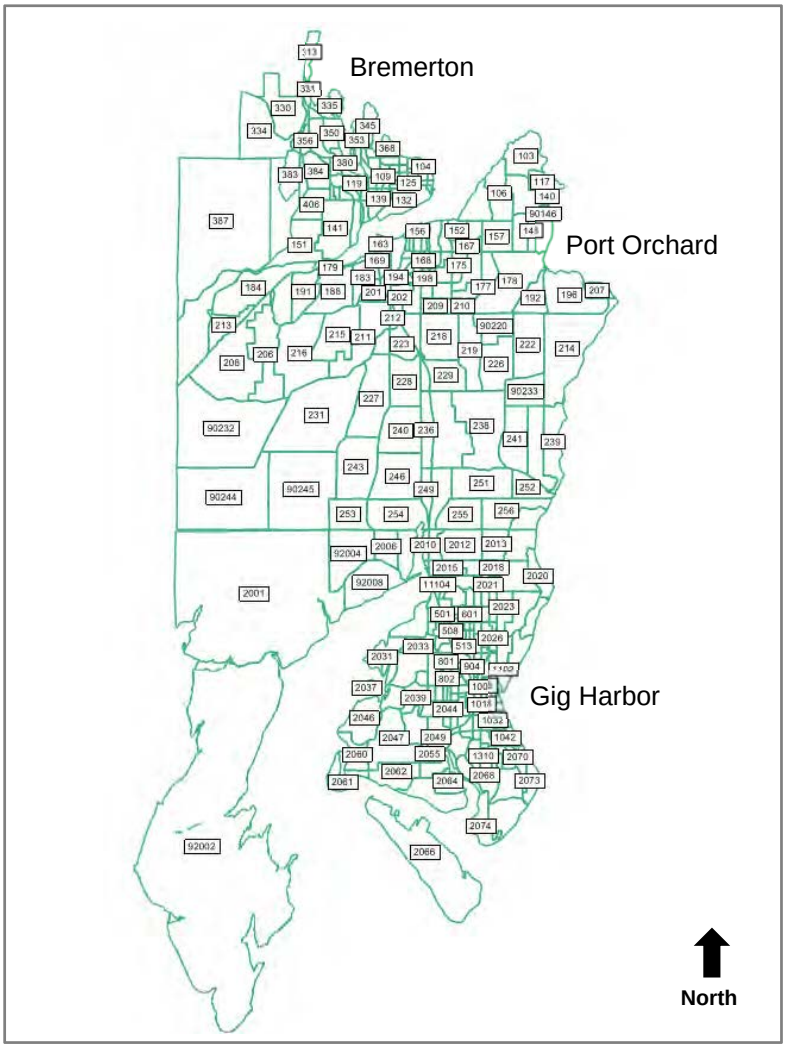


**Figure 3-3. Forecast Model Zone Structure**

The modeling for the SR 16 corridor uses existing land use consistent with housing and employment data obtained from Pierce County and Kitsap County, and Comprehensive Plan updates from the cities of Bremerton, Port Orchard and Gig Harbor completed in 2014 and 2015. To arrive at a single existing condition (2017) land use from the respective counties and cities, base year land uses will be supplemented by developments permitted up to the most current data available in 2017. Table 3-2 identifies the land use categories used in the SR 16 model, as well as units. More detailed information can be found in Appendix I, the *Traffic Forecasting Model Review and Implementation Plan* memorandum.

**Table 3-2. Land Use Categories for SR 16 Visum Corridor Model**

| Land Use Type | Land Use Category | Short Code | Units |
|---|---|---|---|
| Housing | Single-Family | SF | Dwelling Units |
| | Multi-Family | MF | Dwelling Units |
| Employment | Retail | RETAIL | Employees |
| | Finance, Insurance, Real Estate, and Services | FIRES | Employees |
| | Government | GOV | Employees |
| | Education | EDU | Employees |
| | Wholesale Trade, Transportation, Utilities | WTU | Employees |
| | Manufacturing | MAN | Employees |
| | Construction and Resources | CONRES | Employees |
| | National Security | MIL | Employees |

## Origin-Destination Data

Travel patterns in the study corridor were analyzed using existing origin-destination data provided by the traffic data vendor StreetLight Data, Inc. StreetLight Data uses advanced spatial analytics from anonymous connected devices (such as cell phones, GPS navigation apps, and connected cars) to determine travel patterns for a user-specified area. StreetLight data were collected for a variety of key TAZs in the study area to help understand existing patterns and how future growth in the study area will affect mobility. The data are used to calibrate and validate the traffic forecasting models. Further information may be found in Appendix G, the *Data Collection Methods* memorandum.

## Trip Generation

Within the study area, trips from internal TAZ to internal TAZ were calculated using rates found within the Institute of Transportation Engineers (ITE) *Trip Generation Manual*, 9th edition (2012). The “peak hour of adjacent street” rates were used for AM and PM, as well as the percentage of total trips to and from each land use. The ITE trip generation rates used in the analysis are shown in Appendix J, the *Travel Demand Forecasting* memorandum**.**

## Trip Distribution

The trip distribution step allocated person trips generated by each TAZ to destinations internal or external to the study area. The trip distribution process uses a gravity model, which assumes that the attraction between two zones is directly proportional to the number of trips generated by each zone and inversely proportional to the travel time between the zones. The gravity model utility function and gravity model parameters in the SR 16 Visum corridor model are shown in Appendix I. The parameters were adjusted in the calibration step of the model development process.

## Traffic Data

Traffic data collected for this study and travel time runs were further used to calibrate the existing models, and results can be found in Appendix H, *Existing Traffic Operations Analysis* memorandum.

The model study area boundaries include the nine cordons shown in Appendix I. These cordons capture the major external trip generators that are likely to affect travel demand on the study corridor. They also allow the model to evaluate potential bypass routes to the SR 16 and SR 3 corridors, such as Sherman Heights Road near Bremerton. The SR 16 corridor Visum model includes all roadways classified as a major collector or above within the network model. WSDOT's Functional Classification Map (2018c) was referenced to confirm roadway types.

### 3.2.2 Existing Year Model Results

Using the land use and trip generation data, model calibration was conducted for AM and PM peak hours. Turning movement counts and tube counts helped calibrate the existing condition, which included system peaks of 7:30 to 8:30 AM and 4:30 to 5:30 PM. Post-processing was then necessary to convert model volumes in to the correct intersection or sub-area peak period. At certain locations, land use was adjusted to match existing counts. This was necessary at Gorst and Naval Base Kitsap-Bremerton, due to unique travel patterns observed in those areas.

National Cooperative Highway Research Program (NCHRP) Reports 255 and 765 call for two primary metrics to determine calibration: percent deviation and root mean square error (RMSE). To account for minor and major link volumes, the allowed percent deviation varies based on the volume of the existing count. The larger the observed link count, the lesser allowable percent deviation and error.

Existing model calibration is verified by the number of roadway segments within a targeted range of accuracy based on roadway volume. A higher accuracy can be achieved on high-volume roadways. Lower volume roadways have greater hourly and daily variation in volume and so have a larger range of the model result relative to volume considered as achieving accuracy. The results showed that 96 percent of AM segments were within the volume deviation target and 99 percent of the AM segments were within RMSE deviation target. In the PM peak period, 97 percent of segments were within the volume deviation target and 97 percent were within the deviation target. Appendix J provides the details of the existing calibration and parameters for AM and PM peak periods. Complete model validation documentation is also provided in Appendix J.

## 3.3 Existing Operating Conditions

### 3.3.1 Existing Freeway Traffic Operations Analysis

Between SR 3 and the TNB, SR 16 is a limited access freeway. Traffic operations on SR 16 were analyzed for all freeway-mainline, merge, diverge, and weaving segments. The roadway volumes collected in early 2017 were seasonally adjusted to reflect typical May traffic volumes.

Peak hour analysis showed distinctly different peak hours on SR 16 and SR 3. The SR 3 peak hour occurs approximately 1 hour earlier than on SR 16. The peak directions are also different for SR 3 and SR 16. The peak direction on SR 3, northbound in the morning and southbound in the evening, is primarily driven by Naval Base Kitsap-Bremerton. On SR 16, the peak directions reflect commuter traffic to Tacoma and are eastbound in the AM and westbound in the PM. The peak hours used for analysis are:

- SR 16 Corridor: TNB to Gorst interchange
  - AM Peak Hour = 7:30 to 8:30
  - PM Peak Hour = 4:30 to 5:30
- Gorst/SR 3/SR 304 corridor
  - AM Peak Hour = 6:15 to 7:15

- PM Peak Hour = 3:15 to 4:15

Mainline segments are freeway segments between the interchange on-ramps and off-ramps. Merge segments are the portion of the freeway downstream from interchange on-ramps. Diverge segments are the portion of the freeway upstream of interchange off-ramps. There are 87 and 63 unique freeway segments on SR 16 and SR 3 respectively, in both directions.

Freeway operating conditions were analyzed using the Highway Capacity Software (HCS) and are based on the *Highway Capacity Manual* (HCM) freeway capacity models. Freeway level of service (LOS) is based on vehicle density, measured in terms of passenger cars per mile per lane. There are six LOS classifications, each given a letter designation from A to F. The classifications are defined by the Transportation Research Board's 2010 *Highway Capacity Manual*. LOS A represents free flow operations where vehicles are able to easily maneuver within the traffic stream. LOS F represents poor operating conditions where congestion prevents vehicles from maneuvering within the traffic stream. Detailed freeway LOS results for segments on SR 16 and SR 3 are included in Appendix H, *Existing Traffic Operations Analysis.*

## SR 16 Freeway Operating Conditions

During the AM peak hour (7:30 to 8:30 AM), most of the eastbound freeway segments from West Burnham Drive/Borgen Boulevard NW to 24th Street NW operate at LOS E. These conditions reflect heavy peak hour commuter traffic approaching the TNB heading east towards the Tacoma urban area. Traffic entering SR 16 from eastbound on-ramps also contributes to congested conditions. From Wollochet Drive NW, eastbound vehicles must travel through a circular loop on-ramp with a posted speed limit of 10 mph before merging onto the SR 16 mainline. These trips generally enter the traffic stream at speeds slower than the posted speed limit, thereby reducing capacity at the merge. Westbound operations on SR 16 during the AM peak hour generally operate LOS D or better.

During the PM peak hour (4:30 to 5:30 PM), SR 16 eastbound generally operates at LOS D or better. Isolated sections of freeway near Anderson Hill Road SW and SR 166 operate at LOS E. The SR 16 mainline drops from three to two lanes at the left-side off-ramp to SR 166. Anderson Hill Road NW also provides access to and from SR 16 with short deceleration and acceleration lanes. Due to high mainline volumes on SR 16, and vehicles diverging from and merging to SR 16 at this location, the mainline freeway segments experience moderate congestion.

On SR 16 westbound, PM peak hour operations are generally uncongested between Purdy and Port Orchard. Between the TNB and Purdy, a few isolated sections of freeway operate at LOS E as demand for westbound off-ramps increases during the afternoon commute. Freeway mainline segments between major interchanges in Gig Harbor, and freeway segments approaching the SR 302, Borgen Boulevard NW, and Wollochet Drive NW off-ramps experience congestion and operate at LOS E.

Between the AM and PM peak hours, 75 percent of SR 16 freeway segments meet the mobility thresholds. Figure 3-4 shows the general locations of congested segments along SR 16.

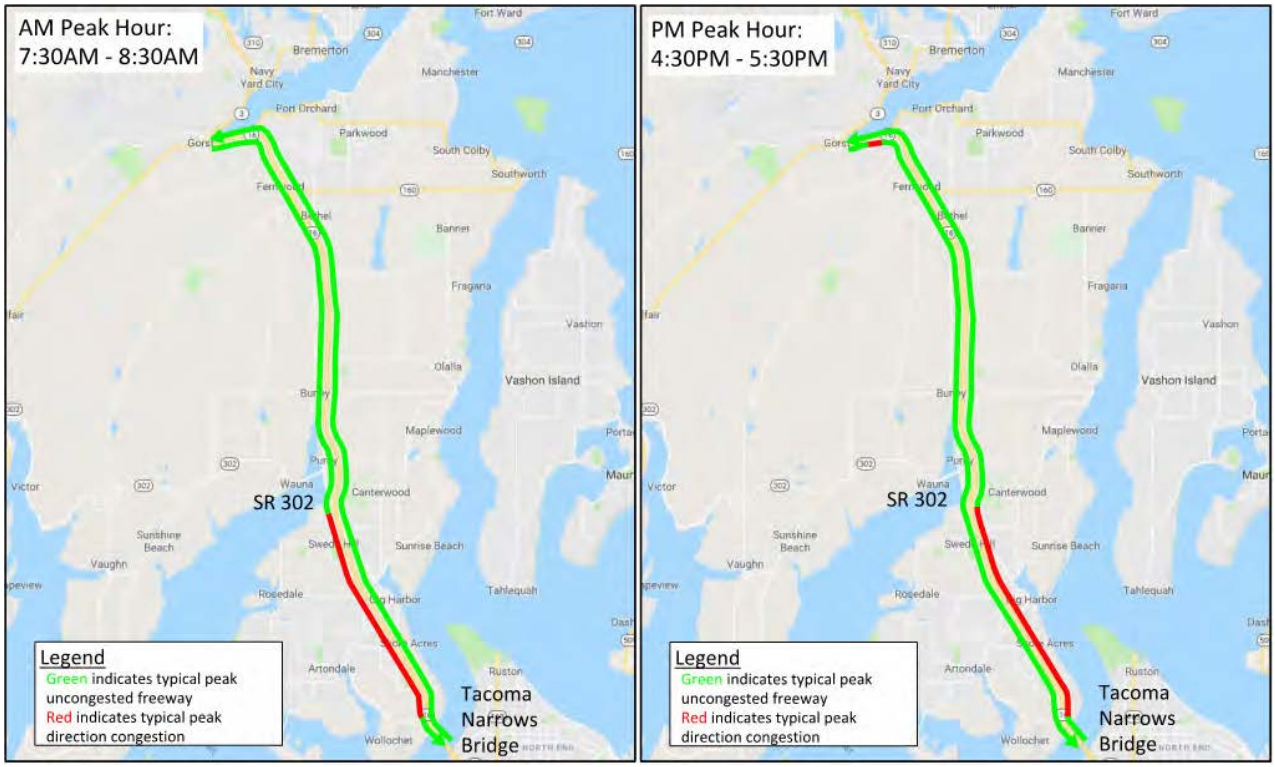


**Figure 3-4. SR 16 Freeway Conditions**

## SR 3 Freeway Operating Conditions

SR 3 between Imperial Way SW and Gorst is a multilane highway with access by at-grade intersections and adjacent driveways. Between Gorst and SR 310, SR 3 is a limited-access facility where vehicles are only permitted to enter or exit the corridor at designated directional on- or off-ramps. Segment analysis for SR 3 was prepared between SR 16 and the SR 310 interchange at the north end of the study area.

Based on peak period traffic volume trends, the peak hour of traffic on SR 3 occurs earlier than the peak hour of traffic on SR 16. During the AM peak hour (6:15 to 7:15 AM), SR 3 is congested in the northbound direction from the Sedgwick Road interchange to SR 304. The freeway segments operate at LOS F, reflecting high commuter traffic demand to the Naval Base Kitsap-Bremerton. Southbound, SR 3 operates at LOS D or better on all freeway segments analyzed, indicating little congestion during this earlier peak.

During the PM peak hour (3:15 to 4:15 PM), SR 3 northbound is generally uncongested with freeway segments operating at LOS D or better south of the SR 310/Kitsap Way interchange.

In the southbound direction, the freeway is congested between SR 310/Kitsap Way and the W Sherman Heights Road off-ramp with all segments operating at LOS F. Approximately 0.4 mile downstream of the SR 3/SR 304 interchange, SR 304 meets the freeway as a merge lane. High vehicle demand from both SR 3 and SR 304 contributes to congested conditions on SR 3 to W Sherman Heights Road. At W Belfair Valley Road, SR 3 widens from two lanes to three lanes in each direction until it intersects with SR 16, where it continues west with two lanes westbound and one lane eastbound.

Of the freeway segments analyzed on SR 3, 60 percent of the segments meet the mobility threshold. Figure 3-5 shows the approximate extents of the congestion on SR 3 in the AM and PM peak hour.

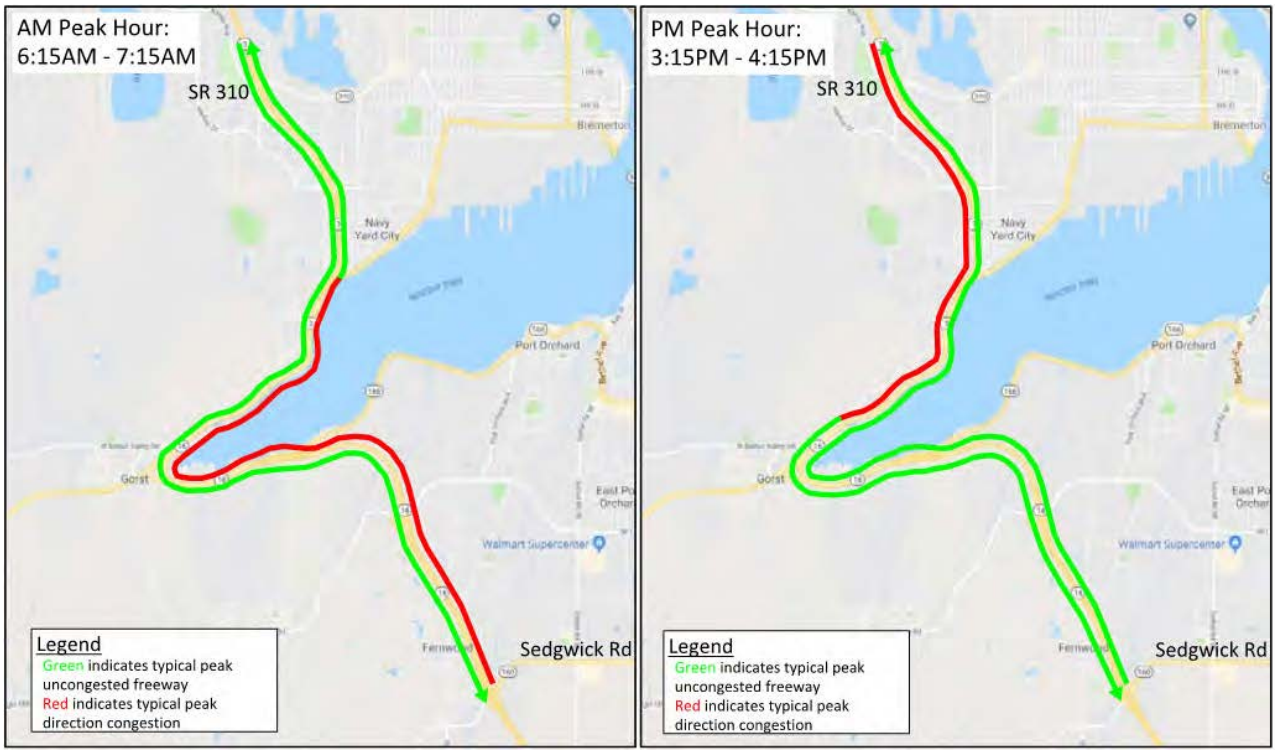


**Figure 3-5. SR 3 Freeway Conditions**

## 3.3.2 Corridor Travel Times

Existing travel times along the study corridors were collected using floating car data collection. A floating car travels with the speed of traffic to measure travel time. Corridor travel times were also collected while two aircraft carriers were in port at Naval Base Kitsap-Bremerton. The average and maximum floating car field travel times are presented Table 3-3 for peak direction travel paths**.** The results are described below.

- From Port Orchard to Naval Base Kitsap-Bremerton, off-peak free flow travel time is 11.3 minutes and AM peak hour travel times are approximately 14.3 minutes, or 27 percent higher than free-flow conditions.
- From Port Orchard to Bremerton the off-peak free flow travel time is 10.3 minutes and the AM peak hour travel time is 13.3 minutes, or 29 percent higher in the peak condition.
- During the AM peak hour in the westbound/northbound direction peak direction, travel times on SR 3 from Port Orchard to either Bremerton or Naval Base Kitsap-Bremerton reflect heavy congestion and LOS F conditions.
- In the eastbound/southbound direction, the field-collected travel time between Port Orchard and the TNB is similar to free-flow conditions. This differs from the freeway analysis results that show various segments operating with LOS E conditions approaching the TNB. The differences are due to the time periods reported; the HCS analysis reports the worst LOS and density in a 15-minute interval, whereas the field travel times have been averaged over the peak hour.

