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April 1, 2021

To: Warrenton Planning Commission

From: Scott Hess, Community Development Director

Re: ITEM 5: This proposal is for 42 units of affordable multi-family housing on approximately 1.54 acres located in the Chelsea Gardens neighborhood. The proposed development is located on Tax Lots 81027BC0: 1500, 1503, 1600, and on partial Tax Lots 81027BC0: 1700, 2100, and 2200. The address is approximately 700 SE 14th Place, Warrenton. The subject property is zone Commercial Mixed Use (C-MU) (File: SDR 20-8)

Background:

In 2018 Warrenton City initiated a rezone of the Chelsea Gardens area from a combination of residential and industrial zoning to Commercial Mixed Use (C-MU). In 2019 the City engaged in a Master Plan process of the area, and developed code criteria for this area under Neighborhood Master Plans, Spur 104 Performance Measures and Redevelopment Standards. The Master Plans code states that this area shall include housing up to 350 units, and commercial space up to 50,000 square feet.

The Trillium House apartments are the first land use application to come into the area under the new zoning and master plan guidelines. This project will provide 42 units of State Funded affordable housing with the majority of units renting to residents who earn 80% of the area's median income.

Public Process, Procedures & Public Notice:

Applicable Warrenton Municipal Code (WMC) chapters and sections include:

16.44 Commercial Mixed Use (C-MU) District,
16.212 Site Design Review – Includes **Variance V 21-1 Analysis and Findings**
16.128 Vehicle and Bicycle Parking,
16.120 Access and Circulation,
16.132 Clear Vision Areas,
16.116 Design Standards Neighborhood
16.188 Multifamily Housing Design Standards,
16.192 Large Scale Developments,
16.256 Traffic Impact Study,
16.114 Neighborhood Master Plans,
16.208.050 Type III Procedure (Quasi-Judicial)

Public Notice letters were sent to affected property owners on January 22, 2021 and placed in The Columbia Press on February 1, 2021.

At the applicant's request, the item was continued from the February 11, 2021 meeting to the April 8, 2021 meeting in order to address traffic concerns, and apply for the Class 2 Variance for a 16% reduction in vehicular parking.

Findings

Below are the applicable code sections, applicant responses, and staff findings.

Chapter 16.44 Commercial Mixed Use (C-MU) District

Multifamily development is a permitted use, with development standards that must meet 16.36.040 Residential High (RH) zoning. The maximum density for multifamily structures is one dwelling unit per 1,600 square feet of site area. In order to meet the land area needed for this site, the developer must purchase property, combine lots, and complete a lot line adjustment. The developer has submitted a lot line adjustment, and has an option to purchase properties in order to provide a total of 67,200 square feet providing the necessary land area for 42 units.

Staff finding: The proposal meets the density requirement. Completion and recording of the Lot Line Adjustment and Lot Combination is a condition of approval prior to moving forward to building permit.

Chapter 16.212.040 review criteria:

A. Application Review Procedure

1. Site Design Review – Determination of Type II or III Application

The new apartments to be located approximately 700 SE 14th Place consist of 42 units and 41,200 square feet of new building area. This will require a Type III process.

Staff finding: Staff agrees.

B. Application Submission Requirements

1. Proposed Site Plan

a. The proposed development site, including boundaries, dimensions, and gross area.

Staff finding: The drawing set meets these requirements.

b. Natural land features identified which are proposed to be removed or modified by the development, including modifications to existing drainage patterns.

There are no natural land features on the site. The site will remain flat with the necessary slopes required for drainage. There are existing trees planted by the current property owner approximately 20 years ago that will be removed.

Staff finding: Staff agrees.

c. The location and dimensions of all proposed public and private streets, drives, rights-of-way, and easements.

This property has no current rights-of-way. The locations of public and private drive isles are shown on the site plan, sheet A1.1. There is a proposed off-site improvement to SE Galena St for fire access, as well as half street improvements to SE 14th Place.

Staff findings: Staff agrees.

d. The location and dimensions of all existing and proposed structures, utilities, pavement and other improvements on the site. Setback dimensions for all existing and proposed buildings shall be provided on the site plan.

The location of existing site conditions, plantings, and utilities, etc. are shown on the attached existing conditions plan, A1.0. The site plan includes the proposed location of buildings, pavement, and sidewalks with dimensioned setbacks and sizes. The proposed utilities are shown on the preliminary utility plan, C1.1.

Staff finding: Staff agrees.

e. The location and dimensions of entrances and exits to the site for vehicular, pedestrian, and bicycle access.

An access to the site has been provided on SE14th Place with a 26-foot drive aisle accessing the site and parking area. Entrances to the building are clearly indicated with sidewalks. Additional Sidewalks are included along SE 14th Place as well as in front of the apartment building. Bicycle circulation utilizes the vehicular drive aisle with both short-term and long-term bicycle parking provided on-site.

Staff finding: The facilities and dimensions are noted.

f. The location and dimensions of all parking and vehicle circulation areas (show striping for parking stalls and wheel stops, as applicable), and proposed paving materials.

RESPONSE: The parking and vehicle circulation is shown on the site plan, A1.1. The project has 62 parking spaces. The developer is asking for a **variance to the parking standard** consisting of a reduction of 16% from vehicle parking spaces. This parking reduction from 74 required spaced is based on additional bike parking, and carpool/vanpool spaces, and deemed more than adequate to accommodate target resident vehicles and their

guests. The developer states that the parking reduction will allow more greenspace for the project, including a play yard and community garden, and benefit the residents and community.

VARIANCE ANALYSIS V-21-1:

Per WMC 16.272.020 Variance Requests may be granted only if, on the basis of the written application, investigation, and evidence submitted by the applicant, findings of fact are made by the zoning administrator (for Class 1 applications) or Planning Commission (for Class 2 applications) that satisfy the criteria of subsections A through F of the above section. Prior variances allowed in the neighborhood shall not be considered by the granting authority in reaching its decision. A determination of whether the standards set forth in this section are satisfied necessarily involves the balancing of competing and conflicting interests. Each request shall be considered on its own merits

Background:

The applicant is requesting a Variance to the parking standards based on providing Carpool/Vanpool spaces as well as additional bicycle parking. The overall reduction being requested 16%. Staff's interpretation of the code is that the Community Development Director may grant a parking reduction based on the site providing specific elements in 16.128.030.10.a. The code states "The Community Development Director may reduce or waive the off-street parking standards for sites with one or more of the following features:" The list includes up to 10% reduction for including vanpool/carpool spaces, another option is up to 10% reduction if the site has more than the minimum number of bicycle parking spaces. Staff feels that the combined 16% reduction is more appropriate to be considered by the Planning Commission. The Planning Commission will need to review the site in light of its anticipated clientele and use and determine if the reduction of parking would not cause detrimental impacts to surrounding property owners.

The applicant provided the following explanations of the six criteria, which will be followed by Staff Findings:

A. The hardship was not created by the person requesting the variance.

> We are requesting a 16% parking reduction from 74 spaces to 62 spaces. The hardship was not created by the Trillium House project team. We believe this reasonable parking reduction benefits the community and especially the adjacent neighbors.

B. The request is necessary to make reasonable use of the property. There will be an unreasonable economic impact upon the person requesting the variance if the request is denied.

> The Parking reduction will result in far more greenspace on the 14th Place frontage of the building - where we intend to locate a playground, community garden, and a landscaped front yard. This request is necessary to make reasonable use of the property and not have it filled with empty parking spaces in lieu of a landscaped area. There will be an unreasonable economic impact upon our residents and NOHA if the variance is denied - resident kids will have far less play area, and/or the community garden will be reduced or eliminated.

C. The request will not substantially be injurious to the neighborhood in which the property is located. The variance will not result in physical impacts, such as visual, noise, traffic or increased potential for drainage, erosion and landslide hazards, beyond those impacts that would typically occur with development in the subject zone.

> The request will not substantially be injurious to the 14th Place / Chelsea Gardens neighborhood. The variance will not result in physical impacts, such as visual, noise, traffic or increased potential for drainage, erosion and landslide hazards, beyond those impacts that would typically occur with development in the 14th Place / Chelsea Gardens neighborhood. Just the opposite - the request will be highly beneficial to the neighborhood.

D. The request is not in conflict with the Comprehensive Plan.

> The request is not in conflict with the Comprehensive Plan. The Comprehensive Plan stresses livability, greenspaces and other qualitative characteristics, and this parking reduction benefits the goals of the Comprehensive Plan.

E. The request is not in conflict with the Development Code. No variance may be granted which will result in a use not permitted in the applicable zone or which will increase the allowable residential density in any zone with the exception of individual lot size reduction.

> The request is in compliance with the Development Code. The Development Code 16.128.030 Vehicle Parking Standards. A.10 (b) allows for a 10% reduction if there are dedicated parking spaces for carpool/vanpool vehicles; and 16.128.030 Vehicle Parking Standards. A.10 (e) allows for a 10% reduction if the site has more than the minimum number of required bicycle parking spaces - it has 13 more bike parking spaces than the required 11 bike parking spaces.

F. Physical circumstance(s) related to the property involved preclude conformance with the standard to be varied.

> Warrenton affordable housing projects should have greenspaces for play yards, community gardens and generous landscaped areas rather that empty parking spaces. Many Warrenton housing projects have few or no outdoor amenities for residents due to parking lots taking up so much of the outdoor space. The physical circumstances related to the property preclude conformance with the parking standard of 74 spaces.

Staff findings - Variance Analysis:

A. Staff concurs. The parking reduction is a function of the code, and while it is being requested by the applicant, they did not create a hardship, but rather would like to utilize code allowances to reduce parking requirements.

B. Staff concurs. The addition of much needed greenspace, as opposed to additional parking, will be a benefit to the overall area and assists in making the Chelsea Gardens Master Plan a reality.

C. Staff concurs. Based on the presented information, assessment of other multi-family properties in Warrenton, and professional opinion, this parking reduction will not cause harm to the surrounding area. Further, this

parking reduction will be offset by additional long term bicycle parking and van pool spaces that will benefit residents and help make up for the reduced total parking spaces.

D. Staff concurs. The request is not in conflict with the Comprehensive Plan outlines future growth within areas with urban services, and providing housing for all income levels. This project meets those goals, and the parking reduction provides open space and amenities for a new housing project.

E. Staff concurs. The Development Code provides a method for achieving this Variance should the Planning Commission agree with the findings.

F. Staff concurs. The applicant is attempting to balance parking and open space amenities in the newly rezoned Chelsea Gardens Master Planned area. As this is the first project of its kind in this area, it is important that it provide amenities and open space that will benefit the residents. In the future there will be additional options for greenspace and open space generally, but this site is self-supporting at this time.

Staff's opinion is that this parking reduction is reasonable and acceptable for this site given the likelihood for tenants to work at similar industries in the area lending to utilization of carpool. Staff further notes that the parking stalls satisfy the dimensional standards of required spaces of WMC 16.128.030. Staff recommends that the Planning Commission Approve the Variance as submitted.

End of Variance Analysis – Return to Site Design Review

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g. Pedestrian and bicycle circulation areas, including sidewalks, internal pathways, pathway connections to adjacent properties, and any bicycle lanes or trails.

RESPONSE: The site plan includes the circulation areas within the site for pedestrians and bicycles. In total the site provides 24 bike parking spaces with 4 uncovered, and 20 spaces within a long-term bike barn. This is nearly double the code requirement of 11 spaces for this use. There is no bike lane proposed for SE 14th Place, and no current bike lane on the 104S however there is a shoulder wide enough to accommodate bikes as well as a painted bike lane on Ensign.

Staff finding: The proposal satisfies the requirements of WMC 16.128.040.

h. Loading and service areas for waste disposal, loading and delivery.

RESPONSE: A trash enclosure is located at the southern end of the parking lot with direct head-in truck parking. The enclosure is designed to accommodate two 6-yard dumpsters as well as full recycle options and a cardboard bin.

Staff finding: This feature appears to satisfy the requirement; note that the City Public Works Director has made a recommendation for the pick-up schedule, and the engineering letter has asked for full plans of the garbage enclosure to assure it meets City standards.

i. Outdoor recreation spaces, common areas, plazas, outdoor seating, street furniture, and similar improvements.

RESPONSE: Open common spaces are provided at the north of the site on both sides of the parking lot access. This can be reviewed on sheet A1.1.

Staff finding: Staff agrees.

j. Location, type, and height of outdoor lighting.

RESPONSE: Please see:
1. Sheet A1.1 dated March 3, 2021, and
2. Trillium House - Type III Application Response to City Comments - EXHIBITS, dated March 3, 2021

Staff finding: The updated Plan Sheet A1.1 dated March 3, 2021 shows locations of lights. Outdoor lighting and street lights must meet City standards and will be confirmed at time of Civil Submittal and review.

k. Location of mail boxes, if known.

RESPONSE: The mailboxes are in the Lobby of the building. This is acceptable to Cindy Ollis, acting Postmaster. USPS approves inside mailboxes with access via key or a FOB.

Staff finding: Staff concurs.

l. Locations, sizes, and types of signs (shall comply with Chapter 16.144).

RESPONSE: Signs on the Trillium House site will include ADA parking signs, the street address number affixed to the building, and signs for resident information at Trash/Recycle, and the Community Garden shed. If a monument sign is desired at a later date, the Trillium owner/development team will submit a proposal to the City.

Staff finding: Sign Permits are handled administratively through application to the Planning Department. Signage requirements for the CMU zone are articulated in WMC 16.144.040, and will be reviewed at the time of permit application.

m. The Community Development Director may require studies or exhibits prepared by qualified professionals to address specific site features (e.g., traffic, noise, environmental features, site drainage, natural hazards, etc.).

RESPONSE: A Stormwater Report, Traffic Analysis, and Impact Study information were provided as part of the application packet.

Staff finding: Engineering and Public Works review of the submitted stormwater report highlights a number of items still outstanding to address in regards to water infrastructure for the project. The Developer must address those comments prior to building permit. Traffic in this general area is a known problem for the City. Discussion regarding traffic and mitigation will be discussed with the section on Traffic Impact Study.

n. The applicant's entire tax lot and the surrounding property to a distance sufficient to determine the location of the development in the City, and the relationship between the proposed development site and adjacent property and development. The property boundaries, dimensions and gross area shall be identified.

RESPONSE: The boundaries, dimensions and gross area are shown on the site plan sheet SV1.1.

Staff finding: Acknowledged.

o. Identification of slopes greater than 10%.

RESPONSE: The site will have no slopes greater than 10%.

Staff finding: Acknowledged.

p. The location, condition (paved, gravel unimproved, etc.) and width of all public and private streets, drives, sidewalks, pathways, rights-of-way, and easements on the site and adjoining the site.

RESPONSE: Please see notes above. These are shown on the architectural and civil site plan sheet A 1.1.

Staff finding: The condition and pavement are generally noted on the Site Plan; however, the Engineering and Public Works Review letter requests a number of additional details for the HWY 104 and 14th intersection, improvements required to 14th Street, and confirmation of fire access for SE Galena St. improvements. These conditions must be met prior to building permit.

q. Any areas identified as located in a designated floodplain and/or floodway.

RESPONSE: The site is not located in a floodplain or floodway.

Staff finding: Staff agrees.

r. Depict any wetland and riparian areas, streams and/or wildlife habitat areas.

RESPONSE: The site has no riparian areas, streams or wildlife habitat areas.

Staff finding: Staff agrees.

s. Site features such as pavement, areas having unique views, and drainage ways, canals and ditches.

RESPONSE: The site is bounded by a number of drainage ways and ditches. Some of which will be improved for storm water.

Staff finding: Please see the associated notes from the Engineering and Public Works review letter regarding improvements to these storm water areas. Establishing owner information for those sites unknown will be required before being permitted to drain to those areas.

t. Any designated historic and cultural resources areas on the site and/or adjacent parcels or lots.

RESPONSE: The site has no historic or cultural resources that we know of.

Staff finding: Staff finds it unlikely such resources would exist on this site.

u. The location, size and type of trees and other vegetation on the property.

RESPONSE: There are a few existing trees planted approximately 20 years ago by the current property owner which will be removed for the new development. The remainder of vegetation on the site is grass that will be removed and improved.

Staff finding: Staff notes that a landscape plan is included with the application package.

v. North arrow, scale, names and addresses of all property owners.

RESPONSE: The north arrow and scale are identified on each plan sheet. The property owner's information is provided on survey sheet SV1.1.

Staff finding: Acknowledged.

w. Name and address of applicant, project designer, engineer, architect, surveyor, and/or planner, if applicable.

RESPONSE: This information is provided on the plans cover sheet.

Staff finding: Acknowledged.

2. Architectural Drawings.

a. Building elevations with building height and width dimensions.

RESPONSE: See attached architectural plans on sheets A5.1 and A5.2.

Staff finding: Architectural elevation drawings are included and discussed below.

b. Building materials, color and type.

RESPONSE: The exterior materials consist of a variety of painted fiber cement siding products including: straight edge panel, shingle siding, and casement trim. board & batten siding. Roofing will be architectural style composition tile. As shown on the attached rendering there are four colors on the building accentuating architectural features and entrances.

Staff finding: The application satisfies this criterion.

c. The name of the architect or designer.

RESPONSE: Please see attached information provided on the plans cover sheet.

Staff finding: Acknowledged.

3. Preliminary Grading Plan

RESPONSE: This has been prepared on sheet C2.1

Staff finding: Acknowledged.

4. Landscape Plan

RESPONSE: Please see attached landscape plan sheet L2.1.

Staff finding: The landscape plan is attached and satisfies the requirements and standards of WMC 16.124.070 New Landscaping. The Landscape plan is also checked again at time of building permit submittal to assure conformance with City Codes.

5. Proposed sign(s) shall be required in conformance with the City's Sign Code.

RESPONSE: Signs on the Trillium House site will include ADA parking signs, the street address number affixed to the building, and signs for resident information at Trash/Recycle, and the Community Garden shed. If a monument sign is desired at a later date, the Trillium owner/development team will submit a proposal to the City.

Staff finding: Sign Permits are handled administratively through application to the Planning Department. Signage requirements for the CMU zone are articulated in WMC 16.144.040, and will be reviewed at the time of permit application.

6. Copies of all existing and proposed restrictions or covenants.

RESPONSE: There are no restrictions or covenants attached to this property.

Staff finding: Acknowledged.

7. Letter or narrative report documenting compliance with the applicable approval criteria contained in subsection C of this section.

RESPONSE: Please see below.

Staff finding: Noted.

C. Review Criteria

1. The application is complete, as determined in accordance with Chapter 16.208 and subsection B of this section.

RESPONSE: The application is complete and all the required information is provided.

Staff finding: Staff concurs.

2. The application complies with all the applicable provisions of the underlying land use district (Division 2), including building and yard setbacks, lot area and dimensions, density and floor area, lot coverage, building height, building orientation, architecture, and other special standards as may be required for certain land uses.

RESPONSE: Based on the information provided the project complies with all the land use district (Division 2) and other standards as required.

Staff finding: The proposal complies with the applicable development standards of the C-MU district as a permitted use. conditional use. Infrastructure improvements, traffic mitigation, and addressing all Engineering, Public Works, and Fire Department comments will be required to support the development.

3. The applicant shall be required to upgrade any existing development that does not comply with the applicable land use district standards, in conformance with Chapter 16.276, Nonconforming Uses and Development.

RESPONSE: See engineering review letter for additional infrastructure notes and comments to be addressed. The Trillium House Development complies with the applicable land use district standards.

Staff finding: The applicant will be required to test/upgrade local facilities and infrastructure to ensure the ability to serve the site and will also be required to make certain street improvements and storm water improvements to mitigate downstream impacts.

4. The application complies with the applicable design standards contained in Division 3. (Ord. 1175-A § 21, 2013)

RESPONSE: Based on the information provided, with the Variance to parking requested, the proposed project complies with the applicable design standards. As such, the Applicant's proposal to build the apartment complex with 42 units is consistent with the City of Warrenton Code.

Staff finding: The proposal is substantively in compliance with Warrenton Municipal Code Division 3 Design Standards. Planning Commission will need to weigh the benefits of the parking reduction. Staff is supportive of the parking as proposed, as this project is the first step to reimagining this area as a walkable neighborhood. Please note that all conditions of approval from the Engineering, Public Works, and Fire must be satisfied prior to building permit.

16.132.010 Clear Vision Areas:

A. A clear vision area shall be maintained on the corner of property adjacent to the intersection of two streets, or adjacent to the intersection of a street and a railroad.

RESPONSE: No obstructions are planned for the corner improvements at 14th Street and 104S that would encroach in the clear vision area.

Staff finding: Staff agrees.

16.116.030 Design Standards Narrative:
A. Orientation of Buildings: Building(s) shall be located on the property with the principal building entrance oriented toward the primary focal point of the property/development.

RESPONSE: The buildings is oriented to the parking lot with a main entrance and terrace opening onto the playground and community garden area. Parking is focused to the south of the project and is partly screened by the building.

Staff finding: The proposal satisfies this criterion.

B. Natural Features: The property owner/developer is encouraged to protect and incorporate areas of special interests and other natural features such as grade, trees, vegetation and waterways, into the overall site plan. These areas may be calculated as part of the landscaping requirement if healthy and not damaged during construction.

RESPONSE: There are no natural features on site to take advantage of or preserve.

Staff finding: Staff concurs.

C. Building Requirements:

1. Customer Entrances. The customer entrance(s) shall be clearly defined and highly visible by using features such as canopies, porticos, overhangs, recesses/projections, raised corniced parapets over the door, arcades, arches, wing walls, and integral planters are highly encouraged.

RESPONSE: The primary pedestrian entrances are color coded along the length of the building, as well as a main entrance on the north side.

Staff finding: The proposal satisfies this criterion.

2. Roof Design. Roofs should be designed to reduce the apparent exterior mass of a building, add visual interest and be appropriate to the architectural style of the building. Variations within one architectural style are highly encouraged. Visible roof lines and roofs that project over the exterior wall of a building enough to cast a shadow on the ground are highly encouraged. Architectural methods shall be used to conceal flat roof tops. Overhanging eaves, sloped roofs and multiple roof elements are highly encouraged. Mansard style roofs shall not be allowed.

RESPONSE: The roofs have a two-foot overhang and height variation along the north and south side of the building.

Staff finding: The proposal satisfies this criterion.

3. Materials.

a. The predominant exterior building materials shall be of high quality materials, including, but not limited to brick, sandstone, wood, native stone and tinted/textured concrete masonry units and/or glass products. Simulated material may be substituted for any of the aforementioned building materials.

b. At least three different building materials shall be used for 100% construction of a building.

c. Exterior building materials shall not include smooth-faced concrete block, tilt-up concrete panels, or T 1-11. Prefabricated steel panels are excluded unless the design and material meets the City's design standards.

d. Metal roof may be allowed if compatible with the overall architectural design of the building.

RESPONSE: The exterior materials consist of a variety of painted fiber cement siding products including: straight edge panel, shingle siding, and casement trim. board & batten siding. Roofing will be architectural style composition tile. As shown on the attached rendering there are four colors on the building accentuating architectural features and entrances.

Staff finding: The proposal satisfies this criterion.

4. Architectural Features. Architectural features include, but are not limited to, the following: recesses, projections, wall insets, arcades, window display areas, awnings, balconies, window projections, landscape structures or other features that complement the design intent of the structure and are acceptable to the Community Development Director.

RESPONSE: The building includes wall insets and color variation to provide architectural interest. The covered area and gathering space to the north provides a key focal point that makes the most of the open space provided on site.

Staff finding: The proposal satisfies this criterion.

5. Building Colors. Exterior colors shall be of low reflectance, subtle, neutral or muted earth tone colors. The use of high intensity colors such as black, neon, metallic or fluorescent colors for the facade and/or roof of the building are prohibited except as approved for building trim.

RESPONSE: As shown on the attached rendering there are four primary building colors that accentuate the articulations of the building and are appropriate in style and the environment of the area.

Staff finding: The proposal satisfies this criterion.

6. Mechanical Equipment, Outdoor Storage and Service Areas. The location of loading docks, outdoor storage yards and all other service areas shall be located to the sides and/or rear of a building, except when a site abuts Highway 101, in which case the said areas shall be located to the sides of the building that do not face Highway 101.

a. All outdoor storage yards, loading docks, service areas and mechanical equipment or vents larger than eight inches in diameter shall be concealed by screens at least as high as the equipment they hide, of a color and material matching or compatible with the dominant colors and materials found on the facades of the principal building. Chain link or cyclone fencing (with or without slats) shall not be used to satisfy this requirement.

b. Equipment that would remain visible despite the screening, due to differences in topography (i.e., a site that is at a lower grade than surrounding roadways) shall be completely enclosed except for vents needed for air flow, in which event such vents shall occupy no more than 25% of the enclosure façade.

c. The architectural design of the buildings shall incorporate design features which screen, contain and conceal all heating, ventilation, air conditioning units, trash enclosures, dumpsters, loading docks and service yards.

RESPONSE: The trash is screened by an enclosure located at the back of the site.
Please see: Sheet A1.1 dated March 3, 2021 for mechanical equipment location. There will be one HVAC condenser unit on a concrete pad west of the building on the northern side.

Staff finding: The proposal satisfies this criterion.

D. Community Amenities. Each building shall contribute to the establishment or enhancement of the community and public spaces by providing at least two community amenities such as: a patio/seating area, water feature, art work or sculpture, clock tower, pedestrian plaza with park benches, open spaces, or other features, such as a park acceptable to the review authority.

RESPONSE: Amenities include an outside courtyard for common use and seating. Outdoor play area, and a community garden. The amenities are a key feature of the plans for this apartment community.

Staff finding: The proposal satisfies this criterion.

E. Outdoor Lighting. The lighting for residential, commercial and industrial zones shall be shielded and directed down into the site and shall not shine or glare onto adjacent property or streets. Light poles, light fixtures and flag poles shall not exceed 25 feet in height. Installation cost shall be borne by the developer.

RESPONSE:
Please see:
1. Sheet A1.1 dated March 3, 2021, and
2. Trillium House - Type III Application Response to City Comments - EXHIBITS, dated March 3, 2021

Staff finding: The updated Plan Sheet A1.1 dated March 3, 2021 shows locations of lights. Outdoor lighting and street lights must meet City standards and will be confirmed at time of Civil Submittal and review.

F. Parking (Pods) Areas. Parking (pods) areas shall be divided by a six-foot pathway placed between the two rows of head-on parking stalls, which shall extend the full length of each parking pod. There shall be parking spaces provided for travelers in RVs and travel trailers. This section shall be in compliance with the requirements in Section 16.120.030 and Chapter 16.128 (Vehicle and Bicycle Parking).

RESPONSE: Parking is provided on site as required by code with landscape islands breaking up the parking area. The design as currently drawn meets requirements, but the parking space reduction is still pursuant to a Variance request.

Staff finding: As discussed above, the proposal satisfies this criterion.

G. Pathways/Walkways from Parking Area to Building Entrance(s). Internal pedestrian walkways shall be developed for persons who need access to the building(s) from the parking pods (areas). The walkways shall be located within the pods and shall be designed to provide access from the pods to the entrances of the buildings(s). The walkways shall be designed to separate people from moving vehicles as much as possible. These walkways shall have a minimum width of five feet with no car overhang or other obstruction. The walkways must also be designed for disabled access according to the International Building Code. This may require the walkways to be widened or modified. The walkways shall be distinguished from the parking and driving areas by use of any of the following materials: special pavers, bricks, raised elevation or scored concrete. Other materials may be used if they are appropriate to the overall design of the site and building and acceptable to the review authority; and shall meet the requirements in Section 16.120.030 (Pedestrian Access and Circulation).

RESPONSE: Accessible concrete walkways connect all portions of the project, parking, trash, buildings, with each other and the adjacent streets.

Staff finding: As stated above, the proposal satisfies this criterion and WMC 16.120.030.

H. Landscaping. Landscaping shall meet the requirements in Chapter 16.124 (Landscaping, Street Trees, Fences and Walls).

RESPONSE: Landscaping meets the requirement of the code. Parking areas have trees to break up and shade the paved areas. The street frontage landscape provides 2" caliper street trees. The north area is fully landscaped around the park and community gardens. The main entrance on the north will be landscaped with a combination planting and hardscape to provide a usable and active common area for tenants.

Staff finding: The proposal satisfies this criterion and the standards of WMC 16.124.

Chapter 16.188.030 Multifamily Housing 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).

RESPONSE: The longest single elevation of the building is 177 feet, with recessed projections on the north and south of 7.5' respectively.

Staff finding: The proposal satisfies this criterion.

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.

RESPONSE: The total gross site area is 67,226 square feet. The common spaces provided across the site are 30,458 (45%) square feet. The pervious/landscaping areas are 24,455 (36%).

Staff finding: The proposal satisfies this criterion.

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.

RESPONSE: The trash enclosure is located with direct head-in access.

Staff finding: The trash receptable is located appropriately for the site, and a top-down detail has been provided. Please provide complete plans for the trash enclosure including height and type of material per the Engineering and Public Works review letter.

16.140 Stormwater and Surface Water Management

Staff finding: WMC 16.140 provides direction for stormwater management for all developments. In response, the applicant included a preliminary stormwater plan with the application package. The city engineer has determined that the preliminary stormwater management plan is satisfactory for making a land use decision, but that a final plan will be required at the time construction plans are submitted for review.

Chapter 16.192 Large-Scale Development:

16.192.030 Soil Suitability:

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.

RESPONSE: Please see Geo Consultants Northwest – Geotechnical Site Evaluation – Trillium House, dated February 17, 2021

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

RESPONSE: Please see Geo Consultants Northwest – Geotechnical Site Evaluation – Trillium House, dated February 17, 2021

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.
RESPONSE: Trillium Team provided Phase I Environmental Report performed 12/8/2020 by Coles + Betts Environmental Consulting. The detailed environmental report indicates that there are not significant amounts of hazardous soils.

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.

RESPONSE: Trillium Team provided Phase I Environmental Report performed 12/8/2020 by Coles + Betts Environmental Consulting. The detailed environmental report indicates that there are not significant amounts of hazardous soils.

Staff finding—A-D: Staff concurs. The area is a long-standing low intensity single-family neighborhood. There is a known fill area indicated in the soils report with recommendations of how to best excavate and support soils in that area. Staff recommends that the developer meet the required construction methods within the geotechnical report.

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.

RESPONSE: A stormwater management plan is attached within the application.

Staff finding: Stormwater management is 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.

RESPONSE: Please see the Civil drawings for the design and requirements of the existing utilities beginning on plan sheet C1.1 preliminary utility plan.

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.

RESPONSE: Please see the Civil drawings for the design of the onsite utilities.

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.

RESPONSE: Please see the Civil drawings for the design of the onsite utilities.

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

RESPONSE: Compliance with the City codes is noted.

Staff finding: Engineering and Public Works have performed a review of the proposed utility plans and have made their comments available to the applicant. Addressing all engineering and public works comments is a condition of approval and will be required prior to building permit.

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.
RESPONSE: Please see Trillium House - Type III Application Response to City Comments - EXHIBITS, dated March 3, 2021 for a letter from Tom Rogozinski, Superintendent, indicating that local schools will be capable of accommodating the children from the development.

Staff finding: Staff concurs

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.

RESPONSE: A landscape design has been submitted as part of this package which complies with the City's requirements.

Staff finding: Landscaping is addressed above.

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.

RESPONSE:

Staff finding: Signage is addressed above.

16.192.090 Additional Provisions:

A. The City of Warrenton may charge the applicant additional fees, as necessary, to cover the cost of reviewing surveys, reports, plans, or construction methods required to comply with the provisions of this Code.

B. The City of Warrenton may require the owner or developer to post a performance bond to assure that improvements required to comply with the provisions of this section are completed in accordance with the plans and specifications as approved by the Community Development Director, and/or hearings body.

C. Proposals for large-scale developments shall be reviewed for consistency with all applicable sections of this Code prior to issuance of a development permit, including grading, filling, or building permits.

D. The standards of this section are required in addition to development review (Type I and II) and site design review (Type III) standards of Chapter 16.212.

RESPONSE: The above items are noted and no additional requirements are deemed necessary at this time.

Staff finding: Acknowledged.

16.256 Traffic Impact Study

16.256.050 Approval Criteria

The traffic impact study report shall be reviewed according to the following criteria:

A. The study complies with the content requirements set forth by the City and/or other road authorities as appropriate;

RESPONSE: A traffic impact analysis was provided as requested by the City, and was updated per the letter from Stuart Emmons dated March 3, 2021 to reflect a proportional share analysis of the Traffic Mitigation projects highlighted in the Chelsea Garden's CMU rezone.

B. The study demonstrates that adequate transportation facilities exist to serve the proposed land use action or identifies mitigation measures that resolve identified traffic safety problems in a manner that is satisfactory to the road authority;

RESPONSE: The traffic indicates that traffic mitigation in the area surrounding this development is already warranted, and that this project will have minimal impacts on increasing traffic congestion above levels currently experienced.

C. For affected City facilities, the study demonstrates that the project meets mobility and other applicable performance standards established in the adopted transportation system plan, and includes identification of multi-modal solutions used to meet these standards, as needed; and

RESPONSE: No additional mitigation for traffic is proposed with this project. The updated traffic report and response letter from Stuart Emmons dated March 3, 2021 highlights the applicant's proposal. The updated traffic report states that the Trillium House project will add 5 evening peak trip hours to that intersection. The traffic report outlines the methodology used to reach a cost estimate. The consultant divided the cost of the left-hand turn lane improvement by the left-hand turn lane volumes to get a "proportionate share fee" of $5130 per evening peak hour trip. Applying that cost back to the number of trips projects by Trillium House results in proportionate share of $25,650 from the Trillium House to the City in order to assist in constructing the left-hand turn lane. Further the project will be assessed $21,714 in transportation System Development Charges. Trillium House Team's proposal is to provide a fee in lieu of a total of $3936. This represents the difference between the proportionate share analysis and the SDC's dedicated to transportation ($25,560- $21,714 = $3936).

D. Proposed design and construction of transportation improvements are in accordance with the design standards and the access spacing standards specified in the transportation system plan. (Ord. 1225 § 13, 2019)

RESPONSE: No additional mitigation for traffic is proposed with this project. Rather a proportionate share fee is proposed. Future projects would be constructed to meet design standards.

Staff finding: Traffic at the intersection of 104 S and Ensign Drive intersection is a known concern for the City and the neighbors in the Chelsea Gardens area. The developer, City, and ODOT have been in discussions about the resolution to traffic mitigation in this area. The City initiated the rezone in the Chelsea Gardens area in 2018-2019. As part of the initial rezone process the City hired a consultant to perform a traffic study to understand what the traffic impacts would be from the area's increase in development intensity. The study highlighted additional projects outside of the Ensign and 104S turn lane that would be impacted based on the increased development. Also, the rezone contemplated improvements for sidewalks, parks, and trails as identified in the Chelsea Gardens Master Plan. The Trillium House team provided the City with a proportionate share analysis that only included the 104S and Ensign improvement. That report indicated that the project should provide $25,650 towards improving the intersection. The applicant further requested that the City accept the difference between the estimated standard SDC fee for Transportation of $21,714 and provide only $3936 in additional funding for traffic mitigation. Staff has reviewed this request, and has determined that the Transportation SDC charge must be applied across the entire City, as opposed to being held for future improvement of a single project. Any fee towards traffic mitigation as it relates to this site or the rezone will be collected as a System Development District Charge above and beyond the initial SDC Fees collected. In response to the applicant's March 3, 2021 letter and updated traffic study from the Trillium Team, Staff hired a third-party traffic consultant, DKS Associates, to perform a proportionate share review for transportation. The consultant's proportionate share fee for the Trillium House project, based on a Trip Basis calculation, is $120,142. This cost includes traffic mitigation projects beyond the 104S and Ensign intersection. In order to assist with moving this project forward beyond this Site Design Review, Staff recommends that the City and the Developer enter into a Development Agreement in order to establish a proportional share fee, as determined by the City's consultant, for impacts related to: traffic mitigation, sidewalks, parks, and trails. Staff believes this will both assist in mitigating future traffic, and will meet the intent of the rezone and Master Plan.

16.114 Neighborhood Master Plans

16.114.030 Neighborhood Master Plan Development Standards

A. All development shall provide the following primary urban services: water, sanitary sewer facilities connecting to the City sewer system, local streets, fire protection and drainage. An inability to provide an acceptable level of all primary services shall result in the denial of a land use application.

Staff finding: The Trillium House project provides an adequate level of primary urban services as proposed. There is currently uncertainty over the ownership of the proposed storm drainage path. Staff has requested that the applicant provide proof of ownership of the drainage, secure an easement for drainage, and/or design an alternate system for drainage. This has been included below as a condition of approval.

B. All development shall be reviewed to ascertain whether an adequate level of the following secondary urban services exists: collector and arterial streets, transit, schools, police protection, and

parks. Where the City determines and supports with findings that an unacceptable level of secondary urban services exist, the City may deny the land use application unless the developer insures the availability of an acceptable level of the services within five years from occupancy.

Staff finding: To meet the requirements of this code section the City is preparing a funding source that includes preparing a new non-citywide System Development District with System Development Charges used for the benefit of projects related to the rezone and Master Plan. Developments within this District will be required to pay their equitable share of the necessary street improvements that were required as part of the rezoning and included in the Neighborhood Master Planning of the area. The equitable share will be determined by developing non-citywide System Development Charges to be paid by all developments in this District.

The City requires the Trillium development to prepare a development agreement to be signed by the developer and Warrenton City commission that agrees to pay future SDCs associated with the Chelsea Gardens zone change and Spur 104 Master Plan. This agreement shall be signed by both parties prior to submitting any engineer or building plans or documents.

C. City specifications shall be the standard used as measurement of acceptability of a service, including traffic engineering and adopted City transportation policies, to disperse new traffic trips generated by the impact of new development. If street standards are proposed that differ from the TSP, findings and analysis shall be provided to demonstrate compliance and consistency with neighborhood planning principles.

Staff finding: The proposal meets the City's traffic engineering standards for new roadways. The City has reviewed the traffic report, and has proposed a solution through the Rough Proportionality Analysis.

D. Encourage the maximum redevelopment of the area to facilitate the creation of a pedestrian friendly, transit supportive, and people oriented neighborhood where residents and visitors can walk to services within the neighborhood and adjacent areas.

Staff finding: The developer has attempted to maximize their development to provide amenities and open space in addition to 42 units of needed low- and moderate-income housing.

E. Development proposed within the neighborhood overlay that is consistent with the master plan is streamlined whereas any proposed development that does not support neighborhood planning principles in Comprehensive Plan and other policies should be discouraged. (Ord. 1233 § 1, 2020)

Staff finding: The proposal is consistent with the residential element of the Chelsea Gardens Master Plan.

16.114.040 Spur 104 Performance Measures & Redevelopment Standards

A. Development shall consider either the "Mixed Use Concept" or "Residential Concept" contained herein. At a minimum, streets, parks, open space, and trails shall be adhered to and planned for in future development.

Staff finding: The development is a residential concept that provides its own open space with a small park area for residents of the development.

B. The total number of housing units for the new neighborhood shall not exceed 350 units. The types of units and minimum density are described in the Commercial Mixed Use (CMU) Zone and High Density Residential Zone (RH) standards. Housing units that existed prior to 2018 shall not be counted towards the cap on the total amount. Adaptive reuse of cultural or historic structures built prior to 1940 is strongly encouraged.

Staff finding: The Trillium House project will develop the first 42 units of residential housing as permitted by this code section. There are no existing structures or adaptive reuse proposed.

C. The total amount of commercial space shall not exceed 50,000 SF. No building footprint shall be larger than 20,000 SF to encourage a mixed use, neighborhood scale, and pedestrian-oriented design. Maximum of building floor area shall be regulated by height standard. The types of uses allowed are described in the Commercial Mixed Use (CMU) Zone. However, drive thrus shall be prohibited to reduce traffic impacts.

Staff finding: This project is residential, so this code provision does not apply.

D. Architectural design shall be governed by Chapter 16.116 Design Standards. In addition, at least three distinct exterior materials shall be used. Glass entries and vestibules shall not be counted towards the required amount of materials. A distinctive entry is required. New parking for commercial uses should be located to the rear or side portion of the lot.

Staff finding: Staff has reviewed the proposal against the architectural design standards and finds it to be in conformance with those requirements.

E. All new development shall contribute to planned parks and trails identified on the concept plans and Parks Master Plan.

Staff finding: To meet the requirements of this code section the City is preparing a funding source that includes preparing a System Development District with System Development Charges. Developments within this District will be required to pay their equitable share of the Parks and Trails included in the Spur 104 Master Planning area. The equitable share will be determined by developing System Development Charges to be paid by all developments within this District.

The City requires the Trillium development to prepare a development agreement to be signed by the developer and Warrenton City commission that agrees to pay future SDCs associated with the Chelsea Gardens zone change and Spur 104 Master Plan. This agreement shall be signed by both parties prior to submitting any engineer or building plans or documents.

F. Zero lot line developments for single family attached are allowed subject to site design review. (Ord. 1233 § 1, 2020)

Staff finding: This project is multi-family residential, so this code provision does not apply.

CONCLUSIONS AND RECOMMENDATION

The applicant has demonstrated that the proposed multiple family development satisfies the requirements of the underlying Commercial Mixed Use (C-MU) District. The project design also shows that with conditions is consistent and in compliance with the multiple design standards that guide multiple family projects. Accordingly, staff recommends approval with the following Conditions of Approval:

Trillium House SDR 20-8 Conditions of Approval:

1. Building permits are not able to be issued across property lines. Recordation of a Lot Line Adjustment, Lot Combination, or other Recorded instrument combining lots or eliminating the lot line crossing the building, shall be complete prior to issuance of a building permit.
2. Address all comments in the engineering review letter from A.M. Engineering dated March 30, 2021. This includes comments from Public Works and the consultant Engineer. The comments contained within the engineering letter stand as conditions of approval.
3. Address all comments in the Warrenton Fire Department Letter dated February 2, 2021. The comments contained within the Fire Department letter stand as conditions of approval.
4. Construction Documents shall meet all requirements of federal, state, and local standards, codes, ordinances, guidelines and/or other legal requirements.
5. Hydrants and associated water systems on private property shall be constructed within an easement to allow for future improvements and maintenances to the system by the City.
6. Developer is required to confirm fire flow availability prior to submittal of Construction Drawings. If offsite water improvements are necessary, the design plans shall be included with the project Construction Drawings.

7. Improvements to the intersection of 14th Street and 104 S shall meet ODOT design and approval standards. Design shall include appropriate street signage and striping. These improvements will include striping and asphalt repairs and improvements necessary.
8. Street lighting will be required. Lighting plans shall be submitted for approval prior to issuance of a building permit.
9. A Final Stormwater Report will be required to be submitted with final Construction Documents.
10. Developer will coordinate with City to finalize plans for refuse container to meet the requirements of the City Code
11. Fire flow will need to be demonstrated to be in excess of calculated rate based on building design and fire protection features. Warrenton Fire Department requires a hydrant flow test be performed to determine flows are adequate for a four-story building.
12. No Parking—Fire Lane signs shall be placed along the east side of S.E. Galena Court from S.E. 14th Place to the end of S.E. Galena where it terminates into the parking lot. Overhead lines shall not be placed over the drive aisles and the aisles should not be more than 30 feet from any structure to provide access with an aerial ladder truck.
13. The developer will be responsible for providing a video inspection of the sanitary sewer to determine its condition and potential need for repair.
14. As outlined in the Engineering letter dated March 30, 2021, ownership of property affected by storm water improvements must be resolved, or an alternative stormwater design must be approved by the City prior to issuance of a building permit.
15. A Development Agreement to be signed by the developer and Warrenton City Commission, or other funding mechanism acceptable to the city, that agrees to pay an additional System Development District Charge associated with the Chelsea Gardens rezone and Spur 104 Master Plan based on a proportionate share fee, as determined by the City's consultant, for impacts related to: traffic mitigation, sidewalks, parks, and trails. This agreement shall be signed by both parties prior to submitting any engineer or building plans or documents.

Variance V 21-1 Findings:

A. The parking reduction is a function of the code, and while it is being requested by the applicant, they did not create a hardship, but rather would like to utilize code allowances to reduce parking requirements.

B. The addition of much needed greenspace, as opposed to additional parking, will be a benefit to the overall area and assists in making the Chelsea Gardens Master Plan a reality.

C. Based on the presented information, assessment of other multi-family properties in Warrenton, and professional opinion, this parking reduction will not cause harm to the surrounding area. Further, this parking reduction will be offset by additional long term bicycle parking and van pool spaces that will benefit residents and help make up for the reduced total parking spaces.

D. The request is not in conflict with the Comprehensive Plan outlines future growth within areas with urban services, and providing housing for all income levels. This project meets those goals, and the parking reduction provides open space and amenities for a new housing project.

E. The Development Code provides a method for achieving this Variance should the Planning Commission agree with the findings.

F. The applicant is attempting to balance parking and open space amenities in the newly rezoned Chelsea Gardens Master Planned area. As this is the first project of its kind in this area, it is important that it provide amenities and open space that will benefit the residents. In the future there will be additional options for greenspace and open space generally, but this site is self-supporting at this time.

Recommended Motions:

Site Design Review - SDR 20-8

I motion to approve the Site Design Review SDR 20-8, for Trillium House apartments, located approximately 700 SE 14th Place, based on the findings in the staff report, conditions of approval, and discussion.

Variance - V 21-1

I motion to approve the Variance V 21-1, for Trillium House apartments, located approximately 700 SE 14th Place, for parking reduction, based on the findings in the staff report and discussion.

Attachments:

1. Trillium House Drawings: Architectural, Landscape, Survey dated December 10, 2021

2. Trillium House Application Booklet and Narrative dated December 10, 2021

3. Lancaster Mobley Traffic Analysis dated January 5, 2021

4. Lancaster Mobley Proportionality Analysis dated March 3, 2021

5. Stuart Emmons Response Letter to Left-Hand turn Land dated March 3, 2021

6. City requested third-party DKS Traffic Proportionality Analysis (preliminary table) dated April 4, 2021

7. Storm Water Report and Maps dated March 23, 2021

7a. Alternative Storm Water Design dated March 31, 2021

8. A&M Engineering Review Letter dated March 30, 2021

9. Stuart Emmons Response Letter to A.M. Engineering dated March 31, 2021

10. Fire Department Letter dated February 2, 2021

11. Variance Application dated February 18, 2021

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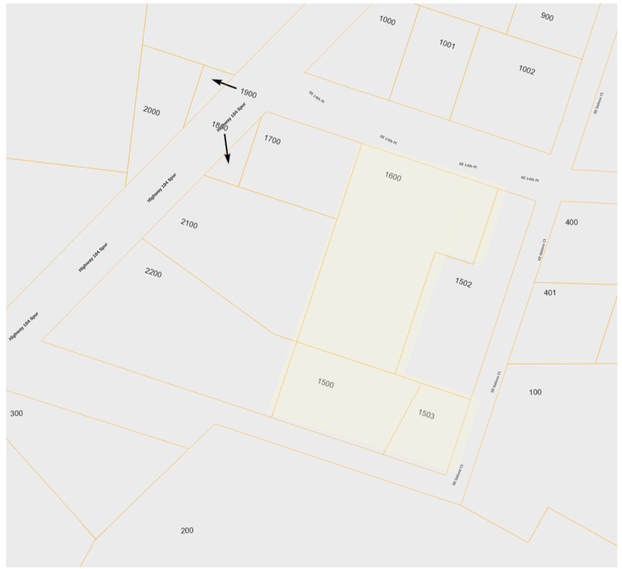

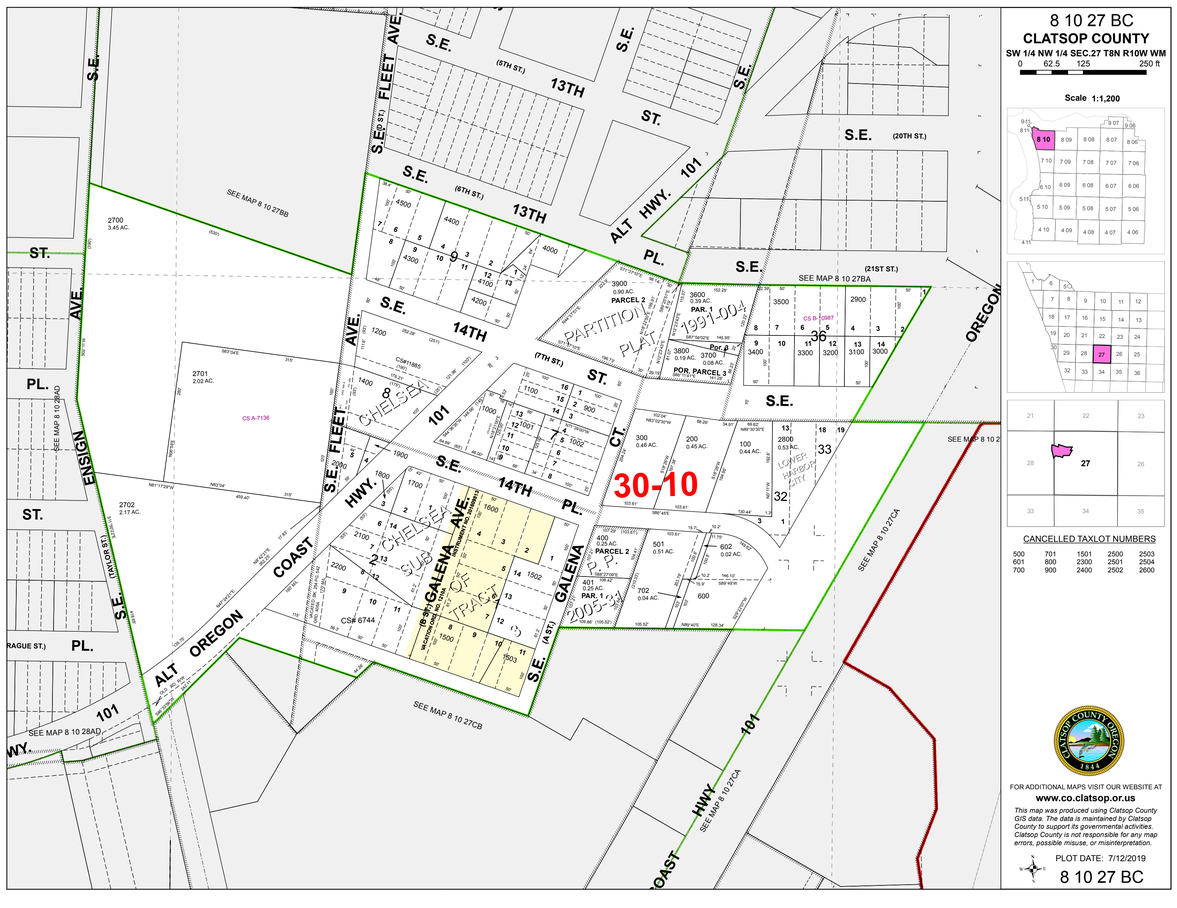

Trillium House
Design Development Drawings
December 10, 2020

14th Place
Warrenton Oregon

DRAWINGS - TABLE OF CONTENTS

PART 1

ARCHITECTURAL

LANDSCAPE

SURVEY

CIVIL

CLIENT
Northwest Oregon Housing Authority (NOHA)
147 S. Main Ave
Warrenton, OR 97146

CONTRACTOR
Walsh Construction Compapy
2905 SW 1st Ave
Portland, OR 97201
Jay Nees, Project Engineer
jnees@walshconstruction.com
503.219.2945

ARCHITECT:
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100 39th Street
Astoria, OR, 97103
www.emmonsdesign.com
Stuart Emmons, AIA
wse@emmonsdesign.com
503.705.3050

STRUCTURAL ENGINEER
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Scott Nyseth, Principal
Taylor Banner, Project Engineer
taylor.banner@stonewoodstructural.com
360.216.1704

GEOTECHNICAL ENGINEER
GEO Consultants Northwest, Inc.
www.gcnweb.com
2839 SE Milwaukie Avenue, Portland, OR 97202
David K. Rankin, CEG LHG, LEG, QE
Principal – geotechnical/environmental
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503.616.9425

DEVELOPMENT TEAM
RCA Consulting
Ross Cornelius

Green Light Development
Briana Murtaugh

EMMONS DESIGN, LLC

100 39TH STREET.
ASTORIA, OR, 97103
503.705.3050

REGISTERED ARCHITECT
3972
STUART EMMONS
PORTLAND, OR
STATE OF OREGON

NOTES:
1. LEGAL DESCRIPTION: SUBDIVISION OF TRACT 3 CHELSEA, BLK 1: LOTS: 2, 3, 4, 5, 6, 7, 8, 9, 10, 11. BLK 2: PARTIAL BLOCKS 1, 11, 12, 13, 14. Tax Lots: 1600, 1500, 1503. PARTIAL TAX LOTS: 1700, 2100, 2200

TRILLIUM HOUSE

SE 14TH PLACE
WARRENTON, OR

DESIGN
DEVELOPMENT

SITE EXISTING
CONDITIONS,
DEMOLITION PLAN

DECEMBER 9, 2020
SCALE FOR 24x36: 1" = 20'

N

DD
V12

A1.0

Trillium House, Zoning Summary, V12

SITE AREAS			ACTUAL		REQUIRED		Warrenton Municipal Code Chapter/Section:
Site Area			67,226	SF	10,000	for Multi-family	16.44.040.A.3 / 16.36.040.A.4
					67,200	for 42 Units	16.36.040.A.5
Dwelling Units			42				16.36.040.A.5
Site SF/unit (67,226 SF/42 Units)			1,601				16.36.040.A.5
Building Area (SF)							
Housing		10,550					
Tool		120					
Bike		502					
Trash (488 SF enclosure w no roof)		N/A					
Total Building Area			11,172				
Lot Coverage by Buildings			17%		55%	Maximum	16.44.040.A.10
Impervious Surfaces (add to bldgs)							
Pathways		4,396					
Playground		1,607					
Parking, Driveways		23,940					
Concrete Slabs (@ Trash/Recycle)		855					
Curbs		801					
Total Impervious Area (non bldg)			31,599	SF			
Total Impervious Area (bldg + non bldg)			42,771	SF			
Pervious/Landscape Area			24,455	SF			
Common Space (includes path, playground)			30,458	SF			
% of Site			45%		20%	Minimum	16.188.030.B

BUILDING ENVELOPE INFORMATION				
Building Length	192'-5 1/2"	200'	Maximum	16.188.030.A
Building Height	40'	40'	Maximum	16.44.040.A.8

PARKING LANDSCAPE			
Parking Boundary	26,021		
Parking Landscape	2,081		
% Parking Landscaped	8.0%	8.0%	16.124.070.E.2

SETBACKS	ACTUAL	REQUIRED	
Front Yard	90'-3"	15'-0"	16.44.040.B.1
Sire Yard	11'-6"	8'-0"	16.44.040.B.2
Rear Yard	78'-6"	15'-0"	16.44.040.B.3
Accessory Structures (in rear yd setback)	N/A	5'-0"	16.280.020.B

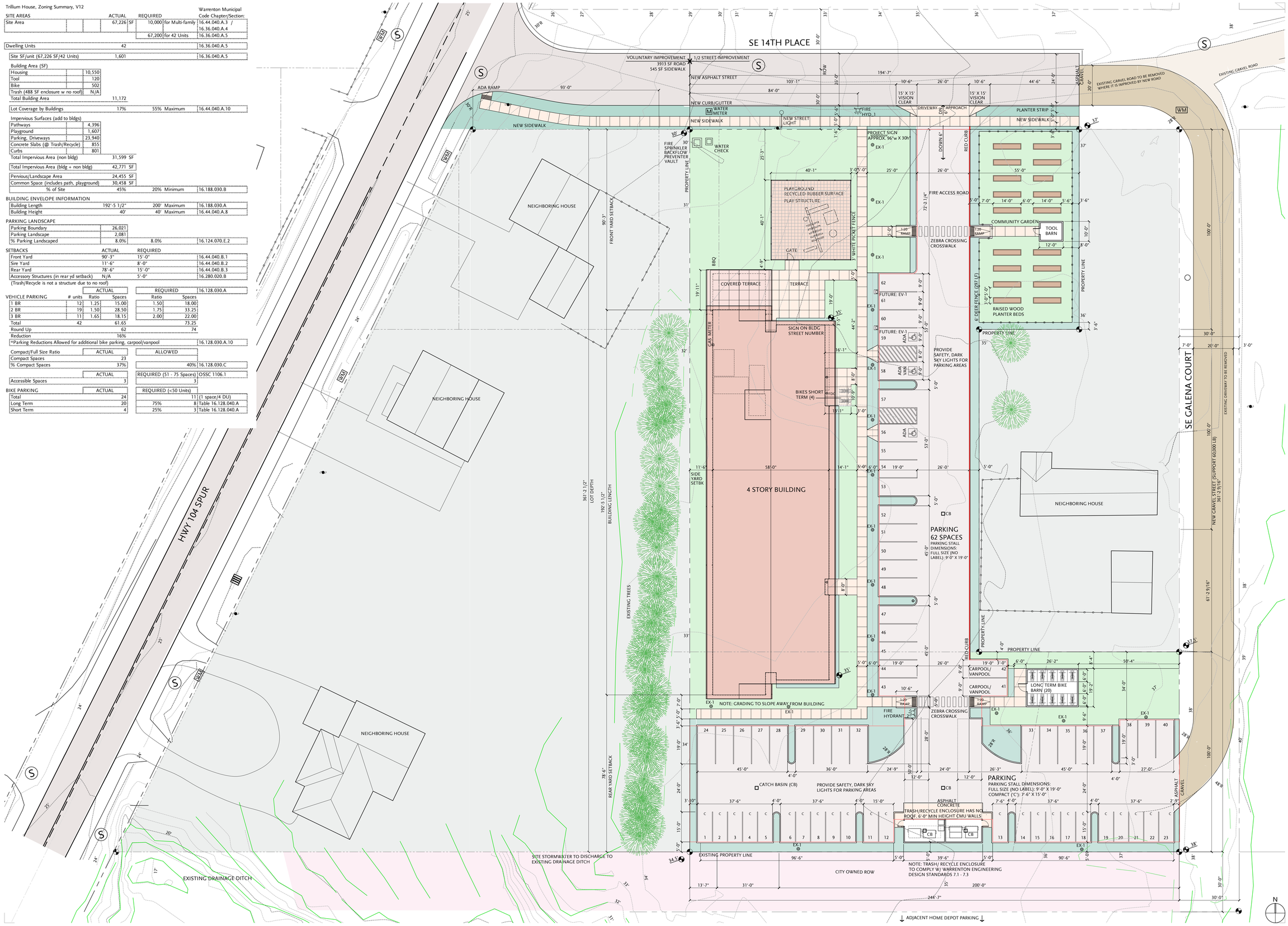
(Trash/Recycle is not a structure due to no roof)

VEHICLE PARKING	# units	Ratio	ACTUAL Spaces	REQUIRED Ratio	REQUIRED Spaces	16.128.030.A
1 BR	12	1.25	15.00	1.50	18.00	
2 BR	19	1.50	28.50	1.75	33.25	
3 BR	11	1.65	18.15	2.00	22.00	
Total	42		61.65		73.25	
Round Up			62		74	
Reduction			16%			
*Parking Reductions Allowed for additional bike parking, carpool/vanpool						16.128.030.A.10

Compact/Full Size Ratio	ACTUAL	ALLOWED	
Compact Spaces	23		
% Compact Spaces	37%	40%	16.128.030.C

	ACTUAL	REQUIRED (51 - 75 Spaces)	OSSC 1106.1
Accessible Spaces	3	3	

BIKE PARKING	ACTUAL	REQUIRED (<50 Units)		
Total	24		11	(1 space/4 DU)
Long Term	20	75%	8	Table 16.128.040.A
Short Term	4	25%	3	Table 16.128.040.A



EMMONS DESIGN, LLC

100 39TH STREET.
ASTORIA, OR, 97103
503.705.3050

REGISTERED ARCHITECT
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STUART EMMONS
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STATE OF OREGON

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TRILLIUM HOUSE

SE 14TH PLACE
WARRENTON, OR

DESIGN DEVELOPMENT

SITE PLAN

DECEMBER 9, 2020
SCALE FOR 24x36: 1" = 20'

N

DD
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A1.1

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100 39TH STREET.
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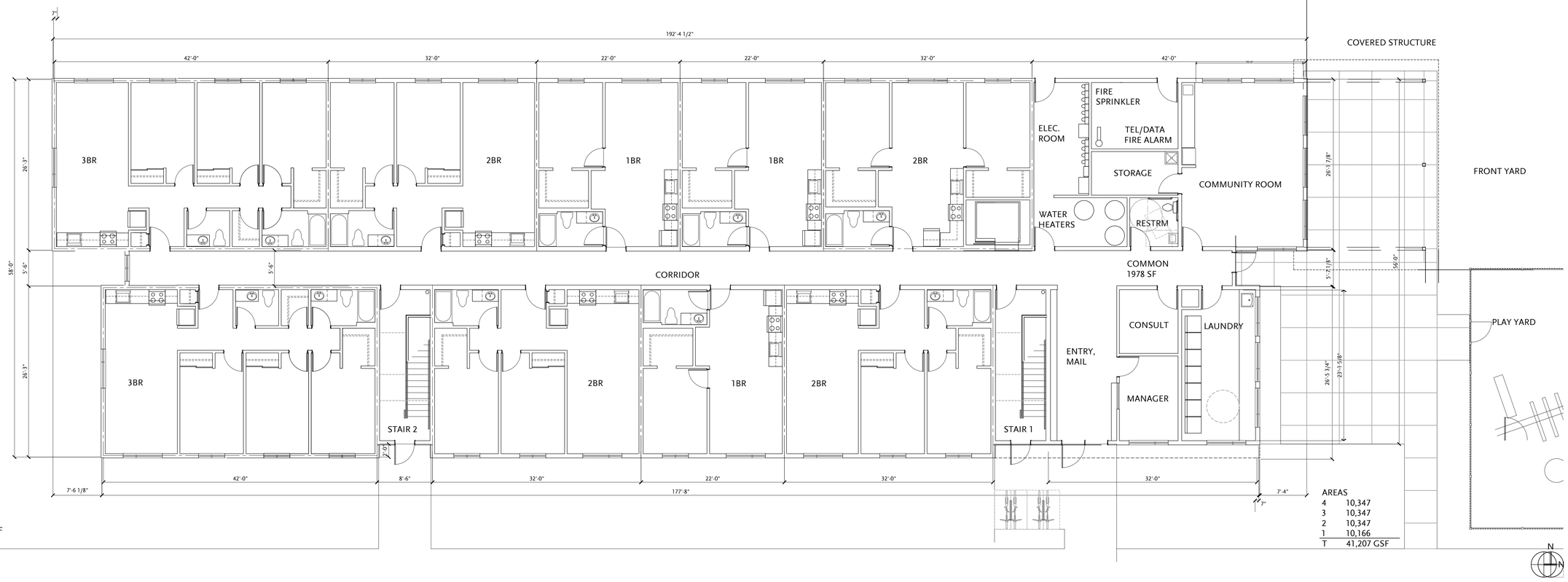
503.705.3050

REGISTERED ARCHITECT
3972
STUART EMMONS
PORTLAND, OR
STATE OF OREGON

FLOORS 2-4
10,347 GSF

FLOOR 1
10,166 GSF



AREAS

4	10,347
3	10,347
2	10,347
1	10,166
T	41,207 GSF

TRILLIUM HOUSE

SE 14TH PLACE
WARRENTON, OR

DESIGN DEVELOPMENT

FLOOR PLANS BUILDING

DECEMBER 9, 2020
SCALE FOR 24x36:1/8" = 1'-0"

N

DD
V12

A2.2

1. EAST ELEVATION

2. WEST ELEVATION

A.
SIDING: HARDIESHINGLE, STRAIGHT EDGE PANEL, COLOR: GRAY SLATE

B.
SIDING: HARDIEPANEL, PAINTED
WINDOW: VPI, 72w X 72h, SINGLE CASEMENT, SILVER
WINDOW TRIM: HARDIETRIM, 4/4 SMOOTH, 3.5"w, PAINTED

C.
SIDING: HARDIESHINGLE, STRAIGHT EDGE PANEL COLOR: GRAY SLATE
WINDOW: VPI, 48w X 54h, DOUBLE CASEMENT, WHITE
WINDOW TRIM: HARDIETRIM, 5/4 SMOOTH, 9.25"w, PAINTED WHITE

D.
SIDING: HARDIEPANEL, PAINTED
WINDOW: VPI, 36w X 36h, FIXED, SILVER
DOOR: 36W X 84H, FULL LIGHT
WINDOW & DR TRIM: HARDIETRIM, 4/4 SMOOTH, 3.5"w, PAINTED

E.
SIDING: HARDIEPANEL, PAINTED
WINDOWS: VPI, 72w X 54h, SINGLE CASEMENT, SILVER
DOORS: 2) 36W X 84H, FULL LIGHT
WINDOW & DR TRIM: HARDIETRIM, 4/4 SMOOTH, 3.5"w PAINTED

100 39TH STREET.
ASTORIA, OR, 97103
503.705.3050

REGISTERED ARCHITECT
3972
STUART EMMONS
PORTLAND, OR
STATE OF OREGON

TRILLIUM HOUSE

SE 14TH PLACE
WARRENTON, OR

DESIGN DEVELOPMENT

EXTERIOR ELEVATIONS EAST & WEST

DECEMBER 9, 2020
SCALE FOR 24x36:1/8" = 1'-0"

DD
V12

A5.1

100 39TH STREET.
ASTORIA, OR, 97103
503.705.3050

1. NORTH ELEVATION

2. SOUTH ELEVATION

ROOF.
3:12 COMPOSITION TILE

A.
SIDING: HARDIESHINGLE, STRAIGHT EDGE PANEL, COLOR: GRAY SLATE

B.
SIDING: HARDIEPANEL, PAINTED
WINDOW: VPI, 72w X 72h, SINGLE CASEMENT, SILVER
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TRILLIUM HOUSE

SE 14TH PLACE
WARRENTON, OR

DESIGN
DEVELOPMENT

EXTERIOR ELEVATIONS
NORTH & SOUTH

DECEMBER 9, 2020
SCALE FOR 24x36: 1/8" = 1'-0"

DD
V12

A5.2

Trillium House
Landscape_V12

LEGAL DESCRIPTION	SUBDIVISION OF TRACT 3 CHELSEA, BLK 1: LOTS: 2, 3, 4, 5, 6, 7, 8, 9, 10, 11. BLK 2: PARTIAL BLOCKS 1, 11, 12, 13, 14. Tax Lots: 1600, 1500, 1503. Partial Tax Lots: 1700, 2100, 2200

% OF SITE TO BE LANDSCAPED	36%

PLANTING MATERIAL

Trees

Code	Common Name	Botanical Name	Size: Caliper	Gallon	Height (approx)	Type	Commernt	Purpose	Color	Comply with
T-1	Cherry		2" min		10'	Deciduous	+/- 25' height due to electrical lines	Street Trees	Pink flowers in spring	16.124.080 Street Trees.
T-2	TBD		1.5 min		10'	Deciduous		Alée along driveway, trees in Parking islands	Spring flowers	
T-3	TBD		1.5 min		10'	Deciduous				
T-4	TBD		1.5 min		10'	Deciduous			Focus Tree	
T-5	Apple		1.5 min		8'	Deciduous		Fruit	Pink flowers in spring	
T-6	TBD		2 min		12'	Deciduous		Summer Shade	TBD	
T-7	Cedar		1.5 min		8'	Conifer		Screen front yard from neighbor	Evergreen	

Shrubs

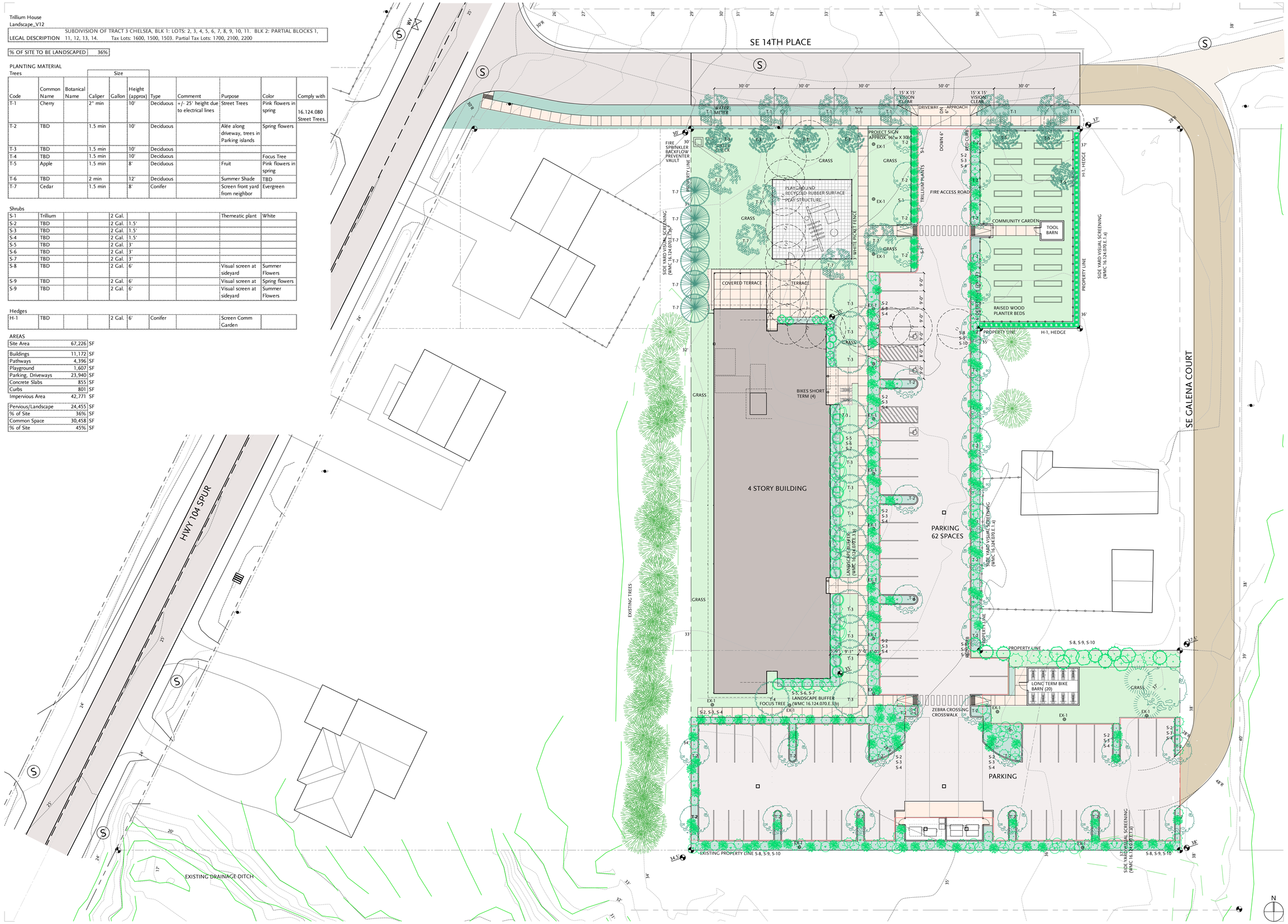
S-1	Trillium			2 Gal.				Themeatic plant	White
S-2	TBD			2 Gal.	1.5'				
S-3	TBD			2 Gal.	1.5'				
S-4	TBD			2 Gal.	1.5'				
S-5	TBD			2 Gal.	3'				
S-6	TBD			2 Gal.	3'				
S-7	TBD			2 Gal.	3'				
S-8	TBD			2 Gal.	6'			Visual screen at sideyard	Summer Flowers
S-9	TBD			2 Gal.	6'			Visual screen at	Spring flowers
S-9	TBD			2 Gal.	6'			Visual screen at sideyard	Summer Flowers

Hedges

H-1	TBD			2 Gal.	6'	Conifer		Screen Comm Garden	

AREAS

Site Area	67,226	SF
Buildings	11,172	SF
Pathways	4,396	SF
Playground	1,607	SF
Parking, Driveways	23,940	SF
Concrete Slabs	855	SF
Curbs	801	SF
Impervious Area	42,771	SF
Pervious/Landscape	24,455	SF
% of Site	36%	SF
Common Space	30,458	SF
% of Site	45%	SF



EMMONS DESIGN, LLC

100 39TH STREET.
ASTORIA, OR, 97103
503.705.3050

NOTES:
1. FOR PROPOSED GRADING, AND STORMWATER FLOW DIRECTIONS, PLEASE SEE SHEET C2.1

LEGEND

EX-1 EXTERIOR LIGHT - APPROX 15' HIGH

TRILLIUM HOUSE

SE 14TH PLACE
WARRENTON, OR

DESIGN DEVELOPMENT

LANDSCAPE PLAN

DECEMBER 9, 2020
SCALE FOR 24x36: 1" = 20'

N

DD
V12

L2.1

EMMONS DESIGN, LLC

100 39TH STREET.
ASTORIA, OR, 97103
503.705.3050

MAGYAR
LAND SURVEYING LLC

TRILLIUM HOUSE

SE 14TH PLACE
WARRENTON, OR

DESIGN
DEVELOPMENT

SITE SURVEY

DECEMBER 9, 2020
SCALE FOR 24x36: 1" = 30'

N

DD
V12

SV1.1

Trillium House

SE 14th Place,
Chelsea Gardens
Warrenton, OR, 97146

Type III Application
December 10, 2020

Contents:

APPLICATION BOOKLET

STORMWATER REPORT

DRAWINGS

December 10, 2020

EMMONS DESIGN FIRWOOD DESIGN GROUP WALSH CONSTRUCTION CO. RCA consulting GREEN LIGHT DEVELOPMENT NOHA northwest oregon housing authority

Trillium House is a high-quality affordable family housing project in the Chelsea Gardens neighborhood of Warrenton. It is new model for multi-family housing on the North Coast, that features a much higher percentage of the site for landscape, and includes a playground, community garden, covered terrace, and generous front yard.

