FINAL MEMORANDUM #6: ALTERNATIVES ANALYSIS, PROJECT LIST, AND COST ESTIMATES

Date:	December 27, 2021
To:	Steve Williams, Ellen Rogalin, and Scott Hoelscher; Clackamas County Michael Walter, City of Happy Valley
From:	Marc Butorac PE, PTOE, PMP, Krista Purser, PE, and Russ Doubleday
Project:	Damascus Mobility Plan
Subject:	Final Alternatives Analysis, Project List, and Cost Estimates (Task 8.4)

Table of Contents

Introduction

This memorandum provides a summary of the future needs, imminent systemic safety enhancements, potential alternatives, alternatives analysis, and cost estimates for the project alternatives.

Future Needs

Key future network operational and safety needs identified in *Memorandum #5: Future Damascus Mobility Plan Area Transportation System Conditions* include:

- Monitor demand in the study area to ensure intersections are projected to continue to operate acceptably.
- Monitor the performance of the SE Tillstrom Road/SE Wiese Road/SE Bohna Park intersection area. The existing SE Wiese Road/SE Bohna Park Road intersection exceeds ODOT's 90th percentile crash rate for similar intersections. Metro's Regional Travel Demand Model shows this intersection as one meeting point in the future. Assess potential changes to the roadway network and consider how the change in traffic patterns and geometric changes in the area may impact safety performance.
- Consider the existing and future freight and transit networks in future recommendations.

In addition to these concerns, the project team heard safety concerns regarding speeding along several roadways and desire for shoulder space to walk and bike in the Damascus area.

Imminent Damascus Area Systemic Safety Enhancements

As described in *Memorandum #5: Future Damascus Mobility Plan Area Transportation System Conditions*, there are 12 intersections and two roadway segments that were identified as locations for additional safety signage. Table 1 identifies these locations.

Since these 14 projects are expected to go to bid shortly and be completed in 2022, they are included in this memorandum, but not included in the alternatives analysis.

Table 1. Safety Projects from the Damascus Area Systemic Safety Enhancements Project

ID	Location	Description
1	SE Tillstrom Road & SE 190th Drive	Install safety signage
2	SE Tillstrom Road & SE Borges Road	Install safety signage
3	SE Tillstrom Road & SE Bohna Park Road	Install safety signage
4	SE Wiese Road & SE Bohna Park Road	Install safety signage
5	SE 222nd Drive & SE Borges Road	Install safety signage
6	SE 222nd Drive & SE Tillstrom Road	Install safety signage and overhead flashing beacons
7	SE 222nd Drive & SE Bohna Park Road	Install safety signage
8	SE 242nd Avenue & SE Sunshine Valley Road	Install safety signage
9	SE 222nd Drive & SE Hoffmeister Road	Install safety signage
10	SE 242nd Avenue & SE Tillstrom Road	Install safety signage
11	SE 242nd Avenue & SE Bohna Park Road	Install safety signage
12	SE 242nd Avenue & SE Hoffmeister Road	Install safety signage
13	SE 222nd Drive	Install safety signage
14	SE Wiese Road	Install safety signage

Potential Alternatives

This section outlines potential alternatives at a series of intersections within the Damascus Mobility Plan study area, as well as one area-wide alternative, to address existing and future needs. This section discusses the reasons for including each alternative, as well as potential issues or drawbacks that any alternative may include.

A1 - SE TILLSTROM ROAD/SE BOHNA PARK ROAD AND SE WIESE ROAD/SE BOHNA PARK ROAD

SE Tillstrom Road and SE Bohna Park Road are parallel roadways that meet at a tight acute angle. Heading east from the intersection, SE Tillstrom Road maintains a relatively flat grade, while SE Bohna Park Road drops down toward Rock Creek. The SE Wiese Road/SE Bohna Park Road intersection, approximately 500 feet to the east of the SE Tillstrom Road/SE Bohna Park Road intersection, is only about 50 feet away from SE Tillstrom Road and separated by a 10 to15-foot embankment (see Exhibit 1). Exhibit 2 shows the SE Wiese Road/SE Bohna Park Road intersection in the foreground; the truck in the background is on SE Tillstrom Road.

Exhibit 1. The SE Tillstrom Road/SE Bohna Park Road and SE Wiese Road/SE Bohna Park Road Intersections

Source: Google Earth

Exhibit 2. The SE Wiese Road/SE Bohna Park Road Intersection with SE Tillstrom Road in the Background

As identified in *Memorandum #4: Evaluation of the Damascus Mobility Plan Area Transportation System*, the SE Wiese Road/SE Bohna Park Road intersection has an intersection crash rate that exceeds the Oregon Department of Transportation's (ODOT) 90th percentile rate for three-legged stop-controlled intersections.

Potential mitigation solutions are divided into short-term alternatives that address safety concerns through traffic control changes, and long-term alternatives that more fundamentally address issues between these two closely-spaced intersections.

A1.1 Right-In, Right-Out, or Right-In, Right-Out, Left-In (Short-Term)

As shown in Figure 1, there are very few northbound right-turns and westbound left-turns at the SE Bohna Park Road/SE Tillstrom Road intersection. The majority of vehicles turning on or off of SE Bohna Park Road are making an eastbound right-turn or a northbound left-turn. Both of these turning movements, as shown in Figure 2, are low-angle turns, and the eastbound right-turn can be completed at high speed. This results in the northbound left-turn movement, which is stop-controlled, having to get up to very high speeds from a full stop while looking for traffic sharply over their right shoulder.

Figure 1. Existing Traffic Conditions at SE Bohna Park Road Intersections

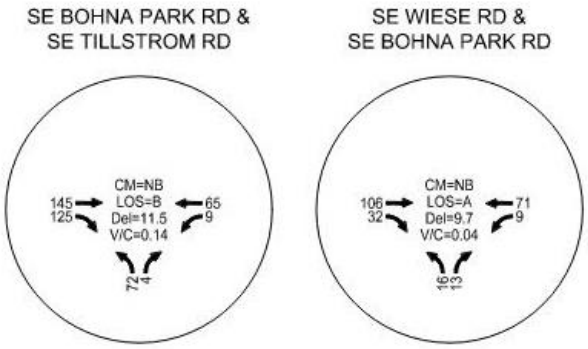


Figure 2. High-Volume Turning Movements at SE Bohna Park Rd/SE Tillstrom Rd Intersection

Source: Google Earth

In the short-term, reconfiguring this intersection to a right-in, right-out (RIRO), or right-in, right-out, left-in (RIROLI) configuration would eliminate the high-volume northbound left-turn movement, shown in Figure 3. Currently, these left-turning vehicles need to complete the turn onto a 40 MPH road with limited sight distance (see Exhibit 3). In addition, of the three reported crashes at the SE Wiese Road/SE Bohna Park Road intersection, two involved vehicles making a northbound left-turn. Under a RIRO or RIROLI scenario at the SE Tillstrom Road/SE Bohna Park Road intersection, these turns would no longer be legal at the SE Wiese Road/SE Bohna Park Road intersection, which should help address the intersection crash rate.

Under either a RIRO or RIROLI scenario, northbound left-turning vehicles would need to travel out of direction to reach SE Tillstrom Road, either via SE 222nd Drive to SE Borges Road or via Wiese Road to Highway 212 to SE Foster Road. Using existing speed limits, the travel time from the SE Bohna Park Road/SE Tillstrom intersection to the SE Foster Road/SE Tillstrom Road intersection is:

- Approximately three minutes with no detour
- Approximately six and a half minutes using SE 222nd Avenue and SE Borges Road
- Approximately seven and a half minutes using SE Wiese Road and Highway 212 to SE Foster Road

These detours would impact approximately 25 properties near this intersection on SE Bohna Park Road. Larger vehicles may need to be restricted on SE Bohna Park Road.

A1.2. All-Way Stop Control at SE Tillstrom Road/SE Bohna Park Road Intersection

Another way to address a safety concern for the northbound left-turn movement from SE Bohna Park Road would be to change the intersection control from two-way stop control to all-way stop control. Such a change would address sight distance issues for these northbound vehicles looking east and would safely allow these vehicles to complete their turn without needing to navigate in front of high-speed traffic.

Given the horizontal curvature of SE Tillstrom Road to the east of the intersection (see Exhibit 3), signage will be key to ensure that westbound vehicles do stop at the intersection. While it would add considerable cost to the alternative, straightening this curve would allow oncoming vehicles to better see the stop sign at the oncoming intersection.

Exhibit 3. The SE Tillstrom Road/SE Bohna Park Road Intersection, Looking East

In the long-term, relocating the existing SE Tillstrom Road/SE Bohna Park Road intersection to establish a new orthogonal intersection would be beneficial for traffic safety and operations. The project team identified two potential locations for such an intersection, shown in Figure 4 and Figure 5.

A1.3. Rerouting SE Bohna Park Road to Meet SE Delia Street

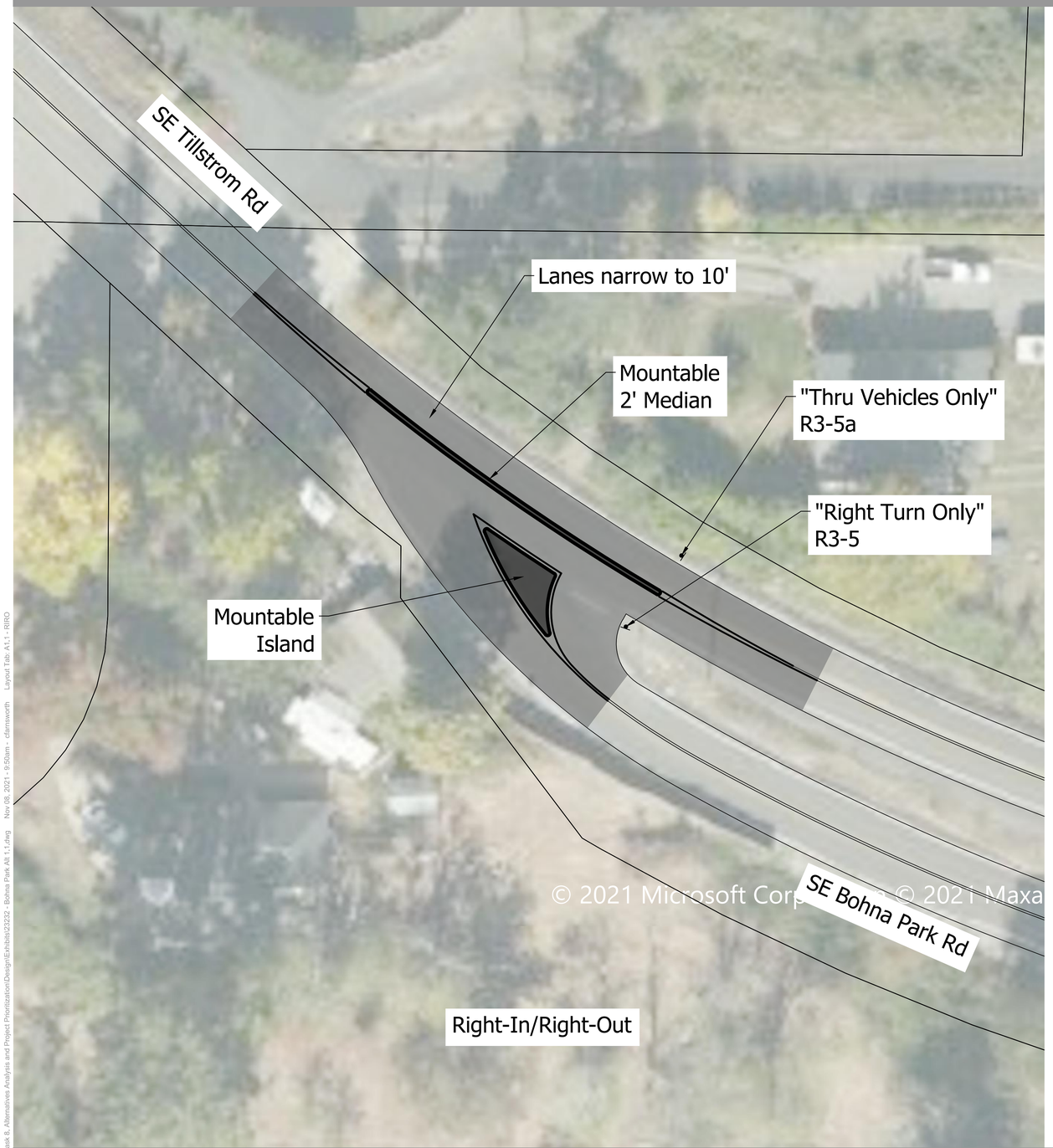
Rerouting SE Bohna Park Road to SE Delia Street (shown in red on the figure below) would develop a new roadway connection to the south of the intersection with SE Tillstrom Road. The purpose of this alternative would be to utilize the existing SE Tillstrom Road/SE Delia Street intersection as a safer location for adding traffic that currently uses the SE Tillstrom Road/SE Bohna Park Road intersection. The alignment shown in the figure is illustrative; if this alternative is selected, an exact route would need to account for topography and existing structures.

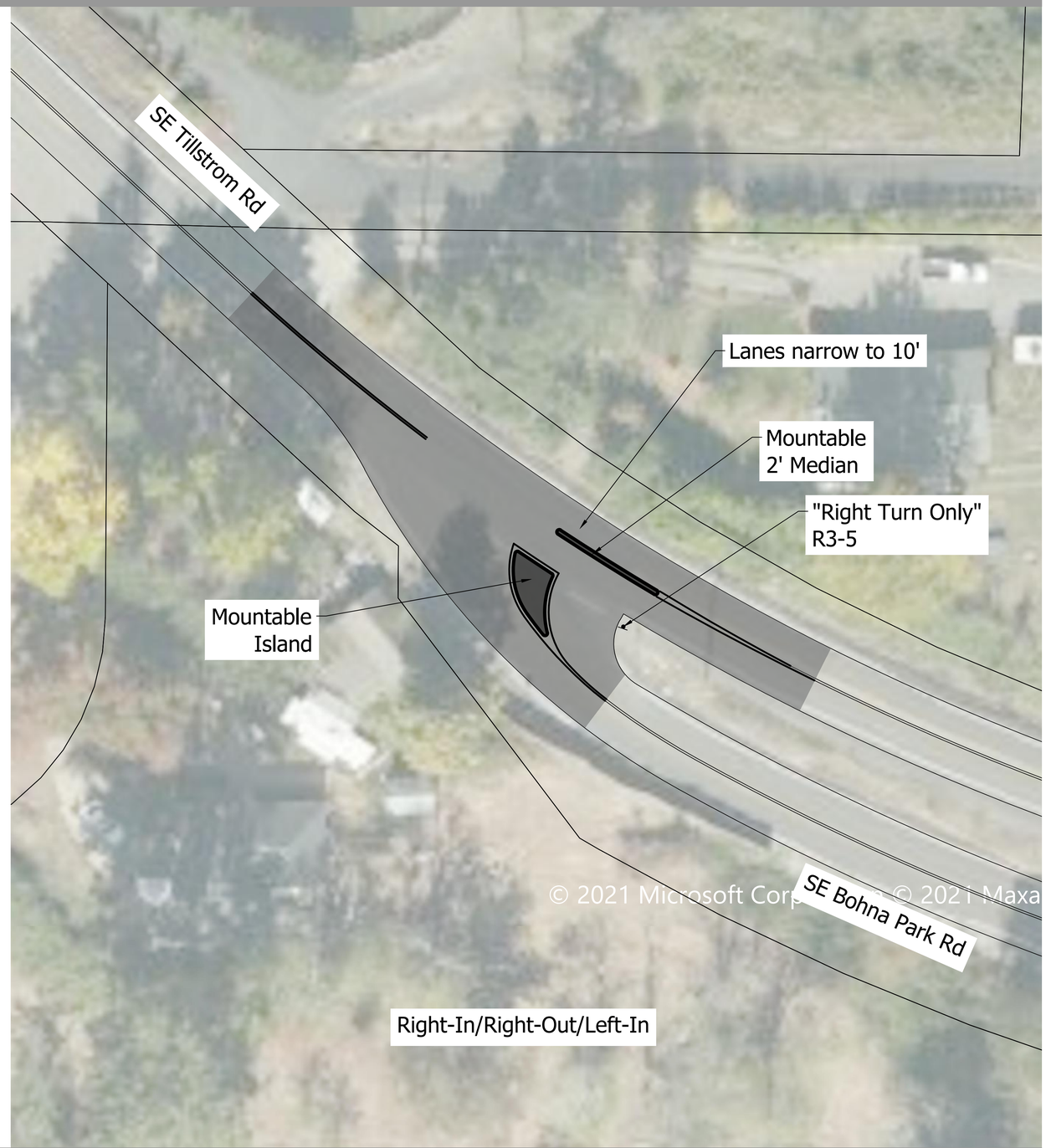
A1.4. Establishing a New Connection between SE Tillstrom Road and SE Bohna Park Road

Establishing a new connection to the east (shown in blue in the figure below) would add a new roadway where the grade separation between the two roadways on either end is less extreme. This alternative would also remove SE Bohna Park Road to the west of SE Wiese Road, effectively turning this intersection into a curve in the road. This alternative was deemed to be cost-prohibitive given the location of Rock Creek and the need to build a roadway across wetlands.

Bohna Park/Tillstrom Alternative 1.1

Preliminary Design Subject to Change
November 2021





KITTELSON & ASSOCIATES
PHONE: (503) 228-5230 CONTACT: Marc Butorac, PE, Caleb Cox, PE

Scale: 1" = 50'
50 25 0 50

DRAFT CONCEPTUAL PLAN
The purpose of this plan is to identify possible future transportation improvements, including potential property and environmental impacts, design and conceptual costs, and feasibility of the improvements. These draft materials are provided for public review and comment. The proposed projects are under consideration, but have not been approved by Clackamas County. If any of the projects are approved by the county, then determining the actual impacts, discussions with property owners and setting project schedules will depend on the availability of future funding and would take place during the design and construction phase.

Figure 3

Damascus Mobility Plan
Clackamas County, Oregon

H:\25252252 - Damascus Mobility Plan\Task 8, Alternatives Analysis and Project Prioritization\Design\Exhibits\252522 - Bohna Park Alt 1.1.dwg Nov 08, 2021 - 9:58am - clarnsworth Layout Tab: A1.1 - RIRO

Bohna Park/Tillstrom Alternative 1.3

Preliminary Design Subject to Change
Date: November 1, 2021

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Figure 4

Damascus Mobility Plan
Clackamas County, Oregon

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Bohna Park/Tillstrom Alternative 1.4

Preliminary Design Subject to Change
Date: November 1, 2021

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Figure 5

Damascus Mobility Plan
Clackamas County, Oregon

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A2 - SE 242ND AVENUE/SE BORGES ROAD

The SE 242nd Avenue/SE Borges Road intersection is a three-leg, stop-controlled intersection with a channelized southbound right-turn lane (see Exhibit 4). The speed limit on SE 242nd Avenue is 45 MPH, and the eastbound approach to the intersection has limited sight distance for southbound traffic, as shown in Exhibit 5. The County has already identified a preferred alternative based on previous work at this location.

Exhibit 4. The SE 242nd Avenue/SE Borges Road Intersection

Source: Google Earth

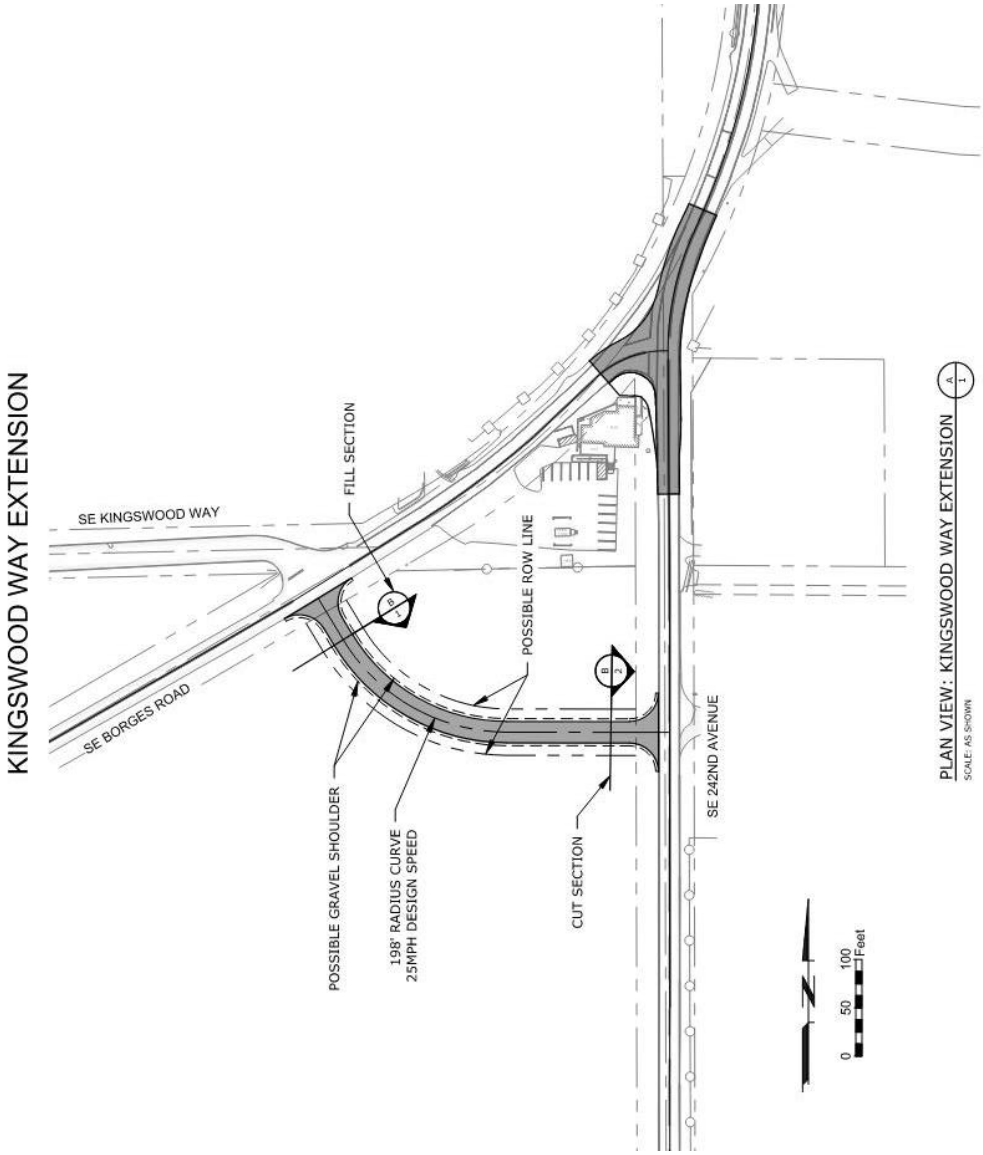
Exhibit 5. The SE 242nd Avenue/SE Borges Road Intersection (Looking North)

A2 – Extend SE Kingswood Way to Meet SE 242nd Avenue

As shown in Figure 6, the County's preferred alternative extends SE Kingswood Way to the southeast of its existing intersection with SE Borges Road to connect with SE 242nd Avenue. The existing SE 242nd Avenue/SE Borges Road intersection will be closed to through traffic, though access to the businesses will be maintained.

This alternative allows for improved sight distance compared to the existing SE 242nd Avenue/SE Borges Road intersection. This alternative will also need to account for elevation changes along the new roadway alignment, filling in the ditch on the west side of SE 242nd Avenue where the SE Kingswood Way alignment will tie in.

Figure 6. Realignment of the SE 242nd Avenue/SE Borges Road Intersection



Source: Murraysmith, Clackamas County

A3 - SE 242ND AVENUE/SE BOHNA PARK ROAD

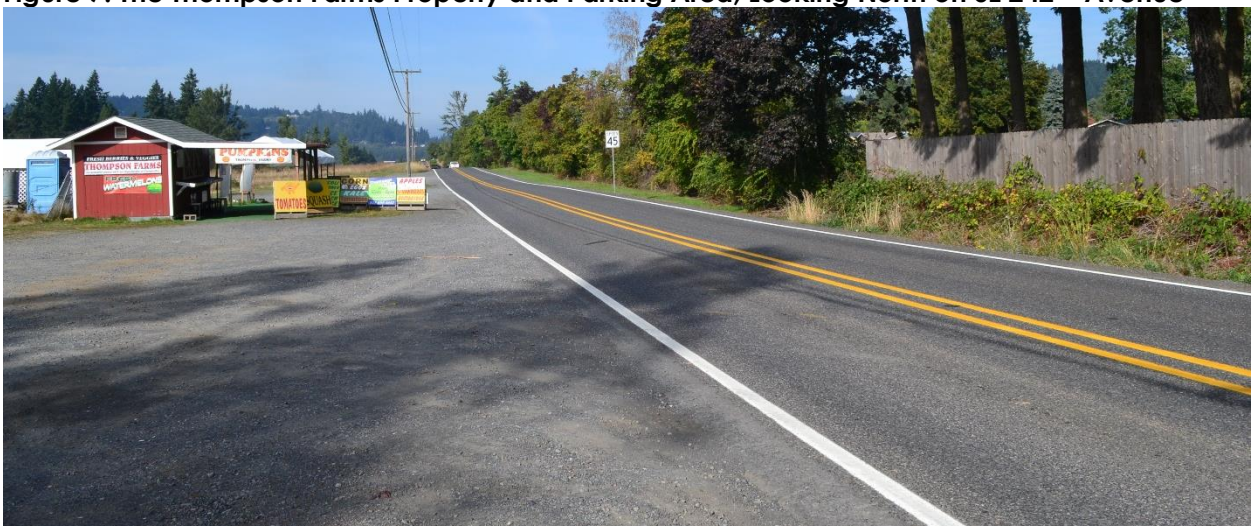
Based on feedback from the virtual open house, the project team analyzed the SE 242nd Avenue/SE Bohna Park Road intersection to improve access management and sight distance for vehicles at the intersection as well as those at Thompson Farms on the northwest corner of the intersection (see Exhibit 6).

Exhibit 6. SE 242nd Avenue/SE Bohna Park Road

Source: Google Earth

Currently, Thompson Farms has a gravel parking lot for approximately 450 feet along the west side of SE 242nd Avenue (see Figure 7), as well as a site access along SE Bohna Park Road approximately 35 feet from the SE 242nd Avenue/SE Bohna Park Road intersection.

Figure 7. The Thompson Farms Property and Parking Area, Looking North on SE 242nd Avenue



To improve access management at this site and to improve predictability of vehicle movements for vehicles along SE 242nd Avenue and at the SE 242nd Avenue/SE Bohna Park Road intersection, the following alternatives are proposed (shown in Figure 8).

1. Close the access located on SE Bohna Park Road;
2. Consolidate access south of the Thompson Farms farm stand to one location;
3. Consolidate access north of the farm stand to one or two locations, and
4. Add delineated shoulders to better separate the roadway right of way and the farm parking lot. (These are included as part of the area-wide alternative, described in more detail below.)

242nd Ave/Bohna Park

Preliminary Design Subject to Change
November 2021

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Scale: 1" = 50'
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Figure 8

Damascus Mobility Plan
Clackamas County, Oregon

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A4 - DAMASCUS SEGMENT-BASED ALTERNATIVES

Across many county roads in Damascus, the roadway shoulders are either insufficiently narrow or non-existent (see Exhibit 7). The American Association of State Highway and Transportation Officials (AASHTO) publishes *A Policy on Geometric Design of Highways and Streets* (the *Green Book*), which Clackamas County uses for its shoulder width on arterial and collector roadways. According to Table 6-5 in the *Green Book*, roads with under 400 average daily traffic (ADT) should have a two-foot shoulder on each side of the road, roads with under 2,000 ADT should have a four-foot shoulder on each side of the road, and roads with more than 2,000 ADT should have a six-foot shoulder on each side of the road. At the same time, wider shoulders in rural environments can inadvertently promote higher speeds. As such, the County assesses the width needs for shoulders on a case-by-case basis, based on operating and safety performance.

Exhibit 7. SE Tillstrom Road (Located at SE 222nd Avenue) with No Shoulders

Adding the appropriate shoulder width to county roads within the Damascus Mobility Plan study area should create safer conditions for drivers to eliminate hard pavement edges and allow for easier shoulder pullovers. Wider shoulders could also provide a safer environment for people walking and biking, where sidewalks and/or bike paths are infeasible.

Table 2 lists the major arterial and collector roadways in the Damascus Mobility Plan study area that were included in *Memorandum #4: Evaluation of the Damascus Mobility Plan Area Transportation System*, along with two higher-speed local road segments that provide important connections within the community.

Table 2 also includes the length of each roadway segment to account for shoulder widening.

Table 2. Arterial, Collector and Selected Local Roadways Segment-Based Alternatives

Alt	Roadway	Functional Classification	Speed Limit	Segment Length
A4.1	**SE 190th Dr**	Major Arterial	40 MPH	530 feet
A4.2	**SE 242nd Ave**	Major Arterial	45 MPH	16,002 feet
A4.3	**SE Sunnyside Rd (172nd to 187th)**	Major Arterial	40 MPH	5,229 feet
A4.4	**SE Sunnyside Rd (187th to Hwy 212)**	Major Arterial	40 MPH	3,182 feet
A4.5	**SE 232nd Dr**	Minor Arterial	45 MPH	9,993 feet
A4.6	**SE Foster Rd**	Minor Arterial	45 MPH	4,567 feet
A4.7	**SE Tillstrom Rd**	Minor Arterial	40 MPH	15,891 feet
A4.8	**SE 190th Dr**	Collector	45 MPH	2,870 feet
A4.9	**SE 222nd Dr**	Collector	45 MPH	15,992 feet
A4.10	**SE 257th Ave**	Collector	45 MPH	1,431 feet
A4.11	**SE Borges Rd**	Collector	40 MPH	15,465 feet
A4.12	**SE Hoffmeister Rd**	Collector	45 MPH	4,106 feet
A4.13	**SE Royer Rd**	Collector	25 MPH	10,001 feet
A4.14	**SE Sunshine Valley Rd**	Collector	40 MPH	3,716 feet
A4.15	**SE Telford Rd**	Collector	45 MPH	2,533 feet
A4.16	**SE Bohna Park Road**	Local	40 MPH	10,713 feet
A4.17	**SE Wiese Road**	Local	Unknown	8,142 feet

Cost Estimates

This section presents the cost estimates for the alternatives. All cost estimates were created at a planning level and based on roughly estimated earthwork and right-of-way information. As a result, cost estimates are subject to change with additional information, engineering, and design refinement.

Table 3 shows the preliminary cost estimates for the intersection-based alternatives for the Damascus Mobility Plan. The cost estimate for A2 is contingent on more information from the county on the details of the project at SE 242nd Avenue/SE Borges Road. All estimates include six-foot shoulders to the extent of the tie-in location.

Table 3. Cost Estimates for the Intersection-Based Alternatives

Alt	Name	Cost Estimate
A1.1	Right-In, Right-Out, or Right-In, Right-Out, Left-In	**$50,000**
A1.2	All-Way Stop Control at SE Tillstrom Road/SE Bohna Park Road	**$5,000**
A1.3	Rerouting SE Bohna Park Road to Meet SE Delia Street	**$1,855,000**
A1.4	Establishing a New Connection between SE Tillstrom Road and SE Bohna Park Road	**$1,245,000**
A2	Extend SE Kingswood Way to Meet SE 242nd Avenue	**$1,483,000**
A3	Access Management at SE 242nd Avenue/SE Bohna Park Road	**$210,000**

Table 4 shows the preliminary cost estimates for the segment-based alternatives for the Damascus Mobility Plan. All segments were assumed to have no existing shoulders. These segments assume an average of four feet of new shoulder on each side of the road with no right-of-way takes and moderate earthwork. Similar to the intersection-based alternatives, the segment cost estimates are planning-level cost estimates subject to further refinement and identification of appropriate shoulder width.

Table 4. Cost Estimates for Segment-Based Alternatives

Alt	Roadway	Segment Length (ft)	Cost Estimate
A4.1	SE 190th Dr	530	**$145,000**
A4.2	SE 242nd Ave	16,002	**$4,305,000**
A4.3	Sunnyside (172nd-187th)	5,229	**$1,410,000**
A4.4	Sunnyside (187th-OR 212)	3,182	**$860,000**
A4.5	SE 232nd Dr	9,993	**$2,690,000**
A4.6	SE Foster Rd	4,567	**$1,230,000**
A4.7	SE Tillstrom Rd	15,891	**$4,275,000**
A4.8	SE 190th Dr	2,870	**$775,000**
A4.9	SE 222nd Dr	15,992	**$4,305,000**
A4.10	SE 257th Ave	1,431	**$385,000**
A4.11	SE Borges Rd	15,465	**$4,160,000**
A4.12	SE Hoffmeister Rd	4,106	**$1,105,000**
A4.13	SE Royer Rd	10,001	**$2,690,000**
A4.14	SE Sunshine Valley Rd	3,716	**$1,000,000**
A4.15	SE Telford Rd	2,533	**$685,000**
A4.16	SE Bohna Park Road	10,713	**$2,885,000**
A4.17	SE Wiese Road	8,142	**$2,190,000**

Alternatives Analysis

The alternatives were analyzed using the evaluation criteria identified in *Memorandum #3: Damascus Mobility Plan Transportation Planning Framework*. These six criteria are:

- Goal 1: Sustainability
  - Does the project increase the potential for walking, biking or taking transit?
  - Does the project impact identified environmentally sensitive areas?
- Goal 2: Local Businesses and Jobs
  - Is the project located in or near an existing or future employment area?
  - Does the project create a direct connection from a highway or higher order facility to an employment area?
- Goal 3: Livable and Local
  - Does the project increase connections between residential areas and commercial areas or to daily needs and services?
  - Does the project reduce the potential impacts of flooding?
  - Does the project help implement a local land use or development plan?
- Goal 4: Safety and Health
  - Does the project improve a safety focus intersection, a candidate road safety audit corridor or an ODOT Safety Priority Index System (SPIS) site?
  - Does the project have the potential to reduce emissions near schools or densely populated areas?
- Goal 5: Equity
  - Is the project located in a transportation disadvantaged area and does it increase transportation options for that disadvantaged community?
  - Does the project increase access for transportation-disadvantaged populations to daily needs and services such as schools, medical services, jobs and groceries?
- Goal 6: Fiscally Responsible
  - What is the estimated cost effectiveness of the project?
  - Is the project located within an area prone to landslides?

Each goal is scored on a -1 to 2 scale: an alternative receives a score of -1 if it degrades the evaluation criteria, a score of 0 if it has no impact on the evaluation criteria, a score of 1 if it indirectly improves the evaluation criteria, and a score of 2 if it directly improves the criteria. Table 5 below scores each of the six intersection alternatives according to the evaluation criteria.

Table 5. Evaluation Criteria Scoring of the Intersection-Based Alternatives

Alt	Criteria 1 Score	Criteria 2 Score	Criteria 3 Score	Criteria 4 Score	Criteria 5 Score	Criteria 6 Score	Total Score
A1.1	0	0	-1	2	0	2	**3**
A1.2	0	0	0	1	0	2	**3**
A1.3	0	0	2	2	0	-2	**2**
A1.4	-1	0	1	2	0	-1	**1**
A2.1	1	0	1	2	0	-1	**3**
A3.1	0	2	0	2	0	1	**5**

Of the A1 alternatives shown in Table 5, A1.1 is recommended in the mid-term, and A1.3 is recommended in the long-term. While A1.1 and A1.2 have identical scores above, limited sight distance may impact the effectiveness of an all-way stop control intersection, while a right-in, right-out intersection will not be impacted. Both alternatives A2.1 and A3.1 are recommended at SE 242nd Avenue/SE Borges Road and at SE 242nd Avenue/SE Bohna Park Road, respectively.

Table 6 scores each of the 16 segment-based alternatives according to the evaluation criteria.

Table 6. Evaluation Criteria Score of the Segment-Based Alternatives

Alt	Criteria 1 Score	Criteria 2 Score	Criteria 3 Score	Criteria 4 Score	Criteria 5 Score	Criteria 6 Score	Total Score
A4.1	1	0	0	0	0	2	**3**
A4.2	1	0	2	1	0	-1	**3**
A4.3	1	1	2	2	0	1	**7**
A4.4	1	1	1	2	0	-1	**4**
A4.5	1	0	2	1	0	-1	**3**
A4.6	1	1	1	1	0	1	**5**
A4.7	1	0	2	2	0	-1	**4**
A4.8	1	0	0	0	0	2	**3**
A4.9	1	0	0	0	0	-1	**0**
A4.10	1	0	0	0	0	-1	**0**
A4.11	1	0	0	0	0	-1	**0**
A4.12	1	0	2	2	0	-1	**4**
A4.13	1	1	0	0	0	-1	**1**
A4.14	1	0	0	0	0	-1	**0**
A4.15	1	0	0	0	0	-1	**0**
A4.16	1	0	0	0	0	-1	**0**
A4.17	1	0	0	0	0	-1	**0**

Of the A4 alternatives shown in Table 6, the highest-scoring segments, in order, are:

- A4.3 – SE Sunnyside Road (172nd – 187th)
- A4.6 – SE Foster Road
- A4.7 – SE Tillstrom Road
- A4.4 – SE Sunnyside Road (187th – OR 212)
- A4.12 – SE Hoffmeister Road
- A4.1/A4.8 – SE 190th Drive (arterial and collector segments)
- A4.2 – SE 242nd Avenue
- A4.5 – SE 232nd Drive

Preliminary Preferred Alternatives Recommendations

Table 7 summarizes the projects, cost, and timeframes for the alternatives recommended in this memorandum. These recommendations will be refined with feedback and follow-up information from the County.

Table 7. Recommended Alternatives

Alt	Description	Cost	Timeframe
A1.3	Reroute SE Bohna Park Road to meet SE Delia Street	$1,855,000	Long-term
A2.1	Extend SE Kingswood Way to meet SE 242nd Avenue	$1,483,000	Short-term
A3.1	Access Management at SE 242nd Avenue/SE Bohna Park Road	$210,000	Mid-term
A4.1	SE 190th Dr Shoulders	$145,000	Long-term
A4.2	SE 242nd Ave Shoulders	$4,305,000	Long-term
A4.3	Sunnyside (172nd-187th) Shoulders	$1,410,000	Mid-term
A4.4	Sunnyside (187th-OR 212) Shoulders	$860,000	Mid-term
A4.5	SE 232nd Dr Shoulders	$2,690,000	Long-term
A4.6	SE Foster Rd Shoulders	$1,230,000	Mid-term
A4.7	SE Tillstrom Rd Shoulders	$4,275,000	Mid-term
A4.8	SE 190th Dr Shoulders	$775,000	Long-term
A4.9	SE 222nd Dr Shoulders	$4,305,000	Long-term
A4.10	SE 257th Ave Shoulders	$385,000	Long-term
A4.11	SE Borges Rd Shoulders	$4,160,000	Long-term
A4.12	SE Hoffmeister Rd Shoulders	$1,105,000	Mid-term
A4.13	SE Royer Rd Shoulders	$2,690,000	Long-term
A4.14	SE Sunshine Valley Rd Shoulders	$1,000,000	Long-term
A4.15	SE Telford Rd Shoulders	$685,000	Long-term
A4.16	SE Bohna Park Road Shoulders	$2,885,000	Long-term
A4.17	SE Wiese Road Shoulders	$2,190,000	Long-term

Appendices

A. Systemic Countermeasures Toolkit

B. Damascus Area Systemic Safety Enhancements

C. Cost Estimates

D. SE 242nd Avenue and SE Borges Road Realignment

Appendix A: Systemic Countermeasures Toolkit

This section presents a suite of potential systemic engineering countermeasures. Systemic solutions can often be applied on a wide-scale (same treatment at many different locations) for relatively low-cost. Many of these may be incorporated into capital projects as well as ongoing maintenance activities to maximize cost-effectiveness.

