PLANNING COMMISSION MEETING AGENDA
Tuesday, May 12, 2015, 7:00 PM
City Municipal Center, 616 NE 4th Avenue

Special Meeting

I. CALL TO ORDER

II. ROLL CALL

IV. MEETING ITEMS

A. Green Mountain Subdivision Planned Residential Development Public Hearing
Details: A public hearing for preliminary master plan approval for the Green Mountain Planned Residential Development (PRD) and Subdivision approval for the first phase.
Presenter: Robert Maul, Planning Manager
Recommended Action: Conduct a public hearing, take public testimony, deliberate and render a decision on the preliminary plat and to provide a master plan recommendation for the City Council. (Exhibit List follows:)

Exhibit 78 - City Staff PowerPoint Presentation

B. Rules of Procedure for Quasi-Judicial Hearings

Rules Procedure Quasi Judicial Hearings

VI. NEXT MEETING DATE

A. The next Planning Commission Meeting will be held on Tuesday, June 16, 2015, in the City Council Chambers at 7:00 p.m.

VII. ADJOURNMENT

NOTE: The City of Camas welcomes and encourages the participation of all of its citizens in the public meeting process. A special effort will be made to ensure that persons with special needs have opportunities to participate. For more information, please call 360.834.6864.

COMMUNITY DEVELOPMENT DEPARTMENT
616 NE 4th Avenue
Camas, WA 98607
www.cityofcamas.us

STAFF REPORT
Green Mountain Planned Residential Development and Preliminary Plat Application
File Nos. SUB14-02, SEPA14-21, ARCH14-10

Staff Report Date: May 5th, 2015

TO:	Planning Commission	HEARING DATE: **May12th, 2015**
PROPOSAL:	A planned residential development for a 1,300 lot master-planned community on 283 acres and a preliminary subdivision (Phase I) to include 201 single detached residential lots on 51.21 acres.	
LOCATION:	The entire project is located north of NE Goodwin Road and northeast of NE Ingle Road in Camas, Washington and comprised of nine tax parcels: 172555-000, 171727-000, 171704-000, 172341-000 are zoned (R-10); 172557-000 and 172553-000 are zoned (MF-10); 173178-000 and 173165-000 are zoned (R-6) and 172559-000 is zoned (CC); and further described as Sections 17, 20 and 21, Township 2 North, Range 3 East of the Willamette Meridian, Camas Washington.	
APPLICANT:	Green Mountain Land, LLC	

PUBLIC NOTICE:	Notice of public hearing mailed to property owners within 300 feet of the site on 4/28/2015, and published in the *Post Record* on 4/28/2015, Legal publication #533827.
STATE ENVIRONMENTAL POLICY ACT (SEPA):	The City issued a SEPA Determination of Non-significance (DNS) (file no. SEPA14-21) on March 3rd, 2015. **No appeals were filed**.
APPLICABLE LAW: The application was submitted on **December 30, 2014,** and deemed complete upon request of the applicant on January 29, 2015. The applicable codes are those in effect on the date it was first submitted, and as specified in a development agreement. Camas Municipal Code Chapters (CMC)(through Ordinance No. 2600): Title 16 Environment, Title 17 Land Development; and Title 18 Zoning; Specifically, Chapter 17.11 Subdivisions, Chapter 18.07 Use Authorization, Chapter 18.09 Density and Development, Chapter 18.23 Planned Residential Development, Chapter 18.55 Administrative Provisions, and Chapter 3.88 (Impact Fees). A recorded development agreement between the City and the applicant also governs certain requirements of the proposal. [**Note**: Citations from Camas Municipal Code (CMC) are indicated with ***italicized*** **type**.]	

I. Summary

Zoning: Single-Family Residential (R-6), Single-Family Residential (R-10), Multi-Family (MF-10), and Community Commercial (CC)

Proposed Lots: PRD: 1,300 residential and commercial lots

Total site area: 283 acres

Open Spaces: 85 acres

History and Background:

In 2007, the City updated its Comprehensive Plan and Zoning map to include additional land to its North Urban Growth Area (NUGA) and developed capital facilities plans (sewer, water, and transportation) for the NUGA as required by GMA. In 2008, the NUGA area was annexed and the pre-annexation agreement created out of that process was soon replaced with a Development Agreement (DA) in 2009 that provided a conceptual framework for the future development of the Green Mountain property. Green Mountain, LLC purchased the property in 2012 and prepared updated technical information for the property. With the expiration of the 2009 DA coupled with the new technical information, a new DA was prepared and approved December 22, 2014 which contains a conceptual Master Plan for a mixed use planned residential development including requirements relating to parks and open space, transportation, tree preservation, planning standards, stormwater, streetscape and significant views for specific areas of the project. Additional history and background of the Development Agreement is set forth in Resolution 1315, Exhibit 55, recording number 5134733 AGR.

Physical Description:

The top of Green Mountain, including its western and southern slopes, stands at the northeast corner of the property. The northern portion of the property is generally forested with moderate to steep slopes and contains multiple terraces and rock outcroppings. The Green Mountain clubhouse and golf course sits on the southern half of the property on gentle to moderate slopes. The southern section also contains numerous wetlands, man-made ponds and ditches, a tributary creek with an adjoining oak grove and a gas transmission line. A BPA power line traverses the entire property. Adjacent to the site, to the north, is the Mountain Glenn subdivision with single-family residences. The site is bordered on the south by NE Goodwin Road and on the west by NE Ingle Road. Immediately to the east is a single-family residence zoned R-6; however County land outside of the UGA abuts a portion of the site to the east and is zoned large lot rural residential.

Proposed Action:

Application has been made to the City of Camas for planned residential development (PRD) and preliminary plat approval for a portion of the Green Mountain area, submitted December 30, 2014 and deemed complete on January 29, 2015 (Exhibit 57). The PRD proposal includes 1,300 single and multi-family residential homes, 8.8 acres of commercial/retail/office buildings, common open spaces, parks, trails, landscaping, associated parking lots, access roads, stormwater and detention facilities, utilities and other related infrastructural improvements. The master plan created development areas ("aka pods") with designated residential densities. The PRD will be developed in multiple phases with subsequent preliminary plat approval processes.

The preliminary plat proposal (City file number SUB14-02), which is Phase I of the PRD, would segregate 51.21 acres of this area into 201 lots lots ranging in size from 3,000 square feet to 9,000 square feet to accommodate front and alley loaded single-family residential homes. The proposal includes various tracts for open space and parks, access and parking, stormwater facilities, and a clubhouse. The proposed preliminary plat is accessed off of NE Ingle Road and an extensive network of trails meanders throughout the site. The proposal also includes an exception request to the required development standard setback for stormwater facilities fronting rights-of-way. Additional flexibility in lots standards was proposed to coincide with the density and dimensional standards adopted in the Development Agreement. The applicant proposes several different "pods" to provide for a variety of single family detached lot sizes with up to seven different residential densities, not to exceed densities specified in the recorded DA.

This report includes the applicable approval criteria, followed by staff analysis, findings of compliance or non-compliance with the applicable codes and the DA, and a recommendation to the Planning Commission.

II. Discussion and Findings for Critical Areas (Title 16) and Sensitive Areas and Open Space

CMC 16.31 Archeological Resource Preservation

Findings: The applicant provided a detailed archaeological report for the PRD in its entirety, and for the first phase subdivision, as per CMC 16.31. Certified mailing labels to the impacted tribes dated December 19th, 2015 were provided with the application (Exhibit 52). The Washington State Department of Archaeology and Historic Preservation (DAHP) provided written comments for the SEPA determination (Exhibit 62). Additional archaeological review will be necessary for future phases of the development. The applicant will be required to coordinate and comply with DAHP with all phases of the development prior to construction taking place for all respective phases, as per CMC16.31.050. A condition to this effect is warranted. Additionally, In the event that any archaeological or historic materials are encountered during project activity, work in the immediate area (initially allowing for a 100-foot buffer; this number may vary by circumstance) must stop and the following actions taken:

a. Implement reasonable measures to protect the discovery site, including any appropriate stabilization or covering;

b. Take reasonable steps to ensure the confidentiality of the discovery site; and

c. Take reasonable steps to restrict access to the site of discovery.

The project proponent shall notify the concerned tribes and all appropriate city, county, state, and federal agencies, including the Washington State Department or Archaeology and Historical Preservation. (CMC 16.31.150(D))

Conclusion: As conditioned, this section can be met.

CMC 16.33 Public View, Open Space Protection and Historic Sites and Structures

Findings: The applicant has provided a detailed tree preservation approach with the recorded DA with regards to CMC16.33. Exhibit E in the DA provides a tree preservation strategy for each phase of the development. In total, 4,759 trees, or 50% will be retained for the overall site. Additionally, the site will see additional landscaping provided with the development of the subdivision phases and commercial spaces, in addition to parks development thereby raising the overall tree canopy of the development as it builds out.

The applicant is also proposing to provide an approximate total of 103 acres of open space for the development as a whole, which is close to 33% of the overall site area. Some of the open space will include a trial system, community park space, and natural environmental spaces such as wetlands and tree habitat mitigation areas. This section can be met as proposed.

The site does contain an existing structure that the applicant's archaeologist did recommend should be retained either in place, or elsewhere on site. DAHP did recommend that the structure should be retained, but if not possible then further consultation will be necessary to see if additional documentation of structure is warranted. A condition to this effect is warranted.

Conclusion: As conditioned, this section can be met.

CMC 16.53 Wetlands

Findings: The applicant provided a critical area report (CAR) which complies with the standards of CMC Chapter 16.53 Wetlands and CMC Chapter 16.61, and with additional email correspondences from the Ecological Land Services.

In brief, the applicant avoided impacting the wetland areas to the extent practical, and utilized the provisions for buffer reductions and demonstrated that mitigation of impacts could occur onsite.

The site overall contains several man-made and naturally occurring wetlands as listed in the CAR. The first phase of this development does not propose to fill any jurisdictional wetlands, nor does the first phase contain any jurisdictional wetlands. The applicant does propose to buffer average two buffers related to Wetland D and G. No net loss is proposed for the two buffer areas to be averaged as per the CAR.

The applicant proposes to set aside several areas for wetlands and their respective buffer areas in the development, but it is unclear if they will be contained in tracts. Preserved wetland areas and their associated buffers are required to be placed in tracts, as per CMC 16.51.240. A condition to this effect is warranted. Prior to final plat approval, private covenants will need to be submitted, and must include provisions for proper maintenance and protection of this tract. CMC§16.51.210, allows the city to require adequate protective mechanisms. The city may require permanent fencing and signs adjacent to the critical area tract to act as a clear demarcation between private and common spaces. There are a few areas that will be set aside for tracts that will tie into trail and open space. Clear demarcation along the trail lines shall be in place with signage along the boundaries between wetland boundaries, buffer and recreational open space. Staff recommends that signs and fencing be installed along the final boundaries between housing lots and wetland areas with their respective buffers and shall be reviewed during engineering review. A condition to this effect will be included with this report.

Future phases that will impact jurisdictional wetland and/or their associated buffers will require additional review and approval by the city with those subsequent applications. A condition to this effect is warranted.

CMC 16.59 Geologically Hazardous Areas

Findings: The PRD site overall does have some areas that trigger a geotechnical review. The applicant has provided a detailed geotechnical report (Exhibit 46). The conclusion of the report is that phase 1 is considered low risk for geo-hazards. There are recommendations contained in the report that suggest having site preparation done in conformance with building code requirement with any excavation and grading of native and fill soils on site for when construction takes place. The applicant also acknowledges that further study is necessary for each respective phase. The applicant shall submit additional geological studies for each subsequent phase of this PRD.

Conclusions: As conditioned, this section can be met.

CMC 16.61 Fish and Wildlife Habitat Conservation Areas

Findings: The applicant's CAR did address the various elements listed in the CMC regarding habitat areas contained in this chapter. A comment letter was received by Washington State Department of Fish and Wildlife (WDFW) through the SEPA comment period (Exhibit 66). The applicant's consultant, Ecological Land Services, provided written responses to each concern raised by WDFW, which are as follows:

Oregon White Oak Habitat

The applicant is proposing to remove 8 oak trees with the first phase of the development that qualify for tree protection. The applicant, through its CAR, is going to mitigate for those trees at a higher replacement ratio than that is required in CMC16.51.120, which is normally 2 to 1. The applicant is proposing to provide Oak Tree mitigation within a buffer of a Category III wetland abutting Phase 1 as depicted in Figure 9 of the CAR. The applicant has also further discussed the oak tree habitat overall for the site with the WDFW, whereby they will look to provide an Oak Habitat Mitigation Bank up front for the rest of the development site to pre-mitigate for this and future phases. A detailed planting, mitigation and monitoring plan will be required to be provided to the city prior to any construction taking place on site. A condition to this effect is warranted.

Green Mountain Biodiversity Area

There has been some debate as to the accuracy of Clark County's mapping of a forested area in phase 1 if it qualifies as a Biodiversity Area. According to ELS, the young, deciduous forested area in the northern part of Phase 1 doesn't meet the definition of Biodiversity Area. If this conclusion is supported by WDFW the city will not require additional conditions for phase 1.

There are other areas within the PRD overall that do have mapped Biodiversity distinction that will require further review and analysis for those respective phases.

Townsend's Big-eared Bat

The developable portions of Phase 1 do not contain topography suitable for caves. According to the applicant, WDFW's main concern was potential habitat outside of the Phase 1 project area, but within the PRD. This area will need to be surveyed by WDFW and ELS biologists prior to any development in the potential habitat area.

Bradshaw's Lomatium

The documented Bradshaw's lomatium is outside the boundaries of Phase 1 and the PRD. The closest known location is about 0.25 miles from the nearest PRD boundary. According to ELS, WDFW didn't believe that there was suitable habitat within Phase 1 or the PRD for the lomatium, concurring with findings by ELS biologists and onsite maintenance staff knowledgeable about plants.

Conclusion: As conditioned, this section can be met.

III. Discussion and Findings for Preliminary Plat Criteria of Approval (CMC17.11.030)

The italicized text in boxes is the criteria of approval for preliminary plat applications per CMC§17.11.030(D) (**1 through10**).

1. The proposed subdivision is in conformance with the Camas comprehensive plan, parks and open space comprehensive plan, neighborhood traffic management plan, and any other city adopted plans;

The applicant's narrative at pages 17 and 18 identifies that the proposed subdivision is in conformance with the Camas Comprehensive Plan (Comp Plan), 2014 Parks, Recreation and Open Space Plan (Parks Plan), Neighborhood Traffic Management Plan (NTM Plan) and any other city adopted plans.

The proposed subdivision will help accommodate the projected growth through well-planned utilization of existing land. The proposed houses, when built, will provide housing opportunities to meet the needs of the community in accordance with the Housing element of the Comprehensive Plan. The mixed-use urban village will allow for economic development opportunities and will be well integrated into the surrounding development. The parks and open space needs can be met with the development of park land and trail networks, in addition to preservation of open space and natural areas. Many of these elements were addressed in the DA.

PARKS AND OPEN SPACE PLAN: The applicant proposes to provide for open space and parks by utilizing five components to their development.

- Open Space Area: The applicant is proposing to retain approximately 33% of the site in open space both for active recreation and natural space preservation.
- Community Trail System: The trail system is proposed to have both regional and neighborhood trail networks. The required regional T27 Trail is shown to navigate through the entire development largely using the BPA easement. The applicant is proposing that the T27 trail will be 8' wide paved at the central park area then taper down to 6' paved where the grade goes up to 8%, then down to 4' compacted gravel surface over 8% in terrain. The applicant also proposes to provide neighborhood trails T29 and T30. Those trails are proposed to be 6' in width with compacted gravel surfacing from flat up to 8% grade, and 4' wide compacted gravel over 8% in grade. Over 3 miles of trails are proposed overall.
- Central Community Open Space and Park: In the center of the development is the proposed 14 acre central park. Five acres of which will be used for active recreational area to include appropriate amenities including, but not limited to playground equipment, open lawn area to accommodate field space, paved sport courts, water features, restrooms, and site furnishings to name a few.
- Residents' Clubhouse: The applicant is also proposing a private club house for use of the residents. The clubhouse will contain an outdoor pool, meeting rooms, lounge and will be owned and maintained by the HOA.
- Landscape Master Plan Components: The overall development will have a comprehensive landscape plan that will help tie the community's sense of place together.

The T27 trail is required to be developed at minimum width of 12' and shall be paved in asphalt or concrete as per the 2014 Parks, Recreation, and Open space plan on table B1. The same table also contains minimum standards for local trails, rustic trails and semi-primitive trails. Staff met with the parks development review committee on March 13th, 2015 to discuss the project. The following are a summary of comments from the review committee.

- Project appears to plan for the appropriate trails, public viewing area atop Green Mountain, and a neighborhood park as called for in the Parks and Open Space Plan. The committee appreciated seeing regional trail connection that is tied into the local community as well as seeing the development of viewing areas atop Green Mountain. (In discussions with a rep. of the applicant, the top of Green Mountain is heavily forested. The City has identified the desire to protect the natural backdrop of Lacamas Lake including Green Mountain). Additional discussion on balancing a viewing area with the natural backdrop should occur with the committee prior to final construction plan approvals on the GM trails.

- The committee was concerned with construction of trails on steep slopes. It was noted the plans indicate slopes up to 16% which they felt were too steep. They recommended that the design minimize slopes and not exceed 8- 12% except where it is determined to not to otherwise be practicable.

- Where trails cannot meet ADA, the committee is interested in offsetting this with design efforts elsewhere to incorporate ADA accessibility in trail design, picnic areas, viewing platforms, etc.

- The committee would like to see the trail on Green Mountain connect to the adjacent County lands and would like to see this coordinated with the County Parks Dept. This will coincide with the Clark County Parks Department's request that the proposed development contain trail linkages to the County Parks area trails that abut the site.

- The location of the park within the community is supported. There is some concern as to the amount of usable area and how it ultimately is improved. The connectivity of the park to the larger trail networks is applauded. The Parks Board will ultimately need to be involved in the review of the Park Design and improvements. The Park would be a City Park and the Committee would support improvements being Impact Fee Creditable.

- The committee is interested in walking the site with the developer at some point prior to finalizing construction plans.

Essentially, the applicant has clearly provided some thought towards the implementation of the necessary parks and open space requirements based on the parks master plan. They have also provided some additional elements that help make the project become more innovative in design than standard subdivisions. It is unclear, however, what the intent for development and final ownership of the five acre neighborhood park proposed in phase 1. The neighborhood parks element in the parks master plan envisions a city owned Public Park to serve the area. The design, development and parks credit plan for the five acre central park shall be finalized prior to final plat approval for phase 1. Taking into considering the comments from the parks committee, and the required trail design standards as listed in the Parks Master Plan, staff will provide conditions as appropriate to ensure trail and parks development compliance.

Neighborhood Traffic Management Plan
The city has a Neighborhood Traffic Management Plan (NTM). This plan identifies the need for installation of acceptable traffic calming features when a proposed development will create 700 Average Daily Trips (ADT) or more.

The submitted Transportation Impact Analysis (TIA) clearly demonstrates that this threshold will be exceeded with the first phase of development.

The applicant has not identified traffic calming features other than the narrowed entry street and the majority of internal streets at 28 feet wide. There is no discussion of traffic calming elements for the remainder of Planning Pod 1 or the other six Planning Pods within the development.

A condition of approval requiring installation of traffic calming elements in the number, type and location acceptable to the city engineer is warranted.

Prior to final engineering plan approval for any phase the applicant shall install acceptable traffic calming elements in the number, type and location deemed necessary by the City Engineer.

Staff finds that as conditioned the applicant can or will comply with the city's NTM plan.

Findings: Staff finds that the project as conditioned can be consistent with the city's comprehensive plans.

2. Provisions have been made for water, storm drainage, erosion control and sanitary sewage disposal for the subdivision that are consistent with current standards and plans as adopted in the Camas Design Standard Manual;

Findings:

Water:

There is an existing 8" dead end water line in NE Ingle Road that currently serves the golf course and clubhouse. In 2013 the city performed some limited water modeling at the applicant's request to determine available fire flows under various scenarios (see Technical Memorandum from Gray & Osborne, Inc. dated November 20, 2013 - exhibit #77).

The modeling showed that the existing system (and future 8" diam. extensions) can only provide adequate fire flows for the lower, southerly portion of the site near NE 28th Ave.

Fire flows were not adequate in the middle and northerly portions of the site without upsizing portions of the system as shown by the modeling results of scenario #2. With those improvements, adequate fire flow was only provided for a portion of proposed Phase 1 up to an approximate elevation of 270 to 280 feet.

Under scenario #3 adequate fire flows were provided for elevations of the site at or below 370 feet in elevation. In order to serve the portions of the site above 370 feet in elevation a booster pump station will need to be constructed.

Per the applicants Phase 1 grading plan it appears the highest lot elevation is approximately 330' on Lot #'s184 &185 in Phase 1H. Staff would note for the record that all lots in Phases 1A through Phase 1E appear to be located at or below 250 feet in elevation.

Prior to final engineering plan approval for any phase the applicant shall demonstrate that adequate fire flows are available for the lots proposed. A condition of approval to this effect is warranted.

Prior to final engineering plan approval for any phase the applicant shall demonstrate to the city's satisfaction that the proposed water system improvements being installed will provide adequate fire flows for the lots proposed.

Per Chapter 8 of the city's Water System Plan of June 2010 (WSP), multiple projects are identified for the Green Mountain area. The WSP identifies a future developer driven booster pump station (DE-5), a water storage facility (S-6), a 24" diameter transmission main (T-7) and a 12" developer funded NUGA transmission main (N-1) on or adjacent to the subject property. Neither the DA nor the application materials specify how, when or where the applicant will install the booster pump station (DE-5) or provide a future location for water storage facility (S-6). Additionally, the water system mainline improvements (T-7) and (N-1) are not discussed or identified in the application materials or the DA.

To conform with the City's 2010 WSP, a condition of approval specifying the applicant's responsibility to design and construct the T-7 and N-1 transmission mains shown within and adjacent to the PRD per the WSP is warranted. Construction of the transmission mains through the PRD site and up to the water storage facility S-6 must be completed prior to final plat approval of the phase(s) the mains are located within or adjacent to, or to the extent necessary to achieve adequate fire flows. Additionally, a condition of approval specifying the applicant's responsibility to design and construct Booster Pump Station DE-5 is warranted. The Booster Station shall be constructed prior to final plat approval for any phase that has a lot located above 370 feet in elevation.

The applicant shall design and construct transmission mains T-7 and N-1 within the Planned Residential Development area per the Camas Water System Plan of June 2010. Construction of the transmission mains shall be completed prior to final plat approval of the phase(s) the mains are located within, or adjacent to, or to the extent necessary to achieve adequate fire flows. The applicant shall also design and construct Booster Station DE-5 prior to final plat approval for any phase that has a lot located above 370 feet in elevation.

As noted above, the 2010 WSP identifies Reservoir S-6 located within the applicant's site. Due to the uncertainty regarding timing for the need for additional storage in the City's water system and in consideration of the size of the project, a condition is warranted requiring dedication of land suitable for construction of a 2.0 million gallon reservoir. Design and construction of the reservoir itself would be completed by the City. Prior to Final Masterplan approval, the City and applicant shall enter into an agreement specifying the location and size of the land dedication for the reservoir and specifying timing of the required land dedication.

Prior to Final Masterplan approval, the City and applicant shall enter into an agreement specifying the location and size of the land dedication for the reservoir and specifying timing of the required land dedication.

Water wells, septic tanks and septic drain fields

It is unclear to staff if there are existing water wells on site as they are not identified on the existing conditions plans or in the application materials. Staff would note that CMC 17.19.020 (A 3) requires abandonment of existing wells, septic tanks and septic drain fields. Existing water wells shall be properly abandoned in accordance with State and County guidelines prior to final plat approval for the phase they may be located in. Transfer of any existing water rights to the City of Camas will also be required as part of the abandonment. A condition of approval to this effect is warranted.

Existing water wells on-site shall be properly abandoned in accordance with State and County guidelines prior to final plat approval for the particular phase that the well may be located in. Additionally, any water rights associated with the abandoned well shall be transferred to the City.

Staff finds that as conditioned the applicant can and will provide water system improvements consistent with the city's Engineering Standards and WSP.

Storm Drainage:

Staff would note for the record that although there are provisions for regional stormwater facilities in the DA at Section 6 and at CMC 17.19.040 (C 3a), the facilities proposed do not appear to provide a regional function.

The applicant has submitted a preliminary stormwater Technical Information Report (TIR) and storm plan for Planning Pod 1 (203 lots) consistent with the requirements of CMC 14.02, CMC 17.11.030 (B 8) and the Camas Stormwater Design Standards Manual (CSDSM).

For Planning Pod 1, the applicant is proposing 3 wet ponds for water quality and quantity control. The proposed wet ponds will provide phosphorus control in addition to basic treatment in accordance with the requirements of Section 5.04 of the CSDSM.

Two of the wet ponds do not meet the location requirements of CMC 17.19.030 (F 6) in that they are not setback a minimum of 30 feet from the street. The third wet pond will meet the minimum street setback requirement.

The applicant is requesting an exception to the requirements of CMC 17.19.030 (F 6) for the two wet ponds located on each side of the entry drive and adjacent to NE Ingle Road (Tracts A & H). The proposed locations are at or near the low point of Planning Pod 1 but are not located at the low point of the subject property.

Staff is not entirely opposed to the applicant's exception request; however, Staff would note that the proposed storm drainage system as proposed is not a superior or more innovative design than a standard subdivision as required by the CMC pertaining to Planned Residential Developments. Staff strongly recommends to the applicant to consider providing regional stormwater facilities, potentially in the southerly portion of the PRD that can serve a larger area of the proposed PRD.

Staff finds that the requested exception to the requirements of CMC 17.19.030.F.6 may be warranted provided the applicant be required to include enhanced landscaping, screening and fencing acceptable to the city prior to final engineering plan approval of any phase. A condition of approval to this effect is warranted.

Enhanced water quality and quantity control facilities landscaping, screening and attractive fencing style acceptable to the city shall be included on the final landscaping plan prior to approval of any phase.

Staff finds that as conditioned the applicant can or will provide adequate stormwater drainage for Planning Pod 1.

<u>Erosion Control:</u>

Adequate erosion control measures will be provided during the site improvements contemplated for this PRD in accordance with adopted city standards. The Erosion Sediment Control plans will ultimately be submitted to the city for review and approval prior to any ground disturbance.

CMC 17.21.030 requires submittal of an erosion control bond for ground disturbances of one acre or more.

Additionally, the applicant will prepare a Stormwater Pollution Prevention Plan (SWPPP) as part of their application for their general construction stormwater permit that is required through the Washington State Department of Ecology for ground disturbances of over one acre.

Staff finds that adequate provisions for erosion control can or will be made.

<u>Sanitary Sewage Disposal:</u>

Currently there is no public sanitary sewer system serving the Green Mountain area of Camas. The nearest sewer line is a 6" diameter STEP force main (no solids) that serves the LaCamas Lake Trailhead restroom facility located at NW Alexandria Lane and NE Goodwin Road approximately 2,200 feet southwest of the intersection of NE Ingle Road and NE Goodwin Road.

The General Sewer Plan Amendment of April 2010 (Sewer Plan) provides a plan on how the North Urban Growth Area (NUGA) will be sewered. The NUGA is divided into six basins served by multiple regional pump stations and major force main and gravity piping systems. The Sewer Plan calls for traditional gravity sewer flows (including solids) from all six basins to be directed south and east along the north side of LaCamas Lake.

The subject property is located in Basin 1 as shown in the Sewer Plan. As described above, Basin 1 is shown in the Sewer Plan to be permanently serviced by the regional pump station and force main system along the north side of LaCamas Lake. The Applicant and the City have been working diligently over the last year to develop a design and financing plan to construct the permanent traditional gravity system as quickly as possible. It is currently anticipated that the City will design and construct the permanent system with a financial contribution by the applicant. However, to date, a final agreement has not been reached regarding the applicant's proportionate share or other responsibility for constructing the permanent system. As such, a condition is warranted to require the applicant to enter into an agreement with the City relating to sewer facilities that will provide for, among other things, the construction, general financing and timing of the construction of permanent sewer facilities that will serve the PRD.

Recognizing the size and extent of the permanent system, the Sewer Plan also provides for a temporary connection south to the city's existing STEP force main located within NE Goodwin Road at Alexandria Lane. The Sewer Plan provides the following guidance with respect to a temporary connection:

"As an interim stage, prior to full development, the possibility of temporarily partitioning off flows from developments within Basins I and II to the existing STEP system to the southwest is also addressed. Discharge to the STEP system should be temporary because flows from NUGA were not included in the original design of STEP conveyance, and high operation and maintenance costs and unfavorable downstream impacts to conveyance and WWTP facilities have led the City to conclude that further expansion of the STEP service is undesirable."

Since timing of the permanent system on the north side of LaCamas Lake is uncertain, should the permanent sewer system not be in place prior to engineering approval of Planning Pod 1, Staff finds there is adequate capacity in the existing STEP system on the south side of LaCamas Lake to temporarily serve the 201 lots included with the Phase 1, Planning Pod 1 of the Green Mountain PRD. This temporary connection to the south shall only serve proposed Planning Pod 1 (201 Lots). The applicant shall be responsible for constructing all on and off-site improvements necessary for the temporary system to serve their site. A condition of approval to this effect is warranted.

Additional Phases of the development beyond Planning Pod 1 will be required to direct conventional gravity sanitary sewer flows to the east and south along the north side of LaCamas Lake per the Sewer Plan. Should the permanent sewer system on the north side of LaCamas Lake not be constructed prior to engineering approval of subsequent phases, the City may accept additional sewer flows into the existing STEP system provided the applicant shows and the City confirms that there is adequate capacity in the STEP system at the time of engineering approval for each subsequent phase. In this scenario, the applicant shall be responsible for designing, constructing and permitting all improvements to continue using the STEP system. A condition of approval to this effect is warranted.

Proposed Condition: The applicant shall enter into an agreement with the city that will provide for the construction, general financing and timing of the construction of permanent sewer facilities that will serve the PRD. The applicant will be responsible for constructing all on and off-site improvements necessary for the temporary system to serve their site including abandonment and/or decommissioning of the large community septic tanks. Should the permanent sewer system on the north side of LaCamas Lake not be constructed prior to engineering approval of subsequent phases, the City may accept additional sewer flows into the existing STEP system provided the applicant shows and the City confirms that there is adequate capacity in the STEP system at the time of engineering approval for each subsequent phase. In this scenario, the applicant shall be responsible for designing, constructing and permitting and abandoning/decommissioning all temporary improvements to continue using the STEP system.

The applicant is proposing to construct a sanitary sewer pump station near the intersection of NE Ingle Road and NE Goodwin Road on a city owned parcel. The Sewer Plan identifies a regional pump station at this location to serve portions of the NUGA it is feasible that the pump station may be used to provide both temporary and permanent service to the PRD. As such, portions of the pump station that may be used permanently could be a creditable improvement as it is intended to serve the entire basin.

If a regional pump station is proposed and constructed the applicant will need to enter into an agreement with the city that identifies the required improvements and what portions of the system improvements are creditable or reimbursable. A condition of approval to this effect is warranted.

Prior to installing a regional pump station the applicant shall enter into an agreement with the city that specifies the required pump station improvements and how the improvements will be credited and/or reimbursed.

As part of the temporary connection to the STEP system, the applicant will also be required to provide a solids retention system acceptable to the city as the existing STEP system is only suited to handle effluent flows (no solids). The applicant is proposing large underground community septic tanks that will allow the solids to settle out of the sewer prior to reaching the pump station. The proposed tank locations are shown in exhibit 71. One tank is proposed in the central park south of the proposed club house. The other two proposed tank locations are east of and adjacent to the two wet ponds located on each sides of the entry road.

Prior to final engineering plan approval for any phase the applicant shall be required to supply a sewer basin analysis and appropriate tank sizing and anti-buoyance calculations acceptable to the city. Additionally, the applicant will be required to complete an odor control analysis and provide odor control facilities for the large septic tanks and effluent line flowing to the pump station. The entire temporary system shall be designed and constructed such that the septic tanks may be abandoned or removed so the subdivision may be served via a conventional gravity system. Because the septic tanks provide a temporary service, the applicant shall be required to maintain all tanks according to the manufacturer's recommendations and City standards. Conditions of approval to this effect are warranted.

Prior to final engineering plan approval of any phase the applicant shall submit a sewer basin analysis, tank sizing and anti-buoyance calculations acceptable to the city. The applicant will also be responsible for providing appropriate odor control for the temporary system including the large community septic tanks as well as the downstream system to the pump station. The entire temporary system shall be designed and constructed such that the septic tanks may be abandoned or removed so the subdivision may be served via a conventional gravity system. Because the septic tanks provide a temporary service, the applicant shall be required to maintain all tanks according to the manufacturer's recommendations and City standards.

Staff finds that adequate provisions can or will be made for water, storm drainage, erosion control and sanitary sewage disposal which are consistent with the Camas Municipal Code, the Water System Plan, the General Sewer Plan Amendment and the Camas Design Standard Manual.

Conclusion: As conditioned, this section can be met.

3. Provisions have been made for road, utilities, street lighting, street trees and other improvements that are consistent with the six-year street plan, the Camas Design Standard Manual and other state adopted standards and plans;

Findings:

Roads:

NE Goodwin Road/NE 28th Street and NE Ingle Road are existing public roadways adjacent to and serving the subject property. These roads are rural in nature and do not include bike lanes, sidewalks, street lighting, turn lanes or other urban improvements.

NE Goodwin Road/NE 28th Street have a functional classification of arterial in the 2012 Traffic Impact Fee (TIF) update. The TIF designates NE Goodwin Road west of NE Ingle Road as a 5 lane arterial and as a 3 lane arterial east of NE Ingle Road. NE Ingle Road is classified as a collector street.

The TIF also identifies NE Goodwin Road/NE 28th Street east of NE Ingle Road as a North District TIF creditable improvement. Installation of a traffic signal at the intersection of NE Goodwin Road & NE Ingle Road is also TIF creditable.

As subsequent Planning Pods are developed adjacent to NE Goodwin Road/NE 28th Street and/or when traffic conditions warrant the signal, the applicant will be responsible to provide those improvements.

Prior to installing TIF eligible improvements the applicant shall enter into an agreement with the city that specifies the required improvements, the cost of those improvements and what portions of the improvements are creditable or reimbursable. A condition of approval to this effect is warranted.

Prior to installing half width street improvements along NE Goodwin Road/NE 28th Street or installing a traffic signal at the intersection of NE Goodwin Road & NE Ingle Road, the applicant shall enter into an agreement with the city specifying the improvements to be installed, the cost of those improvements and what part of the improvements are creditable or reimbursable. Right-of-way (ROW) dedication along NE Ingle Road and NE Goodwin Road shall be of sufficient width to provide a minimum paved width of 43' which shall include an 11' wide center left turn lane, two 5' wide bike lanes and two 11' travel lanes. Interior roadways, with the exception of the entry roadway, shall include ROW widths of 60' and/or 52' with respective paved widths of 36' and 28' for all interior streets with the exception of the entry roadway that is proposed at 74' ROW width with a landscape median island.

Internal street connections

Currently there is not an internal street connection proposed to the northerly half of the site. Planning pods B4, E4, F1a, F1c, F2, F3, F4 and G, a total of 69 acres of developable land, will be served by only one access point located at pod B4. These pods are located on the steeper portion of the site. Details as to final street grades, locations, etc. are not yet detailed enough to determine if the development as proposed will provide safe and reliable access during inclement weather including snow and ice events.

Planning pod F1b appears to be a stand-alone 2 acre pod with a separate access off of NE Ingle Road. This pod does not appear to be connected to other pods of the development by internal roadways or by the community wide trail system.

The northerly portion of this development appears to be a standard subdivision that is benefitting from the flexibility of the PRD provisions of the code.

Staff finds that there is no substantive evidence in the record that indicates that the applicant has evaluated alternate roadway layouts, locations or other methods that may provide an internal roadway connection to the northerly portion of the site. Staff would recommend that the applicant demonstrate to the city's satisfaction that this connection is not feasible. A condition of approval to this effect is warranted.

The applicant shall demonstrate to the city's satisfaction that it is not feasible to provide an internal street connection to the northerly portion of the site.

Study area intersections of concern

The applicant has provided a Traffic Impact Analysis (TIA) that evaluated the existing roadway system, traffic volumes, speeds, and crash history of the adjacent roadways and select intersections in the vicinity of the site. The TIA evaluated traffic operations based on Planning Pod 1 buildout in 2018 and the Master Plan buildout in 2029. The studied intersections fall within three jurisdictions; namely City of Camas, City of Vancouver and WSDOT.

NE 199th Ave. & NE 58th St. (SR-500)

Per the TIA this intersection located north of the site was identified with high crash rate for eastbound turning movements and under existing conditions currently meets WSDOT guidelines for an eastbound right turn lane.

Construction of a right turn lane at this location could require right-of-way acquisition and would likely impact one or more driveways. Planning Pod 1 at buildout will contribute 27 eastbound right turn trips at this intersection (18% of all turns). At full master plan buildout the development will contribute 138 eastbound right turns (73% of all turns). Given the small impact of Phase 1 no improvements were recommended in conjunction with Phase 1.

Staff finds that a nexus might ultimately be established between requiring construction of an eastbound right turn lane on NE 58th Street at NE 199th Avenue as traffic volume increases attributable to the proposed master plan development based on level of service and delay at the intersection.

Future preliminary plat applications should provide an updated TIA with an assessment as to the potential need for providing a right-turn taper or lane at this intersection. A condition of approval to this effect is warranted.

Prior to preliminary plat approval of each additional Planning Pod or phase the applicant shall submit an updated assessment as to the potential need for providing an eastbound right turn taper or lane at the intersection of NE 58th Avenue at NE 199th Street.

NE Goodwin Road/NE Ingle Road

Per the TIA, this intersection has a high crash history. The TIA makes several recommendations that will help improve safety at this intersection as follows:

- The TIA recommends relocating the stop bar on NE Ingle Road approximately 20 to 25 feet further south to improve sight distance with the initial site improvements of the first phase.

- The TIA recommends installing an eastbound left turn lane on NE Goodwin Road at NE Ingle Road with a minimum 100' of storage with the initial site improvements of the first phase.

- The TIA recommends installing a westbound right turn lane on NE Goodwin Road at NE Ingle Road with a minimum of 100' of storage prior to occupancy of the 203rd home.

- The TIA recommends that subsequent preliminary plat applications include an analysis of traffic operations at the intersection of NE Goodwin Road & NE Ingle Road and when warranted require the developer to install a traffic signal.

Conditions of approval to these effects are warranted.

- Prior to Final Acceptance of the first phase of improvements the applicant shall relocate the stop bar on NE Ingle Road as detailed in the construction plans and as directed by the city.
- Prior to Final Acceptance of the first phase of improvements the applicant shall install an eastbound left turn lane with a minimum 100' storage in NE Goodwin Road at NE Ingle Road.
- Prior to Final Acceptance of any phase that will yield a total preliminarily platted total of 203 or more homes, the applicant shall construct a westbound right turn lane with a minimum 100' of storage in NE Goodwin Road at NE Ingle Road.
- Half street improvements along the applicant's property frontage of Ingle Road shall be constructed in a manner to provide a minimum width of 43 feet of pavement.
- Subsequent preliminary plat applications shall include an updated TIA that analyzes traffic operations at the intersection of NE Goodwin Road & NE Ingle Road and when warranted the developer shall install the signal.

NE 192nd Avenue/NE 13th Street

Under existing conditions this intersection operates acceptably with the exception of the morning AM peak hour for southbound left turns on NE 192nd Avenue associated with students attending the Union High School.

The TIA projects that this intersection will not meet the City of Vancouver's LOS requirements in the 2029 background condition (completion of Planning Pod 1 only) or the 2029 total traffic condition (at full master plan buildout).

The TIA indicates that NE 192nd Ave is a 5 lane arterial TIF eligible route in the City of Vancouver. In the event that NE 192nd is widened to 5 lanes through the intersection of NE 13th Street the intersection will meet the City of Vancouver's intersection minimum LOS requirements. To mitigate total traffic conditions a westbound right turn lane on NE 13th Street would also be required. In the event that NE 192nd Ave is not widened a northbound right turn land and a westbound right turn lane would be sufficient to mitigate the 2029 total traffic condition.

As the timing of corridor improvements on NE 192nd Ave. are unknown the TIA makes a recommendation that the developer be required to provide a proportionate share contributions to the City of Vancouver towards the construction of a northbound right turn lane on NE 192nd Avenue and an westbound right turn lane on NE 13th Avenue. Details of the proposed proportionate cost sharing methodology are include in Appendix "M" of the TIA. A condition of approval to this effect is warranted.

The applicant shall enter into an agreement with the City of Vancouver for proportionate share contributions towards the construction of a northbound right turn lane on NE 192nd Ave. and a westbound right turn lane on NE 13th Street. The agreement shall specify when proportionate share payments are triggered and the amount of those payments.

<u>NE 242nd Avenue/NE 28th Street</u>

Per the TIA this intersection currently meets WSDOT's guidelines for a left turn lane on the eastbound approach under existing conditions. At buildout of Planning Pod 1 the TIA finds that no eastbound left turn trips will be added to this intersection from the proposed development. At full master plan buildout the TIA projects that this development will add 9 eastbound left turns at this intersection.

Staff finds that the traffic impact fee payments made by this development for Phase 1 and future phases of the project will mitigate development impacts at the intersection and therefore require no additional mitigation.

<u>Access spacing on NE 28th Street</u>

As noted previously, NE 28th Street is designated as an arterial street. Intersection access spacing requirements for an arterial are a minimum of 660' to a maximum of 1,000 feet.

The proposed entry road into Planning Pod 3 off of NE 28th Street should be located a minimum of 660 feet to the west of the east project boundary in order to allow adjacent parcels to the east maximum opportunities to locate their site access off of NE 28th Street. A condition of approval to this effect is warranted.

The applicant shall locate the proposed entry drive into Planning Pod 3 off of NE 28th Street a minimum of 660' west of the project's east boundary.

<u>Alleys &Cul-de-sac's</u>

The applicant is providing a number of alley loaded lots. Staff would note for the record that in accordance with CMC 17.19.040 (A 6) alleys are to be privately owned and maintained. The applicant is proposing a 20' tract width for the alleys where the code only requires an 18' Tract width. The code also requires a minimum paved width of 16'. The applicant shall meet or exceed the minimum alley requirements noted in the CMC. A condition of approval to this effect is warranted.

The applicant is also proposing several cul-de-sac's. The application materials show cul-de-sac radii at 40'. Staff would note for the record that per the CDSM the minimum ROW radius for a cul-de-sac where parking is prohibited is 43' with a minimum paved radius of 35'.

The applicant shall meet or exceed the minimum alley Tract and paved width requirements of the code. Cul-de-sac ROW radii shall meet the minimum 43' width of the Camas Design Standards Manual.

Utilities, Street Lighting, Street Trees, and Other Improvements:

The applicant can or will make adequate provisions for utilities as shown on the Preliminary Development Plans.

LED Street lighting will be installed along all street frontages within and adjacent to the proposed development.

CMC 17.19.030 (F 1) requires the applicant to install one 2 inch diameter tree in the front yard of each lot. The location of these trees should be shown on the final site improvement plans along with the enhanced landscaping to screen the stormwater facility. The applicant will also be required to provide acceptable fencing and landscaping along NE Ingle Road and NE Goodwin Road in accordance with CMC 17.19.040 (B 11c). The proposed fencing, landscaping and street tree plantings shall be included with the final engineering plan submittal for the site improvements. A condition of approval to this effect is warranted.

Prior to final engineering plan approval for any phase the applicant shall include a landscaping plan that details the location, number, plant species proposed, planting notes, fencing notes and associated details.

Staff finds that the applicant can or will make adequate provisions for roads, utilities, street lighting, street trees, and other improvements that are consistent with the six-year street plan, the Camas Design Standard Manual and other state adopted standards and plans.

Conclusion: As conditioned, this section can be met.

4. Provisions have been made for dedications, easements and reservations;

Findings and Conclusions: The applicant, through the final platting process shall make provisions to dedicate appropriate right of way, easements, and reservations as conditioned herein. This section can be met as conditioned.

5. The design, shape and orientation of the proposed lots are appropriate to the proposed use. In addition to meeting the minimum lot size density requirement, each residential lot must provide a building envelope that allows a building that at least conforms to the developers own building restrictions (CC and R's). Therefore corner lots, lots with easements, or lots with environmental constraints may have to be larger than other lots in the subdivision;

Findings:

Design and Shape of lots: The proposed layouts of the lots in Phase 1 are based on the general pod layout for the overall PRD and contain lots from Pods D, C, and E. As discussed in the narrative on pages 8-12; the different Pods have densities and dimensional standards relative to current city zoning designations. These Pods are intended to have some flexibility built into them with regards to setbacks, housing type, and a range of dimensional standards. The pods for A, B and C are intended to be in line with higher density standards in the code (MF-10, 18, and 24), and pods D, E, F and G are modeled after zoning districts R-5, 6, 7.5, and 20 respectively. Pod standards for A, B and C were approved in the Development Agreement. The remaining pods are proposed with the PRD application.

As proposed, the lots contained in phase 1 generally comply with the applicant's own proposed lot standards table with the exception of the following lots. Pod D lots are supposed to have a maximum lot size of 7,600 square feet based on the applicant's dimensional table, which leaves lots 121, 141 and 168 as being too large. Lots located in Pod E have five lots that are too large based on the applicant's own table (182, 183, 184, 185, and 191). Staff recommends that the applicant either modify those lots, or provide a modified dimensional table that addresses maximum lot sizes. If the table is modified there should be a footnote that indicates that regardless of maximum lot size, and overall density for that respective Pod shall be maintained for this and all future phases.

Lots 70-75 are proposed to have vehicular access off of the alleyway shown and frontage and pedestrian access off of two access tracts (C and E). While staff supports the concept, there is a question as to how future lots in Pod B1 will interact with lots 73-75. The goal will be to ensure compatible integration between the two Pods. The applicant will need to provide this assurance when developing the future phases.

All lots that take access off of alleyways shall ensure that the fronts of the houses face public and private streets and access tracts. A condition to this effect is warranted.

The applicant shall demonstrate the build ability of lots 64, 90, 93, 182 and 183 prior to final plat approval. A condition to this effect is warranted.

As will be discussed further in section 18.23.110 of this report, the applicant has only shown layouts for lots contained in phase 1. No other phase or their respective pods have been proposed to have any lot or road layout. As such it is difficult to determine overall internal and abutting compatibility of the phases as they related to a master plan. That said, the applicant has worked in good faith towards developing a master plan with the city. As such, the city will allow for a more detailed final master plan to be submitted prior to the final plat approval for phase 1.

Conclusions: As conditioned herein, this section can be met.

6. The subdivision complies with the relevant requirements of the Camas subdivision and zoning codes, and all other relevant local regulations;

Findings and Conclusions:

SALES OFFICE USE: The application did not propose a sales office for the development. The absence of approval of a sales office consolidated with this Type III hearing, will limit a sales office at the time of development to six months as a Temporary Use per CMC§ 18.07.040 Table 2(Note 4). The applicant may provide for the contingency that a sales office may be necessary for longer than six months. Staff finds that special conditions for the installation, use and removal of the sales office are appropriate in accordance with CMC§18.43.050(F), and are provided with this report if the applicant is in agreement.

PHASING: Pursuant to CMC17.11.040, a phasing plan "shall be submitted at the time of preliminary plat approval". The applicant has shown a phasing plan in both the DA and with the PRD application thereby meeting this section.

Staff finds that the development can be conditioned to meet the relevant requirements of zoning and phasing.

7. Appropriate provisions are made to address all impacts identified by the transportation impact study;

See section 3 listed above.

8. Appropriate provisions for maintenance of privately owned common facilities have been made;

Finding and Conclusion: The applicant has provided a draft copy of CC&R's with the application, which will provide maintenance guidelines and requirements for the private facilities. This section can be met.

9. Appropriate provisions, in accordance with RCW 58.17.110, are made for: The public health, safety, and general welfare and for such open spaces, drainage ways, streets, or roads, alleys or other public ways, transit stops, potable water supplies, sanitary wastes, parks and recreation, playgrounds, schools and school grounds and all other relevant facts, including sidewalks and other planning features that assure safe walking conditions for students who only walk to and from school; and the public use and interest will be served by the platting of such subdivision and dedication.

Finding and Conclusion: The applicant is proposing privately owned and maintained tracts for stormwater facilities, off-street parking and open spaces. The internal roadways are proposed to be dedicated as public roadways and some private. The applicant is providing adequate and appropriate utilities for stormwater, water, and sanitary sewer that will also be dedicated to the public. An internal public trail and a neighborhood park consistent with the 2014 Parks, Recreation and Open Space Comprehensive Plan will be provided by the applicant. The applicant will also provide sidewalks with the proposed street construction to provide adequate pedestrian mobility. This section can be met as proposed.

10. The application and plans shall be consistent with the applicable regulations of the adopted comprehensive plans, shoreline master plan, state and local environmental acts and ordinances in accordance with RCW 36.70B.030.

Findings and Conclusion: Staff finds that the preliminary subdivision application can or will be consistent with the requirements of the Camas Municipal Code, the City of Camas comprehensive plan, SEPA requirements and the previously approved Development Agreement as modified by the proposed conditions at the conclusion of this report.

IV. Discussion and Findings for Planned Residential Development Criteria of Approval CMC18.23.030, Approval Standards CMC 18.23.100, and Relationship to adjacent areas.

CMC 18.23.030.A-H Planned residential developments shall be established under the following criteria:

A. A PRD may be allowed in all R and MF zoning districts.

The overall site for the proposed PRD has 267.5 acres of residentially zoned land and 15.8 acres of commercial. In anticipation of this PRD, the applicant worked with staff to revise the CMC to allow for contiguous commercial land to be part of the PRD pursuant to Ordinance 15-008 (Exhibit 75), which was adopted on March 16th, 2015.

This section can be met as proposed.

B. The minimum land area necessary to apply for a PRD shall be ten acres of contiguous land.

The overall site is 283 acres in area thereby meeting this section.

C. All land in which a PRD is to be developed shall be held and maintained in a single ownership, including but not limited to an individual, partnership, corporation, or homeowner's association. Evidence of such ownership shall be provided to the planning commission and city council before PRD approval.

All records provided to the city by the applicant provide certification that the 283 acres are under one ownership. This section can be met.

D. Permissible uses within a PRD include any use listed as a permitted use or conditional use in the applicable zone, as per CMC Section 18.07.040 Table 2, when approved as part of a master plan. Notwithstanding an approved master plan, incidental accessory buildings, incidental accessory structures, and home occupations may be authorized on a case by case basis.

The Development Agreement that accompanied this application did vest the applicant with the codes in effect at the time of recording, which was the end of 2014. This section can be met as proposed. However, if there are future uses proposed in either the residential or commercial sections of the development that will require conditional use permits, then appropriate review and approval from the city will be required. A condition to this effect is warranted.

E. A minimum of fifty percent to a maximum of seventy percent of the overall permitted density of the PRD must be single family homes.

The mixture of densities and housing types proposed by the applicant will comply with this section. The applicant's narrative on page 13 addresses this requirement. As proposed, this can be met.

F. The multifamily component (two or more attached dwelling units) of a PRD shall ideally be developed toward the interior of the tract, rather than the periphery, to ensure compatibility with existing single-family residences that border the surrounding properties. Deviation from this requirement shall be requested during the preliminary master plan review, and specifically approved by the planning commission and city council.

The overall general layout for the PRD has been approved through the Development Agreement. Overall, the layout does essentially higher density, multi-level units surrounding the commercial core. The units and densities do then transition out to lower densities as you head north and east on the site. As proposed, the higher density multi-family units are not directly on the periphery. This section can be met as proposed.

G. Density standards and bonuses for a PRD shall be in accordance with CMC Sections 18.23.040 and 18.23.050.

This section was addressed through the recorded DA. As such, this can be met as proposed.

H. An equivalent amount of up to twenty percent of the developable area shall be set aside and developed as recreational open space in a PRD, and shall include the following:

1. Passive or active recreation concentrated in large usable areas;

2. Provide trails and open space for connection and extension with the city's open space and trail plan, if feasible; and

3. Be held under one ownership, and maintained by the ownership; or be held in common ownership by means of homeowner's association, and maintained by the homeowner's association. The open space and recreation areas shall be dedicated for public use and be maintained by the ownership or homeowners' association.

As evidenced earlier in this report and in the applicant materials, the applicant has set aside close to 33% of the site for open space. This includes usable park space, trails, and natural open areas such as wetlands. As will be conditioned herein, open space areas for stormwater tracts, wetlands and other common areas will be maintained by the homeowners association with provisions for maintenance to be listed in CC&R's.

The trail system proposed is extensive through the site. The city's comprehensive parks plan anticipates a public regional trail in the area (T27) and neighborhood trials (T29 and T30). As discussed earlier in this report, the parks and open space component can be met through the proposal and conditions contained herein.

CMC 18.23.100.A-H Approval for a PRD shall be based on the following standards:

A. The proposed PRD conforms to:

1. The City of Camas' comprehensive plan;

2. All provisions of the Camas Zoning Code which are not proposed for modification;

3. Engineering design standards; and

4. Any other applicable city, state, federal regulations, policies, or plans, except those standards proposed for modification.

Findings and Conclusion: The applicant's narrative addresses this section on pages 17-19. Staff concurs that this application complies with this subsection. Comp plan elements have been addressed, the provisions of the CMC are either met, or conditioned herein, and compliance with all other state and federal regulations are required.

Staff finds that there is no substantive evidence in the record that would indicate that the proposed PRD will not meet all of the City of Camas engineering design standards.

The city has a Neighborhood Traffic Management Plan (NTM). This plan identifies the need for installation of acceptable traffic calming features when a proposed development will create 700 Average Daily Trips (ADT) or more.

The submitted Transportation Impact Analysis (TIA) clearly demonstrates that this threshold will be exceeded with the first phase of development.

The applicant has not identified traffic calming features other than the narrowed entry street and the majority of internal streets at 28 feet wide. There is no discussion of traffic calming elements for the remainder of Planning Pod 1 or the other six Planning Pods within the development.

A condition of approval requiring installation of traffic calming elements in the number, type and location acceptable to the city engineer is warranted.

Prior to final engineering plan approval for any phase the applicant shall install acceptable traffic calming elements in the number, type and location deemed necessary by the City Engineer.

B. Utilities and other public services necessary to serve the needs of the proposed development shall be made available, including open spaces, drainageways, streets, alleys, other public ways, potable water, transit facilities, sanitary sewers, parks, playgrounds, schools, sidewalks, and other improvements that assure safe walking conditions for students who walk to and from school.

Findings and Conclusion:

Water:

There is an existing 8" dead end water line in NE Ingle Road that currently serves the golf course and clubhouse. In 2013 the city performed some limited water modeling at the applicant's request to determine available fire flows under various scenarios (see Technical Memorandum from Gray & Osborne, Inc. dated November 20, 2013 - exhibit # 77).

The modeling showed that the existing system (and future 8" diam. extensions) can only provide adequate fire flows for the lower, southerly portion of the site near NE 28th Ave.

Fire flows were not adequate in the middle and northerly portions of the site without upsizing portions of the system as shown by the modeling results of scenario #2. With those improvements, adequate fire flow was only provided for a portion of proposed Phase 1 up to an approximate elevation of 270 to 280 feet.

Under scenario #3 adequate fire flows were provided for elevations of the site at or below 370 feet in elevation. In order to serve the portions of the site above 370 feet in elevation a booster pump station will need to be constructed.

Per the applicants Phase 1 grading plan it appears the highest lot elevation is approximately 330' on Lot #'s184 &185 in Phase 1H. Staff would note for the record that all lots in Phases 1A through Phase 1E appear to be located at or below 250 feet in elevation.

Prior to final engineering plan approval for any phase the applicant shall demonstrate that adequate fire flows are available for the lots proposed. A condition of approval to this effect is warranted.

Prior to final engineering plan approval for any phase the applicant shall demonstrate to the city's satisfaction that the proposed water system improvements being installed will provide adequate fire flows for the lots proposed.

Per Chapter 8 of the city's Water System Plan of June 2010 (WSP), multiple projects are identified for the Green Mountain area. The WSP identifies a future developer driven booster pump station (DE-5), a water storage facility (S-6), a 24" diameter transmission main (T-7) and a 12" developer funded NUGA transmission main (N-1) on or adjacent to the subject property. Neither the DA nor the application materials specify how, when or where the applicant will install the booster pump station (DE-5) or provide a future location for water storage facility (S-6). Additionally, the water system mainline improvements (T-7) and (N-1) are not discussed or identified in the application materials or the DA.

To conform with the City's 2010 WSP, a condition of approval specifying the applicant's responsibility to design and construct the T-7 and N-1 transmission mains shown within and adjacent to the PRD per the WSP is warranted. Construction of the transmission mains through the PRD site and up to the water storage facility S-6 must be completed prior to final plat approval of the phase(s) the mains are located within or adjacent to, or to the extent necessary to achieve adequate fire flows. Additionally, a condition of approval specifying the applicant's responsibility to design and construct Booster Pump Station DE-5 is warranted. The Booster Station shall be constructed prior to final plat approval for any phase that has a lot located above 370 feet in elevation.

The applicant shall design and construct transmission mains T-7 and N-1 within the Planned Residential Development area per the Camas Water System Plan of June 2010. Construction of the transmission mains shall be completed prior to final plat approval of the phase(s) the mains are located within, or adjacent to, or to the extent necessary to achieve adequate fire flows. The applicant shall also design and construct Booster Station DE-5 prior to final plat approval for any phase that has a lot located above 370 feet in elevation.

As noted above, the 2010 WSP identifies Reservoir S-6 located within the applicant's site. Due to the uncertainty regarding timing for the need for additional storage in the City's water system and in consideration of the size of the project, a condition is warranted requiring dedication of land suitable for construction of a 2.0 million gallon reservoir. Design and construction of the reservoir itself would be completed by the City. Prior to Final Masterplan approval, the City and applicant shall enter into an agreement specifying the location and size of the land dedication for the reservoir and specifying timing of the required land dedication.

Prior to Final PRD Masterplan approval, the City and applicant shall enter into an agreement specifying the location and size of the land dedication for the reservoir and specifying timing of the required land dedication.

Existing wells, septic tanks and septic drain fields

It is unclear to staff if there are existing water wells on site as they are not identified on the existing conditions plans or in the application materials. Staff would note that CMC 17.19.020 (A 3) requires abandonment of existing wells, septic tanks and septic drain fields. Existing water wells shall be properly abandoned in accordance with State and County guidelines prior to final plat approval for the phase they may be located in. Transfer of any existing water rights to the City of Camas will also be required as part of the abandonment. A condition of approval to this effect is warranted.

Existing water wells on-site shall be properly abandoned in accordance with State and County guidelines prior to final plat approval for the particular phase that the will may be located in. Additionally, any water rights associated with the abandoned will shall be transferred to the City.

Staff finds that as conditioned the applicant can and will provide water system improvements consistent with the city's Engineering Standards and WSP.

Storm Drainage:

Staff would note for the record that although there are provisions for regional stormwater facilities in the DA at Section 6 and at CMC 17.19.040 (C 3a), the facilities proposed do not appear to provide a regional function.

The applicant has submitted a preliminary stormwater Technical Information Report (TIR) and storm plan for Planning Pod 1 (203 lots) consistent with the requirements of CMC 14.02, CMC 17.11.030 (B 8) and the Camas Stormwater Design Standards Manual (CSDSM).

For Planning Pod 1, the applicant is proposing 3 wet ponds for water quality and quantity control. The proposed wet ponds will provide phosphorus control in addition to basic treatment in accordance with the requirements of Section 5.04 of the CSDSM.

Two of the wet ponds do not meet the location requirements of CMC 17.19.030 (F 6) in that they are not setback a minimum of 30 feet from the street. The third wet pond will meet the minimum street setback requirement.

The applicant is requesting an exception to the requirements of CMC 17.19.030 (F 6) for the two wet ponds located on each side of the entry drive and adjacent to NE Ingle Road (Tracts A & H). The proposed locations are at or near the low point of Planning Pod 1 but are not located at the low point of the subject property.

Staff is not entirely opposed to the applicant's exception request; however, Staff would note that the proposed storm drainage system as proposed is not a superior or more innovative design than a standard subdivision as required by the CMC pertaining to Planned Residential Developments. Staff strongly recommends to the applicant to consider providing regional stormwater facilities, potentially in the southerly portion of the PRD that can serve a larger area of the proposed PRD.

Staff finds that the requested exception to the requirements of CMC 17.19.030.F.6 may be warranted provided the applicant be required to include enhanced landscaping, screening and fencing acceptable to the city prior to final engineering plan approval of any phase. A condition of approval to this effect is warranted.

Enhanced water quality and quantity control facilities landscaping, screening and attractive fencing style acceptable to the city shall be included on the final landscaping plan prior to approval of any phase.

Staff finds that as conditioned the applicant can or will provide adequate stormwater drainage for Planning Pod 1.

Erosion Control:

Adequate erosion control measures will be provided during the site improvements contemplated for this PRD in accordance with adopted city standards. The Erosion Sediment Control plans will ultimately be submitted to the city for review and approval prior to any ground disturbance.

CMC 17.21.030 requires submittal of an erosion control bond for ground disturbances of one acre or more.

Additionally, the applicant will prepare a Stormwater Pollution Prevention Plan (SWPPP) as part of their application for their general construction stormwater permit that is required through the Washington State Department of Ecology for ground disturbances of over one acre.

Staff finds that adequate provisions for erosion control can or will be made.

Sanitary Sewage Disposal:

Currently there is no public sanitary sewer system serving the Green Mountain area of Camas. The nearest sewer line is a 6" diameter STEP force main (no solids) that serves the LaCamas Lake Trailhead restroom facility located at NW Alexandria Lane and NE Goodwin Road approximately 2,200 feet southwest of the intersection of NE Ingle Road and NE Goodwin Road.

The General Sewer Plan Amendment of April 2010 (Sewer Plan) provides a plan on how the North Urban Growth Area (NUGA) will be sewered. The NUGA is divided into six basins served by multiple regional pump stations and major force main and gravity piping systems. The Sewer Plan calls for traditional gravity sewer flows (including solids) from all six basins to be directed south and east along the north side of LaCamas Lake.

The subject property is located in Basin 1 as shown in the Sewer Plan. As described above, Basin 1 is shown in the Sewer Plan to be permanently serviced by the regional pump station and force main system along the north side of LaCamas Lake. The Applicant and the City have been working diligently over the last year to develop a design and financing plan to construct the permanent traditional gravity system as quickly as possible. It is currently anticipated that the City will design and construct the permanent system with a financial contribution by the applicant. However, to date, a final agreement has not been reached regarding the applicant's proportionate share or other responsibility for constructing the permanent system. As such, a condition is warranted to require the applicant to enter into an agreement with the City relating to sewer facilities that will provide for, among other things, the construction, general financing and timing of the construction of permanent sewer facilities that will serve the PRD.

Recognizing the size and extent of the permanent system, the Sewer Plan also provides for a temporary connection south to the city's existing STEP force main located within NE Goodwin Road at Alexandria Lane. The Sewer Plan provides the following guidance with respect to a temporary connection:

"As an interim stage, prior to full development, the possibility of temporarily partitioning off flows from developments within Basins I and II to the existing STEP system to the southwest is also addressed. Discharge to the STEP system should be temporary because flows from NUGA were not included in the original design of STEP conveyance, and high operation and maintenance costs and unfavorable downstream impacts to conveyance and WWTP facilities have led the City to conclude that further expansion of the STEP service is undesirable."

Since timing of the permanent system on the north side of LaCamas Lake is uncertain, should the permanent sewer system not be in place prior to engineering approval of Planning Pod 1, Staff finds there is adequate capacity in the existing STEP system on the south side of LaCamas Lake to temporarily serve the 203 lots included with the Phase 1, Planning Pod 1 of the Green Mountain PRD. This temporary connection to the south shall only serve proposed Planning Pod 1 (203 Lots). The applicant shall be responsible for constructing all on and off-site improvements necessary for the temporary system to serve their site. A condition of approval to this effect is warranted.

Additional Phases of the development beyond Planning Pod 1 will be required to direct conventional gravity sanitary sewer flows to the east and south along the north side of LaCamas Lake per the Sewer Plan. Should the permanent sewer system on the north side of LaCamas Lake not be constructed prior to engineering approval of subsequent phases, the City may accept additional sewer flows into the existing STEP system provided the applicant shows and the City confirms that there is adequate capacity in the STEP system at the time of engineering approval for each subsequent phase. In this scenario, the applicant shall be responsible for designing, constructing and permitting all improvements to continue using the STEP system. A condition of approval to this effect is warranted.

Proposed Condition: The applicant shall enter into an agreement with the city that will provide for the construction, general financing and timing of the construction of permanent sewer facilities that will serve the PRD. The applicant will be responsible for constructing all on and off-site improvements necessary for the temporary system to serve their site including abandonment and/or decommissioning of the large community septic tanks. Should the permanent sewer system on the north side of LaCamas Lake not be constructed prior to engineering approval of subsequent phases, the City may accept additional sewer flows into the existing STEP system provided the applicant shows and the City confirms that there is adequate capacity in the STEP system at the time of engineering approval for each subsequent phase. In this scenario, the applicant shall be responsible for designing, constructing and permitting and abandoning/decommissioning all temporary improvements to continue using the STEP system.

The applicant is proposing to construct a sanitary sewer pump station near the intersection of NE Ingle Road and NE Goodwin Road on a city owned parcel. The Sewer Plan identifies a regional pump station at this location to serve portions of the NUGA. The pump station may be used to provide both temporary and permanent service to the PRD. As such, portions of the pump station that may be used permanently could be a creditable improvement as it is intended to serve the entire basin.

If a regional pump station is proposed and constructed the applicant will need to enter into an agreement with the city that identifies the required improvements and what portions of the system improvements are creditable or reimbursable. A condition of approval to this effect is warranted.

Prior to installing a regional pump station the applicant shall enter into an agreement with the city that specifies the required pump station improvements and how the improvements will be credited and/or reimbursed.

As part of the temporary connection to the STEP system, the applicant will also be required to provide a solids retention system acceptable to the city as the existing STEP system is only suited to handle effluent flows (no solids). The applicant is proposing large underground community septic tanks that will allow the solids to settle out of the sewer prior to reaching the pump station. The proposed tank locations are shown in exhibit___. One tank is proposed in the central park south of the proposed club house. The other two proposed tank locations are east of and adjacent to the two wet ponds located on each sides of the entry road.

Prior to final engineering plan approval for any phase the applicant shall be required to supply a sewer basin analysis and appropriate tank sizing and anti-buoyance calculations acceptable to the city. Additionally, the applicant will be required to complete an odor control analysis and provide odor control facilities for the large septic tanks and effluent line flowing to the pump station. The entire temporary system shall be designed and constructed such that the septic tanks may be abandoned or removed so the subdivision may be served via a conventional gravity system. Because the septic tanks provide a temporary service, the applicant shall be required to maintain all tanks according to the manufacturer's recommendations and City standards. Conditions of approval to this effect are warranted.

Prior to final engineering plan approval of any phase the applicant shall submit a sewer basin analysis, tank sizing and anti-buoyance calculations acceptable to the city. The applicant will also be responsible for providing appropriate odor control for the temporary system including the large community septic tanks as well as the downstream system to the pump station. The entire temporary system shall be designed and constructed such that the septic tanks may be abandoned or removed so the subdivision may be served via a conventional gravity system. Because the septic tanks provide a temporary service, the applicant shall be required to maintain all tanks according to the manufacturer's recommendations and City standards.

Staff finds that adequate provisions can or will be made for water, storm drainage, erosion control and sanitary sewage disposal which are consistent with the Camas Municipal Code, the Water System Plan, the General Sewer Plan Amendment and the Camas Design Standard Manual.

C. The probable adverse environmental impacts of the proposed development, together with any practical means of mitigating adverse impacts, have been considered such that the proposal shall not have an unacceptable adverse effect upon the quality of the environment, in accordance with CMC Title 16 and 43.21C RCW.

Findings and Conclusion: The applicant's narrative addresses this section on page 19. Staff has also provided findings earlier in this report that either finds compliance with the application, or that the application can be conditioned to comply with city standards.   Staff concurs that this application complies with this subsection as proposed and/or conditioned herein.

D. Approving the proposed development shall serve the public use and interest, and adequate provision has been made for the public health, safety, and general welfare.

Findings and Conclusion: The applicant's narrative addresses this section on page 19. Staff concurs that this application complies with this subsection as proposed and/or conditioned herein.

E. The proposed development satisfies the standards and criteria set forth in this chapter.

Findings and Conclusion: The applicant's narrative addresses this section on page 20. Staff concurs that this application complies with this subsection as proposed and/or conditioned herein.

F. The proposed development shall be superior to, or more innovative than conventional development, and shall provide greater public benefit without additional probable adverse impacts to public health, safety, or the environment, than available through the use of the conventional zoning and/or development standards.

Findings and Conclusion: The applicant has taken great care to coordinate with staff over a period of time to develop a master plan that can be superior and more innovative than conventional development. The plan integrates a variety of housing types and densities throughout the development rather than having one district simply abut another. Additionally, the incorporation of an Urban Village with recreational opportunities throughout the development can help create a community that is livable and well integrated in concept. As proposed and conditioned herein, this section can be met.

G. The proposed development shall provide at least two access points (where a PRD does not have access to a primary or secondary arterial) that distribute the traffic impacts to adjacent street in an acceptable manner.

Findings and Conclusion: The applicant has proposed at least two access points off of NE Goodwin Road and 8 access points off of NE Ingle Road. This subsection can be met as proposed.

H. Preliminary approval does not constitute approval to obtain any building permits or begin construction of the project.

18.23.110: Relationship to adjacent areas.

The design and layout of a planned development shall take into account the integration and compatibility of the site to the surrounding areas. The perimeter of the planned development shall be so designed as to minimize any undesirable impact on adjacent properties. Setbacks from the property lines of the planned development shall be comparable to, or compatible with, those of any existing development on adjacent properties. Or, if adjacent properties are undeveloped, then setbacks shall conform to the type of development that may be permitted on adjacent properties.

Pods D2, D3, D5, D6, and some of E1 and E2, all abut land that is located within Clark County jurisdiction that is currently zoned FR-40, which is agricultural based zoning at 40 acre minimum. To design an urban development to "bevel" lot sizes would be impractical. The same premise will apply to pods F2 and F3 at the northern end of the development.

Pods B2, B4, F1a, F1b, and F1c all internally abut lots located within the city limits and have could have beveling standards apply to them. The easterly boundaries of pods E2 and E3 will abut land in the city limits that will likely get developed. Compatibility to that abutting land hasn't necessarily been provided to the city. The applicant will need to demonstrate how these respective pods can be comparable to and compatible with these existing lots.

Currently, the conceptual master plan with proposed pod types leave some questions to staff with regards to compatibility and the relationship with the initial first phase and its respective pods and future phases. While the applicant has provided some detail in the written narrative, actual conceptual layouts are not available to determine compatibility with the rest of the development. Most immediate are the proposed phase lines contained on page 3 of 25 from the plan set do not match up with the posed phase 1 preliminary plat on page 23 of 25. As such, it is difficult to discern the relationship for the first phase with pods B1, B2, B3 and a portion of E1. There are proposed roads that could conceivably move into those phases, but because there are no lot layouts, road networks, or access compatibility staff has a difficulty in finding compliance without that additional information. Additionally, it is difficult to determine how they future phase will link in with one-another. Staff finds that a final PRD master plan is appropriate that shall contain the following elements:

- The location of all areas to be conveyed, dedicated, or maintained as public or private streets; access and egress to the development showing proposed traffic circulation, parking areas, and pedestrian walks, (for all phases and pods)

- The proposed location of any residential buildings, and any other structures, including identification of all buildings as single-family, duplex, townhouse, apartment, condominium, designated manufactured home, or otherwise, (for all phases and pods)
- The location of areas to be maintained as common open space, and a description of the proposed use of those areas, (for all phases and pods)

A condition to this effect is warranted.

Conclusions: As conditions, this section can be met.

V. Recommendations

Staff recommends APPROVAL of the preliminary plat of phase 1 for Green Mountain (SUB14-02) in addition to the approval of the PRD.

PROPOSED CONDITIONS OF APPROVAL (SUB14-02)

Engineering:

1. Prior to final engineering plan approval for any phase the applicant shall install acceptable traffic calming elements in the number, type and location deemed necessary by the City Engineer.
2. Prior to final engineering plan approval for any phase the applicant shall demonstrate to the city's satisfaction that the proposed water system improvements being installed will provide adequate fire flows for the lots proposed.
3. The applicant shall design and construct transmission mains T-7 and N-1 within the Planned Residential Development area per the Camas Water System Plan of June 2010. Construction of the transmission mains shall be completed prior to final plat approval of the phase(s) the mains are located within, or adjacent to, or to the extent necessary to achieve adequate fire flows. The applicant shall also design and construct Booster Station DE-5 prior to final plat approval for any phase that has a lot located above 370 feet in elevation.
4. Prior to Final Masterplan approval, the City and applicant shall enter into an agreement specifying the location and size of the land dedication for the reservoir and specifying timing of the required land dedication.
5. Existing water wells on-site shall be properly abandoned in accordance with State and County guidelines prior to final plat approval for the particular phase that the will may be located in. Additionally, any water rights associated with the abandoned will shall be transferred to the City.

6. Enhanced water quality and quantity control facilities landscaping, screening and attractive fencing style acceptable to the city shall be included on the final landscaping plan prior to approval of any phase.
7. The applicant shall enter into an agreement with the city that will provide for the construction, general financing and timing of the construction of permanent sewer facilities that will serve the PRD. The applicant will be responsible for constructing all on and off-site improvements necessary for the temporary system to serve their site including abandonment and/or decommissioning of the large community septic tanks. Should the permanent sewer system on the north side of LaCamas Lake not be constructed prior to engineering approval of subsequent phases, the City may accept additional sewer flows into the existing STEP system provided the applicant shows and the City confirms that there is adequate capacity in the STEP system at the time of engineering approval for each subsequent phase. In this scenario, the applicant shall be responsible for designing, constructing and permitting and abandoning/decommissioning all temporary improvements to continue using the STEP system.
8. Prior to installing a regional pump station the applicant shall enter into an agreement with the city that specifies the required pump station improvements and how the improvements will be credited and/or reimbursed.
9. Prior to final engineering plan approval of any phase the applicant shall submit a sewer basin analysis, tank sizing and anti-buoyance calculations acceptable to the city. The applicant will also be responsible for providing appropriate odor control for the temporary system including the large community septic tanks as well as the downstream system to the pump station. The entire temporary system shall be designed and constructed such that the septic tanks may be abandoned or removed so the subdivision may be served via a conventional gravity system. Because the septic tanks provide a temporary service, the applicant shall be required to maintain all tanks according to the manufacturer's recommendations and City standards.
10. Prior to installing half width street improvements along NE Goodwin Road/NE 28th Street or installing a traffic signal at the intersection of NE Goodwin Road & NE Ingle Road, the applicant shall enter into an agreement with the city specifying the improvements to be installed, the cost of those improvements and what part of the improvements are creditable or reimbursable. Right-of-way (ROW) dedication along NE Ingle Road and NE Goodwin Road shall be of sufficient width to provide a minimum paved width of 43' which shall include an 11' wide center left turn lane, two 5' wide bike lanes and two 11' travel lanes. Interior roadways shall be include ROW widths of 60' and/or 52' with respective paved widths of 36' and 28'.
11. Prior to preliminary plat approval of each additional Planning Pod or phase the applicant shall submit an updated assessment as to the potential need for providing an eastbound right turn taper or lane at the intersection of NE 58th Avenue at NE 199th Street.
12. Prior to Final Acceptance of the first phase of improvements the applicant shall relocate the stop bar on NE Ingle Road as detailed in the construction plans and as directed by the city.
13. Prior to Final Acceptance of the first phase of improvements the applicant shall install an eastbound left turn lane with a minimum 100' storage in NE Goodwin Road at NE Ingle Road.
14. Prior to Final Acceptance of any phase that will yield a total preliminarily platted total of 203 or more homes, the applicant shall construct a westbound right turn lane with a minimum 100' of storage in NE Goodwin Road at NE Ingle Road.
15. Half street improvements along the applicant's property frontage of Ingle Road shall be constructed in a manner to provide a minimum width of 43 feet of pavement.
16. Subsequent preliminary plat applications shall include an updated TIA that analyzes traffic operations at the intersection of NE Goodwin Road & NE Ingle Road and when warranted the developer shall install the signal.
17. The applicant shall enter into an agreement with the City of Vancouver for proportionate share contributions towards the construction of a northbound right turn lane on NE 192nd Ave. and a

westbound right turn lane on NE 13th Street. The agreement shall specify when proportionate share payments are triggered and the amount of those payments.

18. The applicant shall locate the proposed entry drive into Planning Pod 3 off of NE 28th Street a minimum of 660' west of the project's east boundary.
19. The applicant shall meet or exceed the minimum alley Tract and paved width requirements of the code. Cul-de-sac ROW radii shall meet the minimum 43' width of the Camas Design Standards Manual.
20. Prior to final engineering plan approval for any phase the applicant shall include a landscaping plan that details the location, number, plant species proposed, planting notes, fencing notes and associated details
21. Prior to final engineering plan approval for any phase the applicant shall install acceptable traffic calming elements in the number, type and location deemed necessary by the City Engineer.
22. Prior to final engineering plan approval for any phase the applicant shall demonstrate to the city's satisfaction that the proposed water system improvements being installed will provide adequate fire flows for the lots proposed.
23. Prior to Final Masterplan approval, the City and applicant shall enter into an agreement specifying the location and size of the land dedication for the reservoir and specifying timing of the required land dedication.
24. Existing water wells on-site shall be properly abandoned in accordance with State and County guidelines prior to final plat approval for the particular phase that the will may be located in. Additionally, any water rights associated with the abandoned will shall be transferred to the City.

Planning:

25. The applicant shall comply with all conditions of approval for the Washington State Department of Archaeology Historic Preservation prior to any construction taking place on site.
26. All jurisdictional wetlands on site shall be contained in separate tracts and clear signage and demarcation approved by the city shall be installed at appropriate wetland and buffer boundaries as appropriate.
27. The applicant shall submit additional geotechnical studies for each subsequent phase of this PRD.
28. A single sales office in a model home for purposes of selling lots within the development may be located within each phase, and remain until 30% of lots are sold within the phase, or two years after Certificate of Occupancy was issued for model home, whichever is less. After such time, the sales office in the home or the trailer must be removed.
29. Prior to the Building Department issuing a Certificate of Occupancy, each lot shall install a minimum of one 2" caliper tree to be located in the planter strip or front yard of each lot, as specified on the plat. Required trees shall be maintained in good health, and damaged or dying trees shall be promptly replaced (within six months) by the homeowner. This condition shall be noted on the final plat.
30. Phasing plans as proposed are not approved with this permit, and must be submitted for approval prior to final engineering plan submittal of any phase, which comply with CMC17.11.040 Phasing. If additional phases are proposed, which are not proposed in the preliminary application, then approval of a major modification permit will be required.
31. Final landscaping plans for off-street parking areas in conformance with the parking lot landscaping standards of CMC Chapter 18.13 shall be included with final engineering plans for each phase.

32. Final landscaping plans shall include fencing along rear and side yards of residential lots, which are adjacent to open space tracts. A minimum 4-foot, continuous, uniform fence shall be installed prior to final acceptance of each phase, or other demarcation as acceptable by the city.
33. Future phases that will impact jurisdictional wetland and/or their associated buffers will require additional review and approval by the city with those subsequent applications.
34. All multi-family attached dwelling units (townhouses), apartment buildings, and commercial structures shall be subject to design review prior to final site plan approval, and/or building permit issuance.
35. Prior to the development of the public central park, the applicant shall have reviewed the proposal with the Parks Advisory Committee and have final design approval from staff prior to final plat approval.
36. Tail connection from the upper part of Green Mountain to Clark County Parks land to the east will be required at the development of phases 5 and 6 (as currently proposed).
37. Final trail design and approval for both regional trails and neighborhood trails will be required prior to final engineering approval for each applicable phase.
38. For oak habitat impacts, a detailed planting, mitigation and monitoring plan will be required to be provided to the city prior to any construction taking place on site. This shall be provided prior to engineering approval for the first, and each subsequent phase.
39. Compatible integration for lots 73-75 with Pod B1 shall be done with the review and approval of Phase 2 that contains that pod.
40. All lots that take access off of alleyways shall ensure that the fronts of the houses face public, private streets and access tracts.
41. The applicant shall demonstrate the build ability of lots 64, 90, 93, 182 and 183 prior to final plat approval for phase 1.
42. Prior to final plat approval for phase 1 the applicant shall submit for and receive final master plan approval for the remaining phases and pods that will contain the following:
    a. The location of all areas to be conveyed, dedicated, or maintained as public or private streets; access and egress to the development showing proposed traffic circulation, parking areas, and pedestrian walks,
    b. The proposed location of any residential buildings, and any other structures, including identification of all buildings as single-family, duplex, townhouse, apartment, condominium, designated manufactured home, or otherwise,
    c. The location of areas to be maintained as common open space, and a description of the proposed use of those areas,
43. Any future use that is subject to the vested use table that triggers a conditional use permit shall still be subject to those approval standards and process.
44. In the event that any archaeological or historic materials are encountered during project activity, work in the immediate area (initially allowing for a 100-foot buffer; this number may vary by circumstance) must stop and the following actions taken:
    a. Implement reasonable measures to protect the discovery site, including any appropriate stabilization or covering;
    b. Take reasonable steps to ensure the confidentiality of the discovery site; and
    c. Take reasonable steps to restrict access to the site of discovery.
    The project proponent shall notify the concerned tribes and all appropriate city, county, state, and federal agencies, including the Washington State Department or Archaeology and Historical Preservation. (CMC 16.31.150(D))

Fire:

45. Low Flow Life Safety Residential Fire Sprinklers (NFPA 13D) required in all new dwellings: Dead ends over 400 feet. CMC (Camas Municipal Code) 17.19.040.14, CMC 17.19.030.D.5.d
46. Low Flow Life Safety Residential Fire Sprinklers are required where structure(s) are accessed by a flag lot, access tract, or private road. CMC 17.19.030.D.5.c, 17.19.040.A.7
47. Low Flow Life Safety Residential Fire Sprinklers that comply with 13D or 13R are required in all buildings abutting a street designed and constructed with less than 36 feet of pavement width.
48. In the unusual case where a subdivision is not required to have residential sprinklers, any new single family residence or duplex to be used as a model home or home sales office shall have Low Flow Life Safety Residential Fire Sprinklers installed. CMC 15.17.050
49. The distance from a required fire hydrant may be doubled when Low Flow Life Safety Residential Fire Sprinklers are installed throughout a fully sprinklered subdivision. CMC 17.19.040.C.4.a. Distance shall be reduced by 100 feet for dead end roads or single point access. For Green Mountain PRD the maximum hydrant spacing shall be 900 feet or less.
50. Establishing Hydrant Flow Tests per NFPA 24 (National Fire Protection Association) utilizing a Washington State Licensed Fire Sprinkler Contractor may be waived when Low Flow Life Safety Residential Fire Sprinklers are installed throughout a fully sprinklered subdivision. 17.15.030.D.C
51. Low Flow Life Safety Residential Fire Sprinklers are required where minimum hydrant water flow from the closest hydrant is not met. CMC 17.19.040.C.4.a, CMC 15.04.010.D (IFC Appendix B, Fire Flow) A Washington State Licensed Fire Sprinkler Contractor meeting NFPA 24 Fire Flow guidelines may be hired to establish the gallons per minute (fire flow). A permit is required with the fire marshal's office prior to the flow test.
52. An approved address sign, in accordance with the Camas Municipal Code, must be posted for each residence where the flag lot leaves the public road or access tract. CMC 17.19.030.D.5.d
53. When access grades exceed those specified in CMC 17.19.040.12.b, Low Flow Life Safety Residential Fire Sprinklers are required to be installed. CMC 17.19.040.12.b.iii.
54. Underground oil tank removal requires a permit with the fire marshal's office following IFC (International Fire Code) 3404.2.14
55. Any existing structures that are scheduled to be torn down may be considered for fire department training.
56. Any blasting that may be needed for this location is required to follow the CMC Blasting Code and requires a permit with the fire marshal's office. CMC 15.40
57. Any gates serving two or more homes is required to follow the gate code CMC 12.36
58. Gated access to two or more homes is required to have Low Flow Life Safety Residential Fire Sprinklers installed CMC 12.36.040.J
59. A second means of a fully constructed normal access to a subdivision may be waived when Low Flow Life Safety Residential Fire Sprinklers are installed. Each request will be evaluated for possible approval and will include factors such as grade, wild land urban interface, distance of dead ends, density, street widths and so on.
60. Currently fire Impact Fees of .20 cents per square foot are waived when Low Flow Life Safety Residential Fire Sprinklers are installed.
61. Currently 13D Permit fees are waived when Low Flow Life Safety Residential Fire Sprinklers are installed. However permit submittals are still required.
62. No building, structure or development regulated by the building and/or fire code shall be erected, constructed, enlarged, altered, repaired, moved, converted or demolished unless a separate permit for each building, structure or development has first been obtained from the fire department. Camas Municipal Code 15.04.030.D.12a.
63. Dead end fire apparatus access roads in excess of 150 feet in length shall be provided with approved provisions for the turning around of fire apparatus. 35 foot radius cul-de-sac is acceptable. IFC 503.2.5 Flexibility on length possible when entire subdivision is sprinklered.

64. Automatic fire sprinkler system designed and installed in accordance with NFPA 13D is required in all new dwellings. IFC B 105, CMC 17.19
65. Onsite fire hydrants required contact fire department for locations. IFC Appendix C Sec. C 105
66. Required distance from a fire hydrant may be increased when approved automatic fire sprinklers are installed in the entire subdivision. IFC C 105, CMC 17.19
67. Contact the building department for street names and addresses. CMC 17.19.040 (b) (7) Ord. 2421
68. Separate permits with the Fire Marshal's office and the public works dept. for private access gates/barriers. IFC D 103.5, CMC 12.36
69. A separate permit with the Fire Marshal's office is required for any underground tank removal/disposal or abandoning in place. IFC 105.7.5, 3404.2.13.1.4
70. Approved monument provisions required to be made for the addressing of flag lots or access driveways. Address numbers shall be plainly legible and clearly visible and must be posted for each residence where the flag lot access or easement leaves the public road, one monument shall be used for multiple addresses. IFC 505.1, CMC 17.19.030-D-5-G
71. Contact the fire marshal's office for residential water line supply installation guidelines regarding water flow for Life Safety Fire Sprinkler Systems. Items to discuss, early involvement with your fire sprinkler contractor, 1 1/4" minimum supply line. Larger supply line may be required if there are long runs or significant elevation gain, and valve shut off at the meter shall be a flow through type such as a ball valve, gate valve type, minimizing 90 degree connections decreasing friction loss. (360-834-6191 option 2)
72. Third Party Wildland Urban Interface study by Third Party evaluations on each lot may be waived when entire subdivision has life safety residential fire sprinklers installed.
73. A separate permit with the Fire Marshal's office required for any blasting performed on site. IFC 105.6.15, CMC 1540
74. Any structure needing to be demolished may be evaluated for use as a CWFD training burn if. Please contact 360-834-6191 for further information.
75. Street signs to include hundred block designations.

Plat Notes:

1. A homeowners association (HOA) will be required for this development. Copies of the C.C. & R's shall be submitted and on file with the City of Camas.
2. Each phase of the subdivision plats shall contain the approved density and dimensional standards table as approved with this development.
3. Building permits will not be issued by the Building Department until all subdivision improvements are completed and Final Acceptance has been issued by the City.
4. Automatic life safety residential fire sprinkler system designed and installed in accordance with NFPA 13D is required in all new dwellings.
5. The lots in this subdivision are subject to traffic impact fees, school impact fees, fire impact fees and park/open space impact fees. Each new dwelling will be subject to the payment of appropriate impact fees at the time of building permit issuance.
6. Prior to the Building Department issuing a Certificate of Occupancy, each lot shall install a minimum of one 2" caliper tree to be located in the planter strip or front yard of each lot, as specified on the plat. Required trees shall be maintained in good health, and damaged or dying trees shall be promptly replaced (within six months) by the homeowner.

VI. Appeals

18.55.240 - Judicial appeals.

The city's final decision on an application may be appealed by a party of record with standing to file a land use petition in Clark County superior court. Such petition must be filed within twenty-one days after issuance of the decision, as provided in Chapter 36.70C RCW.

VIII. Exhibits

The application materials were provided electronically on a compact disc.

Exhibit No.	Description	Date
1	Cover Page and Table of Contents	12/30/14
2	Application Form	12/30/14
3	Pre Application notes	2/25/14
4	Developer's GIS packet	Jan. 2014
5	Applicant's Narrative	Dec. 2014
6	Density and Dimensions chart	Dec. 2014
7	Sheet 1 of 25: Cover Sheet	12/30/14
8	Sheet 2 of 25: Master Plan	12/30/14
9	Sheet 3 of 25: Development Standards and Phasing Plan	12/30/14
10	Sheet 4 of 25: Conceptual Open Space, Park & Landscape Master Plan	12/30/14
11	Sheet 5 of 25: Landscape Master Plan Components	12/30/14
12	Sheet 7 of 25: Existing Conditions Survey	12/30/14
13	Sheet 8 of 25: Existing Conditions Survey	12/30/14
14	Sheet 9 of 25: Existing Conditions Survey	12/30/14
15	Sheet 10 of 25: Existing Conditions Survey	12/30/14
16	Sheet 11 of 25: Existing Conditions Survey	12/30/14
17	Sheet 12 of 25: Existing Conditions Survey	12/30/14
18	Sheet 13 of 25: Existing Conditions Survey	12/30/14
19	Sheet 14 of 25: Existing Conditions Survey	12/30/14
20	Sheet 15 of 25: Existing Conditions Survey Phase 1	12/30/14
21	Sheet 16 of 25: Existing Conditions Survey Phase 1	12/30/14
22	Sheet 17 of 25: Preliminary Offsite Utility	12/30/14
23	Sheet 18 of 25: Preliminary Utility Plan South	12/30/14
24	Sheet 19 of 25: Preliminary Utility Plan North	12/30/14
25	Sheet 20 of 25: Preliminary Storm Facility Plan	12/30/14
26	Sheet 21 of 25: Preliminary Grading Plan South	12/30/14
27	Sheet 22 of 25: Preliminary Grading Plan North	12/30/14

Exhibit No.	Description	Date
28	Sheet 23 of 25: Preliminary Plat Phase 1	12/30/14
29	Sheet 24 of 25: Preliminary Phasing Plan	12/30/14
30	Sheet 25 of 25: Street Sections	12/30/14
31	Revised Sheet 3 of 25: Development Standards and Phasing Plan	1/30/15
32	Revised Sheet 4 of 25: Conceptual Landscape Master Plan	1/30/15
33	Revised Sheet 5 of 25: Landscape Master Plan	1/30/15
34	Revised Sheet 6 of 25: Schematic Landscape Master Plans	1/30/15
35	Revised Sheet 23 of 25: Preliminary Plat Phase 1	1/30/15
36	Revised Density and Dimensions chart	1/30/15
37	SEPA Checklist	12/30/14
38	Letter: Odren to Camas Community Development Dept: SEPA Request for Early Notice of DS	12/30/14
39	Current Deed	12/30/14
40	Mailing labels	12/17/14
41	Draft CC&R's	12/30/14
42	Existing Easements	12/30/14
43	Traffic Report prepared by Kittelson & Associates, Inc.	11/20/14
44	Traffic Report Appendices prepared by Kittelson & Associates, Inc.	11/20/14
45	Preliminary Drainage Report prepared by Olson Engineering	12/31/14
46	Preliminary Geotechnical Engineering Report prepared by Metropolitan Land Group, LLC	12/3/14
47	Critical Areas Report, Buffer Modification, and Tree Preservation Plan prepared by Ecological Land Services, Inc.	Dec. 2014
48	Critical Areas Report: Appendix A	Dec. 2014
49	Critical Areas Report: Appendix B	Dec. 2014
50	Critical Areas Report: Appendix C	Dec. 2014
51	Critical Areas Report: Phase I Figures	Dec. 2014
52	Proof of mailing Archaeological Predetermination Report to DAHP, Cowlitz, Chinook, Yakima, Grand Ronde	12/19/14
53	Impact Fee Estimate	Dec. 2013
54	Resolution No. 1315 approving Development Agreement	12/15/14

Exhibit No.	Description	Date
55	Development Agreement recording number 5134733 AGR	1/6/15
56	Picture of development sign	1/21/15
57	Letter: Maul to Printz: completeness review	1/29/15
58	Notice of Application; published, posted and mailed to property owners within 300-ft.	2/10/15
59	SEPA DNS Public Notice; published, posted and mailed to agencies	3/3/15
60	SEPA comment letter: Clark County Department of Environmental Services	12/9/14
61	SEPA comment letter: Department of Archaeology and Historic Preservation (DAHP)	3/19/15
62	SEPA comment letter: DAHP revised comments	3/23/15
63	SEPA comment letter: Department of Natural Resources (DNR)	3/23/15
64	SEPA comment letter: Department of Ecology (DOE)	3/17/15
65	SEPA comment letter: City of Vancouver Public Works traffic comments	10/23/14
66	SEPA comment letter: Washington Department of Fish & Wildlife (WDFW)	3/17/15
67	Citizen Comment: Denette email	2/27/15
68	City Parks Development Review Committee comments	3/19/15
69	Email: Ecological Land Services Inc. to Maul: summarizing discussions with WDFW concerns	4/24/15
70	Applicant’s supplemental response to city comments	4/24/15
71	Septic tank locations map	4/24/15
72	Phase I Access Assessment letter from Kittelson & Associates, Inc.	4/24/15
73	Notice of Public Hearing and Special Meeting; published, posted and mailed to property owners within 300-ft.	4/28/15
74	Email: Printz to Maul and PRD chart	5/4/15
75	Ordinance No. 15-008	3/16/15
76	Letter: Ecological Land Services Inc. to Maul	5/5/15
77	Memo: Gray & Osborne, Inc. to City of Camas: Initial water modeling results	11/20/13
78	City staff PowerPoint Presentation	5/12/15

EXHIBIT 1

CITY OF CAMAS

TYPE III PLANNED RESIDENTIAL DEVELOPMENT AND SUBDIVISION SUBMITTAL

GREEN MOUNTAIN PRD

APPLICANT:

GREEN MOUNTAIN LAND, LLC
17933 NW EVERGREEN PARKWAY, SUITE 300
BEAVERTON, OR 97006
(503) 597-7140
FAX (503) 597-7149
John.schmidt@metlandgroup.com

DECEMBER 2014

JOB # 8938.01.02

CONTACT:
LANDERHOLM LAW FIRM
ATTN: RANDY PRINTZ
805 BROADWAY, SUITE 1000
VANCOUVER, WA 98660
(360) 693-3312
randy.printz@landerholm.com

PREPARED BY:
OLSON ENGINEERING, INC.
222 E. EVERGREEN BOULEVARD
VANCOUVER, WA 98660
(360) 695-1385
(360) 695-8117 FAX

PRINCIPAL-IN-CHARGE:
KURT STONEX
kurt@olsonengr.com

PROJECT MANAGER:
MIKE ODREN
mikeo@olsonengr.com

Table of Contents

EXHIBIT 2

City of Camas WASHINGTON

Community Development Department | Planning
616 NE Fourth Avenue | Camas, WA 98607
(360) 817-1568 | www.cityofcamas.us

General Application Form

Case Number:

Applicant Information

Applicant/Contact:: Green Mountain Land, LLC Phone: (503) 597-7100

Address: 17933 NW Evergreen Parkway Suite 300 john.schmidt@wetlandgroup.com

Street Address E-mail Address

Beaverton OR 97006

City State ZIP Code

Property Information

Property Address: 2817 NE Ingle Road Camas, WA See Attached

Street Address County Assessor # / Parcel #

Camas WA 98607

City State ZIP Code

Zoning District R-6, R-10, MF-10, CC Site Size Approx. 284 acres

Description of Project

Brief description: A request to Master Plan an approximately 284 acre site for a planned mixed use (residential and commercial) development and for preliminary plat approval of Phase 1 to subdivide a portion of the property into 201 residential lots.

Are you requesting a consolidated review per CMC 18.55.020(B)? YES ☐ NO ☒

Permits Requested: ☐ Type I ☐ Type II ☒ Type III ☐ Type IV, BOA, Other

Property Owner or Contract Purchaser

Owner's Name: Green Mountain Land, LLC Phone: (503) 597-7100

Last First

Address: 17933 NW Evergreen Parkway Suite 300 john.schmidt@wetlandgroup.com

Street Address Apartment/Unit #

E mail Address: Beaverton OR 97006

City State Zip

Signature

I authorize the applicant to make this application. Further, I grant permission for city staff to conduct site inspections of the property.

Signature: Date: 12/30/14

Note: If multiple property owners are party to the application, an additional application form must be signed by each owner. If it is impractical to obtain a property owner signature, then a letter of authorization from the owner is required.

Date Submitted:	Pre-Application Date:	
Staff:	Related Cases #	**Validation of Fees**

Revised: 01/14/13

Contact:
Landerholm Law Firm
Attn: Randy Printz
805 Broadway Suite 1000
Vancouver, WA 98660

360 693-3312
randy.printz@landerholm.com

EXHIBIT 3

Pre-Application Meeting
Green Mountain PRD
Ingle Rd/Goodwin Rd
File PA14-07

Tuesday, February 25, 2014
2:00pm, Council Chambers
616 NE Fourth Avenue, Camas WA 98607

Applicant / Contact:	**Applicant**: Landerholm Law Firm Attn: Randy Printz 805 Broadway Suite 100 Vancouver WA 98660 Ph: (360) 696-3312 Email: randy.printz@landerholm.com	**Contact:** Same
Representing City of Camas:	Phil Bourquin, Community Development Director Robert Maul, Planning Manager Sarah Fox, Sr. Planner Bob Cunningham, Building Official Randy Miller, Fire Marshal Eric Levison, Public Works Director Jerry Acheson, Parks Manager Jim (Curleigh) Carothers, Engineering Manager Wes Heigh, Project Manager Norm Wurzer, Engineer	
Location:	Ingle Rd & Goodwin Rd (see application for tax parcels)	
Zoning:	R10, R6, MF & CC	
Description:	**The applicant proposes to develop a 283 acre site with a variety of lot sizes and densities that will include both single-family and multi-family components.**	

NOTICE: Notwithstanding any representation by City staff at a pre-application conference, staff is not authorized to waive any requirement of the City Code. Any omission or failure by staff to recite to an applicant all relevant applicable code requirements shall not constitute a waiver by the City of any standard or requirement. [CMC 18.55.060 (C)] This pre-application conference shall be valid for a period of 180 days from the date it is held. If no application is filed within 180 days of the conference or meeting, the applicant must schedule and attend another conference before the City will accept a permit application. [CMC 18.55.060 (D)] Any changes to the code or other applicable laws, which take effect between the pre-application conference and submittal of an application, shall be applicable. [CMC 18.55.060 (D)]**. A link to the Camas Municipal Code (CMC) can be found on the City of Camas website, http://www.cityofcamas.us/ on the main page under "Business and Development".**

Planning Department **Sarah Fox 817-7269**

The applicant has proposed several permits, some of which can be consolidated for a single decision issuance. The applicant is responsible for reviewing the code and addressing the applicable provisions.

1) The proposed preliminary master plan for a Planned Residential Development (PRD) application is TYPE III permit, which requires City Council approval, in accordance with the process described within CMC Chapter 18.23 and CMC Chapter 18.55. This underlying permit is typically consolidated with preliminary plat, critical areas, and SEPA reviews. The proposed zoning overlay requires legislative action.

2) Note that the city's development codes within Titles 16, 17, and 18 were amended last month, and are codified online. Also, the city's multi-family dimensional standards at CMC Chapter 18.09 Density and Dimensions were amended, however, at this time; the ordinance has not been codified online, and is therefore attached to these notes. The application will be subject to the codes adopted on the date of application.

3) PRD applications should address the criteria as found under CMC§18.23.100- Approval standards. The contents of an application are provided at CMC§18.23.070- Preliminary Master Plan Requirements. In addition the application should address:
   a) Proposed timing for validity of master plan and phasing.
   b) How the adopted dimensional standards must be modified. Please note, that a preliminary plat application can be approved in phases (See "Phasing" at CMC§17.11.040), and may be approved at a public hearing before the city's Hearings Examiner, rather than by city council as required for a PRD.

4) The proposed preliminary master plan should conform to the city's comprehensive plan for residential density, and the PRD standards at CMC§18.23.040 Density Standards. The current DA lists a total unit count of 1,379 dwelling units, but the proposed amount is closer to 1,643. As discussed in the pre-app, the applicant should address this issue in a revised DA and subsequent overall project application.

***Notes on layout**:*

- All phases of the proposed development must be included at sufficient details to demonstrate compliance with applicable development codes.
- Double frontage lots if proposed, require additional lot depth per CMC 17.19.030 (D)(6). "*Residential lots which have street frontage along two opposite lot lines shall be avoided, except for lots which provide separation of a residential development from a traffic arterial or collector, in which case additional lot depth of at least twenty feet will be provided to act as a buffer strip, or* ***ten-foot landscape tract with ten-foot additional*** *lot depth, or a combination of both* ***to achieve twenty-foot additional depth*** *between the lot and the traffic arterial*."
- Extra (off-street) parking areas are required to be located in a convenient location if average lot sizes are less than 7,400 square feet.
- The proposed lot layout may also contain "Restricted Corner Lots". These are corner that are restricted from access on side yard flanking street. The setbacks on these lots shall be treated as interior lots.

5) Critical area reports required.
   - General requirements for critical areas reports are found at CMC§16.51.140. The city's code contains additional requirements for each type of critical area (e.g. wetlands).
   - Wetland report requirements are found at CMC§16.53.030. The preliminary report and analysis must include efforts to avoid impacts. Alternative layouts to indicate feasibility should be provided.
   - Steep Slopes additional analysis in accordance with CMC16.59.060.
   - Archaeological Predetermination Report required in accordance with CMC§16.31.070, and must include proof of mailing notification to tribes.
   - Wildlife habitat reports must be submitted in accordance with chapter CMC§16.61.
   - Scenic views in accordance with CMC§16.33.010(B) should be illustrated on a site plan, identifying particular corridors.
6) Tree preservation efforts are required.
   - Tree survey must be conducted by biologist (include qualifications). The biologist will be required to review and coordinate tree preservation efforts with preliminary grading plans.
   - CMC 18.31 requires preservation of significant trees "to the extent practical", "healthy trees" and prefers "groups of significant trees". CMC§18.31.110 requires "mandatory preservation" in the form acceptable to the city. CMC§17.19.030 (A)(2) requires "every reasonable effort" to retain trees.
7) Sales office locations should be proposed with preliminary plans. If sales offices are proposed with the Type III application, then time frames for operation of the temporary use can be approved for longer than the limits of typical temporary uses (6 months) if requested.
8) **Zoning Overlay**: An application must include the current and proposed zoning drawing; along with a narrative to address how the change in zoning requested is in conformity with the adopted comprehensive plan, and the public interest. The proposed zone change must be compatible with the existing established development pattern of the surrounding area in terms of lot sizes, densities and uses

9) Fees will be based on the adopted fees at the time of application submittal. The current fees include the following (not all inclusive):

• Preliminary plat	$6,055 + $210 per lot
• PRD	$27 per unit + plat fees
• Zone change	$1,650
• SEPA	$685
• Critical areas	$650 (per type)
• Fire Department Review	$300

Engineering Department **Wes Heigh 817-7237**

1. Construction plans shall be prepared by a licensed Washington State engineer in accordance with City of Camas standards.
2. Per CMC 14.02 stormwater treatment and runoff control shall be designed in accordance with the 2005 Stormwater Management Manual for Western Washington and the City of Camas Stormwater Design Standards Manual.
3. This development is subject to the minimum improvement requirements identified in CMC 17.19.020.
4. Existing wells and septic tanks and septic drain fields shall be abandoned in accordance with state and county guide lines per CMC 17.19.020 (A3).

5. Proposed lots should have frontage on public streets, lot lines should be at right angles to the street or radial to curves per CMC 17.19.030 (D).
6. Flag lots shall meet the requirements of CMC 17.19.030 (D5).
7. Double frontage lots should be avoided per CMC 17.19.030 (D).
8. In accordance with CMC 17.19.030 (E) and per the 2007 Parks, Recreation and Open Space Comprehensive Plan provisions shall be made for Neighborhood Park (NP-16), Special Use Park (SU-14), Trails T-27, T-29 and T-30. The city is currently in the process of updating our Parks Plan. Application materials will need to address the requirements of the current plan at the time of submittal.
9. Street tree planting and landscaping of flag lots is required in accordance with CMC 17.19.030 (F).
10. Stormwater facilities shall be located and landscaped per CMC 17.19.030 (F6) and CMC 17.19.040 (C3a).
11. Maintenance of the storm water facilities will be the responsibility of the Homeowners Association per CMC 17.19.040 (C3).
12. The applicant will be responsible for all traffic control signs, street name signs, pavement markings and street lighting per CMC 17.19.030 (I) (J).
13. The applicant will be responsible for the design and submittal of the utility plan showing the locations for underground power, telephone, gas, CATV, street lights and associated appurtenances.
14. Private streets if proposed will need to meet the provisions of CMC 17.19.040 (A).
15. Public street requirements are found in CMC 17.19.040 (B). For street grades, centerline curve radii, and curb return radii requirements see CMC 17.19.040 (B12).
16. Half width street improvements and ROW dedication will be required along Goodwin Road and NE Ingle Road per CMC 17.19.040 (B2 & B5). Ingle half width ROW is 37' and Goodwin half width ROW at Ingle should be 50' tapering to 37' east of Ingle.
17. Streets should extend to the boundaries of the plat where appropriate to ensure access and circulation to neighboring properties per CMC 17.19.040 (B6a).
18. Where lot size average is under 7,400 SF additional off-street parking will be required in accordance with CMC 17.19.040 (B10c).
19. Any proposed phasing shall be consistent with the requirements of CMC 17.11.040.
20. The application narrative shall specifically address the approval criteria CMC 17.11.030 (D) and CMC 18.23.100.
21. A 3% plan review and inspection fee will be required per resolution number 1023. The fee will be based on an engineer's estimate or construction bid. The fee is due prior to approved construction drawings being released by the City.
22. An erosion control bond will be required for all land disturbing activities of an acre or more per CMC 17.21.030.
23. A NPDES permit will be required for this project per Washington Department of Ecology requirements if more than one acre of land will be disturbed.
24. A traffic study will be required for this project in accordance with the City's adopted Traffic Impact Study Guidelines. The study shall include speed surveys, traffic counts, site distance evaluation, AM and PM peak volumes, trip distribution and assignment, signal warrants, turn pocket analysis, with and without project analysis for the current year, build out year and the future 5 year and 20 year analysis. Evaluation of additional

off-site intersections will be required once trip generation and distribution information is determined, contact the City Engineer for specific intersections.

25. This project will generate more than 700 ADT and will be required to provide acceptable traffic calming measured in accordance with the Neighborhood Traffic Manual.
26. Intersection spacing and intersection setbacks shall meet the requirements of the 2012 TIF Plan.
27. Water and sewer system extensions to the site will need to be consistent with the adopted Water System Plan and the General Sewer Plan Amendment. The improvements will likely require the applicant to enter into agreements with the city for system upsizing and/or latecomer agreements.
28. Regulations for installation of public improvements, improvement agreements, bonding, final platting and final acceptance can be found at CMC 17.21.
29. Exception requests to the requirements of Title 17 shall meet the requirements of CMC 17.23.

Fire Department **Randy Miller 834-6191**

Please note, for current or future questions/issues, All review notes, plat notes and conclusions have been conducted based on the current codes at the time, specifically the International Fire Code (IFC), National Fire Code (NFC) & CMC.

1. Automatic fire sprinkler system designed and installed in accordance with NFPA 13D may be required in all new dwellings. IFC B 105, CMC 17.19 ** Besides the obvious life safety and property protection advantages, Fire Sprinklers provide flexibility for developers in subdivision single access points, long term phasing projects that create dead ends, potential for installation of fewer hydrants, narrower streets, steeper grades, waiver of third party Wildland Interface Studies and finally decreased Fire Impact Fee's.
2. Onsite fire hydrants required, contact fire department for locations. IFC Appendix C Sec. C 105
3. A separate permit with the Fire Marshal's office is required for any underground tank decommissioning, removal/disposal or abandoning in place. IFC 105.7.5, 3404.2.13.1.4
4. Provisions required to be made for the addressing of flag lots. Address numbers shall be plainly legible and clearly visible and must be posted for each residence where the flag lot access or easement leaves the public road. IFC 505.1, CMC 17.19.030-D-5-G
5. Witnessed hydrant flushing by the FMO required prior to final completion per NFPA guidelines in ALL new developments with hydrants.
6. Hydrant chains to be removed prior to final completion.
7. Hydrant pads to be poured below the break-away bolts and to be a minimum 4' by 4' pad.
8. Minimum 3 ft clearance required around all hydrants. No item such as plants, trees, rocks, signs, retaining walls, light poles, traffic signal poles, power/telephone poles, electrical service box, phone/cable box, gas service, driveways, etc. shall obstruct or be within 3 feet of a fire hydrant. Open sky shall exist above the hydrant. IFC 507.5.4.
9. Separate permit with the Fire Marshal's office required for any private access gates/barriers. IFC D 103.5, CMC 12.36.
10. Any structures on site may be evaluated for potential fire department training burns. Please contact the Fire Marshal's Office at 360-834-6191 for further information.

11. Any subdivision or new development where residential or commercial fire sprinklers are not installed requires a Separate Permit with the Fire Marshal's office submitted by a WA State Licensed Fire Sprinkler Contractor to establish actual GPM flow for each hydrant, NFPA 291.

Parks Department **Jerry Acheson 834-5307 x4490**

1. The Park, Recreation and Open Space Comprehensive Plan identifies a regional trail leading to a view point in the area. The applicant should clearly demonstrate how this development will complement and continue the natural environment of this trail corridor.
2. The Park, Recreation and Open Space Comprehensive Plan identifies the need for a neighborhood parks in the vicinity of this proposed subdivision. The application should address how this proposal complies with the comprehensive plan.
3. Park and Open Space impact fees may be creditable toward dedication and/or development of these community resources.

Camas Municipal Code (Ord. No. 2694)

18.05.020 Districts designated.

For the purposes of the Code, the city is divided into zoning districts designated as follows:

District	Symbol	Comprehensive Plan Designation
Residential 20,000	R-20	Single-family Low
Residential 15,000	R-15	Single-family Low
Residential 12,000	R-12	Single-family Medium
Residential 10,000	R-10	Single-family Medium
Residential 7,500	R-7.5	Single-family Medium
Residential 6,000	R-6	Single-family High
Residential 5,000	R-5	Single-family High
Multifamily-10	MF-10	Multifamily Low
Multifamily-18	MF-18	Multifamily High
Multifamily-24	MF-24	Multifamily High
Multifamily Cottage	MF-C	Overlay
Neighborhood Commercial	NC	Commercial
Community Commercial	CC	Commercial
Regional Commercial	RC	Commercial
Mixed Use	MX	Commercial
Downtown Commercial	DC	Commercial
Light Industrial	LI	Industrial
Heavy Industrial	HI	Industrial
Business Park	BP	Industrial
Light Industrial/Business Park	LI/BP	Light Industrial/Business Park
Neighborhood Park	NP	Park
Special Use Park	SU	Park
Open space/Green space	OS	Open space / Green space

18.05.040 Residential and multifamily zones

A. R-20 Residential-20,000. This zone is intended to ensure that the rural character of certain portions of the city is maintained. Residential development is expected to consist of large custom single-family dwellings on uniquely configured lots which are designed to be sensitive to topographic and environmental considerations. The average lot size is twenty thousand square feet at densities of one to two dwellings per acre.

B. R-15 Residential-15,000. This zone is intended for single-family dwellings with a minimum density of two to three dwellings per acre. This zone will permit the rural character of a number of existing neighborhoods to be maintained. The average lot size is fifteen thousand square feet.

C. R-12 Residential-12,000. This zone is intended for single-family dwellings with densities of three to four dwelling units per acre. This zone is designated for areas with steep topography for greater flexibility in site layout, and where potential hazards do not exist. The average lot size is twelve thousand square feet.

D. R-10 Residential-10,000. This zone is intended for single-family dwellings with densities of four to five dwellings per acre. This zone is intended to be zoned near low density residential districts, and where potential natural hazards do not exist. The average lot size is ten thousand square feet.

E. R-7.5 Residential-7,500. This zone is intended for single-family dwellings with densities of five to six dwellings per acre. This zone should have less slope than lower density zones, and be adjacent to existing high density residential districts. The average lot size is seven thousand five hundred square feet.

F. R-6 Residential-6,000. This zone is intended for single-family dwellings with densities of six to seven dwellings per acre. The slope of property is less than other lower density residential zones. This zone serves a transition to multifamily or commercial zones. The average lot size is six thousand square feet.

G. R-5 Residential-5,000. This zone is intended for single-family dwellings, either attached or detached, with densities of up to eight and one-half dwellings per acre. The slope of property is less than other medium density residential zones. Like the R-6 district, this zone serves as a transition to multifamily or commercial zones. The average lot size is five thousand square feet.

H. MF-10 Multifamily Residential. This zone provides for a diversity of dwellings such as duplexes, triplexes, fourplexes, rowhouses, and apartment complexes, with a density of up to ten units per acre. It is desirable for this zone to be adjacent to parks and multi-modal transportation systems. This zone can also serve as a transition between commercial and residential zones.

I. MF-18 and MF-24 Multifamily Residential. These zones are intended to provide for dwellings such as rowhouses and apartment complexes. It is desirable for these zones to be adjacent to parks and multi-modal transportation systems. These zones also serve as a transition between commercial and residential zones.

J. MF-C Cottage. This is an overlay zone, which is intended to increase the housing supply and style choices for smaller, single-level dwellings. It is desirable that cottages are designed to include unique architectural elements such as a front porch, steep-pitch gable roof, and a recessed garage; and to accommodate those with mobility impairments. This overlay zone may be utilized within multi-family zones only, and upon approval of a zoning district change.

18.09.050 Table 3—Density and dimensions for multifamily residential zones

	MF-10	MF-18	MF-24	MF-C Overlay
Density				
Maximum density (dwelling units per gross acre)	10	18	24	18
Minimum density (dwelling units per gross acre)	6.0	6.0	6.0	6.0
Standard lots				
Minimum lot area (square feet)	3,000	2,100	1,800	None
Minimum lot width (feet)	30	20	20	0
Minimum lot depth (feet)	70	60	60	0
Maximum gross floor area (GFA) per dwelling unit (square feet)	No max	No max	No max	1,000 [Note 4]
Setbacks				
Minimum front yard/at garage front (feet)	15/18	10/18	10/18	0/18
Minimum side yard (feet)	3 [Note1]	3 [Note1]	3 [Note1]	0
Minimum side yard, flanking a street (feet)	15	15	15	15
Minimum rear yard	10	10	10	0
Lot coverage				
Maximum building lot coverage	55%	65%	75%	Building coverage is limited by a minimum of 200 sq. ft. of useable yard adjacent to each dwelling unit.
Building height				
Maximum building height (feet)	35 [Note 2]	45 [Note 2]	45 [Note 2]	18 [Note 3]

Table 3 Notes:

1. The non-attached side of a dwelling unit shall be three feet, otherwise a zero-lot line is assumed.
2. Maximum building height: three stories and a basement but not to exceed height listed above.
3. Maximum building height: one story and a basement but not to exceed height listed above.
4. GFA in this instance does not include covered porches or assessory structures as defined per CMC18.17.040.

EXHIBIT 4

DEVELOPER'S

G I S

P A C K E T

Produced By:
Clark County Geographic Information System

For:
Jocelyn Cross
360-695-1385

Subject Property Account Number(s):

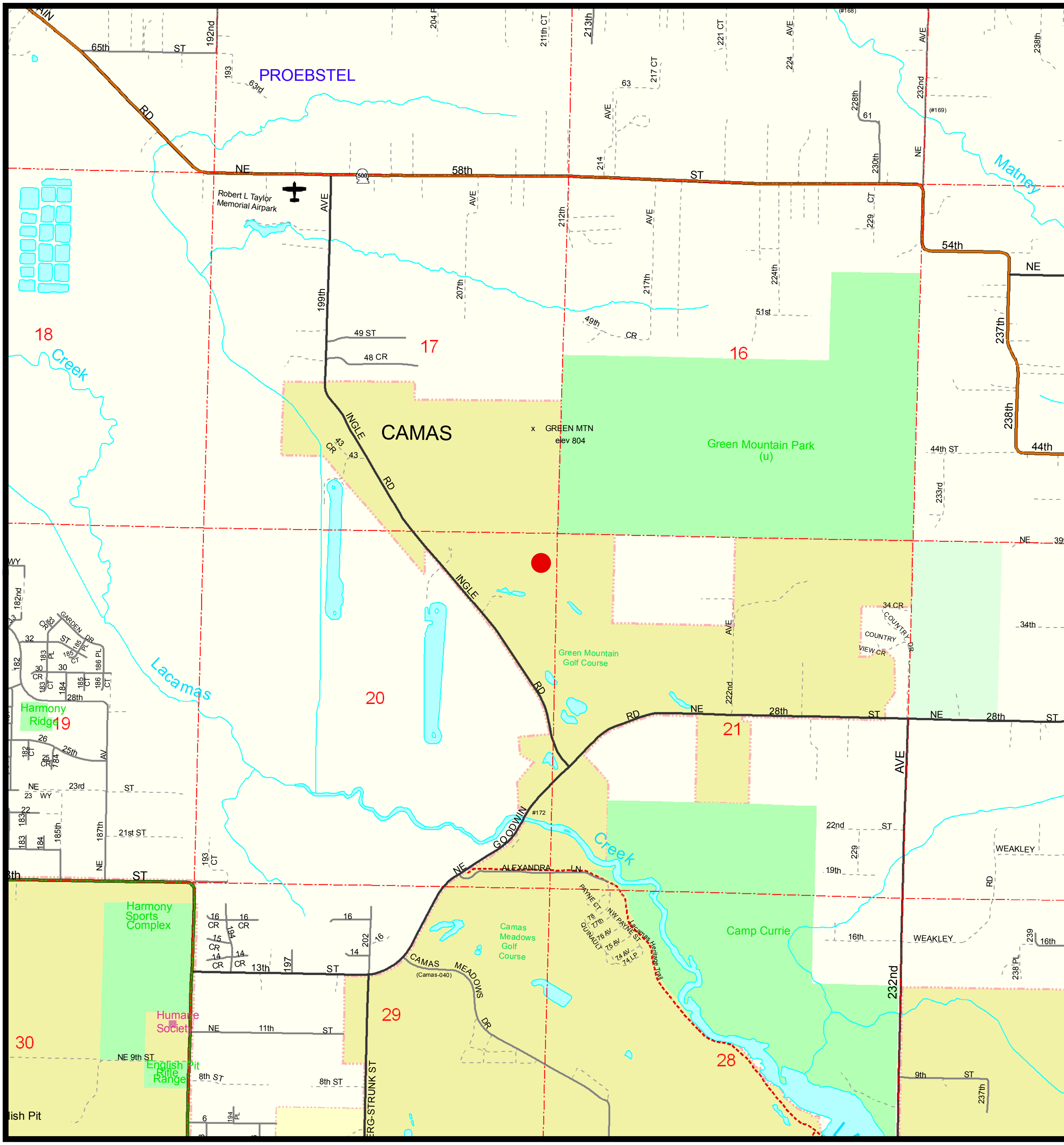
171727000
172341000
171704000
172555000
172557000
172553000
172559000
173165000
173178000

PDF # 120302

Printed: January 28, 2014

Expires: January 28, 2015

Table of Contents



General Location Map

Printed on: January 28, 2014

Account No: 171727000, 172341000, 171704000, 172555000

Owner: GREEN MOUNTAIN LAND LLC

Address: 5300 MEADOWS STE 400

C/S/Z: LAKE OSWEGO, OR 97035

CLARK COUNTY, WASHINGTON

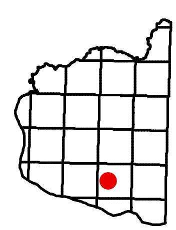
Geographic Information System

N

1:24,000

0 0.1 0.2 0.3 0.4 0.5 Miles

Subject Property Location



Information shown on this map was collected from several sources. Clark County accepts no responsibility for any inaccuracies that may be present.

Property Information Fact Sheet

Mailing Information:
Account No.: 171727000, 172341000, 171704000, 172555000, 172557000, 172553000, 172559000, 173165000, 173178000
Owner: GREEN MOUNTAIN LAND LLC
Address: 5300 MEADOWS STE 400
C/S/Z: LAKE OSWEGO, OR 97035
Assessed Parcel Size: 288.36 Ac
Property Type: Multiple Property Types

PARCEL LOCATION FINDINGS:

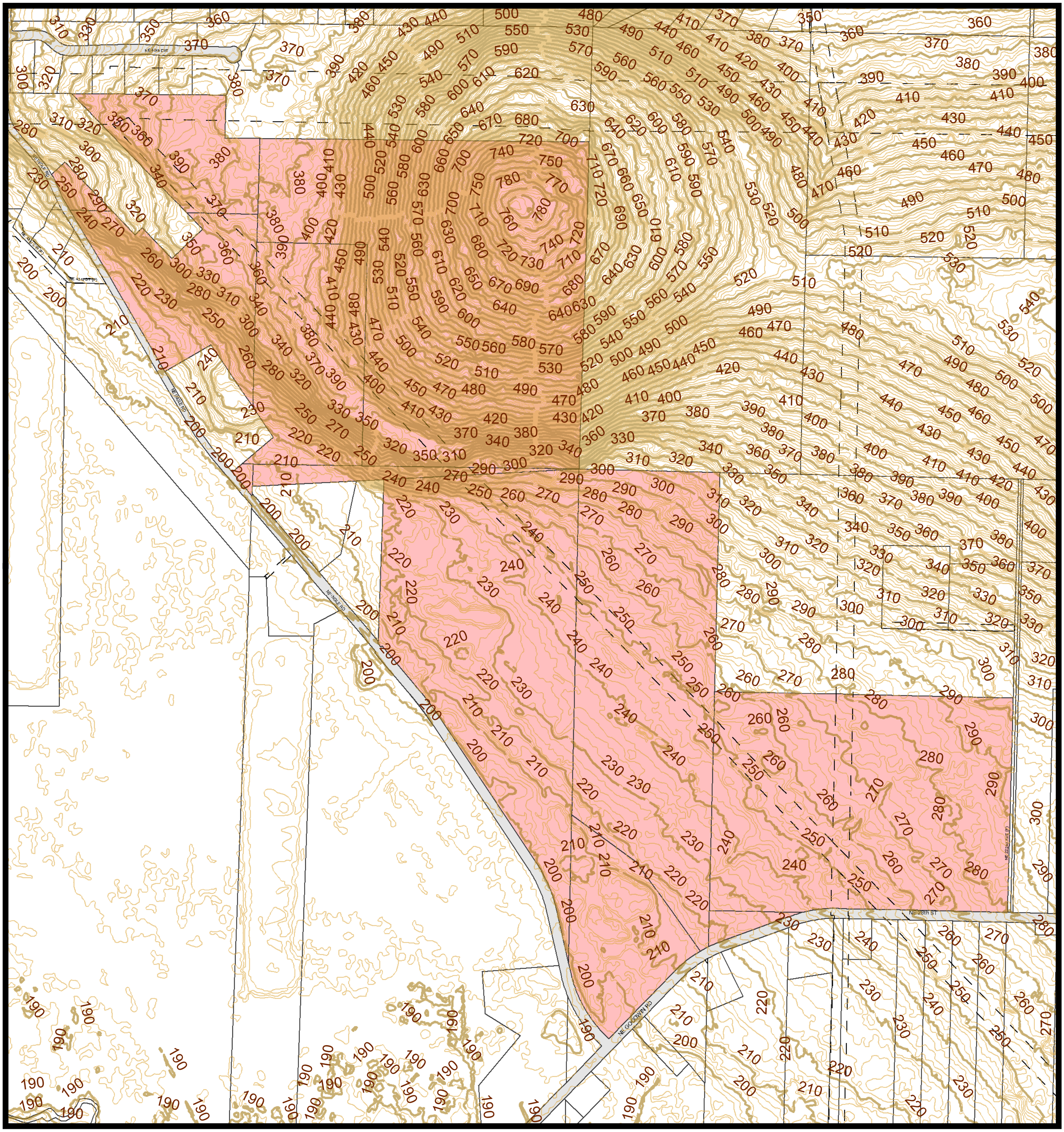
Quarter Section(s): NE 1/4,S20,T2N,R3E,
NW 1/4,S21,T2N,R3E,
SE 1/4,S17,T2N,R3E,
SE 1/4,S20,T2N,R3E,
SW 1/4,S17,T2N,R3E,
SW 1/4,S21,T2N,R3E
Municipal Jurisdiction: Camas
Urban Growth Area: Camas
Zoning: CC, MF-10, R-10, R-6
Comprehensive Plan Designation: COM,
MFL,
SFH,
SFM
Columbia River Gorge NSA: No Mapping Indicators
Building Moratorium: No Indicators

Late-Comer Area: No Mapping Indicators
Trans. Impact Fee Area: Camas
Park Impact Fee District: 0
Neighborhood Association: Proebstel
School District: Evergreen
Elementary School: Harmony
Junior High School: Pacific
Senior High School: Union
Fire District: Camas Washougal FD , FD 5
Sewer District: Rural/Resource
Water District: Camas
Wildland: 500+ elev. & forest, slopes, or no FD,
No Mapping Indicators
Historic Sites: No Mapping Indicators

ENVIRONMENTAL CONSTRAINTS:

Soil Type(s): CvA, 4.2% of parcel
DoB, 47.4%
HcB, 1.0%
LeB, 1.6%
MlA, 6.6%
OmE, 11.5%
OmF, 27.8%
Hydric Soils: Hydric, 10.7% of parcel
Non-Hydric, 89.3%
Flood Zone Designation: Outside Flood Area
CARA: Category 1 Recharge Areas, Category 2 Recharge Areas
Liquefaction Susceptibility: Bedrock, Low to Moderate, Very Low, Very Low to Low
NEHRP: B, C
Slope: 0 - 5 percent, 3.9% of parcel
10 - 15 percent, 5.4%
15 - 25 percent, 6.9%
25 - 40 percent, 19.2%
40 - 100 percent, 6.9%
5 - 10 percent, 57.7%
Landslide Hazards: Areas of Potential Instability,
Slopes > 15%
Slope Stability: Severe erosion hazard areas
Priority Habitat and Species Areas: No Mapping Indicators,
Non-riparian Habitat Conservation Area

Priority Species Area Buffer: No Mapping Indicators
Priority Habitat Area Buffer: WDFW Priority Habitat Buffer
Archeological Predictive: High, 10.9% of parcel
Low, 12.9%
Low-Moderate, 19.0%
Moderate, 13.2%
Moderate-High, 44.0%
Archeological Site Buffers: Mapping Indicators Found



CLARK COUNTY, WASHINGTON
Geographic Information System

N

1:9,600

0 390 780 1,170
Feet

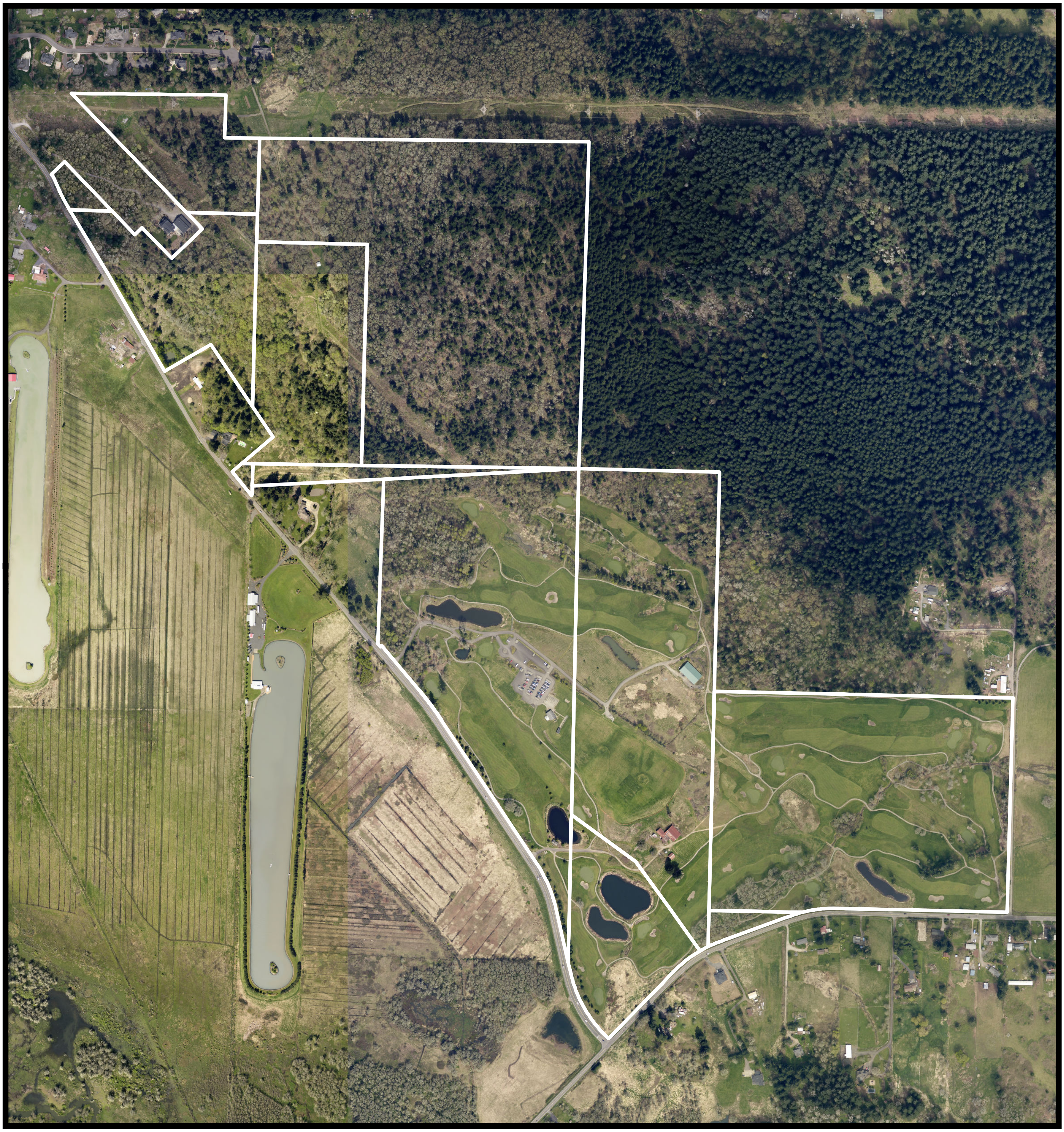
Elevation Contours

Account No: 171727000, 172341000, 171704000, 172555000
Owner: GREEN MOUNTAIN LAND LLC
Address: 5300 MEADOWS STE 400
C/S/Z: LAKE OSWEGO, OR 97035

Printed on: January 28, 2014

- Proposed Development Area
- Public Road
- Transportation or Major Utility Easement
- 2' Elevation Contour

Information shown on this map was collected from several sources. Clark County accepts no responsibility for any inaccuracies that may be present.



2012 Aerial Photography

Account No: 171727000, 172341000, 171704000, 172555000

Owner: GREEN MOUNTAIN LAND LLC

Address: 5300 MEADOWS STE 400

C/S/Z: LAKE OSWEGO, OR 97035

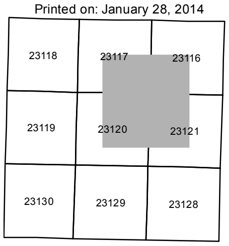
Proposed Development Area

Geographic Information System

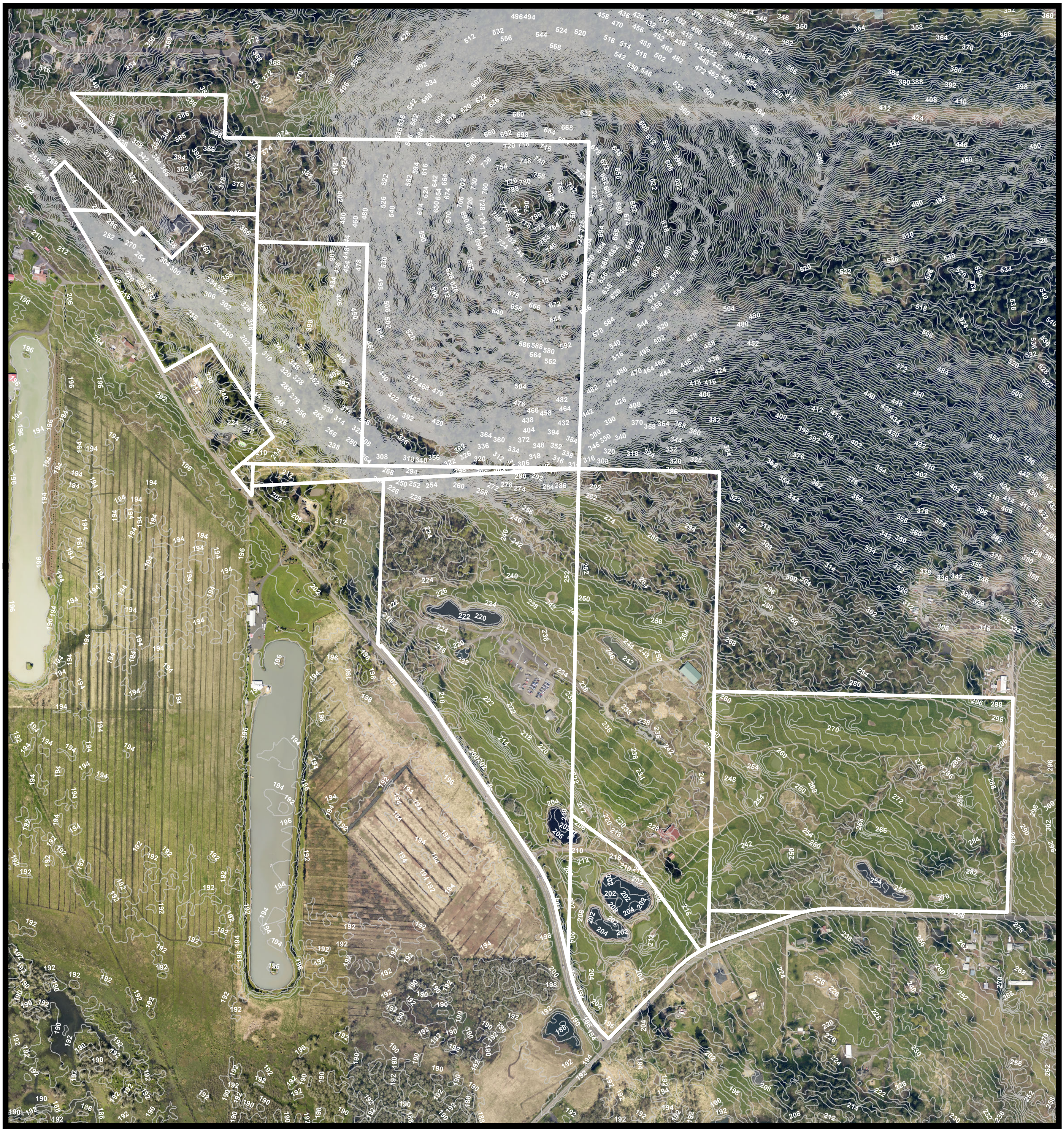
1:9,600

0 400 800 1,200 Feet

Printed on: January 28, 2014



Information shown on this map was collected from several sources. Clark County accepts no responsibility for any inaccuracies that may be present.



2012 Aerial Photography with Contours

Account No: 171727000, 172341000, 171704000, 172555000

Owner: GREEN MOUNTAIN LAND LLC

Address: 5300 MEADOWS STE 400

C/S/Z: LAKE OSWEGO, OR 97035

CLARK COUNTY, WASHINGTON

Geographic Information System

N

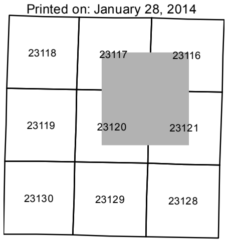
1:9,600

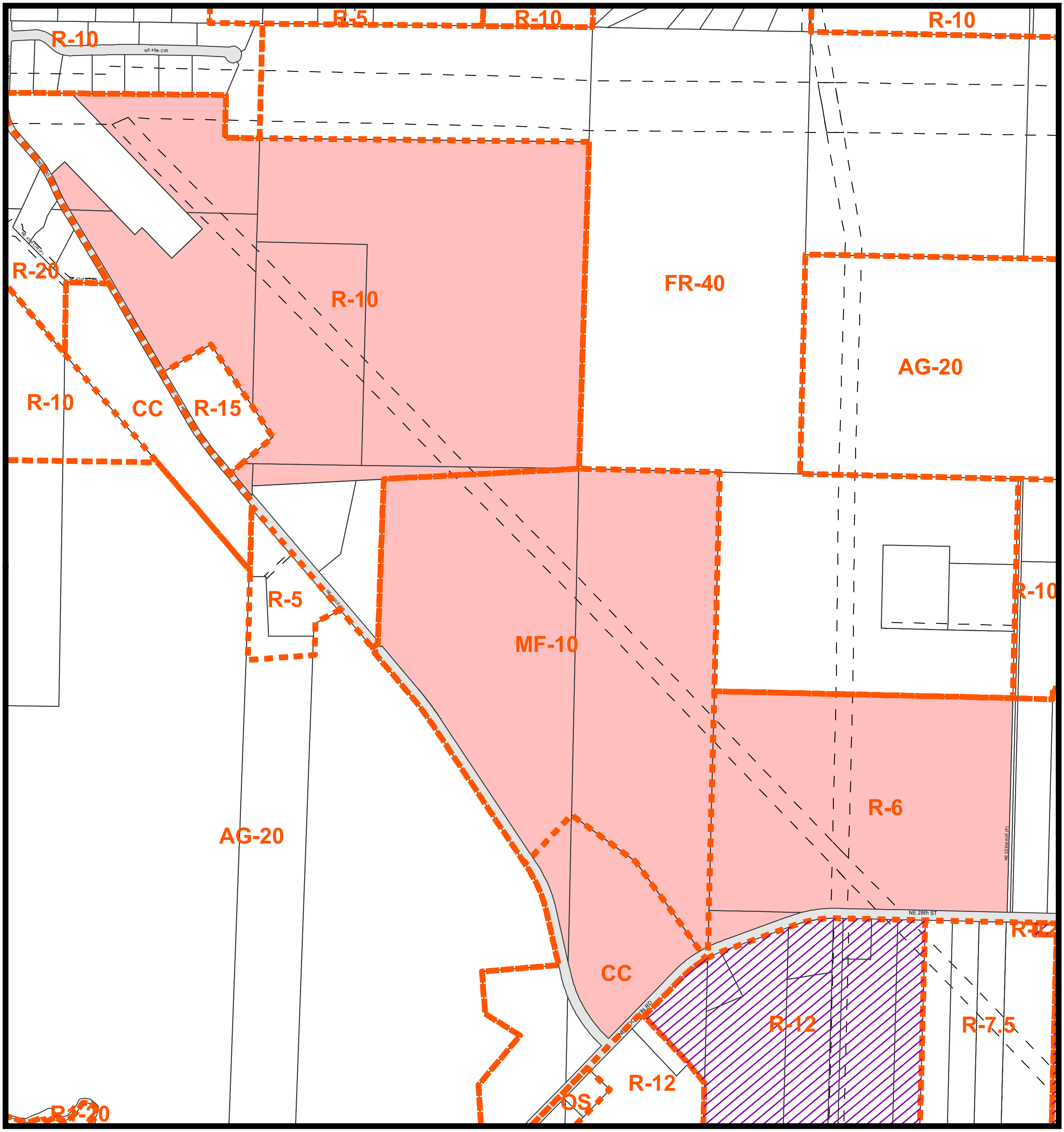
0 410 820 1,230 Feet

Proposed Development Area

2' Elevation Contours

Printed on: January 28, 2014





1:9,600

0 400 800 1,200 Feet

Zoning Designation

Account No: 171727000, 172341000, 171704000, 172555000

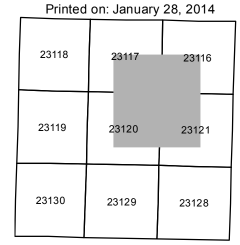
Owner: GREEN MOUNTAIN LAND LLC

Address: 5300 MEADOWS STE 400

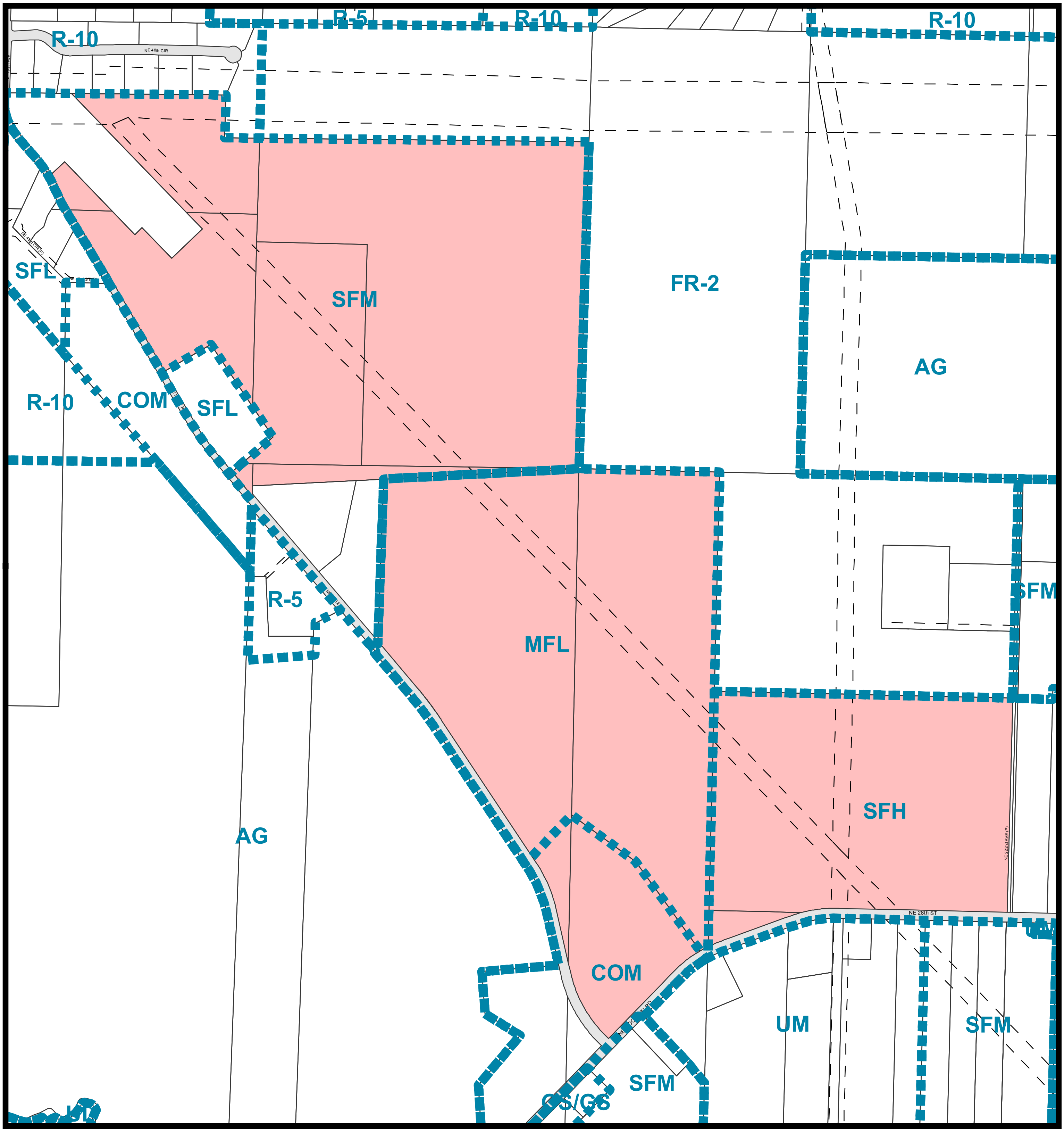
C/S/Z: LAKE OSWEGO, OR 97035

- Subject Parcel
- Public Road
- Transportation or Major Utility Easement
- Zoning Boundary
- Urban Holding - 10 (UH-10)
- Urban Holding - 20 (UH-20)
- Urban Holding - 40 (UH-40)
- Surface Mining Overlay District

Printed on: January 28, 2014



Information shown on this map was collected from several sources. Clark County accepts no responsibility for any inaccuracies that may be present.



CLARK COUNTY, WASHINGTON
Geographic Information System

1:9,600

0 400 800 1,200 Feet

Comprehensive Plan Designation

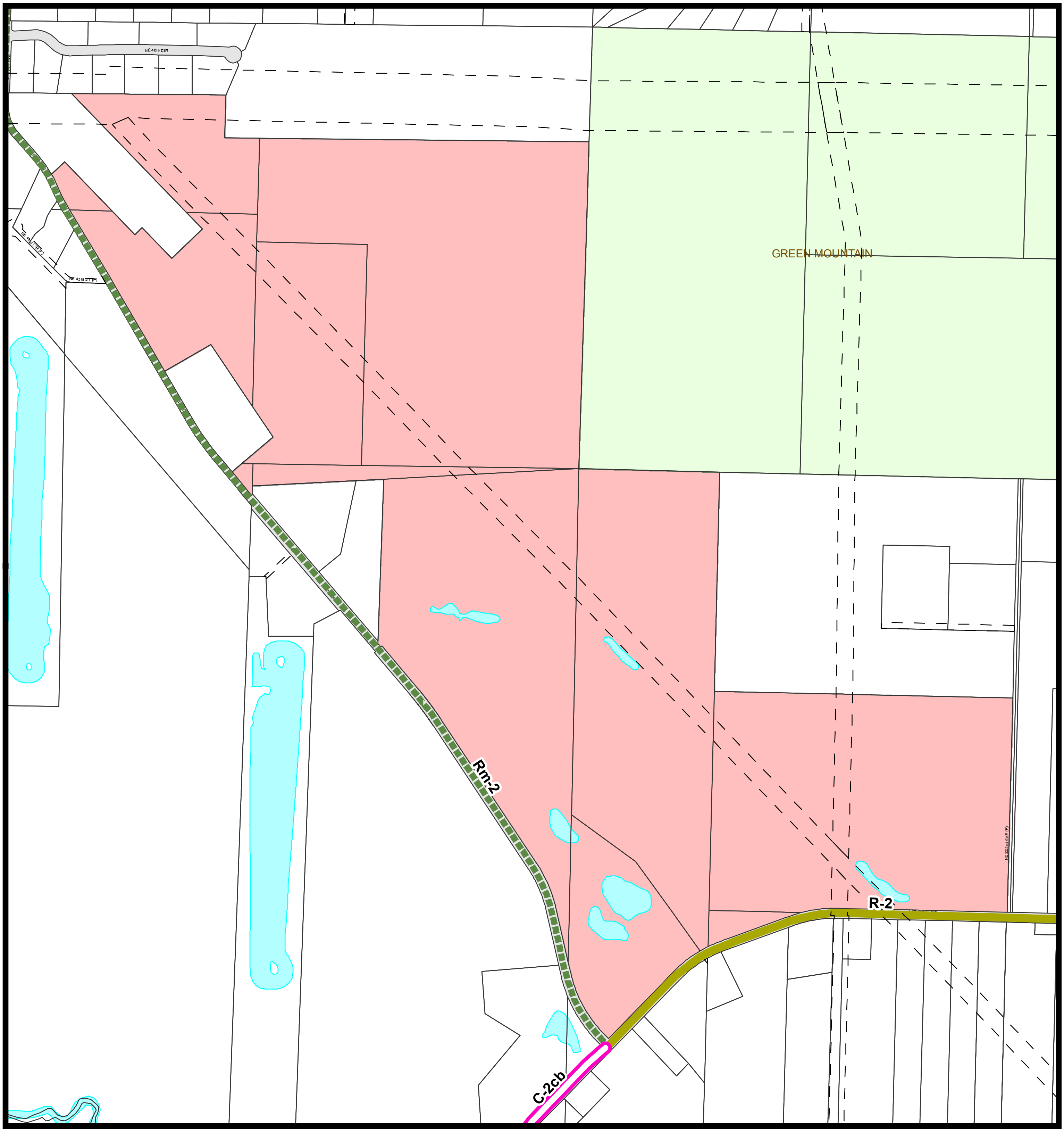
Account No: 171727000, 172341000, 171704000, 172555000
Owner: GREEN MOUNTAIN LAND LLC
Address: 5300 MEADOWS STE 400
C/S/Z: LAKE OSWEGO, OR 97035

- Subject Parcel
- Public Road
- Transportation or Major Utility Easement
- Comprehensive Plan Boundary
- Urban Reserve
- Industrial Reserve
- Railroad Industrial Reserve
- Mining
- Rural Center Mixed Use
- Columbia River Gorge Scenic Area

Printed on: January 28, 2014

23118	23117	23116
23119	23120	23121
23130	23129	23128

Information shown on this map was collected from several sources. Clark County accepts no responsibility for any inaccuracies that may be present.



Arterials C-Tran Routes Parks & Trails

Account No: 171727000, 172341000, 171704000, 172555000
Owner: GREEN MOUNTAIN LAND LLC
Address: 5300 MEADOWS STE 400
C/S/Z: LAKE OSWEGO, OR 97035

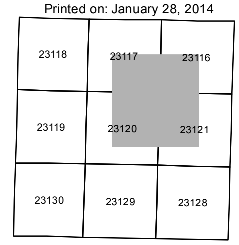
CLARK COUNTY, WASHINGTON
Geographic Information System

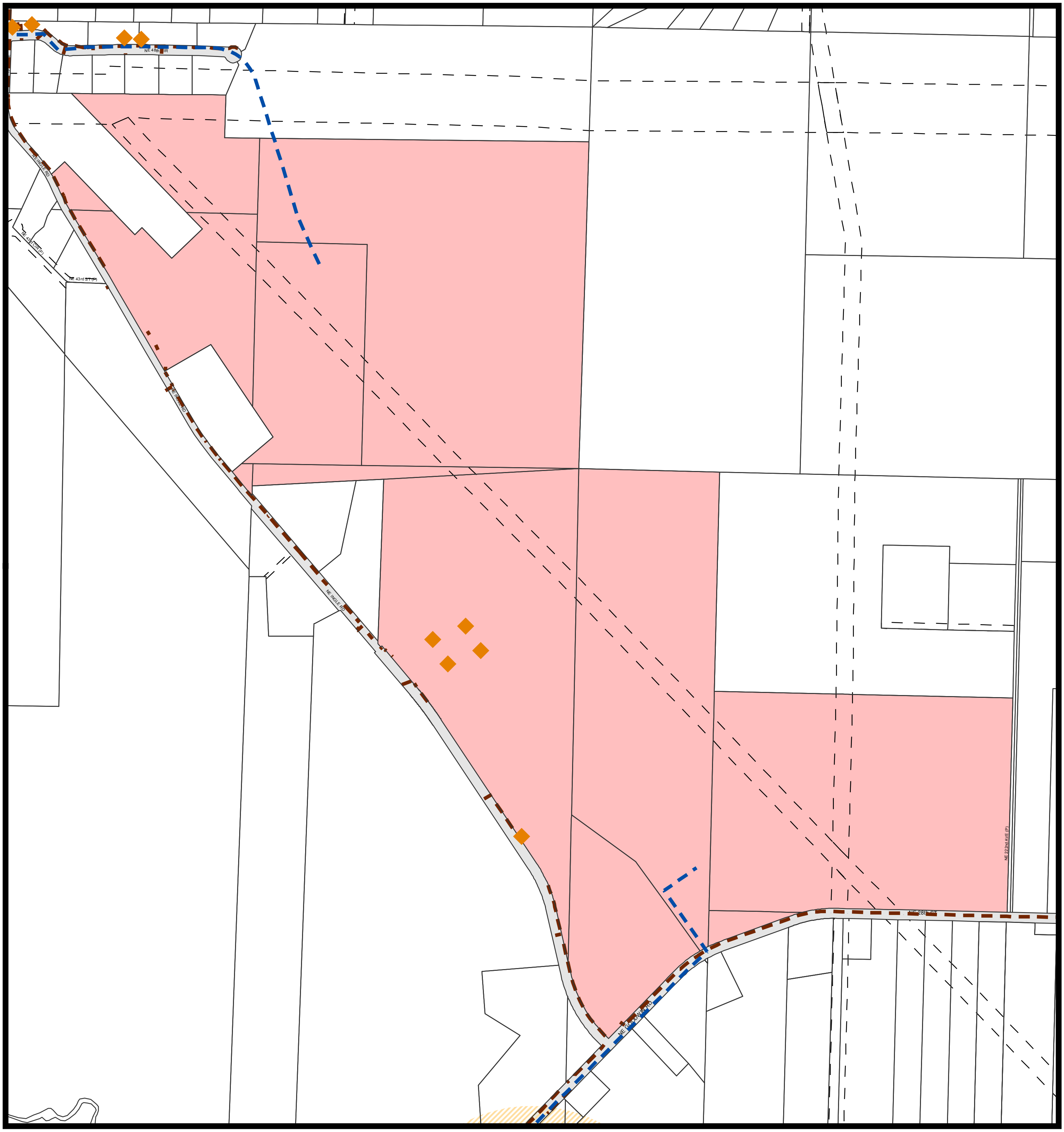
1:9,600

0 390 780 1,170 Feet

Subject Parcel
Public Road
Transportation or Major Utility Easement
Parks
Trails
C-Tran Route
Principal Arterial
Minor Arterial
Collector
Rural Major Collector
Rural Minor Collector
Scenic Highway
State Route

Printed on: January 28, 2014





Water Sewer and Storm Systems

Account No: 171727000, 172341000, 171704000, 172555000
Owner: GREEN MOUNTAIN LAND LLC
Address: 5300 MEADOWS STE 400
C/S/Z: LAKE OSWEGO, OR 97035

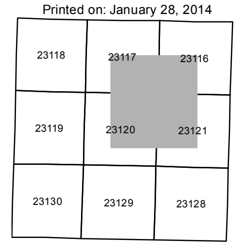
Subject Parcel
Public Road
Transportation or Major Utility Easement
Storm Water Lines
Water Lines
Sewer Lines
1-year Wellhead ZOC
5-year Wellhead ZOC
10-year Wellhead ZOC
Hydrants

CLARK COUNTY, WASHINGTON
Geographic Information System

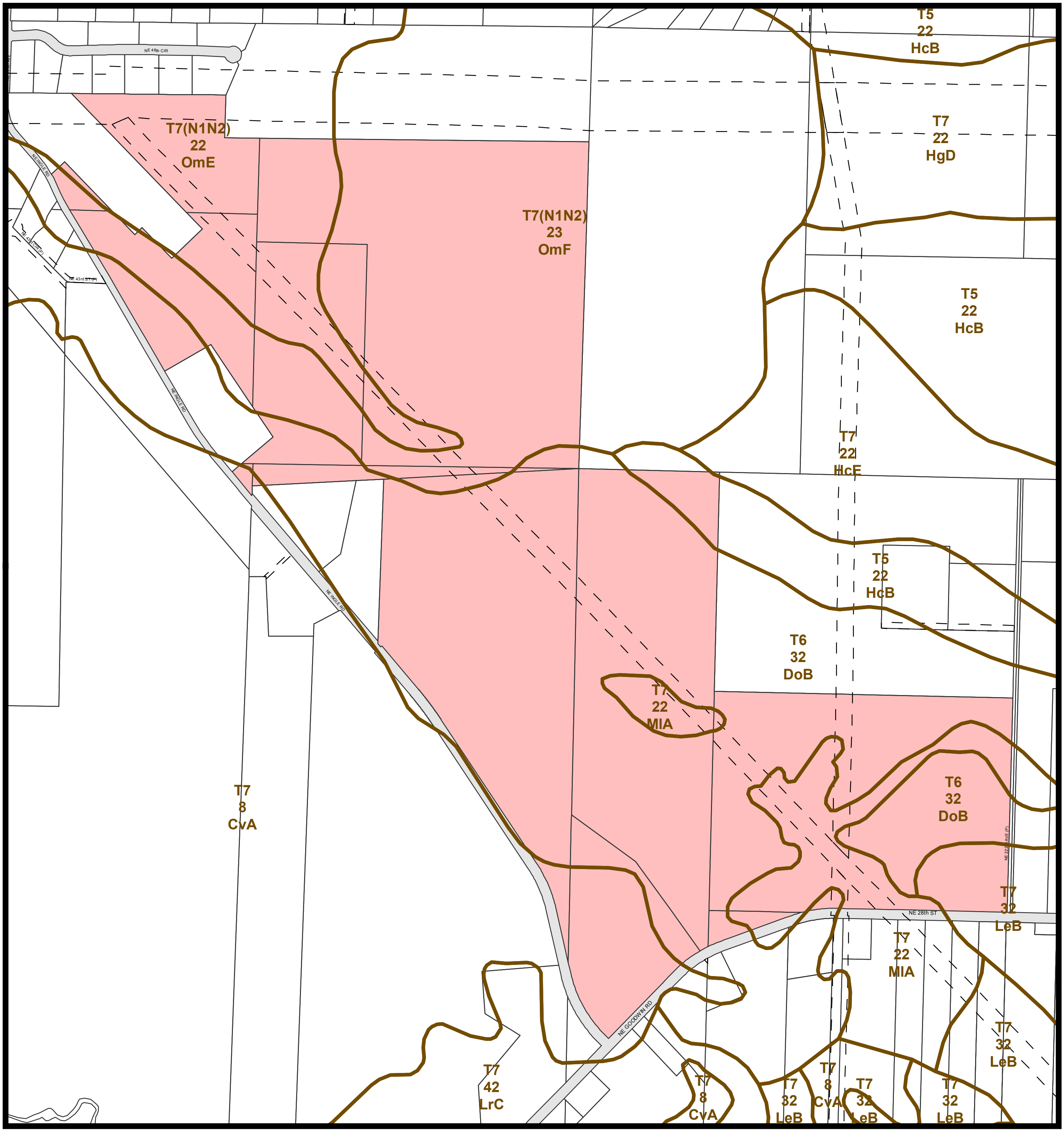
1:9,600

0 390 780 1,170 Feet

Printed on: January 28, 2014



Information shown on this map was collected from several sources. Clark County accepts no responsibility for any inaccuracies that may be present.



Geographic Information System

1:9,600

0 390 780 1,170 Feet

Soil Types

Account No: 171727000, 172341000, 171704000, 172555000

Owner: GREEN MOUNTAIN LAND LLC

Address: 5300 MEADOWS STE 400

C/S/Z: LAKE OSWEGO, OR 97035

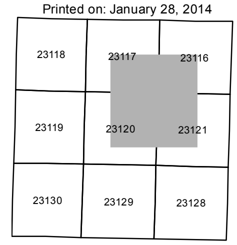
Subject Parcel

Public Road

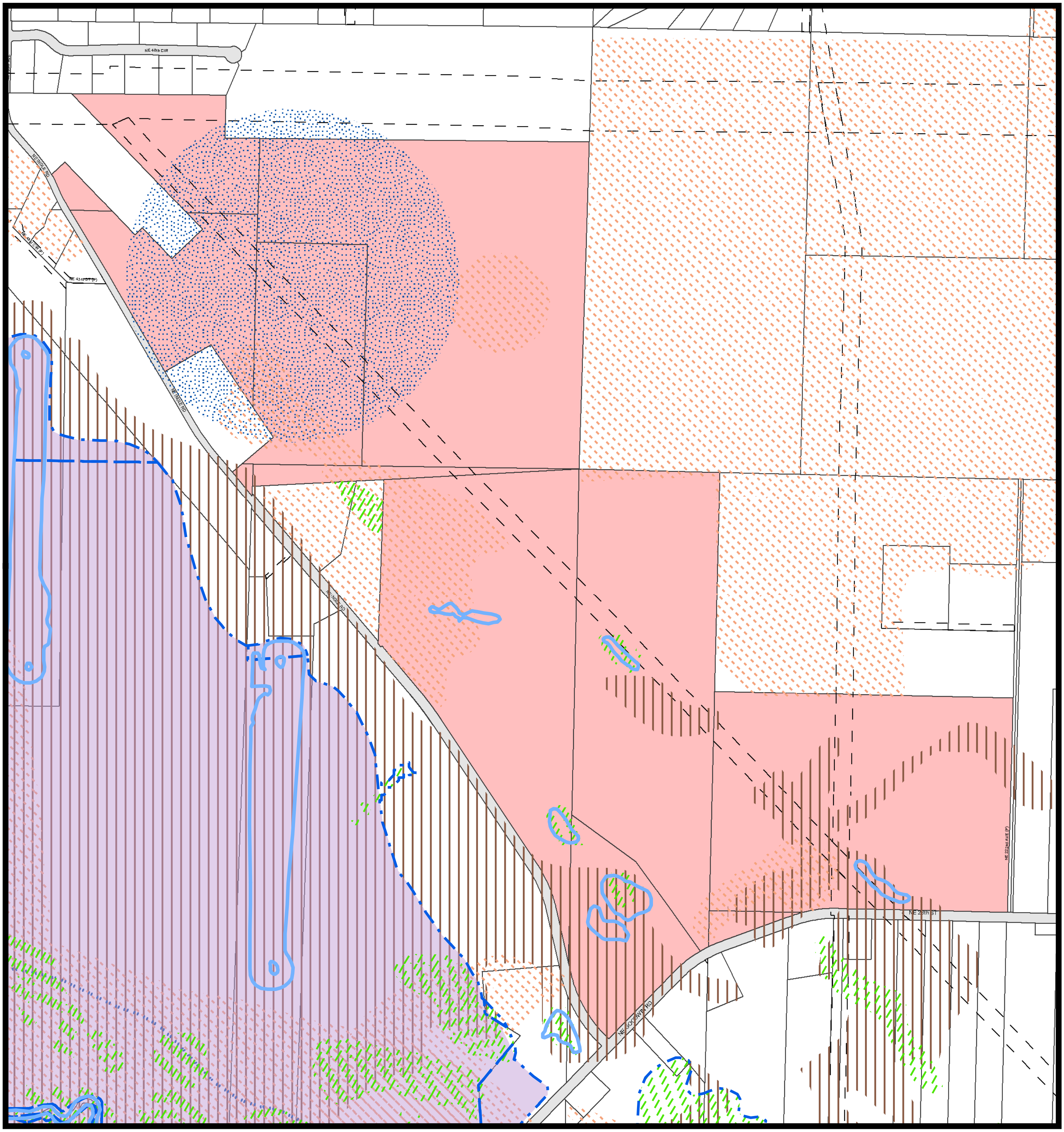
Transportation or Major Utility Easement

Soil Type Boundary

Printed on: January 28, 2014



Information shown on this map was collected from several sources. Clark County accepts no responsibility for any inaccuracies that may be present.



Clark County, Washington
Geographic Information System

1:9,600

0 390 780 1,170 Feet

Environmental Constraints I

Account No: 171727000, 172341000, 171704000, 172555000
Owner: GREEN MOUNTAIN LAND LLC
Address: 5300 MEADOWS STE 400
C/S/Z: LAKE OSWEGO, OR 97035

- Subject Parcel
- Public Road
- Transportation or Major Utility Easement
- Hydric Soils
- Wetland Inventory
- Non-riparian Habitat or Species Area
- CARA Category 1
- 100 year Floodplains
- Floodway
- Shorelines
- Stream

Printed on: January 28, 2014

23118	23117	23116
23119	23120	23121
23130	23129	23128

NOTICE: DEVELOPER'S PACKETS CONTAIN THE UPDATED SHORELINE DESIGNATION MAP LAYER

Mapping of Shoreline Master Program (SMP) Shoreline Designations (SDs)

Clark County jurisdictions formed a coalition and worked together, with oversight from the Washington State Department of Ecology, to update their local SMPs and Shoreline Designation (SD) Maps. Updated shoreline designations have been mapped countywide and are now shown in Developer's Packets. However, because the coalition jurisdictions are proceeding individually toward local adoption and Ecology approval of their SMPs and SD Maps, their SD Maps will become effective at different times throughout the rest of 2012 and into 2013. Therefore, it is important to understand that some projects fall under the new designations and some are still regulated based on prior designations.

Interim and newly adopted Shorelines Master Program (SMP) Shoreline Designation (SD) Map layers can be viewed in MapsOnline until the SMP update process for Clark County jurisdictions is complete. The interim map layer entitled *Interim Shoreline Designations* applies to projects in jurisdictions where the newly adopted SD Maps are not yet effective. The *Shoreline Designation* map layer applies to jurisdictions where the newly adopted SD maps have become effective.

It is important to review the SMP status for the jurisdiction in which your project is located to determine which map layer and shoreline designations apply.

The appropriate shoreline map layer and a link to each jurisdiction's SMP website is listed below:

Clark County - As of September 12, 2012, newly adopted shoreline designations are represented in the Shoreline Designations map layer in Developer's Packets

http://www.clark.wa.gov/planning/land_use/shoreline.html

Vancouver and Camas – As of September 24, 2012, new SMP designations took effect for both Camas and Vancouver. New Shoreline Designations are represented in Developer's Packets.

Vancouver - http://www.cityofvancouver.us/environmentalOrd.asp?menuid=10463&submenuid=10487

Camas - http://www.ci.camas.wa.us/index.php/planning/planningcurrentissues

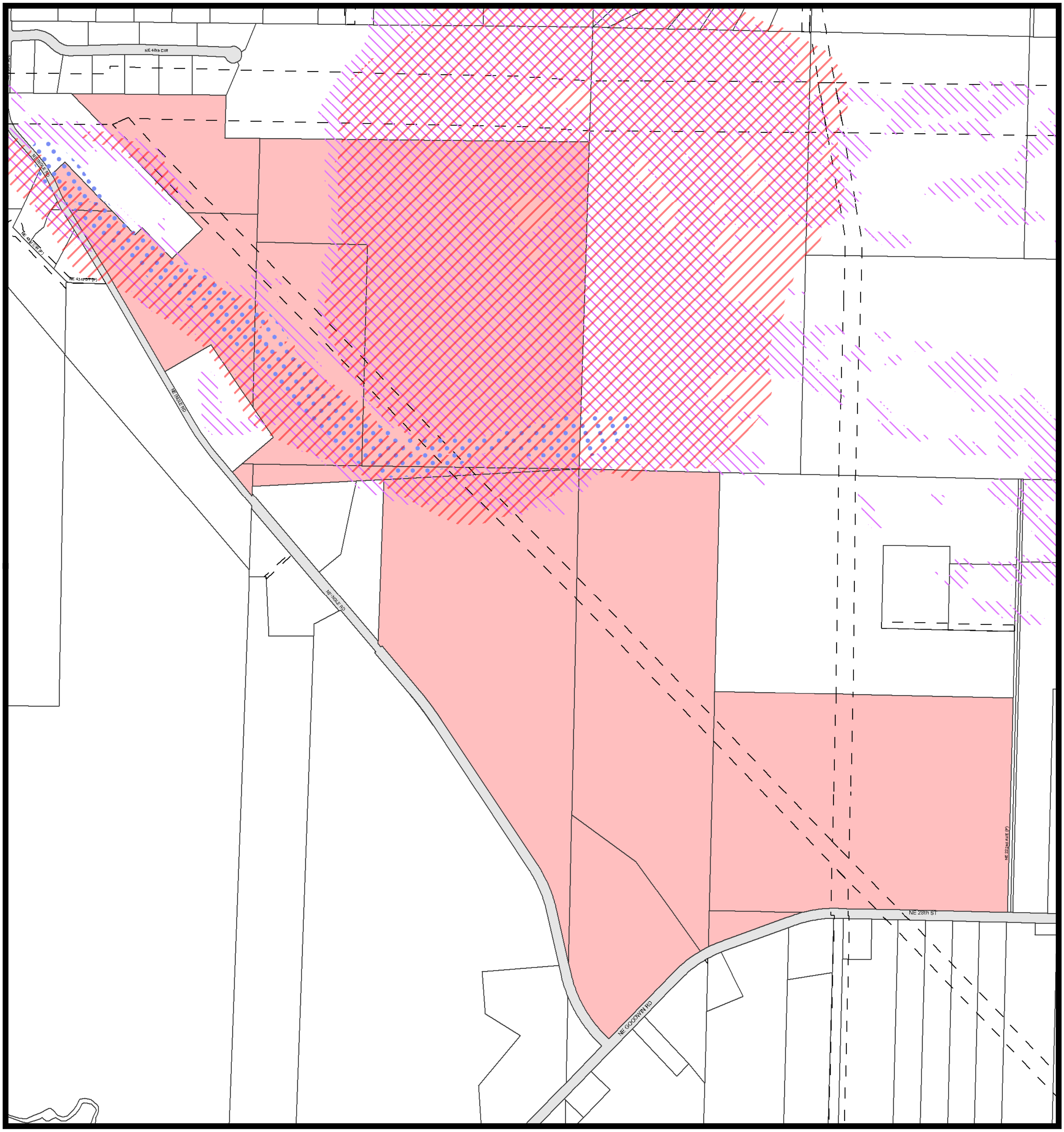
Other jurisdictions – Refer to the Interim Shoreline Designations map layer in MapsOnline until the updated Shoreline Designation Map becomes effective, at which time the Shoreline Designations map layer will take effect.

Battle Ground - http://www.cityofbg.org/index.aspx?nid=374

La Center - http://www.ci.lacenter.wa.us/city_departments/city_planner.html

Ridgefield - http://www.ci.ridgefield.wa.us/resources/documents/SMPAdoptedApril122012.pdf

Washougal - http://www.cityofwashougal.us/city-services/community-development2/planning-division2/services/shoreline-master-program-update.html



CLARK COUNTY, WASHINGTON

Geographic Information System

1:9,600

0 390 780 1,170 Feet

Developer's GIS Packet Page 12 of 19

Environmental Constraints II

Account No: 171727000, 172341000, 171704000, 172555000

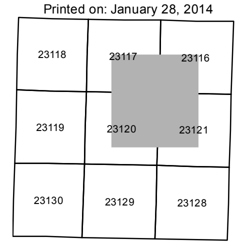
Owner: GREEN MOUNTAIN LAND LLC

Address: 5300 MEADOWS STE 400

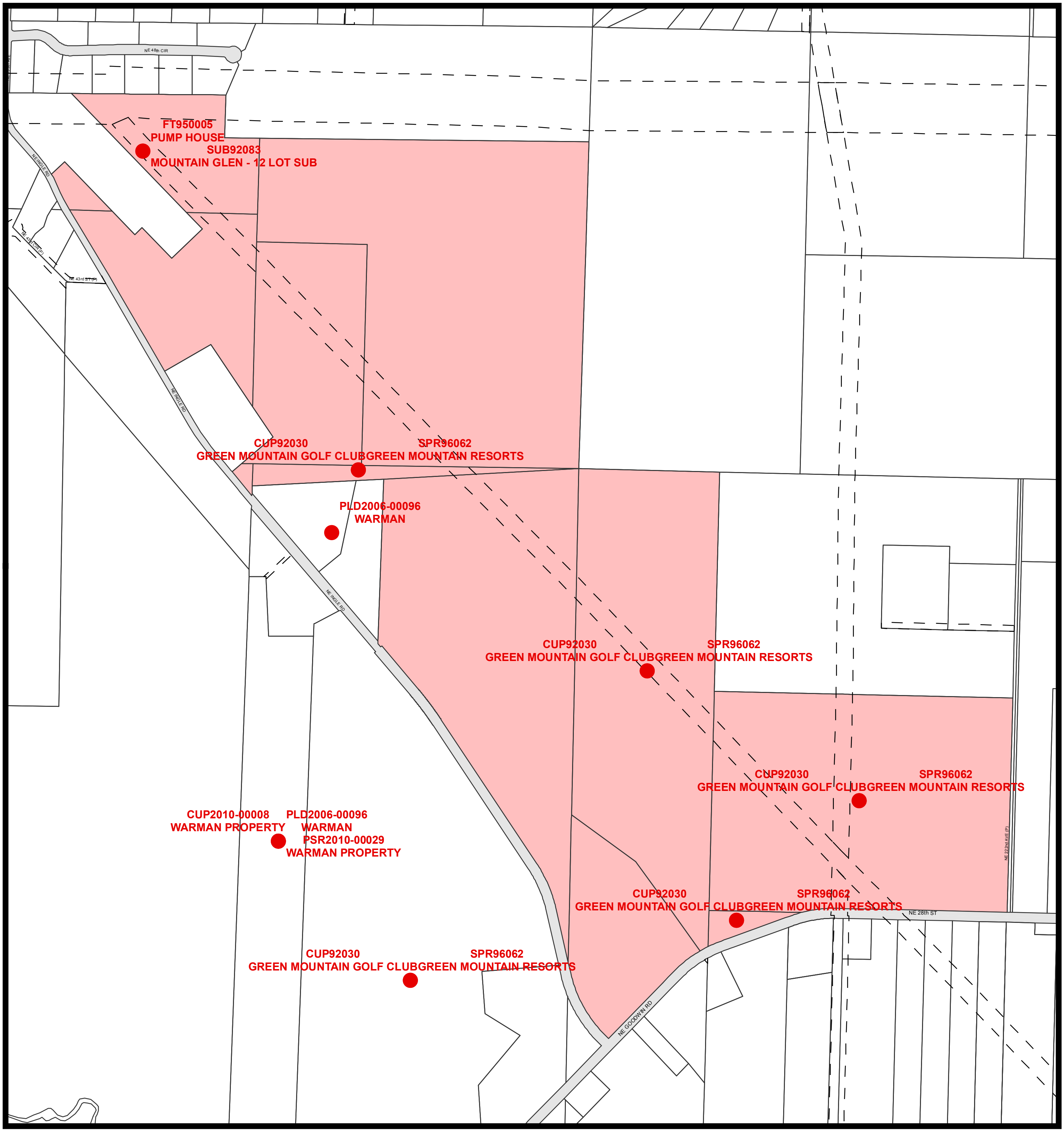
C/S/Z: LAKE OSWEGO, OR 97035

- Subject Parcel
- Public Road
- Transportation or Major Utility Easement
- Slopes > 15%
- Potentially Unstable Slope
- Historic or Active Landslide
- Severe Erosion Hazard Areas
- CCHR Historic Site
- NRHP Historic Site
- INV Historic Site

Printed on: January 28, 2014



Information shown on this map was collected from several sources. Clark County accepts no responsibility for any inaccuracies that may be present.



CLARK COUNTY, WASHINGTON

Department of Assessment and GIS

1:9,600

0 400 800 1,200 Feet

Adjacent Development

Account No: 171727000, 172341000, 171704000, 172555000

Owner: GREEN MOUNTAIN LAND LLC

Address: 5300 MEADOWS STE 400

C/S/Z: LAKE OSWEGO, OR 97035

Proposed Development Area

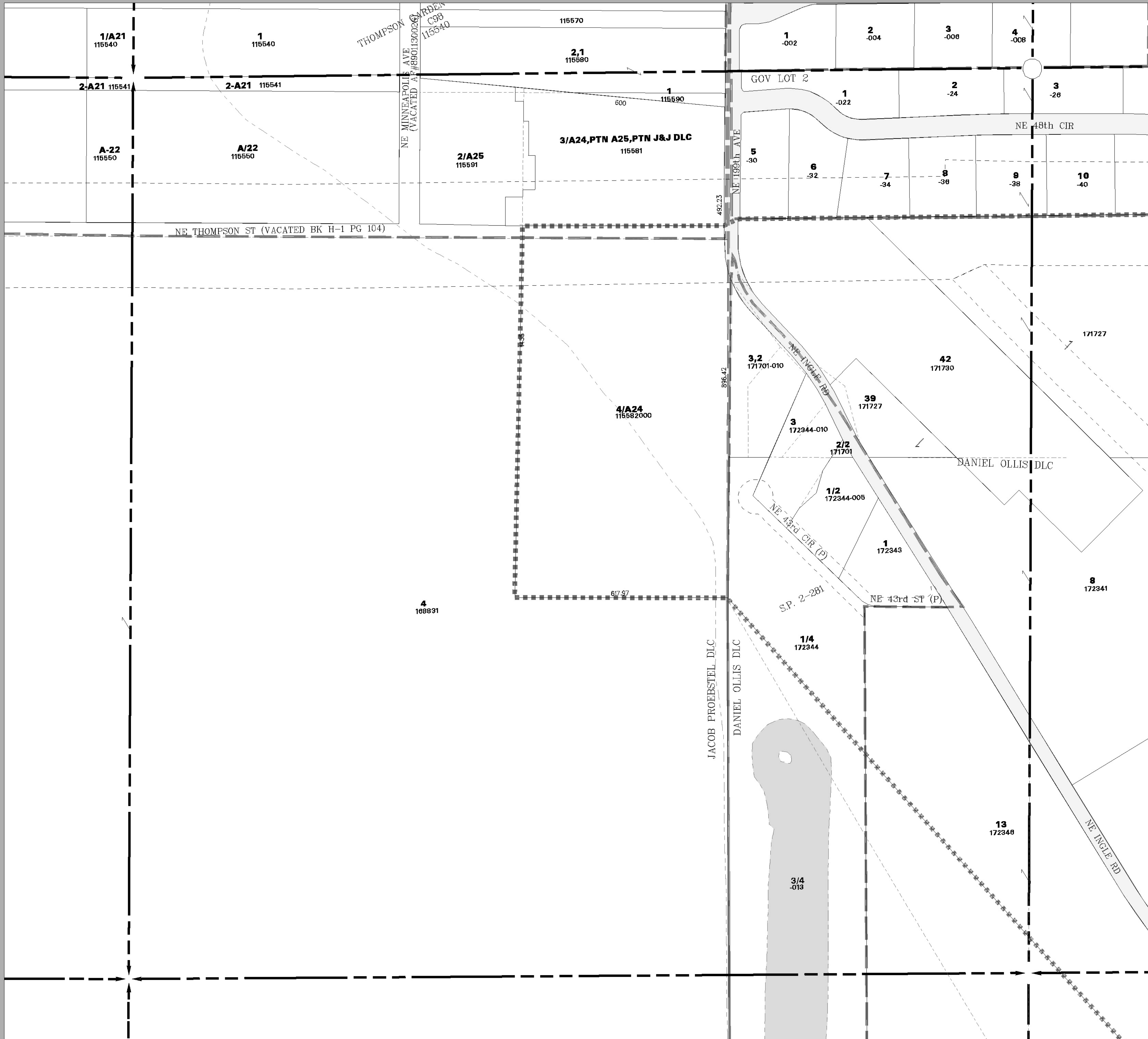
Public Road

Transportation or Major Utility Easement

Printed on: January 28, 2014

23118	23117	23116
23119	23120	23121
23130	23129	23128

Information shown on this map was collected from several sources. Clark County accepts no responsibility for any inaccuracies that may be present.



Clark County Washington

SW Qtr of Section 17 T2N R3E WM

Explanation

- Streams
- Subdiv Lines
- Tax Code
- Easements
- Donation Land Claim
- Railroad
- Utility Line
- Pipelines
- Control Lines
- History Lines
- City Boundaries
- Road Right of Way Actual Road May Not Exist
- Water

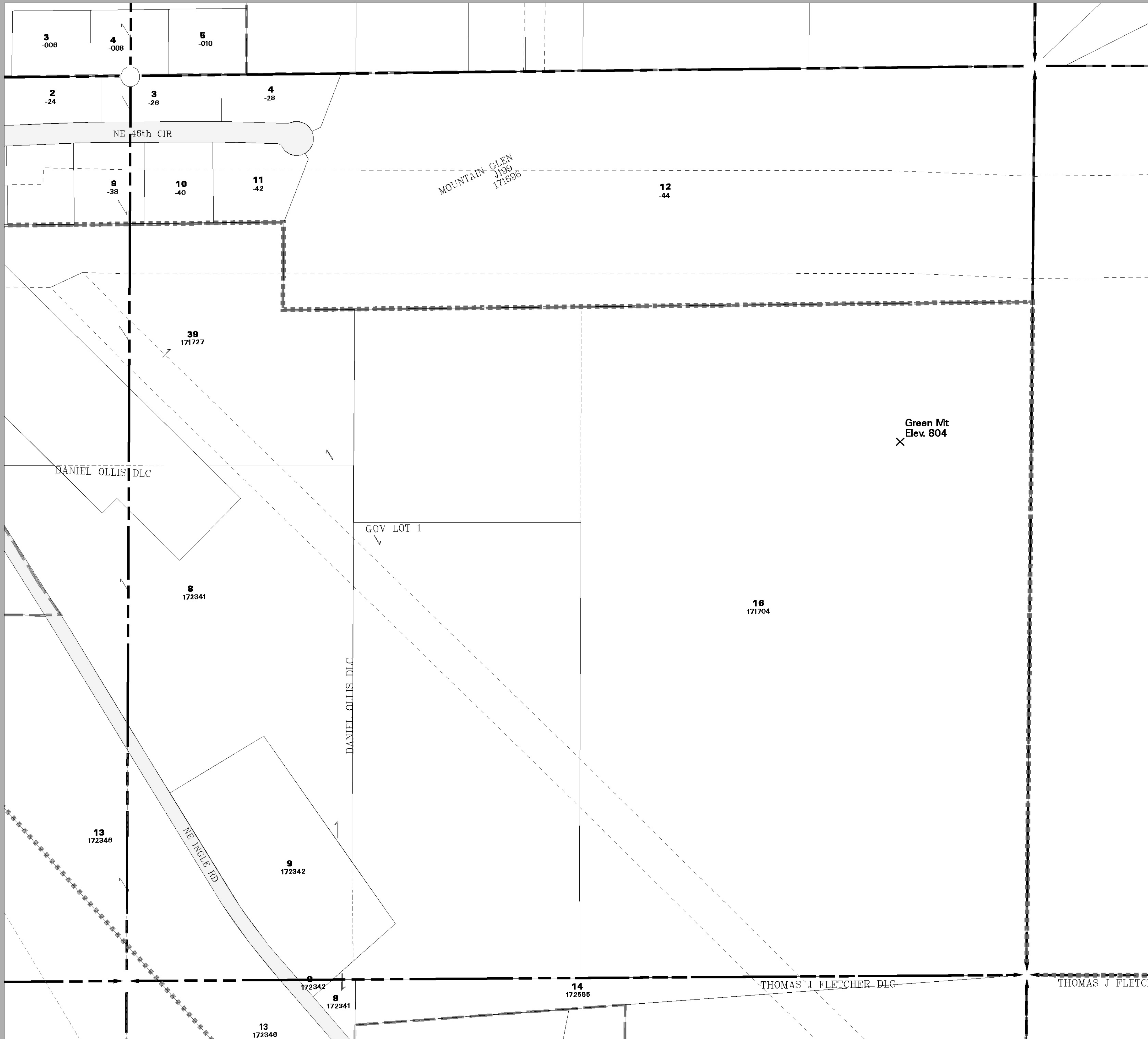
Scale 1:3600

0 100 200 300 400 500 600 Feet

CLARK COUNTY, WASHINGTON

Geographic Information System

January 13, 2014

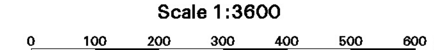


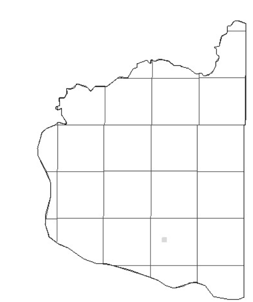
Clark County Washington

SE Qtr of Section 17 T2N R3E WM

Explanation

- Streams
- Subdiv Lines
- Tax Code
- Easements
- Donation Land Claim
- Railroad
- Utility Line
- Pipelines
- Control Lines
- History Lines
- City Boundaries
- Road Right of Way
  Actual Road May Not Exist
- Water



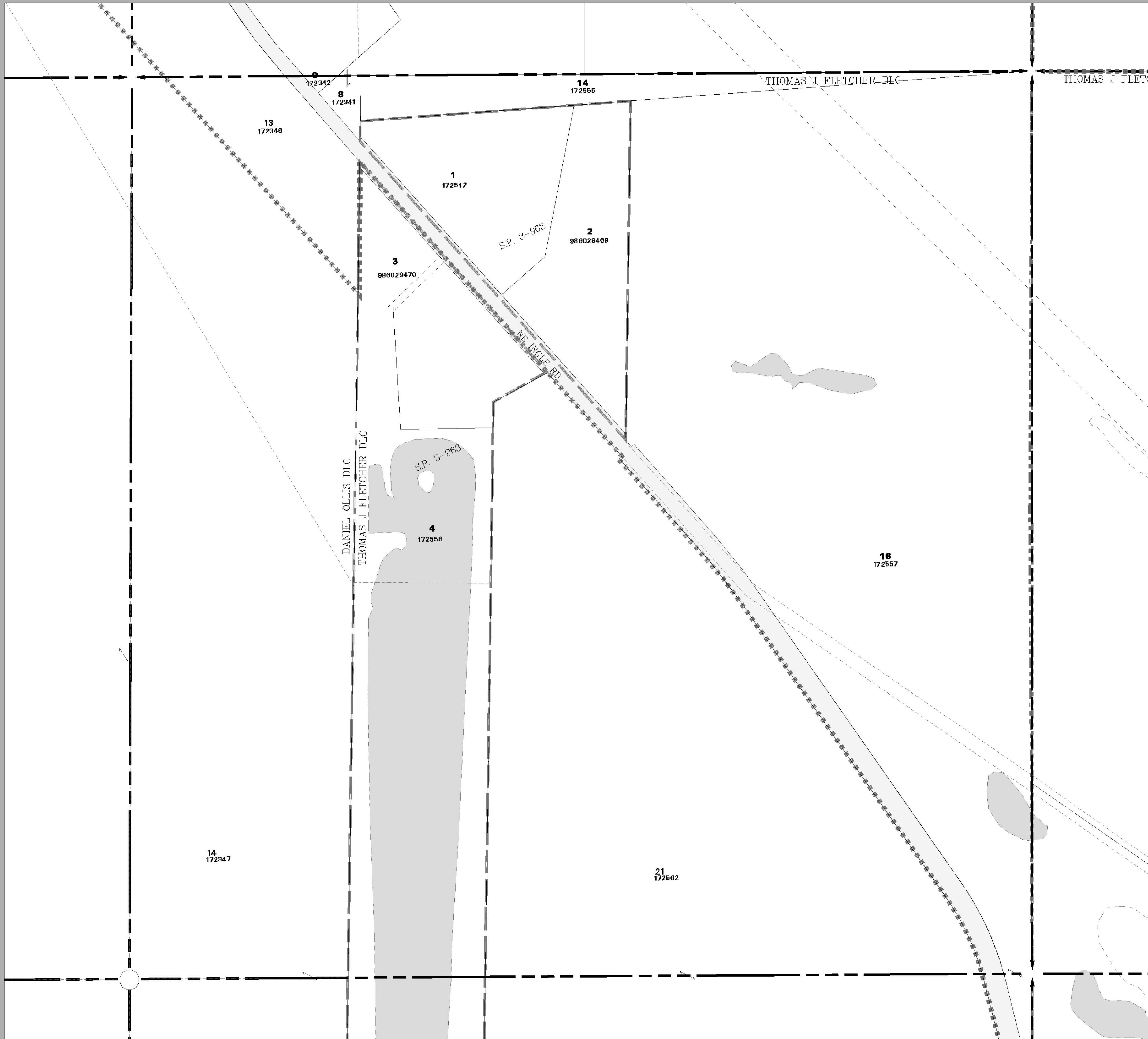


January 13, 2014

CAUTION: This map is based upon information furnished by local surveyors and information available from public records. This information has not been checked by Clark County for accuracy. Clark County expressly disclaims any liability for any inaccuracies which may be present in this map. Users of this map should themselves check any details for accuracy before relying thereon.

Clark County Washington

NE Qtr of Section 20 T2N R3E WM



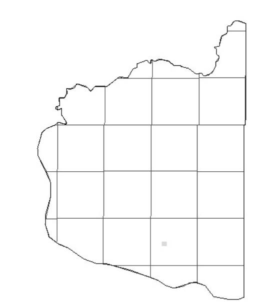
Explanation

- Streams
- Subdiv Lines
- Tax Code
- Easements
- Donation Land Claim
- Railroad
- Utility Line
- Pipelines
- Control Lines
- History Lines
- City Boundaries
- Road Right of Way
  Actual Road May Not Exist
- Water

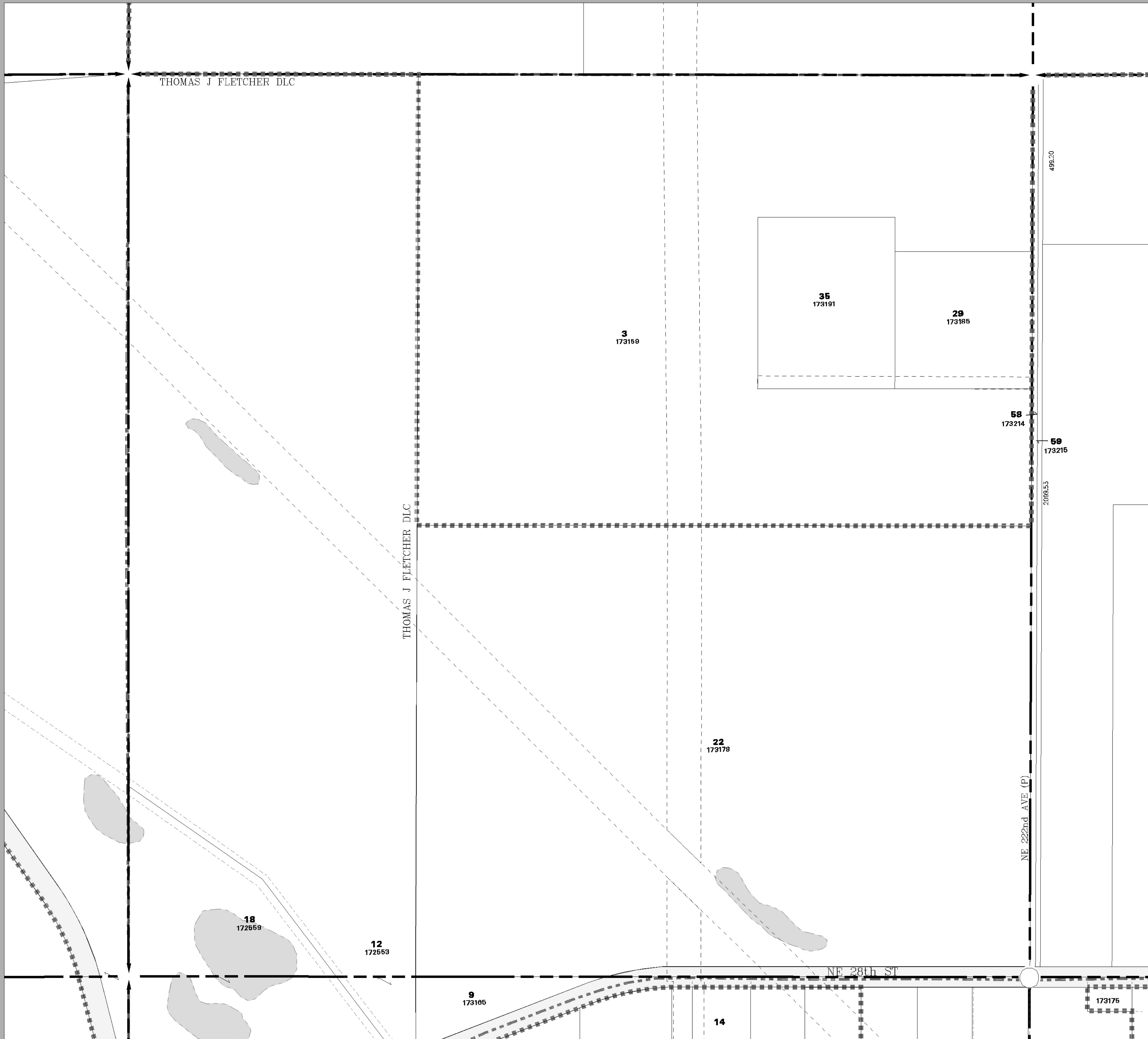
Scale 1:3600

0 100 200 300 400 500 600 Feet

Geographic Information System



January 13, 2014



Clark County Washington

NW Qtr of Section 21 T2N R3E WM

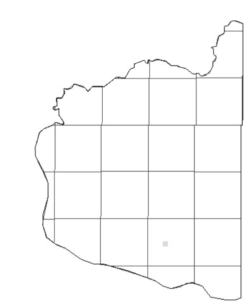
Explanation

- Streams
- Subdiv Lines
- Tax Code
- Easements
- Donation Land Claim
- Railroad
- Utility Line
- Pipelines
- Control Lines
- History Lines
- City Boundaries
- Road Right of Way
  Actual Road May Not Exist
- Water

Scale 1:3600

0 100 200 300 400 500 600 Feet

Clark County, Washington
Geographic Information System

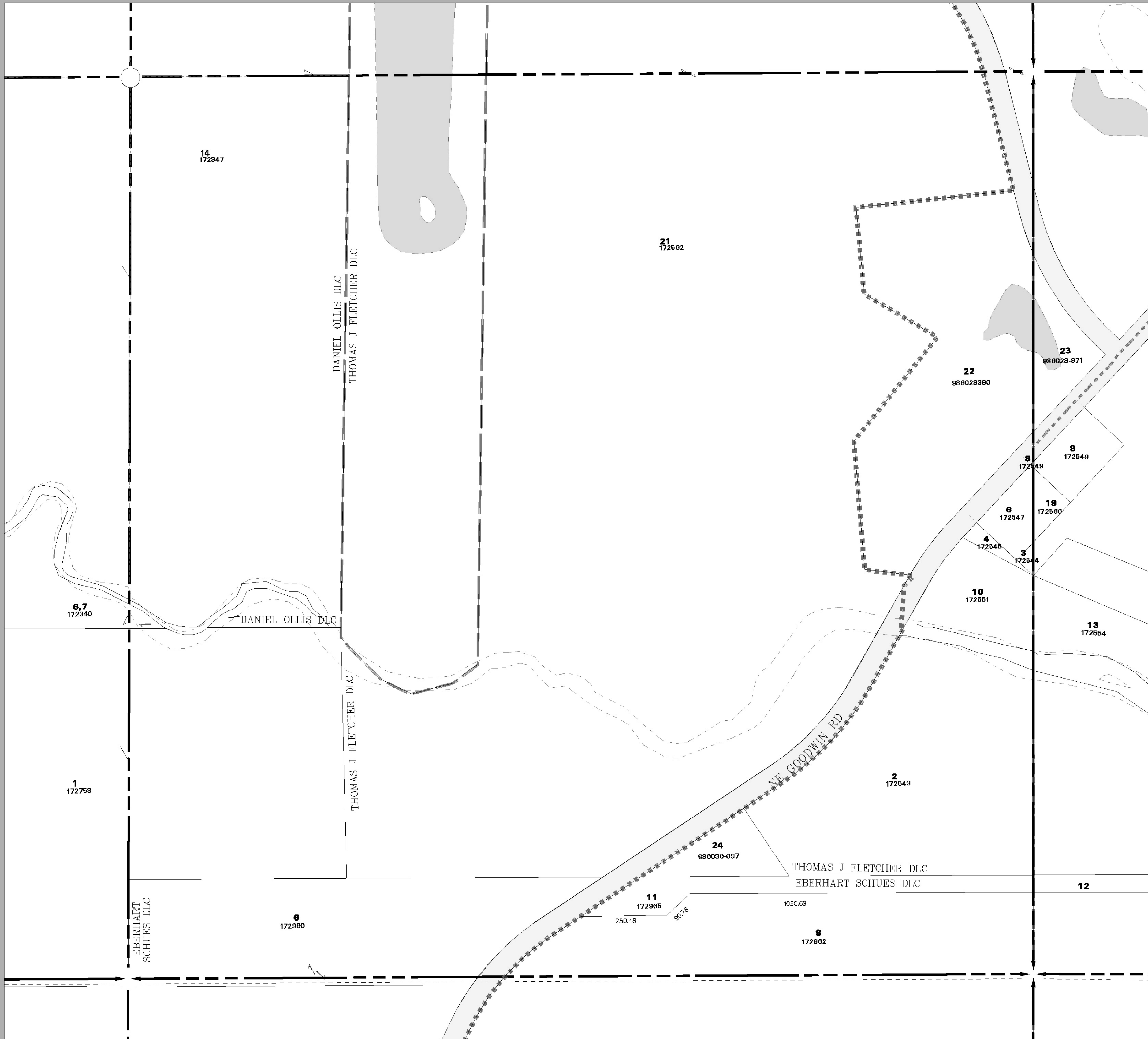


January 13, 2014

CAUTION: This map is based upon information furnished by local surveyors and information available from public records. This information has not been checked by Clark County for accuracy. Clark County expressly disclaims any liability for any inaccuracies which may be present in this map. Users of this map should themselves check any details for accuracy before relying thereon.

Clark County Washington

SE Qtr of Section 20 T2N R3E WM

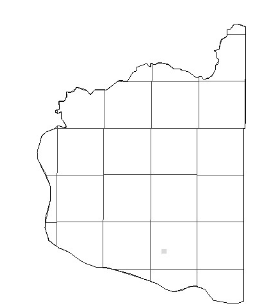


Explanation

- Streams
- Subdiv Lines
- Tax Code
- Easements
- Donation Land Claim
- Railroad
- Utility Line
- Pipelines
- Control Lines
- History Lines
- City Boundaries
- Road Right of Way
  Actual Road May Not Exist
- Water

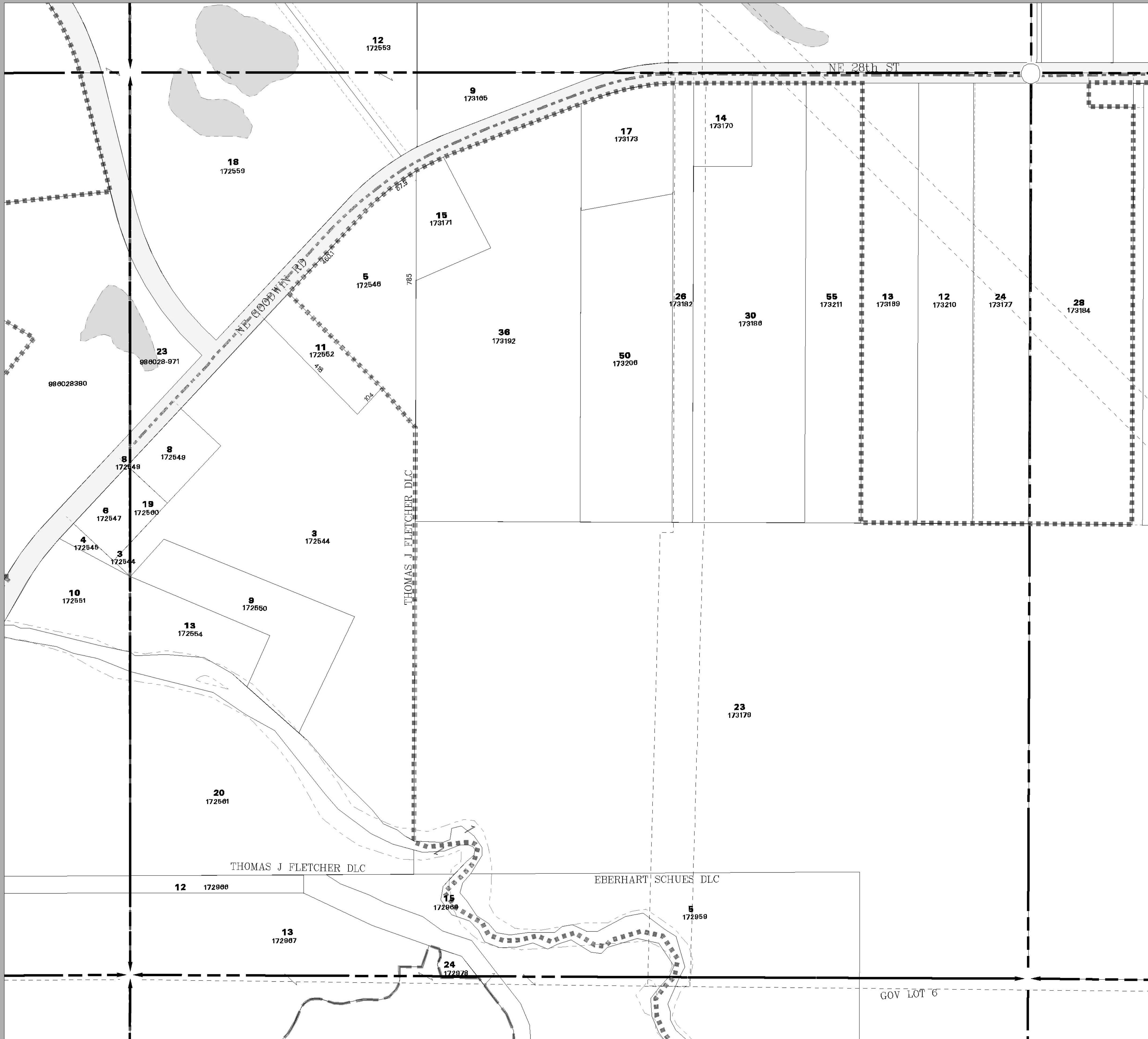
Scale 1:3600

0 100 200 300 400 500 600 Feet



January 13, 2014

CAUTION: This map is based upon information furnished by local surveyors and information available from public records. This information has not been checked by Clark County for accuracy. Clark County expressly disclaims any liability for any inaccuracies which may be present in this map. Users of this map should themselves check any details for accuracy before relying thereon.



Clark County Washington

SW Qtr of Section 21 T2N R3E WM

Explanation

Streams
Subdiv Lines
Tax Code
Easements
Donation Land Claim
Railroad
Utility Line
Pipelines
Control Lines
History Lines
City Boundaries

Road Right of Way
Actual Road May Not Exist
Water

Scale 1:3600

0 100 200 300 400 500 600 Feet

Clark County, Washington
Geographic Information System

January 13, 2014

CAUTION: This map is based upon information furnished by local surveyors and information available from public records. This information has not been checked by Clark County for accuracy. Clark County expressly disclaims any liability for any inaccuracies which may be present in this map. Users of this map should themselves check any details for accuracy before relying thereon.

EXHIBIT 5

CITY OF CAMAS

PRELIMINARY PROJECT NARRATIVE FOR

GREEN MOUNTAIN MIXED USE PRD

Applicant:
Green Mountain Land, LLC
17933 NW Evergreen Parkway, Suite 300
Beaverton, OR 97006

CONTENTS

TABLES

The following table lists the project team and contact information. Inquiries should be directed to Randy Printz as the primary point of contact.

Table 1: Project Team and Contact Information

Owner: **Green Mountain Land, LLC**	**Green Mountain Land, LLC** John Schmidt, owner representative 17933 NW Evergreen Parkway, Suite 300 Lake Oswego OR. 97006 503-597-7100 john.schmidt@metlandgroup.com
Legal Representation & Permitting Coordinator:	**Randy Printz** Landerholm Law Firm P.O. Box 1086 Vancouver, WA 98660 (360) 696-3312 Randy.printz@landerholm.com
Civil Engineer and Surveying:	**Kurt Stonex, P.E., PLS** Olson Engineering 1111 Broadway Vancouver, WA 98660 (360) 695-1385 kurt@olsonengr.com
Project Designer and Landscape Architect:	**Bill Horning, RLA** Western Planning PO Box 2392 Lake Oswego, OR. 97035 (503) 294-0222 bill@westernplanning.com
Traffic Engineer:	**Chris Brehmer, P.E.** 610 SW Alder Street, Suite 700 Portland OR, 97205 (503) 228-5230 CBREHMER@kittelson.com

Introduction & Summary

This narrative is provided in support of Green Mountain Land, LLC's application to develop a portion of the Green Mountain area located in the City of Camas. The 283 acre multi phased mixed use master plan is designed with an array of compatible residential and commercial uses. There are also opportunities to locate public facilities such as police, fire or library. The Green Mountain neighborhood will contain a variety of residential forms, lot sizes and densities that will include both single-family and multi-family components. There are also opportunities for stand-alone and mixed use commercial uses.

The residential and commercial portions of the project have been thoughtfully designed to take advantage of and protect the critical areas on the property. Many of the areas proposed for development are functionally integrated with or oriented around the site's natural areas, proposed parks and trails. The Urban Village component of the project will have a dense and vibrant mix of commercial and multi-family uses that are located along a portion of the central park and other natural open space areas.

The Applicant and the City entered into a Development Agreement in 2014 (2014 DA) that addresses various aspects of the property's development. The Agreement contains a conceptual master plan and provisions relating to transportation, tree preservation, parks and open space, streetscapes and planning standards for specific areas of the project. This PRD application is required to be, and is, consistent with the provisions of the Development Agreement.

With this application, the Applicant is seeking preliminary plat approval for phase 1 and PRD approval for the entire project. The Applicant will submit for Final Plat, Site Plan and Design Review approvals as applicable prior to building permit issuance for each phase of the project. The PRD and preliminary plat approval reviews are subject to SEPA and a full SEPA checklist accompanies this application.

Project Location

The project site is comprised of nine legal lots further described as parcels: 172555-000, 172557-000, 172553-000, 172559-000, 173178-000, 172341-000, 171727-000, 171704-000, and 173165-000. The property is owned by Green Mountain land, LLC and totals 283 acres.

The property is located approximately five miles northwest of downtown Camas and is accessed on the southwest by Ingle Road and on the south by Goodwin Road. NE 48th Circle lies to the north and NE 222nd Avenue is to the east. The property contains varied topography, including slopes and level areas, upper and lower story vegetation, man-made ponds and Green Mountain Golf Course which is located on a large portion of the southerly half of the property.

Aside from the golf course, the non-golf course portion of the site is mostly vacant. Much of the non-golf course portion of the property has trees and understory vegetation. BPA power lines exist on the north and beyond, as well as traversing a portion of the site. Adjacent properties surrounding the site are primarily vacant (to the east south and west, although three single family residences exist along Ingle Road); however, the Mountain Glen cluster subdivision lies to the north of the northerly BPA power lines.

Property Background

This site has a rich history with the City of Camas. In 2007, the City sought to update its Comprehensive Plan and add additional land to its Urban Growth Area (UGA) north of Lacamas Lake (NUGA). As part of that process, full capital facilities plans (CFP's) were required by the Growth Management Act (GMA) to be an integral part of any adopted Comprehensive Plan, including amendment of UGA's. In this case, the City and various stakeholders spent considerable time (years) and effort creating CFP's for sewer, water, transportation and other capital facilities for the NUGA, with analysis performed by WRG and Gray & Osborne (sewer and water) and Kittleson and Associates and DKS Associates (for transportation). The original Green Mountain owners were actively involved in assisting the City in these endeavors.

In addition to the CFP's, the City also analyzed what land uses and development intensities would be appropriate for various areas of the NUGA. This resulted in the City adopting Comprehensive Plan and Zoning designations for the entire NUGA, including Green Mountain. The Comprehensive Plan designations were recommended by the Planning Commission and adopted by the City Council in recognition of the CFP's, topography, proximity to streets and intersections and many other considerations, including the ability to provide urban services to the various areas within the NUGA.

At the December 3, 2007 City Council hearing, the City approved amendments to the City of Camas' Comprehensive Plan and Zoning Map, including the Comprehensive Plan designations of all lands within the expanded NUGA. Subsequently, Ordinances: 2501 (adopting revisions to the Comprehensive Land Use Map of the City of Camas and to the Zoning Map of the City of Camas); 2502 (adopting a Revised Comprehensive Plan in accordance with the goals and requirements of Chapter RCW 36.70A); and 2503 (adopting a revised Zoning Map in accordance with the goals and requirements of RCW Chapter 36.70A), were adopted by the City Council on December 17, 2007.

In early 2008, the City and various NUGA property owners embarked on a process to annex the NUGA. This process included pre-annexation agreements between the property owners and the City. This process culminated in the annexation of the Green Mountain property and other property north of Lacamas Lake under Ordinance No. 2512, dated April 21st, 2008. Subsequently, for Green Mountain, its Pre-Annexation Agreement with the City was replaced in its entirety with a new Development Agreement dated December 21st, 2009 (2009 DA). The primary purposes for the new DA was to assure that adequate capital facilities had been planned for the area (these 2009 DA provisions were satisfied through the City's subsequent adoption of new CFPs for transportation, sewer and water for the NUGA); and to provide a conceptual framework for the future development of the Green Mountain property. The 2009 DA has now expired.

In 2012, Green Mountain Land, LLC, acquired the property and has since been active in moving forward with in-depth engineering and critical area analysis. That technical information was used in creating the conceptual master plan that is part of the 2014 DA. Now, with even further refinement of the technical information related to the property, the Applicant is proposing a project that not only fits within the conceptual framework identified in the 2014 DA and underlying zoning, but with much greater detail and thought for design.

City of Camas Staff and the Applicant's team of representatives met on February 25, 2014 to discuss the project at a pre application conference. Key points of that discussion are discussed below:

1) City staff requested the Applicant determine the number of dwelling units. The maximum number of dwelling units has been established through the 2014 DA, including the location, type and density of those residences as addressed in this narrative.

2) The Applicant is seeking subdivision approval for phase 1. A preliminary plat with sufficient details is part of this application and complies with all of the City's preliminary plat requirements.

3) The Applicant has completed an extensive survey and data collection on the environmental conditions of the site. With this submittal, an archaeological survey, a critical areas report, a geotech investigation, and a tree survey have been prepared to address CMC title 16.

4) A traffic study has been submitted that has been prepared in accordance with the City's adopted Traffic impact Study Guidelines. The study addresses the project's full build out impacts to all affected the intersections over the life of the mixed use PRD and provides mitigation measures to assure that adequate levels of service are maintained.

5) A large community park and open space area has been centrally located such that it can be easily accessed from all corners of the project through the project's trail network, including much of the project's more dense residential areas. This area will serve as a central community gathering place and frame the expansive natural feel of the project as you continue past the site's main entrance.

Existing Conditions and Structures

The 283 acre Green Mountain site encompasses a broad range of natural site features and resources and includes the Green Mountain golf course and a BPA and natural gas transmission line. The 18 hole golf course is located in the lower and southern half of the site. This southern section also includes the southern half of the BPA easement, a gas transmission line, multiple wetlands, man-made ponds and ditches, a local tributary creek with adjoining oak grove and some natural wooded areas. The northern half of the property is wooded except for the BPA easement and contains multiple terraces, and moderate to severe slopes. There are a few isolated small wetlands and several rock outcroppings. The northeast corner of the site contains the top of Green Mountain and portions of its west and southern slopes.

The site is bordered on the west by NE Ingle Road and on the south by NE Goodwin Road. The northern site boundary abuts an east west BPA transmission line and the Mountain Glenn rural cluster subdivision. The east site boundary abuts county owned land outside of the UGA and one parcel of privately held land; however the southern one third of the eastern boundary is inside the UGA and the Camas city limits and is zoned R6. Mid-point on the eastern boundary is large lot rural zoning outside the UGA.

The north portion of the Green Mountain site is currently zoned R-10; the central portion is zoned MF10; and the southeastern area includes approximately 15 acres of Community Commercial zoning at the intersection of Ingle Road and Goodwin Road. The remaining portion of this southeastern area is zoned R-6. The site's zoning permits up to 1840 units, without the use of any density bonus allowed by the City's development standards.

Project Description

In furtherance of the provisions of the City's PRD code, the Applicant has designed a community with blended densities and a variety of residential products. A great deal of thought has gone into the master plan's various densities, uses, locations and orientations, in order to maximize the project's harmony with its wealth of natural features and to create an integrated community that provides a broad range of housing opportunities that can be accessed by a broad range of citizens. The development will ultimately include the construction of up to 1,300 single and multi-family homes, common open spaces, parks, trails, landscaping, 8.8 acres of commercial/retail/office buildings, associated parking lots, access roads, stormwater treatment and detention facilities, utilities and other related infrastructural improvements.

To best accomplish this, the master plan has been designed with planning pods. Each planning pod will identify a certain number of lots, density range, lot size and type of residential unit. The master plan proposes eight planning pods of development. Each pod will be developed in phases. The sequence and timing of these phases will be determined by market conditions and other factors. It is expected that the first phase will break ground in the Summer of 2015 and full master plan build-out is anticipated by 2029.

The most intense use of the site will occur in the mixed-use Urban Village located on the southern portion of the site; with the density of development generally decreasing as development moves east and north. This will serve to frame and preserve the central natural feature of the site – Green Mountain and its steeper slopes by reducing the intensity of development on the steeper areas of the site and locating more intense development on the flatter previously developed portions of the site. For additional details on the number of homes, density and lot sizes please refer to the zoning section within this narrative.

CMC Title 16: SEPA

The State Environmental Policy Act (SEPA) requires the lead agency (in this case the City of Camas), to evaluate the probable significant adverse environmental impacts of a proposed action (in this case granting PRD and Preliminary Plat approval); and to make a Threshold Determination regarding whether additional analysis or information is necessary; or whether specific measures should be imposed to mitigate the project's adverse environmental impacts to moderate levels or below.

SEPA also requires project Applicants to submit a SEPA Checklist describing the project and its potential impact on both the natural and built environment. The Applicant has completed an extensive survey and data collection on the environmental conditions for Phase 1of the master plan and less extensive data collection for the PRD as a whole. With this submittal, an archaeological survey, a critical areas report, a buffer modification plan, a geotechnical investigation and a tree survey/preservation plan have been prepared for the Phase I subdivision.

The SEPA checklist attendant to the Development Agreement entered into between the City and Green Mountain Land LLC in December of 2014, as well as the SEPA checklist accompanying this PRD application, address many environmental considerations for the PRD as a whole. These include, but are not limited to, transportation analysis for the full build out of the PRD, potential offsite storm water impacts to the hydrology, plant communities and wildlife habitat of areas adjacent to the site. In addition, reports on the transportation and archeological impacts for the entire PRD are included in this application. A full tree survey of the entire property has also been completed. Probable significant adverse environmental impacts not analyzed in conjunction with the Development Agreement or as part of Phase I, shall be analyzed in conjunction with each phase of future development.

CMC TITLE 18: Zoning

ZONING MAPS AND DISTRICTS – CMC 18.05

The 283 acre site is currently zoned for a mix of residential uses (R-10, MF-10 and R-6) and community commercial (CC) uses. Table 2 illustrates the existing zoning and the acreage of the property below.

Table 2 - Site Area Breakdown with Existing Zoning

R10 zone	120.2 acres
R6 zone	54.3 acres
MF zone	93.3 acres
CC zone	15.4 acres
Total Site Area:	**283.2**

One of the foundational elements of the master plan for Green Mountain is an Urban Village. The Urban Village is located at the bottom of the hill along Goodwin and Ingle Road in the area of the property with the most intense historic development. The goal of the Urban Village is to create an environment that is pedestrian friendly, accessible to future mass transit, provides a mix of uses that are compatible, easily accessible and functionally integrated in a manner that creates a vibrant place to live work, shop or play.

One of the purposes of the city's PRD code is to allow the blending of zoning designations in conjunction with the integration of open space; this project achieves that through its blending of densities, housing types, open spaces and commercial uses.

If the property were to be developed without utilizing the City's PRD ordinance, the commercial uses would be functionally separated from the remainder of the project. The commercial area would also likely develop as a standard "blank wall" commercial center that is auto oriented with large amounts of surface parking. By functionally integrating the commercial and residential uses, in the PRD, substantial opportunities are presented to create specialty retail and other commercial space that may have residential uses on the second floor. It would also allow some of the commercial uses to be located in the interior of the Urban Village to further enhance the pedestrian opportunities to access goods and services. Opportunities are also created to architecturally blend the commercial uses with the residential uses.

DENSITY AND DIMENSIONS – CMC 18.09

The master plan concept is implemented through the use of development pods with designated residential and commercial densities which are fully described below. Due to the unique nature of this master plan, the Applicant has created some custom design standards in addition to those otherwise provided for in the PRD ordinance. These were approved as part of the Development Agreement.

Master Plan Concept

The Green Mountain master plan concept focuses on utilizing the existing site conditions, resources and features to guide the simultaneous development of the open space plan and the distribution of the residential density. The master plan protects important site resources and features by locating the proposed 1300 dwelling units on the most developable 166 acres of the 267 acres of residential zoning. The master plan concept is implemented through the use of development pods with designated residential densities. The pod boundaries will be refined as each pod moves from concept into development and as more exact resource information is available. The pods and pod access have been designed to minimize impacts to steep slopes and existing site resource areas. The Green Mountain open space master plan integrates the pods and provides for community recreation and connectivity.

The Green Mountain open space master plan protects approximately thirty percent of this site. The open space system is integral to the Green Mountain community as a whole and is used to help define and enhance the center of the community. The Green Mountain open space components include the protection of the top of Green Mountain, a community wide trail system and a large central park connecting and interfacing with the mixed use Urban Village, located at the southern tip of the site. Central park includes a neighborhood park and wetland preservation area with surrounding trails.

The master plan provides for a wide array of residential housing. A key design objective was to locate the lowest density pods on sloping portions of the property. The north section of the site contains multiple terraces, steep to moderate slopes, some rock outcroppings and is predominately wooded in character. This area comprises about 40% of the total site area and the master plan designates only about 22% of the PRD density to this section of the property.

The south section of the land is defined by an intervening wooded steep slope visible from many areas of the lower section. The southern section of the site has large relatively flat areas and has 147 acres of residential zoning and 15 acres of commercial CC zoning. This 147 acres will provide for variety of housing types from multi family uses at the Urban Village to larger single family lots. These neighborhoods surrounding the Urban Village and central park will contain approximately 54% of the site density and the Urban Village will provide for the remaining 24%.

The Urban Village component of the master plan provides a community commercial and higher density residential mixed use village center for the Green Mountain community. The Urban village is approximately 33 acres in size and contains about 12.5 acres of multi-family zoned property and 15.2 acres of community commercial zoned property. The balance of this area is in open space and a circulator street. The village center area is intended to provide an opportunity for development of mixed use buildings including residential over retail or office, as well as, free standing commercial or public facility buildings. The village center will also integrate some free standing residential with replacement commercial acreage coming from mixed use or residential areas within the Urban Village.

Pod Descriptions

The master plan provides pods for the development of up to seven different residential densities. Five of the residential pods provide for a variety of single family detached lot sizes. One pod has an attached and detached housing unit option and one pod is located entirely within the Urban Village and designed for high density multiple family units. An eighth planning unit is the community commercial site at the core of the Urban Village.

A Pods – All three A pods are located in the Urban Village. All three pods are on the south end of the central park circulator street and are across from the park. Two of the pods also back up to the oak lined creek and trail extending into the neighborhoods to the east. These pods may develop as standalone multi-family sites or may combine with each other or the H pod (CC zone) to create the integrated Urban Village.

B Pods – The master plan contains five B pods. B pods are intended to provide for attached townhomes or small detached lots. B1 is the largest B pod at approximately 7.6 acres. B1 is located west of central park and abuts the Urban Village located to the south. The other four B pods total 7.9 acres with the largest being 3.2 acres and these four pods are essentially surrounded by open space.

C Pods – The master plan contains two C pods. These are alley accessed and front accessed small lots in the 4,000 sf range. Both of these pods are in the phase one plat. C1 has been combined with D1 to create the neighborhood north of the Entry Boulevard and west of central park. C2 is a predominately alley accessed neighborhood on the south side of the entry boulevard and west of the park and abuts the B1 pod to the south.

D Pods – There are six D pods totaling approximately 41.5 acres. All of the sites are in the lower southern portion of the property. This density range provides for approximately 5,000 sf lots. Most of these pods are over 5 acres. D1, D2 and D3 are in the phase one plat. D4-D6 are east of the BPA easement in neighborhoods where they could be combined with abutting E pods.

E Pods – There are four E pods. One on the north section, one in the central section and two in the south section. These pods are designed for lots in the 6,000 sf range but could vary between 5,000-9,000 sf. These pods average around 6.4 acres each and may be combined with adjoining D or F pods to create integrated multi lot size neighborhoods.

F Pods – There are four F pods and they are all in the north section. F1 has three sub areas (terraces) and is west of the BPA easement; the remaining pods are contiguous, total approximately 18.5 acres, are east of the BPA easement and are on relatively flat ground at the west base of Green Mountain. These pods are designed for lots in the 7,500 sf range and could vary from 6,000-11,000 sf.

G Pod – There is one G pod and it is located on the southwest lower flank of Green Mountain. Due to the steeper topography in this area these lots are planned to be in the 15,000 to 40,000 sf range.

H Pod – This is the Community Commercial zoned area in the mixed use Urban Village portion of the PRD. This area is 15.4 acres, but contains wetlands which reduce the overall developable area to approximately 8.8 acres. A minimum of 8.8 acres in the Urban Village will be developed with commercial uses. The proposed Urban Village standards will allow this area to develop with a dense and vibrant mix of mutually supporting residential and commercial uses.

Table 3 - Density and Dimensions PRD Pods A-G

	A POD	B POD	C POD
DENSITY	MF-24	MF-18	MF-10
Max. du/gac	24	18	10

Min. du/gac	6	6	6
STANDARD LOTS			
Min. lot SF	*1,000[a]*	*1,000[a]*	3,000 *[a]*
Min. lot width	20	20	30
Min. lot depth	*50*	*50*	70
Max.Floor Area per du	No Max	No Max	No Max
SETBACKS			
Min.front/at garage	*None*	*6/3@OS*/18	*10*/18
Min. side	3 [1]	3 [1]	3 [1]
Min. side Flanking Street	*None [d]*	*10*	*10*
Min. rear *(garage @alley)*	*None [d]*	10 *[b][c]*	10*[b][c]*
LOT COVERAGE, Max.	*None [c]*	*None*	55%
BUILDING HEIGHT, Max.	*60*	45 [2]	35 [2]

a. Single Family Detached homes to be permitted. For SFD in A POD apply B Pod setbacks.
b. 10 feet for front access garage.
c. Minimum rear yard for alley accessed garage is either 3' or 18'.
d. Franchise utilities to be located in front or side yard easements abutting right of way.
1. The non-attached side of a dwelling unit shall be three feet, otherwise a zero-lot line is assumed.
2. Maximum building height: three stories and a basement but not to exceed maximum building height.

Density Transfer Lots	D POD	E POD	F POD	G POD
DENSITY	R-5	R-6	R-7.5	R-20
Max. du/gac	8.7	7.2	5.8	2.1
DENSITY TRANSFER LOTS				
Min. lot size (sq ft)	3,500 *[a]*	4,200	5250	14,000
Max, lot size (sq ft)	*7,000*	*9,000*	*14,999*	*60,000*
Min. lot width	40	50	60	90
Min. lot depth	80	80	80	100
LOT COVERAGE,	45%	40%	40%	30%

Max.				
BUILDING HEIGHT, MAX. (ft)	35	35	35	35
SETBACKS based on lot size	Up to 4,999 sq. ft.	5,000 to 7,499 sq. ft.	7,500 to 14,999 sq. ft.	15,000 to *60,000* sq. ft.
Min.front/at garage	*10/18*	*15/18*	20	30
Min. side and corner lot rear yard (ft)	*4*	5	5	15
Min. side yard flanking a street	*10*	*15*	*15*	30
Min. rear *(garage @alley)*	*15[b][c]*	*20[b][c]*	*20[b][c]*	30
Min. lot frontage on a cul-de-sac or curve (ft)	25	30	30	40

a. Single Family detached homes to be permitted.
b. 10 feet for front access garage.
c. Minimum rear yard for alley accessed garage is either 3' or 18'.
NOTE: POD lot sizes are not subject to lot size averaging.

Table 4 - Urban Village Area
Mixed Use, Community Commercial, A and B PODS

Urban Village Area	Minimum of 8.8 acres with ground floor Employment/Commercial Use (as provided for in 18.07.030 Table 1). Allow horizontal and vertical Mixed Use PODs H, A1, A2, A3, B5 and 100 Units at the Village Center

The retail/commercial component of this site is envisioned to operate utilizing normal commercial hours of operations such as 9am – 9pm. Table 5 illustrates the existing zoning and the acreage of the property below.

Table 5 - Site Area Breakdown with Existing Zoning	
R10 zone	**120.2 acres**
R6 zone	**54.3 acres**
MF zone	**93.3 acres**
CC zone	**15.4 acres**
Total Site Area:	**283.2**

Applicable Development Standards/Review Criteria

PLANNED RESIDENTIAL DEVELOPMENT (PRD) – CMC 18.23

The purposes of the PRD review is to ensure that the design of the site improvements and overall proposal are consistent with applicable standards, minimize adverse impacts on surrounding land uses, allow for and encourage flexibility in the design and foster innovation in design and construction while furthering the goals of the City's Comprehensive Plan. The code allows for modifications to certain regulations when it can be demonstrated that such modification would preserve certain features such as open space.

CMC 18.23.030 provides the scope of development circumstances under which a PRD may be accomplished:

A. A PRD may be allowed in all R, CC and MF zoning districts.

B. The minimum land area necessary to apply for a PRD shall be ten acres of contiguous land.

C. All land in which a PRD is to be developed shall be held and maintained in a single ownership, including but not limited to an individual, partnership, corporation, or homeowner's association. Evidence of such ownership shall be provided to the planning commission and city council before PRD approval.

D. Permissible uses within a PRD include any use listed as a permitted use or conditional use in the applicable zone, as per CMC Section 18.07.040 Table X, when approved as part of a master plan. Notwithstanding an approved master plan, incidental accessory buildings, incidental accessory structures, and home occupations may be authorized on a case by case basis.

E. A minimum of fifty percent to a maximum of seventy percent of the overall permitted density of the PRD must be single-family homes.

F. The multi-family component (two or more attached dwelling units) of a PRD shall ideally be developed toward the interior of the tract, rather than the periphery, to ensure compatibility with existing single-family residences that border the surrounding properties. Deviation from this requirement shall be requested during the preliminary master plan review, and specifically approved by the planning commission and city council.

G. Density standards and bonuses for a PRD shall be in accordance with CMC Sections 18.23.040 and 18.23.050

H. An equivalent amount of up to twenty percent of the developable area shall be set aside and developed as recreational open space in a PRD, and shall include the following:

1. Passive or active recreation concentrated in large usable areas;

2. Provide trails and open space for connection and extension with the city's open space and trail plan, if feasible; and

3. Be held under one ownership, and maintained by the ownership; or be held in common ownership by means of homeowners' association, and maintained by the homeowners' association. The open space and recreation areas shall be dedicated for public use and be maintained by the ownership or homeowners' association.

The property proposed for development under the City's PRD provisions is zoned Community Commercial, Multi Family and Single Family Residential. The property is approximately 283 acres; and thus, exceeds the 10 acre minimum requirement. The property is held in sole ownership by Green Mountain Land LLC. The Applicants are only proposing uses in the PRD that are allowed in the underlying zones of the property.

Over 50% of the residential uses in the proposed PRD are single family homes. The attached multi-family units are contained primarily in the A and B pods. The A pods are all within the Urban Village and are centrally located between the primary commercial area of the site, the BPA easement, wetlands and Goodwin road. The B pods are small and scattered throughout the site, and only one abuts any existing single family residential homes (one existing single family home along Ingle Road).

Density standards under CMC18.23.040 are based on the gross area of the property being considered for the PRD. Open space, greenways, sensitive areas, parks, and recreation areas set aside within the tracts are required to be, and have been used, in the computation of the gross development area for the proposed PRD.

The maximum number of dwelling units for the proposed PRD is calculated in the following table. The tables provided for in CMC 18.09.040 and CMC 18.09.050 were utilized to establish the dwelling units per acre allowed under each residential zoning district.

Table 6 - Residential Density Calculation
R-10 - 120.2 @4.3/ Acres = 516 Units
R-6 – 54.3@ 7.2/Acres = 391 units
MF-10 – 93.3 @10/Acres = 933 units
Total – 1840 Units

The maximum allowable density from each zoning district, in conjunction with the area of each zoning district, (as provided for in CMC 18.23.040C) was utilized to create Table 6. As can be readily seen, the number of units proposed in the Applicant's PRD is substantially less than allowed by the underlying zoning. This disparity is increased further if one takes into consideration the density bonus allowed by the City's PUD and other ordinances, which this proposal does not utilize.

PRELIMINARY MASTER PLAN REQUIREMENTS – CMC 18.23.070.

The City requires the following to occur in conjunction with an application for a PRD:

A. *Initial Conference. Schedule a pre-application conference to discuss and resolve conceptual problems prior to submission of the preliminary master plan related to such application.*

The Applicant has previously had a formal pre application conference with the City on the proposed master PRD plan. The pre application was conducted with the Applicant, their representatives and City staff on February 25, 2013. The meeting notes are included in this application and a general overview of the issues discussed that day are summarized in the project background section found within this narrative.

All of the items listed in the pre application notes have been addressed and are contained within this application. The Applicant has also met with the City on several occasions to discuss various aspects of the proposed project. The master plan, as part of the Development Agreement, has also been through several meetings and workshops and a public hearing before the City Council.

B. Contents. The preliminary master plan shall include the following information:

1. The legal description of the total site proposed for development;

The legal description of the property is contained within the application.

2. The existing and proposed land uses within the development, and the existing and proposed location of all structures;

The existing use of the property is a golf course open to the public. An application for preliminary plat approval of Phase I of the PRD has been filed in conjunction with the PRD. The subdivision of Phase I will create 201 residential lots. Single family residential structures will be constructed on the Phase 1 lots. An approximate 2,500 square foot clubhouse and recreation area will also be constructed as part of Phase I some time prior to issuance of the 99th building permit for the PRD. As future phases of the PRD are developed, additional Preliminary Plat Approval or Site Plan Approval processes will occur. As part of those processes, detailed plans relating to lot size and location and types and location of structures will be identified.

3. The proposed residential density for the development, which shall include the number and types of dwelling units;

The residential density over the entire property is approximately 4.5 dwelling units per acre. The residential density over the residentially zoned portions of the property is approximately 4.8 dwelling units per acre. The City's target density goal as provided for in the Comprehensive Plan is 6 dwelling units per acres. Without substantially impairing existing critical areas including slopes and wetlands, the Applicant cannot add much more density to this project.

The primary maximum number of dwelling units for the PRD is 1,300. The types of homes in the Green Mountain neighborhood will vary greatly between large single family residences in the northern portions of the PRD to apartments and other attached residential homes located in the southern portions of the property. The creation of density and location of lots and specific housing types have been intentionally arranged around appropriate topography, open space and recreational areas. The density has been designed to be sensitive to the critical areas on the site and to be functionally integrated and compatible with other phases of the project. Included in this narrative above is a more detailed discussion of the planning pods and the types of residences that they will contain.

4. Approved building envelopes will establish the setbacks for each lot or parcel in which development may occur;

In conjunction with each pod, setbacks have been established. These are identified in Table 3.

5. A site plan drawn to scale and depicting the following:

a. The location of all areas to be conveyed, dedicated, or maintained as public or private streets; access and egress to the development showing proposed traffic circulation, parking areas, and pedestrian walks,

b. The proposed location of any residential buildings, and any other structures, including identification of all buildings as single-family, duplex, townhouse, apartment, condominium, designated manufactured home, or otherwise,

c. The location of areas to be maintained as common open space, and a description of the proposed use of those areas,

d. The location of areas to be maintained as open space network, if applicable,

e. Proposed lot or boundary lines for residential, open space, parks, and recreational areas, management or allocation purposes;

A site plan complying with this section is part of this PRD application.

6. An accurate survey of the property showing the topography in five-foot contours, identifying slopes above fifteen percent, all existing, isolated trees six inches or more in diameter, all wooded areas, all existing streets, utility easements, drainage patterns, structures, and other improvements, the location of all easements and rights-of-way for utilities, including, but not limited to water, sanitary sewers, storm sewer, electricity, gas, telephone, and cable TV lines;

A survey complying with this section is part of this PRD application.

7. A document containing agreements, provisions, and covenants regarding the establishment of a homeowner's association, which provides for the permanent ownership, maintenance, protection, and use of the planned development, including *streets (if privately owned), storm drain facilities, utilities, common areas (e.g., storage areas, parking areas, and landscaping) open spaces, greenways, parks, and recreational areas;*

Included as part of this application is a description of the types of covenants conditions and restrictions (CC&Rs) that will ultimately be recorded with each subdivision and site plan as they are recorded. All CC&Rs will contain provisions that will provide for the funding, ownership and/or maintenance of all common areas and open spaces within the PRD.

8. A landscaping plan drawn to scale and demonstrating compliance with CMC Chapter 18.13 Landscaping of this title. Additionally, the landscape plan shall indicate the landscaping features such as screening, fences, lighting, and signage;

An overall conceptual landscape plan for the PRD is part of this application. A detailed landscape plan for subdivision application for Phase I of the PRD is also part of this application.

Upper and lower story landscaping will occur as part of the construction of streets, parks, storm water facilities and other common areas. The Green Mountain PRD contains a series of community wide enhancements that connect the community and contribute to establishing a 'sense of place'. The following is a list of some of the planned PRD features:

1. Master Street Tree Plan coordinated to street type and the neighborhoods.
2. Consistent Community Entry signage, decorative street lighting and landscaping.
3. Pocket Parks in higher density areas (not in current open space calculation).
4. Landscape enhanced Entry Boulevard with bike lanes to Central Park.
5. Landscape enhanced storm pond edges.

9. A development schedule outlining the expected schedule and phases of development;

This master planned project will develop over a number of years. Construction could begin as early as the summer of 2015 and full build out likely will occur in 2025 or later.

10. The calculation of all applicable impact fees. This shall be coordinated with the city prior to submission of the preliminary master plan.

A table of all applicable impact fees is included with this application

<u>Professional Preparation – CMC 18.23.080</u>

All of the plans prepared as part of the master plan have been prepared by licensed architects, landscape architects, civil engineers and land surveyors certified in in the state of Washington complying with the professional preparation guidelines of CMC 18.23.080,.

Approval Standards – CMC 18.23.100

Approval for a PRD shall be based on the following standards:

A. The PRD conforms to:

1. The City of Camas Comprehensive Plan

The parcels comprising the PRD have zoning that is consistent with and allowed by each parcel's Comprehensive Plan designation. While the City's Comprehensive Plan has hundreds of goals and policies, the City has identified four primary land use goals:

PRIMARY GOAL 1:

To support, maintain, and improve a community comprised largely of residential neighborhoods, industrial business parks, a downtown core and small commercial areas in an open and natural setting that serves the local community.

The Green Mountain Mixed Use PRD will be an extension of the existing developed Camas community. The PRD creates a unique neighborhood that is designed around the natural setting of the Green Mountain area. This includes Green Mountain itself and variety of other open space and natural areas created by critical areas and the BPA easement. The commercial component has been designed to occur within the Urban Village portion of the neighborhood. The Urban Village will create a vibrant live, work, shop area that will be integrated with the surrounding PRD neighborhood through landscaping and a series of parks, trails and open spaces.

PRIMARY GOAL 2:

To maintain the "small town" atmosphere and feel by preserving, protecting, and strengthening the vitality and stability of existing neighborhoods, while ensuring the compatibility of new developments.

Camas is a growing community. While many of the residents of the PRD neighborhood will work and shop in Camas, because of its location and surrounding topography, this project will not negatively affect existing neighborhoods in Camas. However, the Green Mountain PRD has been designed to be compatible with the small town feel of Camas, while helping to achieve the City's density goals established through its Comprehensive Plan as mandated by the Growth Management Act.

PRIMARY GOAL 3:

To offer a harmonious blend of opportunities for living, working, recreation, education, and cultural activities by protecting natural amenities, and balancing development of services with growth.

One of the primary purposes of the PRD is to create a "harmonious" blend of uses. The Urban Village component of the PRD will provide opportunities for living, working, shopping and recreating at the extensive park area adjacent to the Urban Village. All project components are connected by and extensive trail and pedestrian network. All urban services such as sanitary sewer, water and storm water will be constructed and provided as the project develops.

PRIMARY GOAL 4: To expand the existing permanent open space network and trails system throughout the City while preserving and protecting natural features, wildlife habitat, and critical areas from incompatible land uses.

The Green Mountain PRD will, through its development, dramatically expand the City's trail network by constructing a series of trails currently on the City's Park Plan and by providing an access trail to the top of Green Mountain. Construction of these trails and open space areas has been designed to be adjacent to and take advantage of natural areas such as wetland and habitat areas.

2. All provisions of the Camas Zoning Code which are not proposed for modification; 3. All engineering standards; 4. All other applicable local, state and federal regulations that are applicable to the project.

The proposed PRD is designed to meet all of the City's zoning, design and infrastructure requirements that are either allowed through the PRD process, the Development Agreement or the City's modification or exception process. Demonstration of this can be found in the preliminary drawings and technical reports attendant with this application. These include, but are not limited to, the Phase I subdivision reports relating to wetlands and wildlife habitat, preliminary engineering for storm water, sewer, water, streets and landscaping.

There is a substantial traffic study that was prepared by Kittelson and Associates that analyzes the full build out of the PRD. That study is part of this application. As future phases of the PRD are developed, they will go through a Preliminary Plat approval process or a Site Plan approval process. As part of those processes, preliminary engineering substantially similar to the materials filed with the Phase 1 subdivision application will be prepared and filed for review by the City. The Development Agreement also incorporates a full tree survey of the PRD area and establishes tree preservation requirements. No impacts to critical areas will occur; nor will construction of utilities or other infrastructure in any portion of the PRD occur, without having obtained all necessary local, state and federal permits.

B. Utilities and other public services necessary to serve the needs of the proposed development shall be made available, including open spaces, drainage ways, streets, alleys, other public ways, potable water, transit facilities, sanitary sewers, parks, playgrounds, schools, sidewalks, and other improvements that assure safe walking conditions for students who walk to and from school.

The technical reports and preliminary plat drawings demonstrate that all sewer, water, storm water, streets and pedestrian access ways are provided for in the Phase I preliminary plat. There is also an extensive trail and open space system that is identified on the PRD master plan and the parks and open space plan for the PRD as a whole. About 30% of the PRD will remain in open space connected by a series of parks and trails. The PRD contains a central park and other smaller parks connected by sidewalks or trails. Sidewalks will be provided throughout the project as each phase is completed, providing safe walking for school children. All residences in the project will pay school impact fees.

C. The probable adverse environmental impacts of the proposed development, together with any practical means of mitigating adverse impacts, have been considered such that the proposal shall not have an unacceptable adverse effect upon the quality of the environment, in accordance with CMC Title 16 and 43.21C RCW.

The PRD is subject to SEPA which has been addressed above. While this development, like any other development, creates adverse impacts to the environment, through the construction of code compliant infrastructure and compliance with all environmental regulations, including mitigation, this project's probable significant adverse environmental impacts will be reduced to levels that are moderate or below.

D. Approving the proposed development shall serve the public use and interest, and adequate provision has been made for the public health, safety, and general welfare.

Through compliance with all of the City's regulations relating to the PRD, utility infrastructure, transportation, payment of impact fees, preservation of open spaces and natural areas, construction of parks and trails and further implementation of the City's Comprehensive Plan, this project supports the public's health and serves the public interest.

E. The proposed development satisfies the standards and criteria as set forth in this chapter.

As identified in this section and other parts of the narrative, all of the City's development and zoning criteria will be met.

F. The proposed development shall be superior to, or more innovative than conventional development, and shall provide greater public benefit without additional probable adverse impacts to public health, safety, or the environment, than available through the use of conventional zoning and/or development standards.

In furtherance of the provisions of the City's PRD code, the Applicant has designed a neighborhood with blended densities and a variety of residential products. A great deal of thought has gone into the master plan's various densities, uses, locations and orientations, in order to maximize the project's harmony with its wealth of natural features and to create an integrated community that provides a broad range of housing opportunities that can be accessed by a broad range of citizens. This will be the first project of its kind in Camas that purposefully blends trails, parks, open spaces, a variety of housing choices and commercial uses into one cohesive and integrated neighborhood.

To best accomplish this, the master plan has been designed with planning pods. Each planning pod will identify a certain number of lots, density range, lot size and type of residential unit. The master plan proposes eight planning pod phases of development; the sequence and timing of these phases will be determined by market conditions and other factors. The most intense use of the site will occur in the mixed-use Urban Village located on the southern portion of the site. The density of the PRD generally decreases as development moves east and north to create fewer impacts to critical areas and slopes. This will serve to frame and preserve the central natural feature of the site – Green Mountain. For additional details on the number of homes, density and lot sizes please refer to the zoning section within this narrative.

The Applicant's designers have taken great care and thought about how to best integrate critical areas and created open space, trails and parks into the developed portions of the project. The Green Mountain Open Space Master Plan creates an open space system, that when completed, will comprise approximately one third of the Green Mountain project. The plan provides for level open spaces and includes a regional Central Park in the higher density portion of the planned community. The design of the Master Plan provides the Green Mountain residents with integrated and connected open spaces and a variety of recreational activities, including a large club house and related amenities.

The Green Mountain PRD site contains a number of outstanding physical features and uniquely diverse site features and environments within the Master Plan boundaries. The Open Space Master Plan has been designed to include these elements and distinctive features while integrating and connecting them to the urban community. The Green Mountain PRD site contains the top and southwest quadrant of Green Mountain; a distinctive natural feature in the local landscape. The site has forests, hillsides, bluffs, rock outcroppings, wetlands, open flat areas, streams and native oak groves. These and similar features were identified through the use of site topographic mappings, site aerial photography, site resource studies and site observations.

In addition to this significant open space system, the PRD includes the development of an extensive trail system and Central Park; a combination neighborhood park and open space designed for the center of the community. This complex creates a combined 14 acre open space and park and includes a linear parkway. Central Park will be the focal point of the community. PRD plans also include a clubhouse and a number of high value design and landscape improvements that will work together to reinforce a 'sense of place' and make Green Mountain a quality community.

<u>Open Space and Park Master Plan Components</u>

The Green Mountain Open Space and Park Master Plan utilize the following five components to provide diverse recreational opportunities for the Green Mountain community. The Master Plan creates access from all neighborhood areas to the on-site and adjacent open space.

The majority of the planned open space will be protected natural areas, undeveloped except for trails and an occasional planned road crossing. These areas contain many of the site features referred to above and therefore provide a high-quality open space experience. The trail system provides community access to the open space and pedestrian connections for the neighborhoods. The Park Master Plan incorporates a Central Park and Open Space, and includes community amenities and Landscape Master Plan components. The following overviews these elements:

A. Open Space Area – The Green Mountain open space is a contiguous open space area linked by trails and only interrupted by an occasional planned road crossing and trail. The open space is unique in that it contains several distinct environments.

The northeast section of the open space encompasses the top and forested west and south flanks of Green Mountain (20 acres). The center of the north section includes the BPA easement that traverses the rolling topography characteristic of the upper terrace areas. Parallel to the BPA easement, but at a lower elevation, is an additional north section open space corridor containing a rock rim leading to the central section.

The central sections of the open space area provide forested east west connections to off site open spaces, creating wildlife corridors into and through the community. The central section of the site also contains a rapid and steep change of grade between the upper neighborhoods and neighborhoods in the south section. This grade change can be observed from the lower terrace as the power transmission lines expose some of the rock outcroppings in this steep wooded central section.

The south section is located in the large lower terrace at the base of the hill. This lower section is sloping to relatively flat topography and the site of the Green Mountain Golf Course. The lower section of the site contains over 70% of the homes and is the location of Central Park. This area is partially wooded and has both large open spaces and wooded areas. There are some wetland areas and groves of trees. At the south end of the site the contiguous open space provides access to a creek corridor with an adjacent native oak grove along parts of it.

B. Community Trail System – The City Park Master Plan has identified four trails on this site. One is a regional trail to be located in the BPA easement and three secondary trails. Two secondary trails traverse the site from Ingle Rd. to the east property line and one provides access to the top of Green Mountain. This plan guided the trail locations in the Green Mountain open space. The regional trail (T27) is shown on the plan along with the combined local trails (T29 & T30) and a trail (SU14) to the top of Green Mountain. These trails could become public trails. The combined length of these trails is approximately 2.4 miles depending on final location and layout. The PRD Plans show trail improvement and dedication standards that have been developed to respond to specific site topographic constraints. One unknown trail component at this time is the final location of the SU14 trail and its connection to the regional trail. Sections of SU14 from the connection to the regional trail to a trailhead at the base of the mountain may be provided through some of the neighborhoods on widened or enhanced sidewalks. If the SU14 trail to the top of Green Mountain is built privately this trail would likely be soft surface and primitive.

The Community Trail System also includes a series of significant neighborhood trail connections providing the adjoining neighborhoods with contiguous trails through open spaces or access to the overall system from neighborhood trailheads. There are three major components of the neighborhood trail system. In the north section a parallel corridor to the BPA has been designed to facilitate user access to the system. In the central section an 8 foot pathway/trail will meander along the circulator street abutting Central Park, connect to the regional trail and make a loop around the entire park. In the southwest section abutting the east west flowing creek a neighborhood trail will use the existing cart path as access along the creek through the adjoining oak grove. This trail will connect neighborhoods to the east and regional trail users to and through this section of the Urban Village. These neighborhood trails will provide over .5 mile of additional trails.

Final trail locations and connections will be developed as each phase moves forward with preliminary plats. Trail location and improvements will be adjusted to final site conditions while maintaining the connectivity illustrated by the Master Plan. In the event that the trails will be the sole responsibility of the development to build and eventually the HOA to maintain, improvement standards may be adjusted.

It is anticipated that the combined trail system will ultimately provide over 3 miles of connected on site trails.

C. Central Community Open Space and Park - This centrally located park provides the Green Mountain community with a wide variety of active recreational opportunities. Central Park will create a large open space in the center of the urban community. The east side of Central Park is the location of the regional trail and is adjacent to planned neighborhoods. The park will have circulator street frontage on the other three sides, giving Central Park a major presence in the community. There is a linear parkway planned along this entire street frontage. The parkway will include a landscape enhanced streetscape and meandering pathway. This pathway will connect with the regional trail on the north and south ends of Central Park providing a walking, jogging, strolling loop around the entire 14 acre park.

The south section of Central Park is the north edge of the Urban Village. This section of the park encompasses a large on site wetland and buffer adjacent to the linear parkway. The north section of Central Park will contain a neighborhood park. The full extent of the facilities has yet to be determined.

Phase 1 Central Park plans propose the development of the most active northerly portion of the park. Phase 1 improvements include: park pathways; streetscape landscaping; decorative street lighting; play structure; and a large grass recreation field designed to accommodate informal practice games for all field sports (approx. field area 300’ x 400’). This space will also serve as a location for community gatherings and events.

D. Residents' Clubhouse – Across the street north of the Phase 1 Central Park is a planned residents' Clubhouse. This community facility will provide a social gathering spot for small to medium sized groups. The clubhouse will contain a lounge, meeting rooms, early community orientation and reception areas, and eventual HOA offices. The facility will provide an outdoor pool, fireplace and similar amenities to members of the HOA.

E. Landscape Master Plan Components – The Green Mountain PRD contains a series of community wide enhancements that connect the community and contribute to establishing a 'sense of place'. The following is a list of some of the planned PRD features:

1. Master Street Tree Plan coordinated to street type and the neighborhoods.

2. Consistent Community Entry signage, decorative street lighting and landscaping.

3. Pocket Parks in higher density areas (not in current open space calculation).

4. Landscape enhanced Entry boulevard with bike lanes to Central Park.

5. Landscape enhanced storm pond edges.

Landscaping

18.23.070.B.8 *A landscaping plan drawn to scale and demonstrating compliance with CMC Chapter 18.13 Landscaping of this title. Additionally, the landscape plan shall indicate the landscaping features such as screening, lighting and signage.*

This PRD is a very large site and expected to develop over many years. A Master Plan providing a framework for the Green Mountain Open Space, Park and Landscape improvements is part of the PRD application. Each of the Master Plan elements will be developed in phases as the community develops. PRD landscape improvements will be implemented as each POD is platted or developed.

Phase 1 includes Master Plan PODs C1, C2, D1, D2 and portions of E1 and D6. Phase 1 has a variety of single family home sites sizes and a wide variety of landscape Master Plan improvements. Phase 1 includes implementation of the following Open Space and Landscape Master Plan components:

1. Master Street Tree Plan – All phases of the Green Mountain PRD will have Master Street Tree planting plans. These plans bring lasting value to the neighborhoods.

Trees are selected based on site soil conditions and civil engineering construction plans for any given phase. All selections are made to enhance the character and design of the neighborhood and compliment the setting. Street tree continuity will be maintained with any preceding phase(s). All street tree, common area shrub and ground cover plantings and maintenance will meet the characteristics and requirements specified in 18.13.050 A-E and G-S and the Urban Village will comply with section F, as appropriate. Final landscape construction plans prepared in conjunction with final construction plans will demonstrate compliance with these code sections, as applicable.

2. Entry Signage and Landscaping - Community Signage and complimentary landscaping. Schematic details illustrate the landscape character of this main community entry. The entry area will contain: a sign wall; some fencing; decorative street lights; widened street side planters and themed landscaping. This area connects to the Boulevard leading to Central Park. Detailed planting and irrigation plans will follow final Phase 1 construction grading plans.

3. North Section of Central Park – Central Park is a Park and Open space of around 14 acres. The North Section is the planned center of active recreation. Central Park is anticipated to have other active facilities in the Central and South sections, along the Parkway created by the circulator street abutting the west and south park edges.

The North Section to be developed with Phase 1 will provide an improved park for the Green Mountain Community of about 5 acres in size. Initial development plans are schematically illustrated on Sheet 6. Among other things, these initial improvements include: Parkway street frontage landscaping and ornamental lighting including 8’ meandering neighborhood trail; entry shrub beds with specimen trees; play structure; 6’ neighborhood connector trail; a section of the Regional Trail; and a 350’x400’+ grass recreation field. Final landscape construction plans including final grading and irrigation will be prepared at time of Park development, targeted for the later stages of Phase 1. It is anticipated that this park will continue to have modifications and improvements added to it.

4. Residents’ Clubhouse – A meeting and gathering facility that includes an outdoor pool and barbeque area. The facility will include conference rooms, a “living room” for receptions and small gatherings. The building will initially be used as a “welcome” center but with the growth of the neighborhood will transition into a full time facility for the residents and is expected to ultimately house the HOA offices.

5. Additional Pedestrian facilities – Phase one improvement plans also call for the 300’ extension of the 8’ wide regional trail north of the park across ‘C’ Street. The trail will temporarily end in the neighborhood to the east but is planned to continue up the hill (see sheet 5). Additionally, Phase 1 will extend the regional trail south of the park for about 350’ providing an additional walking access to the neighborhood. Eventually this section of the regional trail will be extended south to connect to the circulator street planned at the south edge of Central Park. Phase 1 also includes the extension of a sidewalk to the planned open space west of C1 and this path will provide a pedestrian connection when POD B2 develops.

6. Landscape enhanced storm pond edges – This enhancement is illustrated on sheet 6. Plans call for the landscaping of the storm pond edges. The ponds will be fenced with 4’ black cyclone fencing placed approximately 15’ back of property line. This area will be landscaped in predominately trees and shrubs providing screening and using plant materials consistent with the pond environment.

7. Chapter 18.13 Landscaping – As described in section 1 above, all common area and right of way plantings will comply with 18.13.050 A-S. Final landscape construction plans will be submitted to the city for review and approval along with the final engineering plans for each phase. 18.13.060- Parking – contains landscape standards for parking areas. Phase 1 plans show 35+ off street parking spaces in 6 different parking areas, and as required by lots smaller than

7,500 SF. These areas are dispersed throughout the neighborhood. One parking area will have double loaded stalls while all the rest are single loaded. All lots will have hedges screening the parking, and parking area trees.

All landscape improvements will comply with the standards found in 18.13.060. The Entry Planting schematic detail shown on sheet 6 illustrates the landscape architectural character to be implemented during final construction plan review. The detail is illustrative of the final landscaping, signage, decorative street lighting, master street tree plantings, fencing, screening and storm pond edge enhancements. This schematic will guide development of the final construction drawings with the intensity of planting being increased and decreased as appropriate to the ownership pattern and use requirements but in all cases will meet code requirements. If appropriate, such assurance as required by 18.13.070 will be provided.

> *G. The proposed development shall provide at least two access points (where a PRD does not have access to a primary or secondary arterial) that distribute the traffic impacts to adjacent streets in an acceptable manner.*

The PRD, as depicted on the drawings, shall have two major access points and will likely have more as future Phases are developed.