The 41,200 SF 4 story building, has a mix of 1, 2 and 3 bedroom units. All residents and guests will be able to access their units by elevator or enclosed stairways, and the building will have enhanced security - residents will need a fob to enter the building, and guests will be invited in by buzzer. On the first floor is a Community Room with kitchenette, counseling room, common laundry, and an office for a manager, as well as a Lobby for entry and mailboxes.

The 42 units of affordable housing will help employers in Warrenton and the North Coast area, by giving employees, especially those with families, an affordable place to live, close to job locations.

The site is in the new Chelsea Gardens neighborhood, recently upzoned to C-MU to allow for a mix of uses, especaily much needed housing. Chelsea Gardens is close to services, jobs, transportation and open space for the convenience of residents. The new school sites are reasonably close to the Chelsea Gardens neighborhood as well.

The project has 62 parking spaces. A parking reduction is based on additional bike parking, and carpool/nanpool spaces, and deemed more than adequate to accommodate target resident vehicles and their guests.

The project also includes off-site improvements in addition to the half street improvement required by the city: specifically connecting the road and sidewalk in front of the project to the Highway 104 Spur.

Trillium House is a new model for affordable housing on the North Coast, that gives residents common areas, more outdoor area, and more security.

Introduction

CITY OF WARRENTON
PLANNING AND BUILDING DEPARTMENT

COMMERCIAL SITE DESIGN APPLICATION

To be accompanied by a Site Plan Map, copy of property deed and if applicable, a Letter of Authorization.

OFFICE USE ONLY
FILE # _____ FEE $_____
ZONING DISTRICT_____
RECEIPT #_____
DATE RECEIVED_____

The site plan review process is a method for assuring compliance with the City of Warrenton Comprehensive Plan and Development Code, and to ensure wise utilization of natural resources, and the proper integration of land uses utilizing appropriate landscaping or screening measures. A commercial enterprise must also consider traffic circulation patterns, off-street parking, refuse containers, safe exit and entrance to the business, building height, dust control, future widening of major thoroughfares, and signs. Please answer the questions as completely as possible.

Legal Description of the Subject Property: Township _____, Range _____, Section(s) _____, Tax Lot(s)
SUBDIVISION OF TRACT 3 CHELSEA, BLK 1: LOTS: 2, 3, 4, 5, 6, 7, 8, 9, 10, 11. BLK 2: PARTIAL BLOCKS 1, 11, 12, 13, 14.
Tax Lots: 1600, 1500, 1503. Partial Tax Lots: 1700, 2100, 2200
Property street address To Be Determined (approximately 700 SE 14th Place, Warrenton, OR, 97

I/WE, THE UNDERSIGNED APPLICANT(S) OR AUTHORIZED AGENT, AFFIRM BY MY/OUR SIGNATURE(S) THAT THE INFORMATION CONTINED IN THE FOREGOING APPLICATION AND ASSOCIATED SUBMISSIONS IS TRUE AND CORRECT.

APPLICANT:

Printed Name: Stuart Emmons, AIA

Signature: _____ Date: December 10, 2020

Address: 107 Kensington Ave. Phone: 503.705.3050

City/State/Zip: Astoria, OR, 97103 Fax: N/A

PROPERTY OWNER (if different from Applicant):

Printed Name: Current: Ken Yuill, John Yuill, Dave Short // May 2021: Trillium House Warrenton Affordable Housing LLC*

Signature: _____ // _____ Date: December 10, 2020

Address: 580 Highway 101 Alt, Warrenton // 147 S Main Ave, Warrenton Phone: (503) 440-1202 // (503) 861-0119

E-mail Address: kjyuill@msn.com // jevans@quadel.com

City/State/Zip: Warrenton, OR, 97146 Fax: N/A

*Trillium House Warrenton Affordable Housing LLC is controlled by
Northwest Oregon Housing Authority.
Jim Evans, NOHA Interim Executive Director

1. In detail, please describe your proposal:
(see Introduction, page 2)

2. Describe what type of business, commodity sold or manufactured, or service you are proposing.
N/A

Current number of employees: _____
Projected number of customers per day _____
Days of operation_____ Hours of operation_____
Number of shipments/deliveries per day _____ per week _____
By what method will these be arriving/sent? _____

3. Does this property have an existing business or businesses? No

If yes, please list the business names and their addresses, and note these businesses on your site plan map.

4. Is there a residence or residences on this property? No

If yes, please list the number of residences and please show these structures on your site plan map.

5. Availability of services: City water Yes, on 14th Place, currently 2" upgrade to 8", City sewer Yes, on 14th Place

6. If you are an existing business, are materials or merchandise currently being stored on site?
No

Where and how do you propose to store materials or merchandise for sale or processing?

7. What percentage of the property is currently landscaped? 100%

   What percentage of the property do you propose to landscape as part of this project? 36%

8. How do you intend to irrigate the existing and proposed landscaping? The project will have irrigation for planting that requires irrigation.

9. Signs require the submittal of a separate application, which may be submitted in conjunction with this site plan application. The project will have a low, approx. 8' wide monument sign at the front vehicle entry near sidewalk.

10. Please explain how you propose to provide for the drainage of this property, or explain why no additional drainage consideration is necessary. The project will have irrigation for planting that requires irrigation.

11. Please provide the type of development on the neighboring properties.

    North: 14th Place (unimproved)
    South: Home Depot
    East: Single Family House
    West: 3) Single Family Houses

12. Provide samples of the building materials for the exterior of the building with detail description of where each type and color will be used in the construction and finishing of the building. See Sheets A5.1 amd A5.2

13. Will all parking for your business be provided on the property? Yes X No _____ All parking must be shown on your site plan map. If off-street parking is to be provided on another property, please attach a copy of the parking easement or agreement from the property owner; or will off-street parking be provided along the abutting street.

14. How does this request comply with the Warrenton Development Code Chapter 16, Section 16.40 (General Commercial)? Compliant. The project will utilize carpool/vanpool (16.128.030.A.10.b) and additional bike parking (16.128.030.A.10.e) to reduce parking. Parking will be sufficient for the resident population.

15. Orientation of proposed building(s) (see Section 16.116.030 in the Warrenton Development Code)
    The building has a large Front Yard and a Front Entry off the primary entry pathway.

16. Please address (on separate sheet of paper) all applicable sections of Design Standards (copy attached) out of the Warrenton Development Code.

See Pages 8 - 9

****

PLEASE UNDERSTAND THAT THIS APPLICATION WILL NOT BE OFFICIALLY ACCEPTED UNTIL DEPARTMENT STAFF HAS DETERMINED THAT THE APPLICATION IS COMPLETELY FILLED OUT AND THE SITE PLAN MAP REQUIREMENTS HAVE BEEN COMPLETED.

Return Application To:

City of Warrenton
Planning and Building Department
PO Box 250
225 S. Main Street
Warrenton, Oregon 97146

Phone: 503-861-0920
Fax: 503-861-2351

****

MAP INSTRUCTIONS AND CHECKLIST

****

A Site Plan Map, which shows all existing and proposed structures and parking areas, must accompany this application. The following checklist identifies the specific information which should be included on this map.

OK Title the map "Commercial Site Design".

24 x 36 The map may be drawn on 8 ½ x 11 or 8 ½ x 14 inch white paper.

OK Township, Range, Section and Tax Lot number of the subject property(ies) shall be included.

OK North arrow, date, and map scale in one inch intervals (1" = 20') shall be noted.

OK Shape, dimensions, and square footage of the parcel shall be shown. Draw the property line with a solid black line and label adjacent street(s), if any.

N/A Identify existing and proposed easements with a dotted line.

OK Identify the location and direction of all water courses and drainage ways, as well as the location of the 100-year floodplain, if applicable.

N/A Illustrate all existing buildings and their sizes.

OK Illustrate all proposed new construction with dashed lines (include dimensions).

OK Illustrate parking area with number of spaces and access drive areas. If off-street parking is to be provided, even in part, on another property, please show its location on your site plan map, and attach a copy of the parking easement or agreement from the adjoining property owner.

OK Illustrate the entrance and exit points to the property, pattern of traffic flow, loading and unloading area, sidewalks and bike paths.

OK Illustrate the existing or proposed location, height, and material of all fences and walls.

OK Illustrate existing or proposed trash and garbage container locations, including type of screening.

See Note Name of the person who prepared the map.

OK Location, type and height of outdoor lighting.

See Note Location of mailboxes if known.

OK Locations, sizes, and types of signs (shall comply with Chapter 16.144 of the Warrenton Development Code).

OK Map shall show entire tax lot plus surrounding properties.

N/A Identification of slopes greater than 10%.

A1.0 location, condition and width of all public and private streets, drives, sidewalks, pathways, right-of-ways, and easements on the site and adjoining the site.

N/A Identify designated flood hazard area(s).

N/A Show wetland and riparian areas, streams and/or wildlife areas.

N/A Any designated historic and cultural resources areas on the site and/or adjacent parcels or lots.

OK Location, size and type of trees and other vegetation on the property.

ZONING CODE SUMMARY ('...' denotes regulation not applicable for this project)
TITLE 16 DEVELOPMENT CODE
DIVISION 2 - LAND USE DISTRICTS
Chapter 16.44 C-MU District (Commercial - Mixed-Use)
A. Density Provisions (selected)

...
8. Max. Building Height 40' (residential)
...
10. Lot Coverage - Residential Uses Not more than 55% of lot area covered by buildings

B. Setback Requirements (Residential and Multiple Uses)

1. Front Yard (Residential) 15'
2. Side Yard 8'
...
4. Rear Yard 15' except Accessory Structures (5')

16.120.929.K.5
Driveway from property line 5'

16.188 Multifamily Housing Design Standards
A. Bldg Mass Max. 200' length
B. Open Space 20% of site for useable common open space (inclusive of setback yards)
C. Trash Receptacles oriented away from adjacent residences, screened with evergreen hedge or solid fence or wall of not less than six feet.

See Zoning Summary spreadsheet on Page 10 for additional information.

LANDSCAPE SUMMARY
SITE
Landscape Coverage: 15% of the site shall be landscaped (16.124.070.C.2)

Site Trees:
Caliper: 1.5"

STREET TREES
Caliper: 2"
Spacing: 30' max
Species: Deciduous Trees (16.124.080.A.9)

Zoning Summary

SITE AREAS			ACTUAL		REQUIRED		Warrenton Municipal Code Chapter/Section:
Site Area			67,226	SF	10,000	for Multi-family	16.44.040.A.3 / 16.36.040.A.4
					67,200	for 42 Units	16.36.040.A.5
Dwelling Units			42				16.36.040.A.5
Site SF/unit (67,226 SF/42 Units)			1,601				16.36.040.A.5

Building Area (SF)

Housing		10,550
Tool		120
Bike		502
Trash (488 SF enclosure w no roof)		N/A
Total Building Area		11,172

Lot Coverage by Buildings	17%	55% Maximum	16.44.040.A.10

Impervious Surfaces (add to bldgs)

Pathways		4,396
Playground		1,607
Parking, Driveways		23,940
Concrete Slabs (@ Trash/Recycle)		855
Curbs		801
Total Impervious Area (non bldg)		31,599 SF

Total Impervious Area (bldg + non bldg)	42,771 SF		
Pervious/Landscape Area	24,455 SF		
Common Space (includes path, playground)	30,458 SF		
% of Site	45%	20% Minimum	16.188.030.B

BUILDING ENVELOPE INFORMATION

Building Length	192'-5 1/2"	200' Maximum	16.188.030.A
Building Height	40'	40' Maximum	16.44.040.A.8

PARKING LANDSCAPE

Parking Boundary	26,021		
Parking Landscape	2,081		
% Parking Landscaped	8.0%	8.0%	16.124.070.E.2

SETBACKS	ACTUAL	REQUIRED	
Front Yard	90'-3"	15'-0"	16.44.040.B.1
Sire Yard	11'-6"	8'-0"	16.44.040.B.2
Rear Yard	78'-6"	15'-0"	16.44.040.B.3
Accessory Structures (in rear yd setback)	N/A	5'-0"	16.280.020.B

(Trash/Recycle is not a structure due to no roof)

		ACTUAL		REQUIRED		16.128.030.A
VEHICLE PARKING	# units	Ratio	Spaces	Ratio	Spaces	
1 BR	12	1.25	15.00	1.50	18.00	
2 BR	19	1.50	28.50	1.75	33.25	
3 BR	11	1.65	18.15	2.00	22.00	
Total	42		61.65		73.25	
Round Up			62		74	
Reduction			16%			
*Parking Reductions Allowed for additional bike parking, carpool/vanpool						16.128.030.A.10

Compact/Full Size Ratio	ACTUAL	ALLOWED	
Compact Spaces	23		
% Compact Spaces	37%	40%	16.128.030.C

	ACTUAL	REQUIRED (51 - 75 Spaces)	OSSC 1106.1
Accessible Spaces	3	3	

BIKE PARKING	ACTUAL	REQUIRED (<50 Units)	
Total	24	11	(1 space/4 DU)
Long Term	20	75% 8	Table 16.128.040.A
Short Term	4	25% 3	Table 16.128.040.A

LEGAL DESCRIPTION	SUBDIVISION OF TRACT 3 CHELSEA, BLK 1: LOTS: 2, 3, 4, 5, 6, 7, 8, 9, 10, 11. BLK 2: PARTIAL BLOCKS 1, 11, 12, 13, 14. Tax Lots: 1600, 1500, 1503. Partial Tax Lots: 1700, 2100, 2200

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			Size							
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% of Site	36%	SF
Common Space	30,458	SF
% of Site	45%	SF

Landscape Information

Trillium House
Trash/Recycle
V1

Recology

Trash	Estimates		
Units	@CY/Mo	Total CY/Mo	
42	2	84	Yards
42	2.5	105	Yards

City of Warrenton Picks Up — OPTION 1: 2) 3 Yard Dumpsters

6	Yards - 2) 3 yard dumpsters
17.5	Pick ups/month
18	Rounded Pick ups/month

for 105 yards

City of Warrenton Picks Up — OPTION 2: 2) 3 Yard Dumpsters

6	Yards - 2) 3 yard dumpsters
13	Pick ups/month
13	Rounded Pick ups/month
3	Pick ups/week

for <84 yards
Recommended by Public Works Director

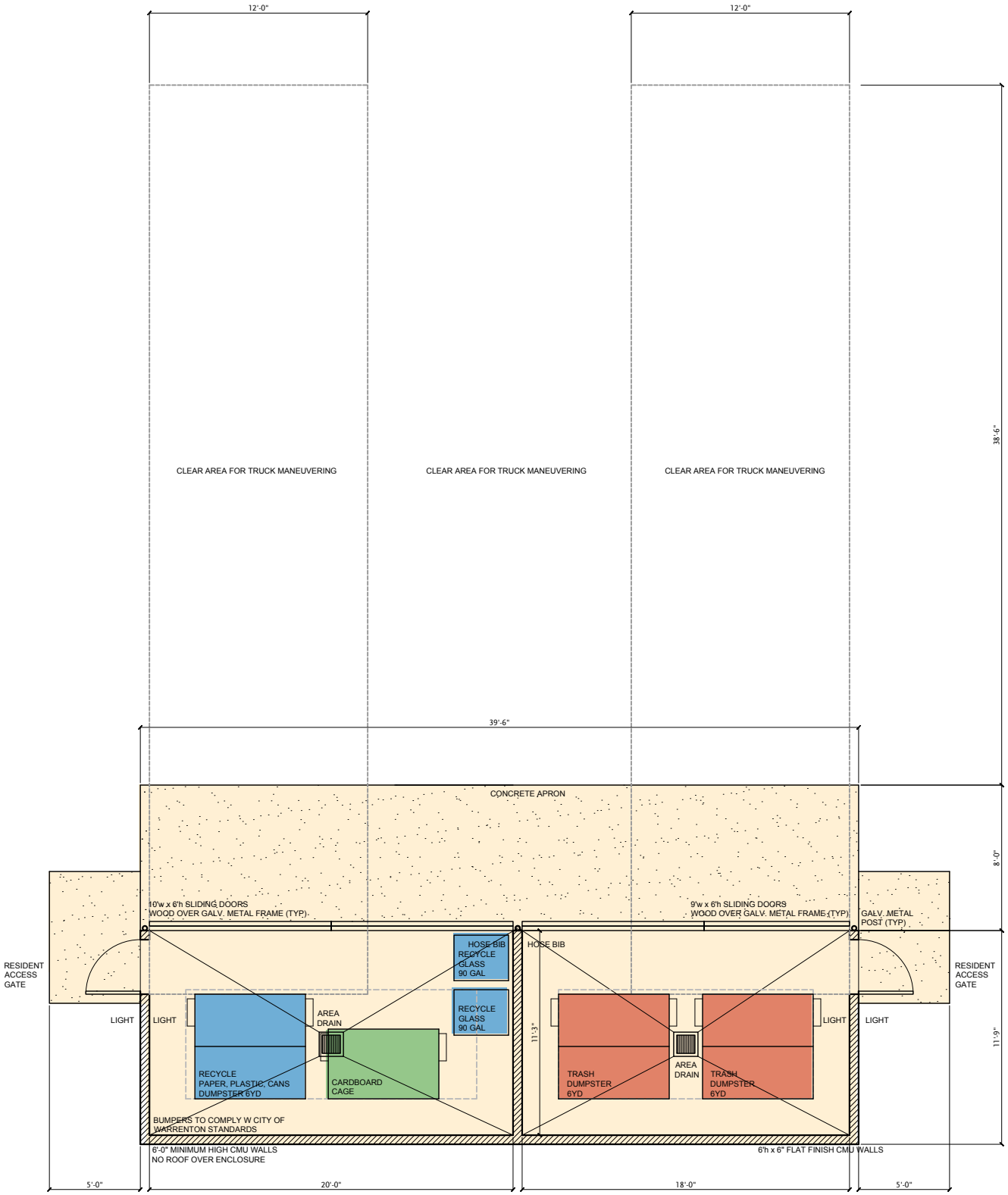
Recology Picks Up — OPTION 3: 2) 6 Yard Dumpsters

12	Yards - 2) 6 yard dumpsters
1.5	Pick ups/month
9	Rounded Pick ups/month

OPTION 4: Compactor

Recycle - Recology Picks Up

Plastic, paper, cans	1) 6 Yard Dumpster
Cardboard	1) Cardboard Cage
Glass	2) 96 gallon bins


12'-0"
12'-0"
CLEAR AREA FOR TRUCK MANEUVERING
CLEAR AREA FOR TRUCK MANEUVERING
CLEAR AREA FOR TRUCK MANEUVERING
38'-6"
39'-6"
CONCRETE APRON
8'-0"
10'w x 6'h SLIDING DOORS
WOOD OVER GALV. METAL FRAME (TYP)
9'w x 6'h SLIDING DOORS
WOOD OVER GALV. METAL FRAME (TYP)
GALV. METAL
POST (TYP)
RESIDENT
ACCESS
GATE
RESIDENT
ACCESS
GATE
HOSE BIB
RECYCLE
GLASS
90 GAL
HOSE BIB
RECYCLE
GLASS
90 GAL
LIGHT
LIGHT
AREA
DRAIN
LIGHT
LIGHT
11'-3"
11'-9"
RECYCLE
PAPER, PLASTIC, CANS
DUMPSTER 6YD
CARDBOARD
CAGE
TRASH
DUMPSTER
6YD
AREA
DRAIN
TRASH
DUMPSTER
6YD
BUMPERS TO COMPLY W CITY OF
WARRENTON STANDARDS
6'-0" MINIMUM HIGH CMU WALLS
NO ROOF OVER ENCLOSURE
6'h x 6" FLAT FINISH CMU WALLS
5'-0"
20'-0"
18'-0"
5'-0"

DRAFT

Warrenton Urban Renewal Zone Change

Transportation Impact Study

Warrenton, Oregon

Date:
July 23, 2018

Prepared for:
City of Warrenton

Prepared by:
Daniel Stumpf, EI
William Farley, PE

LANCASTER ENGINEERING

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Table of Contents

Table of Figures

Table of Tables

Executive Summary

1. The proposed Warrenton Urban Renewal Zone Change will include the rezoning of multiple properties bounded by Oregon Coast Highway (US-101), Fort Stevens Highway Spur (OR-104S), and SE Ensign Lane in Warrenton, Oregon. Specifically, the proposed zone change will rezone approximately 3.0 acres of *General Industrial* (I-1) and 16.9 acres of *Intermediate Density Residential* (R-10) land to *Commercial Mixed Use* (C-MU).
2. The trip generation calculations show that under existing zoning, the subject site could reasonably generate up to 55 morning peak hour trips, 68 evening peak hour trips, and 632 average weekday trips. Under the proposed zoning, the site could reasonably generate up to 359 morning peak hour trips, 750 evening peak hour trips, and 8,396 weekday trips. The net change in trip potential of the site after the proposed rezone is projected to be 220 additional morning peak hour trips, 424 additional evening peak hour trips, and 4,910 additional average weekday trips.
3. No significant trends or crash patterns were identified at any of the study intersections and no specific safety mitigation is recommended.
4. Left-turn lane warrants are projected to be met for the intersection of OR-104S at SE Ensign Lane under existing conditions during the evening peak hour.
5. Per a preliminary warrant analysis, traffic signal warrants are projected to be triggered at the following two intersections.
    a. OR-104S at OR-104 under the 2038 Planning Horizon (regardless of the zone change).
    b. OR-104S at SE Ensign Lane under the 2038 Planning Horizon with the net addition of potential site trips that could be generated under the proposed zoning.

6. Based on the results of the operational analysis, there are seven study intersections that are either currently or projected to operate at LOS F or with v/c ratios in excess of the maximum allowable ODOT performance standards. These intersections include US-101 at E Harbor Street, US-101 at SE Neptune Drive, US-101 at US-101B, US-101 at OR-104S, OR-104S at OR-104, OR-104S at SE Ensign Lane, and US-101 at SE Ensign Lane. Suggested mitigation may include the following:

   a. US-101 at E Harbor Street: Per the City of Warrenton's TSP, install additional turn lanes. Specifically, an additional eastbound left-turn lane, and additional northbound/southbound through lanes.

   b. US-101 at SE Neptune Drive: Extend the planned additional northbound and southbound travel lanes, as described for the US-101 at E Harbor Street intersection, to this intersection.

   c. US-101 at US-101B: Extend the planned additional northbound and southbound travel lanes, as described for the US-101 at E Harbor Street intersection, to this intersection.

   d. OR-104S at OR-104: Either install a traffic signal or reconstruct/restripe the westbound approach to include one left-turn lane and one right-turn lane.

   e. OR-104S at SE Ensign Lane: Either install a traffic signal or restripe the eastbound approach to have one shared through/right-turn lane and a center two-way left-turn lane. In either case, for the purposes of maintaining safety, the westbound approach should be reconstructed/restriped to include a left-turn lane.

   f. The intersections of US-101 at OR-104S and US-101 at SE Ensign Lane are operating just over acceptable v/c ratios per ODOT standards. Provided that alternative mobility standards are adopted for intersections along US-101 within City limits, these intersections are expected to operate acceptably.

7. Five of the study intersections are projected to have 95th-percentile queues at designated pocket turn lanes extend beyond available lane storage: US-101 at E Harbor Street, US-101 at SE Neptune Drive, US-101 at US-101B, OR-104S at SE Ensign Lane, and US-101 at SE Ensign Lane. Provided the above described mitigations are implemented at these intersections, the extended queues at these intersections are expected to decrease.

8. Upon implementing the planned and/or suggested operational mitigations, all study intersections are projected to operate within acceptable capacity per City of Warrenton, Clatsop County, and ODOT standards through the 2038 planning horizon. With mitigative measures in place, the proposed zone change will not degrade the performance of any existing or planned transportation facility below acceptable jurisdictional standards. Accordingly, the Transportation Planning Rule may be satisfied if mitigations are addressed upon development of the site.

Project Description and Location

Introduction

The proposed Warrenton Urban Renewal Zone Change will include the rezoning of multiple properties bounded by Oregon Coast Highway (US-101), Fort Stevens Highway Spur (OR-104S), and SE Ensign Lane in Warrenton, Oregon. Specifically, the proposed zone change will rezone approximately 3.0 acres of *General Industrial* (I-1) and 16.9 acres of *Intermediate Density Residential* (R-10) land to *Commercial Mixed Use* (C-MU). This report addresses the potential impacts of the proposed zone change and subsequent future redevelopment on the nearby street system. Based on correspondence with City of Warrenton and Oregon Department of Transportation (ODOT) staff, the report conducts safety and capacity/level of service analyses at the following intersections:

1. US-101 at E Harbor Street;
2. US-101 at SE Neptune Drive;
3. US-101 at Marlin Drive (US-101B);
4. US-101 at OR-104S;
5. OR-104S at S Main Avenue (OR-104);
6. OR-104S at SE Ensign Lane;
7. US-101 at SE Ensign Lane; and
8. Warrenton-Astoria Highway (US-101B) at SE Ensign Lane.

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 proposed change in zoning 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.

Project and Location Description

The project site is located north of SE Ensign Lane, southeast of OR-104S, and northwest of US-101 in Warrenton, Oregon. The site includes several tax lots which encompass an approximate total of 19.9 acres. Of the 19.9 acres, approximately 3 acres are currently zone as I-1 while the remaining 16.9 acres is zoned as R-10. The site is currently developed with low density single-family detached houses with a few light industrial/commercial uses.

Vicinity Streets

The proposed change in zoning is expected to impact the following nearby vicinity roadways: US-101, E Harbor Street, SE Neptune Drive, OR-104, US-101B, OR-104S, and SE Ensign Lane. Table 1 provides a description of each of the vicinity roadways.

Table 1: Vicinity Roadway Descriptions

Roadway	Jurisdiction	Functional Classification	Cross-Section	Speed	On-street Parking	Bicycle Lanes	Curbs	Sidewalks
US-101	ODOT	Principal Arterial / Statewide Hwy	2 to 6 Lanes	45/55 mph Posted	Not Permitted	Both Sides	Partial Both Sides	Partial Both Sides
E Harbor Street	ODOT	Major Collector / District Hwy	2 to 4 Lanes	45 mph Posted	Not Permitted	Both Sides	Partial South Side	None
SE Neptune Drive	City of Warrenton	Local Street	2 to 3 Lanes	20 mph Statutory	Not Permitted	None	Both Sides	West Side
US-101B	ODOT	Major Collector / Minor Arterial / District Hwy	2 to 3 Lanes	35/45/55 mph Posted	Not Permitted	Partial Both Sides	Partial Both Sides	Partial Both Sides
OR-104	ODOT	Major Collector / District Hwy	2 to 3 Lanes	35 mph Posted	Partially Permitted Both Sides	Both Sides	Partial Both Sides	Partial Both Sides
OR-104S	ODOT	Major Collector / District Hwy	2 Lanes	45 mph Posted	Not Permitted	Both Sides	Partial South Side	Partial South Side
SE Ensign Lane	Clatsop County	Major Collector	3 to 5 Lanes	35 mph Posted	Not Permitted	Both Sides	Both Sides	Partial Both Sides

Note: Jurisdiction & Functional Classification based on City of Warrenton Transportation System Plan and ODOT Oregon Highway Plan/Oregon Transportation Map.

Study Intersections

A majority of site trips generated by the proposed development are expected to have significant impacts to eight major nearby intersections. A summarized description of these intersections is provided in Table 2.

Table 2: Study Intersection Descriptions

Number	Name	Geometry	Traffic Control	Phasing/Stopped Approaches
1	US-101 at E Harbor Street	Three-Legged	Signalized	Permitted/Overlap SWB Right-turn, Protected NEB Left-turn
2	US-101 at SE Neptune Drive	Three-Legged	Signalized	Protected NEB Left-turn
3	US-101 at US-101B	Four-Legged	Signalized	Permitted N/S Left-turns, Protected NE/SW Left-turns
4	US-101 at OR-104S	Four-Legged	Stop-Controlled	EB Stop-Controlled, Restricted SB/EB/WB Turning Movements
5	OR-104S at OR-104	Three-Legged	Stop-Controlled	WB Stop-Controlled
6	OR-104S at SE Ensign Lane	Three-Legged	Stop-Controlled	NB Stop-Controlled
7	US-101 at SE Ensign Lane	Four-Legged	Signalized	FYA N/S Left-turns, Permitted/Overlap NB/WB Right-turns, Protected E/W Left-turns
8	US-101B at SE Ensign Lane	Three-Legged	Stop-Controlled	SB Stop-Controlled

Note: Flashing-Yellow-Arrow denoted as FYA.

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.

Traffic Counts

Traffic counts were conducted at the study intersections on Wednesday, April 11, 2018, from 7:00 AM to 9:00 AM and on Tuesday, April 10, 2018, from 4:00 PM to 6:00 PM. Data was used from each intersection's respective morning and evening peak hours.

Per the requirements established in the ODOT's *Analysis Procedures Manual* as well as direction from ODOT staff, the following seasonal adjustment factors were calculated and applied to each highway's through movement traffic volumes to reflect the 30th highest hour volumes along ODOT facilities:

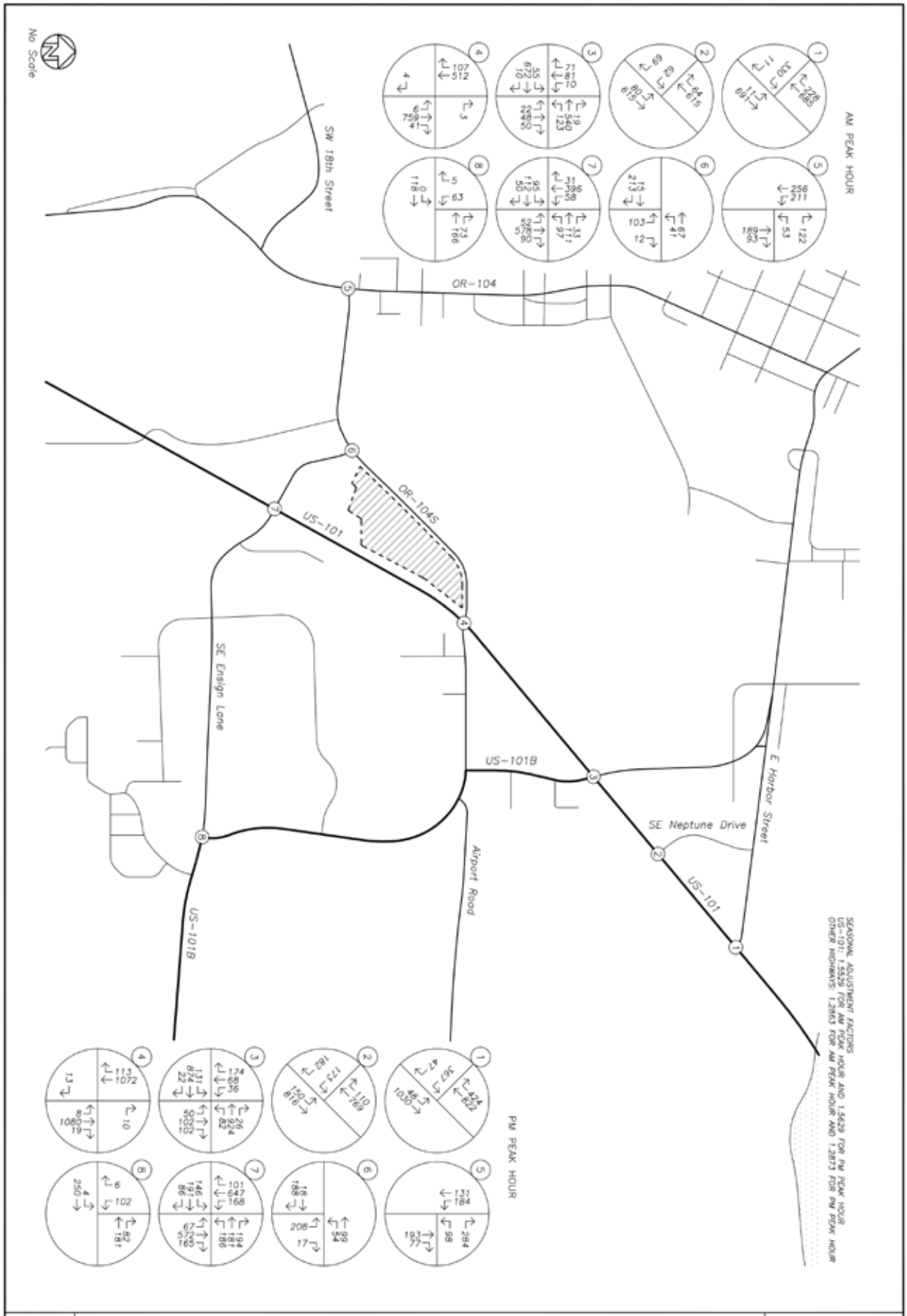
- Based on the Coastal Destination Route seasonal trend, a seasonal adjustment factor of 1.5629 for the April 10 counts and 1.5529 for the April 11 counts were calculated for US-101.
- Based on the average of Commuter and Coastal Destination Route seasonal trends, a seasonal adjustment factor of 1.2873 for the April 10 counts and 1.2863 for the April 11 counts were calculated for US-101B, OR-104, and OR-104S

For instances where the minor-street approach of a study intersection is an ODOT facility, the seasonal adjustment factor for the minor-street roadway was generally applied to traffic volumes other than the major-street through movement. Where the minor-street approach is a local jurisdiction facility, the seasonal adjustment factor was applied to the major-street through movement.

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

VICINITY MAP
Existing Intersection Configurations
Traffic Control Devices and Lane Configurations

FIGURE 1
Page 7



TRAFFIC VOLUMES
Existing Conditions
AM & PM Peak Hours

FIGURE 2
Page 8

Site Trips

Trip Generation

The subject site is currently zoned as *General Industrial* (I-1) and *Intermediate Density Residential* (R-10) and is proposed for a change in zoning to *Commercial Mixed Use* (C-MU). To determine the impacts of the proposed change in zoning, "reasonable worst-case" development scenarios for the existing and proposed zones were determined and compared utilizing data for the most traffic-intensive uses permitted within each zone.

Existing R-10 Zone

Under existing conditions, approximately 3 acres of the site is zoned as I-1 while approximately 16.9 acres is zoned as R-10. To determine a "reasonable worst-case" development scenario under the existing zoning, City of Warrenton Code Sections 16.60 – *General Industrial (I-1) District* and 16.28 – *Intermediate Density Residential (R-10) District* were referenced and compared to a variety of land-uses provided within the *Trip Generation Manual*[1]. Based on an assessment of permitted uses under each respective zone, data from land-use codes 130, *Industrial Park*, and 210, *Single-Family Detached Housing*, were used to estimate a potential, "reasonable worst-case" development scenario under the existing zoning.

For the R-10 zone, each single-family dwelling requires a minimum lot size of 10,000 square-feet. Assuming a 27 percent reduction in the site build-able area (space necessary for street right-of-way improvements, public space, etc., based on existing internal street right-of-way), the existing R-10 zone could include the construction of up to 53 single-family houses. For the I-1 zone, no specific restriction to the building size on a per area basis is provided; however, it is assumed that a reasonable maximum total building footprint would cover approximately 30 percent of the I-1 zone area. Based on this assumption, the I-1 zone may include the construction of up to 39,204 square-feet of building gross floor area.

Proposed C-MU Zone

To determine a "reasonable worst-case" development scenario under the proposed zoning, City of Warrenton Code Section 16.44 – *Commercial Mixed Use (C-MU) District* was referenced and compared to a variety of land-uses provided within the *Trip Generation Manual*. Based on an assessment of permitted uses under the C-MU zone, data from land-use codes 220, *Multi-Family Housing (Low-Rise)*, 720, *Medical-Dental Office Building*, and 820, *Shopping Center*, were used to estimate a potential, "reasonable worst-case" development scenario under the proposed zoning. At the direction of City staff, a likely development scenario may include approximately 50 percent of the site being developed as residential uses, 40 percent as shopping center, and 10 percent as office uses.

Per Code Section 16.36.040, the maximum density for multi-family structures is one dwelling unit per 1,600 square-feet of site area; however, at the direction of City staff, a more reasonable development density of 1,755 square-feet per dwelling unit should be used. Assuming a 27 percent reduction in the site build-able area (space necessary for street right-of-way improvements, public space, etc, based on existing internal street

[1] Institute of Transportation Engineers (ITE), *Trip Generation Manual*, 10th Edition, 2017.

right-of-way), 50 percent of the proposed C-MU zone could include the construction of up to 180 dwelling units.

No specific restriction to the building size on a per area basis is provided for commercial uses within a C-MU zone; therefore, it is assumed that a reasonable maximum total building footprint would cover approximately 30 percent of the project site. Based on this assumption, 50 percent of the C-MU zone could include the construction of up to 130,000 square-feet of commercial building gross floor area. Assuming 1/5 of this area (or 20 percent of the total site area) is developed as office space, approximately 26,000 square-feet of the potential building area will be dedicated to land-use code 720 while the remaining 104,000 square-feet will be dedicated to land-use code 820.

Given the variety of land-uses that could be developed under the proposed zone's "reasonable worst-case" development scenario (including residential, office, and retail land-uses), some trips generated will be shared or internally captured by the other potential uses and will not impact the nearby transportation system. Using the NCHRP Report 684, internal capture rates for the "reasonable worst-case" development scenario under the proposed zoning were calculated for each land-use during the morning and evening peak hours.

The potential *Shopping Center* land-use under the proposed zoning is expected to attract pass-by and diverted trips to the site. Pass-by trips are trips that leave the adjacent roadway to patronize a land-use and then continue in their original direction of travel. Similar to pass-by trips, diverted trips are trips that divert from a nearby roadway not adjacent to the site to patronize a land-use before continuing to their original destination. Pass-by trips do not add additional vehicles to the surrounding transportation system; however, they do add additional turning movements at site access intersections. Diverted trips may add turning movements at both site accesses and other nearby intersections.

For the purposes of this analysis, diverted trips were treated as primary trips while pass-by trip rates were determined using data provided within the *Trip Generation Handbook*[2]. Data from land-use 820 was used to determine pass-by rates for the retail portion of the "reasonable worst-case" development scenario under the proposed zone. It is assumed that the morning peak hour and weekday pass-by rates would approximately match the evening peak hour.

Trip Generation Analysis

The trip generation calculations show that under existing zoning, the subject site could reasonably generate up to 55 morning peak hour trips, 68 evening peak hour trips, and 632 average weekday trips. Under the proposed zoning, the site could reasonably generate up to 359 morning peak hour trips, 750 evening peak hour trips, and 8,396 weekday trips. The net change in trip potential of the site after the proposed rezone is projected to be 220 additional morning peak hour trips, 424 additional evening peak hour trips, and 4,910 additional average weekday trips.

The trip generation estimates are summarized in Table 3. Detailed trip generation calculations are included in the technical appendix to this report.

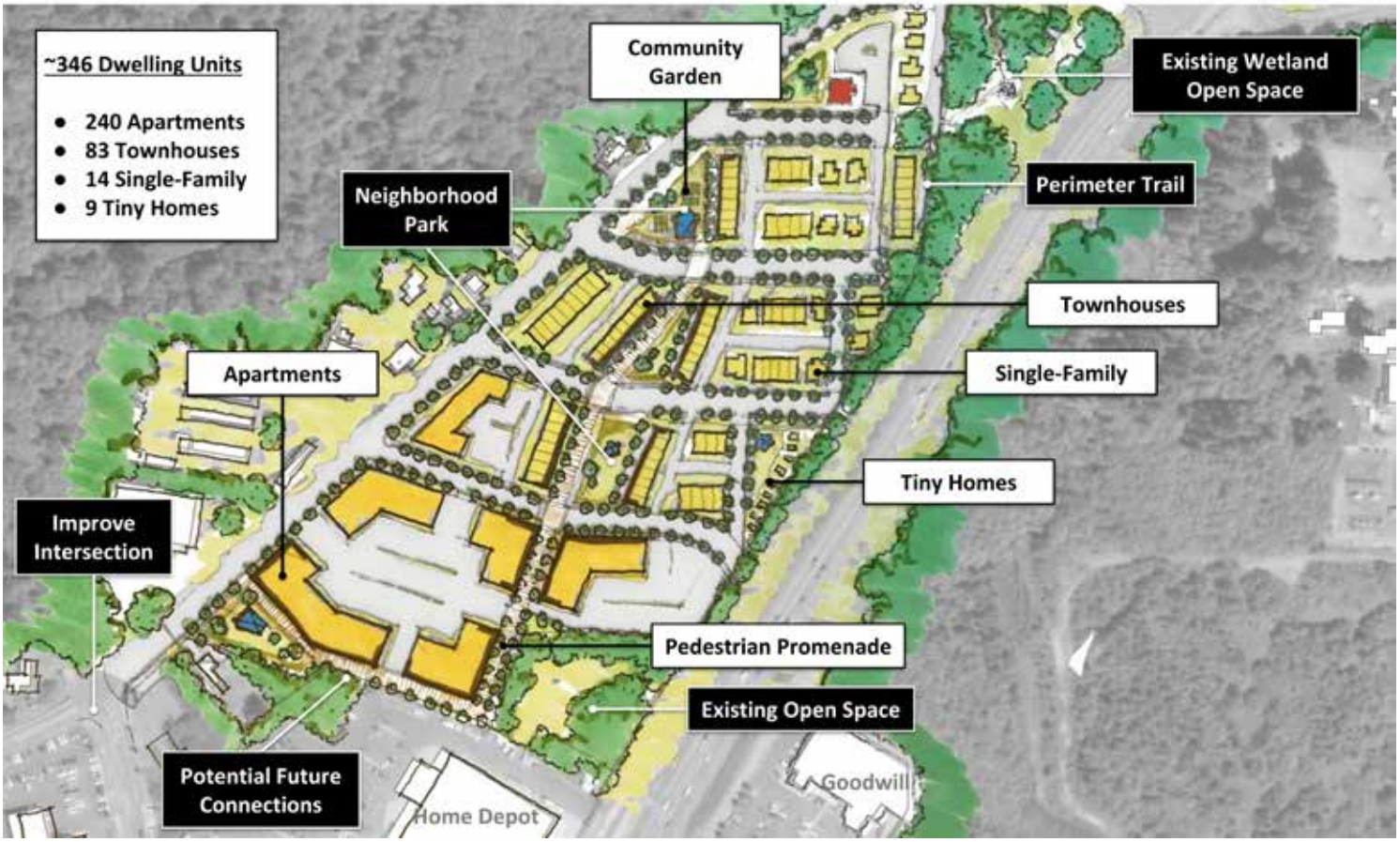
[2] Institute of Transportation Engineers (ITE), *Trip Generation Handbook*, 3rd Edition, 2014.

Table 3: Trip Generation Summary

	ITE Code	Size & Rate	Morning Peak Hour			Evening Peak Hour			Weekday Total
			Enter	Exit	Total	Enter	Exit	Total	
Existing Zoning (I-1 & R-10)									
Industrial Park (I-1)	130	39,200 sq.ft.	13	3	16	3	13	16	132
Single-Family Housing (R-10)	210	53 units	10	29	39	33	19	52	500
Total Trips			23	32	55	36	32	68	632
Proposed Zoning (C-MU)									
Multi-Family Housing	220	180 units	19	64	83	64	37	101	1,318
Internal Trips		*5% (12%)*	*2*	*2*	*4*	*6*	*6*	*12*	*158*
External Trips			17	62	79	58	31	89	1,160
Medical-Dental Office	720	26,000 sq.ft.	56	16	72	25	65	90	904
Internal Trips		*5% (12%)*	*2*	*2*	*4*	*6*	*5*	*11*	*108*
External Trips			54	14	68	19	60	79	796
Shopping Center	820	104,000 sq.ft.	126	78	204	268	291	559	6,174
Internal Trips		*5% (12%)*	*5*	*5*	*10*	*33*	*34*	*67*	*740*
External Trips			121	73	194	235	257	492	5,434
Pass-by Trips		*34%*	*33*	*33*	*66*	*84*	*84*	*168*	*1,848*
Primary Trips			88	40	128	151	173	324	3,586
Total Vehicular Trips			201	158	359	357	393	750	8,396
Total Internal Trips			*9*	*9*	*18*	*45*	*45*	*90*	*1,006*
Total External Trips			192	149	341	312	348	660	7,390
Total Pass-by Trips			*33*	*33*	*66*	*84*	*84*	*168*	*1,848*
Primary Trips			*159*	*116*	*275*	*228*	*264*	*492*	*5,542*
Net New Site Trips			**136**	**84**	**220**	**192**	**232**	**424**	**4,910**

Note: AM (PM and ADT).

C-MU SITE FRAMEWORK PLAN :: RESIDENTIAL CONCEPT



C-MU SITE FRAMEWORK PLAN :: MIXED-USE CONCEPT

FIRWOOD DESIGN GROUP
Reliable Engineering Solutions

December 10, 2020

Trillium House
Impact Study

Introduction:

Per Warrenton Municipal Code, Section 16.208.050.B.2.e requirement for all Type III applications the applicant has prepared this impact study. Many of these items are also discussed in the project narrative responses also provided with this application.

The applicant is proposing a 42 unit multi-family affordable housing development located in Warrenton OR. The property is currently vacant. The applicant is proposing a 41,200 SF 4 Story building with a mix of 1,2, and 3 bedroom units.

Transportation:

Due to the relatively small number of proposed units this development should have no significant impact on the City's transportation system. A Transportation Impact Study was prepared for the City of Warrenton for the Warrenton Urban Renewal Zone Change and is included in this application packet. This study looked at the area south of Home Depot and between Hwy 101 and Hwy 104 Spur as being fully developed with commercial and multifamily family (C-MU zoning) and presented an increase in total trips per day of 3,460; whereas the Trillium House project will only generate an estimated 307 additional trips per day representing only 8.8% of the increase at build out.

No bikeways are proposed, but the proposed roadway will provide bike access as on other local streets within the City.

Access to the site will be primarily from SE 14th Place with a secondary access provided in the southeastern portion of the site for fire access. SE 14th Place will be improved from the intersection of Hwy 104 Spur and easterly to the terminus of the project site's frontage with a half street improvement composed of 26 feet of asphalt paving and sidewalk.

Coordination with ODOT for improvements to the proposed at the intersection of SE 14th Place and Hwy 104 Spur is in process.

Drainage System

Negligible impact to the City's drainage system are anticipated. Stormwater discharges for the site will follow existing routes which currently flow to the southwestern part of the site. Stormwater discharges will flow into the deep gully located between the

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southwestern corner of the site and Highway 104 Spur Road where it enters a 24-inch culvert under Highway 104 Sour Road and discharges to a manhole located in front of the Smart Foodservice facility. The flows out of the manhole are conveyed by an 18-inch pipe to the northwest through the Smart Foodservice property and discharge in relatively flat and open area by the toe a fill bank. Ownership and maintenance responsibility of the above described piping is uncertain. Flows would then continue on through about a three quarters of a mile of tidally influenced channels and marshy areas and eventually discharge into the Skipanon River.

Minor increases in flow will also occur along the improved SE 14th Place which flows northwesterly to stomwater conveyance facilities in the ODOT right-of-way

Treatment and detention of stomwater is not proposed at this time. See the Preliminary Stormwater Report included in this application packet for additional information.

Parks:
The proposed development will have negligible impacts, positive or negative, to the City's parks.

Water System:
Replacement of the existing 2-inch City water main with a new 8-inch water main is proposed from the Hwy 104 Spur Road to the eastern terminus of the project sites frontage. An 8-inch public water main (and an easement to the City) will be extended onto the site to service the onsite fire hydrant.

Appropriate backflow devices will be installed on the domestic water service and the fire suppression (sprinklers) lines, as well as to any irrigation systems.

No concerns about impacts to the water system have been raised by City staff. It is assumed that for a development such as this, that the existing City water system has the capacity needed in terms of flows and storage needs. While not verified yet by the City's hydraulic modeling, it is currently assumed that adequate fire flow is available.

Sanitary Sewer System:
The minimal contribution of wastewater flows from the proposed additional 42 units to the City's sewer system is assumed to be insignificant.

It is not anticipated that the development will have a substantial impact on the City's sanitary sewer system.

Noise Impacts:
Noise impacts are assumed to be negligible. The noise impacts are assumed to be the same as for other multi-family developments in the City.

(End Impact Study)

lancaster mobley

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MAR 12, 2019
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RENEWS: 6/30/2022

Trillium House

Transportation Impact Study
Warrenton, Oregon

Date:
January 5, 2021

Prepared for:
Briana Murtaugh
Trillium House Warrenton Affordable Housing, LLC

Prepared by:
Melissa Webb, PE
Daniel Stumpf, PE

Appendices

List of Figures

List of Tables

Executive Summary

1. The proposed Trillium House will include the construction of a four-story, 42-unit multifamily affordable housing development located on three parcels in Warrenton, Oregon.
2. The trip generation calculations show that the proposed development is projected to generate 11 morning peak hour trips, 13 evening peak hour trips, and 177 average weekday trips.
3. Based on a review of the most recent five years of available crash data, no significant trends or crash patterns were identified at any of the study intersections that were indicative of safety concerns. In addition, neither of the study intersections exhibit a crash rate exceeding ODOT's 90th percentile rate. Accordingly, no safety mitigation is recommended per the crash data analysis.
4. Left-turn lane warrants are projected to be met for the study intersection of OR-104S at SE Ensign Lane under existing conditions, specifically for the westbound approach. Although warrants are met at the intersection, no crashes that could be mitigated with the addition of a dedicated left-turn lane were reported at the intersection. Since the intersection currently operates safely and is projected to operate well within ODOT's capacity standards, the installation of a dedicated turn lane as part of the proposed development is not necessary or recommended.
5. Due to insufficient main and side-street traffic volumes, traffic signal warrants are not projected to be met at the intersection of OR-104S at SE Ensign Lane under any of the analysis scenarios.
6. All study intersections are currently and projected to operate acceptably per jurisdictional standards through year 2023 with completion of the proposed Trillium House development.

Project Description

Introduction

The proposed Trillium House will include the construction of a four-story, 42-unit multifamily affordable housing development located on three parcels in Warrenton, Oregon. Based on comments from City of Warrenton staff, this report conducts safety and capacity/level of service analyses at the following intersections:

1. OR-104S at SE Ensign Lane
2. US-101 at SE Ensign Lane

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 appendices to this report.

Location Description

The project site is located north of the Home Depot retail store, south of SE 14th Place, east of OR-104S, and west of US-101 in Warrenton, Oregon. The site consists of three lots (tax lots 81027BC01600, 81027BC01500, and 81026BC01503) which encompass an approximate total of 1.54 acres. The site is currently undeveloped and, aside from the Home Depot, is predominately surrounded by low density single-family houses.

Figure 1 presents an aerial image of the nearby vicinity with the project site outlined in yellow.

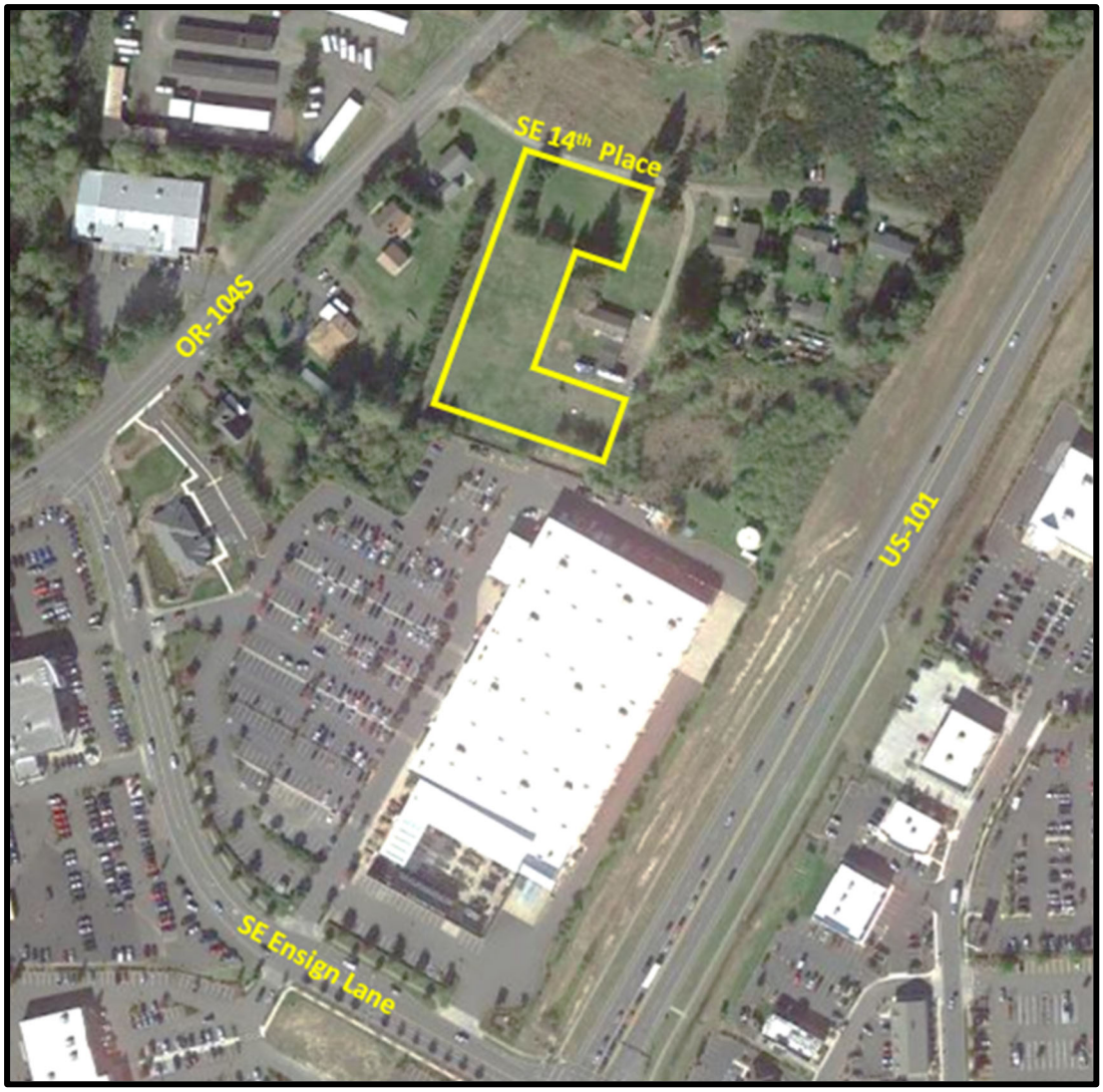


Figure 1: Project Location (image from Google Earth)

Vicinity Roadways

The proposed development is expected to impact four roadways near the site. Table 1 provides a description of each of the vicinity roadways.

Table 1: Vicinity Roadway Descriptions

Street Name	Functional Classification	Cross-Section	Speed (MPH)	Curbs & Sidewalks	On-Street Parking	Bicycle Facilities
US-101	Principal Arterial/ Statewide Highway	2-6 Lanes	45/55 mph Posted	Partial Both Sides	Not Permitted	Both Sides
OR-104S	Major Collector/ District Highway	2-3 Lanes	45 mph Posted	Partial South Side	Not Permitted	Both Sides
SE Ensign Lane	Minor Arterial	3 to 5 Lanes	25/35 mph Posted	Partial Both Sides	Not Permitted	Both Sides
SE 14th Place	Local Street (unpaved gravel road)	2 Lane	25 mph Statutory	None	Not Permitted	None

Table Notes: Functional Classification based on City of Warrenton Transportation System Plan (Volume 1 Figure 9) and ODOT Oregon Highway Plan/Oregon Transportation Map.

Study Intersections

Based on pre-application comments for this project, two intersections were identified for analysis. A summarized description of the study intersections is provided in Table 2.

Table 2: Study Intersection Descriptions

Number	Intersection	Geometry	Traffic Control	Phasing/Stopped Approaches
1	OR-104S at SE Ensign Lane	Three-Legged	Stop-Controlled	NB Stop-Controlled
2	US-101 at SE Ensign Lane	Four-Legged	Signalized	Protected NB/SB/EB/WB Left-Turns, Permitted/Overlap NB/WB Right-Turns

Public Transit

The project site is located near four transit lines which have three stops within an approximate one-half-mile walking/biking distance from the site, located at the intersections of US-101 at SE Ensign Lane and SE Discovery Lane at SE Ensign Lane.

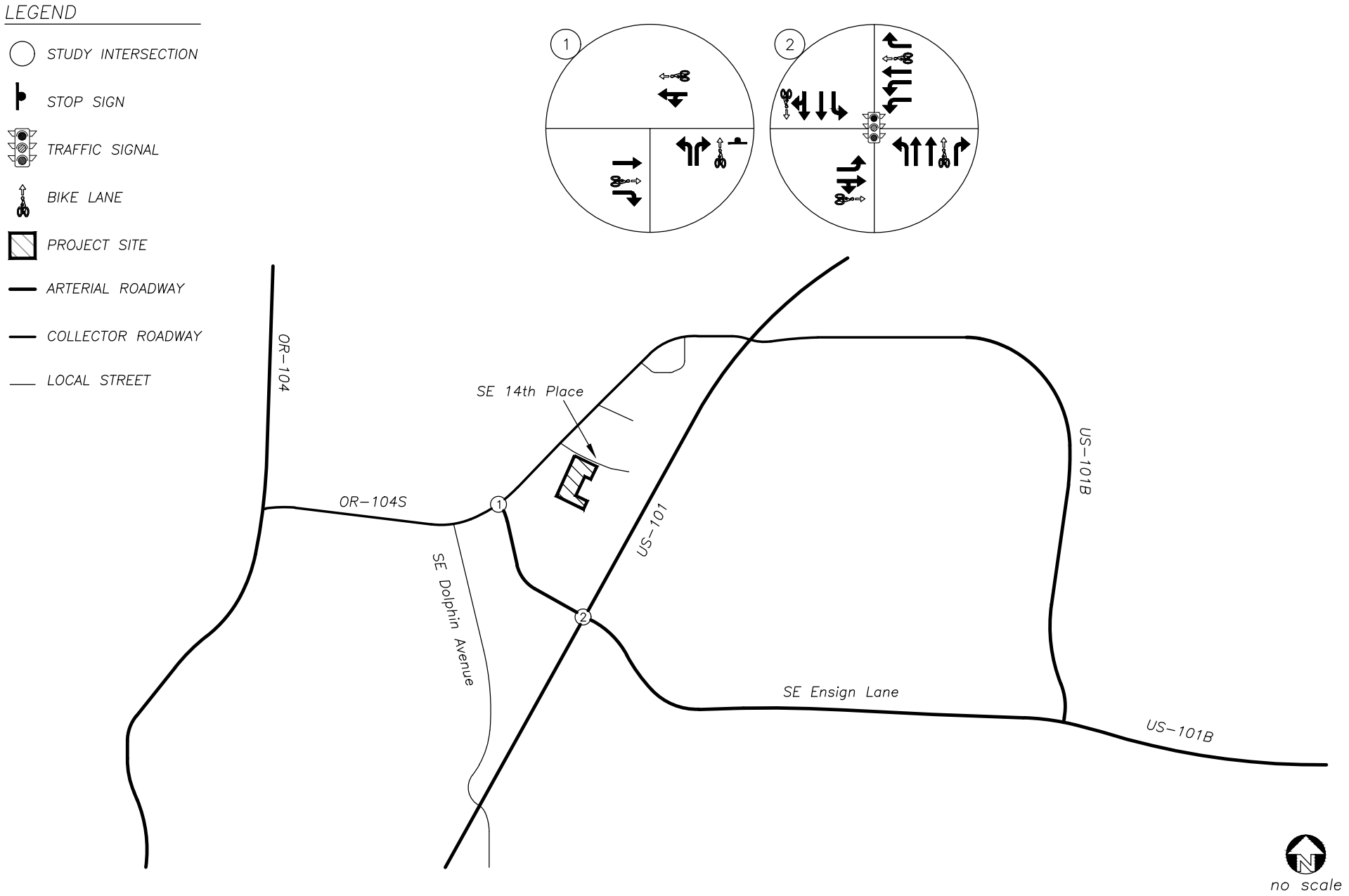
Bus line *Route 15 – Warrenton-Hammond* provides weekday service between the aforementioned city/neighborhood, with a notable stop near Fort Stevens State Park. Weekday service is scheduled from approximately 5:45 AM to 8:40 PM with headways of approximately 45 minutes. Weekend service is provided via the Route 16 bus line.

Bus line *Route 16 – Warrenton-Hammond* provides weekend service between the aforementioned city/neighborhood, with a notable stop near Fort Stevens State Park. Weekend service is scheduled from approximately 7:45 AM to 5:30 PM with headways of approximately 45 minutes. Weekday service is provided via the Route 15 bus line.

Bus line *Route 101 – Astoria-Warrenton-Gearhart-Seaside* provides weekday service between the aforementioned cities, with a notable stop near Astoria Transit Center. Weekday service is scheduled from approximately 6:00 AM to 9:20 PM with headways of approximately 50 minutes. There is no weekend service provided.

The *Pacific Connector* provides limited service between the cities of Astoria and Cannon Beach, with stops in Astoria, Warrenton, Gearhart, Seaside, and Cannon Beach. Weekend service is scheduled from approximately 8:30 AM to 8:30 PM and has headways of approximately two to three hours. There is no weekday service provided.

A vicinity map showing the project site, vicinity streets, and study intersection configurations is shown in Figure 2.



VICINITY MAP

Figure 2

Trillium House

1/5/2021

Site Trips

Trip Generation

The proposed Trillium House will include the construction of a four-story, 42-unit multifamily affordable housing development located on currently undeveloped land. To estimate the number of trips that will be generated by the proposed development, trip rates from the *Trip Generation Manual* [1] were used. Data from land use code 221, *Multifamily Housing (Mid-Rise)*, was used to estimate the proposed development's trip generation based on the number of dwelling units.

Since the proposed development will include the construction of affordable housing units for lower income residents, it is expected that trip generation will be lower than a typical multifamily housing unit. Referencing a Portland State University (PSU) study, *Transportation Impacts of Affordable Housing: Informing Development Review with Travel Behavior Analysis* [2], and assuming that the ITE bases trip generation on a Median/Moderate-Income household, an adjustment factor to the ITE trip generation rates was calculated. Assuming that the proposed development will serve Very Low-Income tenants in a Suburban neighborhood, an adjustment factor of 0.7792 was applied to the standard ITE rates for land use code 221.

The reduction in site trip generation relative to the ITE rates is expected given tenants of the proposed housing development will be lower income and subsequently are expected to have limited access to a personal vehicle. Therefore, access to other means of travel is necessary. As described in the *Public Transit* section of this study, access to nearby bus transit services are available at the intersections of US-101 at SE Ensign Lane and SE Discovery Lane at SE Ensign Lane (approximately one-half mile from the proposed development). Bicycle lanes are provided along OR-104S and SE Ensign Lane as another mode of travel.

The trip generation calculations show that the proposed development is projected to generate 11 morning peak hour trips, 13 evening peak hour trips, and 177 average weekday trips. The trip generation estimates are summarized in Table 3. Detailed trip generation calculations are included in Appendix B.

Table 3: Trip Generation Summary

Land Use	ITE Code	Size/Rate	Morning Peak Hour			Evening Peak Hour			Weekday Total
			In	Out	Total	In	Out	Total	
Multifamily Housing (Mid-Rise)	221	42 units	4	11	15	11	7	18	228
Affordable Housing Adjustment Factor		**0.7792**	**3**	**8**	**11**	**8**	**5**	**13**	**177**

For the purposes of maintaining a conservative analysis of site trip impacts, the ITE trip generation calculations without the affordable housing adjustment factor were used for the remainder of the analysis in this report.

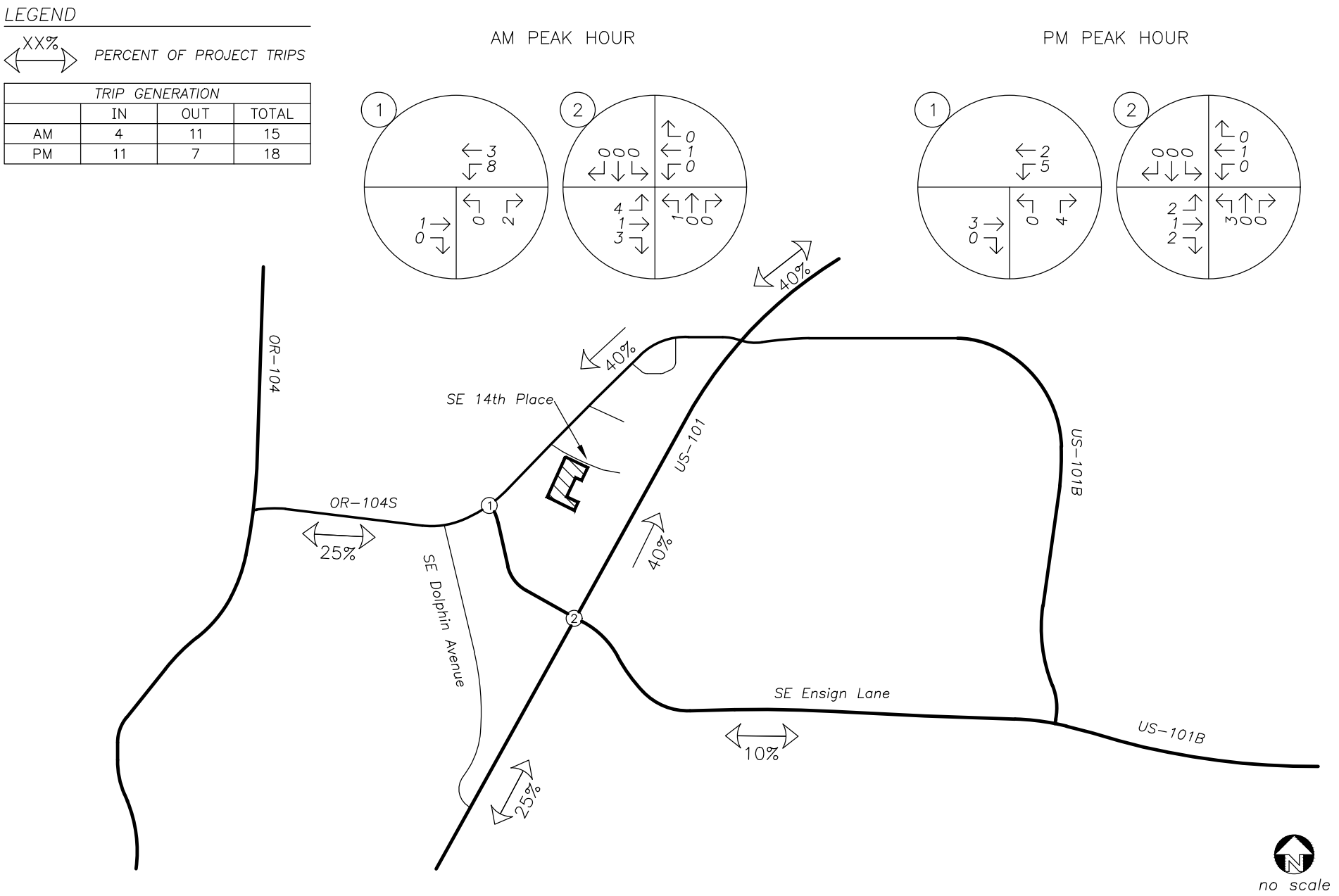
[1] Institute of Transportation Engineers (ITE), *Trip Generation Manual*, 10th Edition, 2017.
[2] Portland State University, *Transportation Impacts of Affordable Housing: Informing Development Review with Travel Behavior Analysis*, 2018

Trip Distribution

The directional distribution of site trips to and from the proposed site was referenced from the *Warrenton Urban Renewal Zone Change Transportation Impact Study* (TIS), dated July 23rd, 2018). As described in the zone change TIS, this distribution was estimated based on the locations of likely trip origins and destinations, locations of major transportation facilities in the site vicinity, and existing travel patterns at the study intersections. The following trip distribution was estimated and used for analysis:

- Approximately 40 percent of site trips will travel to/from the north along US-101;
- Approximately 25 percent of site trips will travel to/from the south along US-101;
- Approximately 25 percent of site trips will travel to/from the west along OR-104S; and
- Approximately 10 percent of site trips will travel to/from the east along SE Ensign Lane.

