Attachment D

Exhibit B

Old Highway 99 Corridor Study

City of Tumwater

November 2022

SCJ ALLIANCE
CONSULTING SERVICES

Old Highway 99 Corridor Study

Project Information

Project:	**Old Highway 99 Corridor Study**
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Reviewing Agency

Jurisdiction:	City of Tumwater555 Israel Road SW Tumwater, WA 98501

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Project Reference:	SCJ #0625.29 Path: N:\Projects\0625 City of Tumwater\0625.29 Tumwater Old Hwy 99 and 79th Ave Corridor Study\Phase 05 - Preliminary Design\0625.29 - Old Hwy 99 and 79th Ave Corridor Study - 2022-0811.docx

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1 PURPOSE

The objective of this *Old Highway 99 Corridor Study* (Project) is to validate and build on recommendations from the *Tumwater City Plan 2036, Transportation Master Plan November 2016* (TMP), and to recommend changes resulting from the process and prepare preliminary design for the Old Highway 99 corridor improvements from approximately 73rd Avenue SE to 93rd Avenue SE. This Project also seeks to create proposed project phases to guide future budgeting and funding pursuits. This report presents an overview of the findings and recommendations for the Project. The study consists of the following elements:

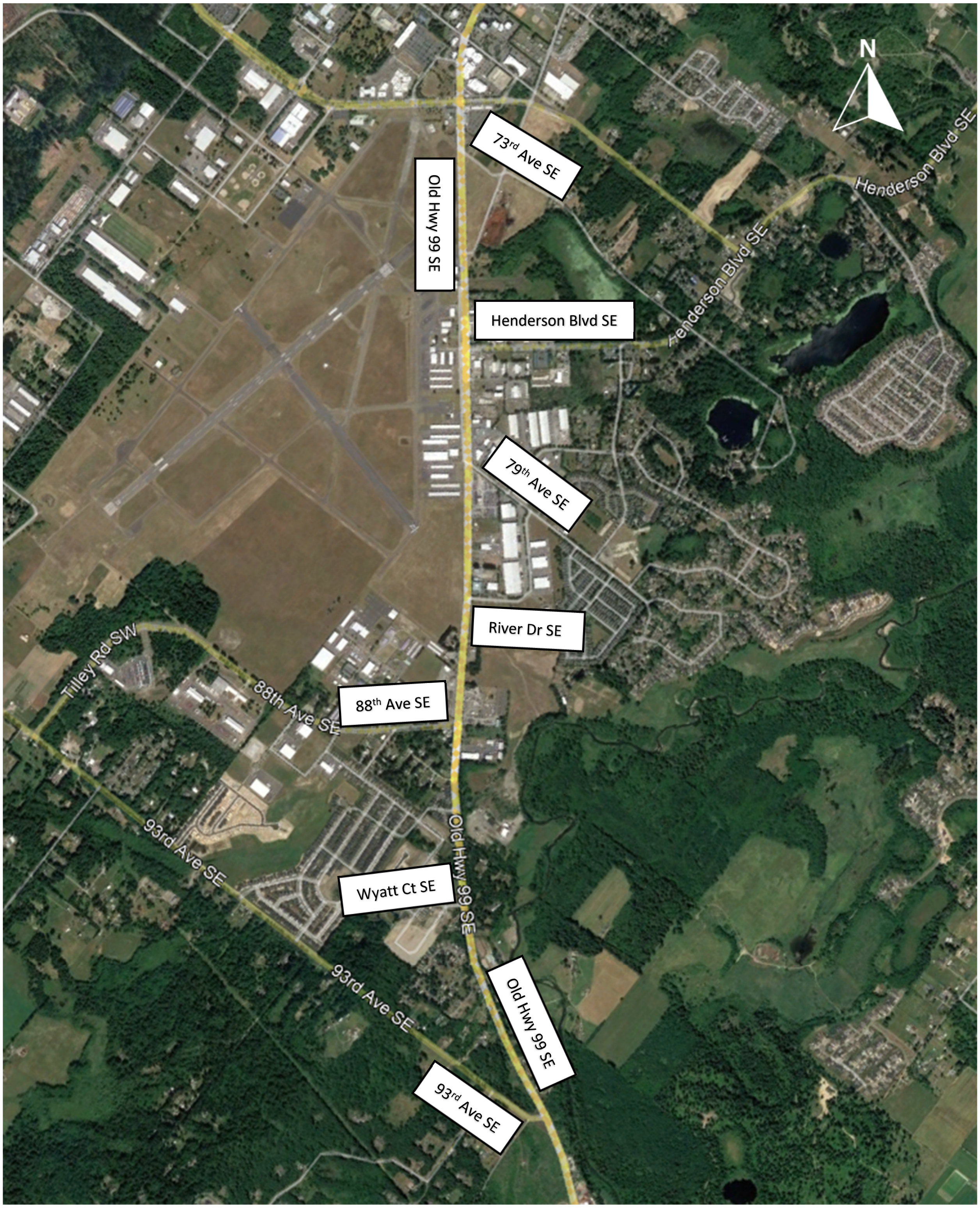
- Corridor Traffic Validation:
  - Validation of operational analysis of the corridor with the proposed and recommended alternatives to validate implementation.
- Alternatives Analysis and Public Involvement
  - Evaluation of alternatives and recommendation for selection.
  - Recommendations for access management and neighborhood traffic calming solutions throughout the corridor.
  - Presentation of the public engagement process.
  - Recommendations of alternatives.
- Preliminary Corridor Concept
  - Conceptual plans defining the recommended improvements that include intersection improvements, key improvements along the corridor, access modifications, stormwater management, and utility undergrounding.
  - Preliminary geotechnical investigation for stormwater design.
- Environmental Strategy
  - Environmental considerations based on existing and known conditions and potential permit requirements.
- Right of Way Plans:
  - Preliminary right of way plans between 73rd Avenue SE and 93rd Avenue SE.
- Project Phasing and Cost Estimates
  - Estimated project costs and recommend phasing of the improvements based on traffic analysis.

Each of these study elements informed a preliminary design that considers traffic, public input, and environmental considerations. With the proposed improvements to the corridor comes larger right of way needs and associated construction costs for each phase of the Project.

The Summary section of the report provides an overview of each element.

Figure 1.1 – Vicinity Map shows the Project limits of the Old Highway 99 Corridor Study.

Figure 1.1 Vicinity Map



2 BACKGROUND

2.1 EXISTING CONDITIONS

Old Highway 99 from 73rd Avenue to 93rd Avenue is a two-lane National Highway System (NHS) arterial from 73rd Avenue to 88th Avenue and connecter from 88th Avenue to 93rd Avenue with a general right of way width varying from 60 to 88 feet. The existing street width varies from 32 to 44 feet from pavement edge to pavement edge. There are 11-foot travel lanes with 5-foot shoulders located along the corridor on each side of the edge of travel way. 12-foot turn lanes are introduced at the following intersections:

- 73rd Avenue
- Henderson Boulevard
- 79th Avenue
- River Drive
- 88th Avenue
- Silver Spot Drive
- 93rd Avenue

The *Tumwater City Plan 2036* future zoning map identifies the properties adjacent to Old Highway 99 for light industrial uses along the east side of the corridor and a mix of general commercial, airport, mixed use, and residential uses along the west side.

Capitol Boulevard provides the primary north-south link for traffic, transit, pedestrians, and bicyclists within the city of Tumwater east of Interstate 5. The corridor currently carries approximately 16,000 vehicles per day and is projected to carry 24,000 vehicles per day by 2040. Old Highway 99 also provides connections to residential developments along the corridor, such as the Bush Prairie, Sterling Crossing, The Preserve, and Melody Pines Estates neighborhoods.

Currently, traffic on Old Highway 99 is heavy and congested, especially in morning and evening peak hours. The 79th Avenue intersection currently fails the city of Tumwater level of service (LOS) standards. Intersections at Henderson Avenue, 88th Avenue, and 93rd Avenue currently operate at an acceptable level of service but fail to maintain an acceptable LOS in 20 years for peak-hour traffic.

2.2 PREVIOUS WORK

In November 2016, the city of Tumwater published the *2036 Transportation Master Plan* (TMP) and laid out plans for the improvement from 73rd Avenue to 93rd Avenue on Old Highway 99. This document acknowledges that 79th Avenue fails to provide an acceptable LOS for existing traffic in 2016 and needs to be upgraded. It also evaluates the intersections at Henderson Avenue, 88th Avenue, and 93rd Avenue and marks these as intersections for improvement to handle projected traffic increase. Old Highway 99 also is projected to need widening to five lanes (two travel lanes in both directions and a middle turn lane) from 73rd Avenue to 88th Avenue and three lanes (one travel lane in each direction and a middle turn lane) from 88th to 93rd Avenue according to the TMP.

3 CORRIDOR TRAFFIC VALIDATION

The Traffic Operational Analysis in **Appendix A** describes the traffic count collection, traffic forecasting, and operational analysis for the Old Highway 99 Corridor. The traffic volumes and analysis were used to determine the intersection and roadway design and provide the baseline future conditions for a value engineering alternatives analysis for the Old Highway 99 intersections at 73rd Avenue, Henderson Boulevard, 88th Avenue, and 93rd Avenue. In support of this study, traffic volume data was collected pre-pandemic in early 2020 at the following locations:

- Old Highway 99/Henderson Boulevard
- Old Highway 99/79th Avenue
- Old Highway 99/88th Avenue
- Old Highway 99/93rd Avenue

Based on the traffic count surveys, the morning and evening peak hours are between 7:15-8:15 AM and 4:30-5:30 PM respectively. These periods represent the highest level of traffic in a single hour and informed the study's determination of LOS for each intersection.

Traffic analysis was conducted for the 2036 Corridor Plan Improvements using the projected 2040 AM and PM peak hour volumes with cycle lengths and phase lengths optimized. The following improvements were included in the 2036 Corridor Plan Improvements:

- Old Highway 99 / 73rd to 88th Avenue widening to five lanes including two-lane roundabouts at Henderson Boulevard and 88th Avenue.
- Old Highway 99 / 79th Avenue widening to five lanes including two-lane roundabout.
- Old Highway 99 / 93rd Avenue installation of a single lane roundabout.

The AM and PM peak hour operations results for the existing 2020, 2040 Baseline, and 2040 Corridor Plan Improvement analysis scenarios are summarized below in Tables 3.1 and 3.2.

Table 3.1 AM Peak Hour Intersection LOS Summary

Intersection	Control Type	Existing 2020	2040 Baseline	2040 – Corridor Plan Improvements[1]
		Intersection LOS and Delay	Intersection LOS and Delay	Intersection LOS and Delay
Old Highway 99 / Henderson Boulevard	Signal	C (22.4)	F (192.7)	A (5.6)
Old Highway 99 / 79th Avenue	Stop	F (59.0)	F (300+)	A (5.2)
Old Highway 99 / 88th Avenue	Signal	A (9.0)	F (120.7)	B (11.5)
Old Highway 99 / 93rd Avenue	Stop	C (23.9)	D (34.0)	A (5.6)

1 Reflects conversion to RAB

Table 3.2 PM Peak Hour Intersection LOS Summary

Intersection	Control Type	Existing 2020 Intersection LOS and Delay	2040 Baseline Intersection LOS and Delay	2040 – Corridor Plan Improvements[1] Intersection LOS and Delay
Old Highway 99 / Henderson Boulevard	Signal	B (13.0)	D (40.7)	A (6.1)
Old Highway 99 / 79th Avenue	Stop	F (115.0)	F (300+)	A (5.4)
Old Highway 99 / 88th Avenue	Signal	A (9.6)	B (12.8)	A (4.8)
Old Highway 99 / 93rd Avenue	Stop	C (21.5)	E (37.7)	A (7.3)

1 Reflects conversion to RAB

Evaluation of the traffic present at these intersections verified the city's assessment of the corridor capacity needs and the immediate need for improvement at the intersection of Old Highway 99 and 79th Avenue. The 79th Avenue intersection currently fails the city's LOS standards and needs improvement to better handle the current traffic. Also, the traffic operational analysis found given the 20-year projection of the intersections at Henderson Avenue and 88th Avenue intersections with Old Highway 99, they will not meet the city LOS standards and will need to be upgraded as well.

4 ALTERNATIVES ANALYSIS AND PUBLIC INVOLVEMENT

4.1 ALTERNATIVES ANALYSIS

This study included an alternatives analysis to determine and recommend roadway cross sections and intersection improvements along the corridor from 73rd Avenue through 88th Avenue in context with the overall corridor improvements. Each alternative evaluated met the requirements laid out in the *2036 Tumwater TMP*. The future section from 88th Avenue to 93rd Avenue will follow the proposed improved section from the TMP and did not undergo an alternatives analysis.

Alternatives for Old Highway 99 from 73rd Avenue to 88th Avenue were evaluated based on the following criteria:

- Bicycle Function/Usability
- Pedestrian Function/Usability
- Emergency Access
- Aesthetics
- Environmental Impact (Mazama Pocket Gopher Habitat)

Through discussion with the city and stakeholders these criteria were ranked from highest to lowest priority. Each criterion was weighed using pair-wise comparisons. Environmental Impact and Emergency Access were prioritized the highest, followed by Bicycle and Pedestrian Function, and Aesthetic received the lowest priority. Table 4.1 shows the performance priorities based on these criteria with input from stakeholders and the city:

Table 4.1 Performance Priorities

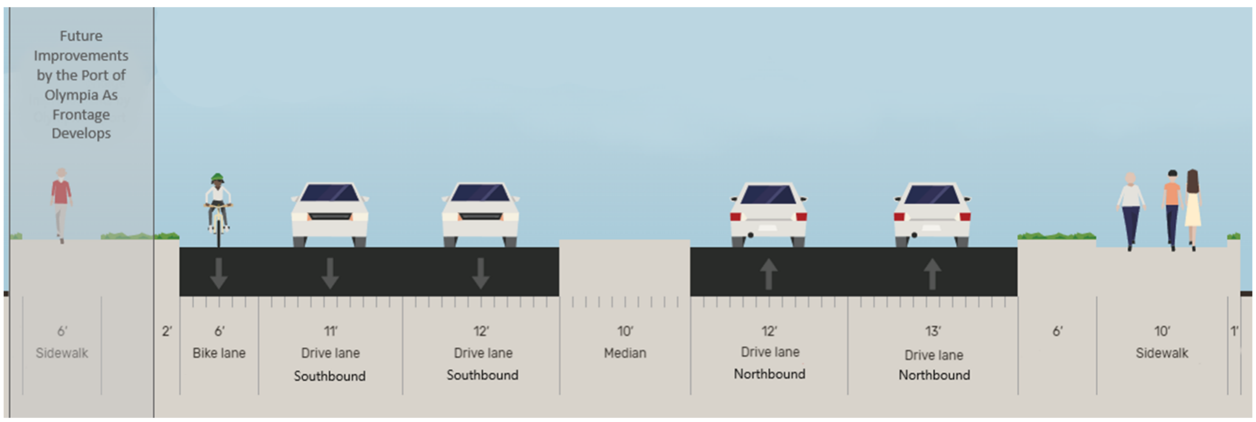
Performance Attributes	*Priorities*
Bike Function	**0.167**
Ped Function	**0.167**
EMS Function	**0.300**
Aesthetic	**0.067**
Enviro Impact	**0.300**
TOTAL	**1.00**

Once the performance attributes rankings were developed, six roadway section alternatives were created to be evaluated and modified through public involvement and stakeholder review. Section 4.2 describes public involvement and how it informed the revised roadway section.

Through the analysis of six alternatives using the performance attributes rankings and public input, Alternative 3B was selected because it provided the highest cost to value ratio. The recommended alternative differed from the TMP by shifting pedestrian facilities to the east side of Old Highway 99 with a 10-foot sidewalk for shared use with bicycles. A 6-foot bicycle lane would be provided for bicycles on the west side of the corridor and provision made for a 10-foot median in place of the two-way left turn lane. The northbound outer lane would have a width of 13 feet and inner lanes a width of 12 feet to provide shy distance from the median. The total width of the recommended alternative is 83 feet.

Because a substantial portion of the west side of Old Highway 99 is bordered by the Olympia Airport, it was determined that sidewalks on the west side will not be heavily used and do not need to be included in the section. To better fit the future section within right of way, the bike lane on the east side of the roadway was removed and the east side sidewalk was widened to provide a shared path for pedestrians and bicyclists. On the east side of the project are businesses which can be linked by a proposed shared used path. Figure 4.1 shows the recommended section below. As the frontage develops for the west side of the corridor bordering the Port of Olympia, the Port of Olympia will undertake frontage improvements.

Figure 4.1 Alternative 3B - Recommended Section for Old Highway 99



As laid out in the TMP, the section from 88th Avenue to 93rd Avenue will include three lanes (one travel lane in both directions and one middle left turn lane), 6-foot northbound and southbound bike lanes, and 5-foot sidewalks on both sides of the roadway. Sidewalks and bike lanes for this portion of the project will allow residents of the nearby neighborhoods to connect to pedestrian and bicycle accommodations more easily and safely. The west sidewalk will terminate at the 88th Avenue roundabout and have crosswalks to connect to the west sidewalk to continue north. For alternative scoring and results see **Appendix B** - Alternatives Analysis Memo.

4.2 PUBLIC INVOLVEMENT/STAKEHOLDER ENGAGEMENT

To inform the alternatives analysis, public input was gathered through a Maptionnaire survey that assessed the perceived safety and functionality of the current Old Highway 99 Corridor. The survey allowed respondents to pinpoint locations that they believed have issues. The results revealed safety and visibility concerns, sidewalk and bicycle needs, transit access insight, and ideas for improving the corridor.

Afterwards, to gather further input on the plan for Old Highway 99, workshops were held for stakeholders from Thurston Emergency Medical Services (EMS), Intercity Transit, Tumwater Unified School District (TUSD), Thurston County, Port of Olympia, Tumwater Fire, Thurston Regional Planning Council (TRPC), and Tumwater Police. Table 4.2 shows a list of the stakeholders:

Table 4.2 Stakeholders

Stakeholder	Agency
Kurt Hardin	Thurston EMS
Eric Phillips	Intercity Transit
Mel Murray	TUSD
Matt Unzelman	Thurston County
Becky Conn	Thurston County
Rudy Rudolph	Port of Olympia
Rachael Jamison	Port of Olympia
Brian Hurley	Tumwater Fire
Scott Carte	TRPC
Bruce Brenna	Tumwater Police

Two workshops were conducted to accommodate public involvement and stakeholder engagement. The first workshop was used to evaluate performance attributes and rank them by importance, providing a basis to weigh the scoring. Six alternative sections were then developed and analyzed. The second workshop was held for the city and stakeholders to assess and rank the alternates. Next, the alternatives were modified based on the second workshop. The modified alternatives were then analyzed to determine a recommended alternative with the best cost to value ratio. This recommended alternative was then presented at a virtual open house. For alternative scoring and results see **Appendix B** - Alternatives Analysis Memo.

5 PRELIMINARY DESIGN LAYOUTS

The preliminary design defines the improvements for the Old Highway 99 Corridor. The intent of this task is to define the improvements listed below in sufficient detail to estimate construction costs at a conceptual design level (30% contingency) and identify right of way needs.

5.1 ROADWAY LAYOUT

Through the process of alternatives analysis and public involvement the following design elements were determined for the preliminary roadway layout design of the Old Highway 99 improvements:

Old Highway 99 will have two main roadway sections:

1. 79th Avenue to 88th Avenue – Two travel lanes in both directions, a median dividing both directions of travel, 6-foot bike lanes on the west side, 10-foot sidewalks on the east side.
2. 88th Avenue to 93rd Avenue – One travel lane in each direction, a median dividing both directions of travel, 6-foot bike lanes on both sides, 6-foot sidewalks on both sides.

In **Appendix F** preliminary plan sheets show the recommended channelization of Old Highway 99.

5.2 ROUNDABOUT LAYOUTS

At the intersections at 79th Avenue, Henderson Avenue, 88th Avenue, and 93rd Avenue, roundabouts are the preferred alternative for improving the intersection.

Appendix F contains layouts, sight distance, and fastest path for the intersections at 79th Avenue, Henderson Avenue, 88th Avenue, and 93rd Avenue.

5.3 STORMWATER

Stormwater studies were conducted based on the *2022 Drainage Design and Erosion Control Manual for Tumwater.* Ongoing evaluation is currently taking place to determine the local water tables and the infiltration rates anticipated for the project. Prior to final design, Geotech must conduct a more comprehensive study of the soils on the project site and perform pit tests to determine final design infiltration rates. Two methods were used for modeling the stormwater along both sides of the roadway: 1) Bioretention for roadway edges with curb and gutter and 2) Compost Amended Vegetated Filter Strips (CAFVS) for roadway edges without curb and gutter. For each of the proposed roundabouts, infiltrations basins can be used to capture the roundabout stormwater runoff and receive any overflow from the bioretention swales and CAVFS.

Full design of all facilities will have to be based on infiltration rates found through Geotech test pits and evaluation of the water table at each specific roundabout location.

Information for stormwater was gathered and summarized to create a stormwater technical memorandum describing the anticipated stormwater design, to document major design decisions, and to serve as a concept for flow control at this preliminary stage. See the Stormwater Tech Memo within **Appendix F**.

5.4 Utilities

As a part of the utility coordination, we collected as-built plans for public and private utilities to create an exhibit that shows all the known utilities on the project site. From this a *Utility Tech Memo* was created to identify any utility conflicts for the project. Due to the expanded section for Old Highway 99 and the introduction of roundabouts at four intersections, certain utilities will need to be relocated, including but not limited to junction boxes, sewer maintenance holes, and water valves. New illumination, signage, and stormwater will have to be coordinated with current utility locations. All aboveground franchise utilities will be required to be relocated underground for the corridor.

As a part of the phases, the utility work will need to be coordinated with utility purveyors to determine where relocations and coordination need to take place.

Appendix F contains the Utility Tech Memo showing all horizontal crossings for the project as identified from the as-built plans.

5.5 Landscaping and Streetscape

Through the process of developing a plan for the Old Highway 99 Corridor Improvements, it was determined that landscaping would consist of grass planting in the planter strips between the street curbs and the sidewalks. Cross sections were created for the corridor from 73rd Avenue to 88th Avenue, and a section from 88th Avenue to 93rd Avenue.

For the entire corridor, there were six visual streetscape and landscape renderings that were evaluated, and a section was determined for the proposed improvements. For alternatives evaluation, see information in **Appendix B.**

6 ENVIRONMENTAL STRATEGIES

6.1 Environmental Considerations

Our environmental assessment follows the premise laid out in Part 4 – Environmental Considerations from the NEPA CE Categorical Exclusion Documentation Form. Considerations include thirteen elements to identify impacts and the plan for mitigation when needed. **Appendix G** contains a tech memo that addresses the following environmental considerations:

- Air Quality
- Critical Areas
- Cultural Resources/Historic Structures
- Floodplains and Floodways
- Hazardous and Problem Waste
- Noise
- 4(f)/6(f) Resources
- Agricultural Lands
- Rivers, Streams, or Tidal Waters
- Tribal Lands
- Water Quality/Stormwater
- Previous Environmental Commitments
- Environmental Justice

Each of these elements were evaluated at a preliminary level to inform where potential considerations may impact design and identify potential mitigation. Specific aspects of the project will need to be evaluated as outlined below:

1. Air Quality evaluation since the improvements will increase corridor capacity.
2. Mazama Pocket Gopher (MPG) habitat which will impact the considerations for design. MPG habitat is adjacent to the corridor along the east and west side of Old Highway 99.
3. Historic sites including a historic oak tree and the George Washington Bush Interpretive site.
4. Hazardous waste material which may be located on property acquired at the gas station and Pick-n-Pull automobile salvage yard, both which overlap the project site.
5. Noise impacts and whether the widening moves traffic closer to noise receptors.
6. An environmental justice assessment for the right of way acquisition and relocation.

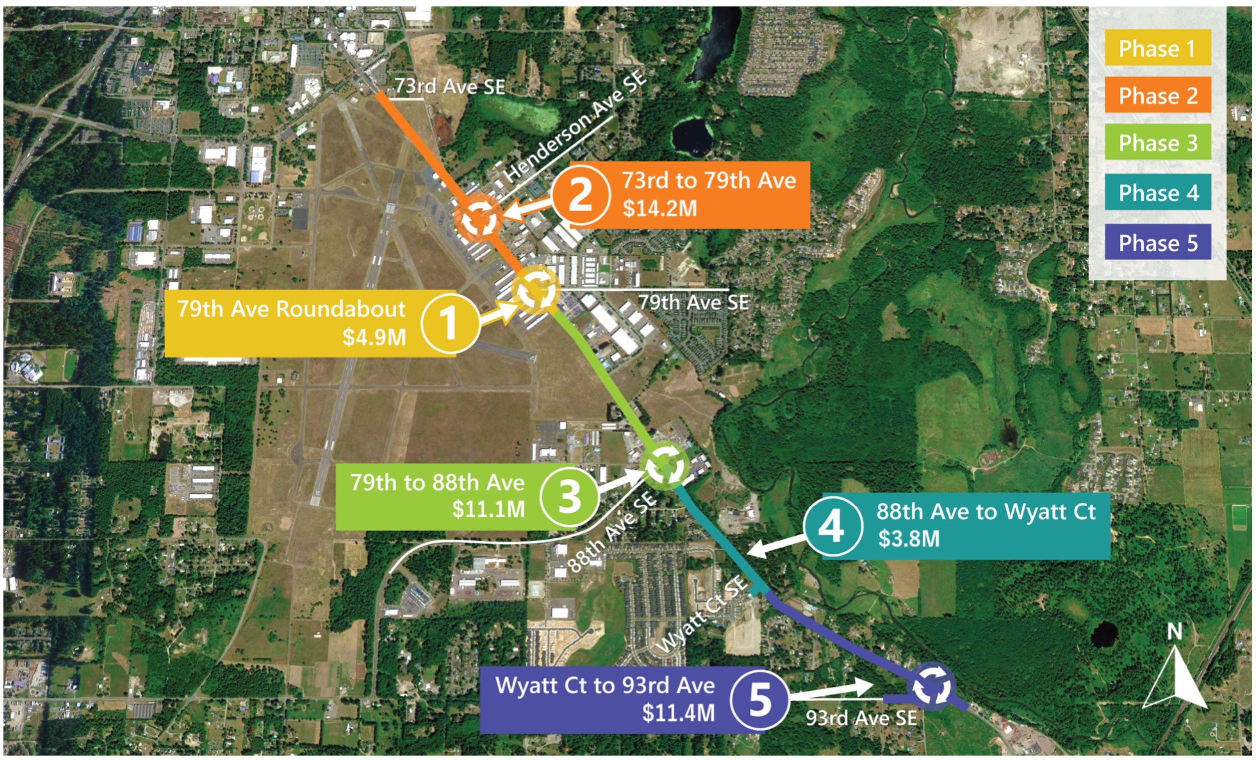
For additional information and supporting reports, see **Appendix G** containing the Environmental Tech Memo.

7 PHASING PLAN AND COST ESTIMATES

7.1 Project Phasing

We evaluated the corridor and phasing options for improvements along Old Highway 99. We based the phasing options on operational benefit, funding opportunities, and practical project size. First, we gave priority to phases providing more operational benefit. Second, we defined phases based on funding opportunities. Third, we sought to keep the cost for individual phases between $4M and $15M (in 2022 dollars). With these considerations in mind, the following phases were determined for the project and their anticipated costs determined.

Figure 7.1 Old Highway 99 Project Phases



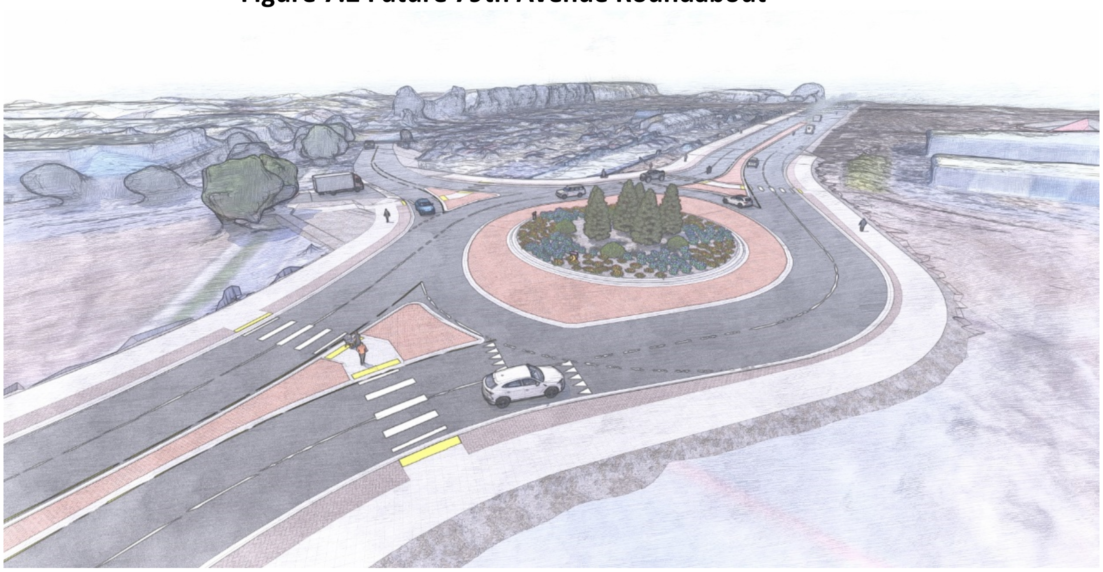
7.1.1 Phase 1 – 79th Avenue Roundabout ($4.9 Million)

For the Project, 79th Avenue fails to provide an acceptable LOS for existing traffic base on the 2020 traffic counts. The construction of a roundabout would alleviate the congestion at this location and raise it to LOS A. Because it is the only intersection that currently has a failing LOS, it is a critical improvement.

The constructed roundabout would have two circulating lanes through the roundabout on Old Highway 99 and then taper to one lane to match the roadway section on both sides of the proposed roundabout. 79th Avenue would tie into the roundabout with one lane going in both directions. A 10-foot sidewalk would be constructed on the east side of the roadway and a 10-foot sidewalk would be constructed on the west side, providing opportunities for bicycles to exit the roadway before reaching the roundabout or allow bicyclists who are comfortable with merging with vehicle traffic to travel through the roundabout.

Construction of new stormwater facilities, signage, and illumination would also be included in Phase 1. Right of way property acquisition will be required for the construction of this phase.

Figure 7.2 Future 79th Avenue Roundabout



7.1.2 Phase 2 – 73rd Avenue to 79th Avenue ($14.2 Million)

Henderson is projected to have a failing LOS in 2040 and is the next highest priority after 79th Avenue improvements. Widening from 73rd Avenue to 79th Avenue would provide continuity with two lanes of travel and a section that accommodates pedestrians and bicyclists connecting to the recent improvements of Capitol Boulevard.

Starting on the north side and working our way south after the 79th Avenue Roundabout, work would include the construction of a roundabout at Henderson Avenue and the widening of Old Highway 99 to two lanes of travel in both directions and a median that ties into the 79th Avenue roundabout improvements. 10-foot sidewalks would be constructed on the east side of the roadway providing pedestrian and bicycle access and bike lanes would be constructed on the west side to tie into the bike lanes constructed for the 79th avenue roundabout. On the west side of the Henderson roundabout, a 10-foot sidewalk would be constructed to provide an exit for bicyclists who are not comfortable merging with traffic to travel through the roundabout.

Construction of new stormwater facilities, signage, and illumination would also be included in Phase 2. Right of way property acquisition will be required for the construction of this phase.

Figure 7.3 Future Henderson Avenue Roundabout

7.1.3 Phase 3 – 79th Avenue to 88th Avenue Roundabout ($11.1 Million)

After 73rd to 79th Avenue improvements, the next phase would include widening to two lanes in both directions and a median between 79th Avenue and 88th Avenue and the construction of a roundabout at 88th Avenue. 10-foot sidewalks would be provided on both the west side and east side of the roundabout to provide both bicycle and pedestrian access. The sidewalk on the west side serves as an exit for bicycles before and after the roundabout at 88th Avenue. The sidewalk on the east side would continue all the way from 79th Avenue to 88th Avenue. From 88th Avenue two lanes of travel in both directions would taper down to one lane of travel in each direction.

Construction of new stormwater facilities, signage, and illumination would also be included in Phase 3. Right of way property acquisition will be required for the construction of this phase.

7.1.4 Phase 4 – 88th Avenue Roundabout to Wyatt Court ($3.8 Million)

Following the 79th Avenue and 88th Avenue Roundabout improvements, would be 88th Avenue to Wyatt Court improvements, including widening for a median dividing the two opposing lanes of travel, 6-foot sidewalks on both sides, and 6-foot bike lanes continuing from the previous phase.

Construction of new stormwater facilities, signage, and illumination would also be included in Phase 4. Right of way property acquisition will be required for the construction of this phase.

7.1.5 Phase 5 – Wyatt Court to 93rd Avenue Roundabout ($11.4 Million)

To conclude the Old Highway 99 improvements, Wyatt Court to 93rd Avenue improvements would include widening for a median dividing the two opposing lanes of travel, 6-foot sidewalks on both sides that taper out to 10-foot sidewalks at 93rd Avenue Roundabout, and bike lanes continuing from the previous phase. A roundabout at 93rd Avenue will be constructed to terminate the project with a sidewalk on both south and north sides of the roundabout to give access to both pedestrians and bicyclists travelling through the roundabout.

Construction of new stormwater facilities, signage, and illumination would also be included in Phase 5. Right of way property acquisition will be required for the construction of this phase.

7.2 PHASE COST ESTIMATES

Each phase was evaluated, and a cost estimated for their completion. Table 7.1 shows the five proposed phases and the combined cost for construction, right of way acquisition, and engineering services.

Table 7.1 Phase Costs

Phase	Description	Cost*
Phase 1	79th Avenue Roundabout	$4,920,000*
Phase 2	73rd Avenue to 79th Avenue	$14,220,000*
Phase 3	79th Avenue to 88th Avenue Roundabout	$11,100,000*
Phase 4	88th Avenue Roundabout to Wyatt Court	$3,780,000*
Phase 5	Wyatt Court to 93rd Avenue Roundabout	$11,400,000*

*Cost includes construction, right of way acquisition, and engineering. See *Section 8 – Right of Way Plan*.

The total phase costs in Table 7.1 are preliminary and represented in 2022 dollars. Over the last three to five years, we have experienced a 15-20% increase in construction costs and continue to see increases on a yearly basis. These cost increases are unprecedented and difficult to predict. Due to these increases and general inflation, we recommend doing a cost analysis to account for inflation and increased construction costs prior to submitting grant applications. **Appendix D** includes copies of the conceptual cost estimates for each phase of the project.

If the city wants to further break down the phases due to cost, the roundabouts can be constructed separate from the section widening. These phases however follow an order that reflects the needs and continuity of the corridor improvements moving forward.

Table 7.2 summarizes the estimated right of way acquisition and relocation cost for each phase listed in the Phasing Plan. **Appendix E** includes a copy of the conceptual right of way plans and estimates.

Table 7.2 Right of Way Costs

Project	Description	Property Acquisitions	Relocations	Cost
Phase 1	79th Avenue Roundabout	4	1	$900,000
Phase 2	73rd Avenue to 79th Avenue	18	1	$3,750,000
Phase 3	79th Avenue to 88th Avenue Roundabout	24	0	$1,990,000
Phase 4	88th Roundabout to Wyatt Court	8	0	$580,000
Phase 5	Wyatt Court to 93rd Avenue Roundabout	25	1	$2,220,000

*Cost includes right of way acquisition and engineering.

Project funding estimates (PFE) for each phase should be completed during the preliminary engineering (PE) phase. Project funding estimates should consider loss of parking and circulation impacts to each parcel. We also recommend establishing contact with each affected property owner early in the PE phase to setup expectations and understand their needs.

See **Appendix E** for concept right of way plans and cost estimates.

APPENDIX A
- TRAFFIC OPPERATIONAL ANALYSIS

Traffic Operational Analysis

Old Highway 99 Corridor Study
City of Tumwater

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August 2022

Operational Analysis

Project Information

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Reviewing Agency

Jurisdiction:	City of Tumwater

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1 Introduction

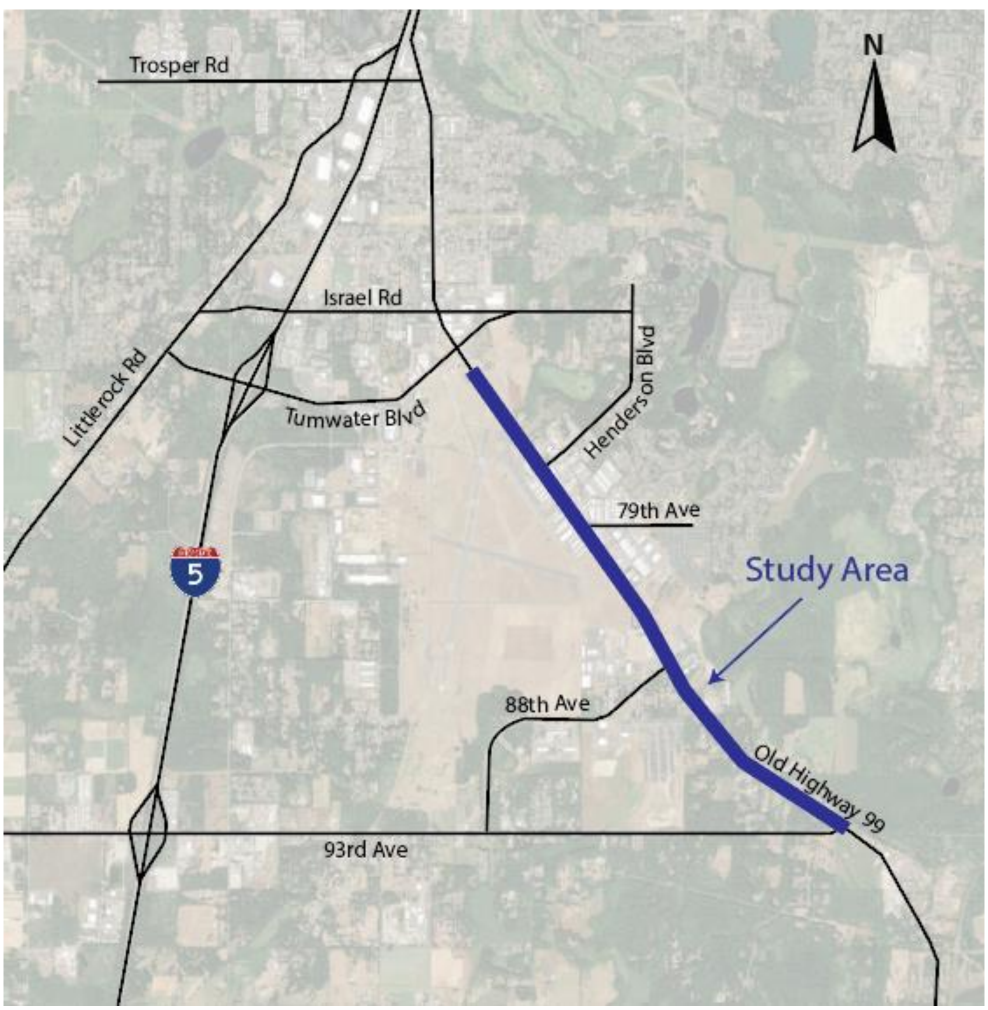
1.1 Project Overview

The City of Tumwater is conducting the *Old Highway 99 Corridor Study* (Corridor Study) to validate the transportation recommendations included in the *Tumwater City Plan 2036, Transportation Master Plan November 2016* (Transportation Plan) to identify and prioritize future projects and to develop strategies for future funding. The Transportation Plan recommends widening the Old Highway 99 corridor to 5 lanes from 73rd Avenue to 88th Avenue and widen to 3 lanes from 88th Avenue to 93rd Avenue. Included in the corridor improvement project was conversion of the two existing traffic signals, at Henderson Boulevard and 88th Avenue, to roundabouts. The Transportation Plan also identified intersection improvements at 79th Avenue and 93rd Avenue, recommending roundabouts at both locations.

The Corridor Study will identify necessary or recommended changes to these recommendations as a result of the validation process and identify preliminary design improvements. The Corridor Study extends from approximately 73rd Avenue SE to 93rd Avenue SE in Tumwater, Washington.

Figure 1 illustrates the Corridor Study area.

Figure 1. Site Vicinity Map



1.2 Study Context

The Corridor Study validation process includes conducting a transportation operational analysis for potential roadway and intersection alternatives. This report describes the traffic count collection, traffic volume forecasting, and operational analysis performed to determine/confirm the recommended roadway and intersection design concepts. The operational analysis has been prepared for existing 2020 AM and PM peak hour conditions, forecasted 2025 AM and PM peak hour conditions and forecasted 2040 AM and PM peak hour conditions at the following intersections:

- Old Highway 99/Henderson Boulevard
- Old Highway 99/79th Avenue
- Old Highway 99/88th Avenue
- Old Highway 99/93rd Avenue

2 Existing Conditions

2.1 Area Land Uses

The Corridor Study extends from 73rd Avenue SE to 93rd Avenue SE. The surrounding land uses along the corridor includes a mix of industrial, commercial and undeveloped land. The Olympia Regional Airport and airport related uses are located along the west side of Old Highway 99 for a large majority of the study area. Old Highway 99 also provides connections to residential developments along the corridor.

The *Tumwater City Plan 2036* future zoning map identifies the properties adjacent to Old Highway 99 to be light industrial uses along the east side of the corridor and a mix of general commercial, airport, mixed use, and residential uses along the west side.

2.2 Roadway Inventory

2.2.1 Old Highway 99

Old Highway 99 is classified as an arterial from 73rd Avenue to south of 88th Avenue, and as a collector from south of 88th Avenue to 93rd Avenue. In the study area, Old Highway 99 has one lane in each direction. The roadway has a paved shoulder with intermittent sidewalks and has a posted speed limit of 50 mph from 93rd Avenue to 79th Avenue where the speed limit drops to 40 mph. The speed limit drops again to 35 mph north of the study area. Old Highway 99 extends from the City of Tenino north to the City of Tumwater. North of the study area, Old Highway 99 transitions to Capitol Boulevard serving as the city's primary north-south transportation route.

2.2.2 Henderson Boulevard

In the study area, Henderson Boulevard is classified as a collector roadway and has one lane in each direction. This roadway has intermittent paved shoulders with no sidewalks and has a posted speed limit of 35 mph. Henderson Boulevard serves as a link between Old Highway 99 and Yelm Highway.

2.2.3 79th Avenue

79th Avenue is classified as a collector roadway and has one lane in each direction. This roadway provides sidewalks along portions of each side of the road and has a posted speed limit of 35 mph. 79th Avenue provides access to residential developments located on the east side of the corridor.

2.2.4 88th Avenue

88th Avenue is classified as a collector roadway and has one lane in each direction. As 88th Avenue transitions to Tilley Road it provides one lane in each direction with a two-way-center-left-turn-lane. This roadway provides paved shoulders and sidewalks and has a posted speed limit of 50 mph. Bike lanes are provided at the transition to Tilley Road. 88th Avenue serves as a link between Old Highway 99 and Tilley Road, which provides access to rural Thurston County.

2.2.5 93rd Avenue

93rd Avenue transitions through several roadway classifications, near Old Highway 99 it is classified as a collector roadway and near I-5 the roadway is an arterial. Between 88th Avenue and I-5, 93rd Avenue changes between collector and arterial as it travels through City and UGA limits. 93rd Avenue provides one lane in each direction and has a posted speed limit of 50 mph between Old Highway 99 and Tilley Road, before reducing to a posted speed limit of 40 mph west of Tilley Road. This roadway serves as a connection to the south and west portions of the City of Tumwater and provides access to and from I-5.

A summary of the existing intersection channelization and control type for each of the study intersections is provided in **Figure 2.**

2.3 Traffic Volume Data

Traffic Count Consultants, Inc (TC2), a transportation data collection service, provided peak period turning movement counts for the study intersections. The counts were conducted between 7:00 am - 9:00 am and between 4:00 pm - 6:00 pm on Wednesday, March 04, 2020 at the following locations:

- Old Highway 99/Henderson Boulevard
- Old Highway 99/79th Avenue
- Old Highway 99/88th Avenue
- Old Highway 99/93rd Avenue

The morning and evening peak traffic periods were selected as the appropriate time periods because they represent the peak commute hours and create the highest level of activity at the study intersections.

Figure 3 shows the existing 2020 AM and PM peak hour traffic volumes for the study intersections. The turning movement count diagrams are provided in **Appendix A**.

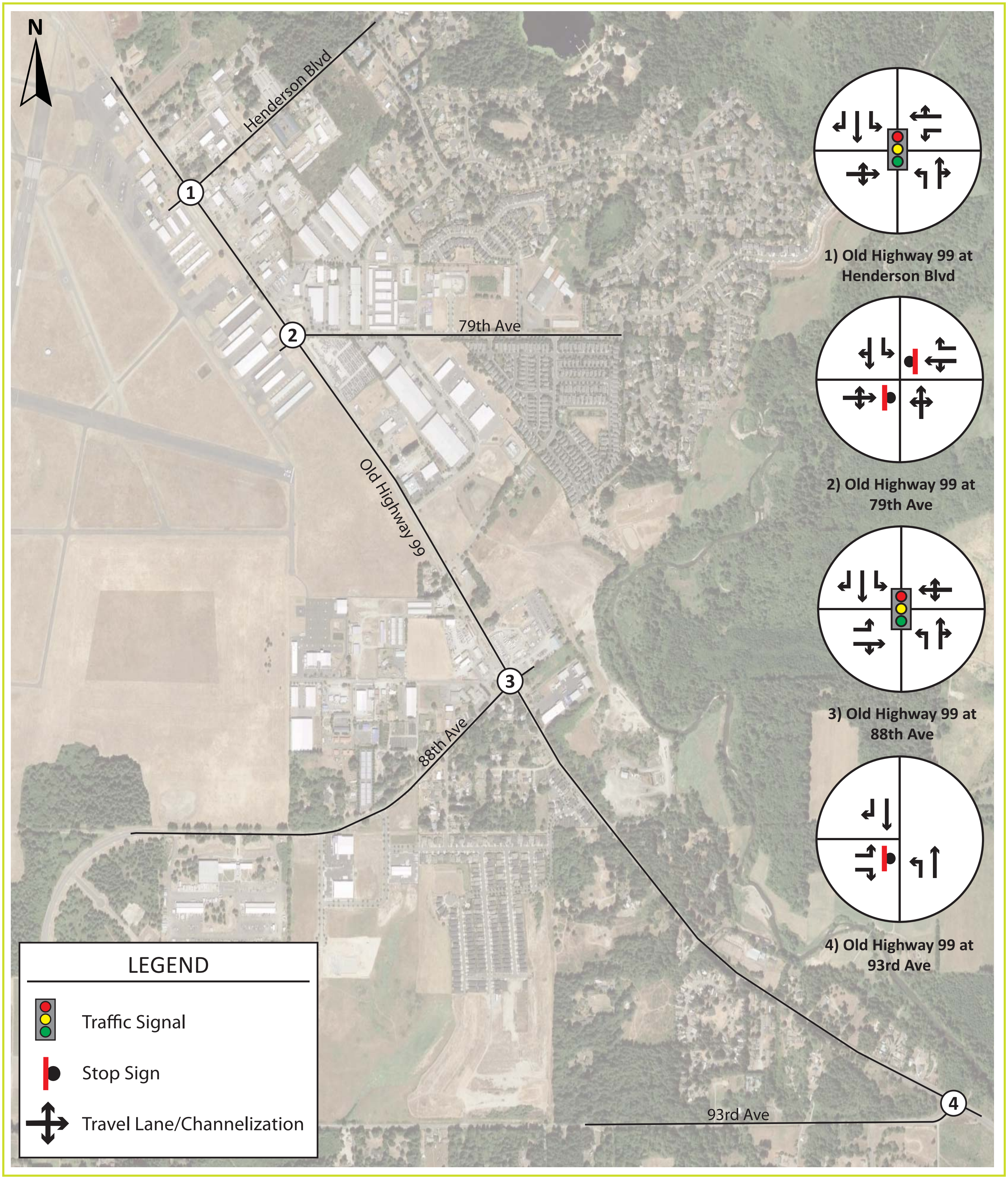


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Figure 2
Existing Channelization

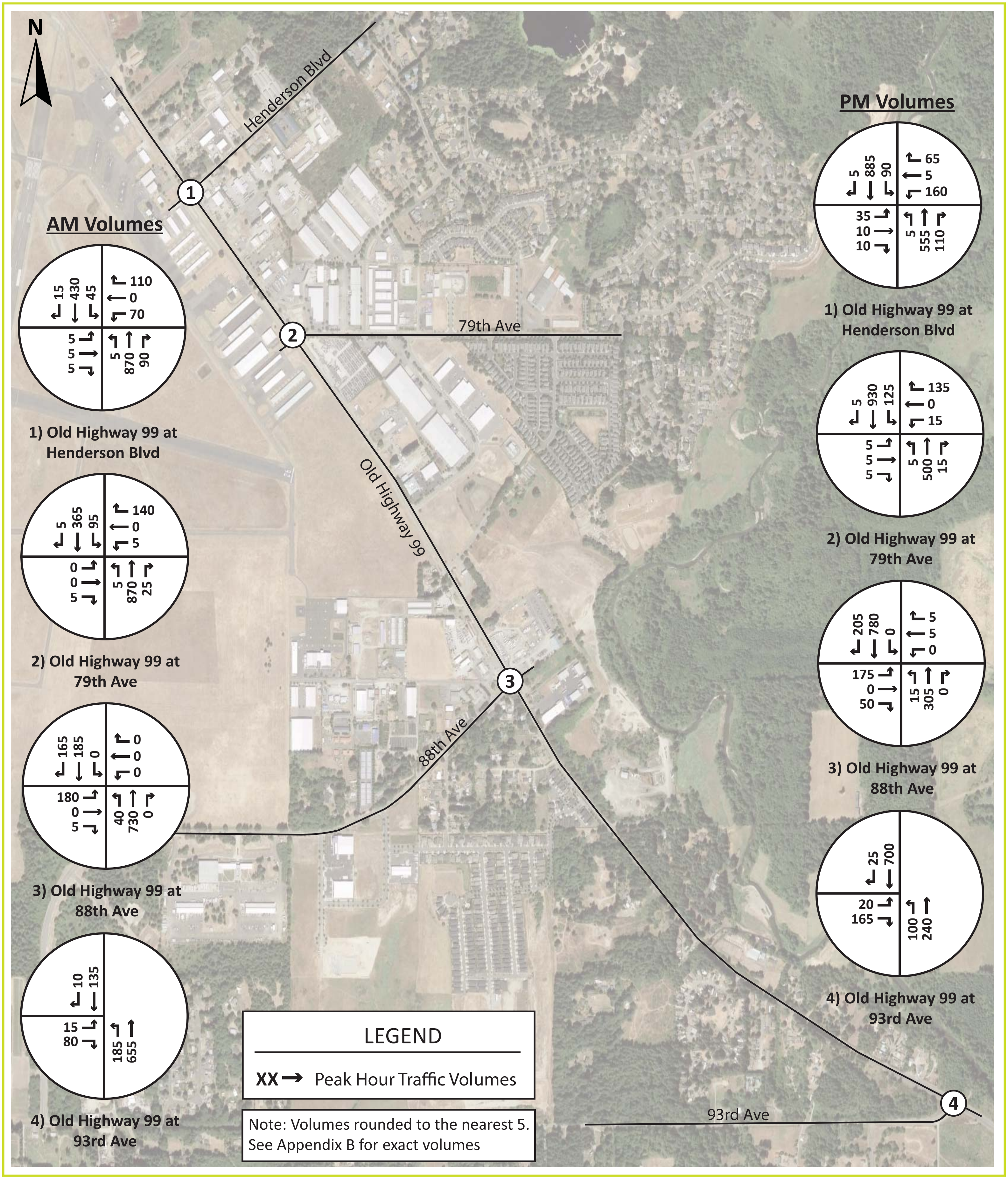

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Figure 3
Existing 2020 AM & PM Peak Hour Traffic Volumes

3 Future Conditions

3.1 Travel Demand Model

The traffic volume projections used in this analysis were calculated using the Thurston Regional Planning Council (TRPC) Emme/4 transportation demand model. The model, prepared by TRPC, has been most recently updated to represent 2015 traffic conditions. The model provides AM and PM peak hour traffic assignments.

TRPC has prepared a 2040 model scenario that includes the regionally adopted household and employment projections for the region. The 2040 scenario also includes all roadway improvements identified in the current Thurston County Regional Transportation Plan (RTP).

3.2 Traffic Volume Forecasts

Using the outputs from the TRPC travel demand models, baseline 2025 and 2040 volume forecasts were prepared. These forecasts were calculated using the annual model volume growth added to the existing turning movement counts at each study intersection. The projected 2025 AM and PM peak hour volumes are provided on **Figure 4**.

The growth contained in the 2040 demand model for the area along the study corridor was evaluated and found to be minimal. To provide a more conservative long-range forecast, an evaluation of the vacant properties along the study corridor was performed. Based on the amount of available land and the current zoning, additional development was assumed and incorporated into the long-range traffic forecast.

3.2.1 Adjustment to the 2040 Baseline Traffic Volume Forecast

To calculate a more conservative 2040 volume forecast an assessment of the vacant property along the study corridor was performed. With the Olympia Regional Airport located on much of the western side of the corridor, the vacant land assessment was primarily performed on the east side of the corridor. Between Henderson Boulevard and 88th Avenue there is approximately 46.25 of vacant land. In discussions with the City it was determined that 80% of this land would be considered built out for the 2040 horizon, resulting in approximately 37 acres of additional development. The current zoning for this entire area is light industrial. An assessment of other developments in the vicinity suggest approximately 40% of the total property contains buildings, with the rest dedicated to access, parking and stormwater treatment. Using 40% for the building coverage, approximately 14.8 acres, or 650,000 square feet, was determined as the amount of additional development.

The vehicle trip generation for the additional development potentialwas estimated using the trip generation rates contained in the 10th edition of the Trip Generation Manual by the *Institute of Transportation Engineers (ITE)*. The land-use category "Warehousing" (land-use code 150) and "General Light Industrial" (land-use code 110) were used.

Table 1 shows the trip generation characteristics for Warehousing and General Light Industrial for the AM and PM peak periods.

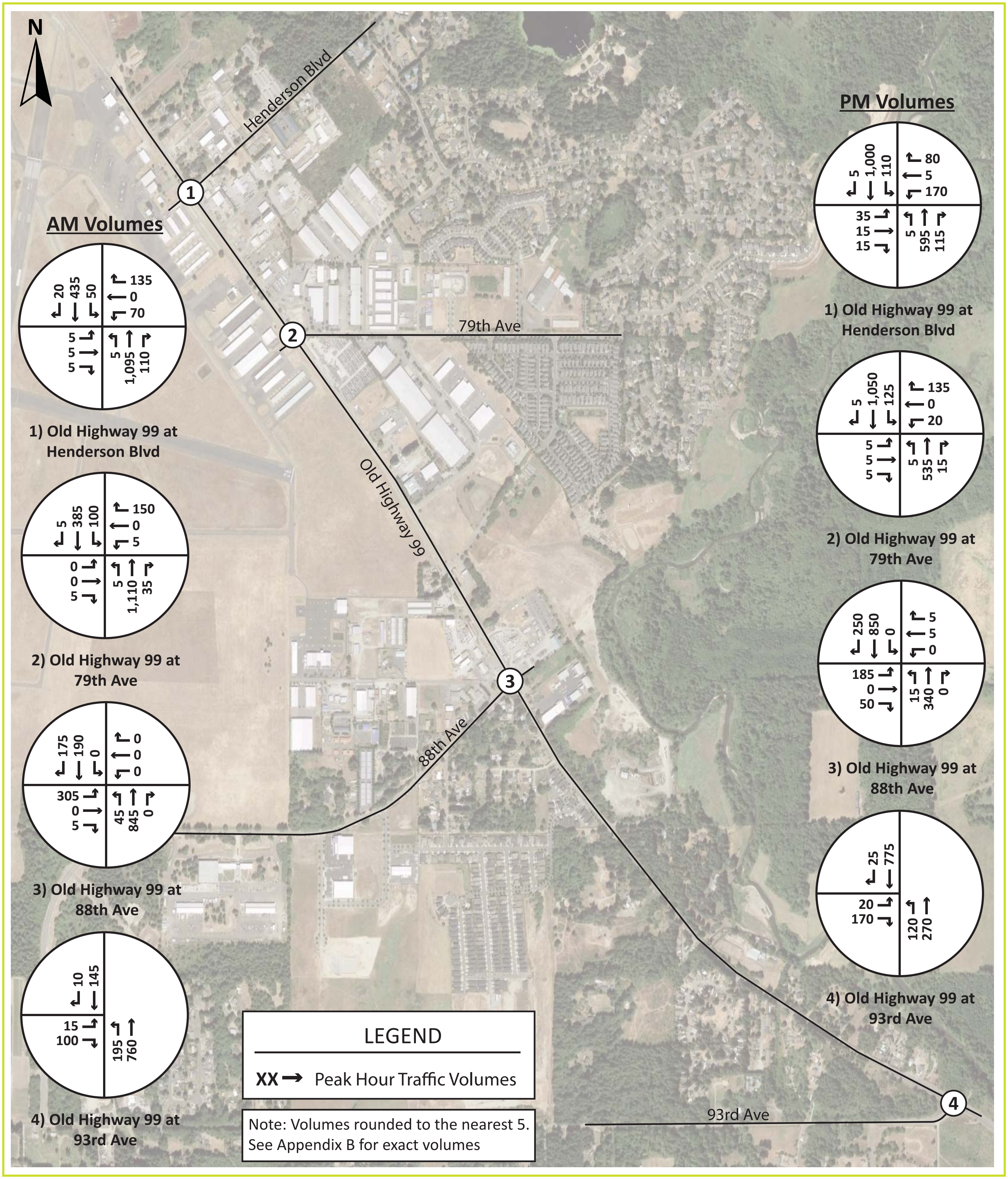

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Figure 4
2025 Baseline AM & PM Peak Hour Traffic Volumes

Table 1. AM and PM Peak Hour Trip Generation Characteristics – Baseline

ITE Land Use (LU)	Unit	Trip Rate	Enter %	Exit %
AM Peak Period				
Warehousing	1,000-sq ft	0.17	77%	23%
General Light Industrial	1,000-sq ft	0.70	88%	12%
PM Peak Period				
Warehousing	1,000-sq ft	0.19	27%	73%
General Light Industrial	1,000-sq ft	0.63	13%	87%

The total trip generation is calculated by applying the unit measure for each land use category to the appropriate trip generation rate. The trip generation is shown in **Table 2** for AM and PM peak periods.

Table 2. AM and PM Peak Period Trip Generation

Land Use	Unit	Total Trips	Enter	Exit
AM Peak Period				
Warehousing	325.00	55	43	12
General Light Industrial	325.00	228	200	28
Total Trips	-	***283***	***243***	***40***
PM Peak Period				
Warehousing	325.00	62	17	45
General Light Industrial	325.00	205	27	178
Total Trips	-	***267***	***44***	***223***

This volume was assigned to the study area using the following distribution patterns from the TRPC travel demand model:

- 15% to/from 88th Avenue
- 15% to/from Henderson Boulevard
- 15% to/from the south on Old Highway 99
- 55% to/from the north on Old Highway 99

These volumes were added to the 2040 baseline forecast volumes described above to produce the modified baseline volumes used in the operational analysis. The 2040 AM and PM peak hour baseline volumes are provided on **Figure 5**.

3.3 Comparison to Tumwater Transportation Plan

The City of Tumwater's Transportation Plan, published in 2016, recommended Old Highway 99 from 73rd Avenue to 88th Avenue be widened to five lanes. An initial step to validate that recommendation is to compare the current PM peak hour volume forecasts to the volume forecasts prepared in the Transportation Plan. The total entering volumes for each of the study intersections were compared to determine if the current 2040 volume forecasts are consistent with the previous volume forecast. These volumes are provided in **Table 3**.

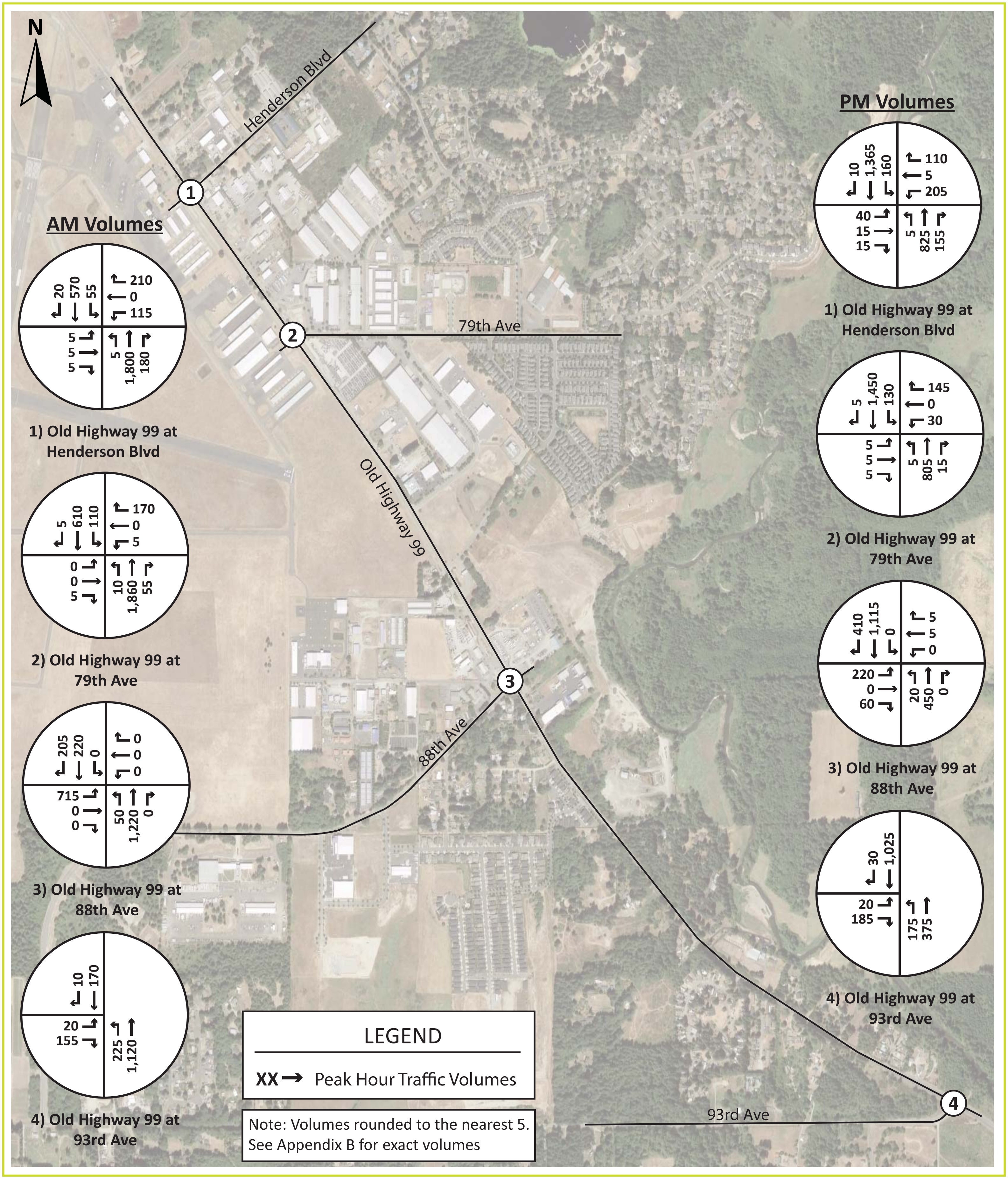

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Figure 5
2040 Baseline AM & PM Peak Hour Traffic Volumes

Table 3. PM Peak Hour 2040 Volume Comparison

Intersection	Master Plan Volume	Current Volumes	Volume Delta
Old Hwy 99/Henderson Blvd	2,725	2,910	+185
Old Hwy 99/79th Ave	2,415	2,580	+165
Old Hwy 99/88th Ave	2,125	2,275	+150
Old Hwy 99/93rd Ave	1,670	1,810	+140

At each of the study intersections the current 2040 traffic volume forecast is similar to but higher than the traffic volume forecasts from the 2016 Transportation Plan. This indicates that the recommendations from the Transportation Plan are still valid.

3.4 Sensitivity Analysis Scenario

In addition to calculating some of the additional growth potential along the study corridor, the City recognizes the potential for property along the corridor to be rezoned in the future, allowing for higher trip generation potential. Given the potential attractiveness of the adjacent properties once the corridor improvement project is constructed, it is anticipated that the property located at each of the controlled intersections could redevelop to commercial/retail uses and generate much higher traffic volumes at the intersections. To ensure that the study intersections are designed to accommodate this higher growth potential an additional 2040 volume forecast scenario was prepared.

All of the growth in this sensitivity scenario is assumed to be commercial/retail. An estimate of the total acreage that could develop/redevelop at each intersection was prepared. A building coverage factor of 25% was then applied to the total acreage to determine the amount of square footage. Below is a description of each study intersection.

3.4.1 Old Highway 99/Henderson Boulevard

The property in each corner of the intersection was evaluated for redevelopment potential. As part of this sensitivity analysis the property in the north and east corners of the intersection (east of Old Highway 99) were both assumed to redevelop. West of Old Highway 99 is the Olympia Regional Airport. This portion of the airport property has some vacant property and office buildings. The west corner of the intersection was also assumed to redevelop to a commercial/retail use. In total, this redevelopment potential amounted to 5.5 acres, which equates to approximately 60,000 sqft.

3.4.2 Old Highway 99/79th Avenue

For this intersection the property on the west side of Old Highway 99, which is the Olympia Regional Airport, contains airplane hangars. None of this property was assumed to redevelop. On the east side of Old Highway 99 the northeast corner has recently been developed. For this scenario only the property to the southeast was assumed to redevelop. The existing pick-a-part business in this property will be impacted by the proposed reconfiguration of the intersection (assumed roundabout project) and half of the property was assumed to redevelop for this scenario (2 acres) which equates to approximately 25,000 sqft.

3.4.3 Old Highway 99/88th Avenue

At this intersection the property to the northwest, which contains the Kiperts retail store, was assumed to remain as is. The existing auto pawn property on the east side of Old Highway 99 was assumed to redevelop. The existing single-family homes southwest of the intersection are currently zones as mixed use. Given this zoning half of the neighborhood was assumed to redevelop as well. Together this equates to roughly 13 acres and 145,000 sqft.

3.4.4 Old Highway 99/93rd Avenue

This intersection is located at the end of the study corridor and was considered too far away from the City to redevelop with commercial/retail activity. No additional growth was added at this location.

3.4.5 Sensitivity Analysis Volume Calculations

Based on the development/redevelopment potential at the different study intersections, the sensitivity analysis includes 230,000 square feet. The vehicle trip generation was estimated using the land-use category “Shopping Center” (land-use code 820). This land use category includes a wide range of commercial and retail uses and should represent the variety of development that could occur if these areas were rezoned.

Table 4 shows the trip generation characteristics for Shopping Center for the AM and PM peak periods.

Table 4. AM and PM Peak Hour Shopping Center (LU 820) Trip Generation – Sensitivity Scenario

Shopping Center (LU 820)	Unit	Trip Rate	Enter %	Exit %
AM Peak Period	1,000-sq ft	0.94	62%	38%
PM Peak Period	1,000-sq ft	Equation[1]	48%	52%

1. See appendix B for equation rates

For the PM peak period the ITE Trip Generation Manual has a fitted curve equation for the shopping center land use. This equation adjusts the trip rate based on the size of the development. The trip generation calculations were done for the square footages at each intersection. The detailed trip calculations are included in **Appendix B.**

The total trip generation is calculated by applying the unit measure for each land use category to the appropriate trip generation rate. The trip generation is shown in **Table 5** for AM and PM peak periods.

Table 5. AM and PM Peak Hour Shopping Center (LU 820) Trip Generation – Sensitivity Scenario

Shopping Center (LU 820)	Unit	Total Trips	Enter	Exit
AM Peak Period	230.00	216	134	82
PM Peak Period	230.00	1,411	678	733

These trips were assigned to the study corridor using the same distribution outlined above in section 3.2.1. This assignment was then added to the 2040 baseline volumes to produce the 2040 sensitivity analysis scenario volumes. The total entering volumes for each of the study intersections with and without the additional sensitivity volumes are provided in **Table 6** to help illustrate the amount of additional traffic with the sensitivity scenario.

Table 6. 2040 Volume Comparison With Sensitivity Scenario

Intersection	AM Peak Hour			PM Peak Hour		
	Baseline	Sensitivity	Volume Delta	Baseline	Sensitivity	Volume Delta
Old Hwy 99/Henderson Blvd	2,960	3,125	+165	2,910	3,670	+760
Old Hwy 99/79th Ave	2,825	2,960	+135	2,580	3,205	+625
Old Hwy 99/88th Ave	2,410	2,560	+150	2,275	3,005	+730
Old Hwy 99/93rd Ave	1,700	1,730	+30	1,810	1,950	+140

The AM and PM peak hour 2040 sensitivity scenario volumes are provided in **Figure 6**. The land included in the modified baseline trip generation and sensitivity scenario trip generation is shown on **Figure 7**.

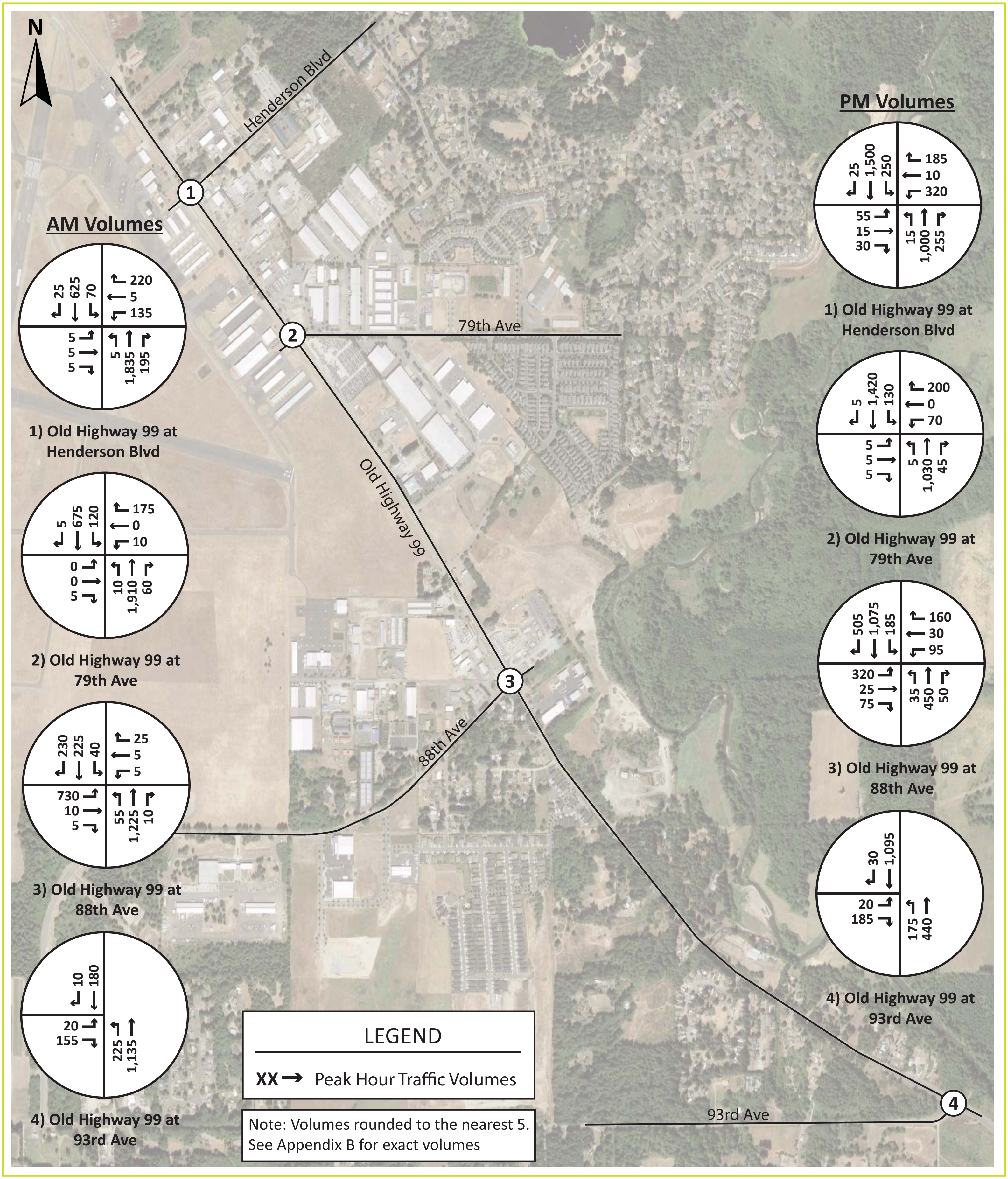

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Figure 6
2040 Projected Sensitivity Scenario
AM & PM Peak Hour Traffic Volumes

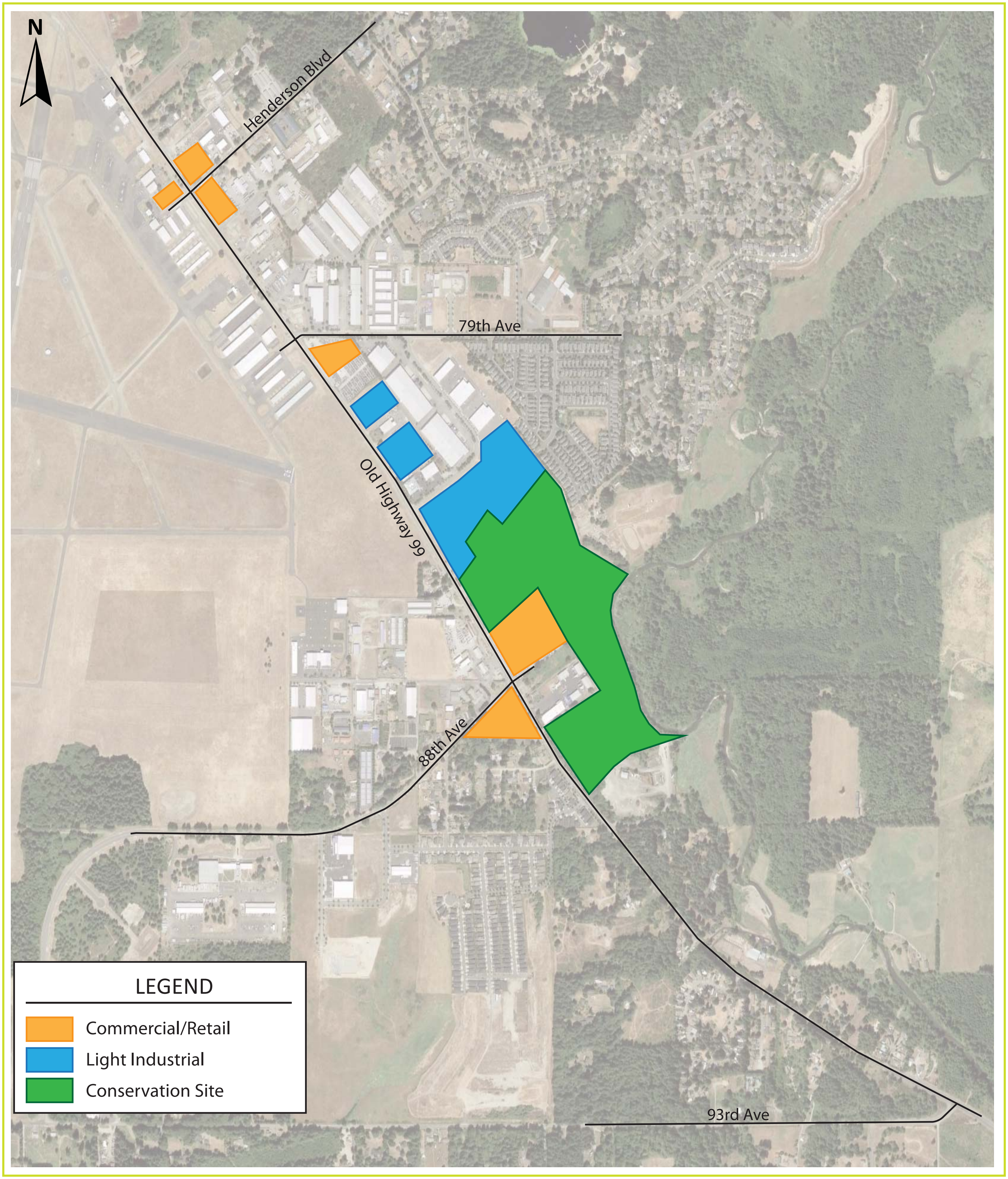

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Figure 7
Locations of Additional Growth

4 Traffic Operations Analysis

Traffic analyses were conducted to identify any deficiencies within the study area for the AM peak hour and PM peak hour for the 2020 base year and the 2025 and 2040 project opening year.

4.1 Level of Service

The acknowledged source for determining overall capacity for arterial segments and independent intersections is the current edition of the *Highway Capacity Manual* (HCM) published by the Transportation Research Board (TRB).

Intersection analysis for stop control and traffic signal intersections was performed using the Synchro software package. This software implements the methods of the 6th Edition HCM. For the roundabout intersection alternatives, the Sidra software package was used. Capacity analysis results are described in terms of Level of Service (LOS). LOS is a qualitative term describing operating conditions a driver will experience while traveling on a street or highway during a specific time interval. LOS ranges from A (very little delay) to F (long delays and congestion).

The Tumwater 2016 Transportation Plans identifies a LOS D standard for intersections within city limits.

4.1.1 Intersection Operations

For signalized intersections, the overall LOS grade represents the weighted average of all movements at the intersection. For intersections under minor street stop-sign control, the LOS of the most difficult movement (typically the minor street left turn) represents the intersection level of service. The LOS/delay criteria for stop sign-controlled intersections are different than for signalized intersections because driver expectation is that a signalized intersection is designed to carry higher traffic volumes and experience greater delay. The following table shows the Level of Service criteria for stop-controlled intersections and signalized intersections

Table 7. Level of Service Criteria for Intersections

Level of Service	Signalized Intersection Average Control Delay (seconds/vehicle)	Stop-Controlled Intersection Average Control Delay (seconds/vehicle)
A	≤ 10	≤ 10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50

4.2 2040 Intersection Analysis

The analysis was conducted for the following scenarios:

- Existing 2020 traffic volumes
- Projected 2040 baseline traffic volumes without the corridor widening
- Projected 2040 baseline traffic volumes with the corridor widening
- Projected 2040 baseline traffic volumes with the corridor widening and intersection improvements
- Projected 2040 sensitivity scenario traffic volumes with the corridor widening and intersection improvements.

The operational analysis results of the study intersections for the projected 2040 scenarios are provided in **Table 8** for the AM peak hour and **Table 9** for the PM peak hour. The LOS analysis worksheets are included in **Appendix C.** Existing intersection channelization is provided in Figure 2.

Table 8. Existing and 2040 AM Peak Hour Intersection Level of Service

				Projected 2040							
				Existing Channelization				Roundabout Control			
		Existing 2020		No Widening		With Widening		With Widening		With Sensitivity Scenario	
	Intersection	LOS (delay)	Worst v/c (dir)	LOS (delay)	Worst v/c (dir)	LOS (delay)	Worst v/c (dir)	LOS (delay)	Worst v/c (dir)	LOS (delay)	Worst v/c (dir)
1	Old Highway 99/ Henderson Boulevard	C (22.4)	0.96 (NB)	F (192.7)	1.55 (NB)	C (22.2)	0.91 (NB)	A (5.6)	0.55 (WB)	A (6.0)	0.69 (NB)
2	Old Highway 99/ 79th Avenue	F (59.0)	0.51 (WB)	F (300+)	1.98 (WB)	F (300+)	0.68 (WB)	A (5.2)	0.66 (NB)	A (5.4)	0.68 (NB)
3	Old Highway 99/ 88th Avenue	A (9.0)	0.82 (NB)	F (120.7))	1.25 (NB)	D (35.6)	0.92 (NB)	B (11.5)	0.71 (NB)	B (14.3)	0.79 (NB)
4	Old Highway 99/ 93rd Avenue	C (23.9)	0.16 (NB)	D (34.0)	0.18 (EB)	D (34.0)	0.18 (EB)	A (5.6)	0.94 (NB)	A (4.8)	0.66 (NB)

Table 9. Existing and 2040 PM Peak Hour Intersection Level of Service

				Projected 2040							
				Existing Channelization				Roundabout Control			
		Existing 2020		No Widening		With Widening		With Widening		With Sensitivity Scenario	
	Intersection	LOS (delay)	Worst v/c (dir)	LOS (delay)	Worst v/c (dir)	LOS (delay)	Worst v/c (dir)	LOS (delay)	Worst v/c (dir)	LOS (delay)	Worst v/c (dir)
1	Old Highway 99/ Henderson Boulevard	B (13.0)	0.84 (NB)	D (40.7)	0.98 (SB)	B (11.9)	0.78 (SB)	A (6.1)	0.56 (SB)	A (8.4)	0.73 (SB)
2	Old Highway 99/ 79th Avenue	F (115.0)	0.36 (WB)	F (300+)	6.20 (WB)	F (300+)	4.43 (WB)	A (5.4)	0.51 (SB)	A (5.3)	0.61 (SB)
3	Old Highway 99/ 88th Avenue	A (9.6)	0.83 (SB)	B (12.8)	0.89 (SB)	A (7.4)	0.63 (SB)	A (4.8)	0.54 (SB)	A (8.9)	0.77 (EB)
4	Old Highway 99/ 93rd Avenue	C (21.5)	0.46 (EB)	E (37.7)	0.65 (EB)	E (37.7)	0.65 (EB)	A (7.3)	0.82 (SB)	A (5.5)	0.60 (SB)

4.2.1 Old Highway 99/Henderson Boulevard

This intersection operates under traffic signal control. In the 2040 horizon with no intersection or corridor improvements the intersection is projected to operate at LOS F in the AM peak hour and LOS D in the PM peak hour. The AM peak hour is projected to have a very high volume of traffic traveling northbound into the City (1,800) which cannot be accommodated by a single travel lane. The PM peak hour volumes are more balanced between northbound and southbound, but the volume to capacity ratios for the southbound direction are approaching 1.0, indicating likely queue and congestion issues with a single travel lane.

With the corridor widening to provide two through lanes in each direction of Old Highway 99 the existing traffic signal is projected to operate within the LOS D standard during both peak periods. Roundabout control for the 2040 baseline volumes was also analyzed, resulting in LOS A during both peak periods. The roundabout geometry included two travel lanes in each direction of Old Highway 99 and single-lane approaches for Henderson Boulevard. This roundabout layout was assessed with the sensitivity scenario and is projected to remain at LOS A.

4.2.2 Old Highway 99/79th Avenue

This intersection operates under stop-sign control for the eastbound and westbound approaches. The intersection currently operates at LOS F for both peak periods and is projected to worsen significantly in 2040, with and without the corridor widening improvement. With construction of a roundabout the intersection is projected to operate at LOS A for both peak periods. The roundabout geometry included two travel lanes in each direction of Old Highway 99 and single-lane approaches for Henderson Boulevard. This roundabout layout was assessed with the sensitivity scenario and is projected to remain at LOS A.

4.2.3 Old Highway 99/88th Avenue

This intersection operates under traffic signal-control, with the southbound approach, which serves the existing auto pawn business, often gated. This intersection currently operates at LOS A during both peak periods. In the 2040 horizon with no corridor widening the intersection is projected to operate at LOS F in the AM peak hour and LOS B in the PM peak hour. As with the Henderson Boulevard intersection, the AM peak hour has a large volume of traffic traveling north on Old Highway 99, coming from further south on Old Highway 99 and from 88th Avenue. During the PM peak hour, the southbound v/c ratio is approaching 0.90, suggesting that approach will experience some queue and congestion issues.

With the corridor widening to provide two through lanes in each direction of Old Highway 99 the existing traffic signal is projected to operate at LOS D for the AM peak hour and LOS A for the PM peak hour. Roundabout control for the 2040 baseline volumes was also analyzed. A single-lane roundabout was evaluated, to determine if roundabout control would remove the need for corridor widening at the intersection. However, given the high volume of northbound traffic during the AM peak hour a multi-lane roundabout will be necessary. This roundabout layout assumed single lane approaches for both 88th Avenue approaches. Additionally, the analysis included short approach and departure lanes for the south leg, as Old Highway 99 transitions to a 2/3 lane corridor. This layout results in a LOS B during the AM peak hour and a LOS A in the PM peak hour. This roundabout layout was assessed with the sensitivity scenario and is projected to maintain the same level of service results.

4.2.4 Old Highway 99/93rd Avenue

This is a tee intersection which operates under stop-sign control for the eastbound approach. To maximize the existing control the intersection has been improved over the years to include acceleration lanes for both directions of Old Highway 99, providing a northbound acceleration lane for the 93rd Ave eastbound left-turns and a southbound acceleration lane for the 93rd Ave eastbound right-turns.

This intersection currently operates at LOS C during the AM peak hour and LOS D during the PM peak hour. In the 2040 baseline the intersection is projected to operate at LOS D for the AM peak hour and LOS E during the PM peak hour. The corridor widening is not planned to extend down to 93rd Avenue and had no impact on the intersection operational analysis. With a LOS E result in the PM peak hour this intersection falls below the City's LOS standard. A single-lane roundabout was analyzed for both peak hours and was found to operate within the City of Tumwater's LOS standard, but with directional v/c ratios (NB in the AM and SB in the PM) that are approaching 1.0. For the sensitivity scenario analysis, the NB approach during the AM peak hour and the SB approach during the PM peak hour both experienced v/c ratios that produced significant queues. To accommodate this, additional entry lanes for both Old Highway 99 approaches were assessed. The south leg contains a through lane and left-turn lane and two exit lanes, the north leg provides two through lanes and a single exit lane and the 93rd Avenue leg provides a single approach and departure lane. This configuration is projected to operate at LOS A in 2040 for the baseline and the sensitivity scenarios.

The roundabout layouts for each of the study intersections are provided in **Appendix C**.

4.3 2025 Opening Year Intersection Analysis

The 2040 operational analysis has validated the Transportation Plan improvements and have provided the long-term needs of each study intersection. The project has identified a 2025 opening year and this analysis has been performed to identify which improvements are anticipated to be needed during the opening year. The study intersections have been analyzed for the following scenarios:

- Existing 2020 traffic volumes
- Projected 2025 baseline traffic volumes without the corridor widening
- Projected 2025 baseline traffic volumes with the corridor widening
- Projected 2025 baseline traffic volumes with the corridor widening and intersection improvements

The operational analysis results of the study intersections for the projected 2025 scenarios are provided in **Table 10** for the AM peak hour and **Table 11** for the PM peak hour. The LOS analysis worksheets are included in **Appendix C.** Existing intersection channelization is provided in Figure 2.

Table 10. 2025 AM Peak Hour Intersection Level of Service

				Projected 2025					
		Existing 2020		No Widening		With Widening		Roundabout Control	
	Intersection	LOS (delay)	Worst v/c (dir)	LOS (delay)	Worst v/c (dir)	LOS (delay)	Worst v/c (dir)	LOS (delay)	Worst v/c (dir)
1	Old Highway 99/ Henderson Boulevard	C (22.4)	0.96 (NB)	C (28.7)	0.96 (NB)	B (11.6)	0.76 (NB)	A (5.0)	0.43 (NB)
2	Old Highway 99/ 79th Avenue	F (59.0)	0.51 (WB)	F (121.5)	0.70 (WB)	F (75.9)	0.36 (WB)	A (5.0)	0.39 (NB)
3	Old Highway 99/ 88th Avenue	A (9.0)	0.82 (NB)	B (13.0)	0.85 (NB)	A (8.5)	0.60 (NB)	A (6.4)	0.38 (NB)
4	Old Highway 99/ 93rd Avenue	C (23.9)	0.16 (NB)	C (22.4)	0.14 (NB)	C (22.4)	0.14 (NB)	A (5.2)	0.77 (NB)

Table 11. 2025 PM Peak Hour Intersection Level of Service

				Projected 2025					
		Existing 2020		No Widening		With Widening		Roundabout Control	
	Intersection	LOS (delay)	Worst v/c (dir)	LOS (delay)	Worst v/c (dir)	LOS (delay)	Worst v/c (dir)	LOS (delay)	Worst v/c (dir)
1	Old Highway 99/ Henderson Boulevard	C (13.0)	0.84 (NB)	B (15.8)	0.86 (NB)	B (10.1)	0.71 (SB)	A (5.9)	0.43 (SB)
2	Old Highway 99/ 79th Avenue	F (115.0)	0.36 (WB)	F (156.4)	0.51 (WB)	F (60.8)	0.26 (WB)	A (4.8)	0.40 (SB)
3	Old Highway 99/ 88th Avenue	A (9.6)	0.83 (SB)	A (8.4)	0.80 (SB)	A (6.4)	0.52 (SB)	A (5.3)	0.42 (SB)
4	Old Highway 99/ 93rd Avenue	C (21.5)	0.46 (EB)	C (22.8)	0.47 (EB)	C (22.8)	0.47 (EB)	A (5.7)	0.63 (SB)

4.3.1 Old Highway 99/Henderson Boulevard

This intersection is projected to operate at LOS C for the AM peak hour and LOS B for the PM peak hour. However, given the high northbound v/c ratio during the AM peak hour it is anticipated that widening of Old Highway 99 through this intersection will be needed for the 2025 horizon. The southbound v/c ratio during the PM peak hour (0.84) is also fairly high but may be accommodated with a single travel lane.

4.3.2 Old Highway 99/79th Avenue

Given the existing operational failure at this location during both peak periods, intersection improvements are warranted for the 2025 horizon. With the ultimate configuration roundabout, with two travel lanes in each direction of Old Highway 99, the intersection is projected to operate at LOS A for both peak periods, with no v/c ratio above 0.40. This suggests a single-lane roundabout may be sufficient as an opening condition. A single-lane roundabout is projected to also operate at LOS A for both peak periods, although the NB v/c ratio during the AM peak hour is projected to be 0.88, suggesting it would soon need to provide additional capacity.

4.3.3 Old Highway 99/88th Avenue

This intersection is currently operating at LOS A during each peak hour and is projected to operate at LOS B or better during both peak hours for the 2025 horizon without any corridor widening. This suggests that the southern portion of the Old Highway 99 study corridor may not require widening as soon as the northern portion.

4.3.4 Old Highway 99/93rd Avenue

This intersection currently provides acceleration lanes for both minor street stop-controlled movements, with those elements it is currently operating at LOS C for each peak hour. In the 2025 horizon this intersection is projected to remain at LOS C. This suggests that corridor or intersection improvements near 93rd Avenue will not be needed in the short term.

5 Summary/Conclusion

The City of Tumwater is conducting the *Old Highway 99 Corridor Study* to validate the transportation recommendations included in the *Tumwater City Plan 2036, Transportation Master Plan November 2016*. The plan recommends widening Old Highway 99 to 5 lanes from 73rd Avenue to 88th Avenue and widen to 3 lanes from 88th Avenue to 93rd Avenue. Included in the corridor improvement project was conversion of the two existing traffic signals, at Henderson Boulevard and 8th Avenue, to roundabouts. Additional projects in the Transportation Plan identified intersection improvements at 79th Avenue and 93rd Avenue, recommending roundabouts at both locations.

A summary of the key conclusions reached from this analysis includes:

- Based on the updated volume forecast and 2040 baseline operational analysis, each of the improvements identified in the Transportation Master Plan are still warranted.
- Based on the 2040 operational analysis, the existing study intersections operating under traffic signal control, Henderson Boulevard and 88th Avenue, are projected to operate within the City of Tumwater's LOS standard under traffic signal or roundabout control with the widened Old Highway 99 corridor improvement.
- The 79th Avenue intersection operates below the City's LOS standard today. With a widened corridor roundabout control is projected to operate at LOS A.
- The 93rd Avenue intersection currently operates at LOS C or better for both peak periods. In the 2040 horizon the PM peak hour is projected to operate at LOS E. Installation of a single lane roundabout is projected to operate at LOS A for both peak periods.
- Based on the 2025 opening year analysis the corridor widening will be needed for the northern portion of the study corridor.
- A sensitivity analysis should be performed to determine how far the widening will be needed for the opening year horizon.
- Additional sensitivity analysis should be conducted to determine when the roundabout improvements need to provide additional throughput on Old Highway 99.

Appendix A

Traffic Volume Counts

Prepared for: **SCJ Alliance**

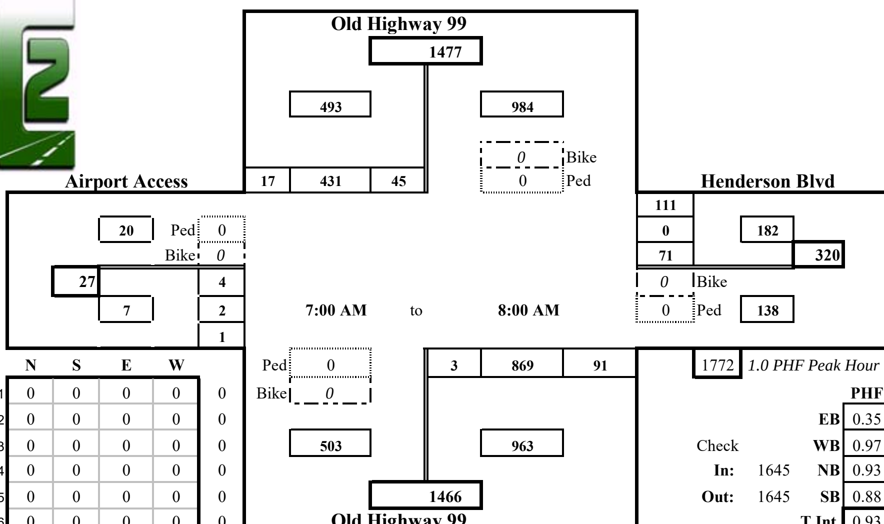
Traffic Count Consultants, Inc.

Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: Old Highway 99 & Henderson Blvd **Date of Count:** Wed 03/04/2020
Location: Tumwater, WA **Checked By:** Cameron

Time Interval Ending at	From North on (SB) Old Highway 99				From South on (NB) Old Highway 99				From East on (WB) Henderson Blvd				From West on (EB) Airport Access				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
7:15 A	10	7	68	4	8	0	194	22	3	15	0	30	0	2	2	1	345
7:30 A	3	14	119	3	6	0	214	28	0	18	0	27	0	0	0	0	423
7:45 A	5	14	121	3	7	1	240	19	0	21	0	24	0	0	0	0	443
8:00 A	6	10	123	7	7	2	221	22	1	17	0	30	0	2	0	0	434
8:15 A	7	6	78	0	1	0	160	13	1	7	2	17	0	4	2	0	289
8:30 A	5	5	81	3	10	1	195	20	0	12	0	13	0	1	0	1	332
8:45 A	2	9	75	4	3	0	128	13	3	12	0	19	0	1	0	0	261
9:00 A	12	8	85	3	6	1	122	21	0	11	3	14	0	1	0	0	269
9:15 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	50	73	750	27	48	5	1474	158	8	113	5	174	0	11	4	2	2796
	Peak Hour: 7:00 AM to 8:00 AM																
Total	24	45	431	17	28	3	869	91	4	71	0	111	0	4	2	1	1645
Approach	493				963				182				7				1645
%HV	4.9%				2.9%				2.2%				n/a				3.4%
PHF	0.88				0.93				0.97				0.35				0.93



PEDs Across:	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	2	0	0	2
INT 08	0	0	0	0	0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	2	0	0	2

Bicycles From:	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

			PHF	%HV
		EB	0.35	n/a
Check		WB	0.97	2.2%
In:	1645	NB	0.93	2.9%
Out:	1645	SB	0.88	4.9%
		T Int.	0.93	3.4%

Conditions:

Special Notes

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

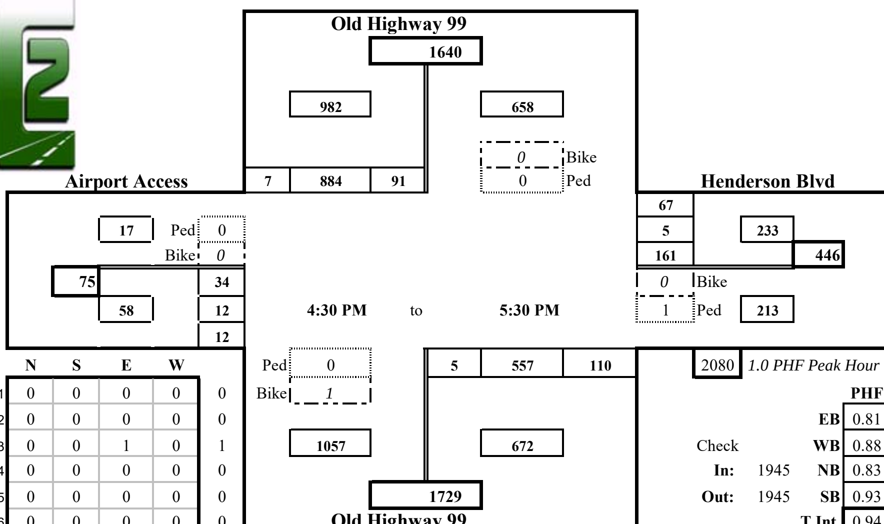
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: Old Highway 99 & Henderson Blvd **Date of Count:** Wed 03/04/2020

Location: Tumwater, WA **Checked By:** Cameron

Time Interval	From North on (SB) Old Highway 99				From South on (NB) Old Highway 99				From East on (WB) Henderson Blvd				From West on (EB) Airport Access				Interval Total
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	8	25	223	2	4	0	148	14	0	32	0	21	0	8	3	3	479
4:30 P	5	20	198	0	5	0	106	27	0	33	2	14	0	2	5	2	409
4:45 P	4	17	210	2	5	2	170	30	0	30	0	14	0	9	4	2	490
5:00 P	0	25	229	4	3	1	133	27	1	40	3	23	0	6	2	3	496
5:15 P	4	26	238	1	4	1	140	31	1	41	1	23	0	10	5	3	520
5:30 P	4	23	207	0	0	1	114	22	0	50	1	7	0	9	1	4	439
5:45 P	4	23	183	0	3	1	95	15	1	34	0	14	0	2	1	1	369
6:00 P	2	14	169	2	4	0	100	15	0	40	1	19	0	3	2	2	367
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	31	173	1657	11	28	6	1006	181	3	300	8	135	0	49	23	20	3569
	Peak Hour: 4:30 PM to 5:30 PM																
Total	12	91	884	7	12	5	557	110	2	161	5	67	0	34	12	12	1945
Approach	982				672				233				58				1945
%HV	1.2%				1.8%				0.9%				n/a				1.3%
PHF	0.93				0.83				0.88				0.81				0.94



2080 *1.0 PHF Peak Hour Volume*

			PHF	%HV
		EB	0.81	n/a
Check		WB	0.88	0.9%
In:	1945	NB	0.83	1.8%
Out:	1945	SB	0.93	1.2%
		T Int.	0.94	1.3%

Conditions:

PEDs Across:	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	1	0	1
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	1	0	1
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	2	0	2

Bicycles From:	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	1	0	0	1
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	1	0	0	1

Special Notes

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

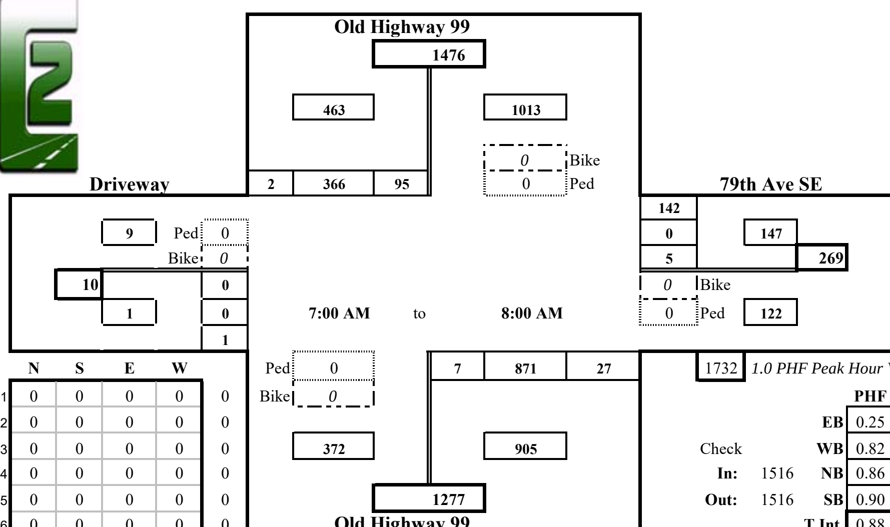
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: Old Highway 99 & 79th Ave SE | **Date of Count:** Wed 03/04/2020

Location: Tumwater, WA | **Checked By:** Cameron

Time Interval	From North on (SB) Old Highway 99				From South on (NB) Old Highway 99				From East on (WB) 79th Ave SE				From West on (EB) Driveway				Interval Total
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
7:15 A	10	20	60	1	10	3	191	8	1	0	0	40	0	0	0	0	323
7:30 A	3	24	103	0	4	0	214	6	5	2	0	33	0	0	0	0	382
7:45 A	5	20	106	0	5	1	254	7	1	2	0	43	0	0	0	0	433
8:00 A	5	31	97	1	7	3	212	6	1	1	0	26	0	0	0	1	378
8:15 A	6	25	62	3	0	0	139	4	0	1	0	29	0	0	0	0	263
8:30 A	6	17	73	1	6	0	180	5	3	4	0	34	0	0	0	2	316
8:45 A	5	12	76	1	2	1	118	4	1	1	0	24	0	0	0	1	238
9:00 A	10	22	62	0	7	0	121	8	0	4	0	23	0	0	0	0	240
9:15 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	50	171	639	7	41	8	1429	48	12	15	0	252	0	0	0	4	2573
	Peak Hour: 7:00 AM to 8:00 AM																
Total	23	95	366	2	26	7	871	27	8	5	0	142	0	0	0	1	1516
Approach	463				905				147				1				1516
%HV	5.0%				2.9%				5.4%				n/a				3.8%
PHF	0.90				0.86				0.82				0.25				0.88



1732 *1.0 PHF Peak Hour Volume*

	PHF	%HV
EB	0.25	n/a
WB	0.82	5.4%
NB	0.86	2.9%
SB	0.90	5.0%
T Int.	0.88	3.8%

Check
In: 1516
Out: 1516

Conditions:

PEDs Across:

	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	**0**

Bicycles From:

	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Special Notes

SCJ20029M_02A

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: Old Highway 99 & 79th Ave SE **Date of Count:** Wed 03/04/2020

Location: Tumwater, WA **Checked By:** Cameron

Time Interval	From North on (SB) Old Highway 99				From South on (NB) Old Highway 99				From East on (WB) 79th Ave SE				From West on (EB) Driveway				Interval Total
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	1	41	212	1	6	0	118	3	1	5	0	39	0	0	0	4	423
4:30 P	5	33	196	0	2	0	112	4	0	5	0	23	0	2	0	5	380
4:45 P	2	27	209	0	5	0	140	4	1	3	0	41	0	0	1	3	428
5:00 P	1	29	233	0	2	1	107	2	1	5	0	45	0	1	0	2	425
5:15 P	3	35	263	1	5	0	138	4	1	6	0	27	0	0	0	1	475
5:30 P	3	32	226	0	1	0	116	3	0	3	0	20	0	1	0	0	401
5:45 P	2	26	194	0	2	0	82	2	1	4	0	15	0	1	0	2	326
6:00 P	1	28	195	1	2	1	94	3	1	8	0	25	0	1	0	1	357
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	18	251	1728	3	25	2	907	25	6	39	0	235	0	6	1	18	3215
	Peak Hour: 4:30 PM to 5:30 PM																
Total	9	123	931	1	13	1	501	13	3	17	0	133	0	2	1	6	1729
Approach	1055				515				150				9				1729
%HV	0.9%				2.5%				2.0%				n/a				1.4%
PHF	0.88				0.89				0.75				0.56				0.91

Old Highway 99

1691

1055 636

0 Bike
0 Ped

Driveway

1 931 123

79th Ave SE

133
0
17

150

287

2 Ped 1
Bike 0

11

2
1
6

9

4:30 PM to **5:30 PM**

1 Bike
0 Ped

137

Ped 0
Bike 0

1 501 13

1900 *1.0 PHF Peak Hour Volume*

954 515

1469

Old Highway 99

PEDs Across:	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	1	1
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	1	1

Special Notes

Bicycles From:	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	1	0	1
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	1	0	1

			PHF	%HV
		EB	0.56	n/a
Check		WB	0.75	2.0%
In:	1729	NB	0.89	2.5%
Out:	1729	SB	0.88	0.9%
		T Int.	0.91	1.4%

Conditions:

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

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WBE/DBE

Intersection: Old Highway 99 & 88th Ave SE **Date of Count:** Wed 03/04/2020

Location: Tumwater, WA **Checked By:** Cameron

Time Interval	From North on (SB) Old Highway 99				From South on (NB) Old Highway 99				From East on (WB) Driveway				From West on (EB) 88th Ave SE				Interval Total
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
7:15 A	3	0	26	34	3	7	165	0	0	0	0	0	3	33	0	1	266
7:30 A	2	0	49	44	2	6	178	0	0	0	0	0	0	49	0	0	326
7:45 A	3	0	48	47	1	13	217	0	0	0	0	0	2	52	0	0	377
8:00 A	2	0	62	42	1	15	170	0	0	0	0	0	2	46	0	1	336
8:15 A	4	0	36	20	2	4	124	0	0	0	0	0	1	29	0	3	216
8:30 A	5	0	39	38	0	2	140	0	0	0	0	0	1	35	0	1	255
8:45 A	5	1	44	33	1	2	96	0	0	0	0	0	1	25	1	2	204
9:00 A	2	2	37	23	1	2	91	1	0	0	0	0	4	33	0	1	190
9:15 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	26	3	341	281	11	51	1181	1	0	0	0	0	14	302	1	9	2170
	Peak Hour: 7:00 AM to 8:00 AM																
Total	10	0	185	167	7	41	730	0	0	0	0	0	7	180	0	2	1305
Approach	352				771				0				182				1305
%HV	2.8%				0.9%				n/a				3.8%				1.8%
PHF	0.85				0.84				n/a				0.88				0.87

Old Highway 99

1262

352 | 910

2 Bike
0 Ped

167 | 185 | 0

88th Ave SE

208 Ped 0
Bike 0
390 | 180
182 | 0
2

7:00 AM to **8:00 AM**

Driveway

0
0 | 0
0 | 0
0 Bike
0 Ped | 0

Ped 0
Bike 1

41 | 730 | 0

187 | 771

958

Old Highway 99

1508 *1.0 PHF Peak Hour Volume*

		PHF	%HV
	EB	0.88	3.8%
Check	WB	n/a	n/a
In: 1305	NB	0.84	0.9%
Out: 1305	SB	0.85	2.8%
	T Int.	0.87	1.8%

Conditions:

PEDs Across:

	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Bicycles From:

	N	S	E	W	
INT 01	1	0	0	0	1
INT 02	1	1	0	0	2
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	2	1	0	0	3

Special Notes

Prepared for: **SCJ Alliance**

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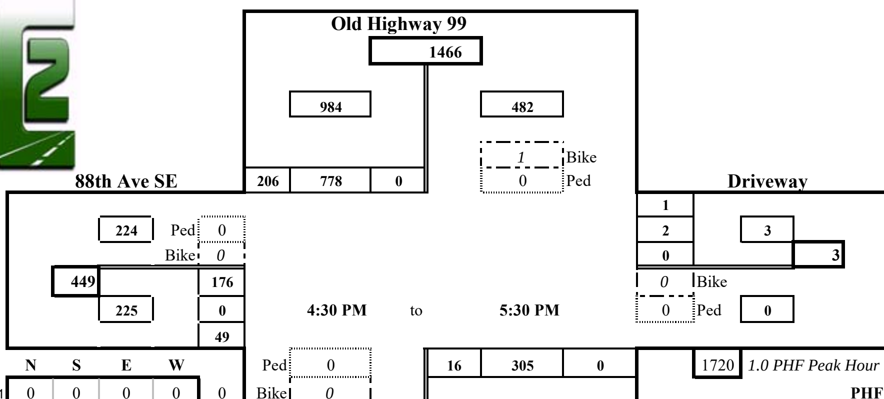
WBE/DBE

Intersection: Old Highway 99 & 88th Ave SE **Date of Count:** Wed 03/04/2020

Location: Tumwater, WA **Checked By:** Cameron

Time Interval Ending at	From North on (SB) Old Highway 99				From South on (NB) Old Highway 99				From East on (WB) Driveway				From West on (EB) 88th Ave SE				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	0	0	157	43	2	4	66	0	0	0	0	0	1	49	0	11	330
4:30 P	1	0	161	46	0	1	63	0	0	0	0	0	2	38	0	2	311
4:45 P	1	0	182	54	0	6	82	0	0	0	0	0	1	50	0	11	385
5:00 P	0	0	181	60	0	3	67	0	0	0	0	1	2	32	0	9	353
5:15 P	3	0	223	40	2	5	79	0	0	0	2	0	1	60	0	21	430
5:30 P	2	0	192	52	0	2	77	0	0	0	0	0	0	34	0	8	365
5:45 P	1	0	170	32	1	4	51	0	0	0	0	0	1	29	0	2	288
6:00 P	0	0	163	45	0	0	65	0	0	1	0	0	0	28	0	3	305
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	8	0	1429	372	5	25	550	0	0	1	2	1	8	320	0	67	2767
	Peak Hour: 4:30 PM to 5:30 PM																
Total	6	0	778	206	2	16	305	0	0	0	2	1	4	176	0	49	1533
Approach	984				321				3				225				1533
%HV	0.6%				0.6%				n/a				1.8%				0.8%
PHF	0.94				0.91				0.38				0.69				0.89



1720 *1.0 PHF Peak Hour Volume*

			PHF	%HV
		EB	0.69	1.8%
Check		WB	0.38	n/a
In:	1533	NB	0.91	0.6%
Out:	1533	SB	0.94	0.6%
		T Int.	0.89	0.8%

PEDs Across:	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	1	1
INT 08	0	0	0	0	0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	1	1

Bicycles From:	N	S	E	W	
INT 01	1	0	0	1	2
INT 02	0	0	0	1	1
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	1	0	0	0	1
INT 06	0	0	0	0	0
INT 07	0	0	0	1	1
INT 08	0	0	0	0	0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	2	0	0	3	5

N U's	S U's	E U's	W U's
1			
1	0	0	0

Special Notes

SCJ20029M_03P

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: Old Highway 99 & 93rd Ave SE **Date of Count:** Wed 03/04/2020

Location: Tumwater, WA **Checked By:** Cameron

Time Interval Ending at	From North on (SB) Old Highway 99				From South on (NB) Old Highway 99				From East on (WB) 0				From West on (EB) 93rd Ave SE				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
7:15 A	1	0	22	1	5	32	153	0	0	0	0	0	2	4	0	14	226
7:30 A	1	0	34	4	4	57	154	0	0	0	0	0	1	6	0	13	268
7:45 A	2	0	33	3	2	71	196	0	0	0	0	0	2	3	0	25	331
8:00 A	2	0	47	2	1	27	151	0	0	0	0	0	1	3	0	26	256
8:15 A	2	0	30	1	2	32	116	0	0	0	0	0	2	2	0	19	200
8:30 A	4	0	21	4	2	27	108	0	0	0	0	0	2	3	0	18	181
8:45 A	2	0	48	3	4	18	83	0	0	0	0	0	2	2	0	36	190
9:00 A	0	0	26	3	5	38	83	0	0	0	0	0	1	4	0	18	172
9:15 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:30 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:45 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00 A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	14	0	261	21	25	302	1044	0	0	0	0	0	13	27	0	169	1824
	Peak Hour: 7:00 AM to 8:00 AM																
Total	6	0	136	10	12	187	654	0	0	0	0	0	6	16	0	78	1081
Approach	146				841				0				94				1081
%HV	4.1%				1.4%				n/a				6.4%				2.2%
PHF	0.74				0.79				n/a				0.81				0.82

N

Old Highway 99

816

146 670

0 Bike
0 Ped

93rd Ave SE

10 136

197 Ped 0
Bike 0

291 16

94 78

7:00 AM to 8:00 AM

Ped 0
Bike 0

187 654

214 841

1055

Old Highway 99

1324 *1.0 PHF Peak Hour Volume*

		PHF	%HV
	EB	0.81	6.4%
Check	WB	n/a	n/a
In: 1081	NB	0.79	1.4%
Out: 1081	SB	0.74	4.1%
	T Int.	0.82	2.2%

Conditions:

PEDs Across:	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Bicycles From:	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Special Notes

SCJ20029M_04A

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

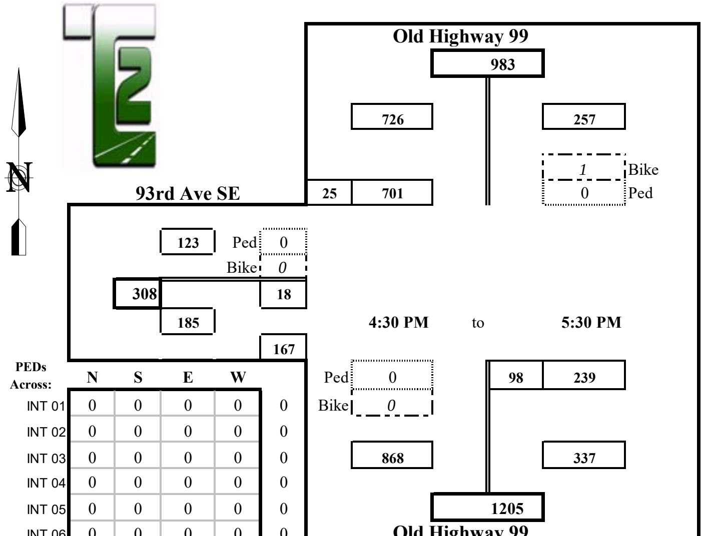
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: Old Highway 99 & 93rd Ave SE **Date of Count:** Wed 03/04/2020

Location: Tumwater, WA **Checked By:** Cameron

Time Interval	From North on (SB) Old Highway 99				From South on (NB) Old Highway 99				From East on (WB) 0				From West on (EB) 93rd Ave SE				Interval Total
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
4:15 P	0	0	136	6	2	21	45	0	0	0	0	0	2	2	0	29	239
4:30 P	0	0	143	4	1	23	58	0	0	0	0	0	1	7	0	24	259
4:45 P	0	0	164	6	2	17	70	0	0	0	0	0	1	2	0	50	309
5:00 P	0	0	154	8	1	18	49	0	0	0	0	0	0	11	0	35	275
5:15 P	2	0	207	3	2	36	60	0	0	0	0	0	0	4	0	37	347
5:30 P	2	0	176	8	0	27	60	0	0	0	0	0	0	1	0	45	317
5:45 P	1	0	149	2	0	25	38	0	0	0	0	0	0	3	0	36	253
6:00 P	0	0	146	6	0	13	49	0	0	0	0	0	0	2	0	23	239
6:15 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:30 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6:45 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:00 P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	5	0	1275	43	8	180	429	0	0	0	0	0	4	32	0	279	2238
	Peak Hour: 4:30 PM to 5:30 PM																
Total	4	0	701	25	5	98	239	0	0	0	0	0	1	18	0	167	1248
Approach	726				337				0				185				1248
%HV	0.6%				1.5%				n/a				0.5%				0.8%
PHF	0.86				0.88				n/a				0.89				0.90



PEDs Across:	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Bicycles From:	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	1	0	0	0	1
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	1	0	0	0	1

1388 *1.0 PHF Peak Hour Volume*

			PHF	%HV
		EB	0.89	0.5%
Check		WB	n/a	n/a
In:	1248	NB	0.88	1.5%
Out:	1248	SB	0.86	0.6%
		T Int.	0.90	0.8%

Conditions:

Special Notes

SCJ20029M_04P

Appendix B

Traffic Volume Calculations Worksheets

Old Highway 99

Trip Generation Summary - Baseline Modification

Tumwater, WA

AM Peak Hour Trip Generation															
Site Plan Description	LUC	ITE Description	Variable	Value	ITE Rate	Distribution		Total Trips			Pass-By Trips		Net New Trips		
						In	Out	In	Out	Total	%	Total	In	Out	Total
Warehousing	150	Warehousing	ksqft	325.000	0.17	77%	23%	43	12	55	0.0%	0	43	12	55
Light Industrial	110	General Light Industrial	ksqft	325.000	0.70	88%	12%	200	28	228	0.0%	0	200	28	228
Total								**243**	**40**	**283**		**0**	**243**	**40**	**283**

PM Peak Hour Trip Generation															
Site Plan Description	LUC	ITE Description	Variable	Value	ITE Rate	Distribution		Total Trips			Pass-By Trips		Net New Trips		
						In	Out	In	Out	Total	%	Total	In	Out	Total
Warehousing	150	Warehousing	ksqft	325.000	0.19	27%	73%	17	45	62	0.0%	0	17	45	62
Light Industrial	110	General Light Industrial	ksqft	325.000	0.63	13%	87%	27	178	205	0.0%	0	27	178	205
Total								**44**	**223**	**267**		**0**	**44**	**223**	**267**

Old Highway 99

Trip Generation Summary - Sensitivity Scenario

Tumwater, WA

AM Peak Hour Trip Generation																
Site Plan Description	LUC	ITE Description	Variable	Value	ITE Rate	Distribution		Total Trips			Pass-By Trips		Net New Trips		
						In	Out	In	Out	Total	%	Total	In	Out	Total
Mixed-Use Commercial - Henderson	820	Shopping Center	ksqft	60.000	0.94	62%	38%	35	21	56	0.0%	0	35	21	56
Mixed-Use Commercial - 79th	820	Shopping Center	ksqft	25.000	0.94	62%	38%	15	9	24	0.0%	0	15	9	24
Mixed-Use Commercial - 88th North	820	Shopping Center	ksqft	100.000	0.94	62%	38%	58	36	94	0.0%	0	58	36	94
Mixed-Use Commercial - 88th South	820	Shopping Center	ksqft	45.000	0.94	62%	38%	26	16	42	0.0%	0	26	16	42
Total								**134**	**82**	**216**		**0**	**134**	**82**	**216**

PM Peak Hour Trip Generation															
Site Plan Description	LUC	ITE Description	Variable	Value	ITE Rate	Distribution		Total Trips			Pass-By Trips		Net New Trips		
						In	Out	In	Out	Total	%	Total	In	Out	Total
Mixed-Use Commercial - Henderson	820	Shopping Center	ksqft	60.000	6.21	48%	52%	179	193	372	34.0%	127	118	127	245
Mixed-Use Commercial - 79th	820	Shopping Center	ksqft	25.000	7.79	48%	52%	94	101	195	34.0%	66	62	67	129
Mixed-Use Commercial - 88th North	820	Shopping Center	ksqft	100.000	5.43	48%	52%	261	282	543	34.0%	185	172	186	358
Mixed-Use Commercial - 88th South	820	Shopping Center	ksqft	45.000	6.69	48%	52%	144	157	301	34.0%	102	95	104	199
Total								**678**	**733**	**1,411**		**480**	**447**	**484**	**931**

820 Fitted Curve Equation - Henderson: **6.21**

820 Fitted Curve Equation - 79th: **7.79**

820 Fitted Curve Equation - 88th North: **5.43**

820 Fitted Curve Equation - 88th South: **6.69**

SCJ ALLIANCE
CONSULTING SERVICES

Old Highway 99 Corridor

AM Peak Hour Volumes

Global Growth Rate: annual 1.00%

Intersection	Movement		EXISTING 2020 VOLUMES	Baseline: Existing Model	Future Model	Model 2040 Growth	Background 2040 Growth	Annual Growth Rate	Background 2025 Growth	Interim 2025 Volumes	Baseline 2040	Baseline Modificaton	Modified 2040 Baseline	Sensitivity Scenario: Sensitivity Scenario Primary	Sensitivity Scenario Pass-By	Sensitivity Scenario 2040
		L	**4**	-	-	0	1	0	0	**4**	5	0	**5**	2	0	**7**
	EB	T	**2**	-	-	0	0	0	0	**2**	2	0	**2**	0	0	**2**
		R	**1**	-	-	0	0	0	0	**1**	1	0	**1**	1	0	**2**
1		L	**71**	146	152	6	0	0	1	**72**	77	37	**114**	21	0	**135**
Old Highway 99	WB	T	**0**	-	-	0	0	0	0	**0**	0	0	**0**	1	0	**1**
Henderson Blvd		R	**111**	164	264	100	0	0	25	**136**	211	0	**211**	10	0	**221**
		L	**3**	-	-	0	1	0	0	**3**	4	0	**4**	2	0	**6**
TMC Date: 03/04/2020	NB	T	**869**	1,139	2,047	908	0	0	226	**1,095**	1,777	22	**1,799**	34	0	**1,833**
		R	**91**	120	201	81	0	0	20	**111**	172	6	**178**	19	0	**197**
7:00-8:00		L	**45**	43	54	11	0	0	3	**48**	56	0	**56**	16	0	**72**
PHF: 0.93	SB	T	**431**	575	582	7	0	0	2	**433**	438	134	**572**	54	0	**626**
		R	**17**	-	-	0	3	0	1	**18**	20	0	**20**	3	0	**23**
											0		**0**	163		**163**
		L	**0**	-	-	0	0	0	0	**0**	0	0	**0**	0	0	**0**
	EB	T	**0**	-	-	0	0	0	0	**0**	0	0	**0**	0	0	**0**
		R	**1**	-	-	0	0	0	0	**1**	1	0	**1**	0	0	**1**
2		L	**5**	47	44	-3	1	0	0	**5**	6	0	**6**	2	0	**8**
Old Highway 99	WB	T	**0**	-	-	0	0	0	0	**0**	0	0	**0**	0	0	**0**
79th Ave		R	**142**	80	108	28	0	0	7	**149**	170	0	**170**	7	0	**177**
		L	**7**	-	-	0	1	0	0	**7**	8	0	**8**	0	0	**8**
TMC Date: 03/04/2020	NB	T	**871**	1,179	2,140	961	0	0	240	**1,111**	1,832	28	**1,860**	48	0	**1,908**
		R	**27**	92	120	28	0	0	7	**34**	55	0	**55**	4	0	**59**
7:00-8:00		L	**95**	94	110	16	0	0	4	**99**	111	0	**111**	11	0	**122**
PHF: 0.88	SB	T	**366**	627	625	-2	73	0	18	**384**	439	171	**610**	65	0	**675**
		R	**2**	-	-	0	0	0	0	**2**	2	0	**2**	0	0	**2**
											0		**0**	137		**137**
		L	**180**	266	763	497	0	0	124	**304**	677	36	**713**	19	0	**732**
	EB	T	**0**	-	-	0	0	0	0	**0**	0	0	**0**	9	0	**9**
		R	**2**	8	6	-2	0	0	0	**2**	2	0	**2**	2	0	**4**
3		L	**0**	-	-	0	0	0	0	**0**	0	0	**0**	5	0	**5**
Old Highway 99	WB	T	**0**	-	-	0	0	0	0	**0**	0	0	**0**	5	0	**5**
88th Ave		R	**0**	-	-	0	0	0	0	**0**	0	0	**0**	26	0	**26**
		L	**41**	60	33	-27	8	0	2	**43**	49	0	**49**	4	0	**53**
TMC Date: 03/04/2020	NB	T	**730**	906	1,358	452	0	0	113	**843**	1,182	36	**1,218**	7	0	**1,225**
		R	**0**	-	-	0	0	0	0	**0**	0	0	**0**	8	0	**8**
7:00-8:00		L	**0**	-	-	0	0	0	0	**0**	0	0	**0**	41	0	**41**
PHF: 0.87	SB	T	**185**	249	278	29	0	0	7	**192**	214	6	**220**	4	0	**224**
		R	**167**	328	264	-64	33	0	8	**175**	200	6	**206**	22	0	**228**
											0		**0**	152		**152**
		L	**16**	3	0	-3	3	0	1	**17**	19	0	**19**	0	0	**19**
	EB	T	**0**	-	-	0	0	0	0	**0**	0	0	**0**	0	0	**0**
		R	**78**	105	184	79	0	0	20	**98**	157	0	**157**	0	0	**157**
4		L	**0**	-	-	0	0	0	0	**0**	0	0	**0**	0	0	**0**
Old Highway 99	WB	T	**0**	-	-	0	0	0	0	**0**	0	0	**0**	0	0	**0**
93rd Ave		R	**0**	-	-	0	0	0	0	**0**	0	0	**0**	0	0	**0**
		L	**187**	366	238	-128	37	0	9	**196**	224	0	**224**	0	0	**224**
TMC Date: 03/04/2020	NB	T	**654**	963	1,391	428	0	0	108	**762**	1,082	36	**1,118**	19	0	**1,137**
		R	**0**	-	-	0	0	0	0	**0**	0	0	**0**	0	0	**0**
7:00-8:00		L	**0**	-	-	0	0	0	0	**0**	0	0	**0**	0	0	**0**
PHF: 0.82	SB	T	**136**	256	282	26	0	0	7	**143**	162	6	**168**	11	0	**179**
		R	**10**	1	1	0	2	0	1	**11**	12	0	**12**	0	0	**12**
													0	30		**1,728**