Relationship to Adjacent Areas - CMC 18.23.110

> *The design and layout of a planned development shall take into account the integration and compatibility of the site to the surrounding areas. The perimeter of the planned development shall be so designed as to minimize any undesirable impact on adjacent properties. Setbacks from the property lines of the planned development shall be comparable to, or compatible with, those of any existing development on adjacent properties. Or, if adjacent properties are undeveloped, then setbacks shall conform to the type of development that may be permitted on adjacent properties.*

As can be seen from the above description of the project's design, extensive effort has been exercised to design a project that is sensitive to and integrates the variety of slopes, wetlands, habitat areas present around Green Mountain and the surrounding landscape. The project has not proposed development directly adjacent to existing development. To the west is property acquired by DNR for opens space; to the north is a large BPA easement; to the north east is property owned by the County for a park; to the south east is property currently slated for development with zoning similar to that of the Green Mountain PRD in that location. To the south are largely wetlands and the Goodwin Road arterial.

CMC Title 13: Public Services

WATER

This project will require connections to the existing potable water system owned by the City of Camas. The proposal to extend the water system to the site is consistent with the adopted Water Systems Plan. The water system is designed to provide adequate flow to the site (including fire). All of the commercial buildings that meet the size criteria will be fitted with internal sprinkler systems. Compliance with CMC Title 13 has been demonstrated in the schematic utility plan provided for in the preliminary engineering that identifies how water and water service will be extended to the future development areas of the site. The City has sufficient water capacity to serve this project as proposed.

SANITARY SEWER

Sanitary sewer will initially be sent through the conveyance system located in the Camas Meadows development as currently allowed by the City's General Sewer Plan. The City and the Applicant have discussed alternatives for the future that might involve taking sewer to the east through other portions of the North Urban Growth Area. The City and the property owners in that area will continue to work together to identify potential alternatives to more efficiently and cost effectively provide sewer to this area. The City's sewer treatment plant has capacity to serve this development as proposed.

REFUSE COLLECTION AND DISPOSAL

Residential garbage and recycling will be collected on a weekly bias. Commercial disposal details will be provided once specific user(s) are identified during the Preliminary Plat and Site Plan process.

STORM WATER DRAINAGE

Storm water treatment and quantity control will be provided through wetponds and other traditional storm water facilities. These facilities will be located at various points within the project as determined by the Applicant's and City's engineers. Outflow from these facilities will go into either existing storm water ditches along Ingle Road or to existing culverts under Ingle Road. All of the storm water facilities will be designed to meet the requirements of the Western Washington Storm Water Manual and Camas' existing storm water regulations. The storm water facilities will be owned and maintained by a homeowner's association. Calculations and further information regarding the drainage facilities are included in the Stormwater Narrative for Green Mountain PRD prepared by Olson Engineering.

CMC Title 16: Critical Areas and Open Space

ARCHAEOLOGICAL RESOURCE PRESERVATION - CMC 16.31

The Applicant has prepared a full archeological report which has been submitted to the Department of Archeology and Historic Preservation, as well as, local Native American Tribes. Evidence of these certified mailings is included in this application.

PUBLIC VIEW, OPEN SPACE PROTECTION AND HISTORIC SITES AND STRUCTURES – CMC 16.33

The Green Mountain open space master plan preserves and enhances approximately thirty percent of this site. The open space system is integral to the community master plan and is used to help define and enhance the center of the community. The open space components include the protection and view preservation of the top of Green Mountain, a community wide trail system and a large central park connecting and interfacing with the Mixed Use Urban Village, located at the southern tip of the site. More information on the open space protection provided by this project is located above in the portion of the narrative addressing the innovation of the PRD, as well as, the portion below addressing landscape and open spaces.

GENERAL PROVISIONS - CMC 16.51/WETLANDS CMC 16.53

The purpose of this code section is to designate and classify ecologically sensitive and hazardous areas and to protect these areas and their functions and value, while allowing for some reasonable use of property. These critical area regulations shall apply as an overlay and in addition to zoning and other regulations, including the City of Camas' Design Standards Manual, and shall be reviewed concurrently under SEPA and development review.

The Application contains all of the environmental reports and analyses required by the City's code for the submittal of this application with particular attention to Phase 1. Because the PRD will be developed in many phases over many years, the specific impacts to particular wetlands and critical areas not associated with Phase I will not be known until those phases of the project are designed and proposed. This application does contain substantial information about the location of various critical areas located throughout the entire PRD. The PRD has been designed to minimize or avoid impacts to these areas. Phase I, which is being proposed for preliminary plat approval concurrently with this PRD application, does have a full critical areas analysis that complies with all applicable regulations.

Ecological Land Services, professional wetlands and wildlife biologists, have prepared an extensive code compliant analysis of the Phase I impacts to regulated critical areas. That analysis finds that there are no wetlands located in Phase I; however, two wetlands are located within 300 feet of the project. The project encroaches within the base wetland buffers associated with Wetland D and Wetland G (see ELS report) located within the northern and southern portions of the project site, but outside of the Phase 1 area (Figure 8 of the CAR report prepared by ELS).

Four man-made ponds and two man-made ditches are located within the Phase 1 boundary. The man-made ponds and ditches located onsite were previously created as part of the existing golf course. The man-made ponds have engineered slopes, rubber liners, and have been maintained by the golf course. A piping system connects the water features to a pump house (south of the project area). Man-made Pond H (0.49 acres) is located to the northeast of the parking and clubhouse area and along the western edge of the golf course trail system. Man-made Pond I (0.73 acres) is located to the northwest of the parking and clubhouse area and parallels the main entrance to the golf course. Man-made Pond J (0.15 acres) is located to the south of the main entrance to the golf course and man-made Pond I. Other man made ditches and pond facilities are located in Phase 1 and throughout the PRD.

Adjacent Critical Areas

The City of Camas code section *16.53.030-Critical Area Report*, requires that all wetlands, buffer zones, water features, and other critical areas within 300 feet of the project area (Phase 1 site boundary) be discussed within the critical area report. Wetlands located outside of Phase 1 site boundary, but within 300 feet include Wetlands B, D, G, and O. Additional and more specific information on the location and type of wetlands on the site is contained within the ELS report attendant with this application.

Stream Habitat

The ordinary high water mark (OHWM) of Stream O was delineated onsite and determined to be a non-fish bearing seasonal (Type Ns) stream and is regulated locally by *CMC 16.61*. *CMC 16.61.040(D)*, requires Stream O (Type Ns) to have a 25-foot buffer.

CRITICAL AQUIFER RECHARGE AREA - CMC 16.55

The master plan area is not located within a Critical Aquifer Recharge Category I Area.

FREQUENTLY FLOODED AREAS - CMC 16.57

The master plan boundary is not located within a frequently flooded area.

GEOLOGICALLY HAZARDOUS AREAS - CMC 16.59

The PRD contains a few areas that are mapped as triggering application of the Geo Hazard ordinance. A geotechnical report has been prepared by Geo Pacific Engineers that fully addresses Phase I. As future phases of the PRD are platted, additional geotechnical review, as required by the City's code will be undertaken.

DESIGNATION OF FISH AND WILDLIFE HABITAT CONSERVATION AREAS - CMC 16.61

The Washington Department of Fish and Wildlife (WDFW) maps priority Oregon white oak (Quercus garryana) stands within 300 feet of the Phase 1 project boundary. Clark County Geographic Information System (CCGIS) maps one wetland, one stream, and a non-riparian habitat conservation area within or adjacent to the Phase 1 project boundary (Figure 5 of the

CAR report prepared by ELS). ELS has performed an extensive analysis of the area's wildlife and wildlife habitat. The ELS habitat and wildlife report analyzes all regulated species and habitats in an around phase I. For further information regarding regulated habitats and species as they pertain to this site, please see the ELS report attendant with this application.

TREE PRESERVATION – CMC 18.31

To meet tree retention requirements regulated by the City of Camas, a tree survey was performed. An inventory of the onsite tree habitat was tabulated and provided to the City of Camas within Exhibit "E" of the Development Agreement (DA). See Appendix B for a copy of the "Tree Preservation Plan" to be followed by the Phase 1 project. Additional Tree Preservation Plan details are provided in the "Tree Preservation Plan" section of this report.

OREGON WHITE OAK HABITAT

Oregon white oak habitat was also located onsite by ELS. A total of 20 Oregon white oak trees were inventoried within or immediately adjacent to the phase 1 project boundary. Out of the twenty (20) total Oregon white oak trees, seven (7) measure 20 inches or greater diameter at breast height (dbh) and therefore are regulated by the tree preservation plan within the 2014 DA, (Exhibit E) governing the project.

Tree preservation plan – CMC 18.31

The non-Oregon white oak trees proposed for removal by the Phase 1 project have been inventoried and accounted for in the Tree Preservation Plan. The Tree Preservation Plan encompasses the entire PRD area (approximately 283 acres). The tree preservation plan divides the property into five "zones" that identify five distinct areas of future development. The zones were established to assure that acceptable numbers of trees were preserved throughout the property, not just in one isolated area rendering the remaining portions of the site bare of trees. The percentage of trees protected in a given zone varies from 34 percent to 77 percent, with the net result being that at least 50 percent of the existing trees across the overall property ownership will be preserved.

The Tree Preservation Plan identifies that Zone C will consist of development pods B1, B2, B3, C1, C2, D1, D2, D3, and E1 and will preserve 488 trees out of the 1,454 trees inventoried within the zone to provide a preservation of 34 percent of the trees within the zone. The Phase 1 development consists of all of the development pods listed under Zone C except pods B1, B2 and B3. The remaining Zone C area (Pod B1 located south of Phase 1 and B2 and B3) contains 222 trees. The Phase 1 development fully complies with the Tree Preservation Plan and with the future removal of the additional 222 trees when the remaining pods within the zone are developed, Zone C will still meet the full retention quantity of 488 trees. (Figure 8 and Appendix B of the CAR report prepared by ELS).

OREGON WHITE OAK IMPACTS AND MITIGATION

The project design team worked to retain oak trees by altering the Phase 1 development and associated green space boundaries. Many oak trees will be retained within the green space area, leaving only seven jurisdictional Oregon white oaks within the Phase 1 project site that could not be avoided (Figure 9). The seven individual Oregon white oak trees to be impacted consist of the following oak tree numbers as referenced in CAR report; Oak Tree Numbers – 1, 2, 7, 21, 55, and 64. The oak impacts will be mitigated as provided for and required by the 2014 DA (Exhibit E). Mitigation for the seven Oregon white oak trees includes installing 1.5-inch caliper minimum stock replacement oaks at a 2:1 replacement ratio. The oak mitigation for Phase 1 oak impacts is proposed within the wetland buffer associated with Wetlands D over an area approximately 6,526 square feet in size to allow for 20-foot spacing of the trees allowing for mature canopy growth in the future (Figure 9 of the CAR report prepared by ELS).

Maintenance activities are to consist of controlling invasive species with mowing activities or herbicide application performed by a licensed herbicide applicator. Total percent cover of invasive species is to remain below 20-percent for the duration of the monitoring period.

CMC Title 17: Land Development

SUBDIVISIONS – CMC 17.11

The Applicant is seeking preliminary plat approval for Phase 1. The application shall be processed as Type III decision subject to the provisions of CMC Chapter 18.55.

PRELIMINARY SUBDIVISION PLAT APPROVAL – CMC 17.11.30

A pre application conference was conducted in February of 2014, complying with CMC 17.11.30A. The purposes for Subdivision Plan review are to establish procedures to ensure that the design of site and improvements are consistent with applicable standards. Subdivision approval criteria are provided for in CMC 17.11.30B and are described as follows:

An application meeting all of the submittal requirements of CMC 17.11.30B has been submitted by the Applicant with this application.

> *CMC 17.11.30D. Criteria for Preliminary Plat Approval. The hearings examiner decision on an application for preliminary plat approval shall be based on the following criteria:*
>
> 1. *The proposed subdivision is in conformance with the Camas comprehensive plan, parks and open space comprehensive plan, neighborhood traffic management plan, and any other city adopted plans;*

Phase 1 conforms to the Camas Comprehensive plan by complying with the requirements for the underlying zone, the DA, and the PRD standards. Phase I will be compatible with the future development of the areas around Phase I as described in this PRD narrative. Phase I will construct park and open space and trail amenities as part of its development. Through compliance with all of the City's regulations relating to the PRD, utility infrastructure, transportation, payment of impact fees, preservation of open spaces and natural areas, construction of parks and trails and further implementation of the City's Comprehensive Plan, this subdivision supports and furthers the City's Comprehensives plan.

2. Provisions have been made for water, storm drainage, erosion control and sanitary sewage disposal for the subdivision that are consistent with current standards and plans as adopted in the Camas Design Standard Manual;

The technical reports and preliminary plat drawings demonstrate that all sewer, water, storm water, streets and pedestrian access ways are provided for in the Phase I preliminary plat. There is also an extensive trail and open space system that is identified on the PRD master plan and the parks and open space plan for the PRD as a whole. About 30% of the PRD will remain in open space connected by a series of parks and trails. The PRD contains a central park and other smaller parks connected by sidewalks or trails. Sidewalks will be provided throughout the project as each phase is completed, providing safe walking for school children. All residences in the project will pay school impact fees.

3. Provisions have been made for road, utilities, street lighting, street trees and other improvements that are consistent with the six-year street plan, the Camas Design Standard Manual and other state adopted standards and plans;

The proposed PRD is designed to meet all of the City's zoning, design and infrastructure requirements that are either allowed through the PRD process, the Development Agreement or the City's modification or exception process. Demonstration of this can be found in the preliminary drawings and technical reports attendant with this application. These include, but are not limited to, the Phase I subdivision reports relating to wetlands and wildlife habitat, preliminary engineering for storm water, sewer, water, streets and landscaping. There is a substantial traffic study that was prepared by Kittelson and Associates that analyzes the full build out of the PRD. That study is part of this application and fully analyzes all of Phase I's transportation impacts.

The Applicant has provided new roads, utilities, street lighting, street trees and other improvements as indicated in the proposed plans. All internal and external proposed improvements will comply with the City of Camas standards

4. Provisions have been made for dedications, easements and reservations;

The proposed internal and exterior road improvements are designed per the Camas Design Standard Manual. Additional easements will be addressed during final engineering. Please refer to the preliminary subdivision plan for more detailed information.

5. The design, shape and orientation of the proposed lots are appropriate to the proposed use;

A great deal of thought has gone into the master plan's various densities, uses, locations and orientations, in order to maximize the project's harmony with its extensive natural features and to create an integrated community that provides a broad range of housing opportunities that can be accessed by a range of citizens. Phase I is part of this plan. As can be seen, Phase I contains a variety of housing types and lot sizes that are oriented around this areas natural features. Phase I will provide a logical transition between the denser urban village to the south and the less dense larger lots of future phases to the north.

6. The subdivision complies with the relevant requirements of the Camas land development and zoning codes, and all other relevant local regulations;

The proposed phase 1 subdivision is designed to meet all of the City's zoning, design and infrastructure requirements that are either allowed through the Subdivision and PRD process, the Development Agreement or the City's modification or exception process. Demonstration of this can be found in the preliminary drawings and technical reports attendant with this application. These include, but are not limited to, the Phase I subdivision reports relating to wetlands and wildlife habitat, preliminary engineering for storm water, sewer, water, streets and landscaping.

7. Appropriate provisions are made to address all impacts identified by the transportation impact study;

There is a substantial traffic study that was prepared by Kittelson and Associates that analyzes the full build out of the Phase 1 subdivision. That study is part of this application.

8. Appropriate provisions for maintenance of commonly owned private facilities have been made;

Included as part of this application is a description of the types of covenants conditions and restrictions (CC&Rs) that will ultimately be recorded with each subdivision and site plan as they are recorded. All CC&Rs will contain provisions that will provide for the funding, ownership and/or maintenance of all common areas and open spaces within the PRD.

9. Appropriate provisions, in accordance with RCW 58.17.110, are made for:

a. The public health, safety, and general welfare and for such open spaces, drainage ways, streets, or roads, alleys or other public ways, transit stops, potable water supplies, sanitary wastes, parks and recreation, playgrounds, schools and school grounds and all other relevant facts, including sidewalks *and other planning features that assure safe conditions at schools bus shelter/stops, and for students who walk to and from school, and*

b. The public use and interest will be served by the platting of such subdivision and dedication;

Through compliance with all of the City's regulations relating to the subdivision and PRD standards, utility infrastructure, transportation, payment of impact fees, preservation of open spaces and natural areas, construction of parks and trails and further implementation of the City's Comprehensive Plan, this project supports the public's health and serves the public interest.

10. The application and plans shall be consistent with the applicable regulations of the adopted comprehensive plans, shoreline master plan, state and local environmental acts and ordinances in accordance with RCW 36.70B.030.

ONSITE CRITICAL AREAS

The majority of the Phase 1 site boundary is located within existing open groomed fairways, paved parking lot, and a clubhouse structure associated with the active golf course. The topography is gently to moderately sloping to the south-southwest towards NE Goodwin Road and NE Ingle Road. Green Mountain is located offsite to the northeast. A 100-foot wide Bonneville Power Administration (BPA) high voltage transmission line easement is located within the central portion of the site (Figures 2 and 8).

The subdivision is designed to meet or exceed all of the City's Comprehensive Plan and State and local environmental regulations and ordinances in accordance with RCW 36.70B.030. Demonstration of this can be found in the preliminary drawings and technical reports attendant with this application. These include, but are not limited to, the Phase I subdivision reports relating to wetlands and wildlife habitat, preliminary engineering for storm water, sewer, water, streets, landscaping and zoning.

PHASING – CMC 17.11.040

The master plan proposes various phases of development, with the sequence and timing of the phases to be finalized over the course of the next several years. It is expected that Phase 1 will break ground in the Summer of 2015 and be completed by 2018 and full master plan build-out is estimated to occur prior to 2029. The phases have been designed to either "stand alone" to meet all regulatory requirements or will be able to meet all regulatory requirements, based upon construction of infrastructure, loading, parking, stormwater, sewer, water, landscaping, etc., associated with preceding phases. The phasing plan submitted meets the requirements of CMC 17.11.040 and 18.23.

EXCEPTIONS - CMC 17.23.010 (A)

The Applicant is requesting an exception to the required 30' setback of the stormwater facility from the fronting rights-of-way. The Applicant is requesting that be reduced to 15 feet along Ingle Road and the project's entry road. The proposed location of the stormwater facilities are in the southwest portion of the site. Based upon the site's topography, this is the lowest (and thus most effective) area of the site to collect and treat storm water. Due to the slopes in this area, if the storm water facility were to be moved farther from Ingle road, large walls and substantial excavation and grading would be needed. Under this scenario only minimum landscaping would be required. The facility would be easily seen from Ingle Road.

The Applicant is proposing to reduce the distance to Ingle road and to the project's entry road to 15', but is also proposing to heavily landscape the facility with evergreen trees and lower story vegetation. A drawing depicting the location and type of this enhanced landscape buffer is provided with this application. The aesthetic view of the facilities will be greatly enhanced if the Applicant's request is granted.

The granting of this proposed exception will not be detrimental to the public welfare or injurious to other property within the vicinity of this proposed development, because it will better shield and landscape the proposed facility and require less severe excavation, grading and hard surfaces in this area. Refer to the Preliminary Subdivision Plan, which has been submitted with this application.

CMC Title 18: Land Development

PARKING – CMC 18.11

The residential component of the project will contain a minimum of two offsite parking spaces that will comply with parking table CMC 18.11.130. As the commercial buildings develop within the Urban Village area and the retail/commercial tenants are determined, the parking spaces, ADA compliance, loading areas and landscaping areas between the parking will be depicted on the site plan and reviewed for compliance at that time. The parking lot design and layout will meet CMC 18.11 and the international parking code.

SIGNS – CMC 18.15

Schematic details illustrate the landscape character of this main community entry. The entry area will contain: a sign wall; some fencing; decorative street lights; widened street side planters and themed landscaping. This area connects to the boulevard leading to central park. Detailed planting and irrigation plans will follow final Phase 1 construction grading plans.

As the commercial buildings develop within the Urban Village area and the retail/commercial tenants are determined. All signs will comply with applicable City permitting and design standards at the time of installation.

PROCEDURE – CMC 18.23.130

The Applicant is proceeding under a Type III review process pursuant to CMC 18.55 for the PRD and Subdivision components of the application.

Conclusion

The Applicant has provided a unique master plan concept that utilizes the site's unique natural features to guide the open space plan and the location and orientation of a wide array of residential housing types and densities. The open space components include the protection of the top of Green Mountain, a community wide trail system and a large central park connecting and interfacing with the mixed use Urban Village and other portions of the project. These are designed to meet the recreational and aesthetic needs of the existing and future residents of the City, while not compromising the environmental sensitivity of the area.

The project as designed will create an eclectic and vibrant neighborhood that will be integrated through its parks and trail system and will allow for shopping and employment opportunities close to home. As demonstrated in this narrative the proposal complies with all applicable City codes and furthers the goals of the City's adopted Comprehensive Plan.

EXHIBIT 6

DENSITY and DIMENSIONS -

Green Mountain PRD PODs A-G and corresponding Camas Zones

	A POD	B POD	C POD
DENSITY	**MF-24**	**MF-18**	**MF-10**
Max. du/gac	24	18	10
Min. du/gac	6	6	6
STANDARD LOTS			
Min. lot SF	~~1,800~~ ***1,000 [a]***	~~2,100~~ ***1,000[a]***	3,000 ***[a]***
Min. lot width	20	20	30
Min. lot depth	~~60~~ ***50***	~~60~~ ***50***	70
Max.Floor Area per du	No Max	No Max	No Max
SETBACKS			
Min.front/at garage	~~10/18~~ ***None***	~~10~~ ***6/3@OS***/18	~~15/18~~ ***10***/18
Min. side	3 [1]	3 [1]	3 [1]
Min. side Flanking Street	~~15~~ ***None [d]***	~~15~~ ***10***	~~15~~ ***10***
Min. rear ***(garage @alley)***	~~10~~ ***None [d]***	10 ***[b][c]***	10***[b][c]***
LOT COVERAGE, Max.	~~75%~~ ***None [c]***	~~65%~~ ***None***	55%
BUILDING HEIGHT, Max.	~~45[2]~~ ***60***	45 [2]	35 [2]

a. Single Family Detached homes to be permitted. For SFD in A POD apply B Pod setbacks.

b. 10 feet for front access garage.

c. Minimum rear yard for alley accessed garage is either 3' or 18'.

d. Franchise utilities to be located in front or side yard easements abutting right of way.

1. The non-attached side of a dwelling unit shall be three feet, otherwise a zero-lot line is assumed.
2. Maximum building height: three stories and a basement but not to exceed maximum building height.

Density Transfer Lots	D POD	E POD	F POD	G POD
DENSITY	**R-5**	**R-6**	**R-7.5**	**R-20**
Max. du/gac	8.7	7.2	5.8	2.1
DENSITY TRANSFER LOTS				
Min. lot size (sq ft)	3,500 ***[a]***	4,200	5250	14,000
Max, lot size (sq ft)	~~6,000~~ ***7,000***	~~7,200~~ ***9,000***	~~9,000~~ ***14,999***	~~24,000~~ ***60,000***
Min. lot width	40	50	60	90
Min. lot depth	80	80	80	100
LOT COVERAGE, Max.	45%	40%	40%	30%
BUILDING HEIGHT, MAX. (ft)	35	35	35	35
SETBACKS **based on ~~avg.~~ lot size**	Up to 4,999 sq. ft.	5,000 to 7,499 sq. ft.	7,500 to ***14,999*** sq. ft.	15,000 to ***60,000*** sq. ft.
Min.front/at garage	~~15~~ ***10/18***	~~20~~ ***15/18***	20	30
Min. side and corner lot rear yard (ft)	~~5~~ ***4***	5	5	15
Min. side yard flanking a street	~~15~~ ***10***	~~20~~ ***15***	~~20~~ ***15***	30
Min. rear ***(garage @alley)***	~~20~~ ***15[b][c]***	~~25~~ ***20[b][c]***	~~25~~ ***20[b][c]***	30
Min. lot frontage on a cul-de-sac or curve (ft)	25	30	30	40

a. Single Family detached homes to be permitted.

b. 10 feet for front access garage.

c. Minimum rear yard for alley accessed garage is either 3' or 18'.

NOTE: POD lot sizes are not subject to lot size averaging.

12/29/14

GREEN MOUNTAIN

A MIXED USE PLANNED RESIDENTIAL DEVELOPMENT

EXHIBIT 7

CAMAS, WASHINGTON

GREEN MOUNTAIN LAND, LLC.

MASTER PLAN OVERVIEW

(SEE SHEET 2)

PROJECT TEAM

Property Owner:
Green Mountain Land LLC.
5300 Meadows Road
Suite #400
Lake Oswego, OR 97035

Project Managers:
John O'Neil
John Schmidt
Metropolitan Land Group, LLC.
17933 NW Evergreen Parkway, Suite 300
Beaverton, OR 97006
(503) 597-7100 FAX: (503) 597-7149
email: johno@metlandgroup.com

Land Use Attorney:
Landerholm
Contact: Randy Printz
805 Broadway, Suite 1000
P.O. Box 1086
Vancouver, WA 98666
(360) 816-2530 FAX: (360) 696-2122
email: randy.printz@landerholm.com

Land Planning / Landscape Architecture:
Western Planning Associates, Inc.
Contact: William F. Horning
PO Box 2392
Lake Oswego, OR 97035
(503) 294-0222
email: bill@westernplanning.com

Civil Engineering & Surveying:
Olson Engineering, Inc.
Contact: Kurt Stonex, P.E.
1111 Broadway
Vancouver, WA 98660
(360) 695-1385 FAX: (360) 695-8117
kurt@olsonengr.com

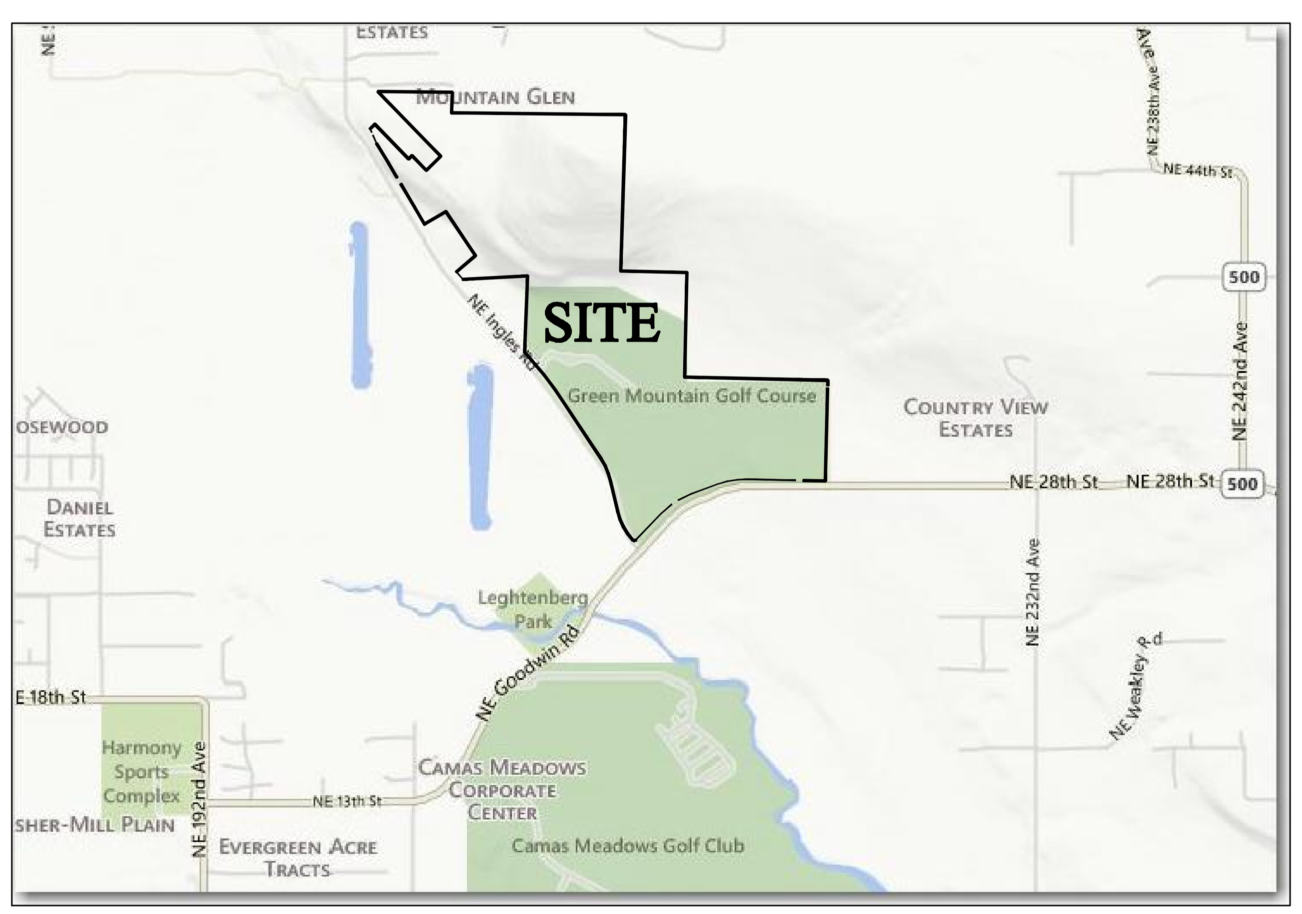
Geotechnical Engineer:
GeoPacific Engineering, Inc.
Contact: Beth K. Rapp, RG
14835 SW 72nd Ave
Portland, OR 97224
(503) 598-8445 FAX: (503) 941-9281
brapp@geopacificeng.com

Wetland Biologist & Natural Resources:
Ecological Land Services
Contact: Andrea Aberle
1157 3rd Ave, Suite 2200
Longview, WA 98632
(360) 578-1371 FAX: (360) 414-9305
email: andrea@eco-land.com

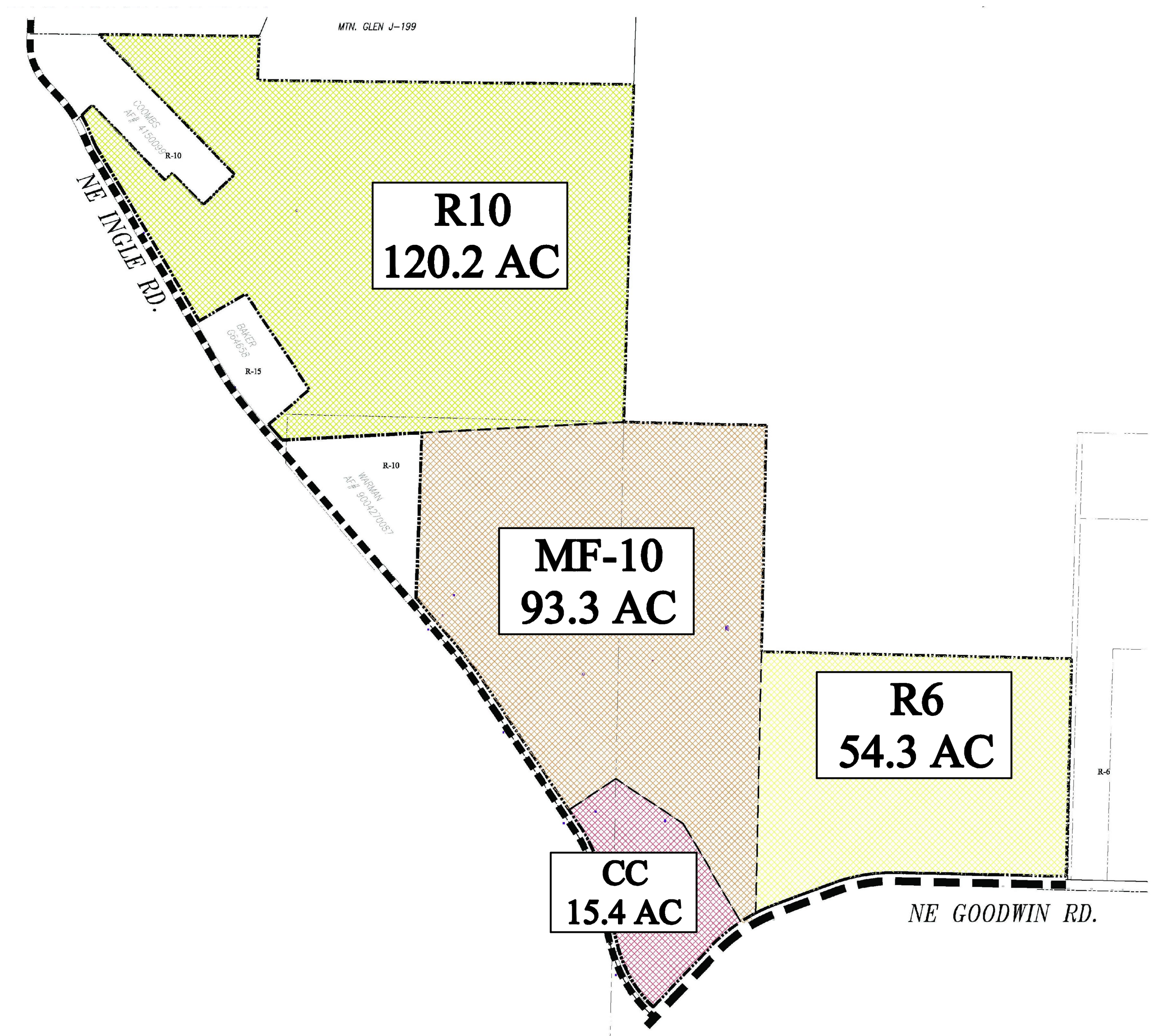
Traffic Engineer:
Kittelson & Associates, Inc.
Contact: Chris Brehmer
610 SW Alder Street, Suite 700
Portland, OR 97205
(503) 228-5230
email: cbrehmer@kittelson.com

Archaeologist:
Archaeological Services, LLC
Contact: Alexander Gall
2464 Stapleton Road #3
Vancouver, WA 98661
(360) 260-8614 FAX: (360) 260-0129

SHEET INDEX



VICINITY MAP



ZONING MAP

WESTERN PLANNING ASSOCIATES

Land Planning
Landscape
Architecture

P.O.BOX 2392
LAKE OSWEGO, OR
97035
503-294-0222

SCALE: AS NOTED

DESIGNED BY: WFH
DRAWN BY: SH
CHECKED BY: WFH

DATE: 12/30/14
REVISED:

STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
WILLIAM F. HORNING
CERTIFICATE NO. 382

GREEN MOUNTAIN
COVER SHEET
GREEN MOUNTAIN LAND, LLC.
CAMAS, WASHINGTON

EXHIBIT 8

GREEN MOUNTAIN

CAMAS, WASHINGTON

CONCEPTUAL MASTER PLAN FOR A MIXED USE PLANNED RESIDENTIAL DEVELOPMENT

GREEN MOUNTAIN LAND, LLC.

TOTAL SITE AREA 283.3 AC

SITE AREA TABLE

R10 ZONE	119.7 AC
R6 ZONE	54.8 AC
MF10 ZONE	93.0 AC
CC ZONE	15.8 AC

RESIDENTIAL DENSITY CALCULATION

R-10	119.7	@ 4.3 / ACRES = 515 UNITS
R-6	54.8	@ 7.2 / ACRES = 395 UNITS
MF-10	93.0	@ 10 / ACRES = 930 UNITS
TOTAL		1840 UNITS

DENSITY TABLE

POD	ACRES	APPROX. LOT SIZE RANGE	DENSITY RANGE	UNIT / LOT RANGE
A	12.2 (A1-A3)	HD	16-18	195-220
B	15.5 (B1-B5)	1000-3000	12 - 16	186-248
C	11.9 (C1-C2)	3000-5000	7-12	83-143
D	41.3 (D1-D6)	4000-7000	5 - 8	207-330
E	26.5 (E1-E4)	4500-9000	4 - 7	106-185
F	28.6 (F1-F4)	5500-11,000	3.5 - 5	100-143
G	30.0 (G1)	15,000-40,000	1.5 - 2	30-60
H	15.4 (CC)			100-150
TOTALS	181.4 AC			1007-1300 *

* TOTAL UNITS /LOTS NOT TO EXCEED 1300

URBAN VILLAGE AREA (H, A1, A2, A3, B5)
A COMMERCIAL, MIXED USE AND RESIDENTIAL COMMUNITY CENTER (± 33.5 AC GROSS, 24.2 AC NET)

CIRCULATION COMPONENTS

ARTERIAL (1.1 AC)

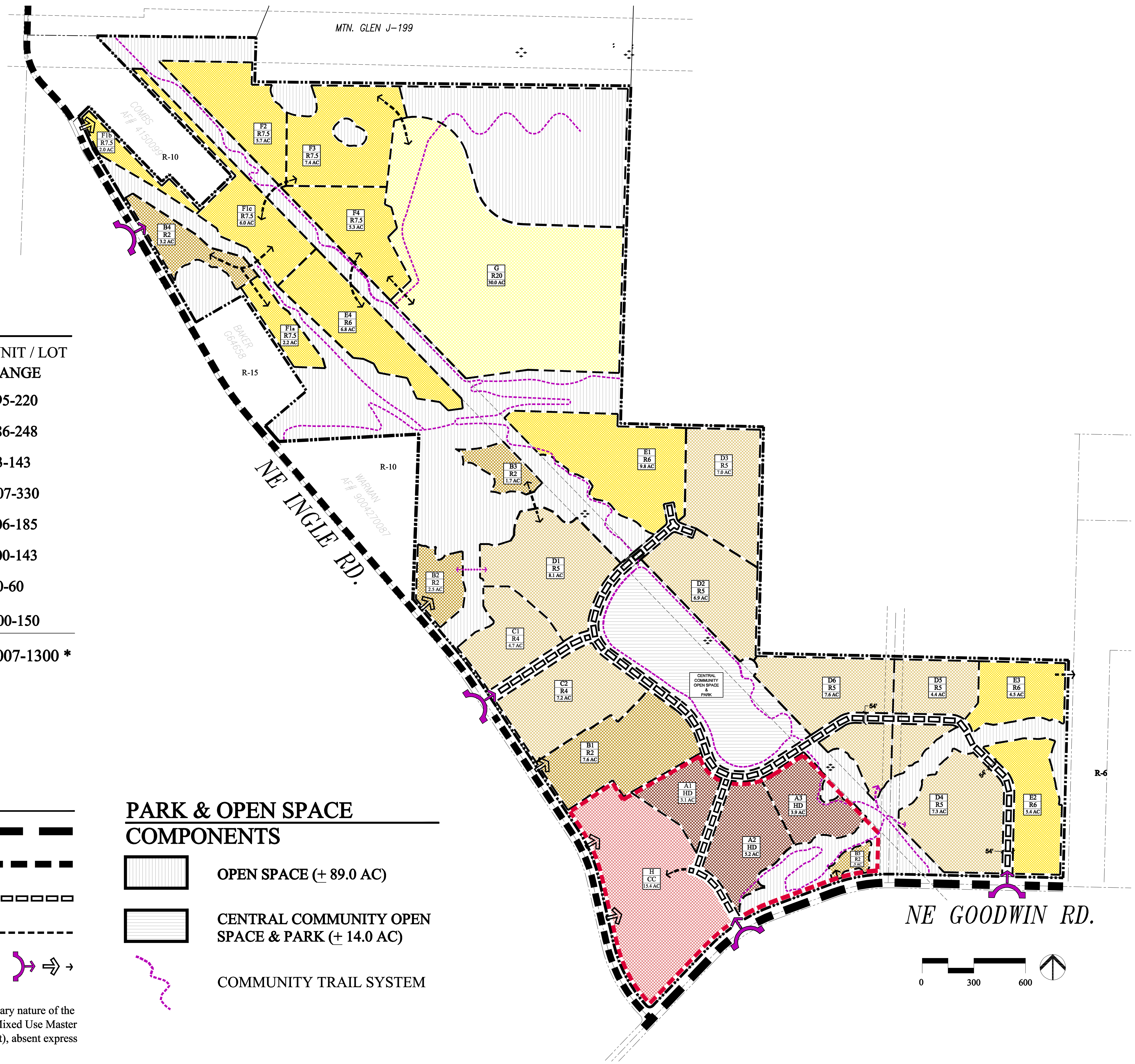
COLLECTOR (.7 AC)

NEIGHBORHOOD CIRCULATOR
LOCATION SHOWN IS APPROXIMATE & SUBJECT TO ADJUSTMENT

NEIGHBORHOOD CONNECTOR
LOCATION SHOWN IS APPROXIMATE & SUBJECT TO ADJUSTMENT

COMMUNITY ENTRIES & ACCESS POINTS
LOCATION SHOWN IS APPROXIMATE & SUBJECT TO ADJUSTMENT

NOTE:
The precise location and number of units within the pods are approximate due to the preliminary nature of the design. While unit numbers per pod may change, the total number of units of the proposed Mixed Use Master Plan will not be exceeded (except as provided for in section 5 of the Development Agreement), absent express consent from the City after appropriate regulatory process.



PARK & OPEN SPACE COMPONENTS

OPEN SPACE (± 89.0 AC)

CENTRAL COMMUNITY OPEN SPACE & PARK (± 14.0 AC)

COMMUNITY TRAIL SYSTEM

WESTERN PLANNING ASSOCIATES

Land Planning
Landscape Architecture

P.O.BOX 2392
LAKE OSWEGO, OR
97035
503-294-0222

SCALE: AS NOTED
DESIGNED BY: WFH
DRAWN BY: SH
CHECKED BY: WFH

DATE: 12/30/14
REVISED:

STATE OF WASHINGTON
REGISTERED LANDSCAPE ARCHITECT
WILLIAM F. HORNING
CERTIFICATE NO. 382

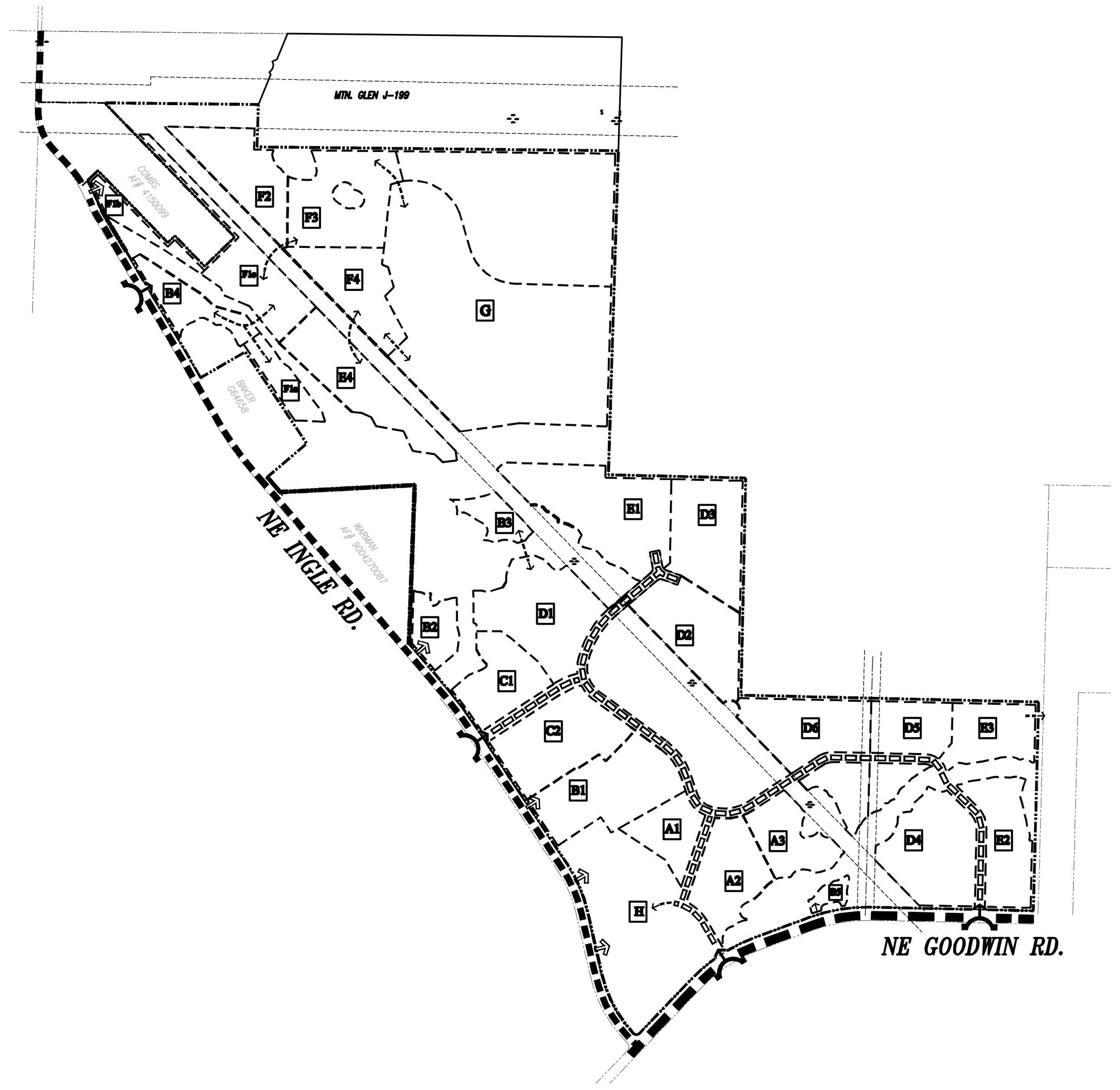
GREEN MOUNTAIN MASTER PLAN
GREEN MOUNTAIN LAND, LLC.
CAMAS, WASHINGTON

GREEN MOUNTAIN

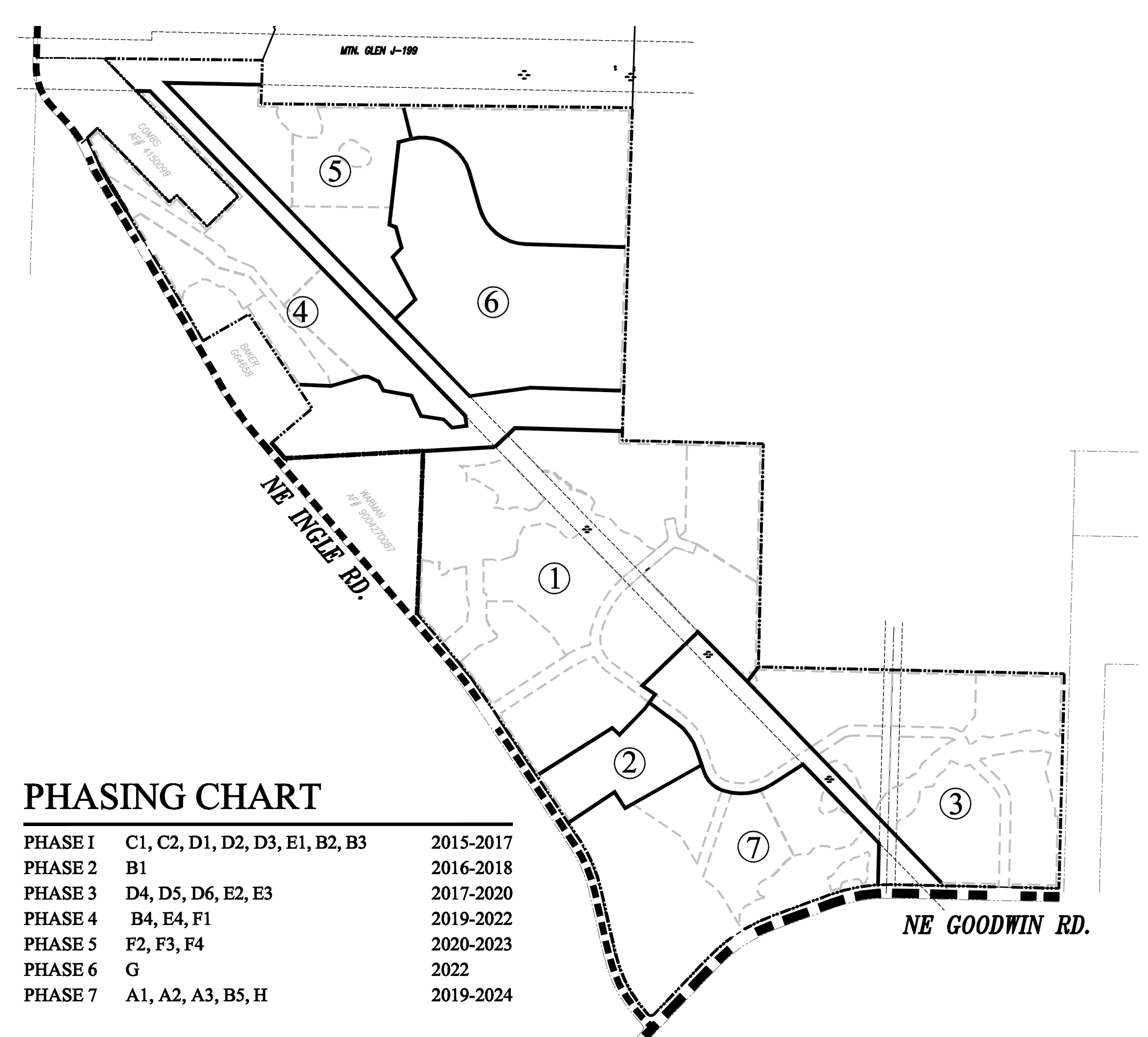
CAMAS, WASHINGTON

DEVELOPMENT STANDARDS & PHASING PLAN

GREEN MOUNTAIN LAND, LLC.



PLANNING UNITS



PHASING CHART

PHASE I	C1, C2, D1, D2, D3, E1, B2, B3	2015-2017
PHASE 2	B1	2016-2018
PHASE 3	D4, D5, D6, E2, E3	2017-2020
PHASE 4	B4, E4, F1	2019-2022
PHASE 5	F2, F3, F4	2020-2023
PHASE 6	G	2022
PHASE 7	A1, A2, A3, B5, H	2019-2024

PHASING PLAN

PLANNING STANDARDS

URBAN VILLAGE AREA

URBAN VILLAGE AREA - Mixed Use, Community Commercial, A and B PODS

Urban Village Area	Minimum of 8.8 acres with ground floor Employment/Commercial Use (as provided for in 18.07.030 Table 1). Allow horizontal and vertical Mixed Use PODs H, A1, A2, A3, B5 and 100 Units at the Village Center

DENSITY & DIMENSIONS

DENSITY and DIMENSIONS -

Green Mountain PRD PODs A-G and corresponding Camas Zones

	A POD	B POD	C POD
DENSITY	**MF-24**	**MF-18**	**MF-10**
Max. du/gac	24	18	10
Min. du/gac	6	6	6
STANDARD LOTS			
Min. lot SF	~~1,800~~ 1,000 [a]	~~2,100~~ 1,000[a]	3,000 [a]
Min. lot width	20	20	30
Min. lot depth	~~60~~ 50	~~60~~ 50	70
Max.Floor Area per du	No Max	No Max	No Max
SETBACKS			
Min.front/at garage	~~10/18~~ None	~~10~~ 6/3@OS/18	~~15/18~~ 10/18
Min. side	3 [1]	3 [1]	3 [1]
Min. side Flanking Street	~~15~~ None [d]	~~15~~ 10	~~15~~ 10
Min. rear *(garage @alley)*	~~10~~ None [d]	10 [b][c]	10[b][c]
LOT COVERAGE, Max.	~~75%~~ None [c]	~~65%~~ None	55%
BUILDING HEIGHT, Max.	~~45[2]~~ 60	45 [2]	35 [2]

a. Single Family Detached homes to be permitted. For SFD in A POD apply B Pod setbacks.

b. 10 feet for front access garage.

c. Minimum rear yard for alley accessed garage is either 3' or 18'.

d. Franchise utilities to be located in front or side yard easements abutting right of way.

1. The non-attached side of a dwelling unit shall be three feet, otherwise a zero-lot line is assumed.
2. Maximum building height: three stories and a basement but not to exceed maximum building height.

Density Transfer Lots	D POD	E POD	F POD	G POD
DENSITY	**R-5**	**R-6**	**R-7.5**	**R-20**
Max. du/gac	8.7	7.2	5.8	2.1
DENSITY TRANSFER LOTS				
Min. lot size (sq ft)	3,500 [a]	4,200	5250	14,000
Max, lot size (sq ft)	~~6,000~~ 7,000	~~7,200~~ 9,000	~~9,000~~ 14,999	~~24,000~~ 60,000
Min. lot width	40	50	60	90
Min. lot depth	80	80	80	100
LOT COVERAGE, Max.	45%	40%	40%	30%
BUILDING HEIGHT, MAX. (ft)	35	35	35	35
SETBACKS based on ~~avg.~~ lot size	Up to 4,999 sq. ft.	5,000 to 7,499 sq. ft.	7,500 to 14,999 sq. ft.	15,000 to 60,000 sq. ft.
Min.front/at garage	~~15~~ 10/18	~~20~~ 15/18	20	30
Min. side and corner lot rear yard (ft)	~~5~~ 4	5	5	15
Min. side yard flanking a street	~~15~~ 10	~~20~~ 15	~~20~~ 15	30
Min. rear *(garage @alley)*	~~20~~ 15[b][c]	~~25~~ 20[b][c]	~~25~~ 20[b][c]	30
Min. lot frontage on a cul-de-sac or curve (ft)	25	30	30	40

a. Single Family detached homes to be permitted.

b. 10 feet for front access garage.

c. Minimum rear yard for alley accessed garage is either 3' or 18'.

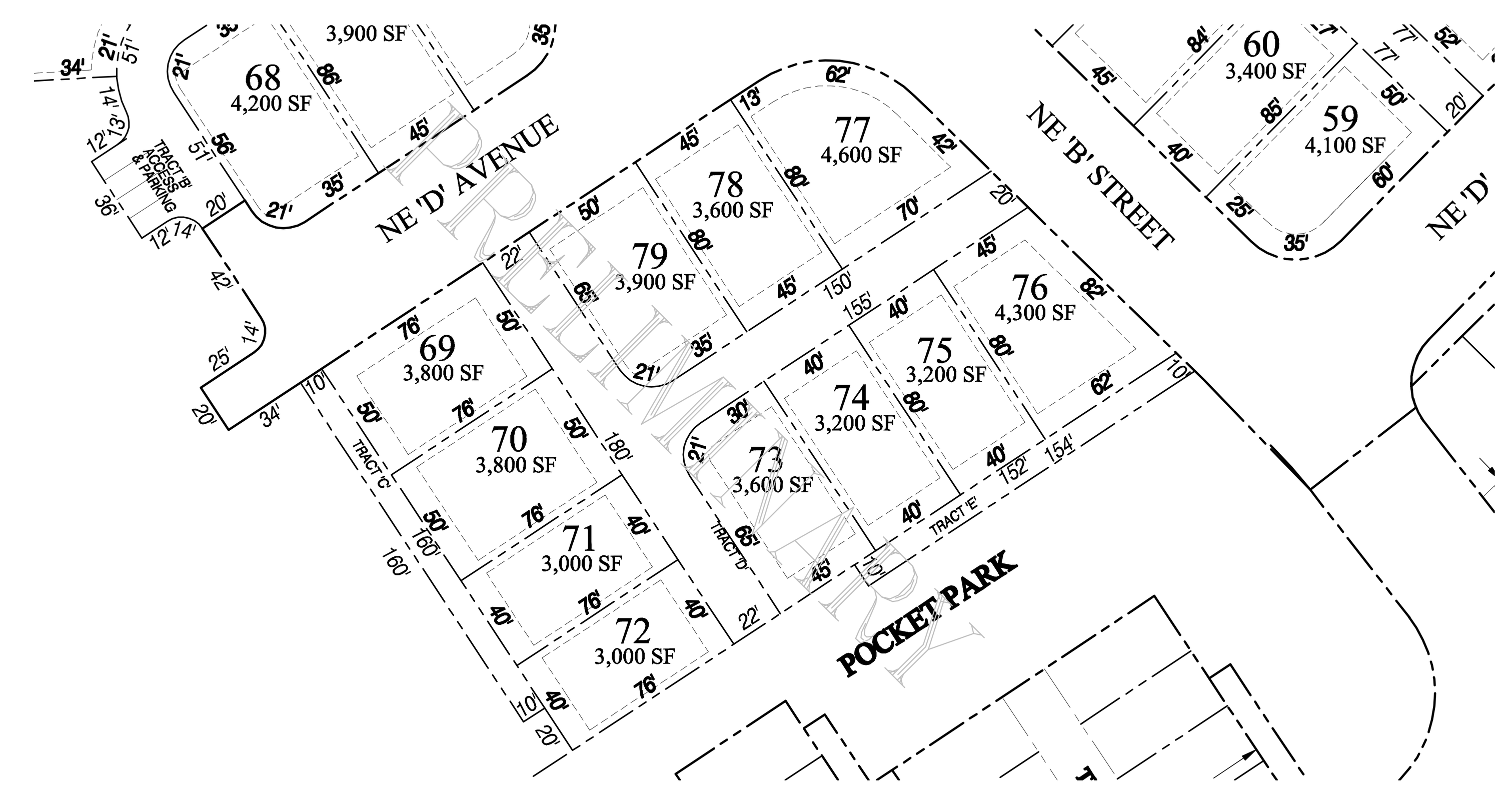
NOTE: POD lot sizes are not subject to lot size averaging.

12/29/14

POD B- TYPICAL LOT & DEVELOPMENT PATERNS

LOT DIMENSIONS & BUILDING ENVELOPES

0 60 120



POD C- TYPICAL LOT & DEVELOPMENT PATERNS

LOT DIMENSIONS & BUILDING ENVELOPES

0 60 120

WESTERN PLANNING ASSOCIATES

Land Planning
Landscape
Architecture

P.O.BOX 2392
LAKE OSWEGO, OR
97035
503-294-0222

SCALE: AS NOTED

DESIGNED BY: WFH
DRAWN BY: SH
CHECKED BY: WFH

DATE: 12/30/14
REVISED:

WILLIAM F. HORNING
CERTIFICATE NO. 382

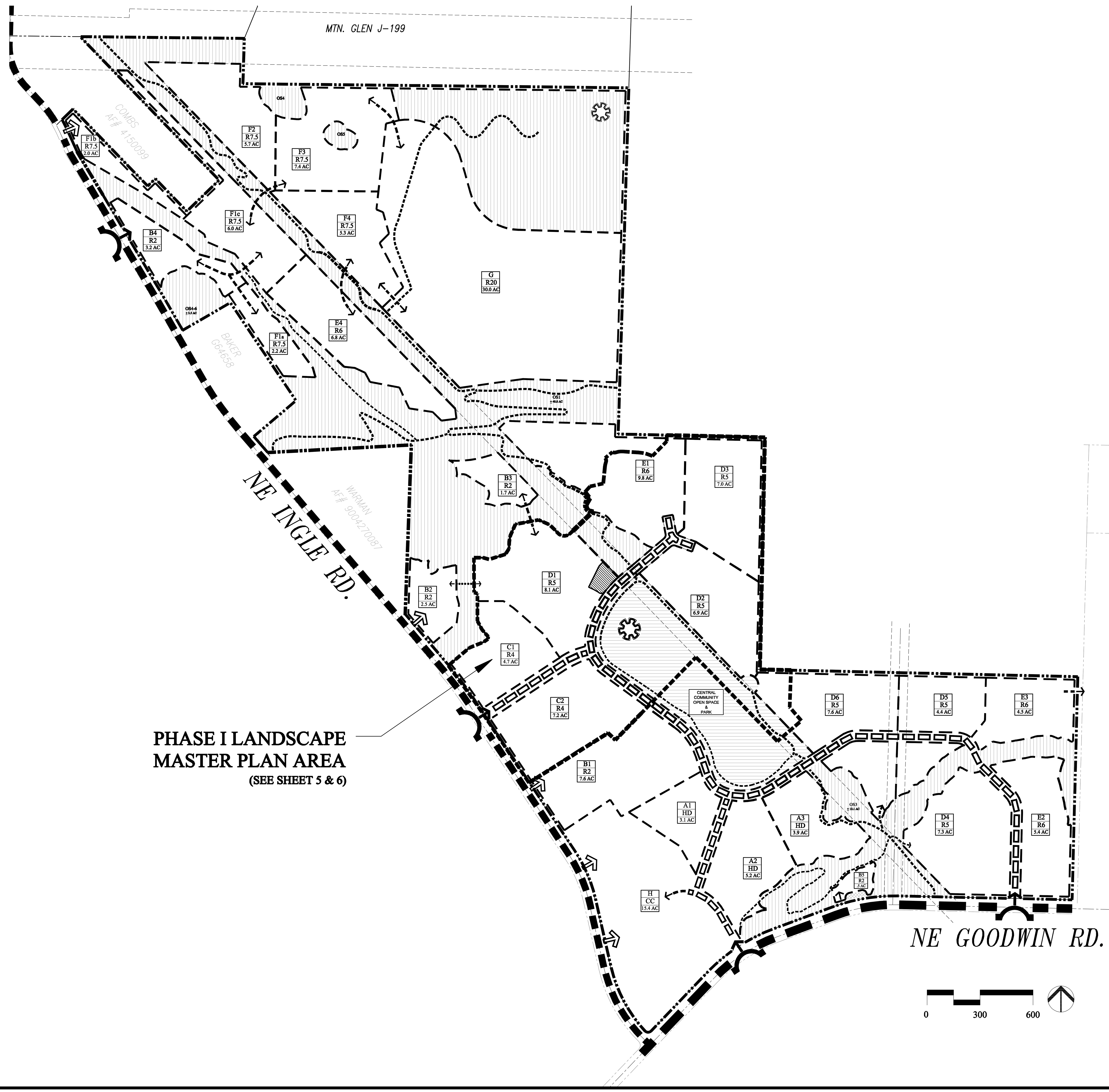
GREEN MOUNTAIN
DEVELOPMENT STANDARDS & PHASING PLAN
GREEN MOUNTAIN LAND, LLC.
CAMAS, WASHINGTON

GREEN MOUNTAIN

CONCEPTUAL OPEN SPACE, PARK & LANDSCAPE MASTER PLAN

CAMAS, WASHINGTON

GREEN MOUNTAIN LAND, LLC.



LEGEND

PARK & OPEN SPACE COMPONTENTS

PARKS & OPEN SPACE AREAS (+ 89 *)

CENTRAL COMMUNITY OPEN SPACE & PARK (14 AC)

TOP OF GREEN MOUNTAIN

COMMUNITY TRAIL SYSTEM
(LOCATION SHOWN IS CONCEPTUAL)

REGIONAL TRAIL T27
TYPICAL EASEMENT WIDTH 24 FEET ** PLUS SWITCHBACK AREAS
8' WIDE AT CENTRAL PARK. PAVED
6' WIDE FLAT UP TO 8% TRAIL GRADE, PAVED
4' WIDE IN STEEP TERRAIN (8%- 16% TRAIL GRADE), COMPACTED GRAVEL

T29 / T30 / SU14
TYPICAL EASEMENT WIDTH 24 FEET** PLUS SETCHBACK AREAS
6' WIDE FLAT UP TO 8% TRAIL GRADE, COMPACTED GRAVEL
4' WIDE IN STEEP TERRAIN (8% - 16% TRAIL GRADE), COMPACTED GRAVEL

NEIGHBORHOOD TRAILS
EASEMENTS IN COMMON AREA TRACTS
6' WIDE FLAT UP TO 8% TRAIL GRADE, PAVED
4' WIDE IN STEEP TERRAIN (8% - 16% TRAIL GRADE), COMPACTED GRAVEL

* DOES NOT INCLUDE POCKET PARKS

** WHERE NOT ADJACENT TO A PUBLIC RIGHT OF WAY

LANDSCAPE MASTER PLAN COMPONENTS

GREEN MOUNTAIN CLUB HOUSE

ENTRY BOULEVARD

PROJECT IDENTIFICATION & ENTRY FEATURE

WESTERN PLANNING ASSOCIATES
Land Planning
Landscape Architecture
P.O.BOX 2392
LAKE OSWEGO, OR
97035
503-294-0222

SCALE: AS NOTED
DESIGNED BY: WFH
DRAWN BY: SH
CHECKED BY: WFH
DATE: 12/30/14
REVISED:

PRELIMINARY
STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
WILLIAM F. HORNING
CERTIFICATE NO. 382

GREEN MOUNTAIN
CONCEPTUAL OPEN SPACE, PARK & LANDSCAPE MASTER PLAN
GREEN MOUNTAIN LAND, LLC.
CAMAS, WASHINGTON

GREEN MOUNTAIN

EXHIBIT 11

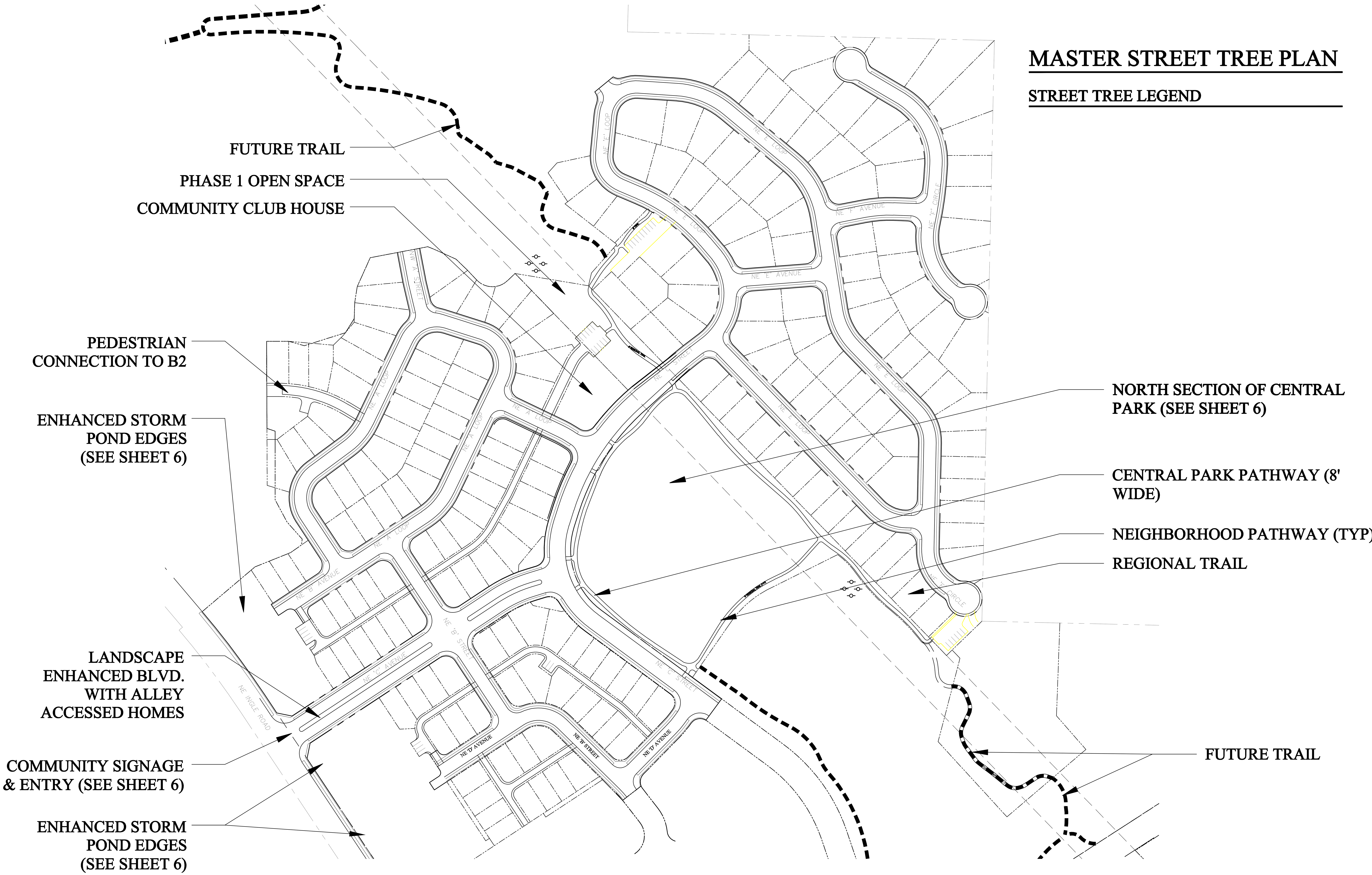
CAMAS, WASHINGTON

LANDSCAPE MASTER PLAN COMPONENTS- PHASE 1

GREEN MOUNTAIN LAND, LLC.

MASTER STREET TREE PLAN

STREET TREE LEGEND



WESTERN PLANNING ASSOCIATES

Land Planning
Landscape
Architecture

P.O.BOX 2392
LAKE OSWEGO, OR
97035
503-294-0222

SCALE: AS NOTED

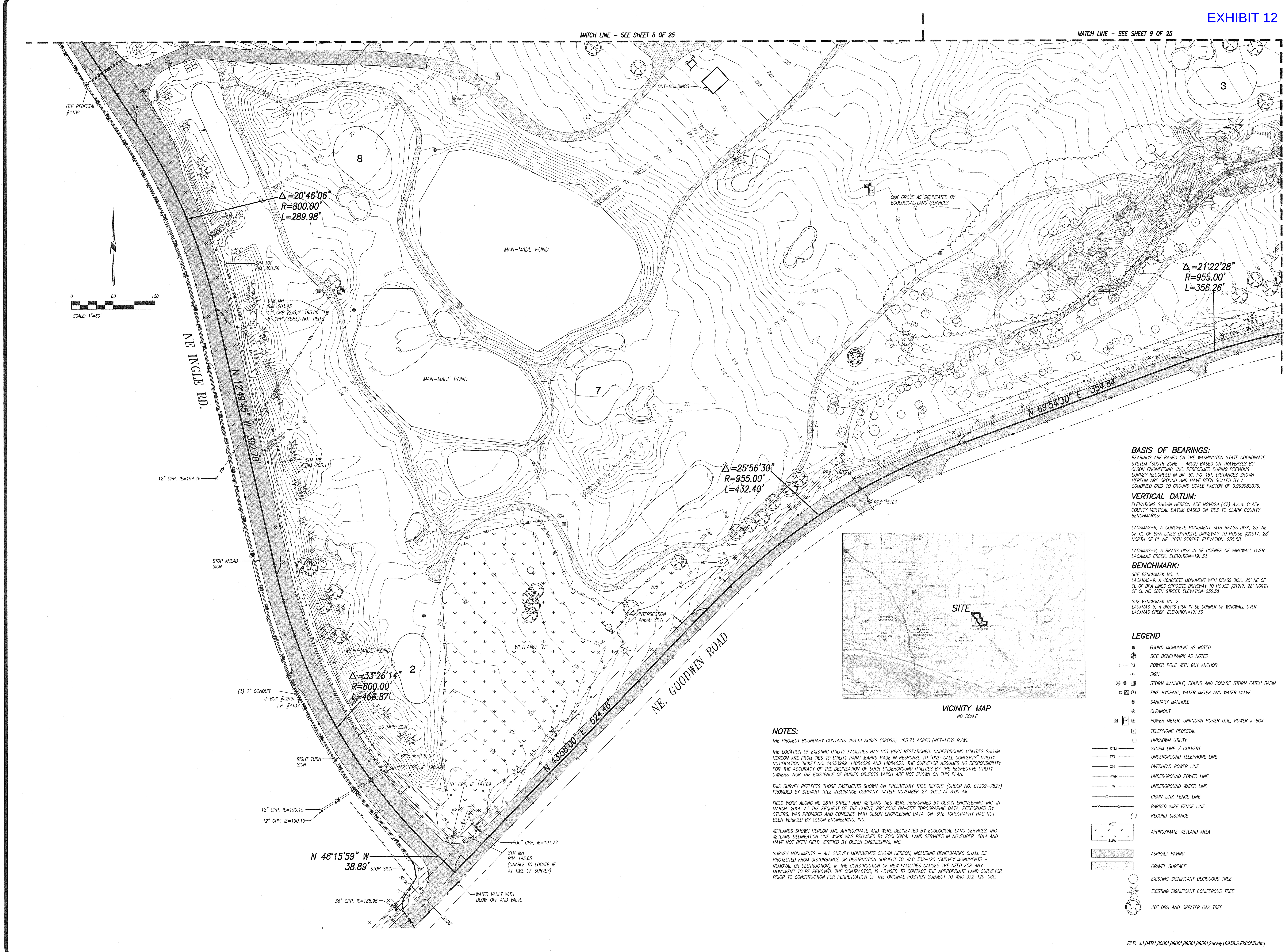
DESIGNED BY: WFH
DRAWN BY: SH
CHECKED BY: WFH

DATE: 12/30/14
REVISED:

PRELIMINARY
STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
WILLIAM F. HORNING
CERTIFICATE NO. 382

GREEN MOUNTAIN
LANDSCAPE MASTER PLANCOMPONENTS
GREEN MOUNTAIN LAND, LLC.
CAMAS, WASHINGTON

EXHIBIT 12



NOTES:

THE PROJECT BOUNDARY CONTAINS 288.19 ACRES (GROSS). 283.73 ACRES (NET-LESS R/W).

THE LOCATION OF EXISTING UTILITY FACILITIES HAS NOT BEEN RESEARCHED. UNDERGROUND UTILITIES SHOWN HEREON ARE FROM TIES TO UTILITY PAINT MARKS MADE IN RESPONSE TO "ONE-CALL CONCEPTS" UTILITY NOTIFICATION TICKET NO. 14053999, 14054029 AND 14054032. THE SURVEYOR ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE DELINEATION OF SUCH UNDERGROUND UTILITIES BY THE RESPECTIVE UTILITY OWNERS, NOR THE EXISTENCE OF BURIED OBJECTS WHICH ARE NOT SHOWN ON THIS PLAN.

THIS SURVEY REFLECTS THOSE EASEMENTS SHOWN ON PRELIMINARY TITLE REPORT (ORDER NO. 01209–7827) PROVIDED BY STEWART TITLE INSURANCE COMPANY, DATED: NOVEMBER 27, 2012 AT 8:00 AM.

FIELD WORK ALONG NE 28TH STREET AND WETLAND TIES WERE PERFORMED BY OLSON ENGINEERING, INC. IN MARCH, 2014. AT THE REQUEST OF THE CLIENT, PREVIOUS ON–SITE TOPOGRAPHIC DATA, PERFORMED BY OTHERS, WAS PROVIDED AND COMBINED WITH OLSON ENGINEERING DATA. ON–SITE TOPOGRAPHY HAS NOT BEEN VERIFIED BY OLSON ENGINEERING, INC.

WETLANDS SHOWN HEREON ARE APPROXIMATE AND WERE DELINEATED BY ECOLOGICAL LAND SERVICES, INC. WETLAND DELINEATION LINE WORK WAS PROVIDED BY ECOLOGICAL LAND SERVICES IN NOVEMBER, 2014 AND HAVE NOT BEEN FIELD VERIFIED BY OLSON ENGINEERING, INC.

SURVEY MONUMENTS – ALL SURVEY MONUMENTS SHOWN HEREON, INCLUDING BENCHMARKS SHALL BE PROTECTED FROM DISTURBANCE OR DESTRUCTION SUBJECT TO WAC 332–120 (SURVEY MONUMENTS – REMOVAL OR DESTRUCTION). IF THE CONSTRUCTION OF NEW FACILITIES CAUSES THE NEED FOR ANY MONUMENT TO BE REMOVED. THE CONTRACTOR, IS ADVISED TO CONTACT THE APPROPRIATE LAND SURVEYOR PRIOR TO CONSTRUCTION FOR PERPETUATION OF THE ORIGINAL POSITION SUBJECT TO WAC 332–120–060.

BASIS OF BEARINGS:

BEARINGS ARE BASED ON THE WASHINGTON STATE COORDINATE SYSTEM (SOUTH ZONE – 4602) BASED ON TRAVERSES BY OLSON ENGINEERING, INC. PERFORMED DURING PREVIOUS SURVEY RECORDED IN BK. 51, PG. 161. DISTANCES SHOWN HEREON ARE GROUND AND HAVE BEEN SCALED BY A COMBINED GRID TO GROUND SCALE FACTOR OF 0.999982076.

VERTICAL DATUM:

ELEVATIONS SHOWN HEREON ARE NGVD29 (47) A.K.A. CLARK COUNTY VERTICAL DATUM BASED ON TIES TO CLARK COUNTY BENCHMARKS:

LACAMAS–9, A CONCRETE MONUMENT WITH BRASS DISK, 25' NE OF CL OF BPA LINES OPPOSITE DRIVEWAY TO HOUSE #21917, 28' NORTH OF CL NE. 28TH STREET. ELEVATION=255.58

LACAMAS–8, A BRASS DISK IN SE CORNER OF WINGWALL OVER LACAMAS CREEK. ELEVATION=191.33

BENCHMARK:

SITE BENCHMARK NO. 1:
LACAMAS–9, A CONCRETE MONUMENT WITH BRASS DISK, 25' NE OF CL OF BPA LINES OPPOSITE DRIVEWAY TO HOUSE #21917, 28' NORTH OF CL NE. 28TH STREET. ELEVATION=255.58

SITE BENCHMARK NO. 2:
LACAMAS–8, A BRASS DISK IN SE CORNER OF WINGWALL OVER LACAMAS CREEK. ELEVATION=191.33

LEGEND

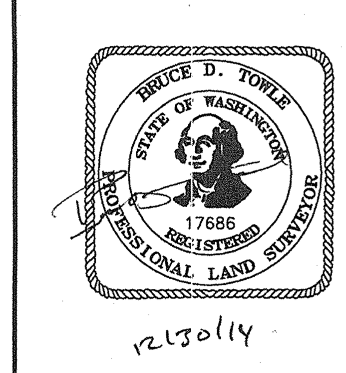
FOUND MONUMENT AS NOTED
SITE BENCHMARK AS NOTED
POWER POLE WITH GUY ANCHOR
SIGN
STORM MANHOLE, ROUND AND SQUARE STORM CATCH BASIN
FIRE HYDRANT, WATER METER AND WATER VALVE
SANITARY MANHOLE
CLEANOUT
POWER METER, UNKNOWN POWER UTIL, POWER J–BOX
TELEPHONE PEDESTAL
UNKNOWN UTILITY
STM — STORM LINE / CULVERT
TEL — UNDERGROUND TELEPHONE LINE
OH — OVERHEAD POWER LINE
PWR — UNDERGROUND POWER LINE
W — UNDERGROUND WATER LINE
CHAIN LINK FENCE LINE
BARBED WIRE FENCE LINE
( ) RECORD DISTANCE
WET — APPROXIMATE WETLAND AREA
ASPHALT PAVING
GRAVEL SURFACE
EXISTING SIGNIFICANT DECIDUOUS TREE
EXISTING SIGNIFICANT CONIFEROUS TREE
20" DBH AND GREATER OAK TREE

FILE: J:\DATA\8000\8900\8930\8938\Survey\8938.S.EXCOND.dwg

CLIENT:
METROPOLITAN LAND GROUP, LLC
17933 NW EVERGREEN PARKWAY,
SUITE 300
BEAVERTON, OR 97006

EXISTING CONDITIONS SURVEY FOR:
GREEN MOUNTAIN MIXED USE PRD
SECTIONS 17, 20 AND 21 T. 2 N., R. 3 E., W.M. CITY OF CAMAS, WA

OLSON LAND SURVEYORS
ENGINEERS
ENGINEERING INC. 222 E. EVERGREEN BLVD., VANCOUVER, WA 98660
360-695-1385
503-289-9936



CHANGES / REVISIONS

DESCRIPTION	DATE

DESIGNED:	
DRAWN:	B.D.T.
CHECKED:	J.M.B.
DATE	DECEMBER 2014
SCALE:	1" = 60'

GREEN MOUNTAIN PRD
JOB NO. 8938.01.02

EXHIBIT 13

CLIENT:
METROPOLITAN LAND GROUP, LLC
17933 NW EVERGREEN PARKWAY, SUITE 300
BEAVERTON, OR 97006

EXISTING CONDITIONS SURVEY FOR:

GREEN MOUNTAIN MIXED USE PRD

SECTIONS 17, 20 & 21 T. 2 N., R 3 E., W.M., CITY OF CAMAS, WA

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
360-695-1385
503-289-9936
222 E. EVERGREEN BLVD., VANCOUVER, WA 98660

BRUCE D. TOWLE
STATE OF WASHINGTON
REGISTERED
17686
PROFESSIONAL LAND SURVEYOR
12/30/14

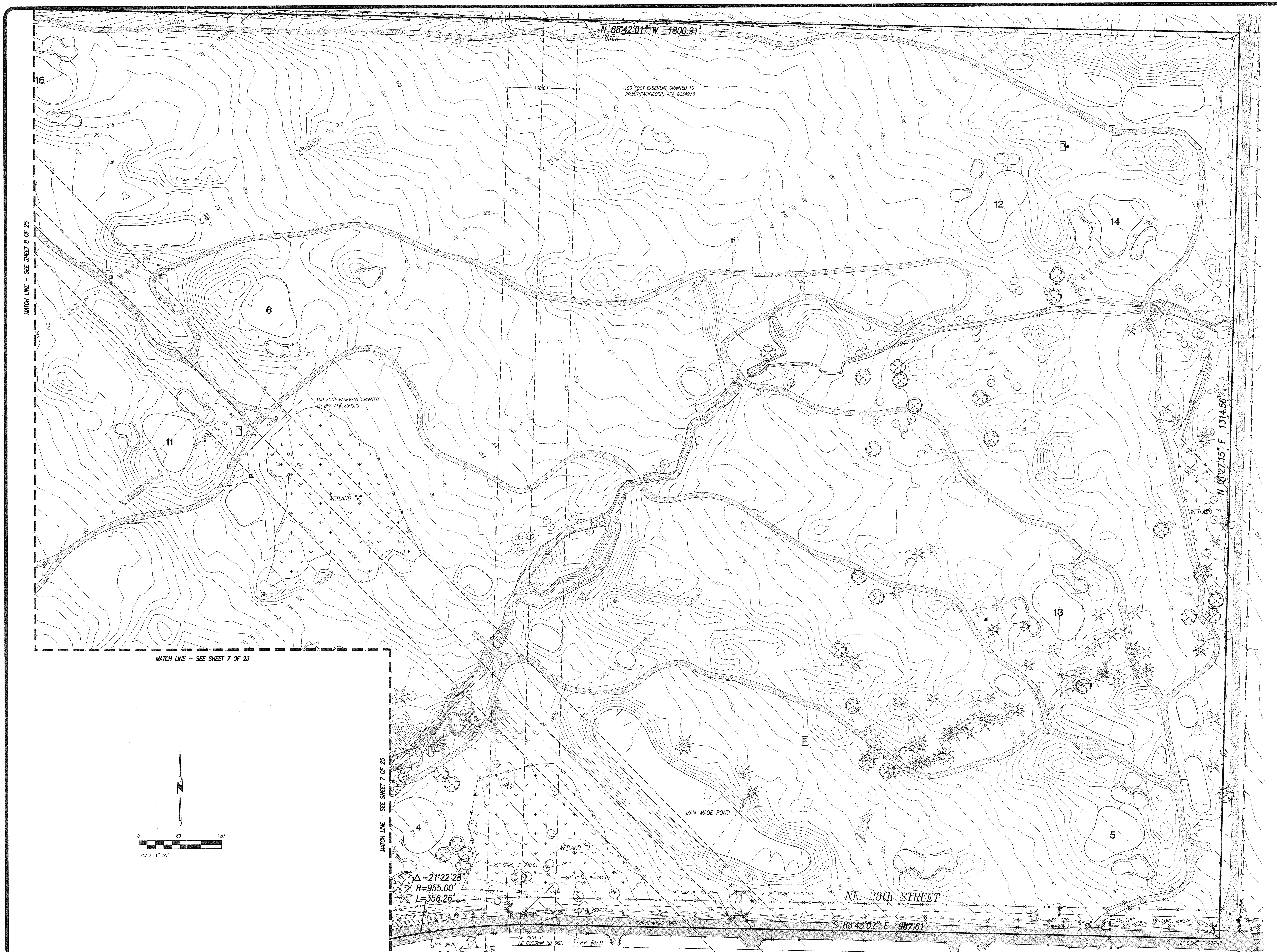
CHANGES / REVISIONS	
DESCRIPTION	DATE

DESIGNED:	
DRAWN:	B.D.T.
CHECKED:	J.M.B.
DATE	DECEMBER 2014
SCALE:	1" = 60'

GREEN MOUNTAIN PRD
JOB NO. 8938.01.02

SHEET
8 of 25

EXHIBIT 14



CLIENT:

METROPOLITAN LAND GROUP, LLC
17933 NW EVERGREEN PARKWAY,
SUITE 300
BEAVERTON, OR 97006

EXISTING CONDITIONS SURVEY FOR:

GREEN MOUNTAIN MIXED USE PRD

SECTIONS 17, 20 & 21 T. 2 N., R 3 E., W.M., CITY OF CAMAS, WA

OLSON LAND SURVEYORS
ENGINEERS
360-695-1385
503-289-9936
ENGINEERING INC. 222 E. EVERGREEN BLVD., VANCOUVER, WA 98660

BRUCE D. TOWLE
STATE OF WASHINGTON
17686
REGISTERED
PROFESSIONAL LAND SURVEYOR

12/30/14

CHANGES / REVISIONS

DESCRIPTION	DATE

DESIGNED:

DRAWN: B.D.T.

CHECKED: J.M.B.

DATE DECEMBER 2014

SCALE: 1" = 60'

GREEN MOUNTAIN PRD

JOB NO. 8938.01.02

EXHIBIT 15

CLIENT:

METROPOLITAN LAND GROUP, LLC
17933 NW EVERGREEN PARKWAY,
SUITE 300
BEAVERTON, OR 97006

EXISTING CONDITIONS SURVEY FOR:

GREEN MOUNTAIN MIXED USE PRD

SECTIONS 17, 20 & 21 T. 2 N., R 3 E., W.M., CITY OF CAMAS, WA

OLSON LAND SURVEYORS
ENGINEERS
ENGINEERING INC. 222 E. EVERGREEN BLVD., VANCOUVER, WA 98660
360-695-1385
503-289-9936

BRUCE D. TOWLE
STATE OF WASHINGTON
17686
REGISTERED
PROFESSIONAL LAND SURVEYOR
12/30/14

CHANGES / REVISIONS

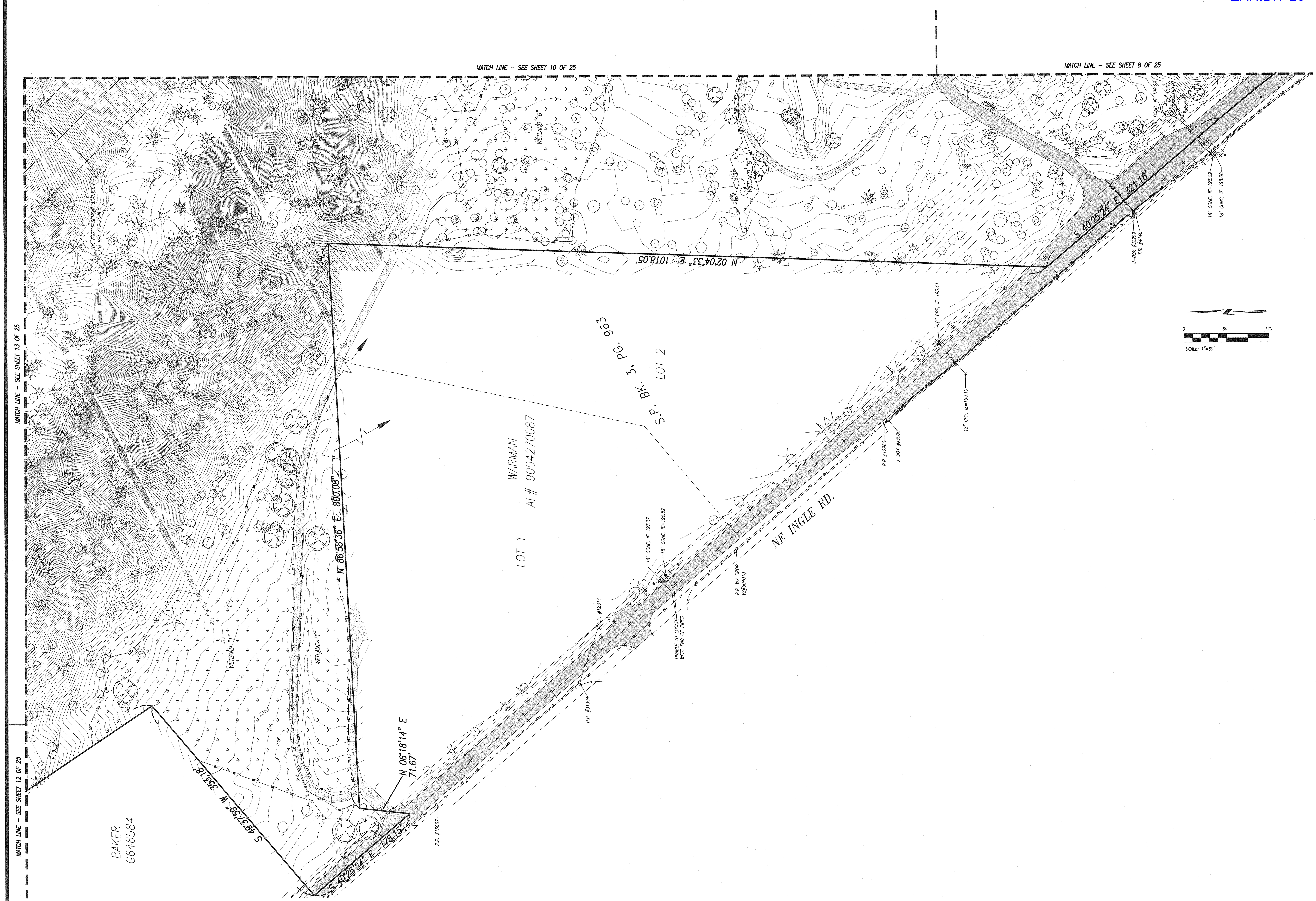
DESCRIPTION	DATE

DESIGNED:
DRAWN: B.D.T.
CHECKED: J.M.B.
DATE DECEMBER 2014
SCALE: 1" = 60'

GREEN MOUNTAIN PRD
JOB NO. 8938.01.02

SHEET
10 of 25

EXHIBIT 16



CLIENT:
METROPOLITAN LAND GROUP, LLC
17933 NW EVERGREEN PARKWAY,
SUITE 300
BEAVERTON, OR 97006

EXISTING CONDITIONS SURVEY FOR:
GREEN MOUNTAIN MIXED USE PRD
SECTIONS 17, 20 & 21 T. 2 N., R 3 E., W.M., CITY OF CAMAS, WA

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN BLVD., VANCOUVER, WA 98660

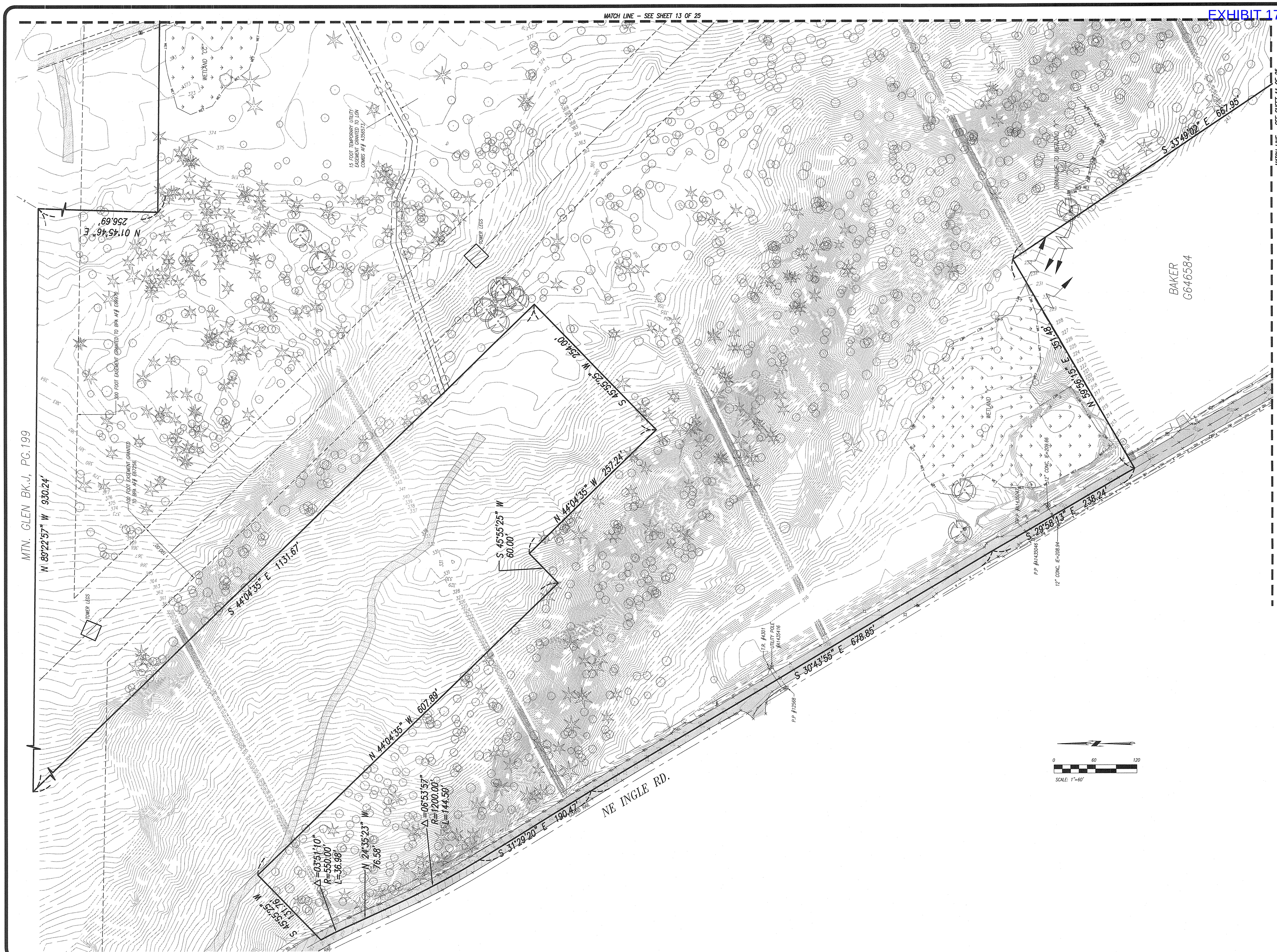
BRUCE D. TOWLE
STATE OF WASHINGTON
17686
REGISTERED
PROFESSIONAL LAND SURVEYOR
12/30/14

CHANGES / REVISIONS	
DESCRIPTION	DATE

DESIGNED:
DRAWN: B.D.T.
CHECKED: J.M.B.
DATE DECEMBER 2014
SCALE: 1" = 60'

GREEN MOUNTAIN PRD
JOB NO. 8938.01.02

EXHIBIT 17



CLIENT:
METROPOLITAN LAND GROUP, LLC
17933 NW EVERGREEN PARKWAY,
SUITE 300
BEAVERTON, OR 97006

EXISTING CONDITIONS SURVEY FOR:

GREEN MOUNTAIN MIXED USE PRD

SECTIONS 17, 20 & 21 T. 2 N., R 3 E., W.M., CITY OF CAMAS, WA

OLSON LAND SURVEYORS ENGINEERS
360-695-1385
503-289-9936
ENGINEERING INC. 222 E. EVERGREEN BLVD., VANCOUVER, WA 98660

BRUCE D. TOWLE
STATE OF WASHINGTON
17686
REGISTERED
PROFESSIONAL LAND SURVEYOR

12/30/14

CHANGES / REVISIONS

DESCRIPTION	DATE

DESIGNED:
DRAWN: B.D.T.
CHECKED: J.M.B.
DATE DECEMBER 2014
SCALE: 1" = 60'

GREEN MOUNTAIN PRD
JOB NO. 8938.01.02

EXHIBIT 18

CLIENT:
METROPOLITAN LAND GROUP, LLC
17933 NW EVERGREEN PARKWAY,
SUITE 300
BEAVERTON, OR 97006

EXISTING CONDITIONS SURVEY FOR:
GREEN MOUNTAIN MIXED USE PRD
SECTIONS 17, 20 & 21 T. 2 N., R 3 E., W.M., CITY OF CAMAS, WA

OLSON LAND SURVEYORS
ENGINEERS
ENGINEERING INC. 222 E. EVERGREEN BLVD., VANCOUVER, WA 98660
360-695-1385
503-289-9936

BRUCE D. TOWLE
STATE OF WASHINGTON
17686
REGISTERED
PROFESSIONAL LAND SURVEYOR
12/30/14

CHANGES / REVISIONS

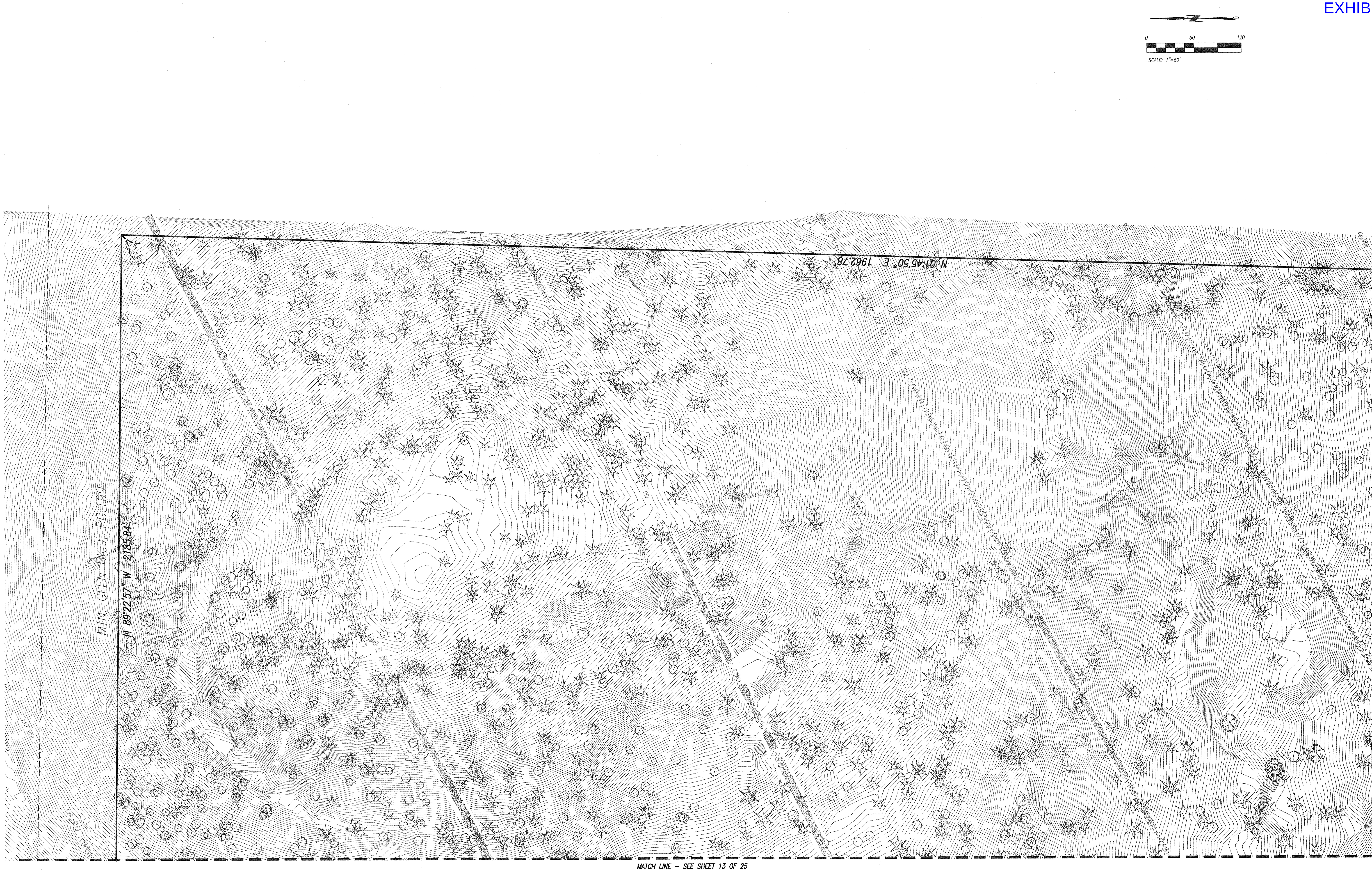
DESCRIPTION	DATE

DESIGNED:
DRAWN: B.D.T.
CHECKED: J.M.B.
DATE DECEMBER 2014
SCALE: 1" = 60'

GREEN MOUNTAIN PRD
JOB NO. 8938.01.02

SHEET
13 of 25

EXHIBIT 19



CLIENT:

METROPOLITAN LAND GROUP, LLC
17933 NW EVERGREEN PARKWAY,
SUITE 300
BEAVERTON, OR 97006

EXISTING CONDITIONS SURVEY FOR:

GREEN MOUNTAIN MIXED USE PRD

SECTIONS 17, 20 & 21 T. 2 N., R 3 E., W.M., CITY OF CAMAS, WA

OLSON LAND SURVEYORS
ENGINEERS
ENGINEERING INC. 222 E. EVERGREEN BLVD., VANCOUVER, WA 98660
360-695-1385
503-289-9936

BRUCE D. TOWLE
STATE OF WASHINGTON
17686
REGISTERED
PROFESSIONAL LAND SURVEYOR
12/30/14

CHANGES / REVISIONS

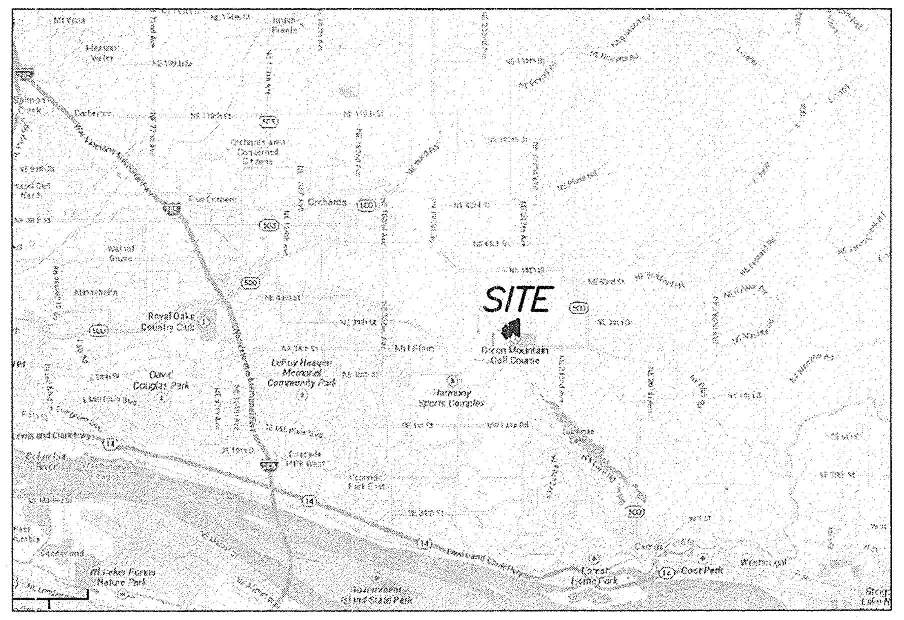
DESCRIPTION	DATE

DESIGNED:	
DRAWN:	B.D.T.
CHECKED:	J.M.B.
DATE	DECEMBER 2014
SCALE:	1" = 60'

GREEN MOUNTAIN PRD
JOB NO. 8938.01.02

SHEET
14 of 25

EXHIBIT 20



VICINITY MAP
NO SCALE

BASIS OF BEARINGS:

BEARINGS ARE BASED ON THE WASHINGTON STATE COORDINATE SYSTEM (SOUTH ZONE – 4602) BASED ON TRAVERSES BY OLSON ENGINEERING, INC. PERFORMED DURING PREVIOUS SURVEY RECORDED IN BK. 51, PG. 161. DISTANCES SHOWN HEREON ARE GROUND AND HAVE BEEN SCALED BY A COMBINED GRID TO GROUND SCALE FACTOR OF 0.999982076.

VERTICAL DATUM:

ELEVATIONS SHOWN HEREON ARE NGVD29 (47) A.K.A. CLARK COUNTY VERTICAL DATUM BASED ON TIES TO CLARK COUNTY BENCHMARKS:

LACAMAS-9, A CONCRETE MONUMENT WITH BRASS DISK, 25' NE OF CL OF BPA LINES OPPOSITE DRIVEWAY TO HOUSE #21917, 28' NORTH OF CL NE. 28TH STREET. ELEVATION=255.58

LACAMAS-8, A BRASS DISK IN SE CORNER OF WINGWALL OVER LACAMAS CREEK. ELEVATION=191.33

BENCHMARK:

SITE BENCHMARK NO. 1:
LACAMAS-9, A CONCRETE MONUMENT WITH BRASS DISK, 25' NE OF CL OF BPA LINES OPPOSITE DRIVEWAY TO HOUSE #21917, 28' NORTH OF CL NE. 28TH STREET. ELEVATION=255.58

SITE BENCHMARK NO. 2:
LACAMAS-8, A BRASS DISK IN SE CORNER OF WINGWALL OVER LACAMAS CREEK. ELEVATION=191.33

NOTES:

THE PROPOSED PHASE 1 BOUNDARY CONTAINS 51.2 ACRES.

THE LOCATION OF EXISTING UTILITY FACILITIES HAS NOT BEEN RESEARCHED. UNDERGROUND UTILITIES SHOWN HEREON ARE FROM TIES TO UTILITY PAINT MARKS MADE IN RESPONSE TO "ONE-CALL CONCEPTS" UTILITY NOTIFICATION TICKET NO. 14053999, 14054029 AND 14054032. THE SURVEYOR ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE DELINEATION OF SUCH UNDERGROUND UTILITIES BY THE RESPECTIVE UTILITY OWNERS, NOR THE EXISTENCE OF BURIED OBJECTS WHICH ARE NOT SHOWN ON THIS PLAN.

THIS SURVEY REFLECTS THOSE EASEMENTS SHOWN ON PRELIMINARY TITLE REPORT (ORDER NO. 01209-7827) PROVIDED BY STEWART TITLE INSURANCE COMPANY, DATED: NOVEMBER 27, 2012 AT 8:00 AM.

FIELD WORK ALONG NE 28TH STREET AND WETLAND TIES WERE PERFORMED BY OLSON ENGINEERING, INC. IN MARCH, 2014. AT THE REQUEST OF THE CLIENT, PREVIOUS ON-SITE TOPOGRAPHIC DATA, PERFORMED BY OTHERS, WAS PROVIDED AND COMBINED WITH OLSON ENGINEERING DATA. ON-SITE TOPOGRAPHY HAS NOT BEEN VERIFIED BY OLSON ENGINEERING, INC.

WETLANDS SHOWN HEREON ARE APPROXIMATE AND WERE DELINEATED BY ECOLOGICAL LAND SERVICES, INC. WETLAND DELINEATION LINE WORK WAS PROVIDED BY ECOLOGICAL LAND SERVICES IN NOVEMBER, 2014 AND HAVE NOT BEEN FIELD VERIFIED BY OLSON ENGINEERING, INC.

SURVEY MONUMENTS – ALL SURVEY MONUMENTS SHOWN HEREON, INCLUDING BENCHMARKS SHALL BE PROTECTED FROM DISTURBANCE OR DESTRUCTION SUBJECT TO WAC 332-120 (SURVEY MONUMENTS – REMOVAL OR DESTRUCTION). IF THE CONSTRUCTION OF NEW FACILITIES CAUSES THE NEED FOR ANY MONUMENT TO BE REMOVED. THE CONTRACTOR, IS ADVISED TO CONTACT THE APPROPRIATE LAND SURVEYOR PRIOR TO CONSTRUCTION FOR PERPETUATION OF THE ORIGINAL POSITION SUBJECT TO WAC 332-120-060.

LEGEND

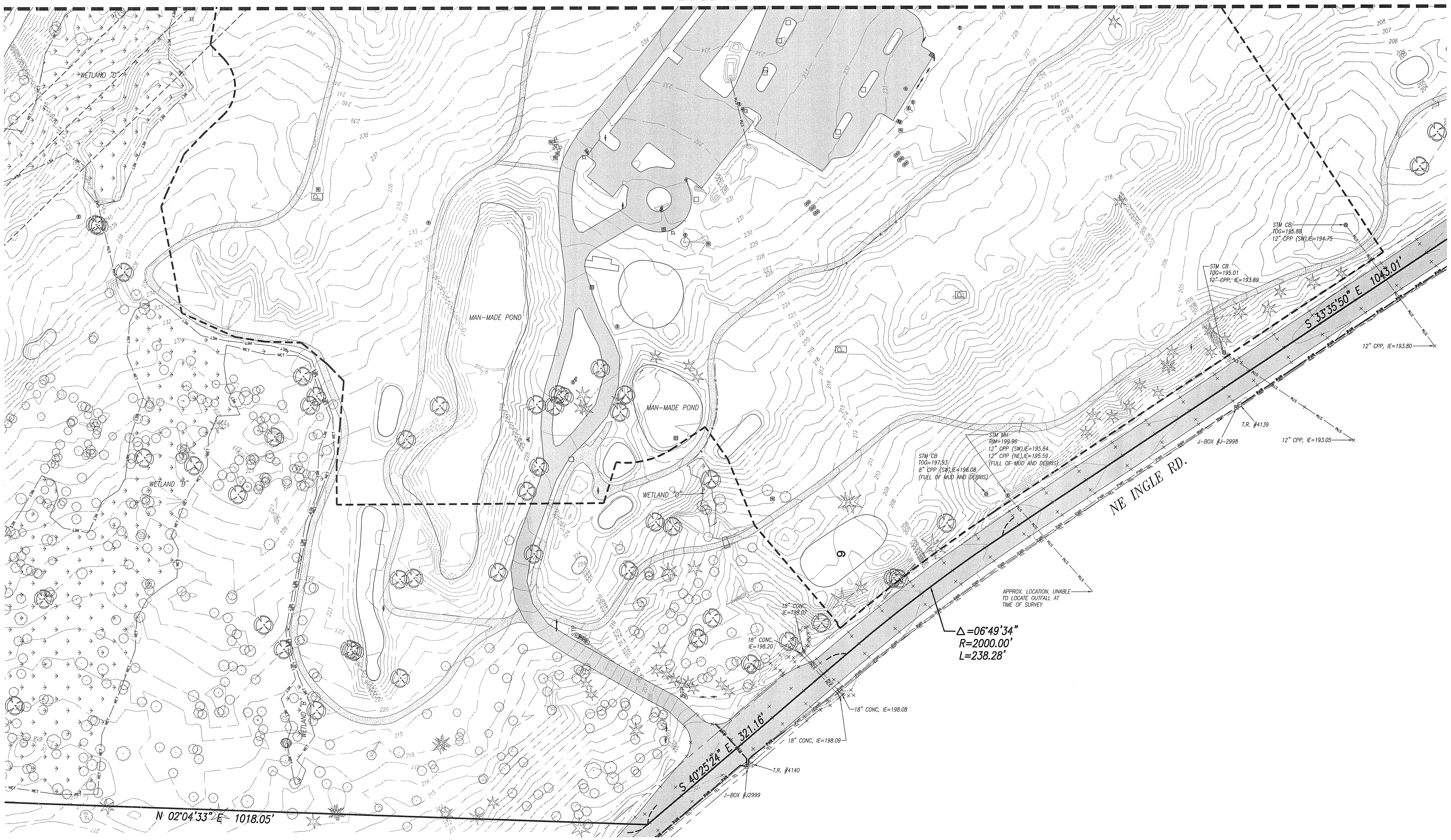
Symbol	Description
●	FOUND MONUMENT AS NOTED
	SITE BENCHMARK AS NOTED
	POWER POLE WITH GUY ANCHOR
	SIGN
STM	STORM MANHOLE, ROUND AND SQUARE STORM CATCH BASIN
WM	FIRE HYDRANT, WATER METER AND WATER VALVE
	SANITARY MANHOLE
	CLEANOUT
EM P JB	POWER METER, UNKNOWN POWER UTIL, POWER J-BOX
T	TELEPHONE PEDESTAL
□	UNKNOWN UTILITY
STM	STORM LINE / CULVERT
TEL	UNDERGROUND TELEPHONE LINE
OH	OVERHEAD POWER LINE
PWR	UNDERGROUND POWER LINE
W	UNDERGROUND WATER LINE
—o—	CHAIN LINK FENCE LINE
—x—x—	BARBED WIRE FENCE LINE
( )	RECORD DISTANCE

LEGEND CONT.

Symbol	Description
WET	APPROXIMATE WETLAND AREA
	ASPHALT PAVING
	GRAVEL SURFACE
	EXISTING SIGNIFICANT DECIDUOUS TREE
	EXISTING SIGNIFICANT CONIFEROUS TREE
	20" DBH AND GREATER OAK TREE
– – –	PROPOSED PHASE 1 BOUNDARY

0 60 120
SCALE: 1"=60'

MATCH LINE – SEE SHEET 16 OF 25



CLIENT:
METROPOLITAN LAND GROUP, LLC
17933 NW EVERGREEN PARKWAY,
SUITE 300
BEAVERTON, OR 97006

EXISTING CONDITIONS SURVEY FOR:
GREEN MOUNTAIN MIXED USE PRD-PHASE 1
SECTIONS 20 & 21 T. 2 N., R 3 E., W.M., CITY OF CAMAS, WA

OLSON LAND SURVEYORS ENGINEERS
ENGINEERING INC. 222 E. EVERGREEN BLVD., VANCOUVER, WA 98660
360-695-1385
503-289-9936

BRUCE D. TOWLE
STATE OF WASHINGTON
17686
REGISTERED
PROFESSIONAL LAND SURVEYOR

12/30/14

CHANGES / REVISIONS	
DESCRIPTION	DATE

DESIGNED:
DRAWN: B.D.T.
CHECKED: J.M.B.
DATE DECEMBER 2014
SCALE: 1" = 60'

GREEN MOUNTAIN PRD
JOB NO. 8938.01.02

EXHIBIT 21

MATCH LINE – SEE SHEET 15 OF 25

CLIENT:
METROPOLITAN LAND GROUP, LLC
17933 NW EVERGREEN PARKWAY,
SUITE 300
BEAVERTON, OR 97006

EXISTING CONDITIONS SURVEY FOR:
GREEN MOUNTAIN MIXED USE PRD–PHASE 1
SECTIONS 20 & 21 T. 2 N., R 3 E., W.M., CITY OF CAMAS, WA

OLSON LAND SURVEYORS
ENGINEERS
360-695-1385
503-289-9936
ENGINEERING INC. 222 E. EVERGREEN BLVD., VANCOUVER, WA 98660

BRUCE D. TOWLE
STATE OF WASHINGTON
17686
REGISTERED
PROFESSIONAL LAND SURVEYOR
12/30/14

CHANGES / REVISIONS

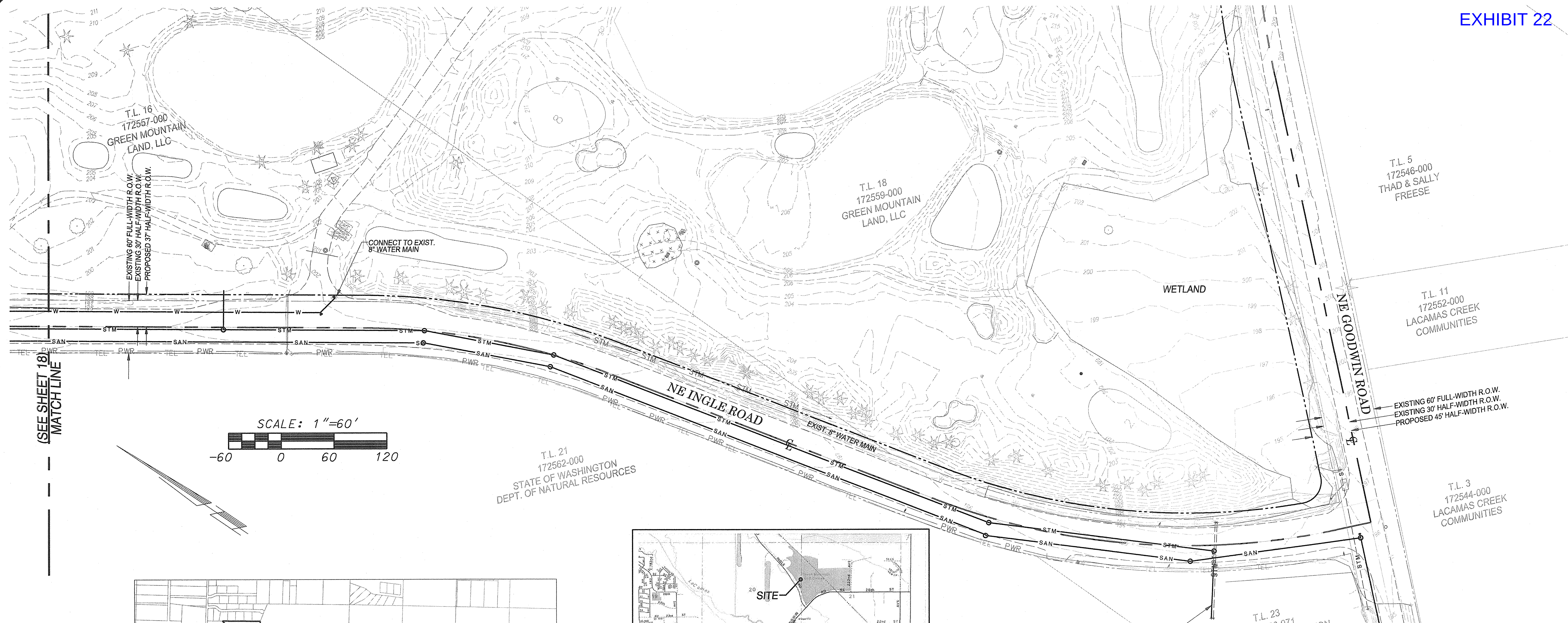
DESCRIPTION	DATE

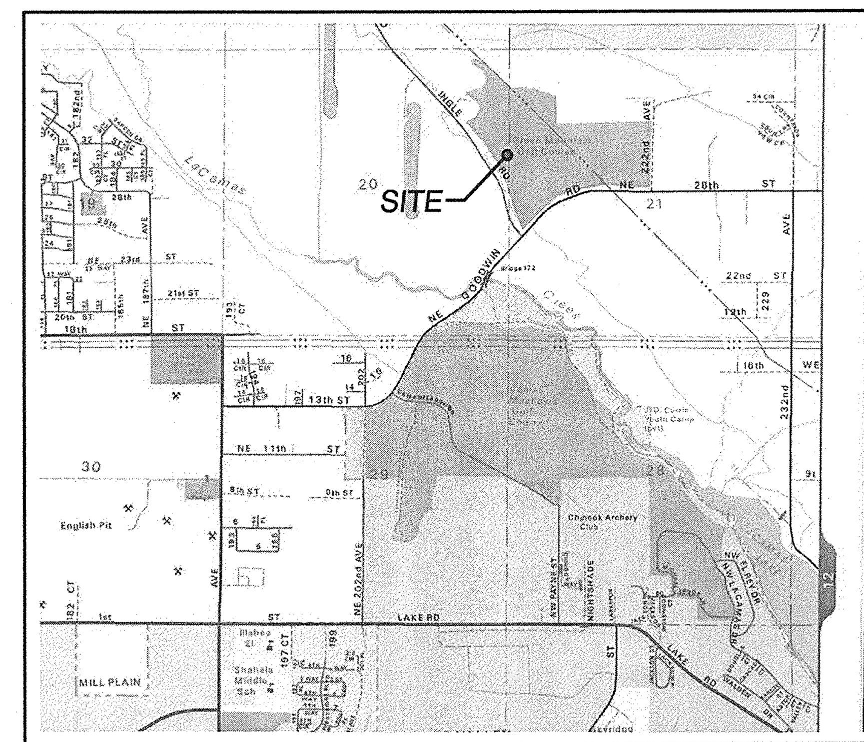
DESIGNED:
DRAWN: B.D.T.
CHECKED: J.M.B.
DATE: DECEMBER 2014
SCALE: 1" = 60'

GREEN MOUNTAIN PRD
JOB NO. 8938.01.02

SHEET
16 of 25

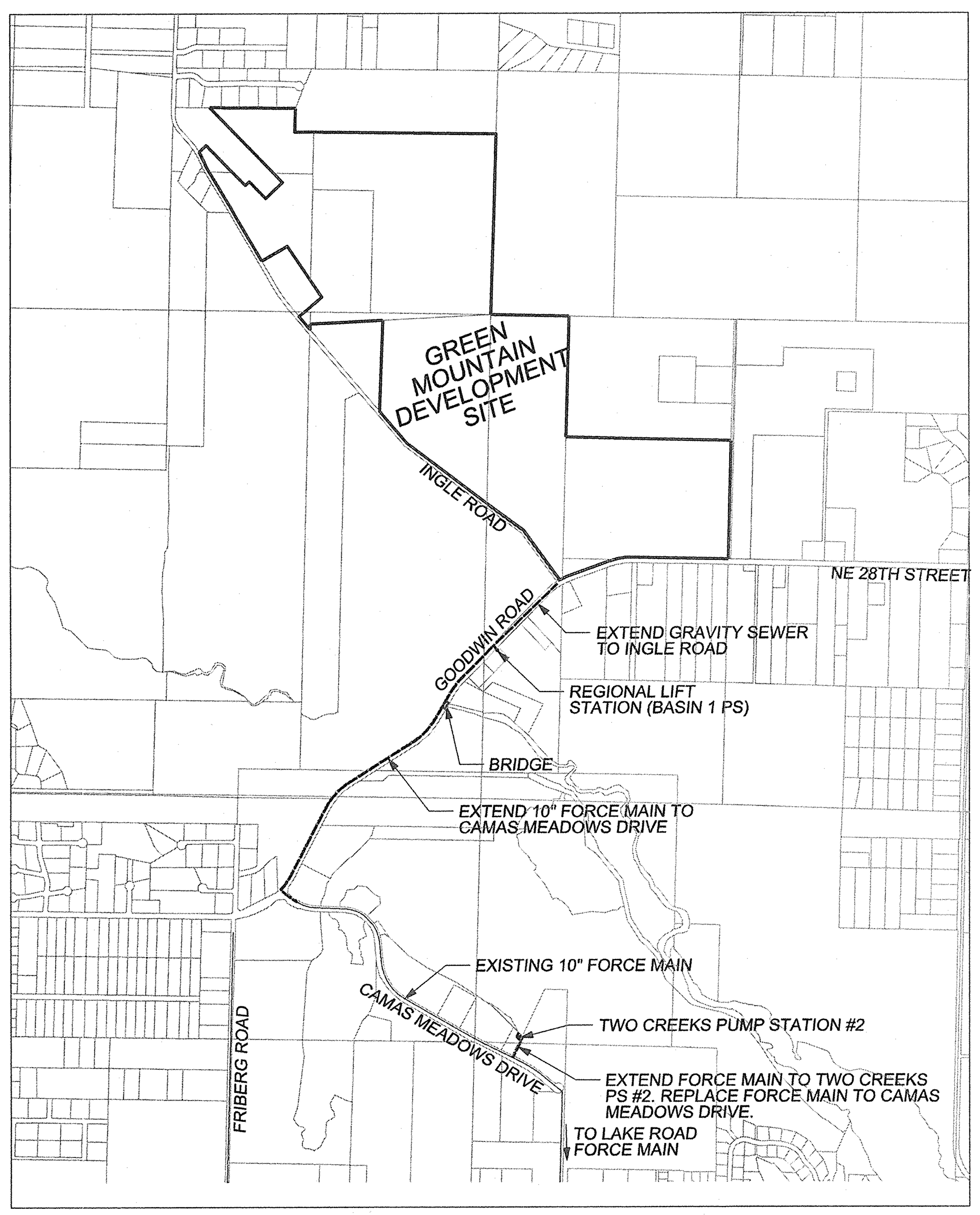
EXHIBIT 22





VICINITY MAP

NTS



SANITARY FORCE MAIN EXTENSION DETAIL

NTS

A / 17

LEGEND

- PERIMETER OF SITE
- RIGHT-OF-WAY LINE
- CENTERLINE OF ROAD
- FACE OF CURB
- LOT LINE
- POD BOUNDARY
- EASEMENT LINE
- STM — STORM SEWER LINE
- STM — EXIST STORM SEWER
- SAN — SANITARY SEWER LINE
- SAN — EXIST SANITARY SEWER
- W — WATER SERVICE LINE
- W — EXIST WATER LINE
- MANHOLE
- CLEAN OUT
- CATCH BASIN
- FIRE HYDRANT ASSEMBLY
- THRUST BLOCK
- W — WATER SERVICE ASSEMBLY
- BF — BACKFLOW ASSEMBLY
- WATER VALVE AND BOX
- BLOW-OFF ASSEMBLY

PRELIMINARY UTILITY NOTES

STORM SEWER:

1) STORMWATER QUALITY AND QUANTITY CONTROL TO BE ACHIEVED USING WETPONDS WITH DETENTION ABOVE THE WETPOOL. STORMWATER FROM THE DEVELOPMENT TO BE DISCHARGED VIA OUTFALLS TO THE EXISTING WETLANDS/STREAM WEST OF NE INGLE ROAD.

2) WETPONDS HAVE BEEN SIZED TO MEET THE PHOSPHORUS CONTROL REQUIREMENTS FOR THE LACAMAS WATER SHED, AS SPECIFIED BY THE CITY OF CAMAS AND THE WASHINGTON STATE DEPARTMENT OF ECOLOGY.

3) THE PROPOSED STORMWATER FACILITIES WILL BE PRIVATELY OWNED AND MAINTAINED, WITH ACCESS AND INSPECTION EASEMENTS TO BE DEDICATED TO THE CITY OF CAMAS AS REQUIRED.

SANITARY:

1) SANITARY SEWER SERVICE WILL BE PROVIDED BY CITY OF CAMAS.

2) SANITARY SEWER WILL BE A GRAVITY SEWER. NEW SEWER MAIN WILL BE EXTENDED OFFSITE TO NEW PUMP STATION LOCATION ON NE GOODWIN RD.

3) SANITARY SEWER EASEMENTS WILL BE DEDICATED TO CITY OF CAMAS AS REQUIRED.

WATER:

1) WATER SERVICE WILL BE PROVIDED BY CITY OF CAMAS.

2) A NEW 8" DIP WATER MAIN WILL BE LOOPED THROUGH THE SITE TO PROVIDE WATER AND FIRE SERVICE TO THE PROPOSED DEVELOPMENT. CONNECTIONS WILL BE MADE TO THE EXISTING 8" DIP MAINS LOCATED IN NE INGLE RD. AND NE GOODWIN RD.

3) FIRE HYDRANTS WILL BE LOCATED AS SHOWN, OR AS DIRECTED BY THE FIRE MARSHAL.

4) WATER EASEMENTS WILL BE DEDICATED TO CITY OF CAMAS AS REQUIRED.

EROSION CONTROL:

1) EROSION CONTROL BMP'S WILL BE DESIGNED DURING FINAL DESIGN PER THE CITY OF CAMAS DESIGN STANDARDS MANUAL.

J:\data\8000\8900\8930\8938\Engineering\Prelim\Phase 1\8938.e.Border.Prelim.Ph1 Utility Offsite.dgn
M:\Microstation V8\pen tables\OCE table setup\oce street util.tbl

CLIENT:

GREEN MOUNTAIN LAND LLC.
17933 NW EVERGREEN PARKWAY
SUITE #300
BEAVERTON, OR 97006

ATTN: JOHN O'NEIL
PH: (503) 597-7100
EMAIL: johno@metlandgroup.com

PRELIMINARY OFFSITE UTILITY PLAN FOR:

GREEN MOUNTAIN MIXED USE PRD PHASE 1

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN BLVD., VANCOUVER, WA 98660
360-695-1385
503-289-9936

PETER A. TUCK
STATE OF WASHINGTON
31847
REGISTERED PROFESSIONAL ENGINEER
12/30/14

CHANGES / REVISIONS	
DESCRIPTION:	DATE:

DESIGNED: RWP

DRAWN: RWP

CHECKED: PAT

DATE: DECEMBER 2014

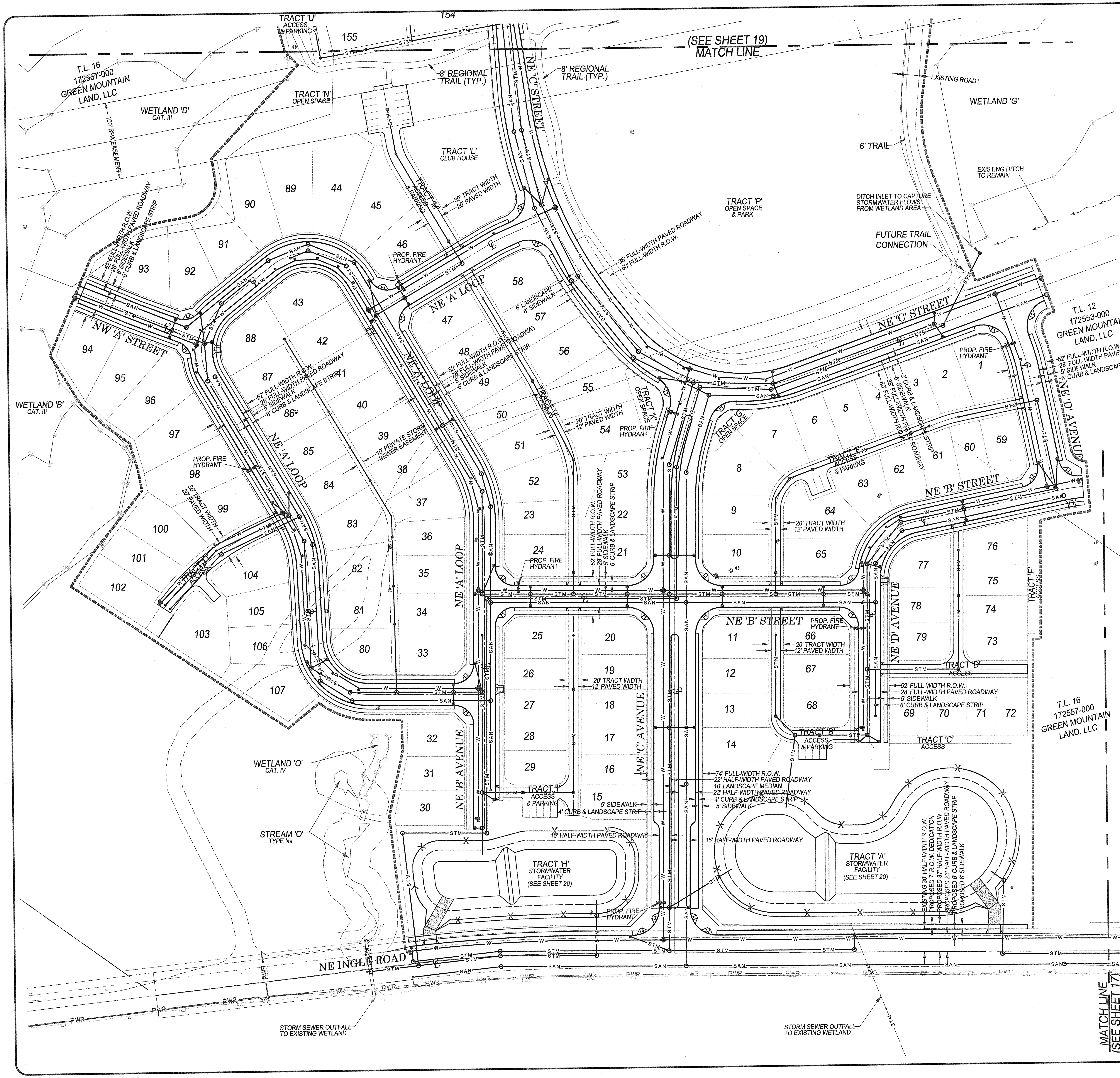
SCALE: H: 1" = 60' V: N/A

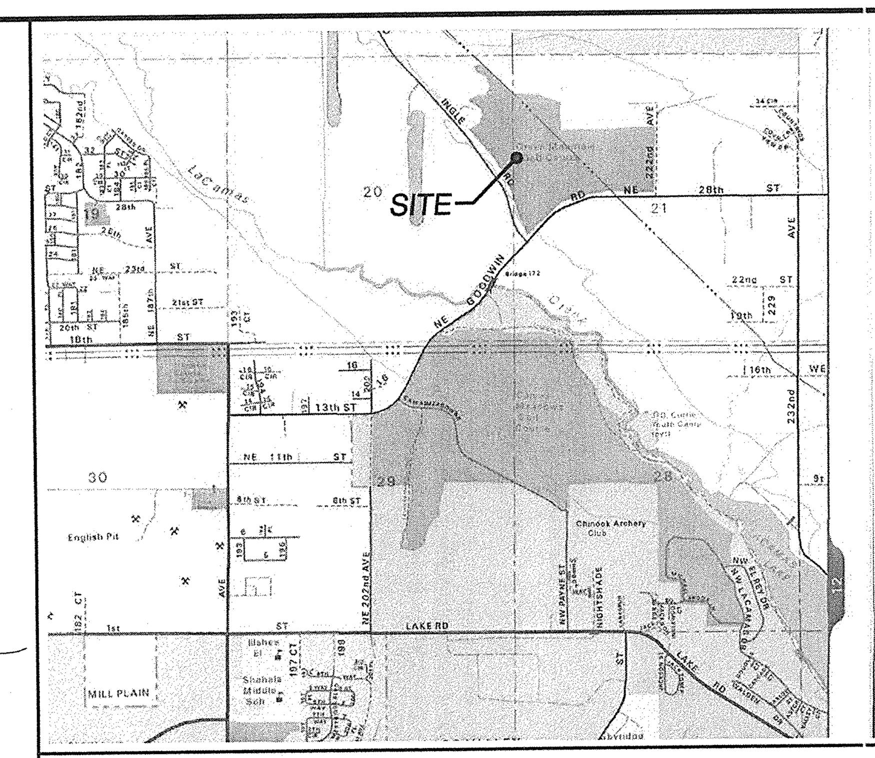
GREEN MOUNTAIN PHASE 1

JOB NO. 8938.01.02

SHEET

EXHIBIT 23





VICINITY MAP
NTS

LEGEND

PERIMETER OF SITE
RIGHT-OF-WAY LINE
CENTERLINE OF ROAD
FACE OF CURB
LOT LINE
POD BOUNDARY
EASEMENT LINE
STM — STORM SEWER LINE
STM — EXIST STORM SEWER
SAN — SANITARY SEWER LINE
SAN — EXIST SANITARY SEWER
W — WATER SERVICE LINE
W — EXIST WATER LINE
MANHOLE
CLEAN OUT
CATCH BASIN
FIRE HYDRANT ASSEMBLY
THRUST BLOCK
W — WATER SERVICE ASSEMBLY
BF — BACKFLOW ASSEMBLY
WATER VALVE AND BOX
BLOW-OFF ASSEMBLY

PRELIMINARY UTILITY NOTES

STORM SEWER:

1) STORMWATER QUALITY AND QUANTITY CONTROL TO BE ACHIEVED USING WETPONDS WITH DETENTION ABOVE THE WETPOOL. STORMWATER FROM THE DEVELOPMENT TO BE DISCHARGED VIA OUTFALLS TO THE EXISTING WETLANDS/STREAM WEST OF NE INGLE ROAD.

2) WETPONDS HAVE BEEN SIZED TO MEET THE PHOSPHORUS CONTROL REQUIREMENTS FOR THE LACAMAS WATER SHED, AS SPECIFIED BY THE CITY OF CAMAS AND THE WASHINGTON STATE DEPARTMENT OF ECOLOGY.

3) THE PROPOSED STORMWATER FACILITIES WILL BE PRIVATELY OWNED AND MAINTAINED, WITH ACCESS AND INSPECTION EASEMENTS TO BE DEDICATED TO THE CITY OF CAMAS AS REQUIRED.

SANITARY:

1) SANITARY SEWER SERVICE WILL BE PROVIDED BY CITY OF CAMAS.

2) SANITARY SEWER WILL BE A GRAVITY SEWER. NEW SEWER MAIN WILL BE EXTENDED OFFSITE TO NEW PUMP STATION LOCATION ON NE GOODWIN RD. (REFER TO SHEET 17)

3) SANITARY SEWER EASEMENTS WILL BE DEDICATED TO CITY OF CAMAS AS REQUIRED.

WATER:

1) WATER SERVICE WILL BE PROVIDED BY CITY OF CAMAS.

2) A NEW 8" DIP WATER MAIN WILL BE LOOPED THROUGH THE SITE TO PROVIDE WATER AND FIRE SERVICE TO THE PROPOSED DEVELOPMENT. CONNECTIONS WILL BE MADE TO THE EXISTING 8" DIP MAINS LOCATED IN NE INGLE RD. AND NE GOODWIN RD.

3) FIRE HYDRANTS WILL BE LOCATED AS SHOWN, OR AS DIRECTED BY THE FIRE MARSHAL.

4) WATER EASEMENTS WILL BE DEDICATED TO CITY OF CAMAS AS REQUIRED.

EROSION CONTROL:

1) EROSION CONTROL BMP'S WILL BE DESIGNED DURING FINAL DESIGN PER THE CITY OF CAMAS DESIGN STANDARDS MANUAL.

SCALE: 1"=60'
-60 0 60 120

J:\data\8000\8900\8930\8938\Engineering\Prelim\Phase 1\8938.e.Border.Prelim.Ph1 Utility S.dgn
M:\Microstation V8\pen tables\OCE table setup\oce street util.tbl

CLIENT:
GREEN MOUNTAIN LAND LLC.
17933 NW EVERGREEN PARKWAY
SUITE #300
BEAVERTON, OR 97006

ATTN: JOHN O'NEIL
PH: (503) 597-7100
EMAIL: johno@metlandgroup.com

PRELIMINARY UTILITY PLAN (SOUTH) FOR:
GREEN MOUNTAIN MIXED USE PRD PHASE 1

OLSON ENGINEERING INC. LAND SURVEYORS ENGINEERS
222 E. EVERGREEN BLVD., VANCOUVER, WA 98660
360-695-1385
503-289-9936

PETER A. TUCK, STATE OF WASHINGTON, 35813, REGISTERED PROFESSIONAL ENGINEER
12/30/14

CHANGES / REVISIONS

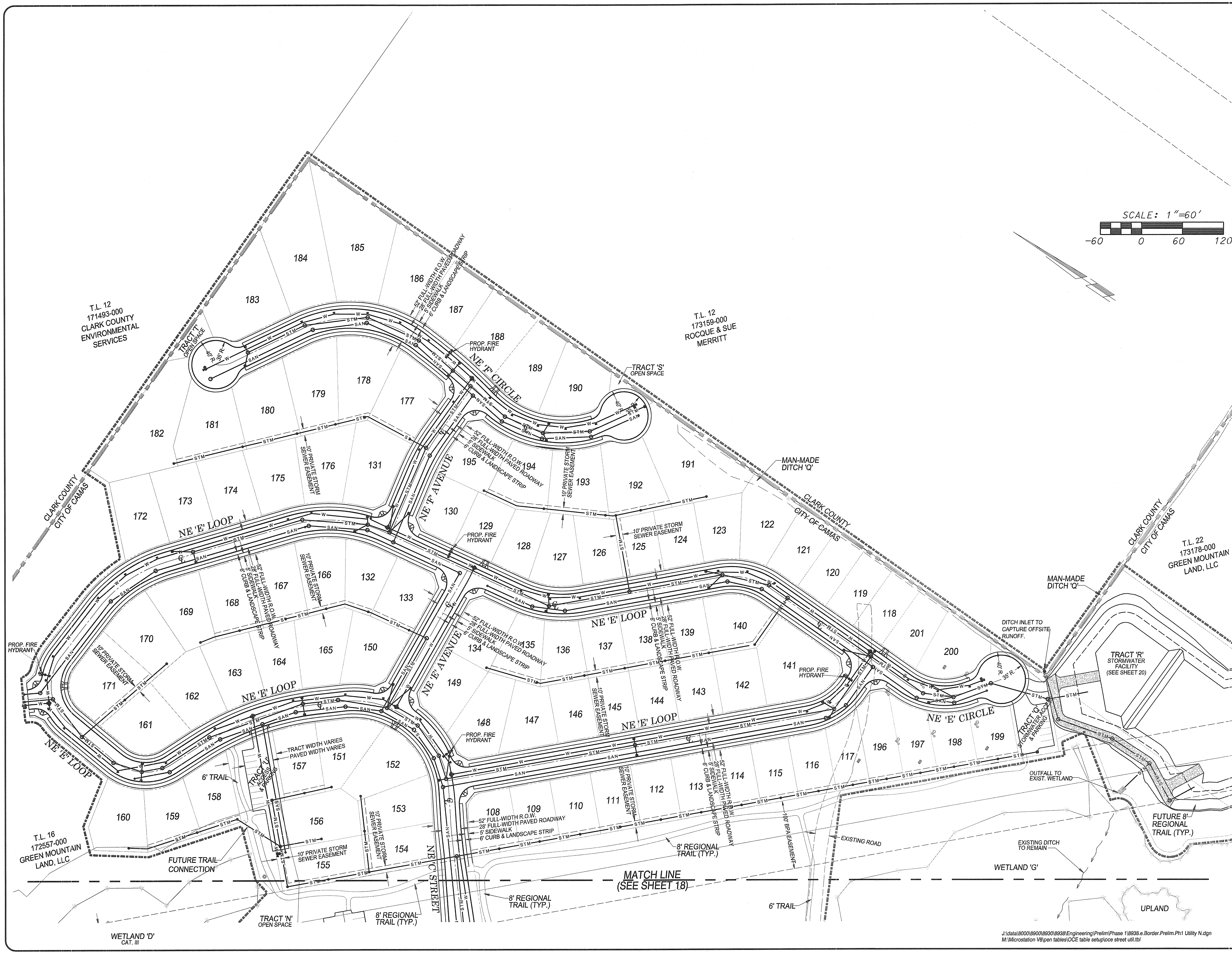
DESCRIPTION:	DATE:

DESIGNED: RWP
DRAWN: RWP
CHECKED: PAT
DATE: DECEMBER 2014
SCALE: H: 1" = 60' V: N/A

GREEN MOUNTAIN PHASE 1
JOB NO. E938.01.02

SHEET
18 of 25

EXHIBIT 24



CLIENT:
GREEN MOUNTAIN LAND LLC.
17933 NW EVERGREEN PARKWAY
SUITE #300
BEAVERTON, OR 97006

ATTN: JOHN O'NEIL
PH: (503) 597-7100
EMAIL: johno@metlandgroup.com

PRELIMINARY UTILITY PLAN (NORTH) FOR:
GREEN MOUNTAIN MIXED USE PRD
PHASE 1

OLSON ENGINEERING INC. LAND SURVEYORS ENGINEERS
222 E. EVERGREEN BLVD., VANCOUVER, WA 98660
360-695-1385
503-289-9936

PETER A. TUCK
STATE OF WASHINGTON
REGISTERED PROFESSIONAL ENGINEER

12/30/14

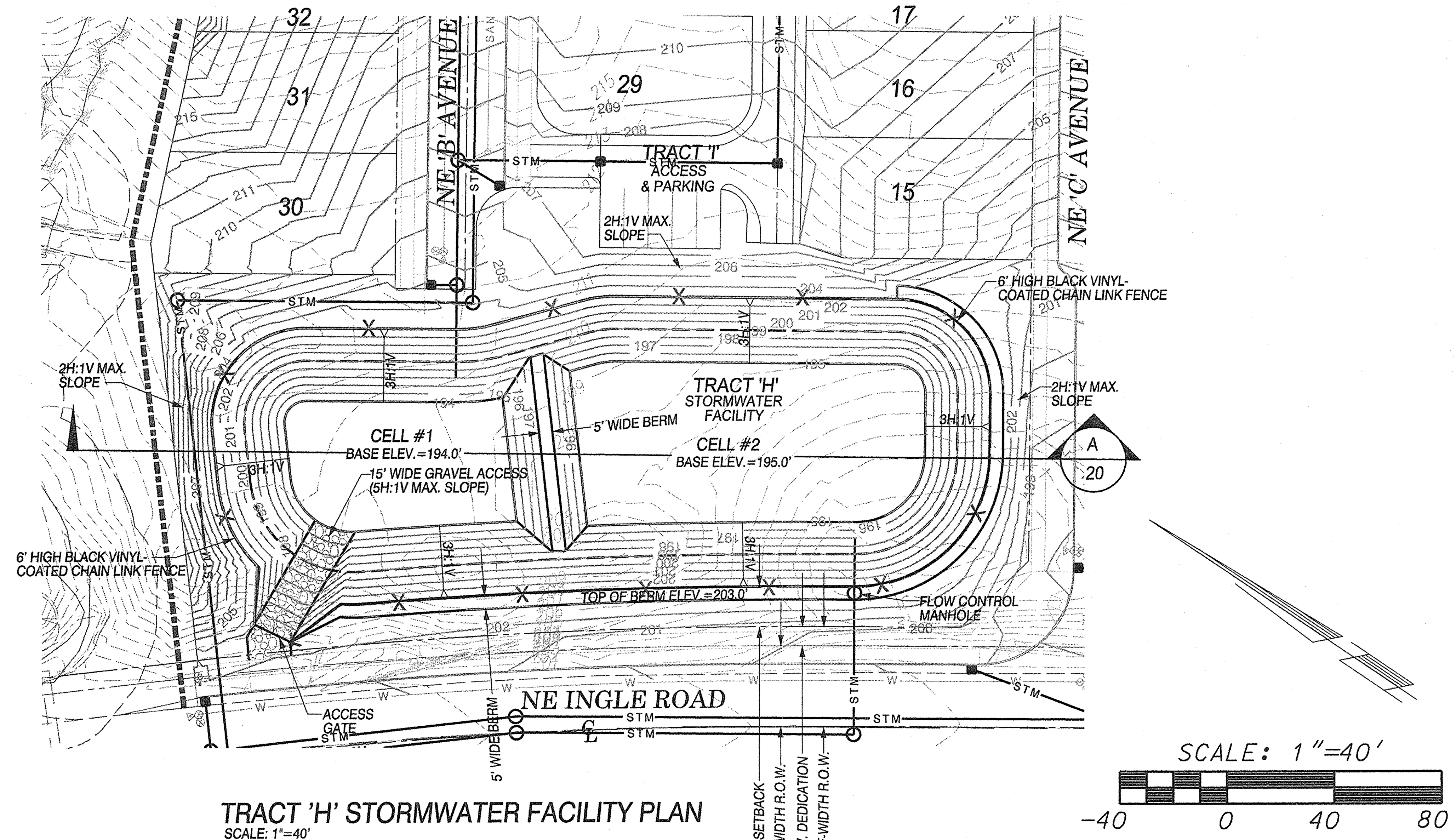
CHANGES / REVISIONS	
DESCRIPTION:	DATE:

DESIGNED: RWP
DRAWN: RWP
CHECKED: PAT
DATE: DECEMBER 2014
SCALE: H: 1" = 60' V: N/A

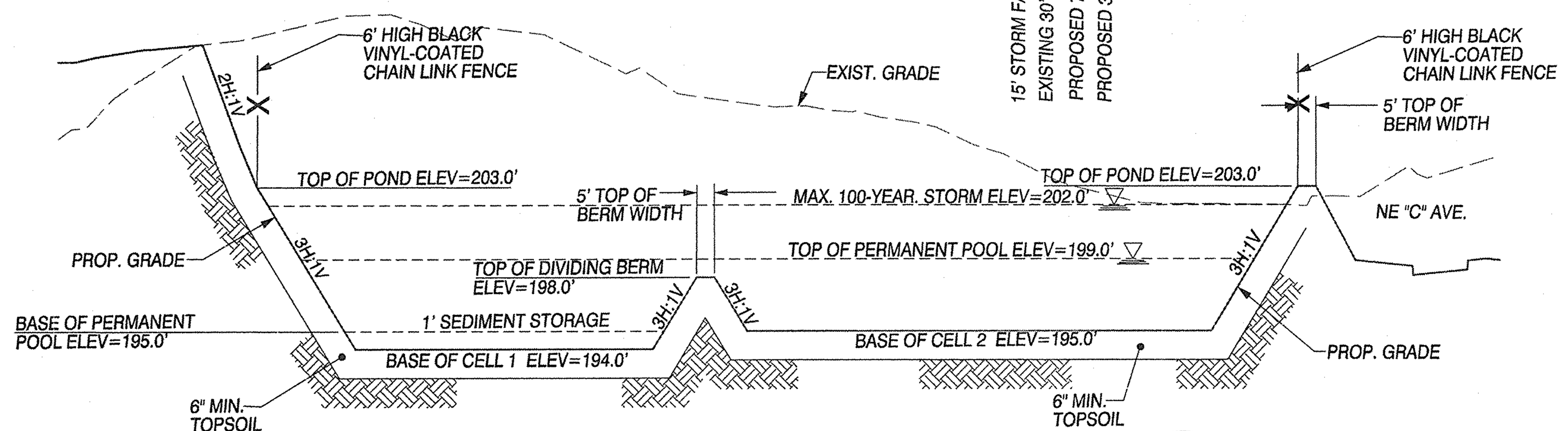
GREEN MOUNTAIN PHASE 1
JOB NO. 8938.01.02

SHEET
19 of 25

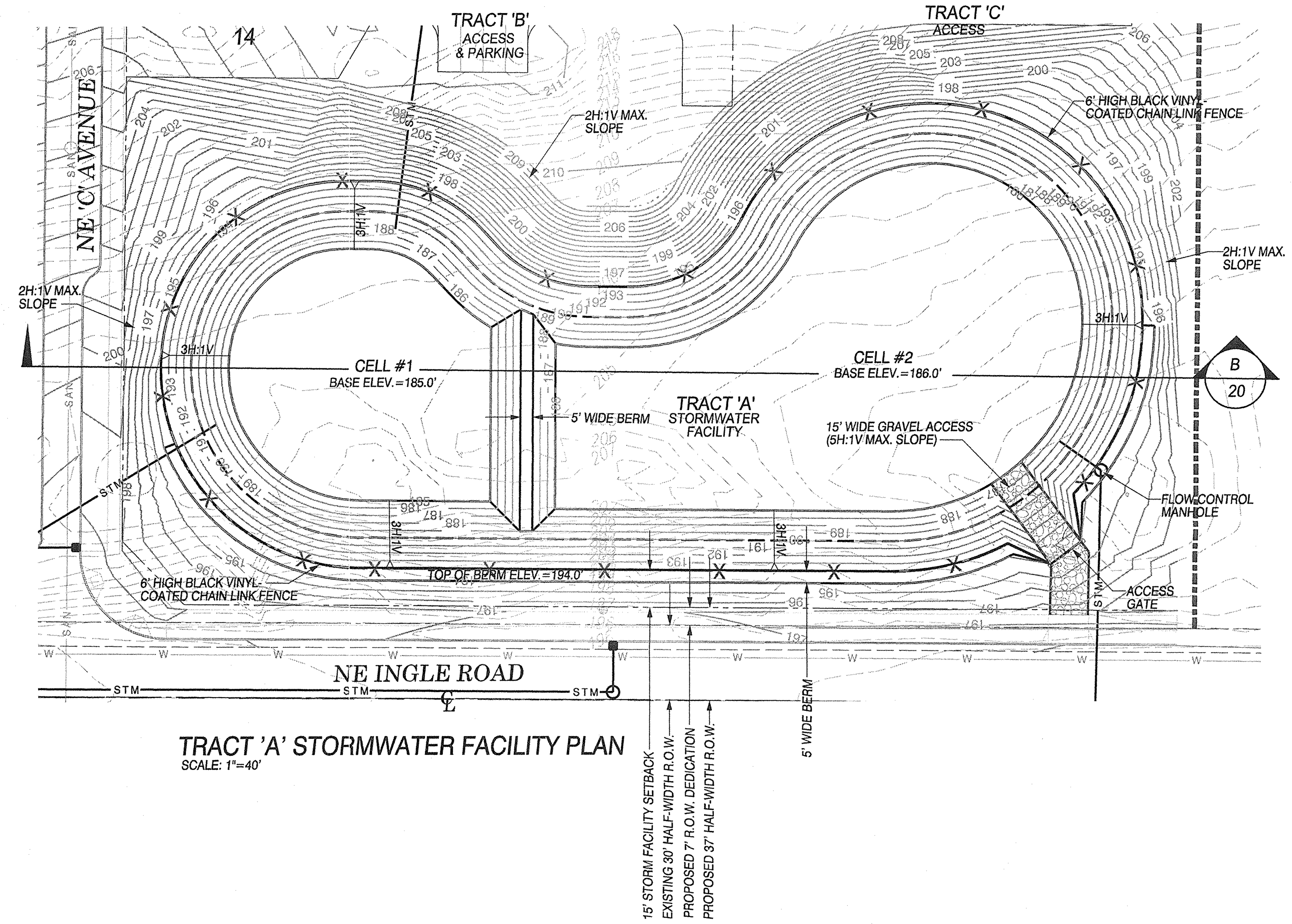
EXHIBIT 25



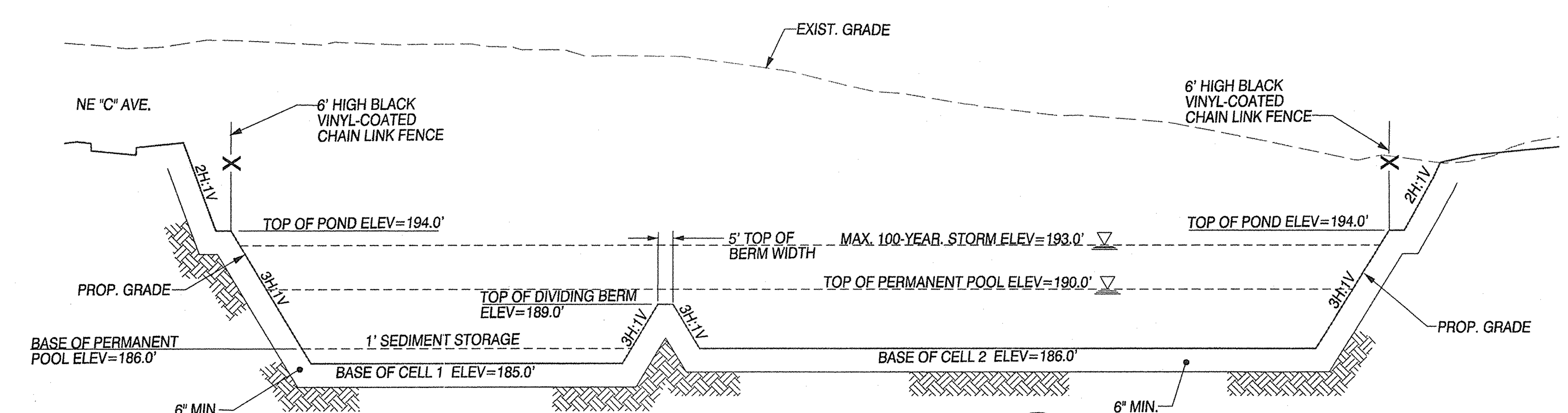
TRACT 'H' STORMWATER FACILITY PLAN
SCALE: 1"=40'



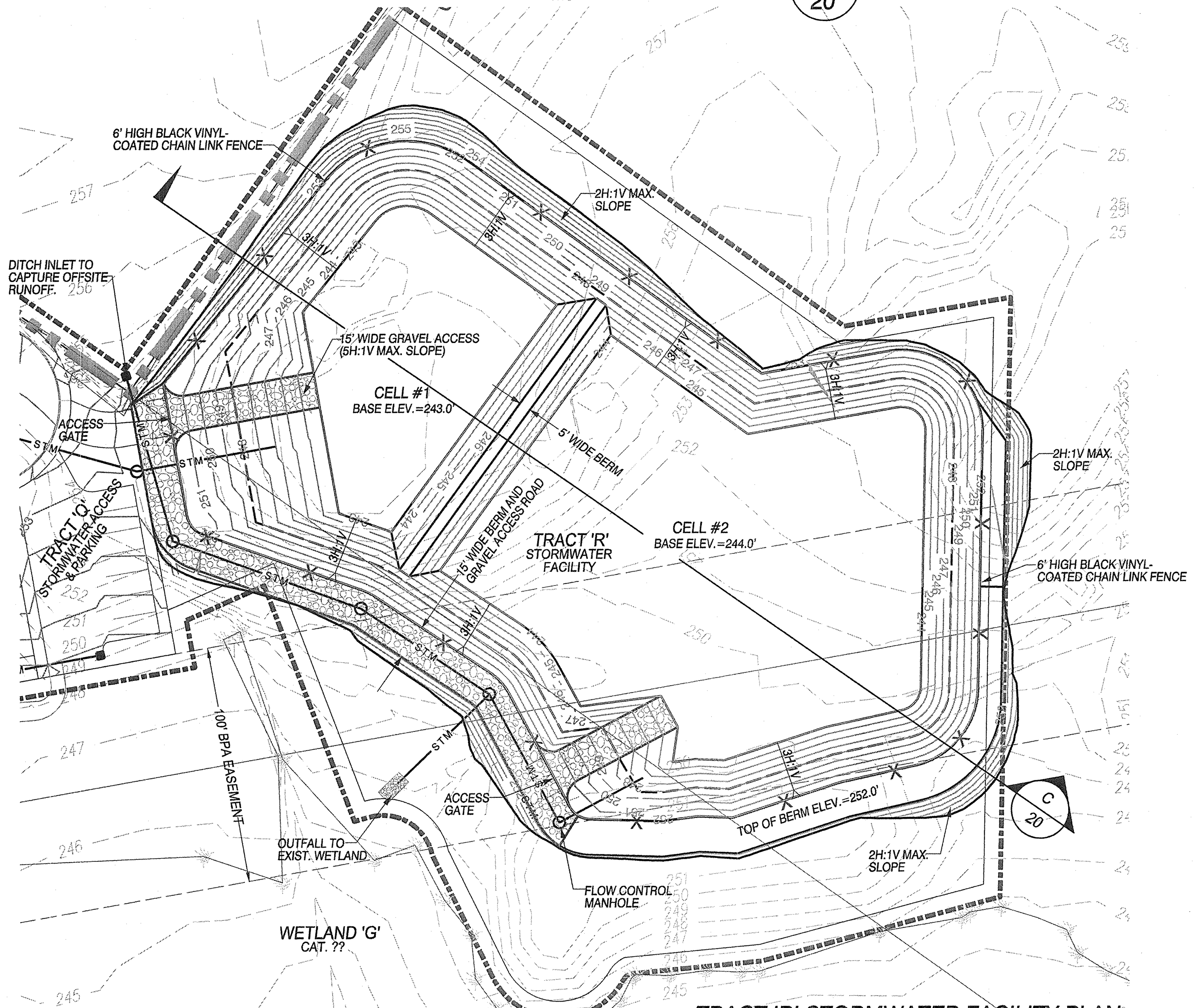
TRACT 'H' STORMWATER FACILITY SECTION (A/20)
NTS



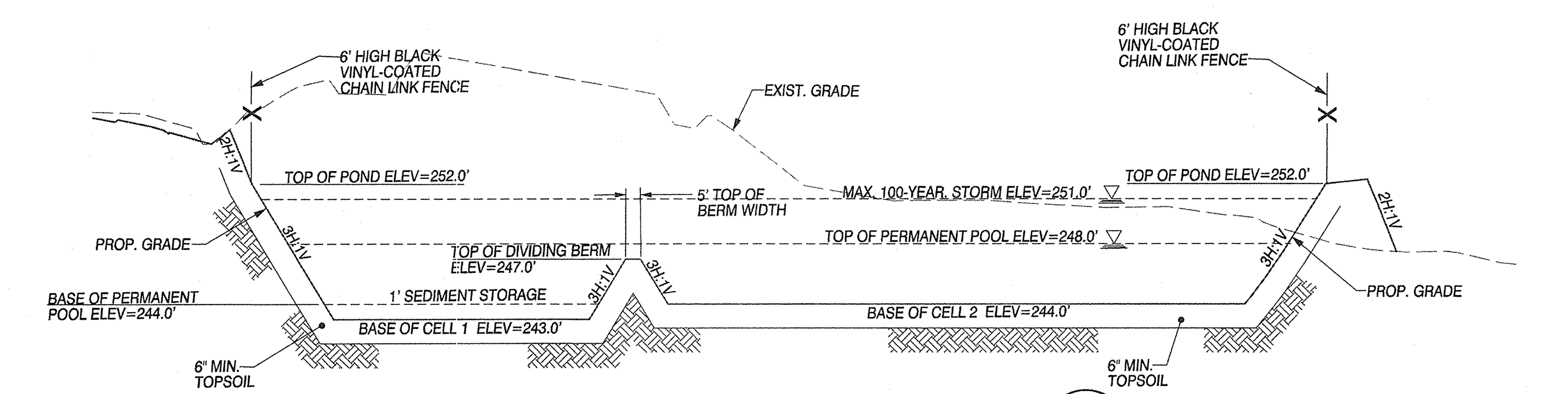
TRACT 'A' STORMWATER FACILITY PLAN
SCALE: 1"=40'



TRACT 'A' STORMWATER FACILITY SECTION (B/20)
NTS



TRACT 'R' STORMWATER FACILITY PLAN
SCALE: 1"=40'



TRACT 'R' STORMWATER FACILITY SECTION (C/20)
NTS

J:\data\8000\8900\8930\8938\Engineering\Prelim\Phase 1\8938.e.Border.Prelim.Ph1 Storm Fac.dgn
M:\Microstation V8\pen tables\OCE table setup\oce stormpond.tbl

CLIENT:
GREEN MOUNTAIN LAND LLC.
17933 NW EVERGREEN PARKWAY
SUITE #300
BEAVERTON, OR 97006
ATTN: JOHN O'NEIL
PH: (503) 597-7100
EMAIL: johno@metlandgroup.com

PRELIMINARY STORM FACILITY PLAN AND SECTIONS FOR:
GREEN MOUNTAIN MIXED USE PRD
PHASE 1

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN BLVD., VANCOUVER, WA 98660
360-695-1385
503-289-9936

PETER A. TUCK, STATE OF WASHINGTON, 33817, REGISTERED PROFESSIONAL ENGINEER
12/30/14

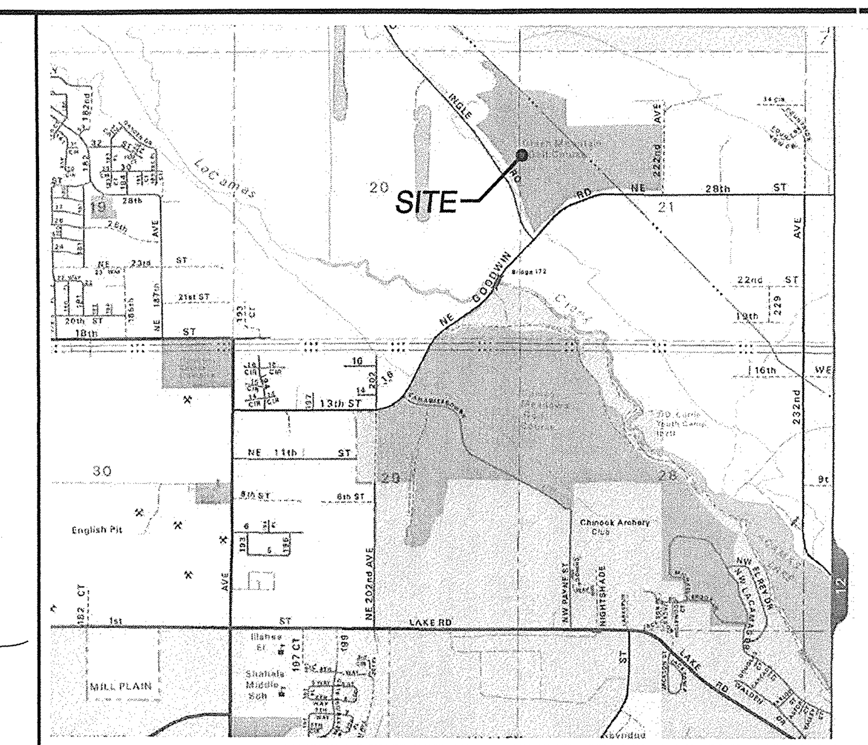
CHANGES / REVISIONS

DESCRIPTION:	DATE:

DESIGNED: RWP
DRAWN: RWP
CHECKED: PAT
DATE: DECEMBER 2014
SCALE: H: 1" = 40' V: N/A

GREEN MOUNTAIN PHASE 1
JOB NO. 8938.01.02

EXHIBIT 26



VICINITY MAP
NTS

LEGEND

—— - - - ——	PERIMETER OF SITE
—— - - ——	RIGHT-OF-WAY LINE
—— - —— - ——	CENTERLINE OF ROAD
——————	FACE OF CURB
——————	LOT LINE
——————	POD BOUNDARY
— — — — —	EASEMENT LINE
—— STM ——	STORM SEWER LINE
— — STM — —	EXIST STORM SEWER
—— SAN ——	SANITARY SEWER LINE
— — SAN — —	EXIST SANITARY SEWER
—— W ——	WATER SERVICE LINE
— — W — —	EXIST WATER LINE
MANHOLE	THRUST BLOCK
CLEAN OUT	WATER SERVICE ASSEMBLY
CATCH BASIN	BF BACKFLOW ASSEMBLY
FIRE HYDRANT ASSEMBLY	WATER VALVE AND BOX
	BLOW-OFF ASSEMBLY

PRELIMINARY GRADING NOTE

1) EROSION CONTROL TO BE DESIGNED AT TIME OF FINAL DESIGN PER CITY OF CAMAS REQUIREMENTS.

SCALE: 1"=60'
-60 0 60 120

CLIENT:
GREEN MOUNTAIN LAND LLC.
17933 NW EVERGREEN PARKWAY
SUITE #300
BEAVERTON, OR 97006

ATTN: JOHN O'NEIL
PH: (503) 597-7100
EMAIL: johno@metlandgroup.com

PRELIMINARY GRADING PLAN (SOUTH) FOR: GREEN MOUNTAIN MIXED USE PRD PHASE 1

OLSON LAND SURVEYORS ENGINEERS
ENGINEERING INC. 222 E. EVERGREEN BLVD., VANCOUVER, WA 98660
360-695-1385
503-289-9936

PETER A. TUCK
STATE OF WASHINGTON
31617
PROFESSIONAL ENGINEER
12/30/14

CHANGES / REVISIONS

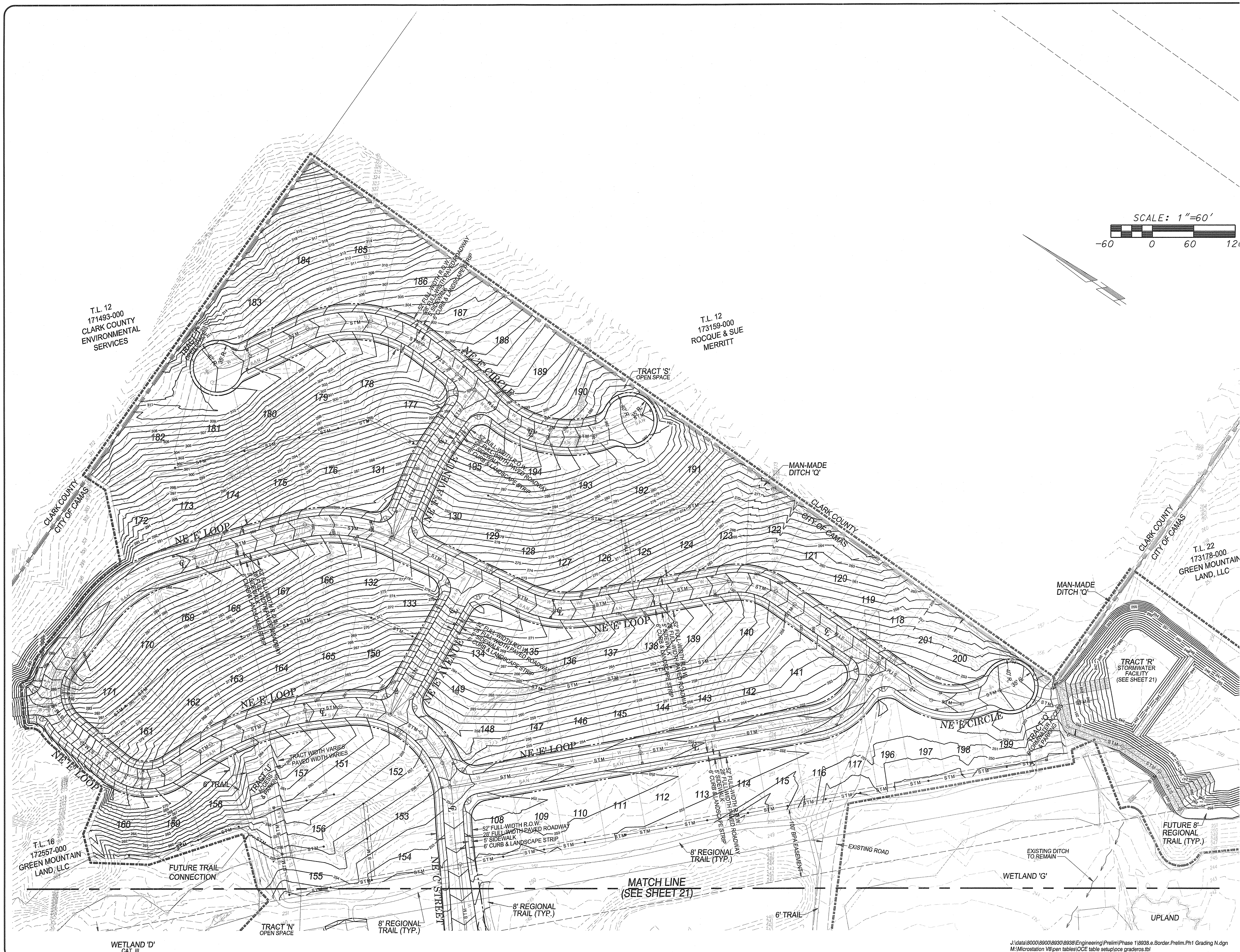
DESCRIPTION:	DATE:

DESIGNED: RWP
DRAWN: RWP
CHECKED: PAT
DATE: DECEMBER 2014
SCALE: H: 1" = 60' V: N/A

GREEN MOUNTAIN PHASE 1
JOB NO. 8938.01.02

J:\data\8000\8900\8930\8938\Engineering\Prelim\Phase 1\8938.e.Border.Prelim.Ph1 Grading S.dgn
M:\Microstation V8\pen tables\OCE table setup\oce graderos.tbl

EXHIBIT 27



J:\data\8000\8900\8930\8938\Engineering\Prelim\Phase 1\8938.e.Border.Prelim.Ph1 Grading N.dgn
M:\Microstation V8\pen tables\OCE table setup\oce graderos.tbl

CLIENT:

GREEN MOUNTAIN LAND LLC.
17933 NW EVERGREEN PARKWAY
SUITE #300
BEAVERTON, OR 97006

ATTN: JOHN O'NEIL
PH: (503) 597-7100
EMAIL: johno@metlandgroup.com

PRELIMINARY GRADING PLAN (NORTH) FOR:

GREEN MOUNTAIN MIXED USE PRD PHASE 1

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
360-695-1385
503-289-9936
222 E. EVERGREEN BLVD., VANCOUVER, WA 98660

PETER A. TUCK
STATE OF WASHINGTON
31897
REGISTERED
PROFESSIONAL ENGINEER
12/30/14

CHANGES / REVISIONS

DESCRIPTION:	DATE:

DESIGNED: RWP

DRAWN: RWP

CHECKED: PAT

DATE: DECEMBER 2014

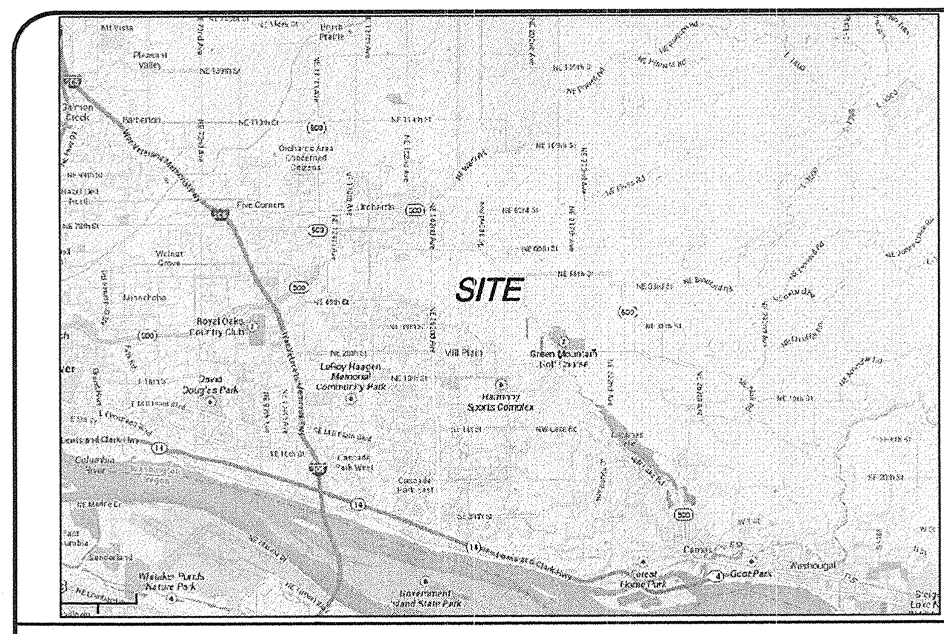
SCALE: H: 1" = 60'
V: N/A

GREEN MOUNTAIN PHASE 1

JOB NO. 8938.01.02

SHEET

22 of 25



VICINITY MAP SEC. 17, 20 & 21 T2N R3E W.M.
NTS

SUBDIVISION NOTES

EXISTING SITE DATA:

PRESENT USE:	GOLF COURSE
EXISTING ZONING:	R-6, MF-10

PROPOSED SITE DATA:

PROPOSED USE:	201 LOT SUBDIVISION
WETLAND, STREAM, STEEP BANK BUFFER AREAS/PROTECTED AREAS, AND PLANNED ENHANCEMENT AREAS:	AS SHOWN
PROPOSED PRIVATE ROADS:	AS SHOWN
PROPOSED EASEMENTS:	REFER TO ENGINEERING PLANS
PROPOSED ON-SITE ROAD RIGHTS-OF-WAY:	AS SHOWN
PROPOSED PEDESTRIAN AND BICYCLE FACILITIES:	AS SHOWN
PROPOSED EASEMENTS FOR ACCESS, DRAINAGE, UTILITIES, ETC:	REFER TO ENGINEERING PLANS
PROPOSED LOADING ZONES:	NONE PROPOSED
PROPOSED SEPTIC SYSTEMS:	NONE PROPOSED
PROPOSED OPEN SPACE/PARK:	AS SHOWN
PROPOSED TRANSIT FACILITIES:	NONE PROPOSED
PROPOSED SIGNS (SIGN PLAN):	SEE SIGN PLAN
PROPOSED LIGHTING:	STREET LIGHT TO BE PROVIDED
PROPOSED LOTS, TRACTS, ETC:	AS SHOWN
EXISTING BUILDINGS TO REMAIN:	AS SHOWN
PROPOSED LANDSCAPING (LANDSCAPE PLAN):	AS SHOWN ON THE LANDSCAPE PLAN
PROPOSED BUILDINGS:	LOTS FOR SINGLE AND/OR MULTI-FAMILY DETACHED RESIDENCES & CLUBHOUSE
PROPOSED PARKING:	AS SHOWN

IF ANY CULTURAL RESOURCES AND/OR HUMAN REMAINS ARE DISCOVERED IN THE COURSE OF UNDERTAKING THE DEVELOPMENT ACTIVITY, THE DEPARTMENT OF ARCHAEOLOGY AND HISTORIC PRESERVATION IN OLYMPIA SHALL BE NOTIFIED. FAILURE TO COMPLY WITH THESE STATE REQUIREMENTS MAY CONSTITUTE A CLASS C FELONY, SUBJECT TO IMPRISONMENT AND/OR FINES.

LAND INVENTORY:

TOTAL PHASE 1 AREA:	51.21 ACRES (2,230,558 SF)
TOTAL DEVELOPED AREA:	45.22 ACRES (1,969,658 SF)
TOTAL LOT AREA:	26.02 ACRES (1,133,500 SF)
TOTAL INFRASTRUCTURE AREA (INCL. STORM FACILITIES) INCL. ACCESS TRACTS 'B', 'C', 'D', 'F', 'I', 'J', 'O' AND 'U'	20.47 ACRES (891,469 SF)
TOTAL TRACT AREA:	13.51 ACRES (588,500 SF)
TOTAL AREA OF CRITICAL AREAS:	0 ACRES (0 SF)
TOTAL AREA OF RECREATIONAL OPEN SPACES: INCL. OPEN SPACE TRACTS 'G', 'K', 'N', 'P', 'S', 'T' AND A PORTION OF 'U'	6.12 ACRES (266,800 SF)

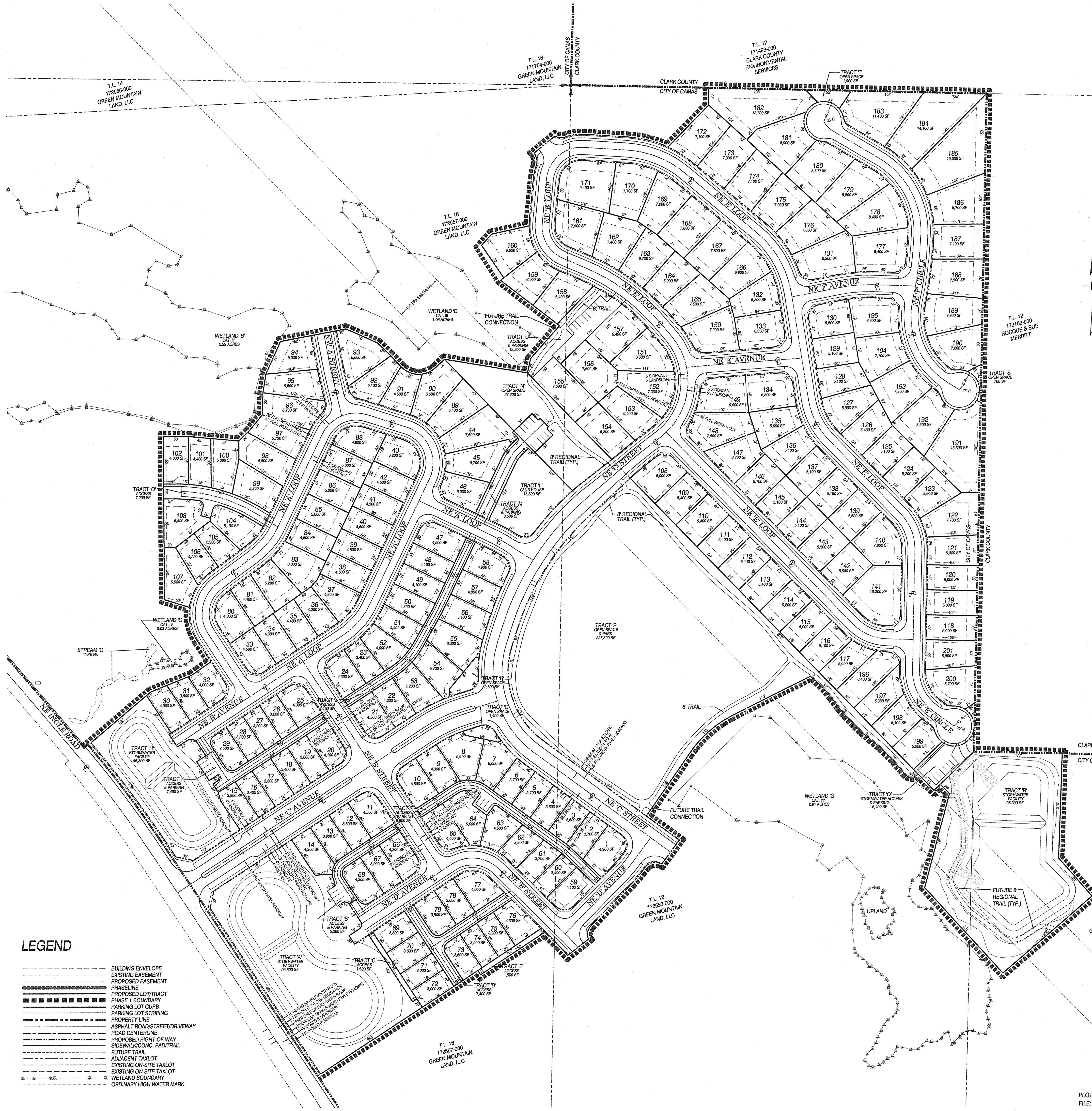
DEVELOPMENT STANDARDS

GREEN MOUNTAIN PRD STANDARDS FOR PRD LOT DEVELOPMENT	MULTI-FAMILY LOTS ('C' PODS) LOTS 1-32 LOTS 59-79 SEE NOTE 1	SINGLE-FAMILY 'D' PODS LOTS 33-58 LOTS 80-130 LOTS 132-171 LOTS 196-201	SINGLE-FAMILY 'E' PODS LOT 131 LOTS 172-195
MINIMUM LOT AREA	3,000 SF	3,500 SF	4,200 SF
MAXIMUM LOT AREA	N/A	7,000	9,000
MINIMUM LOT WIDTH	30'	40'	50'
MINIMUM LOT DEPTH	70'	80'	80'
MINIMUM LOT WIDTH ON A CURVE OR CUL-DE-SAC	N/A	25'	30'
MAXIMUM BUILDING HEIGHT	35' SEE NOTE 2	35'	35'
MAXIMUM BUILDING COVERAGE	55%	45%	40%
MINIMUM SETBACKS		SEE CHART BELOW FOR SINGLE-FAMILY SETBACKS	
FRONT YARD (INCLUDES 6' PUBLIC UTILITY EASEMENT)	10'		
GARAGE SETBACK FROM R.O.W.	18'		
SIDE YARD	3' SEE NOTE 3		
STREET SIDE YARD	10'		
REAR YARD SEE NOTES 4 & 5	10'		

SETBACKS FOR PODS 'C' AND 'D' SEE NOTE 6				
LOT AREA	UP TO 4,999 SF	5,000 SF TO 7,499 SF	7,500 SF TO 9,999 SF	10,000 SF TO 40,000 SF
FRONT YARD (INCLUES 6' PUBLIC UTILITY EASEMENT)	10'	15'	20'	30'
SIDE YARD AND CORNER LOT REAR YARD	4'	5'	5'	15'
CORNER LOT STREET SIDE YARD	10'	15'	15'	30'
REAR YARD SEE NOTES 4 & 5	15'	20'	20'	30'
MINIMUM LOT WIDTH ON A CURVE OR CUL-DE-SAC	25'	30'	30'	40'

1. SINGLE-FAMILY DETACHED HOMES PERMITTED.
2. THE NON-ATTACHED SIDE OF A DWELLING UNIT SHALL BE THREE FEET. OTHERWISE A ZERO-LOT LINE IS ASSUMED.
3. MAXIMUM BUILDING HEIGHT: THREE STORIES AND A BASEMENT BUT NOT TO EXCEED MAXIMUM BUILDING HEIGHT.
4. 10 FEET FOR FRONT ACCESS GARAGE.
5. MINIMUM REAR YARD FOR ALLEY ACCESS GARAGE IS EITHER 3 FEET OR 18 FEET.
6. SETBACKS BASED ON LOT SIZE. LOT SIZES ARE NOT SUBJECT TO LOT SIZE AVERAGING.
7. BUILDING ENVELOPES SHOWN ON THE PLAN ILLUSTRATE THE FRONT YARD SETBACK. REFER TO TABLE FOR REQUIRED GARAGE FRONT YARD BUILDING SETBACKS.

BASE SUBDIVISION LAYOUT PROVIDED BY WESTERN PLANNING ASSOCIATES.
ENVIRONMENTAL INFORMATION PROVIDED BY ECOLOGICAL LAND SERVICES.



LEGEND

BUILDING ENVELOPE
EXISTING EASEMENT
PROPOSED EASEMENT
PHASELINE
PROPOSED LOT/TRACT
PHASE 1 BOUNDARY
PARKING LOT CURB
PARKING LOT STRIPING
PROPERTY LINE
ASPHALT ROAD/STREET/DRIVEWAY
ROAD CENTERLINE
PROPOSED RIGHT-OF-WAY
SIDEWALK/CONC. PAD/TRAIL
FUTURE TRAIL
ADJACENT TAXLOT
EXISTING ON-SITE TAXLOT
EXISTING ON-SITE TAXLOT
WETLAND BOUNDARY
ORDINARY HIGH WATER MARK

OWNER/APPLICANT:
GREEN MOUNTAIN LAND, LLC
17933 NW EVERGREEN PARKWAY, SUITE 300
BEAVERTON, OR 97006
(503) 597-7100
(503) 597-7149 FAX
john.schmidt@metlandgroup.com

CONTACT:
LANDERHOLM LAW FIRM
ATTN: RANDY PRINTZ
805 BROADWAY SUITE 1000
VANCOUVER, WA 98660
(360) 693-3312
randy.printz@landerholm.com

PREPARED BY:
OLSON ENGINEERING, INC.
ATTN: MIKE ODREN
1111 BROADWAY
VANCOUVER, WA 98660
(360) 695-1385
FAX (360) 695-8117
mikeo@olsonengr.com

N

GRAPHIC SCALE
0 50 100 200
(IN FEET)
1 inch = 100 ft.

PLOT: consultant3.ctb
FILE: j:/data/8000/8900/8930/8938/Planning/8938.p.plat.prelim.dwg

PRELIMINARY PLAT FOR:
GREEN MOUNTAIN MIXED USE PRD PHASE 1

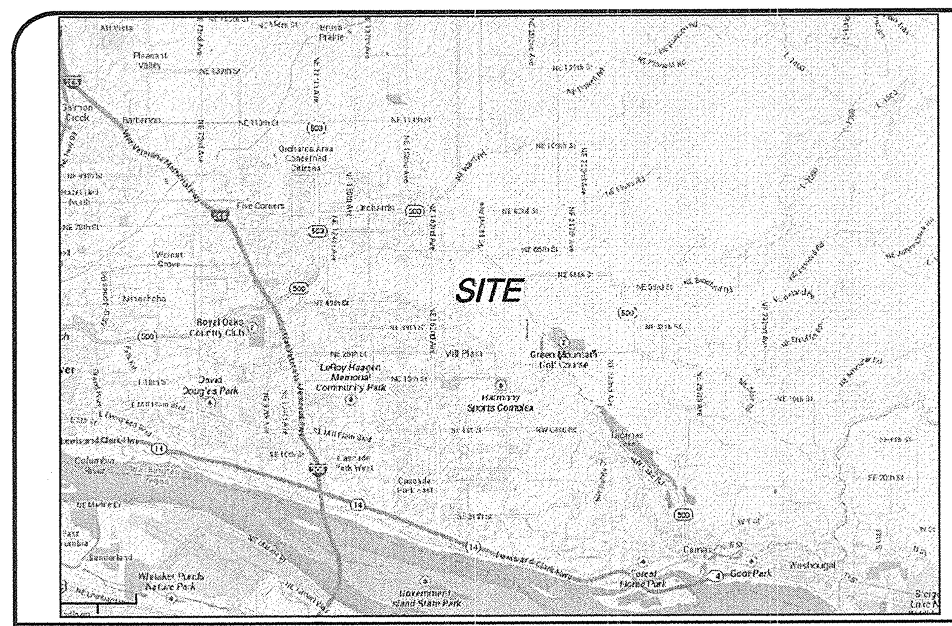
OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
1111 BROADWAY, VANCOUVER, WA 98660
360-695-1385
503-289-9936

KURT F. STONEX
STATE OF WASHINGTON
26352
REGISTERED PROFESSIONAL ENGINEER
12/31/14

CHANGES / REVISIONS	
DESCRIPTION:	DATE:

DESIGNED: WPA/MRO
DRAWN: WPA/MRO
CHECKED: KFS
DATE: DECEMBER 2014
SCALE: H: 1" = 100'
V:

GREEN MOUNTAIN PRD - PHASE 1
JOB NO. 8938.01.02



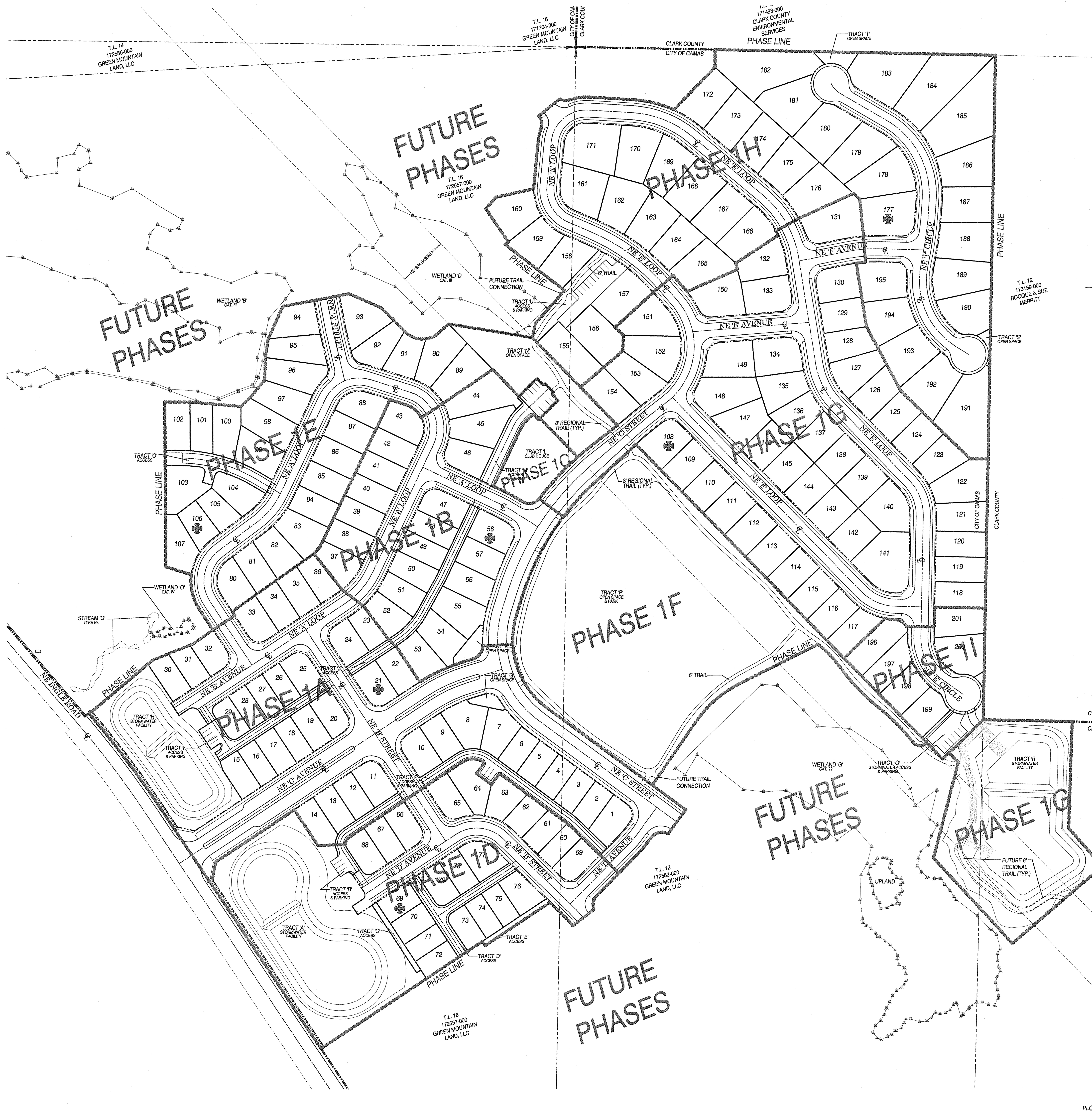
VICINITY MAP SEC. 17, 20 & 21 T2N R3E W.M.
NTS

PHASING NOTES

1. PHASING SHALL GENERALLY FOLLOW THE PHASING LINES AS INDICATED ON THE PLAN WITH UP TO 9 PHASES. PHASING LINES MAY BE ADJUSTED SLIGHTLY DEPENDING ON MARKET CONDITIONS, CONSTRUCTION RELATED ISSUES, ETC. EVEN THOUGH PHASES ARE LISTED AS PHASES 1A THROUGH 1I, PHASING SHALL NOT NECESSARILY FOLLOW ANY PREDETERMINED ORDER. SOME PHASES MAY BE CONSTRUCTED SIMULTANEOUSLY.

2. MANY PHASES WILL EITHER REQUIRE FILL MATERIAL OR WILL REQUIRE REMOVAL OF MATERIAL IN ORDER TO ESTABLISH FINAL LOT AND/OR ROAD GRADES. DEPENDING ON THE ORDER OF CONSTRUCTION, THE MATERIAL MAY BE BORROWED FROM OR STOCKPILED IN OTHER PHASES.

3. LOTS SHOWN TO CONTAIN FUTURE SALES OFFICES ARE SUBJECT TO CHANGE. ONE SALES OFFICE SHALL BE PROVIDED PER SUB-PHASE.



OWNER/APPLICANT:
GREEN MOUNTAIN LAND, LLC
17933 NW EVERGREEN PARKWAY, SUITE 300
BEAVERTON, OR 97006
(503) 597-7100
(503) 597-7149 FAX
john.schmidt@metlandgroup.com

CONTACT:
LANDERHOLM LAW FIRM
ATTN: RANDY PRINTZ
805 BROADWAY SUITE 1000
VANCOUVER, WA 98660
(360) 693-3312
randy.printz@landerholm.com

PREPARED BY:
OLSON ENGINEERING, INC.
ATTN: MIKE ODREN
1111 BROADWAY
VANCOUVER, WA 98660
(360) 695-1385
FAX (360) 695-8117
mikeo@olsonengr.com

GRAPHIC SCALE
0 50 100 200
(IN FEET)
1 inch = 100 ft.

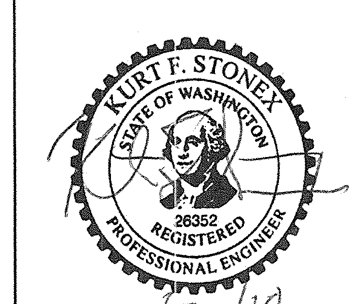
LEGEND

- BUILDING ENVELOPE
- EXISTING EASEMENT
- PROPOSED EASEMENT
- PHASELINE
- PROPOSED LOT/TRACT
- PHASE 1 BOUNDARY
- PARKING LOT CURB
- PARKING LOT STRIPING
- PROPERTY LINE
- ASPHALT ROAD/STREET/DRIVEWAY
- ROAD CENTERLINE
- PROPOSED RIGHT-OF-WAY
- SIDEWALK/CONC. PAD/TRAIL
- FUTURE TRAIL
- ADJACENT TAXLOT
- EXISTING ON-SITE TAXLOT
- EXISTING ON-SITE TAXLOT
- WETLAND BOUNDARY
- ORDINARY HIGH WATER MARK
- SALES OFFICE LOCATION (ONE PER SUB PHASE)

PLOT: consultant3.ctb
FILE: j:/data/8000/8900/8930/8938/Planning/8938.p.plat.prelim.dwg

PRELIMINARY PHASING PLAN FOR:
GREEN MOUNTAIN MIXED USE PRD PHASE 1

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
1111 BROADWAY, VANCOUVER, WA 98660
360-695-1385
503-289-9936



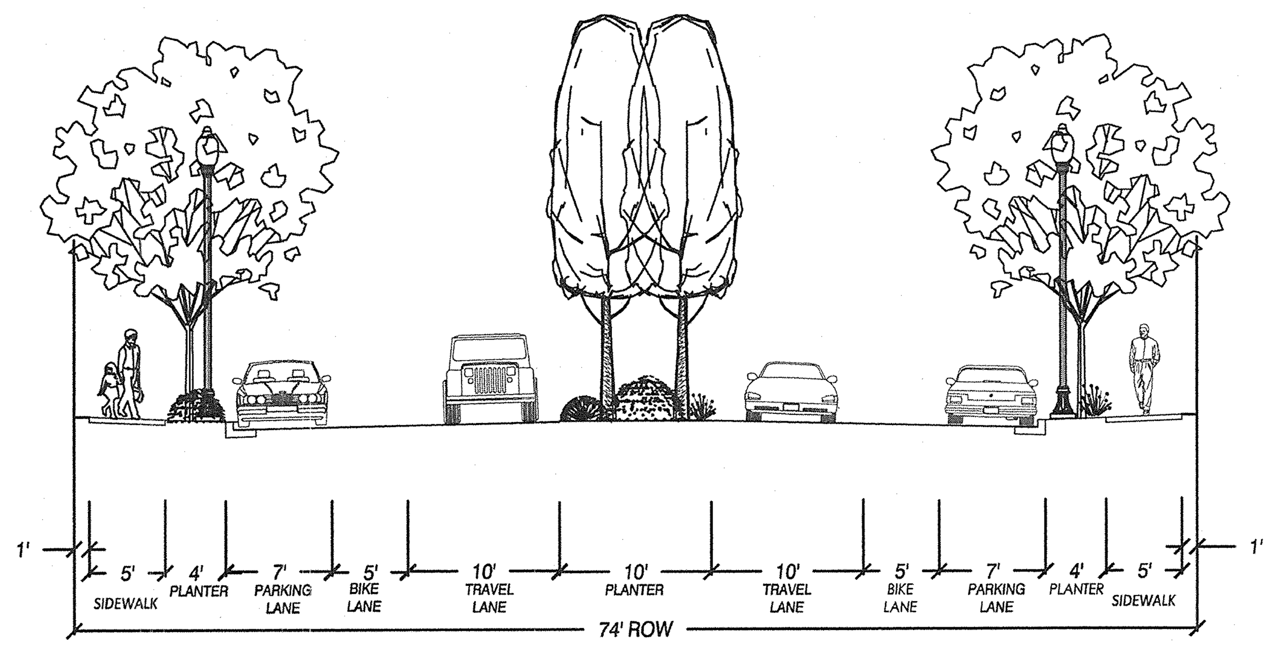
12/31/14

CHANGES / REVISIONS	
DESCRIPTION:	DATE:

DESIGNED: WPA/MRO
DRAWN: WPA/MRO
CHECKED: KFS
DATE: DECEMBER 2014
SCALE: H: 1" = 100'
V:

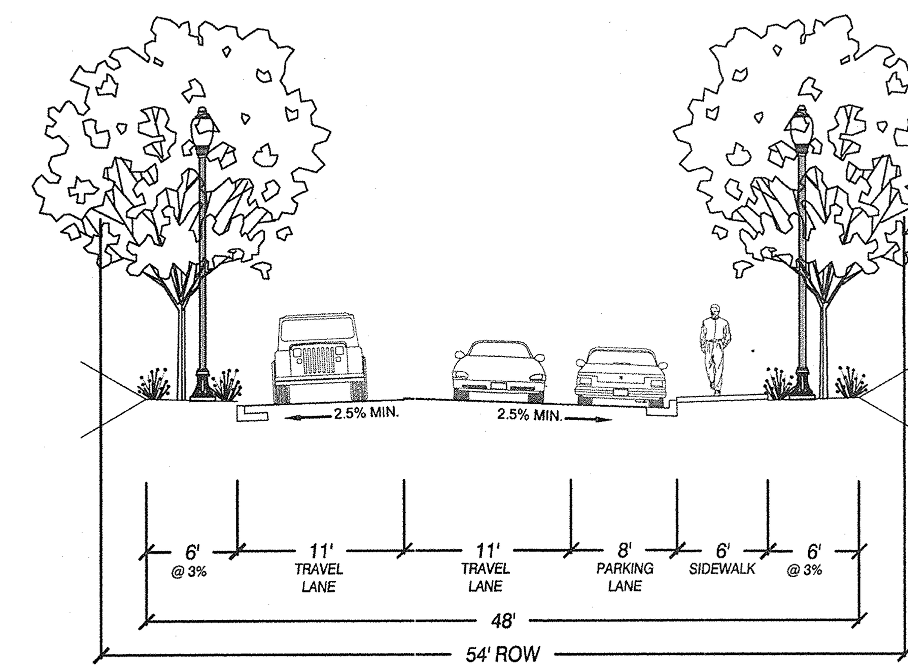
GREEN MOUNTAIN PRD - PHASE 1
JOB NO. 8938.01.02

EXHIBIT 30



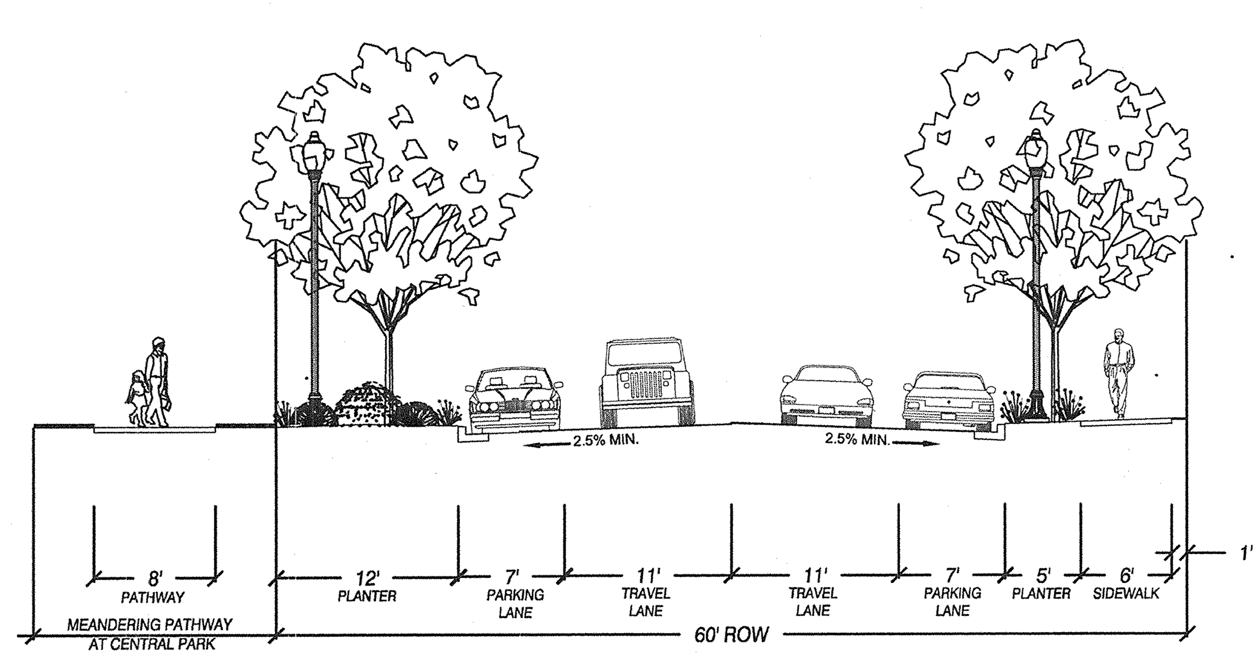
NOTE: REPLACE PARKING WITH LANDSCAPED CURB EXTENSION AT SELECT INTERSECTIONS

ENTRY BOULEVARD



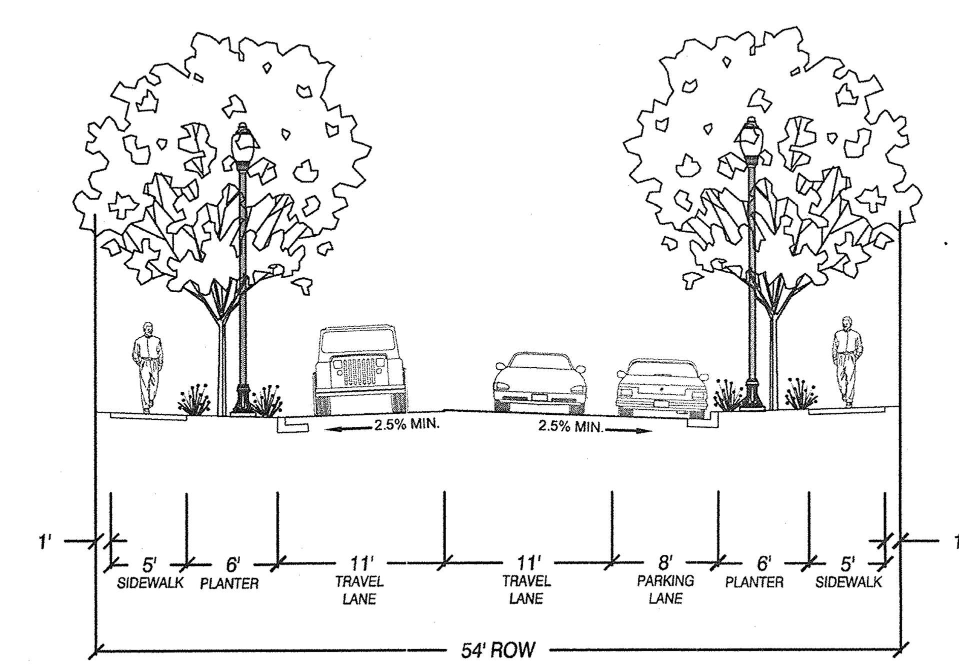
CIRCULATOR STREET

AT D&E PODS



CIRCULATOR STREET

AT CENTRAL PARK



CIRCULATOR STREET

AT ENVIRONMENTALLY SENSITIVE FRONTAGE OR CROSSING &
AT STREET GRADES GREATER THAN 12%

OWNER/APPLICANT:
GREEN MOUNTAIN LAND, LLC
17933 NW EVERGREEN PARKWAY, SUITE 300
BEAVERTON, OR 97006
(503) 597-7100
(503) 597-7149 FAX
john.schmidt@metlandgroup.com

CONTACT:
LANDERHOLM LAW FIRM
ATTN: RANDY PRINTZ
805 BROADWAY SUITE 1000
VANCOUVER, WA 98660
(360) 693-3312
randy.printz@landerholm.com

PREPARED BY:
OLSON ENGINEERING, INC.
ATTN: MIKE ODREN
1111 BROADWAY
VANCOUVER, WA 98660
(360) 695-1385
FAX (360) 695-8117
mikeo@olsonengr.com

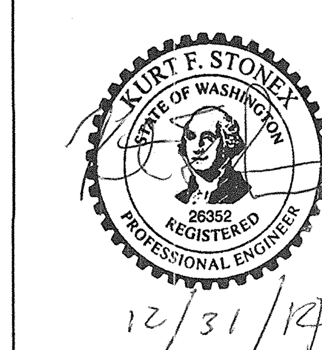
N

GRAPHIC SCALE
0 50 100 200
(IN FEET)
1 inch = 100 ft.

PLOT: consultant3.ctb
FILE: j:/data/8000/8900/8930/8938/Planning/8938.p.plat.prelim.dwg

STREET SECTIONS FOR:
GREEN MOUNTAIN MIXED USE PRD
PHASE 1

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
1111 BROADWAY, VANCOUVER, WA 98660
360-695-1385
503-289-9936



12/31/14

CHANGES / REVISIONS	
DESCRIPTION:	DATE:

DESIGNED: WPA/MRO

DRAWN: WPA/MRO

CHECKED: KFS

DATE: DECEMBER 2014

SCALE: H: 1" = 100'
V:

GREEN MOUNTAIN PRD - PHASE 1

JOB NO. 8938.01.02

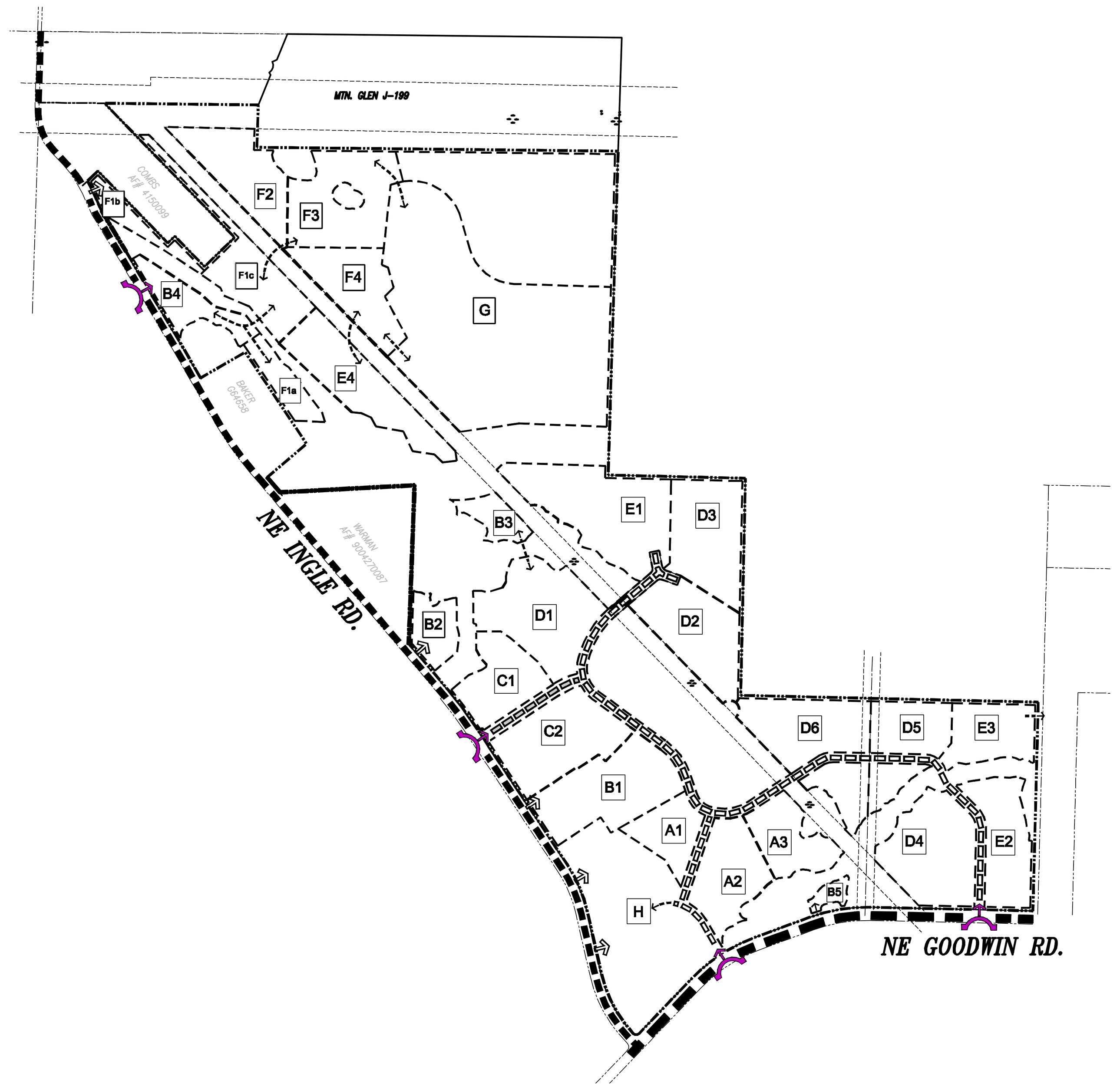
EXHIBIT 31

GREEN MOUNTAIN

DEVELOPMENT STANDARDS & PHASING PLAN

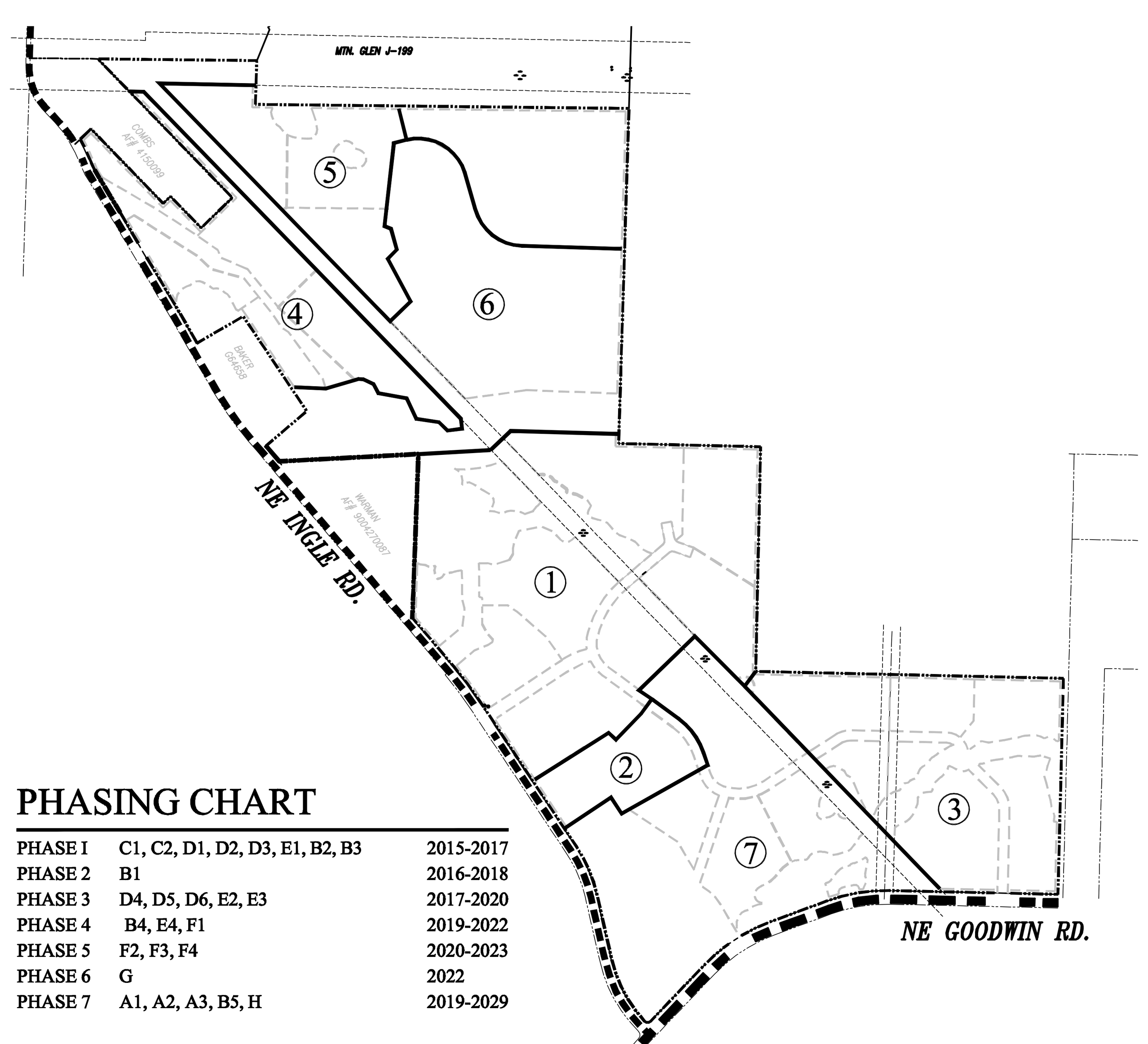
CAMAS, WASHINGTON

GREEN MOUNTAIN LAND, LLC.



PLANNING UNITS

0 800 1600



PHASING CHART

PHASE 1	C1, C2, D1, D2, D3, E1, B2, B3	2015-2017
PHASE 2	B1	2016-2018
PHASE 3	D4, D5, D6, E2, E3	2017-2020
PHASE 4	B4, E4, F1	2019-2022
PHASE 5	F2, F3, F4	2020-2023
PHASE 6	G	2022
PHASE 7	A1, A2, A3, B5, H	2019-2029

PHASING PLAN

0 800 1600

PLANNING STANDARDS

URBAN VILLAGE AREA

URBAN VILLAGE AREA - Mixed Use, Community Commercial, A and B PODS

Urban Village Area	Minimum of 8.8 acres with ground floor Employment/Commercial Use (as provided for in 18.07.030 Table 1). Allow horizontal and vertical Mixed Use PODs H, A1, A2, A3, B5 and 100 Units at the Village Center

DENSITY & DIMENSIONS

Green Mountain PRD PODs A-G and corresponding Camas Zones

	A POD	B POD	C POD
DENSITY	**MF-24**	**MF-18**	**MF-10**
Max. du/gross ac	24	18	10
Min. du/gross ac	6	6	6
STANDARD LOTS			
Min. lot SF	~~1,800~~ 1,000 [a]	~~2,100~~ 1,000[a]	3,000 [a]
Min. lot width	20	20	30
Min. lot depth	~~60~~ 50	~~60~~ 50	70
Max. Floor Area per du	No Max	No Max	No Max
SETBACKS			
Min. front/at garage	~~10/18~~ None	~~10~~ 6/3@OS/18	~~15/18~~ 10/18
Min. side	3 [1]	3 [1] [d]	3 [1] [d]
Min. side Flanking Street	~~15~~ None [e]	~~15~~ 10 [d]	~~15~~ 10 [d]
Min. rear *(garage @alley)*	~~10~~ None [e]	10 [b][c]	10[b][c]
LOT COVERAGE, Max.	~~75%~~ None [c]	~~65%~~ None	55%
BUILDING HEIGHT, Max.	~~45[2]~~ 60	45 [2]	35 [2]

a. Single Family Detached homes to be permitted. For SFD in A POD apply B Pod setbacks.

b. 10 foot rear yard for front access garage.

c. Minimum rear yard for alley accessed garage is either 4' or 18'.

d. Minimum side yard at alley is 5'.

e. Franchise utilities to be located in front or side yard easements abutting right of way.

1. The non-attached side of a dwelling unit shall be three feet, otherwise a zero-lot line is assumed.
2. Maximum building height: three stories and a basement but not to exceed maximum building height.

Density Transfer Lots	D POD	E POD	F POD	G POD
DENSITY	**R-5**	**R-6**	**R-7.5**	**R-20**
Max. du/gross ac.	8.7	7.2	5.8	2.1
DENSITY TRANSFER LOTS				
Min. lot size (sq. ft.)	3,500 [a]	4,200	5250	14,000
Max, lot size (sq. ft.)	~~6,000~~ 7,600	~~7,200~~ 9,000	~~9,000~~ 14,999	~~24,000~~ 60,000
Min. lot width	40	50	60	90
Min. lot depth	80	80	80	100
LOT COVERAGE, Max.	45%	40%	40%	30%
BUILDING HEIGHT, MAX. (ft.)	35	35	35	35
SETBACKS based on ~~avg.~~ lot size	Up to 4,999 sq. ft.	5,000 to 7,499 sq. ft.	7,500 to 14,999 sq. ft.	15,000 to 60,000 sq. ft.
Min. front/at garage	~~15~~ 10/18	~~20~~ 15/18	20	30
Min. side and corner lot rear yard (ft.)	~~5~~ 4	5	5	15
Min. side yard flanking a street	~~15~~ 10[d]	~~20~~ 15[d]	~~20~~ 15	30
Min. rear *(garage @alley)*	~~20~~ 15[b][c]	~~25~~ 20[b][c]	~~25~~ 20[b][c]	30
Min. lot frontage on a cul-de-sac or curve (ft.)	25	30	30	40

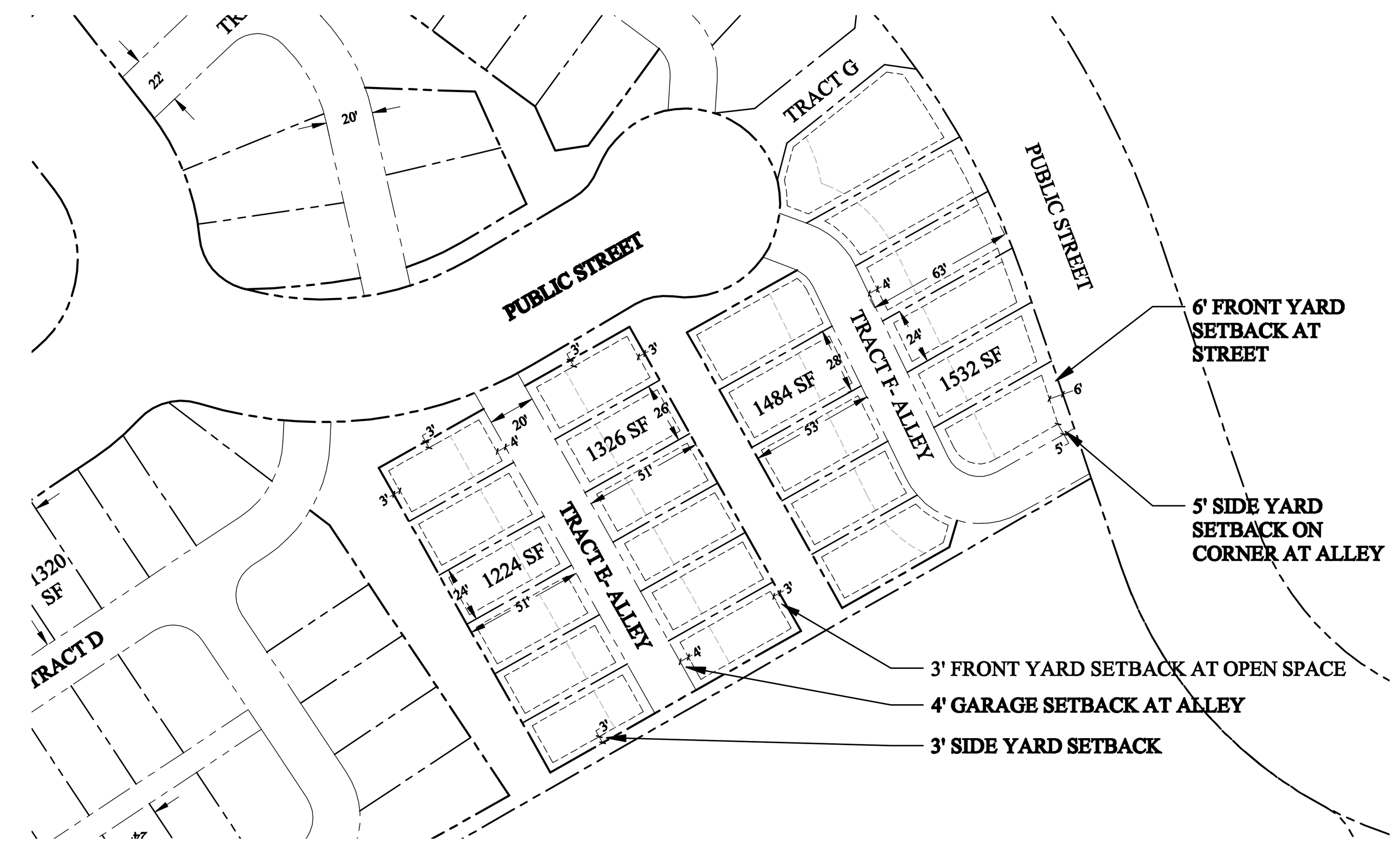
a. Single Family detached homes to be permitted.

b. 10 foot rear yard for front access garage.

c. Minimum rear yard for alley accessed garage is either 4' or 18'.

d. Minimum side yard at alley is 5'.

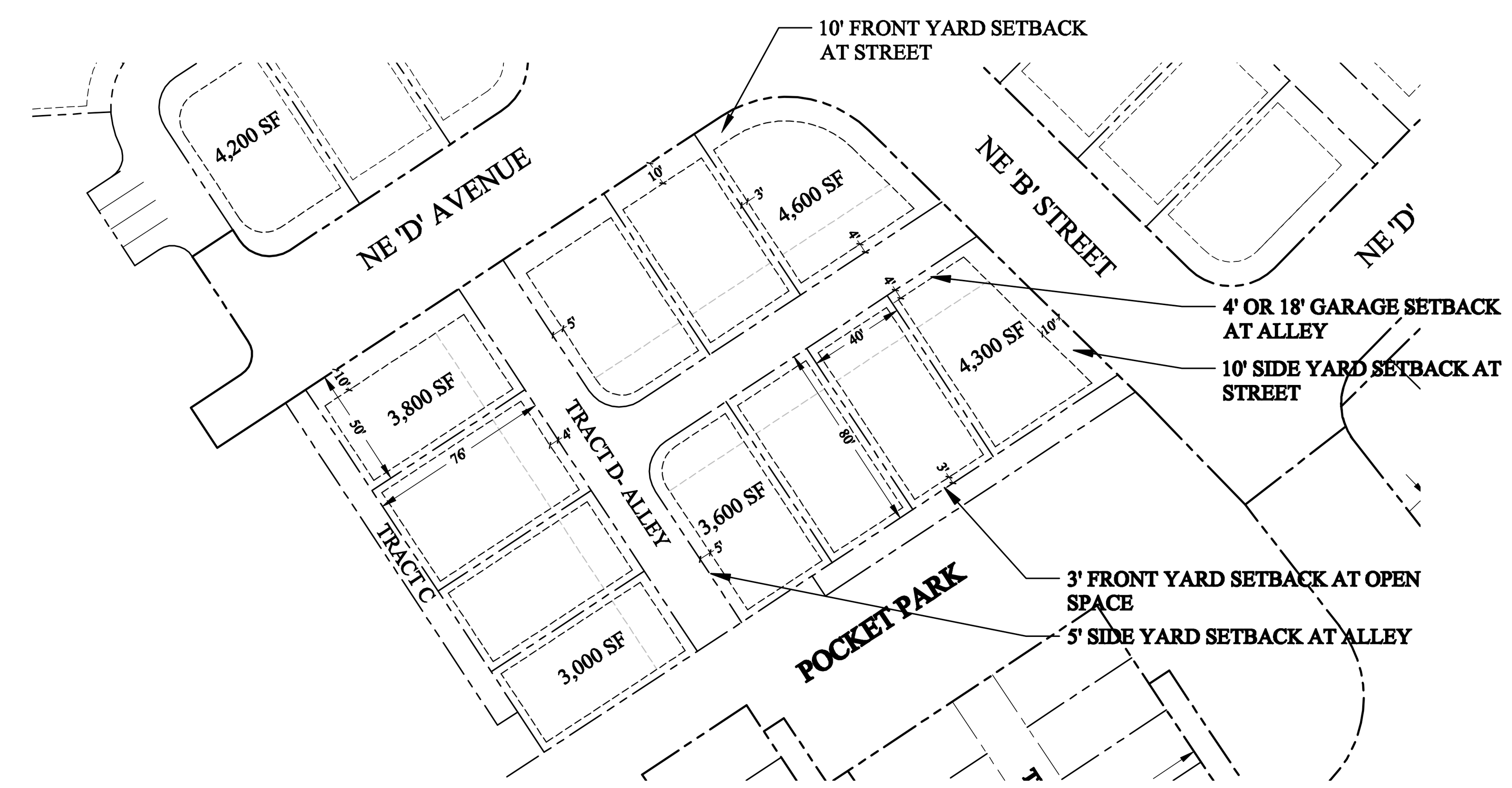
NOTE: POD lot sizes are not subject to lot size averaging.



POD B- TYPICAL LOT & DEVELOPMENT PATTERNS

LOT DIMENSIONS & BUILDING ENVELOPES

0 60 120



POD C- TYPICAL LOT & DEVELOPMENT PATTERNS

LOT DIMENSIONS & BUILDING ENVELOPES

0 60 120

WESTERN PLANNING ASSOCIATES

Land Planning
Landscape
Architecture

P.O.BOX 2392
LAKE OSWEGO, OR
97035
503-294-0222

SCALE: AS NOTED

DESIGNED BY: WFH
DRAWN BY: SH
CHECKED BY: WFH

DATE: 01/15/15
REVISED:

PRELIMINARY
STATE OF WASHINGTON
REGISTERED LANDSCAPE ARCHITECT
WILLIAM F. HORNING
CERTIFICATE NO. 382

GREEN MOUNTAIN
DEVELOPMENT STANDARDS & PHASING PLAN
GREEN MOUNTAIN LAND, LLC.
CAMAS, WASHINGTON

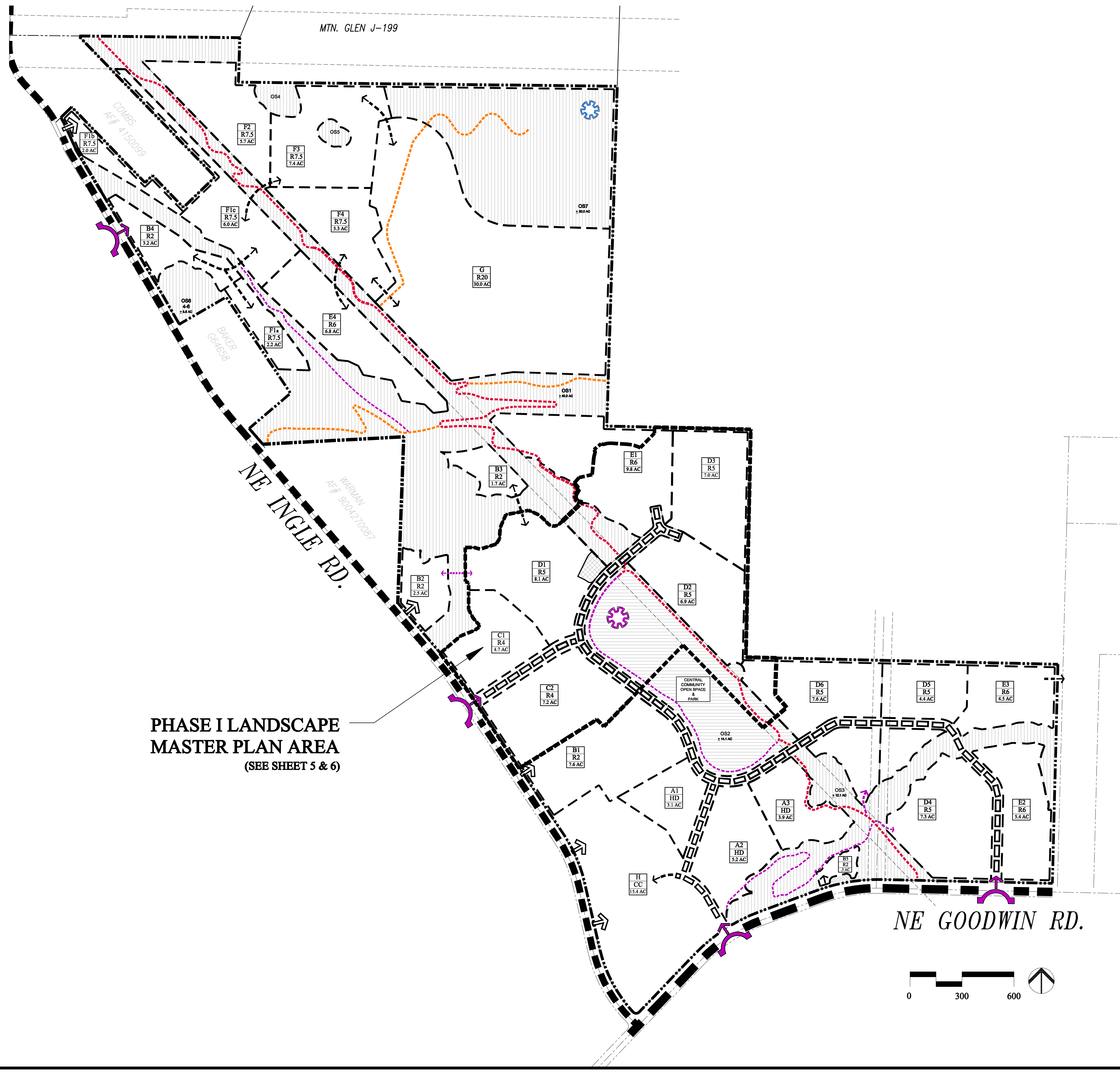
EXHIBIT 32

GREEN MOUNTAIN

CONCEPTUAL OPEN SPACE, PARK & LANDSCAPE MASTER PLAN

CAMAS, WASHINGTON

GREEN MOUNTAIN LAND, LLC.



LEGEND

PARK & OPEN SPACE COMPONTENTS

PARKS & OPEN SPACE AREAS (+ 89 * ACRES TOTAL)

CENTRAL COMMUNITY OPEN SPACE & PARK [+14 AC]

TOP OF GREEN MOUNTAIN [+20 AC]

COMMUNITY TRAIL SYSTEM
(LOCATION SHOWN IS CONCEPTUAL)

REGIONAL TRAIL T27
TYPICAL EASEMENT WIDTH 24 FEET ** PLUS SWITCHBACK AREAS
8' WIDE AT CENTRAL PARK. PAVED
6' WIDE FLAT UP TO 8% TRAIL GRADE, PAVED
4' WIDE IN STEEP TERRAIN (8%- 16% TRAIL GRADE), COMPACTED GRAVEL

T29 / T30 / SU14
TYPICAL EASEMENT WIDTH 24 FEET PLUS SWITCHBACK AREAS**
6' WIDE FLAT UP TO 8% TRAIL GRADE, COMPACTED GRAVEL
4' WIDE IN STEEP TERRAIN (8% - 16% TRAIL GRADE), COMPACTED GRAVEL

NEIGHBORHOOD TRAILS
EASEMENTS IN COMMON AREA TRACTS
6' WIDE FLAT UP TO 8% TRAIL GRADE, PAVED
4' WIDE IN STEEP TERRAIN (8% - 16% TRAIL GRADE), COMPACTED GRAVEL

*** DOES NOT INCLUDE POCKET PARKS**

**** WHERE NOT ADJACENT TO A PUBLIC RIGHT OF WAY**

LANDSCAPE MASTER PLAN COMPONENTS

ENTRY BOULEVARD

IDENTIFICATION & LANDSCAPED ENTRY

GREEN MOUNTAIN CLUB HOUSE

WESTERN PLANNING ASSOCIATES
Land Planning Landscape Architecture
P.O.BOX 2392
LAKE OSWEGO, OR 97035
503-294-0222

SCALE: AS NOTED
DESIGNED BY: WFH
DRAWN BY: SH
CHECKED BY: WFH

DATE: 01/14/15
REVISED:

PRELIMINARY
STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
WILLIAM F. HORNING
CERTIFICATE NO. 382

GREEN MOUNTAIN
CONCEPTUAL OPEN SPACE, PARK & LANDSCAPE MASTER PLAN
GREEN MOUNTAIN LAND, LLC.
CAMAS, WASHINGTON

EXHIBIT 33

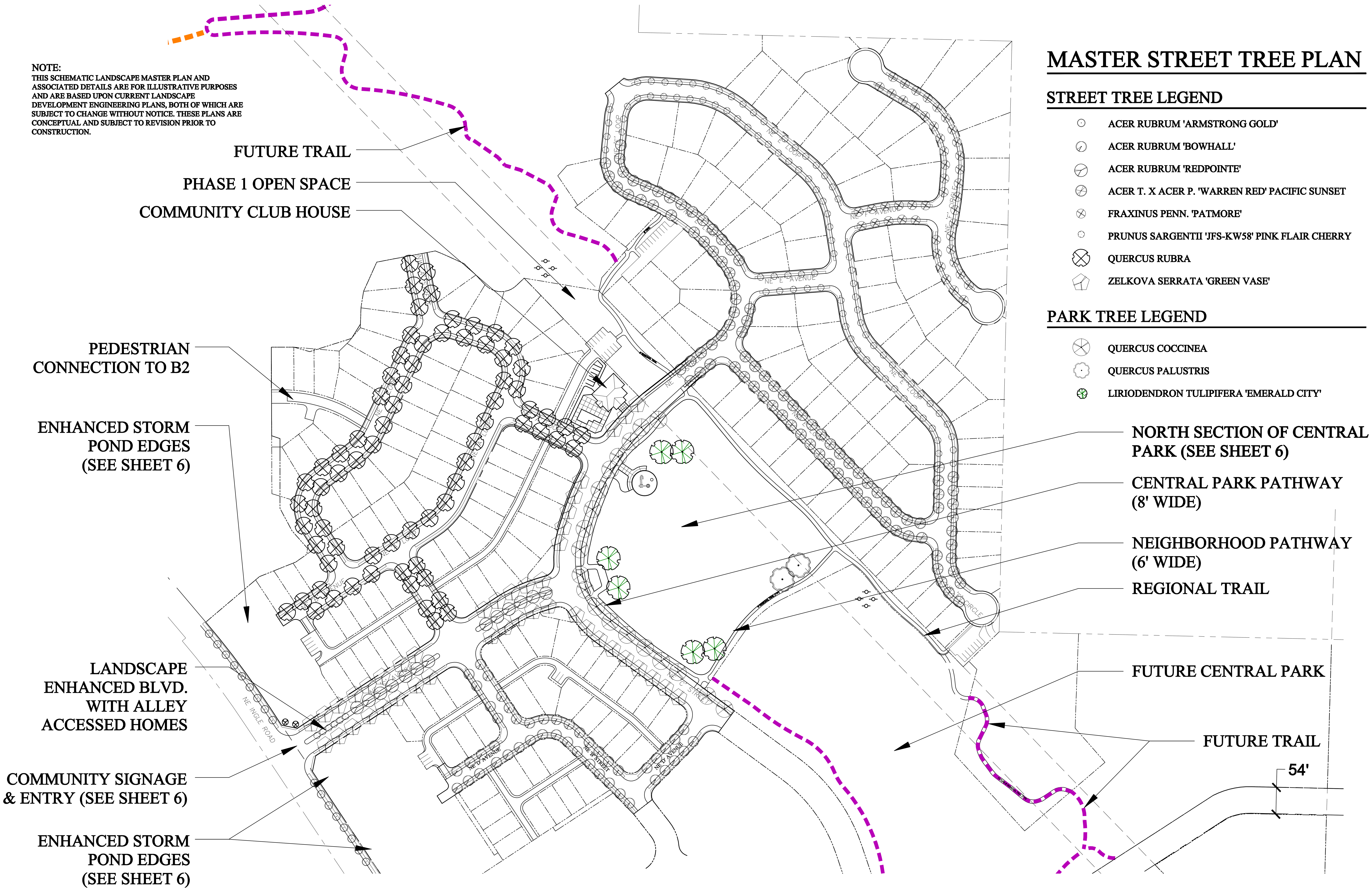
GREEN MOUNTAIN

LANDSCAPE MASTER PLAN COMPONENTS- PHASE 1

CAMAS, WASHINGTON

GREEN MOUNTAIN LAND, LLC.

NOTE:
THIS SCHEMATIC LANDSCAPE MASTER PLAN AND ASSOCIATED DETAILS ARE FOR ILLUSTRATIVE PURPOSES AND ARE BASED UPON CURRENT LANDSCAPE DEVELOPMENT ENGINEERING PLANS, BOTH OF WHICH ARE SUBJECT TO CHANGE WITHOUT NOTICE. THESE PLANS ARE CONCEPTUAL AND SUBJECT TO REVISION PRIOR TO CONSTRUCTION.



MASTER STREET TREE PLAN

STREET TREE LEGEND

- ACER RUBRUM 'ARMSTRONG GOLD'
- ACER RUBRUM 'BOWHALL'
- ACER RUBRUM 'REDPOINTE'
- ACER T. X ACER P. 'WARREN RED' PACIFIC SUNSET
- FRAXINUS PENN. 'PATMORE'
- PRUNUS SARGENTII 'JFS-KW58' PINK FLAIR CHERRY
- QUERCUS RUBRA
- ZELKOVA SERRATA 'GREEN VASE'

PARK TREE LEGEND

- QUERCUS COCCINEA
- QUERCUS PALUSTRIS
- LIRIODENDRON TULIPIFERA 'EMERALD CITY'

WESTERN PLANNING ASSOCIATES

Land Planning
Landscape Architecture

P.O.BOX 2392
LAKE OSWEGO, OR 97035
503-294-0222

SCALE: AS NOTED

DESIGNED BY: WFH
DRAWN BY: SH
CHECKED BY: WFH

DATE: 01/14/15
REVISED:

PRELIMINARY
STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
WILLIAM F. HORNING
CERTIFICATE NO. 382

GREEN MOUNTAIN
LANDSCAPE MASTER PLAN COMPONENTS
GREEN MOUNTAIN LAND, LLC.
CAMAS, WASHINGTON

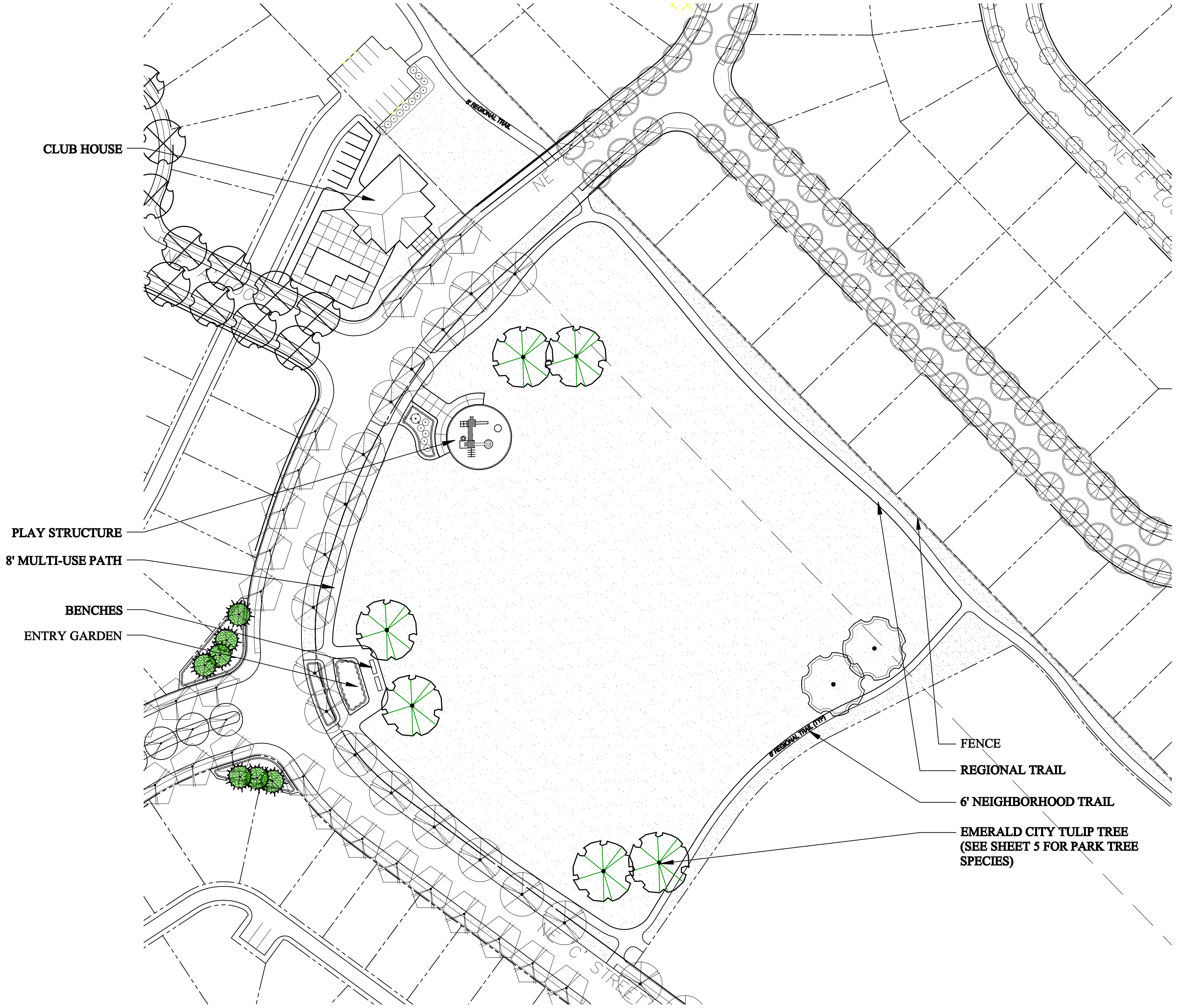
EXHIBIT 34

GREEN MOUNTAIN

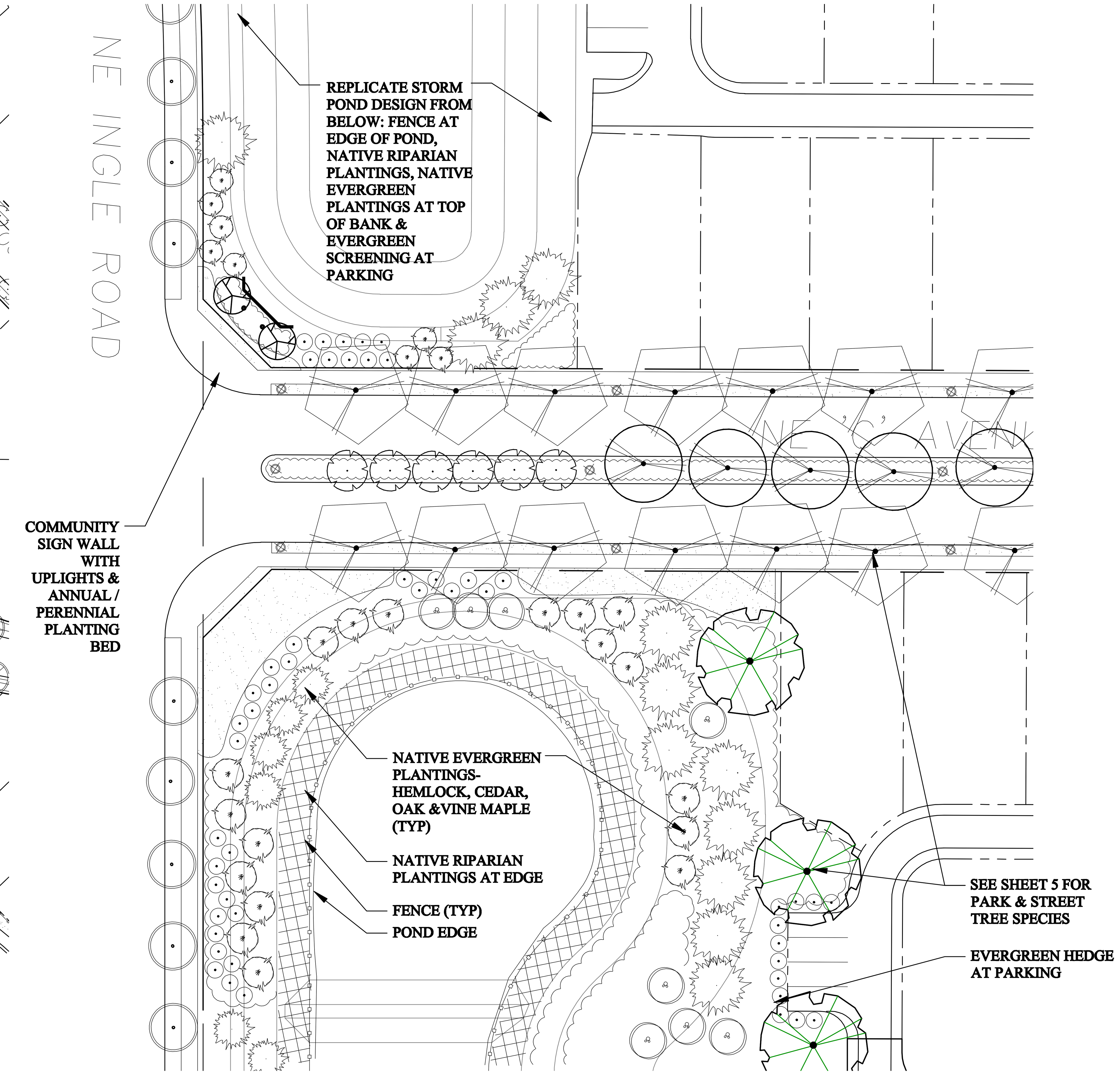
SCHEMATIC LANDSCAPE MASTER PLAN

CAMAS, WASHINGTON

GREEN MOUNTAIN LAND, LLC.



NORTH SECTION CENTRAL PARK & CLUBHOUSE



NEIGHBORHOOD ENTRY & STORM POND EDGE PLANTING

NOTE:
THIS SCHEMATIC LANDSCAPE MASTER PLAN AND ASSOCIATED DETAILS ARE FOR ILLUSTRATIVE PURPOSES AND ARE BASED UPON CURRENT LANDSCAPE DEVELOPMENT ENGINEERING PLANS, BOTH OF WHICH ARE SUBJECT TO CHANGE WITHOUT NOTICE. THESE PLANS ARE CONCEPTUAL AND SUBJECT TO REVISION PRIOR TO CONSTRUCTION.

WESTERN PLANNING ASSOCIATES

Land Planning
Landscape Architecture

P.O.BOX 2392
LAKE OSWEGO, OR
97035
503-294-0222

SCALE: AS NOTED

DESIGNED BY: WFH
DRAWN BY: SH
CHECKED BY: WFH

DATE: 01/14/15
REVISED:

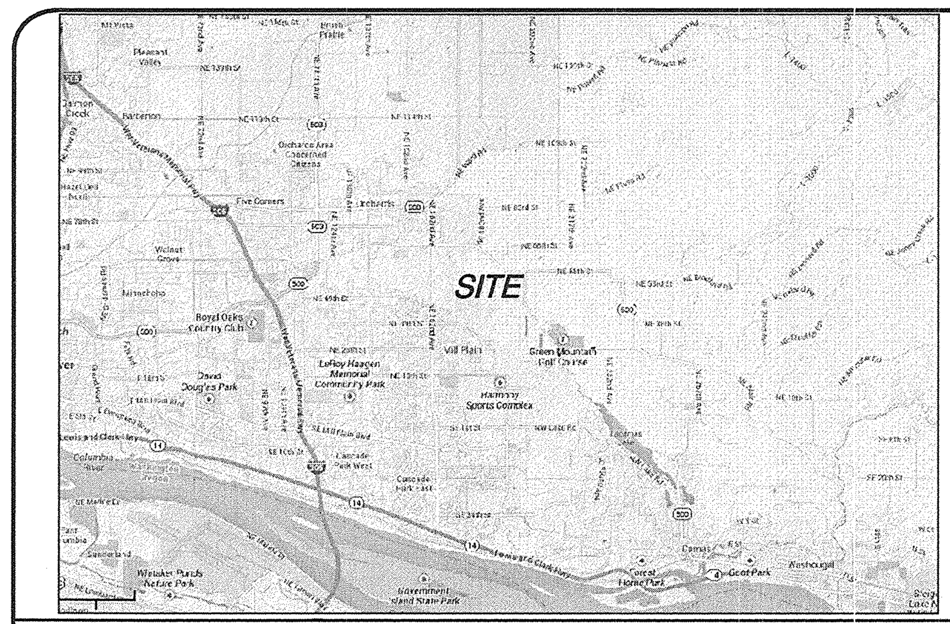
STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT

WILLIAM F. HORNING

CERTIFICATE NO. 382

GREEN MOUNTAIN
SCHEMATIC LANDSCAPE MASTER PLANS
GREEN MOUNTAIN LAND, LLC.
CAMAS, WASHINGTON

EXHIBIT 35



VICINITY MAP   SEC. 17, 20 & 21 T2N R3E W.M.

NTS

SUBDIVISION NOTES

EXISTING SITE DATA:

PRESENT USE:	GOLF COURSE
EXISTING ZONING:	R-6, MF-10

PROPOSED SITE DATA:

PROPOSED USE:	201 LOT SUBDIVISION
WETLAND, STREAM, STEEP BANK BUFFER AREAS/PROTECTED AREAS, AND PLANNED ENHANCEMENT AREAS:	AS SHOWN
PROPOSED PRIVATE ROADS:	AS SHOWN
PROPOSED EASEMENTS:	REFER TO ENGINEERING PLANS
PROPOSED ON-SITE ROAD RIGHTS-OF-WAY:	AS SHOWN
PROPOSED PEDESTRIAN AND BICYCLE FACILITIES:	AS SHOWN
PROPOSED EASEMENTS FOR ACCESS, DRAINAGE, UTILITIES, ETC:	REFER TO ENGINEERING PLANS
PROPOSED LOADING ZONES:	NONE PROPOSED
PROPOSED SEPTIC SYSTEMS:	NONE PROPOSED
PROPOSED OPEN SPACE/PARK:	AS SHOWN
PROPOSED TRANSIT FACILITIES:	NONE PROPOSED
PROPOSED SIGNS (SIGN PLAN):	SEE SIGN PLAN
PROPOSED LIGHTING:	STREET LIGHT TO BE PROVIDED
PROPOSED LOTS, TRACTS, ETC:	AS SHOWN
EXISTING BUILDINGS TO REMAIN:	AS SHOWN
PROPOSED LANDSCAPING (LANDSCAPE PLAN):	AS SHOWN ON THE LANDSCAPE PLAN
PROPOSED BUILDINGS:	LOTS FOR SINGLE AND/OR MULTI-FAMILY DETACHED RESIDENCES & CLUBHOUSE
PROPOSED PARKING:	AS SHOWN

IF ANY CULTURAL RESOURCES AND/OR HUMAN REMAINS ARE DISCOVERED IN THE COURSE OF UNDERTAKING THE DEVELOPMENT ACTIVITY, THE DEPARTMENT OF ARCHAEOLOGY AND HISTORIC PRESERVATION IN OLYMPIA SHALL BE NOTIFIED. FAILURE TO COMPLY WITH THESE STATE REQUIREMENTS MAY CONSTITUTE A CLASS C FELONY, SUBJECT TO IMPRISONMENT AND/OR FINES.