The trip distribution and assignment for the total site trips generated during the morning and evening peak hours is shown in Figure 3.



SITE TRIP DISTRIBUTION & ASSIGNMENT

Proposed Development Plan - Site Trips
AM & PM Peak Hours

Figure 3

Trillium House
1/5/2021

Traffic Volumes

Existing Conditions

Due to the ongoing COVID-19 viral pandemic, as of mid-March 2020 traffic volumes around Clatsop County have been depressed relative to normal conditions, whereby traditional traffic count data collection methods are not recommended. Therefore, the following methodology was used to adjust historical traffic counts at the study intersections to estimate year 2021 traffic conditions without the influence of COVID-19.

Traffic counts were conducted at the study intersections from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM on the following dates:

1. Wednesday, October 31st, 2018
2. Tuesday, October 30th, 2018

Data was used from each intersection's respective morning and evening peak hours.

In order to reflect year 2021 traffic conditions without the impacts of COVID-19, the 2018 intersection volumes were increased by applying a two percent per year compounded growth factor to all turning movements over a three-year period.

Per the requirements established in ODOT's *Analysis Procedures Manual* (APM), seasonal adjustment factors were calculated and applied to the through movement traffic volumes along OR-104S to reflect the 30th highest hour volumes along ODOT facilities. The adjustment factors were calculated based on an average of the Commuter and Coastal Destination Route seasonal trends, utilizing ODOT's *Seasonal Trend Table*. The following factors were applied to the intersection of OR-104S at SE Ensign Lane:

- 1.3304 for the October 31st counts (AM counts); and
- 1.3264 for the October 30th counts (PM counts).

According to the alternative mobility standards and methodologies described within the City of Warrenton's *Transportation System Plan* (TSP), the segment of US-101 within Warrenton city limits was seasonally adjusted to the annual average weekday volumes rather than the 30th highest hour volumes per the APM. The adjustment factors were calculated based on an average of the Commuter and Coastal Destination Route seasonal trends, utilizing ODOT's *Seasonal Trend Table*. The following factors were applied to the intersection of US-101 at SE Ensign Lane:

- 1.0582 for the October 31st counts (AM counts); and
- 1.0552 for the October 30th counts (PM counts).

Figure 4 shows the existing traffic volumes at the study intersections during the morning and evening peak hours.

Background Conditions

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 future traffic volumes for non-ODOT facilities, a compounded growth rate of 1.81 percent per year was applied to the adjusted existing traffic volumes over a two-year period to approximate year 2023 background conditions. The assumed 1.81 percent per year growth rate is based on the expected population growth reported in the City of Warrenton's TSP (dated January 2019) between years 2015 to 2035.

To estimate the future traffic volumes for ODOT facilities, linear growth rates were calculated for the traffic volumes along OR-104S and US-101 using ODOT's *2038 Future Volumes Table*. The following growth rates were determined for the aforementioned roadways:

- 2.07 percent per year along OR-104S; and
- 1.03 percent per year along US-101.

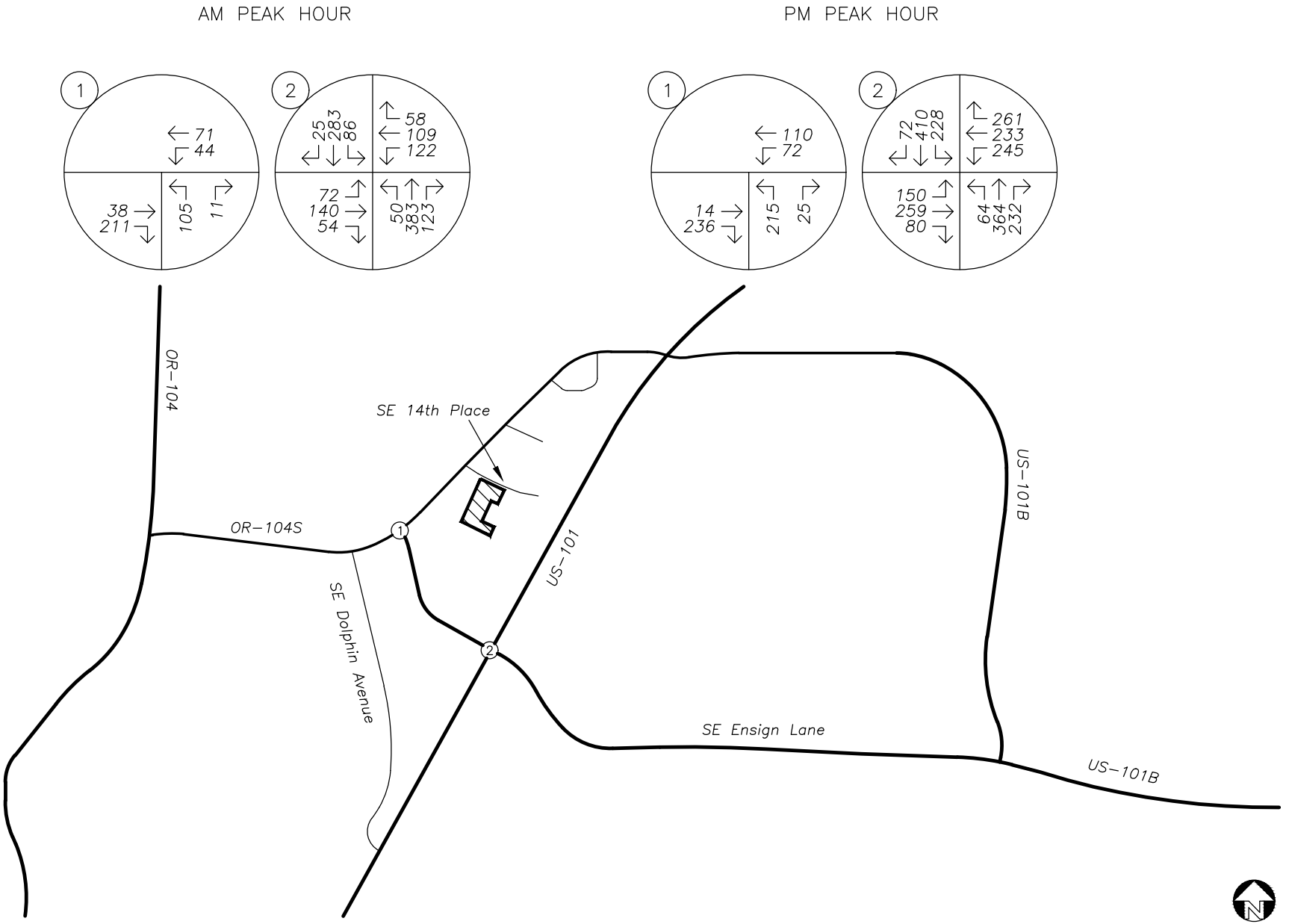
For intersections where the major-street is an ODOT facility and the minor-street is a local jurisdiction facility, these linear growth rates were applied to the measured existing through volumes traveling along each of the ODOT facilities, while a compounded growth rate of 1.81 percent per year was applied to the non-ODOT turning movement traffic volumes.

Figure 5 shows the projected year 2023 background traffic volumes at the study intersections during the morning and evening peak hours.

Buildout Conditions

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 2023 background traffic volumes to obtain the expected year 2023 buildout volumes.

Figure 6 shows year 2023 buildout traffic volumes at the study intersections during the morning and evening peak hours.



lancaster mobley

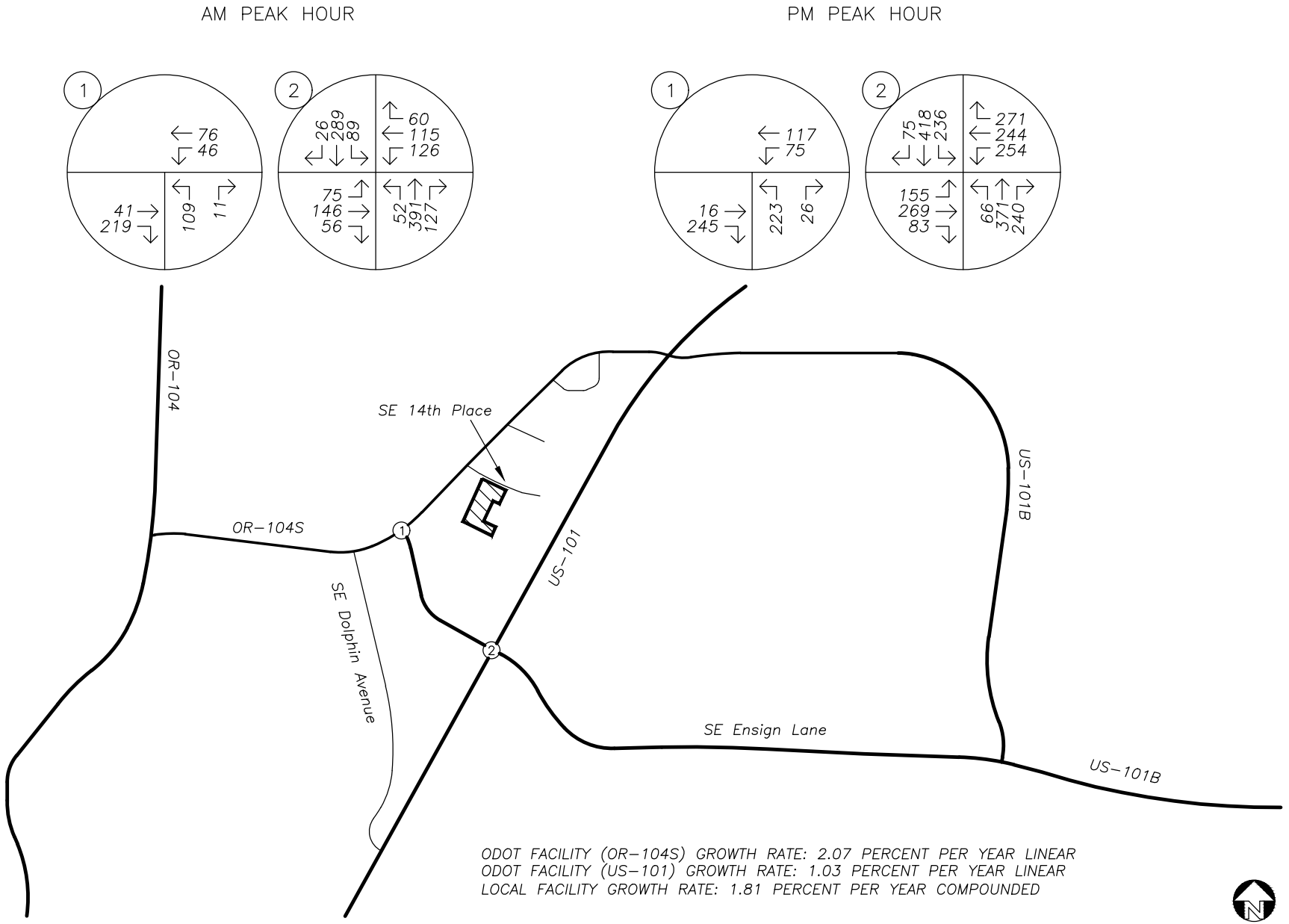
TRAFFIC VOLUMES

Year 2021 Existing Conditions - Adjusted
AM & PM Peak Hours

Figure 4

Trillium House

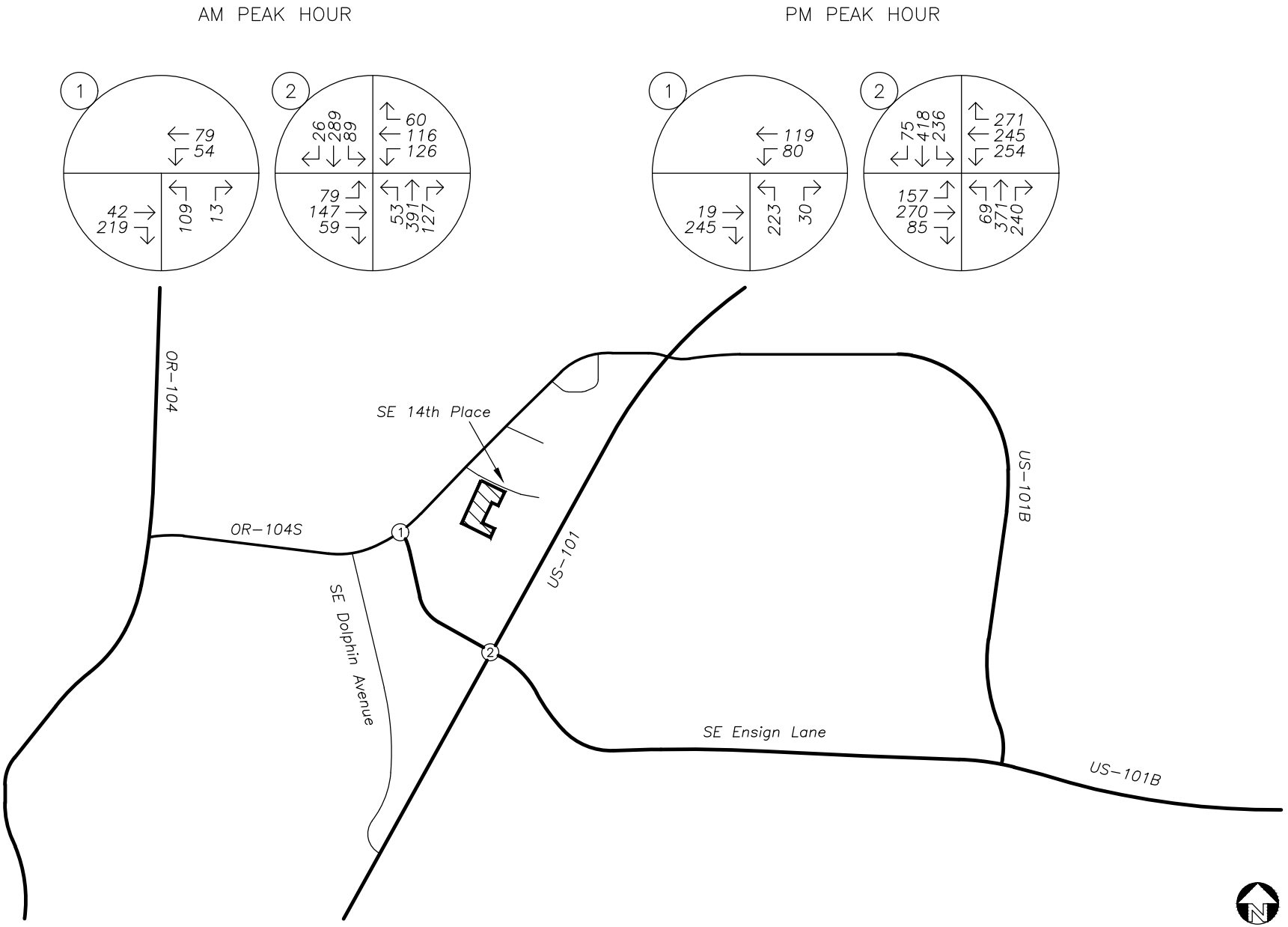
1/5/2021



lancaster mobley

TRAFFIC VOLUMES
Year 2023 Background Conditions
AM & PM Peak Hours

Figure 5
Trillium House
1/5/2021



TRAFFIC VOLUMES
Year 2023 Buildout Conditions
AM & PM Peak Hours

Figure 6
Trillium House
1/5/2021

Safety Analysis

Crash History Review

Using data obtained from ODOT's Crash Data System, a review of approximately five years of the most recent available crash history (January 2014 through December 2018) was performed at the study intersections. 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 hour represents approximately 10 percent of the annual average daily traffic (AADT) at the intersection. Crash rates in excess of 1.00 crashes per million entering vehicles (CMEV) may be indicative of design deficiencies and therefore require a need for further investigation and possible mitigation.

With regard to crash severity, ODOT classifies crashes into the following five categories:

- Property Damage Only (*PDO*);
- Possible Injury – Complaint of Pain (*Injury C*);
- Non-Incapacitating Injury (*Injury B*),
- Incapacitating Injury – Bleeding, Broken Bones (*Injury A*); and
- Fatality or Fatal Injury

The study intersections along OR-104S and US-101 are ODOT facilities, which adhere to the crash analysis methodologies within ODOT's *Analysis Procedures Manual* [3](APM). According to *Exhibit 4-1: Intersection Crash Rates per MEV by Land Type and Traffic Control* of the APM, intersections which experience crash rates in excess of their respective 90th percentile crash rates should be "flagged for further analysis". For intersections in urban settings (i.e. intersections within City limits), the following 90th percentile rates are applicable to the study intersections:

- Unsignalized, three-legged intersections: 0.293 CMEV; and
- Signalized, four-legged intersections): 0.860 CMEV.

Table 4 provides a summary of crash types while Table 5 summarizes crash severities and rates for each of the study intersections. Detailed crash data is provided in Appendix D.

[3] Oregon Department of Transportation, *Analysis Procedures Manual*, Updated November 2018

Table 4: Crash Type Summary

Intersection		Crash Type								Total Crashes
		Turn	Rear End	Angle	Fixed Object	Side swipe	Ped/ Bike	Backing	Other	
1	OR-104S at SE Ensign Lane	1	0	0	0	0	0	0	0	1
2	US-101 at SE Ensign Lane	21	13	1	0	0	1	1	0	37

Table 5: Crash Severity and Rate Summary

Intersection		Severity					Total Crashes	AADT	Crash Rate
		PDO	C	B	A	Fatality			
1	OR-104S at SE Ensign Lane	1	0	0	0	0	1	6,050	0.09
2	US-101 at SE Ensign Lane	18	13	4	2	0	37	24,100	0.84

*Table Notes: **BOLDED** text indicates a crash rate in excess of the 90th Percentile CMEV per ODOT's APM.*

Based on a review of the crash data, there were three crashes which involved a bicyclist or were classified as *Injury A*. An in-depth analysis of these crashes is detailed in the following section.

US-101 at SE Ensign Lane

The intersection of US-101 at SE Ensign Lane had one reported crash that involved a bicyclist. According to the crash data, the collision occurred when a northwest-bound bicyclist, who was utilizing an intersection crosswalk, failed to yield right of way to a right-turning, northwest-bound passenger car. The bicyclist sustained injuries consistent with *Injury B* classification.

One of the collisions at the intersection that was classified as *Injury A* occurred when the driver of a southwest-bound passenger car (Vehicle 1) disregarded the traffic signal and made a left-turn into oncoming traffic and struck a northeast-bound passenger car (Vehicle 2). The driver of Vehicle 1 sustained injuries consistent with *Injury A* classification, while the passenger of Vehicle 2 sustained injuries consistent with *Injury B* classification. The driver of Vehicle 2 had no reported injuries.

The second collision that was classified as *Injury A* occurred when the driver of a northwest-bound passenger car (Vehicle 1) disregarded the traffic signal and continued through the intersection, striking a southwest-bound passenger car (Vehicle 2). A contributing factor to the collision was the driver of Vehicle 1 being physically ill. The driver of Vehicle 1 sustained injuries consistent with *Injury A* classification, while the driver of Vehicle 2 was uninjured.

Analysis Conclusions

Based on a review of the most recent five years of available crash data, no significant trends or crash patterns were identified at any of the study intersections that were indicative of safety concerns. In addition, neither of the study intersections exhibit a crash rate exceeding ODOT's 90th percentile rate. Accordingly, no safety mitigation is recommended per the crash data analysis.

Warrant Analysis

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

Left-Turn Lane Warrants

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 used for ODOT intersections implement the design curves developed by the Texas Transportation Institute, as adopted by ODOT in its APM. 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 projected to be met for the study intersection of OR-104S at SE Ensign Lane under existing conditions, specifically for the westbound approach. Although warrants are met at the intersection, to re-iterate warrants are met under existing conditions without impacts from the proposed development. Additionally, no crashes that could be mitigated with the addition of a dedicated left-turn lane, specifically westbound rear-end collisions, were reported at the intersection as described in the *Crash History Review* section. Since the intersection currently operates safely and is projected to operate well within ODOT's capacity standards (see the *Operational Analysis* section in this report), the installation of a dedicated turn lane as part of the proposed development is not necessary or recommended.

Preliminary Traffic Signal Warrants

Preliminary traffic signal warrants were examined for the unsignalized study intersection of OR-104S at SE Ensign Lane to determine whether the installation of a new traffic signal will be warranted at the intersection by the 2023 buildout year of the proposed Trillium House development.

Due to insufficient main and side-street traffic volumes, traffic signal warrants are not projected to be met at the intersection of OR-104S at SE Ensign Lane under any of the analysis scenarios.

Operational Analysis

Intersection Capacity Analysis

A capacity and delay analysis were conducted for each of the study intersections per the signalized and unsignalized intersection analysis methodologies in the *Highway Capacity Manual* (HCM)[4]. Intersections are generally evaluated based on the average control delay experienced by vehicles and are assigned a grade according to their operation. 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 volume-to-capacity (v/c) ratio is a measure that compares the traffic volumes (demand) against the available capacity of an intersection.

Performance Standards

All study intersections that are composed of and operate under the jurisdiction of ODOT must meet standards established in the *Oregon Highway Plan*. Based on each highway's respective classification, location, and posted speed, the following operational standards apply:

- The intersection of US-101 at SE Ensign Lane is required to operate with a v/c ratio of 0.85 or less (see paragraph below);
- The intersection of OR-104S at SE Ensign Lane is required to operate with a v/c ratio of 0.90 or less.

Per the City of Warrenton's TSP, alternative mobility standards which include utilizing a v/c ratio of 0.85 for intersections along US-101, within Warrenton city limits, were recommended to the Oregon Transportation Commission (OTC). These alternative standards have been adopted by the OTC, whereby an 0.85 v/c ratio standard of operation was applied to the study intersection along US-101.

Delay & Capacity Analysis

The LOS, delay, and v/c results of the capacity analysis are shown in Table 6 for the morning and evening peak hours. It should be noted that the HCM 6th Edition, utilizing TrafficWare (Synchro) software, does not provide an overall intersection v/c ratio for signalized intersections. Therefore, signalized intersection v/c ratios were calculated utilizing HCM 2000 in the TrafficWare software. Detailed calculations as well as tables showing the relationship between delay and LOS are included in Appendix F.

[4] Transportation Research Board, *Highway Capacity Manual 6th Edition*, 2016.

Table 6: Capacity Analysis Summary

Intersection & Condition	AM Peak Hour			PM Peak Hour		
	LOS	Delay (s)	V/C	LOS	Delay (s)	V/C
1. OR-104S at SE Ensign Lane						
2021 Existing Conditions	B	11	0.19	B	15	0.41
2023 Background Conditions	B	12	0.20	C	15	0.44
2023 Buildout Conditions	B	12	0.21	C	16	0.45
2. US-101 at SE Ensign Lane						
2021 Existing Conditions	C	27	0.33	C	34	0.61
2023 Background Conditions	C	27	0.35	C	34	0.64
2023 Buildout Conditions	C	28	0.35	C	35	0.64

Table Notes: ***BOLDED*** *text indicates intersection operation above jurisdictional standards.*

Based on the analysis results, all study intersections are currently and projected to operate acceptably per jurisdictional standards through year 2023 with completion of the proposed Trillium House development.

Conclusions

Based on a review of the most recent five years of available crash data, no significant trends or crash patterns were identified at any of the study intersections that were indicative of safety concerns. In addition, neither of the study intersections exhibit a crash rate exceeding ODOT's 90th percentile rate. Accordingly, no safety mitigation is recommended per the crash data analysis.

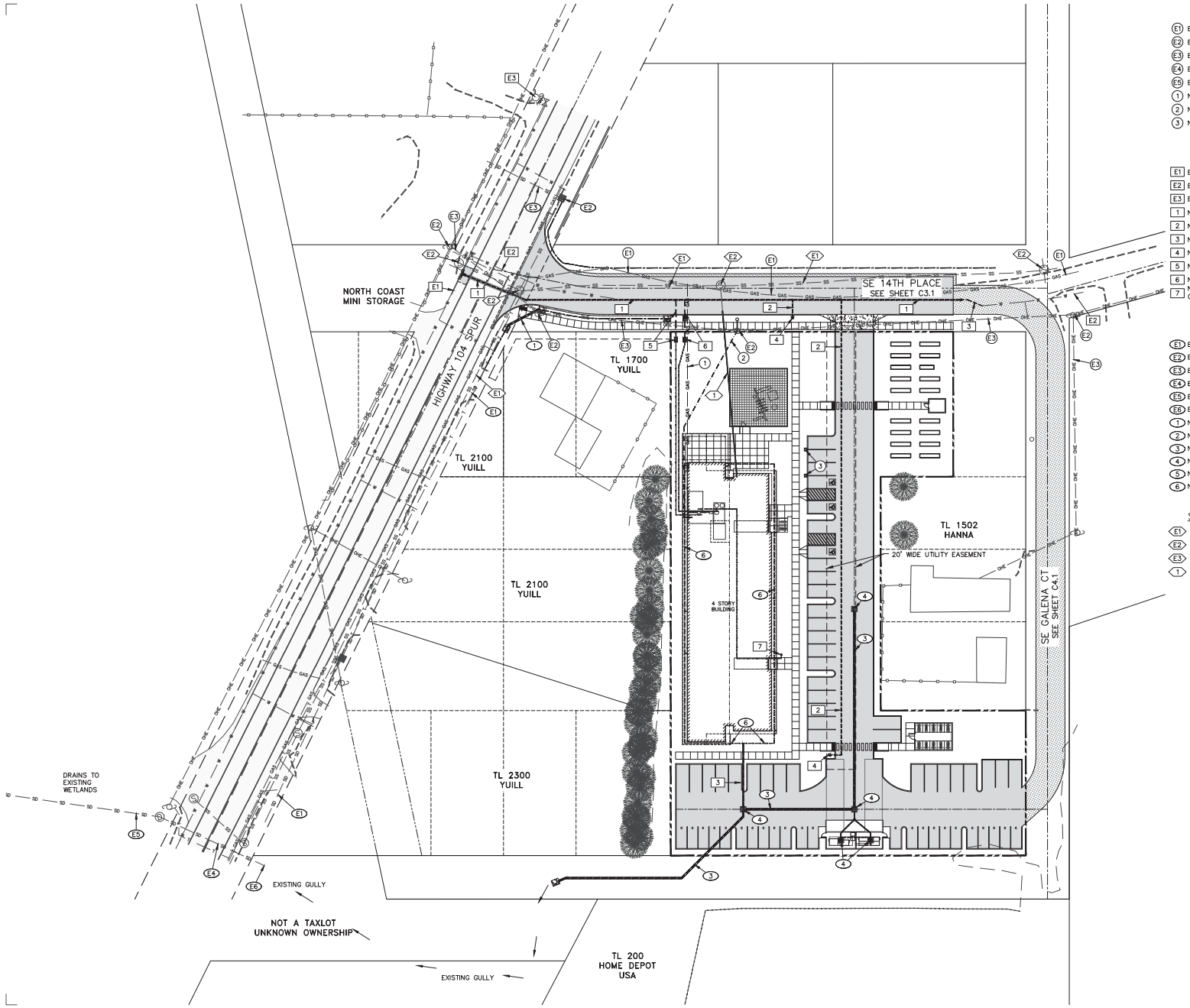
Left-turn lane warrants are projected to be met for the study intersection of OR-104S at SE Ensign Lane under existing conditions, specifically for the westbound approach. Although warrants are met at the intersection, no crashes that could be mitigated with the addition of a dedicated left-turn lane were reported at the intersection. Since the intersection currently operates safely and is projected to operate well within ODOT's capacity standards, the installation of a dedicated turn lane as part of the proposed development is not necessary or recommended.

Due to insufficient main and side-street traffic volumes, traffic signal warrants are not projected to be met at the intersection of OR-104S at SE Ensign Lane under any of the analysis scenarios.

All study intersections are currently and projected to operate acceptably per jurisdictional standards through year 2023 with completion of the proposed Trillium House development.

Appendix A

Site Plan



UTILITY NOTES

- E1 EXISTING GAS LINE
- E2 EXISTING OVERHEAD POWER POLE
- E3 EXISTING OVERHEAD POWER LINE
- E4 EXISTING OVERHEAD POWER LINE
- E5 EXISTING COMMUNICATIONS LINE
- 1 NEW GAS SERVICE
- 2 NEW UNDERGROUND ELECTRICAL SERVICE
- 3 NEW ELECTRIC CAR CHARGING STATION

WATER NOTES

- E1 EXISTING PUBLIC 8" WATER LINE
- E2 EXISTING PUBLIC 2" WATER LINE
- E3 EXISTING PUBLIC FIRE HYDRANT
- 1 NEW PUBLIC 8" WATER LINE
- 2 NEW PUBLIC 6" WATER LINE
- 3 NEW PUBLIC 2" WATER LINE
- 4 NEW PUBLIC FIRE HYDRANT
- 5 NEW PRIVATE FIRE SPRINKLER SERVICE
- 6 NEW PRIVATE DOMESTIC WATER SERVICE
- 7 NEW PRIVATE FIRE DEPARTMENT CONNECTION (FDC) AND LINE

STORM SEWER NOTES

- E1 EXISTING 12" CMP CULVERT
- E2 EXISTING CATCH BASIN
- E3 EXISTING 12" STEEL STORM LINE
- E4 EXISTING 24" PVC STORM LINE
- E5 EXISTING 18" STEEL STORM LINE
- E6 EXISTING CULVERT INLET
- 1 NEW PUBLIC 12" STORM LINE
- 2 NOT USED
- 3 NEW PRIVATE STORM LINE
- 4 NEW PRIVATE CATCH BASIN
- 5 NEW PRIVATE OUTFALL TO EXISTING GULLY
- 6 NEW PRIVATE ROOF DRAIN COLLECTION LINE

SANITARY SEWER NOTES

- E1 EXISTING 8" PUBLIC SANITARY SEWER LINE
- E2 EXISTING PUBLIC SANITARY SEWER MANHOLE
- E3 EXISTING SANITARY SEWER STUB
- 1 NEW 6" SANITARY SEWER SERVICE

emmons design, llc

100 39TH STREET.
ASTORIA, OR, 97103
503.705.3050

FDG
Firwood Design Group, LLC
SURVEYING ENGINEERING PLANNING
359 E. HISTORIC COLUMBIA RIVER HWY.
TROUTDALE, OREGON 97060
BUS: (503) 669-8737 FAX: (503) 668-8748

TRILLIUM HOUSE

SE 14TH PLACE
WARRENTON, OR

DESIGN
DEVELOPMENT

PRELIMINARY
UTILITY PLAN

DECEMBER 9, 2020
SCALE FOR 24x36:
1" = 30'

0 30 60
SCALE IN FEET

DD
V12

C1.1

Appendix B

Trip Generation

PSU Affordable Housing Study – Table 4

TRIP GENERATION CALCULATIONS

Land Use: Multifamily Housing (Mid-Rise)
Land Use Code: 221
Setting/Location General Urban/Suburban
Variable: Dwelling Units
Variable Value: 42

AM PEAK HOUR

Trip Rate: 0.36

	Enter	Exit	Total
Directional Distribution	26%	74%	
Trip Ends	**4**	**11**	**15**

PM PEAK HOUR

Trip Rate: 0.44

	Enter	Exit	Total
Directional Distribution	61%	39%	
Trip Ends	**11**	**7**	**18**

WEEKDAY

Trip Rate: 5.44

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**114**	**114**	**228**

SATURDAY

Trip Rate: 4.91

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**103**	**103**	**206**

Source: TRIP GENERATION, Tenth Edition

Table 4: Predicted home-based vehicle trips (Model 1) relative to base case scenario

Income Category	Non-Urban	Suburban Neighborhood	Urban Neighborhood	Urban District	Urban Core
Single-Family Dwellings					
Extremely Low-Income	46%	55%	52%	44%	27%
Very Low-Income	60%	71%	67%	56%	35%
Low-Income	72%	85%	81%	68%	42%
Median/Moderate-Income	77%	92%	87%	73%	46%
Above Moderate-Income	84%	**100%**	95%	80%	50%
Multifamily Dwellings					
Extremely Low-Income	39%	46%	44%	37%	23%
Very Low-Income	50%	60%	57%	47%	30%
Low-Income	60%	71%	68%	57%	36%
Median/Moderate-Income	65%	77%	73%	61%	38%
Above Moderate-Income	71%	84%	80%	67%	42%

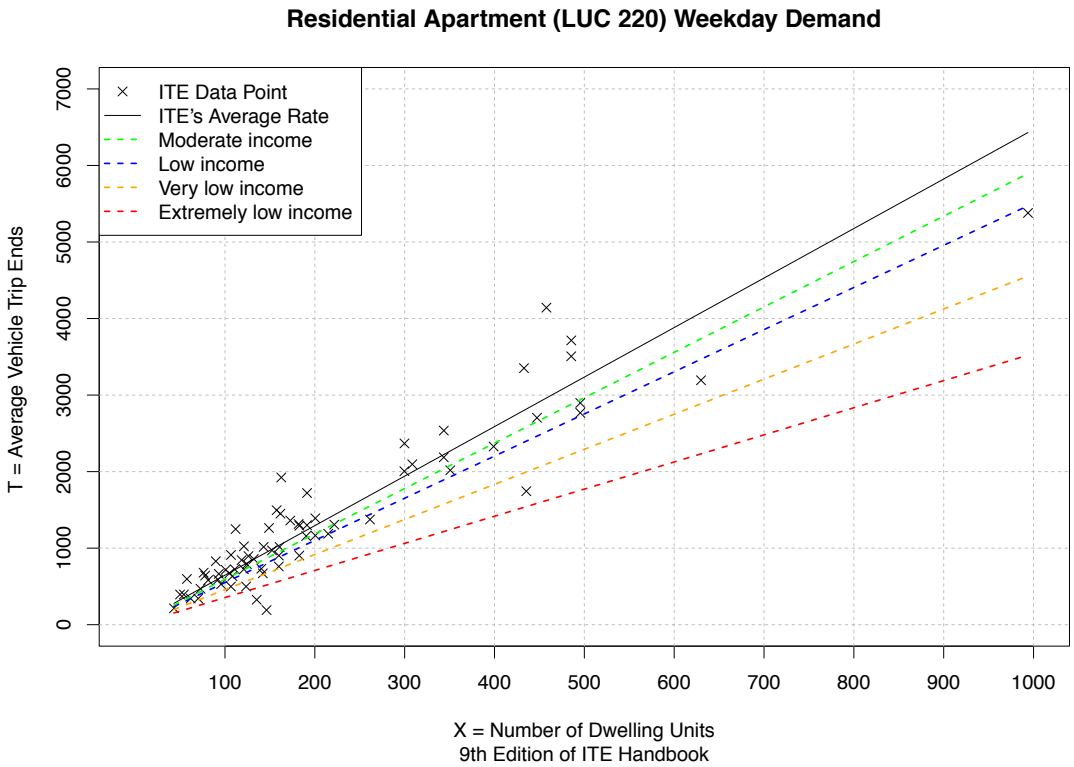


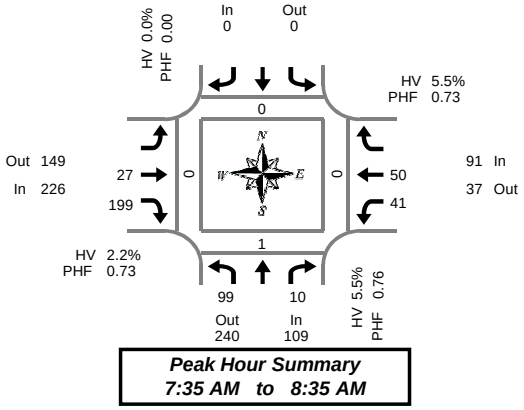
Figure 2: ITE residential apartment (LUC 220) weekday vehicle trips compared to home-based vehicle trip estimates from Model 1

8 Implications for affordable housing development

Many impact fee rates are developed using methodologies based upon vehicle trip estimates from ITE. If these rates are not sensitive to the issues we have been discussing—urban context and socioeconomics—they assume that all housing development will have same impact. Some fee structures fail to distinguish

Total Vehicle Summary

All Traffic Data Services Inc.
Clay Carney
(503) 833-2740



Peak Hour Summary
7:35 AM to 8:35 AM

SE Ensign Ln & Or-104 S

Wednesday, October 31, 2018
7:00 AM to 9:00 AM

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

Interval Start Time	Northbound SE Ensign Ln				Southbound SE Ensign Ln				Eastbound Or-104 S				Westbound Or-104 S				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes	T	R	Bikes	L	T		Bikes			North	South	East	West
7:00 AM	8		0	0				0	0	3	0	1	1		0	13		0	0	0	0
7:05 AM	5		1	0				0	1	10	0	0	2		0	19		0	0	0	0
7:10 AM	10		1	0				0	0	9	0	0	2		0	22		0	0	0	0
7:15 AM	6		1	0				0	0	7	0	4	5		0	23		0	0	0	0
7:20 AM	4		0	0				0	0	15	0	1	5		0	25		0	0	0	0
7:25 AM	9		1	0				0	0	11	0	2	4		0	27		0	0	0	0
7:30 AM	6		0	0				0	0	18	0	0	2		0	26		0	0	0	0
7:35 AM	10		2	0				0	3	21	0	1	7		0	44		0	0	0	0
7:40 AM	3		0	0				0	1	18	0	0	8		0	30		0	0	0	0
7:45 AM	9		0	0				0	3	20	0	5	8		0	45		0	0	0	0
7:50 AM	18		1	0				0	1	23	0	6	4		0	53		0	0	0	0
7:55 AM	7		1	0				0	5	18	0	3	2		0	36		0	0	0	0
8:00 AM	4		1	0				0	2	23	0	5	2		0	37		0	0	0	0
8:05 AM	9		0	0				0	4	25	0	3	1		0	42		0	0	0	0
8:10 AM	9		2	0				0	1	4	1	1	3		0	20		0	0	0	0
8:15 AM	6		2	0				0	2	8	0	5	6		0	29		0	0	0	0
8:20 AM	9		0	0				0	2	12	0	4	4		0	31		0	1	0	0
8:25 AM	6		0	0				0	2	16	0	3	2		0	29		0	0	0	0
8:30 AM	9		1	0				0	1	11	0	5	3		0	30		0	0	0	0
8:35 AM	12		0	0				0	1	15	0	4	1		0	33		0	0	0	0
8:40 AM	9		0	0				0	1	15	0	2	0		0	27		0	0	0	0
8:45 AM	3		1	0				0	0	20	0	4	4		0	32		0	0	0	0
8:50 AM	2		0	0				0	0	11	0	4	3		0	20		0	0	0	0
8:55 AM	7		1	0				0	2	13	0	0	1		0	24		0	0	0	0
Total Survey	180		16	0				0	32	346	1	63	80		0	717		0	1	0	0

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

Interval Start Time	Northbound SE Ensign Ln				Southbound SE Ensign Ln				Eastbound Or-104 S				Westbound Or-104 S				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes	T	R	Bikes	L	T		Bikes			North	South	East	West
7:00 AM	23		2	0				0	1	22	0	1	5		0	54		0	0	0	0
7:15 AM	19		2	0				0	0	33	0	7	14		0	75		0	0	0	0
7:30 AM	19		2	0				0	4	57	0	1	17		0	100		0	0	0	0
7:45 AM	34		2	0				0	9	61	0	14	14		0	134		0	0	0	0
8:00 AM	22		3	0				0	7	52	1	9	6		0	99		0	0	0	0
8:15 AM	21		2	0				0	6	36	0	12	12		0	89		0	1	0	0
8:30 AM	30		1	0				0	3	41	0	11	4		0	90		0	0	0	0
8:45 AM	12		2	0				0	2	44	0	8	8		0	76		0	0	0	0
Total Survey	180		16	0				0	32	346	1	63	80		0	717		0	1	0	0

Peak Hour Summary
7:35 AM to 8:35 AM

By Approach	Northbound SE Ensign Ln				Southbound SE Ensign Ln				Eastbound Or-104 S				Westbound Or-104 S				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	109	240	349	0	0	0	0	0	226	149	375	1	91	37	128	0	426	0	1	0	0
%HV	5.5%				0.0%				2.2%				5.5%				3.8%				
PHF	0.76				0.00				0.73				0.73				0.79				

By Movement	Northbound SE Ensign Ln				Southbound SE Ensign Ln				Eastbound Or-104 S				Westbound Or-104 S				Total
	L		R	Total				Total		T	R	Total	L	T		Total	
Volume	99		10	109				0		27	199	226	41	50		91	426
%HV	6.1%	NA	0.0%	5.5%	NA	NA	NA	0.0%	NA	0.0%	2.5%	2.2%	7.3%	4.0%	NA	5.5%	3.8%
PHF	0.73		0.63	0.76				0.00		0.61	0.75	0.73	0.73	0.54		0.73	0.79

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

Interval Start Time	Northbound SE Ensign Ln				Southbound SE Ensign Ln				Eastbound Or-104 S				Westbound Or-104 S				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes	T	R	Bikes	L	T		Bikes			North	South	East	West
7:00 AM	95		8	0				0	14	173	0	23	50		0	363		0	0	0	0
7:15 AM	94		9	0				0	20	203	1	31	51		0	408		0	0	0	0
7:30 AM	96		9	0				0	26	206	1	36	49		0	422		0	1	0	0
7:45 AM	107		8	0				0	25	190	1	46	36		0	412		0	1	0	0
8:00 AM	85		8	0				0	18	173	1	40	30		0	354		0	1	0	0

Appendix D

Crash History Data

URBAN NON-SYSTEM CRASH LISTING

CITY OF WARRENTON, CLATSOP COUNTY

ENSIGN AVE at FT STEVENS HY SPUR, City of Warrenton, Clatsop County, 01/01/2014 to 12/31/2018

1 - 2 of 2 Crash records shown.

SER# INVEST RD DPT UNLOC?	S D M P R J S W E A U I C O E L G N H R D C S V L K	DATE DAY TIME LAT	CLASS DIST FROM LONG	CITY STREET FIRST STREET SECOND STREET LRS	RD CHAR DIRECT LOCTN	INT-TYPE (MEDIAN) LEGS (#LANES)	INT-REL TRAF- CONTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH COLL SVRTY	SPCL USE TRLR QTY OWNER V# TYPE	MOVE FROM TO	PRTC P# TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT	EVENT	CAUSE
00561	N N N N N	11/04/2015	17	SE ENSIGN AVE	INTER	3-LEG	N	N	CLD	ANGL-OTH	01 NONE 0	TURN-L										27
CITY		WE		FT STEVENS HY SPUR	CN		STOP SIGN	N	DRY	TURN	PRVTE	S -W								015		00
N		5P			04	0		N	DLIT	PDO	PSNGR CAR		01 DRVR	NONE	18	M	OR-Y		016	038		27
N		46 8 59.26	-123 55 13.09	048500100S00													OR<25					
											02 NONE 0	TURN-L										
											PRVTE	E -S								000		00
											PSNGR CAR		01 DRVR	NONE	60	M	OR-Y		000	000		00
																	OR<25					
00571	N N N	10/18/2016	17	SE ENSIGN AVE	INTER	3-LEG	N	N	CLD	ANIMAL	01 NONE 0	STRGHT									035	12
CITY		TU		FT STEVENS HY SPUR	CN		STOP SIGN	N	DRY	OTH	PRVTE	SW-NE								000	035	00
N		10P			03	0		N	DARK	INJ	PSNGR CAR		01 DRVR	INJC	33	F	OR-Y		000	000		00
N		46 8 59.26	-123 55 13.09	048500100S00													OR<25					

CITY OF WARRENTON, CLATSOP COUNTY

ENSIGN AVE at OREGON COAST HY, City of Warrenton, Clatsop County, 01/01/2014 to 12/31/2018

1 - 4 of 37 Crash records shown.

SER# / INVEST / RD DPT / UNLOC?	S P E D	D R E A	M J U I	S C G N	W O H R	DATE / DAY / TIME / LAT	CLASS / DIST / FROM / LONG	CITY STREET / FIRST STREET / SECOND STREET / LRS	RD CHAR / DIRECT / LOCTN	INT-TYPE (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH / COLL / SVRTY	V#	SPCL USE / TRLR QTY / OWNER	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT EVENT	CAUSE
00279	N	Y	N	N	N	07/03/2014	02	ENSIGN AVE	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT										04
STATE						TH		OREGON COAST HY	NE		TRF SIGNAL	N	DRY	REAR		PRVTE	NE-SW									000	00
N						12P			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	INJC	43	M	OR-Y		020	088	04
N						46 8 49.7954039	-123 55 3.3557519	000900100S00															OR<25				
															02	NONE 0	STOP										
																PRVTE	NE-SW									011	00
																PSNGR CAR		01	DRVR	INJC	45	M	OR-Y		000	000	00
																							OR<25				
00590	N	N	N	N	N	11/18/2015	14	ENSIGN AVE	INTER	CROSS	N	N	RAIN	S-1STOP	01	NONE 0	STRGHT										07
CITY						WE		OREGON COAST HY	NE		TRF SIGNAL	N	WET	REAR		PRVTE	NE-SW									000	00
N						3P			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	64	M	OR-Y		043	000	07
N						46 8 49.8	-123 55 3.36	000900100S00															OR<25				
															02	NONE 0	STOP										
																PRVTE	NE-SW									011	00
																PSNGR CAR		01	DRVR	INJC	44	F	OR-Y		000	000	00
																							OR>25				
00315	N	N	N	N	N	06/21/2016	14	ENSIGN AVE	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 9	TURN-L										08
CITY						TU		OREGON COAST HY	NE		TRF SIGNAL	N	DRY	TURN		N/A	NW-NE									088	00
N						4P			05	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00
N						46 8 49.8	-123 55 3.36	000900100S00															UNK				
															02	NONE 9	STRGHT										
																N/A	SW-NE									000	00
																PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00
																							UNK				
00608	N	N	N	N	N	10/10/2017	14	ENSIGN AVE	INTER	CROSS	N	N	CLR	BIKE													02
STATE						TU		OREGON COAST HY	NE		R-GRN-SIG	N	WET	TURN			-										
N						12P			05	0		N	DAY	INJ			STRGHT	01	BIKE	INJB	57	M		I	XWLK	028	035	02
N						46 8 49.8	-123 55 3.36	000900100S00									SE NW										
															01	NONE 1	TURN-R										
																PRVTE	SE-NE									000	00
																PSNGR CAR		01	DRVR	NONE	41	M	OTH-Y		000	000	00
																							N-RES				
00192	Y	N	N	N	N	04/28/2018	14	ENSIGN AVE	INTER	CROSS	N	N	CLD	S-1STOP	01	NONE 0	STRGHT										07,01
CITY						SA		OREGON COAST HY	NE		TRF SIGNAL	N	DRY	REAR		PRVTE	NE-SW									000	00
N						2P			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	42	M	OR-Y		043,047	000	07,01
N						46 8 49.82	-123 55 3.36	000900100S00															OR<25				
															02	NONE 0	STOP										
																PRVTE	NE-SW									011	00
																PSNGR CAR		01	DRVR	INJC	19	F	OR-Y		000	000	00
																							OR<25				

SER# / INVEST / RD DPT / UNLOC?	S P E D	D R A L	M J U G	S I N	W C H	O R	DATE / DAY / TIME / LAT	CLASS / DIST / FROM / LONG	CITY STREET / FIRST STREET / SECOND STREET / LRS	RD CHAR / DIRECT / LOCTN	INT-TYPE (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH / COLL / SVRTY	V#	SPCL USE / TRLR QTY / OWNER	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT EVENT	CAUSE
																02	NONE 0	STOP									
																	PRVTE	NE-SW								011	00
																	PSNGR CAR		02	PSNG	NONE	01	M			000	000 00
00421	N	N	N	N	N		08/13/2018	14	ENSIGN AVE	INTER	CROSS	N	N	CLD	S-1STOP	01	NONE 0	STRGHT									11
CITY							MO		OREGON COAST HY	NE		TRF SIGNAL	N	DRY	REAR		RENTL	NE-SW								000	11
N							10A			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	56	F	OTH-Y		017	088	00
N							46 8 49.8	-123 55 3.36	000900100S00															N-RES				
																02	NONE 0	STOP									
																	RENTL	NE-SW								011	00
																	PSNGR CAR		01	DRVR	INJC	62	M	OTH-Y		000	000 00
																								N-RES			
																02	NONE 0	STOP									
																	RENTL	NE-SW								011	00
																	PSNGR CAR		02	PSNG	INJC	27	F			000	000 00
																02	NONE 0	STOP									
																	RENTL	NE-SW								011	00
																	PSNGR CAR		03	PSNG	INJC	58	F			000	000 00
																02	NONE 0	STOP									
																	RENTL	NE-SW								011	00
																	PSNGR CAR		04	PSNG	INJC	64	F			000	000 00
00522	N	N	N				09/22/2018	14	ENSIGN AVE	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 9	STRGHT									27
CITY							SA		OREGON COAST HY	NE		TRF SIGNAL	N	DRY	REAR		N/A	NE-SW								000	00
N							2P			06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000 00
N							46 8 49.8	-123 55 3.35	000900100S00															UNK			
																02	NONE 9	STOP									
																	N/A	NE-SW								011	00
																	MOTRHOME		01	DRVR	NONE	00	Unk	UNK		000	000 00
																								UNK			
00534	N	N	N	N	N		10/23/2015	14	ENSIGN AVE	INTER	CROSS	N	N	CLR	O-OTHER	01	NONE 0	TURN-R									02
CITY							FR		OREGON COAST HY	SE		L-GRN-SIG	N	DRY	TURN		PRVTE	SW-SE								088	00
N							1P			05	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	22	M	OR-Y		028	000	02
N							46 8 49.8	-123 55 3.36	000900100S00															OR<25				
																02	NONE 0	TURN-L									
																	PRVTE	NE-SE								000	00
																	PSNGR CAR		01	DRVR	NONE	63	M	OR-Y		000	000 00
																								OR<25			

SER# / INVEST / RD DPT / UNLOC?	S P E D	D R A C	M J U S	S I G V	W C N L	DATE / DAY / TIME / LAT	CLASS / DIST / FROM / LONG	CITY STREET / FIRST STREET / SECOND STREET / LRS	RD CHAR / DIRECT / LOCTN	INT-TYPE (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH / COLL / SVRTY	V#	SPCL USE / TRLR QTY / OWNER	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT EVENT	CAUSE
00416	N	N	N		N	07/28/2017	17	ENSIGN AVE	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 1	STRGHT										27
CITY			FR			0	0	OREGON COAST HY	SE		TRF SIGNAL	N	DRY	REAR		PRVTE	SE-NW								000	00
N			12P						06	0		N	DAY	INJ		SEMI TOW		01	DRVR	NONE	53	M	OR-Y		016	000	27
N			46 8 50.14			-123 55 3.08																	OR<25				
															02	NONE 0	STOP										
																PRVTE	SE-NW									011	00
																PSNGR CAR		01	DRVR	INJC	65	F	OR-Y		000	000	00
																							OR<25				
00236	N	N	N		Y	04/30/2017	17	ENSIGN AVE	INTER	CROSS	N	N	CLD	S-1STOP	01	NONE 9	STRGHT										07
CITY			SU			0	0	OREGON COAST HY	SE		TRF SIGNAL	N	DRY	REAR		N/A	SE-NW								000	00
N			2P						06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00
N			46 8 50.14			-123 55 3.08																	UNK				
															02	NONE 9	STOP										
																N/A	SE-NW									013	00
																PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00
																							UNK				
00456	N	N	N		N	08/25/2018	17	ENSIGN AVE	INTER	CROSS	N	N	CLD	S-1STOP	01	NONE 9	STRGHT										29
CITY			SA			0	0	OREGON COAST HY	SE		TRF SIGNAL	N	DRY	REAR		N/A	SE-NW								000	00
N			1P						06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00
N			46 8 49.96			-123 55 2.49																	UNK				
															02	NONE 9	STOP										
																N/A	SE-NW									011	00
																PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00
																							UNK				
00230	N	N	N			06/03/2014	02	ENSIGN AVE	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT										29
NONE			TU					OREGON COAST HY	SW		TRF SIGNAL	N	DRY	REAR		PRVTE	SW-NE								000	00
N			3P						06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	F	UNK		026	000	29
N			46 8 50.2529279			-123 55 2.9920439		000900100S00															UNK				
															02	NONE 0	STOP										
																PRVTE	SW-NE									011	00
																PSNGR CAR		01	DRVR	NONE	30	M	OR-Y		000	000	00
																							OR<25				
00282	N	N	N		N	06/19/2015	14	ENSIGN AVE	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT										07
CITY			FR					OREGON COAST HY	SW		TRF SIGNAL	N	DRY	REAR		PRVTE	SW-NE								000	00
N			7P						06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	21	F	OR-Y		043	000	07
N			46 8 50.25			-123 55 2.99		000900100S00															OR<25				
															02	NONE 0	STOP										
																PRVTE	SW-NE									011	00
																PSNGR CAR		01	DRVR	INJC	66	M	OR-Y		000	000	00
																							OR<25				

CITY OF WARRENTON, CLATSOP COUNTY

ENSIGN AVE at OREGON COAST HY, City of Warrenton, Clatsop County, 01/01/2014 to 12/31/2018

14 - 17 of 37 Crash records shown.

SER# / INVEST / RD DPT / UNLOC?	S P E D	D R A L	M J U G	S I N V	W C H L	O R K	DATE / DAY / TIME / LAT	CLASS / DIST / FROM / LONG	CITY STREET / FIRST STREET / SECOND STREET / LRS	RD CHAR / DIRECT / LOCTN	INT-TYPE (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH / COLL / SVRTY	V#	SPCL USE / TRLR QTY / OWNER	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT EVENT	CAUSE
00026	N	N	N		N	N	01/13/2016	14	ENSIGN AVE	INTER	CROSS	N	N	CLD	S-1STOP	01	NONE 0	STRGHT										29
CITY							WE		OREGON COAST HY	SW		TRF SIGNAL	N	DRY	REAR		PRVTE	SW-NE								000	00
N							4P			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	84	M	OTH-Y		026	000	29
N							46 8 49.8	-123 55 3.36	000900100S00															N-RES				
																02	NONE 0	STOP										
																	PRVTE	SW-NE									011	00
																	PSNGR CAR		01	DRVR	INJC	60	F	OR-Y		000	000	00
																								OR<25				
																02	NONE 0	STOP										
																	PRVTE	SW-NE									011	00
																	PSNGR CAR		02	PSNG	INJC	59	F			000	000	00
00271	N	N	N				06/26/2014	09	ENSIGN AVE	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 0	STRGHT										29
NONE							TH	0	OREGON COAST HY	NW		TRF SIGNAL	N	DRY	REAR		PRVTE	NW-SE								000	00
N							11A			06	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	62	M	OR-Y		026	000	29
N							46 8 50.1432719	-123 55 3.0800639																OR-?				
																02	NONE 0	STOP										
																	PRVTE	NW-SE									011	00
																	PSNGR CAR		01	DRVR	INJC	50	F	OR-Y		000	000	00
																								OR<25				
00033	N	N	N		N	N	01/17/2016	17	ENSIGN AVE	INTER	CROSS	N	N	RAIN	ANGL-STP	01	NONE 9	BACK										08
CITY							SU	0	OREGON COAST HY	NW		L-GRN-SIG	N	WET	BACK		N/A	S -NW								088	00
N							4P			06	0		N	DUSK	PDO		PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00
N							46 8 50.14	-123 55 3.08																UNK				
																02	NONE 9	STOP										
																	N/A	NW-SE									012	00
																	PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00
																								UNK				
00476	N	N	N		N	N	09/03/2018	17	ENSIGN AVE	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE 9	STRGHT										07,22
CITY							MO	100	OREGON COAST HY	NW		TRF SIGNAL	N	DRY	REAR		N/A	NW-SE								088	00
N							1P			06	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00
N							46 8 50.39	-123 55 3.72																UNK				
																02	NONE 9	STOP										
																	N/A	NW-SE									011	00
																	PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00
																								UNK				
00146	N	N	N		N	N	04/04/2014	02	ENSIGN AVE	INTER	CROSS	N	N	RAIN	O-1 L-TURN	01	NONE 0	STRGHT										02
CITY							FR		OREGON COAST HY	CN		TRF SIGNAL	N	WET	TURN		PRVTE	SW-NE								000	00
N							7P			04	0		N	DLIT	PDO		PSNGR CAR		01	DRVR	NONE	50	M	OR-Y		000	000	00
N							46 8 49.7954039	-123 55 3.3557519	000900100S00															OR<25				

CITY OF WARRENTON, CLATSOP COUNTY

ENSIGN AVE at OREGON COAST HY, City of Warrenton, Clatsop County, 01/01/2014 to 12/31/2018

18 - 21 of 37 Crash records shown.

SER# / INVEST / RD DPT / UNLOC?	S P E D	D R A L	M J U G	S I N C	W C H O	DATE / DAY / TIME / LAT	CLASS / DIST / FROM / LONG	CITY STREET / FIRST STREET / SECOND STREET / LRS	RD CHAR / DIRECT / LOCTN	INT-TYPE (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH / COLL / SVRTY	V#	SPCL USE TRLR QTY / OWNER	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT EVENT	CAUSE
															02	NONE 0	TURN-L										
																PRVTE	NE-SE									006	00
																PSNGR CAR		01	DRVR	NONE	21	F	OR-Y OR<25		004,028	000	02
															02	NONE 0	TURN-L										
																PRVTE	NE-SE									006	00
																PSNGR CAR		02	PSNG	NO<5	01	M			000	000	00
00335	N	N	N	N	N	07/29/2014	02	ENSIGN AVE	INTER	CROSS	N	N	CLR	O-1 L-TURN	01	NONE 0	TURN-L										02
CITY						TU		OREGON COAST HY	CN		L-GRN-SIG	N	DRY	TURN		PRVTE	NE-SE									000	00
N						4P			02	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	67	F	OR-Y		028	000	02
N						46 8 50.2529279	-123 55 2.9920439	000900100S00															OR<25				
															02	NONE 0	STRGHT										
																PRVTE	SW-NE									000	00
																PSNGR CAR		01	DRVR	NONE	55	M	OR-Y OR<25		000	000	00
00476	N	N	N	N	N	09/24/2014	02	ENSIGN AVE	INTER	CROSS	N	N	CLD	O-1 L-TURN	01	NONE 0	STRGHT										02
CITY						WE		OREGON COAST HY	CN		L-GRN-SIG	N	WET	TURN		PRVTE	SW-NE									000	00
N						8A			01	0		N	DAY	INJ		PSNGR CAR		01	DRVR	INJC	61	F	OR-Y		000	000	00
N						46 8 50.14	-123 55 3.08	000900100S00															OR<25				
															02	NONE 0	TURN-L										
																PRVTE	NE-SE									000	00
																PSNGR CAR		01	DRVR	NONE	24	M	OR-Y OR<25		028	000	02
00219	N	N	N	N	N	05/24/2015	14	ENSIGN AVE	INTER	CROSS	N	N	CLD	O-1 L-TURN	01	NONE 0	TURN-L										02
CITY						SU		OREGON COAST HY	CN		TRF SIGNAL	N	DRY	TURN		PRVTE	NE-SE									000	00
N						11A			04	0		N	DAY	INJ		PSNGR CAR		01	DRVR	NONE	58	F	OR-Y		028	000	02
N						46 8 49.8	-123 55 3.36	000900100S00															OR<25				
															02	NONE 0	STRGHT										
																PRVTE	SW-NE									000	00
																PSNGR CAR		01	DRVR	NONE	34	M	OTH-Y N-RES		000	000	00
															02	NONE 0	STRGHT										
																PRVTE	SW-NE									000	00
																PSNGR CAR		02	PSNG	INJC	34	F			000	000	00
															02	NONE 0	STRGHT										
																PRVTE	SW-NE									000	00
																PSNGR CAR		03	PSNG	NO<5	01	M			000	000	00
															02	NONE 0	STRGHT										
																PRVTE	SW-NE									000	00
																PSNGR CAR		04	PSNG	NO<5	04	M			000	000	00

CITY OF WARRENTON, CLATSOP COUNTY

ENSIGN AVE at OREGON COAST HY, City of Warrenton, Clatsop County, 01/01/2014 to 12/31/2018

22 - 25 of 37 Crash records shown.

SER# / INVEST / RD DPT / UNLOC?	S P E D	D R A L C	M J U G S	S I N V	W C O H L	DATE / DAY / TIME / LAT	CLASS / DIST / FROM / LONG	CITY STREET / FIRST STREET / SECOND STREET / LRS	RD CHAR / DIRECT / LOCTN	INT-TYPE (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH / COLL / SVRTY	V#	SPCL USE / TRLR QTY / OWNER / TYPE	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT	EVENT	CAUSE
00601	N	N	N		N	11/23/2015	14	ENSIGN AVE	INTER	CROSS	N	N	RAIN	O-1 L-TURN	01	NONE 0	STRGHT											02
CITY			MO					OREGON COAST HY	CN		L-GRN-SIG	N	WET	TURN		PRVTE	SW-NE									000		00
N			4P						04	0		N	DUSK	INJ		PSNGR CAR		01	DRVR	INJC	27	F	OR-Y		000	000		00
N			46 8 49.8				-123 55 3.36	000900100S00															OR<25					
															02	NONE 0	TURN-L											
																PRVTE	NE-SE									000		00
																PSNGR CAR		01	DRVR	INJB	68	M	OTH-Y		004,028	000		02
																							N-RES					
															02	NONE 0	TURN-L											
																PRVTE	NE-SE									000		00
																PSNGR CAR		02	PSNG	INJB	65	F			000	000		00
00616	N	N	N		N	11/29/2015	14	ENSIGN AVE	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	TURN-L											04
CITY			SU					OREGON COAST HY	CN		L-GRN-SIG	N	DRY	TURN		PRVTE	SE-SW									000		00
N			3P						03	0		N	DAY	INJ		PSNGR CAR		01	DRVR	INJC	56	M	OR-Y		000	000		00
N			46 8 49.8				-123 55 3.36	000900100S00															OR<25					
															02	NONE 0	TURN-L											
																PRVTE	NE-SE									000		00
																PSNGR CAR		01	DRVR	NONE	86	M	OR-Y		020	000		04
																							OR<25					
															02	NONE 0	TURN-L											
																PRVTE	NE-SE									000		00
																PSNGR CAR		02	PSNG	INJC	79	F			000	000		00
00235	N	N	N		N	05/30/2015	14	ENSIGN AVE	INTER	CROSS	N	N	CLD	O-1 L-TURN	01	NONE 0	TURN-L											079	04
CITY			SA					OREGON COAST HY	CN		L-GRN-SIG	N	DRY	TURN		PRVTE	NE-SE									000		00
N			10A						03	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	19	M	OR-Y		000	000		00
N			46 8 49.8				-123 55 3.36	000900100S00															OR<25					
															02	NONE 0	STRGHT											
																PRVTE	SW-NE									000	079	00
																PSNGR CAR		01	DRVR	NONE	50	M	OR-Y		020	000		04
																							OR<25					
00315	N	N	N		N	07/01/2015	14	ENSIGN AVE	INTER	CROSS	N	N	CLD	S-OTHER	01	NONE 0	TURN-L											006	29
CITY			WE					OREGON COAST HY	CN		L-GRN-SIG	N	DRY	TURN		PRVTE	NW-NE									000		00
N			9A						03	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	44	F	OR-Y		026	000		29
N			46 8 49.8				-123 55 3.36	000900100S00															OR<25					
															02	NONE 0	TURN-L											
																PRVTE	NW-NE									013	006	00
																PSNGR CAR		01	DRVR	NONE	61	M	OR-Y		000	000		00
																							OR<25					

SER# / INVEST / RD DPT / UNLOC?	S P E D	D R A L C	M J U G S	S I N V	W C O H L	DATE / DAY / TIME / LAT	CLASS / DIST / FROM / LONG	CITY STREET / FIRST STREET / SECOND STREET / LRS	RD CHAR / DIRECT / LOCTN	INT-TYPE (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH / COLL / SVRTY	V#	SPCL USE / TRLR / OWNER	QTY	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT EVENT	CAUSE
00020	N	N	N		N	01/09/2016	14	ENSIGN AVE	INTER	CROSS	N	N	CLR	O-1 L-TURN	01	NONE	0	STRGHT										02
CITY			SA					OREGON COAST HY	CN		L-GRN-SIG	N	DRY	TURN		PRVTE		SW-NE									000	00
N			4P						01	0		N	DUSK	INJ		PSNGR CAR			01	DRVR	NONE	77	M	OR-Y		000	000	00
N			46 8 49.8				-123 55 3.36	000900100S00																OR<25				
															02	NONE	0	TURN-L										
																PRVTE		NE-SE									000	00
																PSNGR CAR			01	DRVR	NONE	50	M	OTH-Y		004,028	000	02
																								N-RES				
															02	NONE	0	TURN-L										
																PRVTE		NE-SE									000	00
																PSNGR CAR			02	PSNG	INJC	61	F			000	000	00
00234	N	N	N		N	05/09/2016	14	ENSIGN AVE	INTER	3-LEG	N	N	CLR	O-1 L-TURN	01	NONE	9	TURN-L										02
CITY			MO					OREGON COAST HY	CN		L-GRN-SIG	N	DRY	TURN		N/A		NE-SE									000	00
N			8A						03	0		N	DAY	PDO		PSNGR CAR			01	DRVR	NONE	00	Unk	UNK		000	000	00
N			46 8 49.8				-123 55 3.36	000900100S00																UNK				
															02	NONE	9	STRGHT										
																N/A		SW-NE									000	00
																PSNGR CAR			01	DRVR	NONE	00	Unk	UNK		000	000	00
																								UNK				
00559	N	N	N		N	09/24/2017	14	ENSIGN AVE	INTER	CROSS	N	N	CLR	O-1 L-TURN	01	NONE	0	TURN-L										02
CITY			SU					OREGON COAST HY	CN		TRF SIGNAL	N	DRY	TURN		PRVTE		SW-NW									000	00
N			3P						01	0		N	DAY	INJ		PSNGR CAR			01	DRVR	INJB	70	M	OR-Y		028	000	02
N			46 8 49.8				-123 55 3.36	000900100S00																OR<25				
															01	NONE	0	TURN-L										
																PRVTE		SW-NW									000	00
																PSNGR CAR			02	PSNG	INJB	61	M			000	000	00
															02	NONE	0	STRGHT										
																PRVTE		NE-SW									000	00
																PSNGR CAR			01	DRVR	NONE	42	M	OR-Y		000	000	00
																								OR>25				
00372	N	N	N		N	07/10/2017	14	ENSIGN AVE	INTER	CROSS	N	N	CLR	O-1 L-TURN	01	NONE	9	STRGHT										04
CITY			MO					OREGON COAST HY	CN		L-GRN-SIG	N	DRY	TURN		N/A		NE-SW									000	00
N			11A						02	0		N	DAY	PDO		PSNGR CAR			01	DRVR	NONE	00	Unk	UNK		000	000	00
N			46 8 49.8				-123 55 3.36	000900100S00																UNK				
															02	NONE	9	TURN-L										
																N/A		SW-NW									000	00
																PSNGR CAR			01	DRVR	NONE	00	Unk	UNK		000	000	00
																								UNK				

SER# / INVEST / RD DPT / UNLOC?	S P E D	D R A C	M J U S	S I G V	W C N L	DATE / DAY / TIME / LAT	CLASS / DIST / FROM / LONG	CITY STREET / FIRST STREET / SECOND STREET / LRS	RD CHAR / DIRECT / LOCTN	INT-TYPE (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH / COLL / SVRTY	V#	SPCL USE / TRLR QTY / OWNER	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT EVENT	CAUSE
00600	N	N	N		N	10/09/2017	14	ENSIGN AVE	INTER	CROSS	N	N	CLD	O-1 L-TURN	01	NONE 9	STRGHT										02,27
CITY			MO					OREGON COAST HY	CN		L-GRN-SIG	N	DRY	TURN		N/A	SW-NE								000	00
N			5P						01	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00
N			46 8 49.8	-123 55 3.36		000900100S00																	UNK				
															02	NONE 9	TURN-L										
																N/A	NE-SE								000	00
																PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00
																							UNK				
00793	N	N	N			12/28/2017	14	ENSIGN AVE	INTER	CROSS	N	N	RAIN	ANGL-OTH	01	NONE 9	TURN-R										02
NONE			TH					OREGON COAST HY	CN		TRF SIGNAL	N	WET	TURN		N/A	SE-NE								000	00
N			5P						02	0		N	DLIT	PDO		PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00
N			46 8 49.8	-123 55 3.36		000900100S00																	UNK				
															02	NONE 9	STRGHT										
																N/A	SW-NE								000	00
																PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00
																							UNK				
00151	N	N	N		N	04/04/2018	14	ENSIGN AVE	INTER	CROSS	N	N	CLD	O-1 L-TURN	01	NONE 0	STRGHT										04
CITY			WE					OREGON COAST HY	CN		L-GRN-SIG	N	DRY	TURN		PRVTE	SW-NE								000	00
N			7P						04	0		N	DLIT	INJ		PSNGR CAR		01	DRVR	NONE	68	M	OTH-Y		000	000	00
N			46 8 49.8	-123 55 3.35		000900100S00																	OR>25				
															01	NONE 0	STRGHT										
																PRVTE	SW-NE								000	00
																PSNGR CAR		02	PSNG	INJB	41	F			000	000	00
															02	NONE 0	TURN-L										
																PRVTE	NE-SE								000	00
																PSNGR CAR		01	DRVR	INJA	57	M	OR-Y		020,004	000	04
																							OR<25				
00237	N	N	N		N	05/25/2018	14	ENSIGN AVE	INTER	3-LEG	N	N	CLR	O-1 L-TURN	01	NONE 0	TURN-L										04
CITY			FR					OREGON COAST HY	CN		TRF SIGNAL	N	DRY	TURN		PRVTE	NE-SE								088	00
N			9A						01	0		N	DAY	INJ		PSNGR CAR		01	DRVR	INJB	51	M	OR-Y		020	000	04
N			46 8 49.82	-123 55 3.38		000900100S00																	OR>25				
															02	NONE 0	STRGHT										
																PRVTE	SW-NE								000	00
																PSNGR CAR		01	DRVR	INJC	57	M	OR-Y		000	000	00
																							OR<25				
															02	NONE 0	STRGHT										
																PRVTE	SW-NE								000	00
																PSNGR CAR		02	PSNG	INJC	42	F			000	000	00