Old Highway 99 Corridor

PM Peak Hour Volumes

Global Growth Rate: annual 1.00%

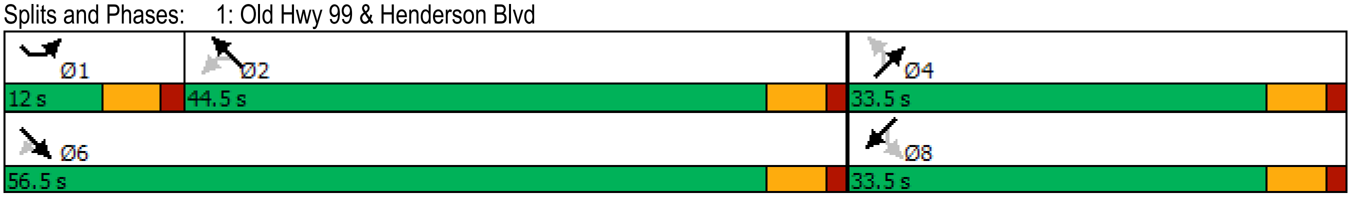
Intersection	Movement		EXISTING 2020 VOLUMES	Baseline										Sensitivity Scenario		
				Existing Model	Future Model	Model 2040 Growth	Background 2040 Growth	Annual Growth Rate	Background 2025 Growth	Interim 2025 Volumes	Baseline 2040 Volumes	Baseline Modificaton	Modified 2040 Baseline	Sensitivity Scenario Primary	Sensitivity Scenario Pass-By	Sensitivity Scenario 2040
		L	34	-	-	0	7	1.0%	2	36	41	0	41	12	4	57
	EB	T	12	-	-	0	2	1.0%	1	13	14	0	14	3		17
		R	12	-	-	0	2	1.0%	1	13	14	0	14	7	7	28
1		L	161	79	118	39	0	1.2%	10	171	200	7	207	80	34	321
Old Highway 99	WB	T	5	-	-	0	1	1.0%	0	5	6	0	6	3		9
Henderson Blvd		R	67	37	80	43	0	3.2%	11	78	110	0	110	58	18	186
		L	5	-	-	0	1	1.0%	0	5	6	0	6	6	4	16
TMC Date: 03/04/2020	NB	T	557	587	732	145	0	1.3%	36	593	702	123	825	196	-22	999
		R	110	80	91	11	0	0.5%	3	113	121	34	155	83	18	256
4:30-5:30		L	91	49	120	71	0	3.9%	18	109	162	0	162	54	35	251
PHF: 0.94	SB	T	884	688	1,143	455	0	2.6%	115	999	1,339	24	1,363	181	-42	1502
		R	7	-	-	0	1	1.0%	0	7	8	0	8	11	7	26
											0		0	694		694
		L	2	-	-	0	0	1.0%	0	2	2	0	2	0	0	2
	EB	T	1	-	-	0	0	1.0%	0	1	1	0	1	0	0	1
		R	6	-	-	0	1	1.0%	0	6	7	0	7	0	0	7
2		L	17	56	69	13	0	3.8%	3	20	30	0	30	20	22	72
Old Highway 99	WB	T	0	-	-	0	0	0.0%	0	0	0	0	0	0	0	0
79th Ave		R	133	68	79	11	0	0.4%	3	136	144	0	144	47	11	202
		L	1	-	-	0	0	1.0%	0	1	1	0	1	0	0	1
TMC Date: 03/04/2020	NB	T	501	599	744	145	0	1.4%	35	536	646	157	803	238	-11	1,030
		R	13	47	48	1	0	0.4%	0	13	14	0	14	19	11	44
4:30-5:30		L	123	66	71	5	0	0.2%	1	124	128	0	128	43	22	193
PHF: 0.91	SB	T	931	702	1,190	488	0	2.6%	121	1,052	1,419	31	1,450	225	-22	1653
		R	1	-	-	0	0	1.0%	0	1	1	0	1	0	0	1
											0		0	592		592
		L	176	213	195	-18	35	1.0%	9	185	211	7	218	100	0	318
	EB	T	0	-	-	0	0	0.0%	0	0	0	0	0	26	0	26
		R	49	28	17	-11	10	1.0%	2	51	59	0	59	15	0	74
3		L	0	-	-	0	0	0.0%	0	0	0	0	0	28	65	93
Old Highway 99	WB	T	2	-	-	0	0	1.0%	0	2	2	0	2	28	0	30
88th Ave		R	1	-	-	0	0	1.0%	0	1	1	0	1	130	27	158
		L	16	18	13	-5	3	1.0%	1	17	19	0	19	14	0	33
TMC Date: 03/04/2020	NB	T	305	361	500	139	0	2.3%	35	340	444	6	450	27	-27	450
		R	0	-	-	0	0	0.0%	0	0	0	0	0	25	27	52
4:30-5:30		L	0	-	-	0	0	0.0%	0	0	0	0	0	121	66	187
PHF: 0.89	SB	T	778	466	768	302	0	1.9%	74	852	1,080	33	1,113	29	-66	1076
		R	206	213	385	172	0	4.2%	43	249	378	33	411	95	0	506
											0		0	638		638
		L	18	2	4	2	0	0.6%	1	19	20	0	20	0	0	20
	EB	T	0	-	-	0	0	0.0%	0	0	0	0	0	0	0	0
		R	167	175	193	18	0	0.5%	4	171	185	0	185	0	0	185
4		L	0	-	-	0	0	0.0%	0	0	0	0	0	0	0	0
Old Highway 99	WB	T	0	-	-	0	0	0.0%	0	0	0	0	0	0	0	0
93rd Ave		R	0	-	-	0	0	0.0%	0	0	0	0	0	0	0	0
		L	98	93	171	78	0	4.0%	20	118	176	0	176	0	0	176
TMC Date: 03/04/2020	NB	T	239	378	509	131	0	2.7%	32	271	370	6	376	66	0	442
		R	0	-	-	0	0	0.0%	0	0	0	0	0	0	0	0
4:30-5:30		L	0	-	-	0	0	0.0%	0	0	0	0	0	0	0	0
PHF: 0.90	SB	T	701	492	782	290	0	2.1%	74	775	991	33	1,024	72	0	1096
		R	25	3	3	0	5	1.0%	1	26	30	0	30	0	0	30
													0	138		1,949

Appendix C
Capacity Analysis Worksheets

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	45	430	15	5	870	90	5	2	1	70	1	110
Future Volume (vph)	45	430	15	5	870	90	5	2	1	70	1	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	175		50	50		0	0		0	150		0
Storage Lanes	1		1	1		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		1810			1652			415			1137	
Travel Time (s)		24.7			22.5			9.4			25.8	
Turn Type	Prot	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	1	6			2			4			8	
Permitted Phases			6	2			4			8		
Detector Phase	1	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	10.5	25.5	25.5	26.5	26.5		33.5	33.5		33.5	33.5	
Total Split (s)	12.0	56.5	56.5	44.5	44.5		33.5	33.5		33.5	33.5	
Total Split (%)	13.3%	62.8%	62.8%	49.4%	49.4%		37.2%	37.2%		37.2%	37.2%	
Maximum Green (s)	6.5	51.0	51.0	39.0	39.0		28.0	28.0		28.0	28.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5			5.5		5.5	5.5	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0		1.5	1.5		1.5	1.5	
Recall Mode	None	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)		5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)		15.0	15.0	16.0	16.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		0	0	0	0		0	0		0	0	

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 65.8	
Natural Cycle: 110	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 1: Old Hwy 99 & Henderson Blvd



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	45	430	15	5	870	90	5	2	1	70	1	110
Future Volume (veh/h)	45	430	15	5	870	90	5	2	1	70	1	110
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1826	1826	1826	1856	1856	1856	1900	1900	1900	1870	1870	1870
Adj Flow Rate, veh/h	48	462	16	5	935	97	5	2	1	75	1	118
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	5	5	5	3	3	3	0	0	0	2	2	2
Cap, veh/h	78	1318	1117	650	978	101	122	42	10	278	1	168
Arrive On Green	0.04	0.72	0.72	0.59	0.59	0.59	0.11	0.11	0.11	0.11	0.11	0.11
Sat Flow, veh/h	1739	1826	1547	909	1653	172	289	391	97	1414	13	1574
Grp Volume(v), veh/h	48	462	16	5	0	1032	8	0	0	75	0	119
Grp Sat Flow(s),veh/h/ln	1739	1826	1547	909	0	1825	777	0	0	1414	0	1587
Q Serve(g_s), s	1.7	6.0	0.2	0.1	0.0	34.1	0.0	0.0	0.0	0.0	0.0	4.6
Cycle Q Clear(g_c), s	1.7	6.0	0.2	0.1	0.0	34.1	4.7	0.0	0.0	2.8	0.0	4.6
Prop In Lane	1.00		1.00	1.00		0.09	0.62		0.12	1.00		0.99
Lane Grp Cap(c), veh/h	78	1318	1117	650	0	1079	174	0	0	278	0	169
V/C Ratio(X)	0.62	0.35	0.01	0.01	0.00	0.96	0.05	0.00	0.00	0.27	0.00	0.70
Avail Cap(c_a), veh/h	176	1451	1230	665	0	1109	650	0	0	744	0	692
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	30.1	3.3	2.5	5.4	0.0	12.3	25.8	0.0	0.0	26.9	0.0	27.7
Incr Delay (d2), s/veh	2.9	0.2	0.0	0.0	0.0	17.3	0.0	0.0	0.0	0.2	0.0	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.8	0.0	0.0	0.0	13.5	0.1	0.0	0.0	1.0	0.0	1.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.0	3.5	2.5	5.4	0.0	29.6	25.9	0.0	0.0	27.0	0.0	29.7
LnGrp LOS	C	A	A	A	A	C	C	A	A	C	A	C
Approach Vol, veh/h		526			1037			8			194	
Approach Delay, s/veh		6.1			29.5			25.9			28.7	
Approach LOS		A			C			C			C	
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	8.4	43.5		12.3		51.8		12.3				
Change Period (Y+Rc), s	5.5	5.5		5.5		5.5		5.5				
Max Green Setting (Gmax), s	6.5	39.0		28.0		51.0		28.0				
Max Q Clear Time (g_c+I1), s	3.7	36.1		6.7		8.0		6.6				
Green Ext Time (p_c), s	0.0	1.8		0.0		2.8		0.4				
Intersection Summary												
HCM 6th Ctrl Delay			22.4									
HCM 6th LOS			C									

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	1	1	1	5	1	140	95	365	5	5	870	25
Future Vol, veh/h	1	1	1	5	1	140	95	365	5	5	870	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	300	275	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	0	0	0	5	5	5	5	5	5	3	3	3
Mvmt Flow	1	1	1	5	1	154	104	401	5	5	956	27

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	1669	1605	404	1593	1594	970	983	0	0	406	0	0
Stage 1	612	612	-	980	980	-	-	-	-	-	-	-
Stage 2	1057	993	-	613	614	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.15	6.55	6.25	4.15	-	-	4.13	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.545	4.045	3.345	2.245	-	-	2.227	-	-
Pot Cap-1 Maneuver	77	106	651	85	105	303	691	-	-	1147	-	-
Stage 1	484	487	-	297	324	-	-	-	-	-	-	-
Stage 2	275	326	-	475	478	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	33	89	651	74	88	303	691	-	-	1147	-	-
Mov Cap-2 Maneuver	33	89	-	74	88	-	-	-	-	-	-	-
Stage 1	411	413	-	252	321	-	-	-	-	-	-	-
Stage 2	134	323	-	402	406	-	-	-	-	-	-	-

Approach	EB	WB	SE	NW
HCM Control Delay, s	59	29.7	2.3	0
HCM LOS	F	D		

Minor Lane/Major Mvmt	NWL	NWT	NWR	EBLn1	WBLn1	WBLn2	SEL	SET	SER
Capacity (veh/h)	1147	-	-	70	76	303	691	-	-
HCM Lane V/C Ratio	0.005	-	-	0.047	0.087	0.508	0.151	-	-
HCM Control Delay (s)	8.2	0	-	59	56.8	28.5	11.1	-	-
HCM Lane LOS	A	A	-	F	F	D	B	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.3	2.7	0.5	-	-

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	1	185	165	40	730	1	180	1	5	1	1	1
Future Volume (vph)	1	185	165	40	730	1	180	1	5	1	1	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		150	150		0	150		0	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			30			30	
Link Distance (ft)		3851			1410			1160			265	
Travel Time (s)		52.5			19.2			26.4			6.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6		6	2			4			8		
Detector Phase	6	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		26.0	26.0	
Total Split (s)	34.0	34.0	34.0	34.0	34.0		26.0	26.0		26.0	26.0	
Total Split (%)	56.7%	56.7%	56.7%	56.7%	56.7%		43.3%	43.3%		43.3%	43.3%	
Maximum Green (s)	28.0	28.0	28.0	28.0	28.0		22.0	22.0		22.0	22.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		4.0	4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		17.0	17.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	

Intersection Summary	
Area Type:	Other
Cycle Length: 60	
Actuated Cycle Length: 54.1	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 3: 88th Ave & Old Hwy 99

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	1	185	165	40	730	1	180	1	5	1	1	1
Future Volume (veh/h)	1	185	165	40	730	1	180	1	5	1	1	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1885	1885	1885	1841	1841	1841	1900	1900	1900
Adj Flow Rate, veh/h	1	213	190	46	839	1	207	1	6	1	1	1
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	3	3	3	1	1	1	4	4	4	0	0	0
Cap, veh/h	308	1008	854	673	1022	1	455	43	256	187	155	106
Arrive On Green	0.54	0.54	0.54	0.54	0.54	0.54	0.19	0.19	0.19	0.19	0.19	0.19
Sat Flow, veh/h	650	1856	1572	990	1883	2	1393	228	1367	306	826	566
Grp Volume(v), veh/h	1	213	190	46	0	840	207	0	7	3	0	0
Grp Sat Flow(s),veh/h/ln	650	1856	1572	990	0	1885	1393	0	1595	1698	0	0
Q Serve(g_s), s	0.0	2.2	2.3	0.9	0.0	13.6	5.2	0.0	0.1	0.0	0.0	0.0
Cycle Q Clear(g_c), s	13.7	2.2	2.3	3.1	0.0	13.6	5.2	0.0	0.1	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	1.00		0.86	0.33		0.33
Lane Grp Cap(c), veh/h	308	1008	854	673	0	1024	455	0	298	447	0	0
V/C Ratio(X)	0.00	0.21	0.22	0.07	0.00	0.82	0.45	0.00	0.02	0.01	0.00	0.00
Avail Cap(c_a), veh/h	446	1402	1188	883	0	1424	1021	0	947	1108	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	12.6	4.4	4.4	5.2	0.0	7.0	14.4	0.0	12.3	12.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.1	0.0	0.0	2.8	0.7	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.2	0.2	0.1	0.0	2.2	1.4	0.0	0.0	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.6	4.5	4.5	5.2	0.0	9.8	15.1	0.0	12.3	12.3	0.0	0.0
LnGrp LOS	B	A	A	A	A	A	B	A	B	B	A	A
Approach Vol, veh/h		404			886			214			3	
Approach Delay, s/veh		4.5			9.5			15.0			12.3	
Approach LOS		A			A			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		26.1		10.9		26.1		10.9				
Change Period (Y+Rc), s		6.0		4.0		6.0		4.0				
Max Green Setting (Gmax), s		28.0		22.0		28.0		22.0				
Max Q Clear Time (g_c+I1), s		15.6		7.2		15.7		2.1				
Green Ext Time (p_c), s		4.5		0.5		1.3		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			9.0									
HCM 6th LOS			A									

Intersection	
Int Delay, s/veh	2.4

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	135	10	185	655	15	80
Future Vol, veh/h	135	10	185	655	15	80
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	450	300	-	300	0
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	82	82	82	82	82	82
Heavy Vehicles, %	4	4	1	1	6	6
Mvmt Flow	165	12	226	799	18	98

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	177	0	1416	165
Stage 1	-	-	-	-	165	-
Stage 2	-	-	-	-	1251	-
Critical Hdwy	-	-	4.11	-	6.46	6.26
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.209	-	3.554	3.354
Pot Cap-1 Maneuver	-	-	1405	-	148	869
Stage 1	-	-	-	-	855	-
Stage 2	-	-	-	-	265	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1405	-	124	869
Mov Cap-2 Maneuver	-	-	-	-	209	-
Stage 1	-	-	-	-	855	-
Stage 2	-	-	-	-	222	-

Approach	EB		WB		NE	
HCM Control Delay, s	0		1.8		11.9	
HCM LOS					B	

Minor Lane/Major Mvmt	NELn1	NELn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	209	869	-	-	1405	-
HCM Lane V/C Ratio	0.088	0.112	-	-	0.161	-
HCM Control Delay (s)	23.9	9.7	-	-	8.1	-
HCM Lane LOS	C	A	-	-	A	-
HCM 95th %tile Q(veh)	0.3	0.4	-	-	0.6	-

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	50	435	20	5	1095	110	5	2	1	70	1	135
Future Volume (vph)	50	435	20	5	1095	110	5	2	1	70	1	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	175		50	50		0	0		0	150		0
Storage Lanes	1		1	1		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		1810			1652			415			1137	
Travel Time (s)		24.7			22.5			9.4			25.8	
Turn Type	Prot	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	1	6			2			4			8	
Permitted Phases			6	2			4			8		
Detector Phase	1	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	10.5	25.5	25.5	26.5	26.5		33.5	33.5		33.5	33.5	
Total Split (s)	11.2	116.4	116.4	105.2	105.2		33.6	33.6		33.6	33.6	
Total Split (%)	7.5%	77.6%	77.6%	70.1%	70.1%		22.4%	22.4%		22.4%	22.4%	
Maximum Green (s)	5.7	110.9	110.9	99.7	99.7		28.1	28.1		28.1	28.1	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5			5.5		5.5	5.5	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0		1.5	1.5		1.5	1.5	
Recall Mode	None	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)		5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)		15.0	15.0	16.0	16.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		0	0	0	0		0	0		0	0	

Intersection Summary	
Area Type:	Other
Cycle Length: 150	
Actuated Cycle Length: 132.9	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 1: Old Hwy 99 & Henderson Blvd

HCM 6th Signalized Intersection Summary — Baseline 2025
1: Old Hwy 99 & Henderson Blvd — AM Peak Hour

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	50	435	20	5	1095	110	5	2	1	70	1	135
Future Volume (veh/h)	50	435	20	5	1095	110	5	2	1	70	1	135
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1826	1826	1826	1856	1856	1856	1900	1900	1900	1870	1870	1870
Adj Flow Rate, veh/h	53	458	21	5	1153	116	5	2	1	74	1	142
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	5	5	5	3	3	3	0	0	0	2	2	2
Cap, veh/h	68	1472	1248	714	1201	121	63	22	6	191	1	169
Arrive On Green	0.04	0.81	0.81	0.72	0.72	0.72	0.11	0.11	0.11	0.11	0.11	0.11
Sat Flow, veh/h	1739	1826	1547	908	1659	167	156	205	52	1414	11	1576
Grp Volume(v), veh/h	53	458	21	5	0	1269	8	0	0	74	0	143
Grp Sat Flow(s),veh/h/ln	1739	1826	1547	908	0	1826	413	0	0	1414	0	1587
Q Serve(g_s), s	3.8	8.3	0.3	0.2	0.0	80.1	0.1	0.0	0.0	0.0	0.0	11.3
Cycle Q Clear(g_c), s	3.8	8.3	0.3	0.2	0.0	80.1	11.3	0.0	0.0	7.3	0.0	11.3
Prop In Lane	1.00		1.00	1.00		0.09	0.62		0.12	1.00		0.99
Lane Grp Cap(c), veh/h	68	1472	1248	714	0	1322	90	0	0	191	0	170
V/C Ratio(X)	0.78	0.31	0.02	0.01	0.00	0.96	0.09	0.00	0.00	0.39	0.00	0.84
Avail Cap(c_a), veh/h	78	1590	1347	768	0	1429	251	0	0	352	0	350
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	60.7	3.2	2.4	4.9	0.0	15.9	51.4	0.0	0.0	54.0	0.0	55.8
Incr Delay (d2), s/veh	30.4	0.1	0.0	0.0	0.0	14.8	0.2	0.0	0.0	0.5	0.0	4.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	1.9	0.1	0.0	0.0	30.3	0.2	0.0	0.0	2.3	0.0	4.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	91.1	3.3	2.4	4.9	0.0	30.6	51.5	0.0	0.0	54.5	0.0	60.0
LnGrp LOS	F	A	A	A	A	C	D	A	A	D	A	E
Approach Vol, veh/h		532			1274			8			217	
Approach Delay, s/veh		12.0			30.5			51.5			58.1	
Approach LOS		B			C			D			E	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	10.5	97.7		19.2		108.2		19.2				
Change Period (Y+Rc), s	5.5	5.5		5.5		5.5		5.5				
Max Green Setting (Gmax), s	5.7	99.7		28.1		110.9		28.1				
Max Q Clear Time (g_c+I1), s	5.8	82.1		13.3		10.3		13.3				
Green Ext Time (p_c), s	0.0	10.2		0.0		2.8		0.4				

Intersection Summary			
HCM 6th Ctrl Delay			28.7
HCM 6th LOS			C

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	1	1	1	5	1	150	100	385	5	5	1110	35
Future Vol, veh/h	1	1	1	5	1	150	100	385	5	5	1110	35
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	300	275	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	5	5	5	5	5	5	3	3	3
Mvmt Flow	1	1	1	5	1	158	105	405	5	5	1168	37

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	1894	1833	408	1816	1817	1187	1205	0	0	410	0	0
Stage 1	618	618	-	1197	1197	-	-	-	-	-	-	-
Stage 2	1276	1215	-	619	620	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.15	6.55	6.25	4.15	-	-	4.13	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.545	4.045	3.345	2.245	-	-	2.227	-	-
Pot Cap-1 Maneuver	54	77	648	59	77	226	569	-	-	1143	-	-
Stage 1	480	484	-	224	256	-	-	-	-	-	-	-
Stage 2	207	256	-	471	475	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	14	62	648	49	62	226	569	-	-	1143	-	-
Mov Cap-2 Maneuver	14	62	-	49	62	-	-	-	-	-	-	-
Stage 1	391	394	-	183	253	-	-	-	-	-	-	-
Stage 2	61	253	-	382	387	-	-	-	-	-	-	-

Approach	EB	WB	SE	NW
HCM Control Delay, s	121.5	52.4	2.6	0
HCM LOS	F	F		

Minor Lane/Major Mvmt	NWL	NWT	NWR	EBLn1	WBLn1	WBLn2	SEL	SET	SER
Capacity (veh/h)	1143	-	-	34	51	226	569	-	-
HCM Lane V/C Ratio	0.005	-	-	0.093	0.124	0.699	0.185	-	-
HCM Control Delay (s)	8.2	0	-	121.5	85.3	51.1	12.8	-	-
HCM Lane LOS	A	A	-	F	F	F	B	-	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.4	4.5	0.7	-	-

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	1	190	175	45	845	1	305	1	5	1	1	1
Future Volume (vph)	1	190	175	45	845	1	305	1	5	1	1	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		150	150		0	150		0	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			30			30	
Link Distance (ft)		3851			1410			1160			265	
Travel Time (s)		52.5			19.2			26.4			6.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6		6	2			4			8		
Detector Phase	6	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		26.0	26.0	
Total Split (s)	53.0	53.0	53.0	53.0	53.0		27.0	27.0		27.0	27.0	
Total Split (%)	66.3%	66.3%	66.3%	66.3%	66.3%		33.8%	33.8%		33.8%	33.8%	
Maximum Green (s)	47.0	47.0	47.0	47.0	47.0		23.0	23.0		23.0	23.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		4.0	4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		17.0	17.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 68.2
Natural Cycle: 65
Control Type: Actuated-Uncoordinated

Splits and Phases: 3: 88th Ave & Old Hwy 99

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	1	190	175	45	845	1	305	1	5	1	1	1
Future Volume (veh/h)	1	190	175	45	845	1	305	1	5	1	1	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1885	1885	1885	1841	1841	1841	1900	1900	1900
Adj Flow Rate, veh/h	1	200	184	47	889	1	321	1	5	1	1	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	1	1	1	4	4	4	0	0	0
Cap, veh/h	225	1026	870	633	1041	1	501	71	355	194	189	148
Arrive On Green	0.55	0.55	0.55	0.55	0.55	0.55	0.27	0.27	0.27	0.27	0.27	0.27
Sat Flow, veh/h	620	1856	1572	1007	1883	2	1393	267	1334	402	710	556
Grp Volume(v), veh/h	1	200	184	47	0	890	321	0	6	3	0	0
Grp Sat Flow(s),veh/h/ln	620	1856	1572	1007	0	1885	1393	0	1601	1669	0	0
Q Serve(g_s), s	0.1	3.0	3.3	1.4	0.0	22.1	12.1	0.0	0.2	0.0	0.0	0.0
Cycle Q Clear(g_c), s	22.2	3.0	3.3	4.3	0.0	22.1	12.1	0.0	0.2	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	1.00		0.83	0.33		0.33
Lane Grp Cap(c), veh/h	225	1026	870	633	0	1042	501	0	426	531	0	0
V/C Ratio(X)	0.00	0.19	0.21	0.07	0.00	0.85	0.64	0.00	0.01	0.01	0.00	0.00
Avail Cap(c_a), veh/h	408	1575	1335	931	0	1600	709	0	665	774	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	19.9	6.2	6.3	7.3	0.0	10.5	19.3	0.0	15.0	14.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.1	0.0	0.0	2.9	1.4	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.7	0.7	0.2	0.0	6.1	3.7	0.0	0.1	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.9	6.3	6.4	7.3	0.0	13.4	20.7	0.0	15.0	14.9	0.0	0.0
LnGrp LOS	B	A	A	A	A	B	C	A	B	B	A	A
Approach Vol, veh/h		385			937			327			3	
Approach Delay, s/veh		6.4			13.1			20.6			14.9	
Approach LOS		A			B			C			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		36.6		18.7		36.6		18.7				
Change Period (Y+Rc), s		6.0		4.0		6.0		4.0				
Max Green Setting (Gmax), s		47.0		23.0		47.0		23.0				
Max Q Clear Time (g_c+I1), s		24.1		14.1		24.2		2.1				
Green Ext Time (p_c), s		6.5		0.7		1.5		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			13.0
HCM 6th LOS			B

Intersection	
Int Delay, s/veh	2.3

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	145	10	195	760	15	100
Future Vol, veh/h	145	10	195	760	15	100
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	450	300	-	300	0
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	4	1	1	6	6
Mvmt Flow	153	11	205	800	16	105

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	164	0	1363	153
Stage 1	-	-	-	-	153	-
Stage 2	-	-	-	-	1210	-
Critical Hdwy	-	-	4.11	-	6.46	6.26
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.209	-	3.554	3.354
Pot Cap-1 Maneuver	-	-	1421	-	160	883
Stage 1	-	-	-	-	865	-
Stage 2	-	-	-	-	277	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1421	-	137	883
Mov Cap-2 Maneuver	-	-	-	-	223	-
Stage 1	-	-	-	-	865	-
Stage 2	-	-	-	-	237	-

Approach	EB	WB	NE
HCM Control Delay, s	0	1.6	11.3
HCM LOS			B

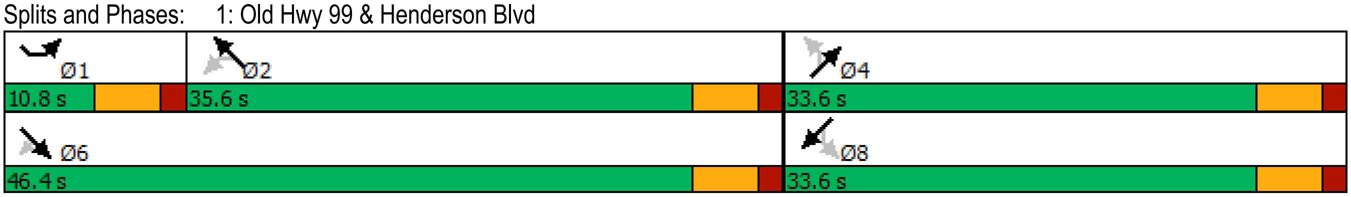
Minor Lane/Major Mvmt	NELn1	NELn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	223	883	-	-	1421	-
HCM Lane V/C Ratio	0.071	0.119	-	-	0.144	-
HCM Control Delay (s)	22.4	9.6	-	-	8	-
HCM Lane LOS	C	A	-	-	A	-
HCM 95th %tile Q(veh)	0.2	0.4	-	-	0.5	-

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	50	435	20	5	1095	110	5	2	1	70	1	135
Future Volume (vph)	50	435	20	5	1095	110	5	2	1	70	1	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	175		50	50		0	0		0	150		0
Storage Lanes	1		1	1		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		1810			1652			415			1137	
Travel Time (s)		24.7			22.5			9.4			25.8	
Turn Type	Prot	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	1	6			2			4			8	
Permitted Phases			6	2			4			8		
Detector Phase	1	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	10.5	25.5	25.5	26.5	26.5		33.5	33.5		33.5	33.5	
Total Split (s)	10.8	46.4	46.4	35.6	35.6		33.6	33.6		33.6	33.6	
Total Split (%)	13.5%	58.0%	58.0%	44.5%	44.5%		42.0%	42.0%		42.0%	42.0%	
Maximum Green (s)	5.3	40.9	40.9	30.1	30.1		28.1	28.1		28.1	28.1	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5			5.5		5.5	5.5	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0		1.5	1.5		1.5	1.5	
Recall Mode	None	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)		5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)		15.0	15.0	16.0	16.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		0	0	0	0		0	0		0	0	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 51.9
Natural Cycle: 80
Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Old Hwy 99 & Henderson Blvd



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	50	435	20	5	1095	110	5	2	1	70	1	135
Future Volume (veh/h)	50	435	20	5	1095	110	5	2	1	70	1	135
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1826	1826	1826	1856	1856	1856	1900	1900	1900	1870	1870	1870
Adj Flow Rate, veh/h	53	458	21	5	1153	116	5	2	1	74	1	142
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	5	5	5	3	3	3	0	0	0	2	2	2
Cap, veh/h	92	2218	989	579	1525	153	162	55	13	363	1	206
Arrive On Green	0.05	0.64	0.64	0.47	0.47	0.47	0.13	0.13	0.13	0.13	0.13	0.13
Sat Flow, veh/h	1739	3469	1547	908	3235	325	303	419	103	1414	11	1576
Grp Volume(v), veh/h	53	458	21	5	627	642	8	0	0	74	0	143
Grp Sat Flow(s),veh/h/ln	1739	1735	1547	908	1763	1797	826	0	0	1414	0	1587
Q Serve(g_s), s	1.4	2.6	0.2	0.1	14.0	14.0	0.0	0.0	0.0	0.0	0.0	4.1
Cycle Q Clear(g_c), s	1.4	2.6	0.2	0.1	14.0	14.0	4.1	0.0	0.0	1.9	0.0	4.1
Prop In Lane	1.00		1.00	1.00		0.18	0.62		0.12	1.00		0.99
Lane Grp Cap(c), veh/h	92	2218	989	579	831	847	230	0	0	363	0	207
V/C Ratio(X)	0.58	0.21	0.02	0.01	0.76	0.76	0.03	0.00	0.00	0.20	0.00	0.69
Avail Cap(c_a), veh/h	193	2968	1324	722	1110	1131	880	0	0	1009	0	933
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.1	3.6	3.2	6.7	10.4	10.4	18.2	0.0	0.0	18.9	0.0	19.9
Incr Delay (d2), s/veh	2.1	0.0	0.0	0.0	2.1	2.1	0.0	0.0	0.0	0.1	0.0	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.3	0.0	0.0	3.6	3.7	0.1	0.0	0.0	0.7	0.0	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.2	3.6	3.2	6.7	12.5	12.5	18.3	0.0	0.0	19.0	0.0	21.4
LnGrp LOS	C	A	A	A	B	B	B	A	A	B	A	C
Approach Vol, veh/h		532			1274			8			217	
Approach Delay, s/veh		5.7			12.5			18.3			20.6	
Approach LOS		A			B			B			C	
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	8.0	28.0		11.8		36.1		11.8				
Change Period (Y+Rc), s	5.5	5.5		5.5		5.5		5.5				
Max Green Setting (Gmax), s	5.3	30.1		28.1		40.9		28.1				
Max Q Clear Time (g_c+I1), s	3.4	16.0		6.1		4.6		6.1				
Green Ext Time (p_c), s	0.0	6.5		0.0		2.9		0.5				
Intersection Summary												
HCM 6th Ctrl Delay			11.6									
HCM 6th LOS			B									

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	1	1	1	5	1	150	100	385	5	5	1110	35
Future Vol, veh/h	1	1	1	5	1	150	100	385	5	5	1110	35
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	300	275	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	5	5	5	5	5	5	3	3	3
Mvmt Flow	1	1	1	5	1	158	105	405	5	5	1168	37

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	1213	1833	205	1610	1817	603	1205	0	0	410	0	0
Stage 1	618	618	-	1197	1197	-	-	-	-	-	-	-
Stage 2	595	1215	-	413	620	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.6	6.6	7	4.2	-	-	4.16	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.6	5.6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.6	5.6	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.55	4.05	3.35	2.25	-	-	2.23	-	-
Pot Cap-1 Maneuver	140	77	808	68	75	435	558	-	-	1138	-	-
Stage 1	448	484	-	192	251	-	-	-	-	-	-	-
Stage 2	463	256	-	579	471	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	75	62	808	57	60	435	558	-	-	1138	-	-
Mov Cap-2 Maneuver	75	62	-	57	60	-	-	-	-	-	-	-
Stage 1	364	393	-	156	248	-	-	-	-	-	-	-
Stage 2	290	253	-	468	382	-	-	-	-	-	-	-

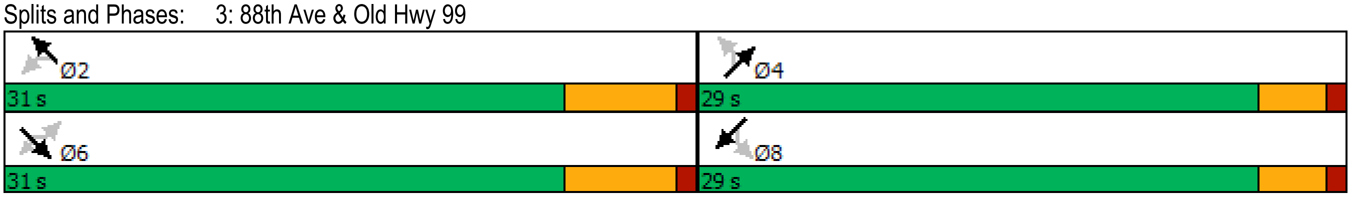
Approach	EB	WB	SE	NW
HCM Control Delay, s	43	20.1	2.6	0.1
HCM LOS	E	C		

Minor Lane/Major Mvmt	NWL	NWT	NWR	EBLn1	WBLn1	WBLn2	SEL	SET	SER
Capacity (veh/h)	1138	-	-	98	57	435	558	-	-
HCM Lane V/C Ratio	0.005	-	-	0.032	0.111	0.363	0.189	-	-
HCM Control Delay (s)	8.2	0.1	-	43	75.9	17.9	12.9	-	-
HCM Lane LOS	A	A	-	E	F	C	B	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.4	1.6	0.7	-	-

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	1	190	175	45	845	1	305	1	5	1	1	1
Future Volume (vph)	1	190	175	45	845	1	305	1	5	1	1	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		150	150		0	150		0	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			30			30	
Link Distance (ft)		3851			487			1160			265	
Travel Time (s)		52.5			6.6			26.4			6.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6		6	2			4			8		
Detector Phase	6	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		26.0	26.0	
Total Split (s)	31.0	31.0	31.0	31.0	31.0		29.0	29.0		29.0	29.0	
Total Split (%)	51.7%	51.7%	51.7%	51.7%	51.7%		48.3%	48.3%		48.3%	48.3%	
Maximum Green (s)	25.0	25.0	25.0	25.0	25.0		25.0	25.0		25.0	25.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		4.0	4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		17.0	17.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	

Intersection Summary	
Area Type:	Other
Cycle Length: 60	
Actuated Cycle Length: 45.5	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 3: 88th Ave & Old Hwy 99



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	1	190	175	45	845	1	305	1	5	1	1	1
Future Volume (veh/h)	1	190	175	45	845	1	305	1	5	1	1	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1885	1885	1885	1841	1841	1841	1900	1900	1900
Adj Flow Rate, veh/h	1	200	184	47	889	1	321	1	5	1	1	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	3	3	3	1	1	1	4	4	4	0	0	0
Cap, veh/h	354	1416	631	592	1474	2	625	77	383	248	224	162
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.29	0.29	0.29	0.29	0.29	0.29
Sat Flow, veh/h	620	3526	1572	1007	3671	4	1393	267	1334	343	781	562
Grp Volume(v), veh/h	1	200	184	47	434	456	321	0	6	3	0	0
Grp Sat Flow(s),veh/h/ln	620	1763	1572	1007	1791	1884	1393	0	1601	1687	0	0
Q Serve(g_s), s	0.0	1.2	2.5	1.0	6.1	6.1	6.8	0.0	0.1	0.0	0.0	0.0
Cycle Q Clear(g_c), s	6.2	1.2	2.5	2.2	6.1	6.1	6.8	0.0	0.1	0.0	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	1.00		0.83	0.33		0.33
Lane Grp Cap(c), veh/h	354	1416	631	592	719	757	625	0	460	634	0	0
V/C Ratio(X)	0.00	0.14	0.29	0.08	0.60	0.60	0.51	0.00	0.01	0.00	0.00	0.00
Avail Cap(c_a), veh/h	587	2742	1223	971	1393	1465	1307	0	1245	1431	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	10.0	6.1	6.5	6.8	7.6	7.6	10.6	0.0	8.2	8.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.3	0.1	0.8	0.8	0.7	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.2	0.4	0.1	1.1	1.1	1.6	0.0	0.0	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.0	6.1	6.8	6.8	8.4	8.4	11.3	0.0	8.2	8.2	0.0	0.0
LnGrp LOS	B	A	A	A	A	A	B	A	A	A	A	A
Approach Vol, veh/h		385			937			327			3	
Approach Delay, s/veh		6.5			8.3			11.2			8.2	
Approach LOS		A			A			B			A	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		18.9		13.2		18.9		13.2				
Change Period (Y+Rc), s		6.0		4.0		6.0		4.0				
Max Green Setting (Gmax), s		25.0		25.0		25.0		25.0				
Max Q Clear Time (g_c+I1), s		8.1		8.8		8.2		2.0				
Green Ext Time (p_c), s		4.8		0.9		1.5		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			8.5
HCM 6th LOS			A

Intersection						
Int Delay, s/veh	2.3					

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	145	10	195	760	15	100
Future Vol, veh/h	145	10	195	760	15	100
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	450	300	-	300	0
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	4	1	1	6	6
Mvmt Flow	153	11	205	800	16	105

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	164	0	1363	153
Stage 1	-	-	-	-	153	-
Stage 2	-	-	-	-	1210	-
Critical Hdwy	-	-	4.11	-	6.46	6.26
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.209	-	3.554	3.354
Pot Cap-1 Maneuver	-	-	1421	-	160	883
Stage 1	-	-	-	-	865	-
Stage 2	-	-	-	-	277	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1421	-	137	883
Mov Cap-2 Maneuver	-	-	-	-	223	-
Stage 1	-	-	-	-	865	-
Stage 2	-	-	-	-	237	-

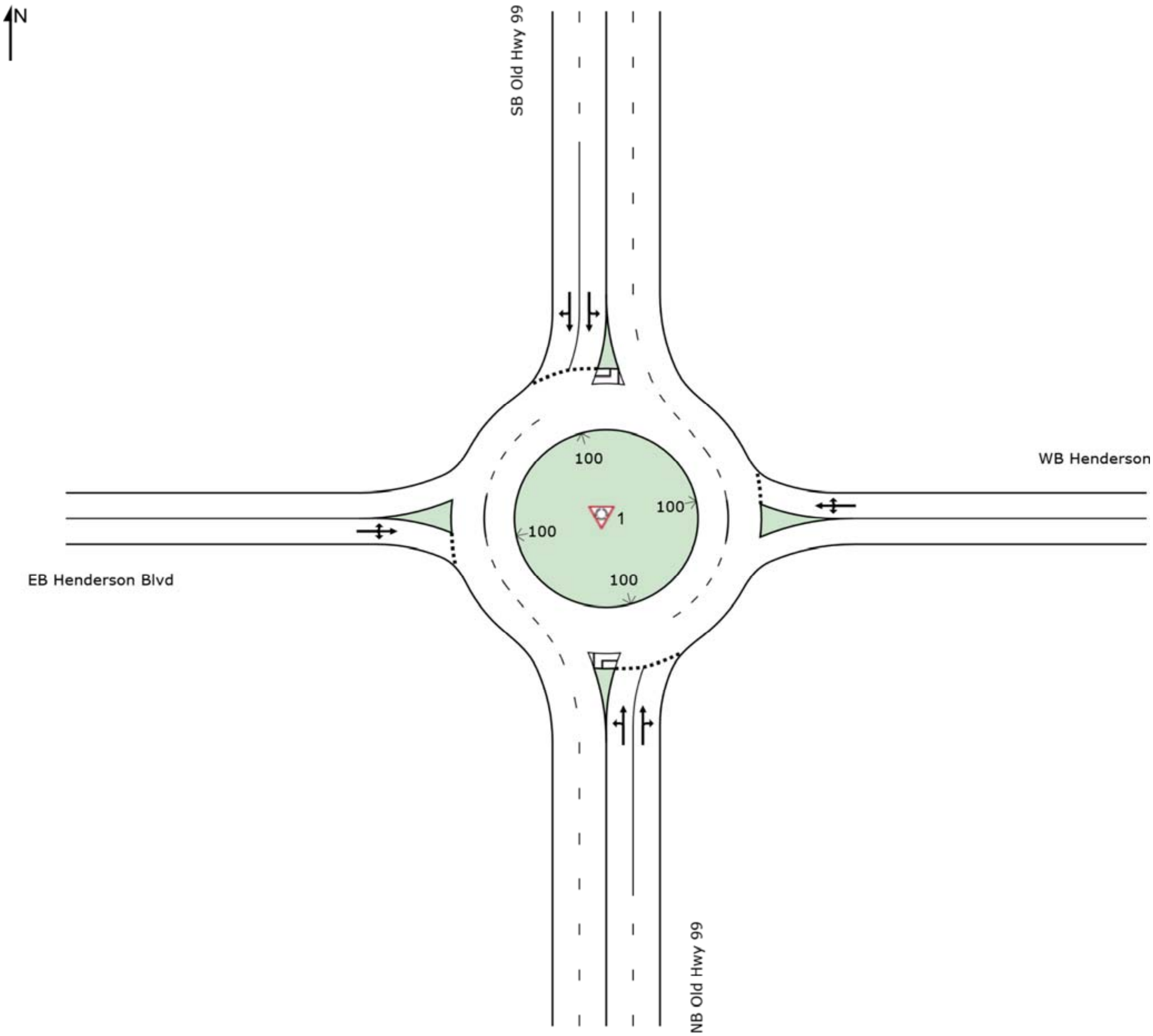
Approach	EB	WB	NE
HCM Control Delay, s	0	1.6	11.3
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	223	883	-	-	1421	-
HCM Lane V/C Ratio	0.071	0.119	-	-	0.144	-
HCM Control Delay (s)	22.4	9.6	-	-	8	-
HCM Lane LOS	C	A	-	-	A	-
HCM 95th %tile Q(veh)	0.2	0.4	-	-	0.5	-

SITE LAYOUT

Site: 1 [AM 2025 Old Hwy 99-Henderson Blvd - Baseline]

Projected 2040
AM Peak Hour
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 1 [AM 2025 Old Hwy 99-Henderson Blvd - Baseline]

Projected 2025
AM Peak Hour
Site Category: (None)
Roundabout

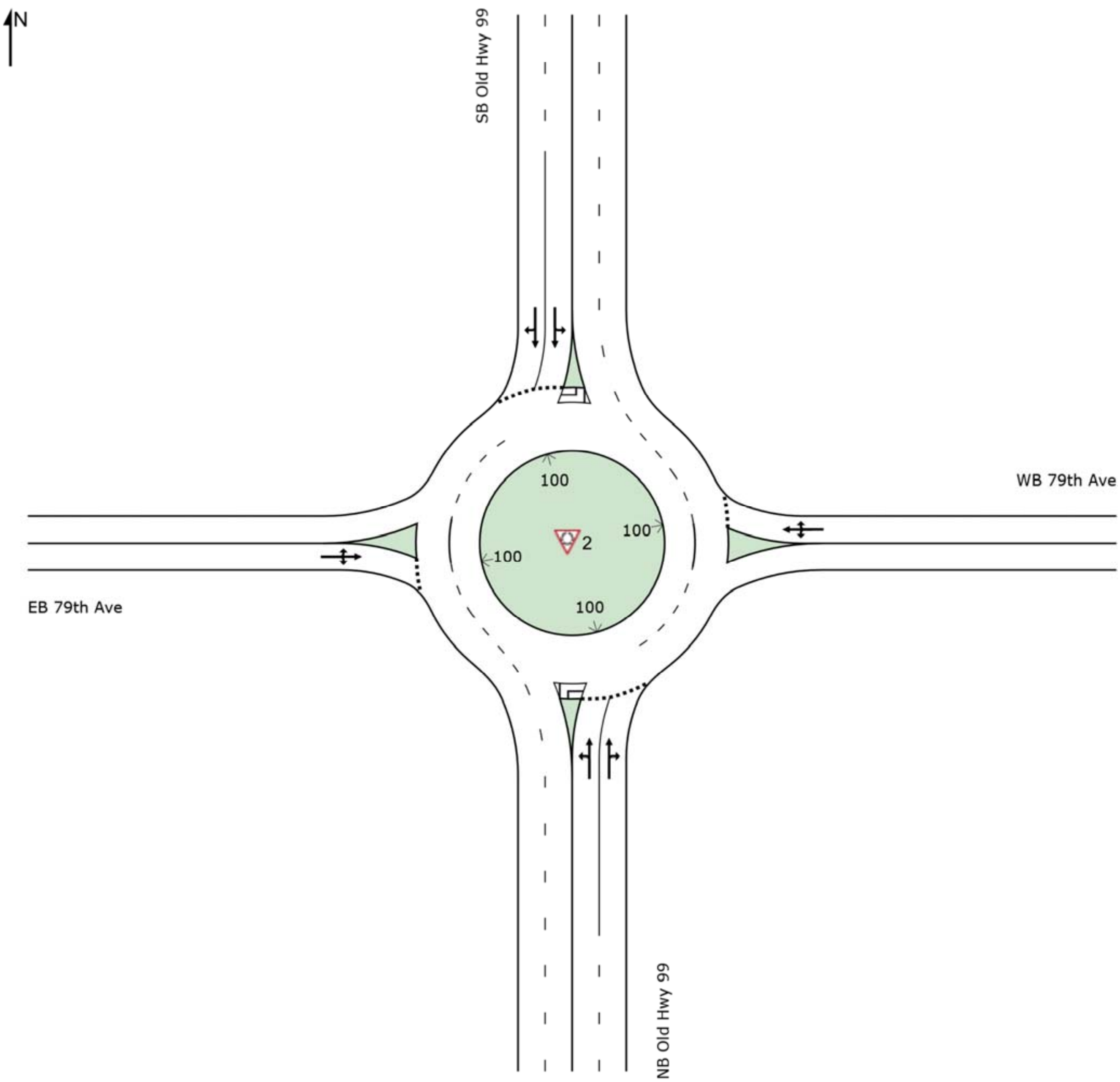
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	5	3.0	0.432	10.2	LOS B	2.8	72.5	0.25	0.40	0.25	37.2
8	T1	1095	3.0	0.432	4.3	LOS A	2.8	72.6	0.24	0.40	0.24	37.2
18	R2	110	3.0	0.432	4.4	LOS A	2.8	72.6	0.24	0.40	0.24	35.9
Approach		1210	3.0	0.432	4.3	LOS A	2.8	72.6	0.24	0.40	0.24	37.1
East: WB Henderson Blvd												
1	L2	70	2.0	0.299	13.3	LOS B	1.1	28.9	0.61	0.82	0.62	35.2
6	T1	5	2.0	0.299	7.4	LOS A	1.1	28.9	0.61	0.82	0.62	35.0
16	R2	135	2.0	0.299	7.3	LOS A	1.1	28.9	0.61	0.82	0.62	34.0
Approach		210	2.0	0.299	9.3	LOS A	1.1	28.9	0.61	0.82	0.62	34.4
North: SB Old Hwy 99												
7	L2	50	5.0	0.188	10.2	LOS B	1.0	26.7	0.25	0.46	0.25	36.6
4	T1	435	5.0	0.188	4.3	LOS A	1.0	27.1	0.24	0.42	0.24	36.9
14	R2	20	5.0	0.188	4.4	LOS A	1.0	27.1	0.24	0.40	0.24	35.9
Approach		505	5.0	0.188	4.9	LOS A	1.0	27.1	0.24	0.43	0.24	36.9
West: EB Henderson Blvd												
5	L2	5	0.0	0.017	11.3	LOS B	0.1	1.3	0.40	0.61	0.40	36.1
2	T1	5	0.0	0.017	5.4	LOS A	0.1	1.3	0.40	0.61	0.40	35.9
12	R2	5	0.0	0.017	5.3	LOS A	0.1	1.3	0.40	0.61	0.40	34.9
Approach		15	0.0	0.017	7.3	LOS A	0.1	1.3	0.40	0.61	0.40	35.6
All Vehicles		1940	3.4	0.432	5.0	LOS A	2.8	72.6	0.28	0.45	0.28	36.7

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 2 [AM 2040 Old Hwy 99-79th Ave - Land Use 2]

Projected 2040
AM Peak Hour
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 2 [AM 2025 Old Hwy 99-79th Ave - Baseline]

Projected 2025
AM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles

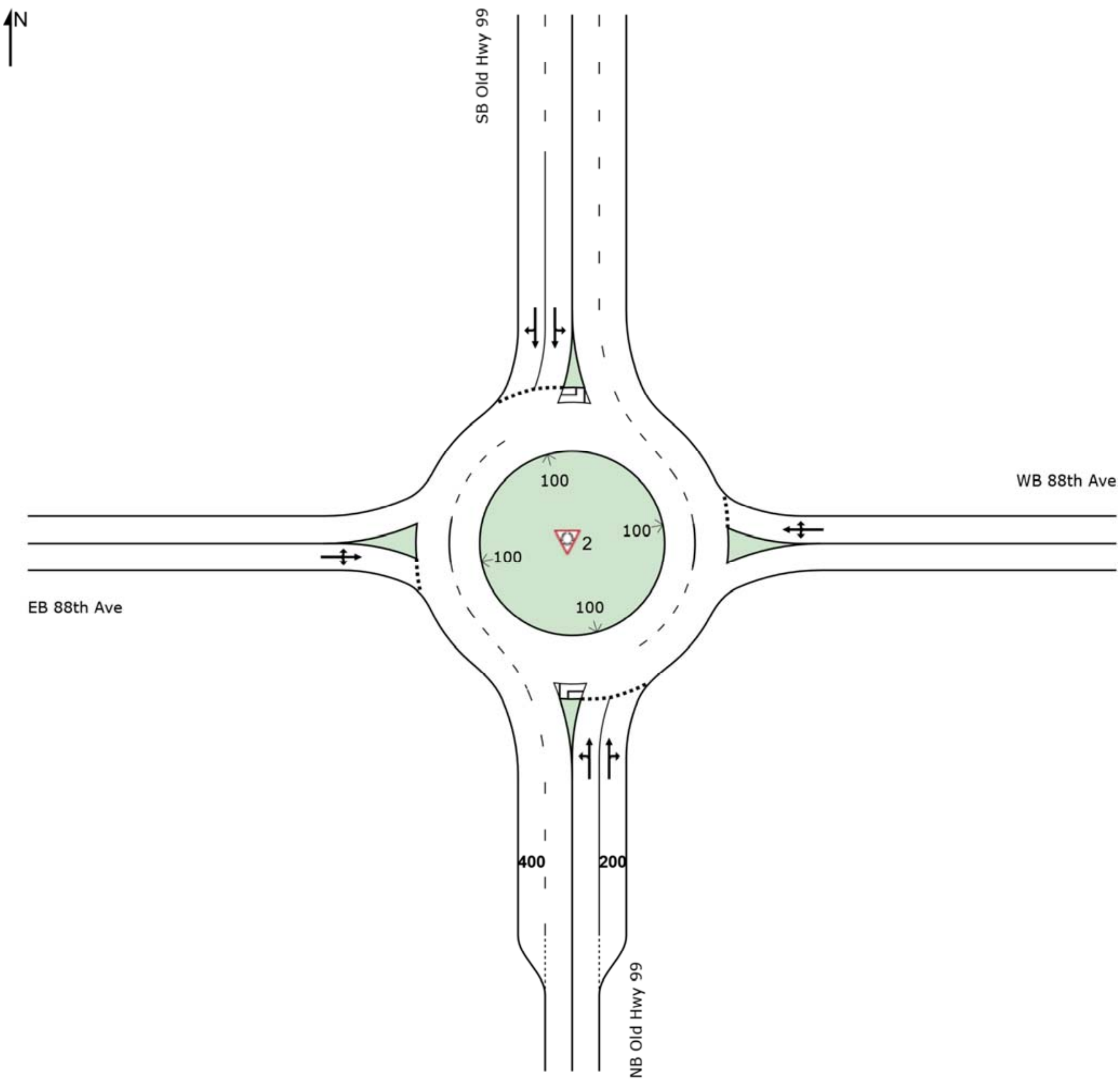
Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	5	3.0	0.386	10.4	LOS B	2.3	57.6	0.30	0.43	0.30	37.0
8	T1	1010	3.0	0.386	4.5	LOS A	2.3	57.8	0.29	0.42	0.29	37.0
18	R2	35	3.0	0.386	4.6	LOS A	2.3	57.8	0.29	0.42	0.29	35.7
Approach		1050	3.0	0.386	4.5	LOS A	2.3	57.8	0.29	0.42	0.29	37.0
East: WB 79th Ave												
1	L2	5	5.0	0.227	12.9	LOS B	0.8	21.1	0.58	0.77	0.58	36.2
6	T1	1	5.0	0.227	7.1	LOS A	0.8	21.1	0.58	0.77	0.58	36.1
16	R2	150	5.0	0.227	7.0	LOS A	0.8	21.1	0.58	0.77	0.58	35.0
Approach		156	5.0	0.227	7.2	LOS A	0.8	21.1	0.58	0.77	0.58	35.1
North: SB Old Hwy 99												
7	L2	100	5.0	0.172	9.9	LOS A	0.9	22.5	0.07	0.51	0.07	36.5
4	T1	385	5.0	0.172	4.0	LOS A	0.9	22.6	0.07	0.42	0.07	37.4
14	R2	5	5.0	0.172	4.2	LOS A	0.9	22.6	0.07	0.37	0.07	36.5
Approach		490	5.0	0.172	5.2	LOS A	0.9	22.6	0.07	0.44	0.07	37.2
West: EB 79th Ave												
5	L2	1	0.0	0.003	11.1	LOS B	0.0	0.2	0.36	0.55	0.36	36.2
2	T1	1	0.0	0.003	5.2	LOS A	0.0	0.2	0.36	0.55	0.36	36.0
12	R2	1	0.0	0.003	5.1	LOS A	0.0	0.2	0.36	0.55	0.36	35.0
Approach		3	0.0	0.003	7.1	LOS A	0.0	0.2	0.36	0.55	0.36	35.8
All Vehicles		1699	3.8	0.386	5.0	LOS A	2.3	57.8	0.25	0.46	0.25	36.9

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 2 [PM 2040 Old Hwy 99-88th Ave - Land Use 2]

Projected 2040
PM Peak Hour
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 2 [AM 2025 Old Hwy 99-88th Ave - Baseline]

Projected 2025
AM Peak Hour
Site Category: (None)
Roundabout

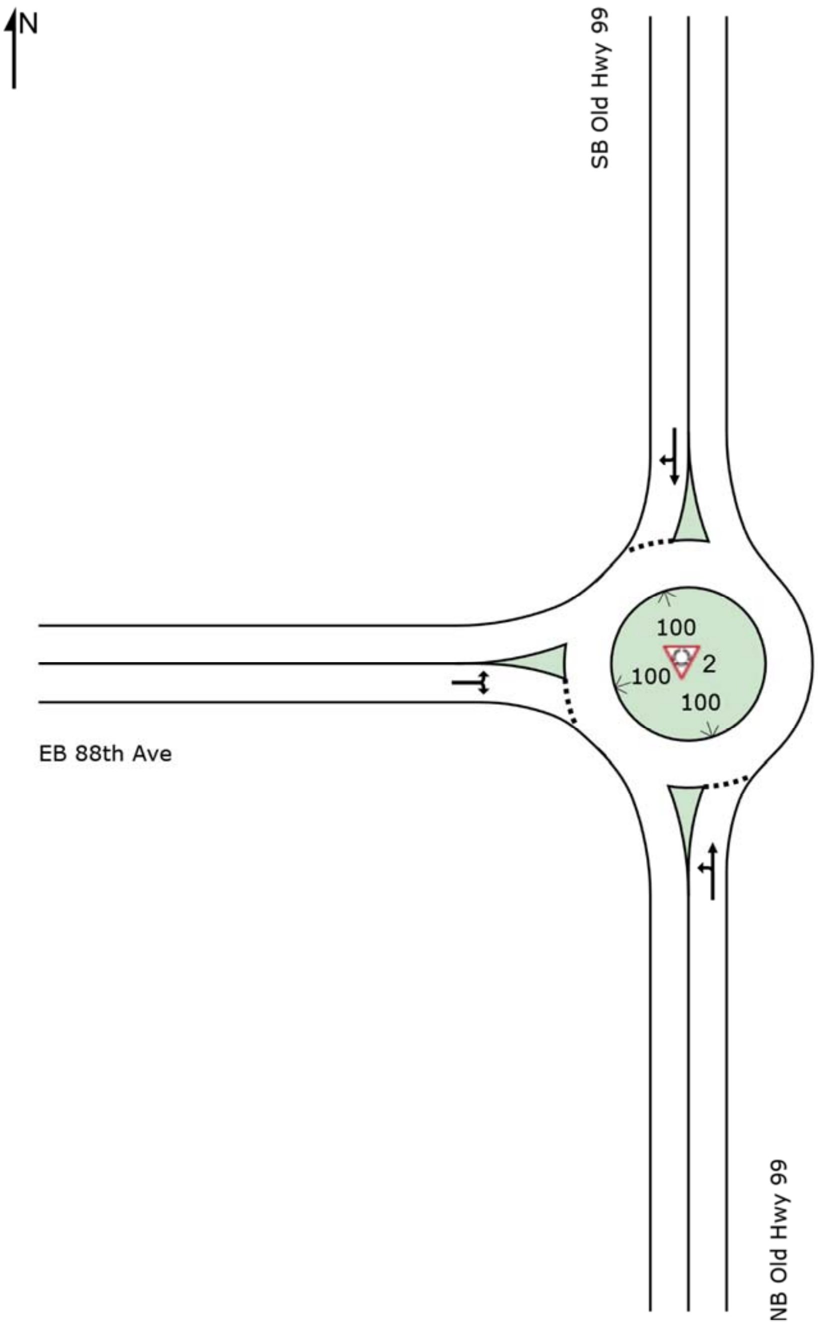
Movement Performance - Vehicles													
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	45	1.0	0.376	11.5	LOS B	2.3	57.6	0.53	0.57	0.53	36.0
8	T1	845	1.0	0.376	5.5	LOS A	2.4	59.5	0.52	0.54	0.52	36.1
18	R2	1	1.0	0.376	5.5	LOS A	2.4	59.5	0.52	0.51	0.52	35.0
Approach		891	1.0	0.376	5.8	LOS A	2.4	59.5	0.52	0.54	0.52	36.1
East: WB 88th Ave												
1	L2	1	0.0	0.005	12.8	LOS B	0.0	0.4	0.60	0.65	0.60	35.4
6	T1	1	0.0	0.005	6.9	LOS A	0.0	0.4	0.60	0.65	0.60	35.2
16	R2	1	0.0	0.005	6.9	LOS A	0.0	0.4	0.60	0.65	0.60	34.2
Approach		3	0.0	0.005	8.9	LOS A	0.0	0.4	0.60	0.65	0.60	34.9
North: SB Old Hwy 99												
7	L2	1	3.0	0.130	10.0	LOS A	0.7	17.3	0.16	0.37	0.16	37.6
4	T1	190	3.0	0.130	4.1	LOS A	0.7	17.3	0.16	0.37	0.16	37.5
14	R2	175	3.0	0.130	4.3	LOS A	0.7	17.0	0.17	0.46	0.17	36.2
Approach		366	3.0	0.130	4.2	LOS A	0.7	17.3	0.17	0.41	0.17	36.9
West: EB 88th Ave												
5	L2	305	4.0	0.309	10.8	LOS B	1.3	34.7	0.34	0.67	0.34	34.2
2	T1	1	4.0	0.309	5.0	LOS A	1.3	34.7	0.34	0.67	0.34	34.1
12	R2	5	4.0	0.309	4.9	LOS A	1.3	34.7	0.34	0.67	0.34	33.2
Approach		311	4.0	0.309	10.7	LOS B	1.3	34.7	0.34	0.67	0.34	34.2
All Vehicles		1571	2.1	0.376	6.4	LOS A	2.4	59.5	0.40	0.54	0.40	35.9

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 2 [PM 2025 Old Hwy 99-93rd Ave - Baseline]

Projected 2040
PM Peak Hour
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 2 [AM 2025 Old Hwy 99-93rd Ave - Baseline]

Projected 2025
AM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	205	1.0	0.770	10.0	LOS B	11.5	290.0	0.27	0.41	0.27	36.7
8	T1	800	1.0	0.770	4.1	LOS A	11.5	290.0	0.27	0.41	0.27	36.6
Approach		1005	1.0	0.770	5.3	LOS A	11.5	290.0	0.27	0.41	0.27	36.6
North: SB Old Hwy 99												
4	T1	153	4.0	0.150	4.8	LOS A	0.7	18.4	0.36	0.47	0.36	36.8
14	R2	11	4.0	0.150	4.9	LOS A	0.7	18.4	0.36	0.47	0.36	35.7
Approach		163	4.0	0.150	4.8	LOS A	0.7	18.4	0.36	0.47	0.36	36.7
West: EB 88th Ave												
5	L2	16	6.0	0.110	10.5	LOS B	0.5	13.5	0.31	0.52	0.31	36.8
12	R2	105	6.0	0.110	4.6	LOS A	0.5	13.5	0.31	0.52	0.31	35.6
Approach		121	6.0	0.110	5.4	LOS A	0.5	13.5	0.31	0.52	0.31	35.7
All Vehicles		1289	1.8	0.770	5.2	LOS A	11.5	290.0	0.29	0.43	0.29	36.6

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	55	570	20	5	1800	180	5	2	1	115	1	210
Future Volume (vph)	55	570	20	5	1800	180	5	2	1	115	1	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	175		50	50		0	0		0	150		0
Storage Lanes	1		1	1		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		1810			1652			415			1137	
Travel Time (s)		24.7			22.5			9.4			25.8	
Turn Type	Prot	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	1	6			2			4			8	
Permitted Phases			6	2			4			8		
Detector Phase	1	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	10.5	25.5	25.5	26.5	26.5		33.5	33.5		33.5	33.5	
Total Split (s)	10.5	116.5	116.5	106.0	106.0		33.5	33.5		33.5	33.5	
Total Split (%)	7.0%	77.7%	77.7%	70.7%	70.7%		22.3%	22.3%		22.3%	22.3%	
Maximum Green (s)	5.0	111.0	111.0	100.5	100.5		28.0	28.0		28.0	28.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5			5.5		5.5	5.5	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0		1.5	1.5		1.5	1.5	
Recall Mode	None	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)		5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)		15.0	15.0	16.0	16.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		0	0	0	0		0	0		0	0	

Intersection Summary	
Area Type:	Other
Cycle Length: 150	
Actuated Cycle Length: 138.4	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 1: Old Hwy 99 & Henderson Blvd

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	55	570	20	5	1800	180	5	2	1	115	1	210
Future Volume (veh/h)	55	570	20	5	1800	180	5	2	1	115	1	210
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1826	1826	1826	1856	1856	1856	1900	1900	1900	1870	1870	1870
Adj Flow Rate, veh/h	55	570	20	5	1800	180	5	2	1	115	1	210
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	5	5	5	3	3	3	0	0	0	2	2	2
Cap, veh/h	61	1415	1199	602	1165	116	56	20	5	228	1	234
Arrive On Green	0.03	0.78	0.78	0.70	0.70	0.70	0.15	0.15	0.15	0.15	0.15	0.15
Sat Flow, veh/h	1739	1826	1547	820	1660	166	99	132	33	1414	8	1579
Grp Volume(v), veh/h	55	570	20	5	0	1980	8	0	0	115	0	211
Grp Sat Flow(s),veh/h/ln	1739	1826	1547	820	0	1826	264	0	0	1414	0	1586
Q Serve(g_s), s	4.5	14.6	0.4	0.3	0.0	100.5	0.1	0.0	0.0	0.0	0.0	18.7
Cycle Q Clear(g_c), s	4.5	14.6	0.4	4.4	0.0	100.5	18.8	0.0	0.0	13.2	0.0	18.7
Prop In Lane	1.00		1.00	1.00		0.09	0.62		0.12	1.00		1.00
Lane Grp Cap(c), veh/h	61	1415	1199	602	0	1281	80	0	0	228	0	235
V/C Ratio(X)	0.91	0.40	0.02	0.01	0.00	1.55	0.10	0.00	0.00	0.50	0.00	0.90
Avail Cap(c_a), veh/h	61	1415	1199	602	0	1281	145	0	0	295	0	310
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	68.9	5.3	3.7	7.7	0.0	21.3	53.3	0.0	0.0	57.6	0.0	59.9
Incr Delay (d2), s/veh	81.0	0.2	0.0	0.0	0.0	249.3	0.2	0.0	0.0	0.6	0.0	19.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	4.3	0.1	0.0	0.0	123.5	0.3	0.0	0.0	4.0	0.0	8.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	149.8	5.4	3.7	7.7	0.0	270.6	53.5	0.0	0.0	58.2	0.0	79.5
LnGrp LOS	F	A	A	A	A	F	D	A	A	E	A	E
Approach Vol, veh/h		645			1985			8			326	
Approach Delay, s/veh		17.7			270.0			53.5			72.0	
Approach LOS		B			F			D			E	
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	10.5	106.0		26.7		116.5		26.7				
Change Period (Y+Rc), s	5.5	5.5		5.5		5.5		5.5				
Max Green Setting (Gmax), s	5.0	100.5		28.0		111.0		28.0				
Max Q Clear Time (g_c+I1), s	6.5	102.5		20.8		16.6		20.7				
Green Ext Time (p_c), s	0.0	0.0		0.0		3.7		0.5				
Intersection Summary												
HCM 6th Ctrl Delay			192.7									
HCM 6th LOS			F									

Intersection	
Int Delay, s/veh	36

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	1	1	1	5	1	170	110	610	5	10	1860	55
Future Vol, veh/h	1	1	1	5	1	170	110	610	5	10	1860	55
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	300	275	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	5	5	5	5	5	5	3	3	3
Mvmt Flow	1	1	1	5	1	170	110	610	5	10	1860	55

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	2826	2768	613	2742	2743	1888	1915	0	0	615	0	0
Stage 1	833	833	-	1908	1908	-	-	-	-	-	-	-
Stage 2	1993	1935	-	834	835	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.15	6.55	6.25	4.15	-	-	4.13	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.545	4.045	3.345	2.245	-	-	2.227	-	-
Pot Cap-1 Maneuver	11	20	496	13	20	~ 86	302	-	-	960	-	-
Stage 1	366	386	-	86	114	-	-	-	-	-	-	-
Stage 2	80	114	-	358	379	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	13	496	9	13	~ 86	302	-	-	960	-	-
Mov Cap-2 Maneuver	-	13	-	9	13	-	-	-	-	-	-	-
Stage 1	233	245	-	55	114	-	-	-	-	-	-	-
Stage 2	-	114	-	226	241	-	-	-	-	-	-	-

Approach	EB	WB	SE	NW
HCM Control Delay, s		$ 563.4	3.6	0
HCM LOS	-	F		

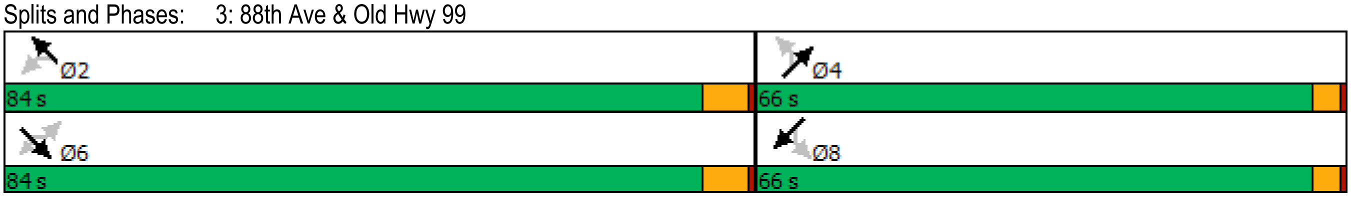
Minor Lane/Major Mvmt	NWL	NWT	NWR	EBLn1	WBLn1	WBLn2	SEL	SET	SER
Capacity (veh/h)	960	-	-	-	9	86	302	-	-
HCM Lane V/C Ratio	0.01	-	-	-	0.667	1.977	0.364	-	-
HCM Control Delay (s)	8.8	0	-	-	$ 684.4	$ 559.1	23.6	-	-
HCM Lane LOS	A	A	-	-	F	F	C	-	-
HCM 95th %tile Q(veh)	0	-	-	-	1.3	14.8	1.6	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	1	220	205	50	1220	1	715	1	5	1	1	1
Future Volume (vph)	1	220	205	50	1220	1	715	1	5	1	1	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		150	150		0	150		0	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			30			30	
Link Distance (ft)		3851			1410			1160			265	
Travel Time (s)		52.5			19.2			26.4			6.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6		6	2			4			8		
Detector Phase	6	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		26.0	26.0	
Total Split (s)	84.0	84.0	84.0	84.0	84.0		66.0	66.0		66.0	66.0	
Total Split (%)	56.0%	56.0%	56.0%	56.0%	56.0%		44.0%	44.0%		44.0%	44.0%	
Maximum Green (s)	78.0	78.0	78.0	78.0	78.0		62.0	62.0		62.0	62.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		4.0	4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		17.0	17.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	

Intersection Summary	
Area Type:	Other
Cycle Length: 150	
Actuated Cycle Length: 150	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 3: 88th Ave & Old Hwy 99



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	1	220	205	50	1220	1	715	1	5	1	1	1
Future Volume (veh/h)	1	220	205	50	1220	1	715	1	5	1	1	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1885	1885	1885	1841	1841	1841	1900	1900	1900
Adj Flow Rate, veh/h	1	220	205	50	1220	1	715	1	5	1	1	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	3	3	3	1	1	1	4	4	4	0	0	0
Cap, veh/h	48	965	818	490	979	1	624	110	551	242	241	225
Arrive On Green	0.52	0.52	0.52	0.52	0.52	0.52	0.41	0.41	0.41	0.41	0.41	0.41
Sat Flow, veh/h	453	1856	1572	970	1883	2	1393	267	1334	507	584	545
Grp Volume(v), veh/h	1	220	205	50	0	1221	715	0	6	3	0	0
Grp Sat Flow(s),veh/h/ln	453	1856	1572	970	0	1885	1393	0	1601	1636	0	0
Q Serve(g_s), s	0.0	9.7	10.8	4.4	0.0	78.0	61.9	0.0	0.3	0.0	0.0	0.0
Cycle Q Clear(g_c), s	78.0	9.7	10.8	14.1	0.0	78.0	62.0	0.0	0.3	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	1.00		0.83	0.33		0.33
Lane Grp Cap(c), veh/h	48	965	818	490	0	980	624	0	662	708	0	0
V/C Ratio(X)	0.02	0.23	0.25	0.10	0.00	1.25	1.15	0.00	0.01	0.00	0.00	0.00
Avail Cap(c_a), veh/h	48	965	818	490	0	980	624	0	662	708	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	75.0	19.6	19.9	23.5	0.0	36.0	46.4	0.0	25.9	25.9	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.1	0.2	0.1	0.0	119.2	83.5	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	4.1	3.9	1.0	0.0	65.5	38.7	0.0	0.1	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	75.2	19.7	20.0	23.5	0.0	155.2	129.9	0.0	25.9	25.9	0.0	0.0
LnGrp LOS	E	B	C	C	A	F	F	A	C	C	A	A
Approach Vol, veh/h		426			1271			721			3	
Approach Delay, s/veh		20.0			150.0			129.0			25.9	
Approach LOS		C			F			F			C	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		84.0		66.0		84.0		66.0				
Change Period (Y+Rc), s		6.0		4.0		6.0		4.0				
Max Green Setting (Gmax), s		78.0		62.0		78.0		62.0				
Max Q Clear Time (g_c+I1), s		80.0		64.0		80.0		2.1				
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		120.7
HCM 6th LOS		F

Intersection	
Int Delay, s/veh	2.3

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	180	10	225	1135	20	155
Future Vol, veh/h	180	10	225	1135	20	155
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	450	300	-	300	0
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	4	4	1	1	6	6
Mvmt Flow	180	10	225	1135	20	155

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	190	0	1765	180
Stage 1	-	-	-	-	180	-
Stage 2	-	-	-	-	1585	-
Critical Hdwy	-	-	4.11	-	6.46	6.26
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.209	-	3.554	3.354
Pot Cap-1 Maneuver	-	-	1390	-	90	853
Stage 1	-	-	-	-	841	-
Stage 2	-	-	-	-	181	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1390	-	75	853
Mov Cap-2 Maneuver	-	-	-	-	144	-
Stage 1	-	-	-	-	841	-
Stage 2	-	-	-	-	152	-

Approach	EB	WB	NE
HCM Control Delay, s	0	1.3	12.9
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	144	853	-	-	1390	-
HCM Lane V/C Ratio	0.139	0.182	-	-	0.162	-
HCM Control Delay (s)	34	10.2	-	-	8.1	-
HCM Lane LOS	D	B	-	-	A	-
HCM 95th %tile Q(veh)	0.5	0.7	-	-	0.6	-

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	55	570	20	5	1800	180	5	2	1	115	1	210
Future Volume (vph)	55	570	20	5	1800	180	5	2	1	115	1	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	175		50	50		0	0		0	150		0
Storage Lanes	1		1	1		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		1810			1652			415			1137	
Travel Time (s)		24.7			22.5			9.4			25.8	
Turn Type	Prot	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	1	6			2			4			8	
Permitted Phases			6	2			4			8		
Detector Phase	1	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	10.5	25.5	25.5	26.5	26.5		33.5	33.5		33.5	33.5	
Total Split (s)	11.0	76.4	76.4	65.4	65.4		33.6	33.6		33.6	33.6	
Total Split (%)	10.0%	69.5%	69.5%	59.5%	59.5%		30.5%	30.5%		30.5%	30.5%	
Maximum Green (s)	5.5	70.9	70.9	59.9	59.9		28.1	28.1		28.1	28.1	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5			5.5		5.5	5.5	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0		1.5	1.5		1.5	1.5	
Recall Mode	None	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)		5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)		15.0	15.0	16.0	16.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		0	0	0	0		0	0		0	0	

Intersection Summary	
Area Type:	Other
Cycle Length: 110	
Actuated Cycle Length: 91.5	
Natural Cycle: 110	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 1: Old Hwy 99 & Henderson Blvd

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	55	570	20	5	1800	180	5	2	1	115	1	210
Future Volume (veh/h)	55	570	20	5	1800	180	5	2	1	115	1	210
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1826	1826	1826	1856	1856	1856	1900	1900	1900	1870	1870	1870
Adj Flow Rate, veh/h	55	570	20	5	1800	180	5	2	1	115	1	210
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	5	5	5	3	3	3	0	0	0	2	2	2
Cap, veh/h	71	2504	1117	588	2013	198	88	31	8	276	1	250
Arrive On Green	0.04	0.72	0.72	0.62	0.62	0.62	0.16	0.16	0.16	0.16	0.16	0.16
Sat Flow, veh/h	1739	3469	1547	820	3242	319	156	197	50	1414	8	1579
Grp Volume(v), veh/h	55	570	20	5	965	1015	8	0	0	115	0	211
Grp Sat Flow(s),veh/h/ln	1739	1735	1547	820	1763	1798	403	0	0	1414	0	1586
Q Serve(g_s), s	2.9	5.0	0.3	0.2	42.0	45.1	0.1	0.0	0.0	0.0	0.0	11.8
Cycle Q Clear(g_c), s	2.9	5.0	0.3	0.2	42.0	45.1	11.9	0.0	0.0	8.1	0.0	11.8
Prop In Lane	1.00		1.00	1.00		0.18	0.62		0.12	1.00		1.00
Lane Grp Cap(c), veh/h	71	2504	1117	588	1094	1116	127	0	0	276	0	251
V/C Ratio(X)	0.77	0.23	0.02	0.01	0.88	0.91	0.06	0.00	0.00	0.42	0.00	0.84
Avail Cap(c_a), veh/h	104	2683	1197	614	1152	1175	329	0	0	486	0	486
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	43.5	4.2	3.6	6.6	14.6	15.1	33.3	0.0	0.0	35.9	0.0	37.5
Incr Delay (d2), s/veh	10.0	0.0	0.0	0.0	7.9	10.2	0.1	0.0	0.0	0.4	0.0	2.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	1.1	0.1	0.0	14.9	16.9	0.2	0.0	0.0	2.4	0.0	4.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	53.5	4.3	3.6	6.6	22.5	25.3	33.3	0.0	0.0	36.3	0.0	40.4
LnGrp LOS	D	A	A	A	C	C	C	A	A	D	A	D
Approach Vol, veh/h		645			1985			8			326	
Approach Delay, s/veh		8.5			23.9			33.3			38.9	
Approach LOS		A			C			C			D	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	9.3	62.4		20.0		71.7		20.0				
Change Period (Y+Rc), s	5.5	5.5		5.5		5.5		5.5				
Max Green Setting (Gmax), s	5.5	59.9		28.1		70.9		28.1				
Max Q Clear Time (g_c+I1), s	4.9	47.1		13.9		7.0		13.8				
Green Ext Time (p_c), s	0.0	9.8		0.0		3.8		0.7				

Intersection Summary			
HCM 6th Ctrl Delay			22.2
HCM 6th LOS			C

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	1	1	1	5	1	170	110	610	5	10	1860	55
Future Vol, veh/h	1	1	1	5	1	170	110	610	5	10	1860	55
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	300	275	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	5	5	5	5	5	5	3	3	3
Mvmt Flow	1	1	1	5	1	170	110	610	5	10	1860	55

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	1784	2768	308	2434	2743	958	1915	0	0	615	0	0
Stage 1	833	833	-	1908	1908	-	-	-	-	-	-	-
Stage 2	951	1935	-	526	835	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.6	6.6	7	4.2	-	-	4.16	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.6	5.6	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.6	5.6	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.55	4.05	3.35	2.25	-	-	2.23	-	-
Pot Cap-1 Maneuver	53	20	694	16	19	252	294	-	-	954	-	-
Stage 1	334	386	-	68	111	-	-	-	-	-	-	-
Stage 2	283	114	-	496	374	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	12	13	694	11	12	252	294	-	-	954	-	-
Mov Cap-2 Maneuver	12	13	-	11	12	-	-	-	-	-	-	-
Stage 1	209	242	-	43	111	-	-	-	-	-	-	-
Stage 2	91	114	-	309	234	-	-	-	-	-	-	-

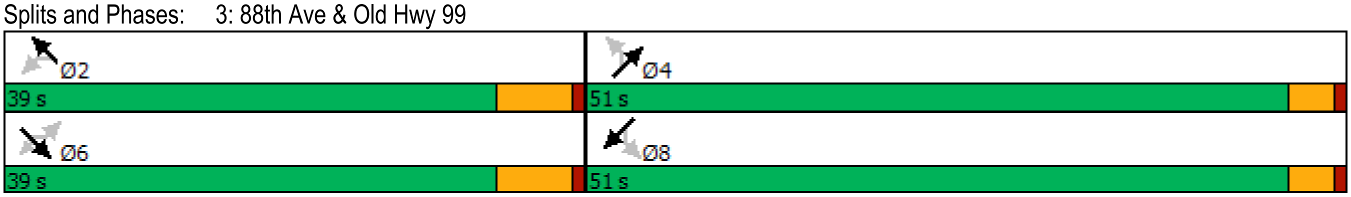
Approach	EB	WB	SE	NW
HCM Control Delay, s	227.2	61.1	3.7	0
HCM LOS	F	F		

Minor Lane/Major Mvmt	NWL	NWT	NWR	EBLn1	WBLn1	WBLn2	SEL	SET	SER
Capacity (veh/h)	954	-	-	19	11	252	294	-	-
HCM Lane V/C Ratio	0.01	-	-	0.158	0.545	0.675	0.374	-	-
HCM Control Delay (s)	8.8	0	-	227.2	$ 531.3	44.5	24.4	-	-
HCM Lane LOS	A	A	-	F	F	E	C	-	-
HCM 95th %tile Q(veh)	0	-	-	0.5	1.2	4.4	1.7	-	-

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	1	220	205	50	1220	1	715	1	5	1	1	1
Future Volume (vph)	1	220	205	50	1220	1	715	1	5	1	1	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		150	150		250	150		0	0		0
Storage Lanes	1		1	1		1	1		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			30			30	
Link Distance (ft)		3851			501			1160			265	
Travel Time (s)		52.5			6.8			26.4			6.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6		6	2			4			8		
Detector Phase	6	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		26.0	26.0	
Total Split (s)	39.0	39.0	39.0	39.0	39.0		51.0	51.0		51.0	51.0	
Total Split (%)	43.3%	43.3%	43.3%	43.3%	43.3%		56.7%	56.7%		56.7%	56.7%	
Maximum Green (s)	33.0	33.0	33.0	33.0	33.0		47.0	47.0		47.0	47.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		4.0	4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		17.0	17.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 89.6	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 3: 88th Ave & Old Hwy 99



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	1	220	205	50	1220	1	715	1	5	1	1	1
Future Volume (veh/h)	1	220	205	50	1220	1	715	1	5	1	1	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1885	1885	1885	1841	1841	1841	1900	1900	1900
Adj Flow Rate, veh/h	1	220	205	50	1220	1	715	1	5	1	1	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	3	3	3	1	1	1	4	4	4	0	0	0
Cap, veh/h	101	1274	568	391	1327	1	814	140	701	315	314	287
Arrive On Green	0.36	0.36	0.36	0.36	0.36	0.36	0.53	0.53	0.53	0.53	0.53	0.53
Sat Flow, veh/h	453	3526	1572	970	3673	3	1393	267	1334	495	598	547
Grp Volume(v), veh/h	1	220	205	50	595	626	715	0	6	3	0	0
Grp Sat Flow(s),veh/h/ln	453	1763	1572	970	1791	1885	1393	0	1601	1640	0	0
Q Serve(g_s), s	0.2	3.8	8.5	3.3	28.1	28.1	44.2	0.0	0.2	0.0	0.0	0.0
Cycle Q Clear(g_c), s	28.3	3.8	8.5	7.0	28.1	28.1	44.3	0.0	0.2	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	1.00		0.83	0.33		0.33
Lane Grp Cap(c), veh/h	101	1274	568	391	647	681	814	0	841	916	0	0
V/C Ratio(X)	0.01	0.17	0.36	0.13	0.92	0.92	0.88	0.00	0.01	0.00	0.00	0.00
Avail Cap(c_a), veh/h	106	1314	586	402	667	702	821	0	850	925	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	40.6	19.3	20.8	21.6	27.0	27.0	20.5	0.0	10.0	10.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.1	0.4	0.1	17.6	17.0	10.7	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	1.4	2.9	0.7	13.8	14.4	15.3	0.0	0.1	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	40.6	19.3	21.1	21.8	44.7	44.0	31.2	0.0	10.0	10.0	0.0	0.0
LnGrp LOS	D	B	C	C	D	D	C	A	B	A	A	A
Approach Vol, veh/h		426			1271			721			3	
Approach Delay, s/veh		20.2			43.4			31.0			10.0	
Approach LOS		C			D			C			A	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		38.0		50.5		38.0		50.5				
Change Period (Y+Rc), s		6.0		4.0		6.0		4.0				
Max Green Setting (Gmax), s		33.0		47.0		33.0		47.0				
Max Q Clear Time (g_c+I1), s		30.1		46.3		30.3		2.1				
Green Ext Time (p_c), s		1.9		0.2		0.5		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			35.6
HCM 6th LOS			D

Intersection						
Int Delay, s/veh	2.3					

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	180	10	225	1135	20	155
Future Vol, veh/h	180	10	225	1135	20	155
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	450	300	-	300	0
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	4	4	1	1	6	6
Mvmt Flow	180	10	225	1135	20	155

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	190	0	1765	180
Stage 1	-	-	-	-	180	-
Stage 2	-	-	-	-	1585	-
Critical Hdwy	-	-	4.11	-	6.46	6.26
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.209	-	3.554	3.354
Pot Cap-1 Maneuver	-	-	1390	-	90	853
Stage 1	-	-	-	-	841	-
Stage 2	-	-	-	-	181	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1390	-	75	853
Mov Cap-2 Maneuver	-	-	-	-	144	-
Stage 1	-	-	-	-	841	-
Stage 2	-	-	-	-	152	-

Approach	EB	WB	NE
HCM Control Delay, s	0	1.3	12.9
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NELn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	144	853	-	-	1390	-
HCM Lane V/C Ratio	0.139	0.182	-	-	0.162	-
HCM Control Delay (s)	34	10.2	-	-	8.1	-
HCM Lane LOS	D	B	-	-	A	-
HCM 95th %tile Q(veh)	0.5	0.7	-	-	0.6	-

MOVEMENT SUMMARY

Site: 1 [AM 2040 Old Hwy 99-Henderson Blvd - Baseline]

Projected 2040
AM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	5	3.0	0.662	10.4	LOS B	6.6	168.2	0.38	0.41	0.38	36.7
8	T1	1800	3.0	0.662	4.5	LOS A	6.6	168.2	0.36	0.41	0.36	36.8
18	R2	180	3.0	0.662	4.6	LOS A	6.5	166.9	0.34	0.41	0.34	35.6
Approach		1985	3.0	0.662	4.5	LOS A	6.6	168.2	0.36	0.41	0.36	36.7
East: WB Henderson Blvd												
1	L2	115	2.0	0.549	17.4	LOS B	3.1	79.3	0.81	1.00	1.10	33.0
6	T1	5	2.0	0.549	11.6	LOS B	3.1	79.3	0.81	1.00	1.10	32.9
16	R2	210	2.0	0.549	11.5	LOS B	3.1	79.3	0.81	1.00	1.10	32.0
Approach		330	2.0	0.549	13.6	LOS B	3.1	79.3	0.81	1.00	1.10	32.4
North: SB Old Hwy 99												
7	L2	55	5.0	0.233	10.4	LOS B	1.4	36.3	0.33	0.48	0.33	36.4
4	T1	570	5.0	0.233	4.4	LOS A	1.5	37.7	0.33	0.45	0.33	36.7
14	R2	20	5.0	0.233	4.6	LOS A	1.5	37.7	0.32	0.42	0.32	35.6
Approach		645	5.0	0.233	5.0	LOS A	1.5	37.7	0.33	0.45	0.33	36.6
West: EB Henderson Blvd												
5	L2	5	0.0	0.016	11.3	LOS B	0.1	1.3	0.45	0.62	0.45	36.0
2	T1	5	0.0	0.016	5.5	LOS A	0.1	1.3	0.45	0.62	0.45	35.8
12	R2	5	0.0	0.016	5.4	LOS A	0.1	1.3	0.45	0.62	0.45	34.8
Approach		15	0.0	0.016	7.4	LOS A	0.1	1.3	0.45	0.62	0.45	35.5
All Vehicles		2975	3.3	0.662	5.6	LOS A	6.6	168.2	0.40	0.49	0.44	36.1

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [AM 2040 Old Hwy 99-79th Ave - Baseline]

Projected 2040
AM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	10	3.0	0.660	10.8	LOS B	5.9	150.2	0.46	0.47	0.46	36.4
8	T1	1860	3.0	0.660	4.8	LOS A	5.9	150.2	0.44	0.46	0.44	36.5
18	R2	55	3.0	0.660	4.9	LOS A	5.8	149.5	0.42	0.45	0.42	35.3
Approach		1925	3.0	0.660	4.9	LOS A	5.9	150.2	0.44	0.46	0.44	36.4
East: WB 79th Ave												
1	L2	5	5.0	0.333	16.0	LOS B	1.6	41.1	0.78	0.91	0.86	34.5
6	T1	1	5.0	0.333	10.1	LOS B	1.6	41.1	0.78	0.91	0.86	34.5
16	R2	170	5.0	0.333	10.0	LOS B	1.6	41.1	0.78	0.91	0.86	33.5
Approach		176	5.0	0.333	10.2	LOS B	1.6	41.1	0.78	0.91	0.86	33.5
North: SB Old Hwy 99												
7	L2	110	5.0	0.237	9.9	LOS A	1.3	33.2	0.09	0.48	0.09	36.7
4	T1	610	5.0	0.237	4.0	LOS A	1.3	33.6	0.09	0.41	0.09	37.4
14	R2	5	5.0	0.237	4.2	LOS A	1.3	33.6	0.09	0.37	0.09	36.4
Approach		725	5.0	0.237	4.9	LOS A	1.3	33.6	0.09	0.42	0.09	37.3
West: EB 79th Ave												
5	L2	1	0.0	0.003	11.2	LOS B	0.0	0.2	0.41	0.57	0.41	36.1
2	T1	1	0.0	0.003	5.4	LOS A	0.0	0.2	0.41	0.57	0.41	35.9
12	R2	1	0.0	0.003	5.3	LOS A	0.0	0.2	0.41	0.57	0.41	34.9
Approach		3	0.0	0.003	7.3	LOS A	0.0	0.2	0.41	0.57	0.41	35.6
All Vehicles		2829	3.6	0.660	5.2	LOS A	5.9	150.2	0.37	0.48	0.37	36.4

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [AM 2040 Old Hwy 99-88th Ave - Baseline]

Projected 2040
AM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	50	1.0	0.713	20.5	LOS C	8.6	216.3	0.97	1.14	1.41	32.3
8	T1	1220	1.0	0.713	13.5	LOS B	9.7	245.3	0.98	1.10	1.39	32.9
18	R2	1	1.0	0.713	12.8	LOS B	9.7	245.3	0.98	1.07	1.37	32.3
Approach		1271	1.0	0.713	13.8	LOS B	9.7	245.3	0.98	1.10	1.39	32.8
East: WB 88th Ave												
1	L2	1	0.0	0.008	17.3	LOS B	0.0	1.0	0.84	0.74	0.84	33.2
6	T1	1	0.0	0.008	11.4	LOS B	0.0	1.0	0.84	0.74	0.84	33.1
16	R2	1	0.0	0.008	11.3	LOS B	0.0	1.0	0.84	0.74	0.84	32.2
Approach		3	0.0	0.008	13.3	LOS B	0.0	1.0	0.84	0.74	0.84	32.8
North: SB Old Hwy 99												
7	L2	1	3.0	0.138	9.9	LOS A	0.8	21.6	0.19	0.37	0.19	37.5
4	T1	220	3.0	0.138	4.1	LOS A	0.8	21.6	0.19	0.37	0.19	37.4
14	R2	205	3.0	0.146	4.3	LOS A	0.9	22.3	0.20	0.46	0.20	36.1
Approach		426	3.0	0.146	4.2	LOS A	0.9	22.3	0.20	0.41	0.20	36.8
West: EB 88th Ave												
5	L2	715	4.0	0.653	11.8	LOS B	4.9	127.6	0.55	0.72	0.58	33.7
2	T1	1	4.0	0.653	6.0	LOS A	4.9	127.6	0.55	0.72	0.58	33.6
12	R2	5	4.0	0.653	5.9	LOS A	4.9	127.6	0.55	0.72	0.58	32.7
Approach		721	4.0	0.653	11.8	LOS B	4.9	127.6	0.55	0.72	0.58	33.7
All Vehicles		2421	2.2	0.713	11.5	LOS B	9.7	245.3	0.71	0.87	0.94	33.7

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [AM 2040 Old Hwy 99-93rd Ave - Baseline]

Projected 2040
AM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	225	1.0	0.939	10.7	LOS D	42.3	1065.8	0.78	0.34	0.78	35.2
8	T1	1120	1.0	0.939	4.7	LOS D	42.3	1065.8	0.78	0.34	0.78	35.1
Approach		1345	1.0	0.939	5.7	LOS A	42.3	1065.8	0.78	0.34	0.78	35.1
North: SB Old Hwy 99												
4	T1	170	4.0	0.154	4.7	LOS A	0.9	22.1	0.42	0.47	0.42	36.6
14	R2	10	4.0	0.154	4.8	LOS A	0.9	22.1	0.42	0.47	0.42	35.5
Approach		180	4.0	0.154	4.7	LOS A	0.9	22.1	0.42	0.47	0.42	36.5
West: EB 88th Ave												
5	L2	20	6.0	0.145	10.5	LOS B	0.7	19.0	0.34	0.52	0.34	36.8
12	R2	155	6.0	0.145	4.6	LOS A	0.7	19.0	0.34	0.52	0.34	35.6
Approach		175	6.0	0.145	5.3	LOS A	0.7	19.0	0.34	0.52	0.34	35.7
All Vehicles		1700	1.8	0.939	5.6	LOS A	42.3	1065.8	0.70	0.37	0.70	35.3

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [AM 2040 Old Hwy 99-Henderson Blvd - Sensitivity Scenario]

Projected 2040
AM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	5	3.0	0.687	10.6	LOS B	7.2	183.1	0.45	0.44	0.45	36.5
8	T1	1835	3.0	0.687	4.6	LOS A	7.2	183.1	0.43	0.43	0.43	36.5
18	R2	195	3.0	0.687	4.7	LOS A	7.1	182.3	0.41	0.43	0.41	35.4
Approach		2035	3.0	0.687	4.7	LOS A	7.2	183.1	0.42	0.43	0.42	36.4
East: WB Henderson Blvd												
1	L2	135	2.0	0.633	19.1	LOS B	4.0	101.0	0.85	1.06	1.25	32.2
6	T1	5	2.0	0.633	13.2	LOS B	4.0	101.0	0.85	1.06	1.25	32.1
16	R2	220	2.0	0.633	13.1	LOS B	4.0	101.0	0.85	1.06	1.25	31.2
Approach		360	2.0	0.633	15.4	LOS B	4.0	101.0	0.85	1.06	1.25	31.6
North: SB Old Hwy 99												
7	L2	70	5.0	0.265	10.5	LOS B	1.6	42.8	0.37	0.50	0.37	36.2
4	T1	625	5.0	0.265	4.5	LOS A	1.7	44.6	0.37	0.46	0.37	36.5
14	R2	25	5.0	0.265	4.6	LOS A	1.7	44.6	0.36	0.43	0.36	35.4
Approach		720	5.0	0.265	5.1	LOS A	1.7	44.6	0.37	0.46	0.37	36.4
West: EB Henderson Blvd												
5	L2	5	0.0	0.017	11.5	LOS B	0.1	1.4	0.48	0.63	0.48	35.9
2	T1	5	0.0	0.017	5.6	LOS A	0.1	1.4	0.48	0.63	0.48	35.7
12	R2	5	0.0	0.017	5.6	LOS A	0.1	1.4	0.48	0.63	0.48	34.7
Approach		15	0.0	0.017	7.6	LOS A	0.1	1.4	0.48	0.63	0.48	35.4
All Vehicles		3130	3.3	0.687	6.0	LOS A	7.2	183.1	0.46	0.51	0.51	35.8

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [AM 2040 Old Hwy 99-79th Ave - Sensitivity Scenario]

Projected 2040
AM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles													
Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	10	3.0	0.684	10.9	LOS B	6.4	162.8	0.50	0.49	0.50	36.3
8	T1	1910	3.0	0.684	5.0	LOS A	6.4	162.8	0.48	0.47	0.48	36.3
18	R2	60	3.0	0.684	5.0	LOS A	6.3	162.4	0.46	0.46	0.46	35.1
Approach		1980	3.0	0.684	5.0	LOS A	6.4	162.8	0.48	0.47	0.48	36.3
East: WB 79th Ave												
1	L2	10	5.0	0.373	16.7	LOS B	1.8	48.0	0.80	0.93	0.92	34.1
6	T1	1	5.0	0.373	10.8	LOS B	1.8	48.0	0.80	0.93	0.92	34.0
16	R2	175	5.0	0.373	10.8	LOS B	1.8	48.0	0.80	0.93	0.92	33.0
Approach		186	5.0	0.373	11.1	LOS B	1.8	48.0	0.80	0.93	0.92	33.1
North: SB Old Hwy 99												
7	L2	120	5.0	0.263	9.9	LOS A	1.5	39.6	0.12	0.48	0.12	36.7
4	T1	675	5.0	0.263	4.1	LOS A	1.6	40.3	0.11	0.41	0.11	37.3
14	R2	5	5.0	0.263	4.2	LOS A	1.6	40.3	0.11	0.37	0.11	36.3
Approach		800	5.0	0.263	4.9	LOS A	1.6	40.3	0.12	0.42	0.12	37.2
West: EB 79th Ave												
5	L2	1	0.0	0.003	11.4	LOS B	0.0	0.2	0.43	0.58	0.43	36.0
2	T1	1	0.0	0.003	5.5	LOS A	0.0	0.2	0.43	0.58	0.43	35.8
12	R2	1	0.0	0.003	5.4	LOS A	0.0	0.2	0.43	0.58	0.43	34.8
Approach		3	0.0	0.003	7.4	LOS A	0.0	0.2	0.43	0.58	0.43	35.5
All Vehicles		2969	3.7	0.684	5.4	LOS A	6.4	162.8	0.40	0.49	0.41	36.3

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [AM 2040 Old Hwy 99-88th Ave - Sensitivity Scenario]

Projected 2040
AM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles

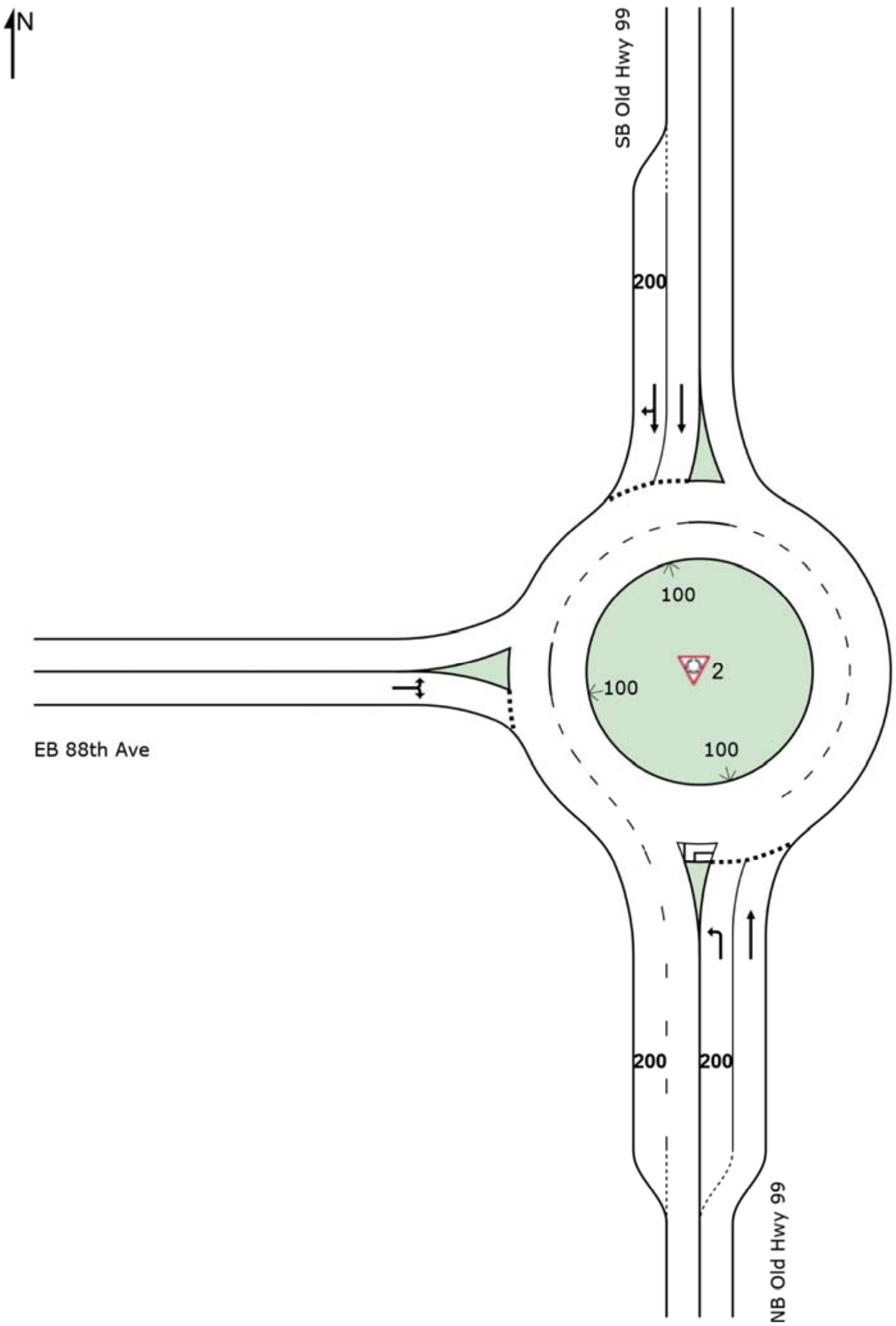
Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	55	1.0	0.791	26.0	LOS C	11.4	287.5	1.00	1.28	1.71	29.9
8	T1	1225	1.0	0.791	18.6	LOS B	13.3	336.4	1.00	1.24	1.68	30.6
18	R2	10	1.0	0.791	17.7	LOS B	13.3	336.4	1.00	1.21	1.66	30.2
Approach		1290	1.0	0.791	18.9	LOS B	13.3	336.4	1.00	1.24	1.68	30.6
East: WB 88th Ave												
1	L2	5	2.0	0.097	18.4	LOS B	0.5	12.8	0.86	0.93	0.86	33.1
6	T1	5	2.0	0.097	12.5	LOS B	0.5	12.8	0.86	0.93	0.86	33.0
16	R2	25	2.0	0.097	12.5	LOS B	0.5	12.8	0.86	0.93	0.86	32.1
Approach		35	2.0	0.097	13.3	LOS B	0.5	12.8	0.86	0.93	0.86	32.3
North: SB Old Hwy 99												
7	L2	40	3.0	0.167	10.0	LOS A	1.0	26.0	0.22	0.43	0.22	37.0
4	T1	225	3.0	0.167	4.1	LOS A	1.0	26.0	0.22	0.43	0.22	36.9
14	R2	230	3.0	0.167	4.4	LOS A	1.0	25.1	0.23	0.46	0.23	36.0
Approach		495	3.0	0.167	4.7	LOS A	1.0	26.0	0.22	0.44	0.22	36.5
West: EB 88th Ave												
5	L2	732	4.0	0.698	12.9	LOS B	6.2	159.8	0.63	0.79	0.71	33.5
2	T1	10	4.0	0.698	7.0	LOS A	6.2	159.8	0.63	0.79	0.71	33.4
12	R2	5	4.0	0.698	7.0	LOS A	6.2	159.8	0.63	0.79	0.71	32.5
Approach		747	4.0	0.698	12.8	LOS B	6.2	159.8	0.63	0.79	0.71	33.5
All Vehicles		2567	2.3	0.791	14.3	LOS B	13.3	336.4	0.74	0.95	1.11	32.4

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 2 [AM 2040 Old Hwy 99-93rd Ave -Land Use 2 (2 NB lanes)]

Projected 2040
AM Peak Hour
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 2 [AM 2040 Old Hwy 99-93rd Ave - Sensitivity Scenario multiple entry lanes]

Projected 2040
AM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles

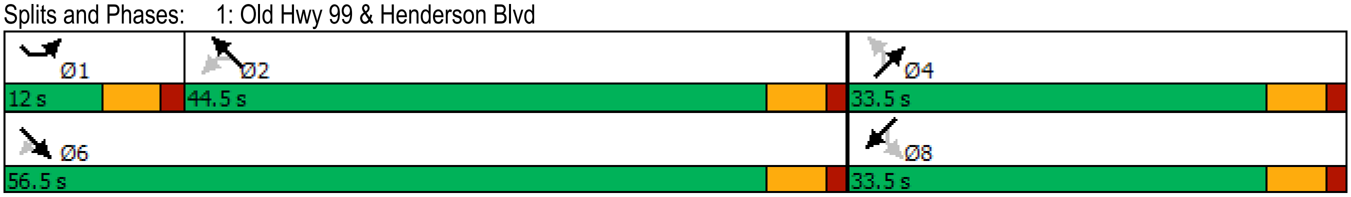
Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	225	1.0	0.183	9.9	LOS A	0.9	22.9	0.11	0.62	0.11	34.8
8	T1	1135	1.0	0.659	3.7	LOS A	6.8	170.3	0.18	0.34	0.18	37.9
Approach		1360	1.0	0.659	4.8	LOS A	6.8	170.3	0.17	0.39	0.17	37.3
North: SB Old Hwy 99												
4	T1	180	4.0	0.106	4.8	LOS A	0.4	10.2	0.28	0.45	0.28	36.9
14	R2	10	4.0	0.053	5.2	LOS A	0.2	4.8	0.29	0.46	0.29	35.6
Approach		190	4.0	0.106	4.8	LOS A	0.4	10.2	0.28	0.45	0.28	36.9
West: EB 88th Ave												
5	L2	20	6.0	0.158	10.5	LOS B	0.6	15.3	0.28	0.53	0.28	37.1
12	R2	155	6.0	0.158	4.6	LOS A	0.6	15.3	0.28	0.53	0.28	35.8
Approach		175	6.0	0.158	5.2	LOS A	0.6	15.3	0.28	0.53	0.28	35.9
All Vehicles		1725	1.8	0.659	4.8	LOS A	6.8	170.3	0.19	0.41	0.19	37.1

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	90	885	5	5	555	110	35	10	10	160	5	65
Future Volume (vph)	90	885	5	5	555	110	35	10	10	160	5	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	175		50	50		0	0		0	150		0
Storage Lanes	1		1	1		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		1810			1652			415			1137	
Travel Time (s)		24.7			22.5			9.4			25.8	
Turn Type	Prot	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	1	6			2			4			8	
Permitted Phases			6	2			4			8		
Detector Phase	1	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	10.5	25.5	25.5	26.5	26.5		33.5	33.5		33.5	33.5	
Total Split (s)	12.0	56.5	56.5	44.5	44.5		33.5	33.5		33.5	33.5	
Total Split (%)	13.3%	62.8%	62.8%	49.4%	49.4%		37.2%	37.2%		37.2%	37.2%	
Maximum Green (s)	6.5	51.0	51.0	39.0	39.0		28.0	28.0		28.0	28.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5			5.5		5.5	5.5	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0		1.5	1.5		1.5	1.5	
Recall Mode	None	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)		5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)		15.0	15.0	16.0	16.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		0	0	0	0		0	0		0	0	

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 69.1	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 1: Old Hwy 99 & Henderson Blvd



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	90	885	5	5	555	110	35	10	10	160	5	65
Future Volume (veh/h)	90	885	5	5	555	110	35	10	10	160	5	65
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1870	1870	1870	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	96	941	5	5	590	117	37	11	11	170	5	69
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	1	1	1	2	2	2	0	0	0	1	1	1
Cap, veh/h	130	1211	1026	309	703	139	209	62	36	362	16	219
Arrive On Green	0.07	0.64	0.64	0.46	0.46	0.46	0.15	0.15	0.15	0.15	0.15	0.15
Sat Flow, veh/h	1795	1885	1598	593	1516	301	662	428	250	1401	109	1505
Grp Volume(v), veh/h	96	941	5	5	0	707	59	0	0	170	0	74
Grp Sat Flow(s),veh/h/ln	1795	1885	1598	593	0	1816	1339	0	0	1401	0	1614
Q Serve(g_s), s	2.7	18.5	0.1	0.3	0.0	17.7	0.4	0.0	0.0	2.7	0.0	2.1
Cycle Q Clear(g_c), s	2.7	18.5	0.1	9.5	0.0	17.7	2.6	0.0	0.0	5.3	0.0	2.1
Prop In Lane	1.00		1.00	1.00		0.17	0.63		0.19	1.00		0.93
Lane Grp Cap(c), veh/h	130	1211	1026	309	0	842	308	0	0	362	0	234
V/C Ratio(X)	0.74	0.78	0.00	0.02	0.00	0.84	0.19	0.00	0.00	0.47	0.00	0.32
Avail Cap(c_a), veh/h	225	1857	1574	480	0	1368	890	0	0	916	0	873
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	23.5	6.6	3.3	13.3	0.0	12.2	19.7	0.0	0.0	21.0	0.0	19.8
Incr Delay (d2), s/veh	3.1	1.2	0.0	0.0	0.0	2.6	0.1	0.0	0.0	0.4	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	3.0	0.0	0.0	0.0	5.1	0.6	0.0	0.0	1.8	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.6	7.8	3.3	13.3	0.0	14.8	19.9	0.0	0.0	21.4	0.0	20.1
LnGrp LOS	C	A	A	B	A	B	B	A	A	C	A	C
Approach Vol, veh/h		1042			712			59			244	
Approach Delay, s/veh		9.5			14.8			19.9			21.0	
Approach LOS		A			B			B			C	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	9.2	29.5		13.0		38.8		13.0				
Change Period (Y+Rc), s	5.5	5.5		5.5		5.5		5.5				
Max Green Setting (Gmax), s	6.5	39.0		28.0		51.0		28.0				
Max Q Clear Time (g_c+I1), s	4.7	19.7		4.6		20.5		7.3				
Green Ext Time (p_c), s	0.0	4.3		0.1		7.5		0.3				

Intersection Summary			
HCM 6th Ctrl Delay			13.0
HCM 6th LOS			B

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	2	1	5	15	1	135	125	930	15	1	500	15
Future Vol, veh/h	2	1	5	15	1	135	125	930	15	1	500	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	300	275	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	0	0	0	2	2	2	1	1	1	3	3	3
Mvmt Flow	2	1	5	16	1	148	137	1022	16	1	549	16

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	1938	1871	1030	1866	1871	557	565	0	0	1038	0	0
Stage 1	1304	1304	-	559	559	-	-	-	-	-	-	-
Stage 2	634	567	-	1307	1312	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.11	-	-	4.13	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.209	-	-	2.227	-	-
Pot Cap-1 Maneuver	50	73	286	56	72	530	1012	-	-	666	-	-
Stage 1	199	232	-	513	511	-	-	-	-	-	-	-
Stage 2	471	510	-	196	228	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	32	63	286	48	62	530	1012	-	-	666	-	-
Mov Cap-2 Maneuver	32	63	-	48	62	-	-	-	-	-	-	-
Stage 1	172	201	-	444	510	-	-	-	-	-	-	-
Stage 2	338	509	-	165	197	-	-	-	-	-	-	-

Approach	EB	WB	SE	NW
HCM Control Delay, s	53.4	25.1	1.1	0
HCM LOS	F	D		

Minor Lane/Major Mvmt	NWL	NWT	NWR	EBLn1	WBLn1	WBLn2	SEL	SET	SER
Capacity (veh/h)	666	-	-	83	49	530	1012	-	-
HCM Lane V/C Ratio	0.002	-	-	0.106	0.359	0.28	0.136	-	-
HCM Control Delay (s)	10.4	0	-	53.4	115	14.4	9.1	-	-
HCM Lane LOS	B	A	-	F	F	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.3	1.3	1.1	0.5	-	-

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	1	780	205	15	305	1	175	1	50	1	2	1
Future Volume (vph)	1	780	205	15	305	1	175	1	50	1	2	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		150	150		0	150		0	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			30			30	
Link Distance (ft)		3851			1410			1160			265	
Travel Time (s)		52.5			19.2			26.4			6.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6		6	2			4			8		
Detector Phase	6	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		26.0	26.0	
Total Split (s)	34.0	34.0	34.0	34.0	34.0		26.0	26.0		26.0	26.0	
Total Split (%)	56.7%	56.7%	56.7%	56.7%	56.7%		43.3%	43.3%		43.3%	43.3%	
Maximum Green (s)	28.0	28.0	28.0	28.0	28.0		22.0	22.0		22.0	22.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		4.0	4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		17.0	17.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	

Intersection Summary	
Area Type:	Other
Cycle Length: 60	
Actuated Cycle Length: 53.5	
Natural Cycle: 65	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 3: 88th Ave & Old Hwy 99

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	1	780	205	15	305	1	175	1	50	1	2	1
Future Volume (veh/h)	1	780	205	15	305	1	175	1	50	1	2	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1870	1870	1870	1900	1900	1900
Adj Flow Rate, veh/h	1	876	230	17	343	1	197	1	56	1	2	1
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	1	1	1	1	1	1	2	2	2	0	0	0
Cap, veh/h	662	1051	891	272	1047	3	450	5	294	151	210	82
Arrive On Green	0.56	0.56	0.56	0.56	0.56	0.56	0.19	0.19	0.19	0.19	0.19	0.19
Sat Flow, veh/h	1045	1885	1598	514	1879	5	1414	28	1561	195	1114	436
Grp Volume(v), veh/h	1	876	230	17	0	344	197	0	57	4	0	0
Grp Sat Flow(s),veh/h/ln	1045	1885	1598	514	0	1884	1414	0	1589	1745	0	0
Q Serve(g_s), s	0.0	15.1	2.9	1.1	0.0	3.9	5.1	0.0	1.2	0.0	0.0	0.0
Cycle Q Clear(g_c), s	3.9	15.1	2.9	16.2	0.0	3.9	5.2	0.0	1.2	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	1.00		0.98	0.25		0.25
Lane Grp Cap(c), veh/h	662	1051	891	272	0	1050	450	0	300	443	0	0
V/C Ratio(X)	0.00	0.83	0.26	0.06	0.00	0.33	0.44	0.00	0.19	0.01	0.00	0.00
Avail Cap(c_a), veh/h	822	1340	1136	351	0	1340	973	0	888	1059	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	5.8	7.2	4.5	13.9	0.0	4.7	15.0	0.0	13.4	13.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	3.7	0.2	0.1	0.0	0.2	0.7	0.0	0.3	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.8	0.3	0.1	0.0	0.5	1.5	0.0	0.4	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	5.8	10.9	4.7	14.0	0.0	4.9	15.7	0.0	13.8	13.0	0.0	0.0
LnGrp LOS	A	B	A	B	A	A	B	A	B	B	A	A
Approach Vol, veh/h		1107			361			254			4	
Approach Delay, s/veh		9.6			5.3			15.3			13.0	
Approach LOS		A			A			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		28.0		11.4		28.0		11.4				
Change Period (Y+Rc), s		6.0		4.0		6.0		4.0				
Max Green Setting (Gmax), s		28.0		22.0		28.0		22.0				
Max Q Clear Time (g_c+I1), s		18.2		7.2		17.1		2.1				
Green Ext Time (p_c), s		1.3		0.7		4.8		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			9.6									
HCM 6th LOS			A									

Intersection	
Int Delay, s/veh	3.9

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	700	25	100	240	20	165
Future Vol, veh/h	700	25	100	240	20	165
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	450	300	-	300	0
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	1	1	2	2	1	1
Mvmt Flow	778	28	111	267	22	183

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	806	0	1267	778
Stage 1	-	-	-	-	778	-
Stage 2	-	-	-	-	489	-
Critical Hdwy	-	-	4.12	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.218	-	3.509	3.309
Pot Cap-1 Maneuver	-	-	819	-	187	398
Stage 1	-	-	-	-	455	-
Stage 2	-	-	-	-	619	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	819	-	162	398
Mov Cap-2 Maneuver	-	-	-	-	360	-
Stage 1	-	-	-	-	455	-
Stage 2	-	-	-	-	535	-

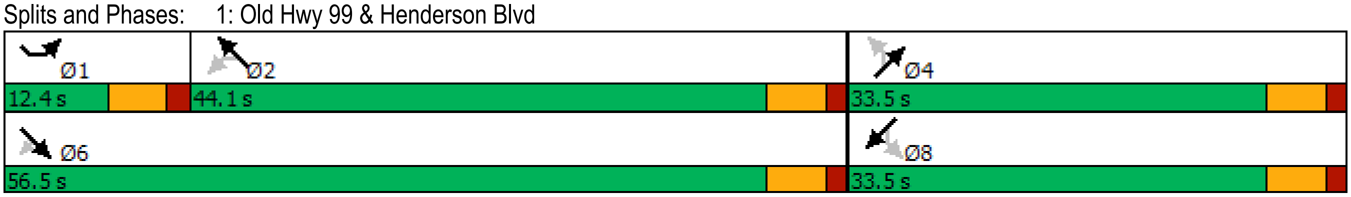
Approach	EB	WB	NE
HCM Control Delay, s	0	3	20.9
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	360	398	-	-	819	-
HCM Lane V/C Ratio	0.062	0.461	-	-	0.136	-
HCM Control Delay (s)	15.7	21.5	-	-	10.1	-
HCM Lane LOS	C	C	-	-	B	-
HCM 95th %tile Q(veh)	0.2	2.4	-	-	0.5	-

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	110	1000	5	5	595	115	35	15	15	170	5	80
Future Volume (vph)	110	1000	5	5	595	115	35	15	15	170	5	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	175		50	50		0	0		0	150		0
Storage Lanes	1		1	1		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		1810			1652			415			1137	
Travel Time (s)		24.7			22.5			9.4			25.8	
Turn Type	Prot	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	1	6			2			4			8	
Permitted Phases			6	2			4			8		
Detector Phase	1	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	10.5	25.5	25.5	26.5	26.5		33.5	33.5		33.5	33.5	
Total Split (s)	12.4	56.5	56.5	44.1	44.1		33.5	33.5		33.5	33.5	
Total Split (%)	13.8%	62.8%	62.8%	49.0%	49.0%		37.2%	37.2%		37.2%	37.2%	
Maximum Green (s)	6.9	51.0	51.0	38.6	38.6		28.0	28.0		28.0	28.0	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5			5.5		5.5	5.5	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0		1.5	1.5		1.5	1.5	
Recall Mode	None	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)		5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)		15.0	15.0	16.0	16.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		0	0	0	0		0	0		0	0	

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 73.8	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 1: Old Hwy 99 & Henderson Blvd



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	110	1000	5	5	595	115	35	15	15	170	5	80
Future Volume (veh/h)	110	1000	5	5	595	115	35	15	15	170	5	80
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1870	1870	1870	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	116	1053	5	5	626	121	37	16	16	179	5	84
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	1	1	1	2	2	2	0	0	0	1	1	1
Cap, veh/h	149	1239	1050	246	726	140	177	75	47	356	13	226
Arrive On Green	0.08	0.66	0.66	0.48	0.48	0.48	0.15	0.15	0.15	0.15	0.15	0.15
Sat Flow, veh/h	1795	1885	1598	533	1523	294	532	507	314	1388	91	1521
Grp Volume(v), veh/h	116	1053	5	5	0	747	69	0	0	179	0	89
Grp Sat Flow(s),veh/h/ln	1795	1885	1598	533	0	1817	1353	0	0	1388	0	1611
Q Serve(g_s), s	3.6	24.6	0.1	0.4	0.0	20.7	0.3	0.0	0.0	2.9	0.0	2.8
Cycle Q Clear(g_c), s	3.6	24.6	0.1	14.8	0.0	20.7	3.2	0.0	0.0	6.1	0.0	2.8
Prop In Lane	1.00		1.00	1.00		0.16	0.54		0.23	1.00		0.94
Lane Grp Cap(c), veh/h	149	1239	1050	246	0	867	299	0	0	356	0	239
V/C Ratio(X)	0.78	0.85	0.00	0.02	0.00	0.86	0.23	0.00	0.00	0.50	0.00	0.37
Avail Cap(c_a), veh/h	219	1699	1440	356	0	1240	816	0	0	837	0	797
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.4	7.5	3.3	17.2	0.0	13.1	21.5	0.0	0.0	22.9	0.0	21.7
Incr Delay (d2), s/veh	5.4	3.2	0.0	0.0	0.0	4.6	0.1	0.0	0.0	0.4	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	5.0	0.0	0.0	0.0	6.7	0.8	0.0	0.0	2.1	0.0	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.9	10.7	3.3	17.3	0.0	17.7	21.6	0.0	0.0	23.3	0.0	22.1
LnGrp LOS	C	B	A	B	A	B	C	A	A	C	A	C
Approach Vol, veh/h		1174			752			69			268	
Approach Delay, s/veh		12.7			17.7			21.6			22.9	
Approach LOS		B			B			C			C	
Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	10.2	32.5		13.9		42.7		13.9				
Change Period (Y+Rc), s	5.5	5.5		5.5		5.5		5.5				
Max Green Setting (Gmax), s	6.9	38.6		28.0		51.0		28.0				
Max Q Clear Time (g_c+I1), s	5.6	22.7		5.2		26.6		8.1				
Green Ext Time (p_c), s	0.0	4.3		0.2		8.5		0.4				
Intersection Summary												
HCM 6th Ctrl Delay			15.8									
HCM 6th LOS			B									

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	2	1	5	20	1	135	125	1050	1	1	535	15
Future Vol, veh/h	2	1	5	20	1	135	125	1050	1	1	535	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	300	275	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	2	2	2	1	1	1	3	3	3
Mvmt Flow	2	1	5	21	1	142	132	1105	1	1	563	16

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	2015	1951	1106	1946	1943	571	579	0	0	1106	0	0
Stage 1	1370	1370	-	573	573	-	-	-	-	-	-	-
Stage 2	645	581	-	1373	1370	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.11	-	-	4.13	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.209	-	-	2.227	-	-
Pot Cap-1 Maneuver	44	65	258	49	65	520	1000	-	-	628	-	-
Stage 1	183	216	-	505	504	-	-	-	-	-	-	-
Stage 2	464	503	-	180	214	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	28	56	258	42	56	520	1000	-	-	628	-	-
Mov Cap-2 Maneuver	28	56	-	42	56	-	-	-	-	-	-	-
Stage 1	159	187	-	438	503	-	-	-	-	-	-	-
Stage 2	336	502	-	152	186	-	-	-	-	-	-	-

Approach	EB	WB	SE	NW
HCM Control Delay, s	59.8	33.6	1	0
HCM LOS	F	D		

Minor Lane/Major Mvmt	NWL	NWT	NWR	EBLn1	WBLn1	WBLn2	SEL	SET	SER
Capacity (veh/h)	628	-	-	74	43	520	1000	-	-
HCM Lane V/C Ratio	0.002	-	-	0.114	0.514	0.273	0.132	-	-
HCM Control Delay (s)	10.7	0	-	59.8	156.4	14.5	9.1	-	-
HCM Lane LOS	B	A	-	F	F	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.4	1.9	1.1	0.5	-	-

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	1	850	250	15	340	1	185	1	50	1	2	1
Future Volume (vph)	1	850	250	15	340	1	185	1	50	1	2	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		150	150		0	150		0	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			30			30	
Link Distance (ft)		3851			1410			1160			265	
Travel Time (s)		52.5			19.2			26.4			6.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6		6	2			4			8		
Detector Phase	6	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		26.0	26.0	
Total Split (s)	64.0	64.0	64.0	64.0	64.0		26.0	26.0		26.0	26.0	
Total Split (%)	71.1%	71.1%	71.1%	71.1%	71.1%		28.9%	28.9%		28.9%	28.9%	
Maximum Green (s)	58.0	58.0	58.0	58.0	58.0		22.0	22.0		22.0	22.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		4.0	4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		17.0	17.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 66	
Natural Cycle: 65	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 3: 88th Ave & Old Hwy 99