LAND INVENTORY:

TOTAL PHASE 1 AREA:	51.21 ACRES (2,230,558 SF)
TOTAL DEVELOPED AREA:	45.22 ACRES (1,969,658 SF)
TOTAL LOT AREA:	26.02 ACRES (1,133,500 SF)
TOTAL INFRASTRUCTURE AREA (INCL. STORM FACILITIES) INCL. ACCESS TRACTS 'B', 'C', 'D', 'F', 'I', 'J', 'O' AND 'U'	20.47 ACRES (891,469 SF)
TOTAL TRACT AREA:	13.51 ACRES (588,500 SF)
TOTAL AREA OF CRITICAL AREAS:	0 ACRES (0 SF)
TOTAL AREA OF RECREATIONAL OPEN SPACES: INCL. OPEN SPACE TRACTS 'G', 'K', 'N', 'P', 'S', "T' AND A PORTION OF 'U'	6.12 ACRES (266,800 SF)

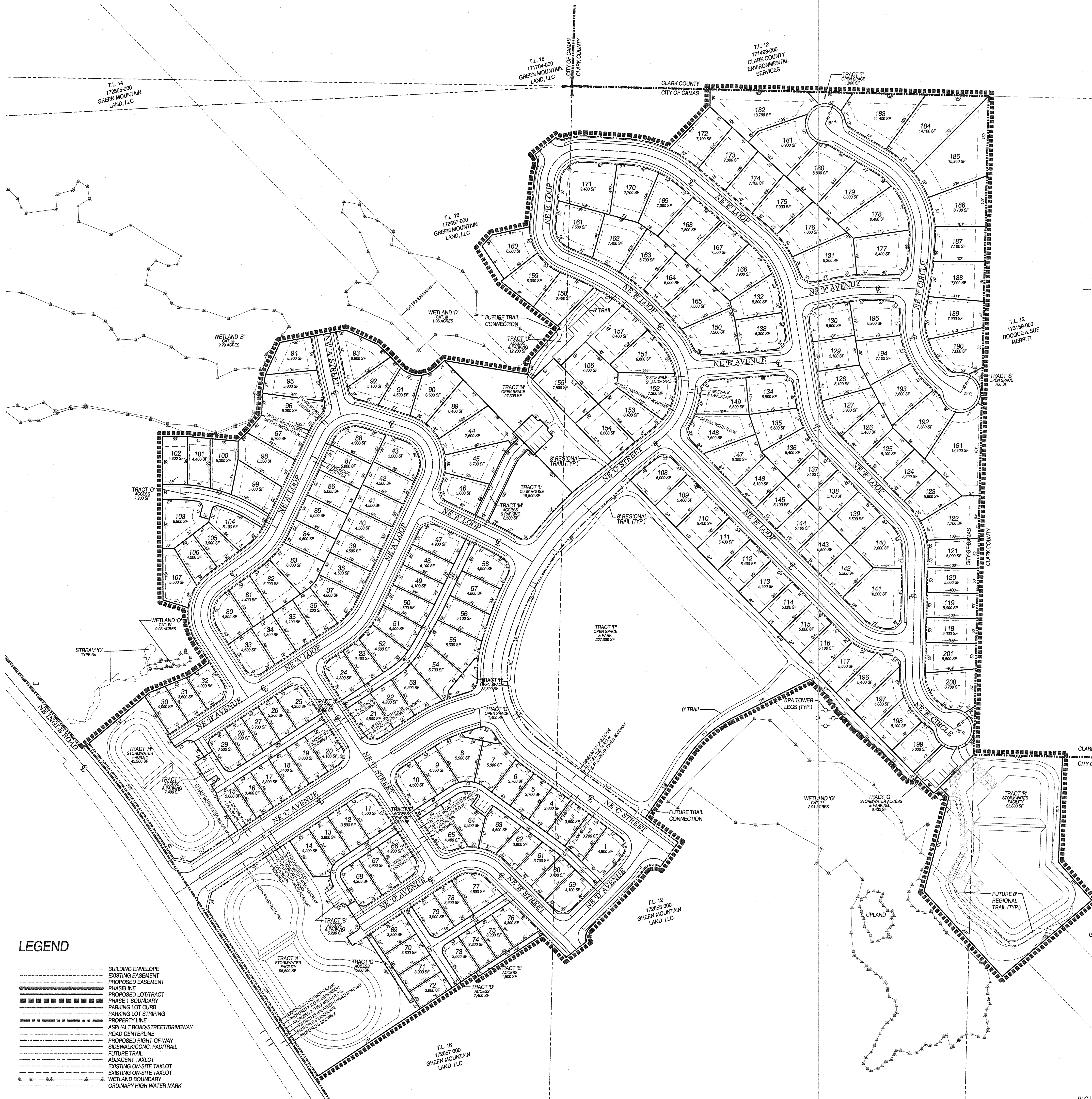
DEVELOPMENT STANDARDS

GREEN MOUNTAIN PRD STANDARDS FOR PRD LOT DEVELOPMENT	MULTI-FAMILY LOTS ('C' PODS) LOTS 1-32 LOTS 59-79 SEE NOTE 1	SINGLE-FAMILY 'D' PODS LOTS 33-58 LOTS 80-130 LOTS 132-171 LOTS 196-201	SINGLE-FAMILY 'E' PODS LOT 131 LOTS 172-195
MINIMUM LOT AREA	3,000 SF	3,500 SF SEE NOTE 1	4,200 SF
MAXIMUM LOT AREA	N/A	7,600	9,000
MINIMUM LOT WIDTH	30'	40'	50'
MINIMUM LOT DEPTH	70'	80'	80'
MINIMUM LOT WIDTH ON A CURVE OR CUL-DE-SAC	N/A	25'	30'
MAXIMUM BUILDING HEIGHT	35' SEE NOTE 3	35'	35'
MAXIMUM BUILDING COVERAGE	55%	45%	40%
MINIMUM SETBACKS		SEE CHART BELOW FOR SINGLE-FAMILY SETBACKS	
FRONT YARD (INCLUDES 6' PUBLIC UTILITY EASEMENT)	10' SEE NOTE 9		
GARAGE SETBACK FROM R.O.W.	18'		
SIDE YARD	3' SEE NOTES 2 & 8		
STREET SIDE YARD	10' SEE NOTES 2 & 8		
REAR YARD	10' SEE NOTES 4 & 5		

SETBACKS FOR PODS 'C' AND 'D' SEE NOTE 6				
LOT AREA	UP TO 4,999 SF	5,000 SF TO 7,499 SF	7,500 SF TO 14,999 SF	15,000 SF TO 60,000 SF
FRONT YARD (INCLUES 6' PUBLIC UTILITY EASEMENT)	10'/18' AT GARAGE	15'/18' AT GARAGE	20'	30'
SIDE YARD AND CORNER LOT REAR YARD	4'	5'	5'	15'
CORNER LOT STREET SIDE YARD	10' SEE NOTE 8	15' SEE NOTE 8	15' SEE NOTE 8	30'
REAR YARD SEE NOTES 4 & 5	15'	20'	20'	30'
MINIMUM LOT WIDTH ON A CURVE OR CUL-DE-SAC	25'	30'	30'	40'

1. SINGLE-FAMILY DETACHED HOMES PERMITTED. FOR SINGLE-FAMILY DETACHED RESIDENCES IN 'A' POD, APPLY 'B' POD SETBACKS.
2. THE NON-ATTACHED SIDE OF A DWELLING UNIT SHALL BE THREE FEET. OTHERWISE A ZERO-LOT LINE IS ASSUMED.
3. MAXIMUM BUILDING HEIGHT: THREE STORIES AND A BASEMENT BUT NOT TO EXCEED MAXIMUM BUILDING HEIGHT.
4. 10 FOOT REAR YARD FOR FRONT ACCESS GARAGE.
5. MINIMUM REAR YARD FOR ALLEY ACCESSED GARAGE IS EITHER 4 FEET OR 18 FEET.
6. SETBACKS BASED ON LOT SIZE. LOT SIZES ARE NOT SUBJECT TO LOT SIZE AVERAGING.
7. BUILDING ENVELOPES SHOWN ON THE PLAN ILLUSTRATE THE FRONT AND REAR YARD BUILDING SETBACKS. REFER TO TABLE ABOVE FOR REQUIRED GARAGE FRONT AND REAR YARD SETBACKS.
8. MINIMUM SIDE YARD AT AN ALLEY IS 5 FEET.
9. 3 FOOT FRONT YARD SETBACK AT OPEN SPACE OR PEDESTRIAN ACCESS TRACT.

BASE SUBDIVISION LAYOUT PROVIDED BY WESTERN PLANNING ASSOCIATES.
ENVIRONMENTAL INFORMATION PROVIDED BY ECOLOGICAL LAND SERVICES.



LEGEND

- BUILDING ENVELOPE
- EXISTING EASEMENT
- PROPOSED EASEMENT
- PHASELINE
- PROPOSED LOT/TRACT
- PHASE 1 BOUNDARY
- PARKING LOT CURB
- PARKING LOT STRIPING
- PROPERTY LINE
- ASPHALT ROAD/STREET/DRIVEWAY
- ROAD CENTERLINE
- PROPOSED RIGHT-OF-WAY
- SIDEWALK/CONC. PAD/TRAIL
- FUTURE TRAIL
- ADJACENT TAXLOT
- EXISTING ON-SITE TAXLOT
- EXISTING ON-SITE TAXLOT
- WETLAND BOUNDARY
- ORDINARY HIGH WATER MARK

OWNER/APPLICANT:
GREEN MOUNTAIN LAND, LLC
17933 NW EVERGREEN PARKWAY, SUITE 300
BEAVERTON, OR 97006
(503) 597-7100
(503) 597-7149 FAX
john.schmidt@metlandgroup.com

CONTACT:
LANDERHOLM LAW FIRM
ATTN: RANDY PRINTZ
805 BROADWAY SUITE 1000
VANCOUVER, WA 98660
(360) 693-3312
randy.printz@landerholm.com

PREPARED BY:
OLSON ENGINEERING, INC.
ATTN: MIKE ODREN
222 E. EVERGREEN BLVD.
VANCOUVER, WA 98660
(360) 695-1385
FAX (360) 695-8117
mikeo@olsonengr.com

GRAPHIC SCALE

0 50 100 200

(IN FEET)
1 inch = 100 ft.

PLOT: consultant3.ctb
FILE: j:/data/8000/8900/8930/8938/Planning/8938.p.plat.prelim.dwg

PRELIMINARY PLAT FOR:
GREEN MOUNTAIN MIXED USE PRD PHASE 1

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
222 E. EVERGREEN BLVD., VANCOUVER, WA 98660
360-695-1385
503-289-9936

KURT F. STONEX
STATE OF WASHINGTON
26352
REGISTERED PROFESSIONAL ENGINEER
1/29/15

CHANGES / REVISIONS	
DESCRIPTION:	DATE:
LOT STANDARD REV'S	01/29/15

DESIGNED: WPA/MRO

DRAWN: WPA/MRO

CHECKED: KFS

DATE: DECEMBER 2014

SCALE: H: 1" = 100'
V:

GREEN MOUNTAIN PRD - PHASE 1

JOB NO. 8938.01.02

EXHIBIT 36

Green Mountain PRD PODs A-G and corresponding Camas Zones

	A POD	B POD	C POD
DENSITY	**MF-24**	**MF-18**	**MF-10**
Max. du/gross ac	24	18	10
Min. du/gross ac	6	6	6
STANDARD LOTS			
Min. lot SF	1,000 [a]	1,000[a]	3,000 [a]
Min. lot width	20	20	30
Min. lot depth	50	50	70
Max. Floor Area per du	No Max	No Max	No Max
SETBACKS			
Min. front/at garage	None	6/3@OS/18	10/18
Min. side	3 [1]	3 [1] [d]	3 [1] [d]
Min. side Flanking Street	None [e]	10 [d]	10 [d]
Min. rear ***(garage @alley)***	None [e]	10 [b][c]	10[b][c]
LOT COVERAGE, Max.	None [c]	None	55%
BUILDING HEIGHT, Max.	60	45 [2]	35 [2]

a. Single Family Detached homes to be permitted. For SFD in A POD apply B Pod setbacks.

b. 10 foot rear yard for front access garage.

c. Minimum rear yard for alley accessed garage is either 4' or 18'.

d. Minimum side yard at alley is 5'.

e. Franchise utilities to be located in front or side yard easements abutting right of way.

1. The non-attached side of a dwelling unit shall be three feet, otherwise a zero-lot line is assumed.
2. Maximum building height: three stories and a basement but not to exceed maximum building height.

Density Transfer Lots	D POD	E POD	F POD	G POD
DENSITY	**R-5**	**R-6**	**R-7.5**	**R-20**
Max. du/gross ac.	8.7	7.2	5.8	2.1
DENSITY TRANSFER LOTS				
Min. lot size (sq. ft.)	3,500 [a]	4,200	5250	14,000
Max, lot size (sq. ft.)	7,600	9,000	14,999	60,000
Min. lot width	40	50	60	90
Min. lot depth	80	80	80	100
LOT COVERAGE, Max.	45%	40%	40%	30%
BUILDING HEIGHT, MAX. (ft.)	35	35	35	35
SETBACKS **based on lot size**	Up to 4,999 sq. ft.	5,000 to 7,499 sq. ft.	7,500 to 14,999 sq. ft.	15,000 to 60,000 sq. ft.
Min. front/at garage	10/18	15/18	20	30
Min. side and corner lot rear yard (ft.)	4	5	5	15
Min. side yard flanking a street	10[d]	15[d]	15	30
Min. rear ***garage @alley)***	15[b][c]	20[b][c]	20[b][c]	30
Min. lot frontage on a cul-de-sac or curve (ft.)	25	30	30	40

a. Single Family detached homes to be permitted.

b. 10 foot rear yard for front access garage.

c. Minimum rear yard for alley accessed garage is either 4' or 18'.

d. Minimum side yard at alley is 5'.

NOTE: POD lot sizes are not subject to lot size averaging.

Community Development
616 NE Fourth Avenue • Camas, WA 98607
(360) 817-1568
http://www.cityofcamas.us

SEPA ENVIRONMENTAL CHECKLIST

UPDATED 2014

Purpose of checklist:

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

***Instructions for applicants*:**

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown. You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for Lead Agencies:

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals:

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B plus the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in Part B - Environmental Elements –that do not contribute meaningfully to the analysis of the proposal.

A. background

1. Name of proposed project, if applicable:

Green Mountain Planned Residential Development (PRD)

2. Name of applicant:

Green Mountain Land, LLC

3. Address and phone number of applicant and contact person:

Applicant:
Green Mountain Land, LLC
17933 NW Evergreen Parkway, Suite 300
Beaverton, OR 97006
Ph: (503) 597-7140
Fax: (503) 597-7149

Contact:
Randall Printz
Landerholm Law Firm
805 Broadway, Suite 1000
PO Box 1086
Vancouver, WA. 98666
Randy.printz@landerholm.com
(360) 696-3312

4. Date checklist prepared:

December, 2014

5. Agency requesting checklist:

City of Camas, Washington

6. Proposed timing or schedule (including phasing, if applicable):

Some grading and development of Phase 1 will take place upon approval and procurement of all applicable reviews and permits. The remaining of portions of the site and future phases will be developed over approximately the next fifteen years. Off-site improvements including, but not limited to, transportation and stormwater improvements, sewer, water, utility routing to the site, etc. shall also take place upon approval and procurement of all applicable reviews and permits. On-site improvements will occur as development of each phase of the PRD is developed.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

None other than the phased development of the full project as described above.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

Stormwater Report – Olson Engineering, Inc.
Critical Areas Report – Ecological Land Services, Inc.
Archaeological Predetermination – Archaeological Services LLC
Geotechnical Investigation – GeoPacific Engineering, Inc.
Traffic Impact Study - Kittelson and Associates

Tree Survey

Previous SEPA checklist and Threshold Determination by the City of Camas in conjuntion with a Development Agreement (DA) relating to this property entered into between the Applicant and the City in December of 2014. These existing environmental documents (SEPA checklist and Threshold Determination relating to the DA) are hereby incorporated into this checklist.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

No other permits are currently pending that the Applicant is aware of.

10. List any government approvals or permits that will be needed for your proposal, if known.

Planned Residential Development Approval	**Preliminary Plat Approval**
Engineering Plan Approval	**Erosion Control Plan Approval**
Grading Plan Approval	**Grading Permit**
Stormwater Plan Approval	**SEPA Determination**
NPDES Permit	**Stormwater Pollution Prevention Program**
Critical Areas Ordinance Approval	**Forest Practice Permit Approval**
Final Plat Approval	**Final Site Plan Approval**
Preliminary Site Plan Approval	

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The Applicant is requesting approval of a Planned Residential Development based on a Conceptual Master Plan on approximately 283 acres at the base of Green Mountain in Camas, Washington. The development will ultimately include the construction of approximately 1,300 single- and multi-family dwelling units, common open space, park(s), commercial and retail buildings, associated parking lots, access roads, stormwater treatment and detention facilities, utilities and other related infrastructural improvements. Refer to Conceptual Master Plan for more information.

Off-site improvements include transportation improvements to widen roads and associated stormwater improvements and the extension of utilities, including sanitary sewer and water, to the site. Specific off-site improvements include the following:

- **Extension of a sanitary sewer force main to Two Creeks Pump Station #2.**
- **Replacement of the sanitary force main to Camas Meadows Drive.**
- **Replacement of the Two Creeks Pump Station #2.**
- **Extension of a 10" sanitary force main to Camas Meadows Drive.**
- **Construction of a regional lift station (Basin 1 Pump Station).**
- **Extension of gravity sewer to Ingle Road.**

- **The City is also working on the potential of having sewer provided from the east. If that occurs, then it is possible that a portion of the effluent from this project could go through sewer facilities constructed to the southeast to Everett Street.**

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

Development of the PRD is located on 9 legal lots totaling approximately 282 acres. Further described as parcels: 171727-000, 172341-000, 171704-000, 172555-000, 172557-000, 172553-000, 172559-000, 172165-000 and 173178-000. The site is located north of NE Goodwin Road and east of NE Ingle Road in the southwest and southeast ¼'s of Section 17, the northeast and southeast ¼'s of Section 20, and the northwest and southwest ¼'s of Section 21, Township 2 North, Range 3 East of the Willamette Meridian, Clark County. The majority of the site is currently in use as the Green Mountain Golf Course. Off-site improvements will take place near Camas Meadows Golf Course, along Camas Meadows Drive and along and adjacent to Goodwin Road and Ingle Road.

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. General description of the site
(circle one): Flat, rolling, hilly, steep slopes, mountainous,
other ____________

b. What is the steepest slope on the site (approximate percent slope)?

According to Clark County GIS information, the steepest slope on the site is between 40 and 100%. Topographic survey information indicates the steepest slopes being located in the northern portion of the site on Green Mountain with approximately 35% with steeper sections at the base of Green Mountain of approximately 65%.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.

According to Clark County GIS data, the soils on the site consist of:

1) **CvA 0-3% (Cove Clay Loam), 4.2% of the parcel.**
2) **DoB 0-5% (Dollar Loam), 47.4% of the parcel.**
3) **HcB 0-8% (Hesson Clay Loam), 1.0% of the parcel.**
4) **LeB 0-8% (Lauren Loam), 1.6% of the parcel.**
5) **MlA 0-3% (McBee Silt Loam), 6.6% of the parcel.**
6) **OmE 3-30% (Olympic stony clay loam), 11.5% of the parcel.**
7) **OmF 30-60% (Olympic stony clay loam), 27.8% of the parcel.**

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

A geotechnical report, provided by GeoPacific Engineering, Inc. dated December 3, 2014, references regional slope stability mapping of Clark County, Washington published by the Washington Department of Natural Resources Division of Geology. Refer to GeoPacific Engineering, Inc. study for more information.

Clark County GIS indicates the presence of Severe Erosion Hazard Areas encompassing all of Green Mountain as well as the slopes along the southwest side of the base of Green Mountain. GIS also indicates the possible presence of Potentially Unstable Slopes along the southwest side of the base of Green Mountain.

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.

Site grading to construct building pads, parking lots, access roads, stormwater facilities and off-site utility improvements. Any imported fill material will be procured from an approved site. Should material need to be hauled off site, it will be taken to an approved location. The approximate amount of grading is unknown at this point, but it may exceed 500,000 cubic yards.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Yes, erosion could occur if adequate erosion control mitigation measures were not implemented. Stormwater and Erosion Control Plans will be prepared and implemented by the Applicant for both on- and off-site improvements, which will meet or exceed the requirements imposed by Camas Municipal Code and the Washington State Department of Ecology (DOE).

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Approximately 65% of the developed portion of the site could be covered with impervious surface following project construction and build-out of all phases. This includes single- and multi-family buildings, commercial buildings, parking lots, access roads, and sidewalks. A large portion of the site (approximately 90 acres) will be developed into park(s) and/or left as common open space.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Stormwater and erosion control plans will be prepared and implemented in accordance with City of Camas code for both on- and off-site improvements. Other measures include minimal disturbance of soils outside of construction area, retain existing vegetation to the maximum extent possible, install sediment fencing on downhill side hill of construction, soil stockpiles to be covered when not in use and temporary permanent vegetative cover shall be applied as soon as possible.

2. Air

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.

Construction equipment and vehicles will generate dust and particulate emissions during the construction period of both on- and off-site improvements. Resident, employee, visitor, shopper, delivery trucks, mail delivery, solid waste and recycling vehicles will generate particulate emissions in the long-term. Other emission sources include small power tools including, but not limited to, small gas-powered equipment used for site and landscape maintenance. The quantities of those emissions are unknown.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

The Applicant is not aware of any offsite sources of emissions or odors exist that would adversely affect the proposed development.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

If necessary, water will be utilized for dust control as needed during construction of on- and off-site improvements. Emission control measures for vehicles and equipment are regulated under the Camas Municipal Code Standards, Washington State Department of Ecology (DOE) and U.S. Environmental Protection Agency (EPA). It is anticipated that that all vehicles and equipment will be in compliance with these regulations.

3. **Water**

a. Surface Water:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type
and provide names. If appropriate, state what stream or river it flows into.

Green Mountain Golf Course contains several man-made ponds and ditches. Clark County GIS indicates the possible presence of hydric soils in isolated areas on-site. There are some wetlands on the site, but none located within the proposed Phase 1 preliminary plat. The site of both the PRD and off-site improvements are located within the LaCamas Creek watershed.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

Yes, proposed on- and off-site improvements will take place within 200 feet of wetlands, wetland buffers or the man-made ponds or streams. See preliminary plat drawings and critical area reports filed in conjuntion with this application.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

Unknown at this time.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

No.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

No.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

No.

b. Ground Water:

1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known.

Stormwater will be discharged through outfalls located at various points on the site. No impacts to ground water will occur. Total quantities are unknown at this time.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

This project does not anticipate discharging any waste in the ground from septic tanks or other sources.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

Stormwater quality treatment and quantity control will be provided via wetpond stormwater facilities located at various locations on site prior to release into either a roadside ditch along Ingle Road or to existing culverts under Ingle Road. The wetpond facilities will be designed to meet the requirements of the Western Washington Stormwater Manual. The stormwater facilities will be owned and maintained by a homeowner's association. Calculations and information regarding the drainage facilities are included in the Stormwater Narrative for Green Mountain PRD prepared by Olson Engineering.

2) Could waste materials enter ground or surface waters? If so, generally describe.

Possible spills including fuels such as diesel or gasoline could potentially spill on the site during construction. Without adequate erosion control or stormwater mitigation, waste materials could possibly enter ground or surface waters. However, the proposed stormwater treatment and erosion control measures will minimize the potential for waste materials to be conveyed to ground or surface waters.

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.

Some existing man-made ditches may be filled or be rerouted.

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any:

This proposal will meet or exceed the City of Camas's and Washington State Department of Ecology's erosion control standards. Any spills will be immediately responded to and appropriate remediation measures will be taken.

4. **Plants**

a. Check the types of vegetation found on the site:

__X deciduous tree: alder, maple, aspen, other Cherry, Cottonwood
__X_evergreen tree: fir, cedar, pine, other Hemlock
__X_shrubs
__X_grass
____pasture
____crop or grain
____ Orchards, vin~~eyards or~~ other per~~manent~~ crops.
__X_wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
____water plants: ~~water lily~~, e~~elgrass, milfoil~~, other
__X_other types of vegetation Blackberry

b. What kind and amount of vegetation will be removed or altered?

Over the course of the full build out of the project the Applicant may remove approximately 4,800 trees of the approximately 9,500 trees found on-site. Over two thousand trees will be planted as part of the development process over the course of full development. Other existing vegetation may be removed in areas to receive construction activities.

c. List threatened and endangered species known to be on or near the site.

No threatened or endangered species are known to be on or near the site. Bradshaws Lomation has been rumored to have been previously seen on property to the west across Ingle Road. Investigation of the Applicant's site by qualified biologists did not find any Bradshaw's Lomation on the Applicant's site.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

Landscaping, with the use of both ornamental and native plants, will be installed throughout the project with development of each phase. Additionally, approximately 90 acres will be devoted to parks and open space areas, with native vegetation being retained in a majority of the open space areas. Refer to the Tree Preservation Plan and Conceptual Park & Open Space Master Plan for more information.

e. List all noxious weeds and invasive species known to be on or near the site.

Himalayan Blackberry.

5. **Animals**

a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site. Examples include:

birds: hawk, heron, eagle, songbirds, other:
mammals: deer, bear, elk, beaver, other:
fish: bass, salmon, trout, herring, shellfish, other ________

b. List any threatened and endangered species known to be on or near the site.

No threatened or endangered species are known to be on or near the site.

c. Is the site part of a migration route? If so, explain.

The site is located within what is commonly referred to as the Pacific Flyway. This Flyway is the general migratory route for various species of ducks, geese, and other migratory waterfowl. The Flyway stretches from Alaska to Mexico and from the Pacific Ocean to the Rocky Mountains. Neotropical birds, such as Robins, may also seasonally utilize or be near the site.

d. Proposed measures to preserve or enhance wildlife, if any:

Landscaping, which will includes ornamental and native trees, shrubs and groundcovers, will be installed in the future that will provide some habitat for wildlife in the future developed areas. Additionally, approximately 89 acres will be devoted to park(s) and open space areas, with native vegetation being retained in a majority of the open space areas which will preserve existing wildlife habitat. Refer to the Tree Preservation Plan and Conceptual Park & Open Space Master Plan for more information.

e. List any invasive animal species known to be on or near the site.

None known.

6. **Energy and natural resources**

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Typical commercial and residential uses of electricity and natural gas will be required for the completed project.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

All construction on site will be designed to comply with the Washington State energy code and the adopted version of the International Building Code.

7. **Environmental health**

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

Heavy equipment and a variety of materials will be utilized to construct the project.

1) Describe any known or possible contamination at the site from present or past uses.

There is no known contamination at the site from present or past uses.

2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.

There is an existing BPA easement and power lines that run through the site.

3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.

Heavy equipment and a variety of materials will be utilized to construct the project.

4) Describe special emergency services that might be required.

No special emergency services will be required. The project area is within the City of Camas and currently served by fire, police and EMS providers.

5) Proposed measures to reduce or control environmental health hazards, if any:

Contractors will be expected to comply with applicable local, state and federal regulations relating to the construction and operation of the project. All construction is anticipated to be inspected according to industry requirements and standards.

b. **Noise**

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

Existing traffic noise from adjacent roadways may be heard on the property.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Construction on the site will create short-term construction noise. Construction activities will not occur after 7 p.m. or before 7 a.m. Visitor, resident, employee, mail delivery, deliveries and solid waste and recycling vehicles will create some noise in the long-term. Other long term noise sources include small power tools including, but not limited to, small gas-powered equipment used for site and landscape maintenance.

3) Proposed measures to reduce or control noise impacts, if any:

Construction activities will likely not occur after 7 p.m. or before 7 a.m.

8. Land and shoreline use

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.

The majority of the site is currently in use as the Green Mountain Golf Course. The steeper sections of Green Mountain are forested, vacant and unused.

Single-family residential uses on large lots occur to the north, east, south and west of the site with open space located northeast of the site.

Surrounding properties adjacent to the proposed project area are zoned as follows:

- **West – CC, R-5, R-20 and AG-20**
- **East – FR-40, R-10**
- **South – R-12**
- **North – R-5, R-10.**

b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?

The past uses of this property are generally unknown to the Applicant except for the existing golf course. It is likely that at some point during the past it was utilized for agricultural purposes. The archeological report referenced in this checklist and the application narrative further discuss the history of the property. There is no known agricultural or forest land of long-term commercial significance proposed for conversion on site.

1) Will the proposal affect or be affected by surrounding working farm or forest land normal

business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:

No.

c. Describe any structures on the site.

There is an existing clubhouse, maintenance building, barn, pump house and several outbuildings.

d. Will any structures be demolished? If so, what?

Yes, all structures may be demolished except for a stone spring house that may have some historical significance.

e. What is the current zoning classification of the site?

R-10, MF-10, R-6 and CC (Community Commercial).

f. What is the current comprehensive plan designation of the site?

SFM (Single Family Medium Density), MFL (Multi Family Low Density), SFH (Single Family High Density) and COM (Commercial).

g. If applicable, what is the current shoreline master program designation of the site?

Not Applicable.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.

Clark County GIS indicates the possible presence of hydric soils on site, as well as possible wetlands, but those may be associated with the man-made ponds on-site. GIS also indicates the possible presence of Non-riparian Habitat or Species Areas on-site as well as Potentially Unstable Slopes and Severe Erosion Hazard Areas. Refer to Preliminary Geotechnical Engineering Report, provided by GeoPacific Engineering, Inc., dated December 3, 2014, for more information regarding Potentially Unstable Slopes and Severe Erosion Hazard Areas. Refer to Wetland and Habitat Delineation and Mitigation Plan, provided by Ecological Land Services, dated December 2014, for more information regarding wetland and habiat areas.

i. Approximately how many people would reside or work in the completed project?

Approximately 3,601 people could reside in the completed residential portion of the project based on 2.77 residents per household for both single-family and multi-family residences. Approximately 180 people could work in the commercial portion of the project based on an estimated square footage of commercial/retail/office of 90,000 square feet (based on the Traffic Impact Study by Kittelson and Associates, dated June 11, 2014) and 1 employee per 500 square feet of building area.

j. Approximately how many people would the completed project displace?

None.

k. Proposed measures to avoid or reduce displacement impacts, if any:

Not applicable.

L. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

With approvals of a Development Agreement, Planned Residential Development and Preliminary Subdivision applications, the proposed plan will comply with the City of Camas' zoning ordinance and Comprehensive Plan as well as applicable City of Camas infrastructure and utility standards.

m. Proposed measures to ensure the proposal is compatible with nearby agricultural and forest lands of long-term commercial significance, if any:

There are no nearby or adjacent agricultural or forest lands of long-term commercial significance.

9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

Approximately 1,300 middle-income single-family and multi-family housing units. Phase 1 includes 201 middle-income single-family housing units.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

None.

c. Proposed measures to reduce or control housing impacts, if any:

Pay traffic, park, school and fire impact fees; SDCs for sewer and water, provide off- and on-site transportation improvements, construct all infrastructure necessary to comply with all applicable development standards, including but not limited to, landscaping, storm water and critical areas; provide parks, trails, recreation areas and open space.

10. Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

The building heights for the proposed buildings are undetermined at this time. They will not exceed Camas height requirements as indicated by City of Camas Municipal Code.

b. What views in the immediate vicinity would be altered or obstructed?

Views across the site may be altered, and adjoining properties may be able to see some or all of the proposed residences and/or commercial buildings.

c. Proposed measures to reduce or control aesthetic impacts, if any:

Landscaping and architectural elements and preservation of common open space areas.

11. **Light and glare**

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

Typical commercial, residential and street lighting will light the area in the night time hours.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

The installation of illuminated materials will be done in such a way to minimize dispersion off-site and to not constitute a safety hazard.

c. What existing off-site sources of light or glare may affect your proposal?

There are some amounts of light levels generated off site but they are unlikely to affect the proposal.

d. Proposed measures to reduce or control light and glare impacts, if any:

Lights will be installed and shielded to minimize dispersion and control any potential offsite impacts. Intensity of lighting will be kept at a level to assure safety on the site, but will meet all applicable City of Camas light shielding and glare reductions.

12. **Recreation**

a. What designated and informal recreational opportunities are in the immediate vicinity?

Designated or informal recreational opportunities in the immediate vicinity include the following:

- **Camas Meadows Golf Course located less than 1 mile to the south;**
- **Harmony Sports Complex located approximately 1 mile to the southwest;**
- **Camp Currie located less than 1 mile to the south.**
- **Chinook Archery Club located approximately 1 mile to the south;**
- **Green Mountain Park, an undeveloped Clark County park, located adjacent to the site to the northeast.**
- **Green Mountain Golf course.**

b. Would the proposed project displace any existing recreational uses? If so, describe. [help]

The existing recreational use of the site as the Green Mountain golf course will likely cease at some future phase of development.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

Development of an on-site park(s), preservation of common open space areas and walking trails and the payment of park impact fees.

13. **Historic and cultural preservation**

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers located on or near the site? If so, specifically describe.

The Applicant has prepared a full archeological report which has been submitted to the Department of Archeology and Historic Preservation, as well as, local Native American Tribes. Evidence of these certified mailings is included in this application.

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.

The Applicant has prepared a full archeological report which has been submitted to the Department of Archeology and Historic Preservation, as well as, local Native American Tribes. Evidence of these certified mailings is included in this application.

c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc. [

The Applicant has prepared a full archeological report which has been submitted to the Department of Archeology and Historic Preservation, as well as, local Native American Tribes. Evidence of these certified mailings is included in this application.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.

In the event any archaeological or historic materials are encountered during project activity, work in the immediate area must stop and the following actions taken:

1. **Implement reasonable measures to protect the discovery site, including any appropriate stabilization or covering; and**
2. **Take reasonable steps to ensure the confidentiality of the discovery site; and,**
3. **Take reasonable steps to restrict access to the site of discovery.**

If human remains are uncovered, appropriate law enforcement agencies shall be notified first, and the above steps followed. If remains are determined to be Native, consultation with the effected Tribes will take place in order to mitigate the final disposition of said remains. The Applicant has prepared a full archeological report which has been submitted to the Department of Archeology and Historic Preservation, as well as, local Native American Tribes. Evidence of these certified mailings is included in this application.

14. **Transportation**

a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.

Primary access to the site will take place at two locations along Ingle Road and one location along NE Goodwin Road. Secondary access may also take place at approximately 5 locations along Ingle Road and two locations along NE Goodwin Road. Refer to the Conceptual Master Plan for more information.

b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?

C-Tran is not currently available at this site. C-Tran Camas Connector Dial-A-Ride service operates within the area on a first-come, first-served basis.

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?

The proposed project will eliminate approximately 150 parking spaces associated with Green Mountain Golf Course. The commercial portion of the project will have approximately 360 parking spaces based on 4 stalls per 1,000 square feet of commercial/retail/office space (total of 90,000 sf of commercial space per Traffic Impact Study by Kittelson and Associates, filed in conjuntion with this application). The residential portion of the project will have approximately 2,600 parking spaces based on two parking spaces (primarily in driveways for single-family residences and in parking lots for multi-family residences) per residential unit.

d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).

Frontage improvements to City of Camas standards will be required along both Ingle Road and NE Goodwin Road. Other off-site improvements will be required over the life of the project. These improvement and their construction triggers are identified in the Kittelson and Associates traffic study filed in conjuntion with this application.

e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

No.

f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?

A Transportation Impact Analysis has been prepared by Kittleson and Associates. Based on 1,300 single and multi-family residential units and 90,000 square feet of Shopping Center use, the

Transportation Impact Analysis identifies the number of PM, AM and average daily trips that are projected to be generated by the proposed development.

g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.

No.

h. Proposed measures to reduce or control transportation impacts, if any:

Pay traffic impact fees, comply with City of Camas road standards and satisfy the mitigation measures proposed by the Kittelson and/or as the project is conditioned.

15. **Public services**

a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.

Yes, future public services will be needed for the development.

b. Proposed measures to reduce or control direct impacts on public services, if any.

The Applicant will construct on site utilities, pay system development charges, property taxes and other municipally imposed taxes and fees.

16. **Utilities**

a. ~~Circle utilities currently~~ available at the site:
electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system,
other ___________

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

Water and sewer will be provided by the City of Camas, electricity by Clark Public Utilities. Refuse by Waste Management, telephone by CenturyLink, natural gas by Northwest Natural.

C. Signature

Under the penalty of perjury, the above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: ______________________

Name of signee John O'Neil

Position and Agency/Organization Green Mountain Land, LLC Manager

Date Submitted: 12/30/14

EXHIBIT 38

OLSON ENGINEERING INC.

Civil Engineering Surveying Planning Landscape Architecture

Practical expertise. Exceptional results.

222 E. Evergreen Blvd.
Vancouver, WA 98660
360-695-1385

December 30, 2014

City of Camas Department of Community Development
616 NE 4th Avenue
Camas, WA 98607

Re: Request for Early Notice of DS, Green Mountain Mixed Use PRD and Preliminary Subdivision SEPA Review

On behalf of the applicant, Green Mountain Land, LLC, we would like to request early notice as allowed under WAC 197-11-350 if the City of Camas believes a Determination of Significance is likely for this project. The applicant may wish to clarify or change features of this project.

Sincerely,

Michael Roy Odren, RLA
Landscape Architect, Land Use Planner

Exhibit 39

4926415 D
RecFee - $74.00 Pages: 3 - STEWART TITLE
Clark County, WA 12/27/2012 02:18

WHEN RECORDED RETURN TO:

Green Mountain Land, LLC
5300 Meadows, Ste 400
Lake Oswego, OR 97035

Real Estate Excise Tax
Ch. 11 Rev. Laws 1951
$ 47,169.98 has been paid
Recp.# 687220 Date 12-27-12
Sec. 61, see Affd. No. ________
Doug Lasher
Clark County Treasurer
By ________ Deputy

687221
687222

Escrow Number: 01209-7827
Filed for Record at Request of: *Stewart Title Company*

SPECIAL WARRANTY DEED
(Not Statutory)

THE GRANTOR(S), Sterling Savings Bank, a Washington Banking Corporation, for and in consideration of Ten Dollars and other good and valuable consideration in hand paid, bargains, sells and conveys to Green Mountain Land, LLC, a Washington limited liability company, the following described estate, situated in the County of Clark, State of Washington:

LEGAL DESCRIPTION ON EXHIBIT " A " ATTACHED HERETO AND MADE A PART HEREOF.

Abbreviated Legal: (Required if full legal not inserted above.)
SW & SE QTR Section 17, T2N R3E, NE & SE QTR Section 20 T2N R3E, SW & NW QTR Section 21 T2N R3E

Tax Parcel Number(s): 171704-000, 171727-000, 172341-000, 172553-000, 172555-000, 172557-000, 172559-000, 173165-000, and 173178-000

Dated: December 19th, 2012

STERLING SAVINGS BANK, a Washington Banking Corporation

By Brenda Vander Does
Brenda Vander Does
Asset Recovery Director

State of Washington
) ss.
County of Spokane

I certify that I know or have satisfactory evidence that Brenda Vander Does is the person who appeared before me, and said person acknowledges that she signed this instrument, on oath stated that she was authorized to execute the instrument and acknowledged it as the Asset Recovery Director of Sterling Savings Bank to be the free and voluntary act of such party for the uses and purposes mentioned in this instrument.

Dated: December 19, 2012

Notary Public
State of Washington
Michele R Robb
Commission Expires 08-27-15

Michele R Robb
Name: Michele R Robb
Notary Public in and for the State of Washington
residing at Spokane
My appointment expires: 8.27.15

Order Number: 01209-7827

EXHIBIT "A"
LEGAL DESCRIPTION

A tract of and In the South half of Section 17, the East half of Section 20, and the West half of Section 21, all in Township 2 North, Range 3 East of the Willamette Meridian, in Clark County, Washington, described as follows:

The following are on a Grid Bearing, Washington State coordinate System. A scale and elevation factor of 1.0000339 has been applied to the measured field distances.

BEGINNING at the Northeast corner of the Southeast quarter of said Section 17; thence South 89°22'57" West, along the North line of the South half of said Section 17, a distance of 3514.90 feet to the centerline of Ingle Road; thence South 01°53'59" West along said centerline 474.48 feet to a point on a 335.00 foot radius curve to the left; thence along said centerline and around said 335.00 foot radius curve to the left, 262.60 feet; thence South 43°00'51" East, along said centerline 123.51 feet to a 675.00 foot radius curve to the right; thence along said centerline and around said 675.00 foot radius curve to the right 205.42 feet thence South 23°56'36" East along said centerline 143.32 feet: thence South 30°50'48" East along said centerline 288.97 feet; thence South 30°43'55 East along said centerline 652.08 feet; thence South 29° 58'13" East along said centerline 237.86 feet to a point which bears South 59°56'31" West from a 1/2 inch iron pipe marking the Northwest corner of that certain tract conveyed to Keith Bakker by deed recorded under Auditor's File No. G 646584 of Clark County, records; thence North 59°56'31" East 21.96 feet to said iron pipe; thence continuing North 59°56'31" along the North line of said Bakker tract 329.82 feet to a 3/4 inch iron pipe and the Northeast corner thereof; thence South 33°48'47" East along the East line of said Bakker tract 667.97 feet to a 3/4 inch iron pipe and the Southeast corner thereof; thence South 49° 38'13" West along the South line of said Bakker tract 353.38 feet to the centerline of Ingle Road; thence South 40°52'01" East along said centerline 178.26 feet to a point which bears South 06°18'14" West from a 1/2 inch iron pipe on an Easterly line of that tract conveyed to James M. Bartmess by instrument recorded under Auditor's File No. 8911140220, Clark County records; thence North 06°18'14" East along said Easterly line 71.81 feet to said iron pipe; thence North 86°58'42" East along a Southerly line of said Bartmess tract 9.99 feet to the Northwest corner of that tract conveyed to Ronald and Rhonda Warman by deed recorded under Auditor's File No. 9004270087, Clark County records; thence North 86°58'42 East along the North line of said Warman tract 790.14 feet to the Northeast corner thereof; thence South 02°04'39" West along the East line of said Warman tract 1018.41 feet to the centerline of Northeast Ingle Road; thence North 40°17'19" West along the centerline of Northeast Ingle Road 315.33 feet to a point which bears North 62°51'09", East from a 1/2 inch Iron rod; thence South 62°51'09" West 200.04 feet to said iron rod, said iron rod also being a point on the East line of that certain tract conveyed to Ronald and Rhonda Warman by deed recorded under Auditor's File No. 8806290070 of Clark County records; thence South 02°04'52" West along the East line of said Warman tract 3397.86 feet, more or less, to the center of LaCamas Creek; thence Westerly along the center of LaCamas Creek 400 feet, more or less, to the West line of said Fletcher Donation Land Claim; thence South 02°04'52" West along the West line of said Donation Land Claim to the Southwest corner thereof; thence South 89°37'12" East along the South line of said Donation Land Claim 808.83 feet to the centerline of said Northeast Goodwin Road; thence North 57°14'04" East along said centerline 534.50 feet to a point on a 955.03 foot radius curve to the left; thence along said centerline and around said 955.03 foot radius curve to the left 458.11 feet; thence North 29°45'03" East along said centerline 224.51 feet to a point on a 955.03 foot radius curve to the right; thence along said centerline and around said 955.03 foot radius curve to the right 233.11 feet; thence North 43°44'09" East along said centerline 1240.54 feet to a point on a 955.03 foot radius curve to the right; thence along said centerline and around said 955.03 foot radius curve to the right 433.61 feet; thence North 69°44'59" East along said centerline 355.01 feet to a point on a 955.03 foot radius curve to the right; thence along said centerline and around said 955.03 foot radius curve to the right 358.90 feet to a point on the South line of the Northwest quarter of said Section 21; thence South 88°43'07" East along said South line 984.63 feet to the Southeast corner of said Northwest quarter; thence North 01°27'07' East along the East line of the Southeast quarter of the Northwest quarter of said Section 21, a distance of 1314.63 feet to the North line of the South half of the Northwest quarter of said Section 21; thence North 88°41'51" West along said North line 1801.15 feet to the East line of said Fletcher Donation Land Claim; thence North 01°14'05" East along the East line of said Donation Land Claim 1315.28 feet to the North line of the Northwest quarter of the Northwest quarter of said Section 21; thence North 88°40'36" West along the North line of said Northwest quarter 830.98 feet to the Northwest corner thereof; thence North 01°45'46" East along the East line of the Southeast quarter of said Section 17, a distance of 2650.20 feet to the point of beginning.

TOGETHER WITH that portion of vacated Ingle Road, as described in that instrument recorded August 19,1998, under Auditor's File No. 9808190303.

EXCEPT that portion lying within N.E. Ingle Road.

ALSO EXCEPT that portion tying within N.E. Goodwin Road.

ALSO EXCEPT that portion conveyed to Green Mountain Resorts, Inc., a Washington corporation recorded under Auditor's File No. 9311050364, records of Clark County, Washington.

ALSO EXCEPT that portion conveyed to R. Lon Combs and Rachelle Combs recorded under Auditors File No. 4150099, described as follows:

A parcel of property in the South half of Section 17, Township 2 North, Range 3 East of the Willamette Meridian in Clark County, Washington described as follows:

COMMENCING at the Southeast corner of Lot 11 of Mountain Glen, a subdivision recorded In Volume J of Plats at Page 199 of Clark County records; thence North 89°22'57' West along the South line of said Mountain Glen Subdivision a distance of 930.24 feet to the TRUE POINT OF BEGINNING: thence South 44°04'35" East 1131.67 feet; thence South 45°55'25" West 254.00 feet; thence North 44°04'35" West 257.24 feet; thence South 45°55'25" West 60.00 feet; thence North 44°04'35" West 607.89 feet; thence South 45°55'25" West 127.98 feet, more or less, to the centerline of N.E. Ingle Road, said point being on a non-tangent 675.00 foot radius curve to the left that has a tangent bearing of North 29°19'40" West into the curve at this point; thence continuing along said centerline, around said 675.00 foot radius curve to the left a distance of 161.24 feet; thence continuing along said centerline North 43°00'51" West 123.1 feet to a 335.00 foot radius curve to the right; thence continuing along said centerline, around said 335.00 foot radius curve to the right, a distance of 262.60 feet; thence continuing along said centerline North 01° 53'59" East 43.47 feet to the South line of said Mountain Glen Subdivision; thence South 89°22'57" East along said South line 399.76 feet to the True Point of Beginning.

ALSO EXCEPT that portion thereof conveyed to Clark County, recorded under Auditors File No. 4217481, records of Clark County, Washington.

ALSO EXCEPT any portion thereof lying West of the centerline of N.E. Ingle Road.

EXHIBIT 40

Certification of Mailing Addresses

Stewart Title has performed the ~~500~~ 300 ft radius search around subject property 171707-000 | 172311-000 | 171724-000 | 172555-000 | 172557-000 | 172553-400 to obtain a mailing list is of all property owners within that radius. | 172559-000 | 173165-000 | 173178-000

To the best of our knowledge, this is a true and correct list based upon the information available to Stewart Title at the time the search was performed.

[signature] 12-17-14

Customer Resources Representative Date

STATE OF Oregon
)ss
COUNTY OF Multnomah

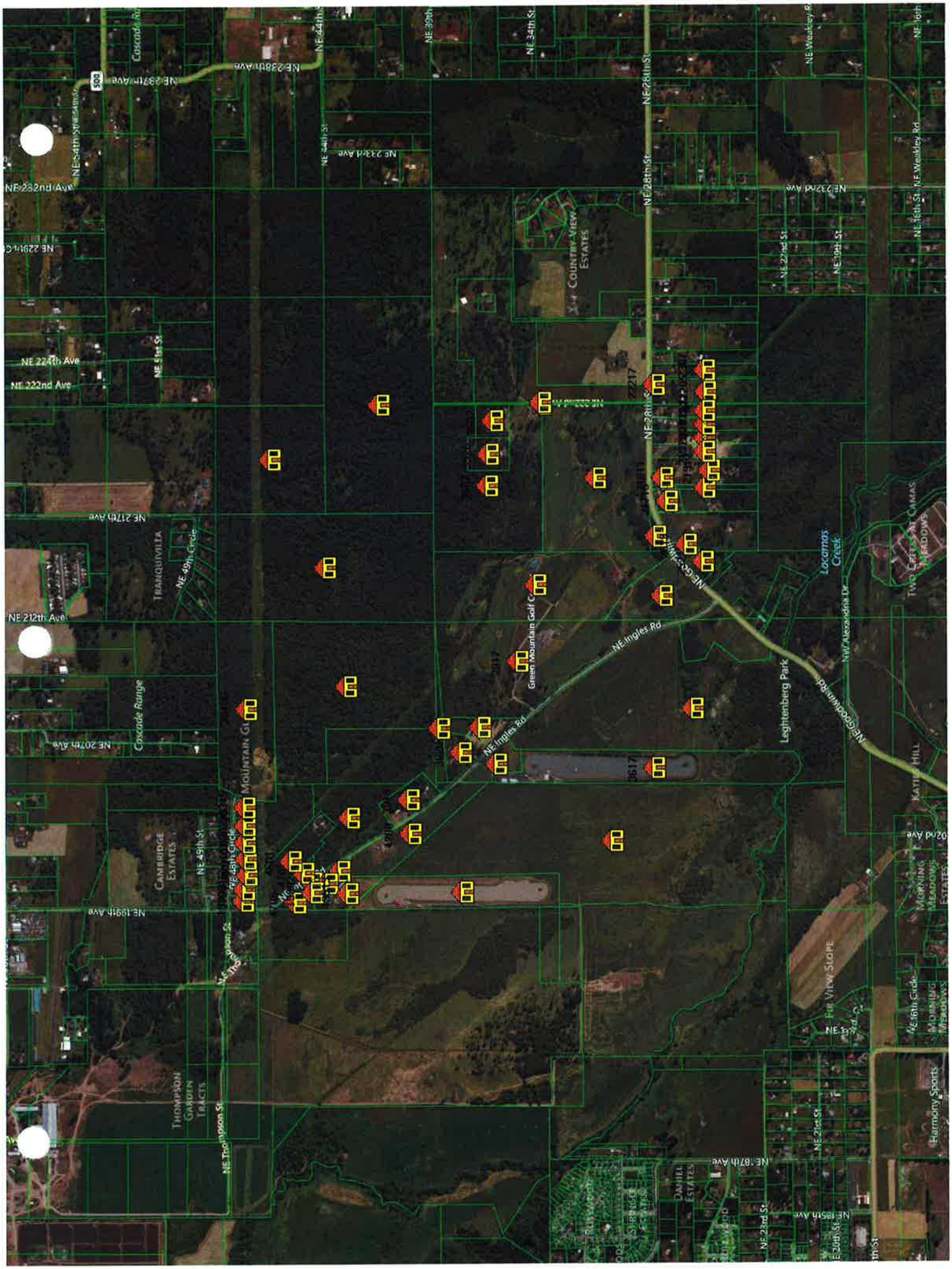
I certify that I know or have satisfactory evidence that Michelle Austin the person who appeared before me and said persons acknowledged they they signed this instrument, and acknowledged it to be their free and voluntary act for the uses and purposes mentioned in this instrument.

Dated: 12 17 2014

[signature]

Name: Shana L Jackson
Notary Public in and for the State of Oregon
Residing at: Portland
My appointment expires: 7 18 17

OFFICIAL SEAL
SHANA L JACKSON
NOTARY PUBLIC-OREGON
COMMISSION NO. 478827
MY COMMISSION EXPIRES JULY 18, 2017



NE 238th Ave
NE 237th Ave
NE 44th St
NE 34th St
NE 233rd Ave
NE 232nd Ave
NE Weakley Rd
NE 28th St
Country View Estates
NE 22nd St
NE 19th St
NE 224th Ave
NE 222nd Ave
NE 51st St
NE 217th Ave
Tranquivilla
NE 49th Circle
NE 212th Ave
Cascade Range
NE 207th Ave
Green Mountain Golf C
NE Ingles Rd
NE Goodwin Rd
Lacamas Creek
Leightenberg Park
NE Alexandra Dr
Katies Hill
Cambridge Estates
NE 49th St
NE 48th Circle
NE 199th Ave
NE Thompson St
Fir View Slope
Morning Meadows Estates
NE 16th Circle
Thompson Garden Tracts
Daniel Estates
NE 187th Ave
NE 185th Ave
NE 23rd St
NE 20th St
Harmony Sports
22217
2817
3617

M C Marine LLC
1035 SW Douglas Pl
Portland, OR 97205

State of Washington Dept of Natural Resources
1111 Washington St SE
Olympia, WA 98501

Ronald & Rhonda Warman
16211 SE 1st St
Vancouver, WA 98684

Rocque & Sue Merritt
3602 NE 222nd Ave
Camas, WA 98607

Gwenna Merritt
3602 NE 222nd Ave
Camas, WA 98607

Dawn Tuggle Trustee
37123 NE Reed Rd
Corbett, OR 97019

Pacific Power & Light Company
Property Tax Dept
825 NE Multnomah St #1900
Portland, OR 97232

Raa Farm LLC
PO BOX 310
Battle Ground, WA 98604

Steve & Dawn Adams
Po Box 3157
Gresham, OR 97030

Clark County Environmental Services Ll
Po Box 9810
Vancouver, WA 98666

Patric & Linda Lydon
19902 NE 43rd Cir
Vancouver, WA 98682

Danny & Marie Jones
19909 NE 48th Cir
Vancouver, WA 98682

Steve & Dawn Adams
Po Box 3157
Gresham, OR 97030

Stephen Tyler & Jinger Shoemaker
19915 NE 48th Cir
Vancouver, WA 98682

Jason Kearney
20007 NE 48th Cir
Vancouver, WA 98682

Mason Swigert
20101 NE 48th Cir
Vancouver, WA 98682

Ann Smith
20111 NE 48th Cir
Vancouver, WA 98682

Michael & Krista Lindhorst
20205 NE 48th Cir
Vancouver, WA 98682

Don & Kelli Randolph
20315 NE 48th Cir
Vancouver, WA 98682

William & Shirley Huyette
20406 NE 48th Cir
Vancouver, WA 98682

James Coburn
21715 NE 28th St #A
Camas, WA 98607

Scott Currie
21811 NE 28th St
Camas, WA 98607

James & Monica Gruher
21917 NE 28th St
Camas, WA 98607

Skip & Melissa Hertenstein
21919 NE 28th St
Camas, WA 98607

Virginia Keck
22007 NE 28th St
Camas, WA 98607

Linda Middagh
22015 NE 28th St
Camas, WA 98607

Terry Emmert
11811 SE Highway 212
Clackamas, OR 97015

Richard & Carliss Harris
5599 NE 82nd Ave #237
Vancouver, WA 98662

Dwight Southern
22205 NE 28th St
Camas, WA 98607

Brad Bowers
22205 NE 28th St
Camas, WA 98607

Nicki Young-Palmer
512 NE 81st St #F
Vancouver, WA 98665

Glen & Theresa Johnson
22307 NE 28th St
Camas, WA 98607

Thad & Sally Freese
16004 NE 14th Cir
Vancouver, WA 98684

Thad & Sally Freese
16004 NE 14th Cir
Vancouver, WA 98684

Kimberly & Travis Gamble
2619 NE Goodwin Rd
Camas, WA 98607

Green Mountain Land LLC
5300 Meadows Rd #400
Lake Oswego, OR 97035

Rocque & Marilyn Merritt
3526 NE 222nd Ave
Camas, WA 98607

Rocque & Marilyn Merritt
3526 NE 222nd Ave
Camas, WA 98607

Rocque & Sue Merritt
3602 NE 222nd Ave
Camas, WA 98607

Gwenna Merritt
3602 NE 222nd Ave
Camas, WA 98607

M C Marine LLC
1035 SW Douglas Pl
Portland, OR 97205

Ronald & Rhonda Warman
16211 SE 1st St
Vancouver, WA 98684

Arlon & Cindy Elmer
3917 NE Sayle Rd
Vancouver, WA 98662

Raa Farm LLC
Po Box 310
Battle Ground, WA 98604

R Lon & Rachelle Combs
4601 NE Ingle Rd
Vancouver, WA 98682

Jeffrey & Dawn Tuggle
37123 NE Reed Rd
Corbett, OR 97019

Patric & Linda Lydon OR Current Resident 19902 NE 43rd Cir Vancouver, WA 98682	Danny & Marie Jones OR Current Resident 19909 NE 48th Cir Vancouver, WA 98682	Steve & Dawn Adams OR Current Resident 19913 NE 43rd Cir Vancouver, WA 98682
Stephen Tyler & Jinger Shoemaker OR Current Resident 19915 NE 48th Cir Vancouver, WA 98682	Jason Kearney OR Current Resident 20007 NE 48th Cir Vancouver, WA 98682	Mason Swigert OR Current Resident 20101 NE 48th Cir Vancouver, WA 98682
Ann Smith OR Current Resident 20111 NE 48th Cir Vancouver, WA 98682	Michael & Krista Lindhorst OR Current Resident 20205 NE 48th Cir Vancouver, WA 98682	Don & Kelli Randolph OR Current Resident 20315 NE 48th Cir Vancouver, WA 98682
William & Shirley Huyette OR Current Resident 20406 NE 48th Cir Vancouver, WA 98682	James Coburn OR Current Resident 21715 NE 28th St Camas, WA 98607	Scott Currie OR Current Resident 21811 NE 28th St Camas, WA 98607
James & Monica Gruher OR Current Resident 21917 NE 28th St Camas, WA 98607	Skip & Melissa Hertenstein OR Current Resident 21919 NE 28th St Camas, WA 98607	Virginia Keck OR Current Resident 22007 NE 28th St Camas, WA 98607
Linda Middagh OR Current Resident 22015 NE 28th St Camas, WA 98607	Terry Emmert OR Current Resident 22111 NE 28th St Camas, WA 98607	Richard & Carliss Harris OR Current Resident 22111 NE 28th St Camas, WA 98607
Dwight Southern OR Current Resident 22205 NE 28th St Camas, WA 98607	Brad Bowers OR Current Resident 22205 NE 28th St Camas, WA 98607	Nicki Young-Palmer OR Current Resident 22217 NE 28th St Camas, WA 98607
Glen & Theresa Johnson OR Current Resident 22307 NE 28th St Camas, WA 98607	Thad & Sally Freese OR Current Resident 2521 NE Goodwin Rd Camas, WA 98607	Thad & Sally Freese OR Current Resident 2521 NE Goodwin Rd Camas, WA 98607
Kimberly & Travis Gamble OR Current Resident 2619 NE Goodwin Rd Camas, WA 98607	Green Mountain Land LLC OR Current Resident 2817 NE Ingle Rd Camas, WA 98607	Rocque & Marilyn Merritt OR Current Resident 3526 NE 222nd Ave Camas, WA 98607
Rocque & Marilyn Merritt OR Current Resident 3526 NE 222nd Ave Camas, WA 98607	Rocque & Sue Merritt OR Current Resident 3602 NE 222nd Ave Camas, WA 98607	Gwenna Merritt OR Current Resident 3602 NE 222nd Ave Camas, WA 98607

M C Marine LLC
OR Current Resident
3617 NE Ingle Rd
Vancouver, WA 98682

Ronald & Rhonda Warman
OR Current Resident
3620 NE Ingle Rd
Vancouver, WA 98682

Arlon & Cindy Elmer
OR Current Resident
3913 NE Ingle Rd
Vancouver, WA 98682

Raa Farm LLC
OR Current Resident
4200 NE Ingle Rd
Camas, WA 98607

R Lon & Rachelle Combs
OR Current Resident
4601 NE Ingle Rd
Vancouver, WA 98682

Jeffrey & Dawn Tuggle
OR Current Resident
4705 NE 199th Ave
Vancouver, WA 98682

EXHIBIT 41

BLUE MOUNTAIN
COMMUNITY MANAGEMENT

TO: John O'neil, Green Mountain Land LLC

FROM: Joe Keizur, Blue Mountain Community Management

RE: Green Mountain Mixed Use PRD HOA Plan

Introduction:

Blue Mountain Community Management (BMCM) is a community management firm located in Portland, OR. BMCM manages over 200 condominium (COA) and homeowner (HOA) associations in Oregon and Washington, including several communities in Clark County. We specialize in working with developers and builders to ensure their developments comply with state law and operate efficiently from day one.

Request:

Green Mountain Land LLC (GML) is seeking a community wide HOA/COA management plan for the Green Mountain Mixed Use PRD (GMMU), located in Camas, Washington. This plan will address a hierarchy of associations, governing documents and common area/elements and will proscribe how each community within the Master Plan is to be managed post completion of development.

Organizational Plan:

The GMMU PRD is a diverse community plan with a variety of proposed residential and commercial uses. Additionally, the GMMU PRD is likely to include several different types of common areas and elements that will require active management. In order to manage this type of community properly, distinct layers of management and documentation will be required:

1. **Green Mountain Master Association**

   Prior to completion or sale of any lot within GMMU, the Declarant plans to set up a master association for the entire GMMU. The scope of the master association will include at a minimum all regional common area/elements. A Reserve Study will be completed that includes all regional common area/elements and all HOA's/COA's within GMMU will be required members of the Association.

   The master association will limit its authority primarily to the management of all selected common areas/elements, enforcement of accepted rules for the selected common areas/elements and collection of funds for the management of the selected common areas/elements.

The cost of maintenance, management and replacement for the selected common areas/elements will be evenly divided across all communities and assessed to individual HOA's and COA's accordingly.

The master association will be managed by the Declarant and/or its assigns until completion of the entire community and post completion will be governed by a board of directors made from the communities within the GMMU.

2. **Individual HOA/COA Communities**

Prior to the recording of any community, the Declarant will require a set of documents prepared for each community. This will include a Declaration, CCR's Bylaws and a Reserve Study specific to the community. These individual association documents will account for common elements specific to the community and will include rules/regulations related governance and living within the specified communities. Examples may include the management of front yard landscaping, specific neighborhood parks, rules and regulations regarding the housing type of the community and the behavior of its residents.

Each community will be required to have a reserve study specific to the type of housing included within the community plus any and all common areas specifically assigned to the individual association. Associations with attached or condominium type housing will require proper reserves for the replacement and repair of all exterior elements commonly required by state law and/or the local jurisdiction.

3. **Exclusions from the Master Association**

Areas identified in the GMMU as either commercial or high density will be excluded from the master association. These communities will either be wholly owned and self-contained, including their own amenities, or they will serve as part of a separate commercial owners association with rules and regulations specific to their common areas/ elements. These two uses do not fit the model and will need to be addressed separately.

Common Element Types:

The following is a list of known common areas/elements that will be present within GMMU:

- Open Space/Natural Area
- Community Private Streets
- Regional and Community Storm Water Facilities
- Regional and Community Clubhouses
- Regional and Community Trails
- Private Regional and Community Parks
- Regional and Community Common Area Landscaping
- Other Community Specific Common Areas

The GMMU remains a conceptual master plan at this time, so providing specific assignment for common areas/elements is a bit premature. However, it is assumed that the following would be assigned to the Master Association:

- Regional and Community Storm Water Facilities (unless conveyed to the jurisdiction)
- Regional Clubhouses
- Regional Trails or Community Trails That Connect to a Larger Trail Network
- Private Regional Parks
- Regional Common Area Landscaping

The remaining common area/element types would be assigned to individual associations:

- Private Streets (unless the private street connects two communities)
- Community Specific Clubhouses
- Community Trails
- Private Community Parks
- Community Common Area Landscaping
- Other Community Specific Common Areas/Elements (gates, fences, basketball courts etc.)

Preparation of Documents:
GML intends to complete both the master association documents and the first set of community specific documents prior to recording of the initial development. These documents will be submitted to the City of Camas for consideration and then the CCR's and Bylaws will be recorded prior to final plat being completed.

AFN #E59925, page 1

Bk.312,Pg.234

Tract No. BCV-121

E59925

TRANSMISSION LINE EASEMENT

FOR AND IN CONSIDERATION of the sum of Six Hundred Dollars- Dollars ($ 600.00),

in hand paid, receipt of which is hereby acknowledged, we, A. F. LECHTENBERG and CLARA E. LECHTENBERG, husband and wife now and at the time of acquiring title; and L. H. LECHTENBERG and MARY G. LECHTENBERG, husband and wife, lessees,

have granted, bargained, and sold and by these presents do hereby grant, bargain, sell, and convey unto the UNITED STATES OF AMERICA and its assigns, a permanent easement and right-of-way over, upon, under, and across the following-described land in the County of Clark, in the State of Washington; to wit:

That portion of the Southeast quarter (SE¼) of the Northwest quarter (NW¼) and Lot Four (4) of Section Twenty-one (21), and that portion of the north one thousand eight hundred (1800) feet of the east one thousand eight hundred (1800) feet of the T. J. Fletcher D. L. C. No. Fifty-one (51) in Sections Twenty (20) and Twenty-one (21), all in Township Two (2) North, Range Three (3) East, Willamette Meridian, Clark County, Washington; which lies within a strip of land 100 feet in width, the boundaries of said strip lying 50 feet distant from, on either side of, and parallel to the survey line of the Bonneville-Camas-Vancouver transmission line as now located and staked on the ground, over, across and upon the above property, said survey line being particularly described as follows:

Beginning at survey station 572+04.3, a point on the south line of Section 21, Township 2 North, Range 3 East, W.M., said point being N. 89° 34' W. a distance of 666.7 feet from the southeast corner of said Section 21; thence N. 28° 31' W. a distance of 139.0 feet to survey station 573+43.3 back equals 573+98.6 ahead; thence N. 45° 27' W. a distance of 6327.5 feet to survey station 637+26.1, a point on the west line of said Section 21, said point being S. 0° 07' E. a distance of 721.6 feet from the northwest corner of said Section 21; thence continuing N. 45° 27' W. a distance of 1023.6 feet to survey station 647+49.7, a point on the north line of Section 20, Township 2 North, Range 3 East, W.M., said point being S. 89° 44' W. a distance of 728.1 feet from the northeast corner of said Section 20.

The undersigned, L. H. Lechtenberg and his wife, Mary G. Lechtenberg, lessees of the above described premises, by virtue of a lease expiring April 1, 1942, for a valuable consideration, receipt of which is hereby acknowledged, join in the execution of this instrument for the sole and specific purpose of subordinating any and all interest which they may have in said premises to the easement herein granted to the United States of America, and are not entering into or becoming a party in any way or manner to the warranties herein contained.

Bk.312,Pg.235

The aforesaid easement and right-of-way is for the following purposes, namely: the perpetual right to enter and to erect, maintain, repair, rebuild, operate, and patrol one or more electric power transmission lines, and one or more telephone and/or telegraph lines, including the right to erect such poles and other transmission line structures, wires, cables, and the appurtenances necessary thereto; the further right to clear said right-of-way and keep the same clear of brush, timber, inflammable structures, and fire hazards; and the right to remove danger trees, if any, located beyond the limits of said right-of-way.

TO HAVE AND TO HOLD the said easement and right-of-way unto the UNITED STATES OF AMERICA and its assigns, forever.

It is further understood and agreed by the undersigned that the payment of such purchase price is accepted as full compensation for all damages incidental to the exercise of any of the rights above described.

We covenant with the UNITED STATES OF AMERICA that we [illegible] lawfully seized and possessed of the lands aforesaid; have a good and lawful right and power to sell and convey the same; that the same are free and clear of all encumbrances, except as above noted, and that we will forever warrant and defend the title thereto and quiet possession thereof against the lawful claims of all persons whomsoever.

Dated this 3rd day of December, 1941.

WITNESSES:

[illegible]
[illegible]
[illegible]
[illegible]

AFN #E59825, page 3

Bk.312,Pg.236

STATE OF *Washington*
COUNTY OF *Clark* } ss:

On the *12th* day of *December*, 1941, personally came before me, a notary public in and for said County and State, the within-named A. F. L[illegible] and CLARA S. L[illegible], husband and wife, to me personally known to be the identical persons described in and who executed the within and foregoing instrument and acknowledged to me that they executed the same as their free and voluntary act and deed, for the uses and purposes therein mentioned.

GIVEN under my hand and official seal the day and year last above written.

(SEAL)

O. E. Henderson
Notary Public in and for the State of *Washington*
Residing at *Seattle*.

My commission expires:

[illegible] OF *Washington*
County of *Clark* } ss:

On the *11th* day of *December*, 1941, personally came before me, a [illegible] public in and for said County and State, the within-named [illegible], husband and wife, to me personally known to be the identical [illegible] voluntary act and [illegible]

[illegible] official seal the day and year last above written.

(SEAL)

O. E. Henderson
[illegible] in and for the State of *Washington*
[illegible] *Seattle*
[illegible] expires: *Sept. 21, 1945.*

Recorded Jan.1?,1942 at 4:35 P.M., by L.F[illegible], K.W.Furgen, County Auditor.

AFN #E67256, page 1

Bk.316,Pg.165

BPA-481
Washington and Oregon
For use with option form BPA-480

TRACT No. BCV-122

E67256

npue

TRANSMISSION LINE EASEMENT

FOR AND IN CONSIDERATION of the sum of Two Hundred Forty- Dollars ($ 240.00),

in hand paid, receipt of which is hereby acknowledged, we, THE UNION CENTRAL LIFE INSURANCE COMPANY, a corporation; and [illegible], contract purchaser, a widower now and at the time of entering into the contract,

have granted, bargained, and sold and by these presents do hereby grant, bargain, sell, and convey unto the UNITED STATES OF AMERICA and its assigns, a permanent easement and right-of-way over, upon, under, and across the following-described land in the County of Clark, in the State of Washington; to wit:

That portion of Lots One (1), Two (2) and Three (3), and the Southeast quarter (SE¼) of the Southeast quarter (SE¼) of Section Seventeen (17), and the north six hundred (600) feet of the east six hundred (600) feet of the Daniel Ollie D. L. C. No. Fifty-two (52) in Section Seventeen (17), all in Township Two (2) North, Range Three (3) East, Willamette Meridian, Clark County, Washington; which lies within a strip of land 100 feet in width, the boundaries of said strip lying 50 feet distant from, on either side of, and parallel to the survey line of the Bonneville-Camas-Vancouver transmission line from survey station 647+49.7 to survey station 676+30.0 back equals 190+46.3 ahead, and which lies within a strip of land 300 feet in width, the boundaries of said strip lying 25 feet distant southerly from, and 275 feet distant northerly from, and parallel to the survey line of said transmission line from survey station 676+30.0 back equals 190+46.3 ahead to survey station 221+55.4, said survey line as now located and staked on the ground, over, across and upon the above property, being particularly described as follows:

Beginning at survey station 647+49.7, a point on the south line of Section 17, Township 2 North, Range 3 East, W.M., said point being S. 89° 44' W. a distance of 728.1 feet from the southeast corner of said Section 17; thence N. 45° 27' W. a distance of 2880.3 feet to survey station 676+30.0 back equals 190+46.3 ahead; thence S. 89° 44' W. a distance of 719.2 feet to survey station 197+65.5 at which point there is an equation in bearings of S. 89° 44' W. back equals S. 89° 40' W. ahead; thence S. 89° 40' W. a distance of 2389.9 feet to survey station 221+55.4, a point on the east line of the John Proebstel D. L. C. No. 73 in Section 18, Township 2 North, Range 3 East, W.M., said point being north a distance of 15.2 feet from the southeast corner of said John Proebstel D. L. C.

Bk.318,Pg.186

The aforesaid easement and right-of-way is for the following purposes, namely: the perpetual right to enter and to erect, maintain, repair, rebuild, operate, and patrol one or more electric power transmission lines, and one or more telephone and/or telegraph lines, including the right to erect such poles and other transmission line structures, wires, cables, and the appurtenances necessary thereto; the further right to clear said right-of-way and keep the same clear of brush, timber, inflammable structures, and fire hazards; and the right to remove danger trees, if any, located beyond the limits of said right-of-way.

TO HAVE AND TO HOLD the said easement and right-of-way unto the UNITED STATES OF AMERICA and its assigns, forever.

It is further understood and agreed by the undersigned that the payment of such purchase price is accepted as full compensation for all damages incidental to the exercise of any of the rights above described.

[illegible] covenant with the UNITED STATES OF AMERICA that [illegible] are lawfully seized and possessed of the lands aforesaid; have a good and lawful right and power to sell and convey the same; that the same are free and clear of all encumbrances, except as above noted, and that [illegible] will forever warrant and defend the title thereto and quiet possession thereof against the lawful claims of all persons whomsoever.

[illegible] Vice-[illegible] Asst. [illegible]ecretary, [illegible] 12th [illegible] May [illegible]

Dated this [illegible] day of [illegible] , 193[illegible]

[illegible] Vice-President

By: [illegible] Asst. Secretary

WITNESS:

L. E. Moore

[illegible]

[illegible]

AFN #E67256, page 3

Bk.318,Pg.187

STATE OF Washington }
COUNTY OF Clark } ss:

On the 28th day of April, 1942, personally came before me, a notary public in and for said County and State, the within-named M. M. WAKEFIELD, a widower,

to me personally known to be the identical person described in and who executed the within and foregoing instrument and acknowledged to me that he executed the same as his free and voluntary act and deed, for the uses and purposes therein mentioned.

GIVEN under my hand and official seal the day and year last above written.

(SEAL)

Notary Public in and for the State of Washington
Residing at Vancouver, Wash.

My commission expires: Aug 1, 1944

STATE OF OHIO }
County of Hamilton } ss:

On this 12th day of May, 1942, before me personally appeared H. L. Nodell, to me known to be the Vice-President of the corporation that executed the within and foregoing instrument, and acknowledged said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that he was authorized to execute said instrument and that the seal affixed is the corporate seal of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year first above written.

(SEAL)

Robert Alfred Kisker
Notary Public in and for the State of Ohio, County of Hamilton.
Residing at Cincinnati, Ohio.
(Robert Alfred Kisker)
My commission expires: February 5, 1944.

Recorded May 21, 1942 at 3:11 P.M., by Fletcher Daniels Abst. Co., K.E.Durgan, County Auditor.

EXIBIT 43

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING / PLANNING
610 SW Alder Street, Suite 700, Portland, OR 97205 P 503.228.5230 F 503.273.8169

MEMORANDUM

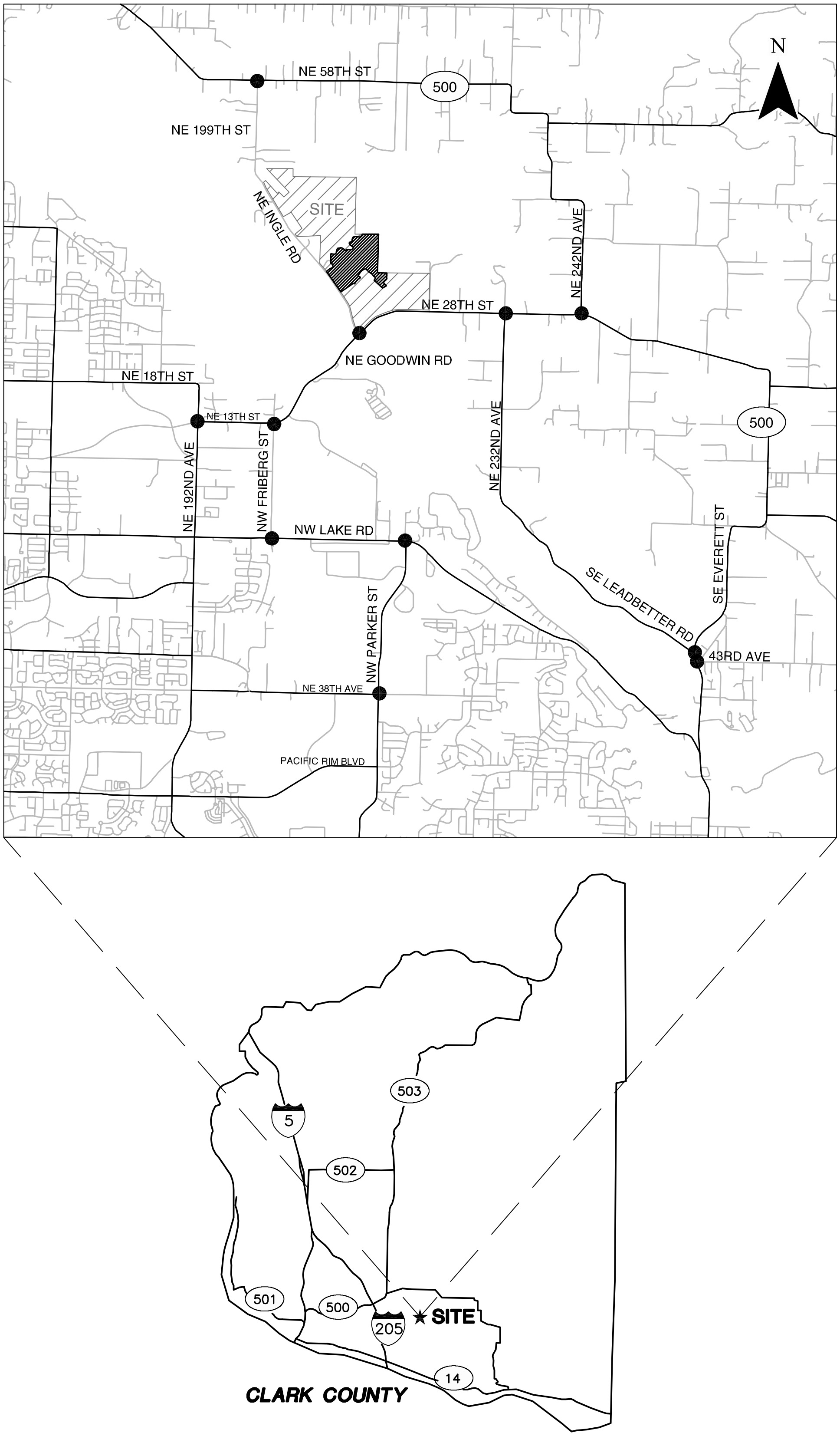
Date:	November 20, 2014	Project #: 13865
To:	Curleigh Carothers, P.E.; City of Camas	
cc:	Ryan Lopossa, P.E.; City of Vancouver Jeff Barsness, P.E.; Washington State Department of Transportation David Jardin, Clark County Randy Printz, Landerholm Law Firm John Schmidt and John O'Neil; Green Mountain Land, LLC	
From:	Chris Brehmer, P.E., Kelly Laustsen, and Ribeka Toda; Kittelson & Associates, Inc.	
Project:	Green Mountain Master Plan	
Subject:	Transportation Impact Analysis	

This memorandum documents the results of the transportation impact analysis prepared by Kittelson & Associates, Inc. (KAI) for the proposed Green Mountain Master Plan development to be located at the northeast corner of NE Ingle Road and NE Goodwin Road in Camas, Washington. This study concludes that Phase 1 of the site can be developed as proposed while maintaining safe and acceptable traffic operations at the study intersections assuming provision of an eastbound left-turn lane on NE Goodwin Road at NE Ingle Road. Further transportation improvements are recommended to accommodate full build-out of the proposed development. The methodology of our analysis, pertinent findings, and our recommendations are documented in this memorandum.

INTRODUCTION

Green Mountain Land, LLC is in the process of preparing a master plan to establish a mixed-use development on the 283-acre site. Green Mountain Golf Course is currently located on a large portion of the property; otherwise the site is vacant. The site is currently zoned for a mix of residential uses (R-10, MF-10 and R-6) and Community Commercial (CC). Figure 1 illustrates the site vicinity map.

The master plan proposes eight phases of development, with the sequence and timing of phases largely market dependent. It is expected that Phase 1 will be completed by 2018 and full master plan build-out will be assumed by 2029 for traffic impact assessment purposes.



● - Study Intersections

Site Vicinity
Camas, Washington

Figure
1

H:\projfile\13865 - Green Mountain Master Plan\dwgs\figs\13865_traffic study -Nov update.dwg Nov 20, 2014 - 2:24pm - klaustsen Layout Tab: 1_SV

Figure 2 illustrates a conceptual image of the master plan site vision. A mix of residential and commercial uses is planned in accordance with the zoning, with a mixed use village proposed to better integrate the commercially zoned portion of the property. The village would be located at the southwest corner of the project and will encompass approximately twenty-four acres. Further project details are provided later in this report.

SCOPE OF THE REPORT

This analysis identifies the transportation-related impacts associated with the proposed Green Mountain Master Plan development and was prepared in accordance with City of Camas transportation impact analysis requirements. The study scope and overall study area for this project were selected based on a review of the local transportation system and direction provided by City of Camas, City of Vancouver, Clark County, and Washington Department of Transportation (WSDOT) staff.

Operational analyses were performed at the following intersections:

- NE 199th Avenue/NE 58th Street (SR 500, WSDOT maintained)
- NE 192nd Avenue/NE 13th Street (City of Vancouver maintained)
- NW Friberg Street/NE Goodwin Road
- NE Ingle Road/NE Goodwin Road
- NE 232nd Avenue/NE 28th Street
- NE 242nd Avenue (SR 500)/NE 28th Street (WSDOT maintained)
- NW Friberg Street/NW Lake Road
- NW Parker Street/NW Lake Road
- NE Everett Street (SR 500)/SE Leadbetter Road
- NW Parker Street/NE 38th Avenue
- NE Everett Street (SR 500)/NE 43rd Avenue (WSDOT maintained)
- Site-Access Driveways

GREEN MOUNTAIN

CONCEPTUAL MASTER PLAN FOR A MIXED USE PRD

CAMAS, WASHINGTON

GREEN MOUNTAIN LAND, LLC. 11/19/14

EXHIBIT B

TOTAL SITE AREA 283.3 AC

SITE AREA TABLE

R10 ZONE	119.7 AC
R6 ZONE	54.8 AC
MF10 ZONE	93.0 AC
CC ZONE	15.8 AC

RESIDENTIAL DENSITY CALCULATION

R-10	119.7	@ 4.3 / ACRES = 515 UNITS
R-6	54.8	@ 7.2 / ACRES = 395 UNITS
MF-10	93.0	@ 10 / ACRES = 930 UNITS
TOTAL		1840 UNITS

DENSITY TABLE

POD	ACRES	APPROXIMATE LOT SIZE RANGE	MAXIMUM UNITS/LOTS
A	12.2 (A1-A3)	HD	219
B	15.5 (B1-B5)	1000-3000	217
C	11.9 (C1-C2)	3000-5000	95
D	41.3 (D1-D6)	4000-6000	309
E	26.5 (E1-E4)	4200-7200	172
F	28.6 (F1-F4)	5250-9000	157
G	30.0 (G1)*	15,000-40,000	31
H	15.4 (CC)		100
TOTALS	181.4 AC		1300

*40% OF G (TOTAL 50 ACRES) TO BE PRESERVED OPEN SPACE

PARK & OPEN SPACE	89.3 ± AC
NEIGHBORHOOD CIRCULATOR	8.2 ± AC
ARTERIAL & COLLECTOR FRONTAGE DEDICATION (GOODWIN & INGLE)	1.8 ± AC

URBAN VILLAGE AREA (H, A1, A2, A3, B5)
A COMMERCIAL, MIXED USE AND RESIDENTIAL COMMUNITY CENTER (± 33.5 AC GROSS, 24.2 AC NET)

CIRCULATION COMPONENTS

ARTERIAL

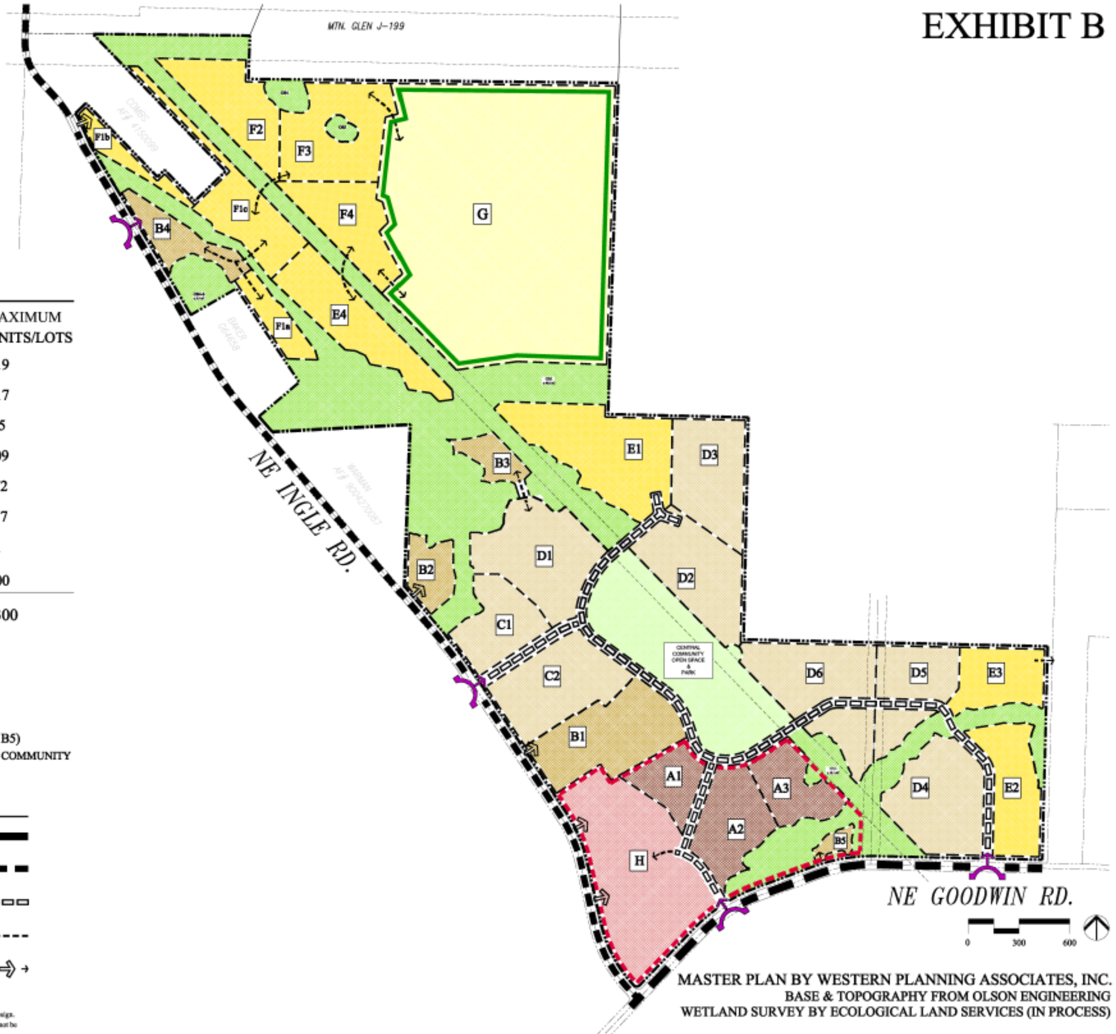
COLLECTOR

NEIGHBORHOOD CIRCULATOR
LOCATION SHOWN IS APPROXIMATE & SUBJECT TO ADJUSTMENT

NEIGHBORHOOD CONNECTOR
LOCATION SHOWN IS APPROXIMATE & SUBJECT TO ADJUSTMENT

COMMUNITY ENTRIES & ACCESS POINTS
LOCATION SHOWN IS APPROXIMATE & SUBJECT TO ADJUSTMENT

NOTE:
The precise location and number of units within the pods are approximate due to the preliminary nature of the design. While unit numbers per pod may change, the total number of units of the proposed Mixed Use Master Plan will not be exceeded, absent express consent from the City after appropriate regulatory process.



MASTER PLAN BY WESTERN PLANNING ASSOCIATES, INC.
BASE & TOPOGRAPHY FROM OLSON ENGINEERING
WETLAND SURVEY BY ECOLOGICAL LAND SERVICES (IN PROCESS)

Plan provided by Western Planning Associates, 11/19/14

Conceptual Master Plan
Camas, Washington

Figure 2

As required by the City of Camas, a transportation impact study was prepared to address the following transportation issues:

- Year 2014 existing land use and transportation system conditions within the site vicinity during the weekday a.m. and p.m. peak hours;
- Planned developments and transportation improvements in the study area;
- Trip generation and distribution estimates for the proposed development;
- Forecast year 2018 background traffic conditions without the proposed development during the weekday a.m. and p.m. peak hours;
- Forecast year 2018 total traffic conditions with the completion of Phase 1 of the proposed development during the weekday a.m. and p.m. peak hours;
- Forecast year 2029 background traffic conditions without the proposed development during the weekday a.m. and p.m. peak hours;
- Forecast year 2029 total traffic conditions with full build-out and occupancy of the proposed development during the weekday a.m. and p.m. peak hours;
- Level of service analyses for the study intersections; and
- On-site access and circulation.

Conclusions and recommendations are provided following the operational analysis.

ANALYSIS METHODOLOGY

All level of service analyses described in this report were performed in accordance with the procedures stated in the *2000 Highway Capacity Manual* (Reference 1). A description of level of service and the criteria by which they are determined is presented in *Appendix "A". Appendix "A"* also indicates how level of service is measured and what is generally considered the acceptable range of level of service.

To ensure that this analysis was based on a reasonable worst-case scenario, the peak 15 minute flow rate during the peak hour analysis periods was used in the evaluation of all intersection levels of service. For this reason, the analysis reflects conditions that are only likely to occur for 15 minutes out of each average peak hour. Traffic conditions during other weekday hours and throughout the weekend will likely be better than those described in this report.

At the City of Vancouver-maintained NE 192nd Avenue/NE 13th Street intersection, the peak 15-minute flow rate was assessed by applying the peak 15-minute volume across the hour and not applying a peak hour factor in accordance with guidance provided by the City.

Operating Standards

The study intersections are each operated and maintained by one of three impacted jurisdictions: WSDOT, the City of Vancouver, or the City of Camas. Each of these jurisdictions has their own operating standards. WSDOT requires LOS “E” or better for non-HSS (Highways of Statewide Significance) in urban areas, City of Vancouver requires LOS “E” or better and a v/c ratio of less than 0.95 for signalized intersections. The City of Camas requires LOS “D” or better and a v/c ratio of 0.90 or better for all intersections. Table 1 lists the study intersections, the responsible jurisdiction, and the corresponding operating standard.

Table 1: Operating Standards at Study Intersections

ID	Study Intersection	Jurisdiction	Standard
1	NE 199th Avenue/NE 58th Street (SR 500)	WSDOT	LOS "C" for non-HSS in rural area[1]
2	NE 192nd Avenue/NE 13th Street	Vancouver	LOS "E" and v/c ratio less than 0.95
3	NW Friberg Street/NE Goodwin Road	Camas	LOS "D" and v/c of 0.90 or better
4	NE Ingle Road/NE Goodwin Road	Camas	LOS "D" and v/c of 0.90 or better
5	NE 232nd Avenue/NE 28th Street	Camas	LOS "D" and v/c of 0.90 or better
6	NE 242nd Avenue (SR 500)/NE 28th Street	WSDOT	LOS "C" for non-HSS in rural area[1]
7	NW Friberg Street/NW Lake Road	Camas	LOS "D" and v/c of 0.90 or better
8	NW Parker Street/NW Lake Road	Camas	LOS "D" and v/c of 0.90 or better
9	NE Everett Street (SR 500)/SE Leadbetter Road	WSDOT	LOS "C" for non-HSS in rural area[1]
10	NW Parker Street/NE 38th Avenue	Camas	LOS "D" and v/c of 0.90 or better
11	NE Everett Street (SR 500)/NE 43rd Avenue	WSDOT	LOS "C" for non-HSS in rural area[1]

[1]The City of Camas TIF Update applied the WSDOT standard for facilities in urban areas (LOS “E” for non-HSS in urban area). Based on conversations with WSDOT, the standard for rural areas is currently applicable to the WSDOT study intersections.

Source: City of Camas Traffic Impact Fee Update (Reference 2)

Turn Lane Guidelines

For roadways under Washington State jurisdiction, such as SR 500, WSDOT has defined traffic-volume based turn lane guidelines within the *WSDOT Design Manual* (Reference 3). Left-turn lane guidelines are provided in section 1310.04(2)(a) while right-turn lane guidelines are provided in section 1310.04(3).

EXISTING CONDITIONS

The existing conditions analysis identifies site conditions and the current operational and geometric characteristics of roadways within the study area. These conditions will be compared with future conditions later in this report.

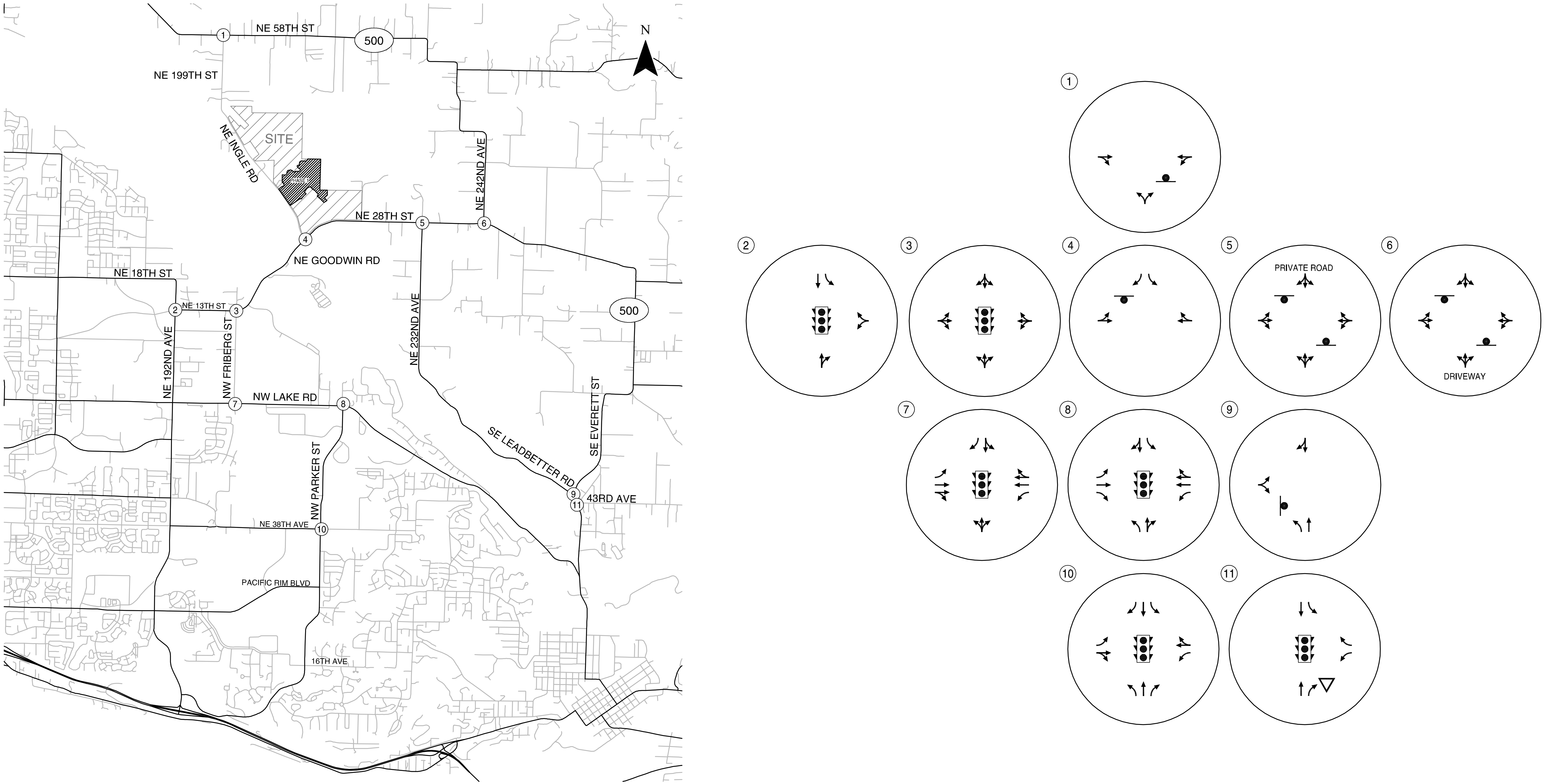
The site of the proposed development and surrounding study area was visited and inventoried in March 2014. At that time, information was collected regarding site conditions, adjacent land uses, existing traffic operations, and transportation facilities in the study area.

Site Conditions and Adjacent Land Uses

The area encompassed by the master plan site is largely undeveloped. The southwest corner of the property is occupied by the Green Mountain Golf Course, a portion of which is proposed to remain open after completion of the Phase 1 master plan development. The areas surrounding the site are also largely undeveloped, with a few single family homes situated along NE 28th Street, NE 199th Avenue, and SR 500.

Transportation Facilities

Table 2 provides a summary of key transportation facilities in the site vicinity and Figure 3 illustrates the existing lane configurations and traffic control devices at the study intersections.



- STOP SIGN
- TRAFFIC SIGNAL
- YIELD SIGN

Existing Lane Configurations and Traffic Control Devices
Camas, Washington

Figure 3

Table 2: Existing Transportation Facilities and Roadway Designations

Roadway	Classification[1]	Cross-Section	Speed Limit (mph)	Side-Walks?	Bicycle Lanes?	Median?	On-Street Parking?
NE 13th Street / NE Goodwin Road / NE 28th Street	Arterial	5-lane	40	Yes	Yes	Yes	None
SR 500	Non-HSS[2]	2-lane	50	None	None	None	None
NE Ingle Road / NE 199th Avenue	Collector	2-lane	50	None	None	None	None
NE 192nd Avenue	Arterial	2-lane	40	Partial	None	None	None
SE 192nd Avenue	Arterial	5-lane	40	Partial	None	None	None
NW Friberg Street / NE 202nd Avenue	Arterial	2-lane	40	Partial	None	None	None
SE 1st Street / NW Lake Road	Arterial	5-lane	40	Yes	Yes	Yes	None
NW Parker Street	Arterial	5-lane	35	Yes	Yes	None	None
NE Everett Road	Arterial	2-lane	35	None	None	None	None
NW Pacific Rim Blvd./ SE 34TH Street	Arterial	5-lane	40	Yes	None	Yes	None

[1] Source: City of Camas Traffic Impact Fee Update (Reference 2)
[2] HSS = Highways of Statewide Significance

Pedestrian and Bicycle Facilities

Neither sidewalks nor striped bicycle facilities are provided in the vicinity of the site on either NE Ingle Road or NE Goodwin Road/NE 28th Street.

Transit Facilities

The C-Tran *Camas Connector* Dial-A-Ride service currently operates within a portion of the study area, with a northern boundary of Lake Road, western boundary of Parker Street, and eastern boundary of SR 500. This service operates by accepting telephone calls from riders to be taken to a location inside a defined boundary. The hours of operation are Monday through Friday from 5:30 a.m. to 9:15 a.m. and 2:00 p.m. to 7:00 p.m. No service is available on holidays (Reference 4).

Crash Analysis

The crash histories of the study intersections were reviewed in an effort to identify potential intersection safety issues. Crash records were obtained from WSDOT. The data represents records between January 1, 2008 and November 30, 2013. The crash rate was calculated to determine the number of crashes per million entering vehicles (MEV). Generally speaking, a crash rate greater than 1.0 crashes per MEV suggests locations where crash patterns should be reviewed in greater detail.

A brief discussion of the crash data at key intersections is presented after Table 3. There were no fatalities reported at the study intersections during the time periods studied. *Appendix "B" contains the crash data.*

As shown in Table 3, the two intersections where the highest crash rates were observed were NE 199th Avenue/NE 58th Street and NE Ingle Road/NE Goodwin Road. At all other intersections, the observed crash rates are well below 1.0 crash per million entering vehicles.

Table 3: Intersection Crash Histories (1/1/2008 - 11/30/2013)

Intersection	Total	Collision Type						Severity		Crash Rate Crashes/ MEV[2]
		Rear End	Turn -ing	Angle	Pedes -trian	Fixed Object	Road way Ditch	PDO[1]	Injury	
1. NE 199th Ave / NE 58th St (SR 500)	7	0	0	4	0	3	0	5	2	0.57
2. NE 192nd Ave / NE 13th St	8	1	6	0	0	1	0	4	4	0.27
3. NE Friberg St / NE Goodwin Rd	5	1	3	1	0	0	0	3	2	0.32
4. NE Ingle Rd / NE Goodwin Rd	16	4	0	5	1	4	2	11	5	1.03
5. NE 232nd Ave / NE 28th St	3	0	0	1	0	2	0	2	1	0.25
6. NE 242nd Ave (SR 500)/ NE 28th St	4	0	0	2	0	1	1	2	2	0.30
7. NW Friberg St / NW Lake Rd	6	3	0	1	0	2	0	6	0	0.24
8. NW Parker St / NW Lake Rd	3	0	1	0	0	2	0	3	0	0.12
9. NE Everett St (SR 500)/ SE Leadbetter Rd	5	0	0	0	0	3	2	2	3	0.54
10. NW Parker St / NE 38th Ave	9	0	5	4	0	0	0	6	3	0.29
11. NE Everett St (SR 500) / NE 43rd Ave	7	1	5	0	0	1	0	3	4	0.36

[1] PDO = Property Damage Only |[2] MEV = Million Entering Vehicles

NE 199th Avenue/NE 58th Street (SR 500)

The second highest crash rate, 0.57, occurs at the intersection of NE 199th Avenue/NE 58th Street. There have been seven reported collisions, including four angle collisions and three fixed-object collisions at this intersection. The crash data was reviewed in an effort to identify potential trends. Three of the angle crashes involved vehicles making a northbound left turn from NE 199th Avenue to NE 58th Street; another involved an eastbound vehicle turning right from NE 58th Street to NE 199th Avenue. Of the three fixed object collisions, two involved utility poles and one involved a domestic animal. Collisions with domestic animals are challenging to eliminate and one of the collisions with the utility poles involved a driver asleep at the wheel. Four of the seven crashes occurred during wet road surface conditions. Given the relatively low number of reported collisions and the unusual nature of three of the seven collisions (the three fixed-object collisions), there are no safety-based mitigation measures recommended at this intersection at this time in conjunction with site development. If an eastbound right-turn lane is added to the intersection in the future (which is currently warranted as will be described later in this report), it may provide safety benefits.

NE Ingle Road/NE Goodwin Road

The highest crash rate, 1.03, occurs at the intersection of NE Ingle Road/NE Goodwin Road. There have been reported collisions including 4 four rear-end collisions, 5 five angle collisions, 4 fixed-object collisions (involving a utility pole, a mailbox, a boulder, and a wood sign post), 2 roadway ditch collisions, and a pedestrian collision at this intersection. As discussed later in this report, the Green Mountain Master Plan proposes to construct an exclusive eastbound left-turn lane on NE Goodwin Road at NE Ingle Road in conjunction with the Phase 1 site development. Providing an eastbound left-turn lane and potential related reconfiguration of the southbound stop bar location (refer to sight distance discussion below) in conjunction with Phase 1 site development could provide a safety benefit at this intersection.

Two of the angle collisions involved vehicles exceeding reasonably safe speeds while making a westbound right-turn at the intersection. One of the recommended mitigation measures for the 2029 full build-out scenario of the proposed development is the addition of a westbound right-turn lane at this intersection, which could provide a safety benefit for turning vehicles. Additional long-term mitigation measures anticipated in conjunction with site development include constructing a three-lane roadway section on NE Goodwin Road along the site frontage and signalizing the intersection when warranted.

Intersection Sight Distance

Intersection sight distance was observed at the study intersections and was found to meet applicable city or WSDOT standards, with the exception of the sight distance at the NE Ingle Road/NE Goodwin Road intersection. As shown in Exhibit 1 below, the stop bar on NE Ingle Road is set back approximately 25 feet from the edge of NE Goodwin Road.

Exhibit 1: Stop Bar on NE Ingle Road at NE Goodwin Road

Image source: Google Maps (right image)

As indicated in Exhibit 2, vehicles currently pull past the stop bar to obtain sufficient sight distance to then execute a turning maneuver. Regardless of the proposed site development, we recommend that the City of Camas consider potential improvements to enhance the intersection sight distance, such as relocating the stop bar closer to NE Goodwin Road.

Exhibit 2: Vehicle Waiting to Make Left-Turn from NE Ingle Road to NE Goodwin Road

Existing Traffic Operations

Manual turning-movement counts were conducted at the study intersections in March and April 2014. The counts were conducted on a typical mid-week day during the morning peak period (7:00 to 9:00 a.m.) and the evening peak period (4:00 to 6:00 p.m.) per City requirements. Individual Intersection peak hours were then identified for operational analysis purposes.

Figures 4 and 5 provide a summary of the existing turning-movement counts, which are rounded to the nearest five vehicles per hour for the weekday a.m. and p.m. peak hours, respectively. *Appendix "C" contains the traffic count worksheets used in this study*.

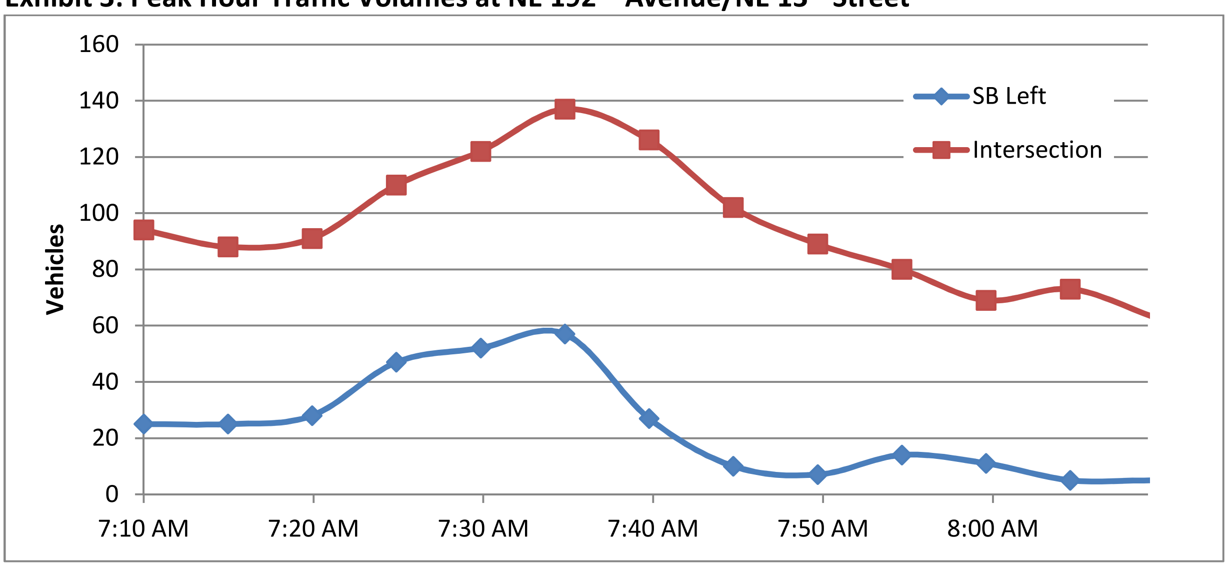
As shown in Figures 4 and 5, the study intersections operate acceptably during both study periods. *Appendix "D" contains the existing conditions traffic operations worksheets.*

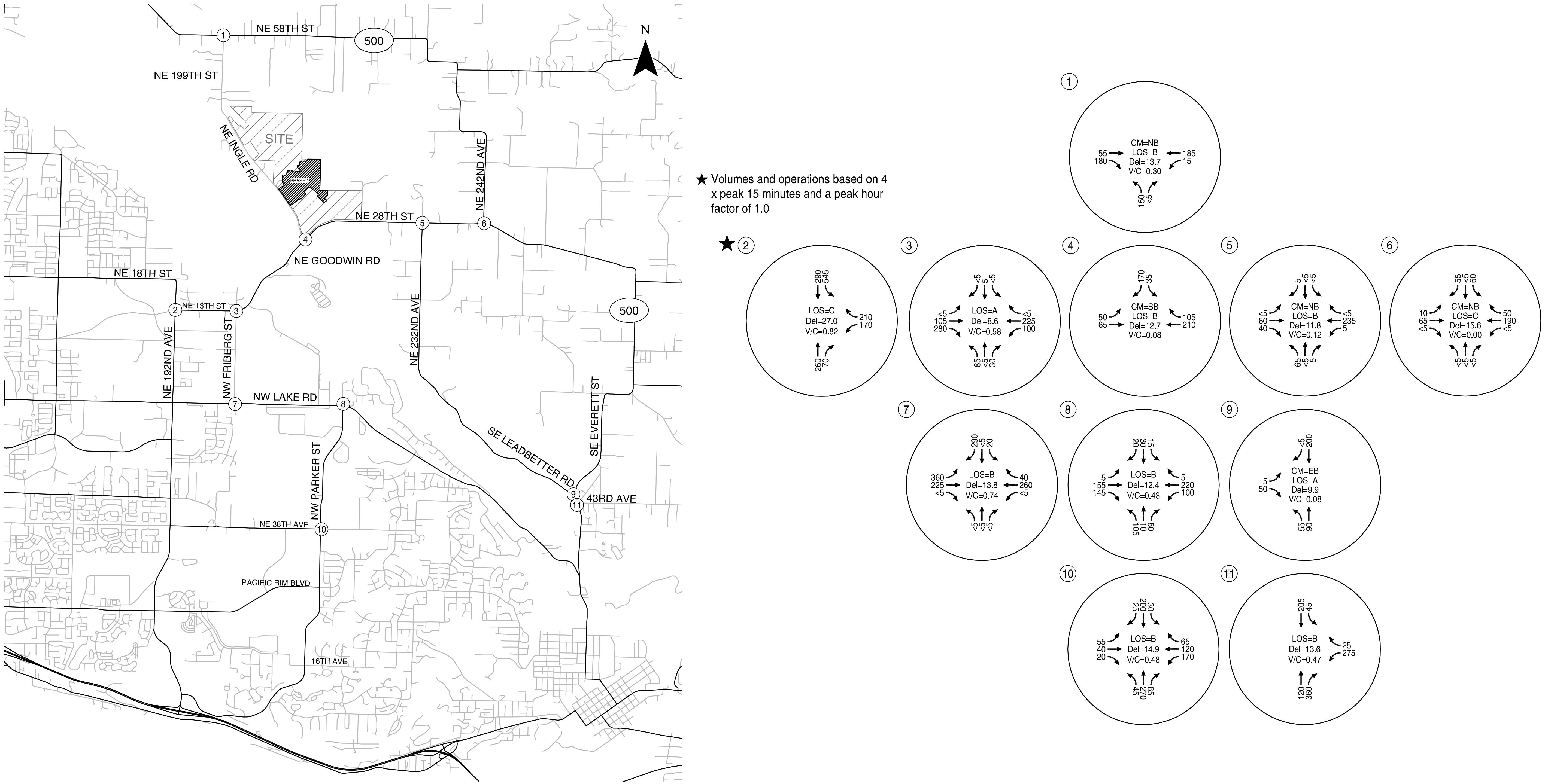
Operations at NE 192nd Avenue / NE 13th Street

As noted in the "Analysis Methodology" section, analysis of the City of Vancouver-maintained NE 192nd Avenue/NE 13th Street intersection involved application of the peak 15-minute flow rate across the hour and not applying a peak hour factor. This analysis methodology is in accordance with guidance provided by the City.

During the weekday AM peak hour, significant peaking occurs at the intersection related to vehicles accessing Union High School on NW Friberg Street. In particular, the southbound left-turning volume peaks in advance of the school start at 7:45 AM, as shown in Exhibit 3. During this "peak of the peak" period, queueing for the southbound left-turn lane sometimes exceeds the available striped storage (approximately 160 feet). Based on field observation, heightened delays and queueing for the southbound left-turn movement are contained to about fifteen minutes in advance of the school start, during which time some southbound left-turning vehicles do not clear through the intersection during each cycle. After this time, volumes decrease significantly and left-turning vehicles consistently clear through the intersection in a single cycle.

Exhibit 3: Peak Hour Traffic Volumes at NE 192nd Avenue/NE 13th Street



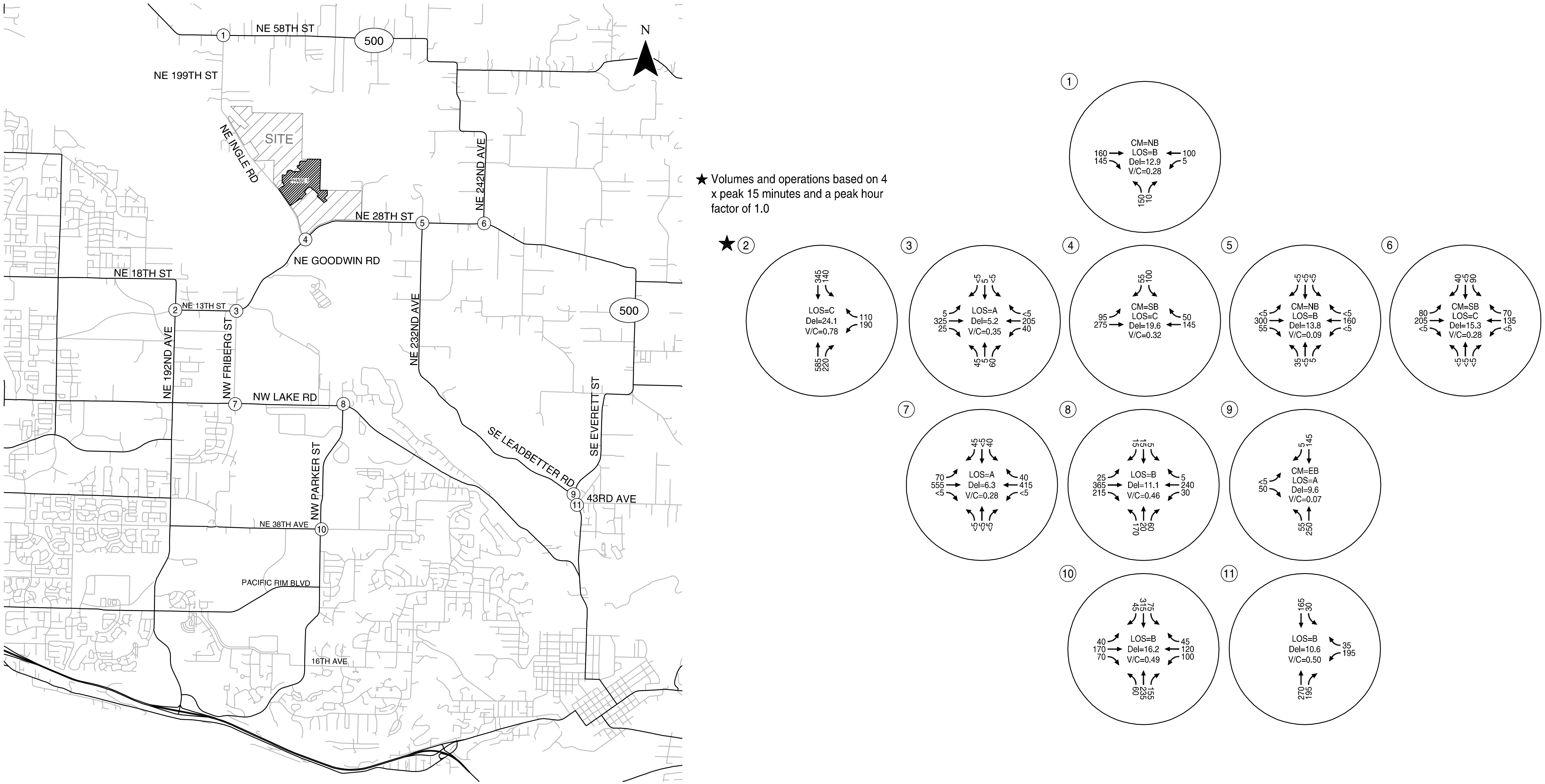


CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

Existing Intersection Operations
Weekday AM Peak Hour
Camas, Washington

Figure 4

H:\projfile\13865 - Green Mountain Master Plan\dwgs\figs\13865_traffic study -Nov update.dwg Nov 20, 2014 - 2:25pm - klaustsen Layout Tab: 4_exAM



CM	=	CRITICAL MOVEMENT (TWSC)
LOS	=	INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del	=	INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C	=	CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC	=	TWO-WAY STOP CONTROL

Existing Intersection Operations
Weekday PM Peak Hour
Camas, Washington

Figure
5

TRAFFIC IMPACT ANALYSIS

The traffic impact analysis identifies how the study area's transportation system will operate upon phased build-out of the proposed master plan site. A horizon year of 2018 was selected to assess conditions with build-out of Phase 1 while a 15-year 2029 horizon year was assumed for site build-out. The impact of site-generated weekday a.m. and p.m. peak hour trips was examined as follows:

- Planned developments and transportation improvements in the study area were identified and accounted for;
- Trip generation and distribution estimates for the proposed development were prepared for Phase 1 and full build-out of the proposed development;
- Forecast year 2018 background traffic conditions without the proposed development were analyzed at the study intersections;
- Forecast year 2018 total traffic conditions with completion of Phase 1 of the proposed development were analyzed at the study intersections;
- Forecast year 2029 background traffic conditions without the proposed development were analyzed at the study intersections;
- Forecast year 2029 total traffic conditions with full build-out and occupancy of the proposed development were analyzed at the study intersections; and
- On-site circulation and site-access operations were evaluated.

Proposed Development Plan

Green Mountain Land, LLC is proposing to master plan the 283-acre site with mixed-use development. Green Mountain Golf Course is currently located on a large portion of the master plan property. We understand that a portion of the existing Green Mountain Golf Course may remain temporarily available for use after completion of Phase 1 site development and that, ultimately, the golf course will be closed prior to full master plan build-out. No effort has been made to account for "credit" for existing trips to and from the golf course for the purposes of this transportation impact analysis report.

The master plan proposes eight phases of development, with the sequence and timing of phases to be finalized pending market conditions. It is expected that Phase 1 will be completed by 2018 and full master plan build-out is assumed by 2029 for traffic impact assessment purposes. A mix of residential and commercial uses is planned in accordance with the zoning, with a mixed use village proposed to better integrate the commercially zoned portion of the property. The application seeks approval of an overlay zone for a portion of the site intended for an urban village. The village would be located at the southwest corner of the project and will encompass approximately twenty-four acres.

For traffic impact study purposes, Phase 1 is assumed to consist of a residential component with 215 single-family detached homes. Full build-out of the master plan residential component assumed construction of up to 536 apartment units and 764 single-family detached homes. The retail portion of the proposed development plan was assumed to develop after Phase 1 and was assumed to be a 90,000 square-foot shopping center for trip generation purposes[1].

Access to Phase 1 development is anticipated along NE Ingle Road, with additional access added to NE Goodwin Road during later stages of the development. Final details of the number and location of site access points will be defined during preparation of individual site plan applications, therefore appropriate planning level assumptions have been made for master planning purposes. The proposed master plan anticipates two public street neighborhood circulator connections to NE Goodwin Road serving the site in conjunction with two public street neighborhood circulator connections along NE Ingle Road. The commercial site is expected to have direct driveway access to NE Ingle Road. Some residential areas (not individual residence driveways) not served by the anticipated neighborhood circulator facilities may also seek direct access to NE Ingle Road or NE Goodwin Road as appropriate.

Trip Generation

Trip generation estimates for the proposed development were generated based on information provided in the standard reference manual *Trip Generation, 9th Edition* published by the Institute of Transportation Engineers (ITE – Reference 7). The internal and pass-by trip rates applied to each land use were also determined from ITE's *Trip Generation, 9th Edition.* Table 4 summarizes the daily, weekday a.m., and weekday p.m. peak-hour trips for the Phase 1 assumed development while Table 5 summarizes the complete master plan site trip generation estimate. All daily trips have been rounded to the nearest ten and all peak hour trips have been rounded to the nearest five trips.

---

[1] The unit mix for phase 1 and buildout was developed based on a reasonable worst-case scenario. Final development may result in a less-intense mix of residential units.

Table 4: Trip Generation Estimate – Phase 1

Land Use	ITE Code	Size	Daily	Weekday AM Peak Hour			Weekday PM Peak Hour		
				Total	In	Out	Total	In	Out
Single-Family Detached Housing	210	215 units	2,050	160	40	120	215	135	80

Table 5: Trip Generation Estimate – Build-out (Includes Phase 1)

Land Use	ITE Code	Size	Daily	Weekday AM Peak Hour			Weekday PM Peak Hour		
				Total	In	Out	Total	In	Out
Apartment	220	536 units	3,570	275	55	220	330	215	115
Single-Family Detached Housing	210	764 units	7,270	575	145	430	765	480	285
Total Residential (1,300 units)			**10,840**	**850**	200	650	1,095	695	400
Internalization (6% Daily, 5% PM)			630	0	0	0	60	30	30
Shopping Center	820	90,000 square feet	6,340	145	90	55	560	270	290
Internalization (10% Daily, 11% PM)			*630*	*0*	*0*	*0*	*60*	*30*	*30*
Pass-By Trips (34%)			*1,940*	*50*	*25*	*25*	*170*	*85*	*85*
Total Trips			17,180	995	290	705	1,655	965	690
Less Internalization			*1,260*	*0*	*0*	*0*	*120*	*60*	*60*
Less Pass-by trips			*1,940*	*50*	*25*	*25*	*170*	*85*	*85*
Net New Trips for Full Build-out			***13,980***	***945***	***265***	***680***	***1,365***	***820***	***545***

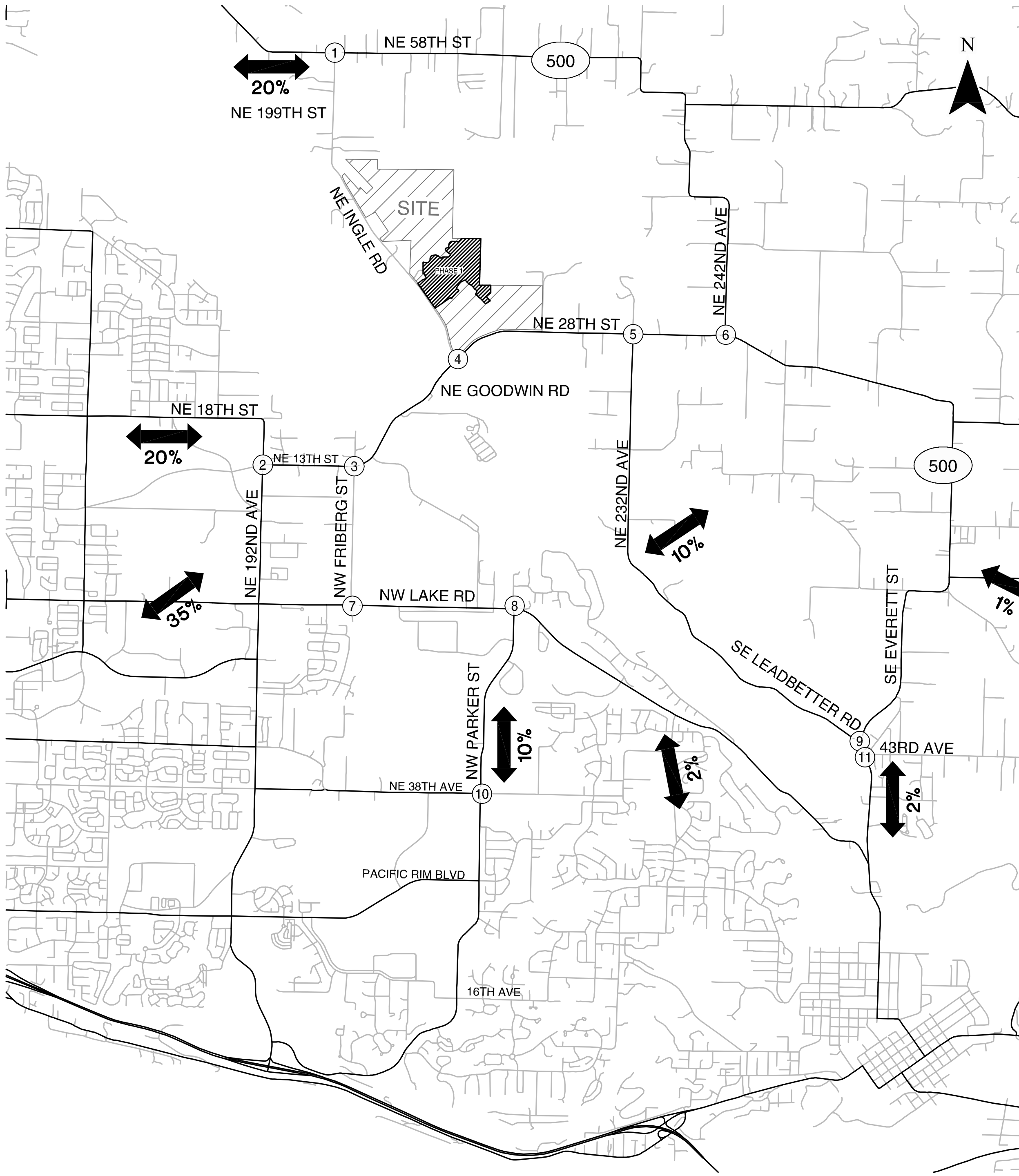
Trip Distribution

The distribution of site-generated trips onto the study area roadway system was estimated based on a review of surrounding roadway characteristics, existing uses, the 2035 travel demand model maintained by the Southwest Washington Regional Transportation Council (RTC), and review agency guidance. Trip distribution patterns were developed separately for the residential and retail trips. Figure 6 illustrates the trip distribution patterns for the residential and retail trips.

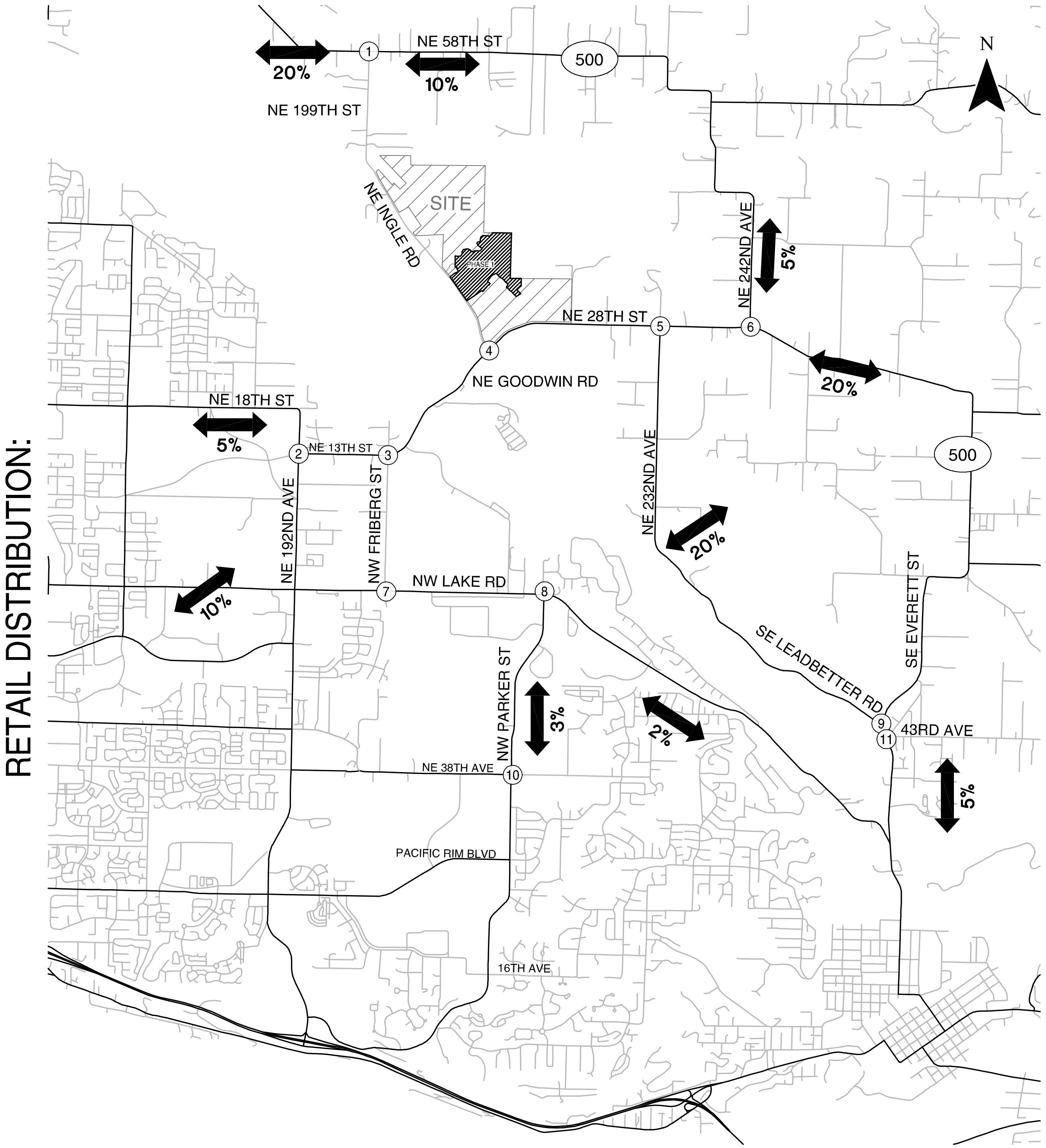
Trip Assignment

The weekday a.m. and p.m. peak hour site trips shown in Tables 4 and 5 were assigned to the roadway network based on the trip distribution patterns shown in Figure 6. Figures 7 through 10 show the assignment of site-generated trips during the weekday a.m. and p.m. peak hours for Phase 1 and at Build-out. Note that the site-generated build-out volumes shown in Figures 9 and 10 include the Phase 1 site-generated trips and thus reflect the total number of trips generated. *A figure showing the assignment of pass-by trips is provided in Appendix "E".*

RESIDENTIAL DISTRIBUTION:



RETAIL DISTRIBUTION:



Estimated Trip Distribution Pattern
Camas, Washington

Figure
6

Total Estimated Trip Assignment - Phase 1
Weekday AM Peak Hour
Camas, Washington

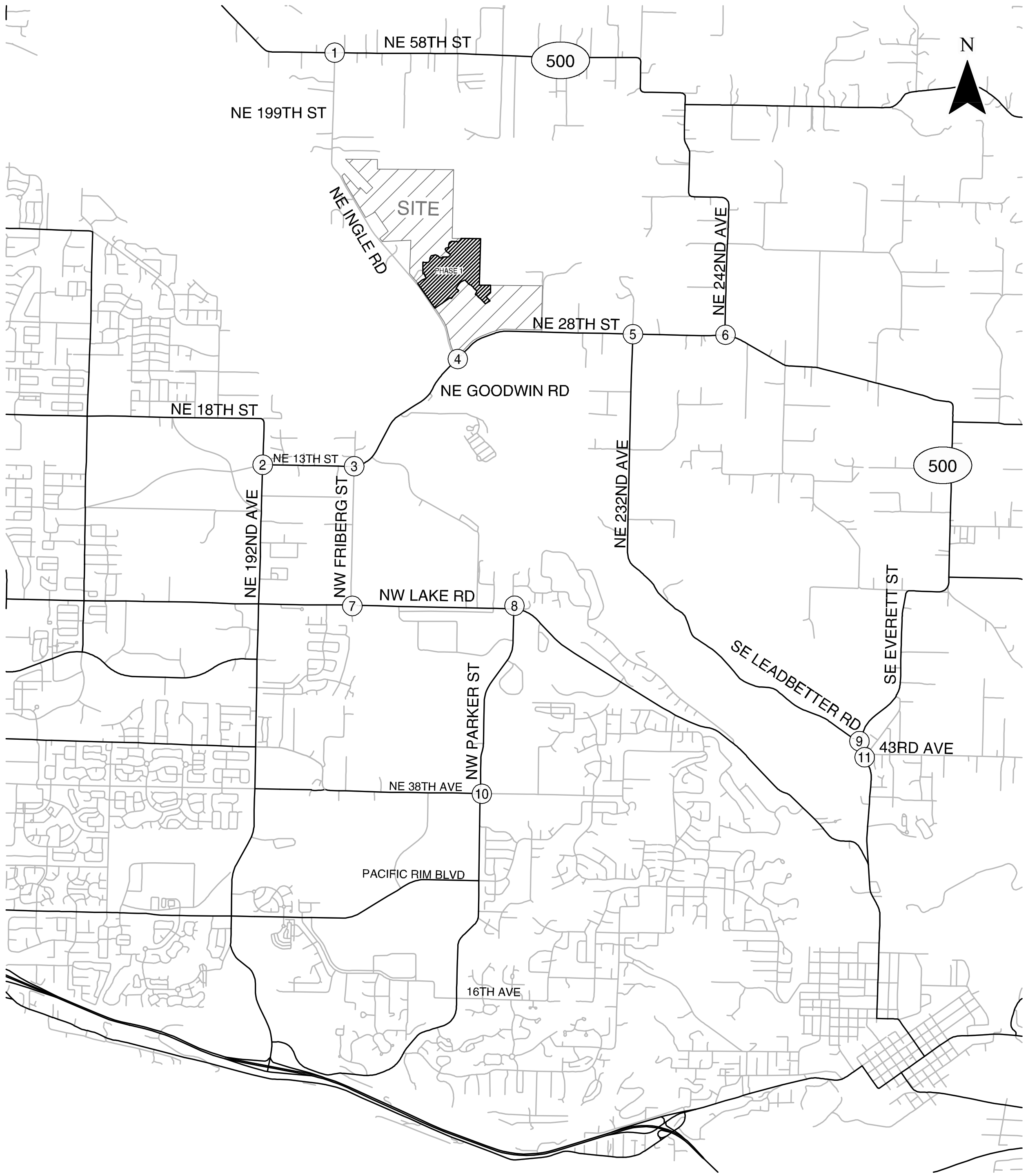
Figure
7

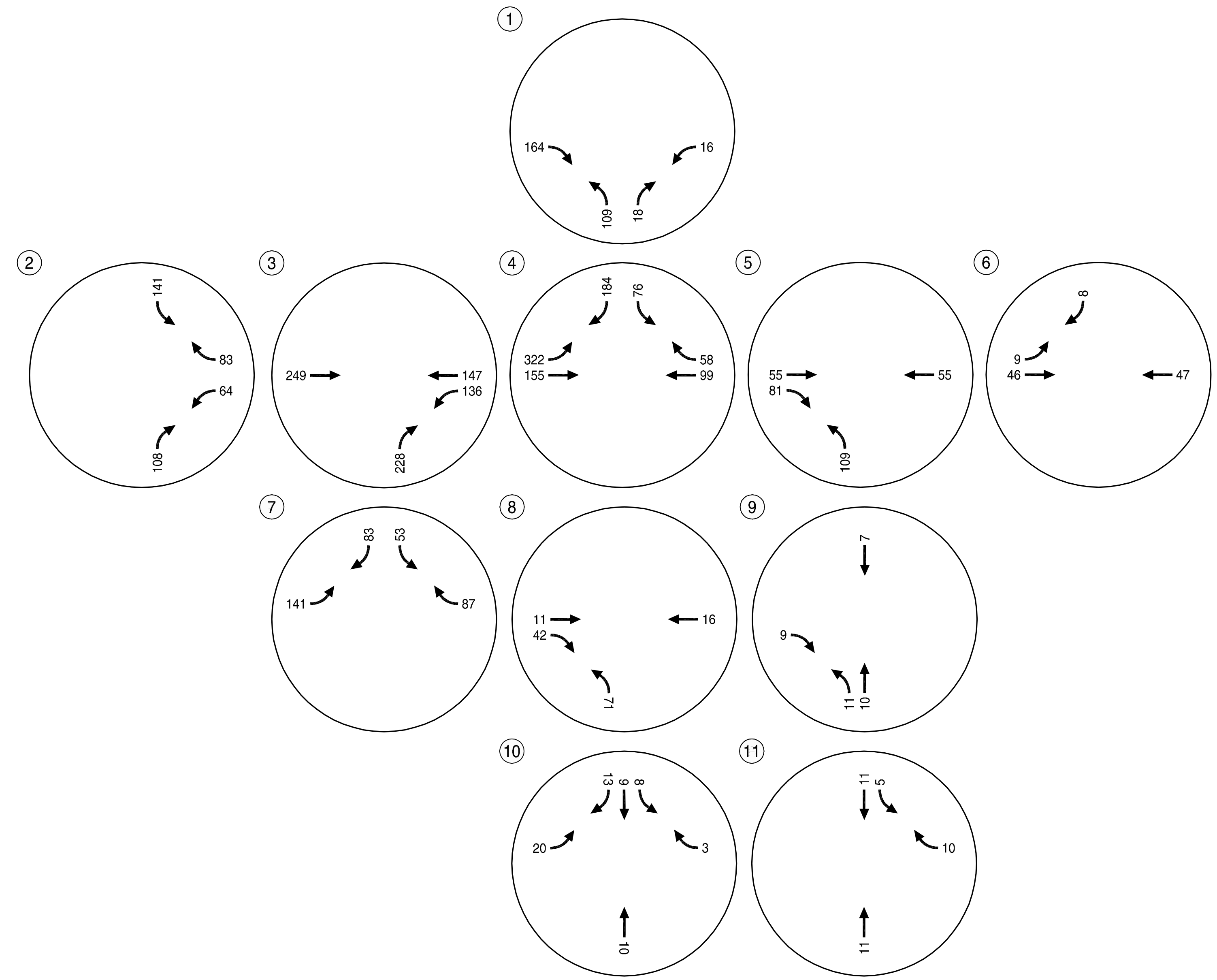
Total Estimated Trip Assignment - Phase 1
Weekday PM Peak Hour
Camas, Washington

Figure 8

Total Estimated Trip Assignment - Full Build-Out
Weekday AM Peak Hour
Camas, Washington

Figure 9





Total Estimated Trip Assignment - Full Build-Out
Weekday PM Peak Hour
Camas, Washington

Figure 10

2018 Background Traffic Conditions

The 2018 background traffic analysis projects how the study area's transportation system will operate during the year that Phase 1 of the proposed development is expected to be completed. This analysis includes traffic growth due to previously approved in-process developments within the study area, but does not include traffic from any of the proposed Green Master Plan development phases. Per agency direction, no growth was applied to City of Camas roadways and a 2% growth rate was applied to City of Vancouver roadways (Reference 8).

Planned Developments and Transportation Improvements

City of Camas staff identified 13 local development projects that are approved but not yet occupied. These in-process developments include:

- Lake Hills
- Two Creeks
- The Summit at Columbia Vista
- Parker Village
- The Hills at Round Lake
- North Hills Subdivision
- Brady Road Subdivision
- Deerhaven Subdivision
- Hadley's Glen
- Millshore Downs
- Fisher Creek Campus
- Lacamas Prairie
- 192nd Plaza West

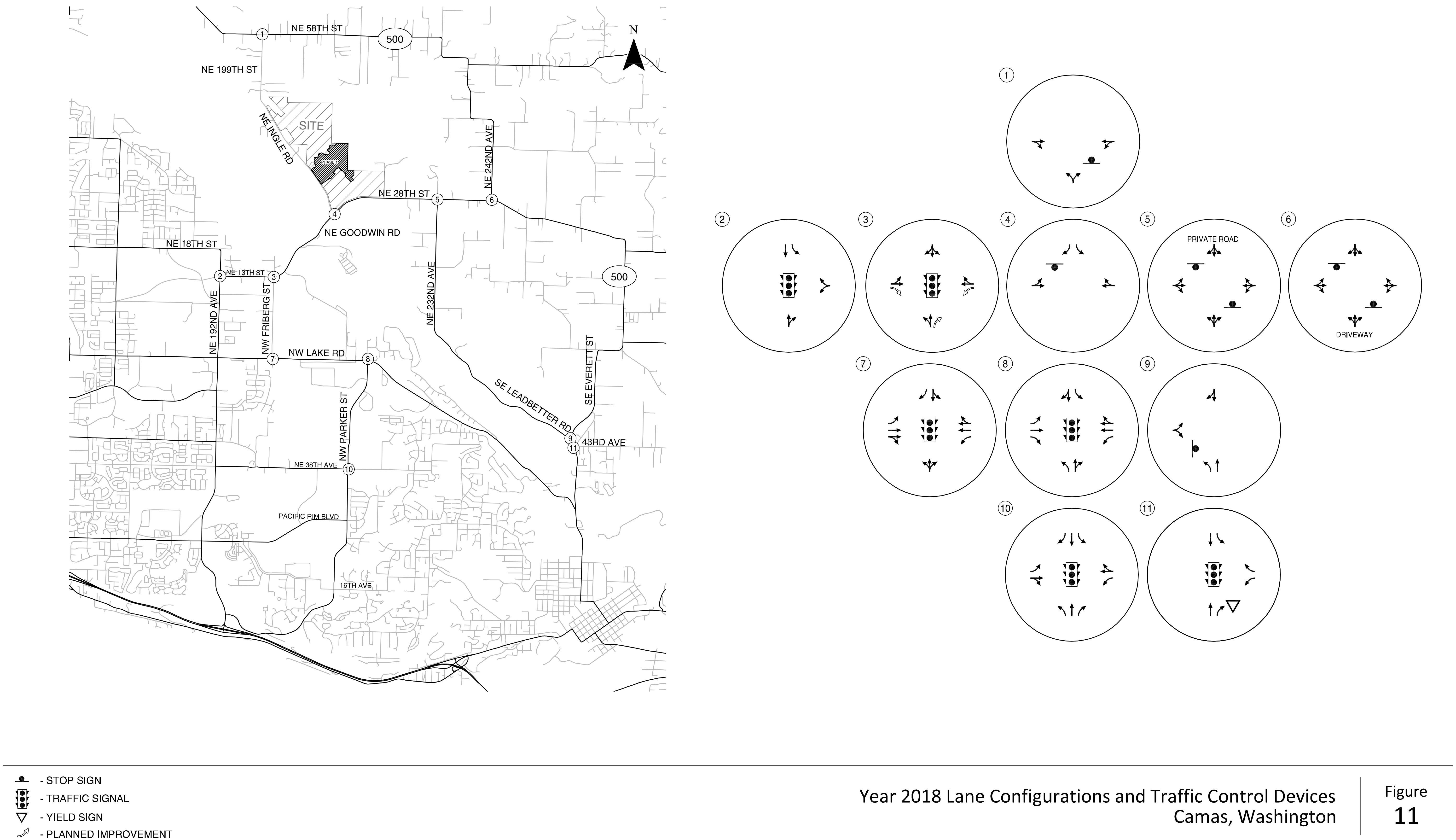
Appendix "F" contains the data received pertaining to the in-process trips.

Planned and funded transportation improvements within the study area include the widening of NW Friberg Street (between Lake Road and NE 13th Street) and the addition of a westbound left-turn lane, northbound right-turn lane, and eastbound right-turn lane at the NW Friberg Street/NE Goodwin Road intersection. Figure 11 shows the lane configuration and traffic control devices assumed in the 2018 analysis.

Traffic Operations

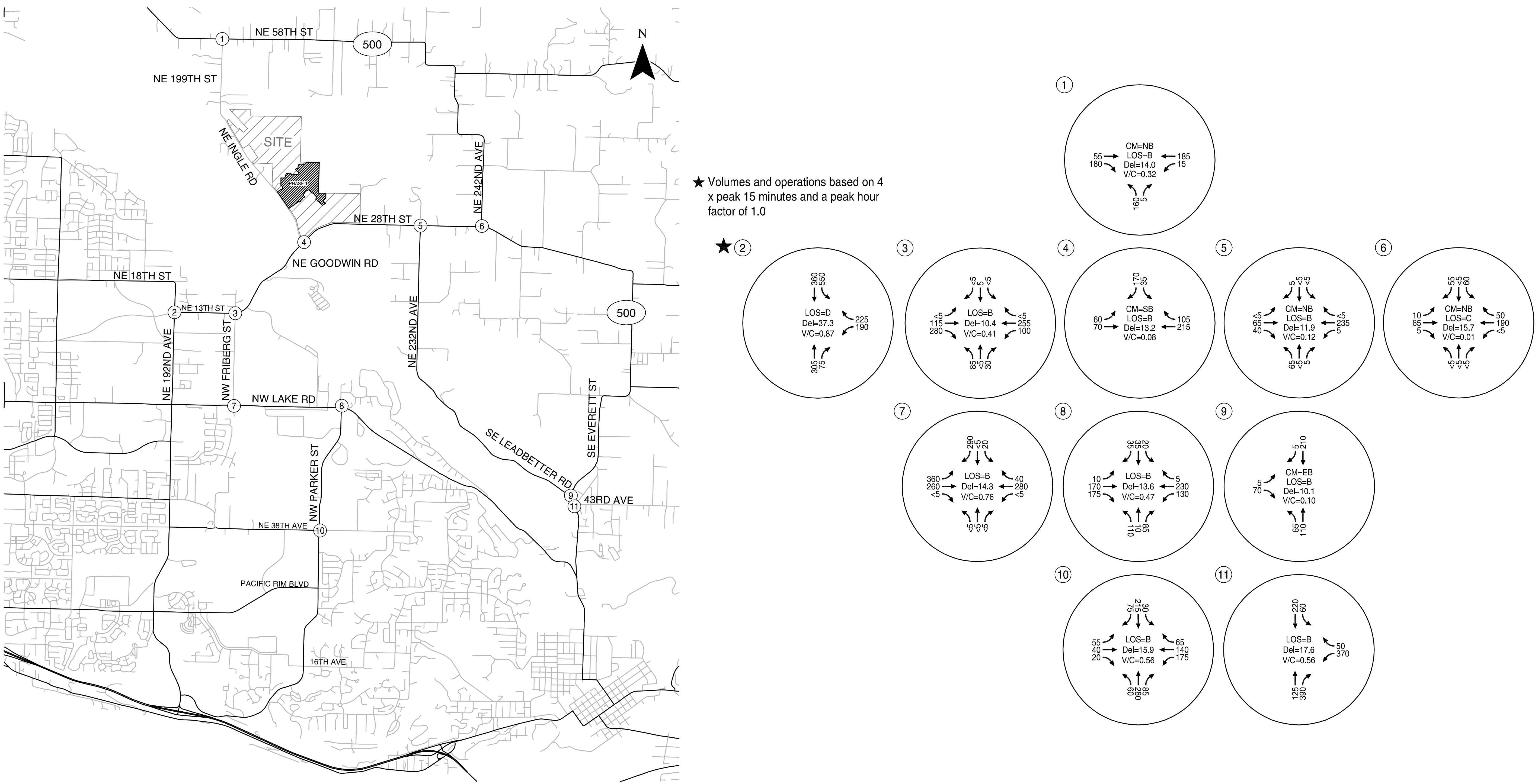
Figures 12 and 13 summarize the year 2018 background traffic operations analysis results at the study intersections for the weekday a.m. and weekday p.m. peak-hours, respectively. The projected turning movement counts are rounded to the nearest five vehicles per hour. As shown, the study intersections operate acceptably during the weekday a.m. and weekday p.m. peak periods in the 2018 background conditions.

Appendix "G" contains the 2018 background conditions traffic operations worksheets.



Year 2018 Lane Configurations and Traffic Control Devices
Camas, Washington

Figure 11



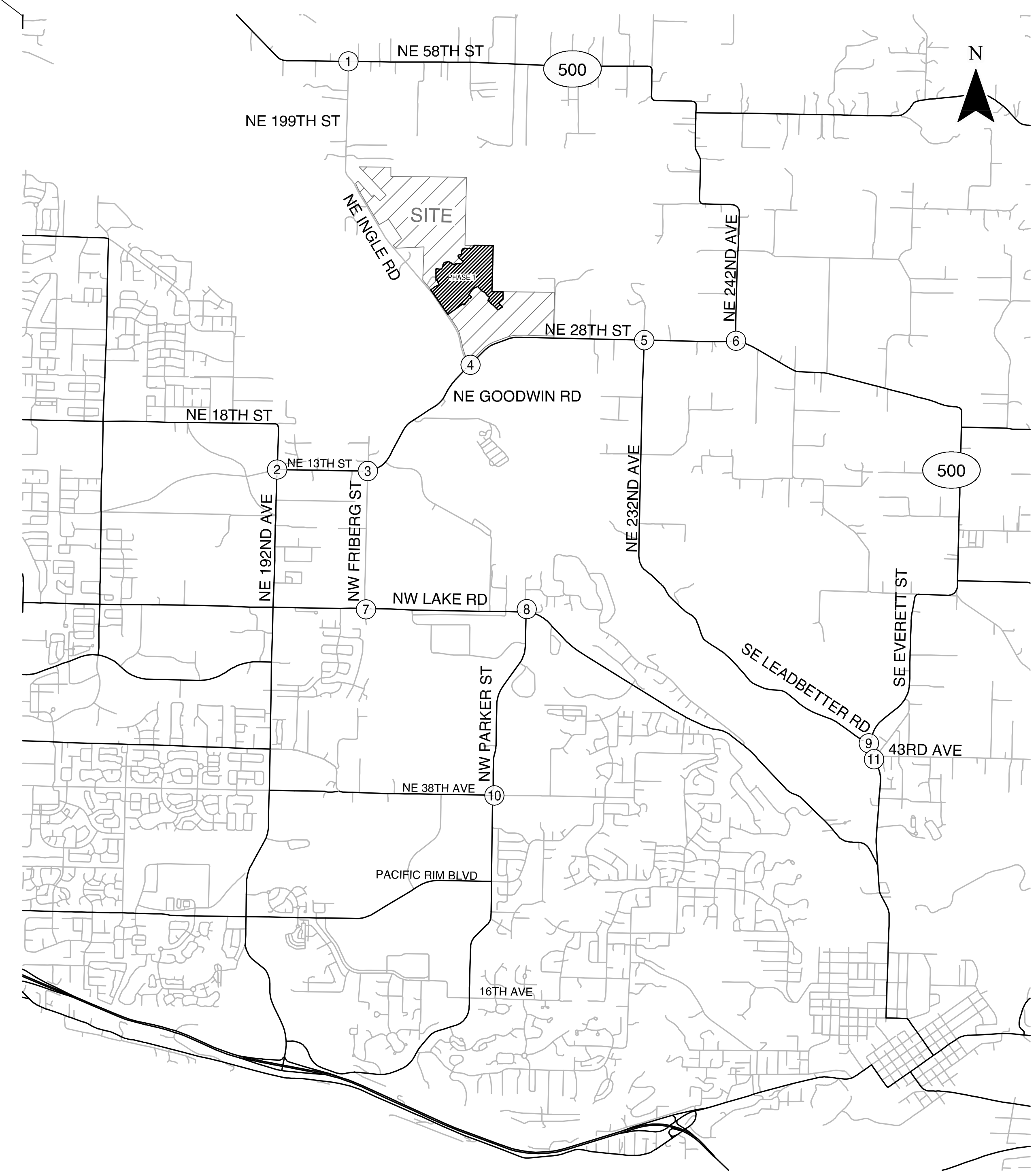
CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

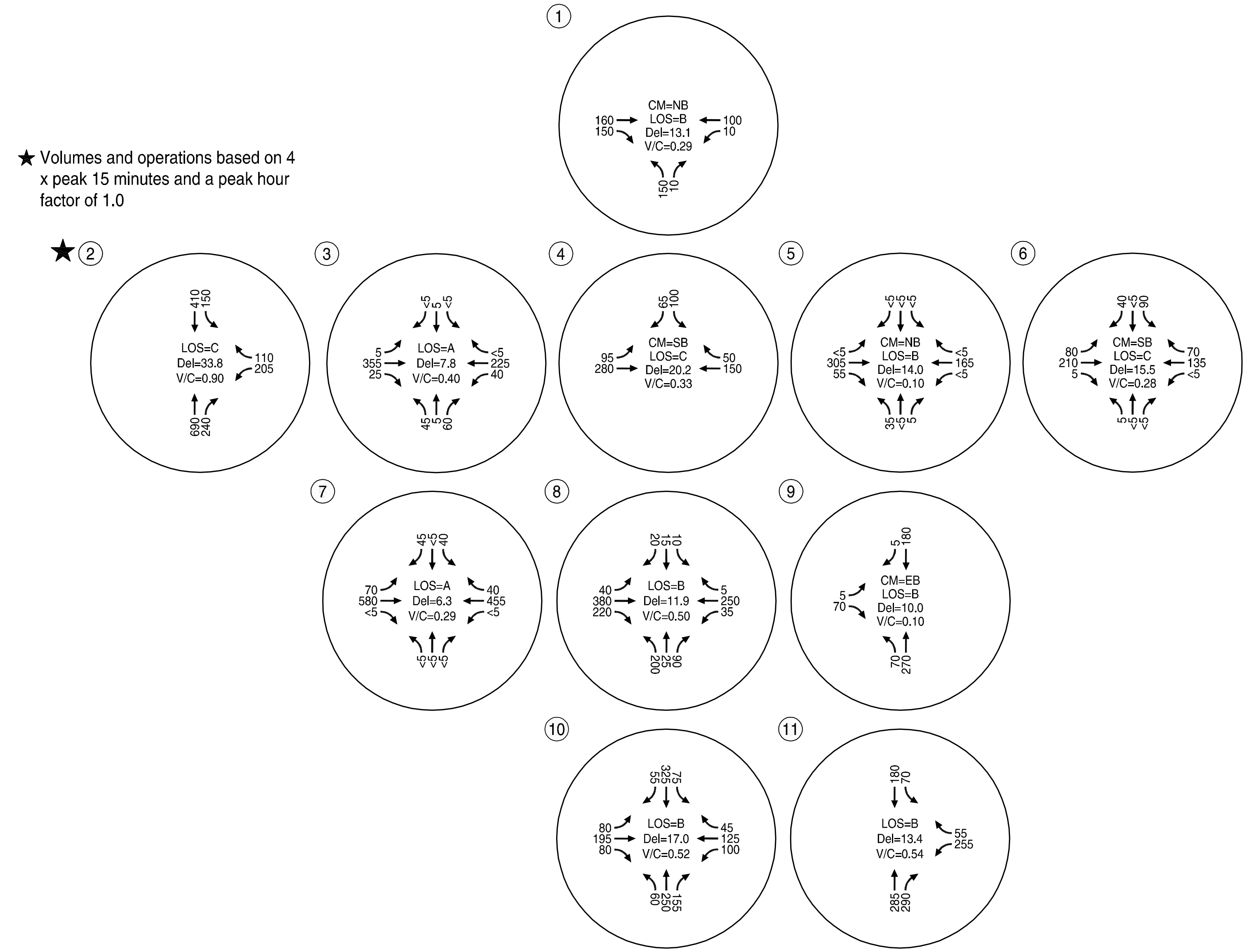
2018 Background Conditions
Weekday AM Peak Hour
Camas, Washington

Figure
12

H:\projfile\13865 - Green Mountain Master Plan\dwgs\figs\13865_traffic study -Nov update.dwg Nov 20, 2014 - 2:30pm - klaustsen Layout Tab: 12_2018bcAM

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING





CM	=	CRITICAL MOVEMENT (TWSC)
LOS	=	INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del	=	INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C	=	CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC	=	TWO-WAY STOP CONTROL

2018 Background Conditions
Weekday PM Peak Hour
Camas, Washington

Figure 13

2018 Total Traffic Conditions

The year 2018 total traffic analysis forecasts how the study area's transportation system will operate with the addition of traffic from Phase 1 of the proposed development. Phase 1 site-generated trips were added to the 2018 background traffic volumes at the study intersections to arrive at the total traffic volumes.

All lane configurations are consistent with background conditions with the exception of the intersection of NE Ingle Road/NE Goodwin Road. The developer proposes to construct an exclusive eastbound left-turn lane on NE Goodwin Road at NE Ingle Road in conjunction with the Phase 1 site development. Consequently, provision of the turn lane was assumed for the total traffic analysis.

Traffic Operations

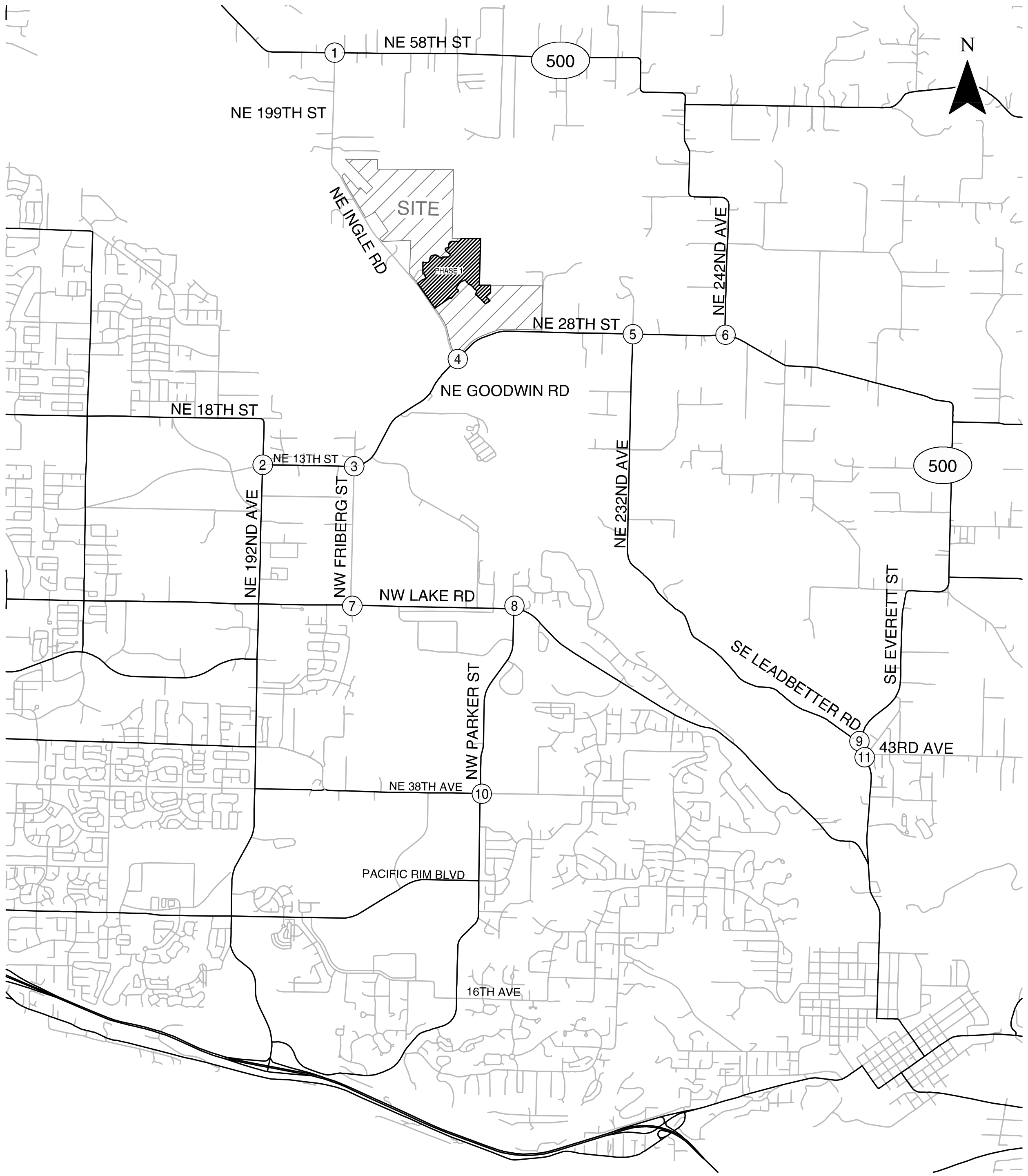
Figures 14 and 15 summarize the year 2018 total traffic operations analysis results at the study intersections for the weekday a.m. and weekday p.m. peak-hours, respectively. The projected turning movement counts are rounded to the nearest five vehicles per hour. As shown, all but one of the study intersections are forecast to operate acceptably during the weekday a.m. and p.m. peak periods under 2018 total traffic conditions. The southbound movement at the intersection of NE Ingle Road/NE Goodwin Road is anticipated to operate at a LOS E during the weekday p.m. peak hour. Operations at this intersection could be mitigated with the addition of an eastbound right-turn lane. Based on a sensitivity analysis, this mitigation is triggered by the 203rd unit to be constructed. Up until this point, the southbound left-turn lane is forecast to operate at a LOS D. Table 6 provides the operations at NE Ingle Road/NE Goodwin Road during the weekday PM peak hour supporting the sensitivity analysis.

Table 6: NE Ingle Road/NE Goodwin Road Operations Assessment – weekday PM peak hour

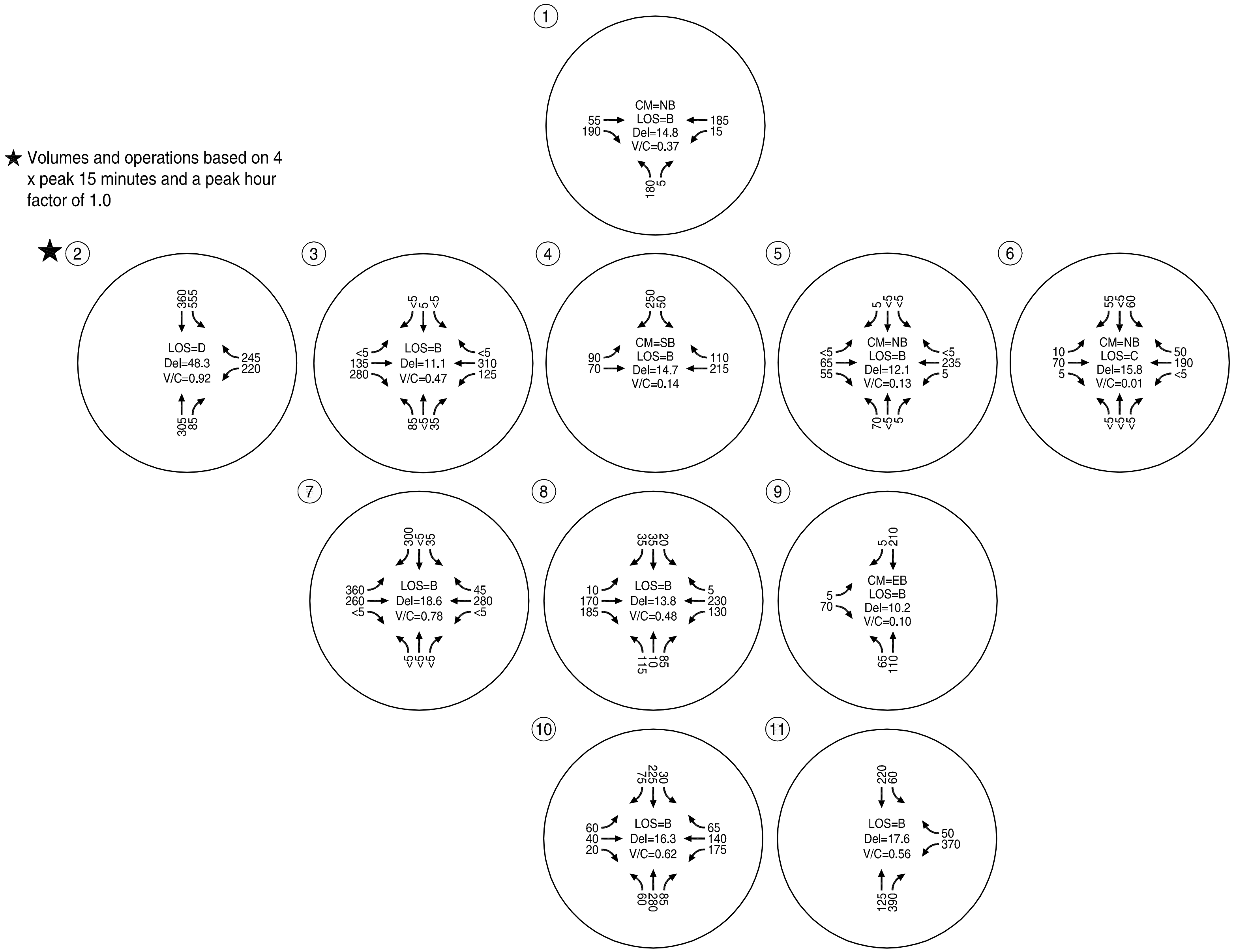
Scenario	Critical Movement	LOS	v/c ratio
2018 Background Conditions	SBL	C	0.33
2018 Background + 200 Homes	SBL	D	0.52
2018 Background + 203 homes	SBL	E	0.53
2018 Total Traffic (215 homes)	SBL	E	0.53
2018 Total Traffic (2015 homes) – mitigated[1]	SBL	D	0.51

Notes: LOS = Level of Service; v/c ratio = volume-to-capacity ratio
[1]Mitigation includes provision of westbound right-turn lane

Appendix "H" contains the 2018 total traffic conditions traffic operations worksheets. Appendix "I" contains the traffic operations worksheets supporting the sensitivity analysis at NE Ingle Road/NE Goodwin Road.



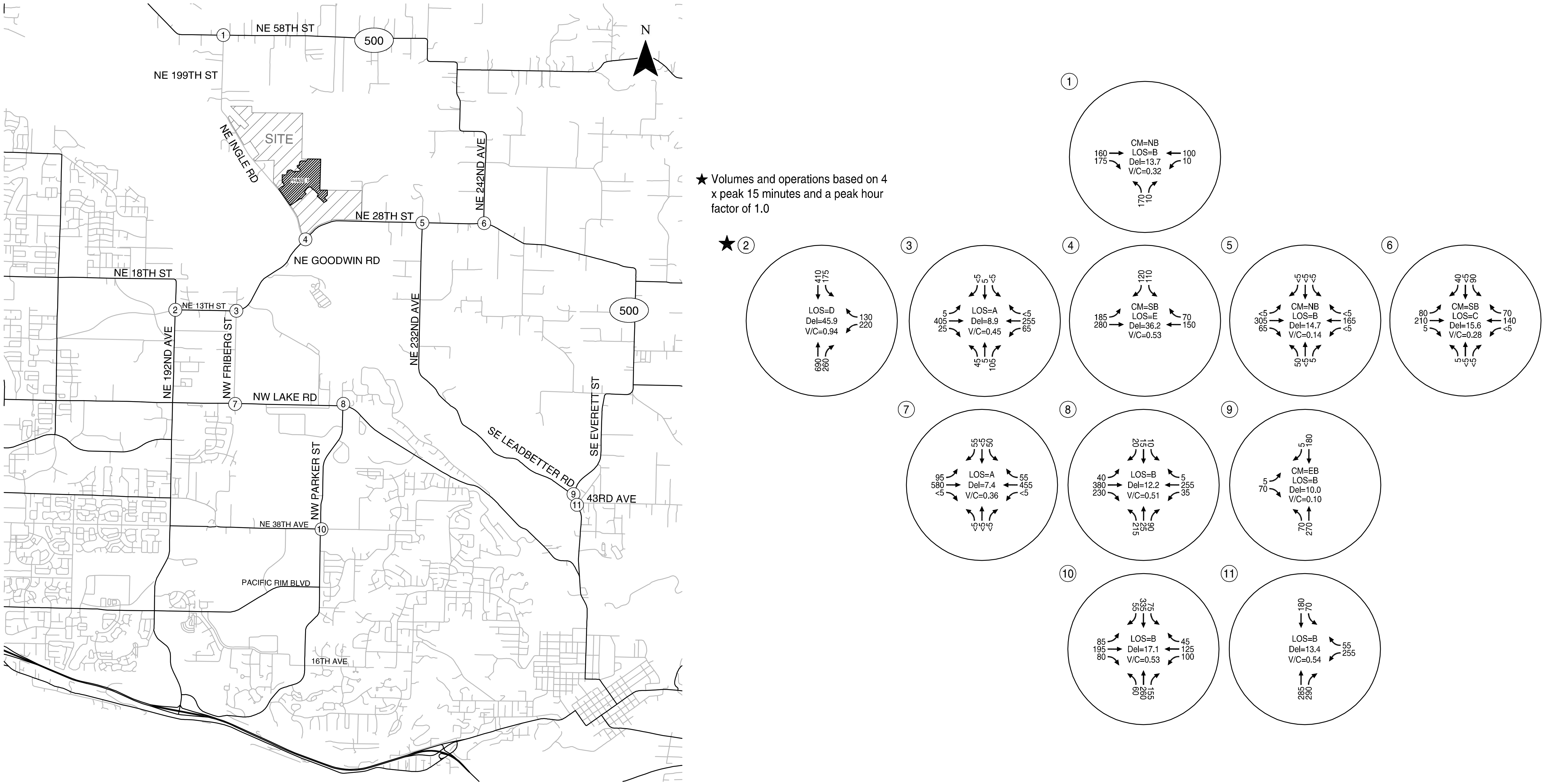
★ Volumes and operations based on 4 x peak 15 minutes and a peak hour factor of 1.0



CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

2018 Total Traffic Conditions (Phase 1)
Weekday AM Peak Hour
Camas, Washington

Figure 14



CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

2018 Total Traffic Conditions (Phase 1)
Weekday PM Peak Hour
Camas, Washington

Figure 15

2029 Background Traffic Conditions

The 2029 background traffic analysis identifies how the study area's transportation system will operate with regional growth, including completion of Phase 1 development. No further funded transportation improvement projects were identified at the study intersections that would be in place prior to the year 2029. In addition to the previously described in-process development, a one percent annual growth rate was applied to the 2018 background traffic volumes on City of Camas roadways to account for regional growth in the area per staff direction. Continued use of a two percent annual growth rate was assumed to the City of Vancouver roadways (NE 192nd Avenue).

The same lane configurations used in the 2018 analysis were assumed, with the exception of the configuration at NE Ingle Road/NE Goodwin Road. As previously noted, the developer proposes to construct an exclusive eastbound left-turn lane at the intersection in conjunction with the Phase 1 site development so this turn lane was assumed for the 2029 analysis. Signal timings were optimized with the assumption that signals in the area will be re-timed in the next fifteen years. In addition, some peak hour factors (PHF) were increased to account for future traffic changes, including:

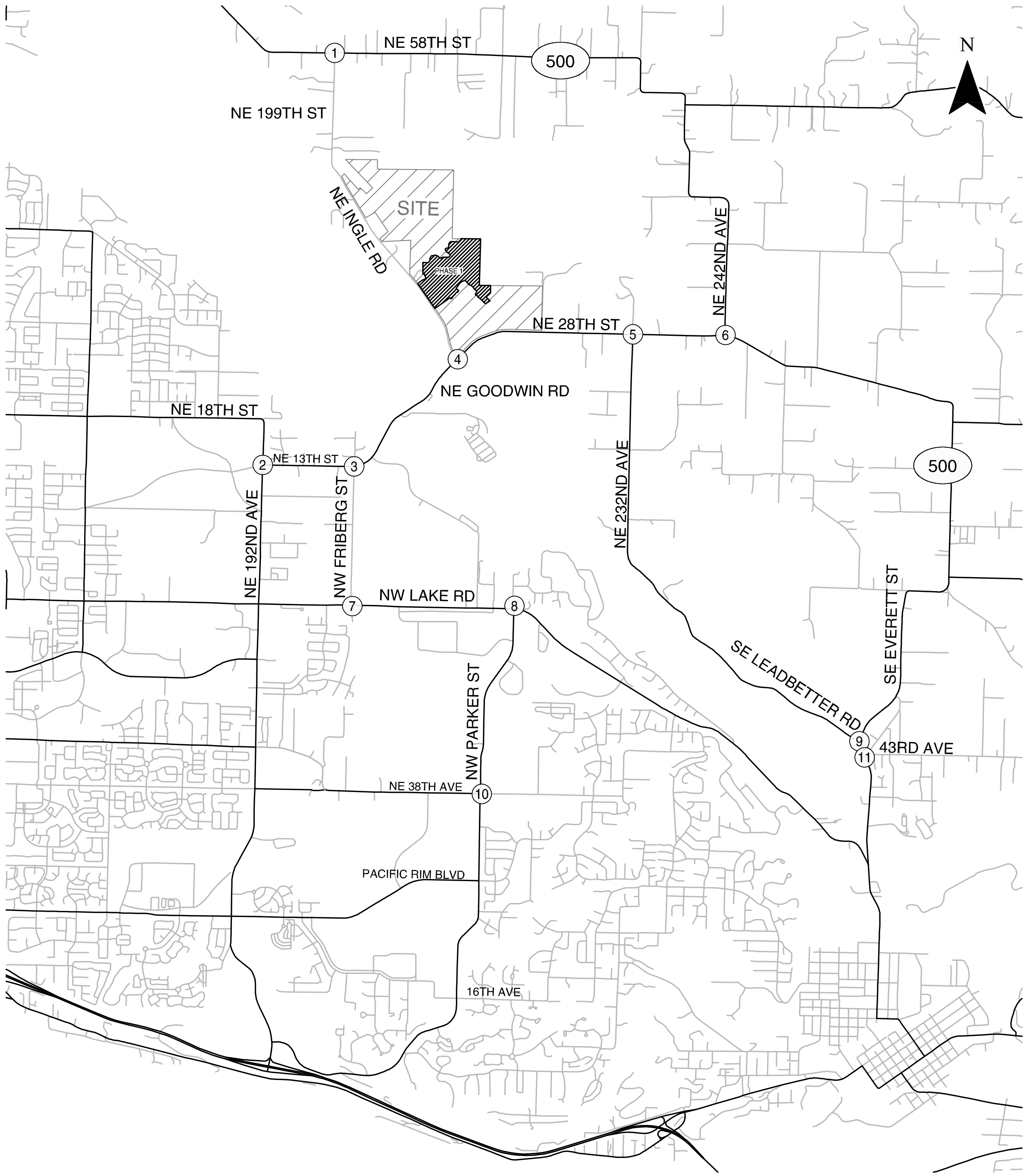
- PHF increased to 0.80 in the a.m. peak hour at NW Friberg Street/NE Goodwin Road and NE 242nd Avenue/NE 28th Street
- PHF increased to 0.75 in the a.m. peak hour at NW Friberg Street/NW Lake Road; NW Parker Street/NW Lake Road; and NW Parker Street/NE 38th Avenue

Traffic Operations

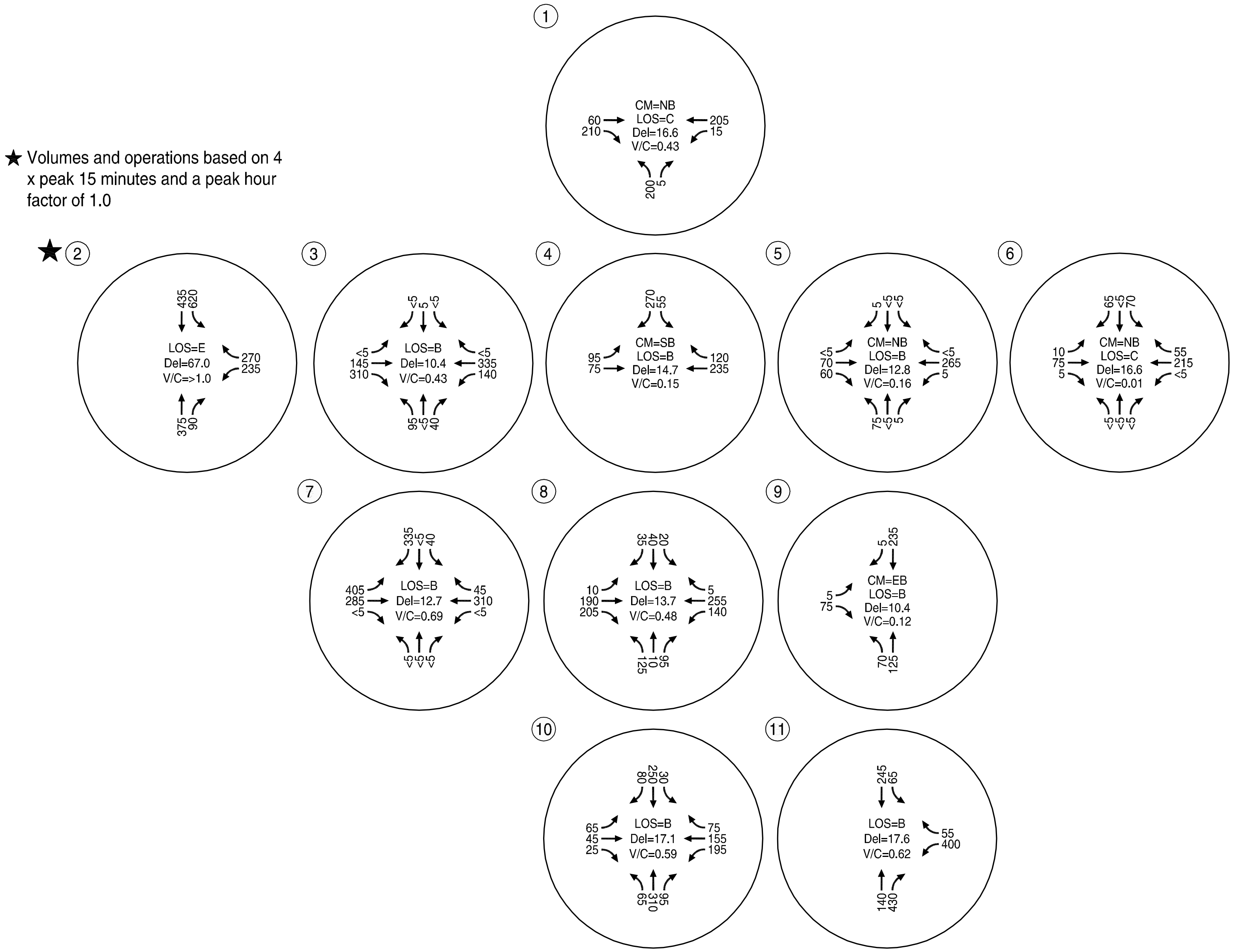
Figures 16 and 17 summarize the year 2029 background traffic operations analysis results at the study intersections for the weekday a.m. and weekday p.m. peak-hours, respectively. As illustrated in the figures, all but two of the study intersections are forecast to operate acceptably:

- The intersection of NE 192nd Avenue/NE 13th Street is projected to operate at a LOS E and over-capacity during the weekday a.m. peak hour and LOS F and over-capacity during the p.m. peak hour.
- The southbound approach to the intersection of NE Ingle Road/NE Goodwin Road is projected to operate at a LOS E during the weekday p.m. peak hour (with provision of the westbound right-turn lane recommended in conjunction with Phase 1 site development).

Appendix "J" contains the 2029 background conditions traffic operations worksheets.



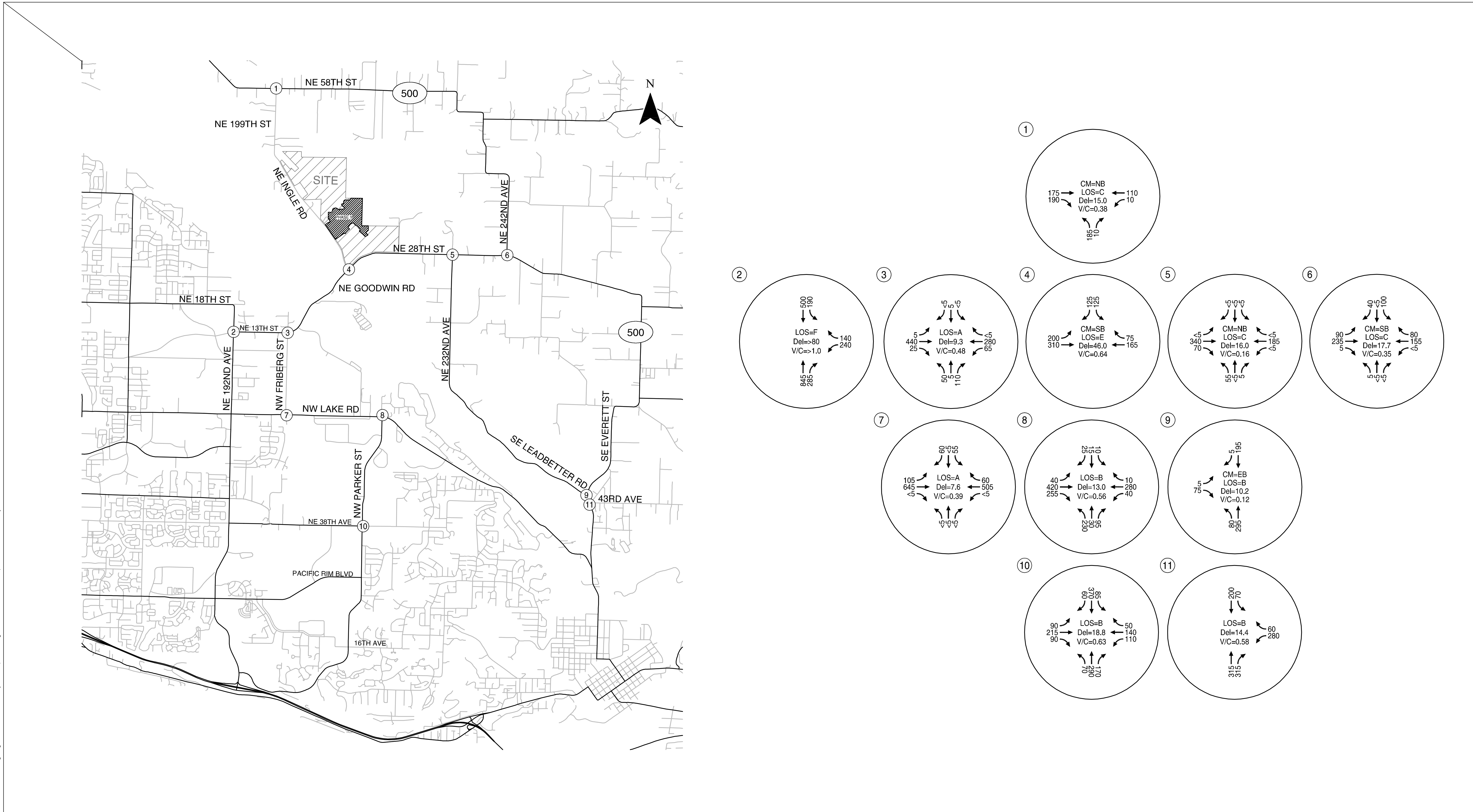
★ Volumes and operations based on 4 x peak 15 minutes and a peak hour factor of 1.0



CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

2029 Background Conditions
Weekday AM Peak Hour
Camas, Washington

Figure 16



CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

2029 Background Conditions
Weekday PM Peak Hour
Camas, Washington

Figure 17

H:\projfile\13865 - Green Mountain Master Plan\dwgs\figs\13865_traffic study -Nov update.dwg Nov 20, 2014 - 2:32pm - klaustsen Layout Tab: 17_2029bcPM

2029 Total Traffic Conditions

The year 2029 total traffic analysis forecasts how the study area's transportation system will operate with full build-out of the proposed master plan development. The year 2029 background traffic volumes were added to the full build-out site-generated traffic to arrive at the total traffic volumes.

Traffic Operations

Figures 18 and 19 summarize the year 2029 total traffic operations analysis results at the study intersections for the weekday a.m. and weekday p.m. peak-hours, respectively. The projected turning movement counts are rounded to the nearest five vehicles per hour. As shown, the following study intersections do not meet standards during either the weekday a.m. or p.m. peak periods:

- NE 199th Avenue/NE 58th Street (SR 500) (weekday a.m. and p.m. peak hours)
- NE 192nd Avenue/NE 13th Street (weekday a.m. and p.m. peak hours, previously was failing during background a.m. and p.m. peak hours)
- NE Ingle Road/NE Goodwin Road (weekday a.m. and p.m. peak hours, previously was failing during background p.m. peak hour)

Potential mitigation measures for these intersections are discussed later in the report.

Appendix "K" contains the 2029 total traffic conditions traffic operations worksheets.

Turn-Lane Considerations

As referenced under the "Analysis Methodology," roadways under Washington State jurisdiction are subject to the turn lane guidelines contained in the *WSDOT Design Manual* (Reference 3). The potential need for turn-lanes at each study intersection was reviewed for the analysis scenarios. Intersections that meet turn-lane guidelines are further discussed below.

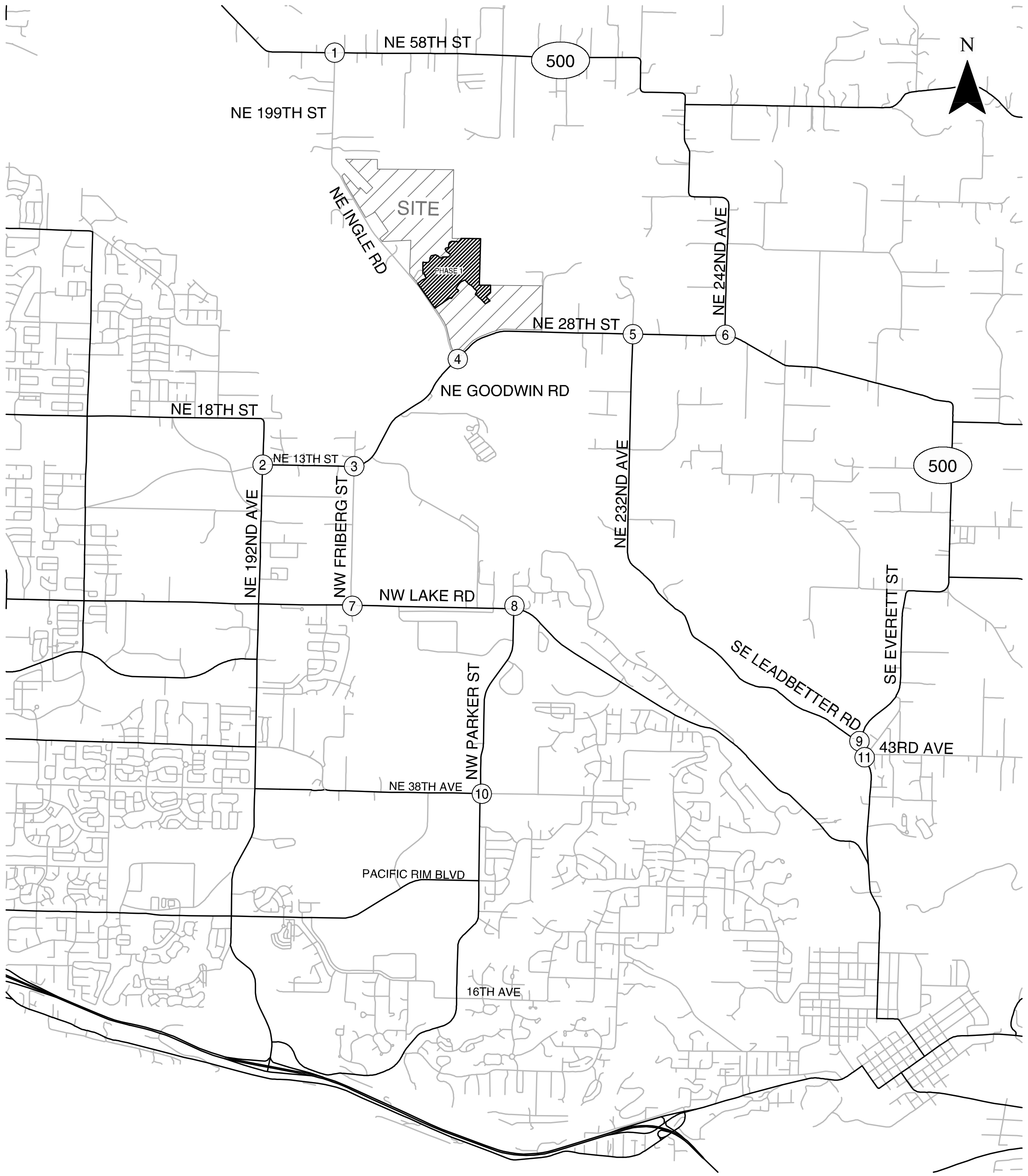
NE 199th Avenue/NE 58th Street (SR 500)

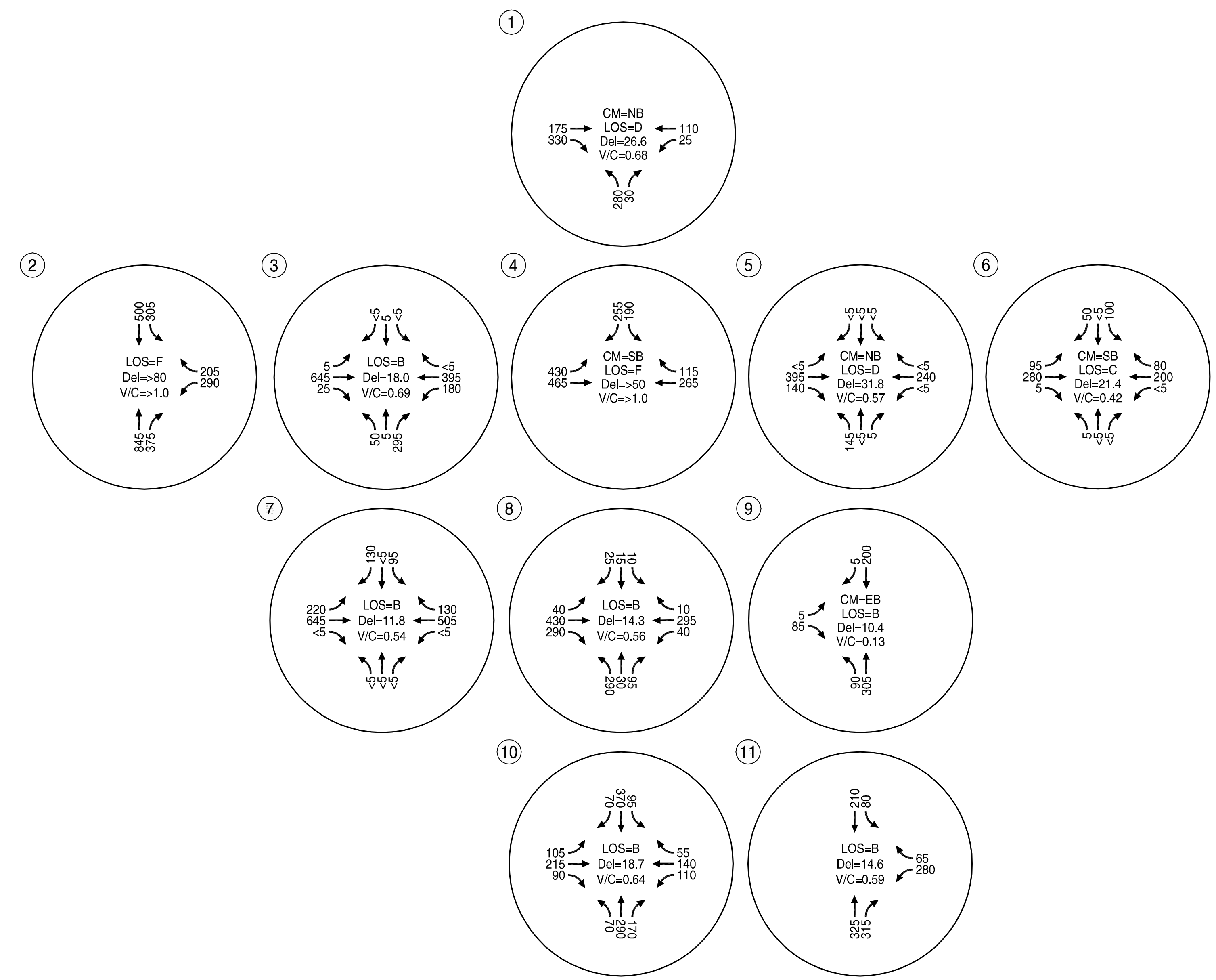
Traffic volumes at the intersection of NE 199th Avenue/NE 58th Street (SR 500) meet WSDOT's guidelines for an eastbound right-turn lane on NE 58th Street under existing conditions and all future scenarios during both the weekday a.m. and p.m. peak hour. Construction of a right-turn lane could require right-of-way acquisition and will likely impact one or more private driveways along NE 58th Street (depending on the length of the deceleration lane constructed).

CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

2029 Total Traffic Conditions (Build Out)
Weekday AM Peak Hour
Camas, Washington

Figure 18





CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

2029 Total Traffic Conditions (Build Out)
Weekday PM Peak Hour
Camas, Washington

Figure 19

The table below assesses volumes at the intersection for various horizon year scenarios and the impact of the proposed development.

Table 7: NE 199th Avenue/NE 58th Street (SR 500) Eastbound Right-Turn Lane Assessment

Scenario	Eastbound Right-Turn (EBRT) Volume	Meets Guideline?	Development-Added EBRT Trips	Impact of Development
2014 Existing Traffic – AM Peak	180	Yes	-	-
2014 Existing Traffic – PM Peak	145	Yes	-	-
2018 Background Traffic – AM Peak	180	Yes	8 (Phase 1)	4%
2018 Background Traffic – PM Peak	150	Yes	27 (Phase 1)	18%
2029 Background Traffic – AM Peak	210	Yes	45 (Build-out)	21%
2029 Background Traffic – PM Peak	190	Yes	138 (Build-out)	73%

The recorded crash history at the intersection was reviewed to identify potential safety issues that an eastbound right-turn lane might address. No crashes were reported involving vehicles making an eastbound right-turn. Given the lack of crash history and the relatively small impact of Phase 1, no improvements are recommended in conjunction with Phase 1. Nonetheless, given the amount of site-generated traffic that will be added to the eastbound right-turn movement as future phases of the master plan build-out, if right turn crashes materially increased, it is possible that a nexus could be established between requiring construction of an eastbound right-turn lane and traffic volume increases attributable to master plan trip development. Accordingly, we recommend that future site plan applications prepared subsequent to Phase 1 provide an updated assessment as to the potential need for providing a right-turn taper or lane at the intersection.

NE 242nd Avenue (SR 500)/NE 28th Street

Traffic volumes at the intersection of NE 242nd Avenue (SR 500)/NE 28th Street meet WSDOT's guidelines for a left-turn lane on the eastbound approach under existing conditions and all future scenarios during the weekday p.m. peak hour. The table below assesses volumes at the intersection for each horizon year scenario and the impact of the proposed development. *As shown in the table, the Phase 1 development does not add any trips to the eastbound left-turn lane*. The trips generated by build-out of the master plan development are from the retail component and total less than 10.

Table 8: NE 242nd Avenue (SR 500)/NE 28th Street Eastbound Left-Turn Lane Assessment

Scenario	Eastbound Left-Turn Volume	Meets Guidelines? (Recommended Storage)	Development-Added Trips	Impact of Development
2014 Existing Traffic – AM Peak	10	No	-	-
2014 Existing Traffic – PM Peak	80	Yes (100 feet)	-	-
2018 Background Traffic – AM Peak	10	No	0 (Phase 1)	0%
2018 Background Traffic – PM Peak	80	Yes (100 feet)	0 (Phase 1)	0%
2029 Background Traffic – AM Peak	10	No	2 (Build-out)	20%
2029 Background Traffic – PM Peak	90	Yes (100 feet)	9 (Build-out)	10%

The recorded crash history at the intersection was reviewed to identify potential safety issues that an eastbound left-turn lane might address. While two angle crashes were reported from vehicles making a southbound left-turn, no crashes were reported involving vehicles making an eastbound left-turn.

Based on our review of the information provided above, we find no basis for recommending improvements to the NE 242nd Avenue (SR 500)/NE 28th Street intersection in conjunction with Phase 1 site development. We base this conclusion on the proposed development adding no trips to the left-turn movement in question, the lack of crash history related to left-turns, and the general lack of a nexus given the small trip impact of the proposed Phase 1 development at this location.

Planned Future Intersection Improvements

The *2012 City of Camas Traffic Impact Fee Update Report* (Reference 2) identifies the future need to widen NE 28th Street to have a center left-turn lane from Ingle Road to NE 242nd Avenue. A related project would create a new NE 242nd Avenue extension south of NE 28th Street. Given the City's planned improvements, we recommend the City of Camas make a finding that the traffic impact fee payments made by the master plan for Phase 1 and future phases of the project mitigate development impacts at the intersection, and therefore require no additional mitigation.

Recommended Mitigations

As discussed above, all study intersections meet operating standards under existing and 2018 background and total traffic conditions for both the weekday a.m. and p.m. peak hours. Four intersections do not meet operating standards in 2029 under background and/or total traffic conditions; each is discussed below.

NE 199th Avenue/NE 58th Street (SR 500)

The minor street northbound left-turn at the intersection of NE 199th Avenue/NE 58th Street (SR 500) is projected to not meet current WSDOT standards in the 2029 total traffic conditions during the weekday a.m. and p.m. peak hours. The intersection is projected to operate at a volume-to-capacity (v/c) ratio of 0.72 and LOS D during the a.m. peak hour and v/c ratio of 0.70 and LOS D during the p.m. peak hour. It is therefore not within WSDOT's LOS requirement (LOS C) for non-HSS facilities in rural areas. The intersection is three-legged and stop-controlled on the northbound approach. The northbound left-turn is the critical movement at the intersection, with all other movements operating at a LOS A and well under capacity. During both the weekday a.m. and p.m. peak hours, the northbound left-turn is 3 seconds or less over the delay threshold between LOS C and LOS D. In the event that the area around the intersection urbanizes before build-out, the WSDOT performance standard will shift to LOS E and the intersection would operate within WSDOT standards.

As discussed in the *Turn-Lane Considerations* section above, the intersection currently meets warrants for an eastbound right-turn lane, which would improve operations for northbound left-turning vehicles to a LOS C during the 2029 total traffic conditions. As also discussed above, it is expected that a nexus might ultimately be established between requiring construction of an eastbound right-turn lane and traffic volume increases attributable to master plan trip development, based on LOS and delay at the intersection. Accordingly, we recommend that future site plan applications prepared subsequent to Phase 1 provide an updated assessment as to the potential need for providing a right-turn taper or lane at the intersection, considering both the need for a right-turn taper or lane and delay with the northbound left-turn.

Appendix "L" contains the traffic operations worksheets supporting the potential mitigations at NE 199th Avenue/NE 58th Street (SR 500).

NE 192nd Avenue/NE 13th Street

The intersection of NE 192nd Avenue/NE 13th Street is projected to not meet standards in the 2029 background conditions and the 2029 total traffic conditions during both the weekday a.m. and p.m. peak hours. The intersection operates over-capacity in all four of these scenarios and at a LOS F during the weekday p.m. peak hour in the background conditions and weekday a.m. and p.m. peak hours in the total traffic scenarios.

Potential Future City of Vancouver Improvements

The City of Vancouver has identified NE 192nd Avenue as ultimately requiring five travel lanes (two southbound through lanes, a center left-turn lane, and two northbound through lanes) and includes the widening on the City's Traffic Impact Fee (TIF) program project list. Because no near-term funding has been programmed for the future five-lane section, the existing section was assumed to be in place in 2029 for the purposes of this traffic study. Widening by the City of Vancouver or others in the interim would add capacity and change the intersection operations.

In the event that NE 192nd Avenue is widened to five lanes through the NE 13th Street intersection, the intersection is projected to meet City of Vancouver intersection operating standards under 2029 background conditions. To mitigate total traffic conditions, a westbound right-turn lane would also be required. In the event that 192nd Avenue is not widened, a northbound right-turn lane and westbound right-turn lane would be sufficient to mitigate 2029 total traffic conditions (mitigation assumes maintaining operations equivalent to or better than those experienced under 2029 background conditions with site build-out but does not fully accommodate forecast queuing).

Potential Master Plan Development Mitigation Options

As noted above, the provision of a northbound right-turn lane and westbound right-turn lane would offer more than sufficient capacity to mitigate the impact of the master plan site build-out while also providing additional capacity to allow for future growth and development. Therefore, we recommend the Green Mountain Master Plan provide a proportionate share contribution towards the construction of a northbound right-turn lane and a westbound right-turn lane on NE 13th Avenue. The City of Vancouver has successfully administered pro-rata share contribution collection systems at other intersections, allowing each development impacting a failing intersection to contribute a "fair-share" of the mitigation cost.

Appendix "M" identifies a proposed proportionate cost sharing methodology. Under this methodology, each trip would be assessed a fee of $391. Therefore the Green Mountain development contribution at full build-out would be approximately $123,600. *Details of the cost estimate, capacity generated by the improvements, and impact of the proposed development supporting the proportionate share calculations are provided in Appendix "M."*

It should be noted that the NE 192nd Avenue/NE 13th Street intersection is listed on the City of Vancouver's TIF program project list. In the case of the Green Mountain Master plan, any TIF credits issued by the City of Vancouver would only be redeemable for development impacts in Vancouver (not Camas).

NE Ingle Road/NE Goodwin Road

The intersection of NE Ingle Road/NE Goodwin Road is projected to not meet City of Camas intersection operating standards in the 2029 background conditions during the weekday p.m. peak hour and the 2029 total traffic conditions during both the weekday a.m. and p.m. peak hours. In order to mitigate 2029 background conditions, a two-way left-turn lane could potentially be provided east of the intersection to facilitate southbound left-turns, which are the critical movement at the intersection.

The City's long-term plans anticipate significant reconstruction of the intersection and the approaching roadways as recorded in the 2012 *City of Camas Traffic Impact Fee Update* (Reference 2). Identified improvement needs include:

- Installation of a traffic signal at NE Ingle Road/NE Goodwin Road;
- The extension of a new collector roadway from NE Ingle Road south to NE 232nd Avenue;
- Widening of NE Goodwin Road from two to three lanes between NE Ingle Road and NE 232nd Avenue; and
- Widening of NE Goodwin Road from two to five lanes NE between Friberg Street and NE Ingle Road.

Considering the Green Mountain Master Plan project location and traffic impacts at the intersection, we recommend the following series of mitigations in conjunction with the proposed development:

- Construct an eastbound left-turn lane on NE Goodwin Road at NE Ingle Road with the first Phase 1 trip.
- Construct a westbound right-turn lane on NE Goodwin Road at NE Ingle Road with the 203rd Phase 1 trip (prior to occupancy of 203rd single family home on site). The right-turn lane should provide at least 100 feet of storage. (Note, in the long-term future, the City could consider restriping the right-turn lane to a shared through/right lane when widening of NE Goodwin Road west of NE Ingle Road develops two westbound receiving lanes).
- Construct a three-lane roadway section (with center two-way left-turn lane) on NE Goodwin Road along the site frontage in conjunction with standard frontage improvements as adjacent development occurs.
- Upon completion of Phase 1 site development (including construction of the eastbound left-turn lane and westbound right-turn lane on NE Goodwin Road at NE Ingle Road with Phase 1), the developer shall monitor the need for installation of a traffic signal with each future site plan application at the intersection and construct a traffic signal when the intersection no longer satisfies City of Camas performance standard (LOS "D" and v/c of 0.90 or better) *and* the intersection volumes meet traffic signal warrants (subject to direction from the City of Camas).

- The monitoring effort is recommended to require preparation of then-current traffic counts, assessment of traffic signal warrants based on build-out of the then-current site plan application (and all other approved development), and a summary report prepared by a licensed professional engineer. The study should consider potential turn movement re-routing that is expected to occur at the NE Goodwin Road/NE Ingle Road intersection as new connections to the master plan site are made to NE Goodwin Road east of NE Ingle Road.

On-site Circulation and Operations

We recommend that a detailed review of on-site circulation and operations be prepared in conjunction with each future site plan application. This review will provide an opportunity to consider site-specific details when they become available and should include consideration of vehicular, pedestrian, and delivery vehicle paths.

On-site landscaping, signage and any above-ground utilities should be provided appropriately to ensure that adequate sight distance is provided and maintained and should be considered as part of future site plan applications.

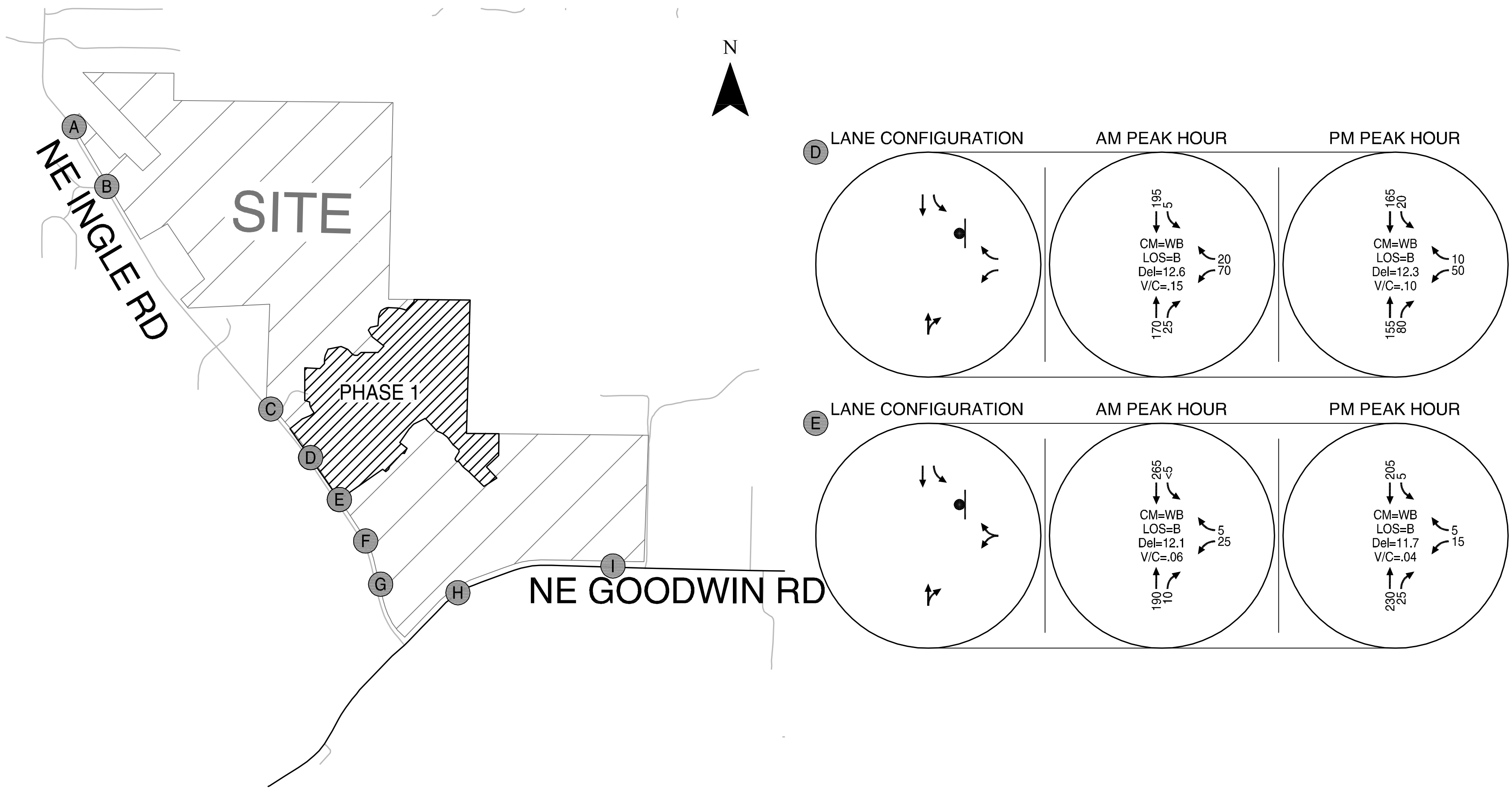
Access Requirements

The City of Camas requires a minimum intersection spacing of 330 feet on three lane collector streets. This spacing should be maintained with the proposed development.

Phase 1 Access Operations

The portion of the site that will be developed with Phase 1 is noted in Figure 2. As seen, two access points are proposed for the Phase 1 development. The proposed lane configuration at these accesses and operations is shown in Figure 20. The developer has proposed to maintain access to the existing golf course in conjunction with the Phase 1 development. The existing gravel maintenance only access will be improved to provide an interim main access to the remaining portion of the golf course (reduced to eight holes). The proposed interim golf course access is located approximately 400 feet south of the proposed southern access, which meets the City’s intersection spacing requirements for a collector street noted above.

Appendix “N” contains the traffic operations worksheets for the Phase 1 access operations.



- STOP SIGN

CM	=	CRITICAL MOVEMENT (TWSC)
LOS	=	INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del	=	INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C	=	CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC	=	TWO-WAY STOP CONTROL

2018 Site Access Lane Configurations and Operations (Phase 1) Camas, Washington

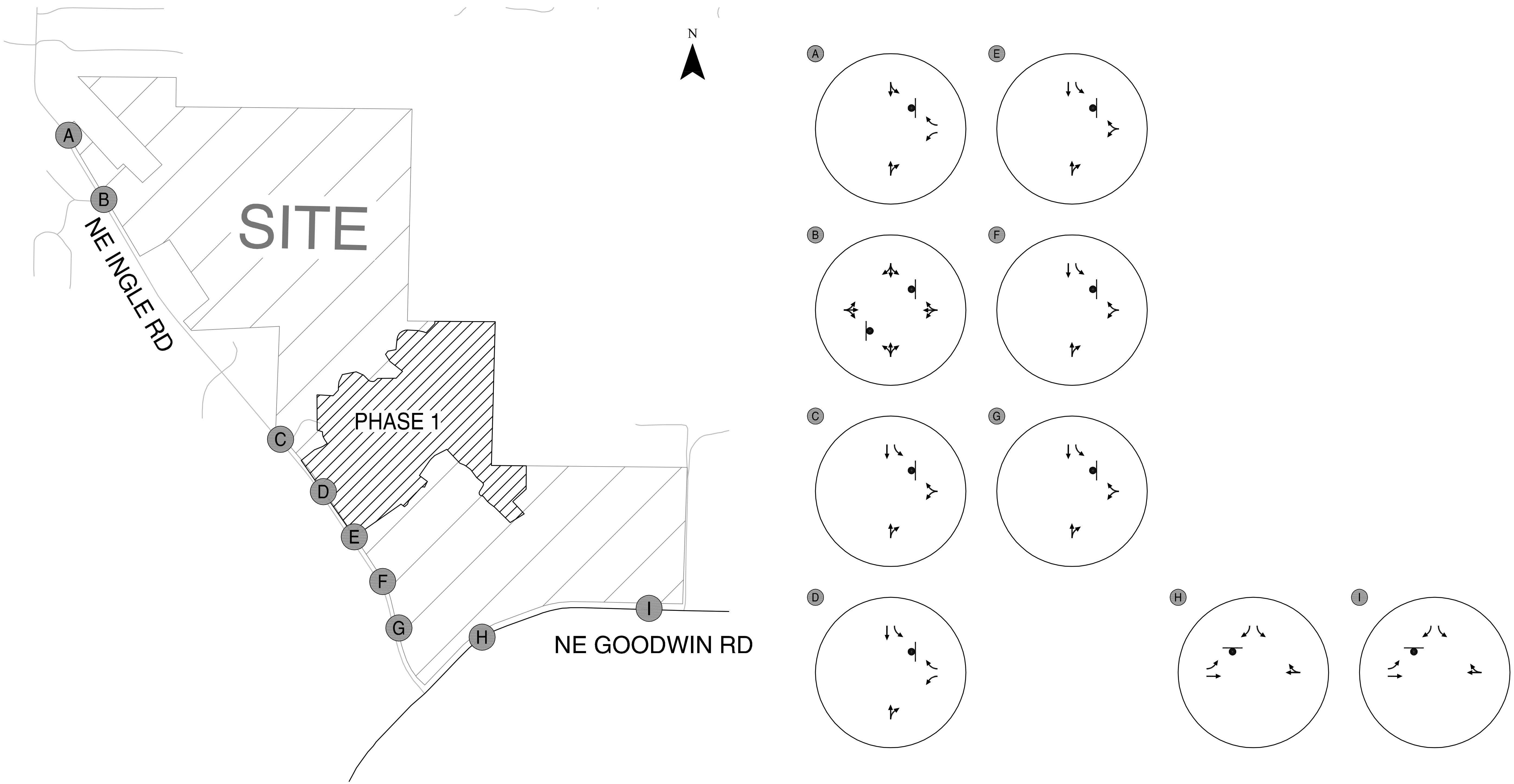
Figure 20

H:\projfile\13865 - Green Mountain Master Plan\dwgs\figs\13865_traffic study -Nov update.dwg Nov 20, 2014 - 2:34pm - klaustsen Layout Tab: 20_ph1SA

Build-out Access Operations

An additional five access points on NE Ingle Road and two access points on NE Goodwin Road are anticipated with full build-out of the development. The exact location of the access points may change as the plans for the development are refined. We assessed operations at these access points assuming the lane configuration shown in Figure 21. As seen in the figure, we expect NE Ingle Road will be developed with a center two-way left-turn lane (TWLTL) through access “C” and NE Goodwin Road will be developed with a TWLTL along the site frontage. Operations at the site accesses for the weekday a.m. and p.m. peak hours are shown in Figures 22 and 23. As seen in the figures, all access points operate at a LOS “C” or better, with the exception of the eastern access on NE Goodwin Road. The southbound left-turn movement at this intersection operates at a LOS D during the weekday p.m. peak hour.

We recommend further evaluation of potential right-turn deceleration lane needs be considered at the time of site plan application. This evaluation should consider the potential need for southbound left-turn lanes or northbound right-turn lanes along NE Ingle Road at the remaining access points as well as corresponding turn lane queue storage requirements. *Appendix “O” contains the traffic operations worksheets for the full build-out access operations.*



Site Access Lane Configurations and Traffic Control Devices (Buildout)
Camas, Washington

Figure 21

CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

2029 Site Access Operations (Build Out)
Weekday AM Peak Hour
Camas, Washington

Figure 22

H:\projfile\13865 - Green Mountain Master Plan\dwgs\figs\13865_traffic study -Nov update.dwg Nov 20, 2014 - 2:37pm - klaustsen Layout Tab: 22_SatBOamSA

CM	=	CRITICAL MOVEMENT (TWSC)
LOS	=	INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del	=	INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C	=	CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC	=	TWO-WAY STOP CONTROL

2029 Site Access Operations (Build Out)
Weekday PM Peak Hour
Camas, Washington

Figure 23

TRANSPORTATION COMPLIANCE LETTER

This master plan traffic study documents the transportation implications of the proposed development at build-out. There are on-site access, circulation, turn lane, and driveway location and design considerations that will need to be addressed when specific site plan applications are made. Further, the phasing and timing of master plan build-out is likely to evolve over time to adapt to market conditions. Accordingly, it is recommended that a transportation compliance letter be prepared for each preliminary plat or site plan application to address on-site transportation, access and pedestrian standards and to ensure that the mitigation measures provided for in this report are applied at the appropriate phase of development. The transportation compliance letter should also document the trip generation of each phase of development to ensure that the total number of trips generated from future development does not exceed the number of trips vested under the Development Agreement.

We recommend each transportation compliance letter could document:

- The number of site-generated trips (daily, weekday a.m. peak hour, weekday p.m. peak hour) estimated to be used by the then-current proposed site development application.
- The number of site-generated trips (daily, weekday a.m. peak hour, weekday p.m. peak hour) previously used by approved site development applications on the master plan site.
- An accounting of the number of site-generated trips (daily, weekday a.m. peak hour, weekday p.m. peak hour) remaining assuming approval of the then-current site plan application.
    - Note: In the event that a future site plan application is projected to use more trips than were previously assumed through the master plan, additional traffic capacity/concurrency analysis would be triggered (unless a traffic count cordon-study of the master plan campus demonstrates the number of trips generated by the site is less than projected by standard ITE trip rates and thus the overall development impact actually is less than or equal to the number of trips assumed by the master plan).
- Evaluation of outstanding mitigation needs (as appropriate consistent with the Master Plan recommendations) at the intersections of:
    - Need for an eastbound right-turn lane at NE 199th Avenue/NE 58th Street (SR 500)
    - NE Ingle Road/NE Goodwin Road (including traffic signal warrant analysis)

FINDINGS AND RECOMMENDATIONS

Based on the results of the transportation impact analysis, Phase 1 of the Green Mountain Master Plan (estimated to generate 2,050 daily trips and 215 net new p.m. peak hour trips) can be developed while maintaining acceptable levels of service and safety at the study intersections without any required off-site mitigations. The primary findings and recommendations of this study are summarized below.

Existing Conditions

- All of the study intersections currently operate acceptably during the weekday a.m. and p.m. peak hours.

Proposed Development Activities

- Phase 1 site development includes 215 residential units. It is estimated to generate 160 net new a.m. peak hour trips (40 in and 120 out) and 215 net new p.m. peak hour trips (135 in and 80 out).
- Build-out of the site development includes 1,300 residential units and 90,000 square feet of retail use. Build-out (including Phase 1) is collectively estimated to generate a total of 995 net new a.m. peak hour trips (290 in and 705 out) and 1,655 net new p.m. peak hour trips (965 in and 690 out).
- Access to Phase 1 of the site will be provided via two full movement driveways on NW Ingle Road. In the future when the site is built out, access will be provided on both NW Ingle Road and NW Goodwin Road.

Year 2018 Background Traffic Conditions

- Year 2018 background conditions (without construction of the Green Mountain mixed-use development) were estimated assuming completion of approved in-process developments within the study area and an annual 2% growth rate on City of Vancouver roadways.
- Operational analyses indicate that the study intersections are forecast to continue to operate acceptably.

Year 2018 Total Traffic Conditions

- Year 2018 total traffic conditions were estimated assuming completion of approved in-process developments within the study area plus Phase 1 of the proposed development.
- Operational analyses indicate that the study intersections are forecast to continue to operate acceptably under 2018 total traffic conditions with one exception:
  - The southbound movement at the intersection of NE Ingle Road/NE Goodwin Road is projected to operate at a LOS E during the weekday p.m. peak hour. This failure is triggered by the 203rd single family residential unit in Phase 1 of the development.

Year 2029 Background Traffic Conditions

- Year 2029 background conditions (with construction of only Phase 1 of proposed development but no further phases) were estimated assuming the same in-process developments included in the 2018 analysis as well as a one percent growth rate on City of Camas roadways and two percent growth rate on City of Vancouver roadways.
- Operational analyses indicate that the study intersections are forecast to continue to operate acceptably under year 2029 background traffic conditions with two exceptions:
  - The intersection of NE 192nd Avenue/NE 13th Street is projected to operate at a LOS E and over-capacity during the weekday a.m. peak hour and LOS F and over-capacity during the weekday p.m. peak hour,
  - The southbound approach to the intersection of NE Ingle Road/NE Goodwin Road is projected to operate at a LOS F during the weekday p.m. peak hour.

Year 2029 Total Traffic Conditions

- Year 2029 total traffic conditions were estimated assuming year 2029 background traffic and complete build-out of the proposed Green Mountain development.
- Operational analyses indicate that the study intersections are forecast to continue to operate acceptably under year 2029 total traffic conditions, with the exception of:
  - NE 199th Avenue/NE 58th Street (SR 500) (weekday a.m. and p.m.)
  - NE 192nd Avenue/NE 13th Street (weekday a.m. and p.m.)
  - NE Ingle Road/NE Goodwin Road (weekday a.m. and p.m.)

Turn-Lane Considerations

- An assessment of turn-lane need was conducted for each study intersection.
- The intersection of NE 199th Avenue/NE 58th Street (SR 500) meets WSDOT's guidelines for a right-turn lane on the eastbound approach under existing conditions and all future scenarios during both the weekday a.m. and p.m. peak hour.
  - The crash history indicates that no crashes were recorded between 2008-2013 involving vehicles making an eastbound right-turn.
  - Given the lack of crash history related to eastbound right-turns and the relatively small impact of Phase 1 (eight eastbound right-turn trips during the weekday a.m. peak hour, 27 eastbound right-turn trips during the weekday p.m. peak hour), no improvements are recommended in conjunction with Phase 1.
  - In the future, the provision of a right-turn taper or lane could be considered if suggested by the crash history at the intersection.
- The intersection of NE 242nd Avenue (SR 500)/NE 28th Street meets WSDOT's guidelines for a left-turn lane on the eastbound approach under existing conditions and all future scenarios during the weekday p.m. peak hour.
  - The crash history indicates that no crashes were recorded between 2008-2013 involving vehicles making an eastbound left-turn.
  - The City's long-term plans include a traffic signal and southbound left-turn lane at NE 242nd Avenue (SR 500)/NE 28th Street.
  - Given the lack of recorded crash history, the small impact of the proposed development (no Phase 1 eastbound left-turns and less than 10 at master plan build-out), and future improvement plans at this intersection, no turn-lane improvements are recommended with Phase 1 site development.

Recommendations

- Regardless of the proposed master plan application, we recommend that the City of Camas consider potential improvements to the intersection of NE Ingle Road/NE Goodwin Road to address intersection sight distance limitations associated with the location of the stop bar, such as relocating the stop bar.
- The following improvements should be provided in conjunction with site development:
  - Phase 1 Site Development

- An eastbound left-turn lane with 100 feet of storage should be provided at NE Ingle Road/NE Goodwin Road.
- A westbound right-turn lane on NE Goodwin Road at NE Ingle Road prior to occupancy of the 203rd single family home in Phase 1. The right-turn lane should provide at least 100 feet of storage.
- On-site and off-site landscaping and any above ground utilities at the site-access driveways and internal roadways should be provided appropriately to ensure that adequate sight-distance is maintained.

- For Phase 1 and all future phases, a Transportation Compliance Letter as described above should be prepared by a licensed professional engineer and submitted with the then-current site plan application.
- Full Build-Out of Site Development (items to be assessed in Transportation Compliance Letter unless otherwise mitigated):
  - Future site plan applications should provide an updated assessment as to the potential need for providing an eastbound right-turn taper or lane at the 199th Avenue (SR 500)/NE 58th Street intersection unless otherwise deemed mitigated by the project or others.
  - Pay a proportionate “fair-share” financial contribution towards capacity mitigations at the intersection of NE 192nd Avenue/NE 13th Street. This contribution would partially fund the eventual construction of a northbound right-turn lane on NE 192nd Avenue and a westbound right-turn lane on NE 13th Avenue.

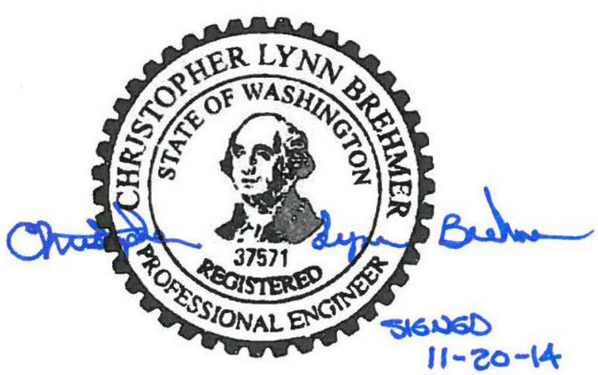
- Mitigations will be needed to improve NE Ingle Road/NE Goodwin Road in 2029. We recommend the following:
  - The applicant construct a three-lane section (with center two-way left-turn lane) on NE Goodwin Road along the site frontage.
  - The applicant assess traffic volumes and signal warrants at NE Ingle Road/NE Goodwin Road with each phase of development and construct a traffic signal and related appurtenances when the intersection no longer satisfies City of Camas performance standard (LOS “D” and v/c of 0.90 or better) and intersection volumes meet traffic signal warrants.

- On-site and off-site landscaping and any above ground utilities at the site-access driveways and internal roadways should be provided appropriately to ensure that adequate sight-distance is maintained.

We trust this letter adequately addresses the traffic impacts associated with the proposed Green Mountain Master Plan development. Please contact us if you have any questions or comments regarding the contents of this report or the analysis performed.

REFERENCES

1. Transportation Research Board 2000. Highway Capacity Manual. 2000.
2. DKS Associates. *City of Camas Traffic Impact Fee Update*. May 2012.
3. Washington State Department of Transportation. *Design Manual*. July 2013.
4. C-Tran. http://www.c-tran.com. May 2014.
5. Oregon Department of Transportation Research Section. *SPR 667 Assessment of Statewide Intersection Safety Performance*. June 2011.
6. American Association of State Highway and Transportation Officials. *Highway Safety Manual*. 2010.
7. Institute of Transportation Engineers. *Trip Generation Manual, 9th Edition*. 2012.
8. City of Vancouver. *Traffic Study Guidelines.* December 2013.



Appendix A Level of Service (LOS)

APPENDIX A LEVEL-OF-SERVICE CONCEPT

Level of service (LOS) is a concept developed to quantify the degree of comfort (including such elements as travel time, number of stops, total amount of stopped delay, and impediments caused by other vehicles) afforded to drivers as they travel through an intersection or roadway segment. Six grades are used to denote the various level of service from “A” to “F”.[1]

SIGNALIZED INTERSECTIONS

The six level-of-service grades are described qualitatively for signalized intersections in Table A1. Additionally, Table A2 identifies the relationship between level of service and average control delay per vehicle. Control delay is defined to include initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Using this definition, Level of Service “D” is generally considered to represent the minimum acceptable design standard.

Table A1 Level-of-Service Definitions (Signalized Intersections)

Level of Service	Average Delay per Vehicle
A	Very low average control delay, less than 10 seconds per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
B	Average control delay is greater than 10 seconds per vehicle and less than or equal to 20 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for a level of service A, causing higher levels of average delay.
C	Average control delay is greater than 20 seconds per vehicle and less than or equal to 35 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
D	Average control delay is greater than 35 seconds per vehicle and less than or equal to 55 seconds per vehicle. The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle length, or high volume/capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	Average control delay is greater than 55 seconds per vehicle and less than or equal to 80 seconds per vehicle. This is usually considered to be the limit of acceptable delay. These high delay values generally (but not always) indicate poor progression, long cycle lengths, and high volume/capacity ratios. Individual cycle failures are frequent occurrences.
F	Average control delay is in excess of 80 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation. It may also occur at high volume/capacity ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also contribute to such high delay values.

[1] Most of the material in this appendix is adapted from the Transportation Research Board, *2000 Highway Capacity Manual*, (2000).

Table A2 Level-of-Service Criteria for Signalized Intersections

Level of Service	Average Control Delay per Vehicle (Seconds)
A	<10.0
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

UNSIGNALIZED INTERSECTIONS

Unsignalized intersections include two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections. The *2000 Highway Capacity Manual* (HCM) provides models for estimating control delay at both TWSC and AWSC intersections. A qualitative description of the various service levels associated with an unsignalized intersection is presented in Table A3. A quantitative definition of level of service for unsignalized intersections is presented in Table A4. Using this definition, Level of Service "E" is generally considered to represent the minimum acceptable design standard.

Table A3 Level-of-Service Criteria for Unsignalized Intersections

Level of Service	Average Delay per Vehicle to Minor Street
A	• Nearly all drivers find freedom of operation. • Very seldom is there more than one vehicle in queue.
B	• Some drivers begin to consider the delay an inconvenience. • Occasionally there is more than one vehicle in queue.
C	• Many times there is more than one vehicle in queue. • Most drivers feel restricted, but not objectionably so.
D	• Often there is more than one vehicle in queue. • Drivers feel quite restricted.
E	• Represents a condition in which the demand is near or equal to the probable maximum number of vehicles that can be accommodated by the movement. • There is almost always more than one vehicle in queue. • Drivers find the delays approaching intolerable levels.
F	• Forced flow. • Represents an intersection failure condition that is caused by geometric and/or operational constraints external to the intersection.

Table A4 Level-of-Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay per Vehicle (Seconds)
A	<10.0
B	>10.0 and ≤ 15.0
C	>15.0 and ≤ 25.0
D	>25.0 and ≤ 35.0
E	>35.0 and ≤ 50.0
F	>50.0

It should be noted that the level-of-service criteria for unsignalized intersections are somewhat different than the criteria used for signalized intersections. The primary reason for this difference is that drivers expect different levels of performance from different kinds of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes than an unsignalized intersection. Additionally, there are a number of driver behavior considerations that combine to make delays at signalized intersections less galling than at unsignalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, while drivers on the minor street approaches to TWSC intersections must remain attentive to the task of identifying acceptable gaps and vehicle conflicts. Also, there is often much more variability in the amount of delay experienced by individual drivers at unsignalized intersections than signalized intersections. For these reasons, it is considered that the control delay threshold for any given level of service is less for an unsignalized intersection than for a signalized intersection. While overall intersection level of service is calculated for AWSC intersections, level of service is only calculated for the minor approaches and the major street left turn movements at TWSC intersections. No delay is assumed to the major street through movements. For TWSC intersections, the overall intersection level of service remains undefined: level of service is only calculated for each minor street lane.

In the performance evaluation of TWSC intersections, it is important to consider other measures of effectiveness (MOEs) in addition to delay, such as v/c ratios for individual movements, average queue lengths, and 95th-percentile queue lengths. By focusing on a single MOE for the worst movement only, such as delay for the minor-street left turn, users may make inappropriate traffic control decisions. The potential for making such inappropriate decisions is likely to be particularly pronounced when the HCM level-of-service thresholds are adopted as legal standards, as is the case in many public agencies.