**Table 3-3. Peak Direction Corridor Travel Times – Peak Hour**

| | Travel Time Description | Start Location | End Location | Peak Hour | Free Flow Travel Time (in Min) | 2017 Existing Year Travel Time (in Min) |
|---|---|---|---|---|---|---|
| AM Peak | Port Orchard to Naval Base Kitsap-Bremerton: WB/NB Peak Direction | SE Mullenix Rd | SR 304/1st St | 6:30 – 7:30 AM | 11.3 | 14.3 |
| | *Port Orchard to SR 3/SR 304* | *SE Mullenix Rd* | *SR 3/SR 304* | 6:30 – 7:30 AM | 8.5 | 11.5 |
| | *SR 3/SR 304 to Naval Base Kitsap-Bremerton* | *SR 3/SR 304* | *SR 304/1st St* | 6:30 – 7:30 AM | 2.8 | 2.9 |
| | Port Orchard to Bremerton WB/NB Peak Direction | SE Mullenix Rd | SR 310/Kitsap Way | 6:30 – 7:30 AM | 10.3 | 13.3 |
| | *Port Orchard to SR 3/SR 304* | *SE Mullenix Rd* | *SR 3/ SR 304* | 6:30 – 7:30 AM | 8.5 | 11.5 |
| | *SR 3/SR 304 to SR 310/Kitsap Way* | *SR 3/SR 304* | *SR 310/Kitsap Way* | 6:30 – 7:30 AM | 1.8 | 1.8 |
| | Port Orchard to Tacoma Narrows Bridge: SB Direction | Old Clifton Rd/Tremont St | Tacoma Narrows Bridge (Center) | 7 – 8 AM | 18.3 | 18.4 |
| | | | | | | |
| PM Peak | Naval Base Kitsap-Bremerton to Port Orchard EB/SB Peak Direction | SR 304/1st St | SE Mullenix Rd | 3:30 – 4:30 PM | 12.0 | 24.5 |
| | *Naval Base Kitsap-Bremerton to SR 3/SR 304* | *SR 304/1st St* | *SR 3/SR 304* | 3:30 – 4:30 PM | 3.1 | 15.0 |
| | *SR 3/SR 304 to Port Orchard* | *SR 3/SR 304* | *SE Mullenix Rd* | 3:30 – 4:30 PM | 8.7 | 9.5 |
| | Bremerton to Port Orchard EB/SB Peak Direction | SR 310/Kitsap Way | SE Mullenix Rd | 3:30 – 4:30 PM | 10.5 | 18.3 |
| | *Bremerton to SR 3/SR 304* | *SR 310/Kitsap Way* | *SR 3/SR 304* | 3:30 – 4:30 PM | 1.8 | 8.8 |
| | *SR 3/SR 304 to Port Orchard* | *SR 3/SR 304* | *SE Mullenix Rd* | 3:30 – 4:30 PM | 8.7 | 9.5 |
| | Tacoma Narrows Bridge to Port Orchard NB Peak Direction | Tacoma Narrows Bridge (Center) | Old Clifton Rd/Tremont St | 5 – 6 PM | 17.6 | 24.5 |

Notes:

Travel times were collected between 6 and 9 AM, and between 3 and 6 PM on March 1 and 2, 2017.

Data was collected on typical days; no accidents or unusual events occurred during data collection.

Data collection occurred while two aircraft carriers were in port at Naval Base Kitsap-Bremerton.

Travel time points along SR 16 and SR 3 were observed on the mainline freeway section.

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- During the PM peak hour in the peak direction, the eastbound/southbound direction between Naval Base Kitsap-Bremerton and Port Orchard, the off-peak free flow travel time is 12.0 minutes and the peak hour travel time is approximately 24.5 minutes or 104 percent higher during the PM peak hour. These long travel times reflect the heavy congestion approaching Gorst and correspond to LOS F highway segments.
- From Bremerton to Port Orchard the off-peak free flow travel time is 10.5 minutes and the PM peak hour travel time is approximately 18.3 minutes or 74 percent increase during the PM peak hour.
- From the TNB to Port Orchard the off-peak free flow travel time is 17.6 minutes and the peak hour travel time is approximately 24.5 minutes or 39 percent increase during the PM peak hour. These peak hour travel times reflect congested conditions on intermittent freeway segments (corresponding to LOS E) through Purdy.

### 3.3.3 Existing Intersection Traffic Operations Analysis

The study area includes 61 study intersections located within Bremerton, Gorst, Port Orchard, and Gig Harbor. Study area intersections include ramp terminals and intersections within an influence area of the SR 16 and SR 3 corridor study area. Study intersections were identified by the project team and confirmed by WSDOT and the Technical Advisory Group.

Table 3-1 includes a list of study intersections and intersection controls. Intersection operations were analyzed using Synchro (version 8) using the HCM 2010 methodology. Roundabouts were analyzed using SIDRA software. The parameters and assumptions are documented in Appendix F, the *Traffic Analysis Methods and Assumptions Memorandum*.

Similar to freeway operations, intersection levels of service are designated with letters ranging from LOS A, which is indicative of good operating conditions with little or no delay, to LOS F, which is indicative of stop-and-go conditions with frequent and lengthy delays. The LOS thresholds are based on average delay per vehicle. LOS D is the adopted intersection LOS standard for peak hour conditions for most of the local jurisdictions and WSDOT.

Most intersection data collection occurred on Tuesdays, Wednesdays, and Thursdays in March 2017 during a period when two active naval aircraft carriers were docked at Naval Base Kitsap–Bremerton. Additional data was collected along Sherman Heights Road in June 2017. The intersection turning movement counts were seasonally adjusted to reflect typical May traffic volumes.

Figures 3-6a to 3-6d present existing AM and PM peak hour intersection LOS results by sub-area. For more detailed results, see Appendix H, *Existing Traffic Operations Analysis* memorandum.

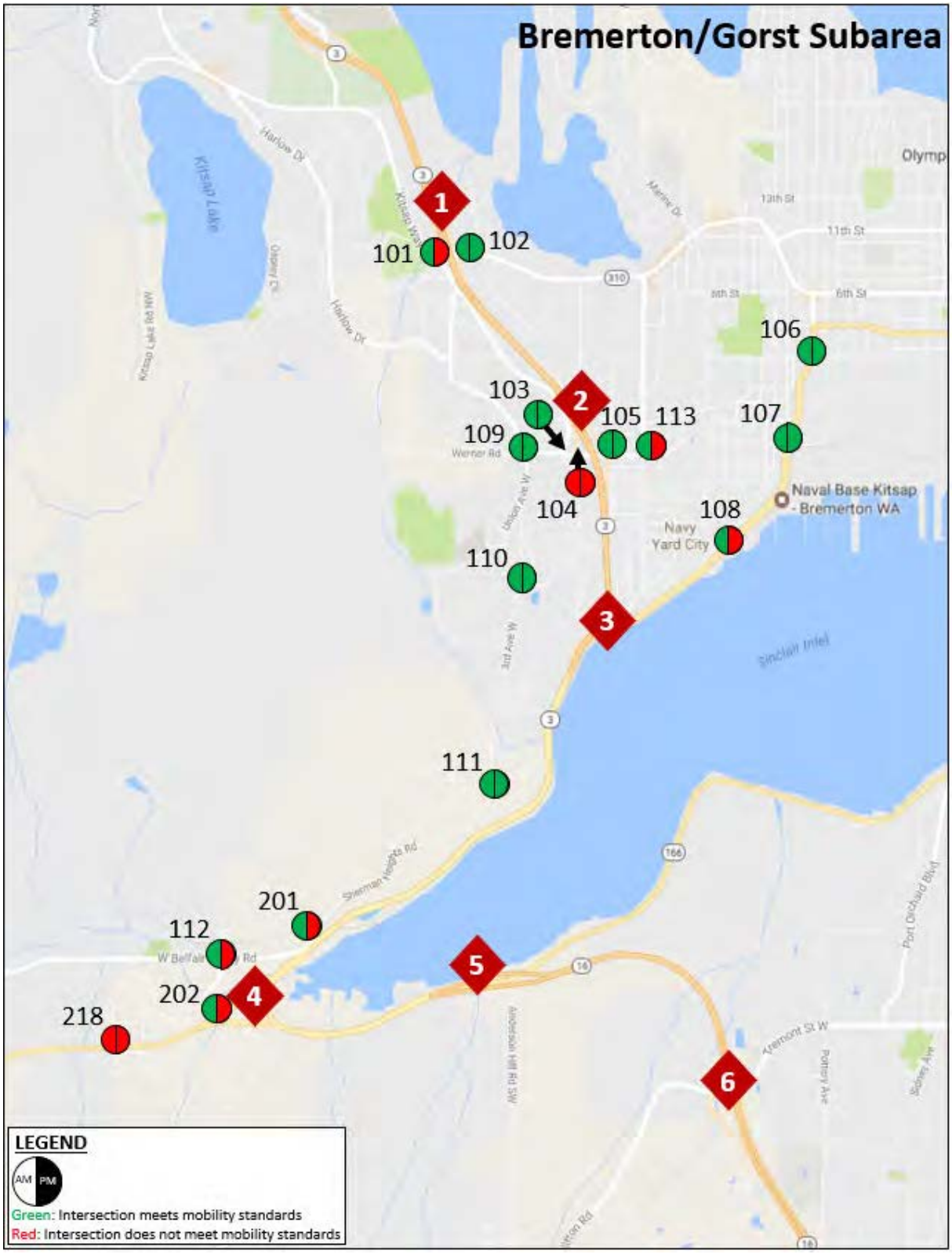



**Figure 3-6a. Existing (2017) Intersection Level of Service by Bremerton/Gorst Sub-area**

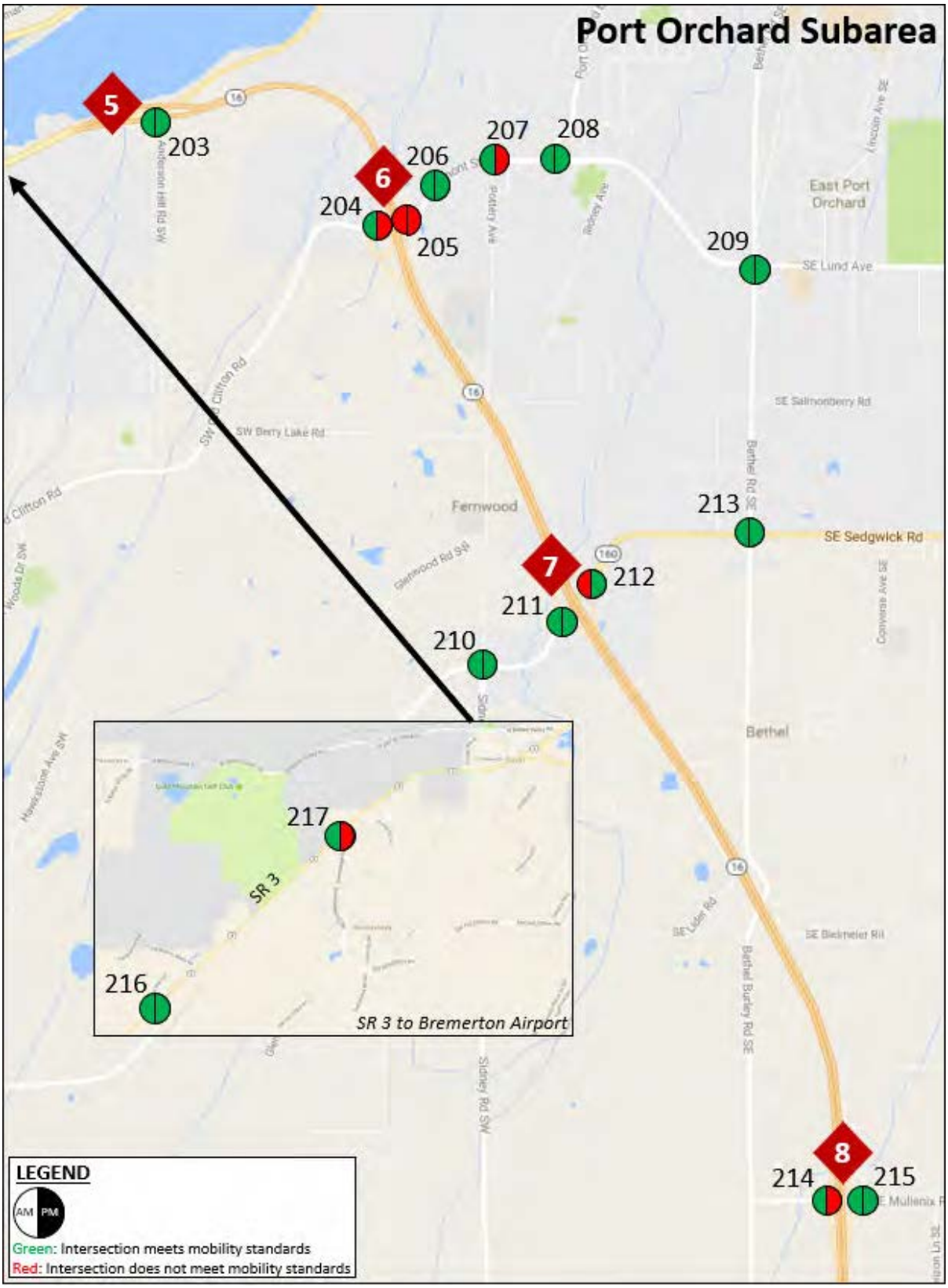



**Figure 3-6b. Existing (2017) Intersection Level of Service by Port Orchard Sub-area**

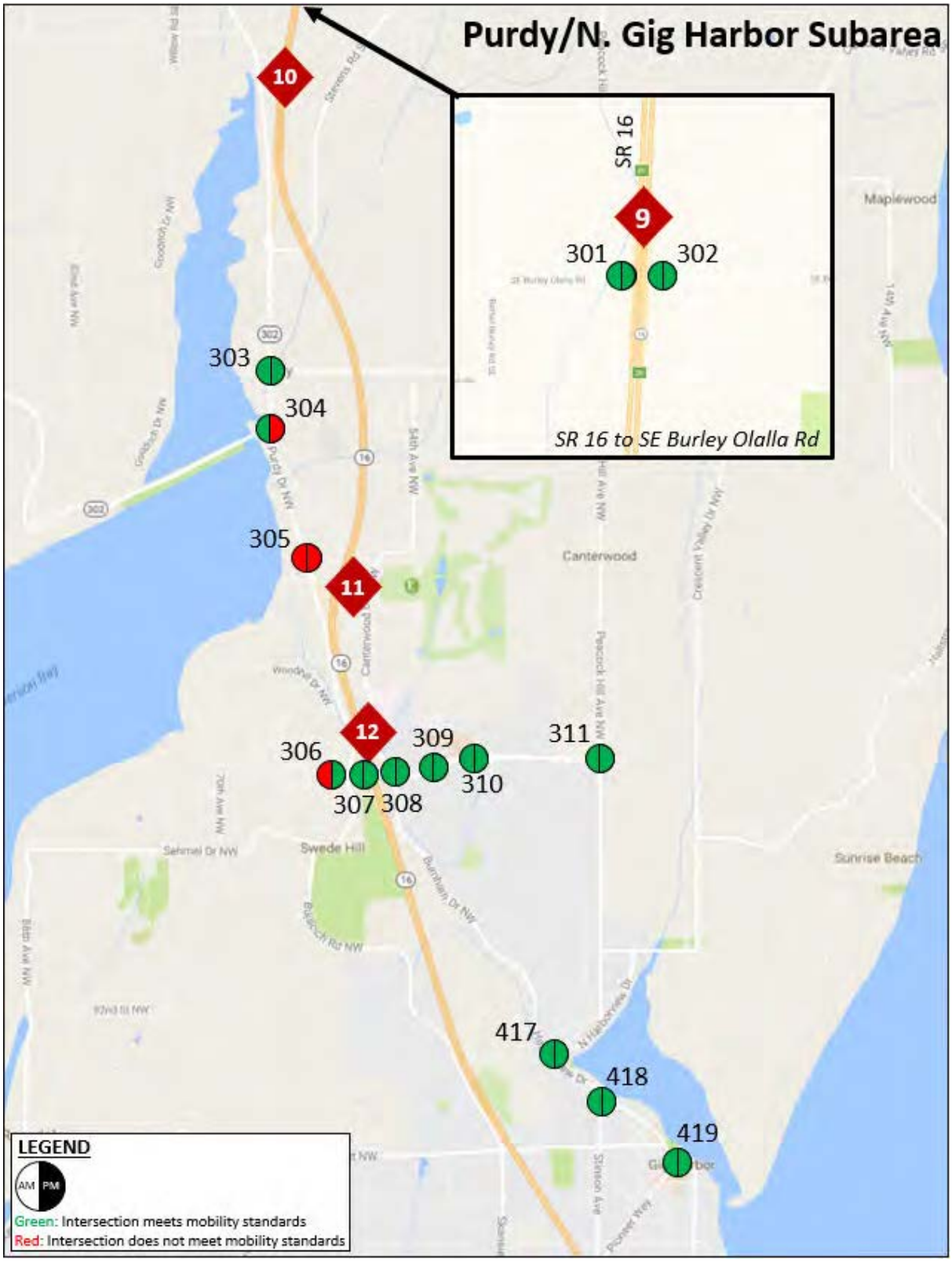



**Figure 3-6c. Existing (2017) Intersection Level of Service by Purdy/North Gig Harbor Sub-area**

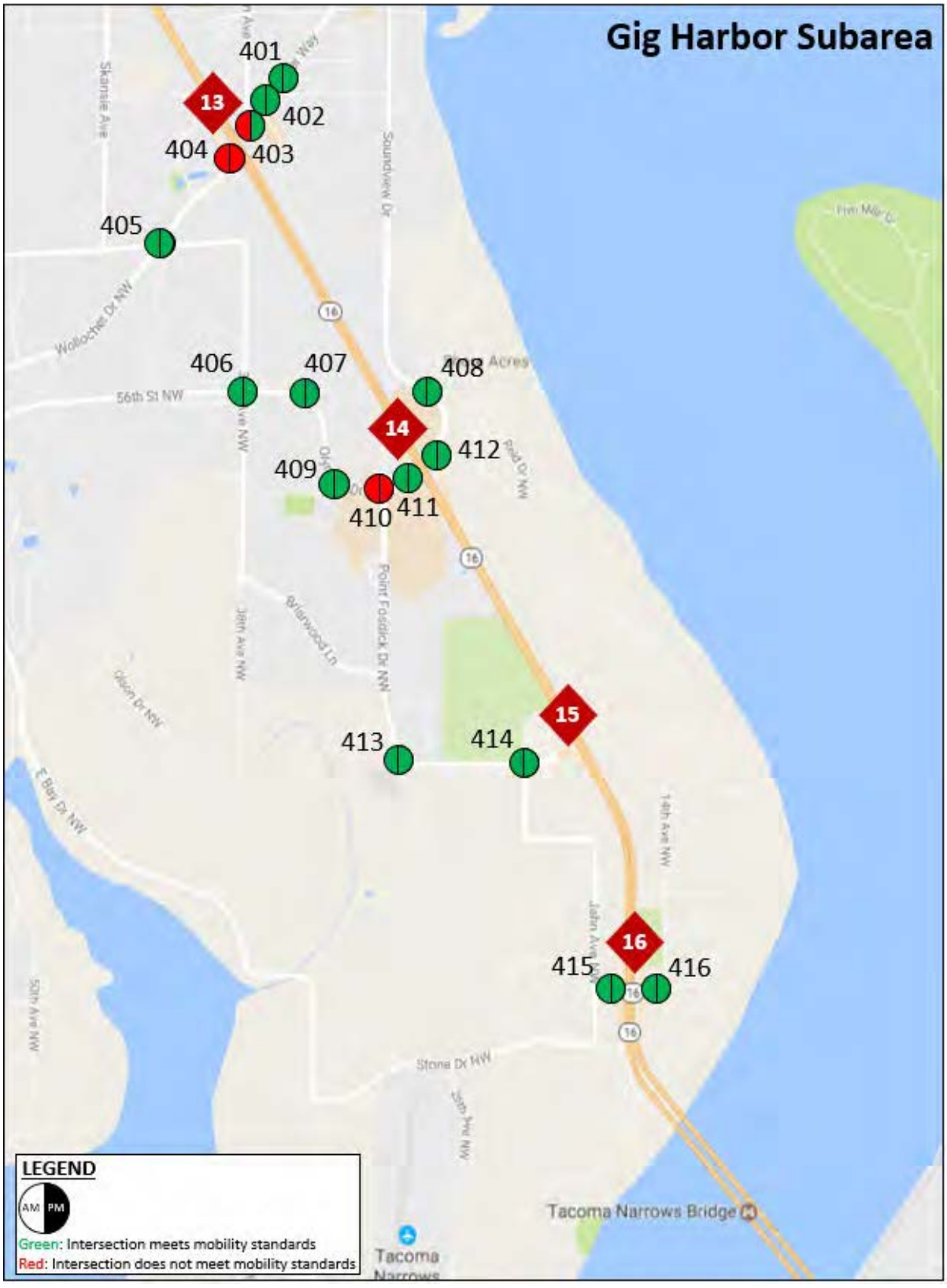



**Figure 3-6d. Existing (2017) Intersection Level of Service by Gig Harbor Sub-area**

## 3.3.4 Existing Safety Conditions for Highways

WSDOT provided crash data for the most recent 5 years (2012-2016) for the state facilities (mainline only) within the study area. Table 3-4 provides a summary of the observed crash data of these facilities by sub-area.