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	1	850	250	15	340	1	185	1	50	1	2	1
Future Volume (veh/h)	1	850	250	15	340	1	185	1	50	1	2	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1870	1870	1870	1900	1900	1900
Adj Flow Rate, veh/h	1	895	263	16	358	1	195	1	53	1	2	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	1	1	1	1	1	1	2	2	2	0	0	0
Cap, veh/h	676	1123	951	272	1119	3	418	5	284	137	201	79
Arrive On Green	0.60	0.60	0.60	0.60	0.60	0.60	0.18	0.18	0.18	0.18	0.18	0.18
Sat Flow, veh/h	1031	1885	1598	489	1879	5	1414	29	1560	205	1101	436
Grp Volume(v), veh/h	1	895	263	16	0	359	195	0	54	4	0	0
Grp Sat Flow(s),veh/h/ln	1031	1885	1598	489	0	1884	1414	0	1590	1742	0	0
Q Serve(g_s), s	0.0	16.5	3.6	1.2	0.0	4.3	5.8	0.0	1.3	0.0	0.0	0.0
Cycle Q Clear(g_c), s	4.3	16.5	3.6	17.6	0.0	4.3	5.9	0.0	1.3	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	1.00		0.98	0.25		0.25
Lane Grp Cap(c), veh/h	676	1123	951	272	0	1122	418	0	290	418	0	0
V/C Ratio(X)	0.00	0.80	0.28	0.06	0.00	0.32	0.47	0.00	0.19	0.01	0.00	0.00
Avail Cap(c_a), veh/h	1390	2429	2058	611	0	2428	852	0	777	928	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	5.6	7.0	4.4	13.8	0.0	4.5	17.4	0.0	15.6	15.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.3	0.2	0.1	0.0	0.2	0.8	0.0	0.3	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.6	0.4	0.1	0.0	0.6	1.8	0.0	0.4	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	5.6	8.4	4.6	13.9	0.0	4.7	18.2	0.0	15.9	15.1	0.0	0.0
LnGrp LOS	A	A	A	B	A	A	B	A	B	B	A	A
Approach Vol, veh/h		1159			375			249			4	
Approach Delay, s/veh		7.5			5.1			17.7			15.1	
Approach LOS		A			A			B			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		32.8		12.2		32.8		12.2				
Change Period (Y+Rc), s		6.0		4.0		6.0		4.0				
Max Green Setting (Gmax), s		58.0		22.0		58.0		22.0				
Max Q Clear Time (g_c+I1), s		19.6		7.9		18.5		2.1				
Green Ext Time (p_c), s		2.2		0.7		8.4		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			8.4
HCM 6th LOS			A

Intersection	
Int Delay, s/veh	3.9

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	775	25	120	270	20	170
Future Vol, veh/h	775	25	120	270	20	170
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	450	300	-	300	0
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	1	1	2	2	1	1
Mvmt Flow	816	26	126	284	21	179

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	842	0	1352	816
Stage 1	-	-	-	-	816	-
Stage 2	-	-	-	-	536	-
Critical Hdwy	-	-	4.12	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.218	-	3.509	3.309
Pot Cap-1 Maneuver	-	-	794	-	166	378
Stage 1	-	-	-	-	436	-
Stage 2	-	-	-	-	589	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	794	-	140	378
Mov Cap-2 Maneuver	-	-	-	-	337	-
Stage 1	-	-	-	-	436	-
Stage 2	-	-	-	-	495	-

Approach	EB	WB	NE
HCM Control Delay, s	0	3.2	22.1
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	337	378	-	-	794	-
HCM Lane V/C Ratio	0.062	0.473	-	-	0.159	-
HCM Control Delay (s)	16.4	22.8	-	-	10.4	-
HCM Lane LOS	C	C	-	-	B	-
HCM 95th %tile Q(veh)	0.2	2.5	-	-	0.6	-

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	110	1000	5	5	595	115	35	15	15	170	5	80
Future Volume (vph)	110	1000	5	5	595	115	35	15	15	170	5	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	175		50	50		0	0		0	150		0
Storage Lanes	1		1	1		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		1810			1652			415			1137	
Travel Time (s)		24.7			22.5			9.4			25.8	
Turn Type	Prot	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	1	6			2			4			8	
Permitted Phases			6	2			4			8		
Detector Phase	1	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	10.5	25.5	25.5	26.5	26.5		33.5	33.5		33.5	33.5	
Total Split (s)	19.0	55.0	55.0	36.0	36.0		35.0	35.0		35.0	35.0	
Total Split (%)	21.1%	61.1%	61.1%	40.0%	40.0%		38.9%	38.9%		38.9%	38.9%	
Maximum Green (s)	13.5	49.5	49.5	30.5	30.5		29.5	29.5		29.5	29.5	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5			5.5		5.5	5.5	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	2.0	3.0	3.0	3.0	3.0		1.5	1.5		1.5	1.5	
Recall Mode	None	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)		5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)		15.0	15.0	16.0	16.0		23.0	23.0		23.0	23.0	
Pedestrian Calls (#/hr)		0	0	0	0		0	0		0	0	

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 56.7	
Natural Cycle: 75	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 1: Old Hwy 99 & Henderson Blvd

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	110	1000	5	5	595	115	35	15	15	170	5	80
Future Volume (veh/h)	110	1000	5	5	595	115	35	15	15	170	5	80
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1870	1870	1870	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	116	1053	5	5	626	121	37	16	16	179	5	84
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	1	1	1	2	2	2	0	0	0	1	1	1
Cap, veh/h	163	2010	896	358	988	191	230	95	56	427	15	248
Arrive On Green	0.09	0.56	0.56	0.33	0.33	0.33	0.16	0.16	0.16	0.16	0.16	0.16
Sat Flow, veh/h	1795	3582	1598	533	2971	573	561	584	346	1388	91	1521
Grp Volume(v), veh/h	116	1053	5	5	374	373	69	0	0	179	0	89
Grp Sat Flow(s),veh/h/ln	1795	1791	1598	533	1777	1767	1491	0	0	1388	0	1611
Q Serve(g_s), s	2.5	7.3	0.1	0.3	7.1	7.1	0.0	0.0	0.0	2.3	0.0	2.0
Cycle Q Clear(g_c), s	2.5	7.3	0.1	0.3	7.1	7.1	2.0	0.0	0.0	4.3	0.0	2.0
Prop In Lane	1.00		1.00	1.00		0.32	0.54		0.23	1.00		0.94
Lane Grp Cap(c), veh/h	163	2010	896	358	591	587	382	0	0	427	0	263
V/C Ratio(X)	0.71	0.52	0.01	0.01	0.63	0.63	0.18	0.00	0.00	0.42	0.00	0.34
Avail Cap(c_a), veh/h	608	4446	1983	588	1359	1352	1243	0	0	1227	0	1192
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.6	5.4	3.9	9.0	11.3	11.3	14.5	0.0	0.0	15.6	0.0	14.8
Incr Delay (d2), s/veh	2.2	0.2	0.0	0.0	1.1	1.1	0.1	0.0	0.0	0.2	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.9	0.0	0.0	1.9	1.9	0.5	0.0	0.0	1.3	0.0	0.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.8	5.7	3.9	9.0	12.4	12.4	14.6	0.0	0.0	15.9	0.0	15.1
LnGrp LOS	B	A	A	A	B	B	B	A	A	B	A	B
Approach Vol, veh/h		1174			752			69			268	
Approach Delay, s/veh		7.0			12.4			14.6			15.6	
Approach LOS		A			B			B			B	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	9.1	18.8		12.0		27.9		12.0				
Change Period (Y+Rc), s	5.5	5.5		5.5		5.5		5.5				
Max Green Setting (Gmax), s	13.5	30.5		29.5		49.5		29.5				
Max Q Clear Time (g_c+I1), s	4.5	9.1		4.0		9.3		6.3				
Green Ext Time (p_c), s	0.1	4.1		0.2		8.1		0.4				

Intersection Summary			
HCM 6th Ctrl Delay			10.1
HCM 6th LOS			B

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	2	1	5	20	1	135	125	1050	1	1	535	15
Future Vol, veh/h	2	1	5	20	1	135	125	1050	1	1	535	15
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	300	275	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	2	2	2	1	1	1	3	3	3
Mvmt Flow	2	1	5	21	1	142	132	1105	1	1	563	16

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	1654	1951	553	1390	1943	290	579	0	0	1106	0	0
Stage 1	1370	1370	-	573	573	-	-	-	-	-	-	-
Stage 2	284	581	-	817	1370	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.54	6.54	6.94	4.12	-	-	4.16	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.52	4.02	3.32	2.21	-	-	2.23	-	-
Pot Cap-1 Maneuver	66	65	482	102	64	707	998	-	-	621	-	-
Stage 1	157	216	-	472	502	-	-	-	-	-	-	-
Stage 2	705	503	-	337	212	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	47	56	482	89	55	707	998	-	-	621	-	-
Mov Cap-2 Maneuver	47	56	-	89	55	-	-	-	-	-	-	-
Stage 1	136	187	-	410	501	-	-	-	-	-	-	-
Stage 2	561	502	-	288	184	-	-	-	-	-	-	-

Approach	EB	WB	SE	NW
HCM Control Delay, s	39.4	18.1	1	0
HCM LOS	E	C		

Minor Lane/Major Mvmt	NWL	NWT	NWR	EBLn1	WBLn1	WBLn2	SEL	SET	SER
Capacity (veh/h)	621	-	-	113	86	707	998	-	-
HCM Lane V/C Ratio	0.002	-	-	0.075	0.257	0.201	0.132	-	-
HCM Control Delay (s)	10.8	0	-	39.4	60.8	11.4	9.2	-	-
HCM Lane LOS	B	A	-	E	F	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.9	0.7	0.5	-	-

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	1	850	250	15	340	1	185	1	50	1	2	1
Future Volume (vph)	1	850	250	15	340	1	185	1	50	1	2	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		150	150		0	150		0	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			30			30	
Link Distance (ft)		3851			489			1160			265	
Travel Time (s)		52.5			6.7			26.4			6.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6		6	2			4			8		
Detector Phase	6	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		26.0	26.0	
Total Split (s)	55.0	55.0	55.0	55.0	55.0		35.0	35.0		35.0	35.0	
Total Split (%)	61.1%	61.1%	61.1%	61.1%	61.1%		38.9%	38.9%		38.9%	38.9%	
Maximum Green (s)	49.0	49.0	49.0	49.0	49.0		31.0	31.0		31.0	31.0	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		4.0	4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	15.0	15.0	15.0	15.0	15.0		15.0	15.0		17.0	17.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 45.7
Natural Cycle: 55
Control Type: Actuated-Uncoordinated

Splits and Phases: 3: 88th Ave & Old Hwy 99

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	1	850	250	15	340	1	185	1	50	1	2	1
Future Volume (veh/h)	1	850	250	15	340	1	185	1	50	1	2	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1870	1870	1870	1900	1900	1900
Adj Flow Rate, veh/h	1	895	263	16	358	1	195	1	53	1	2	1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	1	1	1	1	1	1	2	2	2	0	0	0
Cap, veh/h	672	1732	773	384	1772	5	508	6	304	179	222	85
Arrive On Green	0.48	0.48	0.48	0.48	0.48	0.48	0.20	0.20	0.20	0.20	0.20	0.20
Sat Flow, veh/h	1031	3582	1598	489	3664	10	1414	29	1560	177	1138	438
Grp Volume(v), veh/h	1	895	263	16	175	184	195	0	54	4	0	0
Grp Sat Flow(s),veh/h/ln	1031	1791	1598	489	1791	1883	1414	0	1590	1753	0	0
Q Serve(g_s), s	0.0	5.4	3.2	0.7	1.7	1.7	3.9	0.0	0.9	0.0	0.0	0.0
Cycle Q Clear(g_c), s	1.8	5.4	3.2	6.1	1.7	1.7	4.0	0.0	0.9	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.01	1.00		0.98	0.25		0.25
Lane Grp Cap(c), veh/h	672	1732	773	384	866	911	508	0	310	487	0	0
V/C Ratio(X)	0.00	0.52	0.34	0.04	0.20	0.20	0.38	0.00	0.17	0.01	0.00	0.00
Avail Cap(c_a), veh/h	1796	5639	2515	917	2819	2965	1640	0	1583	1820	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	5.1	5.5	5.0	7.6	4.6	4.6	11.7	0.0	10.4	10.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.2	0.3	0.0	0.1	0.1	0.5	0.0	0.3	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.5	0.3	0.0	0.2	0.2	1.0	0.0	0.3	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	5.1	5.8	5.2	7.7	4.7	4.7	12.2	0.0	10.7	10.1	0.0	0.0
LnGrp LOS	A	A	A	A	A	A	B	A	B	B	A	A
Approach Vol, veh/h		1159			375			249			4	
Approach Delay, s/veh		5.6			4.8			11.8			10.1	
Approach LOS		A			A			B			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		21.1		10.1		21.1		10.1				
Change Period (Y+Rc), s		6.0		4.0		6.0		4.0				
Max Green Setting (Gmax), s		49.0		31.0		49.0		31.0				
Max Q Clear Time (g_c+I1), s		8.1		6.0		7.4		2.1				
Green Ext Time (p_c), s		2.1		0.8		7.7		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			6.4
HCM 6th LOS			A

Intersection	
Int Delay, s/veh	3.9

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	775	25	120	270	20	170
Future Vol, veh/h	775	25	120	270	20	170
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	450	300	-	300	0
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	1	1	2	2	1	1
Mvmt Flow	816	26	126	284	21	179

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	842	0	1352	816
Stage 1	-	-	-	-	816	-
Stage 2	-	-	-	-	536	-
Critical Hdwy	-	-	4.12	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.218	-	3.509	3.309
Pot Cap-1 Maneuver	-	-	794	-	166	378
Stage 1	-	-	-	-	436	-
Stage 2	-	-	-	-	589	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	794	-	140	378
Mov Cap-2 Maneuver	-	-	-	-	337	-
Stage 1	-	-	-	-	436	-
Stage 2	-	-	-	-	495	-

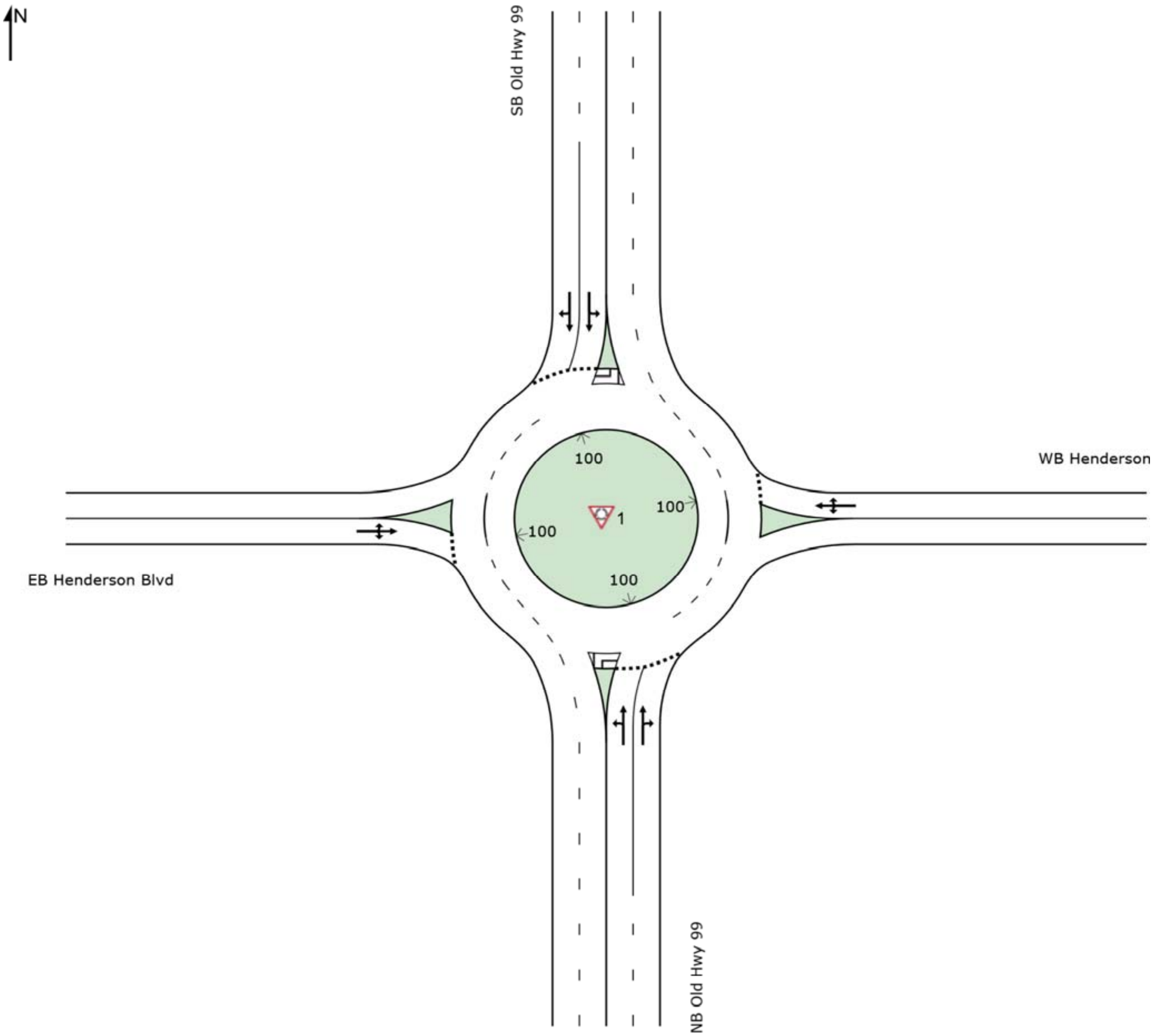
Approach	EB	WB	NE
HCM Control Delay, s	0	3.2	22.1
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	337	378	-	-	794	-
HCM Lane V/C Ratio	0.062	0.473	-	-	0.159	-
HCM Control Delay (s)	16.4	22.8	-	-	10.4	-
HCM Lane LOS	C	C	-	-	B	-
HCM 95th %tile Q(veh)	0.2	2.5	-	-	0.6	-

SITE LAYOUT

Site: 1 [AM 2025 Old Hwy 99-Henderson Blvd - Baseline]

Projected 2040
AM Peak Hour
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 1 [PM 2025 Old Hwy 99-Henderson Blvd - Baseline]

Projected 2025
PM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles

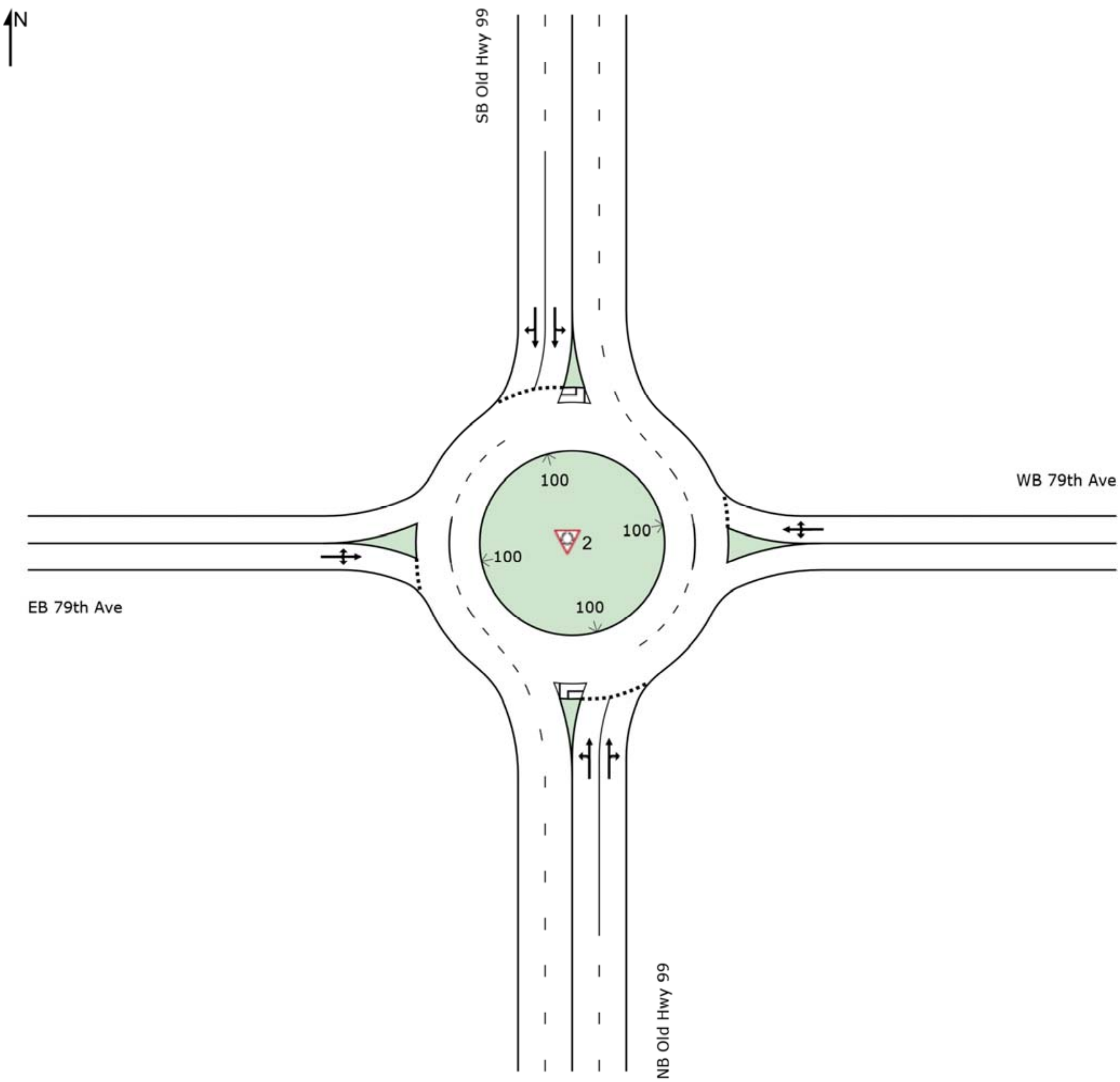
Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	5	2.0	0.273	10.5	LOS B	1.5	37.9	0.35	0.45	0.35	36.9
8	T1	595	2.0	0.273	4.6	LOS A	1.5	38.6	0.34	0.46	0.34	36.9
18	R2	115	2.0	0.273	4.7	LOS A	1.5	38.6	0.34	0.46	0.34	35.6
Approach		715	2.0	0.273	4.7	LOS A	1.5	38.6	0.34	0.46	0.34	36.7
East: WB Henderson Blvd												
1	L2	170	1.0	0.306	12.0	LOS B	1.2	30.2	0.53	0.80	0.53	34.9
6	T1	5	1.0	0.306	6.2	LOS A	1.2	30.2	0.53	0.80	0.53	34.7
16	R2	80	1.0	0.306	6.1	LOS A	1.2	30.2	0.53	0.80	0.53	33.7
Approach		255	1.0	0.306	10.1	LOS B	1.2	30.2	0.53	0.80	0.53	34.5
North: SB Old Hwy 99												
7	L2	110	1.0	0.431	10.8	LOS B	2.9	73.8	0.45	0.53	0.45	36.1
4	T1	1000	1.0	0.431	4.9	LOS A	3.0	75.4	0.44	0.49	0.44	36.3
14	R2	5	1.0	0.431	5.0	LOS A	3.0	75.4	0.44	0.46	0.44	35.2
Approach		1115	1.0	0.431	5.5	LOS A	3.0	75.4	0.45	0.49	0.45	36.3
West: EB Henderson Blvd												
5	L2	35	0.0	0.103	13.1	LOS B	0.4	9.6	0.62	0.83	0.62	34.7
2	T1	15	0.0	0.103	7.2	LOS A	0.4	9.6	0.62	0.83	0.62	34.5
12	R2	15	0.0	0.103	7.2	LOS A	0.4	9.6	0.62	0.83	0.62	33.6
Approach		65	0.0	0.103	10.4	LOS B	0.4	9.6	0.62	0.83	0.62	34.4
All Vehicles		2150	1.3	0.431	5.9	LOS A	3.0	75.4	0.43	0.53	0.43	36.1

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 2 [AM 2040 Old Hwy 99-79th Ave - Land Use 2]

Projected 2040
AM Peak Hour
Site Category: (None)
Roundabout



Organisation: SCJ ALLIANCE | Created: Monday, April 13, 2020 9:33:50 AM
Project: N:\Projects\0625 City of Tumwater\0625.29 Tumwater Old Hwy 99 and 79th Ave Corridor Study\Phase 04 - Alternatives Analysis\Operations \Old Hwy 99-79th Ave.sip8

MOVEMENT SUMMARY

Site: 2 [PM 2025 Old Hwy 99-79th Ave - Baseline]

Projected 2025
PM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles

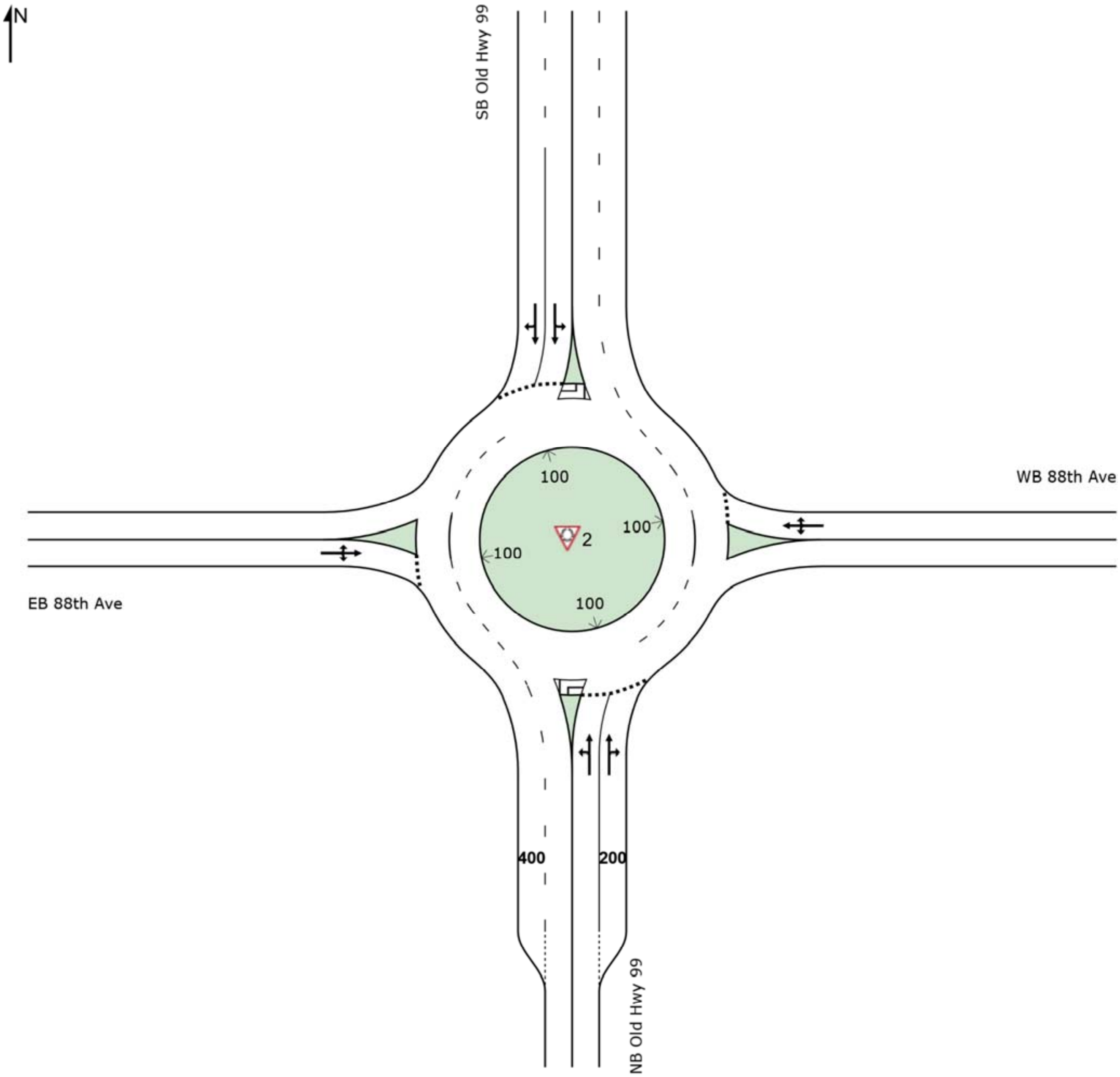
Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	5	3.0	0.209	10.4	LOS B	1.0	26.2	0.29	0.43	0.29	37.1
8	T1	535	3.0	0.209	4.5	LOS A	1.0	26.5	0.28	0.43	0.28	37.1
18	R2	15	3.0	0.209	4.6	LOS A	1.0	26.5	0.28	0.42	0.28	35.8
Approach		555	3.0	0.209	4.6	LOS A	1.0	26.5	0.28	0.43	0.28	37.0
East: WB 79th Ave												
1	L2	20	2.0	0.180	11.6	LOS B	0.6	15.9	0.45	0.68	0.45	36.6
6	T1	1	2.0	0.180	5.7	LOS A	0.6	15.9	0.45	0.68	0.45	36.5
16	R2	135	2.0	0.180	5.6	LOS A	0.6	15.9	0.45	0.68	0.45	35.4
Approach		156	2.0	0.180	6.4	LOS A	0.6	15.9	0.45	0.68	0.45	35.6
North: SB Old Hwy 99												
7	L2	125	1.0	0.402	9.9	LOS A	2.7	68.5	0.16	0.44	0.16	37.0
4	T1	1050	1.0	0.402	4.1	LOS A	2.7	68.7	0.15	0.40	0.15	37.3
14	R2	5	1.0	0.402	4.2	LOS A	2.7	68.7	0.15	0.37	0.15	36.3
Approach		1180	1.0	0.402	4.7	LOS A	2.7	68.7	0.15	0.40	0.15	37.3
West: EB 79th Ave												
5	L2	5	0.0	0.020	12.5	LOS B	0.1	1.6	0.52	0.70	0.52	35.6
2	T1	5	0.0	0.020	6.6	LOS A	0.1	1.6	0.52	0.70	0.52	35.4
12	R2	5	0.0	0.020	6.6	LOS A	0.1	1.6	0.52	0.70	0.52	34.4
Approach		15	0.0	0.020	8.6	LOS A	0.1	1.6	0.52	0.70	0.52	35.1
All Vehicles		1906	1.7	0.402	4.8	LOS A	2.7	68.7	0.22	0.44	0.22	37.1

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 2 [PM 2040 Old Hwy 99-88th Ave - Land Use 2]

Projected 2040
PM Peak Hour
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 2 [PM 2025 Old Hwy 99-88th Ave - Baseline]

Projected 2025
PM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	15	1.0	0.138	10.5	LOS B	0.7	18.2	0.36	0.47	0.36	36.7
8	T1	340	1.0	0.138	4.6	LOS A	0.7	18.6	0.35	0.45	0.35	36.7
18	R2	1	1.0	0.138	4.7	LOS A	0.7	18.6	0.35	0.44	0.35	35.6
Approach		356	1.0	0.138	4.9	LOS A	0.7	18.6	0.35	0.45	0.35	36.7
East: WB 88th Ave												
1	L2	1	0.0	0.008	11.2	LOS B	0.0	0.6	0.40	0.53	0.40	36.5
6	T1	5	0.0	0.008	5.4	LOS A	0.0	0.6	0.40	0.53	0.40	36.3
16	R2	1	0.0	0.008	5.3	LOS A	0.0	0.6	0.40	0.53	0.40	35.3
Approach		7	0.0	0.008	6.2	LOS A	0.0	0.6	0.40	0.53	0.40	36.2
North: SB Old Hwy 99												
7	L2	1	1.0	0.418	9.9	LOS A	2.8	70.3	0.13	0.37	0.13	37.8
4	T1	850	1.0	0.418	4.0	LOS A	2.8	70.3	0.13	0.38	0.13	37.7
14	R2	250	1.0	0.336	4.2	LOS A	2.0	50.7	0.12	0.42	0.12	36.4
Approach		1101	1.0	0.418	4.1	LOS A	2.8	70.3	0.13	0.39	0.13	37.4
West: EB 88th Ave												
5	L2	185	2.0	0.307	13.1	LOS B	1.2	31.3	0.58	0.85	0.58	34.0
2	T1	1	2.0	0.307	7.2	LOS A	1.2	31.3	0.58	0.85	0.58	33.9
12	R2	50	2.0	0.307	7.2	LOS A	1.2	31.3	0.58	0.85	0.58	33.0
Approach		236	2.0	0.307	11.8	LOS B	1.2	31.3	0.58	0.85	0.58	33.8
All Vehicles		1700	1.1	0.418	5.3	LOS A	2.8	70.3	0.24	0.46	0.24	36.7

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
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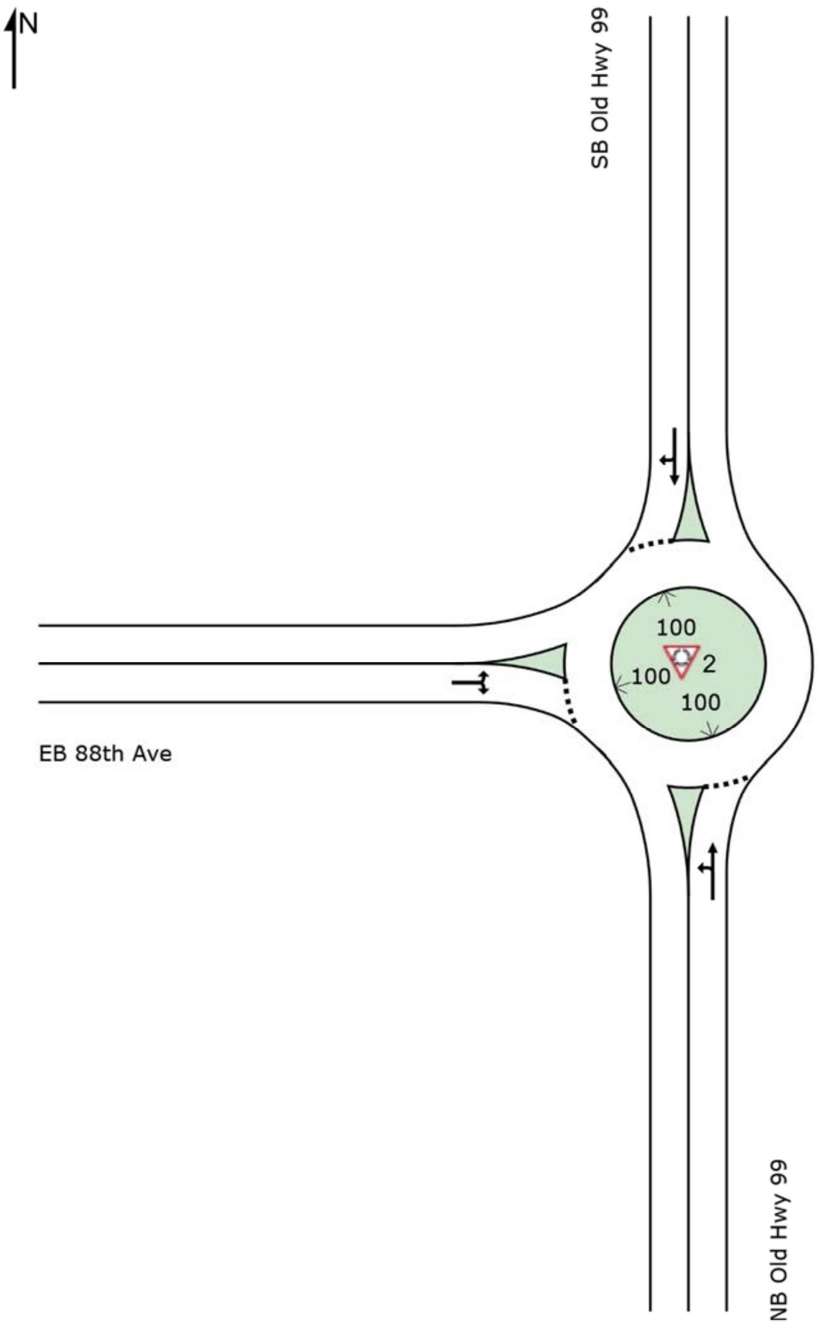
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 2 [PM 2025 Old Hwy 99-93rd Ave - Baseline]

Projected 2040
PM Peak Hour
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 2 [PM 2025 Old Hwy 99-93rd Ave - Baseline]

Projected 2040
PM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	126	2.0	0.291	9.9	LOS A	2.0	49.8	0.14	0.47	0.14	36.8
8	T1	284	2.0	0.291	3.9	LOS A	2.0	49.8	0.14	0.47	0.14	36.7
Approach		411	2.0	0.291	5.7	LOS A	2.0	49.8	0.14	0.47	0.14	36.7
North: SB Old Hwy 99												
4	T1	816	1.0	0.633	4.8	LOS A	5.4	135.3	0.46	0.48	0.46	36.5
14	R2	26	1.0	0.633	4.9	LOS A	5.4	135.3	0.46	0.48	0.46	35.4
Approach		842	1.0	0.633	4.8	LOS A	5.4	135.3	0.46	0.48	0.46	36.5
West: EB 88th Ave												
5	L2	21	1.0	0.265	14.5	LOS B	1.8	44.7	0.80	0.82	0.80	35.1
12	R2	179	1.0	0.265	8.6	LOS A	1.8	44.7	0.80	0.82	0.80	33.9
Approach		200	1.0	0.265	9.2	LOS A	1.8	44.7	0.80	0.82	0.80	34.1
All Vehicles		1453	1.3	0.633	5.7	LOS A	5.4	135.3	0.42	0.52	0.42	36.2

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
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Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	160	1365	10	5	825	155	40	15	15	205	5	110
Future Volume (vph)	160	1365	10	5	825	155	40	15	15	205	5	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	175		50	50		0	0		0	150		0
Storage Lanes	1		1	1		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		1810			1652			415			1137	
Travel Time (s)		24.7			22.5			9.4			25.8	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	0%	0%	0%	1%	1%	1%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	1	6			2			4			8	
Permitted Phases			6	2			4			8		
Detector Phase	1	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	10.5	25.5	25.5	26.5	26.5		33.5	33.5		33.5	33.5	
Total Split (s)	19.5	106.5	106.5	87.0	87.0		33.5	33.5		33.5	33.5	
Total Split (%)	13.9%	76.1%	76.1%	62.1%	62.1%		23.9%	23.9%		23.9%	23.9%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5			5.5		5.5	5.5	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Recall Mode	None	Min	Min	Min	Min		None	None		None	None	

Intersection Summary	
Area Type:	Other
Cycle Length: 140	
Actuated Cycle Length: 135.4	
Natural Cycle: 140	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 1: Old Hwy 99 & Henderson Blvd

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	160	1365	10	5	825	155	40	15	15	205	5	110
Future Volume (veh/h)	160	1365	10	5	825	155	40	15	15	205	5	110
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1870	1870	1870	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	160	1365	10	5	825	155	40	15	15	205	5	110
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	1	1	1	2	2	2	0	0	0	1	1	1
Cap, veh/h	184	1394	1181	76	913	171	138	52	40	278	12	275
Arrive On Green	0.10	0.74	0.74	0.60	0.60	0.60	0.18	0.18	0.18	0.18	0.18	0.18
Sat Flow, veh/h	1795	1885	1598	395	1531	288	538	292	226	1391	70	1538
Grp Volume(v), veh/h	160	1365	10	5	0	980	70	0	0	205	0	115
Grp Sat Flow(s),veh/h/ln	1795	1885	1598	395	0	1819	1055	0	0	1391	0	1608
Q Serve(g_s), s	11.8	91.8	0.2	1.6	0.0	63.4	4.0	0.0	0.0	9.2	0.0	8.5
Cycle Q Clear(g_c), s	11.8	91.8	0.2	74.2	0.0	63.4	12.5	0.0	0.0	21.8	0.0	8.5
Prop In Lane	1.00		1.00	1.00		0.16	0.57		0.21	1.00		0.96
Lane Grp Cap(c), veh/h	184	1394	1181	76	0	1084	231	0	0	278	0	287
V/C Ratio(X)	0.87	0.98	0.01	0.07	0.00	0.90	0.30	0.00	0.00	0.74	0.00	0.40
Avail Cap(c_a), veh/h	187	1418	1201	80	0	1104	274	0	0	320	0	335
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	59.4	16.5	4.6	60.6	0.0	23.8	51.5	0.0	0.0	54.8	0.0	48.8
Incr Delay (d2), s/veh	31.2	18.9	0.0	0.4	0.0	10.4	0.3	0.0	0.0	5.8	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	6.8	36.7	0.1	0.2	0.0	27.1	2.2	0.0	0.0	7.3	0.0	3.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	90.6	35.4	4.6	61.0	0.0	34.2	51.8	0.0	0.0	60.6	0.0	49.1
LnGrp LOS	F	D	A	E	A	C	D	A	A	E	A	D
Approach Vol, veh/h		1535			985			70			320	
Approach Delay, s/veh		41.0			34.3			51.8			56.5	
Approach LOS		D			C			D			E	

Timer - Assigned Phs	1	2	4	6	8
Phs Duration (G+Y+Rc), s	19.3	85.6	29.5	104.8	29.5
Change Period (Y+Rc), s	5.5	5.5	5.5	5.5	5.5
Max Green Setting (Gmax), s	14.0	81.5	28.0	101.0	28.0
Max Q Clear Time (g_c+I1), s	13.8	76.2	14.5	93.8	23.8
Green Ext Time (p_c), s	0.0	3.0	0.1	5.5	0.2

Intersection Summary	
HCM 6th Ctrl Delay	40.7
HCM 6th LOS	D

Intersection	
Int Delay, s/veh	51.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	2	1	5	30	1	145	1	805	15	130	1450	1
Future Vol, veh/h	2	1	5	30	1	145	1	805	15	130	1450	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	300	275	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	2	2	2	1	1	1	3	3	3
Mvmt Flow	2	1	5	30	1	145	1	805	15	130	1450	1

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	2599	2526	813	2529	2533	1451	1451	0	0	820	0	0
Stage 1	815	815	-	1711	1711	-	-	-	-	-	-	-
Stage 2	1784	1711	-	818	822	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.12	6.52	6.22	4.11	-	-	4.13	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.518	4.018	3.318	2.209	-	-	2.227	-	-
Pot Cap-1 Maneuver	17	28	382	~ 19	27	160	470	-	-	805	-	-
Stage 1	374	394	-	115	146	-	-	-	-	-	-	-
Stage 2	105	147	-	370	388	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	0	5	382	~ 5	5	160	470	-	-	805	-	-
Mov Cap-2 Maneuver	0	5	-	~ 5	5	-	-	-	-	-	-	-
Stage 1	373	393	-	115	24	-	-	-	-	-	-	-
Stage 2	2	25	-	363	387	-	-	-	-	-	-	-

Approach	EB	WB	SE	NW
HCM Control Delay, s	178.7	$ 743.6	0	0.8
HCM LOS	F	F		

Minor Lane/Major Mvmt	NWL	NWT	NWR	EBLn1	WBLn1	WBLn2	SEL	SET	SER
Capacity (veh/h)	805	-	-	28	5	160	470	-	-
HCM Lane V/C Ratio	0.161	-	-	0.286	6.2	0.906	0.002	-	-
HCM Control Delay (s)	10.3	0	-	178.7	$ 3732.9	104.5	12.7	-	-
HCM Lane LOS	B	A	-	F	F	F	B	-	-
HCM 95th %tile Q(veh)	0.6	-	-	0.9	5.4	6.5	0	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	1	1115	410	20	450	1	220	1	60	1	2	1
Future Volume (vph)	1	1115	410	20	450	1	220	1	60	1	2	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		150	150		0	150		0	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			30			30	
Link Distance (ft)		3851			1410			1160			265	
Travel Time (s)		52.5			19.2			26.4			6.0	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	2%	2%	2%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6		6	2			4			8		
Detector Phase	6	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		26.0	26.0	
Total Split (s)	64.0	64.0	64.0	64.0	64.0		26.0	26.0		26.0	26.0	
Total Split (%)	71.1%	71.1%	71.1%	71.1%	71.1%		28.9%	28.9%		28.9%	28.9%	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		4.0	4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 82.1	
Natural Cycle: 90	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 3: 88th Ave & Old Hwy 99

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	1	1115	410	20	450	1	220	1	60	1	2	1
Future Volume (veh/h)	1	1115	410	20	450	1	220	1	60	1	2	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1870	1870	1870	1900	1900	1900
Adj Flow Rate, veh/h	1	1115	410	20	450	1	220	1	60	1	2	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	1	1	1	1	1	1	2	2	2	0	0	0
Cap, veh/h	638	1259	1067	169	1256	3	370	5	293	113	195	81
Arrive On Green	0.67	0.67	0.67	0.67	0.67	0.67	0.19	0.19	0.19	0.19	0.19	0.19
Sat Flow, veh/h	947	1885	1598	344	1880	4	1414	26	1563	253	1040	431
Grp Volume(v), veh/h	1	1115	410	20	0	451	220	0	61	4	0	0
Grp Sat Flow(s),veh/h/ln	947	1885	1598	344	0	1884	1414	0	1589	1723	0	0
Q Serve(g_s), s	0.0	33.2	7.9	3.5	0.0	7.2	10.2	0.0	2.2	0.0	0.0	0.0
Cycle Q Clear(g_c), s	7.2	33.2	7.9	36.6	0.0	7.2	10.3	0.0	2.2	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	1.00		0.98	0.25		0.25
Lane Grp Cap(c), veh/h	638	1259	1067	169	0	1258	370	0	298	388	0	0
V/C Ratio(X)	0.00	0.89	0.38	0.12	0.00	0.36	0.59	0.00	0.20	0.01	0.00	0.00
Avail Cap(c_a), veh/h	802	1585	1343	228	0	1585	556	0	507	607	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	6.6	9.3	5.1	24.2	0.0	5.0	26.9	0.0	23.7	22.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	5.4	0.2	0.3	0.0	0.2	1.5	0.0	0.3	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	9.0	1.5	0.3	0.0	1.6	3.5	0.0	0.8	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	6.6	14.7	5.3	24.5	0.0	5.2	28.5	0.0	24.0	22.8	0.0	0.0
LnGrp LOS	A	B	A	C	A	A	C	A	C	C	A	A
Approach Vol, veh/h		1526			471			281			4	
Approach Delay, s/veh		12.2			6.0			27.5			22.8	
Approach LOS		B			A			C			C	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		52.1		16.9		52.1		16.9				
Change Period (Y+Rc), s		6.0		4.0		6.0		4.0				
Max Green Setting (Gmax), s		58.0		22.0		58.0		22.0				
Max Q Clear Time (g_c+I1), s		38.6		12.3		35.2		2.1				
Green Ext Time (p_c), s		2.7		0.7		10.9		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			12.8									
HCM 6th LOS			B									

Intersection	
Int Delay, s/veh	5.3

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	1025	30	175	375	20	185
Future Vol, veh/h	1025	30	175	375	20	185
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	450	300	-	300	0
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	1	1	2	2	1	1
Mvmt Flow	1025	30	175	375	20	185

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1055	0	1750	1025
Stage 1	-	-	-	-	1025	-
Stage 2	-	-	-	-	725	-
Critical Hdwy	-	-	4.12	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.218	-	3.509	3.309
Pot Cap-1 Maneuver	-	-	660	-	95	287
Stage 1	-	-	-	-	348	-
Stage 2	-	-	-	-	481	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	660	-	70	287
Mov Cap-2 Maneuver	-	-	-	-	244	-
Stage 1	-	-	-	-	348	-
Stage 2	-	-	-	-	354	-

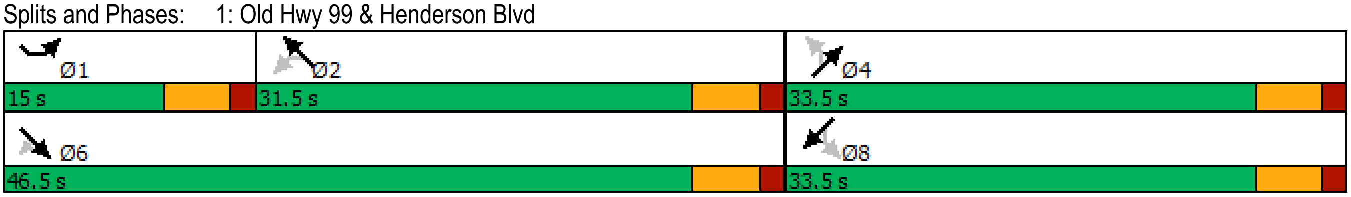
Approach	EB	WB	NE
HCM Control Delay, s	0	3.9	36.1
HCM LOS			E

Minor Lane/Major Mvmt	NELn1	NELn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	244	287	-	-	660	-
HCM Lane V/C Ratio	0.082	0.645	-	-	0.265	-
HCM Control Delay (s)	21.1	37.7	-	-	12.4	-
HCM Lane LOS	C	E	-	-	B	-
HCM 95th %tile Q(veh)	0.3	4.1	-	-	1.1	-

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	160	1365	10	5	825	155	40	15	15	205	5	110
Future Volume (vph)	160	1365	10	5	825	155	40	15	15	205	5	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	175		50	50		0	0		0	150		0
Storage Lanes	1		1	1		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		1810			1652			415			1137	
Travel Time (s)		24.7			22.5			9.4			25.8	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	0%	0%	0%	1%	1%	1%
Shared Lane Traffic (%)												
Turn Type	Prot	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases	1	6			2			4			8	
Permitted Phases			6	2			4			8		
Detector Phase	1	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	10.5	25.5	25.5	26.5	26.5		33.5	33.5		33.5	33.5	
Total Split (s)	15.0	46.5	46.5	31.5	31.5		33.5	33.5		33.5	33.5	
Total Split (%)	18.8%	58.1%	58.1%	39.4%	39.4%		41.9%	41.9%		41.9%	41.9%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	1.5	1.5	1.5	1.5	1.5		1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	5.5	5.5	5.5	5.5	5.5			5.5		5.5	5.5	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Recall Mode	None	Min	Min	Min	Min		None	None		None	None	

Intersection Summary	
Area Type:	Other
Cycle Length: 80	
Actuated Cycle Length: 62.3	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 1: Old Hwy 99 & Henderson Blvd



Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	160	1365	10	5	825	155	40	15	15	205	5	110
Future Volume (veh/h)	160	1365	10	5	825	155	40	15	15	205	5	110
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1870	1870	1870	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	160	1365	10	5	825	155	40	15	15	205	5	110
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	1	1	1	2	2	2	0	0	0	1	1	1
Cap, veh/h	205	2158	963	290	1119	210	205	76	45	413	12	262
Arrive On Green	0.11	0.60	0.60	0.37	0.37	0.37	0.17	0.17	0.17	0.17	0.17	0.17
Sat Flow, veh/h	1795	3582	1598	395	2985	561	520	449	264	1391	70	1538
Grp Volume(v), veh/h	160	1365	10	5	491	489	70	0	0	205	0	115
Grp Sat Flow(s),veh/h/ln	1795	1791	1598	395	1777	1769	1233	0	0	1391	0	1608
Q Serve(g_s), s	4.2	11.8	0.1	0.4	11.6	11.6	0.3	0.0	0.0	2.4	0.0	3.1
Cycle Q Clear(g_c), s	4.2	11.8	0.1	1.2	11.6	11.6	3.4	0.0	0.0	5.8	0.0	3.1
Prop In Lane	1.00		1.00	1.00		0.32	0.57		0.21	1.00		0.96
Lane Grp Cap(c), veh/h	205	2158	963	290	666	663	327	0	0	413	0	274
V/C Ratio(X)	0.78	0.63	0.01	0.02	0.74	0.74	0.21	0.00	0.00	0.50	0.00	0.42
Avail Cap(c_a), veh/h	353	3035	1354	354	955	951	922	0	0	982	0	931
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.8	6.2	3.8	10.1	13.1	13.1	17.5	0.0	0.0	18.9	0.0	17.9
Incr Delay (d2), s/veh	2.4	0.3	0.0	0.0	1.8	1.8	0.1	0.0	0.0	0.3	0.0	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.6	1.8	0.0	0.0	3.5	3.5	0.6	0.0	0.0	2.0	0.0	1.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.3	6.5	3.8	10.1	14.9	14.9	17.6	0.0	0.0	19.2	0.0	18.3
LnGrp LOS	C	A	A	B	B	B	B	A	A	B	A	B
Approach Vol, veh/h		1535			985			70			320	
Approach Delay, s/veh		8.2			14.8			17.6			18.9	
Approach LOS		A			B			B			B	

Timer - Assigned Phs	1	2		4		6		8				
Phs Duration (G+Y+Rc), s	11.0	23.6		13.7		34.7		13.7				
Change Period (Y+Rc), s	5.5	5.5		5.5		5.5		5.5				
Max Green Setting (Gmax), s	9.5	26.0		28.0		41.0		28.0				
Max Q Clear Time (g_c+I1), s	6.2	13.6		5.4		13.8		7.8				
Green Ext Time (p_c), s	0.1	4.6		0.2		10.7		0.5				

Intersection Summary			
HCM 6th Ctrl Delay			11.9
HCM 6th LOS			B

Intersection	
Int Delay, s/veh	35.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Vol, veh/h	2	1	5	30	1	145	1	805	15	130	1450	1
Future Vol, veh/h	2	1	5	30	1	145	1	805	15	130	1450	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	300	275	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	2	2	2	1	1	1	3	3	3
Mvmt Flow	2	1	5	30	1	145	1	805	15	130	1450	1

Major/Minor	Minor1			Minor2			Major1			Major2		
Conflicting Flow All	1801	2526	410	2116	2533	726	1451	0	0	820	0	0
Stage 1	815	815	-	1711	1711	-	-	-	-	-	-	-
Stage 2	986	1711	-	405	822	-	-	-	-	-	-	-
Critical Hdwy	7.5	6.5	6.9	7.54	6.54	6.94	4.12	-	-	4.16	-	-
Critical Hdwy Stg 1	6.5	5.5	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.5	5.5	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.52	4.02	3.32	2.21	-	-	2.23	-	-
Pot Cap-1 Maneuver	51	28	596	~ 29	27	367	468	-	-	798	-	-
Stage 1	342	394	-	94	144	-	-	-	-	-	-	-
Stage 2	270	147	-	593	386	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	8	4	596	~ 7	4	367	468	-	-	798	-	-
Mov Cap-2 Maneuver	8	4	-	~ 7	4	-	-	-	-	-	-	-
Stage 1	341	393	-	94	23	-	-	-	-	-	-	-
Stage 2	25	23	-	585	385	-	-	-	-	-	-	-

Approach	EB	WB	SE	NW
HCM Control Delay, s	$ 369.1	$ 468.9	0	4.2
HCM LOS	F	F		

Minor Lane/Major Mvmt	NWL	NWT	NWR	EBLn1	WBLn1	WBLn2	SEL	SET	SER
Capacity (veh/h)	798	-	-	16	7	367	468	-	-
HCM Lane V/C Ratio	0.163	-	-	0.5	4.429	0.395	0.002	-	-
HCM Control Delay (s)	10.4	3.7	-	$ 369.1	$ 2563.5	21.1	12.7	-	-
HCM Lane LOS	B	A	-	F	F	C	B	-	-
HCM 95th %tile Q(veh)	0.6	-	-	1.3	5.2	1.8	0	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	1	1115	410	20	450	1	220	1	60	1	2	1
Future Volume (vph)	1	1115	410	20	450	1	220	1	60	1	2	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	125		150	150		0	150		0	0		0
Storage Lanes	1		1	1		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		50			50			30			30	
Link Distance (ft)		3851			497			1160			265	
Travel Time (s)		52.5			6.8			26.4			6.0	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	2%	2%	2%	0%	0%	0%
Shared Lane Traffic (%)												
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		6			2			4			8	
Permitted Phases	6		6	2			4			8		
Detector Phase	6	6	6	2	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	26.0	26.0	26.0	26.0	26.0		24.0	24.0		26.0	26.0	
Total Split (s)	58.0	58.0	58.0	58.0	58.0		32.0	32.0		32.0	32.0	
Total Split (%)	64.4%	64.4%	64.4%	64.4%	64.4%		35.6%	35.6%		35.6%	35.6%	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0		4.0	4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min	Min	Min	Min		None	None		None	None	

Intersection Summary	
Area Type:	Other
Cycle Length: 90	
Actuated Cycle Length: 60.1	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 3: 88th Ave & Old Hwy 99

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	1	1115	410	20	450	1	220	1	60	1	2	1
Future Volume (veh/h)	1	1115	410	20	450	1	220	1	60	1	2	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1870	1870	1870	1900	1900	1900
Adj Flow Rate, veh/h	1	1115	410	20	450	1	220	1	60	1	2	1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	1	1	1	1	1	1	2	2	2	0	0	0
Cap, veh/h	637	1774	884	281	2029	5	466	5	324	151	227	90
Arrive On Green	0.55	0.55	0.55	0.55	0.55	0.55	0.21	0.21	0.21	0.21	0.21	0.21
Sat Flow, veh/h	947	3205	1598	344	3666	8	1414	26	1563	211	1093	435
Grp Volume(v), veh/h	1	1115	410	20	220	231	220	0	61	4	0	0
Grp Sat Flow(s),veh/h/ln	947	1602	1598	344	1791	1884	1414	0	1589	1739	0	0
Q Serve(g_s), s	0.0	10.0	6.4	1.8	2.6	2.6	6.0	0.0	1.3	0.0	0.0	0.0
Cycle Q Clear(g_c), s	2.6	10.0	6.4	11.7	2.6	2.6	6.1	0.0	1.3	0.1	0.0	0.0
Prop In Lane	1.00		1.00	1.00		0.00	1.00		0.98	0.25		0.25
Lane Grp Cap(c), veh/h	637	1774	884	281	991	1043	466	0	330	468	0	0
V/C Ratio(X)	0.00	0.63	0.46	0.07	0.22	0.22	0.47	0.00	0.19	0.01	0.00	0.00
Avail Cap(c_a), veh/h	1290	3983	1985	518	2226	2341	1119	0	1063	1235	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	5.4	6.4	5.6	10.4	4.8	4.8	15.5	0.0	13.7	13.2	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.4	0.4	0.1	0.1	0.1	0.7	0.0	0.3	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	1.3	0.9	0.1	0.4	0.4	1.7	0.0	0.4	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	5.4	6.8	6.0	10.5	4.9	4.9	16.3	0.0	13.9	13.2	0.0	0.0
LnGrp LOS	A	A	A	B	A	A	B	A	B	B	A	A
Approach Vol, veh/h		1526			471			281			4	
Approach Delay, s/veh		6.6			5.1			15.8			13.2	
Approach LOS		A			A			B			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		29.2		12.7		29.2		12.7				
Change Period (Y+Rc), s		6.0		4.0		6.0		4.0				
Max Green Setting (Gmax), s		52.0		28.0		52.0		28.0				
Max Q Clear Time (g_c+I1), s		13.7		8.1		12.0		2.1				
Green Ext Time (p_c), s		2.8		0.9		11.2		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			7.4
HCM 6th LOS			A

Intersection	
Int Delay, s/veh	5.3

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	1025	30	175	375	20	185
Future Vol, veh/h	1025	30	175	375	20	185
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	450	300	-	300	0
Veh in Median Storage, #	0	-	-	0	2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	1	1	2	2	1	1
Mvmt Flow	1025	30	175	375	20	185

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1055	0	1750	1025
Stage 1	-	-	-	-	1025	-
Stage 2	-	-	-	-	725	-
Critical Hdwy	-	-	4.12	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.218	-	3.509	3.309
Pot Cap-1 Maneuver	-	-	660	-	95	287
Stage 1	-	-	-	-	348	-
Stage 2	-	-	-	-	481	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	660	-	70	287
Mov Cap-2 Maneuver	-	-	-	-	244	-
Stage 1	-	-	-	-	348	-
Stage 2	-	-	-	-	354	-

Approach	EB	WB	NE
HCM Control Delay, s	0	3.9	36.1
HCM LOS			E

Minor Lane/Major Mvmt	NELn1	NELn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	244	287	-	-	660	-
HCM Lane V/C Ratio	0.082	0.645	-	-	0.265	-
HCM Control Delay (s)	21.1	37.7	-	-	12.4	-
HCM Lane LOS	C	E	-	-	B	-
HCM 95th %tile Q(veh)	0.3	4.1	-	-	1.1	-

MOVEMENT SUMMARY

Site: 1 [PM 2040 Old Hwy 99-Henderson Blvd - Baseline]

Projected 2040
PM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	5	2.0	0.361	10.8	LOS B	2.2	56.8	0.44	0.48	0.44	36.5
8	T1	825	2.0	0.361	4.9	LOS A	2.3	59.0	0.43	0.48	0.43	36.5
18	R2	155	2.0	0.361	4.9	LOS A	2.3	59.0	0.42	0.48	0.42	35.4
Approach		985	2.0	0.361	4.9	LOS A	2.3	59.0	0.43	0.48	0.43	36.4
East: WB Henderson Blvd												
1	L2	205	1.0	0.372	12.4	LOS B	1.7	41.8	0.61	0.85	0.64	34.7
6	T1	5	1.0	0.372	6.5	LOS A	1.7	41.8	0.61	0.85	0.64	34.6
16	R2	110	1.0	0.372	6.5	LOS A	1.7	41.8	0.61	0.85	0.64	33.6
Approach		320	1.0	0.372	10.3	LOS B	1.7	41.8	0.61	0.85	0.64	34.3
North: SB Old Hwy 99												
7	L2	160	1.0	0.562	11.1	LOS B	4.6	115.0	0.57	0.56	0.57	35.7
4	T1	1365	1.0	0.562	5.1	LOS A	4.7	119.5	0.55	0.51	0.55	35.9
14	R2	10	1.0	0.562	5.2	LOS A	4.7	119.5	0.54	0.48	0.54	34.9
Approach		1535	1.0	0.562	5.7	LOS A	4.7	119.5	0.56	0.52	0.56	35.9
West: EB Henderson Blvd												
5	L2	40	0.0	0.118	13.8	LOS B	0.5	12.8	0.72	0.87	0.72	34.2
2	T1	15	0.0	0.118	7.9	LOS A	0.5	12.8	0.72	0.87	0.72	34.1
12	R2	15	0.0	0.118	7.9	LOS A	0.5	12.8	0.72	0.87	0.72	33.1
Approach		70	0.0	0.118	11.3	LOS B	0.5	12.8	0.72	0.87	0.72	34.0
All Vehicles		2910	1.3	0.562	6.1	LOS A	4.7	119.5	0.52	0.55	0.53	35.8

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [PM 2040 Old Hwy 99-79th Ave - Baseline]

Projected 2040
PM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	5	3.0	0.288	10.4	LOS B	1.6	40.1	0.32	0.44	0.32	37.0
8	T1	805	3.0	0.288	4.5	LOS A	1.6	40.8	0.31	0.43	0.31	37.0
18	R2	15	3.0	0.288	4.6	LOS A	1.6	40.8	0.30	0.42	0.30	35.7
Approach		825	3.0	0.288	4.5	LOS A	1.6	40.8	0.30	0.43	0.30	36.9
East: WB 79th Ave												
1	L2	30	2.0	0.197	11.8	LOS B	0.7	18.3	0.52	0.72	0.52	36.3
6	T1	1	2.0	0.197	6.0	LOS A	0.7	18.3	0.52	0.72	0.52	36.2
16	R2	145	2.0	0.197	5.9	LOS A	0.7	18.3	0.52	0.72	0.52	35.1
Approach		176	2.0	0.197	6.9	LOS A	0.7	18.3	0.52	0.72	0.52	35.3
North: SB Old Hwy 99												
7	L2	130	1.0	0.507	10.0	LOS B	4.1	103.4	0.22	0.43	0.22	37.0
4	T1	1450	1.0	0.507	4.1	LOS A	4.1	104.0	0.21	0.40	0.21	37.2
14	R2	5	1.0	0.507	4.3	LOS A	4.1	104.0	0.20	0.37	0.20	36.1
Approach		1585	1.0	0.507	4.6	LOS A	4.1	104.0	0.21	0.40	0.21	37.2
West: EB 79th Ave												
5	L2	5	0.0	0.020	13.1	LOS B	0.1	1.9	0.61	0.73	0.61	35.2
2	T1	5	0.0	0.020	7.2	LOS A	0.1	1.9	0.61	0.73	0.61	35.1
12	R2	5	0.0	0.020	7.2	LOS A	0.1	1.9	0.61	0.73	0.61	34.1
Approach		15	0.0	0.020	9.2	LOS A	0.1	1.9	0.61	0.73	0.61	34.8
All Vehicles		2601	1.7	0.507	4.8	LOS A	4.1	104.0	0.26	0.43	0.26	36.9

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [PM 2040 Old Hwy 99-88th Ave - Baseline]

Projected 2040
PM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	20	1.0	0.174	10.6	LOS B	1.0	24.6	0.41	0.48	0.41	36.5
8	T1	450	1.0	0.174	4.7	LOS A	1.0	25.8	0.40	0.46	0.40	36.6
18	R2	1	1.0	0.174	4.8	LOS A	1.0	25.8	0.39	0.44	0.39	35.4
Approach		471	1.0	0.174	4.9	LOS A	1.0	25.8	0.40	0.46	0.40	36.6
East: WB 88th Ave												
1	L2	1	0.0	0.007	11.2	LOS B	0.0	0.6	0.44	0.54	0.44	36.4
6	T1	5	0.0	0.007	5.4	LOS A	0.0	0.6	0.44	0.54	0.44	36.2
16	R2	1	0.0	0.007	5.3	LOS A	0.0	0.6	0.44	0.54	0.44	35.2
Approach		7	0.0	0.007	6.2	LOS A	0.0	0.6	0.44	0.54	0.44	36.1
North: SB Old Hwy 99												
7	L2	1	1.0	0.538	9.9	LOS A	4.4	111.1	0.17	0.36	0.17	37.7
4	T1	1115	1.0	0.538	4.1	LOS A	4.4	111.1	0.16	0.38	0.16	37.6
14	R2	410	1.0	0.432	4.2	LOS A	3.0	75.7	0.16	0.42	0.16	36.3
Approach		1526	1.0	0.538	4.1	LOS A	4.4	111.1	0.16	0.39	0.16	37.2
West: EB 88th Ave												
5	L2	220	2.0	0.369	14.5	LOS B	1.8	46.7	0.69	0.91	0.75	33.3
2	T1	1	2.0	0.369	8.7	LOS A	1.8	46.7	0.69	0.91	0.75	33.2
12	R2	60	2.0	0.369	8.6	LOS A	1.8	46.7	0.69	0.91	0.75	32.3
Approach		281	2.0	0.369	13.2	LOS B	1.8	46.7	0.69	0.91	0.75	33.1
All Vehicles		2285	1.1	0.538	5.4	LOS A	4.4	111.1	0.28	0.47	0.28	36.5

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [PM 2040 Old Hwy 99-93rd Ave - Baseline]

Projected 2040
PM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	175	2.0	0.389	9.9	LOS A	3.2	80.4	0.16	0.47	0.16	36.7
8	T1	375	2.0	0.389	3.9	LOS A	3.2	80.4	0.16	0.47	0.16	36.6
Approach		550	2.0	0.389	5.8	LOS A	3.2	80.4	0.16	0.47	0.16	36.6
North: SB Old Hwy 99												
4	T1	1025	1.0	0.820	7.0	LOS A	11.7	294.2	0.76	0.64	0.82	35.4
14	R2	30	1.0	0.820	7.0	LOS A	11.7	294.2	0.76	0.64	0.82	34.4
Approach		1055	1.0	0.820	7.0	LOS A	11.7	294.2	0.76	0.64	0.82	35.4
West: EB 88th Ave												
5	L2	20	1.0	0.405	18.2	LOS B	3.3	83.2	0.99	0.99	1.05	33.2
12	R2	185	1.0	0.405	12.3	LOS B	3.3	83.2	0.99	0.99	1.05	32.1
Approach		205	1.0	0.405	12.9	LOS B	3.3	83.2	0.99	0.99	1.05	32.2
All Vehicles		1810	1.3	0.820	7.3	LOS A	11.7	294.2	0.61	0.63	0.65	35.4

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [AM 2040 Old Hwy 99-Henderson Blvd - Sensitivity Scenario]

Projected 2040
AM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	5	3.0	0.687	10.6	LOS B	7.2	183.1	0.45	0.44	0.45	36.5
8	T1	1835	3.0	0.687	4.6	LOS A	7.2	183.1	0.43	0.43	0.43	36.5
18	R2	195	3.0	0.687	4.7	LOS A	7.1	182.3	0.41	0.43	0.41	35.4
Approach		2035	3.0	0.687	4.7	LOS A	7.2	183.1	0.42	0.43	0.42	36.4
East: WB Henderson Blvd												
1	L2	135	2.0	0.633	19.1	LOS B	4.0	101.0	0.85	1.06	1.25	32.2
6	T1	5	2.0	0.633	13.2	LOS B	4.0	101.0	0.85	1.06	1.25	32.1
16	R2	220	2.0	0.633	13.1	LOS B	4.0	101.0	0.85	1.06	1.25	31.2
Approach		360	2.0	0.633	15.4	LOS B	4.0	101.0	0.85	1.06	1.25	31.6
North: SB Old Hwy 99												
7	L2	70	5.0	0.265	10.5	LOS B	1.6	42.8	0.37	0.50	0.37	36.2
4	T1	625	5.0	0.265	4.5	LOS A	1.7	44.6	0.37	0.46	0.37	36.5
14	R2	25	5.0	0.265	4.6	LOS A	1.7	44.6	0.36	0.43	0.36	35.4
Approach		720	5.0	0.265	5.1	LOS A	1.7	44.6	0.37	0.46	0.37	36.4
West: EB Henderson Blvd												
5	L2	5	0.0	0.017	11.5	LOS B	0.1	1.4	0.48	0.63	0.48	35.9
2	T1	5	0.0	0.017	5.6	LOS A	0.1	1.4	0.48	0.63	0.48	35.7
12	R2	5	0.0	0.017	5.6	LOS A	0.1	1.4	0.48	0.63	0.48	34.7
Approach		15	0.0	0.017	7.6	LOS A	0.1	1.4	0.48	0.63	0.48	35.4
All Vehicles		3130	3.3	0.687	6.0	LOS A	7.2	183.1	0.46	0.51	0.51	35.8

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [AM 2040 Old Hwy 99-79th Ave - Sensitivity Scenario]

Projected 2040
AM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	10	3.0	0.684	10.9	LOS B	6.4	162.8	0.50	0.49	0.50	36.3
8	T1	1910	3.0	0.684	5.0	LOS A	6.4	162.8	0.48	0.47	0.48	36.3
18	R2	60	3.0	0.684	5.0	LOS A	6.3	162.4	0.46	0.46	0.46	35.1
Approach		1980	3.0	0.684	5.0	LOS A	6.4	162.8	0.48	0.47	0.48	36.3
East: WB 79th Ave												
1	L2	10	5.0	0.373	16.7	LOS B	1.8	48.0	0.80	0.93	0.92	34.1
6	T1	1	5.0	0.373	10.8	LOS B	1.8	48.0	0.80	0.93	0.92	34.0
16	R2	175	5.0	0.373	10.8	LOS B	1.8	48.0	0.80	0.93	0.92	33.0
Approach		186	5.0	0.373	11.1	LOS B	1.8	48.0	0.80	0.93	0.92	33.1
North: SB Old Hwy 99												
7	L2	120	5.0	0.263	9.9	LOS A	1.5	39.6	0.12	0.48	0.12	36.7
4	T1	675	5.0	0.263	4.1	LOS A	1.6	40.3	0.11	0.41	0.11	37.3
14	R2	5	5.0	0.263	4.2	LOS A	1.6	40.3	0.11	0.37	0.11	36.3
Approach		800	5.0	0.263	4.9	LOS A	1.6	40.3	0.12	0.42	0.12	37.2
West: EB 79th Ave												
5	L2	1	0.0	0.003	11.4	LOS B	0.0	0.2	0.43	0.58	0.43	36.0
2	T1	1	0.0	0.003	5.5	LOS A	0.0	0.2	0.43	0.58	0.43	35.8
12	R2	1	0.0	0.003	5.4	LOS A	0.0	0.2	0.43	0.58	0.43	34.8
Approach		3	0.0	0.003	7.4	LOS A	0.0	0.2	0.43	0.58	0.43	35.5
All Vehicles		2969	3.7	0.684	5.4	LOS A	6.4	162.8	0.40	0.49	0.41	36.3

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [AM 2040 Old Hwy 99-88th Ave - Sensitivity Scenario]

Projected 2040
AM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles

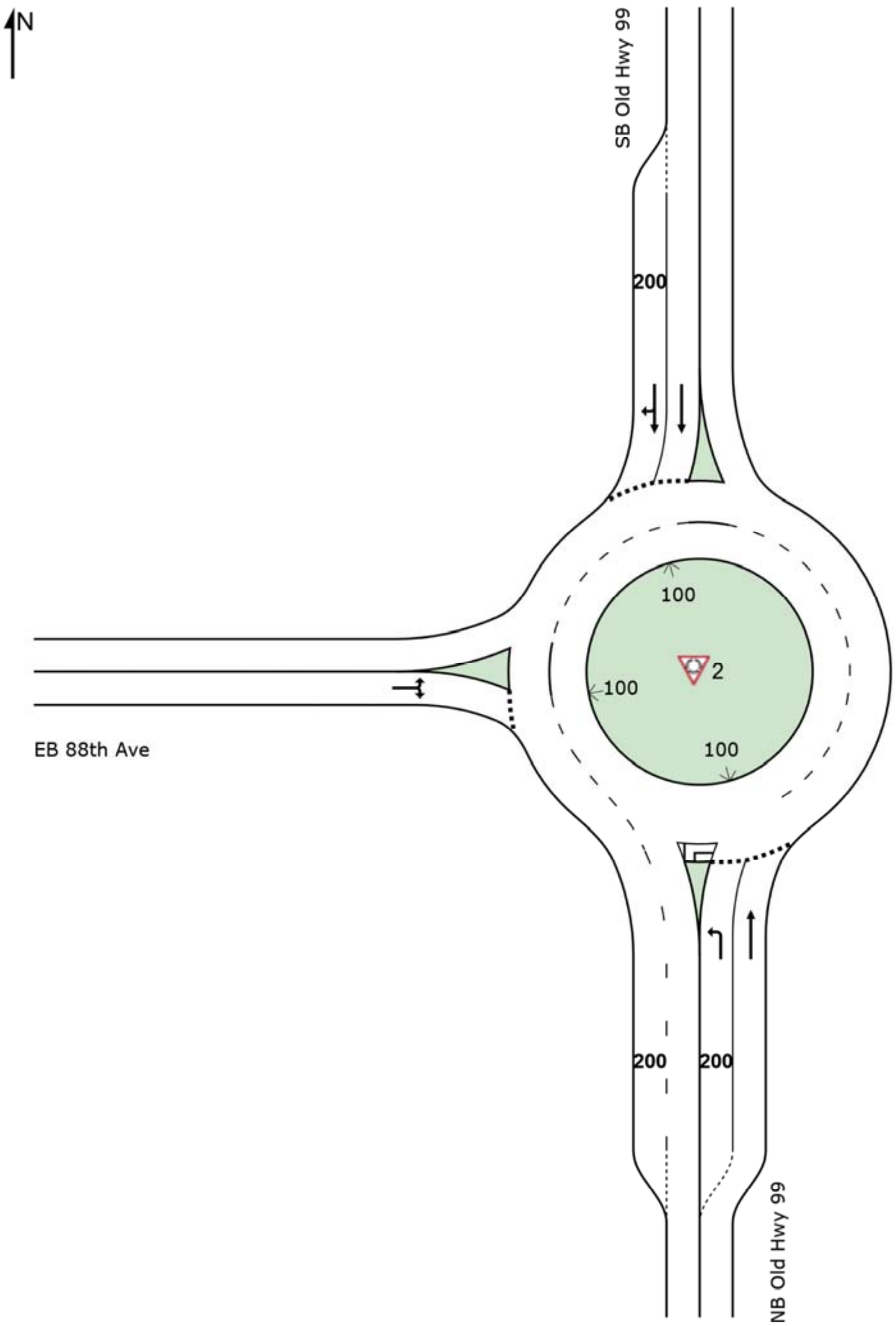
Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	55	1.0	0.791	26.0	LOS C	11.4	287.5	1.00	1.28	1.71	29.9
8	T1	1225	1.0	0.791	18.6	LOS B	13.3	336.4	1.00	1.24	1.68	30.6
18	R2	10	1.0	0.791	17.7	LOS B	13.3	336.4	1.00	1.21	1.66	30.2
Approach		1290	1.0	0.791	18.9	LOS B	13.3	336.4	1.00	1.24	1.68	30.6
East: WB 88th Ave												
1	L2	5	2.0	0.097	18.4	LOS B	0.5	12.8	0.86	0.93	0.86	33.1
6	T1	5	2.0	0.097	12.5	LOS B	0.5	12.8	0.86	0.93	0.86	33.0
16	R2	25	2.0	0.097	12.5	LOS B	0.5	12.8	0.86	0.93	0.86	32.1
Approach		35	2.0	0.097	13.3	LOS B	0.5	12.8	0.86	0.93	0.86	32.3
North: SB Old Hwy 99												
7	L2	40	3.0	0.167	10.0	LOS A	1.0	26.0	0.22	0.43	0.22	37.0
4	T1	225	3.0	0.167	4.1	LOS A	1.0	26.0	0.22	0.43	0.22	36.9
14	R2	230	3.0	0.167	4.4	LOS A	1.0	25.1	0.23	0.46	0.23	36.0
Approach		495	3.0	0.167	4.7	LOS A	1.0	26.0	0.22	0.44	0.22	36.5
West: EB 88th Ave												
5	L2	732	4.0	0.698	12.9	LOS B	6.2	159.8	0.63	0.79	0.71	33.5
2	T1	10	4.0	0.698	7.0	LOS A	6.2	159.8	0.63	0.79	0.71	33.4
12	R2	5	4.0	0.698	7.0	LOS A	6.2	159.8	0.63	0.79	0.71	32.5
Approach		747	4.0	0.698	12.8	LOS B	6.2	159.8	0.63	0.79	0.71	33.5
All Vehicles		2567	2.3	0.791	14.3	LOS B	13.3	336.4	0.74	0.95	1.11	32.4

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 2 [AM 2040 Old Hwy 99-93rd Ave -Land Use 2 (2 NB lanes)]

Projected 2040
AM Peak Hour
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 2 [AM 2040 Old Hwy 99-93rd Ave - Sensitivity Scenario multiple entry lanes]

Projected 2040
AM Peak Hour
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: NB Old Hwy 99												
3	L2	225	1.0	0.183	9.9	LOS A	0.9	22.9	0.11	0.62	0.11	34.8
8	T1	1135	1.0	0.659	3.7	LOS A	6.8	170.3	0.18	0.34	0.18	37.9
Approach		1360	1.0	0.659	4.8	LOS A	6.8	170.3	0.17	0.39	0.17	37.3
North: SB Old Hwy 99												
4	T1	180	4.0	0.106	4.8	LOS A	0.4	10.2	0.28	0.45	0.28	36.9
14	R2	10	4.0	0.053	5.2	LOS A	0.2	4.8	0.29	0.46	0.29	35.6
Approach		190	4.0	0.106	4.8	LOS A	0.4	10.2	0.28	0.45	0.28	36.9
West: EB 88th Ave												
5	L2	20	6.0	0.158	10.5	LOS B	0.6	15.3	0.28	0.53	0.28	37.1
12	R2	155	6.0	0.158	4.6	LOS A	0.6	15.3	0.28	0.53	0.28	35.8
Approach		175	6.0	0.158	5.2	LOS A	0.6	15.3	0.28	0.53	0.28	35.9
All Vehicles		1725	1.8	0.659	4.8	LOS A	6.8	170.3	0.19	0.41	0.19	37.1

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

APPENDIX B
ALTERNATIVES ANALYSIS MEMO

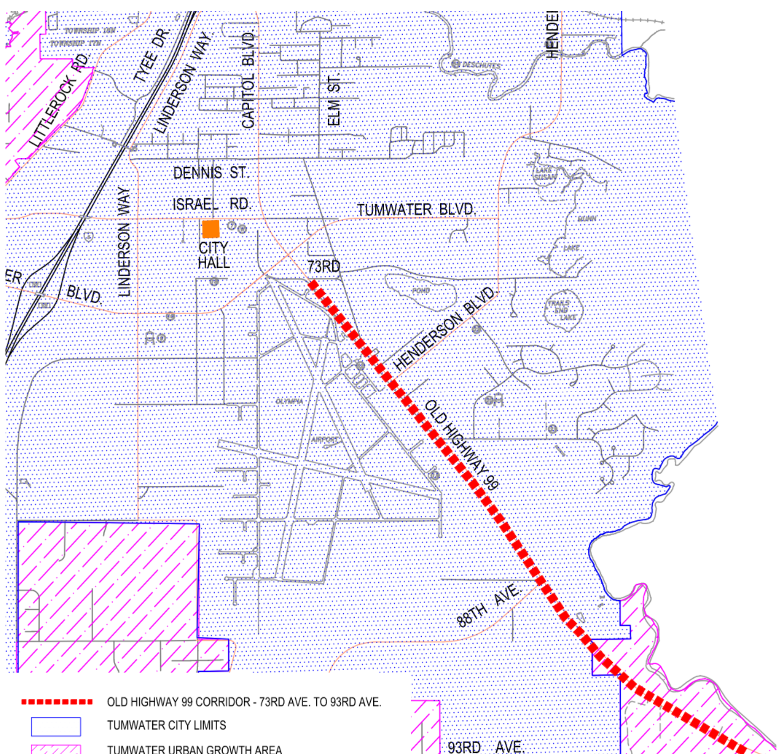
SCJ ALLIANCE
CONSULTING SERVICES

TECHNICAL MEMORANDUM

TO:	Mary Heather Ames
FROM:	Patrick Holm
DATE:	May 3, 2021
PROJECT #:	0625.29
SUBJECT:	Old Highway 99 Corridor Study – Alternatives Analysis – Methods Memo

BACKGROUND

The objective of the Old Highway 99 Corridor Study is to validate the transportation recommendations included in the Tumwater City Plan 2036, Transportation Master Plan November 2016 (Transportation Plan), manage necessary or recommended changes resulting from the validation process, and prepare preliminary design for the Old Highway 99 corridor improvements from approximately 73rd Avenue SE to 93rd Avenue SE. This project will perform transportation and alternatives analysis to determine and recommend roadway cross section and intersection improvements at Henderson Boulevard, 79th Avenue SE, 88th Avenue SE, and 93rd Avenue SE in context with the overall corridor improvements. The corridor study will build upon the Transportation Plan to ultimately define the footprint of improvements and progress a conceptual design.



Vicinity Map – Old Hwy 99 Corridor Study

PURPOSE

The purpose of this alternatives analysis is to analyze potential roadway cross sections proposed for the Old Highway 99 Corridor Study project. Each alternative will be rated based on performance and cost.

CONCEPTUAL ASSUMPTIONS/DESIGN CRITERIA

Old Highway 99 is a Minor Arterial based upon the classification of the City of Tumwater Development Guide (Development Guide). The City's Transportation Master Plan recommends a four-lane section from 73rd Avenue to 88th Avenue with roundabout intersections at Henderson Boulevard, 79th Avenue, 88th Avenue, and 93rd Avenue. All alternatives will meet these minimum requirements. Currently, the posted speed on the corridor varies from 35 mph to 50 mph.

PERFORMANCE RANKING

Criteria and Weighting

We based the following criteria (performance attributes) on the goals of the project and feedback from the first stakeholder's workshop.

The criteria follow:

- Bicycle Function/Usability
- Pedestrian Function/Usability
- Emergency Access Function/Usability
- Aesthetic
- Environmental Impact (Mazama Pocket Gopher Habitat)

Each criterion was originally weighed using pair-wise comparisons based on feedback from the stakeholder group.

PERFORMANCE ATTRIBUTE MATRIX

Old Highway 99 Corridor Study

Rate the relative importance of the attributes relative to the project's Need and Purpose.

Performance Attributes	Bike Function	Ped Function	EMS Function	Aesthetic	Enviro Impact	Total Count	PRIORITIES
Bike Function	A	A/B	C	A	A	3.5	**0.233**
Ped Function		B	C	B	B	3.5	**0.233**
EMS Function			C	C	C	5	**0.333**
Aesthetic				D	D	2	**0.133**
Enviro Impact					E	1	**0.067**
SUB-TOTALS						15.00	**1.00**

Figure 1 – Original Criteria Weighting

Scoring

Each of the six alternatives were scored against the criteria above by the stakeholder group at the second workshop. A rating of 0 to 10 was applied to each performance attribute.

Cost

We generated conceptual cost estimates for each alternative using industry standard cost breakdowns and unit cost values derived from WSDOT unit bid tabs. Each estimate was given a 20% contingency factor due to the conceptual nature. The calculated costs are based on 2021 dollars. We included the following cost-reducing ideas in the alternatives:

- Per discussion with the City, minimizing the roadway section with narrow lanes to decrease pavement.

In addition, the following opportunities may provide cost savings as design details progress:

- Integrating the stormwater mitigation into planter strips has the potential to minimize footprint for stormwater facilities.

Value Ranking

We ranked each alternative by its value. The value of each alternative is a function of the cost index and alternative score, where the cost index is the ratio of individual alternative cost divided by the sum of all alternative costs. The alternative value is determined by dividing the alternative score by the cost index. The alternative with the best value will be the recommended alternative.

$$Criteria\ Score = weight \ * rating$$

$$Alternative\ Score = \sum criteria\ scores$$

$$Cost\ Index = \frac{Alternative\ Cost}{\sum Alternative\ Cost}$$

$$Alternative\ Value = \frac{Alternative\ Score}{Cost\ Index}$$

Formulae for developing Value Index

ALTERNATIVES

(Exhibits of Cross Sections available in Attachment 1)

Alternative 1

Alternative 1 follows the standard City of Tumwater minor arterial prescription with the exception of lane width. The road has four 11-foot travel lanes and one 12-foot two-way left turn lane with 6-foot bike lanes on both sides. The cross section also features 6-foot sidewalks and 6-foot planter strips with a 2-foot buffer strip behind the back of walk. The total width of Alternative 1 is 96 feet.

Alternative 2

Alternative 2 shifts all pedestrian movement to the east side of Old Highway 99 with an 8-foot sidewalk and provides a 6-foot median in place of a two-way left turn lane. The bike lanes remain six feet but the inside lanes grow to 12 feet to provide shy distance for the median. The total width of Alternative 2 is 85 feet.

Alternative 3

Alternative 3 is similar to Alternative 2 but removes bikes from the northbound road and combines them with pedestrians on a 12-foot shared use path. The northbound outer lane grows to 13 feet. The total width of Alternative 3 is 85 feet.

Alternative 4

Alternative 4 builds on Alternative 3 and removes the bike lane from the southbound road and combines it with the eastside shared use path. This would require bikes to be re-routed to the shared use path at intersections bordering the study area. The total width of Alternative 4 is 81 feet.

Alternative 5

Alternative 5 removes bike lanes from the roadway and combines bicycle and pedestrian uses on their respective side with two 10-foot shared use paths. The inner travel lanes are 12 feet with the outer travel lanes at 13 feet. The total width of Alternative 5 is 92 feet.

Alternative 6

Alternative 6 provides the standard section on the northbound: two travel lanes (12-foot inner, 11-foot outer), 6-foot bike lane, 6-foot planter strip, and 6-foot sidewalk. On the southbound side, the bike and pedestrian traffic is separated from the road on a 10-foot shared use path as in Alternative 5. The total width of Alternative 6 is 92 feet

CONCLUSION

After Workshop 2, the stakeholder group completed the performance scoring and value ranking. This process yielded the following ranking:

1. Alternative 5
2. Alternative 1
3. Alternative 6
4. Alternative 3
5. Alternative 4
6. Alternative 2

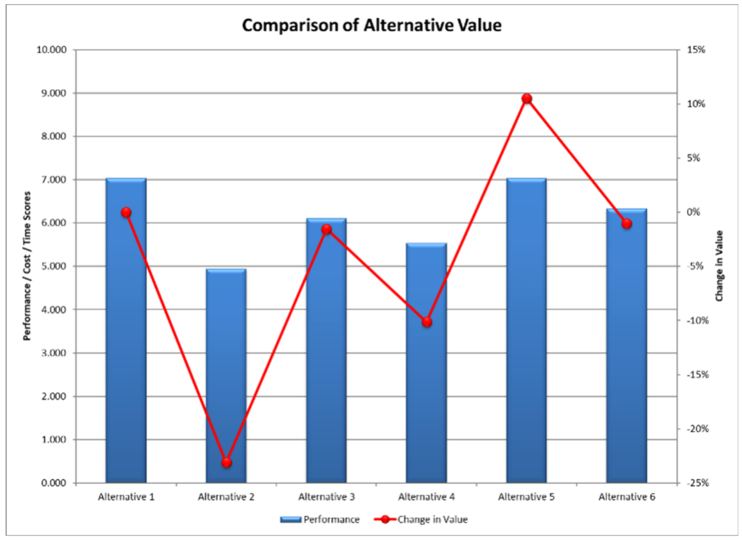


Figure 2 - Draft Ranking

The highest value alternative was Alternative 5 which has two 10-foot shared use paths and no bike lanes on the road.

After the workshop, the City reviewed the results internally and recommended revising steps of the process.

Revised Criteria

The original criteria had placed Environmental Impact as the least important criterion. The City advised to change Environmental Impact to be equally important as the highest criterion (EMS Function) because of the anticipated requirements and hard and soft costs of permitting for Federally listed endangered species. This was mentioned as a likely revision in Workshop 2.

These updated criteria ranking placed a higher value on footprint and impacted the rankings as follows:

1. Alternative 4
2. Alternative 3
3. Alternative 5
4. Alternative 2
5. Alternative 6
6. Alternative 1

The new highest value became Alternative 4 which had no bike lanes either direction and a 12-foot shared use path on the east side of Old Highway 99. The City felt bicycle users would still attempt to go southbound on the road in Alternative 4 introducing multi-modal conflict. For this reason, Alternative 4 was eliminated.

Two alternatives were modified to further reduce impact and look for the highest value:

Alternative 2B

Alternative 2B is the same as Alternative 2 with the exception of a 6-foot sidewalk instead of an 8-foot sidewalk which is more consistent with City sidewalk standards and reduces width.

Alternative 3B

Alternative 3B is the same as Alternative 3 but with a 10-ft sidewalk.

With these modified alternatives, the ranking shuffled slightly as follows:

1. Alternative 3B
2. Alternative 3
3. Alternative 2B
4. Alternative 5
5. Alternative 6
6. Alternative 1

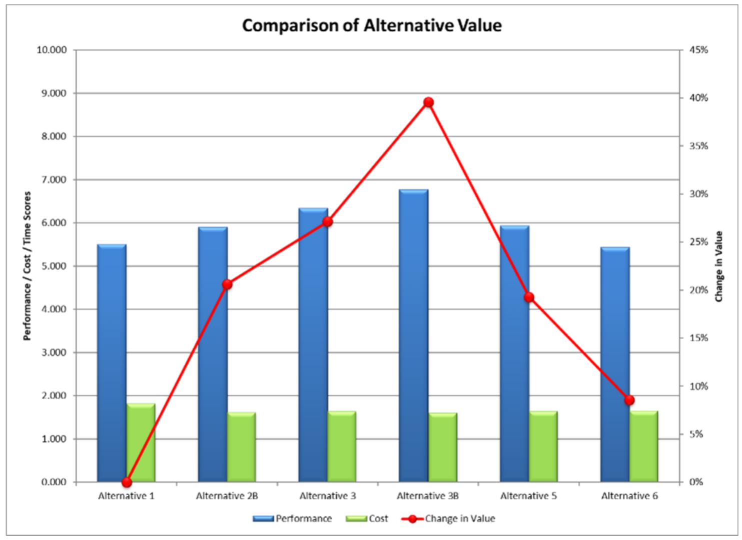


Figure 3 - Final Ranking

Recommendation

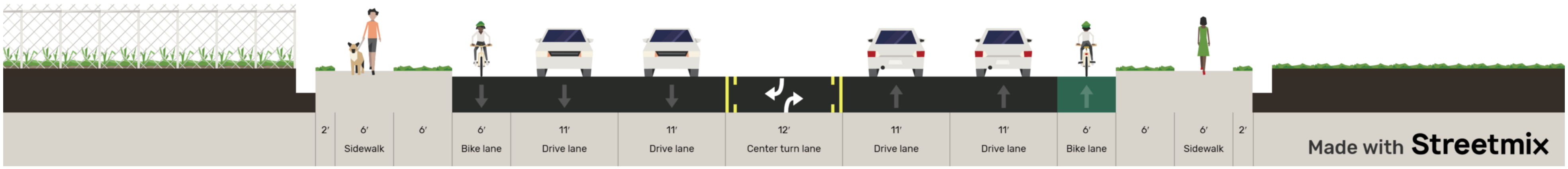
Alternative 3B has the highest value of the revised alternatives. It provides a wide shared use path for pedestrians and cyclists on the westside of Old Highway 99 while also allowing for cyclists to use a bike lane for southbound travel if they choose not to use the shared use path. This alternative will include implementation of a median along the corridor. As the design progresses, the design team will coordinate with stakeholders to coordinate appropriate breaks as needed for safety and access.

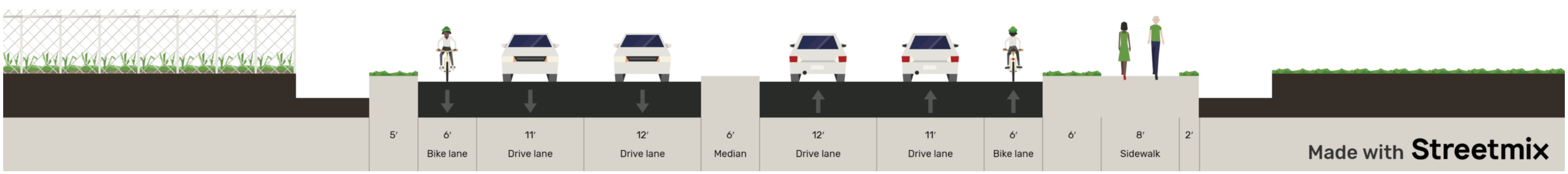
Attachment 1 – Alternative Cross Sections

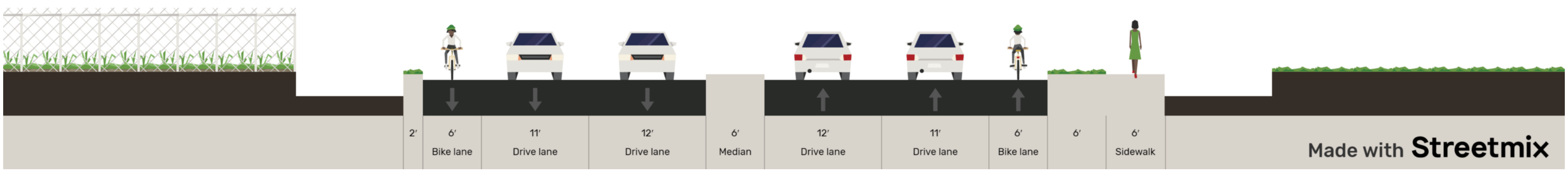
Attachment 2 – Value Metrics Data

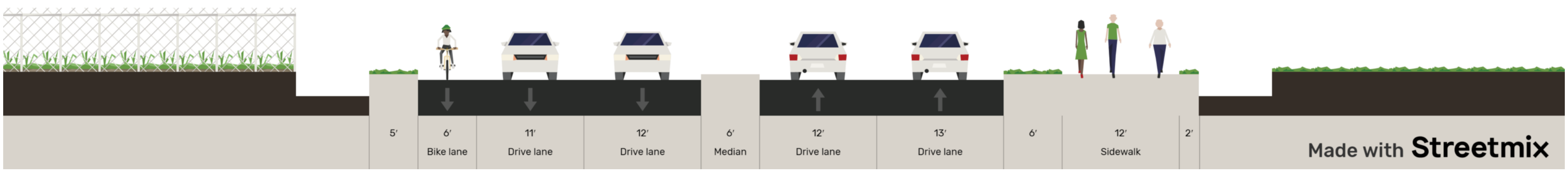
Attachment 3 – Cost Estimates

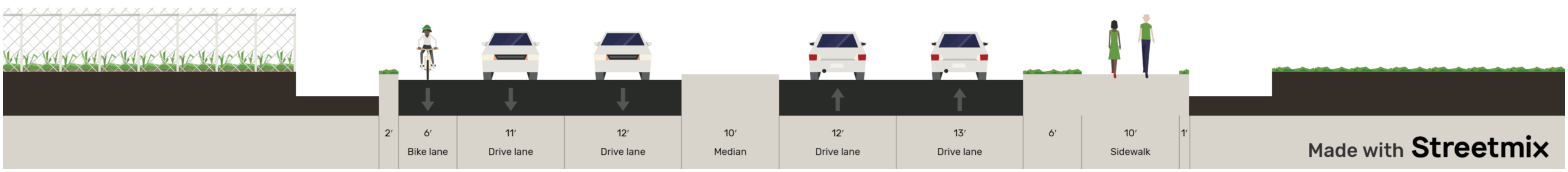
Attachment 1 – Cross Sections

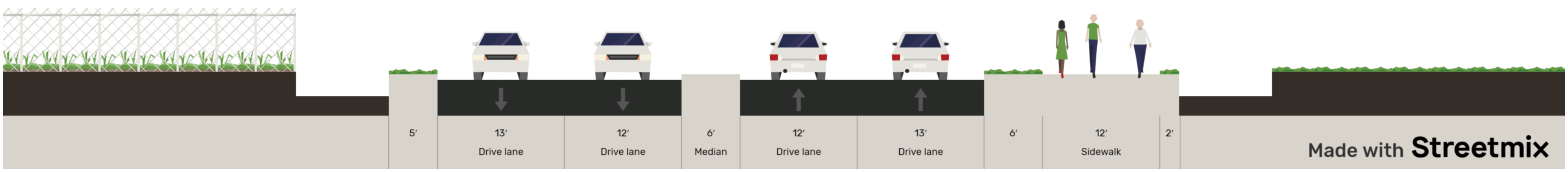

2′
6′
Sidewalk
6′
6′
Bike lane
11′
Drive lane
11′
Drive lane
12′
Center turn lane
11′
Drive lane
11′
Drive lane
6′
Bike lane
6′
6′
Sidewalk
2′
Made with Streetmix


5′
6′
Bike lane
11′
Drive lane
12′
Drive lane
6′
Median
12′
Drive lane
11′
Drive lane
6′
Bike lane
6′
8′
Sidewalk
2′
Made with Streetmix

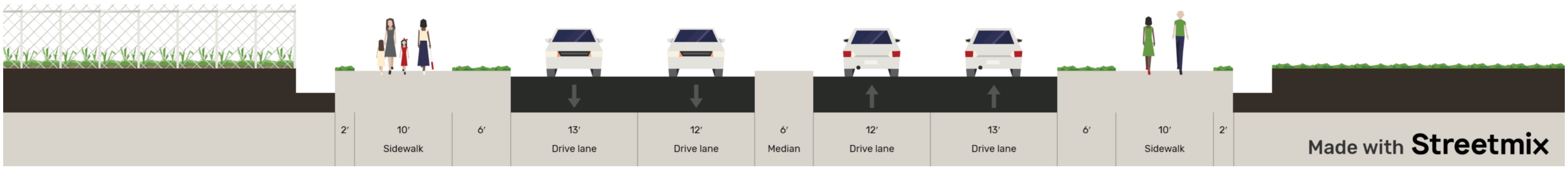

2'
6'
Bike lane
11'
Drive lane
12'
Drive lane
6'
Median
12'
Drive lane
11'
Drive lane
6'
Bike lane
6'
6'
Sidewalk
Made with Streetmix


5′
6′
Bike lane
11′
Drive lane
12′
Drive lane
6′
Median
12′
Drive lane
13′
Drive lane
6′
12′
Sidewalk
2′
Made with Streetmix

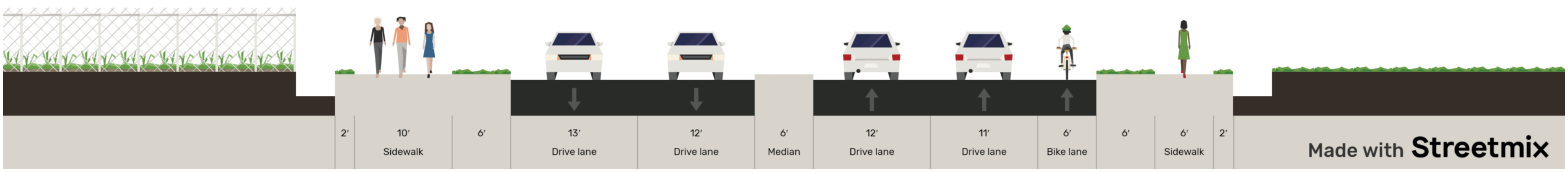

2'
6'
Bike lane
11'
Drive lane
12'
Drive lane
10'
Median
12'
Drive lane
13'
Drive lane
6'
10'
Sidewalk
1'
Made with Streetmix



5′
13′
Drive lane
12′
Drive lane
6′
Median
12′
Drive lane
13′
Drive lane
6′
12′
Sidewalk
2′
Made with Streetmix



2′
10′
Sidewalk
6′
13′
Drive lane
12′
Drive lane
6′
Median
12′
Drive lane
13′
Drive lane
6′
10′
Sidewalk
2′
Made with Streetmix


2′
10′
Sidewalk
6′
13′
Drive lane
12′
Drive lane
6′
Median
12′
Drive lane
11′
Drive lane
6′
Bike lane
6′
6′
Sidewalk
2′
Made with Streetmix

Attachment 2 – Value Metrics Data

PERFORMANCE ATTRIBUTES

Old Hwy 99 Corridor Study

Performance Attribute	**Definition**	
Bike Function		
	Scales	
Rating	**Rating Rationale**	**Rating**
Unacceptable	No Bike Facilities	0
	6-ft bike lanes on road	5
	Separated 12-ft shared use trail ((both directions) one side of road	5
	Separated 10-ft shared use trail one direction, 6-ft bike lane	7
	Separated 12-ft shared use trail one direction, 6-ft bike lane	8
	Separated 10-ft shared use trails on both sides of road	9
Ideal	Separated 10-ft shared use trails on both sides of road, bike lanes	10

Performance Attribute	**Definition**	
Ped Function		
	Scales	
Rating	**Rating Rationale**	**Rating**
Unacceptable	No Pedestrian Facilities/No sidewalk	0
	8-ft sidewalk on eastside	5
	12-ft shared use path on eastside	7
	6-ft sidewalks on both sides with buffer	8
	10-ft shared use trail one side, 6-ft sidewalk other side	9
Ideal	10-ft shared use trail on both sides	10

Performance Attribute	**Definition**	
EMS Function		
	Scales	
Rating	**Rating Rationale**	**Rating**
	No turnarounds	0
	Medians with turnarounds at intersections	3
Ideal	Two-way left turn lane for full access	10

Performance Attribute	**Definition**	
Aesthetic		
	Scales	
Rating	**Rating Rationale**	**Rating**
	No vegetation	0
	Least vegetation	5
	Median vegetation	8
Ideal	Most vegetation	10

Performance Attribute	Definition	
Enviro Impact		
	Scales	
Rating	Rating Rationale	Rating
	Most impact to west	0
	Second most impact to west	4
	Second least impact to west	8
Ideal	Least impact to west	10

PERFORMANCE ATTRIBUTE MATRIX

Old Highway 99 Corridor Study

Rate the relative importance of the attributes relative to the project's Need and Purpose.

Performance Attributes	Bike Function	Ped Function	EMS Function	Aesthetic	Enviro Impact	Total Count	PRIORITIES
Bike Function	A	A/B	C	A	E	2.5	**0.167**
Ped Function		B	C	B	E	2.5	**0.167**
EMS Function			C	C	C/E	4.5	**0.300**
Aesthetic				D	E	1	**0.067**
Enviro Impact					E	4.5	**0.300**
SUB-TOTALS						15.00	**1.00**

PERFORMANCE ASSESSMENT MATRIX

Old Hwy 99 Corridor Study

Alternative 1

Performance Attributes	Rationale	Rating
Bike Function	6-ft bike lanes	5
Ped Function	Sidewalks on both sides	8
EMS Function	TWLTL	10
Aesthetic	Least Vegetation	5
Enviro Impact	Most Impact	0

Alternative 2B Name

Performance Attributes	Rationale	Rating
Bike Function		5
Ped Function		5
EMS Function		3
Aesthetic	Least Vegetation	5
Enviro Impact	Least Impact	10

Alternative 3 Name

Performance Attributes	Rationale	Rating
Bike Function		8
Ped Function		7
EMS Function		3
Aesthetic	Middle amount of vegetation	8
Enviro Impact	Second Least	8

Alternative 3B Name

Performance Attributes	Rationale	Rating
Bike Function		7
Ped Function		7
EMS Function		3
Aesthetic	Middle amount of vegetation	8
Enviro Impact	Least Impact	10

Alternative 5 Name

Performance Attributes	Rationale	Rating
Bike Function		9
Ped Function		10
EMS Function		3
Aesthetic		10
Enviro Impact	Second to Most	4

Alternative 6 Name

Performance Attributes	Rationale	Rating
Bike Function		7

Ped Function		9
EMS Function		3
Aesthetic		10
Enviro Impact	Second to Most	4

Alternative No. 6 Name

Performance Attributes	Rationale	Rating
Bike Function		
Ped Function		
EMS Function		
Aesthetic		
Enviro Impact		

Alternative No. 7 Name

Performance Attributes	Rationale	Rating
Bike Function		
Ped Function		
EMS Function		
Aesthetic		
Enviro Impact		

Alternative No. 8 Name

Performance Attributes	Rationale	Rating
Bike Function		
Ped Function		
EMS Function		
Aesthetic		
Enviro Impact		

Alternative No. 9 Name

Performance Attributes	Rationale	Rating
Bike Function		
Ped Function		
EMS Function		
Aesthetic		
Enviro Impact		

Alternative No. 10 Name

Performance Attributes	Rationale	Rating
Bike Function		
Ped Function		
EMS Function		
Aesthetic		
Enviro Impact		

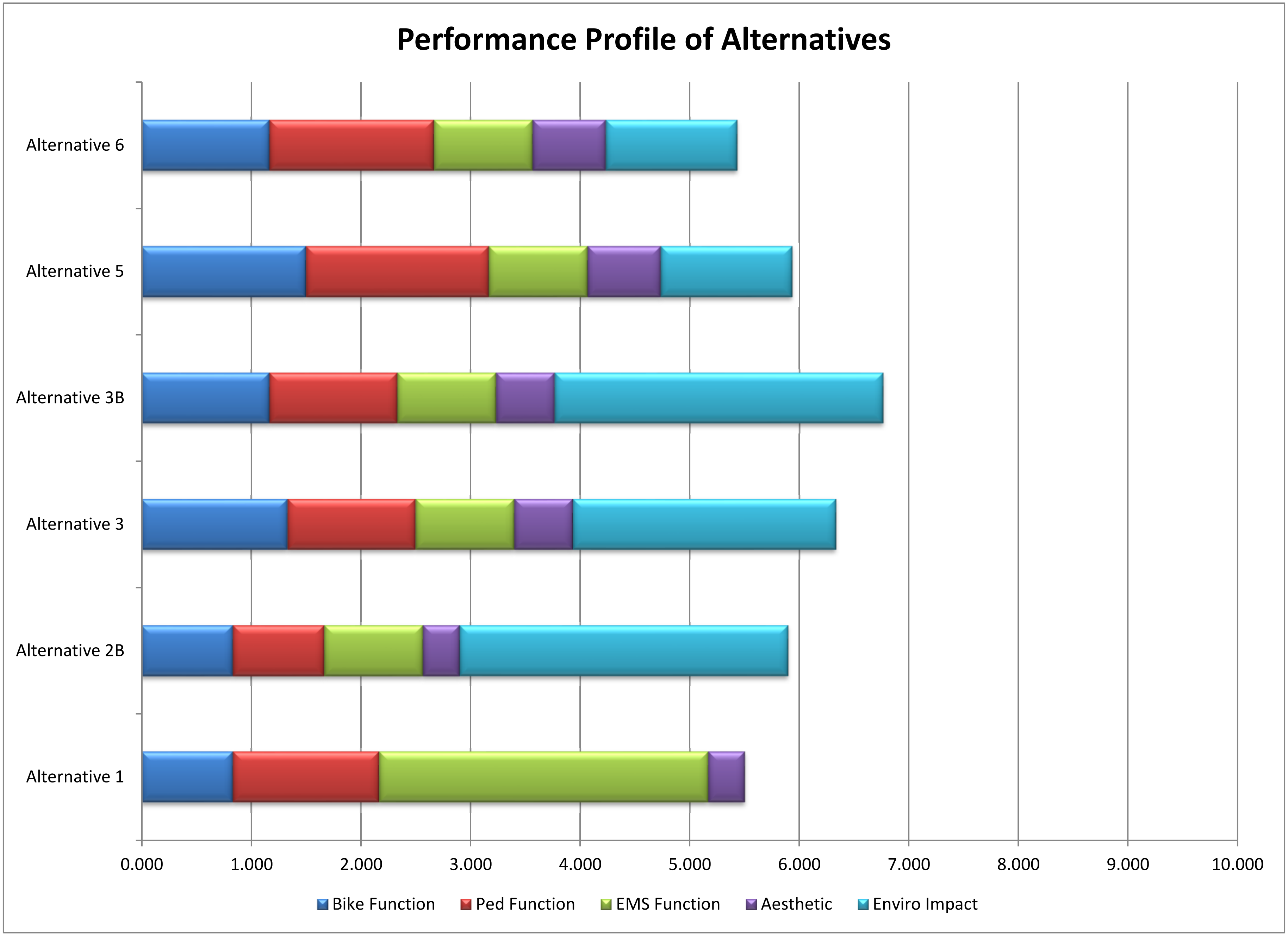
Alternative No. 11 Name

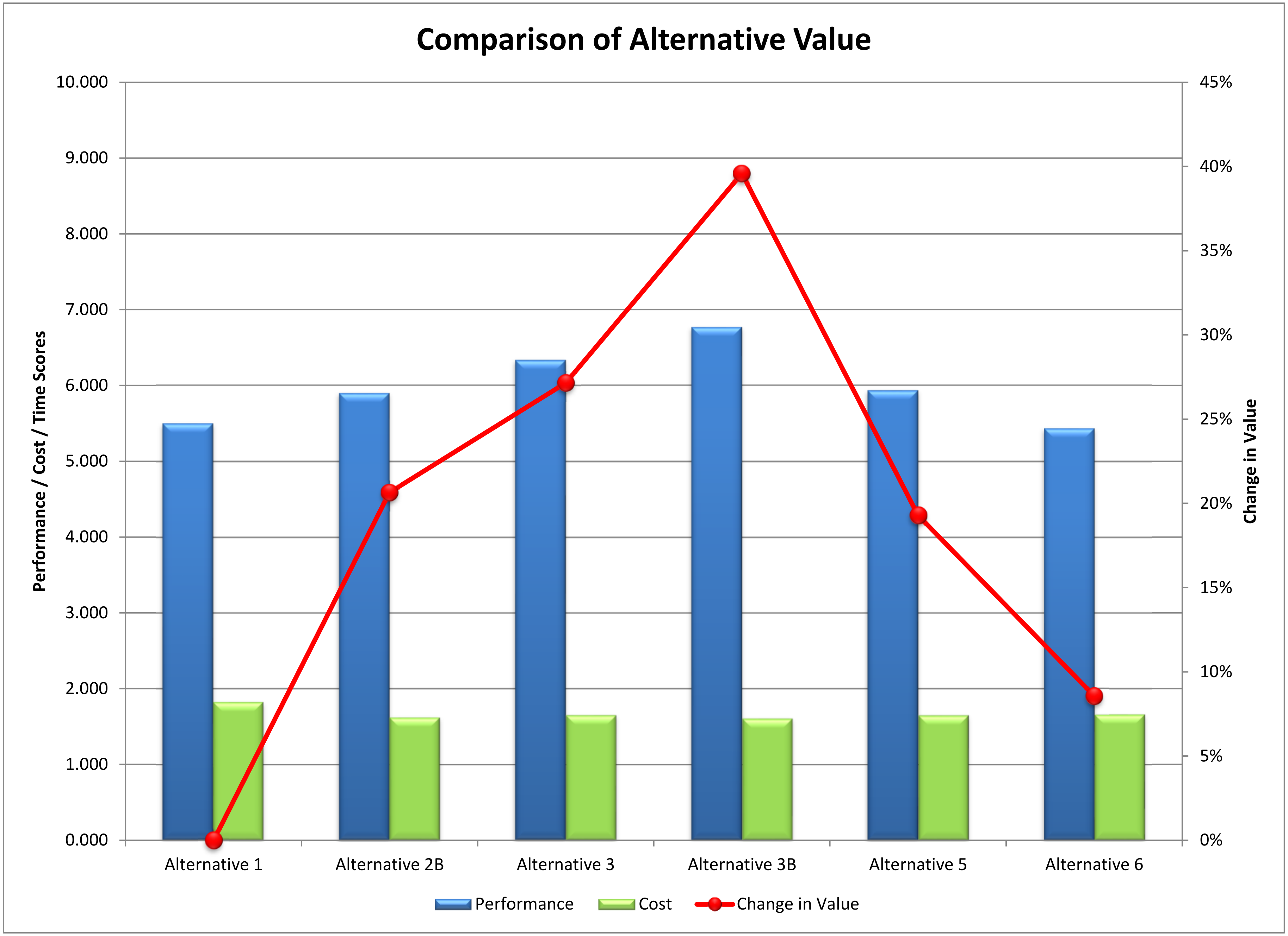
Performance Attributes	Rationale	Rating

Bike Function		
Ped Function		
EMS Function		
Aesthetic		
Enviro Impact		

Alternative No. 12 Name

Performance Attributes	Rationale	Rating
Bike Function		
Ped Function		
EMS Function		
Aesthetic		
Enviro Impact		


Performance Profile of Alternatives
Alternative 6
Alternative 5
Alternative 3B
Alternative 3
Alternative 2B
Alternative 1
0.000
1.000
2.000
3.000
4.000
5.000
6.000
7.000
8.000
9.000
10.000
Bike Function
Ped Function
EMS Function
Aesthetic
Enviro Impact



Comparison of Alternative Value
Performance / Cost / Time Scores
Change in Value
10.000
9.000
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
Alternative 1
Alternative 2B
Alternative 3
Alternative 3B
Alternative 5
Alternative 6
Performance
Cost
Change in Value

Attachment 3 – Cost Estimates

SCJ ALLIANCE
CONSULTING SERVICES

Element	Element Based Upon	Unit	Unit Cost	Estimate Measurement	ALT 1
Roadwork	**Estimated Quantities**				**$ 13,140,445**
	Mobilization	LS	8%	1	$ 1,139,365
	Clearing and Grubbing	SF	$0.23	578,000	$ 132,691
	Roadway Excavation/Select Borrow	CY	$25.00	30,222	$ 755,556
	Roadway Section	SF	$5.13	578,000	$ 2,966,296
	Conveyance	LF	$62.30	8,500	$ 529,550
	Water Quality/Flow Control	SF	$2.28	578,000	$ 1,314,950
	Sidewalk	SY	$45.83	11,333	$ 519,384
	Curb and Gutter	LF	$50.83	8,500	$ 432,038
	Erosion Control	LF	$16.80	8,500	$ 142,800
	Roundabouts	EACH	$1,000,000	3	$ 3,000,000
	Illumination	LF	$78	8,500	$ 663,816
	Permanent Signing	LF	$4.00	8,500	$ 34,000
	Landscaping	LF	$60.00	8,500	$ 510,000
	Traffic Control	LS	$1,000,000	1	$ 1,000,000
Right-of-Way					**$ 4,440,000**
	Parcels	Value			$ 4,440,000
Engineering	**22%**				**$ 2,890,898**
	PE	12%			$ 1,576,853
	CN	10%			$ 1,314,045
	Subtotal				$ 20,471,344
	Conceptual Contingency/Miscellaneous (20%)				$ 2,628,089
	Total				**$ 23,100,000**

SCJ ALLIANCE
CONSULTING SERVICES

Element	Element Based Upon	Unit	Unit Cost	Estimate Measurement	ALT 2
Roadwork	**Estimated Quantities**				**$ 12,242,767**
	Mobilization	LS	8%	1	$ 1,063,813
	Clearing and Grubbing	SF	$0.23	425,000	$ 97,567
	Roadway Excavation/Select Borrow	CY	$25.00	23,926	$ 598,148
	Roadway Section	SF	$5.13	493,000	$ 2,530,076
	Conveyance	LF	$62.30	8,500	$ 529,550
	Water Quality/Flow Control	SF	$2.28	493,000	$ 1,121,575
	Sidewalk	SY	$45.83	11,333	$ 519,384
	Curb and Gutter	LF	$50.83	8,500	$ 432,038
	Erosion Control	LF	$16.80	8,500	$ 142,800
	Roundabouts	EACH	$1,000,000	3	$ 3,000,000
	Illumination	LF	$78	8,500	$ 663,816
	Permanent Signing	LF	$4.00	8,500	$ 34,000
	Landscaping	LF	$60.00	8,500	$ 510,000
	Traffic Control	LS	$1,000,000	1	$ 1,000,000
Right-of-Way					**$ 3,152,700**
	Parcels	Value			$ 3,152,700
Engineering	**22%**				**$ 2,693,409**
	PE	12%			$ 1,469,132
	CN	10%			$ 1,224,277
	Subtotal				$ 18,088,876
	Conceptual Contingency/Miscellaneous (20%)				$ 2,448,553
	Total				**$ 20,540,000**

SCJ ALLIANCE
CONSULTING SERVICES

Element	Element Based Upon	Unit	Unit Cost	Estimate Measurement	ALT 3
Roadwork	**Estimated Quantities**				**$ 12,342,668**
	Mobilization	LS	8%	1	$ 1,071,367
	Clearing and Grubbing	SF	$0.23	484,500	$ 111,226
	Roadway Excavation/Select Borrow	CY	$25.00	26,759	$ 668,981
	Roadway Section	SF	$5.13	459,000	$ 2,355,588
	Conveyance	LF	$62.30	8,500	$ 529,550
	Water Quality/Flow Control	SF	$2.28	459,000	$ 1,044,225
	Sidewalk	SY	$45.83	17,000	$ 779,076
	Curb and Gutter	LF	$50.83	8,500	$ 432,038
	Erosion Control	LF	$16.80	8,500	$ 142,800
	Roundabouts	EACH	$1,000,000	3	$ 3,000,000
	Illumination	LF	$78	8,500	$ 663,816
	Permanent Signing	LF	$4.00	8,500	$ 34,000
	Landscaping	LF	$60.00	8,500	$ 510,000
	Traffic Control	LS	$1,000,000	1	$ 1,000,000
Right-of-Way					**$ 3,390,000**
	Parcels	Value			$ 3,390,000
Engineering	**22%**				**$ 2,715,387**
	PE	12%			$ 1,481,120
	CN	10%			$ 1,234,267
	Subtotal				$ 18,448,054
	Conceptual Contingency/Miscellaneous (20%)				$ 2,468,534
	Total				**$ 20,920,000**

SCJ ALLIANCE
CONSULTING SERVICES

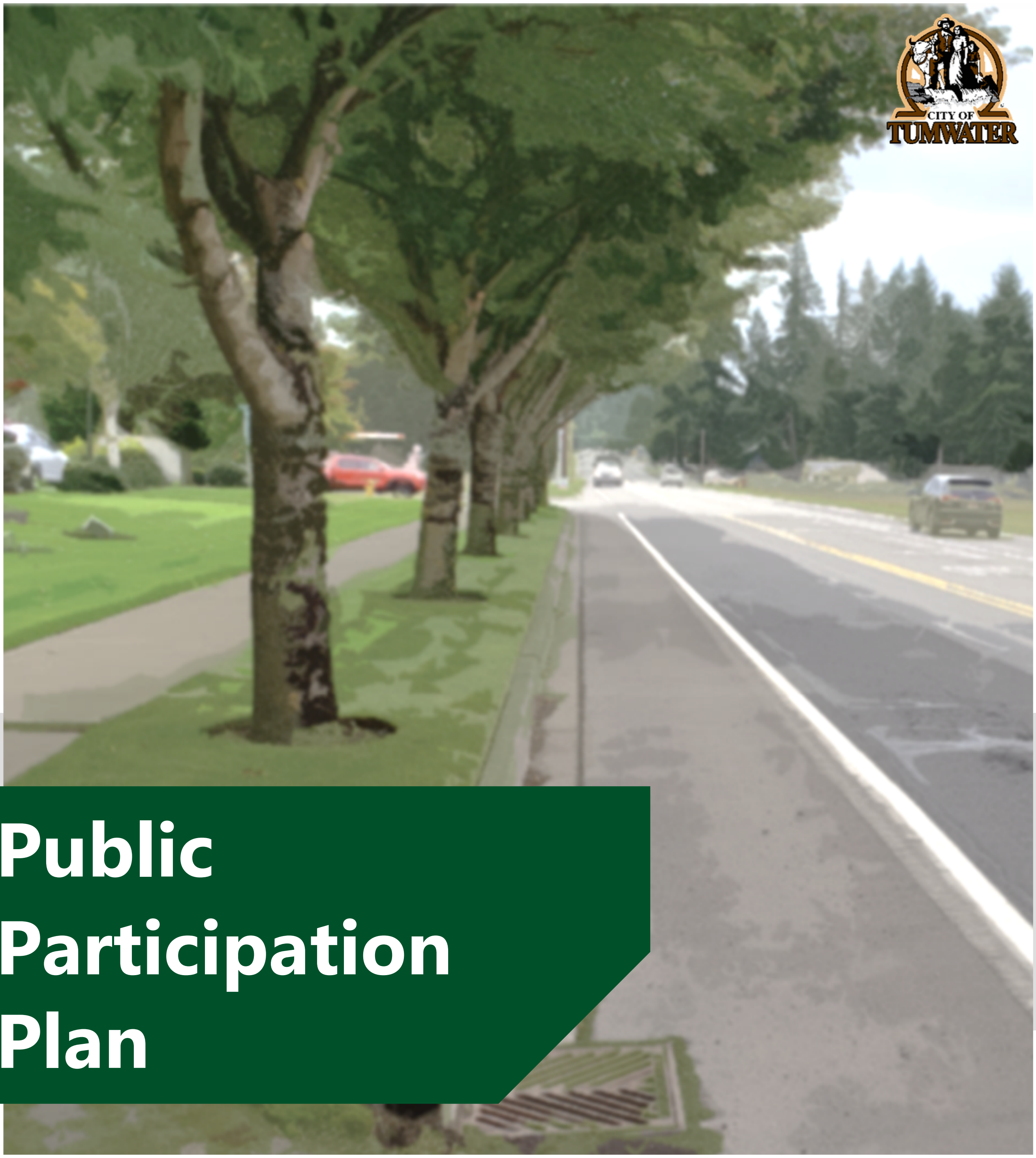
					ALT 3B
Element	**Element Based Upon**	**Unit**	**Unit Cost**	**Estimate Measurement**	
Roadwork	**Estimated Quantities**				**$ 12,406,904**
	Mobilization	LS	8%	1	$ 1,077,336
	Clearing and Grubbing	SF	$0.23	467,500	$ 107,323
	Roadway Excavation/Select Borrow	CY	$25.00	25,815	$ 645,370
	Roadway Section	SF	$5.13	459,000	$ 2,355,588
	Conveyance	LF	$62.30	8,500	$ 529,550
	Water Quality/Flow Control	SF	$2.28	459,000	$ 1,044,225
	Sidewalk	SY	$45.83	9,444	$ 432,820
	Curb and Gutter	LF	$50.83	17,000	$ 864,076
	Erosion Control	LF	$16.80	8,500	$ 142,800
	Roundabouts	EACH	$1,000,000	3	$ 3,000,000
	Illumination	LF	$78	8,500	$ 663,816
	Permanent Signing	LF	$4.00	8,500	$ 34,000
	Landscaping	LF	$60.00	8,500	$ 510,000
	Traffic Control	LS	$1,000,000	1	$ 1,000,000
Right-of-Way					**$ 2,734,118**
	Parcels	Value			$ 2,734,118
Engineering	**22%**				**$ 2,729,519**
	PE	12%			$ 1,488,828
	CN	10%			$ 1,240,690
	Subtotal				$ 17,870,541
	Conceptual Contingency/Miscellaneous (20%)				$ 2,481,381
	Total				**$ 20,360,000**

SCJ ALLIANCE
CONSULTING SERVICES

Element	Element Based Upon	Unit	Unit Cost	Estimate Measurement	ALT 5
Roadwork	**Estimated Quantities**				**$ 12,520,190**
	Mobilization	LS	8%	1	$ 1,085,720
	Clearing and Grubbing	SF	$0.23	544,000	$ 124,885
	Roadway Excavation/Select Borrow	CY	$25.00	28,963	$ 724,074
	Roadway Section	SF	$5.13	425,000	$ 2,181,100
	Conveyance	LF	$62.30	8,500	$ 529,550
	Water Quality/Flow Control	SF	$2.28	425,000	$ 966,875
	Sidewalk	SY	$45.83	24,556	$ 1,125,332
	Curb and Gutter	LF	$50.83	8,500	$ 432,038
	Erosion Control	LF	$16.80	8,500	$ 142,800
	Roundabouts	EACH	$1,000,000	3	$ 3,000,000
	Illumination	LF	$78	8,500	$ 663,816
	Permanent Signing	LF	$4.00	8,500	$ 34,000
	Landscaping	LF	$60.00	8,500	$ 510,000
	Traffic Control	LS	$1,000,000	1	$ 1,000,000
Right-of-Way					**$ 3,110,000**
	Parcels	Value			$ 3,110,000
Engineering	**22%**				**$ 2,754,442**
	PE	12%			$ 1,502,423
	CN	10%			$ 1,252,019
	Subtotal				$ 18,384,632
	Conceptual Contingency/Miscellaneous (20%)				$ 2,504,038
	Total				**$ 20,890,000**

				ALT 6	
Element	Element Based Upon	Unit	Unit Cost	Estimate Measurement	
Roadwork	**Estimated Quantities**				**$ 12,606,457**
	Mobilization	LS	8%	1	$ 1,093,276
	Clearing and Grubbing	SF	$0.23	544,000	$ 124,885
	Roadway Excavation/Select Borrow	CY	$25.00	28,963	$ 724,074
	Roadway Section	SF	$5.13	459,000	$ 2,355,588
	Conveyance	LF	$62.30	8,500	$ 529,550
	Water Quality/Flow Control	SF	$2.28	459,000	$ 1,044,225
	Sidewalk	SY	$45.83	20,778	$ 952,204
	Curb and Gutter	LF	$50.83	8,500	$ 432,038
	Erosion Control	LF	$16.80	8,500	$ 142,800
	Roundabouts	EACH	$1,000,000	3	$ 3,000,000
	Illumination	LF	$78	8,500	$ 663,816
	Permanent Signing	LF	$4.00	8,500	$ 34,000
	Landscaping	LF	$60.00	8,500	$ 510,000
	Traffic Control	LS	$1,000,000	1	$ 1,000,000
Right-of-Way					**$ 3,110,000**
	Parcels	Value			$ 3,110,000
Engineering	**22%**				**$ 2,773,420**
	PE	12%			$ 1,512,775
	CN	10%			$ 1,260,646
	Subtotal				$ 18,489,877
	Conceptual Contingency/Miscellaneous (20%)				$ 2,521,291
	Total				**$ 21,020,000**

APPENDIX C
- PUBLIC PARTICIPATION PLAN



Public Participation Plan

City of Tumwater | Old Highway 99 Corridor Study (2020)

Introduction

Old Highway 99 was first assigned in the mid-1920s as the original north-south highway running along the West Coast of the United States. Extending from Blaine, Washington in the north to its southern terminus in Calexico, California, it ran 1,600 miles border to border.

