



## CITY OF WARRENTON

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Warrenton Planning Commission

Agenda

September 14, 2017

7:00 p.m.

1. Attendance
2. Flag Salute
3. Public Hearing—Site Design Review Application 17-3—Tract A Apartments—Dick Kruger

*Action Item*

4. Public Hearing—Code Amendment—Deleting Mini-storage Facilities from the List of Conditional Uses in the C-1 General Commercial District West of Highway 101

*Action Item*

5. Approval of Minutes of August 10, 2017 meeting (to be sent separately)

*Action Item*

6. Other business.
7. Adjourn

*"Making a difference through excellence of service"*



## CITY OF WARRENTON

September 7, 2017

To: Warrenton Planning Commission  
From: Skip Urling, Community Development Director   
Re: Side Design Review 17—3—Tract A/Forest Rim Apartments—Dick Krueger

Dick Krueger has applied for site design review for a two-building, 68 unit apartment development. Each building would have 22 2-bedroom units and 12 1-bedroom units. The project is located east of the Clatsop Community Food Bank with primary access from SE Chokeberry Avenue and Lane and Snowberry Lane with a proposed emergency only access from SE Ensign Lane. It is identified as Tax Lot 81027DD00100.

Application was submitted July 7 and after submittal of additional information, was deemed complete August 14, 2017. We noticed adjacent property owners of the public hearing August 23 and published notice September 1, 2017.

The application is reviewed under the standards and criteria of Warrenton Municipal Code Chapters:

- 16.36 High Density Residential District
- 16.120 Access and Circulation
- 16.124 Landscaping, Street Trees, Fences and Walls
- 16.128 Vehicle and Bicycle Parking
- 16.140 Stormwater and Surface Water Management
- 16.156 Wetland and Riparian Corridor Development Standards
- 16.188 Multifamily Housing Design Standards
- 16.192 Large Scale Developments
- 16.212 Site Design Review
- 16.28.050 Type III Procedure (Quasi-Judicial)

### FINDINGS

Following are the applicable code sections followed by staff findings:

16.36.040 Development Standards.

- A. Density Provisions.
- 4. Minimum lot area for a multifamily dwelling: 10,000 square feet.
- 5. Maximum density for multifamily structures: one dwelling unit per 1,600 square feet of site area.



6. Lot coverage: not more than 55% of an individual lot area shall be covered by buildings, except as may be permitted by conditional use permit or variance.
7. Minimum lot width at the front building line for single-family detached dwelling or multifamily dwelling: 50 feet.
9. Minimum lot depth: 70 feet.
10. Maximum building height: 40 feet.
11. The lowest density which will be allowed in new subdivisions and other developments with four or more units that are located on sites without significant natural feature problems is five dwelling units per gross acre.

**Staff finding:** The subject property consists of 8.8 acres in an irregular shape, but meets the lot width and depth standards. The application narrative states that dwelling density is one unit/5,638 square feet, with 7.7 units per acre it exceeds the minimum density of 5 dwelling units, the building covers 4.5 percent of the site area, well below the 55 percent limit. At an average height above grade, the buildings would be at 37'7.5", just below the 40 foot height standard.

**B. Setback Requirements.**

1. Minimum front yard setback: 15 feet.
2. Minimum side yard setback: 8 feet.
3. Corner lot minimum secondary street side yard setback: eight feet.
4. Minimum rear yard setback: 15 feet except accessory structures that meet the criteria of Section 16.280.020 may extend to within five feet of a rear property line.
5. Corner lot minimum rear yard setback: 10 feet.

**Staff finding:** It is difficult to define the front, side and rear yards on this property. Still, the smallest setback from any building is 8.6 feet and substantially greater than 15 feet in all other directions.

**C. Design Standards.**

1. An entry door of 36-inch minimum width must face the front yard setback or onto a driveway.
2. A minimum of 20 square feet of glazing must be on the side of the dwelling facing a street.
4. Multifamily housing developments shall comply with the standards of Chapter 16.188.

**Staff finding:** The application states that "each building has three pairs of 36" entry doors facing the parking area and its center driveway aisle. Building #1 is closest to a public street and has twelve 2-bed units with three windows each, four 1-bed units with two windows each, two stairwells with three windows each, and four elevator lobbies with one window each, for a total

of 54 windows. The average size exceeds 20 sf for a total of 1080 sf. The application complies with these criteria.

#### 16.120.020 – Vehicular Access and Circulation

F. Access Options. When vehicle access is required for development (i.e., for off-street parking, delivery, service, drive-through facilities, etc.), access shall be provided by one of the following methods (a minimum of 10 feet per lane is required). These methods are “options” to the developer/subdivider, unless one method is specifically required under Division 2, or through conditions required by the hearings body.

3. Option 3. Access is from a public street adjacent to the development parcel. If practicable, the owner/developer may be required to close or consolidate an existing access point as a condition of approving a new access. Street accesses shall comply with the access spacing standards in subsection G of this section, and require an access permit in accordance with subsection C of this section.

**Staff Findings:** The application states that “access is proposed from existing public right of way (Chokeberry) per access Option 3; property has double frontage (Ensign), however this is proposed for emergency access only in compliance with the standard requiring access from the lower functional classification right of way. A single access is proposed in compliance with the requirement to minimize the number of access points. Access is proposed to have minimum width of 26 ft and maximum width of 26 ft as required for multi-family uses with more than eight units.

Driveway aprons are not proposed – site entrance is an extension of the street.

Fire access and circulation is proposed according to standards of the Oregon Fire Code, including minimum width of 20 ft (26 ft provided typically), clear height of 13’-6” (no overhead obstructions proposed), inside turning radii of 25 ft, standard “hammerhead” turn-around, and maximum grade of 12% along route; buildings are located between 15 ft and 30 ft away from the access road for aerial apparatus access to the building. Note that the Fire Chief commented opposing the refuse container location in the hammerhead. He also commented that the SE Chokeberry Avenue needs to be widened to 26 feet, as would Snowberry Lane.

A traffic report addresses traffic impacts under this chapter and is attached herewith.

Lighting will be designed by vendor using LED fixtures on poles at locations to provide an average of 1 footcandle illumination, with cut-off baffles to prevent glare beyond the

property lines.”

#### 16.120.030 Pedestrian Access and Circulation.

A. Pedestrian Access and Circulation. To ensure safe, direct and convenient pedestrian circulation, all developments, except single-family detached housing, duplexes, or triplexes on individual lots, shall provide a continuous pedestrian and/or multi-use pathway system. (Pathways only provide for pedestrian circulation. Multi-use pathways accommodate pedestrians and bicycles.) The system of pathways shall be designed based on the standards in paragraphs 1 through 3 of this subsection:

1. Continuous Pathways. The pathway system shall extend throughout the development site, and connect to all future phases of development, adjacent trails, public parks and open space areas whenever possible. The developer may also be required to connect or stub pathway(s) to adjacent streets and private property, in accordance with the provisions of Section 16.120.020, Vehicular Access and Circulation, and Chapter 16.136, Public Facilities Standards.

2. Safe, Direct, and Convenient Pathways. Pathways within developments shall provide safe, reasonably direct and convenient connections between primary building entrances and all adjacent streets, based on the following definitions:

a. Reasonably Direct. A route that does not deviate unnecessarily from a straight line or a route that does not involve a significant amount of out-of-direction travel for likely users.

b. Safe and Convenient. Bicycle and pedestrian routes that are reasonably free from hazards and provide a reasonably direct route of travel between destinations.

c. For commercial, industrial, mixed use, public, and institutional buildings, the “primary entrance” is the main public entrance to the building. In the case where no public entrance exists, street connections shall be provided to the main employee entrance.

d. For residential buildings the “primary entrance” is the front door (i.e., facing the street). For multifamily buildings in which each unit does not have its own exterior entrance, the “primary entrance” may be a lobby, courtyard or breezeway which serves as a common entrance for more than one dwelling.

3. Connections Within Development. For all developments subject to site design review, pathways shall connect all building entrances to one another. In addition, pathways shall connect

all parking areas, storage areas, recreational facilities and common areas (as applicable), and adjacent developments to the site, as applicable.

4. Street Connectivity. Pathways (for pedestrians and bicycles) shall be provided at or near mid-block where the block length exceeds the length required by Section 16.120.020. Pathways shall also be provided where cul-de-sacs or dead-end streets are planned, to connect the ends of the streets together, to other streets, and/or to other developments, as applicable. Pathways used to comply with these standards shall conform to all of the following criteria:

- a. Multi-use pathways (i.e., for pedestrians and bicyclists) are no less than six feet wide.
- b. If the streets within the subdivision or neighborhood are lighted, the pathways shall also be lighted.
- c. Stairs or switchback paths using a narrower right-of-way/easement may be required in lieu of a multi-use pathway where grades are steep.
- d. The City may require landscaping within the pathway easement/right-of-way for screening and the privacy of adjoining properties.
- e. The Planning Commission or Community Development Director may determine, based upon facts in the record, that a pathway is impracticable due to: physical or topographic conditions (e.g., freeways, railroads, extremely steep slopes, sensitive lands, and similar physical constraints); buildings or other existing development on adjacent properties that physically prevent a connection now or in the future, considering the potential for redevelopment; and sites where the provisions of recorded leases, easements, covenants, restrictions, or other agreements recorded as of the effective date of the ordinance codified in this chapter prohibit the pathway connection.

B. Design and Construction. Pathways shall conform to all of the standards in paragraphs 1 through 5 of this subsection:

1. Vehicle/Pathway Separation. Where pathways are parallel and adjacent to a driveway or street (public or private), they shall be raised six inches and curbed, or separated from the driveway/street by a five-foot minimum strip with bollards, a landscape berm, or other physical barrier. If a raised path is used, the ends of the raised portions must be equipped with curb ramps.

2. Housing/Pathway Separation. Pedestrian pathways shall be separated a minimum of five feet from all residential living areas on the ground floor, except at building entrances. Separation is measured as measured from the pathway edge to the closest dwelling unit. The separation area

shall be landscaped in conformance with the provisions of Chapter 16.128. No pathway/building separation is required for commercial, industrial, public, or institutional uses.

3. Crosswalks. Where pathways cross a parking area, driveway, or street (“crosswalk”), they shall be clearly marked with contrasting paving materials, humps/raised crossings, or painted striping. An example of contrasting paving material is the use of a concrete crosswalk through an asphalt driveway. If painted striping is used, it shall consist of thermo-plastic striping or similar type of durable application.

4. Pathway Surface. Pathway surfaces shall be concrete, asphalt, brick/masonry pavers, or other durable surface, at least six feet wide, and shall conform to ADA requirements. Multi-use paths (i.e., for bicycles and pedestrians) shall be the same materials, at least six feet wide. (See also Chapter 16.136, Public Facilities Standards, for public multi-use pathway standards.)

5. Accessible Routes. Pathways shall comply with the Americans with Disabilities Act, which requires accessible routes of travel.

**Staff Findings:** The application states that “Access is proposed from existing public right of way (Chokeberry) and continues through the site adjoining parking areas and extending to all building entries, providing a safe and convenient system.

Primary pathways intended for both pedestrians and bicycles are 6 ft wide; 5’ at pedestrian only pathways, except those at the rear of the buildings are 4 ft wide and intended only for emergency egress use by pedestrians. Primary pathways are elevated 6 inches above adjacent vehicle areas; curb ramps are provided at all crossings of vehicle areas. At parking areas in front of the buildings, the asphalt paving and concrete walks are flush for ease of access, with precast concrete wheel stops to limit vehicle travel.

Pathways adjacent to buildings are separated by a minimum of 5 ft width of landscaped area from interior living areas. At ground level patios, screening plantings are provided if the separation is less than 5 ft. Crosswalks are distinguished from vehicle areas by use of concrete paving or painted striping. Pathway surfaces are concrete with a slip-resistant texture.

Lighting will be designed by vendor using LED fixtures to provide an average of 1 footcandle illumination; at pathways in vehicle areas, lighting is shared; around buildings, fixtures will be wall-mounted with cut-off baffles.”

Staff notes that the pedestrian facilities terminate at the Snowberry Lane right-of-way.



Sidewalks should be extended on Snowberry and Chokeberry to SE 19<sup>th</sup> Avenue.

**Table 16.128.030.A Off-Street Parking Requirements**

|                                                       |                      |
|-------------------------------------------------------|----------------------|
| Multifamily and single-family attached dwelling       |                      |
| Studio units or 1-bedroom units less than 500 sq. ft. | 1 space per unit     |
| 1-bedroom units 500 sq. ft. or larger                 | 1.5 spaces per unit  |
| 2-bedroom units                                       | 1.75 spaces per unit |
| 3-bedroom or greater units                            | 2 spaces per unit    |

**Staff Finding:** The application includes the following:

Number of parking spaces -

Twenty one-bedroom units over 500 sf @ 1.5 spaces/unit = 30 spaces

Forty-eight two-bedroom units @ 1.75 spaces/unit = 84 spaces

Total required parking = 114 spaces

Parking provided - 114 spaces - complies

Type of parking spaces –

Full size - 70 provided = 61.4%

Compact - 44 provided = 38.6% - complies (40% max)

Size of parking spaces –

Full size, 90 degree – 9 ft x 19 ft with 26 ft two-way aisle

Compact, 90 degree – 8'-0" x 19 ft with 26 ft two-way aisle

Accessible parking –

Number of spaces – 5 total (full size) :

1 van accessible (8 ft aisle), 4 standard (5 ft aisle)

We note that the application elsewhere describes 68 total units, not the 69 used above. Staff counted 44 2-bedroom units and 24 1-bedroom units. By our calculations, the 1-bedroom units would require 36 parking places and the 2-bedroom units would require 77 parking spaces for a total of 113. The application provides for 114, so it complies with the standard. The number of compact spaces and accessible spaces also comply.

#### 16.128.040 Bicycle Parking Requirements.

1. Multifamily Residences. Every residential use of four or more dwelling units provides at least one sheltered bicycle parking space for each dwelling unit. Sheltered bicycle parking spaces may be located within a garage, storage shed, basement, utility room or similar area. In those instances in which the residential complex has no garage or other easily accessible storage unit, the bicycle parking spaces may be sheltered from sun and precipitation under an eave, overhang, an independent structure, or similar cover.

**Staff finding:** The application states that there is bicycle storage for each unit in the lower level of each building. The application satisfies this standard.

#### 16.140 STORMWATER AND SURFACE WATER MANAGEMENT

This chapter spells out the thresholds and standards for stormwater systems designs. A Stormwater and Surface Water Management Report was submitted with the application package. The City Engineer found the stormwater report satisfactory and had two comments:

- It is the responsibility of the developer to provide improvements that will not negatively impact downstream properties. The applicant has been made aware that there is a perceived increase in water elevations near the airport. The airport is downstream of this development.
- The developer shall agree to make all necessary onsite and offsite stormwater improvements if downstream deficiencies are created by the development of this property.

#### 16.188 MULTIFAMILY HOUSING DESIGN STANDARDS

##### 6.188.030 Design Standards.

A. Building Mass Supplemental Standard. The maximum width or length of a multiple-family building shall not exceed 200 feet (from end-wall to end-wall).

B. Common Open Space Standard. Inclusive of required setback yards, a minimum of 20% of the site area shall be designated and permanently reserved as useable common open space in all multiple-family developments. The site area is defined as the lot or parcel on which the

development is planned, after subtracting any required dedication of street right-of-way and other land for public purposes (e.g., public park or school grounds, etc.). Sensitive lands (e.g., wetlands, riparian areas, and riparian setback areas/corridors) and historic buildings or landmarks open to the public and designated by the Comprehensive Plan may be counted towards meeting common open space requirements.

C. Trash Receptacles. Trash receptacles shall be oriented away from adjacent residences and shall be screened with an evergreen hedge or solid fence or wall of not less than six feet.

**Staff findings:** The application presents the following responses:

- A. Building Mass Supplemental Standard: Overall length of each building is 200'-0" end-wall to end-wall; width is about 50 ft.
- B. Common Open Space Standard: Site area not occupied by buildings or vehicle/hardscape and surrounding landscaping totals 300,000 sf +/-, which includes areas designated as wetland, within the power lines easement and designated as stormwater detention, and is 77% +/- of the site area; in addition, each unit includes a private outdoor area: a patio for units at grade and decks for units above grade.
- C. Trash receptacles are enclosed by a six foot minimum height fence with exposed surfaces finished similar to the buildings.
- D. Other features
  - 1. Monument signage complying with vision clearance will be located near the site entry.
  - 2. Mail boxes will be located in central lobby of each building.

The application complies with these standards.

## 16.192 LARGE-SCALE DEVELOPMENTS

16.192.030 A. Unless the Community Development Director (Type I or Type II) or hearings body (Type III) determines that an adequate detailed soil survey has already been undertaken for the entire portion of the site proposed for development, the owner or developer shall have a new soil survey of the site prepared to determine if construction on the site would be hazardous to facilities on the parcel or to nearby property due to the load bearing capacity of the soils, the potential for wind or water erosion, or the wetness or slope characteristics of the soil.

B. The soil survey shall be performed by a registered geotechnical engineer that is licensed in the State of Oregon.

C. If the detailed soil survey indicates that significant amounts of hazardous soils are in locations desired for development, the developer or owner shall submit a report to the City of Warrenton prepared by a licensed geotechnical engineer which indicates suitable techniques to minimize potential soil hazards to facilities on the parcel or to nearby property.

D. The proposed use will only be approved if:

1. The detailed soil survey indicates that there is not a significant amount of hazardous soils on the portion of the site proposed for development; or

2. A method of eliminating hazards which could result from soils on the site prepared by a licensed geotechnical engineer and submitted to the City of Warrenton Planning and Building Department for review by a City-appointed engineer who will be paid by the developer and/or property owner.

**Staff Finding:** A geotechnical report prepared by a registered geotechnical engineer was submitted as part of the application package. There is indication that it is inadequate.

E. If a detailed soil survey indicates that corrosive resistant materials are appropriate for pipes or foundations associated with the development, the City-appointed engineer may require that suitable materials be used for the pipes or foundations.

#### 16.192.040 Stormwater Management.

The applicant shall submit a stormwater management plan, which shall meet the criteria of Chapter 16.140 of this Code, to the City of Warrenton Planning and Building Department for review for the proposed development that is prepared by a registered engineer currently licensed in the State of Oregon.

**Staff finding:** The stormwater management plan was addressed above.

#### 16.192.050 Utilities.

A. The applicant shall provide detailed information and analyses, as necessary, to the City of Warrenton to allow the City to assess the expected impacts of the development on the capacity of Warrenton's water, sewer, and transportation. The development will only be allowed if sufficient capacity exists or suitable evidence indicates it will exist prior to completion of the development

construction. In deciding the sufficiency of capacity, consideration will be given to possible increases in flows resulting from activities of existing system users and from facilities which are likely to be built due to the proposed use, but are not part of the development.

B. On-site water supply, sewage disposal, access and circulation, shall be approved by the Warrenton Public Works Director. The development will not be allowed unless satisfactory provisions are made for these facilities. Satisfactory provisions, in part, mean that the size of any water lines, sewer lines, access roads, and drainage-ways will be sufficient to meet the needs of the development and, where desirable, accommodate growth in other areas. Suitable arrangement, including dedication of land or use of easements, shall be made so that the City will be able to maintain appropriate water, sewer, street, and drainage facilities. The construction of lengthy pressure-forced sewer lines to the site which by-pass undeveloped properties will be discouraged.

C. Utility lines in the development (including electricity, communications, street lighting and cable television) shall be placed underground. Appurtenances and associated equipment such as surface mounted terminal boxes and meter cabinets may be placed above ground.

D. All utilities shall be installed in conformance with this Code and City construction standards.

**Staff findings:** The City Engineer made the following comments:

- Video inspection of the existing sewer system (manhole to manhole) is necessary to verify the quality and capacity of the system prior to submitting Construction Drawings. Inspection shall be completed per Oregon Standard Specifications.
- Water meter and air release size and vault locations will need to be coordinated with PW. As noted in the Impact Assessment, a backflow preventer will also be necessary for this development.
- Developer is responsible for determining available fire flows and shall measure actual flows once the proposed waterline is constructed.
- A shut off valve is required on the private force main. The valve shall be located near the discharge manhole.
- Control of Hydrogen Sulfide gas produced in the private pump station and force main may be required. Developer shall submit an analysis of probable hydrogen sulfide concentration at the discharge manhole and propose solutions to control these levels if they exceed Oregon DEQ guidelines.

Pacific Power also commented that it has no objections. See email from Marilyn Brockey.

Generally, the city utilities appear to be adequate to serve the development, but some localized detailed investigations are necessary.

16.192.060 Schools.

Evidence indicating that local schools will be capable of accommodating the children from the development must be submitted in conjunction with proposals for large-scale residential development.

**Staff Finding:** The applicant submitted a statement from the property manager at a similar development in the region stating resulted in few school age children residing in that development, and that the size of the dwelling units and market he is targeting with this proposal would yield similar results. Staff finds that acceptable.

16.192.070 Landscape Suitability.

The development shall comply with the provisions of a landscape plan which is consistent with Chapter 16.124 of this Code.

**Staff finding:** The landscape plan shows a planting plan with trees and shrubs in the front of the two buildings and along the drive aisle and parking areas with vine maples along the north side of Building 2. A note states that all disturbed areas will be hydroseeded, but does not describe whether the seed mix will be merely for erosion control or more typical lawn mix. The vast majority of the site which has not or will not be disturbed will remain in existing native vegetation. Staff could find no calculations of the area of ornamental landscaping in the application package.

16.192.080 Signs.

All signs of any type within the development are subject to design review and approval by the Community Development Director or hearings body (Type III). The City shall consider each sign on its merits based on the aesthetic impact on the area, potential traffic hazards, and need for the sign. No sign shall violate provisions in Chapter 16.144.

**Staff finding:** The application states that “A single monument sign is proposed for the area near the entry to the site; its design will be submitted for review at a future time.” Staff finds this acceptable.

## CONCLUSIONS AND RECOMMENDATION

The findings above demonstrate that the application generally satisfies the development standards and criteria of the applicable chapters of the develop code. With the following conditions, the proposed project will be fully consistent. Staff recommends approval subject to the following conditions:

1. Construction Documents shall meet all requirements of federal, state, and local standards, codes, ordinances, guidelines and/or other legal requirements.
2. Prior to approval of construction plans the developer will waive any and all rights to remonstrate against the formation of a Local Improvement District (LID) for the purpose of making sanitary sewer, storm sewer, water or street improvements that benefit the property and assessing the cost to benefited properties pursuant to the City's regulations in effect at the time of such improvement.
3. It is the responsibility of the developer to provide improvements that will not negatively impact downstream properties. The applicant has been made aware that there is a perceived increase in water elevations near the airport. The airport is downstream of this development.
4. The developer shall agree to make all necessary onsite and offsite stormwater improvements if downstream deficiencies are created by the development of this property.
5. Developer will coordinate with City to located refuse containers in an acceptable location. One container does not appear to be appropriate for this size of development. This location shall be approved prior to submittal of construction plans.
6. Video inspection of the existing sewer system (manhole to manhole) is necessary to verify the quality and capacity of the system prior to submitting Construction Drawings. Inspection shall be completed per Oregon Standard Specifications.
7. Water meter and air release size and vault locations will need to be coordinated with PW. As noted in the Impact Assessment, a backflow preventer will also be necessary for this development.
8. Developer is responsible for determining available fire flows and shall measure actual flows once the proposed waterline is constructed.
9. A shut off valve is required on the private force main. The valve shall be located near the discharge manhole.
10. Control of Hydrogen Sulfide gas produced in the private pump station and force main may be required. Developer shall submit an analysis of probable hydrogen sulfide concentration at the discharge manhole and propose solutions to control these levels if they exceed Oregon DEQ guidelines.
11. Relocation of the Food Bank's dumpsters shall be approved by the City prior to approval of construction plans.

12. Maintenance of Snowberry Lane will be the responsibility of the owner and shall be noted on the final design plans and as-builts.
13. Relocation of the Food Bank's storm drain outfall shall be completed prior to approval of construction plans.
14. The developer shall be responsible for the widening of SE Chokeberry Avenue and Snowberry Lane to 26 feet between the curbs and aligned to the extent practicable with that stretch of SE Chokeberry Avenue south of SE 19<sup>th</sup> Avenue. The developer shall also be responsible for extending a sidewalk from the subject property along Snowberry Lane and SE Chokeberry Avenue to SE 19<sup>th</sup> Avenue.
15. All infrastructure (such as access / emergency roads and fire hydrants) will be in place and operational, to the Fire Departments satisfaction, before building can take place.
16. Since the Fire Department access road into the complex (including the emergency access and turn around) are private property, an agreement will be required to allow enforcement of any violations that would impede or hinder Fire Department operations in the area.
17. The emergency access point off SE Ensign Lane is acceptable with structures that are sprinkled and alarmed.
18. The emergency access point off SE Ensign Lane will be provided with a bollard / gate / access system that is acceptable to the Fire Department.
19. Adequate fire flows will be demonstrated to the Fire Departments satisfaction before building will be allowed.
20. Only the site plan is approved with these conditions. It does not include approval for the structures, fire suppression equipment or life safety systems.
21. Curbs along the drive aisle where parking spaces are not provided shall be painted red and signs shall be posted at locations approved by the Fire Chief stating "No Parking—Fire Lane."
22. Prior to the issuance of building permits, a supplemental landscape plan shall be submitted for approval by the Community Development Director detailing the areal calculations of ornamental plantings, natural vegetation, and the seed mix in the proposed hydroseed. The triangular area between the parking areas in the northwest portion of the site shall be planted to lawn.

Suggested motion: *Based on the findings and conclusion of the September 7, 2017 staff report, I move approve Site Design Review Application 17-3 submitted by Dick Krueger for the Tract A Apartments, subject to the 22 conditions included in the staff report.*



## Skip Urling

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**From:** Michael Summers <msummers@co.clatsop.or.us>  
**Sent:** Friday, August 25, 2017 2:06 PM  
**To:** Skip Urling  
**Subject:** RE: DRS 7908\_Willow

Skip,

Here are my comments for the Tract A Kreuger Apartments Project:

The Emergency Access driveway to Ensign Lane needs a barrier to limit access to emergency vehicle only. The emergency access to Ensign Lane needs a road approach permit from Clatsop County Public Works in order to begin construction.

The impact statement refers to some improvements by others at Snowberry and Chokeberry, which are to be completed prior to development. What are these improvements and what happens if the others fail to complete them?

The impact statement refers to a traffic analysis by Lancaster, could I please review this analysis.

Michael Summers, PE  
Clatsop County Public Works Director

1100 Olney Avenue  
Astoria OR, 97103  
Phone: (503) 325-8631  
Fax: (503) 325-9312

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**From:** CASWELL Matthew C [<mailto:Matthew.C.CASWELL@odot.state.or.us>]  
**Sent:** Friday, August 25, 2017 1:49 PM  
**To:** 'Skip Urling'  
**Cc:** KEARNS Richard A; WILLIAMS Virginia L; Michael Summers  
**Subject:** RE: DRS 7908\_Willow

Skip,  
When do you need comments?

**Matt Caswell, P.E.**  
Oregon Department of Transportation  
Development Review Coordinator  
Region 2, 455 Airport Rd SE, Bldg. B  
Salem, OR 97301-5395  
503.986.2849 (Office)  
503.986.2630 (FAX)  
e-mail: [matthew.c.caswell@odot.state.or.us](mailto:matthew.c.caswell@odot.state.or.us)



## Skip Urling

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**From:** CASWELL Matthew C <Matthew.C.CASWELL@odot.state.or.us>  
**Sent:** Wednesday, August 30, 2017 2:40 PM  
**To:** Skip Urling  
**Cc:** 'Michael Summers'; KEARNS Richard A; WILLIAMS Virginia L; BUFFINGTON Mark W  
**Subject:** Track A Apartments - SDR App Kruger - Warrenton

Skip,

Thank you for the opportunity to review and comment on the Willow Drive Apartment Complex, or Track Apartments. ODOT has no objections, conditions or requirements in regards to the use of the existing approach on US 101 Business. However, the emergency use only approach to Ensign lane should have some type of gate or barrier in place when it's not in use to keep the general public from using the approach.

Thanks,

**Matt Caswell, P.E.**

Oregon Department of Transportation

Development Review Coordinator

Region 2, 455 Airport Rd SE, Bldg. B

Salem, OR 97301-5395

503.986.2849 (Office)

503.986.2630 (FAX)

e-mail: [matthew.c.caswell@odot.state.or.us](mailto:matthew.c.caswell@odot.state.or.us)





**CITY OF WARRENTON**  
**PUBLIC WORKS**

**Review Memorandum**

To: Skip Urling, Community Development Director  
From: Collin Stelzig, City Engineer  
Cc: Jim Dunn, Public Works Director  
Date: August 30, 2017

Regarding: Forest Rim Apartments – Taxlot Key 81027DD00100 – Planning Submittal

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The following comments apply to the planning submittal for the Forest Rim Apartments. This memorandum is intended to review the provided documents and determine the functionality of the development and provide comments to the Community Development Director and Planning Commission. This memorandum is not a detailed review of Design Documents.

**Documents Reviewed**

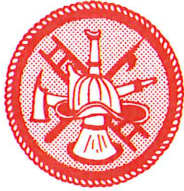
- |                                            |                |
|--------------------------------------------|----------------|
| • Narrative                                | July 10, 2017  |
| • Impact Assessment Report                 | August 3, 2017 |
| • Traffic Impact Study                     | March 15, 2017 |
| • Preliminary Stormwater Management Report | August 2, 2017 |
| • Geotechnical Report                      | April 6, 2017  |
| • Drawings                                 |                |
| ○ Existing Condition and Site Plan         | July 14, 2017  |
| ○ Site Improvement Plan                    | July 14, 2017  |
| ○ Fire Access Details                      | July 14, 2017  |

**Comments and Conditions**

1. Construction Documents shall meet all requirements of federal, state, and local standards, codes, ordinances, guidelines and/or other legal requirements.
2. Prior to approval of construction plans the developer will waive any and all rights to remonstrate against the formation of a Local Improvement District (LID) for the purpose of making sanitary sewer, storm sewer, water or street improvements that benefit the property and assessing the cost to benefited properties pursuant to the City's regulations in effect at the time of such improvement.
3. It is the responsibility of the developer to provide improvements that will not negatively impact downstream properties. The applicant has been made aware that there is a perceived increase in water elevations near the airport. The airport is downstream of this development.
4. The developer shall agree to make all necessary onsite and offsite stormwater improvements if downstream deficiencies are created by the development of this property.

5. Developer will coordinate with City to located refuse containers in an acceptable location. One container does not appear to be appropriate for this size of development. This location shall be approved prior to submittal of construction plans.
6. Video inspection of the existing sewer system (manhole to manhole) is necessary to verify the quality and capacity of the system prior to submitting Construction Drawings. Inspection shall be completed per Oregon Standard Specifications.
7. Water meter and air release size and vault locations will need to be coordinated with PW. As noted in the Impact Assessment, a backflow preventer will also be necessary for this development.
8. Developer is responsible for determining available fire flows and shall measure actual flows once the proposed waterline is constructed.
9. A shut off valve is required on the private force main. The valve shall be located near the discharge manhole.
10. Control of Hydrogen Sulfide gas produced in the private pump station and force main may be required. Developer shall submit an analysis of probable hydrogen sulfide concentration at the discharge manhole and propose solutions to control these levels if they exceed Oregon DEQ guidelines.
11. Relocation of the Food Bank's dumpsters shall be approved by the City prior to approval of construction plans.
12. Maintenance of Snowberry Lane will be the responsibility of the owner and shall be noted on the final design plans and as-builts.
13. Relocation of the Food Bank's storm drain outfall shall be completed prior to approval of construction plans.





# Warrenton Fire Department

P.O. Box 250 Warrenton, OR 97146-0250 503/861-2494 Fax 503/861-2351

## **MEMORANDUM**

**To:** Skip Urling, Community Development Director  
**Date:** August 31, 2017  
**From:** Tim Demers, Fire Chief  
**Re:** Krueger Tract A apartments off Chokeberry site design comments

---

### **ACCESS:**

All points around the structures appear to be accessed within 150 feet.

Access around the building perimeter in the form of a 4 foot wide walkway/sidewalk has been provided. The type of gravel surface will need to be preapproved by the Fire Department.

The Fire Department access requiring a 26 foot wide drive aisle is present. No parking signage and curb painting should be detailed in drawings following the site plan approval. The pavement provided satisfies the all-weather surface requirement and should be capable of carrying 60,000 lbs. The grade should not exceed 10% and approach and departure angles will have to be preapproved. The proposed Fire Apparatus Drive Aisle appears to be negotiable by the attached turning models based on apparatus wheelbase.

The building sides fronting the drive aisle appear to be adequately spaced no closer than 15 feet and no farther than 30 feet away. There can be no overhead utilities crossing, within or between the buildings and the drive aisle.

Corner radiuses appear to be adequate based on the apparatus wheelbase model.

The proposed alternative hammerhead will provide an adequate turn around. The entire alternative hammerhead must have all of the curbs painted red and No Parking, Fire Lane signs installed at pre-approved, regular intervals. The Fire Department is not in favor of the refuse container in the proposed turn around location.

The Chokeberry access to the Food Bank would have to be brought up to an acceptable street standard for the Fire Department before an access from the proposed Snowberry Lane would be considered. Currently the site plan shows an acceptable emergency access point off SE Ensign Lane provided the structures are sprinkled and alarmed. However, it would be preferred that this development have two separated access and egress points.

### **WATER SUPPLY:**

Water supply for the development will need to be calculated depending on the R2 occupancy and construction type of the buildings. Fire flows for the buildings with sprinkler systems and construction

type dependent, may be kept within 1500 GPM. Current hydrant flows will need to be verified by the developer and flows calculated at new proposed locations to confirm adequate fire flows.

It appears that all of the structures are within 200 feet of the two proposed fire hydrants. The proposed fire hydrant locations are acceptable to the Fire Department. Please note that the locations of the hydrants may not be encumbered by parking or landscaping and should be readily visible from the drive aisle.

The fire hydrant detail shows the proper Mueller 2500 Centurion hydrant with 2 each, 2.5 inch, and one each 4.5 inch discharge ports. Also, a permanent 4.5 inch to 5 inch Storz connection will be provided by the developer for each.

Depending on size, construction and occupancy of the buildings, they may require a commercial sprinkler system. Each commercial system must have a remote Fire Department Connection and accompanying Post Indicator Valve. If this is the case the FDC and PIV must be within 50 feet of a hydrant. Also each building will be required to have a sprinkler room that can easily be accessed from the outside of the structure. That location shall be pre-approved by the Fire department.

**ADDRESSING:**

The building will be addressed with contrasting color letters placed on the building facing the Fire Department access. The Fire Department will approve the size, color and location of the address numbers.

**BUILDING ACCESS:**

Each building / occupancy shall be provided with GE Supra lock box complete with keys for emergency entrance by Fire Department personnel. The exact location of the lock box shall be determined by the Fire Department prior to installation. If any of the structures require a sprinkler system the Fire Department access to that room will also need a separate lock box. Remote Post Indicator Valve locks will have a key placed inside the key box as well.

**ALARM SYSTEM:**

Both buildings shall be fully alarmed and monitored with a fire alarm system that meets the requirements of NFPA 72, most current edition.

**CONDITIONS:**

1. The Chokeberry access to the Food Bank would have to be brought up to a street standard that is acceptable to the Fire Department before building can begin and access from the proposed Snowberry Lane would be considered.
2. All infra-structure (such as access / emergency roads and fire hydrants) will be in place and operational, to the Fire Departments satisfaction, before building can take place.
3. Since the Fire Department access road into the complex (including the emergency access and turn around) are private property, an agreement will be required to allow enforcement of any violations that would impede or hinder Fire Department operations in the area.
4. The emergency access point off SE Ensign Lane is acceptable with structures that are sprinkled and alarmed.
5. The emergency access point off SE Ensign Lane will be provided with a bollard / gate / access system that is acceptable to the Fire Department.
6. Adequate fire flows will be demonstrated to the Fire Departments satisfaction before building will be allowed.
7. Only the site plan is approved with these conditions. It does not include approval for the structures, fire suppression equipment or life safety systems.

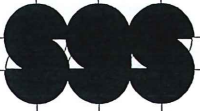




PACIFIC RIM APARTMENTS

DRAWING LEGEND

- A0 RENDERING
- A1.1 BUILDING 1 PLANS
- A1.2 BUILDING 1 PLANS
- A1.3 BUILDING 2 PLANS
- A1.4 BUILDING 2 PLANS
- A2.1 ELEVATIONS
- A2.2 ELEVATIONS
- A3.1 SECTION
- A3.2 SECTION



STEWART GORDON STRAUS  
ARCHITECT PC  
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SUITE #100  
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(503) 672-7517 (OFFICE)  
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sgs@s-strauss.com (e-mail)



PACIFIC RIM  
APARTMENTS  
WARRENTON, OREGON

PROJECT  
NUMBER: 1714

| DRAWING | DATE | BY |
|---------|------|----|
| DESIGN  |      |    |

LAND USE PERMIT  
10 JULY 2017 SGS

SHEET TITLE  
RENDERING

SHEET #  
A0



# PLANT LEGEND

| SYM. | #    | BOTANICAL                        | COMMON                        | SIZE          |
|------|------|----------------------------------|-------------------------------|---------------|
| AC   | 6    | ACER CIRCINATUM                  | NATIVE VINE MAPLE             | 1-1/2 IN CAL  |
| AS   | 6    | ABELIA GRANDIFLORA               | GLOSSY ABELIA                 | 5 GAL         |
| ARA  | 6    | ACER R. "ARMSTRONG"              | COLUNAR RED MAPLE             | 1-1/2 IN CAL  |
| AU24 | 15BT | ARCTOSTAPHYLOS UVAURS-24IN-O.C.  | NATIVE KINKIKINICK            | 4 IN 24" O.C. |
| AZD  | 10   | AZALEA "DELAWARE VALLEY WHITE"   | DELAWARE VALLEY WHITE AZALEA  | 2 GAL         |
| AZF  | 11   | AZALEA "FLAME CREEPER"           | FLAME CREEPER AZALEA          | 2 GAL         |
| CAS  | 1    | CEDRUS ATLANTICA GLAUC           | ATLANTIC CEDAR                | 1-1/2 IN CAL  |
| CCL  | C6   | CROCOSMIA CURTISUS "LUCIFER"     | CROCOSMIA                     | 1 GAL         |
| COS  | 4    | CHAMAECYPARIS OBTUSA "GRACILIS"  | BLENDER HINOKI CYPRESS        | 1-1/2 IN CAL  |
| ECV  | 5T   | ERICA CARNEA "VIVELLII"          | SPRING HEATHER                | 1 GAL         |
| FH   | 6    | FUSCHIA H. "SANTA CLAUS"         | EVERGREEN FUSCHIA             | 2 GAL         |
| FJ   | 2    | FATSIA JAPONICA                  | JAPANESE ARALIA               | 5 GAL         |
| HH   | 12   | HOSTA HONEYBELLS                 | FRAGRANT HOSTA                | 1 GAL         |
| IS   | 10   | IBERIS SEMPERVIRENS              | CANDYTUFF                     | 1 GAL         |
| JS   | 2    | JUNIPERUS C. "SKYROCKET"         | SKYROCKET JUNIPER             | 5FT - 6FT     |
| KL   | 3    | KALMIA LATIFOLIA "Heart of Fire" | Heart of Fire MOUNTAIN LAUREL | 5 GAL         |
| LDI  | 15   | LITHODORA DIFFUSA                | LITHODORA                     | 1 GAL         |
| NDH  | 54   | NANDINA DOMESTICA "HARBOR DYARF" | HARBOR NANDINA                | 2 GAL         |
| OD   | 15   | OSMANTHUS DELAVAYI               | DELAVAY OSMANTHUS             | 2 GAL         |
| PT   | 105  | PACHYSANDRA TERMINALIS           | PACHYSANDRA                   | 4 IN 24" O.C. |
| RM   | 15   | ROSA MEIDLAND "SCARLET"          | SCARLET MEIDLAND ROSE         | 2 GAL         |
| RP   | 16   | RHOODODENDRON "P.J.M."           | P.J.M. RHODY                  | 2 GAL         |
| RUM  | 11   | RHAMNUS L. MINOR "GULF GREEN"    | DWARF YEDDO HANTHORN          | 2 GAL         |
| SH   | 23   | SARCOCOGCA H. "HUMILIS"          | LOM SARCOCOGCA                | 1 GAL         |
| SJ   | 8    | STYRAX JAPONICA                  | JAPANESE SNOWBELL             | 1-1/2 IN CAL  |
| SR   | 6    | SARCOCOGCA RUSCIFOLIA            | TALL SARCOCOGCA               | 2 GAL         |
|      | 8    | ZELKOYA SERRATA GREEN VASE       | GREEN VASE ZELKOYA            | 1-1/2 IN CAL  |

NOTE: ALL DISTURBED SURFACES TO BE HYDROSEEDED

**MULCH**

**DARRELL MULCH**  
LANDSCAPE  
ARCHITECTURE

1907 N.E. 66TH AVENUE #168  
PORTLAND, OREGON 97213  
(503) 222-7416 TEL

REGISTERED  
315  
*Darrell Mulch*  
OREGON  
10-18-93  
LANDSCAPE ARCHITECT

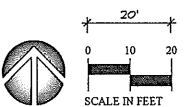
## Tract A Apartments

WARRENTON, OREGON  
Dick Krueger

DATE: 7-13-17  
PROJECT NO: X  
DESIGNED: DM  
DRAWN: DM  
CHECKED: DM  
REVISIONS:

SHEET  
**L1**  
1

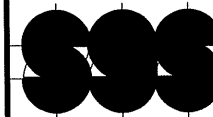
ATTENTION: Oregon law requires you to follow rules adopted by the Oregon Utility Notification Center. Those rules are set forth in OAR 952-001-0010 through OAR 952-001-0090. You may obtain copies of the rules by calling the center. (Note: the telephone number for the Oregon Utility Notification Center is (503) 232-1987).



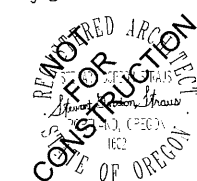
**PLANTING PLAN**

SEED WATER QUALITY FACILITY TO CITY STANDARDS.





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sgs@s-strauss.com (e-mail)



TRASH

PACIFIC RIM  
APARTMENTS  
WARRENTON, OREGON

PROJECT  
NUMBER: 1714

| DRAWING | DATE | BY |
|---------|------|----|
| DESIGN  |      |    |

| LAND USE PERMIT  |
|------------------|
| 10 JULY 2017 SGS |

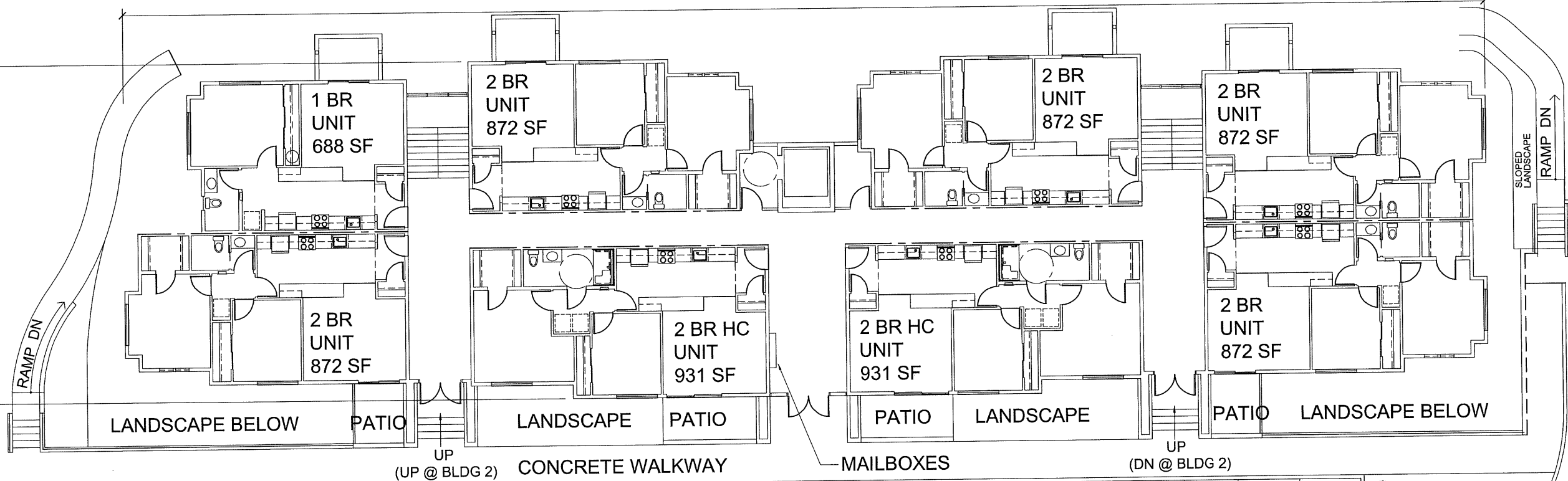
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BLDG PLANS

SHEET #  
A1.1

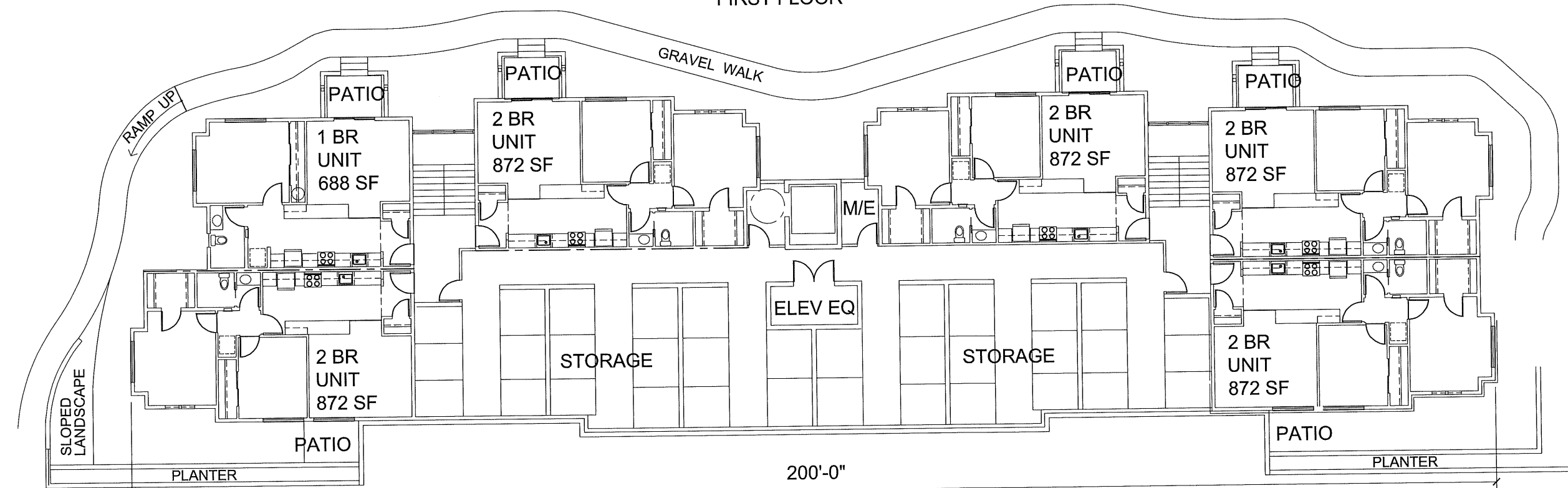
200'-0"

49'-0"

12'-10"



FIRST FLOOR



200'-0"

LOWER LEVEL



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APARTMENTS  
WARRENTON, OREGON

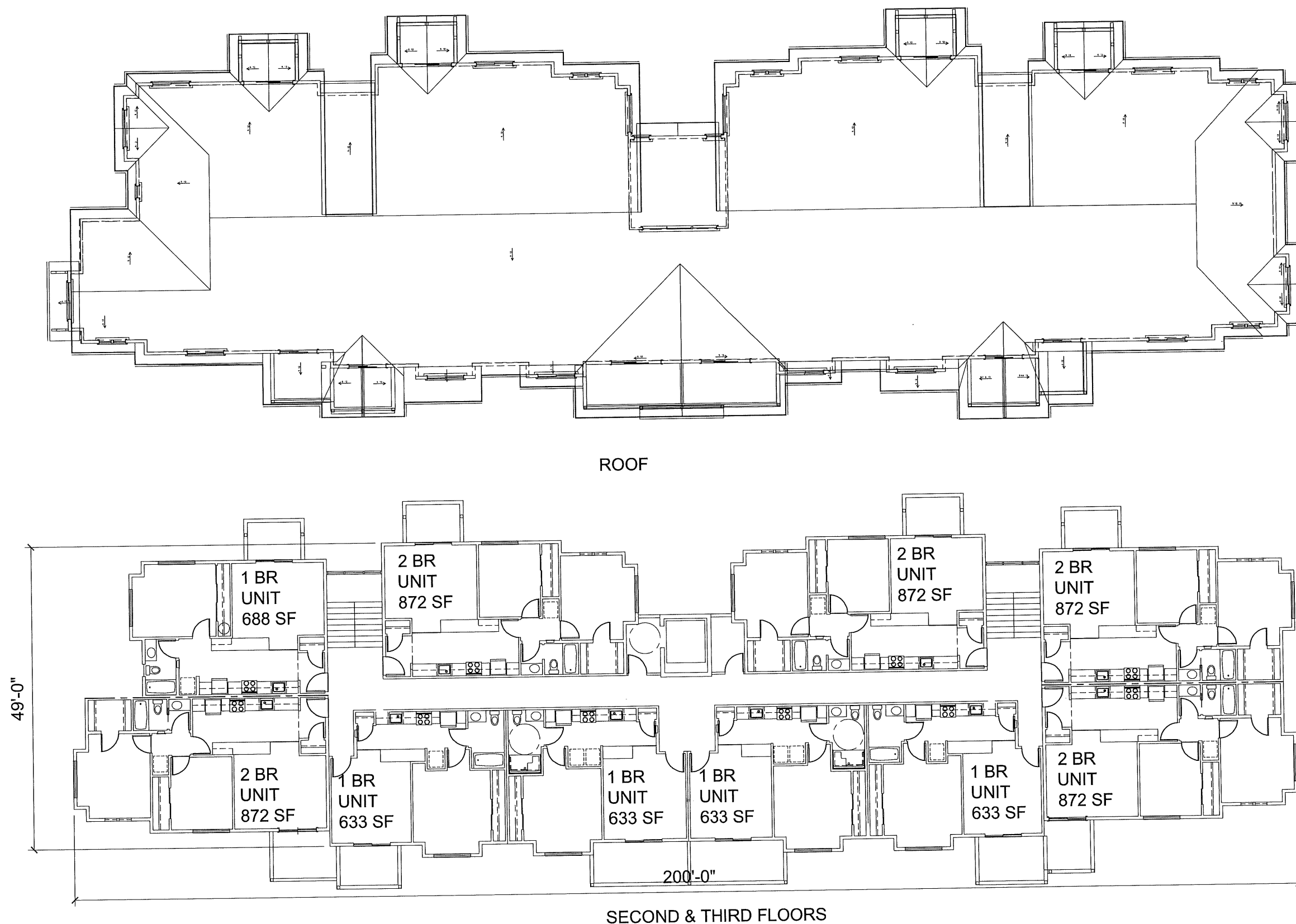
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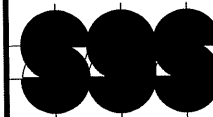
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| DESIGN  |      |    |

| LAND USE PERMIT  |
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| 10 JULY 2017 SGS |

SHEET TITLE  
BLDG PLANS

| SHEET # |
|---------|
| A1.2    |





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APARTMENTS  
WARRENTON, OREGON

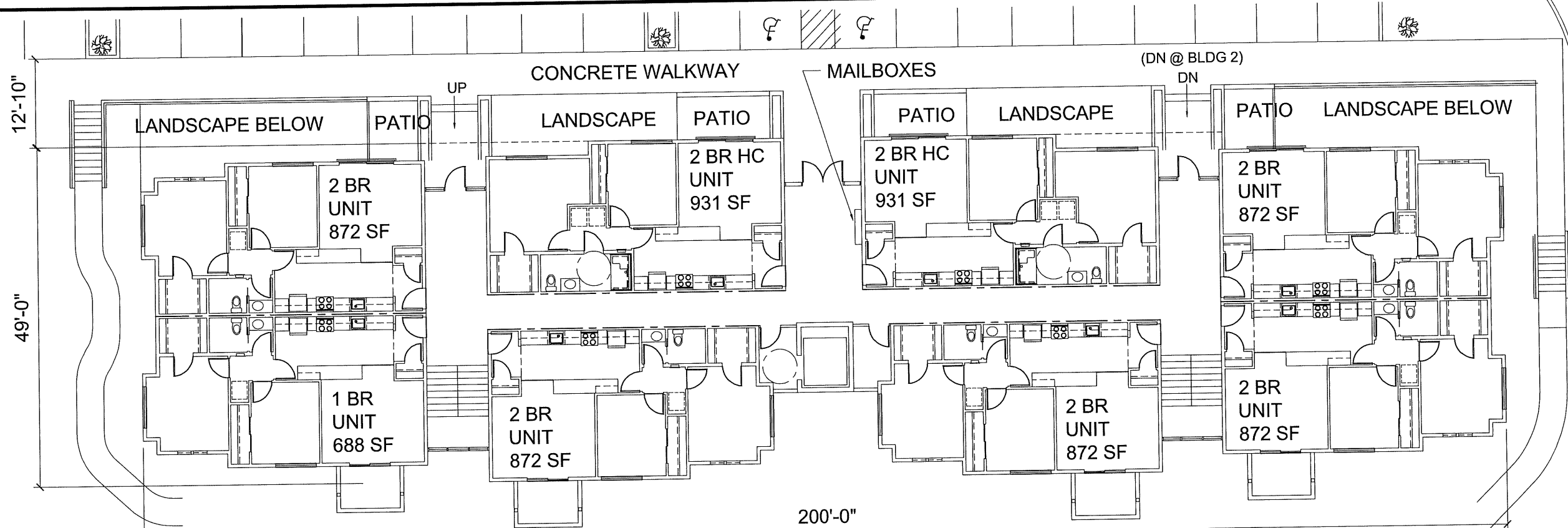
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| DRAWING | DATE | BY |
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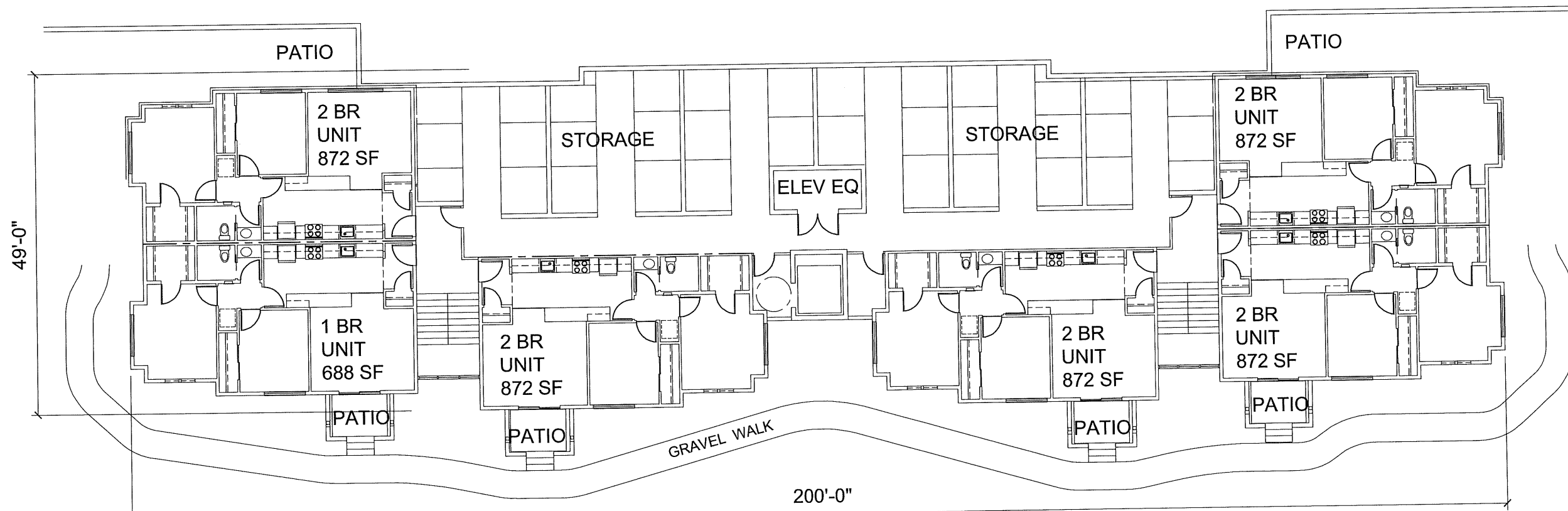
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| LAND USE PERMIT | 10 JULY 2017 | SGS |
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SHEET TITLE  
BLDG PLANS

|         |      |
|---------|------|
| SHEET # | A1.3 |
|---------|------|



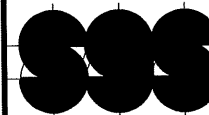
FIRST FLOOR



LOWER LEVEL

1/8" = 1'-0"

 BUILDING 2



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PACIFIC RIM  
APARTMENTS  
WARRENTON, OREGON

PROJECT  
NUMBER: 1714

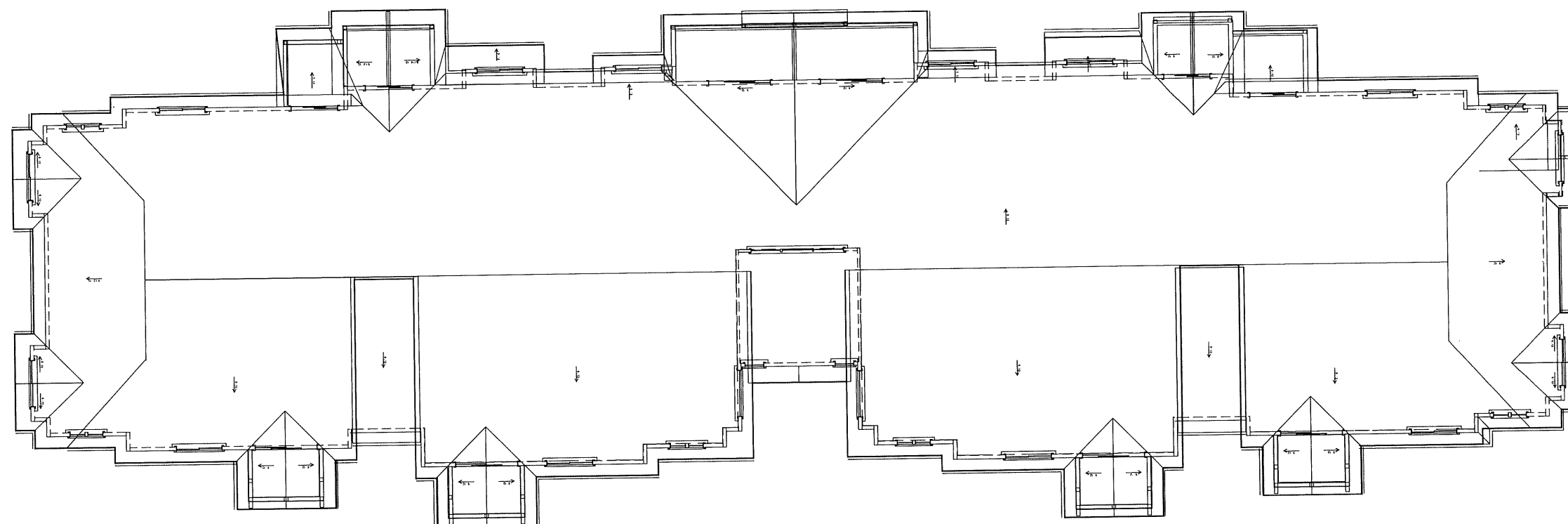
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| DESIGN  |      |    |

|                 |             |     |
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| LAND USE PERMIT | 7 JULY 2017 | SGS |
|-----------------|-------------|-----|

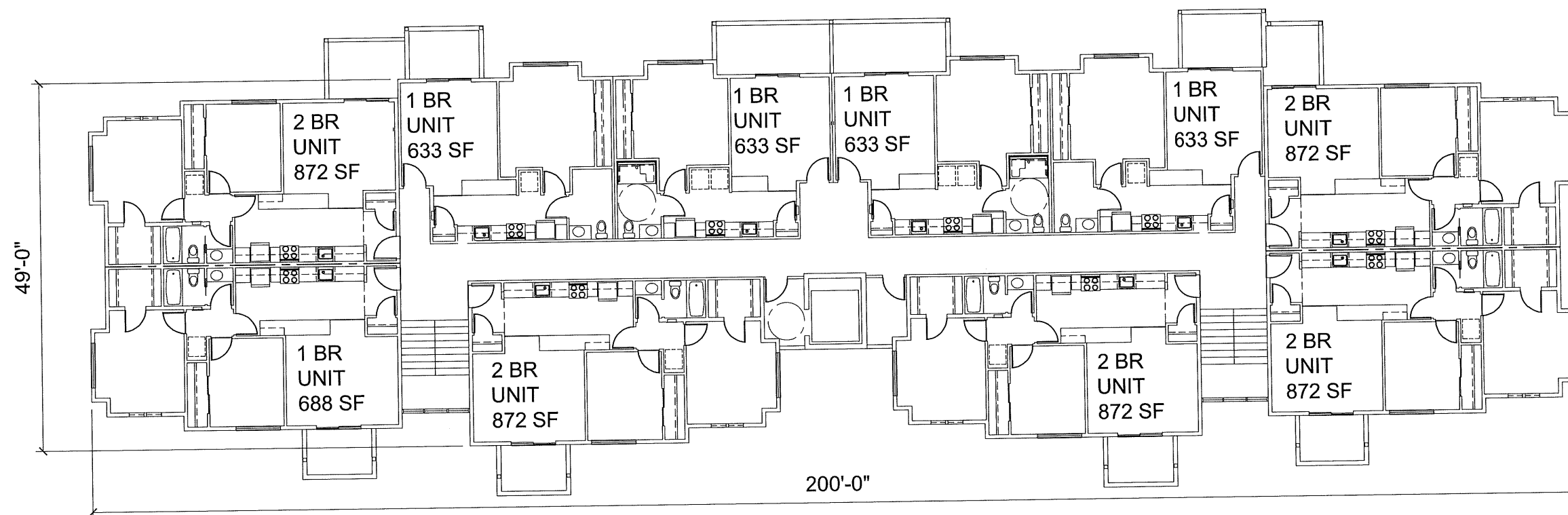
SHEET TITLE  
BLDG PLANS

SHEET #

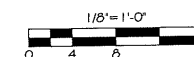
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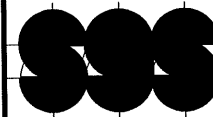
ROOF



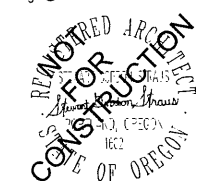
SECOND & THIRD FLOORS



BUILDING 2



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WARRENTON, OREGON

PROJECT  
NUMBER: 1714

| DRAWING | DATE | BY  |
|---------|------|-----|
| DESIGN  |      | SGS |

LAND USE PERMIT  
10 JULY 2017 SGS

SHEET TITLE  
BLDG ELEVATIONS

SHEET #  
A2.1

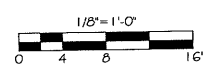


FRONT ELEVATION  
(BUILDINGS 1 & 2)



NORTH ELEVATION  
(BUILDING 1)

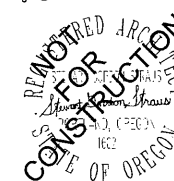
- ELEVATION LEGEND (X)
- 1 HEAVY TEXTURE COMPOSITION SHINGLES
  - 2 FIBER CEMENT SHINGLE SIDING
  - 3 FIBER CEMENT HORIZONTAL SIDING
  - 4 FIBER CEMENT BOARD & BATT SIDING
  - 5 WOOD POST & BEAM STRUCTURE STAINED FINISH
  - 6 WHITE VINYL WINDOWS W/ WHITE TRIM
  - 7 SYNTHETIC STONE VENEER
  - 8 GLAZED ALUMINUM ENTRY
  - 9 ALUMINUM GUARDRAIL SYSTEM
  - 10 ALUMINUM HANDRAIL & GUARDRAIL SYSTEM
  - 11 PAINTED WOOD BAND OR WOOD ORNAMENT







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APARTMENTS  
WARRENTON, OREGON

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| DESIGN  |      | SGS |

| LAND USE PERMIT |     |
|-----------------|-----|
| 10 JULY 2017    | SGS |

SHEET TITLE  
BLDG ELEVATIONS

SHEET #  
A2.2

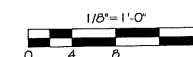


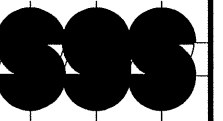
BACK ELEVATION  
(BUILDING 1 & BUILDING 2 SIMILAR)



SOUTH ELEVATION  
(BUILDING 1 & BUILDING 2 REVERSED)

- ELEVATION LEGEND (X)
- 1 HEAVY TEXTURE COMPOSITION SHINGLES
  - 2 FIBER CEMENT SHINGLE SIDING
  - 3 FIBER CEMENT HORIZONTAL SIDING
  - 4 FIBER CEMENT BOARD & BATT SIDING
  - 5 WOOD POST & BEAM STRUCTURE STAINED FINISH
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  - 11 PAINTED WOOD BAND OR WOOD ORNAMENT



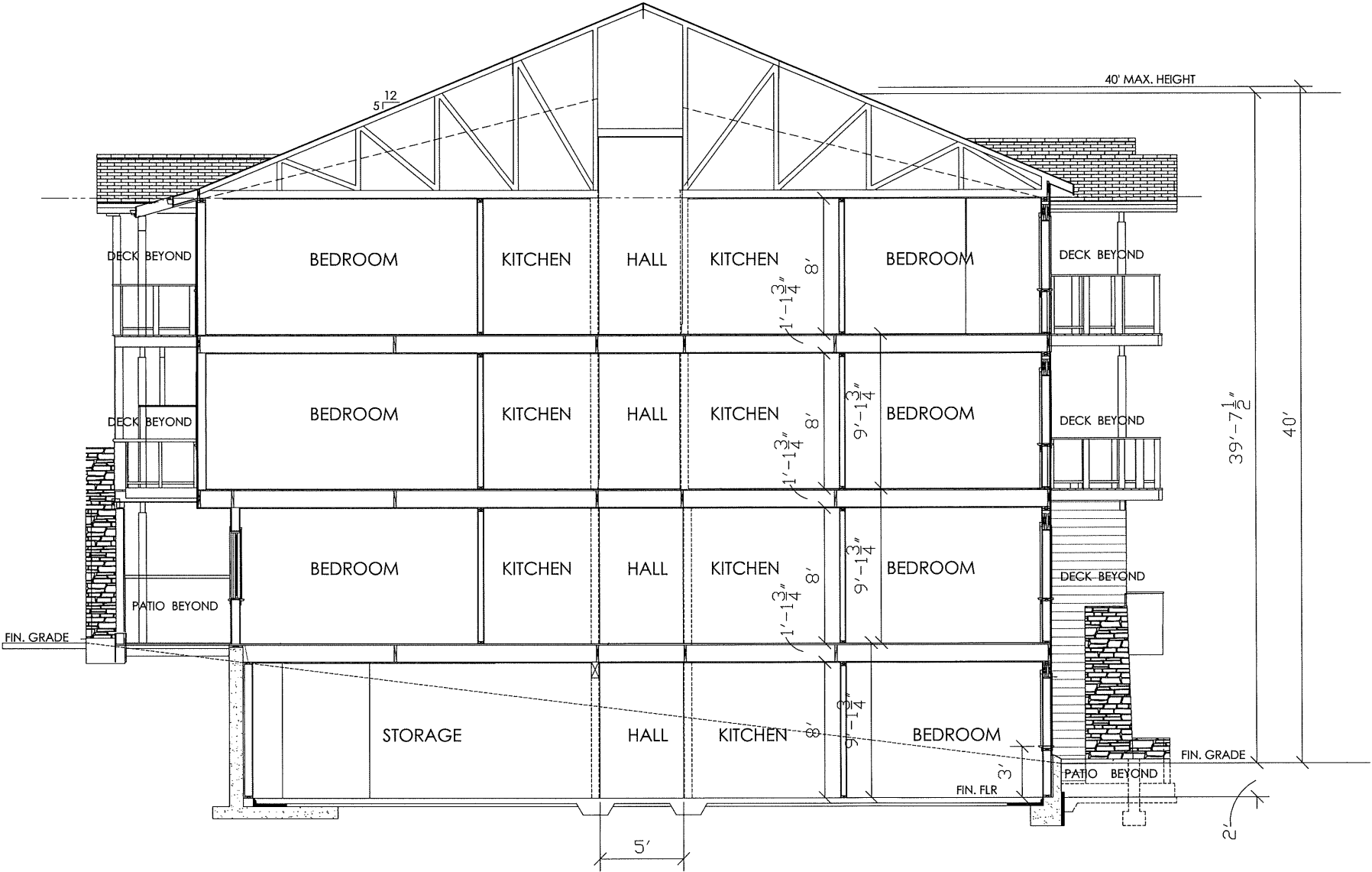


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APARTMENTS  
WARRENTON, OREGON

|                      |              |     |
|----------------------|--------------|-----|
| PROJECT NUMBER: 1714 |              |     |
| DRAWING              | DATE         | BY  |
| DESIGN               |              |     |
|                      |              |     |
| LAND USE REVIEW      |              |     |
|                      | 10 JULY 2017 | SGS |
|                      |              |     |
|                      |              |     |
|                      |              |     |
|                      |              |     |
| SHEET TITLE          |              |     |
| BLDG SECTIONS        |              |     |
| SHEET #              |              |     |
| A 3.1                |              |     |



TYPICAL SECTION



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PACIFIC RIM  
APARTMENTS  
WARRENTON, OREGON

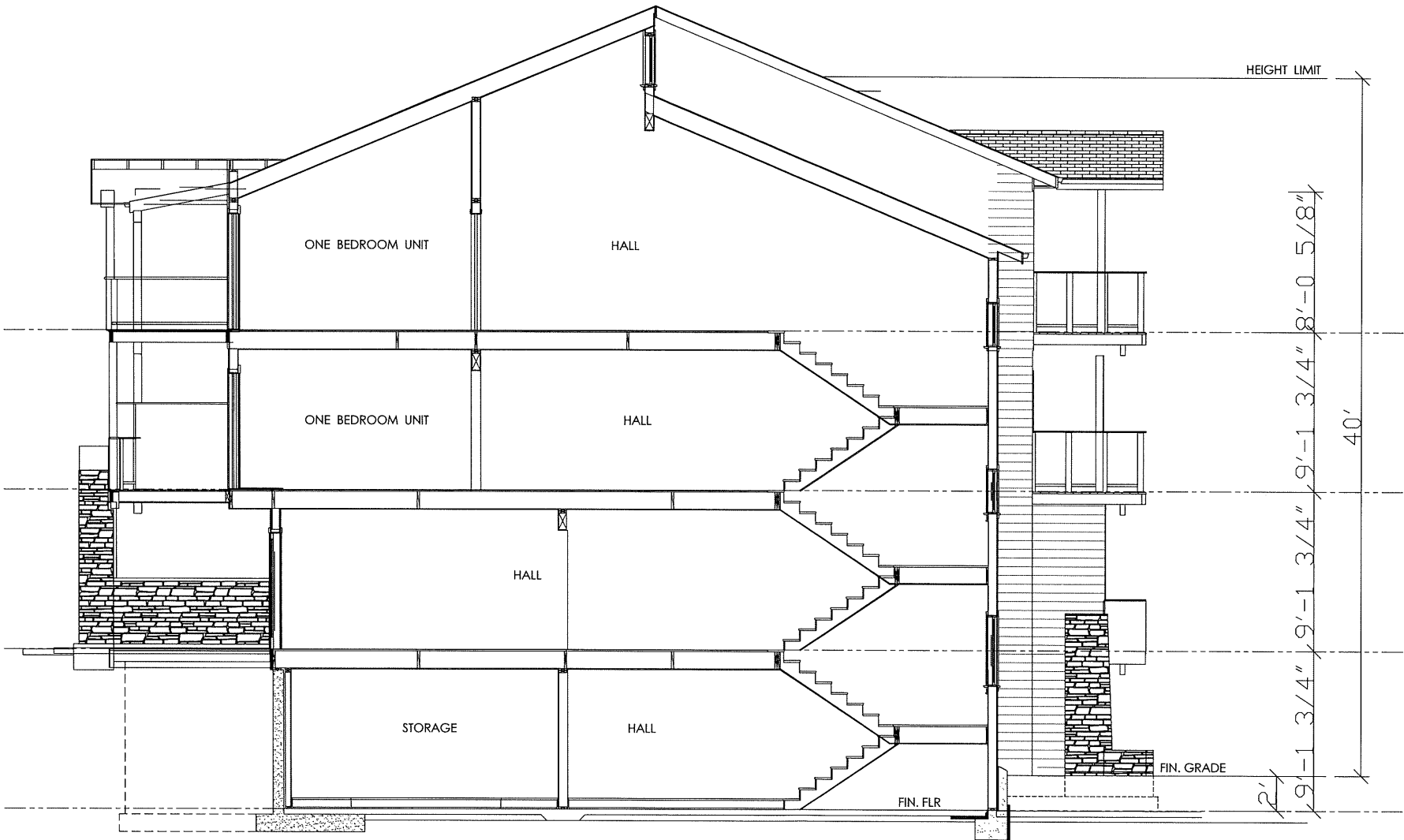
PROJECT  
NUMBER: 1714

| DRAWING | DATE | BY |
|---------|------|----|
| DESIGN  |      |    |

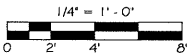
| LAND USE REVIEW  |
|------------------|
| 10 JULY 2017 SGS |

SHEET TITLE  
BLDG SECTIONS

SHEET #  
A 3.2



SECTION AT STAIRS





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1. ATTENTION CONTRACTORS: OREGON LAW REQUIRES YOU TO FOLLOW THE RULES ADOPTED BY THE OREGON UTILITY NOTIFICATION CENTER. THOSE RULES ARE SET FORTH IN OAR 952-001-0010 THROUGH OAR 952-001-0090. YOU MAY OBTAIN COPIES OF THE RULES BY CALLING THE CENTER. (NOTE: THE TELEPHONE NUMBER FOR THE OREGON UTILITY NOTIFICATION CENTER IS (503) 232-1897 OR 1-800-332-2344). AT LEAST TWO (2) BUSINESS DAYS PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL NOTIFY THE OREGON UTILITY NOTIFICATION CENTER OF THE DATE AND LOCATION OF THE PROPOSED CONSTRUCTION, AND THE TYPE OF WORK TO BE PERFORMED.
2. ALL EXISTING FACILITIES TO BE MAINTAINED IN-PLACE BY THE CONTRACTOR UNLESS OTHERWISE SHOWN OR DIRECTED. CONTRACTOR TO LEAVE EXISTING FACILITIES IN AN EQUAL OR BETTER THAN ORIGINAL CONDITION AND TO THE SATISFACTION OF THE ENGINEER.
3. IN ACCORDANCE WITH O.R.S.290.140, IF THE CONTRACTOR FINDS IT NECESSARY TO INTERFERE WITH OR PAVE OVER ANY ESTABLISHED PUBLIC LAND SURVEY CORNER OR ITS ACCESSORIES, WITHIN THE PROJECT LIMITS, THE CONTRACTOR SHALL NOTIFY THE COUNTY SURVEYOR PRIOR TO DOING SO.
4. IN ACCORDANCE WITH O.R.S.290.150, CONTRACTOR SHALL BE RESPONSIBLE FOR REPLACING ALL SURVEY MONUMENTS DISTURBED OR DESTROYED DURING CONSTRUCTION. REPLACING THE SURVEY MONUMENTS SHALL BE DONE BY A REGISTERED LAND SURVEYOR AT THE EXPENSE OF THE CONTRACTOR.
5. EXISTING UTILITY LOCATIONS SHOWN (PLAN & PROFILE) ARE APPROXIMATE ONLY. NO PREDESIGN POT-HOLING WAS DONE TO ESTABLISH THESE LOCATIONS. CONTACT UTILITY COMPANIES FOR PREMARKING. CONTRACTOR TO POT-HOLE EXISTING UTILITIES AT CONNECTION & CROSSING LOCATIONS TO VERIFY DEPTH, LOCATION & TYPE OF EXISTING WATER MAIN, SEWER MAIN & STORM MAIN PRIOR TO ORDERING CONNECTION MATERIALS. NOTIFY ENGINEER IMMEDIATELY IF EXISTING CONDITIONS VARY FROM THAT SHOWN. NOTIFY ENGINEER 24 HOURS PRIOR TO POT-HOLING.
6. CONTRACTOR SHALL VERIFY ALL CONDITIONS ON THE JOB SITE INCLUDING ALL DIMENSIONS, GRADES, ELEVATIONS, EXTENT AND COMPATIBILITY TO THE EXISTING SITE CONDITIONS, AND WITH THE WORK DESCRIBED ON THE CONTRACT DRAWINGS. ANY DISCREPANCIES OR UNEXPLAINED CONDITIONS THAT AFFECT OR CHANGE THE WORK DESCRIBED IN THE CONTRACT DOCUMENTS SHALL BE BROUGHT TO THE ENGINEER'S ATTENTION IMMEDIATELY. CONTRACTOR SHALL NOT PROCEED WITH ANY OF THE WORK IN THE AREA OF DISCREPANCIES UNTIL ALL SUCH DISCREPANCIES ARE RESOLVED. IF THE CONTRACTOR CHOOSES TO DO SO, THEN IT IS UNDERSTOOD THAT HE SHALL BE PROCEEDING AT HIS OWN RISK AND INCUR ALL COST, IF ANY, TO RESOLVE THE ISSUE TO THE SATISFACTION OF THE ENGINEER.
7. TECHNICAL SPECIFICATIONS FOR CONSTRUCTION ARE TO FOLLOW THE CONTRACT SPECIFICATIONS AND THE MOST CURRENT EDITION OF THE IBC, UPC, OREGON STANDARD SPECIFICATIONS FOR CONSTRUCTION (ODOT/APWA) SHALL BE REFERENCED WHERE CONTRACT SPECIFICATIONS DO NOT ADDRESS A SPECIFIC ITEM. SEE SPECIFICATIONS FOR CONSTRUCTION METHODS AND OTHER NOTES PERTINENT TO THIS PROJECT.
8. UPON COMPLETION OF CONSTRUCTION OF THE PROJECT, CONTRACTOR TO SUBMIT RECORD DRAWINGS TO THE ENGINEER. THE PROJECT SHALL NOT BE CONSIDERED COMPLETE UNTIL RECORD DRAWINGS ARE ACCEPTED.
9. CONTRACTOR MAY ENCOUNTER HIGH GROUND-WATER TABLE AT SITE LOCATION. CONTRACTOR SHALL ANTICIPATE AND COORDINATE ANY AND ALL Dewatering TECHNIQUES NECESSARY AND/OR REQUIRED TO COMPLETE PROJECT AS SPECIFIED IN THE TECHNICAL SPECIFICATIONS. CONTRACTOR SHALL BEAR ALL COSTS PERTAINING TO Dewatering EFFORTS.