We have presented the countermeasures in six groups and summarized the documented effectiveness at reducing crashes through the Crash Reduction Factor (CRF), when available:

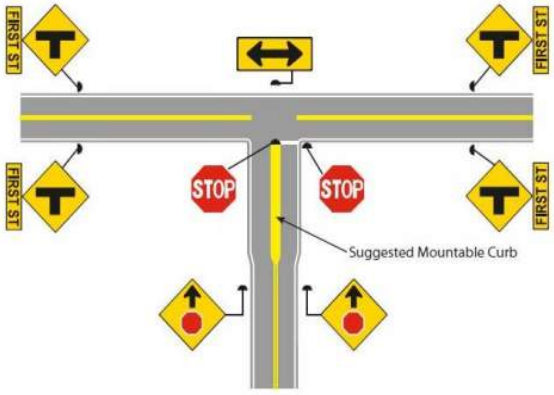
- **Stop-Controlled Intersection Countermeasures**, which are treatments to improve conditions at stop-controlled intersections;
- **Pedestrian Countermeasures**, which are treatments to improve conditions for pedestrians along and across a roadway;
- **Bicyclist Countermeasures**, which are treatments to improve conditions for bicyclists along and across a roadway;
- **Roadway Departure Countermeasures**, which are treatments to reduce lane departure crashes.

1. STOP-CONTROLLED INTERSECTION TREATMENTS

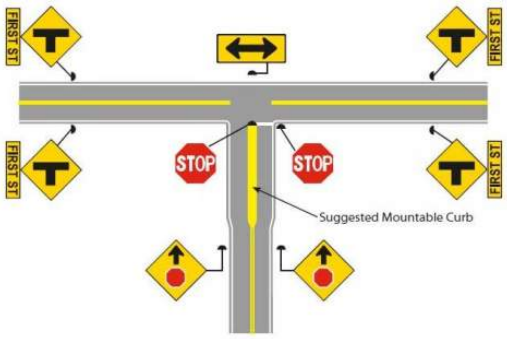
1.1 Provide Flashing Beacons at Stop-Controlled Intersections

Provide Flashing Beacons at Stop-Controlled Intersections		
Flashing beacons can be placed above stop-signs, as well as above stop-ahead warning signs, to raise intersection visibility and awareness. Flashing beacons may flash continuously or be actuated when a vehicle approaches the intersection. This treatment may help reduce angle crashes at intersections where driver awareness of the approaching intersection is a challenge.		
Intersection or Segment	*Intersection (Unsignalized)*	 Source: FHWA
Applicable Crash Types	*Angle crash*	
Potential Crash Reduction	*5 – 58%*	
Planning-Level Cost	*$5,000 per mount*	

1.2 Install Raised Divider on Stop Approach (Splitter Island)

Install Raised Divider on Stop Approach (Splitter Island)		
Installing a raised divider (with mountable curb) on a stop-controlled approach to an intersection can increase intersection visibility by allowing for the addition of a left-side stop sign and better delineate vehicle paths at the intersection. Where possible, a minimum width of 6-feet should be used for the splitter island.		
Intersection or Segment	*Intersection (Unsignalized)*	 Source: FHWA
Applicable Crash Types	*All crash types*	
Potential Crash Reduction	*15%*	
Planning-Level Cost	*$7.55 per square foot*	

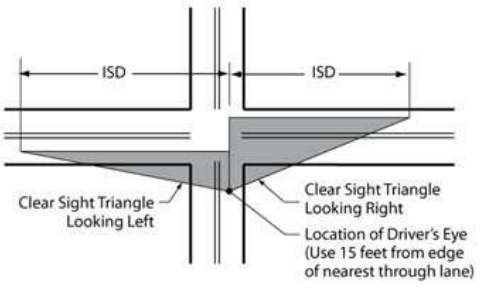
1.3 Increase Intersection Warning with Signing and Striping

Increase Intersection Warning with Signing and Striping		
Implementing a package of low-cost treatments can be used to increase intersection warning and improve safety performance at unsignalized intersections. The improvements include doubled (left and right) oversize warning signs, doubled STOP signs, a raised splitter island on the stop approach (if feasible), street name signs, stop bars, and removing limitations to sight distance. This set of enhancements combines multiple treatments to make the approach of two-way stop-controlled intersections more visible to the driver and increase awareness and visibility of potential conflicts. These treatments can help slow approaching vehicles and increase stop compliance on the controlled approaches.		
Intersection or Segment	*Intersection (Unsignalized)*	 Source: FHWA
Applicable Crash Types	*All crash types*	
Potential Crash Reduction	*11 – 55%*	
Planning-Level Cost	*Varies: $400 per new sign; $700 per oversized sign; $1,000 per Stop Ahead legend*	

1.4 Intersection Lighting

Intersection Lighting		
Adding intersection lighting for signalized and non-signalized intersections helps improve the visibility of the intersection and potential conflicts. Intersection illumination, including pedestrian crossings, helps illuminate crossing pedestrians for approaching motorists and assists pedestrians in navigating the crossing.		
Intersection or Segment	*Intersection*	 Source: Traffic Safety Supply Company
Applicable Crash Types	*Nighttime crashes*	
Potential Crash Reduction	*31 – 38%*	
Planning-Level Cost	*$8,500 per pole*	

1.5 Increase Sight Distance

Increase Sight Distance		
Increasing intersection sight distance may involve a variety of actions to increase the line of sight including clearing vegetation and embankments, relocating objects, implementing parking restrictions. By increasing intersection sight distance, drivers are provided with a greater distance to see potential conflicts and complete maneuvers to avoid potential crashes.		
Intersection or Segment	*Intersection (Signal and Unsignalized)*	 Source: FHWA
Applicable Crash Types	*All crash types*	
Potential Crash Reduction	*11 – 56%*	
Planning-Level Cost	*Varies*	

1.6 Convert to All-Way Stop Control (From Urban 2-Way or Yield Control)

Convert to All-Way Stop Control (From Urban 2-Way or Yield Control)		
This treatment provides more orderly movement at an intersection by reducing through and turning speeds. Typical application of this treatment is at unsignalized intersections with patterns of right-angle and turning crashes with moderate volumes on intersection approaches.		
Intersection or Segment	*Intersection (Unsignalized)*	 Source: FHWA
Applicable Crash Types	*All crash types*	
Potential Crash Reduction	*75%*	
Planning-Level Cost	*$500 per new sign*	

2. PEDESTRIAN TREATMENTS

2.1 Install Continental Crosswalk Markings and Advance Pedestrian Warning Signs at Uncontrolled Locations

Install Continental Crosswalk Markings and Advance Pedestrian Warning Signs at Uncontrolled Locations		
Continental crosswalk markings (perpendicular rectangular blocks painted solid across a crosswalk) are high-visibility crosswalk markings that enhance pedestrian safety over other potential options for crosswalk markings. When paired with advance pedestrian warning signs, this treatment enhances the visibility of pedestrian crossings to help alert drivers to the need to slow their speed and the potential need to stop if pedestrians are present. This treatment would be appropriate in mixed land use corridors with pedestrian and bicyclist presence or a history of pedestrian or bicyclist crashes.		
Intersection or Segment	*Segment*	 Source: Safe Routes to School Guide
Applicable Crash Types	*Pedestrian Crashes*	
Potential Crash Reduction	*15%*	
Planning-Level Cost	*$2,000*	

2.2 Sidewalks

Sidewalks		
This treatment provides a distinct and protected space for pedestrians to walk between a roadway and other land uses. It helps to increase comfort, increase visibility of pedestrians to motorists, and can help prevent vehicles from departing the roadway and striking pedestrians		
Intersection or Segment	*Segment*	 Source: NACTO
Applicable Crash Types	*Pedestrian Crashes, Roadway Departure Crashes*	
Potential Crash Reduction	*80%*[1]	
Planning-Level Cost	*$25 per linear foot*	

[1] From Caltrans *Local Roadway Safety Manual*, April 2018

3. BICYCLIST TREATMENTS

3.1 Bike Lanes / Buffered Bike Lanes

Bike Lanes / Buffered Bike Lanes		
Bike lanes are on-street facilities. This facility type includes bike lanes with a painted buffer (stripe) but no physical (horizontal and vertical) separation between vehicle travel lanes and bicycle travel lanes. Buffered bike lanes provide extra lateral separation visually but without vertical elements. In general, a buffer is preferred where possible.		
Intersection or Segment	*Segment*	 Source: Kittelson
Applicable Crash Types	*Bicycle Crashes*	
Potential Crash Reduction	*0 – 53%*	
Planning-Level Cost	*$4,000 per mile (buffered)*	

3.2 Separated Bike Lanes

Separated Bike Lanes		
Separated bikeways provide a physical separation from vehicular traffic. This separation may include grade separation (slightly elevated bike lane), flexible posts, planters or other inflexible physical barriers, or on-street parking. These bikeways provide bicyclists a greater sense of comfort and security, especially around high-speed roadways. Separated facilities can provide one-way or two-way travel and may be located on either side of a one-way roadway. Separated bikeways are appropriate at speeds and volumes where bike lanes or buffered bike lanes do not adequately address the comfort needs for a majority of the candidate biking population. These facilities are more appropriate than shared-use paths if pedestrian and bicyclist volumes are expected to be relatively high because these two modes are separated from each other.		
Intersection or Segment	*Segment*	 Source: Kittelson
Applicable Crash Types	*Bicycle Crashes*	
Potential Crash Reduction	*Varies*	
Planning-Level Cost	*$110,000 per mile*	

3.3 Shared-Use Path

Shared-Use Path		
Shared-use paths provide a separated facility for exclusive bicyclist and pedestrian use. They have minimal or no conflicting motor vehicle traffic. Generally, shared-use paths serve corridors not served by streets (e.g., river paths or converted rail rights-of-way) or may be parallel to roadways where right-of-way is available (sidepaths). Shared-use paths provide recreational and commute routes for bicyclists. Shared-use paths are typically installed along independent rights-of-way (for example, along greenways or abandoned rail trails). Path crossings may be designed with yield, signal, or stop control depending on path volume and traffic volume on the crossing street. Refer to MUTCD 9C.04 for more information.		
Intersection or Segment	*Segment*	 Source: Kittelson
Applicable Crash Types	*Pedestrian and Bicycle Crashes*	
Potential Crash Reduction	*Varies*	
Planning-Level Cost	*$200 per linear foot ($1.2 million per mile)*	

4. ROADWAY DEPARTURE TREATMENTS

4.1 Install Centerline Rumble Strips

Install Centerline Rumble Strips		
Centerline rumble strips provide auditory and tactile feedback to motorists when they have begun to cross over the centerline of the roadway. Centerline rumble strips can reduce head-on and other crossover crash types on horizontal curves of undivided roadway segments by alerting drivers they are crossing over the centerline into the opposing direction of traffic.		
Intersection or Segment	*Segment*	 Source: FHWA
Applicable Crash Types	*All crash types*	
Potential Crash Reduction	*9 – 45%*	
Planning-Level Cost	*$3,000 per mile*	

4.2 Install Shoulder Rumble Strips

Install Shoulder Rumble Strips		
Shoulder rumble strips provide auditory and tactile feedback to motorists when they begin to exit the outside of the travel lane. Shoulder rumble strips can help reduce run-off-the-road crashes by alerting drivers that they are exiting the lane.		
Intersection or Segment	*Segment*	 Source: FHWA Proven Safety Countermeasures
Applicable Crash Types	*Run off the road crashes*	
Potential Crash Reduction	*16 – 42%*	
Planning-Level Cost	*$850 per mile*	

4.3 Widen Paved Shoulder

Widen Paved Shoulder		
Widen the paved shoulder adjacent to travel lanes. Paved shoulders may increase safety performance for drivers when navigating horizontal curves by providing a paved recovery area for motorists who have left the travel lane. The shoulder can help a driver maintain control and correct the vehicle path. Widening the outside shoulder of a curve provides the greatest benefit on roads where existing space is limited or limited funding is available.		
Intersection or Segment	*Segment*	 Source: FHWA
Applicable Crash Types	*All crash types*	
Potential Crash Reduction	*3 – 18%*	
Planning-Level Cost	*Varies*	

4.4 Install Chevron Signs on Horizontal Curves

Install Chevron Signs on Horizontal Curves		
Chevron signs along horizontal curves provide a visual que to alert and guide motorists through an approaching curve. Chevron signs alert drivers to reduce speeds and prepare to enter a curve. Chevron placement also helps guide drivers through the curve by providing a visual cue to the approaching curve's radius.		
Intersection or Segment	*Segment*	 Source: FHWA
Applicable Crash Types	*Run off the road crash*	
Potential Crash Reduction	*4 – 25%*	
Planning-Level Cost	*$300 per sign*	

4.5 Install Dynamic Feedback Sign on Curves

Install Dynamic Feedback Sign on Curves		
Dynamic speed warning signs alert drivers of their speed into the approach of a curve when their speed is above the curve design speed. Dynamic speed warning signs can reduce curve-related crashes by providing visual feedback to the driver that speeds should be reduced when approaching a curve.		
Intersection or Segment	*Segment*	 Source: FHWA
Applicable Crash Types	*All crash types*	
Potential Crash Reduction	*5%*	
Planning-Level Cost	*Varies*	

4.6 Increase Pavement Friction

Increase Pavement Friction		
High friction surface treatments apply aggregate to the pavement to increase or maintain the pavement friction at a site. Increasing or maintaining appropriate pavement friction through a curve can reduce the potential for motorists to lose control of their vehicle or skid when navigating a curve. Increased pavement friction has been shown to reduce crash frequency during wet conditions and in locations with high friction demand caused by vehicle speeds or roadway geometrics.		
Intersection or Segment	*Segment (particularly curves)*	 Source: FHWA
Applicable Crash Types	*Crash on wet roads*	
Potential Crash Reduction	*20 – 68%*	
Planning-Level Cost	*$30 per square yard*	

4.7 Remove, Relocate, or Protect Fixed Objects Adjacent to Road

Remove, Relocate, or Protect Fixed Objects Adjacent to Road		
Removing or relocating fixed objects adjacent to the roadway increases the unpaved shoulder clear zone. Clearing or moving fixed-objects away from the roadway can reduce fixed-object crashes by providing a clear zone that gives drivers more space and time to correct their path should they leave the road.		
Intersection or Segment	*Segment*	 Source: Florida Vegetation Management Association
Applicable Crash Types	*All crash types*	
Potential Crash Reduction	*38%*	
Planning-Level Cost	*Varies*	

4.8 Install Wider Edge-lines

Install Wider Edge-lines		
Restriping edge-lines to increase their width can improve visibility for drivers. Wider edge-lines more clearly define the edge of the roadway. This increased visibility of the edge of roadway can reduce the incidence of vehicles leaving the roadway.		
Intersection or Segment	*Segment*	 Source: Texas A&M Transportation Institute
Applicable Crash Types	*Run off the road crash*	
Potential Crash Reduction	*11 – 13%*	
Planning-Level Cost	*$0.20 per ft (paint); $0.80 per ft (thermoplastic); $2.00 per ft (MMA)*	

Appendix B: Damascus Area System Safety Enhancements

DAMASCUS AREA SYSTEMIC SAFETY ENHANCEMENTS

PREPARED FOR:

CLACKAMAS COUNTY

JUNE 2021

SHEET INDEX

Legend and Details

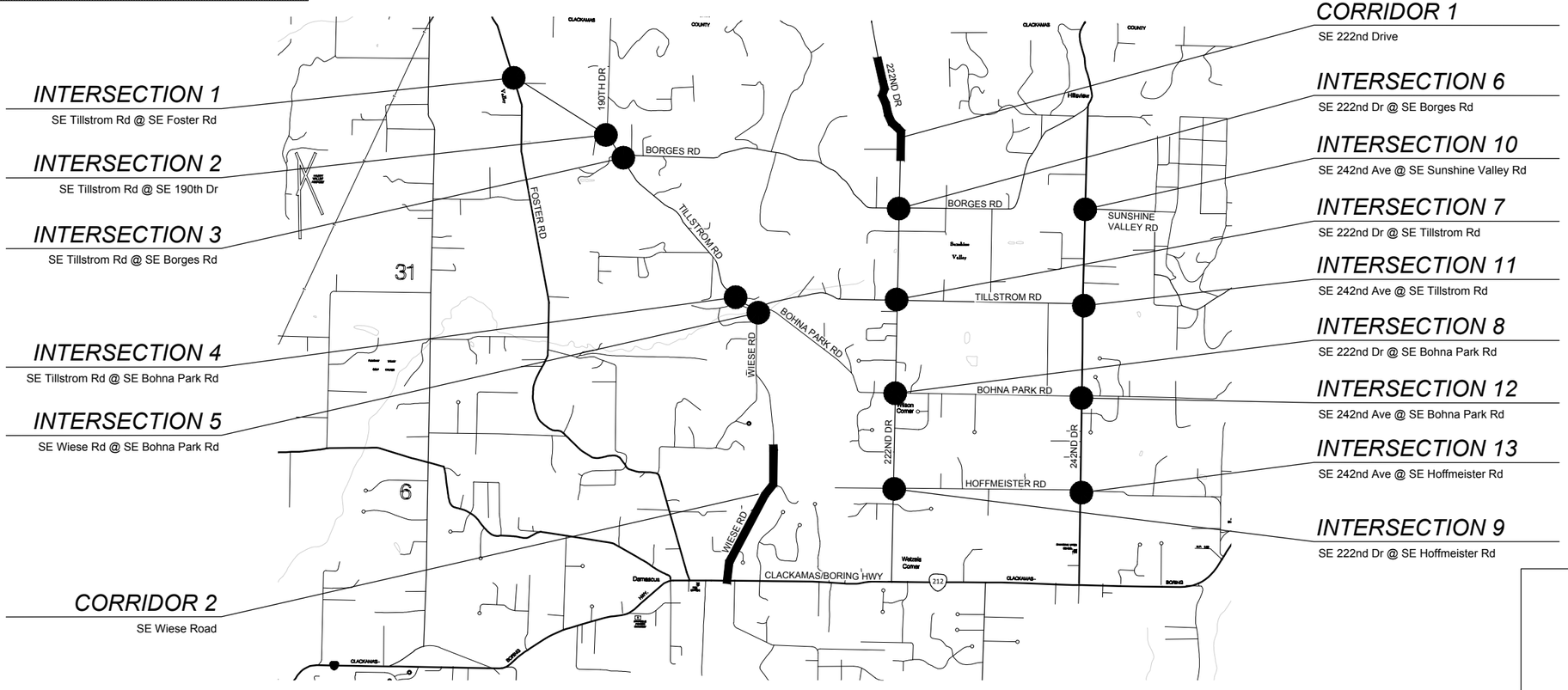
Number	Name
D-01	Legend
D-02	Sign Details
D-03	Typical Single Curve Warning Signage
D-04	Typical Reverse Curve Warning Signage
D-05	Typical Windy Road Curve Signage
D-06	Street Name Sign and Mounting Details
D-07	Sign and Post Installation Details
D-08	Sign Details
D-09	Sign Details
D-10	Pavement Marking Details

Systemic Corridors

Number	Name
C-01	222nd Drive
C-02	Wiese Road

Systemic Intersections

Number	Name
I-01	SE Tillstrom Road/SE Foster Road
I-02	SE Tillstrom Road/SE 190th Drive
I-03	SE Tillstrom Road/SE Borges Road
I-04	SE Tillstrom Road/SE Bohna Park Road
I-05	SE Wiese Road/SE Bohna Park Road
I-06	SE 222nd Drive/SE Borges Road
I-07	SE 222nd Drive/SE Tillstrom Road
I-08	SE 222nd Drive/SE Bohna Park Road
I-09	SE 222nd Drive/SE Hoffmeister Road
I-10	SE 242nd Avenue/SE Sunshine Valley Road
I-11	SE 242nd Avenue/SE Tillstrom Road
I-12	SE 242nd Avenue/SE Bohna Park Road
I-13	SE 242nd Avenue/SE Hoffmeister Road



PROJECT MAP

NO SCALE

KITTELSON & ASSOCIATES

851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

Damascus Area Systemic Safety Enhancements

Cover Sheet

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

DIRECTOR
DAN JOHNSON

DESIGNED BY: DZS | DRAFTED BY: DZS | CHECKED BY: WES

REVISIONS

NO.	DATE:

Sheet No. 1

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LEGEND

SIGNING

#	CURVE NUMBER
X-Y-Z	ALONG CORRIDOR (X) AT CURVE (Y) INSTALL NEW SIGN ASSEMBLY (Z). SEE SIGN INSTALLATION TABLE ON SHEET FOLLOWING CORRIDOR PLAN.
X-Z	AT INTERSECTION (X) INSTALL NEW SIGN ASSEMBLY (Z). SEE SIGN INSTALLATION TABLE ON SHEET FOLLOWING INTERSECTION PLAN.
X-EX-Z	ON CORRIDOR OR INTERSECTION (X) MAINTAIN AND PROTECT SIGN ASSEMBLY (Z). SEE EXISTING SIGN & SIGN REMOVAL TABLE ON SHEET FOLLOWING PLAN SHEETS.
X-RX-Z	ON CORRIDOR OR INTERSECTION (X) REMOVE SIGN ASSEMBLY (Z). SEE EXISTING SIGN & SIGN REMOVAL TABLE ON SHEET FOLLOWING PLAN SHEETS.
X-RS-Z	ON CORRIDOR OR INTERSECTION (X) REMOVE AND SAVE SIGN ASSEMBLY (Z). SEE EXISTING SIGN & SIGN REMOVAL TABLE ON SHEET FOLLOWING PLAN SHEETS.
X-RI-Z	ON CORRIDOR OR INTERSECTION (X) REINSTALL SIGN ASSEMBLY (Z). SEE EXISTING SIGN & SIGN REMOVAL TABLE ON SHEET FOLLOWING PLAN SHEETS.

PAVEMENT MARKINGS

W	INSTALL (4) INCH SOLID WHITE PAVEMENT MARKING. SEE D-05 FOR DETAILS.
W-2	INSTALL (8) INCH SOLID WHITE PAVEMENT MARKING. SEE D-05 FOR DETAILS.
WD	INSTALL (4) INCH DOTTED WHITE PAVEMENT MARKING. SEE D-05 FOR DETAILS.
D	INSTALL DOUBLE NO-PASS YELLOW CENTERLINE PAVEMENT MARKING. SEE D-05 FOR DETAILS.
S-2	INSTALL 2 FOOT WIDE WHITE STOP BAR. SEE D-05 FOR DETAILS.
ST	INSTALL "STOP" PAVEMENT MARKING. SEE D-05 FOR DETAILS.
AH	INSTALL "AHEAD" PAVEMENT MARKING. SEE D-05 FOR DETAILS.
RX / S	REMOVE EXISTING STOP BAR.

MISCELLANEOUS

TV	TRIM VEGETATION BACK TO ALLOW FOR CLEAR SIGHT DISTANCE. WORK TO BE PERFORMED BY CLACKAMAS COUNTY CREWS.

GENERAL NOTES

1. SIGNS PLACED WITHIN CURVES SHALL BE MARKED AND FIELD VERIFIED BY ENGINEER PRIOR TO INSTALLATION OF SIGN.
2. SIGN POSTS THAT ARE MARKED AS MAINTAIN AND PROTECT THAT REQUIRE REPLACEMENT SHALL BE REPLACED PER BID ITEM.
3. ALL SIGN POSTS SHALL BE 12-GAUGE PERFORATED STAINLESS STEEL TUBE UNLESS OTHER WISE NOTED.
4. INTERSECTION SIGNS THAT ARE MARKED IN THE FIELD IN A DRIVEWAY SHALL BE RE-MARKED 10 FEET FROM THE DRIVEWAY FURTHER FROM THE INTERSECTION.
5. SIGN ASSEMBLIES OF MORE THAN 15 SQ. FT. (TOTAL SIGN AREA) SHALL BE INSTALLED ON 2.5" X 2.5" 12-GA. POST WITH SLIP BASE FOUNDATION PER OREGON STANDARD DWG. TM688 (SEE SHEET D-09).

Damascus Area Systemic Safety Enhancements

Legend

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

DIRECTOR
DAN JOHNSON

DESIGNED BY: DZS | DRAFTED BY: DZS | CHECKED BY: WES

REVISIONS

NO.	DATE:

Sheet No. D-01

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REGISTERED PROFESSIONAL ENGINEER
65552PE
OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

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WARNING SIGNS

W1-1L
36"X36"

W1-1R
36"X36"

W1-1aL-XX
36"X36"

W1-1aR-XX
36"X36"

W1-2L
36"X36"

W1-2R
36"X36"

W1-2aL-XX
36"X36"

W1-1aR-XX
36"X36"

W1-3L
36"X36"

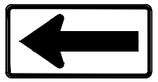
W1-3R
36"X36"

W1-4L
36"X36"

W1-4R
36"X36"

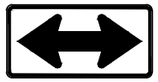
W1-5L
36"X36"

W1-5R
36"X36"



W1-6L
60"X30"

W1-6R
60"X30"



W1-7
60"X30"

W1-8R
24"X30"

W1-8L
24"X30"

W1-10L
36"X36"

W1-10R
36"X36"

W2-1
36"X36"

W2-2L
36"X36"

W2-2R
36"X36"

W2-3L
36"X36"

W2-3R
36"X36"

W2-3La
36"X36"

W2-3Ra
36"X36"

W3-1
36"X36"

W4-4P
36"X36"

W13-1P-20
24"X24"

W13-1P-25
24"X24"

W13-1P-30
24"X24"

W13-1P-35
24"X24"

W13-1P-40
24"X24"

W16-8P
VARIES"X8"

REGULATORY SIGNS

R1-1
36"X36"

R1-3P
18"X6"

GUIDE SIGNS

D3-1
60"X12"

D3-1
48"X12"

D3-1
42"X12"

D3-1
48"X12"

D3-1
60"X12"

D3-1
42"X12"

D3-1
42"X12"

D3-1
66"X12"

D3-1
42"X12"

D3-1
72"X12"

D1-1
60"X12"

D1-1
60"X12"

D1-1
60"X48"

CR1033 - Modified
36"X42"

CR1033 - Modified
36"X36"

CR1033 - Modified
36"X36"

KITTELSON & ASSOCIATES
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REGISTERED PROFESSIONAL ENGINEER
65552PE
OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Damascus Area Systemic Safety Enhancements

Sign Details

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

DIRECTOR
DAN JOHNSON

DESIGNED BY: DZS
DRAFTED BY: DZS
CHECKED BY: WES

REVISIONS

NO.	DATE:

Sheet No.
D-02

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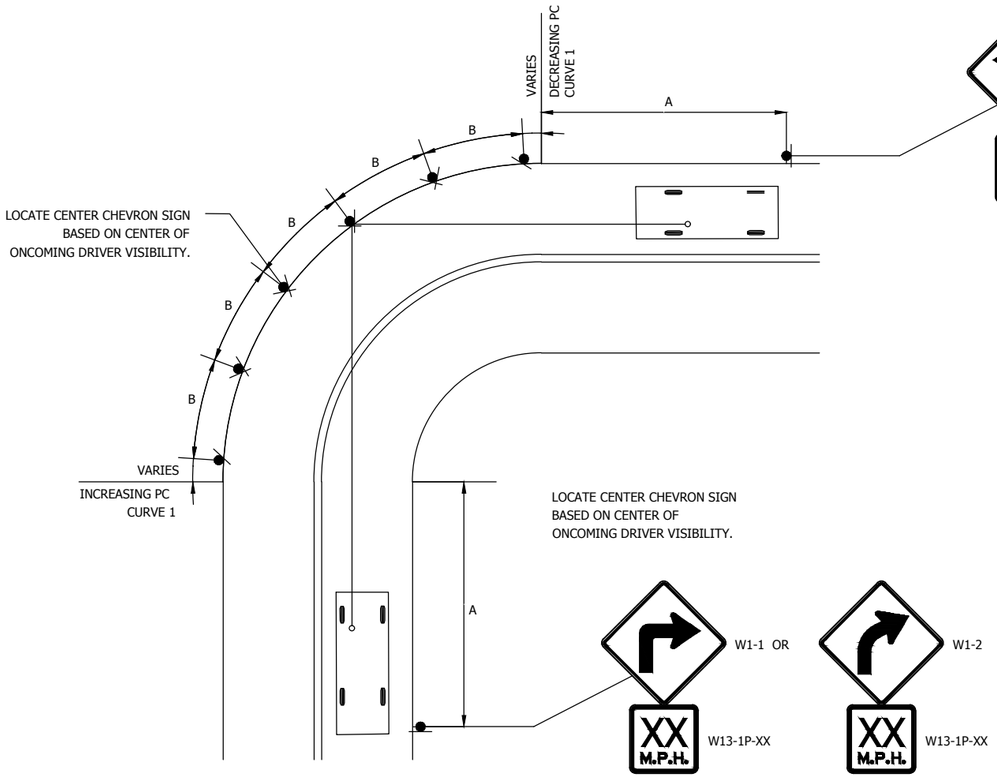

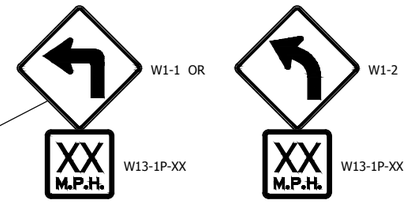

GENERAL NOTES

1. THIS PLAN SHALL BE USED TO ASSIST IN THE PLACEMENT OF CURVE WARNING SIGNS. THE NUMBER OF CHEVRONS, SIGN PLACEMENT DISTANCES, AND SIGN TYPES ARE PROVIDED IN THE SIGN INSTALLATION TABLE FOR EACH INTERSECTION.
2. INSTALL ADVANCE CURVE WARNING SIGNING AS SPECIFIED IN TABLE 1.
3. INSTALL CHEVRONS IF THE DIFFERENCE IN ADVISORY SPEED TO POSTED SPEED IS 10 MPH OR MORE AS SHOWN IN TABLE 2.
4. IF A DRIVEWAY CONFLICTS WITH REQUIRED ADVANCE WARNING SIGN, INSTALL SIGN A MINIMUM OF 10 FEET BEYOND DRIVEWAY AWAY FROM THE CURVE. CONFIRM FINAL PLACEMENT WITH ENGINEER PRIOR TO INSTALLATION.
5. IF A DRIVEWAY CONFLICTS WITH THE PLACEMENT OF A CHEVRON SIGN, OMIT THE CHEVRON SIGN OR INSTALL SIGN A MINIMUM OF 5 FEET (10 FEET IF DESIRED) FROM DRIVEWAY. CONFIRM FINAL PLACEMENT WITH ENGINEER PRIOR TO INSTALLATION.
6. SINGLE CHEVRONS MAY BE USED ON EITHER END OF THE CURVE AS NEEDED. CONFIRM WITH ENGINEER PRIOR TO INSTALLATION.
7. INSTALL ALL SIGNS ON PERFORATED STEEL SQUARE TUBE SIGN SUPPORT UNLESS OTHERWISE NOTED ON PLAN. SEE CLACKAMAS COUNTY STANDARD DRAWING T150 FOR SIGN MOUNTING AND ATTACHMENTS DETAILS AND T250 FOR SIGN INSTALLATION DETAILS.

TABLE 1: ADVANCE PLACEMENT OF WARNING SIGNS (A)

POSTED SPEED	ADVISORY SPEED									
	10	15	20	25	30	35	40	45	50	55
40	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT
45	125 FT	115 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT
50	200 FT	190 FT	175 FT	150 FT	125 FT	115 FT	100 FT	100 FT	100 FT	100 FT
55	275 FT	250 FT	225 FT	215 FT	200 FT	165 FT	125 FT	100 FT	100 FT	100 FT

PC = POINT OF CURVE

TABLE 2: TYPICAL CHEVRON SIGN SPACING (B)

ADVISORY SPEED	SPACING
10 TO 15 mph	40 FT
20 TO 30 mph	80 FT
35 TO 45 mph	120 FT
50 TO 60 mph	160 FT

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OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Damascus Area Systemic Safety Enhancements
Single Curve Detail
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
DIRECTOR
DAN JOHNSON

DESIGNED BY: DZS | DRAFTED BY: DZS | CHECKED BY: WES

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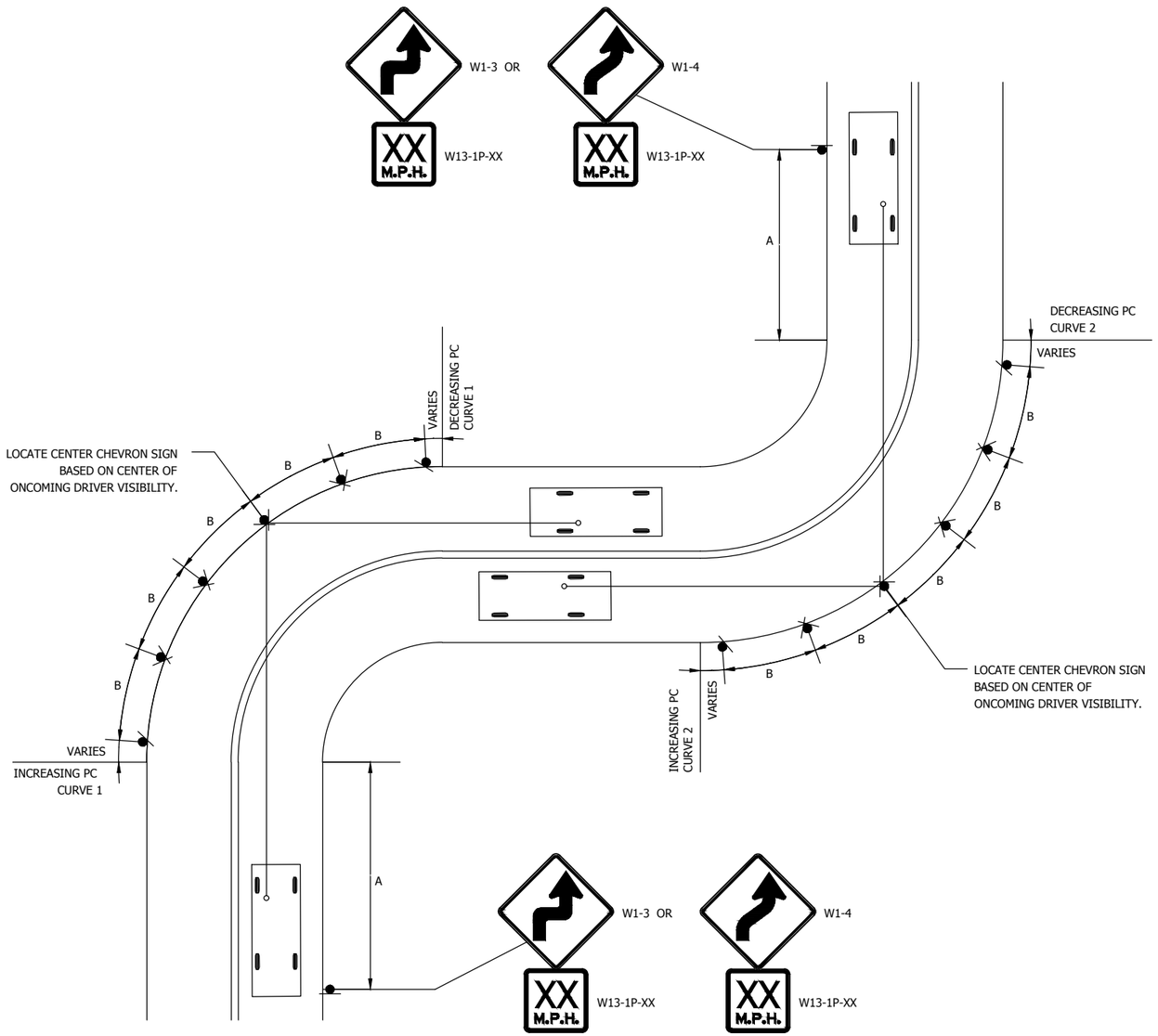

GENERAL NOTES

1. THIS PLAN SHALL BE USED TO ASSIST IN THE PLACEMENT OF CURVE WARNING SIGNS. THE NUMBER OF CHEVRONS, SIGN PLACEMENT DISTANCES, AND SIGN TYPES ARE PROVIDED IN THE SIGN INSTALLATION TABLE FOR EACH INTERSECTION.
2. INSTALL ADVANCE REVERSE CURVE WARNING SIGNING AS SPECIFIED IN TABLE 1.
3. INSTALL CHEVRONS IF THE DIFFERENCE IN ADVISORY SPEED TO POSTED SPEED IS 10 MPH OR MORE AS SHOWN IN TABLE 2.
4. IF A DRIVEWAY CONFLICTS WITH REQUIRED ADVANCE WARNING SIGN, INSTALL SIGN A MINIMUM OF 10 FEET BEYOND DRIVEWAY AWAY FROM THE CURVE. CONFIRM FINAL PLACEMENT WITH ENGINEER PRIOR TO INSTALLATION.
5. IF A DRIVEWAY CONFLICTS WITH THE PLACEMENT OF A CHEVRON SIGN, OMIT THE CHEVRON SIGN OR INSTALL SIGN A MINIMUM OF 5 FEET (10 FEET IF DESIRED) FROM DRIVEWAY. CONFIRM FINAL PLACEMENT WITH ENGINEER PRIOR TO INSTALLATION.
6. SINGLE CHEVRONS MAY BE USED ON EITHER END OF THE CURVE AS NEEDED. CONFIRM WITH ENGINEER PRIOR TO INSTALLATION.
7. INSTALL ALL SIGNS ON PERFORATED STEEL SQUARE TUBE SIGN SUPPORT UNLESS OTHERWISE NOTED ON PLAN. SEE CLACKAMAS COUNTY STANDARD DRAWING T150 FOR SIGN MOUNTING AND ATTACHMENTS DETAILS AND T250 FOR SIGN INSTALLATION DETAILS.