Appendix B Crash Data

REPORTED COLLISIONS THAT OCCURRED AT THE FOLLOWING INTERSECTIONS IN VANCOUVER, CAMAS OR CLARK COUNTY.....1/1/08 - 11/30/13

UNDER 23 UNITED STATES CODE - SECTION 409, THIS DATA CANNOT BE USED IN DISCOVERY OR AS EVIDENCE AT TRIAL IN ANY ACTION FOR DAMAGES AGAINST THE WSDOT, OR ANY JURISDICTION INVOLVED IN THE DATA

NE 192ND AVE AT NE 13TH ST

Intersection	PRIMARY TRAFFICWAY	BLOCK NUMBER	MILE POST	INTERSECTING TRAFFICWAY	CO ONLY INTERSECTING COUNTY ROAD MILEPOST	DIST FROM REF POINT	MI or FT	COMP DIR FROM REF POINT	REFERENCE POINT NAME	*REPORT NUMBER	DATE	TIME	MOST SEVERE INJURY TYPE	# INJ	#FAT	#VEH	#PEDS	JUNCTION RELATIONSHIP	WEATHER	ROADWAY SURFACE CONDITIONS	LIGHTING CONDITIONS	FIRST COLLISION TYPE / OBJECT STRUCK	VEHICLE 1 TYPE	VEH 1 ACTION	MV DRIVER CONT CIRC 1 (UNIT 1)	MV DRIVER CONT CIRC 2 (UNIT 1)	VEH 1 COMP DIR FROM	VEH 1 COMP DIR TO	VEHICLE 2 TYPE	VEH 2 ACTION	VEH 2 COMP DIR FROM	VEH 2 COMP DIR TO	PEDESTRIAN ACTION (UNIT 2)	PEDESTRIAN CONT CIRC 1 (UNIT 2)	IMPACT LOCATION (City, County & Misc Trafficways 2010 forward)
1	NE 192ND AVE	19200		13TH ST NE						3327133	10/15/10	7:56 AM	Serious Injury	1	0	2		At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	From opposite direction - one left turn - one straight	Truck (Flatbad,Van,etc)	Making Left Turn	Did Not Grant RW to Vehicle		North	East	Passenger Car	Going Straight Ahead	South	North			Lane of Primary Trafficway
1	NE 192 AV			NE 13 ST						3241854	12/09/09	7:33 AM	No Injury	0	0	2		At Intersection and Related	Clear or Partly Cloudy	Dry	Dawn	From opposite direction - one left turn - one straight	Passenger Car	Making Left Turn	Did Not Grant RW to Vehicle		North	East	School Bus	Going Straight Ahead	South	North			
1	NE 192ND AVE	1000		NE 13TH ST						3318835	04/11/12	9:36 AM	Possible Injury	1	0	2		At Intersection and Related	Raining	Wet	Daylight	From opposite direction - one left turn - one straight	Passenger Car	Making Left Turn	Did Not Grant RW to Vehicle		North	East	Passenger Car	Going Straight Ahead	South	North			Lane of Primary Trafficway
1	NE 192ND AVE	1000		NE 13TH ST						3432403	05/22/11	12:29 PM	No Injury	0	0	2		At Intersection and Related	Overcast	Dry	Daylight	From opposite direction - one left turn - one straight	Pickup,Panel Truck or Vanette under 10,000 lb	Making Left Turn	Did Not Grant RW to Vehicle		North	East	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	South	North			Lane of Primary Trafficway
1	NE 13TH ST	19200		NE 192ND AVE						3133182	08/24/10	8:27 PM	No Injury	0	0	2		At Intersection and Related	Clear or Partly Cloudy	Dry	Dark-Street Lights On	From same direction - both going straight - one stopped - rear-end	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	Other		East	West	Passenger Car	Stopped at Signal or Stop Sign	East	Vehicle Stopped			Lane of Primary Trafficway
1	30620		0.00	93350	0.75					2474238	04/19/08	1:00 AM	Evident Injury	1	0	2		Not at Intersection and Not Related	Overcast	Dry	Dark-Street Lights On	Mailbox	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	Under Influence of Alcohol		South	North							
1	30620		0.00	93350	0.75					2576260	01/11/08	7:55 PM	No Injury	0	0	2		At Intersection and Related	Overcast	Dry	Dark-Street Lights On	From opposite direction - one left turn - one straight	Passenger Car	Making Left Turn	Did Not Grant RW to Vehicle		North	East	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	South	North			
1	30620		0.00	93350	0.75					2737144	05/31/08	8:06 PM	Evident Injury	1	0	2		At Intersection and Related	Raining	Wet	Daylight	From opposite direction - one left turn - one straight	Pickup,Panel Truck or Vanette under 10,000 lb	Making Left Turn	Did Not Grant RW to Vehicle		North	East	Passenger Car	Going Straight Ahead	South	North			

NW FRIBERG ST AT NW LAKE RD

	PRIMARY TRAFFICWAY	BLOCK NUMBER	MILE POST	INTERSECTING TRAFFICWAY	CO ONLY INTERSECTING COUNTY ROAD MILEPOST	DIST FROM REF POINT	MI or FT	COMP DIR FROM REF POINT	REFERENCE POINT NAME	*REPORT NUMBER	DATE	TIME	MOST SEVERE INJURY TYPE	# INJ	#FAT	#VEH	#PEDS	JUNCTION RELATIONSHIP	WEATHER	ROADWAY SURFACE CONDITIONS	LIGHTING CONDITIONS	FIRST COLLISION TYPE / OBJECT STRUCK	VEHICLE 1 TYPE	VEH 1 ACTION	MV DRIVER CONT CIRC 1 (UNIT 1)	MV DRIVER CONT CIRC 2 (UNIT 1)	VEH 1 COMP DIR FROM	VEH 1 COMP DIR TO	VEHICLE 2 TYPE	VEH 2 ACTION	VEH 2 COMP DIR FROM	VEH 2 COMP DIR TO	PEDESTRIAN ACTION (UNIT 2)	PEDESTRIAN CONT CIRC 1 (UNIT 2)	IMPACT LOCATION (City, County & Misc Trafficways 2010 forward)
2	NW LAKE RD	5200				279	F	E	NW FRIBERG	E020091	05/18/09	2:20 PM	No Injury	0	0	1		Intersection Related but Not at Intersection	Clear or Partly Cloudy	Dry	Daylight	Wood Sign Post	Pickup,Panel Truck or Vanette under 10,000 lb	Making Left Turn	Exceeding Reas. Safe Speed		North	East							
2	NW LAKE RD	5400				100	F	E	NW FRIBERG ST	3253047	07/15/09	6:18 PM	No Injury	0	0	1		Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Daylight	Tree or Stump (stationary)	Passenger Car	Going Straight Ahead	Other		East	West							
2	NW FRIBERG STRUNK WY	6201				150	F	N	SE 1 ST	3240453	09/03/09	2:30 PM	No Injury	0	0	2		Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Daylight	From same direction - both going straight - both moving - rear-end	Passenger Car	Going Straight Ahead	Follow Too Closely		North	South	Passenger Car	Slowing	North	South			
2	NW FRIBERG STRUNK ST	6200				170.4	F	N	SE 1ST ST	E158720	03/09/12	2:34 PM	No Injury	0	0	2		Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Daylight	From same direction - both going straight - one stopped - rear-end	Passenger Car	Going Straight Ahead	Inattention	Follow Too Closely	North	South	Pickup,Panel Truck or Vanette under 10,000 lb	Stopped for Traffic	North	Vehicle Stopped			Lane of Primary Trafficway
2	NW LAKE RD			NE FRIBERG STRUCK RD						2474230	03/18/08	11:42 AM	No Injury	0	0	2		At Intersection and Related	Raining	Wet	Daylight	Entering at angle	Passenger Car	Going Straight Ahead	Disregard Stop and Go Light		East	West	Pickup,Panel Truck or Vanette under 10,000 lb	Making Left Turn	North	East			
2	NW FRIBERG STRUNK ST	5900		NW LAKE RD SE 1 AVE						2983884	10/23/09	2:37 PM	No Injury	0	0	3		At Intersection and Related	Overcast	Wet	Daylight	From same direction - both going straight - one stopped - rear-end	Passenger Car	Going Straight Ahead	Follow Too Closely	Driver Interacting with Passengers, Anim	North	South	Passenger Car	Stopped for Traffic	North	Vehicle Stopped			

NE INGLE RD AT NE GOODWIN RD

	PRIMARY TRAFFICWAY	BLOCK NUMBER	MILE POST	INTERSECTING TRAFFICWAY	CO ONLY INTERSECTING COUNTY ROAD MILEPOST	DIST FROM REF POINT	MI or FT	COMP DIR FROM REF POINT	REFERENCE POINT NAME	*REPORT NUMBER	DATE	TIME	MOST SEVERE INJURY TYPE	# INJ	#FAT	#VEH	#PEDS	JUNCTION RELATIONSHIP	WEATHER	ROADWAY SURFACE CONDITIONS	LIGHTING CONDITIONS	FIRST COLLISION TYPE / OBJECT STRUCK	VEHICLE 1 TYPE	VEH 1 ACTION	MV DRIVER CONT CIRC 1 (UNIT 1)	MV DRIVER CONT CIRC 2 (UNIT 1)	VEH 1 COMP DIR FROM	VEH 1 COMP DIR TO	VEHICLE 2 TYPE	VEH 2 ACTION	VEH 2 COMP DIR FROM	VEH 2 COMP DIR TO	PEDESTRIAN ACTION (UNIT 2)	PEDESTRIAN CONT CIRC 1 (UNIT 2)	IMPACT LOCATION (City, County & Misc Trafficways 2010 forward)
3	93350		2.24	30730	1.87					E273386	09/28/13	3:33 PM	No Injury	0	0	1		At Intersection and Related	Raining	Wet	Daylight	Roadway Ditch	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	Other Driver Distractions Inside Vehicle		North	South							Past the Outside Shoulder of Primary Trafficway
3	NE GOODWIN RD	2400				40	F	SW	NE INGLE RD	E267479	08/27/13	5:37 PM	Evident Injury	1	0	3		Intersection Related but Not at Intersection	Clear or Partly Cloudy	Dry	Daylight	From same direction - both going straight - one stopped - rear-end	Passenger Car	Going Straight Ahead	Inattention	Follow Too Closely	South	North	Pickup,Panel Truck or Vanette under 10,000 lb	Stopped for Traffic	Vehicle Stopped	Vehicle Stopped			Lane of Primary Trafficway
3	NE GOODWIN RD	2300		NE INGLE RD						3610088	08/04/13	11:28 PM	No Injury	0	0	2		At Intersection and Related	Clear or Partly Cloudy	Dry	Dark-No Street Lights	Entering at angle	Pickup,Panel Truck or Vanette under 10,000 lb	Making Left Turn	Did Not Grant RW to Vehicle		North	East	Passenger Car	Going Straight Ahead	East	West			Lane of Primary Trafficway
3	NE GOODWIN RD	2300		NE INGLE RD						3673206	05/10/13	7:35 PM	No Injury	0	0	2		At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	Entering at angle	Pickup,Panel Truck or Vanette under 10,000 lb	Making Left Turn	Did Not Grant RW to Vehicle		South	East	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	East	West			Intersecting Trafficway (WITH Intent to Access)
3	NE INGLE RD	2800		NE GOODWIN RD						3252996	01/23/13	6:33 AM	Serious Injury	1	0	1		Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Dark-No Street Lights	Boulder (stationary)	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	Apparently Asleep		North	South							Past the Outside Shoulder of Primary Trafficway
3	NE 28TH ST	21800				272	F	NE	NE GOODWIN RD	3610117	10/14/12	11:02 PM	No Injury	0	0	1		Not at Intersection and Not Related	Raining	Wet	Dark-No Street Lights	Utility Pole	Passenger Car	Going Straight Ahead	Driver Distractions Outside Vehicle		East	West							Past the Outside Shoulder of Primary Trafficway
3	NE GOODWIN RD			NE INGLE RD						E163123	03/20/12	3:25 PM	Possible Injury	1	0	3		At Intersection and Related	Raining	Wet	Daylight	From same direction - both going straight - one stopped - rear-end	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	Exceeding Reas. Safe Speed		South	North	Pickup,Panel Truck or Vanette under 10,000 lb	Stopped for Traffic	South	Vehicle Stopped			Lane of Primary Trafficway
3	NE GOODWIN RD	2500				200	F	E	NE INGLES RD	2984324	10/16/11	6:35 AM	Serious Injury	1	0	1	1	Not at Intersection and Not Related	Overcast	Dry	Dark-No Street Lights	Vehicle going straight hits pedestrian	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	None		West	East					Xing - Non Intersection - No X Walk	Did Not Grant RW to Vehicle	Lane of Primary Trafficway
3	NE GOODWIN RD	2500				346	F	NE	NE INGLE RD	3411805	08/30/11	10:02 PM	No Injury	0	0	2		At Driveway	Clear or Partly Cloudy	Dry	Dark-No Street Lights	From same direction - one left turn - one straight	Pickup,Panel Truck or Vanette under 10,000 lb	Overtaking and Passing	Improper Passing		Northeast	Southwest	Passenger Car	Making Left Turn	Northeast	Southeast			Lane of Primary Trafficway
3	NE GOODWIN RD	2500				325	F	NE	NE INGLE RD	E108251	05/16/11	9:10 PM	No Injury	0	0	1		Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Dark-No Street Lights	Mailbox	Passenger Car	Going Straight Ahead	Exceeding Reas. Safe Speed	Over Center Line	Northeast	Southwest							Past the Outside Shoulder of Primary Trafficway
3	NE GOODWIN RD	2300		NE INGLE RD						3253123	01/19/10	2:40 PM	No Injury	0	0	2		At Intersection and Related	Raining	Wet	Daylight	Entering at angle	Pickup,Panel Truck or Vanette under 10,000 lb	Making Right Turn	Exceeding Reas. Safe Speed		East	North	Passenger Car	Stopped at Signal or Stop Sign	North	Vehicle Stopped			Intersecting Trafficway (WITH Intent to Access)
3	NE GOODWIN RD			NE INGLE RD						3252953	12/26/09	11:49 PM	No Injury	0	0	1		At Intersection and Related	Clear or Partly Cloudy	Dry	Dark-No Street Lights	Roadway Ditch	Passenger Car	Making Left Turn	Exceeding Stated Speed Limit		West	North							
3	NE INGLE RD	2800		NE GOODWIN RD						3308194	11/07/09	12:06 PM	No Injury	0	0	2		At Intersection and Related	Raining	Wet	Daylight	Entering at angle	Passenger Car	Making Right Turn	Exceeding Reas. Safe Speed		East	North	Pickup,Panel Truck or Vanette under 10,000 lb	Stopped at Signal or Stop Sign	North	Vehicle Stopped			
3	NE INGLE RD					50	F	NW	NE GOODWIN RD	E023009	07/06/09	8:37 AM	Possible Injury	1	0	2		Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Daylight	From same direction - both going straight - both moving - rear-end	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	Other		Southeast	Northwest	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	Southeast	Northwest			
3	NE GOODWIN RD			NE INGLES RD						E021022	06/10/09	4:58 PM	No Injury	0	0	2		At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	Entering at angle	Passenger Car	Making Right Turn	Did Not Grant RW to Vehicle	Driver Distractions Outside Vehicle	North	West	Passenger Car	Going Straight Ahead	East	West			
3	NE GOODWIN RD			NE INGLE RD						2984047	11/20/08	12:17 PM	No Injury	0	0	1		At Intersection and Related	Raining	Wet	Daylight	Wood Sign Post	Passenger Car	Going Straight Ahead	Inattention	Operating Defective Equipment	West	East							

NE 199TH AVE AT NE 58TH ST / SR 500

	PRIMARY TRAFFICWAY	BLOCK NUMBER	MILE POST	INTERSECTING TRAFFICWAY	CO ONLY INTERSECTING COUNTY ROAD MILEPOST	DIST FROM REF POINT	MI or FT	COMP DIR FROM REF POINT	REFERENCE POINT NAME	*REPORT NUMBER	DATE	TIME	MOST SEVERE INJURY TYPE	# INJ	#FAT	#VEH	#PEDS	JUNCTION RELATIONSHIP	WEATHER	ROADWAY SURFACE CONDITIONS	LIGHTING CONDITIONS	FIRST COLLISION TYPE / OBJECT STRUCK	VEHICLE 1 TYPE	VEH 1 ACTION	MV DRIVER CONT CIRC 1 (UNIT 1)	MV DRIVER CONT CIRC 2 (UNIT 1)	VEH 1 COMP DIR FROM	VEH 1 COMP DIR TO	VEHICLE 2 TYPE	VEH 2 ACTION	VEH 2 COMP DIR FROM	VEH 2 COMP DIR TO	PEDESTRIAN ACTION (UNIT 2)	PEDESTRIAN CONT CIRC 1 (UNIT 2)	IMPACT LOCATION (City, County & Misc Trafficways 2010 forward)
4	500		10.27							E252018	06/12/13	7:45 PM	Possible Injury	2	0	2		At Intersection and Related	Raining	Wet	Daylight	Entering at angle	Pickup,Panel Truck or Vanette under 10,000 lb	Making Right Turn	None		West	South	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	South	North			Intersecting Road Increasing Milepost
4	30730		0.01							E164963	04/18/12	6:00 AM	No Injury	0	0	1		At Intersection and Related	Overcast	Wet	Daylight	Utility Pole	Passenger Car	Making Right Turn	Exceeding Reas. Safe Speed	Improper Turn	West	South							Past the Outside Shoulder of Primary Trafficway
4	500		10.25							E165529	04/16/12	1:55 AM	No Injury	0	0	1		Not at Intersection and Not Related	Raining	Wet	Dark-Street Lights On	Utility Pole	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	Under Influence of Alcohol	Apparently Asleep	West	East							Past Right Shoulder Increasing Milepost
4	500		10.27							E072386	10/09/10	2:47 PM	No Injury	0	0	2		At Intersection and Related	Raining	Wet	Daylight	Entering at angle	Pickup,Panel Truck or Vanette under 10,000 lb	Making Left Turn	Did Not Grant RW to Vehicle		Southeast	Southwest	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	Southwest	Northeast			Lane 1 Increasing Milepost
4	500		10.29							E062307	08/02/10	8:20 AM	No Injury	0	0	1		Not at Intersection and Not Related	Clear or Partly Cloudy	Dry	Daylight	Domestic animal other (cat, dog, etc)	Passenger Car	Going Straight Ahead	None		East	West							Lane 1 Decreasing Milepost
4	500		10.27							E039645	01/07/10	5:42 PM	No Injury	0	0	2		At Intersection and Related	Overcast	Dry	Dark-No Street Lights	Entering at angle	Pickup,Panel Truck or Vanette under 10,000 lb	Making Left Turn	Did Not Grant RW to Vehicle		South	West	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	East	West			Lane 1 Decreasing Milepost
4	500		10.27							E022903	06/28/09	8:41 PM	Evident Injury	4	0	2		At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	Entering at angle	Passenger Car	Making Left Turn	Did Not Grant RW to Vehicle		South	West	Passenger Car	Going Straight Ahead	East	West			Lane 1 Decreasing Milepost

NW FRIBERG ST AT NE GOODWIN RD

	PRIMARY TRAFFICWAY	BLOCK NUMBER	MILE POST	INTERSECTING TRAFFICWAY	CO ONLY INTERSECTING COUNTY ROAD MILEPOST	DIST FROM REF POINT	MI or FT	COMP DIR FROM REF POINT	REFERENCE POINT NAME	*REPORT NUMBER	DATE	TIME	MOST SEVERE INJURY TYPE	# INJ	#FAT	#VEH	#PEDS	JUNCTION RELATIONSHIP	WEATHER	ROADWAY SURFACE CONDITIONS	LIGHTING CONDITIONS	FIRST COLLISION TYPE / OBJECT STRUCK	VEHICLE 1 TYPE	VEH 1 ACTION	MV DRIVER CONT CIRC 1 (UNIT 1)	MV DRIVER CONT CIRC 2 (UNIT 1)	VEH 1 COMP DIR FROM	VEH 1 COMP DIR TO	VEHICLE 2 TYPE	VEH 2 ACTION	VEH 2 COMP DIR FROM	VEH 2 COMP DIR TO	PEDESTRIAN ACTION (UNIT 2)	PEDESTRIAN CONT CIRC 1 (UNIT 2)	IMPACT LOCATION (City, County & Misc Trafficways 2010 forward)
5	93350		1.25	30638	0.00					E236292	04/01/13	12:17 PM	No Injury	0	0	2		At Intersection and Related	Overcast	Dry	Daylight	Entering at angle	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	Inattention	Disregard Stop and Go Light	East	West	Passenger Car	Going Straight Ahead	North	South			Lane of Primary Trafficway
5	93350		1.25	30610	0.00					E214923	12/19/12	6:51 PM	No Injury	0	0	2		At Intersection and Related	Raining	Wet	Dark-Street Lights On	From opposite direction - one left turn - one straight	Passenger Car	Making Left Turn	Under Influence of Drugs	Did Not Grant RW to Vehicle	East	South	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	West	East			Lane of Primary Trafficway
5	93350		1.25	30638	0.00					E138496	11/22/11	7:42 AM	Possible Injury	1	0	2		At Intersection and Related	Raining	Wet	Daylight	From opposite direction - one left turn - one straight	Pickup,Panel Truck or Vanette under 10,000 lb	Making Left Turn	Did Not Grant RW to Vehicle		East	South	Passenger Car	Going Straight Ahead	West	East			Lane of Primary Trafficway
5	93350		1.25	30638	0.00					3411803	08/28/11	4:19 PM	Possible Injury	3	0	2		At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	From opposite direction - one left turn - one straight	Passenger Car	Making Left Turn	Did Not Grant RW to Vehicle		East	South	Passenger Car	Going Straight Ahead	West	East			Lane of Primary Trafficway
5	93350		1.25	30610	0.00					3133178	07/12/10	7:38 PM	No Injury	0	0	2		At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	From same direction - both going straight - one stopped - rear-end	Passenger Car	Going Straight Ahead	Inattention		East	West	Pickup,Panel Truck or Vanette under 10,000 lb	Stopped for Traffic	East	Vehicle Stopped			Lane of Primary Trafficway

NE 232ND AVE AT NE 28TH ST

	PRIMARY TRAFFICWAY	BLOCK NUMBER	MILE POST	INTERSECTING TRAFFICWAY	CO ONLY INTERSECTING COUNTY ROAD MILEPOST	DIST FROM REF POINT	MI or FT	COMP DIR FROM REF POINT	REFERENCE POINT NAME	*REPORT NUMBER	DATE	TIME	MOST SEVERE INJURY TYPE	# INJ	#FAT	#VEH	#PEDS	JUNCTION RELATIONSHIP	WEATHER	ROADWAY SURFACE CONDITIONS	LIGHTING CONDITIONS	FIRST COLLISION TYPE / OBJECT STRUCK	VEHICLE 1 TYPE	VEH 1 ACTION	MV DRIVER CONT CIRC 1 (UNIT 1)	MV DRIVER CONT CIRC 2 (UNIT 1)	VEH 1 COMP DIR FROM	VEH 1 COMP DIR TO	VEHICLE 2 TYPE	VEH 2 ACTION	VEH 2 COMP DIR FROM	VEH 2 COMP DIR TO	PEDESTRIAN ACTION (UNIT 2)	PEDESTRIAN CONT CIRC 1 (UNIT 2)	IMPACT LOCATION (City, County & Misc Trafficways 2010 forward)
6	93350		3.09	30950	2.89					2738387	10/17/10	2:07 AM	Possible Injury	1	0	1		At Intersection and Related	Clear or Partly Cloudy	Dry	Dark-No Street Lights	Wood Sign Post	Passenger Car	Going Straight Ahead	Under Influence of Alcohol	Disregard Stop Sign - Flashing Red	South	North							Past the Outside Shoulder of Primary Trafficway
6	93350		3.09	30950	2.89					3170191	08/18/10	3:34 AM	No Injury	0	0	1		At Intersection and Related	Clear or Partly Cloudy	Dry	Dark-Street Lights Off	Wood Sign Post	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	Disregard Stop Sign - Flashing Red		South	North							Past the Outside Shoulder of Primary Trafficway
6	93350		3.09	30950	2.89					3166051	08/16/08	1:33 PM	No Injury	0	0	3		At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	Entering at angle	Pickup,Panel Truck or Vanette under 10,000 lb	Making Left Turn	Did Not Grant RW to Vehicle		South	West	Passenger Car	Going Straight Ahead	West	East			

NW PARKER ST AT NE 38TH AVE

	PRIMARY TRAFFICWAY	BLOCK NUMBER	MILE POST	INTERSECTING TRAFFICWAY	DIST FROM REF POINT	MI or FT	COMP DIR FROM REF POINT	REFERENCE POINT NAME	REPORT NUMBER	DATE	TIME	MOST SEVERE INJURY TYPE	# INJ	#FAT	#VEH	#PEDS	JUNCTION RELATIONSHIP	WEATHER	ROADWAY SURFACE CONDITIONS	LIGHTING CONDITIONS	FIRST COLLISION TYPE / OBJECT STRUCK	VEHICLE 1 TYPE	VEH 1 ACTION	MV DRIVER CONT CIRC 1 (UNIT 1)	MV DRIVER CONT CIRC 2 (UNIT 1)	VEH 1 COMP DIR FROM	VEH 1 COMP DIR TO	VEHICLE 2 TYPE	VEH 2 ACTION
7	NW PARKER ST	3800		NW 38TH AVE					3411738	02/06/13	2:10 PM	No Injury	0	0	2	0	At Intersection and Related	Raining	Wet	Daylight	From opposite direction - one left turn - one straight	Passenger Car	Making Left Turn	Did Not Grant RW to Vehicle		East	South	Passenger Car	Going Straight Ahead
7	NW PARKER ST			NW 38TH AVE					E160269	03/13/12	7:25 AM	No Injury	0	0	2	0	At Intersection and Related	Overcast	Snow/Slush	Daylight	Entering at angle	Passenger Car	Going Straight Ahead	Disregard Stop and Go Light	Inattention	South	North	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead
7	NW 38 AVE	4000		NW PARKER ST					E116356	07/15/11	9:50 AM	Possible Injury	1	0	2	0	At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	From opposite direction - one left turn - one straight	Pickup,Panel Truck or Vanette under 10,000 lb	Making Left Turn	Did Not Grant RW to Vehicle		North	East	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead
7	NW 38TH AVE			NW PARKER ST					2984301	06/17/11	5:04 PM	Possible Injury	1	0	2	0	At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	From opposite direction - one left turn - one straight	Passenger Car	Making Left Turn	Did Not Grant RW to Vehicle		East	South	Passenger Car	Going Straight Ahead
7	NW 38TH AVE			NW PARKER ST					2984222	01/06/11	5:43 PM	No Injury	0	0	2	0	At Intersection and Related	Overcast	Dry	Dark-Street Lights On	From opposite direction - one left turn - one straight	Pickup,Panel Truck or Vanette under 10,000 lb	Making Left Turn	Did Not Grant RW to Vehicle		East	South	Passenger Car	Going Straight Ahead
7	NW 38TH AVE	3400		NW PARKER ST					2984233	11/12/10	5:10 PM	No Injury	0	0	2	0	At Intersection and Related	Clear or Partly Cloudy	Dry	Dark-Street Lights On	Entering at angle	Passenger Car	Going Straight Ahead	Disregard Stop and Go Light		East	West	Passenger Car	Going Straight Ahead
7	NW 38TH AVE	3400		NW PARKER ST					E042126	02/08/10	4:03 PM	No Injury	0	0	2	0	At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	Entering at angle	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	Disregard Stop and Go Light		South	North	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead
7	NW 38TH AVE	3400		NW PARKER ST					E040987	01/28/10	4:08 PM	Possible Injury	1	0	2	0	At Intersection and Related	Overcast	Dry	Dusk	Entering at angle	Passenger Car	Going Straight Ahead	Disregard Stop and Go Light		South	North	School Bus	Going Straight Ahead
7	NW 38TH AVE	3400		NW PARKER ST					2983886	10/29/09	8:27 PM	No Injury	0	0	2	0	At Intersection and Related	Raining	Wet	Dark-Street Lights On	From opposite direction - one left turn - one straight	Not Stated	Making Left Turn	Did Not Grant RW to Vehicle		East	South	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead

SR 500 AT NE 28TH ST

	PRIMARY TRAFFICWAY	BLOCK NUMBER	MILE POST	INTERSECTING TRAFFICWAY	DIST FROM REF POINT	MI or FT	COMP DIR FROM REF POINT	REFERENCE POINT NAME	REPORT NUMBER	DATE	TIME	MOST SEVERE INJURY TYPE	# INJ	#FAT	#VEH	#PEDS	JUNCTION RELATIONSHIP	WEATHER	ROADWAY SURFACE CONDITIONS	LIGHTING CONDITIONS	FIRST COLLISION TYPE / OBJECT STRUCK	VEHICLE 1 TYPE	VEH 1 ACTION	MV DRIVER CONT CIRC 1 (UNIT 1)	MV DRIVER CONT CIRC 2 (UNIT 1)	VEH 1 COMP DIR FROM	VEH 1 COMP DIR TO	VEHICLE 2 TYPE	VEH 2 ACTION
8	500		13.84						E141628	12/04/11	3:50 AM	No Injury	0	0	1	0	At Intersection and Related	Clear or Partly Cloudy	Dry	Dark-No Street Lights	Building	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	Under Influence of Alcohol	Exceeding Reas. Safe Speed	Southwest	Northeast		
8	500		13.84						3166248	06/27/10	5:12 PM	Possible Injury	1	0	2	0	At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	Entering at angle	Pickup,Panel Truck or Vanette under 10,000 lb	Making Left Turn	Did Not Grant RW to Vehicle		North	East	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead
8	500		13.84						2750167	05/28/09	12:44 PM	Possible Injury	2	0	2	0	At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	Entering at angle	Pickup,Panel Truck or Vanette under 10,000 lb	Making Left Turn	Did Not Grant RW to Vehicle		North	East	Passenger Car	Going Straight Ahead
8	500		13.84						3130839	01/29/09	5:55 PM	No Injury	0	0	1	0	At Intersection and Related	Fog or Smog or Smoke	Dry	Dark-No Street Lights	Roadway Ditch	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	Other		West	East		

NE EVERETT ST AT 43RD AVE

	PRIMARY TRAFFICWAY	BLOCK NUMBER	MILE POST	INTERSECTING TRAFFICWAY	DIST FROM REF POINT	MI or FT	COMP DIR FROM REF POINT	REFERENCE POINT NAME	REPORT NUMBER	DATE	TIME	MOST SEVERE INJURY TYPE	# INJ	#FAT	#VEH	#PEDS	JUNCTION RELATIONSHIP	WEATHER	ROADWAY SURFACE CONDITIONS	LIGHTING CONDITIONS	FIRST COLLISION TYPE / OBJECT STRUCK	VEHICLE 1 TYPE	VEH 1 ACTION	MV DRIVER CONT CIRC 1 (UNIT 1)	MV DRIVER CONT CIRC 2 (UNIT 1)	VEH 1 COMP DIR FROM	VEH 1 COMP DIR TO	VEHICLE 2 TYPE	VEH 2 ACTION
9	500		17.33						3411736	01/28/13	7:25 AM	Possible Injury	2	0	2	0	At Intersection and Related	Raining	Wet	Daylight	From opposite direction - one left turn - one straight	Passenger Car	Making Left Turn	Did Not Grant RW to Vehicle		North	East	Passenger Car	Going Straight Ahead
9	500		17.33						3411731	01/18/13	7:27 AM	Possible Injury	2	0	2	0	At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	From opposite direction - one left turn - one straight	School Bus	Making Left Turn	Did Not Grant RW to Vehicle		North	East	Passenger Car	Going Straight Ahead
9	500		17.33						E135644	10/25/11	2:30 PM	No Injury	0	0	2	0	At Intersection and Not Related	Clear or Partly Cloudy	Dry	Daylight	From same direction - both going straight - one stopped - rear-end	Passenger Car	Going Straight Ahead	Follow Too Closely	Driver Distractions Outside Vehicle	North	South	Pickup,Panel Truck or Vanette under 10,000 lb	Stopped for Traffic
9	500		17.33						2984283	01/21/11	7:54 AM	Evident Injury	1	0	2	0	At Intersection and Related	Raining	Wet	Dawn	From opposite direction - one left turn - one straight	Passenger Car	Making Left Turn	Did Not Grant RW to Vehicle		North	East	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead
9	500		17.33						2984210	09/26/10	7:33 PM	No Injury	0	0	1	0	At Intersection and Not Related	Clear or Partly Cloudy	Wet	Dusk	Vehicle Strikes Deer	Passenger Car	Going Straight Ahead	None		South	North		
9	500		17.33						E031616	11/02/09	7:11 AM	Evident Injury	1	0	2	0	At Intersection and Related	Clear or Partly Cloudy	Dry	Daylight	From opposite direction - one left turn - one straight	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead	None		South	North	Passenger Car	Making Left Turn
9	500		17.33						E018209	04/14/09	6:20 PM	No Injury	0	0	2	0	At Intersection and Related	Raining	Wet	Daylight	From opposite direction - one left turn - one straight	Pickup,Panel Truck or Vanette under 10,000 lb	Making Left Turn	Disregard Yield Sign - Flashing Yellow	Inattention	North	East	Pickup,Panel Truck or Vanette under 10,000 lb	Going Straight Ahead

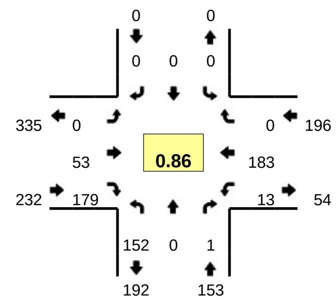
*As of 1/1/2009 citizen reports are no longer being captured (Report # begins with "C")

Prepared by: WSDOT/STCOO/CDAB/MB
1/8/14

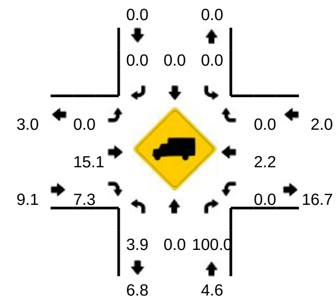
Appendix C Traffic Counts

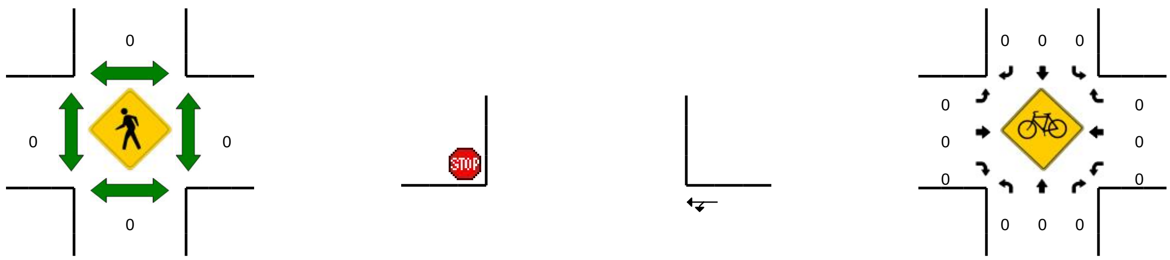
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

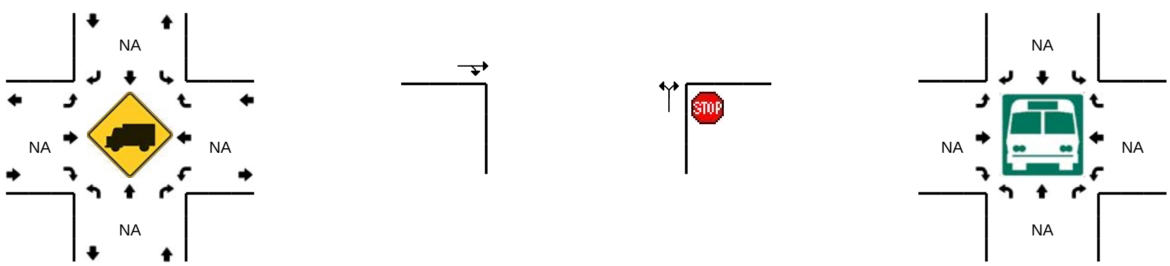
LOCATION: NE 199th Ave -- NE 58th St | **QC JOB #:** 12426915
CITY/STATE: Vancouver, WA | **DATE:** Thu, Feb 20 2014



Peak-Hour: 7:10 AM -- 8:10 AM
Peak 15-Min: 7:25 AM -- 7:40 AM







5-Min Count Period Beginning At	NE 199th Ave (Northbound) Left	Thru	Right	U	NE 199th Ave (Southbound) Left	Thru	Right	U	NE 58th St (Eastbound) Left	Thru	Right	U	NE 58th St (Westbound) Left	Thru	Right	U	Total	Hourly Totals
7:00 AM	7	0	0	0	0	0	0	0	0	2	7	0	0	10	0	0	26	
7:05 AM	10	0	0	0	0	0	0	0	0	3	17	0	1	7	0	0	38	
7:10 AM	12	0	0	0	0	0	0	0	0	7	14	0	1	24	0	0	58	
7:15 AM	8	0	0	0	0	0	0	0	0	4	26	0	1	19	0	0	58	
7:20 AM	14	0	0	0	0	0	0	0	0	3	16	0	2	12	0	0	47	
7:25 AM	8	0	0	0	0	0	0	0	0	4	23	0	2	19	0	0	56	
7:30 AM	12	0	0	0	0	0	0	0	0	4	19	0	1	19	0	0	55	
7:35 AM	15	0	1	0	0	0	0	0	0	8	17	0	2	15	0	0	58	
7:40 AM	9	0	0	0	0	0	0	0	0	2	8	0	0	21	0	0	40	
7:45 AM	27	0	0	0	0	0	0	0	0	2	13	0	0	13	0	0	55	
7:50 AM	14	0	0	0	0	0	0	0	0	2	13	0	1	11	0	0	41	
7:55 AM	12	0	0	0	0	0	0	0	0	5	12	0	1	9	0	0	39	571
8:00 AM	13	0	0	0	0	0	0	0	0	4	7	0	1	8	0	0	33	578
8:05 AM	8	0	0	0	0	0	0	0	0	8	11	0	1	13	0	0	41	581
8:10 AM	10	0	2	0	0	0	0	0	0	2	9	0	1	10	0	0	34	557
8:15 AM	13	0	1	0	0	0	0	0	0	5	10	0	2	8	0	0	39	538
8:20 AM	2	0	1	0	0	0	0	0	0	4	6	0	0	9	0	0	22	513
8:25 AM	11	0	1	0	0	0	0	0	0	1	3	0	0	15	0	0	31	488
8:30 AM	12	0	0	0	0	0	0	0	0	1	6	0	0	9	0	0	28	461
8:35 AM	8	0	0	0	0	0	0	0	0	5	12	0	0	12	0	0	37	440
8:40 AM	10	0	0	0	0	0	0	0	0	2	6	0	1	15	0	0	34	434
8:45 AM	12	0	1	0	0	0	0	0	0	1	6	0	2	12	0	0	34	413
8:50 AM	9	0	0	0	0	0	0	0	0	3	9	0	2	11	0	0	34	406
8:55 AM	6	0	0	0	0	0	0	0	0	7	8	0	0	10	0	0	31	398

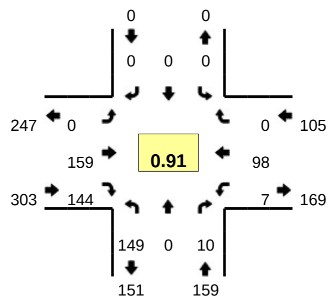
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	140	0	4	0	0	0	0	0	0	64	236	0	20	212	0	0	676
Heavy Trucks	12	0	4		0	0	0		0	12	8		0	4	0		40
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

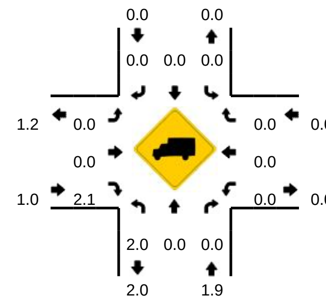
Report generated on 4/8/2014 11:05 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

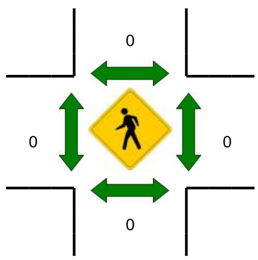
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

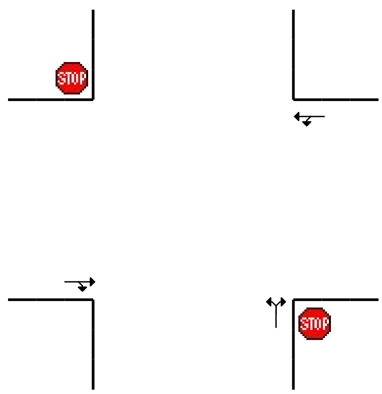
LOCATION: NE 199th Ave -- NE 58th St | **QC JOB #:** 12426916
CITY/STATE: Vancouver, WA | **DATE:** Thu, Feb 20 2014

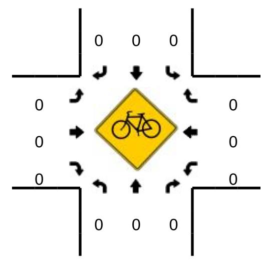


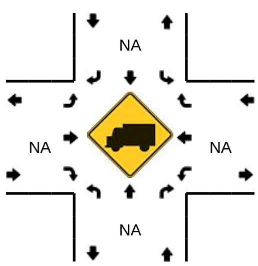
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 5:15 PM -- 5:30 PM

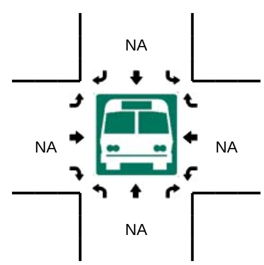












5-Min Count Period Beginning At	NE 199th Ave (Northbound) Left	Thru	Right	U	NE 199th Ave (Southbound) Left	Thru	Right	U	NE 58th St (Eastbound) Left	Thru	Right	U	NE 58th St (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	9	0	1	0	0	0	0	0	0	21	4	0	0	8	0	0	43	
4:05 PM	9	0	1	0	0	0	0	0	0	14	12	0	0	11	0	0	47	
4:10 PM	9	0	4	0	0	0	0	0	0	14	9	0	1	7	0	0	44	
4:15 PM	13	0	0	0	0	0	0	0	0	16	15	0	1	3	0	0	48	
4:20 PM	13	0	0	0	0	0	0	0	0	12	10	0	0	9	0	0	44	
4:25 PM	4	0	0	0	0	0	0	0	0	13	7	0	0	8	0	0	32	
4:30 PM	12	0	0	0	0	0	0	0	0	15	16	0	1	5	0	0	49	
4:35 PM	9	0	2	0	0	0	0	0	0	12	14	0	1	4	0	0	42	
4:40 PM	18	0	0	0	0	0	0	0	0	16	8	0	2	13	0	0	57	
4:45 PM	8	0	1	0	0	0	0	0	0	9	11	0	0	10	0	0	39	
4:50 PM	8	0	2	0	0	0	0	0	0	16	7	0	1	8	0	0	42	
4:55 PM	12	0	2	0	0	0	0	0	0	13	10	0	0	8	0	0	45	532
5:00 PM	14	0	0	0	0	0	0	0	0	13	8	0	0	6	0	0	41	530
5:05 PM	18	0	1	0	0	0	0	0	0	12	11	0	0	11	0	0	53	536
5:10 PM	6	0	0	0	0	0	0	0	0	14	15	0	0	8	0	0	43	535
5:15 PM	11	0	1	0	0	0	0	0	0	12	14	0	0	10	0	0	48	535
5:20 PM	18	0	0	0	0	0	0	0	0	16	15	0	1	7	0	0	57	548
5:25 PM	15	0	1	0	0	0	0	0	0	11	15	0	1	8	0	0	51	567
5:30 PM	4	0	1	0	0	0	0	0	0	10	16	0	0	11	0	0	42	560
5:35 PM	8	0	1	0	0	0	0	0	0	13	12	0	1	7	0	0	42	560
5:40 PM	16	0	2	0	0	0	0	0	0	11	12	0	1	5	0	0	47	550
5:45 PM	9	0	3	0	0	0	0	0	0	6	12	0	0	7	0	0	37	548
5:50 PM	11	0	0	0	0	0	0	0	0	17	13	0	1	9	0	0	51	557
5:55 PM	6	0	1	0	0	0	0	0	0	10	5	0	0	6	0	0	28	540

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	176	0	8	0	0	0	0	0	0	156	176	0	8	100	0	0	624
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	0		0
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

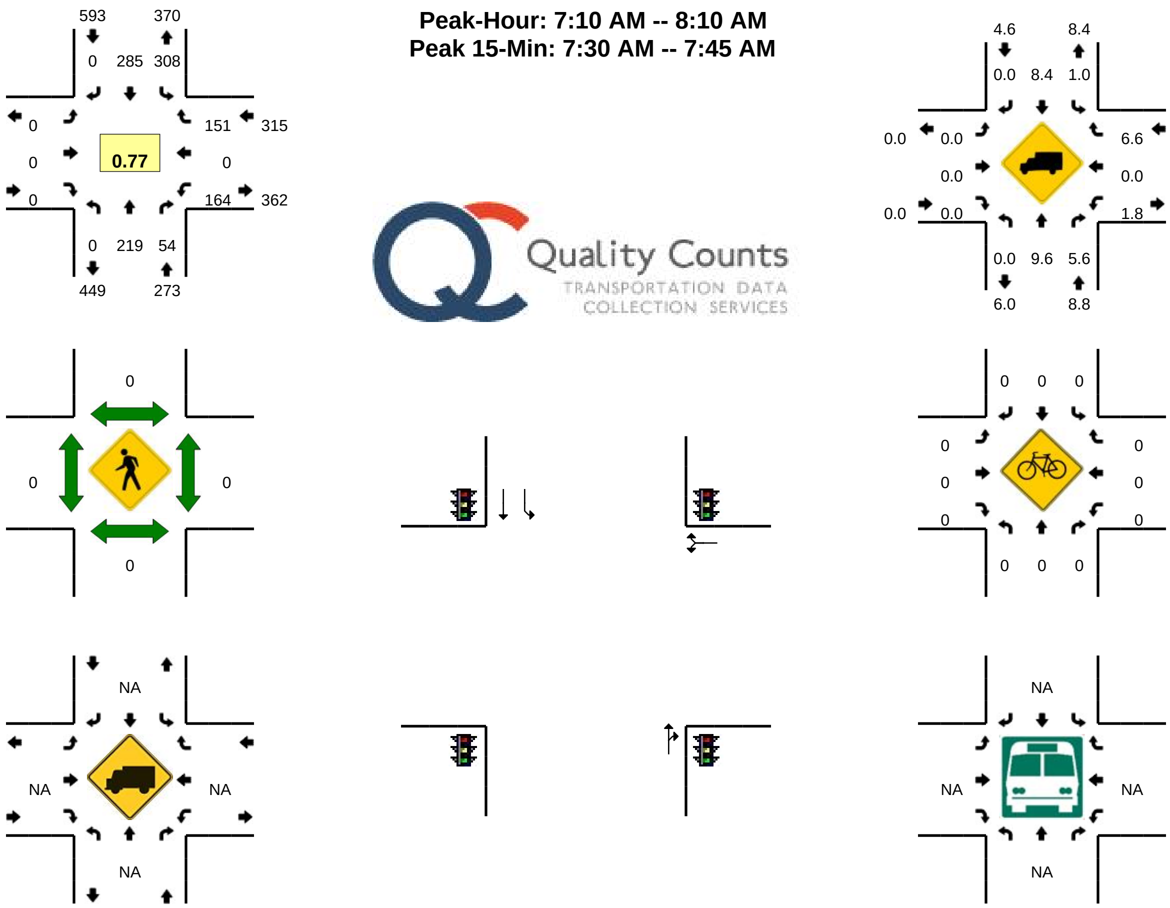
Comments:

Report generated on 2/28/2014 10:39 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

LOCATION: NE 192nd Ave -- NE 13th St | **QC JOB #:** 12426913
CITY/STATE: Vancouver, WA | **DATE:** Thu, Feb 20 2014

Peak-Hour: 7:10 AM -- 8:10 AM
Peak 15-Min: 7:30 AM -- 7:45 AM



5-Min Count Period Beginning At	NE 192nd Ave (Northbound) Left	Thru	Right	U	NE 192nd Ave (Southbound) Left	Thru	Right	U	NE 13th St (Eastbound) Left	Thru	Right	U	NE 13th St (Westbound) Left	Thru	Right	U	Total	Hourly Totals
7:00 AM	0	9	3	0	8	21	0	0	0	0	0	0	5	0	2	0	48	
7:05 AM	0	8	1	0	16	14	0	0	0	0	0	0	11	0	3	0	53	
7:10 AM	0	25	2	0	25	23	0	0	0	0	0	0	13	0	6	0	94	
7:15 AM	0	14	3	0	25	22	0	0	0	0	0	0	14	0	10	0	88	
7:20 AM	0	14	2	0	28	22	0	0	0	0	0	0	10	0	15	0	91	
7:25 AM	0	15	3	0	47	21	0	0	0	0	0	0	15	0	9	0	110	
7:30 AM	0	19	4	0	52	20	0	0	0	0	0	0	12	0	15	0	122	
7:35 AM	0	23	6	0	57	27	0	0	0	0	0	0	10	0	14	0	137	
7:40 AM	0	23	7	0	27	25	0	0	0	0	0	0	20	0	24	0	126	
7:45 AM	0	21	3	0	10	29	0	0	0	0	0	0	17	0	22	0	102	
7:50 AM	0	19	2	0	7	31	0	0	0	0	0	0	16	0	14	0	89	
7:55 AM	0	12	5	0	14	26	0	0	0	0	0	0	14	0	9	0	80	1140
8:00 AM	0	15	6	0	11	22	0	0	0	0	0	0	8	0	7	0	69	1161
8:05 AM	0	19	11	0	5	17	0	0	0	0	0	0	15	0	6	0	73	1181
8:10 AM	0	18	7	0	5	21	0	0	0	0	0	0	10	0	2	0	63	1150
8:15 AM	0	7	4	0	6	14	0	0	0	0	0	0	9	0	3	0	43	1105
8:20 AM	0	12	7	0	6	14	0	0	0	0	0	0	7	0	11	0	57	1071
8:25 AM	0	15	7	0	9	13	0	0	0	0	0	0	8	0	3	0	55	1016
8:30 AM	0	11	3	0	7	19	0	0	0	0	0	0	9	0	2	0	51	945
8:35 AM	0	8	0	0	16	18	0	0	0	0	0	0	17	0	3	0	62	870
8:40 AM	0	11	9	0	18	12	0	0	0	0	0	0	16	0	3	0	69	813
8:45 AM	0	13	9	0	8	17	0	0	0	0	0	0	9	0	7	0	63	774
8:50 AM	0	9	3	0	6	11	0	0	0	0	0	0	16	0	11	0	56	741
8:55 AM	0	14	5	0	6	16	0	0	0	0	0	0	22	0	7	0	70	731

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	260	68	0	544	288	0	0	0	0	0	0	168	0	212	0	1540
Heavy Trucks	0	36	4		0	4	0		0	0	0		0	0	28		72
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

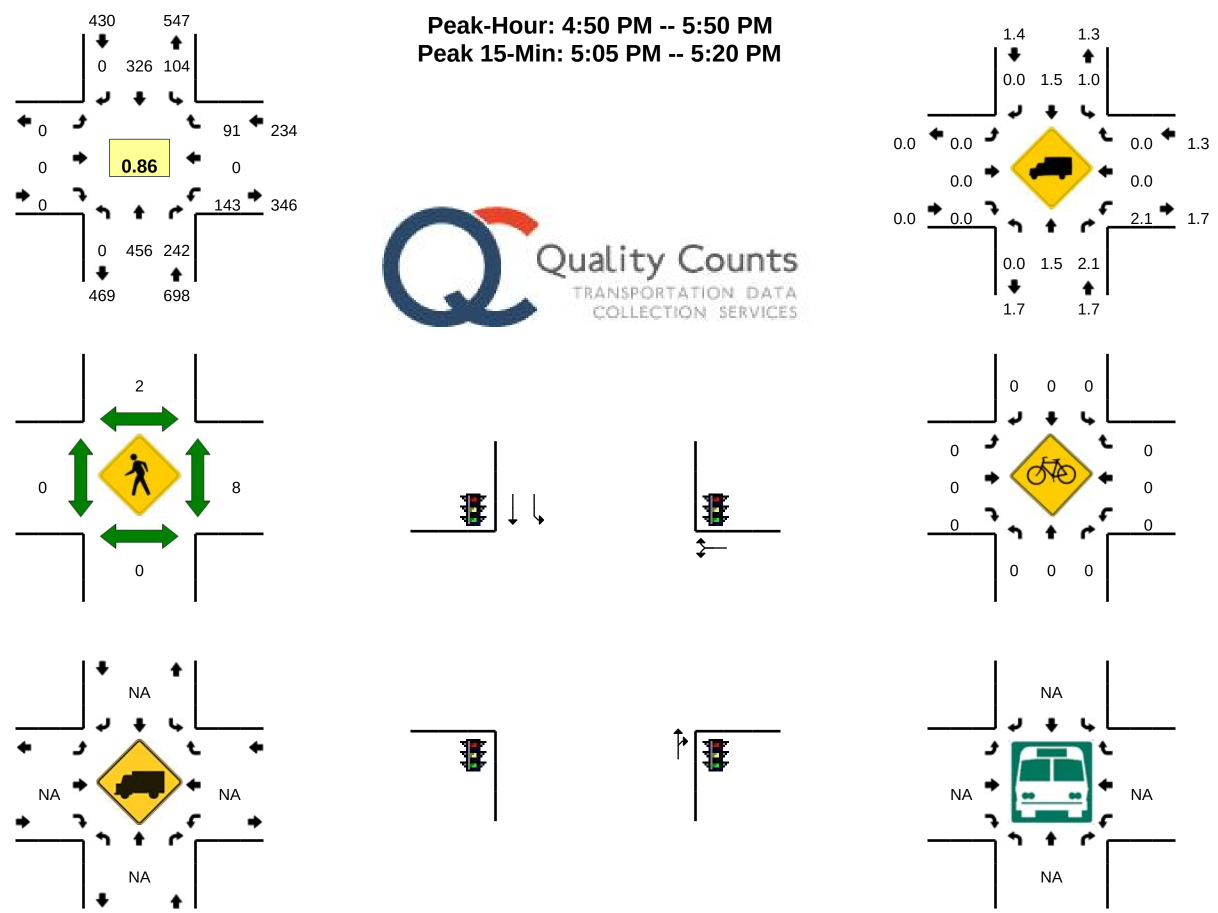
Type of peak hour being reported: Intersection Peak　　Method for determining peak hour: Total Entering Volume

LOCATION: NE 192nd Ave -- NE 13th St　　**QC JOB #:** 12426914

CITY/STATE: Vancouver, WA　　**DATE:** Thu, Feb 20 2014

Peak-Hour: 4:50 PM -- 5:50 PM

Peak 15-Min: 5:05 PM -- 5:20 PM



5-Min Count Period Beginning At	NE 192nd Ave (Northbound) Left	Thru	Right	U	NE 192nd Ave (Southbound) Left	Thru	Right	U	NE 13th St (Eastbound) Left	Thru	Right	U	NE 13th St (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	0	28	11	0	12	15	0	0	0	0	0	0	10	0	9	0	85	
4:05 PM	0	34	13	0	5	23	0	0	0	0	0	0	10	0	7	0	92	
4:10 PM	0	37	15	0	8	29	0	0	0	0	0	0	13	0	13	0	115	
4:15 PM	0	35	10	0	10	15	0	0	0	0	0	0	4	0	11	0	85	
4:20 PM	0	38	23	0	7	17	0	0	0	0	0	0	7	0	5	0	97	
4:25 PM	0	36	16	0	9	25	0	0	0	0	0	0	14	0	8	0	108	
4:30 PM	0	24	18	0	4	21	0	0	0	0	0	0	7	0	7	0	81	
4:35 PM	0	40	15	0	9	20	0	0	0	0	0	0	12	0	6	0	102	
4:40 PM	0	33	20	0	6	36	0	0	0	0	0	0	10	0	4	0	109	
4:45 PM	0	35	12	0	12	27	0	0	0	0	0	0	16	0	3	0	105	
4:50 PM	0	39	19	0	5	35	0	0	0	0	0	0	11	0	6	0	115	
4:55 PM	0	38	22	0	12	25	0	0	0	0	0	0	15	0	11	0	123	1217
5:00 PM	0	33	27	0	10	22	0	0	0	0	0	0	7	0	6	0	105	1237
5:05 PM	0	48	17	0	8	34	0	0	0	0	0	0	6	0	8	0	121	1266
5:10 PM	0	51	17	0	14	29	0	0	0	0	0	0	22	0	9	0	142	1293
5:15 PM	0	47	21	0	13	23	0	0	0	0	0	0	20	0	10	0	134	1342
5:20 PM	0	41	19	0	7	20	0	0	0	0	0	0	13	0	5	0	105	1350
5:25 PM	0	22	15	0	6	20	0	0	0	0	0	0	17	0	9	0	89	1331
5:30 PM	0	36	19	0	6	33	0	0	0	0	0	0	6	0	7	0	107	1357
5:35 PM	0	27	27	0	7	28	0	0	0	0	0	0	8	0	8	0	105	1360
5:40 PM	0	44	18	0	6	30	0	0	0	0	0	0	8	0	2	0	108	1359
5:45 PM	0	30	21	0	10	27	0	0	0	0	0	0	10	0	10	0	108	1362
5:50 PM	0	20	20	0	7	16	0	0	0	0	0	0	16	0	13	0	92	1339
5:55 PM	0	41	17	0	5	22	0	0	0	0	0	0	14	0	11	0	110	1326

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	584	220	0	140	344	0	0	0	0	0	0	192	0	108	0	1588
Heavy Trucks	0	8	4		4	4	0		0	0	0		4	0	0		24
Pedestrians		0				8				0				8			16
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

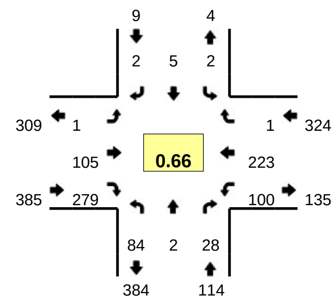
Comments:

Report generated on 2/28/2014 10:39 AM　　SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

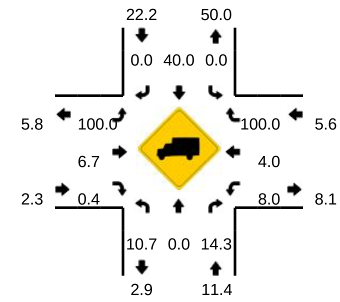
Type of peak hour being reported: Intersection Peak — Method for determining peak hour: Total Entering Volume

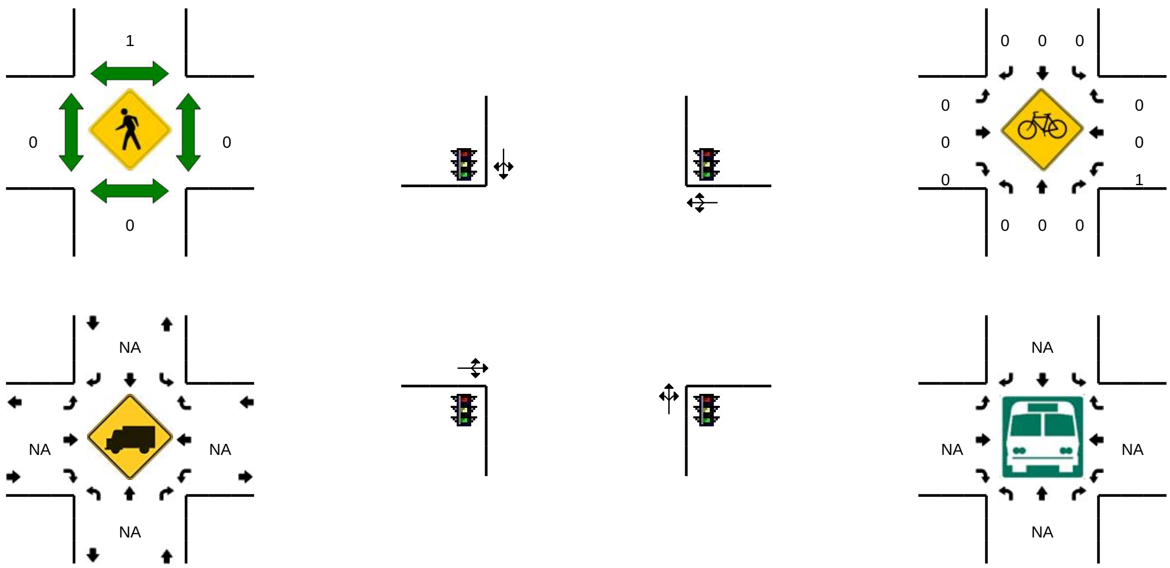
LOCATION: NW Friberg St -- NE Goodwin Rd — **QC JOB #:** 12426911

CITY/STATE: Camas, WA — **DATE:** Tue, Feb 25 2014



Peak-Hour: 7:05 AM -- 8:05 AM
Peak 15-Min: 7:30 AM -- 7:45 AM





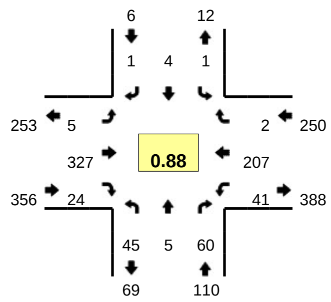
5-Min Count Period Beginning At	NW Friberg St (Northbound) Left	Thru	Right	U	NW Friberg St (Southbound) Left	Thru	Right	U	NE Goodwin Rd (Eastbound) Left	Thru	Right	U	NE Goodwin Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
7:00 AM	1	0	2	0	0	2	1	0	0	11	5	0	6	13	0	0	41	
7:05 AM	2	1	1	0	0	0	0	0	0	8	12	0	3	20	0	0	47	
7:10 AM	4	0	3	0	0	1	0	0	0	7	16	0	8	17	0	0	56	
7:15 AM	6	0	1	0	0	1	0	0	1	11	25	0	8	11	0	0	64	
7:20 AM	4	0	0	0	0	1	0	0	0	5	24	0	22	20	0	0	76	
7:25 AM	6	0	6	0	1	1	0	0	0	6	36	0	5	13	0	0	74	
7:30 AM	8	1	3	0	0	0	0	0	0	7	48	0	12	24	0	0	103	
7:35 AM	14	0	7	0	0	0	1	0	0	7	56	0	19	14	0	0	118	
7:40 AM	13	0	3	0	0	0	0	0	0	9	38	0	9	24	0	0	96	
7:45 AM	13	0	2	0	0	0	0	0	0	8	14	0	4	20	0	0	61	
7:50 AM	7	0	0	0	0	1	0	0	0	8	4	0	4	20	1	0	45	
7:55 AM	3	0	1	0	0	0	0	0	0	10	4	0	4	18	0	0	40	821
8:00 AM	4	0	1	0	1	0	1	0	0	19	2	0	2	22	0	0	52	832
8:05 AM	2	0	1	0	0	0	0	0	0	5	2	0	1	16	0	0	27	812
8:10 AM	2	1	0	0	0	0	0	0	2	2	2	0	7	13	0	0	29	785
8:15 AM	0	0	1	0	0	0	0	0	0	5	2	0	2	13	0	0	23	744
8:20 AM	2	1	0	0	0	0	0	0	0	14	2	0	0	18	0	0	37	705
8:25 AM	1	0	1	0	0	1	0	0	0	12	3	0	3	10	0	0	31	662
8:30 AM	1	0	1	0	0	0	0	0	0	11	10	0	3	18	0	0	44	603
8:35 AM	0	0	2	0	0	0	1	0	0	6	6	0	3	17	0	0	35	520
8:40 AM	1	0	2	0	0	0	1	0	0	4	10	0	6	17	0	0	41	465
8:45 AM	2	0	1	0	0	0	0	0	1	10	4	0	1	12	0	0	31	435
8:50 AM	4	0	1	0	0	2	0	0	0	7	1	0	1	20	0	0	36	426
8:55 AM	2	0	2	0	0	0	0	0	0	6	2	0	1	18	0	0	31	417

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	140	4	52	0	0	0	4	0	0	92	568	0	160	248	0	0	1268
Heavy Trucks	16	0	4		0	0	0		0	4	0		0	8	0		32
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

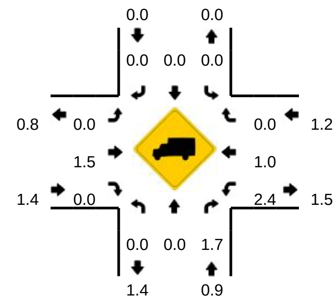
Comments:

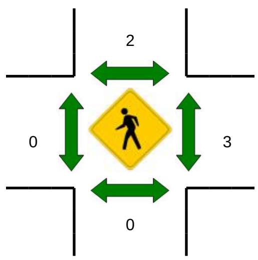
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

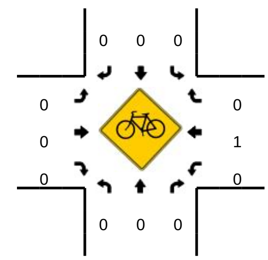
LOCATION: NW Friberg St -- NE Goodwin Rd | **QC JOB #:** 12426912
CITY/STATE: Camas, WA | **DATE:** Tue, Feb 25 2014

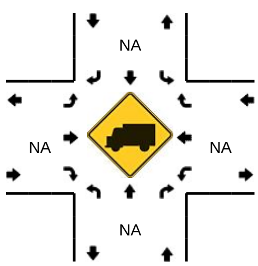


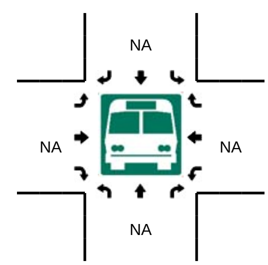
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:05 PM -- 5:20 PM











5-Min Count Period Beginning At	NW Friberg St (Northbound)				NW Friberg St (Southbound)				NE Goodwin Rd (Eastbound)				NE Goodwin Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	3	1	3	0	0	1	0	0	0	20	1	0	5	18	0	0	52	
4:05 PM	6	1	7	0	1	0	0	0	1	26	3	0	3	17	0	0	65	
4:10 PM	9	0	5	0	0	0	1	0	0	25	5	0	0	7	0	0	52	
4:15 PM	3	0	8	0	0	0	0	0	0	16	0	0	1	12	0	0	40	
4:20 PM	2	0	3	0	0	0	1	0	0	19	0	0	2	18	1	0	46	
4:25 PM	4	0	6	0	0	1	1	0	0	20	0	0	3	12	0	0	47	
4:30 PM	0	1	2	0	0	0	0	0	1	21	2	0	4	11	0	0	42	
4:35 PM	4	0	3	0	0	0	0	0	1	18	0	0	1	13	0	0	40	
4:40 PM	4	0	4	0	0	0	0	0	0	24	4	0	2	16	0	0	54	
4:45 PM	2	0	3	0	0	1	1	0	0	23	6	0	5	17	0	0	58	
4:50 PM	5	0	4	0	0	1	0	0	1	20	1	0	3	12	0	0	47	
4:55 PM	3	0	4	0	0	0	0	0	1	26	0	0	3	18	0	0	55	598
5:00 PM	9	0	3	0	0	1	0	0	0	30	4	0	5	11	0	0	63	609
5:05 PM	4	0	7	0	0	0	0	0	1	29	0	0	4	23	0	0	68	612
5:10 PM	5	2	5	0	0	0	0	0	0	32	4	0	3	17	0	0	68	628
5:15 PM	4	1	1	0	1	0	0	0	1	35	2	0	2	20	1	0	68	656
5:20 PM	3	0	7	0	0	0	0	0	1	24	1	0	1	18	0	0	55	665
5:25 PM	5	0	10	0	0	0	0	0	0	26	1	0	2	13	0	0	57	675
5:30 PM	0	1	9	0	0	0	0	0	0	20	1	0	3	14	1	0	49	682
5:35 PM	4	1	1	0	0	1	0	0	0	27	3	0	5	24	0	0	66	708
5:40 PM	1	0	6	0	0	0	0	0	0	35	1	0	5	20	0	0	68	722
5:45 PM	1	1	5	0	0	0	0	0	1	29	0	0	3	14	0	0	54	718
5:50 PM	3	1	8	0	0	0	0	0	0	23	0	0	1	10	0	0	46	717
5:55 PM	1	0	6	0	0	0	0	0	0	16	0	0	2	13	0	0	38	700

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	52	12	52	0	4	0	0	0	8	384	24	0	36	240	4	0	816
Heavy Trucks	0	0	0		0	0	0		0	8	0		0	4	0		12
Pedestrians		0				0				0				8			8
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

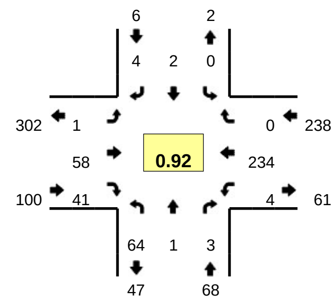
Comments:

Report generated on 2/28/2014 10:39 AM

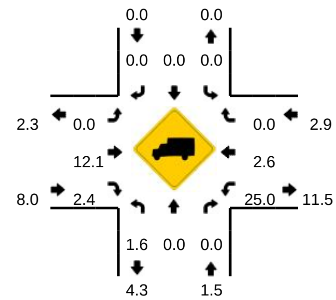
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

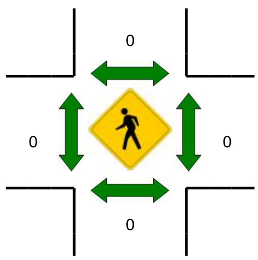
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

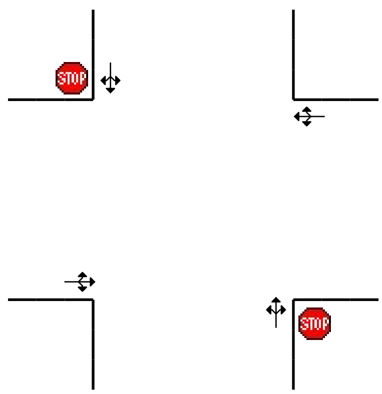
LOCATION: NE 232nd Ave -- NE 28th St | **QC JOB #:** 12426907
CITY/STATE: Camas, WA | **DATE:** Thu, Feb 20 2014

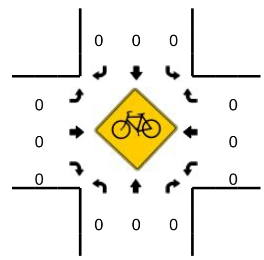


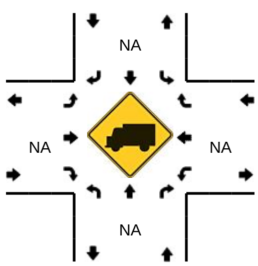
Peak-Hour: 7:05 AM -- 8:05 AM
Peak 15-Min: 7:10 AM -- 7:25 AM

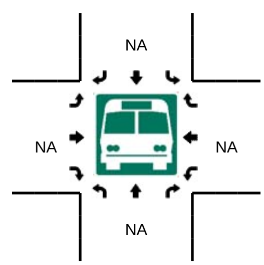












5-Min Count Period Beginning At	NE 232nd Ave (Northbound) Left	Thru	Right	U	NE 232nd Ave (Southbound) Left	Thru	Right	U	NE 28th St (Eastbound) Left	Thru	Right	U	NE 28th St (Westbound) Left	Thru	Right	U	Total	Hourly Totals
7:00 AM	3	0	0	0	0	0	0	0	0	4	2	0	0	13	0	0	22	
7:05 AM	6	0	0	0	0	0	0	0	0	4	4	0	1	17	0	0	32	
7:10 AM	2	0	0	0	0	0	0	0	0	12	9	0	0	20	0	0	43	
7:15 AM	7	0	0	0	0	0	0	0	0	6	3	0	0	20	0	0	36	
7:20 AM	5	0	1	0	0	0	0	0	0	5	1	0	1	20	0	0	33	
7:25 AM	5	0	0	0	0	2	0	0	0	3	3	0	0	20	0	0	33	
7:30 AM	5	0	0	0	0	0	0	0	0	5	2	0	0	20	0	0	32	
7:35 AM	5	0	0	0	0	0	1	0	0	4	3	0	1	22	0	0	36	
7:40 AM	4	1	1	0	0	0	0	0	0	5	4	0	0	18	0	0	33	
7:45 AM	4	0	0	0	0	0	2	0	0	1	2	0	1	28	0	0	38	
7:50 AM	8	0	0	0	0	0	0	0	1	4	4	0	0	18	0	0	35	
7:55 AM	5	0	0	0	0	0	0	0	0	3	3	0	0	13	0	0	24	397
8:00 AM	8	0	1	0	0	0	1	0	0	6	3	0	0	18	0	0	37	412
8:05 AM	1	0	0	0	0	0	0	0	0	6	0	0	1	16	0	0	24	404
8:10 AM	2	0	0	0	0	0	0	0	0	5	4	0	0	16	0	0	27	388
8:15 AM	1	0	0	0	0	0	0	0	0	6	3	0	0	16	0	0	26	378
8:20 AM	1	0	0	0	0	0	1	0	0	2	1	0	0	12	0	0	17	362
8:25 AM	5	0	2	0	0	0	0	0	0	5	1	0	0	16	0	0	29	358
8:30 AM	1	0	0	0	0	0	3	0	0	8	1	0	0	18	0	0	31	357
8:35 AM	4	0	0	0	0	0	1	0	0	6	3	0	0	13	0	0	27	348
8:40 AM	1	0	0	0	0	0	0	0	0	3	1	0	0	22	0	0	27	342
8:45 AM	3	0	0	0	0	0	0	0	0	12	3	0	0	21	0	0	39	343
8:50 AM	2	0	1	0	0	0	1	0	0	6	0	0	0	19	0	0	29	337
8:55 AM	2	0	0	0	0	0	0	0	0	3	2	0	2	20	0	0	29	342

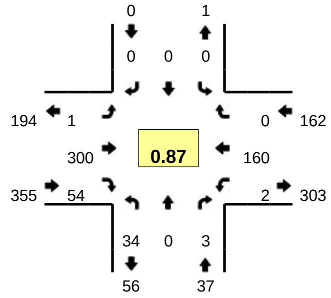
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	56	0	4	0	0	0	0	0	0	92	52	0	4	240	0	0	448
Heavy Trucks	0	0	0		0	0	0		0	16	0		0	0	0		16
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

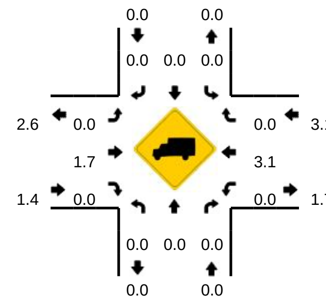
Type of peak hour being reported: Intersection Peak — Method for determining peak hour: Total Entering Volume

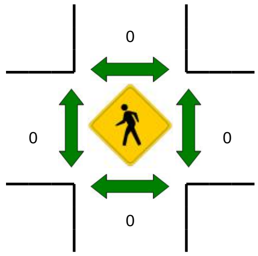
LOCATION: NE 232nd Ave -- NE 28th St — **QC JOB #:** 12426908

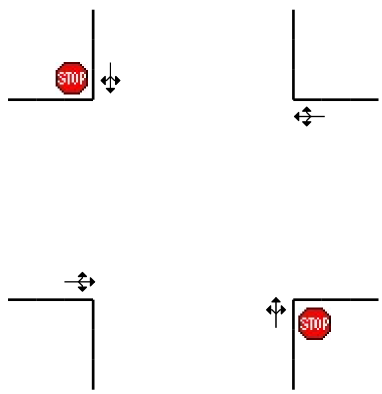
CITY/STATE: Camas, WA — **DATE:** Thu, Feb 20 2014

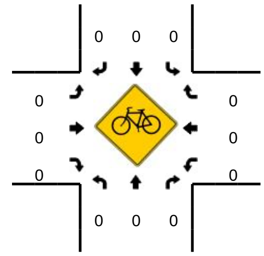


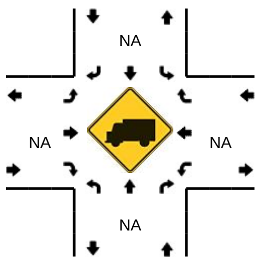
Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:15 PM -- 5:30 PM

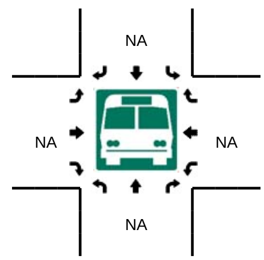












5-Min Count Period Beginning At	NE 232nd Ave (Northbound) Left	Thru	Right	U	NE 232nd Ave (Southbound) Left	Thru	Right	U	NE 28th St (Eastbound) Left	Thru	Right	U	NE 28th St (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	4	0	0	0	0	0	0	0	0	17	5	0	0	11	0	0	37	
4:05 PM	0	0	0	0	0	0	0	0	0	19	3	0	0	18	0	0	40	
4:10 PM	6	0	0	0	0	0	0	0	1	22	2	0	0	11	0	0	42	
4:15 PM	5	0	1	0	0	0	0	0	0	18	1	0	0	12	0	0	37	
4:20 PM	2	0	1	0	0	0	0	0	0	18	7	0	1	8	0	0	37	
4:25 PM	4	0	0	0	0	0	0	0	1	29	3	0	0	8	0	0	45	
4:30 PM	5	0	0	0	1	0	0	0	0	19	3	0	1	12	0	0	41	
4:35 PM	2	0	0	0	0	0	1	0	0	23	2	0	1	8	0	0	37	
4:40 PM	1	0	1	0	0	0	0	0	2	23	5	0	1	15	0	0	48	
4:45 PM	4	0	0	0	0	0	1	0	0	18	3	0	0	7	0	0	33	
4:50 PM	2	0	1	0	0	0	0	0	1	19	5	0	1	21	0	0	50	
4:55 PM	3	0	0	0	0	0	0	0	0	21	1	0	0	10	0	0	35	482
5:00 PM	3	0	0	0	0	0	0	0	1	27	4	0	0	15	0	0	50	495
5:05 PM	2	0	0	0	0	0	0	0	0	26	3	0	0	15	0	0	46	501
5:10 PM	3	0	0	0	0	0	0	0	0	20	3	0	0	19	0	0	45	504
5:15 PM	5	0	0	0	0	0	0	0	0	25	10	0	0	11	0	0	51	518
5:20 PM	2	0	0	0	0	0	0	0	0	38	4	0	0	11	0	0	55	536
5:25 PM	2	0	1	0	0	0	0	0	0	27	5	0	0	19	0	0	54	545
5:30 PM	5	0	0	0	0	0	0	0	0	19	3	0	0	7	0	0	34	538
5:35 PM	0	0	2	0	0	0	0	0	0	26	3	0	1	10	0	0	42	543
5:40 PM	3	0	0	0	0	0	0	0	0	21	5	0	0	15	0	0	44	539
5:45 PM	3	0	0	0	0	0	0	0	0	23	6	0	0	12	0	0	44	550
5:50 PM	2	0	0	0	0	0	0	0	0	25	4	0	0	14	0	0	45	545
5:55 PM	4	0	0	0	0	0	0	0	0	23	4	0	1	12	0	0	44	554

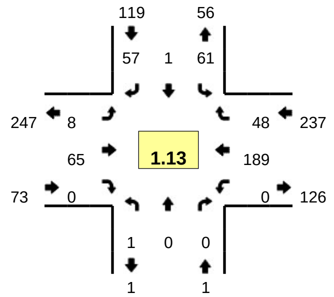
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	36	0	4	0	0	0	0	0	0	360	76	0	0	164	0	0	640
Heavy Trucks	0	0	0		0	0	0		0	4	0		0	0	0		4
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

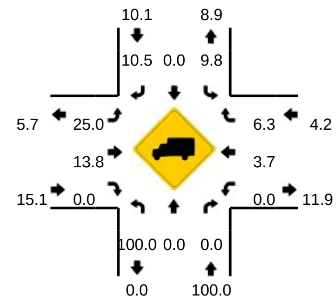
Type of peak hour being reported: System Peak | Method for determining peak hour: Total Entering Volume

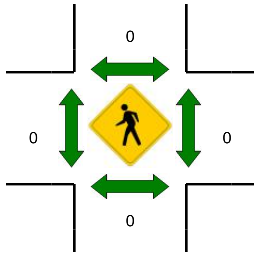
LOCATION: NE 242nd Ave -- NE 28th St | **QC JOB #:** 12470705

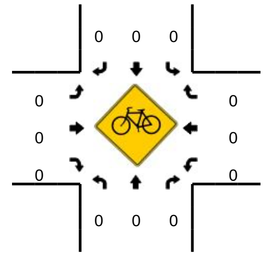
CITY/STATE: Camas, WA | **DATE:** Thu, Apr 03 2014

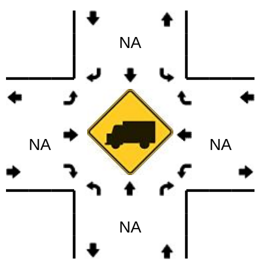


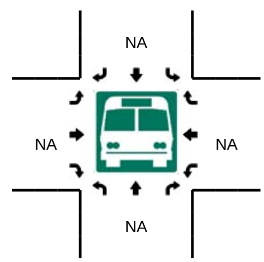
Peak-Hour: 7:05 AM -- 8:05 AM
Peak 15-Min: 7:40 AM -- 7:55 AM











5-Min Count Period Beginning At	NE 242nd Ave (Northbound) Left	Thru	Right	U	NE 242nd Ave (Southbound) Left	Thru	Right	U	NE 28th St (Eastbound) Left	Thru	Right	U	NE 28th St (Westbound) Left	Thru	Right	U	Total	Hourly Totals
7:00 AM	0	0	0	0	3	0	1	0	1	1	1	0	0	11	0	0	18	
7:05 AM	0	0	0	0	2	0	6	0	1	14	0	0	0	24	2	0	49	
7:10 AM	0	0	0	0	7	0	1	0	1	4	0	0	0	12	3	0	28	
7:15 AM	0	0	0	0	7	1	6	0	0	3	0	0	0	12	5	0	34	
7:20 AM	0	0	0	0	9	0	4	0	0	1	0	0	0	15	6	0	35	
7:25 AM	0	0	0	0	9	0	3	0	0	8	0	0	0	17	3	0	40	
7:30 AM	1	0	0	0	9	0	6	0	2	11	0	0	0	29	7	0	65	
7:35 AM	0	0	0	0	2	0	5	0	0	2	0	0	0	15	4	0	28	
7:40 AM	0	0	0	0	7	0	7	0	0	5	0	0	0	8	2	0	29	
7:45 AM	0	0	0	0	4	0	5	0	0	6	0	0	0	18	5	0	38	
7:50 AM	0	0	0	0	1	0	4	0	1	3	0	0	0	17	2	0	28	
7:55 AM	0	0	0	0	3	0	6	0	2	2	0	0	0	10	4	0	27	419
8:00 AM	0	0	0	0	1	0	4	0	1	6	0	0	0	12	5	0	29	430
8:05 AM	0	0	0	0	1	0	3	0	0	7	0	0	0	20	1	0	32	413
8:10 AM	0	0	0	0	4	0	3	0	0	7	0	0	0	14	2	0	30	415
8:15 AM	0	0	0	0	3	0	6	0	0	3	0	0	0	7	1	0	20	401
8:20 AM	0	0	0	0	5	0	8	0	2	4	0	0	0	12	1	0	32	398
8:25 AM	0	0	0	0	3	0	3	0	1	3	0	1	0	19	3	0	33	391
8:30 AM	0	0	0	0	1	0	4	0	0	4	0	0	0	14	2	0	25	351
8:35 AM	0	0	0	0	3	0	5	0	1	9	0	0	0	12	3	0	33	356
8:40 AM	0	0	0	0	5	0	7	0	2	3	0	0	0	13	2	0	32	359
8:45 AM	0	0	0	0	4	0	2	0	2	6	0	0	0	12	3	0	29	350
8:50 AM	0	0	0	0	4	0	7	0	0	3	0	0	0	19	4	0	37	359
8:55 AM	0	0	0	0	4	0	3	0	0	2	0	0	0	14	3	0	26	358

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	0	0	0	48	0	64	0	4	56	0	0	0	172	36	0	380
Heavy Trucks	0	0	0		4	0	8		0	4	0		0	0	0		16
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

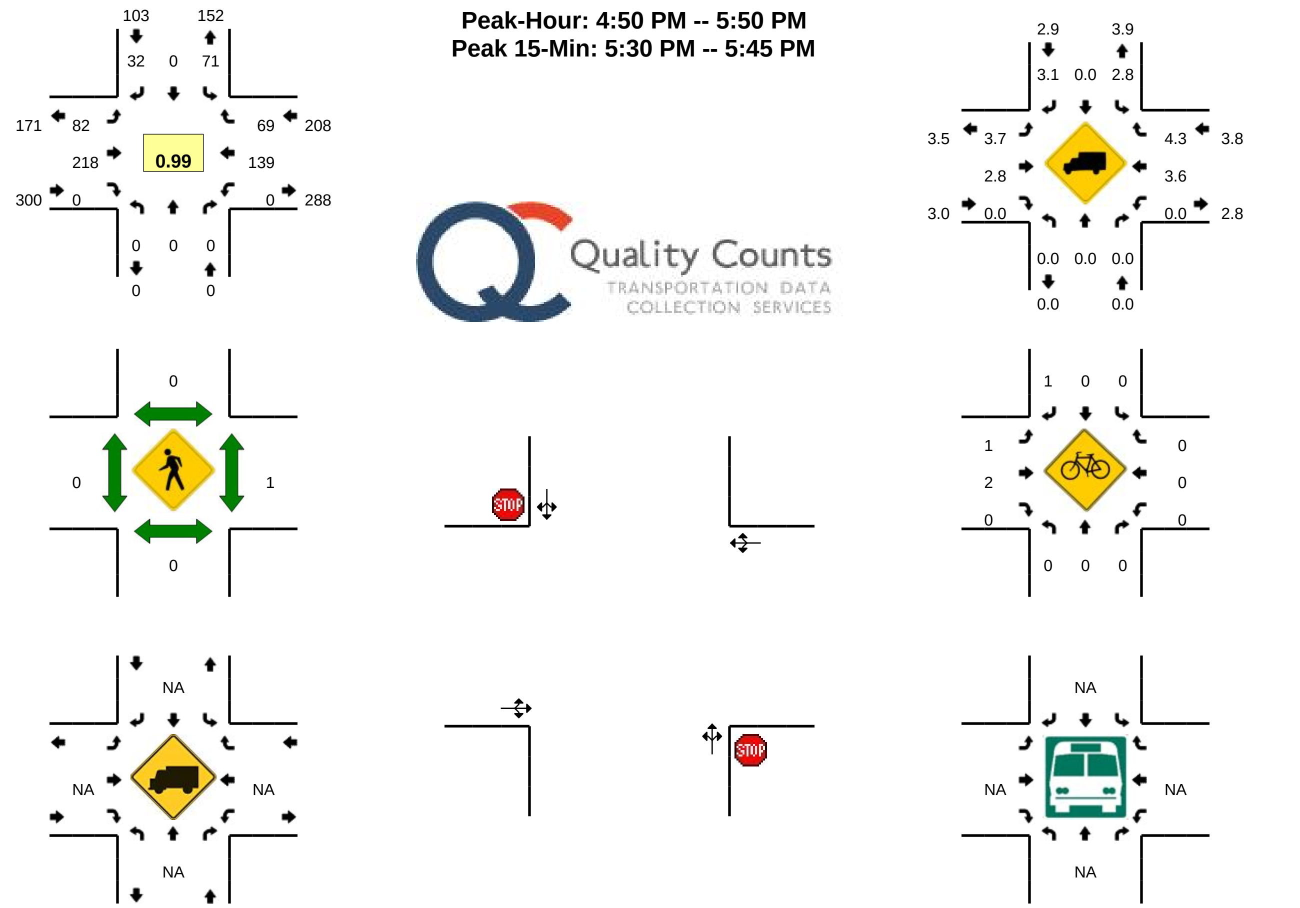
Report generated on 4/7/2014 4:44 PM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: System Peak | Method for determining peak hour: Total Entering Volume

LOCATION: NE 242nd Ave -- NE 28th St
CITY/STATE: Camas, WA

QC JOB #: 12470706
DATE: Wed, Apr 02 2014

Peak-Hour: 4:50 PM -- 5:50 PM
Peak 15-Min: 5:30 PM -- 5:45 PM



5-Min Count Period Beginning At	NE 242nd Ave (Northbound) Left	Thru	Right	U	NE 242nd Ave (Southbound) Left	Thru	Right	U	NE 28th St (Eastbound) Left	Thru	Right	U	NE 28th St (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	0	0	0	0	5	0	3	0	6	8	0	0	0	11	8	0	41	
4:05 PM	0	0	0	0	5	0	4	0	4	11	0	0	0	11	5	0	40	
4:10 PM	0	0	0	0	3	0	2	0	9	17	0	0	0	15	3	0	49	
4:15 PM	0	0	0	0	13	0	5	0	3	22	0	0	0	15	3	0	61	
4:20 PM	0	0	0	0	6	0	5	0	8	17	1	0	0	11	4	0	52	
4:25 PM	1	0	0	0	7	0	0	1	2	24	0	0	1	11	6	0	53	
4:30 PM	0	0	0	0	6	0	2	0	7	14	0	0	0	7	4	0	40	
4:35 PM	0	0	0	0	9	0	2	0	3	21	0	0	1	13	6	0	55	
4:40 PM	0	0	0	0	10	0	6	0	6	8	0	0	0	11	10	0	51	
4:45 PM	0	0	0	0	6	0	3	0	9	17	0	0	0	12	5	0	52	
4:50 PM	0	0	0	0	5	0	5	0	7	13	0	0	0	9	10	0	49	
4:55 PM	0	0	0	0	9	0	5	1	6	19	0	0	0	9	7	0	56	599
5:00 PM	0	0	0	0	7	0	1	0	11	16	0	0	0	10	2	0	47	605
5:05 PM	0	0	0	0	6	0	2	0	7	19	0	0	0	12	10	0	56	621
5:10 PM	0	0	0	0	3	0	0	0	3	14	0	0	0	16	6	0	42	614
5:15 PM	0	0	0	0	6	0	4	0	2	25	0	0	0	12	6	0	55	608
5:20 PM	0	0	0	0	2	0	3	0	3	16	0	0	0	12	6	0	42	598
5:25 PM	0	0	0	0	4	0	5	0	11	18	0	0	0	9	8	0	55	600
5:30 PM	0	0	0	0	5	0	0	0	9	14	0	0	0	13	3	0	44	604
5:35 PM	0	0	0	0	6	0	1	0	6	17	0	0	0	14	5	0	49	598
5:40 PM	0	0	0	0	7	0	3	0	9	26	0	0	0	12	4	0	61	608
5:45 PM	0	0	0	0	10	0	3	0	8	21	0	0	0	11	2	0	55	611
5:50 PM	0	0	0	0	3	0	3	0	7	18	0	0	0	9	9	0	49	611
5:55 PM	0	0	0	0	7	0	1	0	5	15	0	0	0	8	3	0	39	594

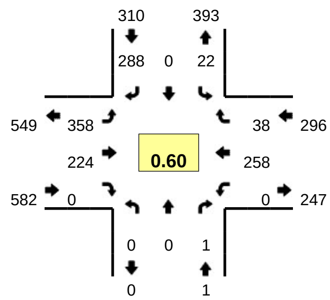
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	0	0	0	72	0	16	0	96	228	0	0	0	156	48	0	616
Heavy Trucks	0	0	0		0	0	0		4	8	0		0	0	4		16
Pedestrians		0				0				0				4			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

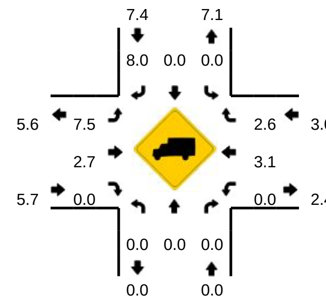
Report generated on 4/7/2014 4:44 PM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

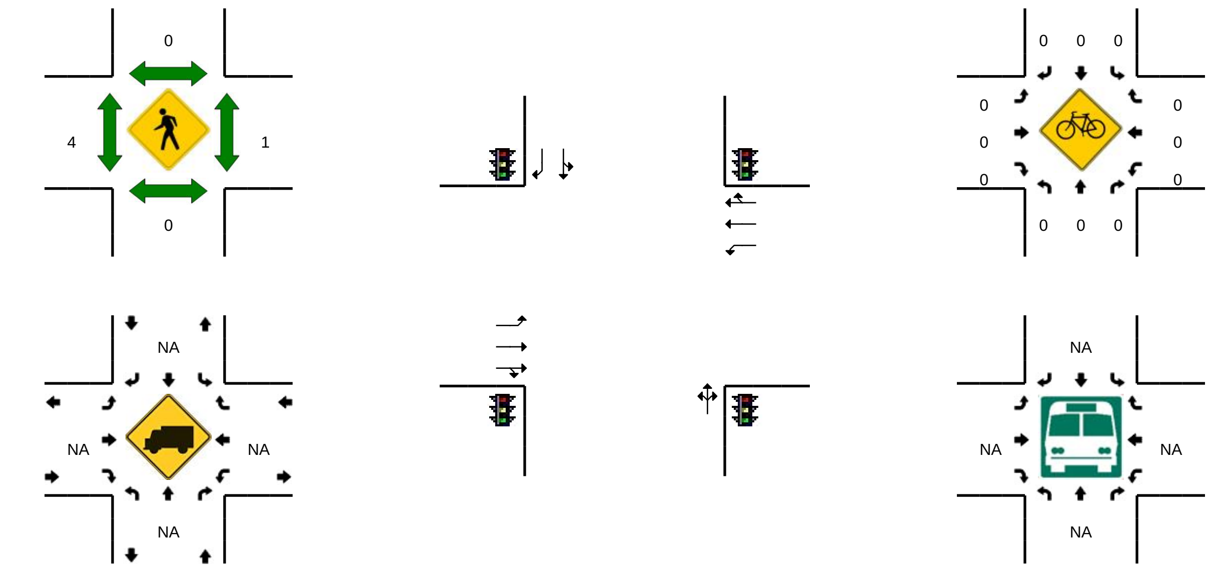
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

LOCATION: NW Friberg St -- NW Lake Rd | **QC JOB #:** 12426905
CITY/STATE: Vancouver, WA | **DATE:** Thu, Feb 20 2014



Peak-Hour: 7:05 AM -- 8:05 AM
Peak 15-Min: 7:30 AM -- 7:45 AM





5-Min Count Period Beginning At	NW Friberg St (Northbound) Left	Thru	Right	U	NW Friberg St (Southbound) Left	Thru	Right	U	NW Lake Rd (Eastbound) Left	Thru	Right	U	NW Lake Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
7:00 AM	0	0	0	0	1	0	0	0	8	13	0	0	0	17	3	0	42	
7:05 AM	0	0	0	0	2	0	4	0	12	16	0	0	0	12	6	0	52	
7:10 AM	0	0	0	0	0	0	3	0	17	24	0	2	0	19	1	0	66	
7:15 AM	0	0	1	0	1	0	9	0	25	9	0	0	0	14	0	0	59	
7:20 AM	0	0	0	0	1	0	11	0	32	4	0	0	0	19	4	0	71	
7:25 AM	0	0	0	0	2	0	38	0	53	10	0	0	0	9	2	0	114	
7:30 AM	0	0	0	0	0	0	46	0	71	15	0	1	0	18	6	0	157	
7:35 AM	0	0	0	0	7	0	59	0	60	17	0	0	0	19	5	0	167	
7:40 AM	0	0	0	0	1	0	56	0	56	33	0	0	0	21	3	0	170	
7:45 AM	0	0	0	0	1	0	41	0	15	22	0	0	0	39	4	0	122	
7:50 AM	0	0	0	0	3	0	9	0	8	28	0	0	0	36	2	0	86	
7:55 AM	0	0	0	0	0	0	7	0	2	21	0	0	0	29	3	0	62	1168
8:00 AM	0	0	0	0	4	0	5	0	4	25	0	0	0	23	2	0	63	1189
8:05 AM	0	0	0	0	3	0	3	0	6	6	0	0	0	20	1	0	39	1176
8:10 AM	0	0	0	0	2	0	3	0	2	22	0	0	0	19	0	0	48	1158
8:15 AM	0	0	0	0	2	0	4	0	3	11	0	0	0	17	2	0	39	1138
8:20 AM	0	0	0	0	1	0	2	0	5	12	0	0	0	21	3	0	44	1111
8:25 AM	0	0	0	0	1	0	2	0	2	13	0	0	0	16	0	0	34	1031
8:30 AM	0	0	0	0	0	0	0	0	6	14	0	0	0	14	0	0	34	908
8:35 AM	0	0	0	0	2	0	2	0	14	13	0	0	0	19	1	0	51	792
8:40 AM	0	0	0	0	1	0	5	0	8	11	0	0	0	15	0	0	40	662
8:45 AM	0	0	0	0	4	0	5	0	3	20	0	0	0	25	2	0	59	599
8:50 AM	1	0	0	0	2	0	5	0	3	15	0	0	0	31	2	0	59	572
8:55 AM	0	0	0	0	2	0	6	0	5	14	0	0	0	30	0	0	57	567

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	0	0	0	32	0	644	0	748	260	0	4	0	232	56	0	1976
Heavy Trucks	0	0	0		0	0	56		0	8	0		0	4	0		68
Pedestrians		0				0				12				4			16
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

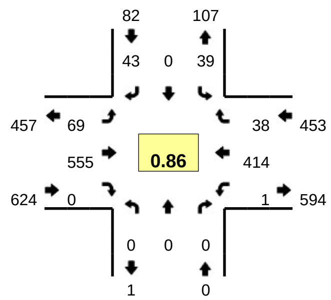
Comments:

Report generated on 2/28/2014 10:33 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak — Method for determining peak hour: Total Entering Volume

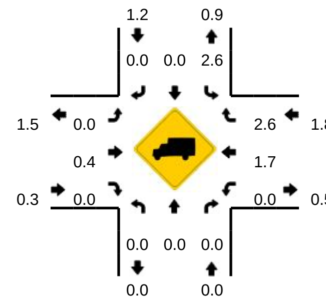
LOCATION: NW Friberg St -- NW Lake Rd — **QC JOB #:** 12426906

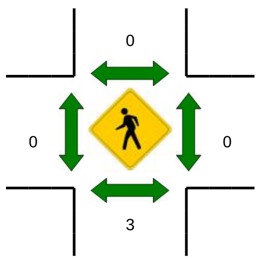
CITY/STATE: Vancouver, WA — **DATE:** Tue, Feb 25 2014

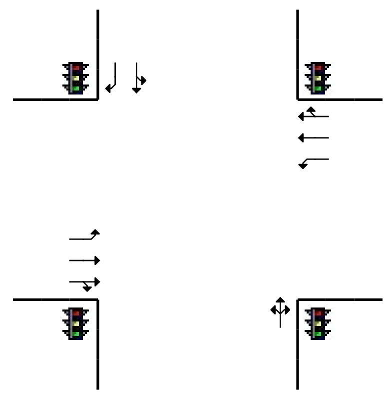


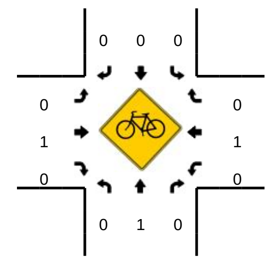
Peak-Hour: 4:45 PM -- 5:45 PM

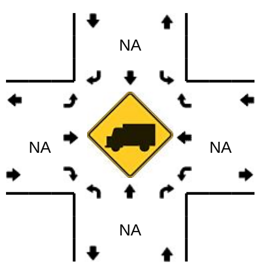
Peak 15-Min: 5:00 PM -- 5:15 PM

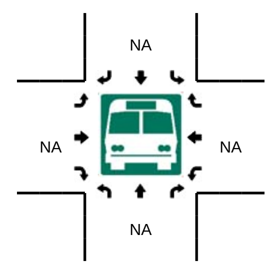












5-Min Count Period Beginning At	NW Friberg St (Northbound) Left	Thru	Right	U	NW Friberg St (Southbound) Left	Thru	Right	U	NW Lake Rd (Eastbound) Left	Thru	Right	U	NW Lake Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	0	0	0	0	1	0	12	0	4	31	0	0	0	53	5	0	106	
4:05 PM	0	0	0	0	1	0	12	0	5	35	0	0	0	45	3	0	101	
4:10 PM	0	1	0	0	2	0	6	0	10	34	1	0	0	33	1	0	88	
4:15 PM	0	0	0	0	0	0	8	0	6	36	0	0	0	36	1	0	87	
4:20 PM	0	0	0	0	0	0	6	0	5	29	0	0	0	26	4	0	70	
4:25 PM	0	0	0	0	0	0	6	0	5	31	0	0	0	32	4	0	78	
4:30 PM	0	0	0	0	1	0	7	0	2	38	0	0	0	26	2	0	76	
4:35 PM	0	0	0	0	1	0	4	0	6	35	0	0	0	26	2	0	74	
4:40 PM	0	0	0	0	2	0	3	0	2	38	0	1	0	35	2	0	83	
4:45 PM	0	0	0	0	5	0	2	0	2	51	0	0	1	32	1	0	94	
4:50 PM	0	0	0	0	7	0	4	0	7	40	0	0	0	32	4	0	94	
4:55 PM	0	0	0	0	1	0	4	0	5	54	0	0	0	32	2	0	98	1049
5:00 PM	0	0	0	0	3	0	8	0	2	46	0	0	0	31	5	0	95	1038
5:05 PM	0	0	0	0	3	0	5	0	6	44	0	0	0	77	4	0	139	1076
5:10 PM	0	0	0	0	3	0	2	0	8	44	0	0	0	39	6	0	102	1090
5:15 PM	0	0	0	0	2	0	3	0	5	43	0	0	0	24	4	0	81	1084
5:20 PM	0	0	0	0	2	0	3	0	9	48	0	0	0	34	0	0	96	1110
5:25 PM	0	0	0	0	2	0	4	0	8	58	0	0	0	29	6	0	107	1139
5:30 PM	0	0	0	0	2	0	1	0	7	42	0	0	0	32	2	0	86	1149
5:35 PM	0	0	0	0	6	0	2	0	2	35	0	0	0	24	2	0	71	1146
5:40 PM	0	0	0	0	3	0	5	0	8	50	0	0	0	28	2	0	96	1159
5:45 PM	0	0	0	0	2	0	3	0	7	51	0	0	0	29	2	0	94	1159
5:50 PM	0	0	0	0	1	0	4	0	10	26	0	0	0	34	3	0	78	1143
5:55 PM	0	0	0	0	0	0	4	0	3	51	0	0	0	28	2	0	88	1133

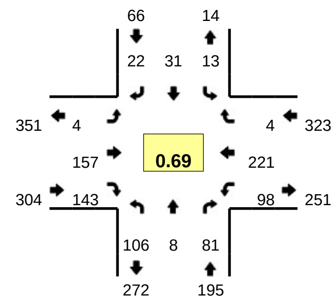
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	0	0	0	36	0	60	0	64	536	0	0	0	588	60	0	1344
Heavy Trucks	0	0	0		0	0	0		0	4	0		0	8	0		12
Pedestrians		4				0				0				0			4
Bicycles	0	0	0		0	0	0		0	1	0		0	1	0		2
Railroad																	
Stopped Buses																	

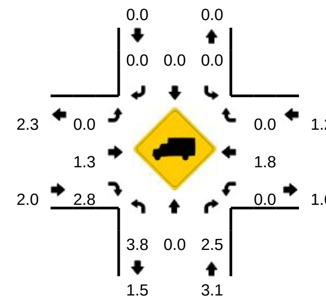
Comments:

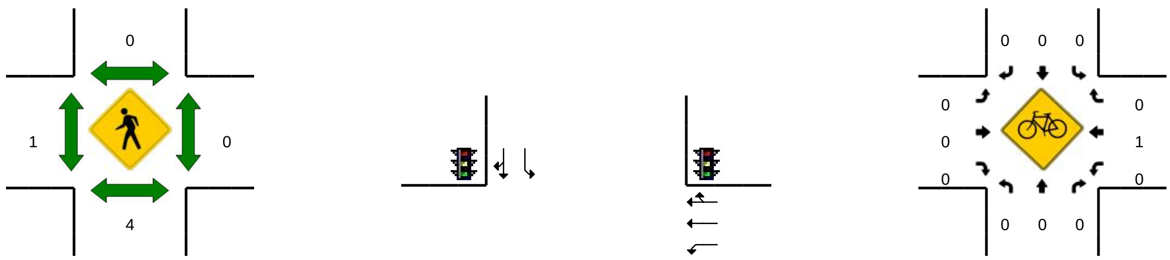
Type of peak hour being reported: Intersection Peak   Method for determining peak hour: Total Entering Volume

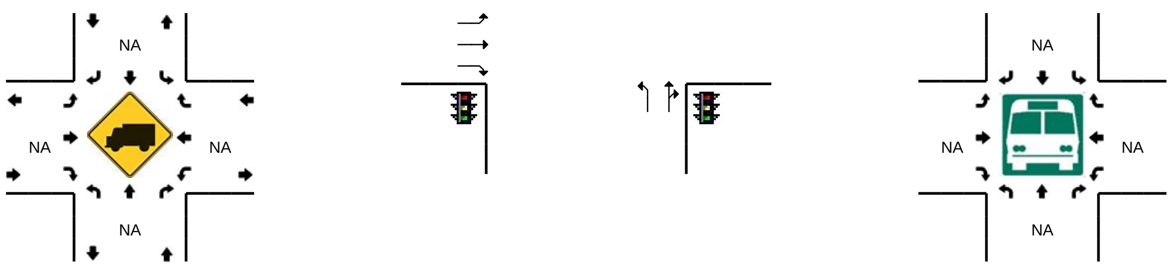
LOCATION: NW Parker St -- NW Lake Rd   **QC JOB #:** 12426903
CITY/STATE: Camas, WA   **DATE:** Thu, Feb 20 2014

Peak-Hour: 7:10 AM -- 8:10 AM
Peak 15-Min: 7:40 AM -- 7:55 AM









5-Min Count Period Beginning At	NW Parker St (Northbound) Left	Thru	Right	U	NW Parker St (Southbound) Left	Thru	Right	U	NW Lake Rd (Eastbound) Left	Thru	Right	U	NW Lake Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
7:00 AM	10	0	1	0	0	0	0	0	1	10	2	0	3	12	0	0	39	
7:05 AM	11	0	5	0	1	2	2	0	1	10	5	0	1	9	1	0	48	
7:10 AM	6	0	9	0	3	2	2	0	0	17	4	0	3	12	0	0	58	
7:15 AM	4	0	2	0	2	1	2	0	1	14	3	0	6	16	0	0	51	
7:20 AM	9	0	2	0	0	3	0	0	0	8	6	0	8	17	0	0	53	
7:25 AM	5	1	1	0	0	1	3	0	0	6	10	0	5	14	0	0	46	
7:30 AM	9	0	4	0	1	4	0	0	0	11	7	0	7	20	1	0	64	
7:35 AM	10	0	4	0	0	2	1	0	0	14	14	0	8	15	1	0	69	
7:40 AM	10	0	11	0	1	6	4	0	0	10	21	1	15	25	1	0	105	
7:45 AM	14	1	13	0	0	2	2	0	1	19	16	0	14	23	0	0	105	
7:50 AM	13	2	16	0	1	3	0	0	0	15	20	0	8	32	0	0	110	
7:55 AM	11	3	9	0	2	2	2	0	0	16	15	0	10	18	0	0	88	836
8:00 AM	7	1	8	0	2	1	3	0	0	15	21	0	6	19	1	0	84	881
8:05 AM	8	0	2	0	1	4	3	0	0	12	6	1	8	10	0	0	55	888
8:10 AM	2	1	2	0	1	0	1	0	0	14	11	0	4	19	0	0	55	885
8:15 AM	5	0	1	0	1	2	1	0	0	12	6	0	4	17	1	0	50	884
8:20 AM	5	0	4	0	1	3	2	0	0	7	6	0	2	18	0	0	48	879
8:25 AM	1	0	6	0	1	0	2	0	0	10	3	0	2	11	0	0	36	869
8:30 AM	1	0	1	0	0	1	2	0	1	8	9	0	3	18	0	0	44	849
8:35 AM	8	0	2	0	0	3	0	0	1	9	8	0	6	16	0	0	53	833
8:40 AM	4	1	5	0	0	1	1	0	0	7	6	0	3	15	1	0	44	772
8:45 AM	12	0	1	0	1	1	2	0	1	16	4	0	4	16	0	0	58	725
8:50 AM	11	0	3	0	1	0	2	0	0	13	4	0	8	22	0	0	64	679
8:55 AM	8	0	4	0	0	1	2	0	1	12	6	0	2	32	1	0	69	660

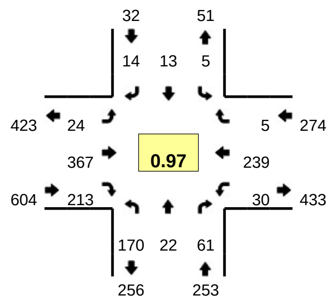
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	148	12	160	0	8	44	24	0	4	176	228	4	148	320	4	0	1280
Heavy Trucks	8	0	4		0	0	0		0	0	4		0	4	0		20
Pedestrians		8				0				0				0			8
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

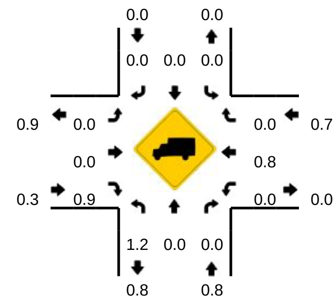
Report generated on 2/28/2014 10:33 AM   SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

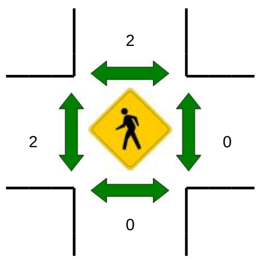
LOCATION: NW Parker St -- NW Lake Rd | **QC JOB #:** 12426904

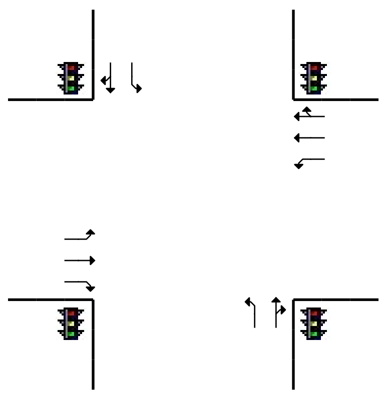
CITY/STATE: Camas, WA | **DATE:** Thu, Feb 20 2014

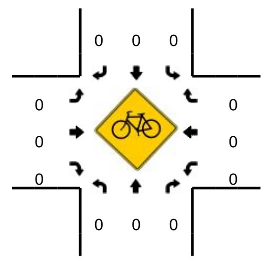


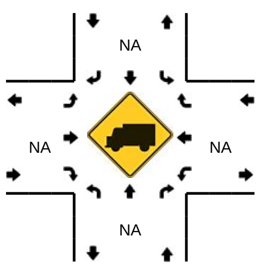
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:30 PM -- 5:45 PM

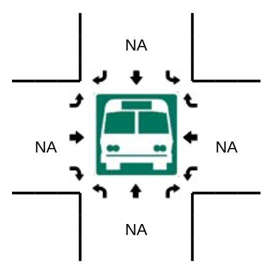










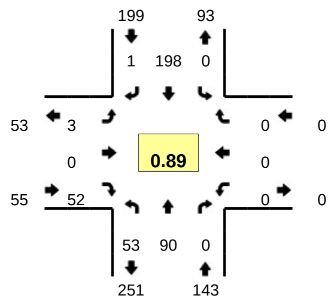


5-Min Count Period Beginning At	NW Parker St (Northbound) Left	Thru	Right	U	NW Parker St (Southbound) Left	Thru	Right	U	NW Lake Rd (Eastbound) Left	Thru	Right	U	NW Lake Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	11	3	3	0	3	1	2	0	0	27	8	0	5	18	0	0	81	
4:05 PM	9	1	7	0	1	5	1	0	2	27	7	0	1	26	0	0	87	
4:10 PM	9	1	6	0	0	0	1	0	2	24	9	1	3	20	0	0	76	
4:15 PM	7	2	7	0	0	1	1	0	2	22	7	0	5	14	2	0	70	
4:20 PM	6	4	5	0	0	0	1	0	2	33	10	0	5	18	1	0	85	
4:25 PM	7	2	2	0	0	0	1	0	1	32	9	2	2	20	0	0	78	
4:30 PM	9	2	1	0	0	0	2	0	0	24	12	0	2	21	0	0	73	
4:35 PM	7	0	2	0	0	0	2	0	1	34	14	0	6	25	0	0	91	
4:40 PM	6	1	3	0	0	2	1	0	1	26	7	0	3	26	0	0	76	
4:45 PM	9	1	7	0	0	1	2	0	2	31	16	0	3	16	0	0	88	
4:50 PM	24	1	1	0	0	1	1	0	2	34	22	0	0	16	0	0	102	
4:55 PM	17	3	5	0	1	2	0	0	5	31	15	0	3	14	1	0	97	1004
5:00 PM	12	1	4	0	2	1	5	0	3	35	11	0	0	24	0	0	98	1021
5:05 PM	11	1	3	0	0	1	0	0	1	24	17	0	1	29	0	0	88	1022
5:10 PM	17	2	8	0	0	0	1	0	4	26	20	0	5	19	0	0	102	1048
5:15 PM	18	2	3	0	0	0	0	0	3	38	10	0	0	17	0	0	91	1069
5:20 PM	13	3	9	0	0	1	1	0	1	23	20	0	3	24	1	0	99	1083
5:25 PM	15	2	4	0	1	3	1	0	0	37	15	0	3	14	2	0	97	1102
5:30 PM	10	4	6	0	0	0	3	0	1	32	22	0	3	21	1	0	103	1132
5:35 PM	13	2	4	0	0	2	0	0	0	28	22	0	1	25	0	0	97	1138
5:40 PM	11	0	7	0	1	1	0	0	2	28	23	0	8	20	0	0	101	1163
5:45 PM	16	1	3	0	0	0	2	0	0	22	18	0	2	20	1	0	85	1160
5:50 PM	18	1	3	0	0	0	4	0	2	24	8	0	1	20	0	0	81	1139
5:55 PM	18	2	3	0	1	1	0	0	5	30	8	1	3	17	0	0	89	1131

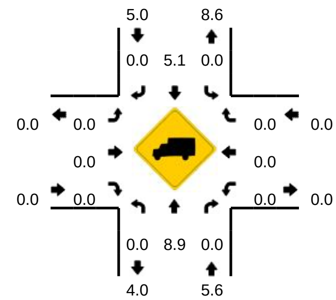
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	136	24	68	0	4	12	12	0	12	352	268	0	48	264	4	0	1204
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	4	0		4
Pedestrians		0				0				8				0			8
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

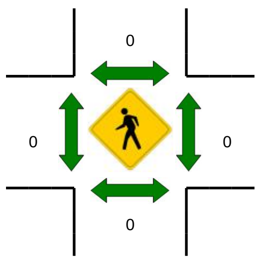
Comments:

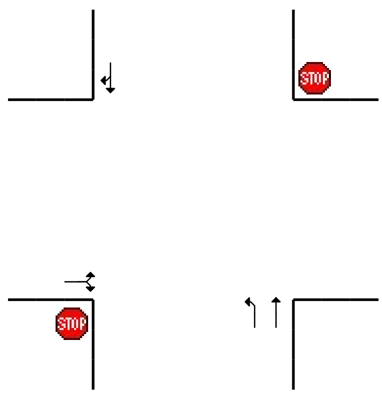
LOCATION: NE Everett St -- SE Leadbetter Rd **QC JOB #:** 12426901
CITY/STATE: Camas, WA **DATE:** Thu, Feb 20 2014

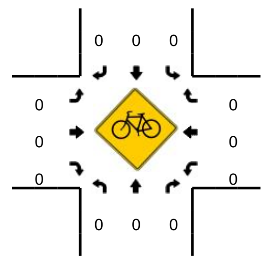


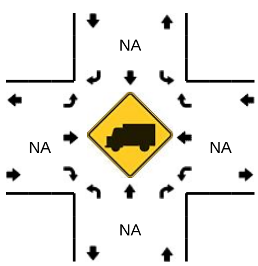
Peak-Hour: 7:05 AM -- 8:05 AM
Peak 15-Min: 7:10 AM -- 7:25 AM

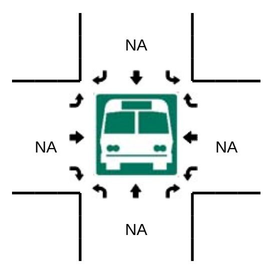












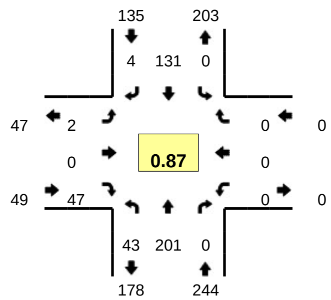
5-Min Count Period Beginning At	NE Everett St (Northbound) Left	Thru	Right	U	NE Everett St (Southbound) Left	Thru	Right	U	SE Leadbetter Rd (Eastbound) Left	Thru	Right	U	SE Leadbetter Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
7:00 AM	5	8	0	0	0	7	0	0	0	0	3	0	0	0	0	0	23	
7:05 AM	1	6	0	0	0	15	0	0	1	0	4	0	0	0	0	0	27	
7:10 AM	6	7	0	0	0	20	0	0	0	0	8	0	0	0	0	0	41	
7:15 AM	6	4	0	0	0	12	0	0	1	0	4	0	0	0	0	0	27	
7:20 AM	4	5	0	1	0	28	0	0	0	0	5	0	0	0	0	0	43	
7:25 AM	5	7	0	0	0	12	0	0	1	0	4	0	0	0	0	0	29	
7:30 AM	4	6	0	0	0	12	1	0	0	0	4	0	0	0	0	0	27	
7:35 AM	3	9	0	0	0	20	0	0	0	0	2	0	0	0	0	0	34	
7:40 AM	5	10	0	0	0	15	0	0	0	0	3	0	0	0	0	0	33	
7:45 AM	8	4	0	0	0	23	0	0	0	0	6	0	0	0	0	0	41	
7:50 AM	2	12	0	0	0	17	0	0	0	0	5	0	0	0	0	0	36	
7:55 AM	5	12	0	0	0	14	0	0	0	0	1	0	0	0	0	0	32	393
8:00 AM	3	8	0	0	0	10	0	0	0	0	6	0	0	0	0	0	27	397
8:05 AM	1	14	0	0	0	6	0	0	0	0	4	0	0	0	0	0	25	395
8:10 AM	0	6	0	0	0	8	0	0	0	0	5	0	0	0	0	0	19	373
8:15 AM	2	5	0	0	0	15	0	0	1	0	1	0	0	0	0	0	24	370
8:20 AM	2	8	0	0	0	7	0	0	1	0	2	0	0	0	0	0	20	347
8:25 AM	0	11	0	0	0	15	0	0	0	0	3	0	0	0	0	0	29	347
8:30 AM	1	17	0	0	0	13	0	0	0	0	1	0	0	0	0	0	32	352
8:35 AM	1	17	0	0	0	18	0	0	1	0	1	0	0	0	0	0	38	356
8:40 AM	1	20	0	0	0	23	0	0	2	0	2	0	0	0	0	0	48	371
8:45 AM	3	6	0	0	0	32	0	0	1	0	2	0	0	0	0	0	44	374
8:50 AM	2	21	0	0	0	17	1	0	1	0	4	0	0	0	0	0	45	383
8:55 AM	1	3	0	0	0	20	1	0	0	0	2	0	0	0	0	0	27	378

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	64	64	0	4	0	240	0	0	4	0	68	0	0	0	0	0	444
Heavy Trucks	0	4	0		0	32	0		0	0	0		0	0	0		36
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

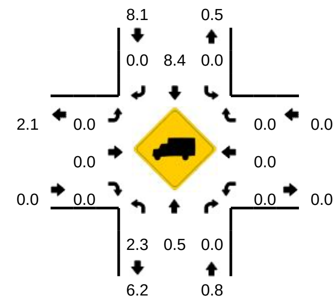
Comments:

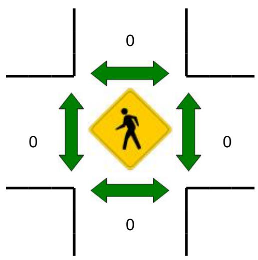
Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

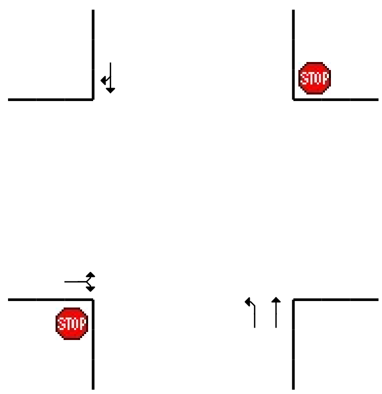
LOCATION: NE Everett St -- SE Leadbetter Rd | **QC JOB #:** 12426902
CITY/STATE: Camas, WA | **DATE:** Thu, Feb 20 2014

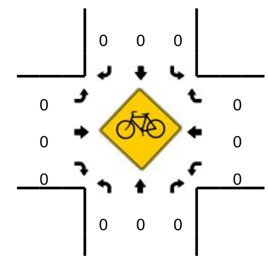


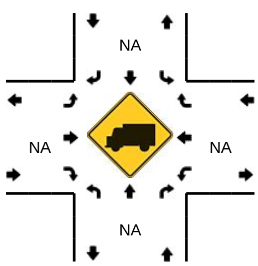
Peak-Hour: 4:00 PM -- 5:00 PM
Peak 15-Min: 4:20 PM -- 4:35 PM

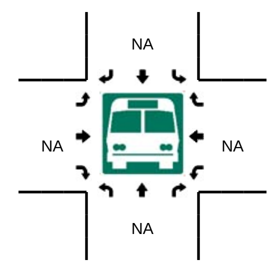












5-Min Count Period Beginning At	NE Everett St (Northbound) Left	Thru	Right	U	NE Everett St (Southbound) Left	Thru	Right	U	SE Leadbetter Rd (Eastbound) Left	Thru	Right	U	SE Leadbetter Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	2	14	0	0	0	11	0	0	0	0	6	0	0	0	0	0	33	
4:05 PM	6	19	0	0	0	10	0	0	0	0	4	0	0	0	0	0	39	
4:10 PM	6	11	0	0	0	13	0	0	0	0	2	0	0	0	0	0	32	
4:15 PM	2	20	0	0	0	11	1	0	1	0	0	0	0	0	0	0	35	
4:20 PM	4	15	0	0	0	15	0	0	1	0	2	0	0	0	0	0	37	
4:25 PM	3	17	0	0	0	16	1	0	0	0	12	0	0	0	0	0	49	
4:30 PM	5	19	0	0	0	11	0	0	0	0	2	0	0	0	0	0	37	
4:35 PM	1	17	0	0	0	11	0	0	0	0	2	0	0	0	0	0	31	
4:40 PM	4	18	0	0	0	5	1	0	0	0	2	0	0	0	0	0	30	
4:45 PM	3	16	0	0	0	8	1	0	0	0	4	0	0	0	0	0	32	
4:50 PM	4	21	0	0	0	9	0	0	0	0	5	0	0	0	0	0	39	
4:55 PM	3	14	0	0	0	11	0	0	0	0	6	0	0	0	0	0	34	428
5:00 PM	4	12	0	0	0	8	0	0	0	0	1	0	0	0	0	0	25	420
5:05 PM	3	17	0	0	0	9	0	0	0	0	1	0	0	0	0	0	30	411
5:10 PM	5	18	0	0	0	8	0	0	0	0	4	0	0	0	0	0	35	414
5:15 PM	1	19	0	0	0	9	0	0	0	0	3	0	0	0	0	0	32	411
5:20 PM	4	16	0	0	0	10	0	0	0	0	6	0	0	0	0	0	36	410
5:25 PM	2	17	0	0	0	8	0	0	0	0	3	0	0	0	0	0	30	391
5:30 PM	3	12	0	0	0	8	0	0	0	0	2	0	0	0	0	0	25	379
5:35 PM	3	26	0	0	0	10	0	0	0	0	3	0	0	0	0	0	42	390
5:40 PM	4	17	0	0	0	8	0	0	0	0	3	0	0	0	0	0	32	392
5:45 PM	1	11	0	0	0	14	1	0	0	0	3	0	0	0	0	0	30	390
5:50 PM	1	12	0	0	0	12	0	0	0	0	7	0	0	0	0	0	32	383
5:55 PM	2	20	0	0	0	6	0	0	0	0	2	0	0	0	0	0	30	379

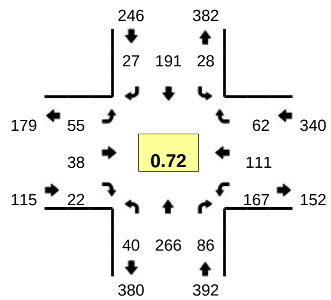
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	48	204	0	0	0	168	4	0	4	0	64	0	0	0	0	0	492
Heavy Trucks	0	0	0		0	32	0		0	0	0		0	0	0		32
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

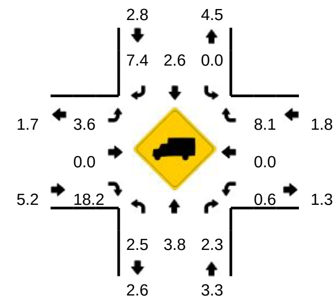
Comments:

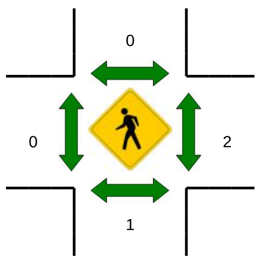
Type of peak hour being reported: System Peak | Method for determining peak hour: Total Entering Volume

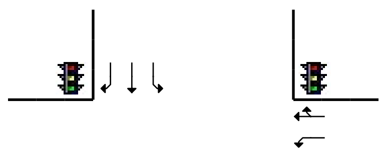
LOCATION: NW Parker St -- NW 38th Ave | **QC JOB #:** 12470703
CITY/STATE: Camas, WA | **DATE:** Thu, Apr 03 2014

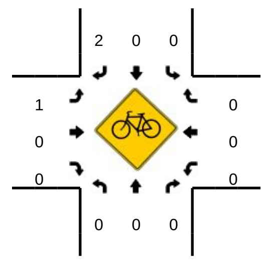
Peak-Hour: 7:05 AM -- 8:05 AM
Peak 15-Min: 7:40 AM -- 7:55 AM

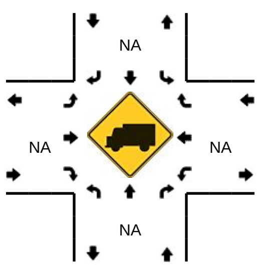


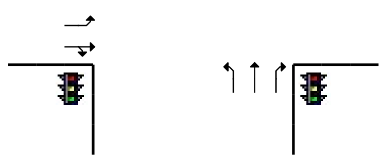


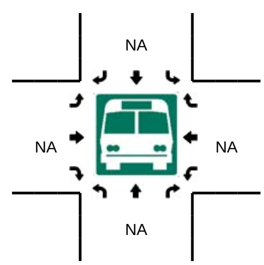












5-Min Count Period Beginning At	NW Parker St (Northbound) Left	Thru	Right	U	NW Parker St (Southbound) Left	Thru	Right	U	NW 38th Ave (Eastbound) Left	Thru	Right	U	NW 38th Ave (Westbound) Left	Thru	Right	U	Total	Hourly Totals
7:00 AM	5	12	2	0	2	10	5	0	1	1	1	0	11	8	1	0	59	
7:05 AM	2	9	7	0	0	7	1	0	3	2	1	0	11	10	1	0	54	
7:10 AM	4	17	8	0	0	10	2	0	2	2	1	0	10	6	2	0	64	
7:15 AM	3	10	7	0	0	10	1	0	2	3	0	0	14	6	1	0	57	
7:20 AM	1	11	1	0	0	8	0	0	1	4	1	0	16	9	1	0	53	
7:25 AM	4	16	6	0	2	8	1	0	1	4	2	0	12	7	1	0	64	
7:30 AM	4	24	5	0	0	14	3	0	2	5	4	0	9	7	5	0	82	
7:35 AM	8	18	6	0	1	14	2	0	10	6	1	0	13	15	8	0	102	
7:40 AM	3	40	4	0	4	13	3	0	5	0	4	0	12	11	11	0	110	
7:45 AM	3	44	3	0	4	23	4	0	9	4	1	1	9	8	9	0	122	
7:50 AM	3	37	17	0	4	30	3	0	6	4	1	0	16	7	17	0	145	
7:55 AM	3	20	16	0	3	33	6	0	7	2	4	0	23	12	5	0	134	1046
8:00 AM	2	20	6	0	10	21	1	0	6	2	2	0	22	13	1	0	106	1093
8:05 AM	6	14	7	0	1	15	1	0	1	2	0	0	16	17	4	0	84	1123
8:10 AM	2	14	3	0	2	10	1	0	2	5	0	0	6	6	0	0	51	1110
8:15 AM	2	8	6	0	1	11	0	0	5	5	5	0	11	6	1	0	61	1114
8:20 AM	4	9	2	0	0	13	3	0	3	2	0	0	8	6	0	0	50	1111
8:25 AM	4	14	6	0	1	11	1	0	2	2	1	0	16	8	2	0	68	1115
8:30 AM	0	13	4	0	1	4	2	0	4	1	0	0	8	5	1	0	43	1076
8:35 AM	5	8	8	0	1	8	1	0	4	3	0	0	11	12	2	0	63	1037
8:40 AM	5	12	11	0	0	8	1	0	3	4	2	0	12	9	0	0	67	994
8:45 AM	3	6	9	0	1	5	1	0	3	6	0	0	11	11	2	0	58	930
8:50 AM	3	12	13	0	2	7	2	0	0	10	1	0	11	15	1	0	77	862
8:55 AM	5	9	12	0	0	7	1	0	1	5	4	0	26	12	0	0	82	810

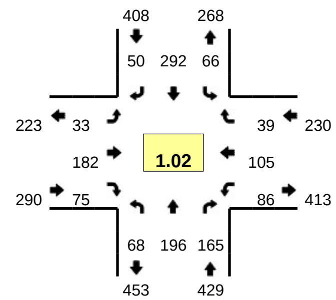
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	36	484	96	0	48	264	40	0	80	32	24	4	148	104	148	0	1508
Heavy Trucks	0	20	4		0	4	4		0	0	4		0	0	8		44
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	1		0	0	0		0	0	0		1
Railroad																	
Stopped Buses																	

Comments:

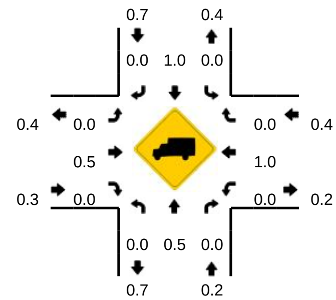
Type of peak hour being reported: System Peak | Method for determining peak hour: Total Entering Volume

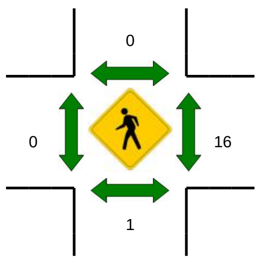
LOCATION: NW Parker St -- NW 38th Ave | **QC JOB #:** 12470704

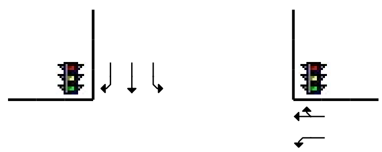
CITY/STATE: Camas, WA | **DATE:** Wed, Apr 02 2014

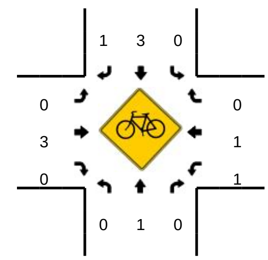


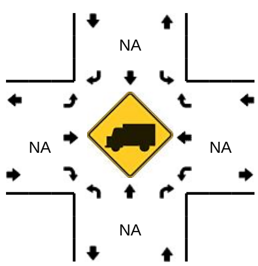
Peak-Hour: 4:50 PM -- 5:50 PM
Peak 15-Min: 5:30 PM -- 5:45 PM

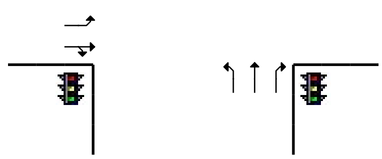


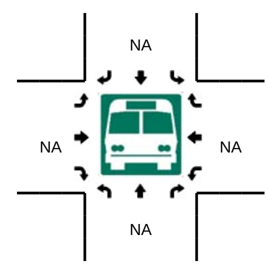












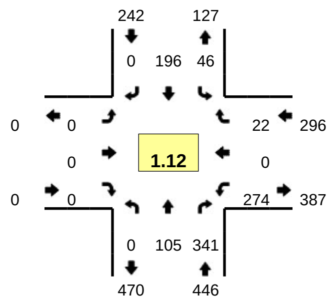
5-Min Count Period Beginning At	NW Parker St (Northbound) Left	Thru	Right	U	NW Parker St (Southbound) Left	Thru	Right	U	NW 38th Ave (Eastbound) Left	Thru	Right	U	NW 38th Ave (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	4	16	11	0	1	15	3	0	2	6	1	0	5	8	2	0	74	
4:05 PM	2	10	13	0	3	15	0	0	4	15	2	0	6	8	3	0	81	
4:10 PM	4	14	14	0	2	11	2	0	3	16	3	0	8	7	3	0	87	
4:15 PM	5	15	13	0	2	13	6	0	2	10	1	0	9	5	5	0	86	
4:20 PM	3	20	12	0	3	9	0	0	1	16	7	0	6	6	3	0	86	
4:25 PM	3	29	12	0	3	12	2	0	6	13	7	0	2	8	7	0	104	
4:30 PM	5	30	11	0	2	13	2	0	7	16	1	0	2	6	9	0	104	
4:35 PM	4	17	13	0	4	24	2	0	5	11	5	0	11	10	6	0	112	
4:40 PM	3	33	19	0	8	31	2	0	4	12	5	0	14	14	3	0	148	
4:45 PM	3	25	8	0	10	27	4	0	3	18	4	0	10	9	8	0	129	
4:50 PM	9	22	14	0	9	45	2	0	2	7	5	0	7	18	3	0	143	
4:55 PM	4	16	7	0	9	41	3	0	2	8	10	0	2	7	5	0	114	1268
5:00 PM	6	13	15	0	11	17	4	0	1	14	4	0	8	15	5	0	113	1307
5:05 PM	3	10	13	0	3	27	1	0	2	16	6	0	6	2	1	0	90	1316
5:10 PM	7	13	12	0	5	23	4	0	4	22	6	0	10	11	4	0	121	1350
5:15 PM	4	20	19	0	1	20	4	0	3	19	8	0	6	9	5	0	118	1382
5:20 PM	9	23	11	0	4	22	9	0	5	13	5	0	9	6	2	0	118	1414
5:25 PM	2	21	9	0	10	14	7	0	4	18	6	0	7	12	1	0	111	1421
5:30 PM	7	21	13	0	2	25	5	0	3	14	4	0	9	9	2	0	114	1431
5:35 PM	4	16	15	0	3	17	3	0	3	17	11	0	9	3	3	0	104	1423
5:40 PM	5	12	18	0	4	27	3	0	3	19	5	0	5	7	5	0	113	1388
5:45 PM	8	9	19	0	5	14	5	0	1	15	5	0	8	6	3	0	98	1357
5:50 PM	6	11	13	0	4	15	5	0	1	11	4	0	14	9	2	0	95	1309
5:55 PM	0	12	11	0	5	12	2	0	4	20	6	0	8	7	0	0	87	1282

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	64	196	184	0	36	276	44	0	36	200	80	0	92	76	40	0	1324
Heavy Trucks	0	0	0		0	0	0		0	0	0		0	0	0		0
Pedestrians		0				0				0				20			20
Bicycles	0	0	0		0	1	0		0	0	0		0	0	0		1
Railroad																	
Stopped Buses																	

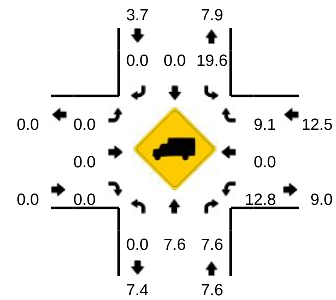
Comments:

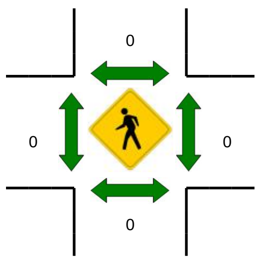
Type of peak hour being reported: System Peak | Method for determining peak hour: Total Entering Volume

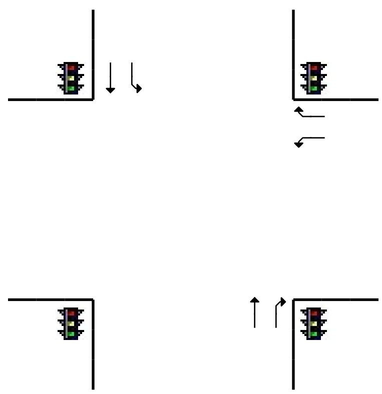
LOCATION: NE Everett St -- NE 43rd Ave | **QC JOB #:** 12470701
CITY/STATE: Camas, WA | **DATE:** Thu, Apr 03 2014

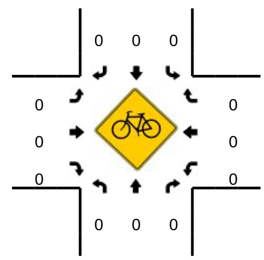


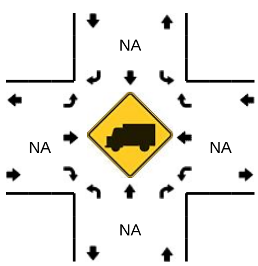
Peak-Hour: 7:05 AM -- 8:05 AM
Peak 15-Min: 7:40 AM -- 7:55 AM

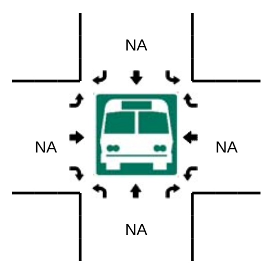












5-Min Count Period Beginning At	NE Everett St (Northbound) Left	Thru	Right	U	NE Everett St (Southbound) Left	Thru	Right	U	NE 43rd Ave (Eastbound) Left	Thru	Right	U	NE 43rd Ave (Westbound) Left	Thru	Right	U	Total	Hourly Totals
7:00 AM	0	6	28	0	2	12	0	0	0	0	0	0	7	0	1	0	56	
7:05 AM	0	11	44	0	3	10	0	0	0	0	0	0	9	0	1	0	78	
7:10 AM	0	5	55	0	7	11	0	0	0	0	0	0	14	0	2	0	94	
7:15 AM	0	10	45	0	5	19	0	0	0	0	0	0	29	0	1	0	109	
7:20 AM	0	4	59	0	14	17	0	0	0	0	0	0	26	0	1	0	121	
7:25 AM	0	8	46	0	10	16	0	0	0	0	0	0	37	0	2	0	119	
7:30 AM	0	7	26	0	2	17	0	0	0	0	0	0	34	0	2	0	88	
7:35 AM	0	11	10	0	0	24	0	0	0	0	0	0	29	0	5	0	79	
7:40 AM	0	8	19	0	2	15	0	0	0	0	0	0	48	0	5	0	97	
7:45 AM	0	11	11	0	0	26	0	0	0	0	0	0	27	0	2	0	77	
7:50 AM	0	13	5	0	1	15	0	0	0	0	0	0	11	0	0	0	45	
7:55 AM	0	11	12	0	0	20	0	0	0	0	0	0	5	0	1	0	49	1012
8:00 AM	0	6	9	0	2	6	0	0	0	0	0	0	5	0	0	0	28	984
8:05 AM	0	8	6	0	0	10	0	0	0	0	0	0	3	0	0	0	27	933
8:10 AM	0	5	2	0	0	6	0	0	0	0	0	0	3	0	2	0	18	857
8:15 AM	0	11	7	0	0	14	0	0	0	0	0	0	3	0	0	0	35	783
8:20 AM	0	5	9	0	1	15	0	0	0	0	0	0	2	0	0	0	32	694
8:25 AM	0	3	9	0	0	16	0	0	0	0	0	0	3	0	1	0	32	607
8:30 AM	0	7	6	0	1	11	0	0	0	0	0	0	9	0	1	0	35	554
8:35 AM	0	4	6	0	1	11	0	0	0	0	0	0	10	0	1	0	33	508
8:40 AM	0	5	7	0	4	13	0	0	0	0	0	0	10	0	1	0	40	451
8:45 AM	0	5	6	0	2	10	0	0	0	0	0	0	13	0	2	0	38	412
8:50 AM	0	8	7	0	1	23	0	0	0	0	0	0	15	0	2	0	56	423
8:55 AM	0	12	6	0	0	14	0	0	0	0	0	0	14	0	3	0	49	423

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	128	140	0	12	224	0	0	0	0	0	0	344	0	28	0	876
Heavy Trucks	0	8	16		0	0	0		0	0	0		24	0	0		48
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

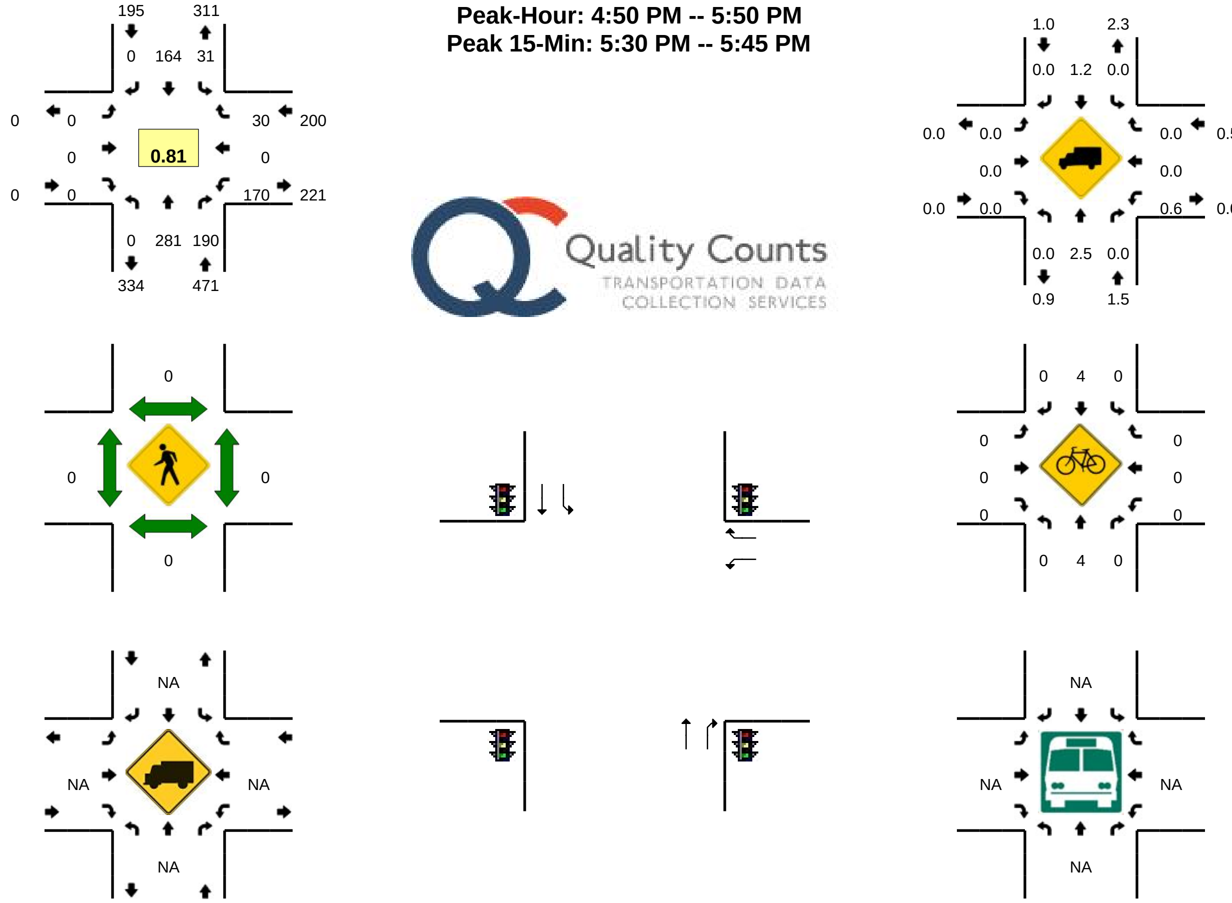
Comments:

Report generated on 4/7/2014 4:44 PM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: System Peak | Method for determining peak hour: Total Entering Volume

LOCATION: NE Everett St -- NE 43rd Ave | **QC JOB #:** 12470702
CITY/STATE: Camas, WA | **DATE:** Wed, Apr 02 2014

Peak-Hour: 4:50 PM -- 5:50 PM
Peak 15-Min: 5:30 PM -- 5:45 PM



5-Min Count Period Beginning At	NE Everett St (Northbound) Left	Thru	Right	U	NE Everett St (Southbound) Left	Thru	Right	U	NE 43rd Ave (Eastbound) Left	Thru	Right	U	NE 43rd Ave (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	0	23	14	0	2	14	0	0	0	0	0	0	17	0	2	0	72	
4:05 PM	0	19	10	0	3	6	0	0	0	0	0	0	14	0	0	0	52	
4:10 PM	0	24	16	0	5	18	0	0	0	0	0	0	8	0	3	0	74	
4:15 PM	0	22	10	0	0	15	0	0	0	0	0	0	13	0	0	0	60	
4:20 PM	0	21	12	0	2	11	0	0	0	0	0	0	11	0	1	0	58	
4:25 PM	0	20	10	0	3	17	0	0	0	0	0	0	7	0	3	0	60	
4:30 PM	0	16	11	0	3	17	0	0	0	0	0	0	13	0	6	0	66	
4:35 PM	0	22	14	0	2	23	0	0	0	0	0	0	13	0	1	0	75	
4:40 PM	0	15	6	0	1	24	0	0	0	0	0	0	10	0	0	0	56	
4:45 PM	0	16	8	0	1	20	0	0	0	0	0	0	10	0	1	0	56	
4:50 PM	0	32	14	0	1	13	0	0	0	0	0	0	9	0	3	0	72	
4:55 PM	0	21	18	0	1	7	0	0	0	0	0	0	10	0	1	0	58	759
5:00 PM	0	17	20	0	3	16	0	0	0	0	0	0	7	0	0	0	63	750
5:05 PM	0	22	17	0	1	14	0	0	0	0	0	0	9	0	1	0	64	762
5:10 PM	0	25	15	0	1	5	0	0	0	0	0	0	12	0	1	0	59	747
5:15 PM	0	30	15	0	5	15	0	0	0	0	0	0	9	0	1	0	75	762
5:20 PM	0	24	21	0	2	11	0	0	0	0	0	0	8	0	1	0	67	771
5:25 PM	0	27	6	0	2	6	0	0	0	0	0	0	7	0	1	0	49	760
5:30 PM	0	25	15	0	5	22	0	0	0	0	0	0	21	0	9	0	97	791
5:35 PM	0	19	16	0	3	19	0	0	0	0	0	0	22	0	2	0	81	797
5:40 PM	0	18	13	0	4	17	0	0	0	0	0	0	33	0	4	0	89	830
5:45 PM	0	21	20	0	3	19	0	0	0	0	0	0	23	0	6	0	92	866
5:50 PM	0	19	17	0	2	16	0	0	0	0	0	0	34	0	7	0	95	889
5:55 PM	0	15	11	0	1	11	0	0	0	0	0	0	19	0	1	0	58	889

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	248	176	0	48	232	0	0	0	0	0	0	304	0	60	0	1068
Heavy Trucks	0	4	0		0	4	0		0	0	0		0	0	0		8
Pedestrians		0				0				0				0			0
Bicycles	0	1	0		0	3	0		0	0	0		0	0	0		4
Railroad																	
Stopped Buses																	

Comments:

Appendix D Existing Conditions Worksheets

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	53	179	13	183	152	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	62	208	15	213	177	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			270		409	166
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			270		409	166
tC, single (s)			4.1		6.4	7.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	4.2
p0 queue free %			99		70	100
cM capacity (veh/h)			1305		588	677

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	270	228	178
Volume Left	0	15	177
Volume Right	208	0	1
cSH	1700	1305	589
Volume to Capacity	0.16	0.01	0.30
Queue Length 95th (ft)	0	1	32
Control Delay (s)	0.0	0.6	13.7
Lane LOS		A	B
Approach Delay (s)	0.0	0.6	13.7
Approach LOS			B

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	35.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	168	212	260	68	544	288
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8		5.4		5.7	5.4
Lane Util. Factor	1.00		1.00		1.00	1.00
Frt	0.92		0.97		1.00	1.00
Flt Protected	0.98		1.00		0.95	1.00
Satd. Flow (prot)	1603		1644		1805	1881
Flt Permitted	0.98		1.00		0.28	1.00
Satd. Flow (perm)	1603		1644		535	1881
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	168	212	260	68	544	288
RTOR Reduction (vph)	30	0	8	0	0	0
Lane Group Flow (vph)	350	0	320	0	544	288
Heavy Vehicles (%)	0%	13%	14%	6%	0%	1%
Turn Type					pm+pt	
Protected Phases	6		4		3	8
Permitted Phases					8	
Actuated Green, G (s)	24.8		22.4		48.0	48.0
Effective Green, g (s)	24.8		22.4		48.0	48.0
Actuated g/C Ratio	0.30		0.27		0.57	0.57
Clearance Time (s)	5.8		5.4		5.7	5.4
Vehicle Extension (s)	1.0		1.0		1.0	1.0
Lane Grp Cap (vph)	473		438		607	1075
v/s Ratio Prot	c0.22		0.19		c0.21	0.15
v/s Ratio Perm					c0.30	
v/c Ratio	0.74		0.73		0.90	0.27
Uniform Delay, d1	26.7		28.1		13.7	9.1
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	5.4		5.3		15.4	0.0
Delay (s)	32.1		33.4		29.1	9.2
Level of Service	C		C		C	A
Approach Delay (s)	32.1		33.4			22.2
Approach LOS	C		C			C

Intersection Summary			
HCM Average Control Delay	27.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	84.0	Sum of lost time (s)	11.5
Intersection Capacity Utilization	84.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	105	279	100	223	1	84	2	28	2	5	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			1.00			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.90			1.00			0.97			0.97	
Flt Protected		1.00			0.98			0.96			0.99	
Satd. Flow (prot)		1676			1770			1589			1486	
Flt Permitted		1.00			0.74			0.77			0.95	
Satd. Flow (perm)		1675			1332			1275			1424	
Peak-hour factor, PHF	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Adj. Flow (vph)	2	159	423	152	338	2	127	3	42	3	8	3
RTOR Reduction (vph)	0	104	0	0	0	0	0	14	0	0	2	0
Lane Group Flow (vph)	0	481	0	0	492	0	0	158	0	0	12	0
Confl. Peds. (#/hr)	1					1						
Heavy Vehicles (%)	100%	7%	0%	8%	4%	100%	11%	0%	14%	0%	40%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		30.5			30.5			12.7			12.7	
Effective Green, g (s)		30.5			30.5			12.7			12.7	
Actuated g/C Ratio		0.60			0.60			0.25			0.25	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		998			793			316			353	
v/s Ratio Prot												
v/s Ratio Perm		0.29			c0.37			c0.12			0.01	
v/c Ratio		0.48			0.62			0.50			0.03	
Uniform Delay, d1		5.9			6.6			16.5			14.6	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.4			1.5			1.2			0.0	
Delay (s)		6.2			8.2			17.8			14.6	
Level of Service		A			A			B			B	
Approach Delay (s)		6.2			8.2			17.8			14.6	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM Average Control Delay	8.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	51.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	52	64	209	104	36	169
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	58	72	235	117	40	190
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	352				482	293
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	352				482	293
tC, single (s)	4.2				6.5	6.2
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.3
p0 queue free %	95				92	74
cM capacity (veh/h)	1175				506	739

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	130	352	40	190
Volume Left	58	0	40	0
Volume Right	0	117	0	190
cSH	1175	1700	506	739
Volume to Capacity	0.05	0.21	0.08	0.26
Queue Length 95th (ft)	4	0	6	26
Control Delay (s)	3.9	0.0	12.7	11.5
Lane LOS	A		B	B
Approach Delay (s)	3.9	0.0	11.8	
Approach LOS			B	

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	36.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	58	41	4	234	0	64	1	3	0	2	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	63	45	4	254	0	70	1	3	0	2	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	254			108			356	351	85	354	373	254
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	254			108			356	351	85	354	373	254
tC, single (s)	4.1			4.3			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.4			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			88	100	100	100	100	99
cM capacity (veh/h)	1322			1351			592	575	979	600	558	789

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	109	259	74	7
Volume Left	1	4	70	0
Volume Right	45	0	3	4
cSH	1322	1351	603	694
Volume to Capacity	0.00	0.00	0.12	0.01
Queue Length 95th (ft)	0	0	10	1
Control Delay (s)	0.1	0.2	11.8	10.2
Lane LOS	A	A	B	B
Approach Delay (s)	0.1	0.2	11.8	10.2
Approach LOS			B	B

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	31.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	8	65	0	0	189	48	1	0	0	61	1	57
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Hourly flow rate (vph)	10	84	0	0	245	62	1	0	0	79	1	74
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	308			84			456	413	84	382	382	277
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	308			84			456	413	84	382	382	277
tC, single (s)	4.3			4.1			8.1	6.5	6.2	7.2	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.4			2.2			4.4	4.0	3.3	3.6	4.0	3.4
p0 queue free %	99			100			100	100	100	86	100	90
cM capacity (veh/h)	1133			1525			341	528	980	558	549	741

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	95	308	1	155
Volume Left	10	0	1	79
Volume Right	0	62	0	74
cSH	1133	1525	341	633
Volume to Capacity	0.01	0.00	0.00	0.24
Queue Length 95th (ft)	1	0	0	24
Control Delay (s)	1.0	0.0	15.6	12.5
Lane LOS	A		C	B
Approach Delay (s)	1.0	0.0	15.6	12.5
Approach LOS			C	B

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	25.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	358	224	0	0	258	38	0	0	1	22	0	288
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	0.95			0.95			1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00			0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00			1.00			1.00	1.00
Frt	1.00	1.00			0.98			0.86			1.00	0.85
Flt Protected	0.95	1.00			1.00			1.00			0.95	1.00
Satd. Flow (prot)	1671	3505			3438			1623			1804	1491
Flt Permitted	0.95	1.00			1.00			1.00			1.00	1.00
Satd. Flow (perm)	1671	3505			3438			1623			1899	1491
Peak-hour factor, PHF	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Adj. Flow (vph)	597	373	0	0	430	63	0	0	2	37	0	480
RTOR Reduction (vph)	0	0	0	0	13	0	0	2	0	0	0	92
Lane Group Flow (vph)	597	373	0	0	480	0	0	0	0	0	37	388
Confl. Peds. (#/hr)							4		1	1		4
Heavy Vehicles (%)	8%	3%	0%	0%	3%	3%	0%	0%	0%	0%	0%	8%
Turn Type	Prot			Prot			Perm			Perm		pm+ov
Protected Phases	7	4		3	8			2			6	7
Permitted Phases							2			6		6
Actuated Green, G (s)	17.8	33.3			11.5			2.6			2.6	20.4
Effective Green, g (s)	17.8	33.3			11.5			2.6			2.6	20.4
Actuated g/C Ratio	0.41	0.76			0.26			0.06			0.06	0.46
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	678	2659			901			96			112	829
v/s Ratio Prot	c0.36	0.11			c0.14			0.00				c0.19
v/s Ratio Perm											0.02	0.07
v/c Ratio	0.88	0.14			0.53			0.00			0.33	0.47
Uniform Delay, d1	12.1	1.4			13.9			19.4			19.8	8.0
Progression Factor	1.00	1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2	12.8	0.0			0.6			0.0			1.7	0.4
Delay (s)	24.8	1.5			14.5			19.4			21.5	8.5
Level of Service	C	A			B			B			C	A
Approach Delay (s)		15.8			14.5			19.4			9.4	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM Average Control Delay	13.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	43.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	48.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	4	157	143	98	221	4	106	8	81	13	31	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.86		1.00	0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1881	1532	1805	3529		1735	1612		1805	1772	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.71	1.00		0.67	1.00	
Satd. Flow (perm)	1805	1881	1532	1805	3529		1291	1612		1281	1772	
Peak-hour factor, PHF	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Adj. Flow (vph)	6	228	207	142	320	6	154	12	117	19	45	32
RTOR Reduction (vph)	0	0	133	0	1	0	0	90	0	0	24	0
Lane Group Flow (vph)	6	228	74	142	325	0	154	39	0	19	53	0
Confl. Peds. (#/hr)			4	4			1					1
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	1%	3%	0%	2%	0%	4%	0%	2%	0%	0%	0%
Turn Type	Prot		Perm	Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2			6		
Actuated Green, G (s)	0.9	17.1	17.1	7.7	23.9		11.3	11.3		11.3	11.3	
Effective Green, g (s)	0.9	17.1	17.1	7.7	23.9		11.3	11.3		11.3	11.3	
Actuated g/C Ratio	0.02	0.36	0.36	0.16	0.50		0.23	0.23		0.23	0.23	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	34	669	545	289	1753		303	379		301	416	
v/s Ratio Prot	0.00	c0.12		c0.08	0.09			0.02			0.03	
v/s Ratio Perm			0.05				c0.12			0.01		
v/c Ratio	0.18	0.34	0.14	0.49	0.19		0.51	0.10		0.06	0.13	
Uniform Delay, d1	23.2	11.4	10.5	18.4	6.7		16.0	14.4		14.3	14.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.5	0.3	0.1	1.3	0.1		1.3	0.1		0.1	0.1	
Delay (s)	25.7	11.7	10.6	19.7	6.8		17.3	14.6		14.4	14.6	
Level of Service	C	B	B	B	A		B	B		B	B	
Approach Delay (s)		11.4			10.7			16.1			14.6	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	12.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	48.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	38.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	3	52	53	90	198	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	3	58	60	101	222	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				358		
pX, platoon unblocked						
vC, conflicting volume	443	223	224			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	443	223	224			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	93	96			
cM capacity (veh/h)	550	822	1357			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	62	60	101	224
Volume Left	3	60	0	0
Volume Right	58	0	0	1
cSH	800	1357	1700	1700
Volume to Capacity	0.08	0.04	0.06	0.13
Queue Length 95th (ft)	6	3	0	0
Control Delay (s)	9.9	7.8	0.0	0.0
Lane LOS	A	A		
Approach Delay (s)	9.9	2.9		0.0
Approach LOS	A			

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	27.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	53	38	21	172	118	65	44	271	86	29	199	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00	0.98	1.00	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	0.95		1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1736	1671		1787	1749		1805	1827	1546	1751	1845	1509
Flt Permitted	0.60	1.00		0.46	1.00		0.47	1.00	1.00	0.40	1.00	1.00
Satd. Flow (perm)	1091	1671		865	1749		893	1827	1546	746	1845	1509
Peak-hour factor, PHF	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Adj. Flow (vph)	76	54	30	246	169	93	63	387	123	41	284	39
RTOR Reduction (vph)	0	26	0	0	29	0	0	0	78	0	0	26
Lane Group Flow (vph)	76	58	0	246	233	0	63	387	46	41	284	13
Confl. Peds. (#/hr)			1	1					3	3		
Heavy Vehicles (%)	4%	0%	19%	1%	0%	8%	0%	4%	2%	3%	3%	7%
Turn Type	pm+pt			pm+pt			pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	10.4	7.6		20.4	13.6		21.5	18.7	18.7	19.3	17.6	17.6
Effective Green, g (s)	10.4	7.6		20.4	13.6		21.5	18.7	18.7	19.3	17.6	17.6
Actuated g/C Ratio	0.20	0.14		0.39	0.26		0.41	0.35	0.35	0.37	0.33	0.33
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
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)	249	241		488	451		412	647	548	305	615	503
v/s Ratio Prot	0.02	0.03		c0.08	c0.13		c0.01	c0.21		0.00	0.15	
v/s Ratio Perm	0.04			0.11			0.05		0.03	0.04		0.01
v/c Ratio	0.31	0.24		0.50	0.52		0.15	0.60	0.08	0.13	0.46	0.03
Uniform Delay, d1	17.8	20.0		11.7	16.8		9.7	14.0	11.3	11.1	13.9	11.8
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	0.7	0.5		0.8	1.0		0.2	1.5	0.1	0.2	0.6	0.0
Delay (s)	18.5	20.6		12.5	17.8		9.9	15.5	11.4	11.3	14.4	11.9
Level of Service	B	C		B	B		A	B	B	B	B	B
Approach Delay (s)		19.6			15.2			14.0			13.8	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	14.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	52.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	44.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	276	23	120	360	46	204
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1597	1482	1743	1509	1504	1900
Flt Permitted	0.95	1.00	1.00	1.00	0.48	1.00
Satd. Flow (perm)	1597	1482	1743	1509	756	1900
Peak-hour factor, PHF	0.72	0.72	0.72	0.72	0.72	0.72
Adj. Flow (vph)	383	32	167	500	64	283
RTOR Reduction (vph)	0	15	0	363	0	0
Lane Group Flow (vph)	383	17	167	137	64	283
Heavy Vehicles (%)	13%	9%	9%	7%	20%	0%
Turn Type		Perm		Perm	pm+pt	
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Actuated Green, G (s)	18.4	18.4	13.7	13.7	22.7	22.7
Effective Green, g (s)	18.4	18.4	13.7	13.7	22.7	22.7
Actuated g/C Ratio	0.37	0.37	0.27	0.27	0.45	0.45
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	587	544	477	413	402	861
v/s Ratio Prot	c0.24		0.10		0.01	c0.15
v/s Ratio Perm		0.01		0.09	0.06	
v/c Ratio	0.65	0.03	0.35	0.33	0.16	0.33
Uniform Delay, d1	13.2	10.1	14.6	14.5	8.1	8.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.6	0.0	0.4	0.5	0.2	0.2
Delay (s)	15.8	10.2	15.1	15.0	8.3	9.0
Level of Service	B	B	B	B	A	A
Approach Delay (s)	15.4		15.0			8.9
Approach LOS	B		B			A

Intersection Summary			
HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	50.1	Sum of lost time (s)	9.0
Intersection Capacity Utilization	34.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	159	144	7	98	149	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	175	158	8	108	164	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			333		377	254
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			333		377	254
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		74	99
cM capacity (veh/h)			1238		621	790

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	333	115	175
Volume Left	0	8	164
Volume Right	158	0	11
cSH	1700	1238	629
Volume to Capacity	0.20	0.01	0.28
Queue Length 95th (ft)	0	0	28
Control Delay (s)	0.0	0.6	12.9
Lane LOS		A	B
Approach Delay (s)	0.0	0.6	12.9
Approach LOS			B

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	32.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	192	108	584	220	140	344
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8		5.4		5.7	5.4
Lane Util. Factor	1.00		1.00		1.00	1.00
Frpb, ped/bikes	0.99		0.99		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.95		0.96		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1714		1785		1752	1881
Flt Permitted	0.97		1.00		0.15	1.00
Satd. Flow (perm)	1714		1785		271	1881
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	192	108	584	220	140	344
RTOR Reduction (vph)	15	0	7	0	0	0
Lane Group Flow (vph)	285	0	797	0	140	344
Confl. Peds. (#/hr)		2		8	8	
Heavy Vehicles (%)	2%	0%	1%	2%	3%	1%
Turn Type					pm+pt	
Protected Phases	6		4		3	8
Permitted Phases					8	
Actuated Green, G (s)	20.0		55.5		69.0	69.0
Effective Green, g (s)	20.0		55.5		69.0	69.0
Actuated g/C Ratio	0.20		0.55		0.69	0.69
Clearance Time (s)	5.8		5.4		5.7	5.4
Vehicle Extension (s)	1.0		1.0		1.0	1.0
Lane Grp Cap (vph)	342		989		302	1295
v/s Ratio Prot	c0.17		c0.45		c0.04	0.18
v/s Ratio Perm					0.28	
v/c Ratio	0.83		0.81		0.46	0.27
Uniform Delay, d1	38.5		18.0		13.6	5.9
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	15.1		4.6		0.4	0.0
Delay (s)	53.6		22.6		14.0	6.0
Level of Service	D		C		B	A
Approach Delay (s)	53.6		22.6			8.3
Approach LOS	D		C			A

Intersection Summary			
HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	100.2	Sum of lost time (s)	16.9
Intersection Capacity Utilization	83.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	327	24	41	207	2	45	5	60	1	4	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		1.00			1.00			0.99			1.00	
Flpb, ped/bikes		1.00			1.00			1.00			1.00	
Frt		0.99			1.00			0.93			0.98	
Flt Protected		1.00			0.99			0.98			0.99	
Satd. Flow (prot)		1848			1861			1686			1850	
Flt Permitted		1.00			0.91			0.86			0.95	
Satd. Flow (perm)		1841			1702			1487			1763	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	6	372	27	47	235	2	51	6	68	1	5	1
RTOR Reduction (vph)	0	3	0	0	0	0	0	56	0	0	1	0
Lane Group Flow (vph)	0	402	0	0	284	0	0	69	0	0	6	0
Confl. Peds. (#/hr)	2					2			3	3		
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	2%	0%	2%	1%	0%	0%	0%	2%	0%	0%	0%
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		19.6			19.6			6.0			6.0	
Effective Green, g (s)		19.6			19.6			6.0			6.0	
Actuated g/C Ratio		0.58			0.58			0.18			0.18	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		1074			993			266			315	
v/s Ratio Prot												
v/s Ratio Perm		c0.22			0.17			c0.05			0.00	
v/c Ratio		0.37			0.29			0.26			0.02	
Uniform Delay, d1		3.7			3.5			11.9			11.4	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		0.2			0.2			0.5			0.0	
Delay (s)		4.0			3.7			12.4			11.4	
Level of Service		A			A			B			B	
Approach Delay (s)		4.0			3.7			12.4			11.4	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM Average Control Delay	5.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	33.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	93	274	144	52	101	57
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	107	315	166	60	116	66
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	225				724	195
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	225				724	195
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				68	92
cM capacity (veh/h)	1355				362	851

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	422	225	116	66
Volume Left	107	0	116	0
Volume Right	0	60	0	66
cSH	1355	1700	362	851
Volume to Capacity	0.08	0.13	0.32	0.08
Queue Length 95th (ft)	6	0	34	6
Control Delay (s)	2.6	0.0	19.6	9.6
Lane LOS	A		C	A
Approach Delay (s)	2.6	0.0	16.0	
Approach LOS			C	

Intersection Summary			
Average Delay	4.8		
Intersection Capacity Utilization	45.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	300	54	2	160	0	34	0	3	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	1	345	62	2	184	0	39	0	3	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	184			407			567	567	376	570	598	184
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	184			407			567	567	376	570	598	184
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			91	100	99	100	100	100
cM capacity (veh/h)	1403			1163			437	435	675	432	417	864

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	408	186	43	0
Volume Left	1	2	39	0
Volume Right	62	0	3	0
cSH	1403	1163	449	1700
Volume to Capacity	0.00	0.00	0.09	0.00
Queue Length 95th (ft)	0	0	8	0
Control Delay (s)	0.0	0.1	13.8	0.0
Lane LOS	A	A	B	A
Approach Delay (s)	0.0	0.1	13.8	0.0
Approach LOS			B	A

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	29.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	78	207	1	2	135	70	1	0	0	89	0	38
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	83	220	1	2	144	74	1	0	0	95	0	40
Pedestrians					1							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					4.0							
Percent Blockage					0							
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	218			221			612	609	222	573	572	181
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	218			221			612	609	222	573	572	181
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.4
p0 queue free %	94			100			100	100	100	77	100	95
cM capacity (veh/h)	1334			1360			370	386	822	408	405	847

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	304	220	1	135
Volume Left	83	2	1	95
Volume Right	1	74	0	40
cSH	1334	1360	370	483
Volume to Capacity	0.06	0.00	0.00	0.28
Queue Length 95th (ft)	5	0	0	28
Control Delay (s)	2.6	0.1	14.8	15.3
Lane LOS	A	A	B	C
Approach Delay (s)	2.6	0.1	14.8	15.3
Approach LOS			B	C

Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	43.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	69	555	0	1	414	38	0	0	0	39	0	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0						4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95						1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00						1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00						1.00	1.00
Frt	1.00	1.00		1.00	0.99						1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00						0.95	1.00
Satd. Flow (prot)	1805	3610		1804	3486						1752	1615
Flt Permitted	0.95	1.00		0.95	1.00						1.00	1.00
Satd. Flow (perm)	1805	3610		1804	3486						1845	1615
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	80	645	0	1	481	44	0	0	0	45	0	50
RTOR Reduction (vph)	0	0	0	0	5	0	0	0	0	0	0	40
Lane Group Flow (vph)	80	645	0	1	520	0	0	0	0	0	45	10
Confl. Peds. (#/hr)			3	3								
Confl. Bikes (#/hr)			1			1			1			
Heavy Vehicles (%)	0%	0%	0%	0%	2%	3%	0%	0%	0%	3%	0%	0%
Turn Type	Prot			Prot			Perm			Perm		pm+ov
Protected Phases	7	4		3	8			2			6	7
Permitted Phases							2			6		6
Actuated Green, G (s)	6.0	26.0		0.9	20.9						2.7	8.7
Effective Green, g (s)	6.0	26.0		0.9	20.9						2.7	8.7
Actuated g/C Ratio	0.14	0.62		0.02	0.50						0.06	0.21
Clearance Time (s)	4.0	4.0		4.0	4.0						4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0						3.0	3.0
Lane Grp Cap (vph)	260	2256		39	1751						120	493
v/s Ratio Prot	c0.04	c0.18		0.00	0.15							0.00
v/s Ratio Perm											c0.02	0.00
v/c Ratio	0.31	0.29		0.03	0.30						0.38	0.02
Uniform Delay, d1	15.9	3.6		19.9	6.1						18.6	13.1
Progression Factor	1.00	1.00		1.00	1.00						1.00	1.00
Incremental Delay, d2	0.7	0.1		0.3	0.1						2.0	0.0
Delay (s)	16.6	3.6		20.2	6.1						20.6	13.1
Level of Service	B	A		C	A						C	B
Approach Delay (s)		5.1			6.2			0.0			16.6	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM Average Control Delay	6.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	41.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	33.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	24	367	213	30	239	5	170	22	61	5	13	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.89		1.00	0.92	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1900	1599	1805	3563		1786	1691		1805	1741	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.74	1.00		0.70	1.00	
Satd. Flow (perm)	1805	1900	1599	1805	3563		1390	1691		1332	1741	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	25	378	220	31	246	5	175	23	63	5	13	14
RTOR Reduction (vph)	0	0	125	0	2	0	0	47	0	0	10	0
Lane Group Flow (vph)	25	378	95	31	249	0	175	39	0	5	17	0
Confl. Peds. (#/hr)	2					2	2					2
Heavy Vehicles (%)	0%	0%	1%	0%	1%	0%	1%	0%	0%	0%	0%	0%
Turn Type	Prot		Perm	Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2			6		
Actuated Green, G (s)	1.1	19.9	19.9	2.3	21.1		11.9	11.9		11.9	11.9	
Effective Green, g (s)	1.1	19.9	19.9	2.3	21.1		11.9	11.9		11.9	11.9	
Actuated g/C Ratio	0.02	0.43	0.43	0.05	0.46		0.26	0.26		0.26	0.26	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	43	820	690	90	1631		359	437		344	449	
v/s Ratio Prot	0.01	c0.20		c0.02	0.07			0.02			0.01	
v/s Ratio Perm			0.06				c0.13			0.00		
v/c Ratio	0.58	0.46	0.14	0.34	0.15		0.49	0.09		0.01	0.04	
Uniform Delay, d1	22.3	9.3	7.9	21.2	7.3		14.5	13.0		12.7	12.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	18.4	0.4	0.1	2.3	0.0		1.0	0.1		0.0	0.0	
Delay (s)	40.7	9.7	8.0	23.5	7.3		15.6	13.1		12.8	12.8	
Level of Service	D	A	A	C	A		B	B		B	B	
Approach Delay (s)		10.4			9.1			14.7			12.8	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	11.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	46.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	2	52	53	249	147	4
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	2	60	61	286	169	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				358		
pX, platoon unblocked	0.92					
vC, conflicting volume	579	171	174			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	499	171	174			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	93	96			
cM capacity (veh/h)	470	878	1403			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	62	61	286	174
Volume Left	2	61	0	0
Volume Right	60	0	0	5
cSH	850	1403	1700	1700
Volume to Capacity	0.07	0.04	0.17	0.10
Queue Length 95th (ft)	6	3	0	0
Control Delay (s)	9.6	7.7	0.0	0.0
Lane LOS	A	A		
Approach Delay (s)	9.6	1.3		0.0
Approach LOS	A			

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	24.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	172	68	99	122	45	61	234	153	76	316	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00	0.96	1.00	1.00	0.98
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	0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1806		1735	1790		1805	1881	1557	1798	1881	1579
Flt Permitted	0.63	1.00		0.41	1.00		0.39	1.00	1.00	0.45	1.00	1.00
Satd. Flow (perm)	1204	1806		743	1790		741	1881	1557	843	1881	1579
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	45	202	80	116	144	53	72	275	180	89	372	55
RTOR Reduction (vph)	0	21	0	0	18	0	0	0	126	0	0	37
Lane Group Flow (vph)	45	261	0	116	179	0	72	275	54	89	372	18
Confl. Peds. (#/hr)			1	1					12	12		
Confl. Bikes (#/hr)			3			1			1			2
Heavy Vehicles (%)	0%	0%	0%	4%	1%	2%	0%	1%	0%	0%	1%	0%
Turn Type	pm+pt			pm+pt			pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	18.0	15.0		20.6	16.3		19.8	16.8	16.8	22.4	18.1	18.1
Effective Green, g (s)	18.0	15.0		20.6	16.3		19.8	16.8	16.8	22.4	18.1	18.1
Actuated g/C Ratio	0.32	0.27		0.37	0.29		0.35	0.30	0.30	0.40	0.32	0.32
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
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)	416	480		347	517		317	560	464	408	604	507
v/s Ratio Prot	0.01	c0.14		c0.03	0.10		0.01	0.15		c0.02	c0.20	
v/s Ratio Perm	0.03			0.10			0.07		0.03	0.07		0.01
v/c Ratio	0.11	0.54		0.33	0.35		0.23	0.49	0.12	0.22	0.62	0.03
Uniform Delay, d1	13.4	17.8		12.4	15.8		12.6	16.3	14.4	11.0	16.2	13.2
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	0.1	1.3		0.6	0.4		0.4	0.7	0.1	0.3	1.9	0.0
Delay (s)	13.5	19.0		13.0	16.2		12.9	17.0	14.5	11.2	18.1	13.2
Level of Service	B	B		B	B		B	B	B	B	B	B
Approach Delay (s)		18.3			15.0			15.6			16.4	
Approach LOS		B			B			B			B	

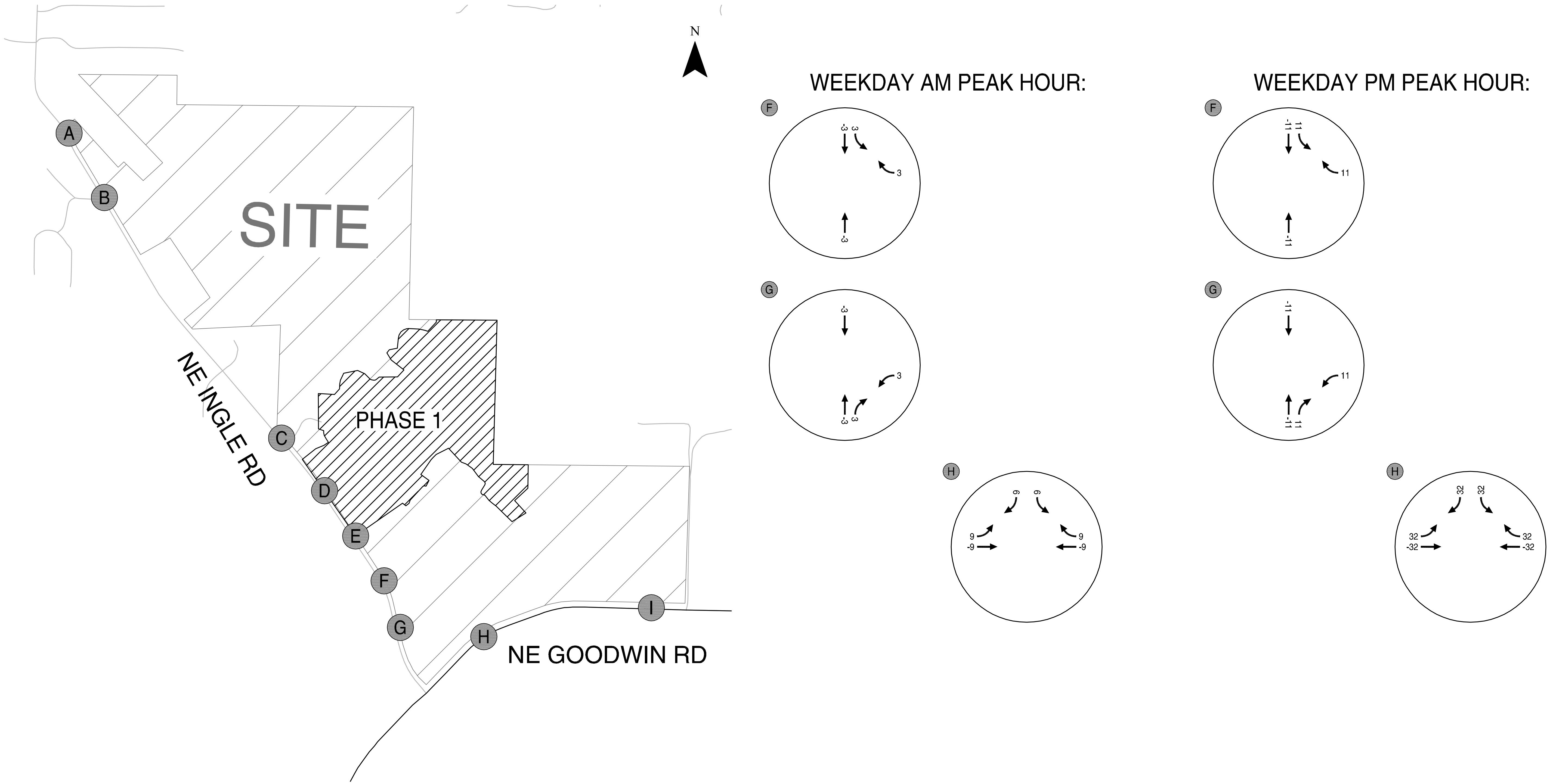
Intersection Summary			
HCM Average Control Delay	16.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	56.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	52.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	195	34	268	193	32	167
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1787	1615	1845	1569	1805	1881
Flt Permitted	0.95	1.00	1.00	1.00	0.38	1.00
Satd. Flow (perm)	1787	1615	1845	1569	716	1881
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	241	42	331	238	40	206
RTOR Reduction (vph)	0	30	0	157	0	0
Lane Group Flow (vph)	241	12	331	81	40	206
Confl. Bikes (#/hr)				8		
Heavy Vehicles (%)	1%	0%	3%	0%	0%	1%
Turn Type		Perm		Perm	pm+pt	
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Actuated Green, G (s)	12.8	12.8	14.7	14.7	21.6	21.6
Effective Green, g (s)	12.8	12.8	14.7	14.7	21.6	21.6
Actuated g/C Ratio	0.29	0.29	0.34	0.34	0.50	0.50
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	527	476	625	531	404	936
v/s Ratio Prot	c0.13		c0.18		0.00	c0.11
v/s Ratio Perm		0.01		0.05	0.04	
v/c Ratio	0.46	0.03	0.53	0.15	0.10	0.22
Uniform Delay, d1	12.5	10.9	11.6	10.0	6.1	6.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.0	0.8	0.1	0.1	0.1
Delay (s)	13.1	10.9	12.4	10.1	6.2	6.3
Level of Service	B	B	B	B	A	A
Approach Delay (s)	12.8		11.4			6.3
Approach LOS	B		B			A

Intersection Summary			
HCM Average Control Delay	10.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	43.4	Sum of lost time (s)	14.0
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Appendix E Pass-by Trip Assignment



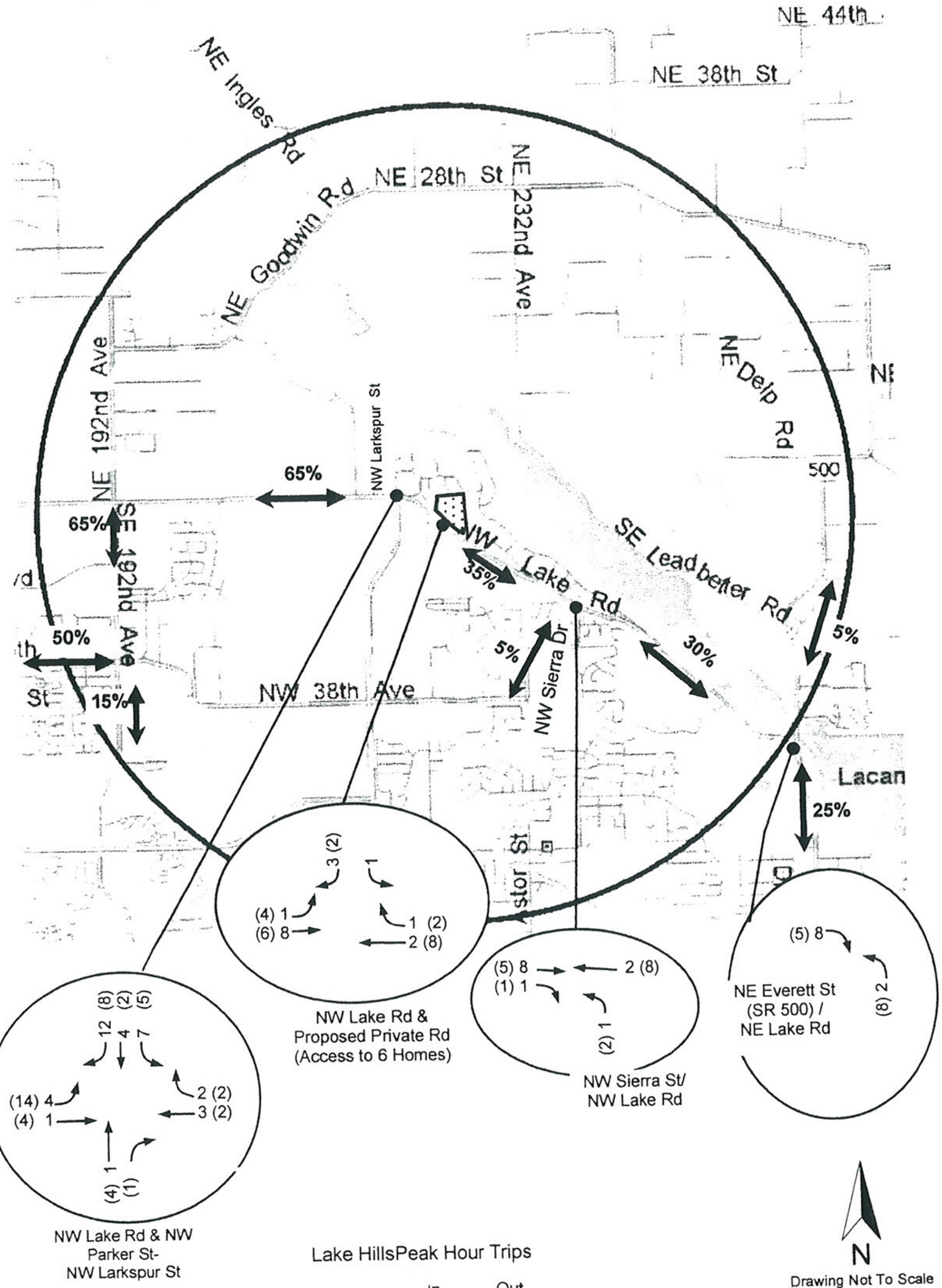
Note: Retail Component (source of pass-by trips) uses driveways F, G, and H

Pass-by Trips for Full Build-Out Scenario
Camas, Washington

Figure
E1

Appendix F In-Process Developments

Figure 8: Weekday Peak Hour Trip Assignment Of New Peak Hour Vehicle Trips Generated by Proposed Lake Hills Residential Development (2-mile Radius)



Lake HillsPeak Hour Trips

	In	Out
AM Peak	10	30
PM Peak	34	20

Proposed Site

AM (PM) Peak Hour Volumes

12.06.001 Lake Hills Residential Development

CTS ENGINEERS

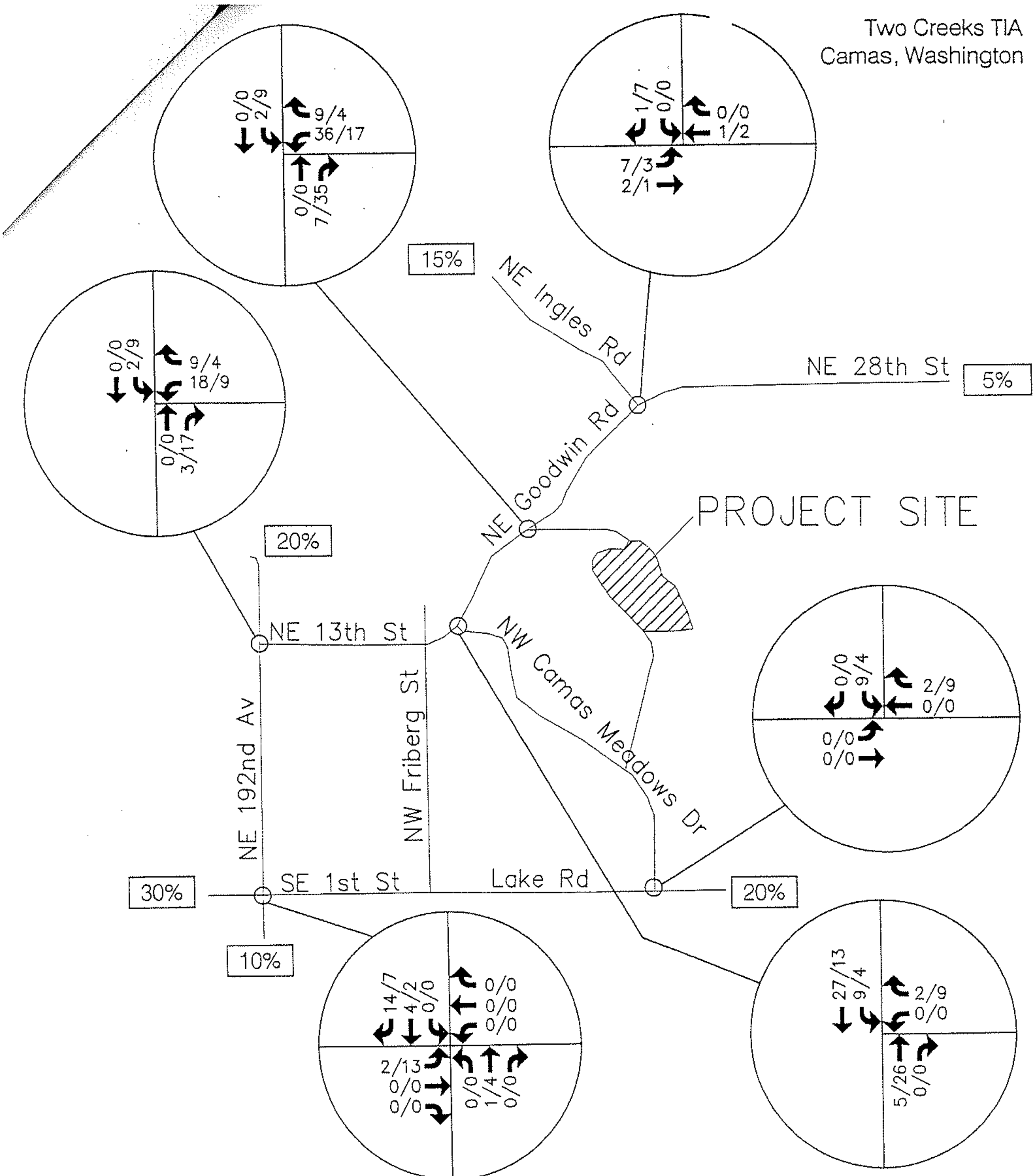


FIGURE 6
Trip Distribution and Assignment
Alternative 2
(123 UNITS)

ALT. #1 WAS 112 UNITS

LEGEND

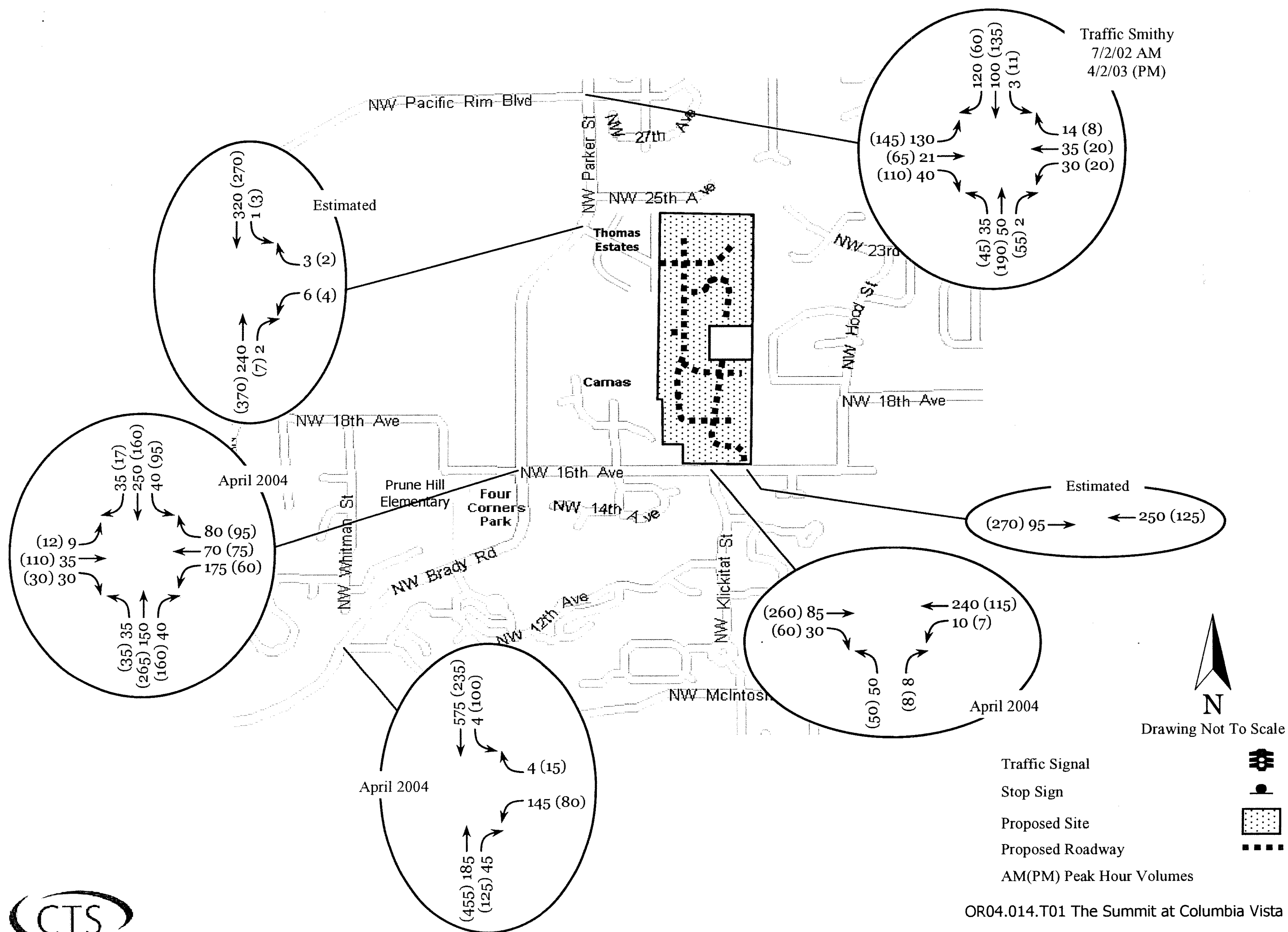
5/10 A.M. and P.M. Peak Hour Traffic Volumes

NOT TO SCALE

40% A.M. and P.M. Peak Hour Trip Distribution

304031.0Figures.dwg

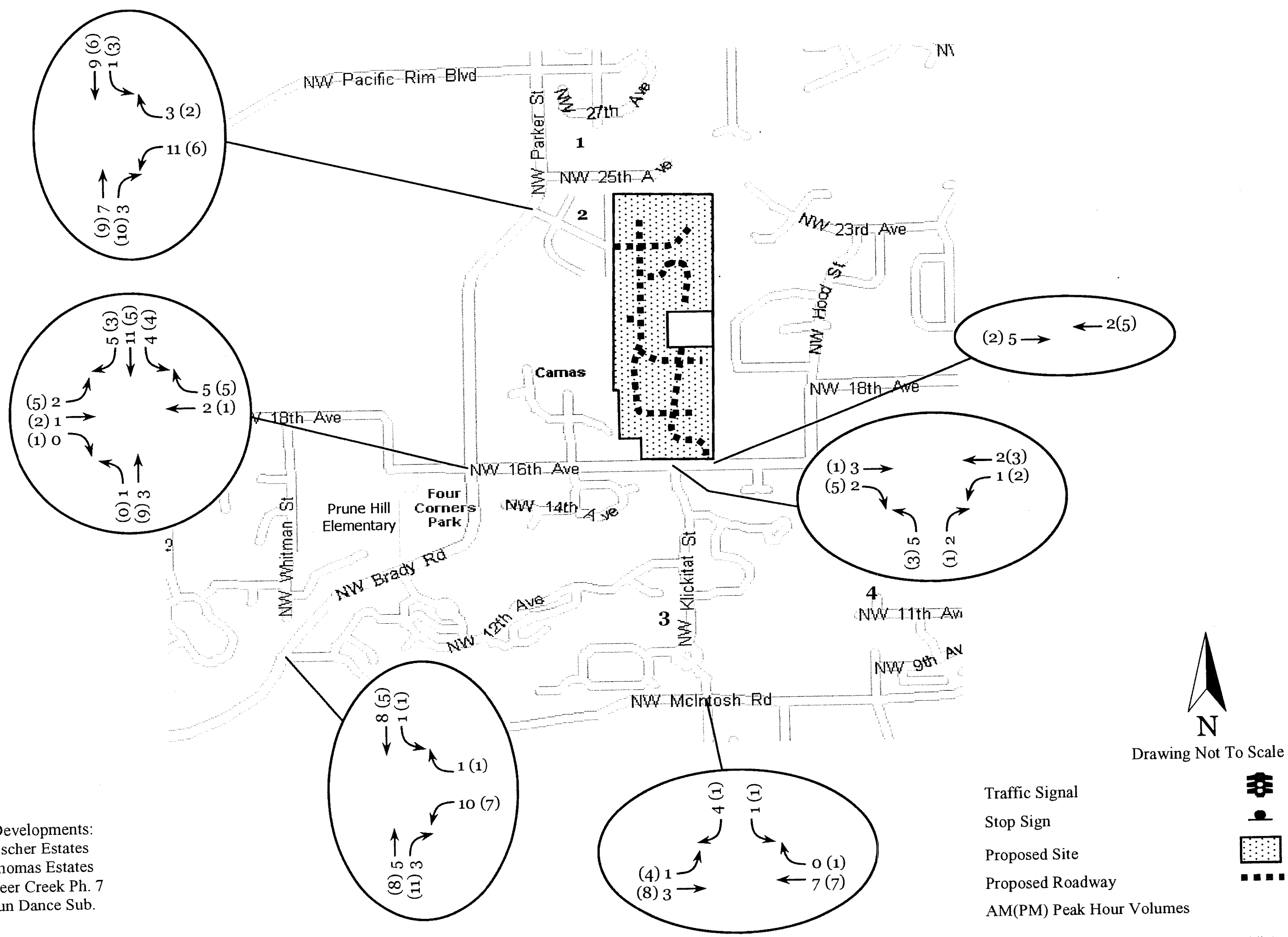
Figure 3: Recent Weekday Peak Hour Traffic Volumes In The Vicinity Of The Summit at Columbia Vista



OR04.014.T01 The Summit at Columbia Vista

CTS ENGINEERS

Figure 6: Weekday Peak Hour In-Process Traffic Volumes In The Vicinity Of The Summit at Columbia Vista

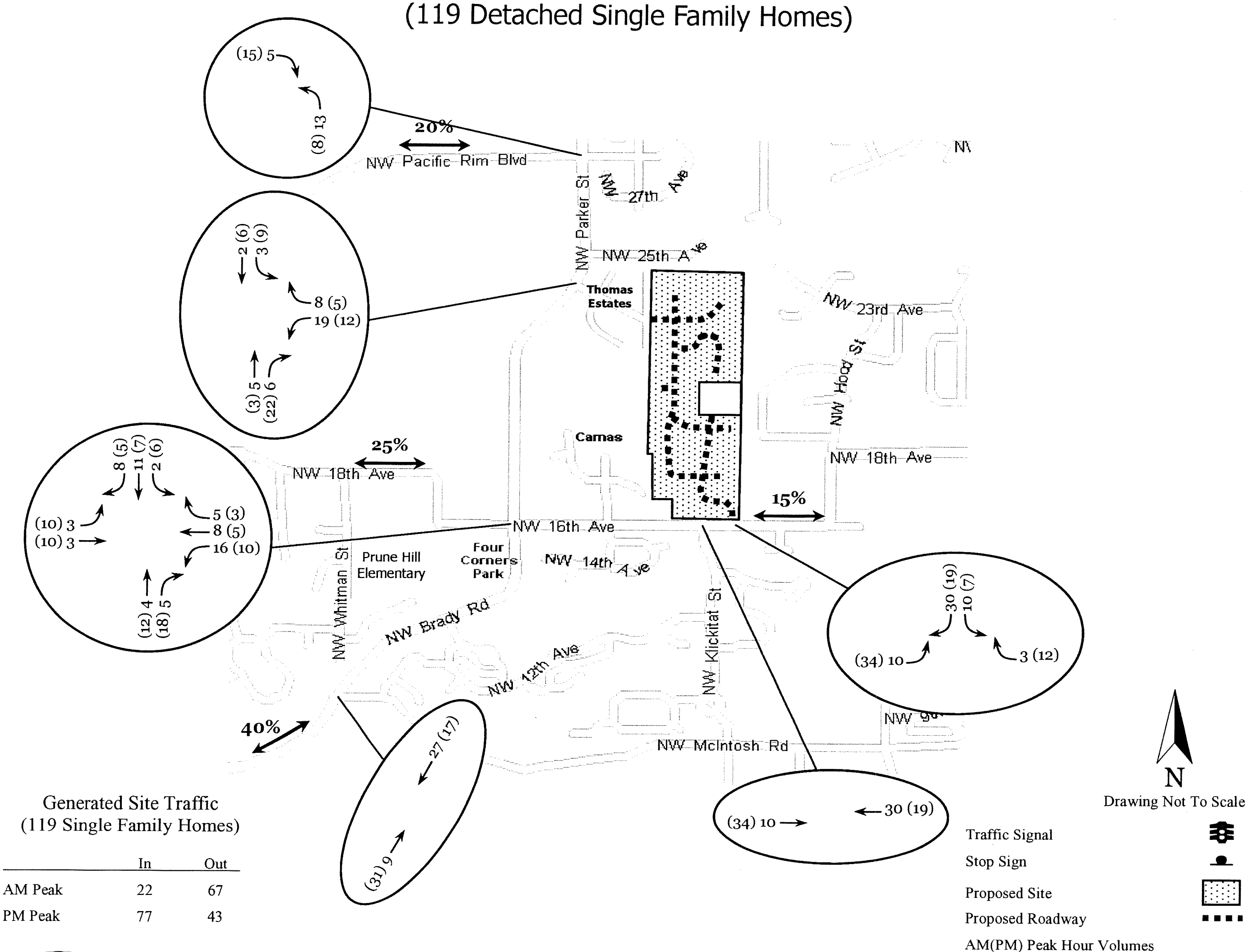


Other Developments:
1) Fischer Estates
2) Thomas Estates
3) Deer Creek Ph. 7
4) Sun Dance Sub.

CTS ENGINEERS

OR04.014.T01 The Summit at Columbia Vista

Figure 9: Weekday Peak Hour Traffic Volumes Generated The Summit at Columbia Vista (119 Detached Single Family Homes)



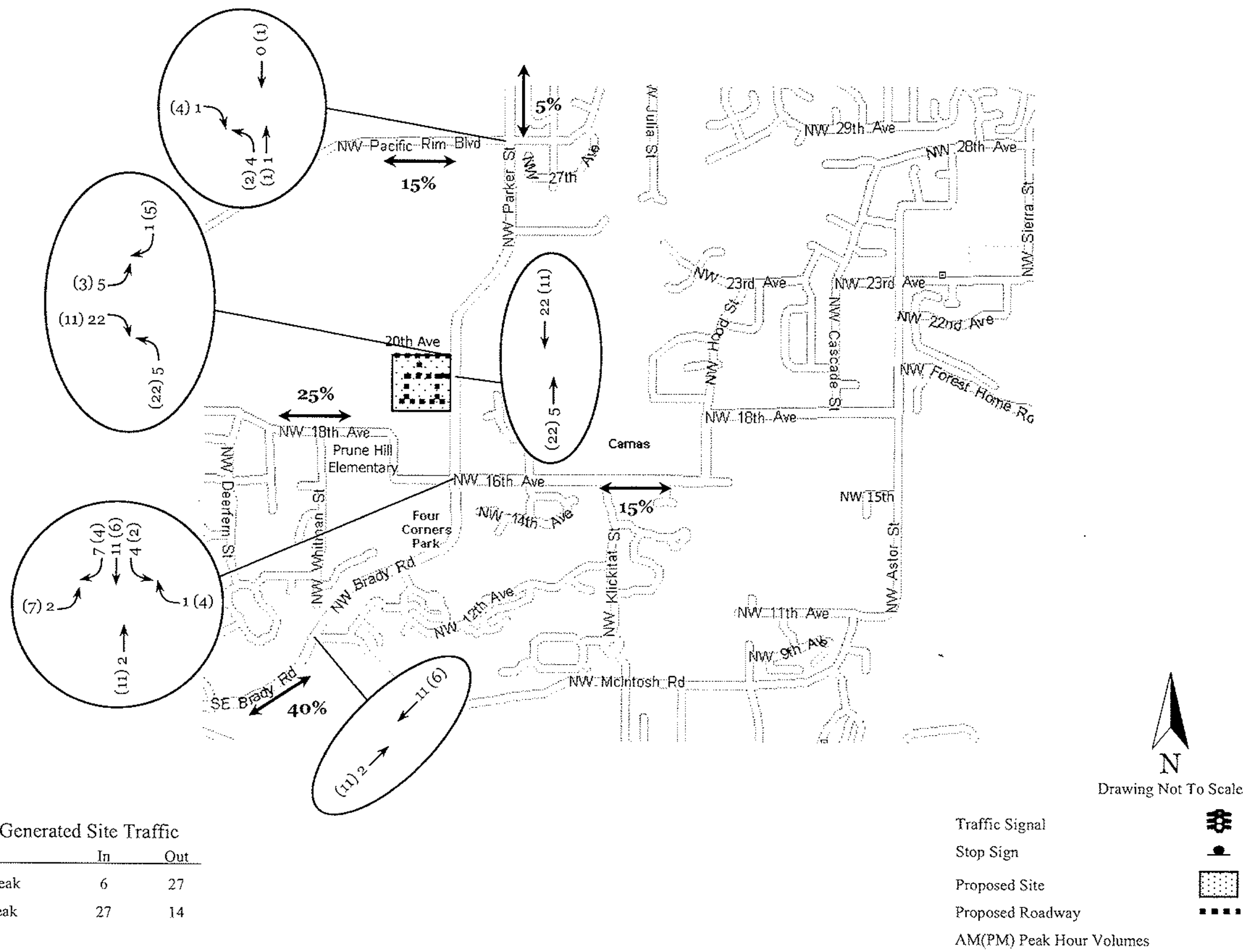
Generated Site Traffic
(119 Single Family Homes)

	In	Out
AM Peak	22	67
PM Peak	77	43

CTS ENGINEERS

OR04.014.T01 The Summit at Columbia Vista

Figure 8: Weekday Peak Hour Traffic Volumes Generated By Parker Village (Residential Development)



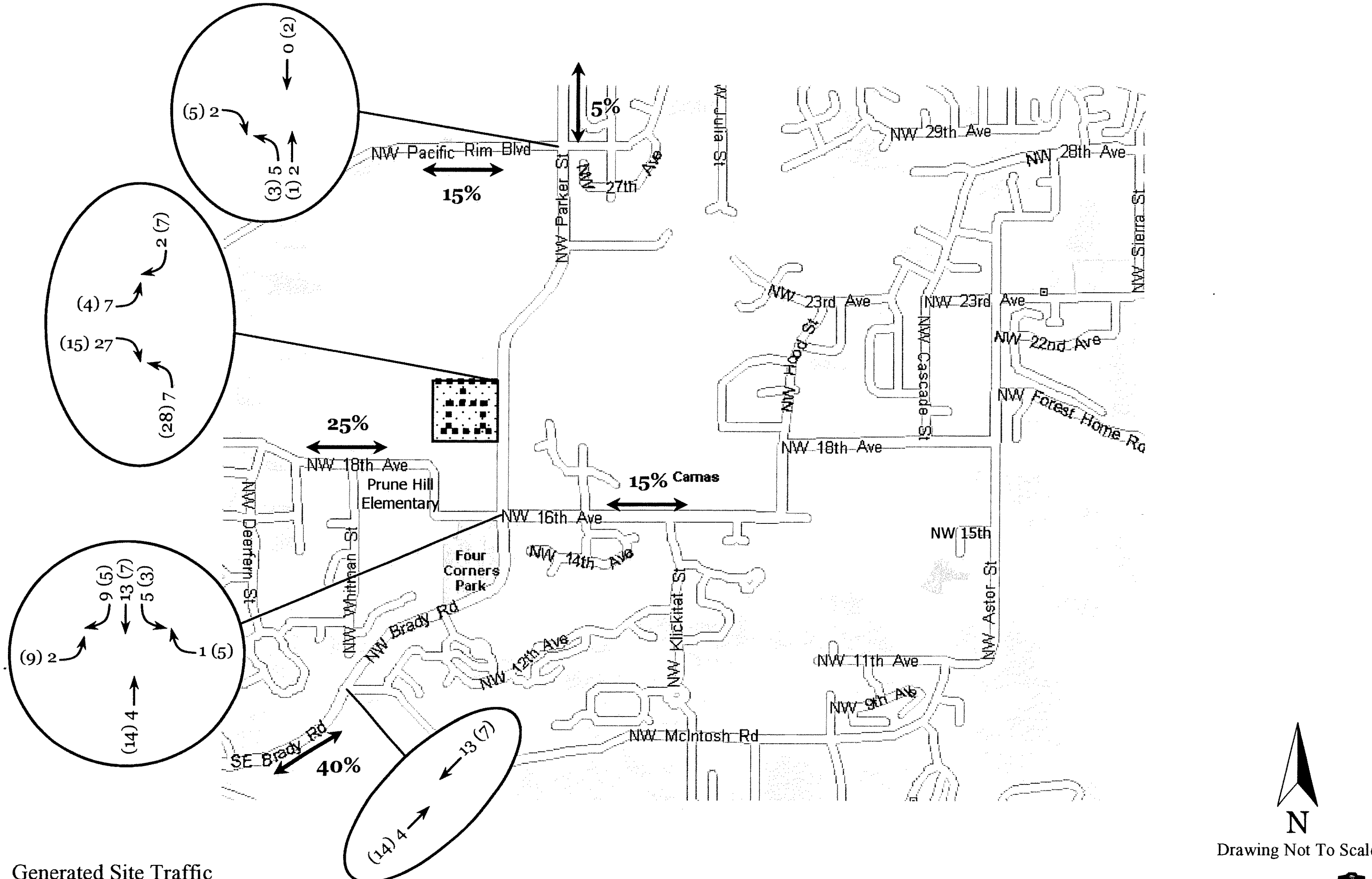
Generated Site Traffic

	In	Out
AM Peak	6	27
PM Peak	27	14

CTS

OR04.093.T01 Parker Village

Figure 9: Weekday Peak Hour Traffic Volumes Generated By Parker Village



Generated Site Traffic

	In	Out
AM Peak	9	33
PM Peak	34	19

Traffic Signal

Stop Sign

Proposed Site

Proposed Roadway

AM(PM) Peak Hour Volumes

OR04.093.T01 Parker Village

CTS Engineers

Table 1 Projected Trip Generation for Residential

ITE Land Use	Units (#)	Weekday						
		ADT	AM Peak Hour			PM Peak Hour		
			Total	Enter	Exit	Total	Enter	Exit
Single-Family (#210)	295							
Generation Rate [1]		9.57	0.75	25%	75%	1.01	63%	37%
Site Trips		**2823**	**221**	55	166	**298**	188	110
Apartment (#220)	128							
Generation Rate [2]		3.12	0.22	20%	80%	0.30	65%	35%
Site Trips		**920**	**66**	13	53	**88**	57	31
Total Estimated Trip Generation		**3743**	**287**	68	219	**386**	245	141

[1] Source: *Trip Generation*, 7th Edition, ITE, 2003, average rates.

[2] Source: *Trip Generation*, 7th Edition, ITE, 2003. Rate shown based on fitted curve evaluation. ADT: $T = 6.01X + 150.35$. AM: $T = 0.49X + 3.73$. PM: $T = 0.55X + 17.65$.

Alternative No. 2 (elementary school alternative) will include 248 single-family units and 128 apartment units. This scenario adds the future 600-student elementary school being planned by the Camas School District. The trip generation is projected to yield an ADT of 4,067 trips with 504 AM peak hour trips and 382 trips in the PM peak hour.

Table 2 Projected Trip Generation for Residential & New Elementary School

ITE Land Use	Units	Weekday									
		ADT	AM Peak Hour			Mid-Afternoon Peak			PM Peak Hour		
			Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit
Single-Family (#210)	248 homes										
Generation Rate [1]		9.57	0.75	25%	75%				1.01	63%	37%
Site Trips		**2373**	**186**	47	139				**250**	158	92
Apartment (#220)	128 apartments										
Generation Rate [2]		3.71	0.27	20%	80%				0.35	65%	35%
Site Trips		**920**	**66**	13	53				**88**	57	31
Elementary School (#520)	600 students										
Generation Rate[3,4]		1.29	0.42	55%	45%	0.28	45%	55%	0.074	45%	55%
Site Trips		**774**	**252**	139	113	**168**	76	92	**44**	20	24
Total Estimated Trip Generation		**4067**	**504**	199	305	**168**	76	92	**382**	235	147

[1] Source: *Trip Generation*, 7th Edition, ITE, 2003, average rates.

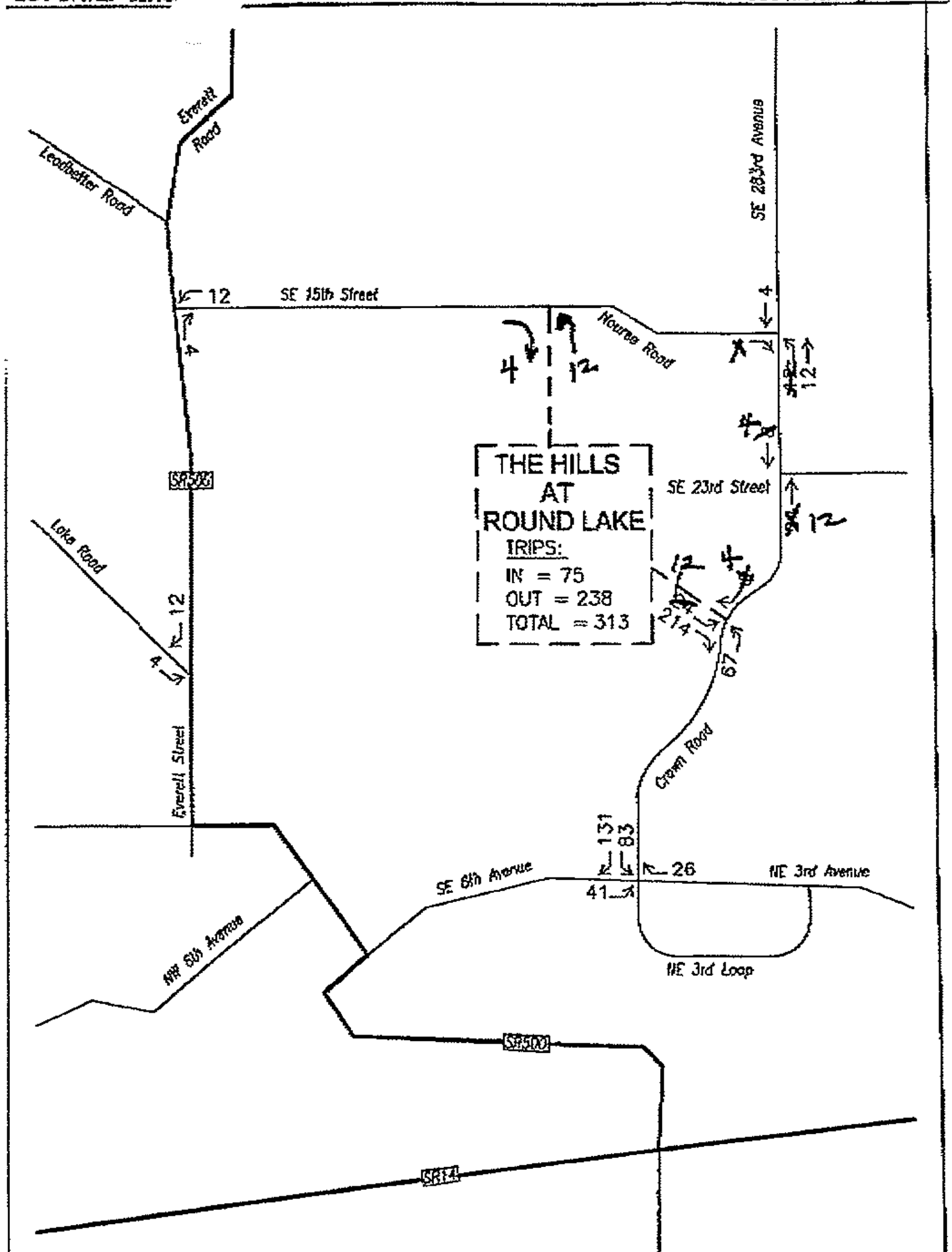
[2] Source: *Trip Generation*, 7th Edition, ITE, 2003. Rate shown based on fitted curve evaluation. ADT: $T = 6.01X + 150.35$. AM: $T = 0.49X + 3.73$. PM: $T = 0.55X + 17.65$.

[3] Source: *Trip Generation*, 7th Edition, ITE, 2003, ADT, AM peak, and Mid-afternoon peak average rates.

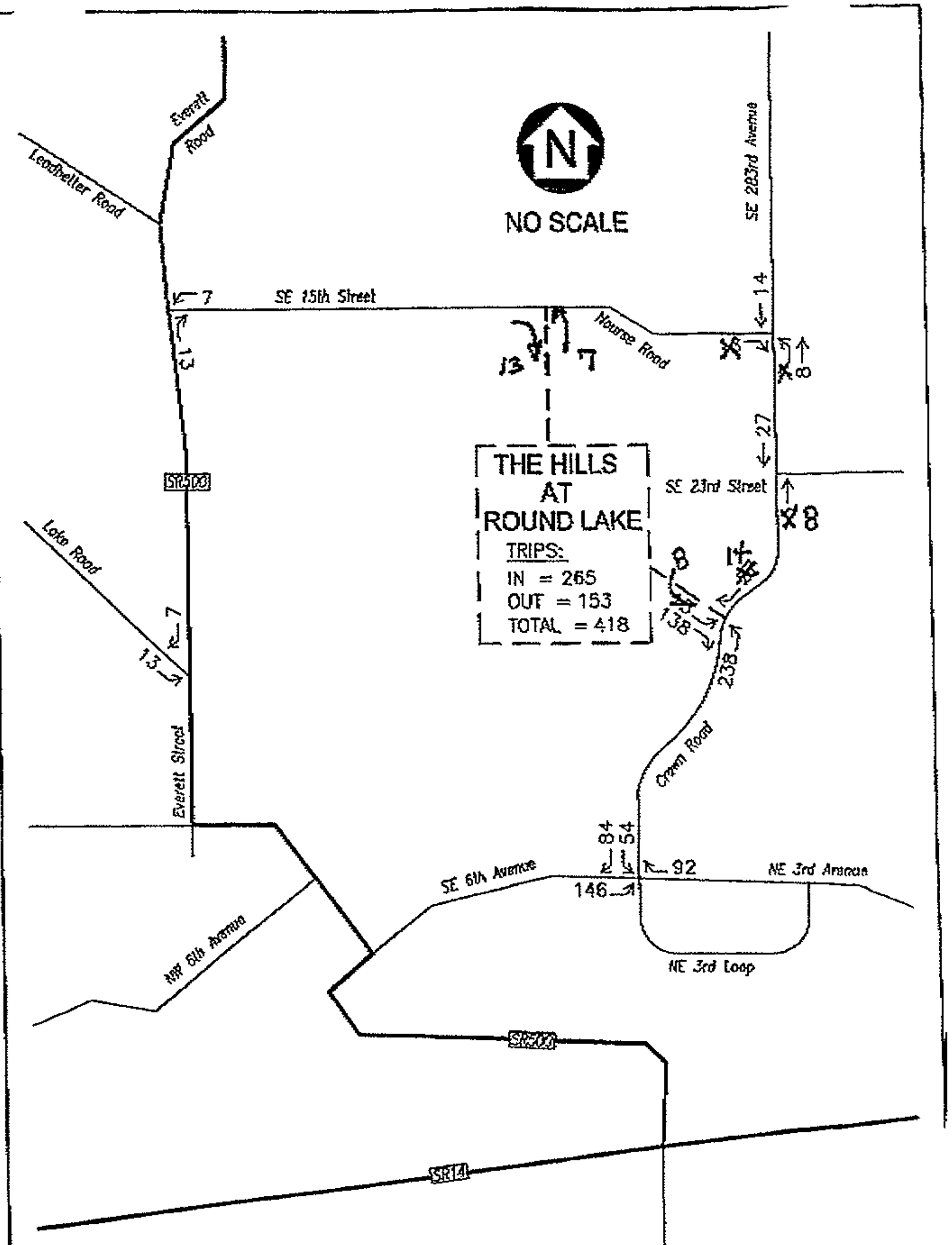
[4] Source: PM peak trip rate calculated from Sherwood, Oregon elementary schools, May 1999.

If you should have any questions regarding this information, please contact Frank Charbonneau, P.E.

PLOT DATE: 02.10.0 FILE: 0504flow.dwg



AM PEAK HOUR



PM PEAK HOUR

CHARBONNEAU ENGINEERING LLC

PROJECT: 05-04

NOTES: Trip generation based on Single-Family Residential (ITE 210) and Apartment (ITE 220) trip rates.

Updated w/North Access 12/7/05 F.C.

TRIP ASSIGNMENT

THE HILLS AT ROUND LAKE

FIGURE 5

NE 43^rd^ Avenue/SE Nourse Road is a two-lane arterial roadway with additional turn pockets at major intersections. The posted speed limit is 25 mph from NE Everett Street to SE 271st Avenue. East of SE 271st Avenue, the speed limit changes to 40 mph. Intermittent sidewalks exist along both sides of the roadway.

SE 283rd Avenue/SE Crown Road is a two-lane arterial roadway with a posted speed limit of 40 mph. Some intermittent shoulders exist along the roadway.

NE 3rd Avenue is a four-lane arterial roadway with additional turn pockets at major intersections. The posted speed limit is 25 mph west of East First Avenue. East of East First Avenue, the speed limit changes to 40 mph. Sidewalks exist along both sides of the roadway.

TRIP GENERATION

Estimates of daily, A.M. peak hour, and P.M. peak hour trips generated by the proposed project were developed from rates published in "Trip Generation, 8th Edition" (Institute of Transportation Engineers, 2008). The proposed development is expected to generate 478 new daily trips, 37 new A.M. peak hour (10 in, 27 out), and 51 new P.M. peak hour (32 in, 19 out) trips. Table 1 summarizes the trip generation for North Hills Subdivision developmentt.

Table 1. Trip Generation Summary for North Hills Subdivision

	Average Daily	A.M. Peak			P.M. Peak		
		In	Out	Total	In	Out	Total
Single Family Residential (ITE Code 210)							
Rate per unit	9.57	0.19	0.56	0.75	0.64	0.37	1.01
	488	10	28	38	33	19	52
Existing Single family (ITE Code 210)							
Rate per unit	9.57	0.19	0.56	0.75	0.64	0.37	1.01
1 existing single family unit	10	0	1	1	1	0	1
Net new trips	478	10	27	37	32	19	51

TRIP DISTRIBUTION

A generalized trip distribution pattern for the A.M. and P.M. peak hour was developed from the existing traffic counts, previous traffic studies, locations of major employment centers, and logical travel paths to and from major travel corridors. The trip distribution patter is listed below:

- SE 283rd Avenue to and from the north – 5%
- NE Everett Street to and from the north – 10%
- Camas High School – 5%
- NE Lake Road – 10%
- NE Everett Street to and from the south – 20%
- SE Crown Road to and from the south – 50%

Based on the trip distribution pattern above, the project-generated trip impact at the following study area intersection was calculated:

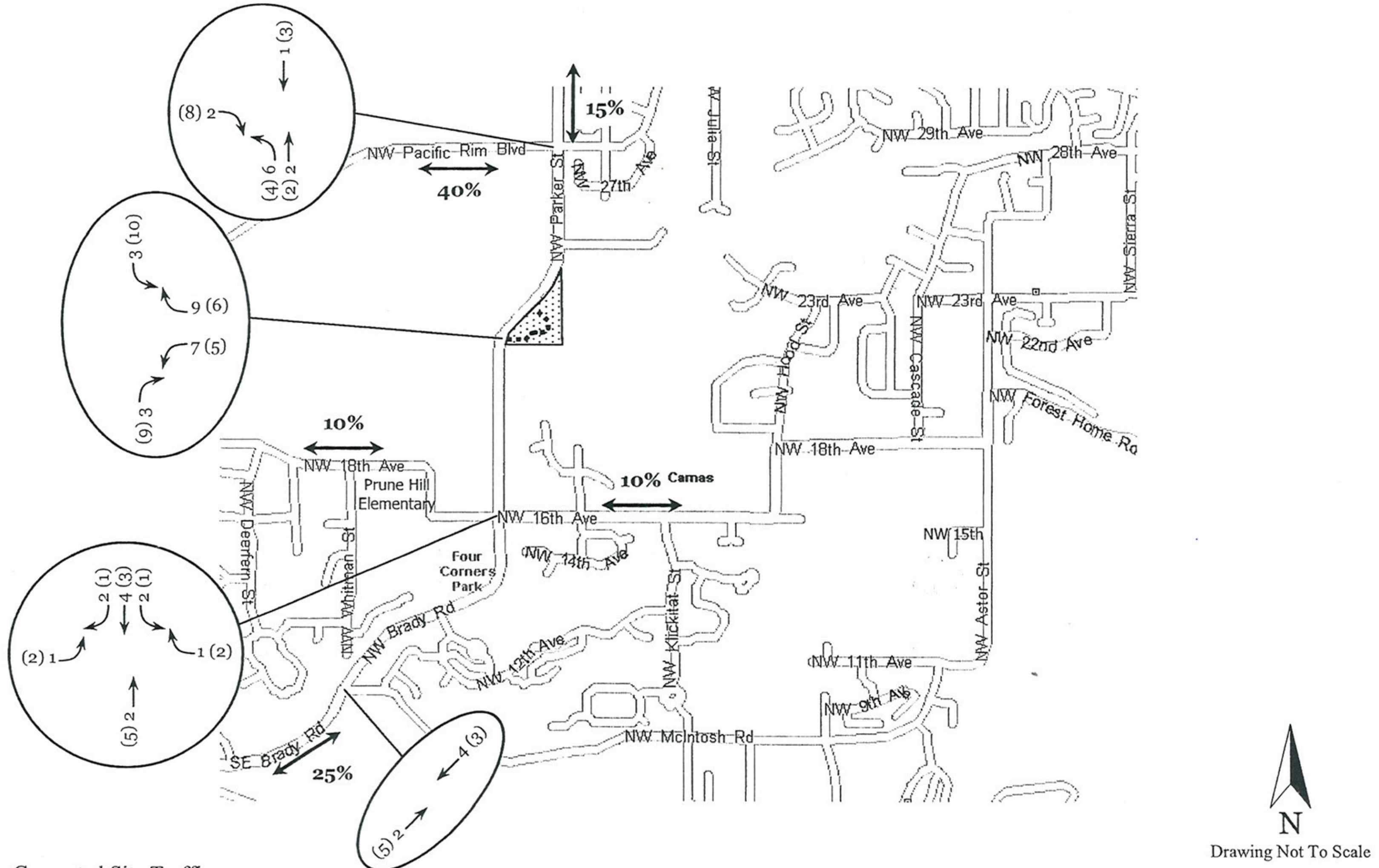
- NE Everett Street (SR 500)/NE 43rd Avenue
- NE Everett Street (SR 500)/NE Lake Road
- SE 277th Avenue/ SE Nourse Road
- SE 283rd Avenue/SE Crown Road/SE Nourse Road
- SE Crown Road/NE 3rd Avenue

Table 2 summarizes the A.M. and P.M. peak hour traffic impacts created by the North Hills Subdivision at the study area intersections.

Table 2. Project Trip Impact Summary

	A.M. Peak			P.M. Peak		
	In	Out	Total	In	Out	Total
NE Everett St/NE 43rd Av	4	11	15	12	8	20
NE Everett St/NE Lake Rd	3	8	11	9	6	15
SE 277th Av/SE Nourse Rd	10	27	37	32	19	51
SE 283rd Av/SE Crown Rd/SE Nourse Rd	5	15	20	18	10	28
SE Crown Rd/NE 3rd Av	5	14	19	16	9	25

Figure 8: Weekday Peak Hour Traffic Volumes Generated By Brady Road Subdivision



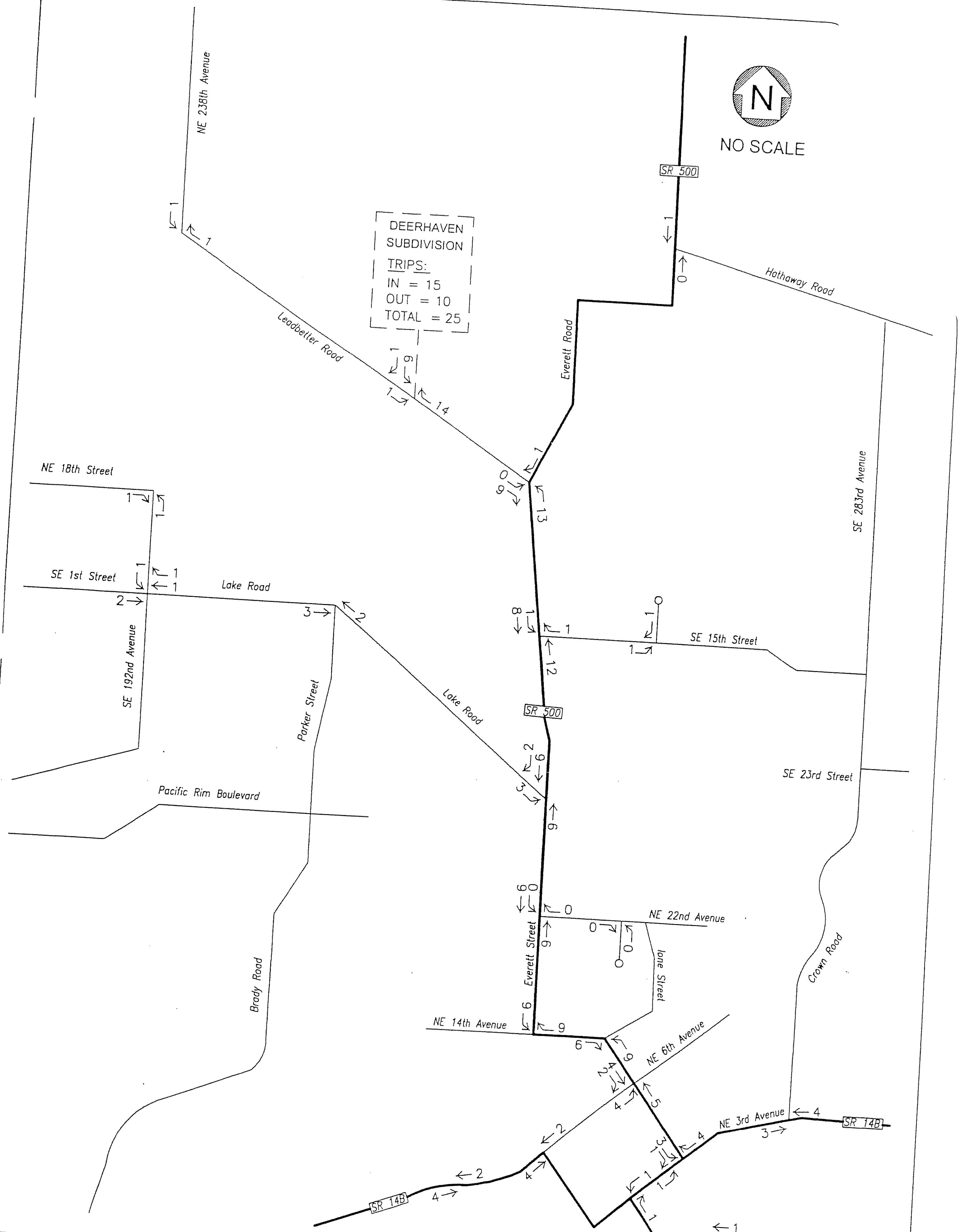
Generated Site Traffic

	In	Out
AM Peak	6	16
PM Peak	19	10

Traffic Signal
Stop Sign
Proposed Site
Proposed Roadway
AM(PM) Peak Hour Volumes

OR05.080.T01 Brady Road Subdivision

CTS Engineers



FILE NAME: 0560flow.dwg

PLOT DATE: 1L J5

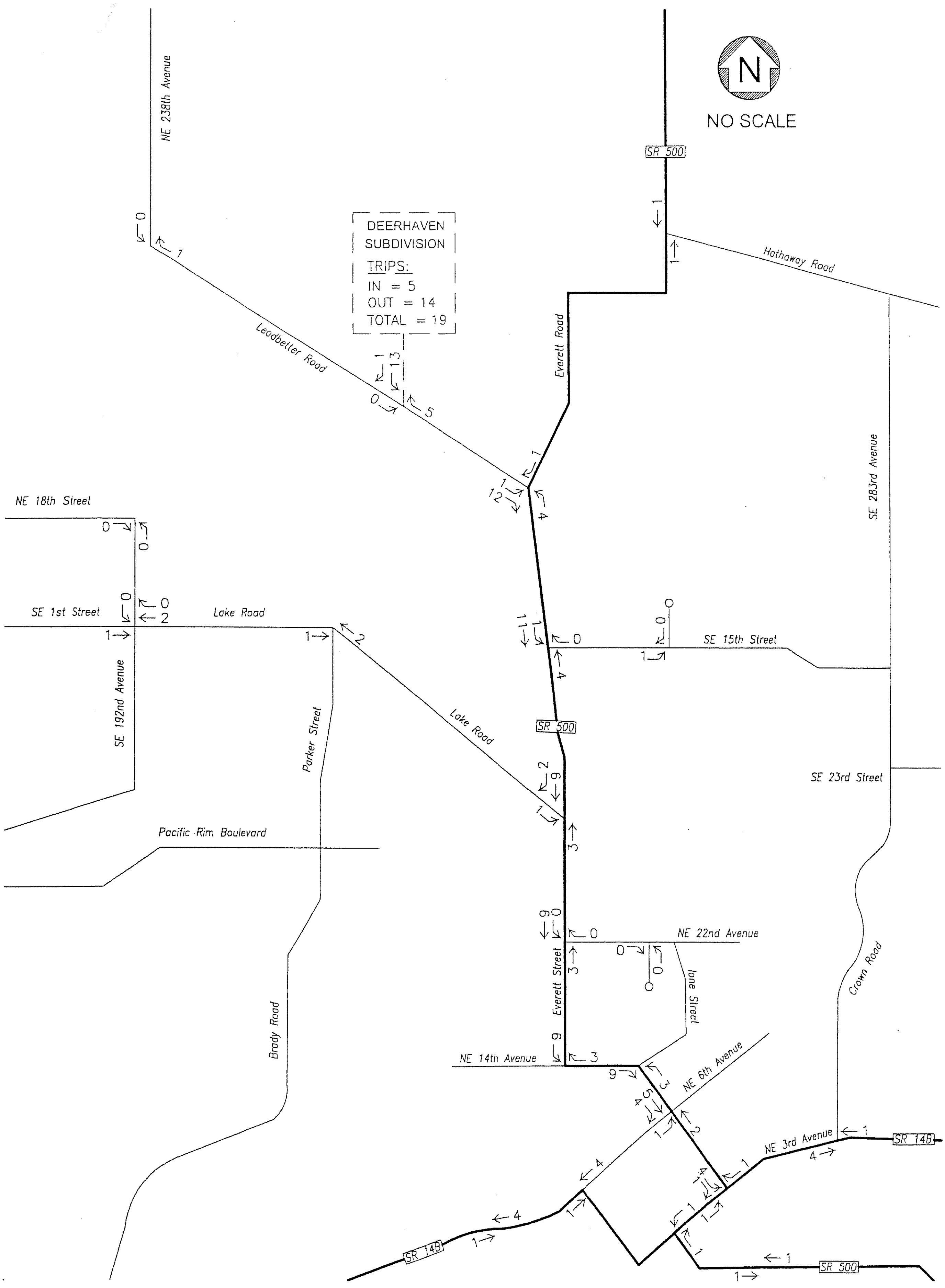
CHARBONNEAU ENGINEERING LLC

PROJECT: 05-60

NOTES: Trip generation based on Single-Family Residential (ITE 210) trip rates.

TRIP ASSIGNMENT
PM PEAK HOUR

FIGURE



FILE NAME: 0560flow.dwg

PLOT DATE: 10. .5

CHARBONNEAU ENGINEERING LLC

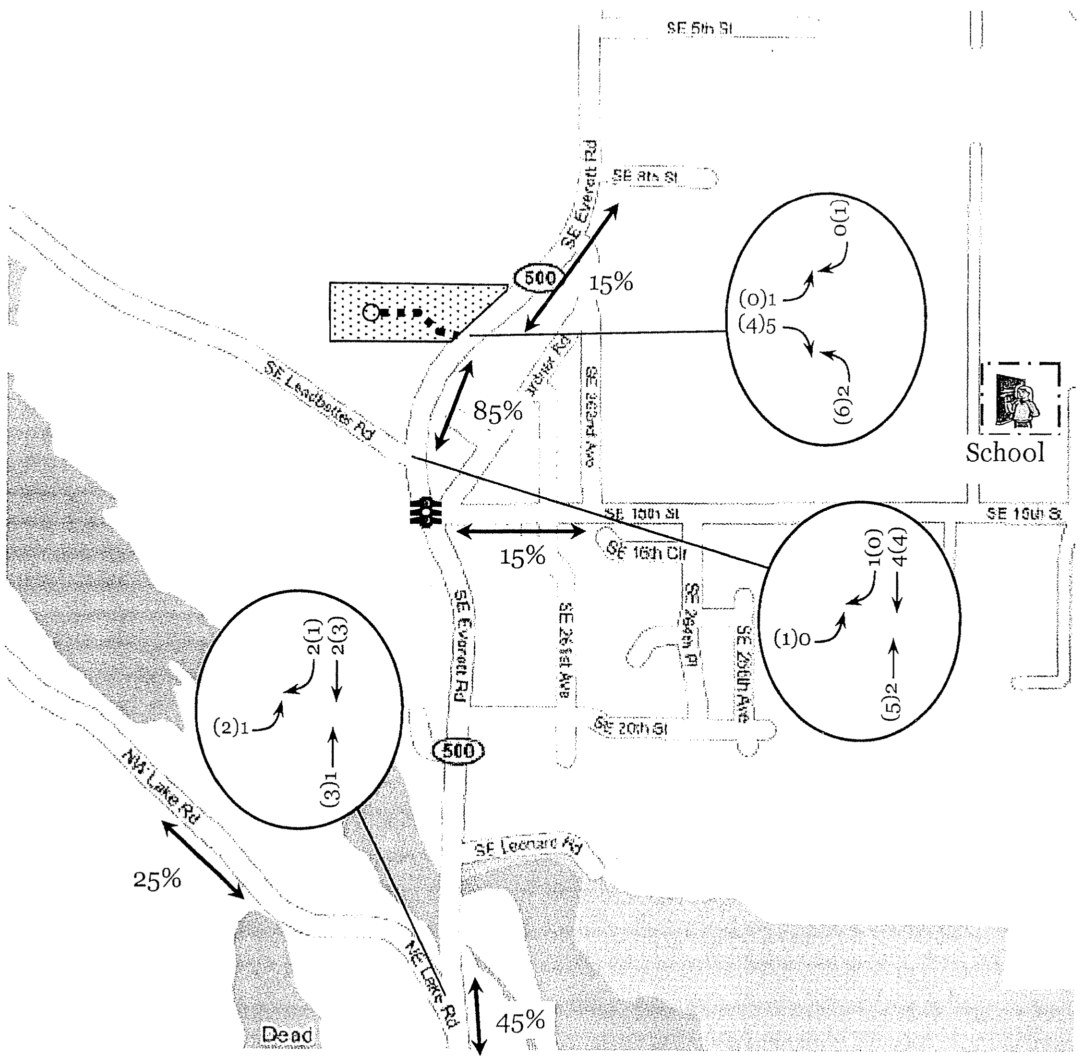
PROJECT: 05-60

NOTES: Trip generation based on Single-Family Residential (ITE 210) trip rates.

TRIP ASSIGNMENT
AM PEAK HOUR
DEERHAVEN SUBDIVISION

FIGURE 5a

Figure 4: Weekday Peak Hour Traffic Volumes Generated By Hadley's Glen



Site Generated Traffic

	In	Out
AM Peak	2	6
PM Peak	7	4

Net New Generated Site Traffic

	In	Out
AM Peak	2	5
PM Peak	6	4

N

Drawing Not To Scale

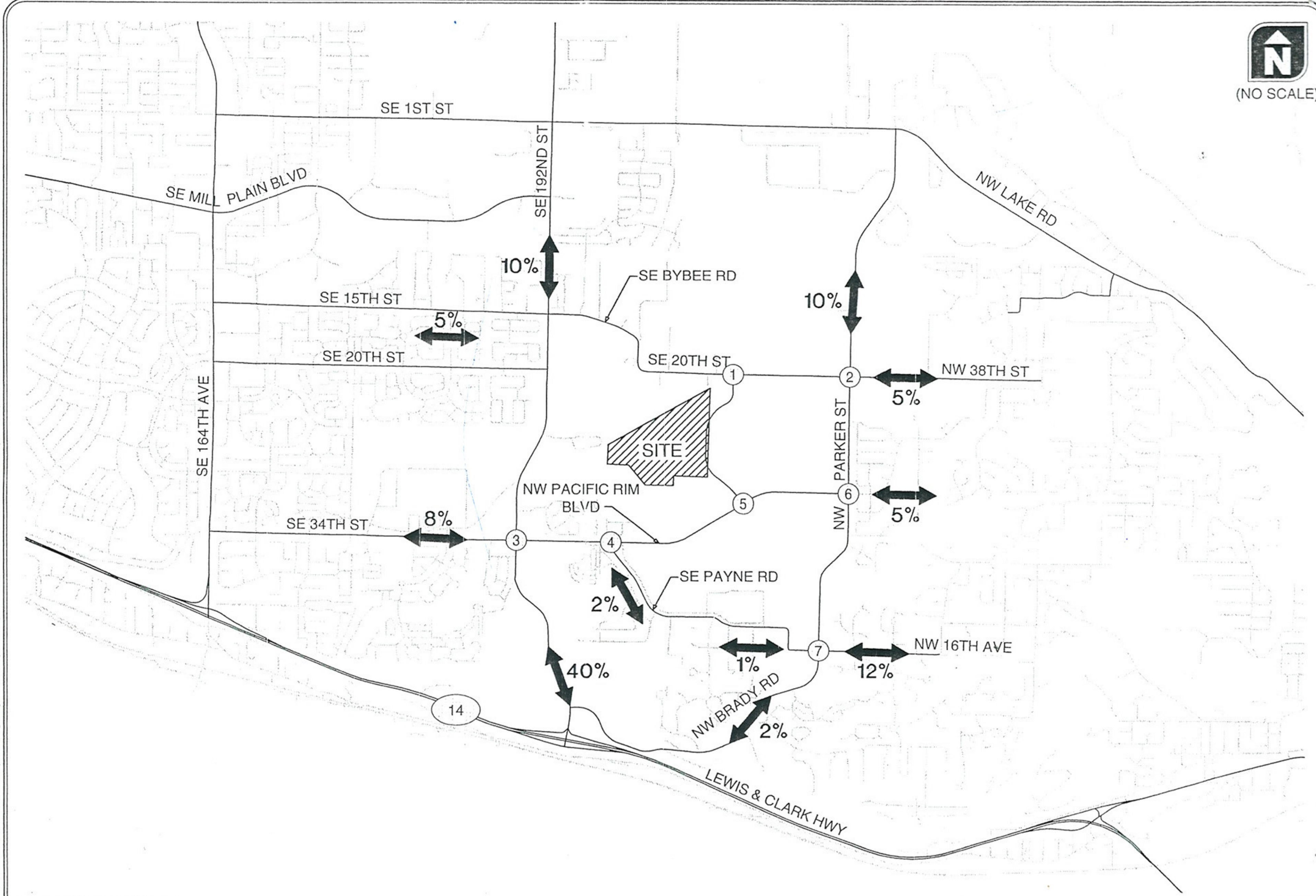
Proposed Site

Proposed Roadway

AM(PM) Peak Hour Volumes

OR05.050.T11 Hadley's Glen

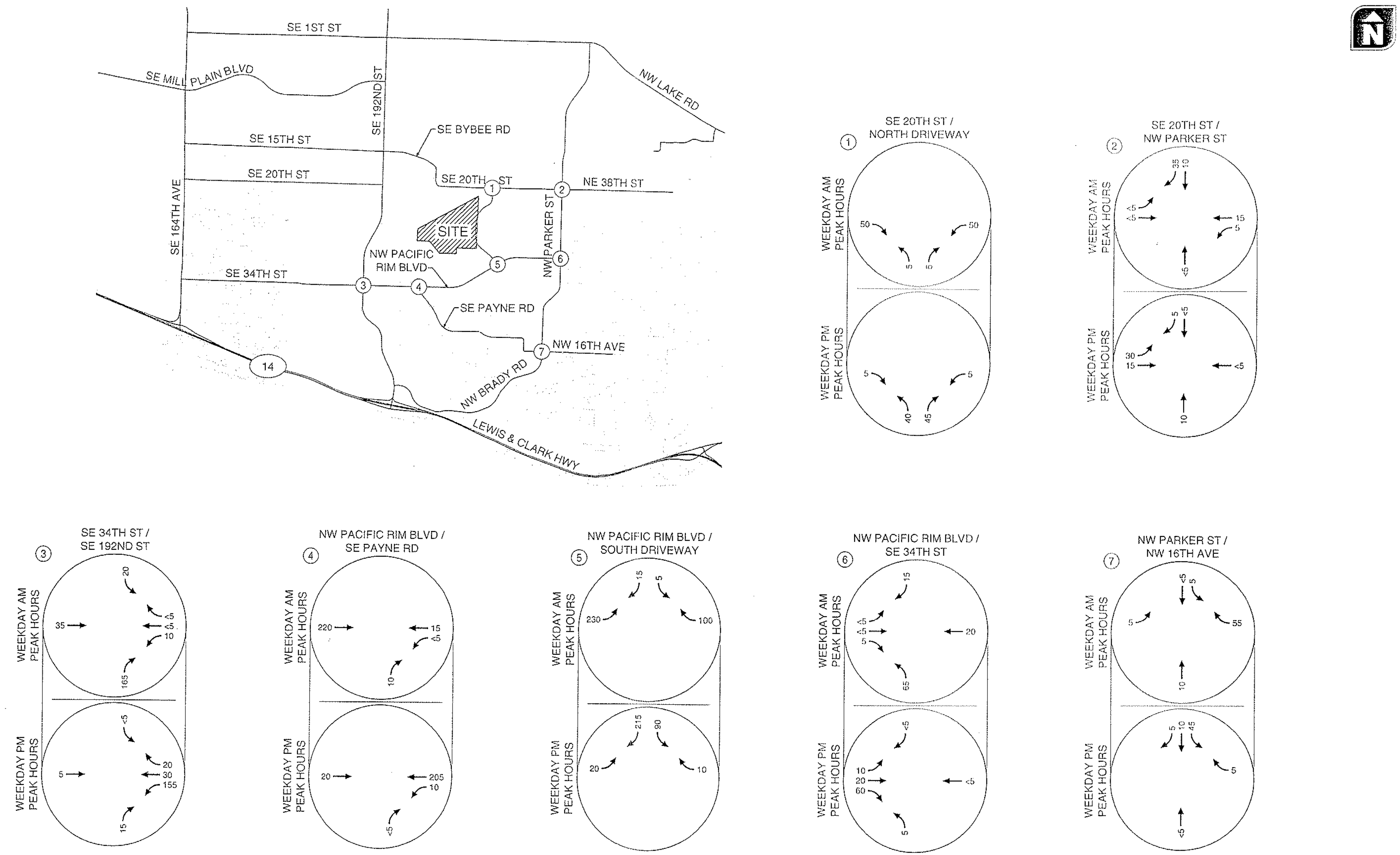
CTS ENGINEERS



ESTIMATED TRIP DISTRIBUTION
CAMAS, WASHINGTON

FIGURE 3

Fisher Cr. Campus Bldgs. 1 & 2



PHASE 1-2 WEEKDAY AM AND PM PEAK HOUR SITE-GENERATED TRIPS
CAMAS, WASHINGTON

FIGURE 5

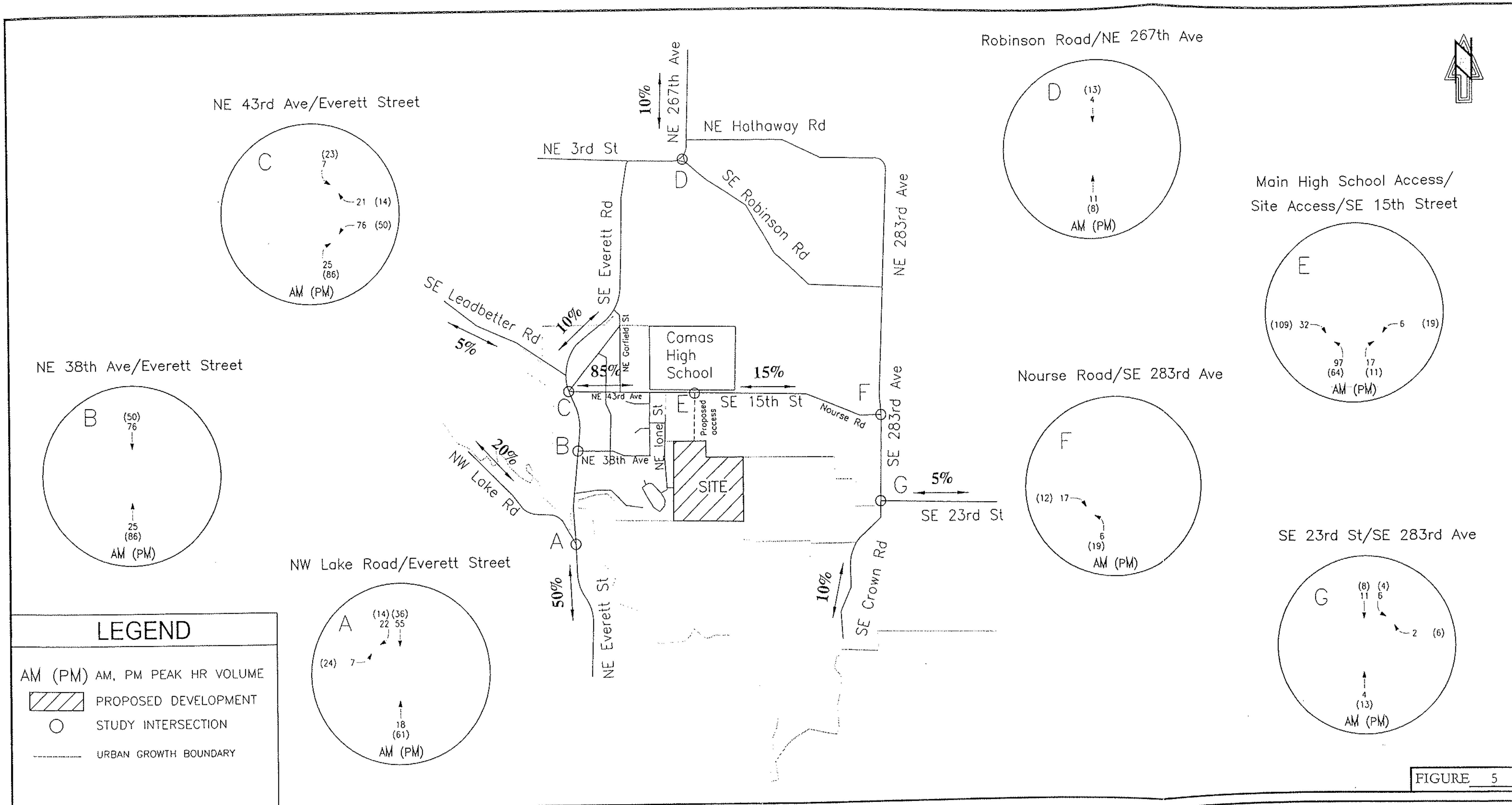


FIGURE 5

SITE GENERATED TRIPS & TRIP DISTRIBUTION
MILLSHORE DOWNS

HOPPER DENNIS JELLISON P.L.L.C.
ENGINEERS & PLANNERS
314 W. 15th Street
Vancouver, WA 98660-2927
(360) 695-3488
(503) 924-4005
FAX (360) 695-8767
Internet: www.hdjengineers.com

Generally, a crash rate greater than one crash per million entering vehicles (MEV) at an intersection is an indicator that a potential geometric or operational issue may exist and that further evaluation should be considered. Table 2 summarizes the intersection crash history.

Table 2 Intersection Crash Histories (January 1, 2006 through December 31, 2010)

Intersection	Number of Crashes	Collision Type					Severity			Crash Rate[2] (per MEV[3])
		Rear End	Turning/ Side Swipe	Angle	Fixed Object	Other	PDO[1]	Injury	Fatal	
NW 38th Avenue/ SE 192nd Avenue	5	2	1	0	2	0	3	2	0	0.14
NW 38th Avenue/ NW Parker Street	6	0	1	4	1	0	5	1	0	0.32
NW Pacific Rim Blvd./ NW Parker Street	2	0	0	1	1	0	1	1	0	0.13
NW 16th Avenue/ NW Brady Road	2	0	0	1	1	0	1	1	0	0.13

[1] Property Damage Only
[2] Crash Rate = (Total Crashes) / (365 days/year x daily entering vehicles / 1,000,000)
[3] MEV – Million Entering Vehicles

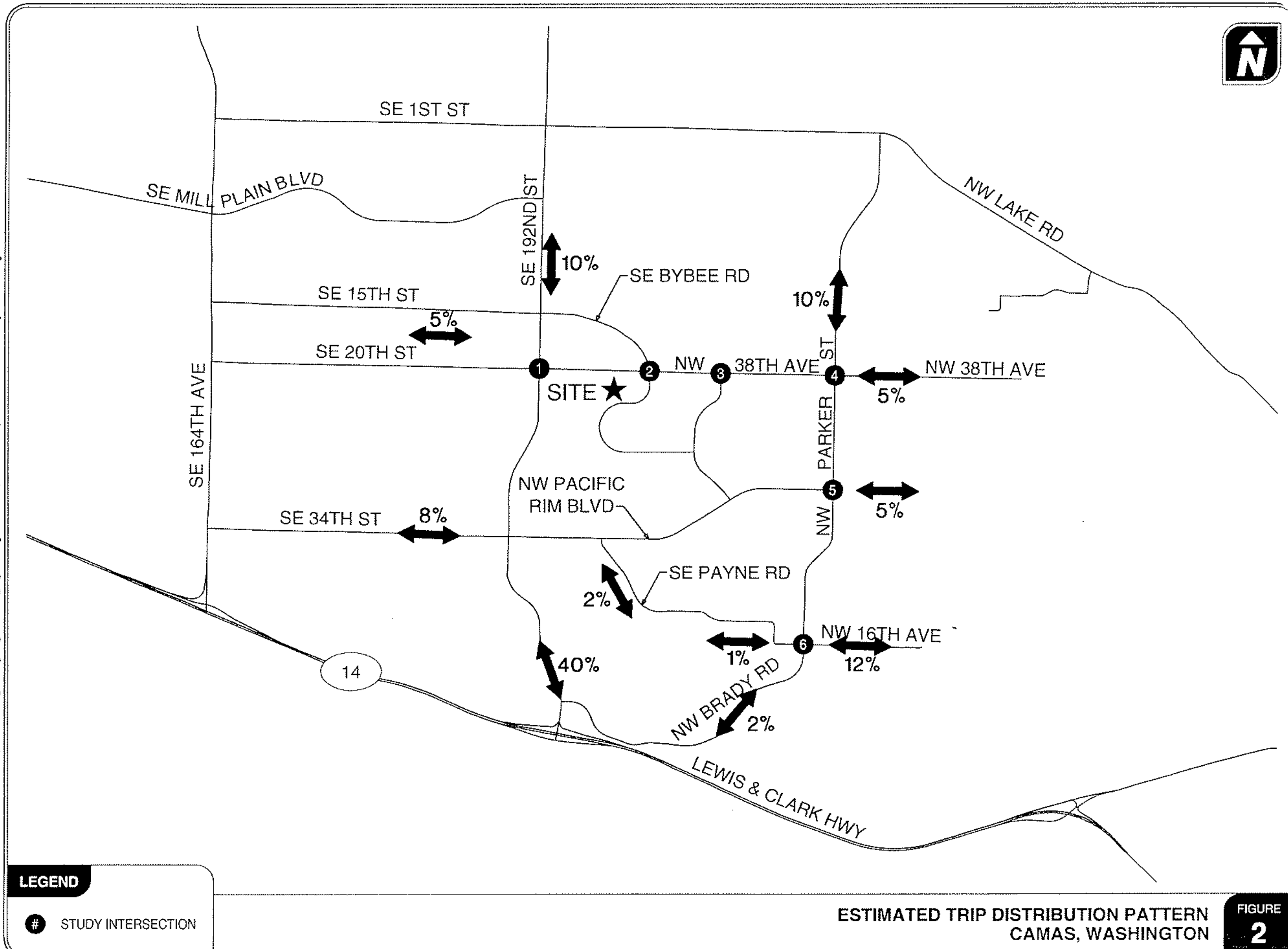
As shown in Table 2, each study intersection's crash rate is less than 1.0 crashes/MEV, there were no fatalities reported during the time periods studied, and no correctable safety issues were identified on the basis of the crash rate comparison alone. *Attachment "A" contains the crash data.*

Proposed Development Trip Generation Estimate

Estimates of daily and weekday a.m. and p.m. peak hour vehicle trip ends for the proposed Fisher Creek Campus were calculated from empirical observations at other similar developments. These observations were obtained from the standard reference manual, *Trip Generation, 8th Edition,* published by the Institute of Transportation Engineers (ITE, Reference 3). Table 3 shows the estimated trip generation associated the proposed buildings. The daily trips shown in Table 3 were rounded to the nearest even number while the weekday a.m. and p.m. peak hour trips were rounded to the nearest trip.

Table 3 Trip Generation Estimate

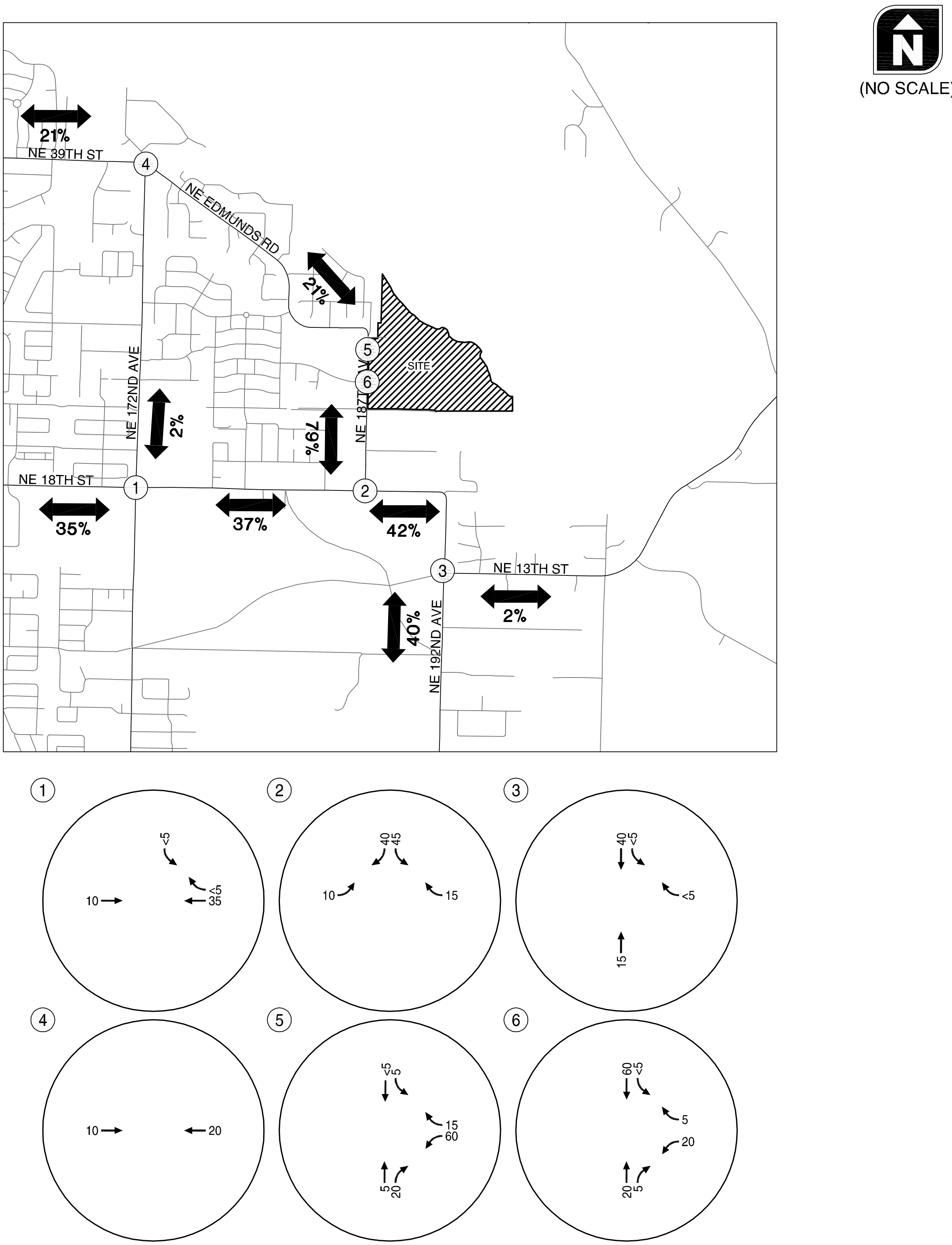
ITE Land Use	ITE Code	Size (square feet)	Daily	Weekday AM Peak Hour			Weekday PM Peak Hour		
				Total	In	Out	Total	In	Out
Corporate Headquarters Building	714	107,256	856	160	149	11	150	15	135



ESTIMATED TRIP DISTRIBUTION PATTERN
CAMAS, WASHINGTON

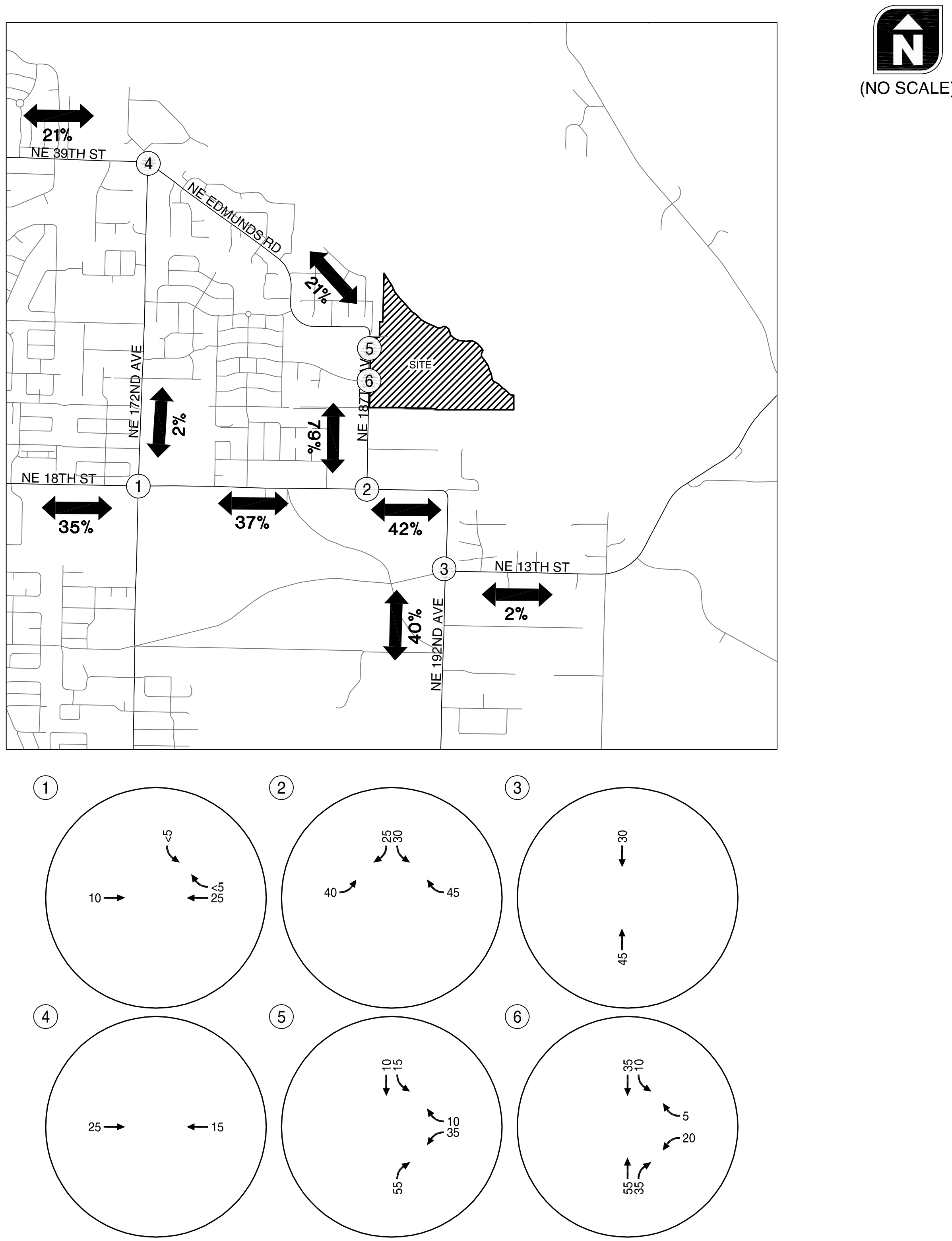
FIGURE 2

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING / PLANNING



ESTIMATED TRIP DISTRIBUTION PATTERN & SITE-GENERATED TRIPS
WEEKDAY AM PEAK HOURS
CLARK COUNTY, WASHINGTON

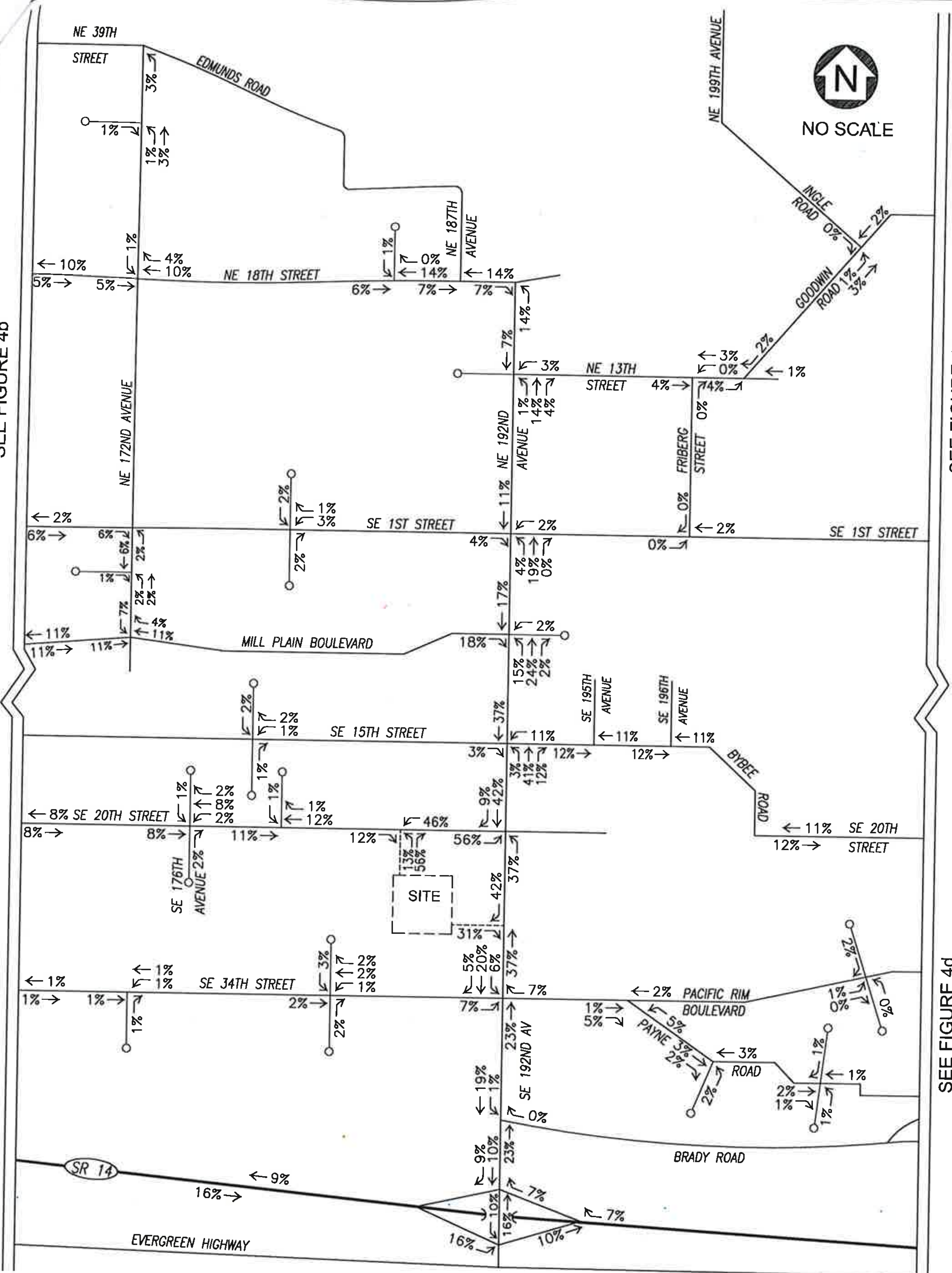
FIGURE **10**



ESTIMATED TRIP DISTRIBUTION PATTERN & SITE-GENERATED TRIPS
WEEKDAY PM PEAK HOURS
CLARK COUNTY, WASHINGTON

FIGURE 11

H:\projfile\13622 - Lennar Bakker Residential Development\dwgs\figs\13622_fig01v4.dwg Oct 24, 2013 - 9:54am - pmarnell Layout Tab: Fig 11



PLOT DATE: 06.13.13

FILE NAME: 1310flow.dwg

CHARBONNEAU ENGINEERING LLC

PROJECT: 13-10

NOTES: Trip distribution based on RTC's EMME/2 model.