**Table 3-4. Observed Crash Data Summary by Sub-area (2012-2016)**

| Sub-area | Highway and Milepost Limits | Crash Frequency by Severity | | |
|---|---|---|---|---|
| | | Fatal Crashes | Serious Injury Crashes | Total Crashes |
| South SR 16 – Gig Harbor | SR 16 Milepost 6 to 13 | 3 | 4 | 323 |
| South SR 16 – Purdy and Gig Harbor | SR 16 Milepost 13 to 22 | 4 | 5 | 248 |
| North SR 16 – Port Orchard | SR 16 Milepost 22 to 29, SR 16 Spur, SR 3 Milepost 30 - 35 | 5 | 10 | 681 |
| SR 3 – Gorst and Bremerton | SR 3 Milepost 35 – 38, SR 304 Milepost 0 – 1.5 | 0 | 9 | 405 |
| | **Total** | **12** | **28** | **1,657** |

The observed crash data were considered in terms of WSDOT's strategic highway safety plan emphasis areas (e.g., Target Zero plan). These emphasis areas focus on the largest contributing factors for crashes to develop targets and strategies for reducing fatal and injury crashes throughout the state.

Appendix H, the *Existing Traffic Operations Analysis* memorandum, provides a detailed classification of the 40 fatal and injury crashes within each Target Zero category and emphasis area by sub-area. In general, lane-departure crashes appear to be the largest contributing factor for fatal and serious injury crashes for the project area. This seems to be particularly focused on the South SR 16 - Gig Harbor and South SR 16 - Purdy and Gig Harbor sub-areas with 57 percent (4 crashes) and 89 percent (8 crashes) of crashes, respectively, involving a lane departure, more specifically, run-off-the-road. In addition, over half (57 percent or 4 crashes) of the fatal and injury crashes in the South SR 16 - Gig Harbor sub-area involved impairment, and 78 percent (or 7 crashes) in the SR 3 - Gorst and Bremerton sub-area involved at least one motorcycle.

Over 1,650 crashes were recorded on the state facilities (mainline only) within the study area over the most recent 5 years of data (2012-2016). Approximately 2.5 percent (or 40) of these crashes were fatal or serious injury crashes. Lane-departure crashes, impairment-involved crashes, and motorcycle-involved crashes are the primary contributing factors within the study area.

Under 23 U.S. Code §148 and 23 U.S. Code §409, 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.

## 3.3.5 Summary of Existing Traffic Operations Analysis

In the AM peak hour, the following freeway segments have substandard LOS:

- SR 16 eastbound, intermittently, from the SR 302 on-ramp to the 24th Street NW on-ramp
- SR 3 northbound, from the Sedgwick Road on-ramp to the SR 304 eastbound off-ramp.
- Both segments are in the peak commute directions of traffic. SR 16 eastbound is towards the Tacoma urban area and SR 3 northbound is towards the Naval Base Kitsap–Bremerton.

In the PM peak hour, the following freeway segments have substandard LOS:

- SR 16 westbound, intermittently, from the 24th Street NW interchange to the SR 302 northbound off-ramp
- SR 16 eastbound, from the SR 166 off-ramp to the SW Old Clifton Road/Tremont Street W off-ramp
- SR 3 southbound, from the SR 310 interchange to the W Sherman Heights off-ramp

During the AM peak hour, 9 of the 61 study intersections, or 15 percent, are operating below their respective LOS standard. During the PM peak hour, 18 of the 61 study intersections, or 30 percent, are below the LOS standard.

## 3.4 Future Traffic Forecasting Model

After existing year model calibration, future year land use and trip generation were applied to develop the future travel demand forecasts. Two primary influences on travel demand are changes in land use and the resulting trip generation; and changes in the transportation network. The planned and programmed improvements were incorporated in the forecast model used to modify the transportation network and are summarized below. Additional detail is provided in Appendix I, *Traffic Forecasting Model Review and Implementation Plan*, Final, April 2017. The methodology to use local jurisdiction land use data for the three forecast horizon years is also summarized below.

### 3.4.1 Consistency with Planned and Programmed Improvements

Local jurisdictions planned and programmed improvements were fully integrated in the future baseline analysis. These projects generally include a modest investment package to improve near-term local street operations (6-year transportation improvement program projects) and long-term capacity improvement based on adopted land use plans (transportation elements of comprehensive plans). Appendix K, *Future Baseline Traffic Operations Analysis* Technical Memorandum provides the detailed documentation of planned and programmed improvements for each transportation mode in the corridor.

WSDOT currently has no program of investments in the SR 16 and SR 3 corridors other than maintenance and safety. This congestion study using the Practical Solutions approach sets the stage for developing a program of improvements. There are currently no planned changes to traffic management using Intelligent Transportation System (ITS) technologies. The TNB tolling is scheduled to end in 2032.

Transit agencies plan for future services with an evaluation of historical ridership trends, existing ridership, future forecasting, and available funding. The annual rates of ridership increase for Kitsap Transit and Mason Transit indicate that transit would not capture an increasing mode share of travel demand in the corridor. Funding limits for Pierce Transit indicate that transit ridership could remain flat; however, Sound Transit could incrementally increase service to the corridor.

The WSDOT ferry system long-range plan (WSDOT, 2009) includes vessel upsizes and new vessels to replace the oldest vessels built during the 1950s and 1960s. This program began in 2014. In June 2017 the *Chimacum* replaced the *Hyak* on the Seattle/Bremerton route. In the fall of 2018 the Washington

State Ferries will take delivery of the *Suquamish* for the Mukilteo/Clinton route. Kitsap Transit operates ferry service with plans for additional service. Fast-ferry service is slated to begin in the fall of 2018 for Kingston to Downtown Seattle and summer 2020 for Southworth to Downtown Seattle.

Local jurisdictions were consulted to identify future planned or programmed pedestrian and bicycle improvements. These nonmotorized improvements were integrated into the strategy packages.

### 3.4.2 Land Use Data

Future land use and growth was determined for the long-term year of 2040 as follows:

1. Long range (2040) land use forecasts were developed based on the latest available local and regional land use targets, plans, policies, and buildable lands analyses. Forecasts were refined to match modeled land use categories and units, and forecasting horizons were reconciled to the modeled long-range analysis horizon of 2040.
2. Long-range land use growth forecasts were obtained from the cities of Bremerton, Gig Harbor, and Port Orchard. These forecasts reflect the most recent comprehensive plan targets for their respective agencies. Land use forecasts for unincorporated Pierce County and Kitsap County were based on the latest available countywide planning policies data and constrained by the buildable lands analyses for their respective agencies. Forecasts were refined by applying developments currently in the application "pipeline," based on information provided by each jurisdiction. This allowed known growth locations, types, and quantities to be reflected in the model.
3. By including the most recent available land use policies and forecasts, the travel demand model also reflects the impacts of major long-range housing and employment growth centers in the study area, including Puget Sound Industrial Center-Bremerton, McCormick Urban Village (Port Orchard), and the Olympic Drive commercial area (Gig Harbor). The baseline 2040 analysis did not assume growth at Naval Base Kitsap-Bremerton.
4. Land use growth forecasts for the cities of Bremerton and Port Orchard and for unincorporated Kitsap County were provided for a 2036 horizon year. Land use growth forecasts for the City of Gig Harbor and surrounding area, including portions of unincorporated Pierce County, were provided for a 2030 horizon year. Linear extrapolation was applied to reconcile all land use growth to a common forecasting year of 2040. Growth forecasts were constrained by the 2014 Kitsap County and 2014 Pierce County buildable lands analyses.
5. The near- and mid-term years' (2022 and 2027) travel demand were developed through interpolation of trip generation between 2017 and 2040. Straight-line interpolation was found to reflect appropriate levels of growth based on planned development patterns, so no adjustments were needed to the trip tables.

### 3.4.3 Application of Model Results

The future year traffic forecasts are used to evaluate the performance measures. The metric is applied, and the performance is prepared for corridor segments. The performance gap provides the level to the goal is that not achieved. For example, if 75 percent of ramp terminals in the Port Orchard segment operate at LOS E or better, the performance gap is 25 percent.

Performance measures and gaps are presented for each goal in Section 3.5, and Chapter 4 provides information on strategies. Detailed results of analysis are provided in Appendix K.

## 3.5 Future Operating Conditions

Traffic forecasts and the resulting operating conditions were prepared to determine estimated future baseline performance. The existing and future operation conditions were evaluated for each of the performance metrics and the performance gap was determined for each of the study goals. An overall performance assessment for each study goal was prepared for each strategy package to compare the performance of each strategy package for each future baseline year. A large amount of data was collected, analyzed for conditions, evaluated by performance metrics, and compiled for existing and each future baseline year to assess the performance gap relative to study goals. This approach provides the framework for the Practical Solutions study requirements in the context of a major corridor study. Multiple strategy packages are evaluated over time to develop the most practical solutions to advise a corridor investment strategy. The study goals and future baseline performance gaps relative to each goal are described below.

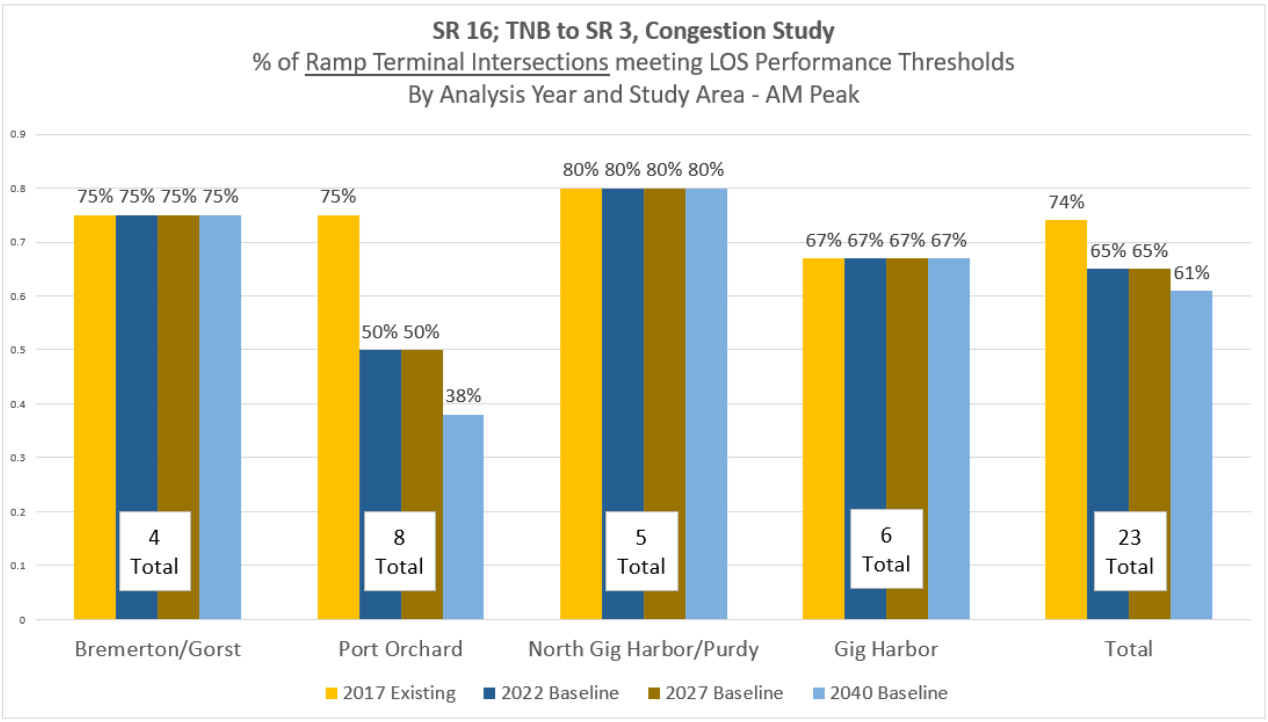
### 3.5.1 Future Year Performance

**Goal #1 Relieve vehicle congestion and improve travel time in the corridor.**

LOS at ramp terminals by sub-area for the AM and PM peak hours are shown on Figure 3-7. For each sub-area, there is a bar chart that shows the performance as percent of intersections meeting LOS performance thresholds. There are four bars of different colors to compare 2017 Existing, 2022 Baseline, 2027 Baseline, and 2040 Baseline results. The sub-area showing the worst future performance is Port Orchard.

Queuing at ramp interchange terminals was prepared for the PM peak hour. The queuing metric is the percentage of queues at SR 16 and SR 3 ramp terminals that do not spill back to mainline for during the AM and PM peak hours. The results show minimal queueing impacts to the mainline at ramp terminals existing or in future years.

LOS on highway segments for the AM and PM peak hours are shown in Figure 3-8. During the AM peak hour, SR 16 eastbound and SR 3 northbound show the worst performance in future years. As would be expected, during the PM peak hour, the opposite directions show the worst future performance



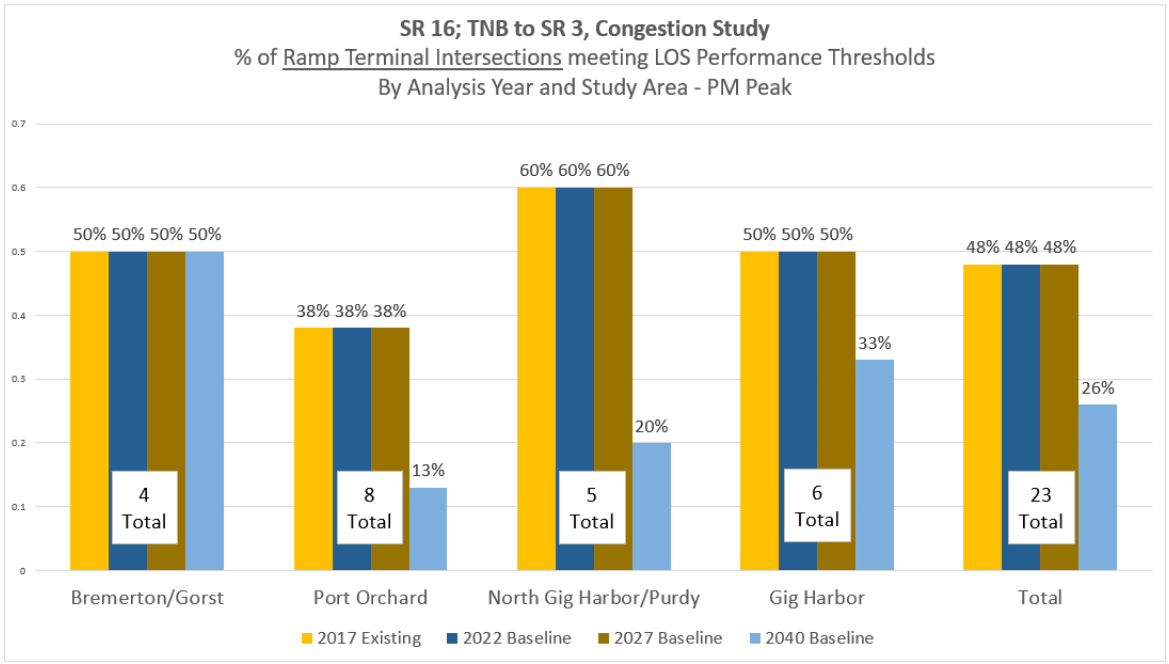
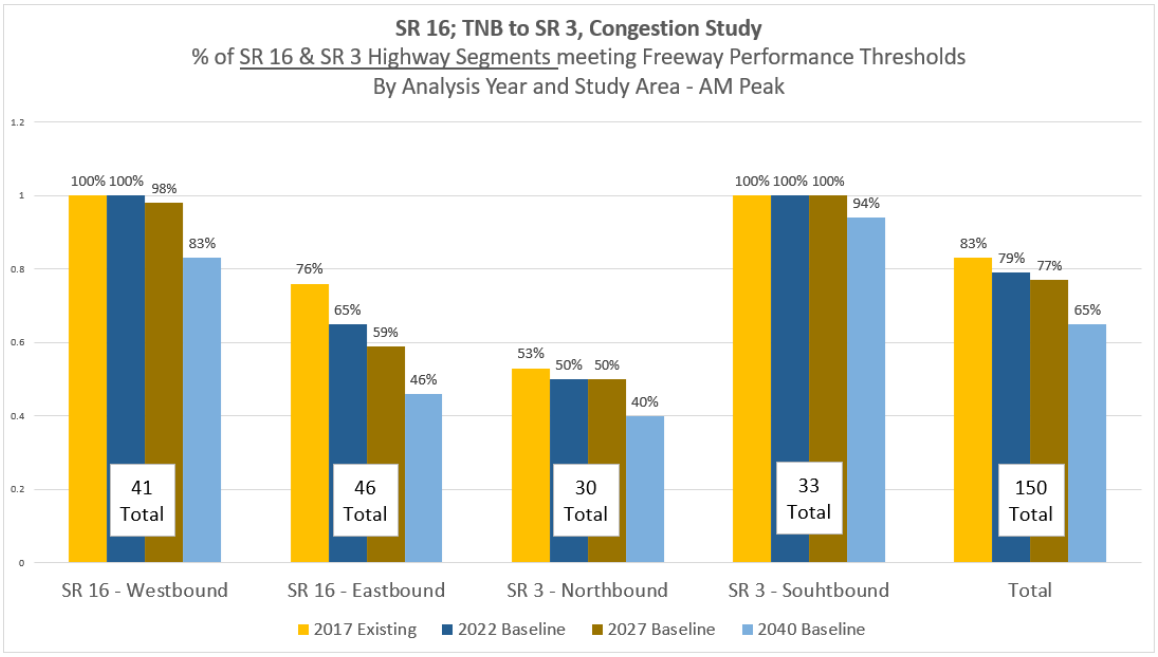




**Figure 3-7. Percentage of Ramp Terminal Intersections Meeting Performance Thresholds**



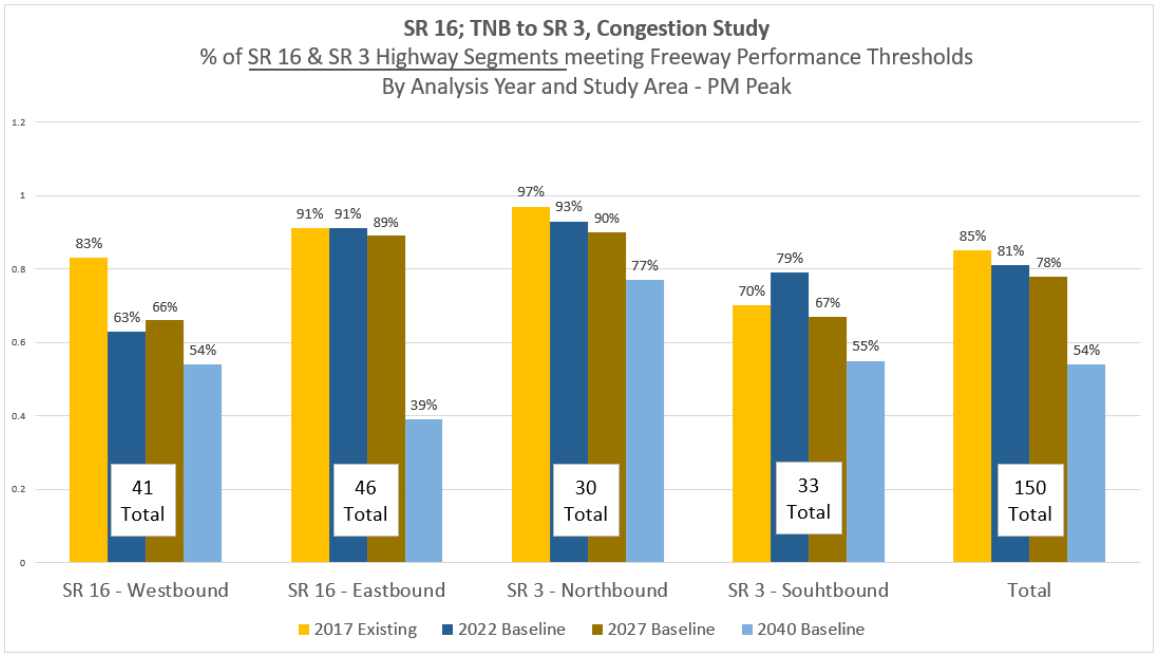




**Figure 3-8. Percentage of Freeway Segments Meeting Performance Threshold**

Corridor Travel Times are presented in Table 3-5. The shaded pink cells indicate where corridor travel times increase by 50 percent. By 2040, travel times between Port Orchard and Bremerton in the peak direction increase by 138 to 387 percent over the free flow travel time. Travel times between the TNB and Port Orchard almost double in the PM peak hour. In non-peak directions, travel times only increase by 80 percent or less over the free flow travel time.