TABLE 1: ADVANCE PLACEMENT OF WARNING SIGNS (A)

POSTED SPEED	ADVISORY SPEED									
	10	15	20	25	30	35	40	45	50	55
40	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT
45	125 FT	115 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT
50	200 FT	190 FT	175 FT	150 FT	125 FT	115 FT	100 FT	100 FT	100 FT	100 FT
55	275 FT	250 FT	225 FT	215 FT	200 FT	165 FT	125 FT	100 FT	100 FT	100 FT

PC = POINT OF CURVE

TABLE 2: TYPICAL CHEVRON SIGN SPACING (B)

ADVISORY SPEED	SPACING
10 TO 15 mph	40 FT
20 TO 30 mph	80 FT
35 TO 45 mph	120 FT
50 TO 60 mph	160 FT

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Damascus Area Systemic Safety Enhancements
Reverse Curve Detail
DATE: June 2021 | PROJECT NO.: #2019-18

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D-04

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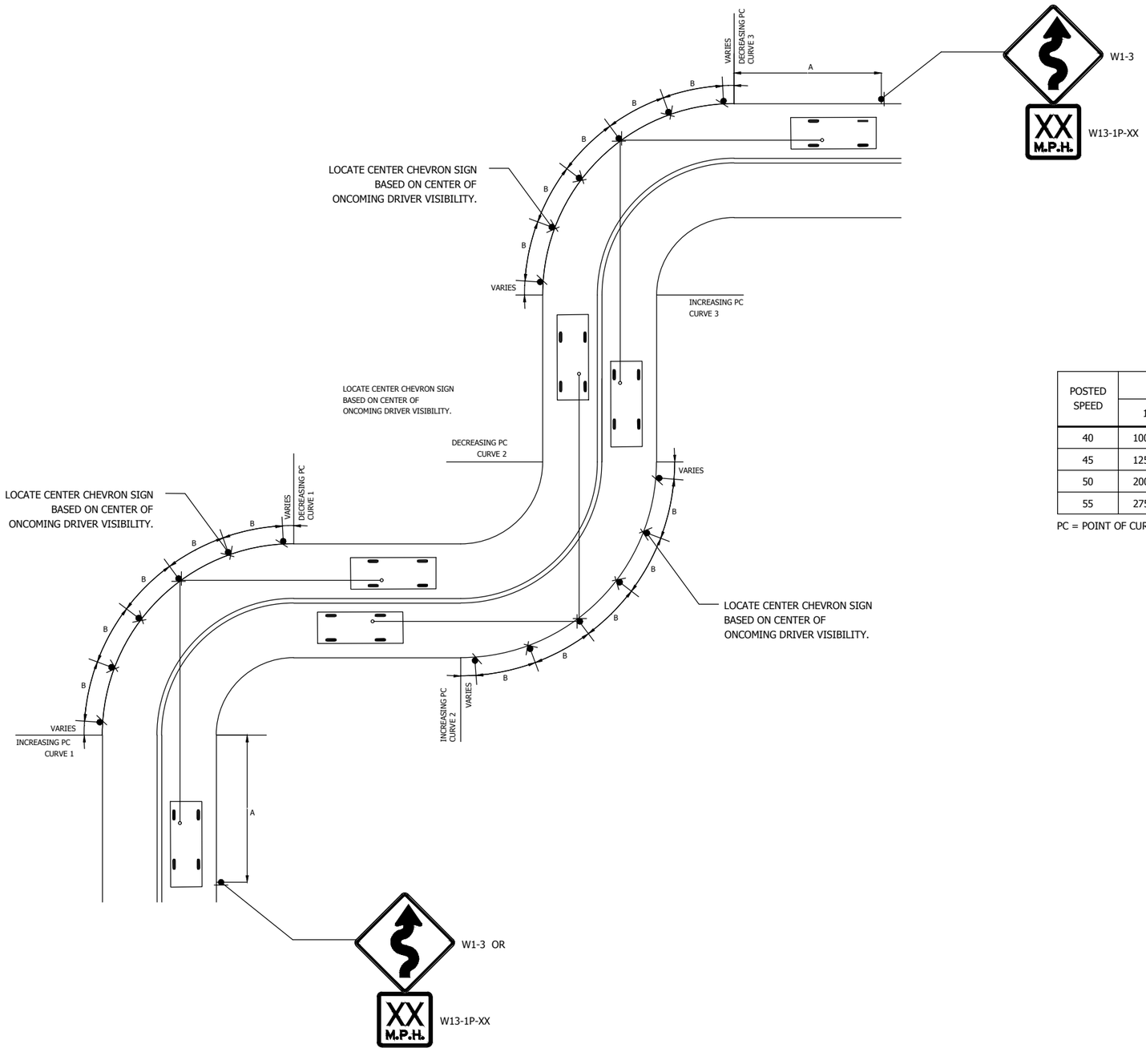

GENERAL NOTES

1. THIS PLAN SHALL BE USED TO ASSIST IN THE PLACEMENT OF CURVE WARNING SIGNS. THE NUMBER OF CHEVRONS, SIGN PLACEMENT DISTANCES, AND SIGN TYPES ARE PROVIDED IN THE SIGN INSTALLATION TABLE FOR EACH INTERSECTION.
2. INSTALL ADVANCE WINDY ROAD CURVE WARNING SIGNING AS SPECIFIED IN TABLE 1.
3. INSTALL CHEVRONS IF THE DIFFERENCE IN ADVISORY SPEED TO POSTED SPEED IS 10 MPH OR MORE AS SHOWN IN TABLE 2.
4. IF A DRIVEWAY CONFLICTS WITH REQUIRED ADVANCE WARNING SIGN, INSTALL SIGN A MINIMUM OF 10 FEET BEYOND DRIVEWAY AWAY FROM THE CURVE. CONFIRM FINAL PLACEMENT WITH ENGINEER PRIOR TO INSTALLATION.
5. IF A DRIVEWAY CONFLICTS WITH THE PLACEMENT OF A CHEVRON SIGN, OMIT THE CHEVRON SIGN OR INSTALL SIGN A MINIMUM OF 5 FEET (10 FEET IF DESIRED) FROM DRIVEWAY. CONFIRM FINAL PLACEMENT WITH ENGINEER PRIOR TO INSTALLATION.
6. SINGLE CHEVRONS MAY BE USED ON EITHER END OF THE CURVE AS NEEDED. CONFIRM WITH ENGINEER PRIOR TO INSTALLATION.
7. INSTALL ALL SIGNS ON PERFORATED STEEL SQUARE TUBE SIGN SUPPORT UNLESS OTHERWISE NOTED ON PLAN. SEE CLACKAMAS COUNTY STANDARD DRAWING T150 FOR SIGN MOUNTING AND ATTACHMENTS DETAILS AND T250 FOR SIGN INSTALLATION DETAILS.

TABLE 1: ADVANCE PLACEMENT OF WARNING SIGNS (A)

POSTED SPEED	ADVISORY SPEED									
	10	15	20	25	30	35	40	45	50	55
40	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT
45	125 FT	115 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT	100 FT
50	200 FT	190 FT	175 FT	150 FT	125 FT	115 FT	100 FT	100 FT	100 FT	100 FT
55	275 FT	250 FT	225 FT	215 FT	200 FT	165 FT	125 FT	100 FT	100 FT	100 FT

PC = POINT OF CURVE

TABLE 2: TYPICAL CHEVRON SIGN SPACING (B)

ADVISORY SPEED	SPACING
10 TO 15 mph	40 FT
20 TO 30 mph	80 FT
35 TO 45 mph	120 FT
50 TO 60 mph	160 FT

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Damascus Area Systemic Safety Enhancements
Windy Road Curve Detail
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
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NO	DATE:

Sheet No. D-05

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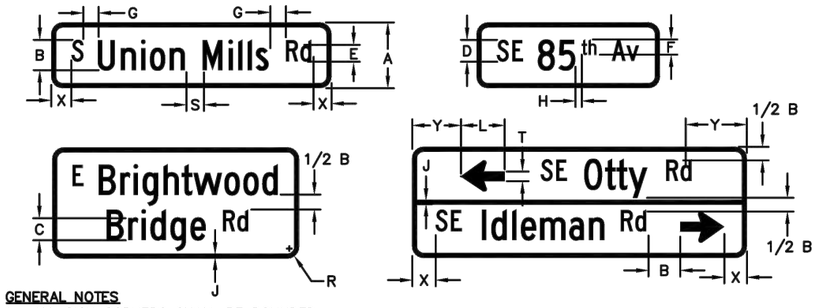
LEGEND DIMENSIONING TABLE

LOCATION	STREET CLASSIFICATION	POSTED SPEED (MPH)	PANEL HT.	PRIMARY LETTER HT.	LOWER-CASE LETTER HT.	SUPPLEMENTAL LETTERING SIZE		SUPER-SCRIPT HT.			BORDER/ DIVIDER THICK-NESS	BOR-DER RAD.	ARROW TAIL THICK-NESS	ARROW LENGTH
						UPPER	LOWER							
			A	B	C	D	E	F	G	H	J	R	T	L
GROUND MOUNT	ARTERIAL/COLLECTOR 4+ LANES	> 40	15	8	6	5	3 ¾	4	3 ⅛	1	½	1 ½		
	ARTERIAL/COLLECTOR 4+ LANES	≤ 40	12	6	4 ½	4	3	3	2 ½	¾	½	1 ½		
	ARTERIAL/COLLECTOR 2-3 LANES	ALL												
	LOCAL	> 25												
	ALTERNATE *		10	5	4	4	3	2 ½	2	½	½	1 ½		
	STACKED LEGEND	ALL	21	6	4 ½	4	3	3	2 ½	¾	½	1 ½	2 ¼	9
	LOCAL/CONNECTOR	≤ 25	8	5	3 ¾	3	1 ⅞	2 ½	1 ½	½				
	PRIVATE	ALL												
OVERHEAD MAST ARM	ALL	ALL	21	12	9	8	6	6	5	1 ¾	1	3		
	ALTERNATE **		18	10	8	6	4 ½	5	3 ¾	1 ¼	1	3		
	STACKED LEGEND	ALL	30	8	6	5	3 ¾	4	3 ⅛	1	1	3	3	12

NOTES: ALL UNITS IN INCHES UNLESS SHOWN OTHERWISE.
S = SPACE BETWEEN WORDS = ⅝ B.
X, Y = ½ OF REMAINING SPACE. SHOULD BE APPROXIMATELY EQUAL TO LETTER HT (B) AND NO LESS THAN ½ B.
* GROUND MOUNTED: MAY BE USED IF 6" LETTERS YIELD SIGNS GREATER THAN 60" LENGTH.
** OVERHEAD: MAY BE USED IF 12" LETTERS YIELD SIGNS GREATER THAN 12' LENGTH.



GENERAL NOTES
1. ALL SIGN CORNERS SHALL BE ROUNDED.
2. BORDERS SHALL BE FLUSH WITH EDGE OF SIGN. BORDERS ARE NOT REQUIRED ON 8" PANELS.
3. LEGEND HEIGHT FOR ALL SIGNS AT AN INTERSECTION DICTATED BY THE HIGHEST CLASSIFICATION ROADWAY.
4. SHOP DRAWINGS SHALL BE SUBMITTED TO ENGINEERING FOR REVIEW PRIOR TO INSTALLATION.
5. SEE T130 FRO ADDITIONAL REQUIREMENTS.

SIGN LEGEND
1. ALL LEGENDS ARE SUBJECT TO THE ENGINEER'S APPROVAL PRIOR TO FABRICATION.
2. LETTERING SHALL BE FHWA SERIES C AT 100% WIDTH UNLESS SPECIFIED OTHERWISE.
3. THE PREFIX SHALL BE ABBREVIATED UPPER-CASE LETTERS.
4. THE STREET NAME SHALL CONSIST OF LOWER-CASE LETTERS WITH AN INITIAL UPPER-CASE LETTER.
5. THE SUFFIX SHALL BE ABBREVIATED AND CONSIST OF AN INITIAL UPPER-CASE LETTER FOLLOWED BY LOWER-CASE LETTER(S).
6. THE DESCENDERS OF LOWERCASE LETTERS SHALL NOT BE USED IN THE VERTICAL SPACING OF THE LEGEND.

MATERIALS
1. ALL SIGN MATERIALS SHALL CONFORM TO THE CURRENT MUTCD AND ODOT STANDARD SPECIFICATIONS.
2. GROUND MOUNTED: GREEN TYPE III OR TYPE IV BACKGROUND WITH SILVER-WHITE TYPE III OR TYPE IV PERMANENT LEGEND, OR SILVER-WHITE TYPE III OR TYPE IV SHEETING BACKGROUND OVERLAID WITH GREEN TRANSPARENT PASTE BACKGROUND WITH RETROFLECTIVE SILVER-WHITE SCREENED LEGEND.
3. OVERHEAD MOUNTED: GREEN TYPE III OR TYPE IV SHEETING BACKGROUND WITH WHITE TYPE IX PERMANENT LEGEND.
4. PRIVATE STREETS: SILVER-WHITE TYPE III OR TYPE IV SHEETING BACKGROUND WITH BLACK NONREFLECTIVE SCREENED, CUT-OUT PERMANENT LEGEND.

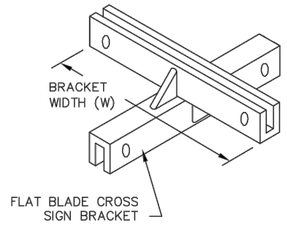
REVISION	DATE	BY
BORDER THICKNESS	1/13	CLS
suffix ltr. upper/lwr	1/13	CLS
	11/19	BP

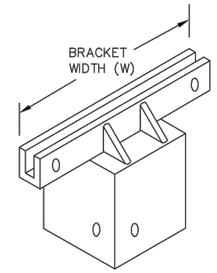
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

APPROVAL DATE: 6/1/2020 SCALE: N.T.S.

STREET NAME SIGNS & DETAILS

STANDARD DRAWING T100





FLAT BLADE SIGN BRACKETS

SIGN BRACKET SIZE

SIGN WIDTH (IN.)	MOUNTING
< 30	POST TOP BRACKET, W = 5 ¼"
30 TO 48	POST TOP BRACKET, W = 12"
> 48	RIVET TO POST

OVERHEAD MOUNTING
1. SIGNS TO BE MOUNTED USING REUSABLE BANDING TYPE ADJUSTABLE BRACKET (SKY BRACKET OR APPROVED EQUAL) UNLESS OTHERWISE SPECIFIED.
2. NEW PROJECTS: SIGNAL MAST ARM SIGNS TO BE INCLUDED ON SIGNING PLANS.
3. EXISTING SIGNAL POLES: PERFORM POLE STRUCTURAL ANALYSIS PRIOR TO ADDING OR ENLARGING SIGNS.

ABBREVIATIONS FOR STREET NAME SUFFIXES

AV = Avenue CT = Court LN = Lane PKWY = Parkway RD = Road TER = Terrace
BLVD = Boulevard DR = Drive LP = Loop PL = Place ST = Street WY = Way
CIR = Circle

REVISION	DATE	BY

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

APPROVAL DATE: 1/1/10 SCALE: N.T.S.

STREET NAME SIGNS & DETAILS (CONTINUED)

STANDARD DRAWING T130

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Damascus Area Systemic Safety Enhancements

Sign Details

DATE: June 2021 PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

DIRECTOR DAN JOHNSON

DESIGNED BY: DZS DRAFTED BY: DZS CHECKED BY: WES

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Sheet No. D-06

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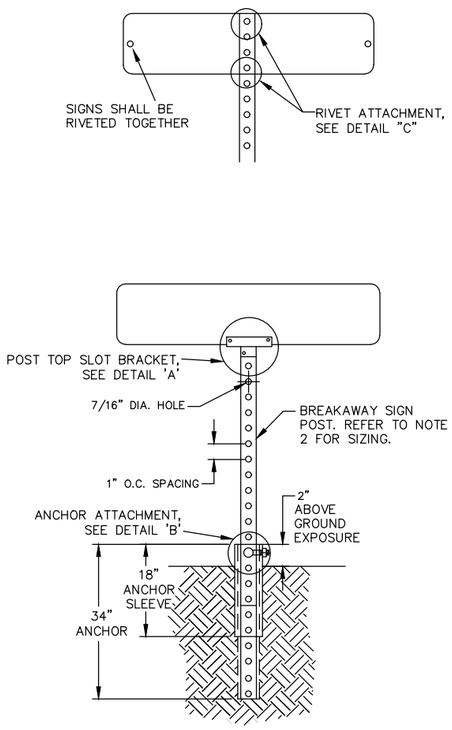
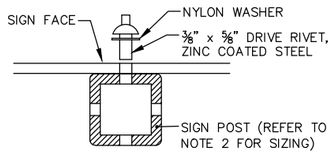
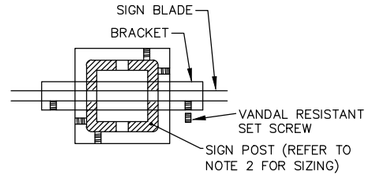
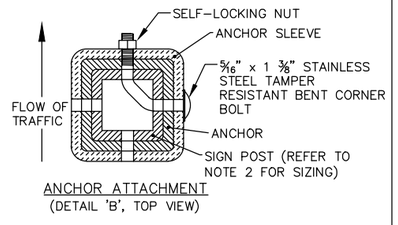




RIVET ATTACHMENT
(DETAIL 'C', TOP VIEW)



POST TOP BRACKET ATTACHMENT
(DETAIL 'A', TOP VIEW)



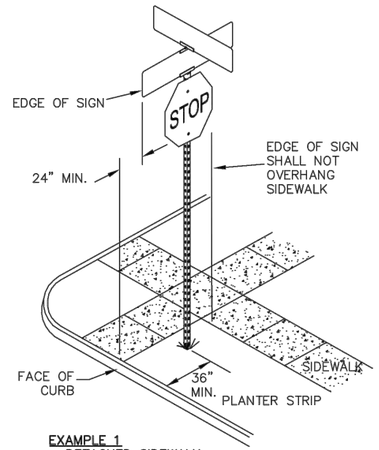
ANCHOR ATTACHMENT
(DETAIL 'B', TOP VIEW)

NOTES

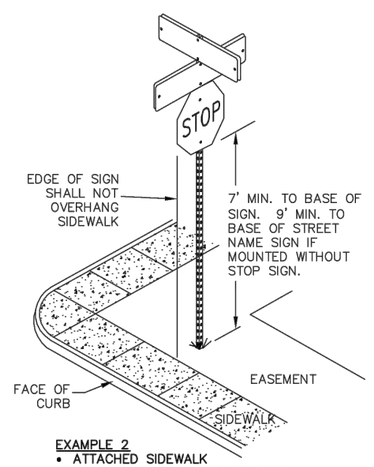
1. SIGN COMBINATION AND MINIMUM SIGN MOUNTING HEIGHT SHALL DETERMINE POST LENGTH. A 10' (MIN.) POST SHALL BE USED. A COMBINATION OF SIGNS GREATER THAN 36" IN HEIGHT SHALL REQUIRE A 12' (MIN.) POST.
2. SIGN POSTS IN CONCRETE AREAS SHALL BE INSTALLED ON SURFACE-MOUNTED BREAKAWAY BASES.
3. NYLON SPACERS SHALL BE USED TO PREVENT CONTACT BETWEEN GALVANIZED STEEL AND ALUMINUM MATERIAL SURFACES.

SIGN MOUNTING AND ATTACHMENTS

COUNTY STANDARD DRAWING T150 MODIFIED

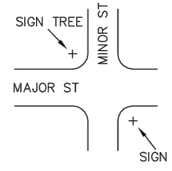


EXAMPLE 1
- DETACHED SIDEWALK
- POST TOP FLAT BLADE BRACKET WITH CROSS BRACKET

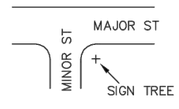


EXAMPLE 2
- ATTACHED SIDEWALK
- DOUBLE SIGNS RIVETED TO POST

TYPICAL SIGN INSTALLATIONS



4-LEG INTERSECTION



T INTERSECTON

TYPICAL STREET NAME SIGN LOCATIONS

REVISION	DATE	BY

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

APPROVAL DATE: 1/1/10 SCALE: N.T.S.

SIGN INSTALLATIONS

STANDARD DRAWING T250

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WADE E. SCARBROUGH
EXPIRES: 06/30/22

Damascus Area Systemic Safety Enhancements

Sign Details

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

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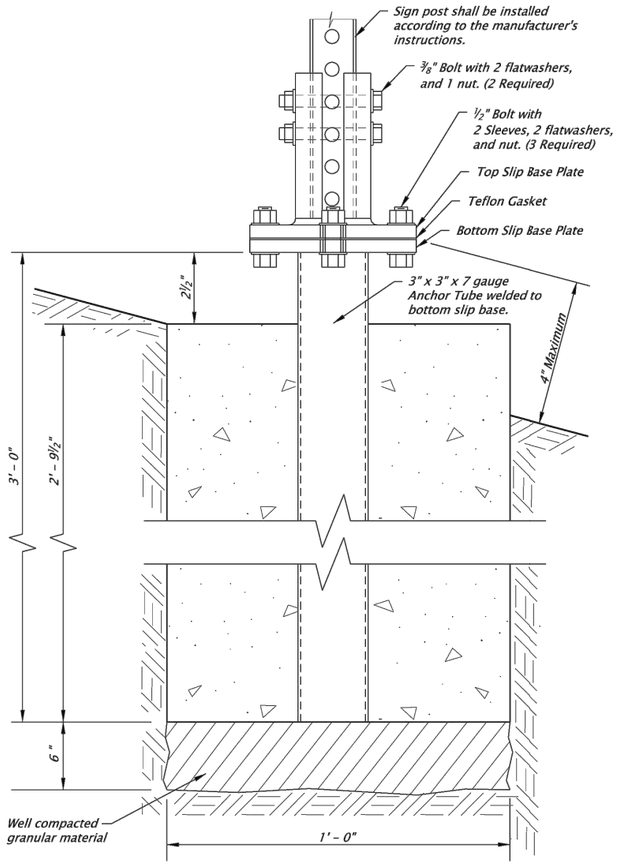
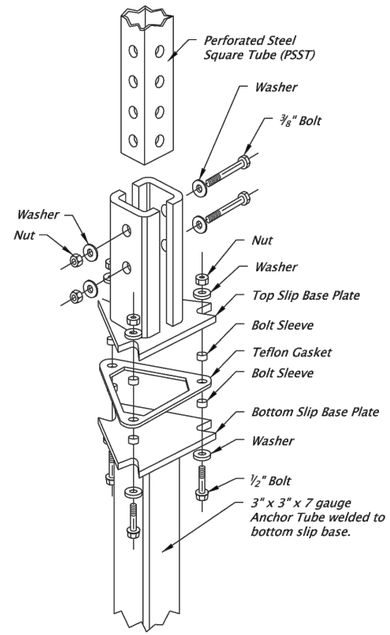
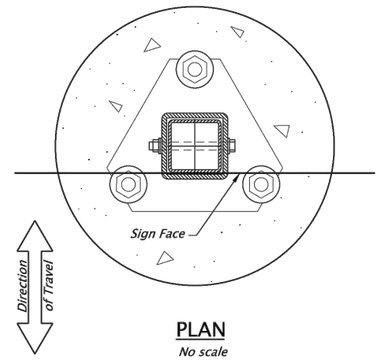


SLIP BASE ELEVATION
No scale



SLIP BASE EXPLODED VIEW
No scale



PLAN
No scale

General Notes:

1. *Material grade for base hardware connection shall be according to the manufacturer's recommendation and based on crash testing.*
2. *Slip base steel shall be hot dipped galvanized or approved equal.*
3. *Footing concrete shall be Commercial Grade Concrete (fc = 3000 psi) per Specification 00440. The CGC mixture may be accepted at the site of placement according to 00440.14.*
4. *Material grade for base hardware connection shall be according to the manufacturer's recommendation and based on crash testing.*
5. *All slip bases shall be pre-assembled by the manufacturer and shall be installed according to the manufacturer's instructions.*
6. *Use slip bases listed on the ODOT Qualified products list or submit crash testing data, installation instructions, and unstamped working drawings according to 00150.35.*
7. *Slip base details shown are not for a specific manufacturer and are only shown to convey general pieces of a slip base system. Specific slip base material will be acccording to the manufacturer's documentation.*

Accompanied by dwgs. TM681, TM687

CALC. BOOK NO. 5752

SDR DATE 06-JAN-2012

NOTE: All material and workmanship shall be in accordance with the current Oregon Standard Specifications

The selection and use of this Standard Drawing, while designed in accordance with generally accepted engineering principles and practices, is the sole responsibility of the user and should not be used without consulting a Registered Professional Engineer.

OREGON STANDARD DRAWINGS

PERFORATED STEEL SQUARE TUBE (PSST) SLIP BASE FOUNDATION

2021

DATE	REVISION DESCRIPTION

Effective Date: December 1, 2020 – May 31, 2021

TM688

TM688

tm688.dgn 10-JUL-2020

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JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Damascus Area Systemic Safety Enhancements

Sign Details

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
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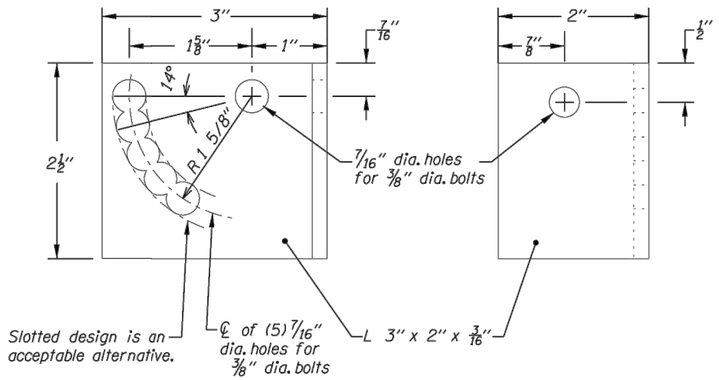
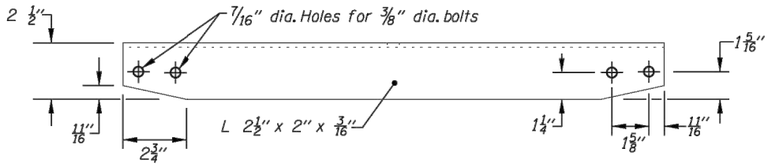


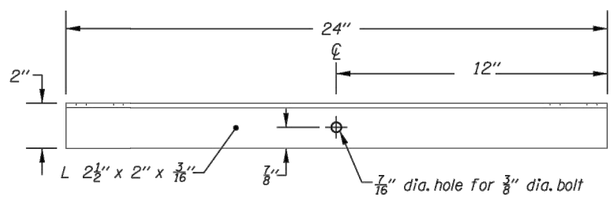
ADJUSTABLE BRACKET

Right Side Shown, Left Side Is Mirror Image.
No scale



BRACE - TOP

No scale

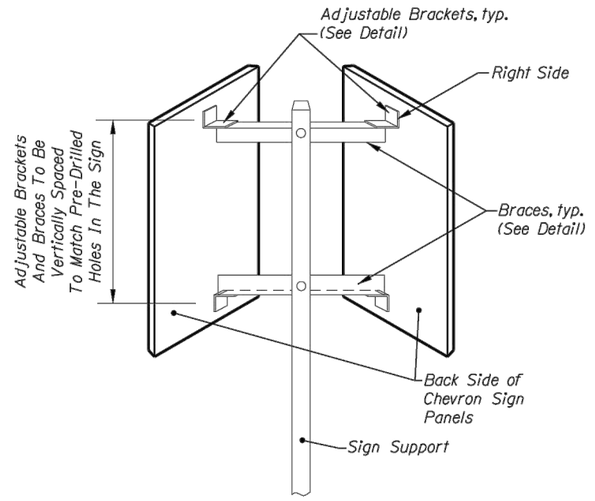


BRACE - ELEVATION

No scale

General Notes:

1. *Install Chevron sign panel in line with and at approximately a right angle to approaching traffic.*
2. *For horizontal and vertical clearances of permanent signs refer to TM200.*
3. *Adjustable Brackets and Braces shall be aluminum. Aluminum shall be 6061 T6 alloy or 6063 T6 alloy.*
4. *Attach signs to adjustable brackets similar to the Sign Attachment Detail shown on TM676. Provide galvanized ASTM A307 Grade A bolts, A563A Hex nuts with locking feature, stainless steel ASTM 316 flat washers, and nylon washer. This does not apply to the hardware required in note 5.*
5. *Attach Braces to sign support according to TM676 without nylon washer and one flat washer on each side.*
6. *Designed for use with 2'-6" tall by 2'-0" wide Chevron sign panels or smaller.*



ADJUSTABLE CHEVRON MOUNT

No scale

Damascus Area Systemic Safety Enhancements

Sign Details

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY — DIRECTOR — DAN JOHNSON

DESIGNED BY: DZS | DRAFTED BY: DZS | CHECKED BY: WES

REVISIONS

NO.	DATE:

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

REGISTERED PROFESSIONAL ENGINEER
65552PE
OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Sheet No.
D-09

H:\24124756 - Damascus Safety Countermeasures\design_CD\CD - Details.dwg 6/18/2021 10:48 AM Dimitryan Shadrin

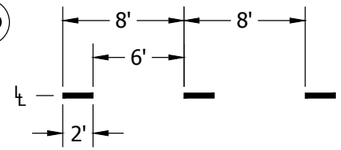
W

4" WHITE LINE

W-2

8" WHITE LINE

WD

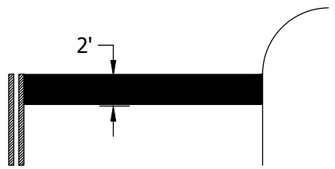


4" WHITE DOTTED LINE
For lane extensions

D

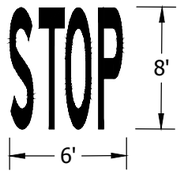
DOUBLE NO-PASS
TWO 4" YELLOW LINES

S-2



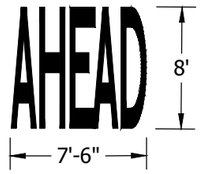
STOP BAR - LARGE
2' WHITE BAR
Install per Standard Drawing TM530

ST



STOP (WHITE)

AH



AHEAD (WHITE)

KITTELSON & ASSOCIATES
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REGISTERED PROFESSIONAL ENGINEER
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OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Damascus Area Systemic Safety Enhancements

Pavement Marking Details

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

DIRECTOR
DAN JOHNSON

DESIGNED BY: DZS
DRAFTED BY: DZS
CHECKED BY: WES

REVISIONS

NO.	DATE:

Sheet No.
D-10

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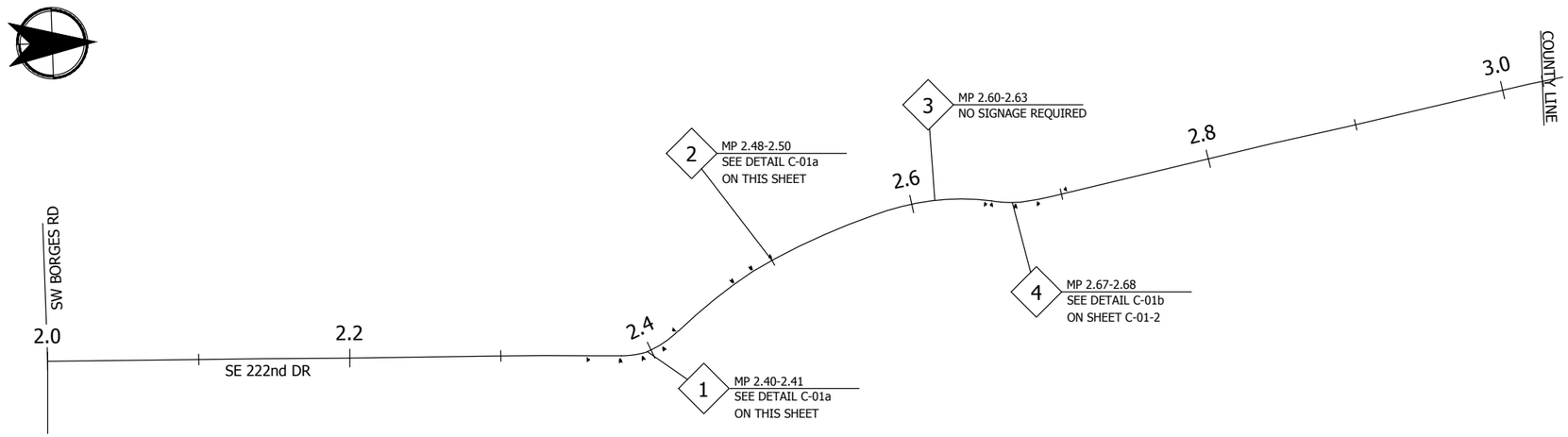
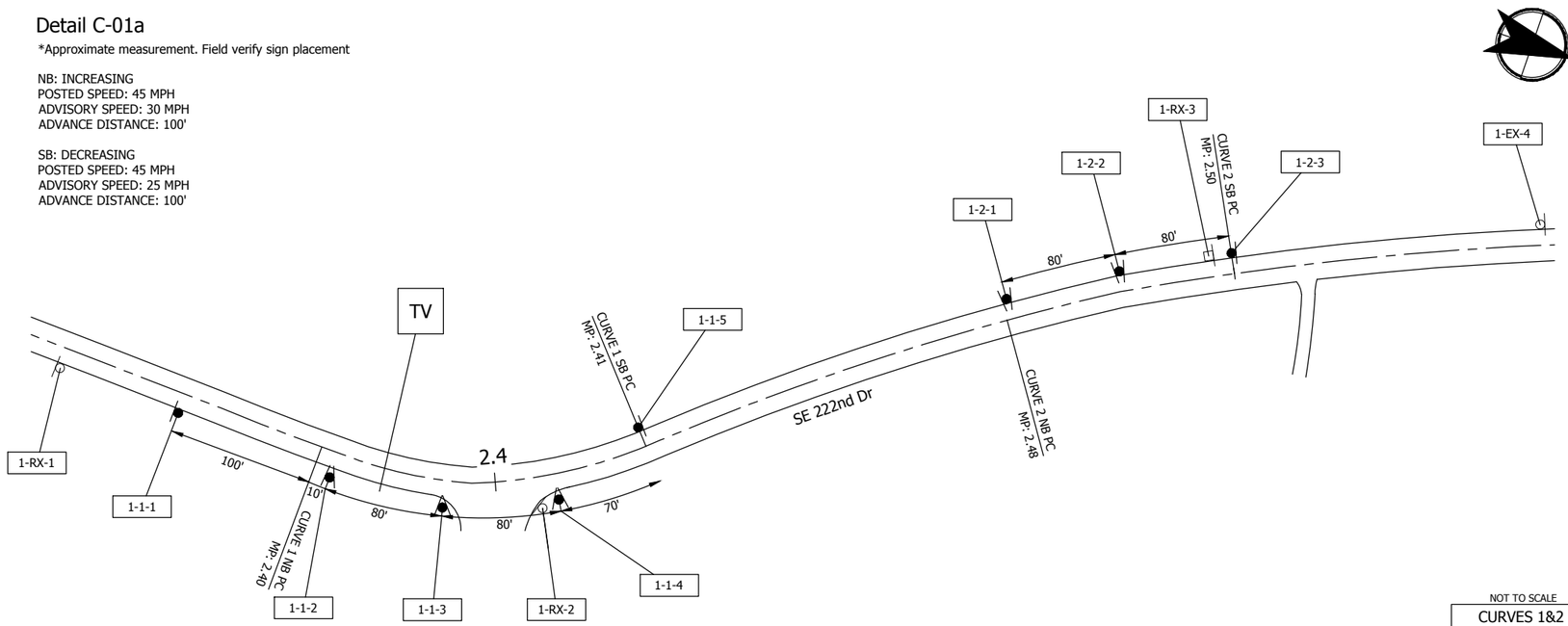


Detail C-01a

*Approximate measurement. Field verify sign placement

NB: INCREASING
POSTED SPEED: 45 MPH
ADVISORY SPEED: 30 MPH
ADVANCE DISTANCE: 100'

SB: DECREASING
POSTED SPEED: 45 MPH
ADVISORY SPEED: 25 MPH
ADVANCE DISTANCE: 100'



NOT TO SCALE

CURVES 1&2
MP: 2.40 to 2.50

Note:
See sheet D-01 for legend

KITTELSON & ASSOCIATES
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WADE E. SCARBROUGH
EXPIRES: 06/30/22

Damascus Area Systemic Safety Enhancements
SE 222nd Drive

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

DIRECTOR

DAN JOHNSON

DESIGNED BY: DZ/TCLF
DRAFTED BY: DZ/TCLF
CHECKED BY: WES

REVISIONS

NO.	DATE:

Sheet No.
C-01-1

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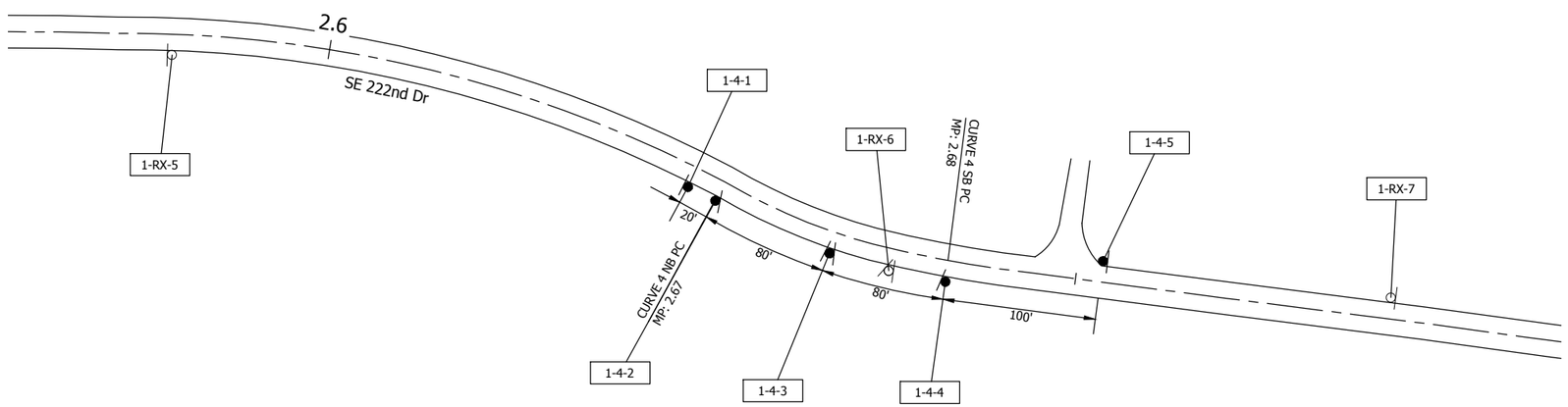
Detail C-01b

*Approximate measurement. Field verify sign placement

NB: INCREASING
POSTED SPEED: 45 MPH
ADVISORY SPEED: 40 MPH
ADVANCE DISTANCE: 100'

SB: DECREASING
POSTED SPEED: 45 MPH
ADVISORY SPEED: 40 MPH
ADVANCE DISTANCE: 100'



NOT TO SCALE

CURVES 3-4
MP: 2.60 to 2.68

Note:
See sheet D-01 for legend

KITTELSON & ASSOCIATES
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REGISTERED PROFESSIONAL ENGINEER
65552PE
OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Damascus Area Systemic Safety Enhancements
SE 222nd Drive
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
DIRECTOR
DAN JOHNSON

DESIGNED BY: DZ/TG/LF
DRAFTED BY: DZ/TG/LF
CHECKED BY: WES

REVISIONS

NO.	DATE:

Sheet No.
C-01-2

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Sign Installation Table

Curve No.	Sign Post No.	Sign Location							Post Type	Post Size	Sign Code	Sign Description	Sign Size (in)		Remarks
		Travel Direction	Point of Curvature	Posted Speed	Advisory Speed	Distance "A"	Distance "B"	Direction from PC					X	Y	
Corridor 01 - 222nd Dr															
1	1	Northbound	45.4525S -122.43447	45 mph	30 mph	100 ft	-	5outh	Psst	2"x2"	W1-5L W13-1P-30	Winding Road Left Advisory Speed 30 MPH	36 24	36 24	Install new sign assembly "A" distance from field located Point of Curvature.
	2					-	See Detail C-01a	North	Psst	2"x2"	W1-8L W1-8R	Chevron Left Chevron Right	24 24	30 30	
	3					-	See Detail C-01a	North	Psst	2"x2"	W1-8L W1-8R	Chevron Left Chevron Right	24 24	30 30	Install new sign assembly "B" distance from next chevron assembly. See C-01a for placement details.
	4					-	See Detail C-01a	North	Psst	2"x2"	W1-8L W1-8R	Chevron Left Chevron Right	24 24	30 30	
	5	Southbound	45.4S278 -122.43463	45 mph	2S mph	0	-	North	Psst	2"x2"	W1-1aR-25	Supplemental Turn Right (25)	36	36	Install new sign assembly at field located Point of Curvature.
2	-	Northbound	45.4S357 -122.435S6	45 mph	4S mph	-	-	-	-	-	-	-	-	-	
	1	Southbound	45.4S37 -122.4357	45 mph	3S mph	-	See Detail C-01a	South	Psst	2"x2"	W1-8R W1-8L	Chevron Right Chevron Left	24 24	30 30	Install new sign assembly "B" distance from next chevron assembly. See C-01a for placement details.
	2					-	See Detail C-01a	South	Psst	2"x2"	W1-8R W1-8L	Chevron Right Chevron Left	24 24	30 30	Install new sign assembly "B" distance from next chevron assembly. See C-01a for placement details.
	3					0 ft	-	North	Psst	2"x2"	W1-2aL-35	Supplemental Curve Left (35)	36	36	Install new sign assembly at field located Point of Curvature.
3	-	Northbound	45.4S52S -122.43649	45 mph	-	This curve does not require any signage.									
	-	Southbound	45.4S545 -122.43658	45 mph	-										
4	1	Northbound	Missing	45 mph	40 mph	20 ft	-	South	Psst	2"x2"	W1-2aL-40	Supplemental Curve Left (40)	36	36	Install new sign assembly "A" distance from field located Point of Curvature.
	2					-	See Detail C-01b	North	Psst	2"x2"	W1-8R	Chevron Right	24	30	Install new sign assembly "B" distance from next chevron assembly. See C-01b for placement details.
	3					-	See Detail C-01b	North	Psst	2"x2"	W1-8L W1-8R	Chevron Left Chevron Right	24 24	30 30	Install new sign assembly "B" distance from next chevron assembly. See C-01b for placement details.
	4					-	See Detail C-01b	North	Psst	2"x2"	W1-8L	Chevron Left	24	30	Install new sign assembly "B" distance from next chevron assembly. See C-01b for placement details.
	5	Southbound	45.4S63 -122.436S4	45 mph	40 mph	100 ft	-	North	Psst	2"x2"	W1-5R W13-1P-25	Winding Road Right Advisory Speed 25 MPH	36 24	36 24	Install new sign assembly "A" distance from field located Point of Curvature.