10. CONTRACTOR SHALL RESTORE ALL SURFACES TO MATCH EXISTING AND ADJACENT GRADES.

1. ALL DESIGN ELEVATIONS SHOWN SHALL BE CONSIDERED TO BE FINISH SURFACE ELEVATIONS UNLESS OTHERWISE NOTED. ALL SURFACES SHALL BE GRADED SMOOTH AND FREE OF IRREGULARITIES THAT COULD ACCUMULATE SURFACE WATER.
2. THE CONTRACTOR SHALL HAVE A SUFFICIENT NUMBER OF COMPACTION TESTS PERFORMED TO MEET SPECIFICATION REQUIREMENTS AT THE CONTRACTOR'S EXPENSE. TESTS SHALL BE PERFORMED BY A QUALIFIED TESTING AGENCY AND WRITTEN RESULTS SHALL BE PROVIDED TO THE APPROPRIATE AGENCY. SHOULD COMPACTION REQUIREMENTS NOT BE MET, CONTRACTOR SHALL RECOMPACT AND PAY ALL ADDITIONAL TESTING COSTS RELATED TO THE RECOMPACTION.

13. CONTRACTOR SHALL ERECT AND MAINTAIN BARRICADES, WARNING SIGNS, TRAFFIC CONES PER ODOT REQUIREMENTS. ACCESS TO EXISTING DRIVEWAYS AND BUSINESSES TO BE MAINTAINED AT ALL TIMES. CONTRACTOR SHALL REPLACE ALL SIGNS REMOVED DURING CONSTRUCTION. CITY TO APPROVE INSTALLATION.

14. THE CONTRACTOR SHALL DEVELOP AND SUBMIT A TRAFFIC CONTROL PLAN FOR REVIEW AND APPROVAL. THE TRAFFIC CONTROL PLAN SHALL DETAIL KEY INTERSECTIONS WITHIN THE PROJECT ZONE. THE CONTRACTOR SHALL FURNISH AND PLACE TRAFFIC CONTROL BARRICADES AND SIGNS ACCORDING TO THE MUTCD AND ODOT SPECIFICATIONS. THE CONTRACTOR SHALL USE CONES, DELINEATORS, DETOUR SIGNS AND BARRICADES TO KEEP VEHICULAR AND PEDESTRIAN TRAFFIC OUT OF THE IMMEDIATE CONSTRUCTION ZONE OF THE CONTRACTOR. ALL SIGNS AND BARRICADES MUST BE APPROVED BY THE COUNTY OF CLATSOP AND THE ENGINEER PRIOR TO ORDERING.

13. GEOTECHNICAL EVALUATION OF THIS SITE WAS PROVIDED BY RAPID SOIL SOLUTIONS. SEE MOST CURRENT GEOTECHNICAL REPORT FOR RECOMMENDATIONS REGARDING SITE PREPARATION, GRADING, AND CONSTRUCTION. GEOTECHNICAL DESIGN, ENGINEERING AND CONSTRUCTION METHODS FOR EARTH WORK OPERATIONS, TEMPORARY OR PERMANENT BRACING, SHORING, UNDERPINNING, AND EARTH RETENTION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. THE FOLLOWING ARE THE RECOMMENDATIONS OF THE GEOTECHNICAL ENGINEER, RAPID SOIL SOLUTIONS, SHALL BE OBSERVED ON ALL CONSTRUCTION TECHNIQUES INVOLVED IN THE WORK, INCLUDING, BUT NOT LIMITED TO, WALL DESIGN, CHECKING AND APPROVAL OF TEMPORARY OR PERMANENT BRACING, INCLUDING, UNDERPINNING, AND EARTH RETENTION. THE CONTRACTOR SHALL CONSTRUCT THE METHODS FOR SOLUTION OF PROBLEMS THAT MAY BE ENCOUNTERED DURING EXECUTION OF THE WORK SUCH AS SETTLEMENT AND/OR DAMAGE TO SUCH SURROUNDING STRUCTURES AS SIDEWALKS, ROADS, UTILITIES, AND EMBANKMENTS ON OWNER'S PROPERTY, AND ON PROPERTY ADJOINING THE WORK.



NO SCALE



NO SCALE

**ELECTRICITY**  
PACIFIC POWER  
ATTN: MARILYN BROCKEY  
2340 SE DOLPHIN  
WARRENTON, OR 97146  
503-861-6005  
503-861-6020 (FAX)

**CABLE TELEVISION**  
CHARTER COMMUNICATIONS  
ATTN: RICH MCCANN  
419 GATEWAY  
ASTORIA, OR 97103  
503-735-5887  
503-235-7421 (FAX)

**GAS**  
NORTHWEST NATURAL GAS  
ATTN: RICH GIRARD  
220 2ND AVENUE  
PORTLAND, OR 97209  
503-226-4211 EXT. 2980  
503-281-6169 (CELL)

**ENGINEER**  
OTAK, INC.  
ATTN: ADAM DAILEY, P.E.  
2533 HWY 101, NORTH  
SEASIDE OR, 97138  
(503) 738-3425  
(503) 738-7455 (FAX)

**ARCHITECT**  
STEWART GORDON STRAUSS ARCHITECT, PC  
ATTN: RUTH STRAUSS  
12600 CRESCENT STREET, SUITE 100  
BEAVERTON, OR 97005  
(503) 672-7517

**GEOTECHNICAL ENGINEER**  
RAPID SOIL SOLUTIONS, LLC  
ATTN: MIA MUMFORD-SEXTON  
3915 SW FLAMM ST.  
PORTLAND, OR 97219  
(503) 816-3689

**TELEPHONE**  
CENTURYLINK  
ATTN.: MIKE WEISNER  
481 INDUSTRY  
ASTORIA, OR 97103  
503-242-7676  
503-242-8449 (FAX)

**ONE CALL CENTER**  
1-800-332-2344 OR 811

**CITY OF WARRENTON**  
ATTN: JIM DUNN  
PUBLIC WORKS DIRECTOR  
45 SW 2ND ST.  
WARRENTON, OR 97146  
(503) 861-0917  
(503) 861-9661 (FAX)

OWNER  
RICHARD KRUEGER  
P.O. BOX 32  
NORTH PLAINS, OR 97133  
(503) 804-1745

**STRUCTURAL ENGINEER**  
MASSAD ENGINEERING GROUP, INC.  
ATTN: GABY MASSAD, P.E., S.E.  
6775 SW 111TH AVE, SUITE 20  
BEAVERTON, OR 97008  
(503) 486-5387  
(503) 486-5097 (FAX)

**EROSION AND SEDIMENT CONTROL INSPECTOR**  
JOHN EDWARDS  
4253-A HWY 101 NORTH  
SEASIDE OR, 97138  
(503) 738-3425  
(503) 738-7455 (FAX)

| <u>SHEET</u> | <u>DESCRIPTION</u>                |
|--------------|-----------------------------------|
| C1           | COVER SHEET                       |
| C2           | EXISTING CONDITIONS AND SITE PLAN |
| C3           | GRADING PLAN                      |
| C4           | UTILITY PLAN                      |
| C5           | FIRE ACCESS DETAILS               |
| C6           | PROPERTY BOUNDARY AND DIMENSIONS  |
| C7           | DETAILS                           |
| C8           | DETAILS II                        |

| EXISTING                                                                              |                            | PROPOSED                                                                              |                            |
|---------------------------------------------------------------------------------------|----------------------------|---------------------------------------------------------------------------------------|----------------------------|
|  | MAJOR CONTOURS 5' INTERVAL |  | MAJOR CONTOURS 5' INTERVAL |
|  | MINOR CONTOURS 1' INTERVAL |  | MINOR CONTOURS 1' INTERVAL |
|  | WATER LINE                 |  | SAWCUT                     |
|  | CATCH BASIN                |  | PROPERTY LINE              |
|  | OVERHEAD POWER             |  | WETLAND BOUNDARY           |
|  | GAS LINE                   |  | WATER LINE                 |
|  | SEWER LINE                 |  | SANITARY SEWER LINE        |
|  | ASPHALT                    |  | STORM LINE                 |
|  | FIRE HYDRANT               |  | CATCH BASIN                |
|  | SANITARY SEWER MANHOLE     |  | FIRE HYDRANT               |
|  | UTILITY POLE               |  | RETAINING WALL             |
|  | EDGE OF CONCRETE           |  | STORM DRAIN MANHOLE        |
|  | WATER VALVE                |  | SANITARY SEWER WETWELL     |
|  | EDGE OF VEGETATION         |  | SANITARY SEWER CLEANOUT    |
|                                                                                       |                            |  | ASPHALT                    |
|                                                                                       |                            |  | CONCRETE                   |
|                                                                                       |                            |  | CRUSHED ROCK               |
|                                                                                       |                            |  | CONCRETE VALLEY GUTTER     |
|                                                                                       |                            |  | BUILDING                   |
|                                                                                       |                            |  | RETAINING WALL             |

## 30% – PLANNING SET

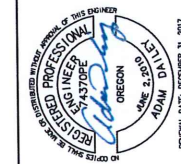
**TRACT A APARTMENTS**  
SITE IMPROVEMENT PLANS  
COVER SHEET  
WARRENTON, CLATSOP COUNTY, OR



4253-A HWY 101 N.  
GEARHART, OREGON 97138  
Phone: (503) 738-3425  
FAX: (503) 738-7455  
Internet: WWW.OTAK.COM  
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Project No. Drawing No.

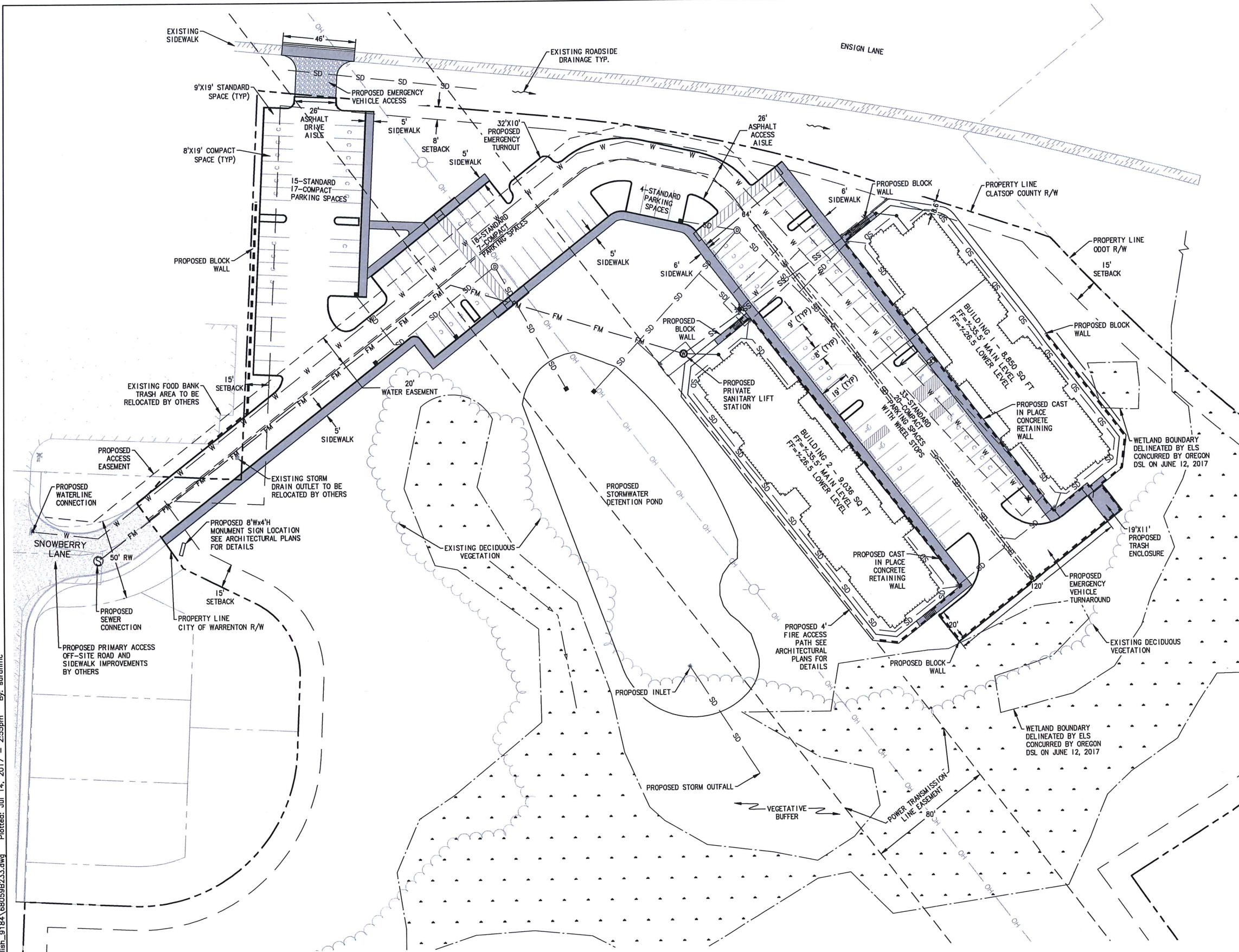
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ADAM DAVID





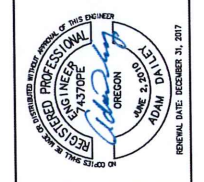
## SITE INFORMATION

GROSS AREA = 383,362 SF  $\approx$  8.80 ACRES

PARKING PROVIDED - 114 SPACES TOTAL  
44 COMPACT  
70 STANDARD  
4 STANDARD DISABLED PERSON  
1 VAN ACCESSIBLE DISABLED PERSON

PARKING REQUIREMENT PER WMC 16.128.030  
114 TOTAL PARKING SPACES  
45 COMPACT SPACES MAXIMUM  
5 ADA TOTAL ADA SPACES MINIMUM  
1 VAN ADA SPACES MINIMUM

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TRACT A APARTMENTS  
SITE IMPROVEMENT PLANS  
EXISTING CONDITIONS AND SITE PLAN  
WARRENTON, CLATSOP COUNTY, OR



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60 30% - PLANNING SET

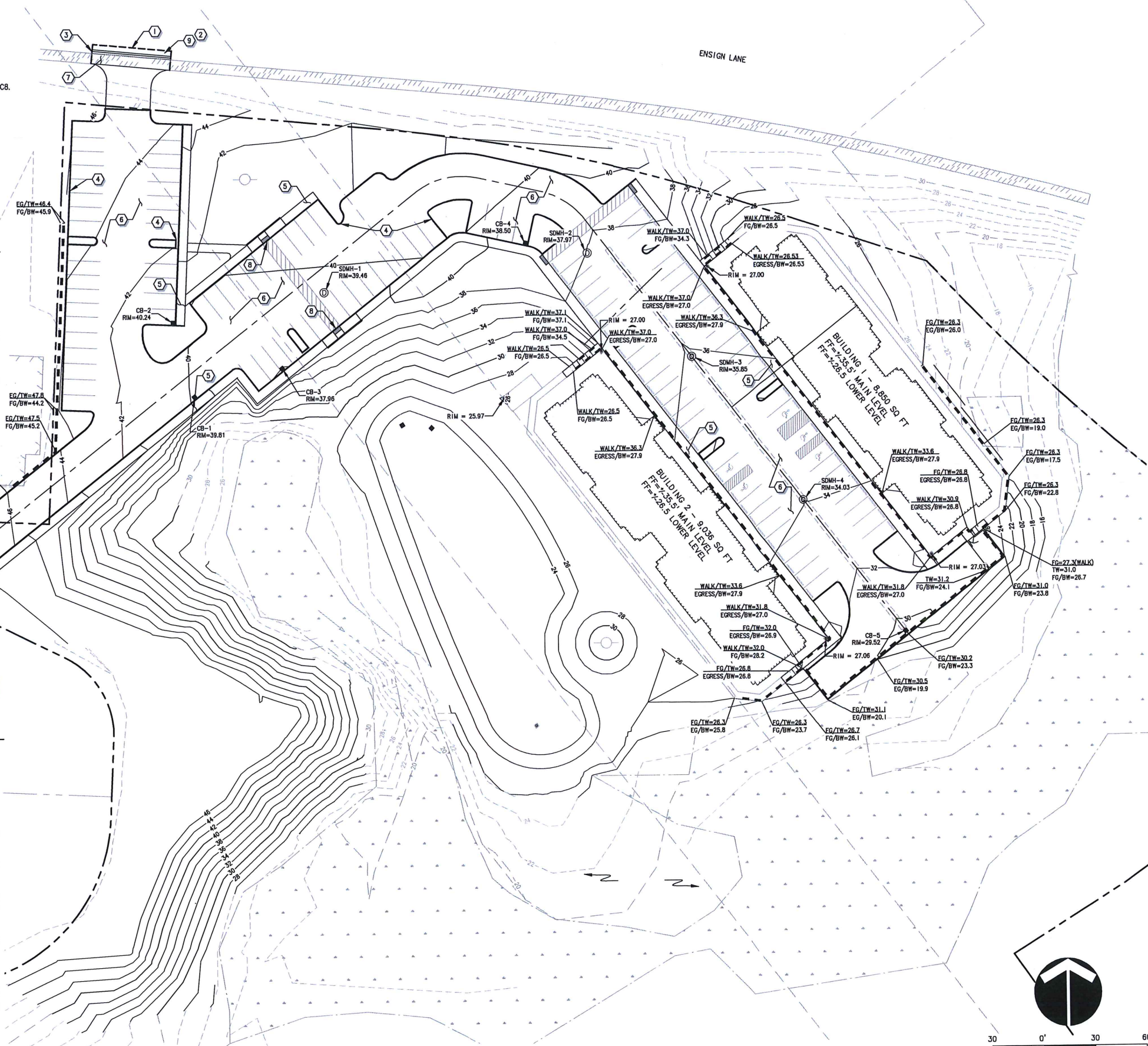


- 1 SAWCUT EXISTING AC/CONCRETE.
- 2 MATCH EXISTING GRADE ALONG SAWCUT.
- 3 CONSTRUCT LOW PROFILE MOUNTABLE CURB AND TRANSITION, SEE DETAILS 2 AND 4, SHEET C8.
- 4 CONSTRUCT STANDARD CURB, SEE DETAIL 6, SHEET C8.
- 5 CONSTRUCT CONCRETE SIDEWALK, SEE DETAIL 3, SHEET C8.
- 6 CONSTRUCT ASPHALT DRIVE AND PARKING, SEE DETAIL 1, SHEET C8.
- 7 CONSTRUCT REINFORCED CONCRETE EMERGENCY ACCESS APRON, SEE DETAIL 7, SHEET C8.
- 8 CONSTRUCT CONCRETE SIDEWALK RAMP WITH DETECTABLE WARNINGS.
- 9 CONSTRUCT ASPHALT PATCH IN MAXIMUM 2" LIFTS, MATCH EXISTING ASPHALT THICKNESS.

1. EXISTING UNDERGROUND UTILITIES TO BE SUPPORTED, SECURED AND MAINTAINED AS NECESSARY TO ALLOW INSTALLATION OF NEW UTILITY LINES. CONTRACTOR SHALL POTHOLE ALL UTILITY CROSSINGS, EXISTING UTILITY LOCATIONS AND DEPTHS MIN. 24 HRS IN ADVANCE OF CONSTRUCTION, TYP. (SUBSURFACE EXPLORATION) DIG WITH EXTREME CAUTION.
2. CONTRACTOR SHALL PROTECT REMAINING VEGETATION AND LANDSCAPE AND TAKE EVERY NECESSARY PRECAUTION TO PROTECT AND STABILIZE DURING CONSTRUCTION. CONTRACTOR SHALL RESTORE ADJACENT AREAS TO EQUAL OR BETTER CONDITION UPON COMPLETION OF THE PROJECT.
3. PROTECT EXISTING ASPHALT SURFACES & STRUCTURES DURING CONSTRUCTION. CONTRACTOR SHALL RESTORE ADJACENT AREAS TO EQUAL OR BETTER CONDITION UPON COMPLETION OF THE PROJECT.
4. CONTRACTOR TO POTHOLE AND VERIFY ALL CONNECTIONS TO EXISTING UTILITIES BEFORE ORDERING MATERIALS.
6. CONTRACTOR TO CONDUCT TESTING, DISINFECTION AND FLUSHING OF WATER SYSTEM INCLUDING NEW WATER SERVICE LINE ASSEMBLIES.

BW=BOTTOM OF RETAINING WALL  
EG=EXISTING GROUND  
FG=FINISHED GRADE  
TW=TOP OF RETAINING WALL  
RIM=UTILITY STRUCTURE ELEVATION

1. ALL PLACEMENT AND COMPACTION OF NATIVE AND IMPORTED FILL MATERIAL SHALL BE PERFORMED IN ACCORDANCE WITH THE MOST CURRENT WARRENTON APARTMENTS GEOTECHNICAL REPORT PREPARED BY RAPID SOIL SOLUTIONS.
2. ALL WASTE MATERIALS SHALL BE REMOVED FROM SITE IMMEDIATELY. STOCKPILE OF WASTE SHALL NOT BE PERMITTED ON SITE.
3. CONTRACTOR SHALL SWEEP ADJACENT ROADS AND PAVED SURFACES AT THE END OF EACH DAY TO REMOVE SOIL OR OTHER MATERIALS TRACKED OFF-SITE.
4. PERMIT TO PERFORM OPERATIONS IN THE RIGHT OF WAY SHALL BE OBTAINED FROM THE APPLICABLE AGENCY BY CONTRACTOR PRIOR TO COMMENCING WORK WITHIN RIGHTS OF WAY.
5. EROSION CONTROL MEASURES SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF DEQ 1200-C PERMIT #32150 PRIOR TO COMMENCING ANY GROUND DISTURBING ACTIVITY.
6. EXPOSED SOIL SHALL BE IMMEDIATELY STABILIZED TO CONTROL SEDIMENT AND EROSION IN ACCORDANCE WITH 1200-C PERMIT REQUIREMENTS.
7. WETLAND BOUNDARIES SHOWN HEREON WERE DELINEATED BY ECOLOGICAL LAND SERVICES JANUARY 17, 2017 AND VERIFIED WITH PETER RYAN OF OREGON DSL ON JUNE 7, 2017. SEE DSL REFERENCE WD2017-0169 FOR ADDITIONAL INFORMATION AS NECESSARY. GRADING, PLACEMENT OF FILL, OR CONSTRUCTION OPERATIONS SHALL NOT BE PERMITTED WITHIN DELINEATED WETLAND BOUNDARIES.



GRADING PLAN  
SCALE: 1" = 30'

30 0' 30 60

SCALE IN FEET

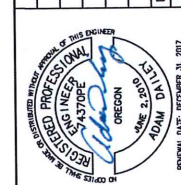
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**TRACT A APARTMENTS**  
SITE IMPROVEMENT PLANS  
GRADING PLAN  
WARRENTON, CLATSOP COUNTY, OR



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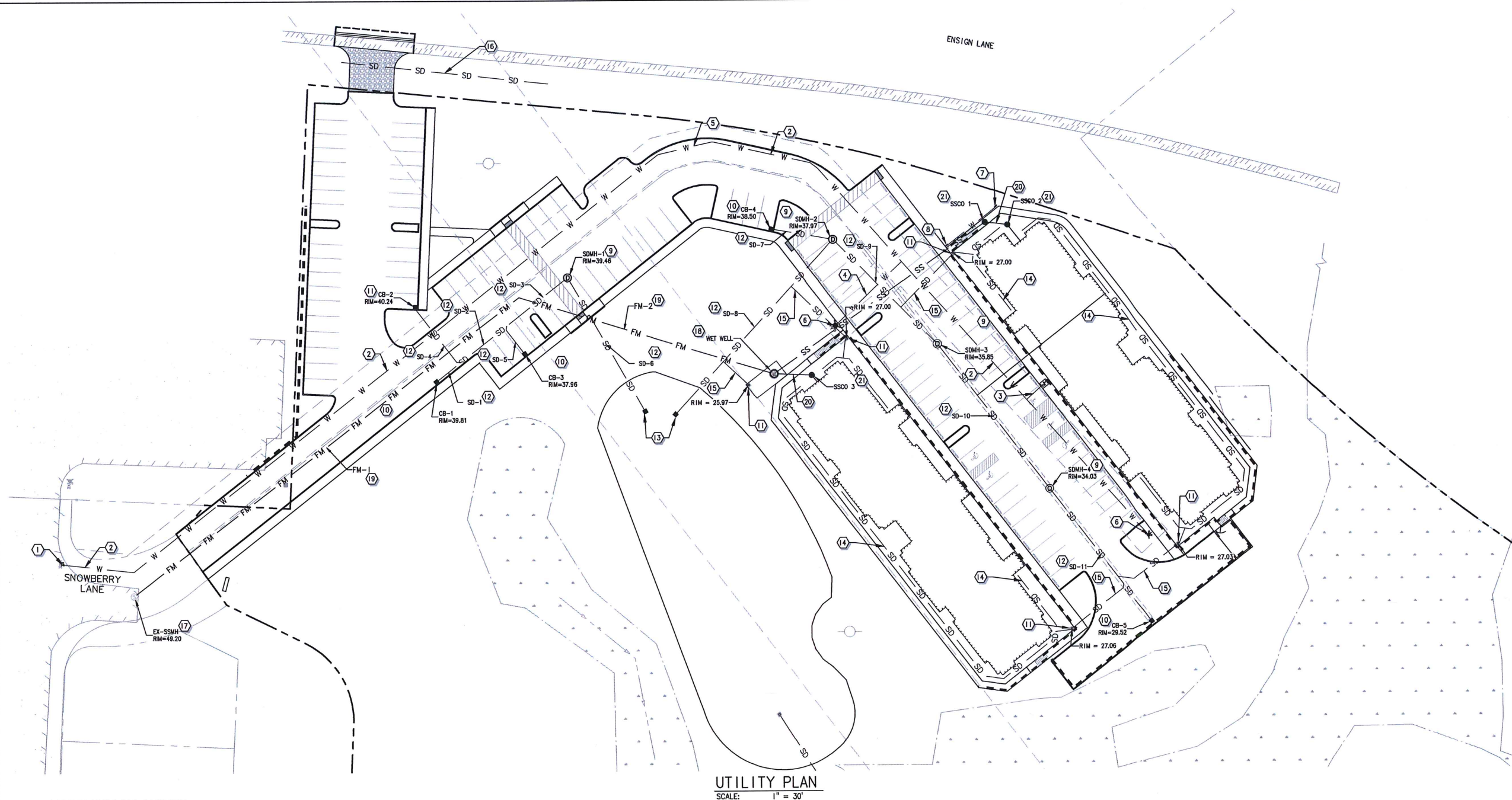
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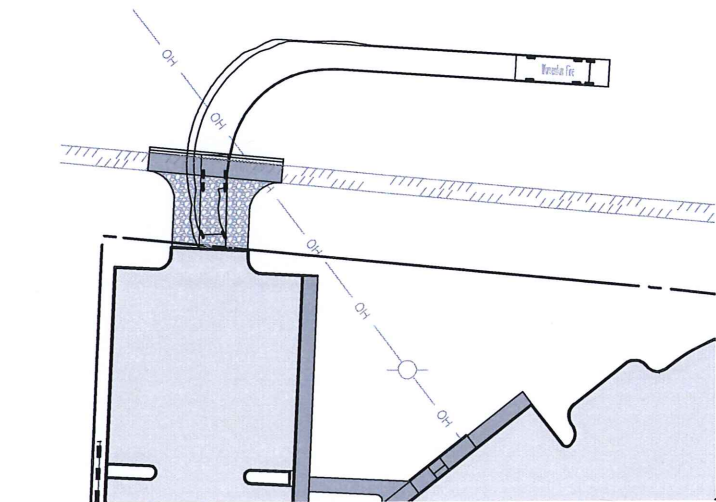




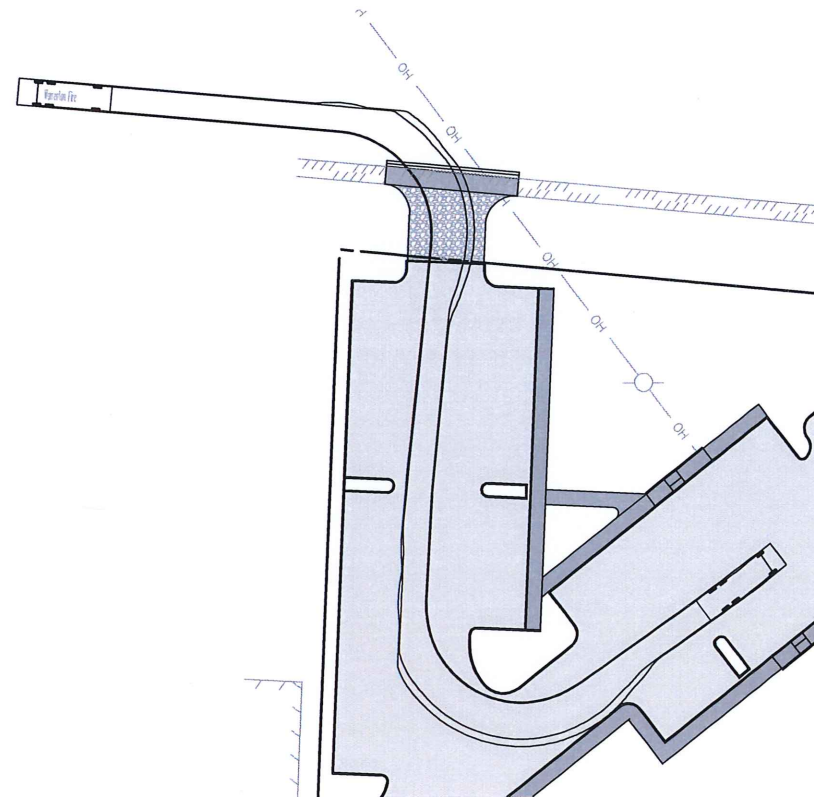
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By: sarahmc



**CHOKEBERRY FIRE ACCESS DETAIL**  
SCALE: 1" = 30'



HAMMERHEAD TURNING MOVEMENT DETAIL



## 30% – PLANNING SET

**TRACT A APARTMENTS**  
SITE IMPROVEMENT PLANS  
FIRE ACCESS DETAILS  
WARRENTON, CLATSOP COUNTY, OR



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RENEWAL DATE: DECEMBER 31, 2017

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S.E. 19TH STREET

REMAINDER OF LOT 124  
NOT PART OF TRACT "A"

CHOKEBERRY AVENUE

N2°36'50"E  
158.13'

R/W

N87°23'10"W  
68.37'

SNOWBERRY LANE

S88°05'58"E  
96.73'

N79°56'35"W  
63.20'

N2°36'50"E  
242.53'

C6

C4  
L=157.06'

TRACT "A"  
FOREST RM  
8.80 ACRES

S.E. ENSIGN LANE

S84°31'35"E  
188.41'

R/W

C1  
L=206.97'

S71°53'49"E  
117.87'

R/W

HIGHWAY 105  
ALTERNATE HIGHWAY 101

C3  
L=355.11'

EXISTING RELOCATED OVERHEAD POWER LINES  
SEE INSTRUMENT# 201703637, FOR 80' WIDE  
EASEMENT

WILLOW DRIVE

| CURVE | LENGTH  | RADIUS   | DELTA     | CHORD   | BEARING     |
|-------|---------|----------|-----------|---------|-------------|
| C1    | 206.98' | 939.00'  | 12°37'45" | 206.56' | S78°12'43"E |
| C2    | 355.11' | 1179.93' | 17°14'37" | 353.77' | S51°19'47"E |
| C3    | 17.49'  | 320.00'  | 03°07'56" | 17.49'  | S56°20'56"W |
| C4    | 157.08' | 100.00'  | 90°00'00" | 141.42' | N47°36'50"E |
| C5    | 58.13'  | 50.00'   | 66°36'50" | 54.91'  | N30°41'35"W |
| C6    | 23.67'  | 75.00'   | 18°04'43" | 23.57'  | N45°18'30"E |

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SCALE IN FEET



30% - PLANNING SET

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SITE IMPROVEMENT PLANS  
PROPERTY BOUNDARY AND DIMENSIONS  
WARRENTON, CLATSOP COUNTY, OR



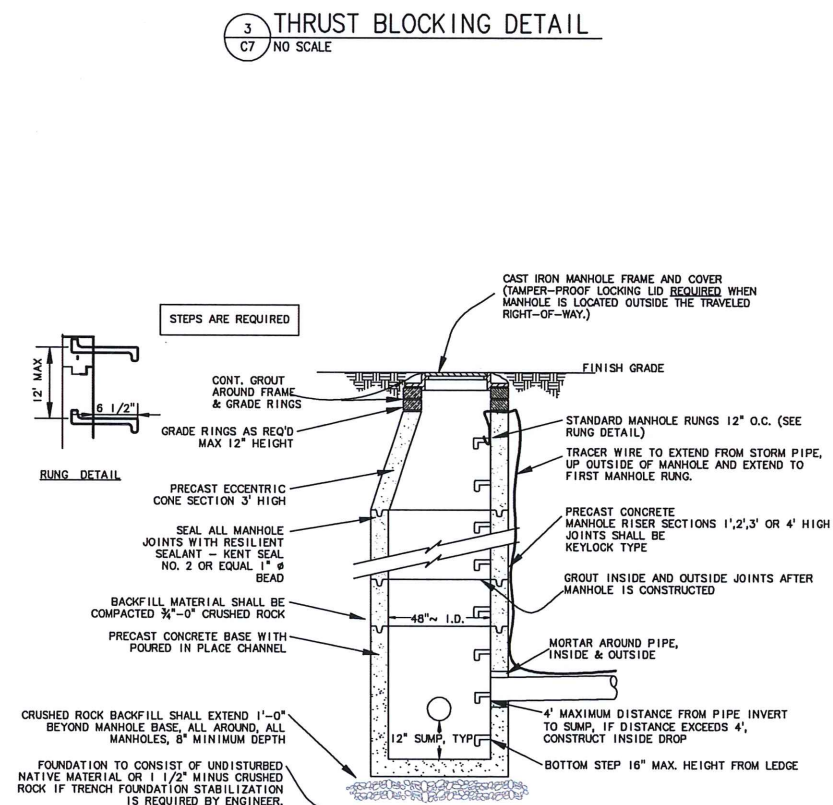
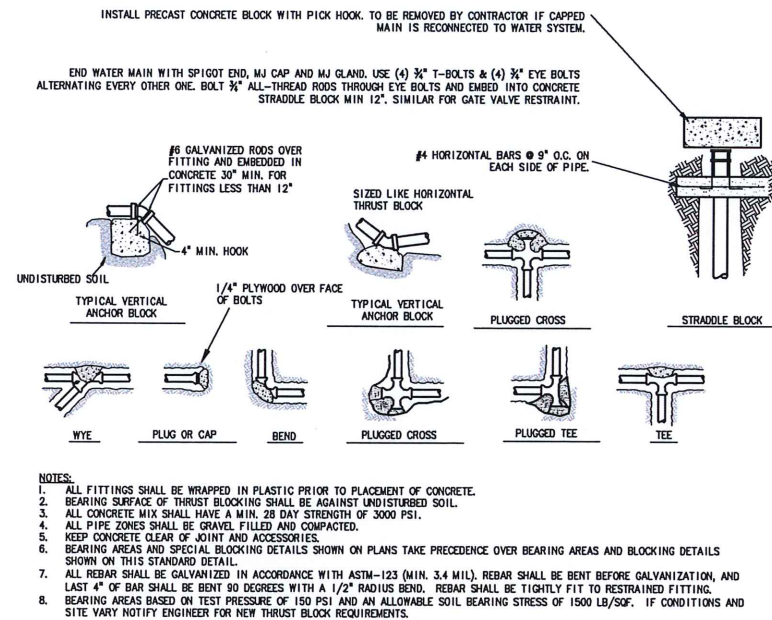
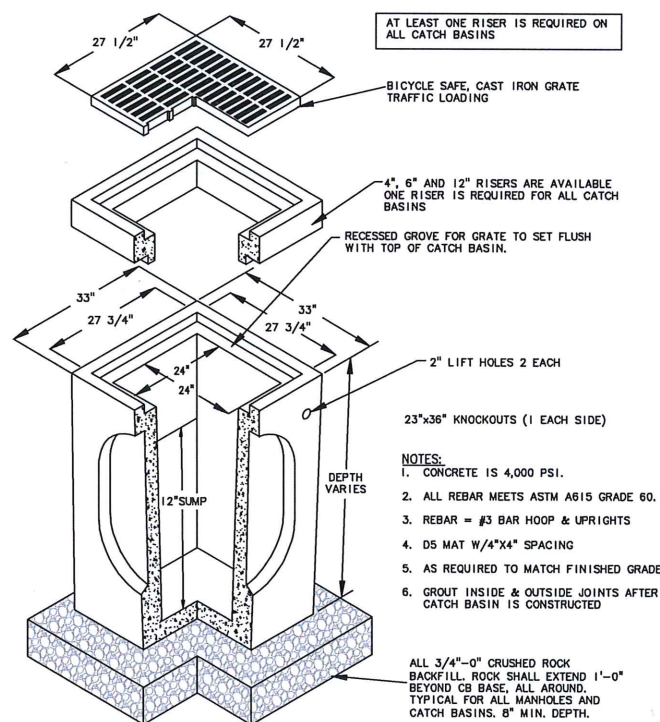
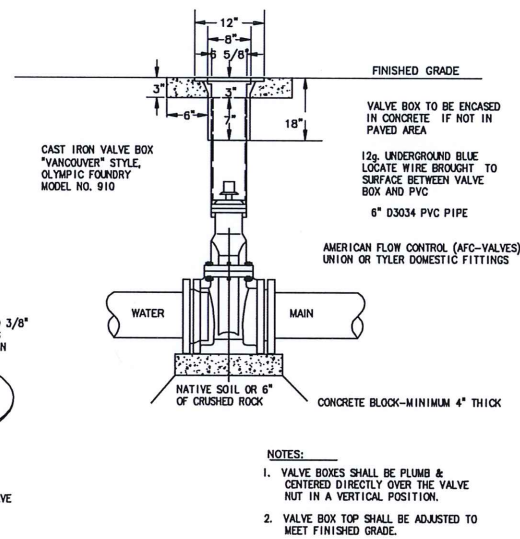
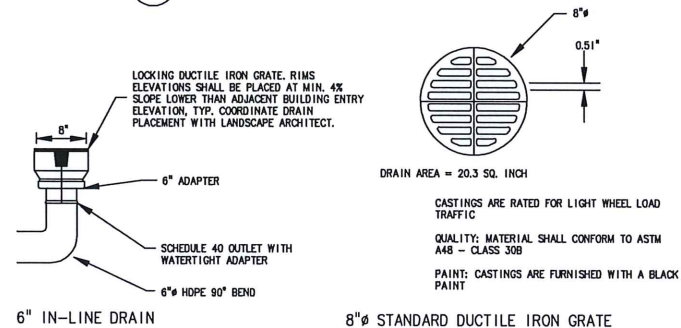
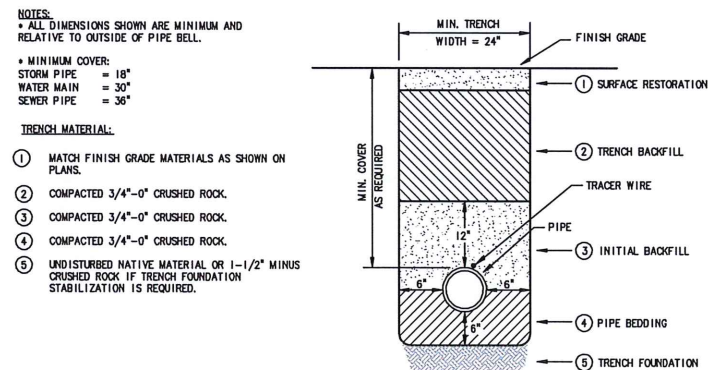
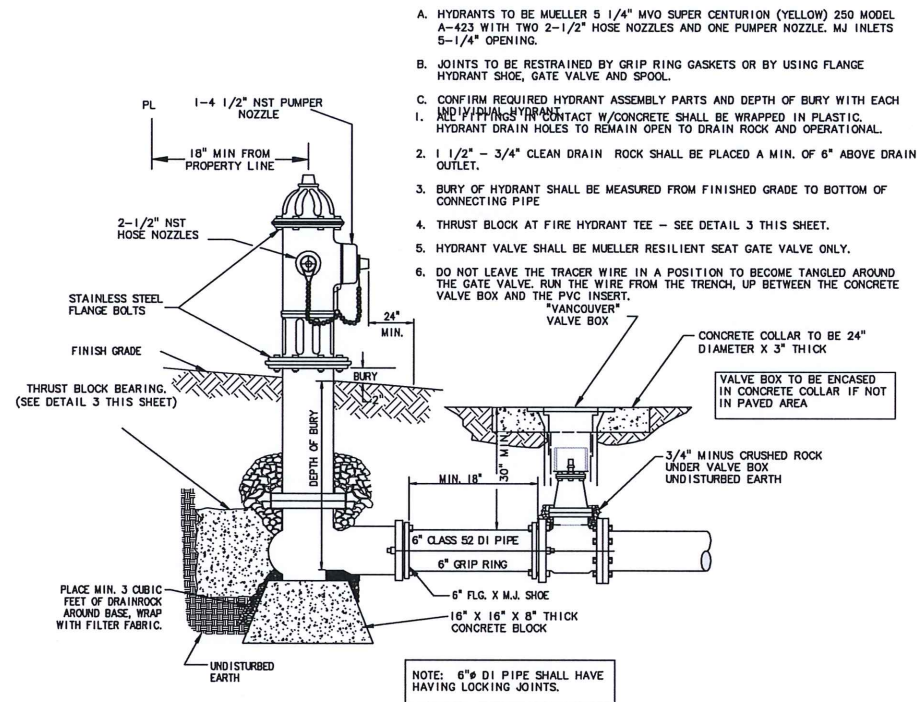
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DETAILS  
WARRENTON, CLATSOP COUNTY, OR

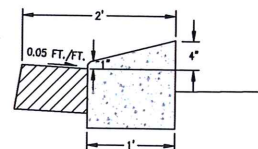


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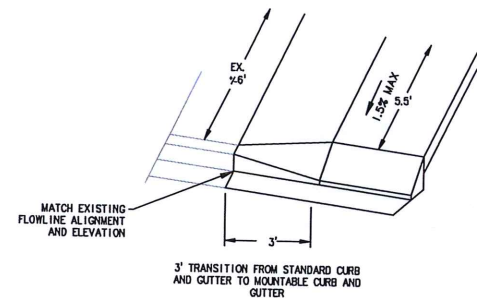
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FAX: (503) 738-7455  
Internet: WWW.OTAK.COM  
68059 68059B233.DWG  
Project No. Drawing No.

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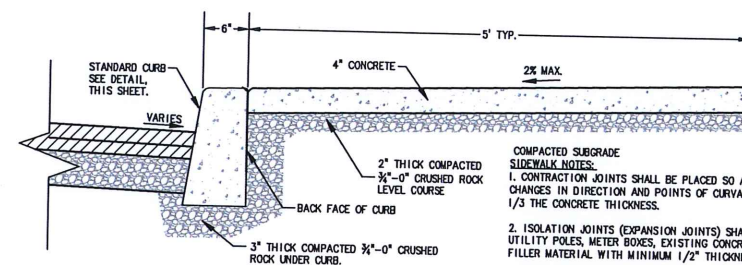




4 LOW PROFILE MOUNTABLE CURB DETAIL  
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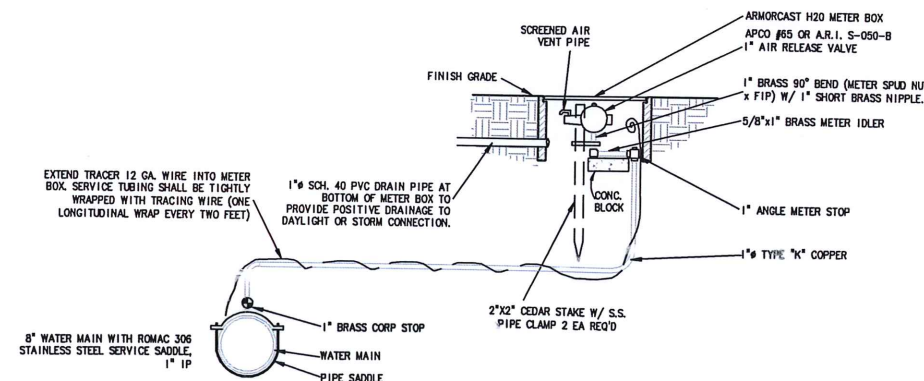
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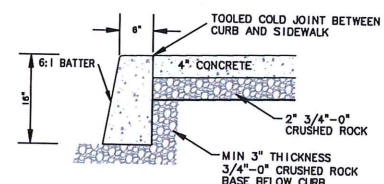
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C8

SIDEWALK DETAIL

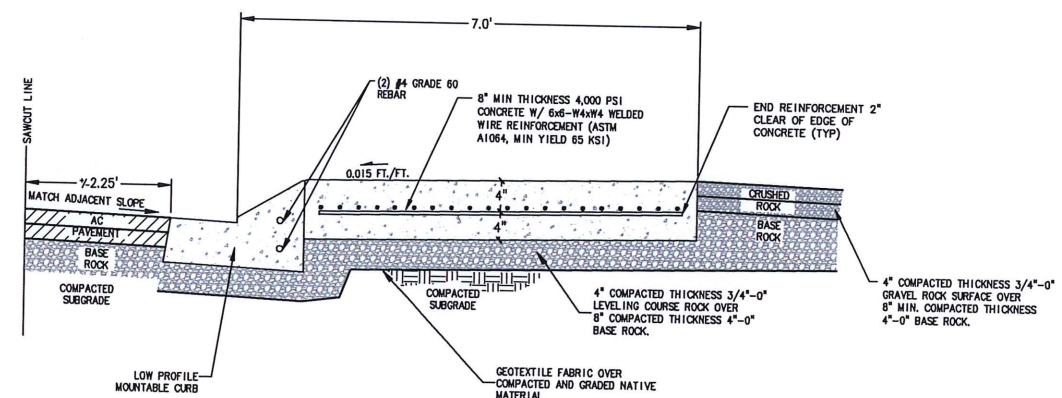
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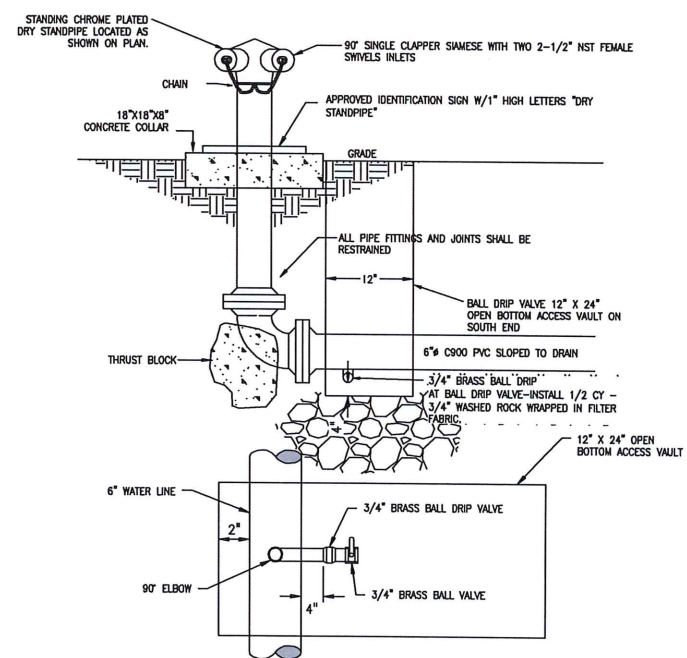
5 AIR RELEASE VALVE  
C8 NO SCALE



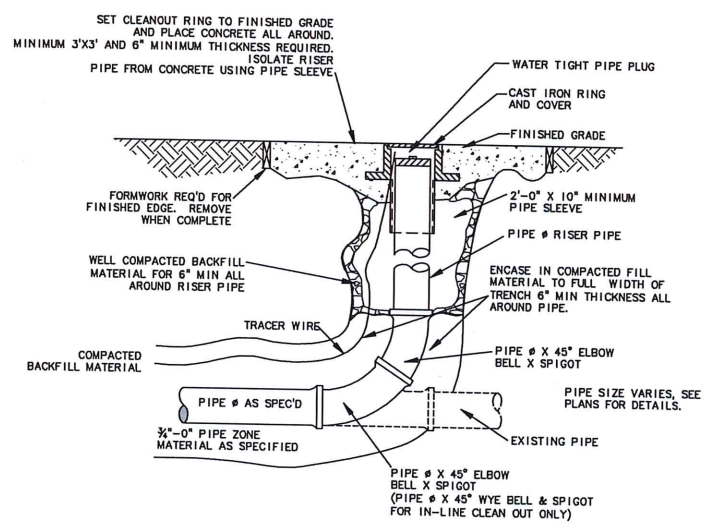
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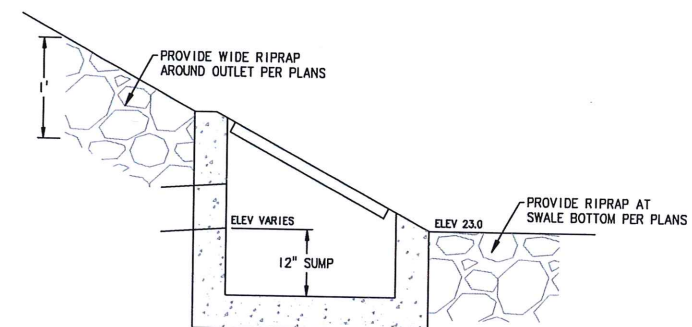
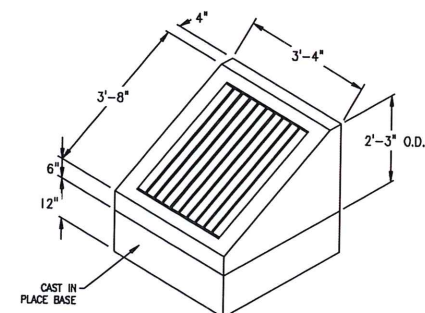
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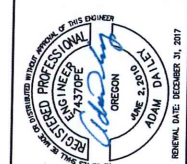
8 MANUAL DRY STANDPIPE DETAIL  
C8 NO SCALE



9 CLEANOUT DETAIL  
C8 NO SCALE



10 STORM DRAIN OUTLET  
C8 NO SCALE

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**TRACT A APARTMENTS**  
SITE IMPROVEMENT PLANS  
DETAILS II  
WARRENTON, CLATSOP COUNTY, OR



4253-A HWY 101 N.  
GEARHART, OREGON 97138  
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FAX: (503) 738-7455  
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Project No. Drawing No.

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### 30% – PLANNING SET

C8

# Memorandum



To: City of Warrenton  
From: Adam Daily, P.E.  
Date: Aug 3<sup>rd</sup>, 2017  
Subject: Impact Assessment Report – Tract A Apartments

4253-A Highway 101 N  
Seaside, OR 97138  
Phone (503) 738-3425  
Fax (503) 738-7455

## *General Compatibility and Visual Elements*

The proposed development will consist of 68 total units in two 4-story multi-family buildings. This will allow more residential density to be achieved in a smaller area. The development site is bordered to the North by SE Ensign Lane, to the West by Clatsop Community Action Regional Food Bank and NorthWest Senior and Disability Services, to the South by a residential subdivision and the East by wetlands.

## *Transportation*

Proposed street improvements include a 26' asphalt access aisle, a concrete sidewalk (5' width transitioning to a 6' width walk), 19' deep parking stalls, a 26' wide 32 space parking lot with an emergency access onto SE Ensign Lane, an emergency vehicle turnaround at access aisle end and streetlights and necessary street signs. Improvements along Chokeberry Ave and Snowberry Ln and the access point on Snowberry will be improved by others prior to the project's completion.

Parking is provided along the access aisle and within the parking lot to the north of the site. A total of 114 parking spaces are provided, meeting the minimum requirements. This will include 5 ADA spaces with access aisles. The parking areas and buildings are connected by pedestrian walks and aisle crossings marked with striping and sidewalk access ramps. The pedestrian walkways adjacent to the drive aisle are elevated 6" above the drive surface. 1 bicycle parking space is provided for each unit. These spaces are located in the storage facility on the lower level of each building.

## *Parks*

The closest city park to the proposed development is Warrenton City Park located 2.4 miles from the site. There are no on-site park requirements for the proposed development. The site does provide landscaped and natural open space for tenants use.

### *Utilities*

The Preliminary Utility Plan for the project is included as Sheet C4 of the plan set. Wastewater from the proposed multi-family buildings will be directed to an existing sanitary sewer within Snowberry Lane through a private pump station on-site. Sanitary sewer laterals from each building will be gravity lines into the private pump station.

There is an existing 8" water main line on Snowberry Ln with an existing valve cluster at the proposed drive aisle access point. The project will be served by an 8" water main extension within an easement along the access aisle. The domestic service will have a commercial water meter with a double check valve. The fire line will be un-metered. Two fire hydrants will be installed on site, one at the north side of the buildings and one at the south side of the buildings. Additionally, two dry standpipes will be located at the north side of the eastern building.

Storm drainage runoff from the proposed development will be collected by building laterals and catch basins. Runoff will be collected in an on-site detention pond for metered release into the unnamed tributary of Adair Slough on the south side of the development. A Preliminary Storm Drainage Report for the project is included.

### *Noise Impacts*

Typical multi-family development, as is proposed with the Tract A Apartments, has similar general types and intensities of noise impacts as a typical single-family development. Noises which would be associated with the proposed multi-family project include car-related noises, laundry exhaust, lawn care equipment noise, and occasional music and other resident-related noises. Construction related noises will be temporary in nature.

The proposed development site is separated from neighboring residential developments to the south by wetlands and vegetated buffers. In addition, noise associated with automobile traffic on SE Ensign Ln provides a fair amount of ambient noise.

### *Traffic*

A Traffic Impact study was completed for the proposed development by Lancaster Engineering. Refer to most recent version for traffic impact information.

### *Environmental*



A Wetland Determination Report was completed by Ecological Land Service and a Drainage Management Plan was completed by Otak for the proposed development. Refer to most recent versions of these reports for information.

**Project Description:** A sixty-eight unit apartment complex in two buildings of thirty-four units each, with associated parking and other site development features.

**Governing Regulations:** City of Warrenton Municipal Code – Title 16: Development Code

Note: only applicable criteria are addressed for each chapter

**16.36.040 - Development Standards: R-H Zone**

**A. Density:**

- Minimum lot area for multi-family – 10,000 sf
- Maximum density for multi-family – one unit per 1600 sf of site area
- Lot coverage – 55%
- Minimum lot width at front building line – 50 ft
- Minimum lot depth – 70 ft
- Maximum building height – 40 ft
- Minimum density with four or more units on sites without significant natural feature problems – five units per acre

**B. Setback Requirements:**

- Minimum front yard setback – 15 ft
- Minimum side yard setback – 8 ft
- Minimum rear yard setback – 15 ft

**C. Design Standards:**

- Entry door of 36" minimum width facing front yard or driveway
- Minimum of 20 sf of glazing on side of dwelling facing street
- Comply with standards of Chapter 16.188 (below)

**Findings:**

- Lot area is 8.8 acres or 383,362 sf - complies
- Density of 68 proposed units is one unit per 5,638 sf - complies
- Building area is 17,249 sf, which is 4.5% of site area – complies
- All frontage widths on public rights of way exceed 50' – complies
- All dimensions across the site exceed 70' – complies
- Proposed density is 7.7 units per acre, however the site has significant natural features (designated wetlands) and also an easement for power transmission line – complies
- Closest point of any building to any property line is 8 feet at the north corner of building #1; all other setbacks exceed 8 feet – complies
- Each building has three pairs of 36" entry doors facing the parking area and its center driveway aisle – complies
- Building #1 is closest to a public street and has twelve 2-bed units with three windows each, four 1-bed units with two windows each, two stairwells with three windows each, and four elevator lobbies with one window each, for a total of 54 windows. The average size exceeds 20 sf for a total of 1080 sf – complies
- Compliance with 16.188 is discussed below.

**16.120.020 – Vehicular Access and Circulation**

**Findings:**

- Access is proposed from existing public right of way (Chokeberry) per access Option 3; property has double frontage (Ensign), however this is proposed for emergency access only in compliance with the standard requiring access from the lower functional classification right of way.
- A single access is proposed in compliance with the requirement to minimize the number of access points.
- Access is proposed to have minimum width of 26 ft and maximum width of 26 ft as required for multi-family uses with more than eight units.
- Driveway aprons are not proposed – site entrance is an extension of the street.
- Fire access and circulation is proposed according to standards of the Oregon Fire Code, including minimum width of 20 ft (26 ft provided typically), clear height of 13'-6" (no overhead obstructions proposed), inside turning radii of 25 ft, standard "hammerhead" turn-around, and maximum grade of 12% along route; buildings are located between 15 ft and 30 ft away from the access road for aerial apparatus access to the building.
- A traffic report addresses traffic impacts under this chapter and is attached herewith.
- Lighting will be designed by vendor using LED fixtures on poles at locations to provide an average of 1 footcandle illumination, with cut-off baffles to prevent glare beyond the property lines.

**16.120.030 – Pedestrian Access and Circulation**

**Findings:**

- Access is proposed from existing public right of way (Chokeberry) and continues through the site adjoining parking areas and extending to all building entries, providing a safe and convenient system.
- Primary pathways intended for both pedestrians and bicycles are 6 ft wide; 5' at pedestrian only pathways, except those at the rear of the buildings are 4 ft wide and intended only for emergency egress use by pedestrians.
- Primary pathways are elevated 6 inches above adjacent vehicle areas; curb ramps are provided at all crossings of vehicle areas. At parking areas in front of the buildings, the asphalt paving and concrete walks are flush for ease of access, with precast concrete wheel stops to limit vehicle travel.
- Pathways adjacent to buildings are separated by a minimum of 5 ft width of landscaped area from interior living areas. At ground level patios, screening plantings are provided if the separation is less than 5 ft.
- Crosswalks are distinguished from vehicle areas by use of concrete paving or painted striping.
- Pathway surfaces are concrete with a slip-resistant texture.
- Lighting will be designed by vendor using LED fixtures to provide an average of 1 footcandle illumination; at pathways in vehicle areas, lighting is shared; around buildings, fixtures will be wall-mounted with cut-off baffles.



**16.128.030 – Vehicle Parking Standards**

**Findings:**

Number of parking spaces -

Twenty one-bedroom units over 500 sf @ 1.5 spaces/unit = 30 spaces

Forty-eight two-bedroom units @ 1.75 spaces/unit = 84 spaces

Total required parking = 114 spaces

Parking provided - 114 spaces - complies

Type of parking spaces –

Full size - 70 provided = 61.4%

Compact - 44 provided = 38.6% - complies (40% max)

Size of parking spaces –

Full size, 90 degree – 9 ft x 19 ft with 26 ft two-way aisle

Compact, 90 degree – 8'-0" x 19 ft with 26 ft two-way aisle

Accessible parking –

Number of spaces – 5 total (full size) :

1 van accessible (8 ft aisle), 4 standard (5 ft aisle)

**16.128.040 – Bicycle Parking Standards**

**Findings:**

One bicycle parking space is provided for each unit.

Location is in the storage facility on the lower level of each building.

**16.140 – Stormwater and Surface Water Management**

**Findings:**

A Stormwater and Surface Water Management Report is provided as a separate document attached herewith addressing the chapters under this heading.

**16.188.030 – Multi-family Specific Design Standards**

**Findings:**

- A. Building Mass Supplemental Standard: Overall length of each building is 200'-0" end-wall to end-wall; width is about 50 ft.
- B. Common Open Space Standard: Site area not occupied by buildings or vehicle/hardscape and surrounding landscaping totals 300,000 sf +/-, which includes areas designated as wetland, within the power lines easement and designated as stormwater detention, and is 77% +/- of the site area; in addition, each unit includes a private outdoor area: a patio for units at grade and decks for units above grade.
- C. Trash receptacles are enclosed by a six foot minimum height fence with exposed surfaces finished similar to the buildings.
- D. Other features
  1. Monument signage complying with vision clearance will be located near the sit entry.
  2. Mail boxes will be located in central lobby of each building.

#### 16.192 – Large Scale Developments

Requirements and findings:

16.192.010 – Applicable to a multi-family development of ten or more dwelling units.

**Findings: The proposed sixty-eight unit project requires Type III review.**

16.192.020 – Soil and storm water hazards must be addressed.

**Findings: Geotechnical and storm water management reports are submitted herewith to demonstrate degree of hazard and any mitigation**

16.192.030 – Soils Suitability must be demonstrate with geotechnical report.

**Findings: Geotechnical report is submitted herewith to demonstrate degree of hazard and any mitigation**

16.192.040 – Storm water management plan must be submitted.

**Findings: Storm water management report is submitted herewith to demonstrate degree of hazard and any mitigation**

16.192.050 – Utility plans and analyses are required to demonstrate impact on existing public and private systems, and to show on-site systems as adequate for the needs of the development and placed underground.

**Findings: The civil engineering documents submitted provide required documentation for all on-site and off-site systems, and demonstrate adequacy for proposed development.**

16.192.060 – Provide evidence that local schools will be capable of accommodating the children from the development.

**Findings: The dwelling units proposed are one and two bedroom units, in an overall development and location generally not intending to attract families with children. The Yacht Club apartments in Astoria by this developer has a similar number and type of units with only four families that include children. We believe it is reasonable to estimate a maximum of ten children that might live in the proposed development.**

16.192.070 – A suitable landscape plan is required.

**Findings: A suitable landscape plan is submitted herewith.**

16.192.080 – Signs within the development are subject to design review.

**Findings: A single monument sign is proposed for the area near the entry to the site; its design will be submitted for review at a future time.**

16.192.090 – Additional provisions for compliance and approval

**Findings: The developer is committed to full compliance to obtain all required approvals.**

**WILLOW DRIVE APARTMENT COMPLEX  
TRAFFIC IMPACT STUDY**

**WARRENTON, OREGON**

**DATE:**  
March 15, 2017

**PREPARED FOR:**  
Richard Krueger

**PREPARED BY:**  
Daniel Stumpf, EI  
Michael Ard, PE



EXPIRES: 12/31/17





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## EXECUTIVE SUMMARY

1. The proposed Willow Drive Apartment Complex will include the construction of a 60-unit apartment complex located north of SE Willow Drive, south of SE Ensign Lane, and east of SE Chokeberry Avenue in Warrenton, Oregon.
2. The trip generation calculations show that the proposed development is projected to generate 33 site trips during the morning peak hour and 51 site trips during the evening peak hour.
3. All study intersections are currently operating acceptably per Clatsop County and ODOT standards and are projected to continue operating acceptably upon build-out of the proposed development through year 2019.
4. No significant trends or crash patterns were identified at any of the study intersections and no specific safety mitigation is recommended.
5. Left-turn lane warrants are not projected to be met for any of the applicable study intersections under any of the analysis scenarios through the 2019 build-out year. No new turn lanes are necessary or recommended.
6. Due to insufficient main and side-street traffic volumes, traffic signal warrants are not projected to be met for any of the unsignalized study intersections under any of the analysis scenarios.

## PROJECT DESCRIPTION & LOCATION

### *INTRODUCTION*

The proposed Willow Drive Apartment Complex will include the construction of a 60-unit apartment complex located north of SE Willow Drive, south of SE Ensign Lane, and east of SE Chokeberry Avenue in Warrenton, Oregon.

This report addresses the impacts of the proposed development on the nearby street system. Based on correspondence with City of Warrenton staff, the report conducts safety and capacity/level-of-service analyses at the following intersections:

1. SE Ensign Lane at SE 19<sup>th</sup> Street;
2. SE Chokeberry Avenue at SE 19<sup>th</sup> Street;
3. SE Chokeberry Avenue at SE Willow Drive; and
4. Warrenton-Astoria Highway (US-101B) at SE Willow Drive.

The purpose of this study is to determine whether the transportation system within the vicinity of the site is capable of safely and efficiently supporting the existing and proposed uses and to determine any mitigation that may be necessary to do so. Detailed information on traffic counts, trip generation calculations, safety analyses, and level-of-service calculations is included in the appendix to this report.

### *LOCATION DESCRIPTION*

The project site is located north of SE Willow Drive, south of SE Ensign Lane, and east of SE 19<sup>th</sup> Street in Warrenton, Oregon. The subject site is located near the edge of city limits within a rural setting, with residential developments to the south and east; SE Ensign Lane/US-101B to the north; and an animal shelter, food bank, and senior/disability center to the west. One notable development located within a quarter-mile walking/biking distance of the site includes South Jetty High School to the west.

The site includes a single tax lot, lot 100, which encompasses an approximate total of 8.8 acres and is currently undeveloped. Access to the site will be provided via the proposed extension of Snowberry Lane from Chokeberry Avenue and ending as a cul-de-sac within the property.

### *VICINITY STREETS*

SE Ensign Lane is classified by Clatsop County as a Major Collector. The roadway has a varying cross-section between three to five travel lanes and has a posted speed of 35 mph. Curbs and bicycle lanes are provided along both sides of the roadway while sidewalks are intermittently provided.

US-101B is classified by Clatsop County as a Minor Arterial and by the Oregon Department of Transportation (ODOT) as a District Highway. The roadway has a varying cross-section of two to three travel lanes and has a posted speed of 45 mph west and a statutory rural highway speed of 55



mph east of SE Willow Drive. Bicycle lanes are provided along both sides of the roadway within the site vicinity. Curbs and sidewalks are not provided on either side of the roadway.

SE 19<sup>th</sup> Street is classified by Clatsop County as a Local Street. The roadway has a two-lane cross-section and has a posted speed of 35 mph. Curbs, sidewalks, and bicycle lanes are not provided on either side of the roadway.

SE Chokeberry Avenue is classified by Clatsop County as a Local Street. The roadway has a two-lane cross-section, without centerline striping, and has a posted speed of 35. Curbs are provided along both sides of the roadway south of SE 19<sup>th</sup> Street while sidewalks are intermittently provided.

SE Willow Drive is classified by Clatsop County as a Local Street. The roadway has a two-lane cross-section, without centerline striping, and has a posted speed of 25 mph north and 20 mph south of SE 19<sup>th</sup> Street. On-street parking is permitted along both sides of the roadway. Curbs are provided along both sides of the roadway while sidewalks are intermittently provided.

#### **STUDY INTERSECTIONS**

The intersection of SE Ensign Lane at SE 19<sup>th</sup> Street is a four-legged intersection that stop-controlled for the northbound and southbound approaches of SE 19<sup>th</sup> Street. The northbound and southbound approaches each have one shared lane for all turning movements. The eastbound and westbound approaches of SE Ensign Lane each have one left-turn lane, one through lane, one right-turn lane, and a bicycle lane situated in between the through and right-turn lanes. Crosswalks are marked across the northern and western intersection legs.

The intersection of SE Chokeberry Avenue at SE 19<sup>th</sup> Street is a four-legged intersection that is stop-controlled for the northbound, southbound, and westbound approaches. All four intersection approaches each have one shared lane for all turning movements. Crosswalks are unmarked across all intersection legs.

The intersection SE Chokeberry Avenue at SE Willow Drive is a three-legged intersection that is stop-controlled for the eastbound approach of SE Chokeberry Avenue. All three intersection approaches each have one shared lane for all turning movements. Crosswalks are unmarked across all intersection legs.

The intersection of US-101B at SE Willow Drive is a three-legged intersection that is stop-controlled for the northbound approach of SE Willow Drive. The northbound approach has one shared lane for all turning movements. The eastbound and westbound approaches each have one shared lane for all turning movements and a bicycle lane to the right of the outermost standard travel lane. Crosswalks are unmarked across all intersection legs.

A vicinity map displaying the project site, vicinity streets, and the study intersections with their associated lane configurations is shown in Figure 1 on page 7.

2e

## **TRAFFIC COUNTS**

Traffic counts were conducted at the study intersections of SE Ensign Lane at SE 19<sup>th</sup> Street, SE Chokeberry Avenue at SE 19<sup>th</sup> Street, and SE Chokeberry Avenue at SE Willow Drive on Thursday, February 23<sup>rd</sup>, 2017, from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM. Data was used from each intersection's respective morning and evening peak hours.

To determine traffic volumes at the intersection of US-101B at SE Willow Drive, through volumes were collected along US-101B just east of SE Ensign Lane. To determine turning volumes at the study intersection, it is assumed that the majority of traffic traveling along SE Willow Drive will likely be from residents of the existing apartment complex to the south and a subdivision to the southwest of the project site. To estimate the number of trips generated by the existing apartment complex and subdivision, trip equations from the *TRIP GENERATION MANUAL*<sup>1</sup> were used. Data from land-use code 210, *Single-Family Detached Housing*, based on 39 existing dwelling units (33 single-family dwellings and 3 duplexes) and land-use code 220, *Apartment*, based on 120 dwelling units (30 four-plexes) was used to estimate existing trips generated by both developments. The total trips traveling to/from the intersection US-101B at SE Willow Drive were reduced by the number of vehicular trips traveling to/from the west at the intersection of SE Chokeberry Avenue at SE Willow Drive. The morning and evening peak hours of this intersection were assumed to be the peak hours of traffic along US-101B.

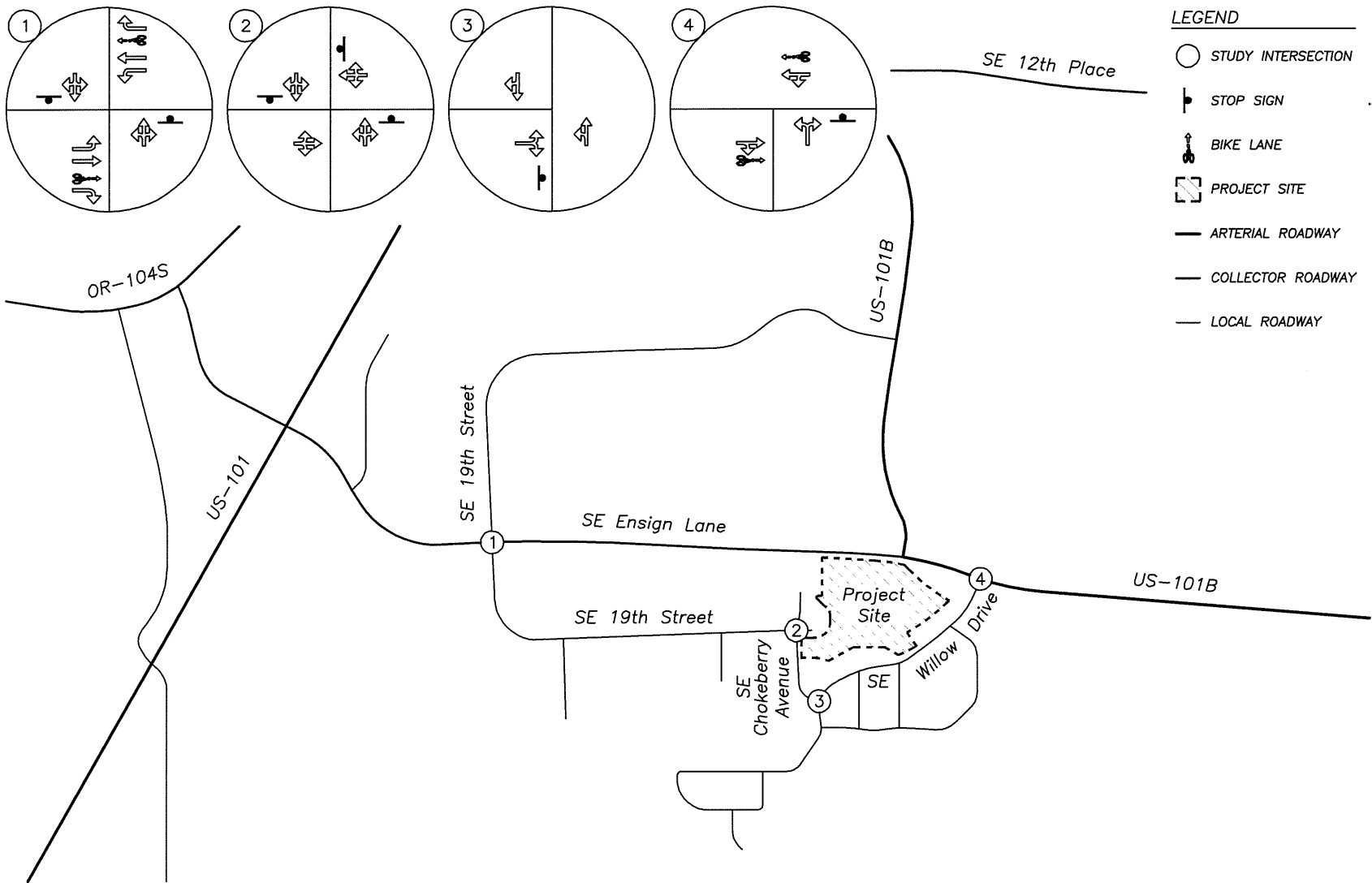
To determine the directional distribution of turning volumes at the intersection of US-101B at SE Willow Drive, morning peak period observations were conducted on Tuesday, March 14, 2017 from 7:00 AM to 9:00 AM. Based on observed turning movement volumes at the intersection, approximately 70 percent of traffic turning on/off of SE Willow Drive is expected to travel to/from the west while 30 percent is expected to travel to/from the east. It should be noted that during the 7:30 AM to 8:30 AM peak hour of traffic along US-101B only 28 vehicles were observed turning on/off SE Willow Drive, which is significantly less than the projected 67 vehicles turning at the intersection per the trip generation methodology described above. Accordingly, it is expected that utilizing the trip generation methodology will likely provide a more conservative analysis of operation at the intersection.

Per requirements established in ODOT's *Analysis Procedures Manual* as well as direction from Peter Schuytema of ODOT, an average seasonal adjustment factor of 1.398 was calculated based on Commuter and Coastal Destination Route seasonal trends. The adjustment factor was applied to the highway's through movement traffic volumes at the future intersection of US-101B at SE Willow Drive to reflect the 30<sup>th</sup> highest hour volumes along the ODOT facility.

Figure 2 on page 8 shows the existing morning and evening peak hour traffic volumes at the study intersections.

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<sup>1</sup> Institute of Transportation Engineers (ITE), *TRIP GENERATION MANUAL*, 9<sup>th</sup> Edition, 2012.