In Washington State, this corridor spurred growth and commerce for more than 40 different communities as goods and travelers were able to quickly navigate from one city to the next. While this route has since lost many of its once daily travelers to Interstate 5 (I-5), the corridor still offers an identity that is closely linked to many of these early west coast cities. In recent years, many of these communities have invested in the revitalization of this route through main street projects, placemaking efforts and expanded boulevards.

At the local level, Old Highway 99 connects south Thurston County, Bush Prairie and the Olympia Regional Airport to the City of Tumwater and Interstate 5. Commercial and residential use levels have crept upwards in recent years, extending rush hours and lengthening vehicle queues.

Currently, there are no bike lanes along this stretch of the corridor and sidewalks are relegated to highly segmented portions connected to new construction. Pedestrians and bikes end up using the shoulder which is as narrow as 2 feet in some locations. With minimal lighting, this becomes especially challenging in the early and later hours of the day as non-motorized travel mixes with vehicle commuters and freight shipments.

Who

The City of Tumwater has received grant funding from the Federal Highway Administration (FHWA) through support from the Thurston Regional Planning Council (TRPC) and Washington State Department of Transportation (WSDOT) to develop safety and mobility strategies to fit in with the surrounding uses while providing for solutions to local and regional commuters, pedestrians, bikes, and freight.

This effort is intended to be completed in close collaboration and participation from local businesses, residents and property owners, tenants, various other stakeholders, and the general public.

What

The study will focus on validating previous traffic information to help inform decision making and strategize development. This stretch of Old Highway 99 also cuts through known Mazama Pocket gopher habitat which is a federally listed species and in close proximity to the Jack Davis Garry Oak Tree. Environmental reports will cover these topics and other environmental factors that will further inform the development of a corridor strategy.

The main goal of the study will be to advance design (intersections, cross-section, stormwater, etc.) and environmental documentation far enough to determine the following:

- Future right-of-way needs (areas and cost).
- Strategies to phase construction projects.
- Estimates for Mazama Pocket Gopher habitat credits per phased project.

Where

For the purposes of this planning effort, the project boundaries run along Old Highway 99 from 73rd Avenue to the southern boundary of the Urban Growth Area at 93rd Avenue. Neighboring parcels and street approaches will also be included within the evaluation and planning process.

When and How

Transportation touches everyone's daily life in some way. As a result, people tend to have a lot of interest, big ideas, and strong opinions when it comes to corridor development. A successful engagement process harnesses that energy and inspires community ownership, while adapting to new insights and feedback.

Stakeholders and community members supply the local knowledge, context, and information necessary to make informed project decisions. Early and often engagement of the residents and businesses who regularly use and depend on Old Highway 99 will be a key factor in the success of this project. This starts with the Public Participation Plan where we identify steps to ensure project transparency, open communication and multiple opportunities for feedback and collaboration.

1. **Virtual Public Workshop:** As a major transportation corridor within Thurston County, thousands of travelers and goods are funneled through this section of Old Highway 99 on a daily basis. It is important that experiences and expectations of these travelers are reflected in the decisions and outcomes of this project.

    - **Action:** A virtual workshop for the project corridor will be developed to offer community members an opportunity to learn about the project goals and provide location-based insights, pinpoint concerns, share ideas, upload images, and discuss topics with neighbors and other corridor users about the spaces they know and value.

    - **Format:** Opportunities to access, navigate, and participate within this virtual workshop will be distributed publicly across social media platforms, the City of Tumwater website, and other city communication channels (email, utility flyers, project website, etc.) The virtual public workshop will be accessible from any internet connected device.

    - **Timeline:** The virtual workshop will start in September 2020 and run through the end of October 2020. This timeline is intended to reduce as many barriers as possible by offering 24-hour availability and in-home access in a format that is flexible to community schedules.

    - **Outcome:** After this phase of outreach has concluded, submitted comments will be reviewed for similarities and new perspectives that can better inform and drive project tasks. Project alternatives and opportunities will then be evaluated based on community input and support.

2. **Project Specific Webpage:** In support of these outreach efforts, a project specific webpage will be developed as the primary information hub for updates, ongoing efforts, and project milestones.

    - **Action:** The webpage will provide an additional level of project transparency as project documents, contact information, opportunities for participation, and next steps will all be published and made publicly available.

- **Format:** The project webpage will be linked and accessible through the City of Tumwater website, with easy navigation and opportunities to provide comments and contact project leads.
- **Timeline:** The webpage will be released and promoted early in the project, allowing visitors to become familiar with the site, learn about the project phases, and identify opportunities for participation.
- **Outcome:** The webpage will ensure transparency throughout the project; providing timely updates; open communication channels, project milestones, and an opportunity to join the mailing list.

3. **Key Stakeholder Outreach/Informational Interviews:** Multiple agencies depend on this section of Old Highway 99 for continued operations and network access. These agencies have a unique understanding of this corridor as it represents a primary link within their daily activities and needs. Target stakeholders within this phase include Intercity Transit, Thurston Regional Planning Council, Thurston County, the Port of Olympia, Tumwater Emergency Services, Tumwater School District, and the Tumwater Traffic Team.
   - **Action:** A targeted outreach effort will be made to hear directly from each of these stakeholder groups; giving them an opportunity to identify any initial thoughts, needs, and concerns, while offering an opportunity for open dialog with the project team. One of the objectives of this phase is to identify site-specific details that may get overlooked at later stages in the process.
   - **Format:** Outreach within this phase will primarily take place via email or telephone depending on stakeholder preferences and available resources.
   - **Timeline:** This phase of outreach is intended to run concurrently with alternative development and refinement following feedback collected within previous phases of outreach. The goal is to have these informational interviews completed as early as possible to best inform project tasks and alternatives analysis.
   - **Outcome:** Once this phase of outreach has been completed, a summary document of frequently asked questions will be made available to the greater public via the project page.
4. **Virtual Project Open House:** Following the insights and ideas gathered throughout this process, a preliminary design will be developed for the corridor. To ensure these designs reflect the expectations of the community, a virtual project open house will be held in early 2021.
   - **Action:** The recommended preliminary corridor design will be shared publicly and distributed to the project webpage and mailing lists.
   - **Format:** The virtual open house will offer interested community members an opportunity to review the preliminary designs and provide feedback to the project team.
   - **Timeline:** The open house will be held in early 2021.
   - **Outcome:** The project team will use the collected input to refine the project into a final design.
5. **City Council Briefings:** To ensure the project is reflective of City goals and community insights, Councilmembers will receive updates on project findings, milestones, and alternatives.

- **Action:** City Council will receive project briefings at two public meetings to review project materials, progress, and recommendations.
- **Format:** Council briefings will take place at two regularly scheduled public meetings. Face to face video presentations from the project leads will promote clarity and open dialogue.
- **Timeline:** Two Council briefings are currently scheduled. The first will take place near the project's midpoint to update the Council on project milestones, findings, and initial renderings. The second briefing will take place near the project's conclusion with refined renderings, deliverables, insights from the community.
- **Outcome:** The intent of this phase is to ensure Councilmembers are well informed and have multiple opportunities to provide targeted guidance to the project leads.

COVID-19

Given the ongoing and variable health risks associated with in person communication, all outreach efforts have been developed for online or telephone-based communication channels. If public gatherings and in person conversations are deemed safe by licensed state health practitioners before the completion of this project, the public participation plan may be revisited.

APPENDIX D
- PROJECT PHASE ESTIMATES

SCJ ALLIANCE
CONSULTING SERVICES

Element	Element Based Upon	Unit	Unit Cost	Estimate Measurement	Phase 1
Roadwork	**Estimated Quantities**				**$ 2,636,099**
	Mobilization	LS	8%	1	$ 230,899
	Roundabout	EACH	$1,890,000	1	$ 1,890,000
	Illumination	LF	$78	3,800	$ 300,000
	Permanent Signing	LF	$4.00	3,800	$ 15,200
	Traffic Control	LS	$200,000	1	$ 200,000
	Subtotal Contruction				$ 2,636,099
	Conceptual Contingency/Miscellaneous (20%)				$ 527,220
	Total Construction				$ 3,163,319
	PE		12%		$ 379,598
	CM		15%		$ 474,498
	ROW		Value		$ 900,000
	Total				**$ 4,920,000**

				Phase 2	
Element	**Element Based Upon**	**Unit**	**Unit Cost**	**Estimate Measurement**	
Roadwork	**Estimated Quantities**				**$ 6,868,160**
	Mobilization	LS	8%	1	$ 601,591
	Clearing and Grubbing	SF	$0.23	312,800	$ 71,809
	Roadway Excavation/Select Borrow	CY	$25.00	13,459	$ 336,481
	Roadway Section	SF	$5.13	294,400	$ 1,510,861
	Conveyance	LF	$62.30	4,600	$ 286,580
	Water Quality/Flow Control	SF	$2.28	294,400	$ 669,760
	Sidewalk	SY	$45.83	3,067	$ 140,539
	Curb and Gutter	LF	$101.66	4,600	$ 467,618
	Erosion Control	LF	$16.80	4,600	$ 77,280
	Roundabout	EACH	$1,890,000	1	$ 1,890,000
	Illumination	LF	$78	4,600	$ 359,242
	Permanent Signing	LF	$4.00	4,600	$ 18,400
	Landscaping	LF	$30.00	4,600	$ 138,000
	Traffic Control	LS	$300,000	1	$ 300,000
	Subtotal Contruction				$ 6,868,160
	Conceptual Contingency/Miscellaneous (20%)				$ 1,373,632
	Total Construction				$ 8,241,792
	PE		12%		$ 989,015
	CM		15%		$ 1,236,269
	ROW		Value		$ 3,750,000
	Total				**$ 14,220,000**

SCJ ALLIANCE
CONSULTING SERVICES

Element	Element Based Upon	Unit	Unit Cost	Estimate Measurement	Phase 3
Roadwork	**Estimated Quantities**				**$ 5,977,245**
	Mobilization	LS	8%	1	$ 523,554
	Clearing and Grubbing	SF	$0.23	185,000	$ 42,470
	Roadway Excavation/Select Borrow	CY	$25.00	10,826	$ 270,648
	Roadway Section	SF	$5.13	236,800	$ 1,215,258
	Conveyance	LF	$62.30	3,700	$ 230,510
	Water Quality/Flow Control	SF	$2.28	236,800	$ 538,720
	Sidewalk	SY	$45.83	2,467	$ 113,042
	Curb and Gutter	LF	$101.66	3,700	$ 376,127
	Erosion Control	LF	$16.80	3,700	$ 62,160
	Roundabouts	EACH	$1,890,000	1	$ 1,890,000
	Illumination	LF	$78	3,700	$ 288,955
	Permanent Signing	LF	$4.00	3,700	$ 14,800
	Landscaping	LF	$30.00	3,700	$ 111,000
	Traffic Control	LS	$300,000	1	$ 300,000
	Subtotal Contruction				$ 5,977,245
	Conceptual Contingency/Miscellaneous (20%)				$ 1,195,449
	Total Construction				$ 7,172,694
	PE		12%		$ 860,723
	CM		15%		$ 1,075,904
	ROW		Value		$ 1,990,000
	Total				**$ 11,100,000**

SCJ ALLIANCE
CONSULTING SERVICES

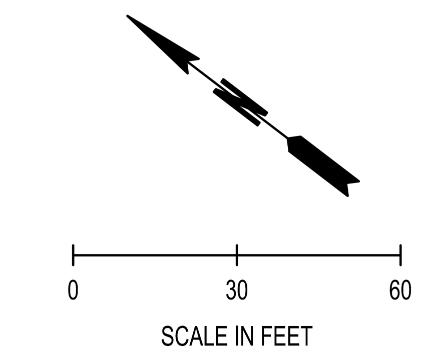
Element	Element Based Upon	Unit	Unit Cost	Estimate Measurement	Phase 4
Roadwork	**Estimated Quantities**				**$ 2,096,746**
	Mobilization	LS	8%	1	$ 183,657
	Clearing and Grubbing	SF	$0.23	136,800	$ 31,405
	Roadway Excavation/Select Borrow	CY	$25.00	6,578	$ 164,444
	Roadway Section	SF	$5.13	110,400	$ 566,573
	Conveyance	LF	$62.30	2,400	$ 149,520
	Water Quality/Flow Control	SF	$2.28	110,400	$ 251,160
	Sidewalk	SY	$45.83	3,200	$ 146,650
	Curb and Gutter	LF	$50.83	2,400	$ 121,987
	Erosion Control	LF	$16.80	2,400	$ 40,320
	Illumination	LF	$78	2,400	$ 187,430
	Permanent Signing	LF	$4.00	2,400	$ 9,600
	Landscaping	LF	$60.00	2,400	$ 144,000
	Traffic Control	LS	$100,000	1	$ 100,000
	Subtotal Contruction				$ 2,096,746
	Conceptual Contingency/Miscellaneous (20%)				$ 419,349
	Total Construction				$ 2,516,095
	PE	12%			$ 301,931
	CM	15%			$ 377,414
	ROW	Value			$ 580,000
	Total				**$ 3,780,000**

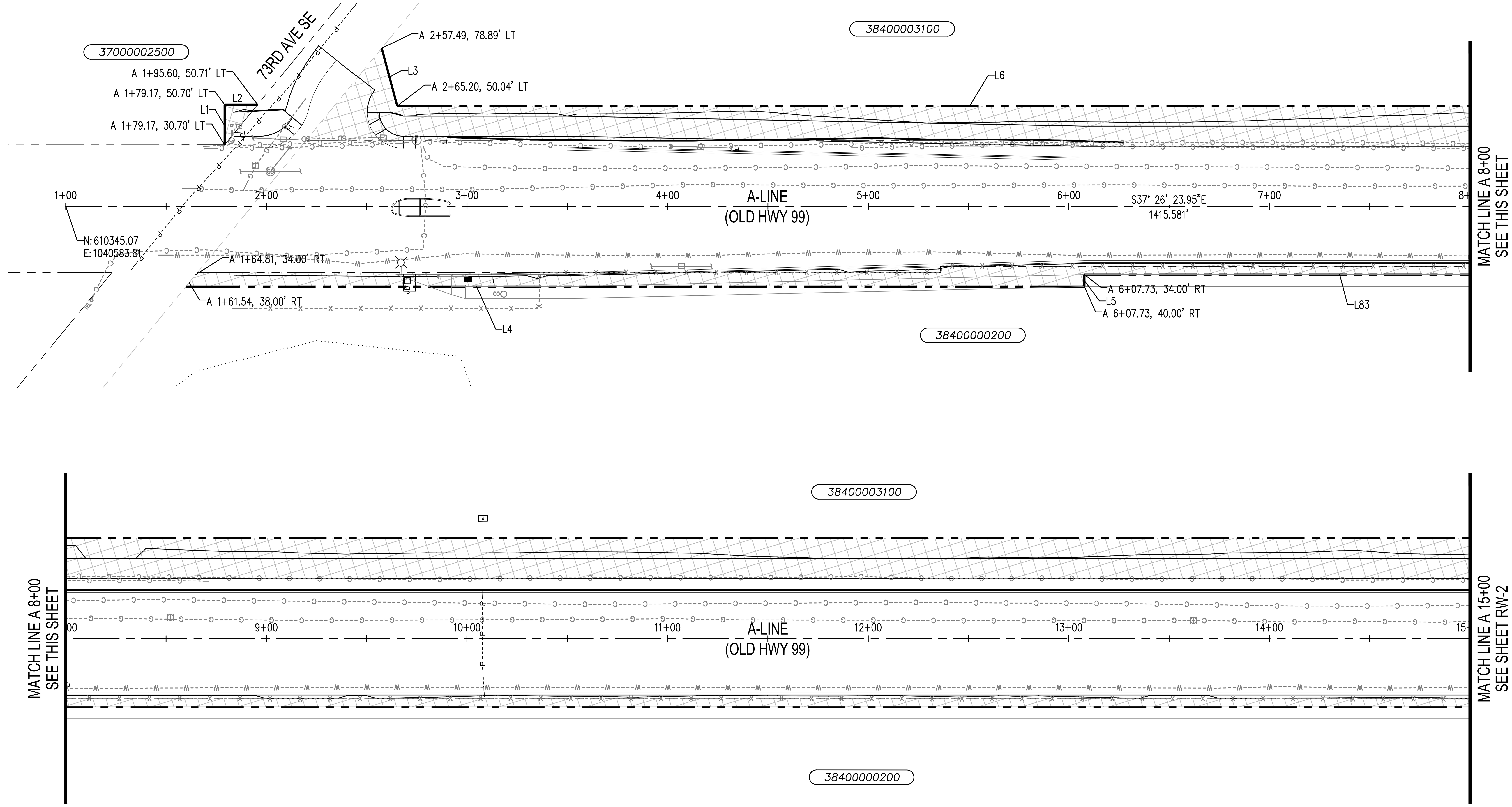
SCJ ALLIANCE
CONSULTING SERVICES

Element	Element Based Upon	Unit	Unit Cost	Estimate Measurement	Phase 5
Roadwork	**Estimated Quantities**				**$ 6,021,285**
	Mobilization	LS	8%	1	$ 527,412
	Clearing and Grubbing	SF	$0.23	225,500	$ 51,768
	Roadway Excavation/Select Borrow	CY	$25.00	11,237	$ 280,926
	Roadway Section	SF	$5.13	188,600	$ 967,895
	Conveyance	LF	$62.30	4,100	$ 255,430
	Water Quality/Flow Control	SF	$2.28	188,600	$ 429,065
	Sidewalk	SY	$45.83	5,467	$ 250,526
	Curb and Gutter	LF	$50.83	8,200	$ 416,790
	Erosion Control	LF	$16.80	4,100	$ 68,880
	Roundabouts	EACH	$1,890,000	1	$ 1,890,000
	Illumination	LF	$78	4,100	$ 320,194
	Permanent Signing	LF	$4.00	4,100	$ 16,400
	Landscaping	LF	$60.00	4,100	$ 246,000
	Traffic Control	LS	$300,000	1	$ 300,000
	Subtotal Contruction				$ 6,021,285
	Conceptual Contingency/Miscellaneous (20%)				$ 1,204,257
	Total Construction				$ 7,225,542
	PE		12%		$ 867,065
	CM		15%		$ 1,083,831
	ROW		Value		$ 2,220,000
	Total				**$ 11,400,000**

APPENDIX E
- CONCEPT RIGHT OF WAY PLANS AND ESTIMATE

S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M





LEGEND

- EXISTING RIGHT-OF-WAY LINE
- EXISTING EASEMENT LINE
- SECTION LINE
- PROPOSED RIGHT-OF-WAY LINE
- PROPOSED CUT & FILL LINE
- PROPOSED RIGHT-OF-WAY
- TEMPORARY CONSTRUCTION EASEMENT (TCE)
- FUTURE FRONTAGE IMPROVEMENTS BY THE PORT OF OLYMPIA

PARCEL LINE AND CURVE TABLE

LINE #/CURVE #	LENGTH	BEARING/DELTA	RADIUS
L1	20.00	N52° 32' 25"E	
L2	16.43	S37° 27' 35"E	
L3	29.86	S37° 35' 03"W	
L4	447.83	S37° 26' 24"E	
L5	6.00	N52° 33' 36"E	
L6	1423.27	S37° 26' 17"E	
L83	907.85	S37° 26' 24"E	

OWNERSHIP TABLE

PARCEL NO.	R/W	TCE
37000002500	164 SF	---
38400003100	28,795 SF	---
38400000200	128,290 SF	1,508 SF

EXISTING LEGEND

- WATER VALVE WITH VALVE BOX
- FITTING WITH THRUST BLOCKING
- FIRE HYDRANT ASSEMBLY
- ---W---W--- EXISTING WATER MAIN
- ---OH---OH--- OVERHEAD POWER LINE
- ---P---P--- UNDERGROUND POWER LINE
- ---C---C--- UNDERGROUND TELECOMMUNICATIONS LINE
- ---SD---SD--- EXISTING STORM DRAIN LINE
- CATCH BASIN TYPE 1
- CATCH BASIN TYPE 2

REVISIONS	DATE	BY
PRELIMINARY		

DESIGNED BY: DESIGNER NAME
ISSUE DATE: SEPTEMBER 2020
DRAWN BY: DRAFTER NAME
JOB No.: 0625.29
CHECKED BY: ENGINEER NAME
DRAWING FILE No.: 0625.29-ROW-01

ALL DIMENSIONS SHOWN IN FEET UNLESS OTHERWISE DESIGNATED

PATRICK HOLM
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CITY OF TUMWATER
555 ISRAEL ROAD SW
TUMWATER, WA 98501

OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON

RIGHT-OF-WAY PLAN
A 1+00 - A 15+00

DRAWING No.: RW-1

SHEET No.: 1 OF 14

Oct 28, 2022 11:10:47am – User david.rowland
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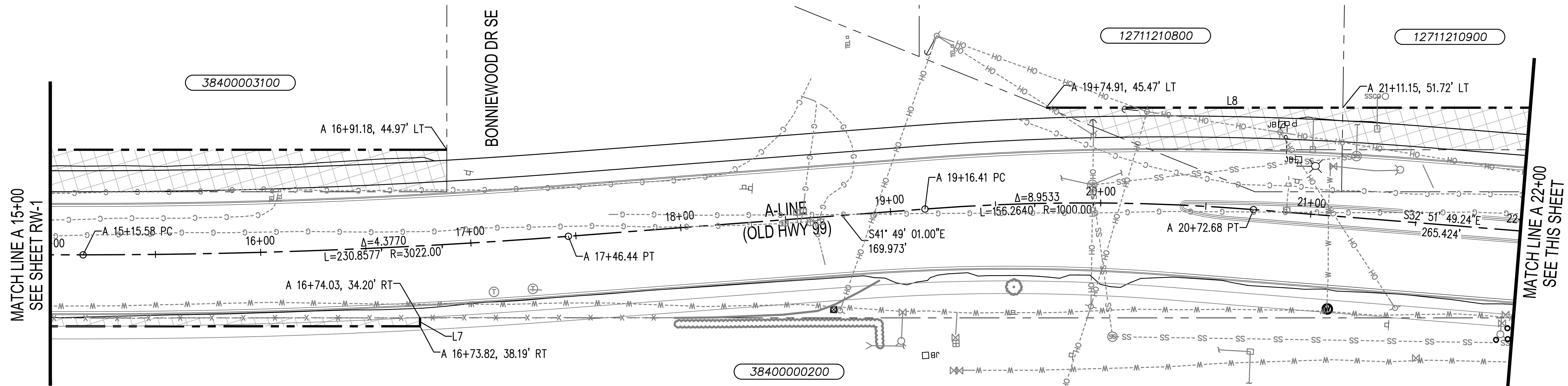

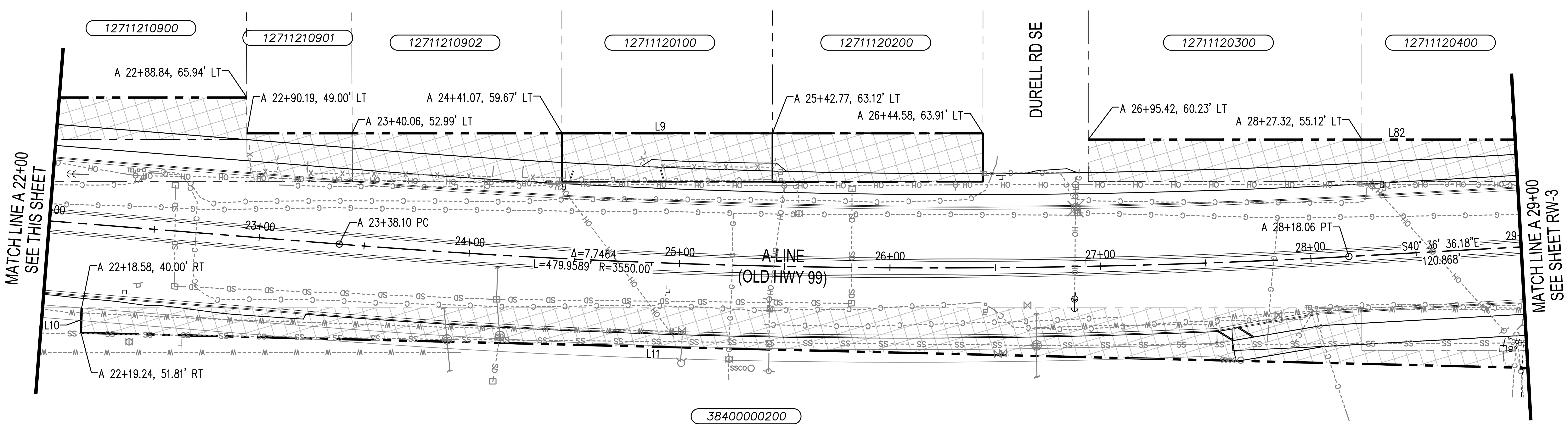

LEGEND

- EXISTING RIGHT-OF-WAY LINE
- EXISTING EASEMENT LINE
- SECTION LINE
- PROPOSED RIGHT-OF-WAY LINE
- PROPOSED CUT & FILL LINE
- PROPOSED RIGHT-OF-WAY
- TEMPORARY CONSTRUCTION EASEMENT (TCE)
- FUTURE FRONTAGE IMPROVEMENTS BY THE PORT OF OLYMPIA

PARCEL LINE AND CURVE TABLE

LINE #/CURVE #	LENGTH	BEARING/DELTA	RADIUS
L7	4.00	N52° 33' 36"E	
L8	319.23	S37° 26' 24"E	
L9	349.61	S37° 26' 24"E	
L10	11.83	N53° 56' 56"E	
L11	786.00	N36° 03' 04"W	
L82	260.42	S37° 26' 24"E	

OWNERSHIP TABLE

PARCEL NO.	R/W	TCE
12711210800	2,320 SF	---
12711210900	3,568 SF	---
12711210901	1,150 SF	---
12711210902	2,291 SF	---
12711120100	2,311 SF	---
12711120200	2,300 SF	---
12711120300	2,600 SF	---
12711120400	2,609 SF	---

REVISIONS	DATE	BY
PRELIMINARY		

DESIGNED BY: DESIGNER NAME
ISSUE DATE: SEPTEMBER 2020
DRAWN BY: DRAFTER NAME
JOB No.: 0625.29
CHECKED BY: ENGINEER NAME
DRAWING FILE No.: 0625.29-ROW-01

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CITY OF TUMWATER
555 ISRAEL ROAD SW
TUMWATER, WA 98501

OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON

RIGHT-OF-WAY PLAN
A 15+00 - A 29+00

DRAWING No.: RW-2

SHEET No.: 2 OF 14

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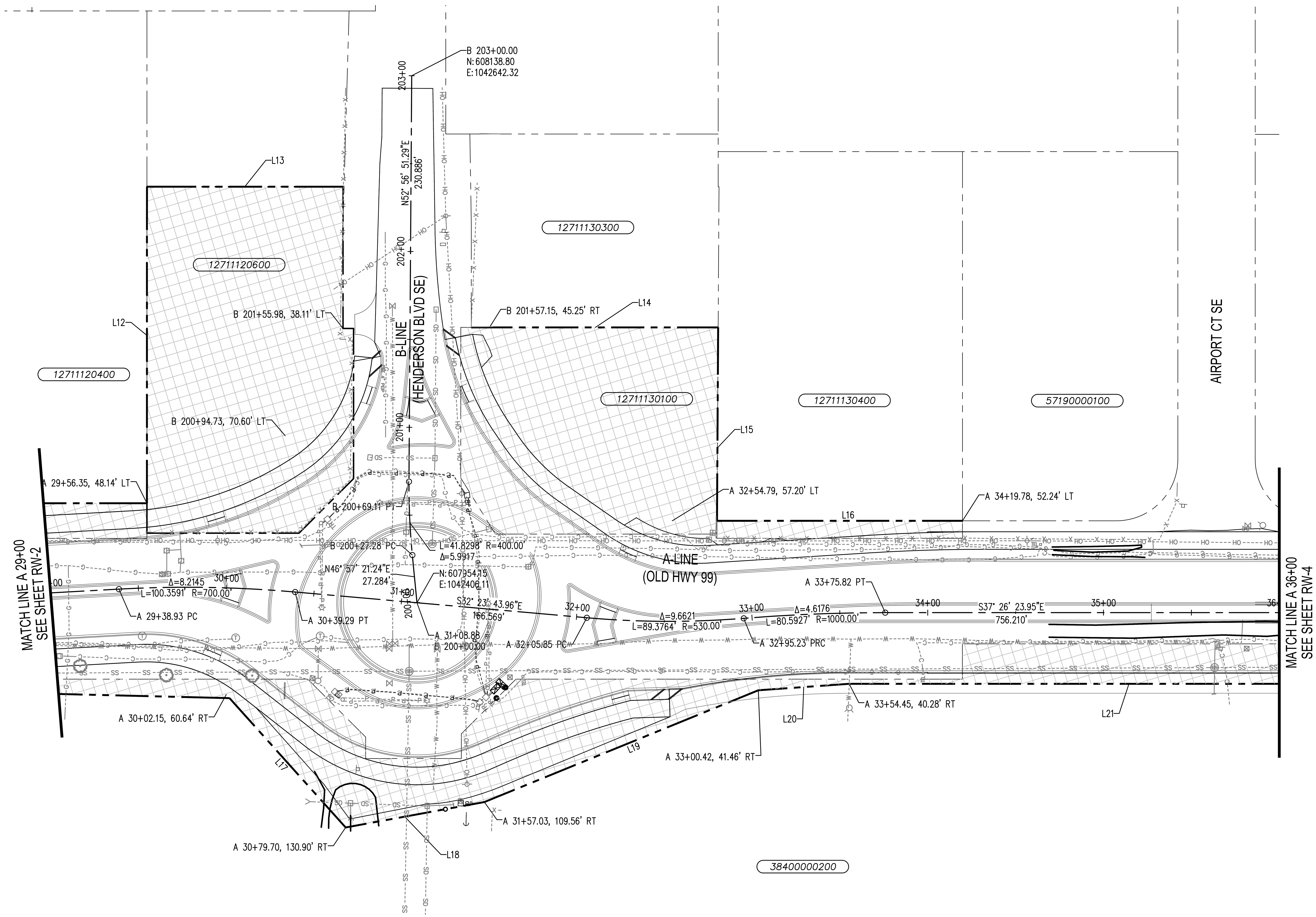

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SCALE IN FEET

LEGEND

- EXISTING RIGHT-OF-WAY LINE
- EXISTING EASEMENT LINE
- SECTION LINE
- PROPOSED RIGHT-OF-WAY LINE
- PROPOSED CUT & FILL LINE
- PROPOSED RIGHT-OF-WAY
- TEMPORARY CONSTRUCTION EASEMENT (TCE)
- FUTURE FRONTAGE IMPROVEMENTS BY THE PORT OF OLYMPIA

PARCEL LINE AND CURVE TABLE

LINE #/CURVE #	LENGTH	BEARING/DELTA	RADIUS
L12	180.05	N52° 33' 55"E	
L13	112.15	S37° 26' 06"E	
L14	140.43	S37° 26' 24"E	
L15	110.03	S52° 54' 22"W	
L16	139.66	S37° 26' 24"E	
L17	98.90	N10° 37' 53"E	
L18	80.23	N47° 49' 30"W	
L19	168.30	N59° 38' 02"W	
L20	51.83	S41° 30' 40"E	
L21	776.72	S37° 26' 24"E	

OWNERSHIP TABLE

PARCEL NO.	R/W	TCE
12711120600	5,895 SF	---
12711130100	7,671 SF	---
12711130400	1,397 SF	---

REVISIONS	DATE	BY
PRELIMINARY		

DESIGNED BY: DESIGNER NAME
ISSUE DATE: SEPTEMBER 2020
DRAWN BY: DRAFTER NAME
JOB No.: 0625.29
CHECKED BY: ENGINEER NAME
DRAWING FILE No.: 0625.29-ROW-01

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PATRICK HOLM, STATE OF WASHINGTON, 49470, REGISTERED PROFESSIONAL ENGINEER

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CITY OF TUMWATER
555 ISRAEL ROAD SW
TUMWATER, WA 98501

OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON

RIGHT-OF-WAY PLAN
A 29+00 - A 36+00

DRAWING No.: RW-3

SHEET No.: 3 OF 14

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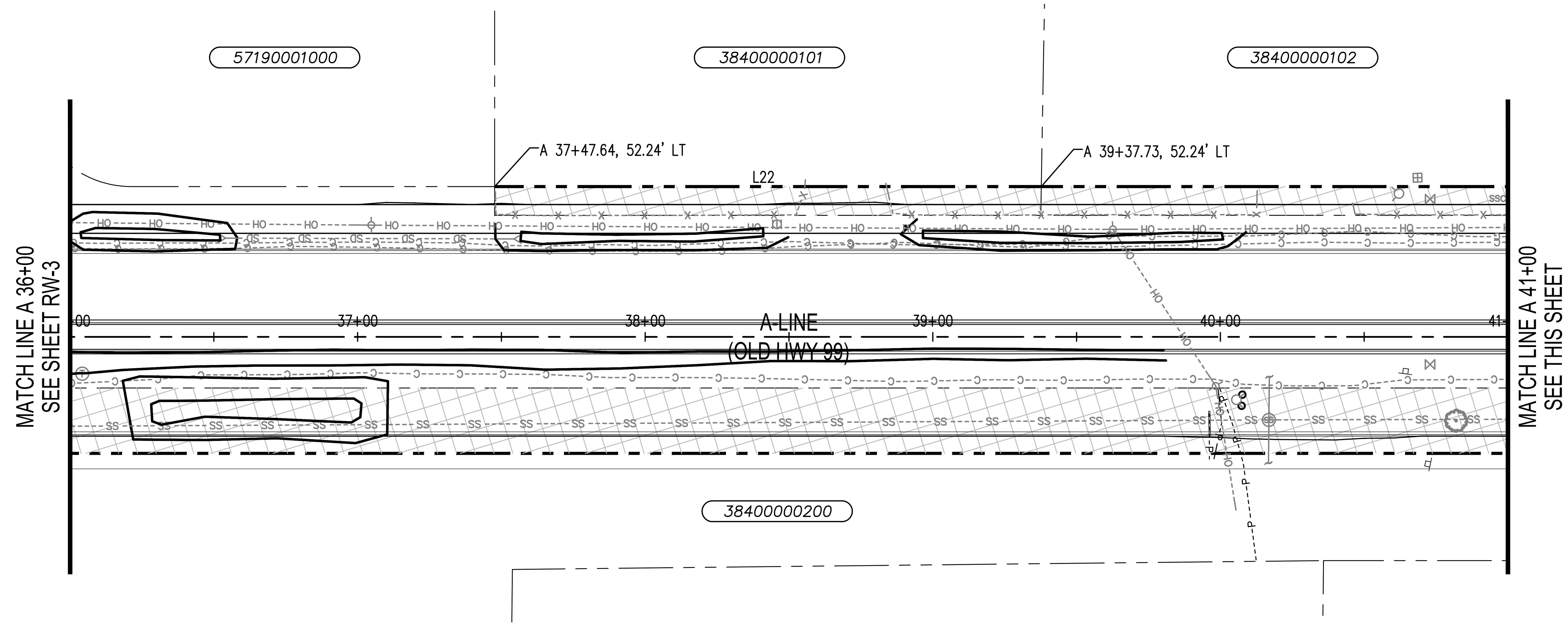

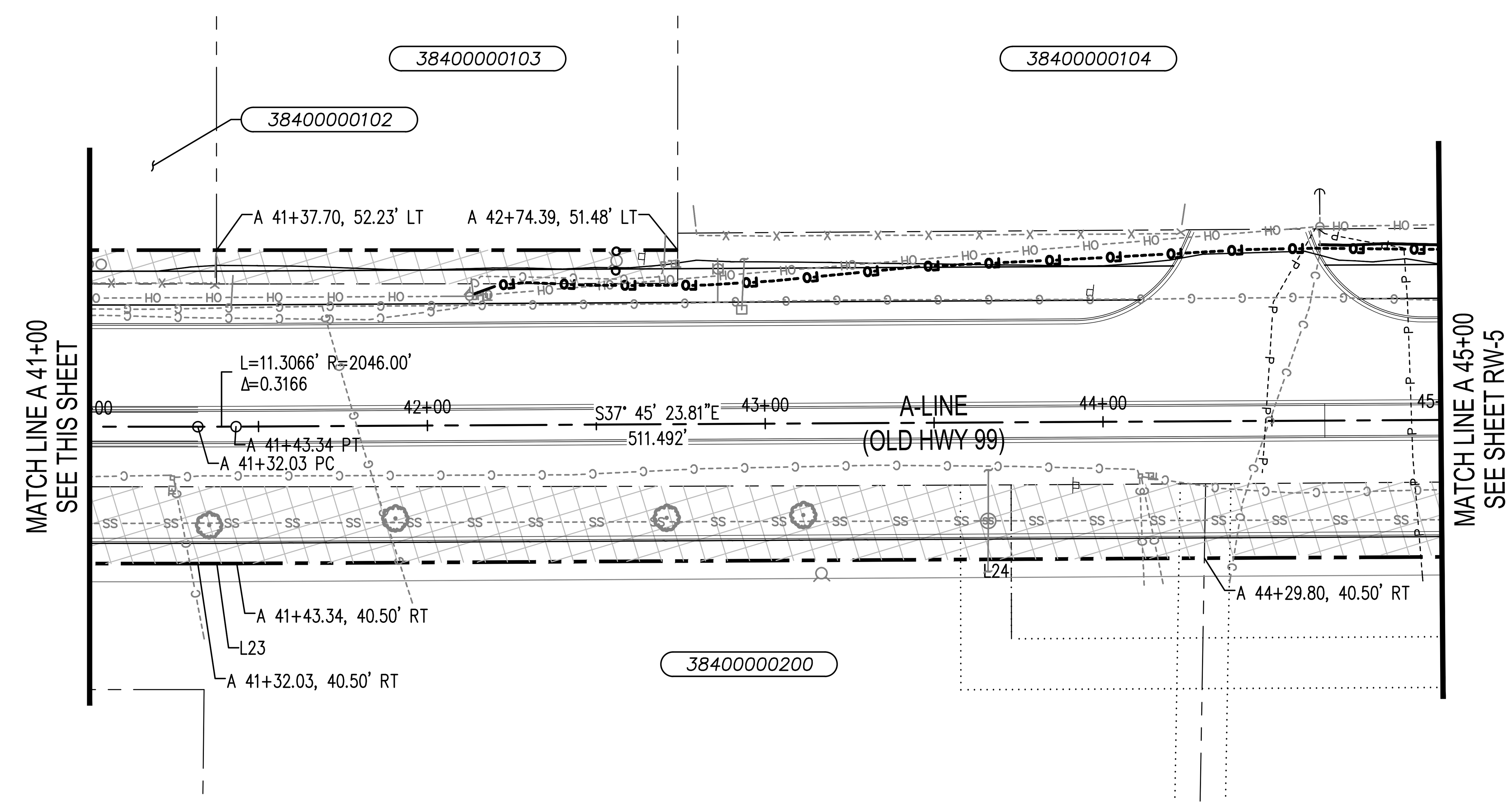

LEGEND

- EXISTING RIGHT-OF-WAY LINE
- EXISTING EASEMENT LINE
- SECTION LINE
- PROPOSED RIGHT-OF-WAY LINE
- PROPOSED CUT & FILL LINE
- PROPOSED RIGHT-OF-WAY
- TEMPORARY CONSTRUCTION EASEMENT (TCE)
- FUTURE FRONTAGE IMPROVEMENTS BY THE PORT OF OLYMPIA

PARCEL LINE AND CURVE TABLE

LINE #/CURVE #	LENGTH	BEARING/DELTA	RADIUS
L22	526.46	S37° 26' 24"E	
L23	11.53	S37° 35' 54"E	
L24	420.86	S37° 45' 24"E	

OWNERSHIP TABLE

PARCEL NO.	R/W	TCE
38400000101	1,900 SF	---
38400000102	1,999 SF	---
38400000103	1,359 SF	---
38400000104	4,078 SF	---

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△	REVISIONS	DATE	BY

PRELIMINARY

DESIGNED BY: DESIGNER NAME
ISSUE DATE: SEPTEMBER 2020
DRAWN BY: DRAFTER NAME
JOB No.: 0625.29
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DRAWING FILE No.: 0625.29-ROW-01

ALL DIMENSIONS SHOWN IN FEET UNLESS OTHERWISE DESIGNATED

PATRICK HOLM
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49470
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CITY OF TUMWATER
555 ISRAEL ROAD SW
TUMWATER, WA 98501

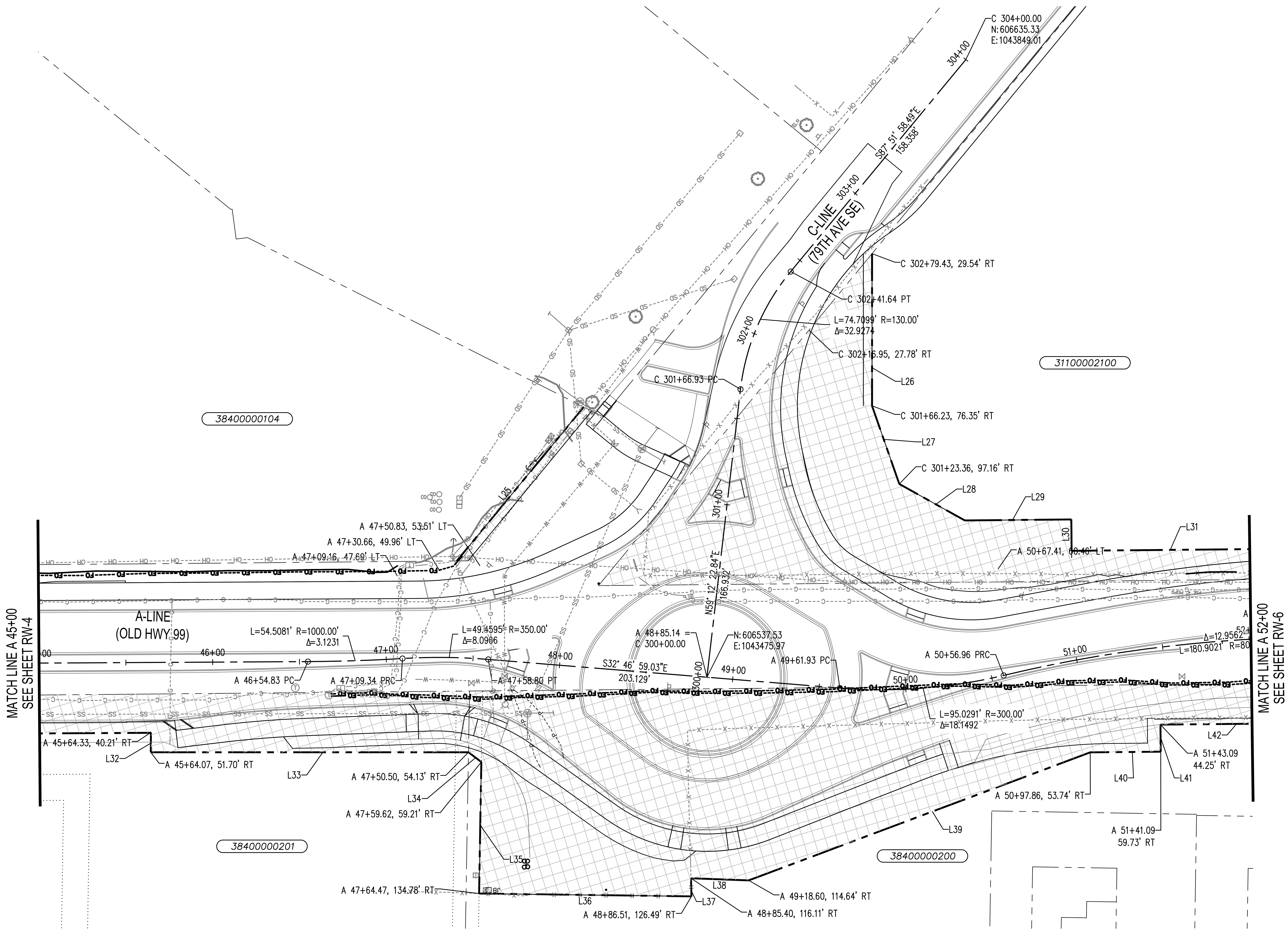
OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON

RIGHT-OF-WAY PLAN
A 36+00 - A 45+00

DRAWING No.: RW-4

SHEET No.: 4 OF 14

S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M



SCALE IN FEET: 0, 30, 60

LEGEND

- EXISTING RIGHT-OF-WAY LINE
- EXISTING EASEMENT LINE
- SECTION LINE
- PROPOSED RIGHT-OF-WAY LINE
- PROPOSED CUT & FILL LINE
- PROPOSED RIGHT-OF-WAY
- TEMPORARY CONSTRUCTION EASEMENT (TCE)
- FUTURE FRONTAGE IMPROVEMENTS BY THE PORT OF OLYMPIA

PARCEL LINE AND CURVE TABLE

LINE #/CURVE #	LENGTH	BEARING/DELTA	RADIUS
L23	11.53	S37° 35' 54"E	
L24	420.86	S37° 45' 24"E	
L25	114.88	S87° 55' 25"E	
L26	87.61	N52° 33' 36"E	
L27	47.66	N33° 19' 30"E	
L28	43.19	N8° 20' 40"W	
L29	61.34	N37° 58' 34"W	
L30	18.06	N52° 01' 25"E	
L31	573.69	N37° 58' 34"W	
L32	11.20	S52° 54' 19"W	
L33	182.97	S37° 26' 23"E	
L34	9.30	S0° 14' 10"E	
L35	75.73	S53° 32' 37"W	
L36	122.32	S36° 40' 22"E	
L37	10.44	N51° 01' 28"E	
L38	33.25	S35° 18' 38"E	
L39	210.06	S57° 59' 09"E	
L40	40.61	S37° 58' 34"E	
L41	15.59	N52° 01' 26"E	
L42	157.77	S37° 58' 34"E	

OWNERSHIP TABLE

PARCEL NO.	R/W	TCE
31100002100	16,604 SF	---
38400000201	9,182 SF	---

REVISIONS	DATE	BY

PRELIMINARY

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CITY OF TUMWATER
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OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON

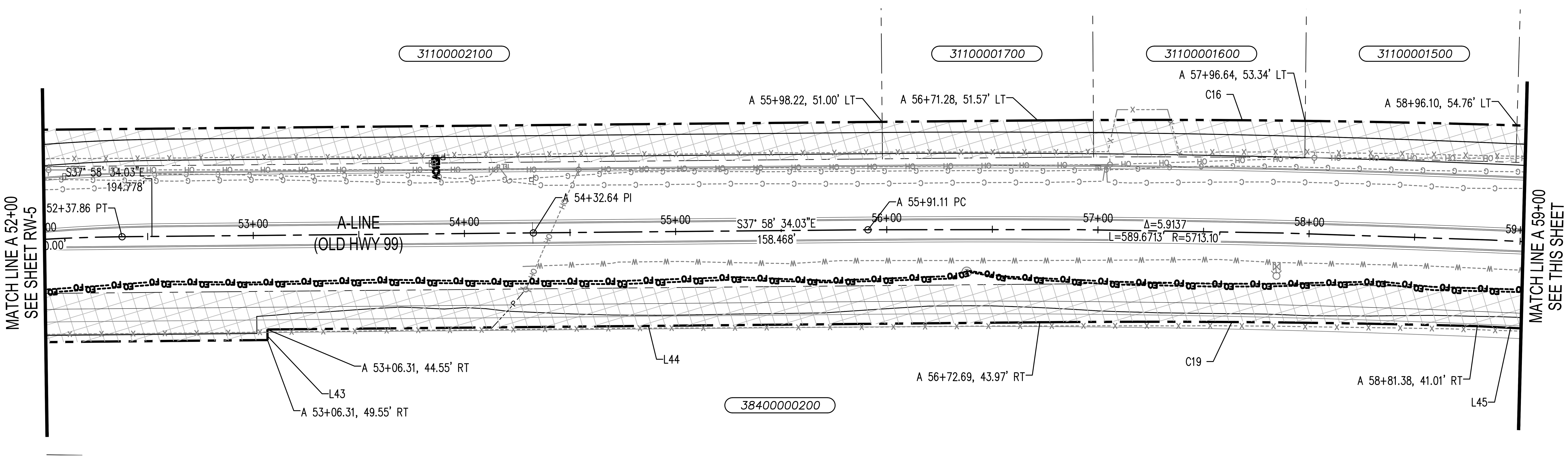
RIGHT-OF-WAY PLAN
A 45+00 - A 52+00

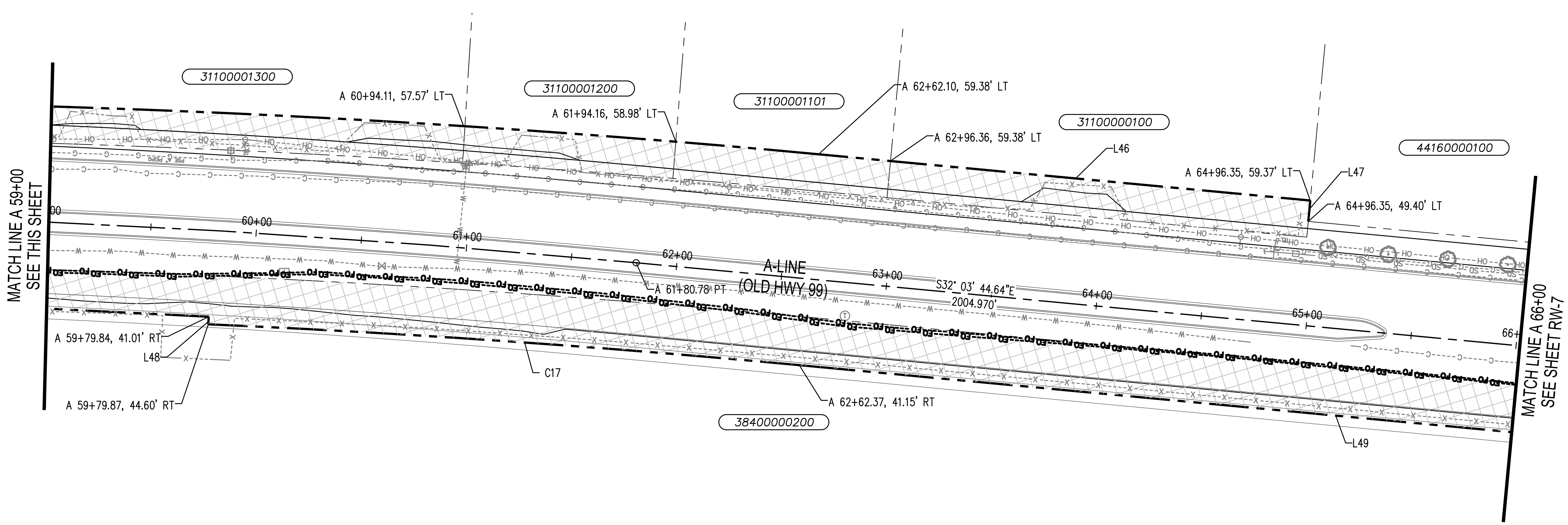
DRAWING No.: RW-5

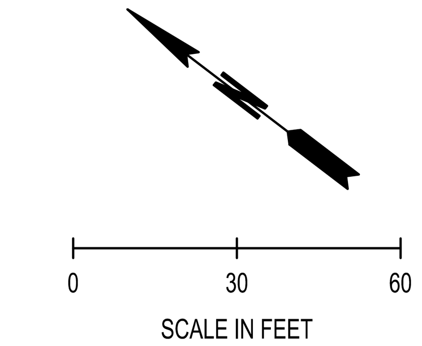
SHEET No.: 5 OF 14

Oct 28, 2022 10:02:37am – User david.rowland
N:\PROJECTS\0625 CITY OF TUMWATER\0625.29 TUMWATER OLD HWY 99 AND 79TH AVE CORRIDOR STUDY\CADD\EXHIBITS\RIGHT OF WAY\0625.29-ROW-01.DWG

S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M







LEGEND

- EXISTING RIGHT-OF-WAY LINE
- EXISTING EASEMENT LINE
- SECTION LINE
- PROPOSED RIGHT-OF-WAY LINE
- PROPOSED CUT & FILL LINE
- PROPOSED RIGHT-OF-WAY
- TEMPORARY CONSTRUCTION EASEMENT (TCE)
- FUTURE FRONTAGE IMPROVEMENTS BY THE PORT OF OLYMPIA

PARCEL LINE AND CURVE TABLE

LINE #/CURVE #	LENGTH	BEARING/DELTA	RADIUS
C16	595.80	5° 54' 49"	5772.43
C17	281.00	2° 50' 15"	5673.93
C19	207.16	2° 05' 24"	5678.93
L43	5.00	N52° 01' 26"E	
L44	365.75	S37° 58' 34"E	
L45	97.75	S34° 34' 18"E	
L46	234.26	N32° 03' 44"W	
L47	240.03	N57° 56' 27"E	
L48	3.60	S55° 31' 52"W	
L49	1871.87	S32° 03' 45"E	

OWNERSHIP TABLE

PARCEL NO.	R/W	TCE
31100001700	750 SF	---
31100001600	750 SF	---
31100001500	750 SF	---
31100001300	1,501 SF	---
31100001200	750	---
31100001101	765 SF	---
31100000100	1,500 SF	---

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OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON

RIGHT-OF-WAY PLAN
A 52+00 - A 66+00

DRAWING No.: RW-6

SHEET No.: 6 OF 14

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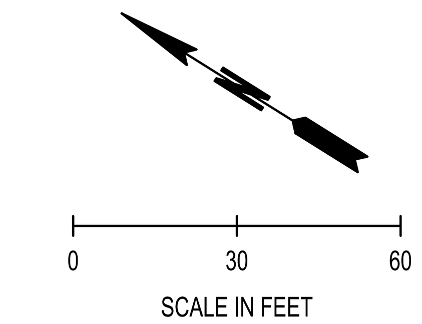

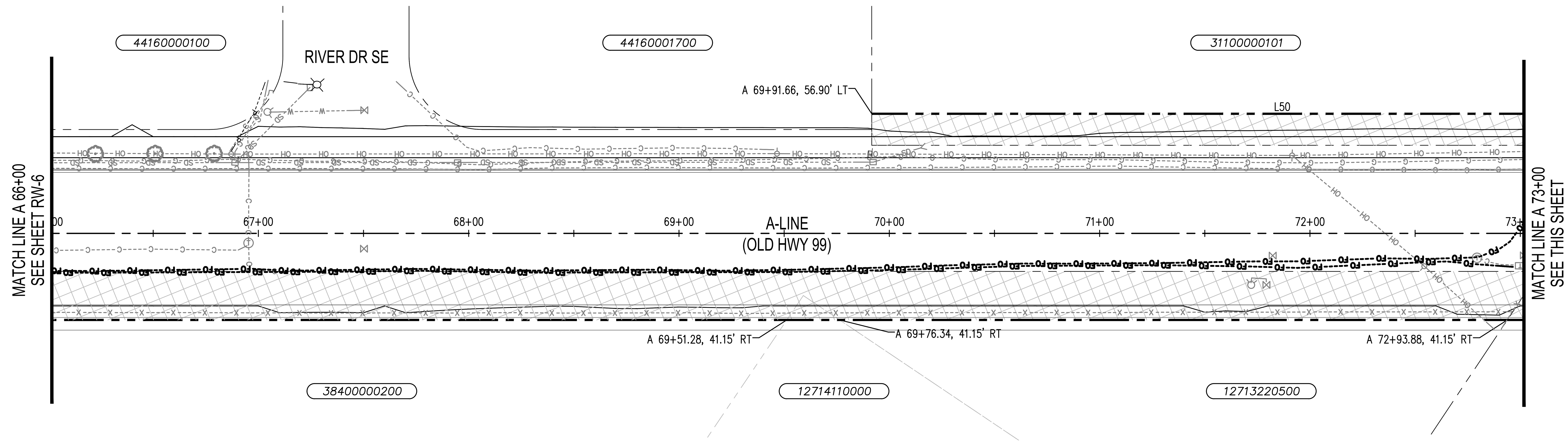

LEGEND

- EXISTING RIGHT–OF–WAY LINE
- EXISTING EASEMENT LINE
- SECTION LINE
- PROPOSED RIGHT–OF–WAY LINE
- PROPOSED CUT & FILL LINE
- PROPOSED RIGHT–OF–WAY
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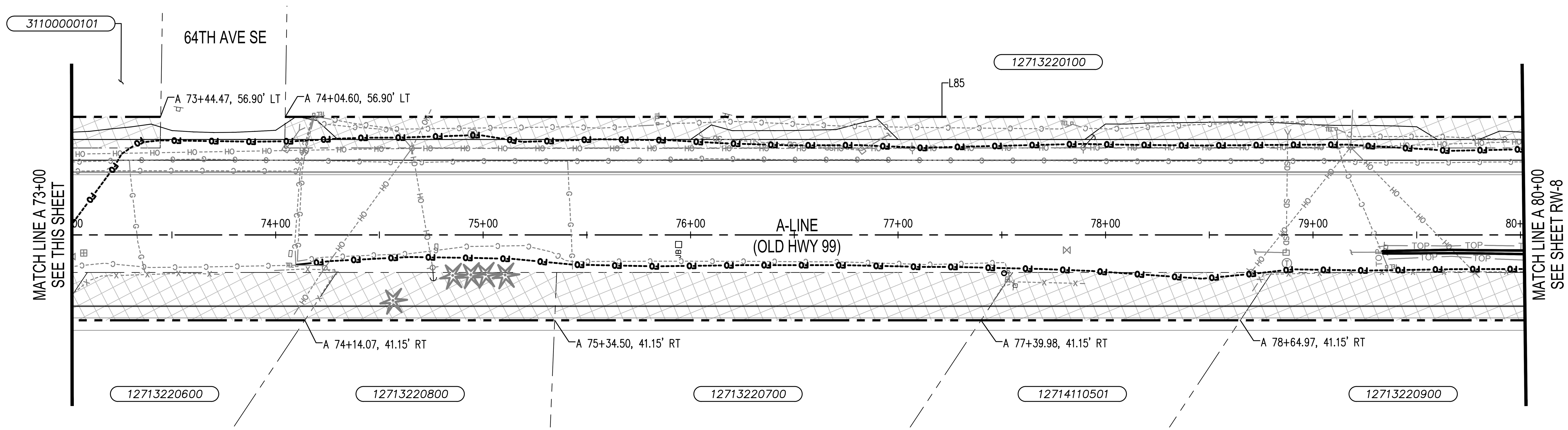
PARCEL LINE AND CURVE TABLE			
LINE #/CURVE #	LENGTH	BEARING/DELTA	RADIUS
L50	352.81	N32° 03' 45"W	
L85	918.65	N32° 03' 45"W	



OWNERSHIP TABLE		
PARCEL NO.	R/W	TCE
31100000101	5,311 SF	---
12714110000	145 SF	---
12713220500	7,751 SF	---
12713220100	9,458 SF	---
12713220600	2,771 SF	---
12713220800	2,610 SF	---
12713220700	4,902 SF	---
12714110501	2,881 SF	---
12713220900	17,621 SF	---

Oct 28, 2022 10:03:36am – User david.rowland
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OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON

RIGHT-OF-WAY
A 66+00 - A 80+00

DRAWING No.: RW-7

SHEET No.: 7 OF 14

LEGEND

- EXISTING RIGHT-OF-WAY LINE
- EXISTING EASEMENT LINE
- SECTION LINE
- PROPOSED RIGHT-OF-WAY LINE
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OWNERSHIP TABLE

PARCEL NO.	R/W	TCE
12713221100	2,933 SF	---
12713221200	178 SF	---
12713221300	3,889 SF	---
12713221500	10,203 SF	---
12713221400	10,050 SF	---
12713221600	4,134 SF	---
12713230405	3,769 SF	---
12713230401	9,291 SF	---
81550000101	1,569 SF	---
81550000100	972 SF	---

PARCEL LINE AND CURVE TABLE

LINE #/CURVE #	LENGTH	BEARING/DELTA	RADIUS
L51	128.33	N37° 21' 56"W	
L52	178.82	N55° 05' 38"W	
L53	73.63	N57° 50' 32"E	
L54	164.67	S32° 24' 29"E	
L55	146.45	S57° 35' 31"W	
L56	329.98	N32° 06' 01"W	
L57	16.15	S57° 56' 15"W	
L58	334.01	S35° 13' 02"E	
L59	41.75	S8° 30' 09"E	
L60	104.27	S49° 53' 18"W	
L61	98.67	S49° 53' 17"W	
L62	72.65	N75° 47' 51"W	
L63	78.08	N46° 35' 04"W	
L64	160.01	N37° 37' 08"W	

Oct 28, 2022 11:23:02am – User david.rowland
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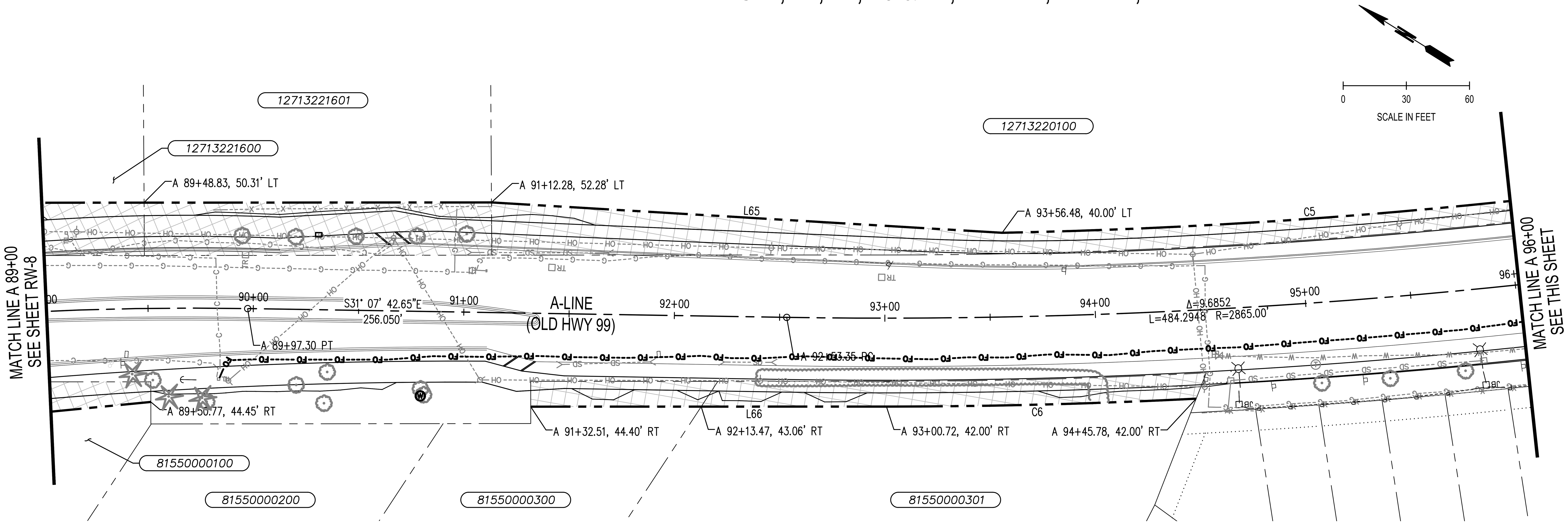
OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON

RIGHT-OF-WAY PLAN
A 80+00 - A 89+00

DRAWING No.: RW-8

SHEET No.: 8 OF 14

S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M



LEGEND

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- PROPOSED RIGHT-OF-WAY
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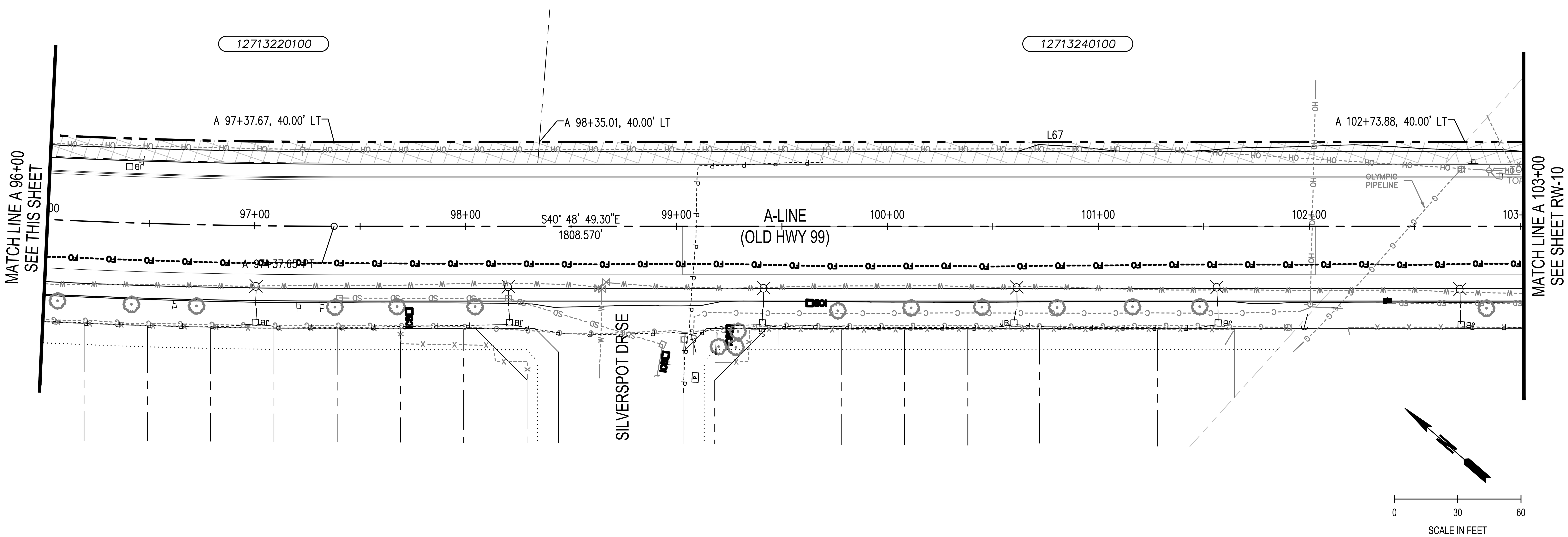
PARCEL LINE AND CURVE TABLE			
LINE #/CURVE #	LENGTH	BEARING/DELTA	RADIUS
C5	375.87	7° 37' 25"	2824.85
C6	147.18	2° 54' 04"	2906.84
L65	242.96	N28° 39' 45"W	
L66	168.93	N32° 04' 33"W	
L67	1918.42	N40° 48' 49"W	



OWNERSHIP TABLE		
PARCEL NO.	R/W	TCE
12713221601	4,110 SF	---
12713220100	9,034 SF	---
81550000300	1,019 SF	---
81550000301	2,803 SF	---
12713240100	4,347 SF	---

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TUMWATER, WA 98501

OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON

RIGHT-OF-WAY PLAN
A 89+00 - A 103+00

DRAWING No.: RW-9
SHEET No.: 9 OF 14

Oct 28, 2022 10:04:58am – User david.rowland
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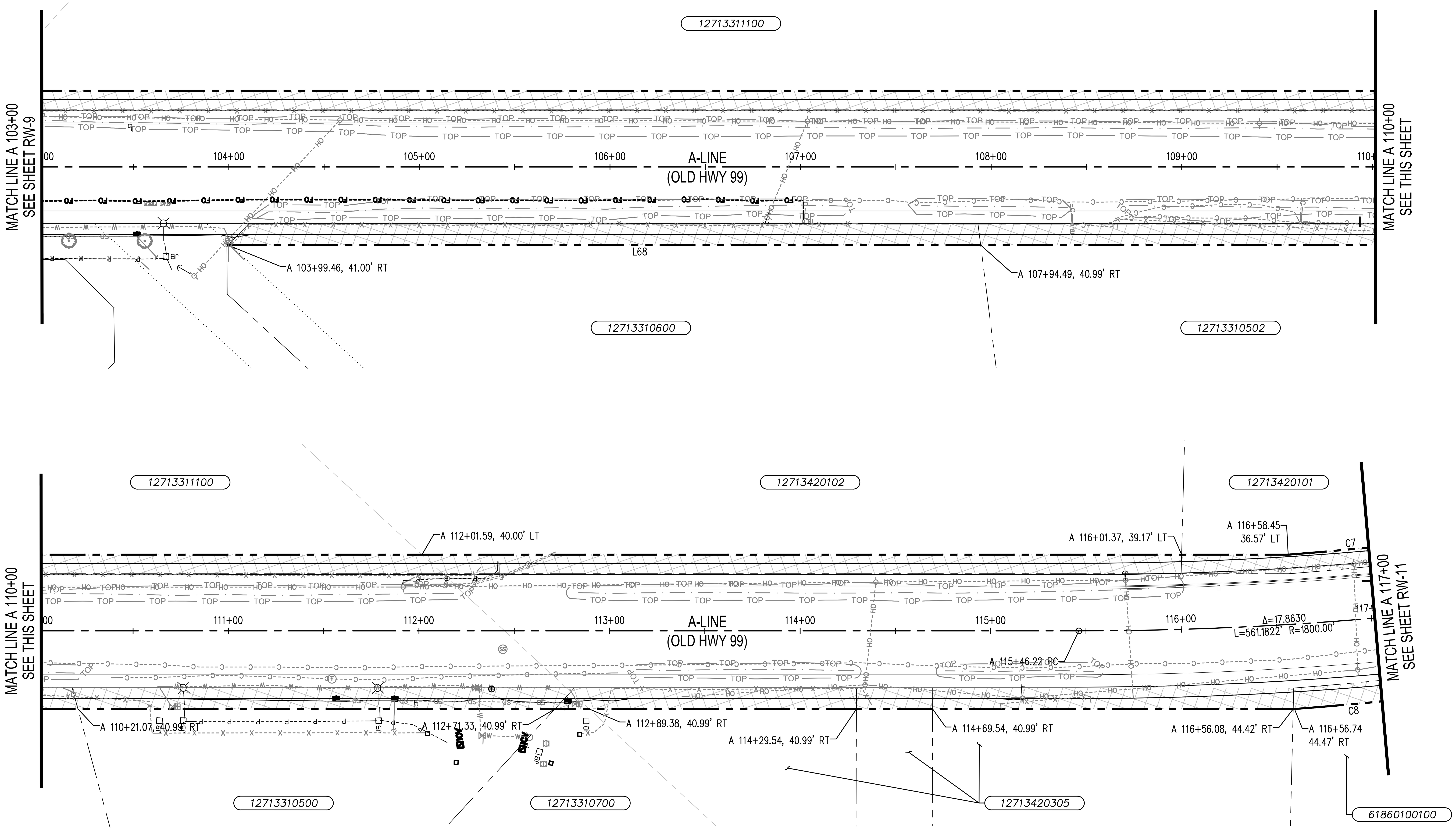
0 30 60
SCALE IN FEET



LEGEND

- EXISTING RIGHT-OF-WAY LINE
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- SECTION LINE
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- PROPOSED RIGHT-OF-WAY
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PARCEL LINE AND CURVE TABLE			
LINE #/CURVE #	LENGTH	BEARING/DELTA	RADIUS
C7	471.50	14° 26' 51"	1869.89
C8	483.04	14° 10' 58"	1951.41
L68	1260.42	N40° 48' 50"W	

OWNERSHIP TABLE		
PARCEL NO.	R/W	TCE
12713311100	9,376	---
12713310600	4,278 SF	---
12713310502	2,484 SF	---
12713420102	3,930 SF	---
12713420101	1,227 SF	---
12713310500	2,821 SF	---
12713310700	81 SF	---
12713420305	4,126 SF	---
61860100100	4,884 SF	---

Oct 28, 2022 10:05:30am - User david.rowland
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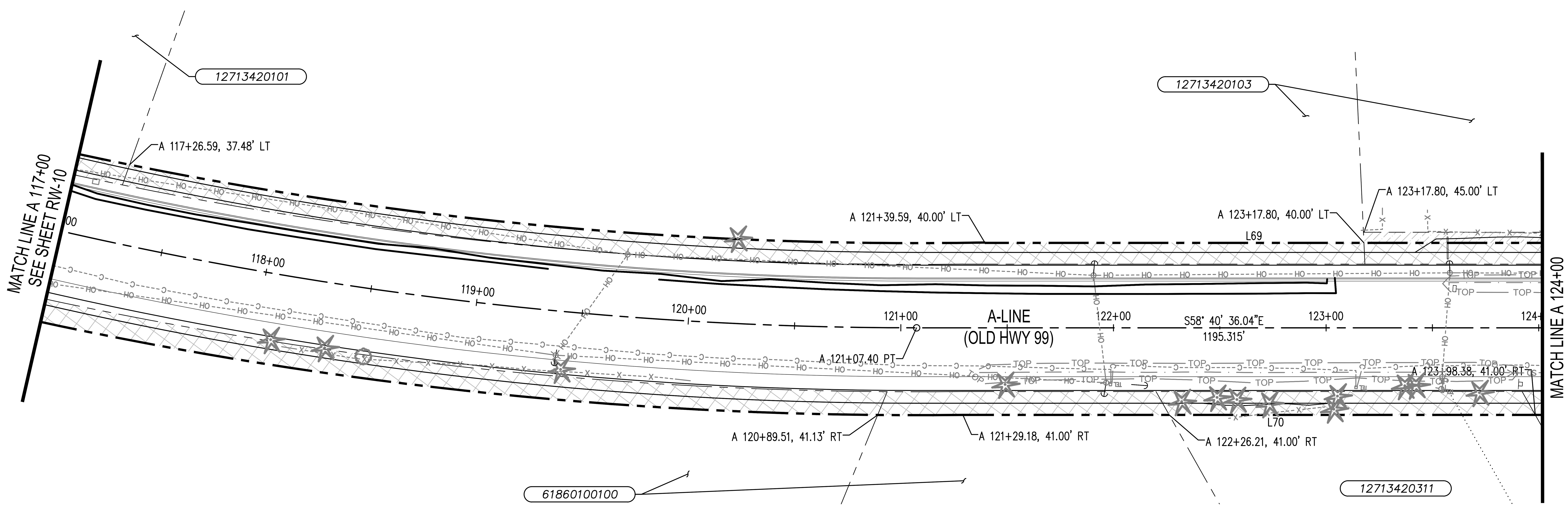
OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON

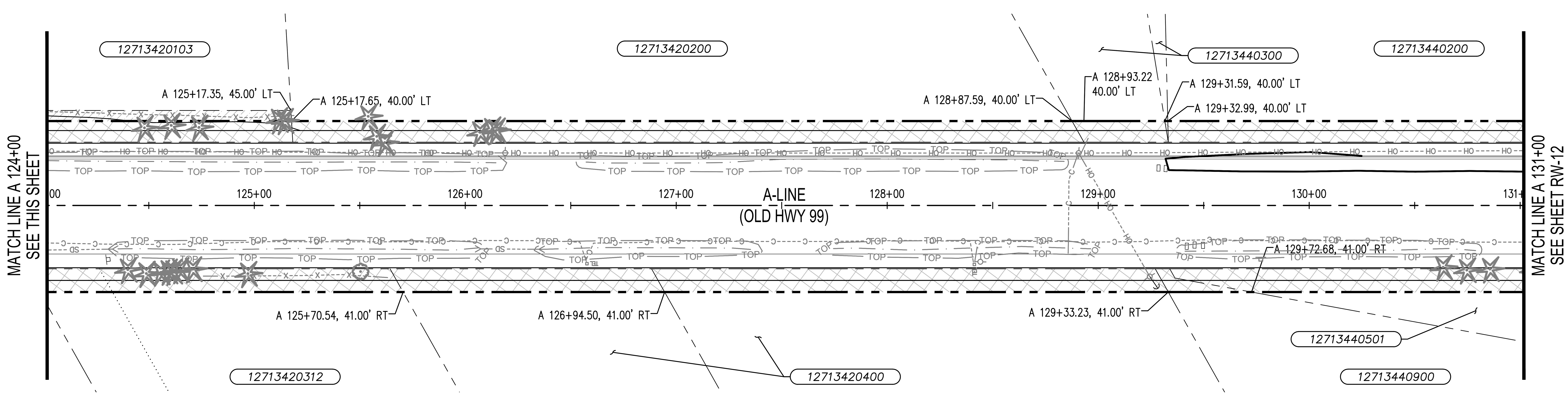
RIGHT-OF-WAY PLAN
A 103+00 - A 117+00

DRAWING No.: RW-10

SHEET No.: 10 OF 14

S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M





0 30 60
SCALE IN FEET

LEGEND

- EXISTING RIGHT-OF-WAY LINE
- EXISTING EASEMENT LINE
- SECTION LINE
- PROPOSED RIGHT-OF-WAY LINE
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PARCEL LINE AND CURVE TABLE

LINE #/CURVE #	LENGTH	BEARING/DELTA	RADIUS
L69	753.63	N58° 40' 36"W	
L70	797.84	N58° 40' 36"W	

OWNERSHIP TABLE

PARCEL NO.	R/W	TCE
12713420103	7,849 SF	999 SF
12713420311	1,894 SF	---
12713420200	3,725 SF	---
12713440300	427 SF	---
12713440200	3,633 SF	---
12713420312	1,894 SF	---
12713420400	3,990 SF	---
12713440900	184 SF	---
12713440501	4,116 SF	---

Oct 28, 2022 10:06:02am – User david.rowland
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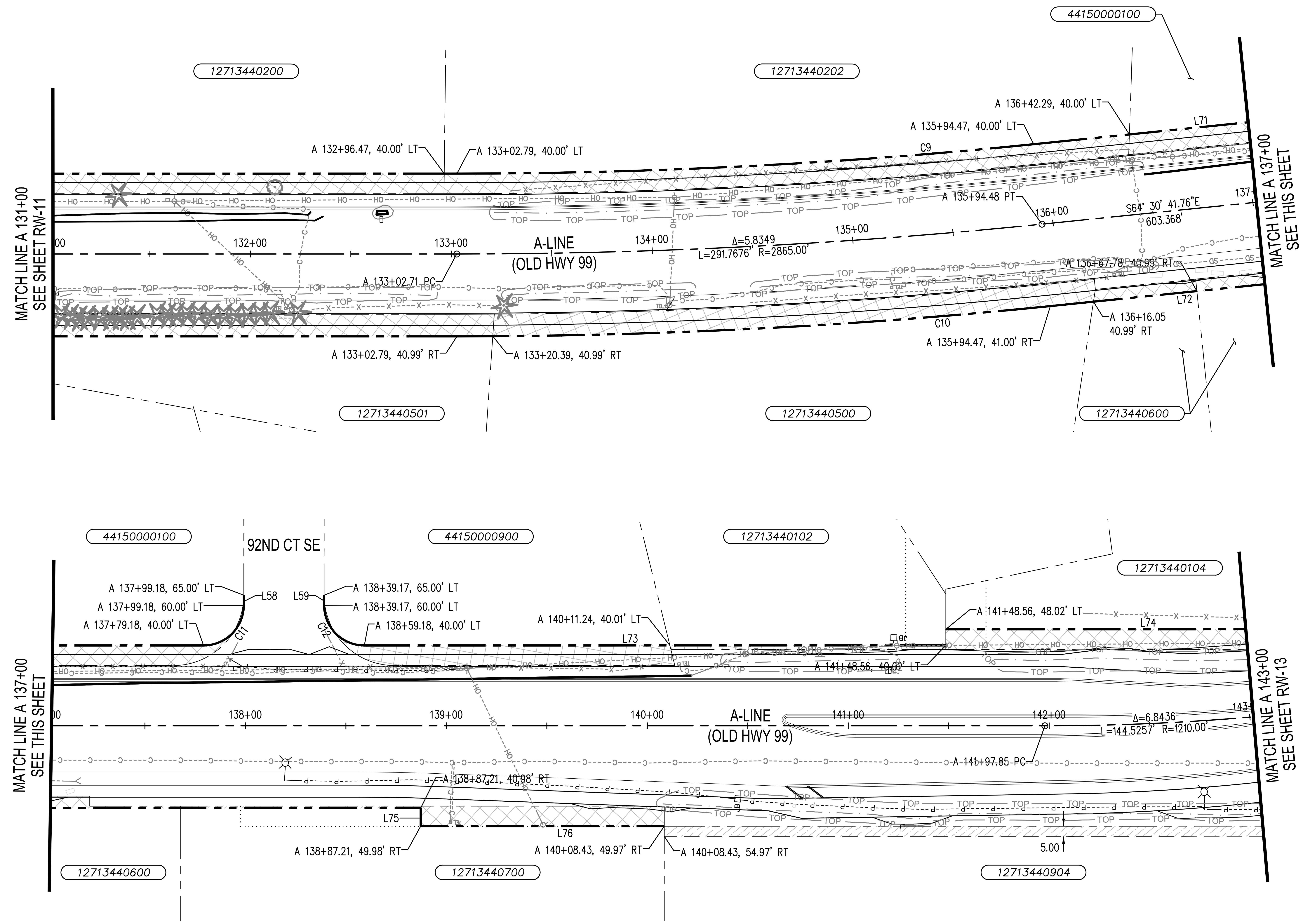
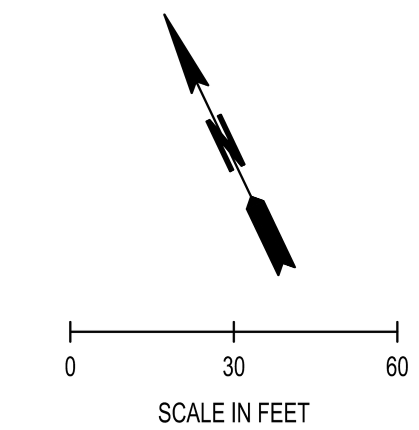
RIGHT-OF-WAY PLAN

DRAWING No.: RW-11

S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M





LEGEND

- EXISTING RIGHT-OF-WAY LINE
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PARCEL LINE AND CURVE TABLE

LINE #/CURVE #	LENGTH	BEARING/DELTA	RADIUS
C9	287.60	5° 50' 00"	2824.86
C10	295.85	5° 50' 00"	2905.87
C11	31.42	89° 59' 57"	20.00
C12	31.42	90° 00' 20"	20.00
L58	5.00	S25° 29' 22"W	
L59	5.00	N25° 29' 22"E	
L71	184.71	N64° 30' 42"W	
L72	269.60	S64° 30' 52"E	
L73	289.39	N64° 30' 59"W	
L74	230.08	N64° 30' 59"W	
L75	9.00	S25° 29' 08"W	
L76	121.22	S64° 30' 52"E	

OWNERSHIP TABLE

PARCEL NO.	R/W	TCE
12713440202	3,416 SF	---
44150000100	1,408 SF	---
12713440500	3,297 SF	---
12713440600	679 SF	---
44150000900	1,565 SF	---
12713440102	274 SF	---
12713440104	2,323 SF	---
12713440700	1,332 SF	---
12713440904	---	1,988 SF

Oct 28, 2022 10:06:32am – User david.rowland
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REVISIONS	DATE	BY
PRELIMINARY		

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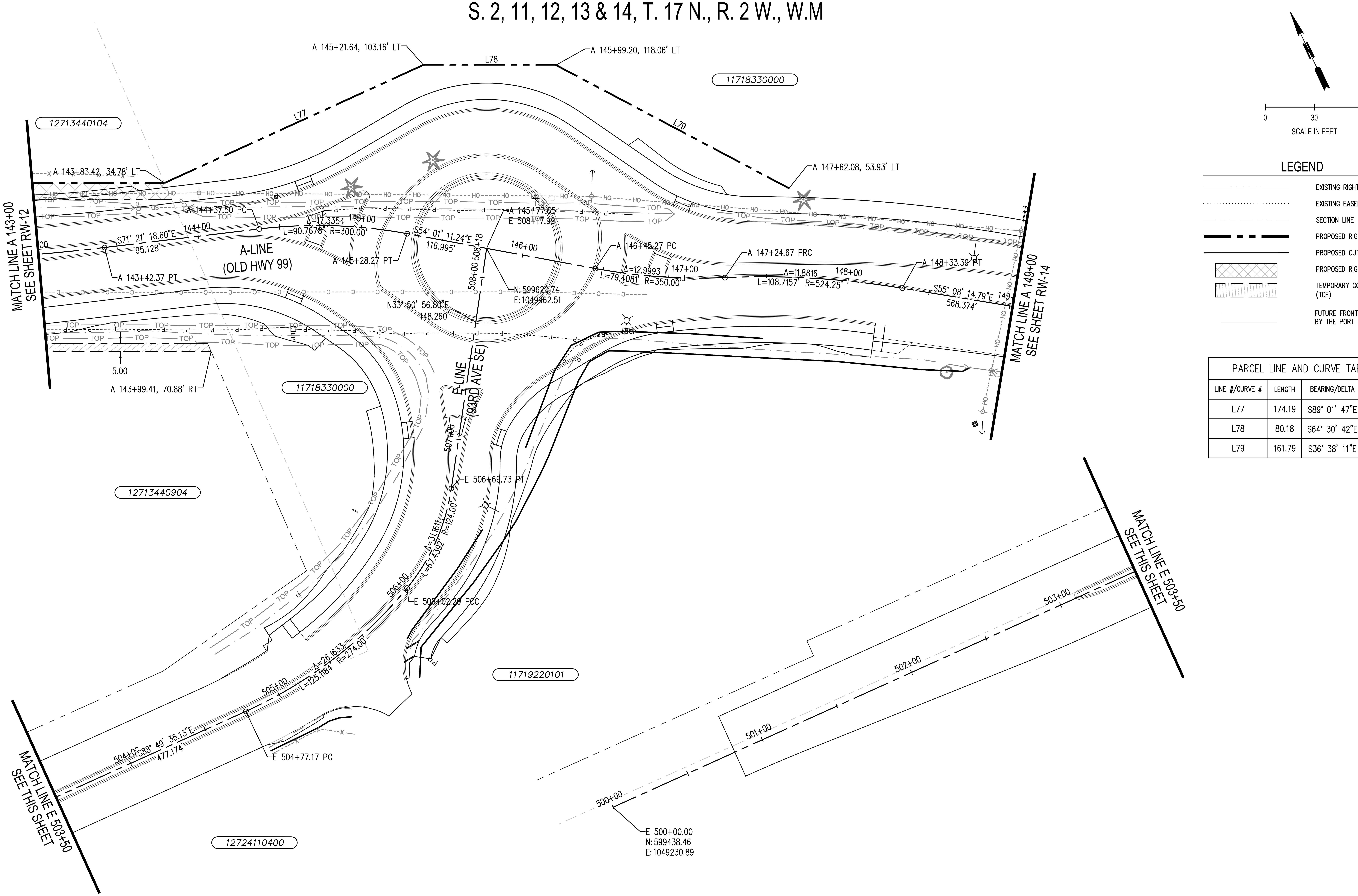
TUMWATER, WASHINGTON

RIGHT-OF-WAY PLAN
A 131+00 - A 143+00

DRAWING No.: RW-12

SHEET No.: 12 OF 14

S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M



LEGEND

- EXISTING RIGHT-OF-WAY LINE
- EXISTING EASEMENT LINE
- SECTION LINE
- PROPOSED RIGHT-OF-WAY LINE
- PROPOSED CUT & FILL LINE
- PROPOSED RIGHT-OF-WAY
- TEMPORARY CONSTRUCTION EASEMENT (TCE)
- FUTURE FRONTAGE IMPROVEMENTS BY THE PORT OF OLYMPIA

PARCEL LINE AND CURVE TABLE

LINE #/CURVE #	LENGTH	BEARING/DELTA	RADIUS
L77	174.19	S89° 01' 47"E	
L78	80.18	S64° 30' 42"E	
L79	161.79	S36° 38' 11"E	

REVISIONS	DATE	BY
PRELIMINARY		

DESIGNED BY: DESIGNER NAME
ISSUE DATE: SEPTEMBER 2020
DRAWN BY: DRAFTER NAME
JOB No.: 0625.29
CHECKED BY: ENGINEER NAME
DRAWING FILE No.: 0625.29-ROW-01

ALL DIMENSIONS SHOWN IN FEET UNLESS OTHERWISE DESIGNATED

PATRICK HOLM, STATE OF WASHINGTON, 49470, REGISTERED PROFESSIONAL ENGINEER

SCJ ALLIANCE
CONSULTING SERVICES
8730 TALLON LANE NE, SUITE 200, LACEY, WASHINGTON 98516
P: 360-352-1465 F: 360-352-1509
SCJALLIANCE.COM

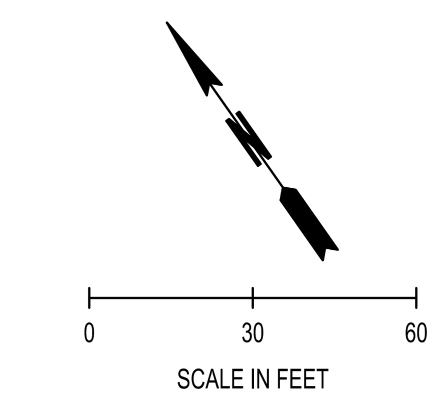
CITY OF TUMWATER
555 ISRAEL ROAD SW
TUMWATER, WA 98501

OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON

RIGHT-OF-WAY PLAN
A 143+00 - A 149+00

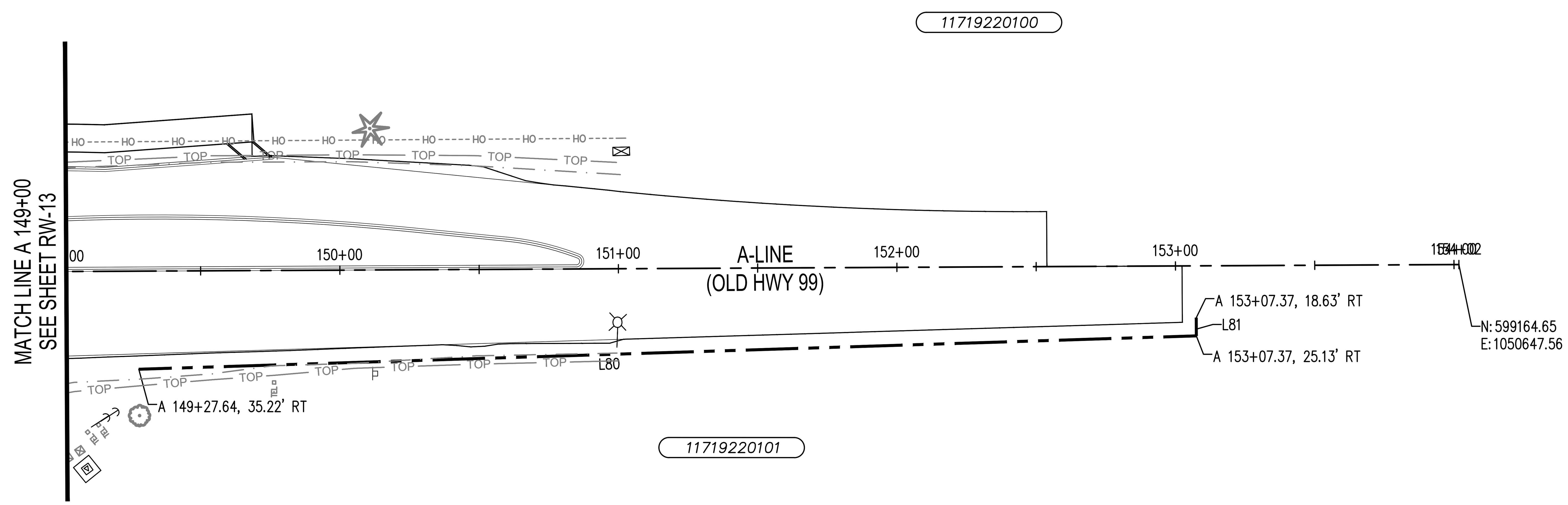
DRAWING No.: RW-13

S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M



LEGEND

- EXISTING RIGHT-OF-WAY LINE
- EXISTING EASEMENT LINE
- SECTION LINE
- PROPOSED RIGHT-OF-WAY LINE
- PROPOSED CUT & FILL LINE
- PROPOSED RIGHT-OF-WAY
- TEMPORARY CONSTRUCTION EASEMENT (TCE)
- FUTURE FRONTAGE IMPROVEMENTS BY THE PORT OF OLYMPIA



PARCEL LINE AND CURVE TABLE			
LINE #/CURVE #	LENGTH	BEARING/DELTA	RADIUS
L80	379.87	S56° 39' 37"E	
L81	6.50	N34° 51' 45"E	

REVISIONS	DATE	BY
PRELIMINARY		

DESIGNED BY: DESIGNER NAME
ISSUE DATE: SEPTEMBER 2020
DRAWN BY: DRAFTER NAME
JOB No.: 0625.29
CHECKED BY: ENGINEER NAME
DRAWING FILE No.: 0625.29-ROW-01

ALL DIMENSIONS SHOWN IN FEET UNLESS OTHERWISE DESIGNATED

PATRICK HOLM
STATE OF WASHINGTON
49470
REGISTERED PROFESSIONAL ENGINEER

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CITY OF TUMWATER
555 ISRAEL ROAD SW
TUMWATER, WA 98501

OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON

RIGHT-OF-WAY PLAN
A 149+00 - A 154+00

DRAWING No.: RW-14

SHEET No.: 14 OF 14

Oct 28, 2022 10:07:36am - User david.rowland
N:\PROJECTS\0625 CITY OF TUMWATER\0625.29 TUMWATER OLD HWY 99 AND 79TH AVE CORRIDOR STUDY\CADD\EXHIBITS\RIGHT OF WAY\0625.29-ROW-01.DWG

Right-of-Way Acquistion Estimate

Phase 1 - 79th RAB

Assessor's No.	Owner	Land Rights	Improvements	Damages	Compensation (Offer)	Appraisal Costs	Review Costs	Negotiation Costs	Title, Costs	Prop. Management	Relocation Costs	Relo. Labor	Sub-Total	Condemn. Costs @20%	Statutory Allowance	Total Costs
38400000104	Kaufman Real Estate LLC	$ 33,000	$ 20,000	$ -	$ 53,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 67,100	$ 13,420	$ 750	$ 81,270
31100002100	Pick A Part Inc.	$ 231,420	$ 87,000	$ -	$ 318,420	$ 4,000	$ 1,900	$ 7,500	$ 700	-	$20,000	5,000	$ 357,520	$ 71,504	$ 750	$ 429,774
38400000200	Port of Olympia	$ 197,094	$ 16,425	$ 8,212	$ 221,731	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 235,831	$ 47,166	$ 750	$ 283,747
38400000201	Port of Olympia	$ 55,000	$ 10,000	$ -	$ 65,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 79,100	$ 15,820	$ 750	$ 95,670
															Total:	**$ 900,000**

1. Multiplier is 1.5 for full parcel acquisitions and 2.0 for strip acquistions

Right-of-Way Acquistion Estimate

Phase 2 - Project start to 79th RAB

Assessor's No.	Owner	Land Rights	Improvements	Damages	Compensation (Offer)	Appraisal Costs	Review Costs	Negotiation Costs	Title, Costs	Prop. Management	Relocation Costs	Relo. Labor	Sub-Total	Condemn. Costs @20%	Statutory Allowance	Total Costs
37000002500	DAC RE LLC	$ 1,400	$ -	$ -	$ 1,400	$ 1,000	-	$ 7,500	$ 700	-	-	-	$ 10,600	$ 2,120	$ 750	$ 13,470
38400003100	Port of Olympia	$ 144,000	$ -	$ -	$ 144,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 158,100	$ 31,620	$ 750	$ 190,470
38400000200	Port of Olympia	$ 272,208	$ 22,684	$ 11,342	$ 306,234	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 320,334	$ 64,067	$ 750	$ 385,151
12711210800	D & W Development LLC	$ 14,000	$ -	$ -	$ 14,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 28,100	$ 5,620	$ 750	$ 34,470
12711210900	J & S Old 99 LLC	$ 21,400	$ -	$ -	$ 21,400	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 35,500	$ 7,100	$ 750	$ 43,350
12711210901	Janette M. Witchey	$ 8,050	$ 5,000	$ -	$ 13,050	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 27,150	$ 5,430	$ 750	$ 33,330
12711210902	Janette M. Witchey	$ 16,000	$ 5,000	$ -	$ 21,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 35,100	$ 7,020	$ 750	$ 42,870
12711120100	Larry Skewis	$ 26,000	$ 15,000	$ -	$ 41,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 55,100	$ 11,020	$ 750	$ 66,870
12711120200	Secure Storage Holdings LLC	$ 25,000	$ 10,000	$ -	$ 35,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 49,100	$ 9,820	$ 750	$ 59,670
12711120300	Secure Storage Holdings LLC	$ 57,000	$ 20,000	$ -	$ 77,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 91,100	$ 18,220	$ 750	$ 110,070
12711120400	included with 12711120300			$ -						-	-	-	$ -	$ -		$ -
12711120600	Ken Slater & Tina Louise-total	$ 159,600	$ 95,000	$ 152,000	$ 406,600	$ 4,000	$ 1,900	$ 7,500	$ 700	$ -	$ -	$ -	$ 420,700	$ 84,140	$ 750	$ 505,590
12711130100	H24 Inc.-total	$ 230,000	$ 100,000	$ 1,170,000	$ 1,500,000	$ 7,500	$ 2,500	$ 7,500	$ 700	$ 1,000	$ 150,000	$ 30,000	$ 1,699,200	$ 339,840	$ 750	$ 2,039,790
12711130400	Kaufman Holdings Inc	$ 16,000	$ 10,000	$ -	$ 26,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 40,100	$ 8,020	$ 750	$ 48,870
38400000101	Airborne Properties Inc	$ 21,000	$ 10,000	$ -	$ 31,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 45,100	$ 9,020	$ 750	$ 54,870
38400000102	M Stream LLC	$ 22,000	$ 10,000	$ -	$ 32,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 46,100	$ 9,220	$ 750	$ 56,070
38400000103	DHB Holdings LLC	$ 15,000	$ 20,000	$ -	$ 35,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 49,100	$ 9,820	$ 750	$ 59,670
															Total:	**$3,750,000**

1. Multiplier is 1.5 for full parcel acquisitions and 2.0 for strip acquistions

Right-of-Way Acquistion Estimate

Phase 3 - 79th RAB to 88th RAB

Assessor's No.	Owner	Land Rights	Improvements	Damages	Compensation (Offer)	Appraisal Costs	Review Costs	Negotiation Costs	Title, Costs	Prop. Management	Relocation Costs	Relo. Labor	Sub-Total	Condemn. Costs @20%	Statutory Allowance	Total Costs
31100001700	Slater Enterprises Phase 1 LLC	$ 8,500	$ 5,000.00	$ -	$ 13,500	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 27,600	$ 5,520	$ 750	$ 33,870
31100001600	Slater Ent. Phase 1 LLC	$ 8,500	$ 5,000.00	$ -	$ 13,500	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 27,600	$ 5,520	$ 750	$ 33,870
31100001500	Slater Ent. Phase 1 (with 1300)												$ -	$ -		$ -
31100001300	Slater Enterprises Phase 1 LLC	$ 27,000	$ 20,000	$ -	$ 47,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 61,100	$ 12,220	$ 750	$ 74,070
31100001200	Slater Ent. Phase 1 LLC(with 1300)												$ -	$ -		$ -
31100001101	Included with 31100001300												$ -	$ -		$ -
31100000100	Gary & Glenna George	$ 17,000	$ 15,000	$ -	$ 32,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 46,100	$ 9,220	$ 750	$ 56,070
31100000101	Liberty Leasing & Const Inc.	$ 37,000	$ 5,000	$ -	$ 42,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 56,100.00	$ 11,220.00	$ 750.00	$ 68,070
38400000200	Port of Olympia	$ 172,698	$ 14,392	$ 7,196	$ 194,285	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 208,385	$ 41,677	$ 750	$ 250,812
12714110000	Port of Olympia	$ 1,000	$ -	$ -	$ 1,000	$ 1,000	$ -	$ 7,500	$ 700	-	-	-	$ 10,200.00	$ 2,040.00	$ 750.00	$ 12,990
12713220500	Port of Olympia	$ 47,000	$ -	$ -	$ 47,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 61,100.00	$ 12,220.00	$ 750.00	$ 74,070
12713220100	Petrocard Inc.	$ 76,000	$ -	$ -	$ 76,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 90,100	$ 18,020	$ 750	$ 108,870
12713220600	Pacific NW Com. Proper Ties LLC	$ 42,000	$ 5,000	$ -	$ 47,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 61,100	$ 12,220	$ 750	$ 74,070
12713220800	Pacific NW Com. Proper Ties LLC	$ 39,000	$ 5,000	$ -	$ 44,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 58,100	$ 11,620	$ 750	$ 70,470
12713220700	Seoly 8421 LLC	$ 74,000	$ 25,000	$ -	$ 99,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 113,100	$ 22,620	$ 750	$ 136,470
12714110501	Pritchett Family LLC	$ 18,000	$ 10,000	$ -	$ 28,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 42,100	$ 8,420	$ 750	$ 51,270
12713220900	Craig S. & Roxanna M. Kinnaman	$ 106,000	$ 70,000	$ 25,000	$ 201,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 215,100	$ 43,020	$ 750	$ 258,870
12713221100	Grant Enterprises LLC	$ 24,000	$ 20,000	$ -	$ 44,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 58,100	$ 11,620	$ 750	$ 70,470
12713221200	KO Capital LLC	$ 2,000	$ -	$ -	$ 2,000	$ 1,000	$ -	$ 7,500	$ 700	-	-	-	$ 11,200	$ 2,240	$ 750	$ 14,190
12713221300	KO Capital LLC	$ 31,000	$ 50,000	$ -	$ 81,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 95,100	$ 19,020	$ 750	$ 114,870
12713221400	Holiday Trust	$ 81,000	$ -	$ 25,000.00	$ 106,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 120,100	$ 24,020	$ 750	$ 144,870
12713221600	Holday Trust	$ 34,000	$ 50,000	$ -	$ 84,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 98,100	$ 19,620	$ 750	$ 118,470
12713230405	Thurston County	$ 30,000	$ -	$ -	$ 30,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 44,100	$ 8,820	$ 750	$ 53,670
12713230401	William T. & Tamara G. Walsh	$ 65,000	$ 25,000	$ -	$ 90,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 104,100	$ 20,820	$ 750	$ 125,670
81550000101	William T. & Tamara G. Walsh	$ 11,000	$ 10,000	$ -	$ 21,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 35,100	$ 7,020	$ 750	$ 42,870
															Total:	$1,990,000

1. Multiplier is 1.5 for full parcel acquisitions and 2.0 for strip acquistions

Right-of-Way Acquistion Estimate

Phase 4 - 88th RAB to Wyatt Intersection

Assessor's No.	Owner	Land Rights	Improvements	Damages	Compensation (Offer)	Appraisal Costs	Review Costs	Negotiation Costs	Title, Costs	Prop. Management	Relocation Costs	Relo. Labor	Sub-Total	Condemn. Costs @20%	Statutory Allowance	Total Costs
81550000100	Raymond C. Evans	$ 7,000	$ 10,000	$ -	$ 17,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 31,100	$ 6,220	$ 750	$ 38,070
12713221601	Holiday Trust	$ 33,000	$ 50,000	$ -	$ 83,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 97,100	$ 19,420	$ 750	$ 117,270
81550000300	Jackson and Jessica Ewing	$ 8,200	$ 5,000	$ 40,000	$ 53,200	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 67,300	$ 13,460	$ 750	$ 81,510
81550000301	406 Properties LLC	$ 23,000	$ 10,000	$ -	$ 33,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 47,100	$ 9,420	$ 750	$ 57,270
12713240100	Lakeside Industries	$ 26,000	$ 5,000	$ -	$ 31,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 45,100	$ 9,020	$ 750	$ 54,870
12713311100	Lenora L. & Greg A. Hansen	$ 47,000	$ 30,000	$ -	$ 77,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 91,100	$ 18,220	$ 750	$ 110,070
12713310600	Terrence N. Travis	$ 22,000	$ 20,000	$ -	$ 42,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 56,100	$ 11,220	$ 750	$ 68,070
12713310502	Debra G. Gwinn	$ 13,000	$ 10,000	$ -	$ 23,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 37,100	$ 7,420	$ 750	$ 45,270
															Total:	**$580,000**

1. Multiplier is 1.5 for full parcel acquisitions and 2.0 for strip acquistions

Right-of-Way Acquistion Estimate

Phase 5 - Wyatt Intersection to project finish

Assessor's No.	Owner	Land Rights	Improvements	Damages	Compensation (Offer)	Appraisal Costs	Review Costs	Negotiation Costs	Title, Costs	Prop. Management	Relocation Costs	Relo. Labor	Sub-Total	Condemn. Costs @20%	Statutory Allowance	Total Costs
12713420102	Evergreen Heights LLC	$ 20,000	$ 20,000	$ -	$ 40,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 54,100	$ 10,820	$ 750	$ 65,670
12713420101	Brinley George Hanson	$ 8,600	$ 10,000	$ -	$ 18,600	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 32,700	$ 6,540	$ 750	$ 39,990
36310000002	Bradbury Owners Association	$ 5,000.00	$ -	$ -	$ 5,000.00	$ 1,000	$ -	$ 7,500	$ 700	-	-	-	$ 14,200	$ 2,840	$ 750	$ 17,790
36310000004	Bradbury Owners Association	$ 5,000.00	$ -	$ -	$ 5,000.00	$ 1,000	$ -	$ 7,500	$ 700	-	-	-	$ 14,200	$ 2,840	$ 750	$ 17,790
12713420305	Villiage Freen Community LLC	$ 33,000	$ 5,000	$ -	$ 38,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 52,100	$ 10,420	$ 750	$ 63,270
61860100100	Melody Pines MHP LLC	$ 30,000	$ 10,000	$ 50,000	$ 90,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 104,100	$ 20,820	$ 750	$ 125,670
12713420103	Matthew & Tina Marie Keogh	$ 56,000	$ 10,000	$ -	$ 66,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 80,100	$ 16,020	$ 750	$ 96,870
12713420311	Adrienne Cherry-total acquistion	$ 225,000	$ 225,000	$ -	$ 450,000	$ 4,000	$ 1,900	$ 7,500	$ 700	$ 1,000	$ 150,000	$ 30,000	$ 645,100	$ 129,020	$ 750	$ 774,870
12713420200	Todd L. Bakke	$ 22,000	$ 20,000	$ -	$ 42,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 56,100	$ 11,220	$ 750	$ 68,070
12713440300	Ann Wasserman	$ 3,000	$ 5,000	$ -	$ 8,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 22,100	$ 4,420	$ 750	$ 27,270
12713440200	Marty & Jessica L. Clark	$ 22,000	$ 10,000	$ -	$ 32,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 46,100	$ 9,220	$ 750	$ 56,070
12713420312	Robert George Miller	$ 21,000	$ 10,000	$ 50,000	$ 81,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 95,100	$ 19,020	$ 750	$ 114,870
12713420400	Monty D. & Madeline C. Pfaff REVO Cable Living Trust	$ 32,000	$ 20,000	$ -	$ 52,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 66,100	$ 13,220	$ 750	$ 80,070
12713440900	Milton V. Brasher	$ 1,500	$ 3,000	$ -	$ 4,500	$ 1,000	-	$ 7,500	$ 700	-	-	-	$ 13,700	$ 2,740	$ 750	$ 17,190
12713440501	Gerald D. & Janet I. McCormick	$ 40,000	$ 5,000	$ -	$ 45,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 59,100	$ 11,820	$ 750	$ 71,670
12713440202	Airborne Properties LLC	$ 21,000	$ 20,000	$ -	$ 41,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 55,100	$ 11,020	$ 750	$ 66,870
44150000100	Melanie G. Ballejo	$ 16,000	$ 10,000	$ 30,000	$ 56,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 70,100	$ 14,020	$ 750	$ 84,870
12713440500	Tumwater School Dist. #33	$ 20,000	$ 5,000	$ -	$ 25,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 39,100	$ 7,820	$ 750	$ 47,670
12713440600	Tumwater School Dist. #33	$ 4,100	$ 5,000	$ -	$ 9,100	$ 1,000	-	$ 7,500	$ 700	-	-	-	$ 18,300	$ 3,660	$ 750	$ 22,710
44150000900	Marvin & Mary Ann Shively	$ 18,000	$ 10,000	$ -	$ 28,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 42,100	$ 8,420	$ 750	$ 51,270
12713440102	Richard G. & Sonja M. Winkelman	$ 1,500	$ 5,000	$ -	$ 6,500	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 20,600	$ 4,120	$ 750	$ 25,470
12713440104	Todd C. & Jennifer J. Feiring	$ 12,000	$ 5,000	$ -	$ 17,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 31,100	$ 6,220	$ 750	$ 38,070
12713440700	Tumwater School Dist. #33	$ 11,000	$ -	$ -	$ 11,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 25,100	$ 5,020	$ 750	$ 30,870
12713440904	Tumwater School Dist. #33	$ 2,000	$ -	$ -	$ 2,000	$ 1,000	-	$ 7,500	$ 700	-	-	-	$ 11,200	$ 2,240	$ 750	$ 14,190
12713221500	KO Capital LLC	$ 82,000	$ 20,000	$ 50,000	$ 152,000	$ 4,000	$ 1,900	$ 7,500	$ 700	-	-	-	$ 166,100	$ 33,220	$ 750	$ 200,070
															Total:	$2,220,000

1. Multiplier is 1.5 for full parcel acquisitions and 2.0 for strip acquistions

APPENDIX F
- PRELIMINARY DESIGN SUPPORTING DOCUMENTS

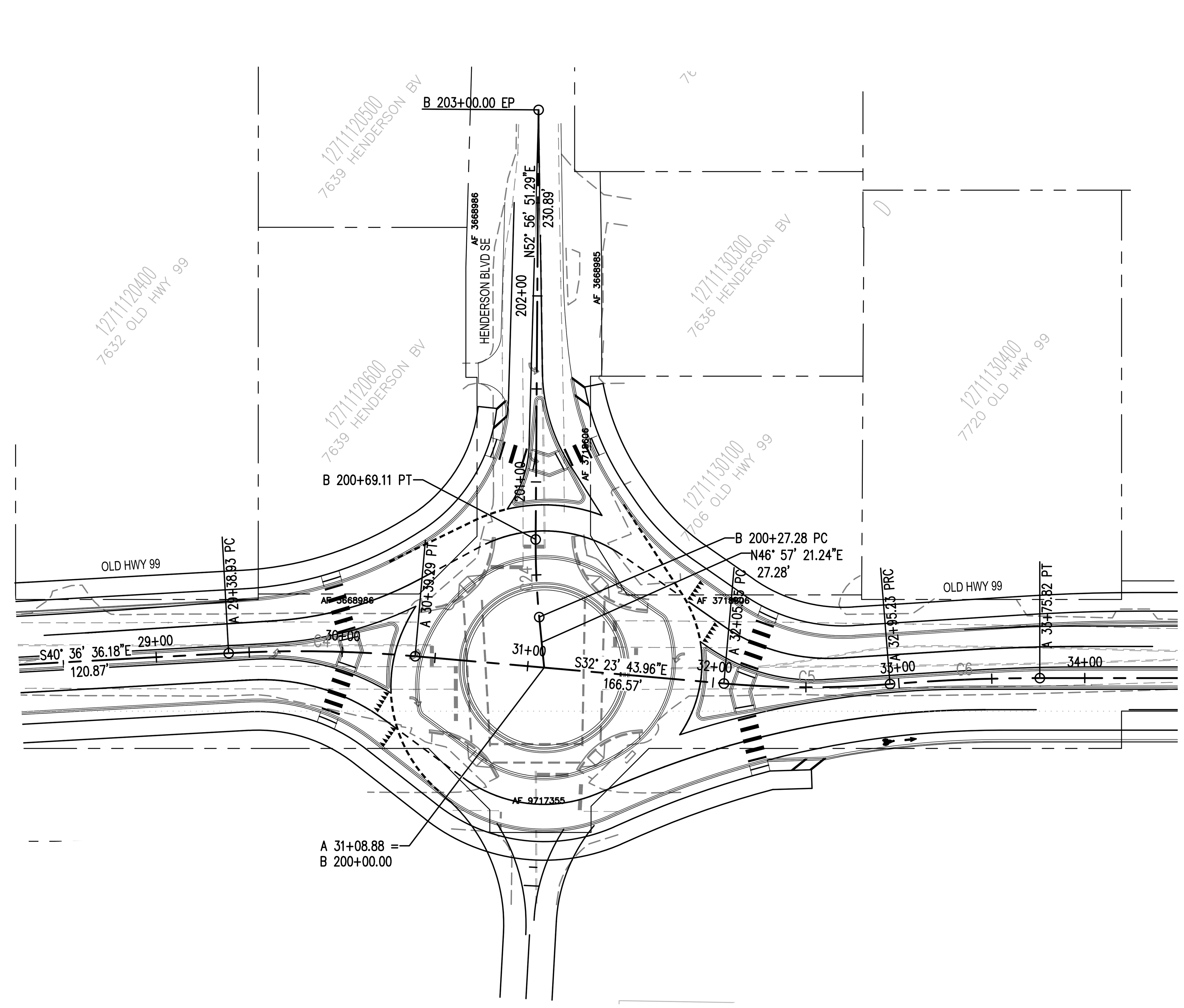
G1) INTERSECTION PLANS
G2) FASTEST PATH EXHIBITS
G3) TRUCK TURNING MOVEMENTS
G4) SIGHT TRIANGLE EXHIBITS
G5) UTILITY TECH MEMO
G6) STORMWATER REPORTS
G7) PRELIMINARY PLAN SET
G8) BASIS OF DESIGN

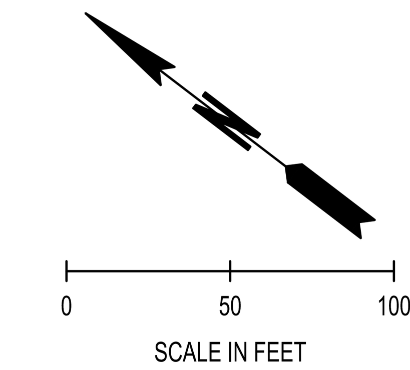
F1) INTERSECTION PLANS

S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M

DESIGN DATA FOR NHS ROUTE, NON-INTERSTATE IMPROVEMENTS

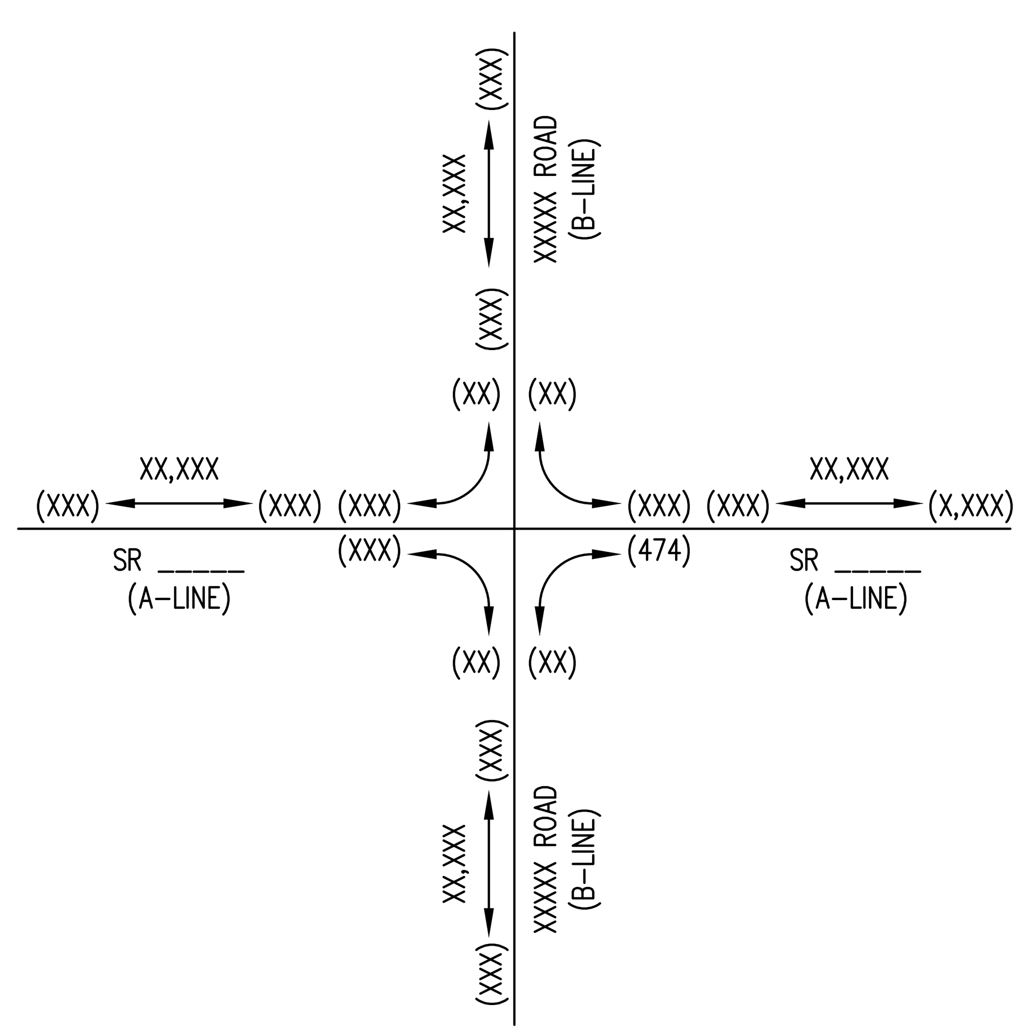
ROADWAY	A–LINE (SR ###)	B–LINE (ROAD NAME)
SUMMARY OF DESIGN	MM/DD/YYYY	-----
INTERSECTION CONTROL TYPE	(UN)SIGNALIZED	STOP
FUNCTIONAL CLASSIFICATION	URBAN PRINCIPAL ARTERIAL	-----
ACCESS CONTROL	LIMITED ACCESS MODIFIED CONTROL	-----
TERRAIN CLASSIFICATION	ROLLING or LEVEL	-----
DESIGN SPEED	XX MPH	-----
POSTED SPEED	XX MPH	-----
DESIGN VEHICLE	WB–67	SU–30
PERCENT TRUCKS	X%	<X%





LEGEND

- RIGHT OF WAY
- PROPERTY LINE
- EASEMENT
- EXISTING EDGE OF PAVEMENT
- YIELD LINE SYMBOL
- STOP LINE
- DOUBLE CENTERLINE
- CENTER STRIPE
- SKIP STRIPE
- EDGE LINE
- WIDE LANE LINE
- WIDE DOTTED LANE LINE
- EDGE OF GRAVEL
- EDGE OF PAVEMENT
- BARRIER
- CEMENT CONCRETE TRAFFIC CURB AND GUTTER
- TRAFFIC ARROWS



XXX=EST. 2030 ADT
(XXX)=EST. 2030 DDHV
TRAFFIC FLOW DIAGRAM

CURVE DATA

CURVE #	ALIGNMENT	P.I. STATION	DELTA	RADIUS	TANGENT	LENGTH
C4	A	29+89.19	8°12'52"	700.00	50.27	100.36
C5	A	32+50.65	9°39'43"	530.00	44.79	89.38
C6	A	33+35.55	4°37'03"	1000.00	40.32	80.59
C24	B	200+48.22	5°59'30"	400.00	20.93	41.83

Aug 27, 2021 2:03:35pm – User jody.brown
N:\PROJECTS\0625 CITY OF TUMWATER\0625.29 TUMWATER OLD HWY 99 AND 79TH AVE CORRIDOR STUDY\CADD\0625.29-IP-01.DWG

△	REVISIONS	DATE	BY
	PRELIMINARY		

DESIGNED BY: DESIGNER NAME	ISSUE DATE: SEPTEMBER 2020
DRAWN BY: DRAFTER NAME	JOB No.: 0625.29
CHECKED BY: ENGINEER NAME	DRAWING FILE No.: 0625.29-IP-01

ALL DIMENSIONS SHOWN IN FEET UNLESS OTHERWISE DESIGNATED

PATRICK HOLM
STATE OF WASHINGTON
49470
REGISTERED
PROFESSIONAL ENGINEER

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CITY OF TUMWATER
555 ISRAEL ROAD SW
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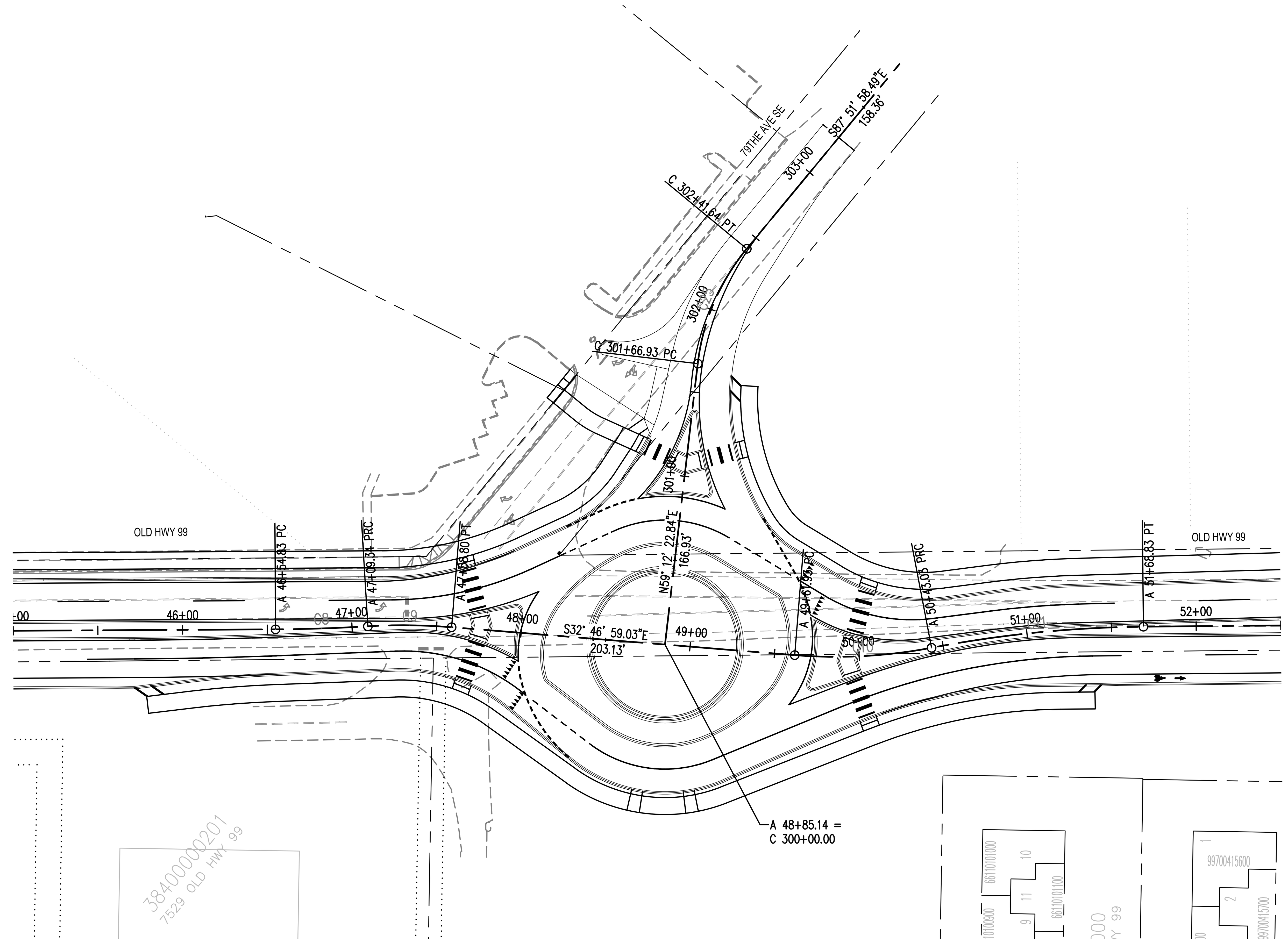
OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON
MP XX TO MP XX