TRIP DISTRIBUTION
AM PEAK HOUR & PM PEAK HOUR
192ND PLAZA WEST

FIGURE 4c

Appendix G 2018 Background Conditions Worksheets

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	53	180	14	183	158	4
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	62	209	16	213	184	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			271		412	166
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			271		412	166
tC, single (s)			4.1		6.4	7.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	4.2
p0 queue free %			99		69	99
cM capacity (veh/h)			1304		585	676

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	271	229	188
Volume Left	0	16	184
Volume Right	209	0	5
cSH	1700	1304	587
Volume to Capacity	0.16	0.01	0.32
Queue Length 95th (ft)	0	1	34
Control Delay (s)	0.0	0.7	14.0
Lane LOS		A	B
Approach Delay (s)	0.0	0.7	14.0
Approach LOS			B

Intersection Summary			
Average Delay	4.0		
Intersection Capacity Utilization	36.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	188	223	307	74	548	358
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8		5.4		5.7	5.4
Lane Util. Factor	1.00		1.00		1.00	1.00
Frt	0.93		0.97		1.00	1.00
Flt Protected	0.98		1.00		0.95	1.00
Satd. Flow (prot)	1608		1645		1805	1881
Flt Permitted	0.98		1.00		0.23	1.00
Satd. Flow (perm)	1608		1645		428	1881
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	188	223	307	74	548	358
RTOR Reduction (vph)	27	0	7	0	0	0
Lane Group Flow (vph)	384	0	374	0	548	358
Heavy Vehicles (%)	0%	13%	14%	6%	0%	1%
Turn Type					pm+pt	
Protected Phases	6		4		3	8
Permitted Phases					8	
Actuated Green, G (s)	30.4		27.1		55.2	55.2
Effective Green, g (s)	30.4		27.1		55.2	55.2
Actuated g/C Ratio	0.31		0.28		0.57	0.57
Clearance Time (s)	5.8		5.4		5.7	5.4
Vehicle Extension (s)	1.0		1.0		1.0	1.0
Lane Grp Cap (vph)	505		461		563	1073
v/s Ratio Prot	c0.24		0.23		c0.23	0.19
v/s Ratio Perm					c0.33	
v/c Ratio	0.76		0.81		0.97	0.33
Uniform Delay, d1	29.9		32.5		21.1	11.0
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	5.8		9.9		30.9	0.1
Delay (s)	35.7		42.3		52.0	11.1
Level of Service	D		D		D	B
Approach Delay (s)	35.7		42.3			35.9
Approach LOS	D		D			D

Intersection Summary			
HCM Average Control Delay	37.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	96.8	Sum of lost time (s)	11.5
Intersection Capacity Utilization	88.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	115	279	100	254	1	84	2	28	2	5	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt		1.00	0.85	1.00	1.00			1.00	0.85		0.97	
Flt Protected		1.00	1.00	0.95	1.00			0.95	1.00		0.99	
Satd. Flow (prot)		1757	1615	1671	1817			1636	1417		1486	
Flt Permitted		1.00	1.00	0.95	1.00			0.72	1.00		0.94	
Satd. Flow (perm)		1751	1615	1671	1817			1237	1417		1407	
Peak-hour factor, PHF	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Adj. Flow (vph)	2	174	423	152	385	2	127	3	42	3	8	3
RTOR Reduction (vph)	0	0	271	0	0	0	0	0	34	0	2	0
Lane Group Flow (vph)	0	176	152	152	387	0	0	130	8	0	12	0
Confl. Peds. (#/hr)	1					1						
Heavy Vehicles (%)	100%	7%	0%	8%	4%	100%	11%	0%	14%	0%	40%	0%
Turn Type	Perm		Perm	Prot			Perm		Perm	Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4				2		2	6		
Actuated Green, G (s)		16.0	16.0	7.9	27.9			8.5	8.5		8.5	
Effective Green, g (s)		16.0	16.0	7.9	27.9			8.5	8.5		8.5	
Actuated g/C Ratio		0.36	0.36	0.18	0.63			0.19	0.19		0.19	
Clearance Time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		631	582	297	1142			237	271		269	
v/s Ratio Prot				c0.09	c0.21							
v/s Ratio Perm		0.10	0.09					c0.11	0.01		0.01	
v/c Ratio		0.28	0.26	0.51	0.34			0.55	0.03		0.04	
Uniform Delay, d1		10.1	10.0	16.5	3.9			16.2	14.6		14.6	
Progression Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.2	0.2	1.5	0.2			2.6	0.0		0.1	
Delay (s)		10.3	10.3	18.0	4.1			18.8	14.6		14.7	
Level of Service		B	B	B	A			B	B		B	
Approach Delay (s)		10.3			8.0			17.8			14.7	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	10.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	44.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	44.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	61	69	213	104	36	171
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	69	78	239	117	40	192
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	356				512	298
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	356				512	298
tC, single (s)	4.2				6.5	6.2
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.3
p0 queue free %	94				92	74
cM capacity (veh/h)	1170				481	735

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	146	356	40	192
Volume Left	69	0	40	0
Volume Right	0	117	0	192
cSH	1170	1700	481	735
Volume to Capacity	0.06	0.21	0.08	0.26
Queue Length 95th (ft)	5	0	7	26
Control Delay (s)	4.1	0.0	13.2	11.6
Lane LOS	A		B	B
Approach Delay (s)	4.1	0.0	11.9	
Approach LOS			B	

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	37.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	63	41	4	236	0	64	1	3	0	2	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	68	45	4	257	0	70	1	3	0	2	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	257			113			364	358	91	362	380	257
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	257			113			364	358	91	362	380	257
tC, single (s)	4.1			4.3			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.4			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			88	100	100	100	100	99
cM capacity (veh/h)	1320			1345			585	569	972	593	553	787

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	114	261	74	7
Volume Left	1	4	70	0
Volume Right	45	0	3	4
cSH	1320	1345	596	690
Volume to Capacity	0.00	0.00	0.12	0.01
Queue Length 95th (ft)	0	0	11	1
Control Delay (s)	0.1	0.2	11.9	10.3
Lane LOS	A	A	B	B
Approach Delay (s)	0.1	0.2	11.9	10.3
Approach LOS			B	B

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	32.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Volume (veh/h)	8	67	3	0	190	48	2	0	0	61	1	57
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Hourly flow rate (vph)	10	87	4	0	247	62	3	0	0	79	1	74
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	309			91			462	419	89	388	390	278
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	309			91			462	419	89	388	390	278
tC, single (s)	4.3			4.1			8.1	6.5	6.2	7.2	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.4			2.2			4.4	4.0	3.3	3.6	4.0	3.4
p0 queue free %	99			100			99	100	100	86	100	90
cM capacity (veh/h)	1132			1517			338	524	975	553	544	740

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	101	309	3	155
Volume Left	10	0	3	79
Volume Right	4	62	0	74
cSH	1132	1517	338	629
Volume to Capacity	0.01	0.00	0.01	0.25
Queue Length 95th (ft)	1	0	1	24
Control Delay (s)	0.9	0.0	15.7	12.6
Lane LOS	A		C	B
Approach Delay (s)	0.9	0.0	15.7	12.6
Approach LOS			C	B

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	25.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	358	260	0	0	281	38	0	0	1	22	0	288
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	0.95			0.95			1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00			0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00			1.00			1.00	1.00
Frt	1.00	1.00			0.98			0.86			1.00	0.85
Flt Protected	0.95	1.00			1.00			1.00			0.95	1.00
Satd. Flow (prot)	1671	3505			3442			1623			1804	1491
Flt Permitted	0.95	1.00			1.00			1.00			1.00	1.00
Satd. Flow (perm)	1671	3505			3442			1623			1899	1491
Peak-hour factor, PHF	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Adj. Flow (vph)	597	433	0	0	468	63	0	0	2	37	0	480
RTOR Reduction (vph)	0	0	0	0	12	0	0	2	0	0	0	78
Lane Group Flow (vph)	597	433	0	0	519	0	0	0	0	0	37	402
Confl. Peds. (#/hr)							4		1	1		4
Heavy Vehicles (%)	8%	3%	0%	0%	3%	3%	0%	0%	0%	0%	0%	8%
Turn Type	Prot			Prot			Perm			Perm		pm+ov
Protected Phases	7	4		3	8			2			6	7
Permitted Phases							2			6		6
Actuated Green, G (s)	17.8	34.0			12.2			2.6			2.6	20.4
Effective Green, g (s)	17.8	34.0			12.2			2.6			2.6	20.4
Actuated g/C Ratio	0.40	0.76			0.27			0.06			0.06	0.46
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	667	2672			942			95			111	816
v/s Ratio Prot	c0.36	0.12			c0.15			0.00				c0.20
v/s Ratio Perm											0.02	0.07
v/c Ratio	0.90	0.16			0.55			0.00			0.33	0.49
Uniform Delay, d1	12.5	1.4			13.9			19.8			20.2	8.5
Progression Factor	1.00	1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2	14.5	0.0			0.7			0.0			1.8	0.5
Delay (s)	27.0	1.5			14.6			19.8			21.9	8.9
Level of Service	C	A			B			B			C	A
Approach Delay (s)		16.3			14.6			19.8			9.9	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	44.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	49.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	168	174	128	228	6	111	9	85	20	35	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.86		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1881	1531	1805	3525		1735	1613		1805	1750	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.69	1.00		0.67	1.00	
Satd. Flow (perm)	1805	1881	1531	1805	3525		1264	1613		1273	1750	
Peak-hour factor, PHF	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Adj. Flow (vph)	12	243	252	186	330	9	161	13	123	29	51	49
RTOR Reduction (vph)	0	0	172	0	2	0	0	94	0	0	37	0
Lane Group Flow (vph)	12	243	80	186	337	0	161	42	0	29	63	0
Confl. Peds. (#/hr)			4	4			1					1
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	1%	3%	0%	2%	0%	4%	0%	2%	0%	0%	0%
Turn Type	Prot		Perm	Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2			6		
Actuated Green, G (s)	1.0	16.1	16.1	10.7	25.8		12.0	12.0		12.0	12.0	
Effective Green, g (s)	1.0	16.1	16.1	10.7	25.8		12.0	12.0		12.0	12.0	
Actuated g/C Ratio	0.02	0.32	0.32	0.21	0.51		0.24	0.24		0.24	0.24	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	36	596	485	380	1790		299	381		301	413	
v/s Ratio Prot	0.01	c0.13		c0.10	0.10			0.03			0.04	
v/s Ratio Perm			0.05				c0.13			0.02		
v/c Ratio	0.33	0.41	0.16	0.49	0.19		0.54	0.11		0.10	0.15	
Uniform Delay, d1	24.6	13.6	12.5	17.6	6.8		17.0	15.2		15.2	15.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.4	0.5	0.2	1.0	0.1		1.9	0.1		0.1	0.2	
Delay (s)	30.0	14.1	12.7	18.6	6.9		18.8	15.3		15.3	15.5	
Level of Service	C	B	B	B	A		B	B		B	B	
Approach Delay (s)		13.7			11.0			17.2			15.5	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	50.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	40.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	4	67	64	112	210	3
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	4	75	72	126	236	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				358		
pX, platoon unblocked						
vC, conflicting volume	507	238	239			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	507	238	239			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	91	95			
cM capacity (veh/h)	500	806	1339			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	80	72	126	239
Volume Left	4	72	0	0
Volume Right	75	0	0	3
cSH	779	1339	1700	1700
Volume to Capacity	0.10	0.05	0.07	0.14
Queue Length 95th (ft)	9	4	0	0
Control Delay (s)	10.1	7.8	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	10.1	2.9		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	29.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	56	41	22	177	140	65	59	278	86	29	214	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00	0.98	1.00	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	0.95		1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1736	1679		1786	1765		1805	1827	1546	1751	1845	1509
Flt Permitted	0.58	1.00		0.51	1.00		0.39	1.00	1.00	0.42	1.00	1.00
Satd. Flow (perm)	1061	1679		968	1765		741	1827	1546	771	1845	1509
Peak-hour factor, PHF	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Adj. Flow (vph)	80	59	31	253	200	93	84	397	123	41	306	110
RTOR Reduction (vph)	0	25	0	0	24	0	0	0	75	0	0	75
Lane Group Flow (vph)	80	65	0	253	269	0	84	397	48	41	306	35
Confl. Peds. (#/hr)			1	1					3	3		
Heavy Vehicles (%)	4%	0%	19%	1%	0%	8%	0%	4%	2%	3%	3%	7%
Turn Type	pm+pt			pm+pt			pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	14.2	11.2		22.8	15.8		25.1	20.7	20.7	19.9	18.1	18.1
Effective Green, g (s)	14.2	11.2		22.8	15.8		25.1	20.7	20.7	19.9	18.1	18.1
Actuated g/C Ratio	0.25	0.20		0.40	0.28		0.44	0.36	0.36	0.35	0.32	0.32
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
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)	298	328		494	487		406	660	559	299	583	477
v/s Ratio Prot	0.01	0.04		c0.07	c0.15		c0.02	c0.22		0.00	0.17	
v/s Ratio Perm	0.05			0.14			0.07		0.03	0.04		0.02
v/c Ratio	0.27	0.20		0.51	0.55		0.21	0.60	0.09	0.14	0.52	0.07
Uniform Delay, d1	17.0	19.3		12.3	17.7		9.9	14.9	12.1	12.6	16.1	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	0.5	0.3		0.9	1.4		0.3	1.6	0.1	0.2	0.9	0.1
Delay (s)	17.5	19.6		13.2	19.1		10.2	16.5	12.1	12.8	16.9	13.8
Level of Service	B	B		B	B		B	B	B	B	B	B
Approach Delay (s)		18.6			16.3			14.7			15.8	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	15.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	57.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	368	50	126	389	58	219
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1597	1482	1743	1509	1504	1900
Flt Permitted	0.95	1.00	1.00	1.00	0.48	1.00
Satd. Flow (perm)	1597	1482	1743	1509	764	1900
Peak-hour factor, PHF	0.72	0.72	0.72	0.72	0.72	0.72
Adj. Flow (vph)	511	69	175	540	81	304
RTOR Reduction (vph)	0	22	0	410	0	0
Lane Group Flow (vph)	511	47	175	130	81	304
Heavy Vehicles (%)	13%	9%	9%	7%	20%	0%
Turn Type		Perm		Perm	pm+pt	
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Actuated Green, G (s)	26.7	26.7	14.9	14.9	26.1	26.1
Effective Green, g (s)	26.7	26.7	14.9	14.9	26.1	26.1
Actuated g/C Ratio	0.43	0.43	0.24	0.24	0.42	0.42
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	690	640	420	364	397	802
v/s Ratio Prot	c0.32		0.10		0.02	c0.16
v/s Ratio Perm		0.03		0.09	0.07	
v/c Ratio	0.74	0.07	0.42	0.36	0.20	0.38
Uniform Delay, d1	14.7	10.3	19.8	19.5	11.1	12.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.3	0.0	0.7	0.6	0.3	0.3
Delay (s)	18.9	10.3	20.5	20.1	11.4	12.6
Level of Service	B	B	C	C	B	B
Approach Delay (s)	17.9		20.2			12.3
Approach LOS	B		C			B

Intersection Summary			
HCM Average Control Delay	17.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	61.8	Sum of lost time (s)	9.0
Intersection Capacity Utilization	42.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	159	148	10	98	152	11
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	175	163	11	108	167	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			337		386	256
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			337		386	256
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		73	98
cM capacity (veh/h)			1233		612	787

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	337	119	179
Volume Left	0	11	167
Volume Right	163	0	12
cSH	1700	1233	621
Volume to Capacity	0.20	0.01	0.29
Queue Length 95th (ft)	0	1	30
Control Delay (s)	0.0	0.8	13.1
Lane LOS		A	B
Approach Delay (s)	0.0	0.8	13.1
Approach LOS			B

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	33.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	204	112	692	241	149	409
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8		5.4		5.7	5.4
Lane Util. Factor	1.00		1.00		1.00	1.00
Frpb, ped/bikes	0.99		0.99		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.95		0.97		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1715		1799		1752	1881
Flt Permitted	0.97		1.00		0.07	1.00
Satd. Flow (perm)	1715		1799		120	1881
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	204	112	692	241	149	409
RTOR Reduction (vph)	14	0	6	0	0	0
Lane Group Flow (vph)	302	0	927	0	149	409
Confl. Peds. (#/hr)		2		8	8	
Heavy Vehicles (%)	2%	0%	1%	2%	3%	1%
Turn Type					pm+pt	
Protected Phases	6		4		3	8
Permitted Phases					8	
Actuated Green, G (s)	21.4		55.6		69.6	69.6
Effective Green, g (s)	21.4		55.6		69.6	69.6
Actuated g/C Ratio	0.21		0.54		0.68	0.68
Clearance Time (s)	5.8		5.4		5.7	5.4
Vehicle Extension (s)	1.0		1.0		1.0	1.0
Lane Grp Cap (vph)	359		979		214	1281
v/s Ratio Prot	c0.18		c0.52		c0.06	0.22
v/s Ratio Perm					0.42	
v/c Ratio	0.84		0.95		0.70	0.32
Uniform Delay, d1	38.8		21.9		25.6	6.6
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	15.5		17.0		7.7	0.1
Delay (s)	54.2		38.9		33.3	6.7
Level of Service	D		D		C	A
Approach Delay (s)	54.2		38.9			13.8
Approach LOS	D		D			B

Intersection Summary			
HCM Average Control Delay	33.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	102.2	Sum of lost time (s)	16.9
Intersection Capacity Utilization	91.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	357	24	41	223	2	45	5	60	1	4	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	0.98		1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt		1.00	0.85	1.00	1.00			1.00	0.85		0.98	
Flt Protected		1.00	1.00	0.95	1.00			0.96	1.00		0.99	
Satd. Flow (prot)		1862	1615	1770	1879			1819	1548		1850	
Flt Permitted		1.00	1.00	0.95	1.00			0.74	1.00		0.95	
Satd. Flow (perm)		1856	1615	1770	1879			1413	1548		1779	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	6	406	27	47	253	2	51	6	68	1	5	1
RTOR Reduction (vph)	0	0	13	0	0	0	0	0	59	0	1	0
Lane Group Flow (vph)	0	412	14	47	255	0	0	57	9	0	6	0
Confl. Peds. (#/hr)	2					2			3	3		
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	2%	0%	2%	1%	0%	0%	0%	2%	0%	0%	0%
Turn Type	Perm		Perm	Prot			Perm		Perm	Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4				2		2	6		
Actuated Green, G (s)		22.3	22.3	2.6	28.9			5.9	5.9		5.9	
Effective Green, g (s)		22.3	22.3	2.6	28.9			5.9	5.9		5.9	
Actuated g/C Ratio		0.52	0.52	0.06	0.68			0.14	0.14		0.14	
Clearance Time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		967	841	108	1269			195	213		245	
v/s Ratio Prot				c0.03	0.14							
v/s Ratio Perm		c0.22	0.01					c0.04	0.01		0.00	
v/c Ratio		0.43	0.02	0.44	0.20			0.29	0.04		0.03	
Uniform Delay, d1		6.3	5.0	19.4	2.6			16.6	16.0		16.0	
Progression Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.3	0.0	2.8	0.1			0.8	0.1		0.0	
Delay (s)		6.6	5.0	22.2	2.7			17.4	16.1		16.0	
Level of Service		A	A	C	A			B	B		B	
Approach Delay (s)		6.5			5.7			16.7			16.0	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM Average Control Delay	7.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	42.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	51.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	97	278	148	52	101	64
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	111	320	170	60	116	74
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	230				743	200
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	230				743	200
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				67	91
cM capacity (veh/h)	1350				351	846

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	431	230	116	74
Volume Left	111	0	116	0
Volume Right	0	60	0	74
cSH	1350	1700	351	846
Volume to Capacity	0.08	0.14	0.33	0.09
Queue Length 95th (ft)	7	0	35	7
Control Delay (s)	2.6	0.0	20.2	9.7
Lane LOS	A		C	A
Approach Delay (s)	2.6	0.0	16.1	
Approach LOS			C	

Intersection Summary			
Average Delay	4.9		
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	304	54	2	164	0	34	0	3	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	1	349	62	2	189	0	39	0	3	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	189			411			576	576	380	579	607	189
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	189			411			576	576	380	579	607	189
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			91	100	99	100	100	100
cM capacity (veh/h)	1398			1158			431	430	671	426	412	859

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	413	191	43	0
Volume Left	1	2	39	0
Volume Right	62	0	3	0
cSH	1398	1158	443	1700
Volume to Capacity	0.00	0.00	0.10	0.00
Queue Length 95th (ft)	0	0	8	0
Control Delay (s)	0.0	0.1	14.0	0.0
Lane LOS	A	A	B	A
Approach Delay (s)	0.0	0.1	14.0	0.0
Approach LOS			B	A

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	29.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Volume (veh/h)	79	208	3	2	137	70	3	0	0	89	0	38
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	84	221	3	2	146	74	3	0	0	95	0	40
Pedestrians					1							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					4.0							
Percent Blockage					0							
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	220			224			619	615	224	579	580	183
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	220			224			619	615	224	579	580	183
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.4
p0 queue free %	94			100			99	100	100	77	100	95
cM capacity (veh/h)	1331			1356			366	383	820	403	401	844

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	309	222	3	135
Volume Left	84	2	3	95
Volume Right	3	74	0	40
cSH	1331	1356	366	478
Volume to Capacity	0.06	0.00	0.01	0.28
Queue Length 95th (ft)	5	0	1	29
Control Delay (s)	2.6	0.1	14.9	15.5
Lane LOS	A	A	B	C
Approach Delay (s)	2.6	0.1	14.9	15.5
Approach LOS			B	C

Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	43.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	69	582	0	1	455	38	0	0	0	39	0	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0						4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95						1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00						1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00						1.00	1.00
Frt	1.00	1.00		1.00	0.99						1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00						0.95	1.00
Satd. Flow (prot)	1805	3610		1804	3492						1752	1615
Flt Permitted	0.95	1.00		0.95	1.00						1.00	1.00
Satd. Flow (perm)	1805	3610		1804	3492						1845	1615
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	80	677	0	1	529	44	0	0	0	45	0	50
RTOR Reduction (vph)	0	0	0	0	5	0	0	0	0	0	0	40
Lane Group Flow (vph)	80	677	0	1	568	0	0	0	0	0	45	10
Confl. Peds. (#/hr)			3	3								
Confl. Bikes (#/hr)			1			1			1			
Heavy Vehicles (%)	0%	0%	0%	0%	2%	3%	0%	0%	0%	3%	0%	0%
Turn Type	Prot			Prot			Perm			Perm		pm+ov
Protected Phases	7	4		3	8			2			6	7
Permitted Phases							2			6		6
Actuated Green, G (s)	6.1	27.1		0.9	21.9						2.8	8.9
Effective Green, g (s)	6.1	27.1		0.9	21.9						2.8	8.9
Actuated g/C Ratio	0.14	0.63		0.02	0.51						0.07	0.21
Clearance Time (s)	4.0	4.0		4.0	4.0						4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0						3.0	3.0
Lane Grp Cap (vph)	257	2286		38	1787						121	487
v/s Ratio Prot	c0.04	c0.19		0.00	0.16							0.00
v/s Ratio Perm											c0.02	0.00
v/c Ratio	0.31	0.30		0.03	0.32						0.37	0.02
Uniform Delay, d1	16.5	3.5		20.5	6.1						19.2	13.5
Progression Factor	1.00	1.00		1.00	1.00						1.00	1.00
Incremental Delay, d2	0.7	0.1		0.3	0.1						1.9	0.0
Delay (s)	17.2	3.6		20.8	6.2						21.1	13.5
Level of Service	B	A		C	A						C	B
Approach Delay (s)		5.0			6.2			0.0			17.1	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM Average Control Delay	6.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	42.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	33.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	378	221	36	252	7	199	26	89	10	15	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.88		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1900	1599	1805	3559		1786	1680		1805	1714	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.73	1.00		0.68	1.00	
Satd. Flow (perm)	1805	1900	1599	1805	3559		1376	1680		1293	1714	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	39	390	228	37	260	7	205	27	92	10	15	23
RTOR Reduction (vph)	0	0	134	0	2	0	0	65	0	0	16	0
Lane Group Flow (vph)	39	390	94	37	265	0	205	54	0	10	22	0
Confl. Peds. (#/hr)	2					2	2					2
Heavy Vehicles (%)	0%	0%	1%	0%	1%	0%	1%	0%	0%	0%	0%	0%
Turn Type	Prot		Perm	Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2			6		
Actuated Green, G (s)	2.2	19.7	19.7	2.3	19.8		13.8	13.8		13.8	13.8	
Effective Green, g (s)	2.2	19.7	19.7	2.3	19.8		13.8	13.8		13.8	13.8	
Actuated g/C Ratio	0.05	0.41	0.41	0.05	0.41		0.29	0.29		0.29	0.29	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	83	783	659	87	1474		397	485		373	495	
v/s Ratio Prot	c0.02	c0.21		0.02	0.07			0.03			0.01	
v/s Ratio Perm			0.06				c0.15			0.01		
v/c Ratio	0.47	0.50	0.14	0.43	0.18		0.52	0.11		0.03	0.04	
Uniform Delay, d1	22.2	10.4	8.8	22.1	8.9		14.2	12.5		12.2	12.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.2	0.5	0.1	3.3	0.1		1.1	0.1		0.0	0.0	
Delay (s)	26.4	10.9	8.9	25.4	8.9		15.3	12.6		12.2	12.3	
Level of Service	C	B	A	C	A		B	B		B	B	
Approach Delay (s)		11.1			10.9			14.3			12.3	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	11.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	47.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	50.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	3	69	71	267	178	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	3	79	82	307	205	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				358		
pX, platoon unblocked	0.90					
vC, conflicting volume	678	207	210			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	586	207	210			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	91	94			
cM capacity (veh/h)	403	838	1360			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	83	82	307	210
Volume Left	3	82	0	0
Volume Right	79	0	0	6
cSH	802	1360	1700	1700
Volume to Capacity	0.10	0.06	0.18	0.12
Queue Length 95th (ft)	9	5	0	0
Control Delay (s)	10.0	7.8	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	10.0	1.6		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	28.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	81	194	82	99	125	45	62	252	153	76	325	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00	0.96	1.00	1.00	0.98
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	0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1802		1735	1791		1805	1881	1557	1799	1881	1579
Flt Permitted	0.58	1.00		0.38	1.00		0.38	1.00	1.00	0.42	1.00	1.00
Satd. Flow (perm)	1105	1802		689	1791		713	1881	1557	790	1881	1579
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	95	228	96	116	147	53	73	296	180	89	382	64
RTOR Reduction (vph)	0	22	0	0	18	0	0	0	126	0	0	43
Lane Group Flow (vph)	95	302	0	116	182	0	73	296	54	89	382	21
Confl. Peds. (#/hr)			1	1					12	12		
Confl. Bikes (#/hr)			3			1			1			2
Heavy Vehicles (%)	0%	0%	0%	4%	1%	2%	0%	1%	0%	0%	1%	0%
Turn Type	pm+pt			pm+pt			pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	20.1	15.8		20.1	15.8		20.5	17.5	17.5	23.1	18.8	18.8
Effective Green, g (s)	20.1	15.8		20.1	15.8		20.5	17.5	17.5	23.1	18.8	18.8
Actuated g/C Ratio	0.35	0.27		0.35	0.27		0.35	0.30	0.30	0.40	0.32	0.32
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
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)	436	492		317	489		309	569	471	390	611	513
v/s Ratio Prot	0.02	c0.17		c0.03	0.10		0.01	0.16		c0.02	c0.20	
v/s Ratio Perm	0.06			0.10			0.07		0.03	0.07		0.01
v/c Ratio	0.22	0.61		0.37	0.37		0.24	0.52	0.12	0.23	0.63	0.04
Uniform Delay, d1	13.0	18.4		13.5	17.0		12.8	16.7	14.6	11.3	16.6	13.4
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	0.3	2.3		0.7	0.5		0.4	0.9	0.1	0.3	2.0	0.0
Delay (s)	13.3	20.7		14.2	17.5		13.2	17.6	14.7	11.6	18.6	13.4
Level of Service	B	C		B	B		B	B	B	B	B	B
Approach Delay (s)		19.0			16.3			16.1			16.8	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	17.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	57.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	54.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	256	53	285	292	68	179
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1787	1615	1845	1569	1805	1881
Flt Permitted	0.95	1.00	1.00	1.00	0.35	1.00
Satd. Flow (perm)	1787	1615	1845	1569	657	1881
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	316	65	352	360	84	221
RTOR Reduction (vph)	0	40	0	238	0	0
Lane Group Flow (vph)	316	25	352	122	84	221
Confl. Bikes (#/hr)				8		
Heavy Vehicles (%)	1%	0%	3%	0%	0%	1%
Turn Type		Perm		Perm	pm+pt	
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Actuated Green, G (s)	16.5	16.5	18.4	18.4	28.7	28.7
Effective Green, g (s)	16.5	16.5	18.4	18.4	28.7	28.7
Actuated g/C Ratio	0.30	0.30	0.34	0.34	0.53	0.53
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	544	492	626	533	460	996
v/s Ratio Prot	c0.18		c0.19		0.02	c0.12
v/s Ratio Perm		0.02		0.08	0.08	
v/c Ratio	0.58	0.05	0.56	0.23	0.18	0.22
Uniform Delay, d1	15.9	13.3	14.6	12.8	7.1	6.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.6	0.0	1.2	0.2	0.2	0.1
Delay (s)	17.5	13.4	15.8	13.0	7.2	6.9
Level of Service	B	B	B	B	A	A
Approach Delay (s)	16.8		14.4			7.0
Approach LOS	B		B			A

Intersection Summary			
HCM Average Control Delay	13.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	54.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	44.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Appendix H 2018 Total Traffic Conditions Worksheets

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	53	188	14	183	182	4
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	62	219	16	213	212	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			280		416	171
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			280		416	171
tC, single (s)			4.1		6.4	7.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	4.2
p0 queue free %			99		64	99
cM capacity (veh/h)			1294		582	672

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	280	229	216
Volume Left	0	16	212
Volume Right	219	0	5
cSH	1700	1294	583
Volume to Capacity	0.16	0.01	0.37
Queue Length 95th (ft)	0	1	43
Control Delay (s)	0.0	0.7	14.8
Lane LOS		A	B
Approach Delay (s)	0.0	0.7	14.8
Approach LOS			B

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	38.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	218	247	307	84	556	358
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8		5.4		5.7	5.4
Lane Util. Factor	1.00		1.00		1.00	1.00
Frt	0.93		0.97		1.00	1.00
Flt Protected	0.98		1.00		0.95	1.00
Satd. Flow (prot)	1612		1643		1805	1881
Flt Permitted	0.98		1.00		0.19	1.00
Satd. Flow (perm)	1612		1643		358	1881
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	218	247	307	84	556	358
RTOR Reduction (vph)	25	0	8	0	0	0
Lane Group Flow (vph)	440	0	383	0	556	358
Heavy Vehicles (%)	0%	13%	14%	6%	0%	1%
Turn Type					pm+pt	
Protected Phases	6		4		3	8
Permitted Phases					8	
Actuated Green, G (s)	35.8		28.1		58.6	58.6
Effective Green, g (s)	35.8		28.1		58.6	58.6
Actuated g/C Ratio	0.34		0.27		0.55	0.55
Clearance Time (s)	5.8		5.4		5.7	5.4
Vehicle Extension (s)	1.0		1.0		1.0	1.0
Lane Grp Cap (vph)	546		437		538	1044
v/s Ratio Prot	c0.27		0.23		c0.24	0.19
v/s Ratio Perm					c0.33	
v/c Ratio	0.81		0.88		1.03	0.34
Uniform Delay, d1	31.7		37.1		26.5	12.9
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	8.0		17.1		47.7	0.1
Delay (s)	39.7		54.2		74.1	13.0
Level of Service	D		D		E	B
Approach Delay (s)	39.7		54.2			50.2
Approach LOS	D		D			D

Intersection Summary			
HCM Average Control Delay	48.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	105.6	Sum of lost time (s)	11.5
Intersection Capacity Utilization	93.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	133	279	126	308	1	84	2	37	2	5	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt		1.00	0.85	1.00	1.00			1.00	0.85		0.97	
Flt Protected		1.00	1.00	0.95	1.00			0.95	1.00		0.99	
Satd. Flow (prot)		1760	1615	1671	1818			1636	1417		1486	
Flt Permitted		1.00	1.00	0.95	1.00			0.72	1.00		0.94	
Satd. Flow (perm)		1754	1615	1671	1818			1237	1417		1409	
Peak-hour factor, PHF	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Adj. Flow (vph)	2	202	423	191	467	2	127	3	56	3	8	3
RTOR Reduction (vph)	0	0	265	0	0	0	0	0	46	0	2	0
Lane Group Flow (vph)	0	204	158	191	469	0	0	130	10	0	12	0
Confl. Peds. (#/hr)	1					1						
Heavy Vehicles (%)	100%	7%	0%	8%	4%	100%	11%	0%	14%	0%	40%	0%
Turn Type	Perm		Perm	Prot			Perm		Perm	Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4				2		2	6		
Actuated Green, G (s)		17.7	17.7	8.9	30.6			8.8	8.8		8.8	
Effective Green, g (s)		17.7	17.7	8.9	30.6			8.8	8.8		8.8	
Actuated g/C Ratio		0.37	0.37	0.19	0.65			0.19	0.19		0.19	
Clearance Time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		655	603	314	1174			230	263		262	
v/s Ratio Prot				c0.11	c0.26							
v/s Ratio Perm		0.12	0.10					c0.11	0.01		0.01	
v/c Ratio		0.31	0.26	0.61	0.40			0.57	0.04		0.04	
Uniform Delay, d1		10.5	10.3	17.7	4.0			17.6	15.8		15.8	
Progression Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.3	0.2	3.3	0.2			3.2	0.1		0.1	
Delay (s)		10.8	10.5	21.0	4.2			20.7	15.9		15.9	
Level of Service		B	B	C	A			C	B		B	
Approach Delay (s)		10.6			9.1			19.3			15.9	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	11.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	47.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	47.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	88	69	213	109	52	251
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	99	78	239	122	58	282
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	362				576	301
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	362				576	301
tC, single (s)	4.2				6.5	6.2
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.3
p0 queue free %	92				86	61
cM capacity (veh/h)	1164				429	732

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	99	78	362	58	282
Volume Left	99	0	0	58	0
Volume Right	0	0	122	0	282
cSH	1164	1700	1700	429	732
Volume to Capacity	0.08	0.05	0.21	0.14	0.39
Queue Length 95th (ft)	7	0	0	12	46
Control Delay (s)	8.4	0.0	0.0	14.7	13.0
Lane LOS	A			B	B
Approach Delay (s)	4.7		0.0	13.3	
Approach LOS				B	

Intersection Summary			
Average Delay	6.1		
Intersection Capacity Utilization	40.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	65	54	4	237	0	68	1	3	0	2	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	71	59	4	258	0	74	1	3	0	2	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	258			129			374	368	100	372	398	258
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	258			129			374	368	100	372	398	258
tC, single (s)	4.1			4.3			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.4			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			87	100	100	100	100	99
cM capacity (veh/h)	1319			1326			576	562	961	584	541	786

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	130	262	78	7
Volume Left	1	4	74	0
Volume Right	59	0	3	4
cSH	1319	1326	586	683
Volume to Capacity	0.00	0.00	0.13	0.01
Queue Length 95th (ft)	0	0	11	1
Control Delay (s)	0.1	0.2	12.1	10.3
Lane LOS	A	A	B	B
Approach Delay (s)	0.1	0.2	12.1	10.3
Approach LOS			B	B

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	32.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	8	69	3	0	191	48	2	0	0	61	1	57
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Hourly flow rate (vph)	10	90	4	0	248	62	3	0	0	79	1	74
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	310			94			466	423	92	392	394	279
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	310			94			466	423	92	392	394	279
tC, single (s)	4.3			4.1			8.1	6.5	6.2	7.2	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.4			2.2			4.4	4.0	3.3	3.6	4.0	3.4
p0 queue free %	99			100			99	100	100	86	100	90
cM capacity (veh/h)	1131			1513			335	521	971	550	541	739

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	104	310	3	155
Volume Left	10	0	3	79
Volume Right	4	62	0	74
cSH	1131	1513	335	626
Volume to Capacity	0.01	0.00	0.01	0.25
Queue Length 95th (ft)	1	0	1	24
Control Delay (s)	0.9	0.0	15.8	12.6
Lane LOS	A		C	B
Approach Delay (s)	0.9	0.0	15.8	12.6
Approach LOS			C	B

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	25.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	362	260	0	0	281	43	0	0	1	36	0	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	0.95			0.95			1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00			0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00			1.00			1.00	1.00
Frt	1.00	1.00			0.98			0.86			1.00	0.85
Flt Protected	0.95	1.00			1.00			1.00			0.95	1.00
Satd. Flow (prot)	1671	3505			3435			1623			1804	1488
Flt Permitted	0.95	1.00			1.00			1.00			0.87	1.00
Satd. Flow (perm)	1671	3505			3435			1623			1651	1488
Peak-hour factor, PHF	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Adj. Flow (vph)	603	433	0	0	468	72	0	0	2	60	0	500
RTOR Reduction (vph)	0	0	0	0	14	0	0	2	0	0	0	76
Lane Group Flow (vph)	603	433	0	0	526	0	0	0	0	0	60	424
Confl. Peds. (#/hr)							4		1	1		4
Heavy Vehicles (%)	8%	3%	0%	0%	3%	3%	0%	0%	0%	0%	0%	8%
Turn Type	Prot			Prot			Perm			Perm		pm+ov
Protected Phases	7	4		3	8			2			6	7
Permitted Phases							2			6		6
Actuated Green, G (s)	17.9	35.0			13.1			4.6			4.6	22.5
Effective Green, g (s)	17.9	35.0			13.1			4.6			4.6	22.5
Actuated g/C Ratio	0.38	0.74			0.28			0.10			0.10	0.47
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	628	2577			945			157			160	828
v/s Ratio Prot	c0.36	0.12			c0.15			0.00				c0.19
v/s Ratio Perm											0.04	0.09
v/c Ratio	0.96	0.17			0.56			0.00			0.38	0.51
Uniform Delay, d1	14.5	1.9			14.8			19.4			20.2	8.7
Progression Factor	1.00	1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2	26.2	0.0			0.7			0.0			1.5	0.5
Delay (s)	40.8	1.9			15.5			19.4			21.6	9.3
Level of Service	D	A			B			B			C	A
Approach Delay (s)		24.5			15.5			19.4			10.6	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM Average Control Delay	18.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	47.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	50.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	170	186	128	229	6	115	9	85	20	35	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.86		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1881	1531	1805	3525		1735	1613		1805	1750	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.69	1.00		0.67	1.00	
Satd. Flow (perm)	1805	1881	1531	1805	3525		1264	1613		1273	1750	
Peak-hour factor, PHF	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Adj. Flow (vph)	12	246	270	186	332	9	167	13	123	29	51	49
RTOR Reduction (vph)	0	0	183	0	2	0	0	94	0	0	37	0
Lane Group Flow (vph)	12	246	87	186	339	0	167	42	0	29	63	0
Confl. Peds. (#/hr)			4	4			1					1
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	1%	3%	0%	2%	0%	4%	0%	2%	0%	0%	0%
Turn Type	Prot		Perm	Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2			6		
Actuated Green, G (s)	1.0	16.5	16.5	10.7	26.2		12.3	12.3		12.3	12.3	
Effective Green, g (s)	1.0	16.5	16.5	10.7	26.2		12.3	12.3		12.3	12.3	
Actuated g/C Ratio	0.02	0.32	0.32	0.21	0.51		0.24	0.24		0.24	0.24	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	35	603	491	375	1793		302	385		304	418	
v/s Ratio Prot	0.01	c0.13		c0.10	0.10			0.03			0.04	
v/s Ratio Perm			0.06				c0.13			0.02		
v/c Ratio	0.34	0.41	0.18	0.50	0.19		0.55	0.11		0.10	0.15	
Uniform Delay, d1	24.9	13.7	12.6	18.0	6.9		17.2	15.3		15.3	15.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.8	0.5	0.2	1.0	0.1		2.2	0.1		0.1	0.2	
Delay (s)	30.7	14.1	12.8	19.1	6.9		19.4	15.4		15.4	15.6	
Level of Service	C	B	B	B	A		B	B		B	B	
Approach Delay (s)		13.8			11.2			17.6			15.6	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	13.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	51.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	41.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	4	68	64	112	211	3
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	4	76	72	126	237	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				358		
pX, platoon unblocked						
vC, conflicting volume	508	239	240			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	508	239	240			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	91	95			
cM capacity (veh/h)	500	805	1338			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	81	72	126	240
Volume Left	4	72	0	0
Volume Right	76	0	0	3
cSH	779	1338	1700	1700
Volume to Capacity	0.10	0.05	0.07	0.14
Queue Length 95th (ft)	9	4	0	0
Control Delay (s)	10.2	7.8	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	10.2	2.9		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	29.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	58	41	22	177	140	65	59	280	86	29	226	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00	0.98	1.00	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	0.95		1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1736	1679		1786	1765		1805	1827	1546	1751	1845	1509
Flt Permitted	0.53	1.00		0.54	1.00		0.38	1.00	1.00	0.41	1.00	1.00
Satd. Flow (perm)	962	1679		1019	1765		713	1827	1546	752	1845	1509
Peak-hour factor, PHF	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Adj. Flow (vph)	83	59	31	253	200	93	84	400	123	41	323	110
RTOR Reduction (vph)	0	25	0	0	25	0	0	0	75	0	0	75
Lane Group Flow (vph)	83	65	0	253	268	0	84	400	48	41	323	35
Confl. Peds. (#/hr)			1	1					3	3		
Heavy Vehicles (%)	4%	0%	19%	1%	0%	8%	0%	4%	2%	3%	3%	7%
Turn Type	pm+pt			pm+pt			pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	15.7	11.4		22.3	14.7		25.1	20.8	20.8	20.3	18.4	18.4
Effective Green, g (s)	15.7	11.4		22.3	14.7		25.1	20.8	20.8	20.3	18.4	18.4
Actuated g/C Ratio	0.27	0.20		0.39	0.25		0.44	0.36	0.36	0.35	0.32	0.32
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
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)	319	332		495	450		392	659	557	297	588	481
v/s Ratio Prot	0.02	0.04		c0.07	c0.15		c0.02	c0.22		0.00	0.18	
v/s Ratio Perm	0.05			0.13			0.08		0.03	0.04		0.02
v/c Ratio	0.26	0.20		0.51	0.60		0.21	0.61	0.09	0.14	0.55	0.07
Uniform Delay, d1	16.1	19.3		12.8	18.9		10.1	15.1	12.2	12.6	16.2	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	0.4	0.3		0.9	2.1		0.3	1.6	0.1	0.2	1.1	0.1
Delay (s)	16.5	19.6		13.7	21.0		10.4	16.7	12.2	12.8	17.3	13.8
Level of Service	B	B		B	C		B	B	B	B	B	B
Approach Delay (s)		18.1			17.6			14.9			16.1	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	16.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	57.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	368	50	126	389	58	221
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1597	1482	1743	1509	1504	1900
Flt Permitted	0.95	1.00	1.00	1.00	0.48	1.00
Satd. Flow (perm)	1597	1482	1743	1509	764	1900
Peak-hour factor, PHF	0.72	0.72	0.72	0.72	0.72	0.72
Adj. Flow (vph)	511	69	175	540	81	307
RTOR Reduction (vph)	0	22	0	410	0	0
Lane Group Flow (vph)	511	47	175	130	81	307
Heavy Vehicles (%)	13%	9%	9%	7%	20%	0%
Turn Type		Perm		Perm	pm+pt	
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Actuated Green, G (s)	26.7	26.7	14.9	14.9	26.1	26.1
Effective Green, g (s)	26.7	26.7	14.9	14.9	26.1	26.1
Actuated g/C Ratio	0.43	0.43	0.24	0.24	0.42	0.42
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	690	640	420	364	397	802
v/s Ratio Prot	c0.32		0.10		0.02	c0.16
v/s Ratio Perm		0.03		0.09	0.07	
v/c Ratio	0.74	0.07	0.42	0.36	0.20	0.38
Uniform Delay, d1	14.7	10.3	19.8	19.5	11.1	12.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.3	0.0	0.7	0.6	0.3	0.3
Delay (s)	18.9	10.3	20.5	20.1	11.4	12.6
Level of Service	B	B	C	C	B	B
Approach Delay (s)	17.9		20.2			12.3
Approach LOS	B		C			B

Intersection Summary			
HCM Average Control Delay	17.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	61.8	Sum of lost time (s)	9.0
Intersection Capacity Utilization	42.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	159	175	10	98	168	11
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	175	192	11	108	185	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			367		401	271
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			367		401	271
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		69	98
cM capacity (veh/h)			1203		600	773

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	367	119	197
Volume Left	0	11	185
Volume Right	192	0	12
cSH	1700	1203	608
Volume to Capacity	0.22	0.01	0.32
Queue Length 95th (ft)	0	1	35
Control Delay (s)	0.0	0.8	13.7
Lane LOS		A	B
Approach Delay (s)	0.0	0.8	13.7
Approach LOS			B

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	35.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	220	128	692	261	176	409
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8		5.4		5.7	5.4
Lane Util. Factor	1.00		1.00		1.00	1.00
Frpb, ped/bikes	0.99		0.99		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.95		0.96		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1712		1793		1752	1881
Flt Permitted	0.97		1.00		0.07	1.00
Satd. Flow (perm)	1712		1793		120	1881
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	220	128	692	261	176	409
RTOR Reduction (vph)	15	0	8	0	0	0
Lane Group Flow (vph)	333	0	945	0	176	409
Confl. Peds. (#/hr)		2		8	8	
Heavy Vehicles (%)	2%	0%	1%	2%	3%	1%
Turn Type					pm+pt	
Protected Phases	6		4		3	8
Permitted Phases					8	
Actuated Green, G (s)	24.6		55.6		71.5	71.5
Effective Green, g (s)	24.6		55.6		71.5	71.5
Actuated g/C Ratio	0.23		0.52		0.67	0.67
Clearance Time (s)	5.8		5.4		5.7	5.4
Vehicle Extension (s)	1.0		1.0		1.0	1.0
Lane Grp Cap (vph)	392		929		235	1253
v/s Ratio Prot	c0.19		c0.53		c0.07	0.22
v/s Ratio Perm					0.43	
v/c Ratio	0.85		1.02		0.75	0.33
Uniform Delay, d1	39.6		25.8		30.7	7.6
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	15.0		34.0		10.8	0.1
Delay (s)	54.6		59.8		41.6	7.7
Level of Service	D		E		D	A
Approach Delay (s)	54.6		59.8			17.9
Approach LOS	D		E			B

Intersection Summary			
HCM Average Control Delay	45.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	107.3	Sum of lost time (s)	16.9
Intersection Capacity Utilization	96.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	404	24	63	255	2	45	5	103	1	4	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	0.98		1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt		1.00	0.85	1.00	1.00			1.00	0.85		0.98	
Flt Protected		1.00	1.00	0.95	1.00			0.96	1.00		0.99	
Satd. Flow (prot)		1862	1615	1770	1879			1819	1548		1850	
Flt Permitted		1.00	1.00	0.95	1.00			0.74	1.00		0.95	
Satd. Flow (perm)		1856	1615	1770	1879			1413	1548		1778	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	6	459	27	72	290	2	51	6	117	1	5	1
RTOR Reduction (vph)	0	0	13	0	0	0	0	0	102	0	1	0
Lane Group Flow (vph)	0	465	14	72	292	0	0	57	15	0	6	0
Confl. Peds. (#/hr)	2					2			3	3		
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	2%	0%	2%	1%	0%	0%	0%	2%	0%	0%	0%
Turn Type	Perm		Perm	Prot			Perm		Perm	Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4				2		2	6		
Actuated Green, G (s)		22.8	22.8	4.5	31.3			5.9	5.9		5.9	
Effective Green, g (s)		22.8	22.8	4.5	31.3			5.9	5.9		5.9	
Actuated g/C Ratio		0.50	0.50	0.10	0.69			0.13	0.13		0.13	
Clearance Time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		936	815	176	1301			184	202		232	
v/s Ratio Prot				c0.04	0.16							
v/s Ratio Perm		c0.25	0.01					c0.04	0.01		0.00	
v/c Ratio		0.50	0.02	0.41	0.22			0.31	0.08		0.03	
Uniform Delay, d1		7.4	5.6	19.1	2.5			17.8	17.3		17.1	
Progression Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.4	0.0	1.5	0.1			1.0	0.2		0.0	
Delay (s)		7.8	5.6	20.7	2.6			18.8	17.4		17.2	
Level of Service		A	A	C	A			B	B		B	
Approach Delay (s)		7.7			6.2			17.9			17.2	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM Average Control Delay	8.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	45.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	56.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	187	278	148	70	111	118
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	215	320	170	80	128	136
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	251				960	210
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	251				960	210
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	84				47	84
cM capacity (veh/h)	1327				239	835

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	215	320	251	128	136
Volume Left	215	0	0	128	0
Volume Right	0	0	80	0	136
cSH	1327	1700	1700	239	835
Volume to Capacity	0.16	0.19	0.15	0.53	0.16
Queue Length 95th (ft)	14	0	0	71	14
Control Delay (s)	8.2	0.0	0.0	36.2	10.1
Lane LOS	A			E	B
Approach Delay (s)	3.3		0.0	22.8	
Approach LOS				C	

Intersection Summary			
Average Delay	7.4		
Intersection Capacity Utilization	38.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	306	63	2	167	0	49	0	3	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	1	352	72	2	192	0	56	0	3	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	192			424			587	587	388	590	623	192
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	192			424			587	587	388	590	623	192
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			87	100	99	100	100	100
cM capacity (veh/h)	1394			1146			423	423	665	419	404	855

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	425	194	60	0
Volume Left	1	2	56	0
Volume Right	72	0	3	0
cSH	1394	1146	432	1700
Volume to Capacity	0.00	0.00	0.14	0.00
Queue Length 95th (ft)	0	0	12	0
Control Delay (s)	0.0	0.1	14.7	0.0
Lane LOS	A	A	B	A
Approach Delay (s)	0.0	0.1	14.7	0.0
Approach LOS			B	A

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	30.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	79	210	3	2	140	70	3	0	0	89	0	38
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	84	223	3	2	149	74	3	0	0	95	0	40
Pedestrians					1							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					4.0							
Percent Blockage					0							
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	223			227			624	621	226	585	585	186
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	223			227			624	621	226	585	585	186
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.4
p0 queue free %	94			100			99	100	100	76	100	95
cM capacity (veh/h)	1328			1354			363	380	818	400	398	841

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	311	226	3	135
Volume Left	84	2	3	95
Volume Right	3	74	0	40
cSH	1328	1354	363	475
Volume to Capacity	0.06	0.00	0.01	0.28
Queue Length 95th (ft)	5	0	1	29
Control Delay (s)	2.6	0.1	15.0	15.6
Lane LOS	A	A	C	C
Approach Delay (s)	2.6	0.1	15.0	15.6
Approach LOS			C	C

Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	43.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	96	582	0	1	455	54	0	0	0	49	0	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0						4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95						1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00						1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00						1.00	1.00
Frt	1.00	1.00		1.00	0.98						1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00						0.95	1.00
Satd. Flow (prot)	1805	3610		1804	3474						1752	1615
Flt Permitted	0.95	1.00		0.95	1.00						0.91	1.00
Satd. Flow (perm)	1805	3610		1804	3474						1677	1615
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	112	677	0	1	529	63	0	0	0	57	0	64
RTOR Reduction (vph)	0	0	0	0	7	0	0	0	0	0	0	48
Lane Group Flow (vph)	112	677	0	1	585	0	0	0	0	0	57	16
Confl. Peds. (#/hr)			3	3								
Confl. Bikes (#/hr)			1			1			1			
Heavy Vehicles (%)	0%	0%	0%	0%	2%	3%	0%	0%	0%	3%	0%	0%
Turn Type	Prot			Prot			Perm			Perm		pm+ov
Protected Phases	7	4		3	8			2			6	7
Permitted Phases							2			6		6
Actuated Green, G (s)	6.8	27.0		0.8	21.0						4.4	11.2
Effective Green, g (s)	6.8	27.0		0.8	21.0						4.4	11.2
Actuated g/C Ratio	0.15	0.61		0.02	0.48						0.10	0.25
Clearance Time (s)	4.0	4.0		4.0	4.0						4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0						3.0	3.0
Lane Grp Cap (vph)	278	2205		33	1651						167	555
v/s Ratio Prot	c0.06	0.19		0.00	c0.17							0.00
v/s Ratio Perm											c0.03	0.01
v/c Ratio	0.40	0.31		0.03	0.35						0.34	0.03
Uniform Delay, d1	16.9	4.1		21.3	7.3						18.5	12.4
Progression Factor	1.00	1.00		1.00	1.00						1.00	1.00
Incremental Delay, d2	1.0	0.1		0.4	0.1						1.2	0.0
Delay (s)	17.8	4.2		21.7	7.5						19.8	12.4
Level of Service	B	A		C	A						B	B
Approach Delay (s)		6.1			7.5			0.0			15.9	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM Average Control Delay	7.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	44.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	33.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	38	380	229	36	255	7	213	26	89	10	15	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.88		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1900	1599	1805	3559		1786	1680		1805	1714	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.73	1.00		0.68	1.00	
Satd. Flow (perm)	1805	1900	1599	1805	3559		1376	1680		1293	1714	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	39	392	236	37	263	7	220	27	92	10	15	23
RTOR Reduction (vph)	0	0	140	0	2	0	0	65	0	0	16	0
Lane Group Flow (vph)	39	392	96	37	268	0	220	54	0	10	22	0
Confl. Peds. (#/hr)	2					2	2					2
Heavy Vehicles (%)	0%	0%	1%	0%	1%	0%	1%	0%	0%	0%	0%	0%
Turn Type	Prot		Perm	Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2			6		
Actuated Green, G (s)	2.2	19.9	19.9	2.4	20.1		14.5	14.5		14.5	14.5	
Effective Green, g (s)	2.2	19.9	19.9	2.4	20.1		14.5	14.5		14.5	14.5	
Actuated g/C Ratio	0.05	0.41	0.41	0.05	0.41		0.30	0.30		0.30	0.30	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	81	775	652	89	1466		409	499		384	509	
v/s Ratio Prot	c0.02	c0.21		0.02	0.08			0.03			0.01	
v/s Ratio Perm			0.06				c0.16			0.01		
v/c Ratio	0.48	0.51	0.15	0.42	0.18		0.54	0.11		0.03	0.04	
Uniform Delay, d1	22.7	10.8	9.1	22.5	9.1		14.3	12.5		12.1	12.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.5	0.5	0.1	3.1	0.1		1.4	0.1		0.0	0.0	
Delay (s)	27.2	11.3	9.2	25.6	9.2		15.7	12.6		12.2	12.2	
Level of Service	C	B	A	C	A		B	B		B	B	
Approach Delay (s)		11.5			11.2			14.6			12.2	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	12.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	48.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	51.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	3	70	72	268	179	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	3	80	83	308	206	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				358		
pX, platoon unblocked	0.90					
vC, conflicting volume	682	209	211			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	591	209	211			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	90	94			
cM capacity (veh/h)	400	837	1359			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	84	83	308	211
Volume Left	3	83	0	0
Volume Right	80	0	0	6
cSH	801	1359	1700	1700
Volume to Capacity	0.10	0.06	0.18	0.12
Queue Length 95th (ft)	9	5	0	0
Control Delay (s)	10.0	7.8	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	10.0	1.7		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	28.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	194	82	99	125	45	62	261	153	76	333	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00	0.96	1.00	1.00	0.98
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	0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1802		1735	1791		1805	1881	1557	1799	1881	1579
Flt Permitted	0.58	1.00		0.37	1.00		0.36	1.00	1.00	0.41	1.00	1.00
Satd. Flow (perm)	1101	1802		683	1791		693	1881	1557	769	1881	1579
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	100	228	96	116	147	53	73	307	180	89	392	64
RTOR Reduction (vph)	0	22	0	0	18	0	0	0	125	0	0	43
Lane Group Flow (vph)	100	302	0	116	182	0	73	307	55	89	392	21
Confl. Peds. (#/hr)			1	1					12	12		
Confl. Bikes (#/hr)			3			1			1			2
Heavy Vehicles (%)	0%	0%	0%	4%	1%	2%	0%	1%	0%	0%	1%	0%
Turn Type	pm+pt			pm+pt			pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	20.1	15.8		20.1	15.8		20.9	17.9	17.9	23.5	19.2	19.2
Effective Green, g (s)	20.1	15.8		20.1	15.8		20.9	17.9	17.9	23.5	19.2	19.2
Actuated g/C Ratio	0.34	0.27		0.34	0.27		0.36	0.31	0.31	0.40	0.33	0.33
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
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)	432	488		313	485		306	578	478	386	619	520
v/s Ratio Prot	0.02	c0.17		c0.03	0.10		0.01	0.16		c0.02	c0.21	
v/s Ratio Perm	0.06			0.10			0.07		0.04	0.08		0.01
v/c Ratio	0.23	0.62		0.37	0.37		0.24	0.53	0.12	0.23	0.63	0.04
Uniform Delay, d1	13.3	18.6		13.7	17.2		12.8	16.7	14.5	11.2	16.6	13.3
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	0.3	2.3		0.7	0.5		0.4	0.9	0.1	0.3	2.1	0.0
Delay (s)	13.5	21.0		14.4	17.7		13.2	17.7	14.6	11.5	18.7	13.3
Level of Service	B	C		B	B		B	B	B	B	B	B
Approach Delay (s)		19.2			16.5			16.1			16.9	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	17.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	58.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	55.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	256	54	286	292	68	181
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1787	1615	1845	1569	1805	1881
Flt Permitted	0.95	1.00	1.00	1.00	0.34	1.00
Satd. Flow (perm)	1787	1615	1845	1569	655	1881
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	316	67	353	360	84	223
RTOR Reduction (vph)	0	42	0	238	0	0
Lane Group Flow (vph)	316	25	353	122	84	223
Confl. Bikes (#/hr)				8		
Heavy Vehicles (%)	1%	0%	3%	0%	0%	1%
Turn Type		Perm		Perm	pm+pt	
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Actuated Green, G (s)	16.5	16.5	18.4	18.4	28.7	28.7
Effective Green, g (s)	16.5	16.5	18.4	18.4	28.7	28.7
Actuated g/C Ratio	0.30	0.30	0.34	0.34	0.53	0.53
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	544	492	626	533	459	996
v/s Ratio Prot	c0.18		c0.19		0.02	c0.12
v/s Ratio Perm		0.02		0.08	0.08	
v/c Ratio	0.58	0.05	0.56	0.23	0.18	0.22
Uniform Delay, d1	15.9	13.3	14.6	12.8	7.1	6.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.6	0.0	1.2	0.2	0.2	0.1
Delay (s)	17.5	13.4	15.8	13.0	7.2	6.9
Level of Service	B	B	B	B	A	A
Approach Delay (s)	16.8		14.4			7.0
Approach LOS	B		B			A

Intersection Summary			
HCM Average Control Delay	13.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	54.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	44.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Appendix I Sensitivity Analysis at NE Ingle Road/NE Goodwin Road

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	97	278	148	52	101	64
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	111	320	170	60	116	74
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	230				743	200
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	230				743	200
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				67	91
cM capacity (veh/h)	1350				351	846

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	431	230	116	74
Volume Left	111	0	116	0
Volume Right	0	60	0	74
cSH	1350	1700	351	846
Volume to Capacity	0.08	0.14	0.33	0.09
Queue Length 95th (ft)	7	0	35	7
Control Delay (s)	2.6	0.0	20.2	9.7
Lane LOS	A		C	A
Approach Delay (s)	2.6	0.0	16.1	
Approach LOS			C	

Intersection Summary			
Average Delay	4.9		
Intersection Capacity Utilization	46.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	181	278	148	68	111	114
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	208	320	170	78	128	131
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	248				945	209
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	248				945	209
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	84				48	84
cM capacity (veh/h)	1329				245	836

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	208	320	248	128	131
Volume Left	208	0	0	128	0
Volume Right	0	0	78	0	131
cSH	1329	1700	1700	245	836
Volume to Capacity	0.16	0.19	0.15	0.52	0.16
Queue Length 95th (ft)	14	0	0	69	14
Control Delay (s)	8.2	0.0	0.0	34.6	10.1
Lane LOS	A			D	B
Approach Delay (s)	3.2		0.0	22.2	
Approach LOS				C	

Intersection Summary			
Average Delay	7.2		
Intersection Capacity Utilization	38.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	184	278	148	69	111	114
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	211	320	170	79	128	131
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	249				952	210
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	249				952	210
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	84				47	84
cM capacity (veh/h)	1328				242	836

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	211	320	249	128	131
Volume Left	211	0	0	128	0
Volume Right	0	0	79	0	131
cSH	1328	1700	1700	242	836
Volume to Capacity	0.16	0.19	0.15	0.53	0.16
Queue Length 95th (ft)	14	0	0	70	14
Control Delay (s)	8.2	0.0	0.0	35.4	10.1
Lane LOS	A			E	B
Approach Delay (s)	3.3		0.0	22.6	
Approach LOS				C	

Intersection Summary			
Average Delay	7.3		
Intersection Capacity Utilization	38.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	187	278	148	70	111	118
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	215	320	170	80	128	136
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	251				960	210
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	251				960	210
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	84				47	84
cM capacity (veh/h)	1327				239	835

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	215	320	251	128	136
Volume Left	215	0	0	128	0
Volume Right	0	0	80	0	136
cSH	1327	1700	1700	239	835
Volume to Capacity	0.16	0.19	0.15	0.53	0.16
Queue Length 95th (ft)	14	0	0	71	14
Control Delay (s)	8.2	0.0	0.0	36.2	10.1
Lane LOS	A			E	B
Approach Delay (s)	3.3		0.0	22.8	
Approach LOS				C	

Intersection Summary			
Average Delay	7.4		
Intersection Capacity Utilization	38.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	187	278	148	70	111	118
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	215	320	170	80	128	136
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	251				920	170
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	251				920	170
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	84				49	85
cM capacity (veh/h)	1327				252	879

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	215	320	170	80	128	136
Volume Left	215	0	0	0	128	0
Volume Right	0	0	0	80	0	136
cSH	1327	1700	1700	1700	252	879
Volume to Capacity	0.16	0.19	0.10	0.05	0.51	0.15
Queue Length 95th (ft)	14	0	0	0	66	14
Control Delay (s)	8.2	0.0	0.0	0.0	33.0	9.8
Lane LOS	A				D	A
Approach Delay (s)	3.3		0.0		21.1	
Approach LOS					C	

Intersection Summary			
Average Delay	7.0		
Intersection Capacity Utilization	34.3%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix J 2029 Background Conditions Worksheets

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	59	209	16	204	200	4
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	69	243	19	237	233	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			312		465	190
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			312		465	190
tC, single (s)			4.1		6.4	7.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	4.2
p0 queue free %			99		57	99
cM capacity (veh/h)			1260		544	653

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	312	256	237
Volume Left	0	19	233
Volume Right	243	0	5
cSH	1700	1260	546
Volume to Capacity	0.18	0.01	0.43
Queue Length 95th (ft)	0	1	55
Control Delay (s)	0.0	0.7	16.6
Lane LOS		A	C
Approach Delay (s)	0.0	0.7	16.6
Approach LOS			C

Intersection Summary			
Average Delay	5.1		
Intersection Capacity Utilization	41.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	237	272	376	92	619	434
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8		5.4		5.7	5.4
Lane Util. Factor	1.00		1.00		1.00	1.00
Frt	0.93		0.97		1.00	1.00
Flt Protected	0.98		1.00		0.95	1.00
Satd. Flow (prot)	1611		1645		1805	1881
Flt Permitted	0.98		1.00		0.15	1.00
Satd. Flow (perm)	1611		1645		286	1881
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	237	272	376	92	619	434
RTOR Reduction (vph)	28	0	7	0	0	0
Lane Group Flow (vph)	481	0	461	0	619	434
Heavy Vehicles (%)	0%	13%	14%	6%	0%	1%
Turn Type					pm+pt	
Protected Phases	6		4		3	8
Permitted Phases					8	
Actuated Green, G (s)	35.4		38.1		77.4	77.4
Effective Green, g (s)	35.4		38.1		77.4	77.4
Actuated g/C Ratio	0.29		0.31		0.62	0.62
Clearance Time (s)	5.8		5.4		5.7	5.4
Vehicle Extension (s)	1.0		1.0		1.0	1.0
Lane Grp Cap (vph)	460		505		590	1174
v/s Ratio Prot	c0.30		0.28		c0.28	0.23
v/s Ratio Perm					c0.37	
v/c Ratio	1.05		0.91		1.05	0.37
Uniform Delay, d1	44.3		41.4		33.2	11.4
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	54.5		20.6		50.6	0.1
Delay (s)	98.8		61.9		83.8	11.5
Level of Service	F		E		F	B
Approach Delay (s)	98.8		61.9			54.0
Approach LOS	F		E			D

Intersection Summary			
HCM Average Control Delay	67.0	HCM Level of Service	E
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	124.0	Sum of lost time (s)	11.5
Intersection Capacity Utilization	103.3%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	145	311	138	334	1	94	2	40	2	6	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt		1.00	0.85	1.00	1.00			1.00	0.85		0.98	
Flt Protected		1.00	1.00	0.95	1.00			0.95	1.00		0.99	
Satd. Flow (prot)		1767	1615	1671	1822			1634	1417		1454	
Flt Permitted		1.00	1.00	0.95	1.00			0.72	1.00		0.95	
Satd. Flow (perm)		1764	1615	1671	1822			1237	1417		1395	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	1	181	389	172	418	1	118	2	50	2	8	2
RTOR Reduction (vph)	0	0	248	0	0	0	0	0	41	0	2	0
Lane Group Flow (vph)	0	182	141	172	419	0	0	120	9	0	10	0
Confl. Peds. (#/hr)	1					1						
Heavy Vehicles (%)	100%	7%	0%	8%	4%	100%	11%	0%	14%	0%	40%	0%
Turn Type	Perm		Perm	Prot			Perm		Perm	Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4				2		2	6		
Actuated Green, G (s)		16.2	16.2	8.3	28.5			8.2	8.2		8.2	
Effective Green, g (s)		16.2	16.2	8.3	28.5			8.2	8.2		8.2	
Actuated g/C Ratio		0.36	0.36	0.19	0.64			0.18	0.18		0.18	
Clearance Time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		639	585	310	1162			227	260		256	
v/s Ratio Prot				c0.10	c0.23							
v/s Ratio Perm		0.10	0.09					c0.10	0.01		0.01	
v/c Ratio		0.28	0.24	0.55	0.36			0.53	0.04		0.04	
Uniform Delay, d1		10.1	10.0	16.5	3.8			16.5	15.0		15.0	
Progression Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.2	0.2	2.1	0.2			2.2	0.1		0.1	
Delay (s)		10.4	10.2	18.7	4.0			18.7	15.1		15.1	
Level of Service		B	B	B	A			B	B		B	
Approach Delay (s)		10.2			8.3			17.6			15.1	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	10.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	44.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	94	76	237	121	56	271
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	106	85	266	136	63	304
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	402				563	266
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	402				563	266
tC, single (s)	4.2				6.5	6.2
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.3
p0 queue free %	91				85	60
cM capacity (veh/h)	1125				433	765

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	106	85	266	136	63	304
Volume Left	106	0	0	0	63	0
Volume Right	0	0	0	136	0	304
cSH	1125	1700	1700	1700	433	765
Volume to Capacity	0.09	0.05	0.16	0.08	0.15	0.40
Queue Length 95th (ft)	8	0	0	0	13	48
Control Delay (s)	8.5	0.0	0.0	0.0	14.7	12.8
Lane LOS	A				B	B
Approach Delay (s)	4.7		0.0		13.1	
Approach LOS					B	

Intersection Summary			
Average Delay	6.0		
Intersection Capacity Utilization	35.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	72	59	4	264	0	76	1	3	0	2	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	78	64	4	287	0	83	1	3	0	2	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	287			142			414	408	110	412	440	287
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	287			142			414	408	110	412	440	287
tC, single (s)	4.1			4.3			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.4			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			85	100	100	100	100	99
cM capacity (veh/h)	1287			1311			542	534	949	549	512	757

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	143	291	87	7
Volume Left	1	4	83	0
Volume Right	64	0	3	4
cSH	1287	1311	551	653
Volume to Capacity	0.00	0.00	0.16	0.01
Queue Length 95th (ft)	0	0	14	1
Control Delay (s)	0.1	0.1	12.8	10.6
Lane LOS	A	A	B	B
Approach Delay (s)	0.1	0.1	12.8	10.6
Approach LOS			B	B

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	34.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	9	77	3	0	213	54	2	0	0	68	1	64
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	11	96	4	0	266	68	2	0	0	85	1	80
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	334			100			501	454	98	421	422	300
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	334			100			501	454	98	421	422	300
tC, single (s)	4.3			4.1			8.1	6.5	6.2	7.2	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.4			2.2			4.4	4.0	3.3	3.6	4.0	3.4
p0 queue free %	99			100			99	100	100	84	100	89
cM capacity (veh/h)	1108			1505			312	500	963	525	521	719

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	111	334	2	166
Volume Left	11	0	2	85
Volume Right	4	68	0	80
cSH	1108	1505	312	603
Volume to Capacity	0.01	0.00	0.01	0.28
Queue Length 95th (ft)	1	0	1	28
Control Delay (s)	0.9	0.0	16.6	13.2
Lane LOS	A		C	B
Approach Delay (s)	0.9	0.0	16.6	13.2
Approach LOS			C	B

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	28.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	403	286	0	0	311	47	0	0	1	39	0	333
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	0.95			0.95			1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00			0.99			1.00	1.00
Flpb, ped/bikes	1.00	1.00			1.00			1.00			1.00	1.00
Frt	1.00	1.00			0.98			0.86			1.00	0.85
Flt Protected	0.95	1.00			1.00			1.00			0.95	1.00
Satd. Flow (prot)	1671	3505			3436			1623			1804	1489
Flt Permitted	0.95	1.00			1.00			1.00			0.91	1.00
Satd. Flow (perm)	1671	3505			3436			1623			1727	1489
Peak-hour factor, PHF	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Adj. Flow (vph)	537	381	0	0	415	63	0	0	1	52	0	444
RTOR Reduction (vph)	0	0	0	0	14	0	0	1	0	0	0	94
Lane Group Flow (vph)	537	381	0	0	464	0	0	0	0	0	52	350
Confl. Peds. (#/hr)							4		1	1		4
Heavy Vehicles (%)	8%	3%	0%	0%	3%	3%	0%	0%	0%	0%	0%	8%
Turn Type	Prot			Prot			Perm			Perm		pm+ov
Protected Phases	7	4		3	8			2			6	7
Permitted Phases							2			6		6
Actuated Green, G (s)	17.8	33.5			11.7			4.4			4.4	22.2
Effective Green, g (s)	17.8	33.5			11.7			4.4			4.4	22.2
Actuated g/C Ratio	0.39	0.73			0.25			0.10			0.10	0.48
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	648	2558			876			156			166	850
v/s Ratio Prot	c0.32	0.11			c0.14			0.00				c0.16
v/s Ratio Perm											0.03	0.08
v/c Ratio	0.83	0.15			0.53			0.00			0.31	0.41
Uniform Delay, d1	12.7	1.9			14.7			18.8			19.3	7.6
Progression Factor	1.00	1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2	8.6	0.0			0.6			0.0			1.1	0.3
Delay (s)	21.3	1.9			15.3			18.8			20.4	8.0
Level of Service	C	A			B			B			C	A
Approach Delay (s)		13.2			15.3			18.8			9.3	
Approach LOS		B			B			B			A	

Intersection Summary			
HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	45.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	53.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	189	203	139	254	6	127	10	94	22	39	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.86		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1881	1531	1805	3527		1735	1613		1805	1751	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.69	1.00		0.67	1.00	
Satd. Flow (perm)	1805	1881	1531	1805	3527		1263	1613		1271	1751	
Peak-hour factor, PHF	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Adj. Flow (vph)	11	252	271	185	339	8	169	13	125	29	52	49
RTOR Reduction (vph)	0	0	178	0	2	0	0	94	0	0	37	0
Lane Group Flow (vph)	11	252	93	185	345	0	169	44	0	29	64	0
Confl. Peds. (#/hr)			4	4			1					1
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	1%	3%	0%	2%	0%	4%	0%	2%	0%	0%	0%
Turn Type	Prot		Perm	Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2			6		
Actuated Green, G (s)	1.0	17.5	17.5	8.5	25.0		12.8	12.8		12.8	12.8	
Effective Green, g (s)	1.0	17.5	17.5	8.5	25.0		12.8	12.8		12.8	12.8	
Actuated g/C Ratio	0.02	0.34	0.34	0.17	0.49		0.25	0.25		0.25	0.25	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	36	648	527	302	1736		318	406		320	441	
v/s Ratio Prot	0.01	c0.13		c0.10	0.10			0.03			0.04	
v/s Ratio Perm			0.06				c0.13			0.02		
v/c Ratio	0.31	0.39	0.18	0.61	0.20		0.53	0.11		0.09	0.15	
Uniform Delay, d1	24.6	12.6	11.6	19.6	7.3		16.4	14.6		14.5	14.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.8	0.4	0.2	3.7	0.1		1.7	0.1		0.1	0.2	
Delay (s)	29.3	13.0	11.8	23.3	7.3		18.1	14.7		14.7	14.9	
Level of Service	C	B	B	C	A		B	B		B	B	
Approach Delay (s)		12.7			12.9			16.6			14.9	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	13.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	50.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	4	74	71	123	234	3
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	4	83	80	138	263	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				358		
pX, platoon unblocked						
vC, conflicting volume	562	265	266			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	562	265	266			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	89	94			
cM capacity (veh/h)	461	779	1309			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	88	80	138	266
Volume Left	4	80	0	0
Volume Right	83	0	0	3
cSH	752	1309	1700	1700
Volume to Capacity	0.12	0.06	0.08	0.16
Queue Length 95th (ft)	10	5	0	0
Control Delay (s)	10.4	7.9	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	10.4	2.9		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	31.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	64	45	24	197	154	73	64	311	96	32	249	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00	0.98	1.00	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	0.95		1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1736	1677		1786	1763		1805	1827	1546	1751	1845	1509
Flt Permitted	0.51	1.00		0.54	1.00		0.39	1.00	1.00	0.35	1.00	1.00
Satd. Flow (perm)	929	1677		1016	1763		734	1827	1546	643	1845	1509
Peak-hour factor, PHF	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Adj. Flow (vph)	85	60	32	263	205	97	85	415	128	43	332	107
RTOR Reduction (vph)	0	26	0	0	24	0	0	0	77	0	0	72
Lane Group Flow (vph)	85	66	0	263	278	0	85	415	51	43	332	35
Confl. Peds. (#/hr)			1	1					3	3		
Heavy Vehicles (%)	4%	0%	19%	1%	0%	8%	0%	4%	2%	3%	3%	7%
Turn Type	pm+pt			pm+pt			pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	16.0	11.7		22.8	15.1		24.5	20.2	20.2	21.9	18.9	18.9
Effective Green, g (s)	16.0	11.7		22.8	15.1		24.5	20.2	20.2	21.9	18.9	18.9
Actuated g/C Ratio	0.27	0.20		0.39	0.26		0.42	0.34	0.34	0.37	0.32	0.32
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
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)	313	335		496	454		385	630	533	297	595	487
v/s Ratio Prot	0.02	0.04		c0.07	c0.16		c0.02	c0.23		0.01	0.18	
v/s Ratio Perm	0.05			0.14			0.08		0.03	0.05		0.02
v/c Ratio	0.27	0.20		0.53	0.61		0.22	0.66	0.10	0.14	0.56	0.07
Uniform Delay, d1	16.3	19.5		12.9	19.2		10.8	16.3	13.0	12.1	16.4	13.8
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	0.5	0.3		1.1	2.4		0.3	2.5	0.1	0.2	1.1	0.1
Delay (s)	16.8	19.8		14.0	21.6		11.1	18.8	13.1	12.4	17.5	13.8
Level of Service	B	B		B	C		B	B	B	B	B	B
Approach Delay (s)		18.4			18.1			16.6			16.3	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	17.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	58.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	400	53	140	431	63	245
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1597	1482	1743	1509	1504	1900
Flt Permitted	0.95	1.00	1.00	1.00	0.47	1.00
Satd. Flow (perm)	1597	1482	1743	1509	748	1900
Peak-hour factor, PHF	0.72	0.72	0.72	0.72	0.72	0.72
Adj. Flow (vph)	556	74	194	599	88	340
RTOR Reduction (vph)	0	23	0	441	0	0
Lane Group Flow (vph)	556	51	194	158	88	340
Heavy Vehicles (%)	13%	9%	9%	7%	20%	0%
Turn Type		Perm		Perm	pm+pt	
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Actuated Green, G (s)	27.4	27.4	16.2	16.2	24.9	24.9
Effective Green, g (s)	27.4	27.4	16.2	16.2	24.9	24.9
Actuated g/C Ratio	0.45	0.45	0.26	0.26	0.41	0.41
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	714	662	461	399	349	772
v/s Ratio Prot	c0.35		0.11		0.02	c0.18
v/s Ratio Perm		0.03		0.10	0.09	
v/c Ratio	0.78	0.08	0.42	0.40	0.25	0.44
Uniform Delay, d1	14.4	9.7	18.7	18.5	11.7	13.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.4	0.1	0.6	0.7	0.4	0.4
Delay (s)	19.7	9.8	19.3	19.2	12.1	13.6
Level of Service	B	A	B	B	B	B
Approach Delay (s)	18.6		19.2			13.3
Approach LOS	B		B			B

Intersection Summary			
HCM Average Control Delay	17.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	61.3	Sum of lost time (s)	9.0
Intersection Capacity Utilization	44.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	177	192	11	109	185	12
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	195	211	12	120	203	13
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			405		444	300
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			405		444	300
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		64	98
cM capacity (veh/h)			1164		566	744

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	405	132	216
Volume Left	0	12	203
Volume Right	211	0	13
cSH	1700	1164	574
Volume to Capacity	0.24	0.01	0.38
Queue Length 95th (ft)	0	1	44
Control Delay (s)	0.0	0.8	15.0
Lane LOS		A	C
Approach Delay (s)	0.0	0.8	15.0
Approach LOS			C

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	38.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	242	140	846	287	192	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8		5.4		5.7	5.4
Lane Util. Factor	1.00		1.00		1.00	1.00
Frpb, ped/bikes	0.99		0.99		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.95		0.97		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1712		1800		1752	1881
Flt Permitted	0.97		1.00		0.07	1.00
Satd. Flow (perm)	1712		1800		120	1881
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	242	140	846	287	192	500
RTOR Reduction (vph)	14	0	7	0	0	0
Lane Group Flow (vph)	368	0	1126	0	192	500
Confl. Peds. (#/hr)		2		8	8	
Heavy Vehicles (%)	2%	0%	1%	2%	3%	1%
Turn Type					pm+pt	
Protected Phases	6		4		3	8
Permitted Phases					8	
Actuated Green, G (s)	28.1		55.6		72.8	72.8
Effective Green, g (s)	28.1		55.6		72.8	72.8
Actuated g/C Ratio	0.25		0.50		0.65	0.65
Clearance Time (s)	5.8		5.4		5.7	5.4
Vehicle Extension (s)	1.0		1.0		1.0	1.0
Lane Grp Cap (vph)	429		893		245	1222
v/s Ratio Prot	c0.21		c0.63		c0.08	0.27
v/s Ratio Perm					0.43	
v/c Ratio	0.86		1.26		0.78	0.41
Uniform Delay, d1	40.1		28.2		33.1	9.4
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	14.9		126.4		14.0	0.1
Delay (s)	55.0		154.7		47.1	9.5
Level of Service	E		F		D	A
Approach Delay (s)	55.0		154.7			19.9
Approach LOS	E		F			B

Intersection Summary			
HCM Average Control Delay	95.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	112.1	Sum of lost time (s)	16.9
Intersection Capacity Utilization	109.0%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	442	27	67	279	2	50	6	110	1	4	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	0.98		1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt		1.00	0.85	1.00	1.00			1.00	0.85		0.98	
Flt Protected		1.00	1.00	0.95	1.00			0.96	1.00		0.99	
Satd. Flow (prot)		1862	1615	1770	1879			1819	1548		1850	
Flt Permitted		1.00	1.00	0.95	1.00			0.74	1.00		0.96	
Satd. Flow (perm)		1855	1615	1770	1879			1414	1548		1780	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	7	502	31	76	317	2	57	7	125	1	5	1
RTOR Reduction (vph)	0	0	15	0	0	0	0	0	109	0	1	0
Lane Group Flow (vph)	0	509	16	76	319	0	0	64	16	0	6	0
Confl. Peds. (#/hr)	2					2			3	3		
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	2%	0%	2%	1%	0%	0%	0%	2%	0%	0%	0%
Turn Type	Perm		Perm	Prot			Perm		Perm	Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4				2		2	6		
Actuated Green, G (s)		25.3	25.3	4.5	33.8			6.2	6.2		6.2	
Effective Green, g (s)		25.3	25.3	4.5	33.8			6.2	6.2		6.2	
Actuated g/C Ratio		0.53	0.53	0.09	0.70			0.13	0.13		0.13	
Clearance Time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		978	851	166	1323			183	200		230	
v/s Ratio Prot				c0.04	0.17							
v/s Ratio Perm		c0.27	0.01					c0.05	0.01		0.00	
v/c Ratio		0.52	0.02	0.46	0.24			0.35	0.08		0.03	
Uniform Delay, d1		7.4	5.4	20.6	2.5			19.1	18.4		18.3	
Progression Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.5	0.0	2.0	0.1			1.2	0.2		0.0	
Delay (s)		7.9	5.4	22.6	2.6			20.2	18.6		18.3	
Level of Service		A	A	C	A			C	B		B	
Approach Delay (s)		7.8			6.5			19.1			18.3	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM Average Control Delay	9.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	48.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	198	310	165	76	123	124
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	228	356	190	87	141	143
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	277				1001	190
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	277				1001	190
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	82				36	83
cM capacity (veh/h)	1298				222	857

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	228	356	190	87	141	143
Volume Left	228	0	0	0	141	0
Volume Right	0	0	0	87	0	143
cSH	1298	1700	1700	1700	222	857
Volume to Capacity	0.18	0.21	0.11	0.05	0.64	0.17
Queue Length 95th (ft)	16	0	0	0	95	15
Control Delay (s)	8.4	0.0	0.0	0.0	46.0	10.0
Lane LOS	A				E	B
Approach Delay (s)	3.3		0.0		27.9	
Approach LOS					D	

Intersection Summary			
Average Delay	8.6		
Intersection Capacity Utilization	36.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	340	69	2	185	0	53	0	3	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	1	391	79	2	213	0	61	0	3	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	213			470			650	650	430	653	690	213
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	213			470			650	650	430	653	690	213
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			84	100	99	100	100	100
cM capacity (veh/h)	1370			1102			384	390	629	380	370	832

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	471	215	64	0
Volume Left	1	2	61	0
Volume Right	79	0	3	0
cSH	1370	1102	392	1700
Volume to Capacity	0.00	0.00	0.16	0.00
Queue Length 95th (ft)	0	0	15	0
Control Delay (s)	0.0	0.1	16.0	0.0
Lane LOS	A	A	C	A
Approach Delay (s)	0.0	0.1	16.0	0.0
Approach LOS			C	A

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	32.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	88	234	3	2	155	78	3	0	0	99	0	42
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	94	249	3	2	165	83	3	0	0	105	0	45
Pedestrians					1							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					4.0							
Percent Blockage					0							
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	248			252			693	690	252	649	650	206
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	248			252			693	690	252	649	650	206
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.4
p0 queue free %	93			100			99	100	100	71	100	95
cM capacity (veh/h)	1301			1325			322	344	791	359	362	819

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	346	250	3	150
Volume Left	94	2	3	105
Volume Right	3	83	0	45
cSH	1301	1325	322	432
Volume to Capacity	0.07	0.00	0.01	0.35
Queue Length 95th (ft)	6	0	1	38
Control Delay (s)	2.7	0.1	16.3	17.7
Lane LOS	A	A	C	C
Approach Delay (s)	2.7	0.1	16.3	17.7
Approach LOS			C	C

Intersection Summary			
Average Delay	4.9		
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	104	646	0	1	503	59	0	0	0	53	0	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0						4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95						1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00						1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00						1.00	1.00
Frt	1.00	1.00		1.00	0.98						1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00						0.95	1.00
Satd. Flow (prot)	1805	3610		1804	3475						1752	1615
Flt Permitted	0.95	1.00		0.95	1.00						0.87	1.00
Satd. Flow (perm)	1805	3610		1804	3475						1604	1615
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	121	751	0	1	585	69	0	0	0	62	0	70
RTOR Reduction (vph)	0	0	0	0	7	0	0	0	0	0	0	52
Lane Group Flow (vph)	121	751	0	1	647	0	0	0	0	0	62	18
Confl. Peds. (#/hr)			3	3								
Confl. Bikes (#/hr)			1			1			1			
Heavy Vehicles (%)	0%	0%	0%	0%	2%	3%	0%	0%	0%	3%	0%	0%
Turn Type	Prot			Prot			Perm			Perm		pm+ov
Protected Phases	7	4		3	8			2			6	7
Permitted Phases							2			6		6
Actuated Green, G (s)	7.2	29.0		0.8	22.6						4.6	11.8
Effective Green, g (s)	7.2	29.0		0.8	22.6						4.6	11.8
Actuated g/C Ratio	0.16	0.63		0.02	0.49						0.10	0.25
Clearance Time (s)	4.0	4.0		4.0	4.0						4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0						3.0	3.0
Lane Grp Cap (vph)	280	2256		31	1693						159	550
v/s Ratio Prot	c0.07	0.21		0.00	c0.19							0.01
v/s Ratio Perm											c0.04	0.01
v/c Ratio	0.43	0.33		0.03	0.38						0.39	0.03
Uniform Delay, d1	17.7	4.1		22.4	7.5						19.6	13.0
Progression Factor	1.00	1.00		1.00	1.00						1.00	1.00
Incremental Delay, d2	1.1	0.1		0.4	0.1						1.6	0.0
Delay (s)	18.8	4.2		22.8	7.6						21.2	13.0
Level of Service	B	A		C	A						C	B
Approach Delay (s)		6.2			7.7			0.0			16.9	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM Average Control Delay	7.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	46.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	35.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	422	254	39	282	8	232	29	96	11	17	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.88		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1900	1599	1805	3559		1786	1681		1805	1721	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.73	1.00		0.67	1.00	
Satd. Flow (perm)	1805	1900	1599	1805	3559		1370	1681		1281	1721	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	42	435	262	40	291	8	239	30	99	11	18	25
RTOR Reduction (vph)	0	0	155	0	2	0	0	68	0	0	17	0
Lane Group Flow (vph)	42	435	107	40	297	0	239	61	0	11	26	0
Confl. Peds. (#/hr)	2					2	2					2
Heavy Vehicles (%)	0%	0%	1%	0%	1%	0%	1%	0%	0%	0%	0%	0%
Turn Type	Prot		Perm	Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2			6		
Actuated Green, G (s)	2.3	21.0	21.0	2.4	21.1		15.8	15.8		15.8	15.8	
Effective Green, g (s)	2.3	21.0	21.0	2.4	21.1		15.8	15.8		15.8	15.8	
Actuated g/C Ratio	0.04	0.41	0.41	0.05	0.41		0.31	0.31		0.31	0.31	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	81	779	656	85	1467		423	519		395	531	
v/s Ratio Prot	c0.02	c0.23		0.02	0.08			0.04			0.01	
v/s Ratio Perm			0.07				c0.17			0.01		
v/c Ratio	0.52	0.56	0.16	0.47	0.20		0.57	0.12		0.03	0.05	
Uniform Delay, d1	23.9	11.6	9.5	23.8	9.7		14.8	12.7		12.3	12.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.5	0.9	0.1	4.1	0.1		1.7	0.1		0.0	0.0	
Delay (s)	29.4	12.4	9.7	27.9	9.7		16.6	12.8		12.4	12.5	
Level of Service	C	B	A	C	A		B	B		B	B	
Approach Delay (s)		12.4			11.9			15.2			12.4	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	51.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	3	76	78	297	196	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	3	87	90	341	225	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				358		
pX, platoon unblocked	0.87					
vC, conflicting volume	749	228	231			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	641	228	231			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	89	93			
cM capacity (veh/h)	361	816	1337			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	91	90	341	231
Volume Left	3	90	0	0
Volume Right	87	0	0	6
cSH	779	1337	1700	1700
Volume to Capacity	0.12	0.07	0.20	0.14
Queue Length 95th (ft)	10	5	0	0
Control Delay (s)	10.2	7.9	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	10.2	1.6		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	29.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	89	214	90	110	139	50	69	288	171	85	370	59
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00	0.96	1.00	1.00	0.98
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	0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1802		1735	1792		1805	1881	1556	1799	1881	1579
Flt Permitted	0.54	1.00		0.33	1.00		0.26	1.00	1.00	0.39	1.00	1.00
Satd. Flow (perm)	1030	1802		607	1792		498	1881	1556	742	1881	1579
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	105	252	106	129	164	59	81	339	201	100	435	69
RTOR Reduction (vph)	0	21	0	0	18	0	0	0	138	0	0	47
Lane Group Flow (vph)	105	337	0	129	205	0	81	339	63	100	435	22
Confl. Peds. (#/hr)			1	1					12	12		
Confl. Bikes (#/hr)			3			1			1			2
Heavy Vehicles (%)	0%	0%	0%	4%	1%	2%	0%	1%	0%	0%	1%	0%
Turn Type	pm+pt			pm+pt			pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	21.6	17.4		21.6	17.4		23.4	19.2	19.2	23.4	19.2	19.2
Effective Green, g (s)	21.6	17.4		21.6	17.4		23.4	19.2	19.2	23.4	19.2	19.2
Actuated g/C Ratio	0.35	0.29		0.35	0.29		0.38	0.31	0.31	0.38	0.31	0.31
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
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)	418	514		293	511		281	592	490	357	592	497
v/s Ratio Prot	0.02	c0.19		c0.03	0.11		c0.02	0.18		0.02	c0.23	
v/s Ratio Perm	0.07			0.13			0.09		0.04	0.09		0.01
v/c Ratio	0.25	0.65		0.44	0.40		0.29	0.57	0.13	0.28	0.73	0.04
Uniform Delay, d1	13.6	19.2		14.2	17.6		12.9	17.5	14.9	12.6	18.6	14.5
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	0.3	3.0		1.1	0.5		0.6	1.3	0.1	0.4	4.7	0.0
Delay (s)	13.9	22.2		15.2	18.1		13.5	18.8	15.0	13.0	23.3	14.6
Level of Service	B	C		B	B		B	B	B	B	C	B
Approach Delay (s)		20.3			17.1			16.9			20.6	
Approach LOS		C			B			B			C	

Intersection Summary			
HCM Average Control Delay	18.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	61.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	279	58	317	314	72	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1787	1615	1845	1569	1805	1881
Flt Permitted	0.95	1.00	1.00	1.00	0.31	1.00
Satd. Flow (perm)	1787	1615	1845	1569	593	1881
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	344	72	391	388	89	247
RTOR Reduction (vph)	0	41	0	252	0	0
Lane Group Flow (vph)	344	31	391	136	89	247
Confl. Bikes (#/hr)				8		
Heavy Vehicles (%)	1%	0%	3%	0%	0%	1%
Turn Type		Perm		Perm	pm+pt	
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Actuated Green, G (s)	18.2	18.2	20.4	20.4	30.9	30.9
Effective Green, g (s)	18.2	18.2	20.4	20.4	30.9	30.9
Actuated g/C Ratio	0.31	0.31	0.35	0.35	0.53	0.53
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	560	506	648	551	430	1000
v/s Ratio Prot	c0.19		c0.21		0.02	c0.13
v/s Ratio Perm		0.02		0.09	0.09	
v/c Ratio	0.61	0.06	0.60	0.25	0.21	0.25
Uniform Delay, d1	17.0	14.0	15.5	13.4	7.7	7.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	0.1	1.6	0.2	0.2	0.1
Delay (s)	19.0	14.0	17.1	13.6	8.0	7.5
Level of Service	B	B	B	B	A	A
Approach Delay (s)	18.1		15.4			7.6
Approach LOS	B		B			A

Intersection Summary			
HCM Average Control Delay	14.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	58.1	Sum of lost time (s)	14.0
Intersection Capacity Utilization	47.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Appendix K 2029 Total Traffic Conditions Worksheets

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	59	254	22	204	312	7
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	69	295	26	237	363	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			364		505	216
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			364		505	216
tC, single (s)			4.1		6.4	7.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	4.2
p0 queue free %			98		29	99
cM capacity (veh/h)			1206		512	629

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	364	263	371
Volume Left	0	26	363
Volume Right	295	0	8
cSH	1700	1206	514
Volume to Capacity	0.21	0.02	0.72
Queue Length 95th (ft)	0	2	146
Control Delay (s)	0.0	1.0	28.0
Lane LOS		A	D
Approach Delay (s)	0.0	1.0	28.0
Approach LOS			D

Intersection Summary			
Average Delay	10.7		
Intersection Capacity Utilization	53.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	371	379	376	135	654	434
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8		5.4		5.7	5.4
Lane Util. Factor	1.00		1.00		1.00	1.00
Frt	0.93		0.96		1.00	1.00
Flt Protected	0.98		1.00		0.95	1.00
Satd. Flow (prot)	1621		1638		1805	1881
Flt Permitted	0.98		1.00		0.13	1.00
Satd. Flow (perm)	1621		1638		246	1881
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	371	379	376	135	654	434
RTOR Reduction (vph)	25	0	10	0	0	0
Lane Group Flow (vph)	725	0	501	0	654	434
Heavy Vehicles (%)	0%	13%	14%	6%	0%	1%
Turn Type					pm+pt	
Protected Phases	6		4		3	8
Permitted Phases					8	
Actuated Green, G (s)	35.2		42.3		83.2	83.2
Effective Green, g (s)	35.2		42.3		83.2	83.2
Actuated g/C Ratio	0.27		0.33		0.64	0.64
Clearance Time (s)	5.8		5.4		5.7	5.4
Vehicle Extension (s)	1.0		1.0		1.0	1.0
Lane Grp Cap (vph)	440		535		581	1208
v/s Ratio Prot	c0.45		0.31		c0.31	0.23
v/s Ratio Perm					c0.42	
v/c Ratio	1.65		0.94		1.13	0.36
Uniform Delay, d1	47.2		42.3		36.1	10.8
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	301.8		23.7		76.9	0.1
Delay (s)	349.0		66.0		113.0	10.9
Level of Service	F		E		F	B
Approach Delay (s)	349.0		66.0			72.3
Approach LOS	F		E			E

Intersection Summary			
HCM Average Control Delay	159.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.26		
Actuated Cycle Length (s)	129.6	Sum of lost time (s)	11.5
Intersection Capacity Utilization	121.9%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	224	311	258	575	1	94	2	82	2	6	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt		1.00	0.85	1.00	1.00			1.00	0.85		0.98	
Flt Protected		1.00	1.00	0.95	1.00			0.95	1.00		0.99	
Satd. Flow (prot)		1770	1615	1671	1824			1634	1417		1454	
Flt Permitted		1.00	1.00	0.95	1.00			0.72	1.00		0.96	
Satd. Flow (perm)		1768	1615	1671	1824			1237	1417		1411	
Peak-hour factor, PHF	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Adj. Flow (vph)	1	280	389	322	719	1	118	2	102	2	8	2
RTOR Reduction (vph)	0	0	224	0	0	0	0	0	85	0	2	0
Lane Group Flow (vph)	0	281	165	322	720	0	0	120	17	0	10	0
Confl. Peds. (#/hr)	1					1						
Heavy Vehicles (%)	100%	7%	0%	8%	4%	100%	11%	0%	14%	0%	40%	0%
Turn Type	Perm		Perm	Prot			Perm		Perm	Perm		
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4				2		2	6		
Actuated Green, G (s)		30.1	30.1	17.0	51.1			11.9	11.9		11.9	
Effective Green, g (s)		30.1	30.1	17.0	51.1			11.9	11.9		11.9	
Actuated g/C Ratio		0.42	0.42	0.24	0.72			0.17	0.17		0.17	
Clearance Time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		750	685	400	1313			207	237		236	
v/s Ratio Prot				c0.19	c0.39							
v/s Ratio Perm		0.16	0.10					c0.10	0.01		0.01	
v/c Ratio		0.37	0.24	0.81	0.55			0.58	0.07		0.04	
Uniform Delay, d1		14.0	13.1	25.4	4.6			27.2	24.9		24.8	
Progression Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		0.3	0.2	11.2	1.7			3.9	0.1		0.1	
Delay (s)		14.3	13.3	36.6	6.3			31.1	25.0		24.9	
Level of Service		B	B	D	A			C	C		C	
Approach Delay (s)		13.7			15.6			28.3			24.9	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	16.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	71.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	167	124	384	133	104	485
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	188	139	431	149	117	545
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	TWLTL			
Median storage veh)			2			
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	581				946	431
vC1, stage 1 conf vol					431	
vC2, stage 2 conf vol					515	
vCu, unblocked vol	581				946	431
tC, single (s)	4.2				6.5	6.2
tC, 2 stage (s)					5.5	
tF (s)	2.3				3.6	3.3
p0 queue free %	81				72	12
cM capacity (veh/h)	964				419	618

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	188	139	481	100	117	545
Volume Left	188	0	0	0	117	0
Volume Right	0	0	50	100	0	545
cSH	964	1700	1700	1700	419	618
Volume to Capacity	0.19	0.08	0.28	0.06	0.28	0.88
Queue Length 95th (ft)	18	0	0	0	28	261
Control Delay (s)	9.6	0.0	0.0	0.0	16.9	39.3
Lane LOS	A				C	E
Approach Delay (s)	5.5		0.0		35.3	
Approach LOS					E	

Intersection Summary			
Average Delay	16.0		
Intersection Capacity Utilization	59.6%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	91	124	4	285	0	108	1	3	0	2	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	99	135	4	310	0	117	1	3	0	2	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	310			234			492	487	166	491	554	310
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	310			234			492	487	166	491	554	310
tC, single (s)	4.1			4.3			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.4			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			76	100	100	100	100	99
cM capacity (veh/h)	1262			1210			480	482	883	487	441	735

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	235	314	122	7
Volume Left	1	4	117	0
Volume Right	135	0	3	4
cSH	1262	1210	486	601
Volume to Capacity	0.00	0.00	0.25	0.01
Queue Length 95th (ft)	0	0	25	1
Control Delay (s)	0.0	0.1	14.9	11.1
Lane LOS	A	A	B	B
Approach Delay (s)	0.0	0.1	14.9	11.1
Approach LOS			B	B

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	37.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	94	3	0	230	54	2	0	0	68	1	67
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	12	118	4	0	288	68	2	0	0	85	1	84
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	355			121			550	499	119	466	468	321
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	355			121			550	499	119	466	468	321
tC, single (s)	4.3			4.1			8.1	6.5	6.2	7.2	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.4			2.2			4.4	4.0	3.3	3.6	4.0	3.4
p0 queue free %	99			100			99	100	100	83	100	88
cM capacity (veh/h)	1087			1479			284	471	938	490	490	699

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	134	355	2	170
Volume Left	12	0	2	85
Volume Right	4	68	0	84
cSH	1087	1479	284	574
Volume to Capacity	0.01	0.00	0.01	0.30
Queue Length 95th (ft)	1	0	1	31
Control Delay (s)	0.9	0.0	17.8	13.9
Lane LOS	A		C	B
Approach Delay (s)	0.9	0.0	17.8	13.9
Approach LOS			C	B

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	29.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	423	286	0	0	311	70	0	0	1	104	0	388
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0			4.0	4.0
Lane Util. Factor	1.00	0.95			0.95			1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00			1.00			0.99			1.00	0.99
Flpb, ped/bikes	1.00	1.00			1.00			1.00			1.00	1.00
Frt	1.00	1.00			0.97			0.86			1.00	0.85
Flt Protected	0.95	1.00			1.00			1.00			0.95	1.00
Satd. Flow (prot)	1671	3505			3409			1623			1804	1484
Flt Permitted	0.95	1.00			1.00			1.00			0.76	1.00
Satd. Flow (perm)	1671	3505			3409			1623			1438	1484
Peak-hour factor, PHF	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Adj. Flow (vph)	564	381	0	0	415	93	0	0	1	139	0	517
RTOR Reduction (vph)	0	0	0	0	22	0	0	1	0	0	0	80
Lane Group Flow (vph)	564	381	0	0	486	0	0	0	0	0	139	437
Confl. Peds. (#/hr)							4		1	1		4
Heavy Vehicles (%)	8%	3%	0%	0%	3%	3%	0%	0%	0%	0%	0%	8%
Turn Type	Prot			Prot			Perm			Perm		pm+ov
Protected Phases	7	4		3	8			2			6	7
Permitted Phases							2			6		6
Actuated Green, G (s)	17.8	35.1			13.3			8.8			8.8	26.6
Effective Green, g (s)	17.8	35.1			13.3			8.8			8.8	26.6
Actuated g/C Ratio	0.34	0.68			0.26			0.17			0.17	0.51
Clearance Time (s)	4.0	4.0			4.0			4.0			4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0			3.0			3.0	3.0
Lane Grp Cap (vph)	573	2370			874			275			244	875
v/s Ratio Prot	c0.34	0.11			c0.14			0.00				c0.17
v/s Ratio Perm											0.10	0.12
v/c Ratio	0.98	0.16			0.56			0.00			0.57	0.50
Uniform Delay, d1	16.9	3.1			16.7			17.9			19.8	8.3
Progression Factor	1.00	1.00			1.00			1.00			1.00	1.00
Incremental Delay, d2	33.3	0.0			0.8			0.0			3.0	0.4
Delay (s)	50.2	3.1			17.5			17.9			22.8	8.7
Level of Service	D	A			B			B			C	A
Approach Delay (s)		31.2			17.5			17.9			11.7	
Approach LOS		C			B			B			B	

Intersection Summary			
HCM Average Control Delay	21.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	51.9	Sum of lost time (s)	12.0
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	8	200	256	139	259	6	145	10	94	22	39	37
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.86		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1881	1531	1805	3527		1735	1613		1805	1751	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.69	1.00		0.67	1.00	
Satd. Flow (perm)	1805	1881	1531	1805	3527		1263	1613		1271	1751	
Peak-hour factor, PHF	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Adj. Flow (vph)	11	267	341	185	345	8	193	13	125	29	52	49
RTOR Reduction (vph)	0	0	230	0	1	0	0	93	0	0	36	0
Lane Group Flow (vph)	11	267	111	185	352	0	193	45	0	29	65	0
Confl. Peds. (#/hr)			4	4			1					1
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	1%	3%	0%	2%	0%	4%	0%	2%	0%	0%	0%
Turn Type	Prot		Perm	Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2			6		
Actuated Green, G (s)	1.0	17.9	17.9	11.0	27.9		14.1	14.1		14.1	14.1	
Effective Green, g (s)	1.0	17.9	17.9	11.0	27.9		14.1	14.1		14.1	14.1	
Actuated g/C Ratio	0.02	0.33	0.33	0.20	0.51		0.26	0.26		0.26	0.26	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	33	612	498	361	1789		324	414		326	449	
v/s Ratio Prot	0.01	c0.14		c0.10	0.10			0.03			0.04	
v/s Ratio Perm			0.07				c0.15			0.02		
v/c Ratio	0.33	0.44	0.22	0.51	0.20		0.60	0.11		0.09	0.14	
Uniform Delay, d1	26.7	14.6	13.5	19.6	7.4		17.9	15.6		15.6	15.8	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	5.9	0.5	0.2	1.2	0.1		2.9	0.1		0.1	0.1	
Delay (s)	32.6	15.1	13.7	20.8	7.5		20.9	15.8		15.7	15.9	
Level of Service	C	B	B	C	A		C	B		B	B	
Approach Delay (s)		14.6			12.1			18.7			15.9	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	55.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	44.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	4	80	74	126	240	3
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	4	90	83	142	270	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				358		
pX, platoon unblocked						
vC, conflicting volume	579	271	273			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	579	271	273			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	88	94			
cM capacity (veh/h)	450	772	1302			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	94	83	142	273
Volume Left	4	83	0	0
Volume Right	90	0	0	3
cSH	747	1302	1700	1700
Volume to Capacity	0.13	0.06	0.08	0.16
Queue Length 95th (ft)	11	5	0	0
Control Delay (s)	10.5	8.0	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	10.5	2.9		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	32.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	69	45	24	197	154	74	64	312	96	39	247	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00	0.98	1.00	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	0.95		1.00	0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1736	1677		1786	1761		1805	1827	1546	1751	1845	1509
Flt Permitted	0.50	1.00		0.54	1.00		0.39	1.00	1.00	0.35	1.00	1.00
Satd. Flow (perm)	922	1677		1018	1761		740	1827	1546	639	1845	1509
Peak-hour factor, PHF	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Adj. Flow (vph)	92	60	32	263	205	99	85	416	128	52	329	133
RTOR Reduction (vph)	0	26	0	0	25	0	0	0	77	0	0	90
Lane Group Flow (vph)	92	66	0	263	279	0	85	416	51	52	329	43
Confl. Peds. (#/hr)			1	1					3	3		
Heavy Vehicles (%)	4%	0%	19%	1%	0%	8%	0%	4%	2%	3%	3%	7%
Turn Type	pm+pt			pm+pt			pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	16.1	11.8		22.9	15.2		24.5	20.2	20.2	21.9	18.9	18.9
Effective Green, g (s)	16.1	11.8		22.9	15.2		24.5	20.2	20.2	21.9	18.9	18.9
Actuated g/C Ratio	0.27	0.20		0.39	0.26		0.42	0.34	0.34	0.37	0.32	0.32
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
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)	313	337		498	456		387	629	532	295	594	486
v/s Ratio Prot	0.02	0.04		c0.07	c0.16		c0.02	c0.23		0.01	0.18	
v/s Ratio Perm	0.06			0.14			0.08		0.03	0.06		0.03
v/c Ratio	0.29	0.20		0.53	0.61		0.22	0.66	0.10	0.18	0.55	0.09
Uniform Delay, d1	16.3	19.5		12.9	19.1		10.8	16.3	13.1	12.2	16.4	13.9
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	0.5	0.3		1.0	2.4		0.3	2.6	0.1	0.3	1.1	0.1
Delay (s)	16.9	19.8		13.9	21.6		11.1	19.0	13.1	12.5	17.5	14.0
Level of Service	B	B		B	C		B	B	B	B	B	B
Approach Delay (s)		18.3			18.0			16.7			16.1	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	17.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	58.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	400	56	144	431	68	253
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1597	1482	1743	1509	1504	1900
Flt Permitted	0.95	1.00	1.00	1.00	0.47	1.00
Satd. Flow (perm)	1597	1482	1743	1509	738	1900
Peak-hour factor, PHF	0.72	0.72	0.72	0.72	0.72	0.72
Adj. Flow (vph)	556	78	200	599	94	351
RTOR Reduction (vph)	0	24	0	439	0	0
Lane Group Flow (vph)	556	54	200	160	94	351
Heavy Vehicles (%)	13%	9%	9%	7%	20%	0%
Turn Type		Perm		Perm	pm+pt	
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Actuated Green, G (s)	27.5	27.5	16.5	16.5	25.2	25.2
Effective Green, g (s)	27.5	27.5	16.5	16.5	25.2	25.2
Actuated g/C Ratio	0.45	0.45	0.27	0.27	0.41	0.41
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	712	661	466	404	347	776
v/s Ratio Prot	c0.35		0.11		0.02	c0.18
v/s Ratio Perm		0.04		0.11	0.09	
v/c Ratio	0.78	0.08	0.43	0.40	0.27	0.45
Uniform Delay, d1	14.5	9.8	18.7	18.5	11.8	13.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.6	0.1	0.6	0.6	0.4	0.4
Delay (s)	20.1	9.9	19.3	19.2	12.2	13.7
Level of Service	C	A	B	B	B	B
Approach Delay (s)	18.8		19.2			13.4
Approach LOS	B		B			B

Intersection Summary			
HCM Average Control Delay	17.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	61.7	Sum of lost time (s)	9.0
Intersection Capacity Utilization	45.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	177	329	26	109	278	30
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	195	362	29	120	305	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			556		552	375
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			556		552	375
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		36	95
cM capacity (veh/h)			1025		481	676

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	556	148	338
Volume Left	0	29	305
Volume Right	362	0	33
cSH	1700	1025	495
Volume to Capacity	0.33	0.03	0.68
Queue Length 95th (ft)	0	2	129
Control Delay (s)	0.0	1.9	26.6
Lane LOS		A	D
Approach Delay (s)	0.0	1.9	26.6
Approach LOS			D

Intersection Summary			
Average Delay	8.9		
Intersection Capacity Utilization	53.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	290	207	846	374	306	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8		5.4		5.7	5.4
Lane Util. Factor	1.00		1.00		1.00	1.00
Frpb, ped/bikes	0.99		0.98		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.94		0.96		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1703		1771		1752	1881
Flt Permitted	0.97		1.00		0.07	1.00
Satd. Flow (perm)	1703		1771		121	1881
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	290	207	846	374	306	500
RTOR Reduction (vph)	17	0	10	0	0	0
Lane Group Flow (vph)	480	0	1210	0	306	500
Confl. Peds. (#/hr)		2		8	8	
Heavy Vehicles (%)	2%	0%	1%	2%	3%	1%
Turn Type					pm+pt	
Protected Phases	6		4		3	8
Permitted Phases					8	
Actuated Green, G (s)	35.1		55.2		82.3	82.3
Effective Green, g (s)	35.1		55.2		82.3	82.3
Actuated g/C Ratio	0.27		0.43		0.64	0.64
Clearance Time (s)	5.8		5.4		5.7	5.4
Vehicle Extension (s)	1.0		1.0		1.0	1.0
Lane Grp Cap (vph)	465		760		349	1204
v/s Ratio Prot	c0.28		c0.68		c0.15	0.27
v/s Ratio Perm					0.41	
v/c Ratio	1.03		1.59		0.88	0.42
Uniform Delay, d1	46.7		36.7		41.3	11.4
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	50.0		272.5		20.5	0.1
Delay (s)	96.8		309.2		61.8	11.4
Level of Service	F		F		E	B
Approach Delay (s)	96.8		309.2			30.6
Approach LOS	F		F			C

Intersection Summary			
HCM Average Control Delay	178.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.28		
Actuated Cycle Length (s)	128.6	Sum of lost time (s)	16.9
Intersection Capacity Utilization	127.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	6	643	27	182	394	2	50	6	295	1	4	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	0.98		1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Frt		1.00	0.85	1.00	1.00			1.00	0.85		0.98	
Flt Protected		1.00	1.00	0.95	1.00			0.96	1.00		0.99	
Satd. Flow (prot)		1862	1615	1770	1880			1819	1546		1849	
Flt Permitted		1.00	1.00	0.95	1.00			0.74	1.00		0.97	
Satd. Flow (perm)		1856	1615	1770	1880			1414	1546		1802	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	7	731	31	207	448	2	57	7	335	1	5	1
RTOR Reduction (vph)	0	0	9	0	0	0	0	0	288	0	1	0
Lane Group Flow (vph)	0	738	22	207	450	0	0	64	47	0	6	0
Confl. Peds. (#/hr)	2					2			3	3		
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	2%	0%	2%	1%	0%	0%	0%	2%	0%	0%	0%
Turn Type	Perm		Prot	Prot			Perm		Perm	Perm		
Protected Phases		4	4	3	8			2			6	
Permitted Phases	4						2		2	6		
Actuated Green, G (s)		30.3	30.3	12.4	46.7			9.0	9.0		9.0	
Effective Green, g (s)		30.3	30.3	12.4	46.7			9.0	9.0		9.0	
Actuated g/C Ratio		0.48	0.48	0.19	0.73			0.14	0.14		0.14	
Clearance Time (s)		4.0	4.0	4.0	4.0			4.0	4.0		4.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		883	768	345	1378			200	218		255	
v/s Ratio Prot			0.01	c0.12	0.24							
v/s Ratio Perm		c0.40						c0.05	0.03		0.00	
v/c Ratio		0.84	0.03	0.60	0.33			0.32	0.22		0.02	
Uniform Delay, d1		14.5	8.9	23.4	3.0			24.6	24.2		23.6	
Progression Factor		1.00	1.00	1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2		6.9	0.0	2.8	0.1			0.9	0.5		0.0	
Delay (s)		21.4	8.9	26.2	3.1			25.5	24.7		23.6	
Level of Service		C	A	C	A			C	C		C	
Approach Delay (s)		20.9			10.4			24.9			23.6	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	18.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	63.7	Sum of lost time (s)	12.0
Intersection Capacity Utilization	76.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	430	464	264	116	189	254
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	494	533	303	133	217	292
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	TWLTL			
Median storage veh)			2			
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	437				1825	303
vC1, stage 1 conf vol					303	
vC2, stage 2 conf vol					1522	
vCu, unblocked vol	437				1825	303
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	56				0	61
cM capacity (veh/h)	1134				109	741

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1	SB 2
Volume Total	494	533	303	133	217	292
Volume Left	494	0	0	0	217	0
Volume Right	0	0	0	133	0	292
cSH	1134	1700	1700	1700	109	741
Volume to Capacity	0.44	0.31	0.18	0.08	1.99	0.39
Queue Length 95th (ft)	56	0	0	0	451	47
Control Delay (s)	10.6	0.0	0.0	0.0	543.3	13.0
Lane LOS	B				F	B
Approach Delay (s)	5.1		0.0		239.2	
Approach LOS					F	

Intersection Summary			
Average Delay	64.4		
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	393	141	2	238	0	147	0	3	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	1	452	162	2	274	0	169	0	3	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	274			614			813	813	533	817	894	274
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	274			614			813	813	533	817	894	274
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			43	100	99	100	100	100
cM capacity (veh/h)	1301			975			299	314	551	295	282	770

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	615	276	172	0
Volume Left	1	2	169	0
Volume Right	162	0	3	0
cSH	1301	975	301	1700
Volume to Capacity	0.00	0.00	0.57	0.00
Queue Length 95th (ft)	0	0	83	0
Control Delay (s)	0.0	0.1	31.8	0.0
Lane LOS	A	A	D	A
Approach Delay (s)	0.0	0.1	31.8	0.0
Approach LOS			D	A

Intersection Summary			
Average Delay	5.2		
Intersection Capacity Utilization	44.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	97	278	3	2	200	78	3	0	0	99	0	50
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	103	296	3	2	213	83	3	0	0	105	0	53
Pedestrians					1							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					4.0							
Percent Blockage					0							
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	296			299			815	804	298	763	764	254
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	296			299			815	804	298	763	764	254
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.4
p0 queue free %	92			100			99	100	100	65	100	93
cM capacity (veh/h)	1249			1274			260	292	745	299	308	770

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	402	298	3	159
Volume Left	103	2	3	105
Volume Right	3	83	0	53
cSH	1249	1274	260	376
Volume to Capacity	0.08	0.00	0.01	0.42
Queue Length 95th (ft)	7	0	1	51
Control Delay (s)	2.7	0.1	19.0	21.4
Lane LOS	A	A	C	C
Approach Delay (s)	2.7	0.1	19.0	21.4
Approach LOS			C	C

Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	53.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	218	646	0	1	503	130	0	0	0	97	0	131
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0						4.0	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95						1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00						1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00						1.00	1.00
Frt	1.00	1.00		1.00	0.97						1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00						0.95	1.00
Satd. Flow (prot)	1805	3610		1803	3409						1752	1615
Flt Permitted	0.95	1.00		0.95	1.00						0.76	1.00
Satd. Flow (perm)	1805	3610		1803	3409						1397	1615
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	253	751	0	1	585	151	0	0	0	113	0	152
RTOR Reduction (vph)	0	0	0	0	22	0	0	0	0	0	0	79
Lane Group Flow (vph)	253	751	0	1	714	0	0	0	0	0	113	73
Confl. Peds. (#/hr)			3	3								
Confl. Bikes (#/hr)			1			1			1			
Heavy Vehicles (%)	0%	0%	0%	0%	2%	3%	0%	0%	0%	3%	0%	0%
Turn Type	Prot			Prot			Perm			Perm		pm+ov
Protected Phases	7	4		3	8			2			6	7
Permitted Phases							2			6		6
Actuated Green, G (s)	14.3	36.1		0.9	22.7						8.4	22.7
Effective Green, g (s)	14.3	36.1		0.9	22.7						8.4	22.7
Actuated g/C Ratio	0.25	0.63		0.02	0.40						0.15	0.40
Clearance Time (s)	4.0	4.0		4.0	4.0						4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0						3.0	3.0
Lane Grp Cap (vph)	450	2270		28	1348						204	751
v/s Ratio Prot	c0.14	0.21		0.00	c0.21							0.02
v/s Ratio Perm											c0.08	0.02
v/c Ratio	0.56	0.33		0.04	0.53						0.55	0.10
Uniform Delay, d1	18.8	5.0		27.8	13.3						22.8	10.9
Progression Factor	1.00	1.00		1.00	1.00						1.00	1.00
Incremental Delay, d2	1.6	0.1		0.5	0.4						3.2	0.1
Delay (s)	20.4	5.1		28.3	13.6						26.0	11.0
Level of Service	C	A		C	B						C	B
Approach Delay (s)		8.9			13.7			0.0			17.4	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	57.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	45.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	431	288	39	296	8	290	29	96	11	17	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	0.88		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1900	1599	1805	3559		1785	1681		1805	1721	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.73	1.00		0.67	1.00	
Satd. Flow (perm)	1805	1900	1599	1805	3559		1370	1681		1281	1721	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	42	444	297	40	305	8	299	30	99	11	18	25
RTOR Reduction (vph)	0	0	180	0	2	0	0	65	0	0	16	0
Lane Group Flow (vph)	42	444	117	40	311	0	299	64	0	11	27	0
Confl. Peds. (#/hr)	2					2	2					2
Heavy Vehicles (%)	0%	0%	1%	0%	1%	0%	1%	0%	0%	0%	0%	0%
Turn Type	Prot		Perm	Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4				2			6		
Actuated Green, G (s)	3.8	21.3	21.3	2.4	19.9		18.5	18.5		18.5	18.5	
Effective Green, g (s)	3.8	21.3	21.3	2.4	19.9		18.5	18.5		18.5	18.5	
Actuated g/C Ratio	0.07	0.39	0.39	0.04	0.37		0.34	0.34		0.34	0.34	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	127	747	628	80	1307		468	574		437	587	
v/s Ratio Prot	c0.02	c0.23		0.02	0.09			0.04			0.02	
v/s Ratio Perm			0.07				c0.22			0.01		
v/c Ratio	0.33	0.59	0.19	0.50	0.24		0.64	0.11		0.03	0.05	
Uniform Delay, d1	24.0	13.0	10.8	25.3	11.9		15.0	12.2		11.9	11.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.5	1.3	0.1	4.8	0.1		2.9	0.1		0.0	0.0	
Delay (s)	25.5	14.3	10.9	30.2	12.0		17.9	12.3		11.9	12.0	
Level of Service	C	B	B	C	B		B	B		B	B	
Approach Delay (s)		13.6			14.0			16.2			12.0	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	54.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	3	84	88	306	202	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	3	97	101	352	232	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				358		
pX, platoon unblocked	0.87					
vC, conflicting volume	789	235	238			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	684	235	238			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	88	92			
cM capacity (veh/h)	336	809	1329			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	100	101	352	238
Volume Left	3	101	0	0
Volume Right	97	0	0	6
cSH	772	1329	1700	1700
Volume to Capacity	0.13	0.08	0.21	0.14
Queue Length 95th (ft)	11	6	0	0
Control Delay (s)	10.4	7.9	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	10.4	1.8		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	31.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	105	214	90	110	139	53	69	289	171	93	371	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00	0.96	1.00	1.00	0.98
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	0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	1802		1735	1788		1805	1881	1556	1799	1881	1579
Flt Permitted	0.54	1.00		0.33	1.00		0.26	1.00	1.00	0.39	1.00	1.00
Satd. Flow (perm)	1019	1802		605	1788		501	1881	1556	742	1881	1579
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	124	252	106	129	164	62	81	340	201	109	436	85
RTOR Reduction (vph)	0	21	0	0	19	0	0	0	137	0	0	58
Lane Group Flow (vph)	124	337	0	129	207	0	81	340	64	109	436	27
Confl. Peds. (#/hr)			1	1					12	12		
Confl. Bikes (#/hr)			3			1			1			2
Heavy Vehicles (%)	0%	0%	0%	4%	1%	2%	0%	1%	0%	0%	1%	0%
Turn Type	pm+pt			pm+pt			pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	21.6	17.4		21.6	17.4		23.6	19.4	19.4	23.6	19.4	19.4
Effective Green, g (s)	21.6	17.4		21.6	17.4		23.6	19.4	19.4	23.6	19.4	19.4
Actuated g/C Ratio	0.35	0.28		0.35	0.28		0.39	0.32	0.32	0.39	0.32	0.32
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
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)	414	512		291	508		283	596	493	359	596	501
v/s Ratio Prot	0.02	c0.19		c0.03	0.12		0.02	0.18		c0.02	c0.23	
v/s Ratio Perm	0.09			0.13			0.09		0.04	0.10		0.02
v/c Ratio	0.30	0.66		0.44	0.41		0.29	0.57	0.13	0.30	0.73	0.05
Uniform Delay, d1	13.8	19.3		14.3	17.7		12.9	17.4	14.9	12.6	18.6	14.5
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	0.4	3.0		1.1	0.5		0.6	1.3	0.1	0.5	4.6	0.0
Delay (s)	14.2	22.3		15.4	18.3		13.4	18.7	15.0	13.1	23.2	14.6
Level of Service	B	C		B	B		B	B	B	B	C	B
Approach Delay (s)		20.2			17.2			16.8			20.3	
Approach LOS		C			B			B			C	

Intersection Summary			
HCM Average Control Delay	18.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	61.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	279	67	327	314	78	209
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1787	1615	1845	1569	1805	1881
Flt Permitted	0.95	1.00	1.00	1.00	0.30	1.00
Satd. Flow (perm)	1787	1615	1845	1569	572	1881
Peak-hour factor, PHF	0.81	0.81	0.81	0.81	0.81	0.81
Adj. Flow (vph)	344	83	404	388	96	258
RTOR Reduction (vph)	0	47	0	251	0	0
Lane Group Flow (vph)	344	36	404	137	96	258
Confl. Bikes (#/hr)				8		
Heavy Vehicles (%)	1%	0%	3%	0%	0%	1%
Turn Type		Perm		Perm	pm+pt	
Protected Phases	8		2		1	6
Permitted Phases		8		2	6	
Actuated Green, G (s)	18.4	18.4	20.8	20.8	31.4	31.4
Effective Green, g (s)	18.4	18.4	20.8	20.8	31.4	31.4
Actuated g/C Ratio	0.31	0.31	0.35	0.35	0.53	0.53
Clearance Time (s)	4.0	4.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	559	505	653	555	423	1004
v/s Ratio Prot	c0.19		c0.22		0.02	c0.14
v/s Ratio Perm		0.02		0.09	0.10	
v/c Ratio	0.62	0.07	0.62	0.25	0.23	0.26
Uniform Delay, d1	17.2	14.2	15.7	13.5	7.9	7.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0	0.1	1.8	0.2	0.3	0.1
Delay (s)	19.2	14.3	17.5	13.7	8.2	7.5
Level of Service	B	B	B	B	A	A
Approach Delay (s)	18.2		15.6			7.7
Approach LOS	B		B			A

Intersection Summary			
HCM Average Control Delay	14.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	58.8	Sum of lost time (s)	14.0
Intersection Capacity Utilization	48.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Appendix L Mitigations at NE 199th Avenue/NE 58th Street (SR 500)

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	59	254	22	204	312	7
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	69	295	26	237	363	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			364		357	69
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			364		357	69
tC, single (s)			4.1		6.4	7.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	4.2
p0 queue free %			98		42	99
cM capacity (veh/h)			1206		624	778

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	69	295	263	371
Volume Left	0	0	26	363
Volume Right	0	295	0	8
cSH	1700	1700	1206	627
Volume to Capacity	0.04	0.17	0.02	0.59
Queue Length 95th (ft)	0	0	2	97
Control Delay (s)	0.0	0.0	1.0	18.7
Lane LOS			A	C
Approach Delay (s)	0.0		1.0	18.7
Approach LOS				C

Intersection Summary			
Average Delay	7.2		
Intersection Capacity Utilization	43.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	177	329	26	109	278	30
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	195	362	29	120	305	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			556		371	195
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			556		371	195
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		50	96
cM capacity (veh/h)			1025		612	852

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	195	362	148	338
Volume Left	0	0	29	305
Volume Right	0	362	0	33
cSH	1700	1700	1025	629
Volume to Capacity	0.11	0.21	0.03	0.54
Queue Length 95th (ft)	0	0	2	80
Control Delay (s)	0.0	0.0	1.9	17.2
Lane LOS			A	C
Approach Delay (s)	0.0		1.9	17.2
Approach LOS				C

Intersection Summary			
Average Delay	5.8		
Intersection Capacity Utilization	43.7%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix M Proportion Share Calculations at NE 192nd Avenue/NE 13th Street

Proposed Proportionate Share Contribution at NE 192nd Avenue/NE 13th Avenue

Cost Estimate:

Item	Unit Cost	Length	Cost	Notes
Northbound right-turn lane and westbound right-turn lane	$ 280,000	1	$ 280,000	Cost estimate attached.
		Total	**$ 280,000**	

Note: Cost estimate may not account for all ROW impacts

Proportionate Share Calculation:

Intersection volume without development (2029 Background Scenario)	2208	
Intersection volume with development (2029 Total Traffic Scenario)	2524	
Trips added by development (2524-2208)	316	
Intersection Capacity without Improvement (2018 Background Scenario)	1808	*Note: without improvement, intersection operates within standards under 2018 background conditions*
Additional volume accomodated with improvements (2524-1808)	716	*Note: with proposed improvements, intersection operates within standards under 2029 total traffic conditions*
Proportionate share cost per trip ($280,000/716)	$ 391	
Proportionate share of capacity used by development (316/716)	0.441	
Proposed proportionate share contribution ($391 per trip * 316 trips)	**$ 123,600**	

OLSON ENGINEERING INC.

1111 BROADWAY, VANCOUVER, WA 98660 (360) 695-1385

Green Mtn. - Right Turn Lane @ NE 192nd Avenue & NE 13th Street - Cost Estimate (Option I)
North Bound Right & West Bound Right

Item #	Description	Unit Of Measure	Quantity		Unit Price		Total Price
	GENERAL CONDITIONS						
1	Mobilization	LS	1	$	10,000.00	$	10,000.00
2	Clearing & Grubbing (Remove Hedge & Trees, etc.)	LS	1	$	2,400.00	$	2,400.00
3	Stripping 6" & Haul Off	CY	235	$	9.00	$	2,115.00
					Total	$	14,515.00
	DEMOLITION						
4	AC Removal (Exist'g Edge Road & Exist'g Driveways To Ba	SF	2,070	$	1.00	$	2,070.00
5	Remove Exist'g Driveway Culvert (24 LF)	LS	1	$	300.00	$	300.00
6	Relocate Exist'g Mail Boxes	EA	5	$	125.00	$	625.00
7	Relocate Exist'g Signs	EA	3	$	125.00	$	375.00
					Total	$	3,370.00
	EROSION CONTROL						
8	Silt Fence	LF	700	$	1.75	$	1,225.00
9	Hydroseed & Mulch Right - Of - Way	SF	14,000	$	0.30	$	4,200.00
10	Erosion Control Maintenance	LS	1	$	1,600.00	$	1,600.00
					Total	$	7,025.00
	SITEWORK						
	North Bound Right & West Bound Right						
11	Sawcut	LF	930	$	2.00	$	1,860.00
12	Mass Grading & Haul Off	CY	480	$	10.00	$	4,800.00
13	Finish Grade	SF	6,345	$	0.30	$	1,903.50
14	Geotextile Fabric	SY	765	$	0.90	$	688.50
15	1¼"- Crushed Rock (0.85')	TN	385	$	20.00	$	7,700.00
16	Asphaltic Concrete (0.85') Class ½" 64-22 HMA	TN	410	$	135.00	$	55,350.00
17	Curb & Gutter	LF	840	$	10.00	$	8,400.00
18	Sidewalk / Pedestrian Ramp	SF	4,275	$	4.00	$	17,100.00
19	Detectable Warning Surface	SF	10	$	25.00	$	250.00
20	Driveway Drop	EA	5	$	25.00	$	125.00
21	Driveway Approach (5)	SF	560	$	4.50	$	2,520.00
22	Pedestrian/Signal Modifications	LS	1	$	33,000.00	$	33,000.00
23	Traffic Control	LS	1	$	10,000.00	$	10,000.00
					Total	$	143,697.00
	SITEWORK						
	Pave Existing Driveways To Right - Of -Way						
24	Removal AC / Gravel (Back Of Sidewalk To Right - Of - Wa	SF	1,435	$	1.00	$	1,435.00
25	Finish Grade	SF	1,435	$	0.30	$	430.50
26	Geotextile Fabric	SY	175	$	0.90	$	157.50
27	1¼"- Crushed Rock (0.67')	TN	70	$	20.00	$	1,400.00
28	Asphaltic Concrete (0.25') Class ½" 64-22 HMA	TN	30	$	135.00	$	4,050.00
					Total	$	7,473.00

	STORM						
29	Stormfilter Catch Basin (2 - Cart.)	EA	2	$	12,000.00	$	24,000.00
30	Infiltration Trench (50 LF)	EA	2	$	2,500.00	$	5,000.00
					Total	$	29,000.00
	STRIPING & SIGNAGE						
31	Solid Double Yellow Line	LF	470	$	1.00	$	470.00
32	Solid White Line	LF	810	$	0.50	$	405.00
33	White Thermoplastic Stop Bar (Extend Existing)	EA	1	$	660.00	$	660.00
34	Crosswalk Marking (Extend Existing	EA	1	$	750.00	$	750.00
					Total	$	2,285.00

Subtotal Construction Costs	$	207,365.00
Soft Cost (20%)	$	41,473.00
Contingency (15%)	$	31,104.75
Total Construction Costs	**$**	**279,942.75**

Appendix N Phase 1 Access Operations Worksheets

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	72	18	171	24	6	196
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	85	21	201	28	7	231
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	460	215			229	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	460	215			229	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	85	97			99	
cM capacity (veh/h)	560	830			1351	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	85	21	229	7	231
Volume Left	85	0	0	7	0
Volume Right	0	21	28	0	0
cSH	560	830	1700	1351	1700
Volume to Capacity	0.15	0.03	0.13	0.01	0.14
Queue Length 95th (ft)	13	2	0	0	0
Control Delay (s)	12.6	9.5	0.0	7.7	0.0
Lane LOS	B	A		A	
Approach Delay (s)	11.9		0.0	0.2	
Approach LOS	B				

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	21.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	24	6	189	8	2	266
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	28	7	222	9	2	313
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	545	227			232	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	545	227			232	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	94	99			100	
cM capacity (veh/h)	502	817			1348	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	35	232	2	313
Volume Left	28	0	2	0
Volume Right	7	9	0	0
cSH	544	1700	1348	1700
Volume to Capacity	0.06	0.14	0.00	0.18
Queue Length 95th (ft)	5	0	0	0
Control Delay (s)	12.1	0.0	7.7	0.0
Lane LOS	B		A	
Approach Delay (s)	12.1	0.0	0.1	
Approach LOS	B			

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	24.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	48	12	153	81	20	165
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	56	14	180	95	24	194
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	469	228			275	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	469	228			275	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	90	98			98	
cM capacity (veh/h)	546	817			1299	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	56	14	275	24	194
Volume Left	56	0	0	24	0
Volume Right	0	14	95	0	0
cSH	546	817	1700	1299	1700
Volume to Capacity	0.10	0.02	0.16	0.02	0.11
Queue Length 95th (ft)	9	1	0	1	0
Control Delay (s)	12.3	9.5	0.0	7.8	0.0
Lane LOS	B	A		A	
Approach Delay (s)	11.8		0.0	0.8	
Approach LOS	B				

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	26.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	16	4	230	27	7	206
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	17	4	250	29	8	224
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	504	265			279	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	504	265			279	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	99			99	
cM capacity (veh/h)	525	774			1283	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	22	279	8	224
Volume Left	17	0	8	0
Volume Right	4	29	0	0
cSH	561	1700	1283	1700
Volume to Capacity	0.04	0.16	0.01	0.13
Queue Length 95th (ft)	3	0	0	0
Control Delay (s)	11.7	0.0	7.8	0.0
Lane LOS	B		A	
Approach Delay (s)	11.7	0.0	0.3	
Approach LOS	B			

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	23.7%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix O Full Build-Out Access Operations Worksheets

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	52	20	303	16	6	270
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	61	24	356	19	7	318
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	698	366			375	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	698	366			375	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	85	97			99	
cM capacity (veh/h)	407	684			1194	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	61	24	375	325
Volume Left	61	0	0	7
Volume Right	0	24	19	0
cSH	407	684	1700	1194
Volume to Capacity	0.15	0.03	0.22	0.01
Queue Length 95th (ft)	13	3	0	0
Control Delay (s)	15.4	10.5	0.0	0.2
Lane LOS	C	B		A
Approach Delay (s)	14.0		0.0	0.2
Approach LOS	B			

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	29.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	0	2	87	0	33	1	286	27	10	312	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	1	0	2	102	0	39	1	336	32	12	367	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	785	762	368	748	746	352	368			368		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	785	762	368	748	746	352	368			368		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	69	100	94	100			99		
cM capacity (veh/h)	293	334	682	327	340	696	1201			1201		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	4	141	369	380
Volume Left	1	102	1	12
Volume Right	2	39	32	1
cSH	473	383	1201	1201
Volume to Capacity	0.01	0.37	0.00	0.01
Queue Length 95th (ft)	1	42	0	1
Control Delay (s)	12.7	19.8	0.0	0.3
Lane LOS	B	C	A	A
Approach Delay (s)	12.7	19.8	0.0	0.3
Approach LOS	B	C		

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	44.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	17	7	306	5	2	397
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	20	8	360	6	2	467
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			None
Median storage veh)			2			
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	835	363			366	
vC1, stage 1 conf vol	363					
vC2, stage 2 conf vol	472					
vCu, unblocked vol	835	363			366	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	99			100	
cM capacity (veh/h)	542	686			1204	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	28	366	2	467
Volume Left	20	0	2	0
Volume Right	8	6	0	0
cSH	578	1700	1204	1700
Volume to Capacity	0.05	0.22	0.00	0.27
Queue Length 95th (ft)	4	0	0	0
Control Delay (s)	11.6	0.0	8.0	0.0
Lane LOS	B		A	
Approach Delay (s)	11.6	0.0	0.0	
Approach LOS	B			

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	30.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	157	59	253	48	18	396
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	185	69	298	56	21	466
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	834	326			354	
vC1, stage 1 conf vol	326					
vC2, stage 2 conf vol	508					
vCu, unblocked vol	834	326			354	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	65	90			98	
cM capacity (veh/h)	531	720			1216	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	185	69	354	21	466
Volume Left	185	0	0	21	0
Volume Right	0	69	56	0	0
cSH	531	720	1700	1216	1700
Volume to Capacity	0.35	0.10	0.21	0.02	0.27
Queue Length 95th (ft)	39	8	0	1	0
Control Delay (s)	15.4	10.5	0.0	8.0	0.0
Lane LOS	C	B		A	
Approach Delay (s)	14.0		0.0	0.3	
Approach LOS	B				

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	36.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	35	13	289	11	4	549
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	41	15	340	13	5	646
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1002	346			353	
vC1, stage 1 conf vol	346					
vC2, stage 2 conf vol	655					
vCu, unblocked vol	1002	346			353	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	98			100	
cM capacity (veh/h)	466	701			1217	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	56	353	5	646
Volume Left	41	0	5	0
Volume Right	15	13	0	0
cSH	513	1700	1217	1700
Volume to Capacity	0.11	0.21	0.00	0.38
Queue Length 95th (ft)	9	0	0	0
Control Delay (s)	12.9	0.0	8.0	0.0
Lane LOS	B		A	
Approach Delay (s)	12.9	0.0	0.1	
Approach LOS	B			

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	38.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	3	9	290	3	17	567
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	4	11	341	4	20	667
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1050	343			345	
vC1, stage 1 conf vol	343					
vC2, stage 2 conf vol	707					
vCu, unblocked vol	1050	343			345	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	98			98	
cM capacity (veh/h)	441	704			1226	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	14	345	20	667
Volume Left	4	0	20	0
Volume Right	11	4	0	0
cSH	613	1700	1226	1700
Volume to Capacity	0.02	0.20	0.02	0.39
Queue Length 95th (ft)	2	0	1	0
Control Delay (s)	11.0	0.0	8.0	0.0
Lane LOS	B		A	
Approach Delay (s)	11.0	0.0	0.2	
Approach LOS	B			

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	39.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	10	3	290	10	6	565
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	12	4	341	12	7	665
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			TWLTL
Median storage veh)						2
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1026	347			353	
vC1, stage 1 conf vol	347					
vC2, stage 2 conf vol	679					
vCu, unblocked vol	1026	347			353	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	99			99	
cM capacity (veh/h)	456	701			1217	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	15	353	7	665
Volume Left	12	0	7	0
Volume Right	4	12	0	0
cSH	496	1700	1217	1700
Volume to Capacity	0.03	0.21	0.01	0.39
Queue Length 95th (ft)	2	0	0	0
Control Delay (s)	12.5	0.0	8.0	0.0
Lane LOS	B		A	
Approach Delay (s)	12.5	0.0	0.1	
Approach LOS	B			

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	39.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	30	202	448	45	28	70
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	35	238	527	53	33	82
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		TWLTL	None			
Median storage veh)		2				
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	580				862	554
vC1, stage 1 conf vol					554	
vC2, stage 2 conf vol					308	
vCu, unblocked vol	580				862	554
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	96				94	85
cM capacity (veh/h)	1004				514	536

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	35	238	580	33	82
Volume Left	35	0	0	33	0
Volume Right	0	0	53	0	82
cSH	1004	1700	1700	514	536
Volume to Capacity	0.04	0.14	0.34	0.06	0.15
Queue Length 95th (ft)	3	0	0	5	13
Control Delay (s)	8.7	0.0	0.0	12.5	12.9
Lane LOS	A			B	B
Approach Delay (s)	1.1		0.0	12.8	
Approach LOS				B	

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	37.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	27	204	407	5	17	86
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	32	240	479	6	20	101
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	485				785	482
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	485				785	482
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				94	83
cM capacity (veh/h)	1089				353	589

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	272	485	20	101
Volume Left	32	0	20	0
Volume Right	0	6	0	101
cSH	1089	1700	353	589
Volume to Capacity	0.03	0.29	0.06	0.17
Queue Length 95th (ft)	2	0	4	15
Control Delay (s)	1.2	0.0	15.8	12.4
Lane LOS	A		C	B
Approach Delay (s)	1.2	0.0	12.9	
Approach LOS			B	

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	43.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	30	11	281	53	20	335
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	35	13	331	62	24	394
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	803	362			393	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	803	362			393	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	90	98			98	
cM capacity (veh/h)	348	687			1177	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total	35	13	393	418
Volume Left	35	0	0	24
Volume Right	0	13	62	0
cSH	348	687	1700	1177
Volume to Capacity	0.10	0.02	0.23	0.02
Queue Length 95th (ft)	8	1	0	2
Control Delay (s)	16.5	10.3	0.0	0.7
Lane LOS	C	B		A
Approach Delay (s)	14.8		0.0	0.7
Approach LOS	B			

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	44.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	0	1	50	0	19	2	316	89	33	332	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	1	0	1	59	0	22	2	372	105	39	391	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	920	950	391	899	898	424	392			476		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	920	950	391	899	898	424	392			476		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	77	100	96	100			96		
cM capacity (veh/h)	238	252	662	254	271	634	1178			1096		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	2	81	479	431
Volume Left	1	59	2	39
Volume Right	1	22	105	1
cSH	350	304	1178	1096
Volume to Capacity	0.01	0.27	0.00	0.04
Queue Length 95th (ft)	1	26	0	3
Control Delay (s)	15.4	21.1	0.1	1.1
Lane LOS	C	C	A	A
Approach Delay (s)	15.4	21.1	0.1	1.1
Approach LOS	C	C		

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	54.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	10	4	402	18	7	374
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	12	5	473	21	8	440
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			None
Median storage veh)			2			
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	940	484			494	
vC1, stage 1 conf vol	484					
vC2, stage 2 conf vol	456					
vCu, unblocked vol	940	484			494	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	99			99	
cM capacity (veh/h)	506	587			1080	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	16	494	8	440
Volume Left	12	0	8	0
Volume Right	5	21	0	0
cSH	527	1700	1080	1700
Volume to Capacity	0.03	0.29	0.01	0.26
Queue Length 95th (ft)	2	0	1	0
Control Delay (s)	12.1	0.0	8.4	0.0
Lane LOS	B		A	
Approach Delay (s)	12.1	0.0	0.2	
Approach LOS	B			

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	32.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	89	33	386	160	60	325
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	105	39	454	188	71	382
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1072	548			642	
vC1, stage 1 conf vol	548					
vC2, stage 2 conf vol	524					
vCu, unblocked vol	1072	548			642	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	76	93			93	
cM capacity (veh/h)	444	540			952	

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	105	39	642	71	382
Volume Left	105	0	0	71	0
Volume Right	0	39	188	0	0
cSH	444	540	1700	952	1700
Volume to Capacity	0.24	0.07	0.38	0.07	0.22
Queue Length 95th (ft)	23	6	0	6	0
Control Delay (s)	15.6	12.2	0.0	9.1	0.0
Lane LOS	C	B		A	
Approach Delay (s)	14.7		0.0	1.4	
Approach LOS	B				

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	48.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	20	7	539	36	13	400
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	24	8	634	42	15	471
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1156	655			676	
vC1, stage 1 conf vol	655					
vC2, stage 2 conf vol	501					
vCu, unblocked vol	1156	655			676	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	98			98	
cM capacity (veh/h)	431	469			925	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	32	676	15	471
Volume Left	24	0	15	0
Volume Right	8	42	0	0
cSH	441	1700	925	1700
Volume to Capacity	0.07	0.40	0.02	0.28
Queue Length 95th (ft)	6	0	1	0
Control Delay (s)	13.8	0.0	9.0	0.0
Lane LOS	B		A	
Approach Delay (s)	13.8	0.0	0.3	
Approach LOS	B			

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	40.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	18	47	527	8	43	377
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	21	55	620	9	51	444
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1169	625			629	
vC1, stage 1 conf vol	625					
vC2, stage 2 conf vol	545					
vCu, unblocked vol	1169	625			629	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	89			95	
cM capacity (veh/h)	422	489			963	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	76	629	51	444
Volume Left	21	0	51	0
Volume Right	55	9	0	0
cSH	468	1700	963	1700
Volume to Capacity	0.16	0.37	0.05	0.26
Queue Length 95th (ft)	14	0	4	0
Control Delay (s)	14.2	0.0	8.9	0.0
Lane LOS	B		A	
Approach Delay (s)	14.2	0.0	0.9	
Approach LOS	B			

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	45.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	54	16	520	25	14	381
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	64	19	612	29	16	448
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL			TWLTL
Median storage veh)			2			2
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1108	626			641	
vC1, stage 1 conf vol	626					
vC2, stage 2 conf vol	481					
vCu, unblocked vol	1108	626			641	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	86	96			98	
cM capacity (veh/h)	446	487			953	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	82	641	16	448
Volume Left	64	0	16	0
Volume Right	19	29	0	0
cSH	455	1700	953	1700
Volume to Capacity	0.18	0.38	0.02	0.26
Queue Length 95th (ft)	16	0	1	0
Control Delay (s)	14.7	0.0	8.8	0.0
Lane LOS	B		A	
Approach Delay (s)	14.7	0.0	0.3	
Approach LOS	B			

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	39.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	98	555	298	121	82	82
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	115	653	351	142	96	96
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		TWLTL	None			
Median storage veh)		2				
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	493				1305	422
vC1, stage 1 conf vol					422	
vC2, stage 2 conf vol					884	
vCu, unblocked vol	493				1305	422
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)	2.2				3.5	3.3
p0 queue free %	89				71	85
cM capacity (veh/h)	1081				334	636

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	115	653	493	96	96
Volume Left	115	0	0	96	0
Volume Right	0	0	142	0	96
cSH	1081	1700	1700	334	636
Volume to Capacity	0.11	0.38	0.29	0.29	0.15
Queue Length 95th (ft)	9	0	0	29	13
Control Delay (s)	8.7	0.0	0.0	20.1	11.7
Lane LOS	A			C	B
Approach Delay (s)	1.3		0.0	15.9	
Approach LOS				C	

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	43.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	88	548	370	17	10	49
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	104	645	435	20	12	58
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	455				1297	445
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	455				1297	445
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	91				93	91
cM capacity (veh/h)	1116				164	617

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	104	645	455	12	58
Volume Left	104	0	0	12	0
Volume Right	0	0	20	0	58
cSH	1116	1700	1700	164	617
Volume to Capacity	0.09	0.38	0.27	0.07	0.09
Queue Length 95th (ft)	8	0	0	6	8
Control Delay (s)	8.6	0.0	0.0	28.7	11.4
Lane LOS	A			D	B
Approach Delay (s)	1.2		0.0	14.4	
Approach LOS				B	

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	38.8%	ICU Level of Service	A
Analysis Period (min)	15		

EXHIBIT 45

OLSON
engineering

Civil Engineering

Surveying

Planning

Landscape Design

Forestry

CITY OF CAMAS

PRELIMINARY DRAINAGE ANALYSIS

GREEN MOUNTAIN MIXED USE PRD PHASE 1

CITY OF CAMAS

DESIGNED BY: RICHARD PROUSE, P.E.
REVIEWED BY: PETER TUCK, P.E.

OLSON
ENGINEERING INC.
Practical expertise. Exceptional results.

Preliminary
Drainage Analysis

Green Mountain Mixed Use PRD
Phase 1

City of Camas

PROJECT NO. 8938.01.02

12/31/14

December 31, 2014

Designed by: Richard Prouse, P.E.

Reviewed by: Peter A. Tuck, P.E.

Olson Engineering, Inc.
1111 Broadway
Vancouver, WA 98660
(360) 695-1385

REVISION	BY	DATE	COMMENTS

Table of Contents

Maps

Technical Information Report

Appendix Index

Appendix F Stormwater Facility Plans, Details, and Specifications:

- Stormwater Facility Plans, Profiles, and Sections
- Stormwater Facility Volume Calculations

Appendix G Preliminary Geotechnical Engineering Report for Green Mountain Phase 1, by GeoPacific Engineering, Inc. dated December 3, 2014.

Appendix H Stormwater Facility Maintenance Manual (By Clark County Public Works Dept.)

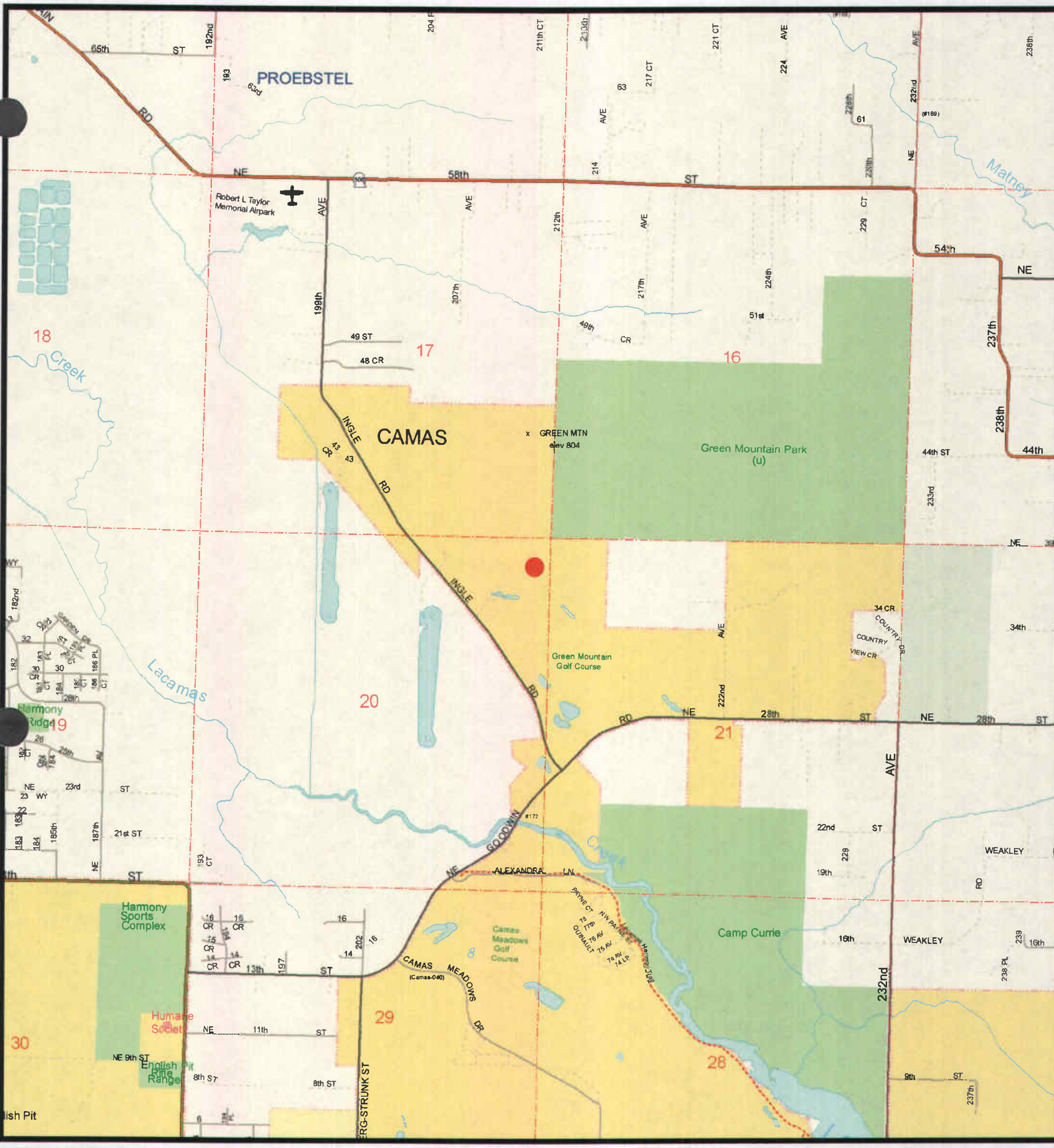
Appendix I City of Camas Pre-Application Conference Notes

Appendix J Development Plans:

- Pre-developed Catchment Plan
- Developed Catchment Plan
- Preliminary Offsite Utility Plan
- Preliminary Utility Plan (South)
- Preliminary Utility Plan (North)
- Preliminary Storm Facility Plan & Sections

Tables

M
A
P
S



General Location Map

Account No: 171727000, 172341000, 171704000, 172555000

Owner: GREEN MOUNTAIN LAND LLC

Address: 5300 MEADOWS STE 400

C/S/Z: LAKE OSWEGO, OR 97035

Printed on: January 28, 2014

CLARK COUNTY, WASHINGTON

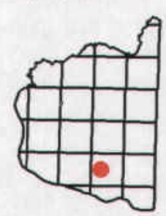
Geographic Information System

1:24,000

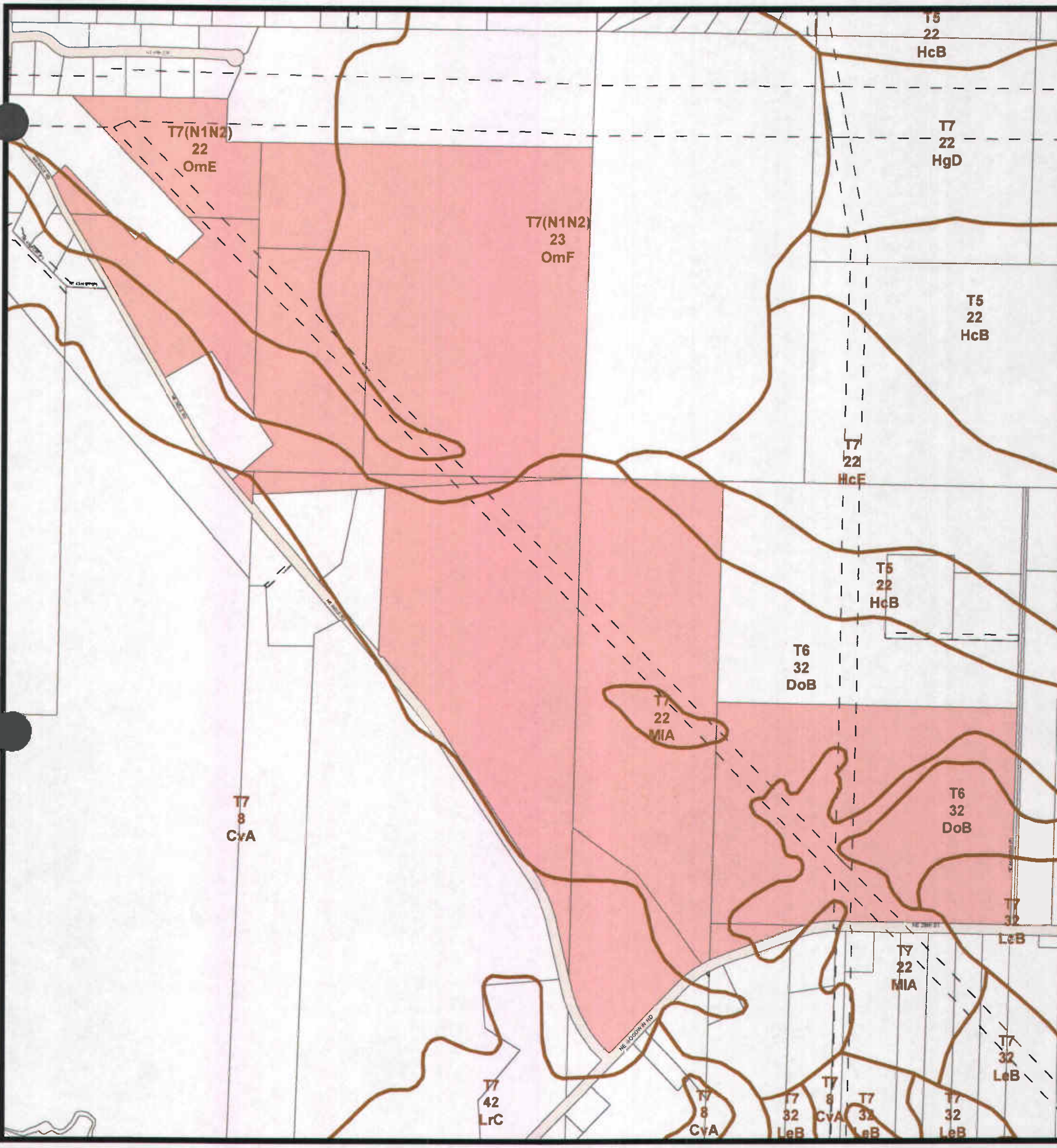
0 0.1 0.2 0.3 0.4 0.5 Miles

N

Subject Property Location



Information shown on this map was collected from several sources. Clark County accepts no responsibility for any inaccuracies that may be present.



CLARK COUNTY, WASHINGTON

Geographic Information System

1:9,600

390 780 1,170 Feet

Soil Types

Account No: 171727000, 172341000, 171704000, 172555000

Owner: GREEN MOUNTAIN LAND LLC

Address: 5300 MEADOWS STE 400

C/S/Z: LAKE OSWEGO, OR 97035

Subject Parcel

Public Road

Transportation or Major Utility Easement

Soil Type Boundary

Printed on January 28, 2014

23118	23117	23116
23119	23120	23121
23130	23129	23128

Information shown on this map was collected from several sources. Clark County accepts no responsibility for any inaccuracies that may be present

CLARK COUNTY, WASHINGTON

Geographic Information System

1:9,600

0 390 780 1,170 Feet

N

Water Sewer and Storm Systems

Account No: 171727000, 172341000, 171704000, 172555000

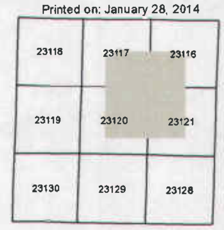
Owner: GREEN MOUNTAIN LAND LLC

Address: 5300 MEADOWS STE 400

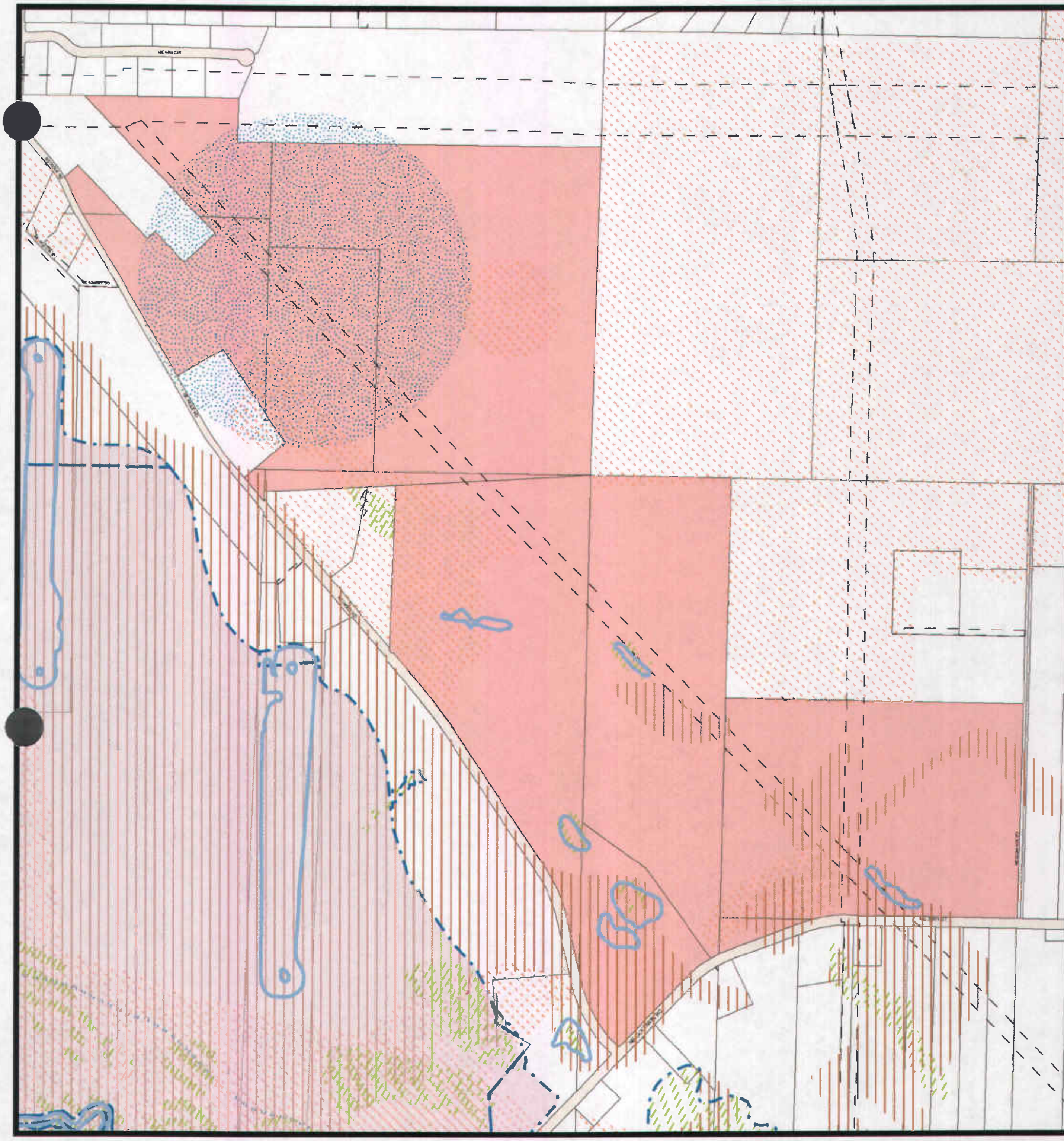
C/S/Z: LAKE OSWEGO, OR 97035

- Subject Parcel
- Public Road
- Transportation or Major Utility Easement
- Storm Water Lines
- Water Lines
- Sewer Lines
- 1-year Wellhead ZOC
- 5-year Wellhead ZOC
- 10-year Wellhead ZOC
- Hydrants

Printed on: January 28, 2014



Information shown on this map was collected from several sources. Clark County accepts no responsibility for any inaccuracies that may be present.



Geographic Information System

1:9,600

0 390 780 1,170 Feet

Environmental Constraints I

Account No: 171727000, 172341000, 171704000, 172555000

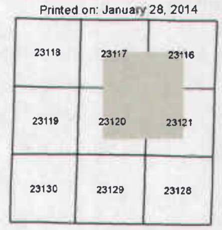
Owner: GREEN MOUNTAIN LAND LLC

Address: 5300 MEADOWS STE 400

C/S/Z: LAKE OSWEGO, OR 97035

- Subject Parcel
- Public Road
- Transportation or Major Utility Easement
- Hydric Soils
- Wetland Inventory
- Non-riparian Habitat or Species Area
- CARA Category 1
- 100 year Floodplains
- Floodway
- Shorelines
- Stream

Printed on: January 28, 2014



Information shown on this map was collected from several sources. Clark County accepts no responsibility for any inaccuracies that may be present.

Environmental Constraints II

Account No: 171727000, 172341000, 171704000, 172555000
Owner: GREEN MOUNTAIN LAND LLC
Address: 5300 MEADOWS STE 400
C/S/Z: LAKE OSWEGO, OR 97035

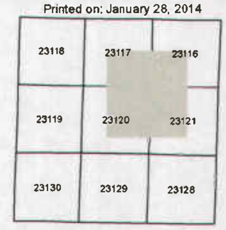
CLARK COUNTY, WASHINGTON
Geographic Information System

1:9,600

0 390 780 1,170 Feet

- Subject Parcel
- Public Road
- Transportation or Major Utility Easement
- Slopes > 15%
- Potentially Unstable Slope
- Historic or Active Landslide
- Severe Erosion Hazard Areas
- CCHR Historic Site
- NRHP Historic Site
- INV Historic Site

Printed on: January 28, 2014



Information shown on this map was collected from several sources. Clark County accepts no responsibility for any inaccuracies that may be present.

CLARK COUNTY, WASHINGTON

Geographic Information System

N

1:9,600

0 390 780 1,170 Feet

Elevation Contours

Account No: 171727000, 172341000, 171704000, 172555000

Owner: GREEN MOUNTAIN LAND LLC

Address: 5300 MEADOWS STE 400

C/S/Z: LAKE OSWEGO, OR 97035

Printed on: January 28, 2014

- Proposed Development Area
- Public Road
- Transportation or Major Utility Easement
- 2' Elevation Contour

Information shown on this map was collected from several sources. Clark County accepts no responsibility for any inaccuracies that may be present.

NARRATIVE

Section A – Project Overview

1. Describe the site location.

The proposed Green Mountain project site is approximately 281.6 acres in size and located on the north side of NE Goodwin Road and the east side of NE Ingle Road in the city of Camas Washington. Phase 1 of the development is 51.2 acres in size and occupies portions of parcels 172557-000, 172553-000, and 173178-000 within the existing Green Mountain Golf Course.

2. Describe the topography, natural drainage patterns, vegetative ground cover, and presence of critical areas (CMC Title 16). Critical areas that receive runoff from the site shall be described to a minimum of ¼ mile away from the site boundary.

The site slopes generally from northeast to southwest with grades ranging from 5% to 20%. The steeper slopes reside at the north end of the site, which is covered with trees and a dense understory. The remainder of the phase 1 site is predominantly covered with grass associated with the golf course fairways and greens, areas of trees and brush between the fairways, manmade ponds, and some wetland areas. Stormwater runoff from the site drains across the site in the southwest direction to NE Ingle Road where it is conveyed under the road by several culverts and then discharged to the existing wetland area west of the road. Critical areas within the site include a stream and wetland areas.

3. Identify and discuss existing onsite stormwater systems and their functions

The golf course includes culverts, ponds, and streams that serve to convey stormwater through the site to the ditch along the northeast side of NE Ingle road. There are several culverts along this ditch that convey stormwater flows beneath NE Ingle Road to the existing wetland area located southwest of the road.

4. Identify and discuss site parameters that influence stormwater system design.

According to the Preliminary Geotechnical Engineering Report completed by GeoPacific Engineering, Inc., the soils within the site were moist to wet and perched groundwater was encountered at approximately 2 to 8.5 feet below the ground surface. As a result, wetpond treatment facilities are being proposed combined with shallow detention ponds above the wetpool elevation. Since the Geotechnical Engineering Report described the soils onsite as being saturated with perched groundwater, all stormwater modeling in WWHM2012 assume saturated soil conditions with Soil Group 4 characterisitics. This is described in greater detail in Section C "Soils Evaluation" of this report.

5. Describe drainage to and from adjacent properties.

All runoff from within the site drains generally in the southwest direction to the existing conveyance ditch located along the northeast side of NE Ingles Road. This stormwater is then conveyed beneath NE Ingles Road via several culverts to the existing wetland area southwest of the road. The site receives offsite runoff from portions of parcel #171493-000 and #173159 located to the north.

6. Describe adjacent areas, including streams, lakes, wetland areas, residential areas, and roads that might be affected by the construction project.

The site is bordered on the southwest by NE Ingle Road. Frontage improvements to this road are proposed as part of this development. There is an existing stream, several manmade ponds, and wetland areas located within the phase 1 site area. No impacts to the existing stream, wetland, or associated buffers are anticipated.

7. Generally describe proposed site construction, size of improvements, and proposed methods of mitigating stormwater runoff quantity and quality impacts.

The proposed development for phase 1 is approximately 51.2 acres in size and includes construction of a 201 lot residential subdivision. Site construction includes frontage improvements along the phase 1 frontage on NE Ingle Road in addition to new onsite roads, sidewalks, driveways, homes, landscape, and park areas. Improvements include 12.34 acres of roof, 8.90 acres of pavement, 2.53 acres of sidewalk, 2.47 acres of driveway, 4.95 acres of pond, 19.59 acres of landscape, and 5.22 acres of open space and park area.

All stormwater runoff from the proposed development is to be captured and routed via pipe to one of three new wetpond stormwater facilities for treatment and detention. Two of the wetponds are to be located at the southwest end of the site along NE Ingle Road in Tracts 'A' and 'H'. A third is to be located at the east end of the site north of the existing wetland area in Tract 'R'. Each of the wetponds is to be comprised of a "large" two-cell pond with detention volume above the wet pool surface elevation. "Large" wet ponds are required in order to meet City of Camas phosphorus control requirements for developments within the LaCamas watershed. The two stormwater facilities next to NE Ingle Road will discharge via pipe to the existing wetland area west of the road and the third facility will discharge to the existing Wetland 'G' next to the facility. Stormwater from this wetland will then be captured in a ditch inlet at the downstream end and conveyed via pipe to the wetland west of NE Ingles Road. All offsite runoff from the north of the site will be captured in a ditch inlet and conveyed via pipe to NE Ingle Road, where it will also be discharged to the existing wetland.

Section B – Minimum Requirements

1. **Describe the land-disturbing activity and document the applicable minimum requirements for the project site. Include the following information in table form: a) amount of existing impervious surface, b) new impervious surface, c) replaced impervious surface, d) native vegetation converted to lawn or landscaping, e) native vegetation converted to pasture, and f) total amount of land-disturbing activity in table format.**

   The entire site lies within the same Threshold Discharge Area (TDA1) and ultimately discharges to the existing wetland southwest of NE Ingle Road. Within the (TDA1) the site has been divided into three separate catchments areas representing the areas of the site routed to each of the three stormwater facilities. These catchment areas are represented by catchments 1P, 2P, and 3P in the pre-developed model and 1D, 2D, and 3D in the developed model. New onsite land-disturbing activity for this proposal is approximately 50.8 acres of the 51.2 acre site. The remaining 0.4 acres is comprised of wetland and park area that are to remain undisturbed and bypass the stormwater facilities.

   The north end of the site is covered with trees and a dense understory and the remainder of the is predominantly covered with grass associated with the golf course fairways and greens, areas of trees and brush between the fairways, manmade ponds, and some wetland areas. There is approximately 3.26 acre of existing impervious roads and buildings within the site. The proposed development includes the addition of 12.34 acres of new roof, 8.90 acres of new asphalt pavement, 2.53 acre of new concrete and asphalt sidewalks, 2.47 acres of new concrete driveway, and 4.95 acres of new stormwater facility that are all classified as "New Impervious Surface". The proposed development also includes 19.59 acres of new landscaping that is classified as "Native Vegetation Converted to Lawn or Landscaping". The remaining 0.40 acre is to remain as undisturbed grass pasture.

   Per Figure 1.1 from the City of Camas Stormwater Design Standards Manual, the development needs to apply the Minimum Requirements as outlined in Figure 1.2. This was determined because the project site will discharge stormwater directly into a Municipal Separate Storm Sewer System owned and operated by the City of Camas and there will be more than 1 acre of disturbance. Per Figure 1.2, since the site has less than 35% of existing impervious surface and the development will add more than 5,000 SF of new impervious surface, Minimum Requirements #1 through #9 will apply to the new impervious surfaces and the converted pervious surfaces.

   Refer to Fig. 1.1 and 1.2, included in Appendix C.

The following table summarizes the proposed site changes:

	TDA 1
Existing Impervious Surface (Acres)	3.256
New Impervious Surface (Acres)	31.190
Replaced Impervious Surface (Acres)	0.000
Existing Impervious Surface to Remain (Acres)	0.000
Native vegetation converted to lawn or landscaping (Acres)	19.590
Native vegetation converted to pasture (Acres)	0.000
Total land-disturbing activity (Acres)	50.780

Table B1: Site Improvement Summary

2. **Provide a statement that confirms the minimum requirements that will apply to the development activity. For land-disturbing activities where minimum requirements 1 through 10 must be met include the following: a) Provide the amount of effective impervious area in each TDA, and document through an approved continuous runoff simulation model the increase in the 100-year flood frequency from pre-developed to developed conditions for each TDA, b) list the TDAs that must meet the runoff control requirements listed in Minimum Requirement 6, c) list the TDAs that must meet the flow control requirements listed in Minimum Requirement 7, and d) list the TDAs that must meet the wetlands protection requirements listed in Minimum Requirement 8.**

   The 8.90 acres of new asphalt pavement, 2.53 acre of new sidewalk, and 2.47 acres of new driveway are classified as "Effective Pollution Generating Impervious Surface" (PGIS). The 19.59 acres of landscaping is classified as "Effective Pollution Generating Pervious Surface" (PGPS). The following table summarizes the additional characteristics that determine compliance with Minimum Requirements 6, 7, and 8:

	TDA 1
Effective Pollution Generating Impervious Surface (PGIS) (Acres)	13.900
Effective Pollution Generating Pervious Surface (PGPS) (Acres)	19.590
Does the Large Water Body Exemption apply to this project?	No
Does the 100-year runoff increase by more than 0.1 cfs?	Yes
Does the project discharge directly or indirectly (through a conveyance system) into a wetland?	Yes

Table B2: Additional Compliance Characteristics

As a result of these surface cover characteristics, the following Minimum Requirements are triggered for this project per the City of Camas Stormwater Design Standards Manual:

	TDA1
Minimum Requirement 2 (Construction Stormwater Pollution Prevention)	Yes
Minimum Requirements 1, 3, 4, and 5 (Stormwater Site Plans, Source Control, Preservation of Natural Drainage Systems & Outfalls, Onsite Stormwater Management)	Yes
Minimum Requirement 6 (Runoff Treatment)	Yes
Minimum Requirement 7 (Flow Control)	Yes
Minimum Requirement 8 (Wetlands Protection)	Yes

Table B3: Applicable Minimum Requirements

Section C – Soils Evaluation

1. **Describe the site's suitability for stormwater infiltration for flow control, runoff treatment, and low impact development (LID) measures.**

   GeoPacific Engineering, Inc. has completed a Preliminary Geotechnical Engineering Report for this development (see Appendix G). Test pits were excavated on site and it was determined that the soil was moist to wet and perched groundwater seepage was encountered at depths of 2 to 8.5 feet. The report concluded that soil mottling, the presence of clay soils, and the prevalence of ground water seepage indicates that the soil will likely accept little runoff. As a result, infiltration is not being considered as a viable option for flow control or treatment on this project.

2. **Identify water table elevations, flow directions (where available), and data on seasonal water table fluctuations with minimum and maximum water table elevations where these may affect stormwater facilities.**

   GeoPacific Engineering, Inc. has completed a Preliminary Geotechnical Engineering Report for this development (see Appendix G). Test pits were excavated on site and orange and gray mottling was observed in near surface soils in all explorations. Soil moisture conditions were moist to wet and perched groundwater seepage was encountered in test pits TP-2, TP-5 through TP-9, TP-13, TP-1 (2013), TP-13 (2013), TP-15 (2013), and TP-16 (2013) at depths of 2 to 8.5 feet. Static groundwater was measured at a depth of 2 feet below the ground surface in test pit TP-1 (2013). As a result of these shallow ground water elevations, the wetpond detention facilities have been proposed with only 3 ft. of detention above the permanent wet pool surface elevation. According to the test pit logs in the vicinity of the proposed stormwater facilities (TP-2, TP-3, and TP-10 (2013)), ground water was observed at elevations lower than 6 feet from ground surface. As a result, the groundwater should not impact the detention volume within the facilities.

3. **Identify and describe soil parameters and design methods for use in hydrologic and hydraulic design of proposed facilities.**

   The Soil Survey of Clark County by the Soil Conservation Service shows the soil onsite is primarily Dollar Loam (DoB) with some areas of Hesson Clay Loam (HcB) and Olympic Clay Loam (OmF). The Hesson Clay Loam and Olympic Clay Loam reside primarily along the north boundary of the phase 1 site (see Vicinity Maps section and Appendix A of this report for the Soils Map). The soil properties are as follows:

   Dollar Loam (DoB)

   Classification: Hydrologic Group C / SG3

   Permeability: 0-32 in. depth, 0.63 to 2.0 in/hr
   32-60 in. depth, < 0.06 in/hr

Curve Numbers:	Meadow/Pasture	CN=85
	Grass/Landscape:	CN=86
	Pavement/Sidewalk:	CN=98
	Roof:	CN=98

Hesson Clay Loam (HcB)

Classification: Hydrologic Group C / SG3

Permeability: 0-22 in. depth, 0.63 to 2.0 in/hr
22-91 in. depth, 0.2 to 0.63 in/hr

Curve Numbers:	Meadow/Pasture	CN=85
	Grass/Landscape:	CN=86
	Pavement/Sidewalk:	CN=98
	Roof:	CN=98

Olympic Clay Loam (OmF)

Classification: Hydrologic Group B / SG3

Permeability: 0-44 in. depth, 0.2 to 0.63 in/hr
44-59 in. depth, 0.2 to 0.63 in/hr

Curve Numbers:	Meadow/Pasture	CN=78
	Grass/Landscape:	CN=80
	Pavement/Sidewalk:	CN=98
	Roof:	CN=98

A detailed list of the runoff curve numbers used in conveyance design is included in Appendix B. According to the Preliminary Geotechnical Engineering Report by GeoPacific Engineering, Inc. (see Appendix G), soil mottling, the presence of clay soils, and the prevalent groundwater seepage indicates that the soils onsite will likely accept little runoff and would be expected to behave more as a Hydrologic Soil Group 4 soil rather than Soil Group 3. As a result, onsite soils have been modeled as a Hydrologic Soil Group 4 for purposes of the stormwater calculations.

Conveyance design for the development is to be completed at time of final design. Runoff for conveyance design is to be estimated using the Santa Barbara Urban Hydrograph (SBUH) methodology. The following design storms are to be used in the hydrologic analysis:

2-year, 24-hour storm	2.8 inches of rainfall
10-year, 24-hour storm	3.9 inches of rainfall
100-year, 24-hour storm	5.2 inches of rainfall
Water Quality Storm (0.70 x 2-year storm)	1.96 inches of rainfall

Isopluvial maps for the 2-year, 10-year, and 100-year storms are included in Appendix B.

4. Report findings of testing and analysis used to determine the infiltration rate.

Due to the high observed groundwater elevations and poor permeability of the existing soil, infiltration is not being proposed for this development.

5. Where unstable or complex soil conditions exist that may significantly affect the design of stormwater facilities, the responsible official may require a preliminary soils report that addresses stormwater design considerations arising from soil conditions. The preliminary soils report shall be prepared by a registered professional engineer proficient in geotechnical investigation and engineering or a registered soil scientist. The preliminary soils report shall include a soils map developed using the criteria set in the *NRCS National Soil Survey Handbook* (NRCS 2007) and the *SCS Soil Survey Manual* (SCS 1993), at a minimum scale of 1:5,000 (12.7 inch/mile).

A Preliminary Geotechnical Engineering Report has been prepared by GeoPacific Engineering, Inc. (see Appendix G). Additional information will be provided, if required.

Section D – Source Control

1. **If the development activity includes any of the activities listed in Section 2.2 of Volume IV of the *Stormwater Management Manual for Western Washington* (SMMWW), identify the source control BMPs to be used with the land-disturbing activity.**

The following Source Control BMPs apply to this project:

- BMPs for Landscaping and Lawn/Vegetation Management
  - Install engineered soil/landscape systems to improve the infiltration and regulation of stormwater in landscaped areas.
  - Do not dispose of collected vegetation into waterways or storm drainage systems.

- BMPs for Maintenance of Stormwater Drainage and Treatment Systems
  - Inspect and clean dispersion trench, conveyance system, and catch basins as needed, and determine whether improvements in O & M are needed.
  - Promptly repair any deterioration threatening the structural integrity of the facilities. These include replacement of clean-out gates, catch basin lids, and rock in dispersion trench.
  - Ensure that storm sewer capacities are not exceeded and that heavy sediment discharges to the sewer system are prevented.
  - Regularly remove debris and sludge from BMPs used for peak-rate control, treatment, etc. and discharge to sanitary sewer if approved by the sewer authority, or truck to a local or state government approved disposal site.
  - Clean catch basins when the depth of deposits reaches 60 percent of the sump depth as measured from the bottom of basin to invert of lowest pipe into or out of the basin. However, in no case should there be less than six inches clearance from the debris surface to the invert of the lowest pipe.
  - Clean woody debris in catch basins as frequently as needed to ensure proper operation of the catch basin.
  - Post warning signs; "Dump No Waste – Drains to Ground Water," "Streams," "Lakes," or emboss on or adjacent to all storm drain inlets where practical.
  - Disposal of sediments and liquids must comply with "Recommendations for Management of Street Wastes" described in Appendix IV-G of Volume IV of the Stormwater Manual.

- BMPs for Urban Streets
  - For maximum Stormwater pollutant reductions on curbed streets and high volume parking lots use efficient vacuum sweepers.
  - For moderate stormwater pollutant reductions on curbed streets use regenerative air sweepers or tandem sweeping operations.
  - For minimal stormwater pollutant reductions on curbed streets use mechanical sweepers.
  - Conduct sweeping at optimal frequencies. Optimal frequencies are those scheduled sweeping intervals that produce the most cost-effective annual reduction of pollutants normally found in stormwater and can vary depending on land use, traffic volume and rainfall patterns.

- Disposal of street sweeping solids must comply with "Recommendations for Management of Street Wastes" described in Appendix IV-G of Volume IV of the Stormwater Manual.
- Inform citizens about eliminating yard debris, oil and other wastes in street gutters to reduce street pollutant sources.
-

Additional recommended BMPs can be found in Section 2.2 of Volume IV of the Stormwater Manual.

Section E – Onsite Stormwater Management BMPs

1. **On the preliminary development plan or other maps, show the site areas where on-site stormwater management BMPs will be effectively implemented. The plan must show the areas of retained native vegetation and required flow lengths and vegetated flow paths, as required for proper implementation of each onsite stormwater BMP. Arrows must show the stormwater flow path to each BMP.**

   All stormwater runoff from the proposed development is to be captured and routed via pipe to one of three new stormwater facilities for treatment and detention. Two of the facilities are to be located at the southwest end of the site along NE Ingle Road in Tracts 'A' and 'H'. A third is to be located at the east end of the site north of the existing wetland area in Tract 'R'. Each of the facilities is to be comprised of a Combined Detention and Wetpool Facility (BMP T10.40). More specifically, these will be "large" two-cell ponds with detention volume above the wet pool surface elevation. "Large" wet ponds are required in order to meet City of Camas phosphorus control requirements for developments within the LaCamas watershed. The two facilities next to NE Ingle Road will discharge via pipe to the existing wetland area west of the road and the third facility will discharge to the existing Wetland 'G' next to the facility. Stormwater from this wetland will then be captured in a ditch inlet at the downstream end and conveyed via pipe to the wetland west of NE Ingles Road. All offsite runoff from the north of the site will be captured in a ditch inlet and conveyed via pipe to NE Ingle Road, where it will also be discharged to the existing wetland. Refer to Preliminary Utility Plans and Developed Catchment Plan in Appendix J for stormwater facility locations.

2. **Identify and describe geotechnical studies or other information used to complete the analysis and design of each on-site stormwater BMP.**

   GeoPacific Engineering, Inc. has completed a Preliminary Geotechnical Engineering Report for this development (see Appendix G). According to the test pit logs in the vicinity of the proposed stormwater facilities (TP-2, TP-3, and TP-10 (2013)), ground water was observed at elevations lower than 6 feet from ground surface. Due to these shallow ground water elevations, the wetpond detention facilities have been proposed with only 3 ft. of detention above the permanent wet pool surface elevation. As a result, the groundwater should not impact the detention volume within the facilities.

3. **Identify the criteria (and their source) used to complete analyses for each on-site stormwater BMP.**

   The facility has been designed to provide treatment for the water quality storm (91% of the 24-hour continuous runoff volume) in accordance with City of Camas Stormwater Design Standards Manual Section 5.03 and Volume V of the Stormwater Management Manual for Western Washington (SMMWW) and detention for the continuous storm in accordance with the requirements of the City of Camas Stormwater Design Standards Manual Section 4.02 and Volume III of the SMMWW. WWHM2012 has been used for the continuous simulation model for this development.

4. **Describe how design criteria will be met for each proposed on-site stormwater management BMP.**

   Three separate Combined Detention and Stormwater Wetpool Facilities (BMP T10.40) are proposed in order to meet treatment and flow control requirements. Stormwater treatment will be met with the two-cell wetpond and flow-control requirements will be met with the 3 ft. of detention above the proposed wetpond permanent pool surface elevation in each of the facilities. The wetpool portion of each facility has been designed per the guidelines set forth in Volume V, Chapter 10 of the SMMWW. Since the development is located within the LaCamas watershed, phosphorus control is required per Section 5.04 of the City of Camas Stormwater Design Standards Manual. "Large" wetponds were selected to meet these requirements from the Phosphorus Treatment Menu in Section 3.3 of Volume V of the SMMWW. Per Section 10.3 of Volume V of the SMMWW, a large wetpond requires a wet pool volume at least 1.5 times larger than the required basic wet pool volume. The detention portion of each facility has been designed in accordance with the guidelines set forth in Volume III, Section 3.2 of the SMMWW. Flow control structures with an orifice and weir will be utilized in order to control stormwater flows from each facility. (Refer to Appendix I for Stormwater Facility Plans and Details).

5. **Describe any on-site application of LID measures planned for the project. Provide a plan that shows the proposed location and approximate size of each LID facility.**

   Due to the relatively high existing ground water elevation and saturated soil conditions, infiltration LID measures are not applicable to this project.

6. **Identify and describe any assumptions used to complete the analysis.**

   Groundwater elevation was assumed to be below the detention volume for purposes of designing the stormwater detention facilities. The detention volume in each pond was assumed to be dry at the beginning of the modeled storm event.

7. **Describe site suitability, including hydrologic soil groups, slopes, areas of native vegetation, and adequate location of each BMP.**

   The Soil Survey of Clark County by the Soil Conservation Service shows the soil onsite is primarily Dollar Loam (DoB) with some areas of Hesson Clay Loam (HcB) and Olympic Clay Loam (OmF). According to the Preliminary Geotechnical Engineering Report by GeoPacific Engineering, Inc. (see Appendix G), soil mottling, the presence of clay soils, and the prevalent groundwater seepage indicates that the soils onsite will likely accept little runoff and would be expected to behave more as a Hydrologic Soil Group 4 soil rather than Soil Group 3. As a result, infiltration is not proposed and onsite soils have been modeled as a Hydrologic Soil Group 4 for purposes of the stormwater calculations.

   The proposed stormwater facilities have been located within the relative low areas of the site in order to provide for the most efficient drainage for the developed site.

Section F – Runoff Treatment Analysis and Design

1. **Document the level of treatment required (basic, enhanced, phosphorus, oil/water separation) based on procedures in Vol. V, Chapter 2 of the SMMWW.**

   Since the development is located within the LaCamas watershed, phosphorus control is required per Section 5.04 of the City of Camas Stormwater Design Standards Manual. According to the procedures outlined in Vol. V, Ch. 2 of the Stormwater Manual, the project requires phosphorus treatment. (See Treatment Facility Selection Flow Chart in Appendix C).

2. **Provide background and description to support the selection of the treatment BMP being proposed. Include an analysis of initial implementation costs and long-term maitenance costs.**

   Due to the relatively high existing ground water elevation and saturated soil conditions, it was determined that Combined Detention and Stormwater Wetpool Facilities (BMP T10.40) would be the most viable treatment option for the site. A cost analysis has not been prepared, but could be provided if deemed to be necessary.

3. **Identify geotechnical or soils studies or other information used to complete the analysis and design.**

   GeoPacific Engineering, Inc. has completed a Preliminary Geotechnical Engineering Report for this development (see Appendix G). Test pits were excavated on site and orange and gray mottling was observed in near surface soils in all explorations. Soil moisture conditions were moist to wet and perched groundwater seepage was encountered in test pits TP-2, TP-5 through TP-9, TP-13, TP-1 (2013), TP-13 (2013), TP-15 (2013), and TP-16 (2013) at depths of 2 to 8.5 feet. Static groundwater was measured at a depth of 2 feet below the ground surface in test pit TP-1 (2013). As a result of these shallow ground water elevations, the wetpond detention facilities have been proposed with only 3 ft. of detention above the permanent wet pool surface elevation. According to the test pit logs in the vicinity of the proposed stormwater facilities (TP-2, TP-3, and TP-10 (2013)), ground water was observed at elevations lower than 6 feet from ground surface. As a result, the groundwater should not impact the detention volume within the facilities.

4. **Identify the BMPs used in the design, and their sources.**

   Three separate Combined Detention and Stormwater Wetpool Facilities (BMP T10.40) are proposed in order to meet treatment and flow control requirements. Stormwater treatment will be met with the two-cell wetpond and flow-control requirements will be met with the 3 ft. of detention above the proposed wetpond permanent pool surface elevation in each of the facilities. The wetpool portion of each facility has been designed per the guidelines set forth in Volume V, Chapter 10 of the SMMWW. Since the development is located within the LaCamas watershed, phosphorus control is required per Section 5.04 of the City of Camas Stormwater Design Standards Manual. "Large" wetponds were selected to meet these requirements from the Phosphorus Treatment Menu in Section 3.3 of Volume V of the SMMWW. Per Section 10.3 of Volume V of the SMMWW, a large wetpond requires a wet pool volume at least 1.5 times larger than the required basic wet pool volume. (Refer to Appendix F for Stormwater Facility Plans and Details).

5. **Summarize the results of the runoff treatment design, and describe how the proposed design meets the requirements of CMC Chapter 14.02 and the Stormwater Manual.**

As required under BMP T10.40, the wetpool portion of the facilities were designed according to the procedure for Wetponds – Basic and Large (BMP T10.10) in Volume V, Chapter 10 of the SMMWW. A general summary of the design criteria is as follows:

- The facility consists of two cells, a presettling cell (Cell #1) and a secondary cell (Cell #2).
- The presettling cell contains approximately 25% to 35% of the total wetpool volume. Refer to the summary of the wetpool surface area calculations below.
- One foot of sediment storage is provided in the presettling cell below the permanent pool base elevation.
- The depth of the presettling cell (Cell#1) is 4 ft, excluding the 1 ft. of sediment storage.
- The depth of the secondary cell (Cell #2) is 4 ft.
- A 5 ft. wide berm extends across the full width of the wetpool and ties into the side slopes and base of the pond.
- All pond side slopes within the wetpool and detention volume are no steeper than 3H:1V.
- The top of the berm is set 1 foot below the WQ design water surface elevation with side slopes no steeper than 3H:1V.
- All inlets have been designed to enter the first cell. Inlets and outlet have been located to maximize the flowpath through the facility. The ratio of the flowpath length to width from the inlet to the outlet is at least 3:1.
- The inlets and the outlets are submerged below the wetpool surface elevation with the inlet inverts a minimum of 2 ft. from the pond bottom, excluding the 1 ft. of sediment storage.

Each of the facilities has been designed to provide treatment for the water quality storm (91% of the 24-hour continuous runoff volume) in accordance with City of Camas Stormwater Design Standards Manual Section 5.03 and Volume V of the SMMWW. Since the development is located within the LaCamas watershed, phosphorus control is required per Section 5.04 of the City of Camas Stormwater Design Standards Manual. "Large" wetponds were selected to meet these requirements from the Phosphorus Treatment Menu in Section 3.3 of Volume V of the SMMWW. Per Section 10.3 of Volume V of the SMMWW, a large wetpond requires a wet pool volume at least 1.5 times larger than the required basic wet pool volume. WWHM2012 has been used for the continuous simulation model for this development (see Appendix D). As required, this volume was used with the sizing procedure described in Volume V, Chapter 10 of the SMMWW in order to size the minimum required wet pool volume for the wetpools. The results of this water quality design are as follows:

Identify required wetpool volume using the wetpond sizing procedure.

Wetpool	WWHM2012 WQ Storm Volume (acre-ft)	WWHM2012 Required WQ Volume for Large Wetpool (cf)
Tract 'A' Wetpool	2.0201	131,994
Tract 'H' Wetpool	0.9776	63,876
Tract 'R' Wetpool	2.5745	168,218

Table F1: Water quality required wetpool volume from WWHM2012

A screen shot from the WWHM3 water quality volume calculation is included in Appendix D of this report.

Calculate the minimum required surface area of the total stormwater wetpool.

Wetpool	Required Wetpool Surface Area (sf)	Design Wetpool Surface Area (sf)
Tract 'A' Wetpool	37,636	43,103
Tract 'H' Wetpool	19,321	20,664
Tract 'R' Wetpool	47,089	48,550

Table F2: Minimum required total wetpool surface area

Detailed wetpool surface area calculations are included in Appendix D.

The wetpool design for each of the three facilities is detailed as follows:

<u>Tract 'A' Wetpool:</u>
The stormwater facility design provides a total wetpool surface area of 43,103 SF at an elevation of 190.0 ft. The presettling cell (Cell #1) has a wetpool base area of 10,026 SF at an elevation of 186.0 ft. and a wetpool surface area of 14,905 SF at an elevation of 190.0 ft. with a total Cell #1 wetpool volume of 49,862 CF. There is 1 ft. of sediment storage under Cell #1 between the elevations of 185.0 ft. and 186.0 ft. The secondary cell (Cell #2) has a base area of 20,539 SF at an elevation of 186.0 ft. and a surface area of 28,198 SF at an elevation of 190.0 ft with a total Cell #2 wetpool volume of 97,474 CF. As required, the wetpool volume of Cell #1 is approximately 34% of the total 147,336 CF wetpool volume. The top of the 5 foot berm between the cells is at an elevation 1 foot below the wetpool surface at 189.0 ft. The side slopes of both cells are 3H:1V with the exception of the pond access which is 5H:1V.

Tract 'H' Wetpool:
The stormwater facility design provides a total wetpool surface area of 20,664 SF at an elevation of 199.0 ft. The presettling cell (Cell #1) has a wetpool base area of 4,573 SF at an elevation of 195.0 ft. and a wetpool surface area of 8,310 SF at an elevation of 199.0 ft. with a total Cell #1 wetpool volume of 25,766 CF. There is 1 ft. of sediment storage under Cell #1 between the elevations of 194.0 ft. and 195.0 ft. The secondary cell (Cell #2) has a base area of 7,567 SF at an elevation of 195.0 ft. and a surface area of 12,354 SF at an elevation of 199.0 ft with a total Cell #2 wetpool volume of 39,842 CF. As required, the wetpool volume of Cell #1 is approximately 35% of the total 65,608 CF wetpool volume. The top of the 5 foot berm between the cells is at an elevation 1 foot below the wetpool surface at 198.0 ft. The side slopes of both cells are 3H:1V with the exception of the pond access which is 5H:1V.

Tract 'R' Wetpool:
The stormwater facility design provides a total wetpool surface area of 48,550 SF at an elevation of 248.0 ft. The presettling cell (Cell #1) has a wetpool base area of 9,654 SF at an elevation of 244.0 ft. and a wetpool surface area of 16,536 SF at an elevation of 248.0 ft. with a total Cell #1 wetpool volume of 52,380 CF. There is 1 ft. of sediment storage under Cell #1 between the elevations of 243.0 ft. and 244.0 ft. The secondary cell (Cell #2) has a base area of 23,565 SF at an elevation of 244.0 ft. and a surface area of 32,015 SF at an elevation of 248.0 ft with a total Cell #2 wetpool volume of 111,160 CF. As required, the wetpool volume of Cell #1 is approximately 32% of the total 163,540 CF wetpool volume. The top of the 5 foot berm between the cells is at an elevation 1 foot below the wetpool surface at 247.0 ft. The side slopes of both cells are 3H:1V with the exception of the pond access which is 5H:1V.

Refer to Appendix D for water quality calculations and stormwater treatment wetpool sizing calculations.

Refer to Appendix F for stormwater facility plans, details, and volume calculations.

6. Provide a table that lists the amount of Pollution-Generating Pervious Surfaces (PGPS) and Pollution-Generating Impervious Surfaces (PGIS) for each Threshold Discharge Area (TDA).

The following table lists the areas of Pollution-Generating Pervious Surfaces (PGPS) and Pollution-Generating Impervious Surfaces (PGIS) for each Threshold Discharge Area (TDA):

	TDA 1
Effective Pollution Generating Impervious Surface (PGIS) (Acres)	13.900
Effective Pollution Generating Pervious Surface (PGPS) (Acres)	19.590

Table F3: Effective Pollution Generating Surface Summary

Section G – Flow Control Analysis and Design

1. **Identify the site's suitability for stormwater infiltration for flow control, including tested infiltration rates, logs of soil borings, and other information.**

   GeoPacific Engineering, Inc. has completed a Preliminary Geotechnical Engineering Report for this development (see Appendix G). Test pits were excavated on site and it was determined that the soil was moist to wet and perched groundwater seepage was encountered at depths of 2 to 8.5 feet. The report concluded that soil mottling, the presence of clay soils, and the prevalence of ground water seepage indicates that the soil will likely accept little runoff. As a result, infiltration is not being considered as a viable option for flow control or treatment on this project.

2. **Identify and describe geotechnical or other studies used to complete the analysis and design.**

   GeoPacific Engineering, Inc. has completed a Preliminary Geotechnical Engineering Report for this development (see Appendix G). According to the test pit logs in the vicinity of the proposed stormwater facilities (TP-2, TP-3, and TP-10 (2013)), ground water was observed at elevations lower than 6 feet from ground surface. Due to these shallow ground water elevations, the wetpond detention facilities have been proposed with only 3 ft. of detention above the permanent wet pool surface elevation. As a result, the groundwater should not impact the detention volume within the facilities.

3. **If infiltration cannot be utilized for flow control, provide the following additional information:**

   a. **Identify areas where flow control credits can be obtained for dispersion, LID, or other measures, per the requirements in the Stormwater Manual.**

   Due to the relatively high existing ground water elevation and saturated soil conditions, infiltration LID measures are not applicable to this project.

   b. **Provide the approximate sizing and location of flow control facilities for each TDA, per Volume III of the Stormwater Manual.**

   All stormwater runoff from the proposed development TDA1 is to be captured and routed via pipe to one of three new stormwater facilities for treatment and detention. Two of the facilities are to be located at the southwest end of the site along NE Ingle Road in Tracts 'A' and 'H'. A third is to be located at the east end of the site north of the existing wetland area in Tract 'R'. Each of the facilities is to be comprised of a Combined Detention and Wetpool Facility (BMP T10.40). More specifically, these will be "large" two-cell ponds with detention volume above the wet pool surface elevation. "Large" wet ponds are required in order to meet City of Camas phosphorus control requirements for developments within the LaCamas watershed. The detention volume in each facility will be 3 ft. with 1 additional ft. of freeboard. The Tract 'A' wetpool has a total detention volume of 196,838 CF, the Tract 'H' wetpool has a detention volume of 99,804 CF, and the Tract 'R' wetpool has a detention volume of 220,586 CF.

The two facilities next to NE Ingle Road will discharge via pipe to the existing wetland area west of the road and the third facility will discharge to the existing Wetland 'G' next to the facility. Stormwater from this wetland will then be captured in a ditch inlet at the downstream end and conveyed via pipe to the wetland west of NE Ingles Road. All offsite runoff from the north of the site will be captured in a ditch inlet and conveyed via pipe to NE Ingle Road, where it will also be discharged to the existing wetland. (Refer to Preliminary Utility Plan in Appendix M for stormwater facility locations).

c. Identify the criteria (and their sources) used to complete the analysis, including pre-developed and post-developed land use characteristics.

The facility has been designed to provide detention for the continuous storm in accordance with the requirements of the City of Camas Stormwater Design Standards Manual Section 4.02 and Volume III of the SMMWW. WWHM2012 has been used for the continuous simulation model for this development. According to the Preliminary Geotechnical Engineering Report by GeoPacific Engineering, Inc. (See Appendix G), soil mottling, the presence of clay soils, and the prevalent groundwater seepage indicates that the soils onsite will likely accept little runoff and would be expected to behave more as a Hydrologic Soil Group 4 soil rather than Soil Group 3. As a result, onsite soils have been modeled as a Hydrologic Soil Group 4 for purposes of the stormwater calculations.

The pre-developed TDA 1 includes Catchments 1P, 2P, and 3P. The developed TDA 1 includes Catchments 1Da, 1Db, 2D, and 3D (see Catchment Plans in Appendix J for location). Catchments 1P, 1Da and 1Db represent the southwest portion of the development and were used to size the Tract 'H' stormwater facility. Catchments 2P and 2D represent the southeast portion of the development and were used to size the Tract 'A' stormwater facility. Catchments 3P and 3D represent the north portion of the site and were used to size the Tract 'R' stormwater facility. All of the stormwater facilities discharge to the existing wetland area to the southwest of NE Ingle Road. A summary of the pre-developed and developed catchment data are shown in the tables below:

Pre-developed catchment areas:

Catchment	Storm Facility	Description	Area (acres)
1P	Tract 'H'	SG4, Forest, Mod.	8.612
2P	Tract 'A'	SG4, Forest, Mod.	17.491
3P	Tract 'R'	SG4, Forest, Mod.	26.540

Table G1: Hydrologic parameters used in pre-developed catchment analysis

Developed catchment areas:

Catchment	Storm Facility	Description	Area (acres)
1Da	Tract 'H'	Roads Mod.	0.965
		Roof Tops Flat	2.066
		Driveways Mod.	0.413
		Sidewalks Mod.	0.318
		Pond	0.921
		SG3, Lawn, Mod.	2.053
1Db	Tract 'H'	Roads Mod.	0.319
		Roof Tops Flat	0.675
		Driveways Mod.	0.131
		Sidewalks Mod.	0.094
		SG3, Lawn, Mod.	0.656
2D	Tract 'A'	Roads Mod.	4.440
		Roof Tops Flat	4.075
		Driveways Mod.	0.815
		Sidewalks Mod.	1.147
		Pond	2.029
		SG3, Lawn, Mod.	4.985
3D	Tract 'R'	Roads Mod.	3.491
		Roof Tops Flat	6.198
		Driveways Mod.	1.240
		Sidewalks Mod.	1.063
		Pond	2.000
		SG3, Lawn, Mod.	12.548

Table G2: Hydrologic parameters used in developed catchment analysis

A summary of the pre-developed and developed TDA 1 land use areas are shown in the tables below:

Pre-developed TDA 1:

Land Use	Description	Area (ac)
Pervious	SG4, Forest, Mod.	52.643
Impervious	N/A	0.000

Table G3: Land use areas for pre-developed TDA 1

Developed TDA 1:

Land Use	Description	Area (ac)
Pervious	SG3, Lawn, Mod.	20.243
Impervious	Roads Mod.	9.215
	Roof Tops Flat	13.014
	Driveways Mod.	2.599
	Sidewalks Mod.	2.622
	Pond	4.950

Table G4: Land use areas for developed TDA 1

4. **For sites considered to be historical prairie, submit a project site report prepared by a wetland scientist or horticulturist experienced in identifying soils, plans, and other evidence associated with historic prairies to demonstrate the existence of historic prairie on the project site. Areas within Camas that were historically prairie include Fern and Lacamas prairies. Contact City staff for a map showing potential prairie locations.**

   This section does not apply.

5. **Complete a hydrologic analysis for existing and developed site conditions, in accordance with the requirements of Chapter 4 of this manual and Chapter 2, Volume III of the Stormwater Manual, using an approved continuous runoff simulation model. Compute existing and developed flow duration for all subbasins. Provide an output table from the continuous flow model.**

   The detention portion of each facility has been designed in accordance with the guidelines set forth in Volume III, Section 3.2 of the SMMWW. A summary of the design criteria is as follows:

   1) The detention has been designed as a flow-through system, maximizing the distance between the inlet and the outlet.

   2) Interior side slopes within the detention zone of the pond have been designed at 3H:1V.

   3) The stormwater facility includes an emergency overflow weir that discharges directly to the existing roadside ditch in the event that the capacity of the facility is exceeded.

   4) A 15 ft. wide gravel access road provides access into the first cell with a maximum slope of 5H:1V.

   5) The entire facility is surrounded with a 6 ft. high chain-link fence.

   The detention volume design for each of the three facilities is detailed as follows:

   <u>Tract 'A' Facility:</u>
   The stormwater facility was designed to provide detention above the wetpool surface elevation of 190.0 ft. Due to the high ground water elevations, the detention zone was kept above the measured groundwater elevation and held to a relatively shallow 3 ft depth, with an additional 1 ft. of freeboard above. The base of the detention zone within the stormwater facility has an area of 43,103 SF at an elevation of 190.0 ft. and the top of the detention zone has an area of 55,316 SF at an elevation of 194.0 ft. The resulting total detention volume is approximately 196,838 CF. Stormwater is to be detained in the detention zone between the elevations of 190.0 ft. and 193.0 ft. Since the top of the pond is at an elevation of 194.0 ft., a freeboard of 1 ft. is provided. Refer to the Stormwater Facility Plan, Details, and Volume Calculations in Appendix F.

   A summary of the pre-developed and developed flows for the Tract 'A' Facility (Catchments 2P and 2D) from the WWHM2012 calculations is shown in the table below:

Return Period	Pre-developed Flow (cfs)	Developed Flow (cfs)
2-Year	4.92	3.15
10-Year	9.01	5.40
50-Year	11.33	7.97
100-Year	12.03	9.26

Table G5: Pre-developed and developed flows for Tract 'A' Facility.

A summary of the developed flows and stormwater facility storage volumes and stage elevations for the Tract 'A' Facility from the WWHM2012 calculations is shown in the table below:

Return Period	Developed Flow (cfs)	Detention Volume (ac-ft)	Detention Stage Elevation (ft)
2-Year	3.15	1.33	1.47 / 191.47
10-Year	5.40	1.71	1.87 / 191.87
50-Year	7.97	2.07	2.23 / 192.23
100-Year	9.26	2.17	2.33 / 192.33

Table G6: Developed flows and facility storage volumes / stage elevations for Tract 'A' Facility

From the tables above, it can be seen that the proposed design meets the flow-control requirements, as specified in the City of Camas Stormwater Design Standards Manual Section 4.02 and Volume III of the SMMWW. It can also be seen that the proposed detention volume is sufficient to detain the stormwater from the developed catchment area 2D and maintain at least 1 ft. of freeboard from the top of pond elevation of 194.0 ft.

Tract 'H' Facility:

The stormwater facility was designed to provide detention above the wetpool surface elevation of 199.0 ft. Due to the high ground water elevations, the detention zone was kept above the measured groundwater elevation and held to a relatively shallow 3 ft depth, with an additional 1 ft. of freeboard above. The base of the detention zone within the stormwater facility has an area of 20,664 SF at an elevation of 199.0 ft. and the top of the detention zone has an area of 29,238 SF at an elevation of 203.0 ft. The resulting total detention volume is approximately 99,804 CF. Stormwater is to be detained in the detention zone between the elevations of 199.0 ft. and 202.0 ft. Since the top of the pond is at an elevation of 203.0 ft., a freeboard of 1 ft. is provided. Refer to the Stormwater Facility Plan, Details, and Volume Calculations in Appendix F.

A summary of the pre-developed and developed flows for the Tract 'H' Facility (Catchments 1P, 1Da, and 1Db) from the WWHM2012 calculations is shown in the table below:

Return Period	Pre-developed Flow (cfs)	Developed Flow (cfs)
2-Year	2.42	1.60
10-Year	4.44	2.77
50-Year	5.58	4.13
100-Year	5.93	4.81

Table G7: Pre-developed and developed flows for Tract 'H' Facility.

A summary of the developed flows and stormwater facility storage volumes and stage elevations for the Tract 'H' Facility from the WWHM2012 calculations is shown in the table below:

Return Period	Developed Flow (cfs)	Detention Volume (ac-ft)	Detention Stage Elevation (ft)
2-Year	1.60	0.61	1.30 / 200.30
10-Year	2.77	0.78	1.63 / 200.63
50-Year	4.13	0.93	1.93 / 200.93
100-Year	4.81	1.00	2.07 / 201.07

Table G8: Developed flows and facility storage volumes / stage elevations for Tract 'H' Facility

From the tables above, it can be seen that the proposed design meets the flow-control requirements, as specified in the City of Camas Stormwater Design Standards Manual Section 4.02 and Volume III of the SMMWW. It can also be seen that the proposed detention volume is sufficient to detain the stormwater from the developed catchment areas 1Da and 1Db and maintain at least 1 ft. of freeboard from the top of pond elevation of 203.0 ft.

<u>Tract 'R' Facility:</u>
The stormwater facility was designed to provide detention above the wetpool surface elevation of 248.0 ft. Due to the high ground water elevations, the detention zone was kept above the measured groundwater elevation and held to a relatively shallow 3 ft depth, with an additional 1 ft. of freeboard above. The base of the detention zone within the stormwater facility has an area of 48,550 SF at an elevation of 248.0 ft. and the top of the detention zone has an area of 61,743 SF at an elevation of 252.0 ft. The resulting total detention volume is approximately 220,586 CF. Stormwater is to be detained in the detention zone between the elevations of 248.0 ft. and 251.0 ft. Since the top of the pond is at an elevation of 252.0 ft., a freeboard of 1 ft. is provided. Refer to the Stormwater Facility Plan, Details, and Volume Calculations in Appendix F.

A summary of the pre-developed and developed flows for the Tract 'R' Facility (Catchments 3P and 3D) from the WWHM2012 calculations is shown in the table below:

Return Period	Pre-developed Flow (cfs)	Developed Flow (cfs)
2-Year	7.47	5.40
10-Year	13.67	9.09
50-Year	17.19	13.25
100-Year	18.26	15.31

Table G9: Pre-developed and developed flows for Tract 'R' Facility.

A summary of the developed flows and stormwater facility storage volumes and stage elevations for the Tract 'R' Facility from the WWHM2012 calculations is shown in the table below:

Return Period	Developed Flow (cfs)	Detention Volume (ac-ft)	Detention Stage Elevation (ft)
2-Year	5.40	1.65	1.47 / 249.47
10-Year	9.09	2.24	1.97 / 249.97
50-Year	13.25	2.77	2.40 / 250.40
100-Year	15.31	2.93	2.53 / 250.53

Table G10: Developed flows and facility storage volumes / stage elevations for Tract 'R' Facility

From the tables above, it can be seen that the proposed design meets the flow-control requirements, as specified in the City of Camas Stormwater Design Standards Manual Section 4.02 and Volume III of the SMMWW. It can also be seen that the proposed detention volume is sufficient to detain the stormwater from the developed catchment areas 3D and maintain at least 1 ft. of freeboard from the top of pond elevation of 252.0 ft.

Refer to the stormwater facility plans, details, and volume calculations in Appendix F.

6. **Include and reference all hydrologic computations, equations, graphs, and any other aids necessary to clearly show the methodology and results.**

   Refer to Appendix E for a detailed WWHM2012 hydraulic analysis of the pre-developed and developed site during the 2-, 10-, 50-, and 100-yr. continuous storm events.

7. **Include all maps, exhibits, graphics, and references used to determine existing and developed site hydrology.**

   Refer to the Utility Plans and Developed Catchment Plans in Appendix J for catchment area locations and the specific locations of the stormwater facilities.

   Refer to the Maps section of this report.

Section H – Wetlands Protection

Refer to the wetland mitigation plan prepared by Ecological Land Services, Inc.

APPENDIX

I. APPENDICES

Appendix Index

Appendix A Hydrologic Soil Groups
Table 7 – Estimated Physical and Chemical Properties of Soils
Soils Map

Appendix B Table III-1.3 SCS Western Washington Runoff Curve Numbers
Table III-1.4 "n" and "k" Values Used in Time Calculations for Hydrographs
Isopluvial Maps for Design Storms

Appendix C Figure 1.1: Flow Chart for Determining Stormwater Requirements.
Section 1.2 "Minimum Requirements" from Vol. I of the SMMWW.
Figure 2.1: Treatment Facility Selection Flow Chart
Section 2.5 "Minimum Requirements" from Vol. I of the SMMWW.

Appendix D WWHM2012 Analysis – 91% Continuous Storm (Water Quality)
Stormwater Treatment Wetland Sizing Calculations

Appendix E WWHM2012 Analysis – Continuous Storm (Flow Control)

Appendix F Stormwater Facility Plans, Details, and Specifications:

- Stormwater Facility Plan, Profile, and Sections.
- Stormwater Facility Volume Calculations

Appendix G Preliminary Geotechnical Engineering Report for Green Mountain Phase 1, by GeoPacific Engineering, Inc. dated December 03, 2014.

Appendix H Stormwater Facility Maintenance Manual
(By Clark County Public Works Dept.)

Appendix I City of Camas Pre-Application Conference Notes

Appendix J Development Plans

- Pre-developed Catchment Plan
- Developed Catchment Plan
- Preliminary Offsite Utility Plan
- Preliminary Utility Plan (South)
- Preliminary Utility Plan (North)
- Preliminary Storm Facility Plan & Sections

A

Exhibit B

Hydrologic Soil Groups for Soils in Clark County

U.S. Department of Agriculture
Soil Conservation Service

Page—1
9/17/91

WATER FEATURES

Survey Area—CLARK COUNTY, WASHINGTON

Map symbol and soil name		Hydro-logic group	Flooding Freq	Flooding Duration	Flooding Months	High water table Depth (Ft)	High water table Kind	High water table Months
BpB	BEAR PRAIRIE	B	NONE		—	6.0—6.0		—
BpC	BEAR PRAIRIE	B	NONE		—	6.0—6.0		—
CnB	CINEBAR	B	NONE		—	6.0—6.0		—
CnD	CINEBAR	B	NONE		—	6.0—6.0		—
CnE	CINEBAR	B	NONE		—	6.0—6.0		—
CnG	CINEBAR	B	NONE		—	6.0—6.0		—
CrE	CINEBAR	B	NONE		—	6.0—6.0		—
CrG	CINEBAR	B	NONE		—	6.0—6.0		—
CsF	CISPUS	B	NONE		—	6.0—6.0		—
CtA	CLOQUATO	B	OCCA		NOV—MAR	6.0—6.0		—
CvA	COVE	D	OCCA		DEC—APR	0—1.0	PERCH	DEC—JUN
CwA	COVE	D	OCCA		DEC—APR	0—1.0	PERCH	DEC—JUN
DoB	DOLLAR	C	NONE		—	1.5—3.0	PERCH	NOV—APR
Fn	FILL LAND		NONE		—	2.0—2.0		—
GeB	GEE	C	NONE		—	2.0—4.0	PERCH	NOV—APR
GeD	GEE	C	NONE		—	2.0—4.0	PERCH	NOV—APR
GeE	GEE	C	NONE		—	2.0—4.0	PERCH	NOV—APR
GeF	GEE	C	NONE		—	2.0—4.0	PERCH	NOV—APR
GuB	GUMBOOT	D	NONE		—	0—1.5	APPAR	DEC—APR
HcB	HESSON	C	NONE		—	6.0—6.0		—
HcD	HESSON	C	NONE		—	6.0—6.0		—
HcE	HESSON	C	NONE		—	6.0—6.0		—
HcF	HESSON	C	NONE		—	6.0—6.0		—
HgB	HESSON	C	NONE		—	6.0—6.0		—
HgD	HESSON	C	NONE		—	6.0—6.0		—
HhE	HESSON	C	NONE		—	6.0—6.0		—
HiA	HILLSBORO	B	NONE		—	6.0—6.0		—
HiB	HILLSBORO	B	NONE		—	6.0—6.0		—
HiC	HILLSBORO	B	NONE		—	6.0—6.0		—
HiD	HILLSBORO	B	NONE		—	6.0—6.0		—
HiE	HILLSBORO	B	NONE		—	6.0—6.0		—
HiF	HILLSBORO	B	NONE		—	6.0—6.0		—
HoA	HILLSBORO	B	NONE		—	6.0—6.0		—
HoB	HILLSBORO	B	NONE		—	6.0—6.0		—
HoC	HILLSBORO	B	NONE		—	6.0—6.0		—
HoD	HILLSBORO	B	NONE		—	6.0—6.0		—
HoE	HILLSBORO	B	NONE		—	6.0—6.0		—
HoG	HILLSBORO	B	NONE		—	6.0—6.0		—
HsB	HILLSBORO	B	NONE		—	6.0—6.0		—
HtA	HOCKINSON	D	NONE		—	0.5—1.5	APPAR	NOV—APR
HuB	HOCKINSON	D	NONE		—	0.5—1.5	APPAR	NOV—APR
HvA	HOCKINSON	D	NONE		—	0.5—1.5	APPAR	NOV—APR
	DOLLAR	C	NONE		—	1.5—3.0	PERCH	NOV—APR

WATER FEATURES

Survey Area—CLARK COUNTY, WASHINGTON

Map symbol and soil name		Hydro-logic group	Flooding			High water table		
			Freq	Duration	Months	Depth (Ft)	Kind	Months
KeC	KINNEY	B	NONE		—	6.0—6.0		—
KeE	KINNEY	B	NONE		—	6.0—6.0		—
KeF	KINNEY	B	NONE		—	6.0—6.0		—
KnF	KINNEY	B	NONE		—	6.0—6.0		—
LaE	LARCHMOUNT	B	NONE		—	6.0—6.0		—
LaG	LARCHMOUNT	B	NONE		—	6.0—6.0		—
LcG	LARCHMOUNT	B	NONE		—	6.0—6.0		—
LeB	LAUREN	B	NONE		—	6.0—6.0		—
LgB	LAUREN	B	NONE		—	6.0—6.0		—
LgD	LAUREN	B	NONE		—	6.0—6.0		—
LgF	LAUREN	B	NONE		—	6.0—6.0		—
LiB	LAUREN	B	NONE		—	6.0—6.0		—
LrC	LAUREN	C	NONE		—	1.5—3.0	PERCH	DEC—MAR
LrF	LAUREN	C	NONE		—	1.5—3.0	PERCH	DEC—MAR
McB	McBEE	C	FREQ		NOV—MAY	2.0—3.0	APPAR	NOV—APR
McB	McBEE	C	OCCA		NOV—MAY	2.0—3.0	APPAR	NOV—APR
MeA	McBEE	C	FREQ		NOV—MAY	2.0—3.0	APPAR	NOV—APR
MfA	McBEE VARIANT	D	RARE		—	—	APPAR	—
MnA	MINNIECE	D	NONE		—	0—2.0	PERCH	NOV—MAY
MnD	MINNIECE	D	NONE		—	0—2.0	PERCH	NOV—MAY
MoA	MINNIECE VARIANT	D	NONE		—	0—2.0	PERCH	NOV—MAY
MsB	MOSSYROCK	B	NONE		—	6.0—6.0		—
NbA	NEWBERG	B	OCCA		DEC—MAR	6.0—6.0		—
NbB	NEWBERG	B	OCCA		DEC—MAR	6.0—6.0		—
OdB	ODNE	D	NONE		—	0—1.5	APPAR	OCT—APR
OeD	OLEQUA	B	NONE		—	6.0—6.0		—
OeE	OLEQUA	B	NONE		—	6.0—6.0		—
OeF	OLEQUA	B	NONE		—	6.0—6.0		—
OhD	OLEQUA VARIANT	C	NONE		—	2.0—3.0	APPAR	NOV—MAY
OhF	OLEQUA VARIANT	C	NONE		—	2.0—3.0	APPAR	NOV—MAY
OiB	OLYMPIC	B	NONE		—	6.0—6.0		—
OiD	OLYMPIC	B	NONE		—	6.0—6.0		—
OiE	OLYMPIC	B	NONE		—	6.0—6.0		—
OiF	OLYMPIC	B	NONE		—	6.0—6.0		—
OmE	OLYMPIC	B	NONE		—	6.0—6.0		—
OmF	OLMPIC	B	NONE		—	6.0—6.0		—
OpC	OLYMPIC VARIANT	C	NONE		—	6.0—6.0		—
OpE	OLYMPIC VARIANT	C	NONE		—	6.0—6.0		—
OpG	OLYMPIC VARIANT	C	NONE		—	6.0—6.0		—
OrC	OLYMPIC VARIANT	C	NONE		—	6.0—6.0		—
PhB	PILCHUCK	C	OCCA		NOV—APR	2.0—4.0	APPAR	NOV—APR
PoB	POWELL	C	NONE		—	1.5—2.0	PERCH	DEC—APR
PoD	POWELL	C	NONE		—	1.5—2.0	PERCH	DEC—APR
PoE	POWELL	C	NONE		—	1.5—2.0	PERCH	DEC—APR

Map Symbol	Soil Name	HSG	SCS Permeability (in/hr)	Dominant USDA Texture	Depth from surface
				SG 3	
DoB	DOLLAR	C	<0.06	Loam	32-60 inches
HcB	HESSON	C	0.2 - 0.63	Clay	22-91 inches
HcD	HESSON	C	0.2 - 0.63	Clay	22-91 inches
HcE	HESSON	C	0.2 - 0.63	Clay	22-91 inches
HcF	HESSON	C	0.2 - 0.63	Clay	22-91 inches
HgB	HESSON	C	0.2 - 0.63	Gravelly Clay	22-91 inches
HgD	HESSON	C	0.2 - 0.63	Gravelly Clay	22-91 inches
HhE	HESSON	C	0.2 - 0.63	Gravelly Clay	22-91 inches
HoA	HILLSBORO	B	0.63 - 2.0	Silt Loam	0-86 inches
HoB	HILLSBORO	B	0.63 - 2.0	Silt Loam	0-86 inches
HoC	HILLSBORO	B	0.63 - 2.0	Silt Loam	0-86 inches
HoD	HILLSBORO	B	0.63 - 2.0	Silt Loam	0-86 inches
HoE	HILLSBORO	B	0.63 - 2.0	Silt Loam	0-86 inches
HoG	HILLSBORO	B	0.63 - 2.0	Silt Loam	0-86 inches
HsB	HILLSBORO	B	0.63 - 2.0	Silt Loam	0-86 inches
McB	McBEE	C	0.63 - 2.0	Silty Clay Loam, Clay	0-65 inches
McA	McBEE	C	0.63 - 2.0	Silty Clay Loam, Clay	0-65 inches
MlA	McBEE	C	0.63 - 2.0 (>20 deeper than 44in)	Gravelly Fine Sandy Loam	19-44 inches
OcD	OLEQUA	B	0.2 - 0.63	Heavy Silt Loam and Silty Clay Loam	17-90 inches
OcE	OLEQUA	B	0.2 - 0.63	Heavy Silt Loam and Silty Clay Loam	17-90 inches
OcF	OLEQUA	B	0.2 - 0.63	Heavy Silt Loam and Silty Clay Loam	17-90 inches
OlB	OLYMPIC	B	0.2 - 0.63	Gravelly Clay Loam	44-59 inches
OlD	OLYMPIC	B	0.2 - 0.63	Gravelly Clay Loam	44-59 inches
OlE	OLYMPIC	B	0.2 - 0.63	Gravelly Clay Loam	44-59 inches
OlF	OLYMPIC	B	0.2 - 0.63	Gravelly Clay Loam	44-59 inches
OmE	OLYMPIC	B	0.2 - 0.63	Gravelly Clay Loam	44-59 inches
OmF	OLYMPIC	B	0.2 - 0.63	Gravelly Clay Loam	44-59 inches
OpC	OLYMPIC VARIANT	C	0.2 - 0.63	Heavy Clay Loam and Heavy silty Clay Loam	0-33 inches
OpE	OLYMPIC VARIANT	C	0.2 - 0.63	Fractured Basalt	0-33 inches
OpG	OLYMPIC VARIANT	C	0.2 - 0.63	Fractured Basalt	0-33 inches
OrC	OLYMPIC VARIANT	C	0.2 - 0.63	Fractured Basalt	0-33 inches
PoB	POWELL	C	0.06 - 0.20	Silt Loam	23 63 inches
PoD	POWELL	C	0.06 - 0.20	Silt Loam	23-63 inches
PoE	POWELL	C	0 06 - 0.20	Silt Loam	23-63 inches
SmA	SAUVIE	B	0.2 - 0.63	Silty Clay Loam and Silt Loam	0-63 inches
SmB	SAUVIE	B	0.2 - 0.63	Silty Clay Loam and Silt Loam	0-63 inches
SnA	SAUVIE	D	2.0 - 6.3	Fine Sandy Loam	36-63 inches
SpB	SAUVIE	B	0.2 - 0.63	Silty Clay Loam and Silt Loam	0-63 inches
				SG 4	
CvA	COVE	D	0.06 - 0.20	Gravelly Silty Clay Loam	21-60 inches
CwA	COVE	D	0.06 - 0.20	Silt Loam	21-60 inches
GcB	GEE	C	<0.06	Silty Clay Loam	22-72 inches
GcD	GEE	C	<0.06	Silty Clay Loam	22-72 inches
GcE	GEE	C	<0.06	Silty Clay Loam	22-72 inches
GcF	GEE	C	<0.06	Silty Clay Loam	22-72 inches
GuB	GUMBOOT	D	0.06 - 0.2	Gravelly Silty Clay Loam, Clay Loam	12-50 inches
HtA	HOCKINSON	D	0.06 - 0.2	Fine Sandy Loam and Loam	23-51 inches
HuB	HOCKINSON	D	0.06 - 0.2	Fine Sandy Loam and Loam	23-51 inches
HvA	HOCKINSON	D	0.06 - 0.2	Fine Sandy Loam and Loam	23-51 inches
LrC	LAUREN	C	<0.06	Very Gravelly Clay Loam	14-60 inches
LrF	LAUREN	C	<0.06	Very Gravelly Clay Loam	14-60 inches
MnA	MINNIECE	D	<0.06	Silty Clay and Clay Basalt Bedrock	0-48 inches
MnD	MINNIECE	D	<0.06	Silty Clay and Clay Basalt Bedrock	0 48 inches
MoA	MINNIECE VARIANT	D	<0.06	Very Gravelly Clay Loam	22-60 inches
OdB	ODNE	D	<0.06	Silt Loam, silty Clay Loam, Clay Loam, and Loam	0-50 inches
OhD	OLEQUA VARIANT	C	<0.06	Silty Clay and Clay	32-82 inches
OhF	OLEQUA VARIANT	C	<0.06	Silty Clay and Clay	32-82 inches
SlB	SARA	D	<0.06	Heavy Silty Clay Loam and Silty Clay	10-70 inches
SlD	SARA	D	<0.06	Heavy Silty Clay Loam and Silty Clay	10-70 inches
SlF	SARA	D	<0.06	Heavy Silty Clay Loam and Silty Clay	10-70 inches
				SG 5	
Sr	SEMIAHMOO	C	0.63 - 2.0	Muck	0-40 inches
Su	SEMIAHMOO VARIANT	D	0.63 - 2.0	Muck	0-30 inches
ThA	TISCH	D	0.2 - 0.63	Muck	31-45 inches

TABLE 7.—*Estimated physical and chemical properties of the soils*

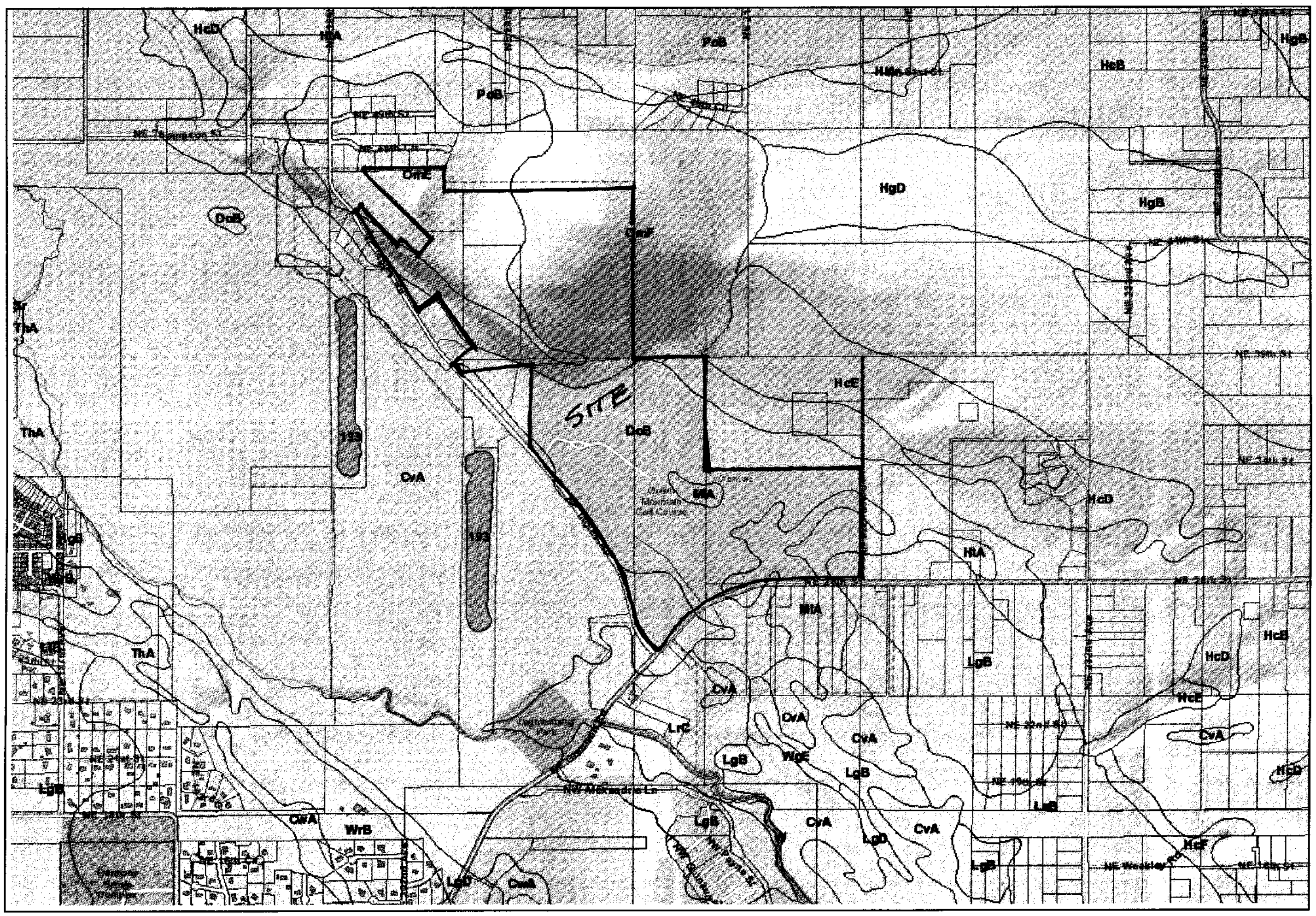
Soil series and map symbols	Depth from surface	Classification: Dominant USDA texture	Classification: Unified	Classification: AASHO	Percentage passing sieve—No. 4 (4.76 mm.)[1]	Percentage passing sieve—No. 10 (2.0 mm.)	Percentage passing sieve—No. 200 (0.074 mm.)	Permeability	Available water capacity	Reaction
	Inches							*Inches per hour*	*Inches per inch of soil*	*pH*
Bear Prairie: BpB, BpC.	0–51	Silt loam	CL	A-6	90–100	85–95	75–85	0.63–2.0	0.19–0.21	4.6–5.5
	51–75	Gravelly loam	ML	A-4	70–80	65–75	50–60	0.63–2.0	0.14–0.16	5.1–6.0
Cinebar: CnB, CnD, CnE, CnG.	0–65	Silt loam and loam.	ML	A-4	90–100	85–95	60–70	0.63–2.0	0.19–0.21	5.1–6.5
CrE, CrG.	0–60	Silt loam	CL	A-4	70–80	60–80	50–70	0.63–2.0	0.12–0.14	5.1–6.
Cispus: CsF.	0–24	Gravelly sandy loam.	SM	A-2	70–80	65–75	20–30	2.0–6.3	0.08–0.10	5.6–6.
	24–53	Very cobbly sand	SM	A-1	35–50	30–50	5–10	>20.0	0.03–0.05	5.6–6.
Cloquato: CtA.	0–40	Silt loam	ML	A-4	--------	100	70–80	0.63–0.20	0.19–0.21	5.6–7.
	40–72	Sandy loam and sand.	SM	A-2	100	95–100	15–30	>6.3	0.08–0.10	5.6–7.
Cove: CvA.	0–36	Clay	CH	A-7	--------	100	70–80	<0.06	0.14–0.16	5.6–7.
	36–54	Gravelly silty clay loam.	CL	A-7	65–75	60–70	50–60	0.06–0.20	0.15–0.17	5.6–7.
Cove, thin solum: CwA.	0–14	Silty clay loam	CL	A-7	--------	100	85–95	0.06–0.20	0.19–0.21	4.5–6.
	14–21	Clay	CH	A-7	--------	100	70–80	<0.06	0.14–0.16	5.6–7.
	21–60	Silt loam	ML or CL	A-4 or A-6.	--------	100	65–75	0.06–0.20	0.19–0.21	6.6–7.
Dollar: DoB.	0–32	Loam	ML	A-4	100	90–95	60–70	0.63–2.0	0.16–0.18	4.5–6.
	32–60	Loam (fragipan)	ML or CL	A-4	100	95–100	60–70	<0.06	0.06–0.08	6.
Fill land: Fn.	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Gee: GeB, GeD, GeE, GeF.	0–22	Silt loam	ML or CL	A-6	--------	100	70–85	0.63–2.0	0.19–0.21	5.1–6.
	22–72	Silty clay loam	CL	A-6	--------	100	70–80	<0.06	0.06–0.08	5.1–6.
Gumboot: GuB.	0–12	Silt loam	OL	A-7	90–95	85–95	75–85	0.63–2.0	0.19–0.21	4.5–7.
	12–50	Gravelly silty clay loam, clay loam.	CL	A-6	90–100	85–95	65–75	0.06–0.2	0.19–0.21	6.1–7.
	50–60	Very gravelly silty clay.	GC	A-7	40–50	35–50	25–35	<0.06	0.06–0.08	6.1–7.
Hesson: HcB, HcD, HcE, HcF.	0–22	Clay loam	CL	A-7	85–95	85–95	65–75	0.63–2.0	0.19–0.21	4.5–6.
	22–91	Clay	CH	A-7	85–90	85–90	75–85	0.2–0.63	0.14–0.16	4.5–6.
HgB, HgD, HhE.	0–22	Gravelly clay loam.	SC	A-6	75–85	70–80	40–50	0.63–2.0	0.14–0.16	4.5–6.
	22–91	Gravelly clay	CH	A-7	75–85	70–80	60–70	0.2–0.63	0.11–0.13	4.5–6.
Hillsboro: HIA, HIB, HIC, HID, HIE, HIF.	0–36	Loam	ML	A-4	--------	100	55–65	0.63–2.0	0.16–0.18	5.1–6.
	36–62	Sandy loam and sand.	SM	A-1	95–100	95–100	15–25	2.0–6.3	0.10–0.12	5.6–7.
HoA, HoB, HoC, HoD, HoE, HoG, HsB.	0–86	Silt loam (boulders on surface of HsB).	ML	A-4	--------	100	80–90	0.63–2.0	0.19–0.21	5.0–6.

See footnotes at end of table.

TABLE 7.—*Estimated physical and chemical properties of the soils*—Continued

Soil series and map symbols	Depth from surface	Classification			Percentage passing sieve—			Perme-ability	Available water capacity	Re-actio
		Dominant USDA texture	Unified	AASHO	No. 4 (4.76 mm.) [1]	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)			
	Inches							*Inches per hour*	*Inches per inch of soil*	*pH*
Minniece: MnA, MnD.	0–48	Silty clay and clay	CH	A-7	90–95	85–95	65–75	<0. 06	0. 06–0. 08	6. 1–7.
	48	Basalt bedrock.								
MoA.	0–12	Silt loam	ML	A-4	100	95–100	65–75	0. 63–2. 0	0. 19–0. 21	6. 1–6.
	12–22	Silty clay	CH	A-7	95–100	95–100	80–90	0. 06–0. 2	0. 12–0. 14	6. 1–6.
	22–60	Very gravelly clay loam (weakly cemented).	GC	A-2	35–50	30–50	20–35	<0. 06	0. 03–0. 05	5. 6–6.
Mossyrock: MsB.	0–23	Silt loam	OL or OH	A-5	95–100	95–100	50–60	0. 63–2. 0	0. 19–0. 21	6. 1–6.
	23–60	Silt loam	ML	A-5	100	95–100	55–65	0. 63–2. 0	0. 19–0. 21	6. 6–7.
	60–74	Loam	ML	A-4	100	95–100	70–80	0. 63–2. 0	0. 16–0. 18	6. 1–7.
Newberg: NbA, NbB.	0–7	Silt loam	ML	A-4	--------	100	70–80	0. 63–2. 0	0. 19–0. 21	5. 6–6.
	7–52	Fine sandy loam and sandy loam.	SM or ML	A-4	--------	100	40–55	2. 0–6. 3	0. 13–0. 15	6. 1–7.
	52–72	Sand	SM	A-1	--------	100	5–15	0. 63–20. 0	0. 05–0. 07	6. 6–7.
Odne: OdB.	0–50	Silt loam, silty clay loam, clay loam, and loam.	CL	A-4 or A-6	--------	100	75–85	<0. 06	0. 10–0. 12	5. 0–6.
Olequa: OeD, OeE, OeF.	0–17	Silt loam	ML	A-7	--------	100	75–85	0. 63–2. 0	0. 19–0. 21	6. 1–6.
	17–90	Heavy silt loam and silty clay loam.	CL	A-7	--------	100	80–90	0. 2–0. 63	0. 19–0. 21	4. 5–6.
OhD, OhF.	0–32	Silty clay loam	CL	A-7	95–100	90–95	85–95	0. 2–0. 63	0. 19–0. 21	-6.
	32–82	Silty clay and clay	CH	A-7	95–100	90–95	85–95	<0. 06	0. 06–0. 08	1–6.
Olympic: OlB, OlD, OlE, OlF, OmE, OmF.	0–44	Clay loam and silty clay loam.	ML or CL	A-7	90–100	90–100	75–85	0. 2–0. 63	0. 19–0. 21	5. 1–6.
	44–59	Gravelly clay loam.	GC	A-4	75–90	70–85	35–50	0. 2–0. 63	0. 10–0. 12	4. 5–5.
	59	Fractured basalt.								
OpC, OpE, OpG, OrC.	0–30	Heavy clay loam and heavy silty clay loam.	ML or CL	A-7	90–95	90–95	75–85	0. 2–0. 63	0. 19–0. 21	5. 1–6.
	30	Fractured basalt.								
Pilchuck: PhB.	0–60	Fine sand	SM	A-3	95–100	90–100	5–10	6. 3–20. 0	0. 05–0. 07	6. 1–7.
Powell: PoB, PoD, PoE.	0–23	Silt loam	ML	A-4	--------	100	80–90	0. 63–0. 20	0. 18–0. 20	5. 1–6.
	23–63	Slit loam (fragipan).	ML	A-4	--------	100	80–90	0. 06–0. 20	0. 06–0. 08	5. 1–6.
Puyallup: PuA.	0–27	Stratified fine sandy loam, loam, and loamy sand.	SM	A-4	100	95–100	35–50	2. 0–6. 3	0. 10–0. 12	5. 6–6.
	27–60	Gravelly sand	SP or SW	A-1	70–90	65–85	0–5	6. 3–20. 0	0. 04–0. 06	6. 6–7.
Riverwash, sandy: Ra.	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Riverwash, cobbly: Rc.	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Rock land: Rk.	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Rough broken land: Ro.	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)

See footnotes at end of table.


HcD
HtA
PoB
HeB
HgB
CwE
HgD
DoB
CwF
ThA
HcE
SITE
DoB
133
CvA
132
MIA
Oregon Mountain Golf Course
HcD
HtA
MIA
LgB
HcB
CvA
HcE
CvA
LrC
LgB
WgE
CvA
LgB
CwA
WrB
LgB
CvA
LgD
CvA
LgB
HcF
NE 28th St
NE 23rd St
NE 19th St
NE Weakley Rd
NE Thompson St
NW McFadden Ln

B

Table III-1.3 SCS Western Washington Runoff Curve Numbers (Published by SCS in 1982) Runoff curve numbers for selected agricultural, suburban and urban land use for Type 1A rainfall distribution, 24-hour storm duration.

LAND USE DESCRIPTION		CURVE NUMBERS BY HYDROLOGIC SOIL GROUP A	B	C	D
Cultivated land(1):	winter condition	86	91	94	95
Mountain open areas:	low growing brush & grasslands	74	82	89	92
Meadow or pasture:		65	78	85	89
Wood or forest land:	undisturbed	42	64	76	81
Wood or forest land:	young second growth or brush	55	72	81	86
Orchard:	with cover crop	81	88	92	94
Open spaces, lawns, parks, golf courses, cemeteries, landscaping.					
Good condition:	grass cover on ≥75% of the area	68	80	86	90
Fair condition:	grass cover on 50-75% of the area	77	85	90	92
Gravel roads & parking lots:		76	85	89	91
Dirt roads & parking lots:		72	82	87	89
Impervious surfaces, pavement, roofs etc.		98	98	98	98
Open water bodies:	lakes, wetlands, ponds etc.	100	100	100	100
Single family residential(2):		Separate curve number shall be selected for pervious & impervious portions of the site or basin			
Dwelling Unit/Gross Acre	%Impervious(3)				
1.0 DU/GA	15				
1.5 DU/GA	20				
2.0 DU/GA	25				
2.5 DU/GA	30				
3.0 DU/GA	34				
3.5 DU/GA	38				
4.0 DU/GA	42				
4.5 DU/GA	46				
5.0 DU/GA	48				
5.5 DU/GA	50				
6.0 DU/GA	52				
6.5 DU/GA	54				
7.0 DU/GA	56				
PUD's, condos, apartments, commercial businesses & industrial areas	%impervious must be computed				

(1) For a more detailed description of agricultural land use curve numbers refer to National Engineering Handbook, Sec. 4, Hydrology, Chapter 9, August 1972.
(2) Assumes roof and driveway runoff is directed into street/storm system.
(3) The remaining pervious areas (lawn) are considered to be in good condition for these curve numbers.

Table III-1.4 "n" AND "k" Values Used in Time Calculations for Hydrographs

"n_s" Sheet Flow Equation Manning's Values (for the initial 300 ft. of travel)

	n_s
Smooth surfaces (concrete, asphalt, gravel, or bare hand packed soil)	0.011
Fallow fields or loose soil surface (no residue)	0.05
Cultivated soil with residue cover (s≤ 0.20 ft/ft)	0.06
Cultivated soil with residue cover (s> 0.20 ft/ft)	0.17
Short prairie grass and lawns	0.15
Dense grasses	0.24
Bermuda grass	0.41
Range (natural)	0.13
Woods or forest with light underbrush	0.40
Woods or forest with dense underbrush	0.80

*Manning values for sheet flow only, from Overton and Meadows 1976 (See TR-55, 1986)

"k" Values Used in Travel Time/Time of Concentration Calculations

Shallow Concentrated Flow (After the initial 300 ft. of sheet flow, R = 0.1)

		k_s
1.	Forest with heavy ground litter and meadows (n = 0.10)	3
2.	Brushy ground with some trees (n = 0.060)	5
3.	Fallow or minimum tillage cultivation (n = 0.040)	8
4.	High grass (n = 0.035)	9
5.	Short grass, pasture and lawns (n = 0.030)	11
6.	Nearly bare ground (n = 0.25)	13
7.	Paved and gravel areas (n = 0.012)	27

Channel Flow (intermittent) (At the beginning of visible channels R = 0.2)

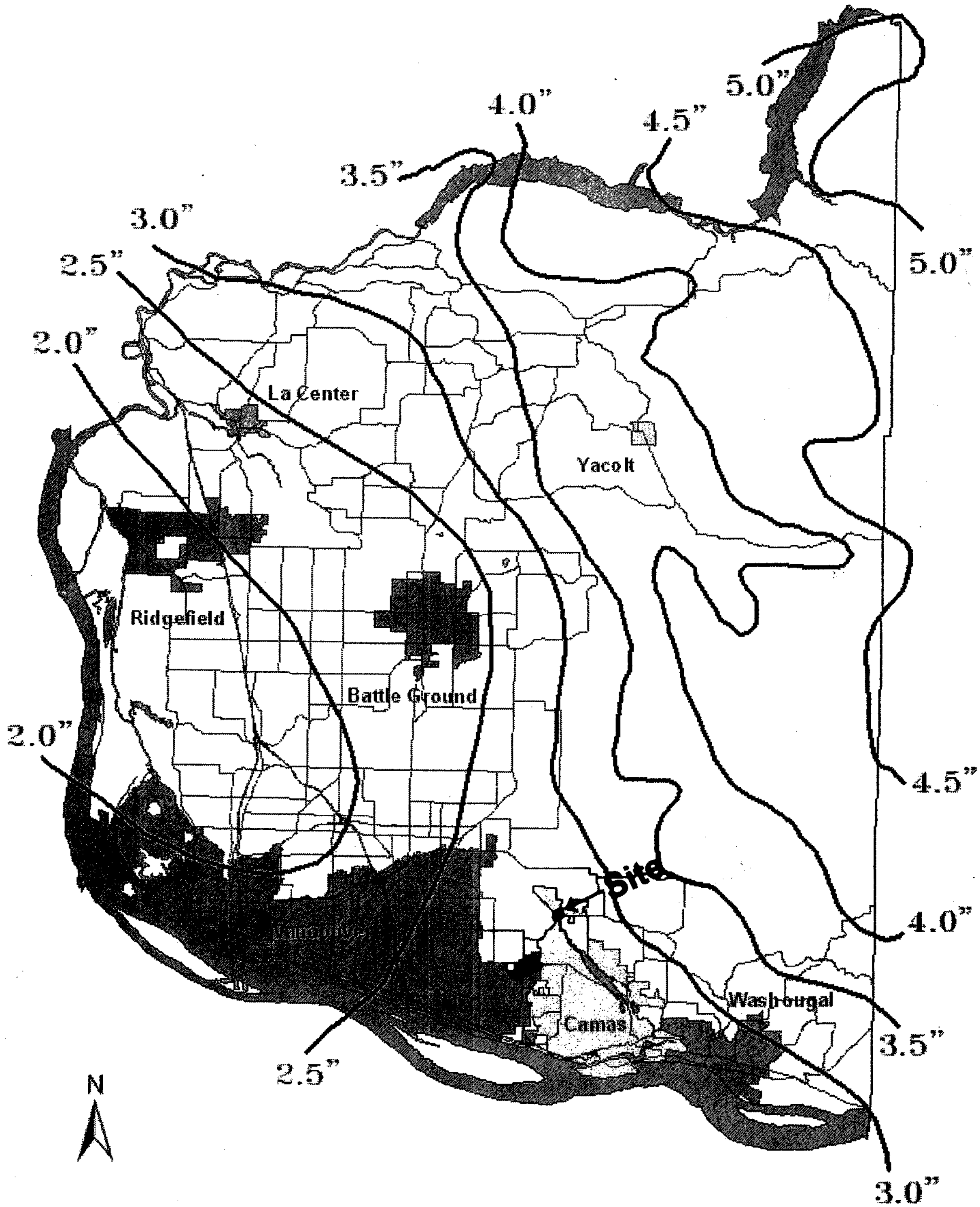
		k_c
1.	Forested swale with heavy ground litter (n = 0.10)	5
2.	Forested drainage course/ravine with defined channel bed (n = 0.050)	10
3.	Rock-lined waterway (n = 0.035)	15
4.	Grassed waterway (n = 0.030)	17
5.	Earth-lined waterway (n = 0.025)	20
6.	CMP pipe (n = 0.024)	21
7.	Concrete pipe (0.012)	42
8.	Other waterways and pipe 0.508/n	

Channel Flow (Continuous stream, R = 0.4)

		k_c
9.	Meandering stream with some pools (n = 0.040)	20
10.	Rock-lined stream (n = 0.035)	23
11.	Grass-lined stream (n = 0.030)	27
12.	Other streams, man-made channels and pipe 0.807/n**	

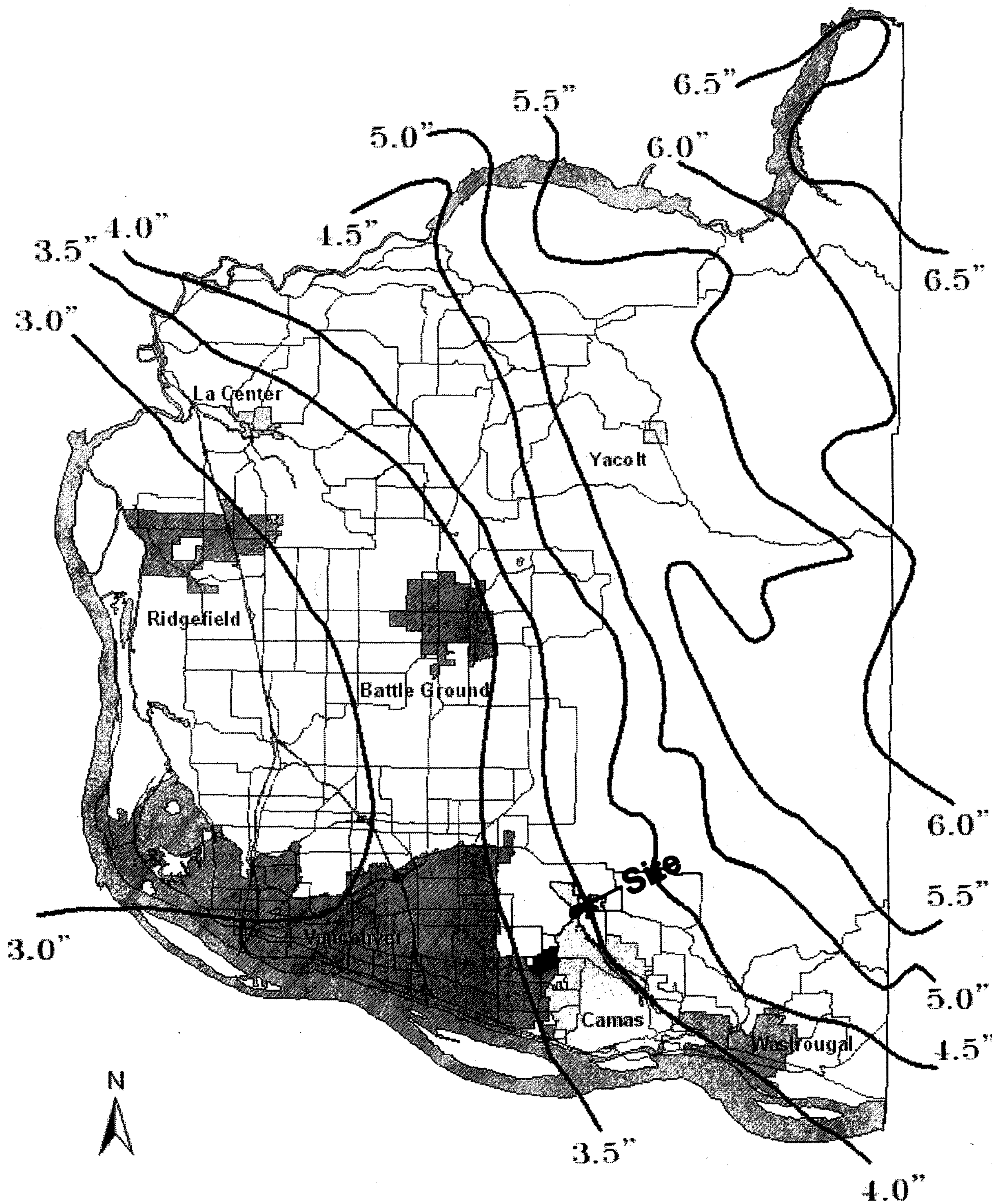
2-YR STORM = 2.8"

Figure A-2: 2-Year, 24-Hour Clark County Isopluvial Map



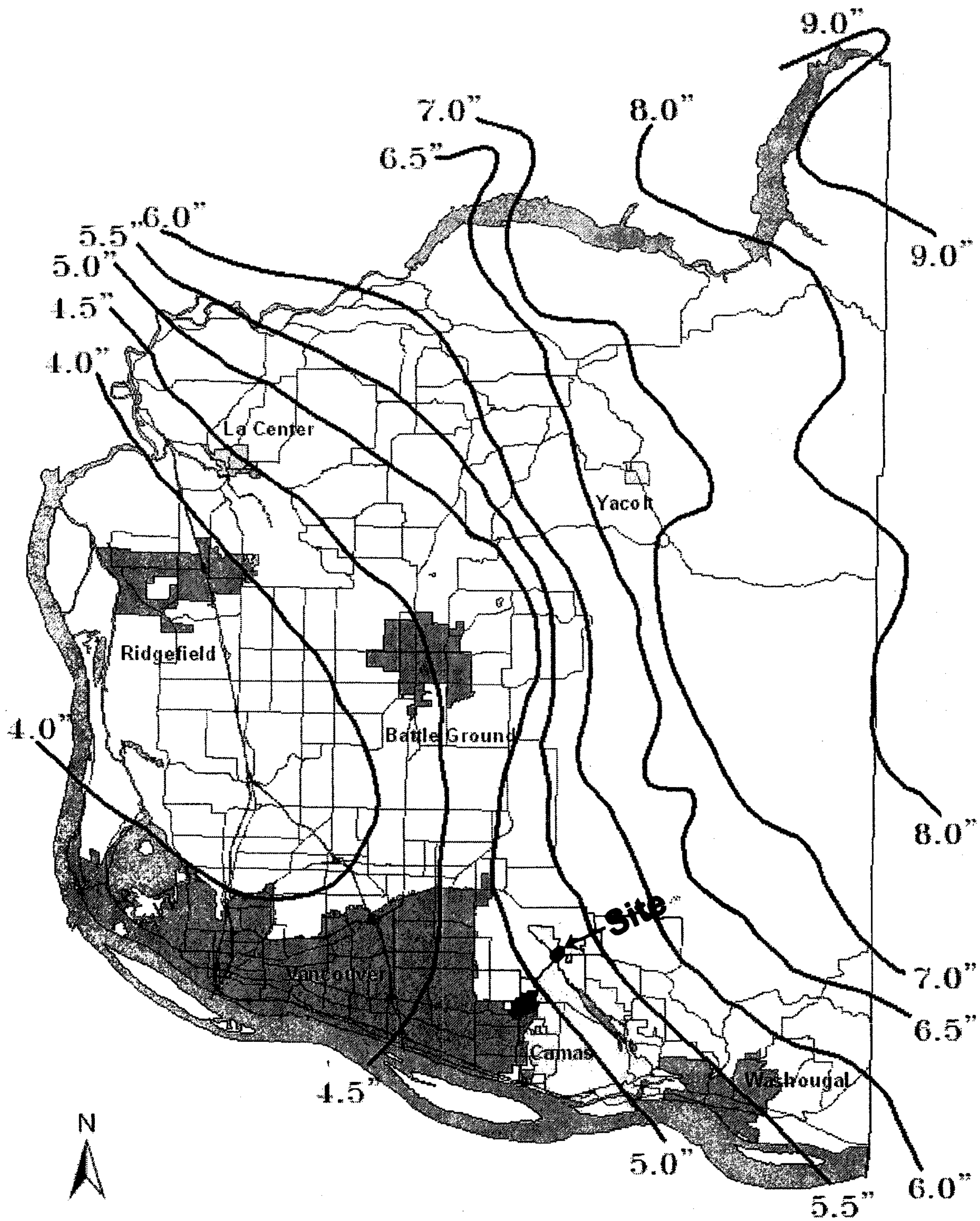
10-YR STORM = 3.9"

Figure A-3: 10-Year, 24-Hour Clark County Isopluvial Map



100-YR STORM = 5.2"

Figure A-5: 100-Year, 24-Hour Clark County Isopluvial Map



C

Figure 1.1: Flow Chart for Determining Stormwater Requirements

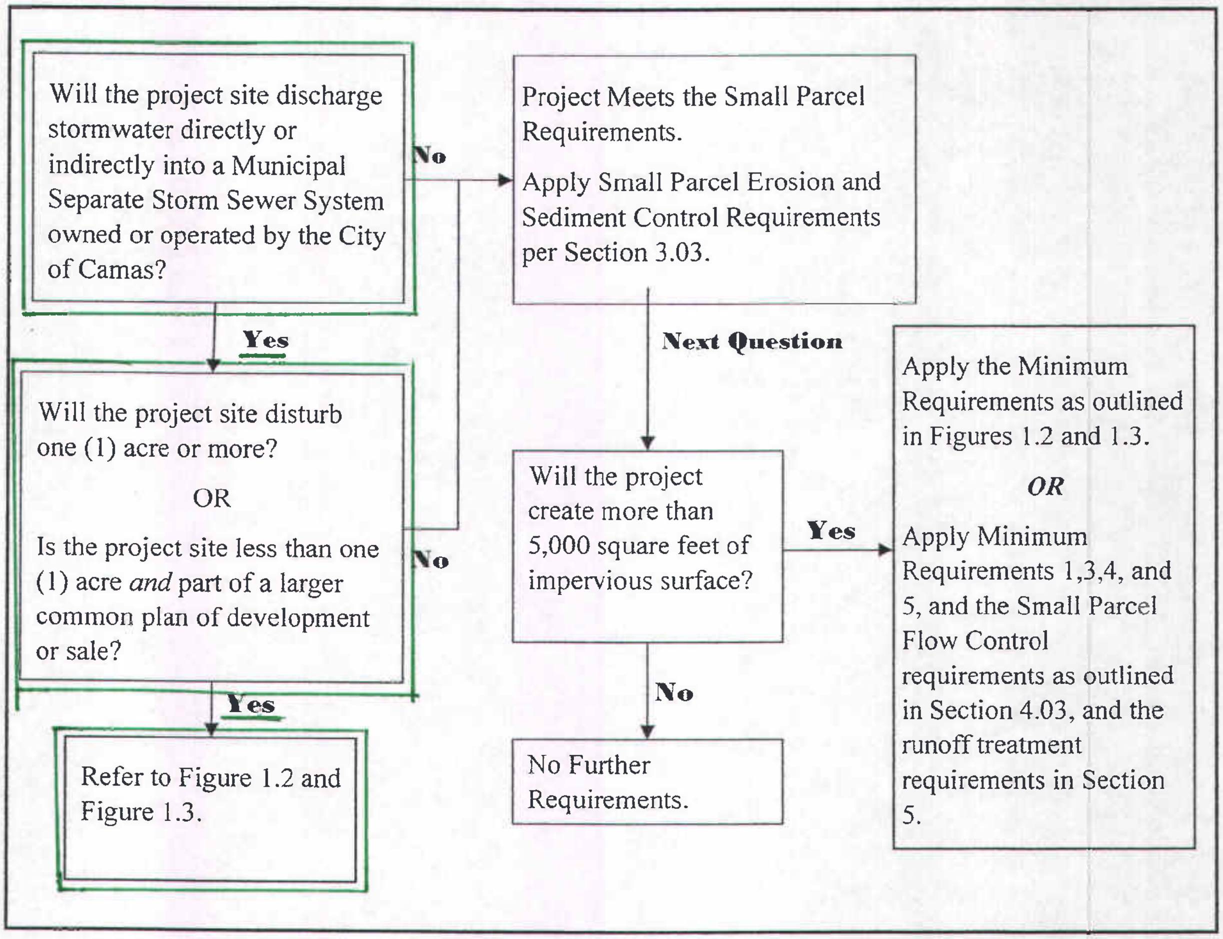
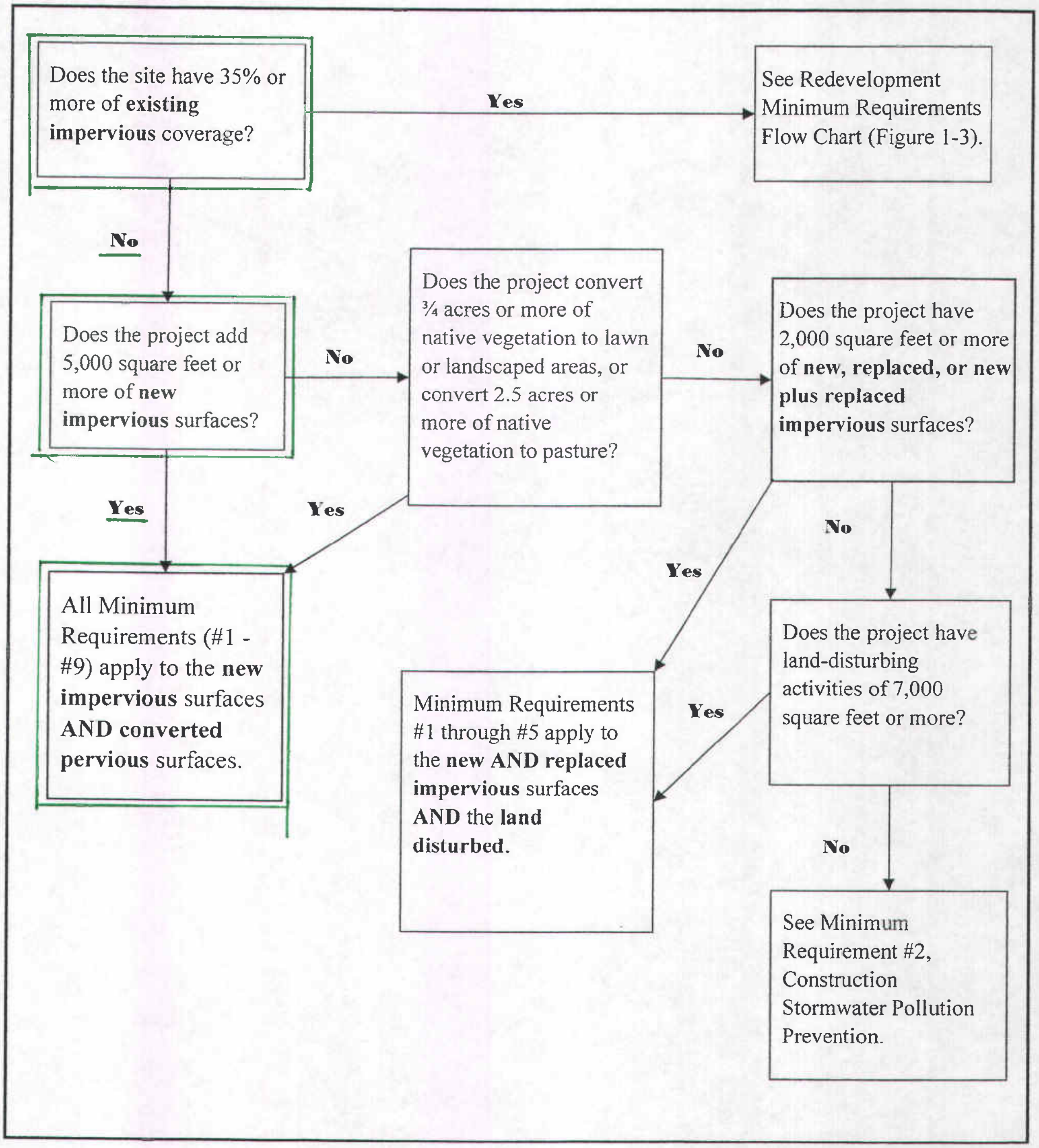
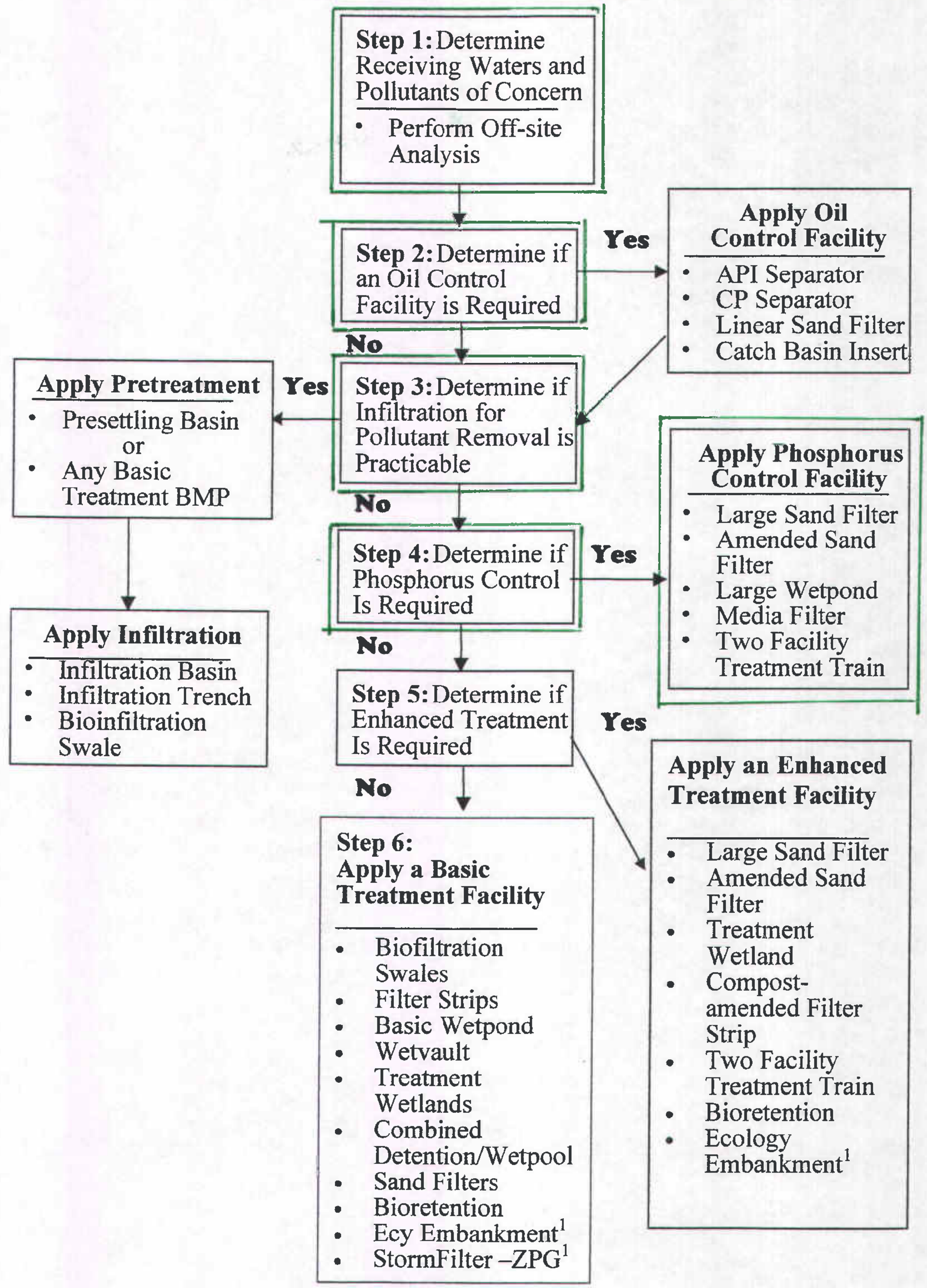


Figure 1.2: New Development Minimum Requirements Flow Chart





[1] See Section 3.5, Chapter 3 of Volume V for more information

Figure 2.1 – Treatment Facility Selection Flow Chart

2.5 Minimum Requirements

This section describes the minimum requirements for stormwater management at development and redevelopment sites. Section 2.4 should be consulted to determine which requirements apply to any given project. Figures 2.4.1 and 2.4.2 should be consulted to determine whether the minimum requirements apply to new surfaces, replaced surfaces, or new and replaced surfaces. Volumes II through V of this manual present Best Management Practices (BMPs) for use in meeting the Minimum Requirements.