**Table 3-5. Existing and Future Travel Times**

| | | | | | | 2022 Baseline | | 2027 Baseline | | 2040 Baseline | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Travel Time Description | Start Location | End Location | Peak Hour | Free Flow Travel Time (min) | 2017 Existing Travel Time (min) | Travel Time (min) | % Increase over FF [a] | Travel Time (min) | % Increase over FF [a] | Travel Time (min) | % Increase over FF [a] |
| **Existing and Baseline Travel Times – AM** | | | | | | | | | | | |
| **Travel Direction: Westbound/Northbound** | | | | | | | | | | | |
| Port Orchard to Naval Base Kitsap-Bremerton | SE Mullenix Rd. | SR 304/1st St. | 6:30 – 7:30 AM | 11.3 | 14.3 | 15.2 | 34% | 16.3 | 44% | 21.3 | 88% |
| Port Orchard to Bremerton | SE Mullenix Rd. | SR 310/Kitsap Way | 6:30 – 7:30 AM | 10.3 | 13.3 | 14.6 | 42% | 16.3 | 58% | 22.7 | 120% |
| **Travel Direction: Eastbound/Southbound** | | | | | | | | | | | |
| Port Orchard to Tacoma Narrows Bridge | Old Clifton Rd./ Tremont St. | Tacoma Narrows Bridge (Center) | 7 – 8 AM | 18.3 | 18.4 | 19.1 | 4% | 20.4 | 12% | 27.1 | 48% |
| **Existing and Baseline Travel Times – PM** | | | | | | | | | | | |
| **Travel Direction: Westbound/Northbound** | | | | | | | | | | | |
| Tacoma Narrows Bridge to Port Orchard | Tacoma Narrows Bridge (Center) | Old Clifton Rd./ Tremont St. | 5 - 6 PM | 17.6 | 24.5 | 25.6 | 46% | 27.0 | 54% | 33.1 | 89% |
| **Travel Direction: Eastbound/Southbound** | | | | | | | | | | | |
| Bremerton to Port Orchard | SR 310/Kitsap Way | SE Mullenix Rd. | 3:30 – 4:30 PM | 10.5 | 18.3 | 18.2 | 74% | 19.6 | 86% | 24.0 | 129% |
| Naval Base Kitsap-Bremerton to Port Orchard | SR 304/1st St. | SE Mullenix Rd. | 3:30 – 4:30 PM | 12.0 | 24.5 | 26.0 | 117% | 27.4 | 128% | 31.9 | 166% |

Notes:

[a]: Percentage difference between baseline and free flow travel time

Existing field travel times were collected between 6 AM and 9 AM, and between 3 PM and 6 PM on March 1 and 2, 2017.

Data was collected on typical days; no accidents or unusual events occurred during data collection.

Data collection occurred while two aircraft carriers were in port at Naval Base Kitsap-Bremerton.

Pink shading indicates travel time increases over 50 percent between free flow and baseline travel times.

**Goal #2 Coordinate with state and local agencies to minimize high levels of traffic congestion on the surrounding local roadway network.**

LOS at local study intersections for the AM and PM peak hours are shown on Figure 3-9. In the Port Orchard sub-area 60 percent of the study intersections meet the LOS performance threshold in 2040, indicating a 40 percent performance gap. The other segments shown minimal differences in existing performance compared to future performance. During the PM peak hour all sub-areas show a drop in performance with the worse condition occurring by 2040 in the North Gig Harbor/Purdy sub-area.

Queuing was an operational issue common to many local intersections. The queuing conditions primarily occurred due to short turn pockets. A practical solution to excess queuing disclosed through the LOS conditions would be to extend the length of turn pockets rather than expand the number of lanes at an intersection approach.

The performance of the local roadway network is a key consideration in Practical Solutions for freeway corridors because local street network congestion issues can cause spillover congestion issues at ramp terminals and the freeway. Solutions that expand the freeway system without improving local intersections is a costly long-term solution. The Practical Solutions approach included a close look at solutions to local intersection performance and the relationship to improved freeway performance.

**Goal #3 Support existing and future planned business and residential growth.**

Eight major areas of development were identified within the study area using land use targets. The eight major developments are: PSIC-B, unincorporated growth surrounding PSIC-B, downtown Bremerton sub-area, industrial zoned Bremerton sub-area, industrial zoned Gig Harbor sub-area, Pioneer and Olympic interchanges in Gig Harbor and SE Sedgwick corridor and McCormick Urban Village in Port Orchard. Study intersections near a key development were grouped and vehicular performance was analyzed as a secondary measure to ensure key planned developments were considered. For more details, see Appendix K.

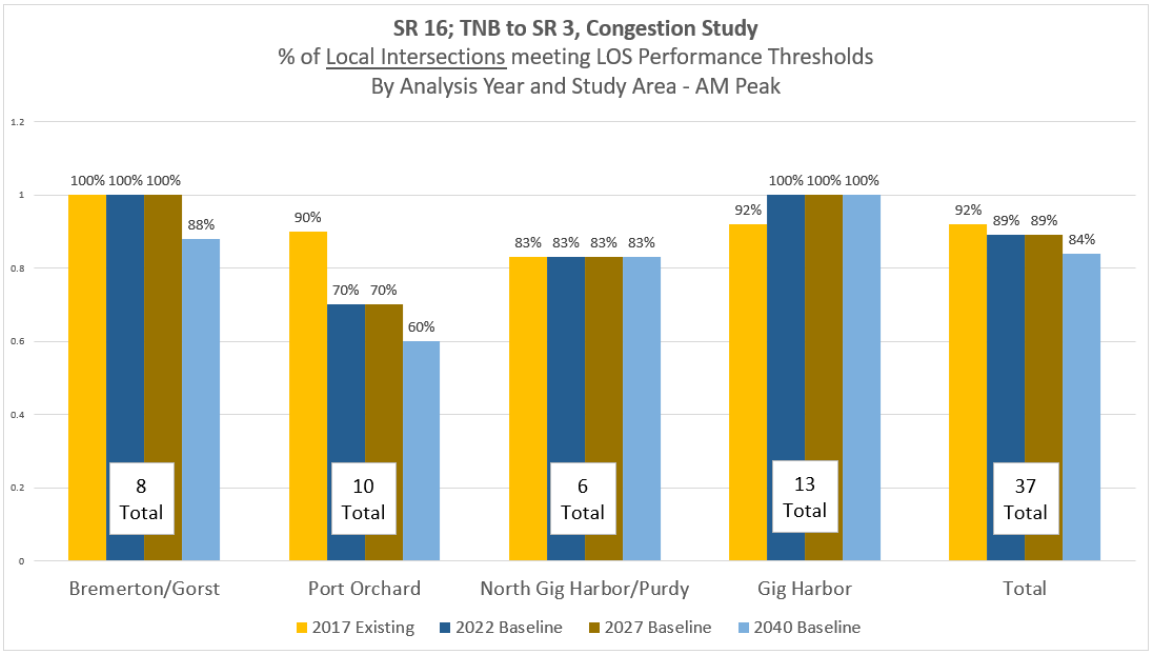
**Goal #4 Invest in strategies that improve multimodal travel options and advance public health.**

Figure 3-10 shows transit route coverage for the greater study area. On the left, the red paths represent all transit routes, and, on the right, the blue paths represent select Kitsap County worker-driver buses. The green path is also the Purdy Connection route. There is little distinction between transit coverage in the existing and future baseline scenarios. Many routes are isolated within the sub-areas and there is a lack of regional transit service. Transit improvements are dependent on transit agency funding, which is historically limited and transit agency plans acknowledge the limitations in transit funding.

Roadways within 0.5 mile of each interchange crossing were inventoried for sidewalks, sharrows, or bike lanes and shoulders. The SR 16 mainline was not inventoried for nonmotorized facilities. In general, most interchange crossings only had minimal pedestrian and bicycle facilities. The recommended package includes solutions to close gaps in the nonmotorized network. A more detailed inventory of the pedestrian and bicycle facilities are in Appendix K.

**Goal #5 Reduce transportation impacts on the environment.**

Increasing congestion of future baseline conditions contributes to increased carbon emissions and pollution. Roadway improvements to reduce congestion will close the environmental performance gap. The future mode shift with each of the strategy packages is minimal and does not contribute to closing an environmental gap related to air quality. Improvement projects resulting from solutions can be designed to improve existing gaps in the local natural environment through stormwater runoff treatment, improving wetland quality, and reconstructing blocked fish passage culverts.



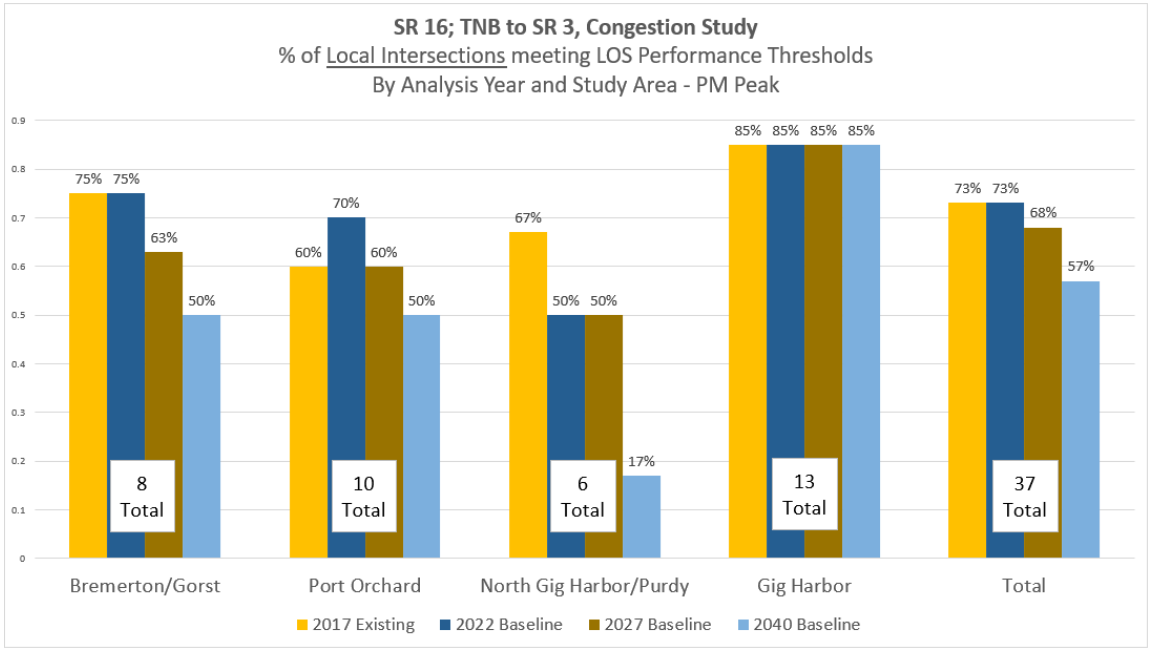




**Figure 3-9. Percentage of Local Intersections Meeting Performance Thresholds**

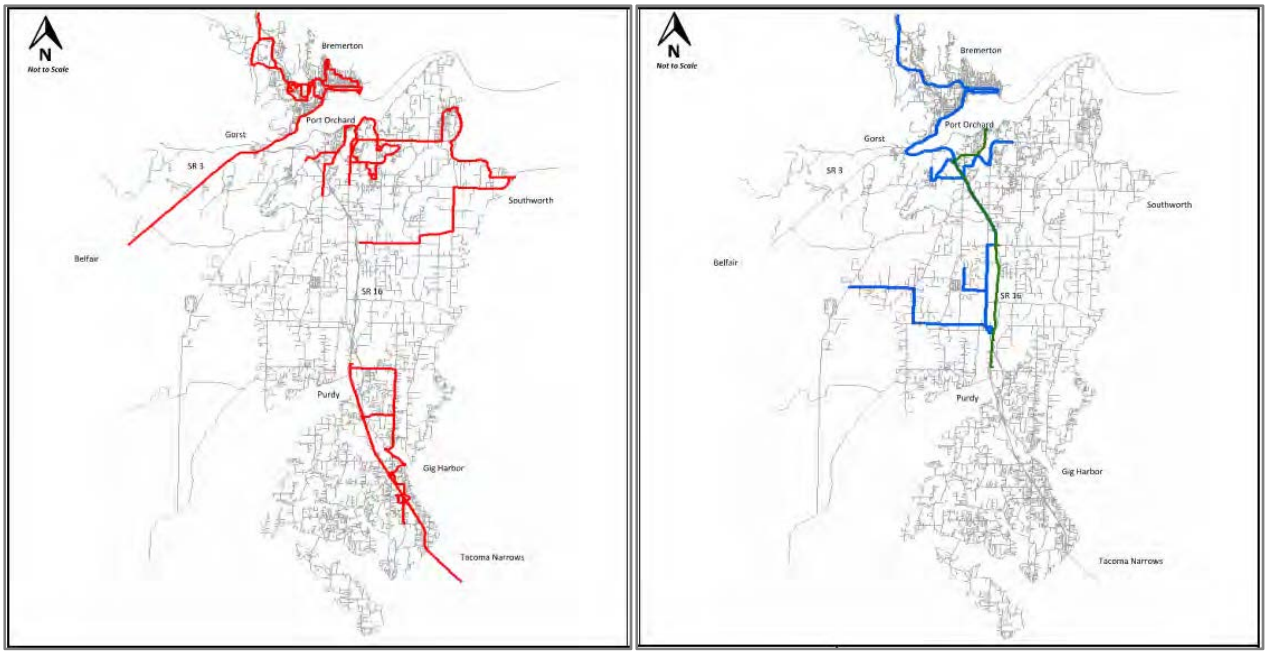



**Figure 3-10. Transit Routes**

**Goal #6 Be consistent with Target Zero Washington State Strategic Highway Safety Plan.**

Safety will be considered through the WSDOT *Strategic Safety Highway Plan*, and provide information leading to prioritization of funding for solutions. Each solution in the recommended strategy package will be developed to address know safety conditions while addressing operational performance gaps. Solution will be developed consistent with the *Target Zero Washington State Strategic Highway Safety Plan*.

**Goal #7 Preserve or enhance critical connections to industrial and institutional facilities, such as Port of Bremerton, Naval Base Kitsap-Bremerton, and Puget Sound Industrial Center**

Future operating conditions with each alternative package were evaluated to identify if the solutions decreased levels of congestion and travel delay for routes to and from the major facilities identified in Goal #7, as well as Bremerton and Pierce County industrial and institutional areas. Alternative routes were assessed to determine the level of redundancy and resiliency in the transportation network. The assessment was prepared near Gorst to routes southwest, northeast and easterly. Alternative routes are longer routes with minimal provision of redundancy. Particularly in Gorst, there is a gap in the alternate routes connecting Port Orchard to Bremerton because of the geometric constraints along SR 3.

**Goal #8 Provide strategies to maximize efficient investment using Practical Solutions approach.**

The recommended solutions for each horizon year follow the Practical Solutions approach by implementing solutions incrementally and prioritizing on low-cost, operational improvements in the near-term. The robust analysis of this study provides a data-driven basis to achieve the Practical Solutions approach.

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# Chapter 4 Strategy Package Development and Evaluation

Chapter 3 documented the analyses of existing and anticipated future performance gaps in the corridor transportation network. Based on these performance gaps the project team engaged with the community and stakeholder groups to brainstorm and identify preliminary ideas to address the transportation performance gaps and issues along the State Route (SR) 16 and SR 3 corridors. This chapter describes how the Washington State Department of Transportation (WSDOT) Practical Solutions approach was used to identify ideas to address performance gaps, group the ideas as solutions into strategy packages and then further evaluate and refine the solutions and strategy packages.

## 4.1 Approach to Development of Solutions and Strategy Packages

The SR 16 Congestion Study incorporated performance-based Practical Solutions planning design at the corridor level by developing packages of solutions as near-term/low-cost, medium-term/medium-cost, and long-term/high-cost. The WSDOT Practical Solutions planning approach is described in more detail in Chapter 1, Section 1.2.

Community engagement is an essential element of WSDOT's Practical Solutions approach. A detailed description of public and stakeholder involvement and outreach throughout this study is provided in Chapter 2. Suggestions for addressing transportation issues and concerns were collected through public open houses held both online and in-person, Technical Advisory Group (TAG) meetings, and Executive Committee meetings. Ideas to address transportation performance gaps were further refined into specific solutions and are aligned with the strategy categories shown in Table 4-1.

**Table 4-1. Strategy Categories**

| Strategy ID | Strategy | Level of Investment | Examples of Solutions |
|---|---|---|---|
| 1 | Operational Improvements/ITS | Low | Intersection turn pockets, signal optimization, variable message signs |
| 2 | Travel Demand Management | Low | Commute trip reduction strategies, telecommuting, etc. |
| 3 | Pedestrian and Bicycle Improvements | Low, Medium, or High | Bike lanes, at-grade pedestrian and bicycle crossing improvements, regional trail extensions |
| 4 | Public Transit Improvements | Low, Medium, or High | Transit route expansion, additional worker buses, enhanced amenities |
| 5 | Medium Capacity Improvements | Medium | Installation of signal or roundabout, enhance intersection channelization |
| 6 | High Capacity Improvements | High | Grade-separated vehicle crossings, roadway extensions, new interchanges, roadway widenings, new roadways |

Some solutions from each strategy were grouped into packages of solutions to comprehensively address performance gaps over the future years. Each of these packages were modelled for performance and the results used to calculate performance metrics and compared against the study goals. Based on input from stakeholders, additional adjustments and refinements were then made into packages of near term, medium term, and long term solutions to address remaining performance gaps. Detailed information on the development of strategies and strategy packages is provided in Appendix L, *Summary of Evaluation and Analysis Procedures*. Strategy package evaluation and performance results are provided in Appendix M, *Evaluation of Strategy Packages.*

## 4.2 Initial Screening of Solutions

A total of 153 ideas were identified and gathered through public and stakeholder outreach. These ideas were reviewed and refined into 109 unique solutions. Ideas were not eliminated from consideration; rather, similar ideas that addressed a common performance gap were combined or grouped with other ideas as a solution. The 109 solutions were then evaluated in an initial screening, to answer the following questions:

- Does the solution meet the study's vision, needs, and goals?
- Is the solution practical or applicable?

Solutions that did not meet the study's vision of providing efficient, connected, and multimodal transportation for regional and local users while supporting economic growth were screened out from further consideration during this step. Solutions that did not meet an existing or future need (i.e. performance gaps), were outside of the planning study area, or were not the most cost-efficient solution to address an identified performance gap were also screened out. If a solution met both criteria in the initial screening, it was advanced for further consideration.

A total of 96 solutions were advanced and assigned an estimated level of investment; "Low" (less than $1 million), "Medium" (between $1 million and $5 million), or "High" (greater than $5 million), and an estimated year of implementation, based on when the solution would address a particular performance gap; "Near-term" (year 2022), "Mid-term" (year 2027), and "Long-term" (year 2040).

Detailed information on the initial screening results (including screened out solutions), the assigned estimated level of investment, and the assigned estimated year of implementation is provided in Appendix L, *Summary of Evaluation and Analysis Procedures*.