Damascus Area Systemic Safety Enhancements
SE 222nd Drive
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

DIRECTOR
DAN JOHNSON

DESIGNED BY: DZ/SLF
DRAFTED BY: DZ/SLF
CHECKED BY: WES

REVISIONS

NO.	DATE:

Sheet No.
C-01-3

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OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

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Existing Sign & Sign Removal

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Material	Sign Location		Remarks
			X	Y		Milepost	Placement	
Corridor 01 - 222nd Dr								
1	W1-1L	Left Turn Warning	30	30	PSST	2.35	Right	Remove existing sign and support.
	W13-1P	Speed Advisory 25 MPH	18	18				Remove existing sign.
2	W1-6	Large Arrow (Single)	48	24	PSST	2.41	Right	Remove existing sign and support.
3	W1-1R	Left Turn Warning	30	30	Wood	2.5	Left	Remove existing sign and support.
	W13-1P	Speed Advisory 30 MPH	18	18				Remove existing sign.
4	S3-1	School Bus Stop Ahead	30	30	PSST	2.54	Left	Maintain and protect.
5	W1-4R	Reverse Curve Right Warning	36	36	PSST	2.58	Right	Remove existing sign and support.
	W13-1P	Speed Advisory 35 MPH	24	24				Remove existing sign.
6	W1-6	Large Arrow (Single)	48	24	PSST	2.68	Right	Remove existing sign and support.
	W1-6	Large Arrow (Single)	48	24				Remove existing sign.
7	W1-4R	Reverse Curve Right Warning	36	36	PSST	2.74	Left	Remove existing sign and support.
	W13-1P	Speed Advisory 35 MPH	18	18				Remove existing sign.

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
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REGISTERED PROFESSIONAL ENGINEER
65552PE
OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Damascus Area Systemic Safety Enhancements
SE 222nd Drive
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

DIRECTOR
DAN JOHNSON

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CHECKED BY: WES

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NO. | DATE:

Sheet No.
C-01-4

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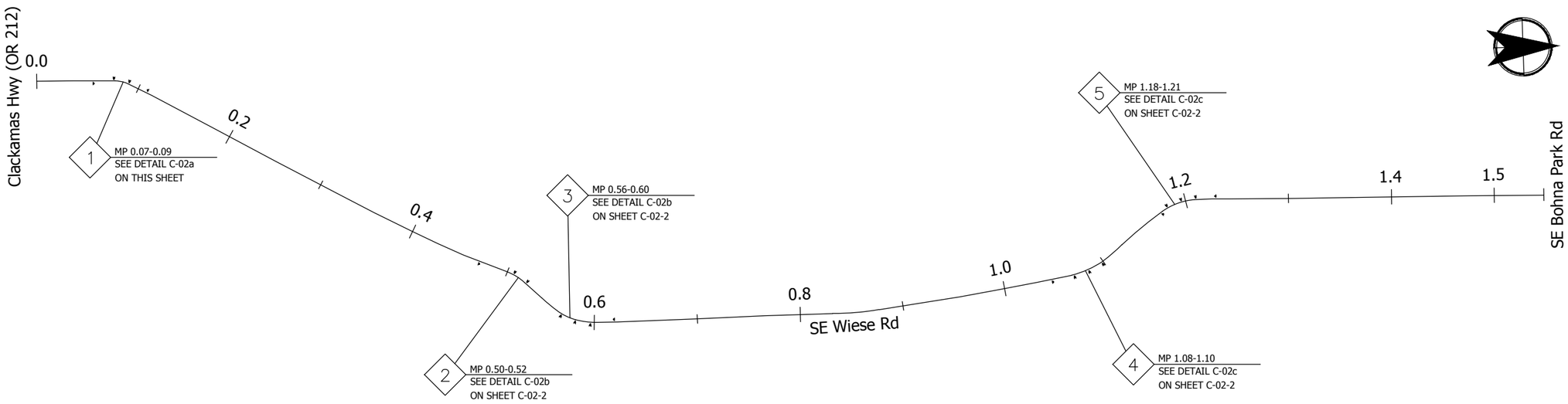
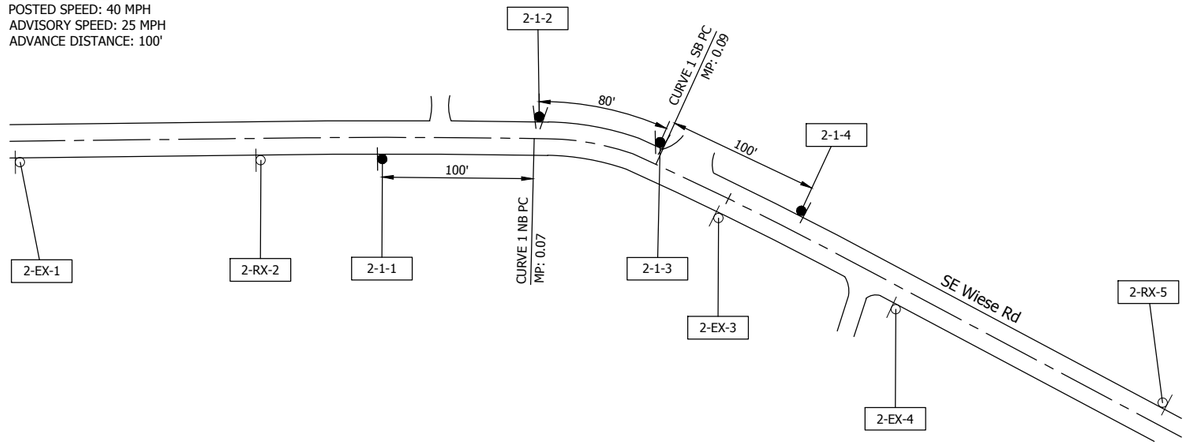


Detail C-02a

*Approximate measurement. Field verify sign placement

NB: INCREASING
POSTED SPEED: 40 MPH
ADVISORY SPEED: 25 MPH
ADVANCE DISTANCE: 100'

SB: DECREASING
POSTED SPEED: 40 MPH
ADVISORY SPEED: 25 MPH
ADVANCE DISTANCE: 100'



NOT TO SCALE

CURVE 1
MP: 0.07-0.09

Note:
See sheet D-01 for legend

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
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REGISTERED PROFESSIONAL ENGINEER
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OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Damascus Area Systemic Safety Enhancements
SE Wiese Road
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
DIRECTOR
DAN JOHNSON

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Sheet No.
C-02-1

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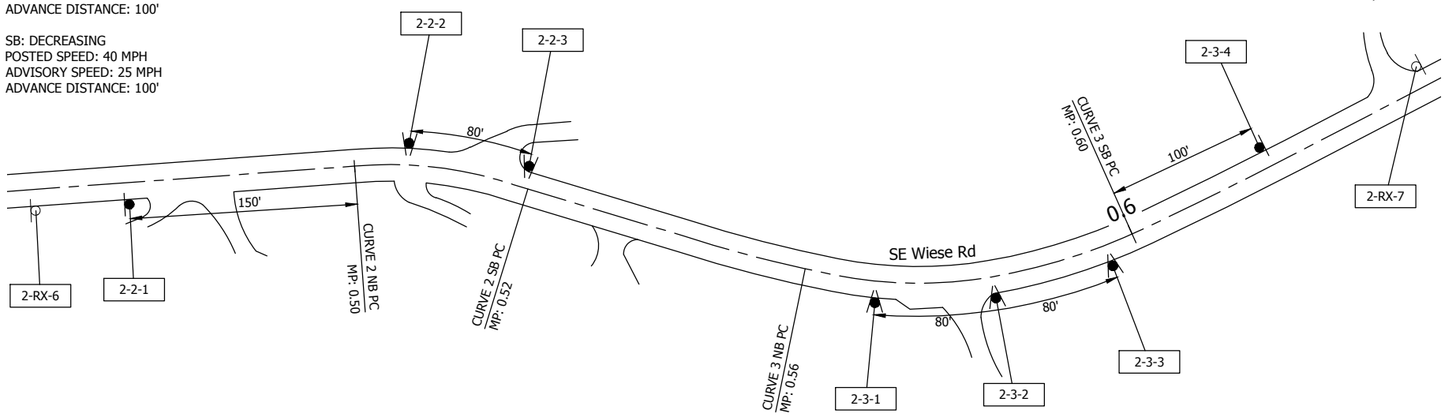
Detail C-02b

*Approximate measurement. Field verify sign placement

NB: INCREASING
POSTED SPEED: 40 MPH
ADVISORY SPEED: 25 MPH
ADVANCE DISTANCE: 100'

SB: DECREASING
POSTED SPEED: 40 MPH
ADVISORY SPEED: 25 MPH
ADVANCE DISTANCE: 100'



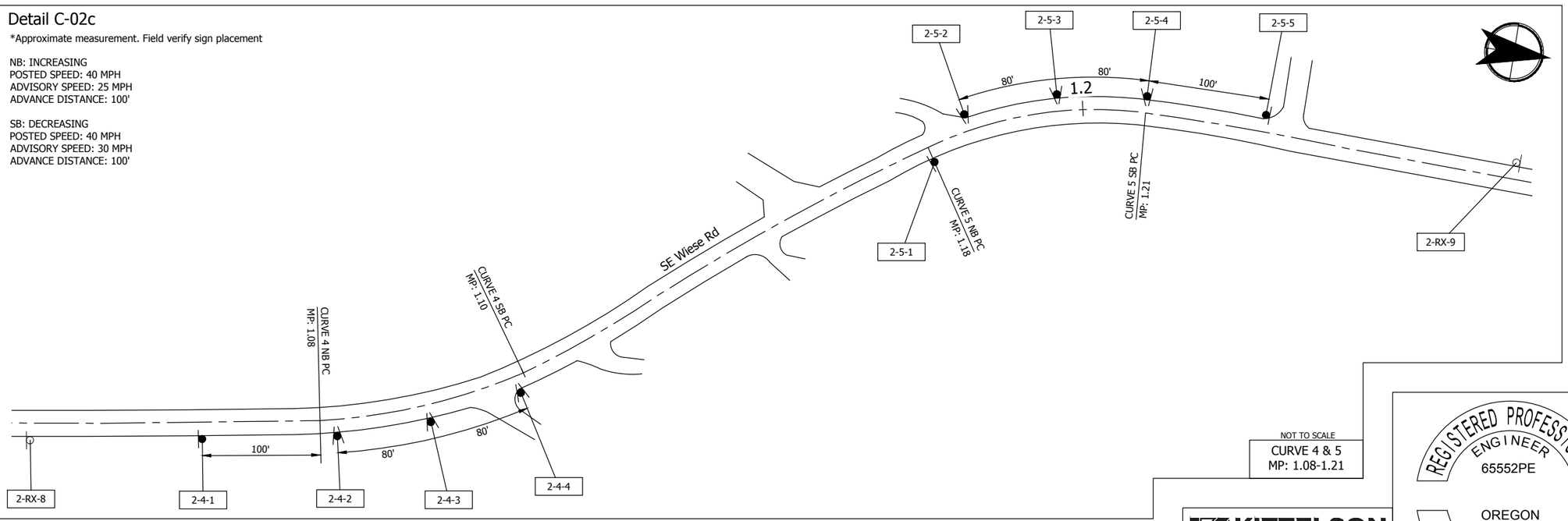
NOT TO SCALE
CURVE 2 & 3
MP: 0.50-0.60

Detail C-02c

*Approximate measurement. Field verify sign placement

NB: INCREASING
POSTED SPEED: 40 MPH
ADVISORY SPEED: 25 MPH
ADVANCE DISTANCE: 100'

SB: DECREASING
POSTED SPEED: 40 MPH
ADVISORY SPEED: 30 MPH
ADVANCE DISTANCE: 100'



NOT TO SCALE
CURVE 4 & 5
MP: 1.08-1.21

Note:
See sheet D-01 for legend

KITTELSON & ASSOCIATES
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REGISTERED PROFESSIONAL ENGINEER
65552PE
OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Damascus Area Systemic Safety Enhancements
SE Wiese Road

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

DIRECTOR
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DRAFTED BY: DZB/SLF
CHECKED BY: WES

REVISIONS
NO. DATE:

Sheet No.
C-02-2

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Sign Installation Table

Curve No.	Sign Post No.	Sign Location							Post Type	Post Size	Sign Code	Sign Description	Sign Size (in)		Remarks
		Travel Direction	Point of Curvature	Posted Speed	Advisory Speed	Distance "A"	Distance "B"	Direction from PC					X	Y	
Corridor 02 - Wiese Rd															
1	1	Northbound	45.41876 -122.4524	40 mph	25 mph	100 ft	-	South	Psst	2"x2"	W1-1R W13-1P-25	Turn Ahead Right Advisory Speed 25 MPH	36 24	36 24	Install new sign assembly "A" distance from field located Point of Curvature.
	2					-	See Detail C-02a	North	Psst	2"x2"	W1-8R W1-8L	Chevron Right Chevron Left	24 24	30 30	Install new sign assembly "B" distance from next chevron assembly. See C-02a for placement details.
	3					-	See Detail C-02a	North	Psst	2"x2"	W1-8R W1-8L	Chevron Right Chevron Left	24 24	30 30	Install new sign assembly "B" distance from next chevron assembly. See C-02a for placement details.
	4	Southbound	45.41894 -122.45238	40 mph	25 mph	100 ft	-	North	Psst	2"x2"	W1-1L W13-1P-25	Turn Ahead Left Advisory Speed 25 MPH	36 24	36 24	Install new sign assembly "A" distance from field located Point of Curvature.
2	1	Northbound	45.4242S -122.4485	40 mph	30 mph	150 ft	-	South	Psst	2"x2"	W1-3R W13-1P-25	Reverse Turn Right Advisory Speed 25 MPH	36 24	36 24	Install new sign assembly "A" distance from field located Point of Curvature.
	2					-	See Detail C-02b	North	Psst	2"x2"	W1-8R W1-8L	Chevron Right Chevron Left	24 24	30 30	Install new sign assembly "B" distance from next chevron assembly. See C-02b for placement details.
	3					-	See Detail C-02b	North	Psst	2"x2"	W1-8R W1-8L	Chevron Right Chevron Left	24 24	30 30	Install new sign assembly "B" distance from next chevron assembly. See C-02b for placement details.
	-	Southbound	45.42437 -122.44842	40 mph	30 mph	-	-	-	-	-	-	-	-	-	
3	-	Northbound	45.42498 -122.4476S	40 mph	25 mph	-	-	-	-	-	-	-	-	-	
	1	Southbound	45.42514 -122.44759	40 mph	25 mph	-	See Detail C-02b	South	Psst	2"x2"	W1-8L W1-8R	Chevron Left Chevron Right	24 24	30 30	Install new sign assembly "B" distance from next chevron assembly. See C-02b for placement details.
	2					-	See Detail C-02b	South	Psst	2"x2"	W1-8L W1-8R	Chevron Left Chevron Right	24 24	30 30	Install new sign assembly "B" distance from next chevron assembly. See C-02b for placement details.
	3					-	See Detail C-02b	South	Psst	2"x2"	W1-8L W1-8R	Chevron Left Chevron Right	24 24	30 30	Install new sign assembly "B" distance from next chevron assembly. See C-02b for placement details.
	4					100 ft	-	North	Psst	2"x2"	W1-3R W13-1P-25	Reverse Turn Right Advisory Speed 25 MPH	36 24	36 24	Install new sign assembly "A" distance from field located Point of Curvature.
4	1	Northbound	45.43227 -122.44841	40 mph	30 mph	100 ft	-	South	Psst	2"x2"	W1-3L W13-1P-25	Reverse Turn Left Advisory Speed 25 MPH	36 24	36 24	Install new sign assembly "A" distance from field located Point of Curvature.
	2					-	See Detail C-02c	North	Psst	2"x2"	W1-8L W1-8R	Chevron Left Chevron Right	24 24	30 30	Install new sign assembly "B" distance from next chevron assembly. See C-02c for placement details.
	3					-	See Detail C-02c	North	Psst	2"x2"	W1-8L W1-8R	Chevron Left Chevron Right	24 24	30 30	Install new sign assembly "B" distance from next chevron assembly. See C-02c for placement details.
	4					-	See Detail C-02c	North	Psst	2"x2"	W1-8L W1-8R	Chevron Left Chevron Right	24 24	30 30	Install new sign assembly "B" distance from next chevron assembly. See C-02c for placement details.
	-	Southbound	4S.432S7 -122.44863	40 mph	30 mph	-	-	-	-	-	-	-	-	-	
5	1	Northbound	4S.433S9 -122.44971	40 mph	25 mph	0 ft		South	Psst	2"x2"	W1-1aR-2S	Supplemental Turn Right (2S)	36	36	Install new sign assembly at field located Point of Curvature.
	2					-	See Detail C-02c	North	Psst	2"x2"	W1-8R W1-8L	Chevron Right Chevron Left	24 24	30 30	Install new sign assembly "B" distance from next chevron assembly. See C-02c for placement details.
	3					-	See Detail C-02c	North	Psst	2"x2"	W1-8R W1-8L	Chevron Right Chevron Left	24 24	30 30	Install new sign assembly "B" distance from next chevron assembly. See C-02c for placement details.
	4					-	See Detail C-02c	North	Psst	2"x2"	W1-8R W1-8L	Chevron Right Chevron Left	24 24	30 30	Install new sign assembly "B" distance from next chevron assembly. See C-02c for placement details.
	5	Southbound	45.43378 -122.44983	40 mph	30 mph	100 ft	-	North	Psst	2"x2"	W1-3L W13-1P-30	Reverse Turn Left Advisory Speed 30 MPH	36 24	36 24	Install new sign assembly "A" distance from field located Point of Curvature.

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Damascus Area Systemic Safety Enhancements
SE Wiese Road
DATE: June 2021
PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
DIRECTOR
DAN JOHNSON

DESIGNED BY: DZ/SELF
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Sheet No. C-02-3

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Existing Sign & Sign Removal

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Material	Sign Location		Remarks
			X	Y		Milepost	Placement	
Corridor 02 - Wiese Rd								
1	CR1033	"NO THRU TRUCKS/ LOCAL DELIVERY ONLY"	30	36	PSST	0.01	Right	Maintain and protect.
2	W1-1R W13-1P	Right Turn Warning Advisory Speed 25 MPH	30 18	30 18	PSST	0.04	Right	Remove existing sign and support. Remove existing sign.
3	S3-1	"SCHOOL BUS STOP AHEAD"	30	30	PSST	0.1	Right	Maintain and protect.
4	R2-1	Regulatory Speed 40 MPH	30	36	PSST	0.125	Right	Maintain and protect.
5	W1-1L W13-1P	Left Turn Warning Advisory Speed 25 MPH	30 18	30 18	Wood	0.16	Left	Remove existing sign and support. Remove existing sign.
6	W1-3R W13-1P	Reverse Turn Right Warning Advisory Speed 30 MPH	30 18	30 18	Wood	0.46	Right	Remove existing sign and support. Remove existing sign.
7	W1-3R W13-1P	Reverse Turn Right Warning Advisory Speed 30 MPH	30 18	30 18	PSST	0.64	Left	Remove existing sign and support. Remove existing sign.
8	W1-3L W13-1P	Reverse Turn Left Warning Advisory Speed 30 MPH	30 18	30 18	Wood	1.02	Right	Remove existing sign and support. Remove existing sign.
9	W1-3L W13-1P	Reverse Turn Left Warning Advisory Speed 30 MPH	30 18	30 18	PSST	1.27	Left	Remove existing sign and support. Remove existing sign.

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Damascus Area Systemic Safety Enhancements
SE Wiese Road
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
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*Distance measured from intersection unless otherwise noted.

Scale: 1" = 80'

80 40 0 80

Damascus Area Systemic Safety Enhancements

SE TILLSTROM RD/SE FOSTER RD

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

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Sign Installation Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Type	Post Size	Sign Location			Remarks
			X	Y			Leg	Side	Distance (ft)	
Intersection 01: Tillstrom Rd/Foster Rd										
1	R1-1	Stop Sign	36	36	PSST	2" x 2"	East	North	20	Install new sign on new support.
2	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	East	North	150	Install new sign on new support.
	W16-8P	Advanced Street Name (Foster Rd)	30	8						Install new sign.
3	R2-1-40	Regulatory Speed 40	30	36	PSST	2" x 2"	East	South	240	Install new sign on new support.
4	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	East	South	150	Install new sign on new support.
	W16-8P	Advanced Street Name (Foster Rd)	30	8						Install new sign.
5	R1-1	Stop Sign	36	36	PSST	2" x 2"	East	South	20	Install new sign on new support.
6	W2-3Ra	Diagonal Road Right-Down Warning	36	36	PSST	2" x 2"	South	East	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	8						Install new sign.
7	W2-3Ra	Diagonal Road Right-Down Warning	36	36	PSST	2" x 2"	South	West	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	8						Install new sign.
8	D3-1	Street Name - 2 Sided (← Tillstrom Rd)/(Tillstrom Rd →)	60	12	PSST	2" x 2"	West	North	0	Install new sign on new support.
	D3-1	Street Name (Foster Rd)	48	12						Install new sign.
9	W1-7	Two-Direction Large Arrow Sign	60	30	PSST	2" x 2"	West	North	0	Install new sign on new support.
10	W2-3L	Diagonal Road Left-up Warning	36	36	PSST	2" x 2"	North	West	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	8						Install new sign.
11	W2-3L	Diagonal Road Left-up Warning	36	36	PSST	2" x 2"	North	East	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	8						Install new sign.
12	(W11-3)	Advisory Warning - Deer	(30)	(30)	PSST	2" x 2"	North	East	125	Reinstall sign on new support.

*Distance measured from intersection unless otherwise noted.

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Damascus Area Systemic Safety Enhancements

SE TILLSTROM RD/SE FOSTER RD

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
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150 BEAVERCREEK ROAD
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Sheet No.
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Existing Sign & Sign Removal Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Material	Sign Location			Remarks
			X	Y		Leg	Side	Distance (ft)	
Intersection 01: Tillstrom Rd/Foster Rd									
1	R1-1	Stop Sign	36	36	PSST	East	North	15	Remove existing sign and support.
2	OR2-1	SPEED 40	30	36	PSST	East	South	240	Remove existing sign and support.
3	W2-2R	Right Side Road Warning	36	36	PSST	South	East	410	Remove existing sign and support.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	12					Remove existing sign.
4	W1-2R	Right Curve Warning	36	36	PSST	South	West	300	Maintain and protect.
	W13-1P-45	Advisory Speed 45 MPH	24	24					
5	D3-1	Street Name (Tillstrom Rd)	48	12	PSST	North	West	-	Remove existing sign and support.
	D3-1	Street Name (Tillstrom Rd)	48	12					Remove existing sign.
	D3-1	Street Name (Foster Rd)	42	12					Remove existing sign.
6	W2-2L	Left Side Road Warning	36	36	PSST	North	West	465	Remove existing sign and support.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	12					Remove existing sign.
7	W11-3	Advisory Warning - Deer	30	30	PSST	North	East	185	Remove and save existing sign and support and reinstall in new location.

*Distance measured from intersection unless otherwise noted.

Damascus Area Systemic Safety Enhancements

SE TILLSTROM RD/SE FOSTER RD

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
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150 BEAVERCREEK ROAD
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Scale: 1" = 80'

80 40 0 80

Damascus Area Systemic Safety Enhancements

SE TILLSTROM RD/SE 190th DRIVE

DATE: June 2021 | PROJECT NO.: #2019-18

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Sheet No. I-02-1

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Sign Installation Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Type	Post Size	Sign Location			Remarks
			X	Y			Leg	Side	Distance (ft)	
Intersection 02: Tillstrom Rd/190th Dr										
1	R1-1	Stop Sign	36	36	PSST	2" x 2"	North	West	15	Install new sign on new support.
2	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	North	West	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	8						Install new sign.
3	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	North	East	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	8						Install new sign.
4	R2-1-45	Regulatory Speed 45 MPH	30	36	PSST	2" x 2"	North	East	110	Install new sign on new support.
5	R1-1	Stop Sign	36	36	PSST	2" x 2"	North	East	35	Install new sign on new support.
6	W1-10L	Left Curve Warning With Side Road	36	36	PSST	2" x 2"	East	North	125	Install new sign on new support.
	W13-1P	Advisory Speed 35 MPH	24	24						Install new sign.
	W16-8P	Advanced Street Name (190th Dr)	24	8						Install new sign.
7	D1-1	Destination (Gresham →)	60	12	PSST	2" x 2"	East	North	225	Install new sign on new support.
8	W1-10L	Left Curve Warning With Side Road	36	36	PSST	2" x 2"	East	South	125	Install new sign on new support.
	W13-1P	Advisory Speed 35 MPH	24	24						Install new sign.
	W16-8P	Advanced Street Name (190th Dr)	24	8						Install new sign.
9	D3-1	Street Name - 2 Sided (← 190th Dr)/(190th Dr →)	42	12	PSST	2.5" x 2.5"	East	South	0	Install new sign on new support.
	D3-1	Street Name (Tillstrom Rd)	60	12						Install new sign.
	W1-7	Two-Direction Large Arrow Sign	60	30						Install new sign.
10	W1-10R	Right Curve Warning With Side Road	36	36	PSST	2" x 2"	West	South	125	Install new sign on new support.
	W13-1P	Advisory Speed 40 MPH	24	24						Install new sign.
	W16-8P	Advanced Street Name (190th Dr)	24	8						Install new sign.
11	D1-1	Destination (← Gresham)	60	12	PSST	2" x 2"	West	South	325	Install new sign on new support.
12	W1-10R	Right Curve Warning With Side Road	36	36	PSST	2" x 2"	West	North	125	Install new sign on new support.
	W13-1P	Advisory Speed 40 MPH	24	24						Install new sign.
	W16-8P	Advanced Street Name (190th Dr)	24	8						Install new sign.
13	R2-1-45	Regulatory Speed 45 MPH	30	36	PSST	2" x 2"	West	North	80	Install new sign on new support.

*Distance measured from intersection unless otherwise noted.

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Damascus Area Systemic Safety Enhancements
SE TILLSTROM RD/SE 190th DRIVE
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
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I-02-2

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Existing Sign & Sign Removal Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Material	Sign Location			Remarks
			X	Y		Leg	Side	Distance (ft)	
Intersection 02: Tillstrom Rd/190th Dr									
1	R1-1	Stop Sign	36	36	PSST	North	West	15	Remove existing sign and support.
2	W3-1	Stop Ahead Warning	30	30	PSST	North	West	500	Remove existing sign and support.
3	OR2-1	SPEED 45	30	36	PSST	North	East	55	Remove existing sign and support.
4	W1-2L W13-1P	Advanced Curve Warning Advisory Speed 35 MPH	30 18	30 18	PSST	South	East	330	Remove existing sign and support.
5	D3-1	Street Name - 2 Sided (190th Dr)	42	12	PSST	South	West	0	Remove existing sign and support.
	D1-1	Destination (← Gresham)	30	8					Remove existing sign.
	D1-1	Destination (Gresham →)	30	8					Remove existing sign.
	D3-1	Street Name (← Tillstrom Rd →)	48	12					Remove existing sign.
	W1-7	Two-Direction Large Arrow Sign	48	24					Remove existing sign.
6	W1-2R W13-1P	Advanced Curve Warning Advisory Speed 40 MPH	30 18	30 18	PSST	West	South	250	Remove existing sign and support.
7	OR2-1	SPEED 45	30	36	PSST	West	North	80	Remove existing sign and support.

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Damascus Area Systemic Safety Enhancements
SE TILLSTROM RD/SE 190th DRIVE
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
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Scale: 1" = 80'

80 40 0 80

*Distance measured from intersection unless otherwise noted.

Damascus Area Systemic Safety Enhancements

SE TILLSTROM RD/SE BORGES RD

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
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Sheet No.
I-03-1

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Sign Installation Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Type	Post Size	Sign Location			Remarks
			X	Y			Leg	Side	Distance (ft)	
Intersection 03: Tillstrom Rd/Borges Rd										
1	R1-1	Stop Sign	36	36	PSST	2" x 2"	East	North	10	Install new sign on new support.
2	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	East	North	155	Install new sign on new support.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	8						Install new sign.
3	R2-1-45	Regulatory Speed 45 MPH	30	36	PSST	2" x 2"	East	South	220	Install new sign on new support.
4	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	East	South	155	Install new sign on new support.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	8						Install new sign.
5	R1-1	Stop Sign	36	36	PSST	2" x 2"	East	South	12	Install new sign on new support.
6	CR1033 Modified	No Thru Trucks On Borges Rd/ Local Delivery Only	30	36	PSST	2" x 2"	South	East	100	Install new sign on new support.
7	W2-2R	Side Road Right Warning	36	36	PSST	2" x 2"	South	East	200	Install new sign on new support.
	W16-8P	Advanced Street Name (Borges Rd)	30	8						Install new sign.
8	W2-2R	Side Road Right Warning	36	36	PSST	2" x 2"	South	West	200	Install new sign on new support.
	W16-8P	Advanced Street Name (Borges Rd)	30	8						Install new sign.
9	R2-1-45	Regulatory Speed 45 MPH	30	36	PSST	2" x 2"	South	West	120	Install new sign on new support.
10	D3-1	Street Name - 2 Sided (Borges Rd)	48	12	PSST	2.5" x 2.5"	North	West	-	Install new sign on new support.
	D3-2	Street Name (Tillstrom Rd)	60	12						Install new sign.
	W1-7	Two-Direction Large Arrow Sign	60	30						Install new sign.
11	CR1033 Modified	No Thru Trucks On Borges Rd/ Local Delivery Only	30	36	PSST	2" x 2"	North	West	100	Install new sign on new support.
12	W2-2L	Side Road Left Warning	36	36	PSST	2" x 2"	North	West	200	Install new sign on new support.
	W16-8P	Advanced Street Name (Borges Rd)	30	8						Install new sign.
13	W2-2L	Side Road Left Warning	36	36	PSST	2" x 2"	North	East	200	Install new sign on new support.
	W16-8P	Advanced Street Name (Borges Rd)	30	8						Install new sign.

*Distance measured from intersection unless otherwise noted.

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Damascus Area Systemic Safety Enhancements
SE TILLSTROM RD/SE BORGES RD
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
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Existing Sign & Sign Removal Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Material	Sign Location			Remarks
			X	Y		Leg	Side	Distance (ft)	
Intersection 03: Tillstrom Rd/Borges Rd									
1	R1-1	Stop Sign	24	24	PSST	East	North	0	Remove existing sign and support.
2	W3-1	Stop Ahead Warning	30	30	Wood	East	North	550	Remove existing sign and support.
3	EX	Adopt-A-Road	EX	EX	PSST	East	South	250	Maintain and protect.
4	OR2-1	SPEED 40	30	36	PSST	East	South	220	Remove existing sign and support.
5	CR1033	No Thru Trucks/ Local Delivery Only	30	36	PSST	East	South	15	Remove existing sign and support.
6	W2-2R	Right Side Road Warning	30	30	PSST	South	East	590	Remove existing sign and support.
	W16-8P	Advanced Street Name (Borges Rd)	36	12					
7	OR2-1	Regulatory Speed 40 MPH	30	36	PSST	South	West	120	Remove existing sign and support.
8	D3-1	Street Name - 2 Sided (Borges Rd)	54	12	PSST	North	West	0	Remove existing sign and support.
	D3-1	Street Name (Tillstrom Rd)	48	12					Remove existing sign.

*Distance measured from intersection unless otherwise noted.

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Damascus Area Systemic Safety Enhancements

SE TILLSTROM RD/SE BORGES RD

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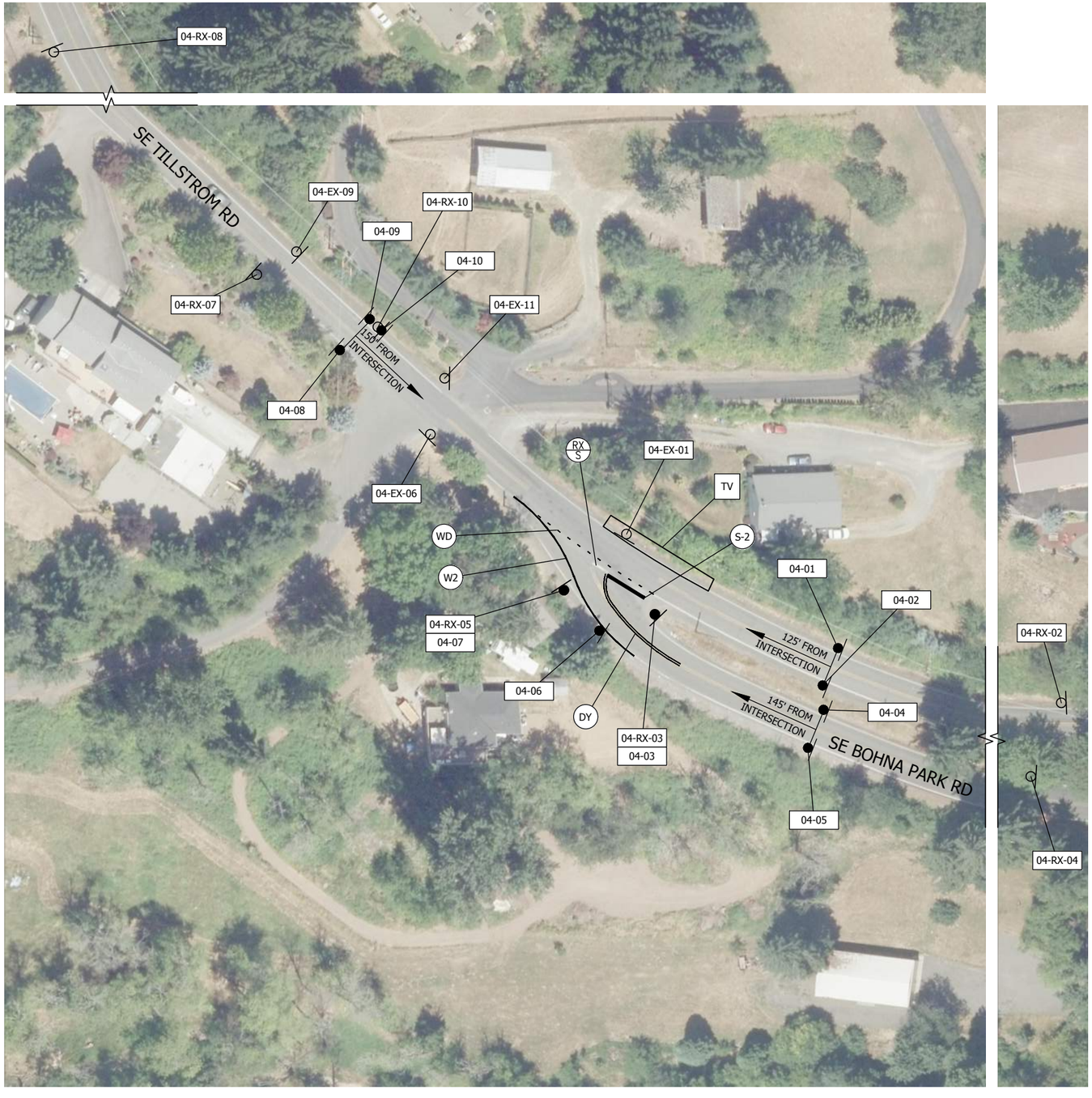
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22



Scale: 1" = 80'

80 40 0 80

*Distance measured from intersection unless otherwise noted.