Throughout this chapter, requirements are written in bold and supplemental guidelines that serve as advice and other materials are not in bold.

2.5.1 Minimum Requirement #1: Preparation of Stormwater Site Plans

All projects meeting the thresholds in Section 2.4 shall prepare a Stormwater Site Plan for local government review. Stormwater Site Plans shall use site-appropriate development principles, as required and encouraged by local development codes, to retain native vegetation and minimize impervious surfaces to the extent feasible. Stormwater Site Plans shall be prepared in accordance with Chapter 3 of this volume.

Objective

The 2,000 square feet threshold for hard surfaces and 7,000 square foot threshold for land disturbance are chosen to capture most single family home construction and their equivalent. Note that the scope of the stormwater site plan only covers compliance with Minimum Requirements #2 through #5 if the thresholds of 5,000 square feet of hard surface or conversion of ¾ acre of vegetation to lawn or landscape, or conversion of 2.5 acres of vegetation to pasture are not exceeded.

Supplemental guidelines

Projects proposed by departments and agencies within the local government with jurisdiction must comply with this requirement. The local government shall determine the process for ensuring proper project review, inspection, and compliance by its own departments and agencies.

2.5.2 Minimum Requirement #2: Construction Stormwater Pollution Prevention (SWPP)

Thresholds

All new development and redevelopment projects are responsible for preventing erosion and discharge of sediment and other pollutants into receiving waters.

Projects which result in 2,000 square feet or more of new plus replaced hard surface area, or which disturb 7,000 square feet or more of land must prepare a Construction SWPP Plan (SWPPP) as part of the Stormwater Site Plan (see Section 2.5.1).

Projects that result in less than 2,000 square feet of new plus replaced hard surface area, or disturb less than 7,000 square feet of land are not required to prepare a Construction SWPPP, but must consider all of the 13 Elements of Construction Stormwater Pollution Prevention and develop controls for all elements that pertain to the project site.

General Requirements

The SWPPP shall include a narrative and drawings. All BMPs shall be clearly referenced in the narrative and marked on the drawings. The SWPPP narrative shall include documentation to explain and justify the pollution prevention decisions made for the project. Each of the 13 elements must be considered and included in the Construction SWPPP unless site conditions render the element unnecessary and the exemption from that element is clearly justified in the narrative of the SWPPP.

Clearing and grading activities for developments shall be permitted only if conducted pursuant to an approved site development plan (e.g., subdivision approval) that establishes permitted areas of clearing, grading, cutting, and filling. These permitted clearing and grading areas and any other areas required to preserve critical or sensitive areas, buffers, native growth protection easements, or tree retention areas shall be delineated on the site plans and the development site.

The SWPPP shall be implemented beginning with initial land disturbance and until final stabilization. Sediment and Erosion control BMPs shall be consistent with the BMPs contained in chapters 3 and 4 of Volume II.

Seasonal Work Limitations - From October 1 through April 30, clearing, grading, and other soil disturbing activities shall only be permitted if shown to the satisfaction of the local permitting authority that silt-laden runoff will be prevented from leaving the site through a combination of the following:

1. **Site conditions including existing vegetative coverage, slope, soil type and proximity to receiving waters.**

2. **Limitations on activities and the extent of disturbed areas.**
3. **Proposed erosion and sediment control measures.**

The following activities are exempt from the seasonal clearing and grading limitations:

1. **Routine maintenance and necessary repair of erosion and sediment control BMPs.**
2. **Routine maintenance of public facilities or existing utility structures that do not expose the soil or result in the removal of the vegetative cover to soil.**
3. **Activities where there is one hundred percent infiltration of surface water runoff within the site in approved and installed erosion and sediment control facilities.**

Project Requirements - Construction SWPPP Elements

Element 1: Preserve Vegetation/Mark Clearing Limits

- **Before beginning land disturbing activities, including clearing and grading, clearly mark all clearing limits, sensitive areas and their buffers, and trees that are to be preserved within the construction area.**
- **Retain the duff layer, native top soil, and natural vegetation in an undisturbed state to the maximum degree practicable.**

Element 2: Establish Construction Access

- **Limit construction vehicle access and exit to one route, if possible.**
- **Stabilize access points with a pad of quarry spalls, crushed rock, or other equivalent BMPs, to minimize tracking of sediment onto public roads.**
- **Locate wheel wash or tire baths on site, if the stabilized construction entrance is not effective in preventing tracking sediment onto roads.**
- **If sediment is tracked off site, clean the affected roadway thoroughly at the end of each day, or more frequently as necessary (for example, during wet weather). Remove sediment from roads by shoveling, sweeping, or pick up and transport the sediment to a controlled sediment disposal area.**
- **Conduct street washing only after sediment is removed in accordance with the above bullet.**

- **Control street wash wastewater by pumping back on-site, or otherwise prevent it from discharging into systems tributary to waters of the State.**

Element 3: Control Flow Rates

- **Protect properties and waterways downstream of development sites from erosion and the associated discharge of turbid waters due to increases in the velocity and peak volumetric flow rate of stormwater runoff from the project site.**
- **Where necessary to comply with the bullet above, construct stormwater retention or detention facilities as one of the first steps in grading. Assure that detention facilities function properly before constructing site improvements (e.g. impervious surfaces).**
- **If permanent infiltration ponds are used for flow control during construction, protect these facilities from siltation during the construction phase.**

Element 4: Install Sediment Controls

- **Design, install, and maintain effective erosion controls and sediment controls to minimize the discharge of pollutants.**
- **Construct sediment control BMPs (sediment ponds, traps, filters, etc.) as one of the first steps in grading. These BMPs shall be functional before other land disturbing activities take place.**
- **Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls must address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site.**
- **Direct stormwater runoff from disturbed areas through a sediment pond or other appropriate sediment removal BMP, before the runoff leaves a construction site or before discharge to an infiltration facility. Runoff from fully stabilized areas may be discharged without a sediment removal BMP, but must meet the flow control performance standard in Element #3, bullet #1.**
- **Locate BMPs intended to trap sediment on-site in a manner to avoid interference with the movement of juvenile salmonids attempting to enter off-channel areas or drainages.**
- **Where feasible, design outlet structures that withdraw impounded stormwater from the surface to avoid discharging sediment that is still suspended lower in the water column.**

Element 5: Stabilize Soils

- **Stabilize exposed and unworked soils by application of effective BMPs that prevent erosion. Applicable BMPs include, but are not limited to: temporary and permanent seeding, sodding, mulching, plastic covering, erosion control fabrics and matting, soil application of polyacrylamide (PAM), the early application of gravel base early on areas to be paved, and dust control.**
- **Control stormwater volume and velocity within the site to minimize soil erosion.**
- **Control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion.**
- **Soils must not remain exposed and unworked for more than the time periods set forth below to prevent erosion:**
  - **During the dry season (May 1 - Sept. 30): 7 days**
  - **During the wet season (October 1 - April 30): 2 days**
- **Stabilize soils at the end of the shift before a holiday or weekend if needed based on the weather forecast.**
- **Stabilize soil stockpiles from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways and drainage channels.**
- **Minimize the amount of soil exposed during construction activity.**
- **Minimize the disturbance of steep slopes.**
- **Minimize soil compaction and, unless infeasible, preserve topsoil.**

Element 6: Protect Slopes

- **Design and construct cut-and-fill slopes in a manner to minimize erosion. Applicable practices include, but are not limited to, reducing continuous length of slope with terracing and diversions, reducing slope steepness, and roughening slope surfaces (for example, track walking).**
- **Divert off-site stormwater (run-on) or ground water away from slopes and disturbed areas with interceptor dikes, pipes and/or swales. Off-site stormwater should be managed separately from stormwater generated on the site.**
- **At the top of slopes, collect drainage in pipe slope drains or protected channels to prevent erosion.**
  - **Temporary pipe slope drains must handle the peak 10-minute velocity of flow from a Type 1A, 10-year, 24-hour frequency**

storm for the developed condition. Alternatively, the 10-year and 1-hour flow rate predicted by an approved continuous runoff model, increased by a factor of 1.6, may be used. The hydrologic analysis must use the existing land cover condition for predicting flow rates from tributary areas outside the project limits. For tributary areas on the project site, the analysis must use the temporary or permanent project land cover condition, whichever will produce the highest flow rates. If using the Western Washington Hydrology Model (WWHM) to predict flows, bare soil areas should be modeled as "landscaped" area.

- **Place excavated material on the uphill side of trenches, consistent with safety and space considerations.**
- **Place check dams at regular intervals within constructed channels that are cut down a slope.**

Element 7: Protect Drain Inlets

- **Protect all storm drain inlets made operable during construction so that stormwater runoff shall not enter the conveyance system without first being filtered or treated to remove sediment.**
- **Clean or remove and replace inlet protection devices when sediment has filled one-third of the available storage (unless a different standard is specified by the product manufacturer).**

Element 8: Stabilize Channels and Outlets

- **Design, construct, and stabilize all on-site conveyance channels to prevent erosion from the following expected peak flows:**
  - **Channels must handle the peak 10-minute velocity of flow from a Type 1A, 10- year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year, 1-hour flow rate indicated by an approved continuous runoff model, increased by a factor of 1.6, may be used. The hydrologic analysis must use the existing land cover condition for predicting flow rates from tributary areas outside the project limits. For tributary areas on the project site, the analysis must use the temporary or permanent project land cover condition, whichever will produce the highest flow rates. If using the Western Washington Hydrology Model (WWHM) to predict flows, bare soil areas should be modeled as "landscaped area.**
- **Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes and downstream reaches at the outlets of all conveyance systems.**

Element 9: Control Pollutants

- **Design, install, implement and maintain effective pollution prevention measures to minimize the discharge of pollutants.**
- **Handle and dispose of all pollutants, including waste materials and demolition debris that occur on-site in a manner that does not cause contamination of stormwater.**
- **Provide cover, containment, and protection from vandalism for all chemicals, liquid products, petroleum products, and other materials that have the potential to pose a threat to human health or the environment. On-site fueling tanks must include secondary containment. Secondary containment means placing tanks or containers within an impervious structure capable of containing 110% of the volume contained in the largest take within the containment structure. Double-walled tanks do not require additional secondary containment.**
- **Conduct maintenance, fueling, and repair of heavy equipment and vehicles using spill prevention and control measures. Clean contaminated surfaces immediately following any spill incident.**
- **Discharge wheel wash or tire bath wastewater to a separate on-site treatment system that prevents discharge to surface water, such as closed-loop recirculation or upland application, or to the sanitary sewer, with local sewer district approval.**
- **Apply fertilizers and pesticides in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Follow manufacturers' label requirements for application rates and procedures.**
- **Use BMPs to prevent contamination of stormwater runoff by pH modifying sources. The sources for this contamination include, but are not limited to: bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, dewatering concrete vaults, concrete pumping and mixer washout waters.**
- **Adjust the pH of stormwater if necessary to prevent violations of water quality standards.**
- **Assure that washout of concrete trucks is performed off-site or in designated concrete washout areas only. Do not wash out concrete trucks onto the ground, or into storm drains, open ditches, streets, or streams. Do not dump excess concrete on-site, except in designated concrete washout areas. Concrete spillage or concrete discharge to surface waters of the State is prohibited.**

- **Obtain written approval from Ecology before using chemical treatment other than CO2 or dry ice to adjust pH.**

Element 10: Control De-Watering

- **Discharge foundation, vault, and trench de-watering water, which has similar characteristics to stormwater runoff at the site, into a controlled conveyance system before discharge to a sediment trap or sediment pond.**
- **Discharge clean, non-turbid de-watering water, such as well-point ground water, to systems tributary to, or directly into surface waters of the State, as specified in Element #8, provided the de-watering flow does not cause erosion or flooding of receiving waters. Do not route clean dewatering water through stormwater sediment ponds. Note that "surface waters of the State" may exist on a construction site as well as off site; for example, a creek running through a site.**
- **Handle highly turbid or otherwise contaminated dewatering water separately from stormwater.**
- **Other treatment or disposal options may include:**
  1. **Infiltration.**
  2. **Transport off-site in a vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute state waters.**
  3. **Ecology-approved on-site chemical treatment or other suitable treatment technologies.**
  4. **Sanitary or combined sewer discharge with local sewer district approval, if there is no other option.**
  5. **Use of a sedimentation bag with outfall to a ditch or swale for small volumes of localized dewatering.**

Element 11: Maintain BMPs

- **Maintain and repair all temporary and permanent erosion and sediment control BMPs as needed to assure continued performance of their intended function in accordance with BMP specifications.**
- **Remove all temporary erosion and sediment control BMPs within 30 days after achieving final site stabilization or after the temporary BMPs are no longer needed.**

Element 12: Manage The Project

- **Phase development projects to the maximum degree practicable and take into account seasonal work limitations.**
- **Inspection and monitoring – Inspect, maintain and repair all BMPs as needed to assure continued performance of their intended function. Projects regulated under the Construction Stormwater General Permit must conduct site inspections and monitoring in accordance with Special Condition S4 of the Construction Stormwater General Permit.**
- **Maintaining an updated construction SWPPP – Maintain, update, and implement the SWPPP.**
- **Projects that disturb one or more acres must have site inspections conducted by a Certified Erosion and Sediment Control Lead (CESCL). Project sites disturbing less than one acre may have a CESCL or a person without CESCL certification conduct inspections. By the initiation of construction, the SWPPP must identify the CESCL or inspector, who must be present on-site or on-call at all times.**
- The CESCL or inspector (project sites less than one acre) must have the skills to assess the:
  - Site conditions and construction activities that could impact the quality of stormwater.
  - Effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges.
- The CESCL or inspector must examine stormwater visually for the presence of suspended sediment, turbidity, discoloration, and oil sheen. They must evaluate the effectiveness of BMPs and determine if it is necessary to install, maintain, or repair BMPs to improve the quality of stormwater discharges.

  Based on the results of the inspection, construction site operators must correct the problems identified by:
  - Reviewing the SWPPP for compliance with the 13 construction SWPPP elements and making appropriate revisions within 7 days of the inspection.
  - Immediately beginning the process of fully implementing and maintaining appropriate source control and/or treatment BMPs as soon as possible, addressing the problems not later than within 10 days of the inspection. If installation of necessary treatment BMPs is not feasible within 10 days, the construction site operator may request an extension within the initial 10-day response period.

- Documenting BMP implementation and maintenance in the site log book (sites larger than 1 acre).

- The CESCL or inspector must inspect all areas disturbed by construction activities, all BMPs, and all stormwater discharge points at least once every calendar week and within 24 hours of any discharge from the site. (For purposes of this condition, individual discharge events that last more than one day do not require daily inspections. For example, if a stormwater pond discharges continuously over the course of a week, only one inspection is required that week.) The CESCL or inspector may reduce the inspection frequency for temporary stabilized, inactive sites to once every calendar month.

Element 13: Protect Low Impact Development BMPs

- **Protect all Bioretention and Rain Garden BMPs from sedimentation through installation and maintenance of erosion and sediment control BMPs on portions of the site that drain into the Bioretention and/or Rain Garden BMPs. Restore the BMPs to their fully functioning condition if they accumulate sediment during construction. Restoring the BMP must include removal of sediment and any sediment-laden Bioretention/rain garden soils, and replacing the removed soils with soils meeting the design specification.**

- **Prevent compacting Bioretention and rain garden BMPs by excluding construction equipment and foot traffic. Protect completed lawn and landscaped areas from compaction due to construction equipment.**

- **Control erosion and avoid introducing sediment from surrounding land uses onto permeable pavements. Do not allow muddy construction equipment on the base material or pavement. Do not allow sediment-laden runoff onto permeable pavements or base materials.**

- **Pavement fouled with sediments or no longer passing an initial infiltration test must be cleaned using procedures in accordance with this manual or the manufacturer's procedures.**

- **Keep all heavy equipment off existing soils under LID facilities that have been excavated to final grade to retain the infiltration rate of the soils.**

Objective

To control erosion and prevent sediment and other pollutants from leaving the site during the construction phase of a project. To have fully functional stormwater facilities and BMP's for the developed site upon completion of construction.

Supplemental Guidelines

If a Construction SWPPP is found to be inadequate (with respect to erosion and sediment control requirements), then the Plan Approval Authority[1] within the Local Government should require that other BMPs be implemented, as appropriate.

The Plan Approval Authority may allow development of generic Construction SWPPP's that apply to commonly conducted public road activities, such as road surface replacement, that trigger this minimum requirement. They may also develop an abbreviated SWPPP format for project sites that will disturb less than 1 acre.

Based on the information provided and/or local weather conditions, the local permitting authority may expand or restrict the seasonal limitation on site disturbance. The local permitting authority shall take enforcement action - such as a notice of violation, administrative order, penalty, or stop-work order under the following circumstances:

- If, during the course of any construction activity or soil disturbance during the seasonal limitation period, sediment leaves the construction site causing a violation of the surface water quality standard; or
- If clearing and grading limits or erosion and sediment control measures shown in the approved plan are not maintained.

Coordination with Utilities and Other Contractors - The primary project proponent shall evaluate, with input from utilities and other contractors, the stormwater management requirements for the entire project, including the utilities, when preparing the Construction SWPPP.

Element #13, Protect Low Impact Development BMPs, is not yet included as a permit condition in the NPDES Construction Stormwater General Permit. That permit is not scheduled for reissuance until December, 2015. Until that permit is reissued with element #13 added as a permit condition, the element may be enforceable only through the requirements of local stormwater codes that may have been updated to include it. Municipal Stormwater Permittees must incorporate this element into local requirements per the timelines in their Municipal Stormwater Permit.

[1] The Plan Approval Authority is defined as that department within a local government that has been delegated authority to approve stormwater site plans.

2.5.3 Minimum Requirement #3: Source Control of Pollution

All known, available and reasonable source control BMPs must be applied to all projects. Source control BMPs must be selected, designed, and maintained according to this manual.

Objective

The intent of source control BMPs is to prevent stormwater from coming in contact with pollutants. They are a cost-effective means of reducing pollutants in stormwater, and, therefore, should be a first consideration in all projects.

Supplemental Guidelines

An adopted and implemented basin plan or a Total Maximum Daily Load (TMDL, also known as a Water Clean-up Plan) may be used to develop more stringent source control requirements that are tailored to a specific basin.

Source Control BMPs include Operational BMPs and Structural Source Control BMPs. See Volume IV for design details of these BMPs. For construction sites, see Volume II, Chapter 4.

Structural source control BMPs should be identified in the stormwater site plan and should be shown on all applicable plans submitted for local government review and approval.

2.5.4 Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls

Natural drainage patterns shall be maintained, and discharges from the project site shall occur at the natural location, to the maximum extent practicable. The manner by which runoff is discharged from the project site must not cause a significant adverse impact to downstream receiving waters and downgradient properties. All outfalls require energy dissipation.

Objective

To preserve and utilize natural drainage systems to the fullest extent because of the multiple stormwater benefits these systems provide; and to prevent erosion at and downstream of the discharge location.

Supplemental Guidelines

Creating new drainage patterns results in more site disturbance and more potential for erosion and sedimentation during and after construction. Creating new discharge points can create significant stream channel erosion problems as the receiving water body typically must adjust to the new flows. Diversions can cause greater impacts than would otherwise occur by discharging runoff at the natural location.

Where no conveyance system exists at the adjacent downgradient property line and the discharge was previously unconcentrated flow or significantly lower concentrated flow, then measures must be taken to prevent downgradient impacts. Drainage easements from downstream property owners may be needed and should be obtained prior to approval of engineering plans.

The following discharge requirement is recommended:

Where no conveyance system exists at the abutting downstream property line and the natural (existing) discharge is unconcentrated, any runoff concentrated by the proposed project must be discharged as follows:

a) If the 100-year peak discharge is less than or equal to 0.2 cfs (0.3 cfs using 15 minute time steps) under existing conditions and will remain less than or equal to 0.2 cfs under developed conditions, then the concentrated runoff may be discharged onto a rock pad or to any other system that serves to disperse flows.

b) If the 100-year peak discharge is less than or equal to 0.5 cfs (0.75 cfs using 15 minute time steps) under existing conditions and will remain less than or equal to 0.5 cfs under developed conditions, then the concentrated runoff may be discharged through a dispersal trench or other dispersal system, provided the applicant can demonstrate that there will be no significant adverse impact to downhill properties or drainage systems.

c) If the 100-year peak discharge is greater than 0.5 cfs for either existing or developed conditions, or if a significant adverse impact to downgradient properties or drainage systems is likely, then a conveyance system must be provided to convey the concentrated runoff across the downstream properties to an acceptable discharge point (i.e., an enclosed drainage system or open drainage feature where concentrated runoff can be discharged without significant adverse impact).

Stormwater control or treatment structures should not be located within the expected 25-year water level elevations for salmonid-bearing waters. Such areas may provide off-channel habitat for juvenile salmonids and salmonid fry. Designs for outfall systems to protect against adverse impacts from concentrated runoff are included in Volume V, Chapter 4.

2.5.5 Minimum Requirement #5: On-site Stormwater Management

Projects shall employ On-site Stormwater Management BMPs in accordance with the following projects thresholds, standards, and lists to infiltrate, disperse, and retain stormwater runoff on-site to the extent feasible without causing flooding or erosion impacts.

Projects qualifying as flow control exempt in accordance with Section 2.5.7 of this chapter do not have to achieve the LID performance standard, nor consider bioretention, rain gardens, permeable pavement, and full dispersion if using List #1 or List #2. However, those projects must implement BMP T5.13; BMPs T5.10A, B, or C; and BMP T5.11or T5.12, if feasible.

Project Thresholds

Projects triggering only Minimum Requirements #1 through #5 shall either:

a. **Use On-site Stormwater Management BMPs from List #1 for all surfaces within each type of surface in List #1; or**

b. **Demonstrate compliance with the LID Performance Standard. Projects selecting this option cannot use Rain Gardens. They may choose to use Bioretention BMPs as described in Chapter 7 of Volume V to achieve the LID Performance Standard.**

Projects triggering Minimum Requirements #1 through #9, must meet the requirements in Table 2.5.1.

Table 2.5.1 On-site Stormwater Management Requirements for Projects Triggering Minimum Requirements #1 - #9

Project Type and Location	Requirement
New development on any parcel inside the UGA, or new development outside the UGA on a parcel less than 5 acres	Low Impact Development Performance Standard and BMP T5.13; or List #2 (applicant option).
New development outside the UGA on a parcel of 5 acres or larger	Low Impact Development Performance Standard and BMP T5.13.
Redevelopment on any parcel inside the UGA, or redevelopment outside the UGA on a parcel less than 5 acres	Low Impact Development Performance Standard and BMP T5.13; or List #2 (applicant option).
Redevelopment outside the UGA on a parcel of 5 acres or larger	Low Impact Development Performance Standard and BMP T5.13.

NOTE: This table refers to the Urban Growth Area (UGA) as designated under the Growth Management Act (GMA) (Chapter 36.70A RCW) of the State of Washington. If the Permittee is located in a county that is not subject to planning under the GMA, the city limits shall be used instead.

Low Impact Development Performance Standard

Stormwater discharges shall match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 8% of the 2-year peak flow to 50% of the 2-year peak flow. Refer to the Standard Flow Control Requirement section in Minimum Requirement #7 for information about the assignment of the pre-developed condition. Project sites that must also meet minimum requirement #7 – flow control - must match flow durations between 8% of the 2-year flow through the full 50-year flow.

List #1: On-site Stormwater Management BMPs for Projects Triggering Minimum Requirements #1 through #5

For each surface, consider the BMP's in the order listed for that type of surface. Use the first BMP that is considered feasible. No other On-site Stormwater Management BMP is necessary for that surface. Feasibility shall be determined by evaluation against:

1. **Design criteria, limitations, and infeasibility criteria identified for each BMP in this manual; and**
2. **Competing Needs Criteria listed in Chapter 5 of Volume V of this manual.**

Lawn and landscaped areas:

- **Post-Construction Soil Quality and Depth in accordance with BMP T5.13 in Chapter 5 of Volume V**

Roofs:

1. **Full Dispersion in accordance with BMP T5.30 in Chapter 5 of Volume V, or Downspout Full Infiltration Systems in accordance with BMP T5.10A in Section 3.1.1 in Chapter 3 of Volume III**
2. **Rain Gardens in accordance with BMP T5.14 in Chapter 5 of Volume V, or Bioretention in accordance with Chapter 7 of Volume V. The rain garden or bioretention facility must have a minimum horizontal projected surface area below the overflow which is at least 5% of the area draining to it.**
3. **Downspout Dispersion Systems in accordance with BMP T5.10B in Section 3.1.2 in Chapter 3 of Volume III**
4. **Perforated Stub-out Connections in accordance with BMP T5.10C in Section 3.1.3 in Chapter 3 of Volume III**

Other Hard Surfaces:

1. **Full Dispersion in accordance with BMP T5.30 in Chapter 5 of Volume V**

2. **Permeable pavement[1] in accordance with BMP T5.15 in Chapter 5 of Volume V, or Rain Gardens in accordance with BMP T5.14 in Chapter 5 of Volume V, or Bioretention in accordance with Chapter 7 of of Volume V. The rain garden or bioretention facility must have a minimum horizontal projected surface area below the overflow which is at least 5% of the area draining to it.**

3. **Sheet Flow Dispersion in accordance with BMP T5.12, or Concentrated Flow Dispersion in accordance with BMP T5.11 in Chapter 5 of Volume V.**

List #2: On-site Stormwater Management BMPs for Projects Triggering Minimum Requirements #1 through #9

For each surface, consider the BMPs in the order listed for that type of surface. Use the first BMP that is considered feasible. No other On-site Stormwater Management BMP is necessary for that surface. Feasibility shall be determined by evaluation against:

1. **Design criteria, limitations, and infeasibility criteria identified for each BMP in this manual; and**

2. **Competing Needs Criteria listed in Chapter 5 of Volume V of this manual.**

Lawn and landscaped areas:

- **Post-Construction Soil Quality and Depth in accordance with BMP T5.13 in Chapter 5 of Volume V.**

Roofs:

1. **Full Dispersion in accordance with BMP T5.30 in Chapter 5 of Volume V, or Downspout Full Infiltration Systems in accordance with BMP T5.10A in Section 3.1.1 in Chapter 3 of Volume III**

2. **Bioretention (See Chapter 7 of Volume V) facilities that have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it.**

3. **Downspout Dispersion Systems in accordance with BMP T5.10B in Section 3.1.2 in Chapter 3 of Volume III**

4. **Perforated Stub-out Connections in accordance with BMP T5.10C in Section 3.1.3 in Chapter 3 of Volume III**

Other Hard Surfaces:

1. **Full Dispersion in accordance with BMP T5.30 in Chapter 5 of Volume V**

---

[1] This is not a requirement to pave these surfaces. Where pavement is proposed, it must be permeable to the extent feasible unless full dispersion is employed.

2. **Permeable pavement[1] in accordance with BMP T5.15 in chapter 5 of Volume V**
3. **Bioretention BMP's (See Chapter 7, Volume V of the SMMWW) that have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it.**
4. **Sheet Flow Dispersion in accordance with BMP T5.12, or Concentrated Flow Dispersion in accordance with BMP T5.11 in Chapter 5 of Volume V.**

Objective

To use practices distributed across a development that reduce the amount of disruption of the natural hydrologic characteristics of the site.

Supplemental Guidelines

"Flooding or erosion impacts" include flooding of septic systems, crawl spaces, living areas, outbuildings, etc.; increased ice or algal growth on sidewalks/roadways; earth movement/settlement ; erosion and other potential damage.

Recent research indicates that traditional development techniques in residential, commercial, and industrial land development cause gross disruption of the natural hydrologic cycle with severe impacts to water and water-related natural resources. Based upon gross level applications of continuous runoff modeling and assumptions concerning minimum flows needed to maintain beneficial uses, watersheds must retain the majority of their natural vegetation cover and soils, and developments must minimize their disruption of the natural hydrologic cycle in order to avoid significant natural resource degradation in lowland streams.

The BMPs described in Section 3.1 of Volume III, and Section 5.3.1 of Volume V are likely insufficient by themselves to prevent significant hydrologic disruptions and impacts to streams and their natural resources. Therefore, local governments should look for opportunities to change their local development codes to minimize impervious surfaces and retain native vegetation in all development situations. Most importantly, to maintain the beneficial uses of our lowland freshwater systems will require land use planning that targets retention of a majority of a creek's watershed in its natural condition, and retains most of the benefits of headwater areas, connected wetlands, riparian, and floodplain areas.

2.5.6 Minimum Requirement #6: Runoff Treatment

Thresholds

When assessing a project against the following thresholds, only consider those hard and pervious surfaces that are subject to this minimum requirement as determined in Section 2.4 of this chapter.

The following require construction of stormwater treatment facilities:

- **Projects in which the total of, pollution-generating hard surface (PGHS) is 5,000 square feet or more in a threshold discharge area of the project, or**
- **Projects in which the total of pollution-generating pervious surfaces (PGPS) – not including permeable pavements – is three-quarters (3/4) of an acre or more in a threshold discharge area, and from which there will be a surface discharge in a natural or man-made conveyance system from the site.**

Treatment Facility Sizing

Size stormwater treatment facilities for the entire area that drains to them, even if some of those areas are not pollution-generating, or were not included in the project site threshold decisions (Section 2.4 of this chapter) or the treatment threshold decisions of this minimum requirement.

Water Quality Design Storm Volume:

- **The volume of runoff predicted from a 24-hour storm with a 6-month return frequency (a.k.a., 6-month, 24-hour storm). Wetpool facilities are sized based upon the volume of runoff predicted through use of the Natural Resource Conservation Service curve number equations in Chapter 2 of Volume III, for the 6-month, 24-hour storm. Alternatively, when using an approved continuous runoff model, the water quality design storm volume shall be equal to the simulated daily volume that represents the upper limit of the range of daily volumes that accounts for 91% of the entire runoff volume over a multi-decade period of record.**

Water Quality Design Flow Rate:

- **Preceding Detention Facilities or when Detention Facilities are not required: The flow rate at or below which 91% of the runoff volume, as estimated by an approved continuous runoff model, will be treated. Design criteria for treatment facilities are assigned to achieve the applicable performance goal (e.g., 80% TSS removal) at the water quality design flow rate . At a minimum, 91% of the total runoff volume, as estimated by an approved continuous runoff model, must pass through the treatment**

facility(ies) at or below the approved hydraulic loading rate for the facility(ies).

- **Downstream of Detention Facilities: The water quality design flow rate must be the full 2-year release rate from the detention facility.**

Treatment Facility Selection, Design, and Maintenance

Stormwater treatment facilities shall be:

- Selected in accordance with the process identified in Chapter 4 of Volume I, and Chapter 2 of Volume V,
- Designed in accordance with the design criteria in Volume V, and
- Maintained in accordance with the maintenance schedule in Volume V.

Additional Requirements

Direct discharge of untreated stormwater from pollution-generating hard surfaces to ground water is prohibited, except for the discharge achieved by infiltration or dispersion of runoff through use of On-site Stormwater Management BMPs, in accordance with Chapter 5, Volume V and Chapter 7, Volume V; or by infiltration through soils meeting the soil suitability criteria in Chapter 3 of Volume III.

Objective

The purpose of runoff treatment is to reduce pollutant loads and concentrations in stormwater runoff using physical, biological, and chemical removal mechanisms so that beneficial uses of receiving waters are maintained and, where applicable, restored. When site conditions are appropriate, infiltration can potentially be the most effective BMP for runoff treatment.

Supplemental Guidelines

See Volume V for more detailed guidance on selection, design, and maintenance of treatment facilities. The water quality design storm volume and flow rates are intended to capture and effectively treat about 90-95% of the annual runoff volume in western Washington. See Appendix I-B for background on their derivation.

Volume V includes performance goals for Basic, Enhanced, Phosphorus, and Oil Control treatment, and a menu of facility options for each treatment type. Treatment facilities that are selected from the appropriate menu and designed in accordance with their design criteria are presumed to meet the applicable performance goals.

An adopted and implemented basin plan , or a Total Maximum Daily Load (TMDL - also known as a Water Clean-up Plan) may be used to develop runoff treatment requirements that are tailored to a specific basin.

However, treatment requirements shall not be less than that achieved by facilities in the Basic Treatment Menu (see Volume V, Chapter 3).

Treatment facilities applied consistent with this manual are presumed to meet the requirement of state law to provide all known available and reasonable methods of treatment (RCW 90.52.040, RCW 90.48.010). This technology-based treatment requirement does not excuse any discharge from the obligation to apply whatever technology is necessary to comply with state water quality standards, Chapter 173-201A WAC; state ground water quality standards, Chapter 173-200 WAC; state sediment management standards, Chapter 173-204 WAC; and the underground injection control program, Chapter 173-218 WAC. Additional treatment to meet those standards may be required by federal, state, or local governments.

Infiltration through use of On-site Stormwater Management BMPs can provide both treatment of stormwater, through the ability of certain soils to remove pollutants, and volume control of stormwater, by decreasing the amount of water that runs off to surface water. Infiltration through engineered treatment facilities that utilize the natural soil profile can also be very effective at treating stormwater runoff, but pretreatment must be applied and soil conditions must be appropriate to achieve effective treatment while not impacting ground water resources. See Chapter 6 of Volume V for pretreatment design details.

Discharge of pollution-generating surfaces into a dry well, after pretreatment for solids reduction, can be acceptable if the soil conditions provide sufficient treatment capacity. Dry wells into gravelly soils are not likely to have sufficient treatment capability. They must be preceded by at least a basic treatment BMP. See Volume V, Chapters 2 and 7 for details.

Impervious surfaces that are "fully dispersed" in accordance with BMP T5.30 in Volume V are not considered effective impervious surfaces. Impervious surfaces that are "dispersed" in accordance with BMPs T5.10B, T5.11, and T5.12 in Section 5.3.1 of Volume V are still considered effective surfaces though they may be modeled as pervious surfaces if flow path lengths meet the specified minima. See Volume III, Appendix III-C for a more complete description of hydrologic representation of On-site Stormwater Management BMPs.

2.5.7 Minimum Requirement #7: Flow Control

Applicability

Projects must provide flow control to reduce the impacts of stormwater runoff from hard surfaces and land cover conversions. The requirement below applies to projects that discharge stormwater directly, or indirectly through a conveyance system, into a fresh waterbody.

Flow Control is not required for projects that discharge directly to, or indirectly to a water listed in Appendix I-E - Flow Control-Exempt Receiving Waters subject to the following restrictions:

- **Direct discharge to the exempt receiving water does not result in the diversion of drainage from any perennial stream classified as Types 1, 2, 3, or 4 in the State of Washington Interim Water Typing System, or Types "S", "F", or "Np" in the Permanent Water Typing System, or from any category I, II, or III wetland; and**
- **Flow splitting devices or drainage BMP's are applied to route natural runoff volumes from the project site to any downstream Type 5 stream or category IV wetland:**
  - **Design of flow splitting devices or drainage BMP's will be based on continuous hydrologic modeling analysis. The design will assure that flows delivered to Type 5 stream reaches will approximate, but in no case exceed, durations ranging from 50% of the 2-year to the 50-year peak flow.**
  - **Flow splitting devices or drainage BMP's that deliver flow to category IV wetlands will also be designed using continuous hydrologic modeling to preserve pre-project wetland hydrologic conditions unless specifically waived or exempted by regulatory agencies with permitting jurisdiction; and**
- **The project site must be drained by a conveyance system that is comprised entirely of manmade conveyance elements (e.g., pipes, ditches, outfall protection, etc.) and extends to the ordinary high water line of the exempt receiving water; and**
- **The conveyance system between the project site and the exempt receiving water shall have sufficient hydraulic capacity to convey discharges from future build-out conditions (under current zoning) of the site, and the existing condition from non-project areas from which runoff is or will be collected; and**
- **Any erodible elements of the manmade conveyance system must be adequately stabilized to prevent erosion under the conditions noted above.**

If the discharge is to a stream that leads to a wetland, or to a wetland that has an outflow to a stream, both this requirement and Minimum Requirement #8 apply.

Local governments may petition Ecology to exempt projects in additional areas. A petition must justify the proposed exemption based upon a hydrologic analysis that demonstrates that the potential stormwater runoff from the exempted area will not significantly

increase the erosion forces on the stream channel nor have near field impacts.

Thresholds

When assessing a project against the following thresholds, consider only those impervious, hard, and pervious surfaces that are subject to this minimum requirement as determined in Section 2.4 of this chapter.

The following circumstances require achievement of the standard flow control requirement for western Washington:

- **Projects in which the total of effective impervious surfaces is 10,000 square feet or more in a threshold discharge area, or**
- **Projects that convert ¾ acres or more of vegetation to lawn or landscape, or convert 2.5 acres or more of native vegetation to pasture in a threshold discharge area, and from which there is a surface discharge in a natural or man-made conveyance system from the site, or**
- **Projects that through a combination of effective hard surfaces and converted vegetation areas cause a 0.10 cubic feet per second increase in the 100-year flow frequency from a threshold discharge area as estimated using the Western Washington Hydrology Model or other approved model and one-hour time steps (or a 0.15 cfs increase using 15-minute time steps).** [2]

Standard Flow Control Requirement

The following requirement applies to the the following counties:

Clallam	Jefferson	Pacific	Snohomish
Clark	King	Pierce	Thurston
Cowlitz	Kitsap	San Juan	Wahkiakum
Grays Harbor	Lewis	Skagit	Whatcom
Island	Mason	Skamania	

[2] The 0.10 cfs (one-hour time steps) or 0.15 cfs (15-minute time steps) increase should be a comparison of the post-project runoff to the existing condition runoff. For the purpose of applying this threshold, the existing condition is either the pre-project land cover, or the land cover that existed at the site as of a date when the local jurisdiction first adopted flow control requirements into code or rules.

Stormwater discharges shall match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow. The pre-developed condition to be matched shall be a forested land cover unless:

- **Reasonable, historic information is provided that indicates the site was prairie prior to settlement (modeled as "pasture" in the Western Washington Hydrology Model); or,**
- **The drainage area of the immediate stream and all subsequent downstream basins have had at least 40% total impervious area since 1985. In this case, the pre-developed condition to be matched shall be the existing land cover condition. The map in Appendix I-F depicts those areas which meet this criterion. Where basin-specific studies determine a stream channel to be unstable, even though the above criterion is met, the pre-developed condition assumption shall be the "historic" land cover condition, or a land cover condition commensurate with achieving a target flow regime identified by an approved basin study.**

This standard requirement is waived for sites that will reliably infiltrate all the runoff from hard surfaces and converted vegetation areas.

Western Washington Alternative Requirement

An alternative requirement may be established through application of watershed-scale hydrological modeling and supporting field observations. Possible reasons for an alternative flow control requirement include:

- **Establishment of a stream–specific threshold of significant bedload movement other than the assumed 50% of the 2-year peak flow;**
- **Zoning and Land Clearing Ordinance restrictions that, in combination with an alternative flow control standard, maintain or reduce the naturally occurring erosive forces on the stream channel; or**
- **A duration control standard is not necessary for protection, maintenance, or restoration of designated and existing beneficial uses or Clean Water Act compliance.**

Additional Requirement

Flow Control BMPs shall be selected, designed, and maintained according to Volume III or a local government manual deemed equivalent to this manual.

Objective

To prevent increases in the stream channel erosion rates that are characteristic of natural conditions (i.e., prior to disturbance by European settlement). The standard intends to maintain the total amount of time that a receiving stream exceeds an erosion-causing threshold based upon historic rainfall and natural land cover conditions. That threshold is assumed to be 50% of the 2-year peak flow. Maintaining the naturally occurring erosion rates within streams is vital, though by itself insufficient, to protect fish habitat and production.

Supplemental Guidelines

Reduction of flows through infiltration decreases stream channel erosion and helps to maintain base flow throughout the summer months. However, infiltration should follow the guidance in this manual to reduce the chance that ground water quality is threatened by such discharges.

Volume III includes a description of the Western Washington Hydrology Model. The model provides ways to represent On-site Stormwater Management BMPs described in Volumes III and V. Using those BMPs reduces the predicted runoff rates and volumes and thus also reduces the size of the required flow control facilities.

Application of sufficient types of On-site Stormwater Management BMPs can result in reducing the effective impervious area and the converted vegetation areas such that a flow control facility is not required. Application of "Full Dispersion", BMP T5.30, also results in eliminating the flow control facility requirement for those areas that are "fully dispersed."

See the guidelines in Appendix I-D for Minimum Requirement #8, and directions concerning use of the Western Washington Hydrology Model for information about the approach for protecting wetland hydrologic conditions.

Diversions of flow from perennial streams and from wetlands can be considered if significant existing (i.e., pre-project) flooding, stream stability, water quality, or aquatic habitat problems would be solved or significantly mitigated by bypassing stormwater runoff rather than providing stormwater detention and discharge to natural drainage features. Bypassing should not be considered as an alternative to applicable flow control or treatment if the flooding, stream stability, water quality or habitat problem to be solved would be caused by the project. In addition, the proposal should not exacerbate other water quality/quantity problems such as inadequate low flows or inadequate wetland water elevations. The existing problems and their solution or mitigation as a result of the direct discharge should be documented by a stormwater engineer or scientist after review of any available drainage reports, basin plans, or other relevant literature. The restrictions in this minimum requirement on conveyance systems that transfer water to an exempt receiving water are applicable in these situations. Approvals by all regulatory authorities with relevant permits applicable to the project are necessary.

Ecology hopes to publish guidance concerning basin studies to develop basin-specific flow control strategies intended to stabilize stream channels and provide flows intended to protect and restore beneficial uses such as fish resources. The recommendations made in basin plans should be consistent with the requirements and intent of the federal Clean Water Act, the State Water Pollution Control Act, and any other applicable natural resources statutes, such as the Federal Endangered Species Act.

2.5.8 Minimum Requirement #8: Wetlands Protection

Applicability

The requirements below apply only to projects whose stormwater discharges into a wetland, either directly or indirectly through a conveyance system.

Thresholds

The thresholds identified in Minimum Requirement #6 – Runoff Treatment, and Minimum Requirement #7 – Flow Control shall also be applied to determine the applicability of this requirement to discharges to wetlands.

Standard Requirement

Projects shall comply with Guide Sheets #1 through #3 in Appendix I-D. The hydrologic analysis shall use the existing land cover condition to determine the existing hydrologic conditions unless directed otherwise by a regulatory agency with jurisdiction.

Additional Requirements

Stormwater treatment and flow control facilities shall not be built within a natural vegetated buffer, except for:

- **Necessary conveyance systems as approved by the local government; or**
- **As allowed in wetlands approved for hydrologic modification and/or treatment in accordance with Guide Sheet 2 in Appendix I-D.**

An adopted and implemented basin plan, or a Total Maximum Daily Load (TMDL, also known as a Water Clean-up Plan) may be used to develop requirements for wetlands that are tailored to a specific basin.

Objective

To ensure that wetlands receive the same level of protection as any other waters of the state. Wetlands are extremely important natural resources which provide multiple stormwater benefits, including ground water recharge, flood control, and stream channel erosion protection. They are easily impacted by development unless careful planning and management are conducted. Wetlands can be severely degraded by stormwater discharges from urban development due to pollutants in the runoff and also due to disruption of natural hydrologic functioning of the wetland system. Changes in water levels and the frequency and duration of inundations are of particular concern.

Supplemental Guidelines

Appendix I-D Guidelines for Wetlands when Managing Stormwater shall be used for discharges to natural wetlands and wetlands constructed as mitigation. While it is always necessary to pre-treat stormwater prior to discharge to a wetland, there are limited circumstances where wetlands may be used for additional treatment and detention of stormwater. These situations are considered in Guide Sheet 2 of Appendix I-D.

Note that if selective runoff bypass is an alternative being considered to maintain the hydroperiod, the hydrologic analysis must consider the impacts of the bypassed flow. For instance, if the bypassed flow is eventually directed to a stream, the flow duration standard, Minimum Requirement #7, applies to the bypass.

2.5.9 Minimum Requirement #9: Operation and Maintenance

An operation and maintenance manual that is consistent with the provisions in Volume V shall be provided for proposed stormwater facilities and BMPs, and the party (or parties) responsible for maintenance and operation shall be identified. At private facilities, a copy of the operation and maintenance manual shall be retained on-site or within reasonable access to the site, and shall be transferred with the property to the new owner. For public facilities, a copy of the operation and maintenance manual shall be retained in the appropriate department. A log of maintenance activity that indicates what actions were taken shall be kept and be available for inspection by the local government.

Objective

To ensure that stormwater control facilities are adequately maintained and operated properly.

Supplemental Guidelines

Inadequate maintenance is a common cause of failure for stormwater control facilities. The description of each BMP in Volumes II, III, and V includes a section on maintenance. Chapter 4 of Volume V includes a schedule of maintenance standards for drainage facilities. Local

D

TRACT 'A' FACILITY

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	8938.e.Green Mtn Ph1-Prelim-Tract A Pond
Site Name:	Green Mountain
Site Address:	NE Goodwin Road
City:	Camas, WA.
Report Date:	12/23/2014
Gage:	Lacamas
Data Start:	1948/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.30
Version:	2014/09/12

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 2P

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
SG4, Forest, Mod	17.491
Pervious Total	17.491
Impervious Land Use	Acres
Impervious Total	0
Basin Total	17.491

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 2D

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
SG3, Lawn, Mod	4.985
Pervious Total	4.985
Impervious Land Use	Acres
ROADS MOD	4.44
ROOF TOPS FLAT	4.075
DRIVEWAYS MOD	0.815
SIDEWALKS MOD	1.147
POND	2.029
Impervious Total	12.506
Basin Total	17.491

Element Flows To:

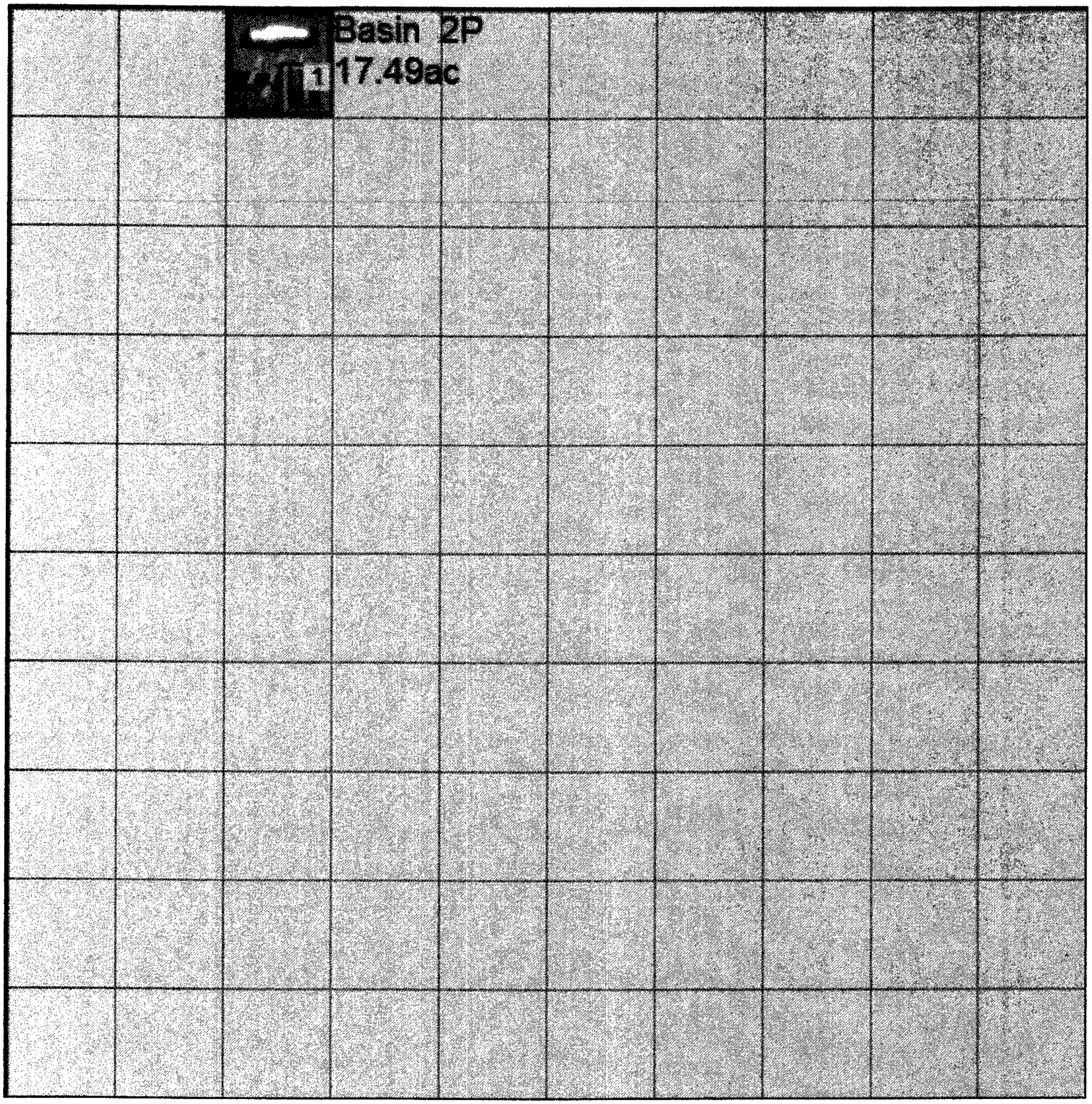
Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

Water Quality

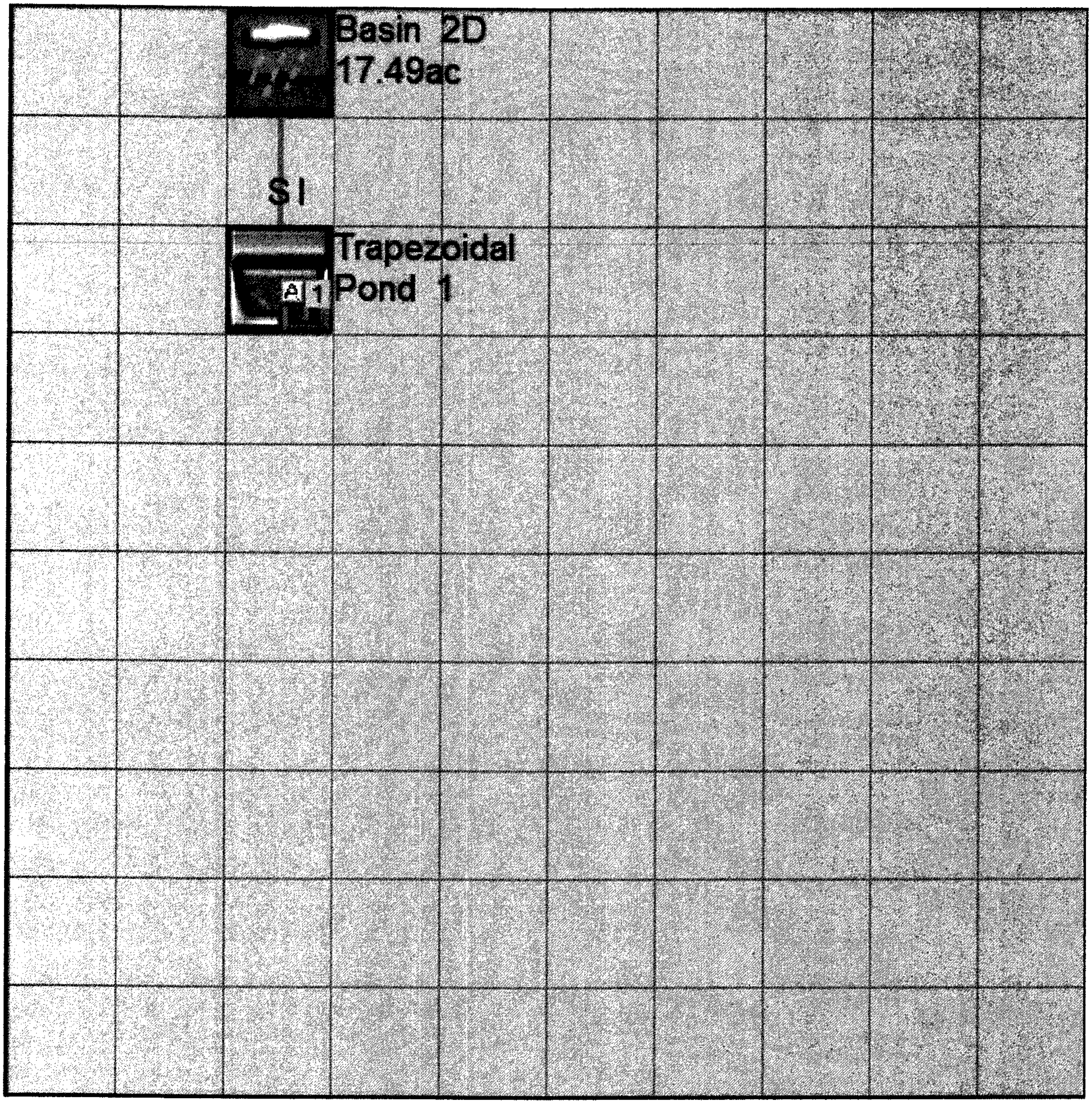
Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	2.0201 acre-feet
On-line facility target flow:	2.7556 cfs.
Adjusted for 15 min:	2.7556 cfs.
Off-line facility target flow:	1.5386 cfs.
Adjusted for 15 min:	1.5386 cfs.

Appendix
Predeveloped Schematic



Mitigated Schematic



TRACT 'H' FACILITY

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	8938.e.Green Mtn Ph1-Prelim-Tract H Pond
Site Name:	Green Mountain
Site Address:	NE Goodwin Road
City:	Camas, WA.
Report Date:	12/23/2014
Gage:	Lacamas
Data Start:	1948/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.30
Version:	2014/09/12

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data
Predeveloped Land Use

Basin 1P

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
SG4, Forest, Mod	8.612
Pervious Total	8.612
Impervious Land Use	Acres
Impervious Total	0
Basin Total	8.612

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1Da

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
SG3, Lawn, Mod	2.053
Pervious Total	2.053
Impervious Land Use	Acres
ROADS MOD	0.965
ROOF TOPS FLAT	2.066
DRIVEWAYS MOD	0.413
SIDEWALKS MOD	0.318
POND	0.921
Impervious Total	4.683
Basin Total	6.736

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

Basin 1Db (Future Lots)

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
SG3, Lawn, Mod	0.656
Pervious Total	0.656
Impervious Land Use	Acres
ROADS MOD	0.319
ROOF TOPS FLAT	0.675
DRIVEWAYS MOD	0.131
SIDEWALKS MOD	0.094
Impervious Total	1.219
Basin Total	1.875

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

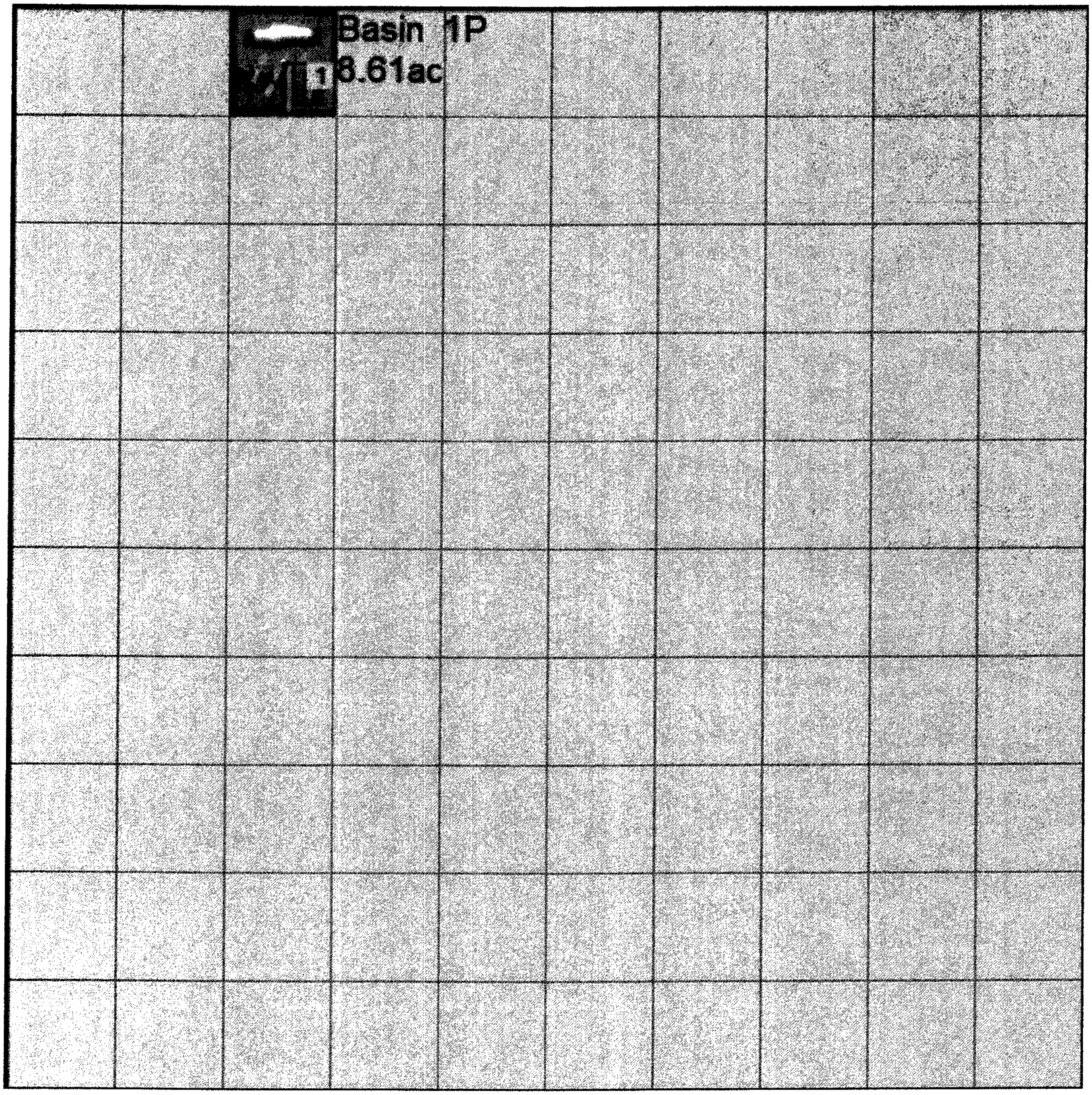
Water Quality

Water Quality BMP Flow and Volume for POC #1

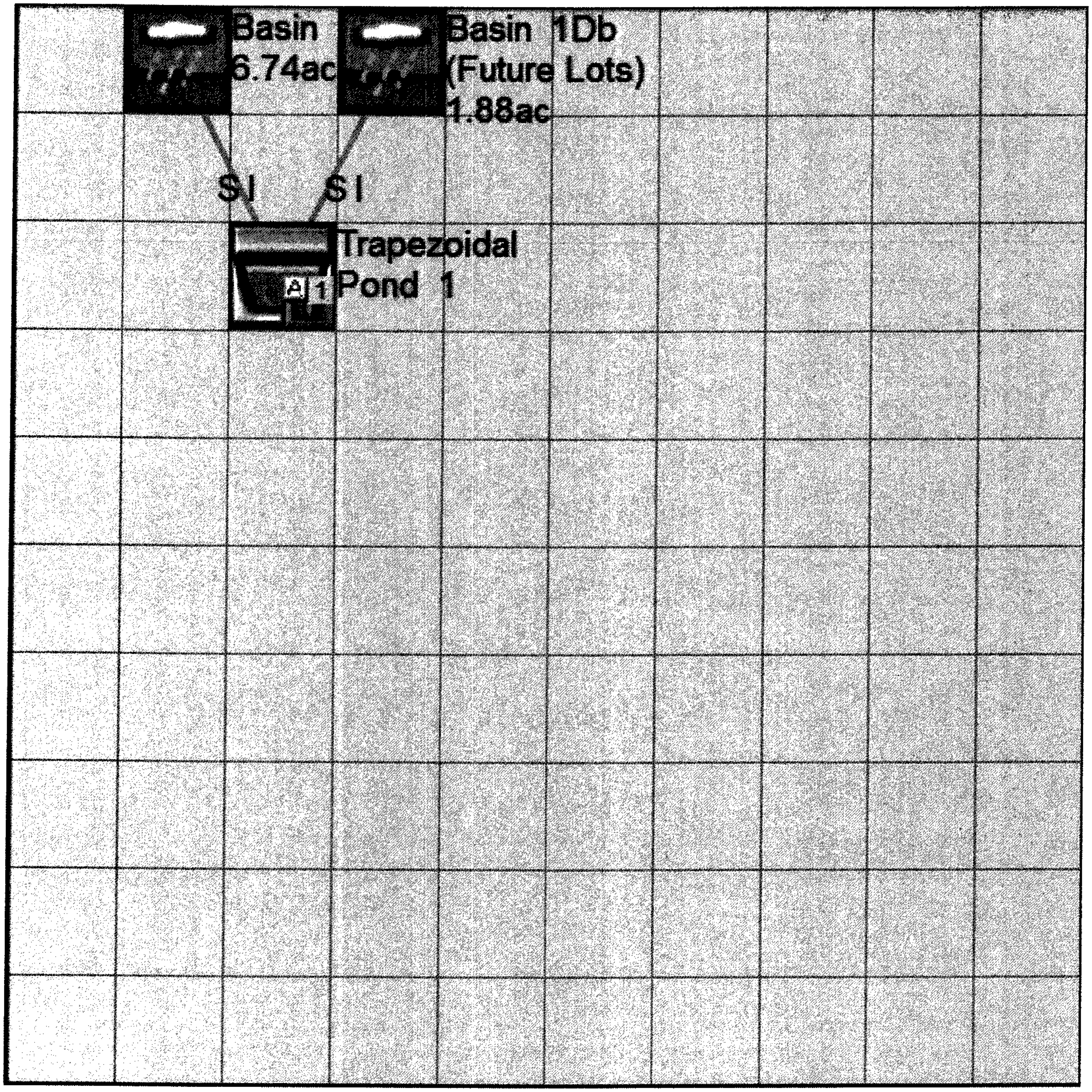
On-line facility volume:	0.9776 acre-feet
On-line facility target flow:	1.284 cfs.
Adjusted for 15 min:	1.284 cfs.
Off-line facility target flow:	0.7159 cfs.
Adjusted for 15 min:	0.7159 cfs.

Appendix

Predeveloped Schematic



Mitigated Schematic



TRACT 'R' FACILITY

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	8938.e.Green Mtn Ph1-Prelim-Tract R Pond-W
Site Name:	Green Mountain
Site Address:	NE Goodwin Road
City:	Camas, WA.
Report Date:	12/23/2014
Gage:	Lacamas
Data Start:	1948/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.30
Version:	2014/09/12

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data
Predeveloped Land Use

Basin 4P & 5P

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
SG4, Forest, Mod	26.54
Pervious Total	26.54
Impervious Land Use	Acres
Impervious Total	0
Basin Total	26.54

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 4D

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
SG3, Lawn, Mod	12.548
Pervious Total	12.548
Impervious Land Use	Acres
ROADS MOD	3.491
ROOF TOPS FLAT	6.198
DRIVEWAYS MOD	1.24
SIDEWALKS MOD	1.063
POND	2
Impervious Total	13.992
Basin Total	26.54

Element Flows To:

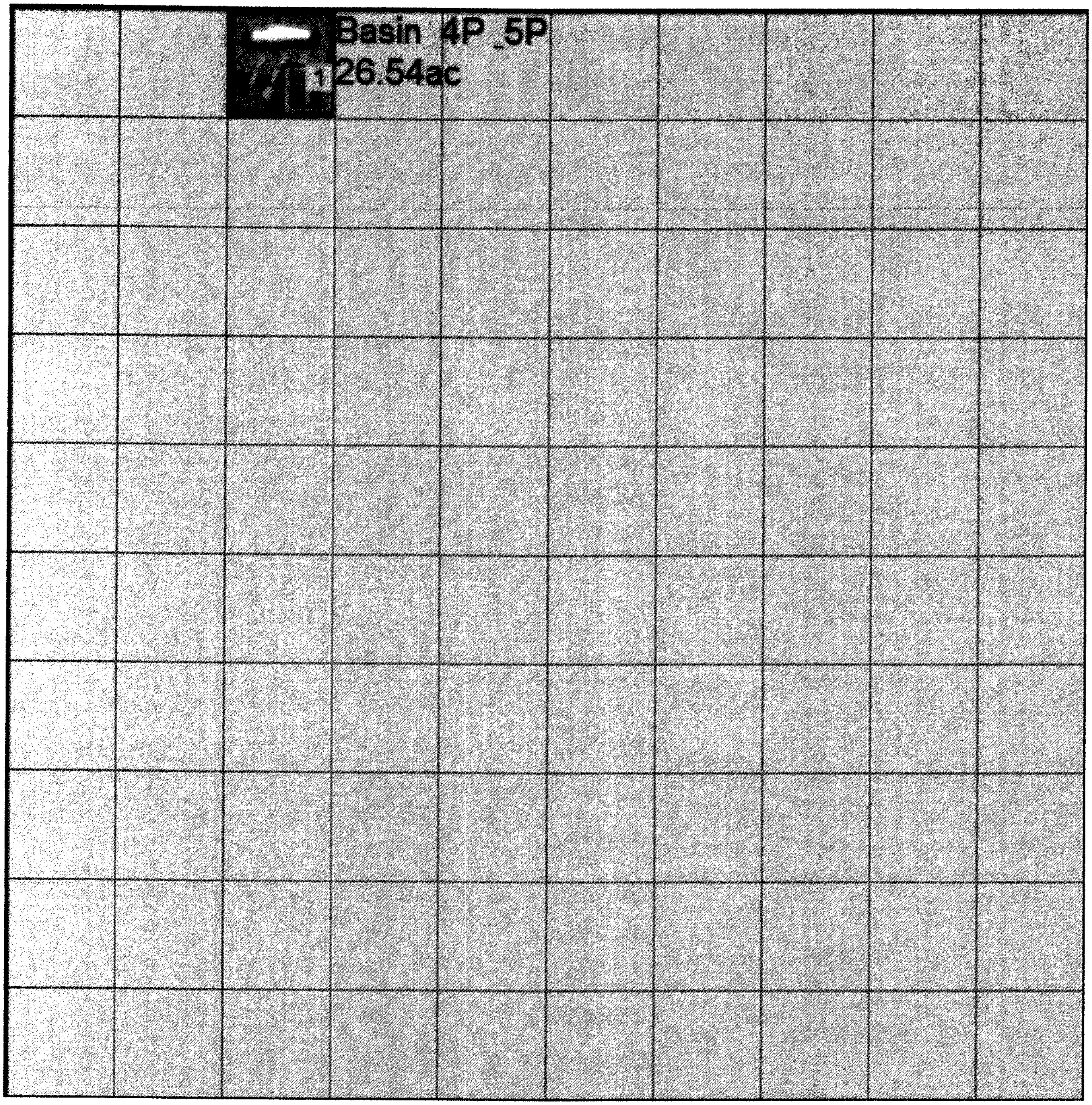
Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

Water Quality

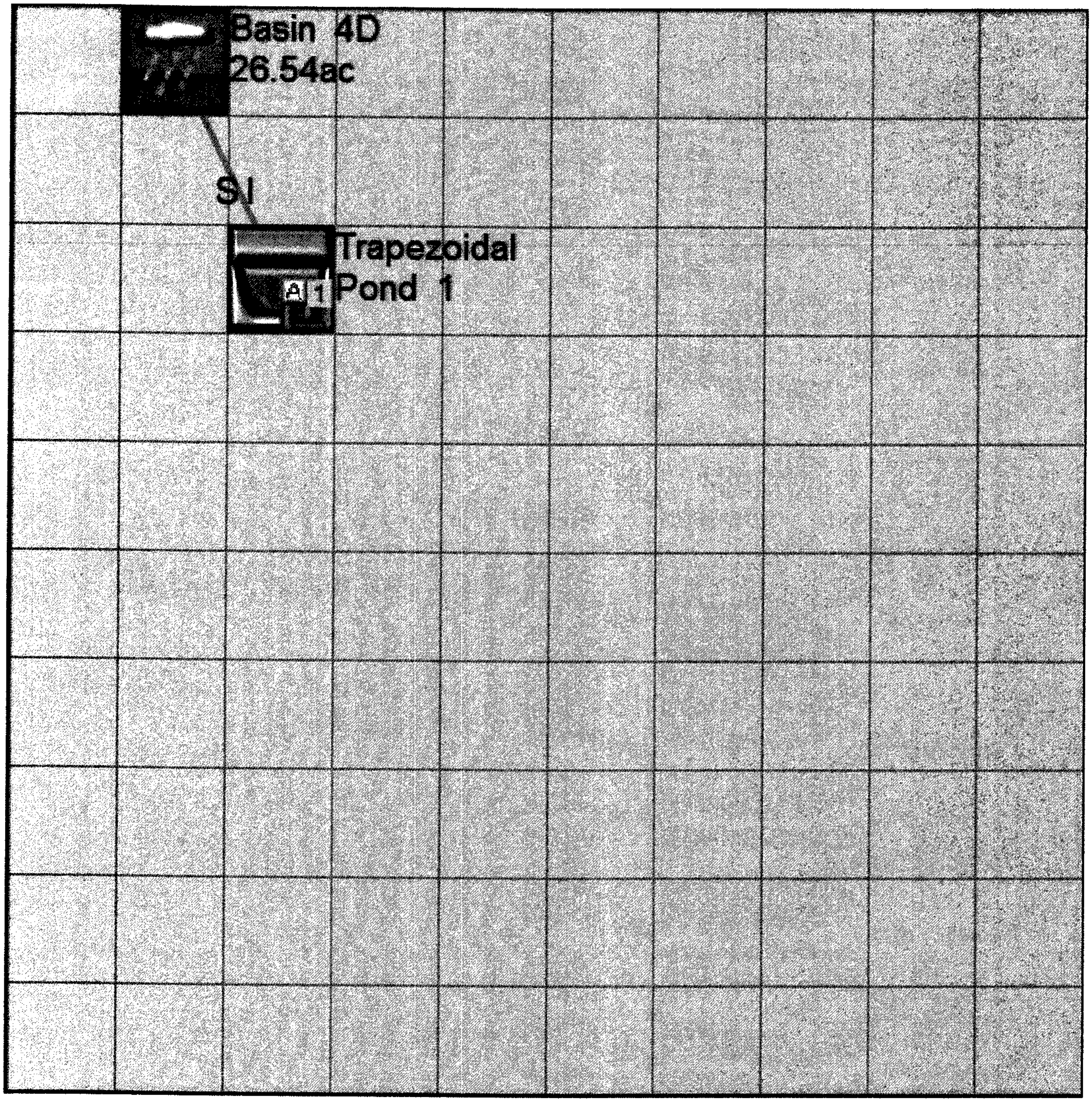
Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	2.5745 acre-feet
On-line facility target flow:	3.1011 cfs.
Adjusted for 15 min:	3.1011 cfs.
Off-line facility target flow:	1.7175 cfs.
Adjusted for 15 min:	1.7175 cfs.

Appendix
Predeveloped Schematic



Mitigated Schematic



Project: Green Mountain
Subject: Wetpool Calculations
Date: December 23, 2014

Wetpool Design Calculations

Tract 'A' Wetpool:

Step 1: Identify required wetpool volume using the sizing procedure.

The 91st percentile, 24-hour runoff volume, estimated by WWHM2012 continuous runoff model (refer to WWHM2012 report):

24-hour volume = 2.0201 ac-ft
(2.0201 ac-ft)*(43,560.17 sf/ac) = **87,996 cf**

Step 2: Multiply the required wetpool volume by a factor of 1.5 to calculate the "large" wetpool volume required for phosphorus control.

(87,996 cf)*(1.5) = **131,994 cf**

Step 3: Calculate the surface area of the stormwater wetpool. Calculate the surface area of the stormwater wetpool by using the volume from Step 1 and dividing by the average water depth (use 4 ft.).

$V_{Total} = h(A_1 + A_2)/2$

where: V_{Total} = total wetpool volume (cf)
h = wetpool average depth (ft)
A_1 = water quality design surface area of wetpool (sf)
A_2 = bottom area of wetpool (sf)
= $(L_1 - 24\ ft)*(W_1 - 24\ ft)$

131,994 cf = (4 ft)*(A_1 + A_2)/2

131,994 cf / 4 ft = 32,999 sf @ 2.0 ft. depth (mid. depth)

32,999 sf = 181.7 ft Length x 181.7 ft Width

A_1 = Top = (182 ft + 12 ft)*(182 ft + 12 ft) = (194 ft)*(194 ft) = 37,636 sf

A_2 = Bottom = (182 ft - 12 ft)*(182 ft - 12 ft) = (170 ft)*(170 ft) = 28,900 sf

Check: (4ft)*(28,900 sf + 37,636 sf)/2 = 133,072 cf => O.K.

A_1 = Top = 37,636 sf A_2 = Bottom = 28,900 sf

⇨ Minimum required for surface area of wetpond = **37,636 sf** **(Design provides 43,103 sf)**

Tract 'H' Wetpool:

Step 1: Identify required wetpool volume using the sizing procedure.

The 91st percentile, 24-hour runoff volume, estimated by WWHM2012 continuous runoff model (refer to WWHM2012 report):

24-hour volume = 0.9776 ac-ft
(0.9776 ac-ft)*(43,560.17 sf/ac) = **42,584 cf**

Step 2: Multiply the required wetpool volume by a factor of 1.5 to calculate the "large" wetpool volume required for phosphorus control.

(42,584 cf)*(1.5) = **63,876 cf**

Step 3: Calculate the surface area of the stormwater wetpool. Calculate the surface area of the stormwater wetpool by using the volume from Step 1 and dividing by the average water depth (use 4 ft.).

$V_{Total} = h(A_1 + A_2)/2$ where: V_{Total} = total wetpool volume (cf)
h = wetpool average depth (ft)
A_1 = water quality design surface area of wetpool (sf)
A_2 = bottom area of wetpool (sf)
= $(L_1 - 24\text{ ft})*(W_1 - 24\text{ ft})$

63,876 cf = (4 ft)*$(A_1 + A_2)/2$

63,876 cf / 4 ft = 15,969 sf @ 2.0 ft. depth (mid. depth)

15,969 sf = 126.4 ft Length x 126.4 ft Width

A_1 = Top = (127 ft + 12 ft)*(127 ft + 12 ft) = (139 ft)*(139 ft) = 19,321 sf

A_2 = Bottom = (127 ft - 12 ft)*(127 ft - 12 ft) = (115 ft)*(115 ft) = 13,225 sf

Check: (4ft)*(13,225 sf + 19,321 sf)/2 = 65,092 cf => O.K.

A_1 = Top = 19,321 sf A_2 = Bottom = 13,225 sf

⇨ Minimum required for surface area of wetpond = **19,321 sf** **(Design provides 20,664 sf)**

<u>Tract 'R' Wetpool:</u>

Step 1: Identify required wetpool volume using the sizing procedure.

The 91st percentile, 24-hour runoff volume, estimated by WWHM2012 continuous runoff model (refer to WWHM2012 report):

24-hour volume = 2.5745 ac-ft
(2.5745 ac-ft)*(43,560.17 sf/ac) = **112,145 cf**

Step 2: Multiply the required wetpool volume by a factor of 1.5 to calculate the "large" wetpool volume required for phosphorus control.

(112,145 cf)*(1.5) = **168,218 cf**

Step 3: Calculate the surface area of the stormwater wetpool. Calculate the surface area of the stormwater wetpool by using the volume from Step 1 and dividing by the average water depth (use 4 ft.).

$V_{Total} = h(A_1 + A_2)/2$

where: V_{Total} = total wetpool volume (cf)
h = wetpool average depth (ft)
A_1 = water quality design surface area of wetpool (sf)
A_2 = bottom area of wetpool (sf)
= $(L_1 - 24\text{ ft})*(W_1 - 24\text{ ft})$

168,218 cf = (4 ft)*($A_1 + A_2$)/2

168,218 cf / 4 ft = 42,055 sf @ 2.0 ft. depth (mid. depth)

42,055 sf = 205.1 ft Length x 205.1 ft Width

A_1 = Top = (205 ft + 12 ft)*(205 ft + 12 ft) = (217 ft)*(217 ft) = 47,089 sf

A_2 = Bottom = (205 ft - 12 ft)*(205 ft - 12 ft) = (193 ft)*(193 ft) = 37,249 sf

Check: (4ft)*(37,249 sf + 47,089 sf)/2 = 168,676 cf => O.K.

A_1 = Top = 47,089 sf A_2 = Bottom = 37,249 sf

⇨ Minimum required for surface area of wetpond = **47,089 sf** **(Design provides 48,550 sf)**

E

TRACT 'A' FACILITY

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	8938.e.Green Mtn Ph1-Prelim-Tract A Pond
Site Name:	Green Mountain
Site Address:	NE Goodwin Road
City:	Camas, WA.
Report Date:	12/23/2014
Gage:	Lacamas
Data Start:	1948/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.30
Version:	2014/09/12

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data
Predeveloped Land Use

Basin 2P

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
SG4, Forest, Mod	17.491
Pervious Total	17.491
Impervious Land Use	Acres
Impervious Total	0
Basin Total	17.491

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 2D

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
SG3, Lawn, Mod	4.985
Pervious Total	4.985
Impervious Land Use	Acres
ROADS MOD	4.44
ROOF TOPS FLAT	4.075
DRIVEWAYS MOD	0.815
SIDEWALKS MOD	1.147
POND	2.029
Impervious Total	12.506
Basin Total	17.491

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Trapezoidal Pond 1

Bottom Length:	194.00 ft.
Bottom Width:	194.00 ft.
Depth:	3 ft.
Volume at riser head:	1.8371 acre-ft.
Side slope 1:	3 To 1
Side slope 2:	3 To 1
Side slope 3:	3 To 1
Side slope 4:	3 To 1
Discharge Structure	
Riser Height:	2 ft.
Riser Diameter:	18 in.
Notch Type:	Rectangular
Notch Width:	1.500 ft.
Notch Height:	0.734 ft.
Orifice 1 Diameter:	9.123 in. Elevation:0 ft.
Element Flows To:	
Outlet 1	Outlet 2

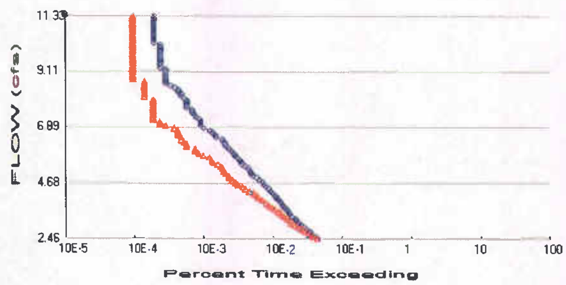
Pond Hydraulic Table

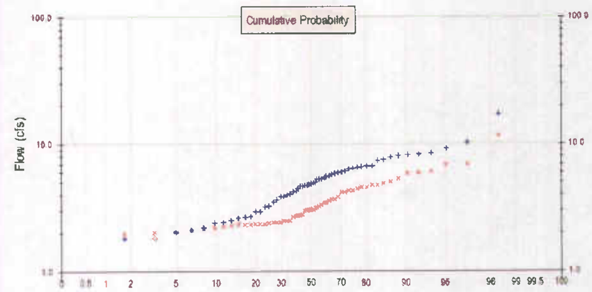
Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	0.864	0.000	0.000	0.000
0.0333	0.865	0.028	0.399	0.000
0.0667	0.867	0.057	0.564	0.000
0.1000	0.869	0.086	0.691	0.000
0.1333	0.871	0.115	0.798	0.000
0.1667	0.872	0.144	0.892	0.000
0.2000	0.874	0.173	0.977	0.000
0.2333	0.876	0.203	1.055	0.000
0.2667	0.878	0.232	1.128	0.000
0.3000	0.880	0.261	1.197	0.000
0.3333	0.881	0.291	1.262	0.000
0.3667	0.883	0.320	1.323	0.000
0.4000	0.885	0.349	1.382	0.000
0.4333	0.887	0.379	1.438	0.000
0.4667	0.889	0.409	1.493	0.000
0.5000	0.890	0.438	1.545	0.000
0.5333	0.892	0.468	1.596	0.000
0.5667	0.894	0.498	1.645	0.000
0.6000	0.896	0.528	1.693	0.000
0.6333	0.898	0.558	1.739	0.000
0.6667	0.900	0.588	1.784	0.000
0.7000	0.901	0.618	1.828	0.000
0.7333	0.903	0.648	1.871	0.000
0.7667	0.905	0.678	1.914	0.000
0.8000	0.907	0.708	1.955	0.000
0.8333	0.909	0.738	1.995	0.000
0.8667	0.910	0.769	2.035	0.000
0.9000	0.912	0.799	2.073	0.000
0.9333	0.914	0.829	2.111	0.000
0.9667	0.916	0.860	2.149	0.000
1.0000	0.918	0.891	2.185	0.000
1.0333	0.920	0.921	2.222	0.000

1.0667	0.922	0.952	2.257	0.000
1.1000	0.923	0.983	2.292	0.000
1.1333	0.925	1.013	2.327	0.000
1.1667	0.927	1.044	2.361	0.000
1.2000	0.929	1.075	2.394	0.000
1.2333	0.931	1.106	2.427	0.000
1.2667	0.933	1.137	2.460	0.000
1.3000	0.934	1.169	2.523	0.000
1.3333	0.936	1.200	2.611	0.000
1.3667	0.938	1.231	2.714	0.000
1.4000	0.940	1.262	2.831	0.000
1.4333	0.942	1.294	2.958	0.000
1.4667	0.944	1.325	3.095	0.000
1.5000	0.946	1.357	3.242	0.000
1.5333	0.947	1.388	3.396	0.000
1.5667	0.949	1.420	3.558	0.000
1.6000	0.951	1.451	3.728	0.000
1.6333	0.953	1.483	3.905	0.000
1.6667	0.955	1.515	4.088	0.000
1.7000	0.957	1.547	4.277	0.000
1.7333	0.959	1.579	4.472	0.000
1.7667	0.961	1.611	4.674	0.000
1.8000	0.962	1.643	4.881	0.000
1.8333	0.964	1.675	5.093	0.000
1.8667	0.966	1.707	5.310	0.000
1.9000	0.968	1.740	5.533	0.000
1.9333	0.970	1.772	5.761	0.000
1.9667	0.972	1.804	5.994	0.000
2.0000	0.974	1.837	6.231	0.000
2.0333	0.976	1.869	6.345	0.000
2.0667	0.978	1.902	6.533	0.000
2.1000	0.979	1.934	6.769	0.000
2.1333	0.981	1.967	7.044	0.000
2.1667	0.983	2.000	7.351	0.000
2.2000	0.985	2.033	7.688	0.000
2.2333	0.987	2.066	8.053	0.000
2.2667	0.989	2.098	8.442	0.000
2.3000	0.991	2.131	8.855	0.000
2.3333	0.993	2.165	9.290	0.000
2.3667	0.995	2.198	9.746	0.000
2.4000	0.997	2.231	10.22	0.000
2.4333	0.998	2.264	10.71	0.000
2.4667	1.000	2.297	11.23	0.000
2.5000	1.002	2.331	11.76	0.000
2.5333	1.004	2.364	12.30	0.000
2.5667	1.006	2.398	12.87	0.000
2.6000	1.008	2.431	13.45	0.000
2.6333	1.010	2.465	14.05	0.000
2.6667	1.012	2.499	14.66	0.000
2.7000	1.014	2.533	15.28	0.000
2.7333	1.016	2.566	15.92	0.000
2.7667	1.018	2.600	16.58	0.000
2.8000	1.020	2.634	17.25	0.000
2.8333	1.022	2.668	17.93	0.000
2.8667	1.024	2.702	18.62	0.000
2.9000	1.025	2.737	19.33	0.000
2.9333	1.027	2.771	20.05	0.000
2.9667	1.029	2.805	20.78	0.000

3.0000	1.031	2.839	21.53	0.000
3.0333	1.033	2.874	22.29	0.000

Analysis Results
POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 17.491
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 4.985
Total Impervious Area: 12.506

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	4.920127
5 year	7.5772
10 year	9.011185
25 year	10.465236
50 year	11.327199
100 year	12.034828

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	3.149125
5 year	4.422885
10 year	5.401487
25 year	6.802812
50 year	7.97383
100 year	9.260231

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	3.699	3.000
1950	4.770	2.697
1951	6.466	2.389
1952	3.882	4.165
1953	5.289	2.354
1954	8.092	2.784
1955	4.064	2.117
1956	7.458	6.078
1957	6.594	3.058
1958	4.894	5.341

1959	2.959	2.049
1960	2.719	3.048
1961	6.803	3.692
1962	4.757	2.759
1963	5.324	2.525
1964	4.940	2.456
1965	4.236	3.139
1966	5.925	3.024
1967	5.354	2.433
1968	6.406	4.747
1969	6.132	7.011
1970	16.965	11.540
1971	2.708	2.224
1972	4.326	2.338
1973	4.500	3.559
1974	6.812	5.858
1975	3.874	2.370
1976	5.849	3.327
1977	0.174	1.969
1978	8.518	4.286
1979	5.556	4.574
1980	3.218	2.199
1981	7.629	4.410
1982	5.046	4.870
1983	9.227	4.285
1984	2.978	2.167
1985	2.145	2.794
1986	2.658	3.233
1987	4.692	2.524
1988	2.241	2.317
1989	2.423	2.435
1990	2.063	2.357
1991	5.448	2.517
1992	5.635	2.322
1993	6.689	4.993
1994	4.828	3.466
1995	3.986	4.537
1996	8.386	6.885
1997	10.221	5.769
1998	8.260	3.814
1999	5.761	3.493
2000	3.296	1.952
2001	1.819	2.021
2002	7.947	3.051
2003	6.051	3.673
2004	1.848	3.207
2005	2.460	2.341
2006	4.663	2.731
2007	2.541	4.173
2008	3.511	4.750

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	**Predeveloped**	**Mitigated**
1	16.9652	11.5396
2	10.2213	7.0112
3	9.2270	6.8852
4	8.5178	6.0777

5	8.3862	5.8579
6	8.2596	5.7687
7	8.0919	5.3408
8	7.9468	4.9929
9	7.6288	4.8701
10	7.4583	4.7502
11	6.8121	4.7473
12	6.8032	4.5739
13	6.6891	4.5369
14	6.5941	4.4103
15	6.4660	4.2860
16	6.4063	4.2851
17	6.1323	4.1726
18	6.0510	4.1647
19	5.9253	3.8136
20	5.8487	3.6916
21	5.7606	3.6733
22	5.6350	3.5592
23	5.5560	3.4931
24	5.4482	3.4661
25	5.3543	3.3270
26	5.3236	3.2325
27	5.2891	3.2072
28	5.0462	3.1388
29	4.9397	3.0580
30	4.8939	3.0507
31	4.8279	3.0483
32	4.7705	3.0239
33	4.7570	3.0003
34	4.6919	2.7938
35	4.6629	2.7841
36	4.4998	2.7590
37	4.3257	2.7313
38	4.2357	2.6975
39	4.0643	2.5250
40	3.9863	2.5238
41	3.8824	2.5174
42	3.8740	2.4555
43	3.6989	2.4350
44	3.5108	2.4327
45	3.2958	2.3889
46	3.2175	2.3700
47	2.9777	2.3572
48	2.9594	2.3543
49	2.7186	2.3408
50	2.7080	2.3377
51	2.6577	2.3220
52	2.5405	2.3175
53	2.4601	2.2245
54	2.4231	2.1991
55	2.2410	2.1672
56	2.1455	2.1167
57	2.0632	2.0487
58	1.8482	2.0207
59	1.8188	1.9685
60	0.1745	1.9521

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
2.4601	894	893	99	Pass
2.5496	823	762	92	Pass
2.6392	755	674	89	Pass
2.7288	687	589	85	Pass
2.8183	626	527	84	Pass
2.9079	576	476	82	Pass
2.9975	535	429	80	Pass
3.0870	490	379	77	Pass
3.1766	456	348	76	Pass
3.2662	430	320	74	Pass
3.3557	392	296	75	Pass
3.4453	363	275	75	Pass
3.5349	346	251	72	Pass
3.6244	324	222	68	Pass
3.7140	304	201	66	Pass
3.8036	287	181	63	Pass
3.8931	271	163	60	Pass
3.9827	253	143	56	Pass
4.0723	237	127	53	Pass
4.1618	226	123	54	Pass
4.2514	211	109	51	Pass
4.3410	193	96	49	Pass
4.4305	182	84	46	Pass
4.5201	165	76	46	Pass
4.6097	152	66	43	Pass
4.6992	145	61	42	Pass
4.7888	131	55	41	Pass
4.8784	120	50	41	Pass
4.9679	107	49	45	Pass
5.0575	100	44	44	Pass
5.1471	96	42	43	Pass
5.2366	91	40	43	Pass
5.3262	83	38	45	Pass
5.4158	75	34	45	Pass
5.5053	71	29	40	Pass
5.5949	69	28	40	Pass
5.6845	62	26	41	Pass
5.7740	59	21	35	Pass
5.8636	56	18	32	Pass
5.9532	52	16	30	Pass
6.0427	49	16	32	Pass
6.1323	44	12	27	Pass
6.2219	43	12	27	Pass
6.3114	41	11	26	Pass
6.4010	39	10	25	Pass
6.4906	32	10	31	Pass
6.5801	30	9	30	Pass
6.6697	28	9	32	Pass
6.7593	26	9	34	Pass
6.8488	21	8	38	Pass
6.9384	19	6	31	Pass
7.0280	19	5	26	Pass
7.1175	19	5	26	Pass

7.2071	18	4	22	Pass
7.2967	16	4	25	Pass
7.3862	15	4	26	Pass
7.4758	14	4	28	Pass
7.5654	14	4	28	Pass
7.6550	12	4	33	Pass
7.7445	12	4	33	Pass
7.8341	12	4	33	Pass
7.9237	12	4	33	Pass
8.0132	11	4	36	Pass
8.1028	10	3	30	Pass
8.1924	10	3	30	Pass
8.2819	9	3	33	Pass
8.3715	9	3	33	Pass
8.4611	8	3	37	Pass
8.5506	7	3	42	Pass
8.6402	6	3	50	Pass
8.7298	6	3	50	Pass
8.8193	6	2	33	Pass
8.9089	6	2	33	Pass
8.9985	6	2	33	Pass
9.0880	6	2	33	Pass
9.1776	6	2	33	Pass
9.2672	5	2	40	Pass
9.3567	5	2	40	Pass
9.4463	5	2	40	Pass
9.5359	5	2	40	Pass
9.6254	5	2	40	Pass
9.7150	5	2	40	Pass
9.8046	5	2	40	Pass
9.8941	5	2	40	Pass
9.9837	5	2	40	Pass
10.0733	5	2	40	Pass
10.1628	5	2	40	Pass
10.2524	4	2	50	Pass
10.3420	4	2	50	Pass
10.4315	4	2	50	Pass
10.5211	4	2	50	Pass
10.6107	4	2	50	Pass
10.7002	4	2	50	Pass
10.7898	4	2	50	Pass
10.8794	4	2	50	Pass
10.9689	4	2	50	Pass
11.0585	4	2	50	Pass
11.1481	4	2	50	Pass
11.2376	4	2	50	Pass
11.3272	4	2	50	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	2.0201 acre-feet
On-line facility target flow:	2.7556 cfs.
Adjusted for 15 min:	2.7556 cfs.
Off-line facility target flow:	1.5386 cfs.
Adjusted for 15 min:	1.5386 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Trapezoidal Pond 1 POC	☐	2608.81			☐	0.00			
Total Volume Infiltrated		2608.81	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50-yr									Duration Analysis Result = Failed

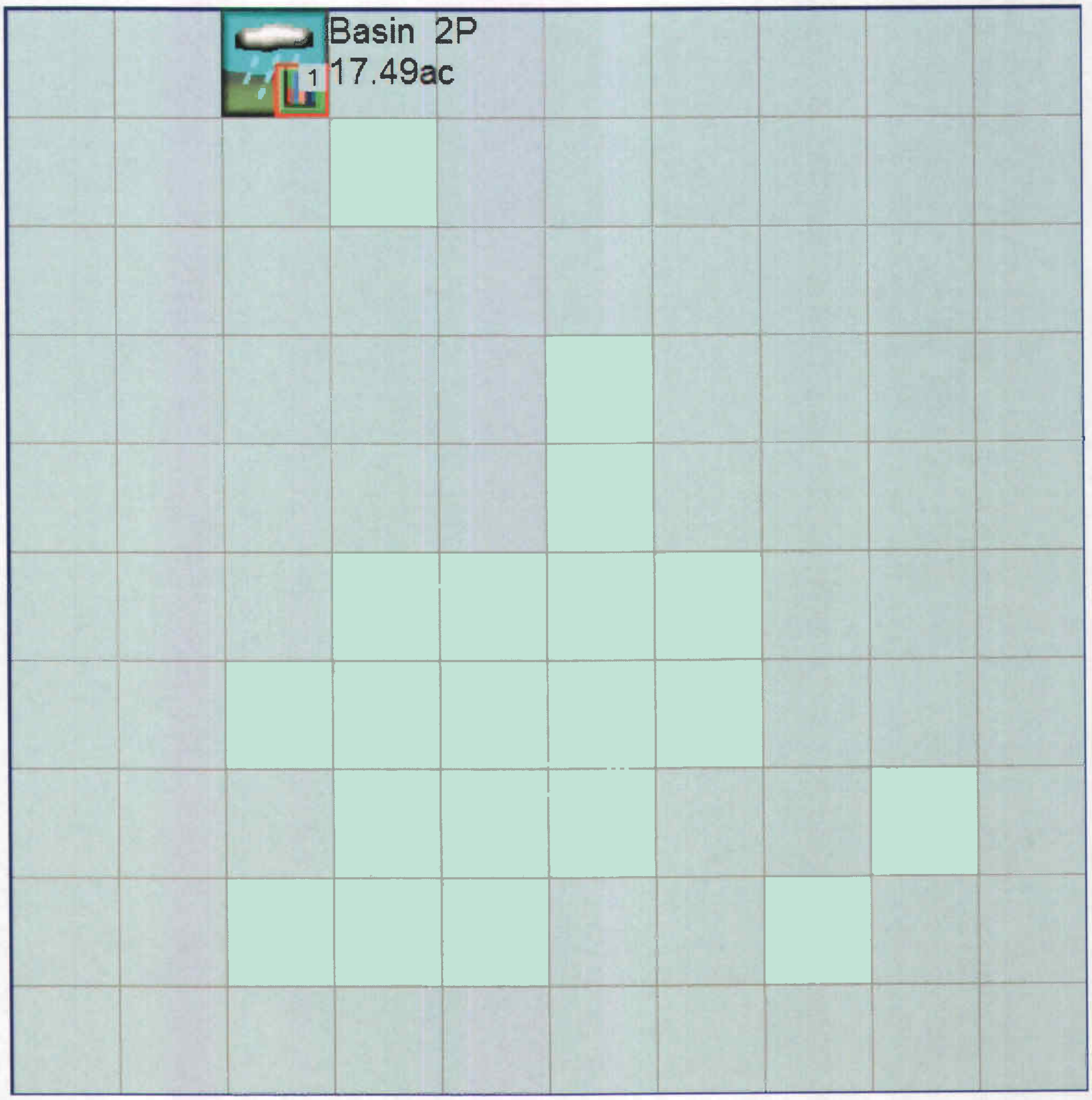
Model Default Modifications

Total of 0 changes have been made.

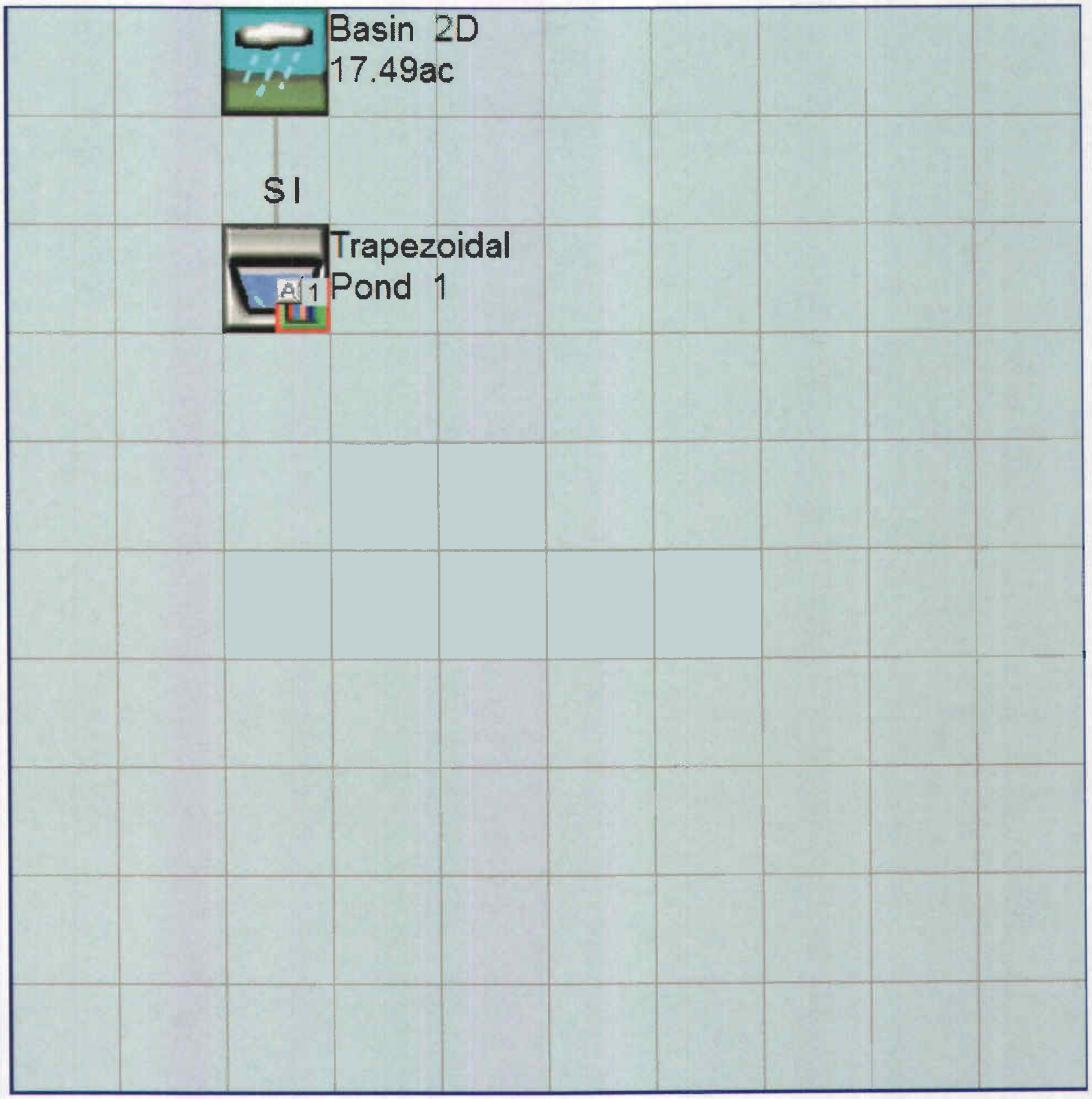
PERLND Changes
No PERLND changes have been made.

IMPLND Changes
No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2008 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   8938.e.Green Mtn Ph1-Prelim-Tract K Pond.wdm
MESSU      25   Pre8938.e.Green Mtn Ph1-Prelim-Tract K Pond.MES
           27   Pre8938.e.Green Mtn Ph1-Prelim-Tract K Pond.L61
           28   Pre8938.e.Green Mtn Ph1-Prelim-Tract K Pond.L62
           30   POC8938.e.Green Mtn Ph1-Prelim-Tract K Pond1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      29
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  2P                    MAX                  1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   29      SG4, Forest, Mod        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   29         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   29         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -   # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   29         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >       PWATER input info: Part 2          ***
    # -   # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   29             0         6      0.04       400       0.1         0      0.96
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >       PWATER input info: Part 3          ***
    # -   # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   29             0         0         3         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                    ***
    # -   #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   29             0.2       0.4      0.35         2       0.4       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -   # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   29             0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name-------> Unit-systems   Printer ***
    # -   #                     User  t-series Engl Metr ***
                                      in  out          ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -   # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -   # ATMP SNOW IWAT  SLD  IWG IQAL   *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -   # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >       IWATER input info: Part 2          ***
    # -   # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >       IWATER input info: Part 3          ***
    # -   # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -   # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK    ***
<Name>   #                  <-factor->     <Name>   #   Tbl#    ***
Basin  2P***
PERLND  29                      17.491     COPY   501      12
PERLND  29                      17.491     COPY   501      13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                           in  out                           ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *          ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN      DELTH      STCOR         KS       DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.3            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.3            IMPLND   1 999 EXTNL  PREC
```

```
WDM       1 EVAP     ENGL    0.8              PERLND   1 999 EXTNL  PETINP
WDM       1 EVAP     ENGL    0.8              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1      48.4     WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2008 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME      0 RUN      1                 UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   8938.e.Green Mtn Ph1-Prelim-Tract K Pond.wdm
MESSU      25   Mit8938.e.Green Mtn Ph1-Prelim-Tract K Pond.MES
           27   Mit8938.e.Green Mtn Ph1-Prelim-Tract K Pond.L61
           28   Mit8938.e.Green Mtn Ph1-Prelim-Tract K Pond.L62
           30   POC8938.e.Green Mtn Ph1-Prelim-Tract K Pond1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      26
      IMPLND       2
      IMPLND       4
      IMPLND       6
      IMPLND       9
      IMPLND      14
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Trapezoidal Pond  1         MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS  Unit-systems   Printer ***
    # -  #                         User  t-series Engl Metr ***
                                          in  out           ***
   26      SG3, Lawn, Mod         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   26         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY
```

```
PRINT-INFO
  <PLS > ***************** Print-flags ***************************** PIVL  PYR
  # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
 26         0    0    4    0    0    0    0    0    0    0    0    0    1    9
END PRINT-INFO

PWAT-PARM1
  <PLS >  PWATER variable monthly parameter value flags  ***
  # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
 26         0    0    0    0    0    0    0    0    0    0    0
END PWAT-PARM1

PWAT-PARM2
  <PLS >      PWATER input info: Part 2         ***
  # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
 26              0         6      0.05       400       0.1         0      0.96
END PWAT-PARM2

PWAT-PARM3
  <PLS >      PWATER input info: Part 3         ***
  # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
 26              0         0       2.5         2         0         0         0
END PWAT-PARM3
PWAT-PARM4
  <PLS >     PWATER input info: Part 4                                  ***
  # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
 26            0.1       0.8      0.25         4       0.4      0.25
END PWAT-PARM4

PWAT-STATE1
  <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
  # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
 26              0         0         0         0         3         1         0
END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name-------> Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
    2       ROADS/MOD             1    1    1   27    0
    4       ROOF TOPS/FLAT        1    1    1   27    0
    6       DRIVEWAYS/MOD         1    1    1   27    0
    9       SIDEWALKS/MOD         1    1    1   27    0
   14       POND                  1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
    4         0    0    1    0    0    0
    6         0    0    1    0    0    0
    9         0    0    1    0    0    0
   14         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   *********
    2         0    0    4    0    0    0    1    9
    4         0    0    4    0    0    0    1    9
    6         0    0    4    0    0    0    1    9
    9         0    0    4    0    0    0    1    9
   14         0    0    4    0    0    0    1    9
```

```
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -   # CSNO RTOP  VRS  VNN RTLI     ***
    2          0    0    0    0    0
    4          0    0    0    0    0
    6          0    0    0    0    0
    9          0    0    0    0    0
   14          0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2        ***
    # -   # ***  LSUR     SLSUR      NSUR     RETSC
    2             400      0.05       0.1      0.08
    4             400      0.01       0.1       0.1
    6             400      0.05       0.1      0.08
    9             400      0.05       0.1      0.08
   14             400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3        ***
    # -   # ***PETMAX    PETMIN
    2               0         0
    4               0         0
    6               0         0
    9               0         0
   14               0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -   # ***  RETS      SURS
    2               0         0
    4               0         0
    6               0         0
    9               0         0
   14               0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->  MBLK   ***
<Name>   #                  <-factor->     <Name>   #  Tbl#   ***
Basin  2D***
PERLND  26                      4.985      RCHRES   1     2
PERLND  26                      4.985      RCHRES   1     3
IMPLND   2                       4.44      RCHRES   1     5
IMPLND   4                      4.075      RCHRES   1     5
IMPLND   6                      0.815      RCHRES   1     5
IMPLND   9                      1.147      RCHRES   1     5
IMPLND  14                      2.029      RCHRES   1     5

******Routing******
PERLND  26                      4.985      COPY     1    12
IMPLND   2                       4.44      COPY     1    15
IMPLND   4                      4.075      COPY     1    15
IMPLND   6                      0.815      COPY     1    15
IMPLND   9                      1.147      COPY     1    15
IMPLND  14                      2.029      COPY     1    15
PERLND  26                      4.985      COPY     1    13
RCHRES   1                          1      COPY   501    16
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
```

```
COPY    501 OUTPUT MEAN    1 1    48.4         DISPLY    1      INPUT   TIMSER 1


<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>    #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                           in  out                           ***
    1     Trapezoidal Pond-009    1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1       1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1       4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #   VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
             FG FG FG FG  possible   exit *** possible   exit     possible  exit
              *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
    1         0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #     FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1              1      0.02       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND    Initial  value  of OUTDGT
         *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1          0          4.0  0.0  0.0  0.0  0.0        0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   91    4
     Depth       Area     Volume   Outflow1 Velocity  Travel Time***
      (ft)    (acres)  (acre-ft)    (cfs)   (ft/sec)    (Minutes)***
  0.000000   0.350487   0.000000   0.000000
  0.033333   0.351622   0.011702   0.399093
  0.066667   0.352760   0.023442   0.564402
  0.100000   0.353899   0.035219   0.691249
  0.133333   0.355040   0.047035   0.798185
  0.166667   0.356183   0.058889   0.892398
  0.200000   0.357328   0.070780   0.977573
  0.233333   0.358474   0.082710   1.055900
  0.266667   0.359622   0.094679   1.128805
  0.300000   0.360773   0.106685   1.197278
  0.333333   0.361925   0.118730   1.262042
  0.366667   0.363079   0.130814   1.323641
```

0.400000	0.364234	0.142935	1.382498
0.433333	0.365392	0.155096	1.438949
0.466667	0.366551	0.167295	1.493268
0.500000	0.367713	0.179533	1.545679
0.533333	0.368876	0.191809	1.596371
0.566667	0.370041	0.204124	1.645501
0.600000	0.371207	0.216479	1.693207
0.633333	0.372376	0.228872	1.739605
0.666667	0.373546	0.241304	1.784797
0.700000	0.374719	0.253775	1.828872
0.733333	0.375893	0.266285	1.871911
0.766667	0.377069	0.278834	1.913981
0.800000	0.378247	0.291423	1.955147
0.833333	0.379426	0.304051	1.995463
0.866667	0.380608	0.316718	2.034981
0.900000	0.381791	0.329425	2.073746
0.933333	0.382976	0.342171	2.111800
0.966667	0.384163	0.354956	2.149180
1.000000	0.385352	0.367782	2.185921
1.033333	0.386542	0.380647	2.222054
1.066667	0.387735	0.393551	2.257609
1.100000	0.388929	0.406496	2.292613
1.133333	0.390125	0.419480	2.327090
1.166667	0.391323	0.432504	2.361064
1.200000	0.392523	0.445568	2.394556
1.233333	0.393725	0.458672	2.427586
1.266667	0.394928	0.471816	2.460229
1.300000	0.396134	0.485001	2.523421
1.333333	0.397341	0.498225	2.611037
1.366667	0.398550	0.511490	2.714587
1.400000	0.399761	0.524795	2.830980
1.433333	0.400973	0.538141	2.958429
1.466667	0.402188	0.551527	3.095731
1.500000	0.403404	0.564954	3.242003
1.533333	0.404622	0.578421	3.396564
1.566667	0.405842	0.591928	3.558865
1.600000	0.407064	0.605477	3.728456
1.633333	0.408288	0.619066	3.904956
1.666667	0.409514	0.632696	4.088038
1.700000	0.410741	0.646367	4.277417
1.733333	0.411970	0.660079	4.472845
1.766667	0.413201	0.673832	4.674098
1.800000	0.414434	0.687626	4.880979
1.833333	0.415669	0.701461	5.093306
1.866667	0.416905	0.715337	5.310917
1.900000	0.418144	0.729254	5.533662
1.933333	0.419384	0.743213	5.761405
1.966667	0.420626	0.757213	5.994019
2.000000	0.421870	0.771255	6.231386
2.033333	0.423116	0.785338	6.345946
2.066667	0.424363	0.799463	6.533947
2.100000	0.425613	0.813629	6.769689
2.133333	0.426864	0.827837	7.044005
2.166667	0.428117	0.842087	7.351598
2.200000	0.429372	0.856378	7.688896
2.233333	0.430629	0.870711	8.053277
2.266667	0.431887	0.885087	8.442710
2.300000	0.433148	0.899504	8.855562
2.333333	0.434410	0.913963	9.290484
2.366667	0.435674	0.928465	9.746334
2.400000	0.436940	0.943008	10.22213
2.433333	0.438208	0.957594	10.71702
2.466667	0.439477	0.972222	11.23026
2.500000	0.440749	0.986893	11.76116
2.533333	0.442022	1.001605	12.30913
2.566667	0.443297	1.016361	12.87362
2.600000	0.444574	1.031159	13.45414
2.633333	0.445853	1.045999	14.05023
2.666667	0.447134	1.060882	14.66148
2.700000	0.448416	1.075808	15.28751

```
  2.733333  0.449700  1.090777  15.92795
  2.766667  0.450986  1.105788  16.58247
  2.800000  0.452274  1.120842  17.25076
  2.833333  0.453564  1.135940  17.93254
  2.866667  0.454856  1.151080  18.62753
  2.900000  0.456149  1.166263  19.33547
  2.933333  0.457445  1.181490  20.05612
  2.966667  0.458742  1.196760  20.78926
  3.000000  0.460041  1.212073  21.53465
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL     1.3           PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL     1.3           IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL     0.8           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL     0.8           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1004 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1005 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK   2

  MASS-LINK       3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK   3

  MASS-LINK       5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK   5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

TRACT 'H' FACILITY

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	8938.e.Green Mtn Ph1-Prelim-Tract H Pond
Site Name:	Green Mountain
Site Address:	NE Goodwin Road
City:	Camas, WA.
Report Date:	12/23/2014
Gage:	Lacamas
Data Start:	1948/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.30
Version:	2014/09/12

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1P

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
SG4, Forest, Mod	8.612
Pervious Total	8.612
Impervious Land Use	Acres
Impervious Total	0
Basin Total	8.612

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1Da

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
SG3, Lawn, Mod	2.053
Pervious Total	2.053
Impervious Land Use	Acres
ROADS MOD	0.965
ROOF TOPS FLAT	2.066
DRIVEWAYS MOD	0.413
SIDEWALKS MOD	0.318
POND	0.921
Impervious Total	4.683
Basin Total	6.736

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

Basin 1Db (Future Lots)

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
SG3, Lawn, Mod	0.656
Pervious Total	0.656
Impervious Land Use	Acres
ROADS MOD	0.319
ROOF TOPS FLAT	0.675
DRIVEWAYS MOD	0.131
SIDEWALKS MOD	0.094
Impervious Total	1.219
Basin Total	1.875

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Trapezoidal Pond 1

Bottom Length:	139.00 ft.
Bottom Width:	139.00 ft.
Depth:	3 ft.
Volume at riser head:	0.9659 acre-ft.
Side slope 1:	3 To 1
Side slope 2:	3 To 1
Side slope 3:	3 To 1
Side slope 4:	3 To 1
Discharge Structure	
Riser Height:	2 ft.
Riser Diameter:	18 in.
Notch Type:	Rectangular
Notch Width:	1.000 ft.
Notch Height:	0.900 ft.
Orifice 1 Diameter:	6.631 in. Elevation:0 ft.
Element Flows To:	
Outlet 1	Outlet 2

Pond Hydraulic Table

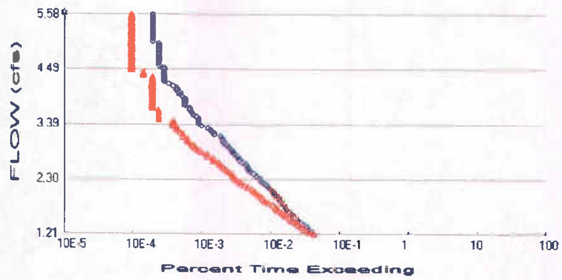
Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	0.443	0.000	0.000	0.000
0.0333	0.444	0.014	0.210	0.000
0.0667	0.446	0.029	0.298	0.000
0.1000	0.447	0.044	0.365	0.000
0.1333	0.448	0.059	0.421	0.000
0.1667	0.450	0.074	0.471	0.000
0.2000	0.451	0.089	0.516	0.000
0.2333	0.452	0.104	0.557	0.000
0.2667	0.453	0.119	0.596	0.000
0.3000	0.455	0.134	0.632	0.000
0.3333	0.456	0.150	0.666	0.000
0.3667	0.457	0.165	0.699	0.000
0.4000	0.459	0.180	0.730	0.000
0.4333	0.460	0.195	0.760	0.000
0.4667	0.461	0.211	0.788	0.000
0.5000	0.462	0.226	0.816	0.000
0.5333	0.464	0.242	0.843	0.000
0.5667	0.465	0.257	0.869	0.000
0.6000	0.466	0.273	0.894	0.000
0.6333	0.468	0.288	0.919	0.000
0.6667	0.469	0.304	0.942	0.000
0.7000	0.470	0.320	0.966	0.000
0.7333	0.472	0.335	0.988	0.000
0.7667	0.473	0.351	1.011	0.000
0.8000	0.474	0.367	1.032	0.000
0.8333	0.476	0.383	1.054	0.000
0.8667	0.477	0.399	1.075	0.000
0.9000	0.478	0.414	1.095	0.000
0.9333	0.480	0.430	1.115	0.000
0.9667	0.481	0.446	1.135	0.000
1.0000	0.482	0.463	1.154	0.000
1.0333	0.484	0.479	1.173	0.000

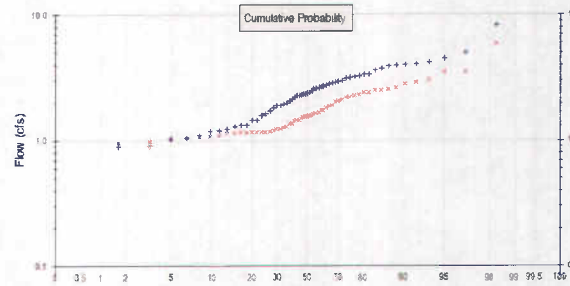
1.0667	0.485	0.495	1.192	0.000
1.1000	0.486	0.511	1.211	0.000
1.1333	0.488	0.527	1.249	0.000
1.1667	0.489	0.544	1.304	0.000
1.2000	0.490	0.560	1.370	0.000
1.2333	0.492	0.576	1.444	0.000
1.2667	0.493	0.593	1.526	0.000
1.3000	0.494	0.609	1.614	0.000
1.3333	0.496	0.626	1.708	0.000
1.3667	0.497	0.642	1.808	0.000
1.4000	0.498	0.659	1.913	0.000
1.4333	0.500	0.675	2.023	0.000
1.4667	0.501	0.692	2.137	0.000
1.5000	0.502	0.709	2.256	0.000
1.5333	0.504	0.726	2.379	0.000
1.5667	0.505	0.742	2.507	0.000
1.6000	0.506	0.759	2.638	0.000
1.6333	0.508	0.776	2.772	0.000
1.6667	0.509	0.793	2.911	0.000
1.7000	0.511	0.810	3.053	0.000
1.7333	0.512	0.827	3.198	0.000
1.7667	0.513	0.844	3.347	0.000
1.8000	0.515	0.862	3.499	0.000
1.8333	0.516	0.879	3.654	0.000
1.8667	0.517	0.896	3.813	0.000
1.9000	0.519	0.913	3.974	0.000
1.9333	0.520	0.931	4.138	0.000
1.9667	0.522	0.948	4.306	0.000
2.0000	0.523	0.965	4.476	0.000
2.0333	0.524	0.983	4.578	0.000
2.0667	0.526	1.000	4.754	0.000
2.1000	0.527	1.018	4.978	0.000
2.1333	0.529	1.036	5.241	0.000
2.1667	0.530	1.053	5.537	0.000
2.2000	0.531	1.071	5.862	0.000
2.2333	0.533	1.089	6.215	0.000
2.2667	0.534	1.107	6.593	0.000
2.3000	0.536	1.124	6.995	0.000
2.3333	0.537	1.142	7.418	0.000
2.3667	0.538	1.160	7.863	0.000
2.4000	0.540	1.178	8.327	0.000
2.4333	0.541	1.196	8.811	0.000
2.4667	0.543	1.214	9.314	0.000
2.5000	0.544	1.232	9.834	0.000
2.5333	0.545	1.251	10.37	0.000
2.5667	0.547	1.269	10.92	0.000
2.6000	0.548	1.287	11.49	0.000
2.6333	0.550	1.305	12.08	0.000
2.6667	0.551	1.324	12.68	0.000
2.7000	0.553	1.342	13.29	0.000
2.7333	0.554	1.361	13.92	0.000
2.7667	0.555	1.379	14.57	0.000
2.8000	0.557	1.398	15.22	0.000
2.8333	0.558	1.416	15.90	0.000
2.8667	0.560	1.435	16.58	0.000
2.9000	0.561	1.454	17.28	0.000
2.9333	0.563	1.472	17.99	0.000
2.9667	0.564	1.491	18.71	0.000

3.0000	0.565	1.510	19.45	0.000
3.0333	0.567	1.529	20.19	0.000

Analysis Results

POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 8.612
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 2.709
Total Impervious Area: 5.902

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	2.422511
5 year	3.730766
10 year	4.436813
25 year	5.15274
50 year	5.577142
100 year	5.925555

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	1.596139
5 year	2.259723
10 year	2.772708
25 year	3.511033
50 year	4.130813
100 year	4.814129

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	1.821	1.575
1950	2.349	1.379
1951	3.184	1.175
1952	1.912	2.147
1953	2.604	1.186
1954	3.984	1.450
1955	2.001	1.057
1956	3.672	3.038
1957	3.247	1.589
1958	2.410	2.658

1959	1.457	1.017
1960	1.339	1.531
1961	3.350	1.913
1962	2.342	1.455
1963	2.621	1.309
1964	2.432	1.243
1965	2.086	1.552
1966	2.917	1.567
1967	2.636	1.195
1968	3.154	2.556
1969	3.019	3.487
1970	8.353	5.971
1971	1.333	1.102
1972	2.130	1.162
1973	2.216	1.822
1974	3.354	2.905
1975	1.907	1.180
1976	2.880	1.684
1977	0.086	0.972
1978	4.194	2.239
1979	2.736	2.423
1980	1.584	1.088
1981	3.756	2.336
1982	2.485	2.428
1983	4.543	2.295
1984	1.466	1.078
1985	1.056	1.384
1986	1.309	1.648
1987	2.310	1.242
1988	1.103	1.151
1989	1.193	1.207
1990	1.016	1.169
1991	2.683	1.288
1992	2.774	1.171
1993	3.294	2.540
1994	2.377	1.759
1995	1.963	2.229
1996	4.129	3.503
1997	5.033	2.840
1998	4.067	2.059
1999	2.836	1.740
2000	1.623	0.969
2001	0.896	0.998
2002	3.913	1.593
2003	2.979	1.892
2004	0.910	1.643
2005	1.211	1.151
2006	2.296	1.436
2007	1.251	2.070
2008	1.729	2.524

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	8.3531	5.9714
2	5.0326	3.5031
3	4.5431	3.4870
4	4.1939	3.0383

5	4.1291	2.9053
6	4.0668	2.8403
7	3.9842	2.6583
8	3.9128	2.5562
9	3.7562	2.5399
10	3.6722	2.5243
11	3.3541	2.4281
12	3.3497	2.4228
13	3.2935	2.3360
14	3.2467	2.2951
15	3.1836	2.2385
16	3.1543	2.2293
17	3.0193	2.1474
18	2.9793	2.0703
19	2.9174	2.0588
20	2.8797	1.9131
21	2.8364	1.8923
22	2.7745	1.8219
23	2.7356	1.7593
24	2.6825	1.7405
25	2.6363	1.6839
26	2.6212	1.6483
27	2.6042	1.6426
28	2.4846	1.5932
29	2.4321	1.5886
30	2.4096	1.5748
31	2.3771	1.5671
32	2.3488	1.5517
33	2.3422	1.5306
34	2.3102	1.4552
35	2.2959	1.4503
36	2.2155	1.4362
37	2.1299	1.3835
38	2.0855	1.3785
39	2.0011	1.3091
40	1.9627	1.2883
41	1.9116	1.2432
42	1.9074	1.2421
43	1.8212	1.2070
44	1.7286	1.1947
45	1.6228	1.1859
46	1.5842	1.1800
47	1.4661	1.1749
48	1.4571	1.1708
49	1.3385	1.1686
50	1.3333	1.1617
51	1.3085	1.1507
52	1.2509	1.1506
53	1.2113	1.1018
54	1.1931	1.0876
55	1.1034	1.0776
56	1.0564	1.0572
57	1.0158	1.0171
58	0.9100	0.9979
59	0.8955	0.9715
60	0.0859	0.9692

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
1.2113	895	891	99	Pass
1.2554	823	764	92	Pass
1.2995	755	664	87	Pass
1.3436	687	591	86	Pass
1.3877	626	528	84	Pass
1.4318	576	493	85	Pass
1.4759	536	442	82	Pass
1.5200	494	399	80	Pass
1.5641	455	353	77	Pass
1.6082	430	327	76	Pass
1.6523	392	300	76	Pass
1.6964	364	271	74	Pass
1.7405	346	249	71	Pass
1.7846	324	227	70	Pass
1.8287	305	197	64	Pass
1.8728	287	176	61	Pass
1.9169	271	161	59	Pass
1.9610	253	147	58	Pass
2.0051	237	133	56	Pass
2.0492	226	124	54	Pass
2.0933	211	113	53	Pass
2.1374	193	98	50	Pass
2.1815	182	88	48	Pass
2.2256	165	77	46	Pass
2.2697	152	71	46	Pass
2.3138	145	64	44	Pass
2.3579	131	60	45	Pass
2.4020	120	57	47	Pass
2.4461	107	52	48	Pass
2.4902	100	48	48	Pass
2.5343	96	43	44	Pass
2.5784	91	39	42	Pass
2.6225	83	37	44	Pass
2.6666	75	32	42	Pass
2.7107	71	31	43	Pass
2.7548	69	26	37	Pass
2.7989	62	25	40	Pass
2.8430	59	21	35	Pass
2.8871	56	19	33	Pass
2.9312	52	17	32	Pass
2.9753	49	16	32	Pass
3.0193	44	14	31	Pass
3.0634	43	13	30	Pass
3.1075	41	13	31	Pass
3.1516	39	11	28	Pass
3.1957	32	11	34	Pass
3.2398	30	10	33	Pass
3.2839	28	9	32	Pass
3.3280	26	9	34	Pass
3.3721	21	8	38	Pass
3.4162	19	8	42	Pass
3.4603	19	8	42	Pass
3.5044	19	5	26	Pass

3.5485	18	5	27	Pass
3.5926	16	5	31	Pass
3.6367	15	5	33	Pass
3.6808	14	5	35	Pass
3.7249	14	4	28	Pass
3.7690	12	4	33	Pass
3.8131	12	4	33	Pass
3.8572	12	4	33	Pass
3.9013	12	4	33	Pass
3.9454	11	4	36	Pass
3.9895	10	4	40	Pass
4.0336	10	4	40	Pass
4.0777	9	4	44	Pass
4.1218	9	4	44	Pass
4.1659	8	4	50	Pass
4.2100	7	4	57	Pass
4.2541	6	4	66	Pass
4.2982	6	4	66	Pass
4.3423	6	4	66	Pass
4.3864	6	3	50	Pass
4.4305	6	3	50	Pass
4.4746	6	2	33	Pass
4.5187	6	2	33	Pass
4.5628	5	2	40	Pass
4.6069	5	2	40	Pass
4.6510	5	2	40	Pass
4.6951	5	2	40	Pass
4.7392	5	2	40	Pass
4.7833	5	2	40	Pass
4.8274	5	2	40	Pass
4.8715	5	2	40	Pass
4.9156	5	2	40	Pass
4.9597	5	2	40	Pass
5.0038	5	2	40	Pass
5.0479	4	2	50	Pass
5.0920	4	2	50	Pass
5.1361	4	2	50	Pass
5.1802	4	2	50	Pass
5.2243	4	2	50	Pass
5.2684	4	2	50	Pass
5.3125	4	2	50	Pass
5.3566	4	2	50	Pass
5.4007	4	2	50	Pass
5.4448	4	2	50	Pass
5.4889	4	2	50	Pass
5.5330	4	2	50	Pass
5.5771	4	2	50	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0.9776 acre-feet
On-line facility target flow:	1.284 cfs.
Adjusted for 15 min:	1.284 cfs.
Off-line facility target flow:	0.7159 cfs.
Adjusted for 15 min:	0.7159 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Trapezoidal Pond 1 POC	☐	1253.39			☐	0.00			
Total Volume Infiltrated		1253.39	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50-yr									Duration Analysis Result = Failed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

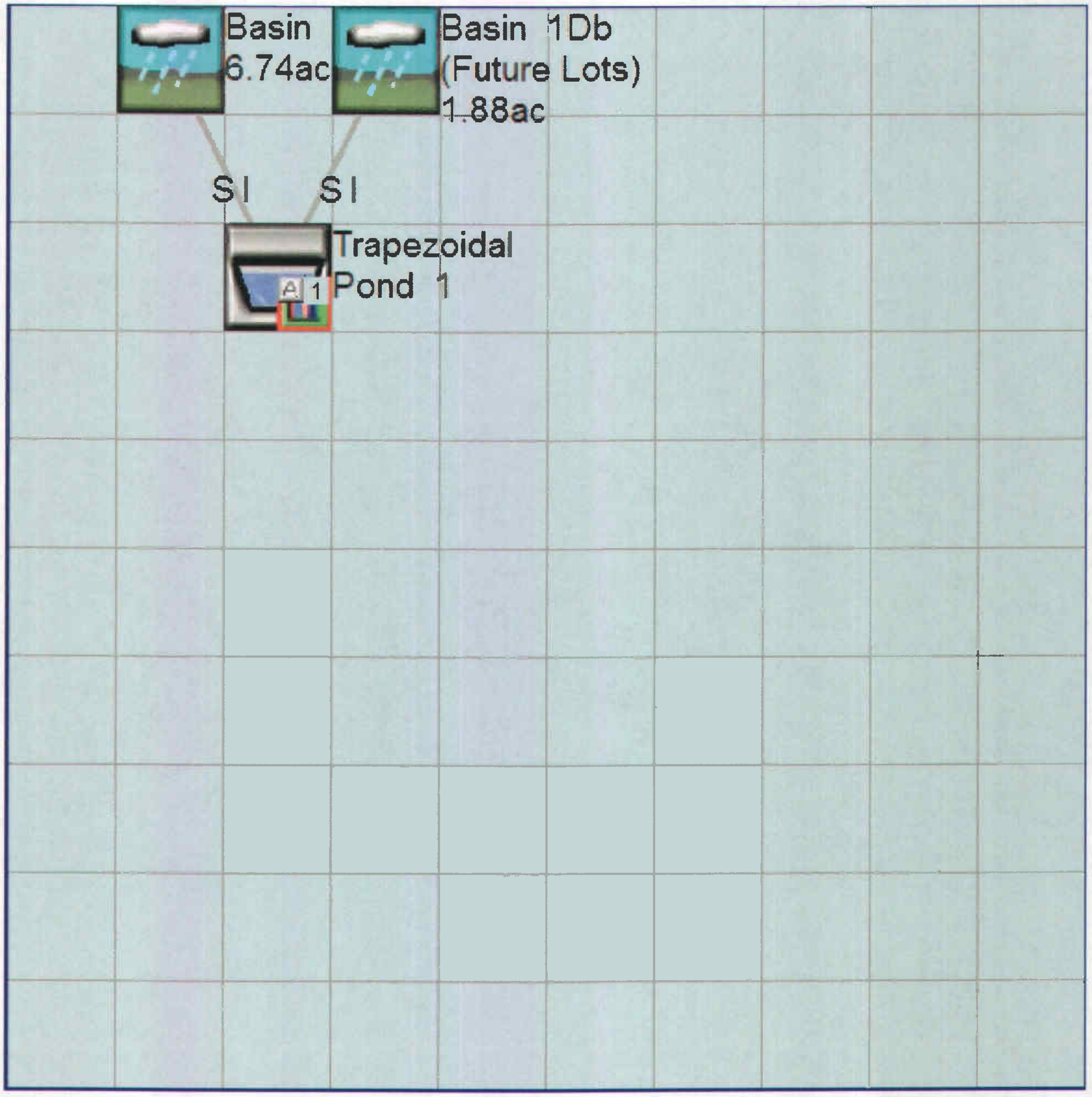
IMPLND Changes

No IMPLND changes have been made.

Appendix

Predeveloped Schematic

Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2008 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME      0 RUN      1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                               ***
WDM        26   8938.e.Green Mtn Ph1-Prelim-Tract F Pond.wdm
MESSU      25   Pre8938.e.Green Mtn Ph1-Prelim-Tract F Pond.MES
           27   Pre8938.e.Green Mtn Ph1-Prelim-Tract F Pond.L61
           28   Pre8938.e.Green Mtn Ph1-Prelim-Tract F Pond.L62
           30   POC8938.e.Green Mtn Ph1-Prelim-Tract F Pond1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      29
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1P                    MAX                   1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   29     SG4, Forest, Mod         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   29         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   29         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   29         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   29             0         6      0.04       400       0.1         0      0.96
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   29             0         0         3         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   29            0.2       0.4      0.35         2       0.4       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   29             0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->    MBLK    ***
<Name>    #                 <-factor->     <Name>   #    Tbl#    ***
Basin  1P***
PERLND  29                       8.612     COPY   501     12
PERLND  29                       8.612     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>    #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY    501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1


<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>    #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                          in  out                            ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit     possible  exit
              *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
           *** ac-ft     for each possible exit      for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.3            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.3            IMPLND   1 999 EXTNL  PREC
```

```
WDM       1 EVAP     ENGL     0.8              PERLND    1 999 EXTNL  PETINP
WDM       1 EVAP     ENGL     0.8              IMPLND    1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1      48.4     WDM    501 FLOW     ENGL       REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2008 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME      0 RUN     1                  UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   8938.e.Green Mtn Ph1-Prelim-Tract F Pond.wdm
MESSU      25   Mit8938.e.Green Mtn Ph1-Prelim-Tract F Pond.MES
           27   Mit8938.e.Green Mtn Ph1-Prelim-Tract F Pond.L61
           28   Mit8938.e.Green Mtn Ph1-Prelim-Tract F Pond.L62
           30   POC8938.e.Green Mtn Ph1-Prelim-Tract F Pond1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      26
      IMPLND       2
      IMPLND       4
      IMPLND       6
      IMPLND       9
      IMPLND      14
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Trapezoidal Pond  1         MAX                   1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                         User  t-series Engl Metr ***
                                         in  out          ***
   26      SG3, Lawn, Mod          1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   26         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY
```

```
  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   26         0    0    4    0    0    0    0    0    0    0    0    0     1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   26         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   26              0         6      0.05       400       0.1         0      0.96
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   26              0         0       2.5         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   26            0.1       0.8      0.25         4       0.4      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
                 ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   26              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
    2       ROADS/MOD             1    1    1   27    0
    4       ROOF TOPS/FLAT        1    1    1   27    0
    6       DRIVEWAYS/MOD         1    1    1   27    0
    9       SIDEWALKS/MOD         1    1    1   27    0
   14       POND                  1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
    4         0    0    1    0    0    0
    6         0    0    1    0    0    0
    9         0    0    1    0    0    0
   14         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   *********
    2         0    0    4    0    0    0    1    9
    4         0    0    4    0    0    0    1    9
    6         0    0    4    0    0    0    1    9
    9         0    0    4    0    0    0    1    9
   14         0    0    4    0    0    0    1    9
```

```
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -   # CSNO RTOP  VRS  VNN RTLI      ***
    2          0    0    0    0    0
    4          0    0    0    0    0
    6          0    0    0    0    0
    9          0    0    0    0    0
   14          0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2        ***
    # -   # ***  LSUR     SLSUR      NSUR     RETSC
    2             400      0.05       0.1      0.08
    4             400      0.01       0.1       0.1
    6             400      0.05       0.1      0.08
    9             400      0.05       0.1      0.08
   14             400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3        ***
    # -   # ***PETMAX    PETMIN
    2               0         0
    4               0         0
    6               0         0
    9               0         0
   14               0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -   # ***  RETS      SURS
    2               0         0
    4               0         0
    6               0         0
    9               0         0
   14               0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1Da***
PERLND  26                       2.053     RCHRES   1      2
PERLND  26                       2.053     RCHRES   1      3
IMPLND   2                       0.965     RCHRES   1      5
IMPLND   4                       2.066     RCHRES   1      5
IMPLND   6                       0.413     RCHRES   1      5
IMPLND   9                       0.318     RCHRES   1      5
IMPLND  14                       0.921     RCHRES   1      5
Basin  1Db (Future Lots)***
PERLND  26                       0.656     RCHRES   1      2
PERLND  26                       0.656     RCHRES   1      3
IMPLND   2                       0.319     RCHRES   1      5
IMPLND   4                       0.675     RCHRES   1      5
IMPLND   6                       0.131     RCHRES   1      5
IMPLND   9                       0.094     RCHRES   1      5

******Routing******
PERLND  26                       2.053     COPY     1     12
IMPLND   2                       0.965     COPY     1     15
IMPLND   4                       2.066     COPY     1     15
IMPLND   6                       0.413     COPY     1     15
IMPLND   9                       0.318     COPY     1     15
IMPLND  14                       0.921     COPY     1     15
```

```
PERLND  26                          2.053     COPY     1      13
PERLND  26                          0.656     COPY     1      12
IMPLND   2                          0.319     COPY     1      15
IMPLND   4                          0.675     COPY     1      15
IMPLND   6                          0.131     COPY     1      15
IMPLND   9                          0.094     COPY     1      15
PERLND  26                          0.656     COPY     1      13
RCHRES   1                              1     COPY   501      16
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1      INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                           in  out                           ***
    1     Trapezoidal Pond-009    1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1        1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1        4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #   VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
             FG FG FG FG  possible   exit *** possible  exit      possible  exit
              *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
    1         0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1              1      0.02       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
           *** ac-ft    for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0          4.0  0.0  0.0  0.0  0.0        0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   91    4
     Depth      Area     Volume  Outflow1 Velocity  Travel Time***
```

(ft)	(acres)	(acre-ft)	(cfs)	(ft/sec)	(Minutes)***
0.000000	0.170873	0.000000	0.000000		
0.033333	0.171666	0.005709	0.210842		
0.066667	0.172461	0.011444	0.298175		
0.100000	0.173258	0.017206	0.365188		
0.133333	0.174056	0.022995	0.421683		
0.166667	0.174857	0.028810	0.471456		
0.200000	0.175659	0.034652	0.516455		
0.233333	0.176463	0.040521	0.557835		
0.266667	0.177269	0.046416	0.596350		
0.300000	0.178077	0.052339	0.632525		
0.333333	0.178887	0.058288	0.666740		
0.366667	0.179698	0.064265	0.699283		
0.400000	0.180512	0.070268	0.730377		
0.433333	0.181327	0.076299	0.760200		
0.466667	0.182144	0.082357	0.788897		
0.500000	0.182963	0.088442	0.816586		
0.533333	0.183783	0.094554	0.843367		
0.566667	0.184606	0.100694	0.869323		
0.600000	0.185430	0.106861	0.894525		
0.633333	0.186256	0.113056	0.919038		
0.666667	0.187085	0.119278	0.942913		
0.700000	0.187914	0.125528	0.966198		
0.733333	0.188746	0.131806	0.988935		
0.766667	0.189580	0.138111	1.011161		
0.800000	0.190415	0.144445	1.032909		
0.833333	0.191252	0.150806	1.054208		
0.866667	0.192091	0.157195	1.075086		
0.900000	0.192932	0.163612	1.095565		
0.933333	0.193775	0.170057	1.115669		
0.966667	0.194620	0.176530	1.135417		
1.000000	0.195466	0.183032	1.154827		
1.033333	0.196314	0.189561	1.173917		
1.066667	0.197164	0.196119	1.192701		
1.100000	0.198016	0.202706	1.211193		
1.133333	0.198870	0.209320	1.249673		
1.166667	0.199726	0.215964	1.304676		
1.200000	0.200583	0.222636	1.370354		
1.233333	0.201442	0.229336	1.444626		
1.266667	0.202303	0.236065	1.526293		
1.300000	0.203166	0.242823	1.614550		
1.333333	0.204031	0.249609	1.708807		
1.366667	0.204898	0.256425	1.808607		
1.400000	0.205766	0.263269	1.913585		
1.433333	0.206636	0.270143	2.023440		
1.466667	0.207509	0.277045	2.137918		
1.500000	0.208383	0.283977	2.256800		
1.533333	0.209258	0.290937	2.379897		
1.566667	0.210136	0.297927	2.507042		
1.600000	0.211015	0.304946	2.638087		
1.633333	0.211897	0.311995	2.772899		
1.666667	0.212780	0.319073	2.911358		
1.700000	0.213665	0.326180	3.053355		
1.733333	0.214552	0.333317	3.198790		
1.766667	0.215440	0.340484	3.347573		
1.800000	0.216331	0.347680	3.499618		
1.833333	0.217223	0.354906	3.654848		
1.866667	0.218117	0.362162	3.813189		
1.900000	0.219013	0.369447	3.974574		
1.933333	0.219911	0.376762	4.138939		
1.966667	0.220811	0.384108	4.306225		
2.000000	0.221712	0.391483	4.476376		
2.033333	0.222616	0.398889	4.578834		
2.066667	0.223521	0.406324	4.754833		
2.100000	0.224428	0.413790	4.978669		
2.133333	0.225337	0.421286	5.241173		
2.166667	0.226247	0.428813	5.537046		
2.200000	0.227160	0.436369	5.862714		
2.233333	0.228074	0.443957	6.215552		
2.266667	0.228990	0.451574	6.593528		

```
   2.300000  0.229908  0.459223  6.995008
   2.333333  0.230828  0.466902  7.418639
   2.366667  0.231750  0.474611  7.863279
   2.400000  0.232674  0.482352  8.327945
   2.433333  0.233599  0.490123  8.811782
   2.466667  0.234526  0.497925  9.314035
   2.500000  0.235455  0.505758  9.834031
   2.533333  0.236386  0.513622  10.37117
   2.566667  0.237319  0.521517  10.92490
   2.600000  0.238253  0.529443  11.49472
   2.633333  0.239190  0.537401  12.08019
   2.666667  0.240128  0.545389  12.68089
   2.700000  0.241068  0.553409  13.29642
   2.733333  0.242010  0.561461  13.92644
   2.766667  0.242954  0.569543  14.57060
   2.800000  0.243899  0.577657  15.22859
   2.833333  0.244847  0.585803  15.90013
   2.866667  0.245796  0.593981  16.58494
   2.900000  0.246747  0.602190  17.28276
   2.933333  0.247700  0.610430  17.99335
   2.966667  0.248655  0.618703  18.71648
   3.000000  0.249611  0.627007  19.45192
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL     1.3           PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL     1.3           IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL     0.8           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL     0.8           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1         1     WDM   1004 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1         1     WDM   1005 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1      48.4     WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1      48.4     WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK   2

  MASS-LINK       3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK   3

  MASS-LINK       5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK   5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15
```

```
  MASS-LINK        16
RCHRES      ROFLOW                                  COPY            INPUT  MEAN
  END MASS-LINK    16

END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

This program and accompanying documentation are provided 'as-is' without warranty of any kind. The entire risk regarding the performance and results of this program is assumed by End User. Clear Creek Solutions Inc. and the governmental licensee or sublicensees disclaim all warranties, either expressed or implied, including but not limited to implied warranties of program and accompanying documentation. In no event shall Clear Creek Solutions Inc. be liable for any damages whatsoever (including without limitation to damages for loss of business profits, loss of business information, business interruption, and the like) arising out of the use of, or inability to use this program even if Clear Creek Solutions Inc. or their authorized representatives have been advised of the possibility of such damages.

Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

TRACT 'R' FACILITY

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	8938.e.Green Mtn Ph1-Prelim-Tract R Pond-W
Site Name:	Green Mountain
Site Address:	NE Goodwin Road
City:	Camas, WA.
Report Date:	12/23/2014
Gage:	Lacamas
Data Start:	1948/10/01
Data End:	2008/09/30
Timestep:	15 Minute
Precip Scale:	1.30
Version:	2014/09/12

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data
Predeveloped Land Use

Basin 4P & 5P

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
SG4, Forest, Mod	26.54
Pervious Total	26.54
Impervious Land Use	Acres
Impervious Total	0
Basin Total	26.54

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 4D

Bypass:	No
GroundWater:	No
Pervious Land Use	Acres
SG3, Lawn, Mod	12.548
Pervious Total	12.548
Impervious Land Use	Acres
ROADS MOD	3.491
ROOF TOPS FLAT	6.198
DRIVEWAYS MOD	1.24
SIDEWALKS MOD	1.063
POND	2
Impervious Total	13.992
Basin Total	26.54

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Trapezoidal Pond 1

Bottom Length:	217.00 ft.
Bottom Width:	217.00 ft.
Depth:	3 ft.
Volume at riser head:	2.2838 acre-ft.
Side slope 1:	3 To 1
Side slope 2:	3 To 1
Side slope 3:	3 To 1
Side slope 4:	3 To 1
Discharge Structure	
Riser Height:	2 ft.
Riser Diameter:	18 in.
Notch Type:	Rectangular
Notch Width:	1.500 ft.
Notch Height:	0.900 ft.
Orifice 1 Diameter:	11.641 inElevation:0 ft.

Element Flows To:
Outlet 1 Outlet 2

Pond Hydraulic Table

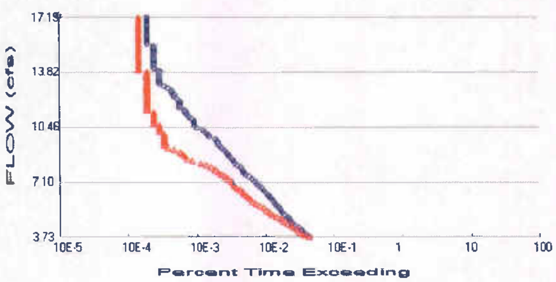
Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	1.081	0.000	0.000	0.000
0.0333	1.083	0.036	0.649	0.000
0.0667	1.085	0.072	0.919	0.000
0.1000	1.087	0.108	1.125	0.000
0.1333	1.089	0.144	1.299	0.000
0.1667	1.091	0.181	1.453	0.000
0.2000	1.093	0.217	1.591	0.000
0.2333	1.095	0.253	1.719	0.000
0.2667	1.097	0.290	1.837	0.000
0.3000	1.099	0.327	1.949	0.000
0.3333	1.101	0.363	2.054	0.000
0.3667	1.103	0.400	2.155	0.000
0.4000	1.105	0.437	2.251	0.000
0.4333	1.107	0.474	2.342	0.000
0.4667	1.109	0.511	2.431	0.000
0.5000	1.111	0.548	2.516	0.000
0.5333	1.113	0.585	2.599	0.000
0.5667	1.115	0.622	2.679	0.000
0.6000	1.117	0.659	2.756	0.000
0.6333	1.119	0.696	2.832	0.000
0.6667	1.121	0.734	2.906	0.000
0.7000	1.123	0.771	2.977	0.000
0.7333	1.125	0.808	3.047	0.000
0.7667	1.127	0.846	3.116	0.000
0.8000	1.129	0.884	3.183	0.000
0.8333	1.131	0.921	3.249	0.000
0.8667	1.133	0.959	3.313	0.000
0.9000	1.135	0.997	3.376	0.000
0.9333	1.137	1.035	3.438	0.000
0.9667	1.139	1.073	3.499	0.000
1.0000	1.141	1.111	3.559	0.000
1.0333	1.143	1.149	3.617	0.000

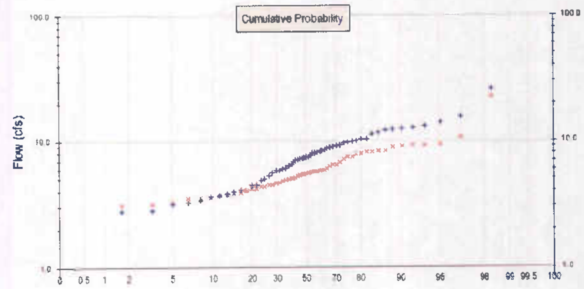
1.0667	1.145	1.187	3.675	0.000
1.1000	1.147	1.225	3.732	0.000
1.1333	1.149	1.263	3.819	0.000
1.1667	1.151	1.302	3.930	0.000
1.2000	1.153	1.340	4.056	0.000
1.2333	1.156	1.379	4.195	0.000
1.2667	1.158	1.417	4.345	0.000
1.3000	1.160	1.456	4.504	0.000
1.3333	1.162	1.495	4.672	0.000
1.3667	1.164	1.533	4.848	0.000
1.4000	1.166	1.572	5.031	0.000
1.4333	1.168	1.611	5.222	0.000
1.4667	1.170	1.650	5.419	0.000
1.5000	1.172	1.689	5.622	0.000
1.5333	1.174	1.728	5.832	0.000
1.5667	1.176	1.768	6.047	0.000
1.6000	1.178	1.807	6.267	0.000
1.6333	1.180	1.846	6.494	0.000
1.6667	1.182	1.886	6.725	0.000
1.7000	1.185	1.925	6.962	0.000
1.7333	1.187	1.965	7.203	0.000
1.7667	1.189	2.004	7.449	0.000
1.8000	1.191	2.044	7.700	0.000
1.8333	1.193	2.084	7.955	0.000
1.8667	1.195	2.123	8.215	0.000
1.9000	1.197	2.163	8.480	0.000
1.9333	1.199	2.203	8.748	0.000
1.9667	1.201	2.243	9.021	0.000
2.0000	1.203	2.283	9.298	0.000
2.0333	1.206	2.324	9.428	0.000
2.0667	1.208	2.364	9.632	0.000
2.1000	1.210	2.404	9.884	0.000
2.1333	1.212	2.444	10.17	0.000
2.1667	1.214	2.485	10.49	0.000
2.2000	1.216	2.525	10.85	0.000
2.2333	1.218	2.566	11.23	0.000
2.2667	1.220	2.607	11.63	0.000
2.3000	1.222	2.647	12.06	0.000
2.3333	1.225	2.688	12.51	0.000
2.3667	1.227	2.729	12.98	0.000
2.4000	1.229	2.770	13.47	0.000
2.4333	1.231	2.811	13.98	0.000
2.4667	1.233	2.852	14.51	0.000
2.5000	1.235	2.893	15.05	0.000
2.5333	1.237	2.934	15.62	0.000
2.5667	1.239	2.976	16.19	0.000
2.6000	1.242	3.017	16.79	0.000
2.6333	1.244	3.059	17.40	0.000
2.6667	1.246	3.100	18.02	0.000
2.7000	1.248	3.142	18.66	0.000
2.7333	1.250	3.183	19.32	0.000
2.7667	1.252	3.225	19.99	0.000
2.8000	1.254	3.267	20.67	0.000
2.8333	1.257	3.309	21.36	0.000
2.8667	1.259	3.351	22.07	0.000
2.9000	1.261	3.393	22.79	0.000
2.9333	1.263	3.435	23.53	0.000
2.9667	1.265	3.477	24.27	0.000

3.0000	1.267	3.519	25.03	0.000
3.0333	1.270	3.561	25.80	0.000

Analysis Results

POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 26.54
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 12.548
Total Impervious Area: 13.992

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	7.465561
5 year	11.497273
10 year	13.67313
25 year	15.879434
50 year	17.187334
100 year	18.261055

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	5.397394
5 year	7.495243
10 year	9.092886
25 year	11.364225
50 year	13.250141
100 year	15.311281

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	5.613	6.815
1950	7.239	4.848
1951	9.811	5.008
1952	5.891	6.307
1953	8.025	4.870
1954	12.278	6.009
1955	6.167	3.578
1956	11.317	9.013
1957	10.006	5.687
1958	7.426	7.431

1959	4.490	3.251
1960	4.125	4.459
1961	10.323	6.489
1962	7.218	5.718
1963	8.078	5.425
1964	7.495	4.690
1965	6.427	4.512
1966	8.991	5.644
1967	8.124	4.352
1968	9.721	9.159
1969	9.305	9.095
1970	25.742	22.162
1971	4.109	4.043
1972	6.564	4.175
1973	6.828	5.575
1974	10.336	8.316
1975	5.878	3.762
1976	8.875	5.509
1977	0.265	2.936
1978	12.925	8.109
1979	8.430	8.223
1980	4.882	3.600
1981	11.576	7.816
1982	7.657	6.485
1983	14.001	7.969
1984	4.518	3.533
1985	3.255	4.632
1986	4.033	5.719
1987	7.119	3.876
1988	3.400	4.368
1989	3.677	3.892
1990	3.131	3.718
1991	8.267	5.840
1992	8.550	5.112
1993	10.150	7.471
1994	7.326	5.228
1995	6.049	5.805
1996	12.725	10.630
1997	15.509	9.197
1998	12.533	8.176
1999	8.741	4.943
2000	5.001	3.135
2001	2.760	3.125
2002	12.058	7.216
2003	9.181	5.849
2004	2.804	4.997
2005	3.733	4.198
2006	7.075	5.342
2007	3.855	5.588
2008	5.327	8.835

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	25.7421	22.1621
2	15.5093	10.6302
3	14.0006	9.1967
4	12.9245	9.1589

5	12.7248	9.0950
6	12.5327	9.0125
7	12.2782	8.8354
8	12.0581	8.3162
9	11.5756	8.2235
10	11.3168	8.1759
11	10.3363	8.1090
12	10.3228	7.9691
13	10.1497	7.8156
14	10.0055	7.4706
15	9.8112	7.4314
16	9.7206	7.2162
17	9.3048	6.8154
18	9.1814	6.4886
19	8.9907	6.4845
20	8.8746	6.3072
21	8.7409	6.0092
22	8.5503	5.8485
23	8.4304	5.8396
24	8.2668	5.8049
25	8.1244	5.7192
26	8.0778	5.7179
27	8.0254	5.6870
28	7.6569	5.6444
29	7.4952	5.5880
30	7.4258	5.5747
31	7.3256	5.5085
32	7.2385	5.4251
33	7.2181	5.3417
34	7.1193	5.2279
35	7.0753	5.1115
36	6.8277	5.0084
37	6.5637	4.9974
38	6.4271	4.9435
39	6.1670	4.8700
40	6.0486	4.8481
41	5.8909	4.6903
42	5.8782	4.6322
43	5.6125	4.5119
44	5.3271	4.4589
45	5.0009	4.3682
46	4.8821	4.3518
47	4.5182	4.1983
48	4.4905	4.1746
49	4.1250	4.0432
50	4.1089	3.8916
51	4.0326	3.8762
52	3.8549	3.7623
53	3.7328	3.7183
54	3.6768	3.5997
55	3.4004	3.5776
56	3.2554	3.5332
57	3.1305	3.2506
58	2.8043	3.1347
59	2.7598	3.1247
60	0.2648	2.9355

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
3.7328	895	895	100	Pass
3.8687	823	768	93	Pass
4.0046	755	667	88	Pass
4.1405	687	597	86	Pass
4.2764	626	530	84	Pass
4.4123	576	481	83	Pass
4.5482	535	430	80	Pass
4.6841	490	380	77	Pass
4.8200	455	342	75	Pass
4.9559	430	302	70	Pass
5.0918	392	262	66	Pass
5.2277	363	238	65	Pass
5.3636	346	213	61	Pass
5.4995	324	193	59	Pass
5.6354	305	170	55	Pass
5.7713	287	147	51	Pass
5.9073	271	133	49	Pass
6.0432	253	122	48	Pass
6.1791	237	113	47	Pass
6.3150	226	103	45	Pass
6.4509	211	98	46	Pass
6.5868	193	89	46	Pass
6.7227	182	79	43	Pass
6.8586	165	73	44	Pass
6.9945	152	71	46	Pass
7.1304	145	67	46	Pass
7.2663	131	60	45	Pass
7.4022	120	54	45	Pass
7.5381	107	48	44	Pass
7.6740	100	43	43	Pass
7.8099	96	39	40	Pass
7.9458	91	34	37	Pass
8.0817	83	29	34	Pass
8.2176	75	24	32	Pass
8.3535	71	18	25	Pass
8.4894	69	15	21	Pass
8.6253	62	14	22	Pass
8.7612	59	13	22	Pass
8.8972	56	12	21	Pass
9.0331	52	10	19	Pass
9.1690	49	8	16	Pass
9.3049	44	7	15	Pass
9.4408	43	7	16	Pass
9.5767	41	7	17	Pass
9.7126	39	7	17	Pass
9.8485	32	7	21	Pass
9.9844	30	7	23	Pass
10.1203	28	6	21	Pass
10.2562	26	6	23	Pass
10.3921	21	6	28	Pass
10.5280	19	6	31	Pass
10.6639	19	5	26	Pass
10.7998	19	5	26	Pass

10.9357	18	5	27	Pass
11.0716	16	5	31	Pass
11.2075	15	5	33	Pass
11.3434	14	5	35	Pass
11.4793	14	4	28	Pass
11.6152	12	4	33	Pass
11.7512	12	4	33	Pass
11.8871	12	4	33	Pass
12.0230	12	4	33	Pass
12.1589	11	4	36	Pass
12.2948	10	4	40	Pass
12.4307	10	4	40	Pass
12.5666	9	4	44	Pass
12.7025	9	4	44	Pass
12.8384	8	4	50	Pass
12.9743	7	4	57	Pass
13.1102	6	4	66	Pass
13.2461	6	4	66	Pass
13.3820	6	4	66	Pass
13.5179	6	4	66	Pass
13.6538	6	4	66	Pass
13.7897	6	4	66	Pass
13.9256	6	3	50	Pass
14.0615	5	3	60	Pass
14.1974	5	3	60	Pass
14.3333	5	3	60	Pass
14.4692	5	3	60	Pass
14.6051	5	3	60	Pass
14.7411	5	3	60	Pass
14.8770	5	3	60	Pass
15.0129	5	3	60	Pass
15.1488	5	3	60	Pass
15.2847	5	3	60	Pass
15.4206	5	3	60	Pass
15.5565	4	3	75	Pass
15.6924	4	3	75	Pass
15.8283	4	3	75	Pass
15.9642	4	3	75	Pass
16.1001	4	3	75	Pass
16.2360	4	3	75	Pass
16.3719	4	3	75	Pass
16.5078	4	3	75	Pass
16.6437	4	3	75	Pass
16.7796	4	3	75	Pass
16.9155	4	3	75	Pass
17.0514	4	3	75	Pass
17.1873	4	3	75	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	2.5745 acre-feet
On-line facility target flow:	3.1011 cfs.
Adjusted for 15 min:	3.1011 cfs.
Off-line facility target flow:	1.7175 cfs.
Adjusted for 15 min:	1.7175 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Trapezoidal Pond 1 POC	☐	3391.62			☐	0.00			
Total Volume Infiltrated		3391.62	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50-yr									Duration Analysis Result = Failed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

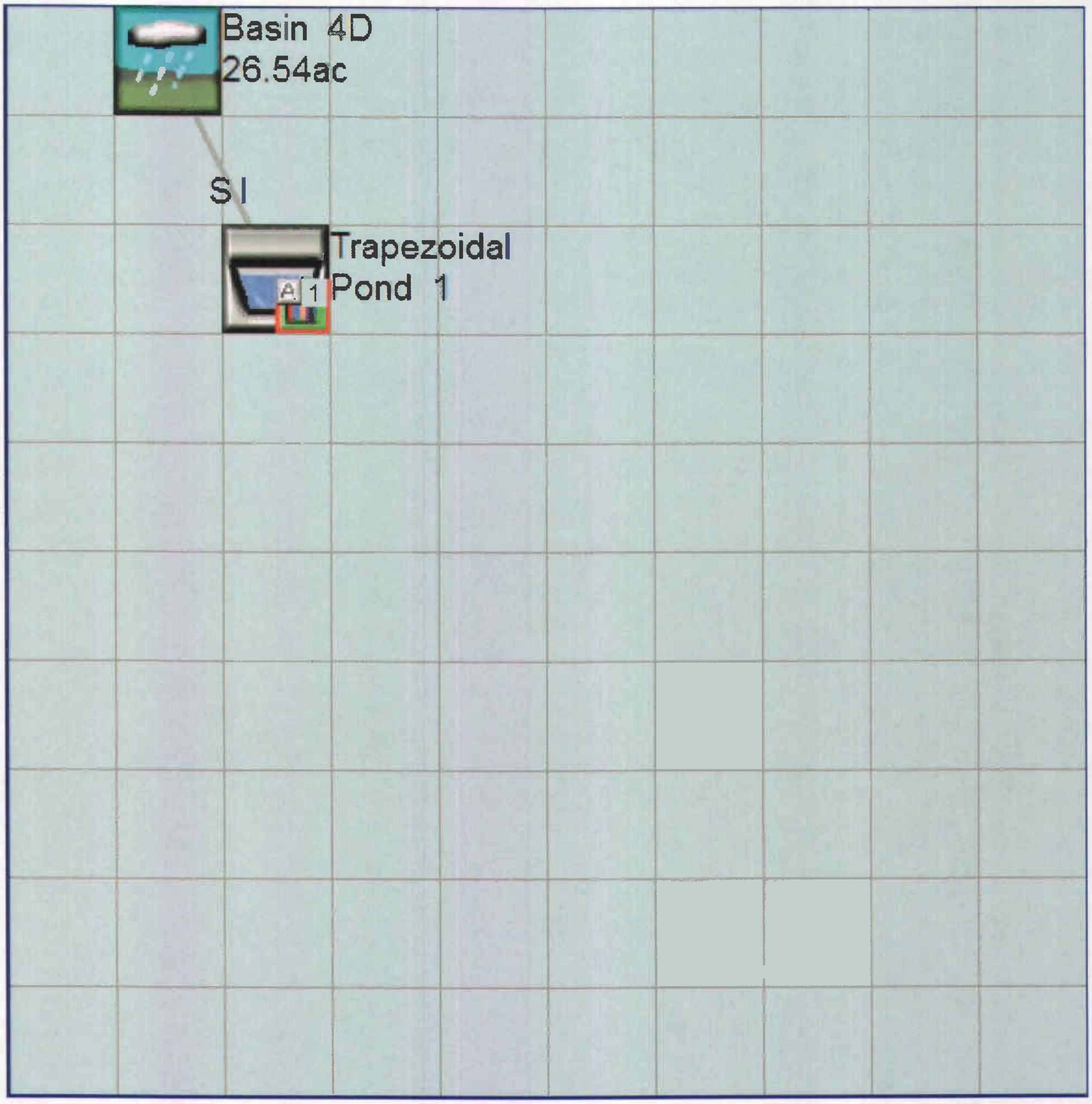
IMPLND Changes

No IMPLND changes have been made.

Appendix

Predeveloped Schematic

Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2008 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   8938.e.Green Mtn Ph1-Prelim-Tract R Pond-W.wdm
MESSU      25   Pre8938.e.Green Mtn Ph1-Prelim-Tract R Pond-W.MES
           27   Pre8938.e.Green Mtn Ph1-Prelim-Tract R Pond-W.L61
           28   Pre8938.e.Green Mtn Ph1-Prelim-Tract R Pond-W.L62
           30   POC8938.e.Green Mtn Ph1-Prelim-Tract R Pond-W1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      29
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  4P & 5P              MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out            ***
   29      SG4, Forest, Mod        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   29         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   29         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   29        0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   29             0          6      0.04       400       0.1         0      0.96
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   29             0          0         3         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                    ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   29            0.2       0.4      0.35         2       0.4       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   29             0          0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI    ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                       <--Area-->      <-Target->    MBLK    ***
<Name>   #                       <-factor->      <Name>   #    Tbl#    ***
Basin  4P & 5P***
PERLND  29                          26.54        COPY   501      12
PERLND  29                          26.54        COPY   501      13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY    501 OUTPUT MEAN   1 1   48.4       DISPLY   1     INPUT  TIMSER 1


<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                         in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR   *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *          ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #     FTABNO       LEN      DELTH      STCOR        KS       DB50       ***
  <------><--------><--------><--------><--------><--------><-------->          ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***    VOL     Initial  value  of COLIND    Initial  value  of OUTDGT
           *** ac-ft     for each possible exit       for each possible exit
  <------><-------->      <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL     1.3           PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL     1.3           IMPLND   1 999 EXTNL  PREC
```

```
WDM       1 EVAP     ENGL     0.8              PERLND    1 999 EXTNL   PETINP
WDM       1 EVAP     ENGL     0.8              IMPLND    1 999 EXTNL   PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>    # <Name>    tem strg strg***
COPY    501 OUTPUT MEAN    1 1     48.4    WDM     501 FLOW     ENGL       REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>      <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>               <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO        0.083333     COPY          INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO        0.083333     COPY          INPUT  MEAN
  END MASS-LINK   13

END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2008 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME      0 RUN      1               UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                               ***
WDM        26   8938.e.Green Mtn Ph1-Prelim-Tract R Pond-W.wdm
MESSU      25   Mit8938.e.Green Mtn Ph1-Prelim-Tract R Pond-W.MES
           27   Mit8938.e.Green Mtn Ph1-Prelim-Tract R Pond-W.L61
           28   Mit8938.e.Green Mtn Ph1-Prelim-Tract R Pond-W.L62
           30   POC8938.e.Green Mtn Ph1-Prelim-Tract R Pond-W1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      26
      IMPLND       2
      IMPLND       4
      IMPLND       6
      IMPLND       9
      IMPLND      14
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Trapezoidal Pond  1         MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out          ***
   26      SG3, Lawn, Mod          1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   26         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY
```

```
  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   26       0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   26       0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   26            0          6      0.05       400       0.1         0      0.96
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   26            0          0       2.5         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   26            0.1       0.8      0.25         4       0.4      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   26            0          0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name-------> Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
    2        ROADS/MOD            1    1    1   27    0
    4        ROOF TOPS/FLAT       1    1    1   27    0
    6        DRIVEWAYS/MOD        1    1    1   27    0
    9        SIDEWALKS/MOD        1    1    1   27    0
   14        POND                 1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
    4         0    0    1    0    0    0
    6         0    0    1    0    0    0
    9         0    0    1    0    0    0
   14         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   *********
    2         0    0    4    0    0    0    1    9
    4         0    0    4    0    0    0    1    9
    6         0    0    4    0    0    0    1    9
    9         0    0    4    0    0    0    1    9
   14         0    0    4    0    0    0    1    9
```

```
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2        0    0    0    0    0
    4        0    0    0    0    0
    6        0    0    0    0    0
    9        0    0    0    0    0
   14        0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >       IWATER input info: Part 2          ***
    # -  # ***  LSUR      SLSUR       NSUR      RETSC
    2            400       0.05        0.1       0.08
    4            400       0.01        0.1        0.1
    6            400       0.05        0.1       0.08
    9            400       0.05        0.1       0.08
   14            400       0.01        0.1        0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >       IWATER input info: Part 3          ***
    # -  # ***PETMAX    PETMIN
    2              0          0
    4              0          0
    6              0          0
    9              0          0
   14              0          0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0          0
    4              0          0
    6              0          0
    9              0          0
   14              0          0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->    <-Target->   MBLK   ***
<Name>   #                  <-factor->    <Name>   #   Tbl#   ***
Basin  4D***
PERLND  26                    12.548      RCHRES   1      2
PERLND  26                    12.548      RCHRES   1      3
IMPLND   2                     3.491      RCHRES   1      5
IMPLND   4                     6.198      RCHRES   1      5
IMPLND   6                      1.24      RCHRES   1      5
IMPLND   9                     1.063      RCHRES   1      5
IMPLND  14                         2      RCHRES   1      5

******Routing******
PERLND  26                    12.548      COPY     1     12
IMPLND   2                     3.491      COPY     1     15
IMPLND   4                     6.198      COPY     1     15
IMPLND   6                      1.24      COPY     1     15
IMPLND   9                     1.063      COPY     1     15
IMPLND  14                         2      COPY     1     15
PERLND  26                    12.548      COPY     1     13
RCHRES   1                         1      COPY   501     16
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
```

```
COPY    501 OUTPUT MEAN    1 1    48.4         DISPLY    1      INPUT  TIMSER 1


<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>    #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name         Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG             ***
                                          in  out                             ***
    1     Trapezoidal Pond-009    1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1       1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR   *********
    1       4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                       ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
    1        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #     FTABNO        LEN      DELTH      STCOR         KS       DB50      ***
  <------><--------><--------><--------><--------><--------><-------->        ***
    1             1       0.02        0.0        0.0        0.5        0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                          ***
    # -  # ***    VOL      Initial  value  of COLIND     Initial  value  of OUTDGT
           *** ac-ft     for each possible exit        for each possible exit
  <------><-------->      <---><---><---><---><---> *** <---><---><---><---><--->
    1           0           4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   91    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)    (cfs)  (ft/sec)    (Minutes)***
  0.000000  0.220488  0.000000  0.000000
  0.033333  0.221389  0.007365  0.649799
  0.066667  0.222292  0.014759  0.918954
  0.100000  0.223196  0.022184  1.125485
  0.133333  0.224103  0.029639  1.299598
  0.166667  0.225011  0.037124  1.452995
  0.200000  0.225921  0.044640  1.591676
  0.233333  0.226833  0.052186  1.719206
  0.266667  0.227746  0.059762  1.837909
  0.300000  0.228662  0.067369  1.949397
  0.333333  0.229579  0.075006  2.054845
  0.366667  0.230499  0.082674  2.155139
```

0.400000	0.231420	0.090373	2.250969
0.433333	0.232342	0.098102	2.342883
0.466667	0.233267	0.105862	2.431325
0.500000	0.234194	0.113653	2.516660
0.533333	0.235122	0.121475	2.599196
0.566667	0.236052	0.129328	2.679190
0.600000	0.236984	0.137212	2.756863
0.633333	0.237918	0.145127	2.832408
0.666667	0.238854	0.153073	2.905989
0.700000	0.239792	0.161051	2.977753
0.733333	0.240731	0.169060	3.047827
0.766667	0.241672	0.177100	3.116326
0.800000	0.242615	0.185171	3.183352
0.833333	0.243560	0.193274	3.248995
0.866667	0.244507	0.201408	3.313337
0.900000	0.245456	0.209574	3.376454
0.933333	0.246406	0.217772	3.438413
0.966667	0.247358	0.226002	3.499274
1.000000	0.248313	0.234263	3.559095
1.033333	0.249268	0.242556	3.617927
1.066667	0.250226	0.250881	3.675818
1.100000	0.251186	0.259238	3.732811
1.133333	0.252147	0.267626	3.819345
1.166667	0.253111	0.276047	3.930242
1.200000	0.254076	0.284501	4.056749
1.233333	0.255043	0.292986	4.195761
1.266667	0.256012	0.301503	4.345496
1.300000	0.256982	0.310053	4.504759
1.333333	0.257955	0.318636	4.672679
1.366667	0.258929	0.327250	4.848585
1.400000	0.259905	0.335898	5.031941
1.433333	0.260883	0.344577	5.222305
1.466667	0.261863	0.353290	5.419307
1.500000	0.262845	0.362035	5.622630
1.533333	0.263828	0.370813	5.831999
1.566667	0.264813	0.379623	6.047173
1.600000	0.265801	0.388467	6.267938
1.633333	0.266790	0.397344	6.494103
1.666667	0.267780	0.406253	6.725495
1.700000	0.268773	0.415196	6.961959
1.733333	0.269768	0.424171	7.203351
1.766667	0.270764	0.433180	7.449541
1.800000	0.271762	0.442222	7.700409
1.833333	0.272762	0.451298	7.955844
1.866667	0.273764	0.460406	8.215741
1.900000	0.274768	0.469549	8.480005
1.933333	0.275773	0.478724	8.748546
1.966667	0.276781	0.487933	9.021280
2.000000	0.277790	0.497176	9.298127
2.033333	0.278801	0.506453	9.428802
2.066667	0.279814	0.515763	9.632787
2.100000	0.280828	0.525107	9.884386
2.133333	0.281845	0.534485	10.17443
2.166667	0.282863	0.543897	10.49763
2.200000	0.283884	0.553343	10.85042
2.233333	0.284906	0.562822	11.23017
2.266667	0.285930	0.572336	11.63486
2.300000	0.286955	0.581884	12.06286
2.333333	0.287983	0.591467	12.51282
2.366667	0.289012	0.601083	12.98360
2.400000	0.290043	0.610734	13.47422
2.433333	0.291077	0.620420	13.98384
2.466667	0.292111	0.630139	14.51169
2.500000	0.293148	0.639894	15.05711
2.533333	0.294187	0.649683	15.61951
2.566667	0.295227	0.659506	16.19833
2.600000	0.296269	0.669364	16.79309
2.633333	0.297314	0.679258	17.40333
2.666667	0.298360	0.689185	18.02864
2.700000	0.299407	0.699148	18.66864

```
    2.733333  0.300457  0.709146  19.32296
    2.766667  0.301508  0.719179  19.99129
    2.800000  0.302562  0.729246  20.67330
    2.833333  0.303617  0.739349  21.36872
    2.866667  0.304674  0.749488  22.07726
    2.900000  0.305733  0.759661  22.79868
    2.933333  0.306793  0.769870  23.53273
    2.966667  0.307856  0.780114  24.27919
    3.000000  0.308920  0.790394  25.03784
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.3            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.3            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.8            PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.8            IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1         1     WDM   1004 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1         1     WDM   1005 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1      48.4     WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1      48.4     WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

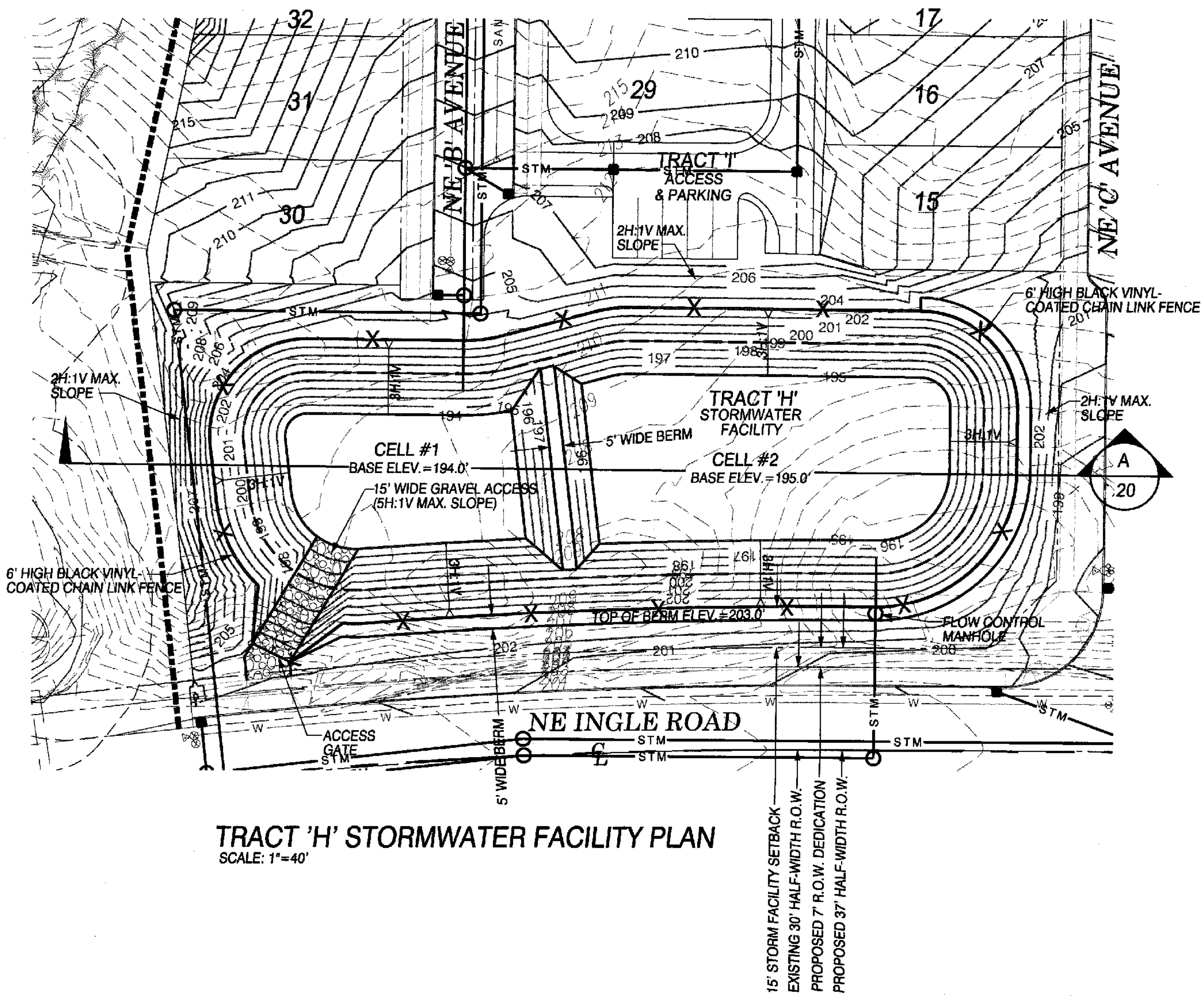
Legal Notice

This program and accompanying documentation are provided 'as-is' without warranty of any kind. The entire risk regarding the performance and results of this program is assumed by End User. Clear Creek Solutions Inc. and the governmental licensee or sublicensees disclaim all warranties, either expressed or implied, including but not limited to implied warranties of program and accompanying documentation. In no event shall Clear Creek Solutions Inc. be liable for any damages whatsoever (including without limitation to damages for loss of business profits, loss of business information, business interruption, and the like) arising out of the use of, or inability to use this program even if Clear Creek Solutions Inc. or their authorized representatives have been advised of the possibility of such damages.

Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

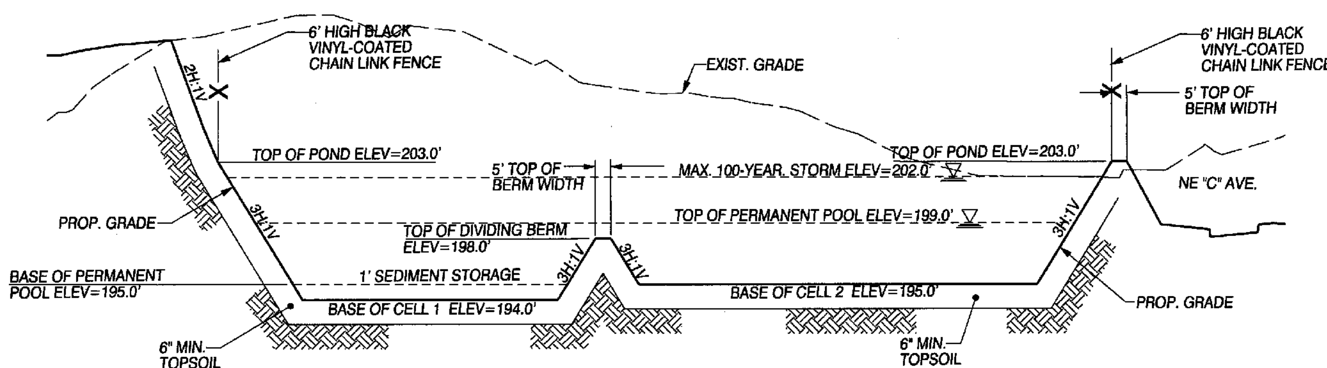
www.clearcreeksolutions.com

F



TRACT 'H' STORMWATER FACILITY PLAN

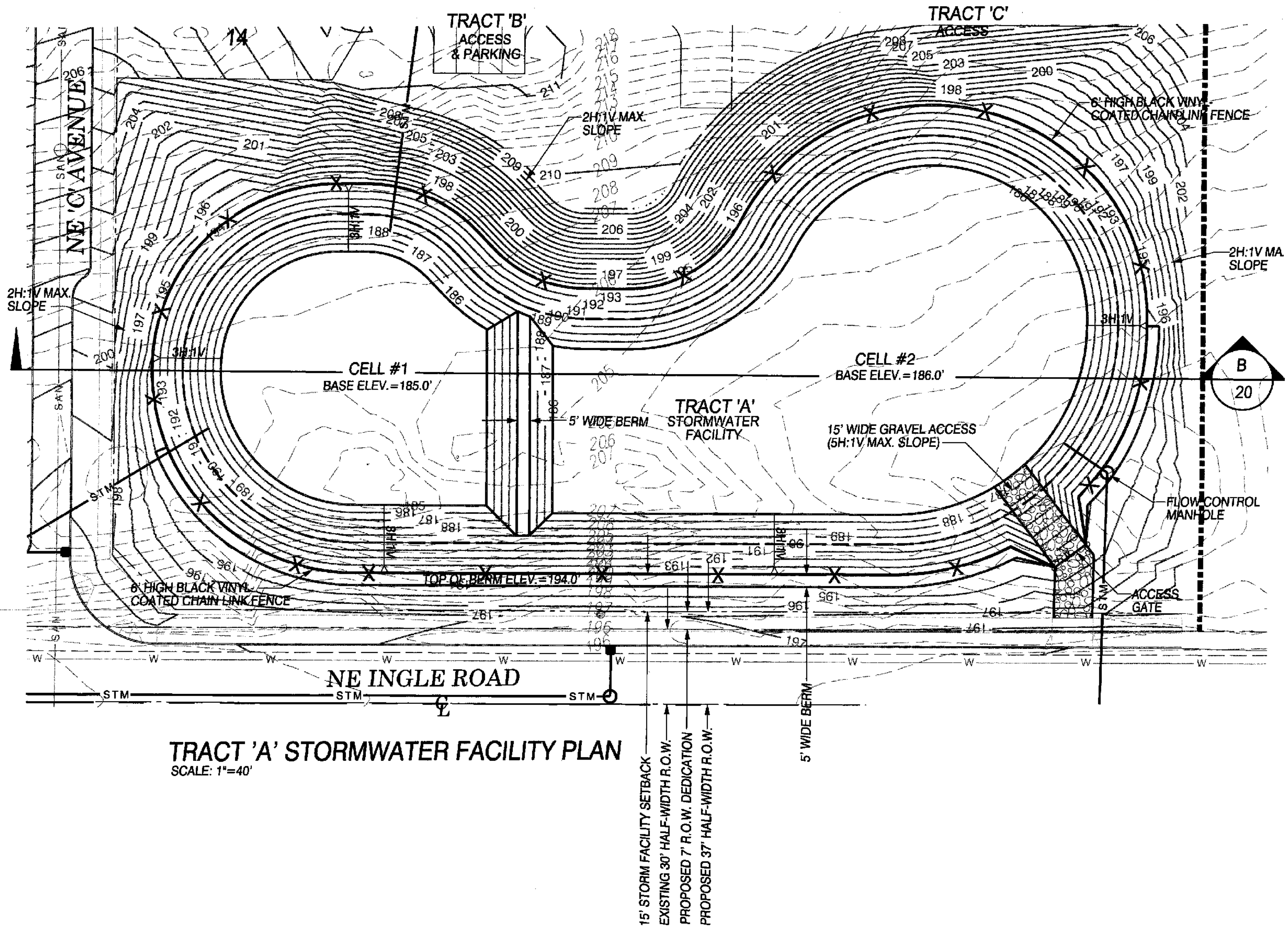
SCALE: 1"=40'



TRACT 'H' STORMWATER FACILITY SECTION

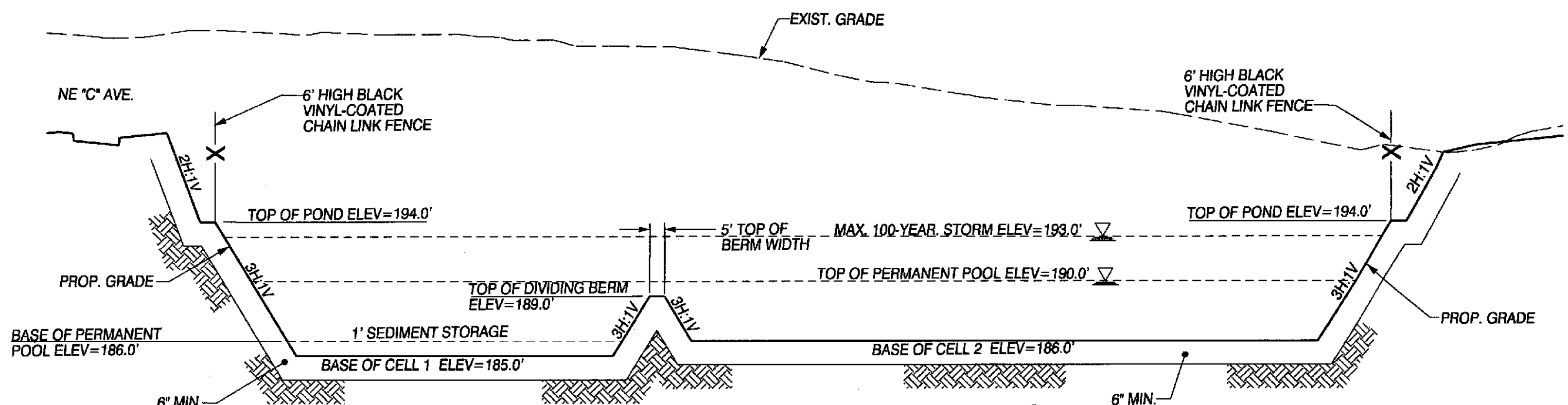
A
20

NTS



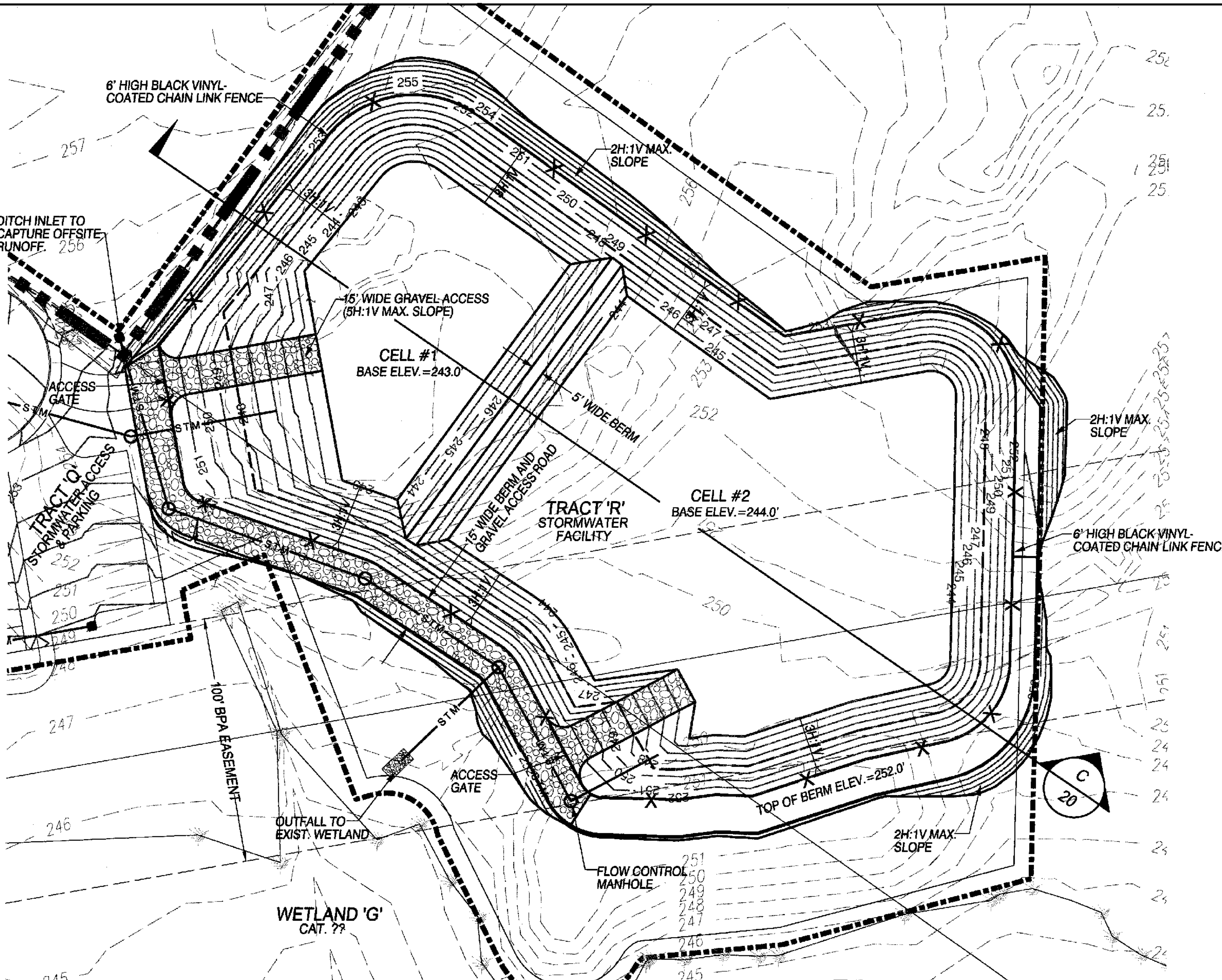
TRACT 'A' STORMWATER FACILITY PLAN

SCALE: 1"=40'



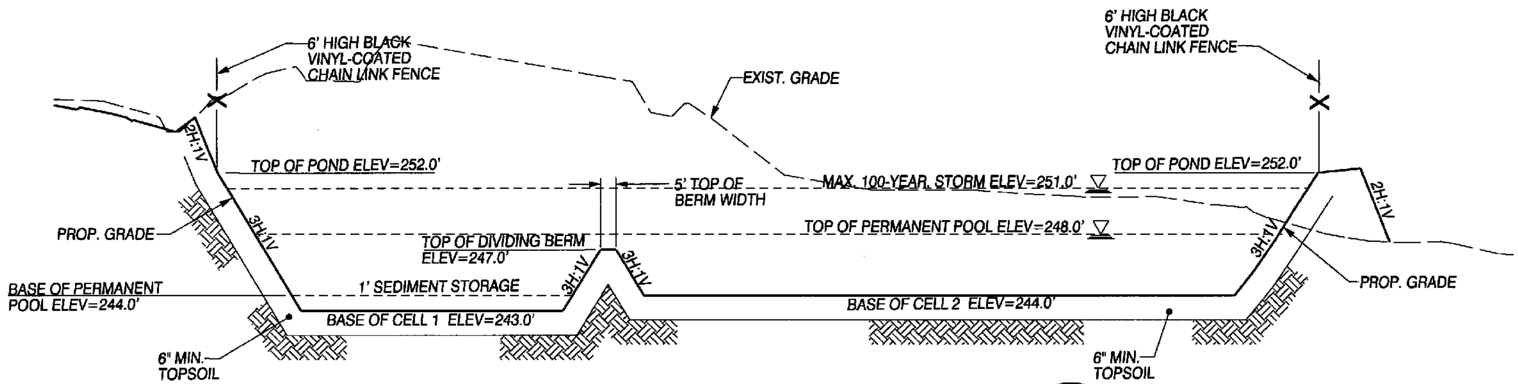
TRACT 'A' STORMWATER FACILITY SECTION B/20

NTS



TRACT 'R' STORMWATER FACILITY PLAN

SCALE: 1"=40'



TRACT 'R' STORMWATER FACILITY SECTION

NTS

C
20

G

Revised December 3, 2014
Project No. 13-3186

John O'Neil
Metropolitan Land Group, LLC
17933 NW Evergreen Parkway, Suite 300
Beaverton, Oregon 97006

SUBJECT: PRELIMINARY GEOTECHNICAL ENGINEERING REPORT
GREEN MOUNTAIN - PHASE 1
NE INGLE ROAD & NE 28TH STREET
CAMAS, WASHINGTON

This report presents the results of a geotechnical engineering study conducted by GeoPacific Engineering, Inc. (GeoPacific) for the above-referenced project. The purpose of our investigation was to evaluate subsurface conditions at the site and to provide geotechnical recommendations for site development. This geotechnical study was performed in accordance with GeoPacific Proposal No. P-4836, dated April 30, 2014, and your subsequent authorization of our proposal and *General Conditions for Geotechnical Services*. This report is considered Preliminary because a final grading plan has not been developed.

SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The Green Mountain site is located on the north side of NE Goodwin Road and east of NE Ingle Road in the City of Camas, Clark County, Washington. The property includes several tax lots that total approximately 281.6 acres. Topography on the southern portion of the site is flat to gently sloping with grades of about 5 to 10 percent. Steeper slopes (up to 35 percent grade) are present on Green Mountain, which is a basalt cinder cone, located in the northern portion of the site. Near vertical slopes are present at the base of Green Mountain where basalt bedrock is exposed.

Phase 1 is approximately 51 acres and located in the southern portion of the site, which is part of the Green Mountain Golf Course. Topography is flat to gently sloping with grades generally about 5 to 20 percent. Improvements include several structures, parking areas and driveways, cart tracks, manmade ponds, and fairways. Vegetation consists of short grasses and sparse trees.

It is our understanding that the proposed development will consist of a subdivision for single family homes, new streets, and associated underground utilities. A grading plan has not been provided for our review; however, we anticipate maximum cuts and fills will be on the order of about 12 feet due to the sloping topography and filling of existing ponds.

REGIONAL AND LOCAL GEOLOGIC SETTING

Regionally, the subject site lies within the Willamette Valley/Puget Sound lowland, a broad structural depression situated between the Coast Range on the west and the Cascade Range on the east. A series of discontinuous faults subdivide the Willamette Valley into a mosaic of fault-bounded, structural blocks (Yeats et al., 1996). Uplifted structural blocks form bedrock highlands, while down-warped structural blocks form sedimentary basins.

The low-lying portion of the site is underlain by the Quaternary aged (last 1.6 million years) Willamette Formation, a catastrophic flood deposits associated with repeated glacial outburst flooding of the Willamette Valley (Trimble, 1963; Yeats et al., 1996; Phillips, 1987). The last of these outburst floods occurred about 10,000 years ago. These deposits typically consist of horizontally layered, micaceous, silty sand with gravel that is underlain by medium dense to dense gravel.

The Willamette Formation is underlain by a gravel conglomerate interbedded with siltstone and sandstone. Evarts (2006) indicates the age of the conglomerate is poorly constrained but is likely Pliocene to Pleistocene in age (10,000 to 5.3 million years ago). The conglomerate is partially cemented with the upper portion moderately weathered.

The northern portion of the Green Mountain site is underlain by Basaltic Andesite of Green Mountain (Evarts, 2006). The gray basaltic andesite lava flows erupted from a cinder cone on Green Mountain during the Pleistocene (2.6 to 5.3 million years ago). The basalt contains weathered ash, trace quartzite pebbles, and fine grained xenoliths (Evarts, 2006).

A portion of the site is underlain by Miocene to Pleistocene age (16 to 0.5 million years ago) terrigenous sedimentary rocks belonging to the Troutdale Formation (Evarts, 2006). The Troutdale Formation is informally divided into an upper and lower member. Lithologies in the upper member include lenticular layers of volcaniclastic (vitric) sand, quartzite-bearing gravel, fine-grained sand, silt and clay, micaceous quartz-rich sand, and conglomerate with a cumulative average thickness of 100 to 150 feet. The lower member consists primarily of laminated silty clay and sand with reported thicknesses in water well logs of up to 800 feet. These sediments vary from weakly-consolidated to well-indurated.

REGIONAL SEISMIC SETTING

At least four potential source zones capable of generating damaging earthquakes are thought to exist in the region. These include the Lacamas Creek-Sandy River Fault, Portland Hills Fault Zone, Gales Creek-Newberg-Mt. Angel Structural Zone, and the Cascadia Subduction Zone, as discussed below.

<u>Lacamas Creek-Sandy River Fault</u>

The Lacamas Creek Fault is recognized based on a fault shear contact between Oligocene (30 million years old) volcanic rocks and the Troutdale Formation, and a series of prominent geomorphic lineaments with a cumulative length of 24 miles (Mundorff, 1964; Beeson et al., 1989). The Sandy River Fault, interpreted from gravity and borehole data, forms a possible right stepping, 7-mile-long extension of the Lacamas Creek Fault that vertically displaces the Columbia River Basalt by 1,300 feet (Beeson et al., 1989; Geomatrix Consultants, 1995). A 1989, M3.9 earthquake in the vicinity may have occurred on the Lacamas Creek Fault. A comprehensive seismic hazard study commissioned by the Oregon Department of Transportation concluded that the Lacamas Creek-Sandy River Fault Zone is potentially active with a possible rupture length of greater than 25 miles. The Lacamas Creek Fault is mapped as being ½ mile southwest of the subject site (Figure 1).

Portland Hills Fault Zone

The Portland Hills Fault Zone is a series of NW-trending faults that include the central Portland Hills Fault, the western Oatfield Fault, and the eastern East Bank Fault. These faults occur in a northwest-trending zone that varies in width between 3.5 and 5.0 miles. The combined three faults vertically displace the Columbia River Basalt by 1,130 feet and appear to control thickness changes in late Pleistocene (approx. 780,000 years) sediment (Madin, 1990). The Portland Hills Fault occurs along the Willamette River at the base of the Portland Hills, and is about 13 miles southwest of the site. The Oatfield Fault occurs along the western side of the Portland Hills, and is about 16 miles southwest of the site. The accuracy of the fault mapping is stated to be within 500 meters (Wong, et al., 2000). No historical seismicity is correlated with the mapped portion of the Portland Hills Fault Zone, but in 1991 a M3.5 earthquake occurred on a NW-trending shear plane located 1.3 miles east of the fault (Yelin, 1992). Although there is no definitive evidence of recent activity, the Portland Hills Fault Zone is assumed to be potentially active (Geomatrix Consultants, 1995).

Gales Creek-Newberg-Mt. Angel Structural Zone

The Gales Creek-Newberg-Mt. Angel Structural Zone is a 50-mile-long zone of discontinuous, NW-trending faults that lies about 36 miles southwest of the subject site. These faults are recognized in the subsurface by vertical separation of the Columbia River Basalt and offset seismic reflectors in the overlying basin sediment (Yeats et al., 1996; Werner et al., 1992). A geologic reconnaissance and photogeologic analysis study conducted for the Scoggins Dam site in the Tualatin Basin revealed no evidence of deformed geomorphic surfaces along the structural zone (Unruh et al., 1994). No seismicity has been recorded on the Gales Creek Fault or Newberg Fault; however, these faults are considered to be potentially active because they may connect with the seismically active Mount Angel Fault and the rupture plane of the 1993 M5.6 Scotts Mills earthquake (Werner et al. 1992; Geomatrix Consultants, 1995).

Cascadia Subduction Zone

The Cascadia Subduction Zone is a 680-mile-long zone of active tectonic convergence where oceanic crust of the Juan de Fuca Plate is subducting beneath the North American continent at a rate of 4 cm per year (Goldfinger et al., 1996). A growing body of geologic evidence suggests that prehistoric subduction zone earthquakes have occurred (Atwater, 1992; Carver, 1992; Peterson et al., 1993; Geomatrix Consultants, 1995). This evidence includes: (1) buried tidal marshes recording episodic, sudden subsidence along the coast of northern California, Oregon, and Washington, (2) burial of subsided tidal marshes by tsunami wave deposits, (3) paleoliquefaction features, and (4) geodetic uplift patterns on the Oregon coast. Radiocarbon dates on buried tidal marshes indicate a recurrence interval for major subduction zone earthquakes of 250 to 650 years with the last event occurring 300 years ago (Atwater, 1992; Carver, 1992; Peterson et al., 1993; Geomatrix Consultants, 1995). The inferred seismogenic portion of the plate interface lies approximately 50 miles west of the Portland Basin at depths of between 20 and 40 kilometers below the surface.

FIELD EXPLORATION

Our site-specific exploration for Phase 1 was conducted on May 23rd, 2014. A total of 13 exploratory test pits were excavated with a medium sized trackhoe to depths ranging between 5 and 9 feet at the approximate locations shown on Figure 2. Test pits TP-1 and TP-12 are outside of the Phase 1 boundary due to a reconfiguration of the layout and are not presented. The previous investigation for the entire Green Mountain site consisted of 25 exploratory test pits excavated November 5th through 7th, 2013. Five test pits from the previous investigation are located within Phase 1 – test pits TP-1, TP-10, TP-13, TP-15, and TP-16. Test pits from the 2013 investigation for the entire Green Mountain site will be referred to as TP-1 (2013), TP-10 (2013), TP-13 (2013), TP-15 (2013), and TP-16 (2013). It should be noted that exploration locations were located in the field by pacing or taping distances from apparent property corners and other site features shown on the plans provided. As such, the locations of the explorations should be considered approximate.

A GeoPacific geologist continuously monitored the field exploration program and logged the borings. Soils observed in the explorations were classified in general accordance with the Unified Soil Classification System. During exploration, our geologist also noted geotechnical conditions such as soil consistency, moisture and groundwater conditions. Logs of test pits are attached to this report. The following report sections are based on the exploration program and summarize subsurface conditions encountered at the site.

Undocumented Fill – Undocumented fill was encountered directly at the ground surface in test pits TP-2, TP-3, TP-4, TP-7, TP-8, TP-10, TP-11, and TP-13. The fill generally consisted of brown, medium stiff to stiff, silt (ML) with gravel, clay, and sand and medium dense, silty sand (SM). The fill extended to a depth of 1.5 to 3.5 feet. It is likely that other areas of undocumented fill exist in the vicinity of the existing structures, driveways, and the throughout the golf course.

Topsoil Horizon – The ground surface in test pits TP-5, TP-6, TP-9, TP-1 (2013), TP-10 (2013), TP-13 (2013), TP-15 (2013), and TP-16 (2013) was directly underlain by a low to highly organic topsoil horizon. The dark brown silt (OL-ML) contained trace amounts of sand and contained fine roots throughout. The topsoil horizon was loose and extended to a depth of 6 to 18 inches.

Colluvial Soil – Colluvial soil, formed by downward migration of material under gravitational forces, was encountered beneath the topsoil horizon in test pit TP-15. These soils generally consisted of stiff to very stiff, silty clay (CL) to clayey silt (ML) with weathered basalt that displayed strong orange and gray mottling. In explorations, the colluvial soil extended to a depth of 3 feet in test pit TP-15.

Buried Topsoil Horizon – A low organic, buried topsoil horizon was encountered beneath the fill in test pit TP-8. The buried topsoil horizon was on the order of 6 inches in thickness - extending to a depth of 3 feet.

Fine Grained Catastrophic Flood Deposits (Willamette Formation) – Underlying the topsoil horizon in test pits TP-5, TP-6, TP-9, TP-1 (2013), TP-10 (2013), and TP-13 (2013); the buried topsoil horizon in test pit TP-8; and the fill in test pits TP-2, TP-4, TP-7, TP-10, and TP-13 was fine grained catastrophic flood deposits. These soils generally consisted of stiff to very stiff, light brown, clayey silt (ML) with trace sand that displayed subtle to strong orange and gray mottling. Where encountered, the flood deposits generally extended to a depth of 3 to 7 feet and beyond the maximum depth of exploration in test pits TP-4, TP-7, TP-8, and TP-1 (2013) excavated to a maximum depth of 8.5 feet.

Conglomerate – Underlying the topsoil horizon in test pits TP-15 (2013) and TP-16 (2013); the fill in test pit TP-3, and the fine grained catastrophic flood deposits in test pits TP-2, TP-5, TP-6, TP-9, TP-10, TP-13, TP-10 (2013), and TP-13 (2013) was dense to very dense subrounded gravel (GM) with sandy, clayey silt matrix; dense, silty sand (SM); and stiff silt (ML) with subrounded gravel. The conglomerate was partially cemented and extended beyond the maximum depth of exploration (6 to 10.5 feet).

Soil Moisture and Groundwater

On May 23, 2014 and November 5 through 7, 2013, soils encountered in test pits were moist to wet. Groundwater seepage was encountered in test pits TP-2, TP-5 through TP-9, TP-13, TP-1 (2013), TP-13 (2013), TP-15 (2013) and TP-16 (2013) at depths of 2 to 8.5 feet. Discharge was visually estimated at ¼ to 2 gallons per minute. In test pit TP-1 (2013), the static groundwater level rose to a depth of 2 feet after the test pit had been left open for a time period of several hours. Experience has shown that temporary perched storm-related groundwater conditions often occur within the surface soils over fine-grained native deposits such as those beneath the site, particularly during the wet season. It is anticipated that groundwater conditions will vary depending on the season, local subsurface conditions, changes in site utilization, and other factors.

SLOPE STABILITY

For the purpose of evaluating slope stability, we: (1) reviewed regional 1:24,000 scale topography by the U.S. Geological Survey and published geologic mapping, (2) reviewed 1:150 scale topographic survey mapping of the site by Olson Engineering, Inc., (3) performed a geological reconnaissance of the site, and (4) evaluated subsurface soil conditions in exploratory test pits. Regional slope stability mapping of Clark County, Washington published by the Washington Department of Natural Resources Division of Geology identifies an area of potential instability on the southwest side of Green Mountain (Fiksdal, 1975). This area roughly correlates with the near vertical rock exposures at the base of Green Mountain that is north of the Phase 1 area. No mapped landslides are indicated in the Phase 1 study area on more recent geologic mapping conducted by Evarts (2006).

Based on the data review, field reconnaissance and site exploration, the slope instability hazard for the Phase 1 portion of the Green Mountain property is considered to be low. Slopes in the Phase 1 area are on the order of 5 to 20 percent. Slope geomorphology at the site is generally smooth and uniform - consistent with relative stability. Subsurface explorations indicate the site is generally underlain by stiff to very-stiff, clayey silt (ML) loess underlain by dense to very dense, silty gravel (GM). These materials are generally characterized by moderate to high shear strength and a relatively high resistance to slope instability on gentle slopes. The Phase 1 area is considered generally suitable for development.

PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

Our investigation indicates that the proposed development is geotechnically feasible, provided that the recommendations of this report are incorporated into the design and construction phases of the project. The primary geotechnical constraint to development is the presence of fill throughout the site. Up to 5 feet of fill was encountered in the exploratory test pits. It is anticipated that fill is prevalent throughout the fairway areas of the golf course where sand traps, ponds, and sculpted topography have been created.

Stormwater Disposal

Soil conditions at the site generally consist of fine grained flood deposits (consisting of clayey silt with sand) underlain by coarse grained, partially cemented conglomerate consisting of subrounded gravel with a clayey silt matrix and trace sand. Orange and gray mottling was observed in near surface soils in all explorations. Soil moisture conditions were moist to wet and perched groundwater seepage was encountered in test pits TP-2, TP-5 through TP-9, TP-13, TP-1 (2013), TP-13 (2013), TP-15 (2013) and TP-16 (2013) at depths of 2 to 8.5 feet. Static groundwater was measured at a depth of 2 feet below the ground surface in test pit TP-1 (2013). Soil mottling, the presence of clay soils, and the prevalent groundwater seepage indicates the soils will likely accept little runoff – if any. Soils with moderate permeability are already saturated with perched groundwater. We would expect soil conditions to behave more as Soil Group 4 soils than Soil Group 3 soils outlined in the Western Washington Continuous Simulation Hydrology Model.

Site Preparation

Due to the presence of fill through the site, areas of proposed construction and areas to receive fill should be cleared of vegetation and existing fill soils should then be removed to stiff or dense native soils. Organic soils are likely present at the bottom of the ponds and should be removed to stiff, native soils. Inorganic debris and organic materials from clearing should be removed from the site. It is likely that the existing fill may be reused as engineered fill provided that they are properly moisture conditioned and free of organic or inorganic debris. Organic-rich root zones should then be stripped from construction areas of the site or where engineered fill is to be placed. Depth of stripping is estimated to average 8+ inches. The final depth of soil removal will be determined on the basis of a site inspection after the stripping/ excavation has been performed. Stripped topsoil should preferably be removed from the site. Any remaining topsoil should be stockpiled only in designated areas and stripping operations should be observed and documented by the geotechnical engineer or his representative.

Remaining undocumented fills and any subsurface structures (dry wells, basements, driveway and landscaping fill, old utility lines, septic leach fields, etc.) should be removed and the excavations backfilled with engineered fill. Fill in excess of 5 feet was encountered directly at the ground surface in test pits for this investigation. Sculpted topography in the vicinity of the fairways indicates the presence of fill. We anticipate that other areas of fill may exist in the vicinity of the existing structures, parking lots, and driveways.

Engineered Fill

All grading for the proposed construction should be performed as engineered grading in accordance with the applicable building code at time of construction with the exceptions and additions noted herein. Proper test frequency and earthwork documentation usually requires daily observation and testing during stripping, rough grading, and placement of engineered fill. Imported fill material must be approved by the geotechnical engineer prior to being imported to the site. Oversize material greater than 6 inches in size should not be used within 3 feet of foundation footings, and material greater than 12 inches in diameter should not be used in engineered fill.

Engineered fill should be compacted in horizontal lifts not exceeding 8 inches using standard compaction equipment. We recommend that engineered fill be compacted to at least 90% of the maximum dry density determined by ASTM D1557 (Modified Proctor) or equivalent. Field density testing should conform to ASTM D2922 and D3017, or D1556. All engineered fill should be observed and tested by the project geotechnical engineer or his representative. Typically, one density test is performed for at least every 2 vertical feet of fill placed or every 500 yd^3, whichever requires more testing. Because testing is performed on an on-call basis, we recommend that the earthwork contractor be held contractually responsible for test scheduling and frequency.

Site earthwork will be impacted by soil moisture and shallow groundwater conditions. Earthwork in wet weather would likely require extensive use of cement or lime treatment, or other special measures, at considerable additional cost compared to earthwork performed under dry-weather conditions.

Excavating Conditions and Utility Trenches

We anticipate that on-site soils can be excavated using conventional heavy equipment such as trackhoes to a depth of 9 feet. All temporary cuts in excess of 4 feet in height should be sloped in accordance with U.S. Occupational Safety and Health Administration (OSHA) regulations (29 CFR Part 1926), or be shored. The existing native soil is classified as Type B Soil and temporary excavation side slope inclinations as steep as 1H:1V may be assumed for planning purposes. This cut slope inclination is applicable to excavations above the water table only. Maintenance of safe working conditions, including temporary excavation stability, is the responsibility of the contractor. Actual slope inclinations at the time of construction should be determined based on safety requirements and actual soil and groundwater conditions.

Soft, saturated soils and groundwater may be encountered in utility trenches, particularly during the wet season. We anticipate that dewatering systems consisting of ditches, sumps and pumps would be adequate for control of perched groundwater. Regardless of the dewatering system used, it should be installed and operated such that in-place soils are prevented from being removed along with the groundwater. Trench bottom stabilization, such as one to two feet of compacted crushed aggregate base, may be necessary in deeper trenches.

Vibrations created by traffic and construction equipment may cause some caving and raveling of excavation walls. In such an event, lateral support for the excavation walls should be provided by the contractor to prevent loss of ground support and possible distress to existing or previously constructed structural improvements.

PVC pipe should be installed in accordance with the procedures specified in ASTM D2321. We recommend that trench backfill be compacted to at least 95% of the maximum dry density obtained by Modified Proctor ASTM D1557 or equivalent. Initial backfill lift thickness for a ¾"-0 crushed aggregate base may need to be as great as 4 feet to reduce the risk of flattening underlying flexible pipe. Subsequent lift thickness should not exceed 1 foot. If imported granular fill material is used, then the lifts for large vibrating plate-compaction equipment (e.g. hoe compactor attachments) may be up to 2 feet, provided that proper compaction is being achieved and each lift is tested. Use of large vibrating compaction equipment should be carefully monitored near existing structures and improvements due to the potential for vibration-induced damage.

Adequate density testing should be performed during construction to verify that the recommended relative compaction is achieved. Typically, one density test is taken for every 4 vertical feet of backfill on each 200-lineal-foot section of trench.

Erosion Control Considerations

During our field exploration program, we did not observe soil types that would be considered highly susceptible to erosion, except in areas of steeply sloping topography. In our opinion, the primary concern regarding erosion potential will occur during construction, in areas that have been stripped of vegetation. Erosion at the site during construction can be minimized by implementing the project erosion control plan, which should include judicious use of straw bales and silt fences. If used, these erosion control devices should be in place and remain in place throughout site preparation and construction.

Erosion and sedimentation of exposed soils can also be minimized by quickly re-vegetating exposed areas of soil, and by staging construction such that large areas of the project site are not denuded and exposed at the same time. Areas of exposed soil requiring immediate and/or temporary protection against exposure should be covered with either mulch or erosion control netting/blankets. Areas of exposed soil requiring permanent stabilization should be seeded with an approved grass seed mixture, or hydroseeded with an approved seed-mulch-fertilizer mixture.

Wet Weather Earthwork

Soils underlying the site are likely to be moisture sensitive and may be difficult to handle or traverse with construction equipment during periods of wet weather. Earthwork is typically most economical when performed under dry weather conditions. Earthwork performed during the wet-weather season will probably require expensive measures such as cement treatment or imported granular material to compact fill to the recommended engineering specifications. If earthwork is to be performed or fill is to be placed in wet weather or under wet conditions when soil moisture content is difficult to control, the following recommendations should be incorporated into the contract specifications.

- Earthwork should be performed in small areas to minimize exposure to wet weather. Excavation or the removal of unsuitable soils should be followed promptly by the placement and compaction of clean engineered fill. The size and type of construction equipment used may have to be limited to prevent soil disturbance. Under some circumstances, it may be necessary to excavate soils with a backhoe to minimize subgrade disturbance caused by equipment traffic;
- The ground surface within the construction area should be graded to promote run-off of surface water and to prevent the ponding of water;
- Material used as engineered fill should consist of clean, granular soil containing less than 5 percent fines. The fines should be non-plastic. Alternatively, cement treatment of on-site soils may be performed to facilitate wet weather placement;
- The ground surface within the construction area should be sealed by a smooth drum vibratory roller, or equivalent, and under no circumstances should be left uncompacted and exposed to moisture. Soils which become too wet for compaction should be removed and replaced with clean granular materials;
- Excavation and placement of fill should be observed by the geotechnical engineer to verify that all unsuitable materials are removed and suitable compaction and site drainage is achieved; and
- Bales of straw and/or geotextile silt fences should be strategically located to control erosion.

If cement or lime treatment is used to facilitate wet weather construction, GeoPacific should be contacted to provide additional recommendations and field monitoring.

Anticipated Foundations

The proposed residential structures may be supported on shallow foundations bearing on competent undisturbed, native soils and/or engineered fill, appropriately designed and constructed as recommended in this report. Foundation design, construction, and setback requirements should conform to the applicable building code at the time of construction. For maximization of bearing strength and protection against frost heave, spread footings should be embedded at a minimum depth of 18 inches below exterior grade. The recommended minimum widths for continuous footings supporting wood-framed walls without masonry are 12 inches for single-story, 15 inches for two-story, and 18 inches for three-story structures. Minimum foundation reinforcement should consist of a No. 4 bar at the top of the stem walls, and a No. 4 bar at the bottom of the footings. Concrete slab-on-grade reinforcement should consist of No. 4 bars placed on 24-inch centers in a grid pattern.

The anticipated allowable soil bearing pressure is 1,500 lbs/ft^2 for footings bearing on competent, native soil and/or engineered fill. A maximum chimney and column load of 30 kips is recommended for the site. The recommended maximum allowable bearing pressure may be increased by 1/3 for short-term transient conditions such as wind and seismic loading. For heavier loads, the geotechnical engineer should be consulted. The coefficient of friction between on-site soil and poured-in-place concrete may be taken as 0.40, which includes no factor of safety. The maximum anticipated total and differential footing movements (generally from soil expansion and/or settlement) are 1 inch and ¾ inch over a span of 20 feet, respectively. We anticipate that the majority of the estimated settlement will occur during construction, as loads are applied. Excavations near structural footings should not extend within a 1H:1V plane projected downward from the bottom edge of footings.

Footing excavations should penetrate through topsoil and any loose soil to competent subgrade that is suitable for bearing support. All footing excavations should be trimmed neat, and all loose or softened soil should be removed from the excavation bottom prior to placing reinforcing steel bars. Due to the moisture sensitivity of on-site native soils, foundations constructed during the wet weather season may require overexcavation of footings and backfill with compacted, crushed aggregate.

Our recommendations are for house construction incorporating raised wood floors and conventional spread footing foundations. If living space of the structures will incorporate basements, a geotechnical engineer should be consulted to make additional recommendations for retaining walls, water-proofing, underslab drainage and wall subdrains. After site development, a Final Soil Engineer's Report should either confirm or modify the above recommendations.

Pavement Design

For design purposes, we used an estimated resilient modulus of 9,000 for compacted native soil. Table 1 presents our recommended minimum pavement section for dry weather construction.

Table 1. Recommended Minimum Dry-Weather Pavement Section

Material Layer	Light-duty Public Streets	Compaction Standard
Asphaltic Concrete (AC)	3 in.	92%/ 92% of Rice Density AASHTO T-209
Crushed Aggregate Base ¾"-0 (leveling course)	2 in.	95% of Modified Proctor AASHTO T-180
Crushed Aggregate Base 1½"-0	8 in.	95% of Modified Proctor AASHTO T-180
Subgrade	12 in.	95% of Modified Proctor AASHTO T-180 or equivalent

Any pockets of organic debris or loose fill encountered during ripping or tilling should be removed and replaced with engineered fill (see *Site Preparation* Section). In order to verify subgrade strength, we recommend proof-rolling directly on subgrade with a loaded dump truck during dry weather and on top of base course in wet weather. Soft areas that pump, rut, or weave should be stabilized prior to paving. If pavement areas are to be constructed during wet weather, the subgrade and construction plan should be reviewed by the project geotechnical engineer at the time of construction so that condition specific recommendations can be provided. The moisture sensitive subgrade soils make the site a difficult wet weather construction project.

During placement of pavement section materials, density testing should be performed to verify compliance with project specifications. Generally, one subgrade, one base course, and one asphalt compaction test is performed for every 100 to 200 linear feet of paving.

Seismic Design

Structures should be designed to resist earthquake loading in accordance with the methodology described in the 2010 ASCE-7 Standard. We recommend Site Class D be used for design. Design values determined for the site using the USGS (United States Geological Survey) *U.S. Seismic Design Maps* tool (Version 3.1.0) are summarized in Table 2, presented on the following page.

Table 2. Recommended Earthquake Ground Motion Parameters (2010 ASCE-7)

Parameter	Value
Location (Lat, Long), degrees	45.646, -122.457
Mapped Spectral Acceleration Values (MCE):	
Peak Ground Acceleration	0.374
Short Period, S_s	0.880 g
1.0 Sec Period, S_1	0.375 g
Soil Factors for Site Class D:	
F_a	1.148
F_v	1.650
Residential Site Value = 2/3 x F_a x S_s	0.673 g
Residential Seismic Design Category	D_0

Soil liquefaction is a phenomenon wherein saturated soil deposits temporarily lose strength and behave as a liquid in response to earthquake shaking. Soil liquefaction is generally limited to loose, granular soils located below the water table. Following development, on-site soils will consist predominantly of engineered fill or native fine-grained soils above the water table, which are not considered susceptible to liquefaction. Therefore, it is our opinion that special design or construction measures are not required to mitigate the effects of liquefaction.

Drainage

The upslope side of retaining walls and perimeter footings should be provided with a drainage system consisting of 3-inch diameter, slotted, flexible plastic pipe embedded in a minimum of 1 ft^3 per lineal foot of clean, free-draining gravel or 1 1/2" - 3/4" drain rock. The drain pipe and surrounding drain rock should be wrapped in non-woven geotextile (Mirafi 140N, or approved equivalent) to minimize the potential for clogging and/or ground loss due to piping. Water collected from the footing drains should be directed into the local storm drain system or other suitable outlet. A minimum 0.5 percent fall should be maintained throughout the drain and non-perforated pipe outlet. Down spouts and roof drains should not be connected to the foundation drains in order to reduce the potential for clogging. The footing drains should include clean-outs to allow periodic maintenance and inspection. Grades around the proposed structure should be sloped such that surface water drains away from the building. Footing drains are recommended to prevent detrimental effects of groundwater on foundations, and should not be expected to eliminate all potential sources of water entering a crawlspace or beneath a slab-on-grade. An adequate grade to a low point outlet drain in any crawlspace areas is required by code. Underslab drains are sometimes added beneath the slab when placed over soils of low permeability and shallow, perched groundwater.

UNCERTAINTIES AND LIMITATIONS

We have prepared this report for the owner and their consultants for use in design of this project only. This report should be provided in its entirety to prospective contractors for bidding and estimating purposes; however, the conclusions and interpretations presented in this report should not be construed as a warranty of the subsurface conditions. Experience has shown that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, GeoPacific should be notified for review of the recommendations of this report, and revision of such if necessary.

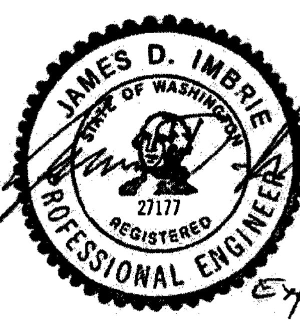
Sufficient geotechnical monitoring, testing and consultation should be provided during construction to confirm that the conditions encountered are consistent with those indicated by explorations. The checklist attached to this report outlines recommended geotechnical observations and testing for the project. Recommendations for design changes will be provided should conditions revealed during construction differ from those anticipated, and to verify that the geotechnical aspects of construction comply with the contract plans and specifications.

Within the limitations of scope, schedule and budget, GeoPacific attempted to execute these services in accordance with generally accepted professional principles and practices in the fields of geotechnical engineering and engineering geology at the time the report was prepared. No warranty, expressed or implied, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or groundwater at this site.

We appreciate this opportunity to be of service.

Sincerely,

GEOPACIFIC ENGINEERING, INC.



Exp 3-31-16

Beth K. Rapp
Senior Geotechnical Staff

James D. Imbrie, P.E.
Principal Geotechnical Engineer

Attachments: References
Figure 1 – Vicinity Map
Figure 2 – Site and Exploration Plan
Test Pit Logs – TP-2 through TP-11, & TP-13
Test Pit Logs from Previous Study – TP-1 (2013), TP-10 (2013), TP-13 (2013), TP-15 (2013) & TP-16 (2013)

REFERENCES

Atwater, B.F., 1992, Geologic evidence for earthquakes during the past 2,000 years along the Copalis River, southern coastal Washington: Journal of Geophysical Research, v. 97, p. 1901-1919.

Beeson, M.H., Tolan, T.L., and Anderson, J.L., 1989, The Columbia River Basalt Group in western Oregon; Geologic structures and other factors that controlled flow emplacement patterns: Geological Society of America Special Paper 239, in Volcanism and tectonicism in the Columbia River flood-basalt province published by the Geological Society of America, p. 223-246.

Carver, G.A., 1992, Late Cenozoic tectonics of coastal northern California: American Association of Petroleum Geologists-SEPM Field Trip Guidebook, May, 1992.

Evarts, R.C., 2006, Geologic Map of the Lacamas Creek Quadrangle, Clark County, Washington: U.S. Geological Survey Scientific Investigations Map 2924.

Fiksdal, A., 1975, Slope stability of Clark County, Washington: Washington Division of Geology and Natural Resources, Open File Report 75-10, map scale 1:63,360.

Geomatrix Consultants, 1995, Seismic Design Mapping, State of Oregon: unpublished report prepared for Oregon Department of Transportation, Personal Services Contract 11688, January 1995.

Goldfinger, C., Kulm, L.D., Yeats, R.S., Appelgate, B, MacKay, M.E., and Cochrane, G.R., 1996, Active strike-slip faulting and folding of the Cascadia Subduction-Zone plate boundary and forearc in central and northern Oregon: in Assessing earthquake hazards and reducing risk in the Pacific Northwest, v. 1: U.S. Geological Survey Professional Paper 1560, P. 223-256.

Madin, I.P., 1990, Earthquake hazard geology maps of the Portland metropolitan area, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report 0-90-2, scale 1:24,000, 22 p.

Mundorff, M.J., 1964, Geology and ground-water conditions of Clark County, Washington, with a description of a major alluvial aquifer along the Columbia River: U.S. Geological Survey Water-Supply Paper 1600, 268 p., 3 pls.

Peterson, C.D., Darioenzo, M.E., Burns, S.F., and Burris, W.K., 1993, Field trip guide to Cascadia paleoseismic evidence along the northern California coast: evidence of subduction zone seismicity in the central Cascadia margin: Oregon Geology, v. 55, p. 99-144.

Phillips W. M., 1987, Geologic map of the Vancouver Quadrangle, Washington and Oregon: Washington Division of Geology and Natural Resources, Open File Report 87-10, 32 p., map scale 1:100,000.

Trimble, D.E., 1963, Geology of Portland, Oregon and adjacent areas: U.S. Geological Survey Bulletin 1119, 119p., 1 plate, scale 1:62,500.

United States Geologic Survey, 2014, U.S. Seismic Design Maps Online Tool, http://earthquake.usgs.gov/designmaps/us/application.php

Unruh, J.R., Wong, I.G., Bott, J.D., Silva, W.J., and Lettis, W.R., 1994, Seismotectonic evaluation: Scoggins Dam, Tualatin Project, Northwest Oregon: unpublished report by William Lettis and Associates and Woodward Clyde Federal Services, Oakland, CA, for U. S. Bureau of Reclamation, Denver CO (in Geomatrix Consultants, 1995).

Werner, K.S., Nabelek, J., Yeats, R.S., Malone, S., 1992, The Mount Angel fault: implications of seismic-reflection data and the Woodburn, Oregon, earthquake sequence of August, 1990: Oregon Geology, v. 54, p. 112-117.

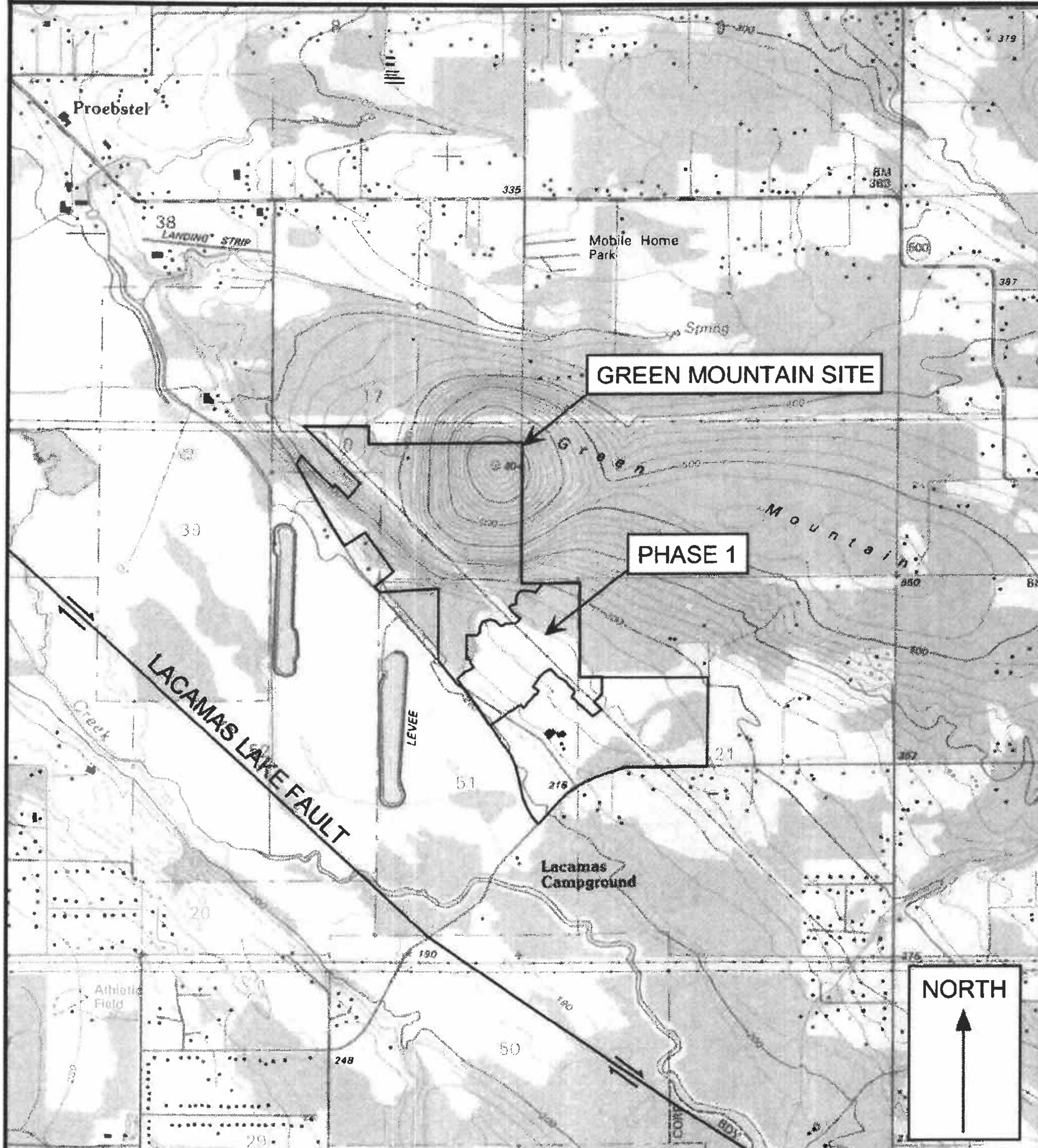
Wong, I. Silva, W., Bott, J., Wright, D., Thomas, P., Gregor, N., Li., S., Mabey, M., Sojourner, A., and Wang, Y., 2000, Earthquake Scenario and Probabilistic Ground Shaking Maps for the Portland, Oregon, Metropolitan Area; State of Oregon Department of Geology and Mineral Industries; Interpretative Map Series IMS-16.

Yeats, R.S., Graven, E.P., Werner, K.S., Goldfinger, C., and Popowski, T., 1996, Tectonics of the Willamette Valley, Oregon: in Assessing earthquake hazards and reducing risk in the Pacific Northwest, v. 1: U.S. Geological Survey Professional Paper 1560, P. 183-222, 5 plates, scale 1:100,000.

Yelin, T.S., 1992, An earthquake swarm in the north Portland Hills (Oregon): More speculations on the seismotectonics of the Portland Basin: Geological Society of America, Programs with Abstracts, v. 24, no. 5, p. 92.

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

VICINITY MAP



Legend

Approximate Scale 1 in = 2,000 ft

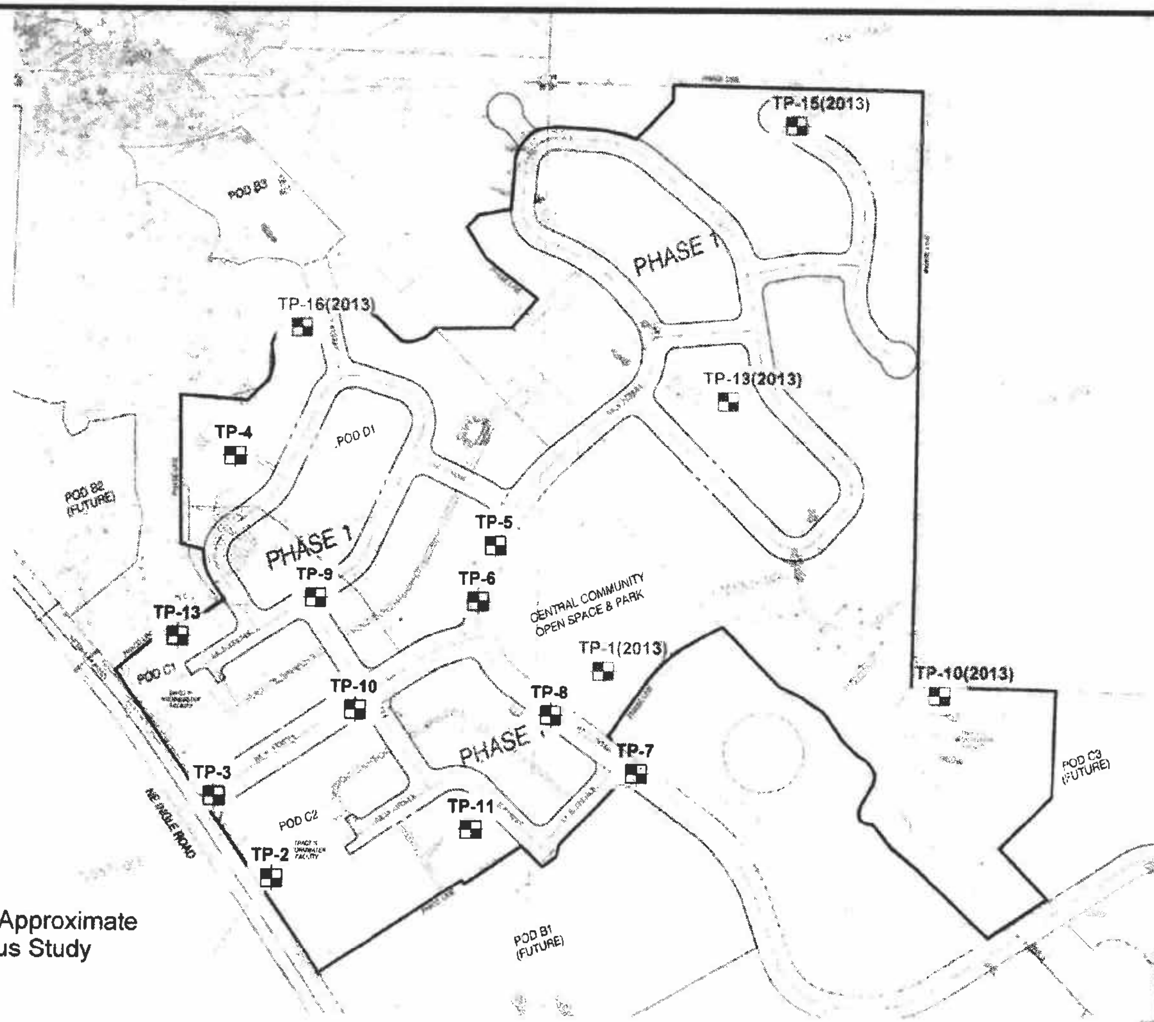
Date: 11/25/2014
Drawn by: EKR

Base map: U.S. Geological Survey 7.5 minute Topographic Map Series, Lacamas Creek, Washington Quadrangle, 1990.

Project: Green Mountain Phase 1 Camas, Washington	Project No. 13-3186	FIGURE 1

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

SITE PLAN AND EXPLORATION LOCATIONS



Legend

TP-2 Test Pit Designation and Approximate Location

TP-16(2013) Test Pit Designation and Approximate Location-from Previous Study

0 400'
APPROXIMATE SCALE 1"=400'

Base map provided by Olson Engineering Dated November 2014.

Project: Green Mountain Phase 1 Camas, Washington	Project No. 13-3186	Date: 10/2/2014 Drawn by: EKR	FIGURE 2

GeoPacific Engineering Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1 Camas, Washington	Project No. 13-3186	Test Pit No. **TP-2**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	3.0					Stiff to very stiff, SILT (ML), trace sand, brown, moderately organic, trace roots throughout, 6 inch topsoil developed at surface, strong orange and gray mottling, trace black staining, moist (Fill)
2	1.5					
3	4.5					Stiff to very stiff, clayey SILT (ML), trace sand, brown, micaceous, subtle orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
4	3.5					
5						
6						
7					Seepage	Dense, subrounded GRAVEL (GM), trace clayey silt matrix, trace sand, brown to gray, trace black staining, partially cemented, strong orange and gray mottling, gravel is up to 9 inches in diameter, well graded, moist to wet (Conglomerate)
8					Seepage	
9						Test Pit Terminated at 8.5 Feet.
10						Note: Groundwater seepage encountered at 7 - 8 feet. Discharge visually estimated at 1/2 gallon per minute.
11						
12						

LEGEND

100 to 1,000 g — Bag Sample
5 Gal Bucket — Bucket Sample
Shelby Tube Sample
Seepage
Water Bearing Zone
Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1, Camas, Washington	Project No. 13-3186	Test Pit No. TP-3

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Type	In-Situ Dry Density (lb/ft^3)	Moisture Content (%)	Water Bearing Zone	Material Description
1	4.5					Stiff to very stiff, SILT (ML), trace subrounded gravel, brown, with inorganic debris (asphalt), trace roots throughout, 6 inch thick topsoil developed at surface, strong orange and gray mottling, trace black staining, moist (Fill)
2	4.5					
3	4.5					
4	3.5					Stiff to very stiff, sandy SILT (ML), trace subrounded gravel, brown, micaceous, subtle to strong orange and gray mottling, trace black staining, moist (Conglomerate)
5						
6						
7						Dense, subrounded GRAVEL (GM), trace clayey silt matrix, trace sand, brown to gray, trace black staining, partially cemented, strong orange and gray mottling, gravel is up to 9 inches in diameter, well graded, moist to wet (Conglomerate)
8						
9						Test Pit Terminated at 8.5 Feet.
10						Note: No seepage or groundwater encountered.
11						
12						

LEGEND

Bag Sample (100 to 1,000 g) · Bucket Sample (5 Gal. Bucket) · Shelby Tube Sample · Seepage · Water Bearing Zone · Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1, Camas, Washington	Project No. 13-3186	Test Pit No. TP-4

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	4.5					Stiff to very stiff, sandy SILT (ML), trace subrounded gravel, gray, trace organic debris, trace roots throughout, 6 inch thick topsoil developed at surface, subtle to strong orange and gray mottling, trace black staining, moist (Fill)
2	4.0					
3	3.5					Stiff to very stiff, sandy SILT (ML), light brown, micaceous, strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
4	3.0					
5						
6						
7						
8						Test Pit Terminated at 8 Feet. Note: No seepage or groundwater encountered.
9						
10						
11						
12						

LEGEND

100 to 1,000 g — Bag Sample
5 Gal. Bucket — Bucket Sample
Shelby Tube Sample
Seepage
Water Bearing Zone
Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1 Camas, Washington	Project No. 13-3186	Test Pit No. **TP-5**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
0–1						Low to moderately organic, SILT (OL-ML), dark brown, fine roots throughout, loose, moist (Topsoil)
1	4.5					Stiff to very stiff, sandy SILT (ML), light brown, micaceous, subtle to strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
2	2.0					
3	2.5					
4	2.5					
5						
6						Medium dense to dense, silty SAND (SM), brown to blue gray below 8.5 feet, subtle to strong orange and gray mottling, sand is fine to medium grained, partially lithified, trace black staining, moist (Conglomerate)
7					Seepage	
8						
9						Test Pit Terminated at 9 Feet.
10						Note: Groundwater seepage encountered at 7.5 feet. Discharge visually estimated at 1/4 gallon per minute.
11						
12						

LEGEND

100 to 1,000 g — Bag Sample; 5 Gal. Bucket — Bucket Sample; Shelby Tube Sample; Seepage; Water Bearing Zone; Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1, Camas, Washington	Project No. 13-3186	Test Pit No. TP-6

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
0–0.5						Low organic, SILT (OL-ML), dark brown, roots throughout, loose, moist (Topsoil)
1	2.5					Stiff to very stiff, sandy SILT (ML), light brown, micaceous, subtle to strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
2	4.5					
3	3.5					
4	4.0					
4.5					Seepage	
5.5–8.5						Medium dense to dense, silty SAND (SM), trace subrounded gravel, brown, strong orange and gray mottling, sand is fine to medium grained, partially lithified, trace black staining, moist (Conglomerate)
8.5–12						Test Pit Terminated at 8.5 Feet.

Note: Groundwater seepage encountered at 4.5 feet.
Discharge visually estimated at 1/4 gallon per minute.

LEGEND: Bag Sample (100 to 1,000 g); Bucket Sample (5 Gal Bucket); Shelby Tube Sample; Seepage; Water Bearing Zone; Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1, Camas, Washington	Project No. 13-3186	Test Pit No. TP-7

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	4.0					Stiff to very stiff, sandy SILT (ML), trace subrounded gravel, light brown, trace roots throughout, 6 inch thick topsoil developed at surface, strong orange and gray mottling, trace black staining, moist (Fill)
2	4.0					
3	2.0					
4	2.5					Stiff to very stiff, sandy SILT (ML), light brown, micaceous, strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
5						
6						
7						
8						
9						Test Pit Terminated at 8.5 Feet.
10						Note: Groundwater seepage encountered at 5.5 - 6.5 feet. Discharge visually estimated at 1/4 gallon per minute.
11						
12						

LEGEND

100 to 1,000 g — Bag Sample
5 Gal Bucket — Bucket Sample
Shelby Tube Sample
Seepage
Water Bearing Zone
Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering Inc
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1, Camas, Washington	Project No. 13-3186	Test Pit No. TP-8

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	2.0					Stiff to very stiff, sandy SILT (ML), light brown, trace roots throughout, 6 inch thick topsoil developed at surface, strong orange and gray mottling, moist (Fill)
2	2.5					Low organic, SILT (OL-ML), gray, trace fine roots throughout, loose, moist (Buried Topsoil)
3	2.0					Stiff to very stiff, sandy SILT (ML), light brown, micaceous, strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
4	1.5					
5						
6					Seepage	
7					Seepage	
8						
9						Test Pit Terminated at 8.5 Feet.
10						Note: Groundwater seepage encountered at 5.5 - 7.5 feet. Discharge visually estimated at 1/2 gallon per minute.
11						
12						

LEGEND

Bag Sample (100 to 1,000 g) · Bucket Sample (5 Gal Bucket) · Shelby Tube Sample · Seepage · Water Bearing Zone · Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1, Camas, Washington	Project No. 13-3186	Test Pit No. TP-9

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
0–0.75						Moderately organic, SILT (OL-ML), trace gravel fill, dark brown, fine roots throughout, loose, moist (Topsoil)
1	4.0					Stiff to very stiff, clayey SILT (ML), trace sand, brown, micaceous, subtle orange and gray mottling, trace roots to 3 feet, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
2	3.5					
3	4.5					
4	4.5					
7–8.5					Seepage	Dense, subrounded GRAVEL (GM), trace clayey silt matrix, trace sand, brown to gray, trace black staining, partially cemented, strong orange and gray mottling, moist to wet (Conglomerate)

Test Pit Terminated at 8.5 Feet.

Note: Groundwater seepage encountered at 7.5 feet.
Discharge visually estimated at 1/4 gallon per minute.

LEGEND

Bag Sample (100 to 1,000 g) · Bucket Sample (5 Gal Bucket) · Shelby Tube Sample · Seepage · Water Bearing Zone · Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1 Camas, Washington	Project No. 13-3186	Test Pit No. TP-10

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	4.0					Stiff to very stiff, SILT (ML), trace sand, brown, trace inorganic debris, trace roots throughout, 6 inch topsoil developed at surface, strong orange and gray mottling, moist (Fill)
2	4.0					Stiff to very stiff, sandy SILT (ML), trace clay, light brown, micaceous, subtle to strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
3	4.5					
4	4.5					
5						
6						Dense to very dense, subrounded GRAVEL (GM), trace clayey silt matrix, trace sand, brown to gray, trace black staining, partially cemented, strong orange and gray mottling, gravel is up to 6 inches in diameter, well graded, moist (Conglomerate)
7						
8						
9						Test Pit Terminated at 8.5 Feet.
10						Note: No seepage or groundwater encountered.
11						
12						

LEGEND

Bag Sample (100 to 1,000 g) · Bucket Sample (5 Gal. Bucket) · Shelby Tube Sample · Seepage · Water Bearing Zone · Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1
Camas, Washington

Project No. 13-3186

Test Pit No. **TP-11**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	2.5					Stiff to very stiff, sandy SILT (ML), trace gravel, light brown, trace fine roots throughout, 6 inch thick topsoil developed at surface, moist (Fill)
2	4.5					Low to moderately organic, SILT (OL-ML), brown, trace fine roots throughout, moist (Buried Topsoil)
3	3.5					Stiff to very stiff, sandy SILT (ML), light brown, subtle to strong orange and gray mottling, moist (Fill)
4	3.0					
5						Test Pit Terminated at 5 Feet due to Buried Water Line Tape.
6						
7						Note: No groundwater or seepage encountered.
8						
9						
10						
11						
12						

LEGEND

100 to 1,000 g — Bag Sample; 5 Gal Bucket — Bucket Sample; Shelby Tube Sample; Seepage; Water Bearing Zone; Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1, Camas, Washington	Project No. 13-3186	Test Pit No. **TP-13**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	1.5					Stiff, sandy SILT (ML), trace clay, light brown, trace roots throughout, 6 inch thick topsoil developed at surface, strong orange and gray mottling, moist (Fill)
2	2.0					
3	2.5					
4	4.0					Stiff to very stiff, sandy SILT (ML), light brown, micaceous, strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
5						
6						
7						Dense to very dense, subrounded GRAVEL (GM), trace silty sand matrix, brown to gray, trace black staining, strong orange and gray mottling, gravel is up to 12 inches in diameter, moist (Conglomerate)
8						
9						Test Pit Terminated at 8.5 Feet.
10						Note: Groundwater seepage encountered at 8.5 feet. Discharge visually estimated at 1/4 gallon per minute.
11						
12						

LEGEND

100 to 1,000 g — Bag Sample
5 Gal. Bucket — Bucket Sample
Shelby Tube Sample
Seepage
Water Bearing Zone
Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain, Camas, Washington	Project No. 13-3186	Test Pit No. TP-1 (2013)

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
0–1.5	0.5 (at 1 ft)					Moderately organic, sandy SILT (OL-ML), dark brown, roots throughout, loose, moist (Topsoil)
1.5–4	1.0 (at 2 ft), 1.0 (at 3 ft), 0.5 (at 4 ft)				Water level at abandonment (2 ft); Seepage (3 ft)	Medium stiff, sandy SILT (ML), brown, micaceous, strong orange and gray mottling, moist to wet (Fine Grained Catastrophic Flood Deposits)
4–12						Test Pit Terminated at 4 Feet for Infiltration Testing. Note: Groundwater seepage encountered at 3 feet. Discharge visually estimated at less than 1 gallon per minute. Static groundwater at 2 Feet at Completion of Infiltration Testing.

LEGEND

100 to 1,000 g — Bag Sample; 5 Gal. Bucket — Bucket Sample; Shelby Tube Sample; Seepage; Water Bearing Zone; Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Camas, Washington	Project No. 13-3186	Test Pit No. TP-10 (2013)

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
0–0.7						Moderately organic, SILT (OL-ML), dark brown, fine roots throughout, loose, moist (Topsoil)
1	2.0					Stiff to very stiff, sandy SILT (ML), trace clay, light brown, micaceous, strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
2	2.0					
3	1.5					
4	3.5					Dense, subrounded GRAVEL (GM), trace sandy silt matrix, light brown to gray, trace black staining, strong orange and gray mottling, micaceous, moist (Conglomerate)
5						
6						Test Pit Terminated at 6 Feet.
7–12						Note: No seepage or groundwater encountered.

LEGEND

Bag Sample (100 to 1,000 g) | Bucket Sample (5 Gal Bucket) | Shelby Tube Sample | Seepage | Water Bearing Zone | Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1, Camas, Washington	Project No. 13-3186	Test Pit No. TP-13 (2013)

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
0–0.75						Moderately organic, SILT (OL-ML), brown, fine roots throughout, loose, moist (Topsoil)
0.75–3	1.5 (at 2 ft); 3.0 (at 3 ft)					Medium stiff to very stiff, sandy SILT (ML), trace clay, light brown, micaceous, strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
3–9					Seepage at 8 ft	Dense, subrounded GRAVEL (GM), trace sandy silt matrix, trace clay, light brown to gray, trace black staining, well graded, strong orange and gray mottling, micaceous, moist (Conglomerate)

Test Pit Terminated at 9 Feet.

Note: Groundwater seepage encountered at 8 feet.
Discharge visually estimated at 1 gallon per minute.

LEGEND

100 to 1,000 g — Bag Sample; 5 Gal. Bucket — Bucket Sample; Shelby Tube Sample; Seepage; Water Bearing Zone; Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1, Camas, Washington	Project No. 13-3186	Test Pit No. TP-15 (2013)

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
0–0.7						Moderately organic, SILT (OL-ML), with basalt fragments, dark brown, fine roots throughout, loose, moist (Topsoil)
1	1.5					
2	3.5				Seepage	Stiff to very stiff, silty CLAY (CL) to clayey SILT (ML), with gray weathered basalt, light reddish-brown, trace fine roots throughout, strong orange and gray mottling, black staining, moist (Colluvial Soil)
3–10.5						Medium dense, silty SAND (SM) with interbeds of stiff, sandy SILT (ML), light brown, micaceous, sand is fine to medium grained, strong orange and gray mottling, trace black staining, moist (Conglomerate)

Test Pit Terminated at 10.5 Feet.

Note: Groundwater seepage encountered at 2 feet.
Discharge visually estimated at 1 gallon per minute.

LEGEND

Bag Sample (100 to 1,000 g) · Bucket Sample (5 Gal. Bucket) · Shelby Tube Sample · Seepage · Water Bearing Zone · Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain, Camas, Washington	Project No. 13-3186	Test Pit No. TP-16 (2013)

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
0–1						Moderately organic, SILT (OL-ML), dark brown, fine roots throughout, loose, moist (Topsoil)
1	0.5					
2	2.0					
3	3.5					Medium dense, silty SAND (SM) with interbeds of stiff, sandy SILT (ML), light brown to gray, micaceous, sand is coarse to medium grained, strong orange and gray mottling, trace black staining, moist to wet (Conglomerate)
4	2.0					
5						
6						
7						
8						
9						Test Pit Terminated at 9 Feet.
10						
11						Note: Groundwater seepage encountered at 3.5 to 6.5 feet. Discharge visually estimated at 2 gallons per minute.
12						

LEGEND

100 to 1,000 g Bag Sample | 5 Gal. Bucket Bucket Sample | Shelby Tube Sample | Seepage | Water Bearing Zone | Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

H

STORMWATER FACILITY MAINTENANCE MANUAL

Clark County Public Works Department
Clean Water Program

CLARK COUNTY, WASHINGTON

January 2009

This page is purposely left blank for duplex printing.

Table of Contents

This page is purposely left blank for duplex printing.

Introduction

Background

All businesses and government agencies have some form of stormwater drainage facilities. Stormwater facilities or storm sewers on private sites drain to roadside ditches, county storm sewer pipes, streams, or to groundwater from infiltration facilities. Storm sewers include pipes, catch basins, manholes, grassy treatment swales, ditches, drywells, ponds, oil/water separators, and any other structures that collect, convey, control, or treat stormwater.

Requirements from the federal Clean Water Act and compliance with rules to protect threatened salmon under the federal Endangered Species Act also require that all storm drainage facilities be properly operated and maintained

In November 1998, Clark County adopted the Water Quality Ordinance (as Chapter 13.26A CCC). The Water Quality Ordinance requires businesses and public agencies to use water quality protection practices, referred to as best management practices or BMPs, to eliminate or reduce pollution from their outdoor activities. The Water Quality Ordinance was amended in July 2000 to include minimum standards for maintaining drainage facilities. The water quality ordinance will be amended in 2008 to meet state standards for preventing pollutants from business and government operations from reaching the storm sewer. Development under Chapter 40.380 CCC is also required to maintain storm sewers. Chapter 40.380 CCC will be amended in 2008 to meet the 2007 NPDES Permit requirements to follow state guidelines for controlling stormwater and erosion on development and construction sites. New facilities are either transferred to county ownership and maintenance or maintained by the owner as private facilities.