SER# / INVEST / RD DPT / UNLOC?	S P E D	D R A C	M J U S	S I G V	W C N L	DATE / DAY / TIME / LAT	CLASS / DIST / FROM / LONG	CITY STREET / FIRST STREET / SECOND STREET / LRS	RD CHAR / DIRECT / LOCTN	INT-TYPE (MEDIAN) / LEGS / (#LANES)	INT-REL / TRAF- / CONTL	OFFRD / RNDBT / DRVWY	WTHR / SURF / LIGHT	CRASH / COLL / SVRTY	V#	SPCL USE TRLR QTY / OWNER / TYPE	MOVE / FROM / TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT EVENT	CAUSE
00281	N	N	N		N	06/18/2018	14	ENSIGN AVE	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT										17,04
CITY			MO					OREGON COAST HY	CN		TRF SIGNAL	N	DRY	ANGL		PRVTE	SE-NW								000	00
N			3P						02	0		N	DAY	INJ		PSNGR CAR		01	DRVR	INJA	52	M	OR-Y		016,020	028	17,04
N			46 8 49.79			-123 55 3.35		000900100S00															OR<25				
															02	NONE 0	STRGHT										
																PRVTE	NE-SW								000	00
																PSNGR CAR		01	DRVR	NONE	22	F	OR-Y		000	000	00
																							OR>25				
00320	N	N	N		N	07/06/2018	14	ENSIGN AVE	INTER	CROSS	N	N	CLR	O-1 L-TURN	01	NONE 0	TURN-L										04
CITY			FR					OREGON COAST HY	CN		L-GRN-SIG	N	DRY	TURN		PRVTE	NE-SE								000	00
N			11A						03	0		N	DAY	INJ		PSNGR CAR		01	DRVR	INJC	70	F	OTH-Y		020,004	088	04
N			46 8 49.81			-123 55 3.38		000900100S00															N-RES				
															02	NONE 0	STRGHT										
																PRVTE	SW-NE								000	00
																PSNGR CAR		01	DRVR	NONE	37	F	OR-Y		000	000	00
																							OR<25				
00003	N	N	N		N	01/03/2018	14	ENSIGN AVE	INTER	CROSS	N	N	CLD	O-1 L-TURN	01	NONE 9	STRGHT										02
CITY			WE					OREGON COAST HY	CN		L-GRN-SIG	N	DRY	TURN		N/A	NE-SW								000	00
N			12P						01	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00
N			46 8 50.14			-123 55 3.08		000900100S00															UNK				
															02	NONE 9	TURN-L										
																N/A	SW-NW								000	00
																PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00
																							UNK				
00243	N	N	N		N	05/29/2018	14	ENSIGN AVE	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 9	TURN-R										02
CITY			TU					OREGON COAST HY	CN		TRF SIGNAL	N	DRY	TURN		N/A	SE-NE								088	00
N			2P						03	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00
N			46 8 50.15			-123 55 3.1		000900100S00															UNK				
															02	NONE 9	STRGHT										
																N/A	SW-NE								000	00
																PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00
																							UNK				

Appendix E

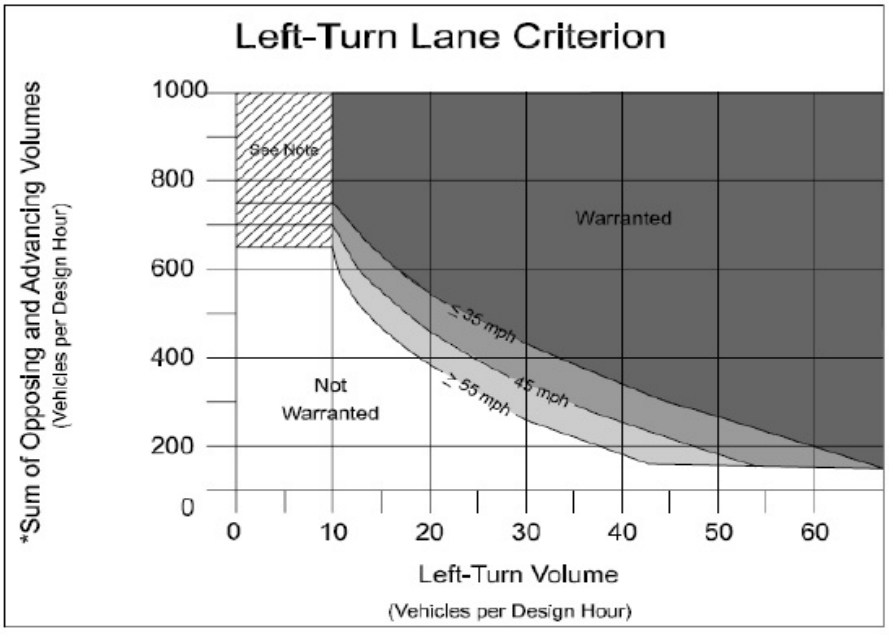
Left-turn Lane Warrants

Traffic Signal Warrants

Project: 20186 Trillium House
Intersection: OR-104S at SE Ensign Lane
Date: 12/28/2020
Scenario: 2021 Existing Conditions - Adjusted

Speed? 45 mph

AM Peak Hour		**PM Peak Hour**	
Left-Turn Volume		Left-Turn Volume	72
Approaching DHV		Approaching DHV	182
# of Advancing Through Lanes		# of Advancing Through Lanes	1
Opposing DHV		Opposing DHV	250
# of Opposing Through Lanes		# of Opposing Through Lanes	1
O+A DHV		**O+A DHV**	**432**
Lane Needed?		Lane Needed?	**Yes**



Source: Oregon DOT Analysis Procedures Manual 2008

*(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

Project: 20186 Trillium House
Date: 1/5/2021
Scenario: Year 2023 Buildout Scenario

Major Street:	OR-104S	Minor Street:	SE Ensign Lane
Number of Lanes:	1	Number of Lanes:	1
PM Peak Hour Volumes:	463	PM Peak Hour Volumes:	245

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)	
WARRANT 1, CONDITION A		100%	70%	100%	70%
Major St.	Minor St.	Warrants	Warrants	Warrants	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					
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?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	4,630	6,200	
Minor Street*	2,450	1,850	**No**
Condition B: Interruption of Continuous Traffic			
Major Street	4,630	9,300	
Minor Street*	2,450	950	**No**
Combination Warrant			
Major Street	4,630	7,440	
Minor Street*	2,450	1,480	**No**

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

Appendix F

Level of Service Descriptions

Capacity Reports

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

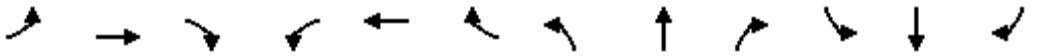
Intersection	
Int Delay, s/veh	3.4

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	105	11	38	211	44	71
Future Vol, veh/h	105	11	38	211	44	71
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	90	0	-	210	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	79	79	79	79	79	79
Heavy Vehicles, %	6	6	2	2	6	6
Mvmt Flow	133	14	48	267	56	90

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	251	49	0	0	316	0
Stage 1	49	-	-	-	-	-
Stage 2	202	-	-	-	-	-
Critical Hdwy	6.46	6.26	-	-	4.16	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.354	-	-	2.254	-
Pot Cap-1 Maneuver	729	1008	-	-	1222	-
Stage 1	963	-	-	-	-	-
Stage 2	822	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	693	1007	-	-	1221	-
Mov Cap-2 Maneuver	693	-	-	-	-	-
Stage 1	962	-	-	-	-	-
Stage 2	783	-	-	-	-	-

Approach	NB	NE	SW
HCM Control Delay, s	11.1	0	3.1
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NBLn1	NBLn2	SWL	SWT
Capacity (veh/h)	-	-	693	1007	1221	-
HCM Lane V/C Ratio	-	-	0.192	0.014	0.046	-
HCM Control Delay (s)	-	-	11.4	8.6	8.1	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	0.7	0	0.1	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	72	140	54	122	109	58	50	383	123	86	283	25
Future Volume (vph)	72	140	54	122	109	58	50	383	123	86	283	25
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	1.00		0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1630	1644		3043	1651	1403	1599	3197	1430	1599	3158	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.56	1.00	1.00	0.49	1.00	
Satd. Flow (perm)	1630	1644		3043	1651	1403	950	3197	1430	821	3158	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	72	140	54	122	109	58	50	383	123	86	283	25
RTOR Reduction (vph)	0	13	0	0	0	44	0	0	47	0	4	0
Lane Group Flow (vph)	72	181	0	122	109	14	50	383	76	86	304	0
Heavy Vehicles (%)	2%	2%	2%	6%	6%	6%	4%	4%	4%	4%	4%	4%
Turn Type	Prot	NA		Prot	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	
Protected Phases	7	4		3	8	1	5	2	3	1	6	
Permitted Phases						8	2		2	6		
Actuated Green, G (s)	9.4	19.4		10.1	20.1	28.2	70.3	64.4	74.5	74.7	66.6	
Effective Green, g (s)	9.4	19.4		10.1	20.1	28.2	70.3	64.4	74.5	74.7	66.6	
Actuated g/C Ratio	0.08	0.16		0.08	0.17	0.23	0.59	0.54	0.62	0.62	0.55	
Clearance Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	127	265		256	276	382	588	1715	941	563	1752	
v/s Ratio Prot	c0.04	c0.11		0.04	0.07	0.00	0.00	c0.12	0.01	c0.01	0.10	
v/s Ratio Perm						0.01	0.05		0.05	0.08		
v/c Ratio	0.57	0.68		0.48	0.39	0.04	0.09	0.22	0.08	0.15	0.17	
Uniform Delay, d1	53.3	47.4		52.4	44.5	35.4	10.6	14.6	9.1	9.1	13.1	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	5.7	7.0		1.4	0.9	0.0	0.1	0.3	0.0	0.1	0.2	
Delay (s)	59.0	54.4		53.8	45.5	35.4	10.7	14.9	9.1	9.3	13.4	
Level of Service	E	D		D	D	D	B	B	A	A	B	
Approach Delay (s)		55.7			47.0			13.3			12.5	
Approach LOS		E			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	27.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

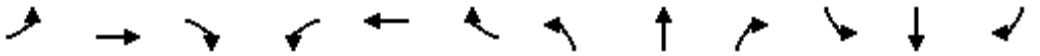
Intersection	
Int Delay, s/veh	5.9

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	215	25	14	236	72	110
Future Vol, veh/h	215	25	14	236	72	110
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	90	0	-	210	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	256	30	17	281	86	131

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	321	18	0	0	299	0
Stage 1	18	-	-	-	-	-
Stage 2	303	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	675	1063	-	-	1268	-
Stage 1	1007	-	-	-	-	-
Stage 2	751	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	625	1062	-	-	1267	-
Mov Cap-2 Maneuver	625	-	-	-	-	-
Stage 1	1006	-	-	-	-	-
Stage 2	696	-	-	-	-	-

Approach	NB	NE	SW
HCM Control Delay, s	14.1	0	3.2
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NBLn1	NBLn2	SWL	SWT
Capacity (veh/h)	-	-	625	1062	1267	-
HCM Lane V/C Ratio	-	-	0.41	0.028	0.068	-
HCM Control Delay (s)	-	-	14.7	8.5	8	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	2	0.1	0.2	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	150	259	80	245	233	261	64	364	232	228	410	72
Future Volume (vph)	150	259	80	245	233	261	64	364	232	228	410	72
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	1.00		0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1662	1688		3193	1733	1459	1630	3260	1432	1629	3187	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.48	1.00	1.00	0.44	1.00	
Satd. Flow (perm)	1662	1688		3193	1733	1459	818	3260	1432	748	3187	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	150	259	80	245	233	261	64	364	232	228	410	72
RTOR Reduction (vph)	0	10	0	0	0	171	0	0	118	0	11	0
Lane Group Flow (vph)	150	329	0	245	233	90	64	364	114	228	471	0
Confl. Peds. (#/hr)	1					1			1	1		
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	2%	2%	2%	2%	2%	2%
Turn Type	Prot	NA		Prot	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	
Protected Phases	7	4		3	8	1	5	2	3	1	6	
Permitted Phases						8	2		2	6		
Actuated Green, G (s)	16.0	28.4		14.6	27.0	41.6	51.3	44.4	59.0	63.5	52.1	
Effective Green, g (s)	16.0	28.4		14.6	27.0	41.6	51.3	44.4	59.0	63.5	52.1	
Actuated g/C Ratio	0.13	0.24		0.12	0.22	0.35	0.43	0.37	0.49	0.53	0.43	
Clearance Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	221	399		388	389	560	396	1206	757	503	1383	
v/s Ratio Prot	c0.09	c0.19		0.08	0.13	0.02	0.01	0.11	0.02	c0.06	0.15	
v/s Ratio Perm						0.04	0.06		0.06	c0.18		
v/c Ratio	0.68	0.82		0.63	0.60	0.16	0.16	0.30	0.15	0.45	0.34	
Uniform Delay, d1	49.6	43.4		50.1	41.7	27.1	20.5	26.8	16.7	15.9	22.5	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	8.0	13.0		3.3	2.5	0.1	0.2	0.6	0.1	0.7	0.7	
Delay (s)	57.6	56.4		53.5	44.1	27.3	20.7	27.5	16.8	16.6	23.2	
Level of Service	E	E		D	D	C	C	C	B	B	C	
Approach Delay (s)		56.8			41.3			23.1			21.1	
Approach LOS		E			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	34.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	71.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

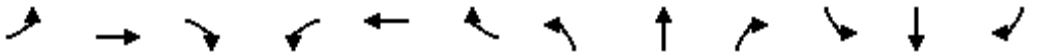
Intersection	
Int Delay, s/veh	3.5

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	109	11	41	219	46	76
Future Vol, veh/h	109	11	41	219	46	76
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	90	0	-	210	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	79	79	79	79	79	79
Heavy Vehicles, %	6	6	2	2	6	6
Mvmt Flow	138	14	52	277	58	96

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	265	53	0	0	330	0
Stage 1	53	-	-	-	-	-
Stage 2	212	-	-	-	-	-
Critical Hdwy	6.46	6.26	-	-	4.16	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.354	-	-	2.254	-
Pot Cap-1 Maneuver	716	1003	-	-	1207	-
Stage 1	959	-	-	-	-	-
Stage 2	814	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	679	1002	-	-	1206	-
Mov Cap-2 Maneuver	679	-	-	-	-	-
Stage 1	958	-	-	-	-	-
Stage 2	772	-	-	-	-	-

Approach	NB	NE	SW
HCM Control Delay, s	11.3	0	3.1
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NBLn1	NBLn2	SWL	SWT
Capacity (veh/h)	-	-	679	1002	1206	-
HCM Lane V/C Ratio	-	-	0.203	0.014	0.048	-
HCM Control Delay (s)	-	-	11.6	8.6	8.1	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0	0.2	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	146	56	126	115	60	52	391	127	89	289	26
Future Volume (vph)	75	146	56	126	115	60	52	391	127	89	289	26
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	1.00		0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1630	1644		3043	1651	1403	1599	3197	1430	1599	3158	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.56	1.00	1.00	0.48	1.00	
Satd. Flow (perm)	1630	1644		3043	1651	1403	943	3197	1430	810	3158	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	75	146	56	126	115	60	52	391	127	89	289	26
RTOR Reduction (vph)	0	13	0	0	0	46	0	0	49	0	4	0
Lane Group Flow (vph)	75	189	0	126	115	14	52	391	78	89	311	0
Heavy Vehicles (%)	2%	2%	2%	6%	6%	6%	4%	4%	4%	4%	4%	4%
Turn Type	Prot	NA		Prot	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	
Protected Phases	7	4		3	8	1	5	2	3	1	6	
Permitted Phases						8	2		2	6		
Actuated Green, G (s)	9.6	19.9		10.3	20.6	28.8	69.6	63.6	73.9	74.0	65.8	
Effective Green, g (s)	9.6	19.9		10.3	20.6	28.8	69.6	63.6	73.9	74.0	65.8	
Actuated g/C Ratio	0.08	0.17		0.09	0.17	0.24	0.58	0.53	0.62	0.62	0.55	
Clearance Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	130	272		261	283	389	579	1694	934	553	1731	
v/s Ratio Prot	c0.05	c0.11		0.04	0.07	0.00	0.00	c0.12	0.01	c0.01	0.10	
v/s Ratio Perm						0.01	0.05		0.05	0.09		
v/c Ratio	0.58	0.69		0.48	0.41	0.04	0.09	0.23	0.08	0.16	0.18	
Uniform Delay, d1	53.2	47.2		52.3	44.3	35.0	10.9	15.1	9.3	9.5	13.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	6.1	7.4		1.4	1.0	0.0	0.1	0.3	0.0	0.1	0.2	
Delay (s)	59.3	54.6		53.7	45.2	35.0	11.0	15.4	9.4	9.6	13.8	
Level of Service	E	D		D	D	D	B	B	A	A	B	
Approach Delay (s)		55.9			46.7			13.7			12.9	
Approach LOS		E			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	27.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	48.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

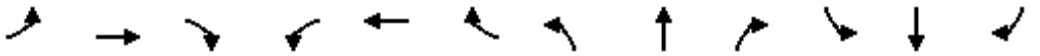
Intersection	
Int Delay, s/veh	6.1

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	223	26	16	245	75	117
Future Vol, veh/h	223	26	16	245	75	117
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	90	0	-	210	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	265	31	19	292	89	139

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	337	20	0	0	312	0
Stage 1	20	-	-	-	-	-
Stage 2	317	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	661	1061	-	-	1254	-
Stage 1	1005	-	-	-	-	-
Stage 2	741	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	609	1060	-	-	1253	-
Mov Cap-2 Maneuver	609	-	-	-	-	-
Stage 1	1004	-	-	-	-	-
Stage 2	684	-	-	-	-	-

Approach	NB	NE	SW
HCM Control Delay, s	14.7	0	3.2
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NBLn1	NBLn2	SWL	SWT
Capacity (veh/h)	-	-	609	1060	1253	-
HCM Lane V/C Ratio	-	-	0.436	0.029	0.071	-
HCM Control Delay (s)	-	-	15.4	8.5	8.1	0
HCM Lane LOS	-	-	C	A	A	A
HCM 95th %tile Q(veh)	-	-	2.2	0.1	0.2	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	155	269	83	254	244	271	66	371	240	236	418	75
Future Volume (vph)	155	269	83	254	244	271	66	371	240	236	418	75
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	1.00		0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1662	1688		3193	1733	1459	1630	3260	1432	1629	3185	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.47	1.00	1.00	0.43	1.00	
Satd. Flow (perm)	1662	1688		3193	1733	1459	810	3260	1432	730	3185	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	155	269	83	254	244	271	66	371	240	236	418	75
RTOR Reduction (vph)	0	10	0	0	0	175	0	0	124	0	12	0
Lane Group Flow (vph)	155	342	0	254	244	96	66	371	116	236	481	0
Confl. Peds. (#/hr)	1					1			1	1		
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	2%	2%	2%	2%	2%	2%
Turn Type	Prot	NA		Prot	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	
Protected Phases	7	4		3	8	1	5	2	3	1	6	
Permitted Phases						8	2		2	6		
Actuated Green, G (s)	16.4	29.5		15.0	28.1	42.7	49.9	42.9	57.9	62.0	50.5	
Effective Green, g (s)	16.4	29.5		15.0	28.1	42.7	49.9	42.9	57.9	62.0	50.5	
Actuated g/C Ratio	0.14	0.25		0.12	0.23	0.36	0.42	0.36	0.48	0.52	0.42	
Clearance Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	227	414		399	405	573	384	1165	744	486	1340	
v/s Ratio Prot	c0.09	c0.20		0.08	0.14	0.02	0.01	0.11	0.02	c0.06	0.15	
v/s Ratio Perm						0.05	0.06		0.06	c0.19		
v/c Ratio	0.68	0.83		0.64	0.60	0.17	0.17	0.32	0.16	0.49	0.36	
Uniform Delay, d1	49.3	42.8		49.9	41.0	26.5	21.3	28.0	17.4	16.9	23.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	8.2	12.7		3.3	2.5	0.1	0.2	0.7	0.1	0.8	0.7	
Delay (s)	57.5	55.5		53.2	43.5	26.6	21.6	28.7	17.5	17.7	24.5	
Level of Service	E	E		D	D	C	C	C	B	B	C	
Approach Delay (s)		56.1			40.8			24.0			22.3	
Approach LOS		E			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	34.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

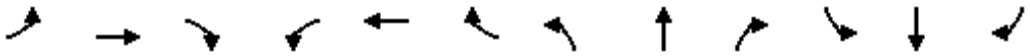
Intersection	
Int Delay, s/veh	3.6

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	109	13	42	219	54	79
Future Vol, veh/h	109	13	42	219	54	79
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	90	0	-	210	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	79	79	79	79	79	79
Heavy Vehicles, %	6	6	2	2	6	6
Mvmt Flow	138	16	53	277	68	100

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	290	54	0	0	331	0
Stage 1	54	-	-	-	-	-
Stage 2	236	-	-	-	-	-
Critical Hdwy	6.46	6.26	-	-	4.16	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.354	-	-	2.254	-
Pot Cap-1 Maneuver	692	1002	-	-	1206	-
Stage 1	958	-	-	-	-	-
Stage 2	794	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	650	1001	-	-	1205	-
Mov Cap-2 Maneuver	650	-	-	-	-	-
Stage 1	957	-	-	-	-	-
Stage 2	746	-	-	-	-	-

Approach	NB	NE	SW
HCM Control Delay, s	11.6	0	3.3
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NBLn1	NBLn2	SWL	SWT
Capacity (veh/h)	-	-	650	1001	1205	-
HCM Lane V/C Ratio	-	-	0.212	0.016	0.057	-
HCM Control Delay (s)	-	-	12	8.7	8.2	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0.1	0.2	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	79	147	59	126	116	60	53	391	127	89	289	26
Future Volume (vph)	79	147	59	126	116	60	53	391	127	89	289	26
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	1.00		0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1630	1642		3043	1651	1403	1599	3197	1430	1599	3158	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.56	1.00	1.00	0.48	1.00	
Satd. Flow (perm)	1630	1642		3043	1651	1403	943	3197	1430	809	3158	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	79	147	59	126	116	60	53	391	127	89	289	26
RTOR Reduction (vph)	0	14	0	0	0	46	0	0	49	0	4	0
Lane Group Flow (vph)	79	192	0	126	116	14	53	391	78	89	311	0
Heavy Vehicles (%)	2%	2%	2%	6%	6%	6%	4%	4%	4%	4%	4%	4%
Turn Type	Prot	NA		Prot	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	
Protected Phases	7	4		3	8	1	5	2	3	1	6	
Permitted Phases						8	2		2	6		
Actuated Green, G (s)	9.8	20.2		10.3	20.7	28.9	69.3	63.3	73.6	73.7	65.5	
Effective Green, g (s)	9.8	20.2		10.3	20.7	28.9	69.3	63.3	73.6	73.7	65.5	
Actuated g/C Ratio	0.08	0.17		0.09	0.17	0.24	0.58	0.53	0.61	0.61	0.55	
Clearance Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	133	276		261	284	390	577	1686	930	550	1723	
v/s Ratio Prot	c0.05	c0.12		0.04	0.07	0.00	0.00	c0.12	0.01	c0.01	0.10	
v/s Ratio Perm						0.01	0.05		0.05	0.09		
v/c Ratio	0.59	0.70		0.48	0.41	0.04	0.09	0.23	0.08	0.16	0.18	
Uniform Delay, d1	53.2	47.0		52.3	44.2	34.9	11.1	15.3	9.5	9.6	13.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	6.9	7.4		1.4	1.0	0.0	0.1	0.3	0.0	0.1	0.2	
Delay (s)	60.1	54.4		53.7	45.2	34.9	11.1	15.6	9.5	9.7	14.0	
Level of Service	E	D		D	D	C	B	B	A	A	B	
Approach Delay (s)		56.0			46.7			13.8			13.0	
Approach LOS		E			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	27.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	48.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

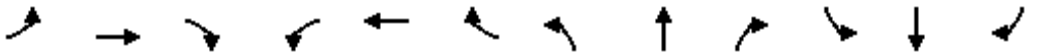
Intersection	
Int Delay, s/veh	6.3

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	223	30	19	245	80	119
Future Vol, veh/h	223	30	19	245	80	119
Conflicting Peds, #/hr	0	0	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	90	0	-	210	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	84	84	84	84	84	84
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	265	36	23	292	95	142

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	356	24	0	0	316	0
Stage 1	24	-	-	-	-	-
Stage 2	332	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	644	1055	-	-	1250	-
Stage 1	1001	-	-	-	-	-
Stage 2	729	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	590	1054	-	-	1249	-
Mov Cap-2 Maneuver	590	-	-	-	-	-
Stage 1	1000	-	-	-	-	-
Stage 2	668	-	-	-	-	-

Approach	NB	NE	SW
HCM Control Delay, s	15.1	0	3.3
HCM LOS	C		

Minor Lane/Major Mvmt	NET	NER	NBLn1	NBLn2	SWL	SWT
Capacity (veh/h)	-	-	590	1054	1249	-
HCM Lane V/C Ratio	-	-	0.45	0.034	0.076	-
HCM Control Delay (s)	-	-	16	8.5	8.1	0
HCM Lane LOS	-	-	C	A	A	A
HCM 95th %tile Q(veh)	-	-	2.3	0.1	0.2	-



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	157	270	85	254	245	271	69	371	240	236	418	75
Future Volume (vph)	157	270	85	254	245	271	69	371	240	236	418	75
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	1.00		0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1662	1687		3193	1733	1459	1630	3260	1432	1629	3185	
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.47	1.00	1.00	0.43	1.00	
Satd. Flow (perm)	1662	1687		3193	1733	1459	810	3260	1432	729	3185	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	157	270	85	254	245	271	69	371	240	236	418	75
RTOR Reduction (vph)	0	10	0	0	0	174	0	0	125	0	12	0
Lane Group Flow (vph)	157	345	0	254	245	97	69	371	115	236	481	0
Confl. Peds. (#/hr)	1					1			1	1		
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	2%	2%	2%	2%	2%	2%
Turn Type	Prot	NA		Prot	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	
Protected Phases	7	4		3	8	1	5	2	3	1	6	
Permitted Phases						8	2		2	6		
Actuated Green, G (s)	16.5	29.7		15.0	28.2	42.8	49.8	42.7	57.7	61.8	50.2	
Effective Green, g (s)	16.5	29.7		15.0	28.2	42.8	49.8	42.7	57.7	61.8	50.2	
Actuated g/C Ratio	0.14	0.25		0.12	0.23	0.36	0.41	0.36	0.48	0.51	0.42	
Clearance Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	228	417		399	407	575	384	1160	742	484	1332	
v/s Ratio Prot	c0.09	c0.20		0.08	0.14	0.02	0.01	0.11	0.02	c0.06	0.15	
v/s Ratio Perm						0.05	0.06		0.06	c0.19		
v/c Ratio	0.69	0.83		0.64	0.60	0.17	0.18	0.32	0.16	0.49	0.36	
Uniform Delay, d1	49.3	42.7		49.9	40.9	26.4	21.4	28.1	17.5	17.0	23.9	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	8.4	12.7		3.3	2.5	0.1	0.2	0.7	0.1	0.8	0.8	
Delay (s)	57.7	55.4		53.2	43.4	26.6	21.7	28.8	17.6	17.8	24.7	
Level of Service	E	E		D	D	C	C	C	B	B	C	
Approach Delay (s)		56.1			40.7			24.1			22.4	
Approach LOS		E			D			C			C	

Intersection Summary			
HCM 2000 Control Delay	34.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	73.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

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Memorandum

To: Briana Murtaugh
Trillium House Warrenton Affordable Housing, LLC

From: Daniel Stumpf, PE

Date: March 3, 2021

Subject: Trillium House – OR-104S at SE Ensign Lane

Introduction

This memorandum reviews a potential proportionate share fee methodology which could be applied to the intersection of Fort Stevens Highway Spur (OR-104S) at SE Ensign Lane, where the installation of a westbound left-turn lane has been requested by the City of Warrenton. The installation of a turn lane was determined as being warranted under existing traffic conditions per the following studies:

- *Warrenton Urban Renewal Zone Change Draft Transportation Impact Study* (TIS), dated July 23, 2018
- *Warrenton-Hammond School District Master Plan Transportation and Parking Impact Analysis*, dated January 10, 2020, and subsequent addendum dated March 10, 2020.
- *Trillium House TIS*, dated January 5, 2021.

This memorandum includes a review of a reasonable proportionate share fee methodology, a cost per trip for the method, and an appropriate proportional fee which may be applicable to the proposed Trillium House project based on the January 5, 2021 TIS. Detailed calculations are included as attachments to this memorandum.

Intersection and Mitigation Description

The intersection of OR-104S at SE Ensign Lane is a three-legged intersection that is stop-controlled on the northbound approach of SE Ensign Lane. OR-104S is under the jurisdiction of ODOT while SE Ensign Lane is under Clatsop County jurisdiction. The northbound approach has dedicated left-turn and right-turn lanes, the eastbound approach has dedicated through and right-turn lanes, and the westbound approach has one shared through/left-turn lane. Dedicated bicycle lanes are provided on all three intersection approaches.

As described in the *Introduction* and the listed traffic studies, a left-turn lane is warranted on the westbound approach of the intersection under existing conditions during the evening peak hour (threshold is also met during the morning peak hour for only the *Trillium House TIS*). Volume warrants used to make this determination are based on the design curves developed by the Texas Transportation Institute, as adopted by ODOT in its Analysis Procedures Manual (APM).

The City of Warrenton's Transportation System Plan (TSP) identified the turn lane mitigation at the intersection of OR-104S at SE Ensign Lane, project ID R22. The project is listed under *Table 5. Aspirational Project List* and will include widening OR-104S to add a dedicated westbound left-turn lane with 100 feet of storage. There are two cost estimates associated with this project: Option A is $1,000,000* and Option B is $140,000 (below *Table 5*, the TSP indicates the asterisked cost, or Option A, was not considered for the aspirational project).

Proportionality Analysis

Methodology

According to the City of Warrenton Ordinance 1233 Section 16.116.040, the Chelsea Gardens Master Plan area may include the construction of a maximum 350 residential dwelling units and 50,000 square feet of commercial space in an area bounded by OR-104S, Oregon Coast Highway (US-101), and a Home Depot hardware store.

To determine a general estimate of trip generation associated with the Chelsea Gardens Master Plan area, trip equations from the *Trip Generation Manual*[1] were used. For the 350 residential dwelling units, data from land use code 221, *Multifamily Housing (Mid-Rise)*, was used to estimate trip generation based on the number of dwelling units. For the commercial space, data from land use code 820, *Shopping Center*, was used to estimate trip generation based on the square-footage of the gross building floor area.

Consistent with the *Warrenton Urban Renewal Zone Change Draft TIS*, an internal capture rate of 12 percent was applied to both the residential and commercial aspects of the Master Plan area. Additionally, a 34 percent pass-by rate was applied the external trips (not internal trips) generated by the commercial space.

The evening peak hour trip generation estimates for the Chelsea Gardens Master Plan area are summarized in Table 1. Detailed trip generation calculations are included in the technical appendix to this report.

[1] Institute of Transportation Engineers (ITE), *Trip Generation Manual*, 10th Edition, 2017.

Table 1: Chelsea Gardens Master Plan Trip Generation Summary

ITE Code		Size	Evening Peak Hour		
			Enter	Exit	Total
Multifamily Housing (Mid-Rise)	221	350 units	90	57	147
Internal Capture	-	*12%*	*11*	*7*	*18*
External Trips	-	-	79	50	129
Shopping Center	820	50,000 SF	156	169	325
Internal Capture	-	*12%*	*19*	*20*	*39*
External Trips	-	-	156	169	325
Pass-by Trips	*820*	*34%*	*55*	*55*	*110*
Primary Trips	-	-	101	114	215
Net New Trips			**180**	**164**	**344**

Consistent with the *Trillium House TIS* and *Warrenton Urban Renewal Zone Change Draft TIS*, 75 percent of the trips leaving the Chelsea Gardens Master Plan area are expected to impact the westbound left-turn movement at the intersection of OR-104 at SE Ensign Lane. Based on the trip generation detailed in Table 2, this equates to 123 evening peak hour trips conducting a westbound left-turn at the intersection.

Since the westbound left-turn lane is warranted under existing conditions and is not directly caused by the additional transportation impacts from the proposed Trillium House development, it is reasonable to allocate some System Development Charges (SDC) to help cover a portion of the mitigation cost. A method for determining a fair share contribution from SDCs may include comparing the existing year 2021 evening peak hour westbound left-turn volumes, as detailed in the *Trillium House TIS*, to the added evening peak hour westbound left-turn volumes from the Chelsea Gardens Master Plan area. Under year 2021 conditions, as presented in Figure 4 of the *Trillium House TIS*, there are 72 evening peak hour vehicles that currently conduct westbound left-turns at the intersection. Following full buildout and occupancy of the master plan area a total of 195 evening peak hour vehicles are estimated to conduct this turning movement. Given approximately 36.9 percent of the total projected westbound left-turns at this intersection are existing volumes, approximately 36.9 percent of the mitigation costs should be covered by SDCs.

For the purposes of this analysis, the cost for Project ID R22 in the TSP (Option A) was used as a proxy for determining a cost per trip; however, once a more definitive project cost is determined for installing the turn lane it is recommended the cost per trip fee be re-evaluated. Assuming the installation of the left-turn lane at the intersection will be $1,000,000 and approximately 36.9 percent of the mitigation cost will be covered by

SDCs, the cost per trip impact will be approximately $5,130 per additional evening peak hour trip impact to the westbound left-turn movement at the intersection.

Table 2 summarizes the calculation for determining the $5,130 proportionate share fee per trip impact.

Table 2: Proprotionate Share Fee per Trip

Left-Turn Lane Project Cost (Based on TSP Project ID R22)	Percentage of Project Cost Covered by SDCs	Remaining Project Cost Covered by Proportionate Share Fees	Chelsea Garden Left-Turns Volumes	Proportionate Share Fee Per PM Peak Hour Trip
$1,000,000	36.9%	$631,000	123	$5,130

Table Note: The project cost should be updated once more precise left-turn lane installation and design costs have been determined.

Note that although this analysis calculates proportionate share impacts based on planned impacts from the Chelsea Gardens Master Plan area, the proportional share fee may be applied to any development project in the area which may add trips to the westbound left-turn movement at the intersection.

Trillium House Proportional Share

Based on the *Trillium House TIS*, the proposed development is projected to impact the westbound left-turn movement at the intersection of OR-104S at SE Ensign Lane with 5 evening peak hour trips (refer to Figure 3 in the TIS). Based on the proportionate share fee methodology, a reasonable proportional share fee of $25,650 may be attributable to the proposed development.

Conclusions

Per the analysis conducted in this memorandum, a methodology was determined to estimate a reasonable proportional share fee for the proposed Trillium House development. Specifically, the method determines a cost per trip in relation to all future development impacts from the Chelsea Gardens Master Plan area to the intersection while taking into consideration existing westbound left-turn volumes at the intersection. Based on this methodology, a reasonable proportionate share fee of $25,650 may be attributable to the proposed development (i.e. $5,130 per westbound left-turning evening peak hour trip).

If you have any questions regarding this technical memorandum, please don't hesitate to contact us.

TRIP GENERATION CALCULATIONS

Land Use: Multifamily Housing (Mid-Rise)
Land Use Code: 221
Setting/Location General Urban/Suburban
Variable: Dwelling Units
Variable Value: 350

AM PEAK HOUR

Trip Equation: Ln(T)=0.98Ln(X)-0.98

	Enter	Exit	Total
Directional Distribution	26%	74%	
Trip Ends	**30**	**87**	**117**

PM PEAK HOUR

Trip Equation: Ln(T)=0.96Ln(X)-0.63

	Enter	Exit	Total
Directional Distribution	61%	39%	
Trip Ends	**90**	**57**	**147**

WEEKDAY

Trip Equation: T=5.45(X)-1.75

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**953**	**953**	**1,906**

SATURDAY

Trip Equation: T=3.04(X)+417.11

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**741**	**741**	**1,482**

Source: TRIP GENERATION, Tenth Edition

TRIP GENERATION CALCULATIONS

Land Use: Shopping Center
Land Use Code: 820
Setting/Location General Urban/Suburban
Variable: 1,000 Sq. Ft. GFA
Variable Value: 50

AM PEAK HOUR

Trip Equation: T=0.50(X)+151.78

	Enter	Exit	Total
Directional Distribution	62%	38%	
Trip Ends	**110**	**67**	**177**

PM PEAK HOUR

Trip Equation: Ln(T)=0.74Ln(X)+2.89

	Enter	Exit	Total
Directional Distribution	48%	52%	
Trip Ends	**156**	**169**	**325**

WEEKDAY

Trip Equation: Ln(T)=0.68Ln(X)+5.57

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**1,876**	**1,876**	**3,752**

SATURDAY

Trip Equation: Ln(T)=0.62Ln(X)+6.24

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**2,900**	**2,900**	**5,800**

Source: TRIP GENERATION, Tenth Edition

EMMONS DESIGN

Scott Hess
Community Development Director
City of Warrenton
225 S Main Ave.
Warrenton, OR 97146

March 3, 2021

Re: Trillium House Response to City Comments
Off-Site Traffic Improvements

Dear Scott:

Thank you for your comments and meeting with us regarding the City comments to our Trillium House Type III documents dated December 10, 2020, and traffic study dated January 5, 2021. We look forward to resolving as many issues as possible prior to the March 11, 2021 Planning Commission. We also look forward to having a good presentation and discussion with the Planning Commission, staff, and any other attendees. Several issues need further resolution so our project can stay on budget and on schedule to deliver 42 units of affordable housing to Warrenton in 2022. This letter addresses the City request that the Trillium House project fund a left-turn lane on westbound Spur 104 (104S) at Ensign. The left-turn lane was estimated at $1,000,000 in the City TSP aspirational projects in 2019[1].

Our project budget was developed based on three pre-application meetings with the City of Warrenton. Our request for State funding was based on this budget, and due to the nature of affordable housing financing, the sources of funding are now fixed. In the spirit of community partnership and our desire to be a good neighbor, we agreed to fund approximately $170,000 in off-site improvements above and beyond the half street improvement required by code. In addition, approximately $10,000 was incurred by our team to provide the City with a Master Development Plan (attachment A) that provides a more feasible path to future development in Chelsea Gardens. Another cost burden on the Trillium House project is $21,714 in transportation related SDCs.

Trillium House is catalyzing Chelsea Gardens. Our 'first-in' efforts and investments are making other projects more feasible. We are showing what can be done in this locale, and the roadway and infrastructure we are providing is making the economics for other sites more realistic for development. Chelsea Gardens is envisioned as a primarily residential neighborhood of mixed incomes, with many of the future projects probably being market rate.

Now, at this late date, our project is being asked to fund additional improvements to an intersection located approximately 1000 feet from our site to address an existing condition[2]. The Lancaster Mobley January 5, 2021 *Trillium House - Transportation Impact Study* we were asked by the City to provide, specific to our project, stated: "...the installation of a dedicated turn lane as part of the proposed development is not necessary or recommended."[3] Said differently, the intersection's deficiencies are based upon existing traffic, not Trillium House's traffic, so the traffic expert found no basis to recommend that Trillium House make any improvements to the intersection. And yet, a badly needed affordable housing project in Warrenton, on a fixed budget, that has already been required to invest over $170,000 in non-required 'above and beyond off-site improvements' (plus more to assist with the City's long range planning), is being asked for even more off-site improvements to fix an *existing* problem.

So that we could better understand the demands on the 104S and Ensign intersection, we commissioned a *'Proportionate Share Fee Methodology'* memorandum from Lancaster Mobley (attachment B) that identifies our project's share of the left turn lane at $25,650. Lancaster's analysis considers the total estimated cost of the needed improvements and allocates the cost on a per PM peak trip basis on existing traffic and demand that is expected to be generated by new development in Chelsea Gardens. This allocation is an equitable and evidentiary based way to make sure that no project is asked to carry a disproportionate burden of transportation improvement costs.

Trillium House team's proposed solution: Leverage the transportation SDCs that the project is required to pay ($21,714) so that those funds are directed toward the City improving the 104S and Ensign intersection with a left turn lane. So that our project pays it's proportional share, in addition to our SDCs, Trillium House Warrenton Affordable Housing, LLC will provide the City with a check for the $3,936 fee in lieu for the improvements, which is the difference between our proportionate share of the left turn lane and the project SDCs dedicated to transportation ($25,650 - $$21,714 = $3936).

The Trillium House project was a big win for Warrenton – our team was fortunate to be awarded a large tax credit allocation by the State of Oregon in a very competitive funding round. The project directly addresses the need for affordable housing in Warrenton and the rest of Clatsop County, as laid out in the January 2019 *Clatsop County Housing Strategies Report*. In our independent talks with some local employers, we heard loud and clear that many Warrenton businesses needed more close-by affordable housing for their current and future employees. Affordable housing creates jobs: this construction project is pumping millions of dollars into the Warrenton economy.

We look forward to providing a successful affordable housing project to the City of Warrenton.

Sincerely,

Stuart Emmons, AIA
Emmons Design
Project Architect for Trillium House

copy:
Ross Cornelius, RCA Consulting, Project Developer
Briana Murtaugh, Greenlight Development, Project Co-Developer
Erik Hoovestal, Firwood Design, Project Civil Engineer
Daniel Stumpf, Lancaster Mobley
Jay Nees, Walsh Construction, Project Construction Manager
Dana Krawczuk, Partner, Stoel Rives, LLP

attachments:
A. Development Plan by Emmons Design for Chelsea Gardens
B. 'Proportionate Share Fee Methodology' Memorandum from Lancaster Mobley, dated March 3, 2021. (6 pages)
C. Trillium House, Transportation Impact Study, January 5, 2021 - Cover and Conclusions (2 pages)
D. Warrenton Urban Renewal Zone Change, Transportation Impact Study, July 23, 2018 - Cover & Executive Summary (2p)

footnotes:
1. Aspirational Project List #R22, Page 30, Warrenton Transportation System Plan, adopted Jan 2019, https://www.ci.warrenton.or.us/sites/default/files/fileattachments/public_works/page/5351/warrenton_tsp.pdf
2. Warrenton Urban Renewal Zone Change, Transportation Impact Study, Executive Summary, page 1, #4 attachment D
3. Trillium House Transportation Impact Study, Jan 5, 2021, Lancaster Mobley Conclusions page 22 of 22 attachment C

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ARCHITECTURE AND PLANNING . WWW.EMMONSDESIGN.COM
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WALSH CONSTRUCTION CO. | CEDC Project

v25, MARCH 27, 2020 | SCALE: 1" = 160' | Chelsea Gardens, Warrenton | District - Development Concept | A1.4

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ASTORIA . WARRENTON . GEARHART . SEASIDE . CANNON BEACH . TILLAMOOK . LINCOLN CITY

WALSH CONSTRUCTION CO. | CEDC Project

v26, MAY 16, 2020 | SCALE: 1" = 160' | Chelsea Gardens, Warrenton | District - Development Concept Future Phases | A1.2

Attachment A. Development Plan by Emmons Design for Chelsea Gardens

lancaster mobley

321 SW 4th Ave., Suite 400
Portland, OR 97204
503.248.0313
lancastermobley.com

Memorandum

To: Briana Murtaugh
Trillium House Warrenton Affordable Housing, LLC

From: Daniel Stumpf, PE

Date: March 3, 2021

Subject: Trillium House – OR-104S at SE Ensign Lane

Introduction

This memorandum reviews a potential proportionate share fee methodology which could be applied to the intersection of Fort Stevens Highway Spur (OR-104S) at SE Ensign Lane, where the installation of a westbound left-turn lane has been requested by the City of Warrenton. The installation of a turn lane was determined as being warranted under existing traffic conditions per the following studies:

- *Warrenton Urban Renewal Zone Change Draft Transportation Impact Study* (TIS), dated July 23, 2018
- *Warrenton-Hammond School District Master Plan Transportation and Parking Impact Analysis*, dated January 10, 2020, and subsequent addendum dated March 10, 2020.
- *Trillium House TIS*, dated January 5, 2021.

This memorandum includes a review of a reasonable proportionate share fee methodology, a cost per trip for the method, and an appropriate proportional fee which may be applicable to the proposed Trillium House project based on the January 5, 2021 TIS. Detailed calculations are included as attachments to this memorandum.

Intersection and Mitigation Description

The intersection of OR-104S at SE Ensign Lane is a three-legged intersection that is stop-controlled on the northbound approach of SE Ensign Lane. OR-104S is under the jurisdiction of ODOT while SE Ensign Lane is under Clatsop County jurisdiction. The northbound approach has dedicated left-turn and right-turn lanes, the eastbound approach has dedicated through and right-turn lanes, and the westbound approach has one shared through/left-turn lane. Dedicated bicycle lanes are provided on all three intersection approaches.

As described in the *Introduction* and the listed traffic studies, a left-turn lane is warranted on the westbound approach of the intersection under existing conditions during the evening peak hour (threshold is also met during the morning peak hour for only the *Trillium House TIS*). Volume warrants used to make this determination are based on the design curves developed by the Texas Transportation Institute, as adopted by ODOT in its Analysis Procedures Manual (APM).

The City of Warrenton's Transportation System Plan (TSP) identified the turn lane mitigation at the intersection of OR-104S at SE Ensign Lane, project ID R22. The project is listed under *Table 5. Aspirational Project List* and will include widening OR-104S to add a dedicated westbound left-turn lane with 100 feet of storage. There are two cost estimates associated with this project: Option A is $1,000,000* and Option B is $140,000 (below *Table 5*, the TSP indicates the asterisked cost, or Option A, was not considered for the aspirational project).

Proportionality Analysis

Methodology

According to the City of Warrenton Ordinance 1233 Section 16.116.040, the Chelsea Gardens Master Plan area may include the construction of a maximum 350 residential dwelling units and 50,000 square feet of commercial space in an area bounded by OR-104S, Oregon Coast Highway (US-101), and a Home Depot hardware store.

To determine a general estimate of trip generation associated with the Chelsea Gardens Master Plan area, trip equations from the *Trip Generation Manual*[1] were used. For the 350 residential dwelling units, data from land use code 221, *Multifamily Housing (Mid-Rise)*, was used to estimate trip generation based on the number of dwelling units. For the commercial space, data from land use code 820, *Shopping Center*, was used to estimate trip generation based on the square-footage of the gross building floor area.

Consistent with the *Warrenton Urban Renewal Zone Change Draft TIS*, an internal capture rate of 12 percent was applied to both the residential and commercial aspects of the Master Plan area. Additionally, a 34 percent pass-by rate was applied the external trips (not internal trips) generated by the commercial space.

The evening peak hour trip generation estimates for the Chelsea Gardens Master Plan area are summarized in Table 1. Detailed trip generation calculations are included in the technical appendix to this report.

[1] Institute of Transportation Engineers (ITE), *Trip Generation Manual*, 10th Edition, 2017.

Table 1: Chelsea Gardens Master Plan Trip Generation Summary

ITE Code		Size	Evening Peak Hour		
			Enter	Exit	Total
Multifamily Housing (Mid-Rise)	221	350 units	90	57	147
Internal Capture	-	*12%*	*11*	*7*	*18*
External Trips	-	-	79	50	129
Shopping Center	820	50,000 SF	156	169	325
Internal Capture	-	*12%*	*19*	*20*	*39*
External Trips	-	-	156	169	325
Pass-by Trips	*820*	*34%*	*55*	*55*	*110*
Primary Trips	-	-	101	114	215
Net New Trips			180	164	344

Consistent with the *Trillium House TIS* and *Warrenton Urban Renewal Zone Change Draft TIS*, 75 percent of the trips leaving the Chelsea Gardens Master Plan area are expected to impact the westbound left-turn movement at the intersection of OR-104 at SE Ensign Lane. Based on the trip generation detailed in Table 2, this equates to 123 evening peak hour trips conducting a westbound left-turn at the intersection.

Since the westbound left-turn lane is warranted under existing conditions and is not directly caused by the additional transportation impacts from the proposed Trillium House development, it is reasonable to allocate some System Development Charges (SDC) to help cover a portion of the mitigation cost. A method for determining a fair share contribution from SDCs may include comparing the existing year 2021 evening peak hour westbound left-turn volumes, as detailed in the *Trillium House TIS*, to the added evening peak hour westbound left-turn volumes from the Chelsea Gardens Master Plan area. Under year 2021 conditions, as presented in Figure 4 of the *Trillium House TIS*, there are 72 evening peak hour vehicles that currently conduct westbound left-turns at the intersection. Following full buildout and occupancy of the master plan area a total of 195 evening peak hour vehicles are estimated to conduct this turning movement. Given approximately 36.9 percent of the total projected westbound left-turns at this intersection are existing volumes, approximately 36.9 percent of the mitigation costs should be covered by SDCs.

For the purposes of this analysis, the cost for Project ID R22 in the TSP (Option A) was used as a proxy for determining a cost per trip; however, once a more definitive project cost is determined for installing the turn lane it is recommended the cost per trip fee be re-evaluated. Assuming the installation of the left-turn lane at the intersection will be $1,000,000 and approximately 36.9 percent of the mitigation cost will be covered by

SDCs, the cost per trip impact will be approximately $5,130 per additional evening peak hour trip impact to the westbound left-turn movement at the intersection.

Table 2 summarizes the calculation for determining the $5,130 proportionate share fee per trip impact.

Table 2: Proprotionate Share Fee per Trip

Left-Turn Lane Project Cost (Based on TSP Project ID R22)	Percentage of Project Cost Covered by SDCs	Remaining Project Cost Covered by Proportionate Share Fees	Chelsea Garden Left-Turns Volumes	Proportionate Share Fee Per PM Peak Hour Trip
$1,000,000	36.9%	$631,000	123	$5,130

Table Note: The project cost should be updated once more precise left-turn lane installation and design costs have been determined.

Note that although this analysis calculates proportionate share impacts based on planned impacts from the Chelsea Gardens Master Plan area, the proportional share fee may be applied to any development project in the area which may add trips to the westbound left-turn movement at the intersection.

Trillium House Proportional Share

Based on the *Trillium House TIS*, the proposed development is projected to impact the westbound left-turn movement at the intersection of OR-104S at SE Ensign Lane with 5 evening peak hour trips (refer to Figure 3 in the TIS). Based on the proportionate share fee methodology, a reasonable proportional share fee of $25,650 may be attributable to the proposed development.

Conclusions

Per the analysis conducted in this memorandum, a methodology was determined to estimate a reasonable proportional share fee for the proposed Trillium House development. Specifically, the method determines a cost per trip in relation to all future development impacts from the Chelsea Gardens Master Plan area to the intersection while taking into consideration existing westbound left-turn volumes at the intersection. Based on this methodology, a reasonable proportionate share fee of $25,650 may be attributable to the proposed development (i.e. $5,130 per westbound left-turning evening peak hour trip).

If you have any questions regarding this technical memorandum, please don't hesitate to contact us.

TRIP GENERATION CALCULATIONS

Land Use: Multifamily Housing (Mid-Rise)
Land Use Code: 221
Setting/Location General Urban/Suburban
Variable: Dwelling Units
Variable Value: 350

AM PEAK HOUR

Trip Equation: Ln(T)=0.98Ln(X)-0.98

	Enter	Exit	Total
Directional Distribution	26%	74%	
Trip Ends	**30**	**87**	**117**

PM PEAK HOUR

Trip Equation: Ln(T)=0.96Ln(X)-0.63

	Enter	Exit	Total
Directional Distribution	61%	39%	
Trip Ends	**90**	**57**	**147**

WEEKDAY

Trip Equation: T=5.45(X)-1.75

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**953**	**953**	**1,906**

SATURDAY

Trip Equation: T=3.04(X)+417.11

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**741**	**741**	**1,482**

Source: TRIP GENERATION, Tenth Edition

TRIP GENERATION CALCULATIONS

Land Use: Shopping Center
Land Use Code: 820
Setting/Location General Urban/Suburban
Variable: 1,000 Sq. Ft. GFA
Variable Value: 50

AM PEAK HOUR

Trip Equation: T=0.50(X)+151.78

	Enter	Exit	Total
Directional Distribution	62%	38%	
Trip Ends	**110**	**67**	**177**

PM PEAK HOUR

Trip Equation: Ln(T)=0.74Ln(X)+2.89

	Enter	Exit	Total
Directional Distribution	48%	52%	
Trip Ends	**156**	**169**	**325**

WEEKDAY

Trip Equation: Ln(T)=0.68Ln(X)+5.57

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**1,876**	**1,876**	**3,752**

SATURDAY

Trip Equation: Ln(T)=0.62Ln(X)+6.24

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**2,900**	**2,900**	**5,800**

Source: TRIP GENERATION, Tenth Edition

lancaster mobley

Trillium House

Transportation Impact Study
Warrenton, Oregon

Date:
January 5, 2021

Prepared for:
Briana Murtaugh
Trillium House Warrenton Affordable Housing, LLC

Prepared by:
Melissa Webb, PE
Daniel Stumpf, PE

Conclusions

Based on a review of the most recent five years of available crash data, no significant trends or crash patterns were identified at any of the study intersections that were indicative of safety concerns. In addition, neither of the study intersections exhibit a crash rate exceeding ODOT's 90th percentile rate. Accordingly, no safety mitigation is recommended per the crash data analysis.

Left-turn lane warrants are projected to be met for the study intersection of OR-104S at SE Ensign Lane under existing conditions, specifically for the westbound approach. Although warrants are met at the intersection, no crashes that could be mitigated with the addition of a dedicated left-turn lane were reported at the intersection. Since the intersection currently operates safely and is projected to operate well within ODOT's capacity standards, the installation of a dedicated turn lane as part of the proposed development is not necessary or recommended.

Due to insufficient main and side-street traffic volumes, traffic signal warrants are not projected to be met at the intersection of OR-104S at SE Ensign Lane under any of the analysis scenarios.

All study intersections are currently and projected to operate acceptably per jurisdictional standards through year 2023 with completion of the proposed Trillium House development.

DRAFT

Warrenton Urban Renewal Zone Change

Transportation Impact Study

Warrenton, Oregon

Date:
July 23, 2018

Prepared for:
City of Warrenton

Prepared by:
Daniel Stumpf, EI
William Farley, PE

LANCASTER ENGINEERING

321 SW 4th Ave., Suite 400 | Portland, OR 97204 | 503.248.0313 | lancasterengineering.com

Executive Summary

1. The proposed Warrenton Urban Renewal Zone Change will include the rezoning of multiple properties bounded by Oregon Coast Highway (US-101), Fort Stevens Highway Spur (OR-104S), and SE Ensign Lane in Warrenton, Oregon. Specifically, the proposed zone change will rezone approximately 3.0 acres of *General Industrial* (I-1) and 16.9 acres of *Intermediate Density Residential* (R-10) land to *Commercial Mixed Use* (C-MU).
2. The trip generation calculations show that under existing zoning, the subject site could reasonably generate up to 55 morning peak hour trips, 68 evening peak hour trips, and 632 average weekday trips. Under the proposed zoning, the site could reasonably generate up to 359 morning peak hour trips, 750 evening peak hour trips, and 8,396 weekday trips. The net change in trip potential of the site after the proposed rezone is projected to be 220 additional morning peak hour trips, 424 additional evening peak hour trips, and 4,910 additional average weekday trips.
3. No significant trends or crash patterns were identified at any of the study intersections and no specific safety mitigation is recommended.
4. Left-turn lane warrants are projected to be met for the intersection of OR-104S at SE Ensign Lane under existing conditions during the evening peak hour.
5. Per a preliminary warrant analysis, traffic signal warrants are projected to be triggered at the following two intersections.
    a. OR-104S at OR-104 under the 2038 Planning Horizon (regardless of the zone change).
    b. OR-104S at SE Ensign Lane under the 2038 Planning Horizon with the net addition of potential site trips that could be generated under the proposed zoning.

Preliminary Project Cost Proportionate Share Estimation

Intersection	Project	Prelim Planning Approx. Cost	Expected total trips (Rezone)	TEV Growth	TEV Growth (Local Trips)	% Rezone Trips of Local Growth	Traffic from Residential Development Project (2023)	% share of zone trips that are project trips	% zone that is project acerage	Project Cost related to Zone Change	Proportionate Share Project Cost for Development (Trip Basis)	Proportionate Share Project Cost for Development (Area Basis)
US-101/ E Harbor St	EB left turn lane + NB/SB thru lanes	$1,200,000	173	421	302	57.3%	6	3.47%	7.74%	$687,417	$23,841	$53,197
US-101/ SE Neptune Dr	+1 NB/SB thru lanes (connect w Harbor St project)	$3,000,000	173	439	320	54.1%	2	1.16%	7.74%	$1,621,875	$18,750	$125,512
US-101/ US-101B (Marlin)	+1 NB/SB thru lanes (connect w Harbor St project)	$3,000,000	184	845	726	25.3%	6	3.26%	7.74%	$760,331	$24,793	$58,840
OR-104S/ OR-104	Signalize OR restripe WB to have +LT lane +RT lane	$560,000	123	516	516	23.8%	5	4.07%	7.74%	$133,488	$5,426	$10,330
OR-104S/ SE Ensign Lane (studied in TIA)	Add WB left turn lane. Signalize OR EB thru/right + TWLT (remove right turn lane)	$1,900,000	377	562	562	67.1%	14	3.71%	7.74%	$1,274,555	$47,331	$98,634
									TOTAL	**$4,477,666**	**$120,142**	**$346,513**

PRELIMINARY STORMWATER REPORT

Trillium House Apartments
SE 14th Place
Warrenton, OR 97146

December 10, 2020
Revised March 2, 2021
Revised March 23, 2021

Prepared By:

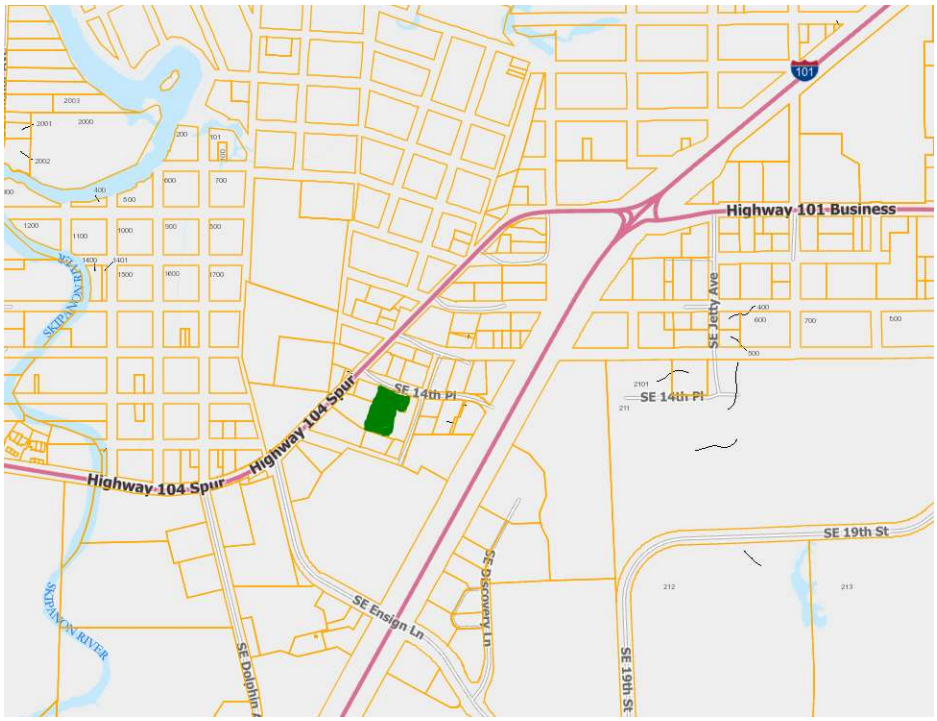
FDG
Firwood Design Group, LLC
SURVEYING • ENGINEERING • PLANNING

359 E. Historic Columbia River Highway
Troutdale, OR 97060
503.668.3737- fax 503.668.3788

TABLE OF CONTENTS

I. PROJECT DESCRIPTION & OBJECTIVE

The proposed project site is situated between Highway 101 and Highway 104 Spur, just north of the Home Depot property. The project property is shown in green below.



The lot is approximately 1.5 acres, bordered by SE 14th Place to the north, SE Galena Court and private taxlots to the east, private taxlots to the west, and an unnamed 30-foot wide City of Warrenton right-of-way to the south. The proposed development consists of a four-story apartment building with a parking lot, community garden, and play structure. Required improvements in public right-of-way associated with the development consist of half-street improvements to SE 14th Place and gravel surfacing of SE Galena Court.

In pre-development conditions, the SE 14th Place connection to Highway 104 Spur is a high point along the Highway 104 Spur ditch. SE 14th Place and a portion of the project site drains north to an existing catch basin at the intersection with Highway 104 Spur, and the areas south of SE 14th Place (including most of the project site) generally drains south and west to the existing gully and storm line under Highway 104 Spur near the Smart Food Warehouse. Both existing storm systems under Highway 104 Spur discharge to existing wetlands north and west of the highway, ultimately draining to the Skipanon River via tide gates through the levee system.

In post-development conditions, the overall drainage pattern is similar. The roadway crown of SE 14th Place defines the drainage basin boundary between the area draining to the existing catch basin to the north and the area draining south to the existing gully. Refer to the concept plans and the pre- and post-development basin maps for additional information.

The pre- and post-development basin maps were used to build a HydroCAD model to analyze runoff peak flow rates and design the detention system. Pipe and ditch capacities were calculated using Manning's equation with the HydraFlow Express tool for AutoCAD Civil3D. Per Warrenton Municipal Code 16.140.050.A, storm sewers are sized for the 100-year design storm. The City of Warrenton has identified downstream deficiencies north and west of Highway 104 Spur, and is requiring detention facilities; per 16.140.050.B, required design recurrence for a commercial or residential storm drainage detention facility is a 10-year design storm.

II. HYDROLOGY

Hydrologic Methods:

In accordance with the City of Warrenton Engineering Design Standards, which generally refers to the ODOT Hydraulics Manual, two hydrologic methods were used. The first method is the Santa Barbara Urban Hydrograph (SBUH) with a Type 1A rainfall distribution; the second is the Soil Conservation Service TR-20 methodology. These methods were selected because both are commonly accepted hydrologic methods for urban drainage basins. Both methods develop runoff hydrographs using the drainage basin time of concentration (T_c) but calculate the final runoff hydrograph differently. SCS TR-20 uses a unit hydrograph that is based on the basin T_c, while the SBUH method calculates instantaneous hydrographs that are routed through an imaginary reservoir to create a time delay equal to the basin T_c. In practice, the difference in final runoff hydrographs between the two methods is sensitive to the drainage basin T_c; both yield similar peak flow rates at near-minimum time of concentrations, but as the drainage basin T_c increases the SCS TR-20 peak flow rate is higher than the SBUH peak flow rate.

As described in the ODOT Hydraulics Manual, Section 7.4, the comparison of multiple hydrological methodologies (which almost always yield different results) is most useful when the results can be used as discharges in a hydraulic model of an existing structure and compared to the actual hydraulic history. In that case, the hydrologic method that produces the most reasonable results in terms of actual hydraulic history is selected for project design. Firwood Design Group is not aware of any measured hydraulic history of the existing culvert under Highway 104 Spur to use in this design process. Therefore, the use of a second hydrologic method can only be used as a reasonableness check. As SCS TR-20 modeling results in higher peak flow rates, the SCS TR-20 model will be used for design to be conservative. The SBUH method will be used to confirm the calculated SCS TR-20 runoff rates are reasonable. Results are considered reasonable when the SCS TR-20 peak flow rate exceeds SBUH in higher T_c basins.

Hydrologic Data for HydroCAD Modeling:

Time of Concentration (T_c): calculated using basin maps and HydroCAD

Design storms:

Table 3.5 – NOAA 24-hr Precipitation Depths	
Design Storm Return Period	Depth (inches)
2-year	3.1
10-year	4.35
25-year	5.1
100-year	6.1

2-Year 24-Hour: 3.10" (water quality facility design)
10-Year 24-Hour: 4.35" (detention system design)
100-Year 24-Hour: 6.10" (conveyance facility design)

Site soils per USDA NRCS: 71B Walluski Medial Silt Loam, hydrologic soil group C

Curve numbers (CN):
Impervious surfaces (roof, widewalks, pavement): 98
Gravel surfaces (some roads and driveways): 89
Landscaped areas: 74

III. CALCULATIONS & ANALYSIS

Existing Catch Basin North of SE 14th Place

The portion of the drainage basin tributary to this existing catch basin that will be modified with this project was analyzed in pre- and post-development conditions. The intent is to show that the post-development peak flow rate is equal to or less than the pre-development peak runoff rate. Catch basin and storm line capacity was not analyzed as the project will not increase impact on the existing stormwater facility.

In post-development conditions, the area tributary to this existing catch basin is reduced due to the construction of a crown in SE 14th Place. As the basin analyzed is small, time of concentration in pre- and post-development conditions was assumed to be the 5-minute minimum. Peak flow rates tributary to the catch basin in the 100-year design storm are compared below.

Hydrologic Model Comparison:
Peak Flow Rate to Existing Catch Basin

	Pre-Dev	Post-Dev
SBUH	0.59 cfs	0.19 cfs
SCS TR-20	0.60 cfs	0.20 cfs

Post-development impervious surfaces and peak runoff tributary to the existing catch basin is reduced from pre-development conditions, so proposed improvements will not negatively impact that storm sewer system. Peak runoff rate is similar with SBUH and SCS TR-20 methodologies, as expected for basins with a low time of concentration.

The proposed roadside ditch draining the north side of SE 14th Place narrows near the existing property corner, as shown on the submitted land use plans. The capacity of this portion of the ditch was checked using HydraFlow Express; with a capacity of 0.8 cfs to the edge of the new roadway shoulder, it can convey the 100-year design storm.

Future Upstream Construction

If SE 14th Place is ever fully built out with development of lots to the north, additional right-of-way from the lot to the north would be necessary to accommodate the curb return and ramp. The ditch would be removed with that work and the stormwater management approach for the north side of SE 14th Place modified at that time.

Highway 104 Spur Roadside Ditch & Culverts

Culverts and ditches along Highway 104 Spur are analyzed for conveyance capacity of the 100-year storm event. For preliminary sizing, the post-development drainage basin tributary to the end of the roadside ditch (prior to entering existing piped storm sewer) was modeled using HydroCAD.

Hydrologic Model Comparison:
Peak Flow Rate in Highway 104 Spur Ditch

	Post-Dev Peak Flow
SBUH	1.10 cfs
SCS TR-20	1.22 cfs

The SCS TR-20 peak runoff rate is higher than SBUH, as expected. Therefore, the higher SCS TR-20 peak runoff rate is used to check conveyance facility capacities.

The existing roadside ditch along Highway 104 Spur is generally flat and shallow. Therefore, the ditch is proposed to be cleaned or re-graded to ensure the ditch has conveyance capacity to the 100-year design storm. The flattest section of ditch has a grade of approximately 0.1%. The roadside culvert inverts are at approximately 15” or more below the edge of the Highway 104 Spur gravel shoulder, so proposed ditch geometry is a trapezoidal channel, 15” deep, 12” wide bottom, and roughly 2:1 side slopes. Flowing full, the capacity of the cleaned ditch using Manning’s equation is 3.13 cfs, more than sufficient to convey the post-development 100-year design storm.

The existing culverts in the Highway 104 Spur ditch are 12” diameter corrugated plastic pipe, assumed to be ADS N-12 or similar with a smooth inside. The shallowest slope culvert is at approximately 0.7%; pipe capacity using Manning’s equation is 3.47 cfs, so

there is sufficient capacity to convey the post-development 100-year design storm peak runoff rate.

Future Upstream Construction

ODOT and the City of Warrenton have identified this section of Highway 104 Spur as a candidate for future re-construction. As full build-out will likely impact the roadside ditch and culverts, it is assumed the storm system along the highway will be re-designed to the outfall at the existing gully with the highway project.

Development of other properties tributary to this storm system prior to highway full build-out is possible. It is assumed that other properties within the drainage basin will be required to meet the same or more stringent detention and downstream analysis requirements as this project prior to permitting. If future development warrants replacement of Highway 104 Spur culverts or enlarging the ditch, those improvements will be completed with that future development.

New SE 14th Place Public Storm Sewer

The new storm sewer to be constructed under SE 14th Place is required by the City of Warrenton to provide a storm drain system for upstream areas. The limiting reach is the portion of storm sewer between the new catch basin at the bottom of SE 14th Place and the Highway 104 Spur ditch/culvert system, a 12" plastic line at 0.50% slope with a Manning's capacity of 2.94 cfs. This capacity is approximately 240% of the post-development peak flow rate of 1.22 cfs tributary to the Highway 104 Spur ditch and storm sewer system.

Future Upstream Construction

It is assumed that the north side of SE 14th Place will continue to drain to the existing catch basin and storm sewer north of SE 14th Place. It is assumed that other properties within the drainage basin tributary to the new SE 14th Place storm sewer, and the existing gully and culvert, will be required to meet the same or more stringent detention and downstream analysis requirements as this project prior to permitting. The limiting reach of the storm sewer could be replaced at a steeper grade (and therefore higher capacity) with minimal disruption to the intersection of SE 14th Place and Highway 104 Spur in the event that future development triggers the need for a redesign of the Highway 104 Spur storm system.

On-Site Private Storm System

The on-site storm system consists of catch basins, pipe, and a new detention system. Per Warrenton municipal code, storm conveyance facilities are designed for the 100-year storm event and detention facilities are designed for the 10-year storm event.

Private Storm Sewer Pipe Capacity

Peak runoff flow rate of the basin tributary to the on-site storm sewer modeled using HydroCAD, and peak flow rates in the 100-year design storm are tabulated below.

Hydrologic Model Comparison:
Peak Flow Rate at New Detention System Inlet

	Post-Dev Peak Flow
SBUH	3.81 cfs
SCS TR-20	4.79 cfs

The SCS TR-20 peak runoff rate is higher than SBUH, as expected. Therefore, the higher SCS TR-20 peak runoff rate is used to check conveyance facility capacities. A 12" diameter plastic pipe with a 1.33% slope has a maximum Manning's capacity of 4.79 cfs, sufficient to convey the 100-year design storm.

Private Detention System

SCS TR-20 is used to design the on-site private detention system to match pre- and post-development peak flow rates in the 10-year, 24-hour design storm. The City of Warrenton has not provided direction on whether the City will require public improvements (primarily SE 14th Place improvements) to be detained; to be conservative, the preliminary private detention system is designed with a peak flow release rate to match pre- and post-development peak flow rates at the existing culvert under Highway 104 Spur in the gully for the basin analyzed.

The concept design of the detention system consists of underground 60" diameter CMP pipe and an outfall to the existing gully and culvert under Highway 104 Spur. Refer to the preliminary plans for additional detail on the concept detention system design. Peak flow rates below do not include the flow contributed by the Home Depot property; as this project will not modify that portion of the drainage basin, it is not analyzed with the detention system design. Flow from the Home Depot property is relevant to culvert 100-year storm conveyance calculations for the existing culvert across Highway 104 Spur and is included in that section.

Pre- and Post-Development Comparison:
10-Year Peak Flow Rate at Existing Culvert Entrance

	Modeled Pre-Dev Peak Flow	Modeled Post-Dev Peak Flow
SCS TR-20	4.18 cfs	3.70 cfs

Future Upstream Construction

It is assumed that the City of Warrenton will not permit development above this project to discharge stormwater runoff onto the project property at higher runoff rates than is

discharged in current conditions, so private conveyance and detention systems are not planned to be over-sized to accommodate additional future runoff.