For this study, four preliminary strategy packages were identified for analysis and evaluation, based on the incremental investment and timeframes listed as follows and on Figure 4-1:

- **Strategy Package A**: Includes near-term and low investment solutions. Analyzed for year 2022 only.
- **Strategy Package B**: Includes near or mid-term and low or medium investment solutions. Analyzed for years 2022 and 2027.
- **Strategy Package C**: Includes mid or long-term and low or medium investment solutions. Analyzed for years 2027 and 2040.
- **Strategy Package D**: Includes long-term and low, medium, or high investment solutions. Analyzed for year 2040 only.

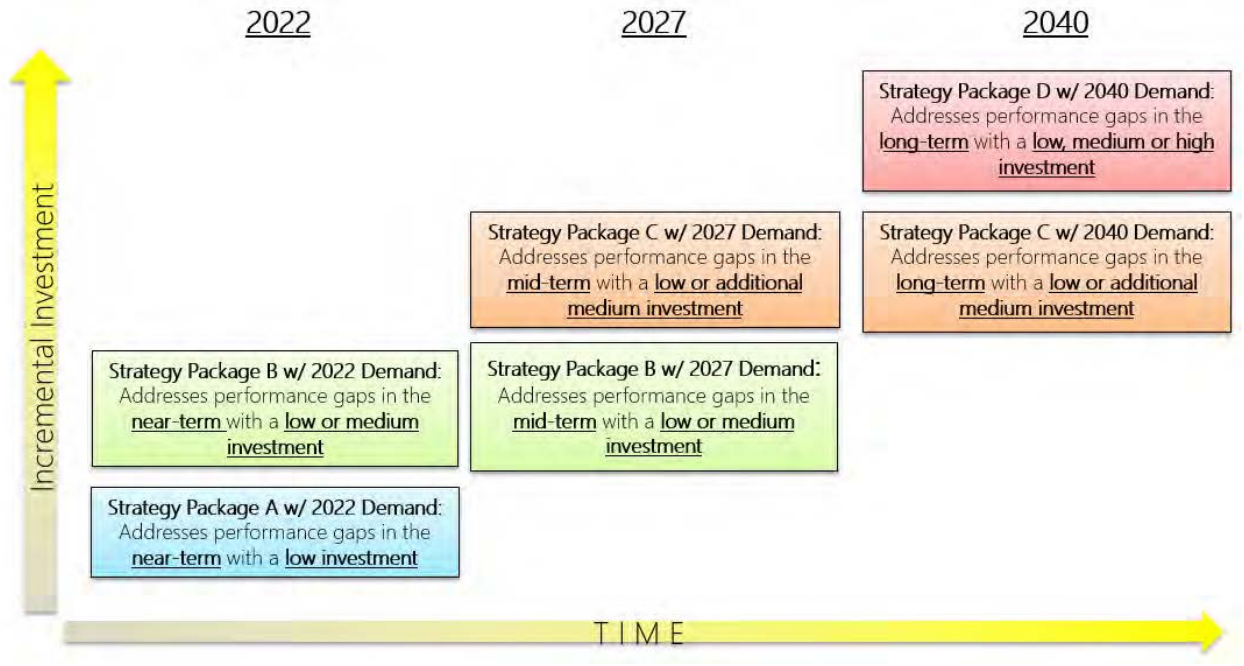


**Figure 4-1. Strategy Packages by Incremental Investment and Timeframe**

## 4.3 Secondary Screening of Solutions

After defining the preliminary strategy packages, the 96 solutions that passed the initial screening were evaluated in a secondary screening. The purpose of the secondary screening was to determine whether the solution fit into any of the of the defined strategy packages.

The secondary screening involved the following questions:

- Does the solution's "level of investment" (low, medium, or high) match the strategy package requirements?
- Does the solution address an identified performance gap in the strategy package for the horizon year (near-, mid-, or long-term)?
- Can the solution be implemented by the strategy package's horizon year?
- Is the solution's purpose and/or design independent from other solutions within the strategy package?
- Does the solution provide the most efficient method for closing the performance gap within the strategy package?

Solutions that met the above criteria were considered for inclusion in a strategy package, as shown on Figure 4-2.

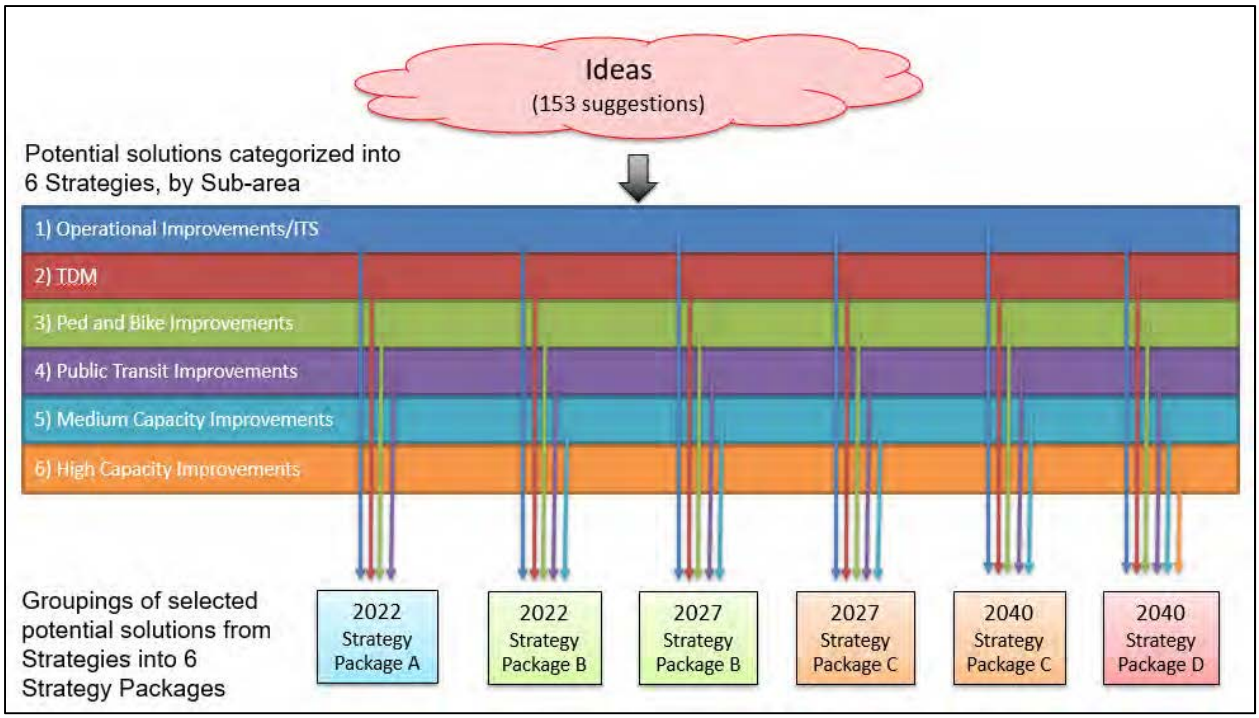


**Figure 4-2. Development of Preliminary Strategy Packages**

Solutions that addressed performance gaps in a similar year or could be implemented in the same timeframe (i.e., near-term, medium-term, or long-term) based on level of investment were packaged together based on the requirements shown on Figure 4-1.

Because certain solutions addressed performance gaps in multiple years, or could be implemented in multiple time frames, they were allocated into more than one of the strategy packages, resulting in following packages with a number of different solutions:

- **Strategy Package A** includes 25 solutions that are categorized as low investments that address performance gaps within the transportation network in the near-term. These solutions include capacity improvements, travel demand management (TDM) solutions, and transit improvements. Many of the low cost operational improvements involve restriping or rechannelizing lane approaches at study intersections to increase capacity (without pavement widening) and optimizing traffic signal timing or phasing to improve vehicle efficiency. Examples of TDM solutions include expanding existing trip-reduction programs at local employment centers and increasing area wide carpooling and vanpooling incentives. Transit improvements include better coordination between agencies within the study area and improved amenities to make transit more attractive to riders.
- **Strategy Package B** includes all solutions from Strategy Package A, plus 19 additional solutions (44 solutions total) categorized as medium investments that address identified needs in the near-term and mid-term horizon years. Building upon investments made in Strategy Package A, Strategy Package B includes:
  - Capacity solutions, such as lane widening, adding a signal or roundabout at existing stop-controlled intersections, or implementing ramp metering at freeway entrances
  - Transit improvements, such as adding stalls at park-and-ride lots

  - Enhancements to the non-motorized network, such as adding bicycle lanes to key existing north-south routes between Gig Harbor and Bremerton.

- **Strategy Package C** further builds upon Strategy Package B and includes three additional (47 solutions total) low or medium investment solutions that address performance gaps identified in the mid-term or long-term horizon year. These three additional solutions involve:
  - Adding turn lanes
  - Improving intersection control through a traffic signal
  - Improving intersection control through a roundabout
- **Strategy Package D** provides 15 additional solutions (62 total), including primarily non-motorized improvements and high investments that address long-term performance gaps. Non-motorized solutions include:
  - Creating new pedestrian or bicycle facilities to connect the communities of Port Orchard, Gorst, and Bremerton
  - Accommodating non-motorized, local crossings of SR 16

  High-investment solutions include:
  - Freeway and local arterial lane widening
  - Interchange or intersection reconstruction

A detailed table showing the results of the secondary screening is provided in Appendix L, *Summary of Evaluation and Analysis Procedures*.

## 4.4 Evaluation of Strategy Packages

A comprehensive evaluation of preliminary strategy packages was conducted, and the evaluation results were presented to the TAG and the Executive Committee. The comprehensive evaluation computation of performance metrics was aligned to the study goals. The evaluation included traffic modeling and analysis for each strategy package of solutions. The results of the traffic analysis provided quantitative and qualitative data to assess performance gap closures in the near-term, mid-term, and long-term horizon years. Intersection LOS, freeway segment LOS, and corridor travel times were compared to the study goals to determine which of the strategy packages for each year better closed performance gaps.

Key findings from the evaluation of the preliminary strategy packages for near-term and mid-term time frames are summarized as follows:

- In the near-term, low-cost solutions in Strategy Package A closed the gap by approximately 50 percent for ramp terminal LOS and queueing performance, local intersection LOS, and LOS at intersections near major developments.
- With additional medium-cost solutions, the LOS and queueing performance gaps at ramp terminals, local intersections, and intersections near major developments would be almost closed. The level of investment associated with these additional medium-cost solutions reduces the cost efficiency of Strategy Package B compared to Strategy Package A in the near-term, and of Strategy Package C compared to Strategy Package B in the mid-term.
- Strategy Package A or B resulted in freeway segments only marginally improved over the baseline condition.

- In terms of transit, pedestrian, or bicycle mobility, Strategy Packages A, B, or C do not provide significant benefit in the near- or mid-term compared to baseline conditions.
- Between Strategy Packages A, B, or C, little to no distinction was observed in their ability to reduce transportation impacts on the environment, or their ability to enhance critical vehicular connections.

Key findings from the evaluation of preliminary strategy packages for the long-term are summarized as follows:

- Freeway performance under Strategy Package D is expected to be better than with Strategy Package C. Compared to the 2040 baseline condition, Strategy Package D would result in nearly all the SR 16 and SR 3 freeway segments operating at or better than their mobility standard.
- With higher-cost investments, Strategy Package D results in more improvement to transit, pedestrian, and bicycle mobility compared to Strategy Package C.
- Although Strategy Package D could affect environmental resources or sensitive areas slightly more than Strategy Package C, it also has a much higher potential to improve wildlife connectivity across the study corridors.
- Strategy Package D could affect environmental resources or sensitive areas slightly more than Strategy Package C, it also has a much higher potential to improve wildlife connectivity across the study corridors.

Appendix M, *Evaluation of Strategy Packages,* provides more detailed information on the performance, performance gap closures, and relative benefits and impacts of Strategy Packages A, B, C, and D.

## 4.5 Refinement of Strategy Packages

Using guidance from the analyses of alternative strategy packages (described in the above section), the best performing solutions were collected into enhanced packages of preliminary recommended solutions for the three horizon years that closed performance gaps and met the Study Goals. While the data-driven, performance-based analysis provides a robust set of data for identification of solutions that provide the most cost-efficient and lasting investments following the Practical Solutions approach, it was equally important to consider stakeholder concerns regarding the unique study area.

The preliminary strategy packages were further refined based on stakeholder input, and traffic modeling and analysis was revised for modified solutions and packages. The refinements were made to the preliminary strategy packages by adding solutions to close performance gaps and/or shifting the implementation period for solutions.

Presentations were made to TAG agencies in subgroups for discussions of remaining concerns and to make further refinements to the strategy packages and solutions. Also, one-on-one discussions and communications were used to make refinements and adjustments.

The primary concerns of stakeholders that were considered in the additional refinements to the recommended strategy packages and solutions included:

- **SR 3, Naval Base Kitsap-Bremerton Traffic Congestion**. Desire to implement Peak-Use Shoulder Lanes and/or widenings in the 5- and 10-year horizon. Recommended solutions should be broken into smaller sub-phases so that some improvements could be implemented earlier.
- **SR 3/SR 16, Gorst Access, Safety and Congestio**n. Solutions should be implemented earlier, in the 5- and 10-year horizon.

- **Resiliency of Transportation Network along SR 3, SR 16, and Gorst.** Need to do more to address resiliency and redundancy due to potential effects of climate change and/or other emergencies.
- **SR 302 Bridge and Corridor Improvements.** The effect of the needs in the adjacent SR 302 corridor, including potential widening or replacement of the SR 302 bridge.
- **SR 16/144th Interchange Configurations.** A new interchange at 144th Street may be needed to relieve traffic congestion off Purdy Drive and provide a more direct access to 144th Street.
- **56th Street off-ramp and Olympic Interchange Modifications.** Desire to add a new off-ramp at 56th Street to relieve traffic.
- **Wollochet Interchange Improvements.** Desire to implement improvements sooner, and potentially widen overcrossing structure.

The refinements to the recommendations for the strategy packages and solutions resulting from the additional stakeholder coordination included:

- Peak-use shoulder lanes on SR 3 between SR 304 and the Railroad Trestle moved to near-term timeframe in recommendations.
- Peak-use shoulder lanes on SR 3 between Gorst and the Railroad Trestle moved to mid-term timeframe in recommendations.
- Solution added to recommendations that addresses resiliency concerns around Gorst.
- Solutions further broken into incremental components to better facilitate phasing.
- Solution added to recommendations to complete the SR 302 Bridge Replacement Environmental Impact Statement.
- Wollochet Ramp Terminal/intersection improvements added to near- and mid-term horizons; ramp modifications to be recommended for mid-term horizon; Wollochet interchange rebuild with potential widening will be added for long-term horizon.
- 56th Street off-ramp does not provide enough benefit to Olympic Drive to justify investment.

## 4.6 Summary of Recommended Strategy Packages and Solutions

The final list of recommended packages and solutions is provided in Appendix A. The recommended solutions identified for the following horizon years are on Figure 4-3.

- Near-Term, 5-year horizon (2022 analysis year): 29 recommended solutions
- Mid-Term, 10-year horizon (2027 analysis year): 30 recommended solutions
- Long-Term, 20-year horizon (2040 analysis year): 17 recommended solutions

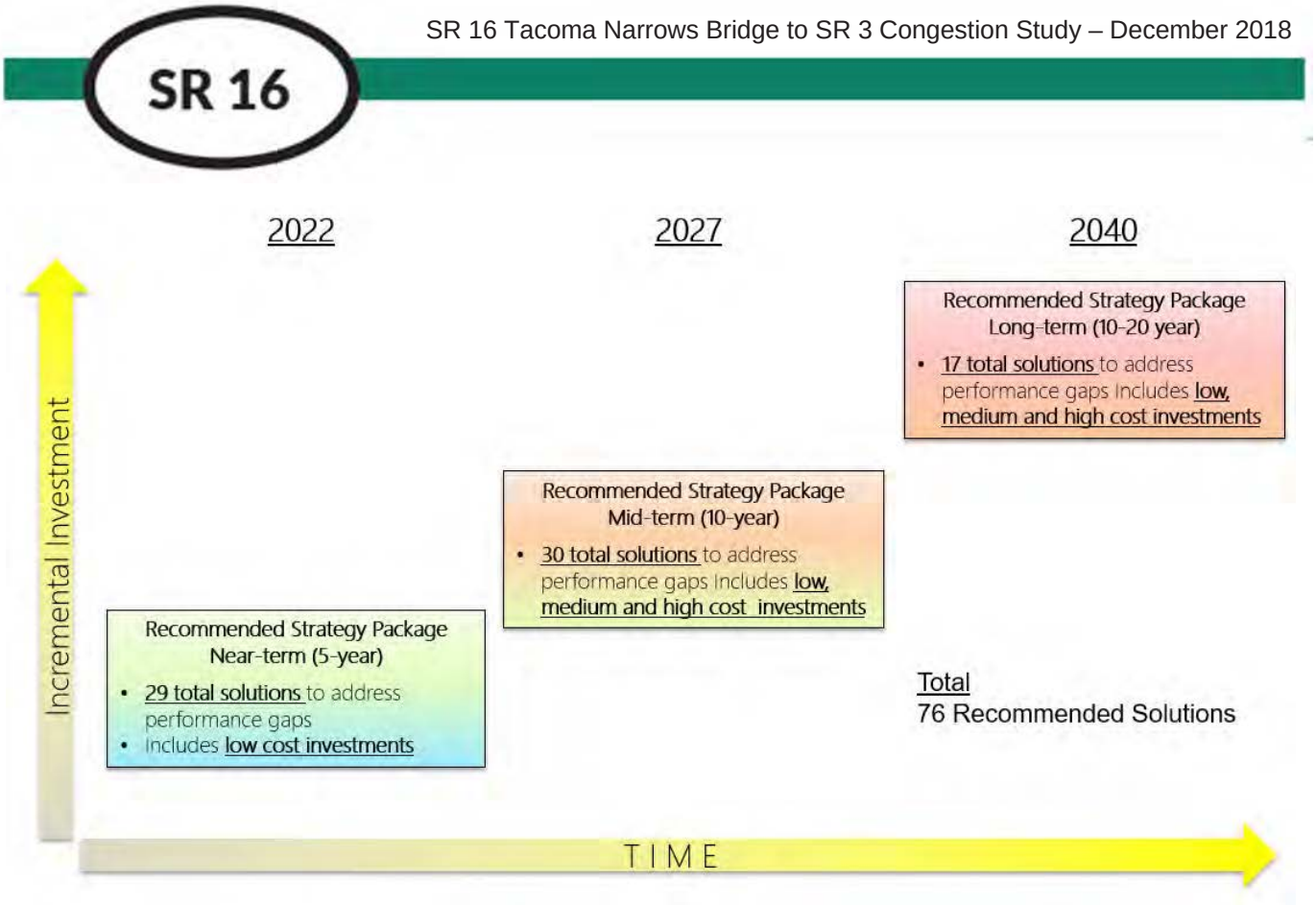


**Figure 4-3. Recommended Strategies**

The packages of recommended solutions are comprised of the following key improvements:

- **Corridor-wide policy considerations** such as TDM strategies, increased coordination incident response, and plans for resiliency along corridor
- **Transit and park-and-ride** improvements such as additional park-and-ride capacity and additional coordination between agencies
- **Operational and signal timing optimization** at key local and state locations
- **Selected capacity improvements** at key local and state facilities through widening, roundabout, or signal installations
- **Pedestrian and bicycle facilities** such as an extension of Cushman Trail, additional facilities between Bremerton/Port Orchard, and additional or enhanced bike lanes along corridor
- S**R 3 and SR 16 corridor** mainline capacity improvements through peak-use shoulder lanes and widening
- **SR 304/Naval Base Kitsap-Bremerton** improvements at Farragut and Charleston Beach Road
- **SR 3/SR 16 Interchange** access control, intersection improvements, and grade separation
- **Tremont Street/Sedgwick Road interchanges** capacity improvements at key intersections
- **SR 302 and Borgen Boulevard interchange** queue storage and capacity/operational improvements
- **Olympic Drive, Wollochet Drive, and Hunt Street crossing** operational and capacity improvements

A summary of recommended solutions by sub-area and by strategy are provided in Tables 4-2 and 4-3. Also shown in the tables are the time periods these solutions would be needed to address performance gaps.