Purpose

This manual is intended to meet all storm sewer systems operation and maintenance requirements under Clark County Code Chapter 13.26A Water Quality, Chapter 40.380 Stormwater Controls, and the Stormwater Management Manual for Western Washington: Volume II (Washington Department of Ecology, April, 2005). It applies to county operations, as well as public or privately owned and operated systems in unincorporated areas of Clark County.

Drainage systems are often in or near areas that are also fish and wildlife habitat. This manual helps make sure that storm sewer owners perform their maintenance in a way that conforms to regulations protecting fish and wildlife.

Why Maintain Storm Sewer Facilities?

Along with keeping the site from flooding, properly maintained storm sewers can help reduce surface water and groundwater pollution. Many newer sites have stormwater control facilities designed to limit the environment damage and flooding damage by stormwater runoff. These systems cost many thousands of dollars to install and require more maintenance than a system of pipes and catch basins.

Storm sewer maintenance is necessary to protect streams, lakes, wetlands, and groundwater. Proper maintenance helps assure that:

- Storm sewers operate as they were designed;
- Storm sewers are cleaned of the pollutants that they trap, such as sediment and oils, so that the site's storm sewers are not overwhelmed and become pollutant sources;
- Sources of pollutants to storm sewers (such as leaky dumpsters) are removed.

What You Should Be Doing

This manual describes the steps you can take to assure that your storm sewers meet water quality requirements. If your site was approved for construction under county stormwater requirements adopted in 1994, the storm sewer system should have an approved plan for maintenance. This manual will help facility owners follow those requirements.

Look for electronic copies of the manual on the Clark County web site:
http://www.clark.wa.gov/water-resources/techassist/business.html

Method for Creating this Manual
Stormwater Management Manual for Western Washington: Volume V

This manual draws on other maintenance manuals to create an updated Stormwater Facility Maintenance Manual for Clark County.

Along with documenting current county standards and practices, this manual includes maintenance practices from the Stormwater Management Manual for Western Washington: Volume ~~II~~V (Washington Department of Ecology, April, 2005), the Pierce County Stormwater Maintenance Manual for Private Facilities (2005), and the Clark County Stormwater Facility Maintenance Manual (July, 2000). The main sources are:

- Washington Department of Ecology (April, 2005) Stormwater Management Manual for Western Washington: Volume V.
- Pierce County (2005) Stormwater Maintenance Manual for Private Facilities.

Emergent Treatment Technologies

Volume V, Chapter 12 of the SWMMWW addresses emerging treatment technologies. Since emerging technologies are rapidly evolving and it is not practical to update the SWMMWW every time a new device comes out, the Technology Assessment Protocol - Ecology (TAPE) was created as guidance for evaluating emerging stormwater treatment technologies. The TAPE can be found online at http://www.ecy.wa.gov/biblio/0210037.html.

Ecology assigns a General Use Level Designation (GULD) on emergent technologies that may be used Washington.

Maintenance standards in General Use Level Designation approvals for emergent technologies not found in the Clark County Stormwater Facility Maintenance Manual are adopted by reference and can be found at http://www.ecy.wa.gov/programs/wq/stormwater/newtech/technologies.html.

Mosquito Control

Mosquitoes can be annoying and sometimes pose a serious risk to public health. In certain areas of the United States, mosquitoes can transmit diseases such as West Nile Virus and equine encephalitis. To combat mosquitoes and the public health hazards they present, Clark County has established mosquito control program. Information on the the Clark County Mosquito Control District can be accessed on line at http://www.clark.wa.gov/mosquito/.

Mosquito control programs place a high priority on trying to prevent a large population of adult mosquitoes from developing so that additional controls may not be necessary. Since mosquitoes must have water to breed, methods of prevention may include identifying stormwater infrastructure such as catch basins, retention/detention systems, and other water holding areas that may harbor mosquitoes.

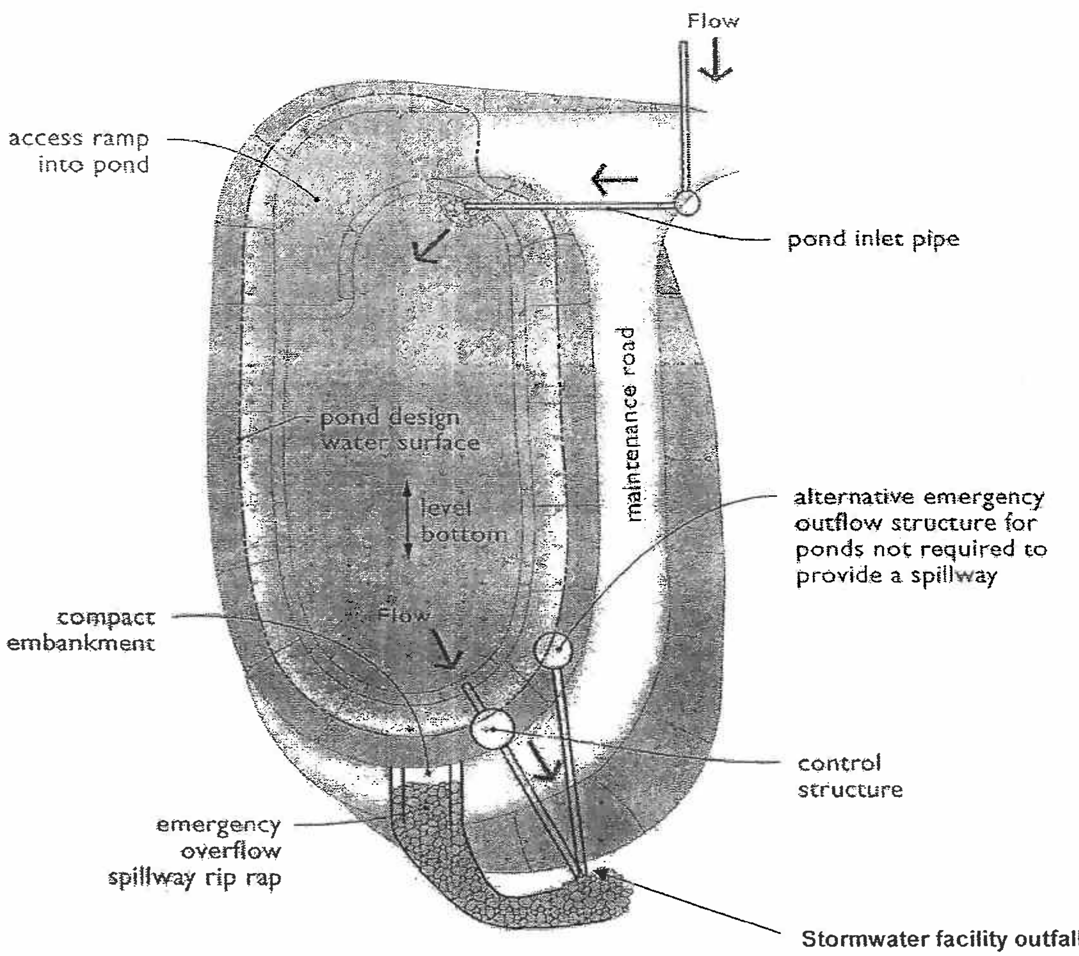
If mosquitoes are identified during stormwater facility maintenance or inspection activities and are a concern, a request to the Clark County Mosquito Control District for service or information regarding mosquito control can be made through either the 24-hour service request line, (360) 397-8430.

Detention Pond

A stormwater detention pond is an open basin built by excavating below existing ground or by constructing above-ground berms (embankments). The detention pond temporarily stores stormwater runoff during rain events and slowly releases it through an outlet (control structure). Detention ponds are typically designed to completely drain within 24 hours after the completion of a storm event. Styles vary greatly from well manicured to natural appearing. Generally, more natural-appearing vegetation is preferred for reduced maintenance and enhanced wildlife habitat. Some facilities are designed to appear as natural water bodies or are in park-like areas.

Facility objects that are typically associated with a detention pond include:

- access road or easement
- fence, gate, and water quality sign
- control structure/flow restrictor
- energy dissipaters
- conveyance stormwater pipe



Detention Pond			
Drainage System Feature	**Potential Defect**	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed Or Not Needed**
General	Trash and Debris	Any trash and debris which exceed 5 cubic feet per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size garbage can). In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Trash and debris cleared from site.
	Poisonous Vegetation and noxious weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by State or local regulations. (Apply requirements of adopted IPM policies for the use of herbicides).	No danger of poisonous vegetation where maintenance personnel or the public might normally be. (Coordinate with Clark County Weed Management department) Complete eradication of noxious weeds may not be possible. Compliance with State or local eradication policies required
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants (Coordinate removal/cleanup with local water quality response agency).	No contaminants or pollutants present.
	Rodent Holes	Any evidence of rodent holes if facility is acting as a dam or berm, or any evidence of water piping through dam or berm via rodent holes.	Rodents destroyed and dam or berm repaired. (Coordinate with Clark County Maintenance and Operations department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)
	Beaver Dams	Dam results in change or function of the facility.	Facility is returned to design function. (Coordinate trapping of beavers and removal of dams with appropriate permitting agencies)
	Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects destroyed or removed from site. Apply insecticides in compliance with adopted Clark County Maintenance and Operations policies.
	Tree Growth and Hazard Trees	Tree growth does not allow maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements). If trees are not interfering with access or maintenance, do not remove. If dead, diseased, or dying trees are identified (Use a certified Arborist to determine health of tree or removal requirements)	Trees do not hinder maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood). Remove hazard Trees
Side Slopes of Pond	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes should be stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms a licensed civil engineer should be consulted to resolve source of erosion.

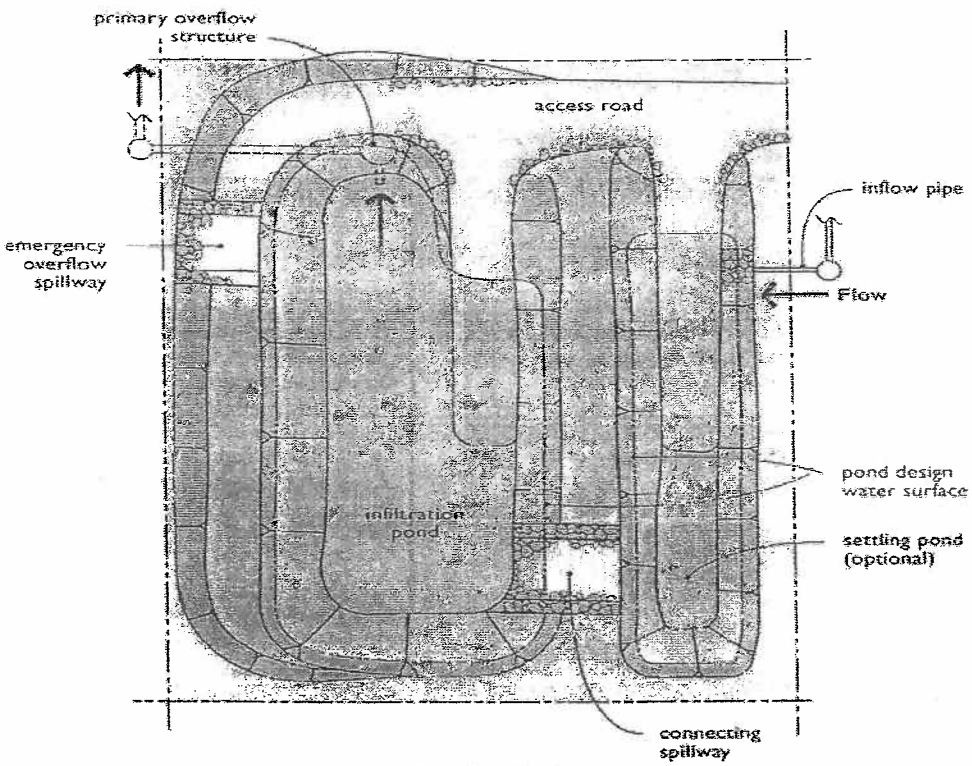
Detention Pond (Continued)			
Drainage System Feature	**Potential Defect**	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed Or Not Needed**
Storage Area	Sediment	Accumulated sediment that exceeds 10% of the designed pond depth unless otherwise specified or affects inletting or outletting condition of the facility.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion.
	Liner (If Applicable)	Liner is visible and has more than three 1/4-inch holes in it.	Liner repaired or replaced. Liner is fully covered.
Pond Berms (Dikes)	Settlements	Any part of berm which has settled 4 inches lower than the design elevation. If settlement is apparent, measure berm to determine amount of settlement. Settling can be an indication of more severe problems with the berm or outlet works. A licensed civil engineer should be consulted to determine the source of the settlement.	Dike is built back to the design elevation.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Emergency Overflow/ Spillway and Berms Over 4 Feet in Height.	Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping. Tree growth on berms over 4 feet in height may lead to piping through the berm which could lead to failure of the berm.	Trees should be removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed civil engineer should be consulted for proper berm/spillway restoration.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Emergency Overflow/ Spillway	Rock Missing	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil at the top of out flow path of spillway. (Rip-rap on inside slopes need not be replaced.)	Rocks and pad depth are restored to design standards.
	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes should be stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms a licensed civil engineer should be consulted to resolve source of erosion.

Infiltration Basin

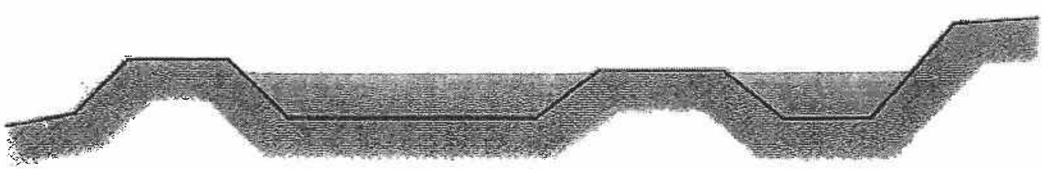
A stormwater infiltration open basin disposes of water by holding it in an area where it can soak into the ground. These are open facilities that may either drain rapidly and have grass bases, or have perpetual ponds where water levels rise and fall with stormwater flows. Infiltration facilities may be designed to handle all of the runoff from an area or they may overflow and bypass larger storms. Since the facility is design to pass water into the ground, anything that can cause the base to clog will reduce performance and is a large concern. Generally, infiltration basins are managed like detention ponds but with greater emphasis on maintaining the capacity to infiltrate stormwater.

Facility objects that are typically associated with an infiltration facility include:

- access road or easement
- fence, gate, and water quality sign
- energy dissipaters
- conveyance stormwater pipe



BIRD'S-EYE VIEW



SIDE PROFILE

Infiltration Basin

Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed Or Not Needed
General	Trash and Debris	Any trash and debris which exceed 5 cubic feet per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size garbage can). In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Trash and debris cleared from site.
	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by State or local regulations. (Apply requirements of adopted IPM policies for the use of herbicides).	No danger of poisonous vegetation where maintenance personnel or the public might normally be. (Coordinate with Clark County Weed Management department) Complete eradication of noxious weeds may not be possible. Compliance with State or local eradication policies required
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants. (Coordinate removal/cleanup with local water quality response agency).	No contaminants or pollutants present.
	Rodent Holes	Any evidence of rodent holes if facility is acting as a dam or berm, or any evidence of water piping through dam or berm via rodent holes.	Rodents destroyed and dam or berm repaired. (Coordinate with Clark County Maintenance and Operations department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)
	Beaver Dams	Dam results in change or function of the facility.	Facility is returned to design function. (Coordinate trapping of beavers and removal of dams with appropriate permitting agencies)
	Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects destroyed or removed from site. Apply insecticides in compliance with adopted Clark County Maintenance and Operations policies.
Storage Area	Sediment	Water ponding in infiltration pond after rainfall ceases and appropriate time allowed for infiltration. (A percolation test pit or test of facility indicates facility is only working at 90% of its designed capabilities. If two inches or more sediment is present, remove).	Sediment is removed and/or facility is cleaned so that infiltration system works according to design.
Filter Bags (If Applicable)	Filled with Sediment and Debris	Sediment and debris fill bag more than 1/2 full.	Filter bag is replaced or system is redesigned.
Rock Filters	Sediment and Debris	By visual inspection, little or no water flows through filter during heavy rain storms.	Gravel in rock filter is replaced.

Infiltration Basin (Continued)			
Drainage System Feature	**Potential Defect**	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed Or Not Needed**
Side Slopes of Pond	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment	Slopes should be stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms a licensed civil engineer should be consulted to resolve source of erosion.
Pond Berms (Dikes)	Settlements	Any part of berm which has settled 4 inches lower than the design elevation. If settlement is apparent, measure berm to determine amount of settlement. Settling can be an indication of more severe problems with the berm or outlet works. A licensed civil engineer should be consulted to determine the source of the settlement.	Dike is built back to the design elevation.
Emergency Overflow/ Spillway and Berms Over 4 Feet in Height.	Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping. Tree growth on berms over 4 feet in height may lead to piping through the berm which could lead to failure of the berm.	Trees should be removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed civil engineer should be consulted for proper berm/spillway restoration.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Emergency Overflow/ Spillway	Rock Missing	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil at the top of out flow path of spillway. (Rip-rap on inside slopes need not be replaced.)	Rocks and pad depth are restored to design standards.
Emergency Overflow/ Spillway	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes should be stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms a licensed civil engineer should be consulted to resolve source of erosion.
Pre-settling Ponds and Vaults	Facility or Sump Filled With Sediment and/or Debris	6" or designed sediment trap depth of sediment.	Sediment is removed.

Catch Basin

A catch basin is an underground concrete structure typically fitted with a slotted grate to collect stormwater runoff and route it through underground pipes. Catch basins can also be used as a junction in a pipe system and may have a solid lid. There are two types.

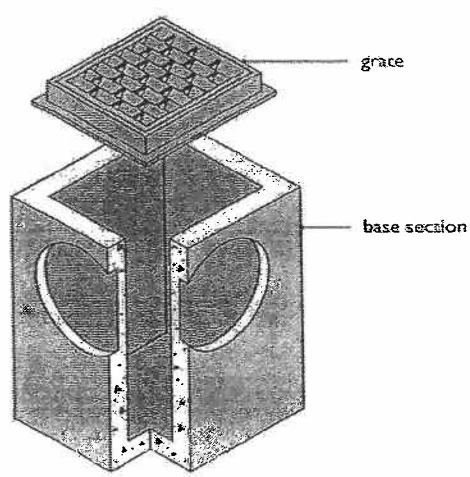
A Type 1 catch basin is a rectangular box with approximate dimensions of 3'x2'x5'. Type 1 catch basins are utilized when the connected conveyance pipes are less than 18 inches in diameter and the depth from the gate to the bottom of the pipe is less than 5 feet.

Type 2 catch basins, also commonly referred to as storm manholes, are round concrete structures ranging in diameter from 4 feet to 8 feet. Type 2 catch basins are used when the connecting conveyance pipe is 18 inches or greater or the depth from grate to pipe bottom exceeds 5 feet. Type 2 catch basins typically have manhole steps mounted on the side of the structure to allow access.

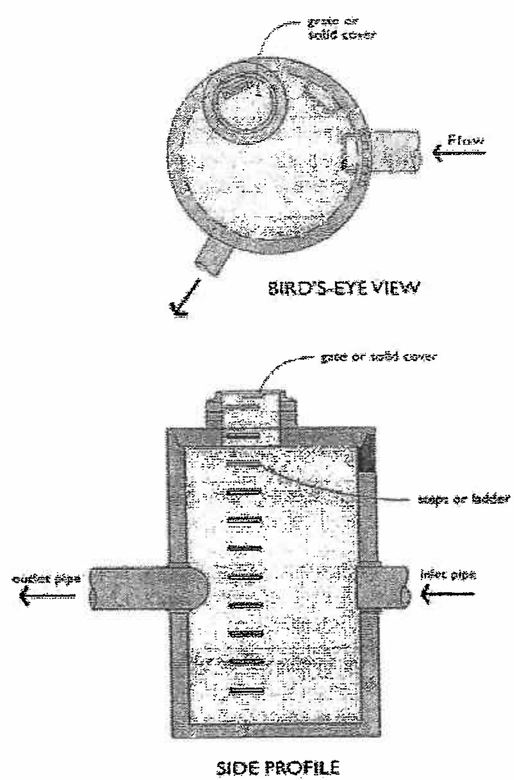
Both types typically provide a storage volume (sump) below the outlet pipe to allow sediments and debris to settle out of the stormwater runoff. Some catch basins are also fitted with a spill control device (inverted elbow on outlet pipe) intended to contain large quantities of grease or oils.

The most common tool for cleaning catch basins is a truck with a tank and vacuum hose (vactor truck) to remove sediment and debris from the sump. A catch basin may be an enclosed space where harmful chemicals and vapors can accumulate. Therefore, if the inspection and maintenance requires entering a catch basin, it should be conducted by an individual trained and certified to work in hazardous confined spaces.

Catch basins are typically associated with all stormwater facilities.



Type I



Type 2

Catch Basins

Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed Or Not Needed
General	Trash and Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.	No Trash or debris located immediately in front of catch basin or on grate opening.
		Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the catch basin.
		Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash or debris.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch (Intent is to make sure no material is running into basin).	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
		Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening.	No vegetation blocking opening to basin.
		Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation or root growth present.
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants (Coordinate removal/cleanup with local water quality response agency).	No contaminants or pollutants present.

Catch Basins (Continued)

Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed Or Not Needed
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is closed
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure (Intent is to keep cover from sealing off access to maintenance).	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

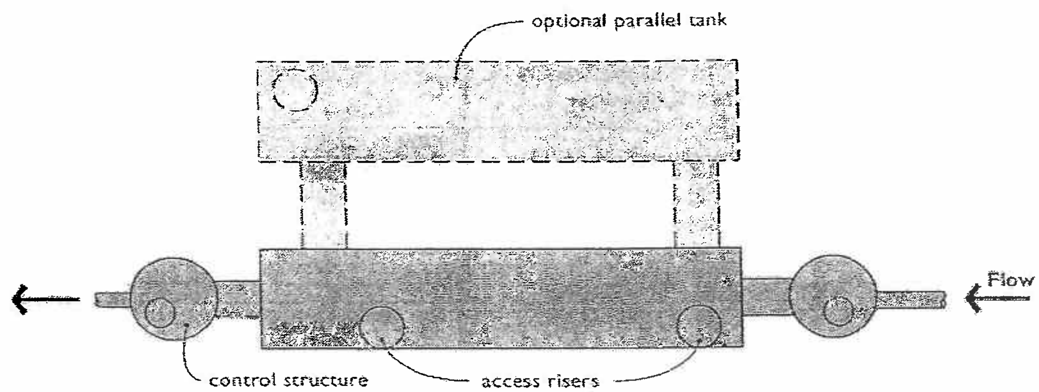
Closed Detention System (Tanks/Vault)

A closed detention system functions similarly to a detention pond with the temporary storage volume provided by an underground structure to regulate the storm discharge rate from the site. The structure is typically constructed of large diameter pipe (48" diameter or greater) or a concrete box (vault). These systems are typically utilized for sites that do not have space available for an above-ground system and are more commonly associated with commercial sites.

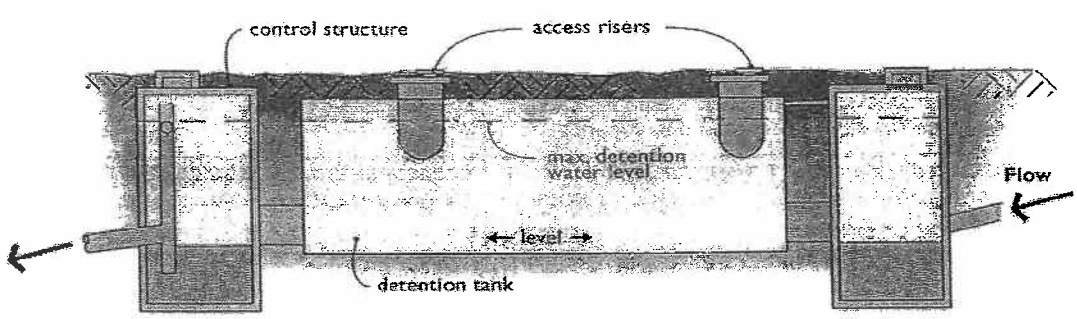
Underground detention systems are enclosed spaces where harmful chemicals and vapors can accumulate. Therefore, the inspection and maintenance of these facilities should be conducted by an individual trained and certified to work in hazardous confined spaces.

Facility objects that are typically associated with a closed detention system include:

- access road or easement
- fence, gate, and water quality sign
- control structure/flow restrictor
- conveyance stormwater pipe



BIRD'S-EYE VIEW



Note:
Closed detention systems will contain water during rainfall events, bus should be empty during dry periods.

SIDE PROFILE

Closed Detention Systems (Tanks/Vaults)

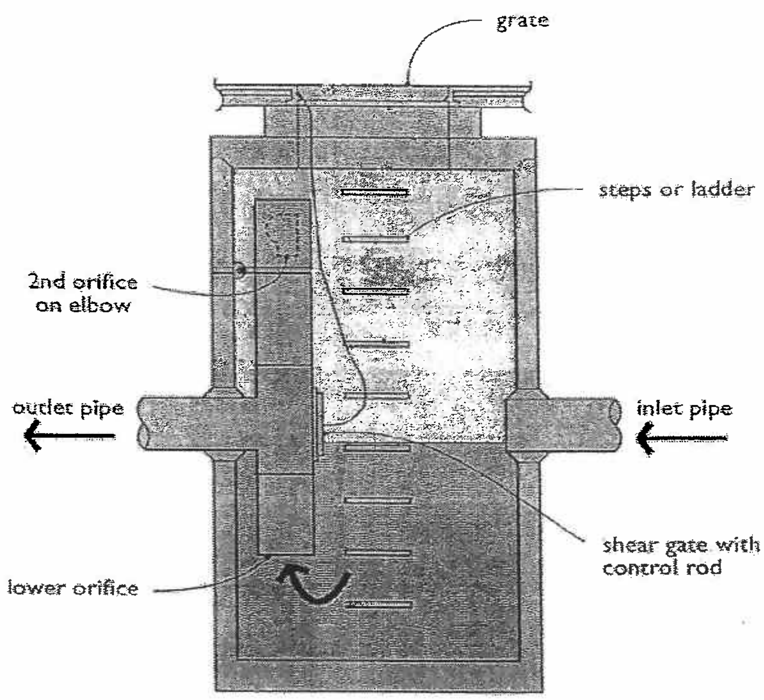
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed Or Not Needed
Storage Area	Plugged Air Vents	One-half of the cross section of a vent is blocked at any point or the vent is damaged.	Vents open and functioning.
	Debris and Sediment	Accumulated sediment depth exceeds 10% of the diameter of the storage area for 1/2 length of storage vault or any point depth exceeds 15% of diameter. (Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than 1/2 length of tank.)	All sediment and debris removed from storage area.
	Joints Between Tank/Pipe Section	Any openings or voids allowing material to be transported into facility. (Will require engineering analysis to determine structural stability).	All joint between tank/pipe sections are sealed.
	Tank Pipe Bent Out of Shape	Any part of tank/pipe is bent out of shape more than 10% of its design shape. (Review required by engineer to determine structural stability).	Tank/pipe repaired or replaced to design.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch and any evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determines that the vault is not structurally sound.	Vault replaced or repaired to design specifications and is structurally sound.
		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls.	No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe.
Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Catch Basins	All Potential Defects	**See Catch Basins on pages 13 – 15**	

Control Structure/Flow Restrictor

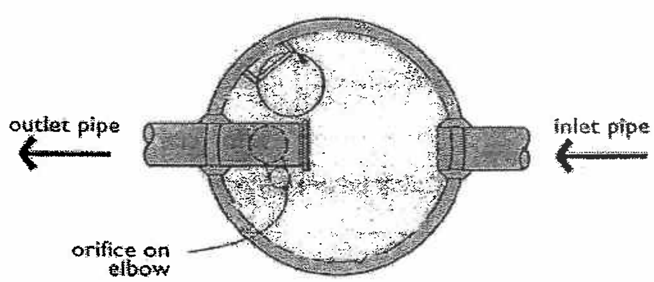
Flow control structures and flow restrictors direct or restrict flow in or out of facility components. Outflow controls on detention facilities are a common example where flow control structures slowly release stormwater at a specific rate. The flow is regulated by a combination of orifices (holes with specifically sized diameters) and weirs (plates with rectangular or "V" shaped notch). Lack of maintenance of the control structure can result in the plugging of an orifice. If these flow controls are damaged, plugged, bypassed, or not working properly, the facility could overtop or release water too quickly. This will likely damage streams, habitat, and property.

Facility objects that are typically associated with a control structure/flow restrictor include:

- detention ponds
- CONTECH® StormFilter
- closed detention system
- conveyance stormwater pipe



BIRD'S-EYE VIEW



SECTION PROFILE

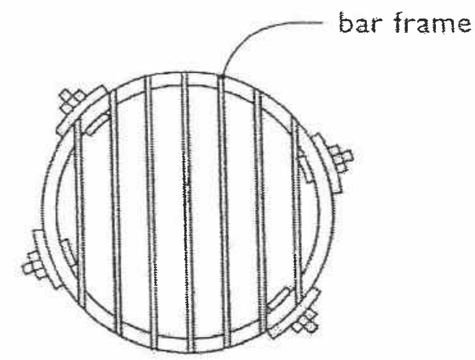
Control Structure/Flow Restrictor

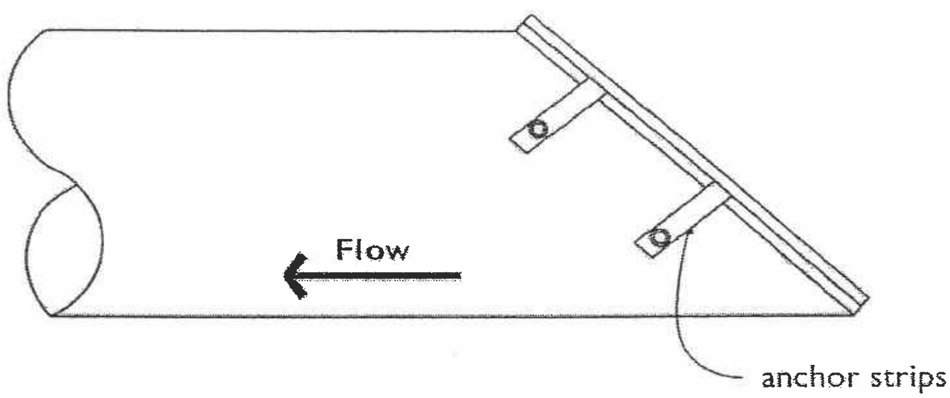
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed Or Not Needed
General	Trash and Debris (Includes Sediment)	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
	Structural Damage	Structure is not securely attached to manhole wall.	Structure securely attached to wall and outlet pipe.
		Structure is not in upright position (allow up to 10% from plumb).	Structure in correct position.
		Connections to outlet pipe are not watertight and show signs of rust.	Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.
		Any holes--other than designed holes--in the structure.	Structure has no holes other than designed holes.
Cleanout Gate	Damaged or Missing	Cleanout gate is not watertight or is missing.	Gate is watertight and works as designed.
		Gate cannot be moved up and down by one maintenance person.	Gate moves up and down easily and is watertight.
		Chain/rod leading to gate is missing or damaged.	Chain is in place and works as designed.
		Gate is rusted over 50% of its surface area.	Gate is repaired or replaced to meet design standards.
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Catch Basins	All Potential Defects	**See Catch Basins on pages 10 - 12**	

Debris Barrier & Access Barrier (e.g. Trash Rack)

A debris barrier is a bar grate over the open end of a culvert or stormwater conveyance pipe. The intent of a debris barrier is to prevent large materials from entering a closed pipe system. Debris barriers are typically located on the outlet pipe from a detention pond to the control structure. If a debris barrier is not located on the outlet pipe, one should be installed to prevent plugging of the control structure and possible flooding.

An access barrier is similar to a debris barrier but is installed on all pipe ends that exceed 18 inches in diameter. Their function is to prevent debris and unauthorized access into the storm conveyance pipe. Only qualified personnel should attempt to maintain or remove debris from the barrier when water is flowing through the conveyance pipe.





Debris Barriers

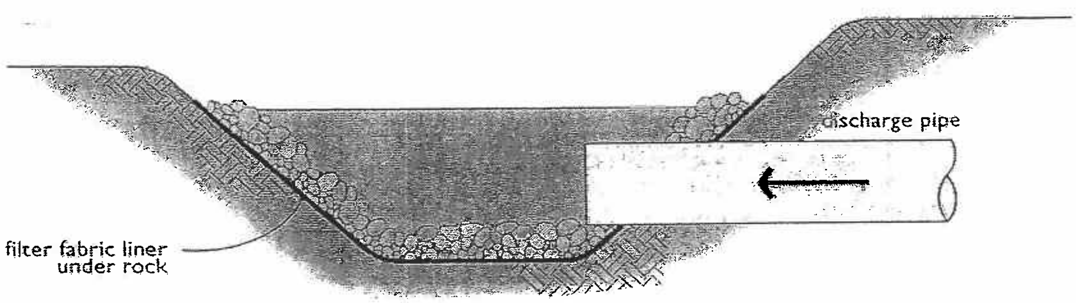
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed Or Not Needed
General	Trash and Debris	Trash or debris that is plugging more than 20% of the openings in the barrier.	Barrier cleared to design flow capacity.
	Damaged/ Missing Bars.	Bars are bent out of shape more than 3 inches.	Bars in place with no bends more than 3/4 inch.
		Bars are missing or entire barrier missing.	Bars in place according to design.
		Bars are loose and rust is causing 50% deterioration to any part of barrier.	Barrier replaced or repaired to design standards.
	Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe	Barrier firmly attached to pipe

Energy Dissipater

An energy dissipater is installed on or near the inlet or outlet to a closed pipe system to prevent erosion at these locations. There are a variety of designs, including wire gabion baskets, rock splash pads, trenches, and specially designed pools or manholes. The rock splash pad is typically constructed of 4- to 12-inch diameter rocks a minimum of 12 inches thick and is often lined with filter fabric. The rock pad should extend above the top of the pipe a minimum of 1 foot.

Facility objects that are typically associated with a energy dissipaters include:

- detention ponds
- infiltration basin
- wetponds
- treatment wetlands



Energy Dissipaters

Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed Or Not Needed
External:			
Rock Pad	Missing or Moved Rock	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil.	Rock pad replaced to design standards.
	Erosion	Soil erosion in or adjacent to rock pad.	Rock pad replaced to design standards.
Dispersion Trench	Pipe Plugged with Sediment	Accumulated sediment that exceeds 20% of the design depth.	Pipe cleaned/flushed so that it matches design.
	Not Discharging Water Properly	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" of water along trench). Intent is to prevent erosion damage.	Trench redesigned or rebuilt to standards.
	Perforations Plugged.	Over 1/2 of perforations in pipe are plugged with debris and sediment.	Perforated pipe cleaned or replaced.
	Water Flows Out Top of "Distributor" Catch Basin.	Maintenance person observes or receives credible report of water flowing out during any storm less than the design storm or its causing or appears likely to cause damage.	Facility rebuilt or redesigned to standards.
	Receiving Area Over-Saturated	Water in receiving area is causing or has potential of causing landslide problems.	No danger of landslides.
Internal:			
Manhole/ Chamber	Worn or Damaged Post, Baffles, Side of Chamber	Structure dissipating flow deteriorates to 1/2 of original size or any concentrated worn spot exceeding one square foot which would make structure unsound.	Structure replaced to design standards.
Catch Basins	All Potential Defects	See Catch Basins on pages 13 - 15	

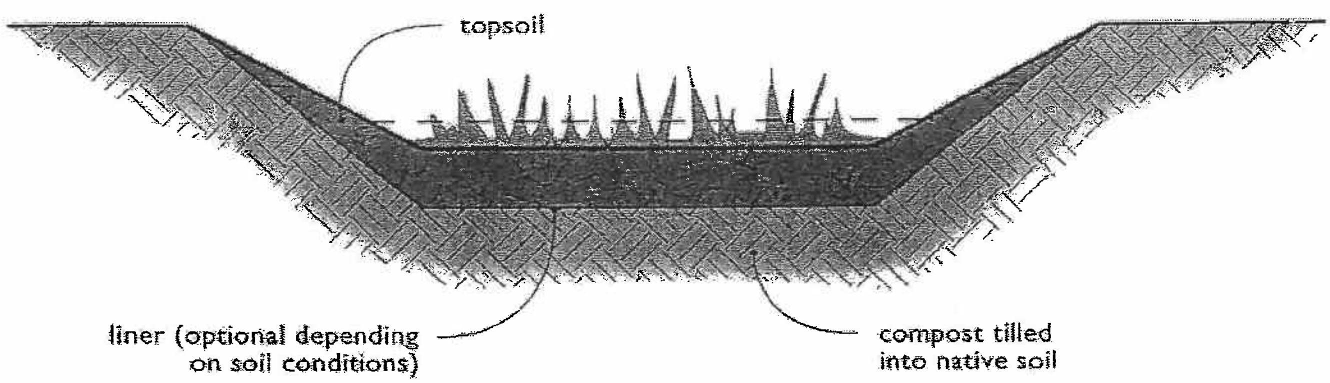
Typical Biofiltration Swale

A biofiltration swale uses grass or other dense vegetation to filter sediment and oily materials out of stormwater. Usually they look like flat-bottomed channels with grass growing in them. Biofiltration uses vegetation in conjunction with slow and shallow-depth flow for runoff treatment. As runoff passes through the vegetation, pollutants are removed through the combined effects of filtration, infiltration, and settling. These effects are aided by the reduction of the velocity of stormwater as it passes through the biofilter.

Biofiltration swales provide stormwater quality control (treatment), but do not provide stormwater quantity control (detention/retention). Swales are stormwater treatment devices that must be properly maintained to sustain pollutant removal capacity.

Facility objects that are often associated with a typical biofiltration swale include:

- access road or easement
- fence, gate, and water quality sign
- energy dissipaters
- debris barrier (e.g. trash rack)
- catch basins/field inlets
- drywell
- infiltration trench
- sediment trap



Typical Biofiltration Swale

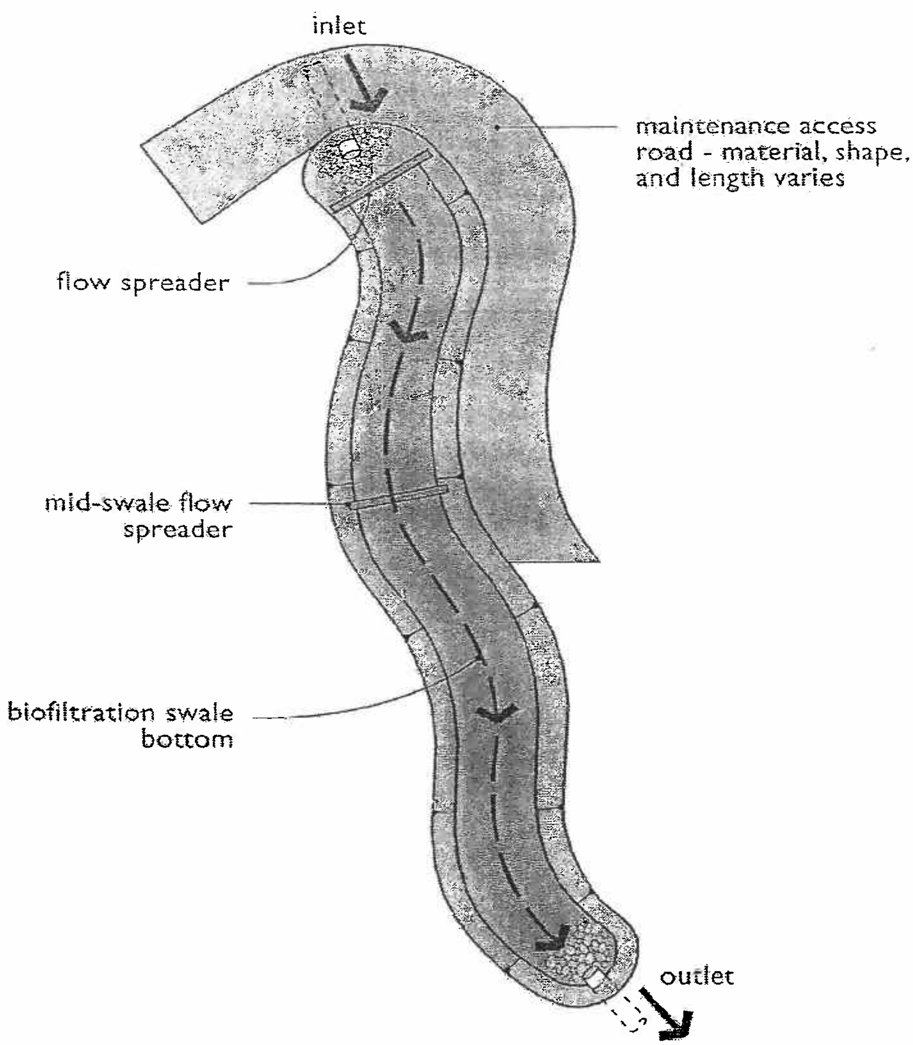
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed Or Not Needed
General	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.	Remove sediment deposits on grass treatment area of the bio-swale. When finished, swale should be level from side to side and drain freely toward outlet. There should be no areas of standing water once inflow has ceased.
	Standing Water	When water stands in the swale between storms and does not drain freely.	Any of the following may apply: remove sediment or trash blockages, improve grade from head to foot of swale, remove clogged check dams, add underdrains or convert to a wet biofiltration swale.
	Flow spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire swale width.	Level the spreader and clean so that flows are spread evenly over entire swale width.
	Constant Baseflow	When small quantities of water continually flow through the swale, even when it has been dry for weeks, and an eroded, muddy channel has formed in the swale bottom.	Add a low-flow pea-gravel drain the length of the swale or by-pass the baseflow around the swale.
	Poor Vegetation Coverage	When grass is sparse or bare or eroded patches occur in more than 10% of the swale bottom.	Determine why grass growth is poor and correct that condition. Re-plant with plugs of grass from the upper slope: plant in the swale bottom at 8-inch intervals. Or re-seed into loosened, fertile soil.
	Vegetation	When the grass becomes excessively tall (greater than 10-inches); when nuisance weeds and other vegetation starts to take over.	Mow vegetation or remove nuisance vegetation so that flow not impeded. Grass should be mowed to a height of 3 to 4 inches. Remove grass clippings.
	Excessive Shading	Grass growth is poor because sunlight does not reach swale.	If possible, trim back over-hanging limbs and remove brushy vegetation on adjacent slopes.
	Inlet/Outlet	Inlet/outlet areas clogged with sediment and/or debris.	Remove material so that there is no clogging or blockage in the inlet and outlet area.
	Trash and Debris Accumulation	Trash and debris accumulated in the bio-swale.	Remove trash and debris from bioswale.
	Erosion/Scouring	Eroded or scoured swale bottom due to flow channelization, or higher flows.	For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. If bare areas are large, generally greater than 12 inches wide, the swale should be re-graded and re-seeded. For smaller bare areas, over seed when bare spots are evident, or take plugs of grass from the upper slope and plant in the swale bottom at 8-inch intervals.

Wet Biofiltration Swale

A wet biofiltration swale is a variation of a basic biofiltration swale for use where the centerline slope is slight, groundwater tables are high, or a continuous low base flow is likely to result in wet soil conditions for long periods of time. Where continuously wet soil conditions exceeds about 2 weeks, typical grasses will die. Thus, vegetation specifically adapted to wet soil conditions is needed. Different vegetation, in turn, requires modification of several of the design and maintenance requirements from the basic biofiltration swale.

Facility objects that are often associated with a wet biofiltration swale include:

- access road or easement
- fence, gate, and water quality sign
- energy dissipaters (flow spreaders)
- debris barrier (e.g. trash rack)
- catch basins/field inlets



Wet Biofiltration Swale			
Drainage System Feature	**Potential Defect**	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed Or Not Needed**
General	Sediment Accumulation	Sediment depth exceeds 2-inches in 10% of the swale treatment area.	Remove sediment deposits in treatment area.
	Water Depth	Water not retained to a depth of about 4 inches during the wet season.	Build up or repair outlet berm so that water is retained in the wet swale.
	Wetland Vegetation	Vegetation becomes sparse and does not provide adequate filtration, OR vegetation is crowded out by very dense clumps of cattail, which do not allow water to flow through the clumps.	Determine cause of lack of vigor of vegetation and correct. Replant as needed. For excessive cattail growth, cut cattail shoots back and compost off-site. Note: normally wetland vegetation does not need to be harvested unless die-back is causing oxygen depletion in downstream waters.
	Inlet/Outlet	Inlet/outlet area clogged with sediment and/or debris.	Remove clogging or blockage in the inlet and outlet areas.
	Trash and Debris Accumulation	Any trash and debris which exceed 5 cubic feet per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size garbage can). In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Remove trash and debris from wet swale.
	Erosion/Scouring	Swale has eroded or scoured due to flow channelization, or higher flows.	Check design flows to assure swale is large enough to handle flows. By-pass excess flows or enlarge swale. Replant eroded areas with fibrous-rooted plants such as Juncus effusus (soft rush) in wet areas or snowberry (Symphoricarpos albus) in dryer areas.

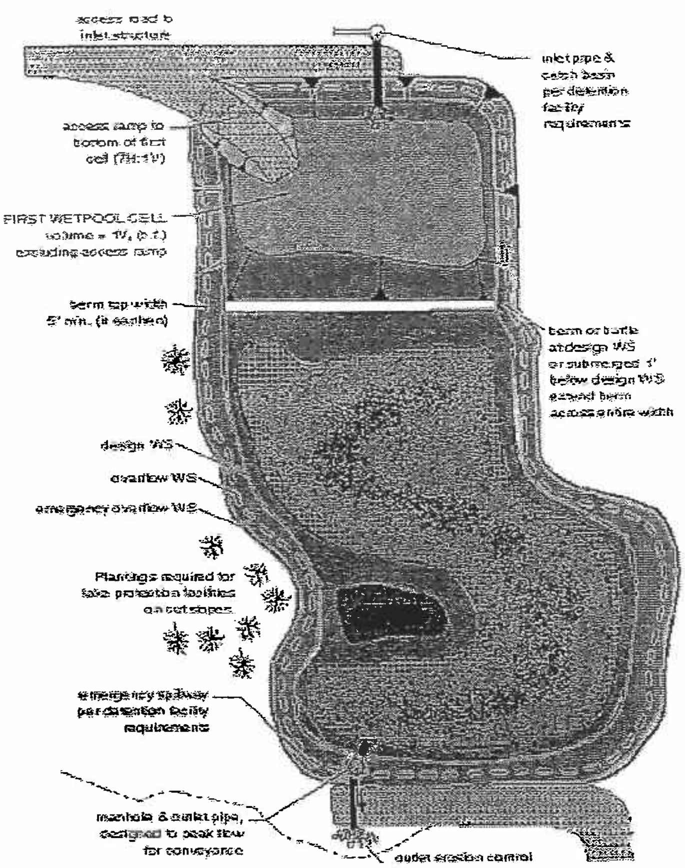
Treatment Wetland

A stormwater treatment wetland is a shallow man-made pond that is designed to treat stormwater through the biological processes associated with emergent aquatic plants. These facilities use dense wetland vegetation and settling to filter sediment and oily materials out of stormwater.

Stormwater treatment wetlands are used to capture pollutants in a managed environment so that they will not reach natural wetlands and other ecologically important habitats. Vegetation must occasionally be harvested and sediment dredged in stormwater treatment wetlands. In general, stormwater wetlands perform well to remove sediment, metals, and pollutants that bind to humic or organic acids.

Facility objects that are often associated with a treatment wetland include:

- access road or easement
- fence, gate, and water quality sign
- energy dissipaters (flow spreaders)
- conveyance stormwater pipe



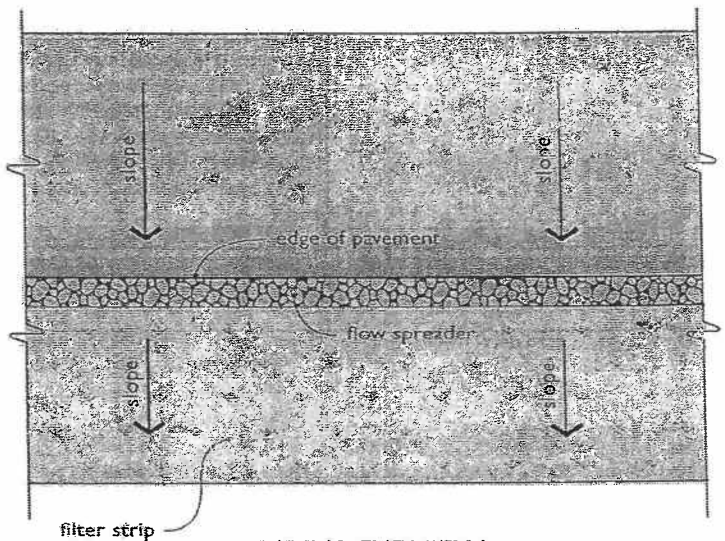
Treatment Wetland			
Drainage System Feature	**Potential Defect**	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed Or Not Needed**
General	Sediment Accumulation	Sediment accumulation exceeds design standards in presettling cell.	Remove sediment deposits in presettling cell.
	Water Depth	Water not retained to a depth of about 18 inches during the wet season.	Repair outlet so that water is retained in the wet swale.
	Wetland Vegetation	Vegetation becomes sparse and does not provide adequate filtration.	Determine cause of lack of vigor of vegetation and correct. Replant as needed.
		Nuisance plant species becomes abundant.	Nuisance plant species should be removed and desirable species should be planted.
	Trash and Debris Accumulation	Any trash and debris which exceed 5 cubic feet per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size garbage can). In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Remove trash and debris from wetland area.

Filter Strip

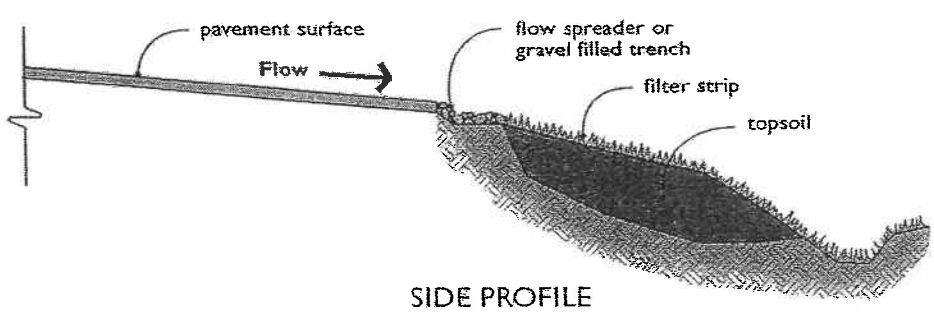
A filter strip is a linear strip of grass that removes sediment and oils from stormwater by filtering it. Stormwater is treated as it runs across the filter. Usually, filter strips are placed along the edge of linear paved areas such as parking lots and roads. Where designed filter strips are installed, road shoulders should only be graded to maintain level flow off the road.

Facility objects that are often associated with a filter strip include:

- access road or easement
- fence, gate, and water quality sign
- energy dissipaters (flow spreaders)



BIRD'S-EYE VIEW



SIDE PROFILE

Filter Strip

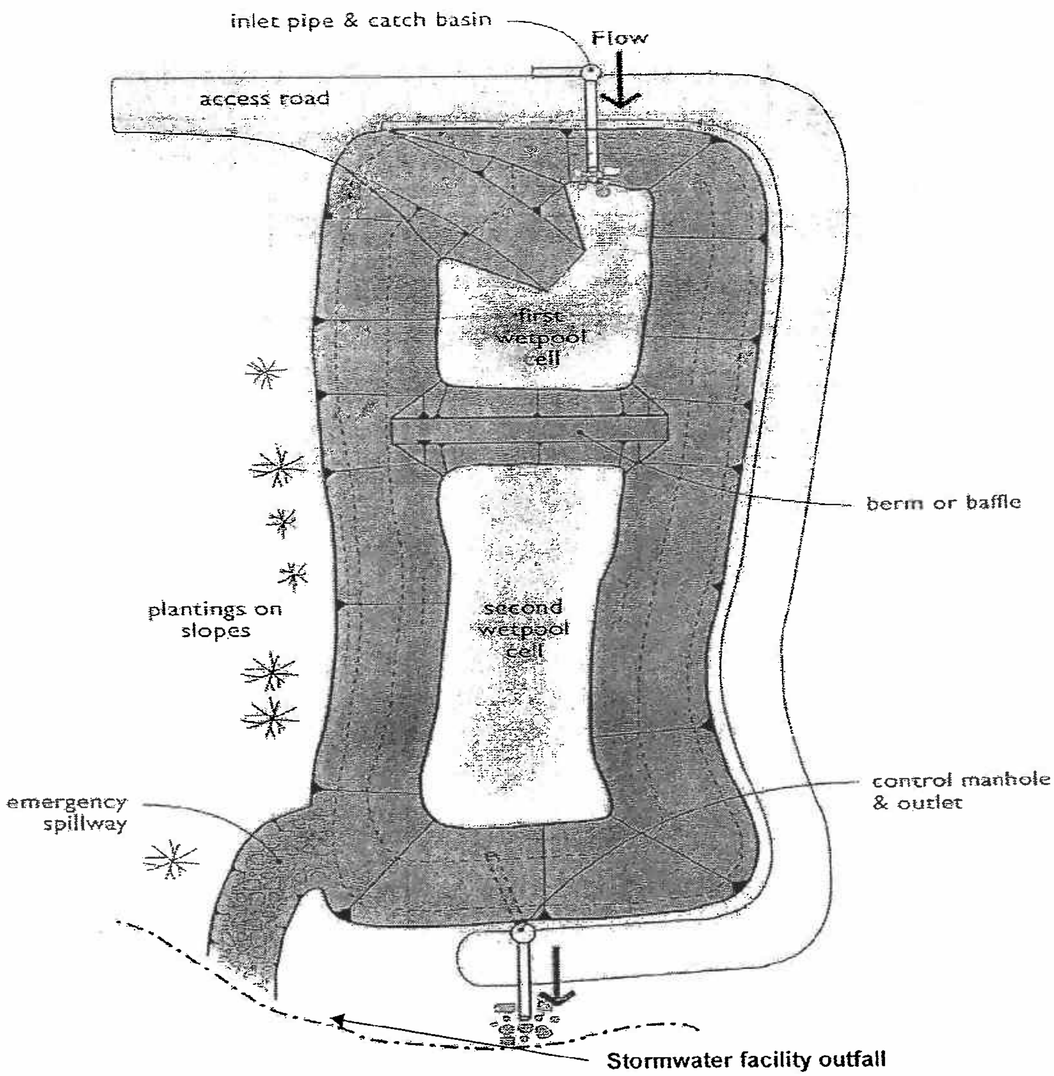
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed Or Not Needed
General	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.	Remove sediment deposits, re-level so slope is even and flows pass evenly through strip.
	Vegetation	When the grass becomes excessively tall (greater than 10-inches); when nuisance weeds and other vegetation starts to take over.	Mow grass, control nuisance vegetation, such that flow not impeded. Grass should be mowed to a height between 3-4 inches.
	Trash and Debris Accumulation	Trash and debris accumulated on the filter strip.	Remove trash and Debris from filter.
	Erosion/Scouring	Eroded or scoured areas due to flow channelization, or higher flows.	For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. The grass will creep in over the rock in time. If bare areas are large, generally greater than 12 inches wide, the filter strip should be re-graded and re-seeded. For smaller bare areas, over seed when bare spots are evident.
	Flow spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire filter width.	Level the spreader and clean so that flows are spread evenly over entire filter width.

Wetpond

A wetpond is an open basin that retains a permanent pool of water (wetpool) year round or only during the wet season. The volume of the wetpond allows sediment and other pollutants to settle out of the runoff. Wetland vegetation is typically planted within the wetpond to provide additional treatment through nutrient (i.e. nitrogen) removal. Detention quantity control can be provided with additional temporary storage volume above the permanent pool elevation.

Facility objects that are typically associated with a wetpond include:

- access road or easement
- fence, gate, and water quality sign
- detention pond
- control structure/flow restrictor
- energy dissipaters
- debris barrier (e.g. trash rack)
- conveyance stormwater pipe



Wetponds

Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed Or Not Needed
General	Water level	First cell is empty, doesn't hold water.	Line the first cell to maintain at least 4 feet of water. Although the second cell may drain, the first cell must remain full to control turbulence of the incoming flow and reduce sediment resuspension.
	Trash and Debris	Accumulation that exceeds 1 CF per 1000-SF of pond area.	Trash and debris removed from pond.
	Sediment Accumulation in Pond Bottom	Sediment accumulations in pond bottom that exceeds the depth of sediment zone plus 6-inches, usually in the first cell.	Sediment removed from pond bottom.
	Oil Sheen on Water	Prevalent and visible oil sheen.	Oil removed from water using oil-absorbent pads or vactor truck. Source of oil located and corrected. If chronic low levels of oil persist, plant wetland plants such as Juncus effusus (soft rush) which can uptake small concentrations of oil.
	Erosion	Erosion of the pond's side slopes and/or scouring of the pond bottom, that exceeds 6-inches, or where continued erosion is prevalent.	Slopes stabilized using proper erosion control measures and repair methods.
	Settlement of Pond Dike/Berm	Any part of these components that has settled 4-inches or lower than the design elevation, or inspector determines dike/berm is unsound.	Dike/berm is repaired to specifications.
	Internal Berm	Berm dividing cells should be level.	Berm surface is leveled so that water flows evenly over entire length of berm.
	Overflow Spillway	Rock is missing and soil is exposed at top of spillway or outside slope.	Rocks replaced to specifications.

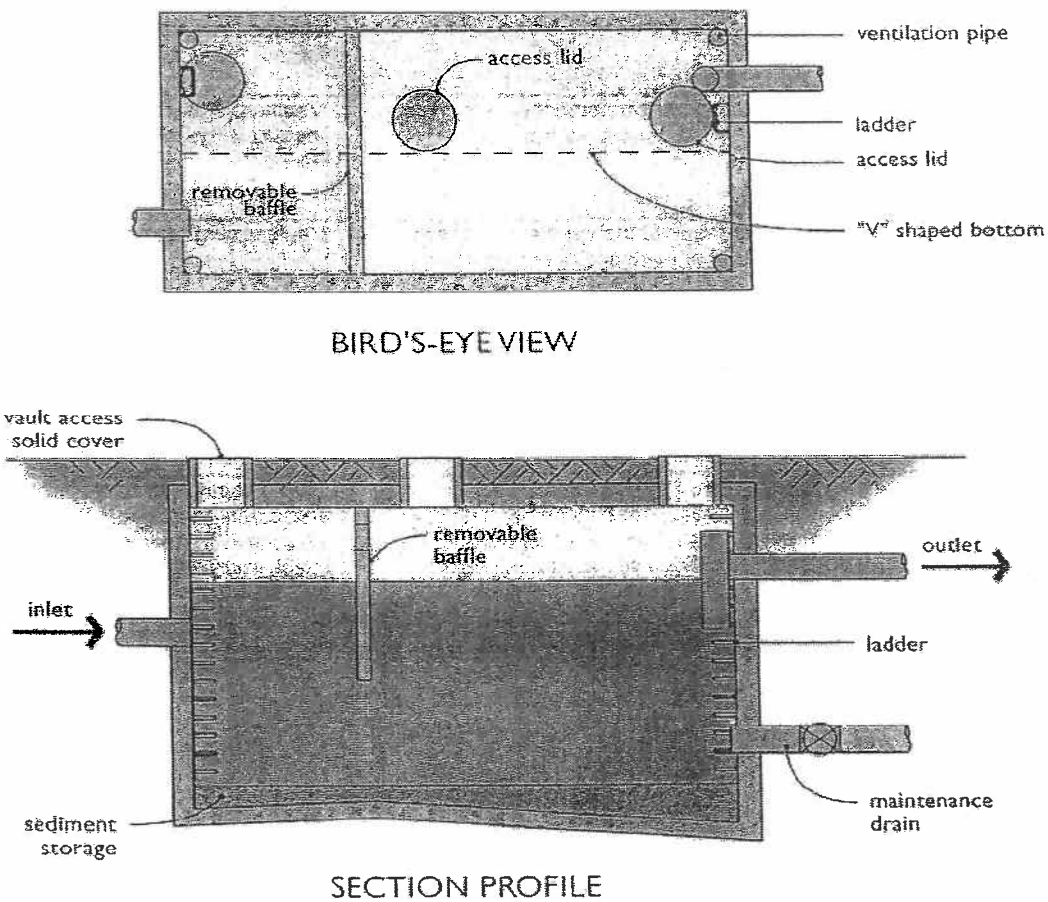
Wet Vault

A wet vault is an underground structure similar in appearance to a detention vault, except that a wet vault has a permanent pool of water (wetpool) which dissipates energy and improves the settling of sediment and other pollutants. Being underground, the wet vault lacks the nutrient removal ability of vegetation.

As discussed in the underground detention systems, wet vaults are a closed space where harmful chemicals and gasses can accumulate. Therefore, the inspection and maintenance of these facilities should be conducted by an individual trained and certified to work in hazardous confined spaces.

Facility objects that are typically associated with a wet vault include:

- access road or easement
- fence, gate, and water quality sign
- conveyance stormwater pipe



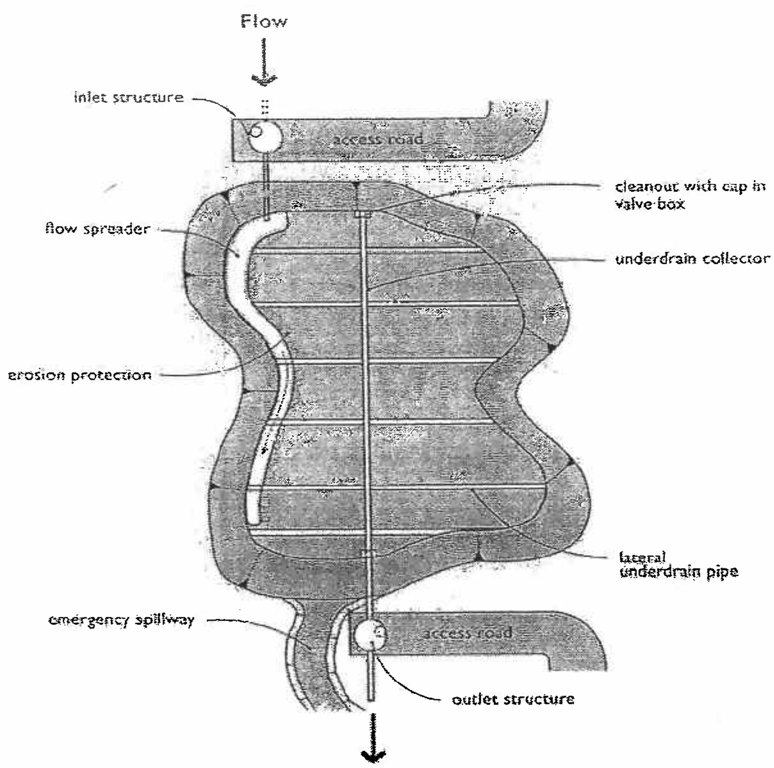
Wet Vault			
Drainage System Feature	**Potential Defect**	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed Or Not Needed**
General	Trash/Debris Accumulation	Trash and debris accumulated in vault, pipe or inlet/outlet (includes floatables and non-floatables).	Remove trash and debris from vault.
	Sediment Accumulation in Vault	Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6-inches.	Remove sediment from vault.
	Damaged Pipes	Inlet/outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened or removed, especially by one person.	Pipe repaired or replaced to proper working specifications.
	Ventilation	Ventilation area blocked or plugged.	Blocking material removed or cleared from ventilation area. A specified % of the vault surface area must provide ventilation to the vault interior (see design specifications).
	Damage - Includes Cracks in Walls Bottom, Damage to Frame and/or Top Slab	Maintenance/inspection personnel determine that the vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection staff.	Baffles repaired or replaced to specifications.
Ladder	Access Ladder Damage	Ladder is corroded or deteriorated, not functioning properly, not attached to structure wall, missing rungs, has cracks and/or misaligned. Confined space warning sign missing.	Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel. Replace sign warning of confined space entry requirements. Ladder and entry notification complies with OSHA standards.

Sand Filter (Above Ground/Open)

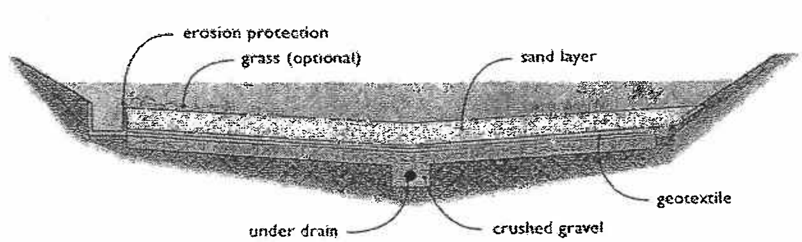
A sand filter functions by filtering stormwater runoff through a sand bed typically 18 inches in depth. The treated runoff is collected in the underdrain system and routed to a detention/retention facility or a downstream conveyance system. A typical sand filtration system consists of a pretreatment system for removing larger sediment and debris from the runoff, a flow spreader, a sand bed, and an underdrain piping. The sand filter bed typically includes a woven (geotextile) fabric between the sand bed and the underdrain system.

An above ground sand filters looks similar to a detention pond with a sand-lined bottom.

Facility objects that are typically associated with an open sand filter include:
- access road or easement
- fence, gate, and water quality sign
- control structure/flow restrictor
- energy dissipaters
- conveyance stormwater pipe



BIRD'S-EYE VIEW



SIDE PROFILE

Sand Filter (Open)

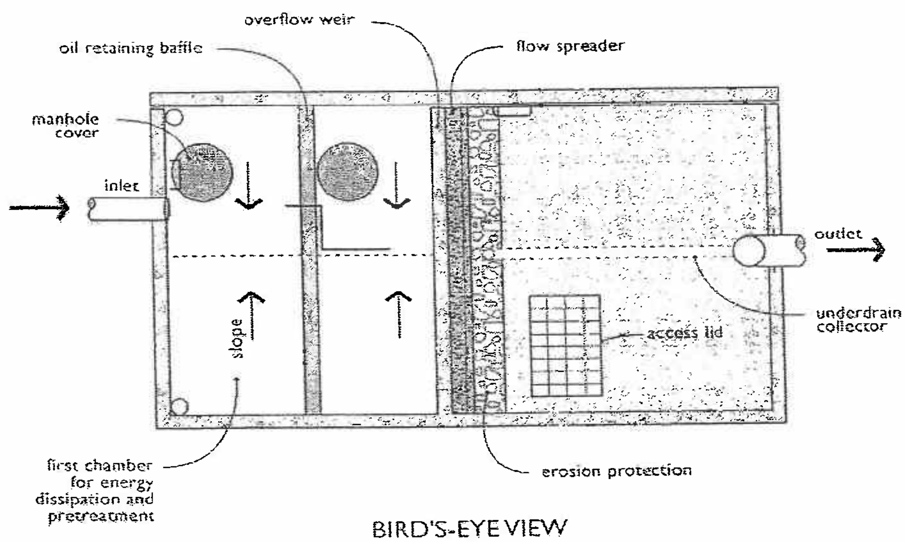
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed Or Not Needed
Above Ground (open sand filter)	Sediment Accumulation on Top Layer	Sediment depth exceeds 1/2-inch.	No sediment deposit on grass layer of sand filter that would impede permeability of the filter section.
	Trash and Debris Accumulations	Trash and debris accumulated on sand filter bed.	Trash and debris removed from sand filter bed.
	Sediment/ Debris in Clean-Outs	When the clean-outs become full or partially plugged with sediment and/or debris.	Sediment removed from clean-outs.
	Sand Filter Media	Drawdown of water through the sand filter media takes longer than 24-hours, and/or flow through the overflow pipes occurs frequently.	Top several inches of sand are scraped. May require replacement of entire sand filter depth depending on extent of plugging (a sieve analysis is helpful to determine if the lower sand has too high a proportion of fine material).
	Prolonged Flows	Sand is saturated for prolonged periods of time (several weeks) and does not dry out between storms due to continuous base flow or prolonged flows from detention facilities.	Low, continuous flows are limited to a small portion of the facility by using a low wooden divider or slightly depressed sand surface.
	Short Circuiting	When flows become concentrated over one section of the sand filter rather than dispersed.	Flow and percolation of water through sand filter is uniform and dispersed across the entire filter area.
	Erosion Damage to Slopes	Erosion over 2-inches deep where cause of damage is prevalent or potential for continued erosion is evident.	Slopes stabilized using proper erosion control measures.
	Rock Pad Missing or Out of Place	Soil beneath the rock is visible.	Rock pad replaced or rebuilt to design specifications.
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter.	Spreader leveled and cleaned so that flows are spread evenly over sand filter.
	Damaged Pipes	Any part of the piping that is crushed or deformed more than 20% or any other failure to the piping.	Pipe repaired or replaced.

Sand Filter (Below Ground/Enclosed)

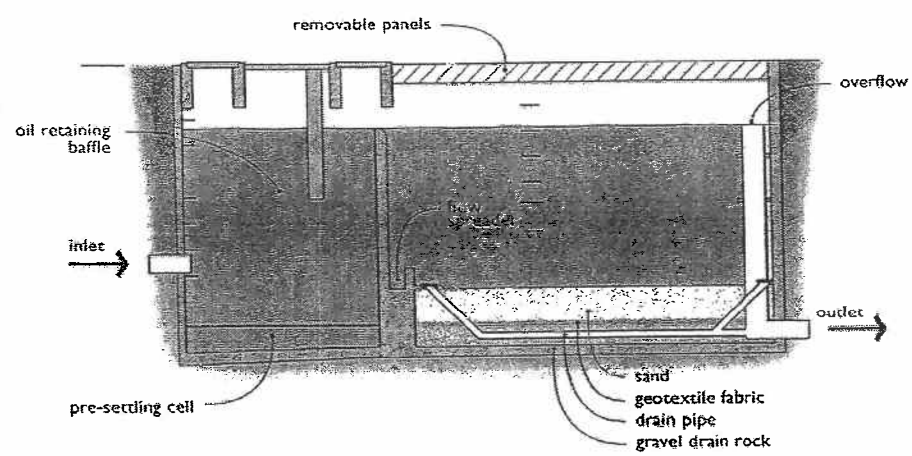
A sand filter vault is similar to an open sand filter except that the sand layer and underdrains are installed below ground in a vault. It consists of presettling and sand filtration cells and functions by filtering stormwater runoff through a sand bed. Treated runoff is collected in the underdrain system and routed to a detention/retention facility or a downstream conveyance system.

Facility objects that are typically associated with a below ground sand filter include:

- access road or easement
- fence, gate, and water quality sign
- conveyance stormwater pipe



BIRD'S-EYE VIEW



SIDE PROFILE

Sand Filter (Below Ground/Enclosed)

Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed Or Not Needed
Below Ground Vault.	Sediment Accumulation on Sand Media Section	Sediment depth exceeds 1/2-inch.	No sediment deposits on sand filter section that which would impede permeability of the filter section.
	Sediment Accumulation in Pre-Settling Portion of Vault	Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6-inches.	No sediment deposits in first chamber of vault.
	Trash/Debris Accumulation	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault and inlet/outlet piping.
	Sediment in Drain Pipes/Cleanouts	When drain pipes, cleanouts become full with sediment and/or debris.	Sediment and debris removed.
	Short Circuiting	When seepage/flow occurs along the vault walls and corners. Sand eroding near inflow area.	Sand filter media section re-laid and compacted along perimeter of vault to form a semi-seal. Erosion protection added to dissipate force of incoming flow and curtail erosion.
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened, corrosion/deformation of cover. Maintenance person cannot remove cover using normal lifting pressure.	Cover repaired to proper working specifications or replaced.
	Ventilation	Ventilation area blocked or plugged	Blocking material removed or cleared from ventilation area. A specified % of the vault surface area must provide ventilation to the vault interior (see design specifications).
	Vault Structure Damaged; Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab.	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles/Internal Walls	Baffles or walls corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel.

Stormwater Management StormFilter®

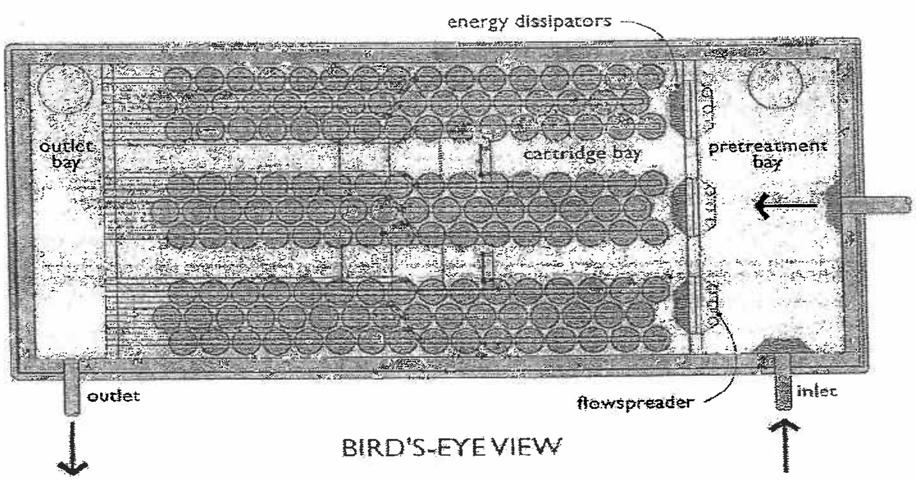
The Stormwater Management StormFilter® is a passive, flow-through, stormwater filtration system. The system is comprised of one or more vaults that house rechargeable, media-filled filter cartridges. The StormFilter works by passing stormwater through the filtering medium, which traps particulates and/or adsorb pollutants such as dissolved metals and hydrocarbons. Once filtered through the media, the treated stormwater is directed to a collection pipe or discharged into an open channel drainage way.

The filter media can be housed in cartridge filters enclosed in concrete vaults or catch basin-like structures. Various types of filter media are available from the manufacturer.

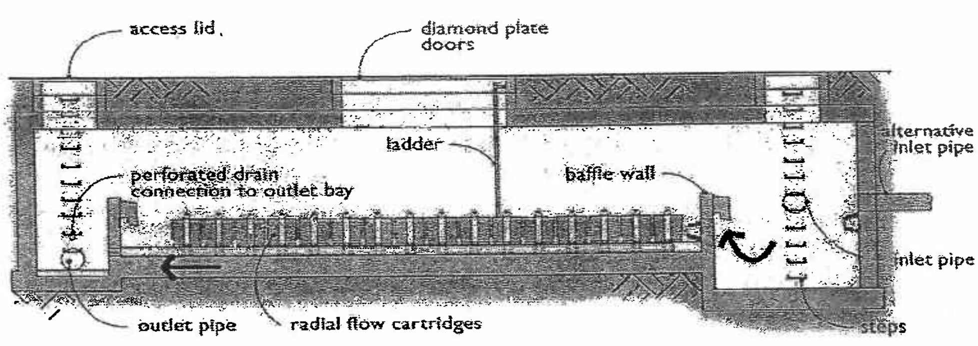
StormFilter units are a proprietary manufactured system. See manufacturer's publications for additional maintenance information.

Facility objects that are typically associated with a StormFilter® system include:

- access road or easement
- control structure/flow restrictor
- conveyance stormwater pipe



BIRD'S-EYE VIEW



SIDE PROFILE

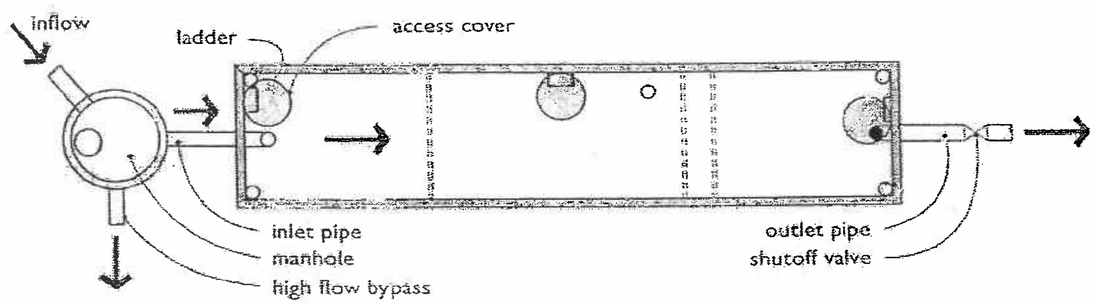
StormFilter® (leaf compost filter)			
Drainage System Feature	**Potential Defect**	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed Or Not Needed**
Fore bay	Sediment Accumulation	Sediment accumulation exceeds 6 inches or 1/3 of available sump.	Sediment accumulation less than 6 inches.
Media Filter Vault	Sediment Accumulation on Top of Filter Cartridges.	Sediment depth exceeds 0.25-inches on top of filter cartridges.	No sediment deposits on top of cartridges. Sediment on cartridges likely indicates that cartridges are plugged and require maintenance. No sediment deposits which would impede permeability of the compost media.
	Sediment Accumulation in Vault	Sediment depth exceeds 4 inches in first chamber. Look for other indicators of clogged cartridges or overflow.	Sediment in vault should be removed. Cartridges should be checked and replaced or serviced as needed. No sediment deposits in vault bottom of first chamber.
	Trash and Floatable Debris Accumulation	Trash and floatable debris accumulated in vault.	No trash or floatable debris in filter vault.
	Sediment in Drain Pipes/Clean-Outs	When drain pipes, clean-outs, become full with sediment and/or debris.	Sediment and debris removed.
	Damaged Pipes	Any part of the pipes that are crushed or damaged due to corrosion and/or settlement.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened; one person cannot open the cover using normal lifting pressure, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking warping, and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.
Below Ground Cartridge Type	Compost Media	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.	Media cartridges replaced.
	Short Circuiting	Flows do not properly enter filter cartridges.	Filter cartridges replaced.
	Filter cartridges Submerged.	Filter vault does not drain within 24 hours following storm. Look for evidence of submergence due to backwater or excessive hydrocarbon loading.	Filter media checked and replaced if needed. If cartridges are plugged with oil, additional treatment or source control BMP may be needed.

Oil/Water Separator (API Type)

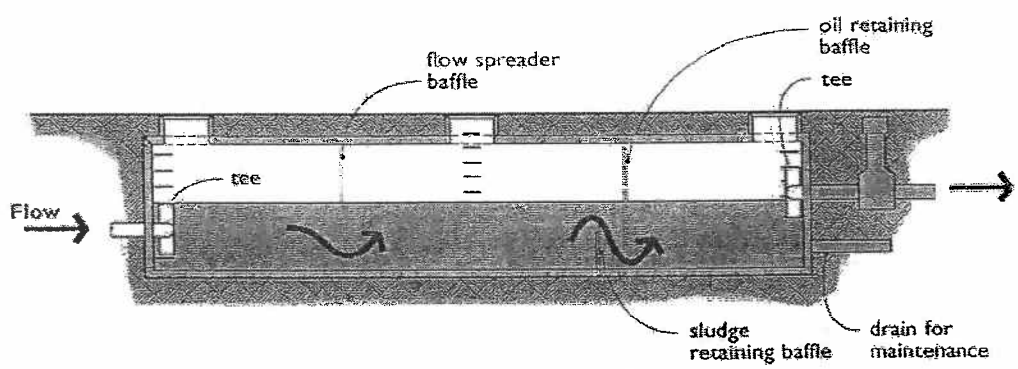
An oil/water separator is an underground vault that treats stormwater by mechanically separating oil from water. The oil rises to the surface and floats on the water and sediment settles to the bottom. Oil/water separators are typically utilized in locations where high oil concentrations in the stormwater runoff are anticipated (e.g. service and fuel stations). Oil/water separators are most commonly used as the first pre-treatment facility in a series of stormwater management facilities.

Facility objects that are typically associated with an oil/water separator include:

- access road or easement
- control structure/flow restrictor



BIRD'S-EYE VIEW



SIDE PROFILE

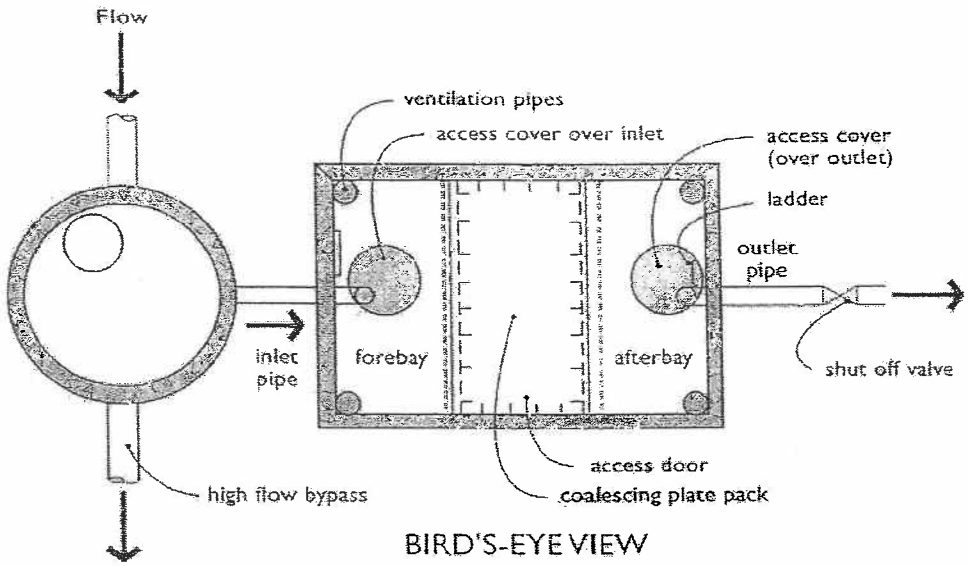
Baffle Oil/Water Separator (API Type)			
Drainage System Feature	**Potential Defect**	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed Or Not Needed**
General	Monitoring	Inspection of discharge water for obvious signs of poor water quality (i.e. obvious oil or other contaminants present)	Effluent discharge from vault should be clear with out thick visible sheen.
	Sediment Accumulation	Sediment depth in bottom of vault exceeds 6-inches in depth.	No sediment deposits on vault bottom that would impede flow through the vault and reduce separation efficiency.
	Trash and Debris Accumulation	Trash and debris accumulation in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault, and inlet/outlet piping.
	Oil Accumulation	Oil accumulations that exceed 1-inch, at the surface of the water.	Extract oil from vault by vactoring. Disposal in accordance with state and local rules and regulations.
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.
	Vault Structure Damage - Includes Cracks in Walls Bottom, Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin).	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Frame is sitting flush on the riser rings or top slab and firmly attached.
		Maintenance person judges that structure is unsound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
		Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is regrouted and secure at basin wall.
		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.

Coalescing Plate Oil/Water Separator

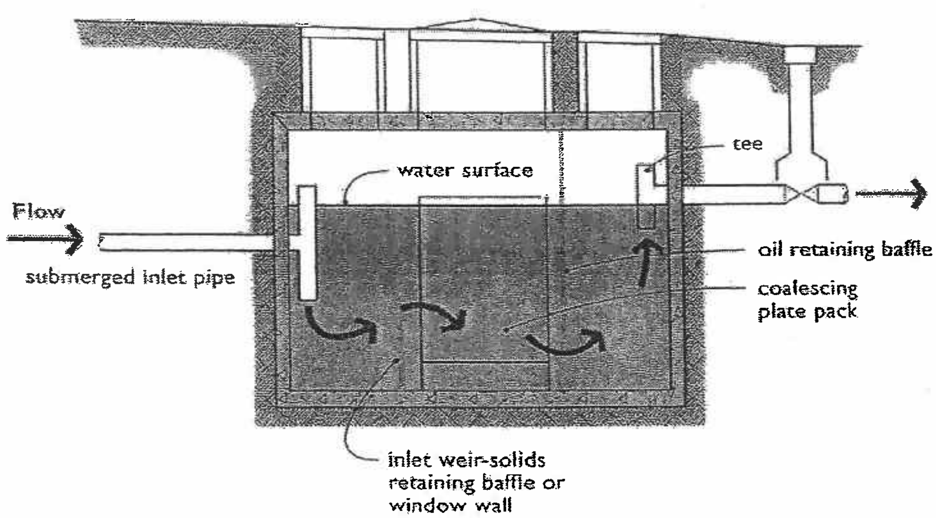
A coalescing plate oil/water separator is generally the same as the API type. The main difference is that coalescing plate separators include a series of parallel plates in the separation bay (2nd bay) that increase the oil removal efficiency of the separator.

Facility objects associated with a coalescing plate oil/water separator may include:

- access road or easement
- control structure/flow restrictor
- conveyance stormwater pipe



BIRD'S-EYE VIEW



SIDE PROFILE

Coalescing Plate Oil/Water Separator

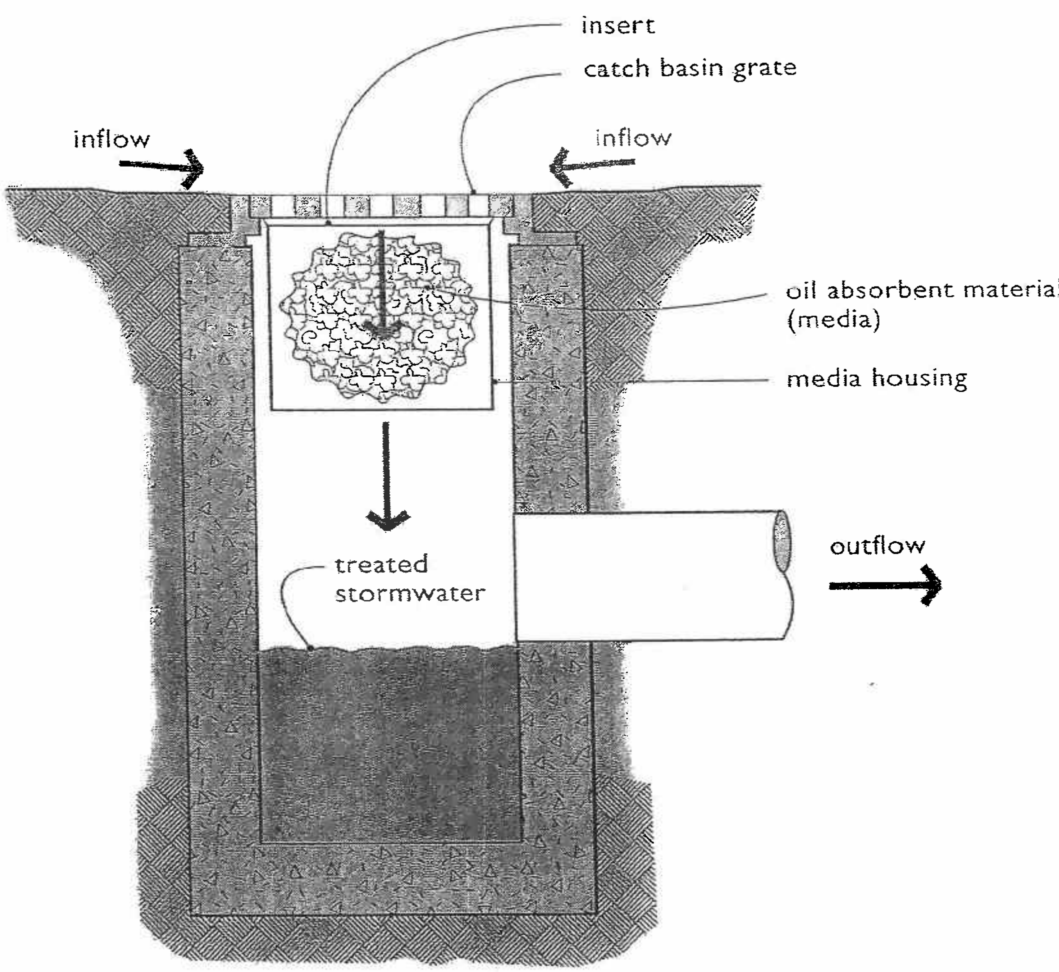
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed Or Not Needed
General	Monitoring	Inspection of discharge water for obvious signs of poor water quality (i.e. obvious oil or other contaminants present)	Effluent discharge from vault should be clear with no thick visible sheen.
	Sediment Accumulation	Sediment depth in bottom of vault exceeds 6-inches in depth and/or visible signs of sediment on plates.	No sediment deposits on vault bottom and plate media, which would impede flow through the vault and reduce separation efficiency.
	Trash and Debris Accumulation	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault, and inlet/outlet piping.
	Oil Accumulation	Oil accumulation that exceeds 1-inch at the water surface.	Oil is extracted from vault using vactoring methods. Coalescing plates are cleaned by thoroughly rinsing and flushing. Should be no visible oil depth on water.
	Damaged Coalescing Plates	Plate media broken, deformed, cracked and/or showing signs of failure.	A portion of the media pack or the entire plate pack is replaced depending on severity of failure.
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired and or replaced.
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Vault Structure Damage - Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.

Catch Basin Insert

Catch basin inserts are becoming more widely used to trap sediment and oil entering catch basins. Most involve some type of filter media and oil-absorbent pads. Filters avoid flooding by overflowing when they become clogged or when there are high storm flows.

Catch basin inserts typically consist of the following components:

- A structure (screened box, brackets, etc.) which contains a pollutant removal medium
- A means of suspending the structure in a catch basin
- A filter medium such as sand, carbon, fabric, etc.
- A primary inlet and outlet for the stormwater
- A secondary outlet for bypassing flows that exceed design flow



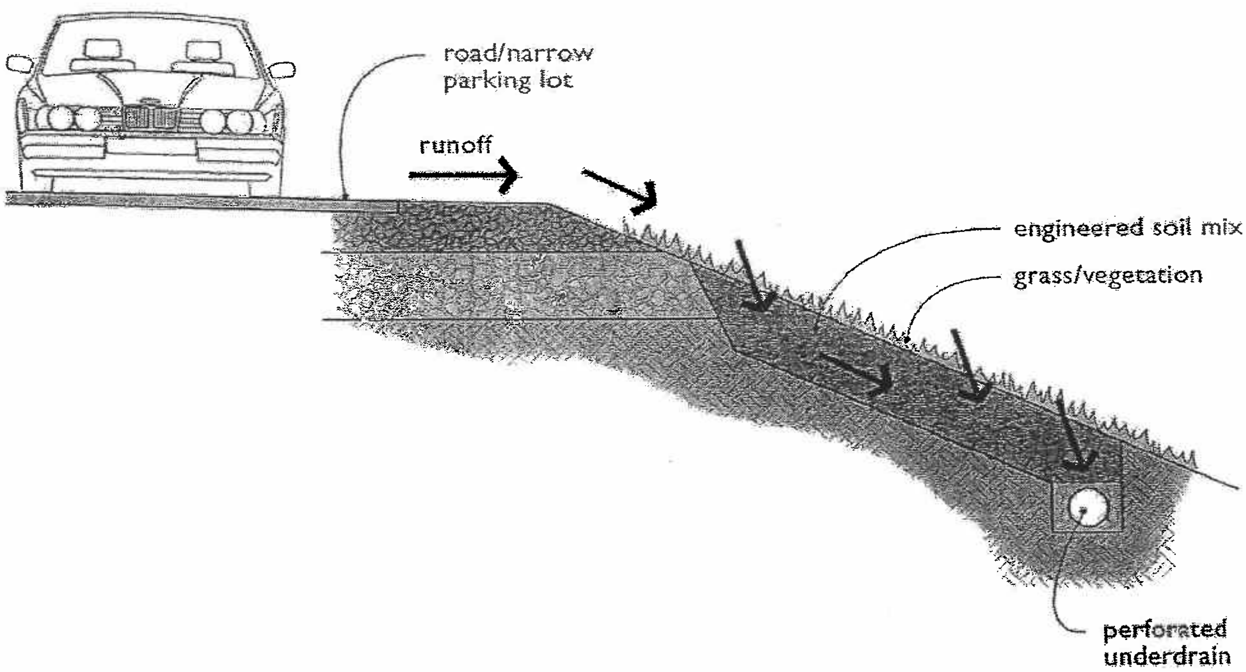
Catch Basin Insert			
Drainage System Feature	**Potential Defect**	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed Or Not Needed**
General	Sediment Accumulation	When sediment forms a cap over the insert media of the insert and/or unit.	No sediment cap on the insert media and its unit.
	Trash and Debris Accumulation	Trash and debris accumulates on insert unit creating a blockage/restriction.	Trash and debris removed from insert unit. Runoff freely flows into catch basin.
	Media Insert Not Removing Oil	Effluent water from media insert has a visible sheen.	Effluent water from media insert is free of oils and has no visible sheen.
	Media Insert Water Saturated	Catch basin insert is saturated with water and no longer has the capacity to absorb.	Remove and replace media insert
	Media Insert-Oil Saturated	Media oil saturated due to petroleum spill that drains into catch basin.	Remove and replace media insert.
	Media Insert Use Beyond Normal Product Life	Media has been used beyond the typical average life of media insert product.	Remove and replace media at regular intervals, depending on insert product.

Media Filter Drain (previously referred to as the Ecology Embankment)

The media filter drain (MFD), previously referred to as the ecology embankment, is a linear flow-through stormwater runoff treatment device that can be sited along highway side slopes (conventional design) and medians (dual media filter drains), borrow ditches, or other linear depressions. The media filter drain can be used where available right of way is limited, sheet flow from the highway surface is feasible, and lateral gradients are generally less than 25% (4H:1V).

Facility objects that are often associated with an ecology embankment include:

- access road or easement
- fence, gate, and water quality sign



Media Filter Drain (previously referred to as the Ecology Embankment)			
Drainage System Feature	**Potential Defect**	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed Or Not Needed**
General	Sediment accumulation on grass filter strip	Sediment depth exceeds 2 inches or creates uneven grading that interferes with sheet flow.	Remove sediment deposits on grass treatment area of the embankment. When finished, embankment should be level from side to side and drain freely toward the toe of the embankment slope. There should be no areas of standing water once inflow has ceased.
	No-vegetation zone/flow spreader	Flow spreader is uneven or clogged so that flows are not uniformly distributed over entire embankment width.	Level the spreader and clean so that flows are spread evenly over entire embankment width.
	Poor vegetation coverage	Grass is sparse or bare, or eroded patches are observed in more than 10% of the grass strip surface area.	Consult with roadside vegetation specialists to determine why grass growth is poor and correct the offending condition. Replant with plugs of grass from the upper slope or reseed into loosened, fertile soil or compost.
	Vegetation	Grass becomes excessively tall (greater than 10 inches); nuisance weeds and other vegetation start to take over.	Mow vegetation or remove nuisance vegetation so that flow is not impeded. Grass should be mowed to a height of 6 inches.
	Media filter drain mix replacement	Water is seen on the surface of the media filter drain mix from storms that are less than a 6-month, 24-hour precipitation event. Maintenance also needed on a 10-year cycle and during a preservation project.	Excavate and replace all of the media filter drain mix contained within the media filter drain.
	Excessive shading	Grass growth is poor because sunlight does not reach embankment.	If possible, trim back overhanging limbs and remove brushy vegetation on adjacent slopes.
	Trash and debris	Trash and debris have accumulated on embankment.	Remove trash and debris from embankment.

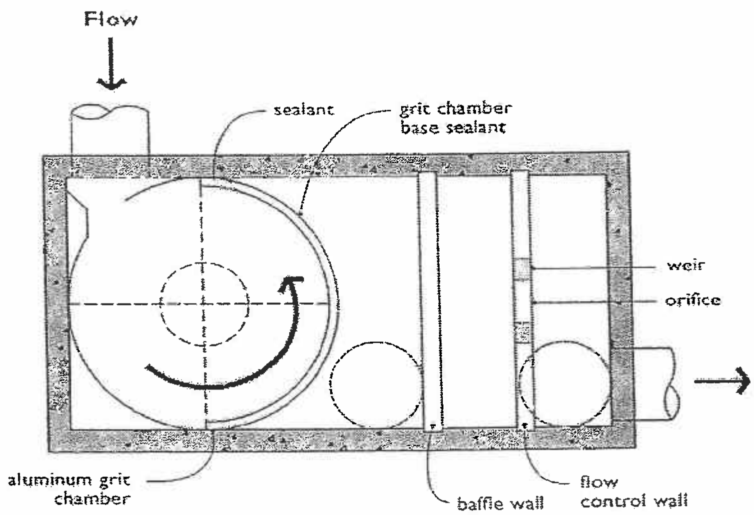
Vortechs® Stormwater Treatment System

A vortex-enhanced sedimentation vault (Downstream Defenders) consists of a cylindrical vessel where the inlet flow spirals around the perimeter in a vortex-type action causing the heavier particles to settle out of the stormwater. It uses a vortex-enhanced settling mechanism (swirl-concentration) to capture settleable solids, floatables, and oil and grease.

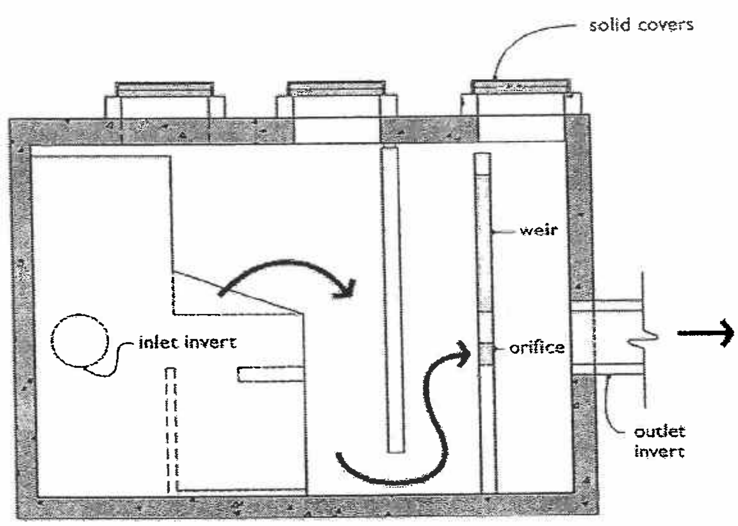
Vortechs® treatment units are a proprietary manufactured system. See manufacturer's publications for additional maintenance information.

Facility objects that are often associated with a Vortechs® system include:

- access road or easement
- fence, gate, and water quality sign
- control structure/flow restrictor
- StormFilter
- conveyance stormwater pipe



BIRD'S-EYE VIEW



SIDE PROFILE

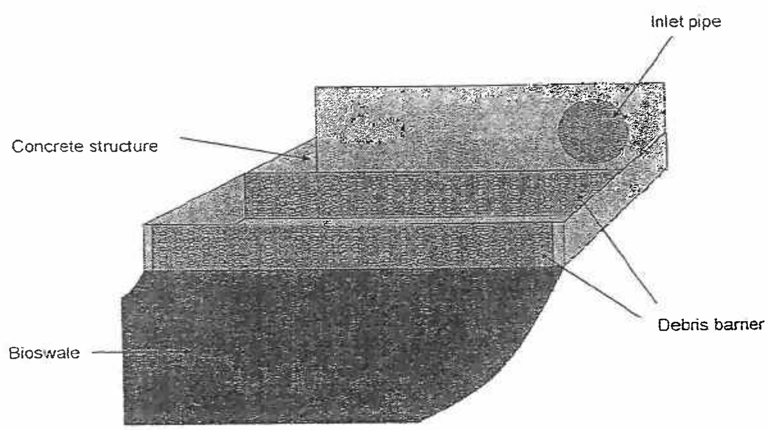
Vortechs® System			
Drainage System Feature	**Potential Defect**	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed Or Not Needed**
General	Sediment Accumulation	Sediment depth is within 12 through 18" of dry weather water surface elevation.	Accumulated sediment should be removed.
	Trash and Debris Accumulation	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault, and inlet/outlet piping.
	Oil Accumulation	Oil accumulation that exceeds 1- inch at the water surface.	Oil is extracted from vault using vactoring methods. Coalescing plates are cleaned by thoroughly rinsing and flushing. Should be no visible oil depth on water.
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired and or replaced.
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Vault Structure Damage - Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Sediment in Drain Pipes/Clean-Outs	When drain pipes, clean-outs, become full with sediment and/or debris.	Sediment and debris removed.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.

Sediment Trap

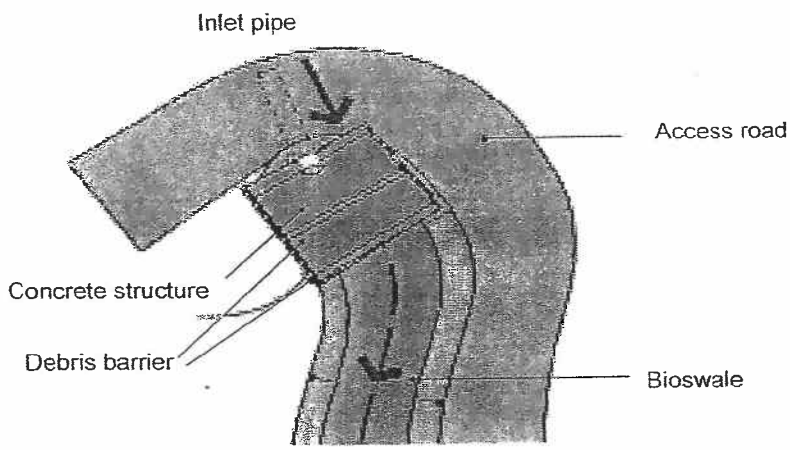
A sediment trap, (also known as a Bradley Weir or a facility sediment trap) is a concrete structure typically fitted with a slotted grate or multiple slotted grates (debris barriers). The concrete structure provides a storage volume (sump) below the outlet pipe to allow sediments and debris to settle out of the stormwater runoff. Some basins are also fitted with a spill control device (elbow on outlet pipe) intended to help direct and dissipate flow. The slotted grate (debris barrier) prevents larger debris from exiting the weir.

Facility objects that are often associated with a Bradley Weir include:

- access road or easement
- fence, gate, and water quality sign
- typical bioswale
- wet bioswale



Bird's-eye view



Sediment Trap

Drainage System Feature	Potential Defect	Maintenance Trigger	Results Expected When Maintenance Is Performed Or Not Needed
General	Trash and Debris	Trash or debris which is located immediately in front of the sediment trap opening or is blocking inletting capacity of the basin by more than 10%.	No Trash or debris located immediately in front of sediment trap or on grate opening.
		Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the	No trash or debris in the sediment trap.
		Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash or debris.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the sediment trap.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert.	No sediment in the sediment trap.
	Structure Damage to Frame and/or Top Slab	Slab has holes larger than 2 square inches or cracks wider than 1/4 inch (Intent is to make sure no material is running into basin.)	Structure is free of holes and cracks.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound.	Sediment trap replaced or repaired to design standards.
		Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Sediment trap replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening.	No vegetation blocking opening to sediment trap.
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants. (Coordinate removal/cleanup with local water quality response agency.)	No contaminants or pollutants present.
Debris barrier	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

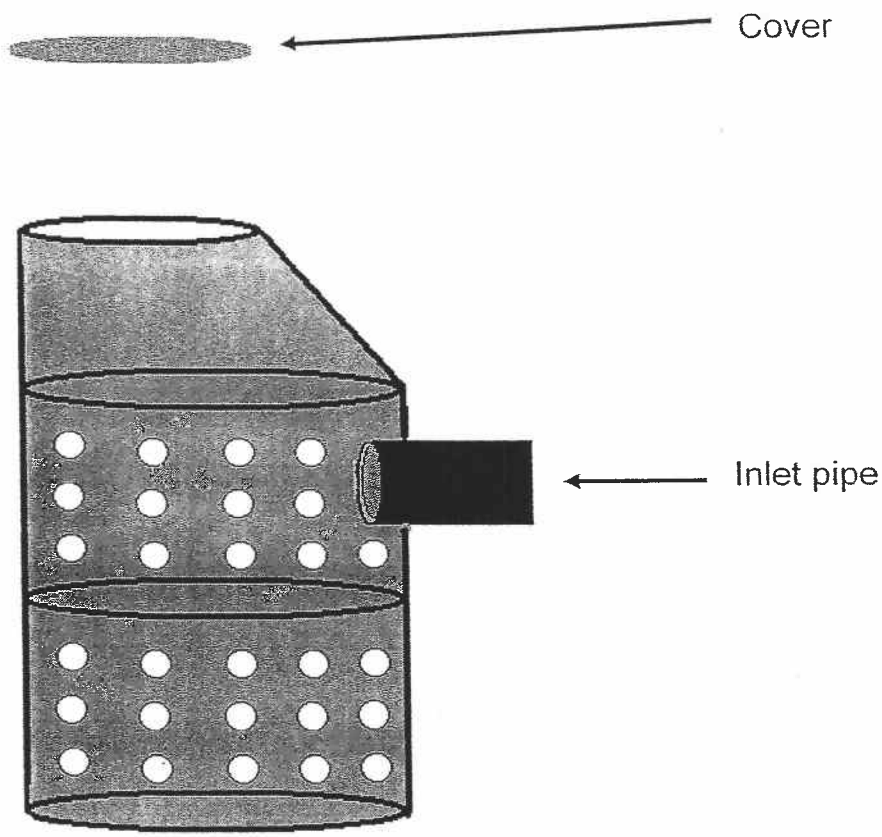
Drywell

A drywell is a perforated, open-bottomed manhole used to infiltrate stormwater into the ground. Drywells temporarily store stormwater runoff during rain events. Drywells do not discharge to a downstream conveyance system or nearby surface water. Instead, drywells rely on the ability of the site's soils to infiltrate the stormwater into the ground.

While not the intended use, drywells trap sediment and some of the oily pollutants in runoff. They are more likely to fill with oily sediment in areas that lack swales or other treatment facilities. Fine soil sediment can clog drywells and lead to localized street flooding. Also, pollutants discharged into drywells can migrate into groundwater. Drywells were often installed in closed topographic depressions, areas with well-drained soils, or areas having inadequate storm sewers. Often, drywells contain groundwater. Because drywells can be easily clogged and tend to concentrate pollutants in one place; pollution and sediment control practices should be used to protect them.

Facility objects that are typically associated with a drywell include:

- access road or easement
- fence, gate, and water quality sign
- field inlet
- bioswale
- StormFilter



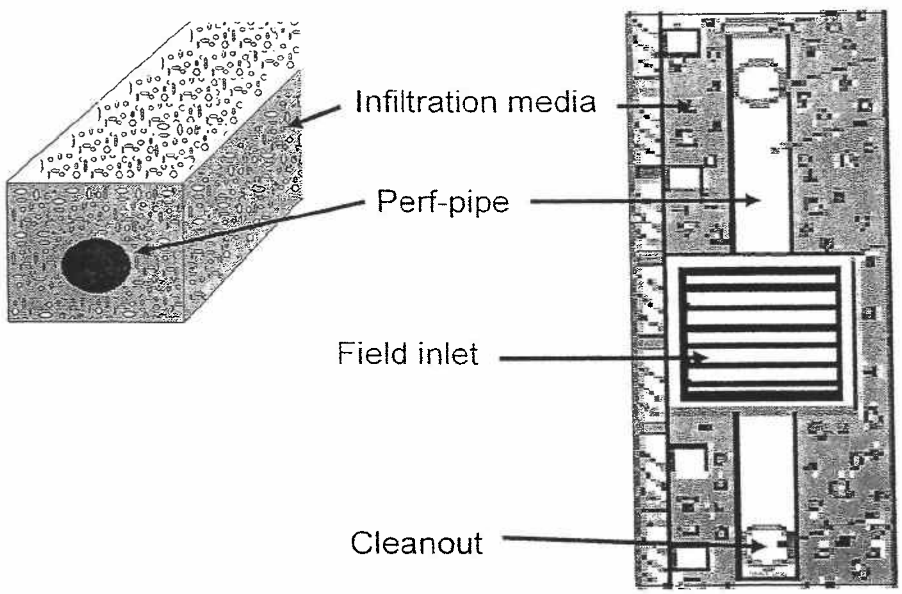
Drywell			
Drainage System Feature	**Potential Defect**	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed Or Not Needed**
General	Does Not Dissipate Stormwater	Does not dissipate stormwater.	Replace or repair.
	Opening Clogged	Openings are clogged, reducing capacity.	Water-jet clogged openings. or Convert existing, clogged drywell to a sediment trap and install a new drywell or drainage trench. To convert to a sediment trap, required are grouting holes, covering the base with concrete, and adding piping.
	Standing Water	Standing water indicates the drywell is into the water table.	Rebuild drywell to prevent stormwater from going directly into groundwater.
	Trash and Debris	Trash, debris, or floatables that may exit through pipes	No trash or debris in drywell.
		Trash or debris in any inlet or outlet pipe.	Inlet and outlet pipes free of trash or debris.
	Sediment	Sediment in drywell exceeds 60 percent of the depth below the inlet pipe.	No sediment in drywell.
	Structure Damage	Maintenance person judges that structure is unsound.	Drywell replaced or repaired to design standards.
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants (Coordinate removal/cleanup with local water quality response agency). • Identify and remove source, AND • Report to Clark County Clean Water Program Illicit Discharge and Detection Elimination Program .	No contaminants or pollutants present.
Drywell Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is closed
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure (Intent is to keep cover from sealing off access to maintenance).	Cover can be removed by one maintenance person.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

Infiltration Trench

A stormwater infiltration trench is a closed basin built by excavating below existing ground. Infiltration trenches temporarily store stormwater runoff during rain events. Infiltration trenches do not discharge to a downstream conveyance system or nearby surface water. Instead, infiltration trenches rely on the ability of the site's soils to infiltrate the stormwater into the ground.

Facility objects that are typically associated with an infiltration trench include:

- access road or easement
- fence, gate, and water quality sign
- bioswale
- sediment trap
- field inlet



Infiltration Trench			
Drainage System Feature	**Potential Defect**	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed Or Not Needed**
General	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants in or around facility. • Identify and remove source, AND • Report to Clark County Clean Water Illicit Discharge and Detection Elimination Program .	No contaminants or pollutants present.
	Observation Well	Sediment depth greater than one foot above stone aggregate or the surface inlet.	No sediment in infiltration trench.
	Drainage Slow	Decreased capacity that indicates slow drainage.	Verify facility design rate. Clean perforated drain pipe. Do not allow removed sediment and water to discharge back into the storm sewer.

Field Inlet

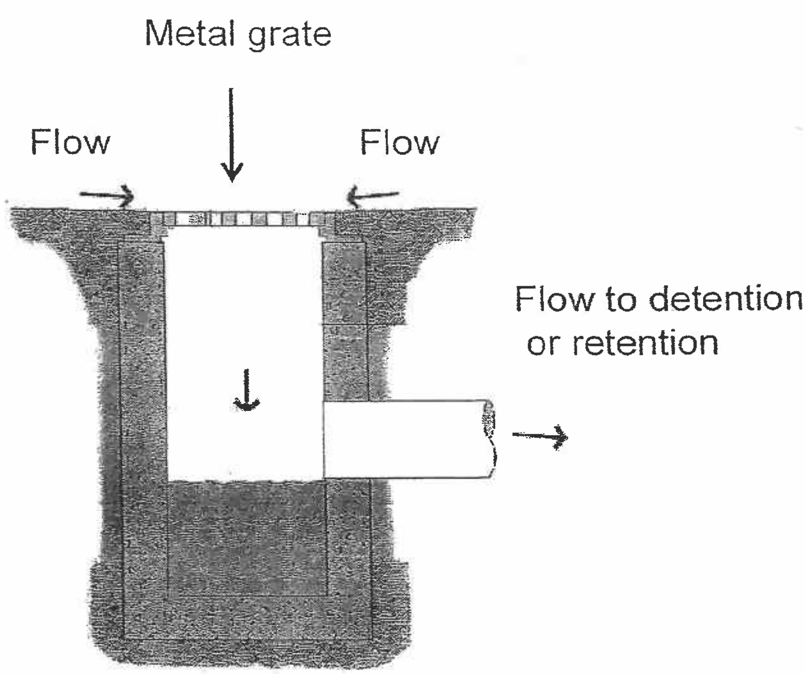
A field inlet is a concrete structure fitted with a slotted grate to collect stormwater runoff and route it through underground pipes.

Field inlets typically provide a storage volume (sump) below the outlet pipe to allow sediments and debris to settle out of the stormwater runoff. Some field inlets are fitted with a spill control device (inverted elbow on outlet pipe) intended to contain large quantities of grease or oils.

The most common tool for cleaning field inlets is a truck with a tank and vacuum hose (vactor truck) to remove sediment and debris from the sump.

Facility objects that are typically associated with a field inlet include:

- access road or easement
- control structure/flow restrictor
- bioswale
- detention pond
- infiltration basin control
- infiltration trench



Field Inlet

Drainage System Feature	Potential Problem	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed Or Not Needed
General	Trash and Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the field inlet by more than 10%.	No Trash or debris located immediately in front of field inlet or on grate opening.
		Trash or debris (in the field inlet) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the	No trash or debris in the field inlet.
		Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash or debris.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the field inlet.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert	No sediment in the field inlet.
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch (Intent is to make sure no material is running into basin).	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
		Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering field inlet through cracks.	Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening.	No vegetation blocking opening to basin.
		Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation or root growth present.
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants Sheen, obvious oil or other contaminants present. • Identify and remove source, AND • Report to Clark County Clean Water Program Illicit Discharge and Detection Elimination Program.	No contaminants or pollutants present.

Field Inlet (Continued)			
Drainage System Feature	**Potential Problem**	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed Or Not Needed**
Metal Grates	Grate Not in Place	Cover is missing or only partially in place. Any open field inlet requires maintenance.	Field inlet cover is closed
	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

Access Road and Easement

Many stormwater facilities have access roads to bring in heavy equipment for facility maintenance. These roads should be maintained for inspection access and ease of equipment access.

All facilities should allow access for the inspection process.

The easement area should be adequately landscaped. Landscaping is an essential component of stormwater management. Bare soil areas may generate higher levels of stormwater runoff and increase erosion and sedimentation in stormwater facilities. The following checklist gives some general guidance for management.

Access Road/Easement			
Drainage System Feature	**Potential Defect**	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed Or Not Needed**
General	Erosion	Soils are bare or eroded.	Seed or use a covering BMP.
	Road Surface	Condition of road surface may lead to erosion of the facility or limit access.	Road repaired.
	Erosion of Ground Surface	Noticeable rills are seen in landscaped areas.	Causes of erosion are identified and steps taken to slow down/spread out the water. Eroded areas are filled, contoured, and seeded. If needed, regrade effected areas.
	Trash & Debris / Litter	Litter accumulation exceeds 1 cubic foot per 1,000 square feet.	No trash or debris present.
	Poisonous Vegetation and Noxious weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by State or local regulations. (Apply requirements of adopted Clark County Maintenance and Operations policies for the use of herbicides).	No danger of poisonous vegetation where maintenance personnel or the public might normally be. (Coordinate with Clark County Weed Management department) Complete eradication of noxious weeds may not be possible. Compliance with State or local eradication policies required
	Tree Growth and Hazard Trees	Tree growth does not allow maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements). If trees are not interfering with access or maintenance, do not remove If dead, diseased, or dying trees are identified (Use a certified Arborist to determine health of tree or removal requirements)	Trees do not hinder maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood). Remove hazard Trees
		Trees or shrubs that have been blown down or knocked over.	Replant tree, inspecting for injury to stem or roots. Replace if severely damaged.

Access Road/Easement (Continued)			
Drainage System Feature	**Potential Defect**	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed Or Not Needed**
General cont.	Vegetation	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by State or local regulations. (Apply requirements of adopted IPM policies for the use of herbicides).	No danger of poisonous vegetation where maintenance personnel or the public might normally be. (Coordinate with County Weed Management department.) Complete eradication of noxious weeds may not be possible. Compliance with State or local eradication policies is required.
	Weeds (Nonpoisonous)	Weeds growing in more than 20% of the landscaped area (trees and shrubs only).	Weeds present in less than 5% of the landscaped area.
	Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects destroyed or removed from site. Apply insecticides in compliance with adopted Clark County Maintenance and Operations policies

Fence, Gate, and/or Water Quality Sign

Stormwater facilities such as detention ponds or treatment wetlands often have fences to protect them from damage and keep children away from ponds or hazardous areas. Certain facilities such as biofiltration swales, approved under Chapter 13.29 CCC, are also required to have informational signs telling the public that the swale is a stormwater facility.

Fence, Gate and/or Water Quality Sign			
Drainage System Feature	**Potential Defect**	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed Or Not Needed**
General	Gate or Fence Allows Unauthorized Entry	Openings in fence, missing gate, openings beneath fence allowing unauthorized access.	Gate and/or fence repaired to prevent unauthorized access
	Locking Mechanism	Mechanism cannot be opened by one maintenance person with proper tools.	Lock repaired/replaced.
		No lock on gate allows unauthorized entry.	Lock replaced.
	Damaged Parts	Posts out of plumb more than six inches.	Post plumb to within 1-1/2 inches of plumb
		Top rails of plumb more than six inches.	top rails free of bends greater than 1 inch.
	Erosion	Erosion has resulted in an opening under a fence that allows entry by people or pets.	Replace soil under fence so that no opening exceeds 4 inches in height.
	Water Quality Sign	Water quality sign is leaning more than 8 inches off vertical.	Sign reset to plumb.
		Water quality sign is missing or 20% of the surface is unreadable.	Sign replaced.

Conveyance Stormwater Pipe

Inlet and outlet stormwater pipes convey stormwater in, through, and out of stormwater facilities.

Storm sewer pipes convey stormwater. Pipes are built from many materials and are sometimes perforated to allow stormwater to infiltrate into the ground. Stormwater pipes are cleaned to remove sediment or blockages when problems are identified. Stormwater pipes must be clear of obstructions and breaks to prevent localized flooding. All stormwater pipes should be in proper working order and free of the possible defects listed below.

Conveyance Storm Pipe			
Drainage System Feature	**Potential Defect**	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed Or Not Needed**
General	Obstructions, Including Roots	Root enters or deforms pipe, reducing flow.	Use mechanical methods to remove root. Do not put root-dissolving chemicals in storm sewer pipes. If necessary, remove the vegetation over the line.
	Pipe Dented or Broken	Inlet/outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
	Pipe Rusted or Deteriorated	Any part of the piping that is crushed or deformed more than 20% or any other failure to the piping.	Pipe repaired and/or replaced.
	Sediment & Debris	Sediment depth is greater than 20% of pipe diameter.	Install upstream debris traps (where applicable) then clean pipe and remove material
	Debris barrier or Trash Rack Missing	Stormwater pipes > than 18 inches need debris barrier	Debris barrier present on all stormwater pipes 18 inches and greater

Stormwater Facility Discharge Points

Stormwater facility discharge points may convey stormwater from the stormwater facility into drainage trenches and receiving waters or other drainage areas. Stormwater facility discharge points need to be assessed to make sure stormwater is not causing any negative impacts to these drainage areas.

Facility Discharge Point			
Drainage System Feature	**Potential Defect**	**Conditions When Maintenance Is Needed**	**Results Expected When Maintenance Is Performed Or Not Needed**
Monitoring	Inspection of Discharge Water for Obvious Signs of Poor Water Quality.	Sheen, obvious oil or other contaminants present. • Identify and remove source, AND • Report to Clark County Clean Water Program Illicit Discharge and Detection Elimination Program .	Effluent discharge from facility should be clear.
	Receiving Area Saturated	Water in receiving area is causing substrate to become saturated and unstable. • Report to Clark County Clean Water Program for Engineer Evaluation.	Receiving area sound.
	Off Site Assessment	Erosion, scouring, or headcuts in ditch or stream banks due to flow channelization, or higher flows. • Report to Clark County Clean Water Program for Engineer Evaluation.	Ditch or stream banks stable.
General	Missing or Moved Rock	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil.	Rock pad replaced to design standards.
	Erosion	Soil erosion in or adjacent to rock pad.	Rock pad replaced to design standards.
	Obstructions, Including Roots	Roots or debris enters pipe or deforms pipe, reducing flow	Use mechanical methods to remove root. Do not put root-dissolving chemicals in storm sewer pipes. If necessary, remove the vegetation over the line.
	Pipe Rusted or Deteriorated	Any part of the pipe that is broken, crushed or deformed more than 20% or any other failure to the piping	Pipe repaired or replaced.
Internal (If Applicable)			
Energy Dissipater	All Potential Defects	**See Energy Dissipater on pages 23 – 24**	

Vegetation Management

The following practices are adapted, with minor modifications for format and local practices, from City of Portland Parks Pest Management Policy (April 1999).

General Goals and Philosophy

Clark County recognizes the special importance of rivers, streams, wetlands, ponds, and stormwater control and treatment facilities. The sensitive nature of such habitats, their plant and animal communities, and their direct link with other waterways require that we establish specific policies to ensure their health.

All landscape management decisions for controlling unwanted vegetation, diseases, and pests should follow Integrated Pest Management principles and decision-making rationale. These are:

- Proper planning and management decisions begin the IPM process
- Cultural methods of vegetation and pest control are preferred and are first employed
- Mechanical means of vegetation and pest control are next in line of preference, and are utilized where feasible
- Biological methods of vegetation and pest control are considered before chemical means, where they are feasible
- Botanical and synthetic pesticides are used only when no other feasible methods exist

General Practices

Use Only Appropriate Plants

Clark County has adopted a list of approved plants for use in development projects. The list also has prohibited undesirable plants. Only plants approved for use in the Clark County Plant List are allowed for use in plantings in unincorporated areas.

Vegetation and Pest Management in Stormwater Control Facilities

Stormwater control facilities include biofiltration treatment swales, treatment wetlands, treatment ponds, detention ponds, open channels, and infiltration basins. Stormwater control facilities discharge to surface water or groundwater either directly or through pipes or ditches. Many facilities are built to remove pollutants from stormwater.

Generally, vegetation should be maintained to blend into surrounding areas. Stormwater facilities can provide habitat for aquatic life and birds. Promoting natural vegetation where feasible improves habitat. Swales often blend into intensively managed landscapes. Pond perimeters can include natural vegetation.

The use of pesticides and, in most cases fertilizer, is not compatible with the task of pollutant removal or the direct connection of stormwater facilities to streams and groundwater.

Features of Stormwater Facilities:

- There is a mix of native and non-native plants
- Generally not used by the public
- Include areas managed to promote design function, such as turf in swales
- Managed landscapes may be nearby
- May be used by fish and wildlife

Objectives for Stormwater Facilities:

- Maintain healthy plant communities
- Avoid or minimize need for chemical intervention
- Control invasive plants where feasible

- No bare soil areas are allowed
- Tolerance for natural appearance and weeds

Practices

The vegetation management focus is establishing and maintaining healthy low-maintenance native plantings and sustaining the design function of vegetated filters such as biofiltration swales. This includes controlling invasive plants where feasible, and planting cover on bare soils.

Only use plants on the City of Vancouver plant list or the Clark County Plant List (Ordinance 1995-01-26).

In some cases, the original plantings may not be appropriate for the actual condition at a facility. One example is a frequently flooded swale that cannot support normal turf. In cases like this, replace turf with appropriate wetland plants if the underlying drainage problem cannot be fixed.

Consider the use of soil amendments such as compost before using fertilizer.

Limit mulch use to covering bare soil while establishing plantings.

Chemical use should be avoided within 25 feet of any area that holds or conveys surface water or stormwater. This includes the base of a biofiltration swale.

Trees or shrubs that block access roads may be trimmed (or removed if within the access road) when access is required for maintenance by heavy equipment.

Trees that pose a risk to stormwater structures due to root growth may be removed and replaced by smaller shrubs.

City of Camas WASHINGTON

Pre-Application Meeting
Green Mountain PRD
Ingle Rd/Goodwin Rd
File PA14-07

Tuesday, February 25, 2014
2:00pm, Council Chambers
616 NE Fourth Avenue, Camas WA 98607

Applicant / Contact:	**Applicant**: Landerholm Law Firm Attn: Randy Printz 805 Broadway Suite 100 Vancouver WA 98660 Ph: (360) 696-3312 Email: randy.printz@landerholm.com	**Contact:** Same
Representing City of Camas:	Phil Bourquin, Community Development Director Robert Maul, Planning Manager Sarah Fox, Sr. Planner Bob Cunningham, Building Official Randy Miller, Fire Marshal Eric Levison, Public Works Director Jerry Acheson, Parks Manager Jim (Curleigh) Carothers, Engineering Manager Wes Heigh, Project Manager Norm Wurzer, Engineer	
Location:	Ingle Rd & Goodwin Rd (see application for tax parcels)	
Zoning:	R10, R6, MF & CC	
Description:	**The applicant proposes to develop a 283 acre site with a variety of lot sizes and densities that will include both single-family and multi-family components.**	

NOTICE: Notwithstanding any representation by City staff at a pre-application conference, staff is not authorized to waive any requirement of the City Code. Any omission or failure by staff to recite to an applicant all relevant applicable code requirements shall not constitute a waiver by the City of any standard or requirement. [CMC 18.55.060 (C)] This pre-application conference shall be valid for a period of 180 days from the date it is held. If no application is filed within 180 days of the conference or meeting, the applicant must schedule and attend another conference before the City will accept a permit application. [CMC 18.55.060 (D)] Any changes to the code or other applicable laws, which take effect between the pre-application conference and submittal of an application, shall be applicable. [CMC 18.55.060 (D)]. **A link to the Camas Municipal Code (CMC) can be found on the City of Camas website, http://www.cityofcamas.us/ on the main page under "Business and Development".**

Planning Department **Sarah Fox 817-7269**

The applicant has proposed several permits, some of which can be consolidated for a single decision issuance. The applicant is responsible for reviewing the code and addressing the applicable provisions.

1) The proposed preliminary master plan for a Planned Residential Development (PRD) application is TYPE III permit, which requires City Council approval, in accordance with the process described within CMC Chapter 18.23 and CMC Chapter 18.55. This underlying permit is typically consolidated with preliminary plat, critical areas, and SEPA reviews. The proposed zoning overlay requires legislative action.

2) Note that the city's development codes within Titles 16, 17, and 18 were amended last month, and are codified online. Also, the city's multi-family dimensional standards at CMC Chapter 18.09 Density and Dimensions were amended, however, at this time; the ordinance has not been codified online, and is therefore attached to these notes. The application will be subject to the codes adopted on the date of application.

3) PRD applications should address the criteria as found under CMC§18.23.100- Approval standards. The contents of an application are provided at CMC§18.23.070- Preliminary Master Plan Requirements. In addition the application should address:
   a) Proposed timing for validity of master plan and phasing.
   b) How the adopted dimensional standards must be modified. Please note, that a preliminary plat application can be approved in phases (See "Phasing" at CMC§17.11.040), and may be approved at a public hearing before the city's Hearings Examiner, rather than by city council as required for a PRD.

4) The proposed preliminary master plan should conform to the city's comprehensive plan for residential density, and the PRD standards at CMC§18.23.040 Density Standards. The current DA lists a total unit count of 1,379 dwelling units, but the proposed amount is closer to 1,643. As discussed in the pre-app, the applicant should address this issue in a revised DA and subsequent overall project application.

   Notes on layout:

   - All phases of the proposed development must be included at sufficient details to demonstrate compliance with applicable development codes.
   - Double frontage lots if proposed, require additional lot depth per CMC 17.19.030 (D)(6). "*Residential lots which have street frontage along two opposite lot lines shall be avoided, except for lots which provide separation of a residential development from a traffic arterial or collector, in which case additional lot depth of at least twenty feet will be provided to act as a buffer strip, or* ***ten-foot landscape tract with ten-foot additional*** *lot depth, or a combination of both* ***to achieve twenty-foot additional depth*** *between the lot and the traffic arterial.*"
   - Extra (off-street) parking areas are required to be located in a convenient location if average lot sizes are less than 7,400 square feet.
   - The proposed lot layout may also contain "Restricted Corner Lots". These are corner that are restricted from access on side yard flanking street. The setbacks on these lots shall be treated as interior lots.

5) Critical area reports required.
   - General requirements for critical areas reports are found at CMC§16.51.140. The city's code contains additional requirements for each type of critical area (e.g. wetlands).
   - Wetland report requirements are found at CMC§16.53.030. The preliminary report and analysis must include efforts to avoid impacts. Alternative layouts to indicate feasibility should be provided.
   - Steep Slopes additional analysis in accordance with CMC16.59.060.
   - Archaeological Predetermination Report required in accordance with CMC§16.31.070, and must include proof of mailing notification to tribes.
   - Wildlife habitat reports must be submitted in accordance with chapter CMC§16.61.
   - Scenic views in accordance with CMC§16.33.010(B) should be illustrated on a site plan, identifying particular corridors.
6) Tree preservation efforts are required.
   - Tree survey must be conducted by biologist (include qualifications). The biologist will be required to review and coordinate tree preservation efforts with preliminary grading plans.
   - CMC 18.31 requires preservation of significant trees "to the extent practical", "healthy trees" and prefers "groups of significant trees". CMC§18.31.110 requires "mandatory preservation" in the form acceptable to the city. CMC§17.19.030 (A)(2) requires "every reasonable effort" to retain trees.
7) Sales office locations should be proposed with preliminary plans. If sales offices are proposed with the Type III application, then time frames for operation of the temporary use can be approved for longer than the limits of typical temporary uses (6 months) if requested.
8) **Zoning Overlay**: An application must include the current and proposed zoning drawing; along with a narrative to address how the change in zoning requested is in conformity with the adopted comprehensive plan, and the public interest. The proposed zone change must be compatible with the existing established development pattern of the surrounding area in terms of lot sizes, densities and uses

9) Fees will be based on the adopted fees at the time of application submittal. The current fees include the following (not all inclusive):

• Preliminary plat	$6,055 + $210 per lot
• PRD	$27 per unit + plat fees
• Zone change	$1,650
• SEPA	$685
• Critical areas	$650 (per type)
• Fire Department Review	$300

Engineering Department **Wes Heigh 817-7237**

1. Construction plans shall be prepared by a licensed Washington State engineer in accordance with City of Camas standards.
2. Per CMC 14.02 stormwater treatment and runoff control shall be designed in accordance with the 2005 Stormwater Management Manual for Western Washington and the City of Camas Stormwater Design Standards Manual.
3. This development is subject to the minimum improvement requirements identified in CMC 17.19.020.
4. Existing wells and septic tanks and septic drain fields shall be abandoned in accordance with state and county guide lines per CMC 17.19.020 (A3).

5. Proposed lots should have frontage on public streets, lot lines should be at right angles to the street or radial to curves per CMC 17.19.030 (D).
6. Flag lots shall meet the requirements of CMC 17.19.030 (D5).
7. Double frontage lots should be avoided per CMC 17.19.030 (D).
8. In accordance with CMC 17.19.030 (E) and per the 2007 Parks, Recreation and Open Space Comprehensive Plan provisions shall be made for Neighborhood Park (NP-16), Special Use Park (SU-14), Trails T-27, T-29 and T-30. The city is currently in the process of updating our Parks Plan. Application materials will need to address the requirements of the current plan at the time of submittal.
9. Street tree planting and landscaping of flag lots is required in accordance with CMC 17.19.030 (F).
10. Stormwater facilities shall be located and landscaped per CMC 17.19.030 (F6) and CMC 17.19.040 (C3a).
11. Maintenance of the storm water facilities will be the responsibility of the Homeowners Association per CMC 17.19.040 (C3).
12. The applicant will be responsible for all traffic control signs, street name signs, pavement markings and street lighting per CMC 17.19.030 (I) (J).
13. The applicant will be responsible for the design and submittal of the utility plan showing the locations for underground power, telephone, gas, CATV, street lights and associated appurtenances.
14. Private streets if proposed will need to meet the provisions of CMC 17.19.040 (A).
15. Public street requirements are found in CMC 17.19.040 (B). For street grades, centerline curve radii, and curb return radii requirements see CMC 17.19.040 (B12).
16. Half width street improvements and ROW dedication will be required along Goodwin Road and NE Ingle Road per CMC 17.19.040 (B2 & B5). Ingle half width ROW is 37' and Goodwin half width ROW at Ingle should be 50' tapering to 37' east of Ingle.
17. Streets should extend to the boundaries of the plat where appropriate to ensure access and circulation to neighboring properties per CMC 17.19.040 (B6a).
18. Where lot size average is under 7,400 SF additional off-street parking will be required in accordance with CMC 17.19.040 (B10c).
19. Any proposed phasing shall be consistent with the requirements of CMC 17.11.040.
20. The application narrative shall specifically address the approval criteria CMC 17.11.030 (D) and CMC 18.23.100.
21. A 3% plan review and inspection fee will be required per resolution number 1023. The fee will be based on an engineer's estimate or construction bid. The fee is due prior to approved construction drawings being released by the City.
22. An erosion control bond will be required for all land disturbing activities of an acre or more per CMC 17.21.030.
23. A NPDES permit will be required for this project per Washington Department of Ecology requirements if more than one acre of land will be disturbed.
24. A traffic study will be required for this project in accordance with the City's adopted Traffic Impact Study Guidelines. The study shall include speed surveys, traffic counts, site distance evaluation, AM and PM peak volumes, trip distribution and assignment, signal warrants, turn pocket analysis, with and without project analysis for the current year, build out year and the future 5 year and 20 year analysis. Evaluation of additional

off-site intersections will be required once trip generation and distribution information is determined, contact the City Engineer for specific intersections.

25. This project will generate more than 700 ADT and will be required to provide acceptable traffic calming measured in accordance with the Neighborhood Traffic Manual.
26. Intersection spacing and intersection setbacks shall meet the requirements of the 2012 TIF Plan.
27. Water and sewer system extensions to the site will need to be consistent with the adopted Water System Plan and the General Sewer Plan Amendment. The improvements will likely require the applicant to enter into agreements with the city for system upsizing and/or latecomer agreements.
28. Regulations for installation of public improvements, improvement agreements, bonding, final platting and final acceptance can be found at CMC 17.21.
29. Exception requests to the requirements of Title 17 shall meet the requirements of CMC 17.23.

Fire Department **Randy Miller 834-6191**

Please note, for current or future questions/issues, All review notes, plat notes and conclusions have been conducted based on the current codes at the time, specifically the International Fire Code (IFC), National Fire Code (NFC) & CMC.

1. Automatic fire sprinkler system designed and installed in accordance with NFPA 13D may be required in all new dwellings. IFC B 105, CMC 17.19 ** Besides the obvious life safety and property protection advantages, Fire Sprinklers provide flexibility for developers in subdivision single access points, long term phasing projects that create dead ends, potential for installation of fewer hydrants, narrower streets, steeper grades, waiver of third party Wildland Interface Studies and finally decreased Fire Impact Fee's.

2. Onsite fire hydrants required, contact fire department for locations. IFC Appendix C Sec. C 105

3. A separate permit with the Fire Marshal's office is required for any underground tank decommissioning, removal/disposal or abandoning in place. IFC 105.7.5, 3404.2.13.1.4

4. Provisions required to be made for the addressing of flag lots. Address numbers shall be plainly legible and clearly visible and must be posted for each residence where the flag lot access or easement leaves the public road. IFC 505.1, CMC 17.19.030-D-5-G

5. Witnessed hydrant flushing by the FMO required prior to final completion per NFPA guidelines in ALL new developments with hydrants.

6. Hydrant chains to be removed prior to final completion.

7. Hydrant pads to be poured below the break-away bolts and to be a minimum 4' by 4' pad.

8. Minimum 3 ft clearance required around all hydrants. No item such as plants, trees, rocks, signs, retaining walls, light poles, traffic signal poles, power/telephone poles, electrical service box, phone/cable box, gas service, driveways, etc. shall obstruct or be within 3 feet of a fire hydrant. Open sky shall exist above the hydrant. IFC 507.5.4.

9. Separate permit with the Fire Marshal's office required for any private access gates/barriers. IFC D 103.5, CMC 12.36.

10. Any structures on site may be evaluated for potential fire department training burns. Please contact the Fire Marshal's Office at 360-834-6191 for further information.

11. Any subdivision or new development where residential or commercial fire sprinklers are not installed requires a Separate Permit with the Fire Marshal's office submitted by a WA State Licensed Fire Sprinkler Contractor to establish actual GPM flow for each hydrant, NFPA 291.

Parks Department **Jerry Acheson 834-5307 x4490**

1. The Park, Recreation and Open Space Comprehensive Plan identifies a regional trail leading to a view point in the area. The applicant should clearly demonstrate how this development will complement and continue the natural environment of this trail corridor.
2. The Park, Recreation and Open Space Comprehensive Plan identifies the need for a neighborhood parks in the vicinity of this proposed subdivision. The application should address how this proposal complies with the comprehensive plan.
3. Park and Open Space impact fees may be creditable toward dedication and/or development of these community resources.

Camas Municipal Code (Ord. No. 2694)

18.05.020 Districts designated.

For the purposes of the Code, the city is divided into zoning districts designated as follows:

District	Symbol	Comprehensive Plan Designation
Residential 20,000	R-20	Single-family Low
Residential 15,000	R-15	Single-family Low
Residential 12,000	R-12	Single-family Medium
Residential 10,000	R-10	Single-family Medium
Residential 7,500	R-7.5	Single-family Medium
Residential 6,000	R-6	Single-family High
Residential 5,000	R-5	Single-family High
Multifamily-10	MF-10	Multifamily Low
Multifamily-18	MF-18	Multifamily High
Multifamily-24	MF-24	Multifamily High
Multifamily Cottage	MF-C	Overlay
Neighborhood Commercial	NC	Commercial
Community Commercial	CC	Commercial
Regional Commercial	RC	Commercial
Mixed Use	MX	Commercial
Downtown Commercial	DC	Commercial
Light Industrial	LI	Industrial
Heavy Industrial	HI	Industrial
Business Park	BP	Industrial
Light Industrial/Business Park	LI/BP	Light Industrial/Business Park
Neighborhood Park	NP	Park
Special Use Park	SU	Park
Open space/Green space	OS	Open space / Green space

18.05.040 Residential and multifamily zones

A. R-20 Residential-20,000. This zone is intended to ensure that the rural character of certain portions of the city is maintained. Residential development is expected to consist of large custom single-family dwellings on uniquely configured lots which are designed to be sensitive to topographic and environmental considerations. The average lot size is twenty thousand square feet at densities of one to two dwellings per acre.

B. R-15 Residential-15,000. This zone is intended for single-family dwellings with a minimum density of two to three dwellings per acre. This zone will permit the rural character of a number of existing neighborhoods to be maintained. The average lot size is fifteen thousand square feet.

C. R-12 Residential-12,000. This zone is intended for single-family dwellings with densities of three to four dwelling units per acre. This zone is designated for areas with steep topography for greater flexibility in site layout, and where potential hazards do not exist. The average lot size is twelve thousand square feet.

D. R-10 Residential-10,000. This zone is intended for single-family dwellings with densities of four to five dwellings per acre. This zone is intended to be zoned near low density residential districts, and where potential natural hazards do not exist. The average lot size is ten thousand square feet.

E. R-7.5 Residential-7,500. This zone is intended for single-family dwellings with densities of five to six dwellings per acre. This zone should have less slope than lower density zones, and be adjacent to existing high density residential districts. The average lot size is seven thousand five hundred square feet.

F. R-6 Residential-6,000. This zone is intended for single-family dwellings with densities of six to seven dwellings per acre. The slope of property is less than other lower density residential zones. This zone serves a transition to multifamily or commercial zones. The average lot size is six thousand square feet.

G. R-5 Residential-5,000. This zone is intended for single-family dwellings, either attached or detached, with densities of up to eight and one-half dwellings per acre. The slope of property is less than other medium density residential zones. Like the R-6 district, this zone serves as a transition to multifamily or commercial zones. The average lot size is five thousand square feet.

H. MF-10 Multifamily Residential. This zone provides for a diversity of dwellings such as duplexes, triplexes, fourplexes, rowhouses, and apartment complexes, with a density of up to ten units per acre. It is desirable for this zone to be adjacent to parks and multi-modal transportation systems. This zone can also serve as a transition between commercial and residential zones.

I. MF-18 and MF-24 Multifamily Residential. These zones are intended to provide for dwellings such as rowhouses and apartment complexes. It is desirable for these zones to be adjacent to parks and multi-modal transportation systems. These zones also serve as a transition between commercial and residential zones.

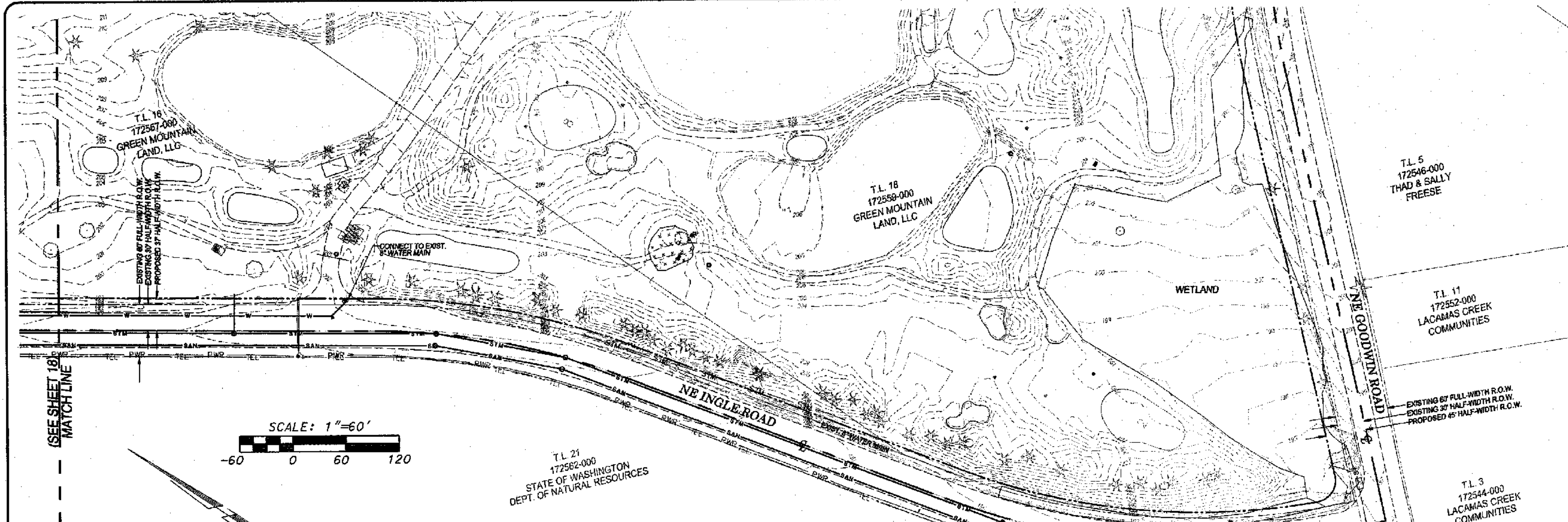
J. MF-C Cottage. This is an overlay zone, which is intended to increase the housing supply and style choices for smaller, single-level dwellings. It is desirable that cottages are designed to include unique architectural elements such as a front porch, steep-pitch gable roof, and a recessed garage; and to accommodate those with mobility impairments. This overlay zone may be utilized within multi-family zones only, and upon approval of a zoning district change.

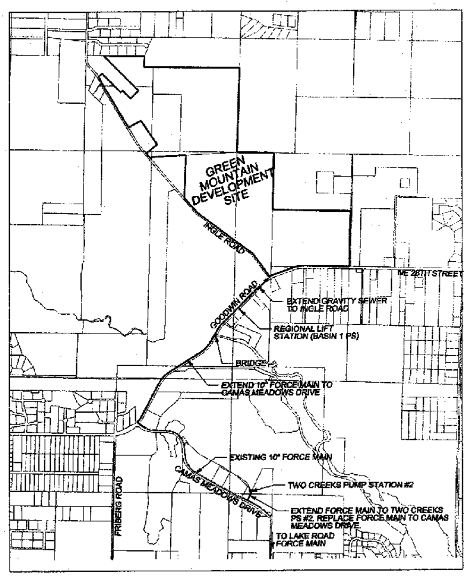
18.09.050 Table 3—Density and dimensions for multifamily residential zones

	MF-10	MF-18	MF-24	MF-C Overlay
Density				
Maximum density (dwelling units per gross acre)	10	18	24	18
Minimum density (dwelling units per gross acre)	6.0	6.0	6.0	6.0
Standard lots				
Minimum lot area (square feet)	3,000	2,100	1,800	None
Minimum lot width (feet)	30	20	20	0
Minimum lot depth (feet)	70	60	60	0
Maximum gross floor area (GFA) per dwelling unit (square feet)	No max	No max	No max	1,000 Note 4
Setbacks				
Minimum front yard/at garage front (feet)	15/18	10/18	10/18	0/18
Minimum side yard (feet)	3 Note 1	3 Note 1	3 Note 1	0
Minimum side yard, flanking a street (feet)	15	15	15	15
Minimum rear yard	10	10	10	0
Lot coverage				
Maximum building lot coverage	55%	65%	75%	Building coverage is limited by a minimum of 200 sq. ft. of useable yard adjacent to each dwelling unit.
Building height				
Maximum building height (feet)	35 Note 2	45 Note 2	45 Note 2	18 Note 3

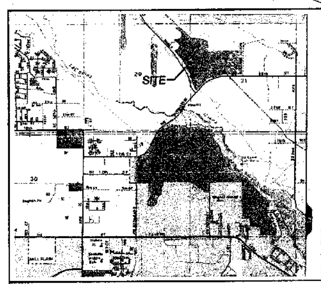
Table 3 Notes:

1. The non-attached side of a dwelling unit shall be three feet, otherwise a zero-lot line is assumed.
2. Maximum building height: three stories and a basement but not to exceed height listed above.
3. Maximum building height: one story and a basement but not to exceed height listed above.
4. GFA in this instance does not include covered porches or assessory structures as defined per CMC18.17.040.





SANITARY FORCE MAIN EXTENSION DETAIL (A/17)
NTS



VICINITY MAP
NTS

LEGEND

- PERIMETER OF SITE
- RIGHT-OF-WAY LINE
- CENTERLINE OF ROAD
- FACE OF CURB
- LOT LINE
- PCD BOUNDARY
- EASEMENT LINE
- STM — STORM SEWER LINE
- STM — EXIST STORM SEWER
- SAN — SANITARY SEWER LINE
- SAN — EXIST SANITARY SEWER
- W — WATER SERVICE LINE
- W — EXIST WATER LINE
- MANHOLE
- CLEAN OUT
- CATCH BASIN
- FIRE HYDRANT ASSEMBLY
- THRUST BLOCK
- WATER SERVICE ASSEMBLY
- BACKFLOW ASSEMBLY
- WATER VALVE AND BOX
- BLOW-OFF ASSEMBLY

PRELIMINARY UTILITY NOTES

STORM SEWER:

1) STORMWATER QUALITY AND QUANTITY CONTROL TO BE ACHIEVED USING WETPONDS WITH DETENTION ABOVE THE WETPOOL. STORMWATER FROM THE DEVELOPMENT TO BE DISCHARGED VIA OUTFALLS TO THE EXISTING WETLANDS/STREAM WEST OF NE INGLE ROAD.
2) WETPONDS HAVE BEEN SIZED TO MEET THE PHOSPHORUS CONTROL REQUIREMENTS FOR THE LACAMAS WATER SHED, AS SPECIFIED BY THE CITY OF CAMAS AND THE WASHINGTON STATE DEPARTMENT OF ECOLOGY.
3) THE PROPOSED STORMWATER FACILITIES WILL BE PRIVATELY OWNED AND MAINTAINED, WITH ACCESS AND INSPECTION EASEMENTS TO BE DEDICATED TO THE CITY OF CAMAS AS REQUIRED.

SANITARY:

1) SANITARY SEWER SERVICE WILL BE PROVIDED BY CITY OF CAMAS.
2) SANITARY SEWER WILL BE A GRAVITY SEWER. NEW SEWER MAIN WILL BE EXTENDED OFFSITE TO NEW PUMP STATION LOCATION ON NE GOODWIN RD.
3) SANITARY SEWER EASEMENTS WILL BE DEDICATED TO CITY OF CAMAS AS REQUIRED.

WATER:

1) WATER SERVICE WILL BE PROVIDED BY CITY OF CAMAS.
2) A NEW 8" DIP WATER MAIN WILL BE LOOPED THROUGH THE SITE TO PROVIDE WATER AND FIRE SERVICE TO THE PROPOSED DEVELOPMENT. CONNECTIONS WILL BE MADE TO THE EXISTING 8" DIP MAINS LOCATED IN NE INGLE RD. AND NE GOODWIN RD.
3) FIRE HYDRANTS WILL BE LOCATED AS SHOWN, OR AS DIRECTED BY THE FIRE MARSHAL.
4) WATER EASEMENTS WILL BE DEDICATED TO CITY OF CAMAS AS REQUIRED.

EROSION CONTROL:

1) EROSION CONTROL BMP'S WILL BE DESIGNED DURING FINAL DESIGN PER THE CITY OF CAMAS DESIGN STANDARDS MANUAL.

CLIENT:
GREEN MOUNTAIN LAND LLC.
17933 NW EVERGREEN PARKWAY
SUITE #300
BEAVERTON, OR 97006
ATTN: JOHN O'NEIL
PH: (503) 597-7100
EMAIL: johno@metlandgroup.com

PRELIMINARY OFFSITE UTILITY PLAN FOR:
GREEN MOUNTAIN MIXED USE PRD
PHASE 1

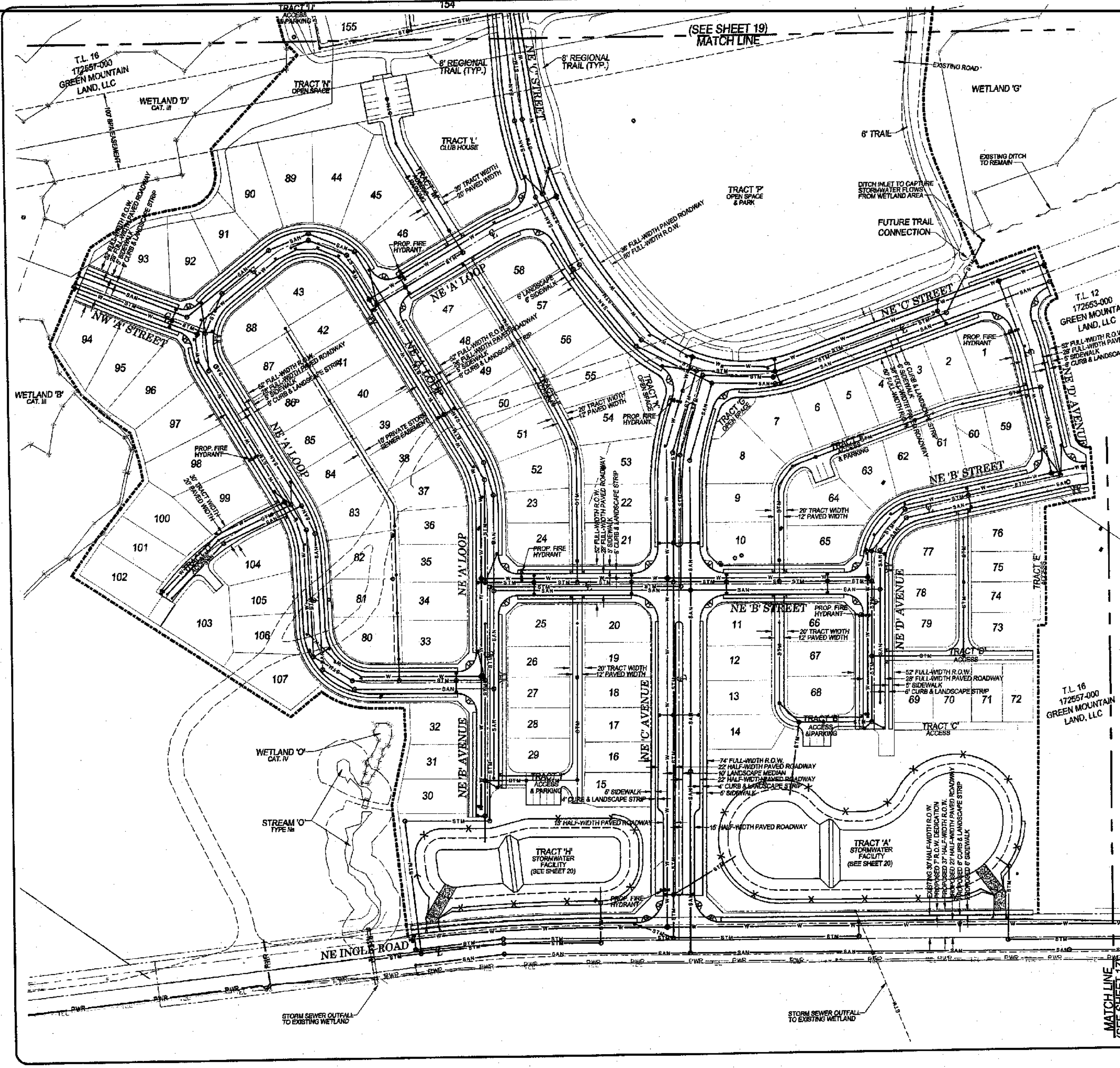
OLSON ENGINEERING INC. LAND SURVEYORS ENGINEERS
222 E. EVERGREEN BLVD., VANCOUVER, WA 98660

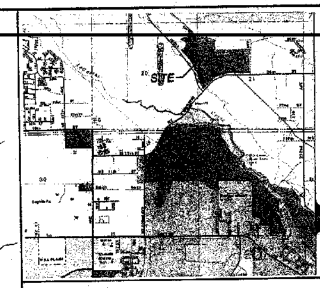
PETER A. TUCK
PROFESSIONAL ENGINEER
12/30/14

CHANGES / REVISIONS	
DESCRIPTION:	DATE:

DESIGNED: RWP
DRAWN: RWP
CHECKED: PAT
DATE: DECEMBER 2014
SCALE: H: 1" = 60' V: N/A

GREEN MOUNTAIN PHASE 1
JOB NO. 8938.01.02





VICINITY MAP
NTS

LEGEND

Symbol	Description
	PERIMETER OF SITE
	RIGHT-OF-WAY LINE
	CENTERLINE OF ROAD
	FACE OF CURB
	LOT LINE
	POD BOUNDARY
	EASEMENT LINE
STM	STORM SEWER LINE
STM	EXIST STORM SEWER
SAN	SANITARY SEWER LINE
SAN	EXIST SANITARY SEWER
W	WATER SERVICE LINE
W	EXIST WATER LINE

MANHOLE
CLEAN OUT
CATCH BASIN
FIRE HYDRANT ASSEMBLY
THRUST BLOCK
WATER SERVICE ASSEMBLY
BACKFLOW ASSEMBLY
WATER VALVE AND BOX
BLOW-OFF ASSEMBLY

PRELIMINARY UTILITY NOTES

STORM SEWER:

1) STORMWATER QUALITY AND QUANTITY CONTROL TO BE ACHIEVED USING WETPONDS WITH DETENTION ABOVE THE WETPOOL. STORMWATER FROM THE DEVELOPMENT TO BE DISCHARGED VIA OUTFALLS TO THE EXISTING WETLANDS/STREAM WEST OF NE INGLE ROAD.
2) WETPONDS HAVE BEEN SIZED TO MEET THE PHOSPHORUS CONTROL REQUIREMENTS FOR THE LACAMAS WATER SHED, AS SPECIFIED BY THE CITY OF CAMAS AND THE WASHINGTON STATE DEPARTMENT OF ECOLOGY.
3) THE PROPOSED STORMWATER FACILITIES WILL BE PRIVATELY OWNED AND MAINTAINED, WITH ACCESS AND INSPECTION EASEMENTS TO BE DEDICATED TO THE CITY OF CAMAS AS REQUIRED.

SANITARY:

1) SANITARY SEWER SERVICE WILL BE PROVIDED BY CITY OF CAMAS.
2) SANITARY SEWER WILL BE A GRAVITY SEWER. NEW SEWER MAIN WILL BE EXTENDED OFFSITE TO NEW PUMP STATION LOCATION ON NE GOODWIN RD. (REFER TO SHEET 17)
3) SANITARY SEWER EASEMENTS WILL BE DEDICATED TO CITY OF CAMAS AS REQUIRED.

WATER:

1) WATER SERVICE WILL BE PROVIDED BY CITY OF CAMAS.
2) A NEW 8" DIP WATER MAIN WILL BE LOOPED THROUGH THE SITE TO PROVIDE WATER AND FIRE SERVICE TO THE PROPOSED DEVELOPMENT. CONNECTIONS WILL BE MADE TO THE EXISTING 8" DIP MAINS LOCATED IN NE INGLE RD. AND NE GOODWIN RD.
3) FIRE HYDRANTS WILL BE LOCATED AS SHOWN, OR AS DIRECTED BY THE FIRE MARSHAL.
4) WATER EASEMENTS WILL BE DEDICATED TO CITY OF CAMAS AS REQUIRED.

EROSION CONTROL:

1) EROSION CONTROL BMP'S WILL BE DESIGNED DURING FINAL DESIGN PER THE CITY OF CAMAS DESIGN STANDARDS MANUAL.

SCALE: 1"=60'
-60 0 60 120

CLIENT:
GREEN MOUNTAIN LAND LLC
17933 NW EVERGREEN PARKWAY
SUITE #300
BEAVERTON, OR 97006
ATTN: JOHN O'NEIL
PH: (503) 597-7100
EMAIL: johno@metlandgroup.com

PRELIMINARY UTILITY PLAN (SOUTH) FOR:
GREEN MOUNTAIN MIXED USE PRD PHASE 1

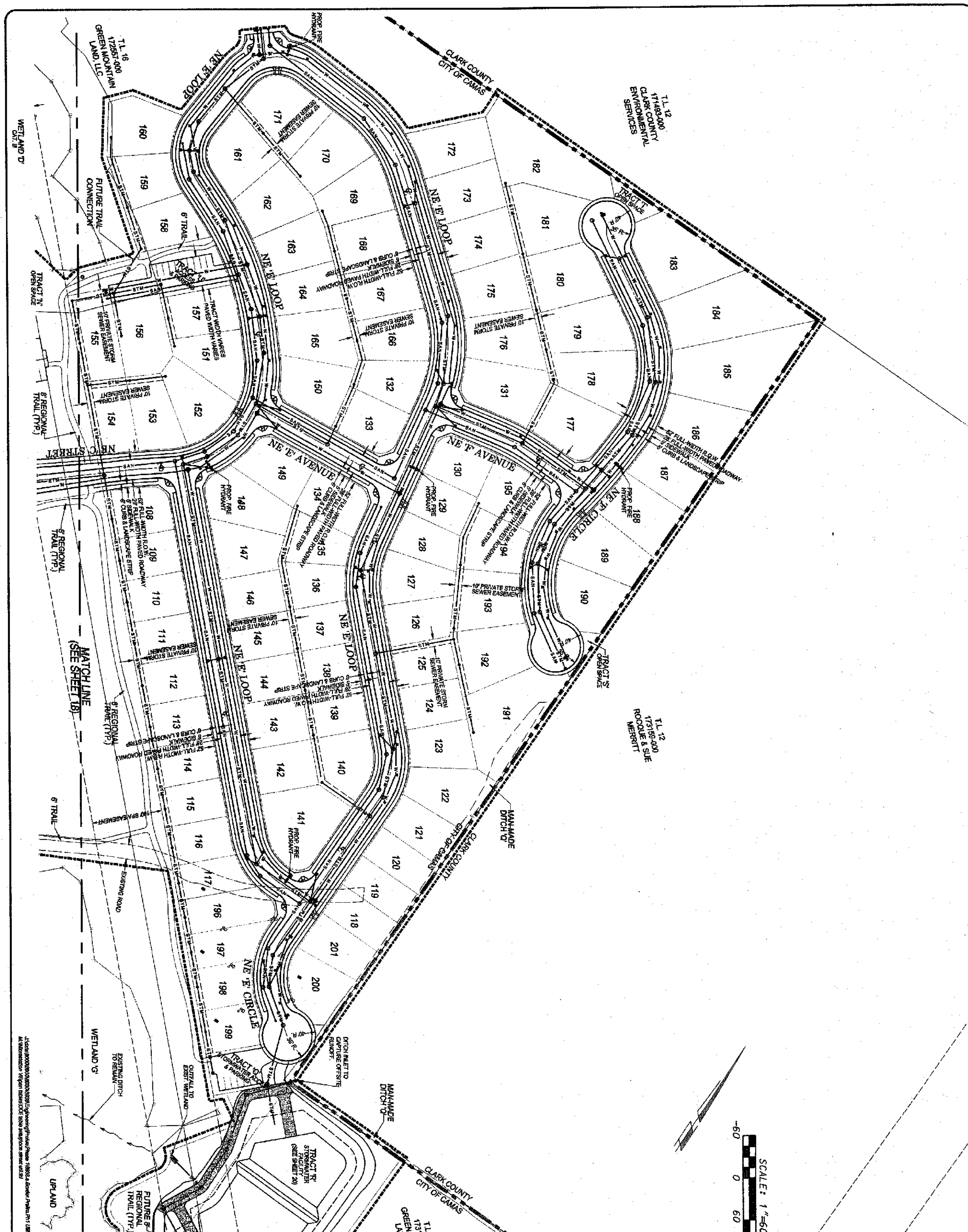
OLSON ENGINEERING INC. LAND SURVEYORS ENGINEERS
222 E. EVERGREEN BLVD., VANCOUVER, WA 98660

PETER A. TUCK STATE OF WASHINGTON PROFESSIONAL ENGINEER
12/30/14

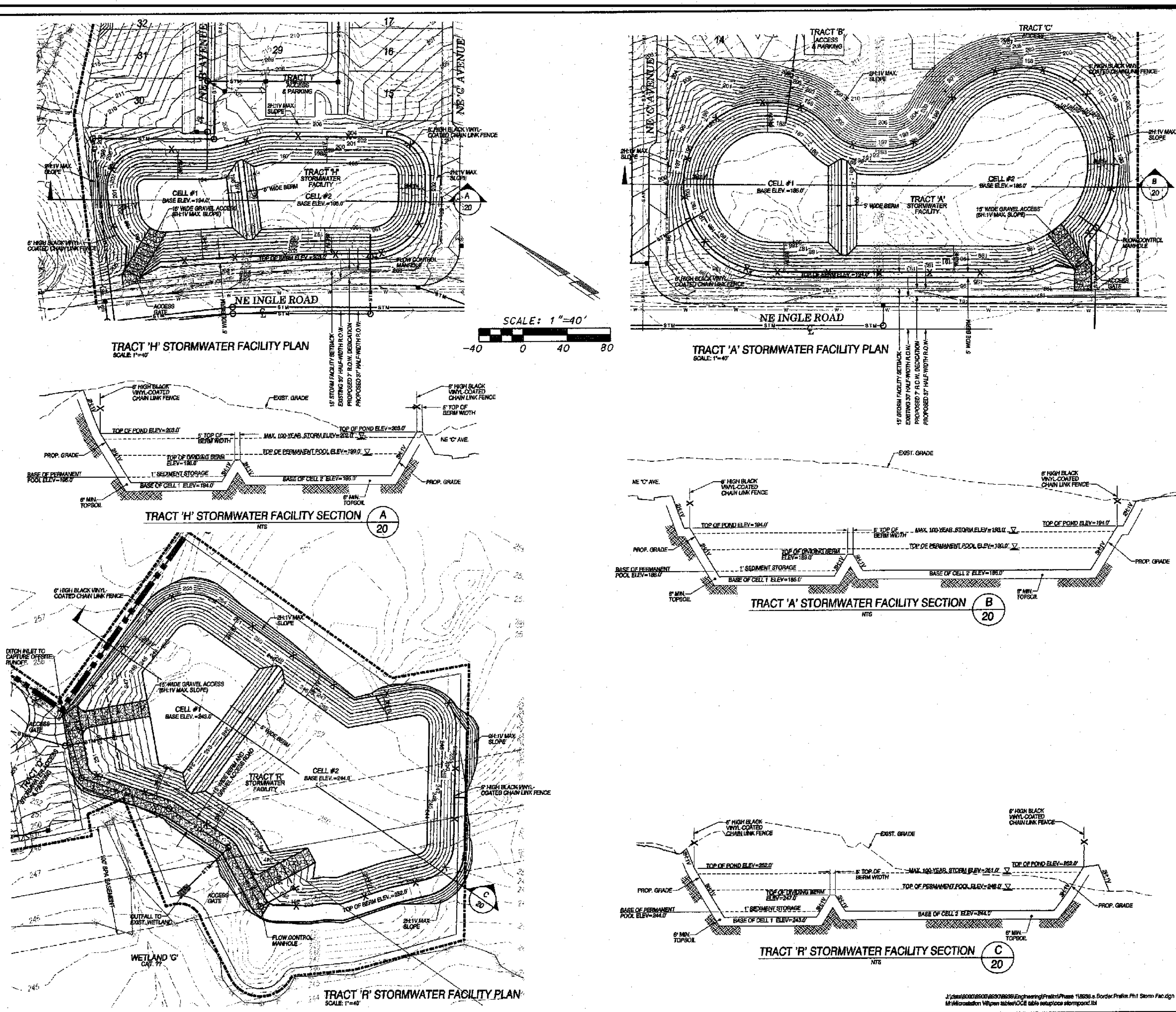
CHANGES / REVISIONS
DESCRIPTION: DATE:

DESIGNED: RWP
DRAWN: RWP
CHECKED: PAT
DATE: DECEMBER 2014
SCALE: H: 1" = 60' V: N/A
COPYRIGHT 2014, OLSON ENGINEERING, INC
GREEN MOUNTAIN PHASE 1
JOB NO. 6938.01.02

SHEET
18 of 25



PRELIMINARY UTILITY PLAN (NORTH) FOR:
GREEN MOUNTAIN MIXED USE PRD
PHASE 1
OLSON
LAND SURVEYORS
ENGINEERS
ENGINEERING INC. 222 E. EVERGREEN BLVD., VANCOUVER, WA 98660
SCALE: 1"=60'
-60 0 60 120
NE 'E' LOOP
NE 'E' AVENUE
NE 'F' AVENUE
NE 'F' CIRCLE
NE 'E' CIRCLE
NE 'C' STREET
MATCH LINE (SEE SHEET 18)
CLARK COUNTY
CITY OF CAMAS
SHEET
19 of 25



CLIENT:
GREEN MOUNTAIN LAND LLC
17933 NW EVERGREEN PARKWAY
SUITE #300
BEAVERTON, OR 97006
ATTN: JOHN O'NEIL

PRELIMINARY STORM FACILITY PLAN AND SECTIONS FOR:

GREEN MOUNTAIN MIXED USE PRD PHASE 1

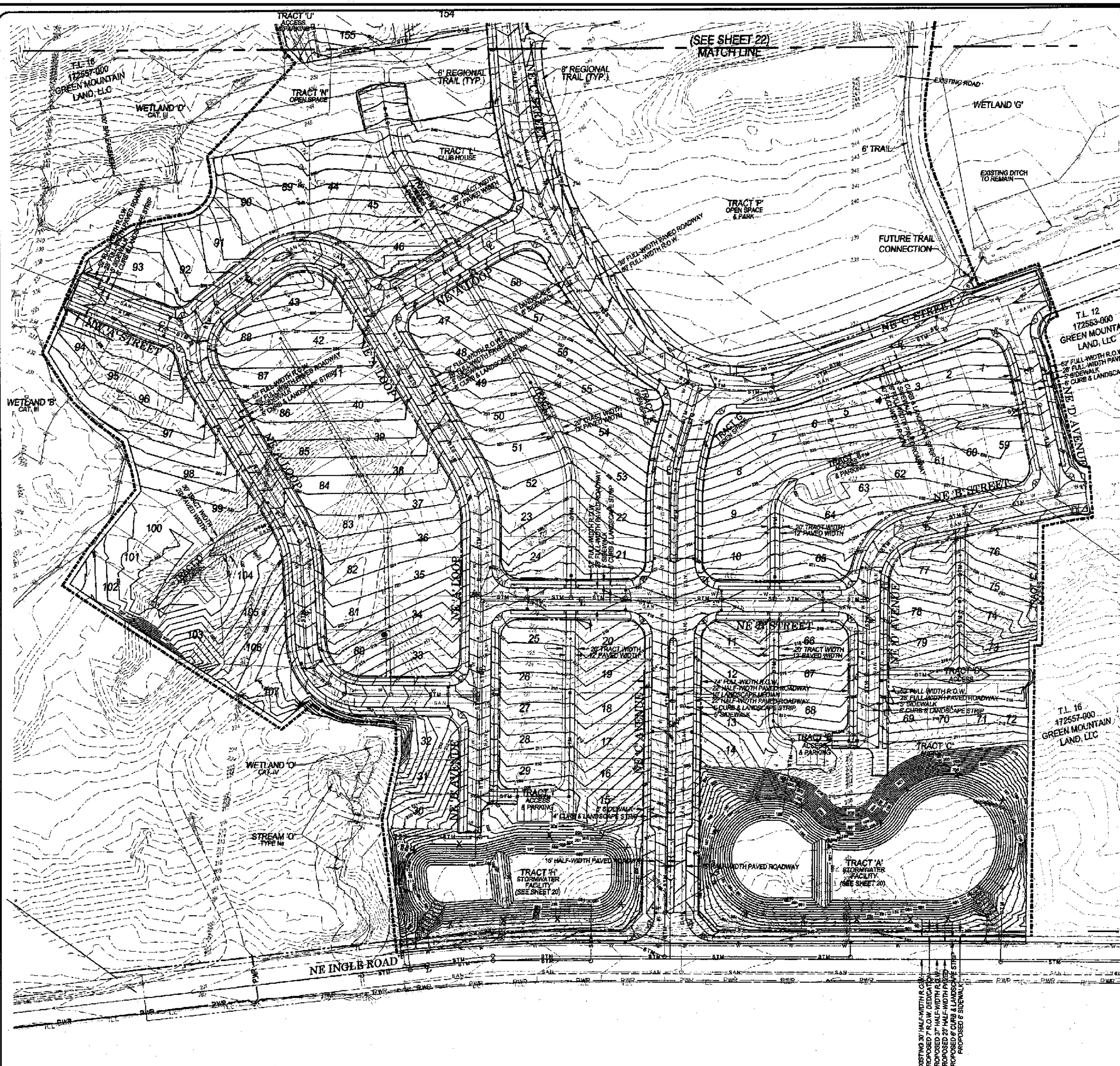
OLSON ENGINEERING INC. LAND SURVEYORS ENGINEERS
222 E. EVERGREEN BLVD., VANCOUVER, WA 98660

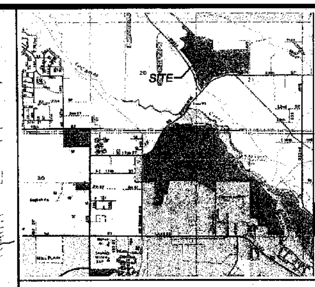
12/30/14

CHANGES / REVISIONS	
DESCRIPTION:	DATE:

DESIGNED: RWP
DRAWN: RWP
CHECKED: PAT
DATE: DECEMBER 2014
SCALE: H: 1" = 40' V: N/A
COPYRIGHT 2014, OLSON ENGINEERING, INC.
GREEN MOUNTAIN PHASE 1
JOB NO. 8935.01.02

SHEET
20 of 25





VICINITY MAP
NTS

LEGEND

	PERIMETER OF SITE
	RIGHT-OF-WAY LINE
	CENTERLINE OF ROAD
	FACE OF CURB
	LOT LINE
	FCD BOUNDARY
	EASEMENT LINE
STM	STORM SEWER LINE
STM	EXIST STORM SEWER
SAN	SANITARY SEWER LINE
SAN	EXIST SANITARY SEWER
W	WATER SERVICE LINE
W	EXIST WATER LINE

MANHOLE	THRUST BLOCK
CLEAN OUT	WATER SERVICE ASSEMBLY
CATCH BASIN	BACKFLOW ASSEMBLY
FIRE HYDRANT ASSEMBLY	WATER VALVE AND BOX
	BLOW-OFF ASSEMBLY

PRELIMINARY GRADING NOTE

1) EROSION CONTROL TO BE DESIGNED AT TIME OF FINAL DESIGN PER CITY OF CAMAS REQUIREMENTS.

SCALE: 1"=60'
-60 0 60 120

J:\data\8000\8900\8930\8938\Engineering\Prelim\Phase 1\8938.e.Border.Prelim.Ph1 Grading S.dgn
N:\Microstation V8\pen tables\DOE table setup\pce gradecos.tbl

CLIENT:
GREEN MOUNTAIN LAND LLC.
17933 NW EVERGREEN PARKWAY
SUITE #300
BEAVERTON, OR 97006

ATTN: JOHN O'NEIL
PH: (503) 597-7100
EMAIL: johno@nellandgroup.com

PRELIMINARY GRADING PLAN (SOUTH) FOR:
GREEN MOUNTAIN MIXED USE PRD PHASE 1

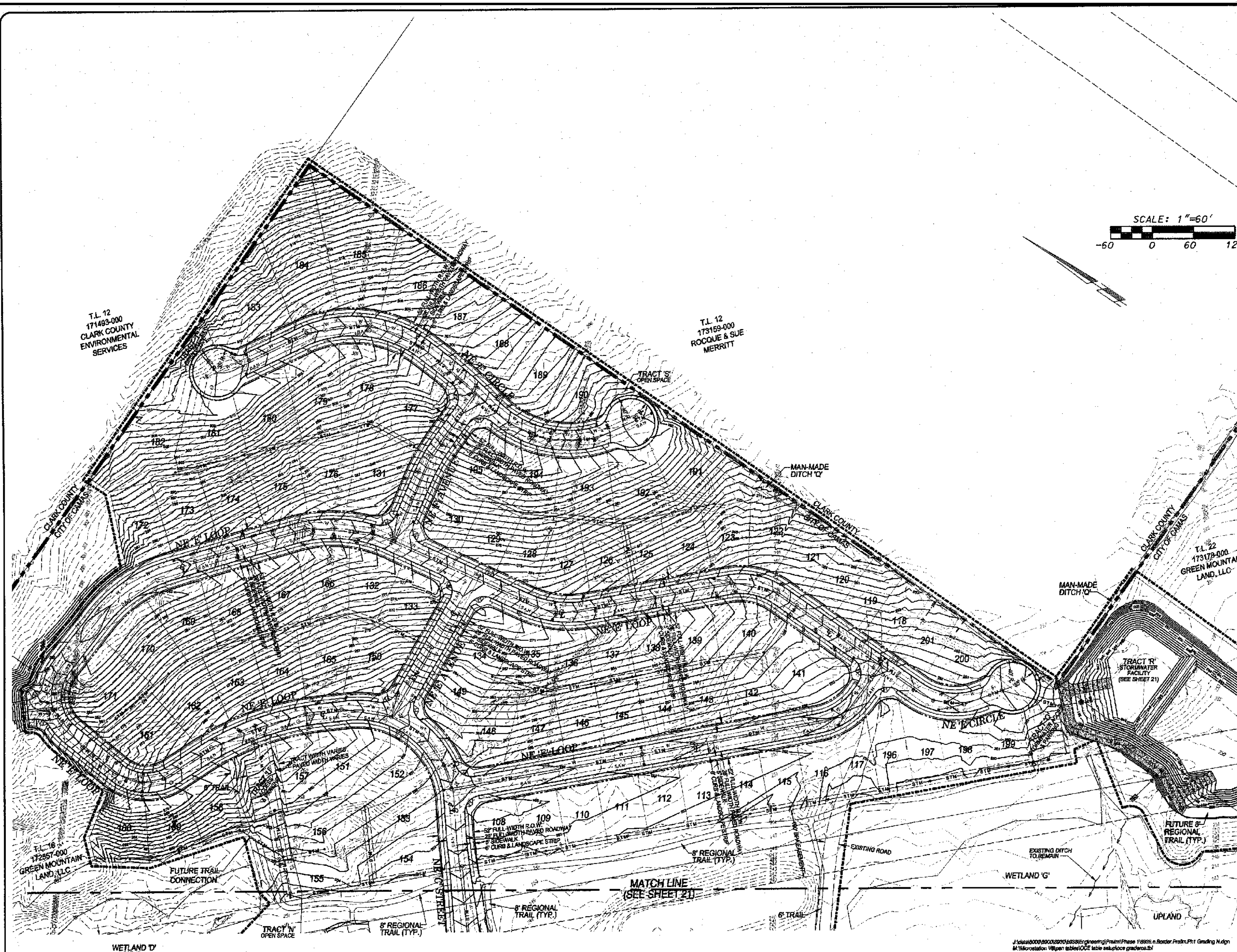
OLSON ENGINEERING INC. LAND SURVEYORS ENGINEERS
222 E. EVERGREEN BLVD., VANCOUVER, WA 98660

PETER A. TUCK STATE OF WASHINGTON 31817 REGISTERED PROFESSIONAL ENGINEER
12/30/14

CHANGES / REVISIONS	
DESCRIPTION:	DATE:

DESIGNED: RWP
DRAWN: RWP
CHECKED: PAT
DATE: DECEMBER 2014
SCALE: H: 1" = 60' V: N/A
COPYRIGHT 2014, OLSON ENGINEERING, INC.
GREEN MOUNTAIN PHASE 1
JOB NO. 8938.01.02

SHEET
21 of 25



CLIENT:

GREEN MOUNTAIN LAND LLC.
17933 NW EVERGREEN PARKWAY
SUITE #300
BEAVERTON, OR 97006

ATTN: JOHN O'NEIL
PH: (503) 597-7100
EMAIL: johno@neillandgroup.com

PRELIMINARY GRADING PLAN (NORTH) FOR:

GREEN MOUNTAIN MIXED USE PRD
PHASE 1

OLSON ENGINEERING INC. — LAND SURVEYORS, ENGINEERS
222 E. EVERGREEN BLVD., VANCOUVER, WA 98660

12/30/14

CHANGES / REVISIONS	
DESCRIPTION:	DATE:

DESIGNED: RWP
DRAWN: RWP
CHECKED: PAT
DATE: DECEMBER 2014
SCALE: H: 1" = 60' V: N/A
COPYRIGHT 2014, OLSON ENGINEERING, INC.
GREEN MOUNTAIN PHASE 1
JOB NO. 8938.01.02

SHEET
22 of 25

Real-World Geotechnical Solutions
Investigation • Design • Construction Support

Revised December 3, 2014
Project No. 13-3186

John O'Neil
Metropolitan Land Group, LLC
17933 NW Evergreen Parkway, Suite 300
Beaverton, Oregon 97006

SUBJECT: PRELIMINARY GEOTECHNICAL ENGINEERING REPORT
GREEN MOUNTAIN - PHASE 1
NE INGLE ROAD & NE 28TH STREET
CAMAS, WASHINGTON

This report presents the results of a geotechnical engineering study conducted by GeoPacific Engineering, Inc. (GeoPacific) for the above-referenced project. The purpose of our investigation was to evaluate subsurface conditions at the site and to provide geotechnical recommendations for site development. This geotechnical study was performed in accordance with GeoPacific Proposal No. P-4836, dated April 30, 2014, and your subsequent authorization of our proposal and *General Conditions for Geotechnical Services*. This report is considered Preliminary because a final grading plan has not been developed.

SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The Green Mountain site is located on the north side of NE Goodwin Road and east of NE Ingle Road in the City of Camas, Clark County, Washington. The property includes several tax lots that total approximately 281.6 acres. Topography on the southern portion of the site is flat to gently sloping with grades of about 5 to 10 percent. Steeper slopes (up to 35 percent grade) are present on Green Mountain, which is a basalt cinder cone, located in the northern portion of the site. Near vertical slopes are present at the base of Green Mountain where basalt bedrock is exposed.

Phase 1 is approximately 51 acres and located in the southern portion of the site, which is part of the Green Mountain Golf Course. Topography is flat to gently sloping with grades generally about 5 to 20 percent. Improvements include several structures, parking areas and driveways, cart tracks, manmade ponds, and fairways. Vegetation consists of short grasses and sparse trees.

It is our understanding that the proposed development will consist of a subdivision for single family homes, new streets, and associated underground utilities. A grading plan has not been provided for our review; however, we anticipate maximum cuts and fills will be on the order of about 12 feet due to the sloping topography and filling of existing ponds.

14835 SW 72nd Avenue
Portland, Oregon 97224
Tel (503) 598-8445
Fax (503) 941-9281

REGIONAL AND LOCAL GEOLOGIC SETTING

Regionally, the subject site lies within the Willamette Valley/Puget Sound lowland, a broad structural depression situated between the Coast Range on the west and the Cascade Range on the east. A series of discontinuous faults subdivide the Willamette Valley into a mosaic of fault-bounded, structural blocks (Yeats et al., 1996). Uplifted structural blocks form bedrock highlands, while down-warped structural blocks form sedimentary basins.

The low-lying portion of the site is underlain by the Quaternary aged (last 1.6 million years) Willamette Formation, a catastrophic flood deposits associated with repeated glacial outburst flooding of the Willamette Valley (Trimble, 1963; Yeats et al., 1996; Phillips, 1987). The last of these outburst floods occurred about 10,000 years ago. These deposits typically consist of horizontally layered, micaceous, silty sand with gravel that is underlain by medium dense to dense gravel.

The Willamette Formation is underlain by a gravel conglomerate interbedded with siltstone and sandstone. Evarts (2006) indicates the age of the conglomerate is poorly constrained but is likely Pliocene to Pleistocene in age (10,000 to 5.3 million years ago). The conglomerate is partially cemented with the upper portion moderately weathered.

The northern portion of the Green Mountain site is underlain by Basaltic Andesite of Green Mountain (Evarts, 2006). The gray basaltic andesite lava flows erupted from a cinder cone on Green Mountain during the Pleistocene (2.6 to 5.3 million years ago). The basalt contains weathered ash, trace quartzite pebbles, and fine grained xenoliths (Evarts, 2006).

A portion of the site is underlain by Miocene to Pleistocene age (16 to 0.5 million years ago) terrigenous sedimentary rocks belonging to the Troutdale Formation (Evarts, 2006). The Troutdale Formation is informally divided into an upper and lower member. Lithologies in the upper member include lenticular layers of volcaniclastic (vitric) sand, quartzite-bearing gravel, fine-grained sand, silt and clay, micaceous quartz-rich sand, and conglomerate with a cumulative average thickness of 100 to 150 feet. The lower member consists primarily of laminated silty clay and sand with reported thicknesses in water well logs of up to 800 feet. These sediments vary from weakly-consolidated to well-indurated.

REGIONAL SEISMIC SETTING

At least four potential source zones capable of generating damaging earthquakes are thought to exist in the region. These include the Lacamas Creek-Sandy River Fault, Portland Hills Fault Zone, Gales Creek-Newberg-Mt. Angel Structural Zone, and the Cascadia Subduction Zone, as discussed below.

Lacamas Creek-Sandy River Fault

The Lacamas Creek Fault is recognized based on a fault shear contact between Oligocene (30 million years old) volcanic rocks and the Troutdale Formation, and a series of prominent geomorphic lineaments with a cumulative length of 24 miles (Mundorff, 1964; Beeson et al., 1989). The Sandy River Fault, interpreted from gravity and borehole data, forms a possible right stepping, 7-mile-long extension of the Lacamas Creek Fault that vertically displaces the Columbia River Basalt by 1,300 feet (Beeson et al., 1989; Geomatrix Consultants, 1995). A 1989, M3.9 earthquake in the vicinity may have occurred on the Lacamas Creek Fault. A comprehensive seismic hazard study commissioned by the Oregon Department of Transportation concluded that the Lacamas Creek-Sandy River Fault Zone is potentially active with a possible rupture length of greater than 25 miles. The Lacamas Creek Fault is mapped as being ½ mile southwest of the subject site (Figure 1).

Portland Hills Fault Zone

The Portland Hills Fault Zone is a series of NW-trending faults that include the central Portland Hills Fault, the western Oatfield Fault, and the eastern East Bank Fault. These faults occur in a northwest-trending zone that varies in width between 3.5 and 5.0 miles. The combined three faults vertically displace the Columbia River Basalt by 1,130 feet and appear to control thickness changes in late Pleistocene (approx. 780,000 years) sediment (Madin, 1990). The Portland Hills Fault occurs along the Willamette River at the base of the Portland Hills, and is about 13 miles southwest of the site. The Oatfield Fault occurs along the western side of the Portland Hills, and is about 16 miles southwest of the site. The accuracy of the fault mapping is stated to be within 500 meters (Wong, et al., 2000). No historical seismicity is correlated with the mapped portion of the Portland Hills Fault Zone, but in 1991 a M3.5 earthquake occurred on a NW-trending shear plane located 1.3 miles east of the fault (Yelin, 1992). Although there is no definitive evidence of recent activity, the Portland Hills Fault Zone is assumed to be potentially active (Geomatrix Consultants, 1995).

Gales Creek-Newberg-Mt. Angel Structural Zone

The Gales Creek-Newberg-Mt. Angel Structural Zone is a 50-mile-long zone of discontinuous, NW-trending faults that lies about 36 miles southwest of the subject site. These faults are recognized in the subsurface by vertical separation of the Columbia River Basalt and offset seismic reflectors in the overlying basin sediment (Yeats et al., 1996; Werner et al., 1992). A geologic reconnaissance and photogeologic analysis study conducted for the Scoggins Dam site in the Tualatin Basin revealed no evidence of deformed geomorphic surfaces along the structural zone (Unruh et al., 1994). No seismicity has been recorded on the Gales Creek Fault or Newberg Fault; however, these faults are considered to be potentially active because they may connect with the seismically active Mount Angel Fault and the rupture plane of the 1993 M5.6 Scotts Mills earthquake (Werner et al. 1992; Geomatrix Consultants, 1995).

Cascadia Subduction Zone

The Cascadia Subduction Zone is a 680-mile-long zone of active tectonic convergence where oceanic crust of the Juan de Fuca Plate is subducting beneath the North American continent at a rate of 4 cm per year (Goldfinger et al., 1996). A growing body of geologic evidence suggests that prehistoric subduction zone earthquakes have occurred (Atwater, 1992; Carver, 1992; Peterson et al., 1993; Geomatrix Consultants, 1995). This evidence includes: (1) buried tidal marshes recording episodic, sudden subsidence along the coast of northern California, Oregon, and Washington, (2) burial of subsided tidal marshes by tsunami wave deposits, (3) paleoliquefaction features, and (4) geodetic uplift patterns on the Oregon coast. Radiocarbon dates on buried tidal marshes indicate a recurrence interval for major subduction zone earthquakes of 250 to 650 years with the last event occurring 300 years ago (Atwater, 1992; Carver, 1992; Peterson et al., 1993; Geomatrix Consultants, 1995). The inferred seismogenic portion of the plate interface lies approximately 50 miles west of the Portland Basin at depths of between 20 and 40 kilometers below the surface.

FIELD EXPLORATION

Our site-specific exploration for Phase 1 was conducted on May 23rd, 2014. A total of 13 exploratory test pits were excavated with a medium sized trackhoe to depths ranging between 5 and 9 feet at the approximate locations shown on Figure 2. Test pits TP-1 and TP-12 are outside of the Phase 1 boundary due to a reconfiguration of the layout and are not presented. The previous investigation for the entire Green Mountain site consisted of 25 exploratory test pits excavated November 5th through 7th, 2013. Five test pits from the previous investigation are located within Phase 1 – test pits TP-1, TP-10, TP-13, TP-15, and TP-16. Test pits from the 2013 investigation for the entire Green Mountain site will be referred to as TP-1 (2013), TP-10 (2013), TP-13 (2013), TP-15 (2013), and TP-16 (2013). It should be noted that exploration locations were located in the field by pacing or taping distances from apparent property corners and other site features shown on the plans provided. As such, the locations of the explorations should be considered approximate.

A GeoPacific geologist continuously monitored the field exploration program and logged the borings. Soils observed in the explorations were classified in general accordance with the Unified Soil Classification System. During exploration, our geologist also noted geotechnical conditions such as soil consistency, moisture and groundwater conditions. Logs of test pits are attached to this report. The following report sections are based on the exploration program and summarize subsurface conditions encountered at the site.

Undocumented Fill – Undocumented fill was encountered directly at the ground surface in test pits TP-2, TP-3, TP-4, TP-7, TP-8, TP-10, TP-11, and TP-13. The fill generally consisted of brown, medium stiff to stiff, silt (ML) with gravel, clay, and sand and medium dense, silty sand (SM). The fill extended to a depth of 1.5 to 3.5 feet. It is likely that other areas of undocumented fill exist in the vicinity of the existing structures, driveways, and the throughout the golf course.

Topsoil Horizon – The ground surface in test pits TP-5, TP-6, TP-9, TP-1 (2013), TP-10 (2013), TP-13 (2013), TP-15 (2013), and TP-16 (2013) was directly underlain by a low to highly organic topsoil horizon. The dark brown silt (OL-ML) contained trace amounts of sand and contained fine roots throughout. The topsoil horizon was loose and extended to a depth of 6 to 18 inches.

Colluvial Soil – Colluvial soil, formed by downward migration of material under gravitational forces, was encountered beneath the topsoil horizon in test pit TP-15. These soils generally consisted of stiff to very stiff, silty clay (CL) to clayey silt (ML) with weathered basalt that displayed strong orange and gray mottling. In explorations, the colluvial soil extended to a depth of 3 feet in test pit TP-15.

Buried Topsoil Horizon – A low organic, buried topsoil horizon was encountered beneath the fill in test pit TP-8. The buried topsoil horizon was on the order of 6 inches in thickness - extending to a depth of 3 feet.

Fine Grained Catastrophic Flood Deposits (Willamette Formation) – Underlying the topsoil horizon in test pits TP-5, TP-6, TP-9, TP-1 (2013), TP-10 (2013), and TP-13 (2013); the buried topsoil horizon in test pit TP-8; and the fill in test pits TP-2, TP-4, TP-7, TP-10, and TP-13 was fine grained catastrophic flood deposits. These soils generally consisted of stiff to very stiff, light brown, clayey silt (ML) with trace sand that displayed subtle to strong orange and gray mottling. Where encountered, the flood deposits generally extended to a depth of 3 to 7 feet and beyond the maximum depth of exploration in test pits TP-4, TP-7, TP-8, and TP-1 (2013) excavated to a maximum depth of 8.5 feet.

Conglomerate – Underlying the topsoil horizon in test pits TP-15 (2013) and TP-16 (2013); the fill in test pit TP-3, and the fine grained catastrophic flood deposits in test pits TP-2, TP-5, TP-6, TP-9, TP-10, TP-13, TP-10 (2013), and TP-13 (2013) was dense to very dense subrounded gravel (GM) with sandy, clayey silt matrix; dense, silty sand (SM); and stiff silt (ML) with subrounded gravel. The conglomerate was partially cemented and extended beyond the maximum depth of exploration (6 to 10.5 feet).

Soil Moisture and Groundwater

On May 23, 2014 and November 5 through 7, 2013, soils encountered in test pits were moist to wet. Groundwater seepage was encountered in test pits TP-2, TP-5 through TP-9, TP-13, TP-1 (2013), TP-13 (2013), TP-15 (2013) and TP-16 (2013) at depths of 2 to 8.5 feet. Discharge was visually estimated at ¼ to 2 gallons per minute. In test pit TP-1 (2013), the static groundwater level rose to a depth of 2 feet after the test pit had been left open for a time period of several hours. Experience has shown that temporary perched storm-related groundwater conditions often occur within the surface soils over fine-grained native deposits such as those beneath the site, particularly during the wet season. It is anticipated that groundwater conditions will vary depending on the season, local subsurface conditions, changes in site utilization, and other factors.

SLOPE STABILITY

For the purpose of evaluating slope stability, we: (1) reviewed regional 1:24,000 scale topography by the U.S. Geological Survey and published geologic mapping, (2) reviewed 1:150 scale topographic survey mapping of the site by Olson Engineering, Inc., (3) performed a geological reconnaissance of the site, and (4) evaluated subsurface soil conditions in exploratory test pits. Regional slope stability mapping of Clark County, Washington published by the Washington Department of Natural Resources Division of Geology identifies an area of potential instability on the southwest side of Green Mountain (Fiksdal, 1975). This area roughly correlates with the near vertical rock exposures at the base of Green Mountain that is north of the Phase 1 area. No mapped landslides are indicated in the Phase 1 study area on more recent geologic mapping conducted by Evarts (2006).

Based on the data review, field reconnaissance and site exploration, the slope instability hazard for the Phase 1 portion of the Green Mountain property is considered to be low. Slopes in the Phase 1 area are on the order of 5 to 20 percent. Slope geomorphology at the site is generally smooth and uniform - consistent with relative stability. Subsurface explorations indicate the site is generally underlain by stiff to very-stiff, clayey silt (ML) loess underlain by dense to very dense, silty gravel (GM). These materials are generally characterized by moderate to high shear strength and a relatively high resistance to slope instability on gentle slopes. The Phase 1 area is considered generally suitable for development.

PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

Our investigation indicates that the proposed development is geotechnically feasible, provided that the recommendations of this report are incorporated into the design and construction phases of the project. The primary geotechnical constraint to development is the presence of fill throughout the site. Up to 5 feet of fill was encountered in the exploratory test pits. It is anticipated that fill is prevalent throughout the fairway areas of the golf course where sand traps, ponds, and sculpted topography have been created.

Stormwater Disposal

Soil conditions at the site generally consist of fine grained flood deposits (consisting of clayey silt with sand) underlain by coarse grained, partially cemented conglomerate consisting of subrounded gravel with a clayey silt matrix and trace sand. Orange and gray mottling was observed in near surface soils in all explorations. Soil moisture conditions were moist to wet and perched groundwater seepage was encountered in test pits TP-2, TP-5 through TP-9, TP-13, TP-1 (2013), TP-13 (2013), TP-15 (2013) and TP-16 (2013) at depths of 2 to 8.5 feet. Static groundwater was measured at a depth of 2 feet below the ground surface in test pit TP-1 (2013). Soil mottling, the presence of clay soils, and the prevalent groundwater seepage indicates the soils will likely accept little runoff – if any. Soils with moderate permeability are already saturated with perched groundwater. We would expect soil conditions to behave more as Soil Group 4 soils than Soil Group 3 soils outlined in the Western Washington Continuous Simulation Hydrology Model.

Site Preparation

Due to the presence of fill through the site, areas of proposed construction and areas to receive fill should be cleared of vegetation and existing fill soils should then be removed to stiff or dense native soils. Organic soils are likely present at the bottom of the ponds and should be removed to stiff, native soils. Inorganic debris and organic materials from clearing should be removed from the site. It is likely that the existing fill may be reused as engineered fill provided that they are properly moisture conditioned and free of organic or inorganic debris. Organic-rich root zones should then be stripped from construction areas of the site or where engineered fill is to be placed. Depth of stripping is estimated to average 8+ inches. The final depth of soil removal will be determined on the basis of a site inspection after the stripping/ excavation has been performed. Stripped topsoil should preferably be removed from the site. Any remaining topsoil should be stockpiled only in designated areas and stripping operations should be observed and documented by the geotechnical engineer or his representative.

Remaining undocumented fills and any subsurface structures (dry wells, basements, driveway and landscaping fill, old utility lines, septic leach fields, etc.) should be removed and the excavations backfilled with engineered fill. Fill in excess of 5 feet was encountered directly at the ground surface in test pits for this investigation. Sculpted topography in the vicinity of the fairways indicates the presence of fill. We anticipate that other areas of fill may exist in the vicinity of the existing structures, parking lots, and driveways.

Engineered Fill

All grading for the proposed construction should be performed as engineered grading in accordance with the applicable building code at time of construction with the exceptions and additions noted herein. Proper test frequency and earthwork documentation usually requires daily observation and testing during stripping, rough grading, and placement of engineered fill. Imported fill material must be approved by the geotechnical engineer prior to being imported to the site. Oversize material greater than 6 inches in size should not be used within 3 feet of foundation footings, and material greater than 12 inches in diameter should not be used in engineered fill.

Engineered fill should be compacted in horizontal lifts not exceeding 8 inches using standard compaction equipment. We recommend that engineered fill be compacted to at least 90% of the maximum dry density determined by ASTM D1557 (Modified Proctor) or equivalent. Field density testing should conform to ASTM D2922 and D3017, or D1556. All engineered fill should be observed and tested by the project geotechnical engineer or his representative. Typically, one density test is performed for at least every 2 vertical feet of fill placed or every 500 yd^3, whichever requires more testing. Because testing is performed on an on-call basis, we recommend that the earthwork contractor be held contractually responsible for test scheduling and frequency.

Site earthwork will be impacted by soil moisture and shallow groundwater conditions. Earthwork in wet weather would likely require extensive use of cement or lime treatment, or other special measures, at considerable additional cost compared to earthwork performed under dry-weather conditions.

Excavating Conditions and Utility Trenches

We anticipate that on-site soils can be excavated using conventional heavy equipment such as trackhoes to a depth of 9 feet. All temporary cuts in excess of 4 feet in height should be sloped in accordance with U.S. Occupational Safety and Health Administration (OSHA) regulations (29 CFR Part 1926), or be shored. The existing native soil is classified as Type B Soil and temporary excavation side slope inclinations as steep as 1H:1V may be assumed for planning purposes. This cut slope inclination is applicable to excavations above the water table only. Maintenance of safe working conditions, including temporary excavation stability, is the responsibility of the contractor. Actual slope inclinations at the time of construction should be determined based on safety requirements and actual soil and groundwater conditions.

Soft, saturated soils and groundwater may be encountered in utility trenches, particularly during the wet season. We anticipate that dewatering systems consisting of ditches, sumps and pumps would be adequate for control of perched groundwater. Regardless of the dewatering system used, it should be installed and operated such that in-place soils are prevented from being removed along with the groundwater. Trench bottom stabilization, such as one to two feet of compacted crushed aggregate base, may be necessary in deeper trenches.

Vibrations created by traffic and construction equipment may cause some caving and raveling of excavation walls. In such an event, lateral support for the excavation walls should be provided by the contractor to prevent loss of ground support and possible distress to existing or previously constructed structural improvements.

PVC pipe should be installed in accordance with the procedures specified in ASTM D2321. We recommend that trench backfill be compacted to at least 95% of the maximum dry density obtained by Modified Proctor ASTM D1557 or equivalent. Initial backfill lift thickness for a ¾"-0 crushed aggregate base may need to be as great as 4 feet to reduce the risk of flattening underlying flexible pipe. Subsequent lift thickness should not exceed 1 foot. If imported granular fill material is used, then the lifts for large vibrating plate-compaction equipment (e.g. hoe compactor attachments) may be up to 2 feet, provided that proper compaction is being achieved and each lift is tested. Use of large vibrating compaction equipment should be carefully monitored near existing structures and improvements due to the potential for vibration-induced damage.

Adequate density testing should be performed during construction to verify that the recommended relative compaction is achieved. Typically, one density test is taken for every 4 vertical feet of backfill on each 200-lineal-foot section of trench.

Erosion Control Considerations

During our field exploration program, we did not observe soil types that would be considered highly susceptible to erosion, except in areas of steeply sloping topography. In our opinion, the primary concern regarding erosion potential will occur during construction, in areas that have been stripped of vegetation. Erosion at the site during construction can be minimized by implementing the project erosion control plan, which should include judicious use of straw bales and silt fences. If used, these erosion control devices should be in place and remain in place throughout site preparation and construction.

Erosion and sedimentation of exposed soils can also be minimized by quickly re-vegetating exposed areas of soil, and by staging construction such that large areas of the project site are not denuded and exposed at the same time. Areas of exposed soil requiring immediate and/or temporary protection against exposure should be covered with either mulch or erosion control netting/blankets. Areas of exposed soil requiring permanent stabilization should be seeded with an approved grass seed mixture, or hydroseeded with an approved seed-mulch-fertilizer mixture.

Wet Weather Earthwork

Soils underlying the site are likely to be moisture sensitive and may be difficult to handle or traverse with construction equipment during periods of wet weather. Earthwork is typically most economical when performed under dry weather conditions. Earthwork performed during the wet-weather season will probably require expensive measures such as cement treatment or imported granular material to compact fill to the recommended engineering specifications. If earthwork is to be performed or fill is to be placed in wet weather or under wet conditions when soil moisture content is difficult to control, the following recommendations should be incorporated into the contract specifications.

- Earthwork should be performed in small areas to minimize exposure to wet weather. Excavation or the removal of unsuitable soils should be followed promptly by the placement and compaction of clean engineered fill. The size and type of construction equipment used may have to be limited to prevent soil disturbance. Under some circumstances, it may be necessary to excavate soils with a backhoe to minimize subgrade disturbance caused by equipment traffic;
- The ground surface within the construction area should be graded to promote run-off of surface water and to prevent the ponding of water;
- Material used as engineered fill should consist of clean, granular soil containing less than 5 percent fines. The fines should be non-plastic. Alternatively, cement treatment of on-site soils may be performed to facilitate wet weather placement;
- The ground surface within the construction area should be sealed by a smooth drum vibratory roller, or equivalent, and under no circumstances should be left uncompacted and exposed to moisture. Soils which become too wet for compaction should be removed and replaced with clean granular materials;
- Excavation and placement of fill should be observed by the geotechnical engineer to verify that all unsuitable materials are removed and suitable compaction and site drainage is achieved; and
- Bales of straw and/or geotextile silt fences should be strategically located to control erosion.

If cement or lime treatment is used to facilitate wet weather construction, GeoPacific should be contacted to provide additional recommendations and field monitoring.

Anticipated Foundations

The proposed residential structures may be supported on shallow foundations bearing on competent undisturbed, native soils and/or engineered fill, appropriately designed and constructed as recommended in this report. Foundation design, construction, and setback requirements should conform to the applicable building code at the time of construction. For maximization of bearing strength and protection against frost heave, spread footings should be embedded at a minimum depth of 18 inches below exterior grade. The recommended minimum widths for continuous footings supporting wood-framed walls without masonry are 12 inches for single-story, 15 inches for two-story, and 18 inches for three-story structures. Minimum foundation reinforcement should consist of a No. 4 bar at the top of the stem walls, and a No. 4 bar at the bottom of the footings. Concrete slab-on-grade reinforcement should consist of No. 4 bars placed on 24-inch centers in a grid pattern.

The anticipated allowable soil bearing pressure is 1,500 lbs/ft^2 for footings bearing on competent, native soil and/or engineered fill. A maximum chimney and column load of 30 kips is recommended for the site. The recommended maximum allowable bearing pressure may be increased by 1/3 for short-term transient conditions such as wind and seismic loading. For heavier loads, the geotechnical engineer should be consulted. The coefficient of friction between on-site soil and poured-in-place concrete may be taken as 0.40, which includes no factor of safety. The maximum anticipated total and differential footing movements (generally from soil expansion and/or settlement) are 1 inch and ¾ inch over a span of 20 feet, respectively. We anticipate that the majority of the estimated settlement will occur during construction, as loads are applied. Excavations near structural footings should not extend within a 1H:1V plane projected downward from the bottom edge of footings.

Footing excavations should penetrate through topsoil and any loose soil to competent subgrade that is suitable for bearing support. All footing excavations should be trimmed neat, and all loose or softened soil should be removed from the excavation bottom prior to placing reinforcing steel bars. Due to the moisture sensitivity of on-site native soils, foundations constructed during the wet weather season may require overexcavation of footings and backfill with compacted, crushed aggregate.

Our recommendations are for house construction incorporating raised wood floors and conventional spread footing foundations. If living space of the structures will incorporate basements, a geotechnical engineer should be consulted to make additional recommendations for retaining walls, water-proofing, underslab drainage and wall subdrains. After site development, a Final Soil Engineer's Report should either confirm or modify the above recommendations.

Pavement Design

For design purposes, we used an estimated resilient modulus of 9,000 for compacted native soil. Table 1 presents our recommended minimum pavement section for dry weather construction.

Table 1. Recommended Minimum Dry-Weather Pavement Section

Material Layer	Light-duty Public Streets	Compaction Standard
Asphaltic Concrete (AC)	3 in.	92%/ 92% of Rice Density AASHTO T-209
Crushed Aggregate Base ¾"-0 (leveling course)	2 in.	95% of Modified Proctor AASHTO T-180
Crushed Aggregate Base 1½"-0	8 in.	95% of Modified Proctor AASHTO T-180
Subgrade	12 in.	95% of Modified Proctor AASHTO T-180 or equivalent

Any pockets of organic debris or loose fill encountered during ripping or tilling should be removed and replaced with engineered fill (see *Site Preparation* Section). In order to verify subgrade strength, we recommend proof-rolling directly on subgrade with a loaded dump truck during dry weather and on top of base course in wet weather. Soft areas that pump, rut, or weave should be stabilized prior to paving. If pavement areas are to be constructed during wet weather, the subgrade and construction plan should be reviewed by the project geotechnical engineer at the time of construction so that condition specific recommendations can be provided. The moisture sensitive subgrade soils make the site a difficult wet weather construction project.

During placement of pavement section materials, density testing should be performed to verify compliance with project specifications. Generally, one subgrade, one base course, and one asphalt compaction test is performed for every 100 to 200 linear feet of paving.

Seismic Design

Structures should be designed to resist earthquake loading in accordance with the methodology described in the 2010 ASCE-7 Standard. We recommend Site Class D be used for design. Design values determined for the site using the USGS (United States Geological Survey) *U.S. Seismic Design Maps* tool (Version 3.1.0) are summarized in Table 2, presented on the following page.

Table 2. Recommended Earthquake Ground Motion Parameters (2010 ASCE-7)

Parameter	Value
Location (Lat, Long), degrees	45.646, -122.457
Mapped Spectral Acceleration Values (MCE):	
Peak Ground Acceleration	0.374
Short Period, S_s	0.880 g
1.0 Sec Period, S_1	0.375 g
Soil Factors for Site Class D:	
F_a	1.148
F_v	1.650
Residential Site Value = 2/3 x F_a x S_s	0.673 g
Residential Seismic Design Category	D_0

Soil liquefaction is a phenomenon wherein saturated soil deposits temporarily lose strength and behave as a liquid in response to earthquake shaking. Soil liquefaction is generally limited to loose, granular soils located below the water table. Following development, on-site soils will consist predominantly of engineered fill or native fine-grained soils above the water table, which are not considered susceptible to liquefaction. Therefore, it is our opinion that special design or construction measures are not required to mitigate the effects of liquefaction.

Drainage

The upslope side of retaining walls and perimeter footings should be provided with a drainage system consisting of 3-inch diameter, slotted, flexible plastic pipe embedded in a minimum of 1 ft^3 per lineal foot of clean, free-draining gravel or 1 1/2" - 3/4" drain rock. The drain pipe and surrounding drain rock should be wrapped in non-woven geotextile (Mirafi 140N, or approved equivalent) to minimize the potential for clogging and/or ground loss due to piping. Water collected from the footing drains should be directed into the local storm drain system or other suitable outlet. A minimum 0.5 percent fall should be maintained throughout the drain and non-perforated pipe outlet. Down spouts and roof drains should not be connected to the foundation drains in order to reduce the potential for clogging. The footing drains should include clean-outs to allow periodic maintenance and inspection. Grades around the proposed structure should be sloped such that surface water drains away from the building. Footing drains are recommended to prevent detrimental effects of groundwater on foundations, and should not be expected to eliminate all potential sources of water entering a crawlspace or beneath a slab-on-grade. An adequate grade to a low point outlet drain in any crawlspace areas is required by code. Underslab drains are sometimes added beneath the slab when placed over soils of low permeability and shallow, perched groundwater.

UNCERTAINTIES AND LIMITATIONS

We have prepared this report for the owner and their consultants for use in design of this project only. This report should be provided in its entirety to prospective contractors for bidding and estimating purposes; however, the conclusions and interpretations presented in this report should not be construed as a warranty of the subsurface conditions. Experience has shown that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, GeoPacific should be notified for review of the recommendations of this report, and revision of such if necessary.

Sufficient geotechnical monitoring, testing and consultation should be provided during construction to confirm that the conditions encountered are consistent with those indicated by explorations. The checklist attached to this report outlines recommended geotechnical observations and testing for the project. Recommendations for design changes will be provided should conditions revealed during construction differ from those anticipated, and to verify that the geotechnical aspects of construction comply with the contract plans and specifications.

Within the limitations of scope, schedule and budget, GeoPacific attempted to execute these services in accordance with generally accepted professional principles and practices in the fields of geotechnical engineering and engineering geology at the time the report was prepared. No warranty, expressed or implied, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or groundwater at this site.

We appreciate this opportunity to be of service.

Sincerely,

GEOPACIFIC ENGINEERING, INC.

JAMES D. IMBRIE
STATE OF WASHINGTON
27177
REGISTERED
PROFESSIONAL ENGINEER
Exp 3-31-16

Beth K. Rapp
Senior Geotechnical Staff

James D. Imbrie, P.E.
Principal Geotechnical Engineer

Attachments: References
Figure 1 – Vicinity Map
Figure 2 – Site and Exploration Plan
Test Pit Logs – TP-2 through TP-11, & TP-13
Test Pit Logs from Previous Study – TP-1 (2013), TP-10 (2013), TP-13 (2013), TP-15 (2013) & TP-16 (2013)

REFERENCES

Atwater, B.F., 1992, Geologic evidence for earthquakes during the past 2,000 years along the Copalis River, southern coastal Washington: Journal of Geophysical Research, v. 97, p. 1901-1919.

Beeson, M.H., Tolan, T.L., and Anderson, J.L., 1989, The Columbia River Basalt Group in western Oregon; Geologic structures and other factors that controlled flow emplacement patterns: Geological Society of America Special Paper 239, in Volcanism and tectonicism in the Columbia River flood-basalt province published by the Geological Society of America, p. 223-246.

Carver, G.A., 1992, Late Cenozoic tectonics of coastal northern California: American Association of Petroleum Geologists-SEPM Field Trip Guidebook, May, 1992.

Evarts, R.C., 2006, Geologic Map of the Lacamas Creek Quadrangle, Clark County, Washington: U.S. Geological Survey Scientific Investigations Map 2924.

Fiksdal, A., 1975, Slope stability of Clark County, Washington: Washington Division of Geology and Natural Resources, Open File Report 75-10, map scale 1:63,360.

Geomatrix Consultants, 1995, Seismic Design Mapping, State of Oregon: unpublished report prepared for Oregon Department of Transportation, Personal Services Contract 11688, January 1995.

Goldfinger, C., Kulm, L.D., Yeats, R.S., Appelgate, B, MacKay, M.E., and Cochrane, G.R., 1996, Active strike-slip faulting and folding of the Cascadia Subduction-Zone plate boundary and forearc in central and northern Oregon: in Assessing earthquake hazards and reducing risk in the Pacific Northwest, v. 1: U.S. Geological Survey Professional Paper 1560, P. 223-256.

Madin, I.P., 1990, Earthquake hazard geology maps of the Portland metropolitan area, Oregon: Oregon Department of Geology and Mineral Industries Open-File Report 0-90-2, scale 1:24,000, 22 p.

Mundorff, M.J., 1964, Geology and ground-water conditions of Clark County, Washington, with a description of a major alluvial aquifer along the Columbia River: U.S. Geological Survey Water-Supply Paper 1600, 268 p., 3 pls.

Peterson, C.D., Darioenzo, M.E., Burns, S.F., and Burris, W.K., 1993, Field trip guide to Cascadia paleoseismic evidence along the northern California coast: evidence of subduction zone seismicity in the central Cascadia margin: Oregon Geology, v. 55, p. 99-144.

Phillips W. M., 1987, Geologic map of the Vancouver Quadrangle, Washington and Oregon: Washington Division of Geology and Natural Resources, Open File Report 87-10, 32 p., map scale 1:100,000.

Trimble, D.E., 1963, Geology of Portland, Oregon and adjacent areas: U.S. Geological Survey Bulletin 1119, 119p., 1 plate, scale 1:62,500.

United States Geologic Survey, 2014, U.S. Seismic Design Maps Online Tool, http://earthquake.usgs.gov/designmaps/us/application.php

Unruh, J.R., Wong, I.G., Bott, J.D., Silva, W.J., and Lettis, W.R., 1994, Seismotectonic evaluation: Scoggins Dam, Tualatin Project, Northwest Oregon: unpublished report by William Lettis and Associates and Woodward Clyde Federal Services, Oakland, CA, for U. S. Bureau of Reclamation, Denver CO (in Geomatrix Consultants, 1995).

Werner, K.S., Nabelek, J., Yeats, R.S., Malone, S., 1992, The Mount Angel fault: implications of seismic-reflection data and the Woodburn, Oregon, earthquake sequence of August, 1990: Oregon Geology, v. 54, p. 112-117.

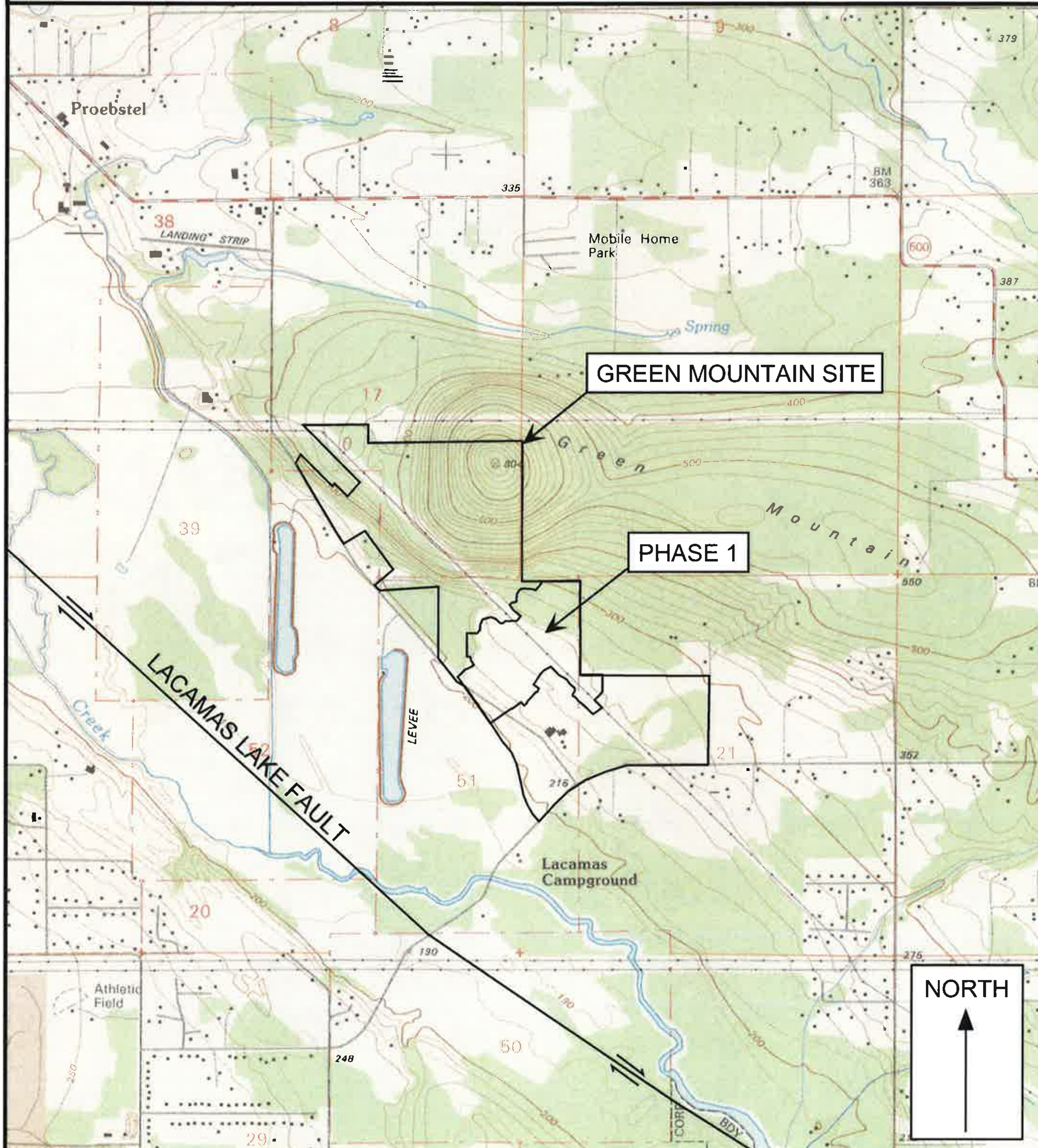
Wong, I. Silva, W., Bott, J., Wright, D., Thomas, P., Gregor, N., Li., S., Mabey, M., Sojourner, A., and Wang, Y., 2000, Earthquake Scenario and Probabilistic Ground Shaking Maps for the Portland, Oregon, Metropolitan Area; State of Oregon Department of Geology and Mineral Industries; Interpretative Map Series IMS-16.

Yeats, R.S., Graven, E.P., Werner, K.S., Goldfinger, C., and Popowski, T., 1996, Tectonics of the Willamette Valley, Oregon: in Assessing earthquake hazards and reducing risk in the Pacific Northwest, v. 1: U.S. Geological Survey Professional Paper 1560, P. 183-222, 5 plates, scale 1:100,000.

Yelin, T.S., 1992, An earthquake swarm in the north Portland Hills (Oregon): More speculations on the seismotectonics of the Portland Basin: Geological Society of America, Programs with Abstracts, v. 24, no. 5, p. 92.

14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

VICINITY MAP



Legend

Approximate Scale 1 in = 2,000 ft

Date: 11/25/2014
Drawn by: EKR

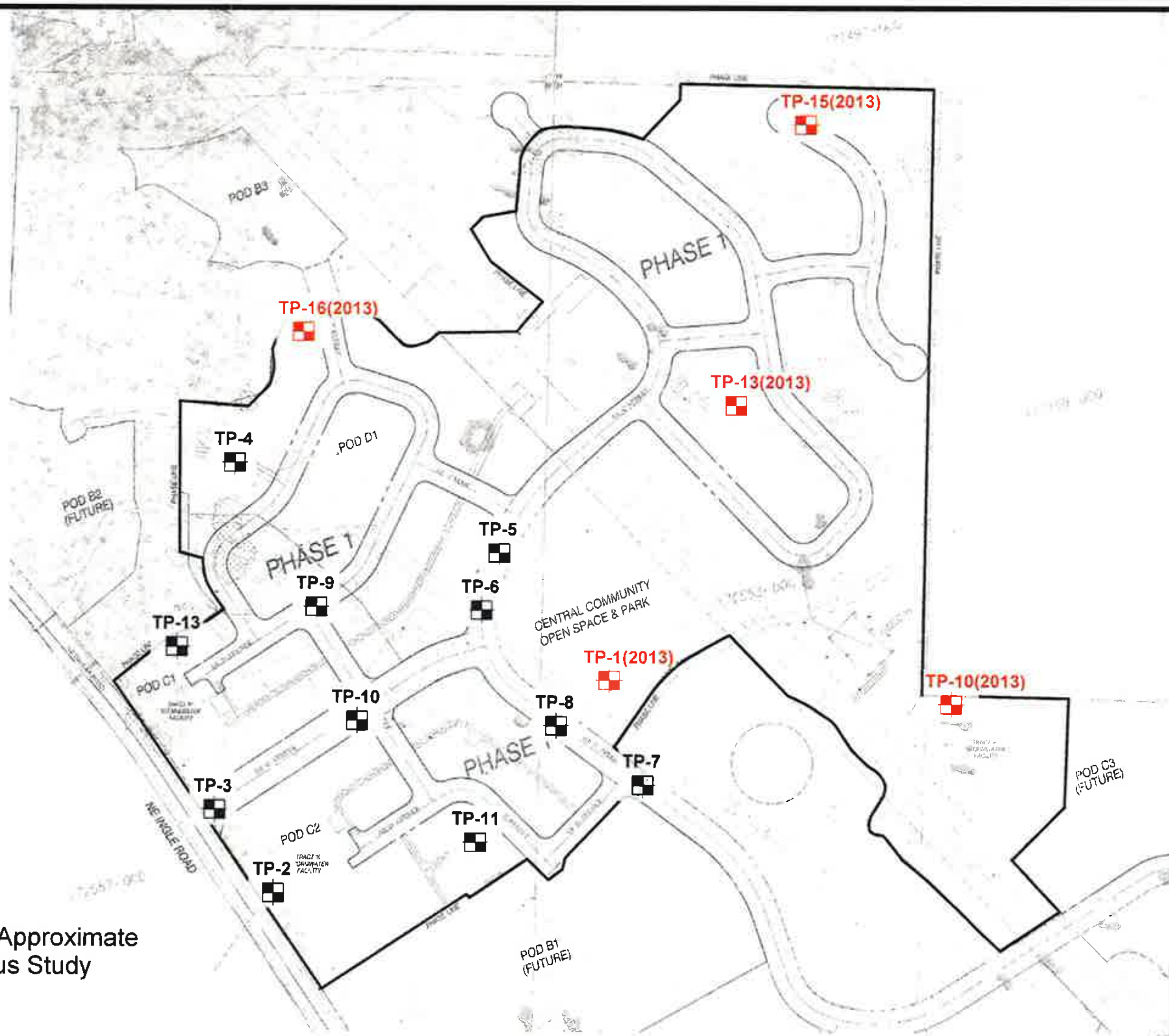
Base map: U.S. Geological Survey 7.5 minute Topographic Map Series, Lacamas Creek, Washington Quadrangle, 1990.

Project: Green Mountain Phase 1 Camas, Washington	Project No. 13-3186	FIGURE 1

GeoPacific Engineering, Inc.

14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

SITE PLAN AND EXPLORATION LOCATIONS



Legend

TP-2 Test Pit Designation and Approximate Location

TP-16(2013) Test Pit Designation and Approximate Location-from Previous Study

0 400'

APPROXIMATE SCALE 1"=400'

Base map provided by Olson Engineering Dated November 2014.

North

Project: Green Mountain Phase 1 Camas, Washington	Project No. 13-3186	Date: 10/2/2014 Drawn by: EKR	FIGURE 2

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1, Camas, Washington	Project No. 13-3186	Test Pit No. **TP-2**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	3.0					Stiff to very stiff, SILT (ML), trace sand, brown, moderately organic, trace roots throughout, 6 inch topsoil developed at surface, strong orange and gray mottling, trace black staining, moist (Fill)
2	1.5					Stiff to very stiff, clayey SILT (ML), trace sand, brown, micaceous, subtle orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
3	4.5					
4	3.5					
5						
6						Dense, subrounded GRAVEL (GM), trace clayey silt matrix, trace sand, brown to gray, trace black staining, partially cemented, strong orange and gray mottling, gravel is up to 9 inches in diameter, well graded, moist to wet (Conglomerate)
7					Seepage	
8					Seepage	
9						Test Pit Terminated at 8.5 Feet.
10						Note: Groundwater seepage encountered at 7 - 8 feet. Discharge visually estimated at 1/2 gallon per minute.
11						
12						

LEGEND

Bag Sample (100 to 1,000 g) · Bucket Sample (5 Gal Bucket) · Shelby Tube Sample · Seepage · Water Bearing Zone · Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1 Camas, Washington	Project No. 13-3186	Test Pit No. **TP-3**

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Type	In-Situ Dry Density (lb/ft^3)	Moisture Content (%)	Water Bearing Zone	Material Description
1	4.5					Stiff to very stiff, SILT (ML), trace subrounded gravel, brown, with inorganic debris (asphalt), trace roots throughout, 6 inch thick topsoil developed at surface, strong orange and gray mottling, trace black staining, moist (Fill)
2	4.5					
3	4.5					
4	3.5					Stiff to very stiff, sandy SILT (ML), trace subrounded gravel, brown, micaceous, subtle to strong orange and gray mottling, trace black staining, moist (Conglomerate)
5						
6						
7						Dense, subrounded GRAVEL (GM), trace clayey silt matrix, trace sand, brown to gray, trace black staining, partially cemented, strong orange and gray mottling, gravel is up to 9 inches in diameter, well graded, moist to wet (Conglomerate)
8						
9						Test Pit Terminated at 8.5 Feet. Note: No seepage or groundwater encountered.
10						
11						
12						

LEGEND

100 to 1,000 g — Bag Sample; 5 Gal. Bucket — Bucket Sample; Shelby Tube Sample; Seepage; Water Bearing Zone; Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1, Camas, Washington	Project No. 13-3186	Test Pit No. **TP-4**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	4.5					Stiff to very stiff, sandy SILT (ML), trace subrounded gravel, gray, trace organic debris, trace roots throughout, 6 inch thick topsoil developed at surface, subtle to strong orange and gray mottling, trace black staining, moist (Fill)
2	4.0					
3	3.5					Stiff to very stiff, sandy SILT (ML), light brown, micaceous, strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
4	3.0					
5						
6						
7						
8						Test Pit Terminated at 8 Feet.
9						
10						Note: No seepage or groundwater encountered.
11						
12						

LEGEND

100 to 1,000 g — Bag Sample
5 Gal Bucket — Bucket Sample
Shelby Tube Sample
Seepage
Water Bearing Zone
Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1 Camas, Washington	Project No. 13-3186	Test Pit No. **TP-5**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
0–1						Low to moderately organic, SILT (OL-ML), dark brown, fine roots throughout, loose, moist (Topsoil)
1	4.5					Stiff to very stiff, sandy SILT (ML), light brown, micaceous, subtle to strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
2	2.0					
3	2.5					
4	2.5					
5						
6–9					Seepage	Medium dense to dense, silty SAND (SM), brown to blue gray below 8.5 feet, subtle to strong orange and gray mottling, sand is fine to medium grained, partially lithified, trace black staining, moist (Conglomerate)
9–12						Test Pit Terminated at 9 Feet. Note: Groundwater seepage encountered at 7.5 feet. Discharge visually estimated at 1/4 gallon per minute.

LEGEND

Bag Sample (100 to 1,000 g) | Bucket Sample (5 Gal. Bucket) | Shelby Tube Sample | Seepage | Water Bearing Zone | Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1 Camas, Washington	Project No. 13-3186	Test Pit No. **TP-6**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
0–0.5						Low organic, SILT (OL-ML), dark brown, roots throughout, loose, moist (Topsoil)
1	2.5					Stiff to very stiff, sandy SILT (ML), light brown, micaceous, subtle to strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
2	4.5					
3	3.5					
4	4.0					
4.5					Seepage	
5						
6						Medium dense to dense, silty SAND (SM), trace subrounded gravel, brown, strong orange and gray mottling, sand is fine to medium grained, partially lithified, trace black staining, moist (Conglomerate)
7						
8						
8.5–12						Test Pit Terminated at 8.5 Feet. Note: Groundwater seepage encountered at 4.5 feet. Discharge visually estimated at 1/4 gallon per minute.

LEGEND

Bag Sample (100 to 1,000 g) | Bucket Sample (5 Gal. Bucket) | Shelby Tube Sample | Seepage | Water Bearing Zone | Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1, Camas, Washington	Project No. 13-3186	Test Pit No. TP-7

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
1	4.0					Stiff to very stiff, sandy SILT (ML), trace subrounded gravel, light brown, trace roots throughout, 6 inch thick topsoil developed at surface, strong orange and gray mottling, trace black staining, moist (Fill)
2	4.0					
3	2.0					
4	2.5					Stiff to very stiff, sandy SILT (ML), light brown, micaceous, strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
5						
6					Seepage	
7						
8						
9						Test Pit Terminated at 8.5 Feet.
10						Note: Groundwater seepage encountered at 5.5 - 6.5 feet. Discharge visually estimated at 1/4 gallon per minute.
11						
12						

LEGEND

Bag Sample (100 to 1,000 g) · Bucket Sample (5 Gal Bucket) · Shelby Tube Sample · Seepage · Water Bearing Zone · Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1, Camas, Washington	Project No. 13-3186	Test Pit No. **TP-8**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
0–1.5	2.0 (1 ft)					Stiff to very stiff, sandy SILT (ML), light brown, trace roots throughout, 6 inch thick topsoil developed at surface, strong orange and gray mottling, moist (Fill)
1.5–2.5	2.5 (2 ft)					Low organic, SILT (OL-ML), gray, trace fine roots throughout, loose, moist (Buried Topsoil)
2.5–8.5	2.0 (3 ft), 1.5 (4 ft)				Seepage (5.5–7.5 ft)	Stiff to very stiff, sandy SILT (ML), light brown, micaceous, strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)

Test Pit Terminated at 8.5 Feet.

Note: Groundwater seepage encountered at 5.5 - 7.5 feet.
Discharge visually estimated at 1/2 gallon per minute.

LEGEND

Bag Sample (100 to 1,000 g) · Bucket Sample (5 Gal Bucket) · Shelby Tube Sample · Seepage · Water Bearing Zone · Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1, Camas, Washington	Project No. 13-3186	Test Pit No. **TP-9**

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	**Material Description**
0–0.7						Moderately organic, SILT (OL-ML), trace gravel fill, dark brown, fine roots throughout, loose, moist (Topsoil)
1	4.0					
2	3.5					Stiff to very stiff, clayey SILT (ML), trace sand, brown, micaceous, subtle orange and gray mottling, trace roots to 3 feet, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
3	4.5					
4	4.5					
5						
6						
7						
8						Dense, subrounded GRAVEL (GM), trace clayey silt matrix, trace sand, brown to gray, trace black staining, partially cemented, strong orange and gray mottling, moist to wet (Conglomerate)
9						Test Pit Terminated at 8.5 Feet.
10						Note: Groundwater seepage encountered at 7.5 feet. Discharge visually estimated at 1/4 gallon per minute.
11						
12						

LEGEND

Bag Sample (100 to 1,000 g) | Bucket Sample (5 Gal Bucket) | Shelby Tube Sample | Seepage | Water Bearing Zone | Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1 Camas, Washington	Project No. 13-3186	Test Pit No. **TP-10**

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Type	In-Situ Dry Density (lb/ft^3)	Moisture Content (%)	Water Bearing Zone	Material Description
1	4.0					Stiff to very stiff, SILT (ML), trace sand, brown, trace inorganic debris, trace roots throughout, 6 inch topsoil developed at surface, strong orange and gray mottling, moist (Fill)
2	4.0					
3	4.5					Stiff to very stiff, sandy SILT (ML), trace clay, light brown, micaceous, subtle to strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
4	4.5					
5						
6						
7						Dense to very dense, subrounded GRAVEL (GM), trace clayey silt matrix, trace sand, brown to gray, trace black staining, partially cemented, strong orange and gray mottling, gravel is up to 6 inches in diameter, well graded, moist (Conglomerate)
8						
9						Test Pit Terminated at 8.5 Feet.
10						Note: No seepage or groundwater encountered.
11						
12						

LEGEND

Bag Sample (100 to 1,000 g)	Bucket Sample (5 Gal. Bucket)	Shelby Tube Sample	Seepage	Water Bearing Zone	Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1, Camas, Washington	Project No. 13-3186	Test Pit No. **TP-11**

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Type	In-Situ Dry Density (lb/ft^3)	Moisture Content (%)	Water Bearing Zone	Material Description
1	2.5					Stiff to very stiff, sandy SILT (ML), trace gravel, light brown, trace fine roots throughout, 6 inch thick topsoil developed at surface, moist (Fill)
2	4.5					Low to moderately organic, SILT (OL-ML), brown, trace fine roots throughout, moist (Buried Topsoil)
3	3.5					Stiff to very stiff, sandy SILT (ML), light brown, subtle to strong orange and gray mottling, moist (Fill)
4	3.0					
5						Test Pit Terminated at 5 Feet due to Buried Water Line Tape.
6						Note: No groundwater or seepage encountered.
7						
8						
9						
10						
11						
12						

LEGEND

Bag Sample (100 to 1,000 g) — Bucket Sample (5 Gal Bucket) — Shelby Tube Sample — Seepage — Water Bearing Zone — Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1, Camas, Washington	Project No. 13-3186	Test Pit No. **TP-13**

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Type	In-Situ Dry Density (lb/ft^3)	Moisture Content (%)	Water Bearing Zone	Material Description
1	1.5					Stiff, sandy SILT (ML), trace clay, light brown, trace roots throughout, 6 inch thick topsoil developed at surface, strong orange and gray mottling, moist (Fill)
2	2.0					
3	2.5					
4	4.0					Stiff to very stiff, sandy SILT (ML), light brown, micaceous, strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
5						
6						
7						Dense to very dense, subrounded GRAVEL (GM), trace silty sand matrix, brown to gray, trace black staining, strong orange and gray mottling, gravel is up to 12 inches in diameter, moist (Conglomerate)
8					Seepage	
9						Test Pit Terminated at 8.5 Feet.
10						Note: Groundwater seepage encountered at 8.5 feet. Discharge visually estimated at 1/4 gallon per minute.
11						
12						

LEGEND

100 to 1,000 g — Bag Sample
5 Gal. Bucket — Bucket Sample
Shelby Tube Sample
Seepage
Water Bearing Zone
Water Level at Abandonment

Date Excavated: 5/23/2014
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Camas, Washington	Project No. 13-3186	Test Pit No. TP-1 (2013)

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
0–1.5	0.5					Moderately organic, sandy SILT (OL-ML), dark brown, roots throughout, loose, moist (Topsoil)
1.5–4	1.0, 1.0, 0.5				Water level at 2 ft; seepage at 3 ft	Medium stiff, sandy SILT (ML), brown, micaceous, strong orange and gray mottling, moist to wet (Fine Grained Catastrophic Flood Deposits)
4						Test Pit Terminated at 4 Feet for Infiltration Testing.

Note: Groundwater seepage encountered at 3 feet.
Discharge visually estimated at less than 1 gallon per minute.
Static groundwater at 2 Feet at Completion of Infiltration Testing.

LEGEND

Bag Sample (100 to 1,000 g) | Bucket Sample (5 Gal Bucket) | Shelby Tube Sample | Seepage | Water Bearing Zone | Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain, Camas, Washington	Project No. 13-3186	Test Pit No. **TP-10 (2013)**

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Type	In-Situ Dry Density (lb/ft^3)	Moisture Content (%)	Water Bearing Zone	Material Description
0–0.7						Moderately organic, SILT (OL-ML), dark brown, fine roots throughout, loose, moist (Topsoil)
1	2.0					Stiff to very stiff, sandy SILT (ML), trace clay, light brown, micaceous, strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
2	2.0					
3	1.5					
4	3.5					Dense, subrounded GRAVEL (GM), trace sandy silt matrix, light brown to gray, trace black staining, strong orange and gray mottling, micaceous, moist (Conglomerate)
5						
6						Test Pit Terminated at 6 Feet.
7						
8						Note: No seepage or groundwater encountered.
9						
10						
11						
12						

LEGEND

100 to 1,000 g — Bag Sample
5 Gal Bucket — Bucket Sample
Shelby Tube Sample
Seepage
Water Bearing Zone
Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1 Camas, Washington	Project No. 13-3186	Test Pit No. TP-13 (2013)

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
0–0.7						Moderately organic, SILT (OL-ML), brown, fine roots throughout, loose, moist (Topsoil)
0.7–3.0	1.5 (at 2 ft) 3.0 (at 3 ft)					Medium stiff to very stiff, sandy SILT (ML), trace clay, light brown, micaceous, strong orange and gray mottling, trace black staining, moist (Fine Grained Catastrophic Flood Deposits)
3.0–9.0					Seepage (at 8 ft)	Dense, subrounded GRAVEL (GM), trace sandy silt matrix, trace clay, light brown to gray, trace black staining, well graded, strong orange and gray mottling, micaceous, moist (Conglomerate)
9.0						Test Pit Terminated at 9 Feet. Note: Groundwater seepage encountered at 8 feet. Discharge visually estimated at 1 gallon per minute.

LEGEND

Bag Sample (100 to 1,000 g) · Bucket Sample (5 Gal Bucket) · Shelby Tube Sample · Seepage · Water Bearing Zone · Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Phase 1, Camas, Washington	Project No. 13-3186	Test Pit No. TP-15 (2013)

Depth (ft)	Pocket Penetrometer (tons/ft^2)	Sample Type	In-Situ Dry Density (lb/ft^3)	Moisture Content (%)	Water Bearing Zone	Material Description
0–0.7						Moderately organic, SILT (OL-ML), with basalt fragments, dark brown, fine roots throughout, loose, moist (Topsoil)
0.7–3.0	1.5 (1 ft); 3.5 (2 ft)				Seepage (2 ft)	Stiff to very stiff, silty CLAY (CL) to clayey SILT (ML), with gray weathered basalt, light reddish-brown, trace fine roots throughout, strong orange and gray mottling, black staining, moist (Colluvial Soil)
3.0–10.5						Medium dense, silty SAND (SM) with interbeds of stiff, sandy SILT (ML), light brown, micaceous, sand is fine to medium grained, strong orange and gray mottling, trace black staining, moist (Conglomerate)

Test Pit Terminated at 10.5 Feet.

Note: Groundwater seepage encountered at 2 feet.
Discharge visually estimated at 1 gallon per minute.

LEGEND

100 to 1,000 g Bag Sample | 5 Gal. Bucket Bucket Sample | Shelby Tube Sample | Seepage | Water Bearing Zone | Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

GeoPacific Engineering, Inc.
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445 Fax: (503) 941-9281

TEST PIT LOG

Project: Green Mountain Camas, Washington	Project No. 13-3186	Test Pit No. TP-16 (2013)

Depth (ft)	Pocket Penetrometer (tons/ft²)	Sample Type	In-Situ Dry Density (lb/ft³)	Moisture Content (%)	Water Bearing Zone	Material Description
0–1						Moderately organic, SILT (OL-ML), dark brown, fine roots throughout, loose, moist (Topsoil)
1	0.5					
2	2.0					
3	3.5					
3.5–6.5					Seepage	Medium dense, silty SAND (SM) with interbeds of stiff, sandy SILT (ML), light brown to gray, micaceous, sand is coarse to medium grained, strong orange and gray mottling, trace black staining, moist to wet (Conglomerate)
4	2.0					
5						
6						
7						
8						
9						Test Pit Terminated at 9 Feet.
10						
11						Note: Groundwater seepage encountered at 3.5 to 6.5 feet. Discharge visually estimated at 2 gallons per minute.
12						

LEGEND

100 to 1,000 g — Bag Sample; 5 Gal Bucket — Bucket Sample; Shelby Tube Sample; Seepage; Water Bearing Zone; Water Level at Abandonment

Date Excavated: 11/5-7/2013
Logged By: B. Rapp
Surface Elevation:

EXHIBIT 47

Critical Areas Report, Buffer Modification, and Tree Preservation Plan
For
Green Mountain Mixed Use PRD - Phase 1
City of Camas, Washington

Prepared For:

Green Mountain Land, LLC
17933 NW Evergreen Parkway, Suite 300
Beaverton, OR 97006
(503) 597-7100

Prepared By:

Ecological Land Services, Inc.
1157 3rd Avenue, Suite 220
Longview, WA 98632
(360) 578-1371
Project Number 2048.01

December 2014

Table of Contents

Attachments:

INTRODUCTION

Ecological Land Services, Inc. (ELS) has completed this critical areas report for Green Mountain Land (GML), LLC for use in designing a phased development within the general location of the existing Green Mountain Golf Course. The project site is located within Section 20, Township 2 North, Range 3 East of the Willamette Meridian near Camas, Washington (Figure 1). This report covers the critical areas associated with the Phase 1 Residential Subdivision (project) proposed at the project site. The Phase 1 Residential Subdivision covers approximately 53.0 acres and is located within portions of Clark County parcels 172557-000 and 172553000. The project site is located north of NE Goodwin Road/NE 28th Street and east of NE Ingles Road (Figure 2). The City of Camas has jurisdiction over the subject site. This report summarizes the findings of the critical areas according to the *City of Camas Municipal Code (CMC) Wetlands Chapter 16.53, Fish and Wildlife Habitat Conservation Areas Chapter 16.61*, and *Sensitive Areas and Open Space Chapter 18.31*.

METHODOLOGY

The wetlands were delineated by ELS following the Routine Determination Method according to the US Army Corps of Engineers *Wetlands Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region Version 2.0* (2010). The Routine Determination Method examines three parameters – vegetation, hydrology, and soils – to determine if wetlands exist in a given area. Hydrology is critical in determining what is wetland but is often difficult to assess because hydrologic conditions can change periodically (hourly, daily, or seasonally). Consequently, it is necessary to determine if hydrophytic vegetation and hydric soils exist, which would indicate that water is present for a duration that is long enough to support a wetland plant community. By definition, wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands are regulated as “Waters of the United States” by the US Army Corps of Engineers (USACE), as “Waters of the State” by the Washington Department of Ecology (WDOE), and locally by *City of Camas Municipal Code (CMC), Wetlands Chapter 16.53*.

ELS biologists evaluated the project site and immediate vicinity (within 300-feet) for jurisdictional wetlands and other critical areas on several occasions over 2013 and 2014. Wetland and stream boundaries were determined through breaks in topography, changes in vegetation, and evidence of surface or subsurface hydrology and were delineated onsite using a Trimble GPS handheld receiver. Vegetation, soil, and hydrology data were collected in test plots to verify the presence or absence of wetlands (Appendix A). Individual Oregon white oak (*Quercus garryana*) trees were also mapped using a Trimble GPS handheld receiver.

SITE CONDITIONS

The project site is located north of NE Goodwin Road/NE 28th Street and east of NE Ingle Road (Figure 2). The Phase 1 Subdivision is proposed within the northern portion of the active Green Mountain Golf Course. The Phase 1 site boundary consists of approximately 53.0 acres and is divided into two general areas described as “onsite” and “adjacent” and are discussed in the following sections of this report.

ONSITE CRITICAL AREAS

The majority of the Phase 1 site boundary is located within existing open groomed fairways, paved parking lot, and a clubhouse structure associated with the active golf course. The topography is gently to moderately sloping to the south-southwest towards NE Goodwin Road and NE Ingle Road. Green Mountain is located offsite to the northeast. A 100-foot wide Bonneville Power Administration (BPA) high voltage transmission line easement is located within the central portion of the site (Figures 2 and 8).

No wetlands are located onsite; however, four wetlands (Wetlands B, D, G and O) are located within 300 feet of the project (Figure 2). These wetlands are covered in more detail under the "Adjacent Critical Areas" section.

Four man-made ponds (H, I, and J) are located within the Phase 1 boundary. The man-made ponds located onsite were created to serve as both landscape amenities and irrigation purposes associated with the existing golf course. The man-made ponds have engineered slopes, rubber liners, and are fully maintained only for irrigation and landscape amenity. An irrigation piping system connects the water features to a pump house (south of the project area). This irrigation system is utilized by the golf course during the dry months of the year. Man-made Pond H (0.49 acres) is located to the northeast of the parking and clubhouse area and along the western edge of the golf course trail system. Man-made Pond I (0.73 acres) is located to the northwest of the parking and clubhouse area and parallels the main entrance to the golf course. Man-made Pond J (0.15 acres) is located to the south of the main entrance to the golf course and man-made Pond I.

Three man-made ditches (Q, R and S) are located within the Phase 1 project boundary. Man-made Ditch Q (0.38 acres in total size) consists of three sections. The three sections of ditch were excavated from uplands by the golf course to convey drainage/runoff to Wetland G. The northern section of ditch conveys hydrology south within a channel running north/south parallel to the property boundary. The eastern section of ditch conveys hydrology west within a channel running east-west parallel to the property boundary. The southern section of ditch conveys hydrology collected from where the northern and eastern sections of ditch converge at the property boundary corner by a ditch, then flowing southwest where it outfalls to Wetland G. Man-made Ditch R (0.07 acres) is located in the northeast corner of the project site. The ditch was excavated from uplands to catch seasonal run-off from the steep south-facing slope of Green Mountain. The ditch system was excavated to divert the hillside run-off to catch-basins located along the eastern edge of the existing tree-abutting the northeast corner of the active golf course. The run-off conveyed from man-made Ditch R is piped underground and southwesterly from these catch basins under the adjacent fairway and into the golf course drainage system. Man-made Ditch S (0.15 acres) is located directly east of the parking lot and clubhouse area near the central portion of the project site. This ditch collects stormwater run-off from the adjacent cart path and parking lot before conveying it northwest to a series of catchbasins located within the parking lot. It is ultimately conveyed to and detained in man-made Pond J (Figure 2).

ELS mapped twenty individual Oregon white oak trees within the northwest portion of the project site. The oak habitat is discussed further within the "Oregon White Oak Habitat" section of this report.

ADJACENT CRITICAL AREAS

The City of Camas code section *16.53.030-Critical Area Report*, requires that all wetlands, buffer zones, water features, and other critical areas within 300 feet of the project area (Phase 1 site boundary) be discussed within the critical area report. Wetlands located outside of Phase 1 site boundary, but within 300 feet include Wetlands B, D, G, and O. Wetland B (2.29 acres) is a slope, forested and scrub/shrub wetland that lies along the western edge of the golf course trail system. Wetland D (1.06 acres) is a depressional, emergent and scrub/shrub wetland located to the east of Wetland B and to the north of the golf course trail system. Wetland G (2.91 acres) is a slope, emergent and scrub/shrub wetland located to the west of the parking and clubhouse area. Wetland O (0.03 acres) is a slope, forested and scrub/shrub wetland located west of Man-made Pond J and south of the existing entrance to the golf course.

Stream O is a narrow non-fish bearing seasonal (Type Ns) stream located just west of the Phase 1 site boundary. The stream flows southwest to the roadside ditch along the east side of NE Ingles Road.

Man-made Ditch G (0.26 acres) is located along the southwest flank of Wetland G. This ditch was excavated from uplands when the golf course was originally constructed and serves to receive water from upslope areas.

TREE PRESERVATION

To meet tree retention requirements regulated by the City of Camas, a formal tree survey was performed. An inventory of the onsite tree habitat was tabulated and provided to the City of Camas within Exhibit E of the Development Agreement (DA). See Appendix B for a copy of the "Tree Preservation Plan" to be followed by the Phase 1 project. Additional Tree Preservation Plan details are provided in the "Tree Preservation Plan" section of this report.

OREGON WHITE OAK HABITAT

Oregon white oak habitat was also located onsite by ELS. A total of 20 Oregon white oak trees were inventoried within or immediately adjacent to the Phase 1 project boundary. Out of the twenty (20) total Oregon white oak trees, eight (8) measure 20 inches or greater diameter at breast height (dbh) and therefore are regulated by the Tree Preservation Plan within the Development Agreement, Exhibit E governing the project. Table 1 summarizes the Oregon white oak habitat and locations of individual oaks are depicted on Figures 2 and 7.

Table 1: Oregon white oak tree summary for the Phase 1 project boundary.

Oak #	Diameter at breast height (inches)
1	**25***
2	**22.5***
3	15
4	14.5
5	17.5
6	19.5
7	**31.7***
8a, 8b^	18, 18^
9	**22***
29	12
30	18
55	**21***
57	13
58	**26***
62	18
63	13
64	**25***
121	**26***
122	8
123	10
Total Quantity of Oaks within Phase 1 = 20 Total Jurisdictional Oaks within Phase 1 = 8	

^ Double trunk tree data listed

* Jurisdictional Oregon white oak tree > 20-inches DBH.

SOILS

The Natural Resources Conservation Service (NRCS) designates the soil within Phase 1 site boundary as Dollar loam (DoB) 0-5% slopes (Figure 3). Dollar loam (DoB) 0-5% slopes soils are characterized moderately deep, moderately well drained soil occurring on low ridges next to depressional areas and is not considered hydric (NRCS 2014). ELS field observations generally concur with the NRCS soil mapping.

NRCS soil series data and mapping practices are based on general, regional soil characteristics and may not accurately display variations in the local soil conditions. The presence or absence of hydric soil does not conclude an area as wetland or upland. Along with hydric soils, hydrology and wetland vegetation must also be present to determine an area as jurisdictional wetland. Due to localized, micro-variations in topography and hydrology, wetlands may be found in areas where hydric soils have not been mapped by the soil survey.

VEGETATION

The majority of the Phase 1 project site consists of maintained fairways and greens associated with the active golf course. In the perimeter and rough areas, the following list of dominant vegetation was observed. The indicator categories following the common and scientific names indicate the likelihood of a species to be found in wetlands. Listed from most-likely to least-likely to be found in wetlands, the indicator categories are:

- **OBL** (obligate wetland) – Almost always occur in wetlands.
- **FACW** (facultative wetland) – Usually occur in wetlands, but may occur in non-wetlands.
- **FAC** (facultative) – Occur in wetlands and non-wetlands.
- **FACU** (facultative upland) – Usually occur in non-wetlands, but may occur in wetlands.
- **UPL** (obligate upland) – Almost never occur in wetlands.
- **NI** (no indicator) – Status not yet determined.

Dominant vegetation in the onsite uplands consisted of trailing blackberry (*Rubus ursinus*, FACU), hairy brackenfern (*Pteridium aquilinum*, FACU), Oregon white oak (*Quercus garryana*, FACU), big leaf maple (*Acer macrophyllum*, FACU), colonial bentgrass (*Agrostis capillaris*, FAC), northern bentgrass (*Agrostis borealis*, FACU), snowberry (*Symphoricarpos albus*, FACU), vine maple (*Acer circinatum*, FAC), western swordfern (*Polystichum munitum*, FACU), bitter cherry (*Prunus emarginata*, FACU), cascara (*Frangula purshiana*, FAC), Oregon ash (*Fraxinus latifolia*, FACW), common velvetgrass (*Holcus lanatus*, FAC), tall fescue (*Festuca arundinacea*, FAC), Kentucky bluegrass (*Poa pratensis*, FAC), Canada thistle (*Cirsium arvense*, FAC), red alder (*Alnus rubra*, FAC), Himalayan blackberry (*Rubus armenicus*, FACU), orchardgrass (*Dactylis glomerata*, FACU), perennial ryegrass (*Lolium perenne*, FAC), red clover (*Trifolium pratense*, FACU), black cottonwood (*Populus balsamifera*, FAC), creeping buttercup (*Ranunculus repens*, FAC), beaked hazelnut (*Corylus cornuta*, FACU), geyer willow (*Salix geyeriana*, FACW), Canada thistle (*Cirsium arvense*, FAC), piggy-back plant (*Tolmiea menziesii*, FAC), Pacific ninebark (*Physocarpus capitatus*, FACW), red elderberry (*Sambucus racemosa*, FACU), holly (*Ilex aquifolium*, FACU), Indian plum (*Oemleria cerasiformis*, FACU), and Douglas fir (*Pseudotsuga menziesii*, FACU).

HYDROLOGY

The hydrology within the Phase 1 project site boundary is highly managed by the golf course. Hydrology is contained within four man-made ponds and conveyed through two man-made ditches and a series of pipes and catch-basins throughout the active golf course. Hydrology is supplied primarily by rainfall, surface run-off, and groundwater fed springs and small streams. The man-made ponds were created along with the original golf course to act as landscape amenities. The water levels within the ponds are manipulated as necessary utilizing an engineered system.

NATIONAL WETLAND INVENTORY

The National Wetland Inventory (NWI) map of the Phase 1 area indicates no mapped wetlands within the subject site (Figure 4). National Wetlands Inventory maps are typically used to gather wetland information about a region, and because of the large scale necessary for regional mapping, they are limited in accuracy for localized analyses. ELS field observations found four man-made ponds and one man-made ditch located onsite which were not mapped by NWI.

PRIORITY HABITATS AND SPECIES MAPPING

The Washington Department of Fish and Wildlife (WDFW) maps priority Oregon white oak (*Quercus garryana)* stands and cave habitat within 300 feet of the Phase 1 project boundary. A biodiversity area and corridor is mapped by the WDFW northeast of the project site consisting of large mature conifer forest (Figure 7).

Clark County Geographic Information System (CCGIS) maps one wetland, one stream, one floodway, and a non-riparian habitat conservation area within or adjacent to the Phase 1 project boundary (Figure 5).

According to the confidential Washington State Department of Natural Resources (DNR) Natural Heritage Information obtained by ELS from the DNR, two state threatened species, dense sedge (*Carex densa*) and Hall's aster (*Symphyotrichum hallii*) and one state and federally endangered species, Bradshaw's lomatium (*Lomatium bradshawii*), have been documented in the vicinity of the subject site.

WILDLIFE

A wide variety of wildlife has been observed by ELS during the recent and previous 2009 field investigations at the project site. Although no formal wildlife survey was completed, ELS has observed medium and small mammals, birds, reptiles, amphibians, and invertebrates that utilize or inhabit the subject site.

CRITICAL AREAS SUMMARY

Critical Areas

No wetlands or streams are located within the proposed Phase 1 development (Figure 2). ELS identified twenty (20) individual Oregon white oak trees within the proposed Phase 1 development. Eight (8) of the Oregon white oak trees identified onsite are 20-inches DBH or greater and are therefore regulated by the City of Camas) within the Phase 1 boundary (Table 1; Figure 2).