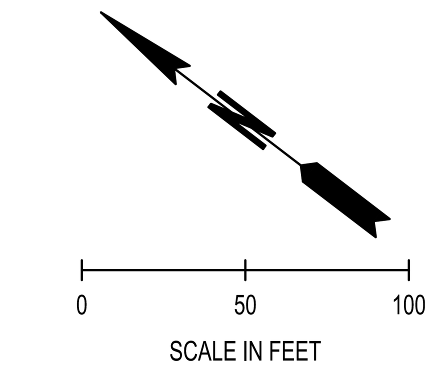
INTERSECTION PLAN @ HENDERSON BLVD
A 28+00 - A 34+50

DRAWING No.: IP-1

SHEET No.: ---- OF XX

S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M





LEGEND

- RIGHT OF WAY
- PROPERTY LINE
- EASEMENT
- EXISTING EDGE OF PAVEMENT
- YIELD LINE SYMBOL
- STOP LINE
- DOUBLE CENTERLINE
- CENTER STRIPE
- SKIP STRIPE
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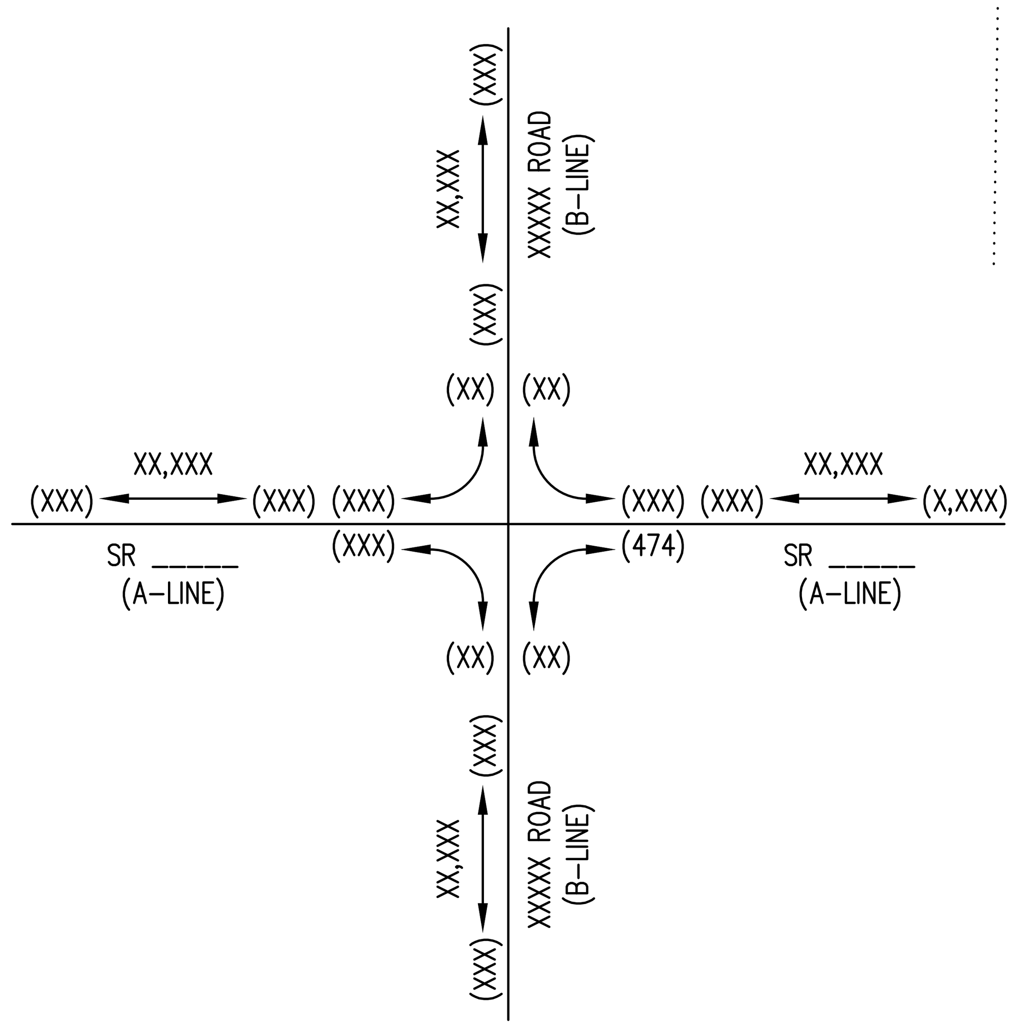
- WIDE LANE LINE
- WIDE DOTTED LANE LINE
- EDGE OF GRAVEL
- EDGE OF PAVEMENT
- BARRIER
- CEMENT CONCRETE TRAFFIC CURB AND GUTTER
- TRAFFIC ARROWS

CURVE DATA

CURVE #	ALIGNMENT	P.I. STATION	DELTA	RADIUS	TANGENT	LENGTH
C8	A	46+82.09	3°07'23"	1000.00	27.26	54.51
C9	A	47+34.11	8°05'48"	350.00	24.77	49.46
C10	A	50+02.73	15°29'22"	300.00	40.80	81.10
C11	A	51+06.10	10°17'47"	700.00	63.07	125.79
C25	C	302+05.35	32°55'39"	130.00	38.42	74.71



XXX=EST. 2030 ADT
(XXX)=EST. 2030 DDHV
TRAFFIC FLOW DIAGRAM

DESIGN DATA FOR NHS ROUTE, NON-INTERSTATE IMPROVEMENTS

ROADWAY	A-LINE (SR ###)	B-LINE (ROAD NAME)
SUMMARY OF DESIGN	MM/DD/YYYY	-----
INTERSECTION CONTROL TYPE	(UN)SIGNALIZED	STOP
FUNCTIONAL CLASSIFICATION	URBAN PRINCIPAL ARTERIAL	-----
ACCESS CONTROL	LIMITED ACCESS MODIFIED CONTROL	-----
TERRAIN CLASSIFICATION	ROLLING or LEVEL	-----
DESIGN SPEED	XX MPH	-----
POSTED SPEED	XX MPH	-----
DESIGN VEHICLE	WB-67	SU-30
PERCENT TRUCKS	X%	<X%

Aug 27, 2021 2:03:45pm – User jody.brown
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REVISIONS	DATE	BY
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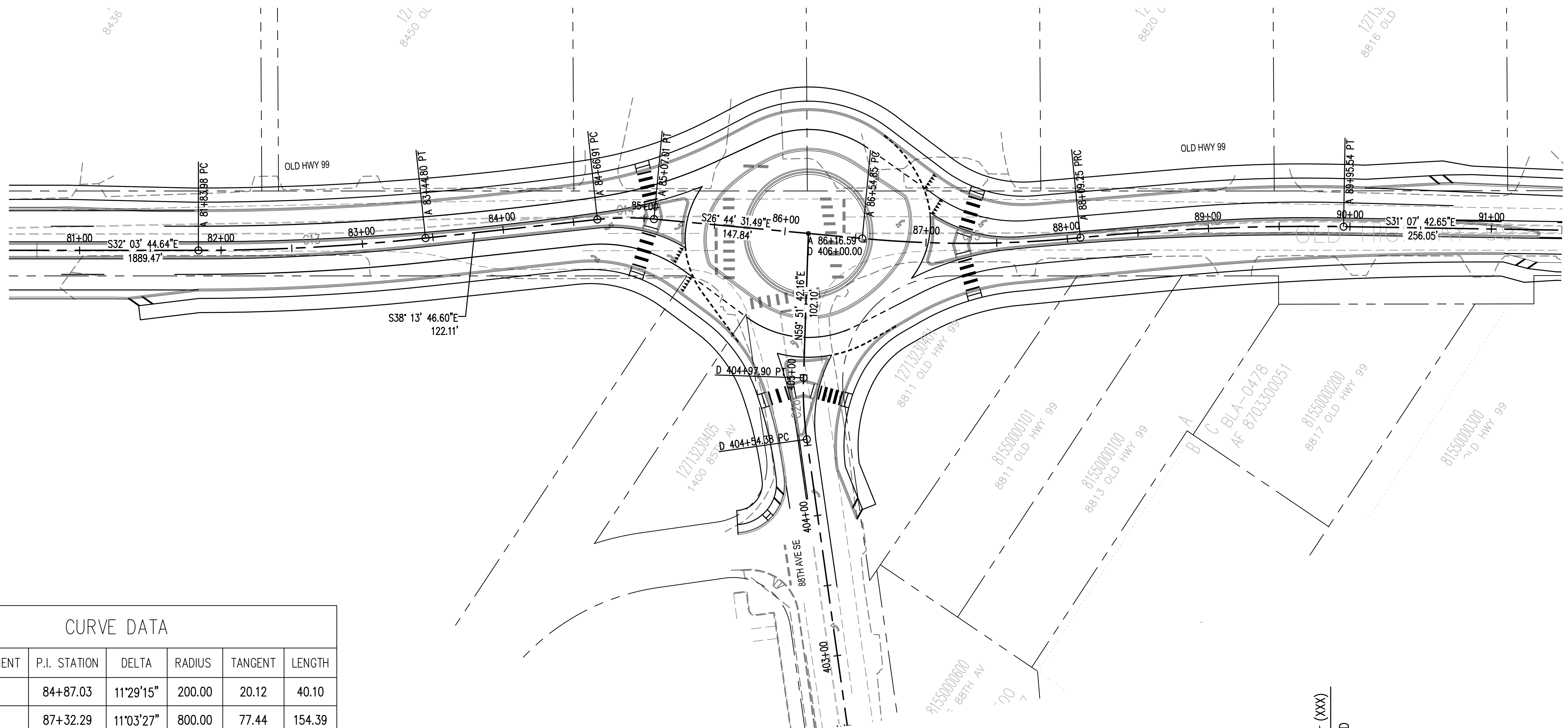
OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON
MP XX TO MP XX

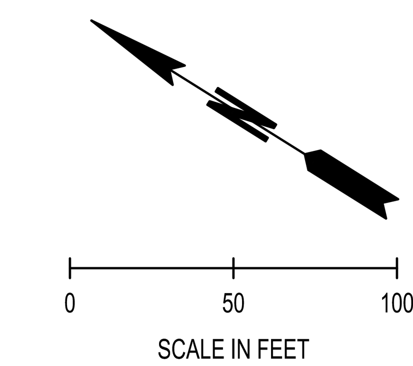
INTERSECTION PLAN @ 79TH AVE
A 47+00 - A 42+50

DRAWING No.: IP-2

SHEET No.: ---- OF XX

S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M





LEGEND

- RIGHT OF WAY
- PROPERTY LINE
- EASEMENT
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- YIELD LINE SYMBOL
- STOP LINE
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- EDGE OF GRAVEL
- EDGE OF PAVEMENT
- BARRIER
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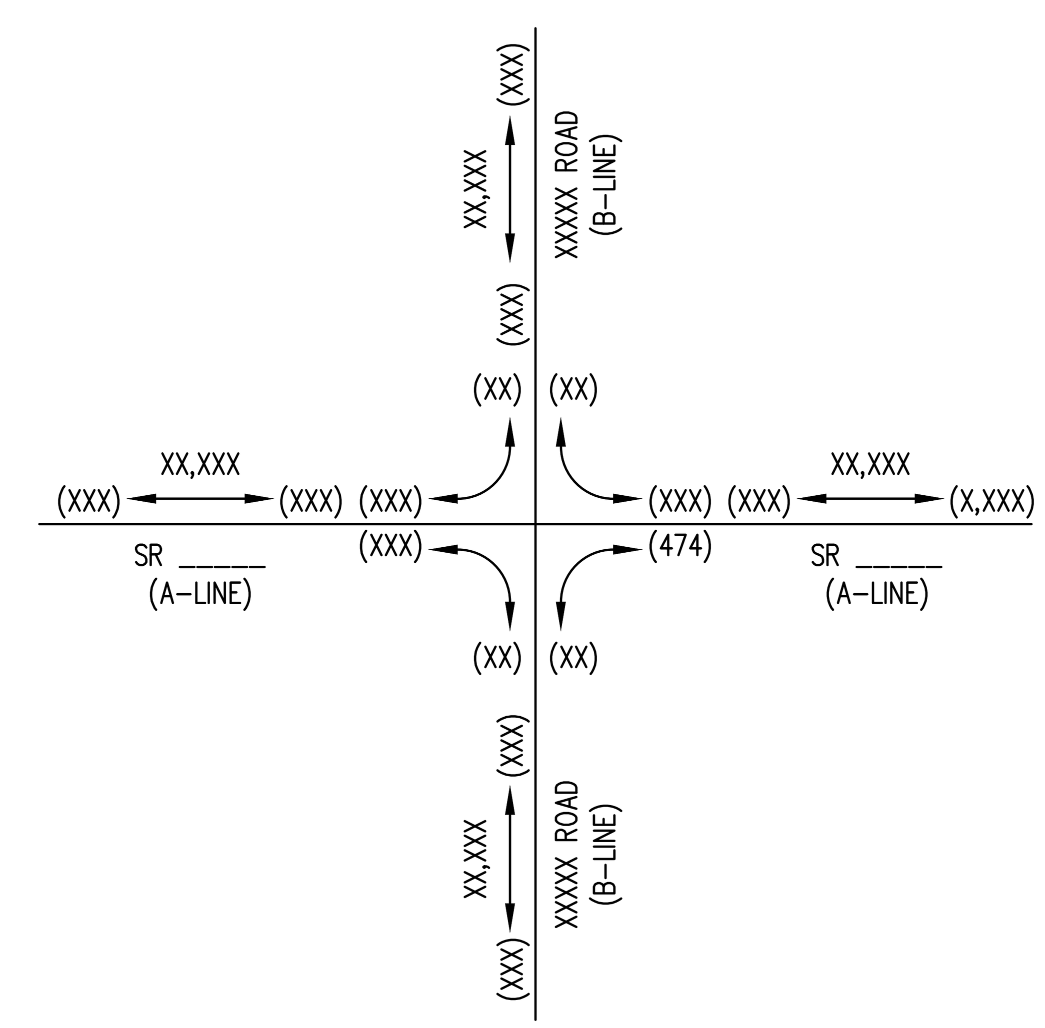
- TRAFFIC ARROWS

CURVE DATA

CURVE #	ALIGNMENT	P.I. STATION	DELTA	RADIUS	TANGENT	LENGTH
C14	A	84+87.03	11°29'15"	200.00	20.12	40.10
C15	A	87+32.29	11°03'27"	800.00	77.44	154.39
C16	A	89+02.50	6°40'16"	1600.00	93.25	186.29
C26	D	404+76.20	9°58'25"	250.00	21.81	43.52

DESIGN DATA FOR NHS ROUTE, NON-INTERSTATE IMPROVEMENTS

ROADWAY	A-LINE (SR ###)	B-LINE (ROAD NAME)
SUMMARY OF DESIGN	MM/DD/YYYY	-----
INTERSECTION CONTROL TYPE	(UN)SIGNALIZED	STOP
FUNCTIONAL CLASSIFICATION	URBAN PRINCIPAL ARTERIAL	-----
ACCESS CONTROL	LIMITED ACCESS MODIFIED CONTROL	-----
TERRAIN CLASSIFICATION	ROLLING or LEVEL	-----
DESIGN SPEED	XX MPH	-----
POSTED SPEED	XX MPH	-----
DESIGN VEHICLE	WB-67	SU-30
PERCENT TRUCKS	X%	<X%



XXX=EST. 2030 ADT
(XXX)=EST. 2030 DDHV
TRAFFIC FLOW DIAGRAM

REVISIONS	DATE	BY
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ISSUE DATE: SEPTEMBER 2020
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DRAWING FILE No.: 0625.29-IP-01

ALL DIMENSIONS SHOWN IN FEET UNLESS OTHERWISE DESIGNATED

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TUMWATER, WA 98501

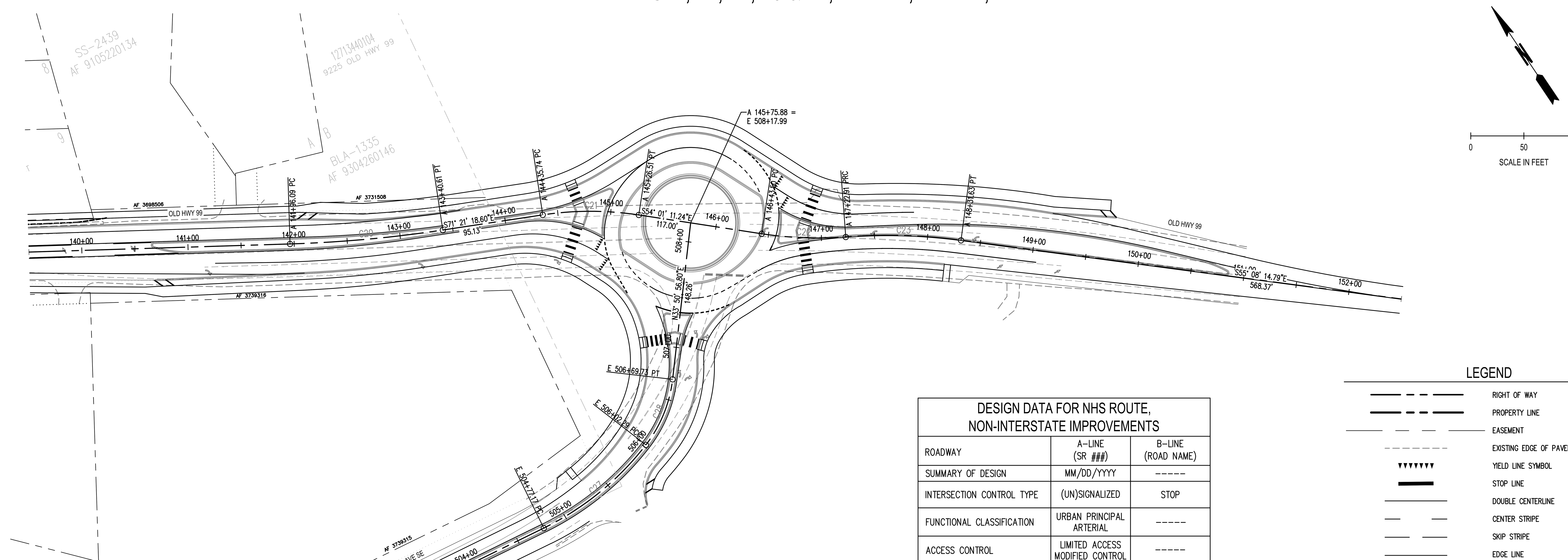
OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON
MP XX TO MP XX

INTERSECTION PLAN @ 88TH AVE
A 80+50 - A 91+00

DRAWING No.: IP-3

SHEET No.: ---- OF XX

S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M



LEGEND

- RIGHT OF WAY
- PROPERTY LINE
- EASEMENT
- EXISTING EDGE OF PAVEMENT
- YIELD LINE SYMBOL
- STOP LINE
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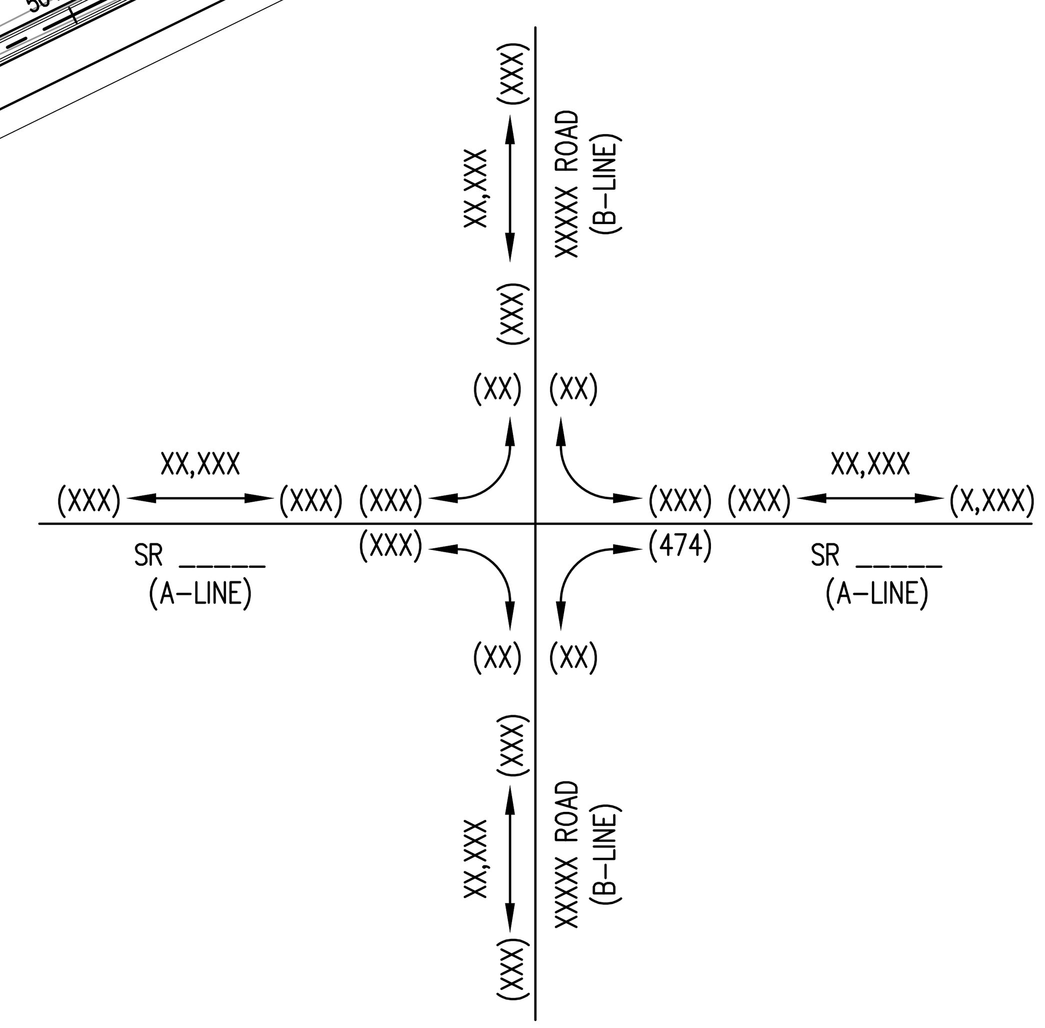
DESIGN DATA FOR NHS ROUTE, NON-INTERSTATE IMPROVEMENTS

ROADWAY	A-LINE (SR ###)	B-LINE (ROAD NAME)
SUMMARY OF DESIGN	MM/DD/YYYY	-----
INTERSECTION CONTROL TYPE	(UN)SIGNALIZED	STOP
FUNCTIONAL CLASSIFICATION	URBAN PRINCIPAL ARTERIAL	-----
ACCESS CONTROL	LIMITED ACCESS MODIFIED CONTROL	-----
TERRAIN CLASSIFICATION	ROLLING or LEVEL	-----
DESIGN SPEED	XX MPH	-----
POSTED SPEED	XX MPH	-----
DESIGN VEHICLE	WB-67	SU-30
PERCENT TRUCKS	X%	<X%



XXX=EST. 2030 ADT
(XXX)=EST. 2030 DDHV
TRAFFIC FLOW DIAGRAM

CURVE DATA

CURVE #	ALIGNMENT	P.I. STATION	DELTA	RADIUS	TANGENT	LENGTH
C27	E	505+40.84	26°09'48"	274.00	63.67	125.12
C28	E	506+36.87	31°09'40"	124.00	34.58	67.44
C20	A	142+68.43	6°50'37"	1210.00	72.35	144.53
C21	A	144+81.47	17°20'07"	300.00	45.73	90.77
C22	A	146+83.38	12°59'57"	350.00	39.88	79.41
C23	A	147+77.46	11°52'54"	524.25	54.55	108.72

Aug 27, 2021 2:04:05pm – User: jody.brown
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REVISIONS	DATE	BY
PRELIMINARY		

DESIGNED BY: DESIGNER NAME
ISSUE DATE: SEPTEMBER 2020
DRAWN BY: DRAFTER NAME
JOB No.: 0625.29
CHECKED BY: ENGINEER NAME
DRAWING FILE No.: 0625.29-IP-01

ALL DIMENSIONS SHOWN IN FEET UNLESS OTHERWISE DESIGNATED

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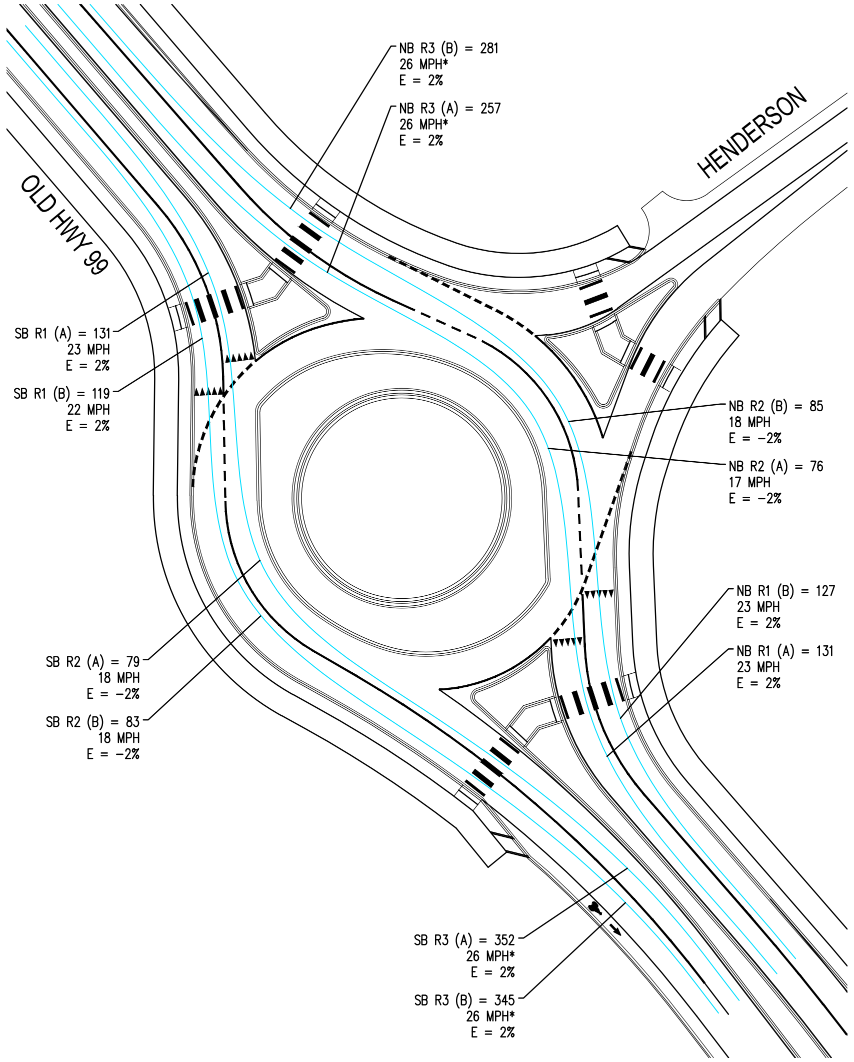
555 ISRAEL ROAD SW
TUMWATER, WA 98501

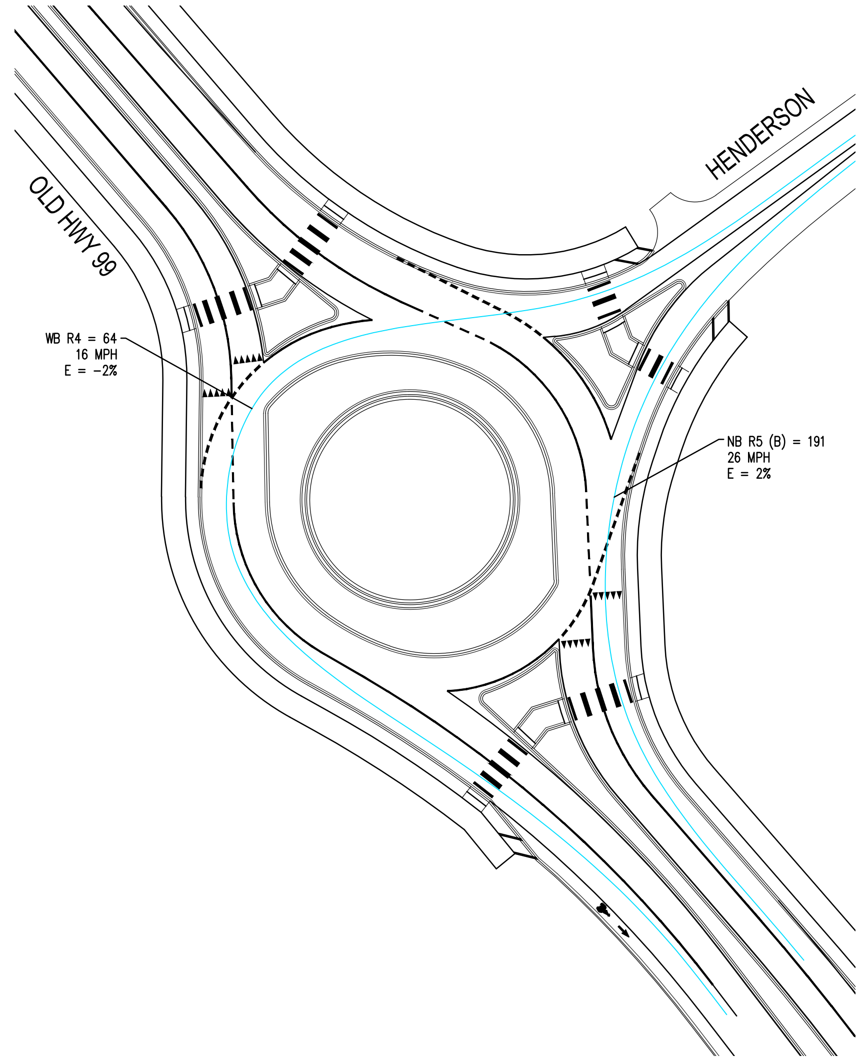
OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON
MP XX TO MP XX

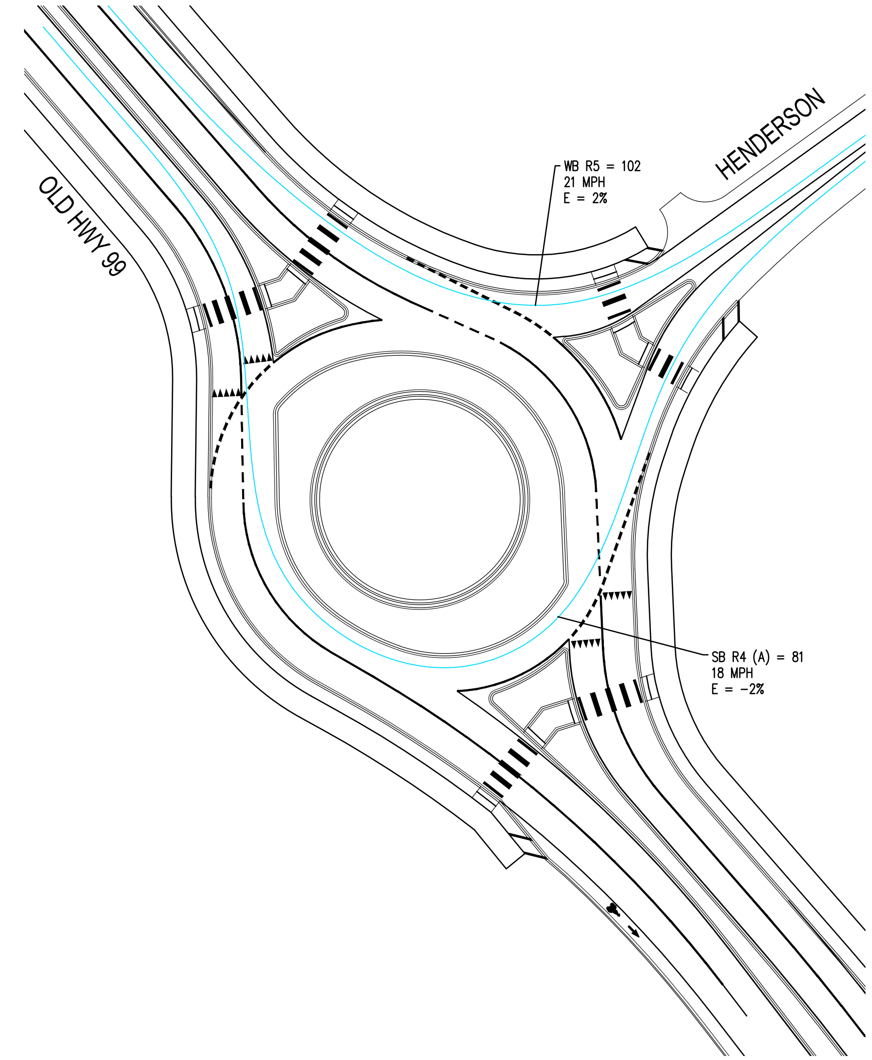
INTERSECTION PLAN @ 93TH AVE
A 139+50 - A 152+50

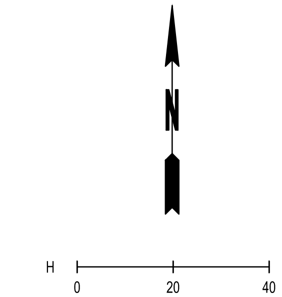
DRAWING No.: IP-4
SHEET No.: ---- OF XX

F2) FASTEST PATH EXHIBITS

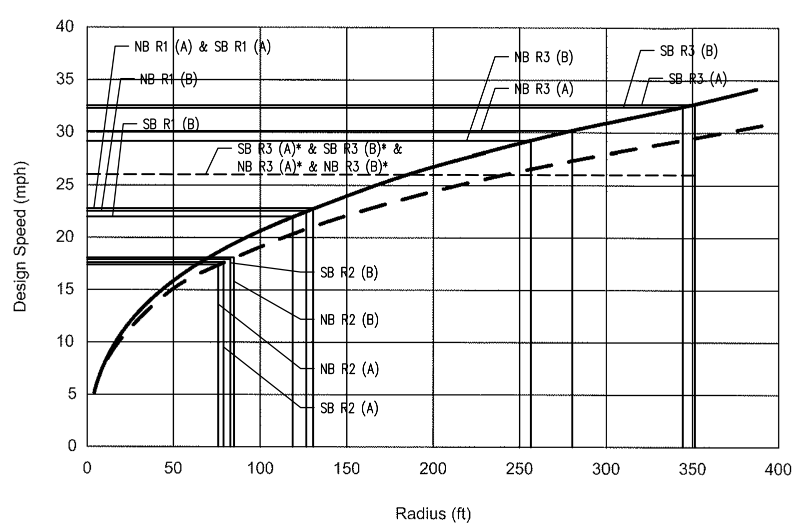






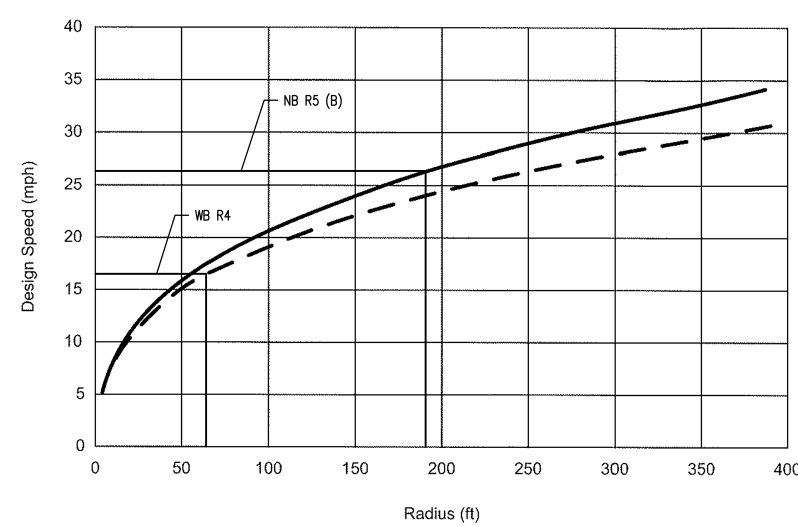


*SPEED USED IS A MAXIMUM EXIT SPEED BY ACCELERATION CALCULATED USING AASHTO GEOMETRIC DESIGN OF HIGHWAY AND STREETS EXHIBIT 2-24: ACCELERATION OF PASSENGER CARS. AND APPLYING IT OVER THE DISTANCE FROM THE MIDDLE OF R2 SPEED CURVES TO THE CONFLICT POINT.



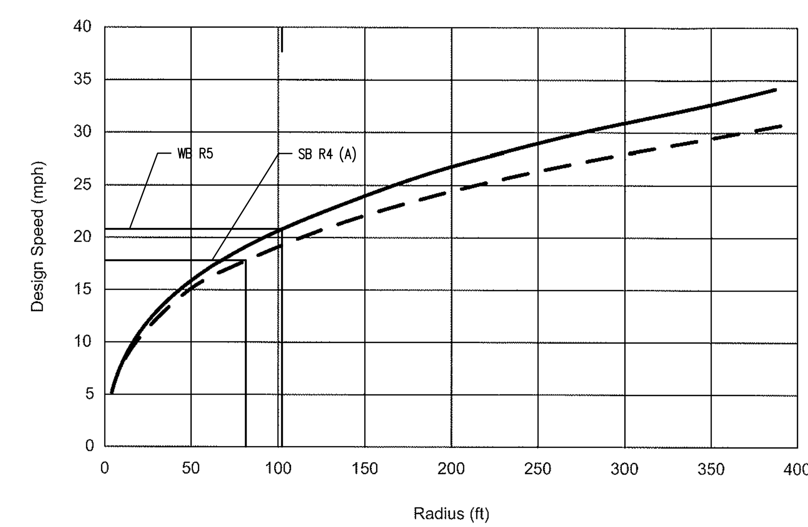
e= +2% (2% superelevation)　　e= -2% (2% adverse crown)

Speed vs. Radius
Exhibit 1320-9



e= +2% (2% superelevation)　　e= -2% (2% adverse crown)

Speed vs. Radius
Exhibit 1320-9



e= +2% (2% superelevation)　　e= -2% (2% adverse crown)

Speed vs. Radius
Exhibit 1320-9

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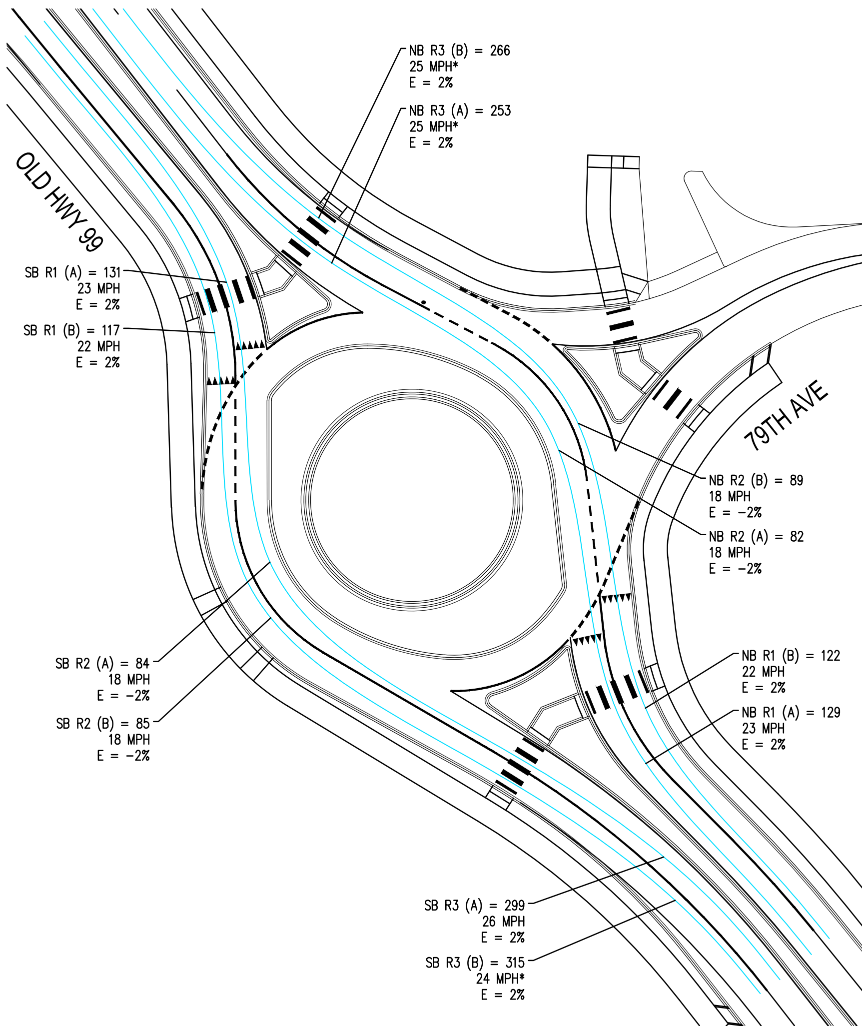
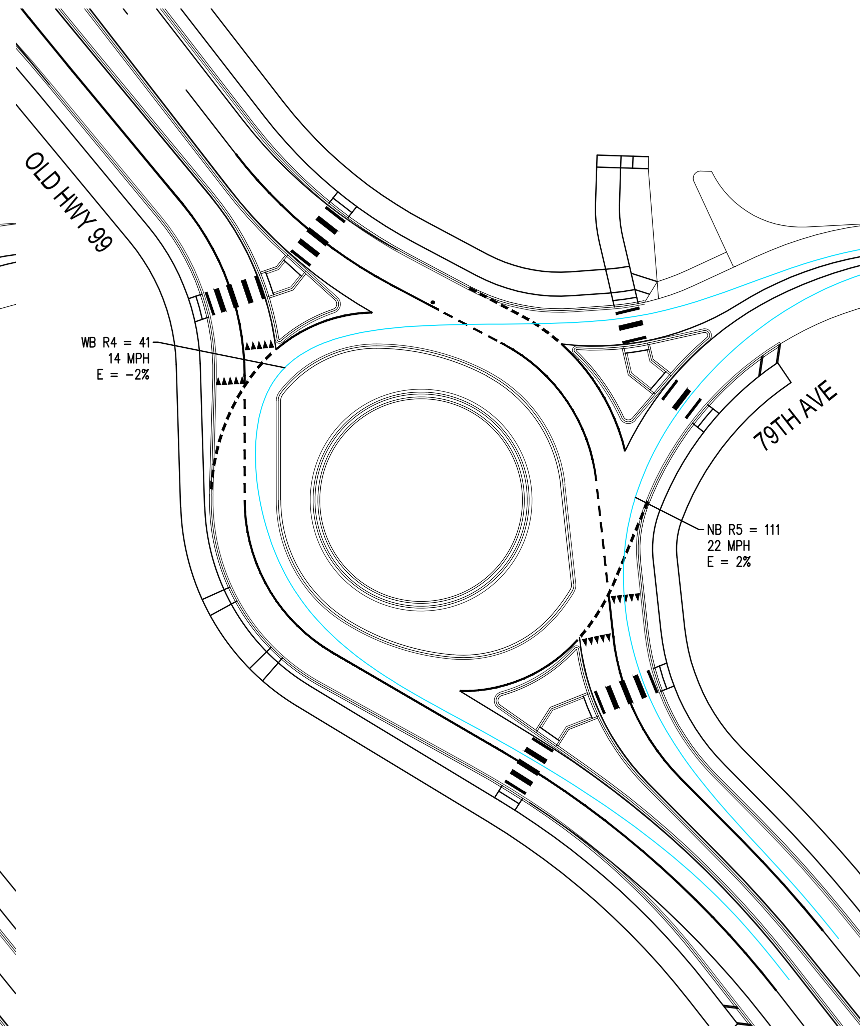
HORIZONTAL SCALE:	1"=40'
DATE:	July, 2021
JOB No.:	0625.29
DRAWING FILE No.:	

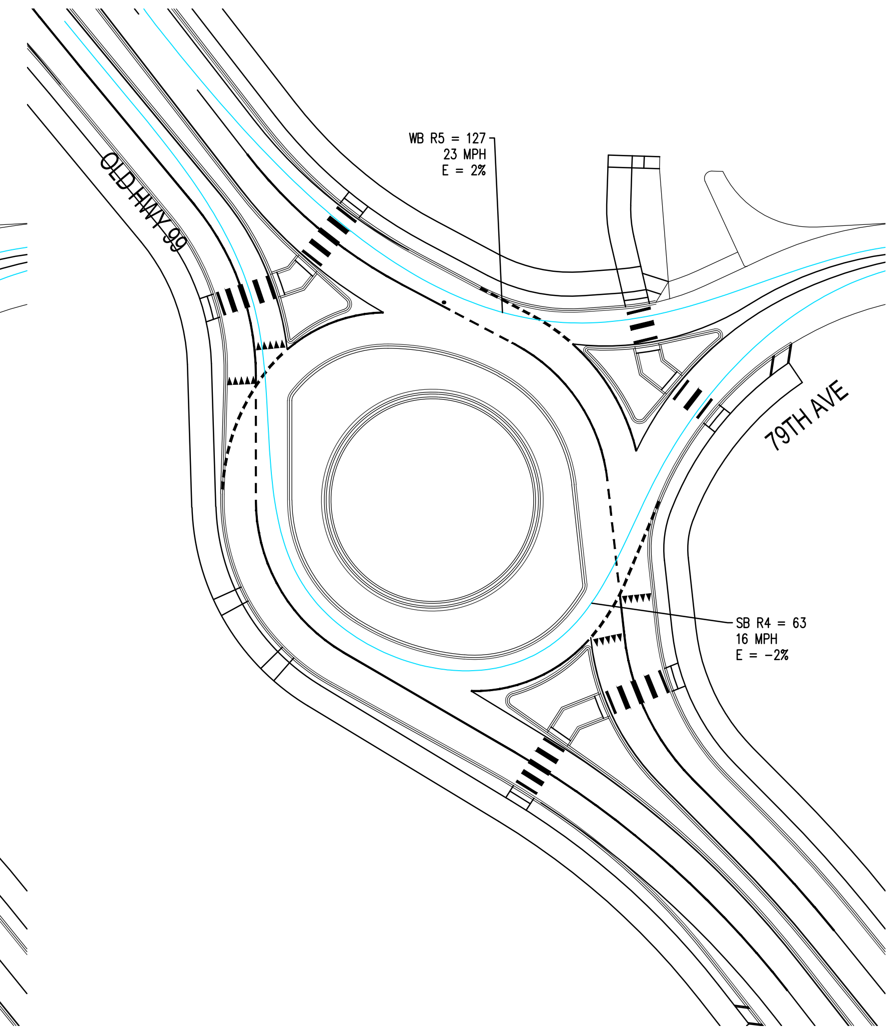
OLD HWY 99 AND 79TH AVE
FASTEST PATH EXHIBIT

EXHIBIT No: EX-1
SHEET No: 1 of 4

Jul 08, 2021 3:11:18pm - User kono.melvin
N:\PROJECTS\0625 CITY OF TUMWATER\0625.29 TUMWATER OLD HWY 99 AND 79TH AVE CORRIDOR STUDY\CADD\EXHIBITS\FASTEST PATH\0625.29_FASTEST PATH.DWG







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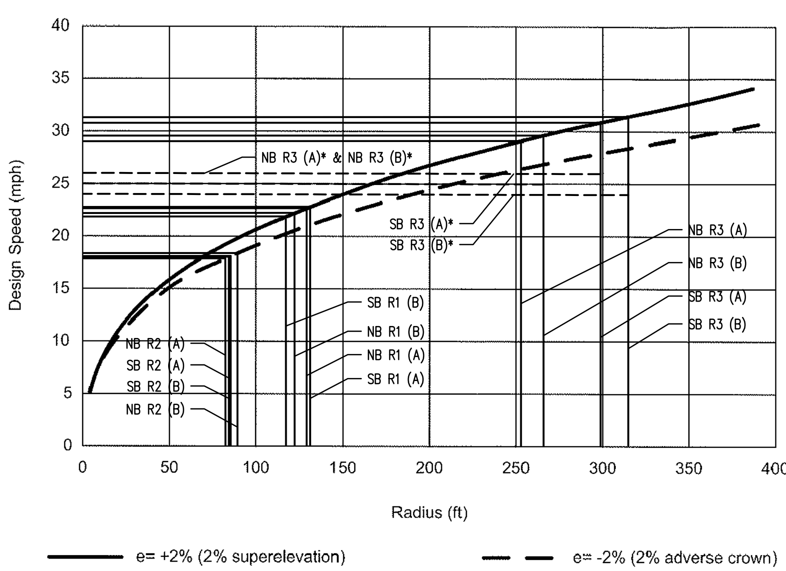
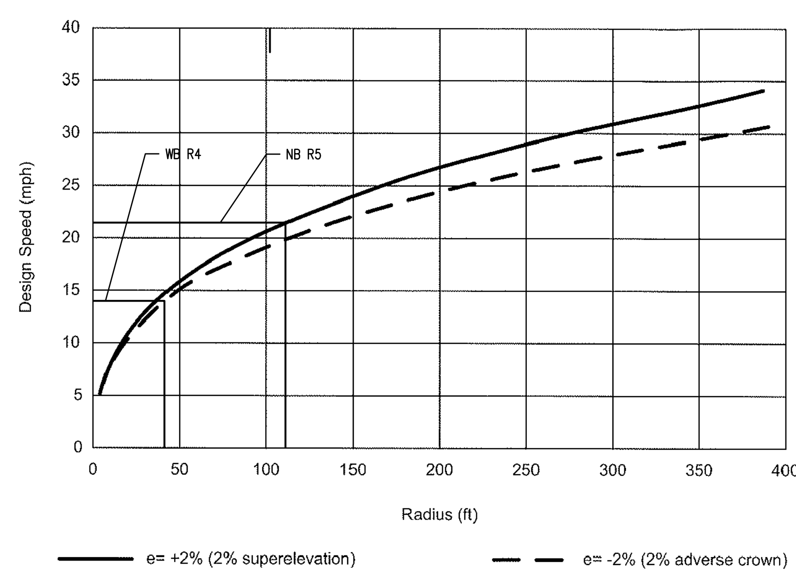
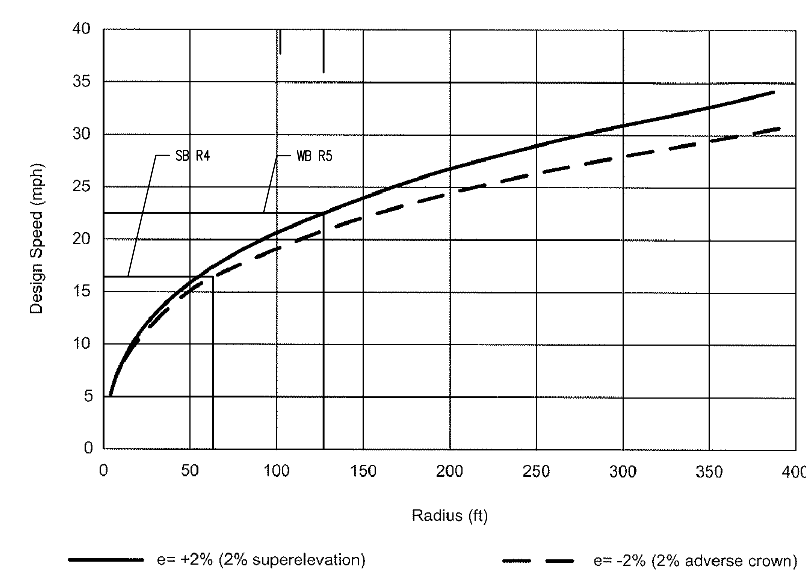
*SPEED USED IS A MAXIMUM EXIT SPEED BY ACCELERATION CALCULATED USING AASHTO GEOMETRIC DESIGN OF HIGHWAY AND STREETS EXHIBIT 2-24: ACCELERATION OF PASSENGER CARS. AND APPLYING IT OVER THE DISTANCE FROM THE MIDDLE OF R2 SPEED CURVES TO THE CONFLICT POINT.



Speed vs. Radius
Exhibit 1320-9



Speed vs. Radius
Exhibit 1320-9



Speed vs. Radius

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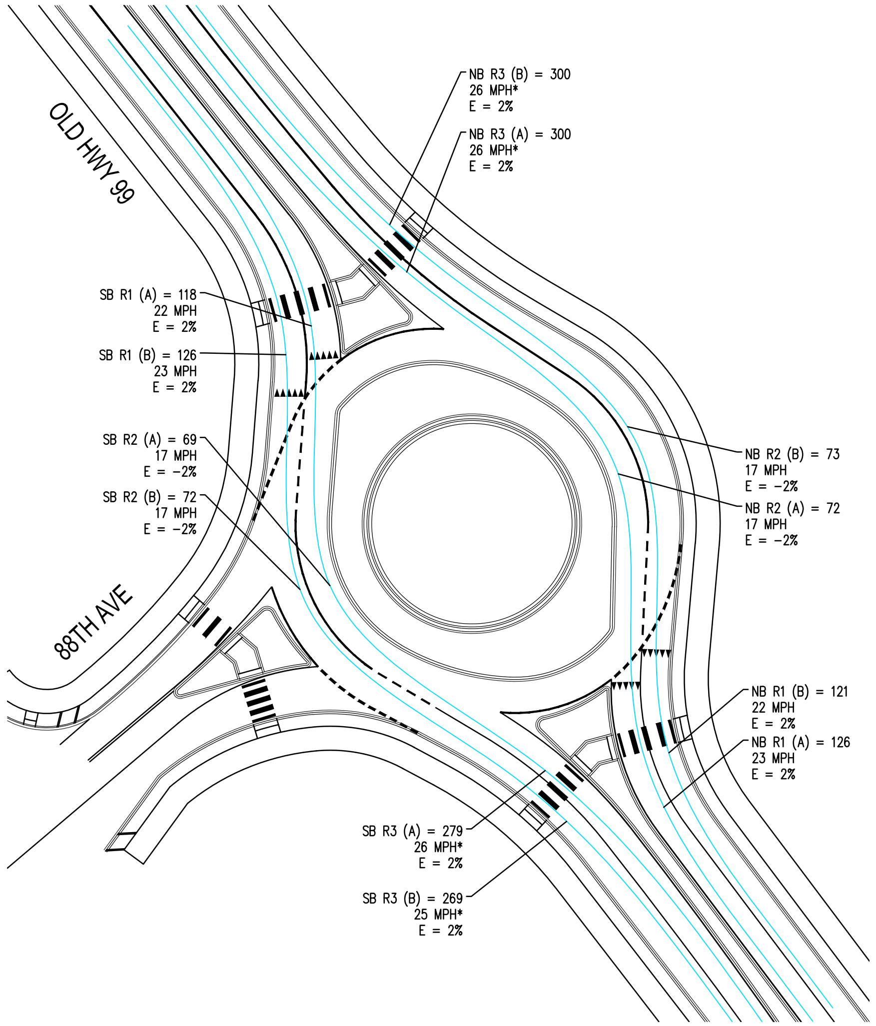
HORIZONTAL SCALE:	1"=40'
DATE:	July, 2021
JOB No.:	0625.29
DRAWING FILE No.:	-

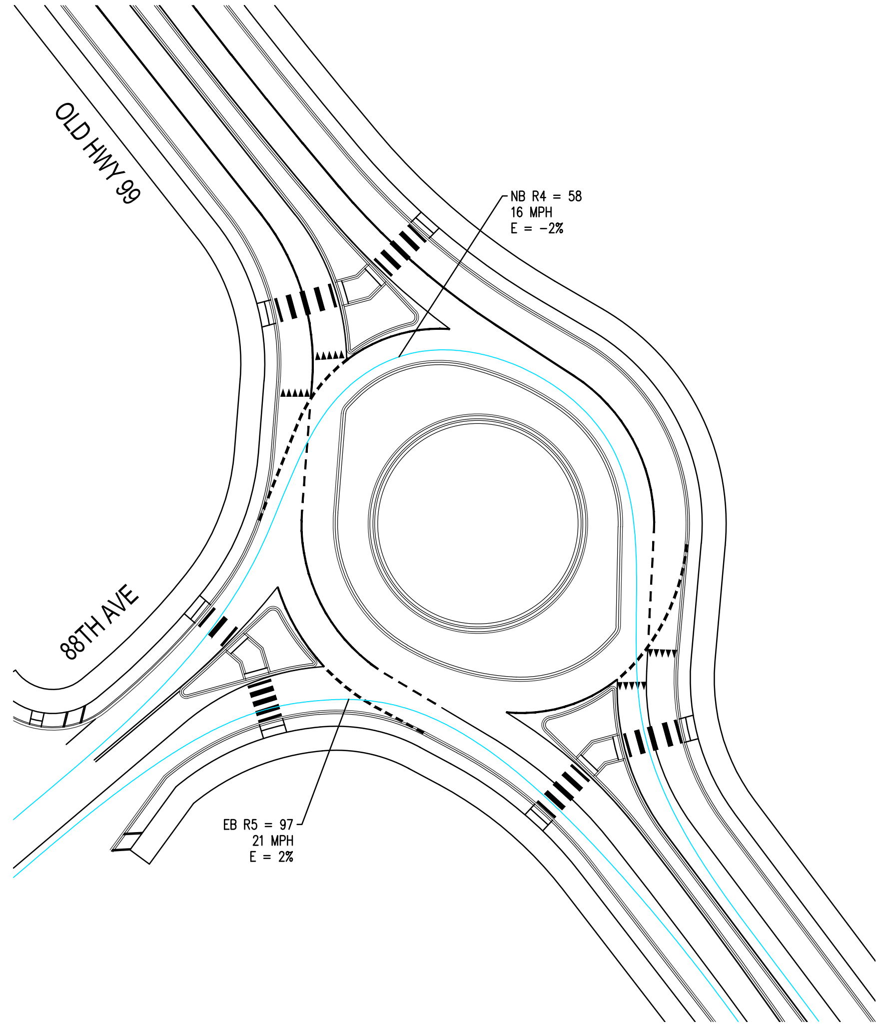
OLD HWY 99 AND 79TH AVE
FASTEST PATH EXHIBIT

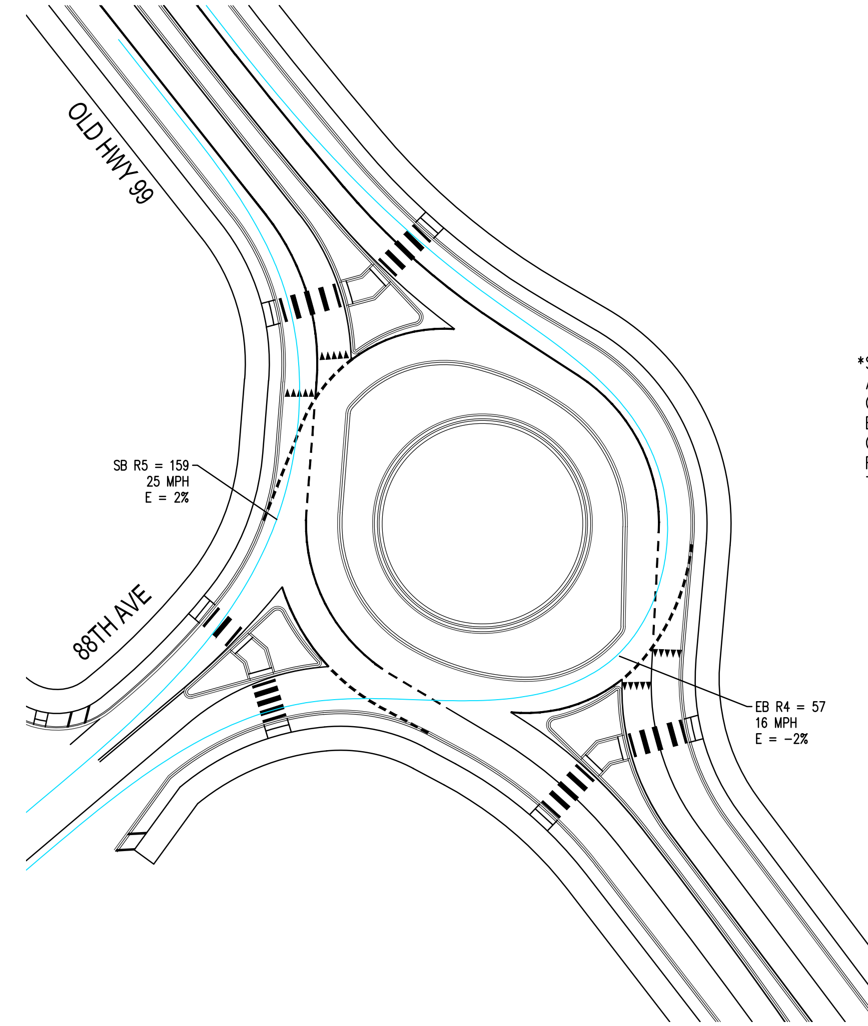
EXHIBIT No: EX-2

SHEET No: 2 of 4

Jul 08, 2021 3:11:25pm - User kono.melvin
N:\PROJECTS\0625 CITY OF TUMWATER\0625.29 TUMWATER OLD HWY 99 AND 79TH AVE CORRIDOR STUDY\CADD\EXHIBITS\FASTEST PATH\0625.29_FASTEST PATH.DWG







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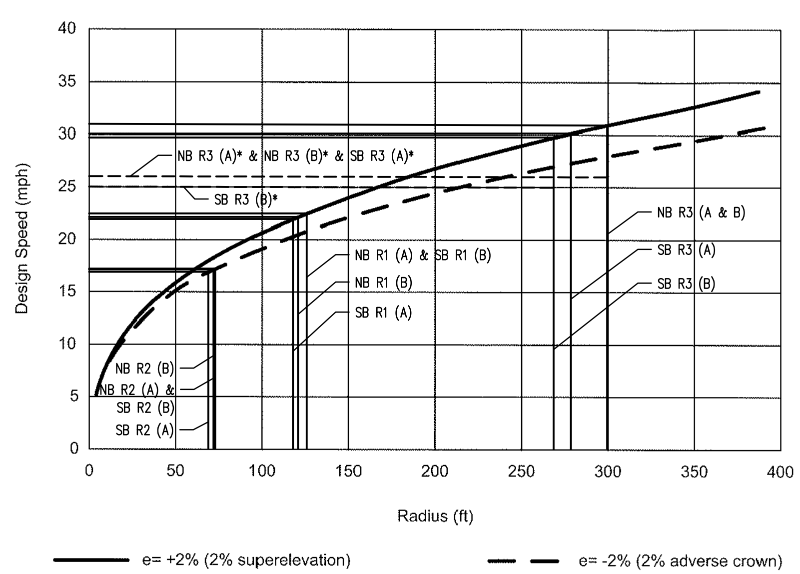
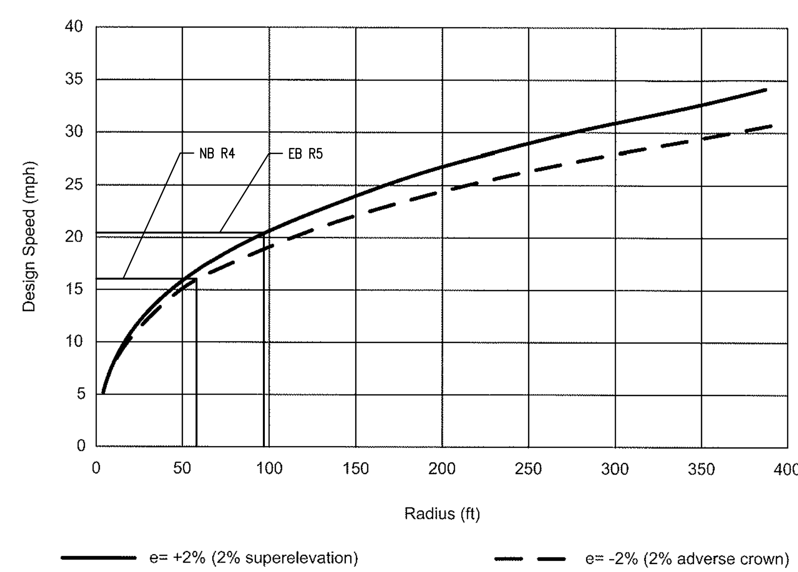
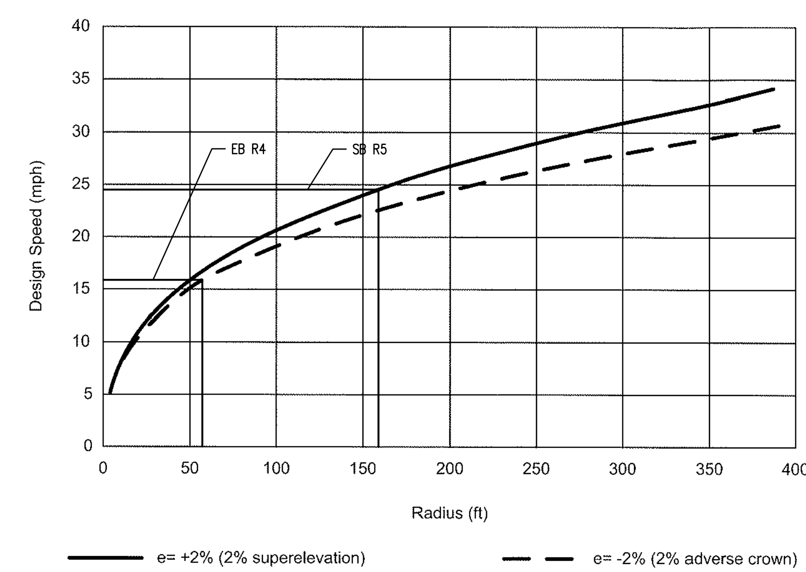
*SPEED USED IS A MAXIMUM EXIT SPEED BY ACCELERATION CALCULATED USING AASHTO GEOMETRIC DESIGN OF HIGHWAY AND STREETS EXHIBIT 2-24: ACCELERATION OF PASSENGER CARS. AND APPLYING IT OVER THE DISTANCE FROM THE MIDDLE OF R2 SPEED CURVES TO THE CONFLICT POINT.



Speed vs. Radius
Exhibit 1320-9



Speed vs. Radius
Exhibit 1320-9



Speed vs. Radius
Exhibit 1320-9

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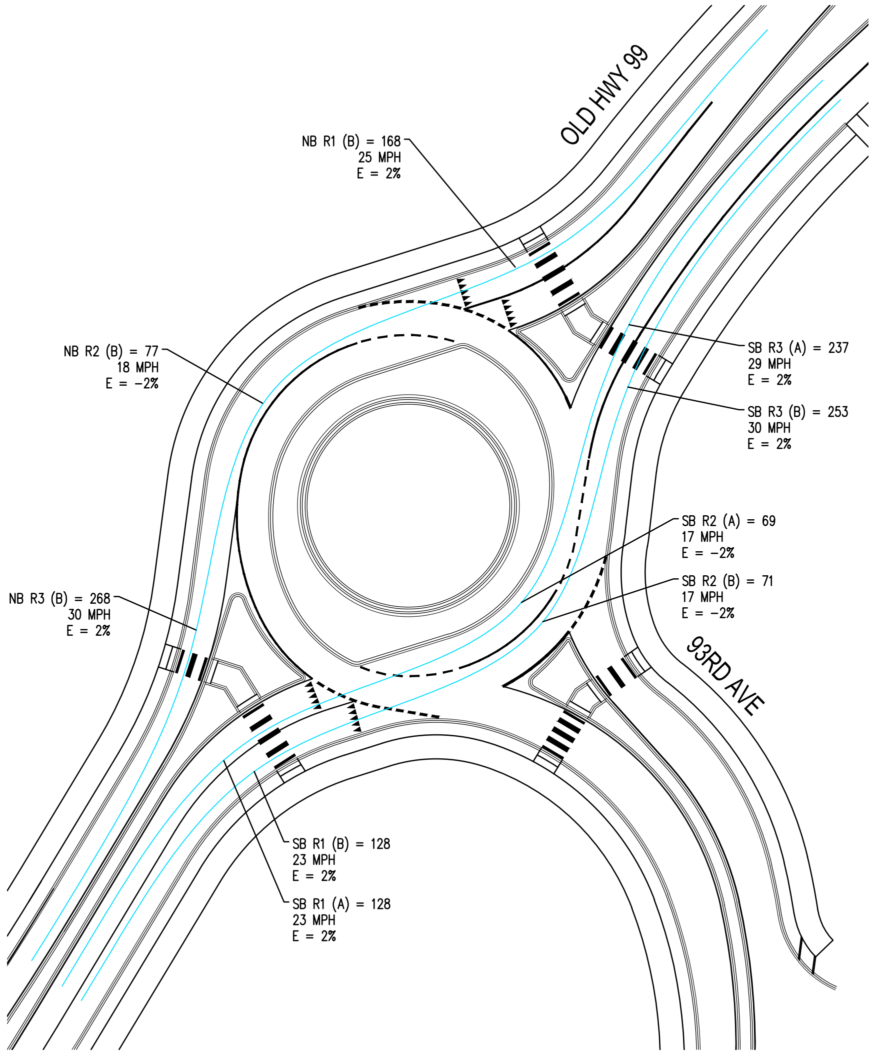
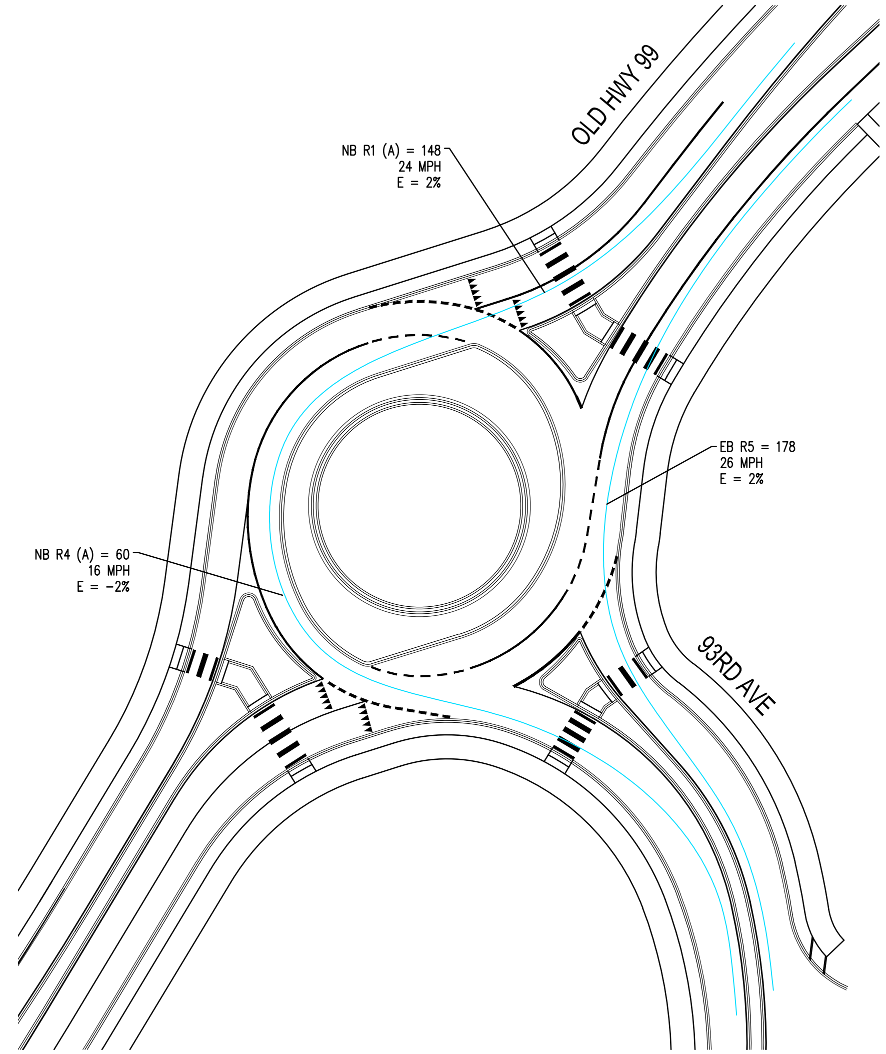
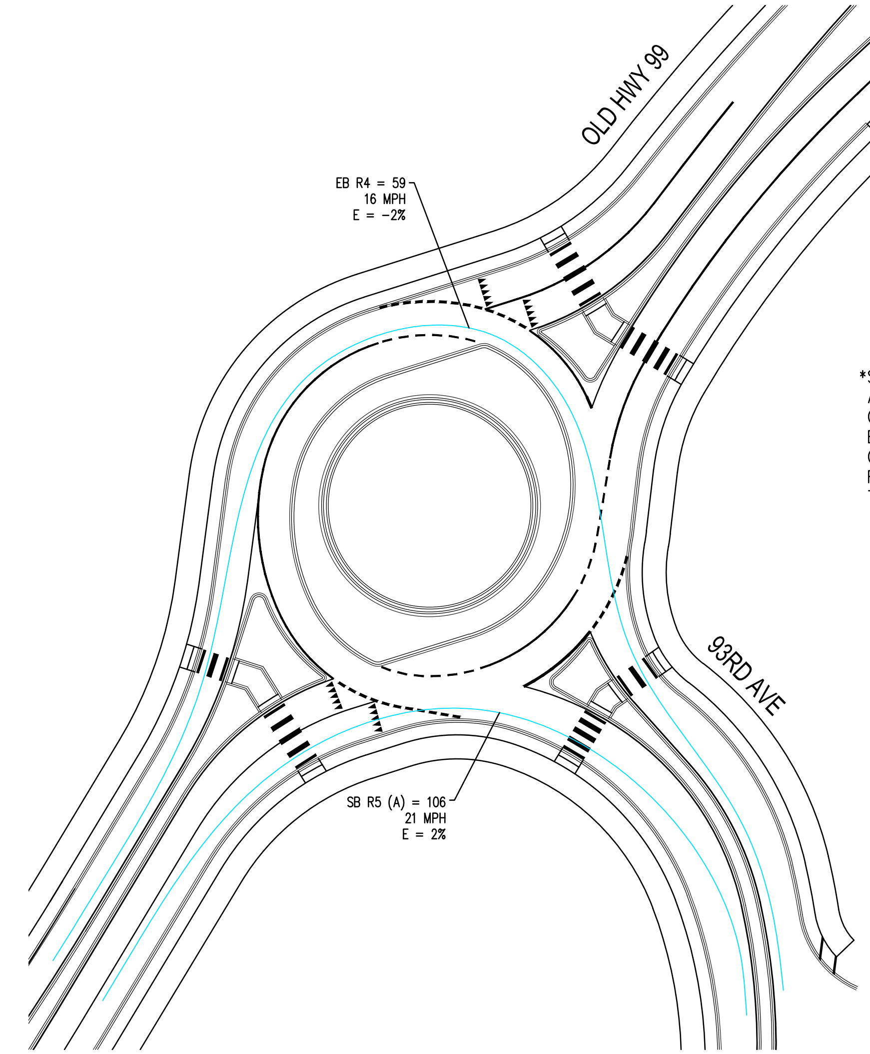
HORIZONTAL SCALE: 1"=40'
DATE: July, 2021
JOB No.: 0625.29
DRAWING FILE No.: -

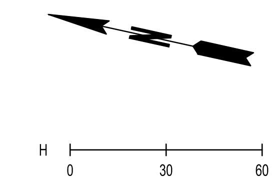
OLD HWY 99 AND 79TH AVE
FASTEST PATH EXHIBIT

EXHIBIT No: EX-3
SHEET No: 3 of 4

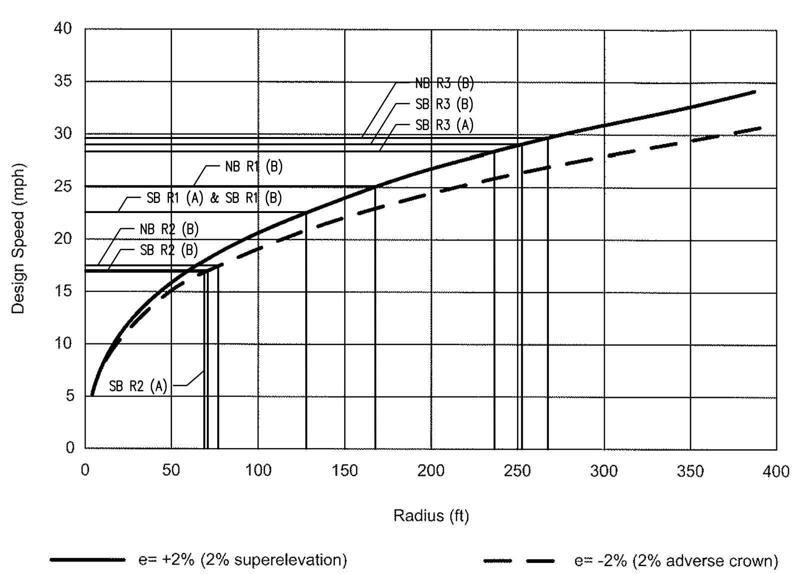




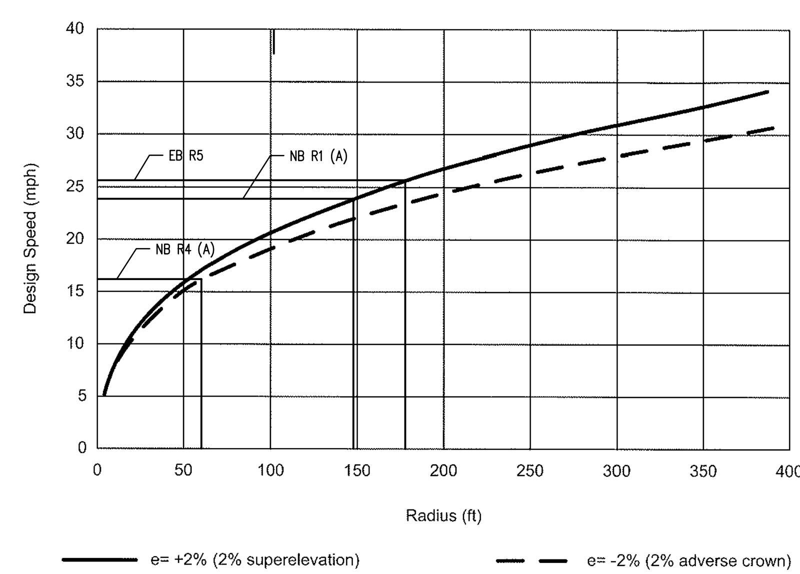




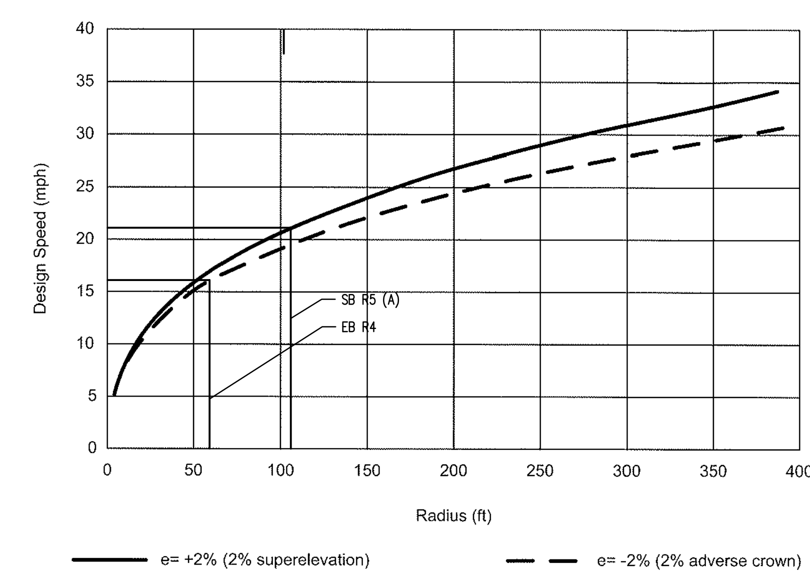
*SPEED USED IS A MAXIMUM EXIT SPEED BY ACCELERATION CALCULATED USING AASHTO GEOMETRIC DESIGN OF HIGHWAY AND STREETS EXHIBIT 2-24: ACCELERATION OF PASSENGER CARS. AND APPLYING IT OVER THE DISTANCE FROM THE MIDDLE OF R2 SPEED CURVES TO THE CONFLICT POINT.



Speed vs. Radius
Exhibit 1320-9



Speed vs. Radius
Exhibit 1320-9



Speed vs. Radius
Exhibit 1320-9

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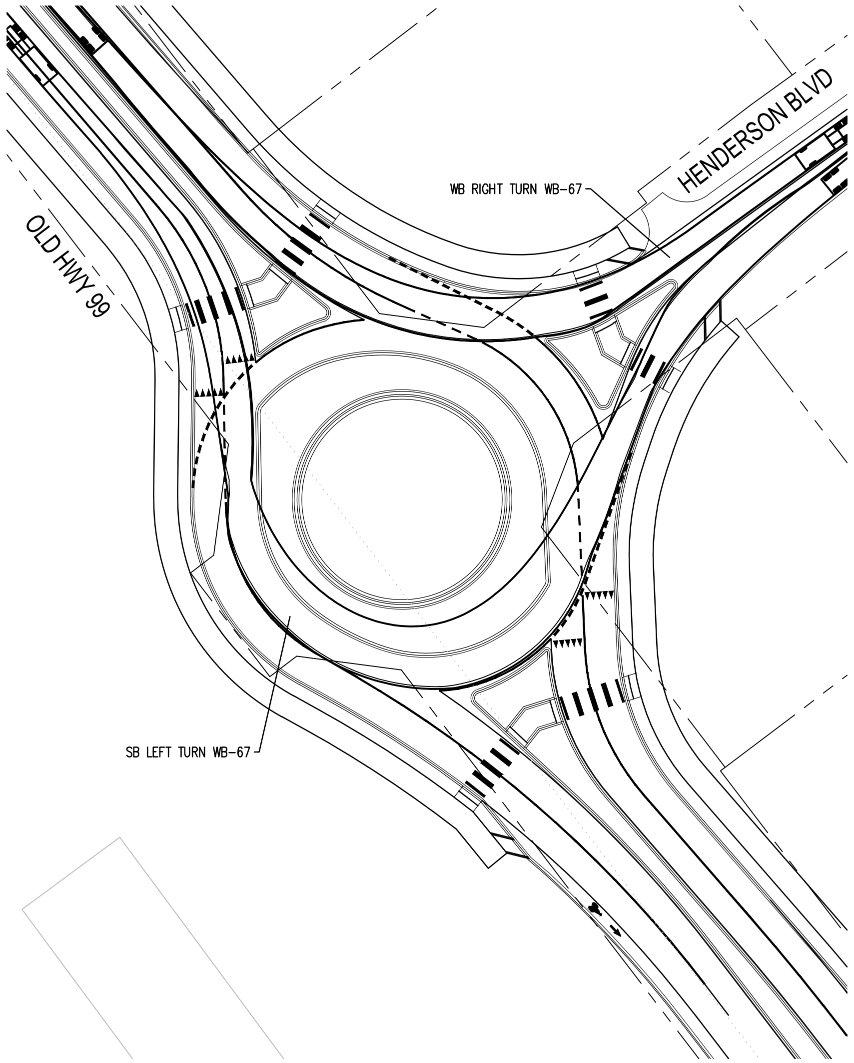
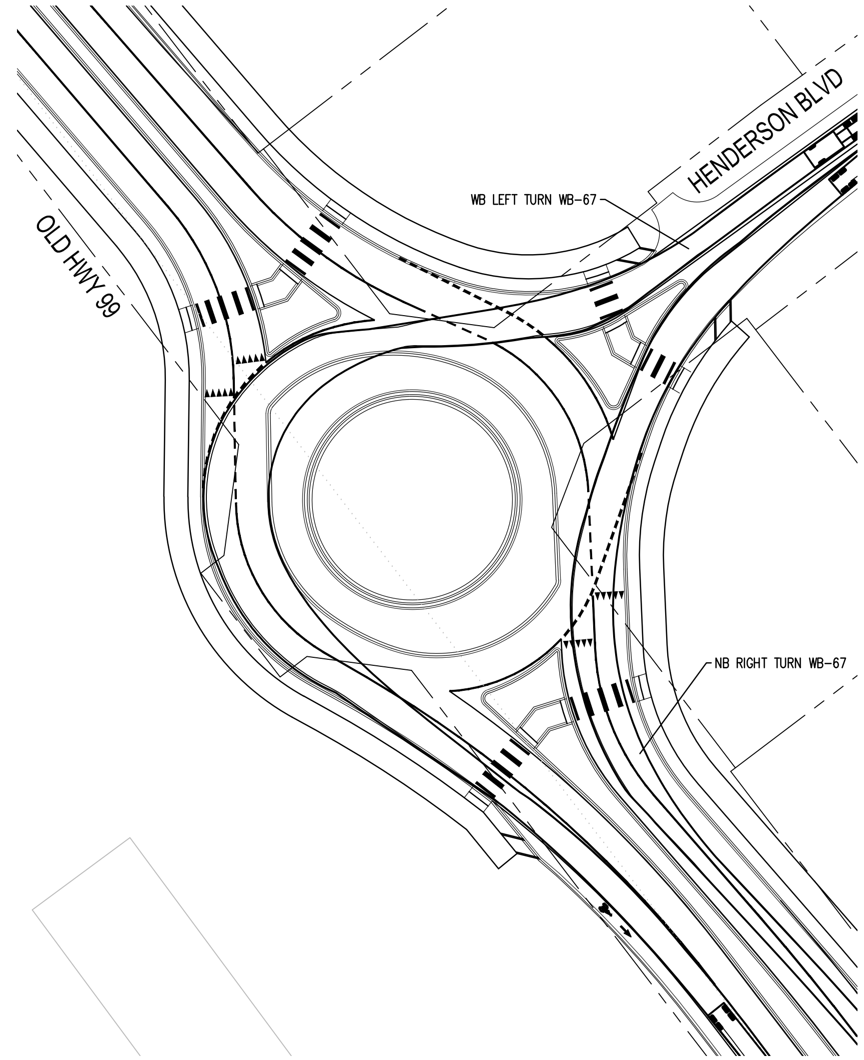
DATE:	July, 2021
JOB No.:	0625.29
DRAWING FILE No.:	-

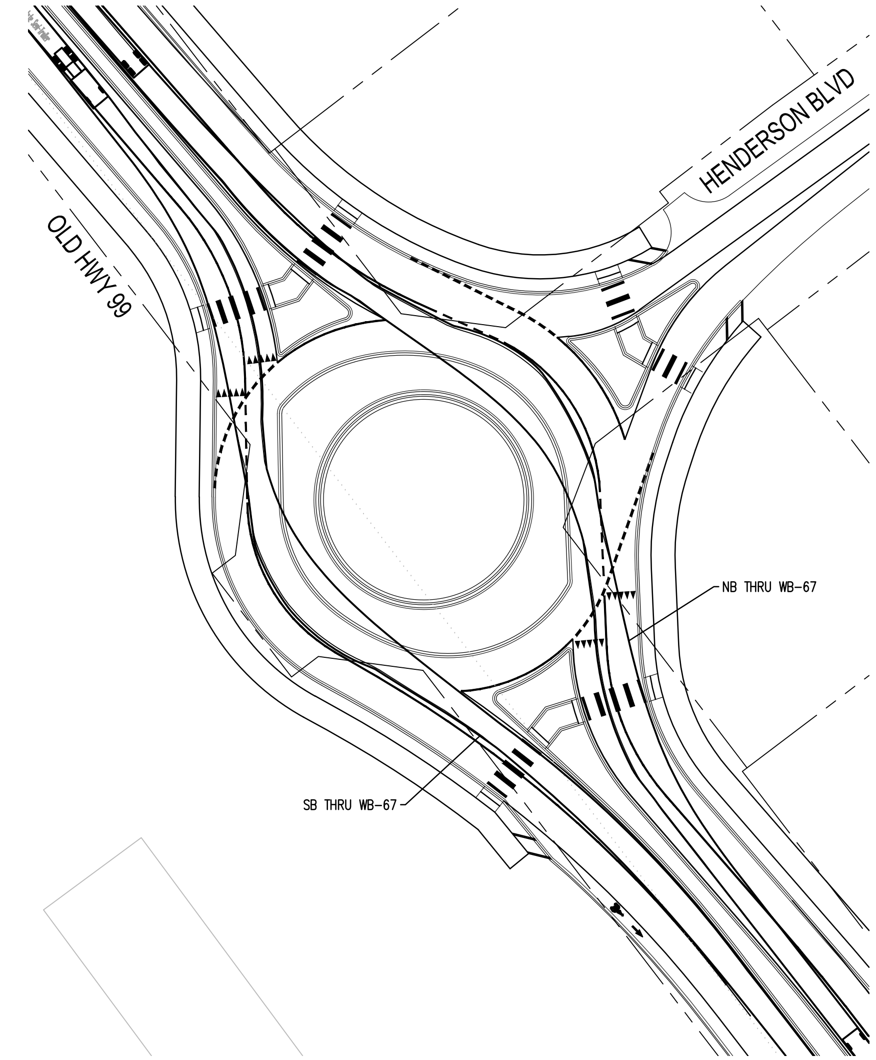
OLD HWY 99 AND 79TH AVE
FASTEST PATH EXHIBIT

EXHIBIT No: EX-4

F3) TRUCK TURNING MOVEMENTS







H 0 20 40

May 11, 2021 9:13:01am – User kano.melvin
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DATE: May, 2021

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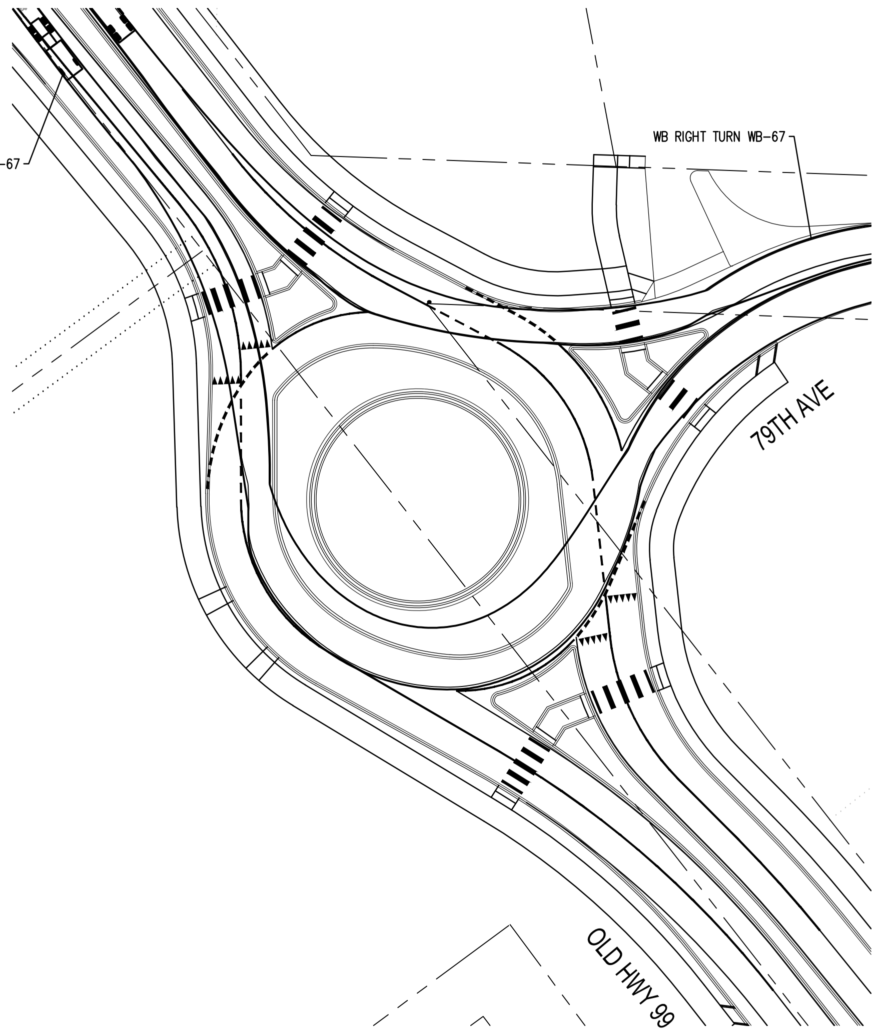
DRAWING FILE No.: -

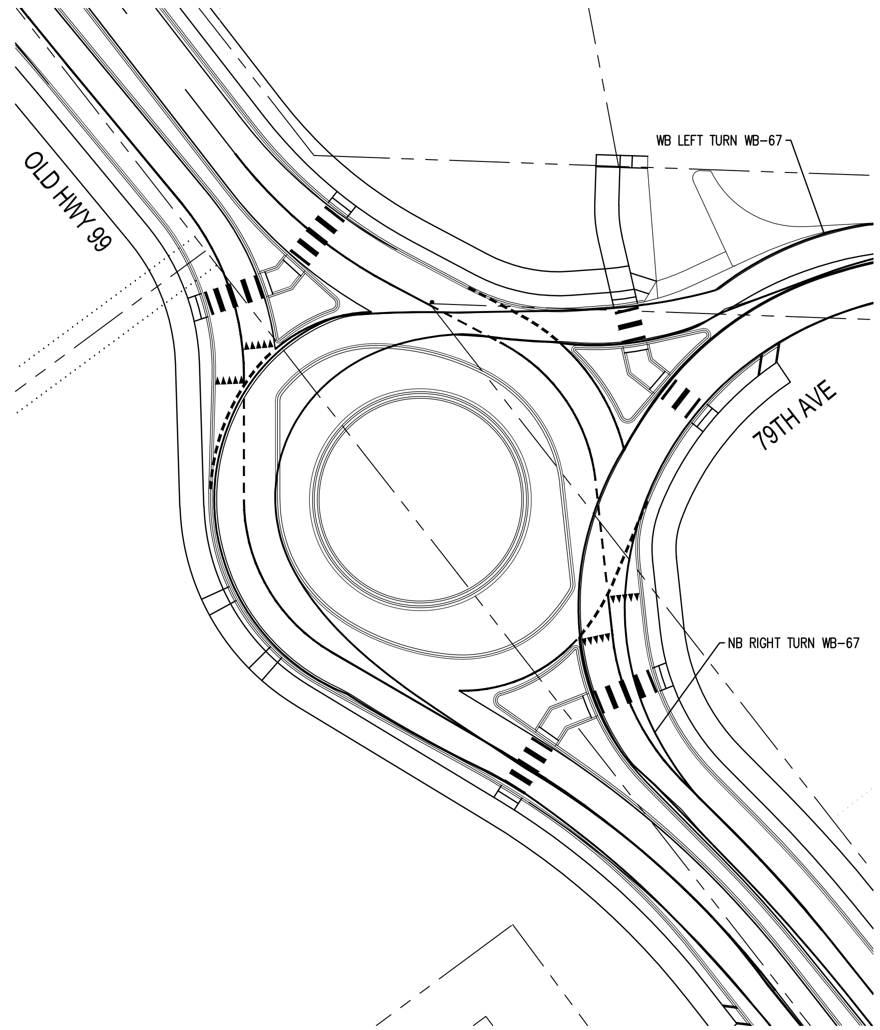
OLD HWY 99 AND HENDERSON BLVD

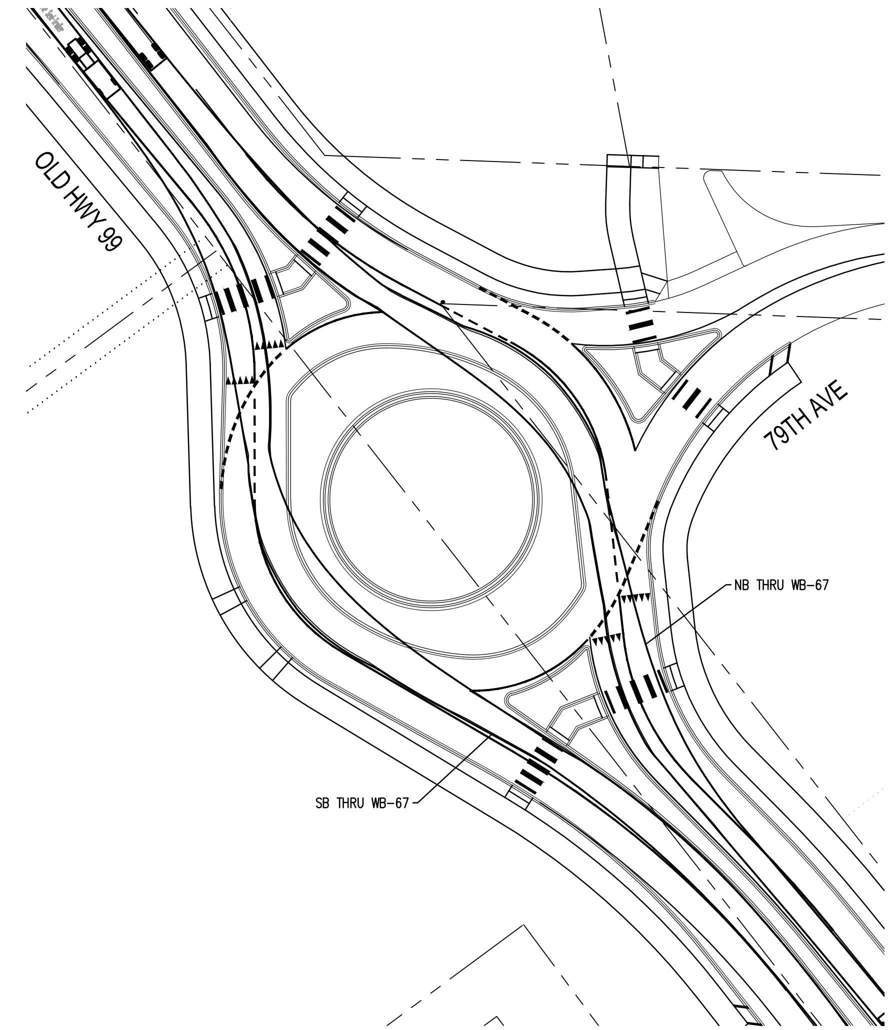
TRUCK TURNING MOVEMENTS

EXHIBIT No: EX-1

SHEET No: 1 of 4







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DATE:	May, 2021
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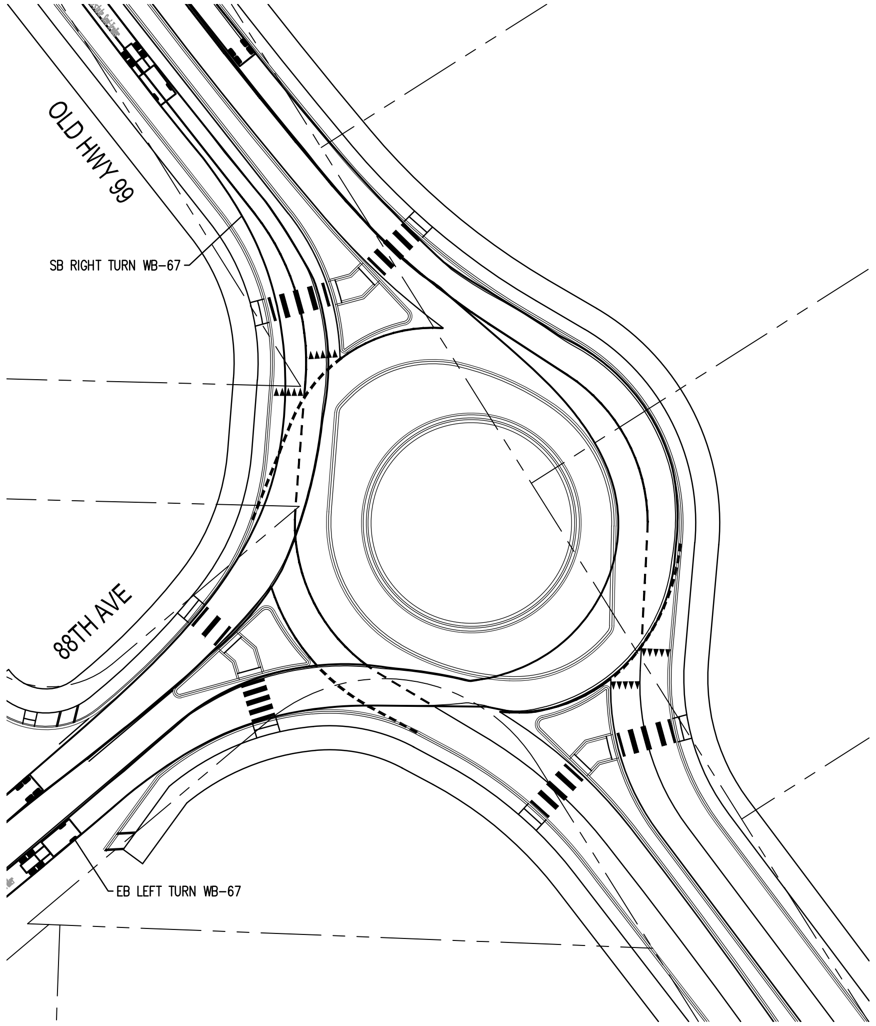
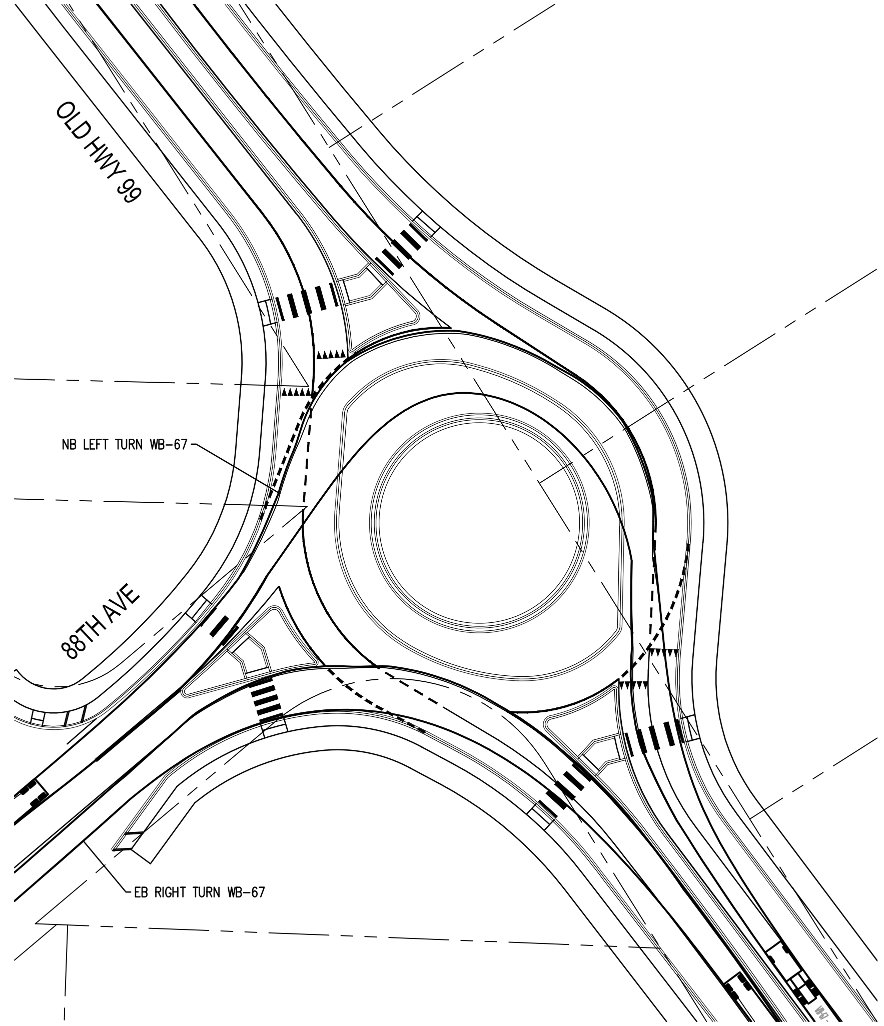
DRAWING FILE No.:	-

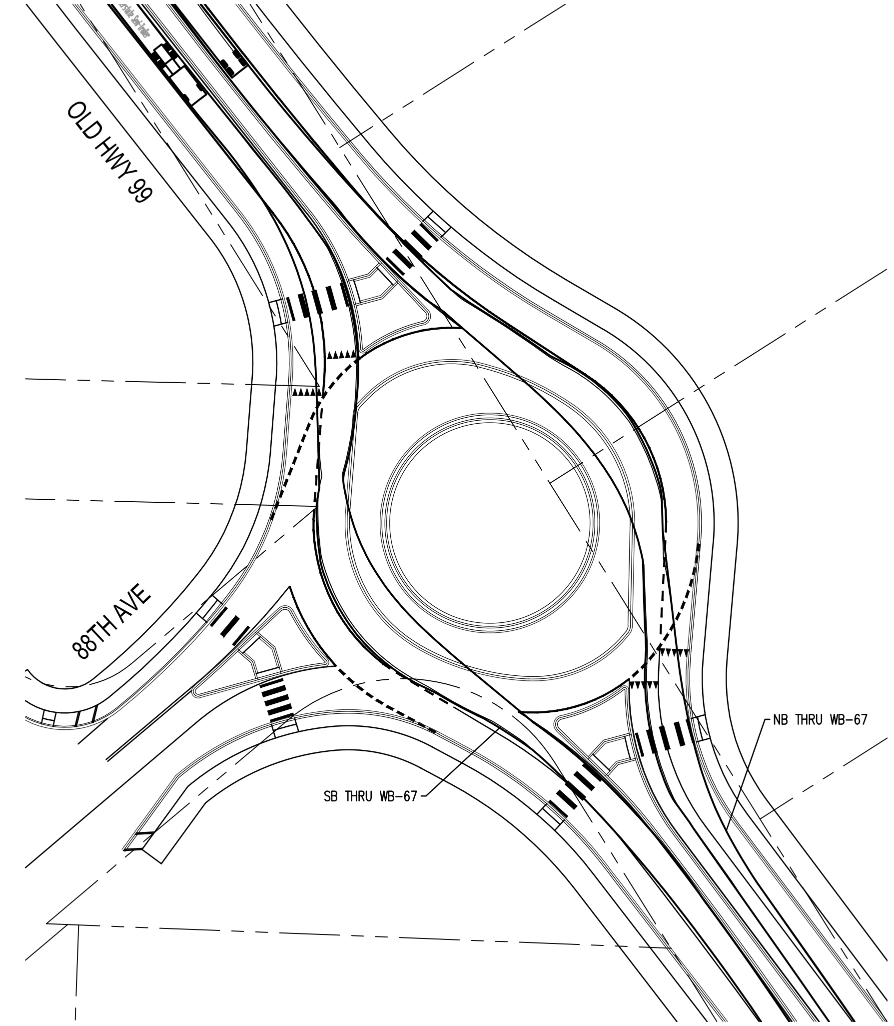
OLD HWY 99 AND 79TH AVE
TRUCK TURNING MOVEMENTS

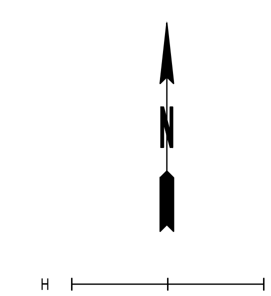
EXHIBIT No: EX-2

SHEET No: 2 of 4









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DATE: May, 2021
JOB No.: -
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OLD HWY 99 AND 88TH AVE
TRUCK TURNING MOVEMENTS

EXHIBIT No: EX-3
SHEET No: 3 of 4

May 11, 2021 9:13:12am – User kono.melvin
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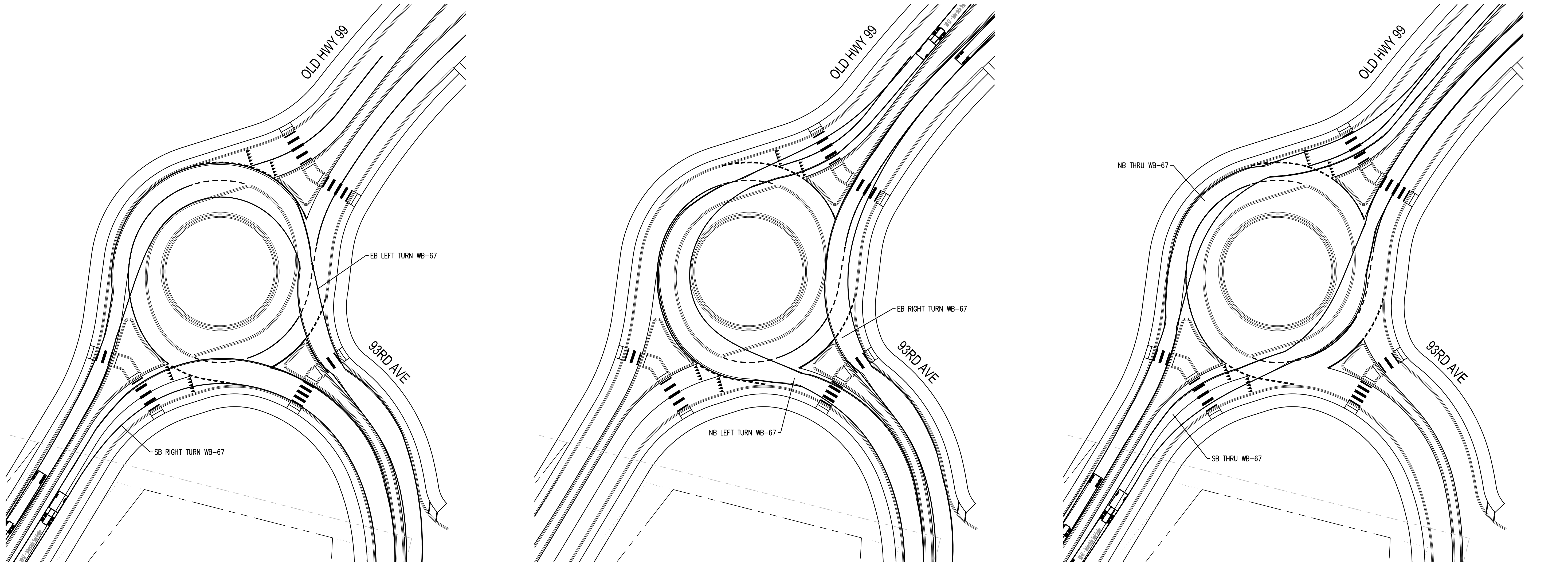

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JOB No.:	-
DRAWING FILE No.:	-

OLD HWY 99 AND 93RD AVE
TRUCK TURNING MOVEMENTS

EXHIBIT No: EX-4

SHEET No: 4 of 4

May 11, 2021 9:13:17am – User kano.melvin
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F4) SIGHT TRIANGLE EXHIBITS

Design Speed (mph)	Design Stopping Sight Distance (ft)	K_c	K_s	VCL_m (ft)
25	155	12	26	75
30	200	19	37	90
35	250	29	49	105
40	305	44	64	120
45	360	61	79	135
50	425	84	96	150
55	495	114	115	165
60	570	151	136	180
65	645	193	157	195
70	730	247	181	210
75	820	312	206	225
80	910	384	231	240

Design Stopping Sight Distance
Exhibit 1260-1

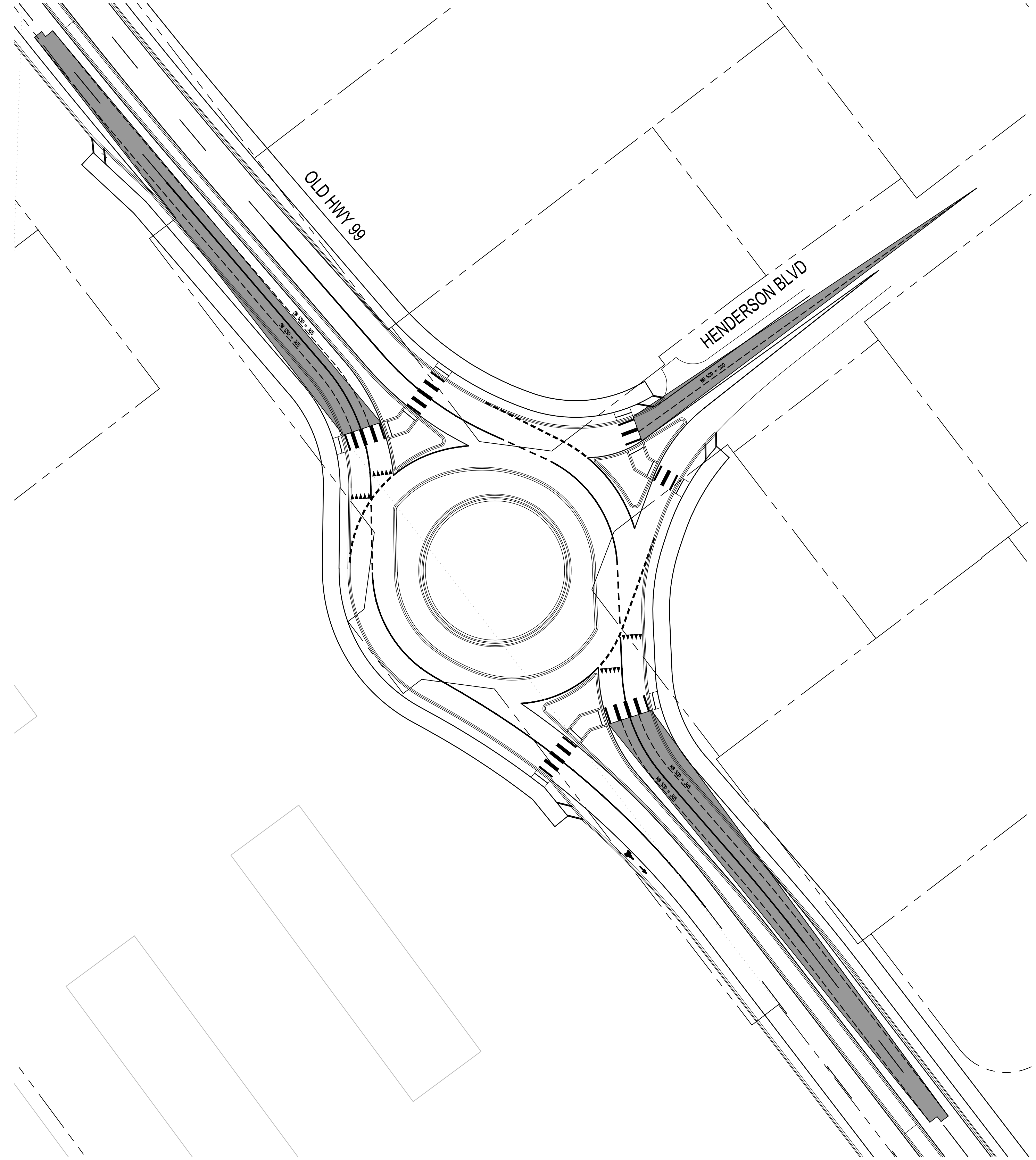
SB1 SSD = 305

SB2 SSD = 305

WB SSD = 250

NB1 SSD = 305

NB2 SSD = 305



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HORIZONTAL SCALE: 1"=30"
DATE: April, 2021
JOB No.: -
DRAWING FILE No.: -

OLD HWY 99 AND HENDERSON BLVD
APPROACH STOPPING SIGHT DISTANCE

EXHIBIT No: EX-01
SHEET No: 1 of 16

May 07, 2021 10:09:38am – User kono.melvin
N:\PROJECTS\0625 CITY OF TUMWATER\0625.29 TUMWATER OLD HWY 99 AND 79TH AVE CORRIDOR STUDY\CADD\EXHIBITS\SIGHT TRIANGLE\0625.29_SIGHTTRIANGLES.DWG

Design Speed (mph)	Design Stopping Sight Distance (ft)	K_c	K_s	VCL_m (ft)
25	155	12	26	75
30	200	19	37	90
35	250	29	49	105
40	305	44	64	120
45	360	61	79	135
50	425	84	96	150
55	495	114	115	165
60	570	151	136	180
65	645	193	157	195
70	730	247	181	210
75	820	312	206	225
80	910	384	231	240

Design Stopping Sight Distance
Exhibit 1260-1

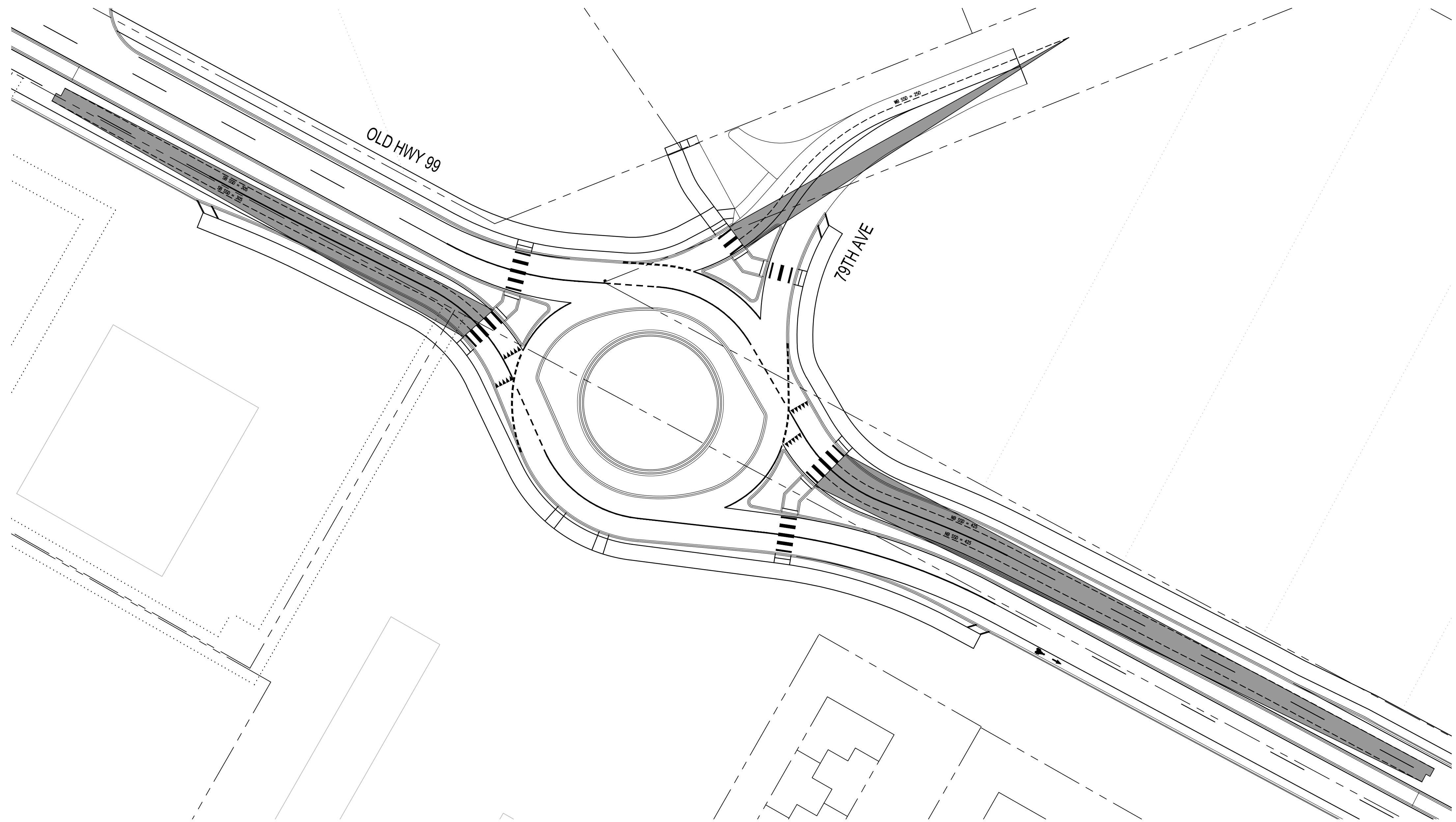
SB1 SSD = 305

SB2 SSD = 305

WB SSD = 250

NB1 SSD = 425

NB2 SSD = 425



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HORIZONTAL SCALE: 1"=30"

DATE: April, 2021

JOB No.: -

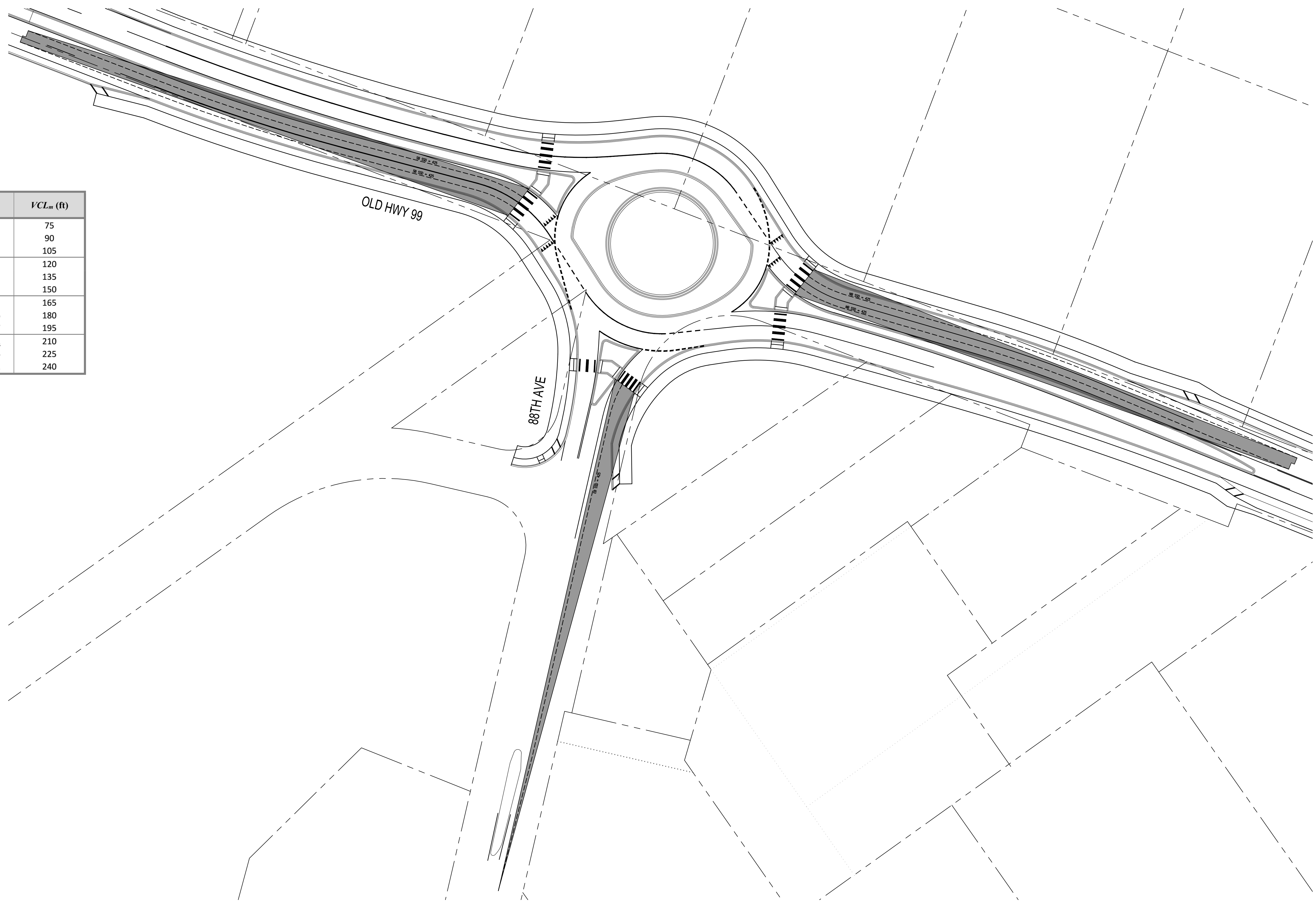
DRAWING FILE No.: -

OLD HWY 99 AND 79TH AVE

APPROACH STOPPING SIGHT DISTANCE

EXHIBIT No: EX-02

SHEET No: 2 of 16



Design Speed (mph)	Design Stopping Sight Distance (ft)	K_c	K_s	VCL_m (ft)
25	155	12	26	75
30	200	19	37	90
35	250	29	49	105
40	305	44	64	120
45	360	61	79	135
50	425	84	96	150
55	495	114	115	165
60	570	151	136	180
65	645	193	157	195
70	730	247	181	210
75	820	312	206	225
80	910	384	231	240