Existing Gully and Culvert Across Highway 104 Spur

The existing culvert under Highway 104 Spur was analyzed to ensure it has capacity to convey the post-development 100-year storm event. As shown on the basin maps, runoff that drains to the gully enters an existing 24" PVC culvert that crosses under Highway 104 Spur to a manhole in front of the Smart Food facility. The manhole outlet line is an 18" steel line which in turn is connected to a short length of 24" corrugated metal pipe where the system discharges to a relatively flat, open area near the toe of a fill slope. No significant channelization was observed at the discharge location.

Pre- and post-development peak runoff tributary to the existing storm system in the gully was modeled in HydroCAD and tabulated below. A portion of the Home Depot site is also tributary to the existing gully and culvert; the 100-year peak flow rate for the Home Depot basin used in this report is from the "Home Depot – Warrenton" Drainage Report, prepared by WRG Design, Inc, dated September 24, 2007. The 2007 report calculated the 100-year design storm peak runoff from the Home Depot property to be 1.62 cfs. To be conservative, it is assumed that the tributary Home Depot peak flow occurs at the same time as the peak flow modeled with this project, so 1.62 cfs was added to both pre- and post-development peak flow rates.

Hydrologic Model Comparison:
100-Year Peak Flow Rate at Existing Culvert

	Modeled Pre-Dev Peak Flow	Total Pre-Dev Peak Flow
SBUH	5.95 cfs	7.57 cfs
SCS TR-20	7.46 cfs	9.08 cfs

The SCS TR-20 peak runoff rate is higher than SBUH, as expected. Therefore, the SCS TR-20 model is used for detention system design and to check conveyance capacity of the existing culvert.

Pre- and Post-Development Comparison:
100-Year Peak Flow Rate at Existing Culvert with New Private Detention System

	Modeled Pre-Dev Peak Flow	Total Pre-Dev Peak Flow	Modeled Post-Dev Peak Flow	Total Post-Dev Peak Flow
SCS TR-20	7.46 cfs	9.08 cfs	9.47 cfs	11.09 cfs

The 24" PVC inlet line capacity was checked. It has a Manning's capacity of 44.10 cfs, approximately 400% of required capacity. The 18" steel line has a shallower slope (only 0.6%) and smaller diameter than the other lines in the system, so it is the limiting reach. The steel pipe capacity using Manning's equation is 9.48 cfs. Therefore, to convey the 100-year design storm the 18" storm line will be operating under pressure flow, or surcharge, conditions. As Highway 104 Spur and the manhole rim are over 9 feet above

the 18” pipe invert, there is elevation available to surcharge the storm system below grade and in the existing gully without impacting Highway 104 Spur.

Hydraflow Express was used to model the 18” storm line as a culvert with the inlet at the manhole. As the storm system discharges to a generally flat wetland area without a well-defined channel, the tailwater elevation was set at 12 ft, the Base Flood Elevation of the FEMA Special Flood Hazard Area behind the Skipanon River levees. The storm line can convey 11.09 cfs with a headwater elevation of approximately 17.28 ft, which is several feet below Highway 104 Spur (approximately 25 ft) and below the manhole rim (23.43 ft). Therefore, the existing pipe has sufficient capacity for the proposed development.

Future Upstream Construction

As the culvert in the gully and downstream storm system is existing, this report analyses only the impact of development proposed with this project. It is assumed that other properties within the drainage basin tributary to the existing gully and culvert will be required to meet the same or more stringent detention and downstream analysis requirements as this project prior to permitting.

IV. WATER QUALITY

Per the 2020 Engineering Design Standards, the City of Warrenton does not generally require water quality treatment of stormwater. However, preliminary design for this project incorporates water quality facilities.

The water quality design storm is 50% of the 2-year 24-hour storm per Figure 14-5:

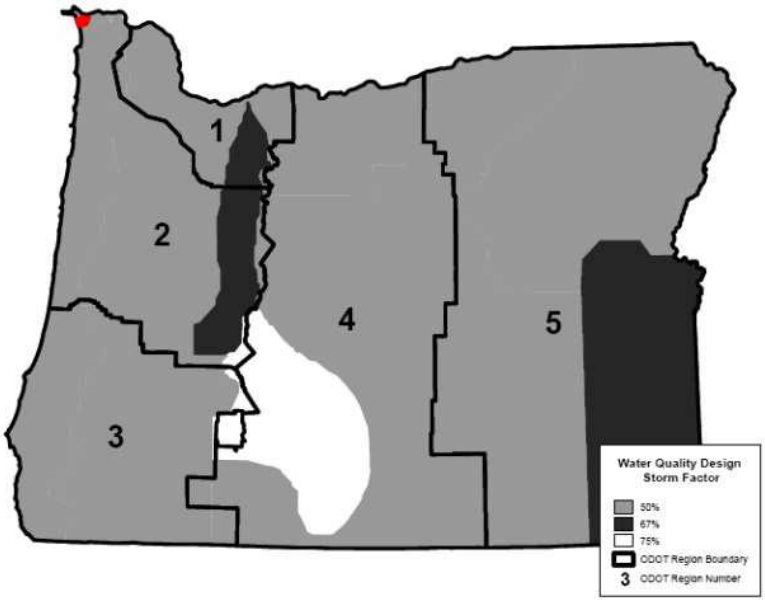


Figure 14-5 Design Storm Factors

The 2-year, 24-hour design storm in Warrenton is 3.10", so the water quality design storm is 1.55" of precipitation over 24 hours.

SCS TR-20 is used to model the water quality design storm peak flow rate for design of the on-site private water quality system. The modeled peak flow rate for the basin draining to the on-site private detention system is 0.22 cfs. The water quality facility will be placed downstream of the detention system; the detention system outlet structure does not provide any detention of the water quality design storm event. Contech StormFilters can provide water quality treatment for up to 0.0334 cfs per StormFilter, so seven (7) StormFilters are required and will be installed in a 72" diameter manhole. The standard Contech detail is included in the appendix for reference.

Value engineering and detailed design of water quality facilities will be completed with the final construction permit plans and associated final stormwater report.

APPENDIX A

Pre- and Post-Development Maps

DRAINAGE BASIN SYMBOL

XX

SEE STORMWATER REPORT FOR ADDITIONAL INFO ON DRAINAGE BASINS

N
W E
S

0 50 100
SCALE IN FEET

PRELIMINARY

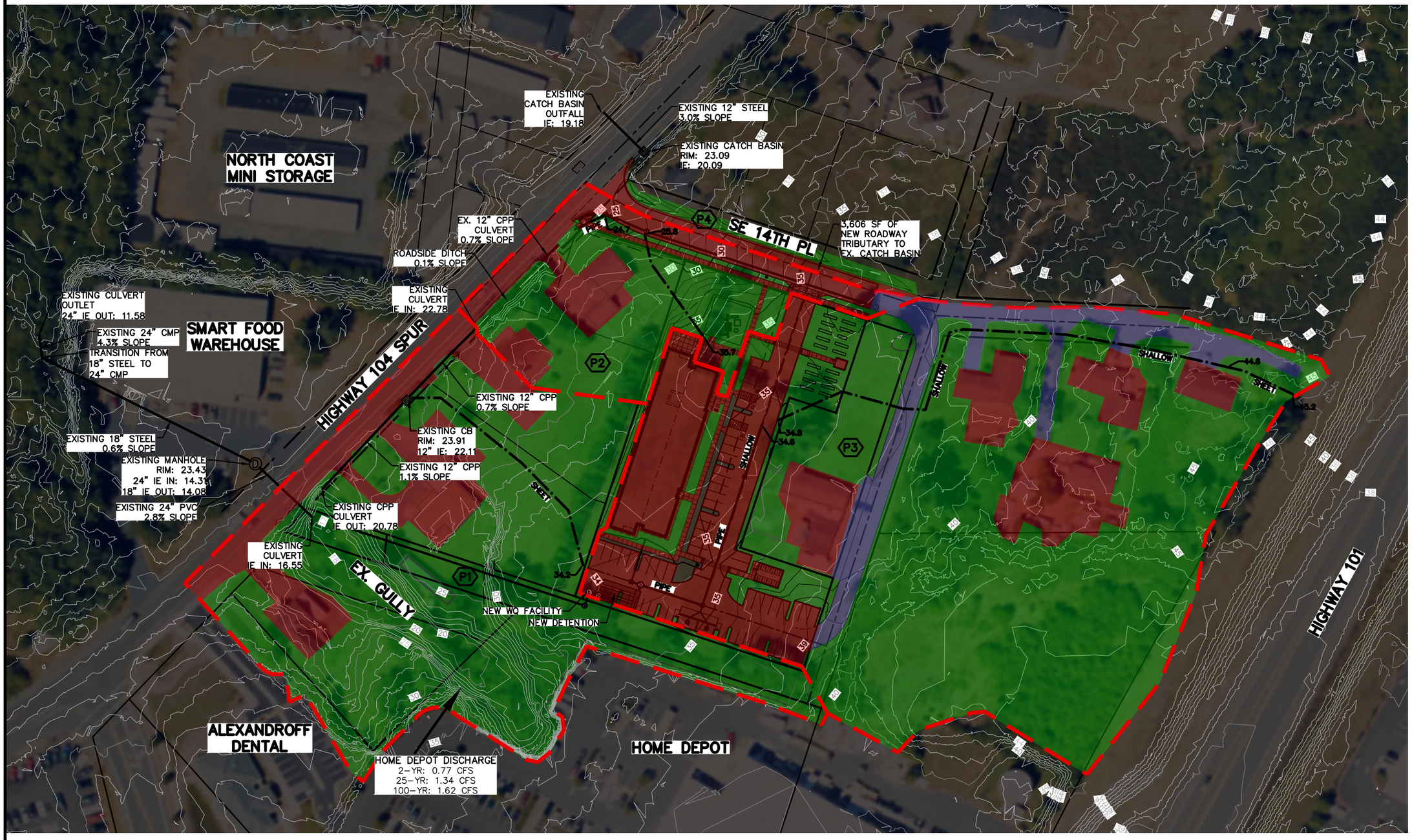
DATE:	NO.	REVISION

DRAWN: BD | DESIGNED: BD | CHECKED: EH
SCALE: AS SHOWN | DATE: MAR 23, 2021
PROJECT NO. E20-078

FDG
Firwood Design Group, LLC
SURVEYING ✦ ENGINEERING ✦ PLANNING
359 E. HISTORIC COLUMBIA RIVER HWY
TROUTDALE, OREGON 97060
BUS: (503) 668-3737 ✦ FAX: (503) 668-3788

EMMONS DESIGNS
100 39TH STREET
ASTORIA OREGON 97103

PRE-DEVELOPMENT 104 SPUR CULVERT BASIN
TRILLIUM HOUSE APARTMENTS
WARRENTON, OREGON 97146



DRAINAGE BASIN SYMBOL

XX

SEE STORMWATER REPORT FOR ADDITIONAL INFO ON DRAINAGE BASINS

N

W E

S

0 50 100

SCALE IN FEET

PRELIMINARY

DATE:	NO.	REVISION

DRAWN: BD | DESIGNED: BD | CHECKED: EH

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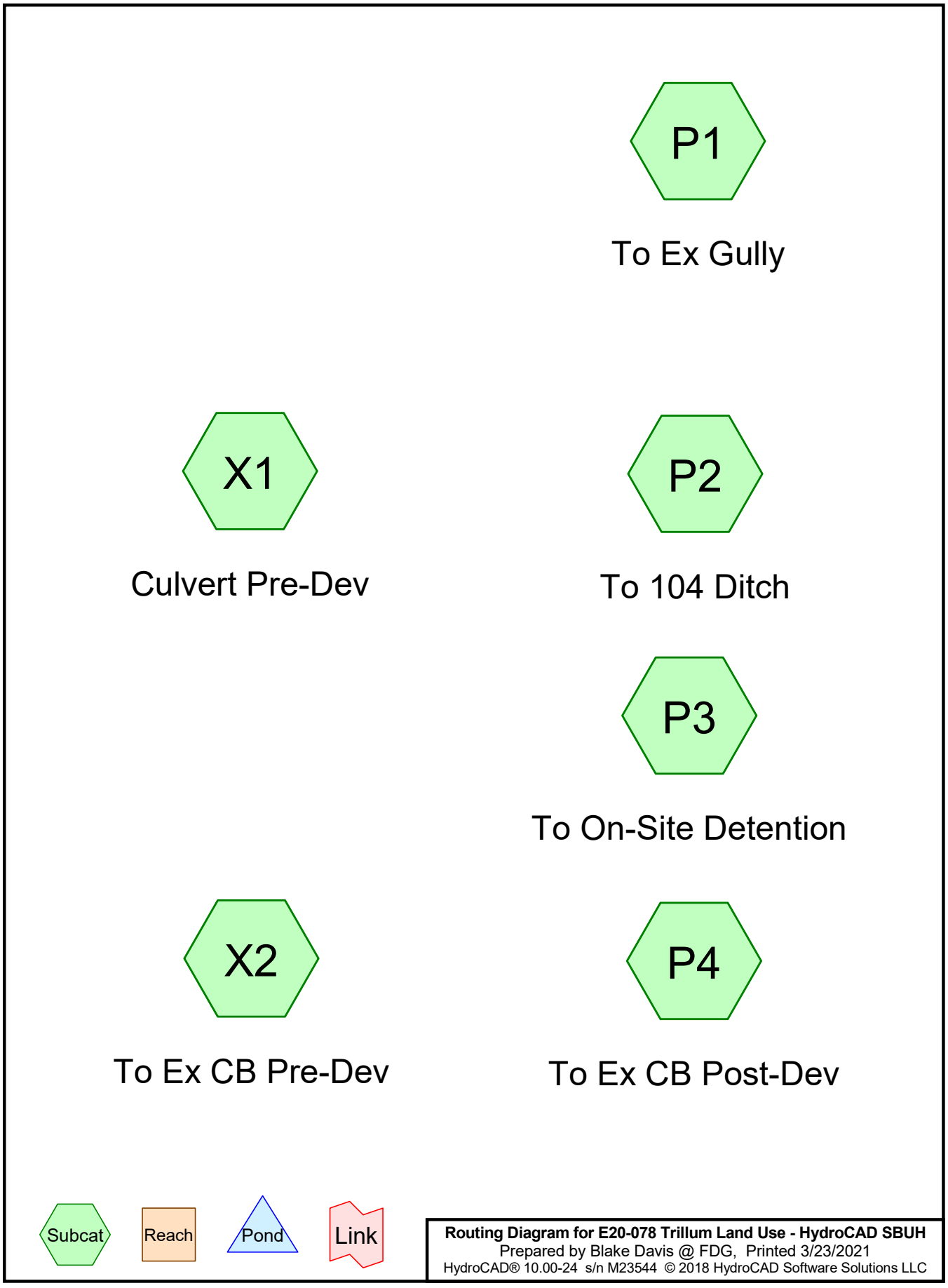
EMMONS DESIGNS
100 39TH STREET
ASTORIA OREGON 97103

POST-DEVELOPMENT 104 SPUR CULVERT BASIN
TRILLIUM HOUSE APARTMENTS
WARRENTON, OREGON 97146

APPENDIX B

HydroCAD & HydraFlow Express Calculations



Routing Diagram for E20-078 Trillum Land Use - HydroCAD SBUH
Prepared by Blake Davis @ FDG, Printed 3/23/2021

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: To Ex Gully Runoff Area=137,600 sf 21.51% Impervious Runoff Depth=2.34"
Flow Length=380' Tc=22.6 min CN=74/98 Runoff=1.31 cfs 26,868 cf

Subcatchment P2: To 104 Ditch Runoff Area=46,500 sf 43.23% Impervious Runoff Depth=2.83"
Flow Length=340' Tc=8.8 min CN=74/98 Runoff=0.69 cfs 10,978 cf

Subcatchment P3: To On-Site Detention Runoff Area=239,700 sf 28.58% Impervious Runoff Depth=2.61"
Flow Length=880' Tc=33.4 min CN=76/98 Runoff=2.28 cfs 52,173 cf

Subcatchment P4: To Ex CB Post-Dev Runoff Area=7,546 sf 47.79% Impervious Runoff Depth=2.94"
Tc=5.0 min CN=74/98 Runoff=0.12 cfs 1,846 cf

Subcatchment X1: Culvert Pre-Dev Runoff Area=405,800 sf 17.42% Impervious Runoff Depth=2.31"
Flow Length=1,220' Tc=31.2 min CN=75/98 Runoff=3.38 cfs 78,234 cf

Subcatchment X2: To Ex CB Pre-Dev Runoff Area=29,426 sf 0.00% Impervious Runoff Depth=2.09"
Tc=5.0 min CN=77/0 Runoff=0.33 cfs 5,124 cf

Total Runoff Area = 866,572 sf Runoff Volume = 175,224 cf Average Runoff Depth = 2.43"
77.79% Pervious = 674,066 sf 22.21% Impervious = 192,506 sf

Summary for Subcatchment P1: To Ex Gully

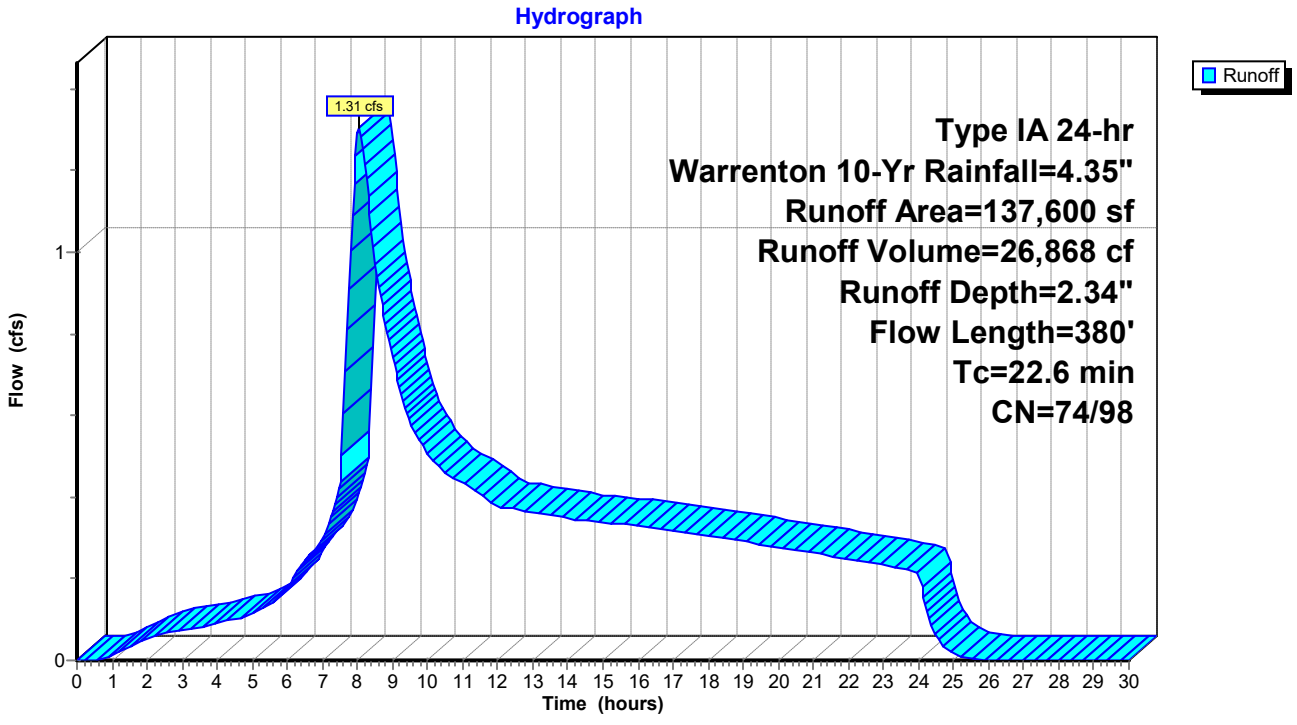
Runoff = 1.31 cfs @ 8.04 hrs, Volume= 26,868 cf, Depth= 2.34"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 10-Yr Rainfall=4.35"

	Area (sf)	CN	Description
*	29,600	98	Impervious
	108,000	74	>75% Grass cover, Good, HSG C
	137,600	79	Weighted Average
	108,000	74	78.49% Pervious Area
	29,600	98	21.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.2	260	0.0400	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.50"
0.4	120	0.0110	5.15	4.05	**Pipe Channel,** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
22.6	380	Total			

Subcatchment P1: To Ex Gully



Summary for Subcatchment P2: To 104 Ditch

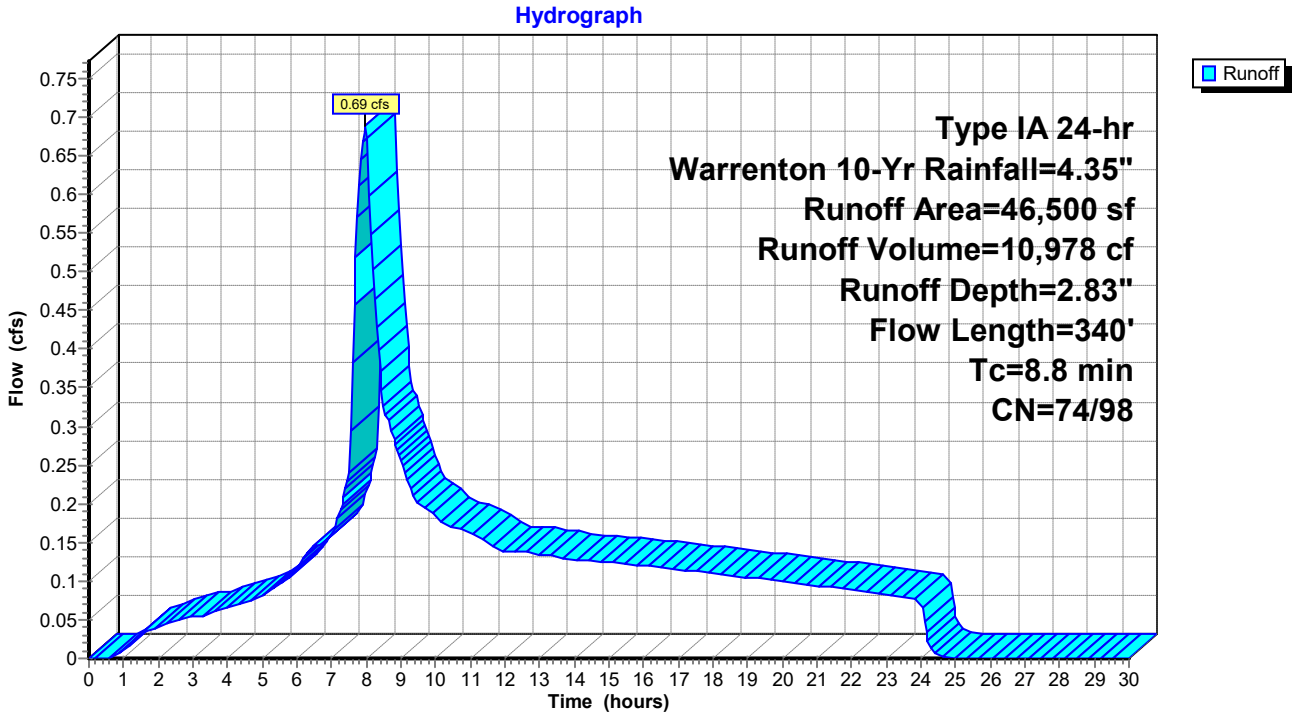
Runoff = 0.69 cfs @ 7.98 hrs, Volume= 10,978 cf, Depth= 2.83"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 10-Yr Rainfall=4.35"

	Area (sf)	CN	Description
*	20,100	98	Impervious
*	600	89	Gravel roads, HSG C
	25,800	74	>75% Grass cover, Good, HSG C
	46,500	85	Weighted Average
	26,400	74	56.77% Pervious Area
	20,100	98	43.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	120	0.0990	0.35		**Sheet Flow, Grass - Avg Slope** Grass: Short n= 0.150 P2= 3.50"
0.2	45	0.0240	3.14		**Shallow Concentrated Flow, Gutter - Avg Slope** Paved Kv= 20.3 fps
0.2	35	0.0050	3.47	2.73	**Pipe Channel, New Pipe Flow - Avg Slope** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
0.2	20	0.0050	1.43	4.46	**Trap/Vee/Rect Channel Flow, 104 Ditch Flow - Avg Slope** Bot.W=0.00' D=1.25' Z= 2.0 '/' Top.W=5.00' n= 0.050
0.1	30	0.0070	4.11	3.23	**Pipe Channel, 104 Culvert - Avg Slope** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
2.4	90	0.0010	0.64	1.99	**Trap/Vee/Rect Channel Flow, 104 Ditch Flow - Avg Slope** Bot.W=0.00' D=1.25' Z= 2.0 '/' Top.W=5.00' n= 0.050
8.8	340	Total			

Subcatchment P2: To 104 Ditch



Summary for Subcatchment P3: To On-Site Detention

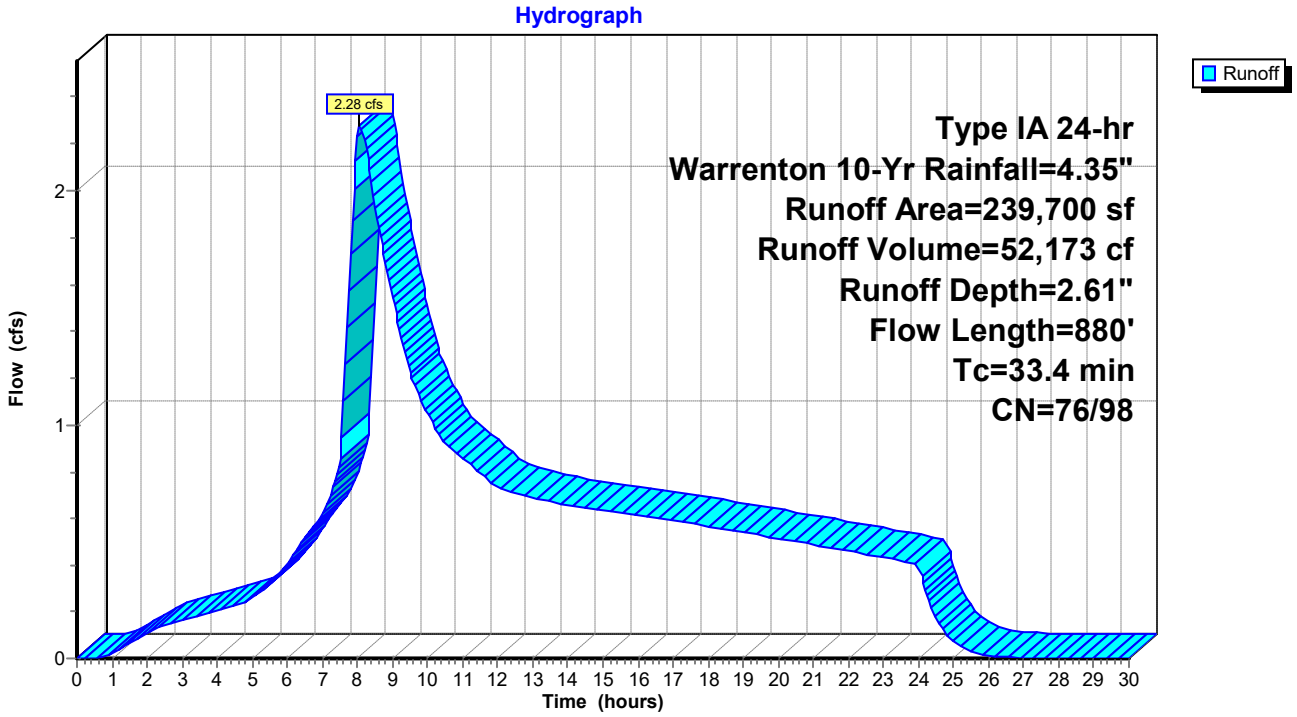
Runoff = 2.28 cfs @ 8.07 hrs, Volume= 52,173 cf, Depth= 2.61"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 10-Yr Rainfall=4.35"

	Area (sf)	CN	Description
*	68,500	98	Impervious
*	152,000	74	Pervious
*	19,200	89	Gravel roads, HSG C
	239,700	82	Weighted Average
	171,200	76	71.42% Pervious Area
	68,500	98	28.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.8	120	0.0080	0.09		**Sheet Flow, Sheet Flow - Avg Slope** Grass: Dense n= 0.240 P2= 3.50"
9.2	530	0.0190	0.96		**Shallow Concentrated Flow, Shallow Concentrated Flow - Avg Slo** Short Grass Pasture Kv= 7.0 fps
0.5	55	0.0100	2.03		**Shallow Concentrated Flow, Shallow Concentrated Flow - Avg Slo** Paved Kv= 20.3 fps
0.9	175	0.0100	3.10	0.61	**Pipe Channel, Pipe Flow - Avg Slope** 6.000" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.012
33.4	880	Total			

Subcatchment P3: To On-Site Detention



Summary for Subcatchment P4: To Ex CB Post-Dev

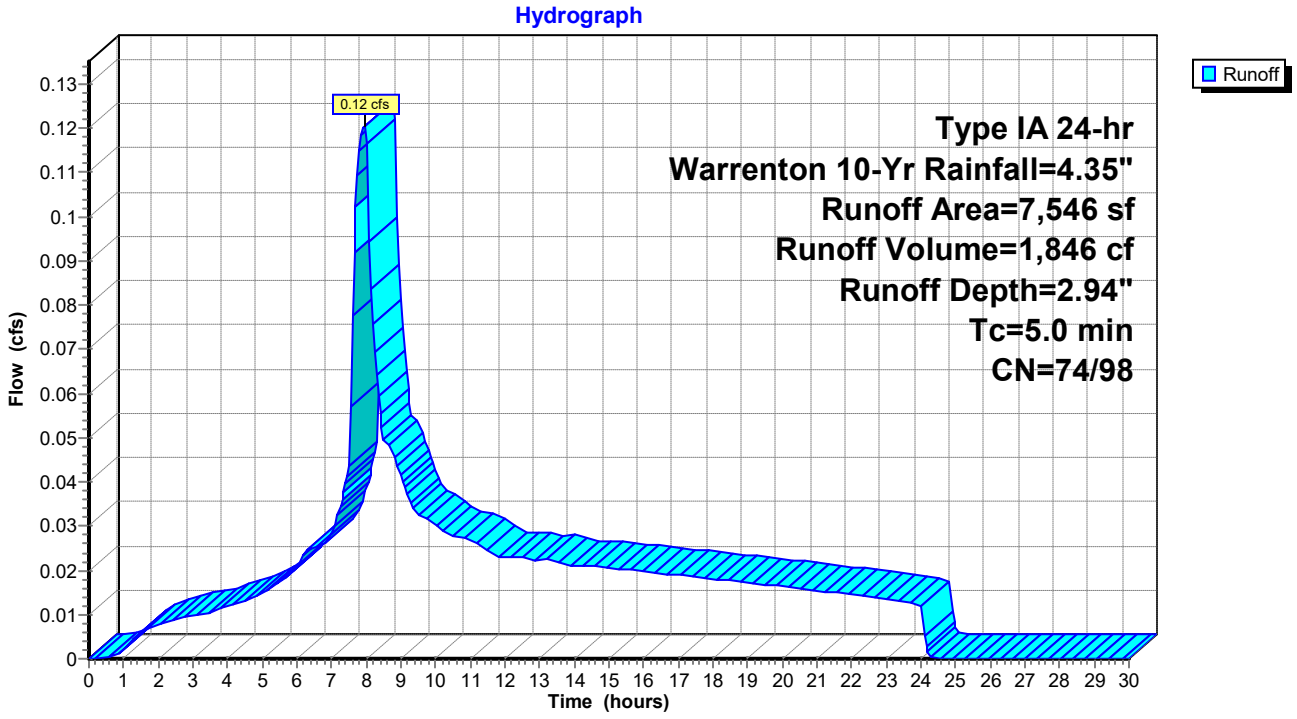
Runoff = 0.12 cfs @ 7.94 hrs, Volume= 1,846 cf, Depth= 2.94"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 10-Yr Rainfall=4.35"

	Area (sf)	CN	Description
*	3,606	98	New Road & Shoulder
	3,940	74	>75% Grass cover, Good, HSG C
	7,546	85	Weighted Average
	3,940	74	52.21% Pervious Area
	3,606	98	47.79% Impervious Area

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

Subcatchment P4: To Ex CB Post-Dev



Summary for Subcatchment X1: Culvert Pre-Dev

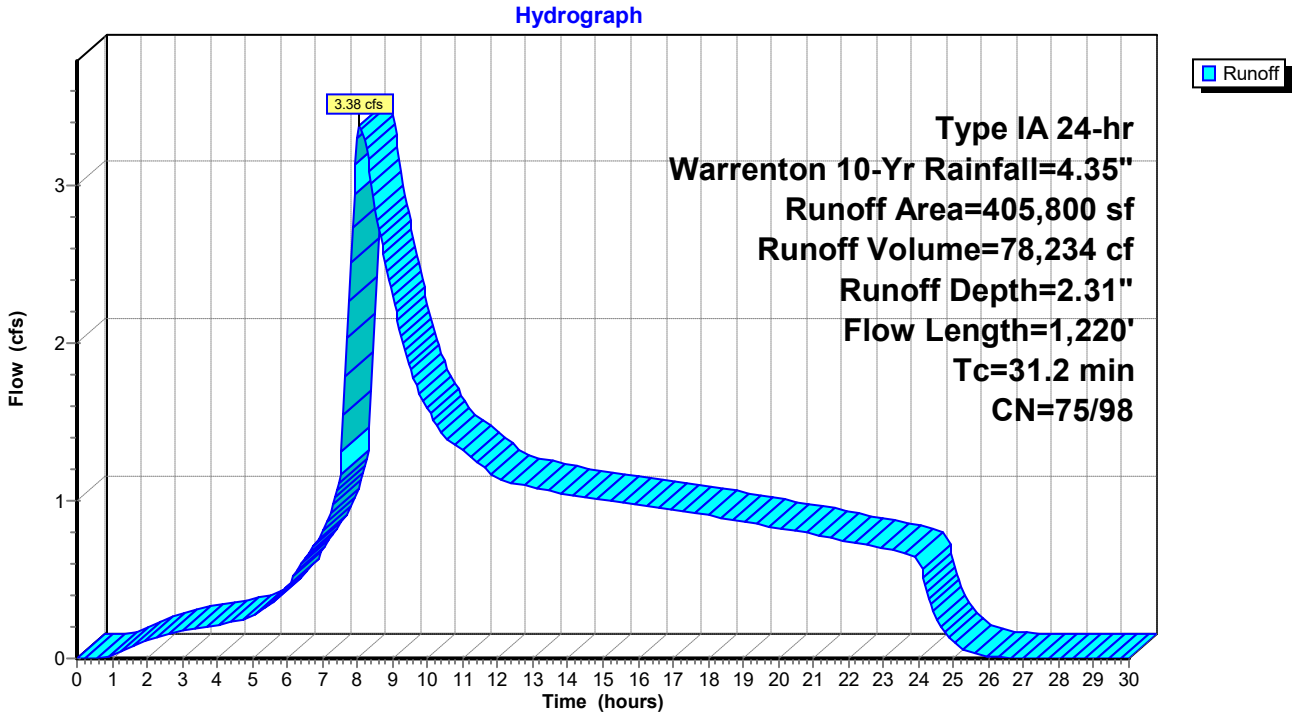
Runoff = 3.38 cfs @ 8.07 hrs, Volume= 78,234 cf, Depth= 2.31"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 10-Yr Rainfall=4.35"

	Area (sf)	CN	Description
*	70,700	98	Impervious
	16,200	89	Gravel roads, HSG C
*	318,900	74	>75% Grass cover, Good, HSG C
	405,800	79	Weighted Average
	335,100	75	82.58% Pervious Area
	70,700	98	17.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	75	0.0100	0.09		**Sheet Flow, Sheet Flow - Avg Slope** Grass: Dense n= 0.240 P2= 3.50"
14.6	865	0.0200	0.99		**Shallow Concentrated Flow, Shallow Concentrated Flow - Avg Slo** Short Grass Pasture Kv= 7.0 fps
1.5	50	0.0010	0.55	1.10	**Trap/Vee/Rect Channel Flow, 104 Ditch - Avg Slope** Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00' n= 0.050
0.8	230	0.0087	4.58	3.60	**Pipe Channel, 104 Storm - Avg Slope** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
31.2	1,220	Total			

Subcatchment X1: Culvert Pre-Dev



Summary for Subcatchment X2: To Ex CB Pre-Dev

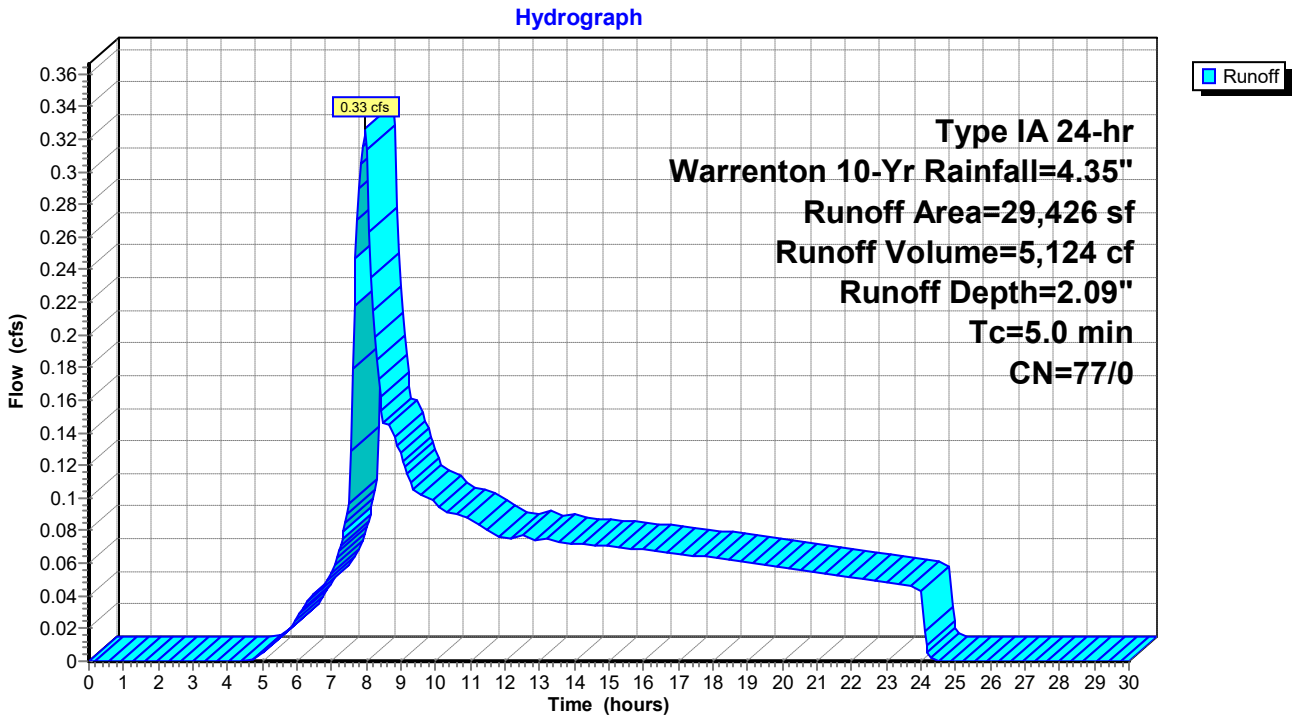
Runoff = 0.33 cfs @ 7.98 hrs, Volume= 5,124 cf, Depth= 2.09"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 10-Yr Rainfall=4.35"

Area (sf)	CN	Description
5,016	89	Gravel roads, HSG C
24,410	74	>75% Grass cover, Good, HSG C
29,426	77	Weighted Average
29,426	77	100.00% Pervious Area

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

Subcatchment X2: To Ex CB Pre-Dev



Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: To Ex Gully Runoff Area=137,600 sf 21.51% Impervious Runoff Depth=3.83"
Flow Length=380' Tc=22.6 min CN=74/98 Runoff=2.27 cfs 43,881 cf

Subcatchment P2: To 104 Ditch Runoff Area=46,500 sf 43.23% Impervious Runoff Depth=4.39"
Flow Length=340' Tc=8.8 min CN=74/98 Runoff=1.10 cfs 17,011 cf

Subcatchment P3: To On-Site Detention Runoff Area=239,700 sf 28.58% Impervious Runoff Depth=4.15"
Flow Length=880' Tc=33.4 min CN=76/98 Runoff=3.81 cfs 82,917 cf

Subcatchment P4: To Ex CB Post-Dev Runoff Area=7,546 sf 47.79% Impervious Runoff Depth=4.51"
Tc=5.0 min CN=74/98 Runoff=0.19 cfs 2,835 cf

Subcatchment X1: Culvert Pre-Dev Runoff Area=405,800 sf 17.42% Impervious Runoff Depth=3.80"
Flow Length=1,220' Tc=31.2 min CN=75/98 Runoff=5.95 cfs 128,571 cf

Subcatchment X2: To Ex CB Pre-Dev Runoff Area=29,426 sf 0.00% Impervious Runoff Depth=3.57"
Tc=5.0 min CN=77/0 Runoff=0.59 cfs 8,746 cf

Total Runoff Area = 866,572 sf Runoff Volume = 283,960 cf Average Runoff Depth = 3.93"
77.79% Pervious = 674,066 sf 22.21% Impervious = 192,506 sf

Summary for Subcatchment P1: To Ex Gully

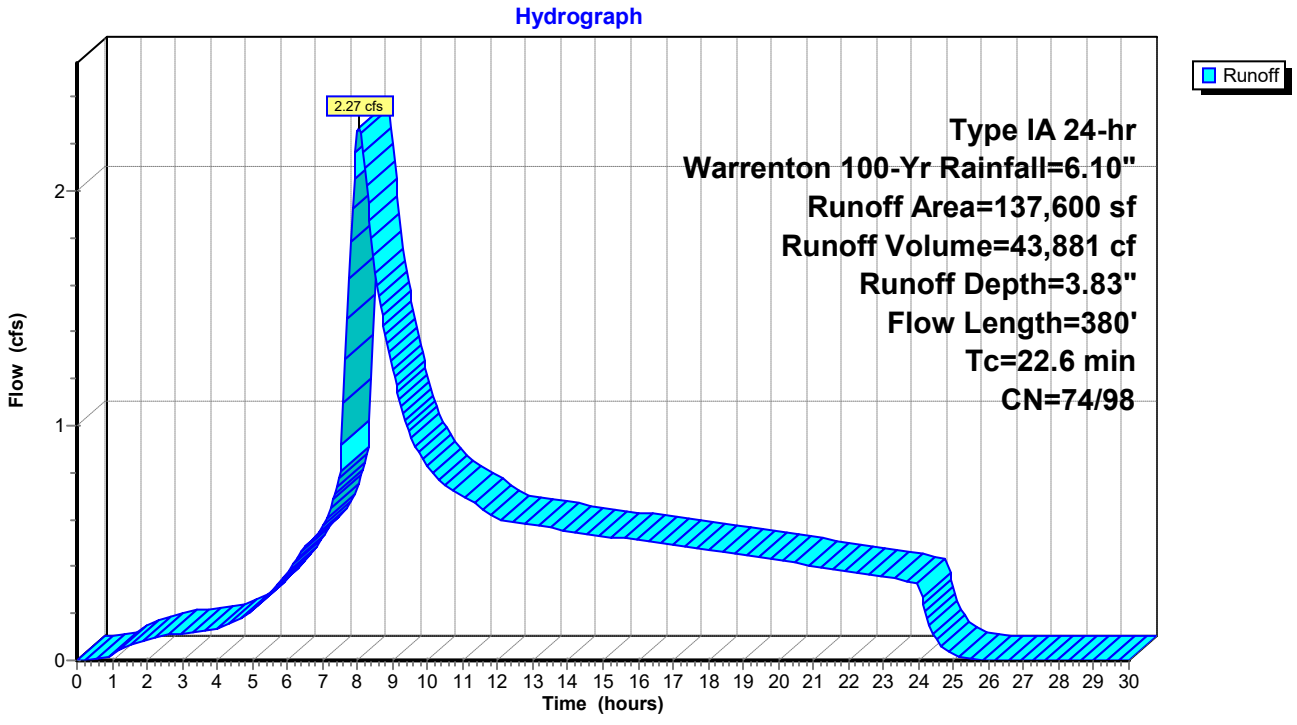
Runoff = 2.27 cfs @ 8.04 hrs, Volume= 43,881 cf, Depth= 3.83"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 100-Yr Rainfall=6.10"

	Area (sf)	CN	Description
*	29,600	98	Impervious
	108,000	74	>75% Grass cover, Good, HSG C
	137,600	79	Weighted Average
	108,000	74	78.49% Pervious Area
	29,600	98	21.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.2	260	0.0400	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.50"
0.4	120	0.0110	5.15	4.05	**Pipe Channel,** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
22.6	380	Total			

Subcatchment P1: To Ex Gully



Summary for Subcatchment P2: To 104 Ditch

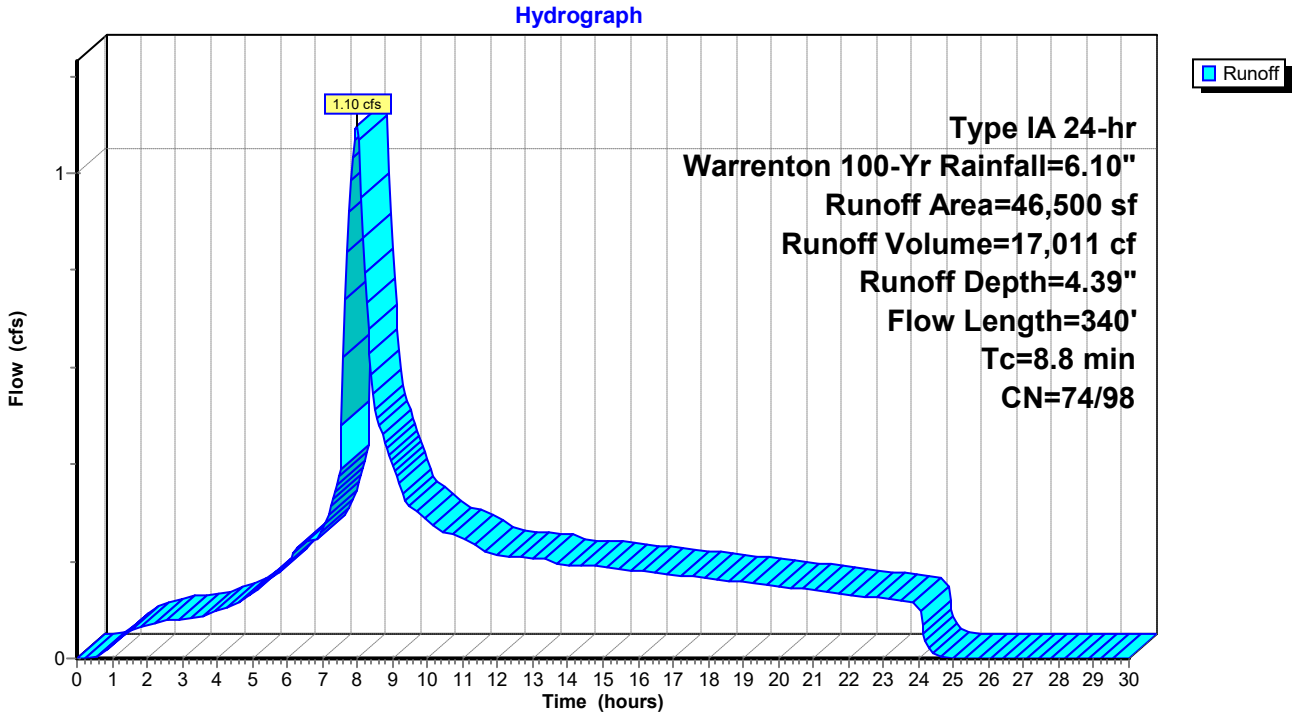
Runoff = 1.10 cfs @ 7.98 hrs, Volume= 17,011 cf, Depth= 4.39"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 100-Yr Rainfall=6.10"

	Area (sf)	CN	Description
*	20,100	98	Impervious
*	600	89	Gravel roads, HSG C
	25,800	74	>75% Grass cover, Good, HSG C
	46,500	85	Weighted Average
	26,400	74	56.77% Pervious Area
	20,100	98	43.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	120	0.0990	0.35		**Sheet Flow, Grass - Avg Slope** Grass: Short n= 0.150 P2= 3.50"
0.2	45	0.0240	3.14		**Shallow Concentrated Flow, Gutter - Avg Slope** Paved Kv= 20.3 fps
0.2	35	0.0050	3.47	2.73	**Pipe Channel, New Pipe Flow - Avg Slope** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
0.2	20	0.0050	1.43	4.46	**Trap/Vee/Rect Channel Flow, 104 Ditch Flow - Avg Slope** Bot.W=0.00' D=1.25' Z= 2.0 '/' Top.W=5.00' n= 0.050
0.1	30	0.0070	4.11	3.23	**Pipe Channel, 104 Culvert - Avg Slope** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
2.4	90	0.0010	0.64	1.99	**Trap/Vee/Rect Channel Flow, 104 Ditch Flow - Avg Slope** Bot.W=0.00' D=1.25' Z= 2.0 '/' Top.W=5.00' n= 0.050
8.8	340	Total			

Subcatchment P2: To 104 Ditch



Summary for Subcatchment P3: To On-Site Detention

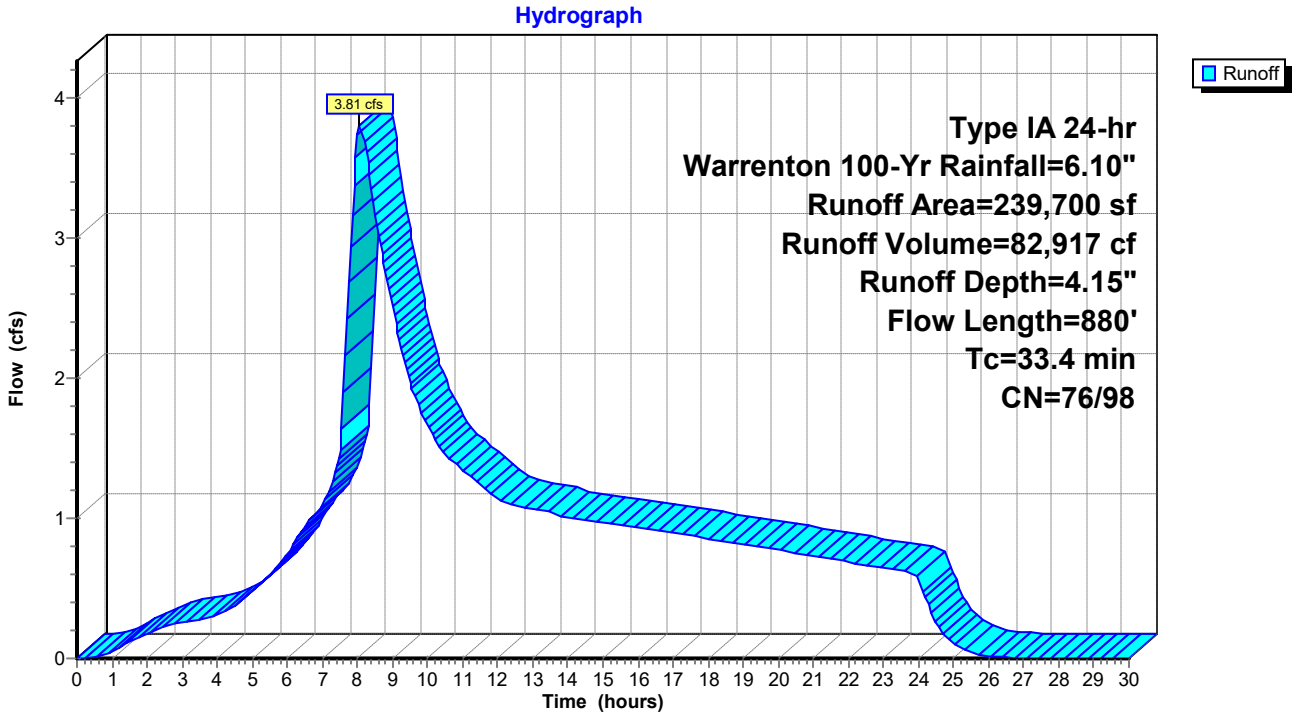
Runoff = 3.81 cfs @ 8.06 hrs, Volume= 82,917 cf, Depth= 4.15"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 100-Yr Rainfall=6.10"

	Area (sf)	CN	Description
*	68,500	98	Impervious
*	152,000	74	Pervious
*	19,200	89	Gravel roads, HSG C
	239,700	82	Weighted Average
	171,200	76	71.42% Pervious Area
	68,500	98	28.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.8	120	0.0080	0.09		**Sheet Flow, Sheet Flow - Avg Slope** Grass: Dense n= 0.240 P2= 3.50"
9.2	530	0.0190	0.96		**Shallow Concentrated Flow, Shallow Concentrated Flow - Avg Slo** Short Grass Pasture Kv= 7.0 fps
0.5	55	0.0100	2.03		**Shallow Concentrated Flow, Shallow Concentrated Flow - Avg Slo** Paved Kv= 20.3 fps
0.9	175	0.0100	3.10	0.61	**Pipe Channel, Pipe Flow - Avg Slope** 6.000" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.012
33.4	880	Total			

Subcatchment P3: To On-Site Detention



Summary for Subcatchment P4: To Ex CB Post-Dev

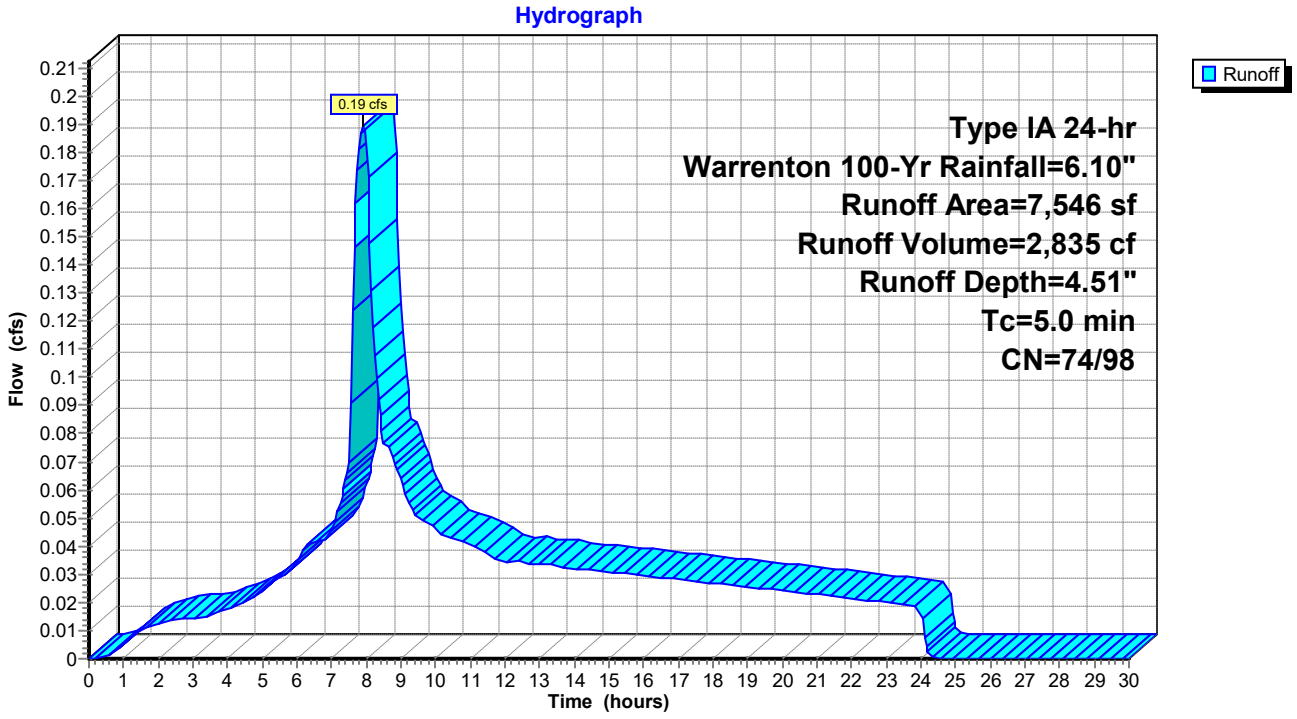
Runoff = 0.19 cfs @ 7.93 hrs, Volume= 2,835 cf, Depth= 4.51"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 100-Yr Rainfall=6.10"

	Area (sf)	CN	Description
*	3,606	98	New Road & Shoulder
	3,940	74	>75% Grass cover, Good, HSG C
	7,546	85	Weighted Average
	3,940	74	52.21% Pervious Area
	3,606	98	47.79% Impervious Area

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

Subcatchment P4: To Ex CB Post-Dev



Summary for Subcatchment X1: Culvert Pre-Dev

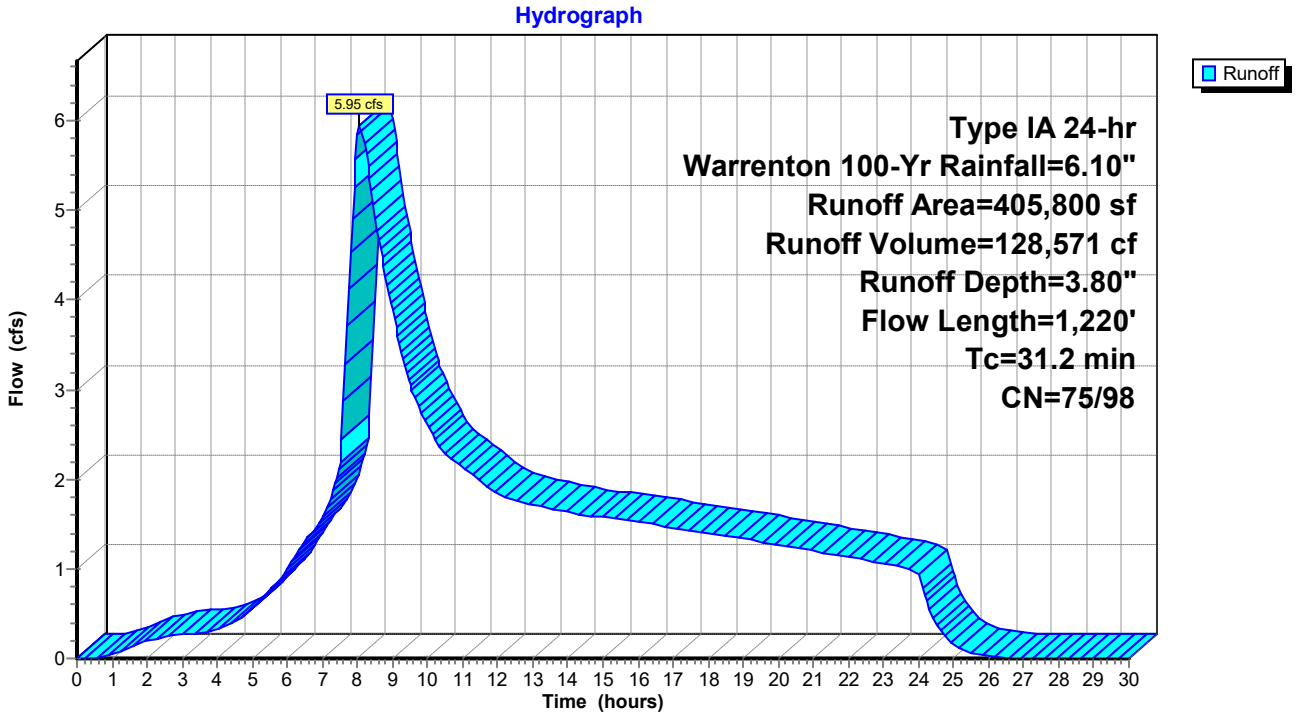
Runoff = 5.95 cfs @ 8.06 hrs, Volume= 128,571 cf, Depth= 3.80"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 100-Yr Rainfall=6.10"

	Area (sf)	CN	Description
*	70,700	98	Impervious
	16,200	89	Gravel roads, HSG C
*	318,900	74	>75% Grass cover, Good, HSG C
	405,800	79	Weighted Average
	335,100	75	82.58% Pervious Area
	70,700	98	17.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	75	0.0100	0.09		**Sheet Flow, Sheet Flow - Avg Slope** Grass: Dense n= 0.240 P2= 3.50"
14.6	865	0.0200	0.99		**Shallow Concentrated Flow, Shallow Concentrated Flow - Avg Slo** Short Grass Pasture Kv= 7.0 fps
1.5	50	0.0010	0.55	1.10	**Trap/Vee/Rect Channel Flow, 104 Ditch - Avg Slope** Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00' n= 0.050
0.8	230	0.0087	4.58	3.60	**Pipe Channel, 104 Storm - Avg Slope** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
31.2	1,220	Total			

Subcatchment X1: Culvert Pre-Dev



Summary for Subcatchment X2: To Ex CB Pre-Dev

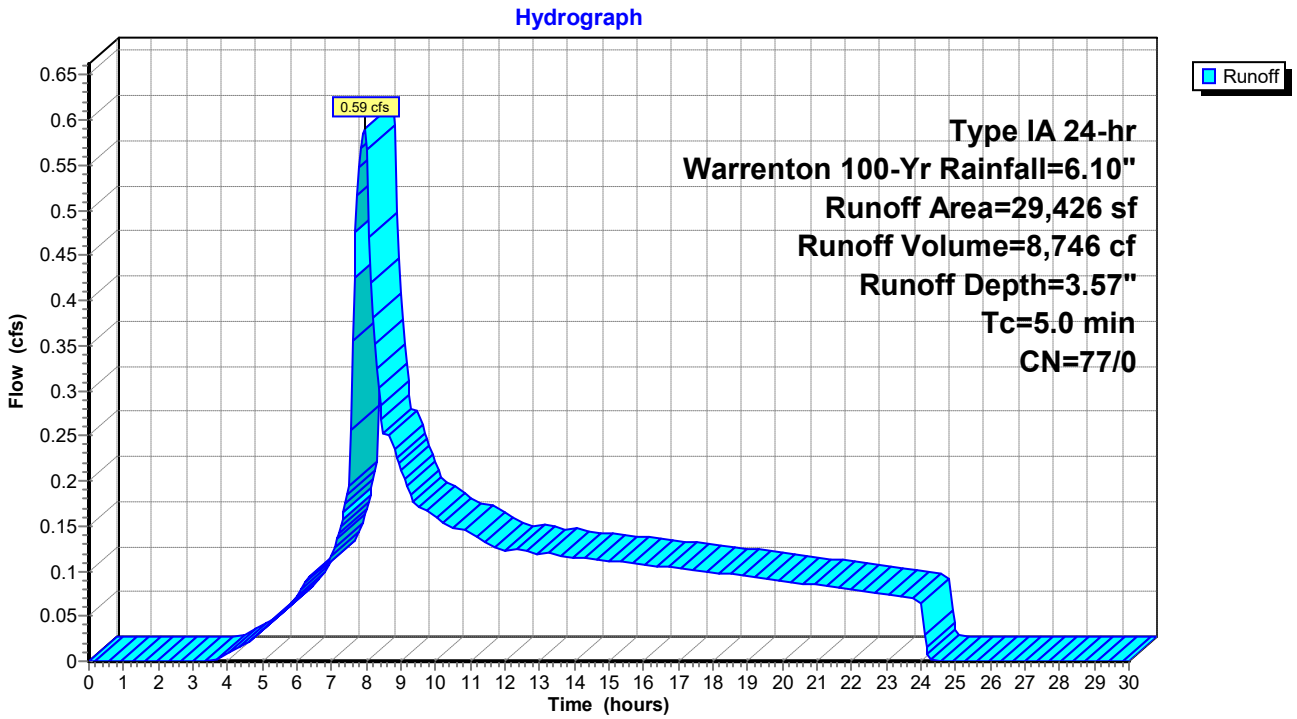
Runoff = 0.59 cfs @ 7.97 hrs, Volume= 8,746 cf, Depth= 3.57"

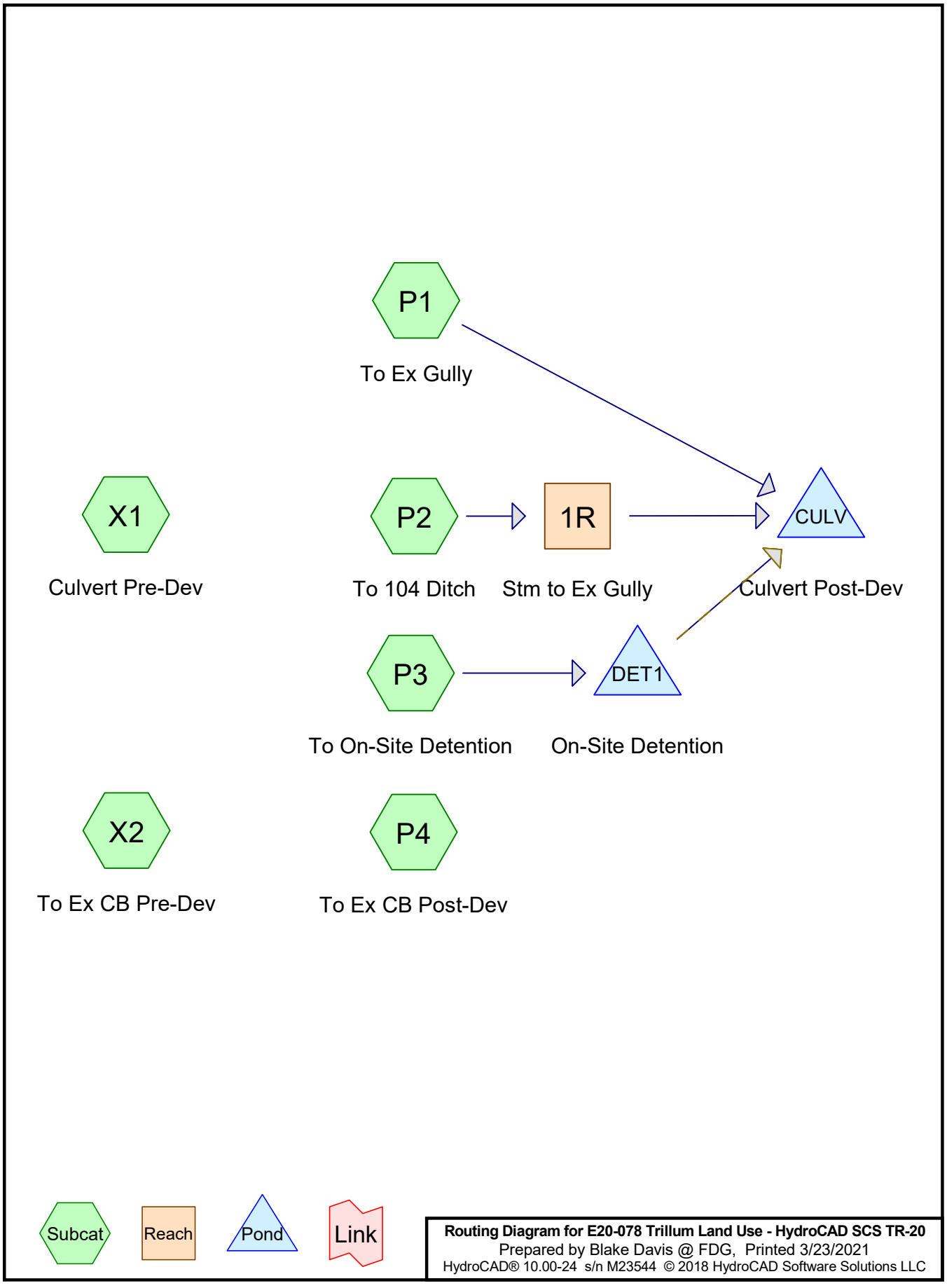
Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 100-Yr Rainfall=6.10"

Area (sf)	CN	Description
5,016	89	Gravel roads, HSG C
24,410	74	>75% Grass cover, Good, HSG C
29,426	77	Weighted Average
29,426	77	100.00% Pervious Area

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

Subcatchment X2: To Ex CB Pre-Dev





Routing Diagram for E20-078 Trillum Land Use - HydroCAD SCS TR-20
Prepared by Blake Davis @ FDG, Printed 3/23/2021

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: To Ex Gully Runoff Area=137,600 sf 21.51% Impervious Runoff Depth=2.25"
Flow Length=380' Tc=22.6 min CN=79 Runoff=1.53 cfs 25,813 cf

Subcatchment P2: To 104 Ditch Runoff Area=46,500 sf 43.23% Impervious Runoff Depth=2.77"
Flow Length=340' Tc=8.8 min CN=85 Runoff=0.75 cfs 10,745 cf

Subcatchment P3: To On-Site Detention Runoff Area=239,700 sf 28.58% Impervious Runoff Depth=2.50"
Flow Length=880' Tc=33.4 min CN=82 Runoff=2.81 cfs 50,037 cf

Subcatchment P4: To Ex CB Post-Dev Runoff Area=7,546 sf 47.79% Impervious Runoff Depth=2.77"
Tc=5.0 min CN=85 Runoff=0.12 cfs 1,744 cf

Subcatchment X1: Culvert Pre-Dev Runoff Area=405,800 sf 17.42% Impervious Runoff Depth=2.25"
Flow Length=1,220' Tc=31.2 min CN=79 Runoff=4.18 cfs 76,127 cf

Subcatchment X2: To Ex CB Pre-Dev Runoff Area=29,426 sf 0.00% Impervious Runoff Depth=2.09"
Tc=5.0 min CN=77 Runoff=0.33 cfs 5,124 cf

Reach 1R: Stm to Ex Gully Avg. Flow Depth=0.31' Max Vel=3.62 fps Inflow=0.75 cfs 10,745 cf
12.000" Round Pipe n=0.012 L=229.0' S=0.0087 '/' Capacity=3.61 cfs Outflow=0.75 cfs 10,745 cf

Pond CULV: Culvert Post-Dev Inflow=3.70 cfs 86,556 cf
Primary=3.70 cfs 86,556 cf

Pond DET1: On-Site Detention Peak Elev=32.06' Storage=2,495 cf Inflow=2.81 cfs 50,037 cf
Primary=2.07 cfs 49,548 cf Secondary=0.15 cfs 423 cf Tertiary=0.15 cfs 26 cf Outflow=2.37 cfs 49,998 cf

Total Runoff Area = 866,572 sf Runoff Volume = 169,589 cf Average Runoff Depth = 2.35"
77.79% Pervious = 674,066 sf 22.21% Impervious = 192,506 sf