H:\24\24756 - Damascus Safety Countermeasures\design_CD\CD - Intersection - SE Tillstrom Road.dwg 6/18/2021 10:52 AM Dimitryan Shadrin

Damascus Area Systemic Safety Enhancements

SE TILLSTROM RD/SE BOHNA PARK RD

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

DIRECTOR

CLACKAMAS COUNTY

DAN JOHNSON

DESIGNED BY: DZS
DRAFTED BY: DZS
CHECKED BY: WES

REVISIONS

NO.	DATE:

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
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REGISTERED PROFESSIONAL ENGINEER
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OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Sheet No.
I-04-1

Sign Installation Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Type	Post Size	Sign Location			Remarks
			X	Y			Leg	Side	Distance (ft)	
Intersection 04: Tillstrom Rd/Bohna Park Rd										
1	W2-3La	Diagonal Left Side Road Warning	36	36	PSST	2" x 2"	East	North	125	Install new sign on new support.
	W16-8P	Advanced Street Name (Bohna Park Rd)	42	8						
2	W2-3La	Diagonal Left Side Road Warning	36	36	PSST	2" x 2"	East	South	125	Install new sign on new support.
	W16-8P	Advanced Street Name (Bohna Park Rd)	42	8						
3	R1-1	Stop Sign	36	36	PSST	2" x 2"	South	North	10	Install new sign on new support.
4	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	South	North	145	Install new sign on new support.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	8						Install new sign.
5	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	South	North	145	Install new sign on new support.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	8						Install new sign.
6	R1-1	Stop Sign	36	36	PSST	2" x 2"	South	South	45	Install new sign on new support.
7	R2-1-40	Regulatory Speed 40 MPH	30	36	PSST	2" x 2"	South	West	25	Install new sign on new support.
8	W2-3R	Diagonal Right Side Road Warning	36	36	PSST	2" x 2"	West	South	150	Install new sign on new support.
	W16-8P	Advanced Street Name (Bohna Park Rd)	42	8						Install new sign.
9	W2-3R	Diagonal Right Side Road Warning	36	36	PSST	2" x 2"	West	North	150	Install new sign on new support.
	W16-8P	Advanced Street Name (Bohna Park Rd)	42	8						Install new sign.
10	R2-1-40	Regulatory Speed 40 MPH	30	36	PSST	2" x 2"	West	North	140	Install new sign on new support.

*Distance measured from intersection unless otherwise noted.

Damascus Area Systemic Safety Enhancements

SE TILLSTROM RD/SE BOHNA PARK RD

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

DIRECTOR DAN JOHNSON

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Sheet No. I-04-2

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JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

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Existing Sign & Sign Removal Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Material	Sign Location			Remarks
			X	Y		Leg	Side	Distance (ft)	
Intersection 04: Tillstrom Rd/Bohna Park Rd									
1	D3-1	Street Name (Bohna Park Rd →)	60	10	PSST	North	East	0	Maintain and protect.
	D3-1	Street Name (← Bohna Park Rd)	60	10					
	D3-1	Street Name (Tillstrom Rd)	48	12					
2	W2-3L	Diagonal Left Side Road Warning (Custom)	36	36	PSST	East	North	450	Remove existing sign and support.
	W16-8P	Advanced Street Name (Bohna Park Rd)	48	12					
3	R1-1	Stop Sign	30	30	PSST	South	East	5	Remove existing sign and support.
4	W3-1	Stop Ahead Warning	30	30	PSST	South	North	450	Remove existing sign and support.
5	OR2-1	SPEED 40	30	36	PSST	South	West	25	Remove existing sign and support.
6	D3-1	Street Name (Delia Rd)	EX	EX	PSST	West	South	70	Maintain and protect.
	W14-1aR	Dead End →	EX	EX					
	W14-1aL	← Dead End	EX	EX					
	R1-1	Stop Sign	EX	EX					
7	W1-4L	Reverse Curve Left Warning	36	36	PSST	West	South	225	Remove existing sign and support.
	W13-1P	Advisory Speed 40 MPH	18	18					
8	W2-3R	Diagonal Right Side Road Warning (Custom)	36	36	PSST	West	South	700	Remove existing sign and support.
	W16-8P	Advanced Street Name (Bohna Park Rd)	48	12					
9	W1-4R	Reverse Curve Right Warning	36	36	PSST	West	North	225	Maintain and protect.
	W13-1P	Advisory Speed 40 MPH	24	24					
10	OR2-1	SPEED 40	30	36	PSST	West	North	150	Remove existing sign and support.
11	D3-1	Street Name (Achilles Rd)	EX	EX	PSST	West	North	85	Maintain and protect.
	W14-1aR	Dead End →	EX	EX					
	W14-1aL	← Dead End	EX	EX					
	R1-1	Stop Sign	EX	EX					

*Distance measured from intersection unless otherwise noted.

Damascus Area Systemic Safety Enhancements
SE TILLSTROM RD/SE BOHNA PARK RD
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

DIRECTOR
DAN JOHNSON

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REVISIONS

NO.	DATE:

Sheet No. I-04-3

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OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

H:\2424756 - Damascus Safety Countermeasures\design_CD\CD - Intersection - SE Tillstrom Road.dwg 6/18/2021 10:52 AM Dimitriyan Shadrin

Scale: 1" = 80'

80 40 0 80

*Distance measured from intersection unless otherwise noted.

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Damascus Area Systemic Safety Enhancements

SE WIESE RD/SE BOHNA PARK RD

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

DIRECTOR

CLACKAMAS COUNTY

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REVISIONS

NO.	DATE:

Sheet No. I-05-01

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OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Sign Installation Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Type	Post Size	Sign Location			Remarks
			X	Y			Leg	Side	Distance (ft)	
Intersection 05: Wiese Rd/Bohna Park Rd										
1	(D3-1)	Street Name (Wiese Rd →)	(48)	(12)	PSST	2.5" x 2.5"	North	East	0	Reinstall existing sign.
	(D3-1)	Street Name (← Wiese Rd)	(48)	(12)						Reinstall existing sign.
	(D3-1)	Street Name (Bohna Park Rd)	(60)	(12)						Reinstall existing sign.
	W1-7	Two-Direction Large Arrow Sign	60	30						Install new sign on new support.
2	CR1033 Modified	No Thru Trucks On Wiese Rd/ Local Delivery Only	30	36	PSST	2' x 2"	East	North	75	Install new sign on new support.
3	W2-2L	Left Side Road Warning	36	36	PSST	2" x 2"	East	North	150	Install new sign on new support.
	W16-8P	Advanced Street Name (Wiese Rd)	30	8						Install new sign.
4	W2-2L	Left Side Road Warning	36	36	PSST	2" x 2"	East	South	150	Install new sign on new support.
	W16-8P	Advanced Street Name (Wiese Rd)	30	8						Install new sign.
5	R1-1	Stop Sign	36	36	PSST	2" x 2"	South	East	10	Install new sign on existing support.
6	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	South	East	125	Install new sign on new support.
	W16-8P	Advanced Street Name (Bohna Park Rd)	42	8						Install new sign.
7	R2-1-40	Regulatory Speed 40 MPH	30	36	PSST	2" x 2"	South	West	185	Install new sign on new support.
8	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	South	West	125	Install new sign on new support.
	W16-8P	Advanced Street Name (Bohna Park Rd)	42	8						Install new sign.
9	R1-1	Stop Sign	36	36	PSST	2" x 2"	South	West	10	Install new sign on new support.
10	CR1033 Modified	No Thru Trucks On Wiese Rd/ Local Delivery Only	30	36	PSST	2" x 2"	West	South	75	Reinstall existing sign on new support.
11	W2-2R	Right Side Road Warning	36	36	PSST	2" x 2"	West	South	150	Install new sign on new support.
	W16-8P	Advanced Street Name (Wiese Rd)	30	8						Install new sign.
12	W2-2R	Right Side Road Warning	36	36	PSST	2" x 2"	West	North	150	Install new sign on new support.
	W16-8P	Advanced Street Name (Wiese Rd)	30	8						Install new sign.

*Distance measured from intersection unless otherwise noted.

Damascus Area Systemic Safety Enhancements
SE WIESE RD/SE BOHNA PARK RD
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY
DIRECTOR
DAN JOHNSON

DESIGNED BY: DZS | DRAFTED BY: DZS | CHECKED BY: WES

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NO. | DATE:

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OREGON
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EXPIRES: 06/30/22

Sheet No.
I-05-02

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Existing Sign & Sign Removal Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Material	Sign Location			Remarks
			X	Y		Leg	Side	Distance (ft)	
Intersection 05: Wiese Rd/Bohna Park Rd									
1	D3-1	Street Name (Wiese Rd →)	48	12	PSST	North	East	0	Remove and save existing sign.
	D3-1	Street Name (← Wiese Rd)	48	12					Remove and save existing sign.
	D3-1	Street Name (Bohna Park Rd)	60	12					Remove and save existing sign.
	W1-7	Two-Direction Large Arrow Sign	48	24					Remove existing sign and support.
2	S3-1	School Bus Stop Ahead	30	30	PSST	East	South	350	Maintain and protect.
3	R1-1	Stop Sign	30	30	PSST	South	East	10	Remove existing sign.
4	W3-1	Stop Ahead Warning	30	30	PSST	South	East	250	Remove existing sign and support.
5	OR2-1	SPEED 40	30	36	PSST	South	West	185	Remove existing sign and support.
6	CR1033	No Thru Trucks/ Local Delivery Only	30	36	PSST	South	West	55	Remove existing sign and support.
7	W1-2R	Right Curve Warning	30	30	Wood	West	South	110	Remove existing sign and support.
	W13-1P	Advisory Speed 40 MPH	18	18					Remove existing sign.

*Distance measured from intersection unless otherwise noted.

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JULY 9, 2001
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EXPIRES: 06/30/22

Damascus Area Systemic Safety Enhancements
SE WIESE RD/SE BOHNA PARK RD
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

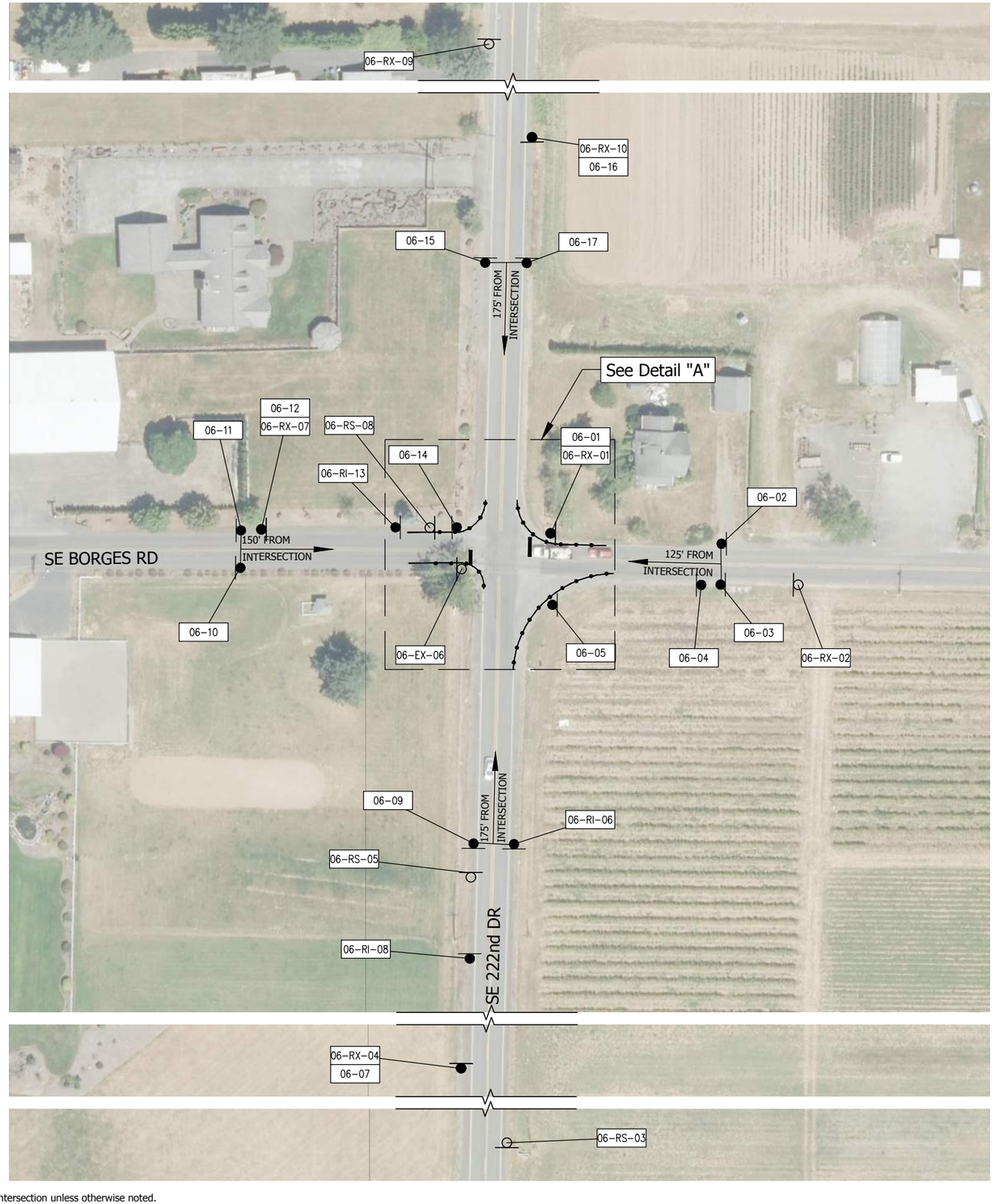
CLACKAMAS COUNTY
DIRECTOR
DAN JOHNSON

DESIGNED BY: DZS
DRAFTED BY: DZS
CHECKED BY: WES

REVISIONS

NO.	DATE:

Sheet No.
I-05-03



*Distance measured from intersection unless otherwise noted.

Scale: 1" = 80'

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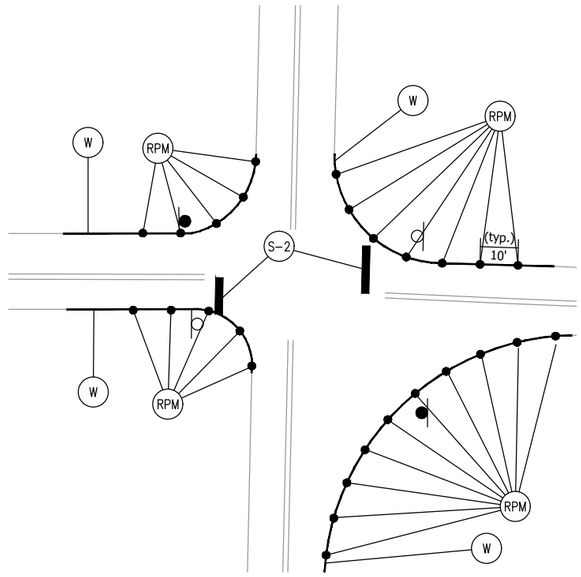

DETAIL "A"

KITTELSON & ASSOCIATES
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REGISTERED PROFESSIONAL ENGINEER
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OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Damascus Area Systemic Safety Enhancements
SE 222nd DR/SE BORGES RD
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

DIRECTOR
DAN JOHNSON

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DRAFTED BY: DZS
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REVISIONS

NO.	DATE:

Sheet No.
I-06-1

H:\2424756 - Damascus Safety Countermeasures\design_CD\CD - Intersection - SE 222nd Drive.dwg 6/18/2021 10:55 AM Dmitryan Shadrin

Sign Installation Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Type	Post Size	Sign Location			Remarks
			X	Y			Leg	Side	Distance (ft)*	
Intersection 06: 222nd Dr/Borges Rd										
1	W4-4P	Cross Traffic Does Not Stop	36	18	PSST	2"x2"	East	North	10	Instal new sign on existing support.
2	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	East	North	125	Install new sign on new support.
	W16-8P	Advanced Street Name (222nd Dr)	24	8						Instal new sign.
3	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	East	South	125	Install new sign on new support.
	W16-8P	Advanced Street Name (222nd Dr)	24	8						Instal new sign.
4	R2-1-40	Regulatory Speed 40	30	36	PSST	2" x 2"	East	South	115	Install new sign on existing support.
5	R1-1	Stop Sign	36	36	PSST	2" x 2"	East	South	10	Install new sign on new support.
	W4-4P	Cross Traffic Does Not Stop	36	18						Instal new sign.
6	(W2-1)	Crossroad Intersection Warning	(36)	(36)	PSST	2" x 2"	South	East	175	Reinstall existing sign on new support.
	W16-8P	Advanced Street Name (Borges Rd)	30	8						Install new sign.
7	R2-1-45	Regulatory Speed 45	30	36	PSST	2" x 2"	South	West	410	Install new sign on existing support.
8	(CCS1389)	Clackamas County Fire	(18)	(24)	PSST	2" x 2"	South	West	250	Reinstall existing sign on new support.
9	W2-1	Crossroad Intersection Warning	36	36	PSST	2" x 2"	South	West	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Borges Rd)	30	8						Install new sign.
10	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	West	South	150	Install new sign on new support.
	W16-8P	Advanced Street Name (222nd Dr)	24	8						Instal new sign.
11	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	West	North	150	Install new sign on new support.
	W16-8P	Advanced Street Name (222nd Dr)	24	8						Instal new sign.
12	R2-1-40	Regulatory Speed 40	30	36	PSST	2" x 2"	West	North	135	Install new sign on existing support.
13	(R5-2a)	No Thru Trucks	(30)	(36)	PSST	2" x 2"	West	North	50	Reinstall existing sign on new support.
14	R1-1	Stop Sign	36	36	PSST	2" x 2"	West	North	10	Install new sign on new support.
15	W2-1	Crossroad Intersection Warning	36	36	PSST	2" x 2"	North	West	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Borges Rd)	30	8						Install new sign.
16	R2-1-40	Regulatory Speed 40	30	36	PSST	2" x 2"	North	East	260	Install new sign on existing support.
17	W2-1	Crossroad Intersection Warning	36	36	PSST	2" x 2"	North	East	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Borges Rd)	30	8						Install new sign.

*Distance measured from intersection unless otherwise noted.

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OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Damascus Area Systemic Safety Enhancements
SE 222nd DR/SE BORGES RD
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
CLACKAMAS COUNTY
DIRECTOR
DAN JOHNSON

DESIGNED BY: DZS | DRAFTED BY: DZS | CHECKED BY: WES

REVISIONS
NO. | DATE:

Sheet No.
I-06-2

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Existing Sign & Sign Removal Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Material	Sign Location			Remarks
			X	Y		Leg	Side	Distance (ft)*	
Intersection 06: 222nd Dr/Borges Rd									
1	D3-1	Street Name - 2 Sided (Borges Rd)	42	12	PSST	East	North	10	Maintain and protect.
	R1-1	Stop Sign	36	36					
	W4-4P	Cross Traffic Does Not Stop	24	12					Remove existing sign.
2	OR2-1	SPEED 40	30	36	PSST	East	South	175	Remove existing sign and support.
3	W2-1	Crossroad Intersection Warning	36	36	PSST	South	East	500	Remove and save existing sign and reinstall in new location.
	W16-8P	Advanced Street Name (Borges Rd)	36	12					Remove existing sign and support.
4	OR2-1	SPEED 45	30	36	PSST	South	East	410	Remove existing sign and support.
5	CCS1389	Clackamas County Fire	18	24	PSST	South	West	200	Remove and save existing sign and support and reinstall in new location.
6	R1-1	Stop Sign	36	36	PSST	West	South	5	Maintain and protect.
7	OR2-1	SPEED 40	30	36	PSST	West	North	135	Remove existing sign and support.
8	R5-2a	No Thru Trucks	30	36	PSST	West	North	25	Remove and save existing sign and reinstall in new location. Remove existing support.
9	W2-1	Crossroad Intersection Warning	30	30	PSST	South	East	485	Remove existing sign and support.
	W16-8P	Advanced Street Name (Borges Rd)	36	12					Remove existing sign.
10	OR2-1	SPEED 40	30	36	PSST	North	East	260	Remove existing sign and support.

*Distance measured from intersection unless otherwise noted.

Damascus Area Systemic Safety Enhancements
SE 222nd DR/SE BORGES RD
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

DIRECTOR
DAN JOHNSON

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REVISIONS

NO.	DATE:

Sheet No.
I-06-3

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OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

H:\2424756 - Damascus Safety Countermeasures\design_CD\CD - Intersection - SE 222nd Drive.dwg 6/18/2021 10:55 AM Dimitryan Shadrin

*Distance measured from intersection unless otherwise noted.

Scale: 1" = 80'

80 40 0 80

SE 222nd DR/SE TILLSTROM RD

Damascus Area Systemic Safety Enhancements

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

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JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

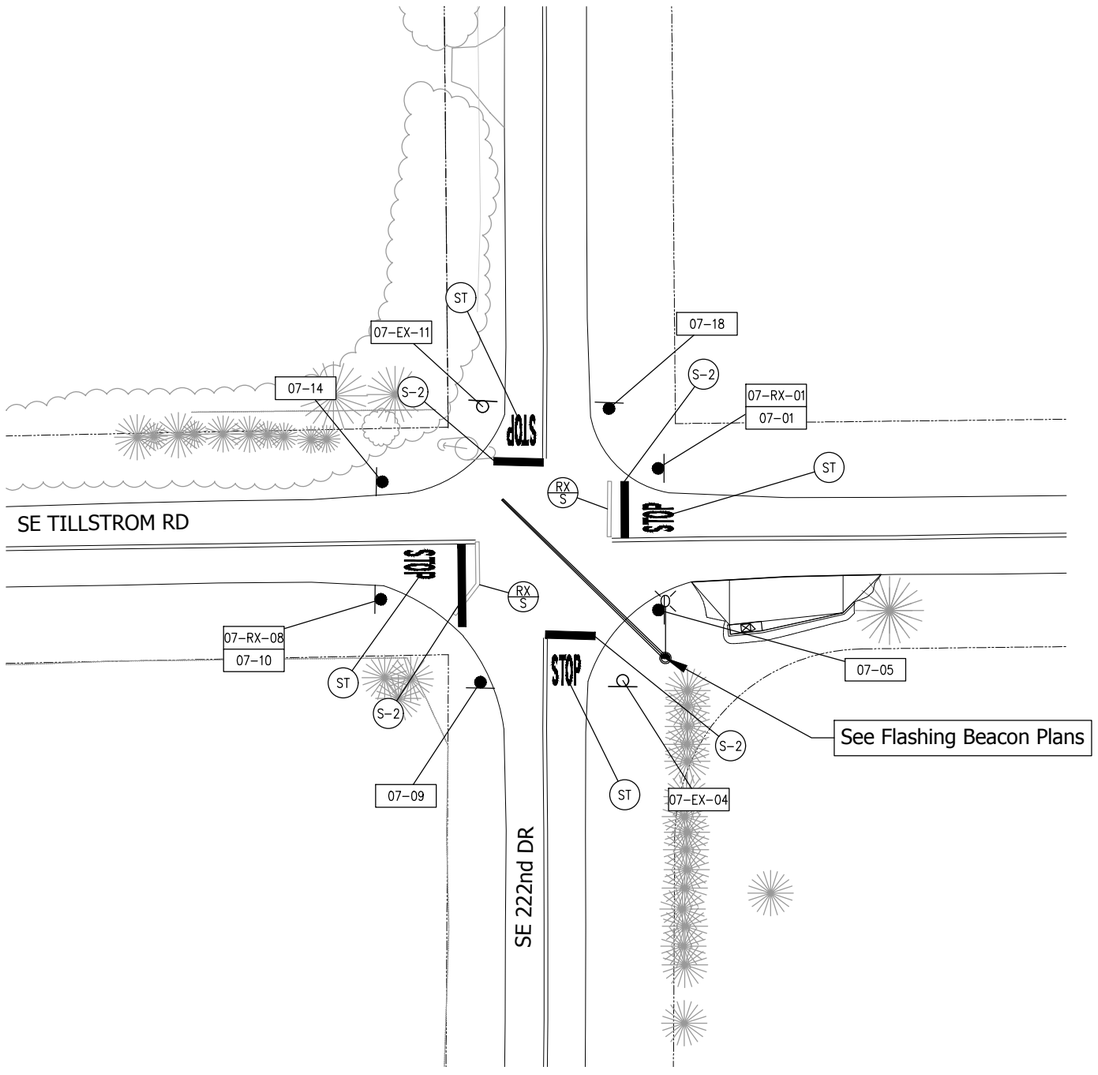
DESIGNED BY: DZS
DRAFTED BY: DZS
CHECKED BY: WES

REVISIONS

NO.	DATE:

Sheet No. I-07-1

H:\24124756 - Damascus Safety Countermeasures\design_CD\CD - Intersection - SE 222nd Drive.dwg 6/18/2021 10:56 AM Dimitryan Shadrin



DETAIL "A"
SCALE 1"=40'

*Distance measured from intersection unless otherwise noted.

Scale: 1" = 40'

40 20 0 40

Damascus Area Systemic Safety Enhancements

SE 222nd DR/SE TILLSTROM RD

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

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CLACKAMAS COUNTY

DAN JOHNSON

DESIGNED BY: DZS
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Sheet No.
I-07-2

H:\24\24756 - Damascus Safety Countermeasures\design_CD\CD - Intersection - SE 222nd Drive.dwg 6/28/2021 12:00 PM Dmitryan Shadrin

Sign Installation Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Type	Post Size	Sign Location			Remarks
			X	Y			Leg	Side	Distance (ft)*	
Intersection 07: 222nd Dr/Tillstrom Rd										
1	(D3-1)	Street Name (Tillstrom Rd)	(48)	(12)	PSST	2.5" x 2.5"	East	North	1S	Reinstall existing sign.
	(D3-1)	Street Name (Tillstrom Rd)	(48)	(12)						Reinstall existing sign.
	(D3-1)	Street Name (222nd Dr)	(36)	(12)						Reinstall existing sign.
	(D3-1)	Street Name (222nd Dr)	(36)	(12)						Reinstall existing sign.
	R1-1	Stop Sign	36	36						Install new sign new support.
	(R1-3)	All-Way	(18)	(6)						Reinstall existing sign.
2	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	East	North	12S	Reinstall existing sign on new support.
	W16-8P	Advanced Street Name (222nd Dr)	24	8						Install new sign.
3	R2-1-40	Regulatory Speed 40	30	36	PSST	2" x 2"	East	South	36S	Install new sign on new support.
4	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	East	South	12S	Install new sign on new support.
	W16-8P	Advanced Street Name (222nd Dr)	24	8						Install new sign.
S	R1-1	Stop Sign	36	36	PSST	2" x 2"	East	South	1S	Install new sign on new support.
	R1-3	All-Way	18	6						Install new sign.
6	(W3-1)	Stop Ahead Warning	(36)	(36)	PSST	2" x 2"	South	East	17S	Reinstall existing sign on new support.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	8						Install new sign.
7	R2-1-4S	Regulatory Speed 4S	30	36	PSST	2" x 2"	South	West	63S	Install new sign on new support.
8	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	South	West	17S	Install new sign on new support.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	8						Install new sign.
9	D3-1	Street Name - 2 Sided (Tillstrom Rd)	60	12	PSST	2.5" x 2.5"	South	West	1S	Install new sign on new support.
	D3-1	Street Name (222nd Dr)	42	12						Install new sign.
	D3-1	Street Name (222nd Dr)	42	12						Install new sign.
	R1-1	Stop Sign	36	36						Install new sign.
	R1-3	All-Way	18	6						Install new sign.
10	R1-1	Stop Sign	36	36	PSST	2" x 2"	West	South	2S	Install new sign on new support.
	R1-3	All-Way	18	6						Install new sign.
11	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	West	South	1SS	Install new sign on new support.
	W16-8P	Advanced Street Name (222nd Dr)	24	8						Install new sign.
12	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	West	North	1SS	Install new sign on new support.
	W16-8P	Advanced Street Name (222nd Dr)	24	8						Install new sign.
13	R2-1-40	Regulatory Speed 40	30	36	PSST	2" x 2"	West	North	14S	Install new sign on new support.
14	R1-1	Stop Sign	36	36	PSST	2" x 2"	West	North	2S	Install new sign on new support.
	R1-3	All-Way	18	6						Install new sign.
1S	(W3-1)	Stop Ahead Warning	(36)	(36)	PSST	2" x 2"	North	West	17S	Reinstall existing sign on new support.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	8						Install new sign.
16	R2-1-4S	Regulatory Speed 4S	30	36	PSST	2" x 2"	North	East	440	Install new sign on new support.
17	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	North	East	17S	Install new sign on new support.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	8						Install new sign.
18	R1-1	Stop Sign	36	36	PSST	2" x 2"	North	East	10	Install new sign on new support.
	R1-3	All-Way	18	6						Install new sign.

*Distance measured from intersection unless otherwise noted.

Damascus Area Systemic Safety Enhancements

SE 222nd DR/SE TILLSTROM RD

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

DIRECTOR

CLACKAMAS COUNTY

DAN JOHNSON

DESIGNED BY: DZS | DRAFTED BY: DZS | CHECKED BY: WES

REVISIONS

NO.	DATE:

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REGISTERED PROFESSIONAL ENGINEER
65552PE
OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Sheet No.
I-07-3

H:\24124756 - Damascus Safety Countermeasures\design_CD\CD - Intersection - SE 222nd Drive.dwg 6/18/2021 10:56 AM Dmitryan Shadrin

Existing Sign & Sign Removal Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Material	Sign Location			Remarks
			X	Y		Leg	Side	Distance (ft)*	
Intersection 07: 222nd Dr/Tillstrom Rd									
1	D3-1	Street Name (Tillstrom Rd)	48	12	PSST	East	North	0	Remove and save existing sign and reinstall in new location.
	D3-1	Street Name (Tillstrom Rd)	48	12					Remove and save existing sign and reinstall in new location.
	D3-1	Street Name (222nd Dr)	36	12					Remove and save existing sign and reinstall in new location.
	D3-1	Street Name (222nd Dr)	36	12					Remove and save existing sign and reinstall in new location.
	R1-1	Stop Sign	30	30					Remove existing sign and support.
	R1-3	All-Way	18	6					Remove and save existing sign and reinstall in new location.
2	W3-1	Stop Ahead Warning	36	36	PSST	East	North	565	Remove and save existing sign and support and reinstall in new location.
3	OR2-1	SPEED 40	30	36	PSST	East	South	365	Remove existing sign and support.
4	R1-1	Stop Sign	36	36	PSST	South	East	5	Maintain and protect.
	R1-3	All-Way	12	6					
5	W3-1	Stop Ahead Warning	36	36	PSST	South	East	520	Remove and save existing sign and support and reinstall in new location.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	12					Remove existing sign.
6	OR2-1	SPEED 45	30	36	PSST	South	West	635	Remove existing sign and support.
7	I-417C	Adopt-A-Road	EX	EX	PSST	South	West	275	Maintain and protect.
8	R1-1	Stop Sign	30	30	PSST	West	South	25	Remove existing sign and support.
	R1-3	All-Way	18	6					Remove existing sign.
9	W3-1	Stop Ahead Warning	36	36	Wood	West	South	700	Remove existing sign and support.
10	OR2-1	SPEED 40	30	36	PSST	West	North	175	Remove existing sign and support.
11	D3-1	Street Name (Tillstrom Rd)	48	12	PSST	North	West	10	Maintain and protect.
	D3-1	Street Name (Tillstrom Rd)	48	12					
	R1-1	Stop Sign	36	36					
	R1-3	All-Way	18	6					
12	W3-1	Stop Ahead Warning	36	36	PSST	North	West	400	Remove and save existing sign and support and reinstall in new location.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	12					Remove existing sign.
13	OR2-1	SPEED 45	30	36	PSST	North	East	440	Remove existing sign and support.

*Distance measured from intersection unless otherwise noted.

Damascus Area Systemic Safety Enhancements
SE 222nd DR/SE TILLSTROM RD
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

DIRECTOR
CLACKAMAS COUNTY
DAN JOHNSON

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I-07-4

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H:\24247\56 - Damascus Safety Countermeasures\design_CD\CD - Intersection - SE 222nd Drive.dwg 6/18/2021 10:56 AM Dmitryan Shadrin

Scale: 1" = 80'

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*Distance measured from intersection unless otherwise noted.

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Damascus Area Systemic Safety Enhancements

SE 222nd DR/SE BOHNA PARK RD

DATE: June 2021 | PROJECT NO.: #2019–18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

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CLACKAMAS COUNTY

DAN JOHNSON

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CHECKED BY: WES

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NO.	DATE:

Sheet No.
I-08-1

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REGISTERED PROFESSIONAL ENGINEER
65552PE
OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Sign Installation Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Type	Post Size	Sign Location			Remarks
			X	Y			Leg	Side	Distance (ft)*	
Intersection 08: 222nd Dr/Bohna Park Rd										
1	(D3-1)	Street Name - 2 Sided (Bohna Park Rd)	(60)	(12)	PSST	2.5" x 2.5"	East	North	10	Reinstall existing sign on new support.
	(D3-1)	Street Name (222nd Rd)	(36)	(12)						Reinstall existing sign.
	(D3-1)	Street Name (222nd Rd)	(36)	(12)						Reinstall existing sign.
	R1-1	Stop Sign	36	36						Install new sign.
	W4-4P	Cross Traffic Does Not Stop	36	18						Install new sign.
2	(W3-1)	Stop Ahead Warning	(36)	(36)	PSST	2" x 2"	East	North	125	Reinstall existing sign on new support.
	W16-8P	Advanced Street Name (222nd Dr)	24	8						Install new sign.
3	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	East	South	125	Install new sign on new support.
	W16-8P	Advanced Street Name (222nd Dr)	24	8						Install new sign.
4	R2-1-40	Regulatory Speed 40	30	36	PSST	2" x 2"	East	South	115	Install new sign on new support.
5	R1-1	Stop Sign	36	36	PSST	2" x 2"	East	South	10	Install new sign on new support.
	W4-4P	Cross Traffic Does Not Stop	36	18						Install new sign.
6	W2-1	Crossroad Intersection Warning	36	36	PSST	2" x 2"	South	East	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Bohna Park Rd)	42	8						Install new sign.
7	W2-1	Crossroad Intersection Warning	36	36	PSST	2" x 2"	South	West	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Bohna Park Rd)	42	8						Install new sign.
8	(D3-1)	Street Name - 2 Sided (Bohna Park Rd)	(60)	(12)	PSST	2.5" x 2.5"	West	South	20	Reinstall existing sign on new support.
	D3-1	Street Name (222nd Rd)	36	12						Install new sign.
	D3-1	Street Name (222nd Rd)	36	12						Install new sign.
	R1-1	Stop Sign	36	36						Install new sign.
	W4-4P	Cross Traffic Does Not Stop	36	18						Install new sign.
9	(W3-1)	Stop Ahead Warning	(36)	(36)	PSST	2" x 2"	West	South	125	Reinstall existing sign on new support.
	W16-8P	Advanced Street Name (222nd Dr)	24	8						Install new sign.
10	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	West	North	125	Install new sign on new support.
	W16-8P	Advanced Street Name (222nd Dr)	24	8						Install new sign.
11	R1-1	Stop Sign	36	36	PSST	2" x 2"	West	North	20	Install new sign on new support.
12	W2-1	Crossroad Intersection Warning	36	36	PSST	2" x 2"	North	West	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Bohna Park Rd)	42	8						Install new sign.
13	W2-1	Crossroad Intersection Warning	36	36	PSST	2" x 2"	North	East	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Bohna Park Rd)	42	8						Install new sign.

*Distance measured from intersection unless otherwise noted.

Damascus Area Systemic Safety Enhancements

SE 222nd DR/SE BOHNA PARK RD

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

DIRECTOR DAN JOHNSON

DESIGNED BY: DZS | DRAFTED BY: DZS | CHECKED BY: WES

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NO.	DATE:

Sheet No. I-08-2

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JULY 9, 2001
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EXPIRES: 06/30/22

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Existing Sign & Sign Removal Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Material	Sign Location			Remarks
			X	Y		Leg	Side	Distance (ft)*	
Intersection 08: 222nd Dr/Bohna Park Rd									
1	D3-1	Street Name - 2 Sided (Bohna Park Rd)	60	12	PSST	East	North	0	Remove and save existing sign and reinstall in new location. Remove existing support.
	D3-1	Street Name (222nd Rd)	36	12					Remove and save existing sign and reinstall in new location.
	D3-1	Street Name (222nd Rd)	36	12					Remove and save existing sign and reinstall in new location.
	R1-1	Stop Sign	30	30					Remove existing sign.
	W4-4P	Cross Traffic Does Not Stop	24	12					Remove existing sign.
2	W3-1	Stop Ahead Warning	36	36	PSST	East	North	540	Remove and save existing sign and reinstall in new location. Remove existing support.
3	OR2-1	SPEED 40	30	36	PSST	East	South	180	Remove existing sign and support.
4	W2-1	Advanced Intersection Warning	30	30	PSST	South	East	500	Remove existing sign and support.
	CCS12	Advance Intersection Sign	24	18					Remove existing sign.
5	D3-1	Street Name - 2 Sided (Bohna Park Rd)	60	12	PSST	West	South	15	Remove and save existing sign and reinstall in new location. Remove existing support.
	R1-1	Stop Sign	30	30					Remove existing sign.
	W4-4P	Cross Traffic Does Not Stop	24	12					Remove existing sign.
6	W3-1	Stop Ahead Warning	36	36	PSST	West	South	335	Remove and save existing sign and reinstall in new location. Remove existing support.
7	W42-8	Slow	36	36	PSST	West	North	290	Maintain and protect.

*Distance measured from intersection unless otherwise noted.