Design Stopping Sight Distance
Exhibit 1260-1

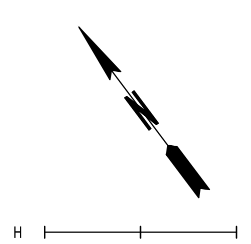
SB1 SSD = 425

SB2 SSD = 425

EB SSD = 425

NB1 SSD = 425

NB2 SSD = 425



May 07, 2021 10:09:48am – User kano.melvin
N:\PROJECTS\0625 CITY OF TUMWATER\0625.29 TUMWATER OLD HWY 99 AND 79TH AVE CORRIDOR STUDY\CADD\EXHIBITS\SIGHT TRIANGLE\0625.29_SIGHTTRIANGLES.DWG

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DATE: April, 2021

JOB No.: -

DRAWING FILE No.: -

OLD HWY 99 AND 88TH AVE

APPROACH STOPPING SIGHT DISTANCE

EXHIBIT No: EX-03

SHEET No: 3 of 16

Design Speed (mph)	Design Stopping Sight Distance (ft)	K_c	K_s	VCL_m (ft)
25	155	12	26	75
30	200	19	37	90
35	250	29	49	105
40	305	44	64	120
45	360	61	79	135
50	425	84	96	150
55	495	114	115	165
60	570	151	136	180
65	645	193	157	195
70	730	247	181	210
75	820	312	206	225
80	910	384	231	240

Design Stopping Sight Distance
Exhibit 1260-1

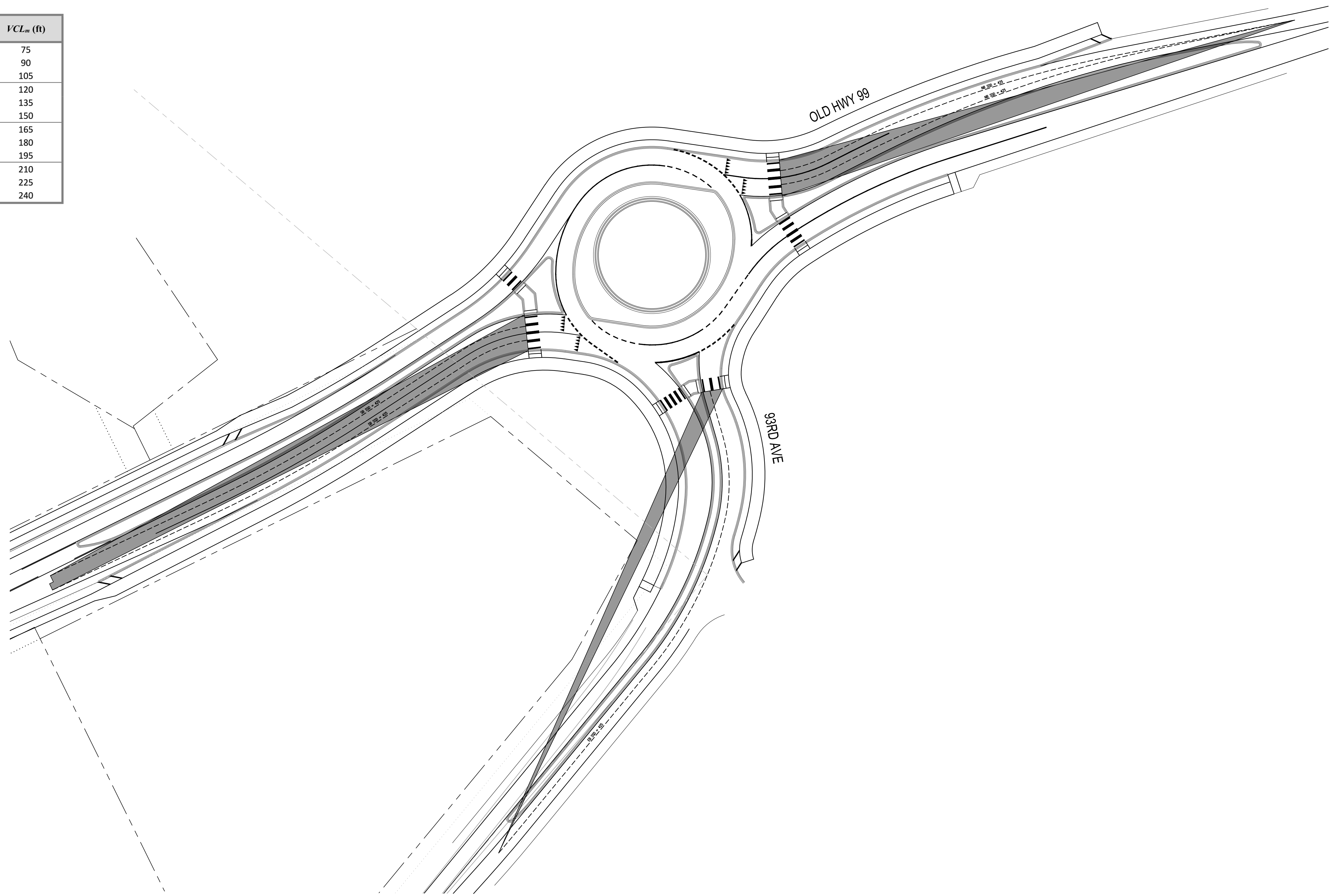
SB1 SSD = 425

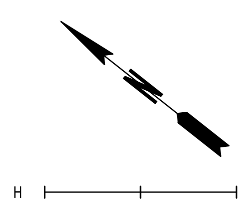
SB2 SSD = 425

EB SSD = 425

NB1 SSD = 425

NB2 SSD = 425





May 07, 2021 10:09:53am – User kono.melvin
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HORIZONTAL SCALE: 1"=30'

DATE: April, 2021

JOB No.: -

DRAWING FILE No.: -

OLD HWY 99 AND 93TH AVE

APPROACH STOPPING SIGHT DISTANCE

EXHIBIT No: EX-04

SHEET No: 4 of 16

$$S = 1.47V(2.5) + \frac{V^2}{30\left[0.347826 \pm \left(\frac{G}{100}\right)\right]}$$

Where:
S = Stopping sight distance on grade (ft)
V = Design speed (mph)
G = Grade (%)

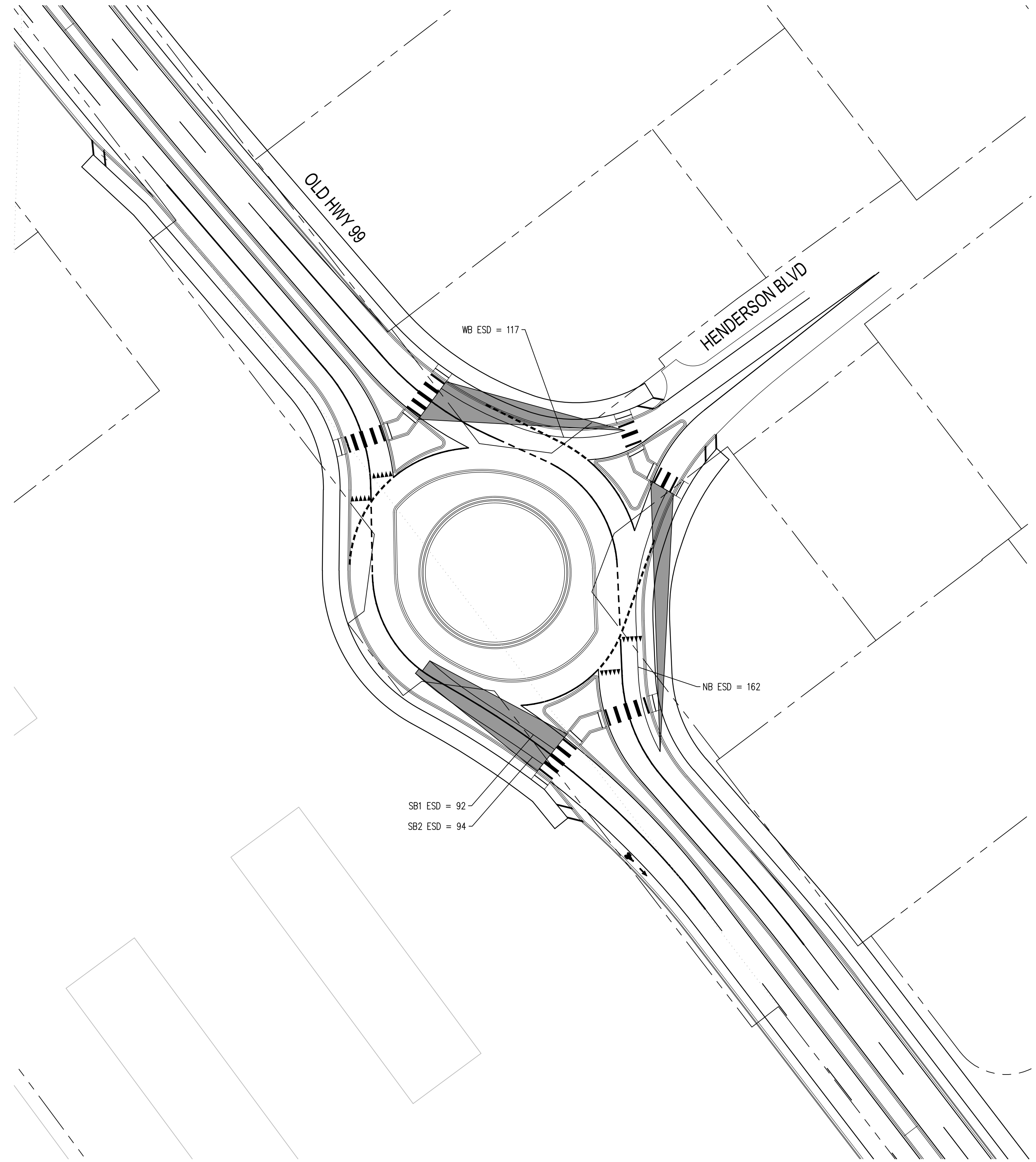
Stopping Sight Distance on Grades
Exhibit 1260-3

$$\text{SB1 ESD} = 1.47(17.2)(2.5) + \frac{(17.2)^2}{30[0.347826 \pm (0/100)]} = 92$$

$$\text{SB2 ESD} = 1.47(17.5)(2.5) + \frac{(17.5)^2}{30[0.347826 \pm (0/100)]} = 94$$

$$\text{WB ESD} = 1.47(20.5)(2.5) + \frac{(20.5)^2}{30[0.347826 \pm (0/100)]} = 117$$

$$\text{NB ESD} = 1.47(26.1)(2.5) + \frac{(26.1)^2}{30[0.347826 \pm (0/100)]} = 162$$



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DATE: April, 2021
JOB No.: -
DRAWING FILE No.: -

OLD HWY 99 AND HENDERSON BLVD
EXIT STOPPING SIGHT DISTANCE

EXHIBIT No: EX-05
SHEET No: 5 of 16

$$S = 1.47V(2.5) + \frac{V^2}{30\left[0.347826 \pm \left(\frac{G}{100}\right)\right]}$$

Where:
S = Stopping sight distance on grade (ft)
V = Design speed (mph)
G = Grade (%)

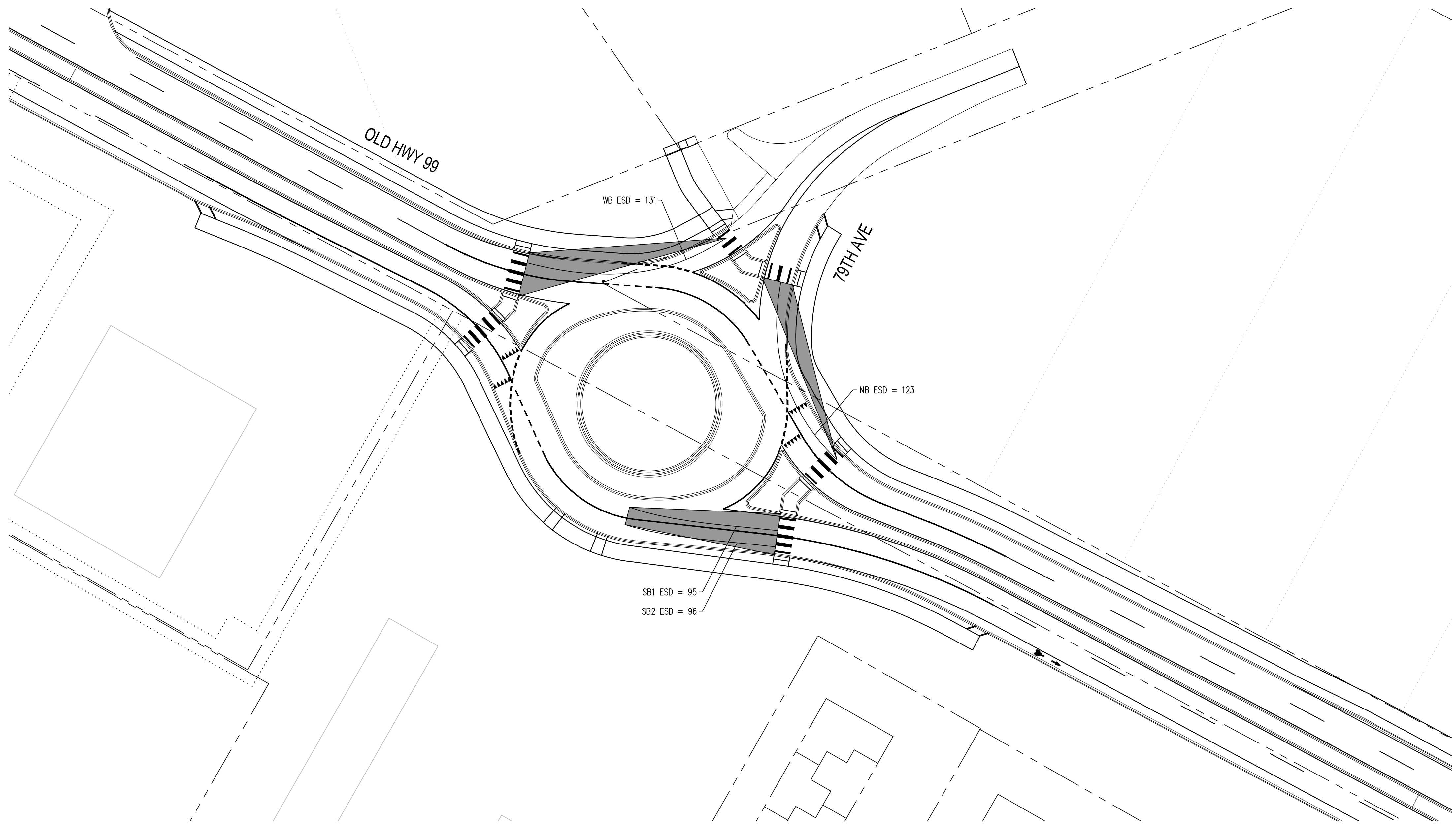
Stopping Sight Distance on Grades
Exhibit 1260-3

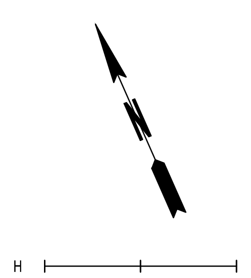
$$\text{SB1 ESD} = 1.47(17.6)(2.5) + \frac{(17.6)^2}{30[0.347826 \pm (0/100)]} = 95$$

$$\text{SB2 ESD} = 1.47(17.7)(2.5) + \frac{(17.7)^2}{30[0.347826 \pm (0/100)]} = 96$$

$$\text{NB ESD} = 1.47(21.3)(2.5) + \frac{(21.3)^2}{30[0.347826 \pm (0/100)]} = 123$$

$$\text{WB ESD} = 1.47(22.3)(2.5) + \frac{(22.3)^2}{30[0.347826 \pm (0/100)]} = 131$$





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HORIZONTAL SCALE:	1"=30'
DATE:	April, 2021
JOB No.:	-
DRAWING FILE No.:	-

OLD HWY 99 AND 79TH AVE
EXIT STOPPING SIGHT DISTANCE

EXHIBIT No: **EX-06**

SHEET No: **6 of 16**

$$S = 1.47V(2.5) + \frac{V^2}{30\left[0.347826 \pm \left(\frac{G}{100}\right)\right]}$$

Where:
S = Stopping sight distance on grade (ft)
V = Design speed (mph)
G = Grade (%)

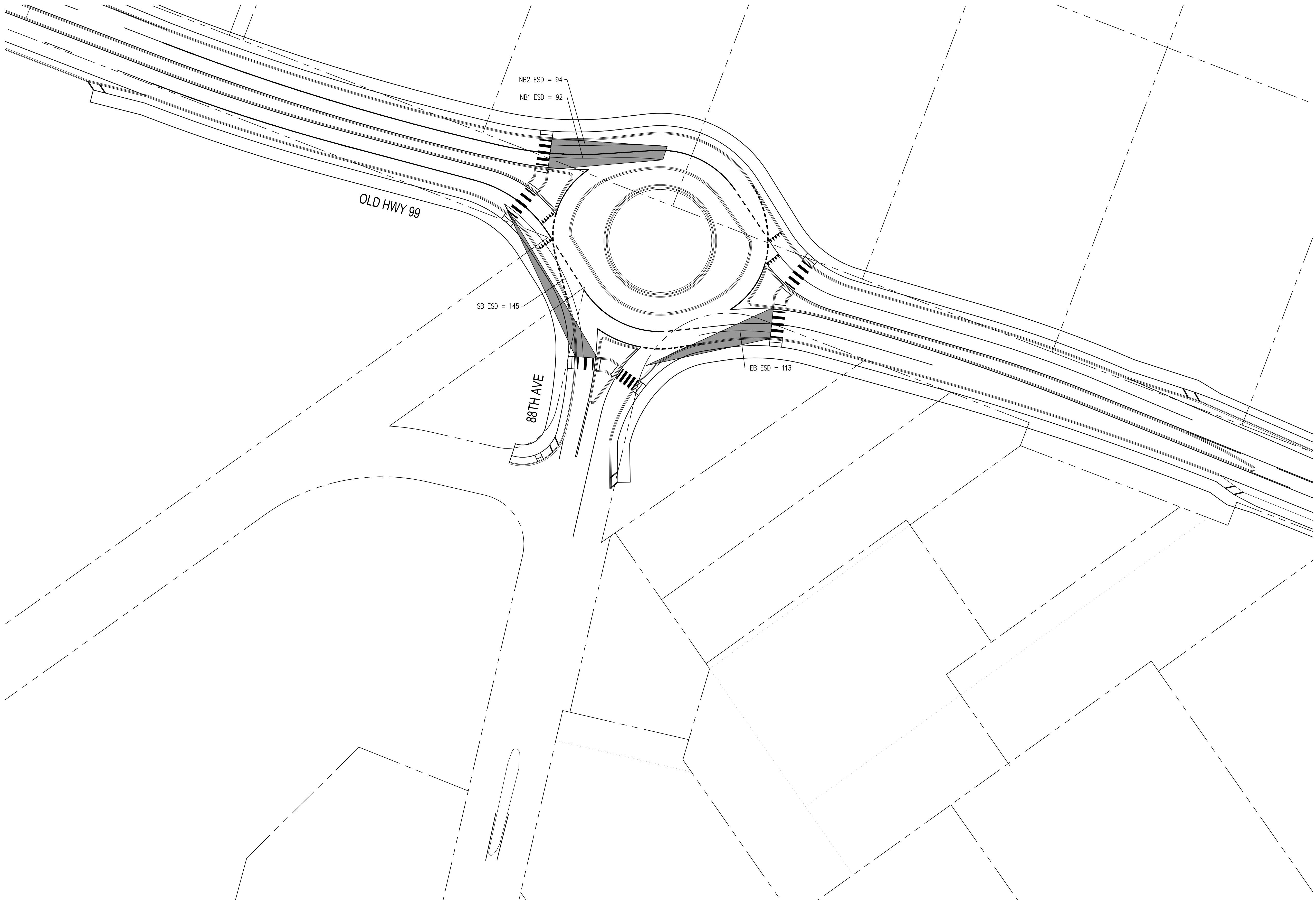
Stopping Sight Distance on Grades
Exhibit 1260-3

$$\text{NB1 ESD} = 1.47(17.1)(2.5) + \frac{(17.1)^2}{30[0.347826 \pm (0/100)]} = 92$$

$$\text{NB2 ESD} = 1.47(17.4)(2.5) + \frac{(17.4)^2}{30[0.347826 \pm (0/100)]} = 94$$

$$\text{SB ESD} = 1.47(24.1)(2.5) + \frac{(24.1)^2}{30[0.347826 \pm (0/100)]} = 145$$

$$\text{EB ESD} = 1.47(20.1)(2.5) + \frac{(20.1)^2}{30[0.347826 \pm (0/100)]} = 113$$



H 0 20 40

May 07, 2021 10:10:08am – User kono.melvin
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DATE: April, 2021
JOB No.: -
DRAWING FILE No.: -

OLD HWY 99 AND 88TH AVE
EXIT STOPPING SIGHT DISTANCE

EXHIBIT No: EX-07

SHEET No: 7 of 16

$$S = 1.47V(2.5) + \frac{V^2}{30\left[0.347826 \pm \left(\frac{G}{100}\right)\right]}$$

Where:
S = Stopping sight distance on grade (ft)
V = Design speed (mph)
G = Grade (%)

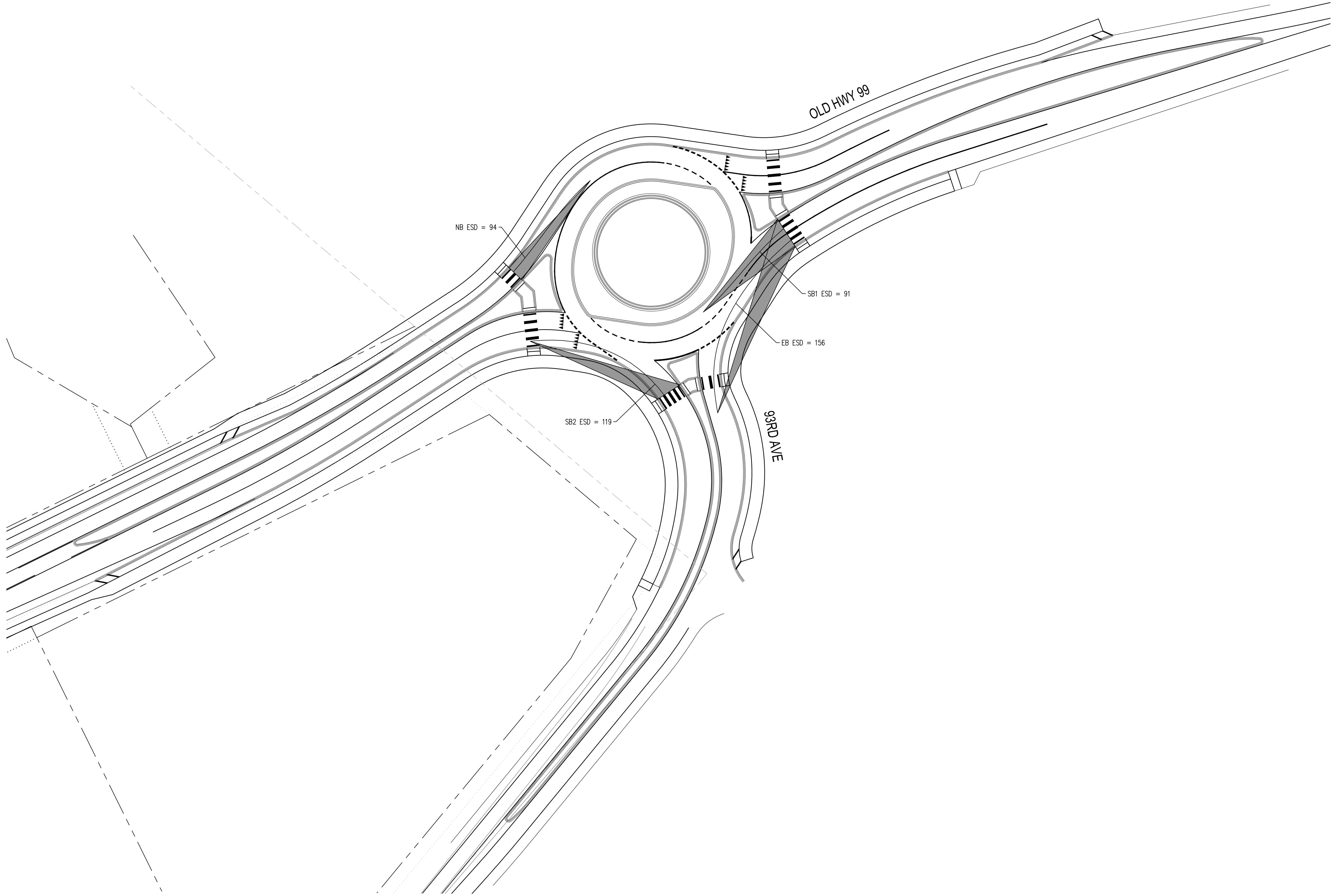
Stopping Sight Distance on Grades
Exhibit 1260-3

$$\text{SB1 ESD} = 1.47(17.1)(2.5) + \frac{(17.1)^2}{30[0.347826 \pm (0/100)]} = 91$$

$$\text{SB2 ESD} = 1.47(17.4)(2.5) + \frac{(17.4)^2}{30[0.347826 \pm (0/100)]} = 119$$

$$\text{NB ESD} = 1.47(24.1)(2.5) + \frac{(24.1)^2}{30[0.347826 \pm (0/100)]} = 94$$

$$\text{EB ESD} = 1.47(20.1)(2.5) + \frac{(20.1)^2}{30[0.347826 \pm (0/100)]} = 156$$



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DATE: April, 2021
JOB No.: -
DRAWING FILE No.: -

OLD HWY 99 AND 93TH AVE
EXIT STOPPING SIGHT DISTANCE

EXHIBIT No: EX-08
SHEET No: 8 of 16

$$S = 1.47V(2.5) + \frac{V^2}{30\left[0.347826 \pm \left(\frac{G}{100}\right)\right]}$$

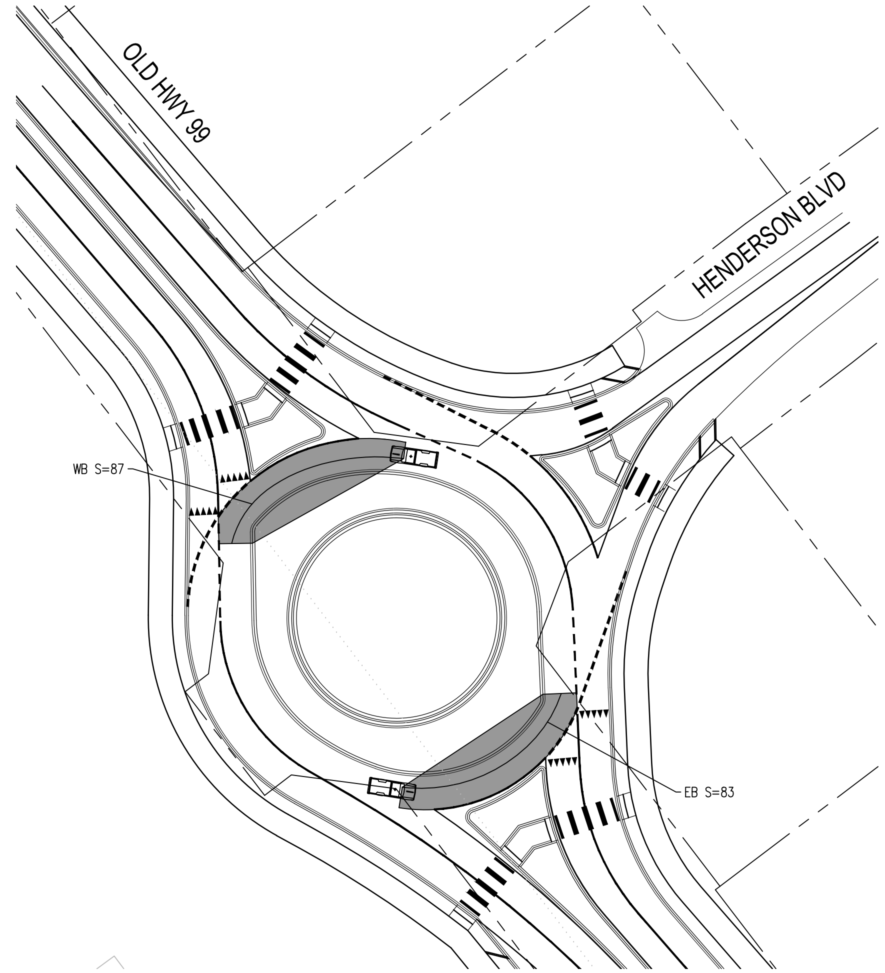
Where:
S = Stopping sight distance on grade (ft)
V = Design speed (mph)
G = Grade (%)

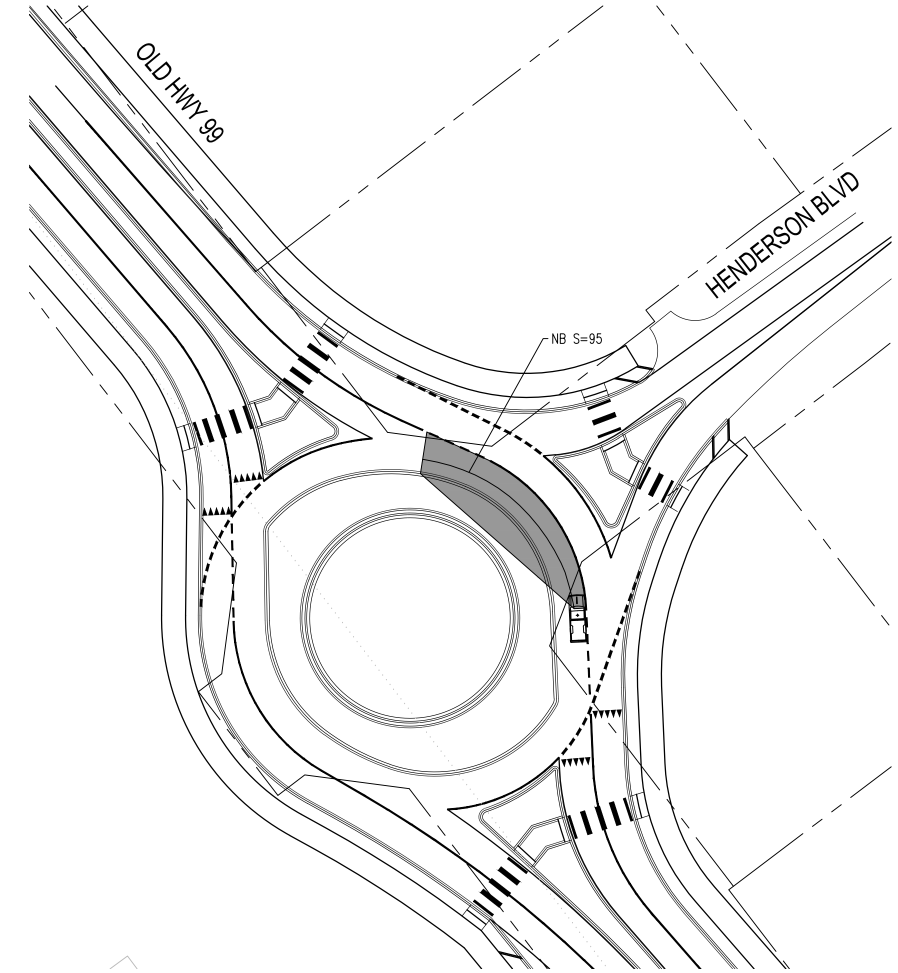
Stopping Sight Distance on Grades
Exhibit 1260-3

WB $S = 1.47(16)(2.5) + \frac{(16)^2}{30[0.347826 \pm (0/100)]} = 87$

SB $S = 1.47(16)(2.5) + \frac{(16)^2}{30[0.347826 \pm (0/100)]} = 95$

EB $S = 1.47(16)(2.5) + \frac{(16)^2}{30[0.347826 \pm (0/100)]} = 83$





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May 07, 2021 10:10:20am – User kono.melvin
N:\PROJECTS\0625 CITY OF TUMWATER\0625.29 TUMWATER OLD HWY 99 AND 79TH AVE CORRIDOR STUDY\CADD\EXHIBITS\SIGHT TRIANGLE\0625.29_SIGHTTRIANGLES.DWG

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P: 360.352.1465 F: 360.352.1509
SCJALLIANCE.COM

HORIZONTAL SCALE: 1"=30"
DATE: April, 2021
JOB No.: -
DRAWING FILE No.: -

OLD HWY 99 AND HENDERSON BLVD
CIRCULATING SIGHT DISTANCE

EXHIBIT No: EX-09

$$S = 1.47V(2.5) + \frac{V^2}{30\left[0.347826 \pm \left(\frac{G}{100}\right)\right]}$$

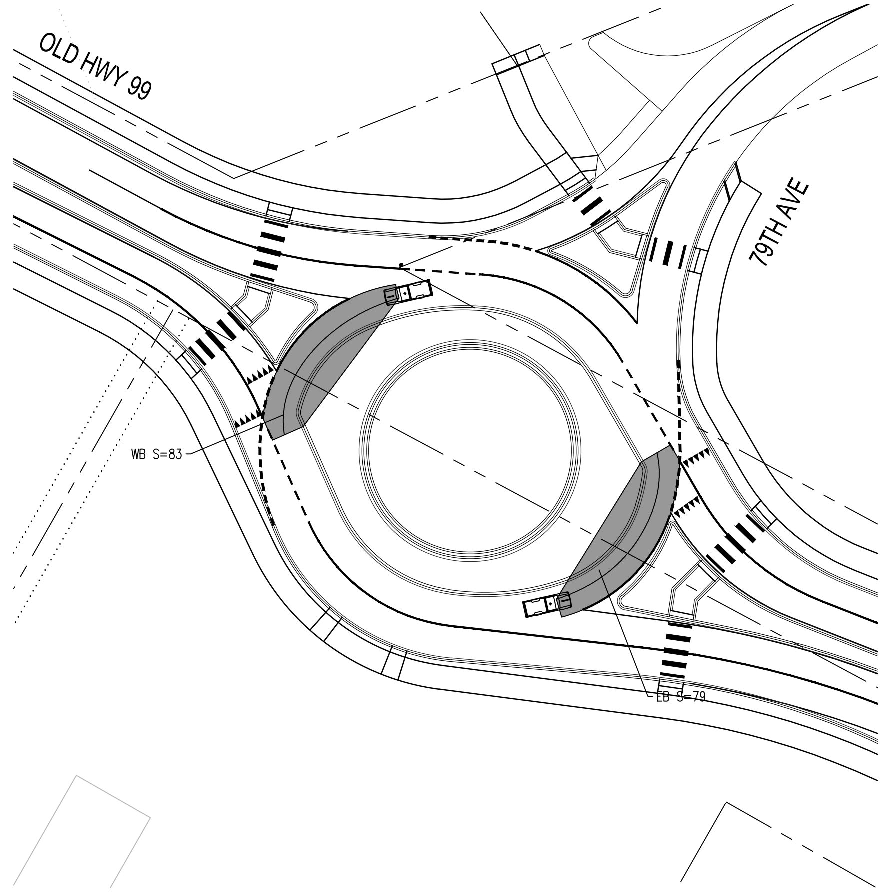
Where:
S = Stopping sight distance on grade (ft)
V = Design speed (mph)
G = Grade (%)

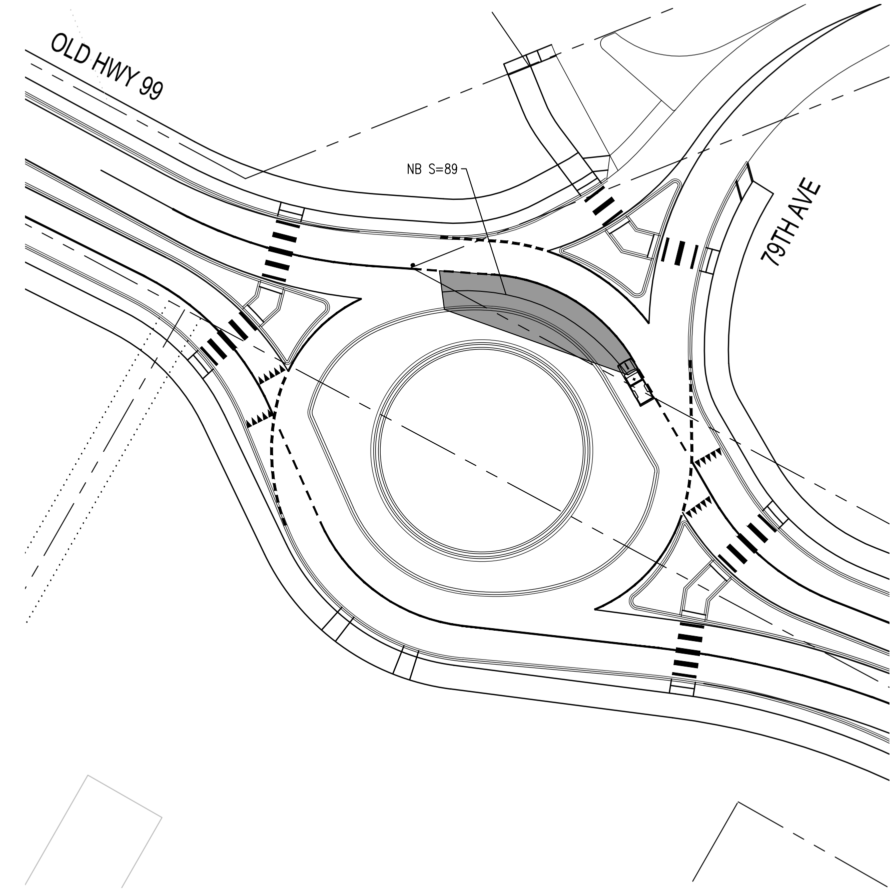
Stopping Sight Distance on Grades
Exhibit 1260-3

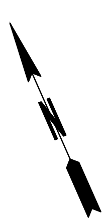
$$\text{WB } S = 1.47(16)(2.5) + \frac{(16)^2}{30[0.347826 \pm (0/100)]} = 83$$

$$\text{NB } S = 1.47(16)(2.5) + \frac{(16)^2}{30[0.347826 \pm (0/100)]} = 89$$

$$\text{EB } S = 1.47(16)(2.5) + \frac{(16)^2}{30[0.347826 \pm (0/100)]} = 79$$







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HORIZONTAL SCALE:	1"=30'
DATE:	April, 2021
JOB No.:	-
DRAWING FILE No.:	-

OLD HWY 99 AND 79TH AVE
CIRCULATING SIGHT DISTANCE

EXHIBIT No: **EX-10**

SHEET No: **10 of 16**

$$S = 1.47V(2.5) + \frac{V^2}{30\left[0.347826 \pm \left(\frac{G}{100}\right)\right]}$$

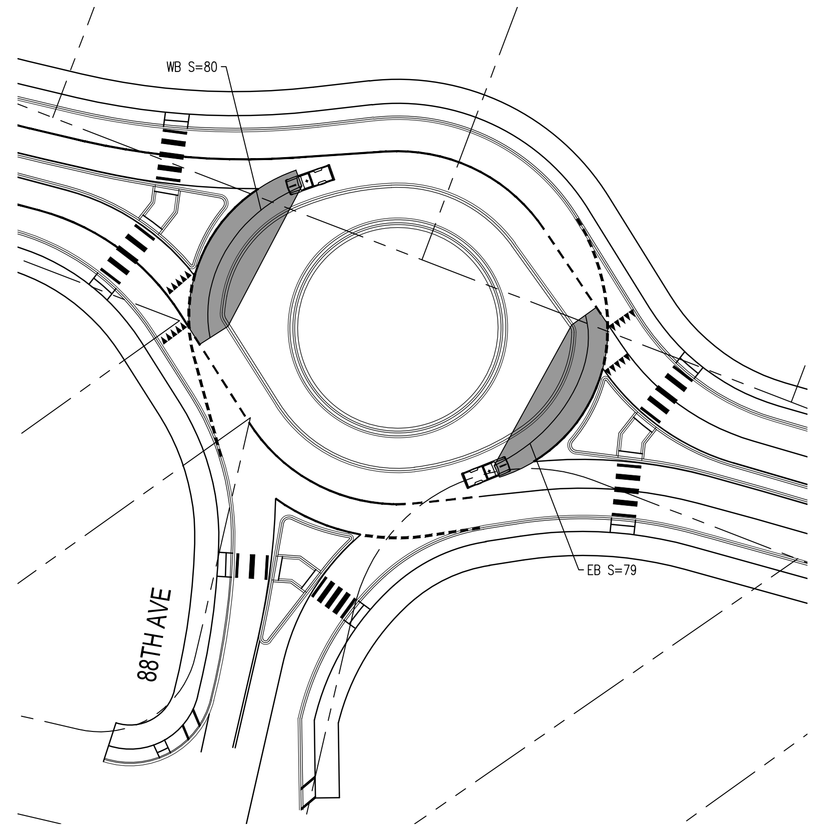
Where:
S = Stopping sight distance on grade (ft)
V = Design speed (mph)
G = Grade (%)

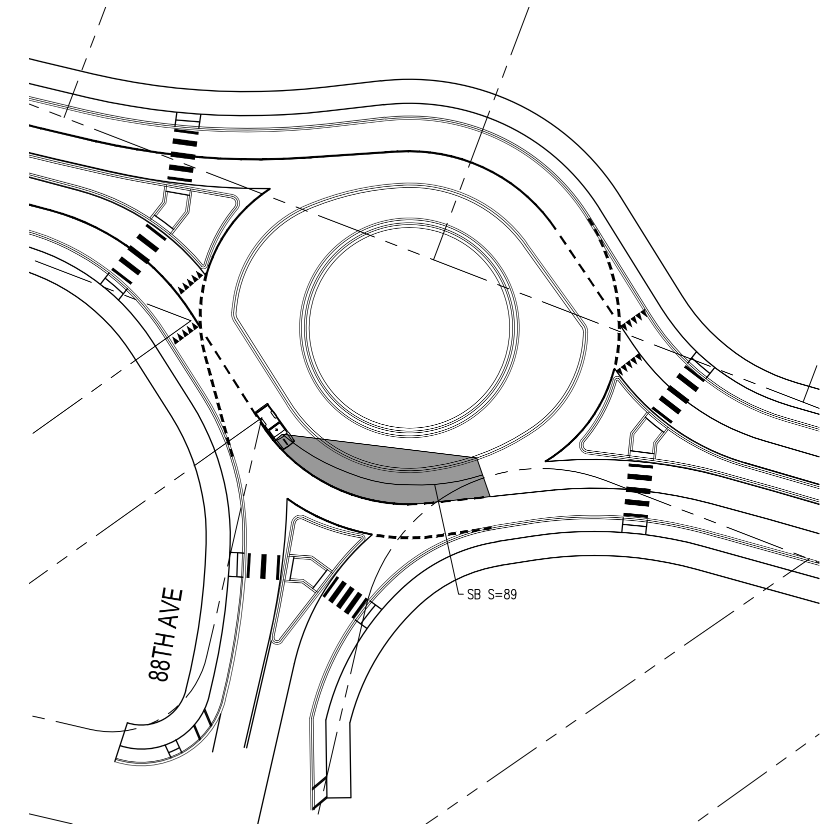
Stopping Sight Distance on Grades
Exhibit 1260-3

$$\text{WB } S = 1.47(16)(2.5) + \frac{(16)^2}{30[0.347826 \pm (0/100)]} = 80$$

$$\text{SB } S = 1.47(16)(2.5) + \frac{(16)^2}{30[0.347826 \pm (0/100)]} = 89$$

$$\text{EB } S = 1.47(16)(2.5) + \frac{(16)^2}{30[0.347826 \pm (0/100)]} = 79$$





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HORIZONTAL SCALE: 1"=30"
DATE: April, 2021
JOB No.: -
DRAWING FILE No.: -

OLD HWY 99 AND 88TH AVE
CIRCULATING SIGHT DISTANCE

EXHIBIT No: EX-11

$$S = 1.47V(2.5) + \frac{V^2}{30\left[0.347826 \pm \left(\frac{G}{100}\right)\right]}$$

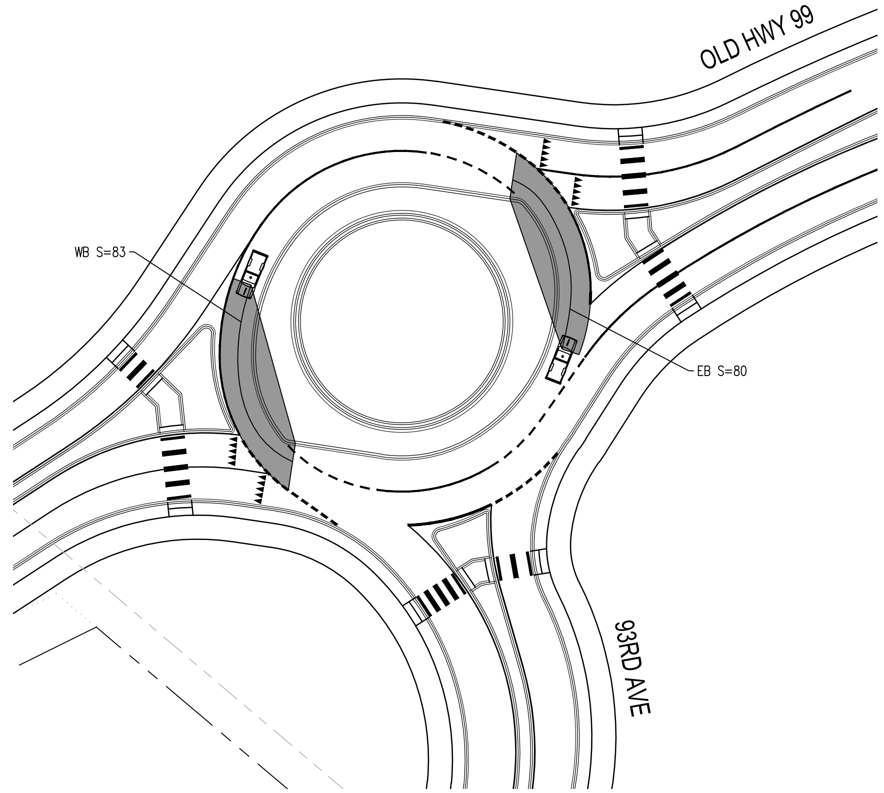
Where:
S = Stopping sight distance on grade (ft)
V = Design speed (mph)
G = Grade (%)

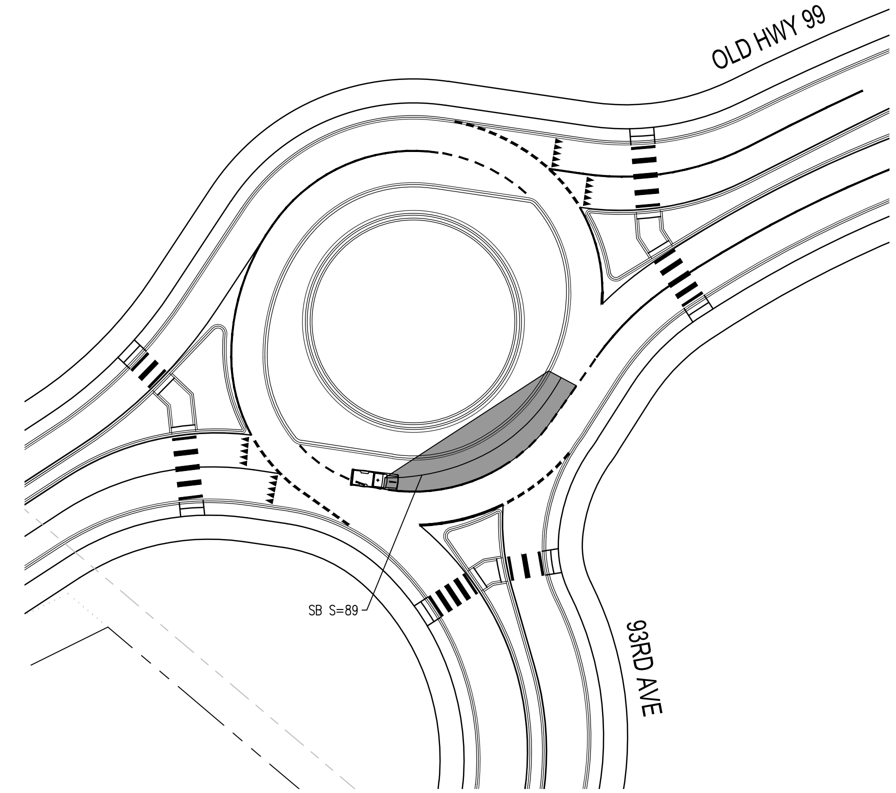
Stopping Sight Distance on Grades
Exhibit 1260-3

WB $S = 1.47(16)(2.5) + \frac{(16)^2}{30[0.347826 \pm (0/100)]} = 83$

SB $S = 1.47(16)(2.5) + \frac{(16)^2}{30[0.347826 \pm (0/100)]} = 89$

EB $S = 1.47(16)(2.5) + \frac{(16)^2}{30[0.347826 \pm (0/100)]} = 80$





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HORIZONTAL SCALE:	1"=30'
DATE:	April, 2021
JOB No.:	-
DRAWING FILE No.:	-

OLD HWY 99 AND 93TH AVE
CIRCULATING SIGHT DISTANCE

EXHIBIT No: EX-12
SHEET No: 12 of 16

May 07, 2021 10:10:35pm – User kono.melvin
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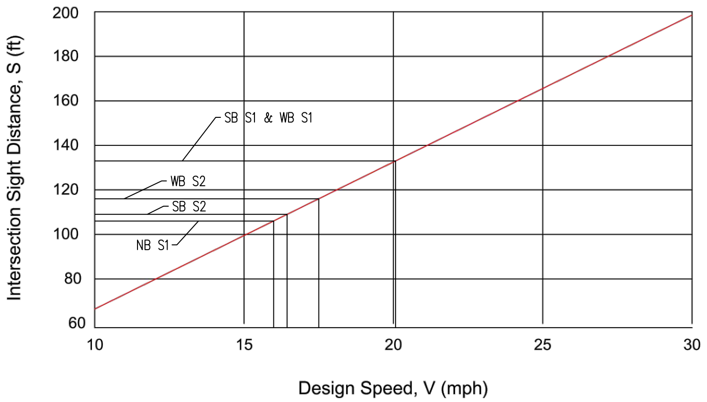

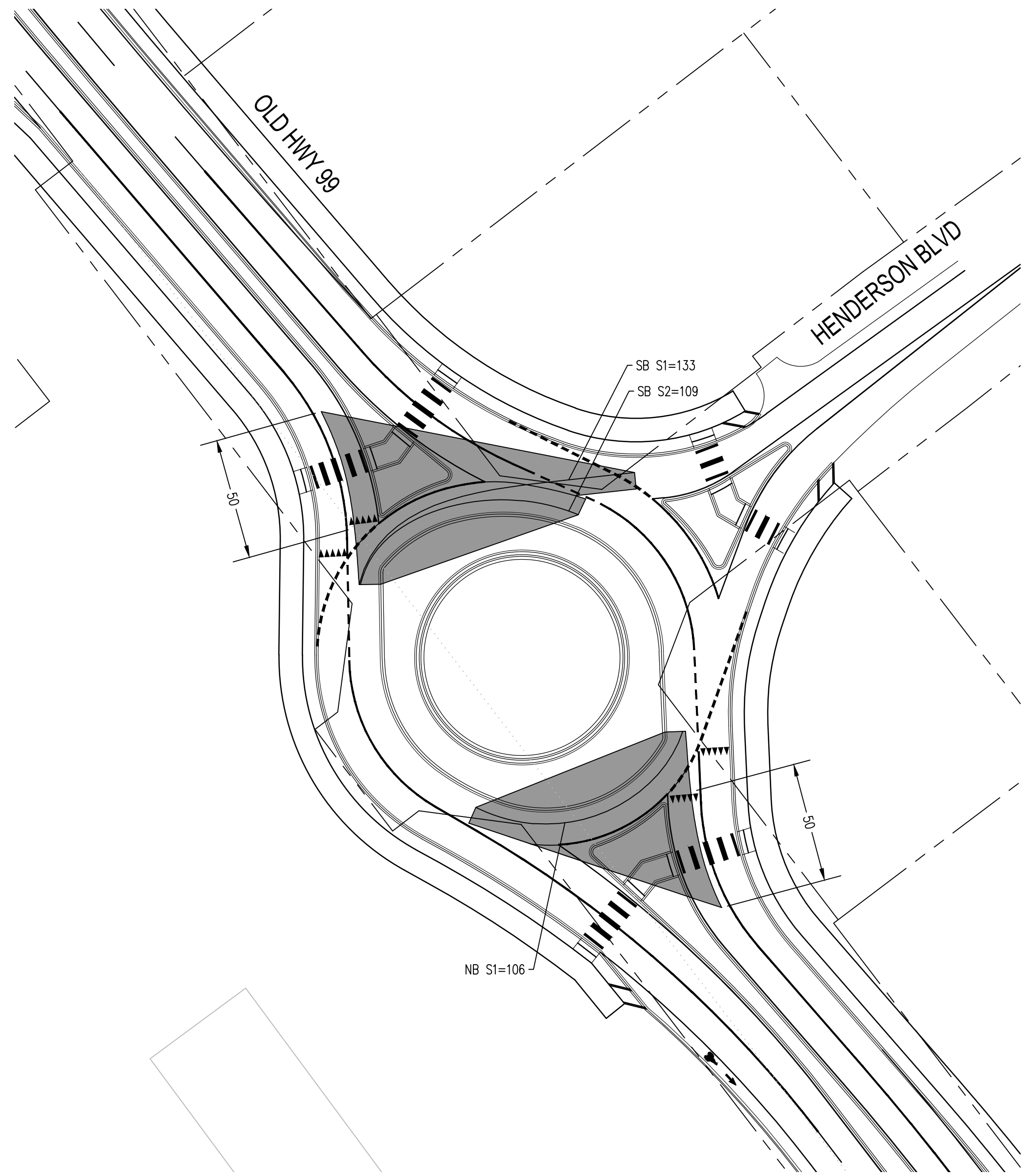

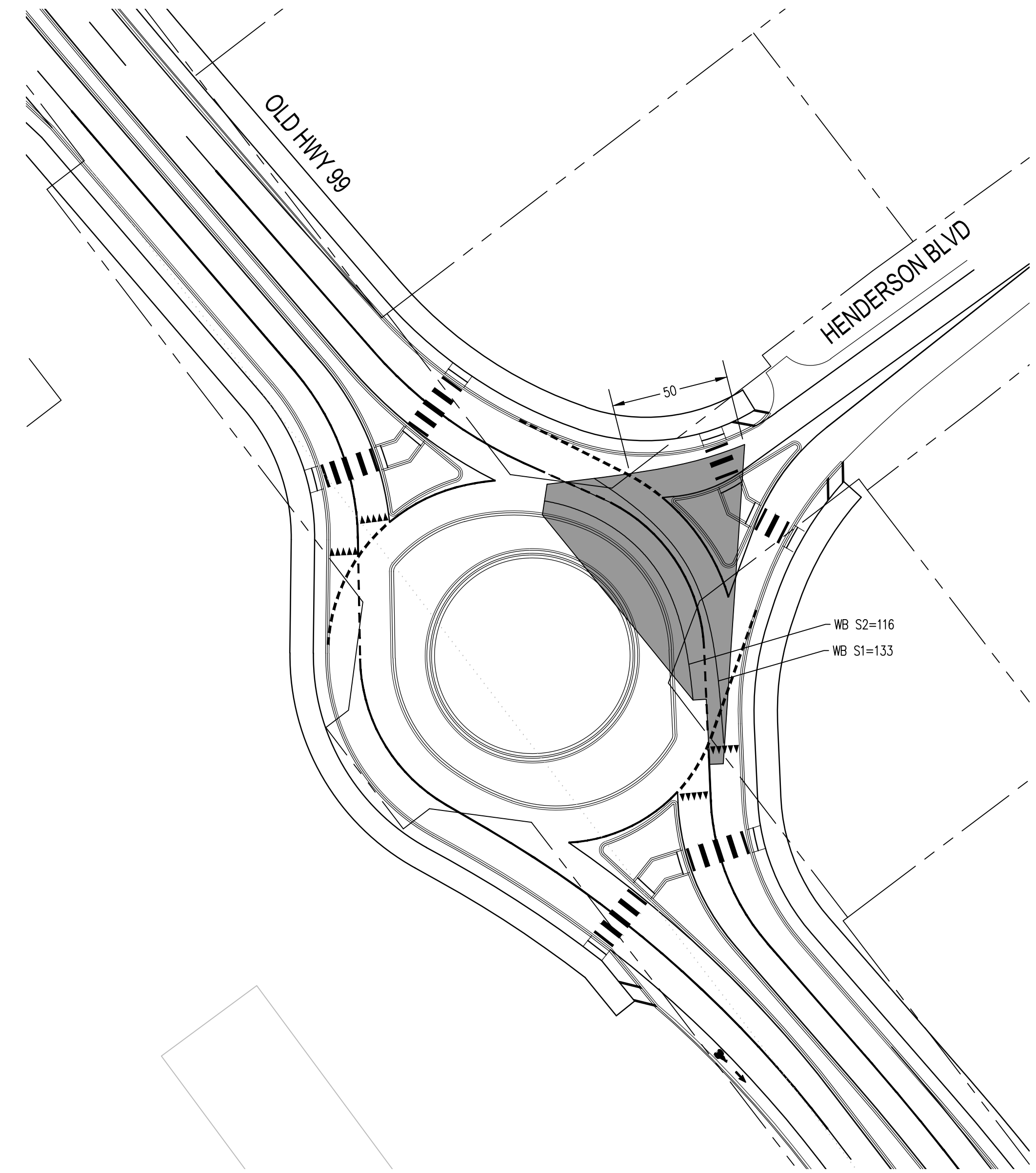

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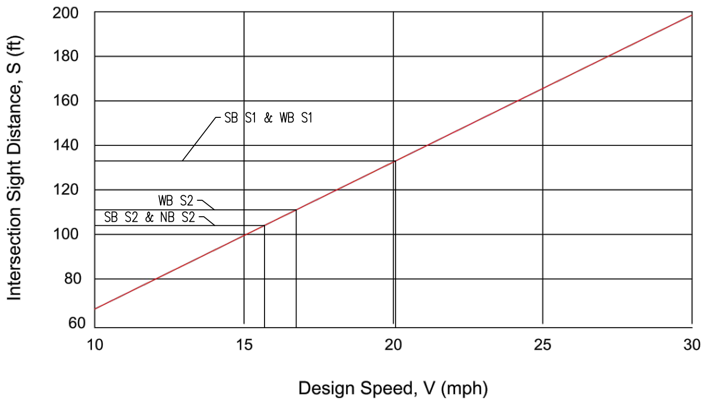
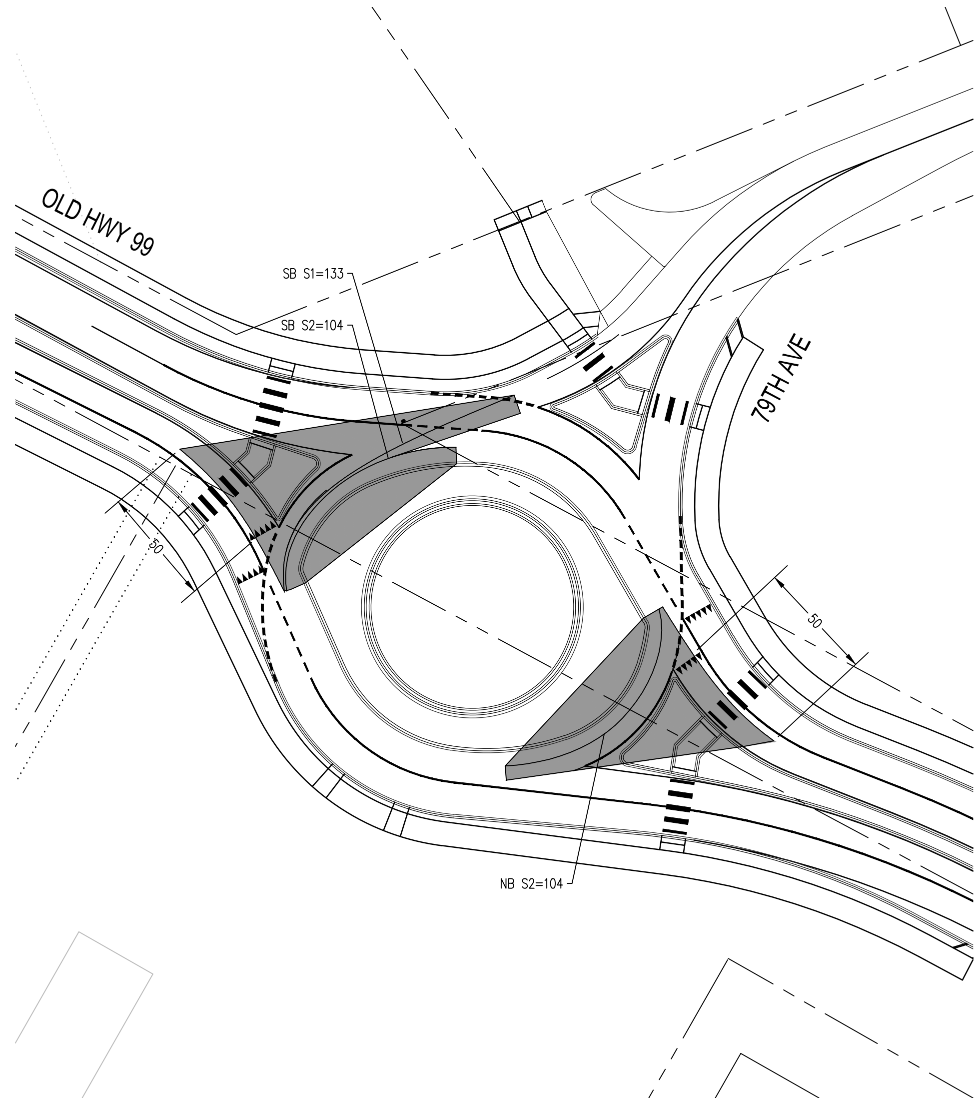
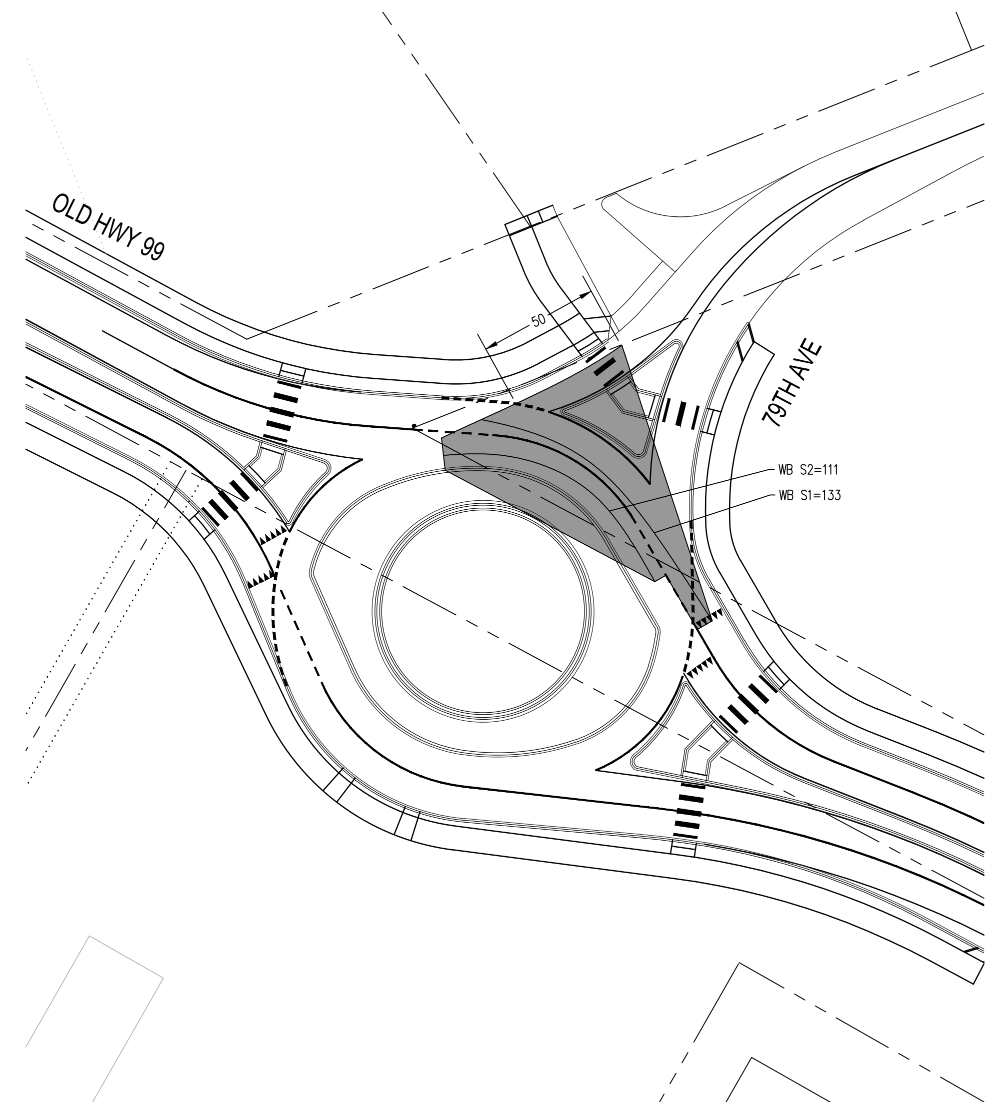
DATE:	April, 2021
JOB No.:	-
DRAWING FILE No.:	-

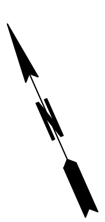
OLD HWY 99 AND HENDERSON BLVD
INTERSECTION SIGHT DISTANCE

EXHIBIT No: EX-13









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HORIZONTAL SCALE:	1"=30'
DATE:	April, 2021
JOB No.:	-
DRAWING FILE No.:	-

OLD HWY 99 AND 79TH AVE
INTERSECTION SIGHT DISTANCE

EXHIBIT No: EX-14

SHEET No: 14 of 16

May 07, 2021 10:10:45am – User kono.melvin
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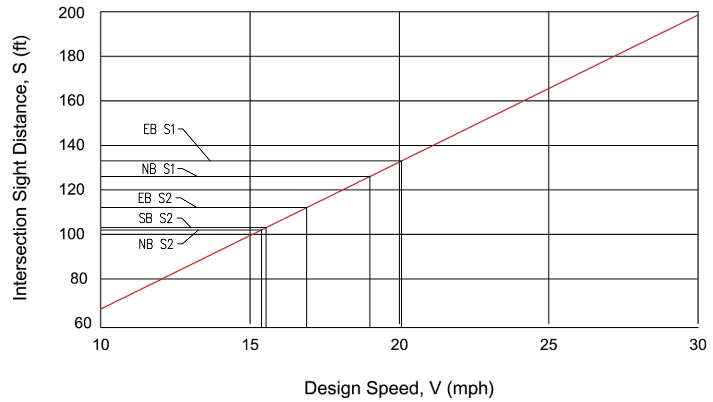

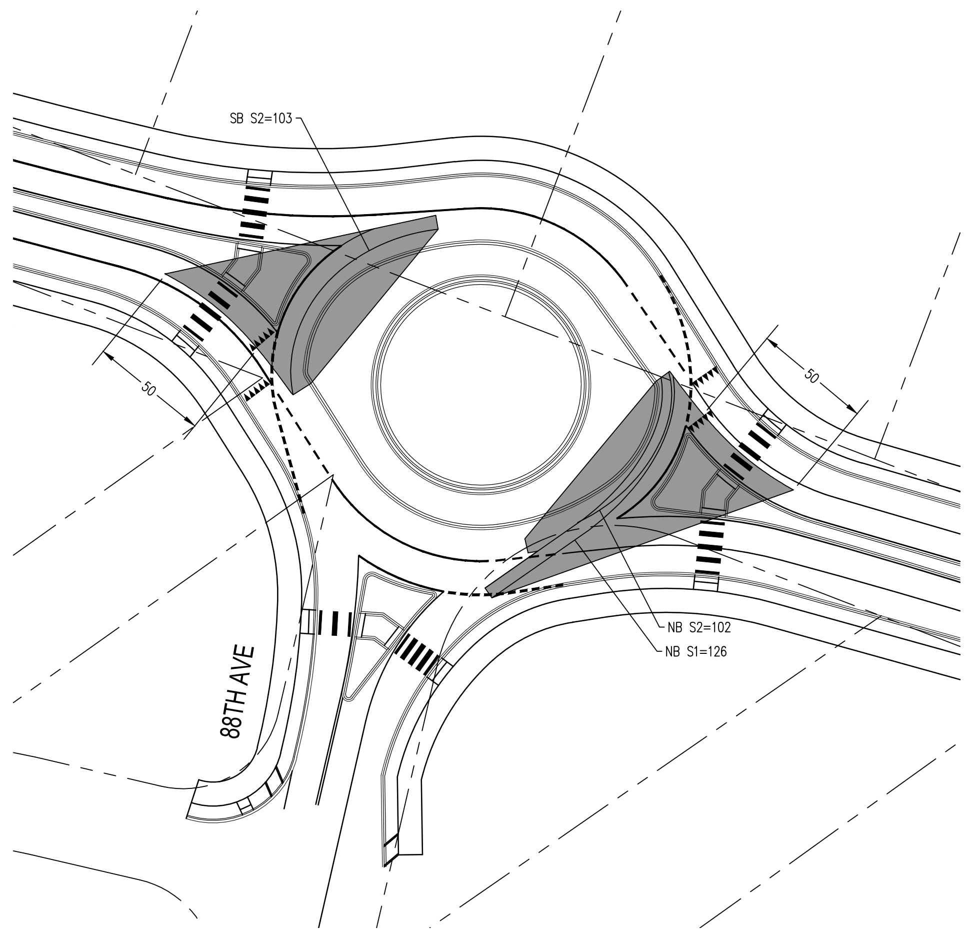

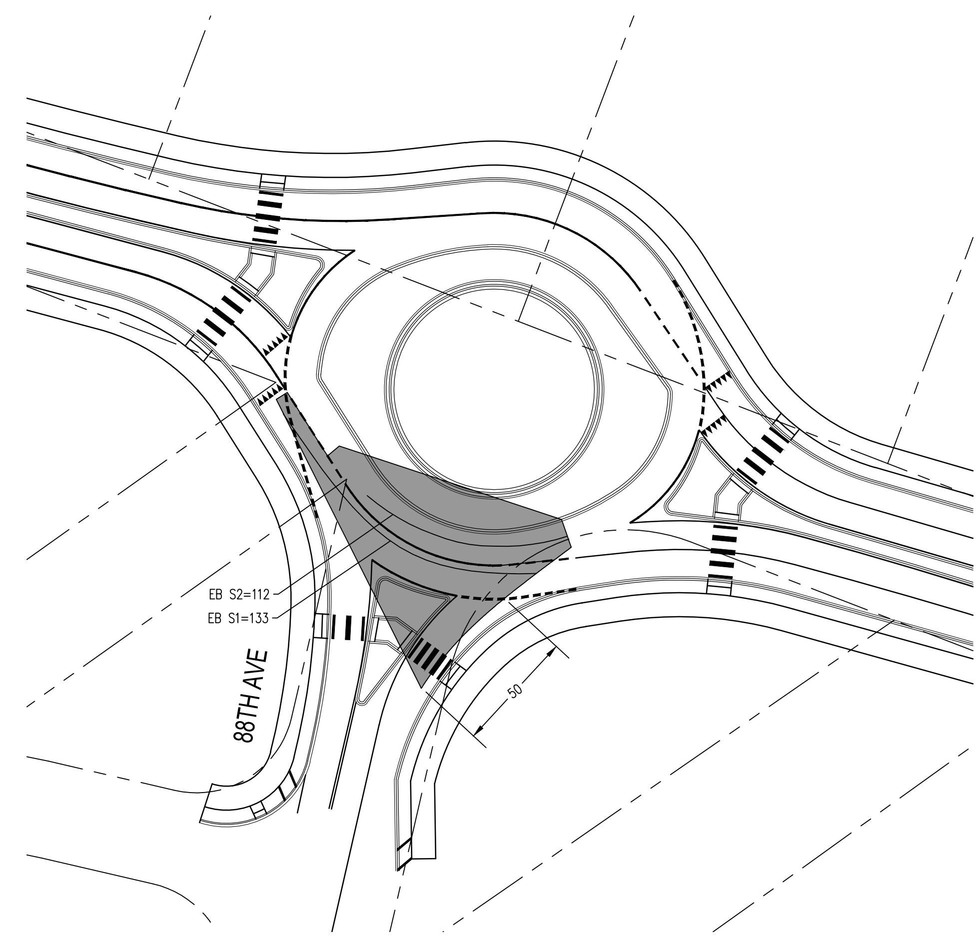

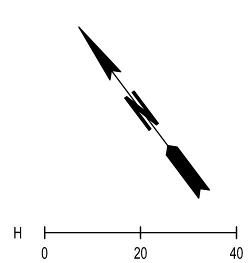

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HORIZONTAL SCALE: 1"=30'

DATE: April, 2021

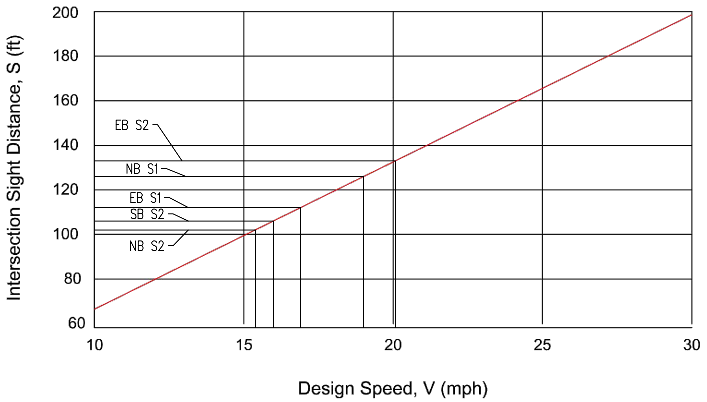
JOB No.: -

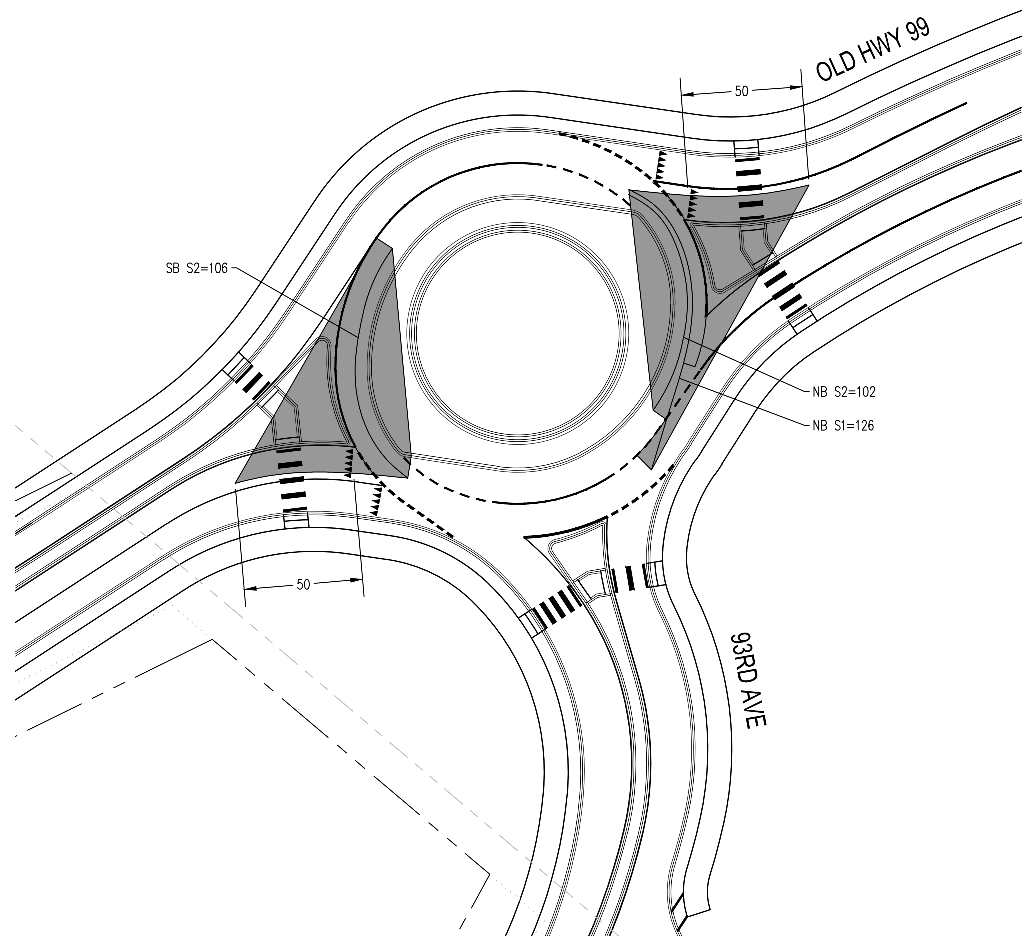
DRAWING FILE No.: -

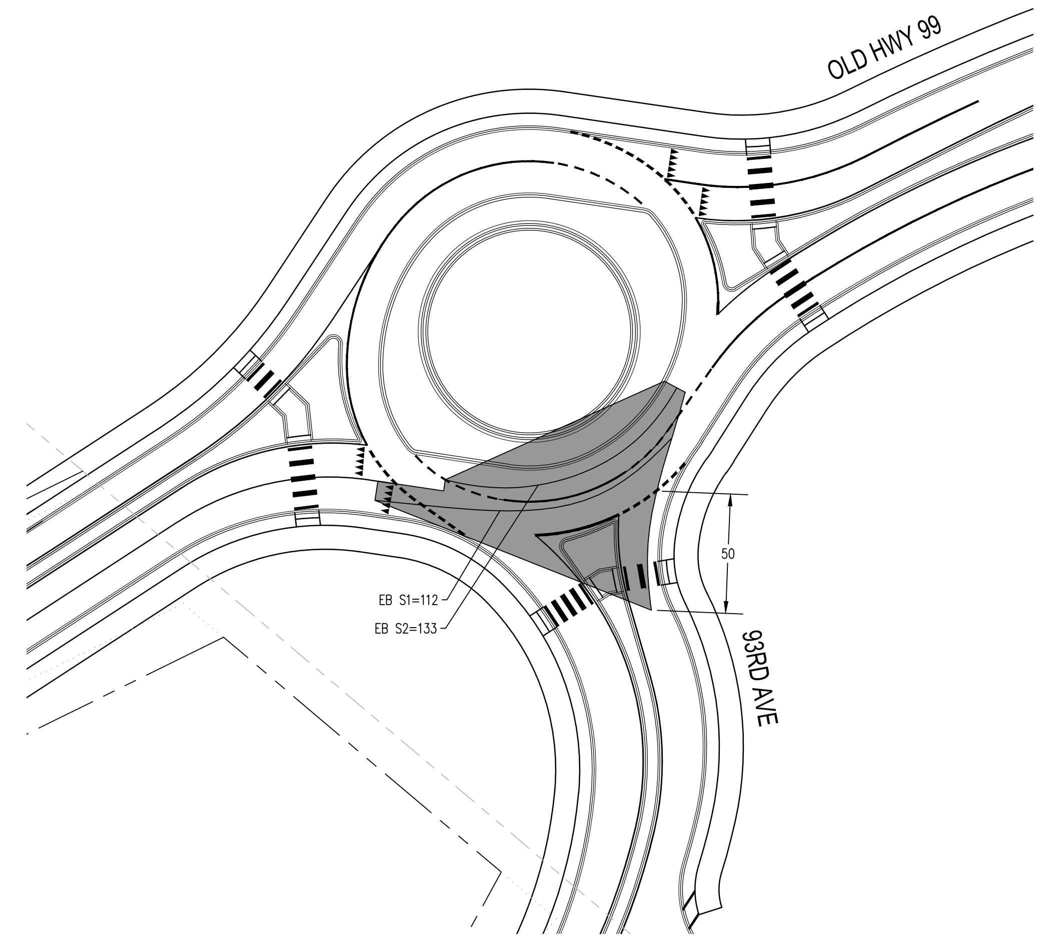
OLD HWY 99 AND 88TH AVE

INTERSECTION SIGHT DISTANCE

EXHIBIT No: EX-15







H 0 20 40

May 07, 2021 10:10:55am – User kono.melvin
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HORIZONTAL SCALE: 1"=30'

DATE: April, 2021

JOB No.: -

DRAWING FILE No.: -

OLD HWY 99 AND 93TH AVE

INTERSECTION SIGHT DISTANCE

EXHIBIT No: EX-16

F5) UTILITY TECH MEMO

SCJ ALLIANCE
CONSULTING SERVICES

Technical Memo

To City of Tumwater

From: David Rowland, PE

Date: September 8th, 2022

Project: 0625.29 – Old Highway 99 Corridor Study

Subject Utility Future Conflicts

Introduction

The Old Highway 99 Corridor Study starts at 73rd Avenue and continues until 93rd Avenue on Old Highway 99. This technical memorandum seeks to provide preliminary design recommendations for utility coordination prior to design for each phase.

Utility Conflicts

For each phase the final footprint of the biofiltration swales, CAVFS, and infiltration basins have not yet been established. Therefore, these elements will require coordination once the footprint and depth are established.

- Phase 1 – 79th Avenue Roundabout

  Installation of signage and illumination poles as well as junction boxes will require the evaluation of the current utilities to prevent conflicts. Stormwater infiltration basins, catch basins and storm pipes near the roundabout at 79th Avenue will require the relocation and coordination of existing utilities with design installations. Biofiltration swales located on east side of the roadway will need to be evaluated to ensure that they do not conflict with existing utilities. Because this phase expands the footprint of the roadway, this will require the relocation of power poles, telephone boxes, storm pipes and structures, and a fire hydrant. Water valves and sewer manholes that are at existing grades, may need to be adjusted to match the new design.

- Phase 2 – 73rd Avenue to 79th Avenue

  Installation of signage and illumination poles as well as junction boxes will require the evaluation of the current utilities to prevent conflicts. Stormwater infiltration basins, catch basins and storm pipes near the roundabout at Henderson Avenue will require the relocation and coordination of existing utilities with design installations. Biofiltration swales located on east side of the roadway will need to be evaluated to ensure that they do not conflict with existing utilities. Because this phase expands the footprint of the roadway, this will require the relocation of power poles, illumination poles and junction boxes, telephone boxes, storm pipes and structures, and a fire hydrant. Water valves, gas valves, and sewer manholes that are at existing grades, may need to be adjusted to match the new design.

1.1. Phase 3 – 79th Avenue to 88th Avenue Roundabout

Installation of signage and illumination poles as well as junction boxes will require the evaluation of the current utilities to prevent conflicts. Stormwater infiltration basins, catch basins and storm pipes near the roundabout at 88th Avenue will require the relocation and coordination of existing utilities with design installations. Because this phase expands the footprint of the roadway, this will require the relocation of power poles, illumination poles and junction boxes, telephone boxes, storm pipes and structures, and a fire hydrant. Water valves, gas valves, and sewer manholes that are at existing grades, may need to be adjusted to match the new design grade.

1.2. Phase 4 – 88th Avenue Roundabout to Wyatt Court

Installation of signage and illumination poles as well as junction boxes will require the evaluation of the current utilities to prevent conflicts. Biofiltration swales located on both sides of the roadway will need to be evaluated to ensure that they do not conflict with existing utilities. Because this phase expands the footprint of the roadway, this will require the relocation of power poles, illumination poles and junction boxes, telephone boxes, and storm pipes and structures. Water valves, gas valves, and sewer manholes that are at existing grades, may need to be adjusted to match the new design grade.

1.3. Phase 5 – Wyatt Court to 93rd Avenue Roundabout

Installation of signage and illumination poles as well as junction boxes will require the evaluation of the current utilities to prevent conflicts. Biofiltration swales located on both sides of the roadway will need to be evaluated to ensure that they do not conflict with existing utilities. Stormwater infiltration basins, catch basins and storm pipes near the roundabout at 93rd Avenue will require the relocation and coordination of existing utilities with design installations. Because this phase expands the footprint of the roadway, this will require the relocation of power poles, illumination poles and junction boxes, telephone boxes, and storm pipes and structures. Water valves, gas valves, and sewer manholes that are at existing grades, may need to be adjusted to match the new design grade.

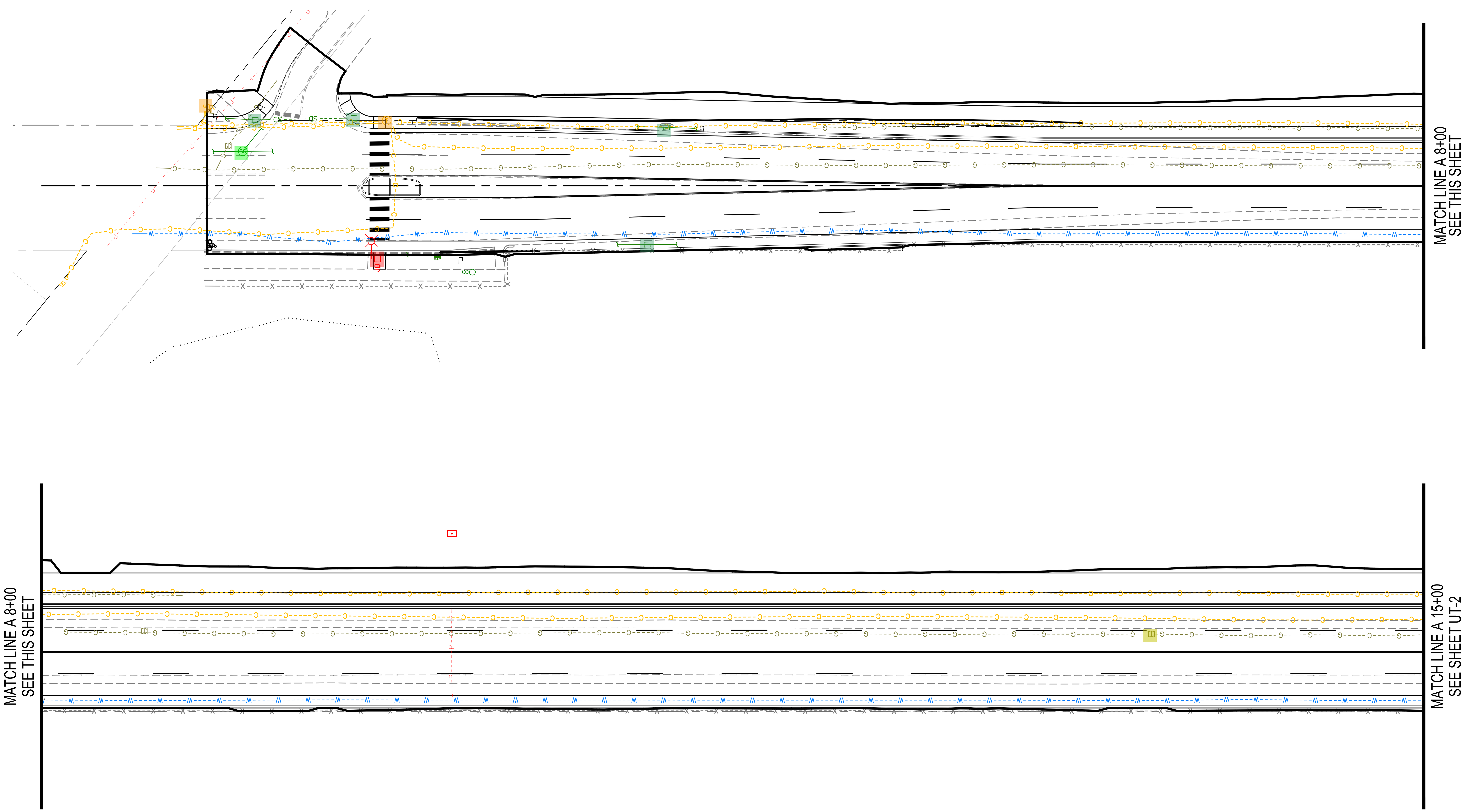
An exhibit showing the extents of the project from 79th Avenue to 93rd Avenue on Old Highway 99 is attached for reference in **Appendix A.**

APPENDIX A

EXISTING UTILITIES PLAN

S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M

0 30 60
SCALE IN FEET



LEGEND

—W—W—	12-INCH WATER MAINS
	WATER VALVE WITH VALVE BOX
	FITTING WITH THRUST BLOCKING
	FIRE HYDRANT ASSEMBLY
—SD—	PROPOSED 12-INCH STORM DRAIN LINE
--SD--SD--SD--	EXISTING STORM DRAIN LINE
--W--W--W--W-	EXISTING WATER MAIN
	CONSTRUCTION CENTERLINE
	ROW/ PROPERTY LINE
--OH--OH--OH-	OVERHEAD POWER LINE
--C--C--C--C-	UNDERGROUND TELECOMMUNICATIONS LINE
--P--P--P--P-	UNDERGROUND POWER LINE
	CATCH BASIN TYPE 1
	CATCH BASIN TYPE 2
	CUT/FILL LINE

UTILITY CONFLICT LEGEND

- GAS
- POWER
- SEWER
- STORMWATER
- TELEPHONE
- WATER

REVISIONS	DATE	BY	DESIGNED BY: DESIGNER NAME	ISSUE DATE: SEPTEMBER 2020
PRELIMINARY			DRAWN BY: DRAFTER NAME	JOB No.: 0625.29
			CHECKED BY: ENGINEER NAME	DRAWING FILE No.: 0625.29-Utility Conflicts Exhibit

ALL DIMENSIONS SHOWN IN FEET UNLESS OTHERWISE DESIGNATED

PATRICK HOLM · STATE OF WASHINGTON · 49470 · REGISTERED PROFESSIONAL ENGINEER

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CITY OF TUMWATER
555 ISRAEL ROAD SW
TUMWATER, WA 98501

OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON
MP XX TO MP XX

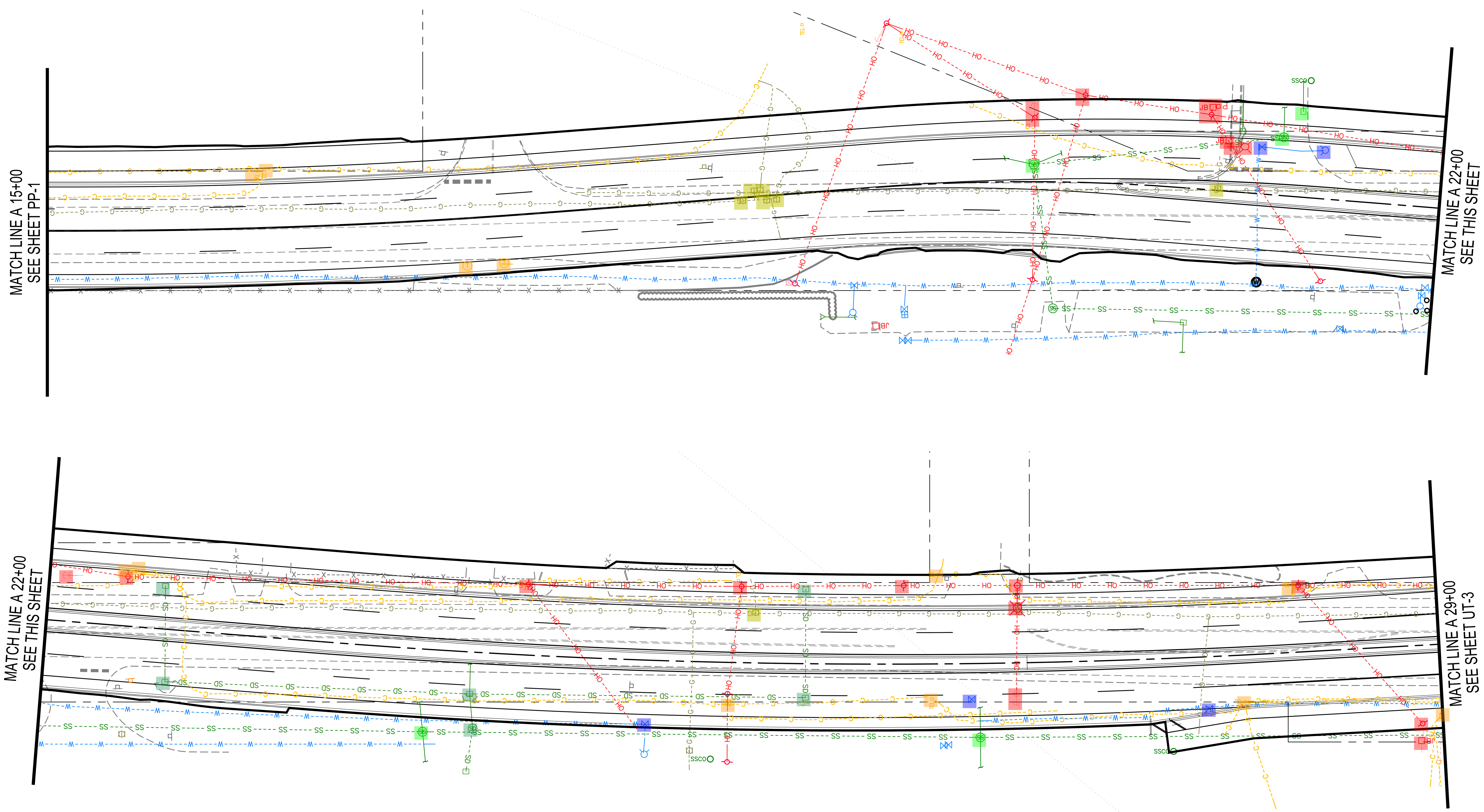
UTILITY PLAN
A 1+00 - A 15+00

DRAWING No.: UT-1

SHEET No.: ---- OF XX

S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M

0 30 60
SCALE IN FEET



LEGEND

- 12-INCH WATER MAINS
- WATER VALVE WITH VALVE BOX
- FITTING WITH THRUST BLOCKING
- FIRE HYDRANT ASSEMBLY
- PROPOSED 12-INCH STORM DRAIN LINE
- EXISTING STORM DRAIN LINE
- EXISTING WATER MAIN
- CONSTRUCTION CENTERLINE
- ROW/ PROPERTY LINE
- OVERHEAD POWER LINE
- UNDERGROUND TELECOMMUNICATIONS LINE
- UNDERGROUND POWER LINE
- CATCH BASIN TYPE 1
- CATCH BASIN TYPE 2
- CUT/FILL LINE

UTILITY CONFLICT LEGEND

- GAS
- POWER
- SEWER
- STORMWATER
- TELEPHONE
- WATER

REVISIONS	DATE	BY	DESIGNED BY: DESIGNER NAME	ISSUE DATE: SEPTEMBER 2020
PRELIMINARY			DRAWN BY: DRAFTER NAME	JOB No.: 0625.29
			CHECKED BY: ENGINEER NAME	DRAWING FILE No.: 0625.29-Utility Conflicts Exhibit

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PATRICK HOLM
STATE OF WASHINGTON
49470
REGISTERED PROFESSIONAL ENGINEER

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CITY OF TUMWATER
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TUMWATER, WA 98501

OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON
MP XX TO MP XX

UTILITY PLAN
A 15+00 - A 29+00

DRAWING No.: UT-2

SHEET No.: ---- OF XX

Oct 20, 2021 8:51:13am – User sam.dunn
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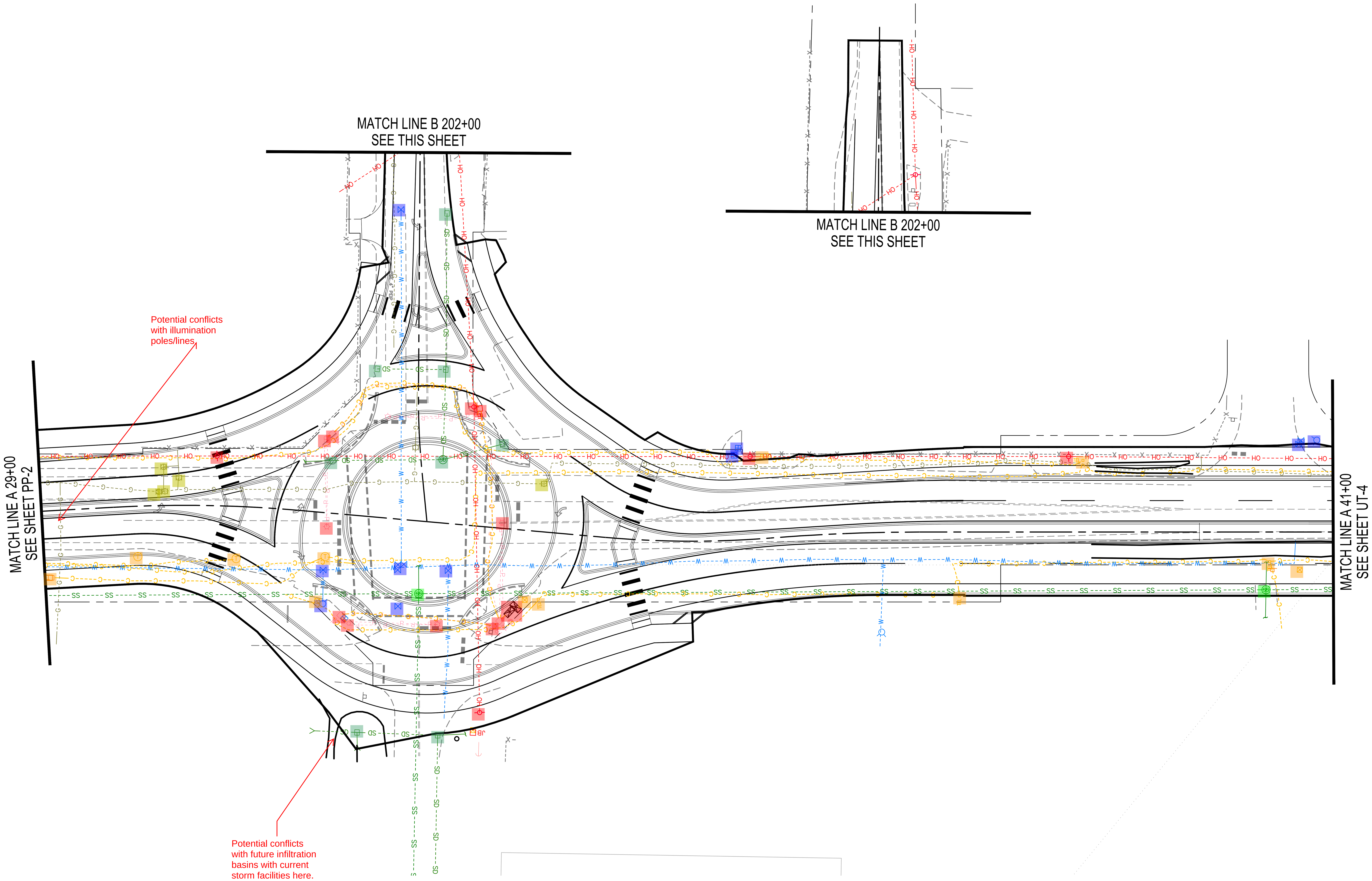
S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M



0 30 60
SCALE IN FEET

LEGEND

- 12-INCH WATER MAINS
- WATER VALVE WITH VALVE BOX
- FITTING WITH THRUST BLOCKING
- FIRE HYDRANT ASSEMBLY
- PROPOSED 12-INCH STORM DRAIN LINE
- EXISTING STORM DRAIN LINE
- EXISTING WATER MAIN
- CONSTRUCTION CENTERLINE
- ROW/ PROPERTY LINE
- OVERHEAD POWER LINE
- UNDERGROUND TELECOMMUNICATIONS LINE
- UNDERGROUND POWER LINE
- CATCH BASIN TYPE 1
- CATCH BASIN TYPE 2
- CUT/FILL LINE

UTILITY CONFLICT LEGEND

- GAS
- POWER
- SEWER
- STORMWATER
- TELEPHONE
- WATER

REVISIONS	DATE	BY
PRELIMINARY		

DESIGNED BY: DESIGNER NAME	ISSUE DATE: SEPTEMBER 2020
DRAWN BY: DRAFTER NAME	JOB No.: 0625.29
CHECKED BY: ENGINEER NAME	DRAWING FILE No.: 0625.29-Utility Conflicts Exhibit

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TUMWATER, WA 98501

OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON
MP XX TO MP XX

UTILITY PLAN
A 29+00 - A 41+00

DRAWING No.: UT-3

SHEET No.: ---- OF XX

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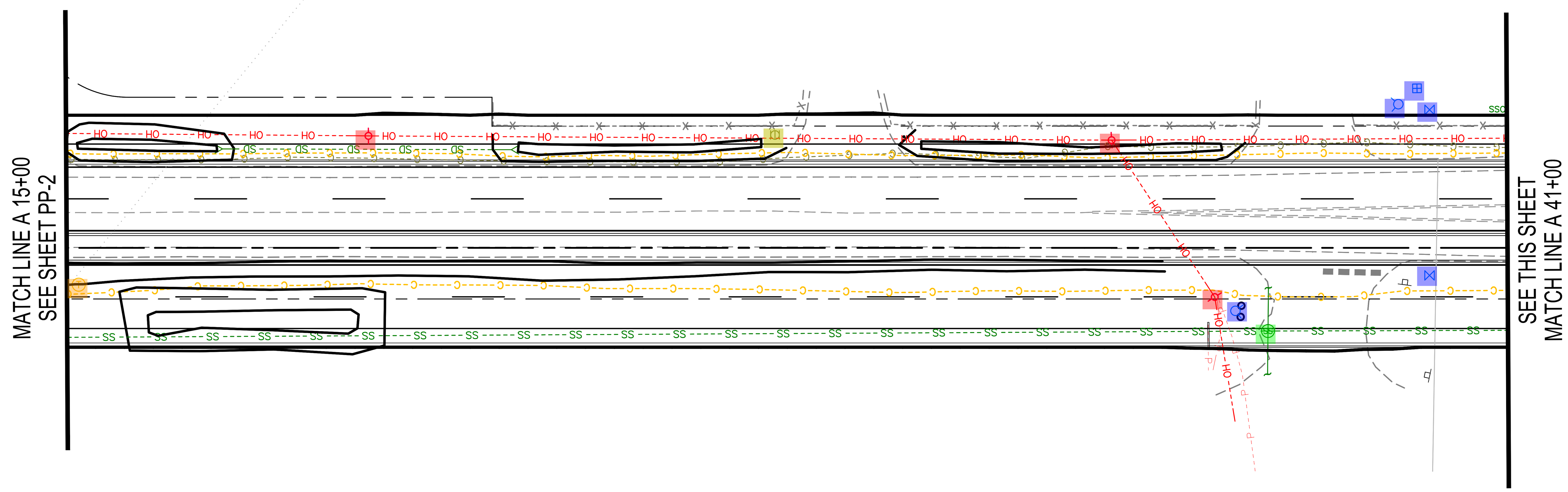
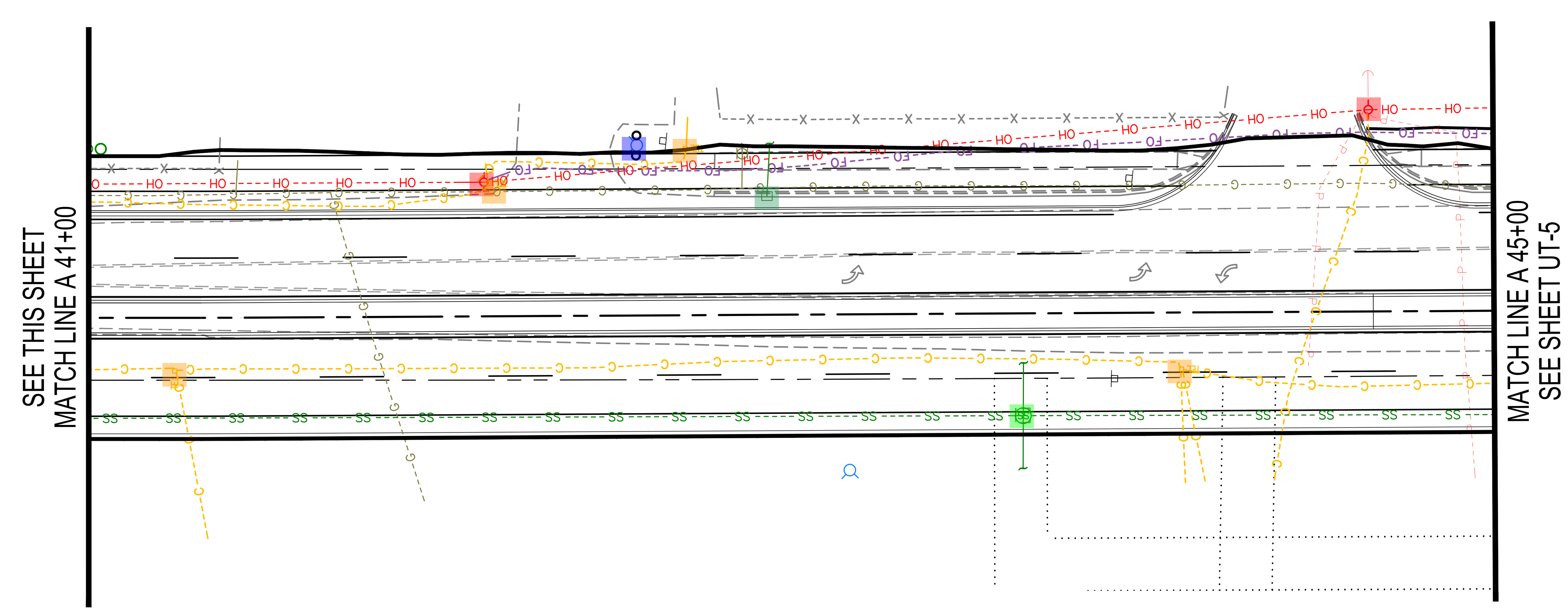
S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M

0 30 60
SCALE IN FEET





LEGEND

- 12-INCH WATER MAINS
- WATER VALVE WITH VALVE BOX
- FITTING WITH THRUST BLOCKING
- FIRE HYDRANT ASSEMBLY
- PROPOSED 12-INCH STORM DRAIN LINE
- EXISTING STORM DRAIN LINE
- EXISTING WATER MAIN
- CONSTRUCTION CENTERLINE
- ROW/ PROPERTY LINE
- OVERHEAD POWER LINE
- UNDERGROUND TELECOMMUNICATIONS LINE
- UNDERGROUND POWER LINE
- CATCH BASIN TYPE 1
- CATCH BASIN TYPE 2
- CUT/FILL LINE

UTILITY CONFLICT LEGEND

- GAS
- POWER
- SEWER
- STORMWATER
- TELEPHONE
- WATER

Oct 20, 2021 8:52:17am - User sam.dunn
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REVISIONS	DATE	BY
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CITY OF TUMWATER
555 ISRAEL ROAD SW
TUMWATER, WA 98501

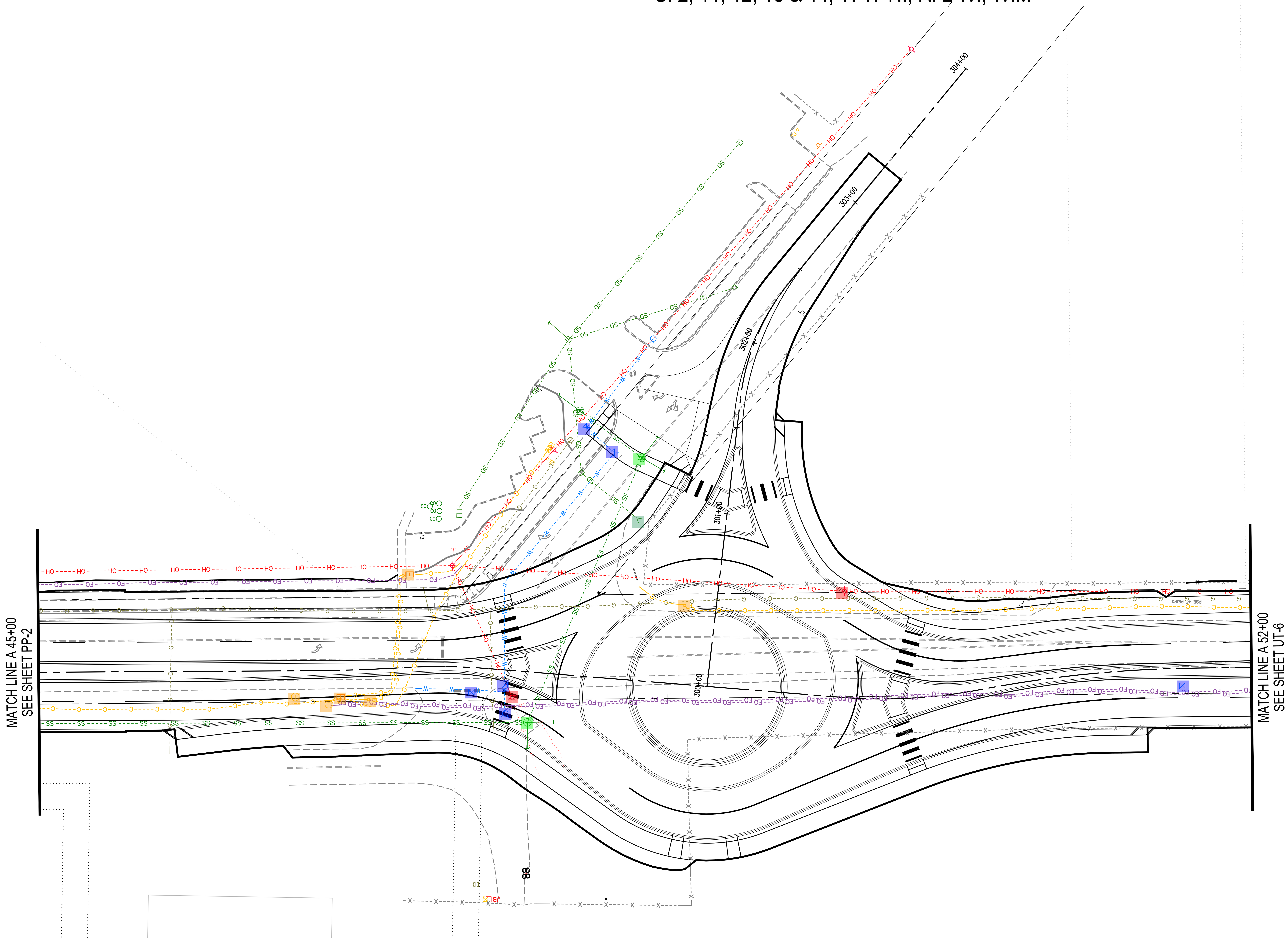
OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON
MP XX TO MP XX

UTILITY PLAN
A 36+00 - A 45+00

DRAWING No.: UT-4

SHEET No.: ---- OF XX

S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M



LEGEND

- 12-INCH WATER MAINS
- WATER VALVE WITH VALVE BOX
- FITTING WITH THRUST BLOCKING
- FIRE HYDRANT ASSEMBLY
- PROPOSED 12-INCH STORM DRAIN LINE
- EXISTING STORM DRAIN LINE
- EXISTING WATER MAIN
- CONSTRUCTION CENTERLINE
- ROW/ PROPERTY LINE
- OVERHEAD POWER LINE
- UNDERGROUND TELECOMMUNICATIONS LINE
- UNDERGROUND POWER LINE
- CATCH BASIN TYPE 1
- CATCH BASIN TYPE 2
- CUT/FILL LINE

UTILITY CONFLICT LEGEND

- GAS
- POWER
- SEWER
- STORMWATER
- TELEPHONE
- WATER

REVISIONS	DATE	BY

PRELIMINARY

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CITY OF TUMWATER
555 ISRAEL ROAD SW
TUMWATER, WA 98501

OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON
MP XX TO MP XX

UTILITY PLAN
A 45+00 - A 52+00

DRAWING No.: UT-5
SHEET No.: ---- OF XX

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S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M

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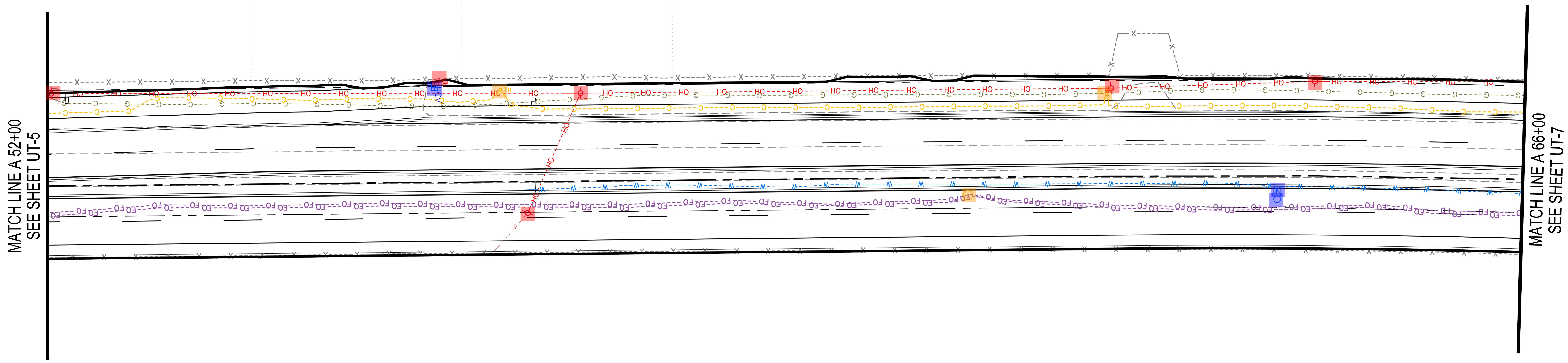

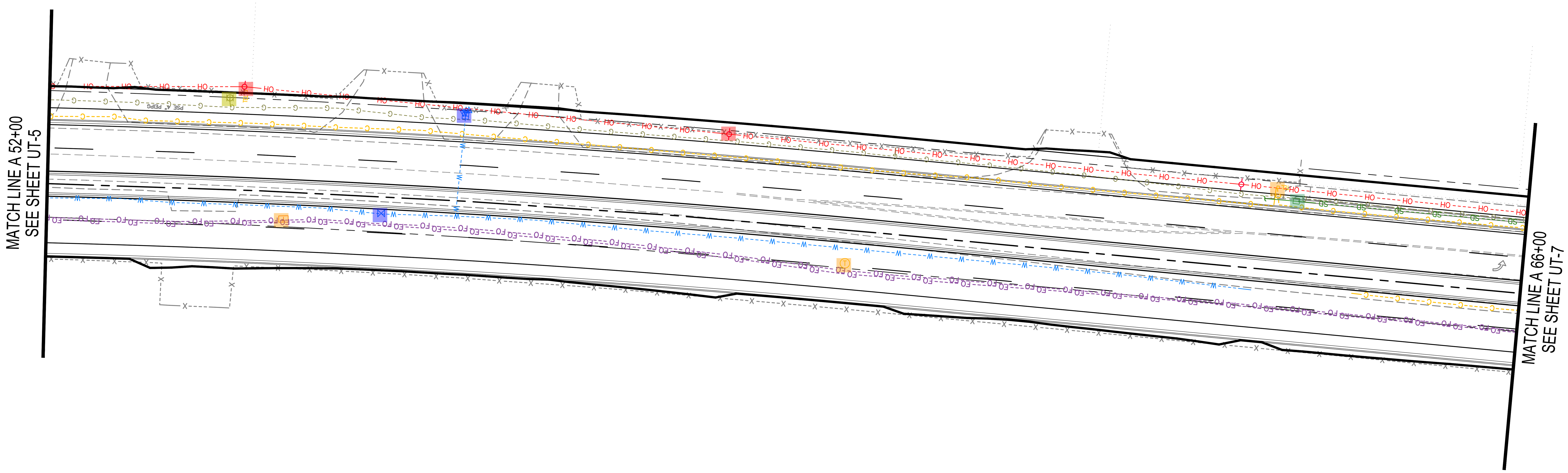

LEGEND

- 12-INCH WATER MAINS
- WATER VALVE WITH VALVE BOX
- FITTING WITH THRUST BLOCKING
- FIRE HYDRANT ASSEMBLY
- PROPOSED 12-INCH STORM DRAIN LINE
- EXISTING STORM DRAIN LINE
- EXISTING WATER MAIN
- CONSTRUCTION CENTERLINE
- ROW/ PROPERTY LINE
- OVERHEAD POWER LINE
- UNDERGROUND TELECOMMUNICATIONS LINE
- UNDERGROUND POWER LINE
- CATCH BASIN TYPE 1
- CATCH BASIN TYPE 2
- CUT/FILL LINE

UTILITY CONFLICT LEGEND

- GAS
- POWER
- SEWER
- STORMWATER
- TELEPHONE
- WATER

REVISIONS	DATE	BY	DESIGNED BY: DESIGNER NAME	ISSUE DATE: SEPTEMBER 2020	ALL DIMENSIONS SHOWN IN FEET UNLESS OTHERWISE DESIGNATED	PATRICK HOLM, STATE OF WASHINGTON, 49470, REGISTERED PROFESSIONAL ENGINEER	SCJ ALLIANCE CONSULTING SERVICES 8730 TALLON LANE NE, SUITE 200, LACEY, WASHINGTON 98516 P: 360-352-1465 F: 360-352-1509 SCJALLIANCE.COM	CITY OF TUMWATER 555 ISRAEL ROAD SW TUMWATER, WA 98501	OLD HIGHWAY 99 CORRIDOR STUDY TUMWATER, WASHINGTON MP XX TO MP XX	DRAWING No.: UT-6
PRELIMINARY			DRAWN BY: DRAFTER NAME	JOB No.: 0625.29					UTILITY PLAN A 52+00 - A 66+00	SHEET No.: ---- OF XX
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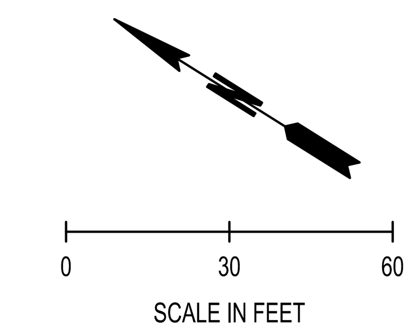

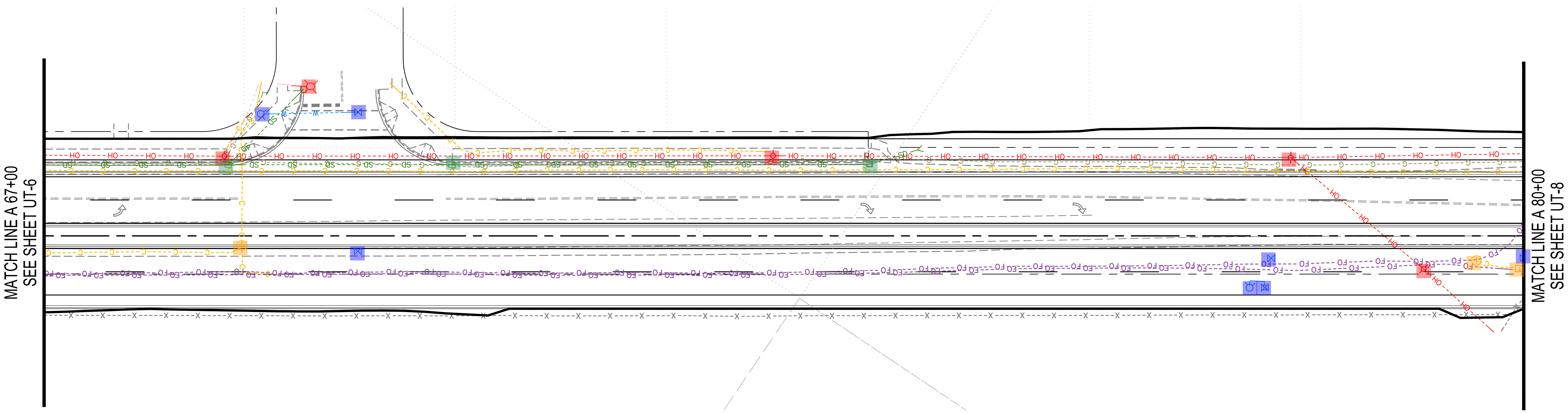

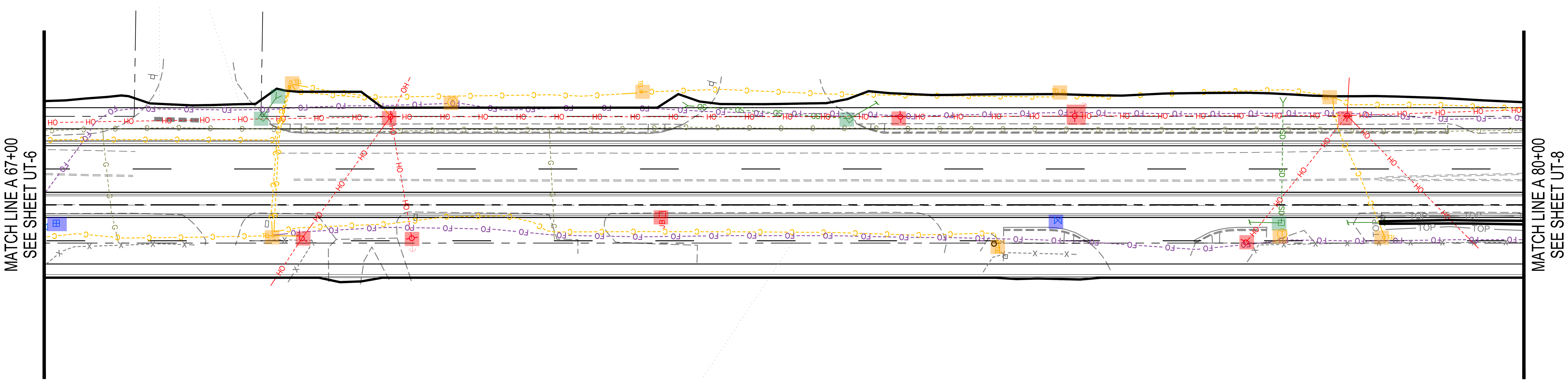

LEGEND

- 12-INCH WATER MAINS
- WATER VALVE WITH VALVE BOX
- FITTING WITH THRUST BLOCKING
- FIRE HYDRANT ASSEMBLY
- PROPOSED 12-INCH STORM DRAIN LINE
- EXISTING STORM DRAIN LINE
- EXISTING WATER MAIN
- CONSTRUCTION CENTERLINE
- ROW/ PROPERTY LINE
- OVERHEAD POWER LINE
- UNDERGROUND TELECOMMUNICATIONS LINE
- UNDERGROUND POWER LINE
- CATCH BASIN TYPE 1
- CATCH BASIN TYPE 2
- CUT/FILL LINE