Summary for Subcatchment P1: To Ex Gully

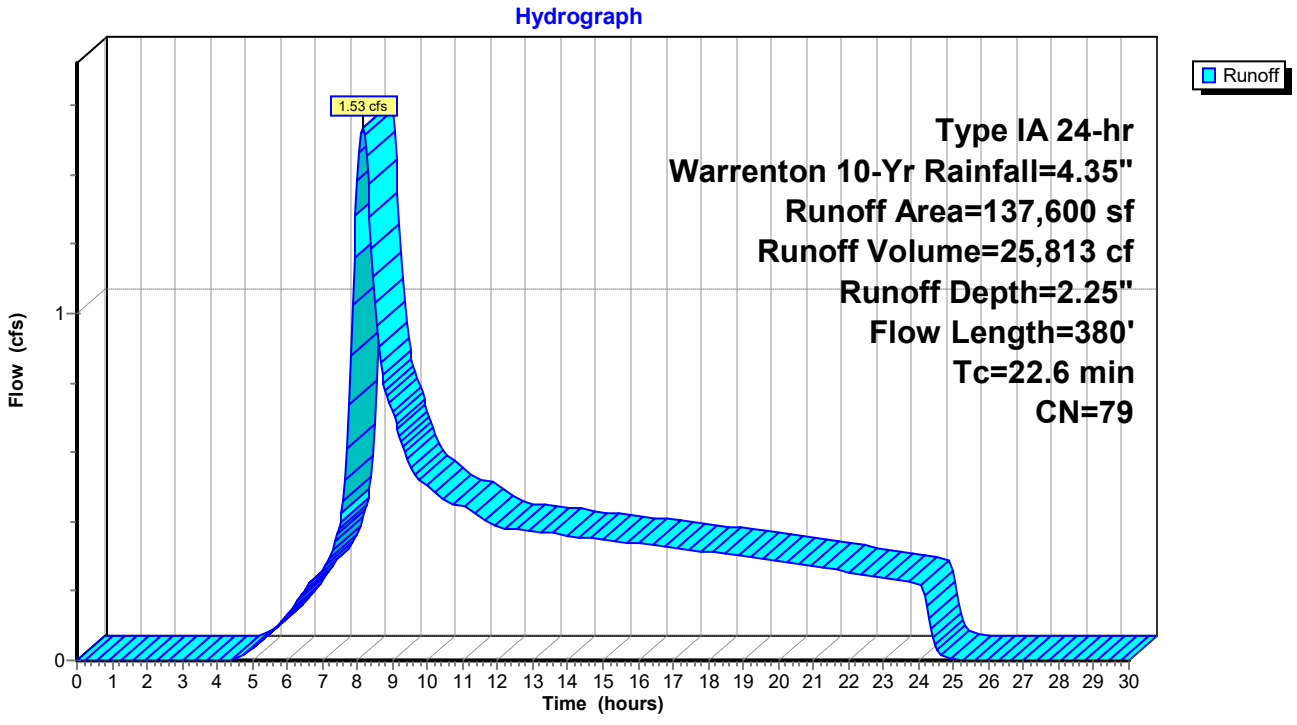
Runoff = 1.53 cfs @ 8.15 hrs, Volume= 25,813 cf, Depth= 2.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 10-Yr Rainfall=4.35"

	Area (sf)	CN	Description
*	29,600	98	Impervious
	108,000	74	>75% Grass cover, Good, HSG C
	137,600	79	Weighted Average
	108,000	74	78.49% Pervious Area
	29,600	98	21.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.2	260	0.0400	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.50"
0.4	120	0.0110	5.15	4.05	**Pipe Channel,** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
22.6	380	Total			

Subcatchment P1: To Ex Gully



Summary for Subcatchment P2: To 104 Ditch

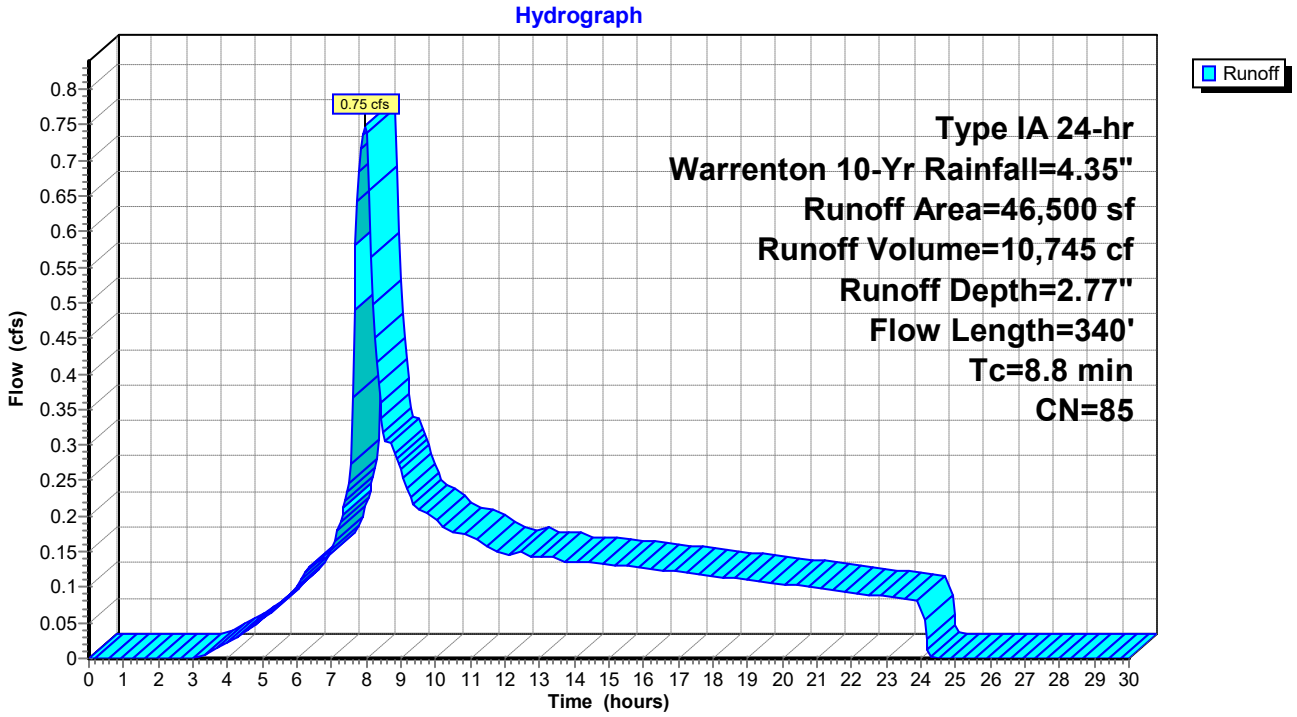
Runoff = 0.75 cfs @ 7.98 hrs, Volume= 10,745 cf, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 10-Yr Rainfall=4.35"

	Area (sf)	CN	Description
*	20,100	98	Impervious
*	600	89	Gravel roads, HSG C
	25,800	74	>75% Grass cover, Good, HSG C
	46,500	85	Weighted Average
	26,400	74	56.77% Pervious Area
	20,100	98	43.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	120	0.0990	0.35		**Sheet Flow, Grass - Avg Slope** Grass: Short n= 0.150 P2= 3.50"
0.2	45	0.0240	3.14		**Shallow Concentrated Flow, Gutter - Avg Slope** Paved Kv= 20.3 fps
0.2	35	0.0050	3.47	2.73	**Pipe Channel, New Pipe Flow - Avg Slope** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
0.2	20	0.0050	1.43	4.46	**Trap/Vee/Rect Channel Flow, 104 Ditch Flow - Avg Slope** Bot.W=0.00' D=1.25' Z= 2.0 '/' Top.W=5.00' n= 0.050
0.1	30	0.0070	4.11	3.23	**Pipe Channel, 104 Culvert - Avg Slope** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
2.4	90	0.0010	0.64	1.99	**Trap/Vee/Rect Channel Flow, 104 Ditch Flow - Avg Slope** Bot.W=0.00' D=1.25' Z= 2.0 '/' Top.W=5.00' n= 0.050
8.8	340	Total			

Subcatchment P2: To 104 Ditch



Summary for Subcatchment P3: To On-Site Detention

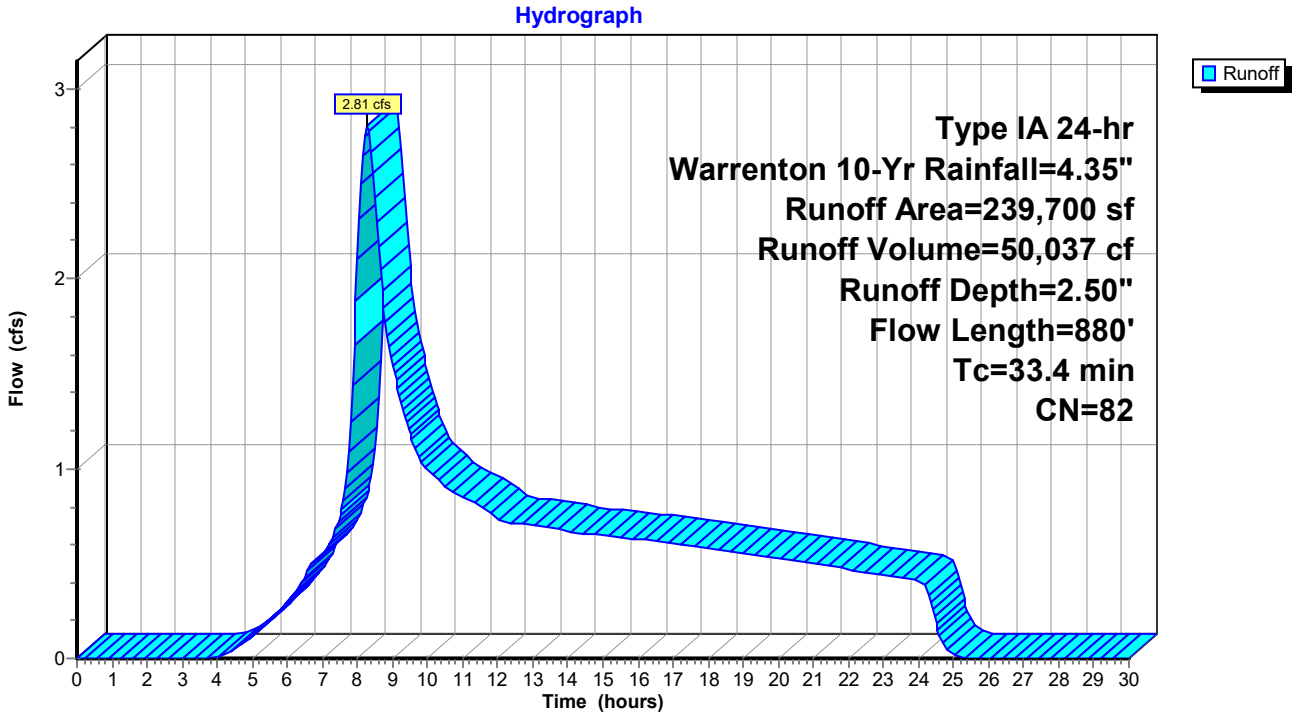
Runoff = 2.81 cfs @ 8.27 hrs, Volume= 50,037 cf, Depth= 2.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 10-Yr Rainfall=4.35"

	Area (sf)	CN	Description
*	68,500	98	Impervious
*	152,000	74	Pervious
*	19,200	89	Gravel roads, HSG C
	239,700	82	Weighted Average
	171,200	76	71.42% Pervious Area
	68,500	98	28.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.8	120	0.0080	0.09		**Sheet Flow, Sheet Flow - Avg Slope** Grass: Dense n= 0.240 P2= 3.50"
9.2	530	0.0190	0.96		**Shallow Concentrated Flow, Shallow Concentrated Flow - Avg Slo** Short Grass Pasture Kv= 7.0 fps
0.5	55	0.0100	2.03		**Shallow Concentrated Flow, Shallow Concentrated Flow - Avg Slo** Paved Kv= 20.3 fps
0.9	175	0.0100	3.10	0.61	**Pipe Channel, Pipe Flow - Avg Slope** 6.000" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.012
33.4	880	Total			

Subcatchment P3: To On-Site Detention



Summary for Subcatchment P4: To Ex CB Post-Dev

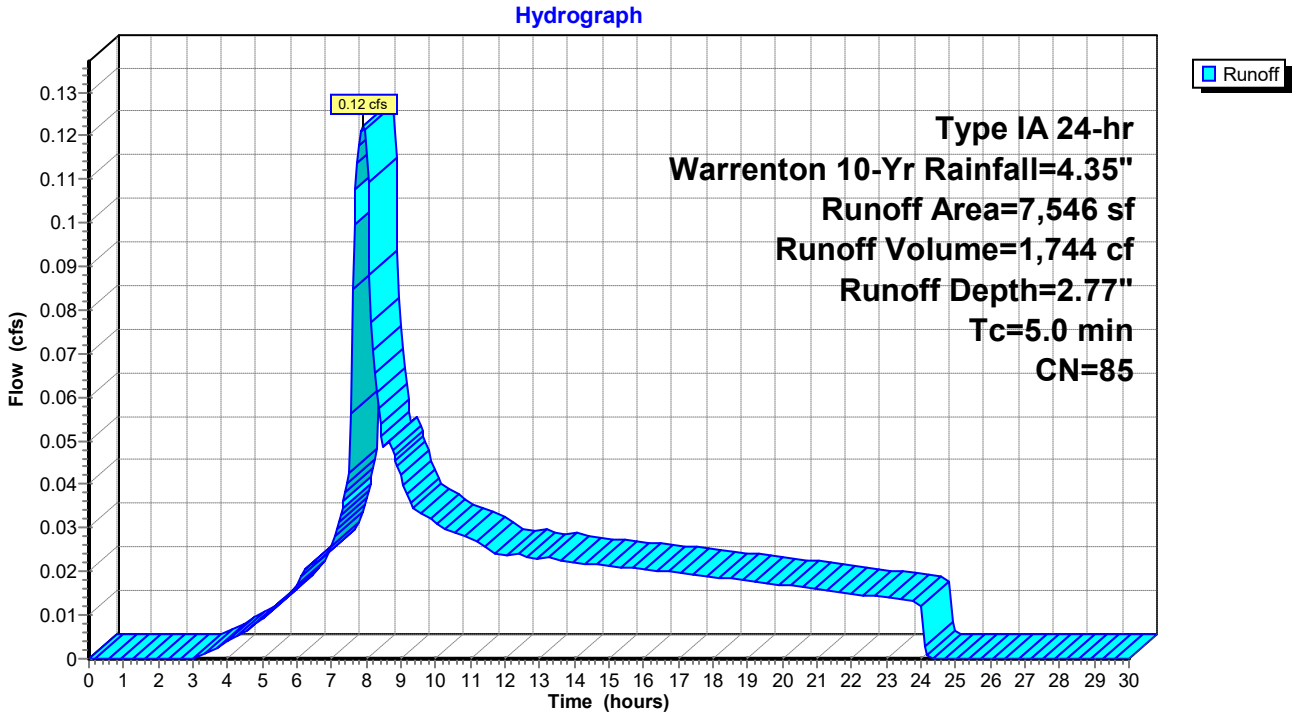
Runoff = 0.12 cfs @ 7.92 hrs, Volume= 1,744 cf, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 10-Yr Rainfall=4.35"

	Area (sf)	CN	Description
*	3,606	98	New Road & Shoulder
	3,940	74	>75% Grass cover, Good, HSG C
	7,546	85	Weighted Average
	3,940	74	52.21% Pervious Area
	3,606	98	47.79% Impervious Area

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

Subcatchment P4: To Ex CB Post-Dev



Summary for Subcatchment X1: Culvert Pre-Dev

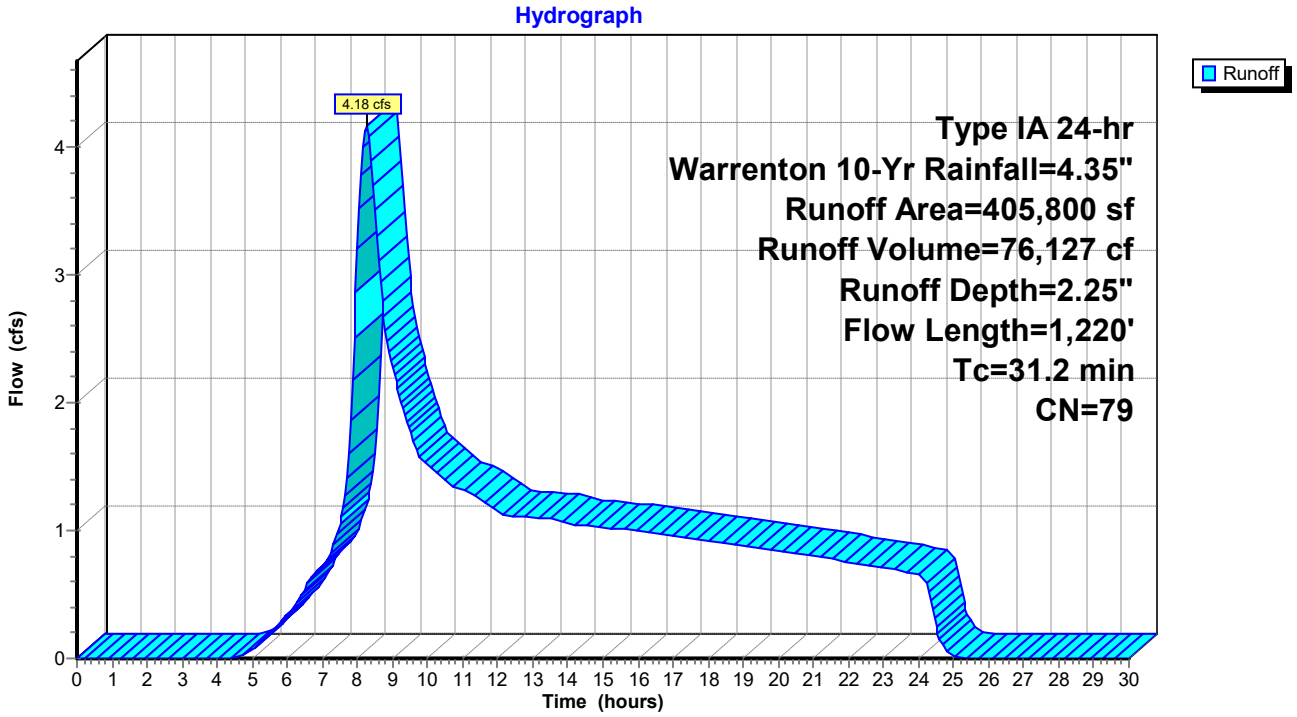
Runoff = 4.18 cfs @ 8.25 hrs, Volume= 76,127 cf, Depth= 2.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 10-Yr Rainfall=4.35"

	Area (sf)	CN	Description
*	70,700	98	Impervious
	16,200	89	Gravel roads, HSG C
*	318,900	74	>75% Grass cover, Good, HSG C
	405,800	79	Weighted Average
	335,100	75	82.58% Pervious Area
	70,700	98	17.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	75	0.0100	0.09		**Sheet Flow, Sheet Flow - Avg Slope** Grass: Dense n= 0.240 P2= 3.50"
14.6	865	0.0200	0.99		**Shallow Concentrated Flow, Shallow Concentrated Flow - Avg Slo** Short Grass Pasture Kv= 7.0 fps
1.5	50	0.0010	0.55	1.10	**Trap/Vee/Rect Channel Flow, 104 Ditch - Avg Slope** Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00' n= 0.050
0.8	230	0.0087	4.58	3.60	**Pipe Channel, 104 Storm - Avg Slope** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
31.2	1,220	Total			

Subcatchment X1: Culvert Pre-Dev



Summary for Subcatchment X2: To Ex CB Pre-Dev

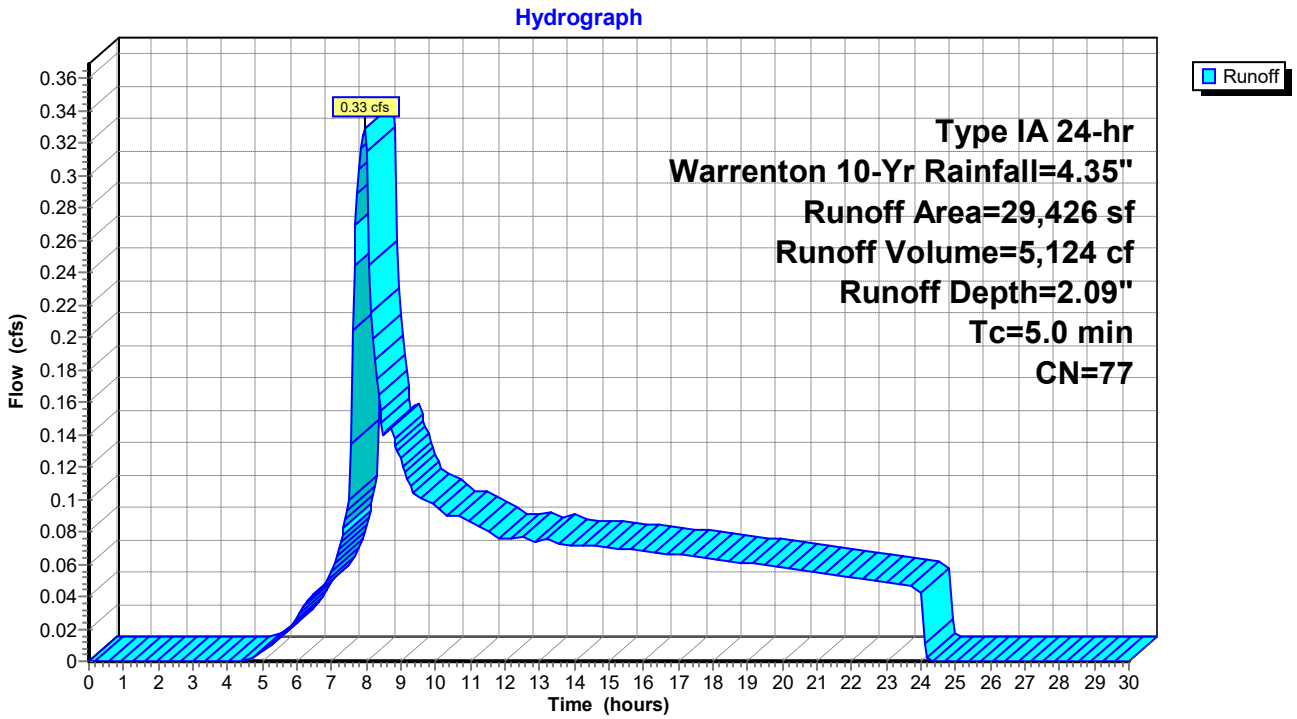
Runoff = 0.33 cfs @ 7.97 hrs, Volume= 5,124 cf, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 10-Yr Rainfall=4.35"

Area (sf)	CN	Description
5,016	89	Gravel roads, HSG C
24,410	74	>75% Grass cover, Good, HSG C
29,426	77	Weighted Average
29,426	77	100.00% Pervious Area

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

Subcatchment X2: To Ex CB Pre-Dev



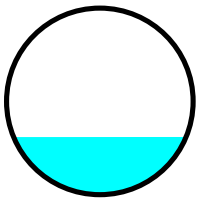
Summary for Reach 1R: Stm to Ex Gully

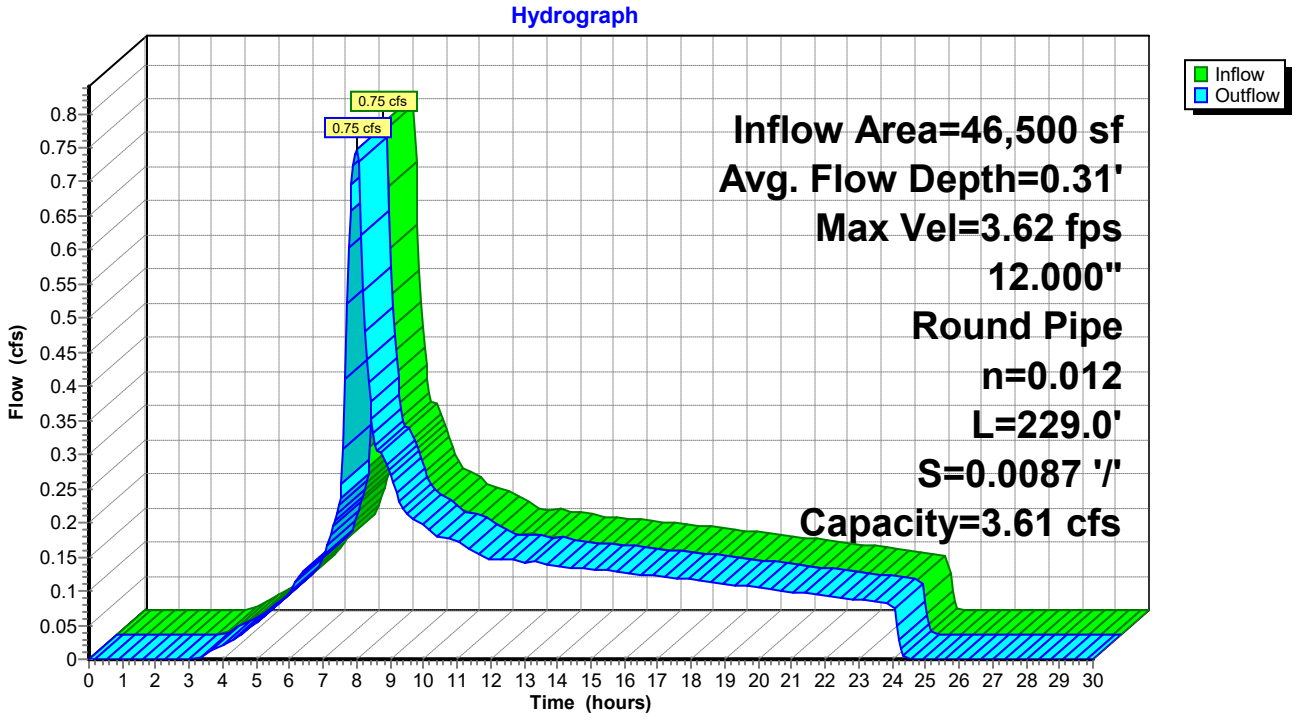
Inflow Area = 46,500 sf, 43.23% Impervious, Inflow Depth = 2.77" for Warrenton 10-Yr event
Inflow = 0.75 cfs @ 7.98 hrs, Volume= 10,745 cf
Outflow = 0.75 cfs @ 8.00 hrs, Volume= 10,745 cf, Atten= 0%, Lag= 1.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.62 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 2.07 fps, Avg. Travel Time= 1.8 min

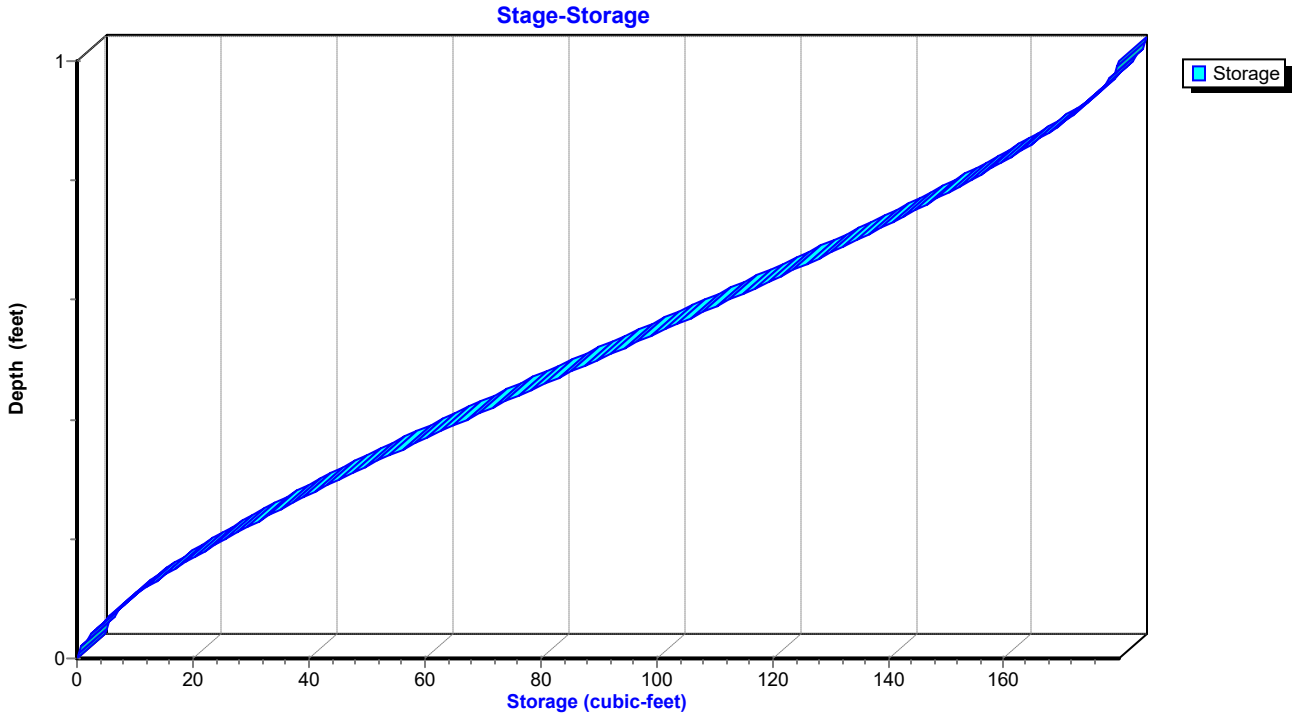
Peak Storage= 47 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.61 cfs

12.000" Round Pipe
n= 0.012
Length= 229.0' Slope= 0.0087 '/'
Inlet Invert= 22.78', Outlet Invert= 20.78'





Reach 1R: Stm to Ex Gully

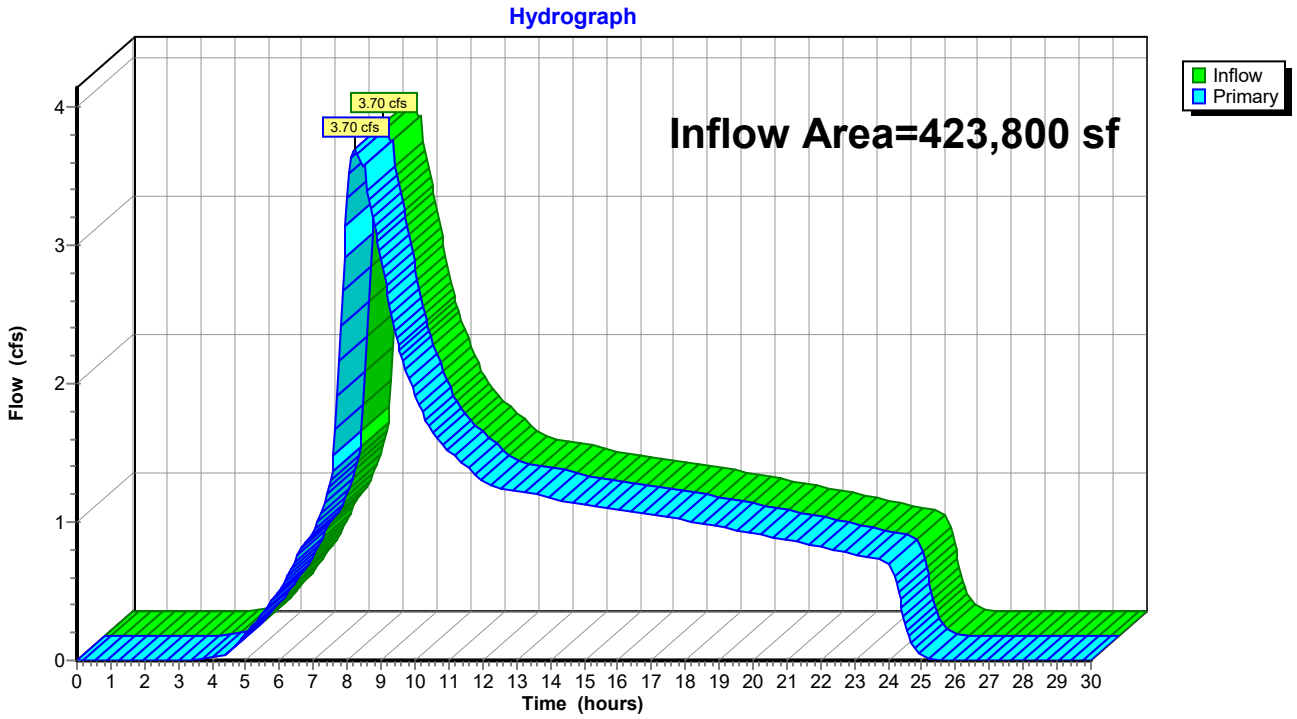


Summary for Pond CULV: Culvert Post-Dev

Inflow Area = 423,800 sf, 27.89% Impervious, Inflow Depth = 2.45" for Warrenton 10-Yr event
Inflow = 3.70 cfs @ 8.24 hrs, Volume= 86,556 cf
Primary = 3.70 cfs @ 8.24 hrs, Volume= 86,556 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Pond CULV: Culvert Post-Dev



Summary for Pond DET1: On-Site Detention

Inflow Area = 239,700 sf, 28.58% Impervious, Inflow Depth = 2.50" for Warrenton 10-Yr event
Inflow = 2.81 cfs @ 8.27 hrs, Volume= 50,037 cf
Outflow = 2.37 cfs @ 8.55 hrs, Volume= 49,998 cf, Atten= 16%, Lag= 16.7 min
Primary = 2.07 cfs @ 8.55 hrs, Volume= 49,548 cf
Secondary = 0.15 cfs @ 8.55 hrs, Volume= 423 cf
Tertiary = 0.15 cfs @ 8.55 hrs, Volume= 26 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 32.06' @ 8.55 hrs Surf.Area= 20 sf Storage= 2,495 cf

Plug-Flow detention time= 9.7 min calculated for 49,915 cf (100% of inflow)
Center-of-Mass det. time= 9.2 min (812.2 - 803.0)

Volume	Invert	Avail.Storage	Storage Description
#1	27.00'	2,356 cf	**60.000" Round Pipe Storage** L= 120.0'
#2	25.00'	147 cf	**5.00'D x 7.50'H Vertical Cone/Cylinder**
		2,503 cf	Total Available Storage

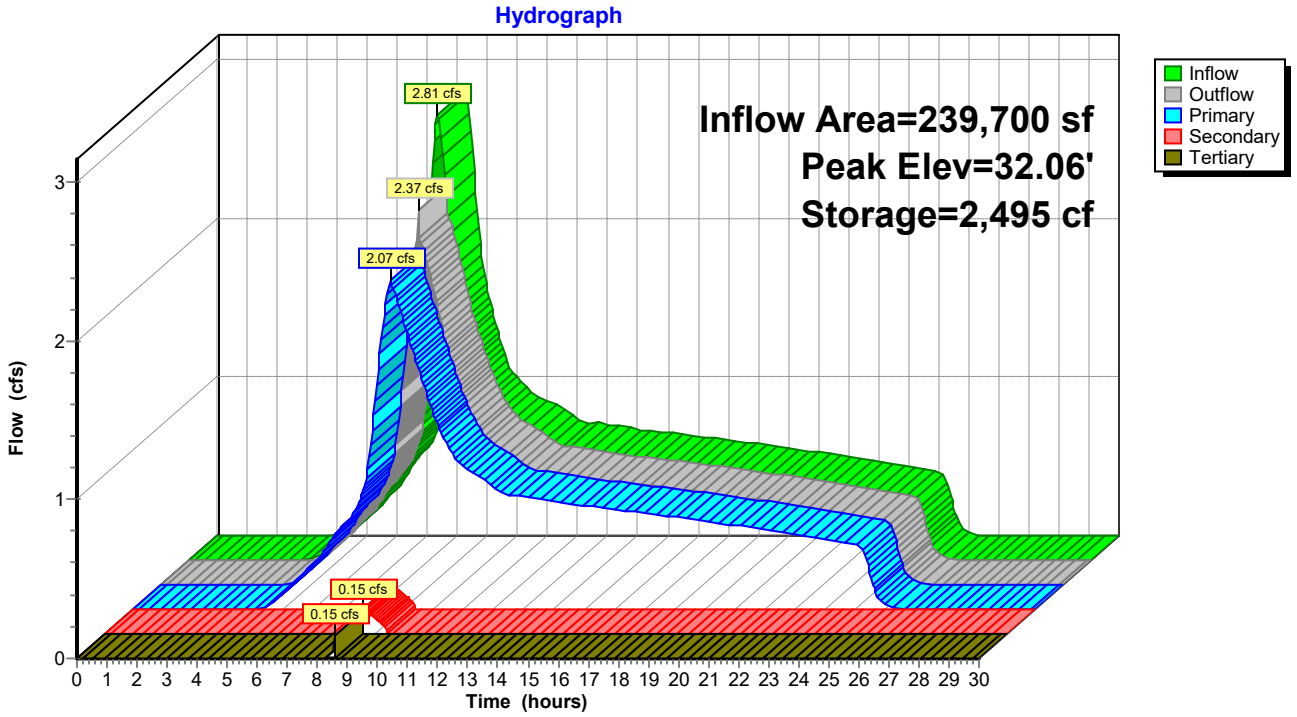
Device	Routing	Invert	Outlet Devices
#1	Primary	27.00'	**6.000" Vert. Orifice at IE** C= 0.600
#2	Secondary	30.00'	**2.000" Vert. Upper Orifice** C= 0.600
#3	Tertiary	32.00'	**12.000" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.07 cfs @ 8.55 hrs HW=32.05' (Free Discharge)
└**1=Orifice at IE** (Orifice Controls 2.07 cfs @ 10.54 fps)

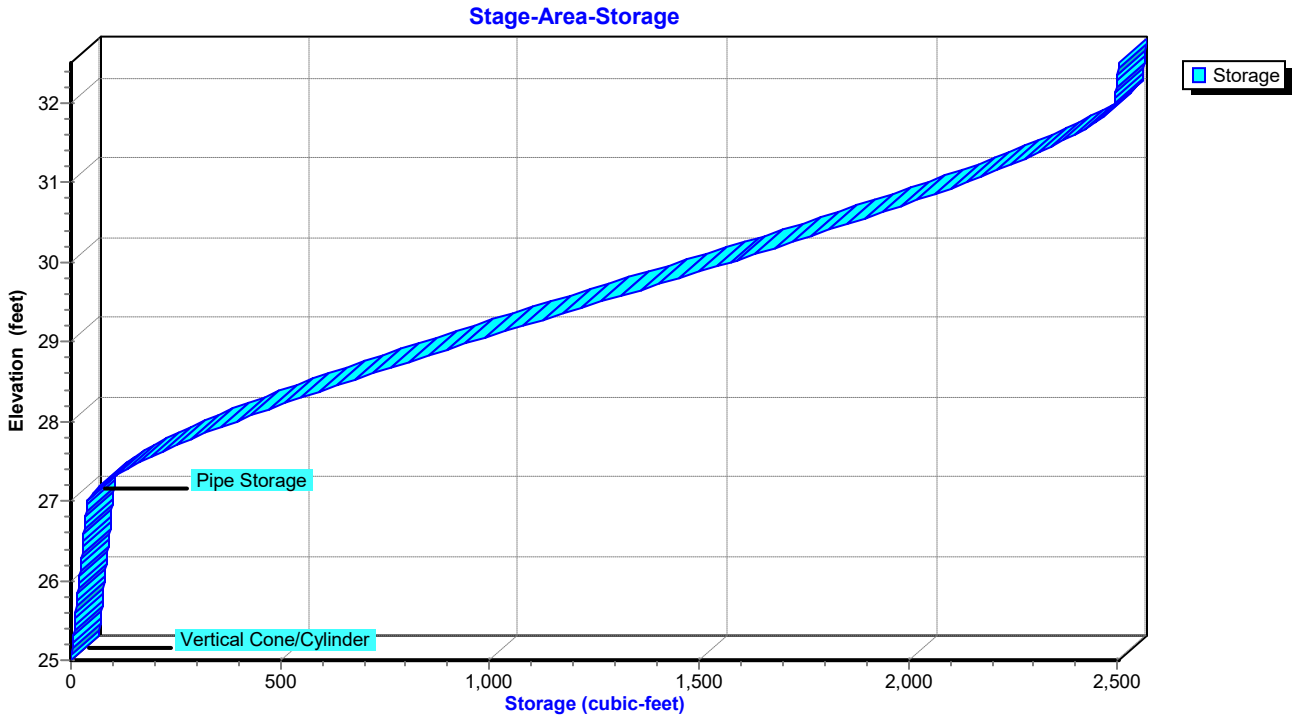
Secondary OutFlow Max=0.15 cfs @ 8.55 hrs HW=32.05' (Free Discharge)
└**2=Upper Orifice** (Orifice Controls 0.15 cfs @ 6.75 fps)

Tertiary OutFlow Max=0.14 cfs @ 8.55 hrs HW=32.06' (Free Discharge)
└**3=Overflow** (Weir Controls 0.14 cfs @ 0.78 fps)

Pond DET1: On-Site Detention



Pond DET1: On-Site Detention



Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: To Ex Gully Runoff Area=137,600 sf 21.51% Impervious Runoff Depth=3.77"
Flow Length=380' Tc=22.6 min CN=79 Runoff=2.74 cfs 43,219 cf

Subcatchment P2: To 104 Ditch Runoff Area=46,500 sf 43.23% Impervious Runoff Depth=4.40"
Flow Length=340' Tc=8.8 min CN=85 Runoff=1.22 cfs 17,038 cf

Subcatchment P3: To On-Site Detention Runoff Area=239,700 sf 28.58% Impervious Runoff Depth=4.08"
Flow Length=880' Tc=33.4 min CN=82 Runoff=4.79 cfs 81,482 cf

Subcatchment P4: To Ex CB Post-Dev Runoff Area=7,546 sf 47.79% Impervious Runoff Depth=4.40"
Tc=5.0 min CN=85 Runoff=0.20 cfs 2,765 cf

Subcatchment X1: Culvert Pre-Dev Runoff Area=405,800 sf 17.42% Impervious Runoff Depth=3.77"
Flow Length=1,220' Tc=31.2 min CN=79 Runoff=7.46 cfs 127,457 cf

Subcatchment X2: To Ex CB Pre-Dev Runoff Area=29,426 sf 0.00% Impervious Runoff Depth=3.57"
Tc=5.0 min CN=77 Runoff=0.60 cfs 8,746 cf

Reach 1R: Stm to Ex Gully Avg. Flow Depth=0.40' Max Vel=4.14 fps Inflow=1.22 cfs 17,038 cf
12.000" Round Pipe n=0.012 L=229.0' S=0.0087 '/' Capacity=3.61 cfs Outflow=1.21 cfs 17,038 cf

Pond CULV: Culvert Post-Dev Inflow=9.47 cfs 141,700 cf
Primary=9.47 cfs 141,700 cf

Pond DET1: On-Site Detention Peak Elev=32.85' Storage=2,503 cf Inflow=4.79 cfs 81,482 cf
Primary=2.24 cfs 74,991 cf Secondary=0.17 cfs 1,110 cf Tertiary=3.49 cfs 5,342 cf Outflow=5.90 cfs 81,443 cf

Total Runoff Area = 866,572 sf Runoff Volume = 280,707 cf Average Runoff Depth = 3.89"
77.79% Pervious = 674,066 sf 22.21% Impervious = 192,506 sf

Summary for Subcatchment P1: To Ex Gully

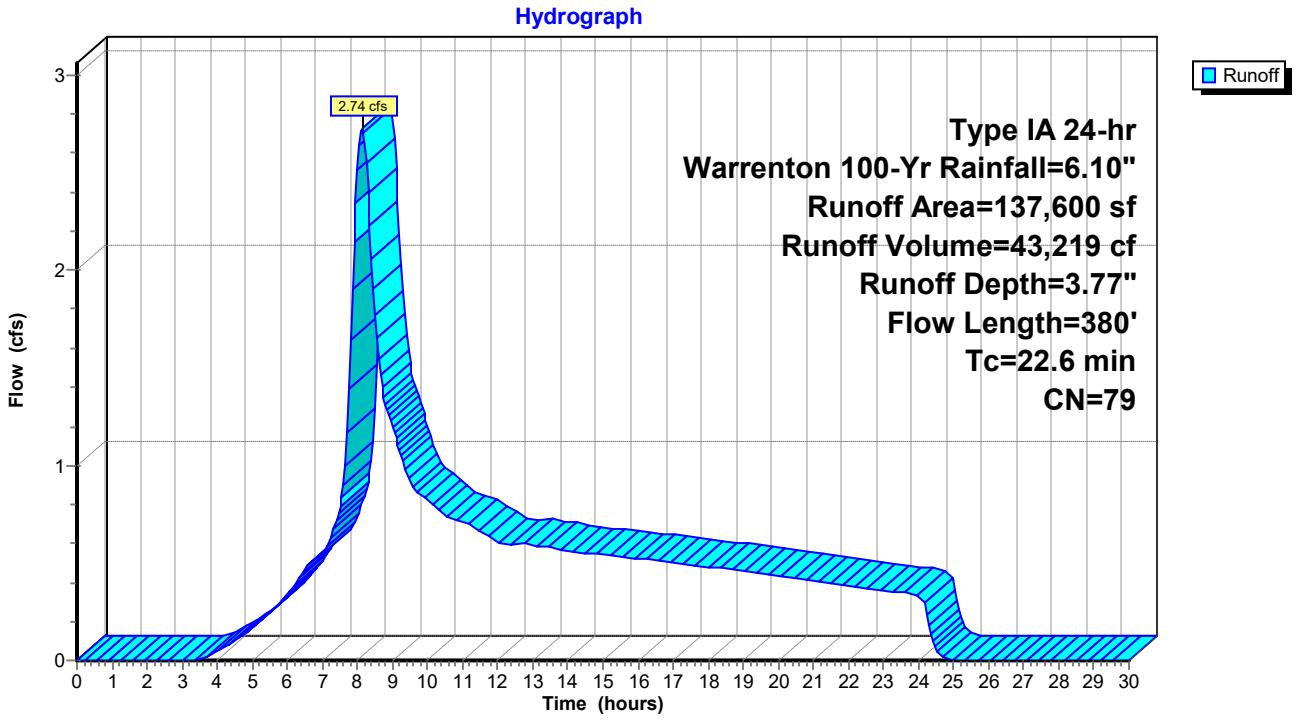
Runoff = 2.74 cfs @ 8.14 hrs, Volume= 43,219 cf, Depth= 3.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 100-Yr Rainfall=6.10"

	Area (sf)	CN	Description
*	29,600	98	Impervious
	108,000	74	>75% Grass cover, Good, HSG C
	137,600	79	Weighted Average
	108,000	74	78.49% Pervious Area
	29,600	98	21.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.2	260	0.0400	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.50"
0.4	120	0.0110	5.15	4.05	**Pipe Channel,** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
22.6	380	Total			

Subcatchment P1: To Ex Gully



Summary for Subcatchment P2: To 104 Ditch

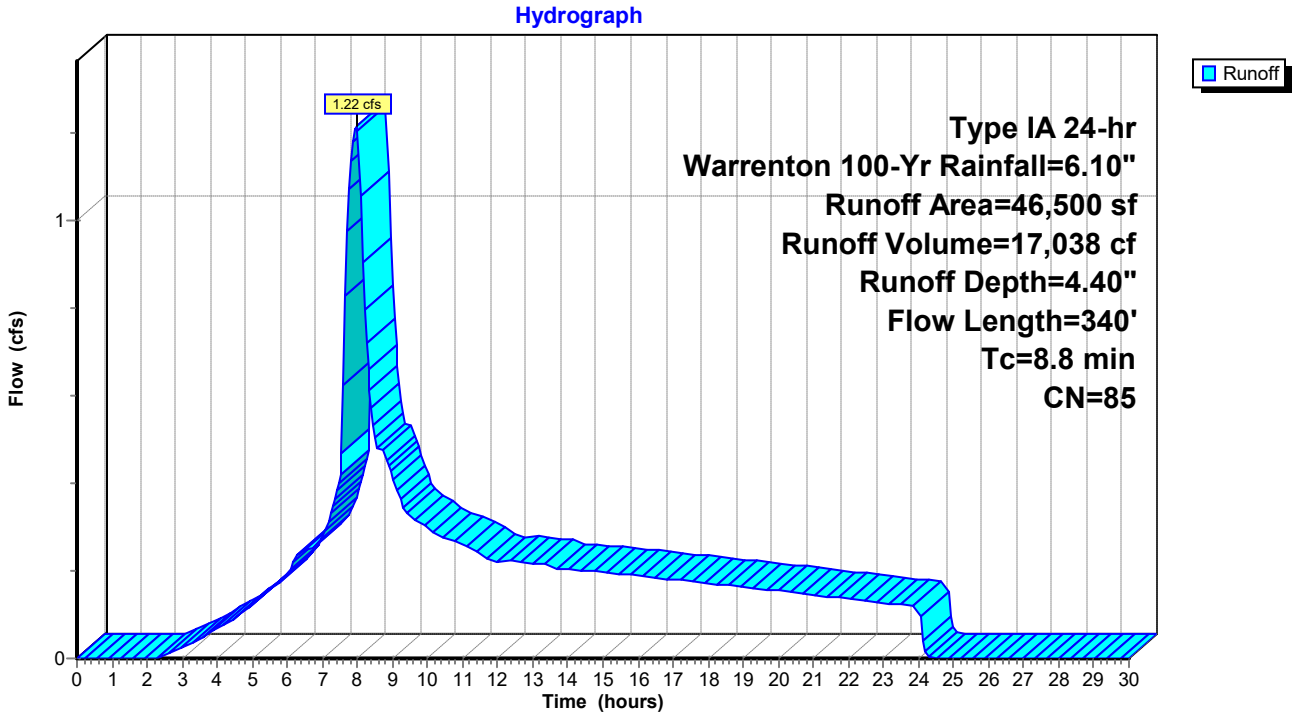
Runoff = 1.22 cfs @ 7.96 hrs, Volume= 17,038 cf, Depth= 4.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 100-Yr Rainfall=6.10"

	Area (sf)	CN	Description
*	20,100	98	Impervious
*	600	89	Gravel roads, HSG C
	25,800	74	>75% Grass cover, Good, HSG C
	46,500	85	Weighted Average
	26,400	74	56.77% Pervious Area
	20,100	98	43.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	120	0.0990	0.35		**Sheet Flow, Grass - Avg Slope** Grass: Short n= 0.150 P2= 3.50"
0.2	45	0.0240	3.14		**Shallow Concentrated Flow, Gutter - Avg Slope** Paved Kv= 20.3 fps
0.2	35	0.0050	3.47	2.73	**Pipe Channel, New Pipe Flow - Avg Slope** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
0.2	20	0.0050	1.43	4.46	**Trap/Vee/Rect Channel Flow, 104 Ditch Flow - Avg Slope** Bot.W=0.00' D=1.25' Z= 2.0 '/' Top.W=5.00' n= 0.050
0.1	30	0.0070	4.11	3.23	**Pipe Channel, 104 Culvert - Avg Slope** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
2.4	90	0.0010	0.64	1.99	**Trap/Vee/Rect Channel Flow, 104 Ditch Flow - Avg Slope** Bot.W=0.00' D=1.25' Z= 2.0 '/' Top.W=5.00' n= 0.050
8.8	340	Total			

Subcatchment P2: To 104 Ditch



Summary for Subcatchment P3: To On-Site Detention

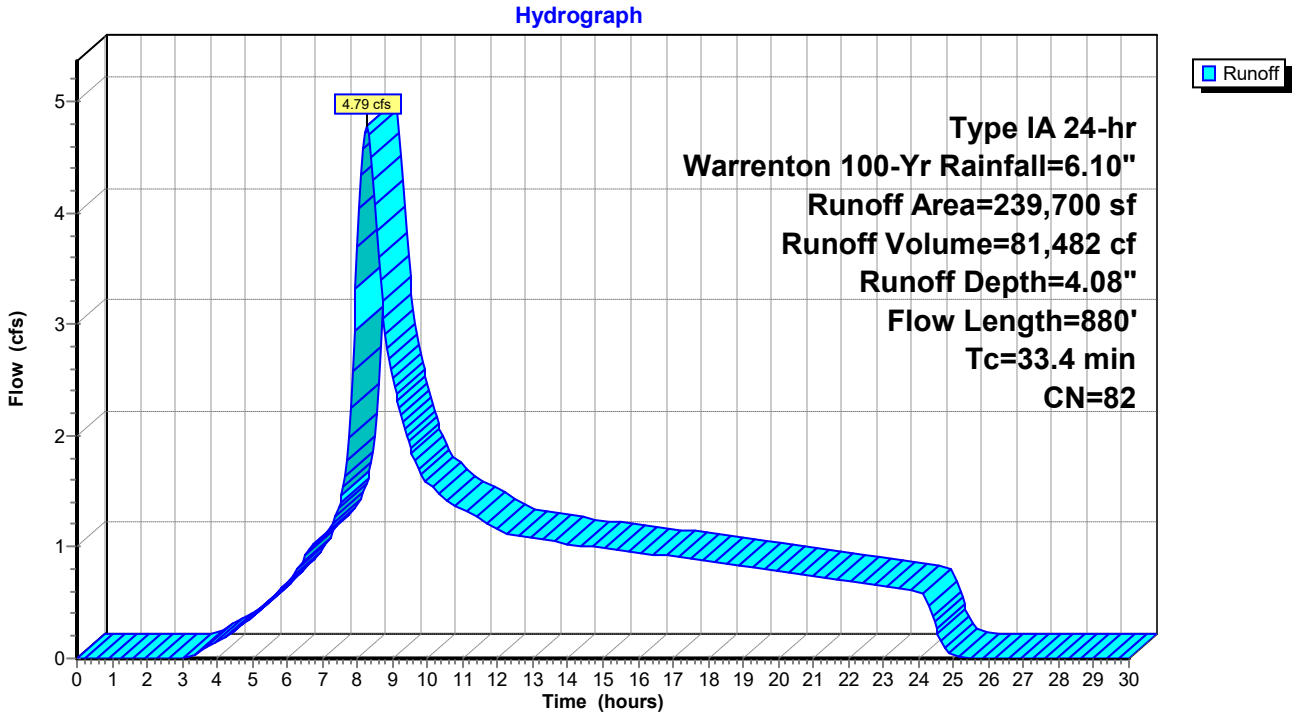
Runoff = 4.79 cfs @ 8.26 hrs, Volume= 81,482 cf, Depth= 4.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 100-Yr Rainfall=6.10"

	Area (sf)	CN	Description
*	68,500	98	Impervious
*	152,000	74	Pervious
*	19,200	89	Gravel roads, HSG C
	239,700	82	Weighted Average
	171,200	76	71.42% Pervious Area
	68,500	98	28.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.8	120	0.0080	0.09		**Sheet Flow, Sheet Flow - Avg Slope** Grass: Dense n= 0.240 P2= 3.50"
9.2	530	0.0190	0.96		**Shallow Concentrated Flow, Shallow Concentrated Flow - Avg Slo** Short Grass Pasture Kv= 7.0 fps
0.5	55	0.0100	2.03		**Shallow Concentrated Flow, Shallow Concentrated Flow - Avg Slo** Paved Kv= 20.3 fps
0.9	175	0.0100	3.10	0.61	**Pipe Channel, Pipe Flow - Avg Slope** 6.000" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.012
33.4	880	Total			

Subcatchment P3: To On-Site Detention



Summary for Subcatchment P4: To Ex CB Post-Dev

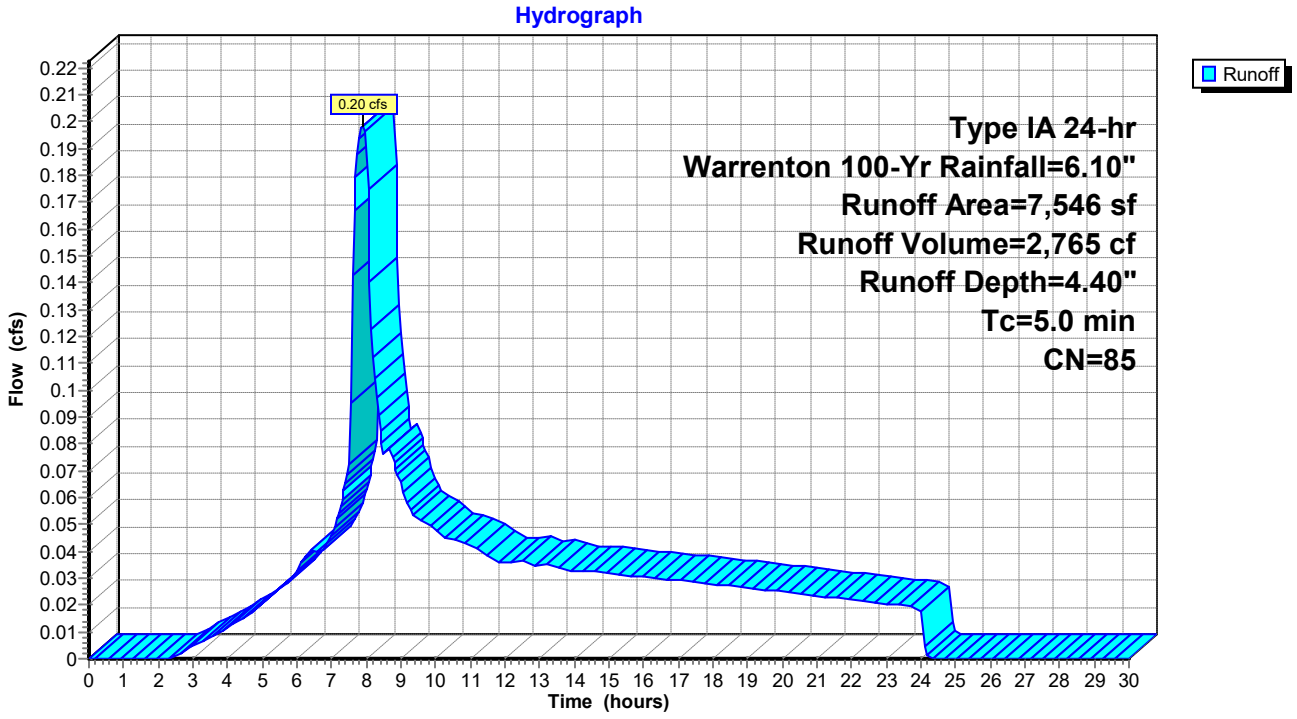
Runoff = 0.20 cfs @ 7.90 hrs, Volume= 2,765 cf, Depth= 4.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 100-Yr Rainfall=6.10"

	Area (sf)	CN	Description
*	3,606	98	New Road & Shoulder
	3,940	74	>75% Grass cover, Good, HSG C
	7,546	85	Weighted Average
	3,940	74	52.21% Pervious Area
	3,606	98	47.79% Impervious Area

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

Subcatchment P4: To Ex CB Post-Dev



Summary for Subcatchment X1: Culvert Pre-Dev

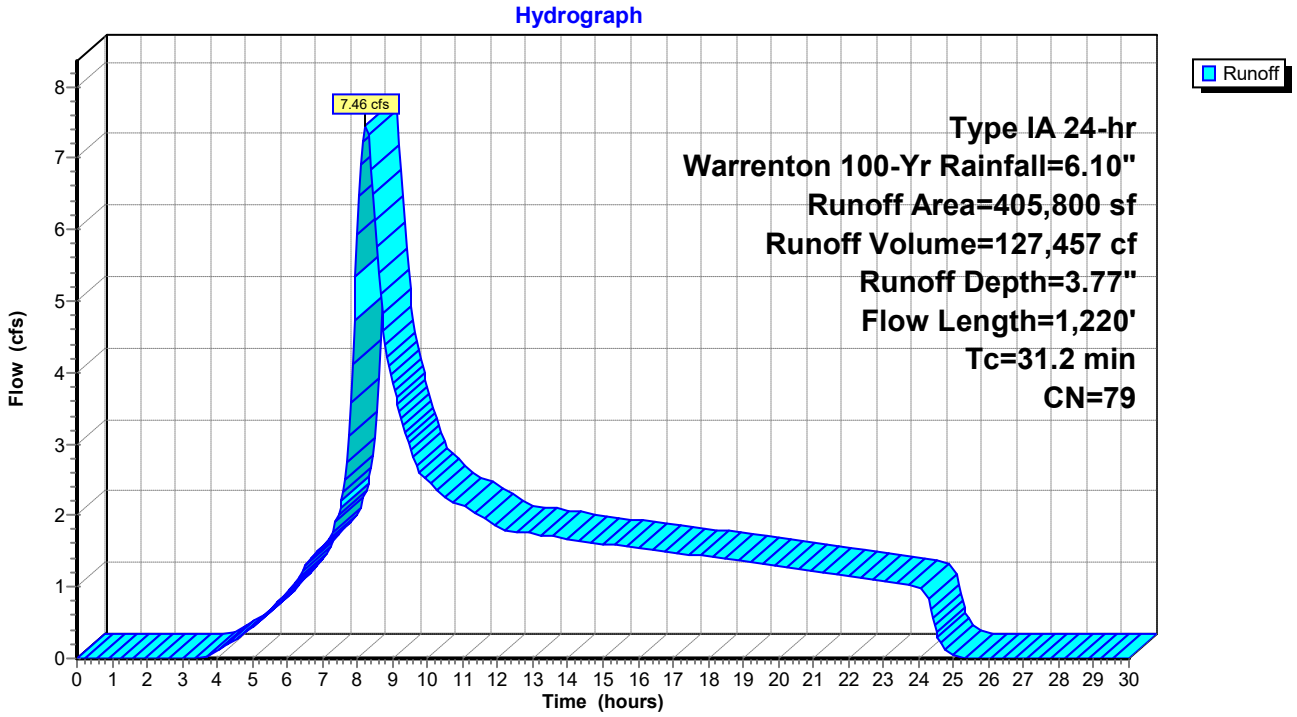
Runoff = 7.46 cfs @ 8.24 hrs, Volume= 127,457 cf, Depth= 3.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 100-Yr Rainfall=6.10"

	Area (sf)	CN	Description
*	70,700	98	Impervious
	16,200	89	Gravel roads, HSG C
*	318,900	74	>75% Grass cover, Good, HSG C
	405,800	79	Weighted Average
	335,100	75	82.58% Pervious Area
	70,700	98	17.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	75	0.0100	0.09		**Sheet Flow, Sheet Flow - Avg Slope** Grass: Dense n= 0.240 P2= 3.50"
14.6	865	0.0200	0.99		**Shallow Concentrated Flow, Shallow Concentrated Flow - Avg Slo** Short Grass Pasture Kv= 7.0 fps
1.5	50	0.0010	0.55	1.10	**Trap/Vee/Rect Channel Flow, 104 Ditch - Avg Slope** Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00' n= 0.050
0.8	230	0.0087	4.58	3.60	**Pipe Channel, 104 Storm - Avg Slope** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
31.2	1,220	Total			

Subcatchment X1: Culvert Pre-Dev



Summary for Subcatchment X2: To Ex CB Pre-Dev

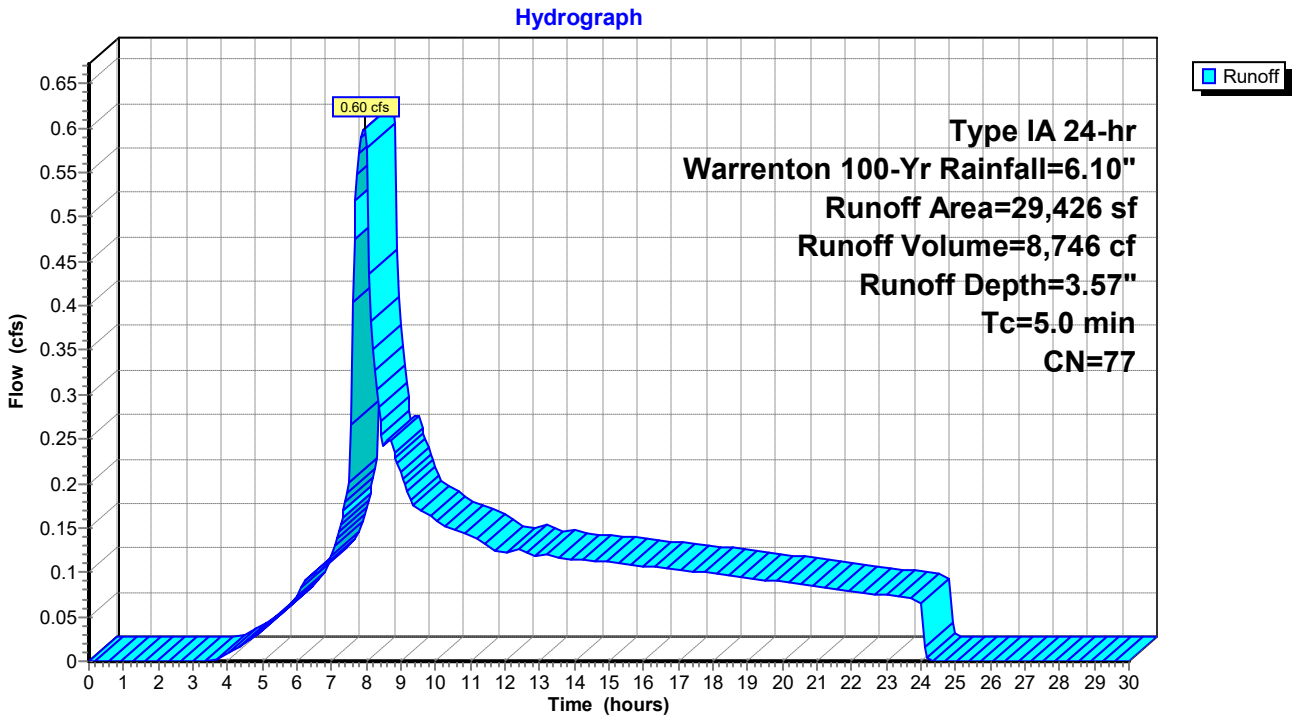
Runoff = 0.60 cfs @ 7.94 hrs, Volume= 8,746 cf, Depth= 3.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton 100-Yr Rainfall=6.10"

Area (sf)	CN	Description
5,016	89	Gravel roads, HSG C
24,410	74	>75% Grass cover, Good, HSG C
29,426	77	Weighted Average
29,426	77	100.00% Pervious Area

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

Subcatchment X2: To Ex CB Pre-Dev



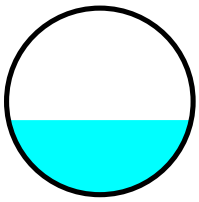
Summary for Reach 1R: Stm to Ex Gully

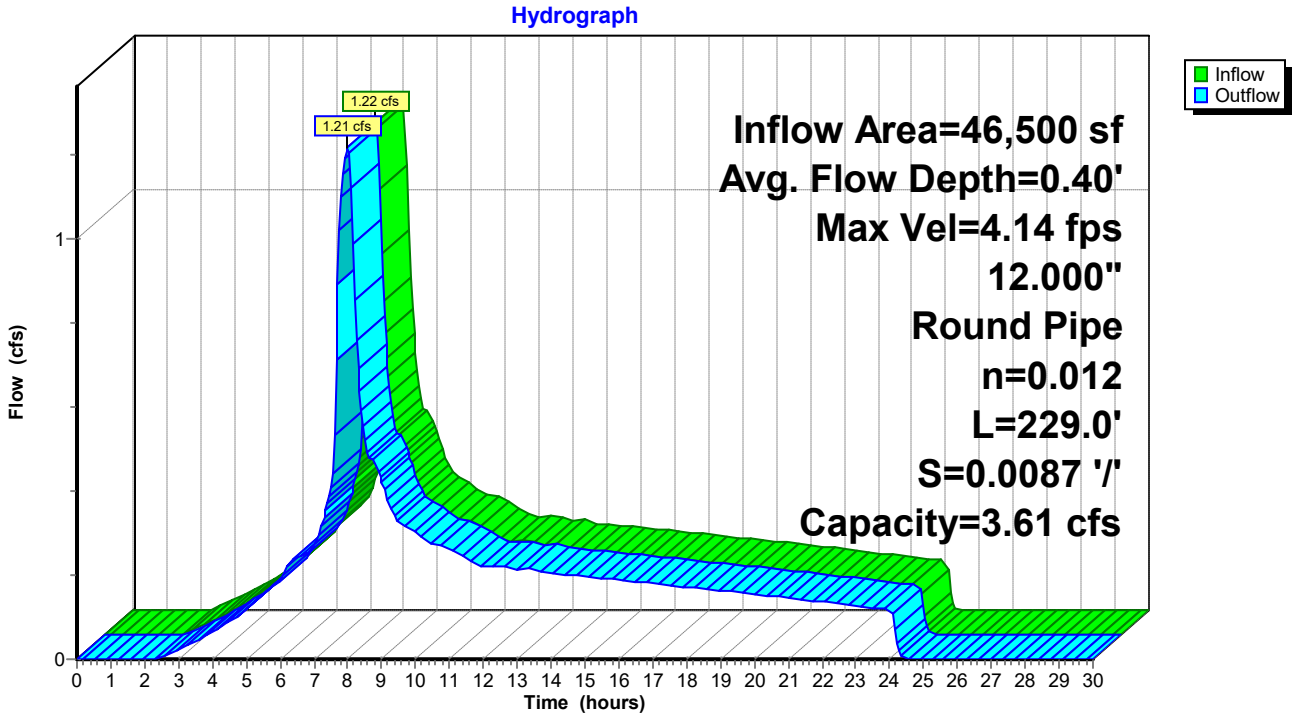
Inflow Area = 46,500 sf, 43.23% Impervious, Inflow Depth = 4.40" for Warrenton 100-Yr event
Inflow = 1.22 cfs @ 7.96 hrs, Volume= 17,038 cf
Outflow = 1.21 cfs @ 7.98 hrs, Volume= 17,038 cf, Atten= 0%, Lag= 1.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.14 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 2.34 fps, Avg. Travel Time= 1.6 min

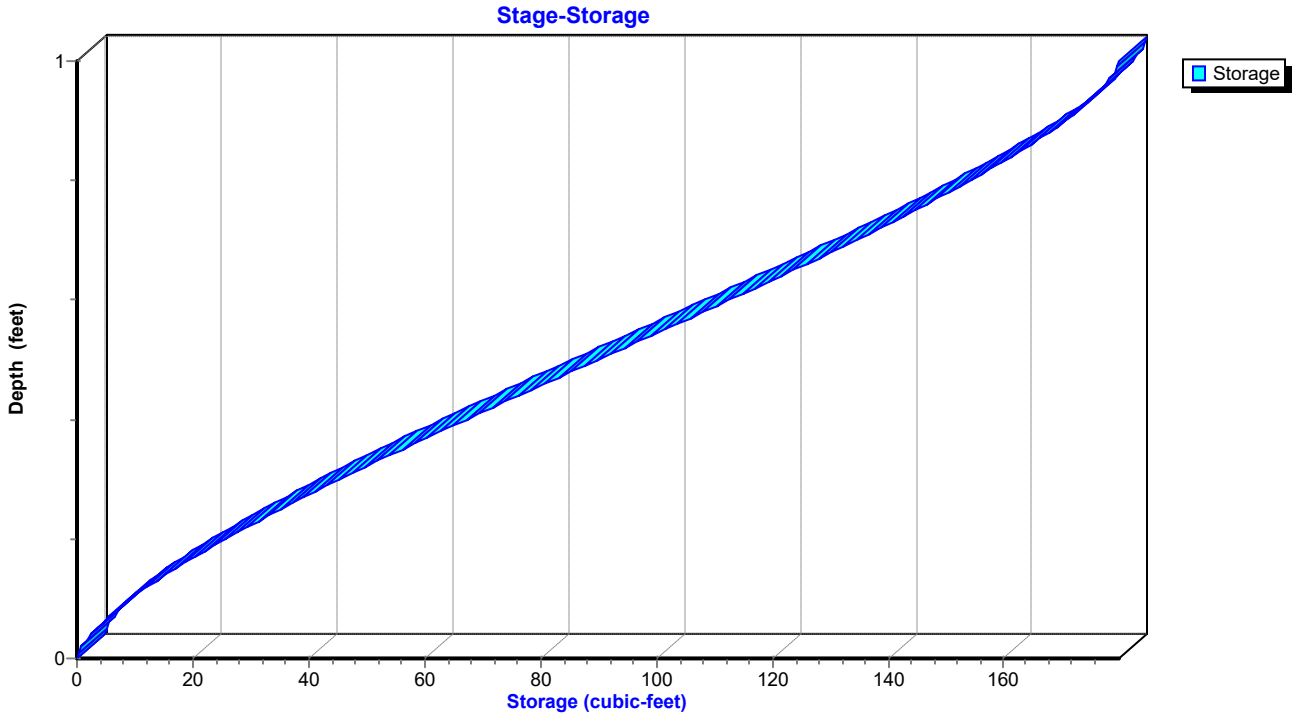
Peak Storage= 67 cf @ 7.97 hrs
Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.61 cfs