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EXPIRES: 06/30/22

Damascus Area Systemic Safety Enhancements
SE 222nd DR/SE BOHNA PARK RD
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

DIRECTOR
DAN JOHNSON

DESIGNED BY: DZS
DRAFTED BY: DZS
CHECKED BY: WES

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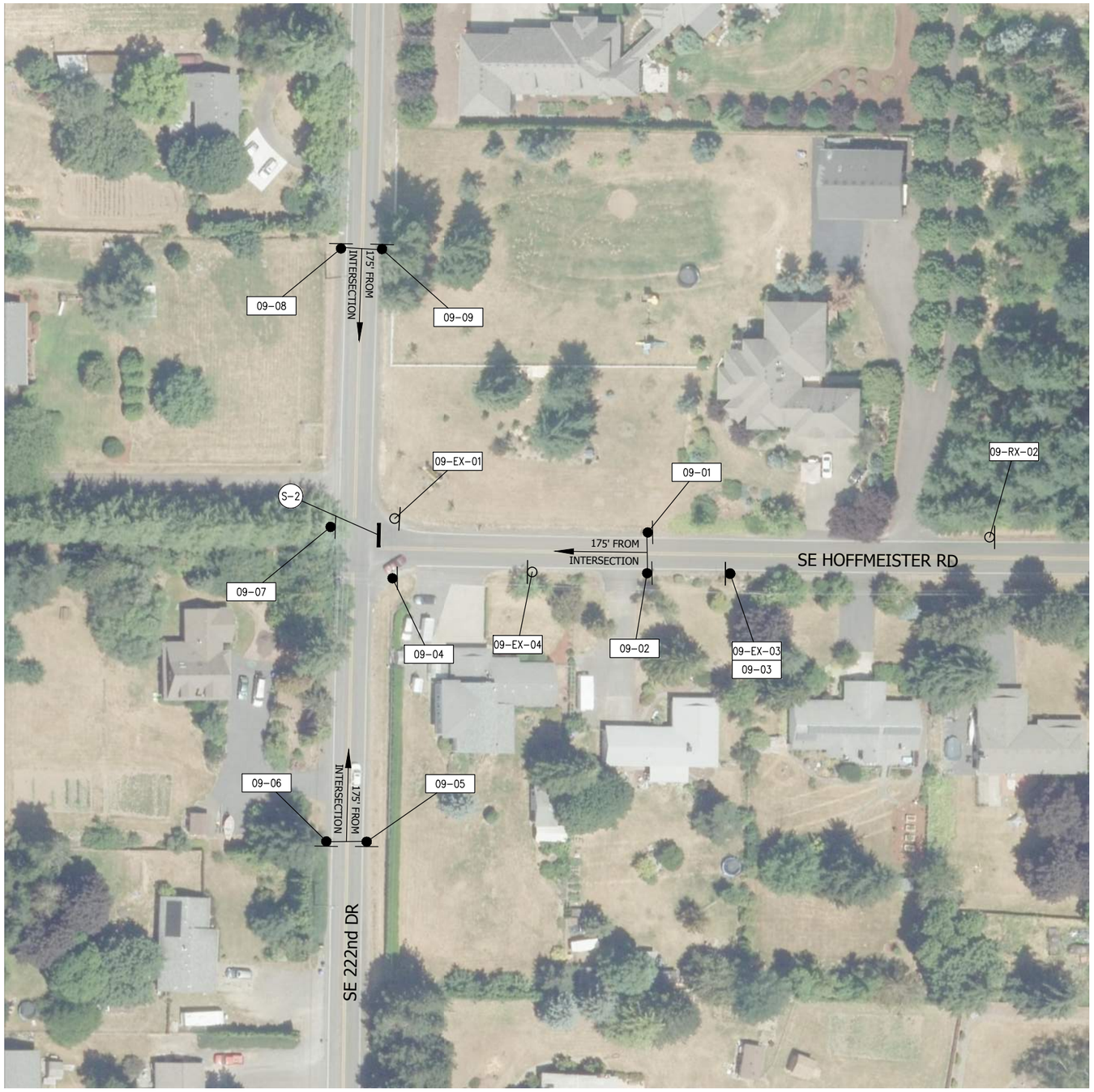
NO. | DATE:

Sheet No.
I-08-3

H:\2402756 - Damascus Safety Countermeasures\design_CD\CD - Intersection - SE 222nd Drive.dwg 6/18/2021 10:57 AM Dimitryan Shadrin



Scale: 1" = 80'

80 40 0 80

*Distance measured from intersection unless otherwise noted.

Damascus Area Systemic Safety Enhancements

SE 222nd DR/SE HOFFMEISTER RD

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

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DAN JOHNSON

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65552PE
OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Sheet No. I-09-1

H:\24\24756 - Damascus Safety Countermeasures\design_CD\CD - Intersection - SE 222nd Drive.dwg 6/18/2021 10:57 AM Dmitryan Shadrin

Sign Installation Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Type	Post Size	Sign Location			Remarks
			X	Y			Leg	Side	Distance (ft)*	
Intersection 09: 222nd Dr/Hoffmeister Rd										
1	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	East	North	175	Install new sign on new support.
	W16-8P	Advanced Street Name (222nd Dr)	24	8						Install new sign.
2	R2-1-40	Regulatory Speed 40	30	36	PSST	2" x 2"	East	South	220	Install new sign on new support.
3	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	East	South	175	Install new sign on new support.
	W16-8P	Advanced Street Name (222nd Dr)	24	8						Install new sign.
4	R1-1	Stop Sign	36	36	PSST	2" x 2"	East	South	10	Install new sign on new support.
5	W2-2R	Right Side Road Intersection Warning	36	36	PSST	2" x 2"	South	East	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Hoffmeister Rd)	48	8						Install new sign.
6	W2-2R	Right Side Road Intersection Warning	36	36	PSST	2" x 2"	South	West	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Hoffmeister Rd)	48	8						Install new sign.
7	W1-7	Two Direction Large Arrow	60	30	PSST	2" x 2"	West	North	0	Install new sign on new support.
8	W2-2L	Left Side Road Intersection Warning	36	36	PSST	2" x 2"	North	West	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Hoffmeister Rd)	48	8						Install new sign.
9	W2-2L	Left Side Road Intersection Warning	36	36	PSST	2" x 2"	North	East	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Hoffmeister Rd)	48	8						Install new sign.

*Distance measured from intersection unless otherwise noted.

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OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Damascus Area Systemic Safety Enhancements
SE 222nd DR/SE HOFFMEISTER RD
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
DIRECTOR
CLACKAMAS COUNTY
DAN JOHNSON

DESIGNED BY: DZS | DRAFTED BY: DZS | CHECKED BY: WES

REVISIONS
NO. | DATE:

Sheet No.
I-09-2

H:\2424756 - Damascus Safety Countermeasures\design_CD\CD - Intersection - SE 222nd Drive.dwg 6/18/2021 10:57 AM Dmitryan Shadrin

Existing Sign & Sign Removal Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Material	Sign Location			Remarks
			X	Y		Leg	Side	Distance (ft)*	
Intersection 09: 222nd Dr/Hoffmeister Rd									
1	D3-1	Street Name - 2 Sided (222nd Dr)	36	12	PSST	East	North	10	Maintain and protect.
	D3-1	Street Name (Hoffmeister Rd)	60	12					
	D3-1	Street Name (Hoffmeister Rd)	60	12					
	R1-1	Stop Sign	36	36					
2	W3-1	Stop Ahead Warning	30	30	PSST	East	North	400	Remove existing sign and support.
3	OR2-1	SPEED 45	30	36	PSST	East	South	220	Remove existing sign and support.
4	I-417C	Adopt-A-Road	EX	EX	PSST	East	South	90	Maintain and protect.

*Distance measured from intersection unless otherwise noted.

Damascus Area Systemic Safety Enhancements

SE 222nd DR/SE HOFFMEISTER RD

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

DIRECTOR

CLACKAMAS COUNTY

DAN JOHNSON

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NO.	DATE:

Sheet No. I-09-3

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EXPIRES: 06/30/22

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*Distance measured from intersection unless otherwise noted.

Scale: 1" = 80'

80 40 0 80

Damascus Area Systemic Safety Enhancements

SE 242nd AVE/SE SUNSHINE VALLEY RD

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

DIRECTOR

DAN JOHNSON

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NO.	DATE:

Sheet No.
I-10-1

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JULY 9, 2001
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EXPIRES: 06/30/22

H:\24\24756 - Damascus Safety Countermeasures\design_CD\CD - Intersection - SE 242nd Avenue.dwg 6/28/2021 12:23 PM Dimitryan Shadrin

Sign Installation Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Type	Post Size	Sign Location			Remarks
			X	Y			Leg	Side	Distance (ft)*	
Intersection 10: 242nd Ave/Sunshine Valley Rd										
1	R1-1	Stop Sign	36	36	PSST	2" x 2"	East	North	20	Install new sign on new support.
2	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	East	North	175	Install new sign on new support.
	W16-8P	Advanced Street Name (242nd Ave)	24	8						Install new sign.
3	R2-1-40	Regulatory Speed 40	30	36	PSST	2" x 2"	East	South	335	Install new sign on new support.
4	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	East	South	175	Install new sign on new support.
	W16-8P	Advanced Street Name (242nd Ave)	24	8						Install new sign.
5	(I-417C)	Adopt-A-Road	(EX)	(EX)	PSST	2" x 2"	East	South	150	Reinstall existing sign on new support.
6	R1-1	Stop Sign	36	36	PSST	2" x 2"	East	South	20	Install new sign on new support.
7	CR1033 Modified	No Thru Trucks On Sunshine Valley RD/ Local Delivery Only	30	36	PSST	2" x 2"	South	East	100	Install new sign on new support.
8	W2-2R	Right Side Road Warning	36	36	PSST	2" x 2"	South	East	200	Install new sign on new support.
	W16-8P	Advanced Street Name (Sunshine Valley Rd)	54	8						Install new sign.
9	W2-2R	Right Side Road Warning	36	36	PSST	2" x 2"	South	West	200	Install new sign on new support.
	W16-8P	Advanced Street Name (Sunshine Valley Rd)	54	8						Install new sign.
10	R2-1-45	Regulatory Speed 45	30	36	PSST	2" x 2"	South	West	130	Install new sign on new support.
11	(D3-1)	Street Name - 2 Sided (Sunshine Valley Rd)	(60)	(10)	PSST	2.5" x 2.5"	West	North	0	Reinstall existing sign on new support.
	(D3-1)	Street Name (242nd Ave)	(42)	(12)						Reinstall existing sign.
	W1-7	Two-Direction Large Arrow	60	30						Install new sign.
12	CR1033 Modified	No Thru Trucks On Sunshine Valley RD/ Local Delivery Only	30	36	PSST	2" x 2"	North	West	100	Install new sign on new support.
13	W2-2L	Left Side Road Warning	36	36	PSST	2" x 2"	North	West	200	Install new sign on new support.
	W16-8P	Advanced Street Name (Sunshine Valley Rd)	54	8						Install new sign.
14	W2-2L	Left Side Road Warning	36	36	PSST	2" x 2"	North	East	200	Install new sign on new support.
	W16-8P	Advanced Street Name (Sunshine Valley Rd)	54	8						Install new sign.
15	R2-1-45	Regulatory Speed 45	30	36	PSST	2" x 2"	North	East	85	Install new sign on new support.

*Distance measured from intersection unless otherwise noted.

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OREGON
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WADE E. SCARBROUGH
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Damascus Area Systemic Safety Enhancements
SE 242nd AVE/SE SUNSHINE VALLEY RD
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
DIRECTOR
CLACKAMAS COUNTY
DAN JOHNSON

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CHECKED BY: WES

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NO. | DATE:

Sheet No.
I-10-2

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Existing Sign & Sign Removal Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Material	Sign Location			Remarks
			X	Y		Leg	Side	Distance (ft)*	
Intersection 10: 242nd Ave/Sunshine Valley Rd									
1	R1-1	Stop Sign	30	30	PSST	East	North	10	Remove existing sign and support.
2	OR2-1	SPEED 40	30	36	PSST	East	South	335	Remove existing sign and support.
3	I-417C	Adopt-A-Road	EX	EX	PSST	East	South	200	Remove and save existing sign and support and reinstall in new location.
4	CR1033	No Thru Trucks/ Local Delivery Only	30	36	Wood	East	South	40	Remove existing sign and support.
5	W2-2R	Right Side Road Warning	36	36	PSST	South	West	630	Remove existing sign and support.
	W16-8P	Advanced Street Name (Sunshine Valley Rd)	54	12					Remove existing sign.
6	OR2-1	SPEED 45	30	36	PSST	South	West	130	Remove existing sign and support.
7	D3-1	Street Name - 2 Sided (Sunshine Valley Rd)	60	10	PSST	West	North	0	Remove and save existing sign and reinstall in new location.
	D3-1	Street Name (242nd Ave)	42	12					Remove and save existing sign and reinstall in new location.
	W1-7	Two-Direction Large Arrow Sign	48	24					Remove existing sign and support.
8	W2-2L	Left Side Road Warning	36	36	PSST	North	West	710	Remove existing sign and support.
	W16-8P	Advanced Street Name (Sunshine Valley Rd)	54	12					Remove existing sign.
9	OR2-1	SPEED 45	30	36	PSST	North	East	85	Remove existing sign and support.

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Damascus Area Systemic Safety Enhancements
SE 242nd AVE/SE SUNSHINE VALLEY RD
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
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I-10-3

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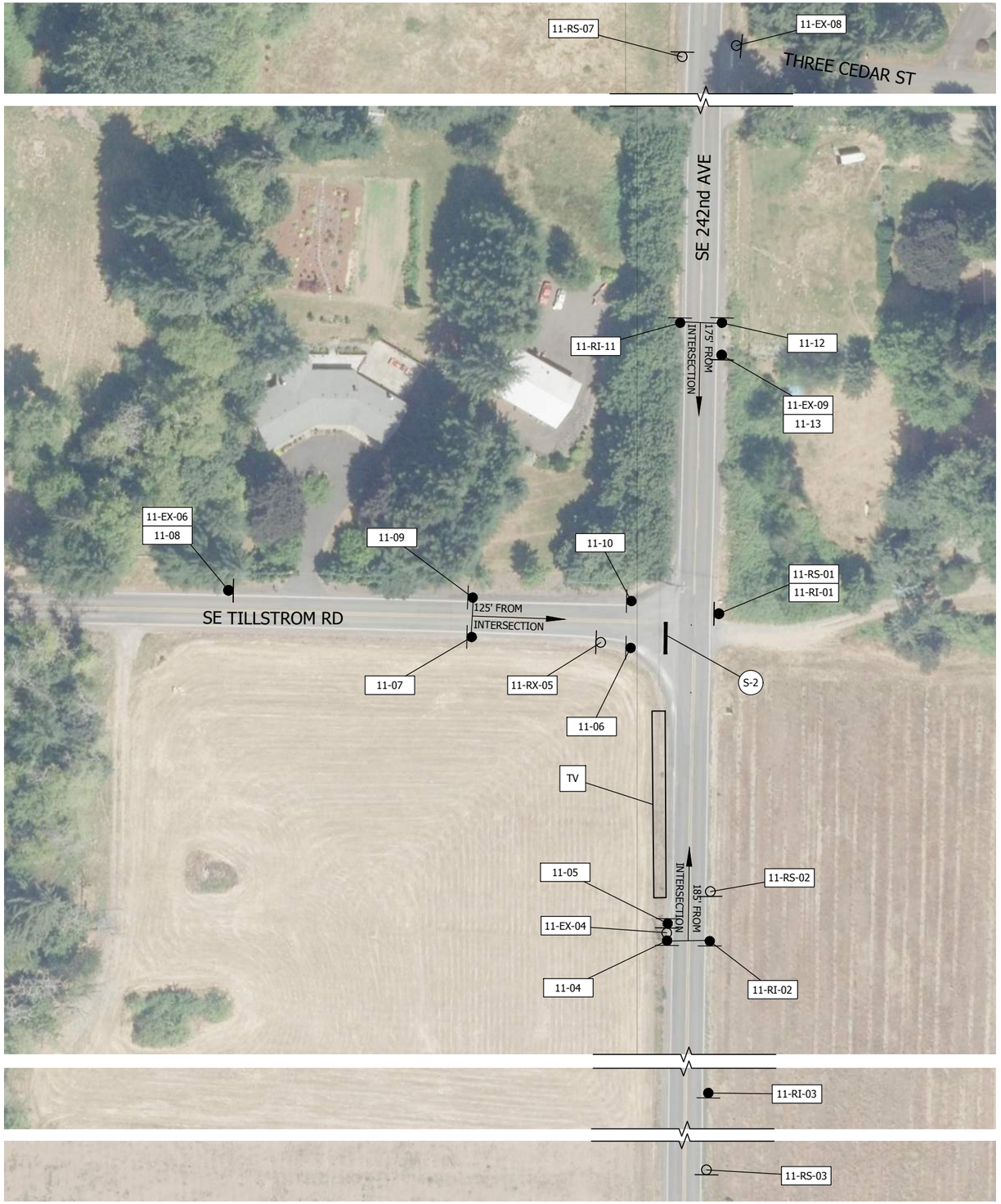

*Distance measured from intersection unless otherwise noted.

Scale: 1" = 80'

80 40 0 80

Damascus Area Systemic Safety Enhancements

SE 242nd AVE/SE TILLSTROM RD

DATE: June 2021 | PROJECT NO.: #2019-18

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Sign Installation Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Type	Post Size	Sign Location			Remarks
			X	Y			Leg	Side	Distance (ft)*	
Intersection 11: 242nd Ave/Tillstrom Rd										
1	(D3-1)	Street Name - 2 Sided (Tillstrom Rd)	(60)	(12)	PSST	2.5" x 2.5"	East	North	0	Reinstall existing sign on new support.
	D1-3	242nd Ave ← Gresham Damascus → Boring	48	48						Install new sign.
	W1-7	Two Direction Large Arrow	60	30						Install new sign.
2	(W2-2L)	Left Side Road Warning	(36)	(36)	PSST	2" x 2"	South	East	175	Reinstall existing sign on new support.
	(W16-8P)	Advanced Street Name (Tillstrom Rd)	(42)	(12)						Reinstall existing sign.
3	(OR22-11)	Unmuffled Braking Prohibited	(30)	(36)	PSST	2" x 2"	South	East	375	Reinstall existing sign on new support.
4	W2-2L	Left Side Road Warning	36	36	PSST	2" x 2"	South	West	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	8						Install new sign.
5	R2-1-45	Regulatory Speed 45	30	36	PSST	2" x 2"	South	West	165	Install new sign on new support.
6	R1-1	Stop Sign	36	36	PSST	2" x 2"	West	South	25	Install new sign on new support.
7	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	West	South	125	Install new sign on new support.
	W16-8P	Advanced Street Name (242nd Ave)	24	8						Install new sign.
8	R2-1-40	Regulatory Speed 40	30	36	PSST	2" x 2"	West	North	280	Install new sign on new support.
9	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	West	North	125	Install new sign on new support.
	W16-8P	Advanced Street Name (242nd Ave)	24	8						Install new sign.
10	R1-1	Stop Sign	36	36	PSST	2" x 2"	West	North	25	Install new sign on new support.
11	(W2-2R)	Right Side Road Warning	(36)	(36)	PSST	2" x 2"	North	West	175	Reinstall existing sign on new support.
	(W16-8P)	Advanced Street Name (Tillstrom Rd)	(42)	(12)						Reinstall existing sign.
12	W2-2R	Right Side Road Warning	36	36	PSST	2" x 2"	North	East	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	8						Install new sign.
13	R2-1-45	Regulatory Speed 45	30	36	PSST	2" x 2"	North	East	150	Install new sign on new support.

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Damascus Area Systemic Safety Enhancements
SE 242nd AVE/SE TILLSTROM RD
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
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Existing Sign & Sign Removal Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Material	Sign Location			Remarks
			X	Y		Leg	Side	Distance (ft)*	
Intersection 11: 242nd Ave/Tillstrom Rd									
1	D3-1	Street Name - 2 Sided (Tillstrom Rd)	60	12	PSST	East	South	0	Remove and save existing sign and reinstall on new support.
	D3-1	Street Name (242nd Ave)	42	12					Remove existing sign.
	D1-1	Destination Sign (Damascus →)	48	12					Remove existing sign.
	D1-1	Destination Sign (← Gresham)	42	12					Remove existing sign.
	D1-1	Destination Sign (Boring →)	36	12					Remove existing sign.
2	OR22-11	Unmuffled Braking Prohibited	30	36	PSST	South	East	150	Remove and save existing sign and support and reinstall in new location.
3	W2-2L	Left Side Road Warning	36	36	PSST	South	East	530	Remove and save existing sign and support and reinstall in new location.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	12					Remove and save existing sign and reinstall in new location.
4	OR2-1	SPEED 45	30	36	PSST	South	West	180	Remove existing sign and support.
5	R1-1	Stop Sign	30	30	PSST	West	South	40	Remove existing sign and support.
6	OR2-1	SPEED 40	30	36	PSST	West	North	280	Remove existing sign and support.
7	W2-2R	Right Side Road Warning	36	36	PSST	North	West	580	Remove and save existing sign and support and reinstall in new location.
	W16-8P	Advanced Street Name (Tillstrom Rd)	42	12					Remove and save existing sign and reinstall in new location.
8	D3-1	Street Name (Three Cedars St)	EX	EX	PSST	North	East	580	Maintain and protect.
	D3-1	Street Name (Three Cedars St)	EX	EX					
	W14-1a	Dead End	EX	EX					
	W14-1a	Dead End	EX	EX					
	R1-1	Stop Sign	EX	EX					
9	OR2-1	SPEED 45	30	36	PSST	North	East	150	Remove existing sign and support.

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Damascus Area Systemic Safety Enhancements
SE 242nd AVE/SE TILLSTROM RD
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
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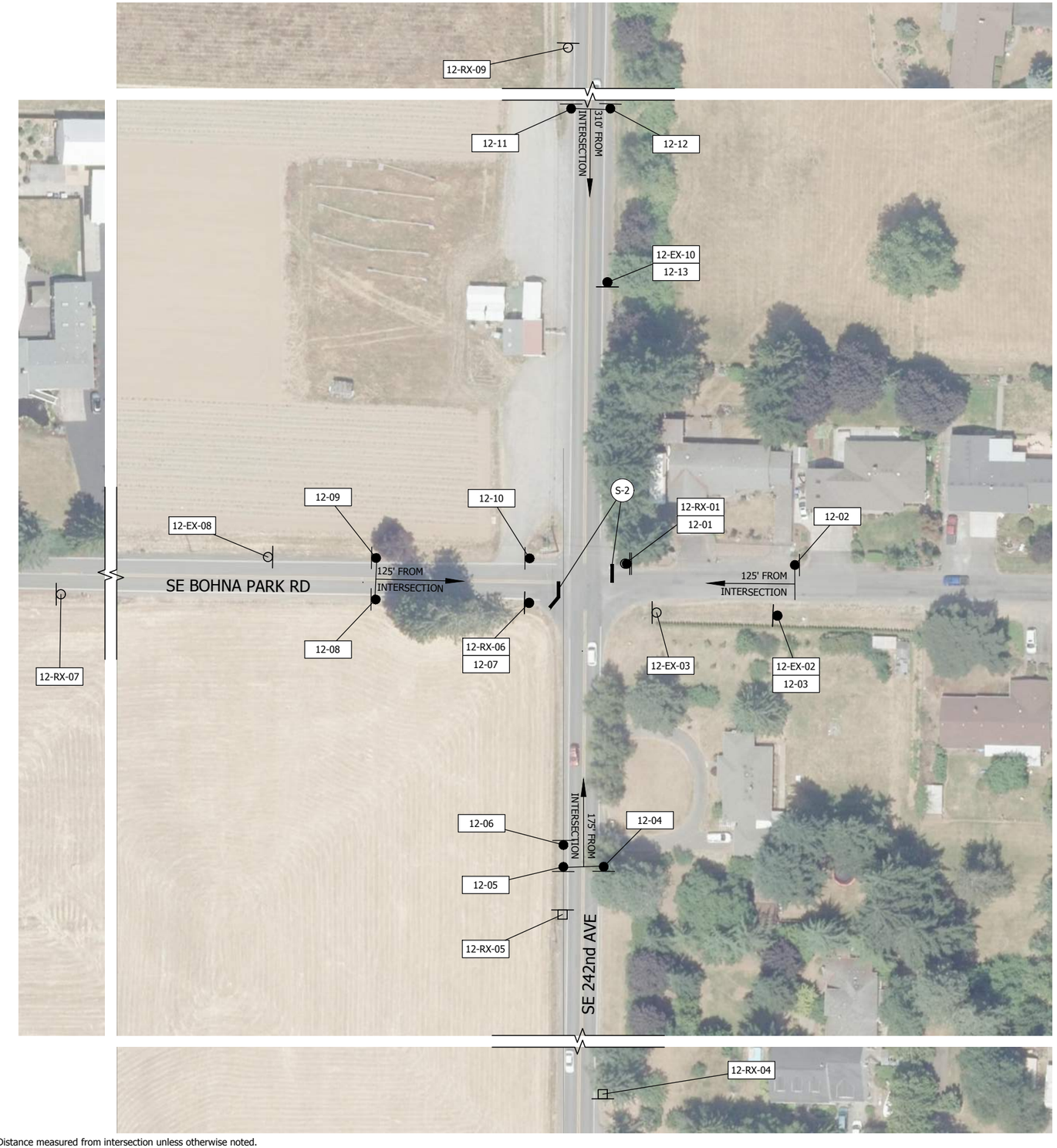

*Distance measured from intersection unless otherwise noted.

Scale: 1" = 80'

80 40 0 80

Damascus Area Systemic Safety Enhancements
SE 242nd AVE/SE BOHNA PARK RD

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
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Sign Installation Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Type	Post Size	Sign Location			Remarks
			X	Y			Leg	Side	Distance (ft)*	
Intersection 12: 242nd Ave/Bohna Park Rd										
1	D3-1	Street Name - 2 Sided (242nd Ave)	42	12	PSST	2.5" x 2.5"	East	North	10	Install new sign on new support.
	D3-1	Street Name (Bohna Park Rd)	60	12						Install new sign.
	D3-1	Street Name (Bohna Park Rd)	60	12						Install new sign.
	R1-1	Stop Sign	36	36						Install new sign.
2	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	East	North	125	Install new sign on new support.
3	R2-1-25	SPEED LIMIT 25	30	36	PSST	2" x 2"	East	South	115	Install new sign on new support.
4	W2-1	Crossroad Warning	36	36	PSST	2" x 2"	South	East	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Bohna Park Rd)	42	8						Install new sign.
5	W2-1	Crossroad Warning	36	36	PSST	2" x 2"	South	West	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Bohna Park Rd)	42	8						Install new sign.
6	R2-1-45	SPEED LIMIT 45	30	36	PSST	2" x 2"	South	West	160	Install new sign on new support.
7	D3-1	Street Name - 2 Sided (242nd Ave)	42	12	PSST	2.5" x 2.5"	West	South	20	Install new sign on new support.
	D3-1	Street Name (Bohna Park Rd)	60	12						Install new sign.
	D3-1	Street Name (Bohna Park Rd)	60	12						Install new sign.
	R1-1	Stop Sign	36	36						Install new sign.
8	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	West	South	125	Install new sign on new support.
	W16-8P	Advanced Street Name (242nd Ave)	24	8						Install new sign.
9	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	West	North	125	Install new sign on new support.
	W16-8P	Advanced Street Name (242nd Ave)	24	8						Install new sign.
10	R1-1	Stop Sign	36	36	PSST	2" x 2"	West	North	20	Install new sign on new support.
11	W2-1	Crossroad Warning	36	36	PSST	2" x 2"	North	West	310	Install new sign on new support.
	W16-8P	Advanced Street Name (Bohna Park Rd)	42	8						Install new sign.
12	W2-1	Crossroad Warning	36	36	PSST	2" x 2"	North	East	310	Install new sign on new support.
	W16-8P	Advanced Street Name (Bohna Park Rd)	42	8						Install new sign.
13	R2-1-45	SPEED LIMIT 45	30	36	PSST	2" x 2"	North	East	190	Install new sign on new support.

*Distance measured from intersection unless otherwise noted.

Damascus Area Systemic Safety Enhancements

SE 242nd AVE/SE BOHNA PARK RD

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
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Existing Sign & Sign Removal Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Material	Sign Location			Remarks
			X	Y		Leg	Side	Distance (ft)*	
Intersection 12: 242nd Ave/Bohna Park Rd									
1	R1-1	Stop Sign	30	30	PSST	East	North	10	Remove existing sign and support.
2	OR2-1	SPEED 25	30	36	PSST	East	South	115	Remove existing sign and support.
3	W14-2	No Outlet	30	30	PSST	East	South	25	Maintain and protect.
4	W2-1	Crossroad Warning	36	36	Wood	South	East	400	Remove existing sign and support.
	W16-8P	Advanced Street Name (Bohna Park Rd)	42	12					Remove existing sign.
5	OR2-1	SPEED 45	30	36	Wood	South	West	210	Remove existing sign and support.
6	D3-1	Street Name (Bohna Park Rd)	42	8	PSST	West	South	20	Remove existing sign and support.
	D3-1	Street Name (Bohna Park Rd)	42	8					Remove existing sign.
	D3-1	Street Name (242nd Ave)	30	8					Remove existing sign.
	D3-1	Street Name (242nd Ave)	30	8					Remove existing sign.
	R1-1	Stop Sign	30	30					Remove existing sign.
7	W3-1	Stop Ahead Warning	30	30	PSST	West	South	530	Remove existing sign and support.
8	R2-1	SPEED 40	30	36	PSST	West	North	200	Maintain and protect.
9	W2-1	Crossroad Warning	36	36	PSST	North	West	510	Remove existing sign and support.
	W16-8P	Advanced Street Name (Bohna Park Rd)	42	12					Remove existing sign.
10	OR2-1	SPEED 45	30	36	PSST	North	East	190	Remove existing sign and support.

*Distance measured from intersection unless otherwise noted.

Damascus Area Systemic Safety Enhancements

SE 242nd AVE/SE BOHNA PARK RD

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
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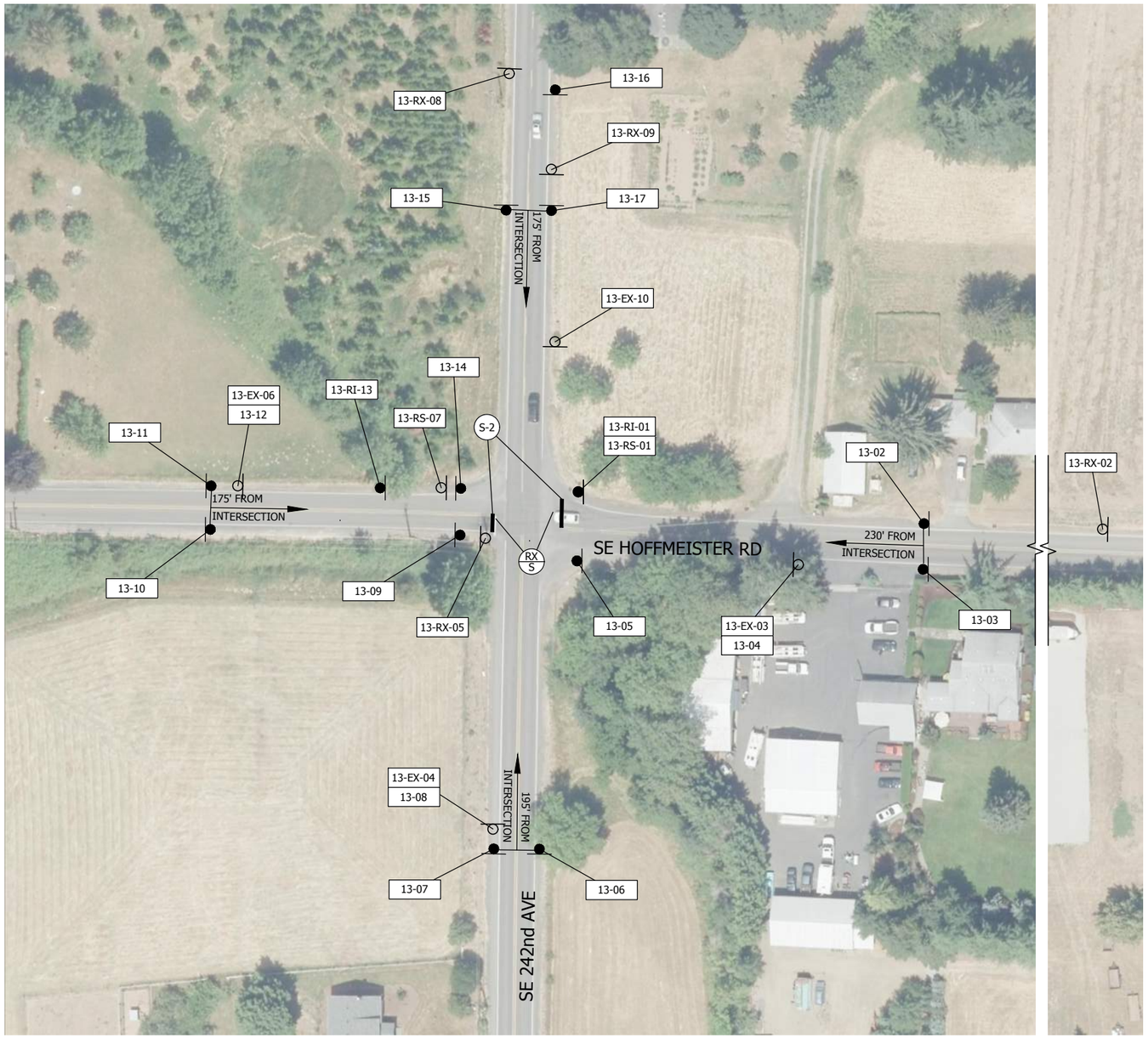

Scale: 1" = 80'

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*Distance measured from intersection unless otherwise noted.

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Damascus Area Systemic Safety Enhancements

SE 242nd AVE/SE HOFFMEISTER RD

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
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Sheet No.
I-13-1

Sign Installation Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Type	Post Size	Sign Location			Remarks
			X	Y			Leg	Side	Distance (ft)*	
Intersection 13: 242nd Ave/Hoffmeister Rd										
1	(D3-1)	Street Name - 2 Sided (Hoffmeister Rd)	(60)	(12)	PSST	2.5" x 2.5"	East	North	15	Reinstall existing sign on new support.
	(D3-1)	Street Name (242nd Ave)	(42)	(12)						Reinstall existing sign.
	(D3-1)	Street Name (242nd Ave)	(42)	(12)						Reinstall existing sign.
	R1-1	Stop Sign	36	36						Install new sign.
2	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	East	North	230	Install new sign on new support.
	W16-8P	Advanced Street Name (242nd Ave)	24	8						Install new sign.
3	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	East	South	230	Install new sign on new support.
	W16-8P	Advanced Street Name (242nd Ave)	24	8						Install new sign.
4	R2-1-45	SPEED LIMIT 4S	30	36	PSST	2" x 2"	East	South	150	Install new sign on new support.
5	R1-1	Stop Sign	36	36	PSST	2" x 2"	East	South	15	Install new sign on new support.
6	W2-1	Crossroad Warning	36	36	PSST	2" x 2"	South	East	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Hoffmeister Rd)	48	8						Install new sign.
7	W2-1	Crossroad Warning	36	36	PSST	2" x 2"	South	West	17S	Install new sign on new support.
	W16-8P	Advanced Street Name (Hoffmeister Rd)	48	8						Install new sign.
8	R2-1-45	SPEED LIMIT 45	30	36	PSST	2" x 2"	South	West	18S	Install new sign on new support.
9	D3-1	Street Name - 2 Sided (Hoffmeister Rd)	66	12	PSST	2.5" x 2.S" (10-ga)	West	South	20	Install new sign on new support.
	D3-1	Street Name (242nd Ave)	42	12						Install new sign.
	D3-1	Street Name (242nd Ave)	42	12						Install new sign.
	R1-1	Stop Sign	36	36						Install new sign.
10	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	West	South	17S	Install new sign on new support.
	W16-8P	Advanced Street Name (242nd Ave)	24	8						Install new sign.
11	W3-1	Stop Ahead Warning	36	36	PSST	2" x 2"	West	North	175	Install new sign on new support.
	W16-8P	Advanced Street Name (242nd Ave)	24	8						Install new sign.
12	R2-1-45	SPEED LIMIT 4S	30	36	PSST	2" x 2"	West	North	160	Install new sign on new support.
13	(I-417C)	Adopt-A-Road	(EX)	(EX)	PSST	2" x 2"	West	North	70	Reinstall existing sign on new support.
14	R1-1	Stop Sign	36	36	PSST	2" x 2"	West	South	20	Install new sign on new support.
1S	W2-1	Crossroad Warning	36	36	PSST	2" x 2"	North	West	175	Install new sign on new support.
	W16-8P	Advanced Street Name (Hoffmeister Rd)	48	8						Install new sign.
16	R2-1	SPEED LIMIT 45	30	36	PSST	2" x 2"	North	East	250	Install new sign on new support.
17	W2-1	Crossroad Warning	36	36	PSST	2" x 2"	North	East	17S	Install new sign on new support.
	W16-8P	Advanced Street Name (Hoffmeister Rd)	48	8						Install new sign.

*Distance measured from intersection unless otherwise noted.

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OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Damascus Area Systemic Safety Enhancements
SE 242nd AVE/SE HOFFMEISTER RD
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045
CLACKAMAS COUNTY
DIRECTOR
DAN JOHNSON

DESIGNED BY: DZS | DRAFTED BY: DZS | CHECKED BY: WES

REVISIONS
NO. | DATE:

Sheet No. I-13-2

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Existing Sign & Sign Removal Table

Sign Post No.	Sign Code	Sign Description	Sign Size (in)		Post Material	Sign Location			Remarks
			X	Y		Leg	Side	Distance (ft)*	
Intersection 13: 242nd Ave/Hoffmeister Rd									
1	D3-1	Street Name - 2 Sided (Hoffmeister Rd)	60	12	PSST	East	North	15	Remove and save existing sign and reinstall on new support.
	D3-1	Street Name (242nd Ave)	42	12					Remove and save existing sign and reinstall on new support.
	D3-1	Street Name (242nd Ave)	42	12					Remove and save existing sign and reinstall on new support.
	R1-1	Stop Sign	30	30					Remove existing sign and support.
2	W3-1	Stop Ahead Warning	30	30	PSST	East	North	450	Remove existing sign and support.
3	OR2-1	SPEED 45	30	36	PSST	East	South	150	Remove existing sign and support.
4	OR2-1	SPEED 45	30	36	PSST	South	West	185	Remove existing sign and support.
5	D3-1	Street Name (Hoffmeister Rd)	42	8	PSST	West	South	5	Remove existing sign and support.
	D3-1	Street Name (242nd Ave)	30	8					Remove existing sign.
	R1-1	Stop Sign	30	30					Remove existing sign.
6	OR2-1	SPEED 45	30	36	PSST	West	North	160	Remove existing sign and support.
7	(I-417C)	Adopt-A-Road	(EX)	(EX)	PSST	West	North	30	Remove and save existing sign and reinstall in new location. Remove existing support.
8	W2-1	Crossroad Warning	36	36	PSST	North	West	260	Remove existing sign and support.
	W16-8P	Advanced Street Name (Bohna Park Rd)	42	12					Remove existing sign.
9	OR2-1	SPEED 45	30	36	PSST	North	East	200	Remove existing sign and support.
10	I-417C	Adopt-A-Road	EX	EX	PSST	North	East	90	Maintain and protect.

*Distance measured from intersection unless otherwise noted.

Damascus Area Systemic Safety Enhancements
SE 242nd AVE/SE HOFFMEISTER RD
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LEGEND

POLES

(CCSM / T) INSTALL (T=TYPE) CLACKAMAS COUNTY STANDARD TRAFFIC SIGNAL MAST ARM POLE (SEE, "POLE ENTRANCE CHART" AND COUNTY STD. DRAWING ON SHEETS TS-3 THRU TS-5.)

(MA / L) INSTALL (L=LENGTH) FOOT TRAFFIC SIGNAL MAST ARM.

(LA / L) INSTALL (L=LENGTH) FOOT LUMINAIRE ARM.

(EX / 1) RETAIN AND PROTECT EXISTING UTILITY POLE (POWER SOURCE).

SIGNALS

(FR / S) INSTALL (S=SIZE) INCH TYPE 1R FLASHING RED BEACON with 2" FLUORESCENT YELLOW REFLECTIVE SHEETING ON BACKBOARD PER STD. DWG. TM460.