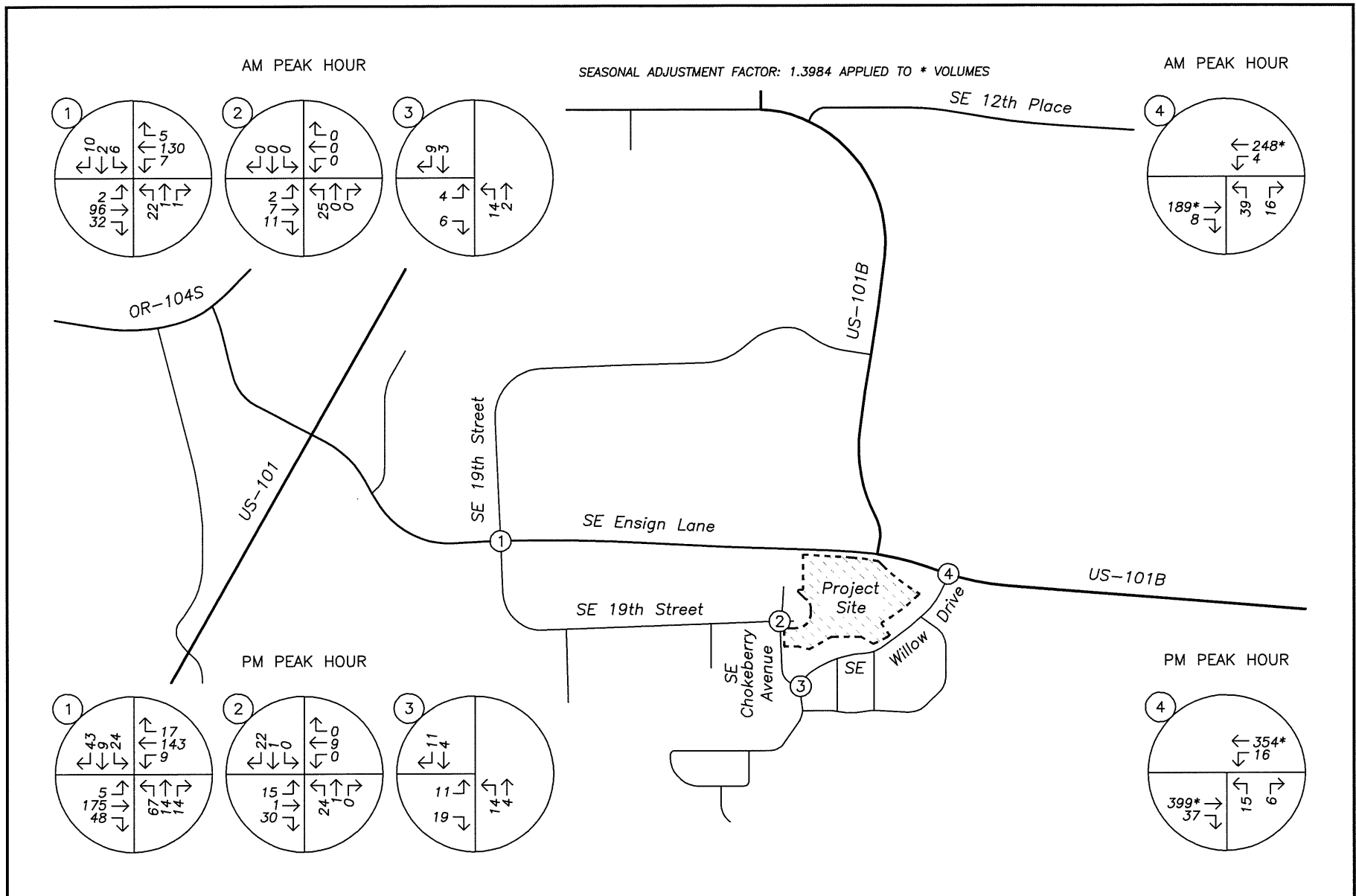
# VICINITY MAP



FIGURE  
1

PAGE  
7





16

TRAFFIC VOLUMES  
Existing Conditions  
AM & PM Peak Hours



FIGURE  
2

PAGE  
8

## SITE TRIPS

### TRIP GENERATION

The proposed Willow Drive Apartment Complex includes the construction of a 60-unit apartment facility. To estimate the number of trips that will be generated by the proposed development, trip equations from the *TRIP GENERATION MANUAL* were used. Data from land-use code 220, *Apartment*, was used to estimate the proposed development's trip generation based on the number of dwelling units.

The trip generation calculations show that the proposed development is projected to generate 33 site trips during the morning peak hour and 51 site trips during the evening peak hour. The trip generation estimates of the proposed development are summarized in Table 1 below. Detailed trip generation calculations are included in the technical appendix to this report.

**Table 1 - Trip Generation Summary**

|                   | ITE<br>Code | Size     | Morning Peak Hour |     |       | Evening Peak Hour |     |       | Weekday |
|-------------------|-------------|----------|-------------------|-----|-------|-------------------|-----|-------|---------|
|                   |             |          | In                | Out | Total | In                | Out | Total | Total   |
| Apartment Complex | 220         | 60 units | 7                 | 26  | 33    | 33                | 18  | 51    | 488     |

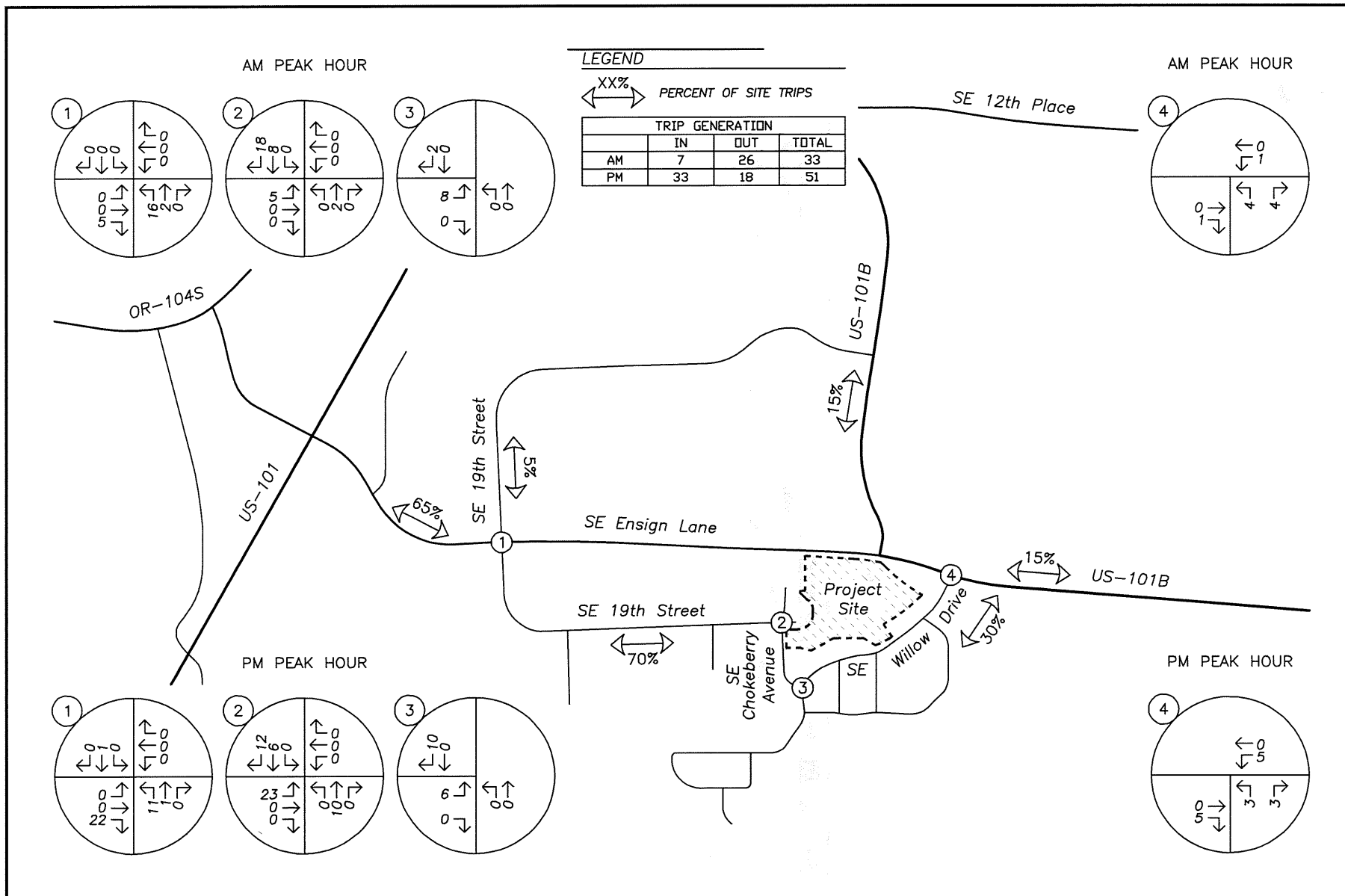
### TRIP DISTRIBUTION

The directional distribution of site trips to/from the project site was estimated based on locations of likely trip destinations, locations of major transportation facilities in the site vicinity, and existing travel patterns at study intersections.

The following trip distribution was estimated and used for analysis:

- At the intersection of SE Ensign Lane at SE 19<sup>th</sup> Street, approximately 65 percent of site trips will travel to/from the west along SE Ensign Lane while approximately 5 percent of site trips will travel to/from the north along SE 19<sup>th</sup> Street.
- At the future intersection of US-101B at SE Willow Drive, approximately 15 percent of site trips will travel to/from the east along US-101B and approximately 15 percent of site trips will travel to/from the north along US-101B.

The trip assignment for the site trips generated by the proposed development during the morning and evening peak hours are shown in Figure 3 on page 10.



16

SITE TRIP DISTRIBUTION & ASSIGNMENT  
Proposed Development Plan – Site Trips  
AM & PM Peak Hours



FIGURE  
3

PAGE  
10



## OPERATIONAL ANALYSIS

### *BACKGROUND VOLUMES*

To provide analysis of the impact of the proposed development on the nearby transportation facilities, an estimate of future traffic volumes is required.

In order to calculate the future traffic volumes for non-ODOT facilities, a compounded growth rate of two percent per year for an assumed build-out condition of two years was applied to the measured existing traffic volumes to approximate year 2019 background conditions.

To estimate the future traffic volumes for ODOT facilities, a linear growth rate of 1.06 percent per year was calculated for the traffic volumes along US-101B using ODOT's 2035 Future Volume Tables. This growth rate was applied to the measured existing traffic volumes over a two-year period to determine year 2019 background traffic volumes for the through traffic traveling along US-101B. A compounded growth rate of two percent per year for an assumed build-out condition of two years was applied to all other turning movement traffic volumes.

Figure 4 on page 12 shows the projected year 2019 background traffic volumes at the study intersections during the morning and evening peak hours.

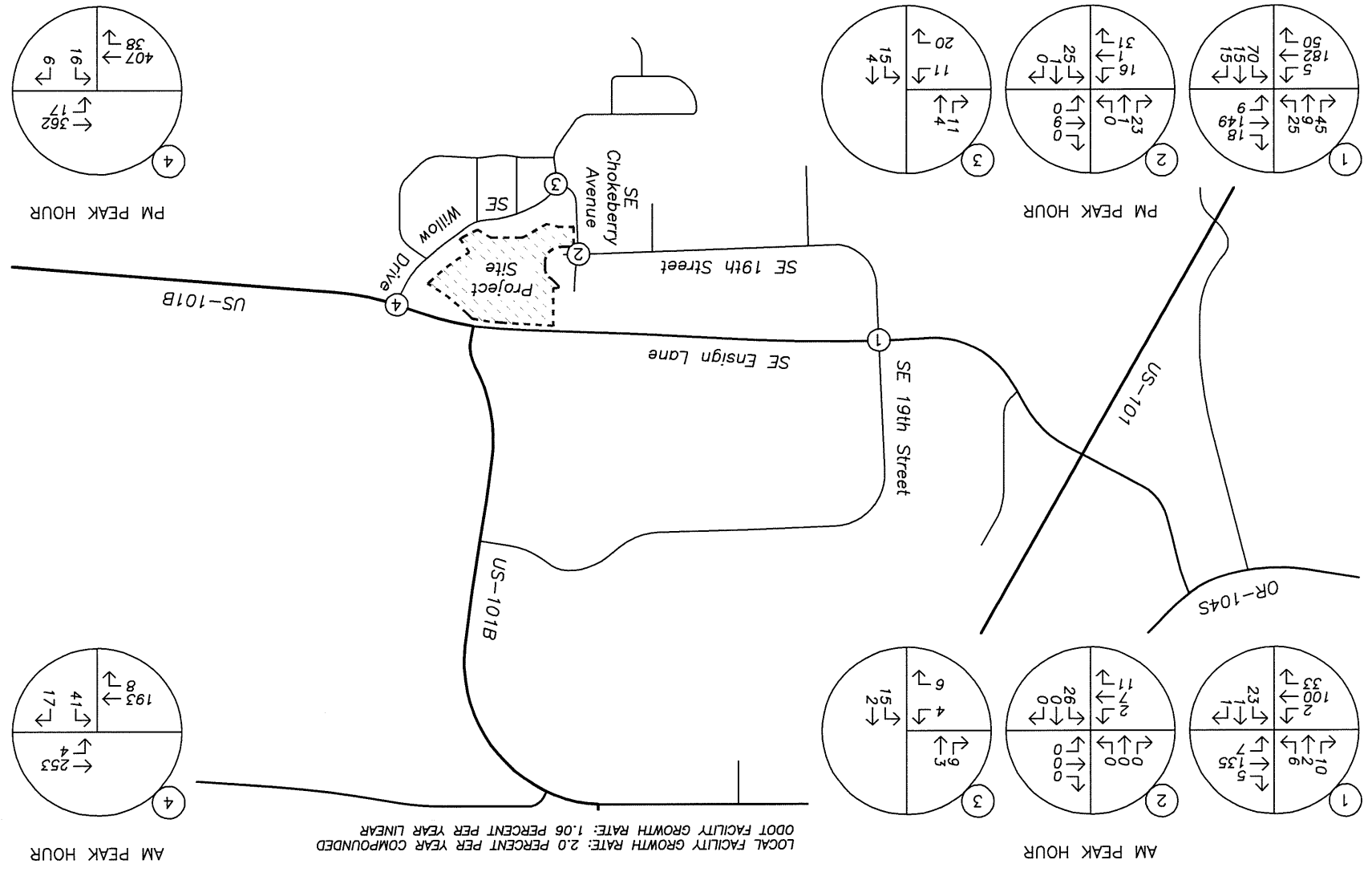
### *BACKGROUND VOLUMES PLUS SITE TRIPS*

Peak hour trips calculated to be generated by the proposed development, as described earlier within the *Site Trips* section, were added to the projected year 2019 background traffic volumes to obtain the expected 2019 background volumes plus site trips.

Figure 5 on page 13 shows the projected year 2019 peak hour background traffic volumes plus proposed development site trips at the study intersections during the morning and evening peak hours.

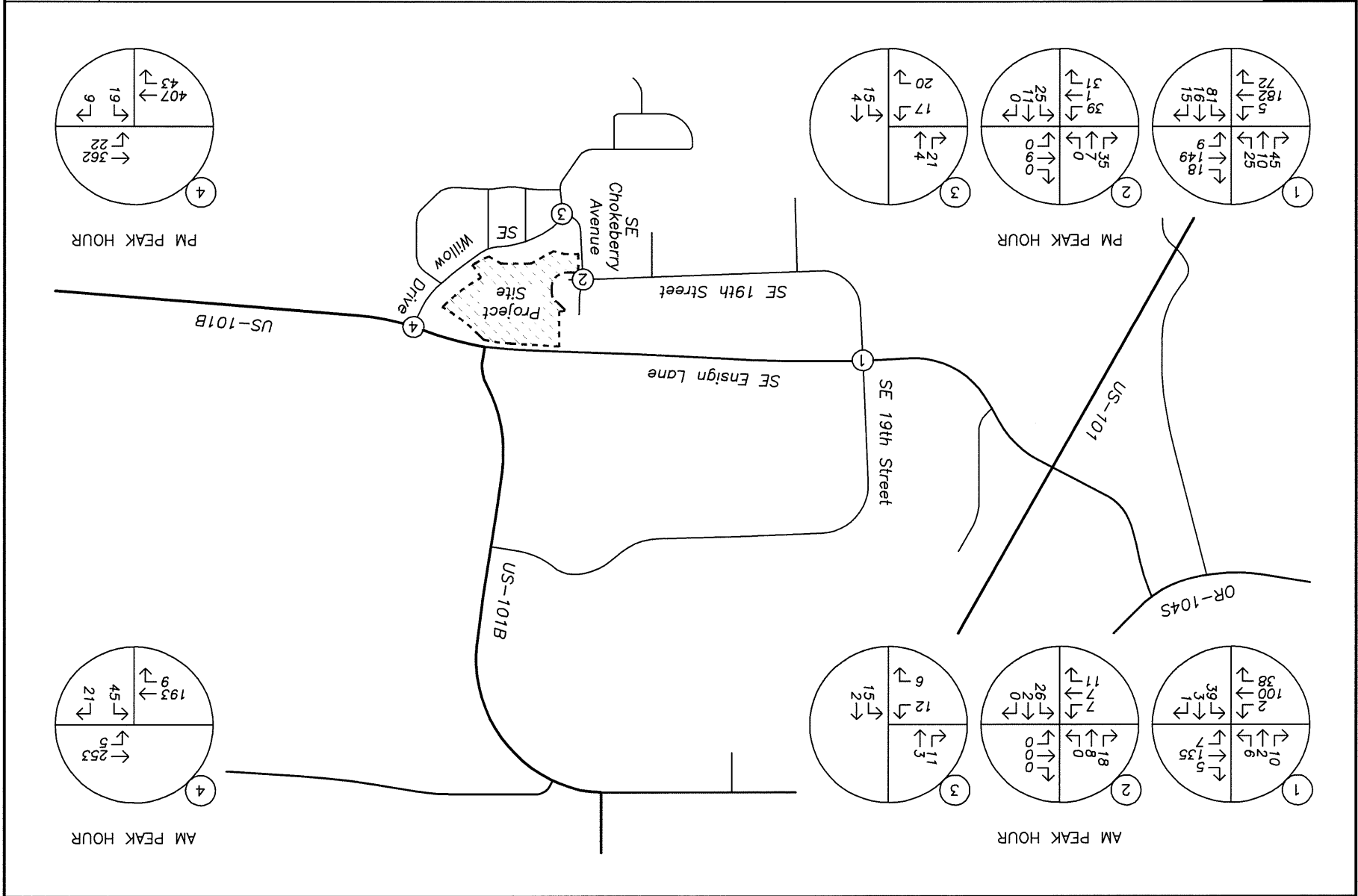
16

# TRAFFIC VOLUMES Year 2019 Background Conditions AM & PM Peak Hours



16

# TRAFFIC VOLUMES Year 2019 Background Conditions plus Site Trips AM & PM Peak Hours







## CAPACITY ANALYSIS

A capacity and delay analysis was conducted for each of the study intersections. The analysis was conducted per the unsignalized intersection analysis methodology in the *HIGHWAY CAPACITY MANUAL*<sup>2</sup> (HCM). The level-of-service (LOS) of an intersection can range from LOS A, which indicates very little or no delay experienced by vehicles, to LOS F, which indicates a high degree of congestion and delay. The v/c ratio is a measure that compares the traffic volumes (demand) against the available capacity of an intersection.

Per Clatsop County's *Transportation System Plan* (TSP) as well as direction by Clatsop County staff, the following minimum operation standards apply at intersections under City jurisdiction:

- Signalized, roundabout, and all-way stop-controlled intersections shall operate at LOS E or better with a v/c ratio no greater than 0.85.
- Two-way stop-controlled and yield-controlled intersections shall operate at LOS E or better with a v/c ratio no greater than 0.90.

The study intersection of US-101B at SE Willow Drive is under the jurisdiction of ODOT and must operate according to standards established in the *OREGON HIGHWAY PLAN*. Based on the classification of US-101B as a non-Freight Route District Highway, intersections are required to operate with a v/c ratio of 0.75 or less when located outside the City's urban growth boundary and within rural lands.

The intersection of SE Ensign Lane at SE 19<sup>th</sup> Street operates at LOS B with v/c ratios of 0.25 or less during the morning and evening peak hours for all analysis scenarios.

The intersection of SE Chokeberry Avenue at SE 19<sup>th</sup> Street operates at LOS A with an intersection capacity utilization of 0.26 or less during the morning and evening peak hours for all analysis scenarios.

The intersection of SE Chokeberry Avenue at SE Willow Drive operates at LOS A with v/c ratios of 0.05 or less during the morning and evening peak hours for all analysis scenarios.

The intersection of US-101B at SE Willow Drive operates at LOS B with a v/c ratio of 0.15 during the morning peak hour and at LOS C with a v/c ratio of 0.28 during the evening peak hour for all analysis scenarios.

The v/c, delay, and LOS results of the capacity analysis are shown in Table 3 for the morning and evening peak hours. Detailed calculations as well as tables showing the relationship between delay and LOS are included in the appendix to this report.

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<sup>2</sup> Transportation Research Board, *HIGHWAY CAPACITY MANUAL 2000*, 2000.

| Table 3 - Capacity Analysis Summary     |                   |       |      |                   |     |       |
|-----------------------------------------|-------------------|-------|------|-------------------|-----|-------|
|                                         | Morning Peak Hour |       |      | Evening Peak Hour |     |       |
|                                         | LOS               | Delay | V/C  | In                | Out | Total |
| SE Ensign Lane at SE 19th Street        |                   |       |      |                   |     |       |
| Existing Conditions                     | B                 | 11    | 0.09 | B                 | 14  | 0.20  |
| 2019 Background Conditions              | B                 | 11    | 0.10 | B                 | 14  | 0.22  |
| 2019 Background plus Site Conditions    | B                 | 12    | 0.10 | B                 | 15  | 0.25  |
| SE Chokeberry Avenue at SE 19th Street* |                   |       |      |                   |     |       |
| Existing Conditions                     | A                 | 7     | 0.13 | A                 | 7   | 0.24  |
| 2019 Background Conditions              | A                 | 7     | 0.13 | A                 | 7   | 0.25  |
| 2019 Background plus Site Conditions    | A                 | 7     | 0.18 | A                 | 8   | 0.26  |
| SE Chokeberry Avenue at SE Willow Drive |                   |       |      |                   |     |       |
| Existing Conditions                     | A                 | 9     | 0.01 | A                 | 9   | 0.04  |
| 2019 Background Conditions              | A                 | 9     | 0.01 | A                 | 9   | 0.04  |
| 2019 Background plus Site Conditions    | A                 | 9     | 0.02 | A                 | 9   | 0.05  |
| US-101B at SE Willow Drive              |                   |       |      |                   |     |       |
| Existing Conditions                     | B                 | 13    | 0.15 | C                 | 15  | 0.28  |
| 2019 Background Conditions              | B                 | 13    | 0.15 | C                 | 16  | 0.28  |
| 2019 Background plus Site Conditions    | B                 | 13    | 0.15 | C                 | 16  | 0.28  |

\* Intersection Capacity Utilization reported in place of v/c ratio.

Based on the results of the operational analysis, all study intersections are currently operating acceptably per Clatsop County and ODOT standards and are projected to continue operating acceptably upon build-out of the proposed development through year 2019. No operational mitigation is necessary or recommended.

## **SAFETY ANALYSIS**

### ***CRASH DATA ANALYSIS***

Using data obtained from the ODOT's Crash Analysis and Reporting Unit, a review of the most recent available five years of crash history (from January 2011 to December 2015) at the study intersections was performed. The crash data was evaluated based on the number of crashes, the type of collisions, the severity of the collisions, and the resulting crash rate for the intersection. Crash rates provide the ability to compare safety risks at different intersections by accounting for both the number of crashes that have occurred during the study period and the number of vehicles that typically travel through the intersection. Crash rates were calculated using the common assumption that traffic counted during the evening peak period represents 10 percent of average daily traffic (ADT) at the intersection. Crash rates in excess of one to two crashes per million entering vehicles (CMEV) may be indicative of design deficiencies and therefore require a need for further investigation and possible mitigation.

The intersection of SE Ensign Lane at SE 19<sup>th</sup> Street had one reported crash during the analysis period. The crash was a rear-end collision and was classified as "Property Damage Only" (PDO). Although crash data was retrieved for five years, the one reported crash had occurred in year 2014 after the intersection was converted from a three-legged intersection to a four-legged. Since the number and types of crashes vary significantly based on intersection geometry and traffic controls, the crash rate was calculated assuming only two years of available history after the reconstruction of the intersection. Subsequently, a higher and more conservative crash rate will be projected at the intersection. The crash rate at the intersection was calculated to be 0.24 CMEV.

All other study intersections had no reported crashes during the analysis period.

Based on the most recent five years of crash data, no significant trends or crash patterns were identified at any of the study intersections and no specific safety mitigation is recommended.

### ***WARRANT ANALYSIS***

Left-turn lane and traffic signal warrants were examined for the study intersections where such treatments would be applicable.

A left-turn refuge lane is primarily a safety consideration for the major street, removing left-turning vehicles from the through traffic stream. The left-turn lane warrants for non-ODOT facilities used were developed from the National Cooperative Highway Research Project's (NCHRP) Report 457. For ODOT facilities, the left-turn lane warrants implement the design curves developed by the Texas Transportation Institute, as adopted by ODOT in its Analysis Procedures Manual. Turn lane warrants were evaluated based on the number of advancing and opposing vehicles as well as the number of turning vehicles, the travel speed, and the number of through lanes.

Left-turn lane warrants are not projected to be met for any of the applicable study intersections under any of the analysis scenarios through the 2019 build-out year. No new turn lanes are necessary or recommended.

Traffic signal warrants were examined for unsignalized study intersections to determine whether the installation of any new traffic signal will be warranted at the intersections upon completion of the proposed development. Due to insufficient main and side-street traffic volumes, traffic signal warrants are not projected to be met for any of the unsignalized study intersections under any of the analysis scenarios.





## CONCLUSIONS

All study intersections are currently operating acceptably per Clatsop County and ODOT standards and are projected to continue operating acceptably upon build-out of the proposed development through year 2019.

No significant trends or crash patterns were identified at any of the study intersections and no specific safety mitigation is recommended.

Left-turn lane warrants are not projected to be met for any of the applicable study intersections under any of the analysis scenarios through the 2019 build-out year. No new turn lanes are necessary or recommended.

Due to insufficient main and side-street traffic volumes, traffic signal warrants are not projected to be met for any of the unsignalized study intersections under any of the analysis scenarios.

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## APPENDIX

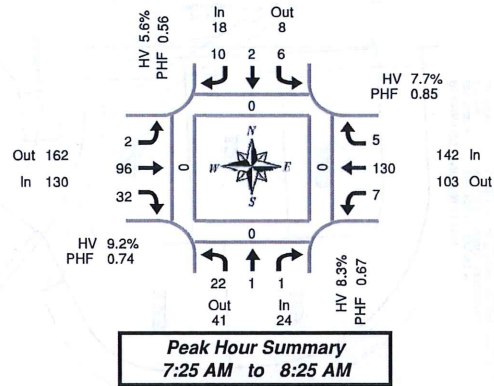




## Total Vehicle Summary



Clay Carney  
(503) 833-2740



## SE 19th St & Ensign Ln

Thursday, February 23, 2017

7:00 AM to 9:00 AM

### 5-Minute Interval Summary

7:00 AM to 9:00 AM

| Interval Start Time | Northbound SE 19th St |   |   |       | Southbound SE 19th St |   |    |       | Eastbound Ensign Ln |     |    |       | Westbound Ensign Ln |     |   |       | Interval Total | Pedestrians Crosswalk |       |      |      |
|---------------------|-----------------------|---|---|-------|-----------------------|---|----|-------|---------------------|-----|----|-------|---------------------|-----|---|-------|----------------|-----------------------|-------|------|------|
|                     | L                     | T | R | Bikes | L                     | T | R  | Bikes | L                   | T   | R  | Bikes | L                   | T   | R | Bikes |                | North                 | South | East | West |
| 7:00 AM             | 0                     | 0 | 0 | 0     | 0                     | 0 | 0  | 0     | 0                   | 4   | 2  | 0     | 0                   | 5   | 0 | 0     | 11             | 0                     | 0     | 0    | 0    |
| 7:05 AM             | 1                     | 0 | 0 | 0     | 0                     | 0 | 1  | 0     | 0                   | 1   | 4  | 0     | 1                   | 7   | 1 | 0     | 16             | 0                     | 0     | 0    | 0    |
| 7:10 AM             | 2                     | 0 | 0 | 0     | 0                     | 0 | 2  | 0     | 0                   | 4   | 2  | 0     | 0                   | 2   | 0 | 0     | 12             | 0                     | 0     | 0    | 0    |
| 7:15 AM             | 3                     | 0 | 0 | 0     | 0                     | 0 | 0  | 0     | 1                   | 2   | 2  | 0     | 1                   | 10  | 0 | 0     | 19             | 0                     | 0     | 0    | 0    |
| 7:20 AM             | 2                     | 0 | 0 | 0     | 0                     | 0 | 1  | 0     | 1                   | 6   | 1  | 0     | 1                   | 9   | 0 | 0     | 21             | 0                     | 0     | 0    | 0    |
| 7:25 AM             | 2                     | 0 | 0 | 0     | 0                     | 0 | 2  | 0     | 0                   | 7   | 0  | 0     | 1                   | 12  | 1 | 0     | 25             | 0                     | 0     | 0    | 0    |
| 7:30 AM             | 1                     | 0 | 0 | 0     | 0                     | 0 | 0  | 0     | 0                   | 7   | 1  | 0     | 0                   | 13  | 0 | 0     | 22             | 0                     | 0     | 0    | 0    |
| 7:35 AM             | 2                     | 0 | 0 | 0     | 1                     | 0 | 1  | 0     | 0                   | 10  | 3  | 0     | 1                   | 6   | 0 | 0     | 24             | 0                     | 0     | 0    | 0    |
| 7:40 AM             | 1                     | 1 | 0 | 0     | 0                     | 0 | 0  | 0     | 0                   | 11  | 3  | 0     | 0                   | 13  | 0 | 0     | 29             | 0                     | 0     | 0    | 0    |
| 7:45 AM             | 5                     | 0 | 0 | 0     | 1                     | 0 | 0  | 0     | 1                   | 11  | 5  | 0     | 0                   | 14  | 2 | 0     | 39             | 0                     | 0     | 0    | 0    |
| 7:50 AM             | 2                     | 0 | 0 | 0     | 1                     | 0 | 1  | 0     | 0                   | 10  | 2  | 0     | 0                   | 12  | 0 | 0     | 28             | 0                     | 0     | 0    | 0    |
| 7:55 AM             | 0                     | 0 | 0 | 0     | 1                     | 0 | 0  | 0     | 0                   | 5   | 4  | 0     | 1                   | 13  | 0 | 0     | 24             | 0                     | 0     | 0    | 0    |
| 8:00 AM             | 2                     | 0 | 0 | 0     | 0                     | 0 | 0  | 0     | 0                   | 8   | 4  | 0     | 0                   | 7   | 0 | 0     | 21             | 0                     | 0     | 0    | 0    |
| 8:05 AM             | 2                     | 0 | 1 | 0     | 1                     | 1 | 0  | 0     | 0                   | 9   | 4  | 0     | 1                   | 8   | 0 | 0     | 27             | 0                     | 0     | 0    | 0    |
| 8:10 AM             | 3                     | 0 | 0 | 0     | 1                     | 0 | 1  | 0     | 0                   | 5   | 1  | 0     | 0                   | 10  | 0 | 0     | 21             | 0                     | 0     | 0    | 0    |
| 8:15 AM             | 0                     | 0 | 0 | 0     | 0                     | 1 | 2  | 0     | 1                   | 8   | 3  | 0     | 0                   | 5   | 2 | 0     | 22             | 0                     | 0     | 0    | 0    |
| 8:20 AM             | 2                     | 0 | 0 | 0     | 0                     | 0 | 3  | 0     | 0                   | 5   | 2  | 0     | 3                   | 17  | 0 | 0     | 32             | 0                     | 0     | 0    | 0    |
| 8:25 AM             | 2                     | 0 | 0 | 0     | 0                     | 0 | 0  | 0     | 0                   | 5   | 3  | 0     | 1                   | 6   | 0 | 0     | 17             | 0                     | 0     | 0    | 0    |
| 8:30 AM             | 3                     | 0 | 0 | 0     | 1                     | 0 | 0  | 0     | 1                   | 6   | 3  | 0     | 0                   | 10  | 0 | 0     | 24             | 0                     | 0     | 0    | 0    |
| 8:35 AM             | 4                     | 0 | 1 | 0     | 0                     | 0 | 0  | 0     | 1                   | 4   | 1  | 0     | 0                   | 11  | 0 | 0     | 22             | 0                     | 0     | 0    | 0    |
| 8:40 AM             | 2                     | 1 | 0 | 0     | 0                     | 0 | 2  | 0     | 0                   | 12  | 4  | 0     | 0                   | 11  | 0 | 0     | 32             | 0                     | 0     | 0    | 0    |
| 8:45 AM             | 1                     | 0 | 2 | 0     | 0                     | 0 | 2  | 0     | 0                   | 5   | 0  | 0     | 0                   | 5   | 1 | 0     | 16             | 0                     | 0     | 0    | 0    |
| 8:50 AM             | 6                     | 0 | 0 | 0     | 0                     | 0 | 1  | 0     | 1                   | 12  | 1  | 0     | 0                   | 10  | 0 | 0     | 31             | 0                     | 0     | 0    | 0    |
| 8:55 AM             | 1                     | 0 | 0 | 0     | 0                     | 1 | 3  | 0     | 0                   | 7   | 1  | 0     | 0                   | 7   | 0 | 0     | 20             | 0                     | 0     | 0    | 0    |
| Total Survey        | 49                    | 2 | 4 | 0     | 7                     | 3 | 22 | 0     | 7                   | 164 | 56 | 0     | 11                  | 223 | 7 | 0     | 555            | 0                     | 0     | 0    | 0    |

### 15-Minute Interval Summary

7:00 AM to 9:00 AM

| Interval Start Time | Northbound SE 19th St |   |   |       | Southbound SE 19th St |   |    |       | Eastbound Ensign Ln |     |    |       | Westbound Ensign Ln |     |   |       | Interval Total | Pedestrians Crosswalk |       |      |      |
|---------------------|-----------------------|---|---|-------|-----------------------|---|----|-------|---------------------|-----|----|-------|---------------------|-----|---|-------|----------------|-----------------------|-------|------|------|
|                     | L                     | T | R | Bikes | L                     | T | R  | Bikes | L                   | T   | R  | Bikes | L                   | T   | R | Bikes |                | North                 | South | East | West |
| 7:00 AM             | 3                     | 0 | 0 | 0     | 0                     | 0 | 3  | 0     | 0                   | 9   | 8  | 0     | 1                   | 14  | 1 | 0     | 39             | 0                     | 0     | 0    | 0    |
| 7:15 AM             | 7                     | 0 | 0 | 0     | 0                     | 0 | 3  | 0     | 2                   | 15  | 3  | 0     | 3                   | 31  | 1 | 0     | 65             | 0                     | 0     | 0    | 0    |
| 7:30 AM             | 4                     | 1 | 0 | 0     | 1                     | 0 | 1  | 0     | 0                   | 28  | 7  | 0     | 1                   | 32  | 0 | 0     | 75             | 0                     | 0     | 0    | 0    |
| 7:45 AM             | 7                     | 0 | 0 | 0     | 3                     | 0 | 1  | 0     | 1                   | 26  | 11 | 0     | 1                   | 39  | 2 | 0     | 91             | 0                     | 0     | 0    | 0    |
| 8:00 AM             | 7                     | 0 | 1 | 0     | 2                     | 1 | 1  | 0     | 0                   | 22  | 9  | 0     | 1                   | 25  | 0 | 0     | 69             | 0                     | 0     | 0    | 0    |
| 8:15 AM             | 4                     | 0 | 0 | 0     | 0                     | 1 | 5  | 0     | 1                   | 18  | 8  | 0     | 4                   | 28  | 2 | 0     | 71             | 0                     | 0     | 0    | 0    |
| 8:30 AM             | 9                     | 1 | 1 | 0     | 1                     | 0 | 2  | 0     | 2                   | 22  | 8  | 0     | 0                   | 32  | 0 | 0     | 78             | 0                     | 0     | 0    | 0    |
| 8:45 AM             | 8                     | 0 | 2 | 0     | 0                     | 1 | 6  | 0     | 1                   | 24  | 2  | 0     | 0                   | 22  | 1 | 0     | 67             | 0                     | 0     | 0    | 0    |
| Total Survey        | 49                    | 2 | 4 | 0     | 7                     | 3 | 22 | 0     | 7                   | 164 | 56 | 0     | 11                  | 223 | 7 | 0     | 555            | 0                     | 0     | 0    | 0    |

### Peak Hour Summary

7:25 AM to 8:25 AM

| By Approach | Northbound SE 19th St |     |       |       | Southbound SE 19th St |     |       |       | Eastbound Ensign Ln |     |       |       | Westbound Ensign Ln |     |       |       | Total | Pedestrians Crosswalk |       |      |      |
|-------------|-----------------------|-----|-------|-------|-----------------------|-----|-------|-------|---------------------|-----|-------|-------|---------------------|-----|-------|-------|-------|-----------------------|-------|------|------|
|             | In                    | Out | Total | Bikes | In                    | Out | Total | Bikes | In                  | Out | Total | Bikes | In                  | Out | Total | Bikes |       | North                 | South | East | West |
| Volume      | 24                    | 41  | 65    | 0     | 18                    | 8   | 26    | 0     | 130                 | 162 | 292   | 0     | 142                 | 103 | 245   | 0     | 314   | 0                     | 0     | 0    | 0    |
| %HV         |                       |     | 8.3%  |       |                       |     | 5.6%  |       |                     |     | 9.2%  |       |                     |     | 7.7%  |       | 8.3%  |                       |       |      |      |
| PHF         |                       |     | 0.67  |       |                       |     | 0.56  |       |                     |     | 0.74  |       |                     |     | 0.85  |       | 0.82  |                       |       |      |      |

| By Movement | Northbound SE 19th St |      |      |       | Southbound SE 19th St |      |       |       | Eastbound Ensign Ln |       |      |       | Westbound Ensign Ln |      |      |       | Total |
|-------------|-----------------------|------|------|-------|-----------------------|------|-------|-------|---------------------|-------|------|-------|---------------------|------|------|-------|-------|
|             | L                     | T    | R    | Total | L                     | T    | R     | Total | L                   | T     | R    | Total | L                   | T    | R    | Total |       |
| Volume      | 22                    | 1    | 1    | 24    | 6                     | 2    | 10    | 18    | 2                   | 96    | 32   | 130   | 7                   | 130  | 5    | 142   | 314   |
| %HV         | 9.1%                  | 0.0% | 0.0% | 8.3%  | 0.0%                  | 0.0% | 10.0% | 5.6%  | 0.0%                | 10.4% | 6.3% | 9.2%  | 0.0%                | 8.5% | 0.0% | 7.7%  | 8.3%  |
| PHF         | 0.69                  | 0.25 | 0.25 | 0.67  | 0.50                  | 0.25 | 0.42  | 0.56  | 0.50                | 0.75  | 0.67 | 0.74  | 0.58                | 0.83 | 0.63 | 0.85  | 0.82  |

### Rolling Hour Summary

7:00 AM to 9:00 AM

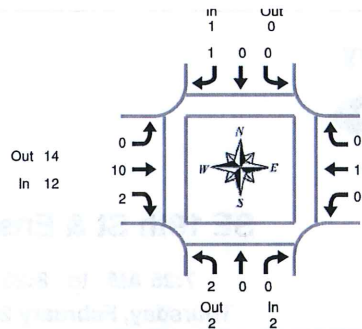
| Interval Start Time | Northbound SE 19th St |   |   |       | Southbound SE 19th St |   |    |       | Eastbound Ensign Ln |    |    |       | Westbound Ensign Ln |     |   |       | Interval Total | Pedestrians Crosswalk |       |      |      |
|---------------------|-----------------------|---|---|-------|-----------------------|---|----|-------|---------------------|----|----|-------|---------------------|-----|---|-------|----------------|-----------------------|-------|------|------|
|                     | L                     | T | R | Bikes | L                     | T | R  | Bikes | L                   | T  | R  | Bikes | L                   | T   | R | Bikes |                | North                 | South | East | West |
| 7:00 AM             | 21                    | 1 | 0 | 0     | 4                     | 0 | 8  | 0     | 3                   | 78 | 29 | 0     | 6                   | 116 | 4 | 0     | 270            | 0                     | 0     | 0    | 0    |
| 7:15 AM             | 25                    | 1 | 1 | 0     | 6                     | 1 | 6  | 0     | 3                   | 91 | 30 | 0     | 6                   | 127 | 3 | 0     | 300            | 0                     | 0     | 0    | 0    |
| 7:30 AM             | 22                    | 1 | 1 | 0     | 6                     | 2 | 8  | 0     | 2                   | 94 | 35 | 0     | 7                   | 124 | 4 | 0     | 306            | 0                     | 0     | 0    | 0    |
| 7:45 AM             | 27                    | 1 | 2 | 0     | 6                     | 2 | 9  | 0     | 4                   | 88 | 36 | 0     | 6                   | 124 | 4 | 0     | 309            | 0                     | 0     | 0    | 0    |
| 8:00 AM             | 28                    | 1 | 4 | 0     | 3                     | 3 | 14 | 0     | 4                   | 86 | 27 | 0     | 5                   | 107 | 3 | 0     | 285            | 0                     | 0     | 0    | 0    |



## Heavy Vehicle Summary



Clay Carney  
(503) 833-2740



## SE 19th St & Ensign Ln

Thursday, February 23, 2017

7:00 AM to 9:00 AM

Peak Hour Summary  
7:25 AM to 8:25 AM

### Heavy Vehicle 5-Minute Interval Summary 7:00 AM to 9:00 AM

| Interval<br>Start<br>Time | Northbound<br>SE 19th St |   |   |       | Southbound<br>SE 19th St |   |   |       | Eastbound<br>Ensign Ln |    |   |       | Westbound<br>Ensign Ln |    |   |       | Interval<br>Total |
|---------------------------|--------------------------|---|---|-------|--------------------------|---|---|-------|------------------------|----|---|-------|------------------------|----|---|-------|-------------------|
|                           | L                        | T | R | Total | L                        | T | R | Total | L                      | T  | R | Total | L                      | T  | R | Total |                   |
| 7:00 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 0  | 0 | 0     | 0                      | 1  | 0 | 1     | 1                 |
| 7:05 AM                   | 1                        | 0 | 0 | 1     | 0                        | 0 | 0 | 0     | 0                      | 0  | 0 | 0     | 0                      | 1  | 0 | 1     | 2                 |
| 7:10 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 0  | 1 | 1     | 0                      | 1  | 0 | 1     | 2                 |
| 7:15 AM                   | 1                        | 0 | 0 | 1     | 0                        | 0 | 0 | 0     | 0                      | 0  | 0 | 0     | 0                      | 0  | 0 | 0     | 1                 |
| 7:20 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 0  | 0 | 0     | 0                      | 0  | 0 | 0     | 0                 |
| 7:25 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 1  | 0 | 1     | 0                      | 1  | 0 | 1     | 2                 |
| 7:30 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 1  | 0 | 1     | 0                      | 0  | 0 | 0     | 1                 |
| 7:35 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 1  | 0 | 1     | 0                      | 0  | 0 | 0     | 1                 |
| 7:40 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 1  | 0 | 1     | 0                      | 2  | 0 | 2     | 3                 |
| 7:45 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 1  | 0 | 1     | 0                      | 1  | 0 | 1     | 2                 |
| 7:50 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 2  | 0 | 2     | 0                      | 0  | 0 | 0     | 2                 |
| 7:55 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 0  | 0 | 0     | 0                      | 3  | 0 | 3     | 3                 |
| 8:00 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 0  | 0 | 0     | 0                      | 1  | 0 | 1     | 1                 |
| 8:05 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 1  | 0 | 1     | 0                      | 0  | 0 | 0     | 1                 |
| 8:10 AM                   | 1                        | 0 | 0 | 1     | 0                        | 0 | 0 | 0     | 0                      | 1  | 0 | 1     | 0                      | 0  | 0 | 0     | 2                 |
| 8:15 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 1  | 1 | 2     | 0                      | 0  | 0 | 0     | 2                 |
| 8:20 AM                   | 1                        | 0 | 0 | 1     | 0                        | 0 | 1 | 1     | 0                      | 0  | 1 | 1     | 0                      | 3  | 0 | 3     | 6                 |
| 8:25 AM                   | 1                        | 0 | 0 | 1     | 0                        | 0 | 0 | 0     | 0                      | 1  | 0 | 1     | 1                      | 0  | 0 | 1     | 3                 |
| 8:30 AM                   | 1                        | 0 | 0 | 1     | 0                        | 0 | 0 | 0     | 0                      | 2  | 0 | 2     | 0                      | 1  | 0 | 1     | 4                 |
| 8:35 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 3  | 0 | 3     | 0                      | 0  | 0 | 0     | 3                 |
| 8:40 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 1  | 0 | 1     | 0                      | 2  | 0 | 2     | 3                 |
| 8:45 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 1  | 0 | 1     | 0                      | 1  | 0 | 1     | 2                 |
| 8:50 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 1 | 1     | 0                      | 3  | 0 | 3     | 0                      | 1  | 0 | 1     | 5                 |
| 8:55 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 4  | 0 | 4     | 0                      | 1  | 0 | 1     | 5                 |
| Total<br>Survey           | 6                        | 0 | 0 | 6     | 0                        | 0 | 2 | 2     | 0                      | 25 | 3 | 28    | 1                      | 20 | 0 | 21    | 57                |

### Heavy Vehicle 15-Minute Interval Summary 7:00 AM to 9:00 AM

| Interval<br>Start<br>Time | Northbound<br>SE 19th St |   |   |       | Southbound<br>SE 19th St |   |   |       | Eastbound<br>Ensign Ln |    |   |       | Westbound<br>Ensign Ln |    |   |       | Interval<br>Total |
|---------------------------|--------------------------|---|---|-------|--------------------------|---|---|-------|------------------------|----|---|-------|------------------------|----|---|-------|-------------------|
|                           | L                        | T | R | Total | L                        | T | R | Total | L                      | T  | R | Total | L                      | T  | R | Total |                   |
| 7:00 AM                   | 1                        | 0 | 0 | 1     | 0                        | 0 | 0 | 0     | 0                      | 0  | 1 | 1     | 0                      | 3  | 0 | 3     | 5                 |
| 7:15 AM                   | 1                        | 0 | 0 | 1     | 0                        | 0 | 0 | 0     | 0                      | 1  | 0 | 1     | 0                      | 1  | 0 | 1     | 3                 |
| 7:30 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 3  | 0 | 3     | 0                      | 2  | 0 | 2     | 5                 |
| 7:45 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 3  | 0 | 3     | 0                      | 4  | 0 | 4     | 7                 |
| 8:00 AM                   | 1                        | 0 | 0 | 1     | 0                        | 0 | 0 | 0     | 0                      | 2  | 0 | 2     | 0                      | 1  | 0 | 1     | 4                 |
| 8:15 AM                   | 2                        | 0 | 0 | 2     | 0                        | 0 | 1 | 1     | 0                      | 2  | 2 | 4     | 1                      | 3  | 0 | 4     | 11                |
| 8:30 AM                   | 1                        | 0 | 0 | 1     | 0                        | 0 | 0 | 0     | 0                      | 6  | 0 | 6     | 0                      | 3  | 0 | 3     | 10                |
| 8:45 AM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 1 | 1     | 0                      | 8  | 0 | 8     | 0                      | 3  | 0 | 3     | 12                |
| Total<br>Survey           | 6                        | 0 | 0 | 6     | 0                        | 0 | 2 | 2     | 0                      | 25 | 3 | 28    | 1                      | 20 | 0 | 21    | 57                |

### Heavy Vehicle Peak Hour Summary 7:25 AM to 8:25 AM

| By<br>Approach | Northbound<br>SE 19th St |   |   | In | Out | Total | In   | Out | Total | In   | Out | Total | In   | Out | Total | Total |
|----------------|--------------------------|---|---|----|-----|-------|------|-----|-------|------|-----|-------|------|-----|-------|-------|
|                | L                        | T | R |    |     |       |      |     |       |      |     |       |      |     |       |       |
| Volume         | 2                        | 2 | 4 |    |     |       | 1    | 0   | 1     | 12   | 14  | 26    | 11   | 10  | 21    | 26    |
| PHF            | 0.25                     |   |   |    |     |       | 0.25 |     |       | 0.75 |     |       | 0.69 |     |       | 0.65  |

| By<br>Movement | Northbound<br>SE 19th St |      |      |       | L    | T    | R    | Total | L    | T    | R    | Total | L    | T    | R    | Total | Total |
|----------------|--------------------------|------|------|-------|------|------|------|-------|------|------|------|-------|------|------|------|-------|-------|
|                | L                        | T    | R    | Total |      |      |      |       |      |      |      |       |      |      |      |       |       |
| Volume         | 2                        | 0    | 0    | 2     | 0    | 0    | 1    | 1     | 0    | 10   | 2    | 12    | 0    | 11   | 0    | 11    | 26    |
| PHF            | 0.25                     | 0.00 | 0.00 | 0.25  | 0.00 | 0.00 | 0.25 | 0.25  | 0.00 | 0.63 | 0.25 | 0.75  | 0.00 | 0.69 | 0.00 | 0.69  | 0.65  |

### Heavy Vehicle Rolling Hour Summary 7:00 AM to 9:00 AM

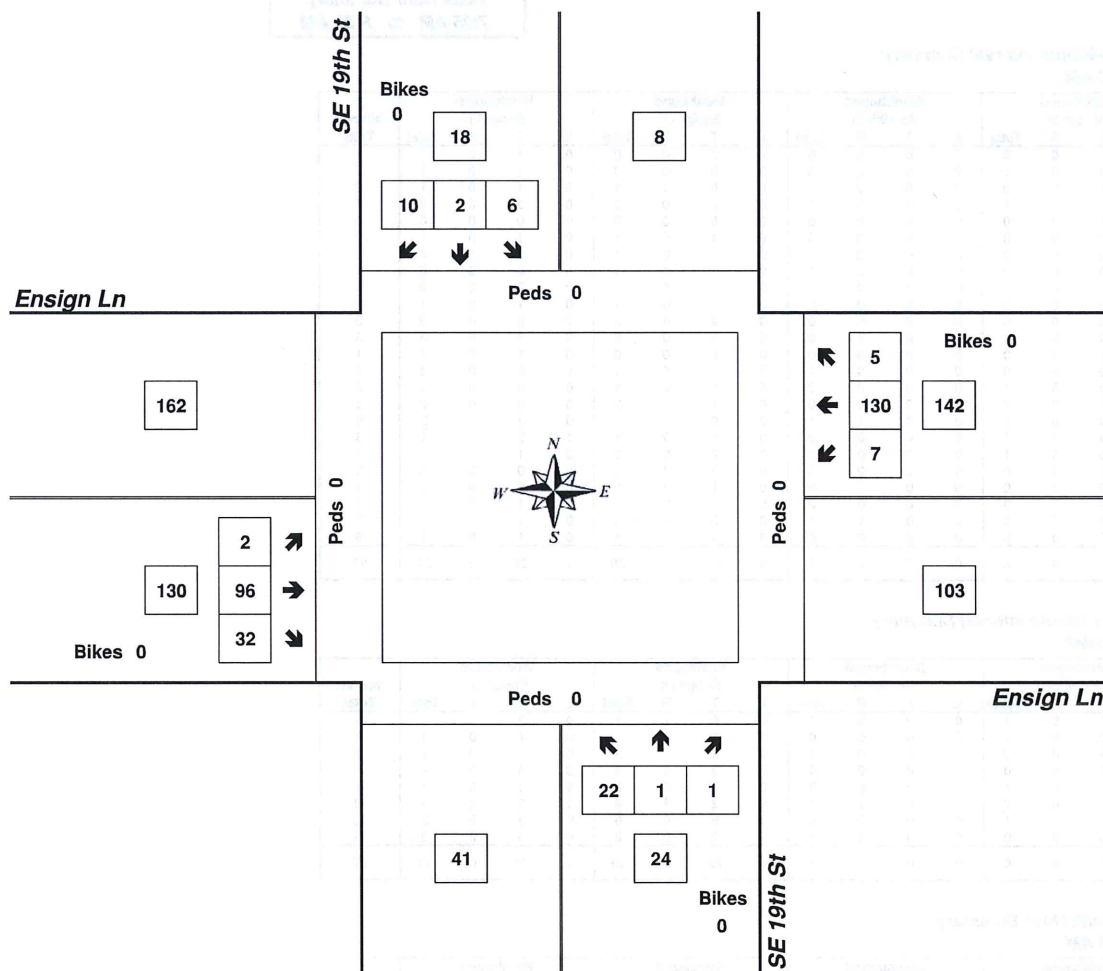
| Interval<br>Start<br>Time | Northbound<br>SE 19th St |   |   |       | Southbound<br>SE 19th St |   |   |       | Eastbound<br>Ensign Ln |    |   |       | Westbound<br>Ensign Ln |    |   |       | Interval<br>Total |
|---------------------------|--------------------------|---|---|-------|--------------------------|---|---|-------|------------------------|----|---|-------|------------------------|----|---|-------|-------------------|
|                           | L                        | T | R | Total | L                        | T | R | Total | L                      | T  | R | Total | L                      | T  | R | Total |                   |
| 7:00 AM                   | 2                        | 0 | 0 | 2     | 0                        | 0 | 0 | 0     | 0                      | 7  | 1 | 8     | 0                      | 10 | 0 | 10    | 20                |
| 7:15 AM                   | 2                        | 0 | 0 | 2     | 0                        | 0 | 0 | 0     | 0                      | 9  | 0 | 9     | 0                      | 8  | 0 | 8     | 19                |
| 7:30 AM                   | 3                        | 0 | 0 | 3     | 0                        | 0 | 1 | 1     | 0                      | 10 | 2 | 12    | 1                      | 10 | 0 | 11    | 27                |
| 7:45 AM                   | 4                        | 0 | 0 | 4     | 0                        | 0 | 1 | 1     | 0                      | 13 | 2 | 15    | 1                      | 11 | 0 | 12    | 32                |
| 8:00 AM                   | 4                        | 0 | 0 | 4     | 0                        | 0 | 2 | 2     | 0                      | 18 | 2 | 20    | 1                      | 10 | 0 | 11    | 37                |

**All Traffic Data**  
Services Inc.

Clay Carney  
(503) 833-2740

## 7:25 AM to 8:25 AM

**Thursday, February 23, 2017**



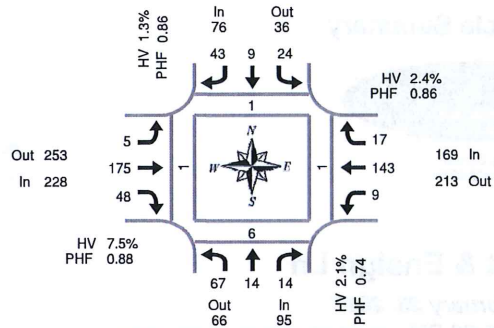
| Approach     | PHF  | HV%  | Volume |
|--------------|------|------|--------|
| EB           | 0.74 | 9.2% | 130    |
| WB           | 0.85 | 7.7% | 142    |
| NB           | 0.67 | 8.3% | 24     |
| SB           | 0.56 | 5.6% | 18     |
| Intersection | 0.82 | 8.3% | 314    |

Count Period: 7:00 AM to 9:00 AM

## Total Vehicle Summary



Clay Carney  
(503) 833-2740



## SE 19th St & Ensign Ln

Thursday, February 23, 2017

4:00 PM to 6:00 PM

Peak Hour Summary  
4:00 PM to 5:00 PM

### 5-Minute Interval Summary

4:00 PM to 6:00 PM

| Interval Start Time | Northbound SE 19th St |    |    |       | Southbound SE 19th St |    |    |       | Eastbound Ensign Ln |     |    |       | Westbound Ensign Ln |     |    |       | Interval Total | Pedestrians Crosswalk |       |      |      |
|---------------------|-----------------------|----|----|-------|-----------------------|----|----|-------|---------------------|-----|----|-------|---------------------|-----|----|-------|----------------|-----------------------|-------|------|------|
|                     | L                     | T  | R  | Bikes | L                     | T  | R  | Bikes | L                   | T   | R  | Bikes | L                   | T   | R  | Bikes |                | North                 | South | East | West |
| 4:00 PM             | 8                     | 3  | 0  | 0     | 2                     | 0  | 3  | 0     | 0                   | 19  | 7  | 0     | 1                   | 12  | 3  | 0     | 58             | 0                     | 5     | 0    | 0    |
| 4:05 PM             | 5                     | 4  | 2  | 0     | 1                     | 1  | 5  | 0     | 0                   | 10  | 7  | 0     | 2                   | 13  | 0  | 0     | 50             | 1                     | 0     | 0    | 0    |
| 4:10 PM             | 7                     | 0  | 3  | 0     | 0                     | 1  | 3  | 0     | 0                   | 12  | 6  | 0     | 0                   | 16  | 2  | 0     | 50             | 0                     | 1     | 0    | 1    |
| 4:15 PM             | 9                     | 1  | 1  | 0     | 3                     | 1  | 2  | 0     | 1                   | 14  | 3  | 0     | 0                   | 9   | 0  | 0     | 44             | 0                     | 0     | 0    | 0    |
| 4:20 PM             | 4                     | 1  | 1  | 0     | 2                     | 1  | 4  | 0     | 2                   | 22  | 3  | 0     | 0                   | 9   | 4  | 0     | 53             | 0                     | 0     | 0    | 0    |
| 4:25 PM             | 9                     | 0  | 0  | 0     | 1                     | 1  | 2  | 0     | 0                   | 19  | 1  | 0     | 2                   | 10  | 2  | 0     | 47             | 0                     | 0     | 0    | 0    |
| 4:30 PM             | 6                     | 2  | 1  | 0     | 2                     | 0  | 6  | 0     | 2                   | 9   | 6  | 0     | 1                   | 17  | 1  | 0     | 53             | 0                     | 0     | 0    | 0    |
| 4:35 PM             | 3                     | 1  | 2  | 0     | 2                     | 0  | 6  | 0     | 0                   | 19  | 5  | 0     | 0                   | 13  | 1  | 0     | 52             | 0                     | 0     | 0    | 0    |
| 4:40 PM             | 4                     | 0  | 0  | 0     | 3                     | 2  | 0  | 0     | 0                   | 17  | 4  | 0     | 1                   | 9   | 0  | 0     | 40             | 0                     | 0     | 0    | 0    |
| 4:45 PM             | 7                     | 2  | 1  | 0     | 5                     | 0  | 3  | 0     | 0                   | 9   | 5  | 0     | 0                   | 14  | 3  | 0     | 49             | 0                     | 0     | 0    | 0    |
| 4:50 PM             | 1                     | 0  | 1  | 0     | 1                     | 1  | 3  | 0     | 0                   | 10  | 1  | 0     | 1                   | 11  | 1  | 0     | 31             | 0                     | 0     | 0    | 0    |
| 4:55 PM             | 4                     | 0  | 2  | 0     | 2                     | 1  | 6  | 0     | 0                   | 15  | 0  | 0     | 1                   | 10  | 0  | 0     | 41             | 0                     | 0     | 1    | 0    |
| 5:00 PM             | 5                     | 0  | 2  | 0     | 0                     | 0  | 0  | 0     | 0                   | 8   | 5  | 0     | 0                   | 17  | 0  | 0     | 37             | 0                     | 0     | 0    | 0    |
| 5:05 PM             | 9                     | 1  | 0  | 0     | 2                     | 1  | 0  | 0     | 0                   | 14  | 4  | 0     | 0                   | 16  | 0  | 0     | 47             | 0                     | 0     | 0    | 0    |
| 5:10 PM             | 5                     | 0  | 2  | 0     | 1                     | 0  | 4  | 0     | 0                   | 10  | 3  | 0     | 1                   | 19  | 2  | 0     | 47             | 0                     | 0     | 0    | 0    |
| 5:15 PM             | 9                     | 0  | 1  | 0     | 4                     | 0  | 2  | 0     | 1                   | 22  | 4  | 0     | 0                   | 11  | 0  | 0     | 54             | 0                     | 0     | 0    | 0    |
| 5:20 PM             | 10                    | 0  | 0  | 0     | 1                     | 0  | 3  | 0     | 1                   | 15  | 3  | 0     | 1                   | 12  | 2  | 0     | 48             | 0                     | 0     | 0    | 0    |
| 5:25 PM             | 6                     | 0  | 1  | 0     | 4                     | 0  | 2  | 0     | 0                   | 12  | 0  | 0     | 0                   | 14  | 0  | 0     | 39             | 0                     | 0     | 0    | 0    |
| 5:30 PM             | 2                     | 0  | 0  | 0     | 2                     | 0  | 2  | 0     | 0                   | 17  | 2  | 0     | 0                   | 7   | 2  | 1     | 34             | 0                     | 0     | 0    | 0    |
| 5:35 PM             | 0                     | 0  | 1  | 0     | 0                     | 0  | 2  | 0     | 1                   | 11  | 3  | 0     | 1                   | 11  | 0  | 0     | 30             | 0                     | 0     | 0    | 0    |
| 5:40 PM             | 3                     | 0  | 0  | 0     | 4                     | 0  | 0  | 0     | 0                   | 17  | 3  | 0     | 0                   | 12  | 2  | 0     | 41             | 0                     | 0     | 0    | 0    |
| 5:45 PM             | 2                     | 0  | 0  | 0     | 2                     | 0  | 4  | 0     | 0                   | 10  | 1  | 0     | 0                   | 4   | 1  | 0     | 24             | 0                     | 0     | 0    | 0    |
| 5:50 PM             | 4                     | 1  | 0  | 0     | 0                     | 0  | 0  | 0     | 0                   | 10  | 2  | 0     | 0                   | 10  | 0  | 0     | 27             | 0                     | 0     | 0    | 0    |
| 5:55 PM             | 5                     | 0  | 0  | 0     | 1                     | 0  | 4  | 0     | 0                   | 14  | 1  | 0     | 0                   | 11  | 0  | 0     | 36             | 0                     | 0     | 0    | 0    |
| Total Survey        | 127                   | 16 | 21 | 0     | 45                    | 10 | 66 | 0     | 8                   | 335 | 79 | 0     | 12                  | 287 | 26 | 1     | 1,032          | 1                     | 6     | 1    | 1    |

### 15-Minute Interval Summary

4:00 PM to 6:00 PM

| Interval Start Time | Northbound SE 19th St |    |    |       | Southbound SE 19th St |    |    |       | Eastbound Ensign Ln |     |    |       | Westbound Ensign Ln |     |    |       | Interval Total | Pedestrians Crosswalk |       |      |      |
|---------------------|-----------------------|----|----|-------|-----------------------|----|----|-------|---------------------|-----|----|-------|---------------------|-----|----|-------|----------------|-----------------------|-------|------|------|
|                     | L                     | T  | R  | Bikes | L                     | T  | R  | Bikes | L                   | T   | R  | Bikes | L                   | T   | R  | Bikes |                | North                 | South | East | West |
| 4:00 PM             | 20                    | 7  | 5  | 0     | 3                     | 2  | 11 | 0     | 0                   | 41  | 20 | 0     | 3                   | 41  | 5  | 0     | 158            | 1                     | 6     | 0    | 1    |
| 4:15 PM             | 22                    | 2  | 2  | 0     | 6                     | 3  | 8  | 0     | 3                   | 55  | 7  | 0     | 2                   | 28  | 6  | 0     | 144            | 0                     | 0     | 0    | 0    |
| 4:30 PM             | 13                    | 3  | 3  | 0     | 7                     | 2  | 12 | 0     | 2                   | 45  | 15 | 0     | 2                   | 39  | 2  | 0     | 145            | 0                     | 0     | 0    | 0    |
| 4:45 PM             | 12                    | 2  | 4  | 0     | 8                     | 2  | 12 | 0     | 0                   | 34  | 6  | 0     | 2                   | 35  | 4  | 0     | 121            | 0                     | 0     | 1    | 0    |
| 5:00 PM             | 19                    | 1  | 4  | 0     | 3                     | 1  | 4  | 0     | 0                   | 32  | 12 | 0     | 1                   | 52  | 2  | 0     | 131            | 0                     | 0     | 0    | 0    |
| 5:15 PM             | 25                    | 0  | 2  | 0     | 9                     | 0  | 7  | 0     | 2                   | 49  | 7  | 0     | 1                   | 37  | 2  | 0     | 141            | 0                     | 0     | 0    | 0    |
| 5:30 PM             | 5                     | 0  | 1  | 0     | 6                     | 0  | 4  | 0     | 1                   | 45  | 8  | 0     | 1                   | 30  | 4  | 1     | 105            | 0                     | 0     | 0    | 0    |
| 5:45 PM             | 11                    | 1  | 0  | 0     | 3                     | 0  | 8  | 0     | 0                   | 34  | 4  | 0     | 0                   | 25  | 1  | 0     | 87             | 0                     | 0     | 0    | 0    |
| Total Survey        | 127                   | 16 | 21 | 0     | 45                    | 10 | 66 | 0     | 8                   | 335 | 79 | 0     | 12                  | 287 | 26 | 1     | 1,032          | 1                     | 6     | 1    | 1    |

### Peak Hour Summary

4:00 PM to 5:00 PM

| By Approach | Northbound SE 19th St |     |       |       | Southbound SE 19th St |     |       |       | Eastbound Ensign Ln |     |       |       | Westbound Ensign Ln |     |       |       | Total | Pedestrians Crosswalk |       |      |      |
|-------------|-----------------------|-----|-------|-------|-----------------------|-----|-------|-------|---------------------|-----|-------|-------|---------------------|-----|-------|-------|-------|-----------------------|-------|------|------|
|             | In                    | Out | Total | Bikes | In                    | Out | Total | Bikes | In                  | Out | Total | Bikes | In                  | Out | Total | Bikes |       | North                 | South | East | West |
| Volume      | 95                    | 66  | 161   | 0     | 76                    | 36  | 112   | 0     | 228                 | 253 | 481   | 0     | 169                 | 213 | 382   | 0     | 568   | 1                     | 6     | 1    | 1    |
| %HV         |                       |     | 2.1%  |       |                       |     | 1.3%  |       |                     |     | 7.5%  |       |                     |     | 2.4%  |       | 4.2%  |                       |       |      |      |
| PHF         |                       |     | 0.74  |       |                       |     | 0.86  |       |                     |     | 0.88  |       |                     |     | 0.86  |       | 0.90  |                       |       |      |      |

| By Movement | Northbound SE 19th St |      |      |       | Southbound SE 19th St |      |      |       | Eastbound Ensign Ln |      |      |       | Westbound Ensign Ln |      |      |       | Total |
|-------------|-----------------------|------|------|-------|-----------------------|------|------|-------|---------------------|------|------|-------|---------------------|------|------|-------|-------|
|             | L                     | T    | R    | Total | L                     | T    | R    | Total | L                   | T    | R    | Total | L                   | T    | R    | Total |       |
| Volume      | 67                    | 14   | 14   | 95    | 24                    | 9    | 43   | 76    | 5                   | 175  | 48   | 228   | 9                   | 143  | 17   | 169   | 568   |
| %HV         | 1.5%                  | 7.1% | 0.0% | 2.1%  | 4.2%                  | 0.0% | 0.0% | 1.3%  | 20.0%               | 8.0% | 4.2% | 7.5%  | 0.0%                | 2.8% | 0.0% | 2.4%  | 4.2%  |
| PHF         | 0.76                  | 0.50 | 0.58 | 0.74  | 0.60                  | 0.75 | 0.77 | 0.86  | 0.31                | 0.80 | 0.60 | 0.88  | 0.75                | 0.87 | 0.61 | 0.86  | 0.90  |

### Rolling Hour Summary

4:00 PM to 6:00 PM

| Interval Start Time | Northbound SE 19th St |    |    |       | Southbound SE 19th St |   |    |       | Eastbound Ensign Ln |     |    |       | Westbound Ensign Ln |     |    |       | Interval Total | Pedestrians Crosswalk |       |      |      |
|---------------------|-----------------------|----|----|-------|-----------------------|---|----|-------|---------------------|-----|----|-------|---------------------|-----|----|-------|----------------|-----------------------|-------|------|------|
|                     | L                     | T  | R  | Bikes | L                     | T | R  | Bikes | L                   | T   | R  | Bikes | L                   | T   | R  | Bikes |                | North                 | South | East | West |
| 4:00 PM             | 67                    | 14 | 14 | 0     | 24                    | 9 | 43 | 0     | 5                   | 175 | 48 | 0     | 9                   | 143 | 17 | 0     | 568            | 0                     | 6     | 1    | 1    |
| 4:15 PM             | 66                    | 8  | 13 | 0     | 24                    | 8 | 36 | 0     | 5                   | 166 | 40 | 0     | 7                   | 154 | 14 | 0     | 541            | 0                     | 0     | 1    | 0    |
| 4:30 PM             | 69                    | 6  | 13 | 0     | 27                    | 5 | 35 | 0     | 4                   | 160 | 40 | 0     | 6                   | 163 | 10 | 0     | 538            | 0                     | 0     | 1    | 0    |
| 4:45 PM             | 61                    | 3  | 11 | 0     | 26                    | 3 | 27 | 0     | 3                   | 160 | 33 | 0     | 5                   | 154 | 12 | 1     | 498            | 0                     | 0     | 1    | 0    |
| 5:00 PM             | 60                    | 2  | 7  | 0     | 21                    | 1 | 23 | 0     | 3                   | 160 | 31 | 0     | 3                   | 144 | 9  | 1     | 464            | 0                     | 0     | 0    | 0    |

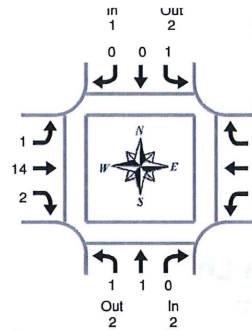


## Heavy Vehicle Summary



Clay Carney  
(503) 833-2740

Out 5  
In 17



**Peak Hour Summary**  
4:00 PM to 5:00 PM

## SE 19th St & Ensign Ln

Thursday, February 23, 2017

4:00 PM to 6:00 PM

### Heavy Vehicle 5-Minute Interval Summary

4:00 PM to 6:00 PM

| Interval<br>Start<br>Time | Northbound<br>SE 19th St |   |   |       | Southbound<br>SE 19th St |   |   |       | Eastbound<br>Ensign Ln |    |   |       | Westbound<br>Ensign Ln |   |   |       | Interval<br>Total |
|---------------------------|--------------------------|---|---|-------|--------------------------|---|---|-------|------------------------|----|---|-------|------------------------|---|---|-------|-------------------|
|                           | L                        | T | R | Total | L                        | T | R | Total | L                      | T  | R | Total | L                      | T | R | Total |                   |
| 4:00 PM                   | 0                        | 1 | 0 | 1     | 0                        | 0 | 0 | 0     | 0                      | 3  | 0 | 3     | 0                      | 0 | 0 | 0     | 4                 |
| 4:05 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 1  | 1 | 2     | 0                      | 1 | 0 | 1     | 3                 |
| 4:10 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 0  | 1 | 1     | 0                      | 0 | 0 | 0     | 1                 |
| 4:15 PM                   | 1                        | 0 | 0 | 1     | 0                        | 0 | 0 | 0     | 1                      | 2  | 0 | 3     | 0                      | 1 | 0 | 1     | 5                 |
| 4:20 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 2  | 0 | 2     | 0                      | 0 | 0 | 0     | 2                 |
| 4:25 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 2  | 0 | 2     | 0                      | 0 | 0 | 0     | 2                 |
| 4:30 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 2  | 0 | 2     | 0                      | 0 | 0 | 0     | 2                 |
| 4:35 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 1  | 0 | 1     | 0                      | 1 | 0 | 1     | 2                 |
| 4:40 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 0  | 0 | 0     | 0                      | 0 | 0 | 0     | 0                 |
| 4:45 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 0  | 0 | 0     | 0                      | 1 | 0 | 1     | 1                 |
| 4:50 PM                   | 0                        | 0 | 0 | 0     | 1                        | 0 | 0 | 1     | 0                      | 0  | 0 | 0     | 0                      | 0 | 0 | 0     | 1                 |
| 4:55 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 1  | 0 | 1     | 0                      | 0 | 0 | 0     | 1                 |
| 5:00 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 0  | 0 | 0     | 1                      | 0 | 1 | 1     | 1                 |
| 5:05 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 1  | 0 | 1     | 0                      | 0 | 0 | 0     | 1                 |
| 5:10 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 0  | 1 | 1     | 0                      | 0 | 0 | 0     | 1                 |
| 5:15 PM                   | 1                        | 0 | 0 | 1     | 0                        | 0 | 0 | 0     | 0                      | 0  | 1 | 1     | 0                      | 0 | 0 | 0     | 2                 |
| 5:20 PM                   | 1                        | 0 | 0 | 1     | 0                        | 0 | 0 | 0     | 0                      | 0  | 0 | 0     | 0                      | 0 | 0 | 0     | 1                 |
| 5:25 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 0  | 0 | 0     | 0                      | 0 | 0 | 0     | 0                 |
| 5:30 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 0  | 0 | 0     | 0                      | 0 | 0 | 0     | 0                 |
| 5:35 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 0  | 0 | 0     | 0                      | 0 | 0 | 0     | 0                 |
| 5:40 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 0  | 0 | 0     | 1                      | 0 | 1 | 1     | 1                 |
| 5:45 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 0  | 0 | 0     | 0                      | 0 | 0 | 0     | 0                 |
| 5:50 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 0  | 0 | 0     | 0                      | 0 | 0 | 0     | 0                 |
| 5:55 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 1  | 0 | 1     | 0                      | 0 | 0 | 0     | 1                 |
| Total Survey              | 3                        | 1 | 0 | 4     | 1                        | 0 | 0 | 1     | 1                      | 16 | 4 | 21    | 0                      | 6 | 0 | 6     | 32                |

### Heavy Vehicle 15-Minute Interval Summary

4:00 PM to 6:00 PM

| Interval<br>Start<br>Time | Northbound<br>SE 19th St |   |   |       | Southbound<br>SE 19th St |   |   |       | Eastbound<br>Ensign Ln |    |   |       | Westbound<br>Ensign Ln |   |   |       | Interval<br>Total |
|---------------------------|--------------------------|---|---|-------|--------------------------|---|---|-------|------------------------|----|---|-------|------------------------|---|---|-------|-------------------|
|                           | L                        | T | R | Total | L                        | T | R | Total | L                      | T  | R | Total | L                      | T | R | Total |                   |
| 4:00 PM                   | 0                        | 1 | 0 | 1     | 0                        | 0 | 0 | 0     | 0                      | 4  | 2 | 6     | 0                      | 1 | 0 | 1     | 8                 |
| 4:15 PM                   | 1                        | 0 | 0 | 1     | 0                        | 0 | 0 | 0     | 1                      | 6  | 0 | 7     | 0                      | 1 | 0 | 1     | 9                 |
| 4:30 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 3  | 0 | 3     | 0                      | 1 | 0 | 1     | 4                 |
| 4:45 PM                   | 0                        | 0 | 0 | 0     | 1                        | 0 | 0 | 1     | 0                      | 1  | 0 | 1     | 0                      | 1 | 0 | 1     | 3                 |
| 5:00 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 1  | 1 | 2     | 0                      | 1 | 0 | 1     | 3                 |
| 5:15 PM                   | 2                        | 0 | 0 | 2     | 0                        | 0 | 0 | 0     | 0                      | 0  | 1 | 1     | 0                      | 0 | 0 | 0     | 3                 |
| 5:30 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 0  | 0 | 0     | 0                      | 1 | 0 | 1     | 1                 |
| 5:45 PM                   | 0                        | 0 | 0 | 0     | 0                        | 0 | 0 | 0     | 0                      | 1  | 0 | 1     | 0                      | 0 | 0 | 0     | 1                 |
| Total Survey              | 3                        | 1 | 0 | 4     | 1                        | 0 | 0 | 1     | 1                      | 16 | 4 | 21    | 0                      | 6 | 0 | 6     | 32                |

### Heavy Vehicle Peak Hour Summary

4:00 PM to 5:00 PM

| By<br>Approach | Northbound<br>SE 19th St |   |   | In | Out | Total | In   | Out | Total | In   | Out | Total | In   | Out | Total | Total |
|----------------|--------------------------|---|---|----|-----|-------|------|-----|-------|------|-----|-------|------|-----|-------|-------|
|                | L                        | T | R |    |     |       |      |     |       |      |     |       |      |     |       |       |
| Volume         | 2                        | 2 | 4 |    |     |       | 1    | 2   | 3     | 17   | 5   | 22    | 4    | 15  | 19    | 24    |
| PHF            | 0.50                     |   |   |    |     |       | 0.25 |     |       | 0.61 |     |       | 0.50 |     |       | 0.67  |

| By<br>Movement | Northbound<br>SE 19th St |      |      |       | In   | Out  | Total | In   | Out  | Total | In   | Out  | Total | In   | Out  | Total | Total |
|----------------|--------------------------|------|------|-------|------|------|-------|------|------|-------|------|------|-------|------|------|-------|-------|
|                | L                        | T    | R    | Total |      |      |       |      |      |       |      |      |       |      |      |       |       |
| Volume         | 1                        | 1    | 0    | 2     | 1    | 0    | 1     | 1    | 14   | 2     | 17   | 0    | 4     | 0    | 4    | 4     | 24    |
| PHF            | 0.25                     | 0.25 | 0.00 | 0.50  | 0.25 | 0.00 | 0.25  | 0.25 | 0.58 | 0.25  | 0.61 | 0.00 | 0.50  | 0.00 | 0.50 | 0.67  |       |