12.000" Round Pipe
n= 0.012
Length= 229.0' Slope= 0.0087 '/'
Inlet Invert= 22.78', Outlet Invert= 20.78'





Reach 1R: Stm to Ex Gully

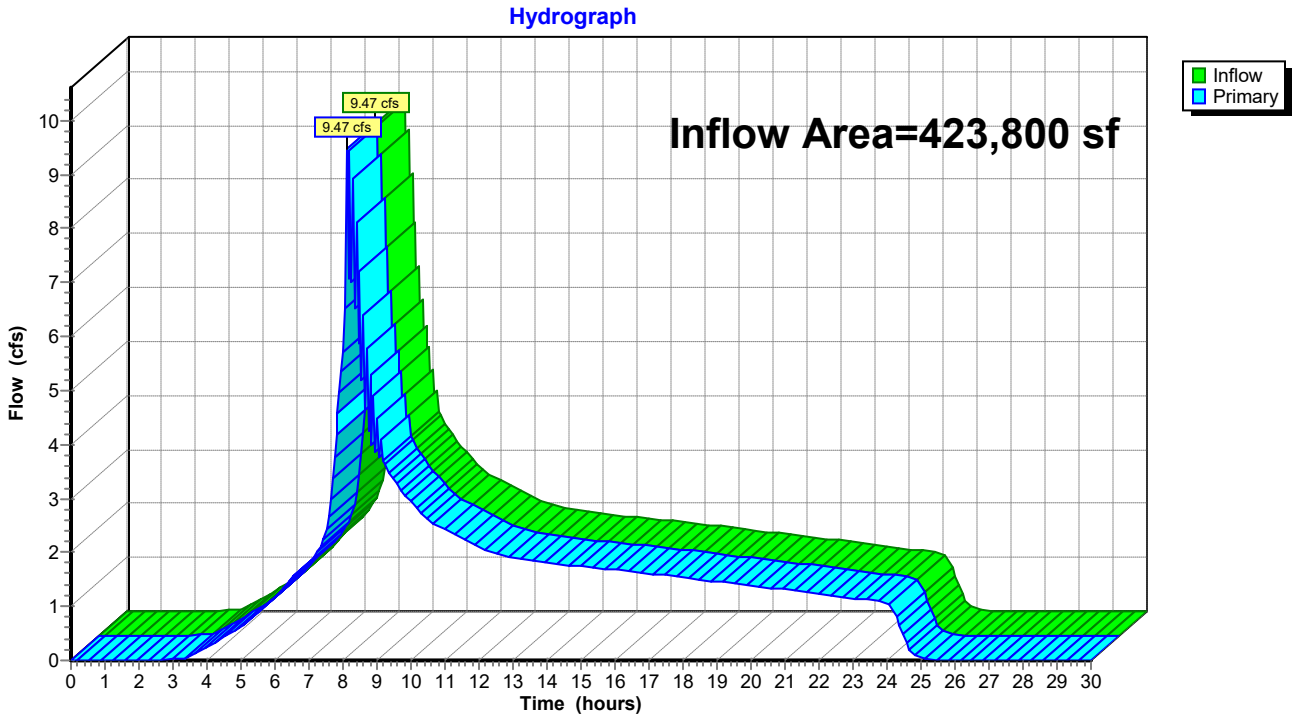


Summary for Pond CULV: Culvert Post-Dev

Inflow Area = 423,800 sf, 27.89% Impervious, Inflow Depth = 4.01" for Warrenton 100-Yr event
Inflow = 9.47 cfs @ 8.10 hrs, Volume= 141,700 cf
Primary = 9.47 cfs @ 8.10 hrs, Volume= 141,700 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Pond CULV: Culvert Post-Dev



Summary for Pond DET1: On-Site Detention

Inflow Area = 239,700 sf, 28.58% Impervious, Inflow Depth = 4.08" for Warrenton 100-Yr event
Inflow = 4.79 cfs @ 8.26 hrs, Volume= 81,482 cf
Outflow = 5.90 cfs @ 8.20 hrs, Volume= 81,443 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.24 cfs @ 8.20 hrs, Volume= 74,991 cf
Secondary = 0.17 cfs @ 8.20 hrs, Volume= 1,110 cf
Tertiary = 3.49 cfs @ 8.20 hrs, Volume= 5,342 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 32.85' @ 8.20 hrs Surf.Area= 20 sf Storage= 2,503 cf

Plug-Flow detention time= 11.4 min calculated for 81,443 cf (100% of inflow)
Center-of-Mass det. time= 10.9 min (786.3 - 775.4)

Volume	Invert	Avail.Storage	Storage Description
#1	27.00'	2,356 cf	**60.000" Round Pipe Storage** L= 120.0'
#2	25.00'	147 cf	**5.00'D x 7.50'H Vertical Cone/Cylinder**
		2,503 cf	Total Available Storage

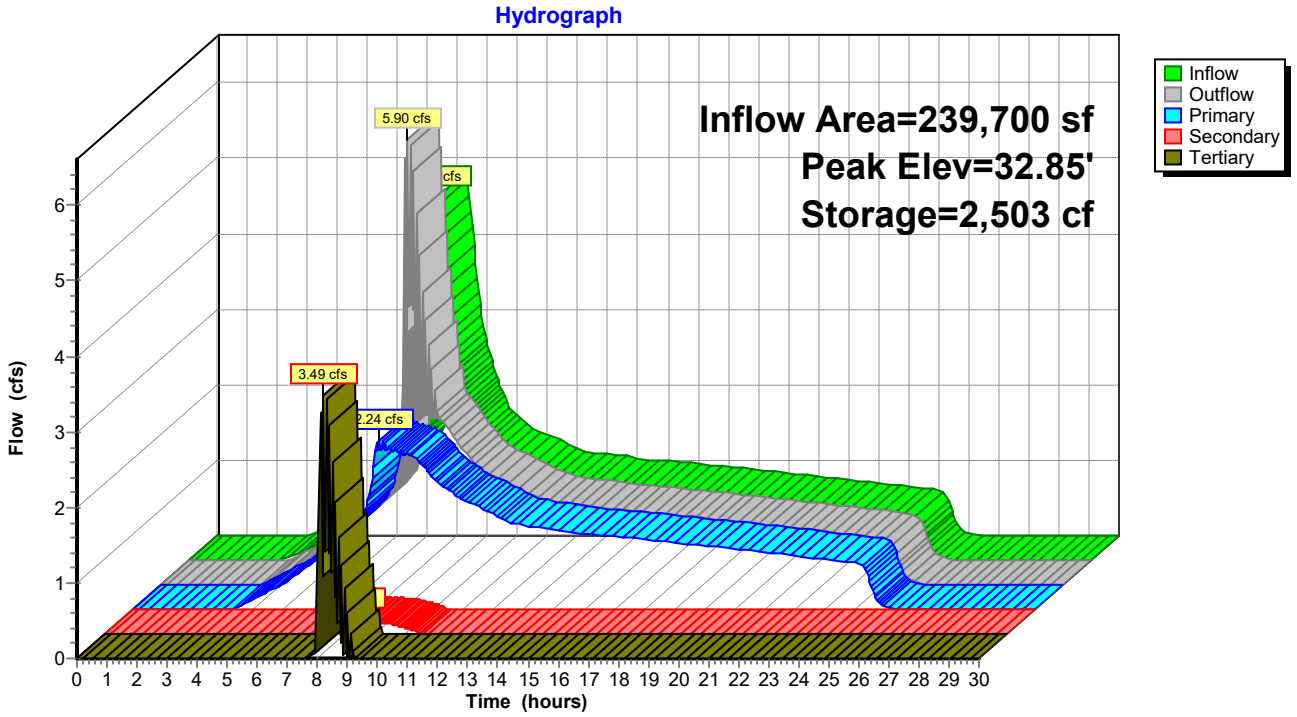
Device	Routing	Invert	Outlet Devices
#1	Primary	27.00'	**6.000" Vert. Orifice at IE** C= 0.600
#2	Secondary	30.00'	**2.000" Vert. Upper Orifice** C= 0.600
#3	Tertiary	32.00'	**12.000" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.24 cfs @ 8.20 hrs HW=32.84' (Free Discharge)
└**1=Orifice at IE** (Orifice Controls 2.24 cfs @ 11.38 fps)

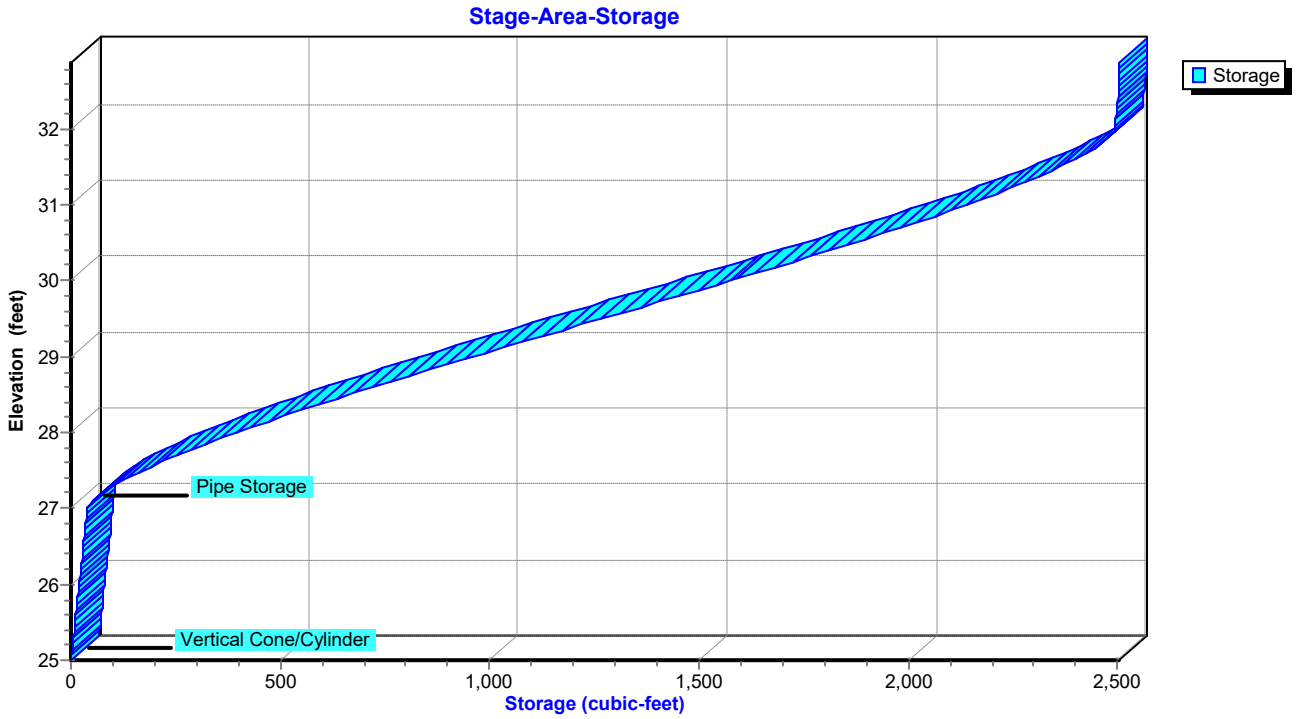
Secondary OutFlow Max=0.17 cfs @ 8.20 hrs HW=32.84' (Free Discharge)
└**2=Upper Orifice** (Orifice Controls 0.17 cfs @ 7.99 fps)

Tertiary OutFlow Max=3.44 cfs @ 8.20 hrs HW=32.83' (Free Discharge)
└**3=Overflow** (Orifice Controls 3.44 cfs @ 4.39 fps)

Pond DET1: On-Site Detention



Pond DET1: On-Site Detention



Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P1: To Ex Gully Runoff Area=137,600 sf 21.51% Impervious Runoff Depth=0.28"
Flow Length=380' Tc=22.6 min CN=79 Runoff=0.07 cfs 3,234 cf

Subcatchment P2: To 104 Ditch Runoff Area=46,500 sf 43.23% Impervious Runoff Depth=0.48"
Flow Length=340' Tc=8.8 min CN=85 Runoff=0.09 cfs 1,875 cf

Subcatchment P3: To On-Site Detention Runoff Area=239,700 sf 28.58% Impervious Runoff Depth=0.37"
Flow Length=880' Tc=33.4 min CN=82 Runoff=0.22 cfs 7,457 cf

Subcatchment P4: To Ex CB Post-Dev Runoff Area=7,546 sf 47.79% Impervious Runoff Depth=0.48"
Tc=5.0 min CN=85 Runoff=0.02 cfs 304 cf

Subcatchment X1: Culvert Pre-Dev Runoff Area=405,800 sf 17.42% Impervious Runoff Depth=0.28"
Flow Length=1,220' Tc=31.2 min CN=79 Runoff=0.19 cfs 9,539 cf

Subcatchment X2: To Ex CB Pre-Dev Runoff Area=29,426 sf 0.00% Impervious Runoff Depth=0.23"
Tc=5.0 min CN=77 Runoff=0.01 cfs 565 cf

Reach 1R: Stm to Ex Gully Avg. Flow Depth=0.11' Max Vel=1.97 fps Inflow=0.09 cfs 1,875 cf
12.000" Round Pipe n=0.012 L=229.0' S=0.0087 '/' Capacity=3.61 cfs Outflow=0.09 cfs 1,875 cf

Pond CULV: Culvert Post-Dev Inflow=0.34 cfs 12,527 cf
Primary=0.34 cfs 12,527 cf

Pond DET1: On-Site Detention Peak Elev=27.29' Storage=100 cf Inflow=0.22 cfs 7,457 cf
Primary=0.22 cfs 7,418 cf Secondary=0.00 cfs 0 cf Tertiary=0.00 cfs 0 cf Outflow=0.22 cfs 7,418 cf

Total Runoff Area = 866,572 sf Runoff Volume = 22,974 cf Average Runoff Depth = 0.32"
77.79% Pervious = 674,066 sf 22.21% Impervious = 192,506 sf

Summary for Subcatchment P1: To Ex Gully

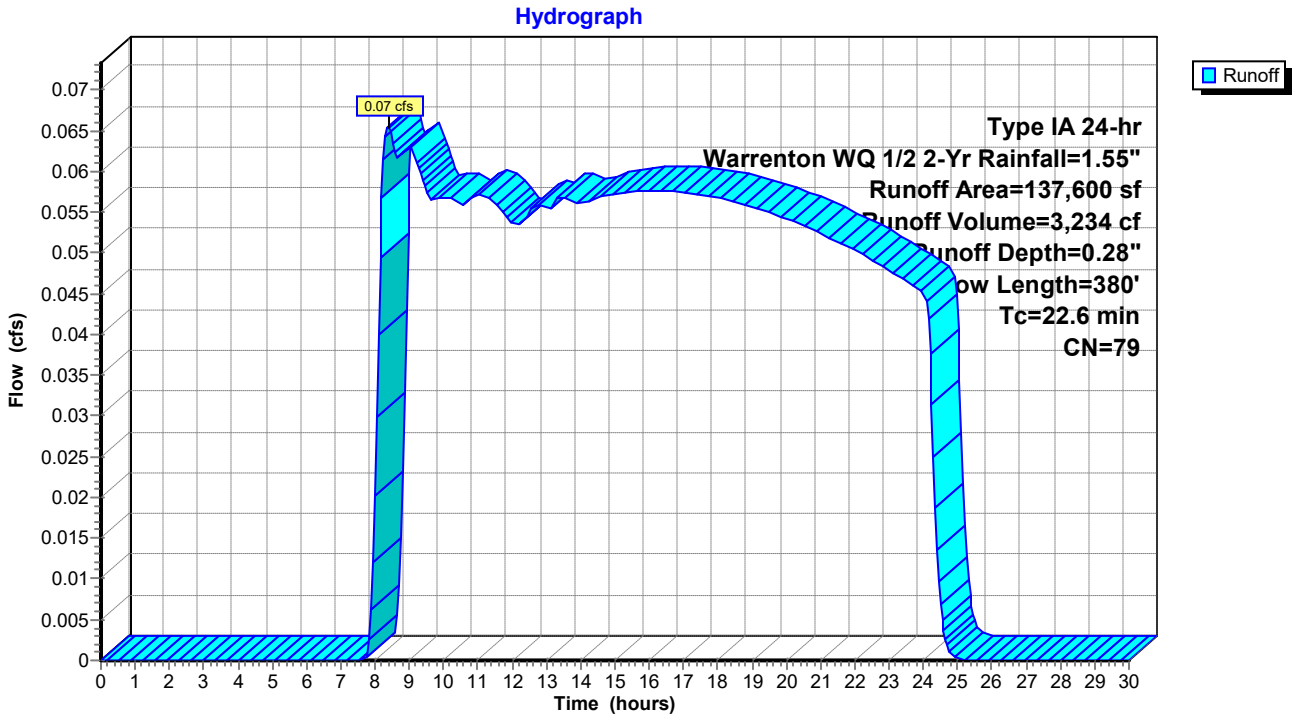
Runoff = 0.07 cfs @ 8.39 hrs, Volume= 3,234 cf, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton WQ 1/2 2-Yr Rainfall=1.55"

	Area (sf)	CN	Description
*	29,600	98	Impervious
	108,000	74	>75% Grass cover, Good, HSG C
	137,600	79	Weighted Average
	108,000	74	78.49% Pervious Area
	29,600	98	21.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.2	260	0.0400	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.50"
0.4	120	0.0110	5.15	4.05	**Pipe Channel,** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
22.6	380	Total			

Subcatchment P1: To Ex Gully



Summary for Subcatchment P2: To 104 Ditch

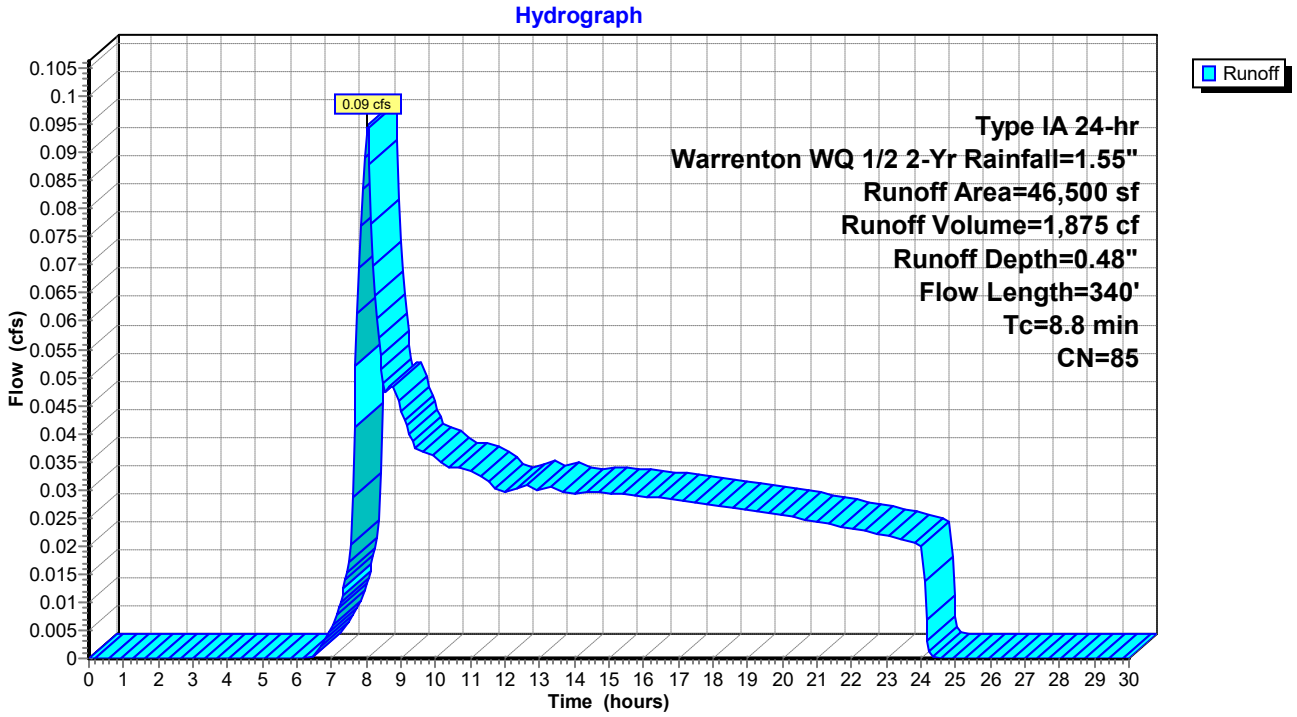
Runoff = 0.09 cfs @ 8.03 hrs, Volume= 1,875 cf, Depth= 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton WQ 1/2 2-Yr Rainfall=1.55"

	Area (sf)	CN	Description
*	20,100	98	Impervious
*	600	89	Gravel roads, HSG C
	25,800	74	>75% Grass cover, Good, HSG C
	46,500	85	Weighted Average
	26,400	74	56.77% Pervious Area
	20,100	98	43.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	120	0.0990	0.35		**Sheet Flow, Grass - Avg Slope** Grass: Short n= 0.150 P2= 3.50"
0.2	45	0.0240	3.14		**Shallow Concentrated Flow, Gutter - Avg Slope** Paved Kv= 20.3 fps
0.2	35	0.0050	3.47	2.73	**Pipe Channel, New Pipe Flow - Avg Slope** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
0.2	20	0.0050	1.43	4.46	**Trap/Vee/Rect Channel Flow, 104 Ditch Flow - Avg Slope** Bot.W=0.00' D=1.25' Z= 2.0 '/' Top.W=5.00' n= 0.050
0.1	30	0.0070	4.11	3.23	**Pipe Channel, 104 Culvert - Avg Slope** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
2.4	90	0.0010	0.64	1.99	**Trap/Vee/Rect Channel Flow, 104 Ditch Flow - Avg Slope** Bot.W=0.00' D=1.25' Z= 2.0 '/' Top.W=5.00' n= 0.050
8.8	340	Total			

Subcatchment P2: To 104 Ditch



Summary for Subcatchment P3: To On-Site Detention

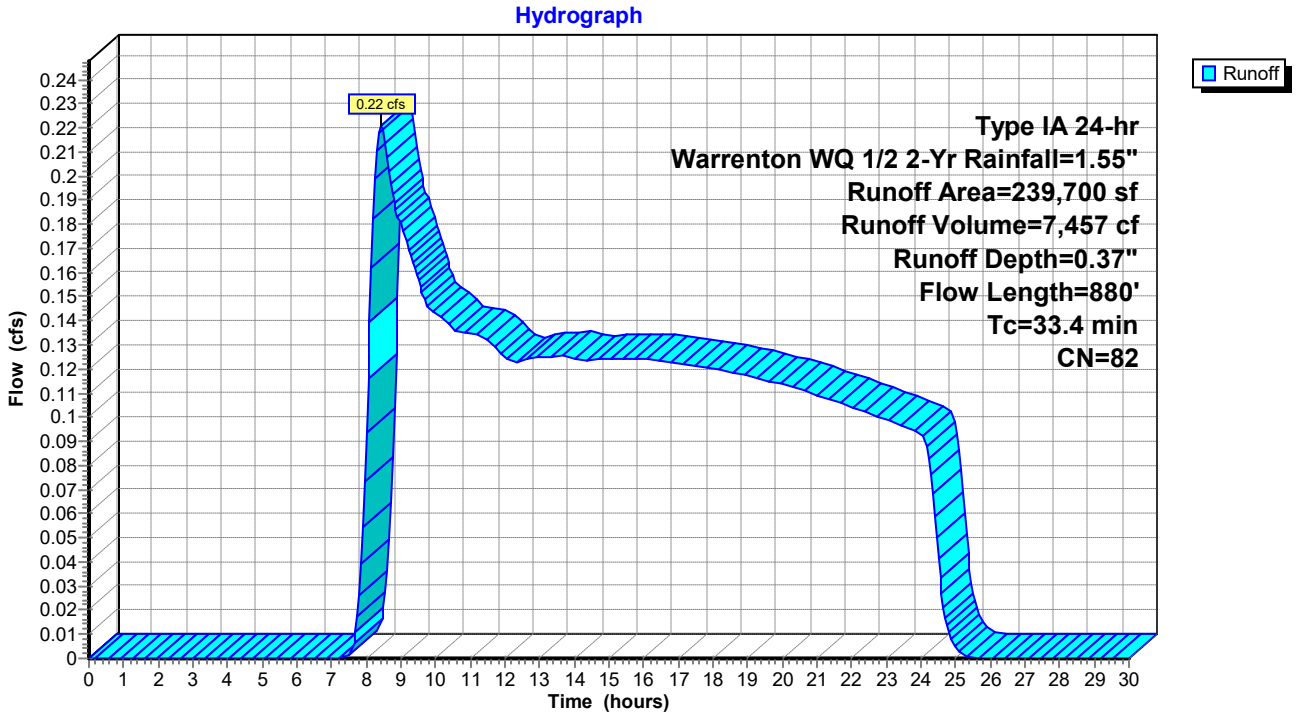
Runoff = 0.22 cfs @ 8.42 hrs, Volume= 7,457 cf, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton WQ 1/2 2-Yr Rainfall=1.55"

	Area (sf)	CN	Description
*	68,500	98	Impervious
*	152,000	74	Pervious
*	19,200	89	Gravel roads, HSG C
	239,700	82	Weighted Average
	171,200	76	71.42% Pervious Area
	68,500	98	28.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.8	120	0.0080	0.09		**Sheet Flow, Sheet Flow - Avg Slope** Grass: Dense n= 0.240 P2= 3.50"
9.2	530	0.0190	0.96		**Shallow Concentrated Flow, Shallow Concentrated Flow - Avg Slo** Short Grass Pasture Kv= 7.0 fps
0.5	55	0.0100	2.03		**Shallow Concentrated Flow, Shallow Concentrated Flow - Avg Slo** Paved Kv= 20.3 fps
0.9	175	0.0100	3.10	0.61	**Pipe Channel, Pipe Flow - Avg Slope** 6.000" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.012
33.4	880	Total			

Subcatchment P3: To On-Site Detention



Summary for Subcatchment P4: To Ex CB Post-Dev

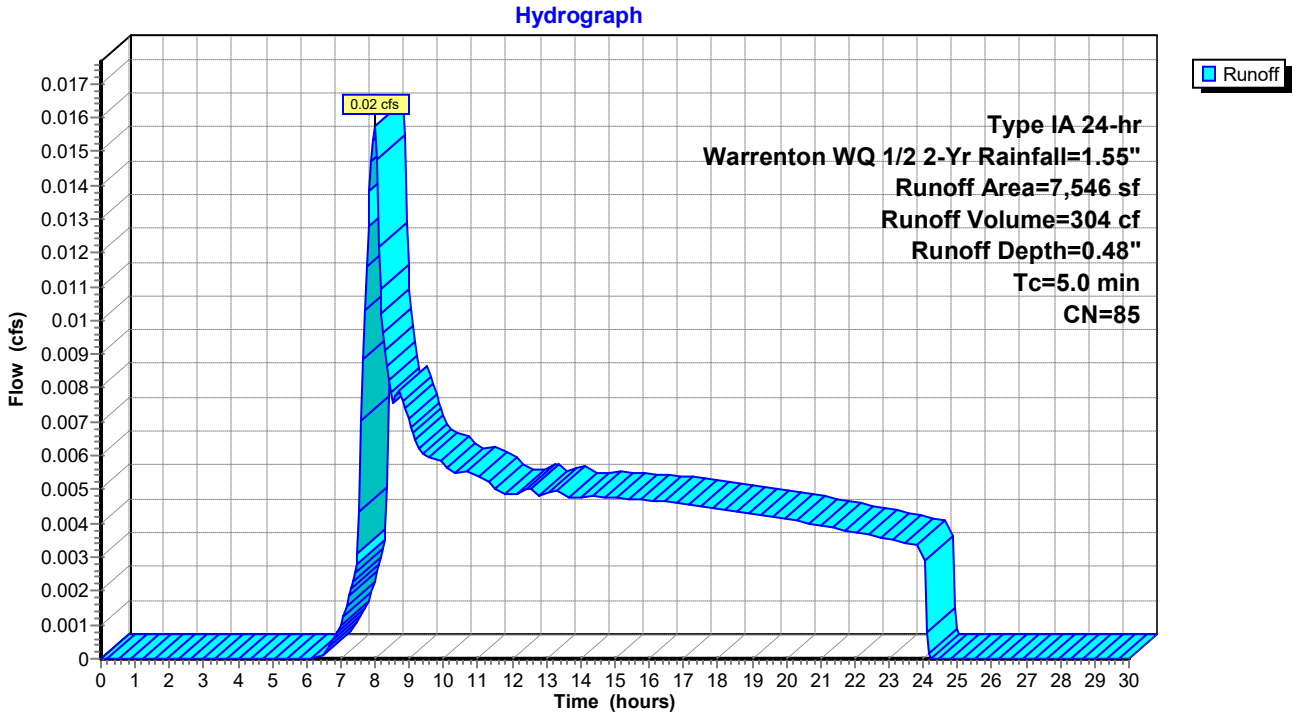
Runoff = 0.02 cfs @ 7.99 hrs, Volume= 304 cf, Depth= 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton WQ 1/2 2-Yr Rainfall=1.55"

	Area (sf)	CN	Description
*	3,606	98	New Road & Shoulder
	3,940	74	>75% Grass cover, Good, HSG C
	7,546	85	Weighted Average
	3,940	74	52.21% Pervious Area
	3,606	98	47.79% Impervious Area

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

Subcatchment P4: To Ex CB Post-Dev



Summary for Subcatchment X1: Culvert Pre-Dev

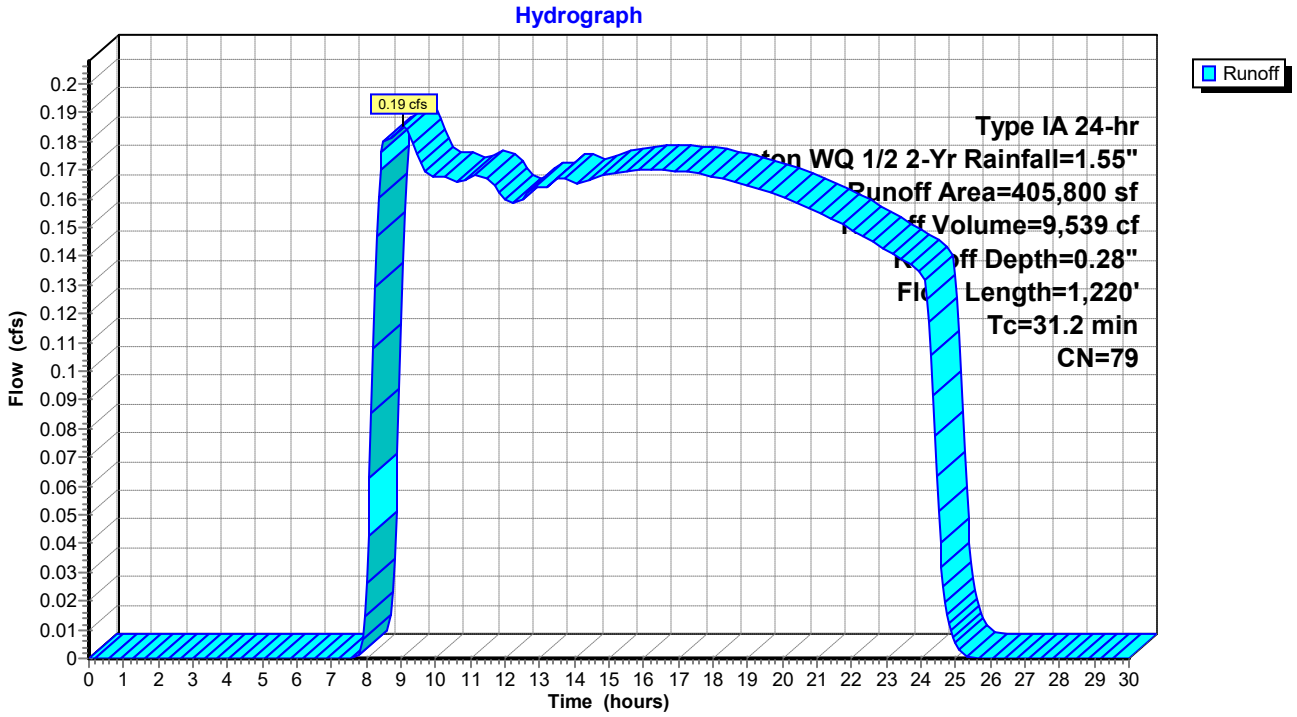
Runoff = 0.19 cfs @ 9.08 hrs, Volume= 9,539 cf, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton WQ 1/2 2-Yr Rainfall=1.55"

	Area (sf)	CN	Description
*	70,700	98	Impervious
	16,200	89	Gravel roads, HSG C
*	318,900	74	>75% Grass cover, Good, HSG C
	405,800	79	Weighted Average
	335,100	75	82.58% Pervious Area
	70,700	98	17.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	75	0.0100	0.09		**Sheet Flow, Sheet Flow - Avg Slope** Grass: Dense n= 0.240 P2= 3.50"
14.6	865	0.0200	0.99		**Shallow Concentrated Flow, Shallow Concentrated Flow - Avg Slo** Short Grass Pasture Kv= 7.0 fps
1.5	50	0.0010	0.55	1.10	**Trap/Vee/Rect Channel Flow, 104 Ditch - Avg Slope** Bot.W=0.00' D=1.00' Z= 2.0 '/' Top.W=4.00' n= 0.050
0.8	230	0.0087	4.58	3.60	**Pipe Channel, 104 Storm - Avg Slope** 12.000" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
31.2	1,220	Total			

Subcatchment X1: Culvert Pre-Dev



Summary for Subcatchment X2: To Ex CB Pre-Dev

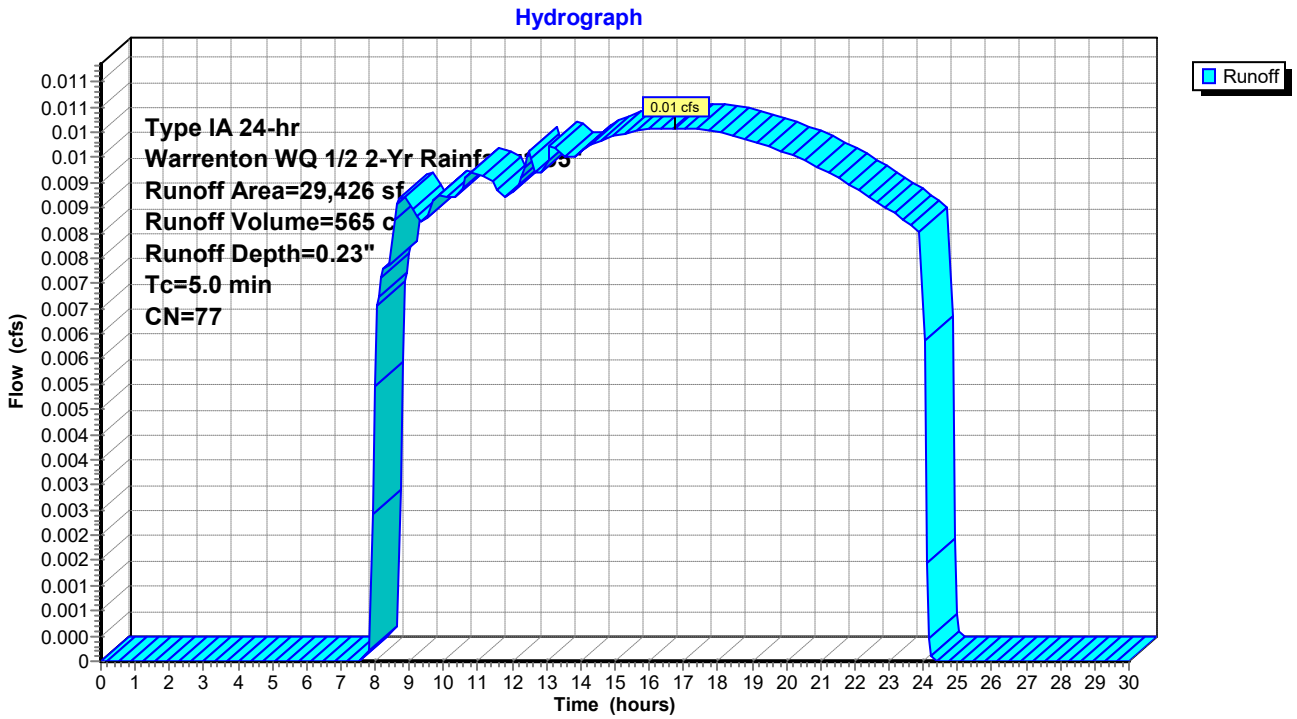
Runoff = 0.01 cfs @ 16.75 hrs, Volume= 565 cf, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Warrenton WQ 1/2 2-Yr Rainfall=1.55"

Area (sf)	CN	Description
5,016	89	Gravel roads, HSG C
24,410	74	>75% Grass cover, Good, HSG C
29,426	77	Weighted Average
29,426	77	100.00% Pervious Area

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

Subcatchment X2: To Ex CB Pre-Dev



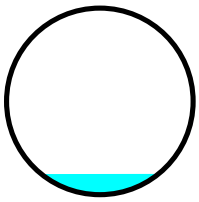
Summary for Reach 1R: Stm to Ex Gully

Inflow Area = 46,500 sf, 43.23% Impervious, Inflow Depth = 0.48" for Warrenton WQ 1/2 2-Yr event
Inflow = 0.09 cfs @ 8.03 hrs, Volume= 1,875 cf
Outflow = 0.09 cfs @ 8.08 hrs, Volume= 1,875 cf, Atten= 2%, Lag= 2.9 min

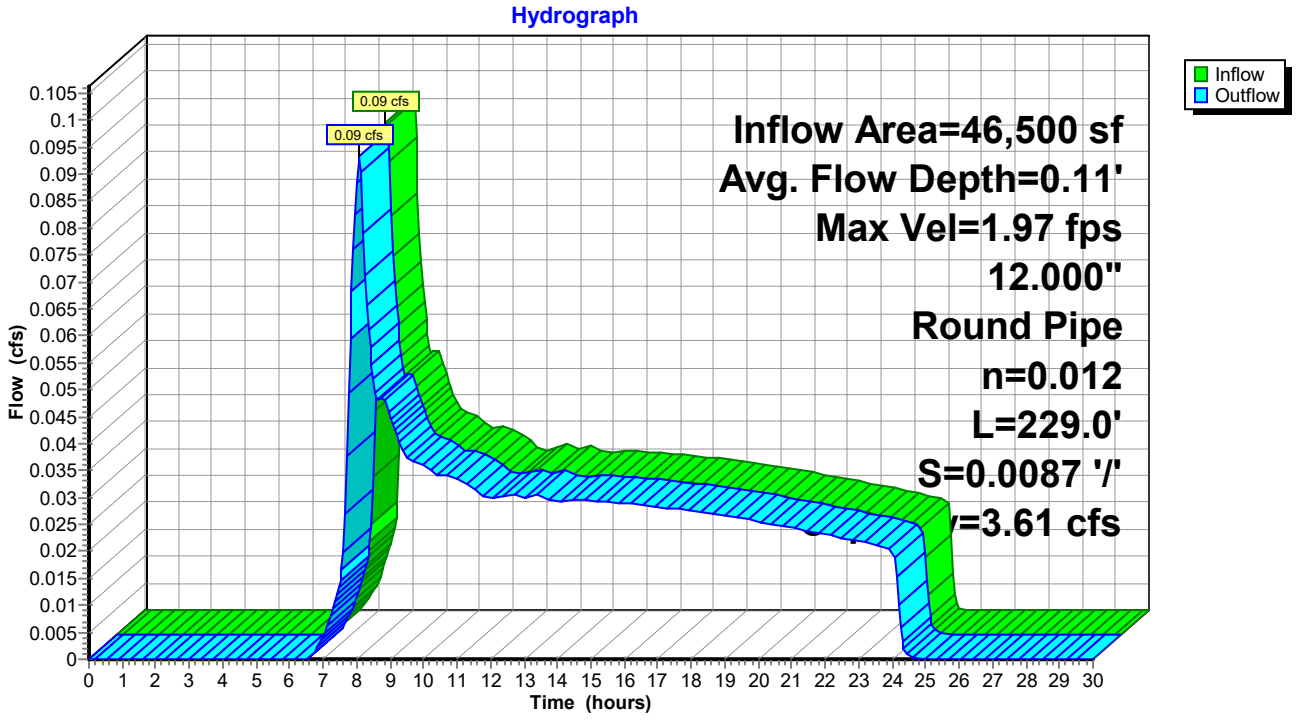
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.97 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 1.33 fps, Avg. Travel Time= 2.9 min

Peak Storage= 11 cf @ 8.05 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.61 cfs

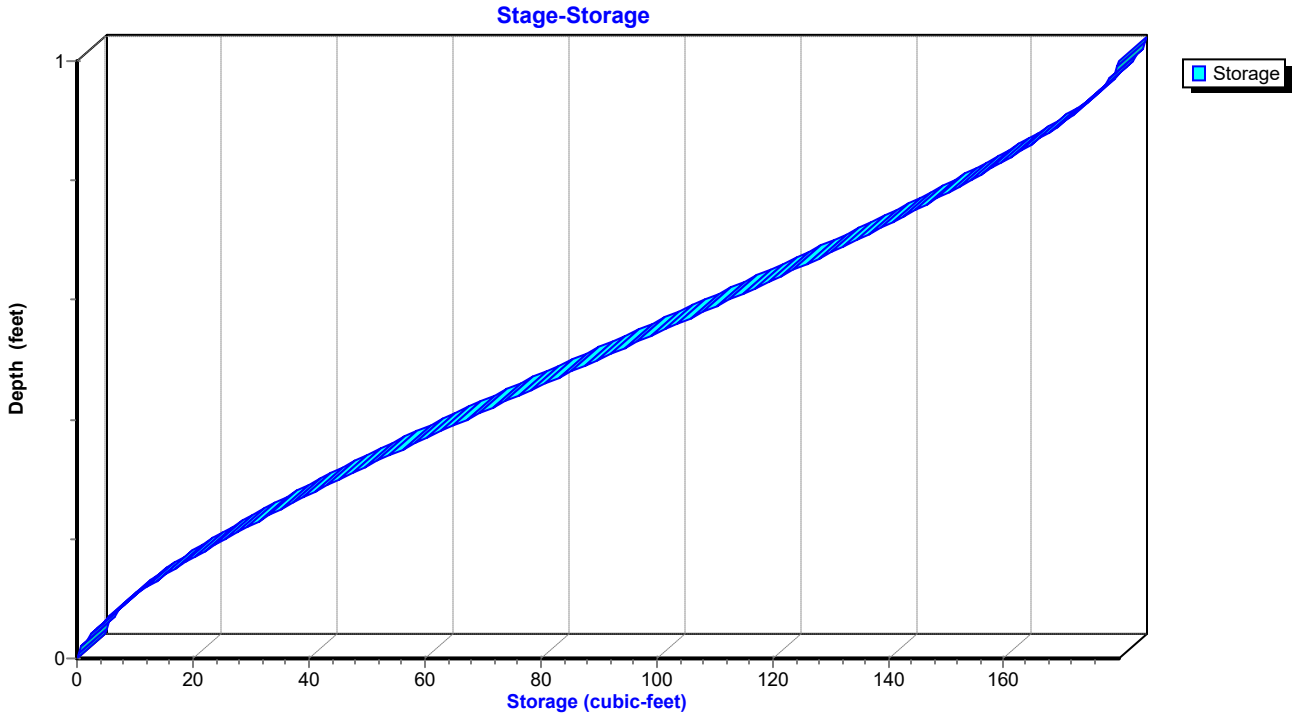
12.000" Round Pipe
n= 0.012
Length= 229.0' Slope= 0.0087 '/'
Inlet Invert= 22.78', Outlet Invert= 20.78'



Reach 1R: Stm to Ex Gully



Reach 1R: Stm to Ex Gully

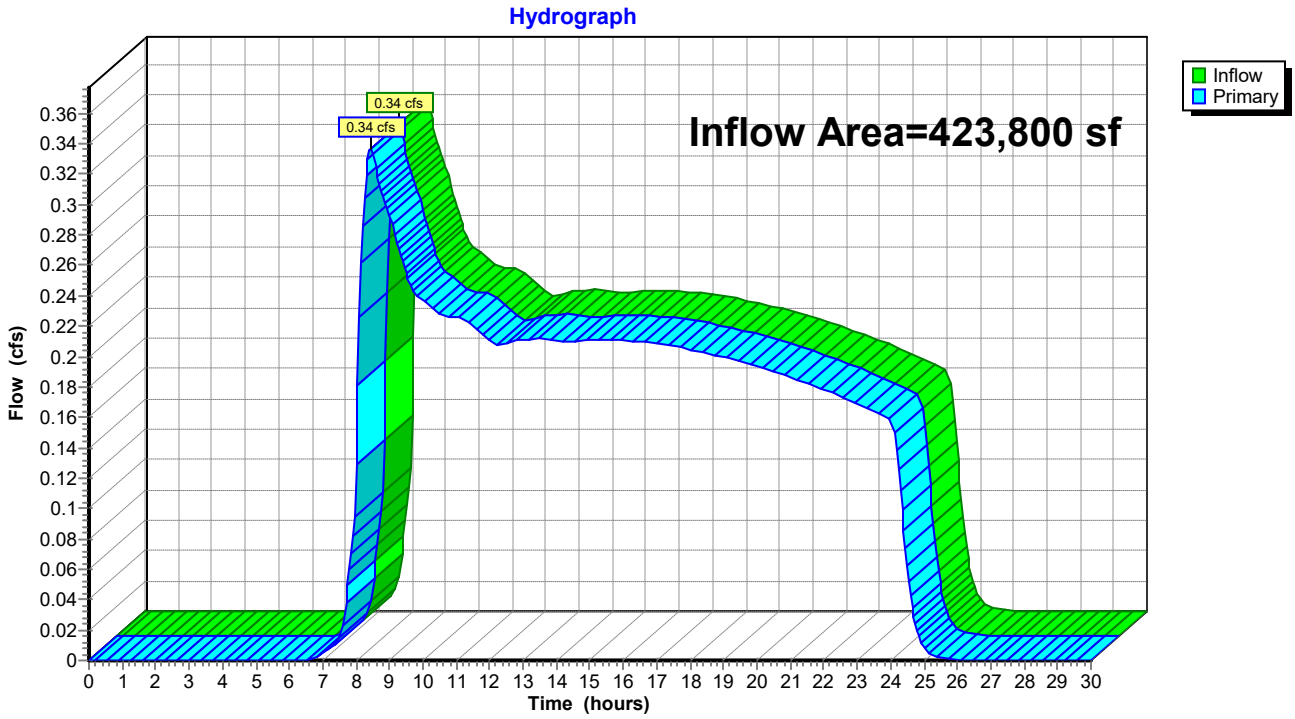


Summary for Pond CULV: Culvert Post-Dev

Inflow Area = 423,800 sf, 27.89% Impervious, Inflow Depth = 0.35" for Warrenton WQ 1/2 2-Yr event
Inflow = 0.34 cfs @ 8.44 hrs, Volume= 12,527 cf
Primary = 0.34 cfs @ 8.44 hrs, Volume= 12,527 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Pond CULV: Culvert Post-Dev



Summary for Pond DET1: On-Site Detention

Inflow Area = 239,700 sf, 28.58% Impervious, Inflow Depth = 0.37" for Warrenton WQ 1/2 2-Yr event
Inflow = 0.22 cfs @ 8.42 hrs, Volume= 7,457 cf
Outflow = 0.22 cfs @ 8.50 hrs, Volume= 7,418 cf, Atten= 1%, Lag= 4.6 min
Primary = 0.22 cfs @ 8.50 hrs, Volume= 7,418 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 27.29' @ 8.50 hrs Surf.Area= 300 sf Storage= 100 cf

Plug-Flow detention time= 10.7 min calculated for 7,418 cf (99% of inflow)
Center-of-Mass det. time= 7.6 min (936.0 - 928.4)

Volume	Invert	Avail.Storage	Storage Description
#1	27.00'	2,356 cf	**60.000" Round Pipe Storage** L= 120.0'
#2	25.00'	147 cf	**5.00'D x 7.50'H Vertical Cone/Cylinder**
		2,503 cf	Total Available Storage

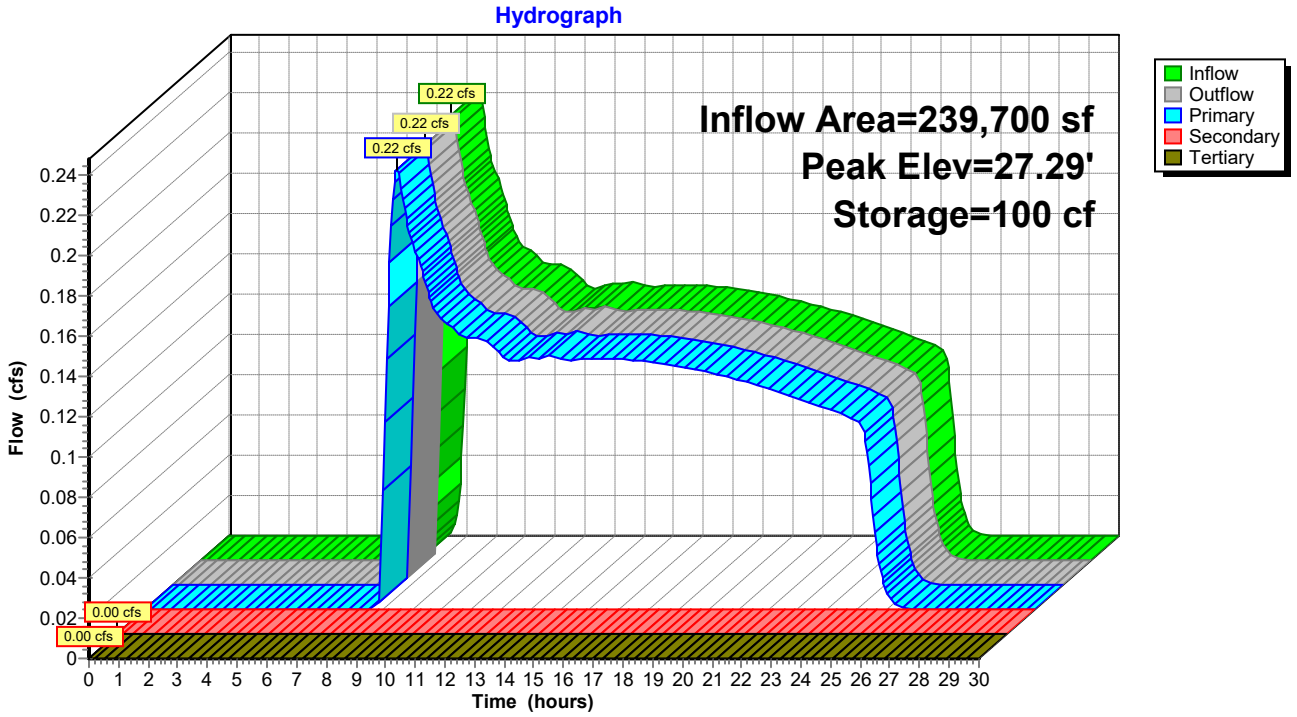
Device	Routing	Invert	Outlet Devices
#1	Primary	27.00'	**6.000" Vert. Orifice at IE** C= 0.600
#2	Secondary	30.00'	**2.000" Vert. Upper Orifice** C= 0.600
#3	Tertiary	32.00'	**12.000" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.22 cfs @ 8.50 hrs HW=27.29' (Free Discharge)
└**1=Orifice at IE** (Orifice Controls 0.22 cfs @ 1.83 fps)

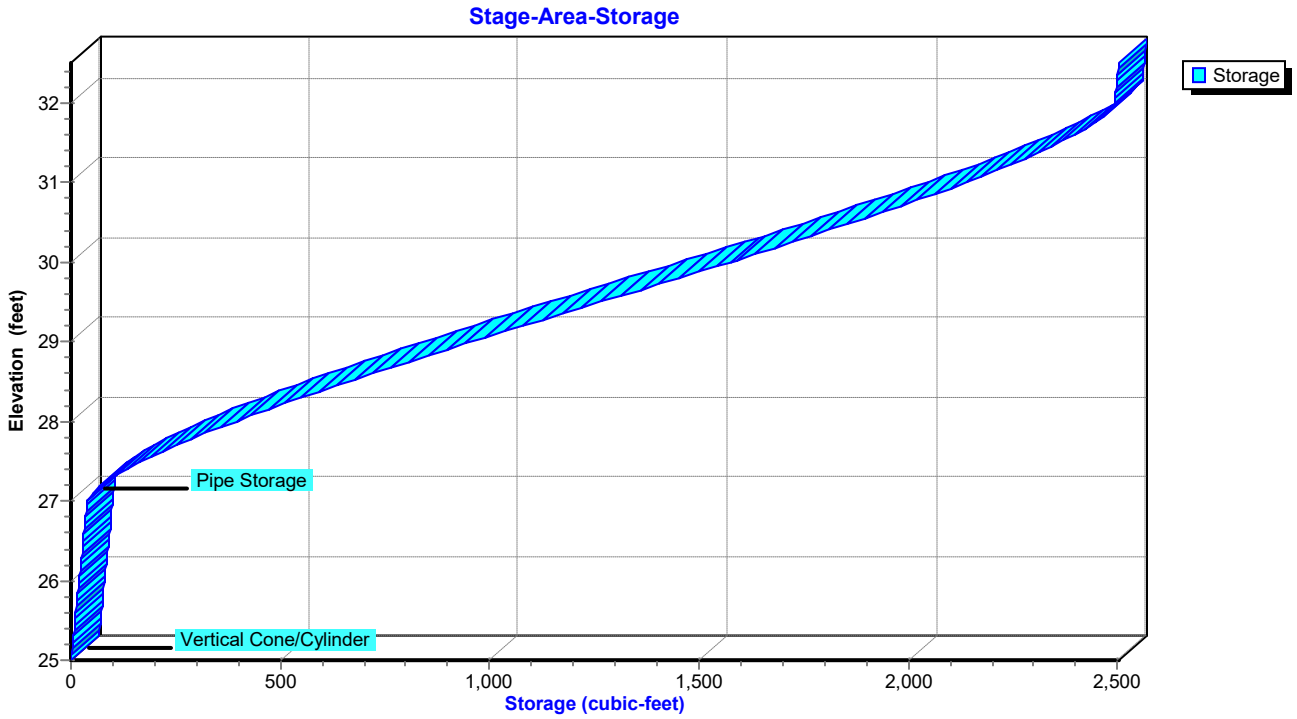
Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.00' (Free Discharge)
└**2=Upper Orifice** (Controls 0.00 cfs)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=25.00' (Free Discharge)
└**3=Overflow** (Controls 0.00 cfs)

Pond DET1: On-Site Detention



Pond DET1: On-Site Detention



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Mar 2 2021

Ex 12in at 0.7%

Circular

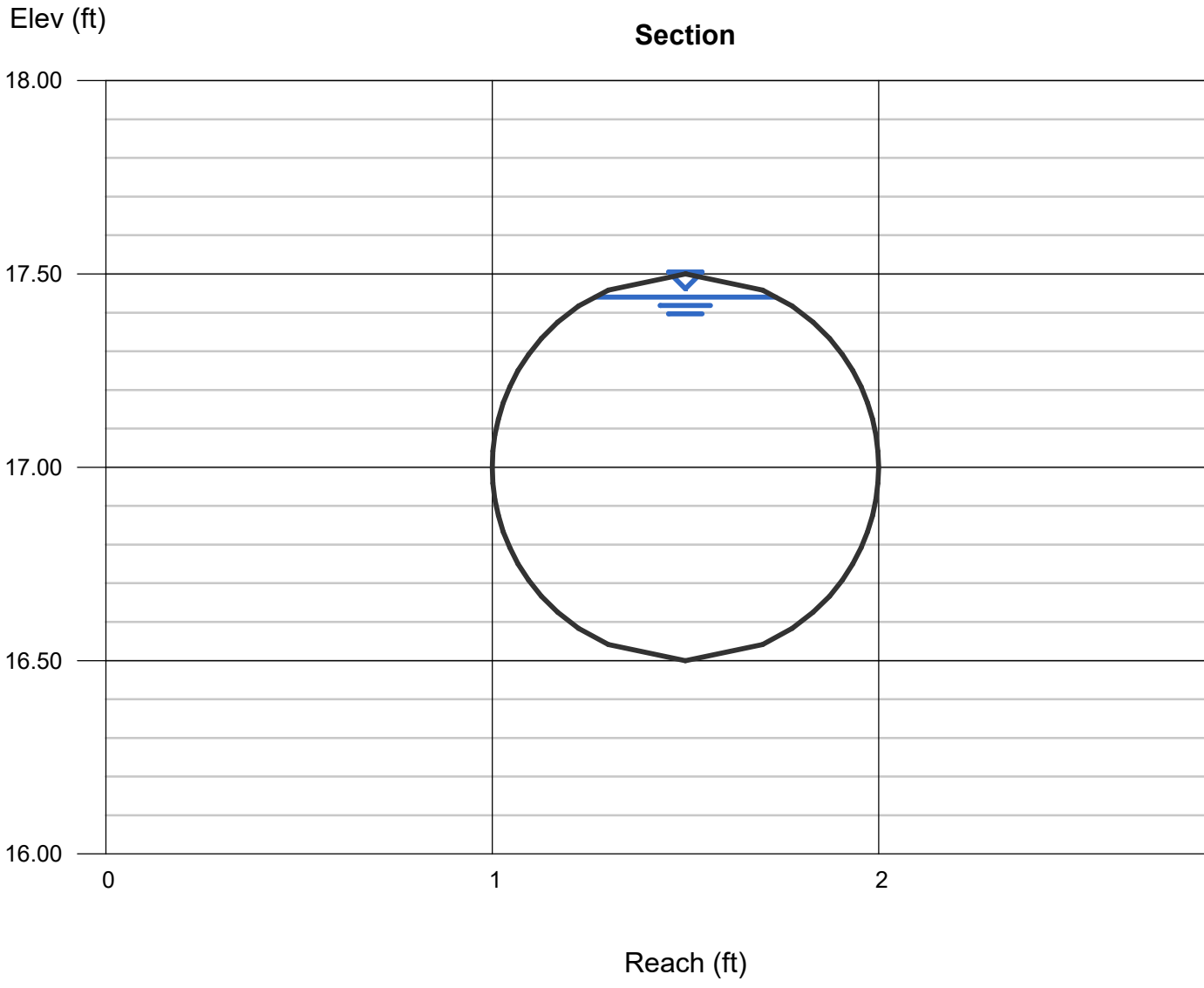
Diameter (ft)	= 1.00
Invert Elev (ft)	= 16.50
Slope (%)	= 0.70
N-Value	= 0.012

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 0.94

Highlighted

Depth (ft)	= 0.94
Q (cfs)	= 3.472
Area (sqft)	= 0.77
Velocity (ft/s)	= 4.53
Wetted Perim (ft)	= 2.65
Crit Depth, Yc (ft)	= 0.80
Top Width (ft)	= 0.47
EGL (ft)	= 1.26



Culvert Report

Ex 18in Storm Line

Invert Elev Dn (ft)	=	12.62
Pipe Length (ft)	=	253.00
Slope (%)	=	0.58
Invert Elev Up (ft)	=	14.08
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

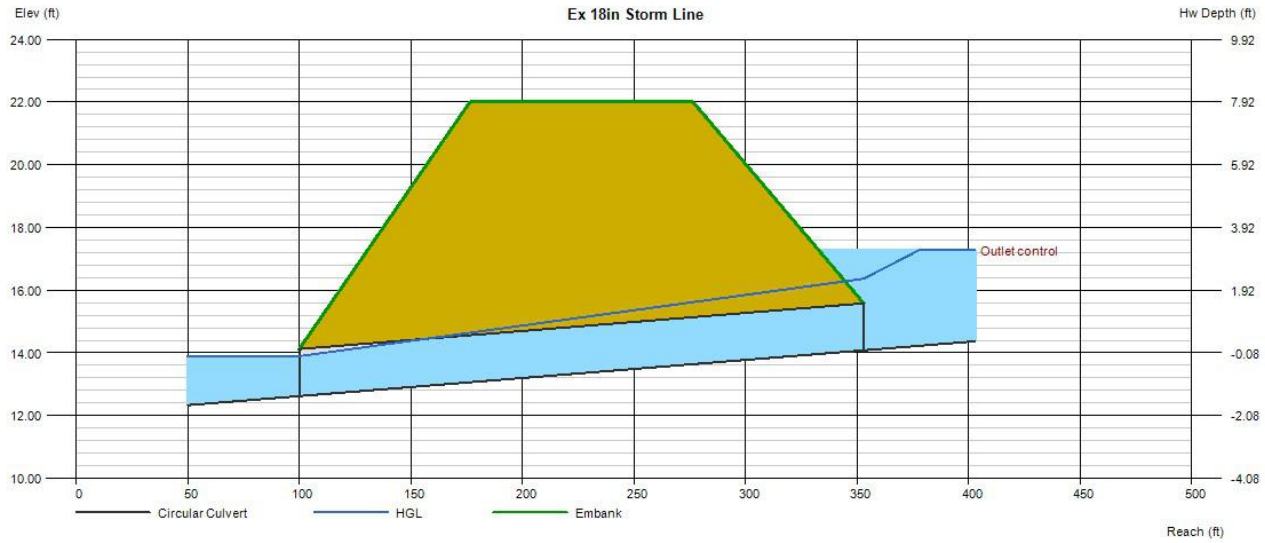
Top Elevation (ft)	=	22.00
Top Width (ft)	=	100.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	11.09
Qmax (cfs)	=	11.09
Tailwater Elev (ft)	=	12

Highlighted

Qtotal (cfs)	=	11.09
Qpipe (cfs)	=	11.09
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	6.93
Veloc Up (ft/s)	=	6.28
HGL Dn (ft)	=	13.89
HGL Up (ft)	=	16.37
Hw Elev (ft)	=	17.28
Hw/D (ft)	=	2.14
Flow Regime	=	Outlet Control



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Dec 9 2020

Ex 18 in Steel

Circular

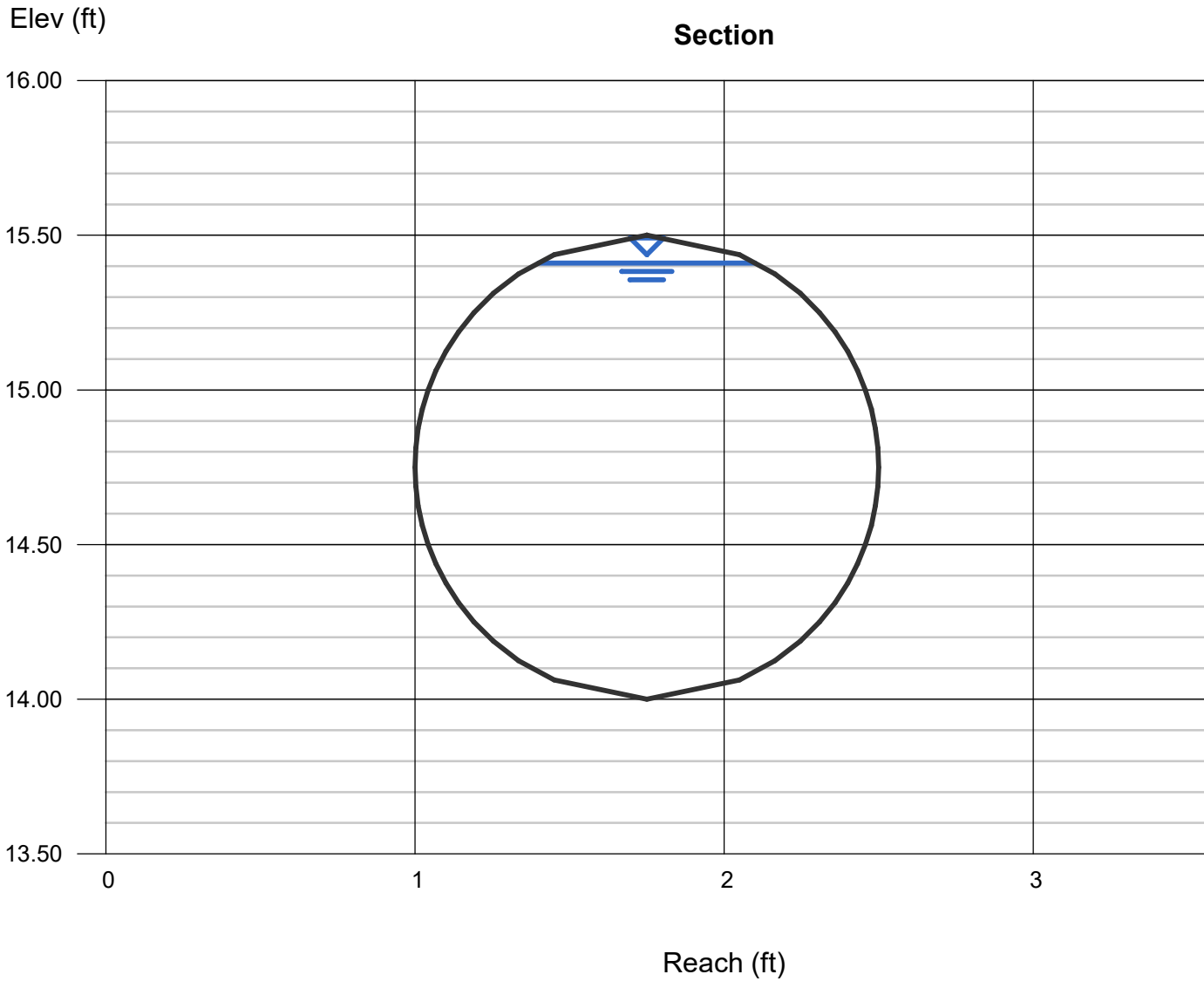
Diameter (ft)	= 1.50
Invert Elev (ft)	= 14.00
Slope (%)	= 0.60
N-Value	= 0.012

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 1.41

Highlighted

Depth (ft)	= 1.41
Q (cfs)	= 9.479
Area (sqft)	= 1.72
Velocity (ft/s)	= 5.50
Wetted Perim (ft)	= 3.98
Crit Depth, Yc (ft)	= 1.19
Top Width (ft)	= 0.71
EGL (ft)	= 1.88



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Mar 2 2021

Ex 24in Culvert Inlet

Circular

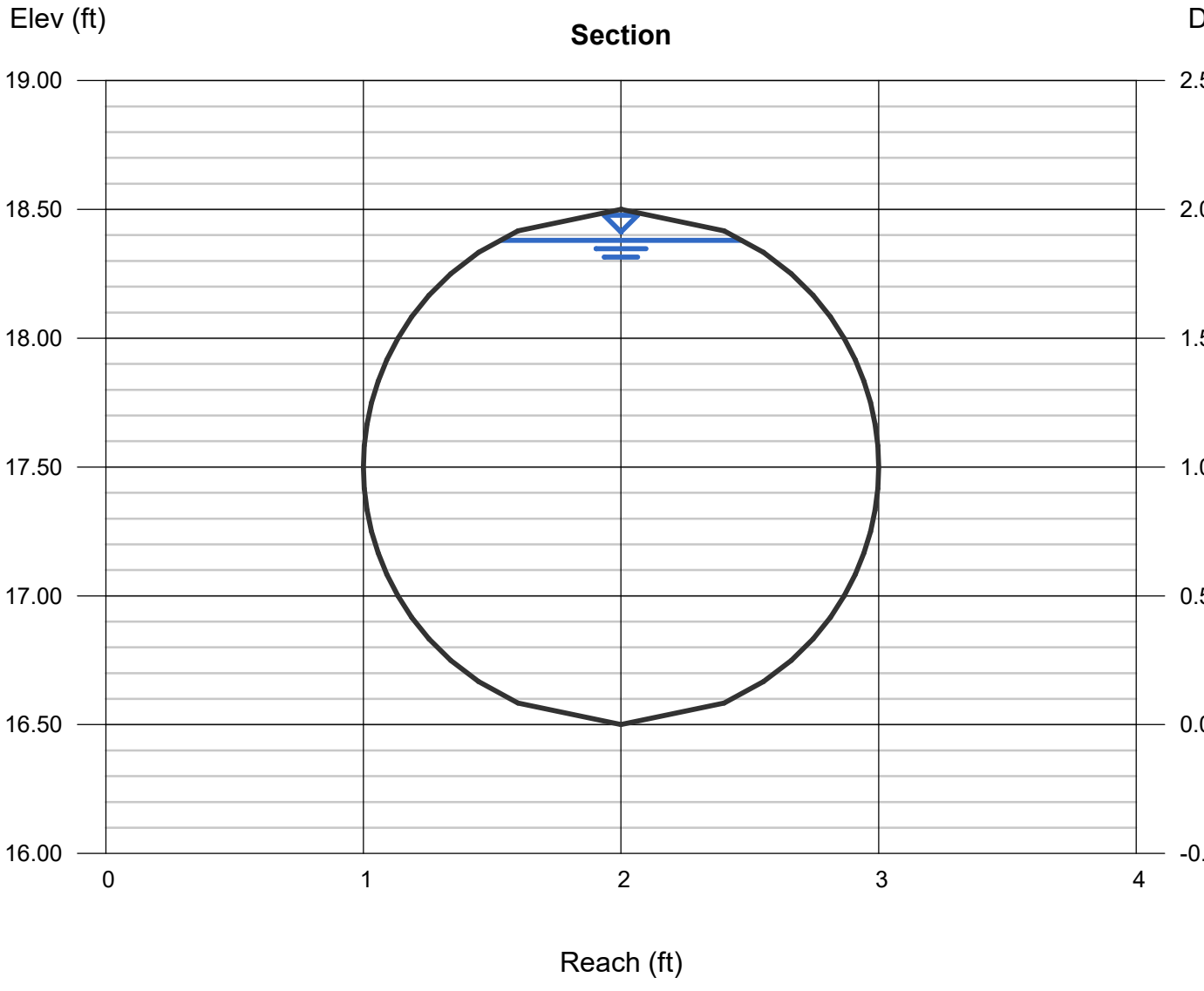
Diameter (ft)	= 2.00
Invert Elev (ft)	= 16.50
Slope (%)	= 2.80
N-Value	= 0.012