**Table 4-2. Recommended Solutions by Sub-area**

| Sub-area | Near-Term, 5-year | Mid-Term, 10-year | Long-Term, 20-year | Total |
|---|---|---|---|---|
| Network-Wide | 8 | 2 | 2 | 12 |
| Bremerton/Gorst | 11 | 11 | 5 | 27 |
| Port Orchard | 2 | 4 | 3 | 9 |
| Purdy/N. Gig Harbor | 6 | 5 | 3 | 14 |
| Gig Harbor | 2 | 2 | 1 | 5 |
| SR 16 Corridor | 0 | 6 | 3 | 9 |
| **Total** | **29** | **30** | **17** | **76** |
| *Cumulative Total* | *29* | *59* | *76* | |

**Table 4-3. Recommended Solutions by Strategy**

| Strategy Category | Near-Term, 5-year | Mid-Term, 10-year | Long-Term, 20-year |
|---|---|---|---|
| 1. Operational Improvements/ITS | 17 | 19 | 20 |
| 2. Travel Demand Management | 3 | 3 | 3 |
| 3. Pedestrian & Bicycle Improvements | 1 | 9 | 11 |
| 4. Public Transit Improvements | 4 | 7 | 9 |
| 5. Medium Capacity Improvements | 2 | 17 | 20 |
| 6. High Capacity Improvements | 2 | 4 | 13 |
| **Total** | **29** | **59** | **76** |

Chapter 5 presents more detail on the strategy packages and each recommended solution by sub-area, along with the benefits that are anticipated. Also shown in Chapter 5 is a summary of overall performance by timeframe that is anticipated with these investments. The list of these 76 recommended solutions is provided in Appendix A. Planning-level cost estimates were developed for each recommended solution and are also presented in Appendix A.

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# Chapter 5 Recommended Packages and Solutions

Chapter 5 provides additional description of strategy packages and recommended solutions and the expected performance benefits. Also provided are a summary of the planning-level cost estimates along with rankings of these recommended solutions in future horizon years.

## 5.1 Corridor Performance with Recommended Solutions

The expected performance of the recommended packages and solutions has been demonstrated to close performance gaps in each horizon year. The performance evaluation against the study goals was applied to the final recommended packages and solutions to demonstrate performance results.

The following subsections are summaries by goal and performance metric. They describe how the recommended solutions perform in relation to the vehicular mobility, non-motorized and transit, environmental, safety, resiliency, and cost-effectiveness goals. The study goals are described in Appendix B. Detailed information on corridor performance against study goals is included in Appendix N, the *Summary of Recommended Solutions* memorandum.

### 5.1.1 Vehicular Mobility Performance (Goals 1 to 3)

Study Goals 1 through 3 address traffic operations and travel time performance. Goal 1 has four sub-components:

- Traffic operations at state highway interchange ramp terminals (intersections)
- Queueing at ramp terminal intersections
- Traffic operations on state highway mainline and segments
- Corridor segment travel time performance

Goal 2 addresses traffic operations at local intersections adjacent to the state highways. Goal 3 addresses how well the transportation system supports planned development.

**Ramp Terminals Performance**

Under baseline conditions, the number of ramp terminal intersections (25 total) meeting their level of service (LOS) mobility thresholds degrades from 62 percent to 38 percent over the 20-year horizon. This performance gap (difference between desired and actual or projected baseline performance) closes completely in the mid- and long-term with the implementation of the recommended solutions. Figure 5-1 shows the percentage of ramp terminal intersections meeting their mobility thresholds in each horizon year.

**Freeway Performance**

The key recommendations along State Route (SR) 3 consist of a peak-use shoulder lane and lane widening from SR 304 through Gorst. The peak-use shoulder lane provides a 15 to 19 percent closure in the performance gap over the baseline conditions in the near- and mid-term, as shown in Figure 5-2. While the lane widening does not completely result in 100 percent of the SR 3 segments meeting mobility thresholds, the 20-year horizon performance gap is smaller than the existing performance gap.

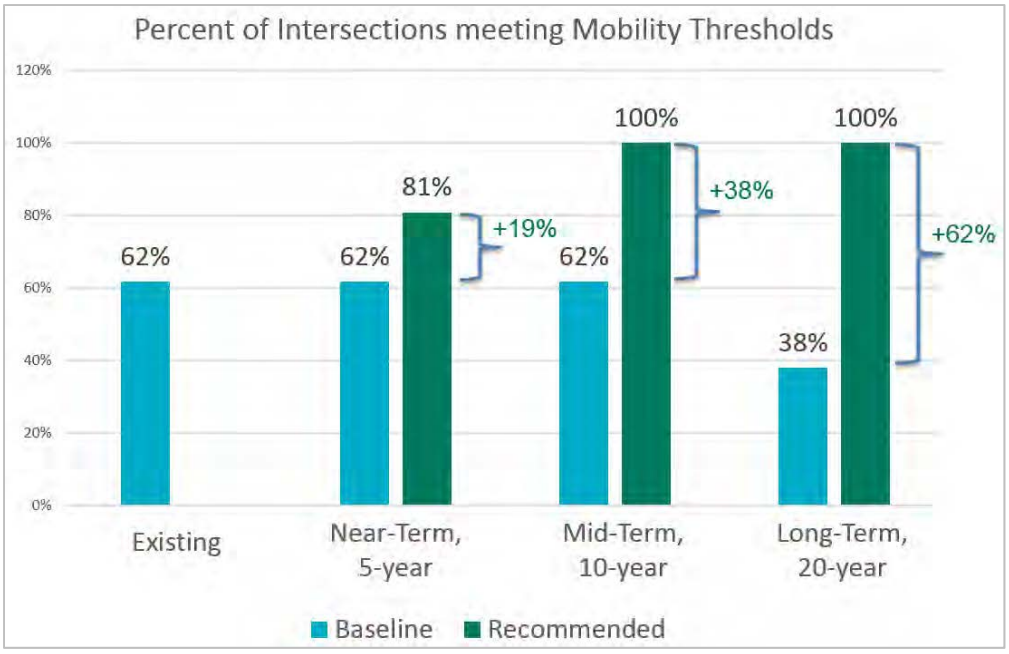


**Figure 5-1. Percentage of Ramp Terminals Meeting Intersection Performance Standards**

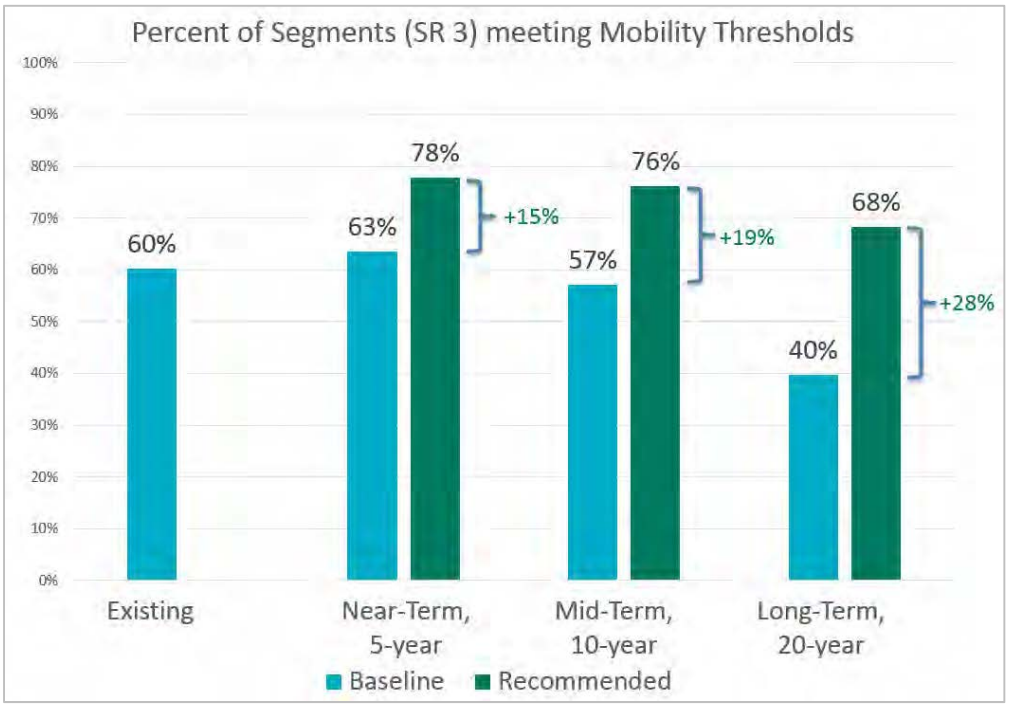


**Figure 5-2. Percentage of SR 3 Freeway Segments Meeting Performance Standards**

The key recommendations along SR 16 include ramp metering, peak-use shoulder lanes in Gig Harbor, lane widening in Port Orchard, and an interchange rebuild at Wollochet Drive/Pioneer Way. Through the near- and mid-term, the percentage of SR 16 freeway segments meeting mobility thresholds returns to the existing performance. As shown in Figure 5-3, the performance gap is nearly closed in the long-term.

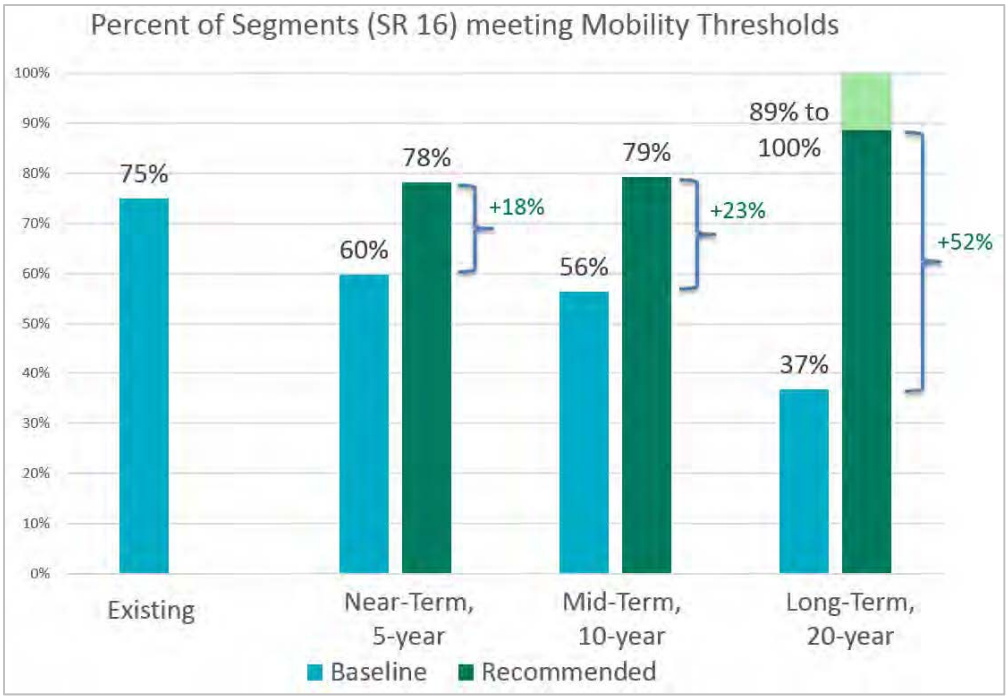


**Figure 5-3. Percentage of SR 16 Freeway Segments Meeting Performance Standards**

## Corridor Travel Times

Peak hour travel time results with and without the recommended solutions for the peak direction are shown in Figure 5-4. In the 5- and 10-year horizons, modest travel time benefits are gained with the recommended solutions, compared to the baseline conditions. The 20-year horizon shows faster travel times than baseline and three of the four travel times also show travel times below existing times.

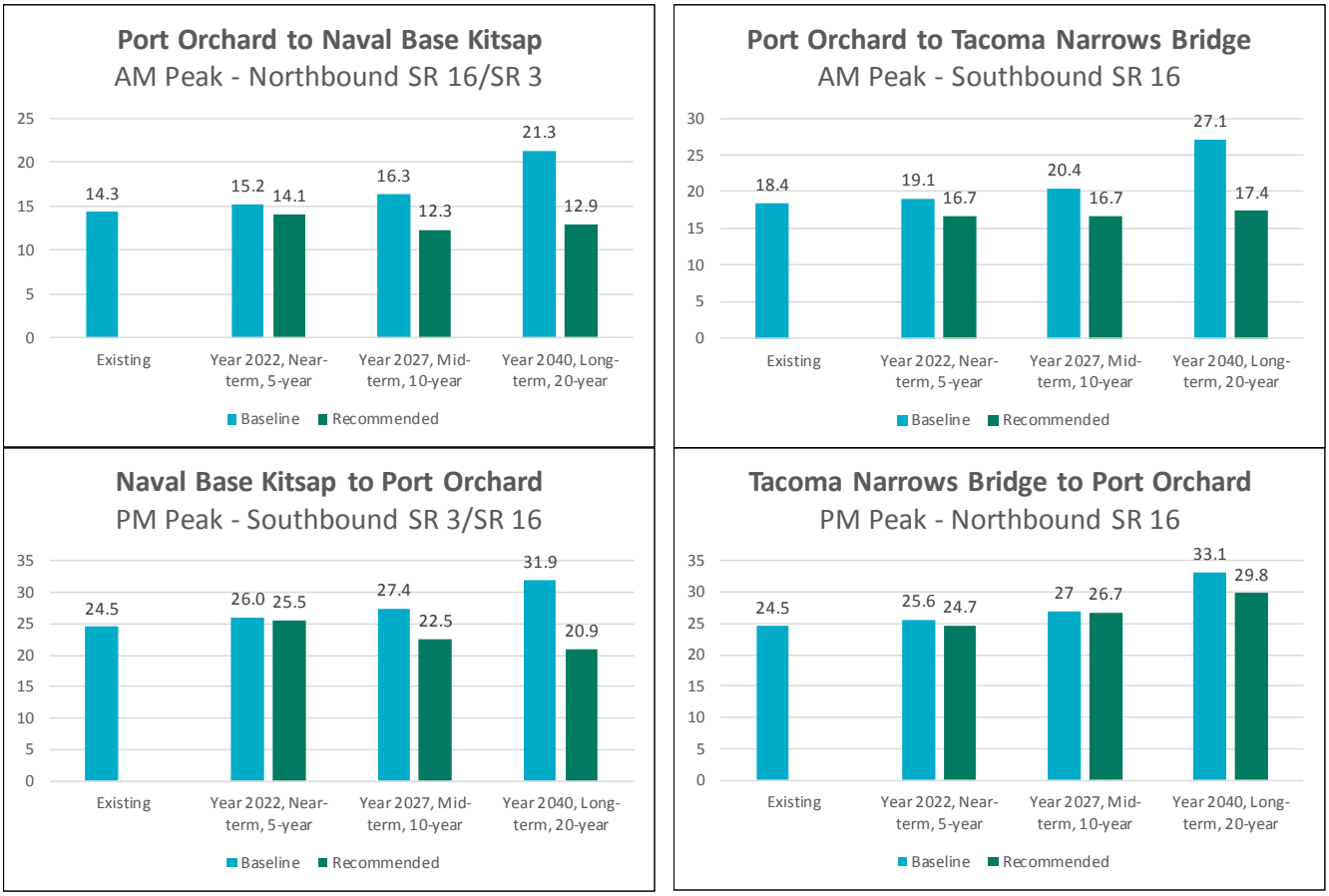


**Figure 5-4. SR 16 and SR 3 Peak Direction Vehicle Travel Time Summary**

Table 5-1 shows the travel time benefits for additional paths in the AM and PM peak hours.

**Table 5-1. Peak Direction Corridor Travel Times – Peak Hour**

| Travel Time Description | 2017 Existing Travel Time (Min) | 2022 Travel Time (Min) | 2027 Travel Time (Min) | 2040 Travel Time (Min) |
|---|---|---|---|---|
| AM Peak | | | | |
| Port Orchard to Naval Base Kitsap-Bremerton: WB/NB Peak Direction | 14.3 | 15.2 / 14.1 (-7%) | 16.3 / 12.3 (-25%) | 21.3 / 12.9 (39%) |
| Port Orchard to Tacoma Narrows Bridge: SB Direction | 18.4 | 19.1 / 16.7 (-13%) | 20.4 / 16.7 (-18%) | 27.1 / 17.4 (-36%) |
| PM Peak | | | | |
| Naval Base Kitsap-Bremerton to Port Orchard EB/SB Peak Direction | 24.5 | 26.0 / 25.5 (-2%) | 27.4 / 22.5 (-18%) | 31.9 / 20.9 (-34%) |
| Tacoma Narrows Bridge to Port Orchard NB Peak Direction | 24.5 | 25.6 / 24.7 (-4%) | 27.0 / 26.7 (-1%) | 33.1 / 29.8 (-10%) |

Notes:

Travel times are shown as 'Baseline Condition / Travel Time with Recommended Solutions.'

Percentages shown in parentheses are the percent change between travel times in the Baseline Condition and travel times with Recommended Solutions implemented.

The Port Orchard travel time point is at the Tremont St Interchange.

Travel times were collected between 6 and 9 AM, and between 3 and 6 PM on March 1 and 2, 2017.

Data were collected on typical days; no accidents or unusual events occurred during data collection.

Data collection occurred while two aircraft carriers were in port at Naval Base Kitsap-Bremerton.

Travel time points along SR 16 and SR 3 were observed on the mainline freeway section.

## Local Intersections Performance

Increasing traffic volumes over the horizon years result in the baseline performance degrading from 75 to just 58 percent of all local intersections (36 total) meeting their LOS threshold by 2040. In the 5-year horizon, the recommended solutions do not effectively close the gap. With higher investments in the 10- and 20-year horizons, the performance gap is nearly completely closed. Figure 5-5 shows the performance of local intersections with the recommended solutions.

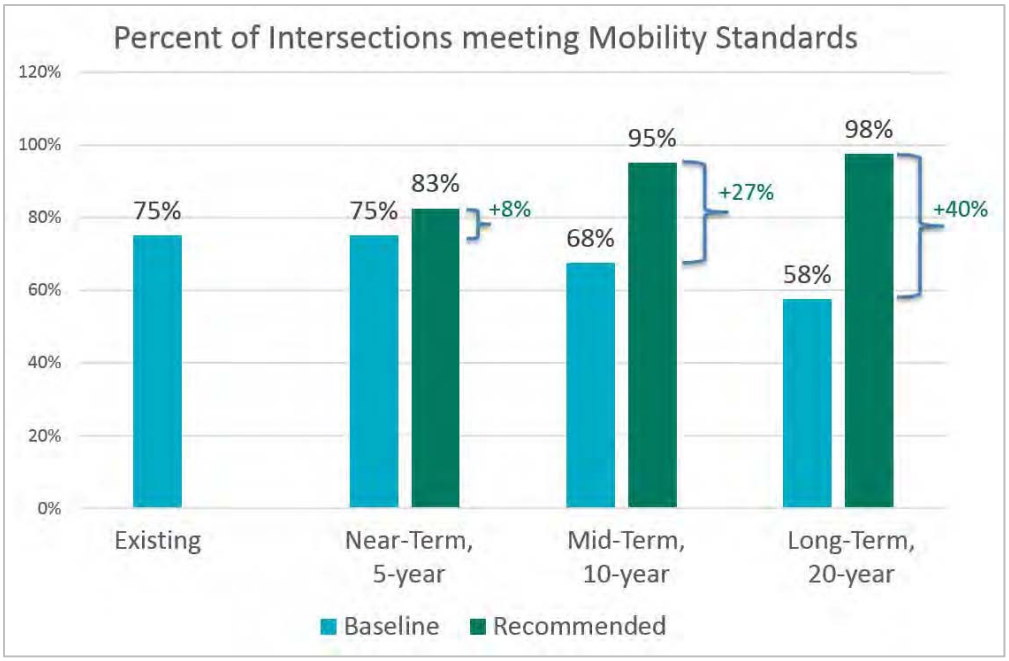


**Figure 5-5. Percentage of Local Intersections Meeting Performance Standards**

### 5.1.2 Non-Motorized and Transit Performance (Goal 4)

Non-motorized solutions were recommended for each horizon year, ranging from large regional trails to local pedestrian and bicycle facilities and the addition of new transit routes. These recommended solutions complete many missing facilities throughout the study area.

In the near-term and mid-term horizons, the recommended solutions would only slightly close the performance gap in transit service, transit travel times, and non-motorized connectivity. This is likely due to the low number of capacity and connectivity solutions included in the recommendations.

By the long-term horizon, high-level investments in the non-motorized network, such as extending the Cushman Trail and adding new pedestrian/bicycle connections along the corridor, would more significantly close the performance gap. Peak-use shoulder lanes in the 5- and 10-year horizons and freeway lane widening in the 20-year horizon recommendations would result in improved transit travel times.

### 5.1.3 Environmental, Safety, and Resiliency Performance (Goals 5 to 7)

Goal 5 addresses the level of potential transportation impacts on the environment. Goal 6 addresses potential effects on safety performance. Goal 7 addresses how well the transportation system is resilient to the potential effects of climate change and emergencies.