### Heavy Vehicle Rolling Hour Summary

4:00 PM to 6:00 PM

| Interval<br>Start<br>Time | Northbound<br>SE 19th St |   |   |       | Southbound<br>SE 19th St |   |   |       | Eastbound<br>Ensign Ln |    |   |       | Westbound<br>Ensign Ln |   |   |       | Interval<br>Total |
|---------------------------|--------------------------|---|---|-------|--------------------------|---|---|-------|------------------------|----|---|-------|------------------------|---|---|-------|-------------------|
|                           | L                        | T | R | Total | L                        | T | R | Total | L                      | T  | R | Total | L                      | T | R | Total |                   |
| 4:00 PM                   | 1                        | 1 | 0 | 2     | 1                        | 0 | 0 | 1     | 1                      | 14 | 2 | 17    | 0                      | 4 | 0 | 4     | 24                |
| 4:15 PM                   | 1                        | 0 | 0 | 1     | 1                        | 0 | 0 | 1     | 1                      | 11 | 1 | 13    | 0                      | 4 | 0 | 4     | 19                |
| 4:30 PM                   | 2                        | 0 | 0 | 2     | 1                        | 0 | 0 | 1     | 0                      | 5  | 2 | 7     | 0                      | 3 | 0 | 3     | 13                |
| 4:45 PM                   | 2                        | 0 | 0 | 2     | 1                        | 0 | 0 | 1     | 0                      | 2  | 2 | 4     | 0                      | 3 | 0 | 3     | 10                |
| 5:00 PM                   | 2                        | 0 | 0 | 2     | 0                        | 0 | 0 | 0     | 0                      | 2  | 2 | 4     | 0                      | 2 | 0 | 2     | 8                 |



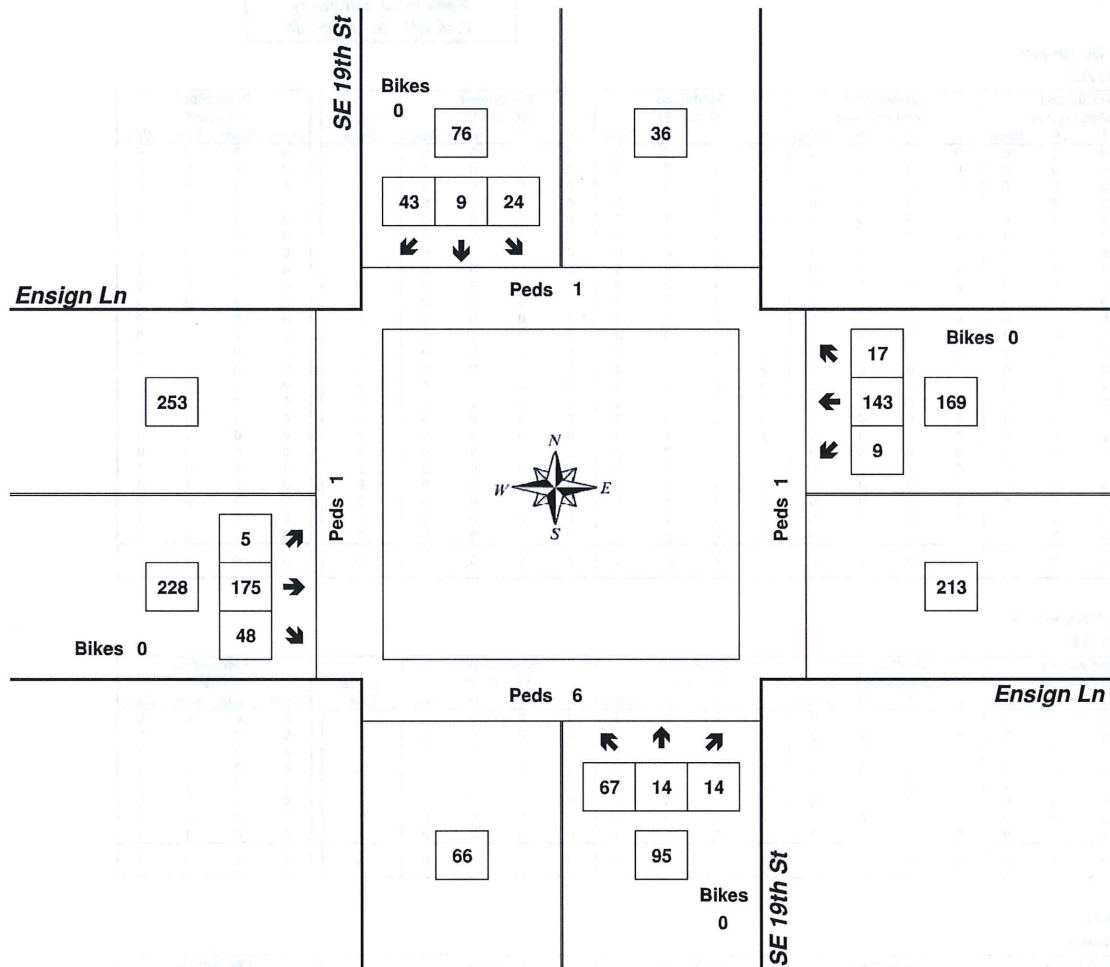
# Peak Hour Summary



Clay Carney  
(503) 833-2740

## SE 19th St & Ensign Ln

4:00 PM to 5:00 PM  
Thursday, February 23, 2017



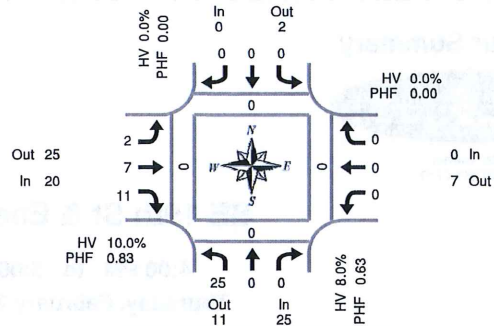
| Approach     | PHF  | HV%  | Volume |
|--------------|------|------|--------|
| EB           | 0.88 | 7.5% | 228    |
| WB           | 0.86 | 2.4% | 169    |
| NB           | 0.74 | 2.1% | 95     |
| SB           | 0.86 | 1.3% | 76     |
| Intersection | 0.90 | 4.2% | 568    |

Count Period: 4:00 PM to 6:00 PM

## Total Vehicle Summary



Clay Carney  
(503) 833-2740



## Chokeberry Ave & SE 19th St

Thursday, February 23, 2017

7:00 AM to 9:00 AM

Peak Hour Summary  
7:45 AM to 8:45 AM

### 5-Minute Interval Summary

7:00 AM to 9:00 AM

| Interval Start Time | Northbound Chokeberry Ave |   |   |       | Southbound Chokeberry Ave |   |   |       | Eastbound SE 19th St |   |    |       | Westbound SE 19th St |   |   |       | Interval Total | Pedestrians Crosswalk |       |      |      |
|---------------------|---------------------------|---|---|-------|---------------------------|---|---|-------|----------------------|---|----|-------|----------------------|---|---|-------|----------------|-----------------------|-------|------|------|
|                     | L                         | T | R | Bikes | L                         | T | R | Bikes | L                    | T | R  | Bikes | L                    | T | R | Bikes |                | North                 | South | East | West |
| 7:00 AM             | 0                         | 0 | 1 | 0     | 0                         | 0 | 1 | 0     | 0                    | 0 | 0  | 0     | 0                    | 0 | 0 | 0     | 2              | 0                     | 0     | 0    | 0    |
| 7:05 AM             | 1                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 0 | 0  | 0     | 0                    | 0 | 0 | 0     | 1              | 0                     | 0     | 0    | 0    |
| 7:10 AM             | 1                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 0 | 0  | 0     | 0                    | 0 | 0 | 0     | 1              | 0                     | 0     | 0    | 0    |
| 7:15 AM             | 4                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 0 | 1  | 0     | 0                    | 0 | 0 | 0     | 5              | 0                     | 0     | 0    | 0    |
| 7:20 AM             | 2                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 0 | 1  | 0     | 0                    | 0 | 0 | 0     | 3              | 0                     | 0     | 0    | 0    |
| 7:25 AM             | 1                         | 0 | 1 | 0     | 0                         | 0 | 0 | 0     | 0                    | 0 | 0  | 0     | 0                    | 0 | 0 | 0     | 2              | 0                     | 0     | 0    | 0    |
| 7:30 AM             | 2                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 0 | 0  | 0     | 0                    | 0 | 0 | 0     | 2              | 0                     | 0     | 0    | 0    |
| 7:35 AM             | 0                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 0 | 2  | 0     | 0                    | 0 | 0 | 0     | 2              | 0                     | 0     | 0    | 0    |
| 7:40 AM             | 3                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 1 | 0  | 0     | 0                    | 0 | 0 | 0     | 4              | 0                     | 0     | 0    | 0    |
| 7:45 AM             | 3                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 1 | 2  | 0     | 0                    | 0 | 0 | 0     | 6              | 0                     | 0     | 0    | 0    |
| 7:50 AM             | 2                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 0 | 0  | 0     | 0                    | 0 | 0 | 0     | 2              | 0                     | 0     | 0    | 0    |
| 7:55 AM             | 0                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 1                    | 1 | 0  | 0     | 0                    | 0 | 0 | 0     | 2              | 0                     | 0     | 0    | 0    |
| 8:00 AM             | 3                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 1 | 0  | 0     | 0                    | 0 | 0 | 0     | 4              | 0                     | 0     | 0    | 0    |
| 8:05 AM             | 1                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 2 | 1  | 0     | 0                    | 0 | 0 | 0     | 4              | 0                     | 0     | 0    | 0    |
| 8:10 AM             | 2                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 0 | 1  | 0     | 0                    | 0 | 0 | 0     | 3              | 0                     | 0     | 0    | 0    |
| 8:15 AM             | 0                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 0 | 2  | 0     | 0                    | 0 | 0 | 0     | 2              | 0                     | 0     | 0    | 0    |
| 8:20 AM             | 3                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 0 | 1  | 0     | 0                    | 0 | 0 | 0     | 4              | 0                     | 0     | 0    | 0    |
| 8:25 AM             | 1                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 0 | 1  | 0     | 0                    | 0 | 0 | 0     | 2              | 0                     | 0     | 0    | 0    |
| 8:30 AM             | 3                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 0 | 0  | 0     | 0                    | 0 | 0 | 0     | 3              | 0                     | 0     | 0    | 0    |
| 8:35 AM             | 3                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 1 | 1  | 0     | 0                    | 0 | 0 | 0     | 5              | 0                     | 0     | 0    | 0    |
| 8:40 AM             | 4                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 1                    | 1 | 2  | 0     | 0                    | 0 | 0 | 0     | 8              | 0                     | 0     | 0    | 0    |
| 8:45 AM             | 1                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 0 | 1  | 0     | 0                    | 0 | 0 | 0     | 2              | 0                     | 0     | 0    | 0    |
| 8:50 AM             | 3                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 0 | 0  | 0     | 0                    | 0 | 0 | 0     | 3              | 0                     | 0     | 0    | 0    |
| 8:55 AM             | 1                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 1                    | 0 | 0  | 0     | 0                    | 0 | 0 | 0     | 2              | 0                     | 0     | 0    | 0    |
| Total Survey        | 44                        | 0 | 2 | 0     | 0                         | 0 | 1 | 0     | 3                    | 8 | 16 | 0     | 0                    | 0 | 0 | 0     | 74             | 0                     | 0     | 0    | 0    |

### 15-Minute Interval Summary

7:00 AM to 9:00 AM

| Interval Start Time | Northbound Chokeberry Ave |   |   |       | Southbound Chokeberry Ave |   |   |       | Eastbound SE 19th St |   |    |       | Westbound SE 19th St |   |   |       | Interval Total | Pedestrians Crosswalk |       |      |      |
|---------------------|---------------------------|---|---|-------|---------------------------|---|---|-------|----------------------|---|----|-------|----------------------|---|---|-------|----------------|-----------------------|-------|------|------|
|                     | L                         | T | R | Bikes | L                         | T | R | Bikes | L                    | T | R  | Bikes | L                    | T | R | Bikes |                | North                 | South | East | West |
| 7:00 AM             | 2                         | 0 | 1 | 0     | 0                         | 0 | 1 | 0     | 0                    | 0 | 0  | 0     | 0                    | 0 | 0 | 0     | 4              | 0                     | 0     | 0    | 0    |
| 7:15 AM             | 7                         | 0 | 1 | 0     | 0                         | 0 | 0 | 0     | 0                    | 0 | 2  | 0     | 0                    | 0 | 0 | 0     | 10             | 0                     | 0     | 0    | 0    |
| 7:30 AM             | 5                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 1 | 2  | 0     | 0                    | 0 | 0 | 0     | 8              | 0                     | 0     | 0    | 0    |
| 7:45 AM             | 5                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 1                    | 2 | 2  | 0     | 0                    | 0 | 0 | 0     | 10             | 0                     | 0     | 0    | 0    |
| 8:00 AM             | 6                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 3 | 2  | 0     | 0                    | 0 | 0 | 0     | 11             | 0                     | 0     | 0    | 0    |
| 8:15 AM             | 4                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 0                    | 0 | 4  | 0     | 0                    | 0 | 0 | 0     | 8              | 0                     | 0     | 0    | 0    |
| 8:30 AM             | 10                        | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 1                    | 2 | 3  | 0     | 0                    | 0 | 0 | 0     | 16             | 0                     | 0     | 0    | 0    |
| 8:45 AM             | 5                         | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 1                    | 0 | 1  | 0     | 0                    | 0 | 0 | 0     | 7              | 0                     | 0     | 0    | 0    |
| Total Survey        | 44                        | 0 | 2 | 0     | 0                         | 0 | 1 | 0     | 3                    | 8 | 16 | 0     | 0                    | 0 | 0 | 0     | 74             | 0                     | 0     | 0    | 0    |

### Peak Hour Summary

7:45 AM to 8:45 AM

| By Approach | Northbound Chokeberry Ave |     |       |       | Southbound Chokeberry Ave |     |       |       | Eastbound SE 19th St |     |       |       | Westbound SE 19th St |     |       |       | Total | Pedestrians Crosswalk |       |      |      |
|-------------|---------------------------|-----|-------|-------|---------------------------|-----|-------|-------|----------------------|-----|-------|-------|----------------------|-----|-------|-------|-------|-----------------------|-------|------|------|
|             | In                        | Out | Total | Bikes | In                        | Out | Total | Bikes | In                   | Out | Total | Bikes | In                   | Out | Total | Bikes |       | North                 | South | East | West |
| Volume      | 25                        | 11  | 36    | 0     | 0                         | 2   | 2     | 0     | 20                   | 25  | 45    | 0     | 0                    | 7   | 7     | 0     | 45    | 0                     | 0     | 0    | 0    |
| %HV         |                           |     | 8.0%  |       |                           |     | 0.0%  |       |                      |     | 10.0% |       |                      |     | 0.0%  |       | 8.9%  |                       |       |      |      |
| PHF         |                           |     | 0.63  |       |                           |     | 0.00  |       |                      |     | 0.63  |       |                      |     | 0.00  |       | 0.70  |                       |       |      |      |

| By Movement | Northbound Chokeberry Ave |      |      |       | Southbound Chokeberry Ave |      |      |       | Eastbound SE 19th St |      |       |       | Westbound SE 19th St |      |      |       | Total |
|-------------|---------------------------|------|------|-------|---------------------------|------|------|-------|----------------------|------|-------|-------|----------------------|------|------|-------|-------|
|             | L                         | T    | R    | Total | L                         | T    | R    | Total | L                    | T    | R     | Total | L                    | T    | R    | Total |       |
| Volume      | 25                        | 0    | 0    | 25    | 0                         | 0    | 0    | 0     | 2                    | 7    | 11    | 20    | 0                    | 0    | 0    | 0     | 45    |
| %HV         | 8.0%                      | 0.0% | 0.0% | 8.0%  | 0.0%                      | 0.0% | 0.0% | 0.0%  | 0.0%                 | 0.0% | 18.2% | 10.0% | 0.0%                 | 0.0% | 0.0% | 0.0%  | 8.9%  |
| PHF         | 0.63                      | 0.00 | 0.00 | 0.63  | 0.00                      | 0.00 | 0.00 | 0.00  | 0.50                 | 0.44 | 0.69  | 0.83  | 0.00                 | 0.00 | 0.00 | 0.00  | 0.70  |

### Rolling Hour Summary

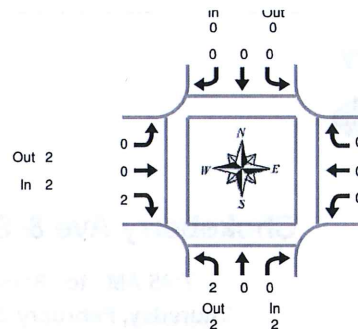
7:00 AM to 9:00 AM

| Interval Start Time | Northbound Chokeberry Ave |   |   |       | Southbound Chokeberry Ave |   |   |       | Eastbound SE 19th St |   |    |       | Westbound SE 19th St |   |   |       | Interval Total | Pedestrians Crosswalk |       |      |      |
|---------------------|---------------------------|---|---|-------|---------------------------|---|---|-------|----------------------|---|----|-------|----------------------|---|---|-------|----------------|-----------------------|-------|------|------|
|                     | L                         | T | R | Bikes | L                         | T | R | Bikes | L                    | T | R  | Bikes | L                    | T | R | Bikes |                | North                 | South | East | West |
| 7:00 AM             | 19                        | 0 | 2 | 0     | 0                         | 0 | 1 | 0     | 1                    | 3 | 6  | 0     | 0                    | 0 | 0 | 0     | 32             | 0                     | 0     | 0    | 0    |
| 7:15 AM             | 23                        | 0 | 1 | 0     | 0                         | 0 | 0 | 0     | 1                    | 6 | 8  | 0     | 0                    | 0 | 0 | 0     | 39             | 0                     | 0     | 0    | 0    |
| 7:30 AM             | 20                        | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 1                    | 6 | 10 | 0     | 0                    | 0 | 0 | 0     | 37             | 0                     | 0     | 0    | 0    |
| 7:45 AM             | 25                        | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 2                    | 7 | 11 | 0     | 0                    | 0 | 0 | 0     | 45             | 0                     | 0     | 0    | 0    |
| 8:00 AM             | 25                        | 0 | 0 | 0     | 0                         | 0 | 0 | 0     | 2                    | 5 | 10 | 0     | 0                    | 0 | 0 | 0     | 42             | 0                     | 0     | 0    | 0    |

## Heavy Vehicle Summary



Clay Carney  
(503) 833-2740



## Chokeberry Ave & SE 19th St

Thursday, February 23, 2017

7:00 AM to 9:00 AM

Peak Hour Summary  
7:45 AM to 8:45 AM

### Heavy Vehicle 5-Minute Interval Summary 7:00 AM to 9:00 AM

| Interval<br>Start<br>Time | Northbound<br>Chokeberry Ave |   |   |       | Southbound<br>Chokeberry Ave |   |   |       | Eastbound<br>SE 19th St |   |   |       | Westbound<br>SE 19th St |   |   |       | Interval<br>Total |
|---------------------------|------------------------------|---|---|-------|------------------------------|---|---|-------|-------------------------|---|---|-------|-------------------------|---|---|-------|-------------------|
|                           | L                            | T | R | Total | L                            | T | R | Total | L                       | T | R | Total | L                       | T | R | Total |                   |
| 7:00 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 1 | 1     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 1                 |
| 7:05 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 7:10 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 7:15 AM                   | 1                            | 0 | 0 | 1     | 0                            | 0 | 0 | 0     | 0                       | 0 | 1 | 1     | 0                       | 0 | 0 | 0     | 2                 |
| 7:20 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 7:25 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 7:30 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 7:35 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 7:40 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 7:45 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 7:50 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 7:55 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 8:00 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 8:05 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 8:10 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 8:15 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 1 | 1     | 0                       | 0 | 0 | 0     | 1                 |
| 8:20 AM                   | 1                            | 0 | 0 | 1     | 0                            | 0 | 0 | 0     | 0                       | 0 | 1 | 1     | 0                       | 0 | 0 | 0     | 2                 |
| 8:25 AM                   | 1                            | 0 | 0 | 1     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 1                 |
| 8:30 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 8:35 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 8:40 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 8:45 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 8:50 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 8:55 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| Total<br>Survey           | 3                            | 0 | 0 | 3     | 0                            | 0 | 1 | 1     | 0                       | 0 | 3 | 3     | 0                       | 0 | 0 | 0     | 7                 |

### Heavy Vehicle 15-Minute Interval Summary 7:00 AM to 9:00 AM

| Interval<br>Start<br>Time | Northbound<br>Chokeberry Ave |   |   |       | Southbound<br>Chokeberry Ave |   |   |       | Eastbound<br>SE 19th St |   |   |       | Westbound<br>SE 19th St |   |   |       | Interval<br>Total |
|---------------------------|------------------------------|---|---|-------|------------------------------|---|---|-------|-------------------------|---|---|-------|-------------------------|---|---|-------|-------------------|
|                           | L                            | T | R | Total | L                            | T | R | Total | L                       | T | R | Total | L                       | T | R | Total |                   |
| 7:00 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 1 | 1     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 1                 |
| 7:15 AM                   | 1                            | 0 | 0 | 1     | 0                            | 0 | 0 | 0     | 0                       | 0 | 1 | 1     | 0                       | 0 | 0 | 0     | 2                 |
| 7:30 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 7:45 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 8:00 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 8:15 AM                   | 2                            | 0 | 0 | 2     | 0                            | 0 | 0 | 0     | 0                       | 0 | 2 | 2     | 0                       | 0 | 0 | 0     | 4                 |
| 8:30 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 8:45 AM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| Total<br>Survey           | 3                            | 0 | 0 | 3     | 0                            | 0 | 1 | 1     | 0                       | 0 | 3 | 3     | 0                       | 0 | 0 | 0     | 7                 |

### Heavy Vehicle Peak Hour Summary 7:45 AM to 8:45 AM

| By<br>Approach | Northbound<br>Chokeberry Ave |     |       | Total | Southbound<br>Chokeberry Ave |     |       | Total | Eastbound<br>SE 19th St |     |       | Total | Westbound<br>SE 19th St |     |       | Total |
|----------------|------------------------------|-----|-------|-------|------------------------------|-----|-------|-------|-------------------------|-----|-------|-------|-------------------------|-----|-------|-------|
|                | In                           | Out | Total |       | In                           | Out | Total |       | In                      | Out | Total |       | In                      | Out | Total |       |
| Volume         | 2                            | 2   | 4     |       | 0                            | 0   | 0     |       | 2                       | 2   | 4     |       | 0                       | 0   | 0     |       |
| PHF            | 0.25                         |     |       |       | 0.00                         |     |       |       | 0.25                    |     |       |       | 0.00                    |     |       |       |

| By<br>Movement | Northbound<br>Chokeberry Ave |      |      |       | Southbound<br>Chokeberry Ave |      |      |       | Eastbound<br>SE 19th St |      |      |       | Westbound<br>SE 19th St |      |      |       | Total |
|----------------|------------------------------|------|------|-------|------------------------------|------|------|-------|-------------------------|------|------|-------|-------------------------|------|------|-------|-------|
|                | L                            | T    | R    | Total | L                            | T    | R    | Total | L                       | T    | R    | Total | L                       | T    | R    | Total |       |
| Volume         | 2                            | 0    | 0    | 2     | 0                            | 0    | 0    | 0     | 0                       | 0    | 2    | 2     | 0                       | 0    | 0    | 0     | 4     |
| PHF            | 0.25                         | 0.00 | 0.00 | 0.25  | 0.00                         | 0.00 | 0.00 | 0.00  | 0.00                    | 0.00 | 0.25 | 0.25  | 0.00                    | 0.00 | 0.00 | 0.00  | 0.25  |

### Heavy Vehicle Rolling Hour Summary 7:00 AM to 9:00 AM

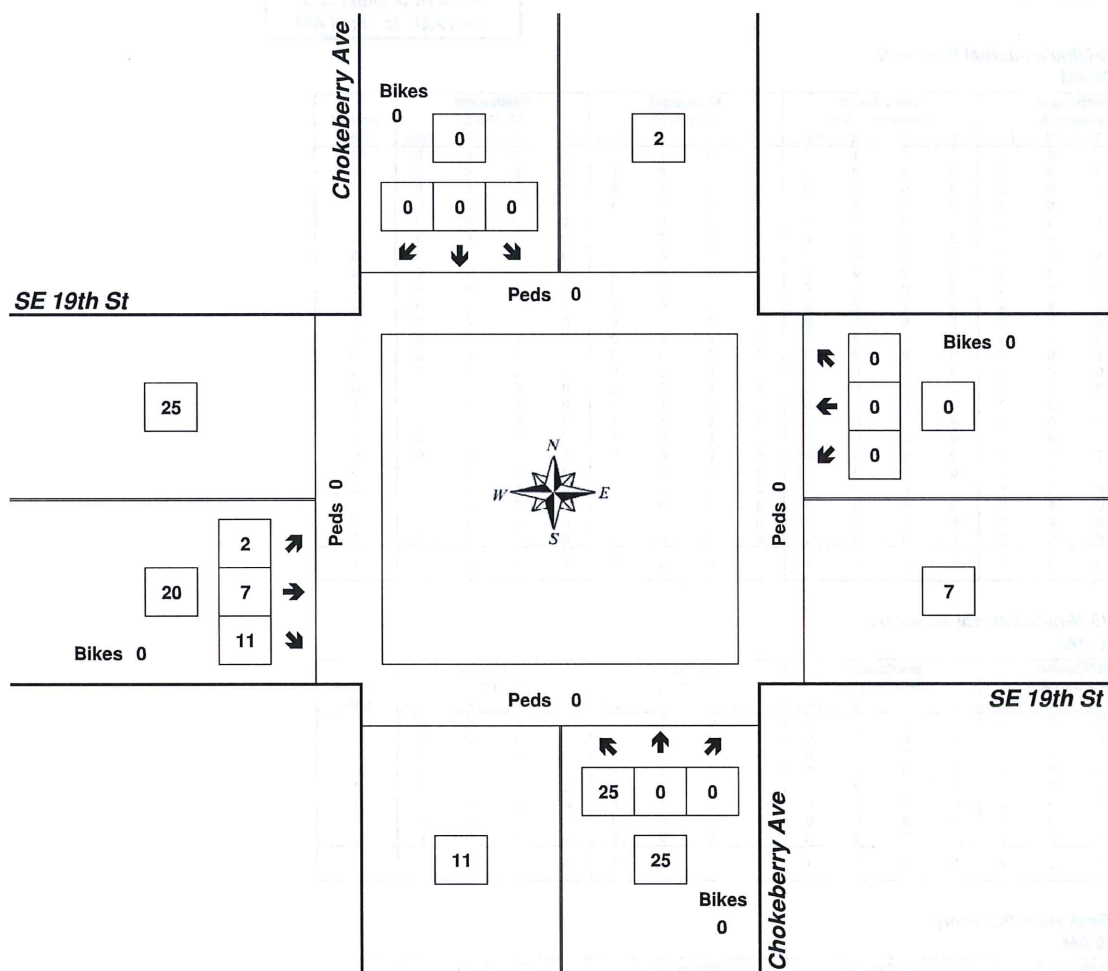
| Interval<br>Start<br>Time | Northbound<br>Chokeberry Ave |   |   |       | Southbound<br>Chokeberry Ave |   |   |       | Eastbound<br>SE 19th St |   |   |       | Westbound<br>SE 19th St |   |   |       | Interval<br>Total |
|---------------------------|------------------------------|---|---|-------|------------------------------|---|---|-------|-------------------------|---|---|-------|-------------------------|---|---|-------|-------------------|
|                           | L                            | T | R | Total | L                            | T | R | Total | L                       | T | R | Total | L                       | T | R | Total |                   |
| 7:00 AM                   | 1                            | 0 | 0 | 1     | 0                            | 0 | 1 | 1     | 0                       | 0 | 1 | 1     | 0                       | 0 | 0 | 0     | 3                 |
| 7:15 AM                   | 1                            | 0 | 0 | 1     | 0                            | 0 | 0 | 0     | 0                       | 0 | 1 | 1     | 0                       | 0 | 0 | 0     | 2                 |
| 7:30 AM                   | 2                            | 0 | 0 | 2     | 0                            | 0 | 0 | 0     | 0                       | 0 | 2 | 2     | 0                       | 0 | 0 | 0     | 4                 |
| 7:45 AM                   | 2                            | 0 | 0 | 2     | 0                            | 0 | 0 | 0     | 0                       | 0 | 2 | 2     | 0                       | 0 | 0 | 0     | 4                 |
| 8:00 AM                   | 2                            | 0 | 0 | 2     | 0                            | 0 | 0 | 0     | 0                       | 0 | 2 | 2     | 0                       | 0 | 0 | 0     | 4                 |



**All Traffic Data**  
Services Inc.

## Chokeberry Ave & SE 19th St

**Thursday, February 23, 2017**



| Approach     | PHF  | HV%   | Volume |
|--------------|------|-------|--------|
| EB           | 0.83 | 10.0% | 20     |
| WB           | 0.00 | 0.0%  | 0      |
| NB           | 0.63 | 8.0%  | 25     |
| SB           | 0.00 | 0.0%  | 0      |
| Intersection | 0.70 | 8.9%  | 45     |

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## Total Vehicle Summary

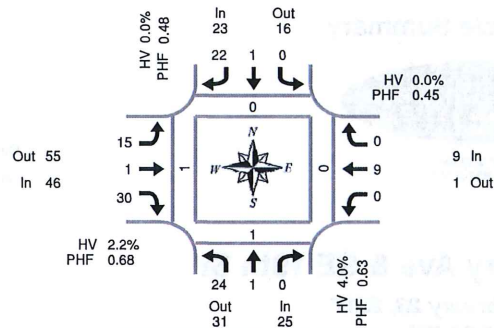


Clay Carney  
(503) 833-2740

## Chokeberry Ave & SE 19th St

Thursday, February 23, 2017

4:00 PM to 6:00 PM



**Peak Hour Summary**  
4:00 PM to 5:00 PM

### 5-Minute Interval Summary

4:00 PM to 6:00 PM

| Interval Start Time | Northbound Chokeberry Ave |   |   |       | Southbound Chokeberry Ave |   |    |       | Eastbound SE 19th St |   |    |       | Westbound SE 19th St |    |   |       | Interval Total | Pedestrians Crosswalk |       |      |      |
|---------------------|---------------------------|---|---|-------|---------------------------|---|----|-------|----------------------|---|----|-------|----------------------|----|---|-------|----------------|-----------------------|-------|------|------|
|                     | L                         | T | R | Bikes | L                         | T | R  | Bikes | L                    | T | R  | Bikes | L                    | T  | R | Bikes |                | North                 | South | East | West |
| 4:00 PM             | 3                         | 0 | 0 | 0     | 0                         | 0 | 4  | 0     | 6                    | 0 | 1  | 0     | 0                    | 0  | 0 | 0     | 14             | 0                     | 0     | 0    | 0    |
| 4:05 PM             | 3                         | 1 | 0 | 0     | 0                         | 0 | 4  | 0     | 2                    | 1 | 3  | 0     | 0                    | 0  | 0 | 0     | 14             | 0                     | 0     | 0    | 1    |
| 4:10 PM             | 3                         | 0 | 0 | 0     | 0                         | 0 | 2  | 0     | 1                    | 0 | 3  | 0     | 0                    | 0  | 0 | 0     | 9              | 0                     | 1     | 0    | 0    |
| 4:15 PM             | 3                         | 0 | 0 | 0     | 0                         | 1 | 5  | 0     | 2                    | 0 | 3  | 0     | 0                    | 2  | 0 | 0     | 16             | 0                     | 0     | 0    | 0    |
| 4:20 PM             | 3                         | 0 | 0 | 0     | 0                         | 0 | 0  | 0     | 1                    | 0 | 2  | 0     | 0                    | 0  | 0 | 0     | 6              | 0                     | 0     | 0    | 0    |
| 4:25 PM             | 1                         | 0 | 0 | 0     | 0                         | 0 | 2  | 0     | 0                    | 0 | 3  | 0     | 0                    | 1  | 0 | 0     | 7              | 0                     | 0     | 0    | 0    |
| 4:30 PM             | 0                         | 0 | 0 | 0     | 0                         | 0 | 3  | 0     | 1                    | 0 | 4  | 0     | 0                    | 1  | 0 | 0     | 9              | 0                     | 0     | 0    | 0    |
| 4:35 PM             | 0                         | 0 | 0 | 0     | 0                         | 0 | 0  | 0     | 0                    | 0 | 2  | 0     | 0                    | 2  | 0 | 0     | 4              | 0                     | 0     | 0    | 0    |
| 4:40 PM             | 2                         | 0 | 0 | 0     | 0                         | 0 | 0  | 0     | 2                    | 0 | 4  | 0     | 0                    | 2  | 0 | 0     | 10             | 0                     | 0     | 0    | 0    |
| 4:45 PM             | 3                         | 0 | 0 | 0     | 0                         | 0 | 1  | 0     | 0                    | 0 | 2  | 0     | 0                    | 1  | 0 | 0     | 7              | 0                     | 0     | 0    | 0    |
| 4:50 PM             | 2                         | 0 | 0 | 0     | 0                         | 0 | 0  | 0     | 0                    | 0 | 3  | 0     | 0                    | 0  | 0 | 0     | 5              | 0                     | 0     | 0    | 0    |
| 4:55 PM             | 1                         | 0 | 0 | 0     | 0                         | 0 | 1  | 0     | 0                    | 0 | 0  | 0     | 0                    | 0  | 0 | 0     | 2              | 0                     | 0     | 0    | 0    |
| 5:00 PM             | 1                         | 0 | 0 | 0     | 0                         | 0 | 0  | 0     | 0                    | 0 | 2  | 0     | 1                    | 1  | 0 | 0     | 5              | 0                     | 0     | 0    | 0    |
| 5:05 PM             | 0                         | 0 | 0 | 0     | 0                         | 1 | 1  | 0     | 0                    | 0 | 6  | 0     | 0                    | 1  | 0 | 0     | 9              | 0                     | 0     | 0    | 0    |
| 5:10 PM             | 1                         | 0 | 0 | 0     | 0                         | 0 | 4  | 0     | 0                    | 0 | 3  | 0     | 0                    | 1  | 0 | 0     | 9              | 0                     | 0     | 0    | 0    |
| 5:15 PM             | 5                         | 0 | 0 | 0     | 0                         | 0 | 2  | 0     | 0                    | 0 | 5  | 0     | 0                    | 0  | 0 | 0     | 12             | 0                     | 0     | 0    | 0    |
| 5:20 PM             | 3                         | 0 | 0 | 0     | 0                         | 0 | 1  | 0     | 0                    | 0 | 3  | 0     | 0                    | 1  | 0 | 0     | 8              | 0                     | 0     | 0    | 0    |
| 5:25 PM             | 3                         | 0 | 0 | 0     | 0                         | 0 | 0  | 0     | 0                    | 0 | 0  | 0     | 0                    | 0  | 0 | 0     | 3              | 0                     | 0     | 0    | 0    |
| 5:30 PM             | 0                         | 0 | 0 | 0     | 0                         | 0 | 0  | 0     | 0                    | 0 | 2  | 0     | 0                    | 0  | 0 | 0     | 2              | 0                     | 0     | 0    | 0    |
| 5:35 PM             | 0                         | 0 | 0 | 0     | 0                         | 0 | 0  | 0     | 1                    | 1 | 1  | 0     | 0                    | 0  | 0 | 0     | 3              | 0                     | 0     | 0    | 0    |
| 5:40 PM             | 3                         | 0 | 0 | 0     | 0                         | 0 | 0  | 0     | 0                    | 0 | 2  | 0     | 0                    | 0  | 0 | 0     | 5              | 0                     | 0     | 0    | 0    |
| 5:45 PM             | 2                         | 0 | 0 | 0     | 0                         | 0 | 0  | 0     | 0                    | 0 | 1  | 0     | 0                    | 0  | 0 | 0     | 3              | 0                     | 0     | 0    | 0    |
| 5:50 PM             | 3                         | 0 | 0 | 0     | 0                         | 0 | 0  | 0     | 0                    | 0 | 1  | 0     | 0                    | 0  | 0 | 0     | 4              | 0                     | 0     | 0    | 0    |
| 5:55 PM             | 1                         | 0 | 0 | 0     | 0                         | 0 | 0  | 0     | 0                    | 0 | 0  | 0     | 0                    | 0  | 0 | 0     | 1              | 0                     | 0     | 0    | 0    |
| Total Survey        | 46                        | 1 | 0 | 0     | 0                         | 2 | 30 | 0     | 16                   | 2 | 56 | 0     | 1                    | 13 | 0 | 0     | 167            | 0                     | 1     | 0    | 1    |

### 15-Minute Interval Summary

4:00 PM to 6:00 PM

| Interval Start Time | Northbound Chokeberry Ave |   |   |       | Southbound Chokeberry Ave |   |    |       | Eastbound SE 19th St |   |    |       | Westbound SE 19th St |    |   |       | Interval Total | Pedestrians Crosswalk |       |      |      |
|---------------------|---------------------------|---|---|-------|---------------------------|---|----|-------|----------------------|---|----|-------|----------------------|----|---|-------|----------------|-----------------------|-------|------|------|
|                     | L                         | T | R | Bikes | L                         | T | R  | Bikes | L                    | T | R  | Bikes | L                    | T  | R | Bikes |                | North                 | South | East | West |
| 4:00 PM             | 9                         | 1 | 0 | 0     | 0                         | 0 | 10 | 0     | 9                    | 1 | 7  | 0     | 0                    | 0  | 0 | 0     | 37             | 0                     | 1     | 0    | 1    |
| 4:15 PM             | 7                         | 0 | 0 | 0     | 0                         | 1 | 7  | 0     | 3                    | 0 | 8  | 0     | 0                    | 3  | 0 | 0     | 29             | 0                     | 0     | 0    | 0    |
| 4:30 PM             | 2                         | 0 | 0 | 0     | 0                         | 0 | 3  | 0     | 3                    | 0 | 10 | 0     | 0                    | 5  | 0 | 0     | 23             | 0                     | 0     | 0    | 0    |
| 4:45 PM             | 6                         | 0 | 0 | 0     | 0                         | 0 | 2  | 0     | 0                    | 0 | 5  | 0     | 0                    | 1  | 0 | 0     | 14             | 0                     | 0     | 0    | 0    |
| 5:00 PM             | 2                         | 0 | 0 | 0     | 0                         | 1 | 5  | 0     | 0                    | 0 | 11 | 0     | 1                    | 3  | 0 | 0     | 23             | 0                     | 0     | 0    | 0    |
| 5:15 PM             | 11                        | 0 | 0 | 0     | 0                         | 0 | 3  | 0     | 0                    | 0 | 8  | 0     | 0                    | 1  | 0 | 0     | 23             | 0                     | 0     | 0    | 0    |
| 5:30 PM             | 3                         | 0 | 0 | 0     | 0                         | 0 | 0  | 0     | 1                    | 1 | 5  | 0     | 0                    | 0  | 0 | 0     | 10             | 0                     | 0     | 0    | 0    |
| 5:45 PM             | 6                         | 0 | 0 | 0     | 0                         | 0 | 0  | 0     | 0                    | 0 | 2  | 0     | 0                    | 0  | 0 | 0     | 8              | 0                     | 0     | 0    | 0    |
| Total Survey        | 46                        | 1 | 0 | 0     | 0                         | 2 | 30 | 0     | 16                   | 2 | 56 | 0     | 1                    | 13 | 0 | 0     | 167            | 0                     | 1     | 0    | 1    |

### Peak Hour Summary

4:00 PM to 5:00 PM

| By Approach | Northbound Chokeberry Ave |     |       |       | Southbound Chokeberry Ave |     |       |       | Eastbound SE 19th St |     |       |       | Westbound SE 19th St |     |       |       | Total | Pedestrians Crosswalk |       |      |      |
|-------------|---------------------------|-----|-------|-------|---------------------------|-----|-------|-------|----------------------|-----|-------|-------|----------------------|-----|-------|-------|-------|-----------------------|-------|------|------|
|             | In                        | Out | Total | Bikes | In                        | Out | Total | Bikes | In                   | Out | Total | Bikes | In                   | Out | Total | Bikes |       | North                 | South | East | West |
| Volume      | 25                        | 31  | 56    | 0     | 23                        | 16  | 39    | 0     | 46                   | 55  | 101   | 0     | 9                    | 1   | 10    | 0     | 103   | 0                     | 1     | 0    | 1    |
| %HV         |                           |     | 4.0%  |       |                           |     | 0.0%  |       |                      |     | 2.2%  |       |                      |     | 0.0%  |       | 1.9%  |                       |       |      |      |
| PHF         |                           |     | 0.63  |       |                           |     | 0.48  |       |                      |     | 0.68  |       |                      |     | 0.45  |       | 0.66  |                       |       |      |      |

| By Movement | Northbound Chokeberry Ave |      |      |       | Southbound Chokeberry Ave |      |      |       | Eastbound SE 19th St |      |      |       | Westbound SE 19th St |      |      |       | Total |
|-------------|---------------------------|------|------|-------|---------------------------|------|------|-------|----------------------|------|------|-------|----------------------|------|------|-------|-------|
|             | L                         | T    | R    | Total | L                         | T    | R    | Total | L                    | T    | R    | Total | L                    | T    | R    | Total |       |
| Volume      | 24                        | 1    | 0    | 25    | 0                         | 1    | 22   | 23    | 15                   | 1    | 30   | 46    | 0                    | 9    | 0    | 9     | 103   |
| %HV         | 4.2%                      | 0.0% | 0.0% | 4.0%  | 0.0%                      | 0.0% | 0.0% | 0.0%  | 0.0%                 | 0.0% | 3.3% | 2.2%  | 0.0%                 | 0.0% | 0.0% | 0.0%  | 1.9%  |
| PHF         | 0.67                      | 0.25 | 0.00 | 0.63  | 0.00                      | 0.25 | 0.50 | 0.48  | 0.42                 | 0.25 | 0.75 | 0.68  | 0.00                 | 0.45 | 0.00 | 0.45  | 0.66  |

### Rolling Hour Summary

4:00 PM to 6:00 PM

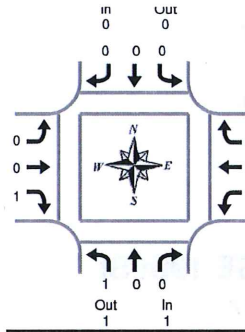
| Interval Start Time | Northbound Chokeberry Ave |   |   |       | Southbound Chokeberry Ave |   |    |       | Eastbound SE 19th St |   |    |       | Westbound SE 19th St |    |   |       | Interval Total | Pedestrians Crosswalk |       |      |      |
|---------------------|---------------------------|---|---|-------|---------------------------|---|----|-------|----------------------|---|----|-------|----------------------|----|---|-------|----------------|-----------------------|-------|------|------|
|                     | L                         | T | R | Bikes | L                         | T | R  | Bikes | L                    | T | R  | Bikes | L                    | T  | R | Bikes |                | North                 | South | East | West |
| 4:00 PM             | 24                        | 1 | 0 | 0     | 0                         | 1 | 22 | 0     | 15                   | 1 | 30 | 0     | 0                    | 9  | 0 | 0     | 103            | 0                     | 1     | 0    | 0    |
| 4:15 PM             | 17                        | 0 | 0 | 0     | 0                         | 2 | 17 | 0     | 6                    | 0 | 34 | 0     | 1                    | 12 | 0 | 0     | 89             | 0                     | 0     | 0    | 0    |
| 4:30 PM             | 21                        | 0 | 0 | 0     | 0                         | 1 | 13 | 0     | 3                    | 0 | 34 | 0     | 1                    | 10 | 0 | 0     | 83             | 0                     | 0     | 0    | 0    |
| 4:45 PM             | 22                        | 0 | 0 | 0     | 0                         | 1 | 10 | 0     | 1                    | 1 | 29 | 0     | 1                    | 5  | 0 | 0     | 70             | 0                     | 0     | 0    | 0    |
| 5:00 PM             | 22                        | 0 | 0 | 0     | 0                         | 1 | 8  | 0     | 1                    | 1 | 26 | 0     | 1                    | 4  | 0 | 0     | 64             | 0                     | 0     | 0    | 0    |

## Heavy Vehicle Summary



Clay Carney  
(503) 833-2740

Out 1  
In 1



Peak Hour Summary  
4:00 PM to 5:00 PM

## Chokeberry Ave & SE 19th St

Thursday, February 23, 2017

4:00 PM to 6:00 PM

### Heavy Vehicle 5-Minute Interval Summary

4:00 PM to 6:00 PM

| Interval<br>Start<br>Time | Northbound<br>Chokeberry Ave |   |   |       | Southbound<br>Chokeberry Ave |   |   |       | Eastbound<br>SE 19th St |   |   |       | Westbound<br>SE 19th St |   |   |       | Interval<br>Total |
|---------------------------|------------------------------|---|---|-------|------------------------------|---|---|-------|-------------------------|---|---|-------|-------------------------|---|---|-------|-------------------|
|                           | L                            | T | R | Total | L                            | T | R | Total | L                       | T | R | Total | L                       | T | R | Total |                   |
| 4:00 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 4:05 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 4:10 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 4:15 PM                   | 1                            | 0 | 0 | 1     | 0                            | 0 | 0 | 0     | 0                       | 0 | 1 | 1     | 0                       | 0 | 0 | 0     | 2                 |
| 4:20 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 4:25 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 4:30 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 4:35 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 4:40 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 4:45 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 4:50 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 4:55 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 5:00 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 5:05 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 5:10 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 1 | 1     | 0                       | 0 | 0 | 0     | 1                 |
| 5:15 PM                   | 2                            | 0 | 0 | 2     | 0                            | 0 | 0 | 0     | 0                       | 0 | 1 | 1     | 0                       | 0 | 0 | 0     | 3                 |
| 5:20 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 5:25 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 5:30 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 5:35 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 5:40 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 5:45 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 5:50 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 5:55 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| Total<br>Survey           | 3                            | 0 | 0 | 3     | 0                            | 0 | 0 | 0     | 0                       | 0 | 3 | 3     | 0                       | 0 | 0 | 0     | 6                 |

### Heavy Vehicle 15-Minute Interval Summary

4:00 PM to 6:00 PM

| Interval<br>Start<br>Time | Northbound<br>Chokeberry Ave |   |   |       | Southbound<br>Chokeberry Ave |   |   |       | Eastbound<br>SE 19th St |   |   |       | Westbound<br>SE 19th St |   |   |       | Interval<br>Total |
|---------------------------|------------------------------|---|---|-------|------------------------------|---|---|-------|-------------------------|---|---|-------|-------------------------|---|---|-------|-------------------|
|                           | L                            | T | R | Total | L                            | T | R | Total | L                       | T | R | Total | L                       | T | R | Total |                   |
| 4:00 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 4:15 PM                   | 1                            | 0 | 0 | 1     | 0                            | 0 | 0 | 0     | 0                       | 0 | 1 | 1     | 0                       | 0 | 0 | 0     | 2                 |
| 4:30 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 4:45 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 5:00 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 1 | 1     | 0                       | 0 | 0 | 0     | 1                 |
| 5:15 PM                   | 2                            | 0 | 0 | 2     | 0                            | 0 | 0 | 0     | 0                       | 0 | 1 | 1     | 0                       | 0 | 0 | 0     | 3                 |
| 5:30 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| 5:45 PM                   | 0                            | 0 | 0 | 0     | 0                            | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                       | 0 | 0 | 0     | 0                 |
| Total<br>Survey           | 3                            | 0 | 0 | 3     | 0                            | 0 | 0 | 0     | 0                       | 0 | 3 | 3     | 0                       | 0 | 0 | 0     | 6                 |

### Heavy Vehicle Peak Hour Summary

4:00 PM to 5:00 PM

| By<br>Approach | Northbound<br>Chokeberry Ave |     |       | Total | Southbound<br>Chokeberry Ave |     |       | Total | Eastbound<br>SE 19th St |     |       | Total | Westbound<br>SE 19th St |     |       | Total |
|----------------|------------------------------|-----|-------|-------|------------------------------|-----|-------|-------|-------------------------|-----|-------|-------|-------------------------|-----|-------|-------|
|                | In                           | Out | Total |       | In                           | Out | Total |       | In                      | Out | Total |       | In                      | Out | Total |       |
| Volume         | 1                            | 1   | 2     |       | 0                            | 0   | 0     |       | 1                       | 1   | 2     |       | 0                       | 0   | 0     |       |
| PHF            | 0.25                         |     |       |       | 0.00                         |     |       |       | 0.25                    |     |       |       | 0.00                    |     |       |       |
|                |                              |     |       |       |                              |     |       |       |                         |     |       |       |                         |     |       | 0.25  |

| By<br>Movement | Northbound<br>Chokeberry Ave |      |      |       | Southbound<br>Chokeberry Ave |      |      |       | Eastbound<br>SE 19th St |      |      |       | Westbound<br>SE 19th St |      |      |       | Total |
|----------------|------------------------------|------|------|-------|------------------------------|------|------|-------|-------------------------|------|------|-------|-------------------------|------|------|-------|-------|
|                | L                            | T    | R    | Total | L                            | T    | R    | Total | L                       | T    | R    | Total | L                       | T    | R    | Total |       |
| Volume         | 1                            | 0    | 0    | 1     | 0                            | 0    | 0    | 0     | 0                       | 0    | 1    | 1     | 0                       | 0    | 0    | 0     | 2     |
| PHF            | 0.25                         | 0.00 | 0.00 | 0.25  | 0.00                         | 0.00 | 0.00 | 0.00  | 0.00                    | 0.00 | 0.25 | 0.25  | 0.00                    | 0.00 | 0.00 | 0.00  | 0.25  |

### Heavy Vehicle Rolling Hour Summary

4:00 PM to 6:00 PM

| Interval<br>Start<br>Time | Northbound<br>Chokeberry Ave |   |   |       | Southbound<br>Chokeberry Ave |   |   |       | Eastbound<br>SE 19th St |   |   |       | Westbound<br>SE 19th St |   |   |       | Interval<br>Total |
|---------------------------|------------------------------|---|---|-------|------------------------------|---|---|-------|-------------------------|---|---|-------|-------------------------|---|---|-------|-------------------|
|                           | L                            | T | R | Total | L                            | T | R | Total | L                       | T | R | Total | L                       | T | R | Total |                   |
| 4:00 PM                   | 1                            | 0 | 0 | 1     | 0                            | 0 | 0 | 0     | 0                       | 0 | 1 | 1     | 0                       | 0 | 0 | 0     | 2                 |
| 4:15 PM                   | 1                            | 0 | 0 | 1     | 0                            | 0 | 0 | 0     | 0                       | 0 | 2 | 2     | 0                       | 0 | 0 | 0     | 3                 |
| 4:30 PM                   | 2                            | 0 | 0 | 2     | 0                            | 0 | 0 | 0     | 0                       | 0 | 2 | 2     | 0                       | 0 | 0 | 0     | 4                 |
| 4:45 PM                   | 2                            | 0 | 0 | 2     | 0                            | 0 | 0 | 0     | 0                       | 0 | 2 | 2     | 0                       | 0 | 0 | 0     | 4                 |
| 5:00 PM                   | 2                            | 0 | 0 | 2     | 0                            | 0 | 0 | 0     | 0                       | 0 | 2 | 2     | 0                       | 0 | 0 | 0     | 4                 |



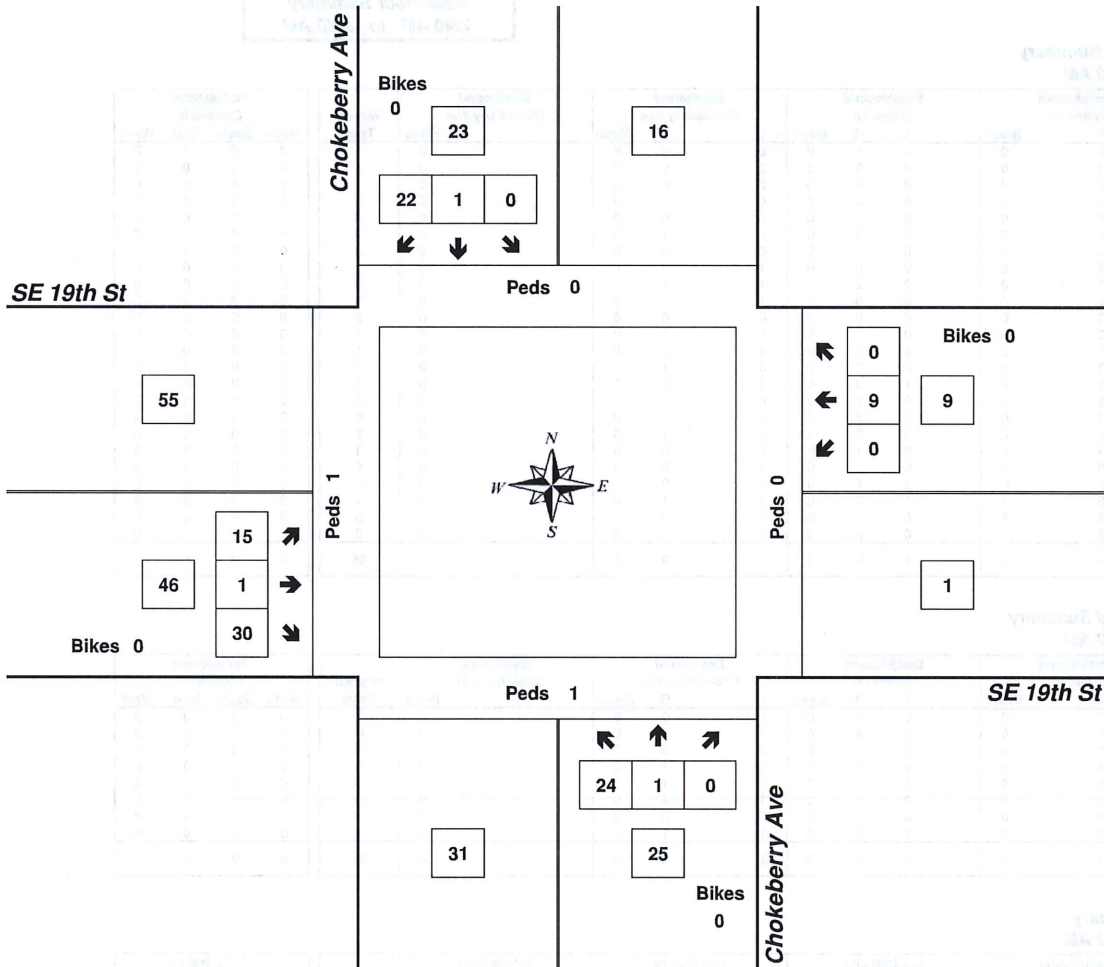
# Peak Hour Summary



Clay Carney  
(503) 833-2740

## Chokeberry Ave & SE 19th St

4:00 PM to 5:00 PM  
Thursday, February 23, 2017



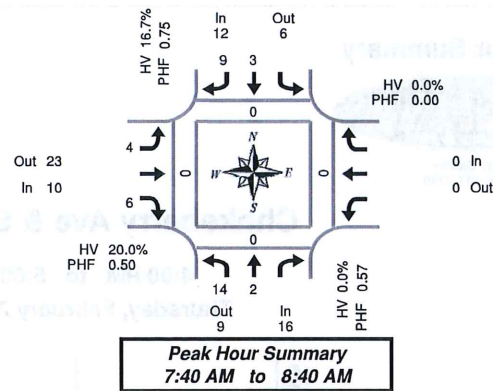
| Approach     | PHF  | HV%  | Volume |
|--------------|------|------|--------|
| EB           | 0.68 | 2.2% | 46     |
| WB           | 0.45 | 0.0% | 9      |
| NB           | 0.63 | 4.0% | 25     |
| SB           | 0.48 | 0.0% | 23     |
| Intersection | 0.66 | 1.9% | 103    |

Count Period: 4:00 PM to 6:00 PM

## Total Vehicle Summary



Clay Carney  
(503) 833-2740



## Willow Ln & Chokeberry Ave

Thursday, February 23, 2017  
7:00 AM to 9:00 AM

### 5-Minute Interval Summary 7:00 AM to 9:00 AM

| Interval Start Time | Northbound Willow Ln |   |       | Southbound Willow Ln |    |       | Eastbound Chokeberry Ave |   |       | Westbound Chokeberry Ave |   |       | Interval Total | Pedestrians Crosswalk |       |      |      |
|---------------------|----------------------|---|-------|----------------------|----|-------|--------------------------|---|-------|--------------------------|---|-------|----------------|-----------------------|-------|------|------|
|                     | L                    | T | Bikes | T                    | R  | Bikes | L                        | R | Bikes |                          |   | Bikes |                | North                 | South | East | West |
| 7:00 AM             | 0                    | 0 | 0     | 0                    | 1  | 0     | 0                        | 0 | 0     | 0                        | 0 | 0     | 1              | 0                     | 0     | 0    | 0    |
| 7:05 AM             | 1                    | 0 | 0     | 0                    | 0  | 0     | 0                        | 0 | 0     | 0                        | 0 | 0     | 1              | 0                     | 0     | 0    | 0    |
| 7:10 AM             | 1                    | 0 | 0     | 0                    | 0  | 0     | 0                        | 0 | 0     | 0                        | 0 | 0     | 1              | 0                     | 0     | 0    | 0    |
| 7:15 AM             | 2                    | 0 | 0     | 0                    | 2  | 0     | 0                        | 1 | 0     | 0                        | 0 | 0     | 5              | 0                     | 0     | 0    | 0    |
| 7:20 AM             | 1                    | 1 | 0     | 0                    | 1  | 0     | 0                        | 0 | 0     | 0                        | 0 | 0     | 3              | 0                     | 0     | 0    | 0    |
| 7:25 AM             | 1                    | 0 | 0     | 0                    | 1  | 0     | 0                        | 1 | 0     | 0                        | 0 | 0     | 3              | 0                     | 0     | 0    | 0    |
| 7:30 AM             | 2                    | 1 | 0     | 0                    | 0  | 0     | 0                        | 0 | 0     | 0                        | 0 | 0     | 3              | 0                     | 0     | 0    | 0    |
| 7:35 AM             | 0                    | 0 | 0     | 0                    | 0  | 0     | 1                        | 0 | 0     | 0                        | 0 | 0     | 1              | 0                     | 0     | 0    | 0    |
| 7:40 AM             | 2                    | 0 | 0     | 0                    | 2  | 0     | 1                        | 0 | 0     | 0                        | 0 | 0     | 5              | 0                     | 0     | 0    | 0    |
| 7:45 AM             | 2                    | 1 | 0     | 0                    | 0  | 0     | 1                        | 1 | 0     | 0                        | 0 | 0     | 5              | 0                     | 0     | 0    | 0    |
| 7:50 AM             | 2                    | 0 | 0     | 0                    | 0  | 0     | 0                        | 0 | 0     | 0                        | 0 | 0     | 2              | 0                     | 0     | 0    | 0    |
| 7:55 AM             | 0                    | 0 | 0     | 0                    | 1  | 0     | 0                        | 0 | 0     | 0                        | 0 | 0     | 1              | 0                     | 0     | 0    | 0    |
| 8:00 AM             | 0                    | 0 | 0     | 0                    | 1  | 0     | 0                        | 0 | 0     | 0                        | 0 | 0     | 1              | 0                     | 0     | 0    | 0    |
| 8:05 AM             | 1                    | 0 | 0     | 2                    | 0  | 0     | 0                        | 1 | 0     | 0                        | 0 | 0     | 4              | 0                     | 0     | 0    | 0    |
| 8:10 AM             | 1                    | 1 | 0     | 1                    | 0  | 0     | 0                        | 0 | 0     | 0                        | 0 | 0     | 3              | 0                     | 0     | 0    | 0    |
| 8:15 AM             | 0                    | 0 | 0     | 0                    | 0  | 0     | 0                        | 2 | 0     | 0                        | 0 | 0     | 2              | 0                     | 0     | 0    | 0    |
| 8:20 AM             | 1                    | 0 | 0     | 0                    | 2  | 0     | 1                        | 1 | 0     | 0                        | 0 | 0     | 5              | 0                     | 0     | 0    | 0    |
| 8:25 AM             | 1                    | 0 | 0     | 0                    | 0  | 0     | 0                        | 1 | 0     | 0                        | 0 | 0     | 2              | 0                     | 0     | 0    | 0    |
| 8:30 AM             | 2                    | 0 | 0     | 0                    | 1  | 0     | 0                        | 0 | 0     | 0                        | 0 | 0     | 3              | 0                     | 0     | 0    | 0    |
| 8:35 AM             | 2                    | 0 | 0     | 0                    | 2  | 0     | 1                        | 0 | 0     | 0                        | 0 | 0     | 5              | 0                     | 0     | 0    | 0    |
| 8:40 AM             | 1                    | 0 | 0     | 0                    | 1  | 0     | 1                        | 0 | 0     | 0                        | 0 | 0     | 3              | 0                     | 0     | 0    | 0    |
| 8:45 AM             | 1                    | 0 | 0     | 1                    | 0  | 0     | 1                        | 1 | 0     | 0                        | 0 | 0     | 4              | 0                     | 0     | 0    | 0    |
| 8:50 AM             | 2                    | 0 | 0     | 0                    | 1  | 0     | 0                        | 0 | 0     | 0                        | 0 | 0     | 3              | 0                     | 0     | 0    | 0    |
| 8:55 AM             | 0                    | 0 | 0     | 0                    | 0  | 0     | 0                        | 0 | 0     | 0                        | 0 | 0     | 0              | 0                     | 0     | 0    | 0    |
| Total Survey        | 26                   | 4 | 0     | 4                    | 16 | 0     | 7                        | 9 | 0     |                          |   | 0     | 66             | 0                     | 0     | 0    | 0    |

### 15-Minute Interval Summary 7:00 AM to 9:00 AM

| Interval Start Time | Northbound Willow Ln |   |       | Southbound Willow Ln |    |       | Eastbound Chokeberry Ave |   |       | Westbound Chokeberry Ave |   |       | Interval Total | Pedestrians Crosswalk |       |      |      |
|---------------------|----------------------|---|-------|----------------------|----|-------|--------------------------|---|-------|--------------------------|---|-------|----------------|-----------------------|-------|------|------|
|                     | L                    | T | Bikes | T                    | R  | Bikes | L                        | R | Bikes |                          |   | Bikes |                | North                 | South | East | West |
| 7:00 AM             | 2                    | 0 | 0     | 0                    | 1  | 0     | 0                        | 0 | 0     | 0                        | 0 | 0     | 3              | 0                     | 0     | 0    | 0    |
| 7:15 AM             | 4                    | 1 | 0     | 0                    | 4  | 0     | 0                        | 2 | 0     | 0                        | 0 | 0     | 11             | 0                     | 0     | 0    | 0    |
| 7:30 AM             | 4                    | 1 | 0     | 0                    | 2  | 0     | 2                        | 0 | 0     | 0                        | 0 | 0     | 9              | 0                     | 0     | 0    | 0    |
| 7:45 AM             | 4                    | 1 | 0     | 0                    | 1  | 0     | 1                        | 1 | 0     | 0                        | 0 | 0     | 8              | 0                     | 0     | 0    | 0    |
| 8:00 AM             | 2                    | 1 | 0     | 3                    | 1  | 0     | 0                        | 1 | 0     | 0                        | 0 | 0     | 8              | 0                     | 0     | 0    | 0    |
| 8:15 AM             | 2                    | 0 | 0     | 0                    | 2  | 0     | 1                        | 4 | 0     | 0                        | 0 | 0     | 9              | 0                     | 0     | 0    | 0    |
| 8:30 AM             | 5                    | 0 | 0     | 0                    | 4  | 0     | 2                        | 0 | 0     | 0                        | 0 | 0     | 11             | 0                     | 0     | 0    | 0    |
| 8:45 AM             | 3                    | 0 | 0     | 1                    | 1  | 0     | 1                        | 1 | 0     | 0                        | 0 | 0     | 7              | 0                     | 0     | 0    | 0    |
| Total Survey        | 26                   | 4 | 0     | 4                    | 16 | 0     | 7                        | 9 | 0     |                          |   | 0     | 66             | 0                     | 0     | 0    | 0    |

### Peak Hour Summary 7:40 AM to 8:40 AM

| By Approach | Northbound Willow Ln |     |       |       | Southbound Willow Ln |     |       |       | Eastbound Chokeberry Ave |     |       |       | Westbound Chokeberry Ave |     |       |       | Total | Pedestrians Crosswalk |       |      |      |
|-------------|----------------------|-----|-------|-------|----------------------|-----|-------|-------|--------------------------|-----|-------|-------|--------------------------|-----|-------|-------|-------|-----------------------|-------|------|------|
|             | In                   | Out | Total | Bikes | In                   | Out | Total | Bikes | In                       | Out | Total | Bikes | In                       | Out | Total | Bikes |       | North                 | South | East | West |
| Volume      | 16                   | 9   | 25    | 0     | 12                   | 6   | 18    | 0     | 10                       | 23  | 33    | 0     | 0                        | 0   | 0     | 0     | 38    | 0                     | 0     | 0    | 0    |
| %HV         |                      |     | 0.0%  |       |                      |     | 16.7% |       |                          |     | 20.0% |       |                          |     | 0.0%  |       | 10.5% |                       |       |      |      |
| PHF         |                      |     | 0.57  |       |                      |     | 0.75  |       |                          |     | 0.50  |       |                          |     | 0.00  |       | 0.79  |                       |       |      |      |

| By Movement | Northbound Willow Ln |      |       | Southbound Willow Ln |       |       | Eastbound Chokeberry Ave |      |       | Westbound Chokeberry Ave |      |       | Total |
|-------------|----------------------|------|-------|----------------------|-------|-------|--------------------------|------|-------|--------------------------|------|-------|-------|
|             | L                    | T    | Total | T                    | R     | Total | L                        | R    | Total |                          |      | Total |       |
| Volume      | 14                   | 2    | 16    | 3                    | 9     | 12    | 4                        | 6    | 10    | 0                        | 0    | 0     | 38    |
| %HV         | 0.0%                 | 0.0% | NA    | 0.0%                 | 22.2% | 16.7% | 0.0%                     | NA   | 33.3% | 20.0%                    | NA   | NA    | 10.5% |
| PHF         | 0.58                 | 0.50 | 0.57  | 0.25                 | 0.75  | 0.75  | 0.50                     | 0.38 | 0.50  | 0.00                     | 0.00 | 0.00  | 0.79  |

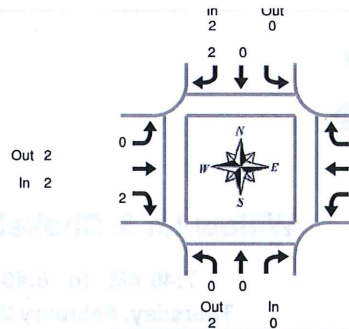
### Rolling Hour Summary 7:00 AM to 9:00 AM

| Interval Start Time | Northbound Willow Ln |   |       | Southbound Willow Ln |   |       | Eastbound Chokeberry Ave |   |       | Westbound Chokeberry Ave |   |       | Interval Total | Pedestrians Crosswalk |       |      |      |
|---------------------|----------------------|---|-------|----------------------|---|-------|--------------------------|---|-------|--------------------------|---|-------|----------------|-----------------------|-------|------|------|
|                     | L                    | T | Bikes | T                    | R | Bikes | L                        | R | Bikes |                          |   | Bikes |                | North                 | South | East | West |
| 7:00 AM             | 14                   | 3 | 0     | 0                    | 8 | 0     | 3                        | 3 | 0     | 0                        | 0 | 0     | 31             | 0                     | 0     | 0    | 0    |
| 7:15 AM             | 14                   | 4 | 0     | 3                    | 8 | 0     | 3                        | 4 | 0     | 0                        | 0 | 0     | 36             | 0                     | 0     | 0    | 0    |
| 7:30 AM             | 12                   | 3 | 0     | 3                    | 6 | 0     | 4                        | 6 | 0     | 0                        | 0 | 0     | 34             | 0                     | 0     | 0    | 0    |
| 7:45 AM             | 13                   | 2 | 0     | 3                    | 8 | 0     | 4                        | 6 | 0     | 0                        | 0 | 0     | 36             | 0                     | 0     | 0    | 0    |
| 8:00 AM             | 12                   | 1 | 0     | 4                    | 8 | 0     | 4                        | 6 | 0     | 0                        | 0 | 0     | 35             | 0                     | 0     | 0    | 0    |

## Heavy Vehicle Summary



Clay Carney  
(503) 833-2740



## Willow Ln & Chokeberry Ave

Thursday, February 23, 2017

7:00 AM to 9:00 AM

Peak Hour Summary  
7:40 AM to 8:40 AM

### Heavy Vehicle 5-Minute Interval Summary 7:00 AM to 9:00 AM

| Interval<br>Start<br>Time | Northbound<br>Willow Ln |   |       | Southbound<br>Willow Ln |   |       | Eastbound<br>Chokeberry Ave |   |       | Westbound<br>Chokeberry Ave |       |  | Interval<br>Total |
|---------------------------|-------------------------|---|-------|-------------------------|---|-------|-----------------------------|---|-------|-----------------------------|-------|--|-------------------|
|                           | L                       | T | Total | T                       | R | Total | L                           | R | Total |                             | Total |  |                   |
| 7:00 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 7:05 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 7:10 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 7:15 AM                   | 0                       | 0 | 0     | 0                       | 1 | 1     | 0                           | 1 | 1     |                             | 0     |  | 2                 |
| 7:20 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 7:25 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 7:30 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 7:35 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 7:40 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 7:45 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 7:50 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 7:55 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 8:00 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 8:05 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 8:10 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 8:15 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 1 | 1     |                             | 0     |  | 1                 |
| 8:20 AM                   | 0                       | 0 | 0     | 0                       | 2 | 2     | 0                           | 1 | 1     |                             | 0     |  | 3                 |
| 8:25 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 8:30 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 8:35 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 8:40 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 8:45 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 8:50 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 8:55 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| Total Survey              | 0                       | 0 | 0     | 0                       | 3 | 3     | 0                           | 3 | 3     |                             | 0     |  | 6                 |

### Heavy Vehicle 15-Minute Interval Summary 7:00 AM to 9:00 AM

| Interval<br>Start<br>Time | Northbound<br>Willow Ln |   |       | Southbound<br>Willow Ln |   |       | Eastbound<br>Chokeberry Ave |   |       | Westbound<br>Chokeberry Ave |       |  | Interval<br>Total |
|---------------------------|-------------------------|---|-------|-------------------------|---|-------|-----------------------------|---|-------|-----------------------------|-------|--|-------------------|
|                           | L                       | T | Total | T                       | R | Total | L                           | R | Total |                             | Total |  |                   |
| 7:00 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 7:15 AM                   | 0                       | 0 | 0     | 0                       | 1 | 1     | 0                           | 1 | 1     |                             | 0     |  | 2                 |
| 7:30 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 7:45 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 8:00 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 8:15 AM                   | 0                       | 0 | 0     | 0                       | 2 | 2     | 0                           | 2 | 2     |                             | 0     |  | 4                 |
| 8:30 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| 8:45 AM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             | 0     |  | 0                 |
| Total Survey              | 0                       | 0 | 0     | 0                       | 3 | 3     | 0                           | 3 | 3     |                             | 0     |  | 6                 |

### Heavy Vehicle Peak Hour Summary 7:40 AM to 8:40 AM

| By Approach | Northbound<br>Willow Ln |     |       | Southbound<br>Willow Ln |     |       | Eastbound<br>Chokeberry Ave |     |       | Westbound<br>Chokeberry Ave |     |       | Total |
|-------------|-------------------------|-----|-------|-------------------------|-----|-------|-----------------------------|-----|-------|-----------------------------|-----|-------|-------|
|             | In                      | Out | Total | In                      | Out | Total | In                          | Out | Total | In                          | Out | Total |       |
| Volume      | 0                       | 2   | 2     | 2                       | 0   | 2     | 2                           | 2   | 4     | 0                           | 0   | 0     | 4     |
| PHF         | 0.00                    |     |       | 0.25                    |     |       | 0.25                        |     |       | 0.00                        |     |       | 0.25  |

| By Movement | Northbound<br>Willow Ln |      |       | Southbound<br>Willow Ln |      |       | Eastbound<br>Chokeberry Ave |      |       | Westbound<br>Chokeberry Ave |       |  | Total |
|-------------|-------------------------|------|-------|-------------------------|------|-------|-----------------------------|------|-------|-----------------------------|-------|--|-------|
|             | L                       | T    | Total | T                       | R    | Total | L                           | R    | Total |                             | Total |  |       |
| Volume      | 0                       | 0    | 0     | 0                       | 2    | 2     | 0                           | 2    | 2     |                             | 0     |  | 4     |
| PHF         | 0.00                    | 0.00 | 0.00  | 0.00                    | 0.25 | 0.25  | 0.00                        | 0.25 | 0.25  |                             | 0.00  |  | 0.25  |

### Heavy Vehicle Rolling Hour Summary 7:00 AM to 9:00 AM

| Interval<br>Start<br>Time | Northbound<br>Willow Ln |   |       | Southbound<br>Willow Ln |   |       | Eastbound<br>Chokeberry Ave |   |       | Westbound<br>Chokeberry Ave |       |  | Interval<br>Total |
|---------------------------|-------------------------|---|-------|-------------------------|---|-------|-----------------------------|---|-------|-----------------------------|-------|--|-------------------|
|                           | L                       | T | Total | T                       | R | Total | L                           | R | Total |                             | Total |  |                   |
| 7:00 AM                   | 0                       | 0 | 0     | 0                       | 1 | 1     | 0                           | 1 | 1     |                             | 0     |  | 2                 |
| 7:15 AM                   | 0                       | 0 | 0     | 0                       | 1 | 1     | 0                           | 1 | 1     |                             | 0     |  | 2                 |
| 7:30 AM                   | 0                       | 0 | 0     | 0                       | 2 | 2     | 0                           | 2 | 2     |                             | 0     |  | 4                 |
| 7:45 AM                   | 0                       | 0 | 0     | 0                       | 2 | 2     | 0                           | 2 | 2     |                             | 0     |  | 4                 |
| 8:00 AM                   | 0                       | 0 | 0     | 0                       | 2 | 2     | 0                           | 2 | 2     |                             | 0     |  | 4                 |

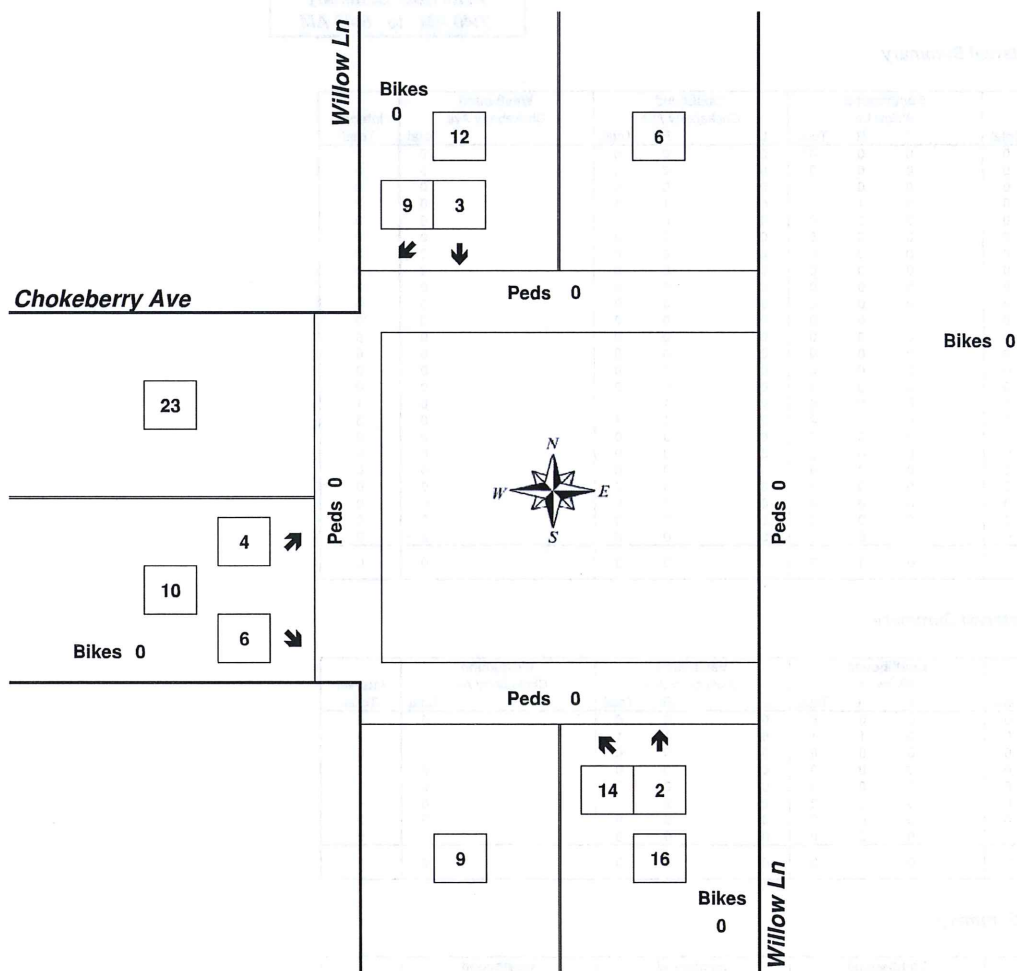


**All Traffic Data**  
Services Inc.

Clay Carney  
(503) 833-2740

## 7:40 AM to 8:40 AM

**Thursday, February 23, 2017**



| Approach     | PHF  | HV%   | Volume |
|--------------|------|-------|--------|
| EB           | 0.50 | 20.0% | 10     |
| WB           | 0.00 | 0.0%  | 0      |
| NB           | 0.57 | 0.0%  | 16     |
| SB           | 0.75 | 16.7% | 12     |
| Intersection | 0.79 | 10.5% | 38     |