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 1.88

Highlighted

Depth (ft)	= 1.88
Q (cfs)	= 44.10
Area (sqft)	= 3.07
Velocity (ft/s)	= 14.38
Wetted Perim (ft)	= 5.30
Crit Depth, Yc (ft)	= 1.97
Top Width (ft)	= 0.94
EGL (ft)	= 5.10



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Mar 2 2021

12 in at 0.5%

Circular

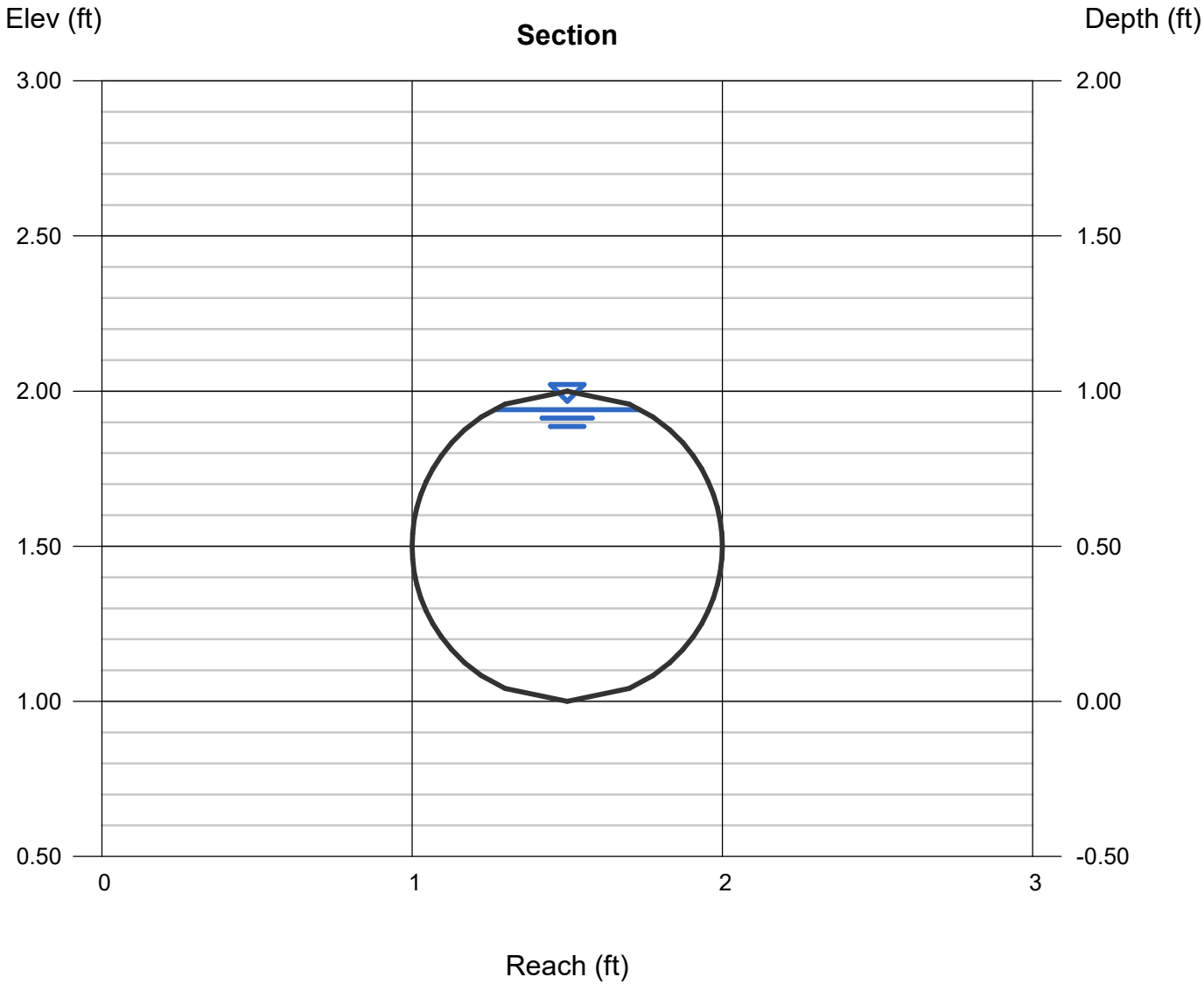
Diameter (ft)	= 1.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.012

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 0.94

Highlighted

Depth (ft)	= 0.94
Q (cfs)	= 2.934
Area (sqft)	= 0.77
Velocity (ft/s)	= 3.83
Wetted Perim (ft)	= 2.65
Crit Depth, Yc (ft)	= 0.74
Top Width (ft)	= 0.47
EGL (ft)	= 1.17



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Mar 2 2021

12 in at 1.33%

Circular

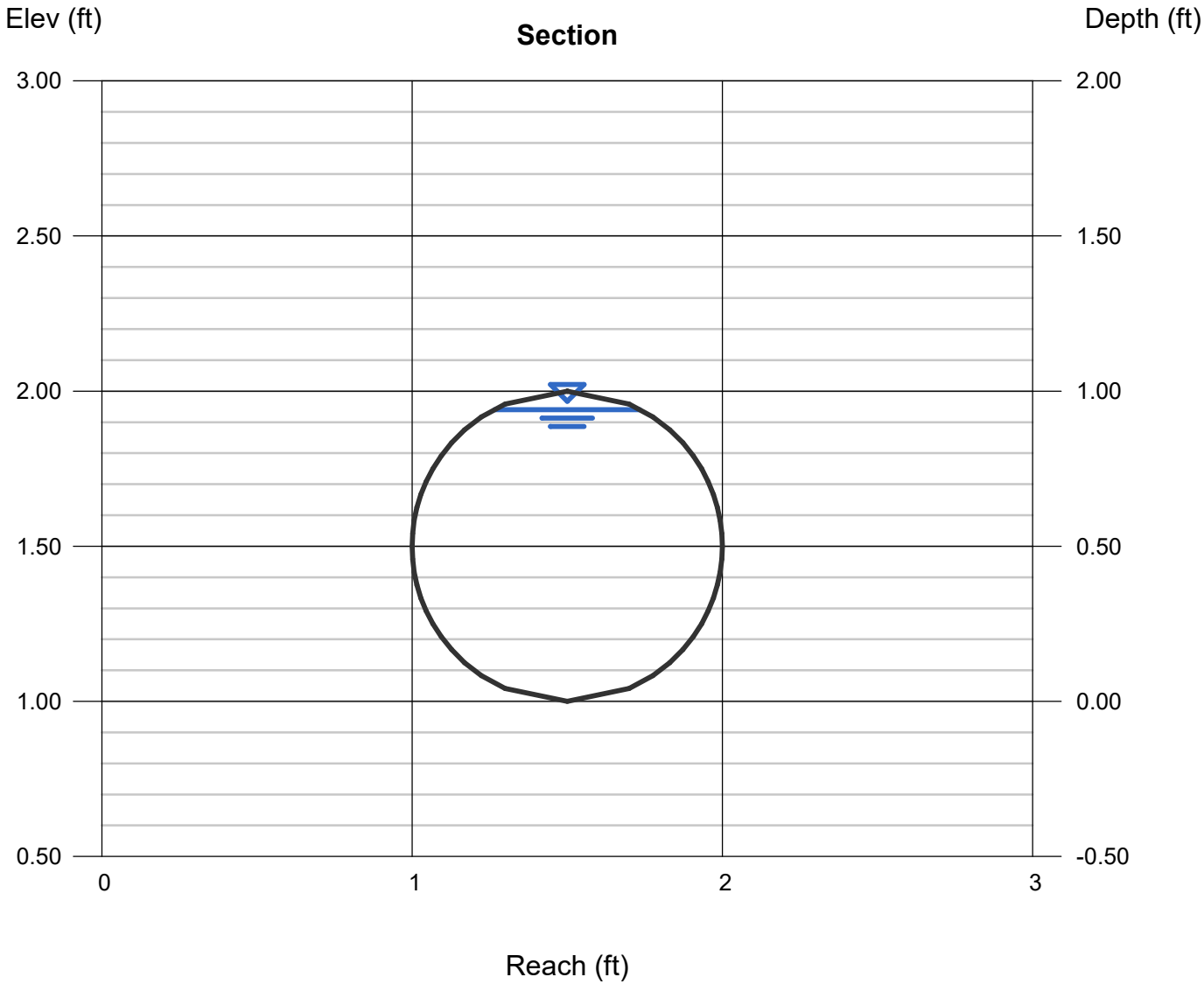
Diameter (ft)	= 1.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.33
N-Value	= 0.012

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 0.94

Highlighted

Depth (ft)	= 0.94
Q (cfs)	= 4.786
Area (sqft)	= 0.77
Velocity (ft/s)	= 6.24
Wetted Perim (ft)	= 2.65
Crit Depth, Yc (ft)	= 0.91
Top Width (ft)	= 0.47
EGL (ft)	= 1.55



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Mar 2 2021

Re-Graded Highway 104 Spur Ditch

Trapezoidal

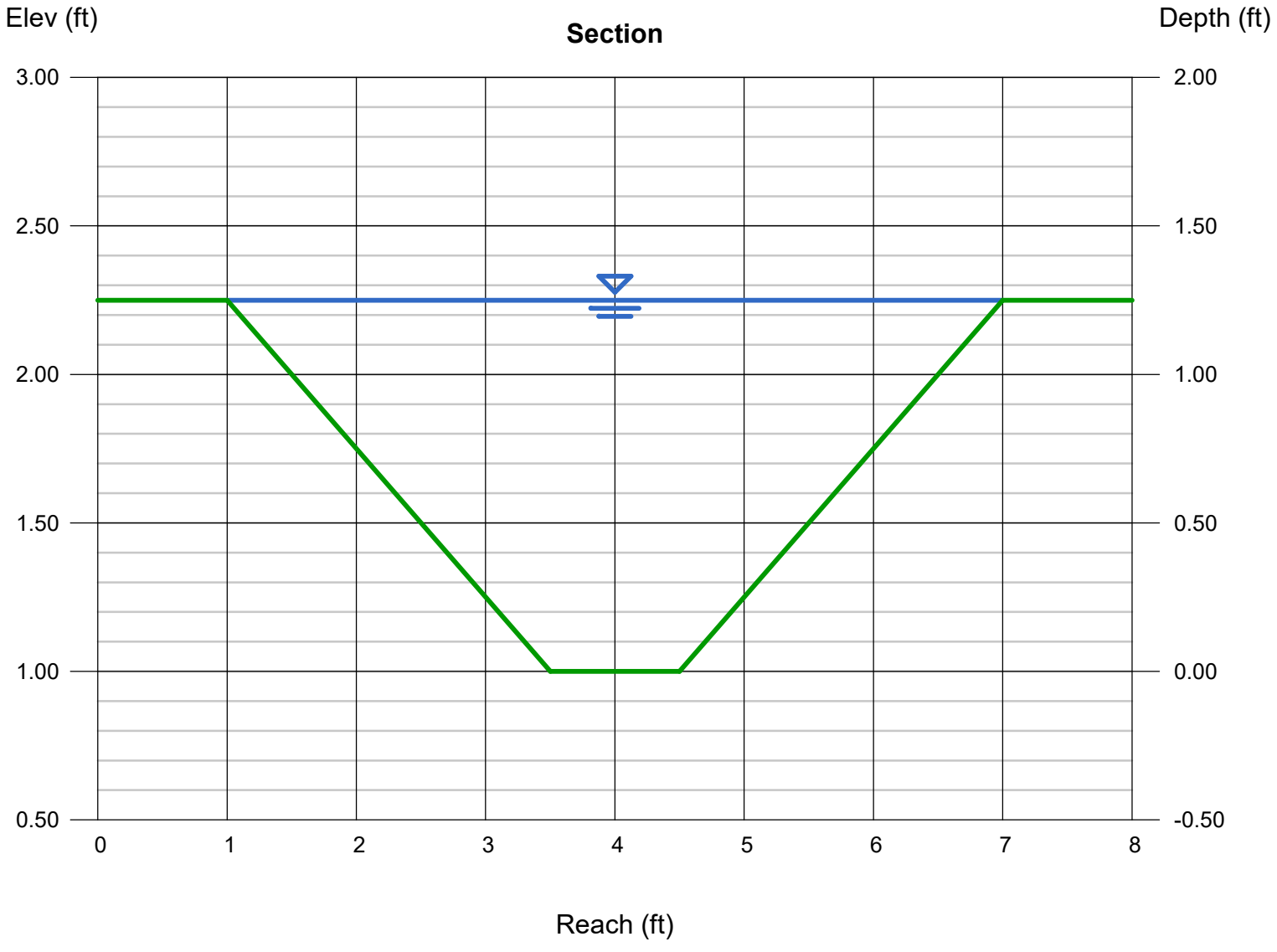
Bottom Width (ft)	= 1.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.25
Invert Elev (ft)	= 1.00
Slope (%)	= 0.10
N-Value	= 0.050

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 1.25

Highlighted

Depth (ft)	= 1.25
Q (cfs)	= 3.129
Area (sqft)	= 4.38
Velocity (ft/s)	= 0.72
Wetted Perim (ft)	= 6.59
Crit Depth, Yc (ft)	= 0.49
Top Width (ft)	= 6.00
EGL (ft)	= 1.26



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Dec 10 2020

Property Corner Roadside Ditch

Triangular

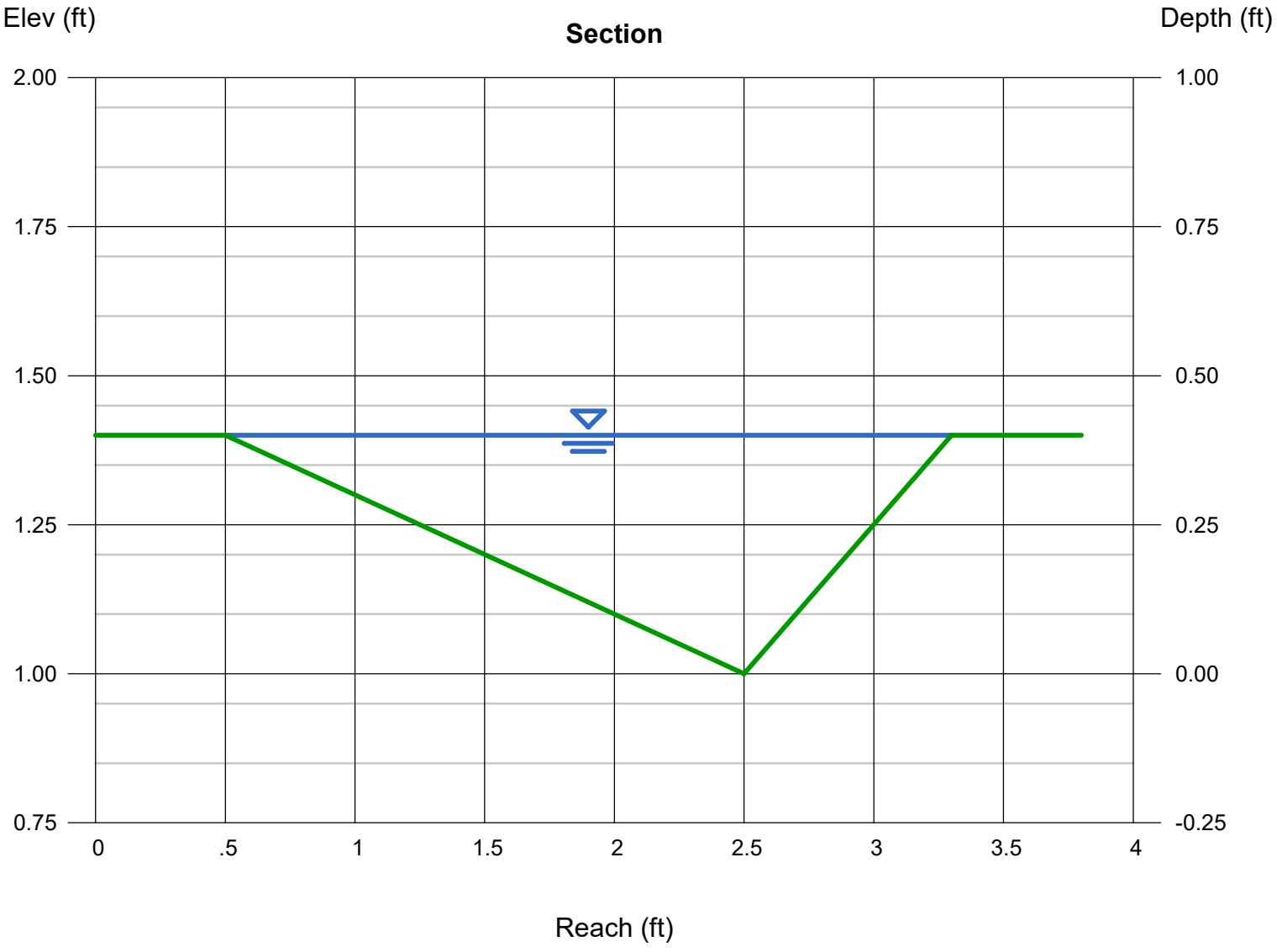
Side Slopes (z:1)	= 5.00, 2.00
Total Depth (ft)	= 0.40
Invert Elev (ft)	= 1.00
Slope (%)	= 1.70
N-Value	= 0.045

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 0.40

Highlighted

Depth (ft)	= 0.40
Q (cfs)	= 0.799
Area (sqft)	= 0.56
Velocity (ft/s)	= 1.43
Wetted Perim (ft)	= 2.93
Crit Depth, Yc (ft)	= 0.32
Top Width (ft)	= 2.80
EGL (ft)	= 0.43



APPENDIX C

USDA Web Soil Survey Map

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Clatsop County, Oregon

November 25, 2020

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:7,130 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 300 600 1200 1800

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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 18, Jun 11, 2020

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

Date(s) aerial images were photographed: Sep 5, 2004—Feb 12, 2017

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
6A	Brallier mucky peat, 0 to 1 percent slopes	2.3	0.9%
12A	Coquille-Clatsop complex, protected, 0 to 1 percent slopes	81.3	31.0%
71B	Walluski medial silt loam, 0 to 7 percent slopes	178.7	68.1%
W	Water	0.0	0.0%
Totals for Area of Interest		**262.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Clatsop County, Oregon

6A—Brallier mucky peat, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 21dc
Elevation: 0 to 20 feet
Mean annual precipitation: 55 to 100 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 180 to 240 days
Farmland classification: Farmland of unique importance

Map Unit Composition

Brallier and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brallier

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Partially decomposed herbaceous and woody plant material

Typical profile

Oe - 0 to 60 inches: mucky peat

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: FrequentNone
Frequency of ponding: Frequent
Available water capacity: Very high (about 20.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Brallier, mineral soil substratum

Percent of map unit: 8 percent
Landform: Flood plains
Hydric soil rating: Yes

Aquents

Percent of map unit: 7 percent
Landform: Flood plains

Hydric soil rating: Yes

12A—Coquille-Clatsop complex, protected, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 219s
Elevation: 0 to 10 feet
Mean annual precipitation: 50 to 100 inches
Mean annual air temperature: 46 to 54 degrees F
Frost-free period: 165 to 245 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Coquille, protected, and similar soils: 60 percent
Clatsop, protected, and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Coquille, Protected

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 6 inches: silt loam
H2 - 6 to 30 inches: silt loam
H3 - 30 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 24 inches
Frequency of flooding: RareNone
Frequency of ponding: Frequent
Available water capacity: High (about 10.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Forage suitability group: Very Poorly Drained (G004AY019OR)
Other vegetative classification: Very Poorly Drained (G004AY019OR)
Hydric soil rating: Yes

Description of Clatsop, Protected

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

Oa - 0 to 6 inches: muck
H1 - 6 to 24 inches: silt loam
H2 - 24 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 24 inches
Frequency of flooding: RareNone
Frequency of ponding: Frequent
Available water capacity: Very high (about 12.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Forage suitability group: Very Poorly Drained (G004AY019OR)
Other vegetative classification: Very Poorly Drained (G004AY019OR)
Hydric soil rating: Yes

Minor Components

Histosols

Percent of map unit: 3 percent
Landform: Flood plains
Hydric soil rating: Yes

Coquille, protected, very gravelly

Percent of map unit: 3 percent
Landform: Flood plains
Hydric soil rating: Yes

Coquille, protected, sandy substratum

Percent of map unit: 2 percent
Landform: Flood plains
Hydric soil rating: Yes

Psammaquents

Percent of map unit: 2 percent
Landform: Flood plains
Hydric soil rating: Yes

71B—Walluski medial silt loam, 0 to 7 percent slopes

Map Unit Setting

National map unit symbol: 21dg
Elevation: 20 to 300 feet
Mean annual precipitation: 80 to 100 inches
Mean annual air temperature: 49 to 52 degrees F
Frost-free period: 160 to 300 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Walluski and similar soils: 80 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Walluski

Setting

Landform: Fluviomarine terraces, stream terraces
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium and/or fluviomarine deposits derived from sedimentary rock

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 13 inches: medial silt loam
Bw1 - 13 to 27 inches: silty clay loam
Bw2 - 27 to 36 inches: silty clay loam
2C - 36 to 62 inches: silty clay loam

Properties and qualities

Slope: 0 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)
Depth to water table: About 27 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very high (about 13.6 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Forage suitability group: Moderately Well Drained <15% Slopes (G004AY016OR)

Other vegetative classification: Moderately Well Drained <15% Slopes (G004AY016OR), Sitka spruce/salmonberry-wet (903)
Hydric soil rating: No

Minor Components

Hebo
Percent of map unit: 5 percent
Landform: Depressions on fluviomarine terraces
Other vegetative classification: Poorly Drained (G004AY018OR)
Hydric soil rating: Yes

W—Water

Map Unit Composition
Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

APPENDIX D

Home Depot Drainage Report

WRG

DRAINAGE REPORT

September 24, 2007
Revised from March 14, 2007

Home Depot - Warrenton
Warrenton, Oregon

Prepared For:
Home Depot USA, Inc.
370 Corporate Drive North
Tukwila, Washington 98188

9/24/07

EXPIRATION DATE: 6/30/09

Prepared By:

WRG Design, Inc.
5415 SW Westgate Dr. Suite #100
Portland, Oregon 97221
WRG PROJECT NO. 2055078.30

The Hwy 101 grassy swale is located parallel to the roadway and is designed to treat stormwater runoff from the road. Runoff will be piped to the swale in the curbed section and will sheet flow continuously in the non-curbed section. The swale will provide treatment prior to entering wetland "B" for basin HWY 101. Note that the residence time of the roadside swale is larger then 9 minutes, which is recommended for continuous inflow swales.

Basin ID	Water Quality Flow (cfs)	Hydraulic Residence Time (min)	Water Design Depth (ft)	Length (ft)	Slope (%)	Side Slope (ft/ft)	Bottom Width (ft)
Onsite	1.63	9	0.5	225	1.5	4:1	6
HWY 101	0.15	140	0.11	1180	0.7	4:1	10

Table 11 – Water Quality Swale

Planting List
The swales will be planted with a fifty-fifty mix of the following grasses within the treatment area:

- American Sloughgrass (Beckmannia Syzigachne)
- Western Manna-grass (Glyceria Occidentalis)

These plants are within the plant community emergent march as specified by CWS *Design and Construction Standards*.

Mechanical Treatment
Contech CDS Media Filtration Vault will treat the northern most portion of Dolphin Lane before discharging into Wetland "D". Up-flow media filters provide a high level or treatment and are approved by the City of Portland. Mechanical filtration devises are an approved mechanism to treat/remove sediments, oil, grease, and nutrients from stormwater. The Contech Vault is sized to manufacture's specifications; each cartridge is able to treat a maximum of 18 gpm, or 0.04 cfs. Table 12 lists water quality flow rate and the required number of cartridges. The 13 cartridges will fit into a 9'x17' vault. The CDS water quality unit will be installed per the CDS Technology guidelines. The vault will require regular monitoring and cleaning according to the maintenance plan composed per the *Operation and Maintenance* requirements (See *Home Depot – Warrenton Operation and Maintenance* plan).

Basin Identification	Water Quality Flow (cfs)	# Cartridges	Model #	Capacity (cfs)
ST1	0.03	13	CDS 816 FILTER	0.50

Table 12 – StormFilter Sizing

WATER QUANTITY

Water Quantity Analysis
A water balance was completed for both Wetlands "B" and "D" to ensure additional flows generated from the site do not negatively impact the wetlands. Proposed flow rates entering the wetlands will be equal to or lower than their existing flow rates for the 2, 25 and 100-year storm events.

Release Rates

Proposed Wetland "D"
The release rates, shown in Table 13, were generated by routing post-developed runoff rates though proposed storm system A and compared to pre-existing flow rates. Given the low post developed rate of discharge no control structure is required.

PEAK FLOW RATES USED FOR TRILLIUM PROJECT

Recurrence Interval	Peak Discharge Runoff Rate (cfs)	
	Proposed	Pre-Existing
2-year	0.77	0.605
25-year	1.34	1.82
100-year	1.62	2.56

Table 13 – Proposed Wetland "D" Release Rates

Flows conveyed to Wetland "D" have been reduced between 14% and 36%. As a result there is no need to mitigate the flows entering existing wetland "D".

Proposed Wetland "B"

The release rates, shown in Table 14, were generated by routing post-developed runoff rates thought proposed storm systems B, C, D, E and F, and compared to allowable release rates. They reflect flow rates discharged through the flow control structure.

Recurrence Interval	Peak Discharge Runoff Rate (cfs)	
	Proposed	Pre-Existing
2-year	13.49	1.74
25-year	22.67	5.13
100-year	27.22	7.15

Table 14 – Proposed Wetland "B" Release Rates

Wetland "B" located on Outlot 5 will be used as flow mitigation for the Home Depot development. The increased size of wetland "B" provides additional system capacity. The proposed control structure is designed to release accumulated runoff after one foot of storage. The adjacent wetland receiving mitigated flows from Wetland "B", based on visual inspection, do not appear to have limited downstream capacity.

Flow Mitigation System

The proposed water quantity facility is located within a mitigated wetland area. The proposed wetland will have an ultimate capacity of 499,331 cubic feet of storage volume. Table 15 lists the detention approximate volumes for the 2, 10, 25 and100-year storm event.

Event	Volume (ft^3)
2-year	179,151
10-year	204,810
25-year	213,663
100-year	226,107

Table 15 – Detention Stage/Volume

Control Structures

The control structure system composed of two ditch inlets and 2 12-inch culverts running under Dolphin Ave. The invert of the ditch inlets is set one foot above the bottom of the wetland.

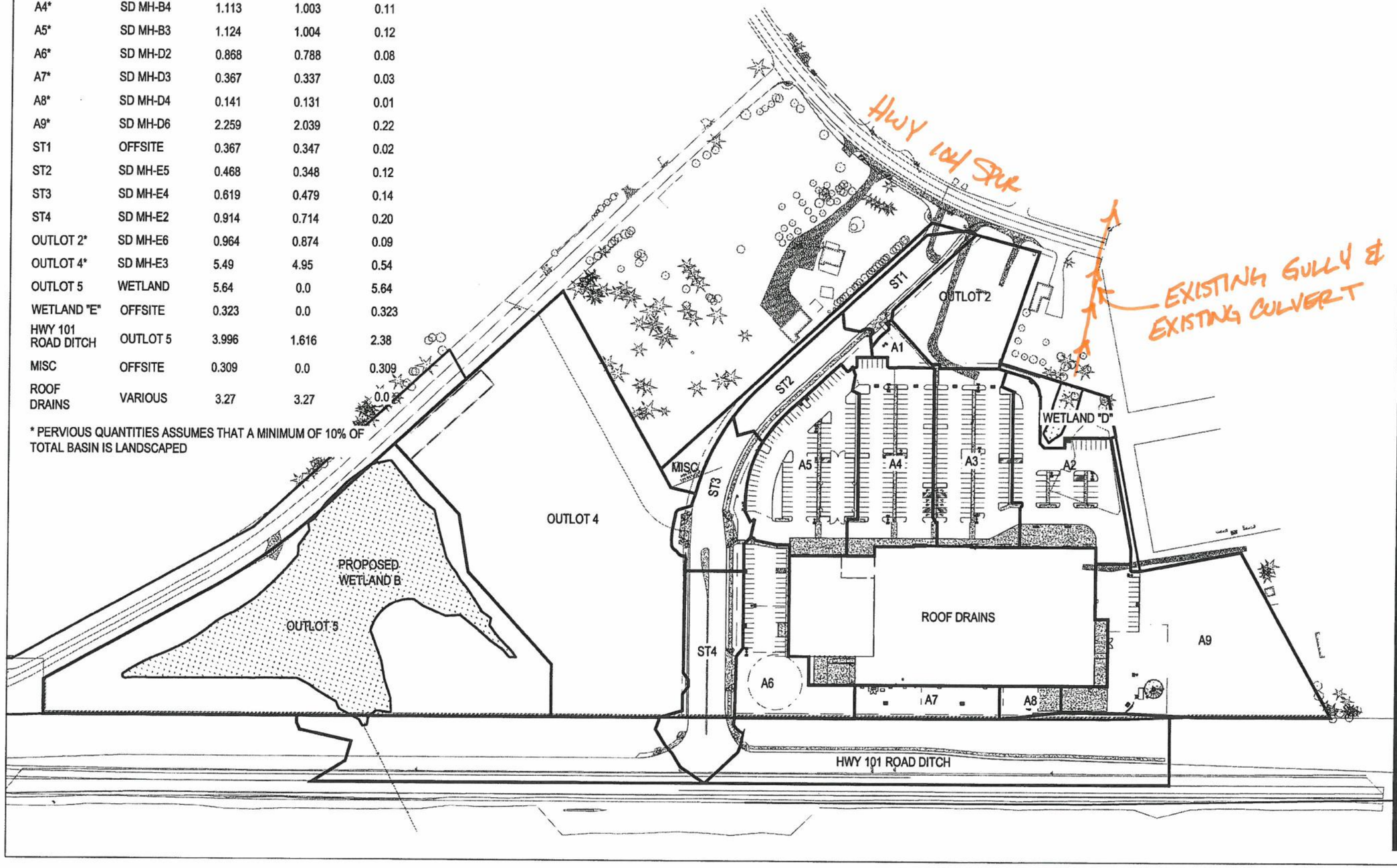
SUMMARY

Storm conveyance and water quality designs follow the guidelines outlined in Services *Design and Construction Standards for Sanitary Sewer and Surface Water Management* issued in June 2007 by Clean Water Services.

The proposed water quality designs will meet or exceed Clean Water Services requirements by treating both existing and post-developed impervious areas.

BASIN I.D.	DRAINS TO	TOTAL AREA	IMP AREA	PER AREA
A1*	SD MH-A2	0.116	0.105	0.011
A2*	SD CB A-1.2	1.045	0.945	0.10
A3*	SD MH-B5	1.085	0.985	0.10
A4*	SD MH-B4	1.113	1.003	0.11
A5*	SD MH-B3	1.124	1.004	0.12
A6*	SD MH-D2	0.868	0.788	0.08
A7*	SD MH-D3	0.367	0.337	0.03
A8*	SD MH-D4	0.141	0.131	0.01
A9*	SD MH-D6	2.259	2.039	0.22
ST1	OFFSITE	0.367	0.347	0.02
ST2	SD MH-E5	0.468	0.348	0.12
ST3	SD MH-E4	0.619	0.479	0.14
ST4	SD MH-E2	0.914	0.714	0.20
OUTLOT 2*	SD MH-E6	0.964	0.874	0.09
OUTLOT 4*	SD MH-E3	5.49	4.95	0.54
OUTLOT 5	WETLAND	5.64	0.0	5.64
WETLAND "E"	OFFSITE	0.323	0.0	0.323
HWY 101 ROAD DITCH	OUTLOT 5	3.996	1.616	2.38
MISC	OFFSITE	0.309	0.0	0.309
ROOF DRAINS	VARIOUS	3.27	3.27	0.0

* PERVIOUS QUANTITIES ASSUMES THAT A MINIMUM OF 10% OF TOTAL BASIN IS LANDSCAPED



WRG DESIGN INC
5415 SW Westgate Dr., Ste 100 Portland, OR 97221
Tel. 503.419.2500 Fax. 503.419.2600
PLANNERS • ENGINEERS • LANDSCAPE ARCHITECTS • SURVEYORS

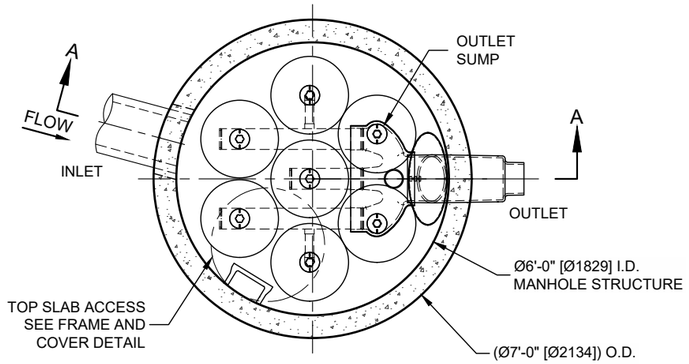
POST DEVELOPED BASIN DELINEATION
HOME DEPOT WARRENTON

THE HOME DEPOT
WARRENTON, OREGON

PROJECT NO. HOD5078.30
DATE: 02/15/2007
BY: MAS
SHEET NO. EXHIBIT 2

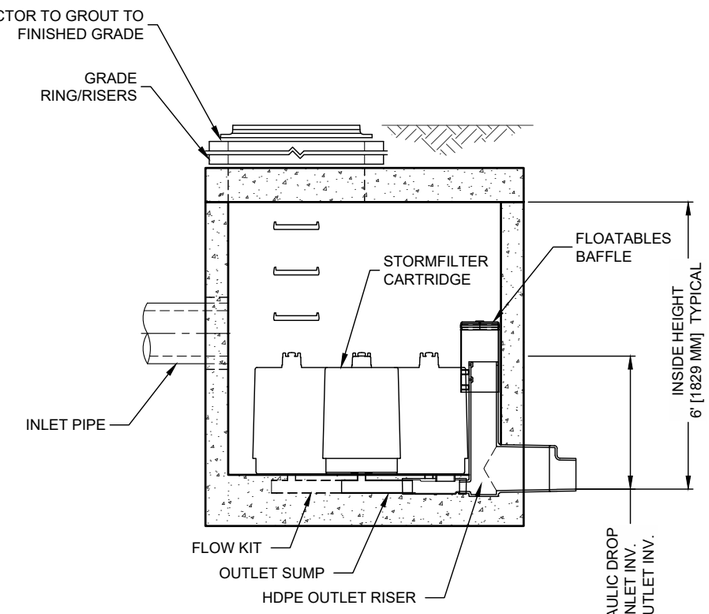
APPENDIX E

Contech StormFilter Manhole Detail



PLAN VIEW

STANDARD OUTLET RISER
FLOWKIT: 42A



SECTION A-A

The Stormwater Management StormFilter®

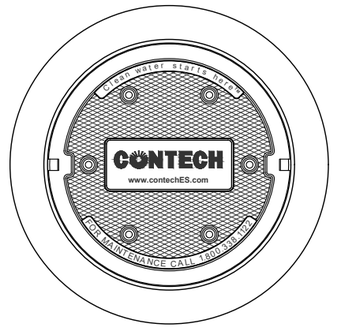
STORMFILTER DESIGN NOTES

STORMFILTER TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE SELECTION AND THE NUMBER OF CARTRIDGES. THE STANDARD MANHOLE STYLE IS SHOWN WITH THE MAXIMUM NUMBER OF CARTRIDGES (7). VOLUME SYSTEM IS ALSO AVAILABLE WITH MAXIMUM 7 CARTRIDGES.
Ø6'-0" [1829 mm] MANHOLE STORMFILTER PEAK HYDRAULIC CAPACITY IS 1.5 CFS [42.5 L/s] . IF THE SITE CONDITIONS EXCEED 1.5 CFS [42.5 L/s] AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

CARTRIDGE SELECTION

CARTRIDGE HEIGHT	27" [686 mm]			18" [458 mm]			LOW DROP		
RECOMMENDED HYDRAULIC DROP (H)	3.05' [930 mm]			2.3' [700 mm]			1.8' [550 mm]		
SPECIFIC FLOW RATE (gpm/sf) [L/s/m^2]	2 [1.30]	1.67* [1.08]	1 [0.65]	2 [1.30]	1.67* [1.08]	1 [0.65]	2 [1.30]	1.67* [1.08]	1 [0.65]
CARTRIDGE FLOW RATE (gpm) [L/s]	22.5 [1.42]	18.79 [1.19]	11.25 [0.71]	15 [0.95]	12.53 [0.79]	7.5 [0.44]	10 [0.63]	8.35 [0.54]	5 [0.32]

* 1.67 gpm/sf [1.08 L/s/m^2] SPECIFIC FLOW RATE IS APPROVED WITH PHOSPHOSORB® (PSORB) MEDIA ONLY



FRAME AND COVER

(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
WATER QUALITY FLOW RATE (cfs) [L/s]	*
PEAK FLOW RATE (cfs) [L/s]	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
CARTRIDGE HEIGHT (SEE TABLE ABOVE)	*
NUMBER OF CARTRIDGES REQUIRED	*
CARTRIDGE FLOW RATE	*
MEDIA TYPE (PERLITE, ZPG, PSORB)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE #1	*	*	*
INLET PIPE #2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR SITE SPECIFIC DRAWINGS WITH DETAILED VAULT DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
4. STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS-20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 5' [1524 mm] AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
6. FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. RADIAL MEDIA DEPTH SHALL BE 7-INCHES [178 mm]. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST 38 SECONDS.
7. SPECIFIC FLOW RATE IS EQUAL TO THE FILTER TREATMENT CAPACITY (gpm) [L/s] DIVIDED BY THE FILTER CONTACT SURFACE AREA (sq ft)[m^2].
8. STORMFILTER STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES

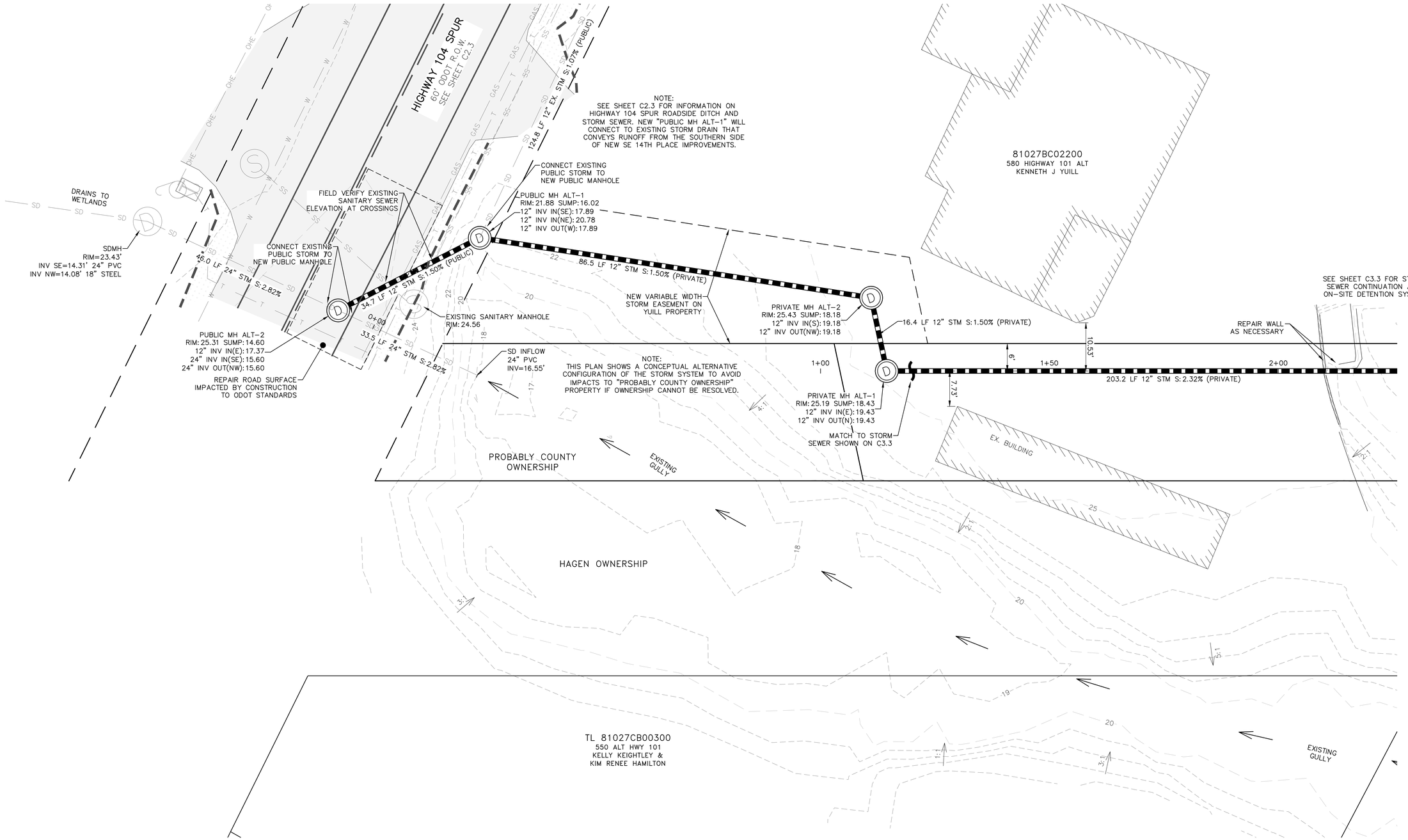
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET PIPE(S).
E. CONTRACTOR TO PROVIDE AND INSTALL CONNECTOR TO THE OUTLET RISER STUB. STORMFILTER EQUIPPED WITH A DUAL DIAMETER HDPE OUTLET STUB AND SAND COLLAR. IF OUTLET PIPE IS LARGER THAN 8 INCHES [200 mm], CONTRACTOR TO REMOVE THE 8 INCH [200 mm] OUTLET STUB AT MOLDED-IN CUT LINE. COUPLING BY FERNCO OR EQUAL AND PROVIDED BY CONTRACTOR.
F. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.

CONTECH® ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

SFMH72
STORMFILTER
STANDARD DETAIL

emmons design, llc

100 39TH STREET.
ASTORIA, OR, 97103
503.705.3050



FDG
Firwood Design Group, LLC
SURVEYING ✦ ENGINEERING ✦ PLANNING
359 E. HISTORIC COLUMBIA RIVER HWY
TROUTDALE, OREGON 97060
BUS: (503) 668-3737 ✦ FAX: (503) 668-3788

TRILLIUM HOUSE

SE 14TH PLACE
WARRENTON, OR

DESIGN DEVELOPMENT

PRIVATE STORM OUTFALL ALTERNATIVE CONFIGURATION

MARCH 30, 2021
SCALE FOR 24x36:
1" = 10'

0 10 20
SCALE IN FEET

DD
V12

C3.3 ALT

A.M. Engineering

P.O. Box 973
Seaside, Oregon 97138
(503) 468-8600
adam@amengnr.com

March 30, 2021

Scott Hess
Community Development Director
City of Warrenton
225 S Main Ave
Warrenton, OR 97146

RE: Trillium House – Site Design Review (WMC 16.212.040)

Dear Mr. Hess,

The City of Warrenton has engaged A.M. Engineering to provide site design review support consulting services.

This letter summarizes my review comments of this information provided to me, by the applicant, on 3/24/21. The reviewed documents include:

- City of Warrenton Planning Department Pre-Application Notes, dated 9/10/20
- City of Warrenton Fire Department Pre-Application Comments, dated 9/16/20
- City of Warrenton Public Works Department Pre-Application Memo, dated 9/16/20
- Preliminary Stormwater Report, Firwood Design Group, dated 12/10/20
- Impact Study, Firwood Design Group, dated 12/10/20
- Trillium House Design Development Drawings, Emmons Design and Firwood Design Group, dated 12/10/20.
- Trillium House – Site Design Review Comments, Dated 2/1/21

The site is located at the corner of S.E. 14th Place and Highway 104 Spur. As submitted, the development consists of a 1 building, 42 unit apartment complex, community garden, and playground.
Half street improvements are provided on 14th and a gravel fire lane is provided on S.E. Galena Court.

The submitted information has been reviewed for compliance with the City of Warrenton Municipal Code Site Design Review, Section 16.212.040 and additional referenced sections. Although the plans include some components of engineering design, engineering standards compliance is not reviewed at this time.

General Notes:

- Construction Documents shall meet all requirements of federal, state, and local standards, codes, ordinances, guidelines and/or other legal requirements.
- The developer is required to follow the City of Warrenton Development Standards. These standards can be found in Title 16 of the Warrenton Municipal Code. Please provide documentation showing how this development will meet the standards set forth in the development code.
- The developer must follow the City's Water and Sewer Regulations. These regulations are included under Title 13 of the Warrenton Municipal Code.
- The developer is required to follow the Engineering Standards & Design Criteria Manual 2020.
- Any design not meeting standards requires a design exception. Each design exception must be individually identified numerically.
- The City of Warrenton refers to ODOT details as standards. Provide applicable ODOT standard drawings and details where appropriate. Ensure the detail or drawing is modified to include any additional information

A.M. Engineering

P.O. Box 973
Seaside, Oregon 97138
(503) 468-8600
adam@amengnr.com

referenced in the Engineering Standards & Design Criteria Manual. Where special details are provided, ensure the Engineering Standards & Design Criteria Manual is met by the detail.

Comments:

1 Provide location and dimensions of all proposed public and private streets, drives, rights-of-way, and easements. Provide in all plan sheets. Dimensions, for location, of Spur 104 right of way and pavement are not show in all plan sheets. Dimensions of the south parking lot are not show in all plan sheets. Dimensions, for location, of 14th right of way and pavement are not show in all plan sheets. Note – Standard easement width is to be provided around all sides of fire hydrants in the construction permit plans.

2 Provide location and dimensions of entrances and exits to the site for vehicular, pedestrian, and bicycle access. Provide in all plan sheets. Dimension for private vehicle asphalt access is not shown in all plan sheets. Dimension for public and private pedestrian access is not shown in all plan sheets.

3 Provide location, condition (paved, gravel unimproved, etc.) and width of all public and private streets, drives, sidewalks, pathways, rights-of-way, and easements on the site and adjoining the site. Provide in all plan sheets. Provide private and public sidewalk material in each plan sheet where sidewalks are shown. Hatching or individual notes are acceptable.

4 Provide property owner(s) name and address on the plan cover sheet.

5 Provide fire lane no parking signs along the north edge of 14th.

6 Establish ownership and provide documentation for properties to the southwest before draining the project site to them. Label ownership in all plan views. Ownership has not been resolved. Applicant proposes to seek a “Quiet Title” which cannot be completed (4-8 months) before the site design review hearing or construction. Because of the risk of the process not to be able to be completed before construction, an alternate design that does not involve the unresolved ownership shall be provided.

7 Provide documented design requirements from coordination with ODOT. Coordination documents, comments, from ODOT are not provided.

8 Developer will determine what public water improvements are needed to provide adequate domestic and fire flows to this development. The improvements will be designed in such a way as to ensure the added flow does not reduce the capacity of the system or negatively impact the system. A water model will be developed by the developer and reviewed by the City appointed consultant. The developer may use the City appointed consultant to prepare the necessary water model. Improvements will need to be reviewed and approved by Oregon Health Authority and City Engineer and paid for by the developer. The applicant states they are working with the City’s consultant for the model and will provide it with the construction docs.

9 Provide reasoning, including calculations if appropriate, to support the impact study findings. The impact study must determine, and state, that there is a definitive impact or not a definitive impact on the existing conditions or systems. General assumptions and opinions not supported by data are not acceptable. A Definitive impact statement for the transportation category is not provided. Without the water model a definitive impact statement cannot be provided.

10 Provide location, type, and height of outdoor lighting. Include summary of submitted lighting information on plan. Provide the lighting information on the site plan.

11 Preliminary Stormwater Report, revised 3/23/21, page 5 incorrectly states the water quality storm is the 2-year storm.

A.M. Engineering

P.O. Box 973
Seaside, Oregon 97138
(503) 468-8600
adam@amengnr.com

12 Preliminary Stormwater Report, revised 3/23/21, page 7, design and construction of the future 14th Place system shall include capacity for the future upstream construction.
13 Preliminary Stormwater Report, revised 3/23/21, page 9, post development flow exceeds pre development flow. Post development flow shall match or be less than pre development flow.
14 Provide a final Stormwater Report for approval with construction documents.
15 Provide final Impact Study with construction documents.

If there are any questions, please don't hesitate to call me.

Sincerely,

Adam Dailey, P.E.
President

Enclosures: None

Cc: Client, File

EMMONS DESIGN

Scott Hess
Community Development Director
City of Warrenton
225 S Main Ave.
Warrenton, OR 97146

Richard Stelzig
Public Works Director
City of Warrenton
225 S Main Ave.
Warrenton, OR 97146

Adam Dailey
A.M. Engineering
PO Box 973
Seaside, OR, 97138

March 31, 2021

Re: Trillium House **Public Works**
Response to 3/30/21 A.M. Engineering / City of Warrenton Public Works Site Design Review letter.

Dear Scott, Collin and Adam:
This letter is submitted in response to the comments in the Site Design Review letter for the Trillium House project, dated March 30, 2021 submitted by A.M. Engineering. The following comments are a collaboration with Firwood Design Group, Emmons Design and the rest of the Trillium House Development team.

Trillium Team Responses in Italics:

1. Provide location and dimensions of all proposed public and private streets, drives, rights-of-way, and easements. Provide in all plan sheets. Dimensions, for location, of Spur 104 right of way and pavement are not show in all plan sheets. Dimensions of the south parking lot are not show in all plan sheets. Dimensions, for location, of 14th right of way and pavement are not show in all plan sheets. Note – Standard easement width is to be provided around all sides of fire hydrants in the construction permit plans.
Response: Dimensions of proposed public and private streets, drives, rights-of-way, easements, and south parking lot are shown in selected Site Plan sheets previously submitted. Additional dimensioning of proposed public and private streets, drives, rights-of-way, easements, and south parking lot will be shown on additional appropriate site plan sheets and will be included in the Permit Documents submitted to the City for permit review.

2. Provide location and dimensions of entrances and exits to the site for vehicular, pedestrian, and bicycle access. Provide in all plan sheets. Dimension for private vehicle asphalt access is not shown in all plan sheets. Dimension for public and private pedestrian access is not shown in all plan sheets.
Response: Location and dimensions of entrances and exits to the site for vehicular, pedestrian, and bicycle access; private vehicle asphalt access; public and private pedestrian access are shown in selected Site Plan sheets previously submitted. Additional dimensioning of proposed location and dimensions of entrances and exits to the site for vehicular, pedestrian, and bicycle access; private vehicle asphalt access; public and private pedestrian access will be shown on additional appropriate site plan sheets and will be included in the Permit Documents submitted to the City for permit review.

3. Provide location, condition (paved, gravel unimproved, etc.) and width of all public and private streets, drives, sidewalks, pathways, rights-of-way, and easements on the site and adjoining the site. Provide in all plan sheets. Provide private and public sidewalk material in each plan sheet where sidewalks are shown. Hatching or individual notes are acceptable.
Response: Most locations, conditions and widths of all public and private streets, drives, sidewalks, pathways, rights-of-way, and easements on the site and adjoining the site; and private and public sidewalk material are shown in selected Site Plan sheets previously submitted. Additional locations, conditions and widths of all public and private streets, drives, sidewalks, pathways, rights-of-way, and easements on the site and adjoining the site; and private and public sidewalk material will be shown on additional appropriate site plan sheets and will be included in the Permit Documents submitted to the City for permit review. We may use hatching or individual notes for further clarification.

4. Provide property owner(s) name and address on the plan cover sheet.
Response: Property owner(s) name and address will be on on the plan cover sheet of the *Permit Documents submitted to the City for permit review.*

5 Provide fire lane no parking signs along the north edge of 14th.
Response: Site plan sheets included in the Permit Documents submitted to the City for permit review.will include fire lane no parking signs along the north edge of 14th.

6 Establish ownership and provide documentation for properties to the southwest before draining the project site to them. Label ownership in all plan views. Ownership has not been resolved. Applicant proposes to seek a "Quiet Title" which cannot be completed (4-8 months) before the site design review hearing or construction. Because of the risk of the process not to be able to be completed before construction, an alternate design that does not involve the unresolved ownership shall be provided.
Response: An alternate design that does not involve the unresolved ownership is provided - attached to this letter and in separate file.

7. Provide documented design requirements from coordination with ODOT. Coordination documents, comments, from ODOT are not provided.
Response: Documented design requirements from out team's coordination with ODOT, and coordination documents, will be included in the Permit Documents submitted to the City for permit review.

8. Developer will determine what public water improvements are needed to provide adequate domestic and fire flows to this development. The improvements will be designed in such a way as to ensure the added flow does not reduce the capacity of the system or negatively impact the system. A water model will be developed by the developer and reviewed by the City appointed consultant. The developer may use the City appointed consultant to prepare the necessary water model. Improvements will need to be reviewed and approved by Oregon Health Authority and City Engineer and paid for by the developer. The applicant states they are working with the City's consultant for the model and will provide it with the construction docs.
Response: Water supply system: The development team will determine what public water improvements are needed to provide adequate domestic and fire flows to this development. The improvements will be designed in such a way as to ensure the added flow does not reduce the capacity of the system or negatively impact the system. A water model will be developed by the development team and reviewed by the City during the permit review process. If the hydraulic water modeling indicates additional impacts or improvements to the water system are needed, they will be mitigated and the mitigation will be part of the Permit drawings submitted to the City for review. We will also have the Oregon Health Authority reviewed and approve public water improvements, if any.

9. Provide reasoning, including calculations if appropriate, to support the impact study findings. The impact study must determine, and state, that there is a definitive impact or not a definitive impact on the existing conditions or systems. General assumptions and opinions not supported by data are not acceptable. A Definitive impact statement for the transportation category is not provided. Without the water model a definitive impact statement cannot be provided.
Response:
Calculations: The Impact Study will be revised to include additional reasoning, including calculations if appropriate, to support the impact study findings, and will be included in the Permit Documents submitted to the City for permit review.
Traffic: The impacts to traffic are presented in the (a) Lancaster Mobley Memo dated March 3, 2021 - Trillium House, OR-104S @ SE Ensign; and in the (b) Trillium House Transportation Impact Study prepared for the applicant by Lancaster Mobley dated January 5, 2021.
Water Model will be included in the Permit Documents submitted to the City for permit review.

10. Provide location, type, and height of outdoor lighting. Include summary of submitted lighting information on plan. Provide the lighting information on the site plan.
Response: Most locations, types, and heights of outdoor lighting, and summary of lighting information, are shown in selected Site Plan sheets previously submitted. Additional locations, types, and heights of outdoor lighting, and summary of lighting information will be shown on additional appropriate site plan sheets and will be included in the Permit Documents submitted to the City for permit review.

11. Preliminary Stormwater Report, revised 3/23/21, page 5 incorrectly states the water quality storm is the 2-year storm.
Response: The final stormwater report will clarify on page 5 that the water quality design storm is 50% of the 2-year storm event, as is described on page 11 of the preliminary stormwater report dated March 23, 2021.

12. Preliminary Stormwater Report, revised 3/23/21, page 7, design and construction of the future 14th Place system shall include capacity for the future upstream construction.
Response: The Final Stormwater Report and other Permit Documents will include capacity for the future upstream construction of the 14th Place stormwater system.

13. Preliminary Stormwater Report, revised 3/23/21, page 9, post development flow exceeds pre development flow. Post development flow shall match or be less than pre development flow.
Response: The peak flow comparison on page 9 of the Preliminary Stormwater Report dated 3/23/21 is for the 100-year design storm event at the existing culvert. Post-development peak flow rates in the 100-year design storm will exceed pre-development peak flow rates because the detention system is not designed for the 100-year 24-hour storm event. WMC 16.140.050.B specifies that the required design storm for detention facilities is the 10-year 24-hour design storm. The 10-year peak flow comparison is shown on Page 8 of the Preliminary Stormwater Report dated 3/23/21.

14. Provide a final Stormwater Report for approval with construction documents.
Response: The Final Stormwater Report will be provided with construction documents (aka Permit Documents) submitted to the City for review.

15. Provide final Impact Study with construction documents.
Response: A final Impact Study will be provided with construction documents (aka Permit Documents submitted to the City for review.

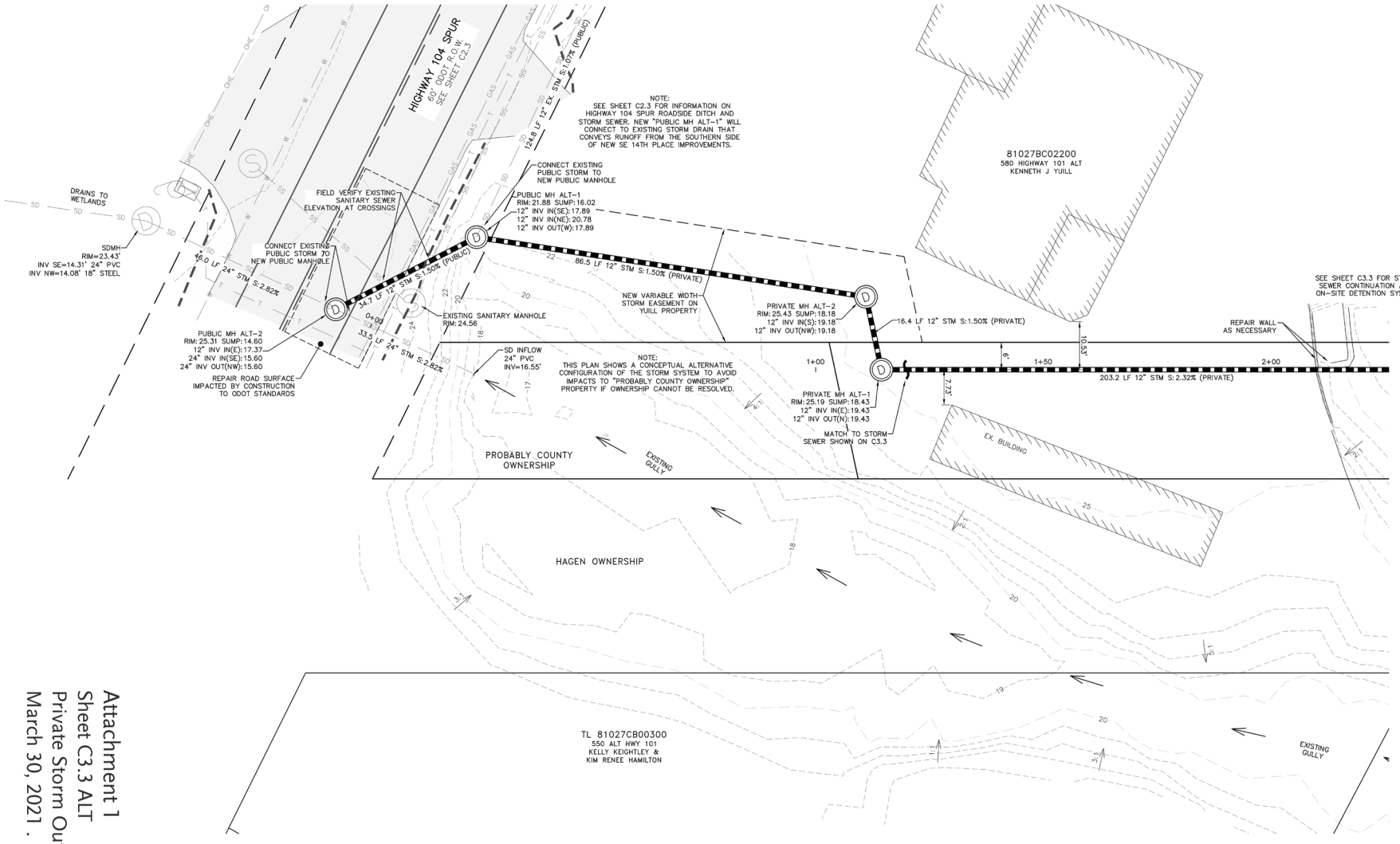
Thank you for reviewing this information.
Sincerely,

Stuart Emmons, AIA
Emmons Design, LLC
Project Architect for Trillium House

copy:
Ross Cornelius, RCA Consulting, Project Developer
Briana Murtaugh, Greenlight Development, Project Co-Developer
Erik Hoovestal, PE, Firwood Design, Project Civil Engineer
Blake Davis, PE, Project Civil Engineer
Jay Nees, Walsh Construction, Project Construction Manager
Dana Krawczuk, Partner, Stoel Rives, LLP

attachments: page
1. Sheet C3.3 ALT. Private Storm Outfall Alternative Configuration . March 30, 2021 . Firwood Design 4
(for better clarity, please see sheet submitted under separate cover)

under separate cover:
(a) Lancaster Mobley Memo dated March 3, 2021 - Trillium House, OR-104S @ SE Ensign
(b) Trillium House Transportation Impact Study, Lancaster Mobley dated January 5, 2021
(c) Sheet C3.3 ALT. Private Storm Outfall Alternative Configuration . March 30, 2021 . Firwood Design (full size)



Attachment 1
Sheet C3.3 ALT
Private Storm Outfall Alternative Configuration
March 30, 2021 . Firwood Design

emmons design, llc

100 39TH STREET.
ASTORIA, OR, 97103
503.705.3050

FDG
Firwood Design Group, LLC
SURVEYING • ENGINEERING • PLANNING
359 E. HISTORIC COLUMBIA RIVER HWY
TROUTDALE, OREGON 97060
BUS: (503) 668-3737 • FAX: (503) 668-3788

TRILLIUM HOUSE

SE 14TH PLACE
WARRENTON, OR

DESIGN DEVELOPMENT

PRIVATE STORM OUTFALL ALTERNATIVE CONFIGURATION

MARCH 30, 2021
SCALE FOR 24x36:
1" = 10'

0 10 20
SCALE IN FEET

DD V12

C3.3 ALT

Warrenton Fire Department

P.O. Box 250 Warrenton, OR 97146-0250 (5 0 3) 861-2494 Fax503/861-2351
225 S. Main Warrenton, Or 97146-0250

MEMORANDUM

To: Scott Hess, Building Official
Van Wilfinger, Building Official
Date: February 2, 2021
From: Brian Alsbury, Fire Chief
Re: **Trillium House Project**

ACCESS:

Proposed access off S.E. 14th Place meets the Warrenton Fire Departments needs. Access from S.E. Galina Court is acceptable with the following condition:

1. 20-foot-wide gravel surface that will support Warrenton Fire Departments vehicles. (60,000 psi)
2. Establish no parking on the East side of S.E. Galina Court from S.E. 14th Place to the end of S.E. Galina, where it turns into the parking lot.

WATER SUPPLY:

Warrenton Fire Department is requesting that a hydrant flow test be performed to determine that water flows for that area are adequate for the proposed four-story apartment building.

* Please see a list of Vendors that have performed flow tests in the City of Warrenton,

Red Hawk Fire Protection
3801 NW Fruit Valley Rd Suite D, Vancouver, WA 98660
(360) 984-3712

Wyatt Fire Protection
9095 SW Burnham St, Tigard, OR 97223
(503) 684-2928

Delta Fire, Inc
14795 SW 72nd Ave, Portland, OR 97224
(503) 620-4020

Viking Fire Protection
3245 NW Front Ave, Portland, OR 97210
(503) 227-1171

Basic Fire Protectio
8135 NE MLK Jr. Blvd, Portland, OR 97211
(503) 285 0713

ADDRESS:
Apartment complex will be required to have address number visible from the street with opposing/contrasting number. i.e. black numbers with white background.

CITY OF WARRENTON

PLANNING AND BUILDING DEPARTMENT
Telephone: 503-861-0920

VARIANCE APPLICATION

OFFICE USE ONLY
FILE # _____ FEE $_____
ZONING DISTRICT_____
RECEIPT #_____

To be accompanied by a Site Plan, copy of property deed and Letter of Authorization, if applicable.

The Variance application process is a method for assuring compliance with the City of Warrenton Comprehensive Plan and Development Code, and to ensure wise utilization of natural resources, and the proper integration of land uses utilizing appropriate landscaping or screening measures. Please answer the questions as completely as possible.

Legal Description of the Subject Property:Township _____, Range _____, Section(s) _____
Tax Lot(s) SUBDIVISION OF TRACT 3 CHELSEA, BLK 1: LOTS: 2, 3, 4, 5, 6, 7, 8, 9, 10, 11. BLK 2: PARTIAL BLOCKS 1, 11, 12, 13, 14. Tax Lots: 1600, 1500, 1503. Partial Tax Lots: 1700, 2100, 2200
Property street address : To Be Determined (approximately 700 SE 14th Place, Warrenton, OR, 97146

I/we, the undersigned applicant(s) or authorized agent, affirm by my/our signature(s) that the information contained in the foregoing application and associated submissions is true and correct.
APPLICANT:

Printed Name: Stuart Emmons, AIA

Signature: _____ Date: February 18, 2020

Address: 107 Kensington Ave. Phone: 503.705.3050

City/State/Zip: Astoria, OR, 97103 Fax: N/A

PROPERTY OWNER (if different from Applicant):

Printed Name: Current: Ken Yuill, John Yuill, Dave Short // May 2021: Trillium House Warrenton Affordable Housing LLC*

Signature _____ // _____ Date: February 18, 2020

Address: 580 Highway 101 Alt / / 147 S Main Ave Phone: (503) 440-1202 // (503) 861-0119

City/State/Zip: Warrenton, OR, 97146 Fax: N/A

This application will not be officially accepted until department staff has determined that the application is completed, the site plan map requirements are met, and a copy of the deed is included.

*Trillium House Warrenton Affordable Housing LLC is controlled by Northwest Oregon Housing Authority.

Jim Evans, NOHA Interim Executive Director

NARRATIVE: Please describe the variance request:

We are requesting a 16% parking reduction from 74 spaces to 62 spaces. The City of Warrenton Development Code allows for:
(b) a 10% reduction to the standard number of automobile parking spaces; for the site having dedicated parking spaces for carpool/vanpool vehicles. [16.128.030 Vehicle Parking Standards. A.10 (b)]

The Site has 2 Parking Spaces dedicated for carpool/vanpool vehicles.

and

(e) a 10% reduction to the standard number of automobile parking spaces if the site has more than the minimum number of required bicycle parking spaces. [16.128.030 Vehicle Parking Standards. A.10 (e)]

The Site has far more bike parking than required by the development code. The project has 20 Long Term bike parking spaces (8 required per Table 16.128.040.A) and 4 Short Term bike parking spaces (3 required per Table 16.128.040.A).

It is our belief that up to a 20% reduction in Parking is allowed by the City of Development Code using both (b) and (e).

In addition, our project is affordable housing - 42 dwelling units of 1, 2, and 3 bedroom units.

• The Institute of Transportation Engineers, Parking Generation Manual 5th Edition, 2019 provides an average parking rate of 0.99 vehicles per dwelling unit (income restricted housing) for affordable housing uses in general urban/suburban settings during a typical weekday. In Trillium House's case - this would be approx. 42 cars.

• Alder Court in downtown Warrenton is a good comparable to Trillium House - affordable housing. Alder Court has 63 parking spaces. An average of 35 parking spaces are used by the residents, per Viridian Management - Alder Court's management company as stated in a recent email.

We believe that the 62 parking spaces for Trillium House are more than adequate for this resident population, and the City of Warrenton, and neighboring properties will be enhanced by this parking reduction in exchange for more greenspace and more resident amenities.

Standard	Required	Proposed
Front Yard Setback	n/a	
Rear Yard Setback	n/a	
Side Yard Setback	n/a	
Lot Dimension	n/a	
Height	n/a	
Landscaping	n/a	
Parking	62	74

SIX VARIANCE CRITERIA

1. The hardship was not created by the person requesting the variance. Please explain.

We are requesting a 16% parking reduction from 74 spaces to 62 spaces. The hardship was not created by the Trillium House project team. We believe this reasonable parking reduction benefits the community and especially the adjacent neighbors.

2. The request is necessary to make reasonable use of the property. There will be an unreasonable economic impact upon the person requesting the variance if the request is denied.

The Parking reduction will result in far more greenspace on the 14th Place frontage of the building - where we intend to locate a playground, community garden, and a landscaped front yard. This request is necessary to make reasonable use of the property and not have it filled with empty parking spaces in lieu of a landscaped area. There will be an unreasonable economic impact upon our residents and NOHA if the variance is denied - resident kids will have far less play area, and/or the community garden will be reduced or eliminated.

3. The request will not substantially be injurious to the neighborhood in which the property in located. The variance will not result in physical impacts, such as visual, noise, traffic or increased potential for drainage, erosion and landslide hazards, beyond those impacts that would typically occur with development in the subject zone.

The request will not substantially be injurious to the 14th Place / Chelsea Gardens neighborhood. The variance will not result in physical impacts, such as visual, noise, traffic or increased potential for drainage, erosion and landslide hazards, beyond those impacts that would typically occur with development in the 14th Place / Chelsea Gardens neighborhood. Just the opposite - the request will be highly beneficial to the neighborhood.

4. The request is not in conflict with the Comprehensive Plan. Please explain.

The request is not in conflict with the Comprehensive Plan. The Comprehensive Plan stresses livability, greenspaces and other qualitative characteristics, and this parking reduction benefits the goals of the Comprehensive Plan.

5. The request is not in conflict with the Development Code. No variance may be granted which will result in a use not permitted in the applicable zone or which will increase the allowable residential density in any zone with the exception of individual lot size reduction. Please explain.

The request is in compliance with the Development Code. The Development Code 16.128.030 Vehicle Parking Standards. A.10 (b) allows for a 10% reduction if there are dedicated parking spaces for carpool/vanpool vehicles; and 16.128.030 Vehicle Parking Standards. A.10 (e) allows for a 10% reduction if the site has more than the minimum number of required bicycle parking spaces - it has 13 more bike parking spaces than the required 11 bike parking spaces.

6. Physical circumstance(s) related to the property involved preclude conformance with the standard to be varied. Please explain.

Warrenton affordable housing projects should have greenspaces for playyards, community gardens and generous landscaped areas rather that empty parking spaces. Many Warrenton housing projects have few or no outdoor amenities for residents due to parking lots taking up so much of the outdoor space. The physical circumstances related to the property preclude conformance with the parking standard of 74 spaces.

Return Application To: **City of Warrenton**
Planning and Building Department
PO Box 250, 225 S. Main Street
Warrenton, Oregon 97146