UTILITY CONFLICT LEGEND

- GAS
- POWER
- SEWER
- STORMWATER
- TELEPHONE
- WATER

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CITY OF TUMWATER
555 ISRAEL ROAD SW
TUMWATER, WA 98501

OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON
MP XX TO MP XX

UTILITY PLAN
A 67+00 - A 80+00

DRAWING No.: UT-7

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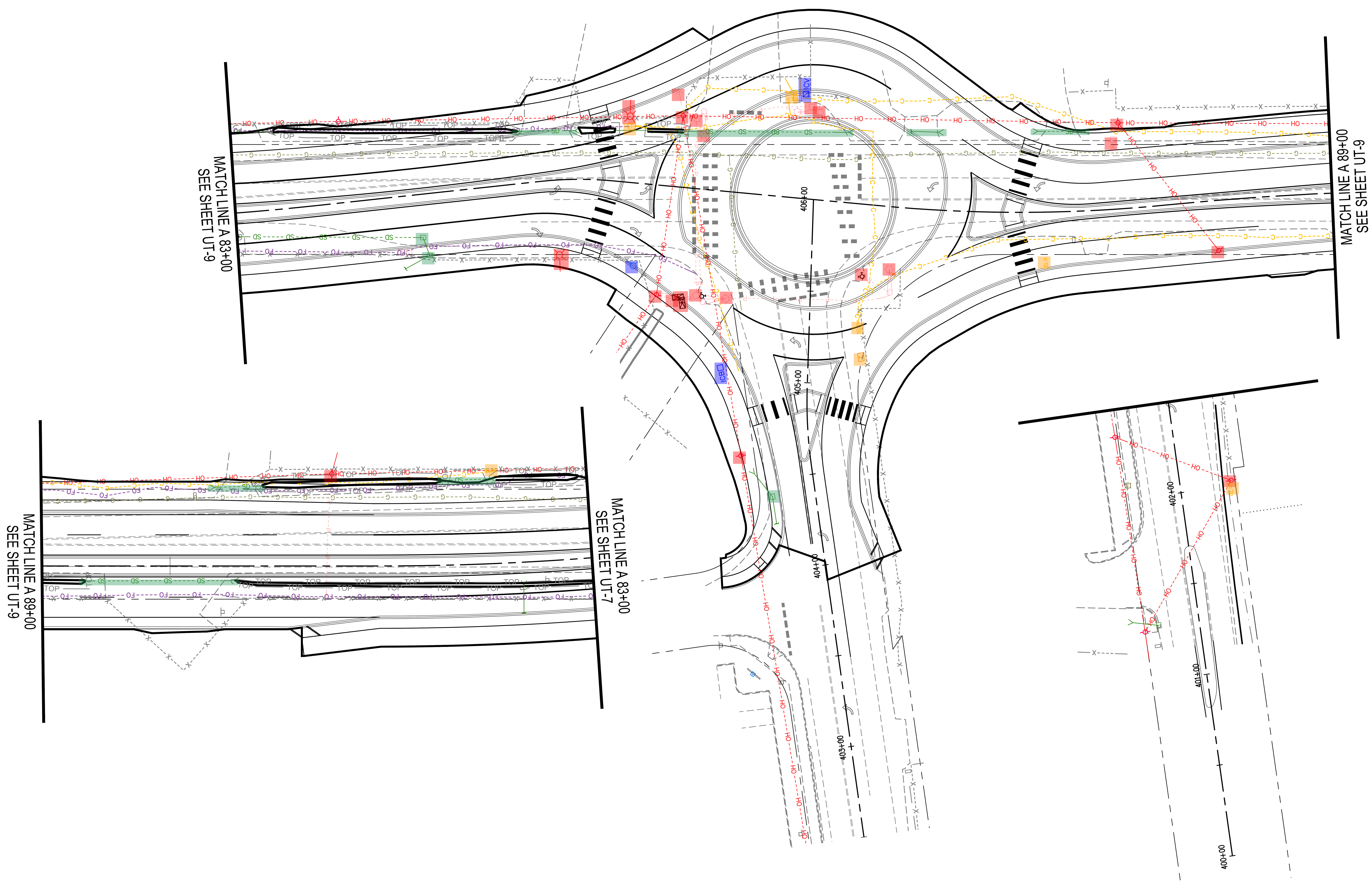

0 30 60
SCALE IN FEET

LEGEND

12–INCH WATER MAINS
WATER VALVE WITH VALVE BOX
FITTING WITH THRUST BLOCKING
FIRE HYDRANT ASSEMBLY
PROPOSED 12–INCH STORM DRAIN LINE
EXISTING STORM DRAIN LINE
EXISTING WATER MAIN
CONSTRUCTION CENTERLINE
ROW/ PROPERTY LINE
OVERHEAD POWER LINE
UNDERGROUND TELECOMMUNICATIONS LINE
UNDERGROUND POWER LINE
CATCH BASIN TYPE 1
CATCH BASIN TYPE 2
CUT/FILL LINE

UTILITY CONFLICT LEGEND

GAS
POWER
SEWER
STORMWATER
TELEPHONE
WATER

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OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON
MP XX TO MP XX

UTILITY PLAN
A 80+00 - A 89+00

DRAWING No.: UT-8

SHEET No.: ---- OF XX

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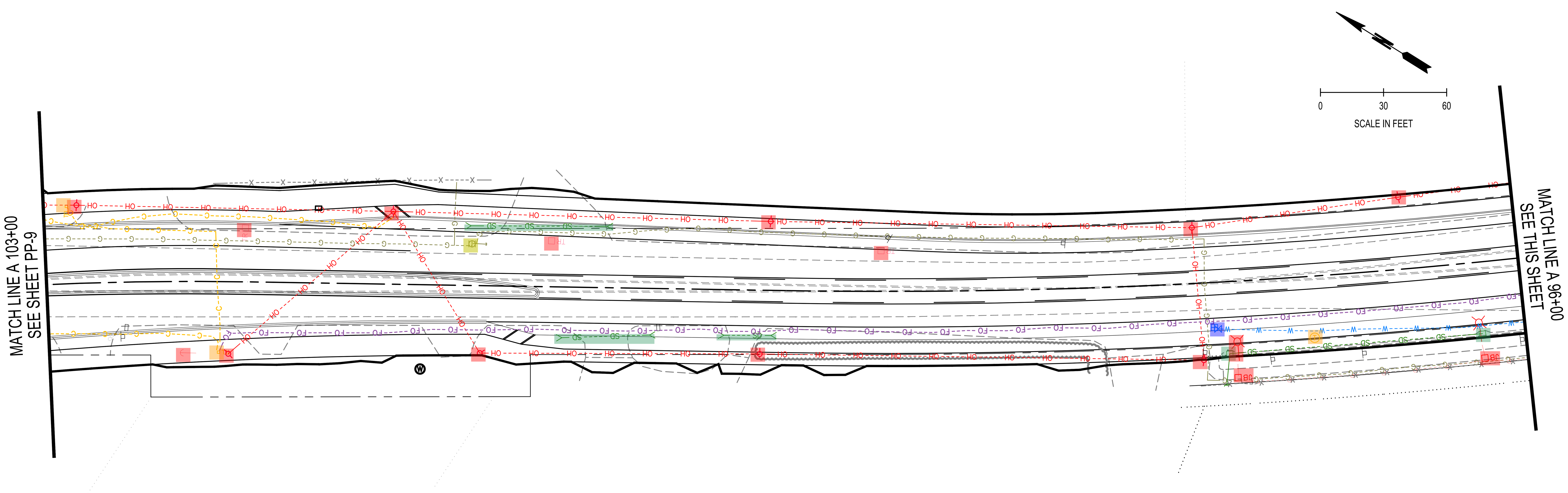

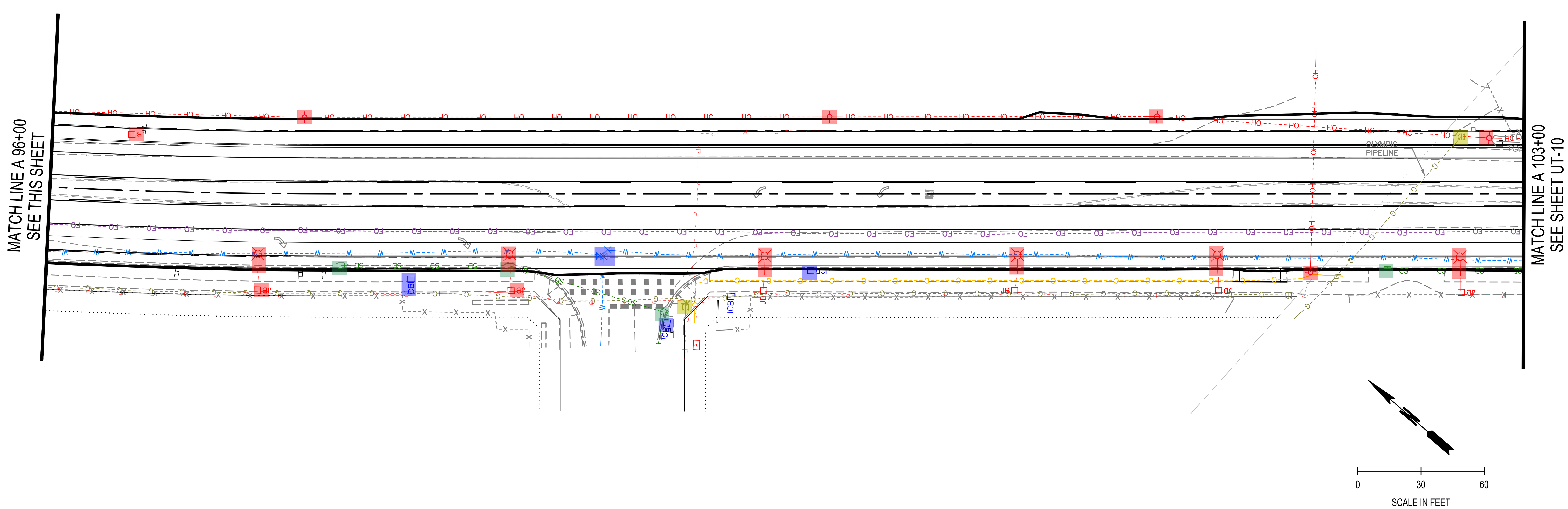

LEGEND

- 12-INCH WATER MAINS
- WATER VALVE WITH VALVE BOX
- FITTING WITH THRUST BLOCKING
- FIRE HYDRANT ASSEMBLY
- PROPOSED 12-INCH STORM DRAIN LINE
- EXISTING STORM DRAIN LINE
- EXISTING WATER MAIN
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- ROW/ PROPERTY LINE
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- UNDERGROUND POWER LINE
- CATCH BASIN TYPE 1
- CATCH BASIN TYPE 2
- CUT/FILL LINE

UTILITY CONFLICT LEGEND

- GAS
- POWER
- SEWER
- STORMWATER
- TELEPHONE
- WATER

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555 ISRAEL ROAD SW
TUMWATER, WA 98501

OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON
MP XX TO MP XX

UTILITY PLAN
A 89+00 - A 103+00

DRAWING No.: UT-9
SHEET No.: ---- OF XX

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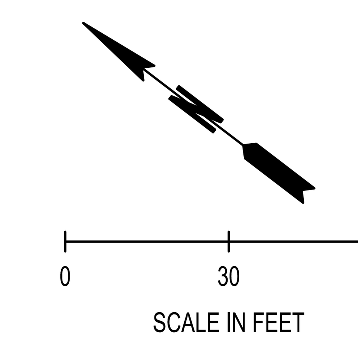
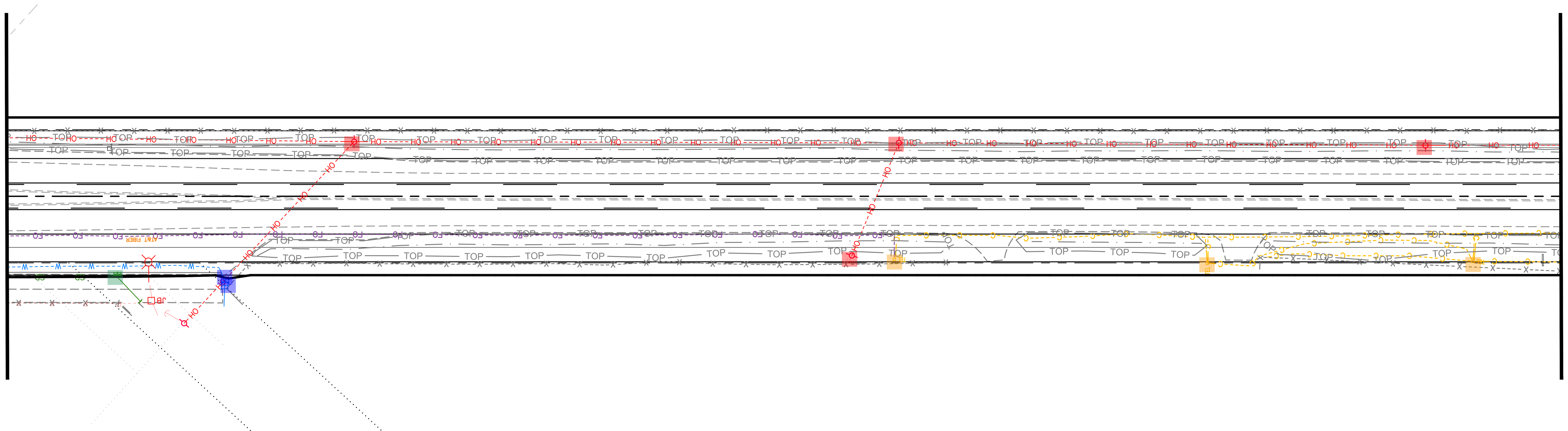
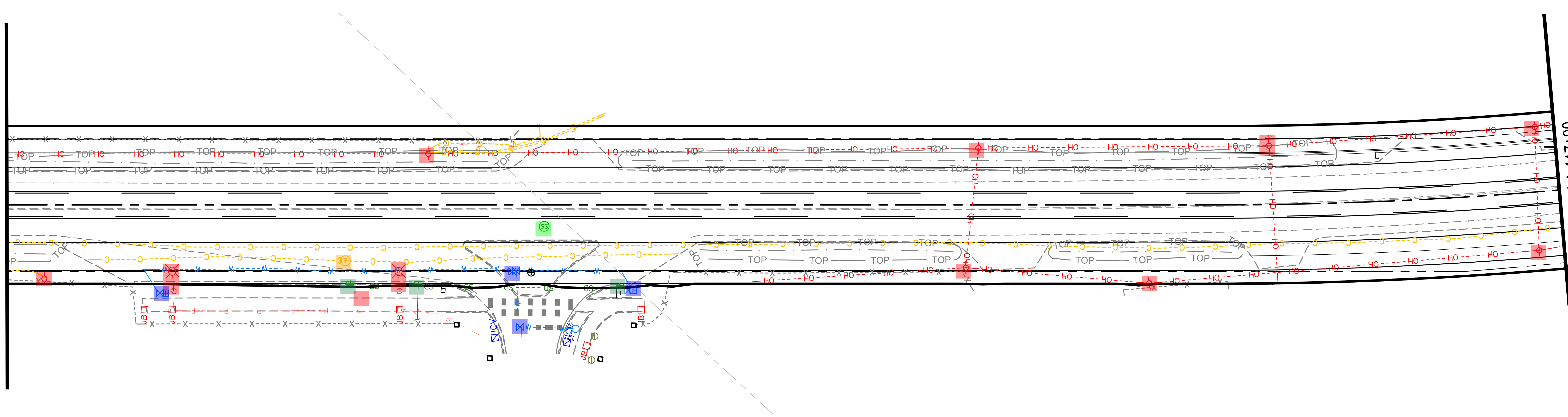


MATCH LINE A 103+00
SEE SHEET PP-9



MATCH LINE A 110+00
SEE THIS SHEET

MATCH LINE A 110+00
SEE THIS SHEET



MATCH LINE A 117+00
SEE SHEET UT-11

LEGEND

- 12-INCH WATER MAINS
- WATER VALVE WITH VALVE BOX
- FITTING WITH THRUST BLOCKING
- FIRE HYDRANT ASSEMBLY
- PROPOSED 12-INCH STORM DRAIN LINE
- EXISTING STORM DRAIN LINE
- EXISTING WATER MAIN
- CONSTRUCTION CENTERLINE
- ROW/ PROPERTY LINE
- OVERHEAD POWER LINE
- UNDERGROUND TELECOMMUNICATIONS LINE
- UNDERGROUND POWER LINE
- CATCH BASIN TYPE 1
- CATCH BASIN TYPE 2
- CUT/FILL LINE

UTILITY CONFLICT LEGEND

- GAS
- POWER
- SEWER
- STORMWATER
- TELEPHONE
- WATER

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CITY OF TUMWATER
555 ISRAEL ROAD SW
TUMWATER, WA 98501

OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON
MP XX TO MP XX

UTILITY PLAN
A 103+00 - A 117+00

DRAWING No.: UT-10

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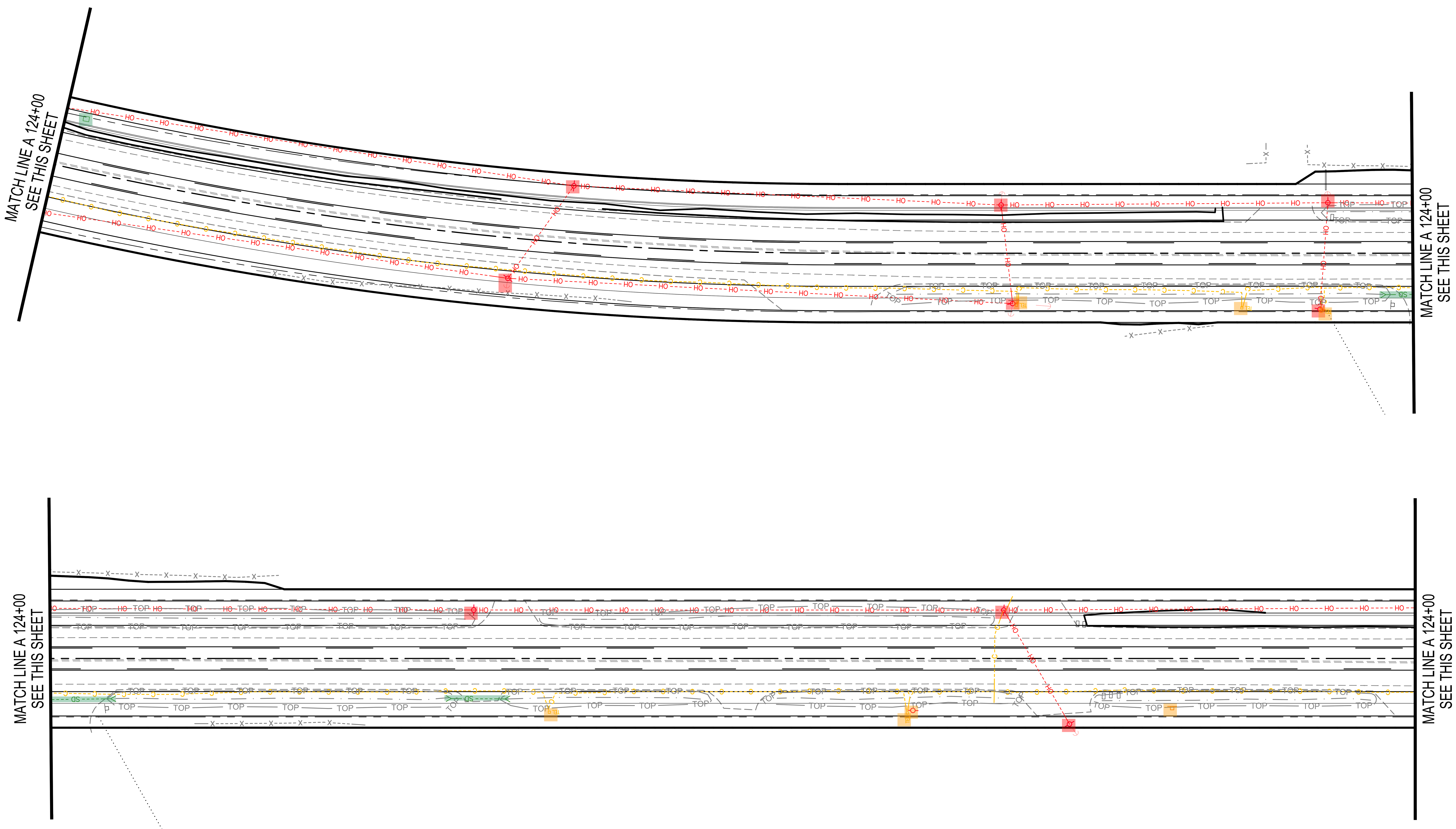

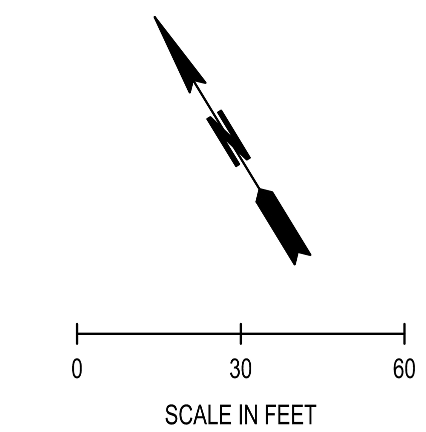

LEGEND

12-INCH WATER MAINS
WATER VALVE WITH VALVE BOX
FITTING WITH THRUST BLOCKING
FIRE HYDRANT ASSEMBLY
PROPOSED 12-INCH STORM DRAIN LINE
EXISTING STORM DRAIN LINE
EXISTING WATER MAIN
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OVERHEAD POWER LINE
UNDERGROUND TELECOMMUNICATIONS LINE
UNDERGROUND POWER LINE
CATCH BASIN TYPE 1
CATCH BASIN TYPE 2
CUT/FILL LINE

UTILITY CONFLICT LEGEND

GAS
POWER
SEWER
STORMWATER
TELEPHONE
WATER

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PRELIMINARY		

DESIGNED BY: DESIGNER NAME
ISSUE DATE: SEPTEMBER 2020
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JOB No.: 0625.29
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OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON
MP XX TO MP XX
UTILITY PLAN

DRAWING No.: UT-11
SHEET No.: ---- OF XX

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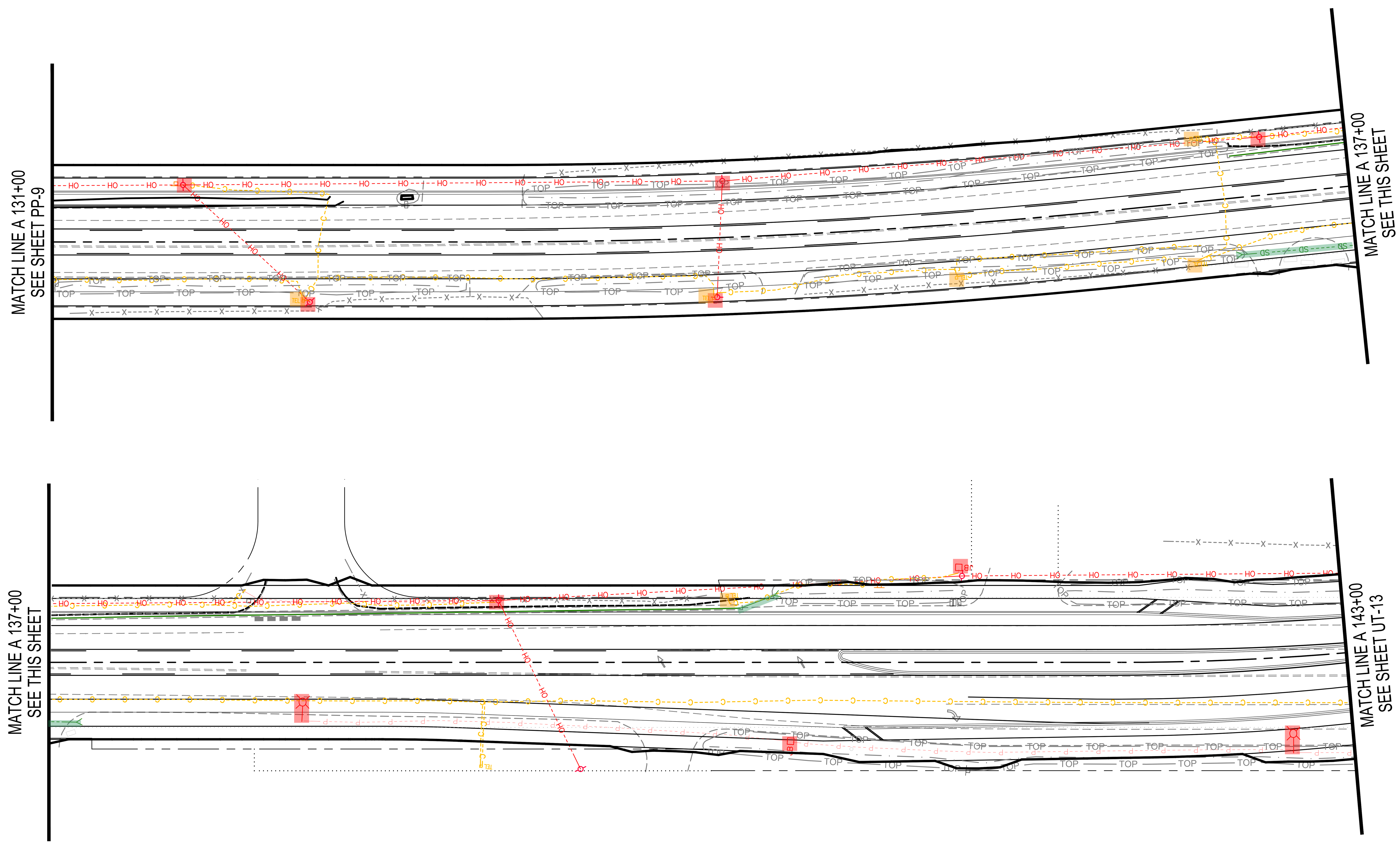

0 30 60
SCALE IN FEET

LEGEND

- 12-INCH WATER MAINS
- WATER VALVE WITH VALVE BOX
- FITTING WITH THRUST BLOCKING
- FIRE HYDRANT ASSEMBLY
- PROPOSED 12-INCH STORM DRAIN LINE
- EXISTING STORM DRAIN LINE
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- CATCH BASIN TYPE 2
- CUT/FILL LINE

UTILITY CONFLICT LEGEND

- GAS
- POWER
- SEWER
- STORMWATER
- TELEPHONE
- WATER

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CITY OF TUMWATER
555 ISRAEL ROAD SW
TUMWATER, WA 98501

OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON
MP XX TO MP XX

UTILITY PLAN
A 131+00 - A 137+00

DRAWING No.: UT-12

SHEET No.: ---- OF XX

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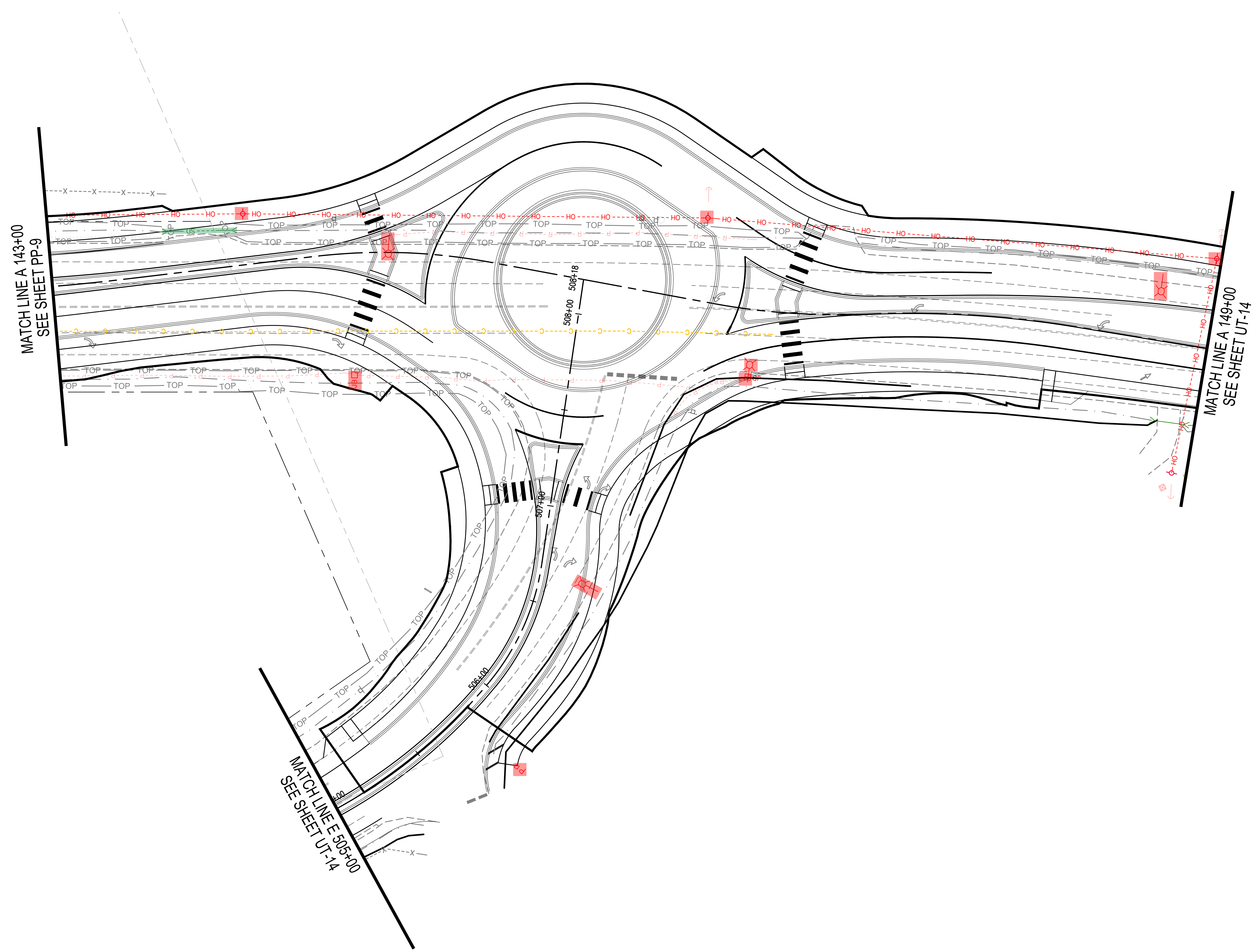

0 30 60
SCALE IN FEET

LEGEND

- 12-INCH WATER MAINS
- WATER VALVE WITH VALVE BOX
- FITTING WITH THRUST BLOCKING
- FIRE HYDRANT ASSEMBLY
- PROPOSED 12-INCH STORM DRAIN LINE
- EXISTING STORM DRAIN LINE
- EXISTING WATER MAIN
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- OVERHEAD POWER LINE
- UNDERGROUND TELECOMMUNICATIONS LINE
- UNDERGROUND POWER LINE
- CATCH BASIN TYPE 1
- CATCH BASIN TYPE 2
- CUT/FILL LINE

UTILITY CONFLICT LEGEND

- GAS
- POWER
- SEWER
- STORMWATER
- TELEPHONE
- WATER

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JOB No.: 0625.29
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CITY OF TUMWATER
555 ISRAEL ROAD SW
TUMWATER, WA 98501

OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON
MP XX TO MP XX

UTILITY PLAN
A 143+00 - A 149+00

DRAWING No.: UT-13
SHEET No.: ---- OF XX

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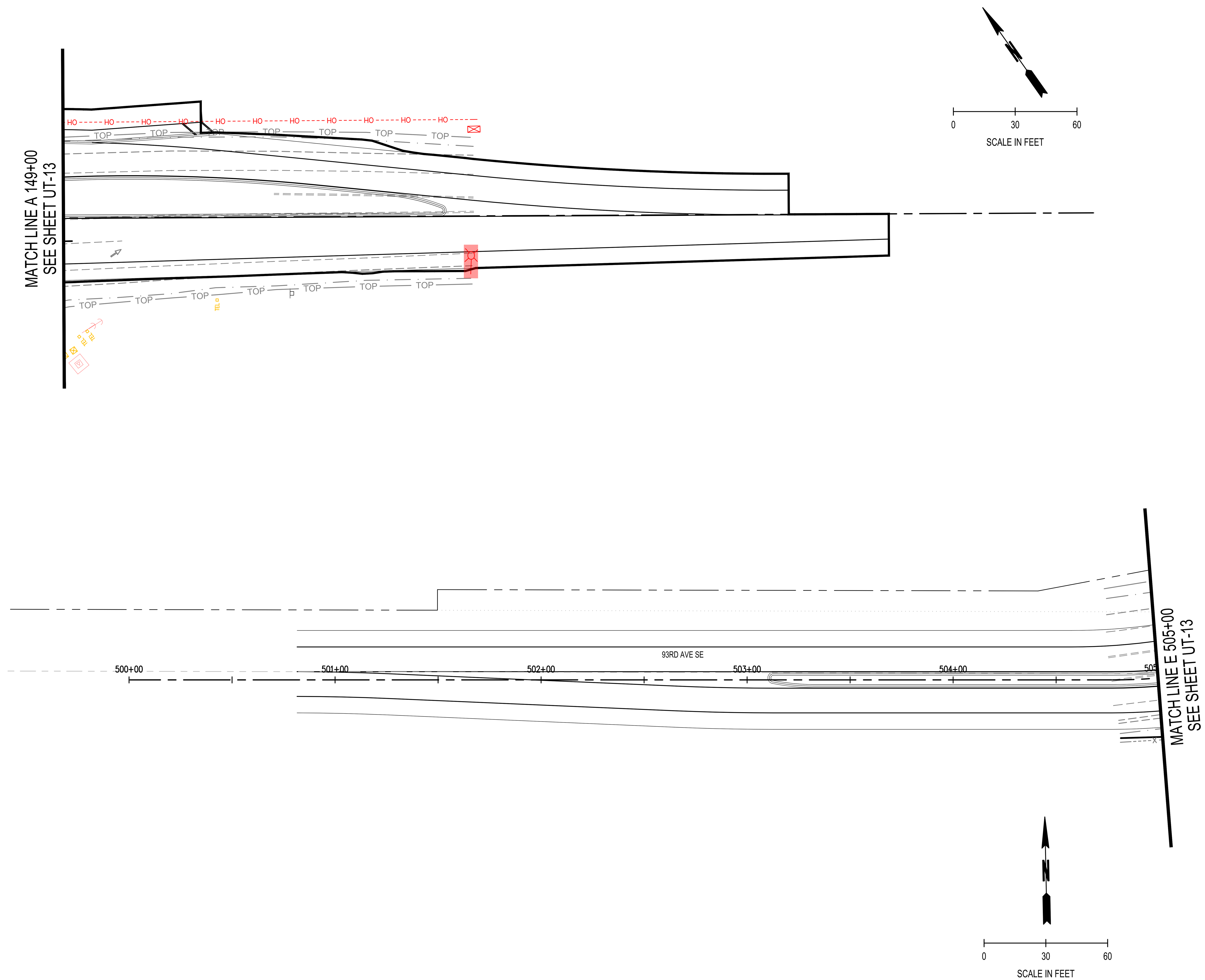

LEGEND

- 12-INCH WATER MAINS
- WATER VALVE WITH VALVE BOX
- FITTING WITH THRUST BLOCKING
- FIRE HYDRANT ASSEMBLY
- PROPOSED 12-INCH STORM DRAIN LINE
- EXISTING STORM DRAIN LINE
- EXISTING WATER MAIN
- CONSTRUCTION CENTERLINE
- ROW/ PROPERTY LINE
- OVERHEAD POWER LINE
- UNDERGROUND TELECOMMUNICATIONS LINE
- UNDERGROUND POWER LINE
- CATCH BASIN TYPE 1
- CATCH BASIN TYPE 2
- CUT/FILL LINE

UTILITY CONFLICT LEGEND

- GAS
- POWER
- SEWER
- STORMWATER
- TELEPHONE
- WATER

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ISSUE DATE: SEPTEMBER 2020
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JOB No.: 0625.29
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DRAWING FILE No.: 0625.29-Utility Conflicts Exhibit

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PATRICK HOLM
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49470
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OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON
MP XX TO MP XX

UTILITY PLAN
A 149+00 - E 505+00

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SHEET No.: ---- OF XX

F6) STORMWATER TECH MEMO

Technical Memo

To City of Tumwater

From: David Rowland, PE

Date: November 1, 2022

Project: 0625.29 – Old Highway 99 Corridor Study

Subject Stormwater Design

Introduction

The Old Highway 99 Corridor Study starts at 73rd Avenue and continues until 93rd Avenue on Old Highway 99. This technical memorandum seeks to provide preliminary design recommendations based on city storm water reports near the Old Highway 99 corridor and geotechnical borings in strategic locations on site. This project will comply with the Tumwater *2022 Drainage Design and Erosion Control Manual* (DDECM) effective July 2022 to manage stormwater runoff.

Due to the large extents of the project, the Old Highway 99 Corridor project was broken up into five different phases. Below are the five phases of the project that were evaluated stormwater solutions:

- Phase 1 – 79th Avenue Roundabout
- Phase 2 – 73rd Avenue to 79th Avenue
- Phase 3 – 79th Avenue to 88th Avenue Roundabout
- Phase 4 – 88th Avenue Roundabout to Wyatt Court
- Phase 5 – Wyatt Court to 93rd Avenue Roundabout

This technical memorandum outlines basin areas, the stormwater management requirements, and the stormwater control plan for each phase of the project and takes the information provided by

Basin Areas

Appendix A contains exhibits for existing conditions and the basin areas. Below are the existing basin areas for all five phases:

<u>Existing Basins – Phase 1 to 5</u>

PHASE 1 – 79th Roundabout Predeveloped Conditions		
SURFACE	SF	ACRES
PGIS =	82,230	1.888
NPGIS =	3,000	0.069
TOTAL IMPERVIOUS =	**85,230**	**1.957**
NPGPS =	113,390	2.603
TOTAL PERVIOUS =	**113,390**	**2.603**
TOTAL =	**198,620**	**4.560**

PHASE 2 – 73rd to 79th Predeveloped Condition		
SURFACE	SF	ACRES
PGIS =	205,190	4.711
NPGIS =	2,650	0.061
TOTAL IMPERVIOUS =	**207,840**	**4.772**
NPGPS =	246,260	5.653
TOTAL PERVIOUS =	**246,260**	**5.653**
TOTAL =	**454,100**	**10.425**

PHASE 3 – 79th to 88th Predeveloped Conditions		
SURFACE	SF	ACRES
PGIS =	175,330	4.025
NPGIS =	3,250	0.075
TOTAL IMPERVIOUS =	**178,580**	**4.100**
NPGPS =	213,100	4.892
TOTAL PERVIOUS =	**213,100**	**4.892**
TOTAL =	**391,680**	**8.992**

PHASE 4 – 88th to Wyatt Predeveloped Conditions		
SURFACE	SF	ACRES
PGIS =	122,420	2.810
NPGIS =	5,060	0.116
TOTAL IMPERVIOUS =	**127,480**	**2.926**
NPGPS =	90,260	2.072
TOTAL PERVIOUS =	**90,260**	**2.072**
TOTAL =	**217,740**	**4.999**

PHASE 5 – Wyatt to 93rd – Predeveloped Condition		
SURFACE	SF	ACRES
PGIS =	208,690	4.791
NPGIS =	0	0
TOTAL IMPERVIOUS =	**208,690**	**4.791**
NPGPS =	206,190	4.733
TOTAL PERVIOUS =	**206,190**	**4.733**
TOTAL =	**414,880**	**9.524**

Appendix B contains proposed conditions and sample areas used to model proposed stormwater systems. Below are the proposed basin areas for all five phases:

Proposed Basins – Phases 1 to 5

Phase 1 – 79th Roundabout Developed Conditions		
SURFACE	SF	ACRES
NEW PGIS =	98,990	2.272
REPLACED PGIS =	82,230	1.888
NEW NPGIS =	36,270	0.833
REPLACED NPGIS =	3,000	0.069
TOTAL IMPERVIOUS =	**135,260**	**3.105**
NPGPS =	61,840	1.420
TOTAL PERVIOUS =	**61,840**	**1.420**
TOTAL =	**197,100**	**4.525**

Phase 2 – 73rd to 79th Developed Conditions		
SURFACE	SF	ACRES
NEW PGIS =	252,460	5.796
REPLACED PGIS =	205,190	4.710
NEW NPGIS =	72,040	1.654
REPLACED NPGIS =	2,650	0.061
TOTAL IMPERVIOUS =	**324,500**	**7.450**
NPGPS =	129,600	2.975
TOTAL PERVIOUS =	**129,600**	**2.975**
TOTAL =	**454,100**	**10.425**

Phase 3 – 79th to 88th – Developed Conditions		
SURFACE	SF	ACRES
NEW PGIS =	216,750	4.976
REPLACED PGIS =	175,330	4.025
NEW NPGIS =	62,330	1.431
REPLACED NPGIS =	3,250	0.075
TOTAL IMPERVIOUS =	**279,080**	**6.407**
NPGPS =	112,600	2.585
TOTAL PERVIOUS =	**112,600**	**2.585**
TOTAL =	**391,680**	**8.992**

Phase 4 – 88th to Wyatt – Developed Conditions		
SURFACE	SF	ACRES
NEW PGIS =	117,900	2.707
REPLACED PGIS =	117,900	2.707
NEW NPGIS =	32,030	0.735
REPLACED NPGIS =	5,060	0.116
TOTAL IMPERVIOUS =	**149,930**	**3.442**
NPGPS =	67,810	1.557
TOTAL PERVIOUS =	**67,810**	**1.557**
TOTAL =	**217,740**	**4.999**

Phase 5 – Wyatt to 93rd – Developed Conditions		
SURFACE	SF	ACRES
NEW PGIS =	218,710	5.02
REPLACED PGIS =	208,690	4.791
NEW NPGIS =	65,690	1.508
REPLACED NPGIS =	0	0.000
TOTAL IMPERVIOUS =	**284,400**	**6.529**
NPGPS =	130,480	2.995
TOTAL PERVIOUS =	**130,480**	**2.995**
TOTAL =	**414,880**	**9.524**

Minimum Requirements

Based on the Tumwater 2022 DDECM, based in the Ecology Manual, all the project phases require application of Minimum Requirements 1-11 for all hard and pollution generating pervious surfaces, and converted vegetation areas.

See **Appendix C** for the Minimum Requirements Flow Charts.

Stormwater Control Plan

Each of the phases will require runoff treatment and flow control. Each system will be designed per the 2022 DDECM and modeled in WWHM2012. For all the phases the use of Bioretention and Compost Amended Vegetated Filter Strips (CAFVS) will be used for flow control. The following preliminary infiltration rates were used for modeling the CAVFs widths, bioretention swales, and infiltration basins:

1. 9.0 inches/hour was used from 73rd Avenue to Henderson Avenue
2. 3.8 inches/hour from Henderson Avenue to 79th Avenue
3. 4.2 inches/hour from 79th Ave to 93rd Avenue

Infiltration pits will need to be used to test the actual infiltration rate for each phase.

For each phase, to evaluate the storm flow control at a preliminary level, a sample portion of the typical section was evaluated to determine the CAVFs width and bioretention necessary for the corridor. Roundabouts were evaluated individually to determine the area needed for infiltration basins.

- Phase 1 – 79th Avenue Roundabout

  This project includes the construction of a roundabout at the intersection of 79th Avenue and Henderson Avenue and three connecting legs into the roundabout. Each leg connecting to Old Highway 99 will have 2 travel lanes in both directions, 10-foot sidewalks, bike lanes that terminate prior to the roundabout. Stormwater from the roundabout will be captured in catch basins and conveyed to infiltration basins. These infiltration basins are planned to be located on the northwest, northeast, and southeast sides of the roundabout. Stormwater along the roadway on the eastside because of the curb will be captured with scuppers and conveyed to bioretention swales. If applicable, CAVFS will be located on the west side of Old Highway 99 and will capture stormwater running off the roadway where curbs and gutters are not present. Any overflow will be routed to the infiltration basins located at the roundabout for both the bioretention facilities and the CAVFS.

  Based on the preliminary geotechnical information acquired from HWA Geotechnical borings, the anticipated infiltration rate is 3.8 inches per hour. This requires the CAFVs to have a width of 6 feet on the west side where a curb and gutter are not present, bioretention swales contained in the 6' planter strip will be able to handle and infiltrate storm water that is generated in areas where a curb and gutter are present. Infiltration basins for the 79th Avenue roundabout will require an area of 9,600 SF.

- Phase 2 – 73rd Avenue to 79th Avenue

  This phase will include construction of a roundabout at Henderson Avenue and the widening of the road to accommodate 2 lanes in both directions. 10-foot sidewalks will be located on the east of the entire length of the road and 6-foot bicycle lanes will be on the edge of the west side. At the roundabout at Henderson bike lanes will terminate to connect to 10-foot sidewalks to accommodate pedestrians and bicyclists. Stormwater along the roadway on the eastside because of the curb will be captured with scuppers and conveyed to bioretention swales. CAVFS will be located on the west side of Old Highway 99 and will capture stormwater running off the roadway where curbs and gutters are not present. Any overflow will be routed to the infiltration basins located at the roundabout for both the bioretention facilities and the CAVFS.

  Based on the preliminary geotechnical information acquired from HWA Geotechnical borings, the anticipated infiltration rate is 9 inches/hour from 73rd Avenue to Henderson Avenue and 3.8 incher/hour from Henderson Avenue to 79th Avenue. This requires the CAFVs to have a width of 4 feet on the west side where a curb and gutter are not present from 73rd Avenue to Henderson Avenue and 6 feet CAVFs from Henderson Avenue to 79th Avenue. Bioretention swales contained in the 6' planter strip will be able to handle and infiltrate storm water that is generated in areas where a curb and gutter are present. Infiltration basins for the Henderson Avenue roundabout stormwater will require an area of 9,600 SF.

- Phase 3 – 79th Avenue to 88th Avenue Roundabout

  Following the roundabout at 79th Avenue, phase 3 includes widening to 2 travel lanes in both directions with medians, 10-foot sidewalk on east side, and 6-foot bike lane on west side and will terminate at the intersection of 88th Avenue and Old Highway 99 that will be improved with a roundabout. Stormwater draining in the roundabout will be captured with catch basins and conveyed to infiltration basins. Stormwater along the roadway on the eastside because of the curb will be captured with scuppers and conveyed to bioretention swales. CAVFS will be located on the west side of Old Highway 99 and will capture stormwater running off the roadway where curbs and gutters are not present. Any overflow will be routed to the infiltration basins located at the roundabout for both the bioretention facilities and the CAVFS.

  Base on the preliminary geotechnical information acquired from HWA Geotechnical borings, the anticipated infiltration rate is 3.8 inches per hour. This requires the CAFVs to have a width of 6 feet on the west side where a curb and gutter are not present, bioretention swales contained in the 6' planter strip will be able to handle and infiltrate storm water that is generated in areas where a curb and gutter are present. Infiltration basins for the Henderson Avenue roundabout stormwater will require an area of 8500 SF.

- Phase 4 – 88th Avenue to Wyatt Court

  After the roundabout at 88th Avenue there will be 1 lane of travel in both direction with a median. 6-foot sidewalks and 6-foot bicycle lanes will run along the west and east sides. Stormwater will be controlled through bioretention on both sides of the roadway. Any overflow from the bioretention swales will be conveyed to the infiltration basins at 88th Avenue.

  Base on the preliminary geotechnical information acquired from HWA Geotechnical borings, the anticipated infiltration rate is 4.2 inches per hour. Bioretention swales contained in the 6' planter strip will be able to handle and infiltrate storm water that is generated in areas where a curb and gutter are present.

- Phase 5 – Wyatt Court to 93rd Avenue Roundabout

  Phase 5 continues the same section from phase 4 and terminates with a single circulating lane roundabout. Stormwater along the roadway on the eastside because of the curb will be captured with scuppers and conveyed to bioretention swales. Overflow from bioretention swales will be conveyed to infiltration basins located at the roundabout at 93rd Avenue.

  Base on the preliminary geotechnical information acquired from HWA Geotechnical borings, the anticipated infiltration rate is 4.2 inches per hour. Bioretention swales contained in the 6' planter strip will be able to handle and infiltrate storm water that is generated in areas where a curb and gutter are present. Infiltration basins for the 93rd Avenue roundabout stormwater will require an area of 8100 SF.

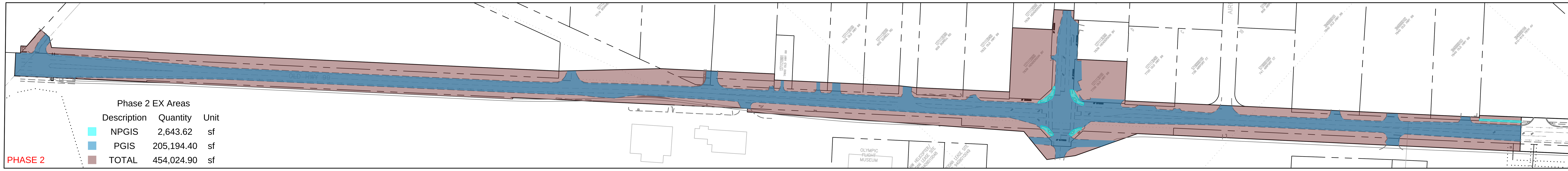
All values for stormwater control facilities will need to be re-evaluated upon design for construction and will require storm facility specific investigation to confirm design infiltration rates prior to final design.

LIST OF APPENDICES

Appendix A – Existing Basin Areas

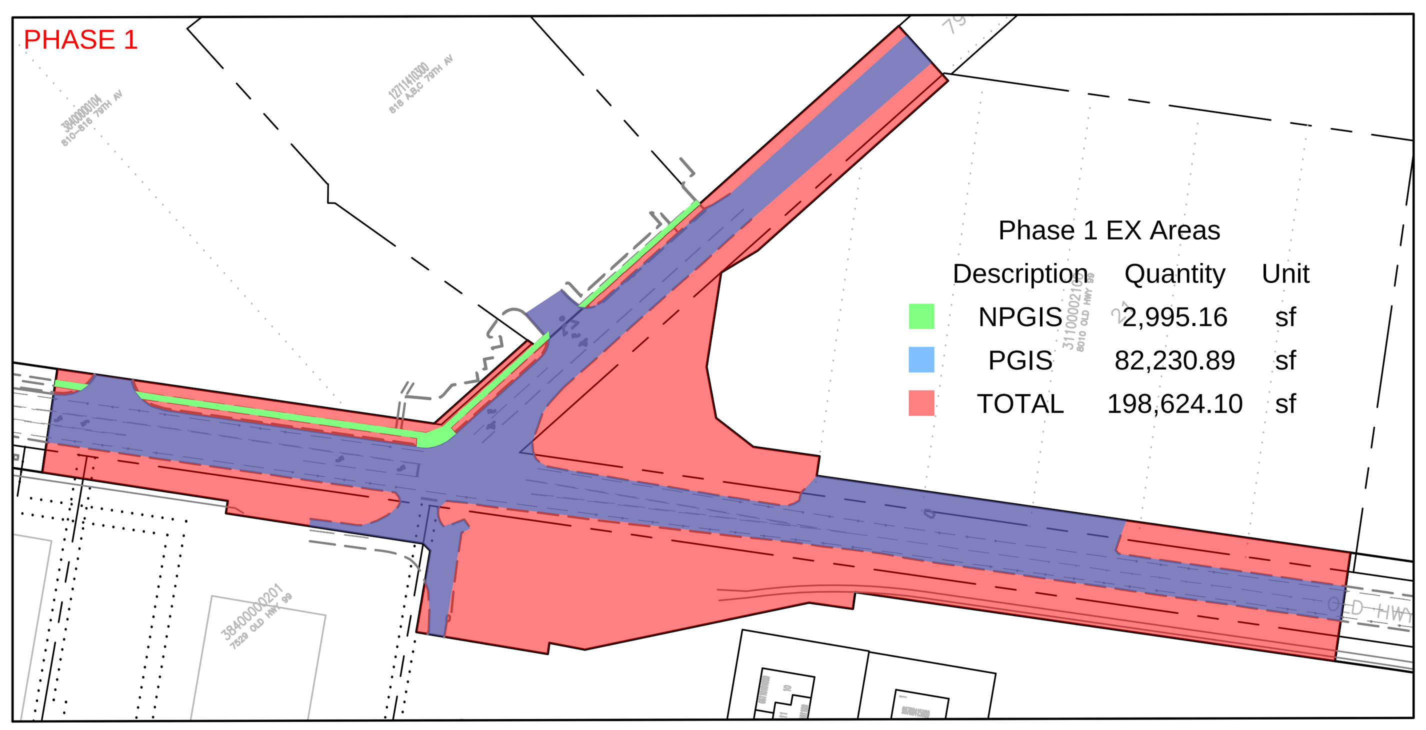
S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M

0 150 300
SCALE IN FEET



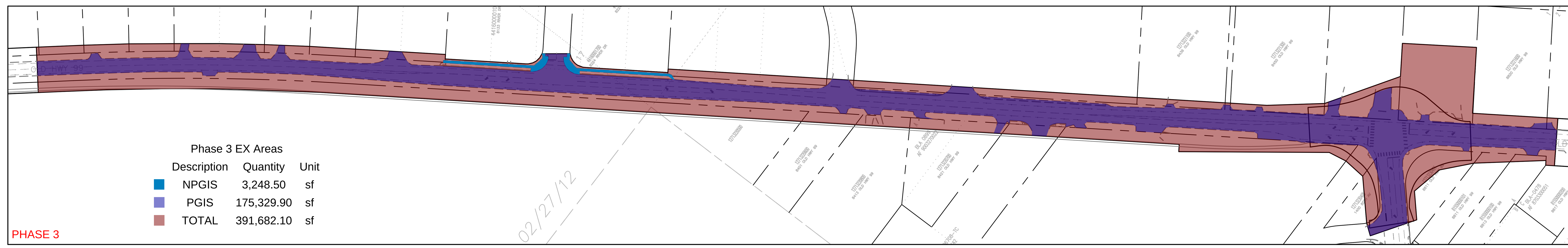
Phase 2 EX Areas

Description	Quantity	Unit
NPGIS	2,643.62	sf
PGIS	205,194.40	sf
TOTAL	454,024.90	sf



Phase 1 EX Areas

Description	Quantity	Unit
NPGIS	2,995.16	sf
PGIS	82,230.89	sf
TOTAL	198,624.10	sf

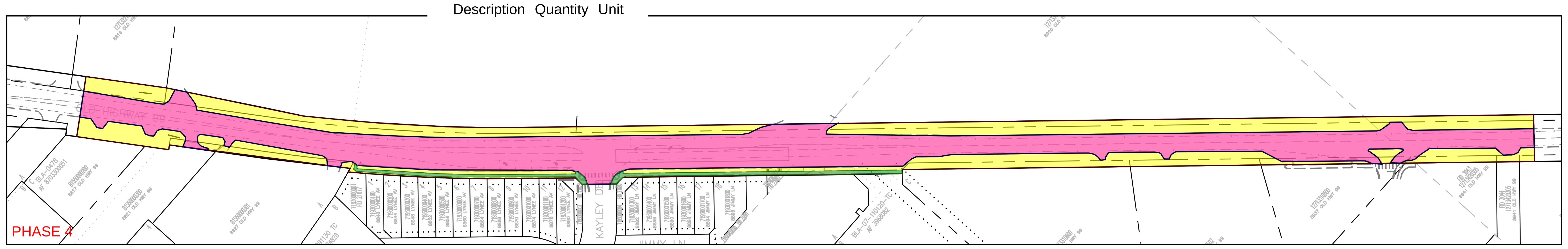


Phase 3 EX Areas

Description	Quantity	Unit
NPGIS	3,248.50	sf
PGIS	175,329.90	sf
TOTAL	391,682.10	sf

Legend

Description	Quantity	Unit



PHASE 1 – 79TH AVENUE ROUNDABOUT

PGIS =	81,040.86
NPGIS =	2,356.55
NPGPS =	113,389.39
Total =	196,786.80

PHASE 2 – 73RD AVENUE TO 79TH AVENUE

PGIS =	205,192.70
NPGIS =	2,644.06
NPGPS =	246,188.14
Total =	454,024.90

PHASE 3 – 79TH AVENUE TO 88TH AVENUE

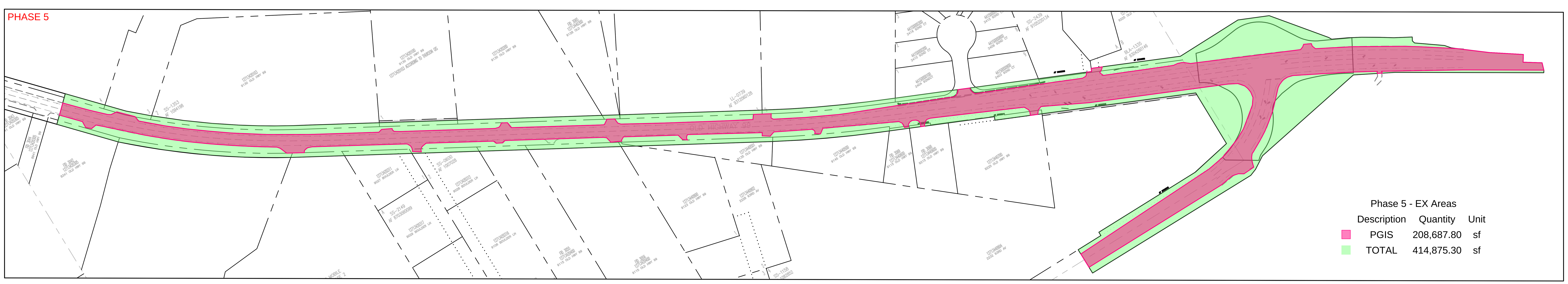
PGIS =	175,330.60
NPGIS =	3,248.50
NPGPS =	213,103.00
Total =	391,682.10

PHASE 4 – 88TH AVENUE TO WYATT COURT

PGIS =	122,414.00
NPGIS =	3,980.94
NPGPS =	91,343.46
Total =	217,738.40

PHASE 5 – WYATT COURT TO 93RD AVENUE

PGIS =	208,686.20
NPGIS =	0.0
NPGPS =	206,189.10
Total =	414,875.30



Phase 5 - EX Areas

Description	Quantity	Unit
PGIS	208,687.80	sf
TOTAL	414,875.30	sf

REVISIONS	DATE	BY

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OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON

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Appendix B – Proposed Basin Areas

S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M

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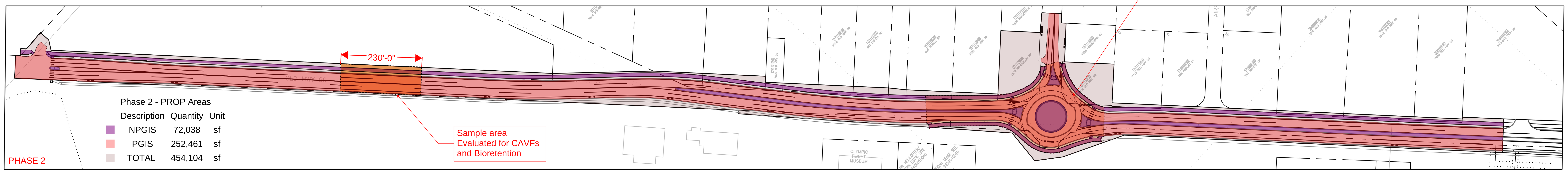
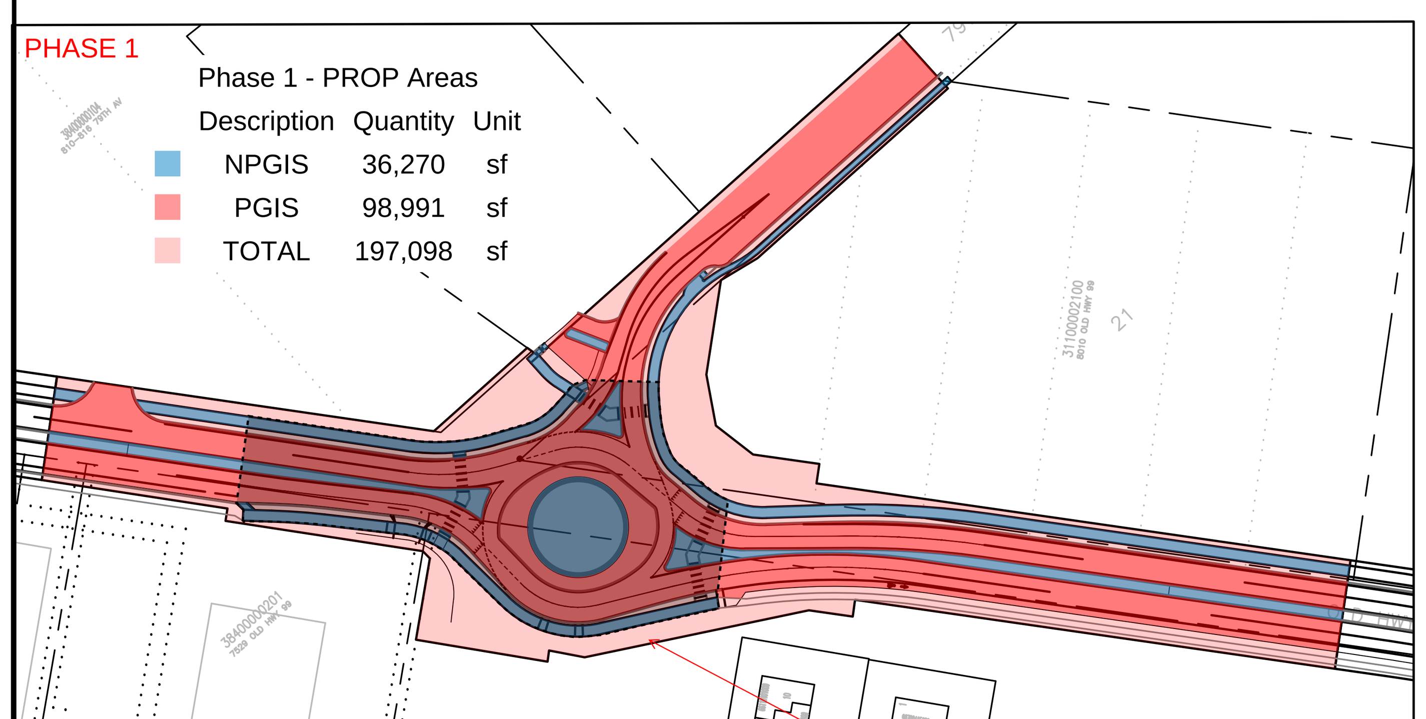
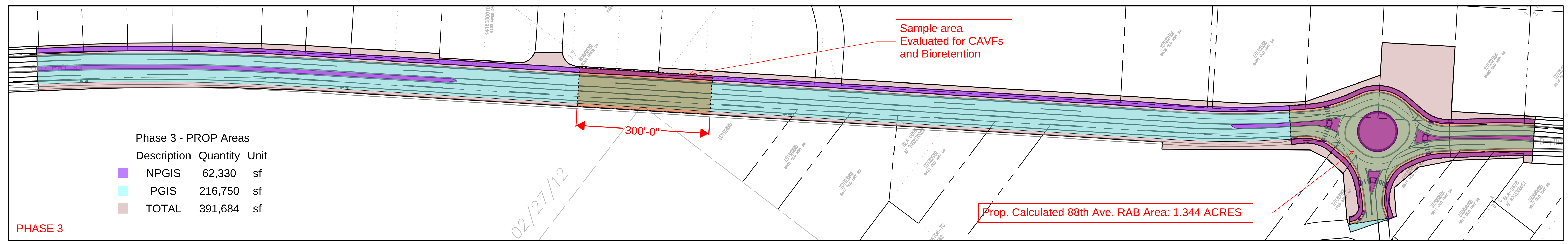
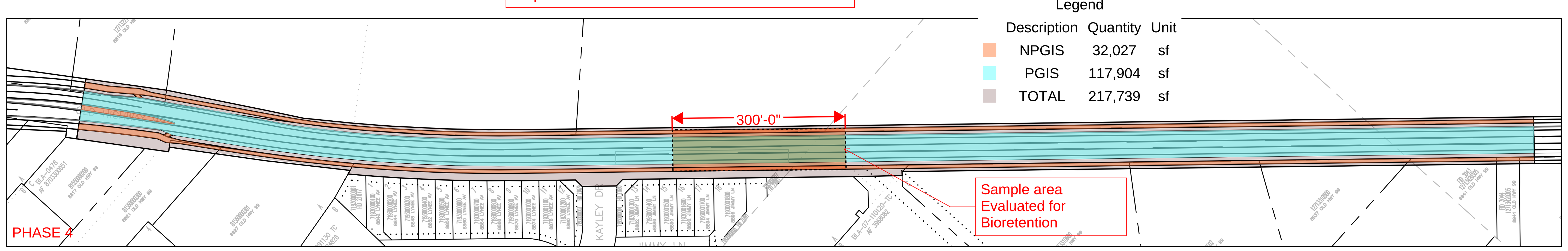
SCALE IN FEET









PHASE 1 – 79TH AVENUE ROUNDABOUT

PGIS =	98,990.57
NPGIS =	36,269.37
NPGPS =	61,838.56
Total =	197,098.50

PHASE 2 – 73RD AVENUE TO 79TH AVENUE

PGIS =	252,461.60
NPGIS =	72,038.34
NPGPS =	129,604.26
Total =	454,104.20

PHASE 3 – 79TH AVENUE TO 88TH AVENUE

PGIS =	216,749.80
NPGIS =	62,331.12
NPGPS =	112,602.38
Total =	391,683.30

PHASE 4 – 88TH AVENUE TO WYATT COURT

PGIS =	117,903.20
NPGIS =	32,023.97
NPGPS =	67,811.11
Total =	217,738.30

PHASE 5 – WYATT COURT TO 93RD AVENUE

PGIS =	218,709.00
NPGIS =	65,690.06
NPGPS =	130,477.84
Total =	414,876.90

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CITY OF TUMWATER
555 ISRAEL ROAD SW
TUMWATER, WA 98501

OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON

PROPOSED BASINS - EXHIBIT

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Appendix C – Stormwater Flow Charts

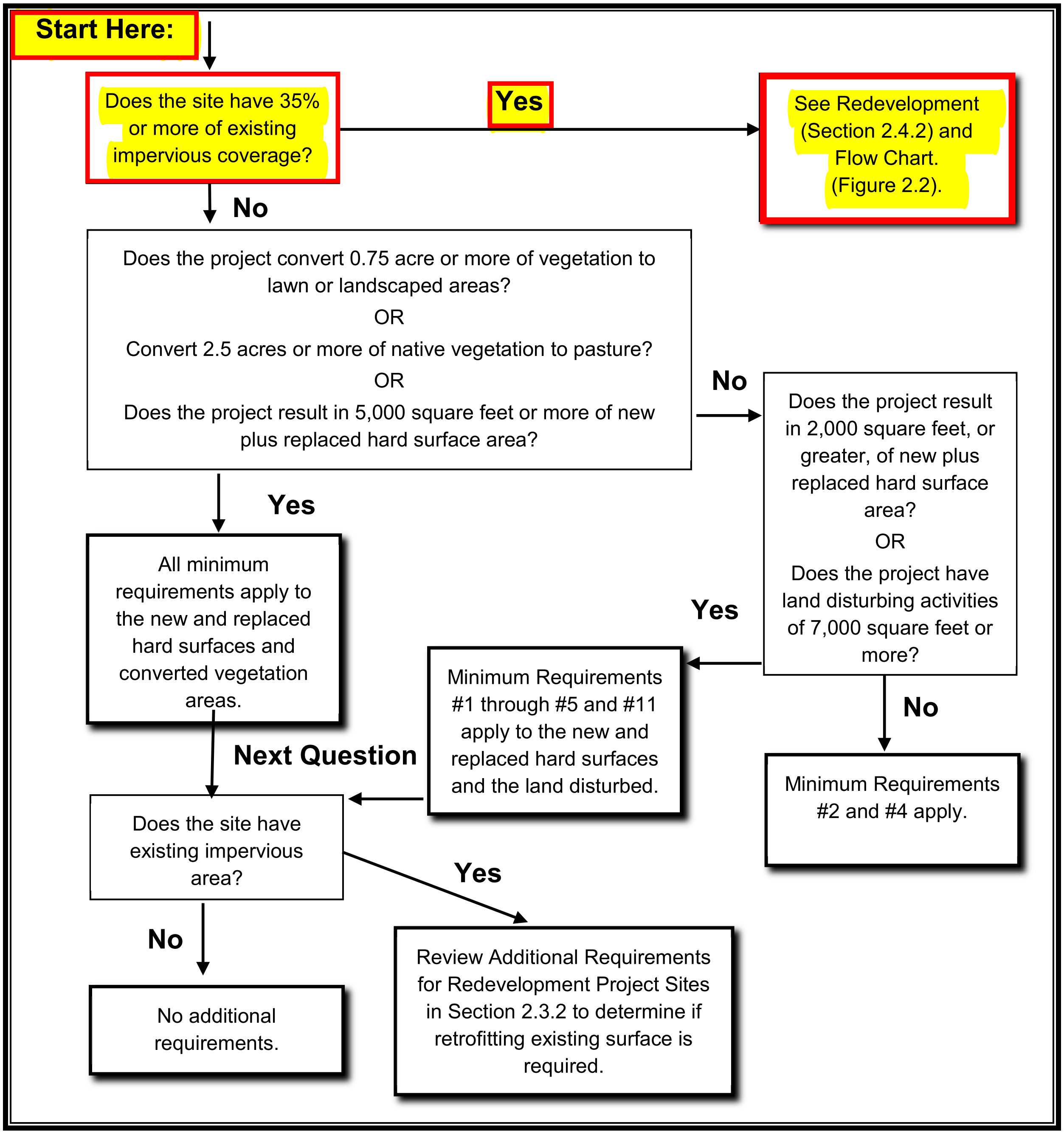


Figure 2.1. Flow Chart for Determining Requirements for New Development.

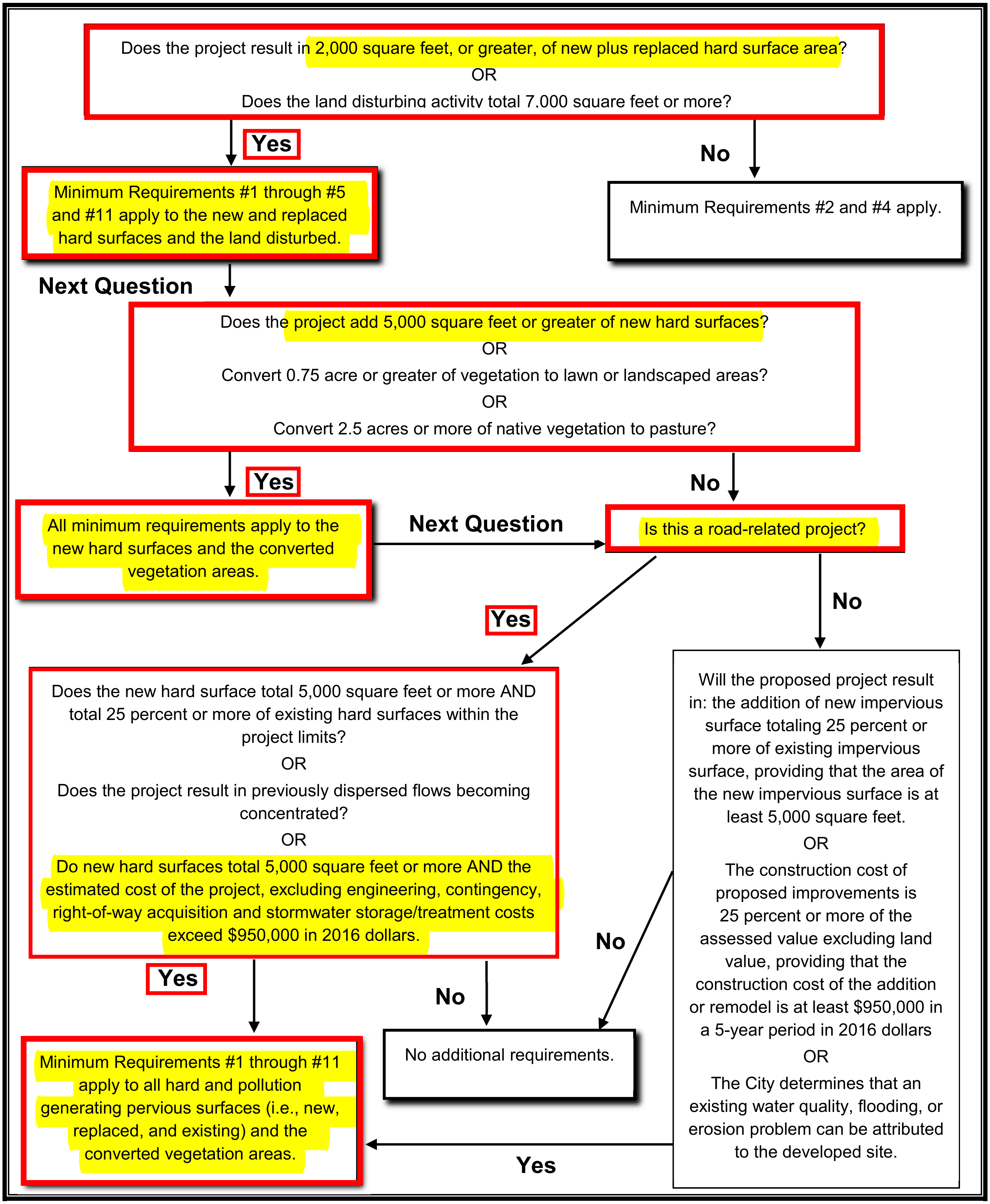


Figure 2.2. Flow Chart for Determining Requirements for Redevelopment.

FLOW CHART FOR ROADWAY WITH AND WITHOUT CURB AND GUTTERS

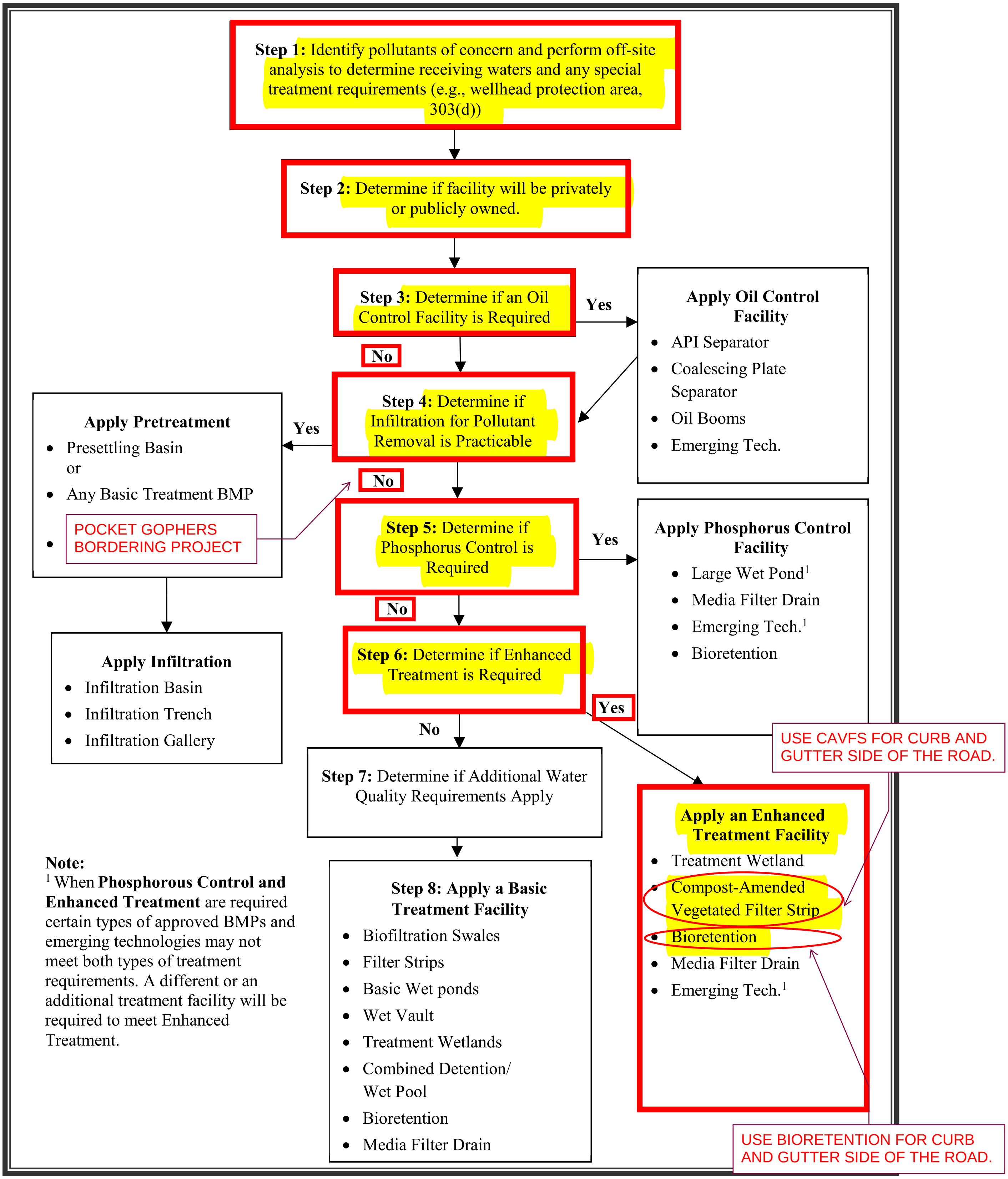


Figure 4.2. Treatment Facility Selection Flow Chart.

FLOW CHART FOR ROUNDABOUTS

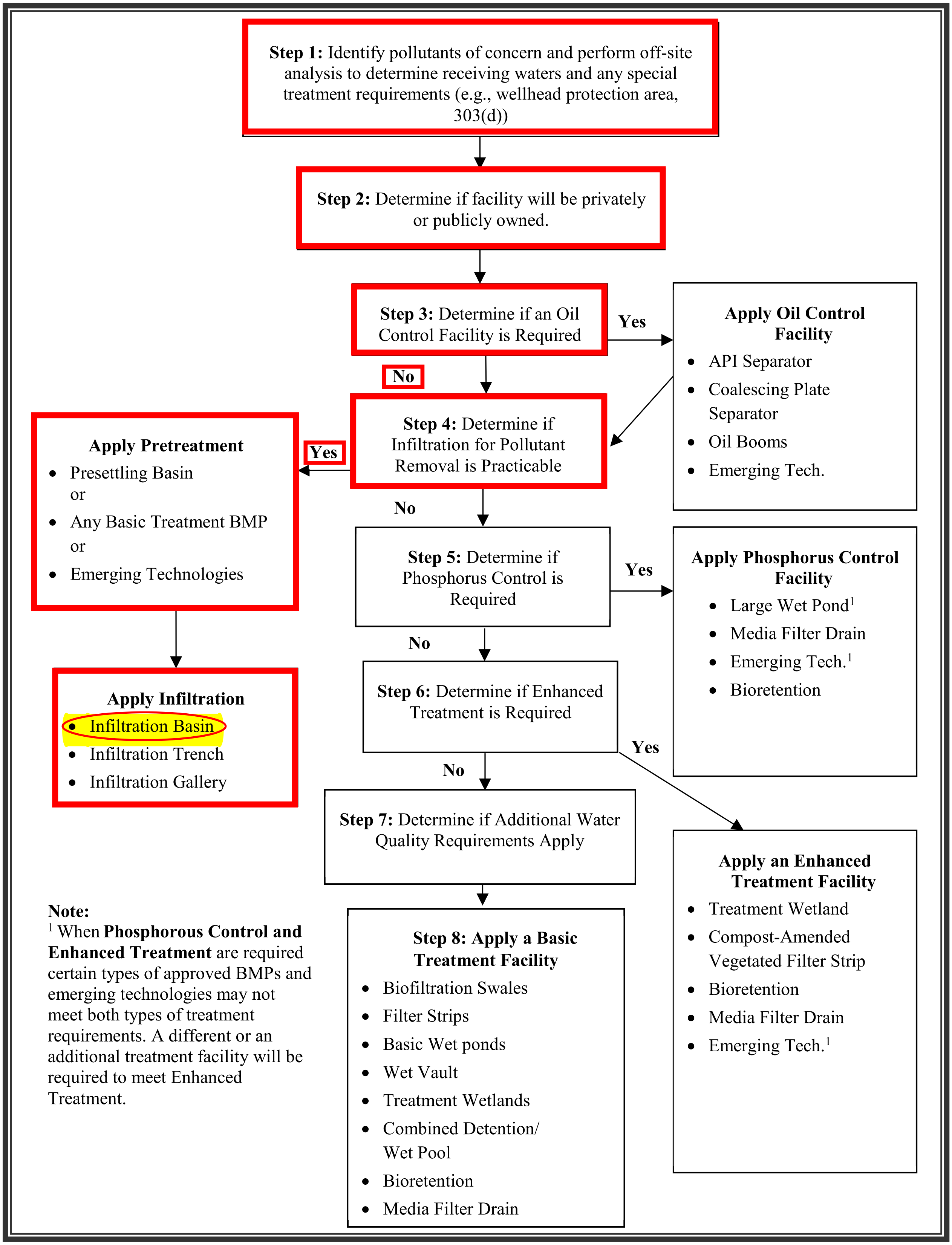


Figure 4.2. Treatment Facility Selection Flow Chart.

Appendix D – HWA Geotechnical Report

PRELIMINARY DRAFT GEOTECHNICAL REPORT
Tumwater Old Hwy 99 and 79th Ave Corridor Study
Tumwater, Washington

HWA Project No. 2019-183-21

Prepared for
SCJ Alliance

October 12, 2022

HWA GEOSCIENCES INC.
DBE/MWBE

Geotechnical Engineering
Pavement Engineering
Geoenvironmental
Hydrogeology
Inspection & Testing

HWA GEOSCIENCES INC.
DBE/MWBE

October 12, 2022
HWA Project No. 2019-183-21

SCJ Alliance
8730 Tallon Lane NE, Suite 200
Olympia, Washington 98516

Attn: Patrick Holm, P.E.

Subject: **Preliminary Draft Geotechnical Report**
Tumwater Old Hwy 99 and 79th Ave Corridor Study
Tumwater, Washington

Dear Patrick,

As requested, HWA GeoSciences Inc. (HWA) has completed a preliminary draft geotechnical report for the Old Hwy 99 and 79th Ave Corridor Study project in Tumwater, Washington. This report presents the results of our field explorations and laboratory testing along with our recommendations pertaining to luminaire foundations and infiltration feasibility.

We appreciate the opportunity to provide geotechnical engineering services on this project. If you have any questions regarding this report or require additional information or services, please contact the undersigned at your convenience.

Sincerely,

HWA GEOSCIENCES INC.

JoLyn Gillie, P.E.
Principal Geotechnical Engineer

Joe Westergreen
Geotechnical Engineer

TABLE OF CONTENTS Page

Table of Contents (Continued)

PRELIMINARY DRAFT GEOTECHNICAL REPORT
TUMWATER OLD HWY 99 AND 79TH AVE CORRIDOR STUDY
TUMWATER, WASHINGTON

1.0 INTRODUCTION

1.1 GENERAL

This report summarizes the results of a preliminary geotechnical engineering investigation performed by HWA GeoSciences, Inc. (HWA) for the Tumwater Old Highway 99 and 79th Avenue Corridor Study in Tumwater, Washington. The approximate location of the project site is shown on the Site and Vicinity Map, Figure 1, and on the Site and Exploration Plans, Figures 2A through 2C. Our field work included logging and drilling of three (3) boreholes to evaluate soil and groundwater conditions along the project corridor. Laboratory tests were conducted on select soil samples to estimate preliminary infiltration potential, water quality treatment potential, and to determine relevant engineering properties.

1.2 PROJECT UNDERSTANDING

It is our understanding that the project involves validating and building on the *Tumwater City Plan 2036, Transportation Master Plan November 2016*, and preparing a preliminary design for the Old Highway 99 corridor improvements from approximately 73rd Avenue SE to 93rd Avenue SE. We understand the project includes transportation and alternatives analysis to determine and recommend a roadway cross section and intersection improvements at Henderson Boulevard, 79th Avenue SE, 88th Avenue SE, and 93rd Avenue SE in context with the overall corridor improvements.

2.0 FIELD INVESTIGATION AND LABORATORY TESTING

2.1 SUBSURFACE EXPLORATIONS

HWA logged the drilling of three (3) machine-drilled geotechnical borings, designated BH-1 through BH-3, to assess subsurface conditions. The locations of the explorations are shown on the Site and Exploration Plans, Figures 2A through 2C. The borings were drilled by Holocene Drilling of Puyallup, Washington on August 12, 2022, under subcontract to HWA, using a Diedrich D-50 track-mounted drill rig equipped with hollow-stem augers. The boring depths varied from approximately 30.9 to 40.9 feet below ground surface (bgs).

In each boring, Standard Penetration Test (SPT) sampling was performed using a 2-inch outside diameter split-spoon sampler driven by a 140-pound automatic hammer. During the SPT, samples were obtained by driving the sampler 18 inches into the soil with the hammer free-falling 30 inches. The numbers of blows required for each 6 inches of penetration were recorded. The Standard Penetration Resistance ("N-value") of the soil is calculated as the number of blows required for the final 12 inches of penetration. This resistance, or N-value, provides an indication of relative density of granular soils and the relative consistency of cohesive soils; both indicators of soil strength.

A geotechnical engineer from HWA logged the explorations and recorded all pertinent information. Soil samples obtained from the borings were classified in the field and representative portions were sealed in plastic bags. Pertinent information including soil sample depths, stratigraphy, soil engineering characteristics, and groundwater occurrence was recorded. These soil samples were then taken to our Bothell, Washington, laboratory for further examination and testing.

The stratigraphic contacts shown on the individual exploration logs represent the approximate boundaries between soil types; actual transitions may be more gradual. The soil and groundwater conditions depicted are only for the specific date and location reported and, therefore, are not necessarily representative of other locations and times. A legend of the terms and symbols used on the exploration logs is presented in Appendix A, Figure A-1. Summary logs of the explorations are presented on Figures A-2 through A-4.

2.3 LABORATORY TESTING

Laboratory tests were conducted on selected samples retrieved from our explorations to characterize infiltration potential, water quality potential, and relevant engineering and index parameters of the soils encountered at the site. The tests included visual classifications, determination of natural moisture contents, grain size distribution analyses, and organic matter testing. In addition, select samples were sent to SoilTest Farm Consultants, Inc. in Moses Lake, Washington, for cation exchange capacity (CEC) and organic matter testing. The tests were conducted in general accordance with appropriate American Society for Testing and Materials (ASTM) standards. CEC tests were conducted in general accordance with Environmental Protection Agency (EPA) method 9081.

A brief description of laboratory test methodology is presented in Appendix B. The test results are presented in Appendix B and displayed on the boring logs in Appendix A, as appropriate. Test results from SoilTest Farm Consultants, Inc. are presented in Appendix C.

3.0 SITE CONDITIONS

3.1 Site Topography and Surface Conditions

The project area is relatively flat with elevation changes of approximately 35 feet over the approximate 2.7-mile-long project alignment. The roadway generally consists of one travel lane in each direction with occasional turn lanes. The northern portion of the alignment is generally bordered by the Olympia Regional Airport and commercial properties. The southern portion of the alignment is generally bordered by residential properties.

3.2 General Geologic Conditions

The project alignment is located within the Puget Lowland. The Puget Lowland has repeatedly been occupied by a portion of the continental glaciers that developed during the ice ages of the Quaternary period. During at least four periods, portions of the ice sheet advanced south from British Columbia into the lowlands of western Washington. The southern extent of these glacial advances was near Olympia, Washington. Each major advance included numerous local advances and retreats, and each advance and retreat resulted in its own sequence of erosion and deposition of glacial lacustrine, outwash, till, and drift deposits. Between and following these glacial advances, sediments from the Olympic and Cascade Mountains accumulated in the Puget Sound Lowland.

Specific geologic information for the project area was obtained from the Geologic Map of the Maytown 7.5-minute Quadrangle, Thurston County, Washington (Logan et al., 2009). The map indicates the project area is generally underlain by deposits of recessional outwash, generally consisting of sand and silt with minor interbeds of gravel. This material is anticipated to be deposited in meltwater derived from stagnant ice and drainage from glacial lakes. The material is generally loose to medium dense.

3.3 Subsurface Soil Conditions

Our explorations were drilled in lightly vegetated areas adjacent to Old Highway 99. At the surface we generally encountered a thin topsoil layer (less than 4 inches thick). Below the topsoil we generally encountered fill (except in BH-2), overlying recessional outwash, over glacial till or advance outwash. Brief descriptions of the soil units observed in our explorations are presented below in order of deposition, beginning with the most recently deposited.

Fill: Fill was encountered in borings BH-1 and BH-3 to approximately 1-foot bgs. The fill generally consisted of medium dense, slightly silty, slightly sandy, gravel.

Recessional Outwash: Recessional outwash was encountered in all borings below the surficial fill or ground surface to depths of approximately 25 to 40 feet bgs. The material generally consists of loose to medium dense, slightly silty to silty sand. In boring BH-3, intermittent layers of soft to stiff, sandy silt were observed between 15 and 25 feet bgs, and an approximate 1-foot-thick layer of stiff clay was encountered at approximately 30 feet bgs.

Glacial Till – Glacial till was encountered below the recessional outwash in BH-3 starting at 40 feet bgs and extending to the maximum depth explored of 40.9 feet bgs. Material consisted of very dense, gravelly, silty sand.

Advance Outwash – Advance outwash was encountered below the recessional outwash in BH-1 and BH-2 starting at depths of approximately 25 to 30 feet and extending the maximum depths explored of 30.9 to 36.5 feet bgs. The advance outwash generally consists of dense to very dense, slightly silty to silty sand.

3.4 GROUNDWATER

Groundwater was encountered during drilling on August 12, 2022, in all borings. Groundwater was encountered at approximately 13, 16, and 20 feet bgs, in borings BH-1, BH-2, and BH-3, respectively. Groundwater levels are anticipated to vary along the project alignment, and to vary seasonally with the highest levels in the wet winter months. If excavations extend below the groundwater table dewatering will be required.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 GENERAL

Based on our subsurface explorations the recessional outwash above the groundwater table is suitable for infiltration of stormwater, however the rates are highly variable. The design of the infiltration facility will depend on the type of facility, the proposed depth of the bottom of the facility, and the required separation between the base of the infiltration facility and the groundwater table. Once the facilities are selected, HWA should review to confirm that there is adequate separation and/or if additional testing/analyses are required to size the proposed facility.

The recessional outwash material is loose and does not meet the assumed lateral bearing pressure values for a City of Tumwater standard luminaire foundation design. We recommend that a non-standard foundation design be conducted to size the foundations for the project luminaires based on the data provided.

Our recommendations for infiltration suitability, luminaire foundations, and general earthwork are discussed in the subsequent sections.

4.2 Evaluation of Infiltration Potential of Site Soils

4.2.1 Feasibility of Using Infiltration

We understand there is desire to infiltrate stormwater as part of the project improvements, if feasible. The feasibility of using infiltration as part of the stormwater management for this site was evaluated in accordance with the 2022 City of Tumwater Drainage Design and Erosion Control Manual (DDECM).

Groundwater was encountered in our explorations while drilling at depths between 13 and 20 feet bgs during drilling. We did not see signs of shallow groundwater during drilling, such as iron oxidation mottling. However, groundwater levels are anticipated to vary seasonally and along the project alignment. In addition, in BH-3, we observed a restrictive layer above the water table consisting of stiff sandy silt starting at 14.5 feet bgs.

Feasibility of using specific infiltration best management practices (BMPs) will depend on the type of facility used and their respective depths of separation required for design. Infiltration BMPs consist of facilities which each have a set of feasibility requirements. These can be grouped into two groups, one being infiltration basins, trenches, and galleries, and the other being bioretention, permeable pavement, and rain gardens.

Infiltration Basins, Trenches, and Galleries

Per the DDECM, infiltration basins, trenches, and galleries require 6 feet of separation between the bedrock, water table, or impermeable layer. This may be decreased to 3 feet with additional testing and performance of mounding analyses. The depth to the groundwater table applies to the highest seasonal groundwater level. At this time, we have the groundwater levels observed in borings completed during the summer, which may not indicate the highest groundwater depth. To account for this, we conclude that the base of the facilities would likely to be limited to about 4 feet bgs to provide the necessary separation without additional testing and analyses. If use of infiltration basins, trenches, or galleries are desired, HWA should review the proposed facilities to determine if additional testing would be needed to ascertain the highest groundwater levels and if mounding analyses would need to be performed.

Bioretention, Permeable Pavement, and Rain Gardens

Based on the requirements of the three BMPs bioretention, permeable pavement, and rain gardens, these infiltration BMPs allow lower depths of separation between the bottom of the facility and the underlying bedrock, water table, or impermeable layer. The bottom of the facilities for these BMPs are generally within about 3 feet of the ground surface. The depths of separation range from 1 foot for permeable pavement and rain gardens, and some smaller bioretention facilities, to 3 feet for bioretention facilities servicing larger impervious areas. No mounding analyses are required, such that we conclude that bioretention, permeable pavement, and rain gardens are all feasible for this project site and could be used for stormwater management without further testing.

4.2.2 Design Infiltration Rate

The City of Tumwater DDECM indicates that soil infiltration rates can be determined by pilot infiltration tests (PITs) or soil grain size analysis (for sites underlain by Type A soils). Based on our explorations, mapped geology, and the United States Department of Agriculture (USDA) soils maps, the native soils encountered in our explorations above the groundwater table consist of recessional outwash soils consistent with Type A Soils.

We used grain size distributions as outlined in Method 2 in Appendix "A" of Volume V of the City of Tumwater DDECM to determine initial saturated hydraulic conductivity. This method is adopted from the WSDOT publication of *A Design Manual for Sizing Infiltration Ponds* (Massmann, 2003). Our grain size analysis results in estimated saturated hydraulic conductivity of the soils ranging from 4 in/hr to 30 in/hr within the recessional outwash encountered in our borings above the groundwater table. The correction factors used are based on the recommendations from the 2022 City of Tumwater DDECM and are summarized below:

- Test Method ($F_{testing}$) – 0.4 for the grain-size analysis method
- Geometry ($F_{geometry}$) – 1.0 based on estimated width of the infiltration facility (W) and depth (D) to groundwater table as provided in Appendix V-A.2.1 of the DDECM. This assumes the depth to width ratio (D/W) is greater than 0.25 and will need to be confirmed once the dimensions of the proposed facility are determined.
- Plugging ($P_{plugging}$) – 0.8 for the fine sands and loamy sands observed in our explorations.

After applying the correction factors, the design infiltration rates ranged from 1 to 9 inches per hour. Table 1 presents preliminary design infiltration rates based on grain-size analysis for each sample tested. We understand that PITs will be completed at the locations of the proposed infiltration facilities to determine the final design infiltration rate for each facility.

Table 1. Preliminary Design Infiltration Rates (based on grain-size analysis)

Boring	USCS Classification	Sample Depth (feet)	D_{10} Value (mm)	D_{60} Value (mm)	D_{90} Value (mm)	% Fines	Combined Correction Factor	Design Infiltration Rate (in/hr)
BH-1	SM	2.5-4.0	0.01	0.11	0.22	49.8	0.32	1.2
BH-1	SP-SM	5.0-6.5	0.07	0.18	0.24	11.2	0.32	9.7
BH-1	SM	7.5-9.0	0.06	0.19	0.28	12.8	0.32	8.7
BH-2	SM	2.5-4.0	0.03	0.21	0.40	27.1	0.32	3.8
BH-2	SP-SM	5.0-6.5	0.01	0.10	0.17	39.9	0.32	1.9
BH-2	SM	7.5-9.0	0.05	0.19	0.29	13.5	0.32	7.9
BH-3	SM	2.5-4.0	0.02	0.15	0.27	23.8	0.32	4.2
BH-3	SP-SM	5.0-6.5	0.01	0.15	0.23	25.2	0.32	3.8
BH-3	SM	7.5-9.0	0.01	0.015	0.18	24.6	0.32	3.9

4.2.3 Soil Suitability for Water Quality Treatment

To evaluate the potential of the existing soils to provide water quality treatment, laboratory tests were conducted on the upper 3 samples from each of our explorations to determine the cation exchange capacity (CEC) and organic matter content of the soil within anticipated potential infiltration depths. The laboratory test results are summarized in Table 2 below.

Table 2: Cation Exchange Capacity and Organic Matter Content

Boring	Sample	Depth (ft)	CEC (meq/100g)	Organic Matter (%)
BH-1	S-1	2.5-4	5.3	1.1
BH-1	S-2	5-6.5	5.5	1.2
BH-1	S-3	7.5-9	3.2	0.8
BH-2	S-1	2.5-4	5.3	1.6
BH-2	S-2	5-6.5	6.9	1.6
BH-2	S-3	7.5-9	7.3	1.1
BH-3	S-1	2.5-4	8.7	4.8
BH-3	S-2	5-6.5	7.8	2.1
BH-3	S-3	7.5-9	7.3	1.9

The 2022 City of Tumwater DDECM indicates that soil must have a CEC greater than or equal to 5 milliequivalents per 100 grams of dry soil, and an organic content great than 1 percent to provide adequate treatment.

Based on the laboratory test results, most of the material tested meets the water quality requirements, expect for the material in boring BH-1 at depth between 7.5 to 9 feet bgs. As this depth is anticipated to be much deeper than the base of the facility, we conclude that the site soils will meet the water quality treatment requirements.

4.2.4 Subgrade Preparation for Infiltration Facilities

Prior to installation of infiltration facilities, the subgrade should be cut to the base of the infiltration facility. Once the soil is cut to the base of the facility, the exposed soils should be verified by the geotechnical engineer, or their representative, to confirm that they are similar to materials tested for the infiltration analyses. Given the variability of site soils, the depth of the receptor soil may differ across the site. The existing subgrade under areas used for infiltration **should not** be compacted or subjected to excessive construction equipment traffic prior to installation. Where erosion of subgrade occurs during construction and has caused accumulation of fine materials and/or surface ponding, this material shall be removed with light equipment and the underlying soils scarified to a minimum depth of 8 inches. Once prepared, the geotechnical engineer should inspect the subgrade to verify that it is suitable to provide the recommended infiltration rates.

4.3 LUMINAIRE FOUNDATION RECOMMENDATIONS

We understand that the project will include installation of new luminaires. We reviewed the City of Tumwater Standard Luminaire Foundation Plan (Plan No. ST-25). The standard foundation plan is designed for 2,000 pounds per square foot (psf) for average soil lateral bearing pressure.

Based on our explorations, the luminaire foundations will be installed within soils that provide lateral bearing pressures lower than those required by the applicable City of Tumwater standard plan. Based on Table 17-2 of the Washington State Department of Transportation Geotechnical Design Manual (WSDOT, 2022), we estimate the average allowable lateral bearing pressure for the upper 8 feet of 1,200 psf.

Based on the loose soil observed in our explorations, a non-standard design is recommended. Non-standard designs can be designed using Brom's method recommended in the *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* (AASHTO, 2013). The estimated friction angle and passive pressure to assume when using the Brom's method are provided below in Table 3.

Table 3 – Recommended Design Parameters for Non-Standard Luminaire Foundations

Φ (deg)	Kp	Moist Unit Weight (pcf)	Buoyant Unit Weight (pcf)	Factor of Safety
30	3.0	120	45.6	3

4.4 CONSTRUCTION CONSIDERATIONS FOR LUMINAIRE FOUNDATIONS

The loose sand and silty sand encountered in our explorations will be prone to caving. We recommend that temporary casing be used for the proposed shaft excavations to limit caving of the on-site material during construction. If shaft excavations extend below the groundwater table, the contractor should be prepared to flood the casing with water or suitable drilling fluid, should it become apparent that water infiltration into the casing will result in potential disturbance to the soils that can impact their ability to provide lateral resistance.

Drilled shaft bottoms should be cleaned to the extent practical using appropriate methods. If more than 12 inches of water are present in the shaft, concrete should be placed by the tremie method into the shafts. Temporary casing should be withdrawn such that the level of concrete is maintained above the bottom of the casing at all times and at such elevations to counteract any potential hydrostatic effects associated with groundwater conditions that may be present at the location of the work.

All luminaire shaft locations should also be evaluated to confirm that the proposed excavations do not conflict with existing utilities.

4.5 RECOMMENDATIONS FOR EARTHWORK

Earthwork is anticipated for the corridor improvements. General recommendations for earthwork are provided in the following sections.

4.5.1 Sidewalk and Road Subgrade Preparation

A geotechnical engineer, or qualified earthwork technician, should evaluate the subgrade soils for walkways and pavements to confirm that the exposed subgrade will provide adequate support for the proposed structure to be placed. Suitable soils are anticipated to be encountered at the base of the excavations for the improvements; however, if loose or soft soils are encountered, they should be removed and replaced with properly compacted structural fill.

In areas proposed to accommodate sidewalk or road shoulder, subgrade preparation should begin with the removal of all topsoil, deleterious material, and vegetation. Using a smooth bucket, the soils should be excavated to the proposed subgrade elevation. The Geotechnical Engineer, or their representative, should evaluate the exposed subgrade soils for the walls and walkway to confirm that the exposed subgrade will provide adequate support for the proposed structure to be placed. Suitable soils are anticipated to be encountered at the base of the excavations for the improvements; however, if loose or soft soils are encountered, they should be removed and replaced with properly compacted structural fill.

4.5.2 Structural Fill Materials and Compaction

Where structural fill is needed to replace unsuitable soils or to construct the pavement section it should consist of Crushed Surfacing Top Course (CSTC), or Crushed Surfacing Base Course (CSBC) as specified in Section 9-03.9(3) of the WSDOT Standard Specifications (WSDOT, 2022) and for the thicknesses provided by the project plans. Structural fill used to raise site grades, or backfill utility trench excavations, should consist of granular materials such as Gravel Borrow, meeting the requirements of Section 9-03.14(1) of the Standard Specifications (WSDOT, 2022). Structural fill soils for these uses should be moisture conditioned, placed in loose horizontal lifts 8 inches thick or less, and compacted to at least 95% of the maximum dry density (MDD) as determined using test method ASTM D1557 (Modified Proctor).

Achievement of proper density of a compacted fill depends on the size and type of compaction equipment, the number of passes, thickness of the layer being compacted and soil moisture-density properties. In areas where limited space restricts the use of heavy equipment, smaller equipment can be used, but the soil must be placed in thin enough layers to achieve the required relative compaction. Generally, loosely compacted soils result from poor construction technique and/or improper moisture content. Soils with high fines contents are particularly susceptible to becoming too wet, and coarse-grained materials easily become too dry for proper compaction.

A Geotechnical Engineer, or their representative, should perform full-time construction monitoring of all fill placement and compaction operations. If the on-site soils are placed either too wet or too dry of optimum moisture content, or if the soils are inadequately compacted, significant settlement should be anticipated.

4.5.3 Temporary Slopes and Excavations

Any temporary excavations deeper than 4 feet should be sloped or shored in accordance with Part N of the Washington Administrative Code (WAC) 296-155 or shored. The recessional outwash soils encountered classify as Type C soils. Temporary excavations in Type C soils may be no steeper than 1.5H:1V to meet safety requirements for worker access during construction. The recommended maximum allowable temporary cut slope inclinations are applicable to temporary excavations above the water table only. Flatter slopes may be required where groundwater seepage in present.

The contractor should monitor the stability of the temporary cut slopes and adjust the construction schedule and slope inclination accordingly. The contractor should be responsible for control of ground and surface water and should employ sloping, slope protection, ditching, sumps, dewatering, and other measures as necessary to prevent sloughing of soils. If temporary shoring is required instead, the design and implementation is the responsibility of the contractor.

4.5.4 Temporary Erosion Control

We recommend that temporary erosion control incorporate Best Management Practices (BMP's) to reduce the potential for erosion at the proposed site during construction. These measures include an erosion control plan that specifies methods for limiting activity during wet periods, placement of a silt retention system on the downslope side of the alignment, and proper disposal or recompaction of any materials that are disturbed on the site.

4.5.4 Wet Weather Earthwork

General recommendations relative to earthwork performed in wet weather or in wet conditions are presented below. These recommendations should be incorporated into the contract specifications.

- Earthwork should be performed in small areas to minimize exposure to wet weather. Excavation or the removal of unsuitable soil should be followed promptly by the placement and compaction of clean structural fill. The size and type of construction equipment used may have to be limited to prevent soil disturbance. Under some circumstances, it may be necessary to excavate soils with a backhoe to minimize subgrade disturbance that may be caused by equipment traffic.

- For wet weather conditions, material used as structural fill should consist of clean granular soil with less than 5 percent passing the U.S. Standard No. 200 sieve, based on wet sieving the fraction passing the ¾-inch sieve. The fine-grained portion of the structural fill soils should be non-plastic. It should be noted that this is an additional restriction on the structural fill materials specified.

- The ground surface within the construction area should be graded to promote run-off of surface water and to prevent the ponding of water.

- The ground surface within the construction area should be sealed on completion of each shift by a smooth drum vibratory roller, or equivalent, and under no circumstances should soil be left uncompacted and exposed to moisture.

- Bales of straw and/or geotextile silt fences should be strategically located to control erosion and the movement of soil.

5.0 CONDITIONS AND LIMITATIONS

We have prepared this report for SCJ Alliance and the City of Tumwater for use in design of this project. This report should be provided in its entirety to prospective contractors for bidding and estimating purposes; however, the conclusions and interpretations presented in this report should not be construed as a warranty of existing subsurface conditions. Experience has shown that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions can occur between exploration locations and may not be detected by a geotechnical study of this nature. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, HWA should be notified for review of the recommendations of this report, and revision of such if necessary.

Sufficient geotechnical monitoring, testing, and consultation should be provided during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should conditions revealed during construction differ from those anticipated, and to verify that geotechnical aspects of construction comply with the contract plans and specifications.

Within the limitations of scope, schedule and budget, HWA attempted to execute these services in accordance with generally accepted professional principles and practices in the fields of geotechnical engineering and engineering geology in the area at the time the report was prepared. No warranty, express or implied, is made.

HWA does not practice or consult in the field of safety engineering. We do not direct the contractor's operations and cannot be responsible for the safety of personnel other than our own on the site. As such, the safety of others is the responsibility of the contractor. The contractor should notify the owner if any of the recommended actions presented herein are considered unsafe.

We appreciate the opportunity to be of service to you on this project.

Sincerely,

HWA GEOSCIENCES INC.

Joe Westergreen, P.E. Geotechnical Engineer	JoLyn Gillie, P.E. Principal Geotechnical Engineer

6.0 REFERENCES

AASHTO, 2013, *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* 6th Edition, Washington D.C.

Logan, Robert L.; Walsh Timothy J.; Stanton, Benjamin W.; Sarikhan, Isabelle Y.; *Geologic Map of the Maytown 7.5-minute Quadrangle, Thurston County, Washington*, Washington State Department of Natural Resources, Geologic Map GM-72, scale 1:24,000. February 2009.

Massmann, Joel W, *A Design Manual for Sizing Infiltration Ponds*, Washington State Transportation Commission, October 2003.

Tumwater, 2022, *City of Tumwater Drainage Design and Erosion Control Manual Volume V – Stormwater BMPs*, City of Tumwater, revised July 2022.

United States Department of Agriculture Natural Resources Conservation Services, Web Soil Survey: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

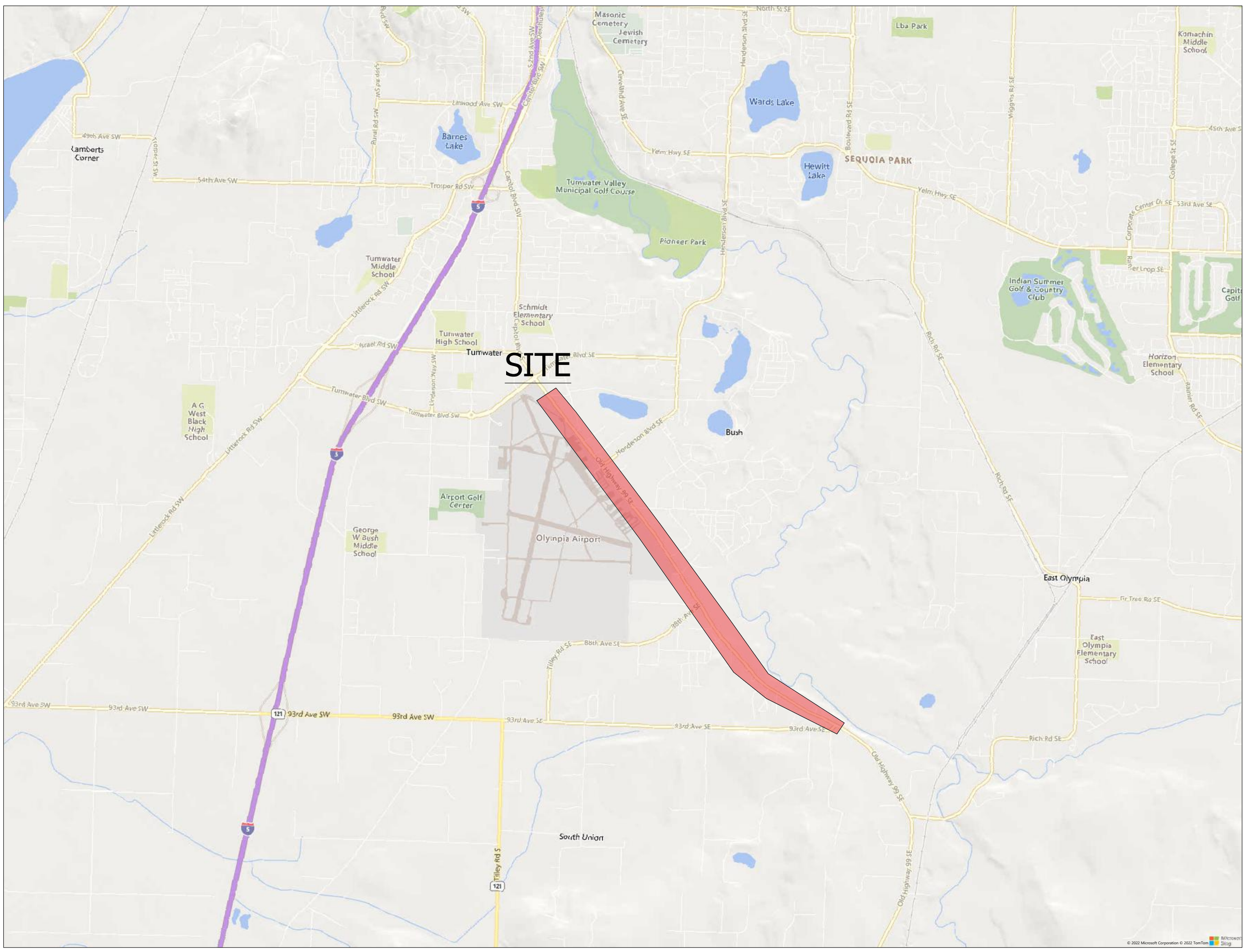
WSDOT, 2022, *Geotechnical Design Manual*, Washington State Department of Transportation, dated February 20, 2022.

WSDOT, 2022*, Standard Specifications for Road, Bridge, and Municipal Construction, 2021* Washington State Department of Transportation. M 41-10.

SITE MAP

0 1500' 3000' 4500' 6000'

SCALE: 1" = 3000'



VICINITY MAP

0 3000' 6000' 9000' 12000'

SCALE: 1" = 6000'

GEOSCIENCES INC.
DBE/MWBE

SITE AND VICINITY MAP

TUMWATER OLD HWY 99 AND 79TH AVE
CORRIDOR STUDY
TUMWATER, WASHINGTON

FIGURE NO.:	
1	
DRAWN BY:	CHECK BY:
CF	JTW
PROJECT #	
2019-183-21	

C:\USERS\CFRY\DESKTOP\2019-183-21 TUMWATER SR 99_73RD TO 93RD AVENUE\2019-183-21 TUMWATER SR 99.DWG <1> Plotted: 9/22/2022 4:01 PM

CAPITAL BLVD SE / OLD HIGHWAY 99 SE
Scale: 1" = 100'-0"

EXPLORATION LEGEND

BH-1 BOREHOLE DESIGNATION AND APPROXIMATE LOCATION

0 50 100 150 200
SCALE: 1" = 100'

HWA GEOSCIENCES INC.
DBE/MWBE

TUMWATER OLD HWY 99 AND 79TH AVE
CORRIDOR STUDY
TUMWATER, WASHINGTON

SITE &
EXPLORATION PLAN

DRAWN BY:	FIGURE NO.:
CF	2A
CHECK BY:	PROJECT NO.:
JTW	2019-183-21

BASE MAP PROVIDED BY: BING

C:\USERS\CFRY\DESKTOP\2019-183-21 TUMWATER SR 99_73RD TO 93RD AVENUE\2019-183-21 TUMWATER SR 99.DWG <2A> Plotted: 9/16/2022 4:54 PM

OLD HIGHWAY 99 SE
Scale: 1" = 100'-0"

EXPLORATION LEGEND

BH-2 ⊕ BOREHOLE DESIGNATION AND APPROXIMATE LOCATION

0 50 100 150 200
SCALE: 1" = 100'

BASE MAP PROVIDED BY: BING

HWA GEOSCIENCES INC. DBE/MWBE

TUMWATER OLD HWY 99 AND 79TH AVE
CORRIDOR STUDY
TUMWATER, WASHINGTON

SITE &
EXPLORATION PLAN

DRAWN BY:	FIGURE NO.:
CF	2B
CHECK BY:	PROJECT NO.:
JTW	2019-183-21

C:\USERS\CFRY\DESKTOP\2019-183-21 TUMWATER SR 99_73RD TO 93RD AVENUE\2019-183-21 TUMWATER SR 99.DWG <2B> Plotted: 9/16/2022 4:54 PM

OLD HIGHWAY 99 SE

Scale: 1" = 100'-0"

EXPLORATION LEGEND

BH-3 BOREHOLE DESIGNATION AND APPROXIMATE LOCATION

0 50 100 150 200

SCALE: 1" = 100'

HWA GEOSCIENCES INC. DBE/MWBE

TUMWATER OLD HWY 99 AND 79TH AVE CORRIDOR STUDY
TUMWATER, WASHINGTON

SITE & EXPLORATION PLAN

DRAWN BY:	FIGURE NO.:
CF	2C
CHECK BY:	PROJECT NO.:
JTW	2019-183-21

BASE MAP PROVIDED BY: BING

C:\USERS\CFRY\DESKTOP\2019-183-21 TUMWATER SR 99_73RD TO 93RD AVENUE\2019-183-21 TUMWATER SR 99.DWG <2C> Plotted: 9/16/2022 4:55 PM

APPENDIX A

FIELD EXPLORATIONS

RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N-VALUE

COHESIONLESS SOILS			COHESIVE SOILS		
Density	N (blows/ft)	Approximate Relative Density(%)	Consistency	N (blows/ft)	Approximate Undrained Shear Strength (psf)
Very Loose	0 to 4	0 - 15	Very Soft	0 to 2	<250
Loose	4 to 10	15 - 35	Soft	2 to 4	250 - 500
Medium Dense	10 to 30	35 - 65	Medium Stiff	4 to 8	500 - 1000
Dense	30 to 50	65 - 85	Stiff	8 to 15	1000 - 2000
Very Dense	over 50	85 - 100	Very Stiff	15 to 30	2000 - 4000
			Hard	over 30	>4000

USCS SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP DESCRIPTIONS	
Coarse Grained Soils More than 50% Retained on No. 200 Sieve Size	Gravel and Gravelly Soils More than 50% of Coarse Fraction Retained on No. 4 Sieve	Clean Gravel (little or no fines)	GW	Well-graded GRAVEL
			GP	Poorly-graded GRAVEL
		Gravel with Fines (appreciable amount of fines)	GM	Silty GRAVEL
			GC	Clayey GRAVEL
	Sand and Sandy Soils 50% or More of Coarse Fraction Passing No. 4 Sieve	Clean Sand (little or no fines)	SW	Well-graded SAND
			SP	Poorly-graded SAND
		Sand with Fines (appreciable amount of fines)	SM	Silty SAND
			SC	Clayey SAND
Fine Grained Soils 50% or More Passing No. 200 Sieve Size	Silt and Clay	Liquid Limit Less than 50%	ML	SILT
			CL	Lean CLAY
			OL	Organic SILT/Organic CLAY
	Silt and Clay	Liquid Limit 50% or More	MH	Elastic SILT
			CH	Fat CLAY
			OH	Organic SILT/Organic CLAY
Highly Organic Soils			PT	PEAT

TEST SYMBOLS

%F	Percent Fines
AL	Atterberg Limits: PL = Plastic Limit, LL = Liquid Limit
CBR	California Bearing Ratio
CN	Consolidation
DD	Dry Density (pcf)
DS	Direct Shear
GS	Grain Size Distribution
K	Permeability
MD	Moisture/Density Relationship (Proctor)
MR	Resilient Modulus
OC	Organic Content
pH	pH of Soils
PID	Photoionization Device Reading
PP	Pocket Penetrometer (Approx. Comp. Strength, tsf)
Res.	Resistivity
SG	Specific Gravity
CD	Consolidated Drained Triaxial
CU	Consolidated Undrained Triaxial
UU	Unconsolidated Undrained Triaxial
TV	Torvane (Approx. Shear Strength, tsf)
UC	Unconfined Compression

SAMPLE TYPE SYMBOLS

2.0" OD Split Spoon (SPT) (140 lb. hammer with 30 in. drop)

Shelby Tube

Non-standard Penetration Test (3.0" OD Split Spoon with Brass Rings)

Small Bag Sample

Large Bag (Bulk) Sample

Core Run

3-1/4" OD Split Spoon

GROUNDWATER SYMBOLS

▽ Groundwater Level (measured at time of drilling)

▼ Groundwater Level (measured in well or open hole after water level stabilized)

COMPONENT DEFINITIONS

COMPONENT	SIZE RANGE
Boulders	Larger than 12 in
Cobbles	3 in to 12 in
Gravel	3 in to No 4 (4.5mm)
Coarse gravel	3 in to 3/4 in
Fine gravel	3/4 in to No 4 (4.5mm)
Sand	No. 4 (4.5 mm) to No. 200 (0.074 mm)
Coarse sand	No. 4 (4.5 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Smaller than No. 200 (0.074mm)

COMPONENT PROPORTIONS

PROPORTION RANGE	DESCRIPTIVE TERMS
< 5%	Clean
5 - 12%	Slightly (Clayey, Silty, Sandy)
12 - 30%	Clayey, Silty, Sandy, Gravelly
30 - 50%	Very (Clayey, Silty, Sandy, Gravelly)

Components are arranged in order of increasing quantities.

NOTES: Soil classifications presented on exploration logs are based on visual and laboratory observation.
Soil descriptions are presented in the following general order:

Density/consistency, color, modifier (if any) GROUP NAME, additions to group name (if any), moisture content. Proportion, gradation, and angularity of constituents, additional comments. (GEOLOGIC INTERPRETATION)

Please refer to the discussion in the report text as well as the exploration logs for a more complete description of subsurface conditions.

MOISTURE CONTENT

DRY	Absence of moisture, dusty, dry to the touch.
MOIST	Damp but no visible water.
WET	Visible free water, usually soil is below water table.

HWA GEOSCIENCES INC.

Tumwater Old Hwy 99 and 79th Ave Corridor Study
Tumwater, Washington

LEGEND OF TERMS AND SYMBOLS USED ON EXPLORATION LOGS

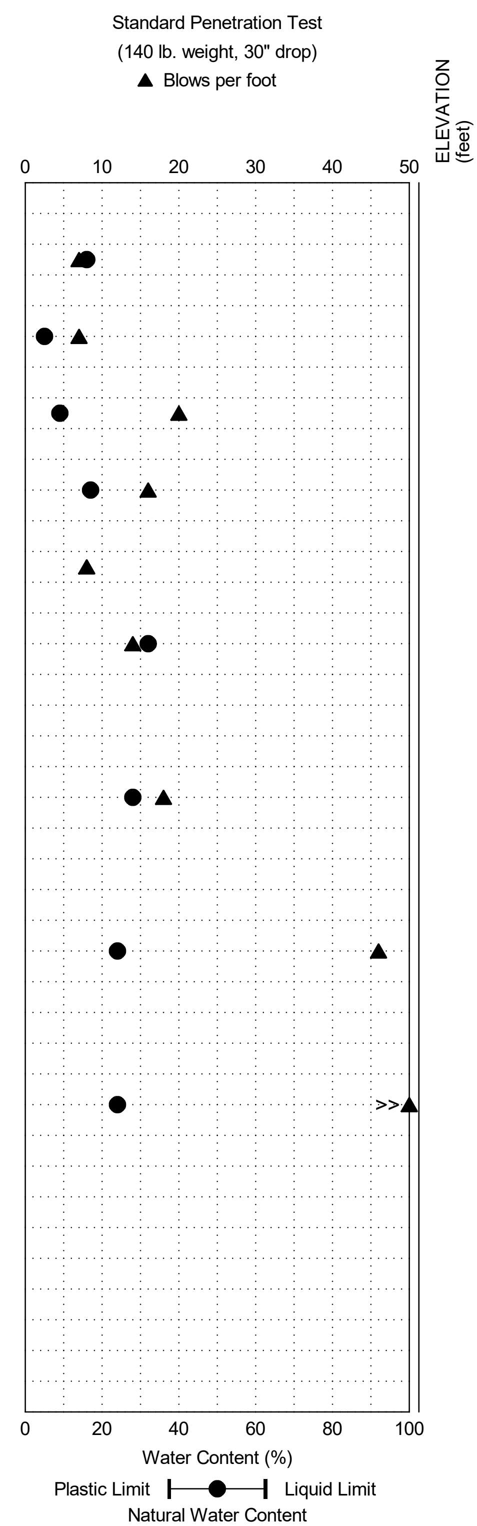
PROJECT NO.: 2019-183-21 FIGURE: A-1

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Track Rig with HSA
SAMPLING METHOD: SPT w/ Autohammer
LOCATION: See Figure 2

DATE STARTED: 8/12/2022
DATE COMPLETED: 8/12/2022
LOGGED BY: J. Westergreen

DEPTH (feet)	USCS SOIL CLASS	DESCRIPTION	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
0	GW GM	Medium dense, slightly silty, slightly sandy, GRAVEL, moist. **(FILL)**				
	SM	Loose, dark brown, very silty, SAND, moist. **(RECESSIONAL OUTWASH)** CEC = 5.3 meq/100g. OC = 1.1%.	S-1	3-3-4	GS OC	
5	SP SM	Loose, gray, slightly silty, SAND, moist. CEC = 5.5 meq/100g. OC = 1.2%.	S-2	3-3-4	GS OC	
	SM	Medium dense, gray, silty SAND, moist. CEC = 3.2 meq/100g. OC = 0.8%.	S-3	5-9-11	GS OC	
10			S-4	6-8-8		
		Becomes loose, wet.	S-5	4-4-4		∇
15		Becomes medium dense.	S-6	2-6-8		
20			S-7	3-7-11		
25	SP SM	Dense, gray, slightly silty, SAND, wet. **(ADVANCE OUTWASH)**	S-8	9-13-33		
30		Becomes very dense.	S-9	32-50/5"		

Boring terminated at 30.9 feet below ground surface (bgs).
Groundwater encountered at 13 feet bgs while drilling.



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Tumwater Old Hwy 99 and 79th Ave Corridor Study
Tumwater, Washington

BORING: BH-1

PAGE: 1 of 1

PROJECT NO.: 2019-183-21 FIGURE: A-2

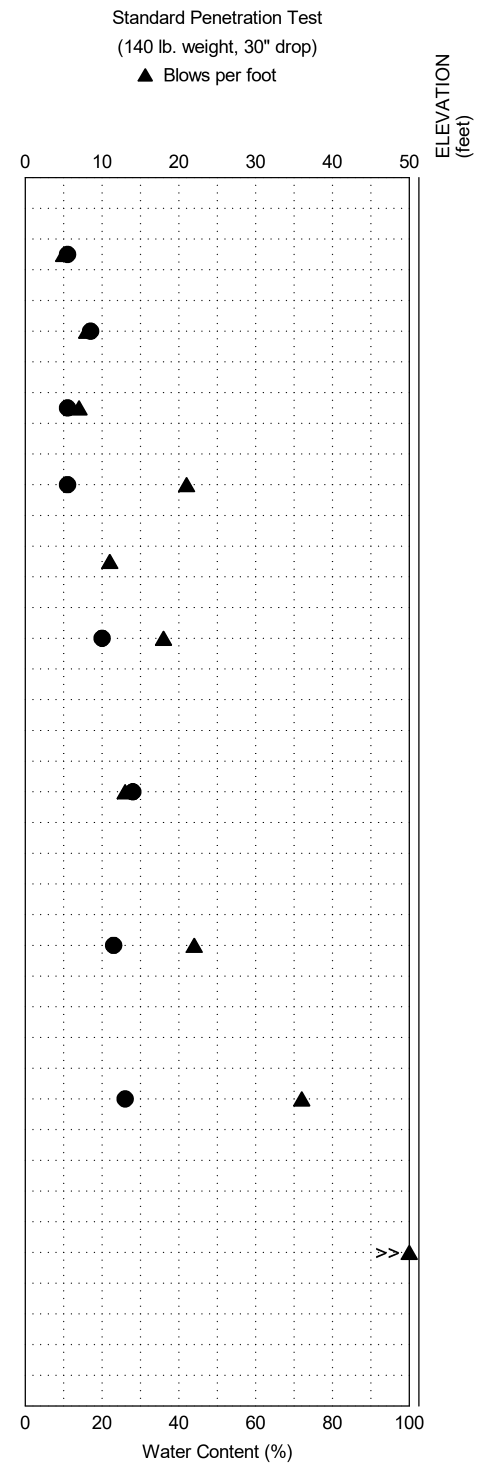
BORING-DSM 2019-183-21.GPJ 9/23/22

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Track Rig with HSA
SAMPLING METHOD: SPT w/ Autohammer
LOCATION: See Figure 2

DATE STARTED: 8/12/2022
DATE COMPLETED: 8/12/2022
LOGGED BY: J. Westergreen

DEPTH (feet)	USCS SOIL CLASS	DESCRIPTION	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
0	SP SM	Loose, gray, slightly silty, SAND, moist. **(RECESSIONAL OUTWASH)**				
2.5	SM	Loose, gray, silty SAND. Trace organics. CEC = 5.3 meq/100g. OC = 1.6%.	S-1	2-2-3	GS OC	
5		Becomes very silty. CEC = 6.9 meq/100g. OC = 1.6%.	S-2	2-3-5	GS OC	
7.5		Becomes silty. CEC = 7.3 meq/100g. OC = 1.1%.	S-3	4-4-3	GS OC	
10	SP SM	Medium dense, gray, slightly silty SAND, moist.	S-4	5-9-12		
12.5			S-5	3-3-8		
15		Becomes wet.	S-6	8-9-9		▽ (16 ft)
20	SM	Medium dense, gray, silty SAND, wet.	S-7	5-6-7		
25			S-8	2-9-13		
30	SM	Dense, gray, silty SAND, wet. **(ADVANCE OUTWASH)**	S-9	9-17-19		
35		Grades to very dense.	S-10	9-17-40		

Boring terminated at 36.5 feet bgs.
Groundwater encountered at 16 feet bgs while drilling.