Count Period: 7:00 AM to 9:00 AM

## Total Vehicle Summary

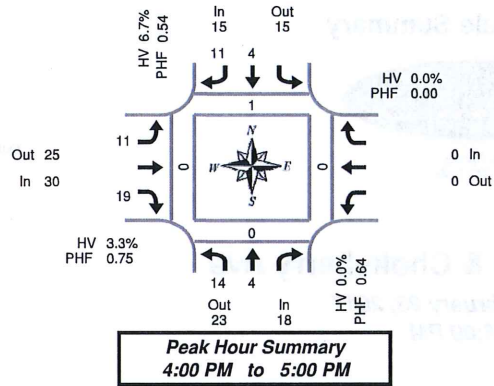


Clay Carney  
(503) 833-2740

## Willow Ln & Chokeberry Ave

Thursday, February 23, 2017

4:00 PM to 6:00 PM



**Peak Hour Summary**  
4:00 PM to 5:00 PM

### 5-Minute Interval Summary 4:00 PM to 6:00 PM

| Interval<br>Start<br>Time | Northbound<br>Willow Ln |   |       | Southbound<br>Willow Ln |    |       | Eastbound<br>Chokeberry Ave |    |       | Westbound<br>Chokeberry Ave |       |       | Interval<br>Total | Pedestrians<br>Crosswalk |       |      |      |
|---------------------------|-------------------------|---|-------|-------------------------|----|-------|-----------------------------|----|-------|-----------------------------|-------|-------|-------------------|--------------------------|-------|------|------|
|                           | L                       | T | Bikes | T                       | R  | Bikes | L                           | R  | Bikes | Bikes                       | Bikes | Bikes |                   | North                    | South | East | West |
| 4:00 PM                   | 3                       | 1 | 0     | 1                       | 0  | 0     | 1                           | 0  | 0     | 0                           | 0     | 0     | 6                 | 0                        | 0     | 0    | 0    |
| 4:05 PM                   | 1                       | 1 | 0     | 1                       | 3  | 0     | 1                           | 2  | 1     | 0                           | 0     | 0     | 8                 | 0                        | 0     | 0    | 0    |
| 4:10 PM                   | 1                       | 0 | 0     | 0                       | 2  | 0     | 2                           | 2  | 0     | 0                           | 0     | 0     | 7                 | 1                        | 0     | 0    | 0    |
| 4:15 PM                   | 3                       | 0 | 0     | 0                       | 1  | 0     | 2                           | 2  | 0     | 0                           | 0     | 0     | 8                 | 0                        | 0     | 0    | 0    |
| 4:20 PM                   | 2                       | 0 | 0     | 0                       | 0  | 0     | 0                           | 2  | 0     | 0                           | 0     | 0     | 4                 | 0                        | 0     | 0    | 0    |
| 4:25 PM                   | 1                       | 1 | 0     | 0                       | 0  | 0     | 1                           | 2  | 0     | 0                           | 0     | 0     | 5                 | 0                        | 0     | 0    | 0    |
| 4:30 PM                   | 0                       | 0 | 0     | 1                       | 0  | 0     | 1                           | 2  | 0     | 0                           | 0     | 0     | 4                 | 0                        | 0     | 0    | 0    |
| 4:35 PM                   | 0                       | 0 | 0     | 0                       | 0  | 0     | 0                           | 2  | 0     | 0                           | 0     | 0     | 2                 | 0                        | 0     | 0    | 0    |
| 4:40 PM                   | 1                       | 0 | 0     | 0                       | 3  | 0     | 2                           | 1  | 0     | 0                           | 0     | 0     | 7                 | 0                        | 0     | 0    | 0    |
| 4:45 PM                   | 0                       | 0 | 0     | 1                       | 1  | 0     | 1                           | 2  | 0     | 0                           | 0     | 0     | 5                 | 0                        | 0     | 0    | 0    |
| 4:50 PM                   | 1                       | 0 | 0     | 0                       | 1  | 0     | 0                           | 3  | 0     | 0                           | 0     | 0     | 5                 | 0                        | 0     | 0    | 0    |
| 4:55 PM                   | 1                       | 1 | 0     | 0                       | 0  | 0     | 0                           | 0  | 0     | 0                           | 0     | 0     | 2                 | 0                        | 0     | 0    | 0    |
| 5:00 PM                   | 0                       | 0 | 0     | 0                       | 1  | 0     | 1                           | 2  | 0     | 0                           | 0     | 0     | 4                 | 0                        | 0     | 0    | 0    |
| 5:05 PM                   | 0                       | 0 | 0     | 0                       | 0  | 0     | 3                           | 4  | 0     | 0                           | 0     | 0     | 7                 | 0                        | 0     | 0    | 0    |
| 5:10 PM                   | 0                       | 0 | 0     | 0                       | 1  | 0     | 1                           | 2  | 0     | 0                           | 0     | 0     | 4                 | 0                        | 0     | 0    | 0    |
| 5:15 PM                   | 1                       | 0 | 0     | 0                       | 4  | 0     | 2                           | 2  | 0     | 0                           | 0     | 0     | 9                 | 0                        | 0     | 0    | 2    |
| 5:20 PM                   | 1                       | 0 | 0     | 0                       | 2  | 0     | 1                           | 2  | 0     | 0                           | 0     | 0     | 6                 | 0                        | 0     | 0    | 0    |
| 5:25 PM                   | 0                       | 0 | 0     | 3                       | 1  | 0     | 0                           | 0  | 0     | 0                           | 0     | 0     | 4                 | 0                        | 0     | 0    | 0    |
| 5:30 PM                   | 0                       | 1 | 0     | 0                       | 0  | 0     | 0                           | 1  | 0     | 0                           | 0     | 0     | 2                 | 0                        | 0     | 0    | 0    |
| 5:35 PM                   | 0                       | 0 | 0     | 0                       | 0  | 0     | 0                           | 2  | 0     | 0                           | 0     | 0     | 2                 | 0                        | 0     | 0    | 0    |
| 5:40 PM                   | 2                       | 0 | 0     | 0                       | 0  | 0     | 0                           | 2  | 0     | 0                           | 0     | 0     | 4                 | 0                        | 0     | 0    | 0    |
| 5:45 PM                   | 2                       | 0 | 0     | 1                       | 0  | 0     | 0                           | 1  | 0     | 0                           | 0     | 0     | 4                 | 0                        | 0     | 0    | 0    |
| 5:50 PM                   | 2                       | 0 | 0     | 1                       | 1  | 0     | 0                           | 0  | 0     | 0                           | 0     | 0     | 4                 | 0                        | 0     | 0    | 0    |
| 5:55 PM                   | 1                       | 0 | 0     | 2                       | 0  | 0     | 0                           | 1  | 0     | 0                           | 0     | 0     | 4                 | 0                        | 0     | 0    | 0    |
| Total Survey              | 23                      | 5 | 0     | 11                      | 21 | 0     | 19                          | 38 | 0     | 0                           | 0     | 0     | 117               | 1                        | 0     | 0    | 2    |

### 15-Minute Interval Summary 4:00 PM to 6:00 PM

| Interval<br>Start<br>Time | Northbound<br>Willow Ln |   |       | Southbound<br>Willow Ln |    |       | Eastbound<br>Chokeberry Ave |    |       | Westbound<br>Chokeberry Ave |       |       | Interval<br>Total | Pedestrians<br>Crosswalk |       |      |      |
|---------------------------|-------------------------|---|-------|-------------------------|----|-------|-----------------------------|----|-------|-----------------------------|-------|-------|-------------------|--------------------------|-------|------|------|
|                           | L                       | T | Bikes | T                       | R  | Bikes | L                           | R  | Bikes | Bikes                       | Bikes | Bikes |                   | North                    | South | East | West |
| 4:00 PM                   | 5                       | 2 | 0     | 2                       | 5  | 0     | 4                           | 3  | 0     | 0                           | 0     | 0     | 21                | 1                        | 0     | 0    | 0    |
| 4:15 PM                   | 6                       | 1 | 0     | 0                       | 1  | 0     | 3                           | 6  | 0     | 0                           | 0     | 0     | 17                | 0                        | 0     | 0    | 0    |
| 4:30 PM                   | 1                       | 0 | 0     | 1                       | 3  | 0     | 3                           | 5  | 0     | 0                           | 0     | 0     | 13                | 0                        | 0     | 0    | 0    |
| 4:45 PM                   | 2                       | 1 | 0     | 1                       | 2  | 0     | 1                           | 5  | 0     | 0                           | 0     | 0     | 12                | 0                        | 0     | 0    | 0    |
| 5:00 PM                   | 0                       | 0 | 0     | 0                       | 2  | 0     | 5                           | 8  | 0     | 0                           | 0     | 0     | 15                | 0                        | 0     | 0    | 0    |
| 5:15 PM                   | 2                       | 0 | 0     | 3                       | 7  | 0     | 3                           | 4  | 0     | 0                           | 0     | 0     | 19                | 0                        | 0     | 0    | 2    |
| 5:30 PM                   | 2                       | 1 | 0     | 0                       | 0  | 0     | 0                           | 5  | 0     | 0                           | 0     | 0     | 8                 | 0                        | 0     | 0    | 0    |
| 5:45 PM                   | 5                       | 0 | 0     | 4                       | 1  | 0     | 0                           | 2  | 0     | 0                           | 0     | 0     | 12                | 0                        | 0     | 0    | 0    |
| Total Survey              | 23                      | 5 | 0     | 11                      | 21 | 0     | 19                          | 38 | 0     | 0                           | 0     | 0     | 117               | 1                        | 0     | 0    | 2    |

### Peak Hour Summary 4:00 PM to 5:00 PM

| By<br>Approach | Northbound<br>Willow Ln |     |       |       | Southbound<br>Willow Ln |     |       |       | Eastbound<br>Chokeberry Ave |     |       |       | Westbound<br>Chokeberry Ave |     |       |       | Total | Pedestrians<br>Crosswalk |       |      |      |
|----------------|-------------------------|-----|-------|-------|-------------------------|-----|-------|-------|-----------------------------|-----|-------|-------|-----------------------------|-----|-------|-------|-------|--------------------------|-------|------|------|
|                | In                      | Out | Total | Bikes | In                      | Out | Total | Bikes | In                          | Out | Total | Bikes | In                          | Out | Total | Bikes |       | North                    | South | East | West |
| Volume         | 18                      | 23  | 41    | 0     | 15                      | 15  | 30    | 0     | 30                          | 25  | 55    | 0     | 0                           | 0   | 0     | 0     | 63    | 1                        | 0     | 0    | 0    |
| %HV            |                         |     | 0.0%  |       |                         |     | 6.7%  |       |                             |     | 3.3%  |       |                             |     | 0.0%  |       | 3.2%  |                          |       |      |      |
| PHF            |                         |     | 0.64  |       |                         |     | 0.54  |       |                             |     | 0.75  |       |                             |     | 0.00  |       | 0.68  |                          |       |      |      |

| By<br>Movement | Northbound<br>Willow Ln |      |       | Southbound<br>Willow Ln |      |       | Eastbound<br>Chokeberry Ave |      |       | Westbound<br>Chokeberry Ave |       |       | Total |
|----------------|-------------------------|------|-------|-------------------------|------|-------|-----------------------------|------|-------|-----------------------------|-------|-------|-------|
|                | L                       | T    | Total | T                       | R    | Total | L                           | R    | Total | Total                       | Total | Total |       |
| Volume         | 14                      | 4    | 18    | 4                       | 11   | 15    | 11                          | 19   | 30    | 0                           | 0     | 0     | 63    |
| %HV            | 0.0%                    | 0.0% | NA    | 0.0%                    | 9.1% | 6.7%  | 0.0%                        | NA   | 5.3%  | 3.3%                        | NA    | NA    | 3.2%  |
| PHF            | 0.58                    | 0.50 | 0.64  | 0.50                    | 0.46 | 0.54  | 0.55                        | 0.79 | 0.75  | 0.00                        | 0.00  | 0.00  | 0.68  |

### Rolling Hour Summary 4:00 PM to 6:00 PM

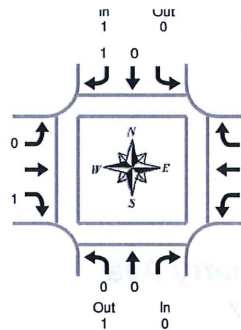
| Interval<br>Start<br>Time | Northbound<br>Willow Ln |   |       | Southbound<br>Willow Ln |    |       | Eastbound<br>Chokeberry Ave |    |       | Westbound<br>Chokeberry Ave |       |       | Interval<br>Total | Pedestrians<br>Crosswalk |       |      |      |
|---------------------------|-------------------------|---|-------|-------------------------|----|-------|-----------------------------|----|-------|-----------------------------|-------|-------|-------------------|--------------------------|-------|------|------|
|                           | L                       | T | Bikes | T                       | R  | Bikes | L                           | R  | Bikes | Bikes                       | Bikes | Bikes |                   | North                    | South | East | West |
| 4:00 PM                   | 14                      | 4 | 0     | 4                       | 11 | 0     | 11                          | 19 | 0     | 0                           | 0     | 0     | 63                | 1                        | 0     | 0    | 0    |
| 4:15 PM                   | 9                       | 2 | 0     | 2                       | 8  | 0     | 12                          | 24 | 0     | 0                           | 0     | 0     | 57                | 0                        | 0     | 0    | 0    |
| 4:30 PM                   | 5                       | 1 | 0     | 5                       | 14 | 0     | 12                          | 22 | 0     | 0                           | 0     | 0     | 59                | 0                        | 0     | 0    | 2    |
| 4:45 PM                   | 6                       | 2 | 0     | 4                       | 11 | 0     | 9                           | 22 | 0     | 0                           | 0     | 0     | 54                | 0                        | 0     | 0    | 2    |
| 5:00 PM                   | 9                       | 1 | 0     | 7                       | 10 | 0     | 8                           | 19 | 0     | 0                           | 0     | 0     | 54                | 0                        | 0     | 0    | 2    |

## Heavy Vehicle Summary



Clay Carney  
(503) 833-2740

Out 1  
In 1



**Peak Hour Summary**  
4:00 PM to 5:00 PM

## Willow Ln & Chokeberry Ave

Thursday, February 23, 2017

4:00 PM to 6:00 PM

### Heavy Vehicle 5-Minute Interval Summary

4:00 PM to 6:00 PM

| Interval<br>Start<br>Time | Northbound<br>Willow Ln |   |       | Southbound<br>Willow Ln |   |       | Eastbound<br>Chokeberry Ave |   |       | Westbound<br>Chokeberry Ave |  |       | Interval<br>Total |
|---------------------------|-------------------------|---|-------|-------------------------|---|-------|-----------------------------|---|-------|-----------------------------|--|-------|-------------------|
|                           | L                       | T | Total | T                       | R | Total | L                           | R | Total |                             |  | Total |                   |
| 4:00 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 4:05 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 4:10 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 4:15 PM                   | 0                       | 0 | 0     | 0                       | 1 | 1     | 0                           | 1 | 1     |                             |  | 0     | 2                 |
| 4:20 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 4:25 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 4:30 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 4:35 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 4:40 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 4:45 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 4:50 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 4:55 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 5:00 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 5:05 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 5:10 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 1 | 1     |                             |  | 0     | 1                 |
| 5:15 PM                   | 0                       | 0 | 0     | 0                       | 2 | 2     | 0                           | 1 | 1     |                             |  | 0     | 3                 |
| 5:20 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 5:25 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 5:30 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 5:35 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 5:40 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 5:45 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 5:50 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 5:55 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| Total Survey              | 0                       | 0 | 0     | 0                       | 3 | 3     | 0                           | 3 | 3     |                             |  | 0     | 6                 |

### Heavy Vehicle 15-Minute Interval Summary

4:00 PM to 6:00 PM

| Interval<br>Start<br>Time | Northbound<br>Willow Ln |   |       | Southbound<br>Willow Ln |   |       | Eastbound<br>Chokeberry Ave |   |       | Westbound<br>Chokeberry Ave |  |       | Interval<br>Total |
|---------------------------|-------------------------|---|-------|-------------------------|---|-------|-----------------------------|---|-------|-----------------------------|--|-------|-------------------|
|                           | L                       | T | Total | T                       | R | Total | L                           | R | Total |                             |  | Total |                   |
| 4:00 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 4:15 PM                   | 0                       | 0 | 0     | 0                       | 1 | 1     | 0                           | 1 | 1     |                             |  | 0     | 2                 |
| 4:30 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 4:45 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 5:00 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 1 | 1     |                             |  | 0     | 1                 |
| 5:15 PM                   | 0                       | 0 | 0     | 0                       | 2 | 2     | 0                           | 1 | 1     |                             |  | 0     | 3                 |
| 5:30 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| 5:45 PM                   | 0                       | 0 | 0     | 0                       | 0 | 0     | 0                           | 0 | 0     |                             |  | 0     | 0                 |
| Total Survey              | 0                       | 0 | 0     | 0                       | 3 | 3     | 0                           | 3 | 3     |                             |  | 0     | 6                 |

### Heavy Vehicle Peak Hour Summary

4:00 PM to 5:00 PM

| By<br>Approach | Northbound<br>Willow Ln |     |       | Southbound<br>Willow Ln |     |       | Eastbound<br>Chokeberry Ave |     |       | Westbound<br>Chokeberry Ave |     |       | Total |
|----------------|-------------------------|-----|-------|-------------------------|-----|-------|-----------------------------|-----|-------|-----------------------------|-----|-------|-------|
|                | In                      | Out | Total | In                      | Out | Total | In                          | Out | Total | In                          | Out | Total |       |
| Volume         | 0                       | 1   | 1     | 1                       | 0   | 1     | 1                           | 1   | 2     | 0                           | 0   | 0     | 2     |
| PHF            | 0.00                    |     |       | 0.25                    |     |       | 0.25                        |     |       | 0.00                        |     |       | 0.25  |

| By<br>Movement | Northbound<br>Willow Ln |      |       | Southbound<br>Willow Ln |      |       | Eastbound<br>Chokeberry Ave |      |       | Westbound<br>Chokeberry Ave |  |       | Total |
|----------------|-------------------------|------|-------|-------------------------|------|-------|-----------------------------|------|-------|-----------------------------|--|-------|-------|
|                | L                       | T    | Total | T                       | R    | Total | L                           | R    | Total |                             |  | Total |       |
| Volume         | 0                       | 0    | 0     | 0                       | 1    | 1     | 0                           | 1    | 1     |                             |  | 0     | 2     |
| PHF            | 0.00                    | 0.00 | 0.00  | 0.00                    | 0.25 | 0.25  | 0.00                        | 0.25 | 0.25  |                             |  | 0.00  | 0.25  |

### Heavy Vehicle Rolling Hour Summary

4:00 PM to 6:00 PM

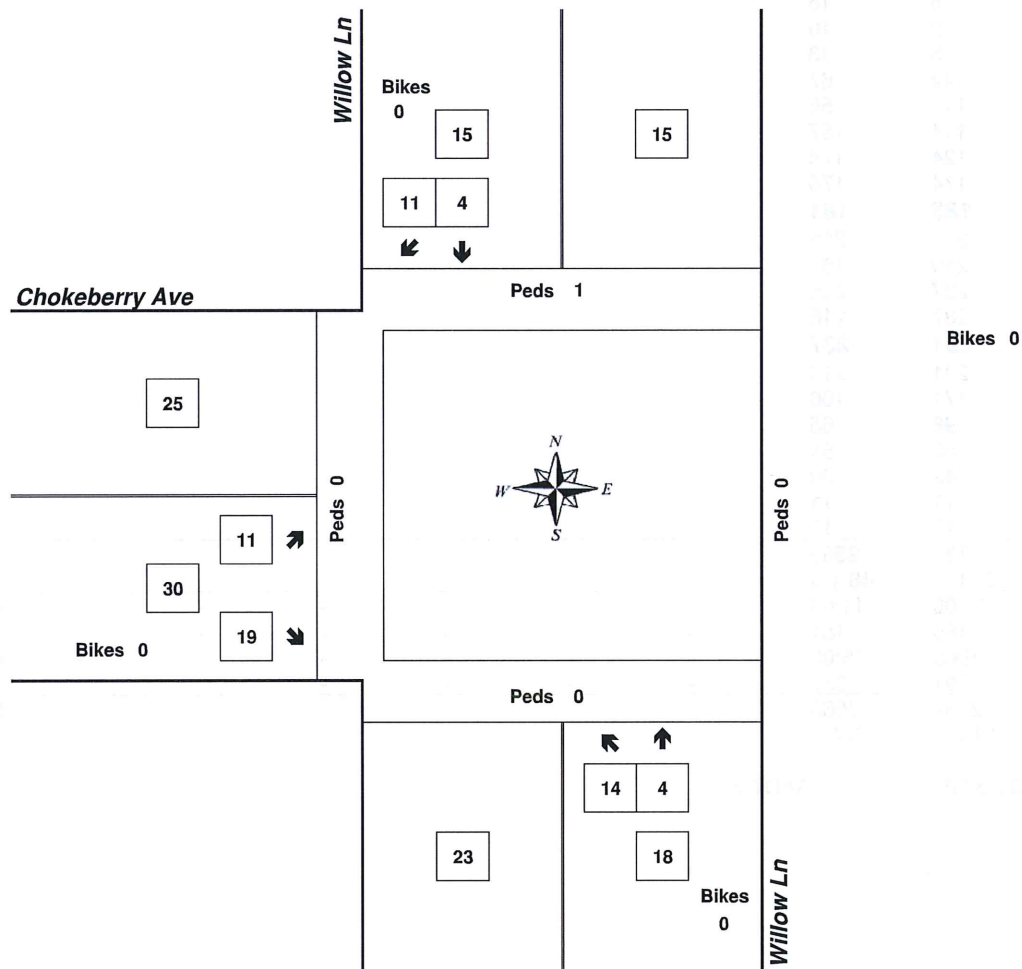
| Interval<br>Start<br>Time | Northbound<br>Willow Ln |   |       | Southbound<br>Willow Ln |   |       | Eastbound<br>Chokeberry Ave |   |       | Westbound<br>Chokeberry Ave |  |       | Interval<br>Total |
|---------------------------|-------------------------|---|-------|-------------------------|---|-------|-----------------------------|---|-------|-----------------------------|--|-------|-------------------|
|                           | L                       | T | Total | T                       | R | Total | L                           | R | Total |                             |  | Total |                   |
| 4:00 PM                   | 0                       | 0 | 0     | 0                       | 1 | 1     | 0                           | 1 | 1     |                             |  | 0     | 2                 |
| 4:15 PM                   | 0                       | 0 | 0     | 0                       | 1 | 1     | 0                           | 2 | 2     |                             |  | 0     | 3                 |
| 4:30 PM                   | 0                       | 0 | 0     | 0                       | 2 | 2     | 0                           | 2 | 2     |                             |  | 0     | 4                 |
| 4:45 PM                   | 0                       | 0 | 0     | 0                       | 2 | 2     | 0                           | 2 | 2     |                             |  | 0     | 4                 |
| 5:00 PM                   | 0                       | 0 | 0     | 0                       | 2 | 2     | 0                           | 2 | 2     |                             |  | 0     | 4                 |



**All Traffic Data**  
Services Inc.

Clay Carney  
(503) 833-2740

**4:00 PM to 5:00 PM**  
**Thursday, February 23, 2017**



| Approach     | PHF  | HV%  | Volume |
|--------------|------|------|--------|
| EB           | 0.75 | 3.3% | 30     |
| WB           | 0.00 | 0.0% | 0      |
| NB           | 0.64 | 0.0% | 18     |
| SB           | 0.54 | 6.7% | 15     |
| Intersection | 0.68 | 3.2% | 63     |

Page 19 of 59

**All Traffic Data**  
**15105 SE 17th St.**  
**Vancouver, WA. 98683**  
**503-833-2740**

Page 1

Site Code: 1  
Hwy 101B E-O SE Ensign Ln

| Start Time | 23-Feb-1 Thu | EB         | WB         |   |   |   |   |   |   | Total      |
|------------|--------------|------------|------------|---|---|---|---|---|---|------------|
| 12:00 AM   |              | 9          | 6          |   |   |   |   |   |   | 15         |
| 01:00      |              | 6          | 5          |   |   |   |   |   |   | 11         |
| 02:00      |              | 3          | 8          |   |   |   |   |   |   | 11         |
| 03:00      |              | 8          | 16         |   |   |   |   |   |   | 24         |
| 04:00      |              | 8          | 16         |   |   |   |   |   |   | 24         |
| 05:00      |              | 15         | 33         |   |   |   |   |   |   | 48         |
| 06:00      |              | 42         | 67         |   |   |   |   |   |   | 109        |
| 07:00      |              | 111        | 159        |   |   |   |   |   |   | 270        |
| 08:00      |              | 114        | 157        |   |   |   |   |   |   | 271        |
| 09:00      |              | 124        | 178        |   |   |   |   |   |   | 302        |
| 10:00      |              | 174        | 176        |   |   |   |   |   |   | 350        |
| 11:00      |              | <b>185</b> | <b>181</b> |   |   |   |   |   |   | <b>366</b> |
| 12:00 PM   |              | 201        | 215        |   |   |   |   |   |   | 416        |
| 01:00      |              | 249        | 167        |   |   |   |   |   |   | 416        |
| 02:00      |              | 237        | 235        |   |   |   |   |   |   | 472        |
| 03:00      |              | 287        | 216        |   |   |   |   |   |   | 503        |
| 04:00      |              | <b>291</b> | <b>237</b> |   |   |   |   |   |   | <b>528</b> |
| 05:00      |              | 281        | 216        |   |   |   |   |   |   | 497        |
| 06:00      |              | 171        | 106        |   |   |   |   |   |   | 277        |
| 07:00      |              | 98         | 65         |   |   |   |   |   |   | 163        |
| 08:00      |              | 53         | 51         |   |   |   |   |   |   | 104        |
| 09:00      |              | 42         | 30         |   |   |   |   |   |   | 72         |
| 10:00      |              | 11         | 11         |   |   |   |   |   |   | 22         |
| 11:00      |              | 17         | 12         |   |   |   |   |   |   | 29         |
| Total      |              | 2737       | 2563       |   |   |   |   |   |   | 5300       |
| Percent    |              | 51.6%      | 48.4%      |   |   |   |   |   |   |            |
| AM Peak    | -            | 11:00      | 11:00      | - | - | - | - | - | - | 11:00      |
| Vol.       | -            | 185        | 181        | - | - | - | - | - | - | 366        |
| PM Peak    | -            | 16:00      | 16:00      | - | - | - | - | - | - | 16:00      |
| Vol.       | -            | 291        | 237        | - | - | - | - | - | - | 528        |
| Total      |              | 2737       | 2563       |   |   |   |   |   |   | 5300       |
| Percent    |              | 51.6%      | 48.4%      |   |   |   |   |   |   |            |
| ADT        |              | ADT 5,300  | AADT 5,300 |   |   |   |   |   |   |            |

Le

## TRIP GENERATION CALCULATIONS Existing Development (SFD's and Duplexes)

*Land Use:* Single-Family Detached Housing  
*Land Use Code:* 210  
*Variable:* Dwelling Units  
*Variable Value:* 39

### AM PEAK HOUR

*Trip Equation:*  $T = 0.70(X) + 9.74$

|                          | Enter | Exit | Total |
|--------------------------|-------|------|-------|
| Directional Distribution | 25%   | 75%  |       |
| Trip Ends                | 9     | 28   | 37    |

### PM PEAK HOUR

*Trip Equation:*  $\ln(T) = 0.90\ln(X) + 0.51$

|                          | Enter | Exit | Total |
|--------------------------|-------|------|-------|
| Directional Distribution | 63%   | 37%  |       |
| Trip Ends                | 28    | 17   | 45    |

### WEEKDAY

*Trip Equation:*  $\ln(T) = 0.92\ln(X) + 2.72$

|                          | Enter | Exit | Total |
|--------------------------|-------|------|-------|
| Directional Distribution | 50%   | 50%  |       |
| Trip Ends                | 221   | 221  | 442   |

### SATURDAY

*Trip Equation:*  $\ln(T) = 0.93\ln(X) + 2.64$

|                          | Enter | Exit | Total |
|--------------------------|-------|------|-------|
| Directional Distribution | 50%   | 50%  |       |
| Trip Ends                | 211   | 211  | 422   |

Source: TRIP GENERATION, Ninth Edition



**TRIP GENERATION CALCULATIONS**  
Existing Development (Four-plexes)

*Land Use:* Apartment  
*Land Use Code:* 220  
*Variable:* Dwelling Units  
*Variable Value:* 120

**AM PEAK HOUR**

*Trip Equation:*  $T = 0.49(X) + 3.73$

|                          | Enter | Exit | Total |
|--------------------------|-------|------|-------|
| Directional Distribution | 20%   | 80%  |       |
| Trip Ends                | 13    | 50   | 63    |

**PM PEAK HOUR**

*Trip Equation:*  $T = 0.55(X) + 17.65$

|                          | Enter | Exit | Total |
|--------------------------|-------|------|-------|
| Directional Distribution | 65%   | 35%  |       |
| Trip Ends                | 55    | 29   | 84    |

**WEEKDAY**

*Trip Equation:*  $T = 6.06(X) + 123.56$

|                          | Enter | Exit | Total |
|--------------------------|-------|------|-------|
| Directional Distribution | 50%   | 50%  |       |
| Trip Ends                | 425   | 425  | 850   |

**SATURDAY**

*Trip Equation:*  $T = 7.85(X) - 256.19$

|                          | Enter | Exit | Total |
|--------------------------|-------|------|-------|
| Directional Distribution | 50%   | 50%  |       |
| Trip Ends                | 343   | 343  | 686   |

Source: TRIP GENERATION, Ninth Edition

## TRIP GENERATION CALCULATIONS

### Proposed Development

*Land Use:* Apartment

*Land Use Code:* 220

*Variable:* Dwelling Units

*Variable Value:* 60

#### AM PEAK HOUR

*Trip Equation:*  $T = 0.49(X) + 3.73$

|                          | Enter | Exit | Total |
|--------------------------|-------|------|-------|
| Directional Distribution | 20%   | 80%  |       |
| Trip Ends                | 7     | 26   | 33    |

#### PM PEAK HOUR

*Trip Equation:*  $T = 0.55(X) + 17.65$

|                          | Enter | Exit | Total |
|--------------------------|-------|------|-------|
| Directional Distribution | 65%   | 35%  |       |
| Trip Ends                | 33    | 18   | 51    |

#### WEEKDAY

*Trip Equation:*  $T = 6.06(X) + 123.56$

|                          | Enter | Exit | Total |
|--------------------------|-------|------|-------|
| Directional Distribution | 50%   | 50%  |       |
| Trip Ends                | 244   | 244  | 488   |

#### SATURDAY

*Trip Equation:*  $T = 7.85(X) - 256.19$

|                          | Enter | Exit | Total |
|--------------------------|-------|------|-------|
| Directional Distribution | 50%   | 50%  |       |
| Trip Ends                | 107   | 107  | 214   |

Source: TRIP GENERATION, Ninth Edition

## LEVEL OF SERVICE

Level of service is used to describe the quality of traffic flow. Levels of service A to C are considered good, and rural roads are usually designed for level of service C. Urban streets and signalized intersections are typically designed for level of service D. Level of service E is considered to be the limit of acceptable delay. For unsignalized intersections, level of service E is generally considered acceptable. Here is a more complete description of levels of service:

*Level of service A:* Very low delay at intersections, with all traffic signal cycles clearing and no vehicles waiting through more than one signal cycle. On highways, low volume and high speeds, with speeds not restricted by other vehicles.

*Level of service B:* Operating speeds beginning to be affected by other traffic; short traffic delays at intersections. Higher average intersection delay than for level of service A resulting from more vehicles stopping.

*Level of service C:* Operating speeds and maneuverability closely controlled by other traffic; higher delays at intersections than for level of service B due to a significant number of vehicles stopping. Not all signal cycles clear the waiting vehicles. This is the recommended design standard for rural highways.

*Level of service D:* Tolerable operating speeds; long traffic delays occur at intersections. The influence of congestion is noticeable. At traffic signals many vehicles stop, and the proportion of vehicles not stopping declines. The number of signal cycle failures, for which vehicles must wait through more than one signal cycle, are noticeable. This is typically the design level for urban signalized intersections.

*Level of service E:* Restricted speeds, very long traffic delays at traffic signals, and traffic volumes near capacity. Flow is unstable so that any interruption, no matter how minor, will cause queues to form and service to deteriorate to level of service F. Traffic signal cycle failures are frequent occurrences. For unsignalized intersections, level of service E or better is generally considered acceptable.

*Level of service F:* Extreme delays, resulting in long queues which may interfere with other traffic movements. There may be stoppages of long duration, and speeds may drop to zero. There may be frequent signal cycle failures. Level of service F will typically result when vehicle arrival rates are greater than capacity. It is considered unacceptable by most drivers.



**LEVEL OF SERVICE CRITERIA  
FOR SIGNALIZED INTERSECTIONS**

| LEVEL<br>OF<br>SERVICE | CONTROL DELAY<br>PER VEHICLE<br>(Seconds) |
|------------------------|-------------------------------------------|
| A                      | <10                                       |
| B                      | 10-20                                     |
| C                      | 20-35                                     |
| D                      | 35-55                                     |
| E                      | 55-80                                     |
| F                      | >80                                       |

**LEVEL OF SERVICE CRITERIA  
FOR UNSIGNALIZED INTERSECTIONS**

| LEVEL<br>OF<br>SERVICE | CONTROL DELAY<br>PER VEHICLE<br>(Seconds) |
|------------------------|-------------------------------------------|
| A                      | <10                                       |
| B                      | 10-15                                     |
| C                      | 15-25                                     |
| D                      | 25-35                                     |
| E                      | 35-50                                     |
| F                      | >50                                       |

# HCM Unsignalized Intersection Capacity Analysis 1: SE 19th Street & SE Ensign Lane

03/14/2017

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--|--|--|--|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |  |  |  |  |
| Lane Configurations               |  |  |  |  |  |  |                                                                                   |  |                                                                                     |                                                                                     |  |                                                                                     |  |  |  |  |
| Traffic Volume (veh/h)            | 2                                                                                 | 96                                                                                | 32                                                                                | 7                                                                                 | 130                                                                               | 5                                                                                 | 22                                                                                | 1                                                                                   | 1                                                                                   | 6                                                                                   | 2                                                                                   | 10                                                                                  |  |  |  |  |
| Future Volume (Veh/h)             | 2                                                                                 | 96                                                                                | 32                                                                                | 7                                                                                 | 130                                                                               | 5                                                                                 | 22                                                                                | 1                                                                                   | 1                                                                                   | 6                                                                                   | 2                                                                                   | 10                                                                                  |  |  |  |  |
| Sign Control                      | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Stop                                                                              |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |                                                                                     |  |  |  |  |
| Grade                             | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     |  |  |  |  |
| Peak Hour Factor                  | 0.82                                                                              | 0.82                                                                              | 0.82                                                                              | 0.82                                                                              | 0.82                                                                              | 0.82                                                                              | 0.82                                                                              | 0.82                                                                                | 0.82                                                                                | 0.82                                                                                | 0.82                                                                                | 0.82                                                                                |  |  |  |  |
| Hourly flow rate (vph)            | 2                                                                                 | 117                                                                               | 39                                                                                | 9                                                                                 | 159                                                                               | 6                                                                                 | 27                                                                                | 1                                                                                   | 1                                                                                   | 7                                                                                   | 2                                                                                   | 12                                                                                  |  |  |  |  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| Lane Width (ft)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| Walking Speed (ft/s)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| Median type                       | None                                                                              |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| vC, conflicting volume            | 165                                                                               |                                                                                   |                                                                                   | 156                                                                               |                                                                                   |                                                                                   | 311                                                                               | 304                                                                                 | 117                                                                                 | 300                                                                                 | 337                                                                                 | 159                                                                                 |  |  |  |  |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| vCu, unblocked vol                | 165                                                                               |                                                                                   |                                                                                   | 156                                                                               |                                                                                   |                                                                                   | 311                                                                               | 304                                                                                 | 117                                                                                 | 300                                                                                 | 337                                                                                 | 159                                                                                 |  |  |  |  |
| tC, single (s)                    | 4.2                                                                               |                                                                                   |                                                                                   | 4.2                                                                               |                                                                                   |                                                                                   | 7.2                                                                               | 6.6                                                                                 | 6.3                                                                                 | 7.2                                                                                 | 6.6                                                                                 | 6.3                                                                                 |  |  |  |  |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| tF (s)                            | 2.3                                                                               |                                                                                   |                                                                                   | 2.3                                                                               |                                                                                   |                                                                                   | 3.6                                                                               | 4.1                                                                                 | 3.4                                                                                 | 3.6                                                                                 | 4.1                                                                                 | 3.4                                                                                 |  |  |  |  |
| p0 queue free %                   | 100                                                                               |                                                                                   |                                                                                   | 99                                                                                |                                                                                   |                                                                                   | 96                                                                                | 100                                                                                 | 100                                                                                 | 99                                                                                  | 100                                                                                 | 99                                                                                  |  |  |  |  |
| cM capacity (veh/h)               | 1372                                                                              |                                                                                   |                                                                                   | 1388                                                                              |                                                                                   |                                                                                   | 616                                                                               | 595                                                                                 | 919                                                                                 | 640                                                                                 | 573                                                                                 | 876                                                                                 |  |  |  |  |
| Direction, Lane #                 | EB 1                                                                              | EB 2                                                                              | EB 3                                                                              | WB 1                                                                              | WB 2                                                                              | WB 3                                                                              | NB 1                                                                              | SB 1                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| Volume Total                      | 2                                                                                 | 117                                                                               | 39                                                                                | 9                                                                                 | 159                                                                               | 6                                                                                 | 29                                                                                | 21                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| Volume Left                       | 2                                                                                 | 0                                                                                 | 0                                                                                 | 9                                                                                 | 0                                                                                 | 0                                                                                 | 27                                                                                | 7                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| Volume Right                      | 0                                                                                 | 0                                                                                 | 39                                                                                | 0                                                                                 | 0                                                                                 | 6                                                                                 | 1                                                                                 | 12                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| cSH                               | 1372                                                                              | 1700                                                                              | 1700                                                                              | 1388                                                                              | 1700                                                                              | 1700                                                                              | 622                                                                               | 746                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| Volume to Capacity                | 0.00                                                                              | 0.07                                                                              | 0.02                                                                              | 0.01                                                                              | 0.09                                                                              | 0.00                                                                              | 0.05                                                                              | 0.03                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| Queue Length 95th (ft)            | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 4                                                                                 | 2                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| Control Delay (s)                 | 7.6                                                                               | 0.0                                                                               | 0.0                                                                               | 7.6                                                                               | 0.0                                                                               | 0.0                                                                               | 11.1                                                                              | 10.0                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| Lane LOS                          | A                                                                                 |                                                                                   |                                                                                   | A                                                                                 |                                                                                   |                                                                                   | B                                                                                 | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| Approach Delay (s)                | 0.1                                                                               |                                                                                   |                                                                                   | 0.4                                                                               |                                                                                   |                                                                                   | 11.1                                                                              | 10.0                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| Approach LOS                      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | B                                                                                 | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| Average Delay                     |                                                                                   |                                                                                   |                                                                                   | 1.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |
| Intersection Capacity Utilization |                                                                                   |                                                                                   |                                                                                   | 20.0%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |  |  |  |  |
| Analysis Period (min)             |                                                                                   |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |



## HCM Unsignalized Intersection Capacity Analysis

### 2: SE Chokeberry Avenue & SE 19th Street

03/14/2017

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--|--|--|--|--|--|--|--|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |  |  |  |  |  |  |  |  |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                     |                                                                                     |  |                                                                                     |  |  |  |  |  |  |  |  |
| Sign Control                      |                                                                                   | Yield                                                                             |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                                |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 2                                                                                 | 7                                                                                 | 11                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 25                                                                                | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |  |  |  |  |  |  |  |  |
| Future Volume (vph)               | 2                                                                                 | 7                                                                                 | 11                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 25                                                                                | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |  |  |  |  |  |  |  |  |
| Peak Hour Factor                  | 0.70                                                                              | 0.70                                                                              | 0.70                                                                              | 0.70                                                                              | 0.70                                                                              | 0.70                                                                              | 0.70                                                                              | 0.70                                                                                | 0.70                                                                                | 0.70                                                                                | 0.70                                                                                | 0.70                                                                                |  |  |  |  |  |  |  |  |
| Hourly flow rate (vph)            | 3                                                                                 | 10                                                                                | 16                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 36                                                                                | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |  |  |  |  |  |  |  |  |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |  |  |  |  |
| Volume Total (vph)                | 29                                                                                | 0                                                                                 | 36                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |  |  |  |  |
| Volume Left (vph)                 | 3                                                                                 | 0                                                                                 | 36                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |  |  |  |  |
| Volume Right (vph)                | 16                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |  |  |  |  |
| Hadj (s)                          | -0.14                                                                             | 0.00                                                                              | 0.34                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |  |  |  |  |
| Departure Headway (s)             | 3.8                                                                               | 4.0                                                                               | 4.3                                                                               | 4.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |  |  |  |  |
| Degree Utilization, x             | 0.03                                                                              | 0.00                                                                              | 0.04                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |  |  |  |  |
| Capacity (veh/h)                  | 922                                                                               | 900                                                                               | 821                                                                               | 900                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |  |  |  |  |
| Control Delay (s)                 | 7.0                                                                               | 7.0                                                                               | 7.5                                                                               | 7.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |  |  |  |  |
| Approach Delay (s)                | 7.0                                                                               | 0.0                                                                               | 7.5                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |  |  |  |  |
| Approach LOS                      | A                                                                                 | A                                                                                 | A                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |  |  |  |  |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |  |  |  |  |
| Delay                             | 7.3                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |  |  |  |  |
| Level of Service                  | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |  |  |  |  |
| Intersection Capacity Utilization | 13.3%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                   |                                                                                   | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |  |  |  |  |
| Analysis Period (min)             | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |  |  |  |  |  |  |  |  |



# HCM Unsignalized Intersection Capacity Analysis 3: SE Willow Drive & SE Chokeberry Avenue

03/14/2017

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBR                                                                               | NBL                                                                               | NBT                                                                               | SBT                                                                               | SBR                                                                               |
| Lane Configurations               |  |                                                                                   |                                                                                   |  |  |                                                                                   |
| Traffic Volume (veh/h)            | 4                                                                                 | 6                                                                                 | 14                                                                                | 2                                                                                 | 3                                                                                 | 9                                                                                 |
| Future Volume (Veh/h)             | 4                                                                                 | 6                                                                                 | 14                                                                                | 2                                                                                 | 3                                                                                 | 9                                                                                 |
| Sign Control                      | Stop                                                                              |                                                                                   |                                                                                   | Free                                                                              | Free                                                                              |                                                                                   |
| Grade                             | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                | 0%                                                                                |                                                                                   |
| Peak Hour Factor                  | 0.79                                                                              | 0.79                                                                              | 0.79                                                                              | 0.79                                                                              | 0.79                                                                              | 0.79                                                                              |
| Hourly flow rate (vph)            | 5                                                                                 | 8                                                                                 | 18                                                                                | 3                                                                                 | 4                                                                                 | 11                                                                                |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (ft)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (ft/s)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   |                                                                                   | None                                                                              | None                                                                              |                                                                                   |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 48                                                                                | 10                                                                                | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 48                                                                                | 10                                                                                | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |
| tC, single (s)                    | 6.6                                                                               | 6.4                                                                               | 4.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.7                                                                               | 3.5                                                                               | 2.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| p0 queue free %                   | 99                                                                                | 99                                                                                | 99                                                                                |                                                                                   |                                                                                   |                                                                                   |
| cM capacity (veh/h)               | 907                                                                               | 1022                                                                              | 1616                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Direction, Lane #                 | EB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 13                                                                                | 21                                                                                | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 5                                                                                 | 18                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 8                                                                                 | 0                                                                                 | 11                                                                                |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 974                                                                               | 1616                                                                              | 1700                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.01                                                                              | 0.01                                                                              | 0.01                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (ft)            | 1                                                                                 | 1                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 8.7                                                                               | 6.2                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | A                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 8.7                                                                               | 6.2                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   | 5.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 17.5%                                                                             | ICU Level of Service                                                              | A                                                                                 |                                                                                   |                                                                                   |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |

# HCM Unsignalized Intersection Capacity Analysis4: SE Willow Drive & US-101B

03/14/2017

|                                   |      |       |                      |      |      |      |
|-----------------------------------|------|-------|----------------------|------|------|------|
|                                   | →    | ↘     | ↙                    | ←    | ↖    | ↗    |
| Movement                          | EBT  | EBR   | WBL                  | WBT  | NBL  | NBR  |
| Lane Configurations               | ↗    |       |                      | ↖    | ↗    |      |
| Traffic Volume (veh/h)            | 189  | 8     | 4                    | 248  | 39   | 16   |
| Future Volume (Veh/h)             | 189  | 8     | 4                    | 248  | 39   | 16   |
| Sign Control                      | Free |       |                      | Free | Stop |      |
| Grade                             | 0%   |       |                      | 0%   | 0%   |      |
| Peak Hour Factor                  | 0.79 | 0.79  | 0.79                 | 0.79 | 0.79 | 0.79 |
| Hourly flow rate (vph)            | 239  | 10    | 5                    | 314  | 49   | 20   |
| Pedestrians                       |      |       |                      |      |      |      |
| Lane Width (ft)                   |      |       |                      |      |      |      |
| Walking Speed (ft/s)              |      |       |                      |      |      |      |
| Percent Blockage                  |      |       |                      |      |      |      |
| Right turn flare (veh)            |      |       |                      |      |      |      |
| Median type                       | None |       |                      | None |      |      |
| Median storage (veh)              |      |       |                      |      |      |      |
| Upstream signal (ft)              |      |       |                      |      |      |      |
| pX, platoon unblocked             |      |       |                      |      |      |      |
| vC, conflicting volume            |      |       | 249                  |      | 568  | 244  |
| vC1, stage 1 conf vol             |      |       |                      |      |      |      |
| vC2, stage 2 conf vol             |      |       |                      |      |      |      |
| vCu, unblocked vol                |      |       | 249                  |      | 568  | 244  |
| tC, single (s)                    |      |       | 4.2                  |      | 6.4  | 6.2  |
| tC, 2 stage (s)                   |      |       |                      |      |      |      |
| tF (s)                            |      |       | 2.3                  |      | 3.5  | 3.3  |
| p0 queue free %                   |      |       | 100                  |      | 90   | 97   |
| cM capacity (veh/h)               |      |       | 1282                 |      | 482  | 795  |
| Direction, Lane #                 | EB 1 | WB 1  | NB 1                 |      |      |      |
| Volume Total                      | 249  | 319   | 69                   |      |      |      |
| Volume Left                       | 0    | 5     | 49                   |      |      |      |
| Volume Right                      | 10   | 0     | 20                   |      |      |      |
| cSH                               | 1700 | 1282  | 544                  |      |      |      |
| Volume to Capacity                | 0.15 | 0.00  | 0.13                 |      |      |      |
| Queue Length 95th (ft)            | 0    | 0     | 11                   |      |      |      |
| Control Delay (s)                 | 0.0  | 0.2   | 12.6                 |      |      |      |
| Lane LOS                          |      | A     | B                    |      |      |      |
| Approach Delay (s)                | 0.0  | 0.2   | 12.6                 |      |      |      |
| Approach LOS                      |      |       | B                    |      |      |      |
| Intersection Summary              |      |       |                      |      |      |      |
| Average Delay                     |      | 1.4   |                      |      |      |      |
| Intersection Capacity Utilization |      | 26.3% | ICU Level of Service | A    |      |      |
| Analysis Period (min)             |      | 15    |                      |      |      |      |



# HCM Unsignalized Intersection Capacity Analysis

## 1: SE 19th Street & SE Ensign Lane

03/14/2017

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |  |  |  |  |                                                                                   |  |                                                                                     |                                                                                     |  |  |
| Traffic Volume (veh/h)            | 5                                                                                 | 175                                                                               | 48                                                                                | 9                                                                                 | 143                                                                               | 17                                                                                | 67                                                                                | 14                                                                                  | 14                                                                                  | 24                                                                                  | 9                                                                                   | 43                                                                                  |
| Future Volume (Veh/h)             | 5                                                                                 | 175                                                                               | 48                                                                                | 9                                                                                 | 143                                                                               | 17                                                                                | 67                                                                                | 14                                                                                  | 14                                                                                  | 24                                                                                  | 9                                                                                   | 43                                                                                  |
| Sign Control                      | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Stop                                                                              |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |                                                                                     |
| Grade                             | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     |
| Peak Hour Factor                  | 0.90                                                                              | 0.90                                                                              | 0.90                                                                              | 0.90                                                                              | 0.90                                                                              | 0.90                                                                              | 0.90                                                                              | 0.90                                                                                | 0.90                                                                                | 0.90                                                                                | 0.90                                                                                | 0.90                                                                                |
| Hourly flow rate (vph)            | 6                                                                                 | 194                                                                               | 53                                                                                | 10                                                                                | 159                                                                               | 19                                                                                | 74                                                                                | 16                                                                                  | 16                                                                                  | 27                                                                                  | 10                                                                                  | 48                                                                                  |
| Pedestrians                       | 1                                                                                 |                                                                                   |                                                                                   | 1                                                                                 |                                                                                   |                                                                                   | 6                                                                                 |                                                                                     |                                                                                     | 1                                                                                   |                                                                                     |                                                                                     |
| Lane Width (ft)                   | 12.0                                                                              |                                                                                   |                                                                                   | 12.0                                                                              |                                                                                   |                                                                                   | 12.0                                                                              |                                                                                     |                                                                                     | 12.0                                                                                |                                                                                     |                                                                                     |
| Walking Speed (ft/s)              | 3.5                                                                               |                                                                                   |                                                                                   | 3.5                                                                               |                                                                                   |                                                                                   | 3.5                                                                               |                                                                                     |                                                                                     | 3.5                                                                                 |                                                                                     |                                                                                     |
| Percent Blockage                  | 0                                                                                 |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   | 1                                                                                 |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       | None                                                                              |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 179                                                                               |                                                                                   |                                                                                   | 253                                                                               |                                                                                   |                                                                                   | 445                                                                               | 411                                                                                 | 201                                                                                 | 411                                                                                 | 445                                                                                 | 161                                                                                 |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 179                                                                               |                                                                                   |                                                                                   | 253                                                                               |                                                                                   |                                                                                   | 445                                                                               | 411                                                                                 | 201                                                                                 | 411                                                                                 | 445                                                                                 | 161                                                                                 |
| tC, single (s)                    | 4.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |                                                                                   | 7.1                                                                               | 6.5                                                                                 | 6.2                                                                                 | 7.1                                                                                 | 6.5                                                                                 | 6.2                                                                                 |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 2.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |                                                                                   | 3.5                                                                               | 4.0                                                                                 | 3.3                                                                                 | 3.5                                                                                 | 4.0                                                                                 | 3.3                                                                                 |
| p0 queue free %                   | 100                                                                               |                                                                                   |                                                                                   | 99                                                                                |                                                                                   |                                                                                   | 84                                                                                | 97                                                                                  | 98                                                                                  | 95                                                                                  | 98                                                                                  | 95                                                                                  |
| cM capacity (veh/h)               | 1360                                                                              |                                                                                   |                                                                                   | 1305                                                                              |                                                                                   |                                                                                   | 477                                                                               | 521                                                                                 | 834                                                                                 | 521                                                                                 | 500                                                                                 | 885                                                                                 |
| Direction, Lane #                 | EB 1                                                                              | EB 2                                                                              | EB 3                                                                              | WB 1                                                                              | WB 2                                                                              | WB 3                                                                              | NB 1                                                                              | SB 1                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 6                                                                                 | 194                                                                               | 53                                                                                | 10                                                                                | 159                                                                               | 19                                                                                | 106                                                                               | 85                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 6                                                                                 | 0                                                                                 | 0                                                                                 | 10                                                                                | 0                                                                                 | 0                                                                                 | 74                                                                                | 27                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 0                                                                                 | 0                                                                                 | 53                                                                                | 0                                                                                 | 0                                                                                 | 19                                                                                | 16                                                                                | 48                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 1360                                                                              | 1700                                                                              | 1700                                                                              | 1305                                                                              | 1700                                                                              | 1700                                                                              | 517                                                                               | 674                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.00                                                                              | 0.11                                                                              | 0.03                                                                              | 0.01                                                                              | 0.09                                                                              | 0.01                                                                              | 0.20                                                                              | 0.13                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (ft)            | 0                                                                                 | 0                                                                                 | 0                                                                                 | 1                                                                                 | 0                                                                                 | 0                                                                                 | 19                                                                                | 11                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 7.7                                                                               | 0.0                                                                               | 0.0                                                                               | 7.8                                                                               | 0.0                                                                               | 0.0                                                                               | 13.7                                                                              | 11.1                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | A                                                                                 |                                                                                   |                                                                                   | A                                                                                 |                                                                                   |                                                                                   | B                                                                                 | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 0.2                                                                               |                                                                                   |                                                                                   | 0.4                                                                               |                                                                                   |                                                                                   | 13.7                                                                              | 11.1                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | B                                                                                 | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     | 4.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization | 27.5%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



## HCM Unsignalized Intersection Capacity Analysis

### 2: SE Chokeberry Avenue & SE 19th Street

03/14/2017

|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                     |                                                                                     |  |                                                                                     |
| Sign Control                      |                                                                                   | Yield                                                                             |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                                |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |
| Traffic Volume (vph)              | 15                                                                                | 1                                                                                 | 30                                                                                | 0                                                                                 | 9                                                                                 | 0                                                                                 | 24                                                                                | 1                                                                                   | 0                                                                                   | 0                                                                                   | 1                                                                                   | 22                                                                                  |
| Future Volume (vph)               | 15                                                                                | 1                                                                                 | 30                                                                                | 0                                                                                 | 9                                                                                 | 0                                                                                 | 24                                                                                | 1                                                                                   | 0                                                                                   | 0                                                                                   | 1                                                                                   | 22                                                                                  |
| Peak Hour Factor                  | 0.66                                                                              | 0.66                                                                              | 0.66                                                                              | 0.66                                                                              | 0.66                                                                              | 0.66                                                                              | 0.66                                                                              | 0.66                                                                                | 0.66                                                                                | 0.66                                                                                | 0.66                                                                                | 0.66                                                                                |
| Hourly flow rate (vph)            | 23                                                                                | 2                                                                                 | 45                                                                                | 0                                                                                 | 14                                                                                | 0                                                                                 | 36                                                                                | 2                                                                                   | 0                                                                                   | 0                                                                                   | 2                                                                                   | 33                                                                                  |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total (vph)                | 70                                                                                | 14                                                                                | 38                                                                                | 35                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left (vph)                 | 23                                                                                | 0                                                                                 | 36                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right (vph)                | 45                                                                                | 0                                                                                 | 0                                                                                 | 33                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Hadj (s)                          | -0.29                                                                             | 0.00                                                                              | 0.26                                                                              | -0.57                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Departure Headway (s)             | 3.8                                                                               | 4.1                                                                               | 4.4                                                                               | 3.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Degree Utilization, x             | 0.07                                                                              | 0.02                                                                              | 0.05                                                                              | 0.03                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Capacity (veh/h)                  | 929                                                                               | 852                                                                               | 799                                                                               | 986                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 7.1                                                                               | 7.2                                                                               | 7.6                                                                               | 6.7                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 7.1                                                                               | 7.2                                                                               | 7.6                                                                               | 6.7                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | A                                                                                 | A                                                                                 | A                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Delay                             |                                                                                   |                                                                                   | 7.1                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Level of Service                  |                                                                                   |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 24.3%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

### HCM Unsignalized Intersection Capacity Analysis 3: SE Willow Drive & SE Chokeberry Avenue

03/14/2017

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBR                                                                               | NBL                                                                               | NBT                                                                               | SBT                                                                               | SBR                                                                               |
| Lane Configurations               |  |                                                                                   |                                                                                   |  |  |                                                                                   |
| Traffic Volume (veh/h)            | 11                                                                                | 19                                                                                | 14                                                                                | 4                                                                                 | 4                                                                                 | 11                                                                                |
| Future Volume (Veh/h)             | 11                                                                                | 19                                                                                | 14                                                                                | 4                                                                                 | 4                                                                                 | 11                                                                                |
| Sign Control                      | Stop                                                                              |                                                                                   |                                                                                   | Free                                                                              | Free                                                                              |                                                                                   |
| Grade                             | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                | 0%                                                                                |                                                                                   |
| Peak Hour Factor                  | 0.68                                                                              | 0.68                                                                              | 0.68                                                                              | 0.68                                                                              | 0.68                                                                              | 0.68                                                                              |
| Hourly flow rate (vph)            | 16                                                                                | 28                                                                                | 21                                                                                | 6                                                                                 | 6                                                                                 | 16                                                                                |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                 |                                                                                   |
| Lane Width (ft)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 12.0                                                                              |                                                                                   |
| Walking Speed (ft/s)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 3.5                                                                               |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   |                                                                                   | None                                                                              | None                                                                              |                                                                                   |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 63                                                                                | 14                                                                                | 22                                                                                |                                                                                   |                                                                                   |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 63                                                                                | 14                                                                                | 22                                                                                |                                                                                   |                                                                                   |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               | 4.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               | 2.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| p0 queue free %                   | 98                                                                                | 97                                                                                | 99                                                                                |                                                                                   |                                                                                   |                                                                                   |
| cM capacity (veh/h)               | 927                                                                               | 1063                                                                              | 1607                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Direction, Lane #                 | EB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 44                                                                                | 27                                                                                | 22                                                                                |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 16                                                                                | 21                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 28                                                                                | 0                                                                                 | 16                                                                                |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 1009                                                                              | 1607                                                                              | 1700                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.04                                                                              | 0.01                                                                              | 0.01                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (ft)            | 3                                                                                 | 1                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 8.7                                                                               | 5.7                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | A                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 8.7                                                                               | 5.7                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   | 5.8                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 17.7%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   | A                                                                                 |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |



# HCM Unsignalized Intersection Capacity Analysis4: SE Willow Drive & US-101B

03/14/2017

|                                   |      |      |       |                      |      |      |
|-----------------------------------|------|------|-------|----------------------|------|------|
|                                   | →    | ↘    | ↙     | ←                    | ↖    | ↗    |
| Movement                          | EBT  | EBR  | WBL   | WBT                  | NBL  | NBR  |
| Lane Configurations               | ↗    |      |       | ↖                    | ↗    | ↘    |
| Traffic Volume (veh/h)            | 399  | 37   | 16    | 354                  | 15   | 6    |
| Future Volume (Veh/h)             | 399  | 37   | 16    | 354                  | 15   | 6    |
| Sign Control                      | Free |      |       | Free                 | Stop |      |
| Grade                             | 0%   |      |       | 0%                   | 0%   |      |
| Peak Hour Factor                  | 0.93 | 0.93 | 0.93  | 0.93                 | 0.93 | 0.93 |
| Hourly flow rate (vph)            | 429  | 40   | 17    | 381                  | 16   | 6    |
| Pedestrians                       |      |      |       |                      |      |      |
| Lane Width (ft)                   |      |      |       |                      |      |      |
| Walking Speed (ft/s)              |      |      |       |                      |      |      |
| Percent Blockage                  |      |      |       |                      |      |      |
| Right turn flare (veh)            |      |      |       |                      |      |      |
| Median type                       | None |      | None  |                      |      |      |
| Median storage (veh)              |      |      |       |                      |      |      |
| Upstream signal (ft)              |      |      |       |                      |      |      |
| pX, platoon unblocked             |      |      |       |                      |      |      |
| vC, conflicting volume            |      |      | 469   |                      | 864  | 449  |
| vC1, stage 1 conf vol             |      |      |       |                      |      |      |
| vC2, stage 2 conf vol             |      |      |       |                      |      |      |
| vCu, unblocked vol                |      |      | 469   |                      | 864  | 449  |
| tC, single (s)                    |      |      | 4.1   |                      | 6.4  | 6.2  |
| tC, 2 stage (s)                   |      |      |       |                      |      |      |
| tF (s)                            |      |      | 2.2   |                      | 3.5  | 3.3  |
| p0 queue free %                   |      |      | 98    |                      | 95   | 99   |
| cM capacity (veh/h)               |      |      | 1093  |                      | 320  | 610  |
| Direction, Lane #                 | EB 1 | WB 1 | NB 1  |                      |      |      |
| Volume Total                      | 469  | 398  | 22    |                      |      |      |
| Volume Left                       | 0    | 17   | 16    |                      |      |      |
| Volume Right                      | 40   | 0    | 6     |                      |      |      |
| cSH                               | 1700 | 1093 | 367   |                      |      |      |
| Volume to Capacity                | 0.28 | 0.02 | 0.06  |                      |      |      |
| Queue Length 95th (ft)            | 0    | 1    | 5     |                      |      |      |
| Control Delay (s)                 | 0.0  | 0.5  | 15.4  |                      |      |      |
| Lane LOS                          |      | A    | C     |                      |      |      |
| Approach Delay (s)                | 0.0  | 0.5  | 15.4  |                      |      |      |
| Approach LOS                      |      |      | C     |                      |      |      |
| Intersection Summary              |      |      |       |                      |      |      |
| Average Delay                     |      |      | 0.6   |                      |      |      |
| Intersection Capacity Utilization |      |      | 41.6% | ICU Level of Service | A    |      |
| Analysis Period (min)             |      |      | 15    |                      |      |      |



# HCM Unsignalized Intersection Capacity Analysis

### 1: SE 19th Street & SE Ensign Lane

03/14/2017

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |  |  |  |  |                                                                                   |  |                                                                                     |                                                                                     |  |  |
| Traffic Volume (veh/h)            | 2                                                                                 | 100                                                                               | 33                                                                                | 7                                                                                 | 135                                                                               | 5                                                                                 | 23                                                                                | 1                                                                                   | 1                                                                                   | 6                                                                                   | 2                                                                                   | 10                                                                                  |
| Future Volume (Veh/h)             | 2                                                                                 | 100                                                                               | 33                                                                                | 7                                                                                 | 135                                                                               | 5                                                                                 | 23                                                                                | 1                                                                                   | 1                                                                                   | 6                                                                                   | 2                                                                                   | 10                                                                                  |
| Sign Control                      | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Stop                                                                              |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |                                                                                     |
| Grade                             | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     |
| Peak Hour Factor                  | 0.82                                                                              | 0.82                                                                              | 0.82                                                                              | 0.82                                                                              | 0.82                                                                              | 0.82                                                                              | 0.82                                                                              | 0.82                                                                                | 0.82                                                                                | 0.82                                                                                | 0.82                                                                                | 0.82                                                                                |
| Hourly flow rate (vph)            | 2                                                                                 | 122                                                                               | 40                                                                                | 9                                                                                 | 165                                                                               | 6                                                                                 | 28                                                                                | 1                                                                                   | 1                                                                                   | 7                                                                                   | 2                                                                                   | 12                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (ft)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (ft/s)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       | None                                                                              |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 171                                                                               |                                                                                   |                                                                                   | 162                                                                               |                                                                                   |                                                                                   | 322                                                                               | 315                                                                                 | 122                                                                                 | 310                                                                                 | 349                                                                                 | 165                                                                                 |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 171                                                                               |                                                                                   |                                                                                   | 162                                                                               |                                                                                   |                                                                                   | 322                                                                               | 315                                                                                 | 122                                                                                 | 310                                                                                 | 349                                                                                 | 165                                                                                 |
| tC, single (s)                    | 4.2                                                                               |                                                                                   |                                                                                   | 4.2                                                                               |                                                                                   |                                                                                   | 7.2                                                                               | 6.6                                                                                 | 6.3                                                                                 | 7.2                                                                                 | 6.6                                                                                 | 6.3                                                                                 |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 2.3                                                                               |                                                                                   |                                                                                   | 2.3                                                                               |                                                                                   |                                                                                   | 3.6                                                                               | 4.1                                                                                 | 3.4                                                                                 | 3.6                                                                                 | 4.1                                                                                 | 3.4                                                                                 |
| p0 queue free %                   | 100                                                                               |                                                                                   |                                                                                   | 99                                                                                |                                                                                   |                                                                                   | 95                                                                                | 100                                                                                 | 100                                                                                 | 99                                                                                  | 100                                                                                 | 99                                                                                  |
| cM capacity (veh/h)               | 1365                                                                              |                                                                                   |                                                                                   | 1381                                                                              |                                                                                   |                                                                                   | 606                                                                               | 586                                                                                 | 913                                                                                 | 629                                                                                 | 564                                                                                 | 869                                                                                 |
| Direction, Lane #                 | EB 1                                                                              | EB 2                                                                              | EB 3                                                                              | WB 1                                                                              | WB 2                                                                              | WB 3                                                                              | NB 1                                                                              | SB 1                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 2                                                                                 | 122                                                                               | 40                                                                                | 9                                                                                 | 165                                                                               | 6                                                                                 | 30                                                                                | 21                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 2                                                                                 | 0                                                                                 | 0                                                                                 | 9                                                                                 | 0                                                                                 | 0                                                                                 | 28                                                                                | 7                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 0                                                                                 | 0                                                                                 | 40                                                                                | 0                                                                                 | 0                                                                                 | 6                                                                                 | 1                                                                                 | 12                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 1365                                                                              | 1700                                                                              | 1700                                                                              | 1381                                                                              | 1700                                                                              | 1700                                                                              | 612                                                                               | 737                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.00                                                                              | 0.07                                                                              | 0.02                                                                              | 0.01                                                                              | 0.10                                                                              | 0.00                                                                              | 0.05                                                                              | 0.03                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (ft)            | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 4                                                                                 | 2                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 7.6                                                                               | 0.0                                                                               | 0.0                                                                               | 7.6                                                                               | 0.0                                                                               | 0.0                                                                               | 11.2                                                                              | 10.0                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | A                                                                                 |                                                                                   |                                                                                   | A                                                                                 |                                                                                   |                                                                                   | B                                                                                 | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 0.1                                                                               |                                                                                   |                                                                                   | 0.4                                                                               |                                                                                   |                                                                                   | 11.2                                                                              | 10.0                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | B                                                                                 | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     | 1.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization | 20.0%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

## HCM Unsignalized Intersection Capacity Analysis

### 2: SE Chokeberry Avenue & SE 19th Street

03/14/2017

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                     |                                                                                     |  |                                                                                     |
| Sign Control                      |                                                                                   | Yield                                                                             |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                                |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |
| Traffic Volume (vph)              | 2                                                                                 | 7                                                                                 | 11                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 26                                                                                | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Future Volume (vph)               | 2                                                                                 | 7                                                                                 | 11                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 26                                                                                | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Peak Hour Factor                  | 0.70                                                                              | 0.70                                                                              | 0.70                                                                              | 0.70                                                                              | 0.70                                                                              | 0.70                                                                              | 0.70                                                                              | 0.70                                                                                | 0.70                                                                                | 0.70                                                                                | 0.70                                                                                | 0.70                                                                                |
| Hourly flow rate (vph)            | 3                                                                                 | 10                                                                                | 16                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 37                                                                                | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total (vph)                | 29                                                                                | 0                                                                                 | 37                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left (vph)                 | 3                                                                                 | 0                                                                                 | 37                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right (vph)                | 16                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Hadj (s)                          | -0.14                                                                             | 0.00                                                                              | 0.34                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Departure Headway (s)             | 3.8                                                                               | 4.0                                                                               | 4.3                                                                               | 4.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Degree Utilization, x             | 0.03                                                                              | 0.00                                                                              | 0.04                                                                              | 0.00                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Capacity (veh/h)                  | 921                                                                               | 900                                                                               | 821                                                                               | 900                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 7.0                                                                               | 7.0                                                                               | 7.5                                                                               | 7.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 7.0                                                                               | 0.0                                                                               | 7.5                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | A                                                                                 | A                                                                                 | A                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Delay                             |                                                                                   |                                                                                   | 7.3                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Level of Service                  |                                                                                   |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 13.3%                                                                             |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



# HCM Unsignalized Intersection Capacity Analysis 3: SE Willow Drive & SE Chokeberry Avenue

03/14/2017

| Movement                          | EBL  | EBR   | NBL                  | NBT  | SBT  | SBR  |
|-----------------------------------|------|-------|----------------------|------|------|------|
| Lane Configurations               |      |       |                      |      |      |      |
| Traffic Volume (veh/h)            | 4    | 6     | 15                   | 2    | 3    | 9    |
| Future Volume (Veh/h)             | 4    | 6     | 15                   | 2    | 3    | 9    |
| Sign Control                      | Stop |       |                      | Free | Free |      |
| Grade                             | 0%   |       |                      | 0%   | 0%   |      |
| Peak Hour Factor                  | 0.79 | 0.79  | 0.79                 | 0.79 | 0.79 | 0.79 |
| Hourly flow rate (vph)            | 5    | 8     | 19                   | 3    | 4    | 11   |
| Pedestrians                       |      |       |                      |      |      |      |
| Lane Width (ft)                   |      |       |                      |      |      |      |
| Walking Speed (ft/s)              |      |       |                      |      |      |      |
| Percent Blockage                  |      |       |                      |      |      |      |
| Right turn flare (veh)            |      |       |                      |      |      |      |
| Median type                       |      |       |                      | None | None |      |
| Median storage veh                |      |       |                      |      |      |      |
| Upstream signal (ft)              |      |       |                      |      |      |      |
| pX, platoon unblocked             |      |       |                      |      |      |      |
| vC, conflicting volume            | 50   | 10    | 15                   |      |      |      |
| vC1, stage 1 conf vol             |      |       |                      |      |      |      |
| vC2, stage 2 conf vol             |      |       |                      |      |      |      |
| vCu, unblocked vol                | 50   | 10    | 15                   |      |      |      |
| tC, single (s)                    | 6.6  | 6.4   | 4.1                  |      |      |      |
| tC, 2 stage (s)                   |      |       |                      |      |      |      |
| tF (s)                            | 3.7  | 3.5   | 2.2                  |      |      |      |
| p0 queue free %                   | 99   | 99    | 99                   |      |      |      |
| cM capacity (veh/h)               | 904  | 1022  | 1616                 |      |      |      |
| Direction, Lane #                 | EB 1 | NB 1  | SB 1                 |      |      |      |
| Volume Total                      | 13   | 22    | 15                   |      |      |      |
| Volume Left                       | 5    | 19    | 0                    |      |      |      |
| Volume Right                      | 8    | 0     | 11                   |      |      |      |
| cSH                               | 973  | 1616  | 1700                 |      |      |      |
| Volume to Capacity                | 0.01 | 0.01  | 0.01                 |      |      |      |
| Queue Length 95th (ft)            | 1    | 1     | 0                    |      |      |      |
| Control Delay (s)                 | 8.7  | 6.3   | 0.0                  |      |      |      |
| Lane LOS                          | A    | A     |                      |      |      |      |
| Approach Delay (s)                | 8.7  | 6.3   | 0.0                  |      |      |      |
| Approach LOS                      | A    |       |                      |      |      |      |
| Intersection Summary              |      |       |                      |      |      |      |
| Average Delay                     |      | 5.0   |                      |      |      |      |
| Intersection Capacity Utilization |      | 17.6% | ICU Level of Service | A    |      |      |
| Analysis Period (min)             |      | 15    |                      |      |      |      |



# HCM Unsignalized Intersection Capacity Analysis4: SE Willow Drive & US-101B

03/14/2017

|                                   | →    | ↘    | ↙     | ←                    | ↖    | ↗    |
|-----------------------------------|------|------|-------|----------------------|------|------|
| Movement                          | EBT  | EBR  | WBL   | WBT                  | NBL  | NBR  |
| Lane Configurations               | ↘    |      |       | ↘                    | ↘    |      |
| Traffic Volume (veh/h)            | 193  | 8    | 4     | 253                  | 41   | 17   |
| Future Volume (Veh/h)             | 193  | 8    | 4     | 253                  | 41   | 17   |
| Sign Control                      | Free |      |       | Free                 | Stop |      |
| Grade                             | 0%   |      |       | 0%                   | 0%   |      |
| Peak Hour Factor                  | 0.79 | 0.79 | 0.79  | 0.79                 | 0.79 | 0.79 |
| Hourly flow rate (vph)            | 244  | 10   | 5     | 320                  | 52   | 22   |
| Pedestrians                       |      |      |       |                      |      |      |
| Lane Width (ft)                   |      |      |       |                      |      |      |
| Walking Speed (ft/s)              |      |      |       |                      |      |      |
| Percent Blockage                  |      |      |       |                      |      |      |
| Right turn flare (veh)            |      |      |       |                      |      |      |
| Median type                       | None |      |       | None                 |      |      |
| Median storage (veh)              |      |      |       |                      |      |      |
| Upstream signal (ft)              |      |      |       |                      |      |      |
| pX, platoon unblocked             |      |      |       |                      |      |      |
| vC, conflicting volume            |      |      | 254   |                      | 579  | 249  |
| vC1, stage 1 conf vol             |      |      |       |                      |      |      |
| vC2, stage 2 conf vol             |      |      |       |                      |      |      |
| vCu, unblocked vol                |      |      | 254   |                      | 579  | 249  |
| tC, single (s)                    |      |      | 4.2   |                      | 6.4  | 6.2  |
| tC, 2 stage (s)                   |      |      |       |                      |      |      |
| tF (s)                            |      |      | 2.3   |                      | 3.5  | 3.3  |
| p0 queue free %                   |      |      | 100   |                      | 89   | 97   |
| cM capacity (veh/h)               |      |      | 1277  |                      | 475  | 790  |
| Direction, Lane #                 | EB 1 | WB 1 | NB 1  |                      |      |      |
| Volume Total                      | 254  | 325  | 74    |                      |      |      |
| Volume Left                       | 0    | 5    | 52    |                      |      |      |
| Volume Right                      | 10   | 0    | 22    |                      |      |      |
| cSH                               | 1700 | 1277 | 539   |                      |      |      |
| Volume to Capacity                | 0.15 | 0.00 | 0.14  |                      |      |      |
| Queue Length 95th (ft)            | 0    | 0    | 12    |                      |      |      |
| Control Delay (s)                 | 0.0  | 0.2  | 12.7  |                      |      |      |
| Lane LOS                          |      | A    | B     |                      |      |      |
| Approach Delay (s)                | 0.0  | 0.2  | 12.7  |                      |      |      |
| Approach LOS                      |      |      | B     |                      |      |      |
| Intersection Summary              |      |      |       |                      |      |      |
| Average Delay                     |      |      | 1.5   |                      |      |      |
| Intersection Capacity Utilization |      |      | 26.5% | ICU Level of Service |      | A    |
| Analysis Period (min)             |      |      | 15    |                      |      |      |