CABINETS

(BMC / FL) INSTALL BASE MOUNTED SERVICE CABINET, 120/240 VOLT METERED, FOR FLASHING BEACON AND ILLUMINATION SYSTEM. SEE WIRING DIAGRAM BELOW AND STD. DWGS. TM 482 AND TM 485. CABINET SHALL INCLUDE PHOTOELECTRIC CONTROL BEHIND POLYCARBONITE WINDOW WITH LIGHT DEFLECTING COVER.

(RTC) INSTALL RECESSED TERMINAL CABINET

CONDUITS

(S) INSTALL (S=SIZE) INCH ELECTRICAL CONDUIT

(HDD) INSTALL CONDUIT BY HORIZONTAL DIRECTIONAL DRILLING. OPEN TRENCH NOT ALLOWED.

(W) INSTALL CONDUIT AND WIRE AS REQURED BY POWER COMPANY

LUMINAIRES

(LED) INSTALL LEOTEK TYPE 2, 530MA, 60 LED (LIGHT EMITTING DIODE) LUMINAIRE (CATALOG NO.: GC1-60F-MV-NW-2-GY-530-SC). BOND LUMINAIRE TO POLE GROUNDING TERMINAL.

(PE) INSTALL PHOTOELECTRIC CONTROL RELAY INSIDE THE BMCL.

SIGNAL MOUNTING OPTIONS

B = Adjustable skybracket (No Tenon)

SIGNAL HEAD OPTIONS

1R = 12" FR

WIRES & CABLES

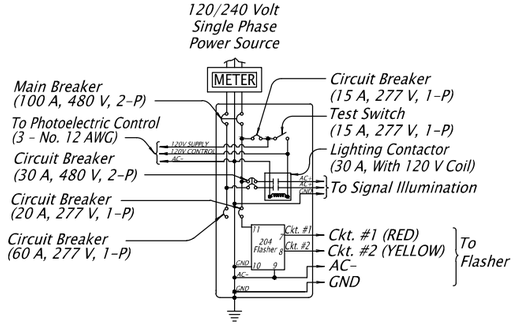
(X-N / G) INSTALL (X=NUMBER OF CABLES) CONTROL CABLES WITH (N=NUMBER) AWG NO. (G=AWG WIRE SIZE) CONDUCTORS.

PL — INSTALL POLY PULL LINE.

G — INSTALL ONE THWN NO. 6 AWG STRANDED COPPER GROUND WIRE.

JUNCTION BOXES

(JB / 3A) INSTALL 30"X17"X12" (MIN. DIMENSON) PRECAST CONCRETE JUNCTION BOX WITH CONCRETE APRON.



SERVICE CABINET WIRING FOR SIGNAL, FLASHER & 240 VOLT ILLUMINATION BMCFL

GENERAL NOTES:

1. ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO CLACKAMAS COUNTY ORDINANCES AND SPECIAL PROVISIONS, THE 2021 OREGON STANDARD SPECIFICATIONS FOR CONSTRUCTION, AND THE OREGON STANDARD DRAWINGS LISTED BELOW.
2. THE CONTRACTOR SHALL VERIFY THE LOCATIONS OF EXISTING UTILITIES AND COORDINATE THIS WORK WITH THE UTILITY COMPANIES/AGENCIES TO ELIMINATE ANY CONFLICTS.
3. THE CONTRACTOR SHALL COORDINATE WORK WITH PGE FOR POWER SERVICE CONNECTION. THE CONTRACTOR SHALL INSTALL CONDUIT AND WIRING TO THE POWER SOURCE AS REQUIRED BY PGE. CONTRACTOR SHALL COORDINATE WITH PGE (SERVICE DESK, 503-736-5450) FOR ALL POWER REQUIREMENTS.
4. THE CONTRACTOR SHALL FIELD VERIFY THE LOCATION OF ALL SIGNAL EQUIPMENT BEFORE INSTALLATION.
5. EQUIPMENT SUBMITTALS AND POLE DRAWINGS SHALL BE PROVIDED TO CLACKAMAS COUNTY BY THE CONTRACTOR AFTER AN INITIAL REVIEW HAS BEEN COMPLETED BY THE PROJECT ENGINEER. CLACKAMAS COUNTY APPROVAL OF THESE SUBMITTALS MUST BE OBTAINED PRIOR TO CONSTRUCTION.
6. INSTALL #12 STRANDED COPPER (ORANGE) TRACER WIRE IN ALL CONDUITS. GROUND ALL TRACER WIRES.
7. ALL CONDUIT RUNS SHALL BE WITHIN RIGHT-OF-WAY.
8. INSTALL POLY PULL TAPE (500 LBF MIN. STRENGTH, NON CONDUCTIVE) IN ALL CONDUITS.
9. ALL UNDERGROUND CONDUITS AND FITTINGS SHALL BE SCHEDULE 80 PVC.

ACCOMPANIED BY DWGS. TM460, TM462, TM470, TM471, TM472, TM482, TM485

Clackamas Co. Dwgs. NWS4700 & NWS4710

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EXPIRES: 06/30/22

Damascus Area Systemic Safety Enhancements

Flashing Beacon Legend

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
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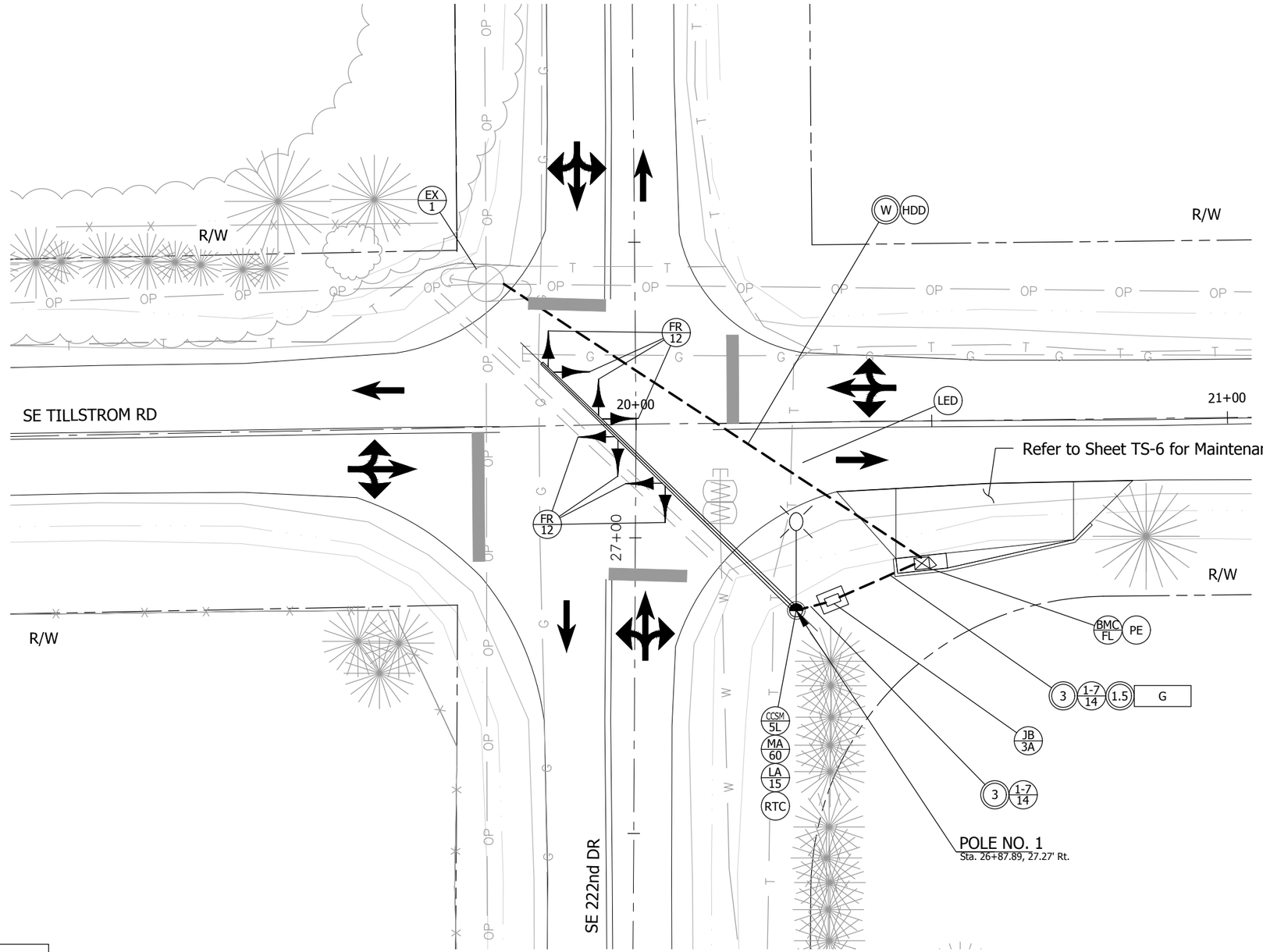

NOTE:
SEE SHEET TS-1
FOR LEGEND

NOTE:
FIELD VERIFY ALL EQUIPMENT BEFORE CONSTRUCTION

Damascus Area Systemic Safety Enhancements

Flashing Beacon Plan

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
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CHECKED BY: WES

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Sheet No.
TS-2

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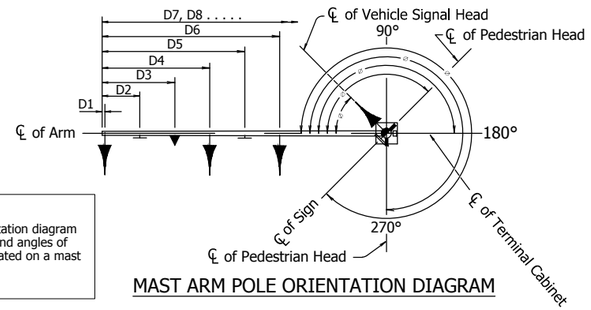
		See TM650 thru TM653	EQUIPMENT ON POLE						EQUIPMENT ON MAST ARM (Length in Feet and Equipment Type)									FOUNDATION INFORMATION (See Std. Drg. NWS4710)		LUMINAIRES				
																						FIXTURE	
POLE NO.	DWG. NO.	TYPE	PED. SIGNAL DEG.	PUSH BUTTON DEG.	TERM. CABINET DEG.	SIGN DEG.	SIGN DEG.	PHOTO ELECTRIC CELL	ARM LENGTH	D 1	D 2	D 3	D 4	D 5	D 6	D 7	D 8	REQUIRED FOUNDATION DEPTH	FOUNDATION CONTROL POINT ELEVATION	ARM LENGTH	ARM DEG.	MOUNTING HEIGHT	TYPE	TYPE	WATTAGE
1	TS-2	CCSM5L	-	-	180	-	-	-	60	1.5 FR	2.5 FR	13.0 FR	14.0 FR	17.5 FR	18.5 FR	28.5 FR	29.5 FR	10'	575.2'	15'	45	35'	TYPE 2	LED*	101

*LED Luminaire = Leotek GC1-60F-MV-NW-2-GY-530-SC

BRACKET MOUNT
FR = Flashing Red Beacon, Adjustable Bracket Mount Tenon Not Required (See Std. Dwg. TM462)



NOTE
Equipment shown on orientation diagram is an example of distance and angles of equipment that may be located on a mast arm or signal pole.

MAST ARM POLE ORIENTATION DIAGRAM

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Damascus Area Systemic Safety Enhancements

Flashing Beacon Details

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TS-3

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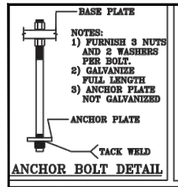
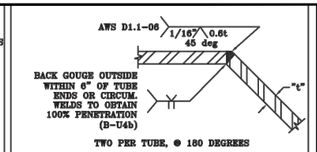
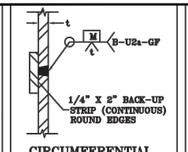


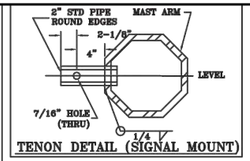
ANCHOR BOLT DETAIL



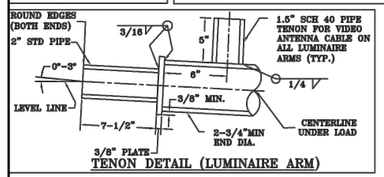
LONGITUDINAL WELD DETAIL



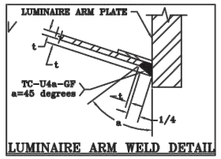
CIRCUMFERENTIAL WELD DETAIL



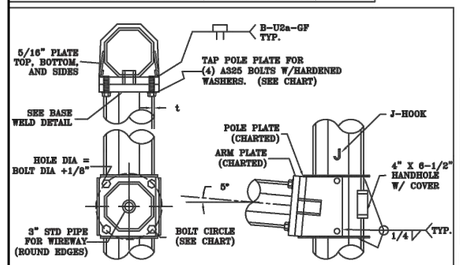
TENON DETAIL (SIGNAL MOUNT)



TENON DETAIL (LUMINAIRE ARM)

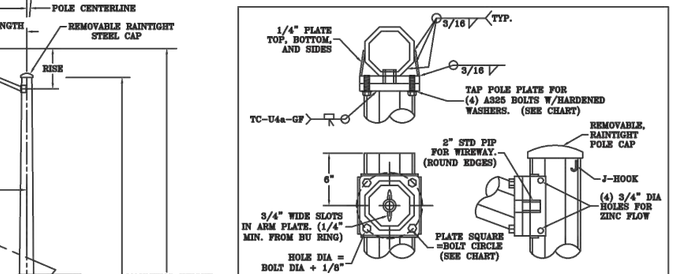


LUMINAIRE ARM WELD DETAIL

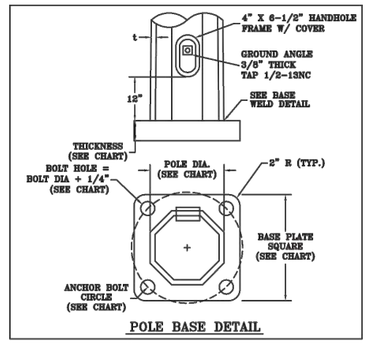


SIGNAL ARM CONNECTION DETAIL

BASE WELD DETAIL



LUMINAIRE ARM CONNECTION DETAIL

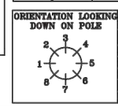


POLE BASE DETAIL

LUMINAIRE ARM DATA TABLE

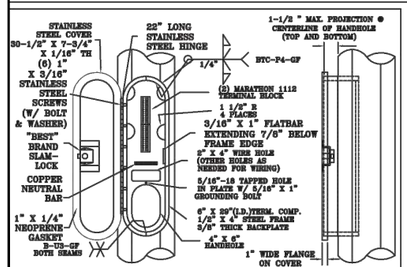
ARM LENGTH (FT)	APPROX RISE (IN)	THICK-NESS (IN)	BASE DIA. (IN)	SQUARE (IN)	BOLT CIRCLE (IN)	ARM PL THICK-NESS (IN)	POLE PL THICK-NESS (IN)	BOLT DIA x L (INxIN)
6.0	18.0	0.1875	4.5	9.0	9.0	1.0	1.0	3/4x2.5
8.0	30.0	0.1875	5.0	9.0	9.0	1.0	1.0	3/4x2.5
10.0	41.0	0.1875	6.0	9.0	9.0	1.0	1.0	3/4x2.5
12.0	53.0	0.1875	6.5	9.0	9.0	1.0	1.0	3/4x2.5
15.0	70.0	0.1875	6.5	9.0	9.0	1.0	1.0	3/4x2.5
20.0	72.0	0.25	6.5	9.0	9.0	1.0	1.0	3/4x2.5
25.0	76.0	0.25	6.5	9.0	9.0	1.0	1.0	3/4x2.5

ORIENTATION LOOKING DOWN ON POLE



POLE ENTRANCE CHART

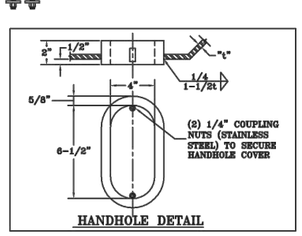
POLE NUMBER											
LUMINAIRE ARM											
MAST ARM											
TERMINAL CABINET											



RECESSED TERMINAL COMPARTMENT DETAIL

POLE SCHEDULE

POLE #	POLE DESIGNATION	MAST ARM LENGTH (FT)	POLE HEIGHT (FT)	MAST ARM HEIGHT (FT)	LUM. MOUNTING HEIGHT (FT)	LUM. ARM LENGTH (FT)	INTERSECTION: TENON LOCATIONS FROM END OF ARM (FT) #1	#2	#3	#4	#5	#6	#7	NOTES



HANDHOLE DETAIL

NOTES:

DESIGN CRITERIA
2001 AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES, AND TRAFFIC SIGNALS.
-100 MPH 3 SECOND GUST
-GUST FACTOR G=1.14
-Ir=1.0 (50 YR. RECURRENCE INTERVAL)
-FATIGUE CATEGORY II, NO GALLOPING, TRUCK SPEED = 55 MPH

GENERAL
-POLES, MAST ARMS, AND LUMINAIRE ARMS SHALL BE OCTAGONAL OR ROUND IN CROSS SECTION AND HAVE A TAPER OF 0.14 IN/FT.
-FABRICATION SHALL CONFORM TO 2001 AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES, AND TRAFFIC SIGNALS.
-FASTENERS LESS THEN 1/2" SHALL BE STAINLESS STEEL OR BRASS.

MATERIALS
-ALL STEEL IN TUBES, BASE PLATES, FLANGE PLATES & GUSSET PLATES SHALL CONFORM TO ASTM A572 GR50.
-ANCHOR BOLTS SHALL CONFORM TO ASTM A307C, NUTS SHALL CONFORM TO ASTM A563 GR DH HEAVY HEX, WASHERS SHALL CONFORM TO ASTM F436 TYPE 1.
-CONNECTION BOLTS SHALL CONFORM TO ASTM A325, WASHERS SHALL CONFORM TO ASTM F436 TYPE 1.
-GALVANIZING SHALL CONFORM TO ASTM A123 & A153.
-PIPE TENONS AND WIRE GUIDES SHALL CONFORM TO ASTM A53 GR B.
-STAINLESS STEEL RECESSED TERMINAL COMPARTMENT DOOR CONFORM TO AISI SS304.

POLE DATA TABLE

POLE DESIGNATION	ARM LENGTH (FT)	BASE DIA. (IN)	THICK-NESS (IN)	SQUARE (IN)	BOLT CIRCLE (IN)	BASE PL THICK-NESS (IN)	ANCHOR BOLT DIA x L (INxIN)	ANCHOR PL SQ x THK (INxIN)
CCSM1	≤15	12	0.1875	18.5	18.0	2.0	2.0x48	5.75x1
CCSM2	16-25	13	0.1875	18.5	18.0	2.0	2.0x48	5.75x1
CCSM3	26-35	14	0.25	20.5	20.0	2.25	2.25x48	5.75x1
CCSM4	36-45	15	0.3125	20.5	20.0	2.25	2.25x48	5.75x1
CCSM5	46-60	17	0.375	24.0	23.0	2.5	2.75x48	7x1.13
CCSM1L	≤15	12	0.25	18.5	18.0	2.0	2.0x48	5.75x1
CCSM2L	16-25	13	0.25	19.0	18.0	2.0	2.25x48	5.75x1
CCSM3L	26-35	14	0.3125(1)	20.5	20.0	2.25	2.25x48	5.75x1
CCSM4L	36-45	15	0.3125(1)	22.5	22.0	2.25	2.5x48	6.38x1.13
CCSM5L	46-60	17	0.375(1)	24.0	23.0	2.5	2.75x48	7x1.13

(1) REDUCE SHAFT THICKNESS TO 0.25" 20' FROM BASE

ARM DATA TABLE

ARM LENGTH (FT)	OCTAGONAL CROSS SECTION BASE DIA. (IN)	OCTAGONAL CROSS SECTION THICK-NESS (IN)	ROUND CROSS SECTION BASE DIA. (IN)	ROUND CROSS SECTION THICK-NESS (IN)	SQUARE (IN)	BOLT CIRCLE (IN)	ARM PL THICK-NESS (IN)	POLE PL THICK-NESS (IN)	BOLT DIA x L (INxIN)
15.0	6.0	0.1875	6.0	0.1875	12	12	1.5	1.25	1.25x3
20.0	7.0	0.1875	8.0	0.1793	12	12	1.5	1.25	1.25x3
25.0	8.0	0.1875	9.0	0.2391	12	12	1.5	1.25	1.25x3
30.0	9.0	0.25	11.0	0.2391	14	14	1.75	1.5	1.25x3.5
35.0	10.0	0.25	11.0	0.3125	14	14	1.75	1.5	1.25x3.5
40.0	11.0	0.25	12.0	0.3125	17	17	2.0	1.5	1.5x3.5
45.0	13.0	0.375	13.0	0.375	17	17	2.0	1.5	1.5x3.5
50.0	14.0	0.375(1)	14.0	0.375(1)	20	19.5	2.25	1.75	1.75x4
55.0	15.0	0.375(1)	15.0	0.375(1)	20	19.5	2.25	1.75	1.75x4
60.0	16.0	0.375(1)	16.0	0.375(1)	21	21.0	2.25	1.75	1.75x4

(1) REDUCE ARM THICKNESS TO 0.25" 20' FROM BASE

NO.	REVISION	DATE
1	UPDATED DESIGN CALCS	11/14/07
2	ADDED FULL PEN. BASE WELD	5/18/08
3	ADDED ROUND CROSS SECTION	6/30/09
4	MOD. BC DIM & ADDED I.D. TAG	3/14/12

CLACKAMAS COUNTY
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD OREGON CITY, OREGON

CLACKAMAS COUNTY MAST ARM STANDARD TYPE CCSM AND TYPE CCSML

DESIGNED BY	DATE	DRAWN BY	DATE
D. EMSLIE	3/21/07	D. EMSLIE	3/21/07

DRAWING NUMBER: NWS4700
SHEET 1 OF 1

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

REGISTERED PROFESSIONAL ENGINEER
65552PE
OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Damascus Area Systemic Safety Enhancements

Flashing Beacon Details

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

DIRECTOR: DAN JOHNSON

DESIGNED BY: DZS | DRAFTED BY: DZS | CHECKED BY: WES

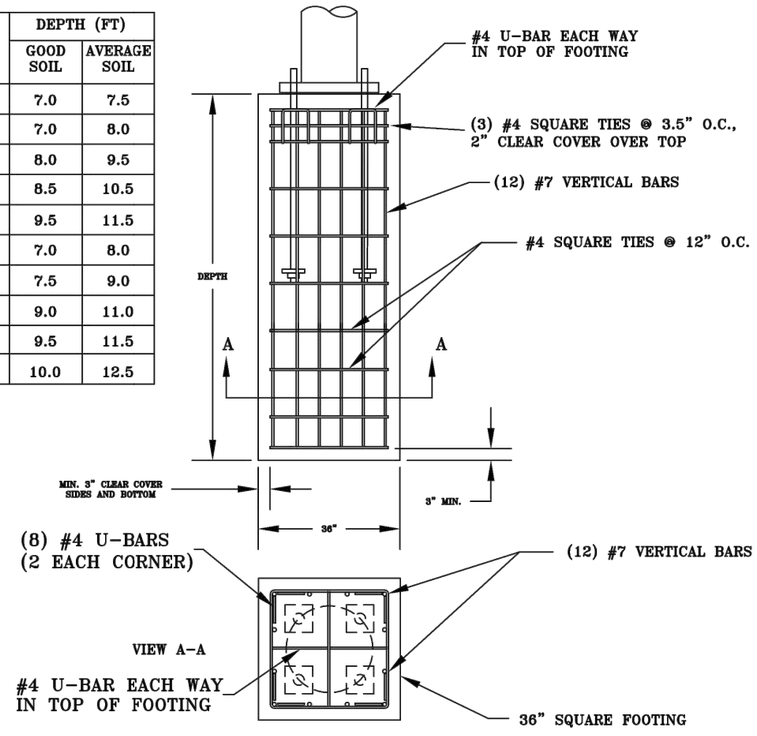
REVISIONS

NO.	DATE:

Sheet No. TS-4

H:\24\24756 - Damascus Safety Countermeasures\design_CD\CD - Signal - 222nd & Tillstrom.dwg 6/18/2021 11:00 AM Dimitryan Shadrin

POLE DESIGATION	DEPTH (FT)	
	GOOD SOIL	AVERAGE SOIL
CCSM1	7.0	7.5
CCSM2	7.0	8.0
CCSM3	8.0	9.5
CCSM4	8.5	10.5
CCSM5	9.5	11.5
CCSM1L	7.0	8.0
CCSM2L	7.5	9.0
CCSM3L	9.0	11.0
CCSM4L	9.5	11.5
CCSM5L	10.0	12.5



NOTES:

1. Vertical steel bars should be equally spaced around the perimeter of the footing allowing for a minimum of 3" of concrete cover over the ties.
2. Vertical steel shall be ASTM A615 Gr 60 (rebar).
3. Minimum concrete strength, f'c = 3,000 psi
4. Concrete shall be poured against undisturbed soil. If the top layer of the soil is disturbed it shall be discounted and the footing depth shall be increased accordingly.
5. The top 4" shall be placed (using concrete or a non-shrinking grout) after installing the pole and appurtenances.

NO.	REVISION	DATE
1	FOUNDATION DEPTH UPDATED	11/19/07

CLACKAMAS COUNTY
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD OREGON CITY, OREGON

CLACKAMAS COUNTY MAST ARM FOUNDATION STANDARD

DESIGNED BY	DATE	DRAWN BY	DATE
D. EMSLIE	3/21/07	D. EMSLIE	3/21/07

DRAWING NUMBER: NWS4710
SHEET 1 OF 1

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

REGISTERED PROFESSIONAL ENGINEER
65552PE
OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Damascus Area Systemic Safety Enhancements
Flashing Beacon Details
DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

DIRECTOR: DAN JOHNSON

DESIGNED BY: DZS
DRAFTED BY: DZS
CHECKED BY: WES

REVISIONS

NO.	DATE:

Sheet No. TS-5

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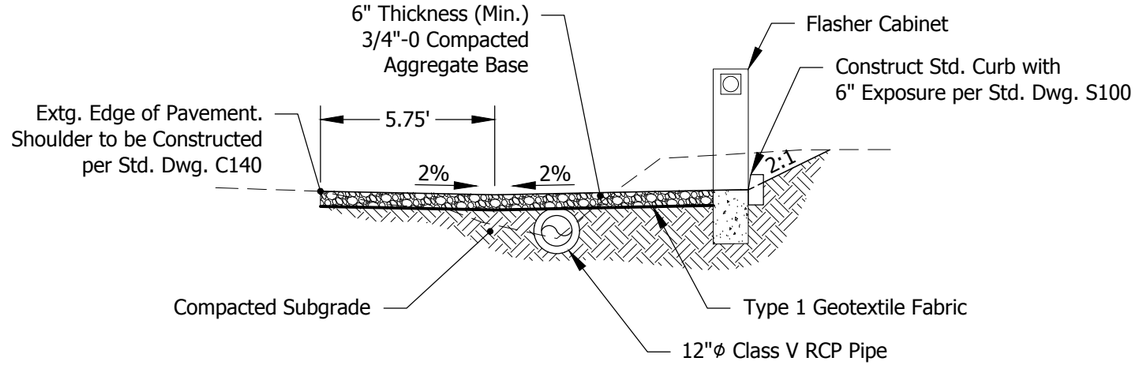
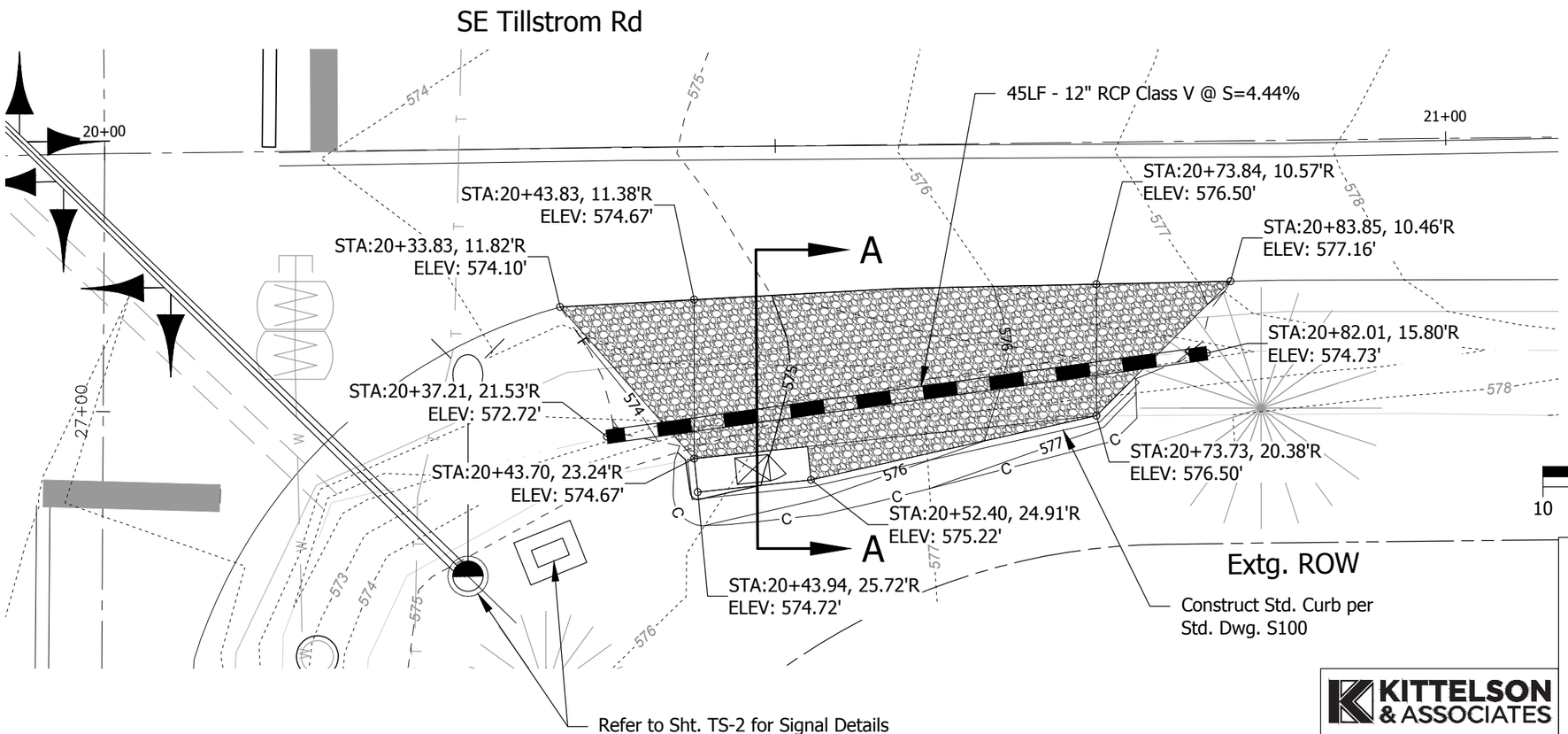


A **Maintenance Pad Section**

SCALE: 1" = 5'



Scale: 1" = 10'

10 5 0 10

H:\24\24756 - Damascus Safety Countermeasures\design_CD\CD - Signal - 222nd & Tillstrom.dwg 6/18/2021 11:00 AM Dimitryan Shadrin

Damascus Area Systemic Safety Enhancements

Maintenance Pad Details

DATE: June 2021 | PROJECT NO.: #2019-18

CLACKAMAS COUNTY
DEPT. OF TRANSPORTATION
AND DEVELOPMENT
150 BEAVERCREEK ROAD
OREGON CITY, OR 97045

CLACKAMAS COUNTY

DIRECTOR

DAN JOHNSON

DESIGNED BY: DZS | DRAFTED BY: DZS | CHECKED BY: WES

REVISIONS

NO.	DATE:

KITTELSON & ASSOCIATES
851 SW 6TH AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

REGISTERED PROFESSIONAL ENGINEER
65552PE
OREGON
JULY 9, 2001
WADE E. SCARBROUGH
EXPIRES: 06/30/22

Sheet No.
TS-6

Appendix C: Cost Estimates

Damascus Mobility Plan

Bohna Park Alternative 1.1 Estimate

Clackamas County

Engineer's Conceptual Estimate

Prepared By: Chelsea Farnsworth		*Date: 11/5/2021*		
Reviewed By: Marc Butorac, PE				
	This Estimate has a Rating of:	**3C**	*(See rating scale guide below.)*	
ITEM	**UNIT**	**TOTAL QUANTITY**	**UNIT PRICE**	**TOTAL COST**
Mobilization	LS	ALL	$3,000.00	$3,000.00
Traffic Control	LS	ALL	$2,000.00	$2,000.00
Removal of Structures and Obstructions	LS	ALL	$1,000.00	$1,000.00
Clearing and Grubbing	LS	ALL	$1,000.00	$1,000.00
Concrete Curbs - Standard Curb	LF	320	$26.10	$8,352.00
Raised Concrete Island	SF	370	$10.90	$4,033.00
Storm Water System & Water Quality Treatment, Complete	LS	ALL	$5,000.00	$5,000.00
Pavement Markings, Complete	LS	ALL	$1,000.00	$1,000.00
Signage, Complete	LS	ALL	$1,000.00	$1,000.00
TOTAL CONSTRUCTION COST				**$ 26,385**
ENGINEERING SUPPORT				
Engineering & Construction Management	LS	25%	$ 26,385	$6,597.00
ENGINEERING SUPPORT SUBTOTAL				**$ 6,597**
ENGINEERING PERMITS SUBTOTAL				**$ -**
TOTAL PROJECT SUBTOTAL				**$ 32,982**
40% Contingency				**$ 13,200**
TOTAL ESTIMATED PROJECT COST				**$ 46,182**

Assumptions:

ESA, wetlands, and waters are not assumed to be present. Potential mitigation costs for environmental impacts are not included.

Scope Accuracy:

Level 1: Project scope well understood and well defined.

Level 2: Project scope conceptual. Scope lacks detail due to potential permit requirements; Unknown project conditions; limited knowledge of external impacts.

Level 3: Project scope is a "vision" with limited detail.

Engineering Effort:

Level A: Preliminary engineering performed. Technical information is available, engineering calculations have been performed; clear understanding of the materials size and quantities needed to execute job. Schedule understood; staff and permitting is fairly clear, (however this element may still need refining). Project Development & Construction Contingencies ranges between 10%-20%.

Level B: Conceptual engineering performed. Technical information is available, rough engineering calculations may have been performed, or similar information from previous similar work is compared and used. Project Development Contingencies ranges between 15% to 25% and Construction Contingencies ranges between 20% to 30%.

Level C: No engineering performed. Educated guesstimating. Limited technical information available and/or analysis performed. Project Development and Construction Contingencies should be selected appropriately by Project Manager. Contingency may range up to 50%.

Damascus Mobility Plan

Bohna Park Alternative 1.2 Estimate

Clackamas County

Engineer's Conceptual Estimate

Prepared By: Krista Purser	*Date: 11/5/2021*
Reviewed By: Marc Butorac, PE	
This Estimate has a Rating of:	**3C** *(See rating scale guide below.)*

ITEM	UNIT	TOTAL QUANTITY	UNIT PRICE	TOTAL COST
Mobilization	LS	ALL	$200.00	$200.00
Traffic Control	LS	ALL	$100.00	$100.00
Removal of Structures and Obstructions	LS	ALL	$100.00	$100.00
Clearing and Grubbing	LS	ALL	$100.00	$100.00
Asphalt Roadway - Grind & Inlay (2" Depth)	SF	60	$3.10	$186.00
Storm Water System & Water Quality Treatment, Complete	LS	ALL	$100.00	$100.00
Permanent Landscaping	SF	0	$3.70	$0.00
Irrigation, Complete	SF	0	$2.50	$0.00
Pavement Markings, Complete	LS	ALL	$100.00	$100.00
Signage, Complete	LS	ALL	$500.00	$500.00
TOTAL CONSTRUCTION COST				**$ 1,386**
ENGINEERING SUPPORT				
Engineering & Construction Management	LS	25%	$ 1,386	$347.00
ENGINEERING SUPPORT SUBTOTAL				**$ 347**
ENGINEERING PERMITS SUBTOTAL				**$ -**
TOTAL PROJECT SUBTOTAL				**$ 1,733**
40% Contingency				**$ 700**
TOTAL ESTIMATED PROJECT COST				**$ 2,433**

Assumptions:

ESA, wetlands, and waters are not assumed to be present. Potential mitigation costs for environmental impacts are not included.

Scope Accuracy:

Level 1: Project scope well understood and well defined.

Level 2: Project scope conceptual. Scope lacks detail due to potential permit requirements; Unknown project conditions; limited knowledge of external impacts.

Level 3: Project scope is a "vision" with limited detail.

Engineering Effort:

Level A: Preliminary engineering performed. Technical information is available, engineering calculations have been performed; clear understanding of the materials size and quantities needed to execute job. Schedule understood; staff and permitting is fairly clear, (however this element may still need refining). Project Development & Construction Contingencies ranges between 10%-20%.

Level B: Conceptual engineering performed. Technical information is available, rough engineering calculations may have been performed, or similar information from previous similar work is compared and used. Project Development Contingencies ranges between 15% to 25% and Construction Contingencies ranges between 20% to 30%.

Level C: No engineering performed. Educated guesstimating. Limited technical information available and/or analysis performed. Project Development and Construction Contingencies should be selected appropriately by Project Manager. Contingency may range up to 50%.

Damascus Mobility Plan

Bohna Park Alternative 1.3 Estimate

Clackamas County

Engineer's Conceptual Estimate

Prepared By: Dimitryan Shadrin	*Date: 11/3/2021*
Reviewed By: Marc Butorac, PE	
This Estimate has a Rating of:	**3C** *(See rating scale guide below.)*

ITEM	UNIT	TOTAL QUANTITY	UNIT PRICE	TOTAL COST
Mobilization	LS	ALL	$41,000.00	$41,000.00
Traffic Control	LS	ALL	$21,000.00	$21,000.00
Erosion Control	LS	ALL	$12,000.00	$12,000.00
Removal of Structures and Obstructions	LS	ALL	$9,000.00	$9,000.00
Clearing and Grubbing	LS	ALL	$8,000.00	$8,000.00
General Earthworks	CY	3,200	$25.00	$80,000.00
Asphalt Roadway - Full Depth	SF	31,800	$9.00	$286,200.00
Subgrade Geotextile	SY	3,534	$1.00	$3,534.00
Pavement Markings, Complete	LS	ALL	$8,000.00	$8,000.00
Signage, Complete	LS	ALL	$6,000.00	$6,000.00
TOTAL CONSTRUCTION COST				**$ 474,734**
ENGINEERING SUPPORT				
Engineering & Construction Management	LS	25%	$ 474,734	$118,684.00
ENGINEERING SUPPORT SUBTOTAL				**$ 118,684**
RIGHT-OF-WAY ACQUISITION				
Residential Property Acquisition	SF	40,600	$18.00	$730,800.00
Commercial Property Acquisition	SF	0	$25.00	$0.00
ENGINEERING PERMITS SUBTOTAL				**$ 730,800**
TOTAL PROJECT SUBTOTAL				**$ 1,324,218**
40% Contingency				**$ 529,690**
TOTAL ESTIMATED PROJECT COST				**$ 1,853,908**

Assumptions:

Full depth pavement reconstruction within project limits. No grind/inlay assumed

Detailed surface modeling and earthworks calculations have not been completed. Earthworks estimate is based on average depth assumptions

ESA, wetlands, and waters are not assumed to be present. Potential mitigation costs for environmental impacts are not included.