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Tumwater Old Hwy 99 and 79th Ave Corridor Study
Tumwater, Washington

BORING:
BH-2

PAGE: 1 of 1

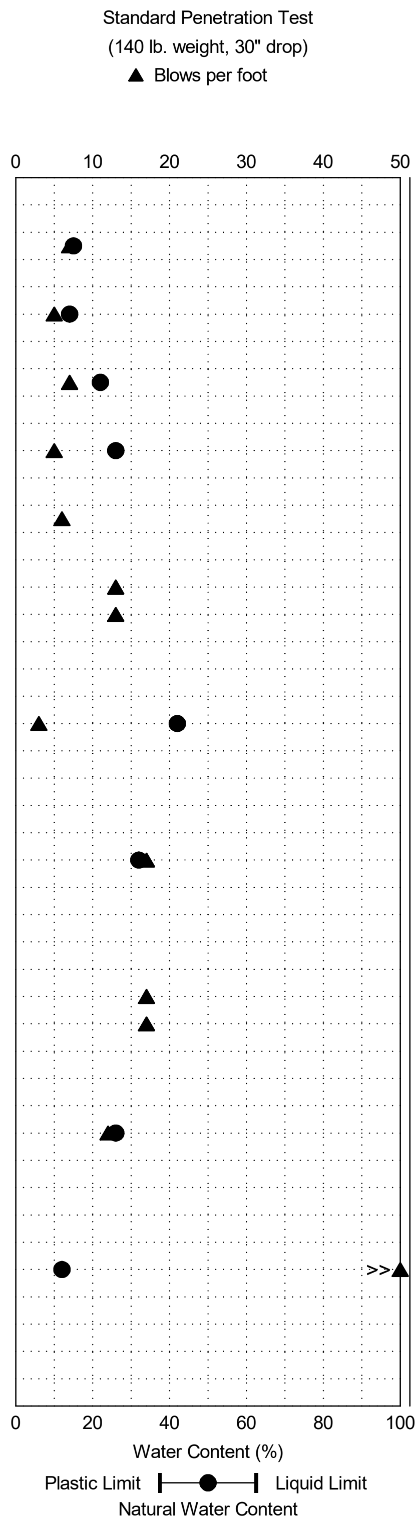
PROJECT NO.: 2019-183-21 FIGURE: A-3

BORING-DSM 2019-183-21.GPJ 9/23/22

DRILLING COMPANY: Holocene Drilling
DRILLING METHOD: Track Rig with HSA
SAMPLING METHOD: SPT w/ Autohammer
LOCATION: See Figure 2

DATE STARTED: 8/12/2022
DATE COMPLETED: 8/12/2022
LOGGED BY: J. Westergreen

DEPTH (feet)	USCS SOIL CLASS	DESCRIPTION	SAMPLE NUMBER	PEN. RESISTANCE (blows/6 inches)	OTHER TESTS	GROUNDWATER
0	GW	Medium dense, slightly silty, slightly sandy, GRAVEL, moist. **(FILL)**				
	GM SM	Loose, dark brown, silty SAND, moist. Trace gravel. **(RECESSIONAL OUTWASH)** CEC = 8.7 meq/100g. OC = 4.8%.	S-1	3-3-4	GS OC	
5		CEC = 7.8 meq/100g. OC = 2.1%.	S-2	2-2-3	GS OC	
		No gravel. CEC = 7.3 meq/100g. OC = 1.9%.	S-3	3-3-4	GS OC	
10		Becomes gray.	S-4	3-2-3		
			S-5	3-1-5		
15	ML	Stiff, gray, sandy SILT, moist	S-6A	1-3-10		
	SM	Medium dense, gray, silty SAND, moist.	S-6B	1-3-10		
	ML	Soft, gray, sandy SILT, wet.				
20			S-7	1-0-3		▽
25	SM	Medium dense, gray, very silty, SAND, wet.	S-8	4-7-10		
30	CL	Very stiff, gray, CLAY, wet	S-9A	0-6-11		
	SM	Medium dense, gray, silty SAND, wet.	S-9B	0-6-11		
35	SP SM	Medium dense, gray, slightly silty SAND, wet.	S-10	3-5-7		
40	SM	Very dense, gray, gravelly, silty, SAND, wet.	S-11	40-50/5"		
45		Boring terminated at 40.9 feet bgs. Groundwater encountered at 20 feet bgs while drilling.				



ELEVATION (feet)

NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

HWA GEOSCIENCES INC.

Tumwater Old Hwy 99 and 79th Ave Corridor Study
Tumwater, Washington

BORING:
BH-3

PAGE: 1 of 1

PROJECT NO.: 2019-183-21 FIGURE: A-4

APPENDIX B

LABORATORY TESTING

APPENDIX B

LABORATORY TESTING

Representative soil samples obtained from the explorations were placed in plastic bags to prevent loss of moisture and transported to our Bothell, Washington, laboratory for further examination and testing. Laboratory tests were conducted on selected soil samples to characterize relevant engineering and index properties of the site soils, as described below.

MOISTURE CONTENT OF SOIL: The moisture content of selected soil samples (percent by dry mass) was determined in general accordance with ASTM D 2216. The results are shown at the sampled intervals on the appropriate summary logs in Appendix A and on the Summary of Material Properties provided on Figures B-1 and B-2 in Appendix B.

MOISTURE CONTENT, ASH, AND ORGANIC MATTER: Selected samples were tested in general accordance with method ASTM D 2974, using moisture content method 'A' (oven dried at 105^{0} C) and ash content method 'C' (burned at 440^{0} C). The results are shown at the sampled intervals on the appropriate summary logs in Appendix A and on the Summary of Material Properties provided on Figures B-1 and B-2 in Appendix B. The results are percent by weight of dry soil.

PARTICLE SIZE ANALYSIS OF SOILS: Selected samples were tested to determine the particle (grain) size distribution of material in general accordance with ASTM D 6913. The results are summarized on the attached Particle Size Analysis of Soils reports, Figures B-3 through B-5, which also provide information regarding the classification of the sample, and the moisture content at the time of testing.

EXPLORATION DESIGNATION	TOP DEPTH (feet)	BOTTOM DEPTH (feet)	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	CEC (meq/100g)	pH	ATTERBERG LIMITS (%) LL	PL	PI	% GRAVEL	% SAND	% FINES	ASTM SOIL CLASSIFICATION	SAMPLE DESCRIPTION
BH-1	2.5	4.0	15.6	1.1	5.3						50.1	49.9	SM	Dark yellowish-brown, silty SAND
BH-1	5.0	6.5	5.2	1.2	5.5						88.8	11.2	SP-SM	Light olive-brown, poorly graded SAND with silt
BH-1	7.5	9.0	8.6	0.8	3.2					0.1	87.0	12.8	SM	Olive-brown, silty SAND
BH-1	10.0	11.5	17.0										SM	Dark olive-brown, silty SAND
BH-1	15.0	16.5	32.4										SM	Dark olive-brown, silty SAND
BH-1	20.0	21.5	28.2										SM	Dark olive-brown, silty SAND
BH-1	25.0	26.5	23.6										SP-SM	Very dark brown, poorly graded SAND with silt
BH-1	30.0	30.9	23.8										SP-SM	Very dark brown, poorly graded SAND with silt
BH-2	2.5	4.0	11.2	1.6	5.3						72.9	27.1	SM	Olive-brown, silty SAND
BH-2	5.0	6.5	17.1	1.6	6.9						60.1	39.9	SM	Yellowish-brown, silty SAND
BH-2	7.5	9.0	10.8	1.1	7.3						86.5	13.5	SM	Very dark grayish-brown, silty SAND
BH-2	10.0	11.5	11.4										SP-SM	Dark brown, poorly graded SAND with silt
BH-2	15.0	16.5	20.1										SP-SM	Dark olive-brown, poorly graded SAND with silt
BH-2	20.0	21.5	27.6										SM	Very dark brown, silty SAND
BH-2	25.0	26.5	22.6										SM	Very dark brown, silty SAND
BH-2	30.0	31.5	25.9										SM	Very dark brown, silty SAND
BH-3	2.5	4.0	14.5	4.8	8.7					3.2	72.9	23.8	SM	Very dark brown, silty SAND
BH-3	5.0	6.5	14.3	2.1	7.8					2.6	72.2	25.2	SM	Very dark gray, silty SAND
BH-3	7.5	9.0	21.6	1.9	7.3						75.4	24.6	SM	Olive-brown, silty SAND
BH-3	10.0	11.5	26.0										SM	Light olive-brown, silty SAND

Notes:
1. This table summarizes information presented elsewhere in the report and should be used in conjunction with the report text, other graphs and tables, and the exploration logs.
2. The classification of soils in this table is based on ASTM D2487 and D2488 as applicable.

HWA GEOSCIENCES INC.

Tumwater Old Hwy 99 and 79th Ave Corridor Study
Tumwater, Washington

SUMMARY OF MATERIAL PROPERTIES

PROJECT NO.: 2019-183-21 FIGURE: B-1

EXPLORATION DESIGNATION	TOP DEPTH (feet)	BOTTOM DEPTH (feet)	MOISTURE CONTENT (%)	ORGANIC CONTENT (%)	CEC (meq/100g)	pH	ATTERBERG LIMITS (%) LL	PL	PI	% GRAVEL	% SAND	% FINES	ASTM SOIL CLASSIFICATION	SAMPLE DESCRIPTION
BH-3	20.0	21.5	41.9										ML	Light olive-brown, SILT with sand
BH-3	25.0	26.5	32.1										SM	Very dark brown, silty SAND
BH-3	35.0	36.5	26.4										SP-SM	Very dark brown, poorly graded SAND with silt
BH-3	40.0	41.5	12.1										SM	Dark olive-brown, silty SAND with gravel

Notes:
1. This table summarizes information presented elsewhere in the report and should be used in conjunction with the report text, other graphs and tables, and the exploration logs.
2. The classification of soils in this table is based on ASTM D2487 and D2488 as applicable.

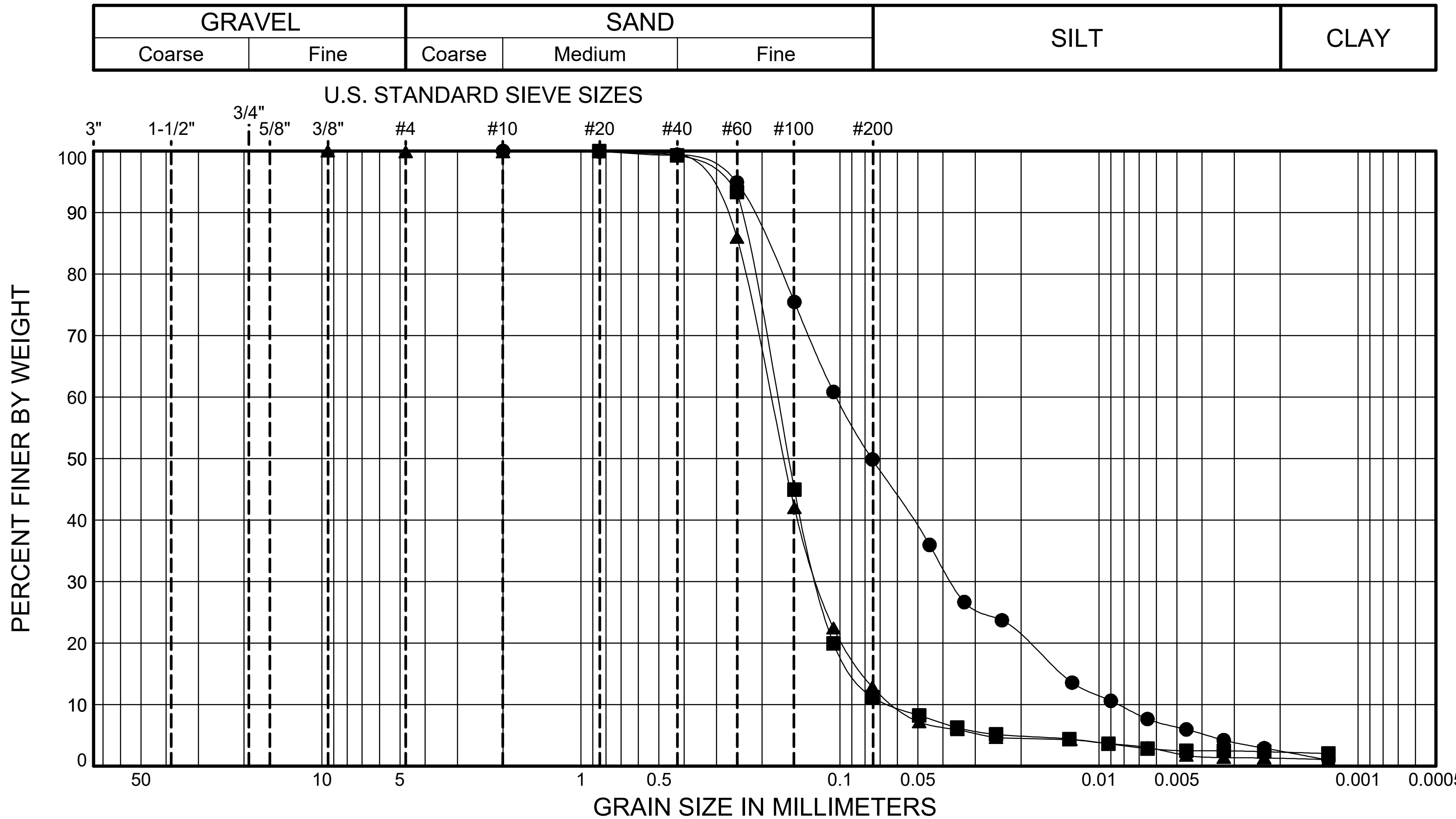
HWA GEOSCIENCES INC.

Tumwater Old Hwy 99 and 79th Ave Corridor Study
Tumwater, Washington

SUMMARY OF
MATERIAL PROPERTIES

PROJECT NO.: 2019-183-21 FIGURE: B-2

MATSUM ORG/PH/CEC_2 2019-183-21.GPJ 9/8/22



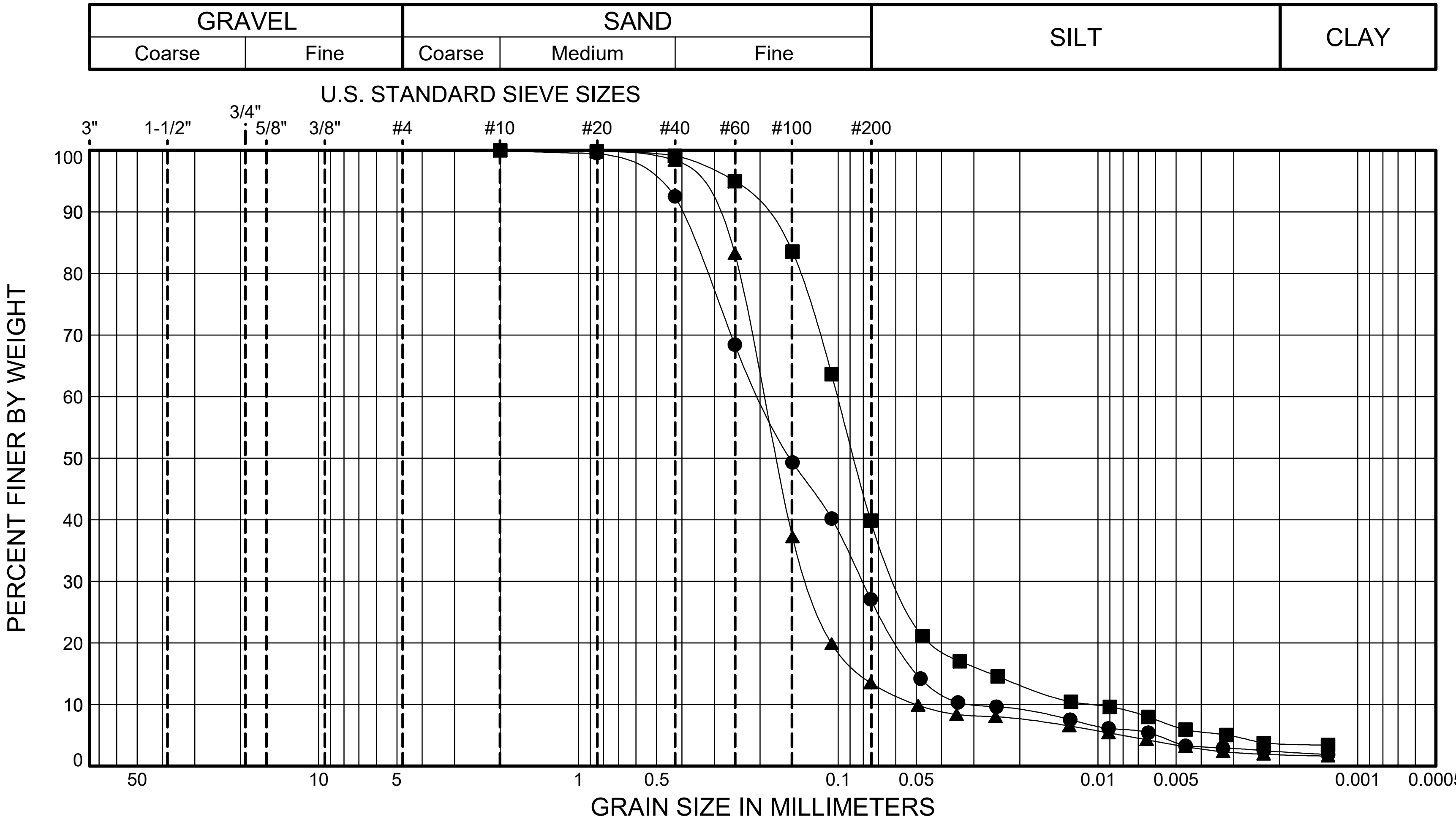
SYMBOL	SAMPLE		DEPTH (ft.)	ASTM SOIL CLASSIFICATION	% MC	LL	PL	PI	Gravel %	Sand %	Silt %	Clay %	Fines %
●	BH-1	S-1	2.5 - 4.0	(SM) Dark yellowish-brown, silty SAND	16					50.1	47.4	2.4	
■	BH-1	S-2	5.0 - 6.5	(SP-SM) Light olive-brown, poorly graded SAND with silt	5					88.8	8.9	2.3	
▲	BH-1	S-3	7.5 - 9.0	(SM) Olive-brown, silty SAND	9				0.1	87.0	11.6	1.2	

HWA GEOSCIENCES INC.

Tumwater Old Hwy 99 and 79th Ave Corridor Study
Tumwater, Washington

PARTICLE-SIZE ANALYSIS OF SOILS METHODS ASTM D6913/D7928

PROJECT NO.: 2019-183-21 FIGURE: B-3



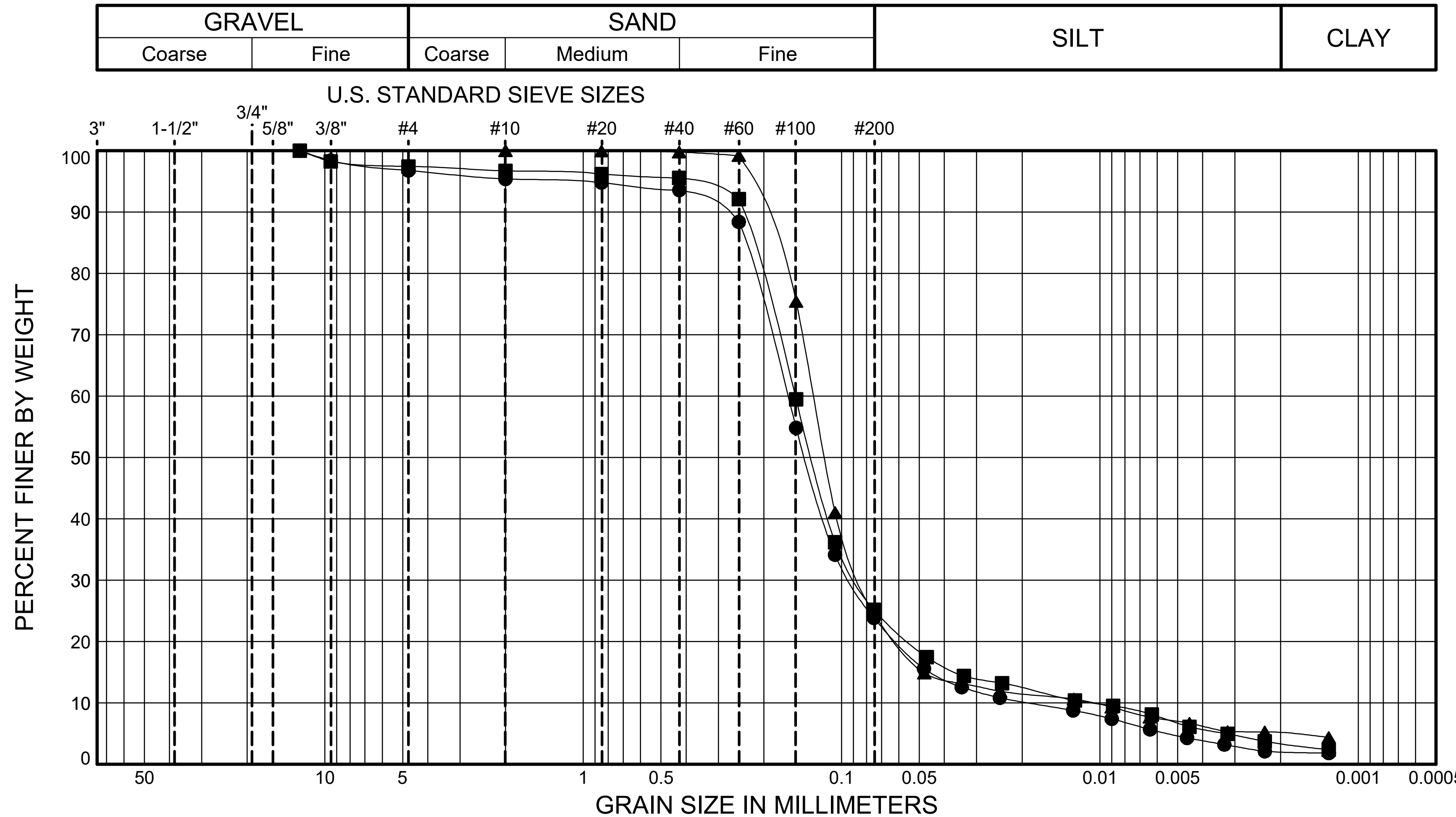
SYMBOL	SAMPLE		DEPTH (ft.)	ASTM SOIL CLASSIFICATION	% MC	LL	PL	PI	Gravel %	Sand %	Silt %	Clay %	Fines %
●	BH-2	S-1	2.5 - 4.0	(SM) Olive-brown, silty SAND	11					72.9	24.8	2.3	
■	BH-2	S-2	5.0 - 6.5	(SM) Yellowish-brown, silty SAND	17					60.1	36.2	3.7	
▲	BH-2	S-3	7.5 - 9.0	(SM) Very dark grayish-brown, silty SAND	11					86.5	11.7	1.8	

HWA GEOSCIENCES INC.

Tumwater Old Hwy 99 and 79th Ave Corridor Study
Tumwater, Washington

PARTICLE-SIZE ANALYSIS OF SOILS METHODS ASTM D6913/D7928

PROJECT NO.: 2019-183-21 FIGURE: B-4



SYMBOL	SAMPLE		DEPTH (ft.)	ASTM SOIL CLASSIFICATION	% MC	LL	PL	PI	Gravel %	Sand %	Silt %	Clay %	Fines %
●	BH-3	S-1	2.5 - 4.0	(SM) Very dark brown, silty SAND	15				3.2	72.9	21.8	2.0	
■	BH-3	S-2	5.0 - 6.5	(SM) Very dark gray, silty SAND	14				2.6	72.2	21.8	3.4	
▲	BH-3	S-3	7.5 - 9.0	(SM) Olive-brown, silty SAND	22					75.4	19.6	5.0	

HWA GEOSCIENCES INC.

Tumwater Old Hwy 99 and 79th Ave Corridor Study
Tumwater, Washington

PARTICLE-SIZE ANALYSIS
OF SOILS
METHODS ASTM D6913/D7928

PROJECT NO.: 2019-183-21 FIGURE: B-5

APPENDIX C

ADDITIONAL LABORATORY TESTING BY OTHERS

soiltest farm consultants, inc.
2925 Driggs Dr., Moses Lake, Wa 98837 - www.soiltestlab.com
Office: (509)765-1622 - Fax:(509)765-0314 - (800)764-1622

Soil PAP NAPT 2022

Soil & Plant Program 2022 NAPT Participating Laboratory

HWA GEOSCIENCES
21312 30TH DRIVE SE, STE 110

BOTHELL , WA 98021

Laboratory #: S22-18530

Date Received: 9/6/2022
Grower: #2019-183
Field: BH-1 S-1 AT 2.5FT
Sampled By:
Customer Account #:
Customer Sample ID:

Soil Test Results

Cation Exchange	CEC	meq/100g	5.3

pH 1:1		
E.C. 1:1	m.mhos/cm	
Est Sat Paste E.C.	m.mhos/cm	
Effervescence		
Ammonium - N	mg/kg	
Organic Matter W.B.	%	1.1

Other Tests:

We make every effort to provide an accurate analysis of your sample. For reasonable cause we will repeat tests, but because of factors beyond our control in sampling procedures and the inherent variability of soil, our liability is limited to the price of the tests. Recommendations are to be used as general guides and should be modified for specific field conditions and situations. Note: "u" indicates that the element was analyzed for but not detected

This is your Invoice #: S22-18530 Account #: 188200 Reviewed by: K. Bair, PhD, C List Cost: $26.00

soiltest farm consultants, inc.
2925 Driggs Dr., Moses Lake, Wa 98837 - www.soiltestlab.com
Office: (509)765-1622 - Fax:(509)765-0314 - (800)764-1622

Soil PAP NAPT 2022

Soil & Plant Program 2022 NAPT Participating Laboratory

HWA GEOSCIENCES
21312 30TH DRIVE SE, STE 110

BOTHELL , WA 98021

Laboratory #: S22-18531

Date Received: 9/6/2022
Grower: #2019-183
Field: BH-1 S-2 AT 5.0FT
Sampled By:
Customer Account #:
Customer Sample ID:

Soil Test Results

Cation Exchange	CEC	meq/100g	5.5

pH 1:1
E.C. 1:1 m.mhos/cm
Est Sat Paste E.C. m.mhos/cm
Effervescence

Ammonium - N mg/kg
Organic Matter W.B. %

Other Tests:

This is your Invoice #: S22-18531 Account #: 188200 Reviewed by: K. Bair, PhD, C List Cost: $13.00

soiltest farm consultants, inc.
2925 Driggs Dr., Moses Lake, Wa 98837 - www.soiltestlab.com
Office: (509)765-1622 - Fax:(509)765-0314 - (800)764-1622

HWA GEOSCIENCES
21312 30TH DRIVE SE, STE 110

BOTHELL , WA 98021

Laboratory #: S22-18532

Date Received: 9/6/2022
Grower: #2019-183
Field: BH-1 S-3 AT 7.5FT
Sampled By:
Customer Account #:
Customer Sample ID:

Soil Test Results

Cation Exchange	CEC	meq/100g	3.2

pH 1:1
E.C. 1:1 m.mhos/cm
Est Sat Paste E.C. m.mhos/cm
Effervescence

Ammonium - N mg/kg
Organic Matter W.B. %

Other Tests:

We make every effort to provide an accurate analysis of your sample. For reasonable cause we will repeat tests, but because of factors beyond our control in sampling procedures and the inherent variability of soil, our liability is limited to the price of the tests. Recommendations are to be used as general guides and should be modified for specific field conditions and situations. Note: "u" indicates that the element was analyzed for but not detected

This is your Invoice #: S22-18532 Account #: 188200 Reviewed by: K. Bair, PhD, C List Cost: $13.00

soiltest
farm consultants, inc.

2925 Driggs Dr., Moses Lake, Wa 98837 - www.soiltestlab.com
Office: (509)765-1622 - Fax:(509)765-0314 - (800)764-1622

Soil PAP NAPT 2022

Soil & Plant Program 2022 NAPT Participating Laboratory

HWA GEOSCIENCES
21312 30TH DRIVE SE, STE 110

BOTHELL , WA 98021

Laboratory #: S22-18533

Date Received: 9/6/2022
Grower: #2019-183
Field: BH-2 S-1 AT 2.5FT
Sampled By:
Customer Account #:
Customer Sample ID:

Soil Test Results

Cation Exchange	CEC	meq/100g	5.3

pH 1:1
E.C. 1:1 m.mhos/cm
Est Sat Paste E.C. m.mhos/cm
Effervescence

Ammonium - N mg/kg
Organic Matter W.B. %

Other Tests:

We make every effort to provide an accurate analysis of your sample. For reasonable cause we will repeat tests, but because of factors beyond our control in sampling procedures and the inherent variability of soil, our liability is limited to the price of the tests. Recommendations are to be used as general guides and should be modified for specific field conditions and situations. Note: "u" indicates that the element was analyzed for but not detected

This is your Invoice #: S22-18533 Account #: 188200 Reviewed by: K. Bair, PhD, C List Cost: $13.00

Soil PAP NAPT 2022

soiltest farm consultants, inc.
2925 Driggs Dr., Moses Lake, Wa 98837 - www.soiltestlab.com
Office: (509)765-1622 - Fax:(509)765-0314 - (800)764-1622

Soil & Plant Program 2022 NAPT Participating Laboratory

HWA GEOSCIENCES
21312 30TH DRIVE SE, STE 110

BOTHELL , WA 98021

Laboratory #: S22-18534

Date Received:	9/6/2022
Grower:	#2019-183
Field:	BH-2 S-2 AT 5.0FT
Sampled By:	
Customer Account #:	
Customer Sample ID:	

Soil Test Results

Cation Exchange	CEC	meq/100g	6.9

pH 1:1
E.C. 1:1 m.mhos/cm
Est Sat Paste E.C. m.mhos/cm
Effervescence

Ammonium - N mg/kg
Organic Matter W.B. %

Other Tests:

We make every effort to provide an accurate analysis of your sample. For reasonable cause we will repeat tests, but because of factors beyond our control in sampling procedures and the inherent variability of soil, our liability is limited to the price of the tests. Recommendations are to be used as general guides and should be modified for specific field conditions and situations. Note: "u" indicates that the element was analyzed for but not detected

This is your Invoice #: S22-18534 Account #: 188200 Reviewed by: K. Bair, PhD, C List Cost: $13.00

Soil PAP NAPT 2022

soiltest farm consultants, inc.

2925 Driggs Dr., Moses Lake, Wa 98837 - www.soiltestlab.com
Office: (509)765-1622 - Fax:(509)765-0314 - (800)764-1622

Soil & Plant Program 2022 NAPT Participating Laboratory

HWA GEOSCIENCES	Date Received: 9/6/2022
21312 30TH DRIVE SE, STE 110	Grower: #2019-183
	Field: BH-2 S-3 AT 7.5FT
BOTHELL , WA 98021	Sampled By:
Laboratory #: S22-18535	Customer Account #:
Soil Test Results	Customer Sample ID:

Cation Exchange	CEC	meq/100g	7.3

pH 1:1
E.C. 1:1 m.mhos/cm
Est Sat Paste E.C. m.mhos/cm
Effervescence

Ammonium - N mg/kg
Organic Matter W.B. %

Other Tests:

We make every effort to provide an accurate analysis of your sample. For reasonable cause we will repeat tests, but because of factors beyond our control in sampling procedures and the inherent variability of soil, our liability is limited to the price of the tests. Recommendations are to be used as general guides and should be modified for specific field conditions and situations. Note: "u" indicates that the element was analyzed for but not detected

This is your Invoice #: S22-18535 Account #: 188200 Reviewed by: K. Bair, PhD, C List Cost: $13.00

soiltest farm consultants, inc.
2925 Driggs Dr., Moses Lake, Wa 98837 - www.soiltestlab.com
Office: (509)765-1622 - Fax:(509)765-0314 - (800)764-1622

HWA GEOSCIENCES
21312 30TH DRIVE SE, STE 110

BOTHELL , WA 98021

Laboratory #: S22-18536

Date Received: 9/6/2022
Grower: #2019-183
Field: BH-3 S-1 AT 2.5FT
Sampled By:
Customer Account #:
Customer Sample ID:

Soil Test Results

Cation Exchange	CEC	meq/100g	8.7

pH 1:1
E.C. 1:1 m.mhos/cm
Est Sat Paste E.C. m.mhos/cm
Effervescence

Ammonium - N mg/kg
Organic Matter W.B. %

Other Tests:

This is your Invoice #: S22-18536 Account #: 188200 Reviewed by: K. Bair, PhD, C List Cost: $13.00

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HWA GEOSCIENCES
21312 30TH DRIVE SE, STE 110

BOTHELL , WA 98021

Laboratory #: S22-18537

Date Received: 9/6/2022
Grower: #2019-183
Field: BH-3 S-2 AT 5.0FT
Sampled By:
Customer Account #:
Customer Sample ID:

Soil Test Results

Cation Exchange	CEC	meq/100g	7.8

pH 1:1		
E.C. 1:1	m.mhos/cm	
Est Sat Paste E.C.	m.mhos/cm	
Effervescence		
Ammonium - N	mg/kg	
Organic Matter W.B.	%	2.1

Other Tests:

We make every effort to provide an accurate analysis of your sample. For reasonable cause we will repeat tests, but because of factors beyond our control in sampling procedures and the inherent variability of soil, our liability is limited to the price of the tests. Recommendations are to be used as general guides and should be modified for specific field conditions and situations. Note: "u" indicates that the element was analyzed for but not detected

This is your Invoice #: S22-18537 Account #: 188200 Reviewed by: K. Bair, PhD, C List Cost: $26.00

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Soil PAP NAPT 2022

Soil & Plant Program 2022 NAPT Participating Laboratory

HWA GEOSCIENCES
21312 30TH DRIVE SE, STE 110

BOTHELL , WA 98021

Laboratory #: S22-18538

Date Received: 9/6/2022
Grower: #2019-183
Field: BH-3 S-3 AT 7.5FT
Sampled By:
Customer Account #:
Customer Sample ID:

Soil Test Results

Cation Exchange	CEC	meq/100g	7.3

pH 1:1
E.C. 1:1 m.mhos/cm
Est Sat Paste E.C. m.mhos/cm
Effervescence

Ammonium - N mg/kg
Organic Matter W.B. %

Other Tests:

We make every effort to provide an accurate analysis of your sample. For reasonable cause we will repeat tests, but because of factors beyond our control in sampling procedures and the inherent variability of soil, our liability is limited to the price of the tests. Recommendations are to be used as general guides and should be modified for specific field conditions and situations. Note: "u" indicates that the element was analyzed for but not detected

This is your Invoice #: S22-18538 Account #: 188200 Reviewed by: K. Bair, PhD, C List Cost: $13.00

Appendix E – WWHM Model Reports

See Link:

https://drive.google.com/file/d/1RKKfC8CVoSPVHpnUv1nXDBUiEN-CQP2P/view?usp=share_link

F7) PRELIMINARY PLAN SET

S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M

REVISIONS	DATE	BY	DESIGNED BY: ##########	ISSUE DATE: SEPTEMBER 2020
PRELIMINARY			DRAWN BY: ########	JOB No.: 0625.29
			CHECKED BY: #########	DRAWING FILE No.: 0625.29-Plan Layout

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STATE OF WASHINGTON
49470
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PROFESSIONAL ENGINEER

SCJ ALLIANCE
CONSULTING SERVICES
8730 TALLON LANE NE, SUITE 200, LACEY, WASHINGTON 98516
P: 360-352-1465 F: 360-352-1509
SCJALLIANCE.COM

CITY OF TUMWATER
555 ISRAEL ROAD SW
TUMWATER, WA 98501

OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON

PLAN VIEW

DRAWING No.: EX-1

SHEET No.: 1 OF 14

Sep 13, 2022 5:09:31pm – User: david.rowland
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S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M

REVISIONS	DATE	BY

PRELIMINARY

DESIGNED BY: ##########
ISSUE DATE: SEPTEMBER 2020
DRAWN BY: ########
JOB No.: 0625.29
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DRAWING FILE No.: 0625.29-Plan Layout

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CITY OF TUMWATER
555 ISRAEL ROAD SW
TUMWATER, WA 98501

OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON

PLAN VIEW

DRAWING No.: EX-2

SHEET No.: 2 OF 14

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	REVISIONS	DATE	BY							
	PRELIMINARY			DESIGNED BY: ##########	ISSUE DATE: SEPTEMBER 2020	ALL DIMENSIONS SHOWN IN FEET UNLESS OTHERWISE DESIGNATED	PATRICK HOLM, STATE OF WASHINGTON, 49470 REGISTERED PROFESSIONAL ENGINEER	SCJ ALLIANCE CONSULTING SERVICES 8730 TALLON LANE NE, SUITE 200, LACEY, WASHINGTON 98516 P: 360-352-1465 F: 360-352-1509 SCJALLIANCE.COM	CITY OF TUMWATER 555 ISRAEL ROAD SW TUMWATER, WA 98501	OLD HIGHWAY 99 CORRIDOR STUDY TUMWATER, WASHINGTON / PLAN VIEW
				DRAWN BY: ########	JOB No.: 0625.29					DRAWING No.: EX-3
				CHECKED BY: #########	DRAWING FILE No.: 0625.29-Plan Layout					SHEET No.: 3 OF 14

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S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M

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OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON

PLAN VIEW

DRAWING No.: EX-4

SHEET No.: 4 OF 14

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OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON

PLAN VIEW

DRAWING No.: EX-5

SHEET No.: 5 OF 14

Sep 13, 2022 5:10:20pm – User: david.rowland
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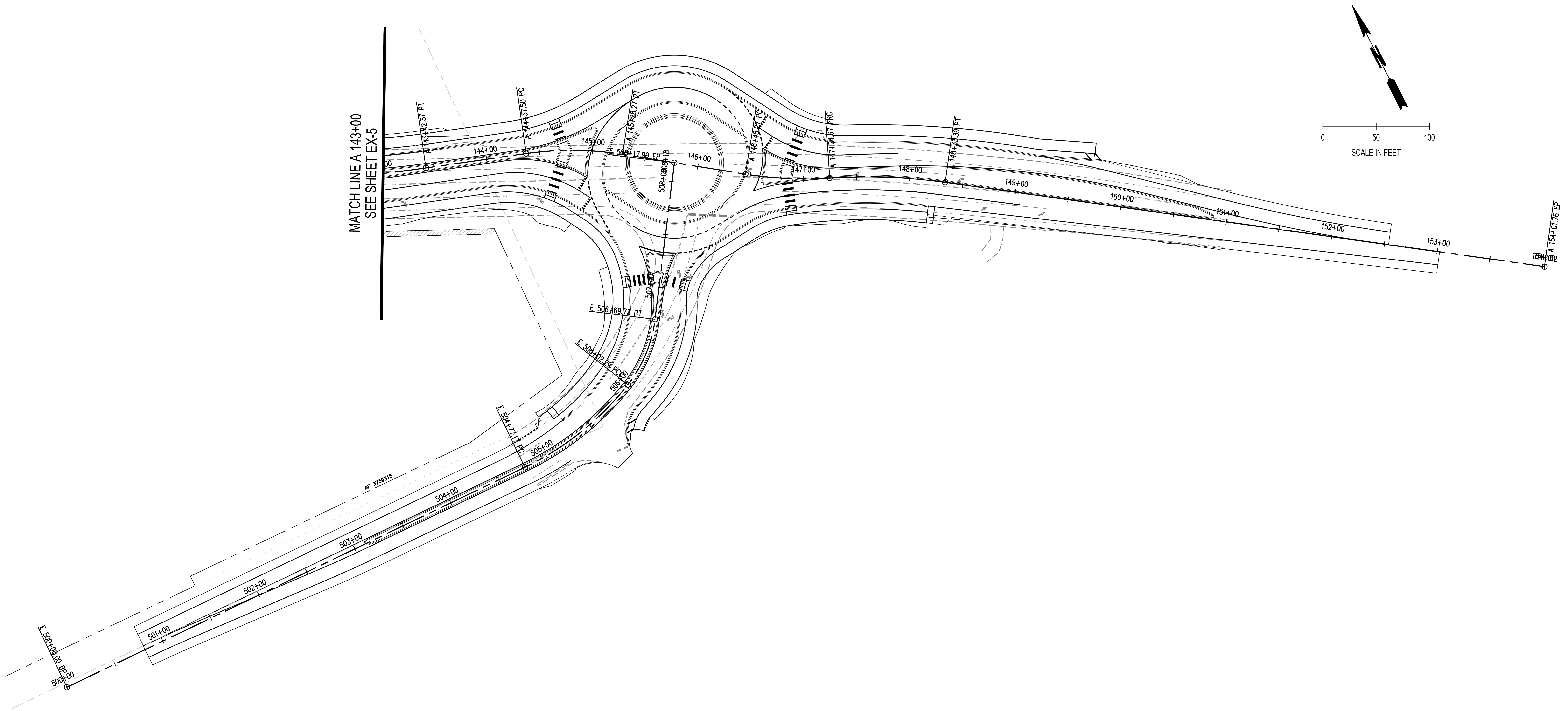
S. 2, 11, 12, 13 & 14, T. 17 N., R. 2 W., W.M



REVISIONS	DATE	BY	DESIGNED BY: ##########	ISSUE DATE: SEPTEMBER 2020
PRELIMINARY			DRAWN BY: ########	JOB No.: 0625.29
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TUMWATER, WA 98501

OLD HIGHWAY 99 CORRIDOR STUDY
TUMWATER, WASHINGTON

PLAN VIEW

DRAWING No.: EX-6

SHEET No.: 6 OF 14

APPENDIX G
- ENVIRONMENTAL TECH MEMO

SCJ ALLIANCE
CONSULTING SERVICES

Technical Memo

To	City of Tumwater
From:	David Rowland, PE
Date:	September 13, 2022
Project:	0625.29 – Old Highway 99 Corridor Study
Subject	Environmental Considerations

Introduction

Our Environmental assessment follows the premise laid out in Part 4 – Environmental Considerations from the NEPA CE Categorical Exclusion Documentation Form. Considerations include thirteen elements to identify impacts and the plan for mitigation when needed. Each of these elements are evaluated at a preliminary level to identify potential mitigation in the future and to inform where potential considerations will impact design.

1. Air Quality

Improvements to Old Highway 99 will increase capacity by adding additional lanes for the Old Highway 99 Corridor and the introduction of roundabouts at multiple intersections. Therefore, each of the phases of the project will be evaluated for the air quality impacts. Currently, no pollutants pose persistent air quality problems subject to the Clean Air Act currently. And while air quality mitigation is not anticipated, each phase of the project will have to be further evaluated prior to completion of design.

2. Critical Areas

Critical Areas for Old Highway 99 corridor improvements from 73rd avenue to 93rd avenue were evaluated for this study to determine if there were any potential mitigation needs moving forward.

Sole Source Aquifers

Looking at a map of Sole Source Aquifers from ESA ArcGIS Maps, it was determined that this project falls outside any sole source aquifers. No mitigation anticipated.

Species Habitat

Species that are impacted from the ESA list are Mazama Pocket Gopher and Streaked Horned Lark designated critical habitats or suitable habitats. Further investigation to how this project impacts these species will have to be evaluated for each phase of the project.

See **Appendix A** for Mazama Pocket Gopher Map.

Wetlands

No wetlands are present for the Old Highway 99 improvements and do not need to be considered for mitigation.

3. Cultural Resources/Historic Structures

For the Study, Cultural Resources and Historic Structures where considered. Two sites were identified as areas to be considered for the Old Highway 99 improvements.

Historic Oak Tree

Located adjacent to Old Highway 99 (formerly Pacific Highway), the garry oak tree stands between 70 and 100 feet high and is 16 feet in circumference. The Oregon white oak (Quercus garryana) or garry oak is the only native oak of Washington.

The tree is significant as a specimen tree of the garry oak species. This tree will be protected.

George Washington Bush Interpretive Site

The George Washington Bush Interpretive Site is a four-sided kiosk designed to be reminiscent of the gable of the W. O. Bush home. On the four sides are interpretative panels about the legacy of the Bush family. Two of the panels are replicas of the Jacob Lawrence George Bush Series of paintings.

This marker commemorates the legacy of the George and Isabella and William O and Mandana Bush Families. This land is part of the original Bush donation claim. The Bush family came with the first permanent American settlement to Tumwater in 1845, settling just east of this marker along the Deschutes River.

Property take will be necessary for this location due to its proximity to the proposed roundabout. There is opportunity to incorporate the interpretive site into the design of the roundabout to provide more accessibility to the site. Currently, the interpretive site is hard to access for pedestrians and bicycles because there are none accommodating facilities passing this site. Further evaluation of incorporating the design with the interpretive site will be required.

See **Appendix B** – Historic Properties Report for additional information regarding these sites.

4. Floodplains and Floodways

Evaluation of the 100-year flood revealed that improvements from 73rd Avenue to 93rd Avenue do not fall within the 100-year floodplain area. No mitigation anticipated. Refer to **Appendix C** – Flood Plan Exhibits for reference.

5. Hazardous and Problem Waste

Excavation Below Existing Ground

Roadway improvements will require the excavation of existing ground. Excavation could expose an abandoned underground storage tanks or a forgotten dump site. Known locations are near the roundabout intersections where we have stormwater bioretention facilities planned. Also, in any locations where catch basins and storm pipes are placed, this will require excavation of existing ground. In addition, illumination installation will require excavation for conduit and junction box installation. The City should consider where chemicals may have been historically used prior to enactment of modern environmental laws.

Groundwater

Thurston County's Geodata map was consulted to verify that no groundwater hazards are located on the project site. No mitigation anticipated. See **Appendix D** for High Ground Water Map.

Property Impacts

Property will have to be acquired as a part of the project to provide the amount of right of way necessary for the project. Property acquired and relocated will have to be evaluated in light of Environmental Justice as laid out in section 13.

Site Location with Respect to Development

None of the future improvements are in undeveloped areas including building, parking, storage areas, or agriculture.

Identified Sites by Department of Ecology Near Project

Upon investigation of the Department of Ecology data base, it was determined that there are three sites that fall within a ½ mile radius of the project that have a history of hazardous and problem waste. Below locations that have a history of hazardous and problem waste:

- Deschutes Animal Clinic Inc
- Pearson Air Inc.
- Gower Flying Service

All these sites have been marked complete for cleanup. There are no current hazardous and problem waste sites that border the project site limits.

Site Reconnaissance

At the intersection of 79th Avenue and Old Highway 99 there will be property impacted that is currently operates a gas station. This property potentially has hazardous or problem waste and will require a Phase 1 Environmental Site Assessment.

Also, the project may require the acquiring of property from a Pick-n-Pull site. This site also has potential for hazardous and problem waste and may require a Phase 1 Environmental Site Assessment.

6. Noise

Improvements to Old Highway 99 will increase capacity by adding additional lanes for the Old Highway 99 Corridor and the introduction of roundabouts at multiple intersections. Therefore, each of the phases of the project will be evaluated for the noise impacts and whether the widening moves traffic closer to noise receptors.

7. 4(f)/6(f) Resources

This project impacts part of the G.W. Bush Historic Site. Part of the anticipated roundabout will impact some of this historic site. And evaluation of how much impact and mitigation will need to take place will be created for this site.

Additionally, this project passes close to an historical oak tree discussed in section 6.1.3.1.

8. Agricultural Lands

Project limits will not extend into Agricultural Lands. No mitigation anticipated.

9. Rivers, Streams, or Tidal Waters

At the end of the project near Old Highway 99 and 93rd Avenue, the Deschutes River falls within 300 feet of the existing roadway. We do not anticipate that the Old Highway 99 future improvements will impact the nearby river. Buffer impacts will be evaluated during the design phase of that project.

See **Appendix F** for Rivers and Streams Exhibit.

10. Tribal Lands

Assessing the tribal lands in the area, the Old Highway 99 corridor improvements from 73rd Avenue to 93rd Avenue does not fall within tribal lands. See **Appendix G** for Tribal Lands Map.

11. Water Quality/Stormwater

Stormwater for the corridor improvements will be treated and follow guidelines provided by the *2022 Drainage Design and Erosion Control Manual for Tumwater*. A stormwater evaluation was conducted for the Old Highway 99 Corridor Study.

12. Previous Environmental Commitments

There are no previous environmental commitments on or bordering the Old Highway 99 improvement project site.

13. Environmental Justice

The study used the EJSCREEN map provided by the Environmental Protection Agency (EPA) to determine the level of limited English proficiency, the population by race, and the number of low-income households. Further evaluation will have to be conducted as a part of each phase for meet the Environmental Justice requirements.

1.1.1.1 Limited English Proficiency

Information on race/ethnicity is useful in identifying populations with limited ability to understand English and the need for translation services. The U.S. Department of Justice recommends that agencies consider providing language translation services if an ethnic group with a primary language other than English comprises 5 percent, or 1,000 persons or more, of an area. For example, if 5 percent or more of an area's population is Hispanic, there is a strong possibility that individuals may be limited in their understanding of English, thereby limiting their ability to participate in the project decision-making process. In this case, translation and interpreter services should be provided.

The ACS Summary Report identifies that the population of the Environmental Justice Area has 1 percent of the population that "speak English less than well." According to the U.S. Department of Justice recommendations, translation services are not required. However, if during the proposal or project process a person is identified as a person who "speaks English less than well," interpretation services will be provided.

1.1.1.2 Population by Race

A determination of the presence of an EJ population was conducted using the EJSCREEN ACS Summary Report and the EJSCREEN Census 2015-2019 Summary Report. Table 6.1 summarizes the 2015-2019 census data for the area within ½ mile each side of centerline of the project.

Table 6.1 Population by Race Along Old Highway 99

Minority	Number of Persons	Percentage
White Alone	1567	80%
Hispanic or Latino (of any race)	170	9%
American Indian and Alaskan Native Alone or in Combination	7	0%
Black or African American Alone or in Combination	64	3%
Asian Alone or in Combination	37	2%
Native Hawaiian and Other Pacific Islander Alone or in Combination	13	1%
Some Other Race Alone or in Combination	104	5%

TOTAL POPULATION	**1962**	**100%**

The closest elementary school is East Olympia Elementary School. The school demographic data is shown in Table 2 and does verify the census data, in summary. Because the study area and the school district boundary do not fully overlap, these differences are likely due to a difference in geographical boundaries.

Table 6.2 Population by Race for East Olympia Elementary

Minority	**Number of Persons**	**Percentage**
White Alone	339	65%
Hispanic or Latino (of any race)	110	21%
American Indian and Alaskan Native Alone or in Combination	1	0%
Black or African American Alone or in Combination	14	3%
Asian Alone or in Combination	18	4%
Native Hawaiian and Other Pacific Islander Alone or in Combination	1	0%
Some Other Race Alone or in Combination	36	7%
TOTAL POPULATION	**519**	**100%**

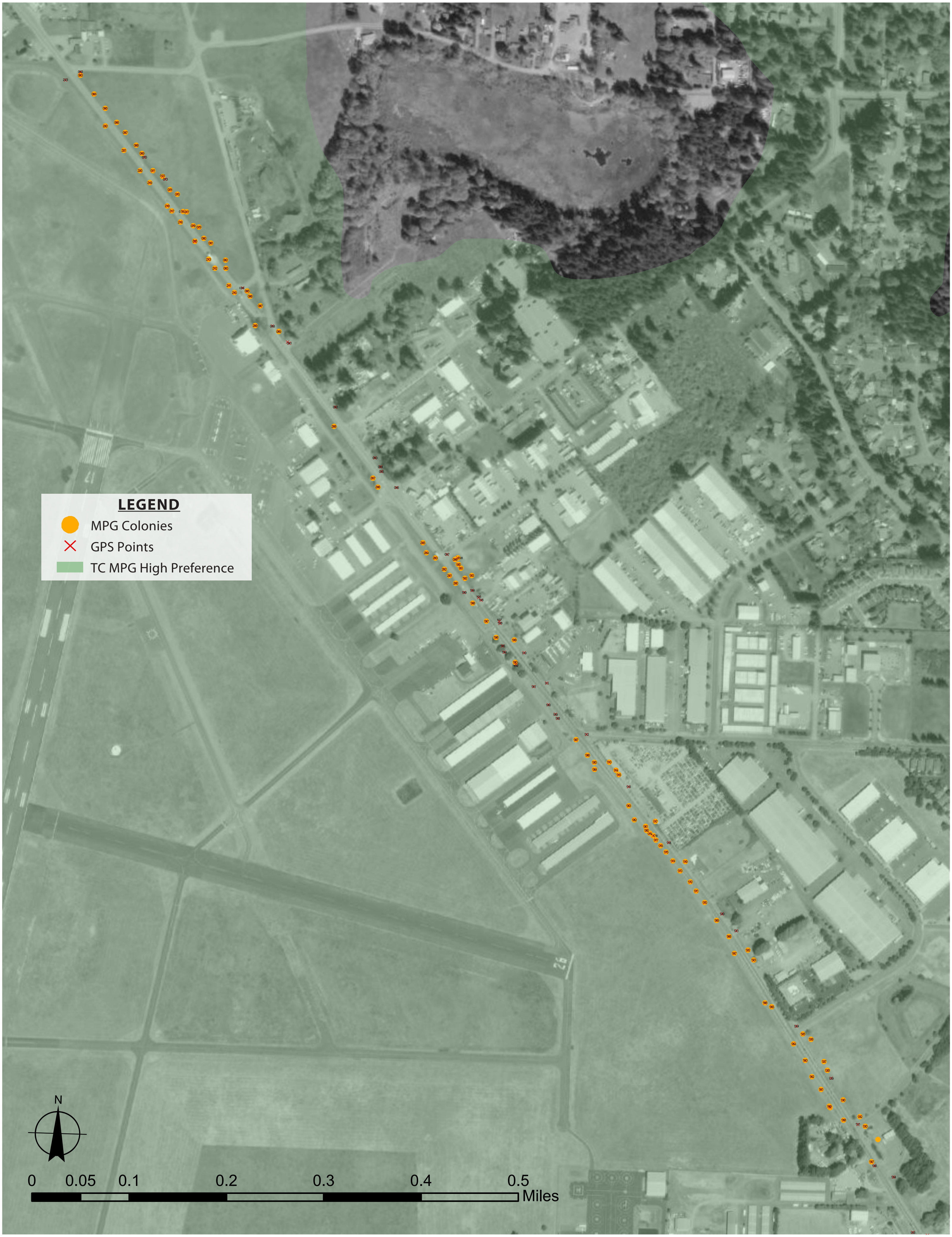
1.1.1.3 Low Income Households

Additionally, the study area is made up of 193 low-income households (23 percent), of a total of 848 total households. This is less than Thurston County's rate of 30 percent of low-income households.

It has not been determined for the property acquisitions and relocations if they will require any EJ mitigation, and evaluation of the property and their owners will need to be conducted on each phase of the project where we have major parcel takes and relocations. For EJSCREEN ACS Summary Reports see **Appendix H.**

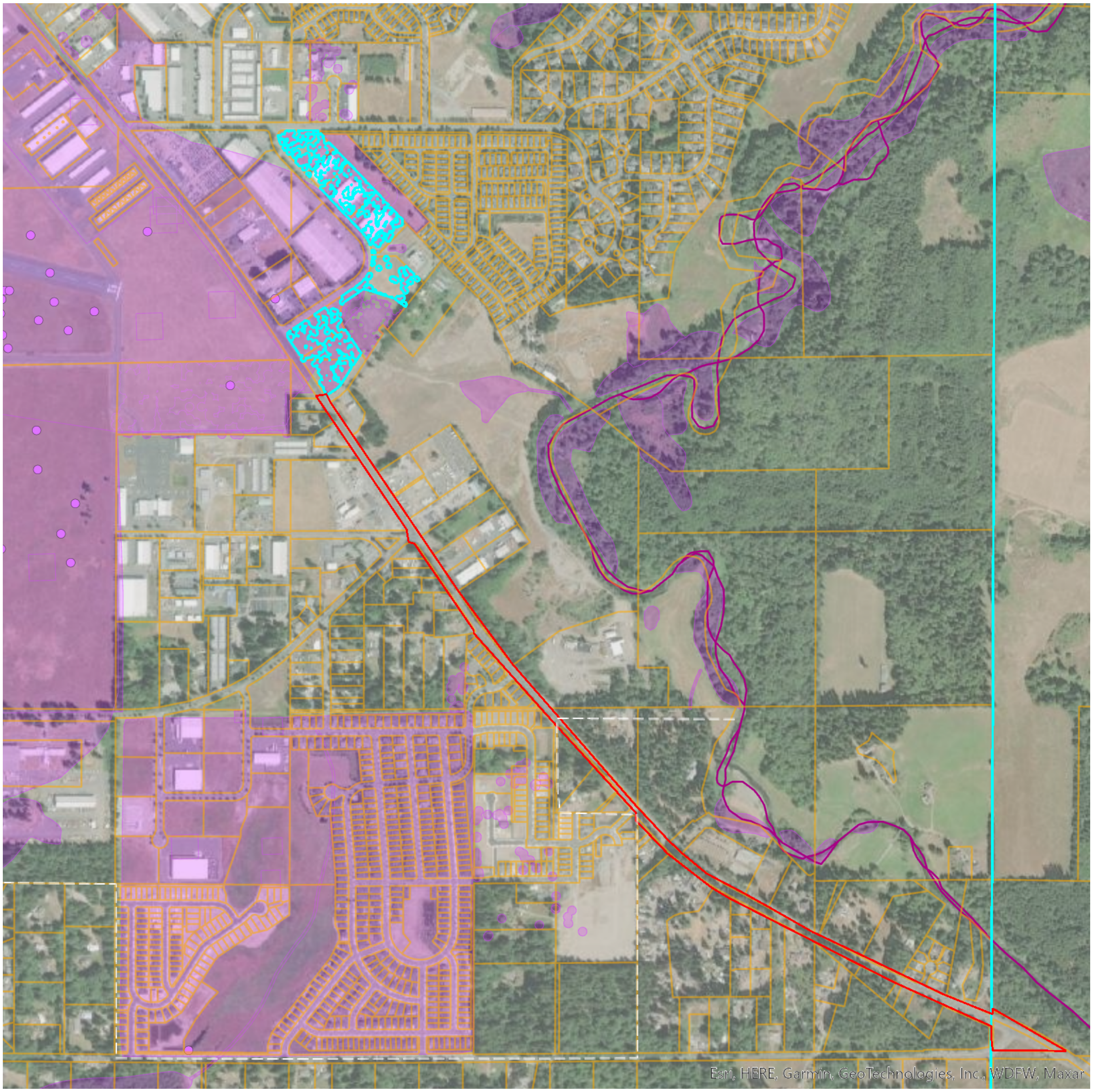
LIST OF APPENDICES

Appendix A - Mazama Pocket Gopher Map And Priority Habitat Species Report



LEGEND
MPG Colonies
GPS Points
TC MPG High Preference
N
0
0.05
0.1
0.2
0.3
0.4
0.5
Miles

Priority Habitats and Species on the Web



Report Date: 08/24/2022

User Comments/Notes:

Report spans from 84th Avenue to 93rd Avenue.

PHS Species/Habitats Overview:

Occurence Name	Federal Status	State Status	Sensitive Location
Mazama (Western) pocket gopher	Threatened	Threatened	No
Big brown bat	N/A	N/A	Yes
Townsend's Big-eared Bat	N/A	Candidate	Yes

PHS Species/Habitats Details:

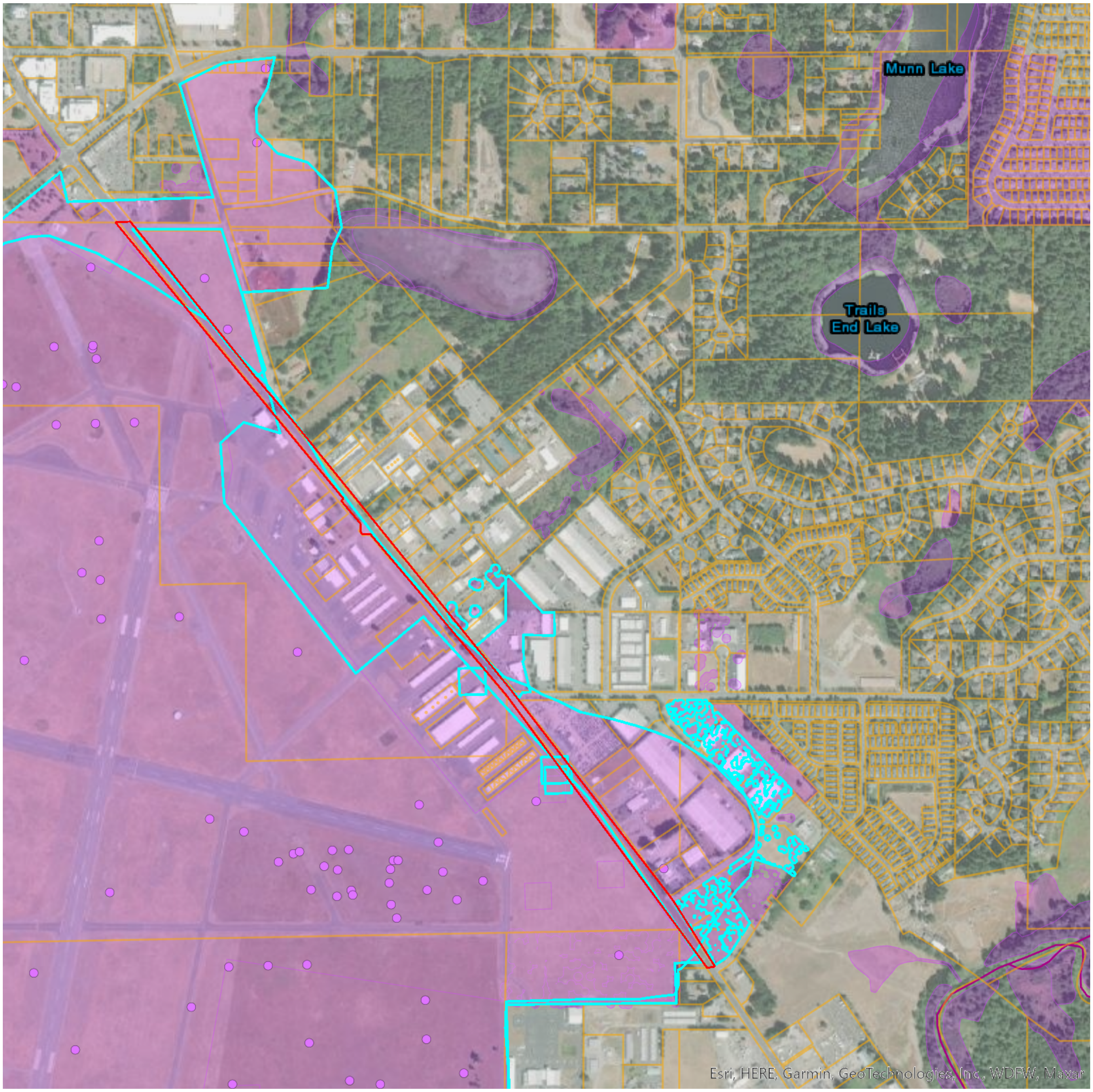
Mazama (Western) pocket gopher	
Scientific Name	*Thomomys mazama*
Priority Area	Occurrence
Site Name	DESCHUTES INDUSTRIAL
Accuracy	Map 1:12,000 <= 33 feet
Notes	MAZAMA POCKET GOPHER MOUND CONCENTRATION AREA. NO MOUND COUNT PROVIDED.
Source Record	4426
Source Dataset	WS_OccurPolygon
Source Date	WS_OccurPolygon
Source Name	CAPELLI, C./WDFW
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	Threatened
State Status	Threatened
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	N
SGCN	Y
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=01175
Geometry Type	Polygons

Big brown bat	
Scientific Name	*Eptesicus fuscus*
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release (360-902-2543) for obtaining information about masked sensitive species and habitats.
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
SGCN	N
Display Resolution	TOWNSHIP
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00605

Big brown bat	
Scientific Name	*Eptesicus fuscus*
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release (360-902-2543) for obtaining information about masked sensitive species and habitats.
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
SGCN	N
Display Resolution	TOWNSHIP
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00605

Townsend's Big-eared Bat	
Scientific Name	*Corynorhinus townsendii*
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release (360-902-2543) for obtaining information about masked sensitive species and habitats.
Federal Status	N/A
State Status	Candidate
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
SGCN	Y
Display Resolution	TOWNSHIP
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00027

Priority Habitats and Species on the Web



Report Date: 08/24/2022

User Comments/Notes:

This report spans from 73rd Avenue to 84th Avenue SE.

PHS Species/Habitats Overview:

Occurence Name	Federal Status	State Status	Sensitive Location
Streaked horned lark	Threatened	Endangered	No
Oregon vesper sparrow	N/A	Candidate	No
Mazama (Western) pocket gopher	Threatened	Threatened	No
Big brown bat	N/A	N/A	Yes
Townsend's Big-eared Bat	N/A	Candidate	Yes

PHS Species/Habitats Details:

Streaked horned lark	
Scientific Name	*Eremophila alpestris strigata*
Priority Area	Breeding Area
Site Name	OLYMPIA AIRPORT
Accuracy	1 mile (Section)
Notes	STREAKED HORNED LARK NESTS ON OLYMPIA AIRPORT.
Source Record	912954
Source Dataset	PHSREGION
Source Name	MCALLISTER, KELLY
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	Threatened
State Status	Endangered
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	N
SGCN	Y
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00026
Geometry Type	Polygons

Oregon vesper sparrow	
Scientific Name	*Pooecetes gramineus affinis*
Priority Area	Breeding Area
Site Name	OLYMPIA AIRPORT
Accuracy	1 mile (Section)
Notes	OREGON VESPER SPARROW NESTS ON OLYMPIA AIRPORT.
Source Record	912962
Source Dataset	PHSREGION
Source Name	MCALLISTER, KELLY
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	Candidate
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	N
SGCN	Y
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00026
Geometry Type	Polygons

Mazama (Western) pocket gopher	
Scientific Name	*Thomomys mazama*
Priority Area	Occurrence
Site Name	OLYMPIA AIRPORT
Accuracy	GPS
Notes	MAZAMA POCKET GOPHER MOUND SYSTEMS (6,040 SURFACE MOUNDS) RECORDED OVER VIRTUALLY ALL OPEN GRASSLAND AREA AT OLYMPIA AIRPORT. POLYGON COVERS ALL 29 OCCUPIED PROJECT ZONES DELINEATED FOR SAMPLING AREA ID'S. DENSITIES DIFFER ACROSS ZONES.
Source Record	3555
Source Dataset	WS_OccurPolygon
Source Date	WS_OccurPolygon
Source Name	CAPELLI, C./WDFW
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	Threatened
State Status	Threatened
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	N
SGCN	Y
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=01175
Geometry Type	Polygons

Mazama (Western) pocket gopher	
Scientific Name	*Thomomys mazama*
Priority Area	Occurrence
Site Name	PERF SOUND INVESTMENT
Accuracy	GPS
Notes	MAZAMA POCKET GOPHER MOUND CONCENTRATION
Source Record	3725
Source Dataset	WS_OccurPolygon
Source Date	WS_OccurPolygon
Source Name	SCHMIDT, T/WDFW
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	Threatened
State Status	Threatened
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	N
SGCN	Y
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=01175
Geometry Type	Polygons

Mazama (Western) pocket gopher	
Scientific Name	*Thomomys mazama*
Priority Area	Occurrence
Site Name	OLYMPIA AIRPORT
Accuracy	Standard buffer
Notes	WESTERN POCKET GOPHER MOUND SYSTEM SCATTERED OVER ENTIRE AIRPORT AND SURROUNDING AREAS. MUCH PRAIRIE HAS BEEN CONVERTED TO GROWING CHRISTMAS TREES, GOPHERS EXIST AMONG THESE TREES AS WELL AS IN UNALTERED AREAS. 5 IO TRAPPED.
Source Record	3160
Source Dataset	WS_OccurPolygon
Source Date	WS_OccurPolygon
Source Name	WALKER, M./WDFW
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	Threatened
State Status	Threatened
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	N
SGCN	Y
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=01175
Geometry Type	Polygons

Mazama (Western) pocket gopher	
Scientific Name	*Thomomys mazama*
Priority Area	Occurrence
Site Name	OLYMPIA AIRPORT
Accuracy	Standard buffer
Notes	MAZAMA (WESTERN) POCKET GOPHER MOUND. LIVE CAPTURE AND RELEASE. AMINAL MARKED WITH RED NAIL POLISH
Source Record	3169
Source Dataset	WS_OccurPolygon
Source Date	WS_OccurPolygon
Source Name	SCHMIDT, A/WDFW
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	Threatened
State Status	Threatened
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	N
SGCN	Y
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=01175
Geometry Type	Polygons

Mazama (Western) pocket gopher	
Scientific Name	*Thomomys mazama*
Priority Area	Occurrence
Site Name	OLYMPIA AIRPORT
Accuracy	Standard buffer
Notes	MAZAMA (WESTERN) POCKET GOPHER MOUND. LIVE CAPTURE AND RELEASE. AMINAL MARKED WITH RED NAIL POLISH
Source Record	3171
Source Dataset	WS_OccurPolygon
Source Date	WS_OccurPolygon
Source Name	SCHMIDT, A/WDFW
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	Threatened
State Status	Threatened
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	N
SGCN	Y
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=01175
Geometry Type	Polygons

Mazama (Western) pocket gopher	
Scientific Name	*Thomomys mazama*
Priority Area	Occurrence
Site Name	DESCHUTES INDUSTRIAL
Accuracy	Map 1:12,000 <= 33 feet
Notes	MAZAMA POCKET GOPHER MOUND CONCENTRATION AREA. NO MOUND COUNT PROVIDED.
Source Record	4426
Source Dataset	WS_OccurPolygon
Source Date	WS_OccurPolygon
Source Name	CAPELLI, C./WDFW
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	Threatened
State Status	Threatened
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	N
SGCN	Y
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=01175
Geometry Type	Polygons

Mazama (Western) pocket gopher	
Scientific Name	*Thomomys mazama*
Priority Area	Occurrence
Site Name	79TH AVE SE
Accuracy	GPS
Notes	PARCEL BOUNDARY MAPPED. EXTENDED AT SOUTHERN POINT TO INCLUDE ADDITIONAL MOUND WAYPOINT.
Source Record	4738
Source Dataset	WS_OccurPolygon
Source Date	WS_OccurPolygon
Source Name	CAPELLI, C./WDFW
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	Threatened
State Status	Threatened
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	N
SGCN	Y
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=01175
Geometry Type	Polygons

Mazama (Western) pocket gopher	
Scientific Name	*Thomomys mazama*
Priority Area	Occurrence
Site Name	PORT OF OLYMPIA AIRPORT - BONNIEWOOD
Accuracy	GPS
Notes	MAZAMA (WESTERN) POCKET GOPHER MOUND CONCENTRATION. 2016: LOC UPDATED TO COUNTY GOPHER HAB PROTECTION AREA PER WDFW REVIEW.
Source Record	4317
Source Dataset	WS_OccurPolygon
Source Date	WS_OccurPolygon
Source Name	SCHMIDT, T/WDFW;OLSON, G./WDFW
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	Threatened
State Status	Threatened
PHS Listing Status	PHS LISTED OCCURRENCE
Sensitive	N
SGCN	Y
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=01175
Geometry Type	Polygons

Big brown bat	
Scientific Name	*Eptesicus fuscus*
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release (360-902-2543) for obtaining information about masked sensitive species and habitats.
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
SGCN	N
Display Resolution	TOWNSHIP
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00605

Townsend's Big-eared Bat	
Scientific Name	*Corynorhinus townsendii*
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release (360-902-2543) for obtaining information about masked sensitive species and habitats.
Federal Status	N/A
State Status	Candidate
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
SGCN	Y
Display Resolution	TOWNSHIP
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00027

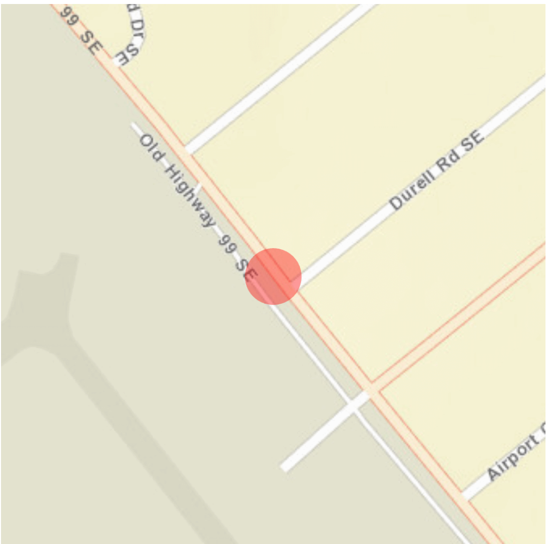
Appendix B – Historic Properties Reports

Historic Property Report

Resource Name: Oak Tree

Property ID: 20170

Location



Address: near 7525 Old Highway 99, vicinity of Tumwater, WA 98501

Geographic Areas: Thurston County, OLYMPIA Quadrangle, T17R02W11

Information

Number of stories: N/A

Construction Dates:

Construction Type	Year	Circa

Historic Use:

Category	Subcategory
Landscape	Landscape - Natural Feature
Landscape	Landscape - Natural Feature

Historic Context:

Category

Architect/Engineer:

Category	Name or Company

Thematics:

Local Registers and Districts

Name	Date Listed	Notes

Project History

Historic Property Report

Resource Name: Oak Tree

Property ID: 20170

Project Number, Organization, Project Name	Resource Inventory	SHPO Determination	SHPO Determined By, Determined Date

Photos

Tree

Original HPI form(s)

Historic Property Report

Resource Name: Oak Tree

Property ID: 20170

Inventory Details - 1/1/1900

Common name:	Meeker Oak Tree (#34-169)
Date recorded:	1/1/1900
Field Recorder:	
Field Site number:	3465
SHPO Determination	

Historic Property Report

Resource Name: Oak Tree

Property ID: 20170

Inventory Details - 4/1/1998

Common name:	Meeker Oak Tree (#34-169)
Date recorded:	4/1/1998
Field Recorder:	Shanna Stevenson
Field Site number:	3465
SHPO Determination	

Detail Information

Surveyor Opinion

Significance narrative:

The tree is significant as a specimen tree of the garry oak species. Rob Kavanaugh an expert on Oregon white oak estimates the tree to be approximately 400 years old. Although coring has been attempted, the tree is too hard to permit examination. The tree also represents the ecology of the native peoples. Native peoples managed the landscape to provide for their food gathering needs. An 1853 survey of the area notes the it was widely burned and we know that the Bush family and others settled here because of the open prairie. This helped the oak tree by eliminating the over-canopy of fir trees for the sun-loving oak. The burning was done to open areas so that the prairie food plants, most notably camas, could thrive. This tree has stood over the centuries because of that land management.

The acorns from oak trees such as this were a vital part of the native peoples diet. Del McBride notes:

"The Squalli ate a lot of acorns. These acorns were cooked in the ground like camas, with hot rocks underneath, covered with dirt, fire on top. After the acorns were cooked, they were put into open-work baskets and these baskets were The acorns must be completely covered with water and mud. This mode of caching was never done without first cooking the acorns. When acorns were taken out of the water, they were ready to eat and not cooked again." Originally published in LURE LORE, Vol. X, No. 1 (Fall 1991) by the Nisqually Reach Nature Center.

Cecelia Svinth Carpenter notes:

" . . . Acorns required more care. They contained a bitter taste which could be removed either by boiling or by burying them in the mud by a stream. Acorns were roasted in the embers of the cooking fire and ground into a meal that could be molded into patties or used to make a gruel or soup." in THE SEASONAL ROUND OF LIFE IN TRADITIONAL TIMES, published by the Washington State Capital Museum.

Marian Smith describes the use of acorns:

"Acorns were gathered wherever they could be found and salt water groups made special trips to prairie groves to obtain them. They were eaten raw or pit-baked. The baked nuts were eaten alone or sometimes with salmon eggs. They were also pounded up and boiled with fish, apparently in the same way as roots. After they were baked, they could be stored in baskets lined with leaves and submerged in still water." The Puyallup-Nisqually, page 251.

Oak was also used by native peoples for digging sticks for root foodstuff when an antler handle was attached. Other possible products were yellow face paint made from the decaying bark of the oak tree, hide scraping tools, braces for dip nets and firewood.

The tree is also on the historic northern branch of the Oregon Trail, the Cowlitz Trail and undoubtedly has seen the progression of human habitation from native peoples, the Hudson's Bay Company and this area's earliest American settlers. The tree was undoubtedly of significant size 150 years ago to be noted by those who passed by and perhaps was a landmark on this part of the trail.

The tree is part of the donation land claims of James and Samuel Dunlap who settled in the area in 1852. They are buried in the Bush/Union Cemetery. A smaller grove of garry oaks was removed from across the road from the tree in 1994, some of which were 100 years old and could have been the progeny of this tree.

In 1984 a community effort saved the tree when the highway was being improved in this area and the right-of-way was re-routed and a barrier installed to insure its security. This signalled its landmark status to the community.

Although various stories about its being the "Meeker Oak" have been circulated, no direct connection with Ezra Meeker has been established. When Meeker made his epic retracing of the Oregon Trail in 1906, he set a marker post in Tumwater and then took the train to Tenino, his next stop instead of driving his team on this section of the trail. Other stories about its being an Indian gathering site have not been verified.

Physical description: Located adjacent to Old Highway 99 (formerly Pacific Highway), the garry oak tree stands between 70 and 100 feet high and is 16 feet in circumference. The Oregon white oak (Quercus garryana) or garry oak is the only native oak of Washington. It was named by David Douglas in 1820 after his friend Nicholas Garry of the Hudson Bay Company. The tree presents a broad canopy over Old Highway 99.

Bibliography:

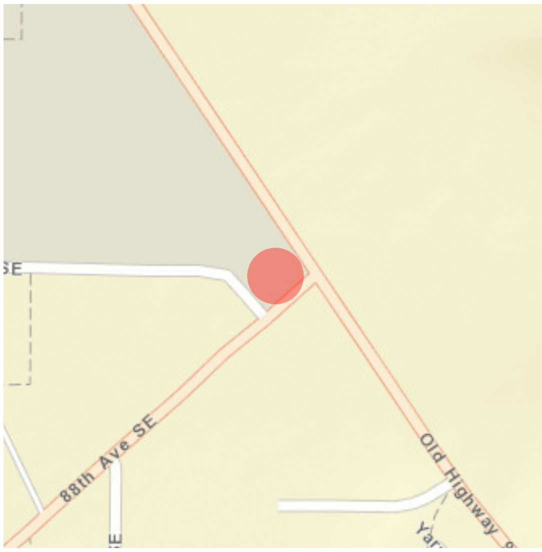
Kavanaugh, Rob, Washington Oak habitat: a plan for managing the oak forests of Washington State, Columbia Gorge Audubon Society, 1991
Correspondence from Jack Davis, 1987, 1994.
Smith, Marian, The Puyallup-Nisqually, AMS Press, New York, reprint 1969.
Carpenter, Cecelia Svinth, "The Seasonal Round of Life in Traditional Times," State Capital Museum, n.d.
McBride, Del "When the Prairie Camas Bloom: Some Notes on edible Plants Among the Puget Sound Indians," Luhr Lore, Vol.X, No. 1 (Fall 1991), Nisqually Reach Nature Center.
Information from 1853 Survey Notes, microfilm, Washington State Library.
Telephone interviews, Rob Kavanaugh, Jack Davis and Joe Roush.
Previous documentation on file (THPC)

Historic Property Report

Resource Name: Bush Interpretative Kiosk

Property ID: 19018

Location



Address: , Olympia, WA 98501

Tax No/Parcel No: 12713230405

Plat/Block/Lot: Metes and Bounds

Geographic Areas: Thurston County, MAYTOWN Quadrangle, T17R02W13

Information

Number of stories: N/A

Construction Dates:

Construction Type	Year	Circa
Built Date	1997	☐

Historic Use:

Category	Subcategory
Recreation and Culture	Recreation and Culture - Monument/Marker
Recreation and Culture	Recreation and Culture - Monument/Marker

Historic Context:

Category
Ethnic Heritage

Architect/Engineer:

Category	Name or Company
Architect	Carlsson, Lars

Thematics:

Local Registers and Districts

Name	Date Listed	Notes

Project History

Project Number, Organization, Project Name	Resource Inventory	SHPO Determination	SHPO Determined By, Determined Date
2006-01-00006, , Thurston County 2002	1/1/1900	Not Determined	

Photos

West side of marker

Inventory Details - 1/1/1900

Common name: Bush Interpretative Site (#34-350)

Date recorded: 1/1/1900

Field Recorder: Shanna Stevenson

Field Site number: 126

SHPO Determination

Detail Information

Surveyor Opinion

Property appears to meet criteria for the National Register of Historic Places: No

Property is located in a potential historic district (National and/or local): No

Significance narrative: This marker commemorates the legacy of the George and Isabella and William O and Mandana Bush Families. This land is part of the original Bush donation claim. The Bush family came with the first permanent American settlement to Tumwater in 1845, settling just east of this marker along the Deschutes River. George Bush was a mulatto who settled in Tumwater in 1845 with his wife Isabella and five sons as part of the first permanent American settlement on Puget Sound. He was a highly respected and expert farmer. He had come to the area north of the Columbia River to escape the restrictive land laws of Oregon against men of color. In fact it took an act of Congress, spurred by Washington legislative action, to grant him and his wife their land.

Bush's family were also outstanding. His son, William Owen Bush was a member of the first state legislature and with his family grew world renown produce from what is now known as Bush Prairie. This produce was exhibited at several world's fairs and exhibitions.

As some of the earliest American settlers on Puget Sound in 1845, George and Isabella Bush with their family played a vital role in the beginnings of Washington Territory. Bush's story is even more remarkable because he was a mulatto who overcame prejudice and discrimination to succeed as one of the areas most beloved figures.

Little is known of Bush's early life. It is believed that he was the son of an East or West Indian who was married the Irish maid of a family in Pennsylvania. Their son, George traveled widely before making his way west in 1844. By some accounts he fought in the Black Hawk War, worked for a fur company and may have been at the Battle of New Orleans. It is known that he married Isabella James, an American of German ancestry on July 4, 1832, in Missouri. The became the parents of nine sons, six of whom survived to adulthood.

Feeling the pressures of prejudice in the slavery state of Missouri before the Civil War, Bush and his family joined the westward migration to the Oregon Country in 1844 with their friends and neighbors. Bush had been very successful in the cattle business and came west with excellent supplies as well has a cache of coins said to be $2000.

Bush and his party reached the Dalles in December, 1844 after a seven month journey. Bush took care of the stock at the Dalles over the while the other went on to Washougal on the Columbia River.

George Bush again met prejudice upon his arrival in the Oregon Country. This area was still under a joint occupation agreement between the U.S. and Great Britain with no formal government. However, the Oregon Provisional Government at Oregon City had passed in June, 1844 a law which excluded Negroes of all conditions from the Oregon area. The sheriff, however, was not required to cross north of the Columbia to enforce the law.

This provision coupled with the desire of the settlers to secure an American foothold north of the Columbia River drove Bush and his party of 30 Americans to Puget Sound where they arrived in November, 1845. By 1846, the Boundary line was settled and the Bush Party had established New Market, later Tumwater at the falls of the Deschutes River as it entered Puget Sound, now part of the United States.

Bush, an accomplished farmer, and his family quickly established a fine farm which encompassed this site. Because of their hospitality and generosity the farm became a noted stopping off place on the Cowlitz Trail which brought settlers north to Puget Sound from the Oregon Trail. Bush was also instrumental in establishing the first mills at the falls of the Deschutes River.

While other white settlers were entitled to free land under the provisions of the Donation Land Claim Law passed in 1850, it took an act of the U.S. Congress to grant George and Isabella Bush their land because of their color. Fifty-five members of the newly formed Washington Territorial Legislature petitioned Congress to grant them their land.

Beloved by his neighbors and friends, Bush died in 1863 and was followed by his wife in 1866 but their legacy continued with their sons who continued to live on the land.

The kiosk was constructed on donated land by the Thurston County Historic Commission with donations from many community groups.

Physical description: Four sided kiosk designed to be reminiscent of the gable of the W. O. Bush home. On the four sides are interpretative panels about the legacy of the Bush family. Two of the panels are replicas of the Jacob Lawrence George Bush Series of paintings.

Bibliography:

Palmer, Gayle, ed. The River Remembers, City of Tumwater, 1995, article, George Bush of Tumwater, Washington by Dr. Darrell Milner.

Appendix C – Flood Plain Exhibits

122°54'22.98"W 47°0'6.62"N

122°52'29.62"W 46°58'N

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP
FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99* With BFE or Depth *Zone AE, AO, AH, VE, AR* Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X* Future Conditions 1% Annual Chance Flood Hazard *Zone X* Area with Reduced Flood Risk due to Levee See Notes *Zone X* Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard *Zone X* Effective LOMRs Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer Levee, Dike, or Floodwall
OTHER FEATURES	B 20.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation 8 Coastal Transect Coastal Transect Baseline Profile Baseline Hydrographic Feature 513 Base Flood Elevation Line (BFE) Limit of Study Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Last refreshed October, 2020.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **8/25/2022 4:15 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD88
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

N

1 inch = 500 feet 1:6,000

0 250 500 1,000 1,500 2,000 Feet

0 50 100 200 300 400 Meters

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

PANEL **282** OF **615**

Panel Contains:

COMMUNITY	NUMBER	PANEL
THURSTON COUNTY	530188	0282
CITY OF TUMWATER	530192	0282

MAP NUMBER
53067C0282F
EFFECTIVE DATE
September 02, 2016

122°54'22.98"W 46°58'14.12"N

122°52'29.62"W 46°56'8.44"N

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) *Zone A, V, A99* With BFE or Depth *Zone AE, AO, AH, VE, AR*
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
		Future Conditions 1% Annual Chance Flood Hazard *Zone X*
		Area with Reduced Flood Risk due to Levee See Notes *Zone X*
		Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN	Area of Minimal Flood Hazard *Zone X*
		Effective LOMRs
		Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES	B 20.2	Cross Sections with 1% Annual Chance
	17.5	Water Surface Elevation
	8	Coastal Transect
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
	513	Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Last refreshed October, 2020.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **8/31/2022 12:58 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD88
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

N

1 inch = 500 feet 1:6,000

0 250 500 1,000 1,500 2,000 Feet

Meters 0 50 100 200 300 400

FEMA
National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

PANEL **284** OF **615**

Panel Contains:

COMMUNITY	NUMBER	PANEL
CITY OF TUMWATER	530192	0284
THURSTON COUNTY	530188	0284

MAP NUMBER
53067C0284F
EFFECTIVE DATE
September 02, 2016

122°52'30.48"W 46°58'14.11"N

122°50'37.13"W 46°56'8.44"N

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee See Notes *Zone X*
	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard *Zone X*
	Effective LOMRs
	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
OTHER FEATURES	(B) 20.2 Cross Sections with 1% Annual Chance
	17.5 Water Surface Elevation
	(8) Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
	513 Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Last refreshed October, 2020.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **8/31/2022 12:56 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD88
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

N

1 inch = 500 feet 1:6,000

0 250 500 1,000 1,500 2,000 Feet

Meters 0 50 100 200 300 400

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

PANEL **303** OF **615**

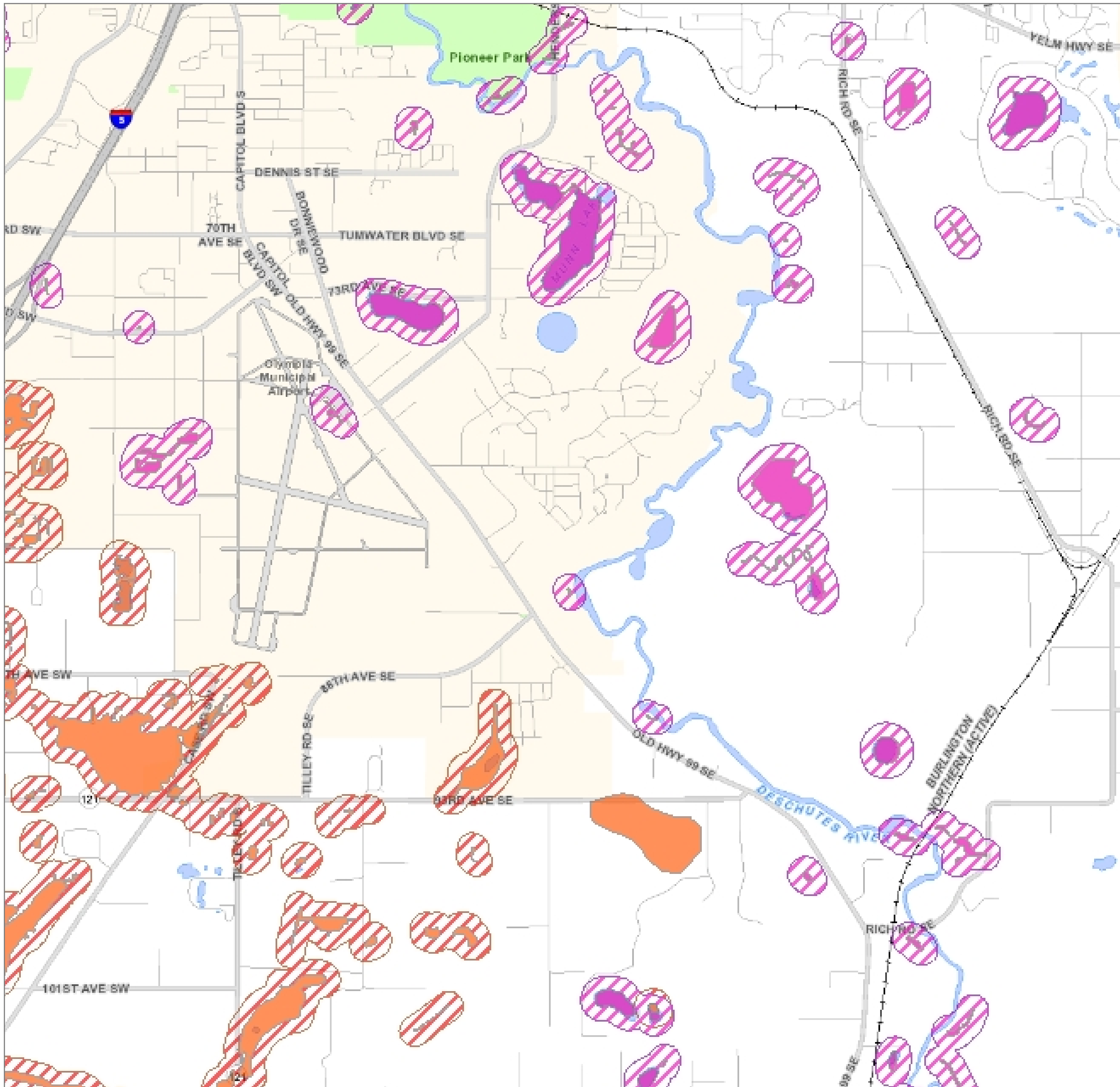
Panel Contains:

COMMUNITY	NUMBER	PANEL
THURSTON COUNTY	530188	0303

MAP NUMBER
53067C0303F
EFFECTIVE DATE
September 02, 2016

Appendix D – High Groundwater Map

Groundwater Map



Legend

Groundwater Concern Areas
- Low Concern
- Limited Groundwater
- Very Limited Groundwater
- Chloride > .5 mg/l
- Pesticide Application

Groundwater Sensitive Areas
-
- ELD INLET WQPD
- HENDERSON INLET WQPD
- LAKES
- MCALLISTER SPRING; MCALLISTER SPRINGS

High Groundwater Hazard Areas
- High Groundwater Hazard Area
- Salmon Creek High Groundwater Hazard

High Groundwater Hazard Review Areas
- High Groundwater Review Area
- Salmon Creek High Groundwater Review Area

Roads - Major (Large Scale)
- <all other values>
- I 5 ACCESS; US 101 ACCESS; US 101 SB OFF RAMP
- I 5; US 101

Roads (Small Scale)

Railroads

Scale 1: 60,460

0 0.5 1
Miles

Map Created Using GeoData Public Website

Published: 8/31/2022

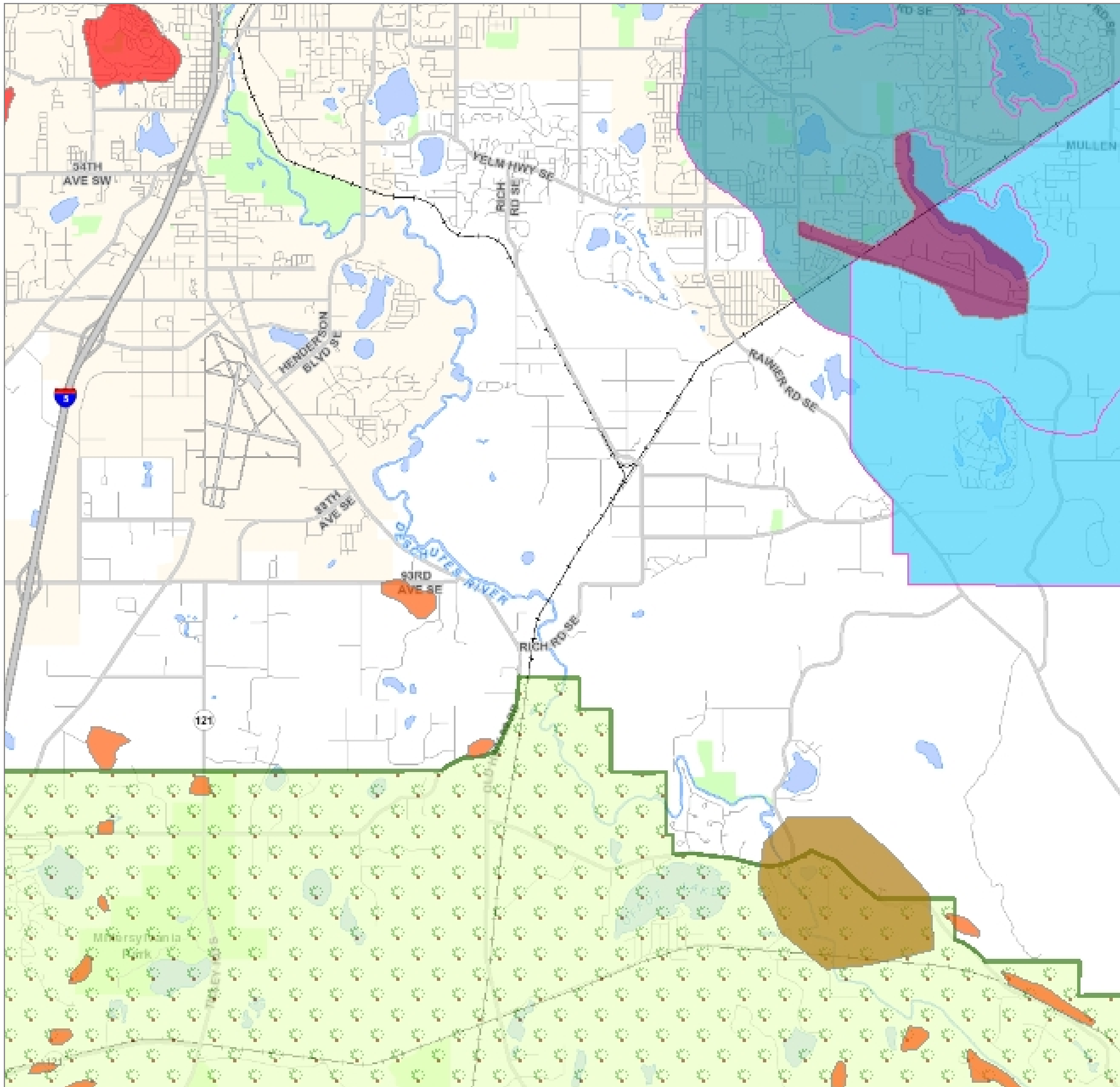
Note:

THURSTON COUNTY
WASHINGTON
SINCE 1852

Thurston County GeoData Center

Appendix E – Agricultural Lands

Agricultural Lands Map



Legend

Groundwater Concern Areas
- Low Concern
- Limited Groundwater
- Very Limited Groundwater
- Chloride > .5 mg/l
- Pesticide Application

Groundwater Sensitive Areas
-
- ELD INLET WQPD
- HENDERSON INLET WQPD
- LAKES
- MCALLISTER SPRING; MCALLISTER SPRINGS

Agritourism Overlay Districts

Roads - Major (Small Scale)
- <all other values>
- I 5 ACCESS; US 101 ACCESS; US 101 SB OFF RAMP
- I 5; US 101

Railroads

County Border

Olympia Municipal Airport

Water Bodies (River - Small Scale)

Water Bodies (Other)

Parks

Cities

Capital Forest

Scale 1: 120,920

0 1 2

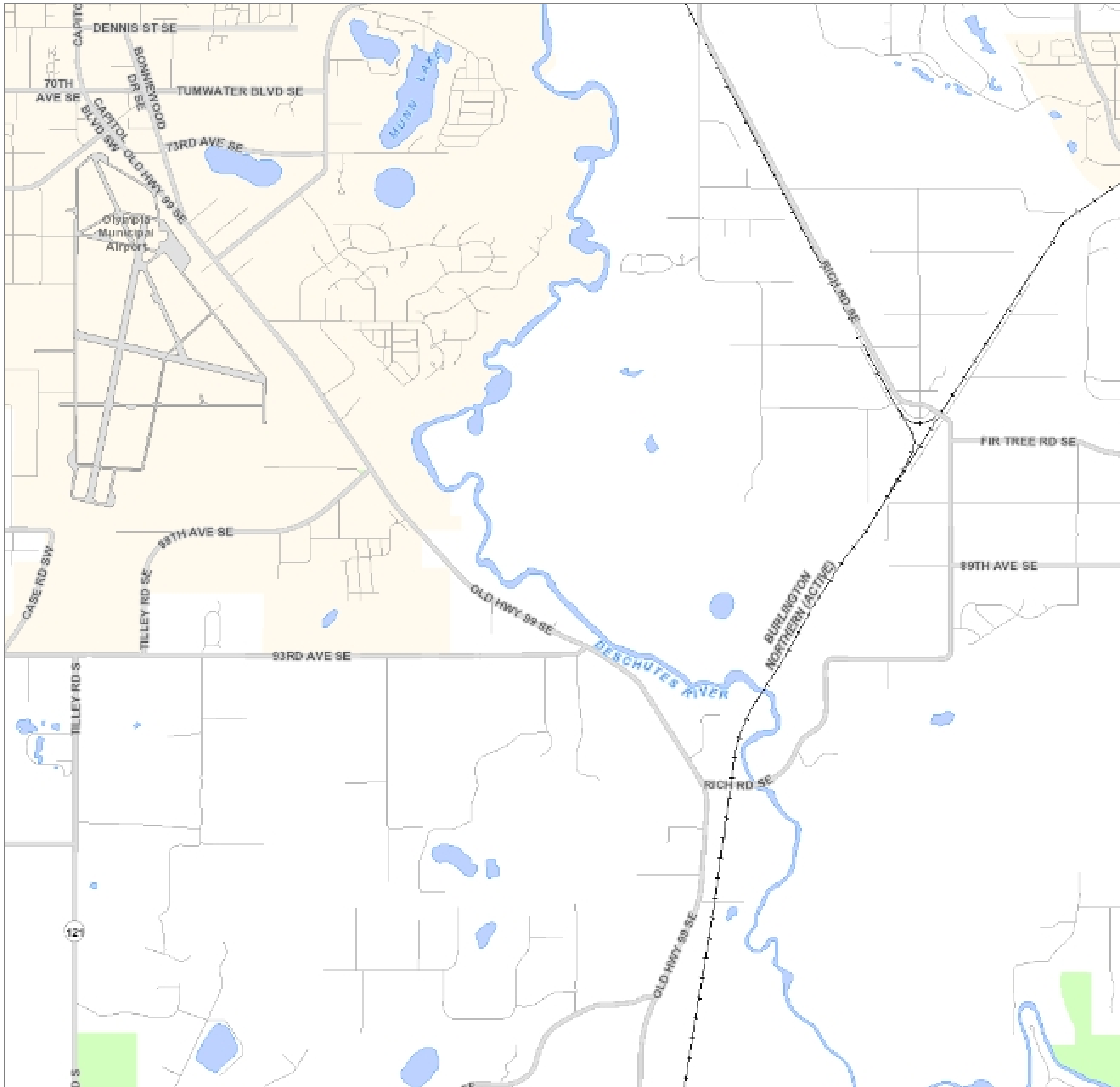
Miles

Map Created Using GeoData Public Website

Published: 8/31/2022

Note:

Appendix F – Rivers and Streams



Rivers and Streams

Legend

- Roads - Major (Large Scale)
  - <all other values>
  - I 5 ACCESS; US 101 ACCESS; US 101 SB OFF RAMP
  - I 5; US 101
- Roads (Small Scale)
- Railroads
- County Border
- Olympia Municipal Airport
- Water Bodies (River - Small Scale)
- Water Bodies (Other)
- Parks
- Cities
- Capital Forest
- County Background
- Roads - Major
  - <all other values>
  - I 5 ACCESS; US 101 ACCESS; US 101 SB OFF RAMP
  - I 5; US 101
- Roads
- Railroads
- County Border
- Olympia Municipal Airport
- Water Bodies (River - Small Scale)
- Water Bodies (Other)
- Parks

Scale 1: 60,460

0 0.5 1
Miles

Map Created Using GeoData Public Website

Published: 8/31/2022

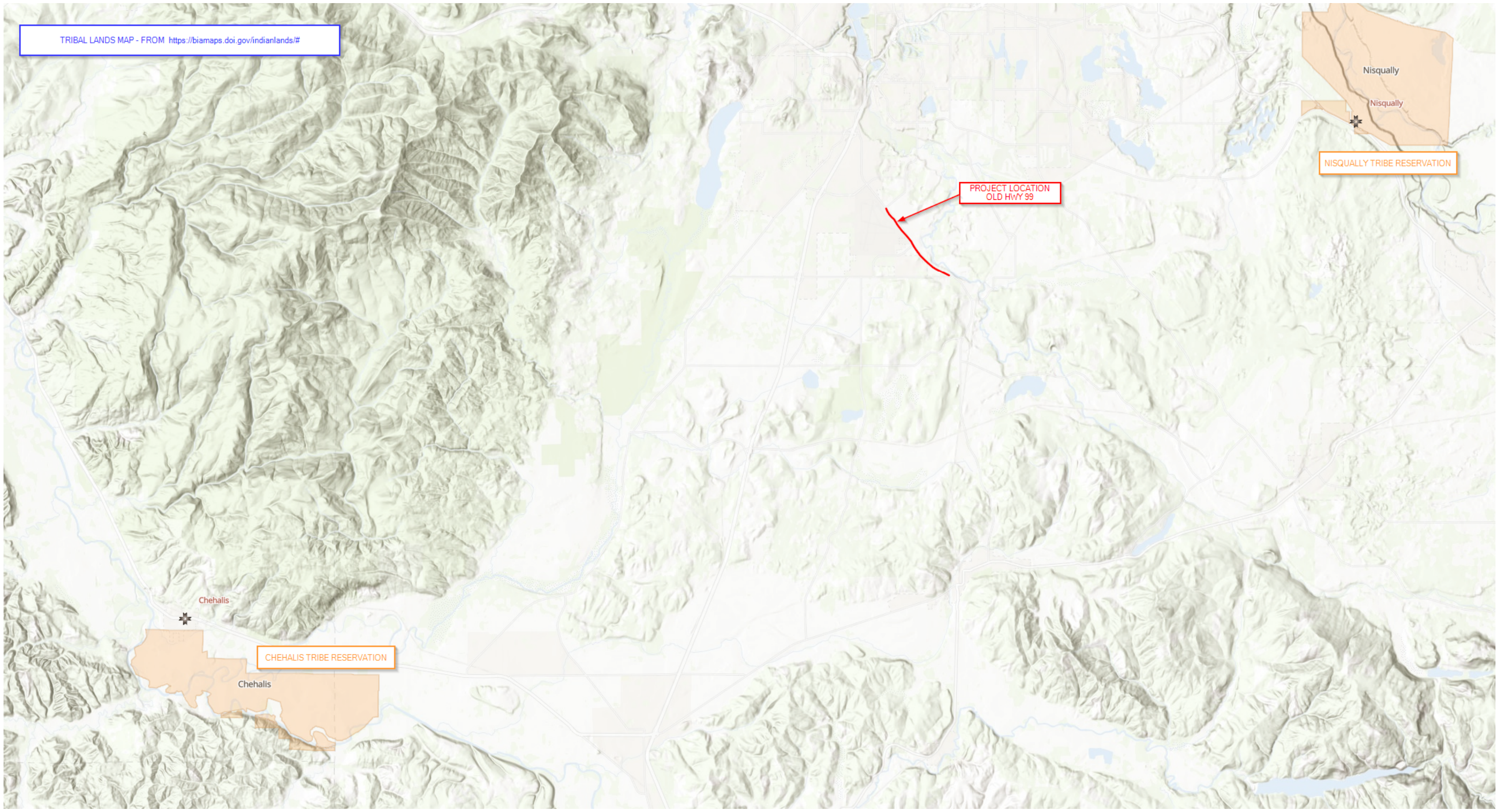
Note: Old Highway 99 fall outside of the 300 ft buffer except for near the intersection at 93rd Avenue and Old Hwy 99. No impacts to Deschutes River anticipated.

THURSTON COUNTY WASHINGTON SINCE 1852

Thurston County GeoData Center

Appendix G – Tribal Lands Map

Tribal Lands with Respect to the Project Site Exhibit



Appendix H – EJ Screen Reports

EJScreen Report (Version 2.0)

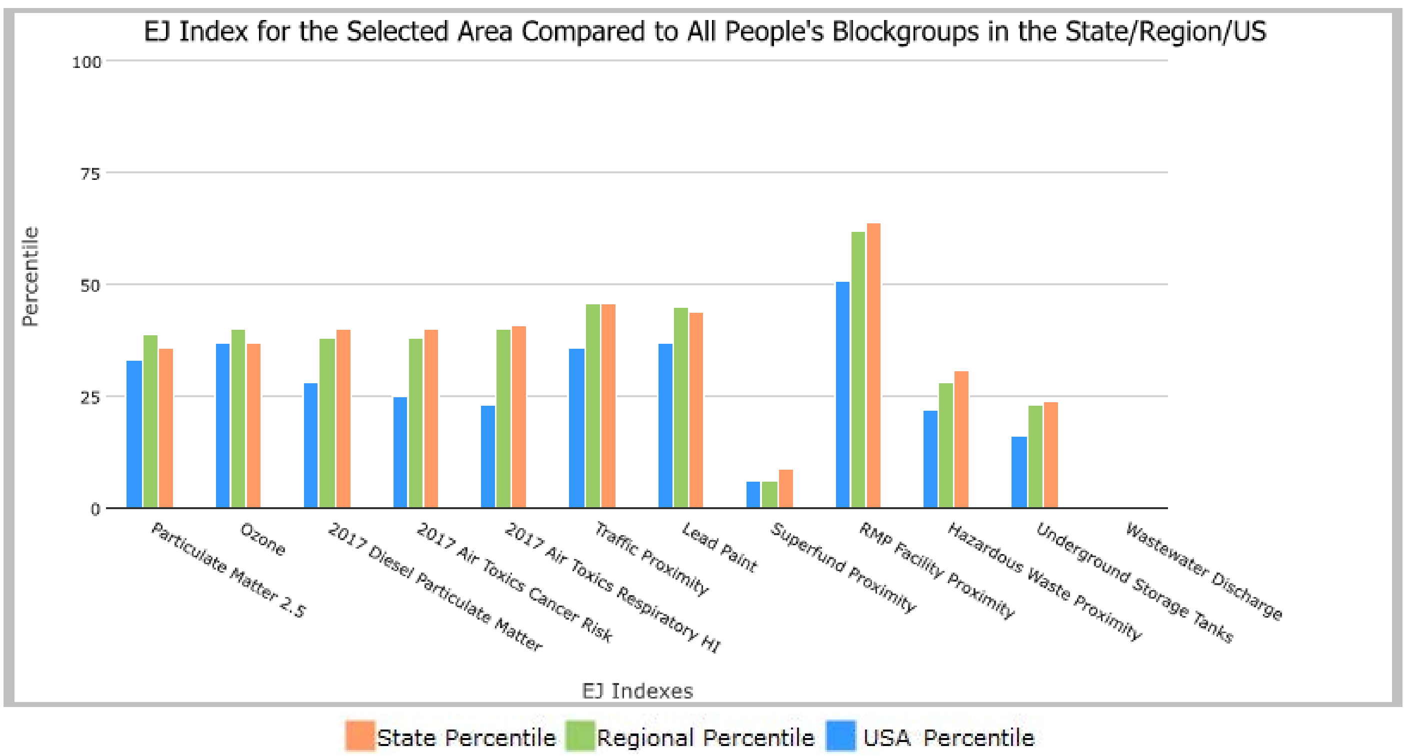
.5 miles Ring around the Corridor, WASHINGTON, EPA Region 10

Approximate Population: 1,962

Input Area (sq. miles): 3.51

Old Hwy 99 Corridor

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
Environmental Justice Indexes			
EJ Index for Particulate Matter 2.5	36	39	33
EJ Index for Ozone	37	40	37
EJ Index for 2017 Diesel Particulate Matter*	40	38	28
EJ Index for 2017 Air Toxics Cancer Risk*	40	38	25
EJ Index for 2017 Air Toxics Respiratory HI*	41	40	23
EJ Index for Traffic Proximity	46	46	36
EJ Index for Lead Paint	44	45	37
EJ Index for Superfund Proximity	9	6	6
EJ Index for RMP Facility Proximity	64	62	51
EJ Index for Hazardous Waste Proximity	31	28	22
EJ Index for Underground Storage Tanks	24	23	16
EJ Index for Wastewater Discharge	N/A	N/A	N/A



This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

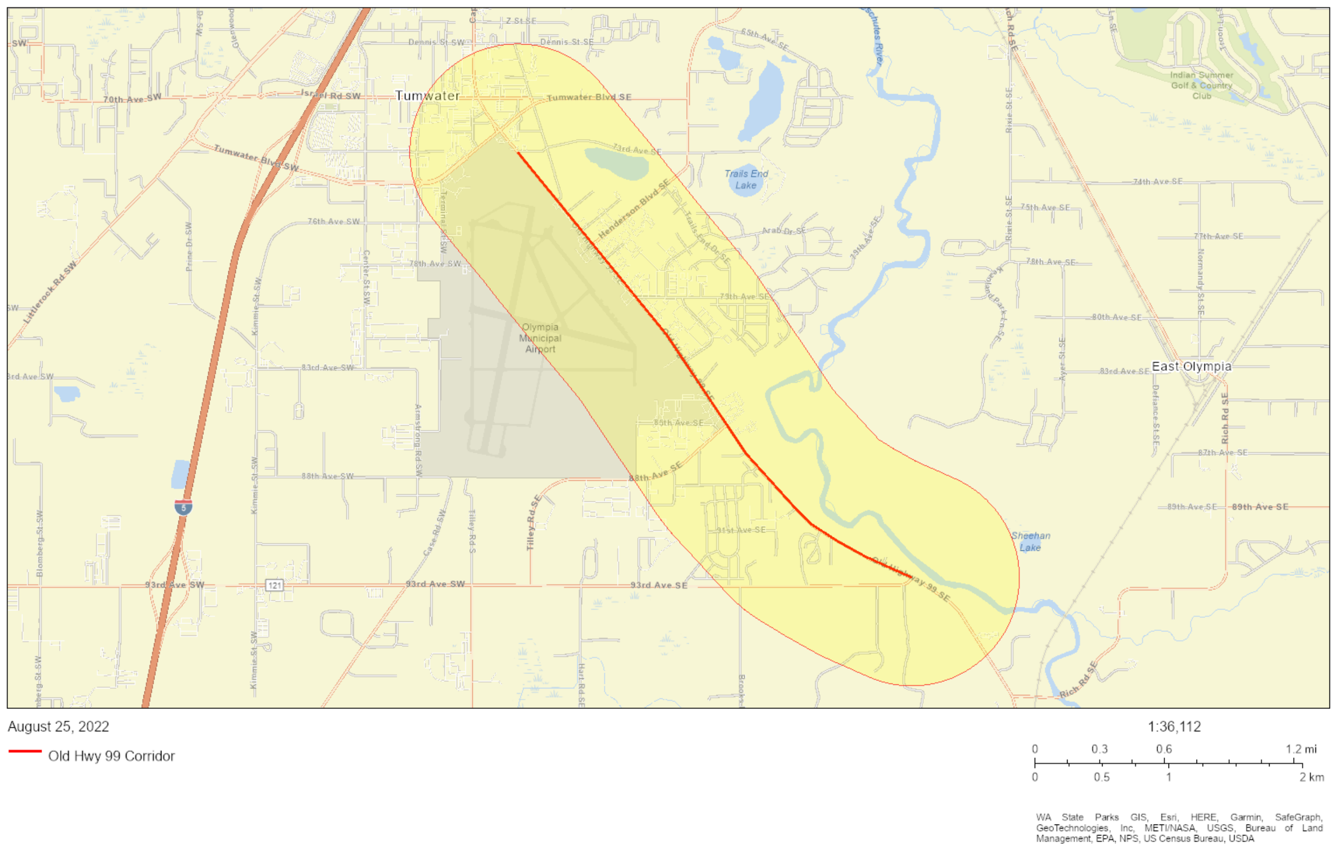
EJScreen Report (Version 2.0)

.5 miles Ring around the Corridor, WASHINGTON, EPA Region 10

Approximate Population: 1,962

Input Area (sq. miles): 3.51

Old Hwy 99 Corridor



Sites reporting to EPA	
Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	1

EJScreen Report (Version 2.0)

.5 miles Ring around the Corridor, WASHINGTON, EPA Region 10

Approximate Population: 1,962

Input Area (sq. miles): 3.51

Old Hwy 99 Corridor

Selected Variables	Value	State Avg.	%ile in State	EPA Region Avg.	%ile in EPA Region	USA Avg.	%ile in USA
Pollution and Sources							
Particulate Matter 2.5 ($\mu g/m^3$)	7.18	7.86	22	8.17	20	8.74	15
Ozone (ppb)	32	35.3	29	37.2	18	42.6	5
2017 Diesel Particulate Matter* ($\mu g/m^3$)	0.235	0.336	38	0.312	<50th	0.295	<50th
2017 Air Toxics Cancer Risk* (lifetime risk per million)	30	35	47	33	50-60th	29	80-90th
2017 Air Toxics Respiratory HI*	0.4	0.52	31	0.47	<50th	0.36	80-90th
Traffic Proximity (daily traffic count/distance to road)	190	710	44	600	48	710	46
Lead Paint (% Pre-1960 Housing)	0.05	0.22	29	0.22	30	0.28	28
Superfund Proximity (site count/km distance)	0.35	0.19	87	0.13	92	0.13	92
RMP Facility Proximity (facility count/km distance)	0.043	0.65	4	0.66	8	0.75	3
Hazardous Waste Proximity (facility count/km distance)	0.63	2.2	43	1.7	52	2.2	48
Underground Storage Tanks (count/km^2)	1.8	6.1	53	4.5	57	3.9	56
Wastewater Discharge (toxicity-weighted concentration/m distance)	N/A	0.021	N/A	0.53	N/A	12	N/A
Socioeconomic Indicators							
Demographic Index	25%	29%	51	28%	51	36%	42
People of Color	20%	31%	36	28%	43	40%	36
Low Income	31%	26%	67	28%	61	31%	55
Unemployment Rate	8%	5%	78	5%	77	5%	75
Linguistically Isolated	1%	4%	46	3%	51	5%	48
Less Than High School Education	7%	9%	51	9%	49	12%	39
Under Age 5	4%	6%	33	6%	33	6%	35
Over Age 64	15%	15%	58	16%	56	16%	55

*Diesel particular matter, air toxics cancer risk, and air toxics respiratory hazard index are from the EPA's 2017 Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. Cancer risks and hazard indices from the Air Toxics Data Update are reported to one significant figure and any additional significant figures here are due to rounding. More information on the Air Toxics Data Update can be found at: https://www.epa.gov/haps/air-toxics-data-update.

For additional information, see: www.epa.gov/environmentaljustice

EJSCREEN ACS Summary Report

Location: User-specified linear location

Ring (buffer): .5-miles radius

Description: Old Hwy 99 Corridor

Summary of ACS Estimates	2015 - 2019
Population	1,962
Population Density (per sq. mile)	954
People of Color Population	395
% People of Color Population	20%
Households	848
Housing Units	871
Housing Units Built Before 1950	28
Per Capita Income	34,234
Land Area (sq. miles) (Source: SF1)	2.06
% Land Area	97%
Water Area (sq. miles) (Source: SF1)	0.07
% Water Area	3%

	2015 - 2019 ACS Estimates	Percent	MOE (±)
Population by Race			
Total	1,962	100%	510
Population Reporting One Race	1,857	95%	964
White	1,670	85%	504
Black	64	3%	176
American Indian	18	1%	41
Asian	37	2%	85
Pacific Islander	14	1%	82
Some Other Race	54	3%	76
Population Reporting Two or More Races	106	5%	147
Total Hispanic Population	170	9%	115
Total Non-Hispanic Population	1,793		
White Alone	1,568	80%	496
Black Alone	64	3%	176
American Indian Alone	7	0%	41
Non-Hispanic Asian Alone	37	2%	85
Pacific Islander Alone	13	1%	80
Other Race Alone	5	0%	18
Two or More Races Alone	99	5%	141
Population by Sex			
Male	892	45%	253
Female	1,070	55%	321
Population by Age			
Age 0-4	85	4%	126
Age 0-17	437	22%	205
Age 18+	1,526	78%	284
Age 65+	301	15%	132

Data Note: Detail may not sum to totals due to rounding. Hispanic population can be of any race.
N/A means not available. **Source:** U.S. Census Bureau, American Community Survey (ACS) 2015 - 2019 .

EJSCREEN ACS Summary Report

Location: User-specified linear location
Ring (buffer): .5-miles radius
Description: Old Hwy 99 Corridor

	2015 - 2019 **ACS Estimates**	**Percent**	**MOE (±)**
Population 25+ by Educational Attainment			
Total	1,433	100%	318
Less than 9th Grade	20	1%	48
9th - 12th Grade, No Diploma	74	5%	85
High School Graduate	275	19%	110
Some College, No Degree	425	30%	225
Associate Degree	204	14%	110
Bachelor's Degree or more	435	30%	174
Population Age 5+ Years by Ability to Speak English			
Total	1,877	100%	435
Speak only English	1,760	94%	322
Non-English at Home[1+2+3+4]	117	6%	116
[1]Speak English "very well"	99	5%	114
[2]Speak English "well"	18	1%	45
[3]Speak English "not well"	0	0%	12
[4]Speak English "not at all"	0	0%	12
[3+4]Speak English "less than well"	0	0%	12
[2+3+4]Speak English "less than very well"	18	1%	45
Linguistically Isolated Households*			
Total	8	100%	23
Speak Spanish	8	100%	20
Speak Other Indo-European Languages	0	0%	12
Speak Asian-Pacific Island Languages	0	0%	12
Speak Other Languages	0	0%	12
Households by Household Income			
Household Income Base	848	100%	147
< $15,000	83	10%	84
$15,000 - $25,000	110	13%	111
$25,000 - $50,000	139	16%	96
$50,000 - $75,000	155	18%	107
$75,000 +	361	43%	149
Occupied Housing Units by Tenure			
Total	848	100%	147
Owner Occupied	534	63%	138
Renter Occupied	315	37%	131
Employed Population Age 16+ Years			
Total	1,598	100%	344
In Labor Force	973	61%	254
Civilian Unemployed in Labor Force	74	5%	82
Not In Labor Force	624	39%	215

Data Note: Datail may not sum to totals due to rounding. Hispanic population can be of anyrace.
N/A means not available. **Source:** U.S. Census Bureau, American Community Survey (ACS)
*Households in which no one 14 and over speaks English "very well" or speaks English only.

EJSCREEN ACS Summary Report

Location: User-specified linear location
Ring (buffer): .5-miles radius
Description: Old Hwy 99 Corridor

	2015 - 2019 **ACS Estimates**	**Percent**	**MOE (±)**
Population by Language Spoken at Home*			
Total (persons age 5 and above)	N/A	N/A	N/A
English	N/A	N/A	N/A
Spanish	N/A	N/A	N/A
French	N/A	N/A	N/A
French Creole	N/A	N/A	N/A
Italian	N/A	N/A	N/A
Portuguese	N/A	N/A	N/A
German	N/A	N/A	N/A
Yiddish	N/A	N/A	N/A
Other West Germanic	N/A	N/A	N/A
Scandinavian	N/A	N/A	N/A
Greek	N/A	N/A	N/A
Russian	N/A	N/A	N/A
Polish	N/A	N/A	N/A
Serbo-Croatian	N/A	N/A	N/A
Other Slavic	N/A	N/A	N/A
Armenian	N/A	N/A	N/A
Persian	N/A	N/A	N/A
Gujarathi	N/A	N/A	N/A
Hindi	N/A	N/A	N/A
Urdu	N/A	N/A	N/A
Other Indic	N/A	N/A	N/A
Other Indo-European	N/A	N/A	N/A
Chinese	N/A	N/A	N/A
Japanese	N/A	N/A	N/A
Korean	N/A	N/A	N/A
Mon-Khmer, Cambodian	N/A	N/A	N/A
Hmong	N/A	N/A	N/A
Thai	N/A	N/A	N/A
Laotian	N/A	N/A	N/A
Vietnamese	N/A	N/A	N/A
Other Asian	N/A	N/A	N/A
Tagalog	N/A	N/A	N/A
Other Pacific Island	N/A	N/A	N/A
Navajo	N/A	N/A	N/A
Other Native American	N/A	N/A	N/A
Hungarian	N/A	N/A	N/A
Arabic	N/A	N/A	N/A
Hebrew	N/A	N/A	N/A
African	N/A	N/A	N/A
Other and non-specified	N/A	N/A	N/A
Total Non-English	N/A	N/A	N/A

Data Note: Detail may not sum to totals due to rounding. Hispanic popultion can be of any race.
N/A meansnot available. **Source:** U.S. Census Bureau, American Community Survey (ACS) 2015 - 2019.
*Population by Language Spoken at Home is available at the census tract summary level and up.

East Olympia Elementary

2021-22

Total Student Enrollment

519

Gender

Female	52.6%
Male	47.4%

Race/Ethnicity

American Indian/ Alaskan Native	0.2%
Asian	3.5%
Black/ African American	2.7%
Hispanic/ Latino of any race(s)	21.2%
Native Hawaiian/ Other Pacific Islander	0.2%
Two or More Races	6.9%
White	65.3%

Program and Characteristic

English Language Learners	6.0%
Non-English Language Learners	94.0%
Non-Foster Care	100.0%
Low-Income	28.3%
Non-Low Income	71.7%
Mobile	3.3%
Non Mobile	96.7%
Highly Capable	3.3%
Non-Highly Capable	96.7%
Homeless	2.3%
Non-Homeless	97.7%
Non Migrant	100.0%
Military Parent	10.0%
Non Military Parent	90.0%
Section 504	1.9%
Non Section 504	98.1%
Students with Disabilities	11.8%
Students without Disabilities	88.2%