# HCM Unsignalized Intersection Capacity Analysis 1: SE 19th Street & SE Ensign Lane

03/14/2017

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |  |  |  |  |                                                                                   |  |                                                                                     |                                                                                     |  |  |
| Traffic Volume (veh/h)            | 5                                                                                 | 182                                                                               | 50                                                                                | 9                                                                                 | 149                                                                               | 18                                                                                | 70                                                                                | 15                                                                                  | 15                                                                                  | 25                                                                                  | 9                                                                                   | 45                                                                                  |
| Future Volume (Veh/h)             | 5                                                                                 | 182                                                                               | 50                                                                                | 9                                                                                 | 149                                                                               | 18                                                                                | 70                                                                                | 15                                                                                  | 15                                                                                  | 25                                                                                  | 9                                                                                   | 45                                                                                  |
| Sign Control                      |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Stop                                                                                |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |
| Grade                             |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                  |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |
| Peak Hour Factor                  | 0.90                                                                              | 0.90                                                                              | 0.90                                                                              | 0.90                                                                              | 0.90                                                                              | 0.90                                                                              | 0.90                                                                              | 0.90                                                                                | 0.90                                                                                | 0.90                                                                                | 0.90                                                                                | 0.90                                                                                |
| Hourly flow rate (vph)            | 6                                                                                 | 202                                                                               | 56                                                                                | 10                                                                                | 166                                                                               | 20                                                                                | 78                                                                                | 17                                                                                  | 17                                                                                  | 28                                                                                  | 10                                                                                  | 50                                                                                  |
| Pedestrians                       |                                                                                   | 1                                                                                 |                                                                                   |                                                                                   | 1                                                                                 |                                                                                   |                                                                                   | 6                                                                                   |                                                                                     |                                                                                     | 1                                                                                   |                                                                                     |
| Lane Width (ft)                   |                                                                                   | 12.0                                                                              |                                                                                   |                                                                                   | 12.0                                                                              |                                                                                   |                                                                                   | 12.0                                                                                |                                                                                     |                                                                                     | 12.0                                                                                |                                                                                     |
| Walking Speed (ft/s)              |                                                                                   | 3.5                                                                               |                                                                                   |                                                                                   | 3.5                                                                               |                                                                                   |                                                                                   | 3.5                                                                                 |                                                                                     |                                                                                     | 3.5                                                                                 |                                                                                     |
| Percent Blockage                  |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   | 1                                                                                   |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       |                                                                                   | None                                                                              |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 187                                                                               |                                                                                   |                                                                                   | 264                                                                               |                                                                                   |                                                                                   | 462                                                                               | 427                                                                                 | 209                                                                                 | 428                                                                                 | 463                                                                                 | 168                                                                                 |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 187                                                                               |                                                                                   |                                                                                   | 264                                                                               |                                                                                   |                                                                                   | 462                                                                               | 427                                                                                 | 209                                                                                 | 428                                                                                 | 463                                                                                 | 168                                                                                 |
| tC, single (s)                    | 4.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |                                                                                   | 7.1                                                                               | 6.5                                                                                 | 6.2                                                                                 | 7.1                                                                                 | 6.5                                                                                 | 6.2                                                                                 |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 2.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |                                                                                   | 3.5                                                                               | 4.0                                                                                 | 3.3                                                                                 | 3.5                                                                                 | 4.0                                                                                 | 3.3                                                                                 |
| p0 queue free %                   | 100                                                                               |                                                                                   |                                                                                   | 99                                                                                |                                                                                   |                                                                                   | 83                                                                                | 97                                                                                  | 98                                                                                  | 94                                                                                  | 98                                                                                  | 94                                                                                  |
| cM capacity (veh/h)               | 1351                                                                              |                                                                                   |                                                                                   | 1293                                                                              |                                                                                   |                                                                                   | 464                                                                               | 510                                                                                 | 826                                                                                 | 506                                                                                 | 488                                                                                 | 877                                                                                 |
| Direction, Lane #                 | EB 1                                                                              | EB 2                                                                              | EB 3                                                                              | WB 1                                                                              | WB 2                                                                              | WB 3                                                                              | NB 1                                                                              | SB 1                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 6                                                                                 | 202                                                                               | 56                                                                                | 10                                                                                | 166                                                                               | 20                                                                                | 112                                                                               | 88                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 6                                                                                 | 0                                                                                 | 0                                                                                 | 10                                                                                | 0                                                                                 | 0                                                                                 | 78                                                                                | 28                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 0                                                                                 | 0                                                                                 | 56                                                                                | 0                                                                                 | 0                                                                                 | 20                                                                                | 17                                                                                | 50                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 1351                                                                              | 1700                                                                              | 1700                                                                              | 1293                                                                              | 1700                                                                              | 1700                                                                              | 504                                                                               | 663                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.00                                                                              | 0.12                                                                              | 0.03                                                                              | 0.01                                                                              | 0.10                                                                              | 0.01                                                                              | 0.22                                                                              | 0.13                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (ft)            | 0                                                                                 | 0                                                                                 | 0                                                                                 | 1                                                                                 | 0                                                                                 | 0                                                                                 | 21                                                                                | 11                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 7.7                                                                               | 0.0                                                                               | 0.0                                                                               | 7.8                                                                               | 0.0                                                                               | 0.0                                                                               | 14.2                                                                              | 11.3                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | A                                                                                 |                                                                                   |                                                                                   | A                                                                                 |                                                                                   |                                                                                   | B                                                                                 | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 0.2                                                                               |                                                                                   |                                                                                   | 0.4                                                                               |                                                                                   |                                                                                   | 14.2                                                                              | 11.3                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | B                                                                                 | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 28.2%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



## HCM Unsignalized Intersection Capacity Analysis

### 2: SE Chokeberry Avenue & SE 19th Street

03/14/2017

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                     |                                                                                     |  |                                                                                     |
| Sign Control                      |                                                                                   | Yield                                                                             |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                                |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |
| Traffic Volume (vph)              | 16                                                                                | 1                                                                                 | 31                                                                                | 0                                                                                 | 9                                                                                 | 0                                                                                 | 25                                                                                | 1                                                                                   | 0                                                                                   | 0                                                                                   | 1                                                                                   | 23                                                                                  |
| Future Volume (vph)               | 16                                                                                | 1                                                                                 | 31                                                                                | 0                                                                                 | 9                                                                                 | 0                                                                                 | 25                                                                                | 1                                                                                   | 0                                                                                   | 0                                                                                   | 1                                                                                   | 23                                                                                  |
| Peak Hour Factor                  | 0.66                                                                              | 0.66                                                                              | 0.66                                                                              | 0.66                                                                              | 0.66                                                                              | 0.66                                                                              | 0.66                                                                              | 0.66                                                                                | 0.66                                                                                | 0.66                                                                                | 0.66                                                                                | 0.66                                                                                |
| Hourly flow rate (vph)            | 24                                                                                | 2                                                                                 | 47                                                                                | 0                                                                                 | 14                                                                                | 0                                                                                 | 38                                                                                | 2                                                                                   | 0                                                                                   | 0                                                                                   | 2                                                                                   | 35                                                                                  |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total (vph)                | 73                                                                                | 14                                                                                | 40                                                                                | 37                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left (vph)                 | 24                                                                                | 0                                                                                 | 38                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right (vph)                | 47                                                                                | 0                                                                                 | 0                                                                                 | 35                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Hadj (s)                          | -0.29                                                                             | 0.00                                                                              | 0.26                                                                              | -0.57                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Departure Headway (s)             | 3.8                                                                               | 4.1                                                                               | 4.4                                                                               | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Degree Utilization, x             | 0.08                                                                              | 0.02                                                                              | 0.05                                                                              | 0.04                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Capacity (veh/h)                  | 926                                                                               | 849                                                                               | 797                                                                               | 983                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 7.1                                                                               | 7.2                                                                               | 7.6                                                                               | 6.7                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 7.1                                                                               | 7.2                                                                               | 7.6                                                                               | 6.7                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | A                                                                                 | A                                                                                 | A                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Delay                             |                                                                                   |                                                                                   |                                                                                   | 7.1                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Level of Service                  |                                                                                   |                                                                                   |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   |                                                                                   | 24.5%                                                                             | ICU Level of Service                                                              |                                                                                   |                                                                                   | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



# HCM Unsignalized Intersection Capacity Analysis 3: SE Willow Drive & SE Chokeberry Avenue

03/14/2017

|                                   |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--|--|--|
| Movement                          | EBL                                                                               | EBR                                                                               | NBL                                                                               | NBT                                                                               | SBT                                                                               | SBR                                                                               |  |  |  |
| Lane Configurations               |  |                                                                                   |                                                                                   |  |  |                                                                                   |  |  |  |
| Traffic Volume (veh/h)            | 11                                                                                | 20                                                                                | 15                                                                                | 4                                                                                 | 4                                                                                 | 11                                                                                |  |  |  |
| Future Volume (Veh/h)             | 11                                                                                | 20                                                                                | 15                                                                                | 4                                                                                 | 4                                                                                 | 11                                                                                |  |  |  |
| Sign Control                      | Stop                                                                              |                                                                                   |                                                                                   | Free                                                                              | Free                                                                              |                                                                                   |  |  |  |
| Grade                             | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                | 0%                                                                                |                                                                                   |  |  |  |
| Peak Hour Factor                  | 0.68                                                                              | 0.68                                                                              | 0.68                                                                              | 0.68                                                                              | 0.68                                                                              | 0.68                                                                              |  |  |  |
| Hourly flow rate (vph)            | 16                                                                                | 29                                                                                | 22                                                                                | 6                                                                                 | 6                                                                                 | 16                                                                                |  |  |  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                 |                                                                                   |  |  |  |
| Lane Width (ft)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 12.0                                                                              |                                                                                   |  |  |  |
| Walking Speed (ft/s)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 3.5                                                                               |                                                                                   |  |  |  |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   |  |  |  |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| Median type                       |                                                                                   |                                                                                   |                                                                                   | None                                                                              | None                                                                              |                                                                                   |  |  |  |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| vC, conflicting volume            | 65                                                                                | 14                                                                                | 22                                                                                |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| vCu, unblocked vol                | 65                                                                                | 14                                                                                | 22                                                                                |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               | 4.1                                                                               |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               | 2.2                                                                               |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| p0 queue free %                   | 98                                                                                | 97                                                                                | 99                                                                                |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| cM capacity (veh/h)               | 924                                                                               | 1063                                                                              | 1607                                                                              |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| Direction, Lane #                 | EB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| Volume Total                      | 45                                                                                | 28                                                                                | 22                                                                                |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| Volume Left                       | 16                                                                                | 22                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| Volume Right                      | 29                                                                                | 0                                                                                 | 16                                                                                |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| cSH                               | 1009                                                                              | 1607                                                                              | 1700                                                                              |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| Volume to Capacity                | 0.04                                                                              | 0.01                                                                              | 0.01                                                                              |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| Queue Length 95th (ft)            | 3                                                                                 | 1                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| Control Delay (s)                 | 8.7                                                                               | 5.7                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| Lane LOS                          | A                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| Approach Delay (s)                | 8.7                                                                               | 5.7                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| Approach LOS                      | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| Average Delay                     |                                                                                   | 5.8                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |  |  |  |
| Intersection Capacity Utilization |                                                                                   | 17.7%                                                                             | ICU Level of Service                                                              | A                                                                                 |                                                                                   |                                                                                   |  |  |  |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |  |  |  |

# HCM Unsignalized Intersection Capacity Analysis4: SE Willow Drive & US-101B

03/14/2017

|                                   |      |      |       |                      |      |      |
|-----------------------------------|------|------|-------|----------------------|------|------|
|                                   | →    | ↘    | ↙     | ←                    | ↖    | ↗    |
| Movement                          | EBT  | EBR  | WBL   | WBT                  | NBL  | NBR  |
| Lane Configurations               | ↱    |      |       | ↱                    | ↘↙   |      |
| Traffic Volume (veh/h)            | 407  | 38   | 17    | 362                  | 16   | 6    |
| Future Volume (Veh/h)             | 407  | 38   | 17    | 362                  | 16   | 6    |
| Sign Control                      | Free |      |       | Free                 | Stop |      |
| Grade                             | 0%   |      |       | 0%                   | 0%   |      |
| Peak Hour Factor                  | 0.93 | 0.93 | 0.93  | 0.93                 | 0.93 | 0.93 |
| Hourly flow rate (vph)            | 438  | 41   | 18    | 389                  | 17   | 6    |
| Pedestrians                       |      |      |       |                      |      |      |
| Lane Width (ft)                   |      |      |       |                      |      |      |
| Walking Speed (ft/s)              |      |      |       |                      |      |      |
| Percent Blockage                  |      |      |       |                      |      |      |
| Right turn flare (veh)            |      |      |       |                      |      |      |
| Median type                       | None |      | None  |                      |      |      |
| Median storage (veh)              |      |      |       |                      |      |      |
| Upstream signal (ft)              |      |      |       |                      |      |      |
| pX, platoon unblocked             |      |      |       |                      |      |      |
| vC, conflicting volume            |      |      | 479   |                      | 884  | 458  |
| vC1, stage 1 conf vol             |      |      |       |                      |      |      |
| vC2, stage 2 conf vol             |      |      |       |                      |      |      |
| vCu, unblocked vol                |      |      | 479   |                      | 884  | 458  |
| tC, single (s)                    |      |      | 4.1   |                      | 6.4  | 6.2  |
| tC, 2 stage (s)                   |      |      |       |                      |      |      |
| tF (s)                            |      |      | 2.2   |                      | 3.5  | 3.3  |
| p0 queue free %                   |      |      | 98    |                      | 95   | 99   |
| cM capacity (veh/h)               |      |      | 1083  |                      | 311  | 602  |
| Direction, Lane #                 | EB 1 | WB 1 | NB 1  |                      |      |      |
| Volume Total                      | 479  | 407  | 23    |                      |      |      |
| Volume Left                       | 0    | 18   | 17    |                      |      |      |
| Volume Right                      | 41   | 0    | 6     |                      |      |      |
| cSH                               | 1700 | 1083 | 356   |                      |      |      |
| Volume to Capacity                | 0.28 | 0.02 | 0.06  |                      |      |      |
| Queue Length 95th (ft)            | 0    | 1    | 5     |                      |      |      |
| Control Delay (s)                 | 0.0  | 0.5  | 15.8  |                      |      |      |
| Lane LOS                          |      | A    | C     |                      |      |      |
| Approach Delay (s)                | 0.0  | 0.5  | 15.8  |                      |      |      |
| Approach LOS                      |      |      | C     |                      |      |      |
| Intersection Summary              |      |      |       |                      |      |      |
| Average Delay                     |      |      | 0.6   |                      |      |      |
| Intersection Capacity Utilization |      |      | 42.9% | ICU Level of Service | A    |      |
| Analysis Period (min)             |      |      | 15    |                      |      |      |



# HCM Unsignalized Intersection Capacity Analysis

## 1: SE 19th Street & SE Ensign Lane

03/14/2017

|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |  |  |  |  |                                                                                   |  |                                                                                     |                                                                                     |  |  |
| Traffic Volume (veh/h)            | 2                                                                                 | 100                                                                               | 38                                                                                | 7                                                                                 | 135                                                                               | 5                                                                                 | 39                                                                                | 3                                                                                   | 1                                                                                   | 6                                                                                   | 2                                                                                   | 10                                                                                  |
| Future Volume (Veh/h)             | 2                                                                                 | 100                                                                               | 38                                                                                | 7                                                                                 | 135                                                                               | 5                                                                                 | 39                                                                                | 3                                                                                   | 1                                                                                   | 6                                                                                   | 2                                                                                   | 10                                                                                  |
| Sign Control                      | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Stop                                                                              |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |                                                                                     |
| Grade                             | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     |
| Peak Hour Factor                  | 0.82                                                                              | 0.82                                                                              | 0.82                                                                              | 0.82                                                                              | 0.82                                                                              | 0.82                                                                              | 0.82                                                                              | 0.82                                                                                | 0.82                                                                                | 0.82                                                                                | 0.82                                                                                | 0.82                                                                                |
| Hourly flow rate (vph)            | 2                                                                                 | 122                                                                               | 46                                                                                | 9                                                                                 | 165                                                                               | 6                                                                                 | 48                                                                                | 4                                                                                   | 1                                                                                   | 7                                                                                   | 2                                                                                   | 12                                                                                  |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane Width (ft)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Walking Speed (ft/s)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       | None                                                                              |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 171                                                                               |                                                                                   |                                                                                   | 168                                                                               |                                                                                   |                                                                                   | 322                                                                               | 315                                                                                 | 122                                                                                 | 312                                                                                 | 355                                                                                 | 165                                                                                 |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 171                                                                               |                                                                                   |                                                                                   | 168                                                                               |                                                                                   |                                                                                   | 322                                                                               | 315                                                                                 | 122                                                                                 | 312                                                                                 | 355                                                                                 | 165                                                                                 |
| tC, single (s)                    | 4.2                                                                               |                                                                                   |                                                                                   | 4.2                                                                               |                                                                                   |                                                                                   | 7.2                                                                               | 6.6                                                                                 | 6.3                                                                                 | 7.2                                                                                 | 6.6                                                                                 | 6.3                                                                                 |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 2.3                                                                               |                                                                                   |                                                                                   | 2.3                                                                               |                                                                                   |                                                                                   | 3.6                                                                               | 4.1                                                                                 | 3.4                                                                                 | 3.6                                                                                 | 4.1                                                                                 | 3.4                                                                                 |
| p0 queue free %                   | 100                                                                               |                                                                                   |                                                                                   | 99                                                                                |                                                                                   |                                                                                   | 92                                                                                | 99                                                                                  | 100                                                                                 | 99                                                                                  | 100                                                                                 | 99                                                                                  |
| cM capacity (veh/h)               | 1365                                                                              |                                                                                   |                                                                                   | 1374                                                                              |                                                                                   |                                                                                   | 606                                                                               | 586                                                                                 | 913                                                                                 | 625                                                                                 | 560                                                                                 | 869                                                                                 |
| Direction, Lane #                 | EB 1                                                                              | EB 2                                                                              | EB 3                                                                              | WB 1                                                                              | WB 2                                                                              | WB 3                                                                              | NB 1                                                                              | SB 1                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 2                                                                                 | 122                                                                               | 46                                                                                | 9                                                                                 | 165                                                                               | 6                                                                                 | 53                                                                                | 21                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 2                                                                                 | 0                                                                                 | 0                                                                                 | 9                                                                                 | 0                                                                                 | 0                                                                                 | 48                                                                                | 7                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 0                                                                                 | 0                                                                                 | 46                                                                                | 0                                                                                 | 0                                                                                 | 6                                                                                 | 1                                                                                 | 12                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 1365                                                                              | 1700                                                                              | 1700                                                                              | 1374                                                                              | 1700                                                                              | 1700                                                                              | 608                                                                               | 735                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.00                                                                              | 0.07                                                                              | 0.03                                                                              | 0.01                                                                              | 0.10                                                                              | 0.00                                                                              | 0.09                                                                              | 0.03                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (ft)            | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 7                                                                                 | 2                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 7.6                                                                               | 0.0                                                                               | 0.0                                                                               | 7.6                                                                               | 0.0                                                                               | 0.0                                                                               | 11.5                                                                              | 10.0                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | A                                                                                 |                                                                                   |                                                                                   | A                                                                                 |                                                                                   |                                                                                   | B                                                                                 | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 0.1                                                                               |                                                                                   |                                                                                   | 0.4                                                                               |                                                                                   |                                                                                   | 11.5                                                                              | 10.0                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | B                                                                                 | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     | 2.1                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization | 20.0%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



## HCM Unsignalized Intersection Capacity Analysis

### 2: SE Chokeberry Avenue & SE 19th Street

03/14/2017

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                     |                                                                                     |  |                                                                                     |
| Sign Control                      |                                                                                   | Yield                                                                             |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                                |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |
| Traffic Volume (vph)              | 7                                                                                 | 7                                                                                 | 11                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 26                                                                                | 2                                                                                   | 0                                                                                   | 0                                                                                   | 8                                                                                   | 18                                                                                  |
| Future Volume (vph)               | 7                                                                                 | 7                                                                                 | 11                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 26                                                                                | 2                                                                                   | 0                                                                                   | 0                                                                                   | 8                                                                                   | 18                                                                                  |
| Peak Hour Factor                  | 0.70                                                                              | 0.70                                                                              | 0.70                                                                              | 0.70                                                                              | 0.70                                                                              | 0.70                                                                              | 0.70                                                                              | 0.70                                                                                | 0.70                                                                                | 0.70                                                                                | 0.70                                                                                | 0.70                                                                                |
| Hourly flow rate (vph)            | 10                                                                                | 10                                                                                | 16                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 37                                                                                | 3                                                                                   | 0                                                                                   | 0                                                                                   | 11                                                                                  | 26                                                                                  |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total (vph)                | 36                                                                                | 0                                                                                 | 40                                                                                | 37                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left (vph)                 | 10                                                                                | 0                                                                                 | 37                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right (vph)                | 16                                                                                | 0                                                                                 | 0                                                                                 | 26                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Hadj (s)                          | -0.04                                                                             | 0.00                                                                              | 0.32                                                                              | -0.42                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Departure Headway (s)             | 4.0                                                                               | 4.1                                                                               | 4.3                                                                               | 3.6                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Degree Utilization, x             | 0.04                                                                              | 0.00                                                                              | 0.05                                                                              | 0.04                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Capacity (veh/h)                  | 873                                                                               | 870                                                                               | 812                                                                               | 984                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 7.2                                                                               | 7.1                                                                               | 7.5                                                                               | 6.7                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 7.2                                                                               | 0.0                                                                               | 7.5                                                                               | 6.7                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | A                                                                                 | A                                                                                 | A                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Delay                             |                                                                                   |                                                                                   | 7.2                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Level of Service                  |                                                                                   |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 18.2%                                                                             | ICU Level of Service                                                              |                                                                                   | A                                                                                 |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

### HCM Unsignalized Intersection Capacity Analysis

#### 3: SE Willow Drive & SE Chokeberry Avenue

03/14/2017

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBR                                                                               | NBL                                                                               | NBT                                                                               | SBT                                                                               | SBR                                                                               |
| Lane Configurations               |  |                                                                                   |                                                                                   |  |  |                                                                                   |
| Traffic Volume (veh/h)            | 12                                                                                | 6                                                                                 | 15                                                                                | 2                                                                                 | 3                                                                                 | 11                                                                                |
| Future Volume (Veh/h)             | 12                                                                                | 6                                                                                 | 15                                                                                | 2                                                                                 | 3                                                                                 | 11                                                                                |
| Sign Control                      | Stop                                                                              |                                                                                   |                                                                                   | Free                                                                              | Free                                                                              |                                                                                   |
| Grade                             | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                | 0%                                                                                |                                                                                   |
| Peak Hour Factor                  | 0.79                                                                              | 0.79                                                                              | 0.79                                                                              | 0.79                                                                              | 0.79                                                                              | 0.79                                                                              |
| Hourly flow rate (vph)            | 15                                                                                | 8                                                                                 | 19                                                                                | 3                                                                                 | 4                                                                                 | 14                                                                                |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Lane Width (ft)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Walking Speed (ft/s)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   |                                                                                   | None                                                                              | None                                                                              |                                                                                   |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 52                                                                                | 11                                                                                | 18                                                                                |                                                                                   |                                                                                   |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 52                                                                                | 11                                                                                | 18                                                                                |                                                                                   |                                                                                   |                                                                                   |
| tC, single (s)                    | 6.6                                                                               | 6.4                                                                               | 4.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.7                                                                               | 3.5                                                                               | 2.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| p0 queue free %                   | 98                                                                                | 99                                                                                | 99                                                                                |                                                                                   |                                                                                   |                                                                                   |
| cM capacity (veh/h)               | 902                                                                               | 1020                                                                              | 1612                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Direction, Lane #                 | EB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 23                                                                                | 22                                                                                | 18                                                                                |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 15                                                                                | 19                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 8                                                                                 | 0                                                                                 | 14                                                                                |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 940                                                                               | 1612                                                                              | 1700                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.02                                                                              | 0.01                                                                              | 0.01                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (ft)            | 2                                                                                 | 1                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 8.9                                                                               | 6.3                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | A                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 8.9                                                                               | 6.3                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   | 5.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 17.6%                                                                             |                                                                                   | ICU Level of Service                                                              | A                                                                                 |                                                                                   |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |



# HCM Unsignalized Intersection Capacity Analysis4: SE Willow Drive & US-101B

03/14/2017

|                                   |      |      |       |                      |      |      |
|-----------------------------------|------|------|-------|----------------------|------|------|
|                                   | →    | ↘    | ↙     | ←                    | ↖    | ↗    |
| Movement                          | EBT  | EBR  | WBL   | WBT                  | NBL  | NBR  |
| Lane Configurations               | ↱    |      |       | ↰                    | ↱    |      |
| Traffic Volume (veh/h)            | 193  | 9    | 5     | 253                  | 45   | 21   |
| Future Volume (Veh/h)             | 193  | 9    | 5     | 253                  | 45   | 21   |
| Sign Control                      | Free |      |       | Free                 | Stop |      |
| Grade                             | 0%   |      |       | 0%                   | 0%   |      |
| Peak Hour Factor                  | 0.79 | 0.79 | 0.79  | 0.79                 | 0.79 | 0.79 |
| Hourly flow rate (vph)            | 244  | 11   | 6     | 320                  | 57   | 27   |
| Pedestrians                       |      |      |       |                      |      |      |
| Lane Width (ft)                   |      |      |       |                      |      |      |
| Walking Speed (ft/s)              |      |      |       |                      |      |      |
| Percent Blockage                  |      |      |       |                      |      |      |
| Right turn flare (veh)            |      |      |       |                      |      |      |
| Median type                       | None |      |       | None                 |      |      |
| Median storage (veh)              |      |      |       |                      |      |      |
| Upstream signal (ft)              |      |      |       |                      |      |      |
| pX, platoon unblocked             |      |      |       |                      |      |      |
| vC, conflicting volume            |      |      | 255   |                      | 582  | 250  |
| vC1, stage 1 conf vol             |      |      |       |                      |      |      |
| vC2, stage 2 conf vol             |      |      |       |                      |      |      |
| vCu, unblocked vol                |      |      | 255   |                      | 582  | 250  |
| tC, single (s)                    |      |      | 4.2   |                      | 6.4  | 6.2  |
| tC, 2 stage (s)                   |      |      |       |                      |      |      |
| tF (s)                            |      |      | 2.3   |                      | 3.5  | 3.3  |
| p0 queue free %                   |      |      | 100   |                      | 88   | 97   |
| cM capacity (veh/h)               |      |      | 1276  |                      | 473  | 789  |
| Direction, Lane #                 | EB 1 | WB 1 | NB 1  |                      |      |      |
| Volume Total                      | 255  | 326  | 84    |                      |      |      |
| Volume Left                       | 0    | 6    | 57    |                      |      |      |
| Volume Right                      | 11   | 0    | 27    |                      |      |      |
| cSH                               | 1700 | 1276 | 543   |                      |      |      |
| Volume to Capacity                | 0.15 | 0.00 | 0.15  |                      |      |      |
| Queue Length 95th (ft)            | 0    | 0    | 14    |                      |      |      |
| Control Delay (s)                 | 0.0  | 0.2  | 12.8  |                      |      |      |
| Lane LOS                          |      | A    | B     |                      |      |      |
| Approach Delay (s)                | 0.0  | 0.2  | 12.8  |                      |      |      |
| Approach LOS                      |      |      | B     |                      |      |      |
| Intersection Summary              |      |      |       |                      |      |      |
| Average Delay                     |      |      | 1.7   |                      |      |      |
| Intersection Capacity Utilization |      |      | 27.8% | ICU Level of Service | A    |      |
| Analysis Period (min)             |      |      | 15    |                      |      |      |



# HCM Unsignalized Intersection Capacity Analysis

## 1: SE 19th Street & SE Ensign Lane

03/14/2017

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |  |  |  |  |                                                                                    |  |                                                                                     |                                                                                     |  |                                                                                     |
| Traffic Volume (veh/h)            | 5                                                                                 | 182                                                                               | 72                                                                                | 9                                                                                 | 149                                                                               | 18                                                                                | 81                                                                                 | 16                                                                                  | 15                                                                                  | 25                                                                                  | 10                                                                                  | 45                                                                                  |
| Future Volume (Veh/h)             | 5                                                                                 | 182                                                                               | 72                                                                                | 9                                                                                 | 149                                                                               | 18                                                                                | 81                                                                                 | 16                                                                                  | 15                                                                                  | 25                                                                                  | 10                                                                                  | 45                                                                                  |
| Sign Control                      | Free                                                                              |                                                                                   |                                                                                   | Free                                                                              |                                                                                   |                                                                                   | Stop                                                                               |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |                                                                                     |
| Grade                             | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                 |                                                                                     |                                                                                     | 0%                                                                                  |                                                                                     |                                                                                     |
| Peak Hour Factor                  | 0.90                                                                              | 0.90                                                                              | 0.90                                                                              | 0.90                                                                              | 0.90                                                                              | 0.90                                                                              | 0.90                                                                               | 0.90                                                                                | 0.90                                                                                | 0.90                                                                                | 0.90                                                                                | 0.90                                                                                |
| Hourly flow rate (vph)            | 6                                                                                 | 202                                                                               | 80                                                                                | 10                                                                                | 166                                                                               | 20                                                                                | 90                                                                                 | 18                                                                                  | 17                                                                                  | 28                                                                                  | 11                                                                                  | 50                                                                                  |
| Pedestrians                       | 1                                                                                 |                                                                                   |                                                                                   | 1                                                                                 |                                                                                   |                                                                                   | 6                                                                                  |                                                                                     |                                                                                     | 1                                                                                   |                                                                                     |                                                                                     |
| Lane Width (ft)                   | 12.0                                                                              |                                                                                   |                                                                                   | 12.0                                                                              |                                                                                   |                                                                                   | 12.0                                                                               |                                                                                     |                                                                                     | 12.0                                                                                |                                                                                     |                                                                                     |
| Walking Speed (ft/s)              | 3.5                                                                               |                                                                                   |                                                                                   | 3.5                                                                               |                                                                                   |                                                                                   | 3.5                                                                                |                                                                                     |                                                                                     | 3.5                                                                                 |                                                                                     |                                                                                     |
| Percent Blockage                  | 0                                                                                 |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   |                                                                                   | 1                                                                                  |                                                                                     |                                                                                     | 0                                                                                   |                                                                                     |                                                                                     |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median type                       | None                                                                              |                                                                                   |                                                                                   | None                                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC, conflicting volume            | 187                                                                               |                                                                                   |                                                                                   | 288                                                                               |                                                                                   |                                                                                   | 462                                                                                | 427                                                                                 | 209                                                                                 | 428                                                                                 | 487                                                                                 | 168                                                                                 |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| vCu, unblocked vol                | 187                                                                               |                                                                                   |                                                                                   | 288                                                                               |                                                                                   |                                                                                   | 462                                                                                | 427                                                                                 | 209                                                                                 | 428                                                                                 | 487                                                                                 | 168                                                                                 |
| tC, single (s)                    | 4.2                                                                               |                                                                                   |                                                                                   | 4.1                                                                               |                                                                                   |                                                                                   | 7.1                                                                                | 6.5                                                                                 | 6.2                                                                                 | 7.1                                                                                 | 6.5                                                                                 | 6.2                                                                                 |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| tF (s)                            | 2.3                                                                               |                                                                                   |                                                                                   | 2.2                                                                               |                                                                                   |                                                                                   | 3.5                                                                                | 4.0                                                                                 | 3.3                                                                                 | 3.5                                                                                 | 4.0                                                                                 | 3.3                                                                                 |
| p0 queue free %                   | 100                                                                               |                                                                                   |                                                                                   | 99                                                                                |                                                                                   |                                                                                   | 81                                                                                 | 96                                                                                  | 98                                                                                  | 94                                                                                  | 98                                                                                  | 94                                                                                  |
| cM capacity (veh/h)               | 1351                                                                              |                                                                                   |                                                                                   | 1267                                                                              |                                                                                   |                                                                                   | 462                                                                                | 510                                                                                 | 826                                                                                 | 505                                                                                 | 473                                                                                 | 877                                                                                 |
| Direction, Lane #                 | EB 1                                                                              | EB 2                                                                              | EB 3                                                                              | WB 1                                                                              | WB 2                                                                              | WB 3                                                                              | NB 1                                                                               | SB 1                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total                      | 6                                                                                 | 202                                                                               | 80                                                                                | 10                                                                                | 166                                                                               | 20                                                                                | 125                                                                                | 89                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left                       | 6                                                                                 | 0                                                                                 | 0                                                                                 | 10                                                                                | 0                                                                                 | 0                                                                                 | 90                                                                                 | 28                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right                      | 0                                                                                 | 0                                                                                 | 80                                                                                | 0                                                                                 | 0                                                                                 | 20                                                                                | 17                                                                                 | 50                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| cSH                               | 1351                                                                              | 1700                                                                              | 1700                                                                              | 1267                                                                              | 1700                                                                              | 1700                                                                              | 499                                                                                | 656                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume to Capacity                | 0.00                                                                              | 0.12                                                                              | 0.05                                                                              | 0.01                                                                              | 0.10                                                                              | 0.01                                                                              | 0.25                                                                               | 0.14                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Queue Length 95th (ft)            | 0                                                                                 | 0                                                                                 | 0                                                                                 | 1                                                                                 | 0                                                                                 | 0                                                                                 | 25                                                                                 | 12                                                                                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 7.7                                                                               | 0.0                                                                               | 0.0                                                                               | 7.9                                                                               | 0.0                                                                               | 0.0                                                                               | 14.6                                                                               | 11.3                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Lane LOS                          | A                                                                                 |                                                                                   |                                                                                   | A                                                                                 |                                                                                   |                                                                                   | B                                                                                  | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 0.2                                                                               |                                                                                   |                                                                                   | 0.4                                                                               |                                                                                   |                                                                                   | 14.6                                                                               | 11.3                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | B                                                                                  | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Average Delay                     | 4.2                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization | 29.9%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

## HCM Unsignalized Intersection Capacity Analysis

### 2: SE Chokeberry Avenue & SE 19th Street

03/14/2017

|                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                   |                                                                                   |  |                                                                                     |                                                                                     |  |                                                                                     |
| Sign Control                      |                                                                                   | Yield                                                                             |                                                                                   |                                                                                   | Stop                                                                              |                                                                                   |                                                                                   | Stop                                                                                |                                                                                     |                                                                                     | Stop                                                                                |                                                                                     |
| Traffic Volume (vph)              | 39                                                                                | 1                                                                                 | 31                                                                                | 0                                                                                 | 9                                                                                 | 0                                                                                 | 25                                                                                | 11                                                                                  | 0                                                                                   | 0                                                                                   | 7                                                                                   | 35                                                                                  |
| Future Volume (vph)               | 39                                                                                | 1                                                                                 | 31                                                                                | 0                                                                                 | 9                                                                                 | 0                                                                                 | 25                                                                                | 11                                                                                  | 0                                                                                   | 0                                                                                   | 7                                                                                   | 35                                                                                  |
| Peak Hour Factor                  | 0.66                                                                              | 0.66                                                                              | 0.66                                                                              | 0.66                                                                              | 0.66                                                                              | 0.66                                                                              | 0.66                                                                              | 0.66                                                                                | 0.66                                                                                | 0.66                                                                                | 0.66                                                                                | 0.66                                                                                |
| Hourly flow rate (vph)            | 59                                                                                | 2                                                                                 | 47                                                                                | 0                                                                                 | 14                                                                                | 0                                                                                 | 38                                                                                | 17                                                                                  | 0                                                                                   | 0                                                                                   | 11                                                                                  | 53                                                                                  |
| Direction, Lane #                 | EB 1                                                                              | WB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Total (vph)                | 108                                                                               | 14                                                                                | 55                                                                                | 64                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Left (vph)                 | 59                                                                                | 0                                                                                 | 38                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Volume Right (vph)                | 47                                                                                | 0                                                                                 | 0                                                                                 | 53                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Hadj (s)                          | -0.12                                                                             | 0.00                                                                              | 0.21                                                                              | -0.50                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Departure Headway (s)             | 4.0                                                                               | 4.3                                                                               | 4.4                                                                               | 3.7                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Degree Utilization, x             | 0.12                                                                              | 0.02                                                                              | 0.07                                                                              | 0.07                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Capacity (veh/h)                  | 861                                                                               | 812                                                                               | 781                                                                               | 929                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Control Delay (s)                 | 7.6                                                                               | 7.3                                                                               | 7.7                                                                               | 7.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach Delay (s)                | 7.6                                                                               | 7.3                                                                               | 7.7                                                                               | 7.0                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Approach LOS                      | A                                                                                 | A                                                                                 | A                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Delay                             |                                                                                   |                                                                                   | 7.5                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Level of Service                  |                                                                                   |                                                                                   | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 26.2%                                                                             | ICU Level of Service                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



# HCM Unsignalized Intersection Capacity Analysis 3: SE Willow Drive & SE Chokeberry Avenue

03/14/2017

|                                   |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBR                                                                               | NBL                                                                               | NBT                                                                               | SBT                                                                               | SBR                                                                               |
| Lane Configurations               |  |                                                                                   |                                                                                   |  |  |                                                                                   |
| Traffic Volume (veh/h)            | 17                                                                                | 20                                                                                | 15                                                                                | 4                                                                                 | 4                                                                                 | 21                                                                                |
| Future Volume (Veh/h)             | 17                                                                                | 20                                                                                | 15                                                                                | 4                                                                                 | 4                                                                                 | 21                                                                                |
| Sign Control                      | Stop                                                                              |                                                                                   |                                                                                   | Free                                                                              | Free                                                                              |                                                                                   |
| Grade                             | 0%                                                                                |                                                                                   |                                                                                   | 0%                                                                                | 0%                                                                                |                                                                                   |
| Peak Hour Factor                  | 0.68                                                                              | 0.68                                                                              | 0.68                                                                              | 0.68                                                                              | 0.68                                                                              | 0.68                                                                              |
| Hourly flow rate (vph)            | 25                                                                                | 29                                                                                | 22                                                                                | 6                                                                                 | 6                                                                                 | 31                                                                                |
| Pedestrians                       |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                 |                                                                                   |
| Lane Width (ft)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 12.0                                                                              |                                                                                   |
| Walking Speed (ft/s)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 3.5                                                                               |                                                                                   |
| Percent Blockage                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0                                                                                 |                                                                                   |
| Right turn flare (veh)            |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Median type                       |                                                                                   |                                                                                   |                                                                                   | None                                                                              | None                                                                              |                                                                                   |
| Median storage (veh)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Upstream signal (ft)              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| pX, platoon unblocked             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC, conflicting volume            | 72                                                                                | 22                                                                                | 37                                                                                |                                                                                   |                                                                                   |                                                                                   |
| vC1, stage 1 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vC2, stage 2 conf vol             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| vCu, unblocked vol                | 72                                                                                | 22                                                                                | 37                                                                                |                                                                                   |                                                                                   |                                                                                   |
| tC, single (s)                    | 6.4                                                                               | 6.2                                                                               | 4.1                                                                               |                                                                                   |                                                                                   |                                                                                   |
| tC, 2 stage (s)                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| tF (s)                            | 3.5                                                                               | 3.3                                                                               | 2.2                                                                               |                                                                                   |                                                                                   |                                                                                   |
| p0 queue free %                   | 97                                                                                | 97                                                                                | 99                                                                                |                                                                                   |                                                                                   |                                                                                   |
| cM capacity (veh/h)               | 915                                                                               | 1053                                                                              | 1587                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Direction, Lane #                 | EB 1                                                                              | NB 1                                                                              | SB 1                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume Total                      | 54                                                                                | 28                                                                                | 37                                                                                |                                                                                   |                                                                                   |                                                                                   |
| Volume Left                       | 25                                                                                | 22                                                                                | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Volume Right                      | 29                                                                                | 0                                                                                 | 31                                                                                |                                                                                   |                                                                                   |                                                                                   |
| cSH                               | 984                                                                               | 1587                                                                              | 1700                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Volume to Capacity                | 0.05                                                                              | 0.01                                                                              | 0.02                                                                              |                                                                                   |                                                                                   |                                                                                   |
| Queue Length 95th (ft)            | 4                                                                                 | 1                                                                                 | 0                                                                                 |                                                                                   |                                                                                   |                                                                                   |
| Control Delay (s)                 | 8.9                                                                               | 5.8                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Lane LOS                          | A                                                                                 | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Approach Delay (s)                | 8.9                                                                               | 5.8                                                                               | 0.0                                                                               |                                                                                   |                                                                                   |                                                                                   |
| Approach LOS                      | A                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Summary              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Average Delay                     |                                                                                   | 5.4                                                                               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |
| Intersection Capacity Utilization |                                                                                   | 17.7%                                                                             |                                                                                   | ICU Level of Service                                                              | A                                                                                 |                                                                                   |
| Analysis Period (min)             |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |



# HCM Unsignalized Intersection Capacity Analysis 4: SE Willow Drive & US-101B

03/14/2017

|                                   |      |       |                      |      |      |      |
|-----------------------------------|------|-------|----------------------|------|------|------|
|                                   | →    | ↘     | ↙                    | ←    | ↖    | ↗    |
| Movement                          | EBT  | EBR   | WBL                  | WBT  | NBL  | NBR  |
| Lane Configurations               | ↻    |       |                      | ↻    | ↻    |      |
| Traffic Volume (veh/h)            | 407  | 43    | 22                   | 362  | 19   | 9    |
| Future Volume (Veh/h)             | 407  | 43    | 22                   | 362  | 19   | 9    |
| Sign Control                      | Free |       |                      | Free | Stop |      |
| Grade                             | 0%   |       |                      | 0%   | 0%   |      |
| Peak Hour Factor                  | 0.93 | 0.93  | 0.93                 | 0.93 | 0.93 | 0.93 |
| Hourly flow rate (vph)            | 438  | 46    | 24                   | 389  | 20   | 10   |
| Pedestrians                       |      |       |                      |      |      |      |
| Lane Width (ft)                   |      |       |                      |      |      |      |
| Walking Speed (ft/s)              |      |       |                      |      |      |      |
| Percent Blockage                  |      |       |                      |      |      |      |
| Right turn flare (veh)            |      |       |                      |      |      |      |
| Median type                       | None |       |                      | None |      |      |
| Median storage (veh)              |      |       |                      |      |      |      |
| Upstream signal (ft)              |      |       |                      |      |      |      |
| pX, platoon unblocked             |      |       |                      |      |      |      |
| vC, conflicting volume            |      |       | 484                  |      | 898  | 461  |
| vC1, stage 1 conf vol             |      |       |                      |      |      |      |
| vC2, stage 2 conf vol             |      |       |                      |      |      |      |
| vCu, unblocked vol                |      |       | 484                  |      | 898  | 461  |
| tC, single (s)                    |      |       | 4.1                  |      | 6.4  | 6.2  |
| tC, 2 stage (s)                   |      |       |                      |      |      |      |
| tF (s)                            |      |       | 2.2                  |      | 3.5  | 3.3  |
| p0 queue free %                   |      |       | 98                   |      | 93   | 98   |
| cM capacity (veh/h)               |      |       | 1079                 |      | 303  | 600  |
| Direction, Lane #                 | EB 1 | WB 1  | NB 1                 |      |      |      |
| Volume Total                      | 484  | 413   | 30                   |      |      |      |
| Volume Left                       | 0    | 24    | 20                   |      |      |      |
| Volume Right                      | 46   | 0     | 10                   |      |      |      |
| cSH                               | 1700 | 1079  | 363                  |      |      |      |
| Volume to Capacity                | 0.28 | 0.02  | 0.08                 |      |      |      |
| Queue Length 95th (ft)            | 0    | 2     | 7                    |      |      |      |
| Control Delay (s)                 | 0.0  | 0.7   | 15.8                 |      |      |      |
| Lane LOS                          |      | A     | C                    |      |      |      |
| Approach Delay (s)                | 0.0  | 0.7   | 15.8                 |      |      |      |
| Approach LOS                      |      |       | C                    |      |      |      |
| Intersection Summary              |      |       |                      |      |      |      |
| Average Delay                     |      | 0.8   |                      |      |      |      |
| Intersection Capacity Utilization |      | 47.1% | ICU Level of Service | A    |      |      |
| Analysis Period (min)             |      | 15    |                      |      |      |      |

OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION  
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT  
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

ENSGN AVE at 19TH ST, City of Warrenton, Clatsop County, 01/01/2011 to 12/31/2015

| COLLISION TYPE  | FATAL<br>CRASHES | NON-<br>PROPERTY |                | TOTAL<br>CRASHES | PEOPLE<br>KILLED |                  | PEOPLE<br>INURED | TRUCKS | DRY<br>SURF | WET<br>SURF | DAY | INTER-<br>SECTION |         | INTER-<br>SECTION<br>RELATED | OFF-<br>ROAD |
|-----------------|------------------|------------------|----------------|------------------|------------------|------------------|------------------|--------|-------------|-------------|-----|-------------------|---------|------------------------------|--------------|
|                 |                  | FATAL<br>CRASHES | DAMAGE<br>ONLY |                  | PEOPLE<br>KILLED | PEOPLE<br>INURED |                  |        |             |             |     | DARK              | SECTION |                              |              |
| YEAR: 2014      | 0                | 0                | 1              | 1                | 0                | 0                | 0                | 0      | 0           | 1           | 1   | 0                 | 1       | 0                            | 0            |
| REAR-END        | 0                | 0                | 1              | 1                | 0                | 0                | 0                | 0      | 0           | 1           | 1   | 0                 | 1       | 0                            | 0            |
| YEAR 2014 TOTAL | 0                | 0                | 1              | 1                | 0                | 0                | 0                | 0      | 0           | 1           | 1   | 0                 | 1       | 0                            | 0            |
| FINAL TOTAL     | 0                | 0                | 1              | 1                | 0                | 0                | 0                | 0      | 0           | 1           | 1   | 0                 | 1       | 0                            | 0            |

Disclaimer: The information contained in this report is compiled from individual driver and police crash reports submitted to the Oregon Department of Transportation as required in ORS 811.720. The Crash Analysis and Reporting Unit is committed to providing the highest quality crash data to customers. However, because submittal of crash report forms is the responsibility of the individual driver, the Crash Analysis and Reporting Unit can not guarantee that all qualifying crashes are represented nor can assurances be made that all details pertaining to a single crash are accurate. Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

CDS360  
03/14/2017  
CITY OF WARRENTON, CLATSOP COUNTY  
OREGON... DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION  
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT  
URBAN NON-SYSTEM CRASH LISTING  
ENHIGN AVE at 19TH ST, City of Warrenton, Clatsop County, 01/01/2011 to 12/31/2015  
Total crash records: 1

| S | D | P | R | S | W | E | A | U | C | O | D | A | T | E | C | L | A | S | S | E | R | # | S | E | R | I | N | V | E | S | T | I | N | G | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R | O | A | D | E | S | T | R |
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Disclaimer: The information contained in this report is compiled from individual driver and police crash reports submitted to the Oregon Department of Transportation as required in ORS 811.720. The Crash Analysis and Reporting Unit is committed to providing the highest quality crash data to customers. However, because submittal of crash report forms is the responsibility of the individual driver, the Crash Analysis and Reporting Unit can not guarantee that all qualifying crashes are represented nor can assurances be made that all details pertaining to a single crash are accurate. Note: Legislative changes to DMV's vehicle crash reporting requirement, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.



OREGON DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION  
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT  
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

CHOKEBERRY AVE at 19TH ST, City of Warrenton, Clatsop County, 01/01/2011 to 12/31/2015

| COLLISION TYPE | FATAL<br>CRASHES | NON-<br>FATAL<br>CRASHES | PROPERTY<br>DAMAGE<br>ONLY | TOTAL<br>CRASHES | PEOPLE<br>KILLED | PEOPLE<br>INJURED | TRUCKS | DRY<br>SURF | WET<br>SURF | DAY | DARK | INTER-<br>SECTION<br>RELATED | INTER-<br>SECTION<br>RELATED | OFF-<br>ROAD |
|----------------|------------------|--------------------------|----------------------------|------------------|------------------|-------------------|--------|-------------|-------------|-----|------|------------------------------|------------------------------|--------------|
| FINAL TOTAL    |                  |                          |                            |                  |                  |                   |        |             |             |     |      |                              |                              |              |

Disclaimer: The information contained in this report is compiled from individual driver and police crash reports submitted to the Oregon Department of Transportation as required in ORS 811.720. The Crash Analysis and Reporting Unit is committed to providing the highest quality crash data to customers. However, because submittal of crash report forms is the responsibility of the individual driver, the Crash Analysis and Reporting Unit can not guarantee that all qualifying crashes are represented nor can assurances be made that all details pertaining to a single crash are accurate. Note: Legislative changes to DMV's vehicle crash reporting requirements, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

## Left-Turn Lane Warrant Analysis

1e

Project: 17033 - Willow Drive Apartment Complex  
 Intersection: SE Chokeberry Avenue at SE Willow Drive  
 Date: 3/14/2017  
 Scenario: 2019 Background plus Site Conditions - AM Peak Hour (NB)

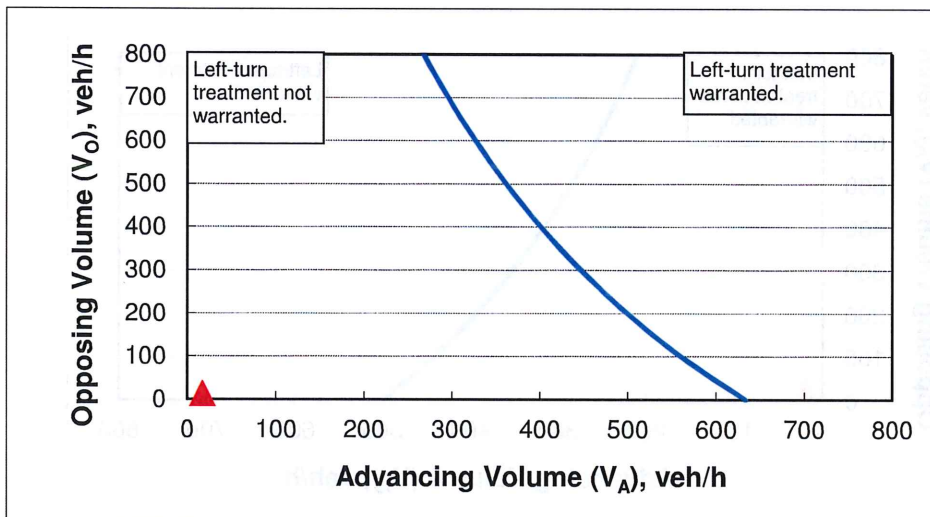
### 2-lane roadway (English)

#### INPUT

| Variable                                                | Value |
|---------------------------------------------------------|-------|
| 85 <sup>th</sup> percentile speed, mph:                 | 25    |
| Percent of left-turns in advancing volume ( $V_A$ ), %: | 88%   |
| Advancing volume ( $V_A$ ), veh/h:                      | 17    |
| Opposing volume ( $V_O$ ), veh/h:                       | 14    |

#### OUTPUT

| Variable                                                                 | Value |
|--------------------------------------------------------------------------|-------|
| Limiting advancing volume ( $V_A$ ), veh/h:                              | 623   |
| <b>Guidance for determining the need for a major-road left-turn bay:</b> |       |
| <b>Left-turn treatment NOT warranted.</b>                                |       |



#### CALIBRATION CONSTANTS

| Variable                                                           | Value |
|--------------------------------------------------------------------|-------|
| Average time for making left-turn, s:                              | 3.0   |
| Critical headway, s:                                               | 5.0   |
| Average time for left-turn vehicle to clear the advancing lane, s: | 1.9   |

## Left-Turn Lane Warrant Analysis

1e

Project: 17033 - Willow Drive Apartment Complex  
 Intersection: SE Chokeberry Avenue at SE Willow Drive  
 Date: 3/14/2017  
 Scenario: 2019 Background plus Site Conditions - PM Peak Hour (NB)

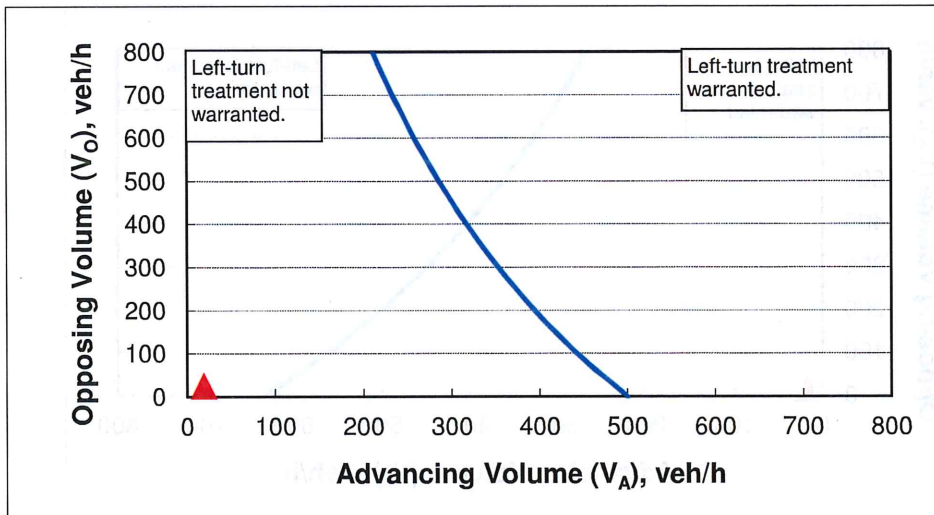
### 2-lane roadway (English)

#### INPUT

| Variable                                                | Value |
|---------------------------------------------------------|-------|
| 85 <sup>th</sup> percentile speed, mph:                 | 25    |
| Percent of left-turns in advancing volume ( $V_A$ ), %: | 79%   |
| Advancing volume ( $V_A$ ), veh/h:                      | 19    |
| Opposing volume ( $V_O$ ), veh/h:                       | 25    |

#### OUTPUT

| Variable                                                                 | Value |
|--------------------------------------------------------------------------|-------|
| Limiting advancing volume ( $V_A$ ), veh/h:                              | 485   |
| <b>Guidance for determining the need for a major-road left-turn bay:</b> |       |
| <b>Left-turn treatment NOT warranted.</b>                                |       |



#### CALIBRATION CONSTANTS

| Variable                                                           | Value |
|--------------------------------------------------------------------|-------|
| Average time for making left-turn, s:                              | 3.0   |
| Critical headway, s:                                               | 5.0   |
| Average time for left-turn vehicle to clear the advancing lane, s: | 1.9   |

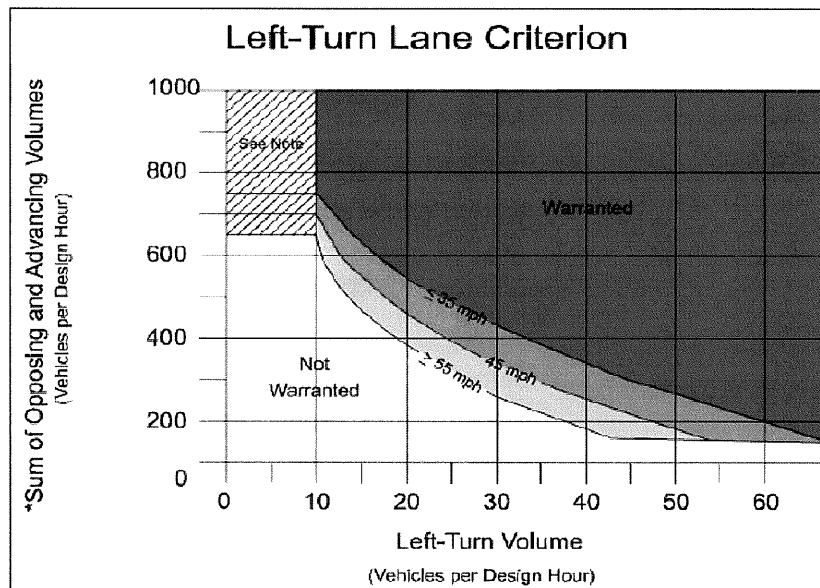




Project: 17033 - Willow Drive Apartment Complex  
 Intersection: US-101B at SE Willow Drive  
 Date: 3/14/2017  
 Scenario: 2019 Background plus Site Conditions

Speed? 55 mph

| AM Peak Hour                 |            | PM Peak Hour                 |            |
|------------------------------|------------|------------------------------|------------|
| Left-Turn Volume             | 5          | Left-Turn Volume             | 22         |
| Approaching DHV              | 258        | Approaching DHV              | 384        |
| # of Advancing Through Lanes | 1          | # of Advancing Through Lanes | 1          |
| Opposing DHV                 | 202        | Opposing DHV                 | 450        |
| # of Opposing Through Lanes  | 1          | # of Opposing Through Lanes  | 1          |
| <b>O+A DHV</b>               | <b>460</b> | <b>O+A DHV</b>               | <b>834</b> |
| Lane Needed?                 | No         | Lane Needed?                 | No         |



\*(Advancing Vol/ # of Advancing Through Lanes)+  
 (Opposing Vol/ # of Opposing Through Lanes)

Note: The criterion is not met from zero to ten left turn vehicles per hour, but careful consideration should be given to installing a left turn lane due to the increased potential for accidents in the through lanes. While the turn volumes are low, the adverse safety and operational impacts may require installation of a left turn. The final determination will be based on a field study.

## Traffic Signal Warrant Analysis

16

Project: 17033 - Willow Drive Apartment Complex  
 Date: 3/14/2017  
 Scenario: Year 2019 Background plus Site Conditions

Major Street: SE Ensign Lane      Minor Street: SE 19th Street  
 Number of Lanes: 3      Number of Lanes: 1  
 PM Peak Hour Volumes: 435      PM Peak Hour Volumes: 108

### Warrant Used:

100 percent of standard warrants used  
 X 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

| Number of Lanes for Moving Traffic on Each Approach: |           | ADT on Major St. (total of both approaches) |              | ADT on Minor St. (higher-volume approach) |              |
|------------------------------------------------------|-----------|---------------------------------------------|--------------|-------------------------------------------|--------------|
|                                                      |           | 100% Warrants                               | 70% Warrants | 100% Warrants                             | 70% Warrants |
| <u>WARRANT 1, CONDITION A</u>                        |           |                                             |              |                                           |              |
| Major St.                                            | Minor St. |                                             |              |                                           |              |
| 1                                                    | 1         | 8,850                                       | 6,200        | 2,650                                     | 1,850        |
| 2 or more                                            | 1         | 10,600                                      | 7,400        | 2,650                                     | 1,850        |
| 2 or more                                            | 2 or more | 10,600                                      | 7,400        | 3,550                                     | 2,500        |
| 1                                                    | 2 or more | 8,850                                       | 6,200        | 3,550                                     | 2,500        |
| <u>WARRANT 1, CONDITION B</u>                        |           |                                             |              |                                           |              |
| 1                                                    | 1         | 13,300                                      | 9,300        | 1,350                                     | 950          |
| 2 or more                                            | 1         | 15,900                                      | 11,100       | 1,350                                     | 950          |
| 2 or more                                            | 2 or more | 15,900                                      | 11,100       | 1,750                                     | 1,250        |
| 1                                                    | 2 or more | 13,300                                      | 9,300        | 1,750                                     | 1,250        |

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

|                                                        | Approach Volumes | Minimum Volumes | Is Signal Warrant Met? |
|--------------------------------------------------------|------------------|-----------------|------------------------|
| <i>Warrant 1</i>                                       |                  |                 |                        |
| <i>Condition A: Minimum Vehicular Volume</i>           |                  |                 |                        |
| Major Street                                           | 4,350            | 7,400           |                        |
| Minor Street*                                          | 1,080            | 1,850           | No                     |
| <i>Condition B: Interruption of Continuous Traffic</i> |                  |                 |                        |
| Major Street                                           | 4,350            | 11,100          |                        |
| Minor Street*                                          | 1,080            | 950             | No                     |
| <i>Combination Warrant</i>                             |                  |                 |                        |
| Major Street                                           | 4,350            | 8,880           |                        |
| Minor Street*                                          | 1,080            | 1,480           | No                     |

\* Minor street right-turning traffic volumes reduced by 25%

## Traffic Signal Warrant Analysis

Project: 17033 - Willow Drive Apartment Complex  
 Date: 3/14/2017  
 Scenario: Year 2019 Background plus Site Conditions

Le

Major Street: SE 19th Street Minor Street: SE Chokeberry Avenue  
 Number of Lanes: 1 Number of Lanes: 1  
 PM Peak Hour Volumes: 107 PM Peak Hour Volumes: 33

### Warrant Used:

☐ 100 percent of standard warrants used  
☒ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

| Number of Lanes for Moving Traffic on Each Approach: |           | ADT on Major St. (total of both approaches) |              | ADT on Minor St. (higher-volume approach) |              |
|------------------------------------------------------|-----------|---------------------------------------------|--------------|-------------------------------------------|--------------|
| Major St.                                            | Minor St. | 100% Warrants                               | 70% Warrants | 100% Warrants                             | 70% Warrants |
| 1                                                    | 1         | 8,850                                       | 6,200        | 2,650                                     | 1,850        |
| 2 or more                                            | 1         | 10,600                                      | 7,400        | 2,650                                     | 1,850        |
| 2 or more                                            | 2 or more | 10,600                                      | 7,400        | 3,550                                     | 2,500        |
| 1                                                    | 2 or more | 8,850                                       | 6,200        | 3,550                                     | 2,500        |

| WARRANT 1, CONDITION B |           | 100% Warrants | 70% Warrants | 100% Warrants | 70% Warrants |
|------------------------|-----------|---------------|--------------|---------------|--------------|
| Major St.              | Minor St. |               |              |               |              |
| 1                      | 1         | 13,300        | 9,300        | 1,350         | 950          |
| 2 or more              | 1         | 15,900        | 11,100       | 1,350         | 950          |
| 2 or more              | 2 or more | 15,900        | 11,100       | 1,750         | 1,250        |
| 1                      | 2 or more | 13,300        | 9,300        | 1,750         | 1,250        |

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

|                                                        | Approach Volumes | Minimum Volumes | Is Signal Warrant Met? |
|--------------------------------------------------------|------------------|-----------------|------------------------|
| <b>Warrant 1</b>                                       |                  |                 |                        |
| <i>Condition A: Minimum Vehicular Volume</i>           |                  |                 |                        |
| Major Street                                           | 1,070            | 6,200           |                        |
| Minor Street*                                          | 330              | 1,850           | No                     |
| <i>Condition B: Interruption of Continuous Traffic</i> |                  |                 |                        |
| Major Street                                           | 1,070            | 9,300           |                        |
| Minor Street*                                          | 330              | 950             | No                     |
| <i>Combination Warrant</i>                             |                  |                 |                        |
| Major Street                                           | 1,070            | 7,440           |                        |
| Minor Street*                                          | 330              | 1,480           | No                     |

\* Minor street right-turning traffic volumes reduced by 25%



## Traffic Signal Warrant Analysis

Project: 17033 - Willow Drive Apartment Complex  
 Date: 3/14/2017  
 Scenario: Year 2019 Background plus Site Conditions

1e

Major Street: SE Willow Drive Minor Street: SE Chokeberry Avenue  
 Number of Lanes: 1 Number of Lanes: 1  
 PM Peak Hour Volumes: 44 PM Peak Hour Volumes: 32

### Warrant Used:

100 percent of standard warrants used  
 X 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

| Number of Lanes for Moving Traffic on Each Approach: |           | ADT on Major St. (total of both approaches) |              | ADT on Minor St. (higher-volume approach) |              |
|------------------------------------------------------|-----------|---------------------------------------------|--------------|-------------------------------------------|--------------|
| Major St.                                            | Minor St. | 100% Warrants                               | 70% Warrants | 100% Warrants                             | 70% Warrants |
| 1                                                    | 1         | 8,850                                       | 6,200        | 2,650                                     | 1,850        |
| 2 or more                                            | 1         | 10,600                                      | 7,400        | 2,650                                     | 1,850        |
| 2 or more                                            | 2 or more | 10,600                                      | 7,400        | 3,550                                     | 2,500        |
| 1                                                    | 2 or more | 8,850                                       | 6,200        | 3,550                                     | 2,500        |
| <b>WARRANT 1, CONDITION B</b>                        |           |                                             |              |                                           |              |
| 1                                                    | 1         | 13,300                                      | 9,300        | 1,350                                     | 950          |
| 2 or more                                            | 1         | 15,900                                      | 11,100       | 1,350                                     | 950          |
| 2 or more                                            | 2 or more | 15,900                                      | 11,100       | 1,750                                     | 1,250        |
| 1                                                    | 2 or more | 13,300                                      | 9,300        | 1,750                                     | 1,250        |

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

|                                                        | Approach Volumes | Minimum Volumes | Is Signal Warrant Met? |
|--------------------------------------------------------|------------------|-----------------|------------------------|
| <b>Warrant 1</b>                                       |                  |                 |                        |
| <b>Condition A: Minimum Vehicular Volume</b>           |                  |                 |                        |
| Major Street                                           | 440              | 6,200           |                        |
| Minor Street*                                          | 320              | 1,850           | No                     |
| <b>Condition B: Interruption of Continuous Traffic</b> |                  |                 |                        |
| Major Street                                           | 440              | 9,300           |                        |
| Minor Street*                                          | 320              | 950             | No                     |
| <b>Combination Warrant</b>                             |                  |                 |                        |
| Major Street                                           | 440              | 7,440           |                        |
| Minor Street*                                          | 320              | 1,480           | No                     |

\* Minor street right-turning traffic volumes reduced by 25%

## Traffic Signal Warrant Analysis

16

Project: 17033 - Willow Drive Apartment Complex  
 Date: 3/14/2017  
 Scenario: Year 2019 Background plus Site Conditions

|                       |         |                       |                 |
|-----------------------|---------|-----------------------|-----------------|
| Major Street:         | US-101B | Minor Street:         | SE Willow Drive |
| Number of Lanes:      | 1       | Number of Lanes:      | 1               |
| PM Peak Hour Volumes: | 834     | PM Peak Hour Volumes: | 19              |

### Warrant Used:

|          |                                                                                                                                               |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------|
|          | 100 percent of standard warrants used                                                                                                         |
| <u>X</u> | 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000. |

| Number of Lanes for Moving Traffic on Each Approach: |                  | ADT on Major St.<br>(total of both approaches) |                 | ADT on Minor St.<br>(higher-volume approach) |                 |
|------------------------------------------------------|------------------|------------------------------------------------|-----------------|----------------------------------------------|-----------------|
|                                                      |                  | 100%                                           | 70%             | 100%                                         | 70%             |
| <u>Major St.</u>                                     | <u>Minor St.</u> | <u>Warrants</u>                                | <u>Warrants</u> | <u>Warrants</u>                              | <u>Warrants</u> |
| 1                                                    | 1                | 8,850                                          | 6,200           | 2,650                                        | 1,850           |
| 2 or more                                            | 1                | 10,600                                         | 7,400           | 2,650                                        | 1,850           |
| 2 or more                                            | 2 or more        | 10,600                                         | 7,400           | 3,550                                        | 2,500           |
| 1                                                    | 2 or more        | 8,850                                          | 6,200           | 3,550                                        | 2,500           |

| WARRANT 1, CONDITION B |           | 100%            | 70%             | 100%            | 70%             |
|------------------------|-----------|-----------------|-----------------|-----------------|-----------------|
|                        |           | <u>Warrants</u> | <u>Warrants</u> | <u>Warrants</u> | <u>Warrants</u> |
| 1                      | 1         | 13,300          | 9,300           | 1,350           | 950             |
| 2 or more              | 1         | 15,900          | 11,100          | 1,350           | 950             |
| 2 or more              | 2 or more | 15,900          | 11,100          | 1,750           | 1,250           |
| 1                      | 2 or more | 13,300          | 9,300           | 1,750           | 1,250           |

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

|                                                        | Approach Volumes | Minimum Volumes | Is Signal Warrant Met? |
|--------------------------------------------------------|------------------|-----------------|------------------------|
| <b>Warrant 1</b>                                       |                  |                 |                        |
| <i>Condition A: Minimum Vehicular Volume</i>           |                  |                 |                        |
| Major Street                                           | 8,340            | 6,200           |                        |
| Minor Street*                                          | 190              | 1,850           | No                     |
| <i>Condition B: Interruption of Continuous Traffic</i> |                  |                 |                        |
| Major Street                                           | 8,340            | 9,300           |                        |
| Minor Street*                                          | 190              | 950             | No                     |
| <i>Combination Warrant</i>                             |                  |                 |                        |
| Major Street                                           | 8,340            | 7,440           |                        |
| Minor Street*                                          | 190              | 1,480           | No                     |

\* Minor street right-turning traffic volumes reduced by 85% of the right-turn capacity.



Recording Instrument #: 200905930  
Recorded By: Clatsop County Clerk  
# of Pages: 7 Fee: 61.00  
Transaction date: 6/23/2009 13:24:17  
Deputy: vobrien

**DECLARATION OF COVENANTS, CONDITIONS,  
AND RESTRICTIONS (CC&RS)**

**FOR**

**FOREST RIM  
WARRENTON, OREGON**

**DECEMBER 8, 2007**

**Amended June 23rd, 2009**

After Recording Return to: Olstedt Construction, Inc. PO Box 2363 Gearhart, Or 97138



**DECLARATION OF  
RESTRICTIONS, CONDITIONS AND COVENANTS  
APPLICABLE TO FOREST RIM**

AMENDED DECLARATION OF RESTRICTIONS, CONDITIONS AND COVENANTS IS APPLICABLE TO FOREST RIM.

WHEREAS OLSTEDT CONSTRUCTION, INC. AND THEIR SUCCESSORS, GRANTEES, OR ASSIGNEES, HEREINAFTER REFERRED TO AS DECLARANT, IS OWNER OF CERTAIN REAL PROPERTY LOCATED IN CLATSOP COUNTY, IN THE STATE OF OREGON, KNOWN AS FOREST RIM, A DULY RECORDED PLAT:

WHEREAS, THE DECLARANT IS DESIROUS TO DECLARE OF PUBLIC RECORD ITS INTENTIONS TO CREATE CERTAIN RESTRICTIVE CONDITIONS AND COVENANTS TO THIS OWNERSHIP OF SAID PROPERTY:

NOW, THEREFORE, THE DECLARANT DOES HEREBY CERTIFY AND DECLARE THAT THE FOLLOWING RESTRICTIONS, CONDITIONS AND COVENANTS SHALL BECOME AND ARE HEREBY MADE A PART OF ALL CONVEYANCES OF LOTS WITHIN THE PLAT OF FOREST RIM RECORDED INSTRUMENT NUMBER \_\_\_\_\_ OF THE PLAT RECORDS OF CLATSOP COUNTY, OREGON AND THAT THE FOLLOWING RESTRICTIONS, CONDITIONS AND COVENANTS SHALL BY REFERENCE BECOME A PART OF ANY SUCH CONVEYANCES AND SHALL APPLY THERETO AS FULLY AND WITH THE SAME EFFECT AS IF SET FORTH AT LARGE THEREIN.

**ARTICLE I**

**PROPERTY SUBJECT TO THESE COVENANTS**

- (1) **INITIAL DEVELOPMENT**  
DECLARANT HEREBY DECLARES THAT ALL OF THE REAL PROPERTY DESCRIBED ABOVE IS HELD AND SHALL BE HELD, CONVEYED, HYPOTHECATED, ENCUMBERED, USED, OCCUPIED AND IMPROVED SUBJECT TO THESE COVENANTS.

**ARTICLE II  
RESIDENTIAL COVENANTS**

- (1) **LAND USE BUILDING TYPES**  
WITH THE EXCEPTION OF LOTS 119-123 AND LOT 124 AS DESCRIBED IN EXHIBIT "ONE" CREATED ON THE LAND PARCEL KNOWN AS TRACT "A" WHICH WILL BE USED FOR COMMERCIAL OFFICES AND STORAGE, NO LOT SHALL BE USED EXCEPT FOR RESIDENTIAL PURPOSES. NO BUILDING SHALL BE ERECTED, ALTERED PLACED OR PERMITTED TO REMAIN ON ANY LOT OTHER THAN ONE DETACHED SINGLE FAMILY DWELLING NOT TO EXCEED TWO STORES OR 40 FEET IN HEIGHT AND WITH THE EXCEPTION OF TOWN HOMES, HAVE AN ATTACHED GARAGE FOR NOT LESS THAN ONE (1) CAR. THE FOREGOING PROVISIONS SHALL NOT EXCLUDE SMALL GARDEN SHEDS, HOWEVER ALL ASSESSORY BUILDINGS WILL REQUIRE THE APPROVAL OF THE CITY OF WARRENTON.
- (2) **DWELLING SIZE AND SETBACKS**  
LOT SIZE FOR A SINGLE FAMILY RESIDENCE WILL BE A MINIMUM OF 5000 SQ. FT.  
SETBACKS SHALL BE 15 FEET FOR FRONT AND BACK YARD, AND 8 FEET FOR THE SIDE YARD. AS PER THE CONDITIONAL USE GRANTED BY THE CITY FOR THE FOREST RIM SUBDIVISION, SIDE YARD SETBACKS MAY BE REDUCED TO 5 FEET IF THE BUILDING HAS A FIRE SUPPRESSION SYSTEM INSTALLED. ALL SETBACKS WILL BE SUPERSEDED BY THE CITY OF WARRENTON STANDARDS AS NOTED IN THE CITY'S DEVELOPMENT CODE.

- (3) EASEMENTS  
EASEMENTS FOR INSTALLATION AND MAINTENANCE OF UTILITIES AND DRAINAGE FACILITIES ARE RESERVED AS SHOWN ON THE RECORDED PLAT.
- (4) NUISANCES  
NO NOXIOUS OR OFFENSIVE ACTIVITY SHALL BE CARRIED ON UPON ANY LOT, NOR SHALL ANYTHING BE DONE THEREON WHICH MAY BE OR MAY BECOME AN ANNOYANCE OR NUISANCE TO THE NEIGHBORHOOD.
- (5) PARKING  
PARKING OF BOATS, TRAILERS, MOTORCYCLES, ONE TON OR LARGER TRUCKS SHALL NOT BE ALLOWED ON PUBLIC WAYS ADJACENT THERETO EXCEPT WHEN PARKED IN THE RESIDENTIAL DRIVEWAY FOR NOT MORE THAN SEVEN (7) CONSECUTIVE DAYS UNLESS SAID VEHICLE IS BELONGING TO PROPERTY OWNER.
- (6) VEHICLES IN DISREPAIR  
NO OWNER SHALL PERMIT ANY VEHICLE WHICH IS IN AN EXTREME STATE OF DISREPAIR TO BE ABANDONED OR TO REMAIN PARKED UPON ANY LOT OR ON ANY STREET FOR A PERIOD IN EXCESS OF FOURTY-EIGHT (48) HOURS. A VEHICLE SHALL BE DEEMED TO BE IN AN EXTREME STATE OF DISREPAIR WHEN ITS PRESENCE OFFENDS THE OCCUPANTS OF THE NEIGHBORHOOD.
- (7) FENCES AND HEDGES  
AS DEFINED IN THIS SECTION, "FENCING" SHALL BE ANY BARRIER OR WALL, INCLUDING TREES AND SHRUBS. THE MAXIMUM HEIGHT OF A SITE OBSCURING FENCE LOCATED ON THE REMAINDER OF THE LOT SHALL BE SIX (6) FEET. FENCES SHALL BE WELL CONSTRUCTED USING MATERIALS APPROVED BY THE ARCHITECTURAL COMMITTEE. FENCES SHALL NOT DETRACT FROM THE APPEARANCES OF THE DWELLING HOUSES LOCATED ON ADJACENT LOTS OR BE OFFENSIVE TO THE OWNERS OR OCCUPANTS THEREOF. NO CHAIN LINK FENCES WILL BE ALLOWED.
- (8) SIGNS  
NO SIGNS SHALL BE ERECTED ON ANY LOT EXCEPT THAT NOT MORE THAN ONE "FOR SALE" SIGN PLACED BY OWNER, DECLARANT OR BY A LICENCED REAL ESTATE AGENT, NOT EXCEEDING TWENTY-FOUR (24) INCHES HIGH AND THIRTY-SIX (36) INCHES LONG, MAY BE TEMPORARILY DISPLAYED ON ANY LOT. THIS RESTRICTION SHALL NOT PROHIBIT THE TEMPORARY PLACEMENT OF "POLITICAL" SIGNS ON ANY LOT BY THE OWNER, OR THE PLACEMENT OF A PROFESSIONAL SIGN THE DEVELOPER OR THE DECLARANT, WHICH MUST COMPLY WITH THE CITY OF WARRENTON ORDINANCES.
- (9) TEMPORARY STRUCTURES  
NO STRUCTURE OF A TEMPORARY CHARACTER, TRAILER, BASEMENT, SHACK, GARAGE, BARN OR OTHER OUTBUILDING SHALL BE USED ON ANY LOT AT ANY TIME AS A RESIDENCE WHETHER TEMPORARILY OR PERMANENTLY. TENTS USED FOR RECREATIONAL PURPOSES WILL BE LIMITED TO SEVEN (7) CONSECUTIVE DAYS.
- (10) LIVESTOCK AND POULTY  
LIVESTOCK AND POULTY ANIMALS ARE NOT ALLOWED, ALL OTHER DOMESTIC ANIMALS WILL BE GOVERNED BY THE CITY OF WARRENTON ORDINANCES.
- (11) GARBAGE AND REFUSE DISPOSAL  
NO LOT OR OPEN SPACE SHALL BE USED OR MAINTAINED AS A DUMPING GROUND OR RUBBISH. TRASH, GARBAGE OR OTHER WASTE SHALL BE KEPT IN SANITARY CONTAINERS AND NOT PLACED IN THE FRONT YARD OF A DWELLING. ALL INCINERATORS OR OTHER EQUIPMENT FOR THE STORAGE OR DISPOSAL OF SUCH

MATERIALS SHALL BE KEPT IN A CLEAN AND SANITARY CONDITION AND OUT OF PUBLIC VIEW. NO BURNING OF PLASTIC MATERIALS WILL BE ALLOWED.

(12) UTILITIES

ALL PLUMBING FACILITIES SHALL COMPLY WITH THE REQUIREMENTS OF THE PLUMBING CODE OF THE CITY OF WARRENTON. NO OUTDOOR OVERHEAD WIRE OR SERVICE DROP FOR THE DISTRIBUTION OF ELECTRIC ENERGY OR FOR TELECOMMUNICATION PURPOSES, AND NO POLE TOWER OR OTHER STRUCTURE SUPPORTING OUTDOOR OVERHEAD WIRES SHALL BE ERECTED, PLACED OR MAINTAINED WITHIN THE FOREST RIM SUBDIVISION. ALL LOT OWNERS OF LOTS WITHIN THIS SUBDIVISION, THEIR HEIRS, SUCCESSORS AND ASSIGNS SHALL USE UNDERGROUND SERVICE WIRES TO CONNECT THEIR PREMISES AND THE STRUCTURES BUILD THEREON TO THE UNDERGROUND ELECTRIC OR TELEPHONE UTILITY FACILITIES PROVIDED.

(13) MAINTENANCE

ALL LOTS, AT ALL TIMES SHALL BE KEPT IN A NEAT AND ORDERLY CONDITION FREE OF BRUSH, VINES, WEEDS DEBRIS, AND THE GRASS THERON CUT OR MOWED AT SUFFICIENT INTERVALS TO PREVENT CREATION OF A NUISANCE OR FIRE HAZARD.