Safety will be considered through the Washington State Department of Transportation (WSDOT) Strategic Safety Highway Plan (2016). Solutions recommended in this study will involve further assessment of safety needs and development of safety mitigation measures in future designs.

For all recommended solutions, any environmental impacts will be further examined in the Practical Solutions design and environmental review phases where solutions and their respective concepts would be refined. The recommendations include solutions that will enhance transportation performance and support non-motorized and transit modes resulting in lower carbon emissions, yielding improved environmental performance.

Resiliency and redundancy are a high priority along SR 3, especially from Gorst to Naval Base Kitsap-Bremerton. Allowing peak-use shoulder lanes and widening along SR 3 increases the capacity and improves the resiliency and redundancy of this roadway segment. Also, this study has identified a solution to establish a coordinated emergency access and evaluation plan for this sub-area.

### 5.1.4 Cost-Effectiveness and Investment Performance (Goal 8)

Goal 8 addresses the cost-effectiveness of the recommended packages of solutions. The recommended packages of solutions were developed following the Practical Solutions approach and focused on matching solutions to the time frames when they are most needed to close performance gaps. The packages are a balanced mix of solutions that apply low-cost operational and demand management solutions first for faster results. Additional investments are applied over time to close gaps in future traffic conditions. The recommended packages of solutions are multimodal, with non-motorized and transit solutions providing alternative travel modes. The packages also include solutions that maximize use of existing infrastructure, such as the development of peak-use shoulder lanes, to provide capacity in congested locations along SR 16 and SR 3.

## 5.2 Sub-Area Recommendations and Performance

Below are brief summaries of the identified performance gaps, how the performance gaps were addressed, and a listing of key solutions for the corridor-wide network. Additional solutions and benefits by location and time frame are also covered in detail in the Bremerton/Gorst, Port Orchard, North Gig Harbor/Purdy, and Gig Harbor sub-areas.

### 5.2.1 Corridor Wide Network

The high-level performance gaps identified corridor-wide included:

- Expected increase in congestion along SR 16 and SR 3 over the next 20 years
- Coordination and integration of transit services between agencies
- Gaps in the pedestrian and bicycle infrastructure network that limit access and connectivity

The highlights of solutions for closing performance gaps along the corridor include:

- Policy solutions – Travel Demand Management (TDM), incident response teams (within the first 5-year period)
- Transit agency coordination (within the first 5-year period)
- Park-and-ride expansion (within the 10- to 20-year period)
- SR 3 and SR 16 peak-use shoulder lanes (within the 10-year period)
- SR 16 ramp metering and ramp storage (within the 10-year period)
- SR 16 peak-use shoulder lane - south (within the 20-year period)

The following are gap closure results corridor-wide:

- The recommended 76 solutions all contribute to improved performance and closing of performance gaps both incrementally and cumulatively over the 5-, 10-, and 20-year time frames.
- Low-cost, incremental improvements occur in the near-term.
- Added capacity occurs in mid- to long-term on SR 16 and SR 3.
- Pedestrian and bicycle facilities are added along the entire corridor.

### 5.2.2 Bremerton/Gorst

In the Bremerton/Gorst sub-area, the following key performance gaps were identified:

- Freeway capacity constraints on SR 16 and on SR 3 result in high levels of congestion and long travel times to and from Naval Base Kitsap-Bremerton. This congestion occurs in the morning and afternoon peaks.
- SR 16 and SR 3 are critical connections for the sub-area and the region that are vulnerable to natural disasters and weather events. With few alternate routes around the Sinclair Inlet, resiliency and redundancy along these corridors need to be improved.
- Few options for safe pedestrian or bicycle travel exist between Gorst and Bremerton, or within Gorst along the Sam Christopherson Avenue and Belfair Valley Road corridors.
- Performance gaps within this sub-area occur at intersections along SR 304 and at the intersection of SR 16 and SR 3/Sam Christopherson Avenue.

Table 5-2 summarizes the key performance gaps in the Bremerton/Gorst sub-area, as well as recommended solutions to address these gaps.

**Table 5-2. Key Recommendations for Bremerton/Gorst**

| Solution ID | Recommended Solution | Performance Gap | Implementation Result |
|---|---|---|---|
| **Near-Term, within 5 years** | | | |
| 1401 | Operational improvements at SR 304 and Charleston Beach Rd. Intersection | LOS E/F from years 2022 - 2040 | LOS D through 2040+ |
| 1701 | SR 3 PUSL from SR 304 to railroad trestle | High levels of traffic congestion during peak periods | Up to 8 percent travel time reduction from baseline during peak period between Naval Base Kitsap-Bremerton and Port Orchard |
| 1001 | Modify lane channelization for SR 16 WB at Gorst | Lane continuity and geometrics | Better lane flow based on upstream traffic from SR 166 |
| 1004 | Optimize signal operations at SR 3 and SR 16/Sam Christopherson intersection | LOS E/F from years 2022 - 2040 | LOS C or better until 2027 |
| 1002 | Consolidate driveways through SR 3/SR 16 interchange area | Capacity and safety concerns | Increased capacity and safety |
| 1094 | Develop a plan to address resiliency and redundancy, including identifying gaps in the network | Resiliency and redundancy needs through Gorst and surrounding transportation network | Needs identified and potential solutions for implementation |
| **Mid-Term, within 10 years** | | | |
| 1402 | Operational improvements at SR 304 and Farragut Ave intersection | LOS E/F in years 2027 - 2040 | LOS D until 2040 |

**Table 5-2. Key Recommendations for Bremerton/Gorst**

| Solution ID | Recommended Solution | Performance Gap | Implementation Result |
|---|---|---|---|
| 1702 | SR 3 PUSL from railroad trestle to Gorst | High levels of traffic congestion during peak periods | Up to 33 percent travel time reduction from baseline during peak period between Naval Base Kitsap-Bremerton and Port Orchard |
| 7201 | SR 16 PUSL from SR 166 to Sedgwick interchange | | |
| 1005 | Construct roundabout at SR 3 and SR 16/Sam Christopherson intersection | LOS E/F from years 2022 - 2040 | LOS C or better through 2040 |
| 1906 | Add or enhance pedestrian and bicycle facilities between Bremerton and Gorst | Gaps in non-motorized network | Improved connectivity and expanded non-motorized facilities |
| **Long-Term, within 20 years** | | | |
| 1403 | Approach widening at SR 304 and Farragut Ave. intersection | LOS E/F in 2040 | LOS D through 2040+ |
| 1908 | Add or enhance pedestrian and bicycle facilities between Bremerton and Port Orchard | Gaps in non-motorized network | Improved connectivity and expanded non-motorized facilities |
| 1703 | SR 3 widening from SR 304 to Gorst | High levels of traffic congestion during peak periods | Up to 50 percent travel time reduction from baseline during peak period between Naval Base Kitsap-Bremerton and Port Orchard and improved resiliency |
| 1704 | Elevation of SR 3/SR 16 through Gorst | | |
| 7202 | SR 16 widening from SR 166 to Sedgwick interchange | | |
| 1003 | Grade separation of SR 3 and SR 16/Sam Christopherson intersection | Resiliency and congestion at intersection | Improved resiliency and travel time between Bremerton airport and Naval Base Kitsap-Bremerton |

PUSL = peak-use shoulder lane

The following recommended solutions address key performance gaps:

- To address freeway congestion and capacity constraints, a peak-use shoulder lane is recommended in the near-term between SR 304 and the existing railroad trestle on southbound SR 3. This solution would improve peak period travel times between the Naval Base Kitsap-Bremerton and Port Orchard by up to 8 percent, compared to baseline conditions, in 2022. In 2027, an extension of the peak-use shoulder lane is recommended from the railroad trestle to Gorst. This mid-term solution would increase peak period capacity and reduce afternoon travel times by up to 33 percent, compared to baseline conditions.
- By 2040, lane widening on SR 3 between SR 304 and Gorst is recommended. This solution would increase capacity and improve traffic flow. With additional downstream lane widening on SR 16 from SR 166 to the Sedgwick interchange, southbound travel times from the Naval Base Kitsap-Bremerton in the afternoon peak would improve by up to 50 percent compared to long-term baseline conditions.

- To address resiliency and redundancy, elevating the freeway through Gorst is recommended in the long-term horizon. This solution would improve traffic flow and create a network connection between Bremerton and Port Orchard that is more resilient to weather events than the current roadway. Grade separation of the SR 16 and SR 3/Sam Christopherson intersection is a long-term recommendation to complement resiliency improvements on SR 16 through Gorst.
- To address gaps in the non-motorized network, pedestrian and bicycle facilities are recommended between Bremerton, Gorst, and Port Orchard.

Figure 5-6 depicts key recommended solutions for the near-, mid-, and long-term horizons within the Bremerton/Gorst sub-area.

| Key Near-Term (5-year) Recommendations | Key Mid-Term (10-year) Recommendations | Key Long-Term (20-year) Recommendations |
|---|---|---|




**Figure 5-6. Key Recommendations for Bremerton/Gorst**

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### 5.2.3 Port Orchard

In Port Orchard, the following key performance gaps were identified:

- Capacity constraints at ramp terminal intersections at the Tremont Street, Sedgwick Road, Mullenix Road, and Burley Olalla Road interchanges.
- Gaps in the pedestrian and bicycle network exist within Port Orchard on major north-south routes and across the SR 16 freeway. There are limited opportunities for continuous non-motorized travel within Port Orchard and between Port Orchard and Bremerton/Gorst or Gig Harbor.

Table 5-3 summarizes the performance gaps in the Port Orchard sub-area, as well as recommended solutions to address these gaps.

**Table 5-3. Key Recommendations for Port Orchard**

| Solution ID | Recommended Solution | Performance Gap | Implementation Result |
|---|---|---|---|
| **Near-Term, within 5 years** | | | |
| 2101 | Operational improvements at Sedgwick Rd and SR 16 WB Ramps | LOS E/F from 2022 to 2040 | LOS D or better through 2040 |
| 2201 | Operational improvements at Mullenix Rd and SR 16 EB Ramps | LOS F from 2022 to 2040 | Reduced intersection delay |
| **Mid-Term, within 10 years** | | | |
| 2001 | Install traffic signals or construct roundabouts at Tremont interchange ramp terminals | LOS E/F from 2022 to 2040 | LOS C or better through 2040 |
| 2022 | Install traffic signal or construct roundabout at Mullenix Rd and SR 16 EB ramps | LOS E/F from 2022 to 2040 | LOS B or better through 2040 |
| 2903 | Add bike lanes to key north-south roadways | Gaps in non-motorized network | Improved connectivity and expanded non-motorized facilities |
| **Long-Term, within 20 years** | | | |
| 2022 | Install traffic signal or construct roundabout at Mullenix Rd and SR 16 WB ramps | LOS E/F from 2022 to 2040 | LOS B or better through 2040 |
| 2302 | Install traffic signal or construct roundabout at Burley Ollala interchange ramp terminals | LOS D/E in 2040 | LOS A or better through 2040 |
| 2403 | Arterial widening on Sedgwick Rd from SR 16 to Bethel Rd | LOS E in 2040 | LOS C or better through 2040 |
| 2902 | Extend the Cushman Trail to Port Orchard or add regional multi-use trail from Pierce County | Gaps in non-motorized network | Improved connectivity and expanded non-motorized facilities |

The following recommended solutions address key performance gaps:

- Intersection control improvements (such as adding a traffic signal or roundabout to stop-controlled locations) or added capacity (such as widening to include turn lanes) would reduce overall vehicle delay compared to baseline conditions and result in LOS D or better at the sub-area interchange ramp terminals in all future horizon years.
- To address gaps in the non-motorized network, bicycle facilities are recommended on key north-south roadways in Port Orchard, such as Bethel Road or Sidney Road, in the mid-term horizon. In the long-term, extending the Cushman Trail from Pierce County into Kitsap County is recommended to address non-motorized gaps. This trail connection would improve performance by expanding the regional pedestrian and bicycle network and enhancing connectivity.

Figure 5-7 shows key recommended solutions for the near-, mid-, and long-term horizons in the Port Orchard sub-area.


**Figure 5-7. Key Recommendations for Port Orchard**

## 5.2.4 Purdy/North Gig Harbor

In the Purdy/North Gig Harbor sub-area, the following key performance gaps were identified:

- Capacity constraints on Purdy Drive and at the SR 302/Purdy Drive intersection result in high levels of congestion and long vehicle queues on northbound Purdy Drive. Queues spill back onto the SR 16 westbound mainline as traffic volumes exceed the capacity of the single-lane roadway.
- Performance gaps within this sub-area occur at intersections along Borgen Boulevard. High traffic volumes at these local study intersections would operate worse than their LOS mobility threshold in the near-, mid-, and long-term.
- Gaps in the pedestrian and bicycle network exist within North Gig Harbor on major north-south routes. Limited non-motorized opportunities exist for continuous north-south travel between North Gig Harbor and Port Orchard.

Table 5-4 summarizes the key performance gaps in the Purdy/North Gig Harbor sub-area, as well as recommended solutions to address these gaps.

**Table 5-4. Key Recommendations for Purdy/North Gig Harbor**

| Solution ID | Recommended Solution | Performance Gap | Implementation Result |
|---|---|---|---|
| **Near-Term, within 5 years** | | | |
| 3001 | Zipper merge signage at SR 16 WB off-ramp to SR 302 | Queue spillback to SR 16 WB from the SR 302 off-ramp | Additional queue storage, some reduction in queue length |
| 3302 | Increase queue storage at intersection of SR 302 and SR 302 Spur/Purdy Dr. | Queue spillback due to congestion on SR 302 bridge, blocking north-south traffic | Improved north-south traffic flow on SR 302 Spur/Purdy Dr. and reduced queues |
| 3305 | Completion of SR 302 EIS as part of the SR 302, Elgin Clifton Rd. to SR 16, Congestion Study | | Develop a preferred alternative for the SR 302 replacement bridge |
| **Mid-Term, within 10 years** | | | |
| 3303 | Install traffic signal or roundabout at intersection of Purdy Dr./Goodnough Dr. | LOS E/F through year 2040 | LOS A through 2040+ |
| 3903 | Extend the Cushman Trail to the Pierce/Kitsap County line. | Gaps in non-motorized network | Improved connectivity and expanded non-motorized facilities |
| 3904 | Add bike lanes to key north-south roadways | Gaps in non-motorized network | Improved connectivity and expanded non-motorized facilities |
| **Long-Term, within 20 years** | | | |
| 3301 | Signal improvements at SR 302 and 144th Ave. intersection | LOS E in year 2040 | LOS C through 2040+ |

**Table 5-4. Key Recommendations for Purdy/North Gig Harbor**

| Solution ID | Recommended Solution | Performance Gap | Implementation Result |
|---|---|---|---|
| 3304 | Widen Purdy Dr. in both directions between SR 302 north and south interchanges | LOS E/F through 2040 at SR 302 and SR 302 Spur/Purdy Dr. intersection. Queue spillback from SR 302 bridge | LOS A in 2040. Increased storage for SR 302 bridge queue spillback |

The following recommended solutions address key performance gaps:

- Operational improvements such as signal timing optimization and added storage capacity are recommended at the SR 302/Purdy Drive intersection in the near-term. In the mid-term, a new traffic signal or roundabout at Purdy Drive and Goodnough Drive is recommended to reduce delay and improve access for cross-street traffic. Long-term recommendations along this corridor include arterial widening in the northbound direction to increase through-capacity and storage for left-turning traffic heading towards the SR 302 bridge. These improvements would result in reduced queuing and study intersections meeting their LOS performance threshold through the long-term horizon year.
- Completing the environmental documentation for the SR 302 bridge as a part of the SR 302, Elgin Clifton Road to SR 16, Congestion Study is recommended in the near-term. This study will support decisions for improved access across and around the Burley Lagoon, which would influence operations on Purdy Drive in the study area.
- Bicycle facilities on key north-south roadways and extending the Cushman Trail to the Pierce/Kitsap County line would expand the non-motorized network and increase connectivity and mobility options for pedestrians and bicycles.

Figure 5-8 depicts key recommended solutions for the near-, mid-, and long-term horizons within the Purdy/North Gig Harbor sub-area.

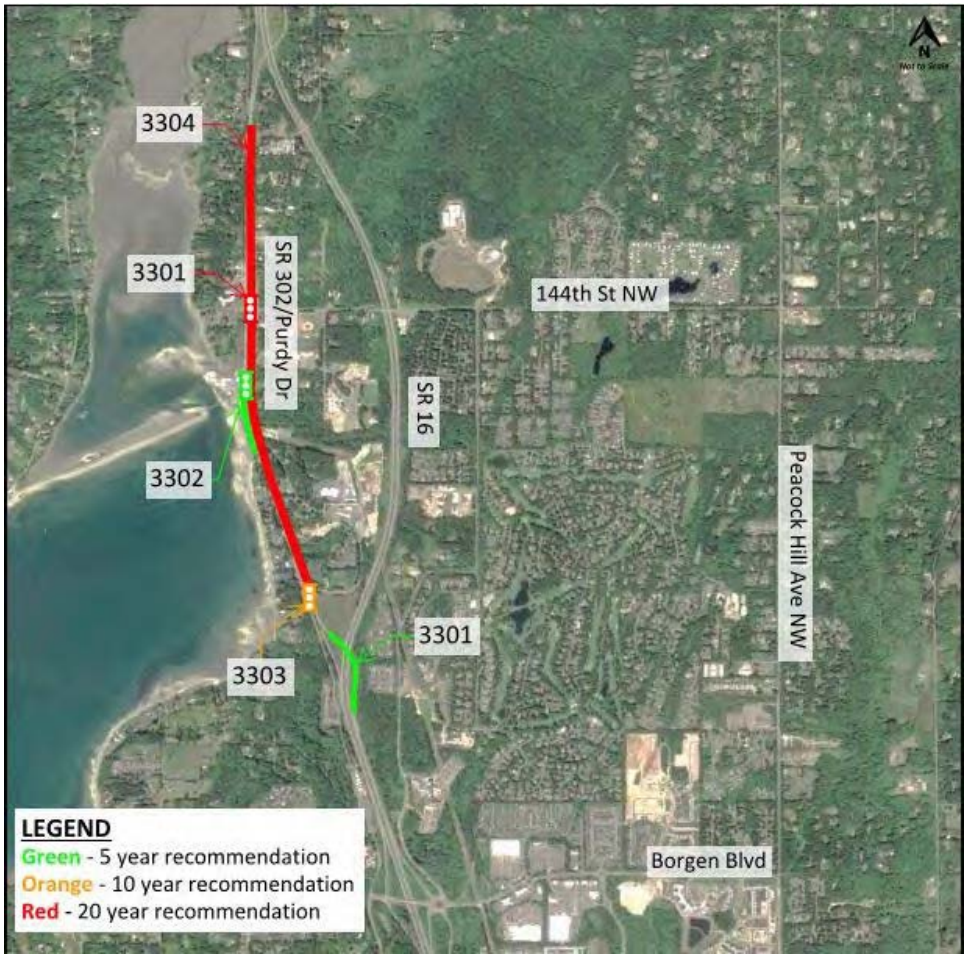


**Figure 5-8. Key Recommendations for Purdy/North Gig Harbor**

## 5.2.5 Gig Harbor

In the Gig Harbor sub-area, the following key performance gaps were identified:

- Capacity constraints at the Olympic Drive and Wollochet Drive/Pioneer Way interchanges result in congestion at ramp terminals and poor operations that exceed mobility thresholds. In the near-term, both ramp terminals at the Wollochet Drive/Pioneer Way interchange would operate at LOS E or F under baseline conditions. In the long-term baseline condition, the westbound off-ramp terminal at Olympic Drive would operate at LOS E.
- Limited east-west travel options result in few options for local traffic to travel across SR 16 Gig Harbor.
- Gaps in the bicycle network exist within Gig Harbor on local north-south routes along the waterfront. Disconnected regional trails result in gaps in the non-motorized network and reduced opportunities for continuous north-south travel through Gig Harbor and between Gig Harbor and Tacoma.

Table 5-5 summarizes the key performance gaps in the Gig Harbor sub-area, as well as recommended solutions to address these gaps.