Scope Accuracy:

Level 1: Project scope well understood and well defined.

Level 2: Project scope conceptual. Scope lacks detail due to potential permit requirements; Unknown project conditions; limited knowledge of external impacts.

Level 3: Project scope is a "vision" with limited detail.

Engineering Effort:

Level A: Preliminary engineering performed. Technical information is available, engineering calculations have been performed; clear understanding of the materials size and quantities needed to execute job. Schedule understood; staff and permitting is fairly clear, (however this element may still need refining). Project Development & Construction Contingencies ranges between 10%-20%.

Level B: Conceptual engineering performed. Technical information is available, rough engineering calculations may have been performed, or similar information from previous similar work is compared and used. Project Development Contingencies ranges between 15% to 25% and Construction Contingencies ranges between 20% to 30%.

Level C: No engineering performed. Educated guesstimating. Limited technical information available and/or analysis performed. Project Development and Construction Contingencies should be selected appropriately by Project Manager. Contingency may range up to 50%.

Damascus Mobility Plan

Bohna Park Alternative 1.4 Estimate

Clackamas County

Engineer's Conceptual Estimate

Prepared By: Dimitryan Shadrin	*Date: 11/3/2021*
Reviewed By: Marc Butorac, PE	
This Estimate has a Rating of:	**3C** *(See rating scale guide below.)*

ITEM	UNIT	TOTAL QUANTITY	UNIT PRICE	TOTAL COST
Mobilization	LS	ALL	$15,000.00	$15,000.00
Traffic Control	LS	ALL	$8,000.00	$8,000.00
Erosion Control	LS	ALL	$6,000.00	$6,000.00
Removal of Structures and Obstructions	LS	ALL	$4,000.00	$4,000.00
Clearing and Grubbing	LS	ALL	$3,000.00	$3,000.00
General Earthworks	CY	1,400	$25.00	$35,000.00
Asphalt Roadway - Full Depth	SF	11,050	$9.00	$99,450.00
Subgrade Geotextile	SY	1,228	$1.00	$1,228.00
Pavement Markings, Complete	LS	ALL	$4,000.00	$4,000.00
Signage, Complete	LS	ALL	$3,000.00	$3,000.00
TOTAL CONSTRUCTION COST				**$ 178,678**
ENGINEERING SUPPORT				
Engineering & Construction Management	LS	25%	$ 178,678	$44,670.00
ENGINEERING SUPPORT SUBTOTAL				**$ 44,670**
RIGHT-OF-WAY ACQUISITION				
Residential Property Acquisition	SF	36,800	$18.00	$662,400.00
Commercial Property Acquisition	SF	0	$25.00	$0.00
ENGINEERING PERMITS SUBTOTAL				**$ 662,400**
TOTAL PROJECT SUBTOTAL				**$ 885,748**
40% Contingency				**$ 354,300**
TOTAL ESTIMATED PROJECT COST				**$ 1,240,048**

Assumptions:

Full depth pavement reconstruction within project limits. No grind/inlay assumed

Detailed surface modeling and earthworks calculations have not been completed. Earthworks estimate is based on average depth assumptions

ESA, wetlands, and waters are not assumed to be present. Potential mitigation costs for environmental impacts are not included.

Scope Accuracy:

Level 1: Project scope well understood and well defined.

Level 2: Project scope conceptual. Scope lacks detail due to potential permit requirements; Unknown project conditions; limited knowledge of external impacts.

Level 3: Project scope is a "vision" with limited detail.

Engineering Effort:

Level A: Preliminary engineering performed. Technical information is available, engineering calculations have been performed; clear understanding of the materials size and quantities needed to execute job. Schedule understood; staff and permitting is fairly clear, (however this element may still need refining). Project Development & Construction Contingencies ranges between 10%-20%.

Level B: Conceptual engineering performed. Technical information is available, rough engineering calculations may have been performed, or similar information from previous similar work is compared and used. Project Development Contingencies ranges between 15% to 25% and Construction Contingencies ranges between 20% to 30%.

Level C: No engineering performed. Educated guesstimating. Limited technical information available and/or analysis performed. Project Development and Construction Contingencies should be selected appropriately by Project Manager. Contingency may range up to 50%.

KINGSWOOD WAY EXTENSION | STUDY

ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	TEMPORARY FEATURES AND APPURTENANCES (MOB, TC, EC)	1	LS	$ 99,150	$ 99,150
2	ROADWORK (SURVEY, EXCAVATION, ETC.)	1	LS	$ 164,400	$ 164,400
3	BASES	1	LS	$ 22,620	$ 22,620
4	WEARING SURFACES (ASPHALT, CONCRETE EDGING, SIDEWALK)	1	LS	$ 27,750	$ 27,750
5	RIGHT OF WAY DEVELOPMENT AND CONTROL (SEEDING, PLANTING)	1	LS	$ 88,806	$ 88,806
6	ENGINEERING DESIGN	1	LS	$ 70,000	$ 70,000
7	COUNTY ADMINISTRATION	1	LS	$ 50,000	$ 50,000
8	CONSTRUCTION MANAGEMENT	1	LS	$ 50,000	$ 50,000
9	ENVIRONMENTAL PERMITTING	1	LS	$ 20,000	$ 20,000
	TOTALS				

Construction Subtotal	$ 592,726
Contingency (50%)	$ 296,363
Right-of-way Acquisition	$ 346,550
Engineering (County + Consultant)	$ 247,128
Total (Rounded)	**$ 1,483,000**

Assumptions:

1. The above 'ITEM DESCRIPTIONS' are for direct construction costs only.
2. Assumed pavement section is 4" ACP over 9" aggregate base.
3. Estimated ROW acquisition includes (1) case files at $10,000 each, plus 18,920 sq.ft permanent acquisition at $15/sq.ft., plus 2,120 sq.ft temporary construction easement at $10/sq.ft, plus 6,310 sq.ft. of permanent slope easement at $5/sq.ft.

Damascus Mobility Plan

Bohna Park Alternative 3 Estimate

Clackamas County

Engineer's Conceptual Estimate

Prepared By: Chelsea Farnsworth		*Date: 11/8/2021*		
Reviewed By: Marc Butorac, PE				
	This Estimate has a Rating of:	**3C**	*(See rating scale guide below.)*	
ITEM	**UNIT**	**TOTAL QUANTITY**	**UNIT PRICE**	**TOTAL COST**
Mobilization	LS	ALL	$11,000.00	$11,000.00
Traffic Control	LS	ALL	$6,000.00	$6,000.00
Removal of Structures and Obstructions	LS	ALL	$3,000.00	$3,000.00
Clearing and Grubbing	LS	ALL	$2,000.00	$2,000.00
General Earthworks	CY	100	$25.00	$2,500.00
Asphalt Roadway - Full Depth	SF	7,200	$9.00	$64,800.00
Subgrade Geotextile	SY	800	$1.00	$800.00
Storm Water System & Water Quality Treatment, Complete	LS	ALL	$24,000.00	$24,000.00
Pavement Markings, Complete	LS	ALL	$2,000.00	$2,000.00
Signage, Complete	LS	ALL	$2,000.00	$2,000.00
TOTAL CONSTRUCTION COST				**$ 118,100**
ENGINEERING SUPPORT				
Engineering & Construction Management	LS	25%	$ 118,100	$29,525.00
ENGINEERING SUPPORT SUBTOTAL				**$ 29,525**
ENGINEERING PERMITS SUBTOTAL				**$ -**
TOTAL PROJECT SUBTOTAL				**$ 147,625**
40% Contingency				**$ 59,050**
TOTAL ESTIMATED PROJECT COST				**$ 206,675**

Assumptions:

Full depth pavement reconstruction for the shoulders. Assume existing 2' shoulders. No grind/inlay assumed

Detailed surface modeling and earthworks calculations have not been completed. Earthworks estimate is based on average depth assumptions

ESA, wetlands, and waters are not assumed to be present. Potential mitigation costs for environmental impacts are not included.

Scope Accuracy:

Level 1: Project scope well understood and well defined.

Level 2: Project scope conceptual. Scope lacks detail due to potential permit requirements; Unknown project conditions; limited knowledge of external impacts.

Level 3: Project scope is a "vision" with limited detail.

Engineering Effort:

Level A: Preliminary engineering performed. Technical information is available, engineering calculations have been performed; clear understanding of the materials size and quantities needed to execute job. Schedule understood; staff and permitting is fairly clear, (however this element may still need refining). Project Development & Construction Contingencies ranges between 10%-20%.

Level B: Conceptual engineering performed. Technical information is available, rough engineering calculations may have been performed, or similar information from previous similar work is compared and used. Project Development Contingencies ranges between 15% to 25% and Construction Contingencies ranges between 20% to 30%.

Level C: No engineering performed. Educated guesstimating. Limited technical information available and/or analysis performed. Project Development and Construction Contingencies should be selected appropriately by Project Manager. Contingency may range up to 50%.

Damascus Mobility Plan Segment Shoulder Widening

Total Estimated Project Cost is the Cost per Foot to Add a 4-Foot Shoulder

Clackamas County

Engineer's Conceptual Estimate

Prepared By: Russ Doubleday		*Date: December 7, 2021*		
Reviewed By: Krista Purser, PE				
	This Estimate has a Rating of:	**3C**	*(See rating scale guide below.)*	
ITEM	**UNIT**	**TOTAL QUANTITY**	**UNIT PRICE**	**TOTAL COST**
Mobilization	LS	ALL	$18,000.00	$18,000.00
Traffic Control	LS	ALL	$9,000.00	$9,000.00
Erosion Control	LS	ALL	$3,000.00	$3,000.00
Removal of Structures and Obstructions	LS	ALL	$4,000.00	$4,000.00
Clearing and Grubbing	LS	ALL	$4,000.00	$4,000.00
General Earthworks	CY	600	$25.00	$15,000.00
Asphalt Roadway - Full Depth	SF	8,000	$8.00	$64,000.00
Asphalt Roadway - Grind & Inlay (2" Depth)	SF	8,000	$3.70	$29,600.00
Subgrade Geotextile	SY	889	$1.00	$889.00
Storm Water System & Water Quality Treatment, Complete	LS	ALL	$39,000.00	$39,000.00
Pavement Markings, Complete	LS	ALL	$3,000.00	$3,000.00
Signage, Complete	LS	ALL	$2,000.00	$2,000.00
Illumination System, Complete	LS	ALL	$15,400.00	$15,400.00
TOTAL CONSTRUCTION COST			**$**	**206,889**
TOTAL PROJECT SUBTOTAL			**$**	**206,889**
30% Contingency			**$**	**62,070**
TOTAL ESTIMATED PROJECT COST			**$**	**268,959**

Scope Accuracy:

Level 1: Project scope well understood and well defined.

Level 2: Project scope conceptual. Scope lacks detail due to potential permit requirements; Unknown project conditions; limited knowledge of external impacts.

Level 3: Project scope is a "vision" with limited detail.

Engineering Effort:

Level A: Preliminary engineering performed. Technical information is available, engineering calculations have been performed; clear understanding of the materials size and quantities needed to execute job. Schedule understood; staff and permitting is fairly clear, (however this element may still need refining). Project Development & Construction Contingencies ranges between 10%-20%.

Level B: Conceptual engineering performed. Technical information is available, rough engineering calculations may have been performed, or similar information from previous similar work is compared and used. Project Development Contingencies ranges between 15% to 25% and Construction Contingencies ranges between 20% to 30%.

Level C: No engineering performed. Educated guesstimating. Limited technical information available and/or analysis performed. Project Development and Construction Contingencies should be selected appropriately by Project Manager. Contingency may range up to 50%.

Alternative	Roadway	Segment Length (ft)	Cost Estimate	Cost Estimate Rounded
A4.1	SE 190th Dr	530	$ 142,548.27	$145,000
A4.2	SE 242nd Ave	16,002	$4,303,881.92	$4,305,000
A4.3	SE Sunnyside Rd	5,229	$1,406,386.61	$1,410,000
A4.4	SE Sunnyside Rd	3,182	$ 855,827.54	$860,000
A4.5	SE 232nd Dr	9,993	$2,687,707.29	$2,690,000
A4.6	SE Foster Rd	4,567	$1,228,335.75	$1,230,000
A4.7	SE Tillstrom Rd	15,891	$4,274,027.47	$4,275,000
A4.8	SE 190th Dr	2,870	$ 771,912.33	$775,000
A4.9	SE 222nd Dr	15,992	$4,301,192.33	$4,305,000
A4.10	SE 257th Ave	1,431	$ 384,880.33	$385,000
A4.11	SE Borges Rd	15,465	$4,159,450.94	$4,160,000
A4.12	SE Hoffmeister Rd	4,106	$1,104,345.65	$1,105,000
A4.13	SE Royer Rd	10,001	$2,689,858.96	$2,690,000
A4.14	SE Sunshine Valley R	3,716	$ 999,451.64	$1,000,000
A4.15	SE Telford Rd	2,533	$ 681,273.15	$685,000
A4.16	SE Bohna Park Road	10,713	$2,881,357.77	$2,885,000
A4.17	SE Wiese Road	8,142	$2,189,864.18	$2,190,000

Appendix D: SE 242nd Avenue and SE Borges Road Realignment

Technical Memorandum

Date: March 2, 2021

Project: SE 242nd Avenue and SE Borges Road Realignment

To: Mike Ward, PE
Clackamas County Department of Development and Transportation
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Re: Kingswood Way | Extension Study

Introduction

Clackamas County (the County) proposes the extension of SE Kingswood Way from the SE Borges Road intersection through to SE 242nd Avenue. The SE Kingswood Way extension (the Extension) would cut through an undeveloped forested parcel (Map 1S3E27D – Lot 100) for the connection to SE 242nd Avenue. A Plan View of the potential project area with concept can be seen on Attachment A.

Purpose

This memorandum is intended to identify the conceptual project footprint for a SE Kingswood Way extension, and to develop costs for the project's addition into the County's Capital Improvement Program.

Background

SE Kingswood Way is a Rural Local road which currently terminates as a T-intersection with SE Borges Road approximately 400 feet southwest of the SE Borges Road and SE 242nd Avenue intersection. SE Borges Road is a Rural Collector, and SE 242nd Avenue is a Rural Major Arterial.

The SE Kingswood Way extension would serve as a replacement for the SE Borges Road and SE 242nd Avenue intersection. The existing SE Borges Road and SE 242nd Avenue intersection will be closed to thru traffic.

LIDAR 10' contour data was used to supplement the existing project survey base mapping for the forested parcel between SE Borges Road and SE 242nd Ave.

Findings

The estimated total cost of the Extension is $1,483,000. A detailed cost estimate can be found in Attachment E at the end of this document.

The existing ground elevation decreases rapidly from the SE Borges Road southern edge of pavement towards the southeast, and decreases rapidly again before the SE 242nd Avenue western edge of pavement. These rapid changes in ground elevation could cause significant cut and fill sections for the Extension. Detailed section views showing the extreme Fill and Cut sections of the Extension can be seen in Attachments B and C.

Clear Sight Triangles for both northbound and southbound traffic on SE 242nd Ave do not have any ground profile obstructions, as can be seen in the Plan and Profile view as seen on Attachment D. The clear sight triangles are based on a 45mph design speed on SE 242nd and a 360 feet Stopping Sight Distance (*Clackamas County Roadway Standards section 240.6 Table 2-10).*

The Posted Speed of SE Kingswood Way is 25mph. Per the County's requirements for Horizontal Curves (*Clackamas County Roadway Standards section 250.6.1)* the minimum radius of 198 feet for a 25mph Design Speed would allow for the Extension to fit within the undeveloped forested parcel. The use of a design speed higher than 30mph would result in a Horizontal Curve radius that could extend the length of the Extension and possibly impact the property on Tax Lot – 400.

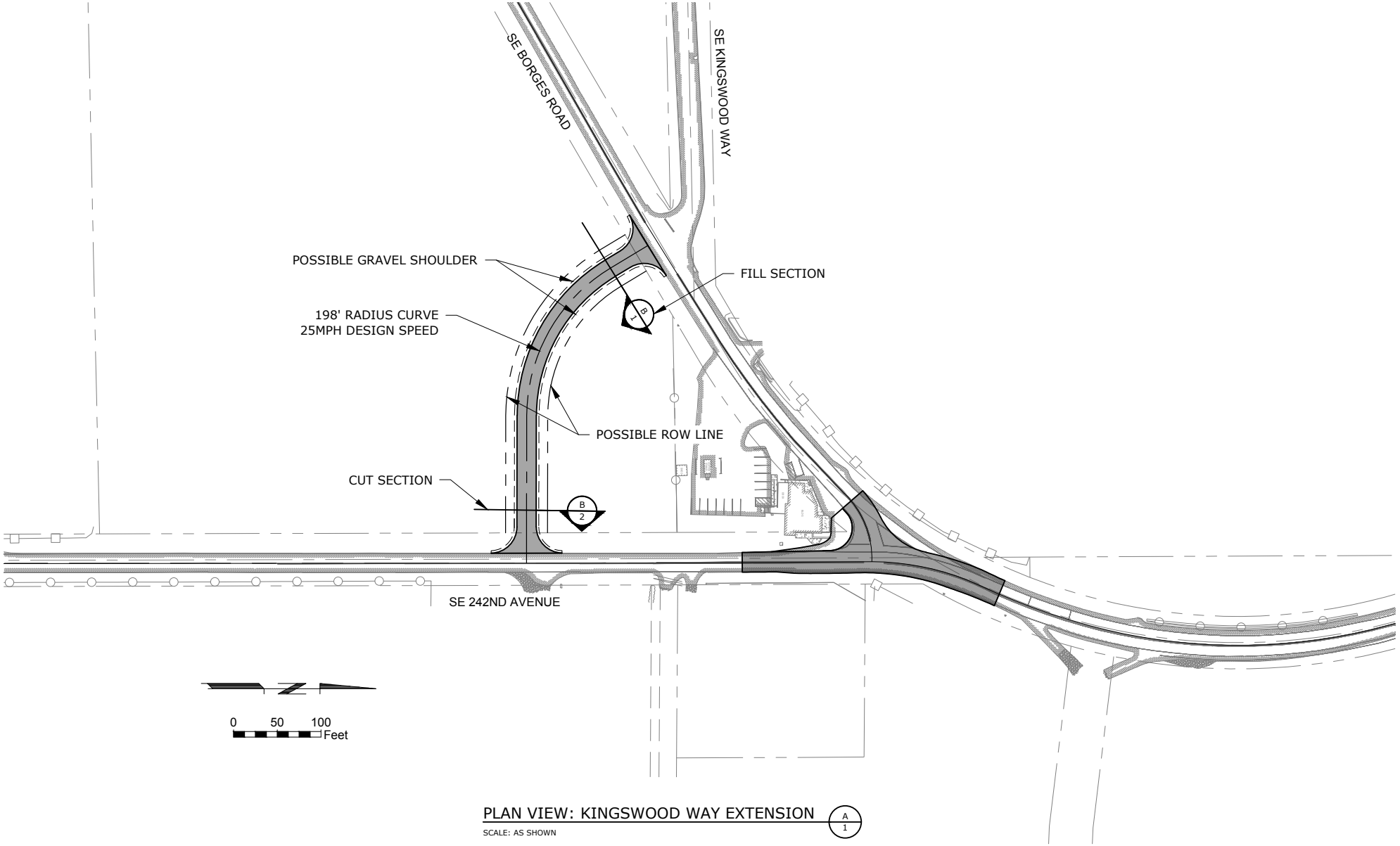
An existing roadside ditch along the west side of SE 242nd Avenue will be filled during construction of the Extension. Excavation and resurfacing of the roadside ditch may be required to provide adequate cover and drainage for a culvert connecting the roadside ditch underneath the Extension.

The entirety of the Extension will be constructed on privately owned parcel(s), the costs for which are reflected in the project estimate.

More detailed project design will require the following information:

- Topographic Survey
- Tree Survey
- Environmental Clearances
- Boundary Survey with Topography

KINGSWOOD WAY EXTENSION

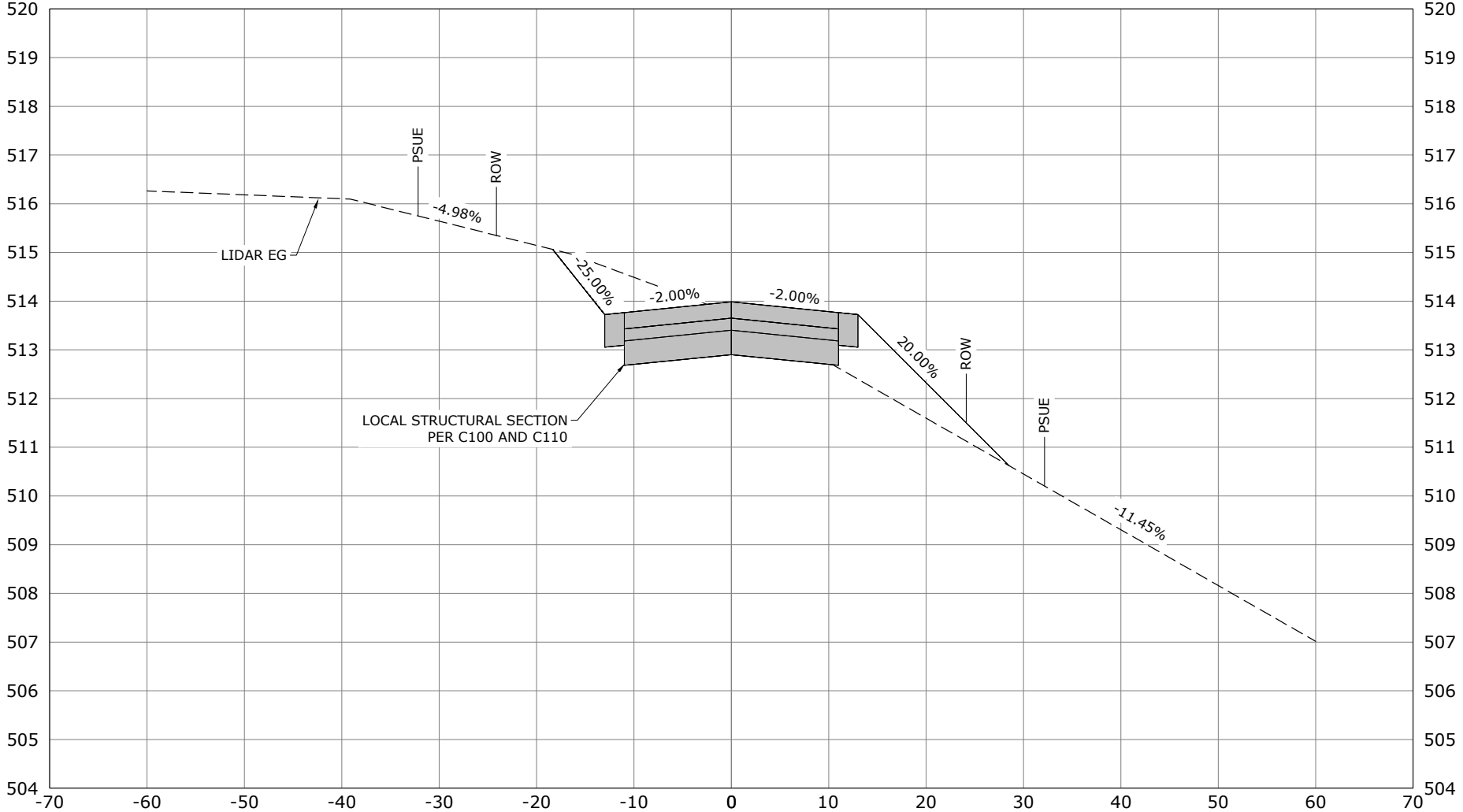


PLAN VIEW: KINGSWOOD WAY EXTENSION A/1

SCALE: AS SHOWN

Attachment A

KINGSWOOD WAY EXTENSION



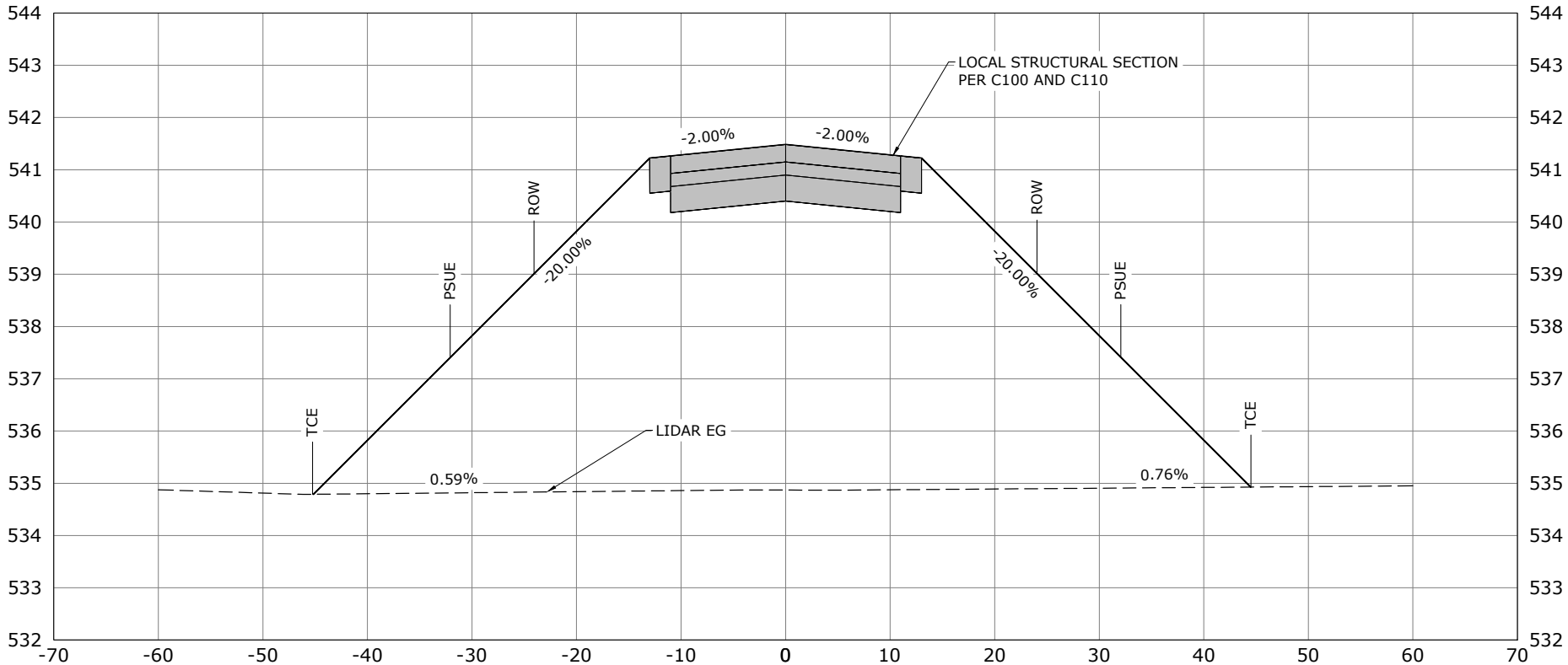
SECTION: 50' OFF OF WEST 242ND AVE EOP

SCALE: NTS

C
1

Attachment C

KINGSWOOD WAY EXTENSION

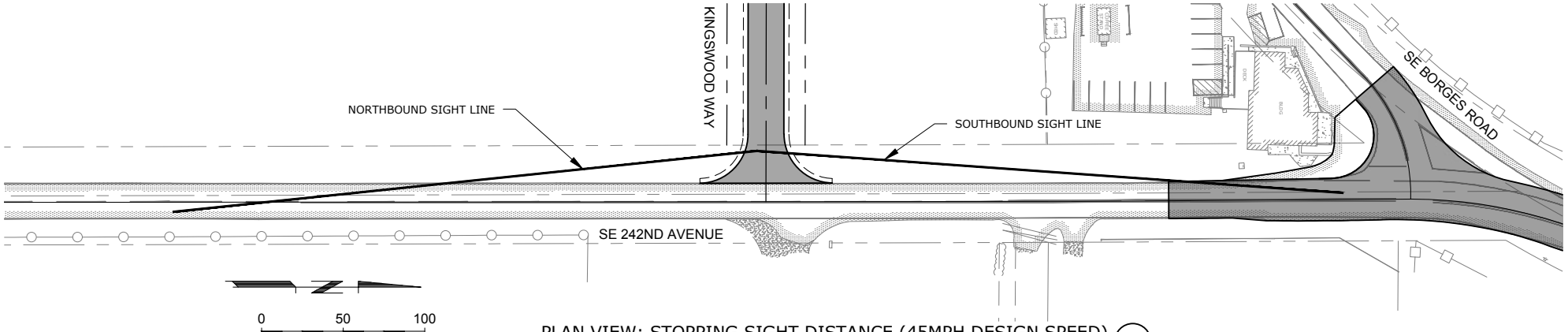


SECTION: 50' OFF BORGES RD EOP (B/1)

SCALE: NTS

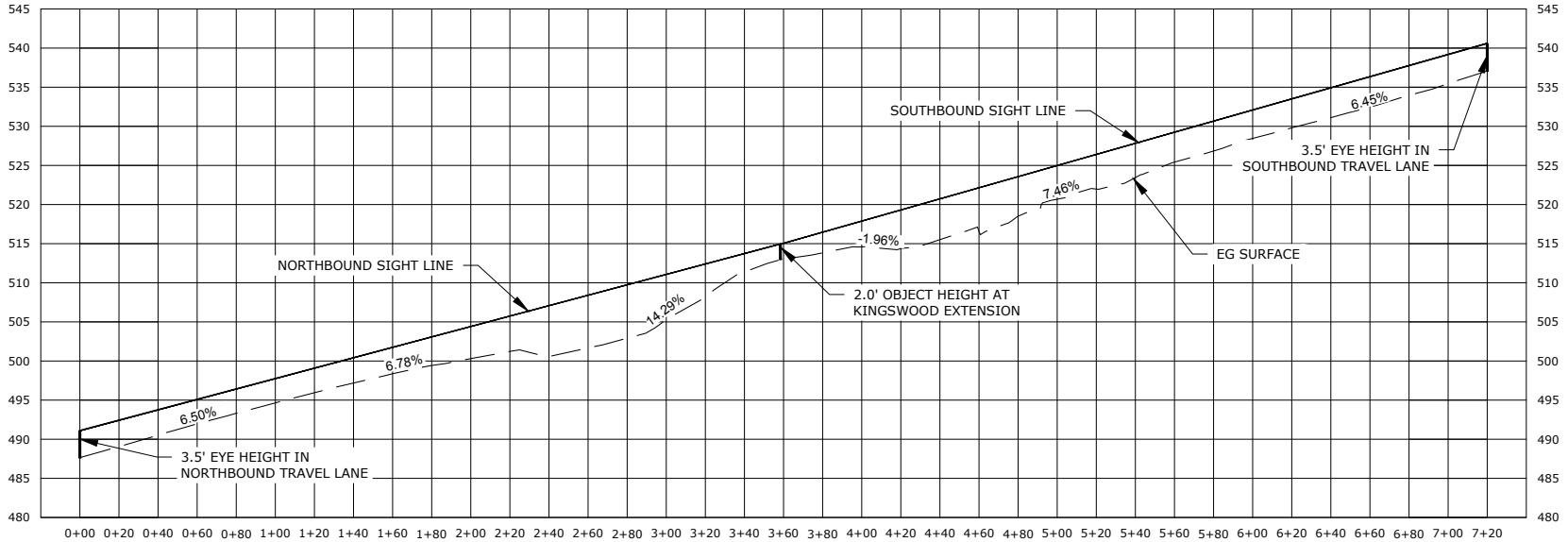
Attachment B

KINGSWOOD WAY EXTENSION



PLAN VIEW: STOPPING SIGHT DISTANCE (45MPH DESIGN SPEED) C/1

SCALE: AS SHOWN



PROFILE VIEW: STOPPING SIGHT DISTANCE (45MPH DESIGN SPEED) C/2

SCALE: AS SHOWN

Attachment C

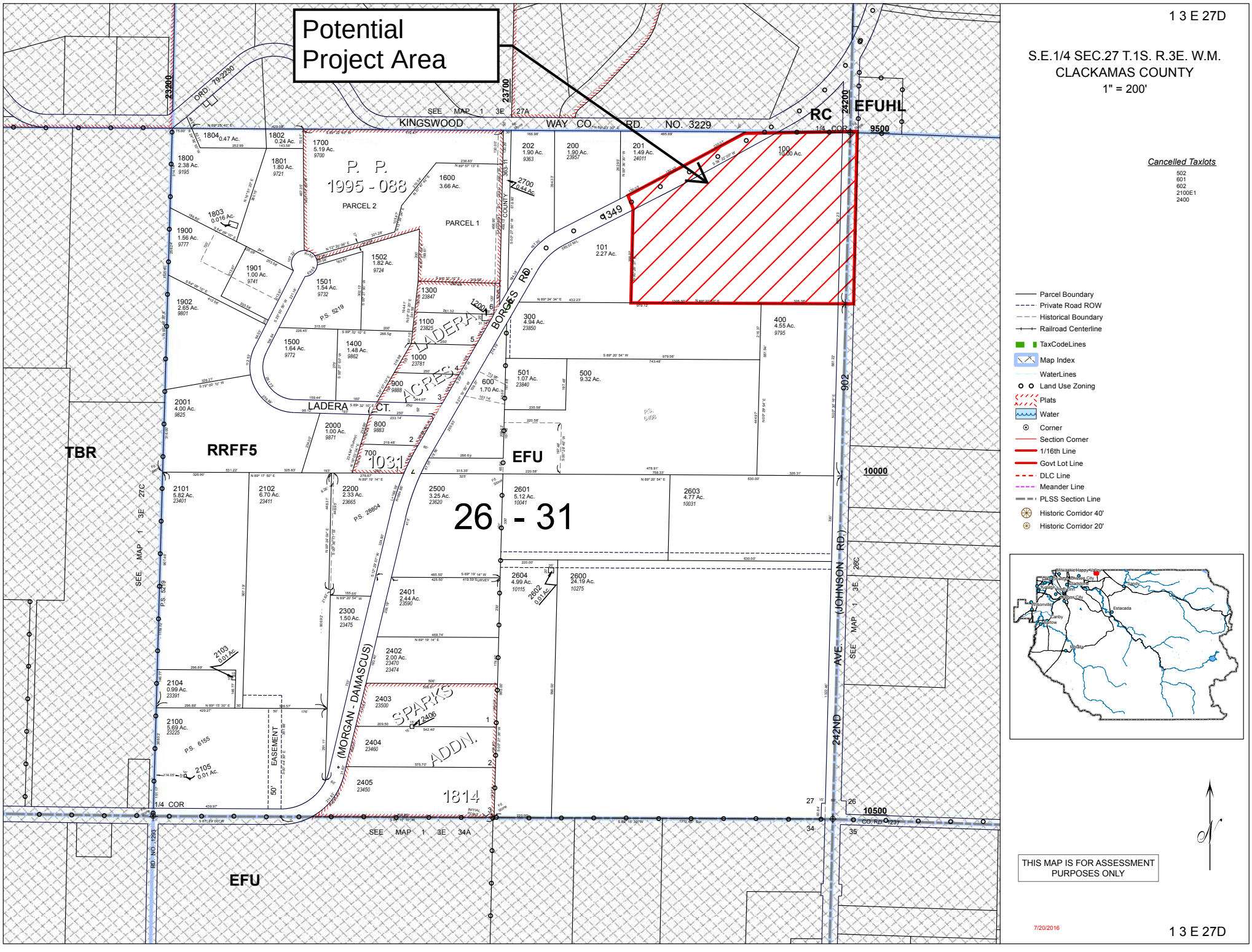
KINGSWOOD WAY EXTENSION | STUDY

ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL
1	TEMPORARY FEATURES AND APPURTENANCES (MOB, TC, EC)	1	LS	$ 99,150	$ 99,150
2	ROADWORK (SURVEY, EXCAVATION, ETC.)	1	LS	$ 164,400	$ 164,400
3	BASES	1	LS	$ 22,620	$ 22,620
4	WEARING SURFACES (ASPHALT, CONCRETE EDGING, SIDEWALK)	1	LS	$ 27,750	$ 27,750
5	RIGHT OF WAY DEVELOPMENT AND CONTROL (SEEDING, PLANTING)	1	LS	$ 88,806	$ 88,806
6	ENGINEERING DESIGN	1	LS	$ 70,000	$ 70,000
7	COUNTY ADMINISTRATION	1	LS	$ 50,000	$ 50,000
8	CONSTRUCTION MANAGEMENT	1	LS	$ 50,000	$ 50,000
9	ENVIRONMENTAL PERMITTING	1	LS	$ 20,000	$ 20,000
	TOTALS				

Construction Subtotal	$ 592,726
Contingency (50%)	$ 296,363
Right-of-way Acquisition	$ 346,550
Engineering (County + Consultant)	$ 247,128
Total (Rounded)	**$ 1,483,000**

Assumptions:

1. The above 'ITEM DESCRIPTIONS' are for direct construction costs only.
2. Assumed pavement section is 4" ACP over 9" aggregate base.
3. Estimated ROW acquisition includes (1) case files at $10,000 each, plus 18,920 sq.ft permanent acquisition at $15/sq.ft., plus 2,120 sq.ft temporary construction easement at $10/sq.ft, plus 6,310 sq.ft. of permanent slope easement at $5/sq.ft.


Potential
Project Area
1 3 E 27D
S.E.1/4 SEC.27 T.1S. R.3E. W.M.
CLACKAMAS COUNTY
1" = 200'
Cancelled Taxlots
502
601
602
2100E1
2400
Parcel Boundary
Private Road ROW
Historical Boundary
Railroad Centerline
TaxCodeLines
Map Index
WaterLines
Land Use Zoning
Plats
Water
Corner
Section Corner
1/16th Line
Govt Lot Line
DLC Line
Meander Line
PLSS Section Line
Historic Corridor 40'
Historic Corridor 20'
THIS MAP IS FOR ASSESSMENT PURPOSES ONLY
7/20/2016
1 3 E 27D
TBR
RRFF5
EFU
EFUHL
RC
26 - 31
KINGSWOOD
LADERA
ACRES
SPARKS
ADDN.
BORGES RD.
(MORGAN - DAMASCUS)
AVE. (JOHNSON RD.)
242ND
CO. RD. 1237
P. P. 1995 - 088
PARCEL 1
PARCEL 2
P.S. 5219
P.S. 6155
P.S. 28804
P.S. 2249
1031
1814
SEE MAP 1 3E 27A
SEE MAP 1 3E 34A
SEE MAP 1 3E 27C
SEE MAP 1 3E 26C
EASEMENT
1/4 COR