(14) BUSINESS AND COMMERCIAL USES

NO GOODS, EQUIPMENT, VEHICLE, MATERIALS OR SUPPLIES USED IN CONNECTION WITH ANY TRADE, SERVICE OR BUSINESS SHALL BE KEPT OR STORED OUTSIDE OF THE HOUSE OR GARAGE ON ANY LOT, EXCEPTING THE RIGHT OF ANY HOMEBUILDER AND THE DECLARANT TO CONSTRUCT RESIDENCES ON ANY LOT, TO STORE CONSTRUCTION EQUIPMENT AND MATERIALS ON SAID LOTS IN THE NORMAL COURSE OF SAID CONSTRUCTION AND TO USE ANY SINGLE FAMILY RESIDENCE AS A SALES OFFICE OR MODEL HOME FOR THE PURPOSE OF SALES.

(15) LANDSCAPE COMPLETION

ALL FRONT YARD LANDSCAPING MUST BE COMPLETED WITHIN SIX (6) MONTHS FROM THE DATE OF POSTING NOTICE OF COMPLETION OR THE DATE OF OCCUPANCY OF THE RESIDENCE CONSTRUCTED THEREON, WHICHEVER OCCURS FIRST. IN THE EVENT OF UNDUE HARDSHIP DUE TO WEATHER CONDITIONS, THIS PROVISION MAY BE EXTENDED BY THE DECLARANT FOR A REASONABLE LENGTH OF TIME NOT TO EXCEED 180 DAYS.

(16) ANTENNAS AND SERVICE FACILITIES

EXTERIOR ANTENNAS SHALL NOT BE PERMITTED TO BE PLACED UPON THE ROOF OF ANY STRUCTURE ON ANY LOT. CLOTHES LINES AND OTHER SERVICE FACILITIES SHALL BE SCREENED SO AS NOT TO BE VIEWED FROM THE STREET OR OTHER LOTS. TELEVISION SATELLITES WILL BE ALLOWED ON BACK SIDE OF HOMES FACING AWAY FROM THE STREET.

(17) EXTERIOR MATERIALS AND FINISHES

EACH DWELLING SHALL BE CONSTRUCTED WITH APPROVAL FROM THE ARCHITECTURAL COMMITTEE. LOCATION, COLOR, SIZE AND DESIGN AND OTHER PARTICULARS FOR PAPER AND MAIL BOXES SHALL BE SUBJECT TO APPROVAL OF THE DECLARANT.

(18) OPEN SPACE

ALL OPEN SPACE IS TO BE KEPT FREE OF GARBAGE, NO DUMPING OF TRASH OR YARD DEBRIS WILL BE ALLOWED. OPEN SPACE WILL REMAIN THE PROPERTY OF THE DECLARENT, HOWEVER IF THE DECLARENT SHOULD DEDICATE THE LAND TO THE FOREST RIM HOMEOWNERS, AN ASSOCIATION MAY BE FORMED AND HOMEOWNER FEES MAY APPLY FOR OPEN SPACE MAINTENANCE.



### ARTICLE III

#### ARCHITECTURAL CONTROL

(1) ARCHITECTURAL CONTROL SHALL BE BY THE DECLARANT. ALL PLANS AND SPECIFICATIONS OF HOUSES TO BE CONSTRUCTED IN FOREST RIM SHALL BE APPROVED IN WRITING BY THE DECLARANT. IN THE EVENT THAT THE DECLARANT FAILS TO APPROVE OR DISAPPROVE THE PLANS AND SPECIFICATIONS WITHIN THIRTY (30) DAYS AFTER THEY HAVE BEEN SUBMITTED, OR IN ANY EVENT, IF CONSTRUCTION HAS BEEN COMMENCED PRIOR TO THE COMPLETION THEREOF, APPROVAL WILL NOT BE REQUIRED AND THE RELATED COVENANTS SHALL BE DEEMED TO HAVE BEEN FULLY COMPLIED WITH. TWO SETS OF ARCHITECTURAL PLANS SHALL BE SUBMITTED AND SHALL SHOW FLOOR PLANS INDICATING BUILDING DIMENSIONS AND AREAS, BUILDING HEIGHT, EXTERIOR BUILDING MATERIALS, COLOR, LANDSCAPING, FENCING AND ANY PROPOSED SHEDS OR OTHER STRUCTURES.

FOR EACH APPLICATION, A NON REFUNDABLE \$150.00 FEE SHALL BE INCLUDED WITH TWO SETS OF PLANS TO COVER THE ARCHITECTURAL REVIEW. WITHIN TEN (10) DAYS OF RECEIPT OF THE PLANS AND FEE, THE DECLARANT SHALL RETURN ONE SET OF PLANS AND EITHER ISSUE A NOTICE OF COMPLIANCE OR NON-COMPLIANCE, OR ISSUE A NOTICE INDICATING CONDITIONAL APPROVAL WITH CORRECTIONS. ANY CHANGES TO AN APPROVED SET OF PLANS SHALL BE REVIEWED BY THE DECLARANT.

### ARTICLE IV

#### GENERAL PROVISIONS

- (1) TERM  
THESE COVENANTS ARE TO RUN WITH THE LAND AND SHALL BE BINDING ON ALL PARTIES AND ALL PERSONS CLAIMING UNDER THEM UNTIL AMENDED OR REVOKED IN THE MANNER PROVIDED HEREIN. THESE COVENANTS CAN BE TERMINATED AND REVOKED OR AMENDED ONLY BY DULY RECORDING AN INSTRUMENT WHICH CONTAINS AN AGREEMENT PROVIDING FOR TERMINATION AND REVOCATION OR AMENDMENT, AND WHICH IS SIGNED BY THE OWNERS OF A MAJORITY OF THE PLOTTED LOTS.
- (2) ENFORCEMENT  
SHOULD ANY PERSON VIOLATE OR ATTEMPT TO VIOLATE ANY OF THE PROVISIONS OF THESE COVENANTS, ANY PERSON OR PERSONS OWNING ANY REAL PROPERTY EMBRACED WITHIN THE PLAT, INCLUDING THE DECLARANT, AT ITS OR THEIR OPTION, SHALL HAVE FULL POWER AND AUTHORITY TO PROSECUTE ANY PROCEEDING AT LAW OR IN EQUITY AGAINST THE PERSON OR PERSONS VIOLATING OR ATTEMPTING TO VIOLATE ANY OF SAID COVENANT OR RESTRICTION HEREIN CONTAINED SHALL IN NO EVENT BE DEEMED A WAIVER OF THE RIGHT TO DO SO THEREAFTER.
- (3) EXPENSES AND ATTORNEY'S FEES  
IN THE EVENT ANY PERSON OR PERSONS OWNING ANY REAL PROPERTY EMBRACED WITHIN THE PLAT OF FOREST RIM, INCLUDING THE DECLARANT, SHALL BRING ANY SUIT OR ACTION TO ENFORCE THESE COVENANTS, THE PREVAILING PROPERTY OWNER SHALL BE ENTITLED TO RECOVER ALL COSTS AND EXPENSES INCURRED BY HIM OR HER IN CONNECTION WITH SUCH SUIT OR ACTION, INCLUDING SUCH AMOUNTS AS THE COURT MAY DETERMINE TO BE REASONABLE ATTORNEY'S FEES AT TRIAL AND UPON ANY APPEAL THEREAFTER.
- (4) SEVERABILITY

INVALIDATION OF ANY ONE OF THESE COVENANTS BY JUDGEMENT OR COURT ORDER SHALL IN NO WAY AFFECT ANY OF THE OTHER PROVISIONS, WHICH SHALL REMAIN IN FULL FORCE AND EFFECT.

(5) LIMITATION OF LIABILITY OF DECLARANT

NEITHER DECLARANT NOR ANY OFFICER OR DIRECTOR THEREOF, SHALL BE LIABLE TO ANY OWNER ON ACCOUNT OF ANY ACTION OR FAILURE TO ACT OF DECLARANT IN PERFORMING ITS DUTIES OR RIGHT HEREUNDER, PROVIDED THAT THE DECLARANT, IN ACCORDANCE WITH ACTUAL KNOWLEDGE POSSESSED BY IT, HAS ACTED IN GOOD FAITH.

(6) MEMBERSHIP, APPOINTMENT AND REMOVAL

THE ARCHITECTURAL CONTROL COMMITTEE, HEREIN AFTER REFERRED TO AS THE DECLARANT, SHALL CONSIST OF AS MANY PERSONS AS DECLARANT SO CHOOSES, HOWEVER WILL NOT CONSIST OF LESS THAN TWO MEMBERS AS THE DECLARANT MAY FROM TIME TO TIME APPOINT. THE DECLARANT SHALL KEEP ON FILE AT HIS PRINCIPAL PLACE OF BUSINESS NAMES AND ADDRESSES OF THE MEMBERS OF THE COMMITTEE. THE POWERS OF THIS COMMITTEE SHALL CEASE ONE YEAR AFTER THE COMPLETION OF CONSTRUCTION OF ALL THE SINGLE FAMILY DWELLINGS AND THE SALE OF ALL THE SAID SINGLE FAMILY DWELLINGS TO THE INITIAL OWNER/OCCUPANT ON ALL OF THE AVAILABLE BUILDING SITES.

IN WITNESS THEREOF, THE UNDERSIGNED, BEING THE DECLARANT HEREIN, HAS HEREUNTO SET ITS HAND ON THIS 23 DAY OF June, 2009.

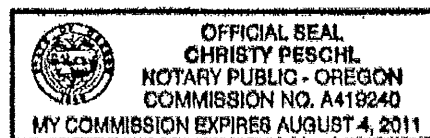
Steve Olstedt  
STEVE OLSTEDT, PRESIDENT  
OLSTEDT CONSTRUCTION INC.

ACKNOWLEDGEMENT:

STATE OF OREGON S.S.  
COUNTY OF CLATSOP

THIS CERTIFIES THAT ON THIS 23 DAY OF June, 2009, BEFORE ME APPEARED Steve Olstedt WHO BEING DULY SWORN, DID SAY THAT HE IS THE DECLARANT OF THE FOREST RIM SUBDIVISION, AND ACKNOWLEDGED TO ME THAT THEY EXECUTED THIS DOCUMENT FREELY AND VOLUNTARILY.

Christy Peschl  
NOTARY PUBLIC FOR OREGON  
MY COMMISSION EXPIRES ON Aug. 4, 2011



**PRELIMINARY REPORT**  
(Continued)

Order No.: 643809000569-FTCLT14

**EXHIBIT "ONE"**

Beginning at a point on the West boundary of Lot 124 in the Plat of Forest Rim, County of Clatsop, State of Oregon;  
said point of beginning bears South 02° 36' 50" West 38.00 feet from the Northwest corner of said Lot 124;  
thence South 02° 36' 50" West 251.35 feet to the most Westerly Southwest corner of said Lot 124;  
thence South 87° 23' 10" East 176.48 feet;  
thence North 02° 36' 50" East 242.53 feet, more or less, to a point that bears South 84° 31' 35" East from the point of beginning;  
thence North 84° 31' 35" West 176.70 feet to the point of beginning.

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**PRELIMINARY  
STORMWATER MANAGEMENT PLAN**

**TRACT A APARTMENTS - WARRENTON**



August 2, 2017

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## Section 1—Introduction and Background

### 1.0 Introduction and Background

The proposed multi-family apartment development will provide additional rental capacity needed to satisfy the demand in the North Coast area. The proposed two apartment buildings consist of 68 units, having a total footprint area of 21,427 square feet.

The property is located south of the intersection of SE Ensign Lane and the Warrenton-Astoria Highway (Hwy 101 Bus.), currently platted as “Tract A” of the Forest Rim Subdivision (see Figure 1). The onsite development will include construction of two apartment buildings, associated parking areas, concrete walkways, landscaping, utilities, and a stormwater management system. Off-site improvements include sidewalk and driveway improvements to SE Ensign Lane.

This preliminary stormwater management plan is a requirement of the City of Warrenton, and will address the requirements specified in WMC 16.140 Stormwater and Surface Water Management. Less than 50 cubic yards of fill will be placed in an adjacent wetland, therefore a Joint Application for Individual Removal-Fill Permit for Oregon Division of State Lands (DSL) and the U.S. Army Corps of Engineers is not required.



Vicinity Map



## **Section 2—Site Configuration and Layout**

### **2.0 Site Configuration and Layout**

#### **2.1 Site Layout**

The subject property is located in Warrenton, Oregon, Township 8 North, Range 10 West, Sections 27, Willamette Meridian. The coordinates for the site are 46° 8' 40" North Latitude and 123°54'8" West Longitude. The subject property is located south of the intersection of SE Ensign Lane and the Warrenton-Astoria Highway (Business 101), and currently platted as "Tract A" of the Forest Rim Subdivision. The site will be accessed from SE Ensign Lane to the north, and from an extension of Snowberry Lane to the west.

#### **2.2 Site Configuration**

The subject property has a total area of approximately 8.80 acres and is currently zoned for High Density Residential. A portion of the property is located within the NWI 2009 Wetland Inventory and in the Non-LSW Warrenton Wetland Inventory as shown by Clatsop County Webmaps. No development is proposed in the wetlands. A topographic survey of the existing site was completed by Otak. The site drains toward the wetland area with slopes between 0 and 30 percent.

Development will include two apartment buildings with a total of 68 units. The combined footprint of the two buildings is 21,427 square feet, or 0.49 acres. The development includes a driveway off of Snowberry Lane, surface parking, a fire vehicle turn-around, concrete pathways, and utilities. The private pavement and concrete impervious areas total 1.26 acres, and the public right-of-way improvements are comprised of 0.03 acres of impervious surface. A total of 1.78 acres of impervious area will be created or replaced as part of this project.

## Section 3—Site Characteristics

### 3.0 Site Characteristics

The stormwater management approach is based on peak flow rate and volume calculations determined from site characteristics including typical rainfall data, existing site hydrology, proximity to a major water body, and soils.

#### 3.1 Typical Rainfall Data

Northwest Oregon rainfall patterns are consistent with a Type 1A precipitation distribution. The precipitation depths for various design storms is referenced in the Warrenton Stormwater Master Plan, dated February 2008 and based on information from the National Oceanic and Atmospheric Administration (NOAA) Atlas 2, Volume 10 (1973). These depths are presented in Table 1. These precipitation events will be used with the Type 1A distribution to determine peak flow and runoff volumes in accordance with the Santa Barbara Urban Hydrograph (SBUH) Method.

| Table 1 – NOAA 24 Hour Precipitation Depths |                |
|---------------------------------------------|----------------|
| Design Storm Return Period                  | Depth (inches) |
| 10-year                                     | 4.35           |
| 100-year                                    | 6.40           |

The nearest rain gauge at the Astoria Airport (gauge 350328) has a recorded annual average rainfall of 68.55 inches. This information is provided by the Western Regional Climate Center (WRCC) and is based on data collected from 1953 to 2016.

#### 3.2 Existing Site Hydrology

The Tract A Apartments site is composed of approximately 8.80 acres of previously undeveloped land. National Wetlands Inventory (NWI) and Local Wetlands Inventory (LWI) area maps are included in the appendix, see Figures 2 and 3. The onsite wetlands were delineated by Ecological Land Services, Inc. Less than 50 cubic yards of fill is proposed within the delineated wetland area. The site is not located within the mapped FEMA 100-year flood plain as shown in Figure 4. Surface drainage generally travels from north to south as shown in Figure 5 – Existing Drainage Conditions. The site drains to Adair Slough, which flows beneath Highway 101 Bus. in a culvert.

### 3.3 Surface Water Bodies

Adair Slough is located near the subject property directly to the south. Proposed storm sewer pipes will convey runoff from the site to the slough. As measured using the Google Earth measuring tool, Adair Slough flows approximately 2 miles and discharges to Young's Bay on the Columbia River and continues from there to the Pacific Ocean.

### 3.4 Soils

The Natural Resource Conservation Service (NRCS) Soil Survey for Clatsop County, Oregon online soil survey was referenced to determine hydrologic soil types for the project location. The project site soils consist of Walluski silt loam with hydrologic soil group (HSG) C, and Coquille-Clatsop complex soils with HSG C/D. Group C/D soils have a moderately high to high runoff potential when thoroughly wet and water transmission is restricted through the soil. Group C soils have a moderately high runoff potential when thoroughly wet. A soil survey map of the proposed site and the soil hydrologic group table are provided in Appendix C.

#### Curve Number

Runoff Curve Numbers (CN) for impervious and pervious surfaces were selected using Table 2-2a – Runoff Curve Numbers for Urban Area from Technical Release 55: Urban Hydrology for Small Watersheds (SCS, 1986), see Appendix B. A summary of the runoff curve numbers under post-development conditions is provided in Table 2.

| Table 2: Runoff Curve Numbers |                 |                       |                       |                   |
|-------------------------------|-----------------|-----------------------|-----------------------|-------------------|
| Condition                     | Category        | Cover Type            | Hydrologic Soil Group | Curve Number (CN) |
| Post-development              | Pervious Area   | Pavement, roofs       | C/D                   | 98                |
|                               | Impervious Area | Woods, good condition | C/D                   | 77                |

#### Time of Concentration

The time of concentration value used for calculating the peak runoff rate from the site during existing conditions is 24.5 minutes, which was determined using the TR-55 method. The time of concentration value used for all developed drainage basins was five (5) minutes, which is a conservative estimate for the small drainage basins in this development, and the minimum time which allowed when using the TR-55 method.



## Section 4—Proposed Site Drainage Plan

### 4.0 Proposed Site Drainage Basin

The guidelines in the City of Portland Stormwater Manual were used to determine the amount of stormwater generated from the proposed area of impact. Peak flow rates and volumes were calculated for the 100-year storm events using the SBUH Method simulated in HydroCAD 10.0.

The subject property is entirely within the Adair Slough drainage basin. For the purposes of this preliminary design, the site has one (1) drainage basin that drains to Adair Slough. Table 3 summarizes the parameters used to determine peak runoff rates and volumes from the drainage basin.

| Table 3 – Hydrologic Design Parameters |                             |         |
|----------------------------------------|-----------------------------|---------|
| Category                               | Drainage Basins             |         |
| Impervious                             | Area (square feet)          | 77,443  |
|                                        | NRCS Curve Number           | 98      |
| Pervious                               | Area (square feet)          | 102,942 |
|                                        | NRCS Curve Number           | 77      |
| Total                                  | Total Area (square feet)    | 180,385 |
|                                        | Time of Concentration (min) | 5       |

### 4.1 Drainage Descriptions

Since the entire site drains to Adair Slough, there is one drainage basin for the site which includes the entire proposed area of impact. This basin has been broken into 3 subbasins; Private, Right-of-Way (ROW), and Uncollected (see Figure 6 – Proposed Drainage Conditions). Stormwater runoff for the Private subbasin is to be collected by roof drains and several proposed catch basins located in the parking areas and the central landscaping areas. The stormwater is then conveyed to the stormwater detention pond and then discharges to Adair Slough. The ROW subbasin sheds into a roadside ditch which conveys flows east to Adair Slough. The Uncollected subbasin is within the area of impact and includes grading area which will be revegetated but will not be collected in the storm sewer system. The uncollected areas sheet flow into Adair Slough. Basin areas are summarized in Appendix A.

The Santa Barbara Urban Hydrograph (SBUH) runoff method was used to calculate peak runoff volumes and flow rates for the 100-year rainfall event. NOAA rainfall depth information and drainage characteristics described in section 3.0 are used for this calculation. The City of Warrenton

requires the stormwater facilities to be designed to convey and detain the stormwater runoff resulting from the 100-year rainfall event.

#### 4.2 Flow Control

The City of Warrenton requires runoff from proposed developments to be released at the existing runoff rate for the 100-year storm event. The Tract A Apartments will drain to a detention pond graded between the development and the wetland area. A flow control structure will meter out flows to meet this detention target. HydroCAD was used to complete the detention sizing exercise, using the existing runoff rate as the post-development release rate target. The pond is currently graded to be 4 feet deep and contain 54,000 cubic feet of storage volume. This pond is oversized, with only 6 inches of water expected during the 100-year event, to ensure adequate area and volume is available and will be downsized during final design. The flow control structure is currently assumed to be a 6-inch diameter orifice within a ditch inlet set at the bottom of the pond, with a higher overflow ditch inlet used for emergency overflow.

Table 4 summarizes the peak flow rate and volume. See Appendix A for additional calculations.

| Table 4 – Peak Flow Rate and Runoff Volume |         |
|--------------------------------------------|---------|
| Existing Drainage Basin                    |         |
| 100-yr Peak Flow (cfs)                     | 2.43    |
| 100-yr Runoff Volume (ft <sup>3</sup> )    | 49,970  |
| Proposed Drainage Basin (Detained)         |         |
| 100-yr Peak Flow (cfs)                     | 2.13    |
| 100-yr Runoff Volume (ft <sup>3</sup> )    | 122,230 |

## **Section 5— Summary and Conclusion**

### **5.0 Summary and Conclusion**

Stormwater runoff from the proposed development will increase due to the increase in impervious area. The proposed runoff during construction will be managed in accordance with an Erosion and Sedimentation Control Plan (ESCP) required to be developed for an NPDES 1200-C permit prior to construction. The (ESCP) will be developed and submitted with the final site design. Proposed conveyance of the 100-year storm will be accomplished by using a catch basin and piping system that will convey flows to a detention pond prior to discharging to Adair Slough. Water quality treatment is not required for this site.



## **Section 6— References**

### **6.0 References**

- City of Portland. 2004. City of Portland Stormwater Management Manual, Chapters 1 and 2. Bureau of Environmental Services: <https://www.portlandoregon.gov/bes/71127>
- U.S. Department of Agriculture - Natural Resource Conservation Service. 2008. Web Soil Survey. <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>. Accessed 6-13-2017.
- USDA Natural Resources Conservation Service Urban Hydrology for Small Watersheds (TR-55) 1986. [http://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/stelprdb1044171.pdf](http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1044171.pdf).
- Western Regional Climate Center. 2006. Astoria WSO Airport Monthly Climate Summary. <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?or0328>.
- City of Warrenton. 2008. Warrenton Stormwater Master Plan-Final.

## Figures



Figure 1  
Taxlot Map





SEE MAP 8 10 27

S.E. ENSIGN LANE

30-04

FOREST

FRM

CHOKEBERRY AVENUE

WILLOW

AZALEA AVENUE

HONEYSUCKLE

HUCKLEBERRY AVENUE

DRIVE

LOOP

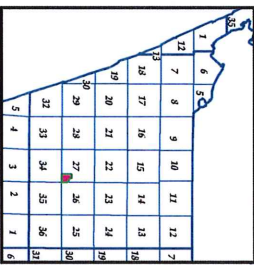
SEE MAP 8 10 26

T8N R10W SEC 27DD WM  
CLATSOP COUNTY  
Scale 1:1200

0 100 200 400 ft  
NAD 1983/85 HARN StatePlane Oregon North FIPS 5001 UTM Zone 18N

Cancelled Accounts

1501 1601 1701 1801 1901  
2001 2101 2201 2301 2401  
2501 2601 2701 2801 2901  
3001 3101 3201 3301 3401  
3501 3601 3701 3801 3901  
4001 4101 4201 4301 4401  
4501 4601 4701 4801 4901  
5001 5101 5201 5301 5401  
5501 5601 5701 5801 5901  
6001 6101 6201 6301 6401  
6501 6601 6701 6801 6901  
7001 7101 7201 7301 7401  
7501 7601 7701 7801 7901  
8001 8101 8201 8301 8401  
8501 8601 8701 8801 8901  
9001 9101 9201 9301 9401  
9501 9601 9701 9801 9901



This map was prepared for assistance by the Clatsop County Assessor's Office. It is not a legal document and should not be used for legal purposes. The Assessor's Office is not responsible for any errors or omissions on this map.

July 21, 2017

8.10.27DD

Figure 2  
National Wetlands Inventory Map







U.S. Fish and Wildlife Service  
National Wetlands Inventory

## Tract A Apartments



August 2, 2017

### Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.



Figure 3  
Local Wetlands Inventory Map



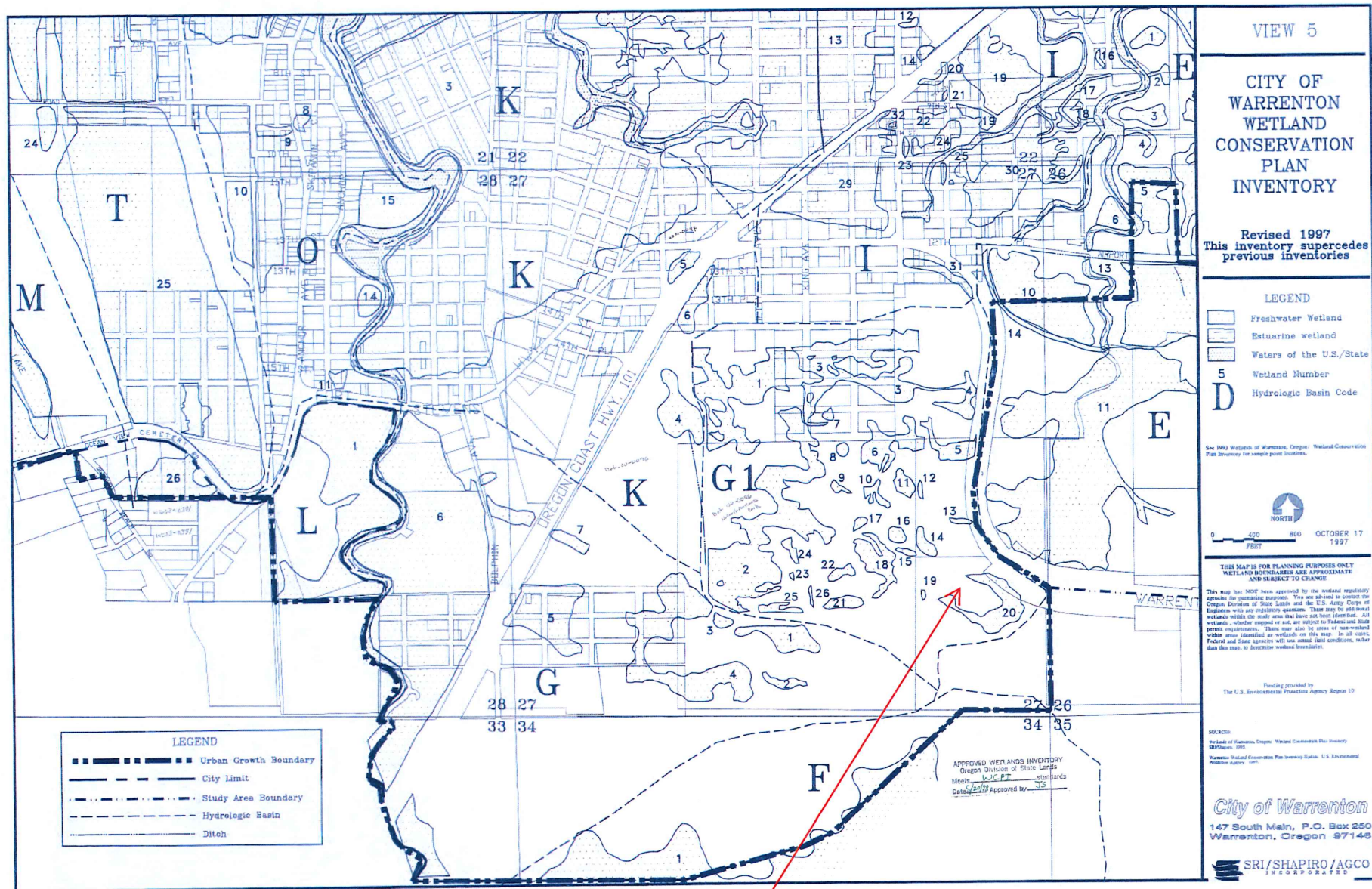


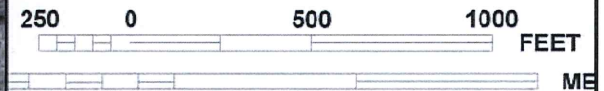
Figure 4  
FEMA Flood Map Firmette







MAP SCALE 1" = 500'



NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0219E

## FIRM

FLOOD INSURANCE RATE MAP

CLATSOP COUNTY,  
OREGON

AND INCORPORATED AREAS

PANEL 0219 OF 0800

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

### CONTAINS:

| COMMUNITY            | NUMBER | PANEL | SUFFIX |
|----------------------|--------|-------|--------|
| CLATSOP COUNTY       | 410027 | 0219  | E      |
| UNINCORPORATED AREAS |        |       |        |
| WARRENTON, CITY OF   | 410033 | 0219  | E      |

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.



MAP NUMBER  
41007C0219E

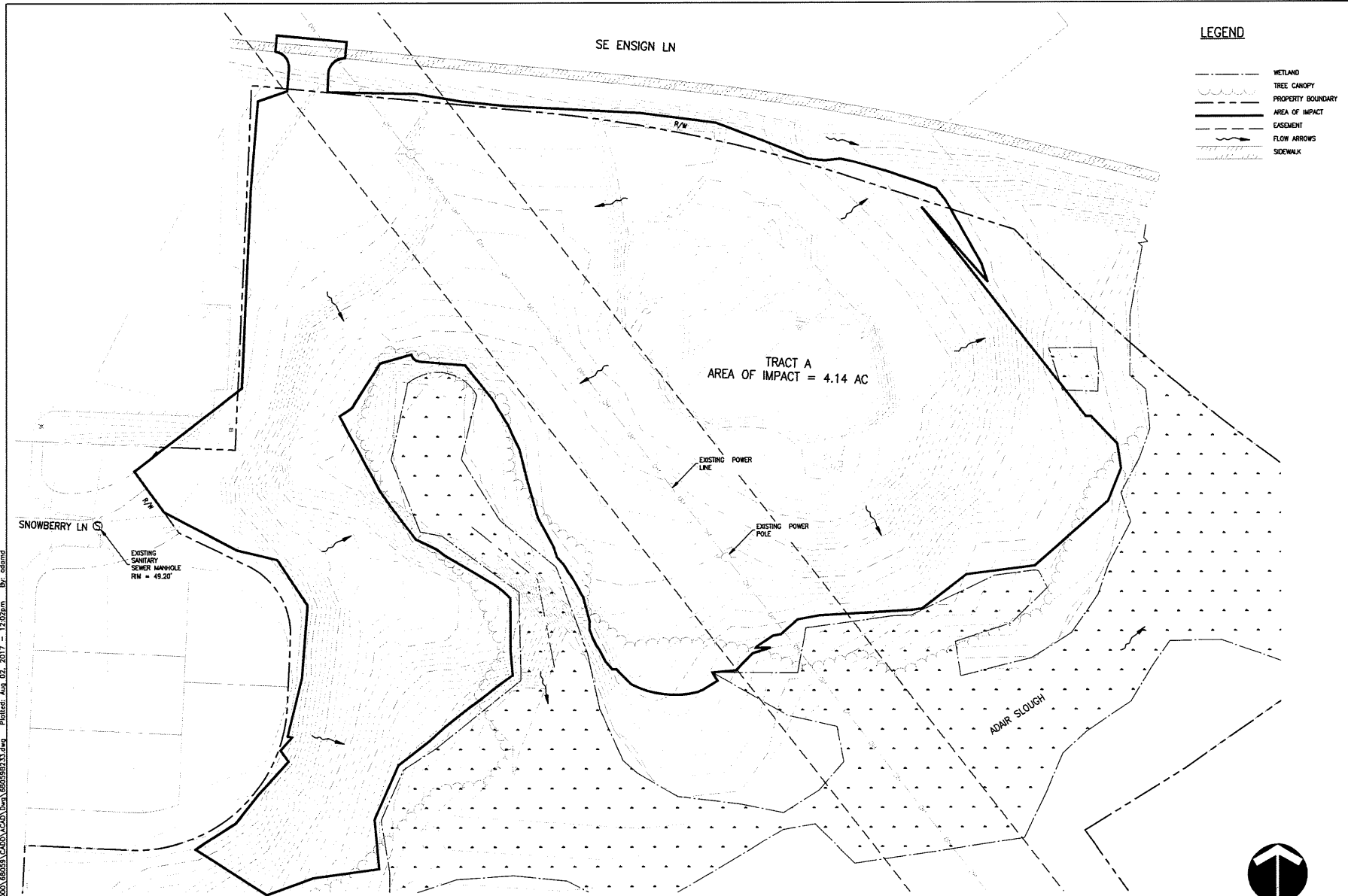
EFFECTIVE DATE  
SEPTEMBER 17, 2010

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at [www.msc.fema.gov](http://www.msc.fema.gov)

Figure 5  
Existing Drainage Conditions





A horizontal scale bar with markings at 0, 30, and 60 feet. The bar is divided into segments: a 30-foot segment with alternating black and white squares, and a 30-foot solid black segment. The text "SCALE" is at the left end and "IN FEET" is at the right end.

**TRACT A APARTMENTS**



Project No. Drawing No.  
**FIGURE 5**  
Sheet No.  
Copyright 2017 ©



Figure 6  
Proposed Drainage Conditions





## Appendices

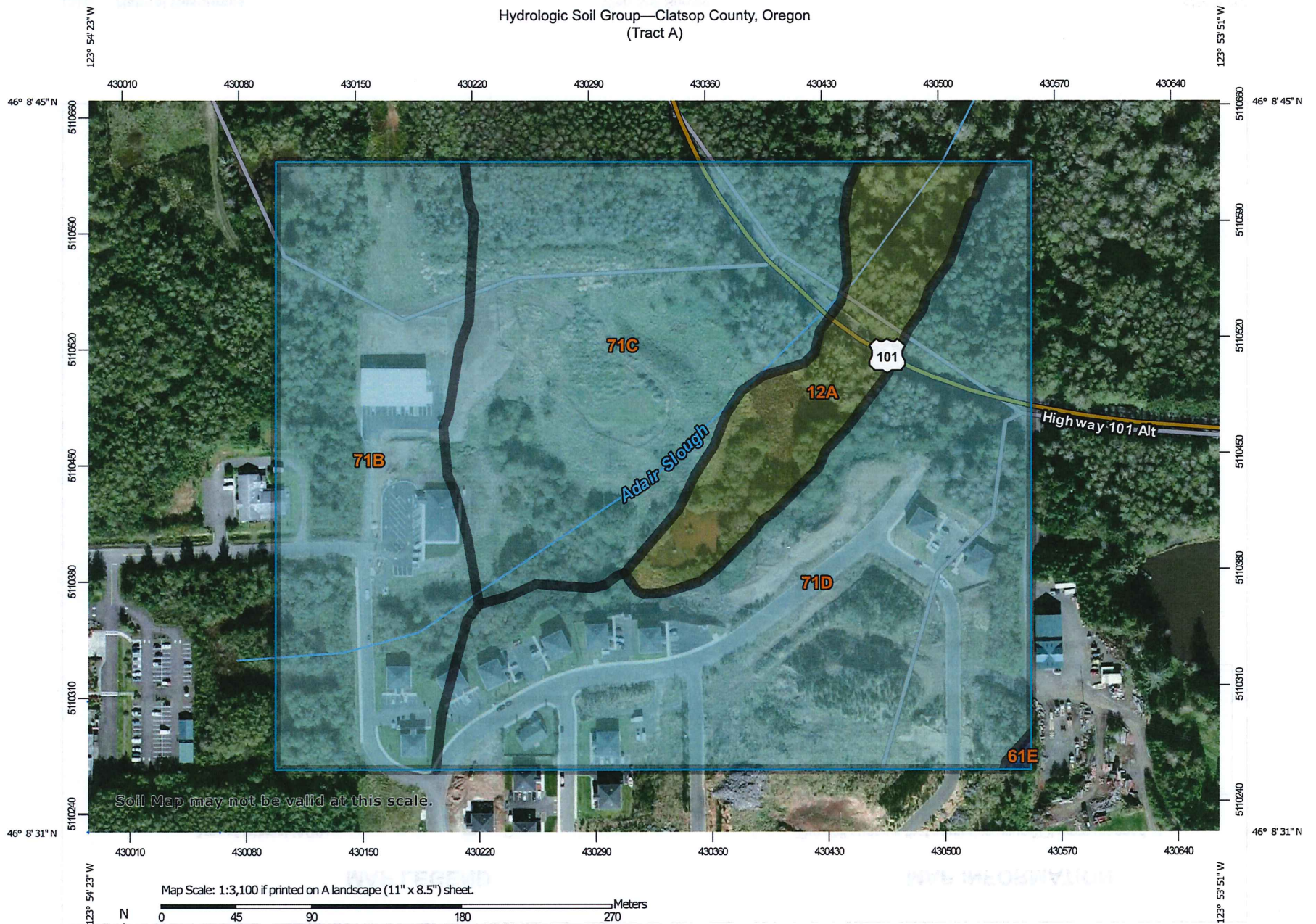




## Appendix A Hydrology

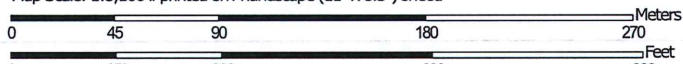


# Hydrologic Soil Group—Clatsop County, Oregon (Tract A)



Soil Map may not be valid at this scale.

Map Scale: 1:3,100 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84



Natural Resources  
Conservation Service

Web Soil Survey  
National Cooperative Soil Survey

4/24/2017  
Page 1 of 4



# Hydrologic Soil Group—Clatsop County, Oregon (Tract A)

## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

#### Soil Rating Polygons

-  A
-  A/D
-  B
-  B/D
-  C
-  C/D
-  D
-  Not rated or not available

#### Soil Rating Lines

-  A
-  A/D
-  B
-  B/D
-  C
-  C/D
-  D
-  Not rated or not available

#### Soil Rating Points

-  A
-  A/D
-  B
-  B/D

-  C
-  C/D
-  D
-  Not rated or not available

### Water Features

 Streams and Canals

### Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL:  
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Clatsop County, Oregon  
Survey Area Data: Version 13, Sep 16, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 8, 2010—Oct 17, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.





## Hydrologic Soil Group

| Hydrologic Soil Group— Summary by Map Unit — Clatsop County, Oregon (OR007) |                                                            |        |              |                |
|-----------------------------------------------------------------------------|------------------------------------------------------------|--------|--------------|----------------|
| Map unit symbol                                                             | Map unit name                                              | Rating | Acres in AOI | Percent of AOI |
| 12A                                                                         | Coquille-Clatsop complex, protected, 0 to 1 percent slopes | C/D    | 4.1          | 9.9%           |
| 61E                                                                         | Templeton-Ecola silt loams, 30 to 60 percent slopes        | B      | 0.1          | 0.1%           |
| 71B                                                                         | Walluski silt loam, 0 to 7 percent slopes                  | C      | 10.0         | 24.3%          |
| 71C                                                                         | Walluski silt loam, 7 to 15 percent slopes                 | C      | 11.6         | 28.0%          |
| 71D                                                                         | Walluski silt loam, 15 to 20 percent slopes                | C      | 15.6         | 37.7%          |
| <b>Totals for Area of Interest</b>                                          |                                                            |        | <b>41.3</b>  | <b>100.0%</b>  |

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher

## Existing Conditions

Table 2-2c Runoff curve numbers for other agricultural lands <sup>1/</sup>

| Cover description                                                            |                      | Curve numbers for hydrologic soil group |    |    |    |
|------------------------------------------------------------------------------|----------------------|-----------------------------------------|----|----|----|
| Cover type                                                                   | Hydrologic condition | A                                       | B  | C  | D  |
| Pasture, grassland, or range—continuous forage for grazing. <sup>2/</sup>    | Poor                 | 68                                      | 79 | 86 | 89 |
|                                                                              | Fair                 | 49                                      | 69 | 79 | 84 |
|                                                                              | Good                 | 39                                      | 61 | 74 | 80 |
| Meadow—continuous grass, protected from grazing and generally mowed for hay. | —                    | 30                                      | 58 | 71 | 78 |
| Brush—brush-weed-grass mixture with brush the major element. <sup>3/</sup>   | Poor                 | 48                                      | 67 | 77 | 83 |
|                                                                              | Fair                 | 35                                      | 56 | 70 | 77 |
|                                                                              | Good                 | 30 <sup>4/</sup>                        | 48 | 65 | 73 |
| Woods—grass combination (orchard or tree farm). <sup>5/</sup>                | Poor                 | 57                                      | 73 | 82 | 86 |
|                                                                              | Fair                 | 43                                      | 65 | 76 | 82 |
|                                                                              | Good                 | 32                                      | 58 | 72 | 79 |
| Woods. <sup>6/</sup>                                                         | Poor                 | 45                                      | 66 | 77 | 83 |
|                                                                              | Fair                 | 36                                      | 60 | 73 | 79 |
|                                                                              | Good                 | 30 <sup>4/</sup>                        | 55 | 70 | 77 |
| Farmsteads—buildings, lanes, driveways, and surrounding lots.                | —                    | 59                                      | 74 | 82 | 86 |

<sup>1/</sup> Average runoff condition, and  $I_a = 0.2S$ .

<sup>2/</sup> *Poor*: <50% ground cover or heavily grazed with no mulch.

*Fair*: 50 to 75% ground cover and not heavily grazed.

*Good*: > 75% ground cover and lightly or only occasionally grazed.

<sup>3/</sup> *Poor*: <50% ground cover.

*Fair*: 50 to 75% ground cover.

*Good*: >75% ground cover.

<sup>4/</sup> Actual curve number is less than 30; use CN = 30 for runoff computations.

<sup>5/</sup> CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.

<sup>6/</sup> *Poor*: Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.

*Fair*: Woods are grazed but not burned, and some forest litter covers the soil.

*Good*: Woods are protected from grazing, and litter and brush adequately cover the soil.



## Proposed Conditions

**Table 2-2a** Runoff curve numbers for urban areas <sup>1/</sup>

| Cover description                                                                                                                          |                                               | Curve numbers for hydrologic soil group |    |    |    |
|--------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------------|----|----|----|
| Cover type and hydrologic condition                                                                                                        | Average percent impervious area <sup>2/</sup> | A                                       | B  | C  | D  |
| <i>Fully developed urban areas (vegetation established)</i>                                                                                |                                               |                                         |    |    |    |
| Open space (lawns, parks, golf courses, cemeteries, etc.) <sup>3/</sup> :                                                                  |                                               |                                         |    |    |    |
| Poor condition (grass cover < 50%) .....                                                                                                   |                                               | 68                                      | 79 | 86 | 89 |
| Fair condition (grass cover 50% to 75%) .....                                                                                              |                                               | 49                                      | 69 | 79 | 84 |
| Good condition (grass cover > 75%) .....                                                                                                   |                                               | 39                                      | 61 | 74 | 80 |
| Impervious areas:                                                                                                                          |                                               |                                         |    |    |    |
| Paved parking lots, roofs, driveways, etc.<br>(excluding right-of-way) .....                                                               |                                               | 98                                      | 98 | 98 | 98 |
| Streets and roads:                                                                                                                         |                                               |                                         |    |    |    |
| Paved; curbs and storm sewers (excluding<br>right-of-way) .....                                                                            |                                               | 98                                      | 98 | 98 | 98 |
| Paved; open ditches (including right-of-way) .....                                                                                         |                                               | 83                                      | 89 | 92 | 93 |
| Gravel (including right-of-way) .....                                                                                                      |                                               | 76                                      | 85 | 89 | 91 |
| Dirt (including right-of-way) .....                                                                                                        |                                               | 72                                      | 82 | 87 | 89 |
| Western desert urban areas:                                                                                                                |                                               |                                         |    |    |    |
| Natural desert landscaping (pervious areas only) <sup>4/</sup> .....                                                                       |                                               | 63                                      | 77 | 85 | 88 |
| Artificial desert landscaping (impervious weed barrier,<br>desert shrub with 1- to 2-inch sand or gravel mulch<br>and basin borders) ..... |                                               | 96                                      | 96 | 96 | 96 |
| Urban districts:                                                                                                                           |                                               |                                         |    |    |    |
| Commercial and business .....                                                                                                              | 85                                            | 89                                      | 92 | 94 | 95 |
| Industrial .....                                                                                                                           | 72                                            | 81                                      | 88 | 91 | 93 |
| Residential districts by average lot size:                                                                                                 |                                               |                                         |    |    |    |
| 1/8 acre or less (town houses) .....                                                                                                       | 65                                            | 77                                      | 85 | 90 | 92 |
| 1/4 acre .....                                                                                                                             | 38                                            | 61                                      | 75 | 83 | 87 |
| 1/3 acre .....                                                                                                                             | 30                                            | 57                                      | 72 | 81 | 86 |
| 1/2 acre .....                                                                                                                             | 25                                            | 54                                      | 70 | 80 | 85 |
| 1 acre .....                                                                                                                               | 20                                            | 51                                      | 68 | 79 | 84 |
| 2 acres .....                                                                                                                              | 12                                            | 46                                      | 65 | 77 | 82 |
| <i>Developing urban areas</i>                                                                                                              |                                               |                                         |    |    |    |
| Newly graded areas                                                                                                                         |                                               |                                         |    |    |    |
| (pervious areas only, no vegetation) <sup>5/</sup> .....                                                                                   |                                               | 77                                      | 86 | 91 | 94 |
| Idle lands (CN's are determined using cover types<br>similar to those in table 2-2c).                                                      |                                               |                                         |    |    |    |

<sup>1/</sup> Average runoff condition, and  $I_a = 0.2S$ .

<sup>2/</sup> The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

<sup>3/</sup> CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

<sup>4/</sup> Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

<sup>5/</sup> Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

## Time of Concentration Calculations

|                                                   |                 |                 |                  |   |
|---------------------------------------------------|-----------------|-----------------|------------------|---|
| Project Name: Warrenton Tract A                   |                 | By: JCT         | Date: 04/25/2017 |   |
| Project Number: 68059                             |                 |                 |                  |   |
| <b>BASIN</b>                                      |                 | <b>Existing</b> |                  |   |
| <b>SHEET FLOW</b>                                 |                 |                 |                  |   |
| <b>INPUT</b>                                      |                 |                 |                  |   |
| Surface Description (from Table 3-1)              |                 | Woods           | -                | - |
| Manning's Roughness Coefficient                   |                 | 0.4             | -                | - |
| Flow Length, L (<300 ft)                          | ft              | 258             | -                | - |
| 2-Year, 24-Hour Rainfall, P <sub>2</sub>          | in              | 3.1             | -                | - |
| Land Slope, s                                     | ft/ft           | 0.100           | -                | - |
| <b>OUTPUT</b>                                     |                 |                 |                  |   |
| Travel Time                                       | hr              | 0.41            | -                | - |
| <b>SHALLOW CONCENTRATED FLOW</b>                  |                 |                 |                  |   |
| <b>INPUT</b>                                      |                 |                 |                  |   |
| Surface Description (paved or unpaved)            |                 | -               | -                | - |
| Flow Length, L                                    | ft              | -               | -                | - |
| Watercourse Slope, s                              | ft/ft           | -               | -                | - |
| <b>OUTPUT</b>                                     |                 |                 |                  |   |
| Average Velocity, V                               | ft/s            | -               | -                | - |
| Travel Time                                       | hr              | 0.000           | -                | - |
| <b>CHANNEL FLOW</b>                               |                 |                 |                  |   |
| <b>INPUT</b>                                      |                 |                 |                  |   |
| Cross Sectional Flow Area, a                      | ft <sup>2</sup> | -               | -                | - |
| Wetted Perimeter, p <sub>w</sub>                  | ft              | -               | -                | - |
| Channel Slope, s                                  | ft/ft           | -               | -                | - |
| Manning's Roughness Coefficient                   |                 | -               | -                | - |
| Flow Length, L                                    | ft              | 0               | -                | - |
| <b>OUTPUT</b>                                     |                 |                 |                  |   |
| Average Velocity, V                               | ft/s            | -               | -                | - |
| Hydraulic Radius, r = a/p <sub>w</sub>            | ft              | -               | -                | - |
| Travel Time                                       | hr              | 0.000           | -                | - |
| <b>Basin Time of Concentration, T<sub>c</sub></b> | <b>hrs</b>      | <b>0.41</b>     | -                | - |
|                                                   | <b>min</b>      | <b>24.5</b>     | -                | - |



## Drainage Basin Areas

68059 Tract A

### Proposed Conditions: Area of Impact

|              | Impervious Area  |                   |                  |                             |                             | Total Pervious |               | Total Area     |             |
|--------------|------------------|-------------------|------------------|-----------------------------|-----------------------------|----------------|---------------|----------------|-------------|
|              | Building<br>(SF) | Pavement*<br>(SF) | Sidewalk<br>(SF) | Total<br>Impervious<br>(SF) | Total<br>Impervious<br>(AC) | Total (SF)     | Total<br>(AC) | Total (SF)     | Total (AC)  |
| <b>Total</b> | <b>21,427</b>    | <b>48,241</b>     | <b>7,775</b>     | <b>77,443</b>               | <b>1.78</b>                 | <b>102,942</b> | <b>2.36</b>   | <b>180,385</b> | <b>4.14</b> |
| Public ROW   | 0                | 900               | 276              | 1,176                       | 0.03                        | 0              | 0.00          | 1,176          | 0.03        |
| Private      | 21,427           | 47,341            | 7,499            | 76,267                      | 1.75                        | 56,079         | 1.29          | 132,346        | 3.04        |
| Uncollected  | 0                | 0                 | 0                | 0                           | 0.00                        | 46,863         | 1.08          | 46,863         | 1.08        |

\*Includes gravel area

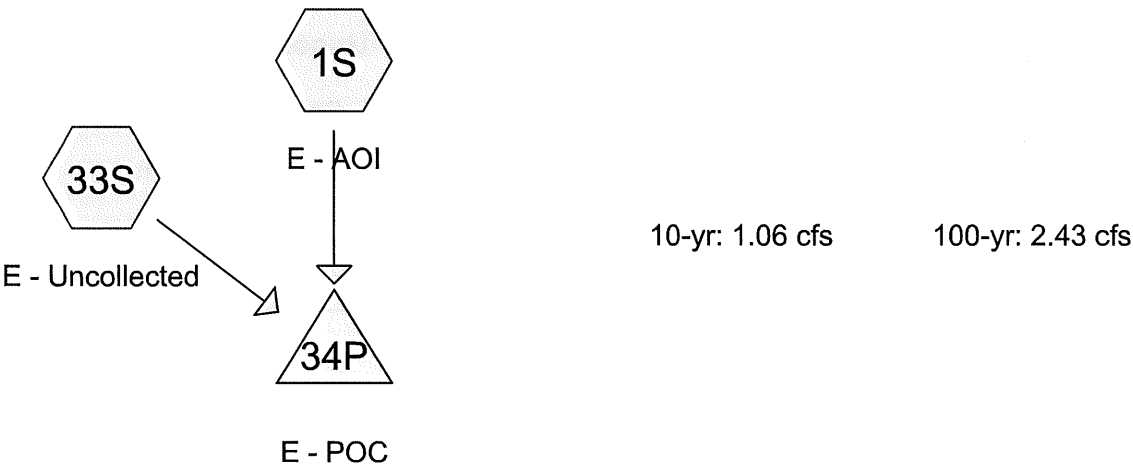


## Appendix B

### Water Quantity



**Existing Conditions**



**Routing Diagram for 68059 Tract A**

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**68059 Tract A**

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Tract A Apartments - Warrenton, Oregon

Type IA 24-hr 10-yr Rainfall=4.35"

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Page 2

**Summary for Subcatchment 1S: E - AOI**

Runoff = 0.79 cfs @ 8.02 hrs, Volume= 0.437 af, Depth= 1.71"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 10-yr Rainfall=4.35"

| Area (sf) | CN | Description                    |
|-----------|----|--------------------------------|
| 133,522   | 72 | Woods/grass comb., Good, HSG C |
| 133,522   | 72 | 100.00% Pervious Area          |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                            |
|-------------|------------------|------------------|----------------------|-------------------|------------------------------------------------------------------------|
| 24.5        | 258              | 0.1000           | 0.18                 |                   | <b>Sheet Flow, Sheet</b><br>Woods: Light underbrush n= 0.400 P2= 3.10" |

**Summary for Subcatchment 33S: E - Uncollected**

Runoff = 0.28 cfs @ 8.02 hrs, Volume= 0.153 af, Depth= 1.71"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 10-yr Rainfall=4.35"

| Area (sf) | CN | Description                    |
|-----------|----|--------------------------------|
| 46,863    | 72 | Woods/grass comb., Good, HSG C |
| 46,863    | 72 | 100.00% Pervious Area          |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                            |
|-------------|------------------|------------------|----------------------|-------------------|------------------------------------------------------------------------|
| 24.5        | 258              | 0.1000           | 0.18                 |                   | <b>Sheet Flow, Sheet</b><br>Woods: Light underbrush n= 0.400 P2= 3.10" |

**Summary for Pond 34P: E - POC**

Inflow Area = 4.141 ac, 0.00% Impervious, Inflow Depth = 1.71" for 10-yr event

Inflow = 1.06 cfs @ 8.02 hrs, Volume= 0.590 af

Primary = 1.06 cfs @ 8.02 hrs, Volume= 0.590 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs



**68059 Tract A**

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Tract A Apartments - Warrenton, Oregon

Type IA 24-hr 100-yr Rainfall=6.40"

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**Summary for Subcatchment 1S: E - AOI**

Runoff = 1.80 cfs @ 8.01 hrs, Volume= 0.849 af, Depth= 3.32"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 100-yr Rainfall=6.40"

| Area (sf) | CN | Description                    |
|-----------|----|--------------------------------|
| 133,522   | 72 | Woods/grass comb., Good, HSG C |
| 133,522   | 72 | 100.00% Pervious Area          |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                            |
|-------------|------------------|------------------|----------------------|-------------------|------------------------------------------------------------------------|
| 24.5        | 258              | 0.1000           | 0.18                 |                   | <b>Sheet Flow, Sheet</b><br>Woods: Light underbrush n= 0.400 P2= 3.10" |

**Summary for Subcatchment 33S: E - Uncollected**

Runoff = 0.63 cfs @ 8.01 hrs, Volume= 0.298 af, Depth= 3.32"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 100-yr Rainfall=6.40"

| Area (sf) | CN | Description                    |
|-----------|----|--------------------------------|
| 46,863    | 72 | Woods/grass comb., Good, HSG C |
| 46,863    | 72 | 100.00% Pervious Area          |

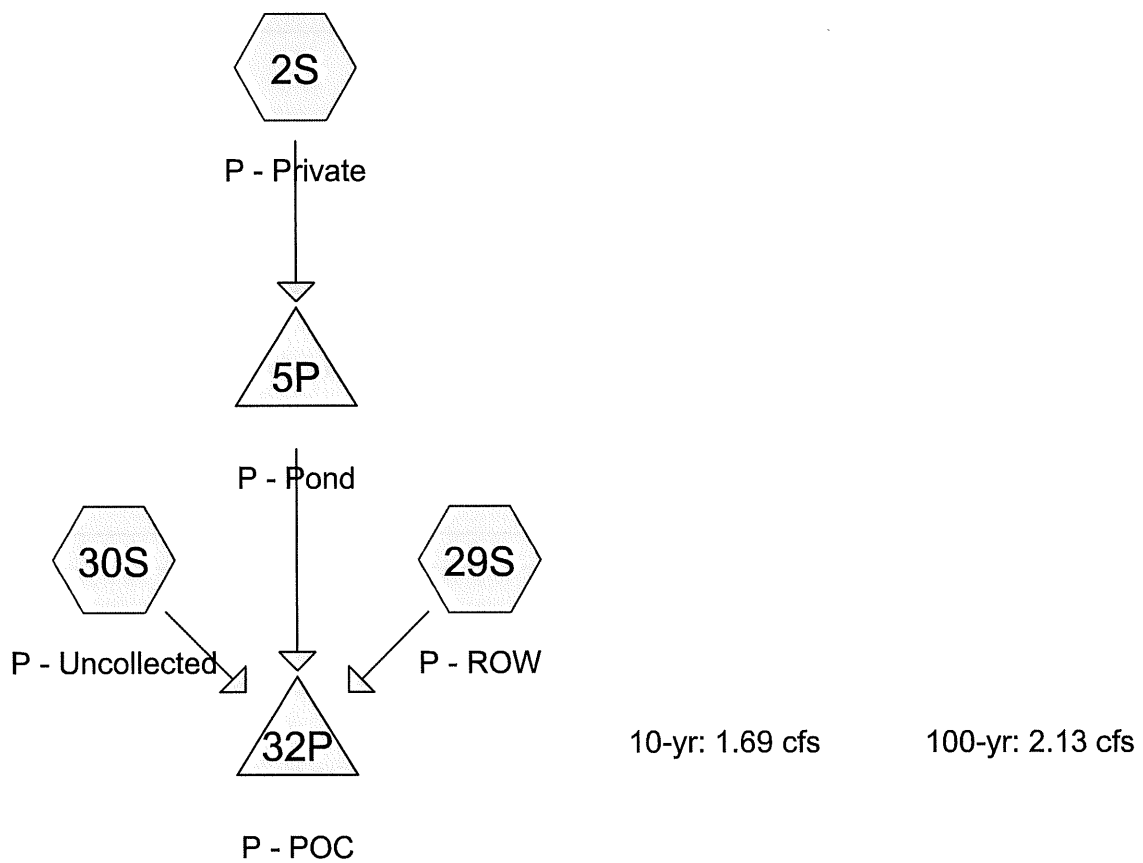
| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                            |
|-------------|------------------|------------------|----------------------|-------------------|------------------------------------------------------------------------|
| 24.5        | 258              | 0.1000           | 0.18                 |                   | <b>Sheet Flow, Sheet</b><br>Woods: Light underbrush n= 0.400 P2= 3.10" |

**Summary for Pond 34P: E - POC**

Inflow Area = 4.141 ac, 0.00% Impervious, Inflow Depth = 3.32" for 100-yr event  
 Inflow = 2.43 cfs @ 8.01 hrs, Volume= 1.147 af  
 Primary = 2.43 cfs @ 8.01 hrs, Volume= 1.147 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

## Proposed Conditions



### Routing Diagram for 68059 Tract A

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Tract A Apartments - Warrenton, Oregon

Type IA 24-hr 10-yr Rainfall=4.35"

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Page 2

**Summary for Subcatchment 2S: P - Private**

Runoff = 2.47 cfs @ 7.90 hrs, Volume= 0.842 af, Depth= 3.32"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 10-yr Rainfall=4.35"

| Area (sf) | CN | Description                     |
|-----------|----|---------------------------------|
| 76,267    | 98 | Paved parking, HSG C            |
| 56,079    | 79 | 50-75% Grass cover, Fair, HSG C |
| 132,346   | 90 | Weighted Average                |
| 56,079    | 79 | 42.37% Pervious Area            |
| 76,267    | 98 | 57.63% Impervious Area          |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description          |
|----------|---------------|---------------|-------------------|----------------|----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Direct |

**Summary for Subcatchment 29S: P - ROW**

Runoff = 0.03 cfs @ 7.88 hrs, Volume= 0.009 af, Depth= 4.11"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 10-yr Rainfall=4.35"

| Area (sf) | CN | Description             |
|-----------|----|-------------------------|
| 1,176     | 98 | Paved parking, HSG C    |
| 1,176     | 98 | 100.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description          |
|----------|---------------|---------------|-------------------|----------------|----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Direct |

**Summary for Subcatchment 30S: P - Uncollected**

Runoff = 0.28 cfs @ 8.02 hrs, Volume= 0.153 af, Depth= 1.71"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 10-yr Rainfall=4.35"

| Area (sf) | CN | Description                    |
|-----------|----|--------------------------------|
| 46,871    | 72 | Woods/grass comb., Good, HSG C |
| 46,871    | 72 | 100.00% Pervious Area          |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description       |
|----------|---------------|---------------|-------------------|----------------|-------------------|
| 24.5     | 258           | 0.1000        | 0.18              |                | Sheet Flow, Sheet |

Woods: Light underbrush n= 0.400 P2= 3.10"



## 68059 Tract A

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### Summary for Pond 5P: P - Pond

Inflow Area = 3.038 ac, 57.63% Impervious, Inflow Depth = 3.32" for 10-yr event  
Inflow = 2.47 cfs @ 7.90 hrs, Volume= 0.842 af  
Outflow = 1.39 cfs @ 8.23 hrs, Volume= 0.842 af, Atten= 44%, Lag= 19.7 min  
Primary = 1.39 cfs @ 8.23 hrs, Volume= 0.842 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Peak Elev= 23.18' @ 8.23 hrs Surf.Area= 9,779 sf Storage= 1,767 cf

Plug-Flow detention time= 3.4 min calculated for 0.841 af (100% of inflow)  
Center-of-Mass det. time= 3.2 min ( 700.2 - 697.1 )

| Volume              | Invert               | Avail.Storage             | Storage Description                                        |
|---------------------|----------------------|---------------------------|------------------------------------------------------------|
| #1                  | 19.00'               | 54,824 cf                 | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet)                                  |
| 19.00               | 5                    | 0                         | 0                                                          |
| 22.99               | 5                    | 20                        | 20                                                         |
| 23.00               | 9,434                | 47                        | 67                                                         |
| 24.00               | 11,385               | 10,410                    | 10,477                                                     |
| 25.00               | 13,432               | 12,409                    | 22,885                                                     |
| 26.00               | 15,577               | 14,505                    | 37,390                                                     |
| 27.00               | 17,821               | 16,699                    | 54,089                                                     |
| 27.04               | 18,954               | 735                       | 54,824                                                     |

| Device | Routing  | Invert | Outlet Devices                                                                                                                                                                       |
|--------|----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 21.00' | <b>12.0" Round CMP_Round 12"</b><br>L= 100.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 21.00' / 20.00' S= 0.0100 '/' Cc= 0.900<br>n= 0.013, Flow Area= 0.79 sf |
| #2     | Device 1 | 19.00' | <b>6.0" Vert. Orifice/Grate</b> C= 0.600                                                                                                                                             |
| #3     | Device 1 | 26.00' | <b>2.5' long x 0.5' breadth OFWR_SDDI</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32                                                        |

**Primary OutFlow** Max=1.39 cfs @ 8.23 hrs HW=23.18' TW=0.00' (Dynamic Tailwater)

1=CMP\_Round 12" (Passes 1.39 cfs of 4.32 cfs potential flow)

2=Orifice/Grate (Orifice Controls 1.39 cfs @ 7.10 fps)

3=OFWR\_SDDI ( Controls 0.00 cfs)

### Summary for Pond 32P: P - POC

Inflow Area = 4.141 ac, 42.93% Impervious, Inflow Depth = 2.91" for 10-yr event  
Inflow = 1.69 cfs @ 8.04 hrs, Volume= 1.004 af  
Primary = 1.69 cfs @ 8.04 hrs, Volume= 1.004 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

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Tract A Apartments - Warrenton, Oregon  
Type IA 24-hr 100-yr Rainfall=6.40"

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**Summary for Subcatchment 2S: P - Private**

Runoff = 3.95 cfs @ 7.90 hrs, Volume= 1.332 af, Depth= 5.26"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 100-yr Rainfall=6.40"

| Area (sf) | CN | Description                     |
|-----------|----|---------------------------------|
| 76,267    | 98 | Paved parking, HSG C            |
| 56,079    | 79 | 50-75% Grass cover, Fair, HSG C |
| 132,346   | 90 | Weighted Average                |
| 56,079    | 79 | 42.37% Pervious Area            |
| 76,267    | 98 | 57.63% Impervious Area          |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description          |
|-------------|------------------|------------------|----------------------|-------------------|----------------------|
| 5.0         |                  |                  |                      |                   | Direct Entry, Direct |

**Summary for Subcatchment 29S: P - ROW**

Runoff = 0.04 cfs @ 7.87 hrs, Volume= 0.014 af, Depth= 6.16"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 100-yr Rainfall=6.40"

| Area (sf) | CN | Description             |
|-----------|----|-------------------------|
| 1,176     | 98 | Paved parking, HSG C    |
| 1,176     | 98 | 100.00% Impervious Area |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description          |
|-------------|------------------|------------------|----------------------|-------------------|----------------------|
| 5.0         |                  |                  |                      |                   | Direct Entry, Direct |

**Summary for Subcatchment 30S: P - Uncollected**

Runoff = 0.63 cfs @ 8.01 hrs, Volume= 0.298 af, Depth= 3.32"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
Type IA 24-hr 100-yr Rainfall=6.40"

| Area (sf) | CN | Description                    |
|-----------|----|--------------------------------|
| 46,871    | 72 | Woods/grass comb., Good, HSG C |
| 46,871    | 72 | 100.00% Pervious Area          |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description |
|-------------|------------------|------------------|----------------------|-------------------|-------------|
| 24.5        | 258              | 0.1000           | 0.18                 |                   |             |

**Sheet Flow, Sheet**

Woods: Light underbrush n= 0.400 P2= 3.10"

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Tract A Apartments - Warrenton, Oregon

Type IA 24-hr 100-yr Rainfall=6.40"

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**Summary for Pond 5P: P - Pond**

Inflow Area = 3.038 ac, 57.63% Impervious, Inflow Depth = 5.26" for 100-yr event  
 Inflow = 3.95 cfs @ 7.90 hrs, Volume= 1.332 af  
 Outflow = 1.50 cfs @ 8.70 hrs, Volume= 1.332 af, Atten= 62%, Lag= 48.2 min  
 Primary = 1.50 cfs @ 8.70 hrs, Volume= 1.332 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs  
 Peak Elev= 23.52' @ 8.70 hrs Surf.Area= 10,441 sf Storage= 5,196 cf

Plug-Flow detention time= 13.8 min calculated for 1.332 af (100% of inflow)  
 Center-of-Mass det. time= 13.7 min ( 699.9 - 686.2 )

| Volume              | Invert               | Avail.Storage             | Storage Description                                        |
|---------------------|----------------------|---------------------------|------------------------------------------------------------|
| #1                  | 19.00'               | 54,824 cf                 | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet)                                  |
| 19.00               | 5                    | 0                         | 0                                                          |
| 22.99               | 5                    | 20                        | 20                                                         |
| 23.00               | 9,434                | 47                        | 67                                                         |
| 24.00               | 11,385               | 10,410                    | 10,477                                                     |
| 25.00               | 13,432               | 12,409                    | 22,885                                                     |
| 26.00               | 15,577               | 14,505                    | 37,390                                                     |
| 27.00               | 17,821               | 16,699                    | 54,089                                                     |
| 27.04               | 18,954               | 735                       | 54,824                                                     |

| Device | Routing  | Invert | Outlet Devices                                                                                                                                                                     |
|--------|----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 21.00' | <b>12.0" Round CMP_Round 12"</b><br>L= 100.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 21.00' / 20.00' S= 0.0100 ' Cc= 0.900<br>n= 0.013, Flow Area= 0.79 sf |
| #2     | Device 1 | 19.00' | <b>6.0" Vert. Orifice/Grate</b> C= 0.600                                                                                                                                           |
| #3     | Device 1 | 26.00' | <b>2.5' long x 0.5' breadth OFWR_SDDI</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32                                                      |

**Primary OutFlow** Max=1.50 cfs @ 8.70 hrs HW=23.52' TW=0.00' (Dynamic Tailwater)

1=CMP\_Round 12" (Passes 1.50 cfs of 4.64 cfs potential flow)

2=Orifice/Grate (Orifice Controls 1.50 cfs @ 7.64 fps)

3=OFWR\_SDDI ( Controls 0.00 cfs)

**Summary for Pond 32P: P - POC**

Inflow Area = 4.141 ac, 42.93% Impervious, Inflow Depth = 4.76" for 100-yr event  
 Inflow = 2.13 cfs @ 8.02 hrs, Volume= 1.644 af  
 Primary = 2.13 cfs @ 8.02 hrs, Volume= 1.644 af, Atten= 0%, Lag= 0.0 min

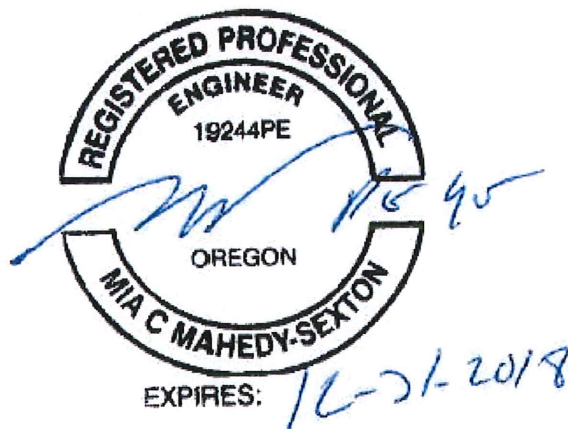
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

# Geotechnical Report

Warrenton Apartments  
Warrenton, Oregon

Prepared for:  
Dick Krueger

6 April 2017



3915 SW Plum Street  
Portland, OR 97219  
503-816-3689





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## **1.0 PROJECT AND SITE DESCRIPTIONS**

Rapid Soil Solutions (RSS) has prepared this geotechnical report for the proposed development of the lot currently assigned the state identification number of 81027DD00100 in Clatsop County, Oregon. RSS understands that the proposed development will include two apartment buildings along with the associated parking and approach via an extension of Snowberry Lane. The site is situated south of SE Ensign Lane but accessed from a short stub road (Snowberry Lane) that currently extends 50' east of Chockberry Ave roughly 650 feet beyond (north) its intersection with SW Willow Drive and about 120 feet north of its intersection with SE 19<sup>th</sup> St. RSS understands that both apartment buildings will be in the eastern half of the subject site. It is roughly 0.73 miles southeast of the Oregon Coast Highway (HWY-101), 1.77 miles southeast of the corner of S Main Ave and Warrenton-Astoria Highway (OR-104) in Warrenton, 2.9 miles east of the Pacific Ocean, 1.63 miles west of the Lewis and Clark River, and is 1.5 miles south-southwest of the southern end of the Oregon Coast Highway Bridge over the Youngs River. The site is situated along the southeastern edge of the city of Warrenton. It can be found in the southeast quarter of the southeast quarter of Section 27, Township 8-North, Range 10-West W.M. in Clatsop County and can be distinguished by the lot number 100 (81027DD00100). The latitude and longitude of the site are 46.144388 and -123.902365 (46°08'39.8"N, 123°54'08.5"W). See Appendix A, Figure 1 for site location indicated on a portion of a USGS 7.5 minute topographic map. Subsequent figures include additional site location information.

## **2.0 SITE CONDITIONS**

### **2.1 Surface Conditions**

This 8.81-acre subject site is situated along the western edge of the Coast Range as the slopes plunge towards the Pacific Ocean. The Oregon Coast Range is an uplifted belt of land spanning roughly 200 miles and comprised of moderately high mountains (averaging 1,500' in elevation with a maximum of 4,097') that occupy a roughly 30-40 mile wide swath along the Pacific Ocean. The mountains are comprised primarily of accreted oceanic sediments and synchronously deposited igneous rocks (where the sediments overlay, underlay and are intruded by the volcanic flows). After the Siletz Terrane accreted to the edge of North America, the ocean floor began to build up a thick accumulation of silt, sand and mud. Over tens of millions of years subduction along the continued, accompanied by sea level fluctuations and the birth and eventual erosion of nearby volcanoes; all the while ocean sediments steadily accumulated allowing for the formation a thick pile of sedimentary rock. Uplift, faulting and folding (associated with margin-parallel shortening in the Cascadia subduction zone) lifted the thick stack of sedimentary rock into the heights of the modern mountain range.

The northern and western slopes of the Oregon Coast Range is a region of varied topography, typically dominated by rugged mountains, bold headlands and marine embayments. The Columbia River cuts across the mountain system and forms the wide marine estuary at Astoria (northeast of the subject site). The lowland areas of the coastal



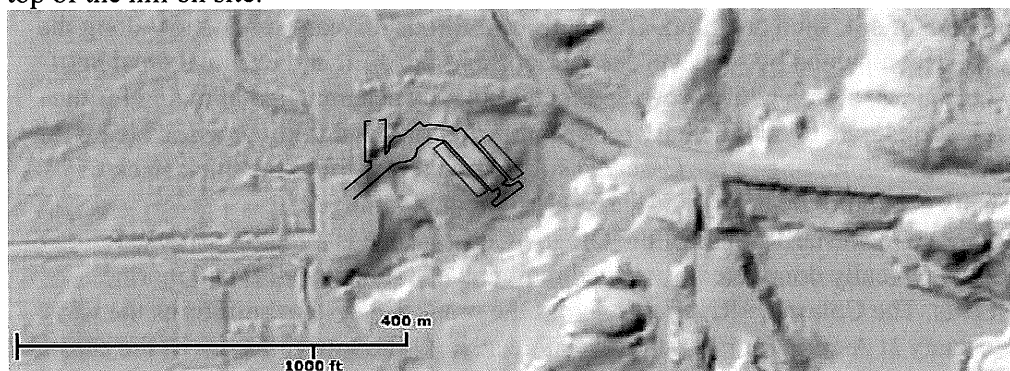
range include marine embayments, coastal plains and dune areas built up along spits and beaches. Uplands rise abruptly from sea level along the coast to ridge tops ranging from 1,000 to 2,000 feet in elevation. Scattered peaks comprised predominantly of volcanic rocks extend up to elevations of about 3,200 feet. These mountains are characterized by rugged ridges and steep-sided canyons. Along the coast, bold headlands and sea stacks, representing erosional remnants of headlands, are scattered across the coastline. Topographic irregularities in mountainous areas and on slopes bordering lowlands are the result of large-scale landsliding. The landslide areas are characterized by displaced rock masses, irregular ridges and swales, sag ponds, undrained depressions and youthful drainage systems.

The site is situated adjacent to the large lowland area associated with the Columbia River, which reaches a width of about 7 miles east of Astoria near Cathlamet Bay. Youngs Bay occupies a large part of this extensive lowland south of Astoria and merges with the flood plains of the Youngs River, Lewis and Clark River and the Clatsop coastal plains. The subject site is situated within these lowlands, perched on an alluvial terrace, potentially also containing some peat.

The slopes on site are descending generally southwards, towards a northeast-descending tributary to Youngs Bay called Adair Slough. The site contains some fill directly below the proposed buildings, accentuating a previously existing hill. The site survey indicates that the slopes ascending from the floodplain to the edge of the apartments is roughly 30%. The proposed structures hang out over the edge of the native slopes. The texture of the topography comprising the top of the hill indicates at least 6' of fill.

Aerial imagery from 2000 indicates that the slopes historically contained grassy fields, and the contours of the field indicate a topography generally consistent with the existing topography. Imagery from 2009, appearing to correspond with the development of Willow Drive/Honeysuckle Loop to the south of the subject site, the two upland portions of the subject site were disturbed, and likely filled. SE Ensign Lane was installed between 2012 and 2014. A large amount of fill was placed directly southwest of Business Highway 101 to fill the substantial grade drop and allow SE Ensign Ln to be relatively level with Business Highway 101.

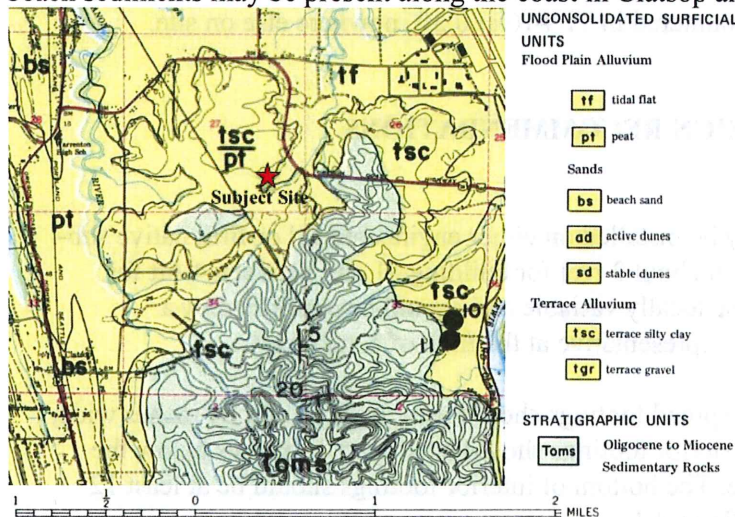
RSS observed the lower slopes of the site to be very wet, with standing water adjacent to the creek. Additionally, the power lines crossing the site do not appear to align with the power line easement presented on map tax map 81027DD. The majority of the site is covered in short grasses, with piles of limbs, brush and other organic debris at the very top of the hill on site.



## 2.2 Regional Geology

Current geologic literature<sup>1,2,3,4,5</sup> classifies the slopes underlying the subject site as Terrace silty clays, potentially containing some peat. The terrace alluvium (Tsc) is formed when the land is uplifted in relation to the base level and the river cuts down into the floodplain. The fragmented and uplifted sections of the older flood plain form terraces above the modern floodplain. Because silt-laden floodwaters commonly rise above the banks of the down cutting river, the terraces are usually mantled by several feet of fine-grained sediment.

Peat and organic soils are common in the estuaries and bays of the Columbia, Nahelem, Necanicum and Nestucca Rivers, in the Tillamook Bay area and at Clatsop spit, just to name a few. Peat forms in swamps, lowlands and tidal flats where the water table remains at or near the ground surface for large parts of the year. Peat and organic soils form thick deposits in areas where a slow steady rise of the water level induces a continued steady growth of sphagnum moss and other plants. Because sedimentation is commonly complex in such areas, silt and other material may cover deposits of peat. In regions of high water table, peat may occur in the subsurface in areas where there is no direct surface indication of its presence. Because sea level has risen as much as 300 feet since the close of the Pleistocene time, a thick subsurface accumulation of peat and interstratified alluvial and beach sediments may be present along the coast in Clatsop and Tillamook Counties.