**Table 5-5. Key Recommendations for Gig Harbor**

| Solution ID | Recommended Solution | Performance Gap | Implementation Result |
|---|---|---|---|
| **Near-Term, within 5 years** | | | |
| 4001 | Signal timing and turn pocket improvements at Wollochet Dr. and SR 16 EB off-ramp | LOS E/F in years 2022 - 2040 | LOS D or better through 2040+ |
| 4001 | Signal timing and turn pocket improvements at Pioneer Way and SR 16 WB on-ramp | LOS E/F in years 2022 - 2040 | LOS D or better through 2040+ |
| **Mid-Term, within 10 years** | | | |
| 7404 | Extend SR 16 WB and SR 16 EB on-ramp acceleration lane at Pioneer Way | Safety, geometrics, and sight distance at merge location | Improved safety, geometrics, and sight distance at merge location |
| 4901 | Complete gaps in the Cushman Trail and the Scott Pierson Trail | Gaps in non-motorized network | Improved connectivity and expanded non-motorized facilities |
| 4902 | Add bike lanes to key north-south roadways | Gaps in non-motorized network | Improved connectivity and expanded non-motorized facilities |
| **Long-Term, within 20 years** | | | |
| 4101 | Signal timing improvements at SR 16 WB ramps and Olympic Dr. | LOS E in 2040 | LOS C or better through 2040+ |
| 4401 | Construct grade separated crossing at Hunt St. | Lack of east-west connections across SR 16. Congestion at Pioneer Way and Olympic Dr. interchanges | New east-west connection across SR 16. Reduced traffic along Olympic Dr. and Pioneer Way interchanges |
| 7501 | Pioneer Way interchange rebuild with potential overcrossing widening | Geometric issues and congestion along interchange | Improved freeway on- and off-ramps |

The following recommended solutions address key performance gaps:

- To address performance gaps at ramp terminal intersections, additional turn lanes and modified signal timing are recommended at the Wollochet Drive/Pioneer Way interchange and Olympic Drive interchange. These recommended solutions would reduce the performance gap, lower vehicle delay, and improve intersection LOS to D or better through the long-term horizon.
- Extending the on-ramp merge lengths on the SR 16 mainline is recommended in the mid-term. This solution would increase the acceleration distance for vehicles entering SR 16 and would improve merging operations on the mainline. In the long-term, a full interchange reconstruction is

recommended and could include reconfiguration to a full diamond with removal of the existing loop ramps. This long-term recommended solution would further improve freeway operations.

- A new grade-separated crossing of SR 16 at Hunt Street is recommended. This new crossing would not provide access to SR 16, but would improve capacity for east-west travel within Gig Harbor and would enhance the local street network connectivity.
- To address gaps in the non-motorized network, extending the Cushman Trail is recommended in the mid-term horizon. Extending the Cushman Trail so that it meets the terminus of the Scott Pierson Trail would complete a regional connection and expand the non-motorized network between Gig Harbor and Tacoma. Adding bike lanes on key north-south roadways, such as Harborview Drive or Soundview Drive, would complete the gap in bicycle facilities and improve access and mobility along the waterfront in the mid-term horizon.

Figure 5-9 depicts key recommended solutions for the near-, mid-, and long-term horizons within the Gig Harbor sub-area.


**Figure 5-9. Key Recommendations for Gig Harbor**

## 5.3 Recommended Solution Investment Summary

Planning-level cost estimates were developed for each recommended solution. Based upon WSDOT procedures for Practical Solutions planning and for planning-level cost estimates, these planning-level cost estimates are based upon representative concepts at this time. Little to no design development work has been conducted to define each solution and these planning-level cost estimates are for planning purposes only. Additional information on planning-level cost estimates are included in Appendix O.

Table 5-6 shows the projected investment amounts for the 5-year, 10-year, and 20-year horizon years. These investments are shown by the type of strategy. The approximate investment totals by horizon year increase over time as larger, medium-to-high capacity solutions are implemented. The costs per solution are also higher in the future horizon years as higher-cost, medium-to-high capacity solutions are implemented. Early, lower-cost investments yield closing of near-to-mid-term performance gaps.

**Table 5-6. Recommended Solutions by Strategy and Summary of Planning-Level Cost by Horizon Year**

| Strategy Category | Near-Term, 5-year | Mid-Term, 10-year | Long-Term, 20-year |
|---|---|---|---|
| 1. Operational Improvements/ITS | 17 | 19 | 20 |
| 2. Travel Demand Management | 3 | 3 | 3 |
| 3. Pedestrian & Bicycle Improvements | 1 | 9 | 11 |
| 4. Public Transit Improvements | 4 | 7 | 9 |
| 5. Medium Capacity Improvements | 2 | 17 | 20 |
| 6. High Capacity Improvements | 2 | 4 | 13 |
| Total Number of Solutions by Period | 29 | 30 | 17 |
| Planning Cost Estimate by Period (in millions) | $90 | $140 | $670 |
| Average Cost per Solution by Period (in millions) | $3.1 | $4.7 | $39.4 |
| Cumulative Total Number of Solutions Over 20 Years | 29 | 59 | 76 |
| Cumulative Planning Cost Estimate of Solutions Over 20 Years (in millions) | $90 | $230 | $900 |

In the next phases of application of the Practical Solutions approach, the representative concepts for each recommended solution will be further defined. The timeframes used for analyses to establish when the solutions are needed were based upon travel demand forecasts and closing performance gaps. The recommended solutions can be initiated prior to the designated timeframes identified (e.g., in the near-term, mid-term, and long-term). Larger medium-to-high capacity solutions will take longer to fund and implement. Further development of each solution may result in cost efficiencies and/or enhanced performance beyond the estimate from the Practical Solutions planning phase.

## 5.4 Prioritization and Ranking of Solutions

A detailed prioritization and ranking was prepared based on criteria developed from the study's needs statements and goals that were established (see Chapter 1). The documentation of the methodology and results of all the rankings for all the recommended solutions and associated scoring is provided in Appendix P, the *Prioritization of Recommended Solutions* memorandum. The detailed rankings in the appendices are grouped by implementation horizon years and separated into three categories; 1) SR 16 and SR 3 Mainline and Ramp Terminals, 2) Non-Motorized, Transit, and Network-Wide Solutions, and 3) Local Transportation Network Solutions.

The results showing the highest ranking recommended solutions for the near-term, medium-term and long-term are described as follows. Each solution was scored on a scale of zero to 100. The top scoring recommended solution within a given implementation horizon was set to a Scaled Score of 100, then other solutions were set relative to 100. Further analysis was prepared and presented in Appendix P using Bubble Charts to show the relationship between project benefit and investment level.

### 5.4.1 Prioritization of Near Term Solutions, 5-year Horizon

The recommended near-term horizon includes 29 solutions. Seven of the highest ranking recommended solutions have a low investment level, two have a medium investment level, and one has a high investment level. The highest-ranking solutions are related to low-cost operational fixes to improve traffic flow and relieve congestion.

Table 5-7 provides a summary of the highest ranking recommended solutions for the near-term, 5-year implementation horizon.

**Table 5-7. Highest Ranking of Recommended Solutions; Near-Term, 5-year Implementation Horizon**

| Rank | Solution ID | Solution Description | Investment Level | Base Score | Scaled Score from 100 |
|---|---|---|---|---|---|
| 1 | 1401 | Implement operational improvements along SR 304 at Charleston Beach Road | Low | 76 | 100 |
| 1 | 3101 | SR 16/Borgen-Burnham interchange - Intersection capacity improvements at WB ramp terminal | Low | 76 | 100 |
| 3 | 4101 | SR 16/Olympic Drive interchange - Ramp terminal rechannelization and improvements at EB and WB ramp terminals | Low | 73 | 96 |
| 3 | 2101 | SR 16/SR 160-Sedgwick interchange - Ramp terminal rechannelization and improvements at WB ramp terminal | Low | 73 | 96 |
| 3 | 1101 | SR 3/Loxie Eagans interchange - Ramp terminal rechannelization and improvements at National Ave. | Low | 73 | 96 |
| 3 | 1201 | SR 3/Kitsap Way interchange - Intersection rechannelization and improvements at SB ramp terminal | Low | 73 | 96 |
| 3 | 4001 | SR 16/Wollochet-Pioneer interchange - Ramp terminal rechannelization and improvements at EB and WB ramp terminals | Medium | 73 | 96 |
| 8 | 1701 | Implement peak-use shoulder lanes along SR 3 between railroad trestle north of Gorst and SR 304 | High | 72 | 95 |
| 9 | 1004 | Optimize signal timing operations and associated equipment or design | Low | 65 | 86 |
| 10 | 3305 | Complete the SR 302 Environmental Impact Statement as part of the SR 302, Elgin Clifton Rd. to SR 16, Congestion Study | Medium | 63 | 83 |

HOV = high occupancy vehicle

## 5.4.2 Prioritization of Mid-term Solutions, 10-Year Horizon

Thirty solutions are recommended in the 10-year mid-term implementation horizon. Five of the highest-ranking recommended solutions have a low investment level and four have a medium investment level. One of the highest-ranking recommended solutions has a high investment level. The highest-ranking solutions are generally related to low cost operational fixes to improve traffic flow and relieve congestion.

Table 5-8 provides a summary of the highest ranking recommended solutions for the 10-year implementation horizon.

**Table 5-8. Highest Ranking of Recommended Solutions; Mid-Term, 10-year Implementation Horizon Year**

| Rank | Solution ID | Solution Description | Investment Level | Base Score | Scaled Score from 100 |
|---|---|---|---|---|---|
| 1 | 1102 | SR 3/Loxie Eagans Interchange - Intersection capacity improvements at SB ramp terminal (signal or roundabout) | Low | 69 | 100 |
| 1 | 2001 | SR 16/Tremont St. Interchange - Intersection capacity improvements at EB and WB ramp terminal (signal or roundabout) | Medium | 69 | 100 |
| 1 | 1702 | Implement peak-use shoulder lanes along SR 3 between railroad trestle and SR 3/SR 16 interchange (Gorst) | High | 69 | 100 |
| 4 | 1005 | Construct roundabout at Sam Christopherson Avenue and SR 3/SR 16 | Medium | 67 | 97 |
| 5 | 3303 | Signalize or install roundabout at SR 302/Purdy Drive and Goodnough Drive | Medium | 65 | 94 |
| 6 | 1402 | Implement operational improvements along SR 304 at Farragut Avenue | Low | 64 | 93 |
| 7 | 1902 | SR 304 - Enhancing vanpool/transit options by converting 2+ HOV lane to 3+ HOV lane | Low | 63 | 91 |
| 8 | 2202 | SR 16/Mullenix Interchange – Intersection capacity improvements at EB and WB ramp terminal (signal or roundabout) | Medium | 62 | 90 |
| 9 | 7001 | Ramp metering on SR 16, north of SR 302 | Low | 61 | 88 |
| 9 | 7101 | Ramp metering on SR 16, south of SR 302 | Low | 61 | 88 |

### 5.4.3 Prioritization of Long-term Solutions, 20-Year Horizon

Seventeen solutions are recommended in the long-term, 20-year implementation horizon. A mix of low-, medium-, and high-investment solutions are included in the top 10 ranking. The highest-ranking solutions are generally related to low-cost operational fixes to improve traffic flow and relieve congestion or high-capacity improvements that improve transportation congestion and resiliency for many drivers.

Table 5-9 provides a summary of the highest ranking recommended solutions for the long-term, 20-year implementation horizon.

**Table 5-9. Highest Ranking of Recommended Solutions; Long-Term, 20-year Implementation Horizon Year**

| Rank | Solution ID | Solution Description | Investment Level | Base Score | Scaled Score from 100 |
|---|---|---|---|---|---|
| 1 | 1704 | Construct an elevated roadway or structure through Gorst to address resiliency and redundancy | High | 75 | 100 |
| 2 | 1703 | Add mainline capacity along SR 3 between SR 3/SR 16 interchange at Gorst and SR 304 | High | 73 | 97 |
| 2 | 7202 | Add lanes to mainline SR 16 within Kitsap County (north of SR 302) | High | 73 | 97 |
| 4 | 1403 | Selected approach widenings at SR 304 and Farragut Avenue | Low | 70 | 93 |
| 4 | 1003 | Reconstruct all or portions of the SR 16/SR 3 interchange and/or intersection of Sam Christopherson Avenue W/SR 3 | High | 70 | 93 |
| 6 | 2302 | SR 16/Burley Olalla Interchange – Intersection capacity improvements at EB and WB ramp terminal (signal or roundabout) | Medium | 66 | 88 |
| 6 | 7501 | SR 16/Wollochet-Pioneer interchange - Interchange widening and full or partial interchange reconstruction | High | 66 | 88 |
| 8 | 7301 | Implement peak-use shoulder lanes on mainline SR 16 within Pierce County (south of SR 302) | High | 63 | 84 |
| 8 | 2403 | Implement arterial widening along SR 160-Sedgwick Road, east of SR 16 | High | 63 | 84 |
| 10 | 3301 | Implement local intersection improvements at SR 302 and 144th Street NW | Low | 62 | 83 |

Chapter 6 includes a discussion regarding continued review, refinement, and prioritization of the recommended solutions. Also provided is a discussion on partnerships for next steps, pursuit of funding, and approaches for implementation.

# Chapter 6 Conclusion and Next Steps

This chapter summarizes the procedures used to meet the requirements of the planning phases of the Washington State Department of Transportation (WSDOT) Practical Solutions approach, followed by next steps moving forward.

## 6.1 Practical Solutions Next Steps Towards Implementation of Recommendations

The State Route (SR) 16, Tacoma Narrows Bridge (TNB) to SR 3, Congestion Study achieves and complies with the requirements of the planning phases of WSDOT's Practical Solutions approach. Figure 6-1 shows the planning phases in the context of project development through implementation.

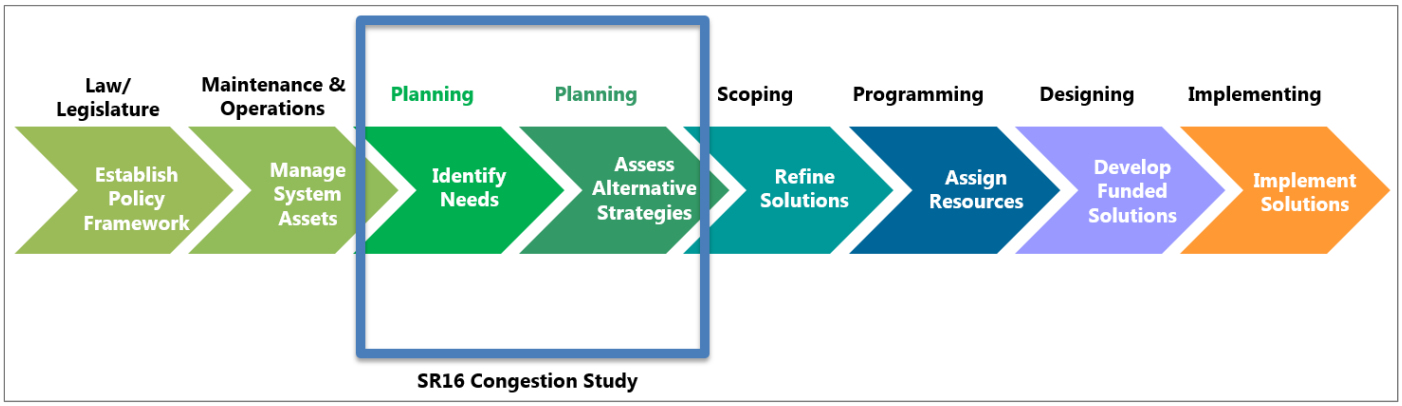


**Figure 6-1. Practical Solutions Phases**

The SR 16, TNB to SR 3, Congestion Study achieves the key tasks for WSDOT's Practical Solutions planning phases. This information is used to demonstrate needs, ideas and strategies considered, and evaluation and selection of strategy packages and solutions, including performance results. This study documentation is also to be used to support next steps towards refining solutions, pursuing and justifying funding, and implementing solutions.

Based on existing and anticipated future gaps in the transportation network, the Technical Advisory Group (TAG) and Executive Committee worked with the project team to prepare prioritized recommended solutions within the SR 16 and SR 3 corridor.

WSDOT will work with stakeholders and partners to implement near-term low-cost strategies, as well as continue to work with stakeholders on the mid-term and long-term solutions in the corridor. The recommended solutions must be incorporated into state, regional, and local plans to position the proposed improvements for future funding and implementation.

## 6.2 Moving Forward

The next steps in the Practical Solutions approach are project scoping and assignment of resources as shown in Figure 6-2.

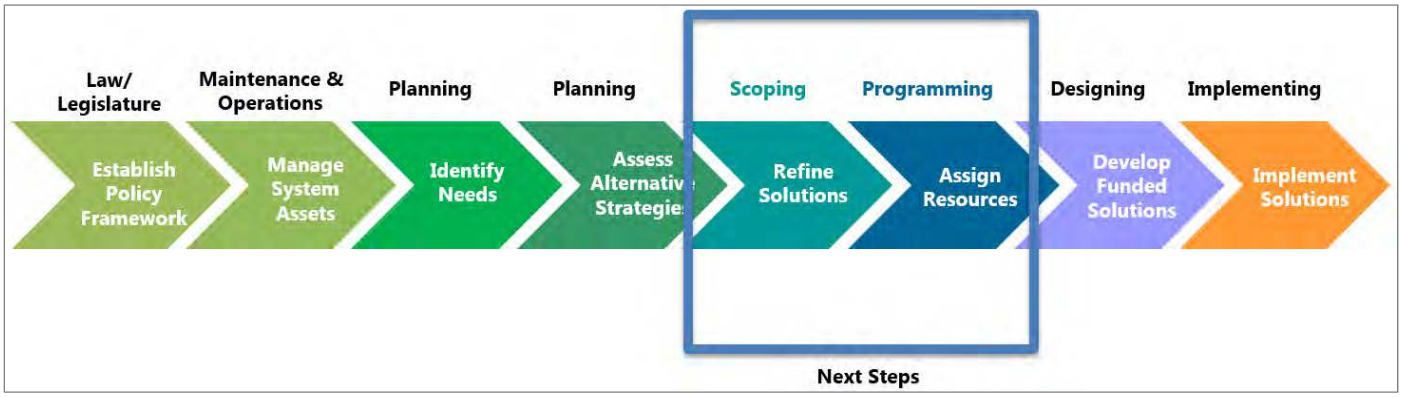


**Figure 6-2. Next Steps**

The initial next steps in scoping include further refinement of the solutions along with multi-disciplinary and multi-organizational engagement. The programming step includes additional system prioritization and optimization of delivery timing. Further refinement and enhancement of solutions occurs in the designing step. The implementing step involves construction and/or operations along with asset management. A key to moving forward in this corridor is the continued partnership of the jurisdictions along the corridor.

### 6.2.1 A Strategic Long-term Corridor Partnership for the SR 16/SR 3 Corridor

The package of recommended solutions provides cost-effective near-term and medium-term solutions that address performance gaps quickly, until larger investments are made in the corridor. The recommended package of solutions, while demonstrating good cost-effectiveness for 2040, contains major solutions that are unfunded. Major projects require approximately one decade to secure funding, prepare predesign/environmental documentation, and prepare final design plans for construction. The recommendations could be further evaluated to select the most cost-effective solutions for which to secure funding. Solutions from the recommendations package could be used to identify long-term projects. A broad outline to moving forward is outlined as follows:

- Establish the Executive Committee as a permanent steering committee for SR 16 improvements.
- Prepare a charter for the partnership with principals that agree to a coordinated program for implementation. Confirm memberships. Demonstrate a commitment to corridor priorities independent of jurisdictional boundaries. Identify partnership-shared level-of-efforts by the TAG members.
- Develop branding and identify the programmatic elements of the SR 16, TNB to SR 3, Congestion Study, for example, “The SR 16 Corridor Improvement Program”.
- Adopt practical solutions, findings, and recommendations of the SR 16 Congestion Study as the SR 16/SR 3 Master Plan.
- Prepare key messages that articulate study goals within the local context and what local leaders expect to achieve. For example:

  - Support the major investments made by the Navy with transportation infrastructure.
  - Reduce peak period congestion at the SR 16/SR 3 interchange in Gorst to connect people to jobs, reduce greenhouse gas emissions, and shift to greater use of transit and non-motorized modes of transportation.
  - The SR 16 Congestion Study is a technically robust analysis of 31 miles of study corridor operations, 16 interchanges and 61 local intersections all evaluated for performance over time in a framework that achieves the most practical solutions.

- Develop near-term and mid-term projects from the highest priority recommended solutions. This step requires resources (funding) for preliminary design to scope and define projects.
- Request funding of the legislature in 2019 and 2020 for project scoping, predesign, and project definition for the highest priority near-term and mid-term recommended solutions.
- Monitor corridor performance to understand and manage the timing of project funding and implementation.
- Monitor corridor performance as projects are implemented. Adapt and adjust the packages and solutions to changing conditions and transportation performance. Report on project implementation to stakeholders.

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