1 <http://www.dnr.wa.gov/geologyportal>

2 Priest, G.R., Myers, Edward, Baptista, Antonio, and Kamphaus, R.A., 1999, Tsunami hazard map of the Warrenton area, Clatsop County, Oregon: Oregon Department of Geology and Mineral Industries, Interpretive Map Series 12, scale 1:24,000.

3 Schlicker, H.G., Deacon, R.J., Beaulieu, J.D., and Olcott, G.W., 1972, Environmental geology of the coastal region of Tillamook and Clatsop Counties: Oregon Department of Geology and Mineral Industries, Bulletin 74, scale 1:62,500.

4 Ma, L., Wells, R.E., Niem, A.R., Niewendorp, C.A., and Madin, I.P., 2009, Preliminary digital compilation map of part of northwestern Oregon: Oregon Department of Geology and Mineral Industries, Open-File Report O-09-03, scale 1:100,000.

5 Walsh, T.J., 1987, Geologic map of the Astoria and Ilwaco quadrangles, Washington and Oregon: Washington Division of Geology and Earth Resources, Open File Report 87-2, scale 1:100,000.

## **2.3 Field Exploration and Subsurface Conditions**

### **2.3.1 Field Explorations**

Ten (10) test pits were excavated with an excavator. The location of the test pits are shown on Figure 3 in Appendix A. A GIT observed the excavation of the pits and logged the subsurface materials with them reviewed by a registered professional engineer. Soil logs detailing materials encountered are Appendix B. The logs were created using the Unified Soil Classification and Visual Manual Procedure (ASTM-D 2488). Samples were transported to the laboratory ACS Testing of Tigard, Oregon for further classification in seal bags. Please see Appendix B for further laboratory results.

### **2.3.1 Subsurface Conditions**

The soil conditions were:

0 - 6ft: Soft fill of silts and clays or top soil. See test pits log for details

6 - 9ft: Stiff to hard silty clay with cemented siltstone and cobbles

Moisture contents range from 28.2 to 48.3%

### **2.3.2 Groundwater**

Groundwater was encountered in TP #10 at 0.3ft, nowhere else on site.

## **3.0 GEOTECHNICAL DESIGN RECOMMENDATIONS**

### **3.1 Foundation Design**

The building foundations may be installed on either engineered fill or firm native sub-grade that is found at a depth of about 2 feet for building #1 and between 4-6ft for building #2. This depth may be locally variable and should be confirmed by a geotechnical engineer or their representative at the time of construction.

Continuous wall and isolated spread footings should be at least 16 and 24 inches wide, respectively. The bottom of exterior footings should be at least 16 inches below the lowest adjacent exterior grade. The bottom of interior footings should be at least 12 inches below the base of the floor slab.

Footings placed on engineered fill or firm native sub-grade should be designed for an allowable bearing capacity of 1500 *pounds per square foot (psf)*. The recommended allowable bearing pressure can be doubled for short-term loads such as those resulting from wind or seismic forces. If 1ft of soil is removed and replaced with compacted  $\frac{3}{4}$ " minus rock then a bearing capacity of **3,000psf** may be used.

Based on our analysis the total post-construction settlement is calculated to be less than 1 inch, with differential settlement of less than 0.5 inch over a 50-foot span for maximum column, perimeter footing loads of less than 100 kips and 6.0 kips per linear foot.

Lateral loads on footings can be resisted by passive earth pressure on the sides of the structures and by friction at the base of the footings. An allowable lateral bearing pressure of 100 *pounds per cubic foot (psf/f)* below grade may be used. Adjacent floor slabs, pavements or the upper 12-inch depth of adjacent, unpaved areas should not be considered when calculating passive resistance. An angle of internal friction of 32 degrees can be used.

If construction is undertaken during wet weather, we recommend a thin layer of compacted, crushed rock be placed over the footing sub-grades to help protect them from disturbance due to the elements and foot traffic.

### 3.2 Floor Slabs

Satisfactory sub-grade support for building floor slabs can be obtained from the native sub-grade prepared in accordance with our recommendations presented below. A 6-inch-thick layer of imported granular material should be placed and compacted over the prepared sub-grade. Imported granular material should be crushed rock or crushed gravel that is fairly well graded between coarse and fine, contains no deleterious materials, have a maximum particle size of 1 inch, have less than 5 percent by weight passing the U.S. Standard No. 200 Sieve, and meet OSSC 02630.10 – Dense Graded Aggregate 1”-0”. The imported granular material should be placed in 6-inch-thick lifts and compacted to at least 95 percent of the maximum dry density as determined by American Society for Testing and Materials (ASTM) D 1557. A sub-grade modulus of 125 pounds per cubic inch (pci) may be used to design the floor slab.

Installation of a vapor barrier is required for all the houses built on this lot. It will reduce the potential for moisture transmission through, and efflorescence growth on, the floor slabs. Additionally, flooring manufacturers often require vapor barriers to protect flooring and flooring adhesives and will warrant their product only if a vapor barrier is installed according to their recommendations. The selection and design of an appropriate vapor barrier, if needed, should be based on discussions among members of the design team.

### 3.3 Seismic Design Criteria

The seismic design criteria for this project found herein is based on the IBC 2012/15 and from the USGS Earthquake Hazards Program. A summary of seismic design criterion below: using a Lat of 46.144388 and Long of -123.902365

|                                                   | <b>Short Period</b> | <b>1 Second</b> |
|---------------------------------------------------|---------------------|-----------------|
| Maximum Credible Earthquake Spectral Acceleration | Ss = 1.327g         | S1 = 0.679g     |
| Adjusted Spectral Acceleration                    | Sms = 1.327         | Sm1 = 1.019     |
| Design Spectral Response Acceleration Perimeters  | Sds = 0.884         | Sd1 = 0.679     |



### 3.4 GeoHazard Review

The Oregon HazVu: Statewide Geohazard Viewer<sup>6</sup> was reviewed on 13 March 2016 to investigate mapped geological hazards. This review indicates that the subject site falls within the mapped FEMA7 zone X: area of moderate to low risk but outside the 100-year floodplain. The expected earthquake-shaking hazard is classified as 'severe' and a Cascadia earthquake-shaking hazard classification of 'severe'. The site is classified as containing a high liquefaction hazard. The tsunami hazard for the subject site is classified as 'low to negligible risk zone'. The nearest mapped fault classified as active by DOGAMI are over 15 miles away (southwest) from the subject site. The site is not classified as containing a historic landslide and the nearest slides are east of the Lewis and Clark River where the slopes begin to ascend into the uplands. The landslide susceptibility of the site is mapped as 'low' to 'moderate'.

### 3.5 Driveway Design

Our pavement design recommendations are based on the clayey SILT, 6" of 1 ½" minus rock with 2" of ¾" minus with 4in of AC will meet 25 year traffic growth for interior street design. Geo-textile fabric is required. RSS found in TP #5 a layer of PEAT that is 1ft thick. TP #5 is located the middle of the proposed parking area. The limits of the peat will need to be explored and the *peat removed*. Peat is highly compressible material and vehicle loading on top of it will cause the future parking and driveway areas to have differential settlement. Please call up to 48hours in advance for field inspections.

RSS shall be called to proof roll the sub-grade before rock is placed. Please allow 48hours for all inspections.

### 3.6 Retaining walls and summary of design values

Default lateral soil load for the design of basement and retaining walls supporting level backfill shall be 35 psf/ft for laterally unrestrained retaining walls and 60 psf/ft for laterally restrained retaining walls. Retaining walls shall be designed with SF of 1.5 for sliding and SF of 2 for overturning.

For embedded building walls, a superimposed seismic lateral force should be calculated based on a dynamic force of  $9H^2$  pounds per lineal foot of wall, where H is the height of the wall in feet, and applied at 1/3 H from the base of the wall. The coefficient of friction for allowable lateral sliding can be taken as 0.35. The wall footings should be designed in accordance with the guidelines provided in the "Foundation Design" section of this report. These design parameters have been provided assuming that back-of-wall drains will be installed to prevent buildup of hydrostatic pressures behind all walls.

The backfill material placed behind the walls and extending a horizontal distance equal to at least half of the height of the retaining wall should consist of granular retaining wall backfill

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<sup>6</sup> <http://www.oregongeology.org/hazvu/>

<sup>7</sup> <http://msc.fema.gov/portal/>

as specified in the “Structural Fill” section of this report. The wall backfill should be compacted to a minimum of 95 percent of the maximum dry density, as determined by ASTM D698. However, backfill located within a horizontal distance of 3 feet from the retaining walls should only be compacted to approximately 92 percent of the maximum dry density, as determined by ASTM D698. Backfill placed within 3 feet of the wall should be compacted in lifts less than 6 inches thick using hand-operated tamping equipment (e.g., jumping jack or vibratory plate compactors). If flat work (e.g., sidewalks or pavements) will be placed atop the wall backfill, we recommend that the upper 2 feet of material be compacted to 95 percent of the maximum dry density, as determined by ASTM D698.

A minimum 12-inch-wide zone of drain rock, extending from the base of the wall to within 6 inches of finished grade, should be placed against the back of all retaining walls. Perforated collector pipes should be embedded at the base of the drain rock. The drain rock should meet the requirements provided in the “Structural Fill” section of this report. The perforated collector pipes should discharge at an appropriate location away from the base of the wall. The discharge pipe(s) should not be tied directly into storm water drain systems, unless measures are taken to prevent backflow into the wall’s drainage system.

Settlements of up to 1 percent of the wall height commonly occur immediately adjacent to the wall as the wall rotates and develops active lateral earth pressures.

#### Engineering values summary

|                             |          |
|-----------------------------|----------|
| Bearing capacity            | 1,500psf |
| Coefficient of friction     | 0.28     |
| Bearing capacity using rock | 3,000psf |
| Phi using rock              | 35 deg   |
| Active pressure             | 35pcf    |
| Passive pressure            | 300pcf   |

## 4.0 CONSTRUCTION RECOMMENDATIONS

### 4.1 Site Preparation

Demolition should include removal of existing improvements throughout the project site. Underground utility lines, vaults, basement walls or tanks should be removed or grouted full if left in place. I recommend that soil disturbed during grubbing operations be removed to firm, undisturbed sub-grade. RSS will need to supply a stripping inspection prior to any other work taking place. Please allow 24hours notice for all inspections.

#### 4.1.1 Proof Rolling

Following stripping and prior to placing aggregate base course, pavement the exposed sub-grade should be evaluated by proof rolling. The sub-grade should be proof rolled to identify soft, loose, or unsuitable areas. Please give 24 hour notice to observe the proof rolling. Soft or loose zones identified during the field

evaluation should be compacted to an unyielding condition or be excavated and replaced with structural fill, as discussed in the *Structural Fill* section of this report.

#### **4.1.2 Wet Weather Conditions**

The near-surface soils will be difficult during or after extended wet periods when the moisture content of the surface soil is more than a few percentage points above optimum. See above roadway design section.

#### **4.1.3 Test pit backfilling**

RSS excavated a total of ten (10) test pits to evaluate the site soils. They were backfilled and compacted with the machine. It will need to be re-excavated at time of construction and backfilled as per the standards in this report.

### **4.2 Excavation**

Subsurface conditions of accessible cleared areas of the project site show predominately silty CLAY to a depth explored (9 feet). Excavations in the upper soils may be readily accomplished with conventional earthwork equipment with smooth faced bucket.

### **4.3 Structural Fills**

Fills should be placed over sub-grade prepared in compliance with Section 4.1 of this report. Material used, as structural fill should be free of organic matter or other unsuitable materials and should meet specifications provided in OSSC, depending upon the application. A discussion of these materials is in the following sections.

#### **4.3.1 Native Soils**

Laboratory testing indicates that the moisture content of the typical for optimum moisture content of the soil required for satisfactory compaction. This is depending on the weather conditions at the time of excavation. Native soils can use ASTM D698 and 95% compaction is required. Please supply the engineer with a 5gallon bucket of material 48hours prior to any compaction tests required. Compaction tests are required every 500 cu feet of fill or every 1.5 feet of elevation. When using native soils for cut and fill slopes the maximum cut slope shall be 2H: 1V.

#### **4.3.2 Imported Granular Fill**

The imported granular material must be reasonably well graded to between coarse and fine material and have less than 5% by weight passing the US Standard No.200 Sieve. Imported granular material should be placed in lifts 8 to 12 inches and be compacted to at least 92% of the maximum dry density, as determined by ASTM D 1557. Where imported granular material is placed over wet or soft soil sub-grades, we recommend that a geo-textile serve as a barrier between the sub-grade and imported granular material. Please supply the engineer with a 5gallon bucket of material 48hours prior to any compaction tests required. Compaction tests are required every 500 cu feet of fill or every 1.5 feet of elevation

#### **4.3.3 Pavement Base Aggregate**

Imported base aggregate for roads and parking lots should be clean, crushed rock or crushed gravel. The base aggregate should meet the gradation defined in OSSC 02630.10 – Dense Graded Aggregate 1 1/2”-0,” with the exception that the aggregate should have less than 5% passing a US Standard No. 200 Sieve. The base aggregate should be compacted to at least 92% of the maximum dry density, as determined by ASTM D 1557. Please supply the engineer with a 5gallon bucket of material 48hours prior to any compaction tests required.

#### **4.4 Drainage Considerations**

The Contractor shall be made responsible for temporary drainage of surface water and groundwater as necessary to prevent standing water and/or erosion at the working surface. We recommend removing only the foliage necessary for construction to help minimize erosion. Slope the ground surface around the structures to create a minimum gradient of 2% away from the building foundations for a distance of at least 5 feet. Surface water should be directed away from all buildings into drainage swales or into a storm drainage system.

### **5.0 CONSTRUCTION OBSERVATIONS**

Satisfactory pavement and earthwork performance depends on the quality of construction. Sufficient monitoring of the activities of the contractor is a key part of determining that the work is completed in accordance with the construction drawings and specifications. I recommend that a geotechnical engineer observe general excavation, stripping, fill placement, and sub-grades in addition to base. Subsurface conditions observed during construction should be compared with those encountered during the subsurface explorations. Recognition of changed conditions requires experience. Therefore, qualified personnel should visit the site with sufficient frequency to detect whether subsurface conditions changes significantly from those anticipated. Please allow up to 48hours for scheduling site inspections.

### **6.0 LIMITATIONS**

This report has been prepared for the exclusive use of the addressee, and their architects and engineers for aiding in the design and construction of the proposed development. It is the addressee's responsibility to provide this report to the appropriate design professionals, building officials, and contractors to ensure correct implementation of the recommendations.

The opinions, comments and conclusions presented in this report were based upon information derived from our literature review, field investigation, and laboratory testing. Conditions between, or beyond, our exploratory borings may vary from those encountered. Unanticipated soil conditions and seasonal soil moisture variations are commonly encountered and cannot be fully determined by merely taking soil samples or soil borings. Such variations may result in changes to our recommendations and may require that additional expenditures be made to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.



If there is a substantial lapse of time between the submission of this report and the start of work at the site; if conditions have changed due to natural causes or construction operations at, or adjacent to, the site; or, if the basic project scheme is significantly modified from that assumed, it is recommended this report be reviewed to determine the applicability of the conclusions and recommendations.

The work has been conducted in general conformance with the standard of care in the field of geotechnical engineering currently in practice in the Pacific Northwest for projects of this nature and magnitude. No warranty, express or implied, exists on the information presented in this report. By utilizing the design recommendations within this report, the addressee acknowledges and accepts the risks and limitations of development at the site, as outlined within the report.

## **APPENDIX A**









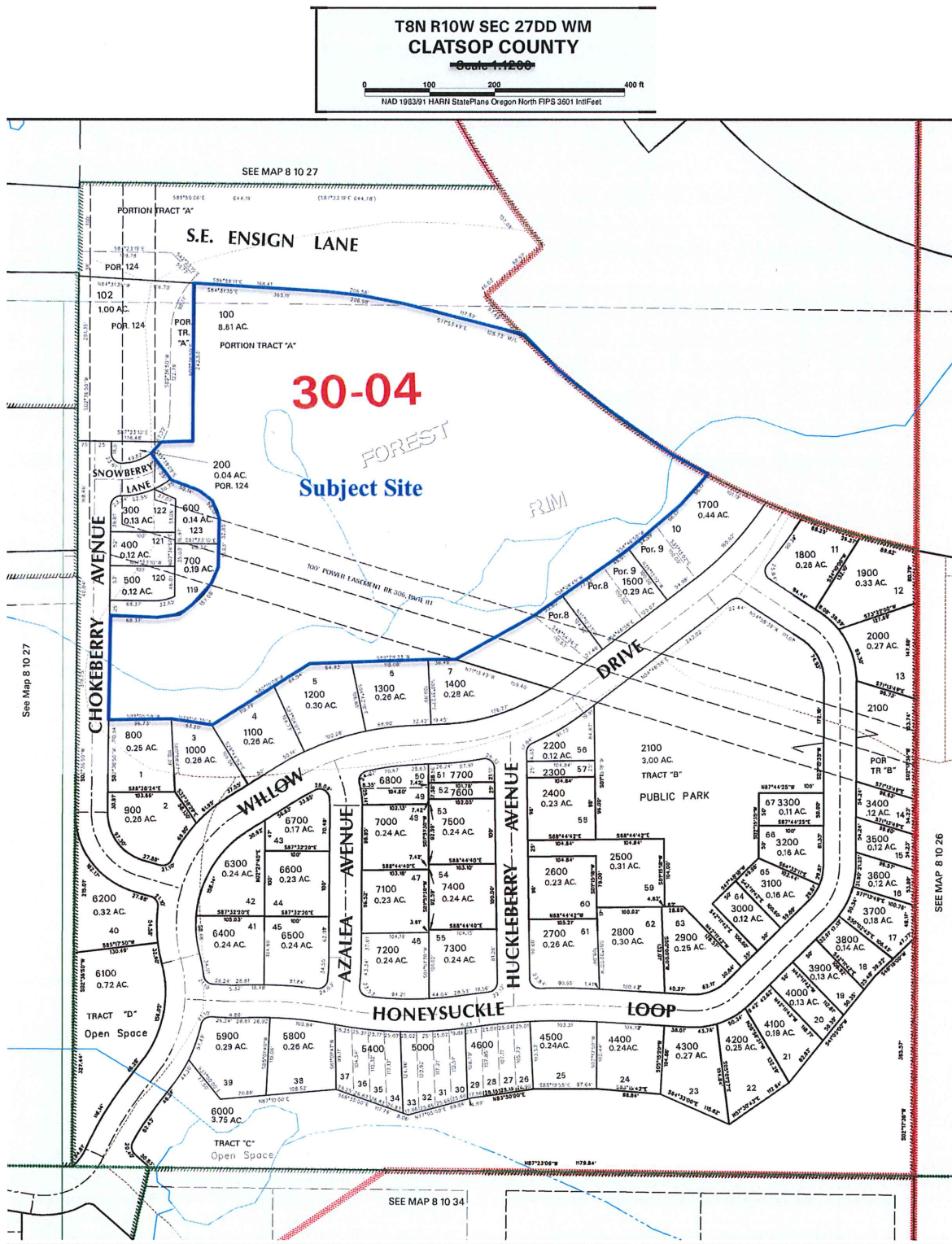


Figure 2: Subject site location on the Clatsop County Assessor's Map



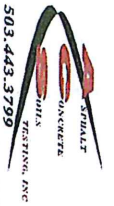






## **APPENDIX B**





**RAPID SOIL SOLUTIONS**  
**3915 SW PLUM STREET**  
**PORTLAND, OR 97219-6018**

7409 SW Tech Center Dr, #145  
 Tigard, OR 97223  
 phn: 503-443-3799  
 fax: 503-620-2748

**PROJECT:** Warrenton APTS  
**LOCATION:**  
**SAMPLE SOURCE:** SEE BELOW

**JOB NO:** 17-6940  
**WORK ORDER NO:**  
**DATE SAMPLED:** 3/7/17

**MECHANICAL SIEVE ANALYSIS**  
**GROUP SYMBOL, USCS (ASTM D-2487)**

| Location & Depth | USCS | LL | PI | SAND         |      |     |     |        |     |     |        |    |      | GRAVEL |      |      |        |        |        |    | COBBLES | Lab # |  |
|------------------|------|----|----|--------------|------|-----|-----|--------|-----|-----|--------|----|------|--------|------|------|--------|--------|--------|----|---------|-------|--|
|                  |      |    |    | Silt or Clay | Fine |     |     | Medium |     |     | Coarse |    | Fine |        |      |      | Coarse |        |        |    |         |       |  |
|                  |      |    |    | #200         | #100 | #50 | #40 | #30    | #16 | #10 | #8     | #4 | 1/4" | 3/8"   | 1/2" | 3/4" | 1"     | 1 1/4" | 1 1/2" | 2" | 3"      | 6"    |  |

MC%

**PERCENT PASSING BY WEIGHT**

|          |      |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |
|----------|------|----|----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|
| TP2 8'   |      | 52 | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9730 |
| TP3 5'   |      | NV | NP |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9730 |
| TP 7 2'  |      | 52 | 13 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9730 |
| TP1 6'   | 28.2 |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 9730 |
| TP4 8'   | 46.9 |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |
| TP5 9'   | 34.9 |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |
| TP6 6'   | 32.6 |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |
| TP8 3'   | 37.6 |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |
| TP9 9'   | 48.3 |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |
| TP10 15' | 37   |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |      |

| BORING  | DEPTH | MC%  |
|---------|-------|------|
| TP2 8'  |       | 40.8 |
| TP3 5'  |       | 29.7 |
| TP 7 2' |       | 35.0 |
|         |       | #### |
|         |       | #### |

REVIEWED BY  
 Doug Esquivel VP

DE/s



# TP#1

SuperLog CivilTech Software, USA www.civiltech.com File: D:\Users\Min\Desktop\WIA WORK\2017\Reports\1st Quarter\GEO\Tech\Warrenton Apartments\TP1 - Warrenton Apts.log Date: 3/16/2017

| Depth | Remarks | Moisture (%) | Dry Density | Blow Counts | Sample Type | Water Table |
|-------|---------|--------------|-------------|-------------|-------------|-------------|
| 0     |         |              |             |             |             |             |
| 1     |         |              |             |             |             |             |
| 2     |         |              |             |             |             |             |
| 3     |         |              |             |             |             |             |
| 4     |         |              |             |             |             |             |
| 5     |         |              |             |             |             |             |
| 6     | 28.2    |              |             |             |             |             |
| 7     |         |              |             |             |             |             |

Surface Elevation: 32  
Boring Date: 3/7/17  
Boring Location: Warrenton, OR  
Drilling Method: Excavator

GWT not encountered

|    |                                                  |
|----|--------------------------------------------------|
| TP | Top Soil with sand, cobble, and gravel           |
| OL | Damp, tan-grey, fine grained, medium, silty CLAY |

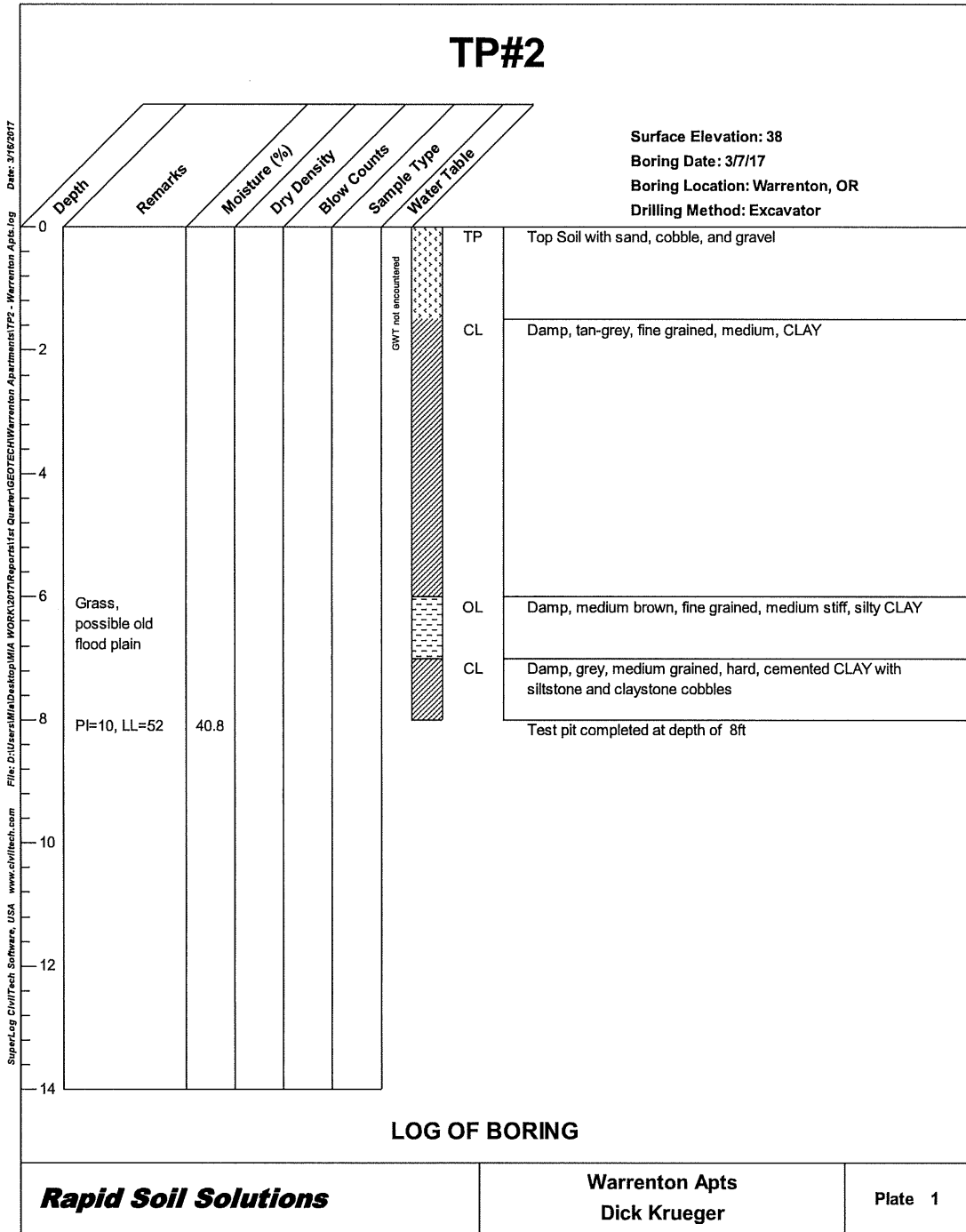
Test pit completed at depth of 6ft

## LOG OF BORING

**Rapid Soil Solutions**

Warrenton Apts  
Dick Krueger

Plate 1



# TP#3

Surface Elevation: 42  
 Boring Date: 3/7/17  
 Boring Location: Warrenton, OR  
 Drilling Method: Excavator

Date: 3/16/2017  
 File: D:\Users\Mia\Desktop\1st Quarter\GEO\TP3 - Warrenton Apts.log  
 SuperLog CivilTech Software, USA www.civiltech.com

| Depth | Remarks      | Moisture (%) | Dry Density | Blow Counts | Sample Type | Water Table                                                                          |
|-------|--------------|--------------|-------------|-------------|-------------|--------------------------------------------------------------------------------------|
| 0     |              |              |             |             | TP          | Top Soil with sand, cobble, and gravel                                               |
| 1     |              |              |             |             |             |                                                                                      |
| 2     |              |              |             |             | CL          | Damp, grey, medium grained, hard, cemented CLAY with siltstone and claystone cobbles |
| 3     |              |              |             |             |             |                                                                                      |
| 4     |              |              |             |             |             |                                                                                      |
| 5     | PI=NP, LL=NL | 29.7         |             |             |             | Test pit completed at depth of 5ft                                                   |
| 6     |              |              |             |             |             |                                                                                      |
| 7     |              |              |             |             |             |                                                                                      |

## LOG OF BORING

**Rapid Soil Solutions**

Warrenton Apts  
 Dick Krueger

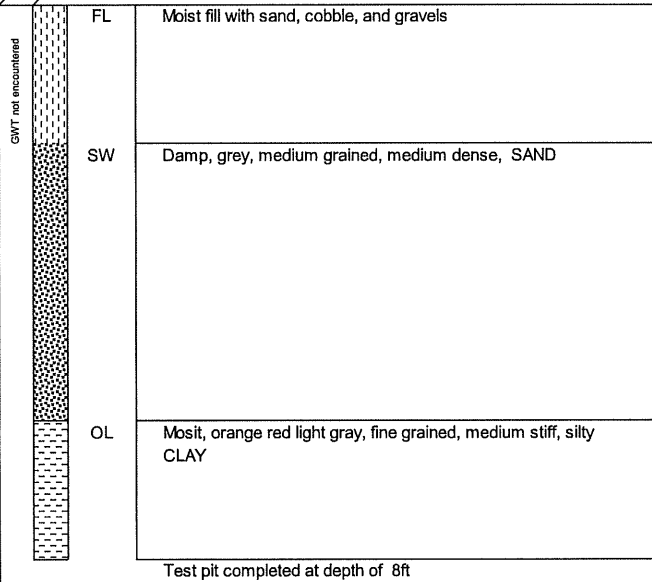
Plate 1

# TP#4

Date: 3/16/2017  
File: D:\Users\Mia\Desktop\1st Quarter\GEO\TECH\Warrenton Apartments\174 - Warrenton Apts.log  
SuperLog CivilTech Software, USA www.civiltech.com

| Depth | Remarks | Moisture (%) | Dry Density | Blow Counts | Sample Type | Water Table |
|-------|---------|--------------|-------------|-------------|-------------|-------------|
| 0     |         |              |             |             |             | FL          |
| 2     |         |              |             |             |             | SW          |
| 4     |         |              |             |             |             |             |
| 6     |         |              |             |             |             | OL          |
| 8     | 46.9    |              |             |             |             |             |
| 10    |         |              |             |             |             |             |
| 12    |         |              |             |             |             |             |
| 14    |         |              |             |             |             |             |

Surface Elevation: 42  
Boring Date: 3/7/17  
Boring Location: Warrenton, OR  
Drilling Method: Excavator



## LOG OF BORING

**Rapid Soil Solutions**

Warrenton Apts  
Dick Krueger

Plate 1



# TP#5

Surface Elevation: 44  
Boring Date: 3/7/17  
Boring Location: Warrenton, OR  
Drilling Method: Excavator

Date: 3/16/2017  
File: D:\Users\lma\Desktop\lma WORK\1077\Reports\1st Quarter\GEO\TECH\Warrenton Apartments\TP5 - Warrenton Apts.log  
SuperLog CivilTech Software, USA www.civiltech.com

| Depth | Remarks | Moisture (%) | Dry Density | Blow Counts | Sample Type | Water Table |
|-------|---------|--------------|-------------|-------------|-------------|-------------|
| 0     |         |              |             |             |             | FL          |
| 2     |         |              |             |             |             | CL          |
| 4     | Peat    |              |             |             |             | PT          |
| 6     |         |              |             |             |             | OL          |
| 8     |         |              |             |             |             | CL          |
| 10    |         | 34.9         |             |             |             |             |
| 12    |         |              |             |             |             |             |
| 14    |         |              |             |             |             |             |

## LOG OF BORING

**Rapid Soil Solutions**

Warrenton Apts  
Dick Krueger

Plate 1

# TP#6

Date: 3/16/2017  
File: D:\Users\Mia\Desktop\WIA WORK\2017\Report\1st Quarrv\GEO\TECH\Warrenton Apartments\TP6 - Warrenton Apts.log  
SuperLog CivilTech Software, USA www.civiltech.com

| Depth | Remarks     | Moisture (%) | Dry Density | Blow Counts | Sample Type | Water Table |
|-------|-------------|--------------|-------------|-------------|-------------|-------------|
| 0     |             |              |             |             |             | FL          |
| 2     |             |              |             |             |             |             |
| 4     |             |              |             |             |             |             |
| 6     | Trace roots |              |             |             |             | CL          |
| 8     |             | 32.6         |             |             |             | CL          |
| 10    |             |              |             |             |             |             |
| 12    |             |              |             |             |             |             |
| 14    |             |              |             |             |             |             |

Surface Elevation: 37  
Boring Date: 3/7/17  
Boring Location: Warrenton, OR  
Drilling Method: Excavator

## LOG OF BORING

**Rapid Soil Solutions**

Warrenton Apts  
Dick Krueger

Plate 1

# TP#7

Surface Elevation: 40  
 Boring Date: 3/7/17  
 Boring Location: Warrenton, OR  
 Drilling Method: Excavator

File: D:\Users\jma\Desktop\WIA WORK\2017\Reports\1st Quarter\GEO\TECH\Warrenton Apartments\177 - Warrenton Apts.log  
 Date: 3/15/2017  
 SuperLog CivilTech Software, USA www.civiltech.com

| Depth | Remarks                                  | Moisture (%) | Dry Density | Blow Counts | Sample Type | Water Table |
|-------|------------------------------------------|--------------|-------------|-------------|-------------|-------------|
| 0     |                                          |              |             |             |             | FL          |
| 2     |                                          |              |             |             |             |             |
| 4     | Roots and fine grained organic materials |              |             |             |             | OL          |
| 6     |                                          |              |             |             |             | OL          |
| 8     |                                          |              |             |             |             | OL          |
| 10    | PI=13, LL=52                             | 35           |             |             |             | OL          |
| 12    |                                          |              |             |             |             |             |
| 14    |                                          |              |             |             |             |             |

GWT not encountered

Mosit fill of silts and clays

Damp, medium-brown, fine grained, soft, organic materials  
 grass roots

Damp, oranges-greys-tans, fine grained, medium stiff, silty CLAY

Damp, medium-brown, fine grained, medium stiff, silty CLAY, trace sands

Damp, oranges-greys-tans, medium grained, medium stiff, silty CLAY

Damp, medium brown-tan, fine grained, stiff, silty CLAY, trace weathered gravels

Test pit completed at depth of 9ft

## LOG OF BORING

**Rapid Soil Solutions**

Warrenton Apts  
 Dick Krueger

Plate 1

# TP#8

Surface Elevation: 34  
 Boring Date: 3/7/17  
 Boring Location: Warrenton, OR  
 Drilling Method: Excavator

Date: 3/16/2017  
 File: D:\Users\Mia\Desktop\WIA WORK\307\Reports\1st Quarter\GED\TECH\Warrenton Apartments\TP8 - Warrenton Apts.log  
 SuperLog CivilTech Software, USA www.civiltech.com

| Depth | Remarks        | Moisture (%) | Dry Density | Blow Counts | Sample Type | Water Table                                        |
|-------|----------------|--------------|-------------|-------------|-------------|----------------------------------------------------|
| 0     |                |              |             |             | TP          | Top Soil                                           |
| 1     |                |              |             |             |             |                                                    |
| 2     | Pocket pen = 2 |              |             |             |             |                                                    |
| 3     |                | 37.6         |             |             | OL          | Moist, orange-tan, fine grained, stiff, silty CLAY |
| 4     |                |              |             |             |             |                                                    |
| 5     |                |              |             |             |             |                                                    |
| 6     |                |              |             |             |             |                                                    |
| 7     |                |              |             |             |             |                                                    |

## LOG OF BORING

Test pit completed at depth of 3ft

**Rapid Soil Solutions**

Warrenton Apts  
 Dick Krueger

Plate 1



# TP#9

Date: 3/16/2017  
File: D:\Users\Mia\Desktop\11A WORK\10171\Report\1st Quarter\GED TECH\Warrenton Apartments\1TP9 - Warrenton Apts.log  
SuperLog CivilTech Software, USA www.civiltech.com

Surface Elevation: 44  
Boring Date: 3/7/17  
Boring Location: Warrenton, OR  
Drilling Method: Excavator

| Depth | Remarks | Moisture (%) | Dry Density | Blow Counts | Sample Type | Water Table |
|-------|---------|--------------|-------------|-------------|-------------|-------------|
| 0     |         |              |             |             |             | FL          |
| 2     |         |              |             |             |             |             |
| 4     |         |              |             |             |             | OL          |
| 6     |         |              |             |             |             |             |
| 8     |         |              |             |             |             |             |
| 10    | 48.3    |              |             |             |             |             |
| 12    |         |              |             |             |             |             |
| 14    |         |              |             |             |             |             |

GWT not encountered

Moist fill of silts and clays

Moist, blue-gray, fine grained, stiff, silty CLAY, trace roots  
stiffer with depth

Test pit completed at depth of 9ft

## LOG OF BORING

**Rapid Soil Solutions**

Warrenton Apts  
Dick Krueger

Plate 1

# TP#10

SuperLog CivilTech Software, USA www.civiltech.com File: D:\Users\Mia\Desktop\WARRENTON APTS\TP10 - Warrenton Apts.log Date: 3/16/2017

Surface Elevation: 24  
Boring Date: 3/7/17  
Boring Location: Warrenton, OR  
Drilling Method: Excavator

| Depth | Remarks | Moisture (%) | Dry Density | Blow Counts | Sample Type | Water Table                              |
|-------|---------|--------------|-------------|-------------|-------------|------------------------------------------|
| 0     |         |              |             |             | TP          | Top Soil                                 |
| 1     |         |              |             |             | OL          | Wet, tan, fine grained, soft, silty CLAY |
| 2     | 37      |              |             |             |             |                                          |
| 3     |         |              |             |             |             |                                          |
| 4     |         |              |             |             |             |                                          |
| 5     |         |              |             |             |             |                                          |
| 6     |         |              |             |             |             |                                          |
| 7     |         |              |             |             |             |                                          |

Test pit completed at depth of 1.5ft

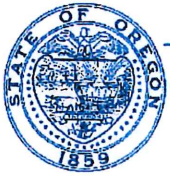
## LOG OF BORING

**Rapid Soil Solutions**

Warrenton Apts  
Dick Krueger

Plate 1





# Oregon

Kate Brown, Governor

June 12, 2017

Dick Krueger  
PO Box 32  
North Plains, Oregon 97133

Re: WD #2017-0169 Wetland Delineation Report for a Proposed  
Residential Subdivision, Clatsop County;  
T 8N R 10W S 27DD Tax Lot 100;  
City of Warrenton Local Wetlands Inventory, Wetland G-1-20

Dear Mr. Krueger:

The Department of State Lands has reviewed the wetland delineation report prepared by Ecological Land Services for the site referenced above. Based upon the information presented in the report, a site visit on June 7th, 2017 and additional information submitted upon request, we concur with the wetland and waterway boundaries as mapped in revised Figure 5 of the report. Please replace all copies of the preliminary wetland map with this final Department-approved map. Within the study area, two wetlands (Wetlands C and D, totaling approximately 0.17 acres), a wetland/waterway (Wetland A, totaling approximately 1.81 acres), and a tributary to Adair Slough (Stream A) were identified.

The wetlands, wetland/waterway, and the tributary are subject to the permit requirements of the state Removal-Fill Law. Under current regulations, a state permit is required for cumulative fill or annual excavation of 50 cubic yards or more in wetlands or below the ordinary high water line (OHWL) of a waterway (or the 2 year recurrence interval flood elevation if OHWL cannot be determined).

This concurrence is for purposes of the state Removal-Fill Law only. Federal or local permit requirements may apply as well. The Army Corps of Engineers will review the report and make a determination of jurisdiction for purposes of the Clean Water Act at the time that a permit application is submitted. We recommend that you attach a copy of this concurrence letter to both copies of any subsequent joint permit application to speed application review.

Please be advised that state law establishes a preference for avoidance of wetland impacts. Because measures to avoid and minimize wetland impacts may include reconfiguring parcel layout and size or development design, we recommend that you work with Department staff on appropriate site design before completing the city or county land use approval process.

## Department of State Lands

775 Summer Street NE, Suite 100

Salem, OR 97301-1279

(503) 986-5200

FAX (503) 378-4844

[www.oregon.gov/dsl](http://www.oregon.gov/dsl)

State Land Board

Kate Brown

Governor

Dennis Richardson

Secretary of State

Tobias Read

State Treasurer





This concurrence is based on information provided to the agency. The jurisdictional determination is valid for five years from the date of this letter unless new information necessitates a revision. Circumstances under which the Department may change a determination are found in OAR 141-090-0045 (available on our web site or upon request). In addition, laws enacted by the legislature and/or rules adopted by the Department may result in a change in jurisdiction; individuals and applicants are subject to the regulations that are in effect at the time of the removal-fill activity or complete permit application. The applicant, landowner, or agent may submit a request for reconsideration of this determination in writing within six months of the date of this letter.

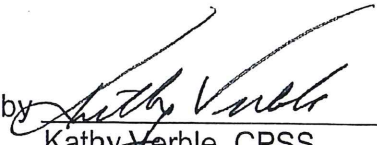
Thank you for having the site evaluated. Please phone me at 503-986-5232 if you have any questions.

Sincerely,



Peter Ryan, PWS  
Jurisdiction Coordinator

Approved by



Kathy Verble, CPSS  
Aquatic Resource Specialist

Enclosures

ec: Steffanie Taylor, Ecological Land Services, Inc.  
City of Warrenton Planning Department (Map enclosed for updating LWI)  
Danielle Erb, Corps of Engineers  
Chris Stevenson, DSL



4/10/2007 3:28 PM S:\Clatsop-OR\Warrenton\1541-01-Forrest Rim\1541.01-Figures\1541.01 - VM, SM, SS, NWI - 03.21.07.dwg josh





T8N R10W SEC 27DD WM  
CLATSOP COUNTY

Scale 1:1200



Canceled  
Accounts

2001  
2002  
2003  
2004  
2005  
2006  
2007

WD 2017-0169

SEE MAP 8 TO 27

S.E. ENSIGN LANE

30-04

FOREST

CHOKERBERRY AVENUE

HUCKLEBERRY AVENUE

AZALEA AVENUE

HONEYSUCKLE LOOP

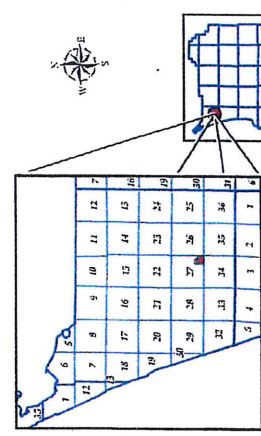
PUBLIC PARK

SEE MAP 8 TO 34



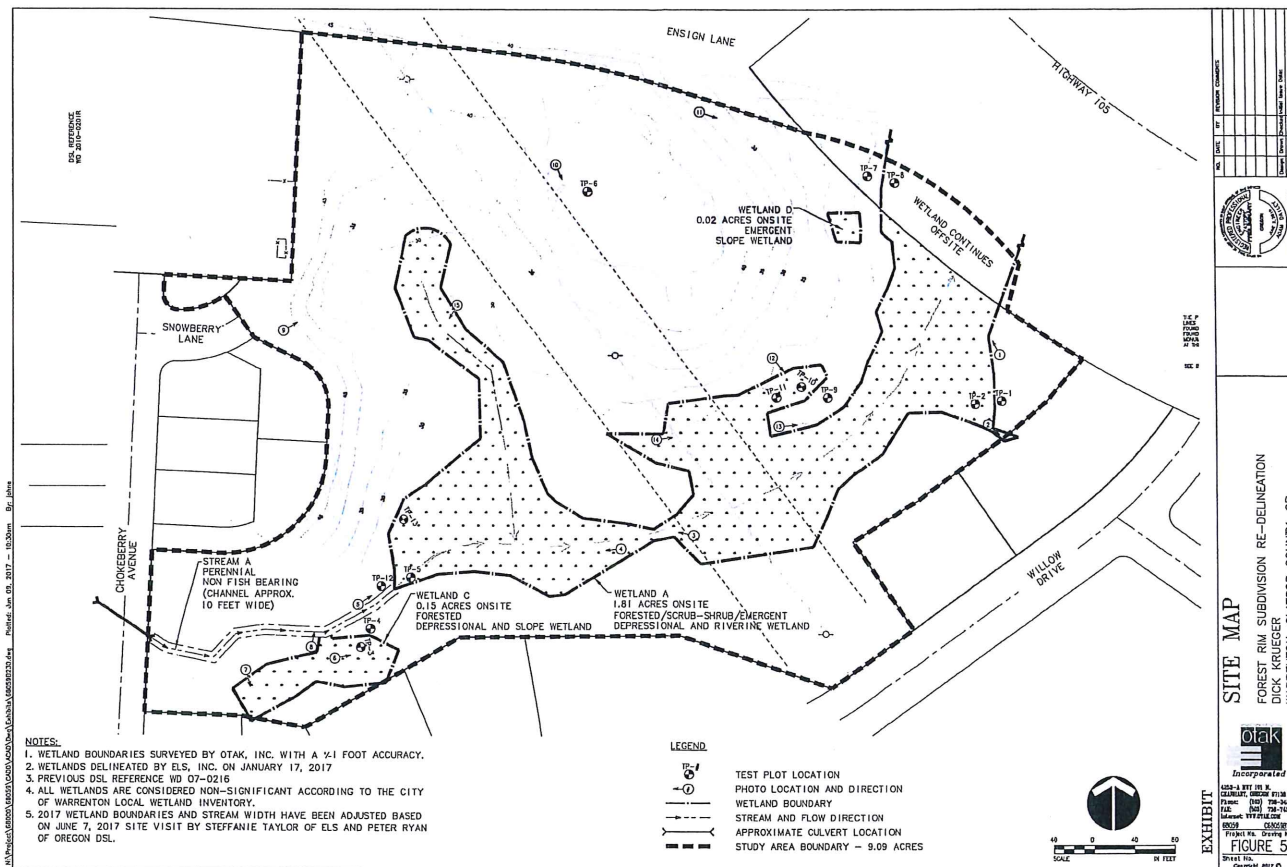
December 07, 2016

8.10.27DD



This map is prepared for reference purposes only. Clatsop County does not warrant the accuracy or completeness of the information shown on this map. The user assumes all responsibility for the use of this map.





DSL WD # 2017-0169  
Approval Issued 6/12/2017  
Approval Expires 6/12/2022





# Krueger Property Management

## Yacht Club Apartments

1310 W. Marine Drive #107

Astoria, OR 97103

503-741-5111



BY: \_\_\_\_\_  
CITY OF WARRENTON

July 28, 2017

Planning Department, City of Warrenton

Skip,

My name is Laurie Willey. I manage Richard Krueger's properties.

We thought it may be helpful to inform you that our 60 apartments at the Yacht Club have a total of six children. Two of which are infants of Military Families.

Most of our tenants are professionals consisting of hospital, military, Clatsop Community College, Court System, Banking and semi-retired people.

Perhaps this may help with our new property Pacific Rim Apartments to have knowledge of what our tenant base consist of.

If you should have any additional questions that we may be of help with please let Mr. Krueger or I know.

Thank you for your time.

Laurie Willey

Property Manager

Krueger Property Management

503.741.5111



CHILD

CHILD

CHILD

CHILD

CHILD

| Rent Roll                   |      |      |     |       |            |                 |            |             |
|-----------------------------|------|------|-----|-------|------------|-----------------|------------|-------------|
| Krueger Property Management |      |      |     |       |            |                 |            |             |
| Yacht Club Apartments       |      |      |     |       |            |                 |            |             |
| Thursday July 27, 2017      |      |      |     |       |            |                 |            |             |
| PEOPLE                      | BLDG | UNIT | BED | SQ FT | Lease EXP  | Name            | Rent       | Price SQ FT |
| 1                           | A    | 100  | 2   | 872   | 5/31/2018  | Martin          | \$1,025.00 | \$1.18      |
| 3                           | A    | 101  | 2   | 872   | 1/31/2018  | Lessard         | \$920.00   | \$1.08      |
| 1                           | A    | 102  | 2   | 851   | 5/31/2018  | Robertson       | \$960.00   | \$1.13      |
| 1                           | A    | 103  | 2   | 851   | M to M     | Lundsford       | \$886.00   | \$1.04      |
| 1                           | A    | 104  | 2   | 851   | 8/1/2017   | Doughty         | \$910.00   | \$1.07      |
| 1                           | A    | 105  | 2   | 851   | 5/31/2018  | Petersen        | \$975.00   | \$1.15      |
| 2                           | A    | 106  | 2   | 872   | M to M     | Douglass        | \$960.00   | \$1.10      |
| 1                           | A    | 107  | 2   | 872   | 4/30/2017  | Willey          | \$0.00     |             |
| 2                           | A    | 200  | 2   | 872   | 8/31/2017  | Ross            | \$1,150.00 | \$1.32      |
| 1                           | A    | 201  | 2   | 872   | 11/30/2017 | Rodriguez       | \$953.00   | \$1.09      |
| 2                           | A    | 202  | 2   | 851   | 2/28/2018  | Park, OSU       | \$1,025.00 | \$1.20      |
| 3                           | A    | 203  | 2   | 851   | M to M     | Tarabochia      | \$933.00   | \$1.10      |
| 2                           | A    | 204  | 2   | 851   | 9/30/2017  | CHURCH, LDS     | \$975.00   | \$1.15      |
| 3                           | A    | 205  | 2   | 851   | 9/30/2017  | Hamar           | \$920.00   | \$1.08      |
| 1                           | A    | 206  | 2   | 872   | 4/30/2018  | Todd            | \$960.00   | \$1.10      |
| 2                           | A    | 207  | 2   | 872   | 4/30/2018  | Guillen         | \$870.00   | \$1.06      |
| 1                           | A    | 300  | 2   | 872   | 8/1/2017   | Winningham      | \$960.00   | \$1.10      |
| 1                           | A    | 301  | 2   | 872   | M to M     | Littlejohn      | \$920.00   | \$1.06      |
| 1                           | A    | 302  | 2   | 851   | 4/30/2018  | Salerno         | \$960.00   | \$1.13      |
| 1                           | A    | 303  | 2   | 851   | M to M     | Johnson         | \$934.00   | \$1.16      |
| 1                           | A    | 304  | 2   | 851   | 6/30/2018  | Douglas         | \$960.00   | \$1.13      |
| 2                           | A    | 305  | 2   | 851   | 1/31/2018  | Milligan        | \$950.00   | \$1.12      |
| 1                           | A    | 306  | 2   | 872   | 9/30/2017  | Vanstane        | \$978.00   | \$1.12      |
| 1                           | A    | 307  | 2   | 872   | M to M     | Sherer          | \$920.00   | \$1.06      |
| 2                           | B    | 100  | 2   | 872   | M to M     | Moyer           | \$1,150.00 | \$1.32      |
| 3                           | B    | 101  | 2   | 872   | 7/31/2018  | Havens          | \$1,025.00 | \$1.18      |
| 1                           | B    | 102  | 1   | 626   | 4/30/2018  | Gambino         | \$975.00   | \$1.56      |
| 1                           | B    | 103  | 1   | 626   | 4/30/2018  | Leif            | \$900.00   | \$1.44      |
| 2                           | B    | 104  | 1   | 626   | 4/30/2018  | Smith           | \$975.00   | \$1.56      |
| 2                           | B    | 105  | 1   | 626   | 6/30/2018  | Meldrum/Matzke  | \$900.00   | \$1.44      |
| 1                           | B    | 106  | 1   | 626   | 5/31/2018  | Bergeron        | \$950.00   | \$1.52      |
| 2                           | B    | 107  | 2   | 872   | 3/31/2018  | Gillum          | \$900.00   | \$1.09      |
| 1                           | B    | 108  | 1   | 626   | 4/30/2018  | DeConto         | \$1,000.00 | \$1.52      |
| 2                           | B    | 109  | 1   | 626   | 5/31/2018  | Griffith        | \$900.00   | \$1.44      |
| 3                           | B    | 110  | 2   | 872   | 4/30/2018  | Wickstrom       | \$1,150.00 | \$1.32      |
| 2                           | B    | 111  | 2   | 872   | 5/31/2018  | Dunkin          | \$1,000.00 | \$1.15      |
| 2                           | B    | 200  | 2   | 872   | 4/30/2018  | Jones           | \$1,150.00 | \$1.32      |
| 2                           | B    | 201  | 2   | 872   | 5/31/2018  | Kurr            | \$990.00   | \$1.15      |
| 2                           | B    | 202  | 1   | 626   | M to M     | Wicker          | \$975.00   | \$1.56      |
| 2                           | B    | 203  | 1   | 626   | 11/30/2017 | Melton/Helligso | \$900.00   | \$1.44      |
| 1                           | B    | 204  | 1   | 626   | 5/31/2018  | SPIES           | \$975.00   | \$1.56      |
| 1                           | B    | 205  | 1   | 626   | 9/2/2017   | Bish            | \$900.00   | \$1.44      |





CHILD

|         |   |     |   |     |           |            |             |        |
|---------|---|-----|---|-----|-----------|------------|-------------|--------|
| 1       | B | 206 | 1 | 626 | 4/30/2018 | Vallo      | \$950.00    | \$1.52 |
| 1       | B | 207 | 1 | 626 | 7/31/2018 | Petersen   | \$900.00    | \$1.44 |
| 1       | B | 208 | 1 | 626 | 6/30/2018 | Miller     | \$900.00    | \$1.52 |
| 1       | B | 209 | 1 | 626 | 4/30/2018 | Sutor      | \$900.00    | \$1.44 |
| 1       | B | 210 | 2 | 872 | 4/30/2018 | Oconnell   | \$1,150.00  | \$1.32 |
| 2       | B | 211 | 2 | 872 | 4/30/2018 | Martinez   | \$1,050.00  | \$1.20 |
| 1       | B | 300 | 2 | 872 | 5/31/2018 | Dennis     | \$1,100.00  | \$1.26 |
| 3       | B | 301 | 2 | 872 | 3/31/2018 | Schwarzman | \$950.00    | \$1.15 |
| 2       | B | 302 | 1 | 626 | 4/30/2018 | Rogers     | \$1,000.00  | \$1.60 |
| 1       | B | 303 | 1 | 626 | 5/31/2018 | Smith      | \$950.00    | \$1.52 |
| 1       | B | 304 | 1 | 626 | 3/31/2018 | Mattila    | \$1,000.00  | \$1.60 |
| 1       | B | 305 | 1 | 626 | 5/31/2018 | Simon      | \$900.00    | \$1.52 |
| 1       | B | 306 | 1 | 626 | 3/31/2018 | Smith      | \$1,000.00  | \$1.60 |
| 1       | B | 307 | 1 | 626 | 7/31/2017 | Reese      | \$950.00    | \$1.52 |
| 1       | B | 308 | 1 | 626 | 4/30/2018 | Lockhart   | \$950.00    | \$1.60 |
| 1       | B | 309 | 1 | 626 | 4/30/2018 | Hennessey, | \$950.00    | \$1.52 |
| 1       | B | 310 | 2 | 872 | 4/30/2018 | Birkenfeld | \$1,150.00  | \$1.32 |
| 2       | B | 311 | 2 | 872 | 4/30/2018 | Knight     | \$1,000.00  | \$1.15 |
| TOTALS: |   |     |   |     |           |            | \$56,756.00 |        |





## CITY OF WARRENTON

---

September 11, 2017

To: Warrenton Planning Commission  
From: Skip Urling, Community Development Director   
Re: Development Code Amendment: Eliminating Mini-Storage Facilities as Conditional Uses in the General Commercial Zone West of Highway 101

At the direction of the City Commission, staff has initiated an amendment to Warrenton Municipal Code 16.40.030 to allow mini-warehouses and similar storage uses in the General Commercial zoning district as conditional uses east Highway 101 only.

This proposal is being reviewed pursuant to Warrenton Municipal Code Sections 16.208.060 (Type IV Procedure - Legislative and Map Amendments), 16.232 (Land Use District Map and Text Amendments), Comprehensive Plan (CP), Statewide Planning Goals, Oregon Revised Statutes and the Oregon Administrative Rules. Notice was sent to affected property owners on August 7, 2017 and published in The Columbia Press on September 1, 2017

### FINDINGS

#### Comprehensive Plan

Section 3.320 Commercial Lands spells out the policies regarding commercial lands. Item (1) states "it is the City's philosophy to promote convenient and attractive commercial areas that, along with other commercial facilities in the County, provided an adequate level of trade and services for local citizens, other County residents and tourists. Commercial enterprises may be permitted in these three kinds of areas.

(c) The purpose of the General Commercial Zone is to allow a broad range of commercial uses providing products and services in the downtown area, the Hammond business district, and along the Highway 101 corridor.

#### Section 9.200 Goal

(3) Strengthen and enhance a strong commercial core within the City of Warrenton.

#### Warrenton Downtown and Marina Master Plans

The Downtown Master Plan calls for a walkable community with a healthy mix of downtown businesses...with a distinct urban character. It envisions active store fronts and a workaday setting for local commerce. A general vision is to improve the central business district for shopping working and living.



The Downtown Master Plan identifies a variety of business types that were seen as well suited to a downtown Warrenton location and desirable by residents participating in the master planning effort. These include:

**Community Businesses**

- Dry cleaners
- Coffee shop/bakery
- Deli or restaurant
- Health Club
- Marine chandlers
- Camping, outdoors and cycling supply
- Fishing tackle
- Bookstore
- Antiques

**Professional Businesses**

- Doctors/dentists
- Insurance
- Lawyers
- Brokers
- Real estate agents/loan officers

**Tourist Businesses**

- Seafood sales and restaurant
- Souvenirs groceries
- Groceries (to serve Fort Stevens) wine store
- Hotel/B&B
- Art gallery
- Clothes and shoes
- Horseback riding
- Bike rentals and repairs
- Scooter/motorbike rental
- Kayak/small craft
- Boat tours

Both the CP and master plan are silent on the specific issue of the appropriateness of mini-storage facilities as a core area use. But due to the nature of their function, mini-storage facilities would not add to the vibrancy and economic boost in the downtown core areas.

## **Compliance with Oregon's Statewide Planning Goals and Related Rules and Statutes**

### ***Goal 1, Citizen Involvement***

Goal 1 outlines policies and procedures to be used by local governments to ensure that citizens will be involved "in all phases of the planning process."

This proposal for a development code amendment is being reviewed in accordance with the acknowledged provisions for citizen involvement in the municipal code. It does not propose any changes to those provisions. This application therefore complies with Goal 1.

### **Goal 2, Land Use Planning**

Goal 2 requires local governments to "establish a land use planning process and policy framework as a basis for all decisions and actions related to use of land and to assure an adequate factual base for such decisions and actions."

The proposal and applicable comprehensive land use plan policies is being reviewed by the Planning Commission who will forward a recommendation to the City Commission who will ultimately make a decision on it, which satisfies Goal 2.

### **Goal 3, Agricultural Lands**

Goal 3 deals with conservation of "agricultural lands" as defined in that goal. The goal's provisions are directed toward counties, not cities (such as Warrenton). The goal states, "Agricultural land does not include land within acknowledged urban growth boundaries...." This goal does not apply.

### **Goal 4, Forest Lands**

Goal 4 deals with conservation of "forest lands" as defined in that goal. Details about such conservation are set forth in related administrative rules: OAR Chapter 660, Division 006. OAR 660-006-0020 states: "Goal 4 does not apply within urban growth boundaries...." This goal does not apply.

### **Goal 5, Natural Resources, Scenic and Historic Areas, and Open Spaces**

The basic aim of Goal 5 is "To protect natural resources and conserve scenic and historic areas and open spaces." Because no such natural resources, scenic and historic areas and open spaces will be affected, this goal does not apply.

### **Goal 6, Air, Water and Land Resources**

Statewide Planning Goal 6 is “to maintain and improve the quality of the air, water and land resources of the state.” It deals mainly with control of “waste and process discharges from future development.” Because no development is proposed, this goal does not apply.

### **Goal 7, Areas Subject to Natural Hazards**

Statewide Planning Goal 7 is to “to protect people and property from natural hazards.” No part of the proposal will affect the city’s approved Goal 7 plan, therefore this goal is not applicable.

### **Goal 8, Recreational Needs**

Goal 8 is “to satisfy the recreational needs of the citizens of the state and visitors and, where appropriate, to provide for the siting of necessary recreational facilities including destination resorts.” This goal does not apply.

### **Goal 9, Economic Development**

Goal 9 calls for the provision of adequate opportunities throughout the state for a variety of economic activities vital to the health, welfare and prosperity for Oregon’s citizens.

This proposal is to amend the development code to limit mini-storage facilities as conditional uses to those areas zoned as General Commercial east of Highway 101. Precluding such uses along the gateways to and the city center would eliminate the potential for such development which does not provide for significant employment opportunities or tax revenue and reserve that potential for uses that do. This goal is satisfied.

### **Goal 10, Housing**

Statewide Planning Goal 10 is “to provide for the housing needs of citizens of the state.” The goal requires cities to assess future need for various housing types and to plan and zone sufficient buildable land to meet those projected needs. This goal is not applicable.

### **Goal 11, Public Facilities and Services**

Goal 11 is “to plan and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development.” Mini-storage facilities are typically low users of public facilities and services. Eliminating the development of such uses west of Highway 101 will not affect this goal. This goal is satisfied.

### **Goal 12, Transportation**

Goal 12 is “to provide and encourage a safe, convenient and economic transportation system.”

Mini-storage facilities typically generate very little traffic. Eliminating the development of such uses west of Highway 101 will not affect this goal. This goal is satisfied.

### **Goal 13, Energy**

Goal 13 is simply “to conserve energy.”

This application for a code amendment would not affect the plan provisions for energy conservation. Any development within the boundaries of the subject property after the proposed rezoning would be subject to those provisions and to all applicable state and federal requirements for energy conservation. This application therefore complies with Goal 13.

### **Goal 14, Urbanization**

Goal 14 is “to provide for an orderly and efficient transition from rural to urban land use, to accommodate urban population and urban employment inside urban growth boundaries, to ensure efficient use of land, and to provide for livable communities.” This is a code amendment to regulate uses and does not affect this goal.

### **Goal 15, Willamette River Greenway**

Goal 15 deals with lands adjoining the Willamette River and does not apply to this proposal.

### **Goal 16, Estuarine Resources**



Goal 16 is “to recognize and protect the unique environmental, economic, and social values of each estuary and associated wetlands; and to protect, maintain, where appropriate develop, and where appropriate restore the long-term environmental, economic, and social values, diversity and benefits of Oregon's estuaries.” Because the code amendment would not affect any natural estuarine characteristics, this goal does not apply.

#### **Goal 17, Coastal Shorelands**

Goal 17 aims “to conserve, protect, where appropriate, develop and where appropriate restore the resources and benefits of all coastal shorelands, recognizing their value for protection and maintenance of water quality, fish and wildlife habitat, water-dependent uses, economic resources and recreation and aesthetics.” This goal does not apply.

#### **Goal 18, Beaches and Dunes**

Goal 18 says that “coastal areas subject to this goal shall include beaches, active dune forms, recently stabilized dune forms, older stabilized dune forms and interdune forms.” No such land forms exist within the area of the proposed amendment this goal does not apply.

#### **Goal 19, Ocean Resources**

Goal 19 deals with management of resources in Oregon’s territorial sea (the waters bordering the state’s coastline). No part of the territory subject to the proposed amendment lies within or next to the territorial sea. Goal 19 thus does not apply to this application.

### **CONCLUSIONS AND RECOMMENDATION**

While the comprehensive plan does not provide clear guidance on the issue of ministorage facilities in the gateway corridors to and the downtown area, the downtown master program identifies the types of businesses desired to create a commercial area that exhibits great vitality. The proposed code amendment is also not in conflict with the statewide planning goals. Accordingly, based on the findings above, staff recommends the Planning Commission forward Ordinance No. 1214-A allowing mini-storage facilities as conditional uses in the C-1 General Commercial zoning district only east of Highway 101 to the City Commission with a recommendation to adopt.

*Suggested motion: Based on the findings and conclusions of the September 11, 2017 staff report, I move to forward Ordinance No. 1214-A to the City Commission with a recommendation to adopt.*

Ordinance No. 1214-A

Introduced by all Commissioners.

**An Ordinance Amending Warrenton Municipal Code (WMC) 16.40.030 [General Commercial] Conditional Uses to Limit the Development of Mini-warehouses or similar storage uses in the C-1 General Commercial Zoning District as Conditional Uses East of Highway 101 only.**

The City Warrenton ordains as follows:

**Section 1.** WMC 16.40.030 is hereby amended as follows:

The following uses and their accessory use may be permitted in the C-1 zone when approved under Chapter 16.220 and shall comply with Sections 16.40.040 through 16.40.060 and Chapters 16.124 (Landscaping) and 16.212 (Site Design Review):

A. Only the following uses and their accessory uses are permitted along Highway 101, SE Marlin and SW Dolphin Avenues, and shall comply with the above noted sections and Chapter 16.132:

1. Cabinet, carpenter, woodworking or sheet metal shops.
2. Processing uses such as bottling plants, bakeries and commercial laundries.
3. Research and development establishments.
4. Wholesale storage and distribution facilities, including cold storage.
5. RV park.
6. Similar uses as those stated in this section.

B. The following uses and their accessory uses are permitted in all other C-1 zoned areas within the City limits of Warrenton:

1. Cabinet, carpenter, woodworking or sheet metal shops.
2. Building contractor shops, including plumbing, electrical and HVAC.
3. Fuel oil distributor.
4. Processing uses such as bottling plants, bakeries and commercial laundries.
5. Research and development establishments.
6. Wholesale storage and distribution facilities, including cold storage.
7. Veterinary clinic, kennels.
8. Tool and equipment rental.
9. Mini-warehouses or similar storage uses, east of Highway 101 only.
10. Church, synagogue, or other place of worship.

11. Commercial uses with 2nd floor residential use(s) [apartment(s)].
12. RV park.
13. Similar uses to those listed in this section.

**Section 2. Severability.** If any section, sentence, clause or phrase of this ordinance is ruled invalid by a court of competent jurisdiction, the remaining portion of this ordinance shall remain valid and in full force and effect.

**Section 3. Effective Date.** This ordinance shall be effective 30 days after the second reading.

**ADOPTED by the City of Warrenton, Oregon, this \_\_\_\_\_ day of \_\_\_\_\_, 2017.**

**First Reading:** \_\_\_\_\_

**Second Reading:** \_\_\_\_\_

Approved:

\_\_\_\_\_  
Henry Balensifer, Mayor

Attest:

\_\_\_\_\_  
Dawne Shaw, Deputy City Recorder



## CITY OF WARRENTON

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### Minutes Warrenton Planning Commission Regular Meeting August 10, 2017

Fort Pointe Planned Unit Development SUB 17-1

**Commissioners Present:** Chair Chris Bridgens; Vice-Chair Paul Mitchell; Commissioners Vince Williams, Chris Hayward, Ken Yuill, Ryan Lampi, Mike Moha had an excused absence.

**Staff Present:** Community Planning Director Skip Urling; Building Clerk Janice Weese

#### **Pledge of Allegiance**

**Approval of Minutes:** Commissioner Mitchell motioned to approve the July 13<sup>th</sup> minutes. Commissioner Hayward seconded. The motion passed unanimously.

**Disclosure by the Commissioners:** Commissioners answered no to all questions or conflicts.

**Subject of Review:** Fort Pointe Development SUB-17-1

#### **Public Hearing Open**

**Staff Report:** Application is for a planned unit development on 53 acres adjacent to NW Ridge Road. The entire property is 277 acres. The project will include 160 single family homes . Eight acres will be reserved for 300 multiple family and 20 townhomes and duplexes. The subject property covers three zoning districts which would allow for 934 dwelling units. The Planned Unit Development code calls for a preliminary PUD plan and then comes back with a final PUD plan before they can move forward to construction drawings and getting a final plat recorded with Clatsop County. There will be around four phases to the construction of the single family dwellings with one phase per year. This will provide an opportunity of different housing types. There are a few issues that need to be addressed, but recommending that the planned unit development preliminary plan be approved but not the preliminary plat of the 160 lots that are being purposed. There are 29 conditions of approval.

Chair Bridgens mentioned the berm that is adjacent to Ridge Road. It is a perfect berm that would allow the project to have privacy and buffer sound and more of a natural vegetation look as you go down the road.

Commissioner Williams expressed his concerns providing parks for such a large development.



**Applicant or Representative Testimony:**

Glen Bolen – OTAK Inc.  
808 SW 3<sup>rd</sup> Avenue Suite 300  
Portland, OR 97205

This is a very large site but only doing a small portion of it right now. This is for a preliminary plan of 160 lots on 45 acres and the other eight acres are reserved for future development for townhomes and multifamily. Tried to develop a straight approach. There are three access points to Ridge Road. After the pre application conference with the city, the city sent them a letter with criteria to look at. They modified their plans using OTAK's storm water engineers and hired an outside firm to do their traffic analysis. Also hired a wetlands firm and is working with Department of State Lands to get recorded. The geotech report will be in the next phase. Understands the need for parks and play spaces and responded to the code and ordinance as written in the development code book. They looked at the measurements to the soccer fields and thought that was an acceptable distance so they listed that as a park on their plans. The subdivision is next to Fort Stevens State Park that would allow the residences access to open space and trails. Has models that test the turning radius of fire engines that will allow for a 25 foot turn around instead of the 45 foot turning radius that the Fire Chief is asking for.

Commissioner Mitchell spoke up and stated that the parks are very important to him. Doesn't feel that it fulfills the code to have kids going to Fort Stevens to play, go bicycling and not be able to cross the road safely. The soccer fields fit into that category also. Very concerned that homes are being built without places where kids can go. Parks were suppose to go into Kalmia, Jade and Juniper Ridge and it never happened. The builder was willing to put something in but the city could not take ownership to keep up the maintenance for it; the city should not have that responsibility. Feels that the builders should create something for the families of that neighborhood but does not think that they should have to keep up the maintenance either. Thinks there should be an understanding in advance that the buyers take care of the maintenance, mowing etc.

Commissioner Yuell agreed with Commissioner Mitchell about needing parks and felt that CCR's or HOA's should be in place to take care of the parks.

Chair Bridgens spoke up and shared that they have the authority to suggest that an HOA or CCR be established and the fees from the residence pay for the maintenance.

Commissioner Mitchell spoke up and said that he feels also that the fire chief's recommendations regarding safety should come first.

A reply was given that they could work on models with the city engineer and fire chief to come up with a solution.

Commissioner Lampi asked what was the reasoning behind having an asphalt meandering sidewalk instead of concrete.

Replied that it would have more of a trail feel.

Commissioner Yuell stated that because of the size of the subdivision, there should be one more access road to the initial three by lot 73 for getting in and out in case of an emergency and for ease.

It was noted that the fire chief said that three exits meets the fire code requirements.

Chair Bridgens brought up that rolled curbs are the reason that a lot of cars are parked up on the sidewalks on Kalmia and Pacific Ridge. Can't expect the police to ticket them even with no parking signs on one side of the street.

Mr. Bolden stated that there is grass between the curb and the pathway. Rolled curbs are a city standard.

Mr. Yuell spoke up and said that the life expectancy of exterior generators, due to rust, are around ten years ; they would save the city a lot of money years down the road if the generator was put inside the pump house.

The superintendant of the school felt they would be able to accommodate all the new students that the development would generate.

Concern was voiced on the 11<sup>th</sup> Street drainage and how was it purposed to be handled. Mr. Bolden replied that the property should not have any drainage affect from the new development. One of the conditions is that a drainage report will be done by OTAK which is their specialty and they are also bound by Oregon Law to not discharge on someone's property. The utility lines will be bored underground; the eastern end there will be an access road that they will construct that the Public Works Department could use for maintenance.

Andres Mirawontes  
16 Encore Court  
Newport Beach, CA. 92663

One of the partners in the project. Would like to start the project as soon as possible. Worked with the local builders who understand the market and the need for housing and discussed lot sizes and location. There is a need for single family residential. They will be doing a market analyst to understand further the needs for the multifamily for rent.

Dale Barrett - OTAK Inc.  
4253 A Hwy 101 N  
Seaside, OR 97138

Brought up a safety issue for having another access point into a highway that is already busy with boats and pickups; that might be a potential accident by adding more access in. Felt that having three accesses would be sufficient for handing the subdivision.

Regarding the park requirements, there was clarification on the revision in the ordinance about how to measure where the subdivision is. Planning Director Urling stated that there was no change in the ordinance. It was a policy interpretation by resolution at the city commission after their application. Might have some spaces to put in some platforms or viewing areas in a couple of the lots that they pulled out so they wouldn't have to cram houses so close to the wetlands.

Mr. Barrett brought up that there were old plans in the county that showed that 11<sup>th</sup> Street was proposed to be a county road. There were some old structures and bridges at one time then ditches made in the 11<sup>th</sup> Street right of way. 11<sup>th</sup> Street was platted over approximately 1200 feet from where the last RV camp spots are in KOA. The county never formalized that road. When they sold to KOA in the early 1980's they sold the whole thing and never reserved the right of way, so KOA is the owner.

Commissioner Lampi spoke up and mentioned that the lot sizes are large and if they could be made smaller to allow increasing the width of the road. Mr. Barrett replied that building envelope that would be affected more than the lot sizes because of the steepness of some of the slopes on the lots.

Adam Dailey – OTAK Inc.  
4253 A Hwy 101 A  
Seaside, OR 97138

Agreed that the street width verses the lot sizes are a big issue and agreed with Mr. Barrett. If they can leave the vegetated buffer alone along Cattail and Ridge Road they will. The road width between curbs is 27 feet. There is a 12 foot travel lane with a 2 foot section that is curb and gutter. Of that two feet, only half a foot of that is the curb so there is still a foot and half, which makes that a 13 and a half foot wide travel lane.

The Fire Chiefs request for a 45 foot radius on the inside of the turning of the truck is extremely large. The outside radius on a standard cul de sac is 45 feet which is an approved cul de sac that the Fire Chief will use. All the entrances show that the fire truck will be able to navigate a 25 foot radius. Have coordinated with the Fire Chief with past projects and is confident that he would agree that the 25 foot corner radius would work.

### **Testimony in Opposition**

Scott Andros – Tagg Farm  
695 NW 9<sup>th</sup> Avenue  
Warrenton, Or 97146

Feels that the ditch on 11<sup>th</sup> Street that runs east and west will flood back into Tansy Creek which has been bulldozed in; the wetlands are being destroyed. Expressed concern that studies have not been done on the impact of the wildlife and habitat. Feels the Tagg farm will be flooded.

### **Public Hearing Closed**

### **Applicant Rebuttal**

Adam Dailey – OTAK Inc.

There are a couple hundred acres between the development and the Tagg farm. The majority of that property will most likely go into a conservancy. Have been very careful not to affect the wetlands.

### **Public Testimony Closed**

Commissioner Lampi asked our City Engineer, Colin Stelzig, to speak on the concerns regarding the drainage issues. They have been dealing with this issue for some time

because the Smith Lake issues that this may be connected with. This is basically a sand dune with lots of infiltration. When this is done there will be impervious areas so there will be runoff. There are processes that can be put in place that will slow it down. OTAK are experts in hydrology and drainages and feels certain when their report is complete and if there are any issues, they will take care of it.

### **Discussion Among Commissioners**

Planning Director Urling added a few comments to the recommendations. For condition number 13, he stated that the easement is put on the plat.

Adding the words, " to the satisfaction of the Fire Chief" to condition numbers 23 and 24 so they can negotiate with him and he is ok with it.

Commissioner Lampi asked if condition number 25 could be discussed at a later date or if it's contingent on this going through right now. Skip replied that he was not sure what the difference was between the street exit postings and the Fire Chief's. They addressed both width and turning radius and parking availability. In other cul de sac's in town where there are no , no parking signs, people park in them. Should there be a fire in one of the houses served with access like that cul de sac, it is going to create a lot of confusion plus people parking on the street legally but within the turning radius of the fire truck. Commissioner Lampi stated that the width could be adequate but wanted to make sure by approving this that they are not locked into it. Skip answered that they should address the road width on Pennyroyal Lane with the Fire Chief. Mr. Lampi suggested that the City Engineer be involved also.

Would like the commission to require the development or the owners to set up a CCR or HOA to maintain the neighborhood parks. It was suggested that the builder put them in and the residences take care of the equipment and lawns mowed. The Planning Director replied that it is already built into the code. The HOA would maintain the park unless it is dedicated to the city.

Commissioner Williams thought that the Fort Pointe Partners will do a good job and was impressed that they are dedicating the rest of the wetlands to a conservancy.

Commissioner Yuell expressed his concern for another exit in the development.

Chair Bridgens expressed her concern for the traffic on SW 9<sup>th</sup> Street. There are school children walking home on 9<sup>th</sup> which is very narrow and dangerous. Thinks that a sidewalk is needed due to the increase of traffic there. It's a safety issue that needs to be addressed.

### **Motion by Commissioners:**

Commissioner Williams motioned to approve the preliminary plan of the Fort Pointe Planned Unit Development, SUB-17-1, subject to the 29 conditions of approval with the inclusions of numbers 23, 24 and 25 to provide an option of the satisfaction of the Fire Chief and City Engineer on road widths and also to revise number 28 as suggested by the County Public Works Director. Commissioner Yuell seconded. The motioned passed unanimously.

### **Other Business**



Commissioner Williams suggested that will all the new developments that are coming in Warrenton extra help might be needed for staff in the office.

Discussed that a request from the mayor to have a joint work session with the City and Planning Commission on road standards, changing or enhancing the park requirements in the subdivision ordinance and a few things that the City Manager might bring up. Dates were suggested and agreed upon for Tuesday August 29<sup>th</sup>.

### **Meeting Adjourned**

Attest and submitted by

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Janice Weese, Building Clerk

Approved

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Chris Bridges, Planning Commission Chair