Priority Habitat and Species

ELS field findings generally concur with the WDFW oak presence, as Oregon white oak habitat was identified onsite. ELS does not concur with the WDFW cave habitat or biodiversity areas as mapped by WDFW or DNR (confidential mapping). ELS did not identify cave or biodiversity habitat within the Phase 1 project boundary or the immediate vicinity. ELS does recognize the potential for cave rich habitat and biodiversity areas (large mature conifer forest habitat) across the other undisturbed portions of the Green Mountain formation outside of the Phase 1 project boundary, but after an intensive field review no caves or undisturbed mature conifer forests were located within the Phase 1 project boundary or the immediate vicinity. Additionally, ELS does not concur with the biodiversity mapping directly east of the Phase 1 project boundary, as this area has been historically logged, evidence of which is visible on recent Google aerial photos (Appendix C).

ELS field findings do not concur with the CCGIS mapping. The CCGIS-mapped wetland was confirmed by ELS to be Man-made Pond H. The CCGIS-mapped stream is not present onsite and is therefore inaccurately mapped. The CCGIS-mapped floodway is located within the same location as Man-made Pond I. The CCGIS non-riparian habitat conservation area mapped boundary northeast of the project site is not entirely accurate. ELS assumes that the WDFW biodiversity area mentioned above and the CCGIS non-riparian habitat conservation area are meant to represent generally the same habitat.

ELS did not identify the presence of rare state threatened plant species or federal endangered plant species within the Phase 1 project boundary during field work investigations conducted over 2013 and 2014.

Adjacent Wetland Buffers

The base buffer widths for the jurisdictional Category III wetlands (B, D, G, and O) located outside of the Phase 1 boundary, but within 300-feet of the project were determined using *CMC 16.53.040(B)* (Table 2). The base buffer width for Category III wetlands with a habitat function score equal to (or less than) 20 points and with a high land use intensity development is 80 feet. Category III Wetlands B, D, and G require a base buffer of 80 feet for the high intensity land use development proposed. The base buffer width for Category IV wetlands with high intensity land use development is 50 feet. Category IV Wetland O requires a base buffer of 50 feet.

Table 2: Wetland Buffer Summary.

Wetland Name	Category	Base Buffer Width with High Land Use
Wetland B	III	80
Wetland D	III	80
Wetland G	III	80
Wetland O	IV	50

Note: Base buffer widths per *CMC 16.53.040(B)*, (Table 2).

Stream Habitat

The ordinary high water mark (OHWM) of Stream O was delineated onsite and determined to be a non-fish bearing seasonal (Type Ns) stream and is regulated locally by *CMC 16.61*. According to *CMC 16.61.040(D)*, Stream O (Type Ns) requires a 25-foot base buffer.

Stream buffer widths can be reduced according to *CMC 16.61.040(D)(2)*. Buffer reduction options must comply with *CMC* by ensuring that the reduction does not reduce stream functions, the width is not reduced by more than 50 percent or to less than 15 feet, and that the reduction is not within another critical area. According to *CMC 16.61.040(D)(2)(f)*, stream buffers may be averaged if conducted in consultation with a qualified biologist and submitted to WDFW for comment.

Table 3: Stream Buffer Summary.

Stream Name	Classification	Base Buffer Width with High Land Use
Stream O	Type Ns	25

Man-Made Ponds and Ditches

ELS delineated three man-made ponds (H, I, and J) and four man-made ditches (G, R, S, and Q) on or adjacent to the project site (Figure 2). Rubber-lined and man-made ponds are considered non-jurisdictional by the City of Camas. These man-made aquatic features are exempt according to *CMC 16.53.010(C)(2)(b): Artificial. 'Wetlands created from non-wetland sites including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, stormwater facilities, farm ponds, and landscape amenities,*" and do not require buffers. The ponds and ditches associated with the golf course are not present on a 1990 Google Earth aerial photo of the project site (Figure 10); however, the ponds are present in a 2002 Google Earth aerial photo (Figure 11). Man-made Ditches G, R, S and Q are considered man-made drainage ditches excavated from uplands and therefore, are exempt according to *CMC 16.53.010(C)(2)* and do not require buffers.

Oregon White Oak Habitat

Oregon white oak individual trees exist throughout the subject site and are addressed in the Tree Preservation Plan within the Development Agreement governing the project site. See Figures 2, 9 and Appendix B.

BUFFER MODIFICATION

Buffer Averaging

Averaging of wetland buffer area for no net loss of area or function is allowed by *CMC 16.53.050(C)(2)* The project proposes to average the buffers and comply with the minimum buffer widths required by *CMC 16.53.050(C)(2)(c)*.

Buffer averaging is allowed by CMC 16.53.050(2) when the following criteria are adhered to:

1. CMC 16.53.050 (C)(2(a) - The total area contained in the buffer after averaging is no less than that contained within the buffer prior to averaging;
2. CMC 16.53.050 (C)(2)(b) - Decreases in width are generally located where wetland functions may be less sensitive to adjacent land uses, and increases are generally located where wetland functions may be more sensitive to adjacent land uses, to achieve no net loss or a net gain in functions;
3. CMC 16.53.050 (C)(2)(c)- The averaged buffer, at its narrowest point, shall not result in a width less than seventy-five percent of the required width, provided that minimum buffer widths shall never be less than fifty feet for all Category I, Category II, and Category III wetlands, and twenty-five feet for all Category IV wetlands; and
4. CMC 16.53.050 (C)(2)(d) - Effect of Mitigation. If wetland mitigation occurs such that the rating of the wetland changes, the requirements for the category of the wetland after mitigation shall apply.

The project complies with the above criteria in the following ways:

1. The total area contained in the buffer after averaging is no less than that contained within the buffer prior to averaging. The buffer averaging "IN" (or replacement buffer area) matches the buffer averaging "OUT" area for Wetlands G, O and D (where averaging is proposed) Therefore, no net decrease in buffer area from that prior to averaging the base buffer width is proposed by the project (Figure 9).

The lot encroachment within 218 square feet of the 80-foot base buffer along the eastern boundary of Wetland D is proposed to allow construction of one residential lot (Lot #160). The buffer modification provides more than the 50-foot minimum buffer (60 feet) and replaces the encroachment area at a 1:1 replacement ratio by averaging. The buffer averaging proposed to offset the encroachment into the Wetland D buffer is 218 square feet. The buffer replacement area proposed consists of removing a section of existing golf course cartpath within the 80-foot base buffer that currently interrupts the buffer with impervious surface and therefore functionally isolates this portion of the southern Wetland D buffer, Figure 9. Therefore, the project proposes no net decrease in buffer area. The buffer averaging area is located within the same wetland as the impact, and provides an expansion in the buffer area that has not been present since construction of the golf course. The area directly south of this buffer replacement area is proposed as open green space.

The lot encroachment within 2,484 square feet of the 50-foot base buffer along the southern boundary of Wetland O is proposed to allow construction of three residential lots. The buffer modification will allow for the 25-foot minimum buffer, while replacing the encroachment area at a 1:1 replacement ratio by averaging 2,484 square feet. Therefore, the project proposes no net decrease in buffer area. The buffer averaging area is located within the same habitat corridor as Wetland O, and expands the narrow Stream O buffer to allow greater protection for both Wetland O and Stream O.

The encroachment of road (NE C Street), pedestrian trail, paved regional trail and gravel stornmwater access road to the Tract R Stormwater Facility within the 80-foot base buffer of Wetland G consists of 9,894 square feet, see Figure 9. The buffer averaging proposed to offset the encroachment into the Wetland G buffer while maintaining the 50-foot minimum buffer allowance is 9,894 square feet. No net loss of area is proposed for the Wetland G buffer onsite.

2. The decreases in buffer width are located within the outer portion of the buffer and within locations where the existing buffer is low functioning as part of the active golf course maintained grass fairway. Little to no function is provided to the adjacent wetlands by the buffer averaging areas proposed therefore, no loss of function will result from the buffer averaging proposed onsite. Design alterations avoided impacting wetlands and, stream habitat, and minimized encroachment to the wetland buffers to the full extent possible considering the variety of constraints posed to the site – wetlands, buffers, streams, Oregon white oak habitat, and the presence of the Bonneville Power Administration (BPA) overhead towers and lines that bisect the site.

3. The minimum buffer width of 50 feet for the Category III Wetland G, and 25 feet for the Category IV Wetland O associated with the project has been met (Figure 9).

4. No mitigation to offset wetland fill is required or proposed by the project. The current wetland categories will not be altered by the proposed project.

Table 4. Minimum Buffer Widths Allowed with Buffer Modification.

Wetland Name	Category	Base Buffer Width at High Land Use	Minimum Buffer Width Allowed with Buffer Modification
Wetland B	III	80	50
Wetland D	III	80	50
Wetland G	III	80	50
Wetland O	IV	50	25

NOTE: Buffer width modification from base buffer width to minimum buffer width allowed per CMC 16.53.050(C)(2)(c) Buffer Averaging and CMC 16.53.050(C)(1)(c) Combined Reductions.

Buffer Reduction with Enhancement

Combined reductions are allowed by *CMC 16.53.050(C)(c)* provided that the minimum buffer widths shall never be less than fifty feet for Category III wetlands. The combination of buffer reduction incentives and restoration are proposed for the southern buffer of Wetland D. The 80-foot base buffer will be reduced to the minimum 50-foot buffer allowed by increasing the functions through an enhancement effort. The enhancement effort will consist of invasive species control and the installation of native shrubs within an area dominated by grass and active golf course fairway. The result of the buffer enhancement will allow an increase in wetland buffer function by providing a dense scrub-shrub vegetation community, 50-feet in width between Wetland D and the proposed lots. The native shrub enhancement proposed has been designed to mimic an Oregon white oak understory vegetation community due to the Oregon white oak mitigation proposed within the same buffer. The total native shrub understory enhancement area proposed by the 50-foot buffer enhancement is approximately 11,768 square feet in size (Figure 9). Plant specifications are listed in Table 5.

Table 5. Wetland D Southern Buffer Enhancement.

Common Name	Scientific Name	Stock Size	Spacing	Quantity
Beaked hazelnut	*Corylus cornuta*	1 gallon, container	6 feet	80
Common snowberry	*Symphoricarpos albus*	1 gallon, container	6 feet	80
Nootka rose	*Rosa nutkana*	1 gallon, container	6 feet	80

Western swordfern	*Polystichum munitum*	1 gallon, container	6 feet	80
			Total =	320

The buffer enhancement area will be maintained and monitored for a period of 5-years following installation per the guidance listed in *CMC 16.53.050(E)(3)(d).*

Maintenance is to consist of invasive species control by mowing activities or herbicide application performed by a licensed herbicide applicator. Total percent cover of invasive species is to remain below 20-percent for the duration of the monitoring period. Invasive species presence is to be determined by ocular estimation across the buffer enhancement area and recorded in annual monitoring reports.

Monitoring activities are to consist of establishing two random monitoring plots across the buffer enhancement area. Vegetation density and cover data is to be collected from 15-foot minimum radius monitoring plots permanently established within the buffer enhancement area. A one hundred percent survival rate is required Year 1. By Year 5, the percent cover of the native shrub cover shall be 25-percent minimum. If by Year 5, or at any point the monitoring data determines that the buffer enhancement area is not on track to meet the Year 5 performance standard, a contingency plan must be created and implemented to ensure the native shrub cover is meeting the outlined criteria. Monitoring reports are to be submitted to the City of Camas by December 31 of each year associated with the 5-year monitoring period.

Stormwater Facility Allowance Within Wetland Buffers
A fill slope associated with the Trace Q Stormwater Facility is proposed within a portion of the Wetland G buffer. Stormwater facilities are allowed within the buffer of wetlands by *CMC 16.53.050(3)* when the following criteria are met:

1. *The associated wetland with low habitat function (less than twenty points on the habitat section of the rating system form),*
2. *The stormwater facility is built on the outer edge of the buffer and does not degrade the existing buffer function,*
3. *The stormwater facility is designed to blend with the natural landscape.*

The project complies with the above criteria in the following ways;

1. Wetland G scored 17 points on the habitat section of the rating system form), meeting the criteria for low habitat function.
2. The stormwater facility will be built on the outer edge of the buffer. The stormwater facility is proposed within the outer 30-feet of the 80-foot base buffer. The facility is further located within an area of buffer currently utilized and maintained as an active golf course. The buffer functions provided post-project will be equal to or greater than the functions currently present and therefore not degrade the existing buffer functions. The current buffer consists of monotypic grass that is maintained and fertilized as part of the actively groomed golf course fairway. Post development, the buffer habitat will not be maintained to the golf course standards, therefore allowing the dedicated open space to

naturally colonize with native trees, shrubs, and herbaceous groundcover. The reduction in maintenance operations across the buffer habitat will lead to more diverse and dense vegetation structure, which will provide higher function to the adjacent critical area habitat. Allowing natural recruitment of native vegetation within the buffers or outer perimeter of the wetland will also lead to wider habitat corridors over time with the growth of additional canopy cover etc. than currently present.

3. The stormwater facility will be constructed within an area dominated by grass within the active golf course fairway. By utilizing this open and fairly flat area of the site, the facility will not take away from the natural landscape. The proposed impervious surface of the maintenance access road has utilized the existing functionally isolated buffer associated with the golf course gravel cart path, (Figure 9). Functionally isolated buffer areas are defined by C*MC 16.53.050(B)(4)(b)* as areas that are functionally separated from a wetland, areas that do not protect the wetland from adverse impacts and generally consists of preexisting roads, structures or vertical separation. The golf course cart path meets the definition of a functionally isolated buffer and was utilized to minimize impacts to the wetland buffer and the overall existing landscape.

TREE PRESERVATION PLAN

The non Oregon white oak trees proposed for removal by the Phase 1 project have been inventoried and accounted for as part of the Development Agreement (DA) Exhibit E - Tree Preservation Plan (Appendix B). The Tree Preservation Plan encompasses the entire Green Mountain Land, LLC (GML) ownership area (approximately 200+ acres) as future development of the area surrounding Phase 1 is proposed by the landowner, GML. The GML ownership was divided into five "zones" that identify five distinct areas of future development. The zones were established to assure that acceptable numbers of trees were preserved throughout the property, not just in one isolated area rendering the remaining portions of the site bare of trees. The percentage of trees protected in a given zone varies from 34 percent to 77 percent, with the net result being that at least 50 percent of the existing trees across the overall property ownership will be preserved.

The Tree Preservation Plan outlines that Zone C will consist of development pods B1, B2, B3, C1, C2, D1, D2, D3, and E1 and will preserve 488 trees out of the 1,454 trees inventoried within the zone to provide a preservation of 34 percent of the trees within the zone. The Phase 1 development consists of all of the development pods listed under Zone C except B1, B2 and B3. That remaining area contains only 222 trees. The Phase 1 development fully complies with the Tree Preservation Plan, and with the future removal of the additional 222 trees when the remaining pods within the zone are developed, Zone C will still meet the full retention quantity of 488 trees (Figure 8 and Appendix B).

Oregon White Oak Impacts and Mitigation

The project design team worked to retain oak trees by altering the Phase 1 development and associated green space boundaries. Out of the twenty total Oregon white oak trees inventoried within the Phase 1 boundary, eight could not be avoided by the project (Figure 9). The eight individual Oregon white oak trees to be impacted consist of the following oak tree numbers as referenced in Table 1 and depicted on Figure 9; Oak Tree Numbers – 1, 2, 7, 9, 121, 55, 58, 64, and 121. The oak impacts will be mitigated for following the Development Agreement (DA) Exhibit E - Tree Preservation Plan (Appendix B). Mitigation for the eight Oregon white oak trees will consist of installing 1.5-inch caliper minimum stock replacement oaks at a 2:1 replacement ratio, for a total of sixteen replacement Oregon white oak trees. The oak mitigation for Phase 1 oak impacts is proposed within the wetland buffer associated with Wetlands D over an area approximately 6,526 square feet in size to allow for 20-foot spacing of the sixteen trees allowing for mature canopy growth in the future (Figure 9).

The Oregon white oak mitigation area will be maintained and monitored for a period of 5-years. Maintenance activities are to consist of controlling invasive species with mowing activities or herbicide application performed by a licensed herbicide applicator. Total percent cover of invasive species is to remain below 20-percent for the duration of the monitoring period. Invasive species presence is to be determined by ocular estimation across the oak mitigation site and recorded in annual monitoring reports. Monitoring activities are to consist of providing an individual stem count for the Oregon white oak replacement trees specified for installation within the southern buffer of Wetland D and site photos showing the health of the oak trees. A one hundred percent survival rate (or sixteen trees in total) is required for the duration of the monitoring period. If at any point monitoring, identifies mortality or stressed oak trees, a contingency plan must be created and implemented. Monitoring reports are to be submitted to the City of Camas by December 31 of each year associated with the 5-year monitoring period.

LIMITATIONS

The opinions and recommendations contained in this report apply to conditions existing when services were performed. ELS is not responsible for the impacts of any changes in environmental standards, practices, or regulations after the date of this report. ELS does not warrant the accuracy of supplemental information incorporated in this report that was supplied by others. This report is prepared solely for the use of our client and may not be used or relied upon by a third party for any purpose. Any such use or reliance will be at such party's risk.

The services described in this report were consistent with our agreement with our client and performed consistent with generally accepted professional consulting principles and practices. ELS personnel base the above listed conclusions on standard scientific methodology and best professional judgment. In our opinion, local, state, and federal regulatory agencies should agree with the findings presented in this report. There are no other warranties, express or implied.

REFERENCES

City of Camas Municipal Code. 2008. *Critical Areas Ordinance. Chapter 16.61 – Fish and Wildlife Conservation Areas.* September 2014.

City of Camas Municipal Code. 2008. *Critical Areas Ordinance Chapter 16.53 – Wetlands.* September 2014.

Clark County GIS. 2004. Maps Online. Online mapping system. http://gis.clark.wa.gov/ccgis/mol//startHabitat.htm. Accessed September 2014.

Cowardin, L.M., C. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. FWS/OBS-87/31. U.S. Department of the Interior, Fish and Wildlife Service, Office of Biological Services, Washington, D.C.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. U.S. Army Waterways Experiment Station, Vicksburg, Mississippi.

Hruby, T. 2004. *Washington State Wetlands Rating System for Western Washington - Revised*. Washington State Department of Ecology Publication #93-74. Olympia, Washington.

Larsen, E. M., and J. T. Morgan. 1998. *Management recommendations for Washington's priority habitats: Oregon white oak woodlands*. Wash. Dept. Fish and Wildlife, Olympia. 37pp.Natural

Natural Resource Conservation Service (NRCS). 2012. *Soil Survey of Clark County, Washington*. Online document <http://www.or.nrcs.usda.gov/pnw_soil/wa_reports.html>. Website accessed September 2014.

U.S. Army Corps of Engineers. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)*, ed. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-08-13. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

Washington Department of Fish and Wildlife (WDFW). 2013. *Habitats and Species Report in the Vicinity of T03R01E Section 25*. Olympia, Washington.

EXHIBIT 47

Critical Areas Report, Buffer Modification, and Tree Preservation Plan
For
Green Mountain Mixed Use PRD - Phase 1
City of Camas, Washington

Prepared For:

Green Mountain Land, LLC
17933 NW Evergreen Parkway, Suite 300
Beaverton, OR 97006
(503) 597-7100

Prepared By:

Ecological Land Services, Inc.
1157 3rd Avenue, Suite 220
Longview, WA 98632
(360) 578-1371
Project Number 2048.01

December 2014

TABLE OF CONTENTS

INTRODUCTION

Ecological Land Services, Inc. (ELS) has completed this critical areas report for Green Mountain Land (GML), LLC for use in designing a phased development within the general location of the existing Green Mountain Golf Course. The project site is located within Section 20, Township 2 North, Range 3 East of the Willamette Meridian near Camas, Washington (Figure 1). This report covers the critical areas associated with the Phase 1 Residential Subdivision (project) proposed at the project site. The Phase 1 Residential Subdivision covers approximately 53.0 acres and is located within portions of Clark County parcels 172557-000 and 172553000. The project site is located north of NE Goodwin Road/NE 28th Street and east of NE Ingles Road (Figure 2). The City of Camas has jurisdiction over the subject site. This report summarizes the findings of the critical areas according to the *City of Camas Municipal Code (CMC) Wetlands Chapter 16.53, Fish and Wildlife Habitat Conservation Areas Chapter 16.61*, and *Sensitive Areas and Open Space Chapter 18.31*.

METHODOLOGY

The wetlands were delineated by ELS following the Routine Determination Method according to the US Army Corps of Engineers *Wetlands Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region Version 2.0* (2010). The Routine Determination Method examines three parameters – vegetation, hydrology, and soils – to determine if wetlands exist in a given area. Hydrology is critical in determining what is wetland but is often difficult to assess because hydrologic conditions can change periodically (hourly, daily, or seasonally). Consequently, it is necessary to determine if hydrophytic vegetation and hydric soils exist, which would indicate that water is present for a duration that is long enough to support a wetland plant community. By definition, wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands are regulated as “Waters of the United States” by the US Army Corps of Engineers (USACE), as “Waters of the State” by the Washington Department of Ecology (WDOE), and locally by *City of Camas Municipal Code (CMC), Wetlands Chapter 16.53*.

ELS biologists evaluated the project site and immediate vicinity (within 300-feet) for jurisdictional wetlands and other critical areas on several occasions over 2013 and 2014. Wetland and stream boundaries were determined through breaks in topography, changes in vegetation, and evidence of surface or subsurface hydrology and were delineated onsite using a Trimble GPS handheld receiver. Vegetation, soil, and hydrology data were collected in test plots to verify the presence or absence of wetlands (Appendix A). Individual Oregon white oak (*Quercus garryana*) trees were also mapped using a Trimble GPS handheld receiver.

SITE CONDITIONS

The project site is located north of NE Goodwin Road/NE 28th Street and east of NE Ingle Road (Figure 2). The Phase 1 Subdivision is proposed within the northern portion of the active Green Mountain Golf Course. The Phase 1 site boundary consists of approximately 53.0 acres and is divided into two general areas described as “onsite” and “adjacent” and are discussed in the following sections of this report.

ONSITE CRITICAL AREAS

The majority of the Phase 1 site boundary is located within existing open groomed fairways, paved parking lot, and a clubhouse structure associated with the active golf course. The topography is gently to moderately sloping to the south-southwest towards NE Goodwin Road and NE Ingle Road. Green Mountain is located offsite to the northeast. A 100-foot wide Bonneville Power Administration (BPA) high voltage transmission line easement is located within the central portion of the site (Figures 2 and 8).

No wetlands are located onsite; however, four wetlands (Wetlands B, D, G and O) are located within 300 feet of the project (Figure 2). These wetlands are covered in more detail under the "Adjacent Critical Areas" section.

Four man-made ponds (H, I, and J) are located within the Phase 1 boundary. The man-made ponds located onsite were created to serve as both landscape amenities and irrigation purposes associated with the existing golf course. The man-made ponds have engineered slopes, rubber liners, and are fully maintained only for irrigation and landscape amenity. An irrigation piping system connects the water features to a pump house (south of the project area). This irrigation system is utilized by the golf course during the dry months of the year. Man-made Pond H (0.49 acres) is located to the northeast of the parking and clubhouse area and along the western edge of the golf course trail system. Man-made Pond I (0.73 acres) is located to the northwest of the parking and clubhouse area and parallels the main entrance to the golf course. Man-made Pond J (0.15 acres) is located to the south of the main entrance to the golf course and man-made Pond I.

Three man-made ditches (Q, R and S) are located within the Phase 1 project boundary. Man-made Ditch Q (0.38 acres in total size) consists of three sections. The three sections of ditch were excavated from uplands by the golf course to convey drainage/runoff to Wetland G. The northern section of ditch conveys hydrology south within a channel running north/south parallel to the property boundary. The eastern section of ditch conveys hydrology west within a channel running east-west parallel to the property boundary. The southern section of ditch conveys hydrology collected from where the northern and eastern sections of ditch converge at the property boundary corner by a ditch, then flowing southwest where it outfalls to Wetland G. Man-made Ditch R (0.07 acres) is located in the northeast corner of the project site. The ditch was excavated from uplands to catch seasonal run-off from the steep south-facing slope of Green Mountain. The ditch system was excavated to divert the hillside run-off to catch-basins located along the eastern edge of the existing tree-abutting the northeast corner of the active golf course. The run-off conveyed from man-made Ditch R is piped underground and southwesterly from these catch basins under the adjacent fairway and into the golf course drainage system. Man-made Ditch S (0.15 acres) is located directly east of the parking lot and clubhouse area near the central portion of the project site. This ditch collects stormwater run-off from the adjacent cart path and parking lot before conveying it northwest to a series of catchbasins located within the parking lot. It is ultimately conveyed to and detained in man-made Pond J (Figure 2).

ELS mapped twenty individual Oregon white oak trees within the northwest portion of the project site. The oak habitat is discussed further within the "Oregon White Oak Habitat" section of this report.

ADJACENT CRITICAL AREAS

The City of Camas code section *16.53.030-Critical Area Report*, requires that all wetlands, buffer zones, water features, and other critical areas within 300 feet of the project area (Phase 1 site boundary) be discussed within the critical area report. Wetlands located outside of Phase 1 site boundary, but within 300 feet include Wetlands B, D, G, and O. Wetland B (2.29 acres) is a slope, forested and scrub/shrub wetland that lies along the western edge of the golf course trail system. Wetland D (1.06 acres) is a depressional, emergent and scrub/shrub wetland located to the east of Wetland B and to the north of the golf course trail system. Wetland G (2.91 acres) is a slope, emergent and scrub/shrub wetland located to the west of the parking and clubhouse area. Wetland O (0.03 acres) is a slope, forested and scrub/shrub wetland located west of Man-made Pond J and south of the existing entrance to the golf course.

Stream O is a narrow non-fish bearing seasonal (Type Ns) stream located just west of the Phase 1 site boundary. The stream flows southwest to the roadside ditch along the east side of NE Ingles Road.

Man-made Ditch G (0.26 acres) is located along the southwest flank of Wetland G. This ditch was excavated from uplands when the golf course was originally constructed and serves to receive water from upslope areas.

TREE PRESERVATION

To meet tree retention requirements regulated by the City of Camas, a formal tree survey was performed. An inventory of the onsite tree habitat was tabulated and provided to the City of Camas within Exhibit E of the Development Agreement (DA). See Appendix B for a copy of the "Tree Preservation Plan" to be followed by the Phase 1 project. Additional Tree Preservation Plan details are provided in the "Tree Preservation Plan" section of this report.

OREGON WHITE OAK HABITAT

Oregon white oak habitat was also located onsite by ELS. A total of 20 Oregon white oak trees were inventoried within or immediately adjacent to the Phase 1 project boundary. Out of the twenty (20) total Oregon white oak trees, eight (8) measure 20 inches or greater diameter at breast height (dbh) and therefore are regulated by the Tree Preservation Plan within the Development Agreement, Exhibit E governing the project. Table 1 summarizes the Oregon white oak habitat and locations of individual oaks are depicted on Figures 2 and 7.

Table 1: Oregon white oak tree summary for the Phase 1 project boundary.

Oak #	Diameter at breast height (inches)
1	**25***
2	**22.5***
3	15
4	14.5
5	17.5
6	19.5
7	**31.7***
8a, 8b^	18, 18^
9	**22***
29	12
30	18
55	**21***
57	13
58	**26***
62	18
63	13
64	**25***
121	**26***
122	8
123	10
Total Quantity of Oaks within Phase 1 = 20 Total Jurisdictional Oaks within Phase 1 = 8	

^ Double trunk tree data listed

* Jurisdictional Oregon white oak tree > 20-inches DBH.

SOILS

The Natural Resources Conservation Service (NRCS) designates the soil within Phase 1 site boundary as Dollar loam (DoB) 0-5% slopes (Figure 3). Dollar loam (DoB) 0-5% slopes soils are characterized moderately deep, moderately well drained soil occurring on low ridges next to depressional areas and is not considered hydric (NRCS 2014). ELS field observations generally concur with the NRCS soil mapping.

NRCS soil series data and mapping practices are based on general, regional soil characteristics and may not accurately display variations in the local soil conditions. The presence or absence of hydric soil does not conclude an area as wetland or upland. Along with hydric soils, hydrology and wetland vegetation must also be present to determine an area as jurisdictional wetland. Due to localized, micro-variations in topography and hydrology, wetlands may be found in areas where hydric soils have not been mapped by the soil survey.

VEGETATION

The majority of the Phase 1 project site consists of maintained fairways and greens associated with the active golf course. In the perimeter and rough areas, the following list of dominant vegetation was observed. The indicator categories following the common and scientific names indicate the likelihood of a species to be found in wetlands. Listed from most-likely to least-likely to be found in wetlands, the indicator categories are:

- **OBL** (obligate wetland) – Almost always occur in wetlands.
- **FACW** (facultative wetland) – Usually occur in wetlands, but may occur in non-wetlands.
- **FAC** (facultative) – Occur in wetlands and non-wetlands.
- **FACU** (facultative upland) – Usually occur in non-wetlands, but may occur in wetlands.
- **UPL** (obligate upland) – Almost never occur in wetlands.
- **NI** (no indicator) – Status not yet determined.

Dominant vegetation in the onsite uplands consisted of trailing blackberry (*Rubus ursinus*, FACU), hairy brackenfern (*Pteridium aquilinum*, FACU), Oregon white oak (*Quercus garryana*, FACU), big leaf maple (*Acer macrophyllum*, FACU), colonial bentgrass (*Agrostis capillaris*, FAC), northern bentgrass (*Agrostis borealis*, FACU), snowberry (*Symphoricarpos albus*, FACU), vine maple (*Acer circinatum*, FAC), western swordfern (*Polystichum munitum*, FACU), bitter cherry (*Prunus emarginata*, FACU), cascara (*Frangula purshiana*, FAC), Oregon ash (*Fraxinus latifolia*, FACW), common velvetgrass (*Holcus lanatus*, FAC), tall fescue (*Festuca arundinacea*, FAC), Kentucky bluegrass (*Poa pratensis*, FAC), Canada thistle (*Cirsium arvense*, FAC), red alder (*Alnus rubra*, FAC), Himalayan blackberry (*Rubus armenicus*, FACU), orchardgrass (*Dactylis glomerata*, FACU), perennial ryegrass (*Lolium perenne*, FAC), red clover (*Trifolium pratense*, FACU), black cottonwood (*Populus balsamifera*, FAC), creeping buttercup (*Ranunculus repens*, FAC), beaked hazelnut (*Corylus cornuta*, FACU), geyer willow (*Salix geyeriana*, FACW), Canada thistle (*Cirsium arvense*, FAC), piggy-back plant (*Tolmiea menziesii*, FAC), Pacific ninebark (*Physocarpus capitatus*, FACW), red elderberry (*Sambucus racemosa*, FACU), holly (*Ilex aquifolium*, FACU), Indian plum (*Oemleria cerasiformis*, FACU), and Douglas fir (*Pseudotsuga menziesii*, FACU).

HYDROLOGY

The hydrology within the Phase 1 project site boundary is highly managed by the golf course. Hydrology is contained within four man-made ponds and conveyed through two man-made ditches and a series of pipes and catch-basins throughout the active golf course. Hydrology is supplied primarily by rainfall, surface run-off, and groundwater fed springs and small streams. The man-made ponds were created along with the original golf course to act as landscape amenities. The water levels within the ponds are manipulated as necessary utilizing an engineered system.

NATIONAL WETLAND INVENTORY

The National Wetland Inventory (NWI) map of the Phase 1 area indicates no mapped wetlands within the subject site (Figure 4). National Wetlands Inventory maps are typically used to gather wetland information about a region, and because of the large scale necessary for regional mapping, they are limited in accuracy for localized analyses. ELS field observations found four man-made ponds and one man-made ditch located onsite which were not mapped by NWI.

PRIORITY HABITATS AND SPECIES MAPPING

The Washington Department of Fish and Wildlife (WDFW) maps priority Oregon white oak (*Quercus garryana)* stands and cave habitat within 300 feet of the Phase 1 project boundary. A biodiversity area and corridor is mapped by the WDFW northeast of the project site consisting of large mature conifer forest (Figure 7).

Clark County Geographic Information System (CCGIS) maps one wetland, one stream, one floodway, and a non-riparian habitat conservation area within or adjacent to the Phase 1 project boundary (Figure 5).

According to the confidential Washington State Department of Natural Resources (DNR) Natural Heritage Information obtained by ELS from the DNR, two state threatened species, dense sedge (*Carex densa*) and Hall's aster (*Symphyotrichum hallii*) and one state and federally endangered species, Bradshaw's lomatium (*Lomatium bradshawii*), have been documented in the vicinity of the subject site.

WILDLIFE

A wide variety of wildlife has been observed by ELS during the recent and previous 2009 field investigations at the project site. Although no formal wildlife survey was completed, ELS has observed medium and small mammals, birds, reptiles, amphibians, and invertebrates that utilize or inhabit the subject site.

CRITICAL AREAS SUMMARY

Critical Areas

No wetlands or streams are located within the proposed Phase 1 development (Figure 2). ELS identified twenty (20) individual Oregon white oak trees within the proposed Phase 1 development. Eight (8) of the Oregon white oak trees identified onsite are 20-inches DBH or greater and are therefore regulated by the City of Camas) within the Phase 1 boundary (Table 1; Figure 2).

Priority Habitat and Species

ELS field findings generally concur with the WDFW oak presence, as Oregon white oak habitat was identified onsite. ELS does not concur with the WDFW cave habitat or biodiversity areas as mapped by WDFW or DNR (confidential mapping). ELS did not identify cave or biodiversity habitat within the Phase 1 project boundary or the immediate vicinity. ELS does recognize the potential for cave rich habitat and biodiversity areas (large mature conifer forest habitat) across the other undisturbed portions of the Green Mountain formation outside of the Phase 1 project boundary, but after an intensive field review no caves or undisturbed mature conifer forests were located within the Phase 1 project boundary or the immediate vicinity. Additionally, ELS does not concur with the biodiversity mapping directly east of the Phase 1 project boundary, as this area has been historically logged, evidence of which is visible on recent Google aerial photos (Appendix C).

ELS field findings do not concur with the CCGIS mapping. The CCGIS-mapped wetland was confirmed by ELS to be Man-made Pond H. The CCGIS-mapped stream is not present onsite and is therefore inaccurately mapped. The CCGIS-mapped floodway is located within the same location as Man-made Pond I. The CCGIS non-riparian habitat conservation area mapped boundary northeast of the project site is not entirely accurate. ELS assumes that the WDFW biodiversity area mentioned above and the CCGIS non-riparian habitat conservation area are meant to represent generally the same habitat.

ELS did not identify the presence of rare state threatened plant species or federal endangered plant species within the Phase 1 project boundary during field work investigations conducted over 2013 and 2014.

Adjacent Wetland Buffers

The base buffer widths for the jurisdictional Category III wetlands (B, D, G, and O) located outside of the Phase 1 boundary, but within 300-feet of the project were determined using *CMC 16.53.040(B)* (Table 2). The base buffer width for Category III wetlands with a habitat function score equal to (or less than) 20 points and with a high land use intensity development is 80 feet. Category III Wetlands B, D, and G require a base buffer of 80 feet for the high intensity land use development proposed. The base buffer width for Category IV wetlands with high intensity land use development is 50 feet. Category IV Wetland O requires a base buffer of 50 feet.

Table 2: Wetland Buffer Summary.

Wetland Name	Category	Base Buffer Width with High Land Use
Wetland B	III	80
Wetland D	III	80
Wetland G	III	80
Wetland O	IV	50

Note: Base buffer widths per *CMC 16.53.040(B)*, (Table 2).

Stream Habitat

The ordinary high water mark (OHWM) of Stream O was delineated onsite and determined to be a non-fish bearing seasonal (Type Ns) stream and is regulated locally by *CMC 16.61*. According to *CMC 16.61.040(D)*, Stream O (Type Ns) requires a 25-foot base buffer.

Stream buffer widths can be reduced according to *CMC 16.61.040(D)(2)*. Buffer reduction options must comply with *CMC* by ensuring that the reduction does not reduce stream functions, the width is not reduced by more than 50 percent or to less than 15 feet, and that the reduction is not within another critical area. According to *CMC 16.61.040(D)(2)(f)*, stream buffers may be averaged if conducted in consultation with a qualified biologist and submitted to WDFW for comment.

Table 3: Stream Buffer Summary.

Stream Name	Classification	Base Buffer Width with High Land Use
Stream O	Type Ns	25

Man-Made Ponds and Ditches

ELS delineated three man-made ponds (H, I, and J) and four man-made ditches (G, R, S, and Q) on or adjacent to the project site (Figure 2). Rubber-lined and man-made ponds are considered non-jurisdictional by the City of Camas. These man-made aquatic features are exempt according to *CMC 16.53.010(C)(2)(b): Artificial. 'Wetlands created from non-wetland sites including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, stormwater facilities, farm ponds, and landscape amenities,*" and do not require buffers. The ponds and ditches associated with the golf course are not present on a 1990 Google Earth aerial photo of the project site (Figure 10); however, the ponds are present in a 2002 Google Earth aerial photo (Figure 11). Man-made Ditches G, R, S and Q are considered man-made drainage ditches excavated from uplands and therefore, are exempt according to *CMC 16.53.010(C)(2)* and do not require buffers.

Oregon White Oak Habitat

Oregon white oak individual trees exist throughout the subject site and are addressed in the Tree Preservation Plan within the Development Agreement governing the project site. See Figures 2, 9 and Appendix B.

BUFFER MODIFICATION

Buffer Averaging

Averaging of wetland buffer area for no net loss of area or function is allowed by *CMC 16.53.050(C)(2)* The project proposes to average the buffers and comply with the minimum buffer widths required by *CMC 16.53.050(C)(2)(c)*.

Buffer averaging is allowed by CMC 16.53.050(2) when the following criteria are adhered to:

1. CMC 16.53.050 (C)(2(a) - The total area contained in the buffer after averaging is no less than that contained within the buffer prior to averaging;
2. CMC 16.53.050 (C)(2)(b) - Decreases in width are generally located where wetland functions may be less sensitive to adjacent land uses, and increases are generally located where wetland functions may be more sensitive to adjacent land uses, to achieve no net loss or a net gain in functions;
3. CMC 16.53.050 (C)(2)(c)- The averaged buffer, at its narrowest point, shall not result in a width less than seventy-five percent of the required width, provided that minimum buffer widths shall never be less than fifty feet for all Category I, Category II, and Category III wetlands, and twenty-five feet for all Category IV wetlands; and
4. CMC 16.53.050 (C)(2)(d) - Effect of Mitigation. If wetland mitigation occurs such that the rating of the wetland changes, the requirements for the category of the wetland after mitigation shall apply.

The project complies with the above criteria in the following ways:

1. The total area contained in the buffer after averaging is no less than that contained within the buffer prior to averaging. The buffer averaging "IN" (or replacement buffer area) matches the buffer averaging "OUT" area for Wetlands G, O and D (where averaging is proposed) Therefore, no net decrease in buffer area from that prior to averaging the base buffer width is proposed by the project (Figure 9).

The lot encroachment within 218 square feet of the 80-foot base buffer along the eastern boundary of Wetland D is proposed to allow construction of one residential lot (Lot #160). The buffer modification provides more than the 50-foot minimum buffer (60 feet) and replaces the encroachment area at a 1:1 replacement ratio by averaging. The buffer averaging proposed to offset the encroachment into the Wetland D buffer is 218 square feet. The buffer replacement area proposed consists of removing a section of existing golf course cartpath within the 80-foot base buffer that currently interrupts the buffer with impervious surface and therefore functionally isolates this portion of the southern Wetland D buffer, Figure 9. Therefore, the project proposes no net decrease in buffer area. The buffer averaging area is located within the same wetland as the impact, and provides an expansion in the buffer area that has not been present since construction of the golf course. The area directly south of this buffer replacement area is proposed as open green space.

The lot encroachment within 2,484 square feet of the 50-foot base buffer along the southern boundary of Wetland O is proposed to allow construction of three residential lots. The buffer modification will allow for the 25-foot minimum buffer, while replacing the encroachment area at a 1:1 replacement ratio by averaging 2,484 square feet. Therefore, the project proposes no net decrease in buffer area. The buffer averaging area is located within the same habitat corridor as Wetland O, and expands the narrow Stream O buffer to allow greater protection for both Wetland O and Stream O.

The encroachment of road (NE C Street), pedestrian trail, paved regional trail and gravel stornmwater access road to the Tract R Stormwater Facility within the 80-foot base buffer of Wetland G consists of 9,894 square feet, see Figure 9. The buffer averaging proposed to offset the encroachment into the Wetland G buffer while maintaining the 50-foot minimum buffer allowance is 9,894 square feet. No net loss of area is proposed for the Wetland G buffer onsite.

2. The decreases in buffer width are located within the outer portion of the buffer and within locations where the existing buffer is low functioning as part of the active golf course maintained grass fairway. Little to no function is provided to the adjacent wetlands by the buffer averaging areas proposed therefore, no loss of function will result from the buffer averaging proposed onsite. Design alterations avoided impacting wetlands and, stream habitat, and minimized encroachment to the wetland buffers to the full extent possible considering the variety of constraints posed to the site – wetlands, buffers, streams, Oregon white oak habitat, and the presence of the Bonneville Power Administration (BPA) overhead towers and lines that bisect the site.

3. The minimum buffer width of 50 feet for the Category III Wetland G, and 25 feet for the Category IV Wetland O associated with the project has been met (Figure 9).

4. No mitigation to offset wetland fill is required or proposed by the project. The current wetland categories will not be altered by the proposed project.

Table 4. Minimum Buffer Widths Allowed with Buffer Modification.

Wetland Name	Category	Base Buffer Width at High Land Use	Minimum Buffer Width Allowed with Buffer Modification
Wetland B	III	80	50
Wetland D	III	80	50
Wetland G	III	80	50
Wetland O	IV	50	25

NOTE: Buffer width modification from base buffer width to minimum buffer width allowed per CMC 16.53.050(C)(2)(c) Buffer Averaging and CMC 16.53.050(C)(1)(c) Combined Reductions.

Buffer Reduction with Enhancement

Combined reductions are allowed by *CMC 16.53.050(C)(c)* provided that the minimum buffer widths shall never be less than fifty feet for Category III wetlands. The combination of buffer reduction incentives and restoration are proposed for the southern buffer of Wetland D. The 80-foot base buffer will be reduced to the minimum 50-foot buffer allowed by increasing the functions through an enhancement effort. The enhancement effort will consist of invasive species control and the installation of native shrubs within an area dominated by grass and active golf course fairway. The result of the buffer enhancement will allow an increase in wetland buffer function by providing a dense scrub-shrub vegetation community, 50-feet in width between Wetland D and the proposed lots. The native shrub enhancement proposed has been designed to mimic an Oregon white oak understory vegetation community due to the Oregon white oak mitigation proposed within the same buffer. The total native shrub understory enhancement area proposed by the 50-foot buffer enhancement is approximately 11,768 square feet in size (Figure 9). Plant specifications are listed in Table 5.

Table 5. Wetland D Southern Buffer Enhancement.

Common Name	Scientific Name	Stock Size	Spacing	Quantity
Beaked hazelnut	*Corylus cornuta*	1 gallon, container	6 feet	80
Common snowberry	*Symphoricarpos albus*	1 gallon, container	6 feet	80
Nootka rose	*Rosa nutkana*	1 gallon, container	6 feet	80

Western swordfern	*Polystichum munitum*	1 gallon, container	6 feet	80
			Total =	320

The buffer enhancement area will be maintained and monitored for a period of 5-years following installation per the guidance listed in *CMC 16.53.050(E)(3)(d).*

Maintenance is to consist of invasive species control by mowing activities or herbicide application performed by a licensed herbicide applicator. Total percent cover of invasive species is to remain below 20-percent for the duration of the monitoring period. Invasive species presence is to be determined by ocular estimation across the buffer enhancement area and recorded in annual monitoring reports.

Monitoring activities are to consist of establishing two random monitoring plots across the buffer enhancement area. Vegetation density and cover data is to be collected from 15-foot minimum radius monitoring plots permanently established within the buffer enhancement area. A one hundred percent survival rate is required Year 1. By Year 5, the percent cover of the native shrub cover shall be 25-percent minimum. If by Year 5, or at any point the monitoring data determines that the buffer enhancement area is not on track to meet the Year 5 performance standard, a contingency plan must be created and implemented to ensure the native shrub cover is meeting the outlined criteria. Monitoring reports are to be submitted to the City of Camas by December 31 of each year associated with the 5-year monitoring period.

Stormwater Facility Allowance Within Wetland Buffers

A fill slope associated with the Trace Q Stormwater Facility is proposed within a portion of the Wetland G buffer. Stormwater facilities are allowed within the buffer of wetlands by *CMC 16.53.050(3)* when the following criteria are met:

1. *The associated wetland with low habitat function (less than twenty points on the habitat section of the rating system form),*
2. *The stormwater facility is built on the outer edge of the buffer and does not degrade the existing buffer function,*
3. *The stormwater facility is designed to blend with the natural landscape.*

The project complies with the above criteria in the following ways;

1. Wetland G scored 17 points on the habitat section of the rating system form), meeting the criteria for low habitat function.
2. The stormwater facility will be built on the outer edge of the buffer. The stormwater facility is proposed within the outer 30-feet of the 80-foot base buffer. The facility is further located within an area of buffer currently utilized and maintained as an active golf course. The buffer functions provided post-project will be equal to or greater than the functions currently present and therefore not degrade the existing buffer functions. The current buffer consists of monotypic grass that is maintained and fertilized as part of the actively groomed golf course fairway. Post development, the buffer habitat will not be maintained to the golf course standards, therefore allowing the dedicated open space to

naturally colonize with native trees, shrubs, and herbaceous groundcover. The reduction in maintenance operations across the buffer habitat will lead to more diverse and dense vegetation structure, which will provide higher function to the adjacent critical area habitat. Allowing natural recruitment of native vegetation within the buffers or outer perimeter of the wetland will also lead to wider habitat corridors over time with the growth of additional canopy cover etc. than currently present.

3. The stormwater facility will be constructed within an area dominated by grass within the active golf course fairway. By utilizing this open and fairly flat area of the site, the facility will not take away from the natural landscape. The proposed impervious surface of the maintenance access road has utilized the existing functionally isolated buffer associated with the golf course gravel cart path, (Figure 9). Functionally isolated buffer areas are defined by C*MC 16.53.050(B)(4)(b)* as areas that are functionally separated from a wetland, areas that do not protect the wetland from adverse impacts and generally consists of preexisting roads, structures or vertical separation. The golf course cart path meets the definition of a functionally isolated buffer and was utilized to minimize impacts to the wetland buffer and the overall existing landscape.

TREE PRESERVATION PLAN

The non Oregon white oak trees proposed for removal by the Phase 1 project have been inventoried and accounted for as part of the Development Agreement (DA) Exhibit E - Tree Preservation Plan (Appendix B). The Tree Preservation Plan encompasses the entire Green Mountain Land, LLC (GML) ownership area (approximately 200+ acres) as future development of the area surrounding Phase 1 is proposed by the landowner, GML. The GML ownership was divided into five "zones" that identify five distinct areas of future development. The zones were established to assure that acceptable numbers of trees were preserved throughout the property, not just in one isolated area rendering the remaining portions of the site bare of trees. The percentage of trees protected in a given zone varies from 34 percent to 77 percent, with the net result being that at least 50 percent of the existing trees across the overall property ownership will be preserved.

The Tree Preservation Plan outlines that Zone C will consist of development pods B1, B2, B3, C1, C2, D1, D2, D3, and E1 and will preserve 488 trees out of the 1,454 trees inventoried within the zone to provide a preservation of 34 percent of the trees within the zone. The Phase 1 development consists of all of the development pods listed under Zone C except B1, B2 and B3. That remaining area contains only 222 trees. The Phase 1 development fully complies with the Tree Preservation Plan, and with the future removal of the additional 222 trees when the remaining pods within the zone are developed, Zone C will still meet the full retention quantity of 488 trees (Figure 8 and Appendix B).

Oregon White Oak Impacts and Mitigation

The project design team worked to retain oak trees by altering the Phase 1 development and associated green space boundaries. Out of the twenty total Oregon white oak trees inventoried within the Phase 1 boundary, eight could not be avoided by the project (Figure 9). The eight individual Oregon white oak trees to be impacted consist of the following oak tree numbers as referenced in Table 1 and depicted on Figure 9; Oak Tree Numbers – 1, 2, 7, 9, 121, 55, 58, 64, and 121. The oak impacts will be mitigated for following the Development Agreement (DA) Exhibit E - Tree Preservation Plan (Appendix B). Mitigation for the eight Oregon white oak trees will consist of installing 1.5-inch caliper minimum stock replacement oaks at a 2:1 replacement ratio, for a total of sixteen replacement Oregon white oak trees. The oak mitigation for Phase 1 oak impacts is proposed within the wetland buffer associated with Wetlands D over an area approximately 6,526 square feet in size to allow for 20-foot spacing of the sixteen trees allowing for mature canopy growth in the future (Figure 9).

The Oregon white oak mitigation area will be maintained and monitored for a period of 5-years. Maintenance activities are to consist of controlling invasive species with mowing activities or herbicide application performed by a licensed herbicide applicator. Total percent cover of invasive species is to remain below 20-percent for the duration of the monitoring period. Invasive species presence is to be determined by ocular estimation across the oak mitigation site and recorded in annual monitoring reports. Monitoring activities are to consist of providing an individual stem count for the Oregon white oak replacement trees specified for installation within the southern buffer of Wetland D and site photos showing the health of the oak trees. A one hundred percent survival rate (or sixteen trees in total) is required for the duration of the monitoring period. If at any point monitoring, identifies mortality or stressed oak trees, a contingency plan must be created and implemented. Monitoring reports are to be submitted to the City of Camas by December 31 of each year associated with the 5-year monitoring period.

LIMITATIONS

The opinions and recommendations contained in this report apply to conditions existing when services were performed. ELS is not responsible for the impacts of any changes in environmental standards, practices, or regulations after the date of this report. ELS does not warrant the accuracy of supplemental information incorporated in this report that was supplied by others. This report is prepared solely for the use of our client and may not be used or relied upon by a third party for any purpose. Any such use or reliance will be at such party's risk.

The services described in this report were consistent with our agreement with our client and performed consistent with generally accepted professional consulting principles and practices. ELS personnel base the above listed conclusions on standard scientific methodology and best professional judgment. In our opinion, local, state, and federal regulatory agencies should agree with the findings presented in this report. There are no other warranties, express or implied.

References

City of Camas Municipal Code. 2008. *Critical Areas Ordinance. Chapter 16.61 – Fish and Wildlife Conservation Areas.* September 2014.

City of Camas Municipal Code. 2008. *Critical Areas Ordinance Chapter 16.53 – Wetlands.* September 2014.

Clark County GIS. 2004. Maps Online. Online mapping system. http://gis.clark.wa.gov/ccgis/mol//startHabitat.htm. Accessed September 2014.

Cowardin, L.M., C. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. FWS/OBS-87/31. U.S. Department of the Interior, Fish and Wildlife Service, Office of Biological Services, Washington, D.C.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1. U.S. Army Waterways Experiment Station, Vicksburg, Mississippi.

Hruby, T. 2004. *Washington State Wetlands Rating System for Western Washington - Revised*. Washington State Department of Ecology Publication #93-74. Olympia, Washington.

Larsen, E. M., and J. T. Morgan. 1998. *Management recommendations for Washington's priority habitats: Oregon white oak woodlands*. Wash. Dept. Fish and Wildlife, Olympia. 37pp.Natural

Natural Resource Conservation Service (NRCS). 2012. *Soil Survey of Clark County, Washington*. Online document <http://www.or.nrcs.usda.gov/pnw_soil/wa_reports.html>. Website accessed September 2014.

U.S. Army Corps of Engineers. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)*, ed. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-08-13. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

Washington Department of Fish and Wildlife (WDFW). 2013. *Habitats and Species Report in the Vicinity of T03R01E Section 25*. Olympia, Washington.

EXHIBIT 48

APPENDIX A

WETLAND RATING FORMS AND DATA SHEETS
(WETLANDS B, D, G AND O)

WETLAND RATING FORM – WESTERN WASHINGTON

Version 2 – Updated July 2006 to increase accuracy and reproducibility among users

Name of wetland (if known): Wetland B   Date of site visit: Oct. 2013

Rated by A. Aberle   Trained by Ecology? Yes X No_____   Date of Training: Oct. 2006

SECTION: 20 TOWNSHIP: 2N RANGE: 3E Is S/T/R in Appendix D? Yes X No__

Map of wetland unit: Figure___ Estimated size 2.29 acres

DRAFT SUMMARY OF RATING

Category based on FUNCTIONS provided by wetland

I ___ II ___ III X IV ___

Category	Functions	Score
Category I = Score >=70	Score for Water Quality Functions	14
Category II = Score 51-69	Score for Hydrologic Functions	5
Category III = Score 30-50	Score for Habitat Functions	19
Category IV = Score < 30	**TOTAL Score for functions**	38

Category based on SPECIAL CHARACTERISTICS of wetland

I _____ II _____ Does not Apply X

Final Category **(choose the "highest" category from above)** III

Check the appropriate type and class of wetland being rated.

Wetland Type		Wetland Class	
Estuarine		Depressional	
Natural Heritage Wetland		Riverine	
Bog		Lake-fringe	
Mature Forest		Slope	X
Old Growth Forest		Flats	
Coastal Lagoon		Freshwater Tidal	
Interdunal			
None of the above	X	Check if unit has multiple HGM classes present	

Comments

Does the wetland being rated meet any of the criteria below?

If you answer YES to any of the questions below you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands That Need Additional Protection (in addition to the protection recommended for its category)	YES	NO
SP1. *Has the wetland been documented as a habitat for any Federally listed Threatened or Endangered* ***animal*** *or* ***plant*** *species (T/E species)?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.		X
SP2. *Has the wetland unit been documented as habitat for any State listed Threatened or Endangered* ***animal*** *species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category 1 Natural Heritage Wetlands (see p. 19 of data form).		X
SP3. *Does the wetland contain individuals of Priority species listed by the WDFW for the state?*		X
SP4. *Does the wetland have a local significance in addition to its functions?* For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.		X

To complete the next part of the data sheet you will need to determine the Hydrogeomorphic Class of the wetland being rated.

The hydrogeomorphic classification groups wetlands into those that function in similar ways. This simplifies the questions needed to answer how well the wetland functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 24 for more detailed instructions on classifying wetlands.

Comments Formal priority and habitat species request has been completed.

Classification of Wetland Units in Western Washington

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the wetland usually controlled by tides (i.e. except during floods)?

☒NO – go to 2 ☐**YES** – the wetland class is **Tidal Fringe**

If yes, is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)? ☐ **YES – Freshwater Tidal Fringe** ☐**NO – Saltwater Tidal Fringe (Estuarine)**

*If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is rated as an **Estuarine** wetland.* Wetlands that were called estuarine in the first and second editions of the rating system are called Salt Water Tidal Fringe in the Hydrogeomorphic Classification. Estuarine wetlands were categorized separately in the earlier editions, and this separation is being kept in this revision. To maintain consistency between editions, the term "Estuarine" wetland is kept. Please note, however, that the characteristics that define Category I and II estuarine wetlands have changed (see p.).

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

☒NO – go to 3 ☐**YES** – The wetland class is **Flats**

If your wetland can be classified as a "Flats" wetland, use the form for **Depressional** wetlands.

3. Does the wetland **meet both** of the following criteria?

☐ The vegetated part of the wetland is on the shores of a body of open water (without any vegetation on the surface) at least 20 acres (8 ha) in size;

☐ At least 30% of the open water area is deeper than 6.6 ft (2 m)?

☒NO – go to 4 ☐**YES** – The wetland class is **Lake-fringe (Lacustrine Fringe)**

4. Does the wetland **meet all** of the following criteria?

☒ The wetland is on a slope (*slope can be very gradual*),

☒ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.

☒ The water leaves the wetland **without being impounded**?

NOTE: *Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks(depressions are usually <3ft diameter and less than 1 foot deep).*

☐NO - go to 5 ☒**YES** – The wetland class is **Slope**

Comments

5. Does the entire wetland unit **meet all** of the following criteria?

☐ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river

☐ The overbank flooding occurs at least once every two years.

NOTE: The riverine unit can contain depressions that are filled with water when the river is not flooding.

☐NO - go to 6 ☐ **YES** – The wetland class is **Riverine**

6. Is the wetland in a topographic depression in which water ponds, or is saturated to the surface, at some time of the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

☐NO – go to 7 ☐**YES** – The wetland class is **Depressional**

7. Is the wetland located in a very flat area with no obvious depression and no overbank flooding. The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

☐NO – go to 8 ☐ **YES** – The wetland class is **Depressional**

8. Your wetland seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within your wetland. NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM Classes within the wetland unit being rated	*HGM Class to Use in Rating*
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake-fringe	Lake-fringe
Depressional + Riverine along stream within boundary	Depressional
Depressional + Lake-fringe	Depressional
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE under wetlands with special characteristics

If you are unable still to determine which of the above criteria apply to your wetland, or you have more than 2 HGM classes within a wetland boundary, classify the wetland as **Depressional** for the rating.

Comments

S	Slope Wetlands WATER QUALITY FUNCTIONS - Indicators that wetland unit functions to improve water quality	Points (only 1 score per box)
S	**S 1. Does the wetland have the potential to improve water quality?**	(see p. 64)
S	S 1.1 Characteristics of average slope of wetland: Slope is 1% or less *(a 1% slope has a 1 foot vertical drop in elevation for every 100 ft horizontal distance)* .... points = 3 Slope is 1% - 2% points = 2 Slope is 2% - 5% points = 1 Slope is greater than 5% points = 0	1
S	S 1.2 The soil 2 inches below the surface (or duff layer) is clay organic *(use NRCS definitions)* YES = 3 points NO = 0 points	0
S	S 1.3 Characteristics of the vegetation in the wetland that traps sediments and pollutants: *Choose the points appropriate for the description that best fits the vegetation in the wetland. Dense vegetation means you have trouble seeing the soil surface. (<75% cover), and uncut means not grazed or mowed and plants are higher than 6 inches.* Dense, ungrazed, herbaceous vegetation > 90% of wetland area points = 6 Dense, ungrazed, herbaceous vegetation > ½ of area points = 3 Dense, woody vegetation > ½ of area points = 2 Dense, ungrazed, herbaceous vegetation > ¼ of area points = 1 Does not meet any of the criteria above for vegetation points = 0 Aerial photo or map with vegetation polygons	Figure__ 6
S	**Total for S 1** *Add the points in the boxes above*	7
S	**S 2. Does the wetland have the opportunity to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland? *Note which of the following conditions provide the sources of pollutants A unit may have pollutants coming form several sources, but any single source would qualify as opportunity..* ☐ Grazing in the wetland or within 150 ft ☐ Untreated stormwater discharges to wetland ☐ Tilled fields or orchards within 150 feet of wetland ☒ Residential, urban areas, or golf courses are within 150 ft upslope of wetland ☐ Other ____ ☒ YES multiplier is 2 ☐ NO multiplier is 1	(see p. 67) multiplier 2
S	**TOTAL - Water Quality Functions** Multiply the score from S1 by S2 ***Add score to table on p. 1***	14

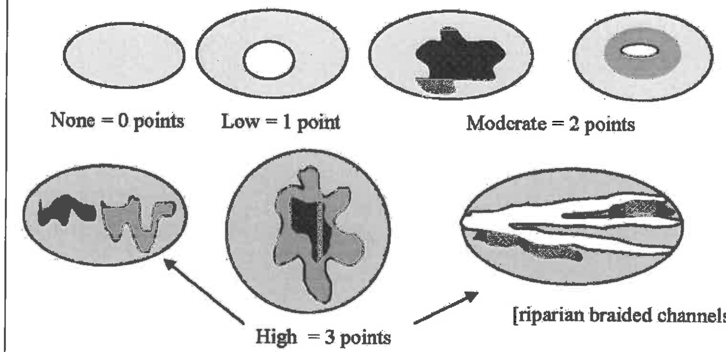
Comments

S	Slope Wetlands HYDROLOGIC FUNCTIONS - Indicators that wetland unit functions to reduce flooding and stream erosion	Points (only 1 score per box)
S	**S 3. Does the wetland have the potential to reduce flooding and erosion?**	(see p. 68)
S	S 3.1 Characteristics of vegetation that reduce the velocity of surface flows during storms. *Choose the points appropriate for the description that best fit conditions in the wetland. (stems of plants should be thick enough (usually> 1/8 in), or dense enough, to remain erect during surface flows)* Dense, uncut, **rigid** vegetation covers >90% of area of the wetland. points = 6 Dense, uncut, **rigid** vegetation >1/2 area of wetland points = 3 Dense, uncut, **rigid** vegetation >1/4 area of wetland points = 1 More than 3/4 of area is grazed, mowed, tilled or vegetation is not rigid points = 0	3
S	S 3.2 Characteristics of slope wetland that holds back small amounts of flood flows: The slope wetland has small surface depressions that can retain water over at least 10% of its area. YES points = 2 NO points = 0	2
S	*Add the points in the boxes above*	5
S	**S 4. Does the wetland have the opportunity to reduce flooding and erosion?** Is the wetland in a landscape position where the reduction in water velocity it provides helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows? *Note which of the following conditions apply.* ☐ Wetland has surface runoff that drains to a river or stream that has flooding problems ☐ Other ____ *Answer NO if the major source of water is controlled by a reservoir (e.g. wetland is a seep that is on the downstream side of a dam.)* ☐YES multiplier is 2 ☒NO multiplier is 1	(see p. 70) multiplier 1
S	**TOTAL - Hydrologic Functions** Multiply the score from S 3 by S 4 ***Add score to table on p. 1***	5

Comments

These questions apply to wetlands of all HGM classes HABITAT FUNCTIONS – Indicators that wetland functions to provide important habitat	**Points** (only 1 score per box)
H 1. Does the wetland have the potential to provide habitat for many species?	
H 1.1 Vegetation structure ***(see p. 72)*** *Check the types of vegetation classes present (as defined by Cowardin)- Size threshold for each class is ¼ acre or more than 10% of the area if unit is smaller than 2.5 acres.* ☐ Aquatic bed ☐ Emergent plants ☒ Scrub/shrub (areas where shrubs have >30% cover) ☒ Forested (areas where trees have >30% cover) *If the unit has a forested class check if:* ☒ Forested areas have 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the forested polygon *Add the number of vegetation types that qualify. If you have:* 4 types or more — points = 4 3 types — points = 2 2 types — points = 1 1 type — points = 0 Map of Cowardin vegetation classes	Figure__ 2
H 1.2 Hydroperiods ***(see p. 73)*** *Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ acre to count. (See text for description of hydroperiods.)* ☐ Permanently flooded or inundated — 4 or more types present — points = 3 ☒ Seasonally flooded or inundated — 3 types present — points = 2 ☒ Occasionally flooded or inundated — 2 types present — points = 1 ☒ Saturated only ☐ Permanently flowing stream or river in, or adjacent to, the wetland ☐ Seasonally flowing stream or river in, or adjacent to, the wetland ☐ ***Lake-fringe wetland* = 2 points** ☐ ***Freshwater tidal wetland* = 2 points**	Figure__ 2
H 1.3 Richness of Plant Species ***(see p. 75)*** Count the number of plant species in the wetland that cover at least 10 ft^2. *(Different patches of the same species can be combined to meet the size threshold.)* *You do not have to name the species.* *Do not include Eurasian Milfoil, reed canarygrass, purple loosestrife, Canadian Thistle.* If you counted: > 19 species — points = 2 5 - 19 species — points = 1 <5 species — points = 0 *List species below if you want to:*	2

Total for page 6

H 1.4 Interspersion of habitats ***(see p. 76)*** Decide from the diagrams below whether interspersion between Cowardin vegetation classes (described in H 1.1), or classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.  NOTE: If you have four or more classes or three vegetation classes and open water the rating is always "high". Use map of Cowardin vegetation classes	Figure__ 2
H 1.5 Special Habitat Features: ***(see p. 77)*** *Check the habitat features that are present in the wetland. The number of checks is the number of points you put into the next column.* ☒ Large, downed, woody debris within the wetland (>4in. diameter and 6 ft long). ☒ Standing snags (diameter at bottom >4 inches) in the wetland ☐ Undercut banks are present for at least 6.6 ft. (2m) and/or overhanging vegetation extends at least 3.3 ft (1m) over a stream (or ditch) in, or contiguous with the unit, for at least 33 ft (10m) ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30 degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet turned grey/brown)* ☐ At least ¼ acre of thin-stemmed persistent vegetation or woody branches are present in areas that are permanently or seasonally inundated *(structures for egg-laying by amphibians)* ☒ Invasive plants cover less than 25% of the wetland area in each stratum of plants *Note: The 20% stated in early printings of the manual on page 78 is an error*	3
H 1. TOTAL Score – potential for providing habitat *Add the scores from H1.1, H1.2, H1.3, H1.4, H1.5*	11

Comments:

H 2. Does the wetland have the opportunity to provide habitat for many species?)	
H 2.1 Buffers *(see p. 80)* *Choose the description that best represents condition of buffer of wetland. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed."* ☐ 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% of circumference. No structures are within the undisturbed part of buffer. (relatively undisturbed also means no grazing, no landscaping, no daily human use) Points = 5 ☐ 100 m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water >50% circumference. **Points = 4** ☐ 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% circumference. **Points = 4** ☐ 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water >25% circumference. **Points = 3** ☒ 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water for > 50% circumference. **Points = 3** **If buffer does not meet any of the three criteria above** ☐ No paved areas (except paved trails) or buildings within 25 m (80ft) of wetland > 95% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** ☐ No paved areas or buildings within 50m of wetland for >50% circumference. Light to moderate grazing or lawns are OK **Points = 2** ☐ Heavy grazing in buffer. **Points = 1** ☐ Vegetated buffers are <2m wide (6.6ft) for more than 95% of the circumference (e.g. tilled fields, paving, basalt bedrock extend to edge of wetland) **Points = 0** ☐ Buffer does not meet any of the criteria above. **Points = 1** Aerial photo showing buffers	Figure__ 3
H 2.2 Corridors and Connections *(see p. 81)* H 2.2.1 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 150 ft wide, has at least 30% cover of shrubs, forest or native undisturbed prairie, that connects to estuaries, other wetlands or undisturbed uplands that are at least 250 acres in size? *(dams in riparian corridors, heavily used gravel roads, paved roads, are considered breaks in the corridor).* ☐YES = **4 points** *(go to H 2.3)* ☒NO = go to H 2.2.2 H 2.2.2 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 50ft wide, has at least 30% cover of shrubs or forest, and connects to estuaries, other wetlands or undisturbed uplands that are at least 25 acres in size? **OR a Lake-fringe** wetland, if it does not have an undisturbed corridor as in the question above? ☒YES = **2 points** *(go to H 2.3)* ☐NO = H 2.2.3 H 2.2.3 Is the wetland: within 5 mi (8km) of a brackish or salt water estuary OR within 3 mi of a large field or pasture (>40 acres) OR within 1 mi of a lake greater than 20 acres? ☐YES = **1 point** ☐NO = **0 points**	2

Total for page_5_

H 2.3 Near or adjacent to other priority habitats listed by WDFW *(see p. 82)* Which of the following priority habitats are within 330ft (100m) of the wetland? *(NOTE: the connections do not have to be relatively undisturbed.* *These are DFW definitions. Check with your local DFW biologist if there are any questions* ☐ **Riparian:** The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other. ☐ **Aspen Stands:** Pure or mixed stands of aspen greater than 0.8 ha (2 acres). ☐ **Cliffs:** Greater than 7.6 m (25 ft) high and occurring below 5000 ft. ☐ **Old-growth forests:** (Old-growth west of Cascade crest) Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 20 trees/ha (8 trees/acre) > 81 cm (32 in) dbh or > 200 years of age. ☐ **Mature forests:** Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80 - 200 years old west of the Cascade crest. ☐ **Prairies:** Relatively undisturbed areas (as indicated by dominance of native plants) where grasses and/or forbs form the natural climax plant community. ☐ **Talus:** Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs. ☐ **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages ☐ **Oregon white Oak:** Woodlands Stands of pure oak or oak/conifer associations where canopy coverage of the oak component of the stand is 25%. ☐ **Urban Natural Open Space:** A priority species resides within or is adjacent to the open space and uses it for breeding and/or regular feeding; and/or the open space functions as a corridor connecting other *priority habitats*, especially those that would otherwise be isolated; and/or the open space is an isolated remnant of natural habitat larger than 4 ha (10 acres) and is surrounded by urban development. ☐ **Estuary/Estuary-like:** Deepwater tidal habitats and adjacent tidal wetlands, usually semi-enclosed by land but with open, partly obstructed or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The salinity may be periodically increased above that of the open ocean by evaporation. Along some low-energy coastlines there is appreciable dilution of sea water. Estuarine habitat extends upstream and landward to where ocean-derived salts measure less than 0.5ppt. during the period of average annual low flow. Includes both estuaries and lagoons. ☐ **Marine/Estuarine Shorelines:** Shorelines include the intertidal and subtidal zones of beaches, and may also include the backshore and adjacent components of the terrestrial landscape (e.g., cliffs, snags, mature trees, dunes, meadows) that are important to shoreline associated fish and wildlife and that contribute to shoreline function (e.g., sand/rock/log recruitment, nutrient contribution, erosion control). If wetland has **3 or more** priority habitats = **4 points** If wetland has **2** priority habitats = **3 points** If wetland has **1** priority habitat = **1 point** No habitats = 0 points *Note: All vegetated wetlands are by definition a priority habitat but are not included in this list. Nearby wetlands are addressed in question H 2.4)*	0

H 2.4 Wetland Landscape *(choose the **one** description of the landscape around the wetland that best fits) (see p. 84)* There are at least 3 other wetlands within ½ mile, and the connections between them are relatively undisturbed (light grazing between wetlands OK, as is lake shore with some boating, but connections should NOT be bisected by paved roads, fill, fields, or other development. points = 5 The wetland is Lake-fringe on a lake with little disturbance and there are 3 other lake-fringe wetlands within ½ mile points = 5 There are at least 3 other wetlands within ½ mile, BUT the connections between them are disturbed points = 3 The wetland is Lake-fringe on a lake **with** disturbance and there are 3 other lake-fringe wetlands within ½ mile points = 3 There is at least 1 wetland within ½ mile. points = 2 There are no wetlands within ½ mile. points = 0	3
H 2. TOTAL Score -opportunity for providing habitat *Add the scores in the column above*	8
TOTAL for H 1 from page 14	11
Total Score for Habitat Functions – add the points for H 1, H 2 and record the result on p. 1	**19**

Comments

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate answers and Category.

Wetland Type *Check off any criteria that apply to the wetland. Select the appropriate Category (from dropdown menu in Category column) when the appropriate criteria are met.*	Category
SC 1.0 Estuarine wetlands *(see p. 86)* Does the wetland meet the following criteria for Estuarine wetlands? ☐ The dominant water regime is tidal, ☐ Vegetated, and ☐ With a salinity greater than 0.5 ppt. ☐YES = Go to SC 1.1 ☒NO	
SC 1.1 Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? ☐YES = Category I ☒NO go to SC 1.2	Cat. I
SC 1.2 Is the wetland at least 1 acre in size and meets at least two of the following three conditions? YES = Category I NO = Category II ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. If the non-native *Spartina* spp. are the only species that cover more than 10% of the wetland, then the wetland should be given a dual rating (I/II). The area of Spartina would be rated a Category II while the relatively undisturbed upper marsh with native species would be a Category I. Do not, however, exclude the area of Spartina in determining the size threshold of 1 acre. ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland has at least 2 of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands.	Cat. I Cat. II Dual rating I/II

SC 2.0 Natural Heritage Wetlands *(see p. 87)* Natural Heritage wetlands have been identified by the Washington Natural Heritage Program/DNR as either high quality undisturbed wetlands or wetlands that support state Threatened, Endangered, or Sensitive plant species. SC 2.1 Is the wetland being rated in a Section/Township/Range that contains a Natural Heritage wetland? *(this question is used to screen out most sites before you need to contact WNHP/DNR)* S/T/R information from Appendix D ☒ or accessed from WNHP/DNR web site ☐ YES ☒ – contact WNHP/DNR (see p. 79) and go to SC 2.2 NO ☐ SC 2.2 Has DNR identified the wetland as a high quality undisturbed wetland or as or as a site with state threatened or endangered plant species? ☐YES = Category I ☒NO__not in a Heritage Wetland	Cat. I
SC 3.0 Bogs *(see p. 87)* Does the wetland (or part of the wetland) meet both the criteria for soils and vegetation in bogs? *Use the key below to identify if the wetland is a bog.* ***If you answer yes you will still need to rate the wetland based on its functions.*** 1. Does the unit have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of the soil profile? (See Appendix B for a field key to identify organic soils) Yes ☐ - go to Q. 3 No ☒ go to Q. 2 2. Does the wetland have organic soils, either peats or mucks that are less than 16 inches deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on a lake or pond? Yes ☐ - go to Q. 3 No ☒ - Is not a bog for purpose of rating 3. Does the wetland have more than 70% cover of mosses at ground level, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (more than 30% of the total shrub and herbaceous cover consists of species in Table 3)? Yes ☐– Is a bog for purpose of rating No ☒-go to Q. 4 NOTE: If you are uncertain about the extent of mosses in the understory you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16" deep. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog. *1.* Is the wetland forested (> 30% cover) with sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine, WITH any of the species (or combination of species) on the bog species plant list in Table 3 as a significant component of the ground cover *(> 30% coverage of the total shrub/herbaceous cover)?* *2.* YES ☐ = Category I NO ☒ Is not a bog for purpose of rating	Cat. I

SC 4.0 Forested Wetlands *(see p. 90)* Does the wetland have at least 1 acre of forest that meets one of these criteria for the Department of Fish and Wildlife's forests as priority habitats? *If you answer yes you will still need to rate the wetland based on its functions.* ☐ **Old-growth forests**: (west of Cascade crest) Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/acre (20 trees/hectare) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 inches (81 cm) or more. NOTE: The criterion for dbh is based on measurements for upland forests. Two-hundred year old trees in wetlands will often have a smaller dbh because their growth rates are often slower. The DFW criterion is and "OR" so old-growth forests do not necessarily have to have trees of this diameter. ☐ **Mature forests**: (west of the Cascade Crest) Stands where the largest trees are 80 – 200 years old OR have average diameters (dbh) exceeding 21 inches (53cm); crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth. ☐YES = Category I ☒ NO not a forested wetland with special characteristics	Cat. I
SC 5.0 Wetlands in Coastal Lagoons *(see p. 91)* Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? ☐ The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks ☐ The lagoon in which the wetland is located contains surface water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)* ☐ YES = Go to SC 5.1 NO ☒ not a wetland in a coastal lagoon SC 5.1 Does the wetland meet all of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of invasive plant species (see list of invasive species on p. 74). ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland is larger than 1/10 acre (4350 square feet) YES ☐= Category I NO ☐= Category II	

SC 6.0 Interdunal Wetlands ***(see p. 93)*** Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ☐ YES = Go to SC 6.1 ☒NO -- not an interdunal wetland for rating ***If you answer yes you will still need to rate the wetland based on its functions.*** In practical terms that means the following geographic areas: • Long Beach Peninsula – lands west of SR103 • Grayland-Westport- lands west of SR 105 • Ocean Shores-Copalis- lands west of SR 115 and SR 109 SC 6.1 Is the wetland one acre or larger, or is it in a mosaic of wetlands that is one acre or larger? ☐ YES = Category II ☐ NO go to SC 6.2 SC 6.2 Is the wetland between 0.1 and 1 acre, or is it in a mosaic of wetlands that is between 0.1 and 1 acre,? ☐ YES = Category III	Cat.II Cat.III
Category of wetland based on Special Characteristics *Choose the "highest" rating if wetland falls into several categories, and record on p. 1.* If you answered NO for all types enter "Not Applicable" on p. 1.	**N/A**

Comments

The wetland has been previously disturbed, therefore, it is not high quality undisturbed wetland. Based on ELS observations on-site, the wetland does not contain state threatened or endangered species.

WETLAND RATING FORM – WESTERN WASHINGTON

Version 2 – Updated July 2006 to increase accuracy and reproducibility among users

Name of wetland (if known): Wetland D Date of site visit: Oct. 2013

Rated by A. Aberle Trained by Ecology? Yes X No_____ Date of Training: Oct. 2006

SECTION: 20 TOWNSHIP: 2N RANGE: 3E Is S/T/R in Appendix D? Yes X No__

Map of wetland unit: Figure 2 Estimated size 1.06 acres

DRAFT SUMMARY OF RATING

Category based on FUNCTIONS provided by wetland

I ___ II ___ III X IV ___

Category	
Category I = Score >=70	
Category II = Score 51-69	
Category III = Score 30-50	
Category IV = Score < 30	

Score for Water Quality Functions	14
Score for Hydrologic Functions	8
Score for Habitat Functions	15
TOTAL Score for functions	37

Category based on SPECIAL CHARACTERISTICS of wetland

I _____ II _____ Does not Apply X

Final Category **(choose the "highest" category from above)** III

Check the appropriate type and class of wetland being rated.

Wetland Type		Wetland Class	
Estuarine		Depressional	X
Natural Heritage Wetland		Riverine	
Bog		Lake-fringe	
Mature Forest		Slope	
Old Growth Forest		Flats	
Coastal Lagoon		Freshwater Tidal	
Interdunal			
None of the above	X	Check if unit has multiple HGM classes present	☒

Comments

Does the wetland being rated meet any of the criteria below?

If you answer YES to any of the questions below you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands That Need Additional Protection (in addition to the protection recommended for its category)	YES	NO
SP1. *Has the wetland been documented as a habitat for any Federally listed Threatened or Endangered* ***animal or plant*** *species (T/E species)?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.		X
SP2. *Has the wetland unit been documented as habitat for any State listed Threatened or Endangered* ***animal*** *species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category 1 Natural Heritage Wetlands (see p. 19 of data form).		X
SP3. *Does the wetland contain individuals of Priority species listed by the WDFW for the state?*		X
SP4. *Does the wetland have a local significance in addition to its functions?* For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.		X

To complete the next part of the data sheet you will need to determine the Hydrogeomorphic Class of the wetland being rated.

The hydrogeomorphic classification groups wetlands into those that function in similar ways. This simplifies the questions needed to answer how well the wetland functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 24 for more detailed instructions on classifying wetlands.

Comments Formal priority and habitat species request has been completed.

Classification of Wetland Units in Western Washington

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the wetland usually controlled by tides (i.e. except during floods)?

☒NO – go to 2 ☐**YES** – the wetland class is **Tidal Fringe**

If yes, is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)? ☐ **YES – Freshwater Tidal Fringe** ☐**NO – Saltwater Tidal Fringe (Estuarine)**

*If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is rated as an **Estuarine** wetland.* Wetlands that were called estuarine in the first and second editions of the rating system are called Salt Water Tidal Fringe in the Hydrogeomorphic Classification. Estuarine wetlands were categorized separately in the earlier editions, and this separation is being kept in this revision. To maintain consistency between editions, the term "Estuarine" wetland is kept. Please note, however, that the characteristics that define Category I and II estuarine wetlands have changed (see p.).

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

☒NO – go to 3 ☐**YES** – The wetland class is **Flats**

If your wetland can be classified as a "Flats" wetland, use the form for **Depressional** wetlands.

3. Does the wetland **meet both** of the following criteria?

☐ The vegetated part of the wetland is on the shores of a body of open water (without any vegetation on the surface) at least 20 acres (8 ha) in size;

☐ At least 30% of the open water area is deeper than 6.6 ft (2 m)?

☒NO – go to 4 ☐**YES** – The wetland class is **Lake-fringe (Lacustrine Fringe)**

4. Does the wetland **meet all** of the following criteria?

☐ The wetland is on a slope (*slope can be very gradual*),

☐ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.

☐ The water leaves the wetland **without being impounded**?

NOTE: *Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks(depressions are usually <3ft diameter and less than 1 foot deep).*

☒NO - go to 5 ☐**YES** – The wetland class is **Slope**

Comments

5. Does the entire wetland unit **meet all** of the following criteria?

☐ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river

☐ The overbank flooding occurs at least once every two years.

NOTE: The riverine unit can contain depressions that are filled with water when the river is not flooding.

☒NO - go to 6 ☐ **YES** – The wetland class is **Riverine**

6. Is the wetland in a topographic depression in which water ponds, or is saturated to the surface, at some time of the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

☐NO – go to 7 ☒**YES** – The wetland class is **Depressional**

7. Is the wetland located in a very flat area with no obvious depression and no overbank flooding. The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

☐NO – go to 8 ☐ **YES** – The wetland class is **Depressional**

8. Your wetland seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within your wetland. NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM Classes within the wetland unit being rated	*HGM Class to Use in Rating*
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake-fringe	Lake-fringe
Depressional + Riverine along stream within boundary	Depressional
Depressional + Lake-fringe	Depressional
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE under wetlands with special characteristics

If you are unable still to determine which of the above criteria apply to your wetland, or you have more than 2 HGM classes within a wetland boundary, classify the wetland as **Depressional** for the rating.

Comments

D	Depressional and Flats Wetlands **WATER QUALITY FUNCTION** – Indicators that the wetland unit functions to improve water quality	Points (only 1 score per box)
D	**D 1. Does the wetland have the potential to improve water quality?**	(see p.38)
D	D 1.1 Characteristics of surface water flows out of the wetland: Unit is a depression with no surface water leaving it (no outlet) points = 3 Wetland has an intermittently flowing, OR highly constricted, permanently flowing outlet points = 2 Wetland has an unconstricted, or slightly constricted, surface outlet *(permanently flowing)* points = 1 Unit is a "flat" depression (Q. 7 on key), or in the Flats class, with permanent surface outflow **and no obvious natural outlet** and/or outlet is a man-made ditch points = 1 *(If ditch is not permanently flowing treat unit as "intermittently flowing")* Provide photo or drawing	Figure__ 2
D	D 1.2 The soil 2 inches below the surface (or duff layer) is clay or organic *(use NRCS definitions)* YES points = 4 NO points = 0	0
D	D 1.3 Characteristics of persistent vegetation (emergent, shrub, and/or forest class): Wetland has persistent, ungrazed, vegetation > = 95% of area points = 5 Wetland has persistent, ungrazed, vegetation > = 1/2 of area points = 3 Wetland has persistent, ungrazed vegetation > = 1/10 of area points = 1 Wetland has persistent, ungrazed vegetation <1/10 of area points = 0 Map of Cowardin vegetation classes	Figure 8B 3
D	D1.4 Characteristics of seasonal ponding or inundation. *This is the area of the wetland that is ponded for at least 2 months, but dries out sometime during the year. Do not count the area that is permanently ponded. Estimate area as the average condition 5 out of 10 yrs.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is > ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0 Map of Hydroperiods	Figure 9B 2
D	**Total for D 1** *Add the points in the boxes above*	7
D	**D 2. Does the wetland have the opportunity to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland? *Note which of the following conditions provide the sources of pollutants. A unit may have pollutants coming from several sources, but any single source would qualify as opportunity.* ☐ Grazing in the wetland or within 150 ft ☐ Untreated stormwater discharges to wetland ☐ Tilled fields or orchards within 150 ft of wetland ☐ A stream or culvert discharges into wetland that drains developed areas, residential areas, farmed fields, roads, or clear-cut logging ☒ Residential, urban areas, golf courses are within 150 ft of wetland ☐ Wetland is fed by groundwater high in phosphorus or nitrogen ☐ Other ____ ☒ **YES** multiplier is 2 ☐ **NO** multiplier is 1	(see p.44) multiplier 2
D	**TOTAL - Water Quality Functions** Multiply the score from D1 by D2 ***Add score to table on p. 1***	14

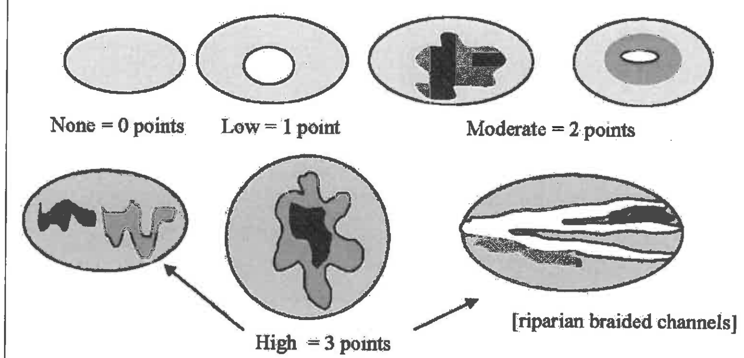
D	Depressional and Flats Wetlands HYDROLOGIC FUNCTIONS - Indicators that wetland functions to reduce flooding and stream degradation	Points
	D 3. Does the wetland have the potential to reduce flooding and erosion?	(see p.46)
D	D 3.1 Characteristics of surface water flows out of the wetland unit Unit is a depression with no surface water leaving it (no outlet) points = 4 Unit has an intermittently flowing, OR highly constricted permanently flowing outlet points = 2 Unit is flat depression (Q. 7 on key), or in the Flats class, with permanent surface outflow **and no obvious natural outlet** and/or is a man-made ditch points = 1 *(If ditch is not permanently flowing treat unit as "intermittently flowing")* Unit has an unconstricted, or slightly constricted, surface outlet (permanently flowing) points = 0	Figure__ 2
D	D 3.2 Depth of storage during wet periods *Estimate the height of ponding above the bottom of the outlet. For units with no outlet measure from the surface of permanent water or deepest part (if dry).* Marks of ponding are 3 ft or more above the surface or bottom of outlet points = 7 The wetland is a "headwater" wetland" points = 5 Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet points = 5 Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 Wetland is flat (yes to Q 2 or Q. 7 on key) but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft points = 0	Figure_ 3
D	D 3.3 Contribution of wetland to storage in the watershed *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* The area of the basin is less than 10 times the area of unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 The area of the basin is more than 100 times the area of the unit points = 0 Entire unit is in the FLATS class points = 5	Figure__ 3
D	**Total for D 3** *Add the points in the boxes above*	8
D	**D 4. Does the wetland have the opportunity to reduce flooding and erosion?** Answer YES if the wetland is in a location in the watershed where the flood storage, or reduction in water velocity it provides, helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows. Answer NO if the water coming into the wetland is controlled by a structure such as flood gate, tide gate, flap valve, reservoir etc. OR you estimate that more than 90% of the water in the wetland is from groundwater in areas where damaging groundwater flooding does not occur. *Note which of the following indicators of opportunity apply.* ☐ Wetland is in a headwater of a river or stream that has flooding problems ☐ Wetland drains to a river or stream that has flooding problems ☐ Wetland has no outlet and impounds surface runoff water that might otherwise flow into a river or stream that has flooding problems ☐ Other ____ ☐ **YES** multiplier is 2 ☒ **NO** multiplier is 1	(see p.49) multiplier 1
D	**TOTAL - Hydrologic Functions** Multiply the score from D 3 by D 4 ***Add score to table on p. 1***	8

Comments Go to Page 13

These questions apply to wetlands of all HGM classes HABITAT FUNCTIONS – Indicators that wetland functions to provide important habitat	**Points** (only 1 score per box)
H 1. Does the wetland have the potential to provide habitat for many species?	
H 1.1 Vegetation structure *(see p. 72)* *Check the types of vegetation classes present (as defined by Cowardin)- Size threshold for each class is ¼ acre or more than 10% of the area if unit is smaller than 2.5 acres.* ☐ Aquatic bed ☒ Emergent plants ☒ Scrub/shrub (areas where shrubs have >30% cover) ☐ Forested (areas where trees have >30% cover) *If the unit has a forested class check if:* ☐ Forested areas have 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the forested polygon *Add the number of vegetation types that qualify. If you have:* 4 types or more — points = 4 3 types — points = 2 2 types — points = 1 1 type — points = 0 Map of Cowardin vegetation classes	Figure 1
H 1.2 Hydroperiods *(see p. 73)* *Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ acre to count. (See text for description of hydroperiods.)* ☐ Permanently flooded or inundated — 4 or more types present — points = 3 ☒ Seasonally flooded or inundated — 3 types present — points = 2 ☒ Occasionally flooded or inundated — 2 types present — points = 1 ☒ Saturated only ☐ Permanently flowing stream or river in, or adjacent to, the wetland ☐ Seasonally flowing stream or river in, or adjacent to, the wetland ☐ ***Lake-fringe wetland* = 2 points** ☐ ***Freshwater tidal wetland* = 2 points**	Figure 2
H 1.3 Richness of Plant Species *(see p. 75)* Count the number of plant species in the wetland that cover at least 10 ft^2. *(Different patches of the same species can be combined to meet the size threshold.)* *You do not have to name the species.* *Do not include Eurasian Milfoil, reed canarygrass, purple loosestrife, Canadian Thistle.* If you counted: > 19 species — points = 2 5 - 19 species — points = 1 *List species below if you want to:* <5 species — points = 0	1

Total for page 4

H 1.4 Interspersion of habitats *(see p. 76)* Decide from the diagrams below whether interspersion between Cowardin vegetation classes (described in H 1.1), or classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.	Figure 2



NOTE: If you have four or more classes or three vegetation classes and open water the rating is always "high". Use map of Cowardin vegetation classes

H 1.5 Special Habitat Features: *(see p. 77)* *Check the habitat features that are present in the wetland. The number of checks is the number of points you put into the next column.* ☐ Large, downed, woody debris within the wetland (>4in. diameter and 6 ft long). ☐ Standing snags (diameter at bottom >4 inches) in the wetland ☐ Undercut banks are present for at least 6.6 ft. (2m) and/or overhanging vegetation extends at least 3.3 ft (1m) over a stream (or ditch) in, or contiguous with the unit, for at least 33 ft (10m) ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30 degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet turned grey/brown)* ☒ At least ¼ acre of thin-stemmed persistent vegetation or woody branches are present in areas that are permanently or seasonally inundated *(structures for egg-laying by amphibians)* ☒ Invasive plants cover less than 25% of the wetland area in each stratum of plants *Note: The 20% stated in early printings of the manual on page 78 is an error*	2
H 1. TOTAL Score – potential for providing habitat *Add the scores from H1.1, H1.2, H1.3, H1.4, H1.5*	8

Comments:

H 2. Does the wetland have the opportunity to provide habitat for many species?)

H 2.1 Buffers *(see p. 80)* — Figure__

Choose the description that best represents condition of buffer of wetland. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed."

- ☐ 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% of circumference. No structures are within the undisturbed part of buffer. (relatively undisturbed also means no grazing, no landscaping, no daily human use) Points = 5
- ☐ 100 m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water >50% circumference. **Points = 4**
- ☐ 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% circumference. **Points = 4**
- ☐ 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water >25% circumference. **Points = 3**
- ☐ 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water for > 50% circumference. **Points = 3**

If buffer does not meet any of the three criteria above

- ☒ No paved areas (except paved trails) or buildings within 25 m (80ft) of wetland > 95% circumference. Light to moderate grazing, or lawns are OK. **Points = 2**
- ☐ No paved areas or buildings within 50m of wetland for >50% circumference. Light to moderate grazing or lawns are OK **Points = 2**
- ☐ Heavy grazing in buffer. **Points = 1**
- ☐ Vegetated buffers are <2m wide (6.6ft) for more than 95% of the circumference (e.g. tilled fields, paving, basalt bedrock extend to edge of wetland) **Points = 0**
- ☐ Buffer does not meet any of the criteria above. **Points = 1**

Aerial photo showing buffers

2

H 2.2 Corridors and Connections *(see p. 81)*

H 2.2.1 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 150 ft wide, has at least 30% cover of shrubs, forest or native undisturbed prairie, that connects to estuaries, other wetlands or undisturbed uplands that are at least 250 acres in size? *(dams in riparian corridors, heavily used gravel roads, paved roads, are considered breaks in the corridor).*

☐YES = **4 points** *(go to H 2.3)* ☒NO = go to H 2.2.2

H 2.2.2 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 50ft wide, has at least 30% cover of shrubs or forest, and connects to estuaries, other wetlands or undisturbed uplands that are at least 25 acres in size? **OR a Lake-fringe** wetland, if it does not have an undisturbed corridor as in the question above?

☐YES = **2 points** *(go to H 2.3)* ☒NO = H 2.2.3

H 2.2.3 Is the wetland:

within 5 mi (8km) of a brackish or salt water estuary OR
within 3 mi of a large field or pasture (>40 acres) OR
within 1 mi of a lake greater than 20 acres?

☒YES = **1 point** ☐NO = **0 points**

1

Total for page 3

H 2.3 Near or adjacent to other priority habitats listed by WDFW *(see p. 82)*

Which of the following priority habitats are within 330ft (100m) of the wetland? *(NOTE: the connections do not have to be relatively undisturbed.*

These are DFW definitions. Check with your local DFW biologist if there are any questions

- ☐ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.
- ☐ **Aspen Stands:** Pure or mixed stands of aspen greater than 0.8 ha (2 acres).
- ☐ **Cliffs:** Greater than 7.6 m (25 ft) high and occurring below 5000 ft.
- ☐ **Old-growth forests:** (Old-growth west of Cascade crest) Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 20 trees/ha (8 trees/acre) > 81 cm (32 in) dbh or > 200 years of age.
- ☐ **Mature forests:** Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80 - 200 years old west of the Cascade crest.
- ☐ **Prairies:** Relatively undisturbed areas (as indicated by dominance of native plants) where grasses and/or forbs form the natural climax plant community.
- ☐ **Talus:** Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.
- ☐ **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages
- ☒ **Oregon white Oak:** Woodlands Stands of pure oak or oak/conifer associations where canopy coverage of the oak component of the stand is 25%.
- ☐ **Urban Natural Open Space**: A priority species resides within or is adjacent to the open space and uses it for breeding and/or regular feeding; and/or the open space functions as a corridor connecting other *priority habitats*, especially those that would otherwise be isolated; and/or the open space is an isolated remnant of natural habitat larger than 4 ha (10 acres) and is surrounded by urban development.
- ☐ **Estuary/Estuary-like:** Deepwater tidal habitats and adjacent tidal wetlands, usually semi-enclosed by land but with open, partly obstructed or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The salinity may be periodically increased above that of the open ocean by evaporation. Along some low-energy coastlines there is appreciable dilution of sea water. Estuarine habitat extends upstream and landward to where ocean-derived salts measure less than 0.5ppt. during the period of average annual low flow. Includes both estuaries and lagoons.
- ☐ **Marine/Estuarine Shorelines**: Shorelines include the intertidal and subtidal zones of beaches, and may also include the backshore and adjacent components of the terrestrial landscape (e.g., cliffs, snags, mature trees, dunes, meadows) that are important to shoreline associated fish and wildlife and that contribute to shoreline function (e.g., sand/rock/log recruitment, nutrient contribution, erosion control).

If wetland has **3 or more** priority habitats = **4 points**
If wetland has **2** priority habitats = **3 points**
If wetland has **1** priority habitat = **1 point** No habitats = 0 points

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list. Nearby wetlands are addressed in question H 2.4)

1

H 2.4 Wetland Landscape *(choose the **one** description of the landscape around the wetland that best fits)* ***(see p. 84)*** There are at least 3 other wetlands within ½ mile, and the connections between them are relatively undisturbed (light grazing between wetlands OK, as is lake shore with some boating, but connections should NOT be bisected by paved roads, fill, fields, or other development. points = 5 The wetland is Lake-fringe on a lake with little disturbance and there are 3 other lake-fringe wetlands within ½ mile points = 5 There are at least 3 other wetlands within ½ mile, BUT the connections between them are disturbed points = 3 The wetland is Lake-fringe on a lake **with** disturbance and there are 3 other lake-fringe wetlands within ½ mile points = 3 There is at least 1 wetland within ½ mile. points = 2 There are no wetlands within ½ mile. points = 0	3
H 2. TOTAL Score -opportunity for providing habitat *Add the scores in the column above*	7
TOTAL for H 1 from page 14	8
Total Score for Habitat Functions – add the points for H 1, H 2 and record the result on p. 1	15

Comments

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate answers and Category.

Wetland Type *Check off any criteria that apply to the wetland. Select the appropriate Category (from dropdown menu in Category column) when the appropriate criteria are met.*	**Category**
SC 1.0 Estuarine wetlands *(see p. 86)* Does the wetland meet the following criteria for Estuarine wetlands? ☐ The dominant water regime is tidal, ☐ Vegetated, and ☐ With a salinity greater than 0.5 ppt. ☐YES = Go to SC 1.1 ☒NO	
SC 1.1 Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? ☐YES = Category I ☐NO go to SC 1.2	Cat. I
SC 1.2 Is the wetland at least 1 acre in size and meets at least two of the following three conditions? YES = Category I NO = Category II ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. If the non-native *Spartina* spp. are the only species that cover more than 10% of the wetland, then the wetland should be given a dual rating (I/II). The area of Spartina would be rated a Category II while the relatively undisturbed upper marsh with native species would be a Category I. Do not, however, exclude the area of Spartina in determining the size threshold of 1 acre. ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland has at least 2 of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands.	Cat. I Cat. II Dual rating I/II

SC 2.0 Natural Heritage Wetlands *(see p. 87)* Natural Heritage wetlands have been identified by the Washington Natural Heritage Program/DNR as either high quality undisturbed wetlands or wetlands that support state Threatened, Endangered, or Sensitive plant species. SC 2.1 Is the wetland being rated in a Section/Township/Range that contains a Natural Heritage wetland? *(this question is used to screen out most sites before you need to contact WNHP/DNR)* S/T/R information from Appendix D ☒ or accessed from WNHP/DNR web site ☐ YES ☒ – contact WNHP/DNR (see p. 79) and go to SC 2.2 NO ☐ SC 2.2 Has DNR identified the wetland as a high quality undisturbed wetland or as or as a site with state threatened or endangered plant species? ☐YES = Category I ☒NO__not in a Heritage Wetland	Cat. I
SC 3.0 Bogs *(see p. 87)* Does the wetland (or part of the wetland) meet both the criteria for soils and vegetation in bogs? *Use the key below to identify if the wetland is a bog.* ***If you answer yes you will still need to rate the wetland based on its functions.*** 1. Does the unit have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of the soil profile? (See Appendix B for a field key to identify organic soils) Yes ☐ - go to Q. 3 No ☒ go to Q. 2 2. Does the wetland have organic soils, either peats or mucks that are less than 16 inches deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on a lake or pond? Yes ☐ - go to Q. 3 No ☒ - Is not a bog for purpose of rating 3. Does the wetland have more than 70% cover of mosses at ground level, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (more than 30% of the total shrub and herbaceous cover consists of species in Table 3)? Yes ☐– Is a bog for purpose of rating No ☒-go to Q. 4 NOTE: If you are uncertain about the extent of mosses in the understory you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16" deep. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog. *1.* Is the wetland forested (> 30% cover) with sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine, WITH any of the species (or combination of species) on the bog species plant list in Table 3 as a significant component of the ground cover *(> 30% coverage of the total shrub/herbaceous cover)?* *2.* YES ☐ = Category I NO ☒ Is not a bog for purpose of rating	Cat. I

SC 4.0 Forested Wetlands *(see p. 90)* Does the wetland have at least 1 acre of forest that meets one of these criteria for the Department of Fish and Wildlife's forests as priority habitats? *If you answer yes you will still need to rate the wetland based on its functions.* ☐ **Old-growth forests**: (west of Cascade crest) Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/acre (20 trees/hectare) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 inches (81 cm) or more. NOTE: The criterion for dbh is based on measurements for upland forests. Two-hundred year old trees in wetlands will often have a smaller dbh because their growth rates are often slower. The DFW criterion is and "OR" so old-growth forests do not necessarily have to have trees of this diameter. ☐ **Mature forests**: (west of the Cascade Crest) Stands where the largest trees are 80 – 200 years old OR have average diameters (dbh) exceeding 21 inches (53cm); crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth. ☐YES = Category I ☒ NO not a forested wetland with special characteristics	Cat. I
SC 5.0 Wetlands in Coastal Lagoons *(see p. 91)* Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? ☐ The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks ☐ The lagoon in which the wetland is located contains surface water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)* ☐ YES = Go to SC 5.1 NO ☒ not a wetland in a coastal lagoon SC 5.1 Does the wetland meet all of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of invasive plant species (see list of invasive species on p. 74). ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland is larger than 1/10 acre (4350 square feet) YES ☐= Category I NO ☐= Category II	

SC 6.0 Interdunal Wetlands ***(see p. 93)*** Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ☐ YES = Go to SC 6.1 ☒NO -- not an interdunal wetland for rating ***If you answer yes you will still need to rate the wetland based on its functions.*** In practical terms that means the following geographic areas: • Long Beach Peninsula – lands west of SR103 • Grayland-Westport- lands west of SR 105 • Ocean Shores-Copalis- lands west of SR 115 and SR 109 SC 6.1 Is the wetland one acre or larger, or is it in a mosaic of wetlands that is one acre or larger? ☐ YES = Category II ☐ NO go to SC 6.2 SC 6.2 Is the wetland between 0.1 and 1 acre, or is it in a mosaic of wetlands that is between 0.1 and 1 acre,? ☐ YES = Category III	Cat.II Cat.III
Category of wetland based on Special Characteristics *Choose the "highest" rating if wetland falls into several categories, and record on p. 1.* If you answered NO for all types enter "Not Applicable" on p 1.	**N/A**

Comments

The wetland has been previously disturbed, therefore, it is not high quality undisturbed wetland. Based on ELS observations on-site, the wetland does not contain state threatened or endangered species.

WETLAND RATING FORM – WESTERN WASHINGTON

Version 2 – Updated July 2006 to increase accuracy and reproducibility among users

Name of wetland (if known): Wetland G   Date of site visit: Oct. 2013

Rated by A. Aberle Trained by Ecology? Yes X No____ Date of Training: Oct. 2006

SECTION: 20 & 21 TOWNSHIP: 2N RANGE: 3E Is S/T/R in Appendix D? Yes X No__

Map of wetland unit: Figure__ Estimated size 2.91 acres

DRAFT SUMMARY OF RATING

Category based on FUNCTIONS provided by wetland

I ___ II ___ III X IV ___

Category I = Score >=70 Category II = Score 51-69 Category III = Score 30-50 Category IV = Score < 30	

Score for Water Quality Functions	14
Score for Hydrologic Functions	3
Score for Habitat Functions	17
TOTAL Score for functions	34

Category based on SPECIAL CHARACTERISTICS of wetland

I_____ II_____ Does not Apply X

Final Category (choose the "highest" category from above) **III**

Check the appropriate type and class of wetland being rated.

Wetland Type		Wetland Class	
Estuarine		Depressional	
Natural Heritage Wetland		Riverine	
Bog		Lake-fringe	
Mature Forest		Slope	X
Old Growth Forest		Flats	
Coastal Lagoon		Freshwater Tidal	
Interdunal			
None of the above	X	Check if unit has multiple HGM classes present	

Comments

Does the wetland being rated meet any of the criteria below?

If you answer YES to any of the questions below you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands That Need Additional Protection (in addition to the protection recommended for its category)	YES	NO
SP1. *Has the wetland been documented as a habitat for any Federally listed Threatened or Endangered **animal or plant** species (T/E species)?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.		X
SP2. *Has the wetland unit been documented as habitat for any State listed Threatened or Endangered **animal** species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category 1 Natural Heritage Wetlands (see p. 19 of data form).		X
SP3. *Does the wetland contain individuals of Priority species listed by the WDFW for the state?*		X
SP4. *Does the wetland have a local significance in addition to its functions?* For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.		X

To complete the next part of the data sheet you will need to determine the Hydrogeomorphic Class of the wetland being rated.

The hydrogeomorphic classification groups wetlands into those that function in similar ways. This simplifies the questions needed to answer how well the wetland functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 24 for more detailed instructions on classifying wetlands.

Comments Formal priority and habitat species request has been completed.

Classification of Wetland Units in Western Washington

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the wetland usually controlled by tides (i.e. except during floods)?

☒NO – go to 2 ☐**YES** – the wetland class is **Tidal Fringe**

If yes, is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)? ☐ **YES – Freshwater Tidal Fringe** ☐**NO – Saltwater Tidal Fringe (Estuarine)**

*If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is rated as an **Estuarine** wetland.* Wetlands that were called estuarine in the first and second editions of the rating system are called Salt Water Tidal Fringe in the Hydrogeomorphic Classification. Estuarine wetlands were categorized separately in the earlier editions, and this separation is being kept in this revision. To maintain consistency between editions, the term "Estuarine" wetland is kept. Please note, however, that the characteristics that define Category I and II estuarine wetlands have changed (see p.).

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

☒NO – go to 3 ☐**YES** – The wetland class is **Flats**

If your wetland can be classified as a "Flats" wetland, use the form for **Depressional** wetlands.

3. Does the wetland **meet both** of the following criteria?

☐ The vegetated part of the wetland is on the shores of a body of open water (without any vegetation on the surface) at least 20 acres (8 ha) in size;

☐ At least 30% of the open water area is deeper than 6.6 ft (2 m)?

☒NO – go to 4 ☐**YES** – The wetland class is **Lake-fringe (Lacustrine Fringe)**

4. Does the wetland **meet all** of the following criteria?

☒ The wetland is on a slope (*slope can be very gradual*),

☒ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.

☒ The water leaves the wetland **without being impounded**?

NOTE: *Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks(depressions are usually <3ft diameter and less than 1 foot deep).*

☐NO - go to 5 ☒**YES** – The wetland class is **Slope**

Comments

5. Does the entire wetland unit **meet all** of the following criteria?

☐ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river

☐ The overbank flooding occurs at least once every two years.

NOTE: The riverine unit can contain depressions that are filled with water when the river is not flooding.

☐NO - go to 6 ☐ **YES** – The wetland class is **Riverine**

6. Is the wetland in a topographic depression in which water ponds, or is saturated to the surface, at some time of the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

☐NO – go to 7 ☐**YES** – The wetland class is **Depressional**

7. Is the wetland located in a very flat area with no obvious depression and no overbank flooding. The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

☐NO – go to 8 ☐ **YES** – The wetland class is **Depressional**

8. Your wetland seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within your wetland. NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM Classes within the wetland unit being rated	*HGM Class to Use in Rating*
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake-fringe	Lake-fringe
Depressional + Riverine along stream within boundary	Depressional
Depressional + Lake-fringe	Depressional
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE under wetlands with special characteristics

If you are unable still to determine which of the above criteria apply to your wetland, or you have more than 2 HGM classes within a wetland boundary, classify the wetland as **Depressional** for the rating.

Comments

S	Slope Wetlands WATER QUALITY FUNCTIONS - Indicators that wetland unit functions to improve water quality	Points (only 1 score per box)
S	**S 1. Does the wetland have the potential to improve water quality?**	*(see p. 64)*
S	S 1.1 Characteristics of average slope of wetland: Slope is 1% or less *(a 1% slope has a 1 foot vertical drop in elevation for every 100 ft horizontal distance)* .... points = 3 Slope is 1% - 2% points = 2 Slope is 2% - 5% points = 1 Slope is greater than 5% points = 0	1
S	S 1.2 The soil 2 inches below the surface (or duff layer) is clay organic *(use NRCS definitions)* YES = 3 points NO = 0 points	0
S	S 1.3 Characteristics of the vegetation in the wetland that traps sediments and pollutants: *Choose the points appropriate for the description that best fits the vegetation in the wetland. Dense vegetation means you have trouble seeing the soil surface. (<75% cover), and uncut means not grazed or mowed and plants are higher than 6 inches.* Dense, ungrazed, herbaceous vegetation > 90% of wetland area points = 6 Dense, ungrazed, herbaceous vegetation > ½ of area points = 3 Dense, woody vegetation > ½ of area points = 2 Dense, ungrazed, herbaceous vegetation > ¼ of area points = 1 Does not meet any of the criteria above for vegetation points = 0 Aerial photo or map with vegetation polygons	Figure__ 6
S	**Total for S 1** *Add the points in the boxes above*	7
S	**S 2. Does the wetland have the opportunity to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland? *Note which of the following conditions provide the sources of pollutants A unit may have pollutants coming form several sources, but any single source would qualify as opportunity..* ☐ Grazing in the wetland or within 150 ft ☐ Untreated stormwater discharges to wetland ☐ Tilled fields or orchards within 150 feet of wetland ☒ Residential, urban areas, or golf courses are within 150 ft upslope of wetland ☐ Other ____ ☒ YES multiplier is 2 ☐ NO multiplier is 1	*(see p. 67)* multiplier 2
S	**TOTAL - Water Quality Functions** Multiply the score from S1 by S2 ***Add score to table on p. 1***	14

Comments

S	Slope Wetlands HYDROLOGIC FUNCTIONS - Indicators that wetland unit functions to reduce flooding and stream erosion	Points (only 1 score per box)
S	**S 3. Does the wetland have the potential to reduce flooding and erosion?**	*(see p. 68)*
S	S 3.1 Characteristics of vegetation that reduce the velocity of surface flows during storms. *Choose the points appropriate for the description that best fit conditions in the wetland. (stems of plants should be thick enough (usually> 1/8 in), or dense enough, to remain erect during surface flows)* Dense, uncut, **rigid** vegetation covers >90% of area of the wetland. points = 6 Dense, uncut, **rigid** vegetation >1/2 area of wetland points = 3 Dense, uncut, **rigid** vegetation >1/4 area of wetland points = 1 More than 3/4 of area is grazed, mowed, tilled or vegetation is not rigid points = 0	3
S	S 3.2 Characteristics of slope wetland that holds back small amounts of flood flows: The slope wetland has small surface depressions that can retain water over at least 10% of its area. YES points = 2 NO points = 0	0
S	*Add the points in the boxes above*	3
S	**S 4. Does the wetland have the opportunity to reduce flooding and erosion?** Is the wetland in a landscape position where the reduction in water velocity it provides helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows? *Note which of the following conditions apply.* ☐ Wetland has surface runoff that drains to a river or stream that has flooding problems ☐ Other ____ *Answer NO if the major source of water is controlled by a reservoir (e.g. wetland is a seep that is on the downstream side of a dam.)* ☐YES multiplier is 2 ☐NO multiplier is 1	*(see p. 70)* multiplier 1
S	**TOTAL - Hydrologic Functions** Multiply the score from S 3 by S 4 ***Add score to table on p. 1***	3

Comments

These questions apply to wetlands of all HGM classes

HABITAT FUNCTIONS – Indicators that wetland functions to provide important habitat

Points (only 1 score per box)

H 1. Does the wetland have the potential to provide habitat for many species?

H 1.1 Vegetation structure *(see p. 72)* — **Figure**

Check the types of vegetation classes present (as defined by Cowardin)- Size threshold for each class is ¼ acre or more than 10% of the area if unit is smaller than 2.5 acres.

- ☐ Aquatic bed
- ☒ Emergent plants
- ☒ Scrub/shrub (areas where shrubs have >30% cover)
- ☐ Forested (areas where trees have >30% cover)

If the unit has a forested class check if:

- ☐ Forested areas have 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the forested polygon

Add the number of vegetation types that qualify. If you have:

4 types or more	points = 4
3 types	points = 2
2 types	points = 1
1 type	points = 0

Map of Cowardin vegetation classes

Points: 1

H 1.2 Hydroperiods *(see p. 73)* — **Figure**

Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ acre to count. (See text for description of hydroperiods.)

- ☐ Permanently flooded or inundated — 4 or more types present — points = 3
- ☒ Seasonally flooded or inundated — 3 types present — points = 2
- ☒ Occasionally flooded or inundated — 2 types present — points = 1
- ☒ Saturated only
- ☐ Permanently flowing stream or river in, or adjacent to, the wetland
- ☐ Seasonally flowing stream or river in, or adjacent to, the wetland
- ☐ ***Lake-fringe wetland* = 2 points**
- ☐ ***Freshwater tidal wetland* = 2 points**

Points: 2

H 1.3 Richness of Plant Species *(see p. 75)*

Count the number of plant species in the wetland that cover at least 10 ft^2. *(Different patches of the same species can be combined to meet the size threshold.)*

You do not have to name the species.

Do not include Eurasian Milfoil, reed canarygrass, purple loosestrife, Canadian Thistle.

If you counted:

> 19 species	points = 2
5 - 19 species	points = 1
<5 species	points = 0

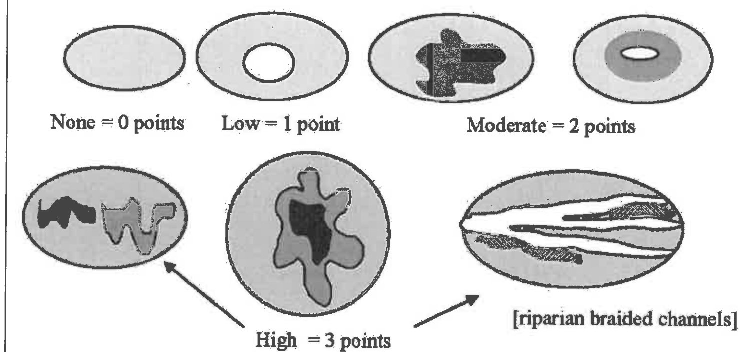
List species below if you want to:

Points: 1

Total for page 4

H 1.4 Interspersion of habitats *(see p. 76)* — **Figure**

Decide from the diagrams below whether interspersion between Cowardin vegetation classes (described in H 1.1), or classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.



NOTE: If you have four or more classes or three vegetation classes and open water the rating is always "high". Use map of Cowardin vegetation classes

Points: 2

H 1.5 Special Habitat Features: *(see p. 77)*

Check the habitat features that are present in the wetland. The number of checks is the number of points you put into the next column.

- ☐ Large, downed, woody debris within the wetland (>4in. diameter and 6 ft long).
- ☒ Standing snags (diameter at bottom >4 inches) in the wetland
- ☐ Undercut banks are present for at least 6.6 ft. (2m) and/or overhanging vegetation extends at least 3.3 ft (1m) over a stream (or ditch) in, or contiguous with the unit, for at least 33 ft (10m)
- ☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30 degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet turned grey/brown)*
- ☒ At least ¼ acre of thin-stemmed persistent vegetation or woody branches are present in areas that are permanently or seasonally inundated *(structures for egg-laying by amphibians)*
- ☐ Invasive plants cover less than 25% of the wetland area in each stratum of plants

Note: The 20% stated in early printings of the manual on page 78 is an error

Points: 2

H 1. TOTAL Score – potential for providing habitat
Add the scores from H1.1, H1.2, H1.3, H1.4, H1.5 — 8

Comments:

H 2. Does the wetland have the opportunity to provide habitat for many species?)

H 2.1 Buffers *(see p. 80)*
Choose the description that best represents condition of buffer of wetland. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed."

Figure__

- ☐ 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% of circumference. No structures are within the undisturbed part of buffer. (relatively undisturbed also means no grazing, no landscaping, no daily human use) Points = 5
- ☐ 100 m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water >50% circumference. **Points = 4**
- ☐ 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% circumference. **Points = 4**
- ☐ 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water >25% circumference. **Points = 3**
- ☐ 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water for > 50% circumference. **Points = 3**

If buffer does not meet any of the three criteria above

- ☒ No paved areas (except paved trails) or buildings within 25 m (80ft) of wetland > 95% circumference. Light to moderate grazing, or lawns are OK. **Points = 2**
- ☐ No paved areas or buildings within 50m of wetland for >50% circumference. Light to moderate grazing or lawns are OK **Points = 2**
- ☐ Heavy grazing in buffer. **Points = 1**
- ☐ Vegetated buffers are <2m wide (6.6ft) for more than 95% of the circumference (e.g. tilled fields, paving, basalt bedrock extend to edge of wetland) **Points = 0**
- ☐ Buffer does not meet any of the criteria above. **Points = 1**

Aerial photo showing buffers

2

H 2.2 Corridors and Connections *(see p. 81)*

H 2.2.1 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 150 ft wide, has at least 30% cover of shrubs, forest or native undisturbed prairie, that connects to estuaries, other wetlands or undisturbed uplands that are at least 250 acres in size? *(dams in riparian corridors, heavily used gravel roads, paved roads, are considered breaks in the corridor).*

☐YES = **4 points** *(go to H 2.3)* ☒NO = go to H 2.2.2

H 2.2.2 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 50ft wide, has at least 30% cover of shrubs or forest, and connects to estuaries, other wetlands or undisturbed uplands that are at least 25 acres in size? **OR a Lake-fringe** wetland, if it does not have an undisturbed corridor as in the question above?

☐YES = **2 points** *(go to H 2.3)* ☒NO = H 2.2.3

H 2.2.3 Is the wetland:
within 5 mi (8km) of a brackish or salt water estuary OR
within 3 mi of a large field or pasture (>40 acres) OR
within 1 mi of a lake greater than 20 acres?

☒YES = **1 point** ☐NO = **0 points**

1

Total for page 3

H 2.3 Near or adjacent to other priority habitats listed by WDFW *(see p. 82)*
Which of the following priority habitats are within 330ft (100m) of the wetland? *(NOTE: the connections do not have to be relatively undisturbed.*
These are DFW definitions. Check with your local DFW biologist if there are any questions

- ☐ **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.
- ☐ **Aspen Stands:** Pure or mixed stands of aspen greater than 0.8 ha (2 acres).
- ☐ **Cliffs:** Greater than 7.6 m (25 ft) high and occurring below 5000 ft.
- ☐ **Old-growth forests:** (Old-growth west of Cascade crest) Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 20 trees/ha (8 trees/acre) > 81 cm (32 in) dbh or > 200 years of age.
- ☒ **Mature forests:** Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80 - 200 years old west of the Cascade crest.
- ☐ **Prairies:** Relatively undisturbed areas (as indicated by dominance of native plants) where grasses and/or forbs form the natural climax plant community.
- ☐ **Talus:** Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.
- ☐ **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages
- ☐ **Oregon white Oak:** Woodlands Stands of pure oak or oak/conifer associations where canopy coverage of the oak component of the stand is 25%.
- ☒ **Urban Natural Open Space:** A priority species resides within or is adjacent to the open space and uses it for breeding and/or regular feeding; and/or the open space functions as a corridor connecting other *priority habitats*, especially those that would otherwise be isolated; and/or the open space is an isolated remnant of natural habitat larger than 4 ha (10 acres) and is surrounded by urban development.
- ☐ **Estuary/Estuary-like:** Deepwater tidal habitats and adjacent tidal wetlands, usually semi-enclosed by land but with open, partly obstructed or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The salinity may be periodically increased above that of the open ocean by evaporation. Along some low-energy coastlines there is appreciable dilution of sea water. Estuarine habitat extends upstream and landward to where ocean-derived salts measure less than 0.5ppt. during the period of average annual low flow. Includes both estuaries and lagoons.
- ☐ **Marine/Estuarine Shorelines**: Shorelines include the intertidal and subtidal zones of beaches, and may also include the backshore and adjacent components of the terrestrial landscape (e.g., cliffs, snags, mature trees, dunes, meadows) that are important to shoreline associated fish and wildlife and that contribute to shoreline function (e.g., sand/rock/log recruitment, nutrient contribution, erosion control).

If wetland has **3 or more** priority habitats = **4 points**
If wetland has **2** priority habitats = **3 points**
If wetland has **1** priority habitat = **1 point** No habitats = 0 points

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list. Nearby wetlands are addressed in question H 2.4)

3

H 2.4 Wetland Landscape *(choose the **one** description of the landscape around the wetland that best fits)* ***(see p. 84)*** There are at least 3 other wetlands within ½ mile, and the connections between them are relatively undisturbed (light grazing between wetlands OK, as is lake shore with some boating, but connections should NOT be bisected by paved roads, fill, fields, or other development. points = 5 The wetland is Lake-fringe on a lake with little disturbance and there are 3 other lake-fringe wetlands within ½ mile points = 5 There are at least 3 other wetlands within ½ mile, BUT the connections between them are disturbed points = 3 The wetland is Lake-fringe on a lake with disturbance and there are 3 other lake-fringe wetlands within ½ mile points = 3 There is at least 1 wetland within ½ mile. points = 2 There are no wetlands within ½ mile. points = 0	3
H 2. TOTAL Score -opportunity for providing habitat *Add the scores in the column above*	9
TOTAL for H 1 from page 14	8
Total Score for Habitat Functions – add the points for H 1, H 2 and record the result on p. 1	17

Comments

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate answers and Category.

Wetland Type *Check off any criteria that apply to the wetland. Select the appropriate Category (from dropdown menu in Category column) when the appropriate criteria are met.*	Category
SC 1.0 Estuarine wetlands *(see p. 86)* Does the wetland meet the following criteria for Estuarine wetlands? ☐ The dominant water regime is tidal, ☐ Vegetated, and ☐ With a salinity greater than 0.5 ppt. ☐YES = Go to SC 1.1 ☒NO	
SC 1.1 Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? ☐YES = Category I ☒NO go to SC 1.2	Cat. I
SC 1.2 Is the wetland at least 1 acre in size and meets at least two of the following three conditions? YES = Category I NO = Category II ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. If the non-native *Spartina* spp. are the only species that cover more than 10% of the wetland, then the wetland should be given a dual rating (I/II). The area of Spartina would be rated a Category II while the relatively undisturbed upper marsh with native species would be a Category I. Do not, however, exclude the area of Spartina in determining the size threshold of 1 acre. ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland has at least 2 of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands.	Cat. I Cat. II Dual rating I/II

SC 2.0 Natural Heritage Wetlands ***(see p. 87)*** Natural Heritage wetlands have been identified by the Washington Natural Heritage Program/DNR as either high quality undisturbed wetlands or wetlands that support state Threatened, Endangered, or Sensitive plant species. SC 2.1 Is the wetland being rated in a Section/Township/Range that contains a Natural Heritage wetland? *(this question is used to screen out most sites before you need to contact WNHP/DNR)* S/T/R information from Appendix D ☒ or accessed from WNHP/DNR web site ☐ YES ☐ – contact WNHP/DNR (see p. 79) and go to SC 2.2 NO ☒ SC 2.2 Has DNR identified the wetland as a high quality undisturbed wetland or as or as a site with state threatened or endangered plant species? ☐YES = Category I ☒NO__not in a Heritage Wetland	Cat. I
SC 3.0 Bogs ***(see p. 87)*** Does the wetland (or part of the wetland) meet both the criteria for soils and vegetation in bogs? *Use the key below to identify if the wetland is a bog.* ***If you answer yes you will still need to rate the wetland based on its functions.*** 1. Does the unit have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of the soil profile? (See Appendix B for a field key to identify organic soils) Yes ☐ - go to Q. 3 No ☒ go to Q. 2 2. Does the wetland have organic soils, either peats or mucks that are less than 16 inches deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on a lake or pond? Yes ☐ - go to Q. 3 No ☒ - Is not a bog for purpose of rating 3. Does the wetland have more than 70% cover of mosses at ground level, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (more than 30% of the total shrub and herbaceous cover consists of species in Table 3)? Yes ☐– Is a bog for purpose of rating No ☒-go to Q. 4 NOTE: If you are uncertain about the extent of mosses in the understory you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16" deep. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog. *1.* Is the wetland forested (> 30% cover) with sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine, WITH any of the species (or combination of species) on the bog species plant list in Table 3 as a significant component of the ground cover *(> 30% coverage of the total shrub/herbaceous cover)?* *2.* YES ☐ = Category I NO ☒ Is not a bog for purpose of rating	Cat. I

SC 4.0 Forested Wetlands ***(see p. 90)*** Does the wetland have at least 1 acre of forest that meets one of these criteria for the Department of Fish and Wildlife's forests as priority habitats? *If you answer yes you will still need to rate the wetland based on its functions.* ☐ **Old-growth forests**: (west of Cascade crest) Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/acre (20 trees/hectare) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 inches (81 cm) or more. NOTE: The criterion for dbh is based on measurements for upland forests. Two-hundred year old trees in wetlands will often have a smaller dbh because their growth rates are often slower. The DFW criterion is and "OR" so old-growth forests do not necessarily have to have trees of this diameter. ☐ **Mature forests**: (west of the Cascade Crest) Stands where the largest trees are 80 – 200 years old OR have average diameters (dbh) exceeding 21 inches (53cm); crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth. ☐YES = Category I ☒ NO not a forested wetland with special characteristics	Cat. I
SC 5.0 Wetlands in Coastal Lagoons ***(see p. 91)*** Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? ☐ The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks ☐ The lagoon in which the wetland is located contains surface water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)* ☐ YES = Go to SC 5.1 NO ☒ not a wetland in a coastal lagoon SC 5.1 Does the wetland meet all of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of invasive plant species (see list of invasive species on p. 74). ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland is larger than 1/10 acre (4350 square feet) YES ☐= Category I NO ☐= Category II	

SC 6.0 Interdunal Wetlands ***(see p. 93)*** Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ☐ YES = Go to SC 6.1 ☒NO -- not an interdunal wetland for rating ***If you answer yes you will still need to rate the wetland based on its functions.*** In practical terms that means the following geographic areas: • Long Beach Peninsula – lands west of SR103 • Grayland-Westport- lands west of SR 105 • Ocean Shores-Copalis- lands west of SR 115 and SR 109 SC 6.1 Is the wetland one acre or larger, or is it in a mosaic of wetlands that is one acre or larger? ☐ YES = Category II ☒ NO go to SC 6.2 SC 6.2 Is the wetland between 0.1 and 1 acre, or is it in a mosaic of wetlands that is between 0.1 and 1 acre,? ☐ YES = Category III	Cat.II Cat.III
Category of wetland based on Special Characteristics *Choose the "highest" rating if wetland falls into several categories, and record on p. 1.* If you answered NO for all types enter "Not Applicable" on p. 1.	**N/A**

Comments

The wetland has been previously disturbed, therefore, it is not high quality undisturbed wetland. Based on ELS observations on-site, the wetland does not contain state threatened or endangered species.

WETLAND RATING FORM – WESTERN WASHINGTON

Version 2 – Updated July 2006 to increase accuracy and reproducibility among users

Name of wetland (if known): Wetland O Date of site visit: Oct. 2013

Rated by A. Aberle Trained by Ecology? Yes X No___ Date of Training: Oct. 2006

SECTION: 20 TOWNSHIP: 2N RANGE: 3E Is S/T/R in Appendix D? Yes X No__

Map of wetland unit: Figure_ Estimated size 0.03 acres

DRAFT SUMMARY OF RATING

Category based on FUNCTIONS provided by wetland

I ___ II ___ III ___ IV X

Category I = Score >=70	
Category II = Score 51-69	
Category III = Score 30-50	
Category IV = Score < 30	

Score for Water Quality Functions	12
Score for Hydrologic Functions	0
Score for Habitat Functions	10
TOTAL Score for functions	**22**

Category based on SPECIAL CHARACTERISTICS of wetland

I ____ II ____ Does not Apply X

Final Category **(choose the "highest" category from above)** IV

Check the appropriate type and class of wetland being rated.

Wetland Type		Wetland Class	
Estuarine		Depressional	
Natural Heritage Wetland		Riverine	
Bog		Lake-fringe	
Mature Forest		Slope	X
Old Growth Forest		Flats	
Coastal Lagoon		Freshwater Tidal	
Interdunal			
None of the above	X	Check if unit has multiple HGM classes present	

Comments

Does the wetland being rated meet any of the criteria below?

If you answer YES to any of the questions below you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands That Need Additional Protection (in addition to the protection recommended for its category)	YES	NO
SP1. *Has the wetland been documented as a habitat for any Federally listed Threatened or Endangered **animal** or **plant** species (T/E species)?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.		X
SP2. *Has the wetland unit been documented as habitat for any State listed Threatened or Endangered **animal** species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category 1 Natural Heritage Wetlands (see p. 19 of data form).		X
SP3. *Does the wetland contain individuals of Priority species listed by the WDFW for the state?*		X
SP4. *Does the wetland have a local significance in addition to its functions?* For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.		X

To complete the next part of the data sheet you will need to determine the Hydrogeomorphic Class of the wetland being rated.

The hydrogeomorphic classification groups wetlands into those that function in similar ways. This simplifies the questions needed to answer how well the wetland functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 24 for more detailed instructions on classifying wetlands.

Comments Formal priority and habitat species request has been completed.

Classification of Wetland Units in Western Washington

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the wetland usually controlled by tides (i.e. except during floods)?

☒NO – go to 2 ☐**YES** – the wetland class is **Tidal Fringe**

If yes, is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)? ☐ **YES – Freshwater Tidal Fringe** ☐**NO – Saltwater Tidal Fringe (Estuarine)**

*If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is rated as an **Estuarine** wetland.* Wetlands that were called estuarine in the first and second editions of the rating system are called Salt Water Tidal Fringe in the Hydrogeomorphic Classification. Estuarine wetlands were categorized separately in the earlier editions, and this separation is being kept in this revision. To maintain consistency between editions, the term "Estuarine" wetland is kept. Please note, however, that the characteristics that define Category I and II estuarine wetlands have changed (see p.).

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

☒NO – go to 3 ☐**YES** – The wetland class is **Flats**

If your wetland can be classified as a "Flats" wetland, use the form for **Depressional** wetlands.

3. Does the wetland **meet both** of the following criteria?

☐ The vegetated part of the wetland is on the shores of a body of open water (without any vegetation on the surface) at least 20 acres (8 ha) in size;

☐ At least 30% of the open water area is deeper than 6.6 ft (2 m)?

☒NO – go to 4 ☐**YES** – The wetland class is **Lake-fringe (Lacustrine Fringe)**

4. Does the wetland **meet all** of the following criteria?

☒ The wetland is on a slope (*slope can be very gradual*),

☒ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.

☒ The water leaves the wetland **without being impounded**?

NOTE: *Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks(depressions are usually <3ft diameter and less than 1 foot deep).*

☐NO - go to 5 ☒**YES** – The wetland class is **Slope**

Comments

5. Does the entire wetland unit **meet all** of the following criteria?

☐ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river

☐ The overbank flooding occurs at least once every two years.

NOTE: The riverine unit can contain depressions that are filled with water when the river is not flooding.

☐NO - go to 6 ☐ **YES** – The wetland class is **Riverine**

6. Is the wetland in a topographic depression in which water ponds, or is saturated to the surface, at some time of the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

☐NO – go to 7 ☐**YES** – The wetland class is **Depressional**

7. Is the wetland located in a very flat area with no obvious depression and no overbank flooding. The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

☐NO – go to 8 ☐ **YES** – The wetland class is **Depressional**

8. Your wetland seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within your wetland. NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM Classes within the wetland unit being rated	*HGM Class to Use in Rating*
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake-fringe	Lake-fringe
Depressional + Riverine along stream within boundary	Depressional
Depressional + Lake-fringe	Depressional
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE under wetlands with special characteristics

If you are unable still to determine which of the above criteria apply to your wetland, or you have more than 2 HGM classes within a wetland boundary, classify the wetland as **Depressional** for the rating.

Comments

S	Slope Wetlands WATER QUALITY FUNCTIONS - Indicators that wetland unit functions to improve water quality	Points (only 1 score per box)
S	**S 1. Does the wetland have the potential to improve water quality?**	(see p. 64)
S	S 1.1 Characteristics of average slope of wetland: Slope is 1% or less *(a 1% slope has a 1 foot vertical drop in elevation for every 100 ft horizontal distance)* .... points = 3 Slope is 1% - 2% points = 2 Slope is 2% - 5% points = 1 Slope is greater than 5% points = 0	0
S	S 1.2 The soil 2 inches below the surface (or duff layer) is clay organic*(use NRCS definitions)* YES = 3 points NO = 0 points	0
S	S 1.3 Characteristics of the vegetation in the wetland that traps sediments and pollutants: *Choose the points appropriate for the description that best fits the vegetation in the wetland. Dense vegetation means you have trouble seeing the soil surface. (<75% cover), and uncut means not grazed or mowed and plants are higher than 6 inches.* Dense, ungrazed, herbaceous vegetation > 90% of wetland area points = 6 Dense, ungrazed, herbaceous vegetation > ½ of area points = 3 Dense, woody vegetation > ½ of area points = 2 Dense, ungrazed, herbaceous vegetation > ¼ of area points = 1 Does not meet any of the criteria above for vegetation points = 0 Aerial photo or map with vegetation polygons	Figure__ 6
S	**Total for S 1** *Add the points in the boxes above*	6
S	**S 2. Does the wetland have the opportunity to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland? *Note which of the following conditions provide the sources of pollutants A unit may have pollutants coming form several sources, but any single source would qualify as opportunity..* ☐ Grazing in the wetland or within 150 ft ☐ Untreated stormwater discharges to wetland ☐ Tilled fields or orchards within 150 feet of wetland ☒ Residential, urban areas, or golf courses are within 150 ft upslope of wetland ☐ Other ____ ☒ YES multiplier is 2 ☐ NO multiplier is 1	(see p. 67) multiplier 2
S	**TOTAL - Water Quality Functions** Multiply the score from S1 by S2 ***Add score to table on p. 1***	12

Comments

S	Slope Wetlands HYDROLOGIC FUNCTIONS - Indicators that wetland unit functions to reduce flooding and stream erosion	Points (only 1 score per box)
S	**S 3. Does the wetland have the potential to reduce flooding and erosion?**	(see p. 68)
S	S 3.1 Characteristics of vegetation that reduce the velocity of surface flows during storms. *Choose the points appropriate for the description that best fit conditions in the wetland. (stems of plants should be thick enough (usually> 1/8 in), or dense enough, to remain erect during surface flows)* Dense, uncut, **rigid** vegetation covers >90% of area of the wetland. points = 6 Dense, uncut, **rigid** vegetation >1/2 area of wetland points = 3 Dense, uncut, **rigid** vegetation >1/4 area of wetland points = 1 More than 3/4 of area is grazed, mowed, tilled or vegetation is not rigid points = 0	0
S	S 3.2 Characteristics of slope wetland that holds back small amounts of flood flows: The slope wetland has small surface depressions that can retain water over at least 10% of its area. YES points = 2 NO points = 0	0
S	*Add the points in the boxes above*	0
S	**S 4. Does the wetland have the opportunity to reduce flooding and erosion?** Is the wetland in a landscape position where the reduction in water velocity it provides helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows? *Note which of the following conditions apply.* ☐ Wetland has surface runoff that drains to a river or stream that has flooding problems ☐ Other ____ *Answer NO if the major source of water is controlled by a reservoir (e.g. wetland is a seep that is on the downstream side of a dam.)* ☐YES multiplier is 2 ☒NO multiplier is 1	(see p. 70) multiplier 1
S	**TOTAL - Hydrologic Functions** Multiply the score from S 3 by S 4 ***Add score to table on p. 1***	0

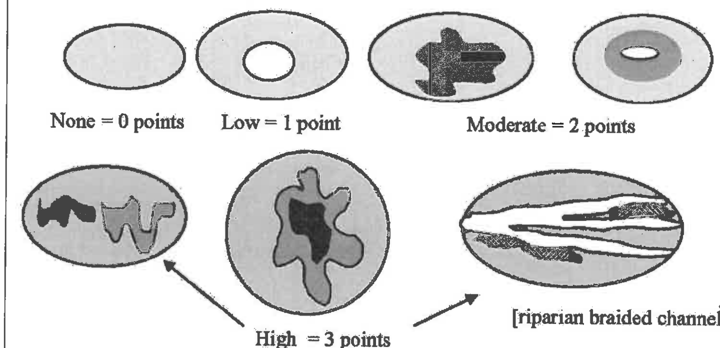
Comments

These questions apply to wetlands of all HGM classes HABITAT FUNCTIONS – Indicators that wetland functions to provide important habitat	**Points** (only 1 score per box)
H 1. Does the wetland have the potential to provide habitat for many species?	
H 1.1 Vegetation structure *(see p. 72)* *Check the types of vegetation classes present (as defined by Cowardin)- Size threshold for each class is ¼ acre or more than 10% of the area if unit is smaller than 2.5 acres.* ☐ Aquatic bed ☐ Emergent plants ☐ Scrub/shrub (areas where shrubs have >30% cover) ☒ Forested (areas where trees have >30% cover) *If the unit has a forested class check if:* ☐ Forested areas have 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the forested polygon *Add the number of vegetation types that qualify. If you have:* 4 types or more — points = 4 Map of Cowardin vegetation classes — 3 types — points = 2 2 types — points = 1 1 type — points = 0	Figure 0
H 1.2 Hydroperiods *(see p. 73)* *Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ acre to count. (See text for description of hydroperiods.)* ☐ Permanently flooded or inundated — 4 or more types present — points = 3 ☒ Seasonally flooded or inundated — 3 types present — points = 2 ☐ Occasionally flooded or inundated — 2 types present — points = 1 ☒ Saturated only ☐ Permanently flowing stream or river in, or adjacent to, the wetland ☐ Seasonally flowing stream or river in, or adjacent to, the wetland ☐ ***Lake-fringe wetland* = 2 points** ☐ ***Freshwater tidal wetland* = 2 points**	Figure 0
H 1.3 Richness of Plant Species *(see p. 75)* Count the number of plant species in the wetland that cover at least 10 ft². *(Different patches of the same species can be combined to meet the size threshold.)* *You do not have to name the species.* *Do not include Eurasian Milfoil, reed canarygrass, purple loosestrife, Canadian Thistle.* If you counted: > 19 species — points = 2 5 - 19 species — points = 1 *List species below if you want to:* <5 species — points = 0	1

Total for page 1

H 1.4 Interspersion of habitats *(see p. 76)* — Figure

Decide from the diagrams below whether interspersion between Cowardin vegetation classes (described in H 1.1), or classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.



NOTE: If you have four or more classes or three vegetation classes and open water the rating is always "high". Use map of Cowardin vegetation classes

Points: 0

H 1.5 Special Habitat Features: *(see p. 77)*

Check the habitat features that are present in the wetland. The number of checks is the number of points you put into the next column.

☒ Large, downed, woody debris within the wetland (>4in. diameter and 6 ft long).
☒ Standing snags (diameter at bottom >4 inches) in the wetland
☐ Undercut banks are present for at least 6.6 ft. (2m) and/or overhanging vegetation extends at least 3.3 ft (1m) over a stream (or ditch) in, or contiguous with the unit, for at least 33 ft (10m)
☐ Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30 degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet turned grey/brown)*
☐ At least ¼ acre of thin-stemmed persistent vegetation or woody branches are present in areas that are permanently or seasonally inundated *(structures for egg-laying by amphibians)*
☐ Invasive plants cover less than 25% of the wetland area in each stratum of plants

Note: The 20% stated in early printings of the manual on page 78 is an error

Points: 2

H 1. TOTAL Score – potential for providing habitat
Add the scores from H1.1, H1.2, H1.3, H1.4, H1.5 — 3

Comments:

H 2. Does the wetland have the opportunity to provide habitat for many species?)	
H 2.1 Buffers *(see p. 80)* *Choose the description that best represents condition of buffer of wetland. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed."* ☐ 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% of circumference. No structures are within the undisturbed part of buffer. (relatively undisturbed also means no grazing, no landscaping, no daily human use) Points = 5 ☐ 100 m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water >50% circumference. **Points = 4** ☐ 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% circumference. **Points = 4** ☐ 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water >25% circumference. **Points = 3** ☐ 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water for > 50% circumference. **Points = 3** **If buffer does not meet any of the three criteria above** ☒ No paved areas (except paved trails) or buildings within 25 m (80ft) of wetland > 95% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** ☐ No paved areas or buildings within 50m of wetland for >50% circumference. Light to moderate grazing or lawns are OK **Points = 2** ☐ Heavy grazing in buffer. **Points = 1** ☐ Vegetated buffers are <2m wide (6.6ft) for more than 95% of the circumference (e.g. tilled fields, paving, basalt bedrock extend to edge of wetland) **Points = 0** ☐ Buffer does not meet any of the criteria above. **Points = 1** Aerial photo showing buffers	**Figure__** 2
H 2.2 Corridors and Connections *(see p. 81)* H 2.2.1 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 150 ft wide, has at least 30% cover of shrubs, forest or native undisturbed prairie, that connects to estuaries, other wetlands or undisturbed uplands that are at least 250 acres in size? *(dams in riparian corridors, heavily used gravel roads, paved roads, are considered breaks in the corridor).* ☐YES = **4 points** *(go to H 2.3)* ☒NO = go to H 2.2.2 H 2.2.2 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 50ft wide, has at least 30% cover of shrubs or forest, and connects to estuaries, other wetlands or undisturbed uplands that are at least 25 acres in size? **OR a Lake-fringe** wetland, if it does not have an undisturbed corridor as in the question above? ☐YES = **2 points** *(go to H 2.3)* ☒NO = H 2.2.3 H 2.2.3 Is the wetland: within 5 mi (8km) of a brackish or salt water estuary OR within 3 mi of a large field or pasture (>40 acres) OR within 1 mi of a lake greater than 20 acres? ☒YES = **1 point** ☐NO = **0 points**	1

Total for page_3_

H 2.3 Near or adjacent to other priority habitats listed by WDFW *(see p. 82)* Which of the following priority habitats are within 330ft (100m) of the wetland? *(NOTE: the connections do not have to be relatively undisturbed.* *These are DFW definitions. Check with your local DFW biologist if there are any questions* ☒ **Riparian:** The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other. ☐ **Aspen Stands:** Pure or mixed stands of aspen greater than 0.8 ha (2 acres). ☐ **Cliffs:** Greater than 7.6 m (25 ft) high and occurring below 5000 ft. ☐ **Old-growth forests:** (Old-growth west of Cascade crest) Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 20 trees/ha (8 trees/acre) > 81 cm (32 in) dbh or > 200 years of age. ☐ **Mature forests:** Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80 - 200 years old west of the Cascade crest. ☐ **Prairies:** Relatively undisturbed areas (as indicated by dominance of native plants) where grasses and/or forbs form the natural climax plant community. ☐ **Talus:** Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs. ☐ **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages ☐ **Oregon white Oak:** Woodlands Stands of pure oak or oak/conifer associations where canopy coverage of the oak component of the stand is 25%. ☐ **Urban Natural Open Space:** A priority species resides within or is adjacent to the open space and uses it for breeding and/or regular feeding; and/or the open space functions as a corridor connecting other *priority habitats*, especially those that would otherwise be isolated; and/or the open space is an isolated remnant of natural habitat larger than 4 ha (10 acres) and is surrounded by urban development. ☐ **Estuary/Estuary-like:** Deepwater tidal habitats and adjacent tidal wetlands, usually semi-enclosed by land but with open, partly obstructed or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The salinity may be periodically increased above that of the open ocean by evaporation. Along some low-energy coastlines there is appreciable dilution of sea water. Estuarine habitat extends upstream and landward to where ocean-derived salts measure less than 0.5ppt. during the period of average annual low flow. Includes both estuaries and lagoons. ☐ **Marine/Estuarine Shorelines:** Shorelines include the intertidal and subtidal zones of beaches, and may also include the backshore and adjacent components of the terrestrial landscape (e.g., cliffs, snags, mature trees, dunes, meadows) that are important to shoreline associated fish and wildlife and that contribute to shoreline function (e.g., sand/rock/log recruitment, nutrient contribution, erosion control). If wetland has **3 or more** priority habitats = **4 points** If wetland has **2** priority habitats = **3 points** If wetland has **1** priority habitat = **1 point** No habitats = 0 points *Note: All vegetated wetlands are by definition a priority habitat but are not included in this list. Nearby wetlands are addressed in question H 2.4)*	1

H 2.4 Wetland Landscape *(choose the **one** description of the landscape around the wetland that best fits)* ***(see p. 84)*** There are at least 3 other wetlands within ½ mile, and the connections between them are relatively undisturbed (light grazing between wetlands OK, as is lake shore with some boating, but connections should NOT be bisected by paved roads, fill, fields, or other development. points = 5 The wetland is Lake-fringe on a lake with little disturbance and there are 3 other lake-fringe wetlands within ½ mile points = 5 There are at least 3 other wetlands within ½ mile, BUT the connections between them are disturbed points = 3 The wetland is Lake-fringe on a lake **with** disturbance and there are 3 other lake-fringe wetlands within ½ mile points = 3 There is at least 1 wetland within ½ mile. points = 2 There are no wetlands within ½ mile. points = 0	3
H 2. TOTAL Score -opportunity for providing habitat *Add the scores in the column above*	7
TOTAL for H 1 from page 14	3
Total Score for Habitat Functions – add the points for H 1, H 2 and record the result on p. 1	10

Comments

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate answers and Category.

Wetland Type *Check off any criteria that apply to the wetland. Select the appropriate Category (from dropdown menu in Category column) when the appropriate criteria are met.*	**Category**
SC 1.0 Estuarine wetlands *(see p. 86)* Does the wetland meet the following criteria for Estuarine wetlands? ☐ The dominant water regime is tidal, ☐ Vegetated, and ☐ With a salinity greater than 0.5 ppt. ☐YES = Go to SC 1.1 ☒NO	
SC 1.1 Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? ☐YES = Category I ☒NO go to SC 1.2	Cat. I
SC 1.2 Is the wetland at least 1 acre in size and meets at least two of the following three conditions? YES = Category I NO = Category II ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. If the non-native *Spartina* spp. are the only species that cover more than 10% of the wetland, then the wetland should be given a dual rating (I/II). The area of Spartina would be rated a Category II while the relatively undisturbed upper marsh with native species would be a Category I. Do not, however, exclude the area of Spartina in determining the size threshold of 1 acre. ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland has at least 2 of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands.	Cat. I Cat. II Dual rating I/II

SC 2.0 Natural Heritage Wetlands ***(see p. 87)*** Natural Heritage wetlands have been identified by the Washington Natural Heritage Program/DNR as either high quality undisturbed wetlands or wetlands that support state Threatened, Endangered, or Sensitive plant species. SC 2.1 Is the wetland being rated in a Section/Township/Range that contains a Natural Heritage wetland? *(this question is used to screen out most sites before you need to contact WNHP/DNR)* S/T/R information from Appendix D ☒ or accessed from WNHP/DNR web site ☐ YES ☐ – contact WNHP/DNR (see p. 79) and go to SC 2.2 NO ☒ SC 2.2 Has DNR identified the wetland as a high quality undisturbed wetland or as or as a site with state threatened or endangered plant species? ☐YES = Category I ☒NO__not in a Heritage Wetland	Cat. I
SC 3.0 Bogs ***(see p. 87)*** Does the wetland (or part of the wetland) meet both the criteria for soils and vegetation in bogs? *Use the key below to identify if the wetland is a bog.* ***If you answer yes you will still need to rate the wetland based on its functions.*** 1. Does the unit have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of the soil profile? (See Appendix B for a field key to identify organic soils) Yes ☐ - go to Q. 3 No ☒ go to Q. 2 2. Does the wetland have organic soils, either peats or mucks that are less than 16 inches deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on a lake or pond? Yes ☐ - go to Q. 3 No ☒ - Is not a bog for purpose of rating 3. Does the wetland have more than 70% cover of mosses at ground level, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (more than 30% of the total shrub and herbaceous cover consists of species in Table 3)? Yes ☐– Is a bog for purpose of rating No ☒-go to Q. 4 NOTE: If you are uncertain about the extent of mosses in the understory you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16" deep. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog. *1.* Is the wetland forested (> 30% cover) with sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine, WITH any of the species (or combination of species) on the bog species plant list in Table 3 as a significant component of the ground cover *(> 30% coverage of the total shrub/herbaceous cover)?* *2.* YES ☐ = Category I NO ☒ Is not a bog for purpose of rating	Cat. I

SC 4.0 Forested Wetlands ***(see p. 90)*** Does the wetland have at least 1 acre of forest that meets one of these criteria for the Department of Fish and Wildlife's forests as priority habitats? *If you answer yes you will still need to rate the wetland based on its functions.* ☐ **Old-growth forests**: (west of Cascade crest) Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/acre (20 trees/hectare) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 inches (81 cm) or more. NOTE: The criterion for dbh is based on measurements for upland forests. Two-hundred year old trees in wetlands will often have a smaller dbh because their growth rates are often slower. The DFW criterion is and "OR" so old-growth forests do not necessarily have to have trees of this diameter. ☐ **Mature forests**: (west of the Cascade Crest) Stands where the largest trees are 80 – 200 years old OR have average diameters (dbh) exceeding 21 inches (53cm); crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth. ☐YES = Category I ☒ NO not a forested wetland with special characteristics	Cat. I
SC 5.0 Wetlands in Coastal Lagoons ***(see p. 91)*** Does the wetland meet all of the following criteria of a wetland in a coastal lagoon? ☐ The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks ☐ The lagoon in which the wetland is located contains surface water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)* ☐ YES = Go to SC 5.1 NO ☒ not a wetland in a coastal lagoon SC 5.1 Does the wetland meet all of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of invasive plant species (see list of invasive species on p. 74). ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland is larger than 1/10 acre (4350 square feet) YES ☐= Category I NO ☐= Category II	

SC 6.0 Interdunal Wetlands ***(see p. 93)*** Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ☐ YES = Go to SC 6.1 ☒NO -- not an interdunal wetland for rating ***If you answer yes you will still need to rate the wetland based on its functions.*** In practical terms that means the following geographic areas: • Long Beach Peninsula – lands west of SR103 • Grayland-Westport- lands west of SR 105 • Ocean Shores-Copalis- lands west of SR 115 and SR 109 SC 6.1 Is the wetland one acre or larger, or is it in a mosaic of wetlands that is one acre or larger? ☐ YES = Category II ☒ NO go to SC 6.2 SC 6.2 Is the wetland between 0.1 and 1 acre, or is it in a mosaic of wetlands that is between 0.1 and 1 acre,? ☐ YES = Category III	Cat.II Cat.III
Category of wetland based on Special Characteristics *Choose the "highest" rating if wetland falls into several categories, and record on p. 1.* If you answered NO for all types enter "Not Applicable" on **p. 1**.	**N/A**

Comments

The wetland has been previously disturbed, therefore, it is not high quality undisturbed wetland. Based on ELS observations on-site, the wetland does not contain state threatened or endangered species.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Green Mountain Mixed Use PRD- Ph. 1 City/County: Camas/Clark Sampling Date: 10/23/13
Applicant/Owner: Green Mountain Land, LLC State: WA Sampling Point: B (3W)
Investigator(s): A. Aberle, A. Allison, C. Siipola Section, Township, Range: Section 21, Township 2N, Range 3E, W.M.
Landform (hillslope, terrace, etc.): terrace Local relief: concave Slope (%): 0-5%
Subregion (LRR): A, NW Forests and Coasts Lat: 45.6471 Long: -122.4560 Datum: n/a
Soil Map Unit Name: DoB Dollar Loam, 0 to 5 percent slopes NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes☒ No☐ (If no, explain Remarks.)
Are Vegetation☐, Soil☐, or Hydrology☐ significantly disturbed? Area "Normal Circumstances" present? Yes☒ No☐
Are Vegetation☐, Soil☐, or Hydrology☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒	No ☐	**Is the Sampled Area within a Wetland?** Yes☒ No☐
Hydric Soils Present?	Yes ☒	No ☐	
Wetland Hydrology Present?	Yes ☒	No ☐	

Remarks: located on north end of Wetland B

VEGETATION (*Use scientific names*)

Tree Stratum (Plot size: 15 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fraxinus latifolia*	80%	yes	FACW
2.	%		
3.	%		
4.	%		
Total Cover:	80%		
Sapling/Shrub Stratum (Plot size: 7.5 ft. radius)			
1. *Cornus alba*	20%	yes	FACW
2. *Acer circinatum*	10%	yes	FAC
3. *Corylus cornuta*	10%	yes	FACU
4.	%		
5.	%		
Total Cover:	40%		
Herb Stratum (Plot size: 2.5 ft radius)			
1. *Xerophyllum tenax*	30%	yes	FACU
2. *Ranunculus repens*	10%	yes	FAC
3. *Rubus ursinus*	10%	yes	FACU
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
Total Cover:	50%		
Woody Vine Stratum (Plot size: ___ ft radius)			
1.	%		
2.	%		
Total Cover:	%		

% Bare Ground in Herb Stratum ___ %

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 57 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:
OBL species		x 1=
FACW species		x 2=
FAC species		x 3=
FACU species		x 4=
UPL species		x 5=
Column Totals:	(A)	(B)

Prevalence Index = B/A=

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes☒ No☐

Remarks:

SOIL

Sampling Point: B (3W)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/2	95%	7.5YR 5/8	5%	C	M	silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☒ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: _____

Depth (inches):

Hydric Soil Present? **Yes** ☒ **No** ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, & 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☒ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches):
Water Table Present?	Yes ☐	No ☒	Depth (Inches):
Saturation Present? (Includes Capillary fringe)	Yes ☐	No ☒	Depth (Inches): _____

Wetland Hydrology Present? **Yes** ☒ **No** ☐

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Green Mountain Mixed Use PRD- Ph. 1 City/County: Camas/Clark Sampling Date: 10/23/13
Applicant/Owner: Green Mountain Land, LLC State: WA Sampling Point: B (4U)
Investigator(s): A. Aberle, A. Allison, C. Siipola Section, Township, Range: Section 21, Township 2N, Range 3E, W.M.
Landform (hillslope, terrace, etc.): terrace Local relief: convex Slope (%): 0-5%
Subregion (LRR): A, NW Forests and Coasts Lat: 45.6471 Long: -122.4560 Datum: n/a
Soil Map Unit Name: DoB Dollar Loam, 0 to 5 percent slopes NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes☒ No☐ (If no, explain Remarks.)
Are Vegetation☐, Soil☐, or Hydrology☐ significantly disturbed? Area "Normal Circumstances" present? Yes☒ No☐
Are Vegetation☐, Soil☐, or Hydrology☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes☐ No☒
Hydric Soils Present?	Yes ☐ No ☒	
Wetland Hydrology Present?	Yes ☐ No ☒	

Remarks: upland assoicated with Wetland B

VEGETATION (*Use scientific names*)

Tree Stratum (Plot size: 15 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer macrophyllum*	20%	yes	FACU
2. *Populus balsamifera*	20%	yes	FAC
3.	%		
4.	%		
Total Cover:	40%		
Sapling/Shrub Stratum (Plot size: 7.5 ft. radius)			
1. *Symphoricarpos albus*	40%	yes	FACU
2. *Corylus cornuta*	30%	yes	FACU
3. *Acer circinatum*	20%	no	FAC
4.	%		
5.	%		
Total Cover:	90%		
Herb Stratum (Plot size: 2.5 ft radius)			
1. *Mahonia nervosa*	30%	yes	FACU
2. *Polystichum munitum*	10%	yes	FACU
3.	%		
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
Total Cover:	40%		
Woody Vine Stratum (Plot size: ____ ft radius)			
1.	%		
2.	%		
Total Cover:	%		

% Bare Ground in Herb Stratum ____ %

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 6 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 17 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:
OBL species		x 1=
FACW species		x 2=
FAC species		x 3=
FACU species		x 4=
UPL species		x 5=
Column Totals:	(A)	(B)

Prevalence Index = B/A= ____

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☐ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data In Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes☐ No☒

Remarks:

SOIL

Sampling Point: B (4U)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/3	100%		%			silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: _____

Depth (inches):

Hydric Soil Present? Yes ☐ No ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, & 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D4)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (Inches):

Water Table Present? Yes ☐ No ☒ Depth (Inches):

Saturation Present? (Includes Capillary fringe) Yes ☐ No ☒ Depth (Inches): _____

Wetland Hydrology Present? Yes ☐ No ☒

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Green Mountain Mixed Use PRD- Ph. 1 City/County: Camas/Clark Sampling Date: 10/23/13
Applicant/Owner: Green Mountain Land, LLC State: WA Sampling Point: B (5W)
Investigator(s): A. Aberle, A. Allison, C. Siipola Section, Township, Range: Section 21, Township 2N, Range 3E, W.M.
Landform (hillslope, terrace, etc.): terrace Local relief: concave Slope (%): 0-5%
Subregion (LRR): A, NW Forests and Coasts Lat: 45.6471 Long: -122.4560 Datum: n/a
Soil Map Unit Name: DoB Dollar Loam, 0 to 5 percent slopes NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes☒ No☐ (If no, explain Remarks.)
Are Vegetation☐, Soil☐, or Hydrology☐ significantly disturbed? Area "Normal Circumstances" present? Yes☒ No☐
Are Vegetation☐, Soil☐, or Hydrology☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒ No ☐	Is the Sampled Area within a Wetland?	Yes☒ No☐
Hydric Soils Present?	Yes ☒ No ☐		
Wetland Hydrology Present?	Yes ☒ No ☐		

Remarks: located on north end of Wetland B

VEGETATION (*Use scientific names*)

Tree Stratum (Plot size: 15 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fraxinus latifolia*	80%	yes	FACW
2.	%		
3.	%		
4.	%		
Total Cover:	80%		
Sapling/Shrub Stratum (Plot size: 7.5 ft. radius)			
1.	%		
2.	%		
3.	%		
4.	%		
5.	%		
Total Cover:	%		
Herb Stratum (Plot size: 2.5 ft radius)			
1. *Rubus armeniacus*	40%	yes	FACU
2. *Juncus effusus*	20%	yes	FACW
3. *Juncus acuminatus*	20%	yes	OBL
4. *Carex obnupta*	10%	no	OBL
5.	%		
6.	%		
7.	%		
8.	%		
Total Cover:	90%		
Woody Vine Stratum (Plot size: ___ ft radius)			
1.	%		
2.	%		
Total Cover:	%		

% Bare Ground in Herb Stratum ____ %

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	4	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC	75	(A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:
OBL species		x 1=
FACW species		x 2=
FAC species		x 3=
FACU species		x 4=
UPL species		x 5=
Column Totals:	(A)	(B)

Prevalence Index = B/A= ____

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data In Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes☒ No☐

Remarks: trace- big leaf maple and beaked hazelnut

SOIL

Sampling Point: B (5W)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/2	85%	10YR 4/6	15%	C	M	silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☒ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: _____

Depth (inches):

Hydric Soil Present? Yes ☒ No ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, & 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☒ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (inches):
Water Table Present?	Yes ☐	No ☒	Depth (Inches):
Saturation Present? (Includes Capillary fringe)	Yes ☐	No ☒	Depth (Inches): _____

Wetland Hydrology Present? Yes ☒ No ☐

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Green Mountain Mixed Use PRD- Ph. 1 City/County: Camas/Clark Sampling Date: 10/23/13
Applicant/Owner: Green Mountain Land, LLC State: WA Sampling Point: B (6U)
Investigator(s): A. Aberle, A. Allison, C. Siipola Section, Township, Range: Section 21, Township 2N, Range 3E, W.M.
Landform (hillslope, terrace, etc.): terrace Local relief: convex Slope (%): 0-5%
Subregion (LRR): A, NW Forests and Coasts Lat: 45.6471 Long: -122.4560 Datum: n/a
Soil Map Unit Name: DoB Dollar Loam, 0 to 5 percent slopes NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes☒ No☐ (If no, explain Remarks.)
Are Vegetation☐, Soil☐, or Hydrology☐ significantly disturbed? Area "Normal Circumstances" present? Yes☒ No☐
Are Vegetation☐, Soil☐, or Hydrology☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☒	Is the Sampled Area within a Wetland?	Yes☐ No☒
Hydric Soils Present?	Yes ☐	No ☒		
Wetland Hydrology Present?	Yes ☐	No ☒		

Remarks: upland assoicated with Wetland B

VEGETATION (*Use scientific names*)

Tree Stratum (Plot size: 15 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer macrophyllum*	30%	yes	FACU
2. *Populus balsamifera*	30%	yes	FAC
3. *Frangula purshiana*	10%	no	FAC
4.	%		
Total Cover:	70%		
Sapling/Shrub Stratum (Plot size: 7.5 ft. radius)			
1. *Corylus cornuta*	20%	yes	FACU
2. *Symphoricarpos albus*	20%	yes	FACU
3. *Physocarpus capitatus*	10%	yes	FACW
4.	%		
5.	%		
Total Cover:	50%		
Herb Stratum (Plot size: 2.5 ft radius)			
1. *Mahonia nervosa*	30%	yes	FACU
2. *Polystichum munitum*	20%	yes	FACU
3.	%		
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
Total Cover:	50%		
Woody Vine Stratum (Plot size: ___ ft radius)			
1.	%		
2.	%		
Total Cover:	%		

% Bare Ground in Herb Stratum ___ %

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 7 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 29 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:	
OBL species		x 1=	
FACW species		x 2=	
FAC species		x 3=	
FACU species		x 4=	
UPL species		x 5=	
Column Totals:	(A)		(B)

Prevalence Index = B/A= ___

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☐ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data In Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes☐ No☒

Remarks:

SOIL

Sampling Point: B (6U)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/3	100%		%			silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: _____

Depth (inches):

Hydric Soil Present? **Yes** ☐ **No** ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, & 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches):
Water Table Present?	Yes ☐	No ☒	Depth (Inches):
Saturation Present? (Includes Capillary fringe)	Yes ☐	No ☒	Depth (Inches): _____

Wetland Hydrology Present? **Yes** ☐ **No** ☒

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Green Mountain Mixed Use PRD- Ph. 1 City/County: Camas/Clark Sampling Date: 10/23/13
Applicant/Owner: Green Mountain Land, LLC State: WA Sampling Point: D (11W)
Investigator(s): A. Aberle, A. Allison, C. Siipola Section, Township, Range: Section 21, Township 2N, Range 3E, W.M.
Landform (hillslope, terrace, etc.): terrace Local relief: concave Slope (%): 0-5%
Subregion (LRR): A, NW Forests and Coasts Lat: 45.6471 Long: -122.4560 Datum: n/a
Soil Map Unit Name: DoB Dollar Loam, 0 to 5 percent slopes NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain Remarks.)
Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Area "Normal Circumstances" present? Yes ☒ No ☐
Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒ No ☐	Is the Sampled Area within a Wetland? Yes ☒ No ☐
Hydric Soils Present?	Yes ☒ No ☐	
Wetland Hydrology Present?	Yes ☒ No ☐	

Remarks: located within Wetland D

VEGETATION (*Use scientific names*)

Tree Stratum (Plot size: 15 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Salix sitchensis*	30%	yes	FACW
2. *Populus balsamifera*	20%	yes	FAC
3. *Alnus rubra*	10%	no	FAC
4.	%		
Total Cover:	60%		
Sapling/Shrub Stratum (Plot size: 7.5 ft. radius)			
1. *Spiraea douglasii*	30%	yes	FACW
2.	%		
3.	%		
4.	%		
5.	%		
Total Cover:	30%		
Herb Stratum (Plot size: 2.5 ft radius)			
1. *Typha latifolia*	30%	yes	OBL
2. *Juncus effusus*	20%	yes	FACW
3. *Carex obnupta*	20%	yes	OBL
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
Total Cover:	70%		
Woody Vine Stratum (Plot size: ___ ft radius)			
1.	%		
2.	%		
Total Cover:	%		

% Bare Ground in Herb Stratum ___ %

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:
OBL species		x 1=
FACW species		x 2=
FAC species		x 3=
FACU species		x 4=
UPL species		x 5=
Column Totals:	(A)	(B)

Prevalence Index = B/A= ____

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data In Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks:

SOIL

Sampling Point: D (11W)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/3	85%	10YR 4/6	15%	C	M	silt loam	
6-16	10YR 3/2	70%	10YR 5/8	30%	C	M	silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☒ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: _____

Depth (inches):

Hydric Soil Present? **Yes** ☒ **No** ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☒ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, & 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☒ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches):
Water Table Present?	Yes ☐	No ☒	Depth (Inches):
Saturation Present? (Includes Capillary fringe)	Yes ☒	No ☐	Depth (Inches): 8

Wetland Hydrology Present? **Yes** ☒ **No** ☐

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Green Mountain Mixed Use PRD- Ph. 1 City/County: Camas/Clark Sampling Date: 10/23/13
Applicant/Owner: Green Mountain Land, LLC State: WA Sampling Point: D (12U)
Investigator(s): A. Aberle, A. Allison, C. Siipola Section, Township, Range: Section 21, Township 2N, Range 3E, W.M.
Landform (hillslope, terrace, etc.): terrace Local relief: convex Slope (%): 0-5%
Subregion (LRR): A, NW Forests and Coasts Lat: 45.6471 Long: -122.4560 Datum: n/a
Soil Map Unit Name: DoB Dollar Loam, 0 to 5 percent slopes NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes☒ No☐ (If no, explain Remarks.)
Are Vegetation☐, Soil☐, or Hydrology☐ significantly disturbed? Area "Normal Circumstances" present? Yes☒ No☐
Are Vegetation☐, Soil☐, or Hydrology☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒	No ☐	Is the Sampled Area within a Wetland? Yes☐ No☒
Hydric Soils Present?	Yes ☐	No ☒	
Wetland Hydrology Present?	Yes ☐	No ☒	

Remarks: upland assoicated with Wetland D

VEGETATION (*Use scientific names*)

Tree Stratum (Plot size: 15 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.	%		
2.	%		
3.	%		
4.	%		
Total Cover:	%		
Sapling/Shrub Stratum (Plot size: 7.5 ft. radius)			
1.	%		
2.	%		
3.	%		
4.	%		
5.	%		
Total Cover:	%		
Herb Stratum (Plot size: 2.5 ft radius)			
1. *Holcus lanatus*	20%	yes	FAC
2. *Anthoxanthum odoratum*	20%	yes	FACU
3. *Agrostis capillaris*	20%	yes	FAC
4. *Hypochaeris radicata*	10%	no	FACU
5. *Trifolium pratense*	10%	no	FACU
6. *Rubus ursinus*	10%	no	FACU
7. *Rumex crispus*	10%	no	FAC
8.	%		
Total Cover:	100%		
Woody Vine Stratum (Plot size: ___ ft radius)			
1.	%		
2.	%		
Total Cover:	%		

% Bare Ground in Herb Stratum ___ %

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:
OBL species		x 1=
FACW species		x 2=
FAC species		x 3=
FACU species		x 4=
UPL species		x 5=
Column Totals:	(A)	(B)

Prevalence Index = B/A= ____

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data In Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes☒ No☐

Remarks:

SOIL

Sampling Point: D (12U)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 4/4	100%		%			silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: _____

Depth (inches):

Hydric Soil Present? **Yes**☐ **No**☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, & 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches):
Water Table Present?	Yes ☐	No ☒	Depth (Inches):
Saturation Present? (Includes Capillary fringe)	Yes ☐	No ☒	Depth (Inches): _____

Wetland Hydrology Present? **Yes** ☐ **No** ☒

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Green Mountain Mixed Use PRD- Ph. 1 City/County: Camas/Clark Sampling Date: 10/23/13
Applicant/Owner: Green Mountain Land, LLC State: WA Sampling Point: TP G (17W)
Investigator(s): A. Aberle, A. Allison, C. Siipola Section, Township, Range: Section 21, Township 2N, Range 3E, W.M.
Landform (hillslope, terrace, etc.): terrace Local relief: concave Slope (%): 0-5%
Subregion (LRR): A, NW Forests and Coasts Lat: 45.6471 Long: -122.4560 Datum: n/a
Soil Map Unit Name: DoB Dollar Loam, 0 to 5 percent slopes NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes☒ No☐ (If no, explain Remarks.)
Are Vegetation☐, Soil☐, or Hydrology☐ significantly disturbed? Area "Normal Circumstances" present? Yes☒ No☐
Are Vegetation☐, Soil☐, or Hydrology☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒	No ☐	**Is the Sampled Area within a Wetland?**	**Yes☒ No☐**
Hydric Soils Present?	Yes ☒	No ☐		
Wetland Hydrology Present?	Yes ☒	No ☐		

Remarks: located within northern portion of Wetland G

VEGETATION (*Use scientific names*)

Tree Stratum (Plot size: 15 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Alnus rubra*	30%	yes	FAC
2.	%		
3.	%		
4.	%		
Total Cover:	30%		
Sapling/Shrub Stratum (Plot size: 7.5 ft. radius)			
1. *Spiraea douglasii*	10%	yes	FACW
2.	%		
3.	%		
4.	%		
5.	%		
Total Cover:	10%		
Herb Stratum (Plot size: 2.5 ft radius)			
1. *Veronica americana*	30%	yes	OBL
2. *Juncus effusus*	20%	yes	FACW
3. *Carex obnupta*	20%	yes	OBL
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
Total Cover:	70%		
Woody Vine Stratum (Plot size: ___ ft radius)			
1.	%		
2.	%		
Total Cover:	%		

% Bare Ground in Herb Stratum ___ %

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:
OBL species		x 1=
FACW species		x 2=
FAC species		x 3=
FACU species		x 4=
UPL species		x 5=
Column Totals:	(A)	(B)

Prevalence Index = B/A= ___

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data In Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes☒ No☐**

Remarks:

SOIL

Sampling Point: G (17W)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/3	85%	10YR 4/6	15%	C	M	silt loam	
4-16	10YR 4/2	70%	10YR 4/6	30%	C	M	silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: _____

Depth (inches):

Hydric Soil Present? **Yes** ☒ **No** ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, & 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☒ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches):
Water Table Present?	Yes ☐	No ☒	Depth (Inches):
Saturation Present? (Includes Capillary fringe)	Yes ☐	No ☒	Depth (Inches): _____

Wetland Hydrology Present? **Yes** ☒ **No** ☐

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Green Mountain Mixed Use PRD- Ph. 1 City/County: Camas/Clark Sampling Date: 10/23/13
Applicant/Owner: Green Mountain Land, LLC State: WA Sampling Point: G (18U)
Investigator(s): A. Aberle, A. Allison, C. Siipola Section, Township, Range: Section 21, Township 2N, Range 3E, W.M.
Landform (hillslope, terrace, etc.): terrace Local relief: convex Slope (%): 0-5%
Subregion (LRR): A, NW Forests and Coasts Lat: 45.6471 Long: -122.4560 Datum: n/a
Soil Map Unit Name: DoB Dollar Loam, 0 to 5 percent slopes NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes☒ No☐ (If no, explain Remarks.)
Are Vegetation☐, Soil☐, or Hydrology☐ significantly disturbed? Area "Normal Circumstances" present? Yes☒ No☐
Are Vegetation☐, Soil☐, or Hydrology☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☒ No ☐ Hydric Soils Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes☐ No☒

Remarks: upland assoicated with northern part of Wetland G

VEGETATION (*Use scientific names*)

Tree Stratum (Plot size: 15 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Alnus rubra*	20%	yes	FAC
2.	%		
3.	%		
4.	%		
Total Cover:	20%		
Sapling/Shrub Stratum (Plot size: 7.5 ft. radius)			
1.	%		
2.	%		
3.	%		
4.	%		
5.	%		
Total Cover:	%		
Herb Stratum (Plot size: 2.5 ft radius)			
1. *Holcus lanatus*	30%	yes	FAC
2. *Agrostis capillaris*	30%	yes	FAC
3. *Hypochaeris radicata*	20%	yes	FACU
4. *Rumex crispus*	10%	no	FAC
5. *Daucus carota*	10%	no	FACU
6.	%		
7.	%		
8.	%		
Total Cover:	100%		
Woody Vine Stratum (Plot size: ____ ft radius)			
1.	%		
2.	%		
Total Cover:	%		
% Bare Ground in Herb Stratum ____ %			

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across All Strata: 4 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:
OBL species		x 1=
FACW species		x 2=
FAC species		x 3=
FACU species		x 4=
UPL species		x 5=
Column Totals:	(A)	(B)

Prevalence Index = B/A=____

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data In Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes☒ No☐

Remarks:

SOIL

Sampling Point: G (18U)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/4	100%		%			gravel and cobbles	
6-16	10YR 4/4	100%		%			sandy loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: _____

Depth (inches):

Hydric Soil Present? **Yes**☐ **No**☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, & 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches):
Water Table Present?	Yes ☐	No ☒	Depth (Inches):
Saturation Present? (Includes Capillary fringe)	Yes ☐	No ☒	Depth (Inches): _____

Wetland Hydrology Present? **Yes** ☐ **No** ☒

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Green Mountain Mixed Use PRD- Ph. 1 City/County: Camas/Clark Sampling Date: 10/23/13
Applicant/Owner: Green Mountain Land, LLC State: WA Sampling Point: G (19W)
Investigator(s): A. Aberle, A. Allison, C. Siipola Section, Township, Range: Section 21, Township 2N, Range 3E, W.M.
Landform (hillslope, terrace, etc.): terrace Local relief: concave Slope (%): 0-5%
Subregion (LRR): A, NW Forests and Coasts Lat: 45.6471 Long: -122.4560 Datum: n/a
Soil Map Unit Name: DoB Dollar Loam, 0 to 5 percent slopes NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain Remarks.)
Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Area "Normal Circumstances" present? Yes ☒ No ☐
Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒ No ☐	Is the Sampled Area within a Wetland? Yes ☒ No ☐
Hydric Soils Present?	Yes ☒ No ☐	
Wetland Hydrology Present?	Yes ☒ No ☐	

Remarks: located within Wetland G

VEGETATION (*Use scientific names*)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
3.	%		
4.	%		
Total Cover:	%		
Sapling/Shrub Stratum (Plot size: 7.5 ft. radius)			
1.	%		
2.	%		
3.	%		
4.	%		
5.	%		
Total Cover:	%		
Herb Stratum (Plot size: 2.5 ft radius)			
1. *Juncus effusus*	60%	yes	FACW
2. *Lotus corniculatus*	20%	yes	FAC
3. *Equisetum arvense*	20%	yes	FAC
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
Total Cover:	100%		
Woody Vine Stratum (Plot size: ____ ft radius)			
1.	%		
2.	%		
Total Cover:	%		
% Bare Ground in Herb Stratum ____ %			

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC	100	(A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:
OBL species		x 1=
FACW species		x 2=
FAC species		x 3=
FACU species		x 4=
UPL species		x 5=
Column Totals:	(A)	(B)

Prevalence Index = B/A= ____

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data In Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks:

SOIL

Sampling Point: G (19W)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/2	85%	7.5YR 5/8	15%	C	M	silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: _____

Depth (inches):

Hydric Soil Present? **Yes** ☒ **No** ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☒ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, & 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches):
Water Table Present?	Yes ☐	No ☒	Depth (Inches):
Saturation Present? (Includes Capillary fringe)	Yes ☐	No ☒	Depth (Inches): _____

Wetland Hydrology Present? **Yes** ☒ **No** ☐

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Green Mountain Mixed Use PRD- Ph. 1 City/County: Camas/Clark Sampling Date: 10/23/13
Applicant/Owner: Green Mountain Land, LLC State: WA Sampling Point: G (20U)
Investigator(s): A. Aberle, A. Allison, C. Siipola Section, Township, Range: Section 21, Township 2N, Range 3E, W.M.
Landform (hillslope, terrace, etc.): terrace Local relief: convex Slope (%): 0-5%
Subregion (LRR): A, NW Forests and Coasts Lat: 45.6471 Long: -122.4560 Datum: n/a
Soil Map Unit Name: DoB Dollar Loam, 0 to 5 percent slopes NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes☒ No☐ (If no, explain Remarks.)
Are Vegetation☐, Soil☐, or Hydrology☐ significantly disturbed? Area "Normal Circumstances" present? Yes☒ No☐
Are Vegetation☐, Soil☐, or Hydrology☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☒	**Is the Sampled Area within a Wetland?** Yes☐ No☒
Hydric Soils Present?	Yes ☐	No ☒	
Wetland Hydrology Present?	Yes ☐	No ☒	

Remarks: upland assoicated with Wetland G

VEGETATION (*Use scientific names*)

Tree Stratum (Plot size: 15 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.	%		
2.	%		
3.	%		
4.	%		
Total Cover:	%		
Sapling/Shrub Stratum (Plot size: 7.5 ft. radius)			
1.	%		
2.	%		
3.	%		
4.	%		
5.	%		
Total Cover:	%		
Herb Stratum (Plot size: 2.5 ft radius)			
1. *Holcus lanatus*	30%	yes	FAC
2. *Anthoxanthum odoratum*	30%	yes	FACU
3. *Dactylis glomerata*	30%	yes	FACU
4. *Cirsium arvense*	20%	yes	FAC
5. *Rubus ursinus*	20%	yes	FACU
6.	%		
7.	%		
8.	%		
Total Cover:	100%		
Woody Vine Stratum (Plot size: ___ ft radius)			
1.	%		
2.	%		
Total Cover:	%		

% Bare Ground in Herb Stratum ___ %

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 40 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:
OBL species		x 1=
FACW species		x 2=
FAC species		x 3=
FACU species		x 4=
UPL species		x 5=
Column Totals:	(A)	(B)

Prevalence Index = B/A= ___

Hydrophytic Vegetation Indicators:

☐ 1 – Rapid Test for Hydrophytic Vegetation
☐ 2 – Dominance Test is >50%
☐ 3 - Prevalence Index is ≤3.0[1]
☐ 4 - Morphological Adaptations[1] (Provide supporting data In Remarks or on a separate sheet)
☐ Wetland Non-Vascular Plants[1]
☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes☐ No☒

Remarks:

SOIL

Sampling Point: G (20U)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/3	100%		%			silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: _____

Depth (inches):

Hydric Soil Present? Yes☐ No☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, & 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches):
Water Table Present?	Yes ☐	No ☒	Depth (Inches):
Saturation Present? (Includes Capillary fringe)	Yes ☐	No ☒	Depth (Inches): _____

Wetland Hydrology Present? Yes ☐ No ☒

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Green Mountain Mixed Use PRD- Ph. 1 City/County: Camas/Clark Sampling Date: 10/22/13
Applicant/Owner: Green Mountain Land, LLC State: WA Sampling Point: TP-7
Investigator(s): A. Aberle, A. Allison, C.Siipola Section, Township, Range: Section 21, Township 2N, Range 3E, W.M.
Landform (hillslope, terrace, etc.): terrace Local relief: concave Slope (%): 0-5%
Subregion (LRR): A, NW Forests and Coasts Lat: 45.6471 Long: -122.4560 Datum: n/a
Soil Map Unit Name: DoB Dollar Loam, 0 to 5 percent slopes NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes☒ No☐ (If no, explain Remarks.)
Are Vegetation☐, Soil☐, or Hydrology☐ significantly disturbed? Area "Normal Circumstances" present? Yes☒ No☐
Are Vegetation☐, Soil☐, or Hydrology☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒ No ☐	Is the Sampled Area within a Wetland? Yes☒ No☐
Hydric Soils Present?	Yes ☒ No ☐	
Wetland Hydrology Present?	Yes ☒ No ☐	

Remarks: located within Wetland G

VEGETATION (*Use scientific names*)

Tree Stratum (Plot size: 30 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.	%		
2.	%		
3.	%		
4.	%		
Total Cover:	0%		
Sapling/Shrub Stratum (Plot size: 15 ft. radius)			
1.	%		
2.	%		
3.	%		
4.	%		
5.	%		
Total Cover:	0%		
Herb Stratum (Plot size: 5 ft radius)			
1. *Holcus lanatus*	70%	yes	FAC
2. *Lotus corniculatus*	30%	yes	FAC
3.	%		
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
Total Cover:	100%		
Woody Vine Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
Total Cover:	0%		

% Bare Ground in Herb Stratum ____ %

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:
OBL species		x 1=
FACW species		x 2=
FAC species		x 3=
FACU species		x 4=
UPL species		x 5=
Column Totals:	(A)	(B)

Prevalence Index = B/A= ____

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data In Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes☒ No☐

Remarks: trace- Canada thistle, slough sedge, trailing blackberry, Himalayan blackberry, small fruited bullrush

SOIL

Sampling Point: TP-7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/1	70%	7.5YR 4/6	30%	C	M	silt loam	
8-16	10YR 3/1	60%	7.5YR 4/6	40%	C	M	silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☒ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: _____

Depth (inches):

Hydric Soil Present? **Yes** ☒ **No** ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, & 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches):
Water Table Present?	Yes ☐	No ☒	Depth (Inches):
Saturation Present? (Includes Capillary fringe)	Yes ☒	No ☐	Depth (Inches): at surface

Wetland Hydrology Present? **Yes** ☒ **No** ☐

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Green Mountain Mixed Use PRD- Ph. 1 City/County: Camas/Clark Sampling Date: 10/22/13
Applicant/Owner: Green Mountain Land, LLC State: WA Sampling Point: TP-8
Investigator(s): A. Aberle, A. Allison, C.Siipola Section, Township, Range: Section 21, Township 2N, Range 3E, W.M.
Landform (hillslope, terrace, etc.): terrace Local relief: convex Slope (%): 0-5%
Subregion (LRR): A, NW Forests and Coasts Lat: 45.6471 Long: -122.4560 Datum: n/a
Soil Map Unit Name: DoB Dollar Loam, 0 to 5 percent slopes NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain Remarks.)
Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Area "Normal Circumstances" present? Yes ☒ No ☐
Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒ No ☐	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒
Hydric Soils Present?	Yes ☐ No ☒	
Wetland Hydrology Present?	Yes ☐ No ☒	

Remarks: upland located within Wetland G

VEGETATION (*Use scientific names*)

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft radius)			
1.	%		
2.	%		
3.	%		
4.	%		
Total Cover:	0%		
Sapling/Shrub Stratum (Plot size: 15 ft. radius)			
1.	%		
2.	%		
3.	%		
4.	%		
5.	%		
Total Cover:	0%		
Herb Stratum (Plot size: 5 ft radius)			
1. *Agrostis capillaris*	80%	yes	FAC
2. *Cirsium arvense*	15%	no	FAC
3. *Plantago lanceolata*	5%	no	FACU
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
Total Cover:	100%		
Woody Vine Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
Total Cover:	0%		
% Bare Ground in Herb Stratum ___ %			

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:
OBL species		x 1=
FACW species		x 2=
FAC species		x 3=
FACU species		x 4=
UPL species		x 5=
Column Totals:	(A)	(B)

Prevalence Index = B/A=____

Hydrophytic Vegetation Indicators:

☐ 1 – Rapid Test for Hydrophytic Vegetation
☒ 2 – Dominance Test is >50%
☐ 3 - Prevalence Index is ≤3.0[1]
☐ 4 - Morphological Adaptations[1] (Provide supporting data In Remarks or on a separate sheet)
☐ Wetland Non-Vascular Plants[1]
☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks:

SOIL

Sampling Point: TP-8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 4/3	100%		%			silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: _____

Depth (inches):

Hydric Soil Present? Yes☐ No☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, & 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D4)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (Inches):

Water Table Present? Yes ☐ No ☒ Depth (Inches):

Saturation Present? (Includes Capillary fringe) Yes ☐ No ☒ Depth (Inches): _____

Wetland Hydrology Present? Yes ☐ No ☒

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Green Mountain Mixed Use PRD- Ph. 1 City/County: Camas/Clark Sampling Date: 10/23/13
Applicant/Owner: Green Mountain Land, LLC State: WA Sampling Point: TP-11
Investigator(s): A. Aberle, A. Allison, C.Siipola Section, Township, Range: Section 21, Township 2N, Range 3E, W.M.
Landform (hillslope, terrace, etc.): terrace Local relief: concave Slope (%): 0-5%
Subregion (LRR): A, NW Forests and Coasts Lat: 45.6471 Long: -122.4560 Datum: n/a
Soil Map Unit Name: DoB Dollar Loam, 0 to 5 percent slope NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain Remarks.)
Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Area "Normal Circumstances" present? Yes ☒ No ☐
Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒ No ☐	Is the Sampled Area within a Wetland? Yes ☒ No ☐
Hydric Soils Present?	Yes ☒ No ☐	
Wetland Hydrology Present?	Yes ☒ No ☐	

Remarks: south end of Wetland G

VEGETATION (*Use scientific names*)

Tree Stratum (Plot size: 30 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.	%		
2.	%		
3.	%		
4.	%		
Total Cover:	0%		
Sapling/Shrub Stratum (Plot size: 15 ft. radius)			
1. *Salix lasiandra*	60%	yes	FACW
2.	%		
3.	%		
4.	%		
5.	%		
Total Cover:	60%		
Herb Stratum (Plot size: 5 ft radius)			
1. *Poa pratensis*	50%	yes	FAC
2. *Lotus corniculatus*	40%	yes	FAC
3. *Carex obnupta*	10%	no	OBL
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
Total Cover:	100%		
Woody Vine Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
Total Cover:	0%		

% Bare Ground in Herb Stratum ____ %

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC	100	(A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:
OBL species		x 1=
FACW species		x 2=
FAC species		x 3=
FACU species		x 4=
UPL species		x 5=
Column Totals:	(A)	(B)

Prevalence Index = B/A= ____

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data In Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks:

SOIL

Sampling Point: TP-11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 4/1	70%	10YR 5/8	30%	C	M	silt clay loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: _____

Depth (inches):

Hydric Soil Present? **Yes** ☒ **No** ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, & 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches):
Water Table Present?	Yes ☐	No ☒	Depth (Inches):
Saturation Present? (Includes Capillary fringe)	Yes ☒	No ☐	Depth (Inches): at surface

Wetland Hydrology Present? **Yes** ☒ **No** ☐

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Green Mountain Mixed Use PRD- Ph. 1 City/County: Camas/Clark Sampling Date: 10/23/13
Applicant/Owner: Green Mountain Land, LLC State: WA Sampling Point: TP-12
Investigator(s): A. Aberle, A. Allison, C.Siipola Section, Township, Range: Section 21, Township 2N, Range 3E, W.M.
Landform (hillslope, terrace, etc.): terrace Local relief: convex Slope (%): 0-5%
Subregion (LRR): A, NW Forests and Coasts Lat: 45.6471 Long: -122.4560 Datum: n/a
Soil Map Unit Name: DoB Dollar Loam, 0 to 5 percent slope NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain Remarks.)
Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Area "Normal Circumstances" present? Yes ☒ No ☐
Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒	No ☐	Is the Sampled Area within a Wetland? Yes ☐ No ☒
Hydric Soils Present?	Yes ☐	No ☒	
Wetland Hydrology Present?	Yes ☐	No ☒	

Remarks: upland south end of Wetland G

VEGETATION (*Use scientific names*)

Tree Stratum (Plot size: 30 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.	%		
2.	%		
3.	%		
4.	%		
Total Cover:	0%		
Sapling/Shrub Stratum (Plot size: 15 ft. radius)			
1.	%		
2.	%		
3.	%		
4.	%		
5.	%		
Total Cover:	%		
Herb Stratum (Plot size: 5 ft radius)			
1. *Agrostis capillaris*	30%	yes	FAC
2. *Holcus lanatus*	20%	yes	FAC
3. *Leucanthemum vulgare*	15%	no	FACU
4. *Plantago lanceolata*	10%	no	FACU
5. *Lotus corniculatus*	10%	no	FAC
6. *Hypochaeris radicata*	10%	no	FACU
7. *Daucus carota*	5%	no	FACU
8.	%		
Total Cover:	100%		
Woody Vine Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
Total Cover:	0%		
% Bare Ground in Herb Stratum ___ %			

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:
OBL species		x 1=
FACW species		x 2=
FAC species		x 3=
FACU species		x 4=
UPL species		x 5=
Column Totals:	(A)	(B)

Prevalence Index = B/A= ____

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data In Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks:

SOIL

Sampling Point: TP-12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 4/3	100%		%			silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: _____

Depth (inches):

Hydric Soil Present? **Yes** ☐ **No** ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, & 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches):
Water Table Present?	Yes ☐	No ☒	Depth (Inches):
Saturation Present? (Includes Capillary fringe)	Yes ☐	No ☒	Depth (Inches): _____

Wetland Hydrology Present? **Yes** ☐ **No** ☒

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Green Mountain Mixed Use PRD- Ph. 1 City/County: Camas/Clark Sampling Date: 10/23/13
Applicant/Owner: Green Mountain Land, LLC State: WA Sampling Point: O (39W)
Investigator(s): A. Aberle, A. Allison, C. Siipola Section, Township, Range: Section 21, Township 2N, Range 3E, W.M.
Landform (hillslope, terrace, etc.): terrace Local relief: concave Slope (%): 0-5%
Subregion (LRR): A, NW Forests and Coasts Lat: 45.6471 Long: -122.4560 Datum: n/a
Soil Map Unit Name: DoB Dollar Loam, 0 to 5 percent slopes NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes☒ No☐ (If no, explain Remarks.)
Are Vegetation☐, Soil☐, or Hydrology☐ significantly disturbed? Area "Normal Circumstances" present? Yes☒ No☐
Are Vegetation☐, Soil☐, or Hydrology☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒	No ☐	**Is the Sampled Area within a Wetland?** Yes☒ No☐
Hydric Soils Present?	Yes ☒	No ☐	
Wetland Hydrology Present?	Yes ☒	No ☐	

Remarks: located within Wetland O

VEGETATION (*Use scientific names*)

Tree Stratum (Plot size: 15 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Salix sitchensis*	80%	yes	FACW
2. *Acer macrophyllum*	10%	no	FACU
3.	%		
4.	%		
Total Cover:	90%		
Sapling/Shrub Stratum (Plot size: 7.5 ft. radius)			
1.	%		
2.	%		
3.	%		
4.	%		
5.	%		
Total Cover:	%		
Herb Stratum (Plot size: 2.5 ft radius)			
1. *Phalaris arundinacea*	20%	yes	FACW
2.	%		
3.	%		
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
Total Cover:	20%		
Woody Vine Stratum (Plot size: ____ ft radius)			
1.	%		
2.	%		
Total Cover:	%		

% Bare Ground in Herb Stratum ____ %

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:	
OBL species		x 1=	
FACW species		x 2=	
FAC species		x 3=	
FACU species		x 4=	
UPL species		x 5=	
Column Totals:	(A)		(B)

Prevalence Index = B/A=____

Hydrophytic Vegetation Indicators:

☐ 1 – Rapid Test for Hydrophytic Vegetation
☒ 2 – Dominance Test is >50%
☐ 3 - Prevalence Index is ≤3.0[1]
☐ 4 - Morphological Adaptations[1] (Provide supporting data In Remarks or on a separate sheet)
☐ Wetland Non-Vascular Plants[1]
☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes☒ No☐

Remarks:

SOIL

Sampling Point: O (39W)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-16	10YR 3/2	95%	10YR 5/8	5%	C	M	silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☒ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: _____

Depth (inches):

Hydric Soil Present? **Yes** ☒ **No** ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, & 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☒ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☒ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches):
Water Table Present?	Yes ☐	No ☒	Depth (Inches):
Saturation Present? (Includes Capillary fringe)	Yes ☐	No ☒	Depth (Inches): _____

Wetland Hydrology Present? **Yes** ☒ **No** ☐

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Green Mountain Mixed Use PRD- Ph. 1 City/County: Camas/Clark Sampling Date: 10/23/13
Applicant/Owner: Green Mountain Land, LLC State: WA Sampling Point: O (40U)
Investigator(s): A. Aberle, A. Allison, C. Siipola Section, Township, Range: Section 21, Township 2N, Range 3E, W.M.
Landform (hillslope, terrace, etc.): terrace Local relief: convex Slope (%): 0-5%
Subregion (LRR): A, NW Forests and Coasts Lat: 45.6471 Long: -122.4560 Datum: n/a
Soil Map Unit Name: DoB Dollar Loam, 0 to 5 percent slopes NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes☒ No☐ (If no, explain Remarks.)
Are Vegetation☐, Soil☐, or Hydrology☐ significantly disturbed? Area "Normal Circumstances" present? Yes☒ No☐
Are Vegetation☐, Soil☐, or Hydrology☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☒	**Is the Sampled Area within a Wetland?**	Yes☐ No☒
Hydric Soils Present?	Yes ☐	No ☒		
Wetland Hydrology Present?	Yes ☐	No ☒		

Remarks: upland assoicated with Wetland O

VEGETATION (*Use scientific names*)

Tree Stratum (Plot size: 15 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer macrophyllum*	50%	yes	FACU
2.	%		
3.	%		
4.	%		
Total Cover:	%		
Sapling/Shrub Stratum (Plot size: 7.5 ft. radius)			
1. *Symphoricarpos albus*	40%	yes	FACU
2.	%		
3.	%		
4.	%		
5.	%		
Total Cover:	40%		
Herb Stratum (Plot size: 2.5 ft radius)			
1. *Mahonia nervosa*	20%	yes	FACU
2. *Phalaris arundinacea*	10%	yes	FACW
3. *Rubus ursinus*	10%	yes	FACU
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
Total Cover:	40%		
Woody Vine Stratum (Plot size: ____ ft radius)			
1.	%		
2.	%		
Total Cover:	%		

% Bare Ground in Herb Stratum 60%

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 20 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:	
OBL species		x 1=	
FACW species		x 2=	
FAC species		x 3=	
FACU species		x 4=	
UPL species		x 5=	
Column Totals:	(A)		(B)

Prevalence Index = B/A=____

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☐ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data In Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes☐ No☒

Remarks:

SOIL

Sampling Point: O (40U)

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/3	100%		%			silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: _____

Depth (inches):

Hydric Soil Present? Yes ☐ No ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, & 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches):
Water Table Present?	Yes ☐	No ☒	Depth (Inches):
Saturation Present? (Includes Capillary fringe)	Yes ☐	No ☒	Depth (Inches): _____

Wetland Hydrology Present? Yes ☐ No ☒

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Green Mountain Mixed Use PRD- Ph. 1 City/County: Camas/Clark Sampling Date: 10/23/13
Applicant/Owner: Green Mountain Land, LLC State: WA Sampling Point: TP-9
Investigator(s): A. Aberle, A. Allison, C.Siipola Section, Township, Range: Section 21, Township 2N, Range 3E, W.M.
Landform (hillslope, terrace, etc.): terrace Local relief: convex Slope (%): 0-5%
Subregion (LRR): A, NW Forests and Coasts Lat: 45.6471 Long: -122.4560 Datum: n/a
Soil Map Unit Name: DoB Dollar Loam, 0 to 5 percent loam NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes☒ No☐ (If no, explain Remarks.)
Are Vegetation☐, Soil☐, or Hydrology☐ significantly disturbed? Area "Normal Circumstances" present? Yes☒ No☐
Are Vegetation☐, Soil☐, or Hydrology☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☒	Is the Sampled Area within a Wetland? Yes☐ No☒
Hydric Soils Present?	Yes ☐	No ☒	
Wetland Hydrology Present?	Yes ☐	No ☒	

Remarks: upland located south of Wetland O

VEGETATION (*Use scientific names*)

Tree Stratum (Plot size: 30 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Quercus garryana*	50%	yes	FACU
2.	%		
3.	%		
4.	%		
Total Cover:	50%		
Sapling/Shrub Stratum (Plot size: 15 ft. radius)			
1.	%		
2.	%		
3.	%		
4.	%		
5.	%		
Total Cover:	0%		
Herb Stratum (Plot size: 5 ft radius)			
1. *Poa pratensis*	90%	yes	FAC
2. *Rubus ursinus*	10%	no	FACU
3.	%		
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
Total Cover:	100%		
Woody Vine Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
Total Cover:	0%		

% Bare Ground in Herb Stratum ____ %

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:
OBL species		x 1=
FACW species		x 2=
FAC species		x 3=
FACU species		x 4=
UPL species		x 5=
Column Totals:	(A)	(B)

Prevalence Index = B/A= ____

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☐ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data In Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes☐ No☒

Remarks:

SOIL

Sampling Point: TP-9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 4/3	100%		%			loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosal (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Minerals (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: _____

Depth (inches):

Hydric Soil Present? **Yes** ☐ **No** ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, & 4B)**
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) **(LRR A)**
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) **(LRR A)**
- ☐ Frost-Heave Hummocks (D4)

Field Observations:

Surface Water Present?	Yes ☐	No ☒	Depth (Inches):
Water Table Present?	Yes ☐	No ☒	Depth (Inches):
Saturation Present? (Includes Capillary fringe)	Yes ☐	No ☒	Depth (Inches): _____

Wetland Hydrology Present? **Yes** ☐ **No** ☒

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Green Mountain Mixed Use PRD- PH. 1 City/County: Camas/Clark Sampling Date: 10/23/13
Applicant/Owner: Green Mountain Land, LLC State: WA Sampling Point: TP-10
Investigator(s): A. Aberle, A. Allison, C.Siipola Section, Township, Range: Section 21, Township 2N, Range 3E, W.M.
Landform (hillslope, terrace, etc.): terrace Local relief: concave Slope (%): 0-5%
Subregion (LRR): A, NW Forest and Coasts Lat: 45.6471 Long: -122.4560 Datum: n/a
Soil Map Unit Name: DoB Dollar Loam, 0 to 5 percent slopes NWI classification: none
Are climatic / hydrologic conditions on the site typical for this time of year? Yes☒ No☐ (If no, explain Remarks.)
Are Vegetation☐, Soil☐, or Hydrology☐ significantly disturbed? Area "Normal Circumstances" present? Yes☒ No☐
Are Vegetation☐, Soil☐, or Hydrology☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☒	No ☐	**Is the Sampled Area within a Wetland?** Yes☒ No☐
Hydric Soils Present?	Yes ☒	No ☐	
Wetland Hydrology Present?	Yes ☒	No ☐	

Remarks: wetland located in center of Wetland O

VEGETATION (*Use scientific names*)

Tree Stratum (Plot size: 30 ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Fraxinus latifolia*	30%	yes	FACW
2. *Alnus rubra*	20%	yes	FAC
3.	%		
4.	%		
Total Cover:	50%		
Sapling/Shrub Stratum (Plot size: 15 ft. radius)			
1.	%		
2.	%		
3.	%		
4.	%		
5.	%		
Total Cover:	0%		
Herb Stratum (Plot size: 5 ft radius)			
1. *Phalaris arundinacea*	100%	yes	FACW
2.	%		
3.	%		
4.	%		
5.	%		
6.	%		
7.	%		
8.	%		
Total Cover:	100%		
Woody Vine Stratum (Plot size: 15 ft radius)			
1.	%		
2.	%		
Total Cover:	0%		

% Bare Ground in Herb Stratum ____ %

Dominance Test Worksheet

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet

Total % Cover of:		Multiply by:
OBL species		x 1=
FACW species		x 2=
FAC species		x 3=
FACU species		x 4=
UPL species		x 5=
Column Totals:	(A)	(B)

Prevalence Index = B/A= ____

Hydrophytic Vegetation Indicators:

- ☐ 1 – Rapid Test for Hydrophytic Vegetation
- ☒ 2 – Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ 4 - Morphological Adaptations[1] (Provide supporting data In Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes☒ No☐

Remarks:

SOIL

Sampling Point: TP-10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 3/1	60%	5YR 5/8	40%	C	M	silt loam	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

☐ Histosal (A1)
☐ Histic Epipedon (A2)
☐ Black Histic (A3)
☐ Hydrogen Sulfide (A4)
☐ Depleted Below Dark Surface (A11)
☐ Thick Dark Surface (A12)
☐ Sandy Mucky Minerals (S1)
☐ Sandy Gleyed Matrix (S4)
☐ Sandy Redox (S5)
☐ Stripped Matrix (S6)
☐ Loamy Mucky Mineral (F1) **(except MLRA 1)**
☐ Loamy Gleyed Matrix (F2)
☐ Depleted Matrix (F3)
☒ Redox Dark Surface (F6)
☐ Depleted Dark Surface (F7)
☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils

☐ 2 cm Muck (A10)
☐ Red Parent Material (TF2)
☐ Very Shallow Dark Surface (TF12)
☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):

Type: _____

Depth (inches):

Hydric Soil Present? Yes☒ No☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (min. of one required; check all that apply)

☐ Surface Water (A1)
☐ High Water Table (A2)
☐ Saturation (A3)
☐ Water Marks (B1)
☐ Sediment Deposits (B2)
☐ Drift Deposits (B3)
☐ Algal Mat or crust (B4)
☐ Iron Deposits (B5)
☐ Surface Soil Cracks (B6)
☐ Inundation Visible on Aerial Imagery (B7)
☐ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, & 4B)**
☐ Salt Crust (B11)
☐ Aquatic Invertebrates (B13)
☐ Hydrogen Sulfide Odor (C1)
☒ Oxidized Rhizospheres along Living Roots (C3)
☐ Presence of Reduced Iron (C4)
☐ Recent Iron Reduction in Tilled Soils (C6)
☐ Stunted or Stressed Plants (D1) **(LRR A)**
☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

☐ Water Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
☐ Drainage Patterns (B10)
☐ Dry-Season Water Table (C2)
☐ Saturation Visible on Aerial Imagery (C9)
☐ Geomorphic Position (D2)
☐ Shallow Aquitard (D3)
☐ FAC-Neutral Test (D5)
☐ Raised Ant Mounds (D6) **(LRR A)**
☐ Frost-Heave Hummocks (D4)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (Inches):
Water Table Present? Yes ☐ No ☒ Depth (Inches):
Saturation Present? (Includes Capillary fringe) Yes ☐ No ☒ Depth (Inches): _____

Wetland Hydrology Present? Yes ☒ No ☐

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

EXHIBIT 49

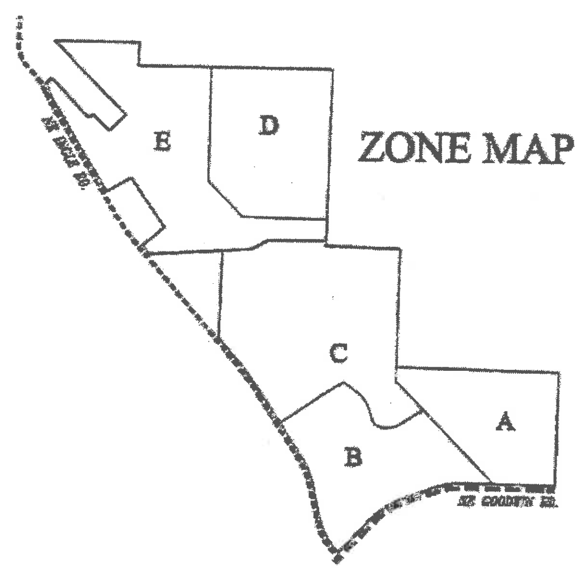
APPENDIX B

TREE PRESERVATION PLAN (DEVELOPMENT AGREEMENT – EXHIBIT E)

EXHIBIT E

Tree Preservation Plan

Zone	Pods Included in Zone	Total Trees in Zone	Trees Preserved	Percentage of Trees Preserved
Zone A (Southeast)	D4, D5, D6 E2, E3	170	90	39%
Zone B (South)	H (CC), A1, A2, A3, B5	342	265	77%
Zone C (Central)	B1, B2, B3, C1, C2, D1, D2, D3, E1	1,454	488	34%
Zone D (Northeast)	G	3,524	2,345	67%
Zone E (Northwest)	B4, E4, F1, F2, F3, F4	4,040	1,571	39%
<u>Total Site</u>		<u>9,589</u>	<u>4,759</u>	<u>50%</u>



The Tree Preservation Plan is based on a complete tree survey of the entire Property. This survey finds that nearly 9,600 trees are present on the property. The Property has been divided into five "zones" that identify five distinct areas of future development. The zones were established to assure that acceptable numbers of trees were preserved throughout the Property, not just in one isolated area rendering the remaining portions of the site bare of trees. The percentage of trees protected in a given zone varies from 34% to 77%, with the net result being that at least 50% of the existing trees on the Property will be preserved.

Compliance with the Tree Preservation Plan will take place with each future development application (Preliminary Plat or Site Plan Review), at which time the applicant will demonstrate that the number of trees protected will meet or exceed the amount listed in the "Trees Preserved" column in the above table. In the event that a given development application covers only part of a zone, the applicant shall demonstrate that the current development application will not preclude the preservation of the minimum number of trees required to be preserved for that zone when the zone is fully developed. In addition to the trees that will be preserved, thousands of trees will be planted as part of the development's landscape requirements, including in parks, open spaces, streetscapes, and residential areas.

Consistent with Camas City code, Oregon White Oak trees over 20" dbh are considered habitats of local importance, as well as Oregon White Oaks that form a grove of one acre or larger. Such oaks shall be considered jurisdictional for the purposes of this Tree Preservation Plan. Any jurisdictional Oregon White Oak trees shall be mitigated for at a 2:1 stem count ratio and installed within an appropriate area on site. Oregon white oak trees installed as mitigation will be 1.5" caliper at a minimum. Where possible, oaks will be planted within vegetation voids associated with riparian corridors, oak groves and green space to increase oak habitat connectivity across the site. The location of oak plantings shall be at the direction of a professional biologist or certified arborist.

EXHIBIT 50

APPENDIX C

GOOGLE AERIAL PHOTOS (2012, 20114)


713 ft
Imagery Date Jul 15, 2014
lat 45.648919° lon -122.449558° elev 0 ft
©2010 Google
Eye alt 2467 ft

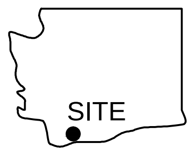
(2014)


713 ft
Imagery Date Aug 16, 2012
lat 45.648919° lon -122.449558° elev 0 ft
©2010 Google
Eye alt 2467 ft

(2012)

EXHIBIT 51

WASHINGTON

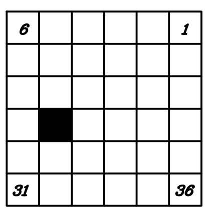


45.6471° Latitude
-122.4560° Longitude

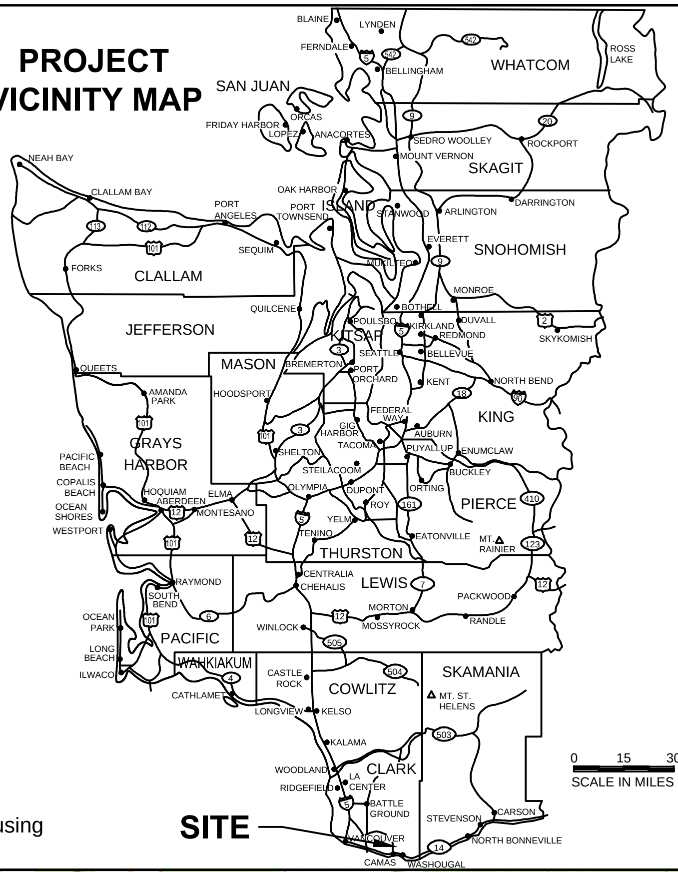
LOCATION MAP

R 3 E

T 2 N



PROJECT VICINITY MAP



NOTE:
USGS topographic quadrangle map reproduced using MAPTECH Inc., Terrain Navigator Pro software.

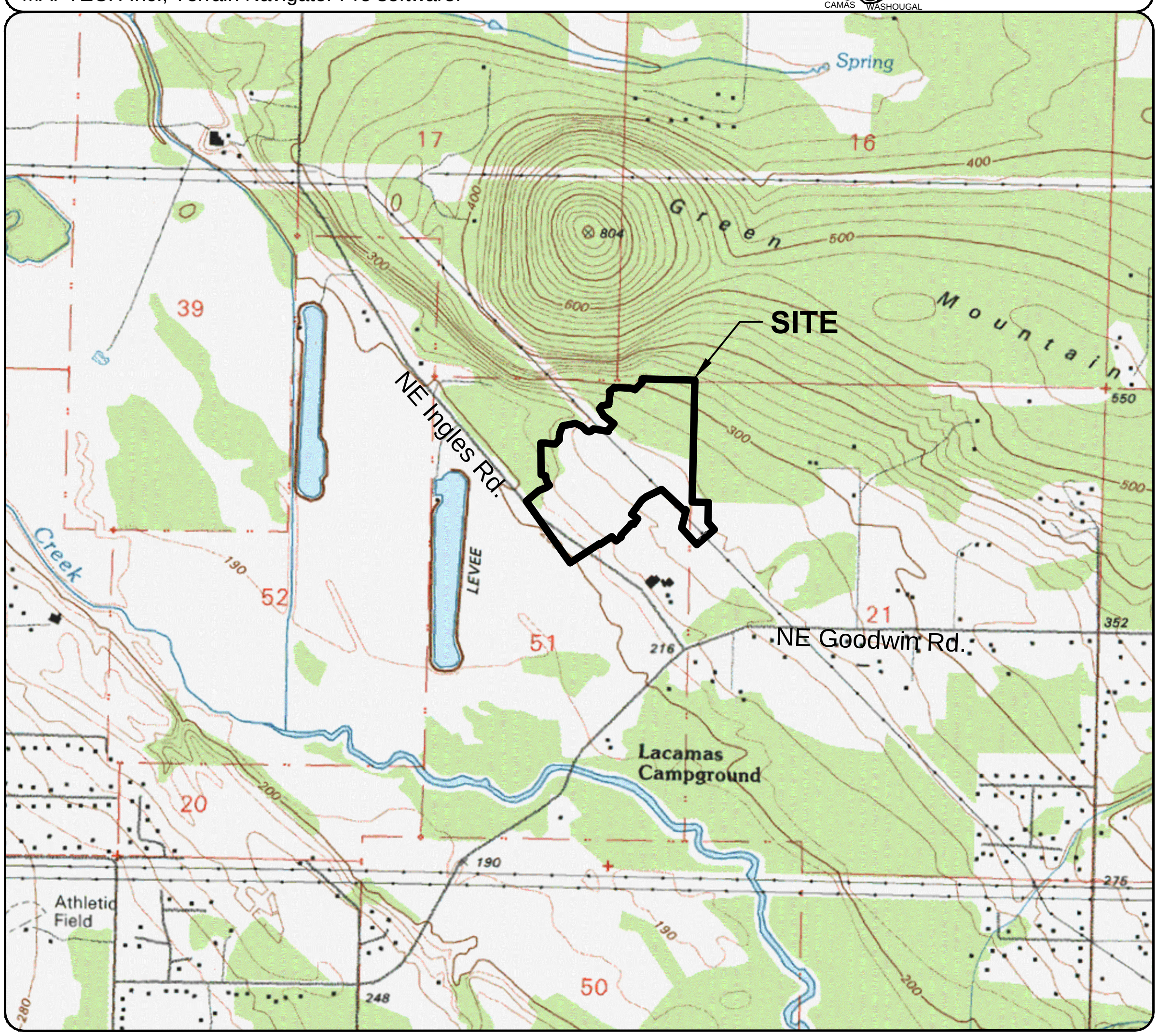
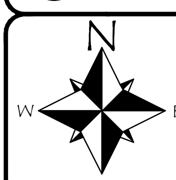


Figure 1
VICINITY MAP
Green Mountain Mixed Use PRD - Phase 1
Green Mountain Land, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.

DATE: 12/19/14
DWN: JKJ
REQ. BY: CS
PRJ. MGR: AA/CS
CHK:
PROJECT NO: 2048.01

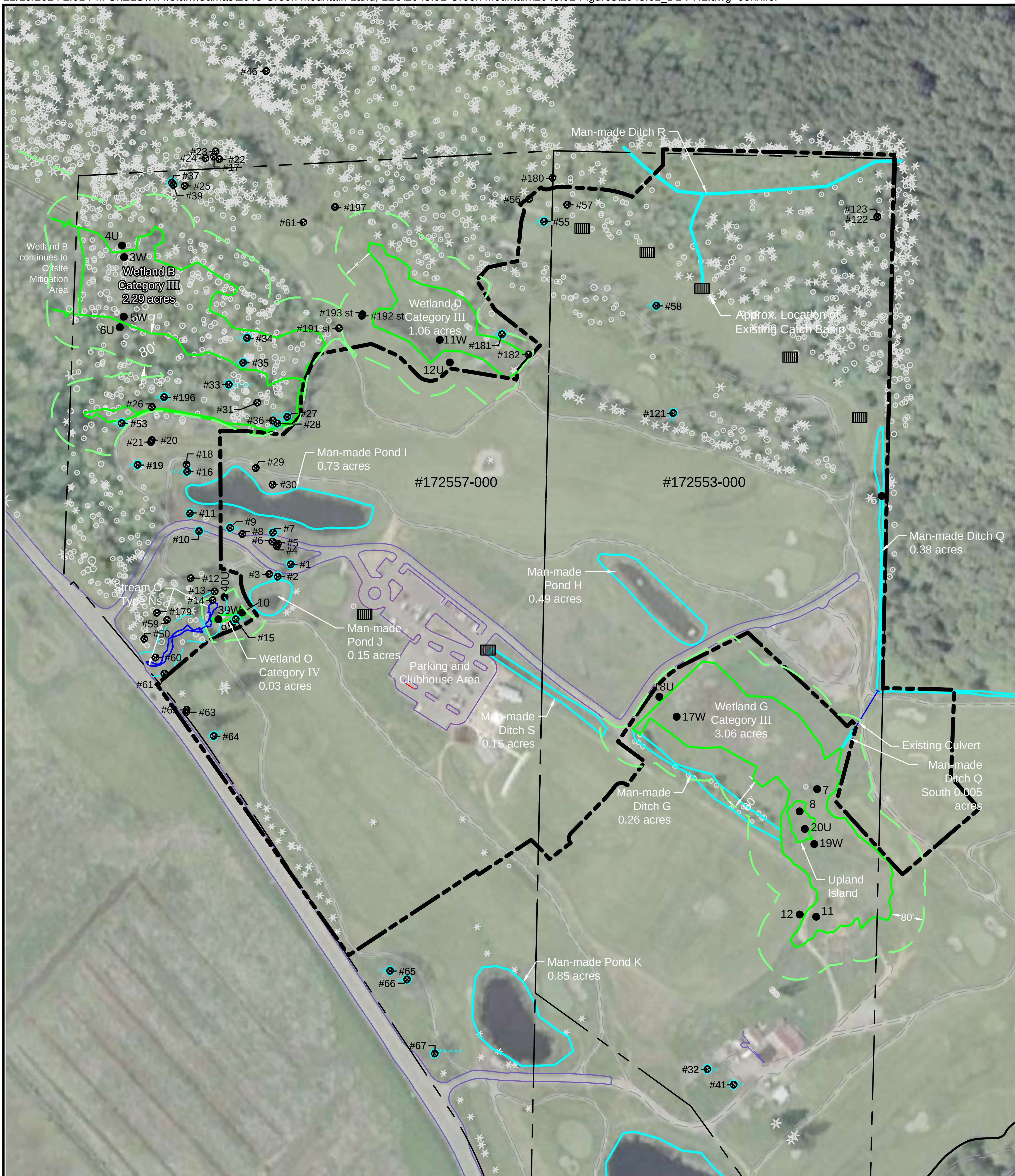
ECOLOGICAL LAND SERVICES, INC.
1157 3rd Ave., Suite 220
Longview, WA 98632
Phone: (360) 578-1371 Fax: (360) 414-9305

0 2000 4000
SCALE IN FEET
1" = 2000'



12/19/2014 2:01 PM S:\ELS\WA\Clark\Camas\2048-Green Mountain Land, LLC\2048.01-Green Mountain\2048.01-Figures\2048.01 DL-PH1.dwg Jennifer

12/19/2014 2:01 PM S:\ELS\WA\Clark\Camas\2048-Green Mountain Land, LLC\2048.01-Green Mountain\2048.01-Figures\2048.01_DL-PH1.dwg Jennifer



LEGEND:

- Phase I Boundary (53 acres)
- Taxlot Boundary
- Wetland
- Wetland Buffer
- Man-made Pond or Ditch
- Stream
- Stream Buffer
- Existing Gravel Path
- Existing Pavement
- Existing Catch Basin
- #121 Jurisdictional Oak Tree (>20" DBH)
- #22 Oak Tree
- Tree Survey (WRG Design)
- 9 Test Plot

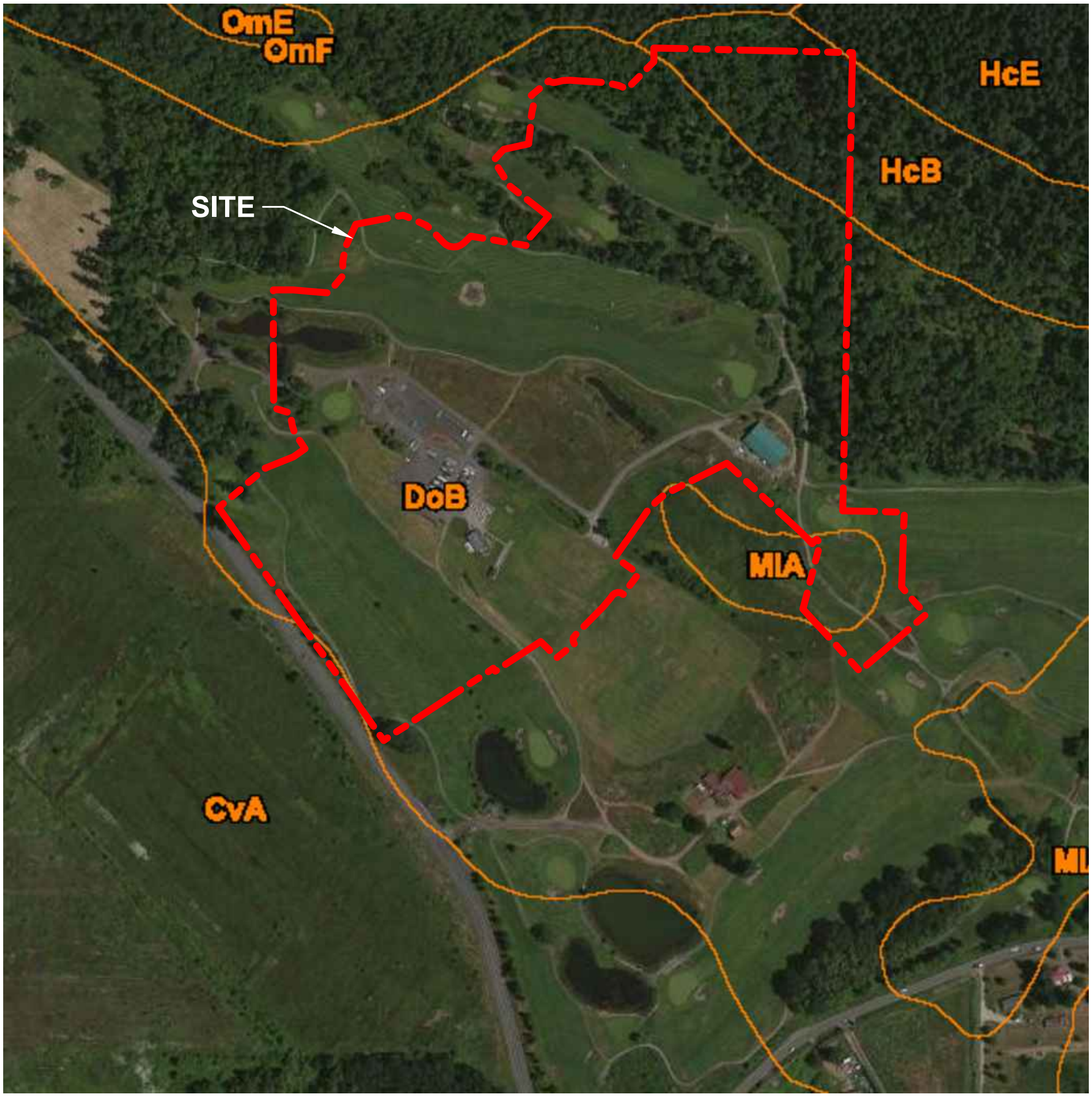
N W E S

0 250 500
SCALE IN FEET
1" = 250'

ECOLOGICAL LAND SERVICES, INC.
1157 3rd Ave., Suite 220
Longview, WA 98632
Phone: (360) 578-1371 Fax: (360) 414-9305

DATE: 12/19/14
DWN: JKJ
REQ. BY: CS
PRJ. MGR: AA/CS
CHK:
PROJECT NO:
2048.01

Figure 2
SITE MAP
Green Mountain Mixed Use PRD - Phase 1
Green Mountain Land, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.



LEGEND:

CvA Cove silty clay loam, 0 to 3 percent slopes. **Hydric.**
DoB Dollar loam, 0 to 5 percent slopes. Not hydric.
HcB Hesson clay loam, 0 to 8 percent slopes. Not hydric.
MIA McBee silt loam, coarse variant, 0 to 3 percent slopes. Not hydric.
OmF Olympic stony clay loam, 30 to 60 percent slopes. Not hydric.

NOTE(S):

1. Map provided on-line by NRCS at web address:
   http://websoilsurvey.nrcs.usda.gov/app/

Figure 3
SOIL SURVEY MAP
Green Mountain Mixed Use PRD - Phase 1
Green Mountain Land, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.

DATE: 12/19/14
DWN: JKJ
REQ. BY: CS
PRJ. MGR: AA/CS
CHK:
PROJECT NO: 2048.01

ECOLOGICAL LAND SERVICES, INC.
1157 3rd Ave., Suite 220
Longview, WA 98632
Phone: (360) 578-1371 Fax: (360) 414-9305

0 500 1000
SCALE IN FEET
1" = 500'

N
W E
S

No mapped wetlands indicated onsite by US Fish & Wildlife Service.

NOTE(S):

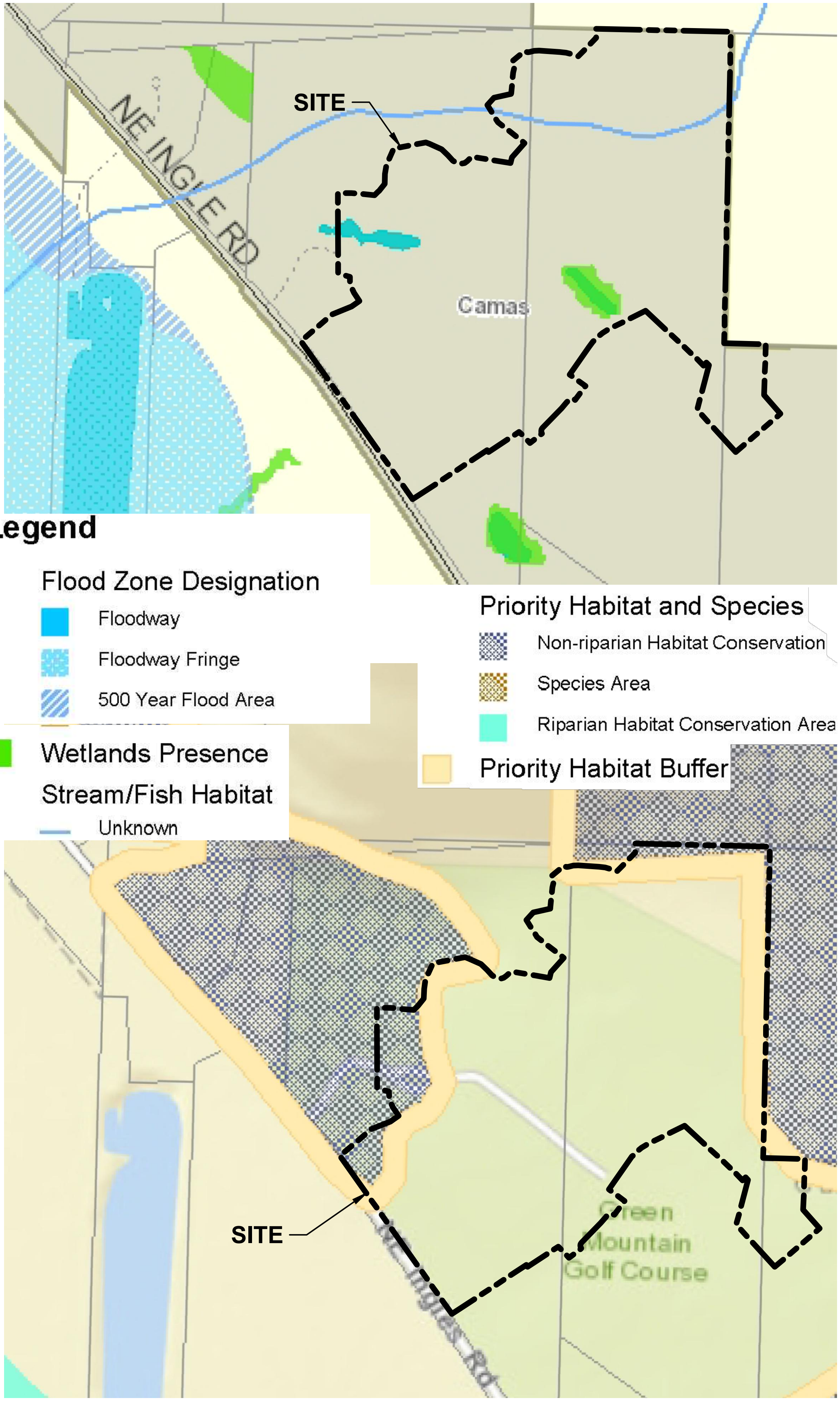
1. Map provided on-line by US Fish & Wildlife Service at web address: *http://www.fws.gov/wetlands/data/index.html*

Figure 4
NATIONAL WETLANDS INVENTORY MAP
Green Mountain Mixed Use PRD - Phase 1
Green Mountain Land, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.

DATE: 12/19/14
DWN: JKJ
REQ. BY: CS
PRJ. MGR: AA/CS
CHK:
PROJECT NO: 2048.01

ECOLOGICAL LAND SERVICES, INC.
1157 3rd Ave., Suite 220
Longview, WA 98632
Phone: (360) 578-1371 Fax: (360) 414-9305

0 500 1000
SCALE IN FEET
1" = 500'



NOTE: Map provided on-line by Clark County, Washington at web address: *http://gis.clark.wa.gov/imf/imf.jsp?site=zoning*

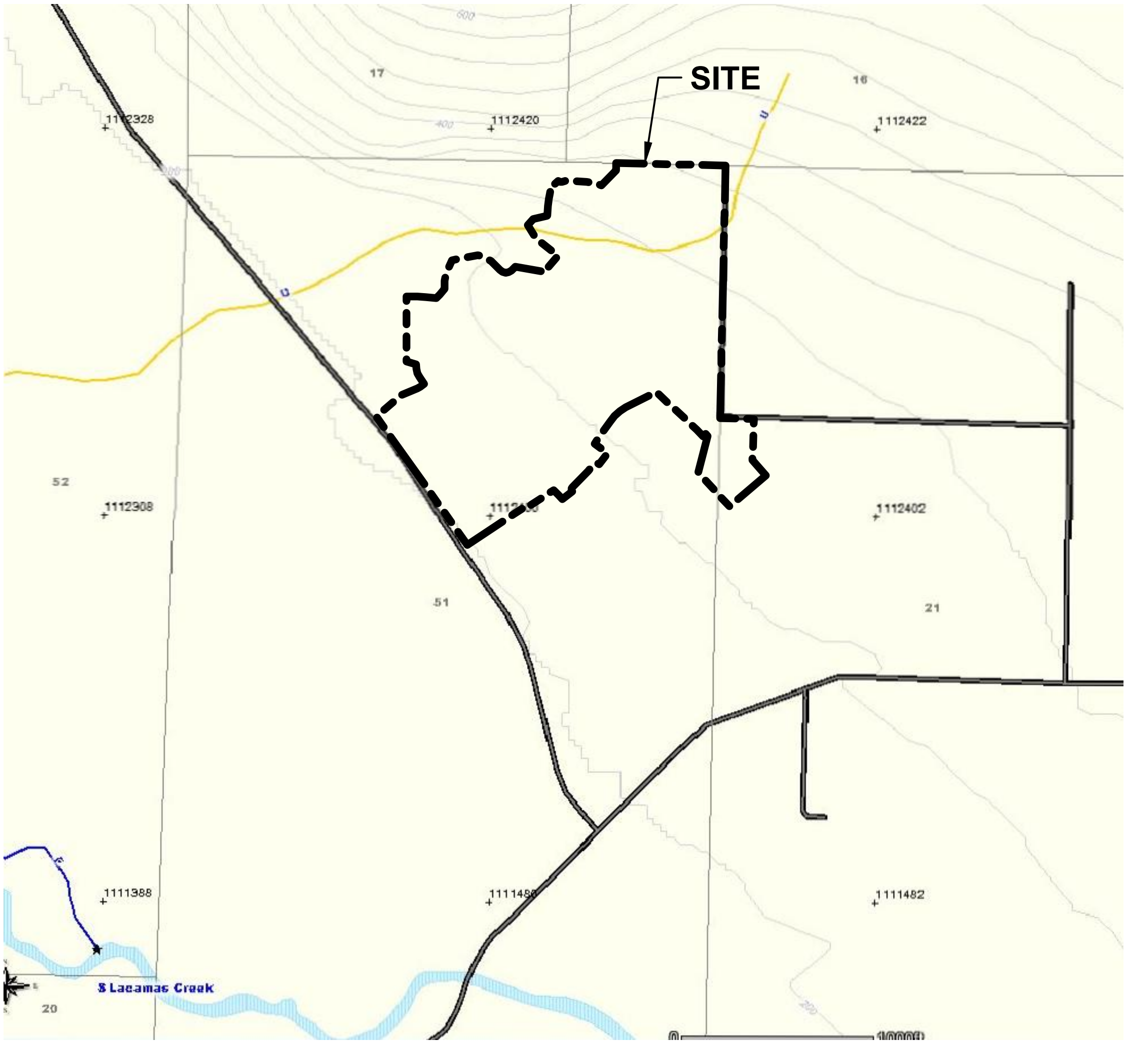
Figure 5
CLARK COUNTY CRITICAL AREAS
Green Mountain Mixed Use PRD - Phase 1
Green Mountain Land, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.

DATE: 12/19/14
DWN: JKJ
REQ. BY: CS
PRJ. MGR: AA/CS
CHK:
PROJECT NO:
2048.01

ECOLOGICAL LAND SERVICES, INC.
1157 3rd Ave., Suite 220
Longview, WA 98632
Phone: (360) 578-1371 Fax: (360) 414-9305

0 600 1200
SCALE IN FEET
1" = 600'

N
W E
S



LEGEND:

- Stream Water Type S, F, N
- U, Unknown Water Type
- ★ Water Type Change
- Open Water

NOTE: Map provided on-line by Washington State Department of Natural Resources at web address: *http://fortress.wa.gov/dnr/app1/Fpars/viewer.htm*

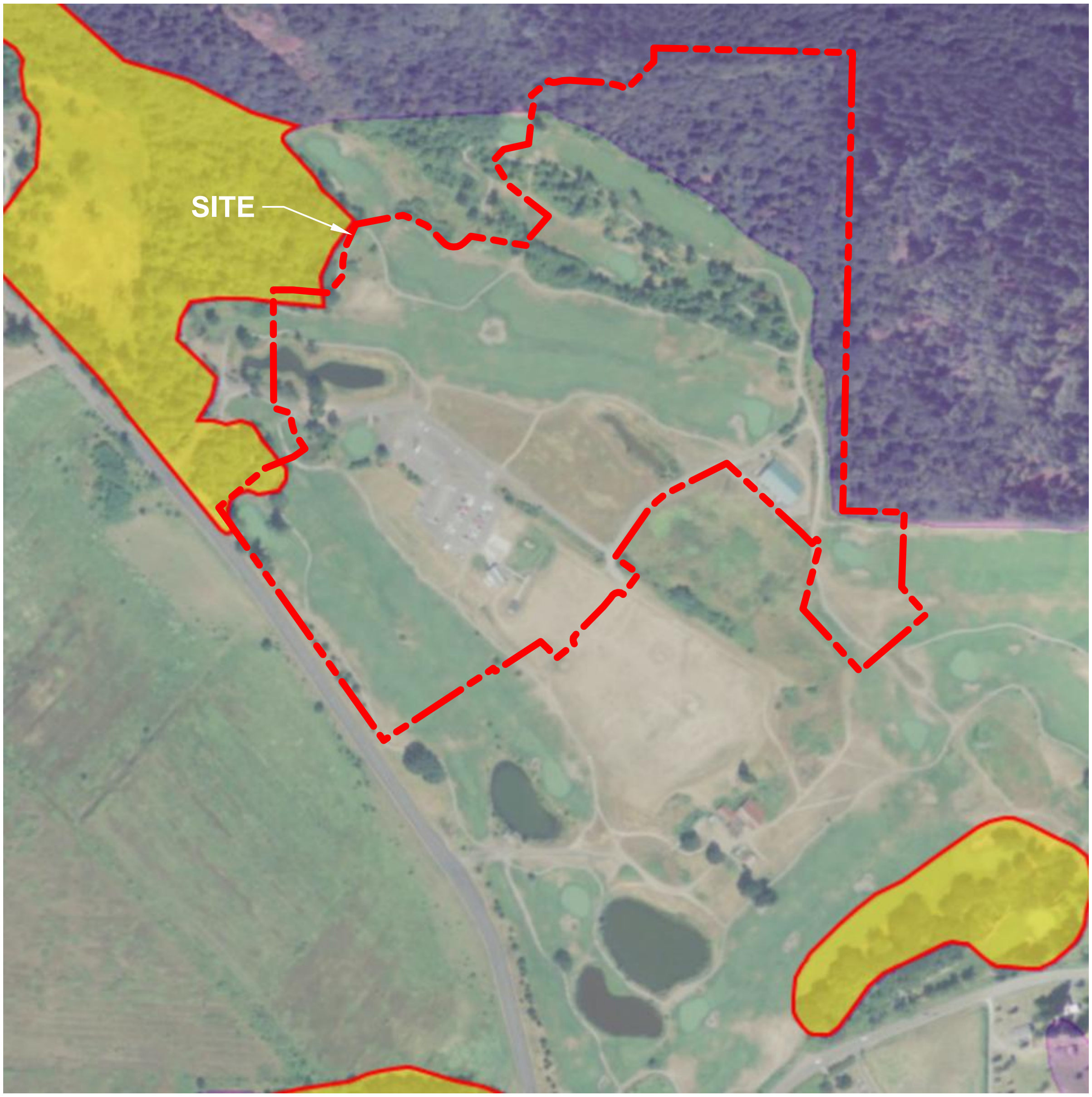
Figure 6
DNR STREAM TYPE MAP
Green Mountain Mixed Use PRD - Phase 1
Green Mountain Land, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.

DATE: 12/19/14
DWN: JKJ
REQ. BY: CS
PRJ. MGR: AA/CS
CHK:
PROJECT NO: 2048.01

ECOLOGICAL LAND SERVICES, INC.
1157 3rd Ave., Suite 220
Longview, WA 98632
Phone: (360) 578-1371 Fax: (360) 414-9305

0 1000 2000
SCALE IN FEET
1" = 1000'

N
W E
S



LEGEND:

- Oak Woodland
- Biodiversity Areas and Corridor

NOTE(S):

1. Priority habitat and species map provided by WDFW at web address: http://apps.wdfw.wa.gov/phsontheweb/

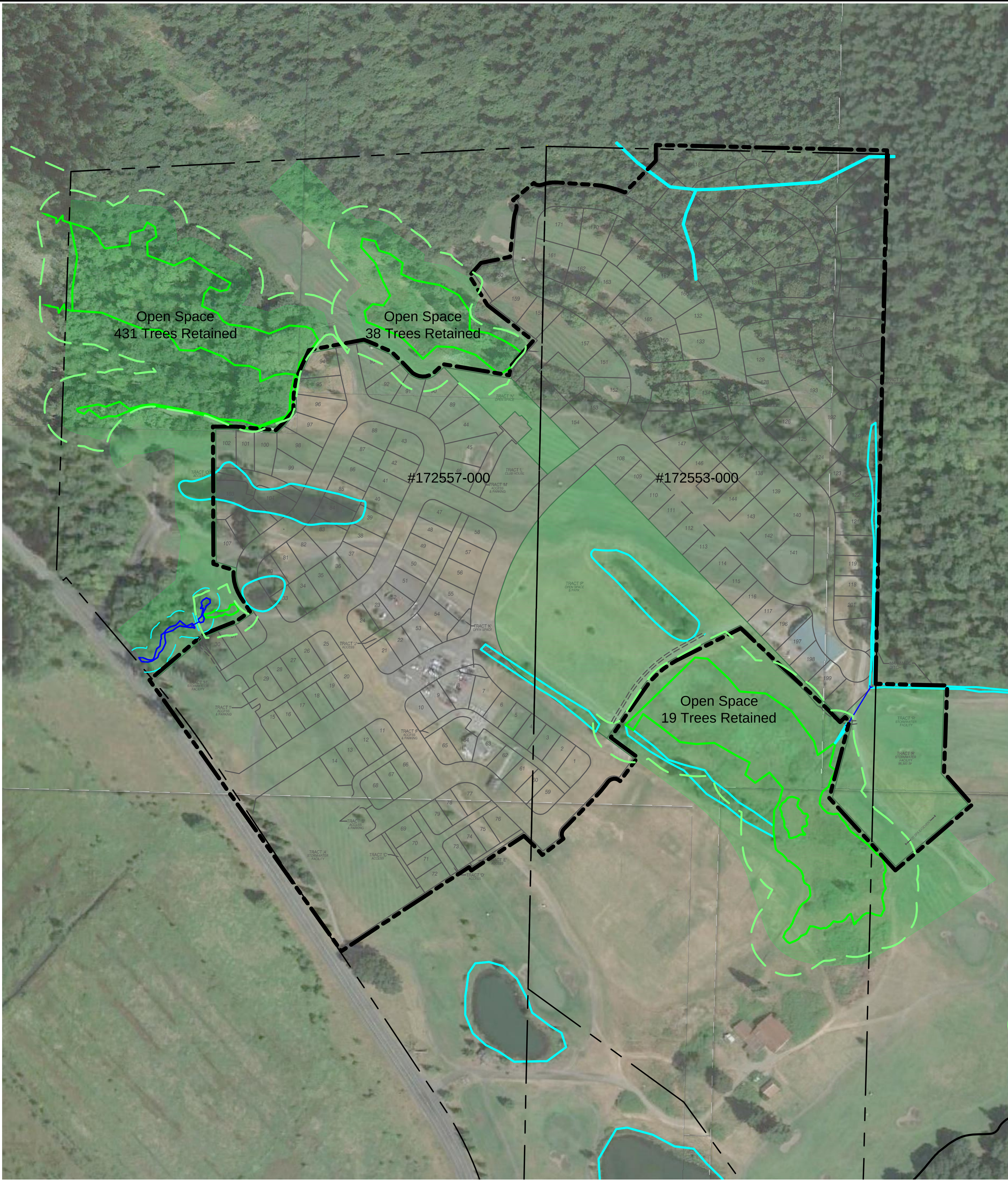
Figure 7
WDFW PRIORITY HABITAT AND SPECIES
Green Mountain Mixed Use PRD - Phase 1
Green Mountain Land, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.

DATE: 12/19/14
DWN: JKJ
REQ. BY: CS
PRJ. MGR: AA/CS
CHK:
PROJECT NO: 2048.01

ECOLOGICAL LAND SERVICES, INC.
1157 3rd Ave., Suite 220
Longview, WA 98632
Phone: (360) 578-1371 Fax: (360) 414-9305

0 500 1000
SCALE IN FEET
1" = 500'

N
W E
S



LEGEND:

- Phase I Boundary (53 acres)
- Taxlot Boundary
- Wetland
- Wetland Buffer
- Man-made Pond or Ditch
- Stream
- Stream Buffer
- Proposed Open Space/Tree Preservation Area

NOTE(S):

1. Development plan provided by Olson Engineering, Inc. Aerial photography from Google Earth™.

N W E S

0 250 500

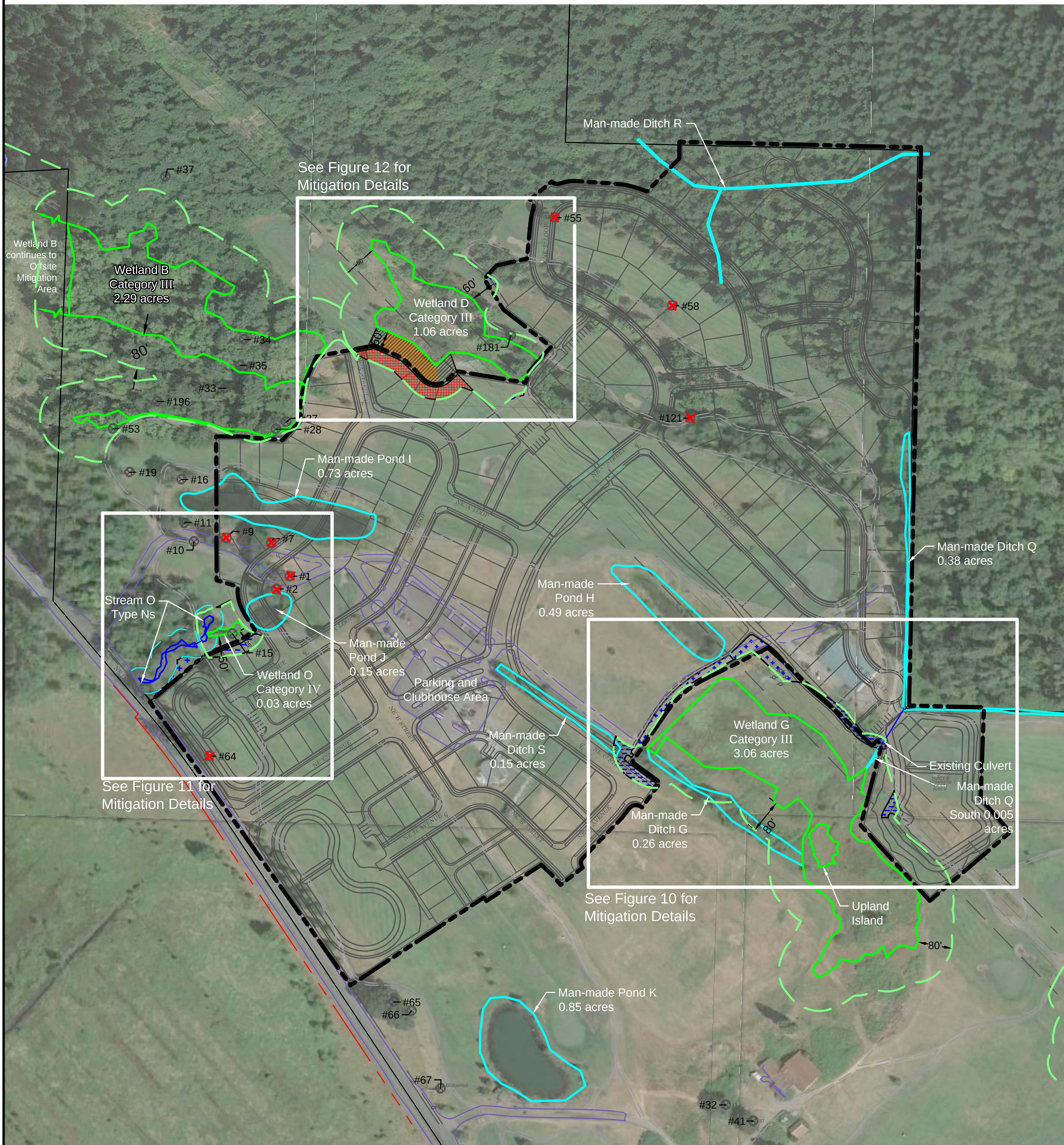
SCALE IN FEET
1" = 250'

ECOLOGICAL LAND SERVICES, INC.
1157 3rd Ave., Suite 220
Longview, WA 98632
Phone: (360) 578-1371 Fax: (360) 414-9305

DATE: 12/14/14
DWN: JKJ
REQ. BY: CS
PRJ. MGR: AA/CS
CHK:
PROJECT NO:
2048.01

Figure 8
PROPOSED PROJECT & TREE PRESERVATION
Green Mountain Mixed Use PRD - Phase 1
Green Mountain Land, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.

12/19/2014 2:01 PM S:\ELS\WA\Clark\Camas\2048-Green Mountain Land, LLC\2048.01-Green Mountain\2048.01-Figures\2048.01_DL-PH1.dwg Jennifer



LEGEND:

Phase I Boundary (53 acres)
Taxlot Boundary
Wetland
Wetland Buffer
Man-made Pond or Ditch
Existing Culvert
Stream
Stream Buffer
Existing Gravel Path
Existing Pavement
#121 Jurisdictional Oak Tree (>20" DBH)
Buffer Averaging-OUT
Buffer Averaging-IN
#121 Jurisdictional Oak Tree to be Removed (8)
Oak Mitigation Area (6,526 sq. ft.)
Buffer Impact Area (8,405 sq. ft.)
Buffer Enhancement Area (11,694 sq. ft.)

NOTE(S):

1. Development plan provided by Olson Engineering, Inc.
   Aerial photography from Google Earth™.

N W E S

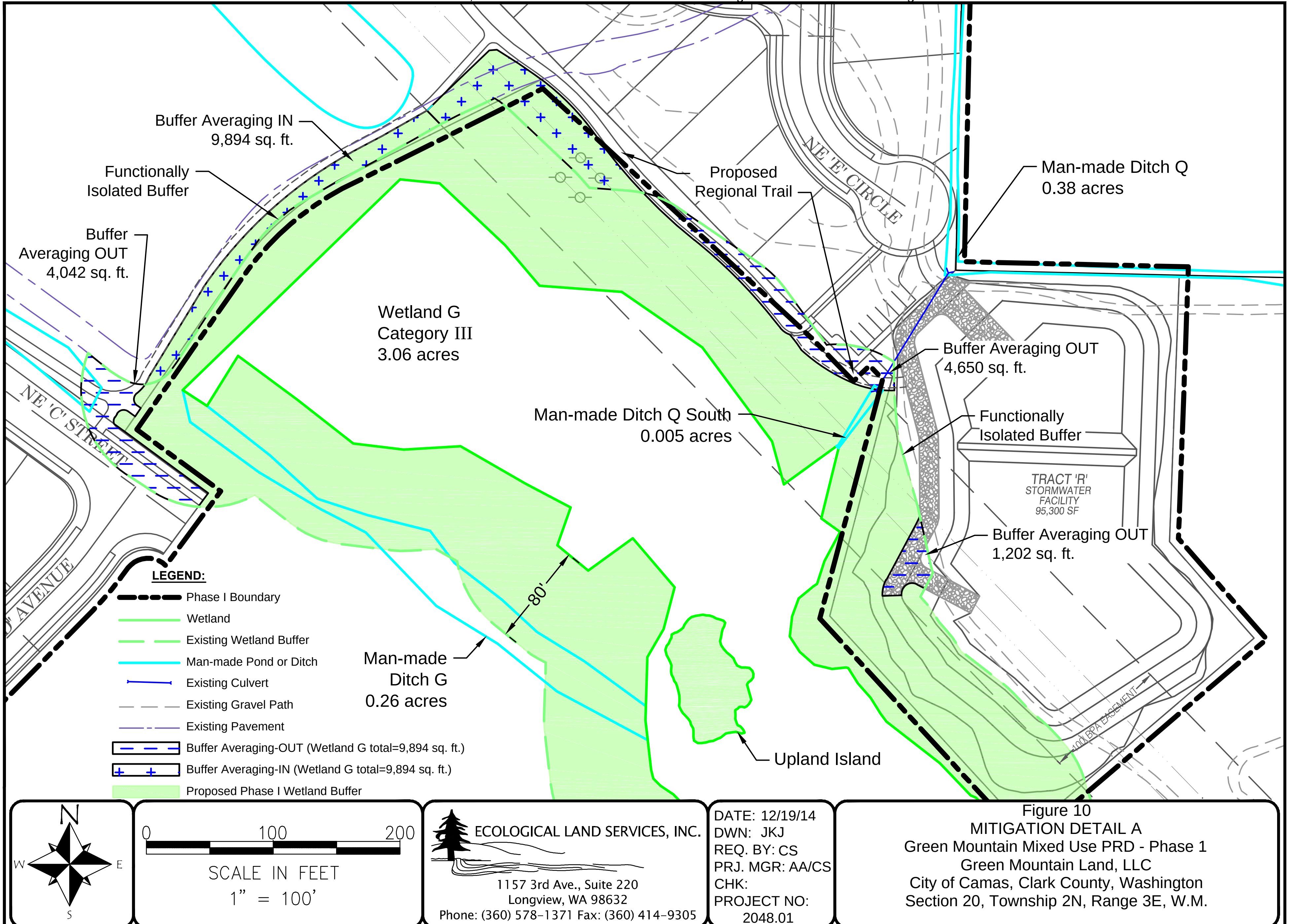
0 250 500
SCALE IN FEET
1" = 250'

ECOLOGICAL LAND SERVICES, INC.
1157 3rd Ave., Suite 220
Longview, WA 98632
Phone: (360) 578-1371 Fax: (360) 414-9305

DATE: 12/19/14
DWN: JKJ
REQ. BY: CS
PRJ. MGR: AA/CS
CHK:
PROJECT NO: 2048.01

Figure 9
MITIGATION SITE MAP
Green Mountain Mixed Use PRD - Phase 1
Green Mountain Land, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.

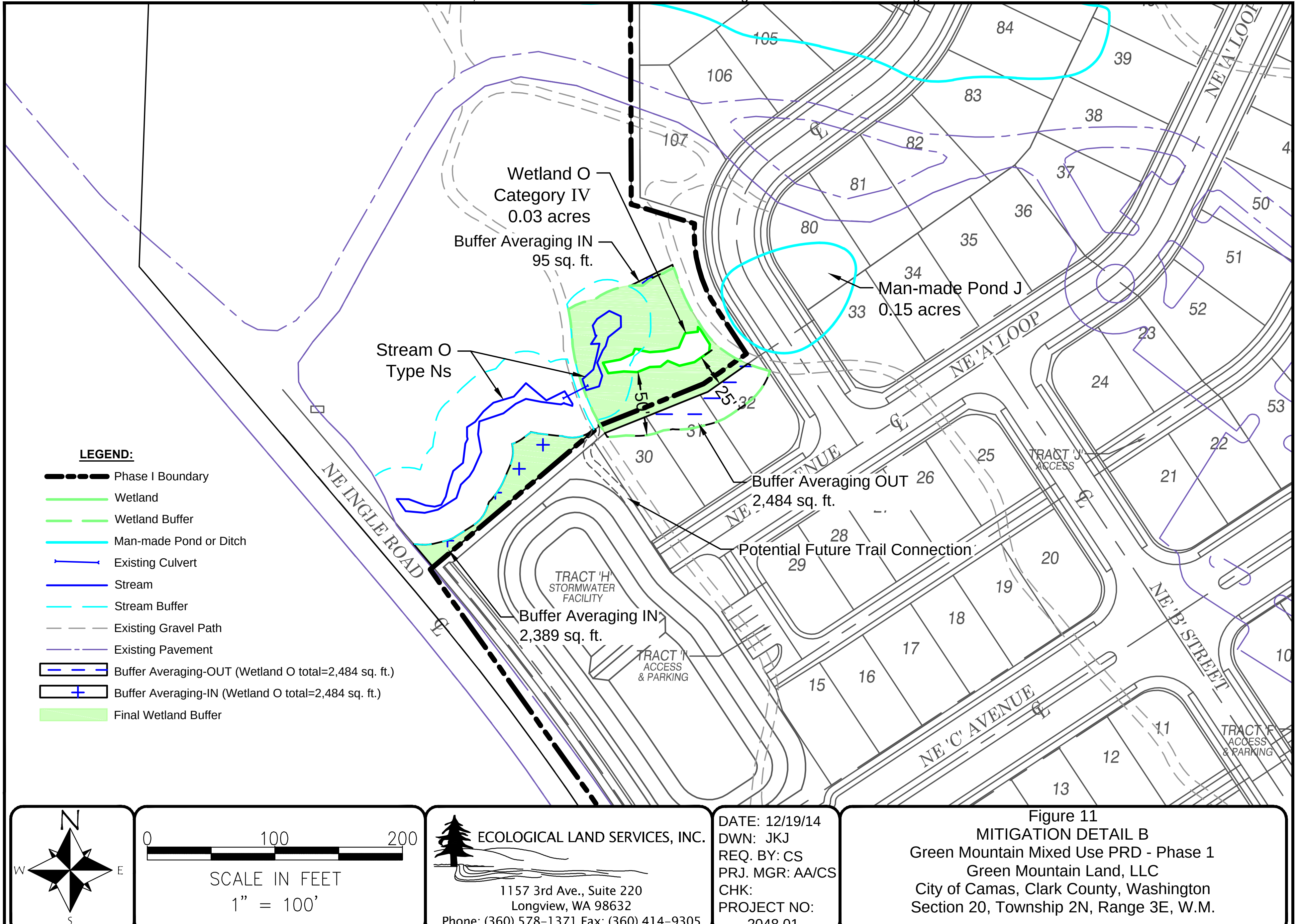
12/19/2014 2:01 PM S:\ELS\WA\Clark\Camas\2048-Green Mountain Land, LLC\2048.01-Green Mountain\2048.01-Figures\2048.01 DL-PH1.dwg Jennifer



ECOLOGICAL LAND SERVICES, INC.
1157 3rd Ave., Suite 220
Longview, WA 98632
Phone: (360) 578-1371 Fax: (360) 414-9305

DATE: 12/19/14
DWN: JKJ
REQ. BY: CS
PRJ. MGR: AA/CS
CHK:
PROJECT NO: 2048.01

Figure 10
MITIGATION DETAIL A
Green Mountain Mixed Use PRD - Phase 1
Green Mountain Land, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.

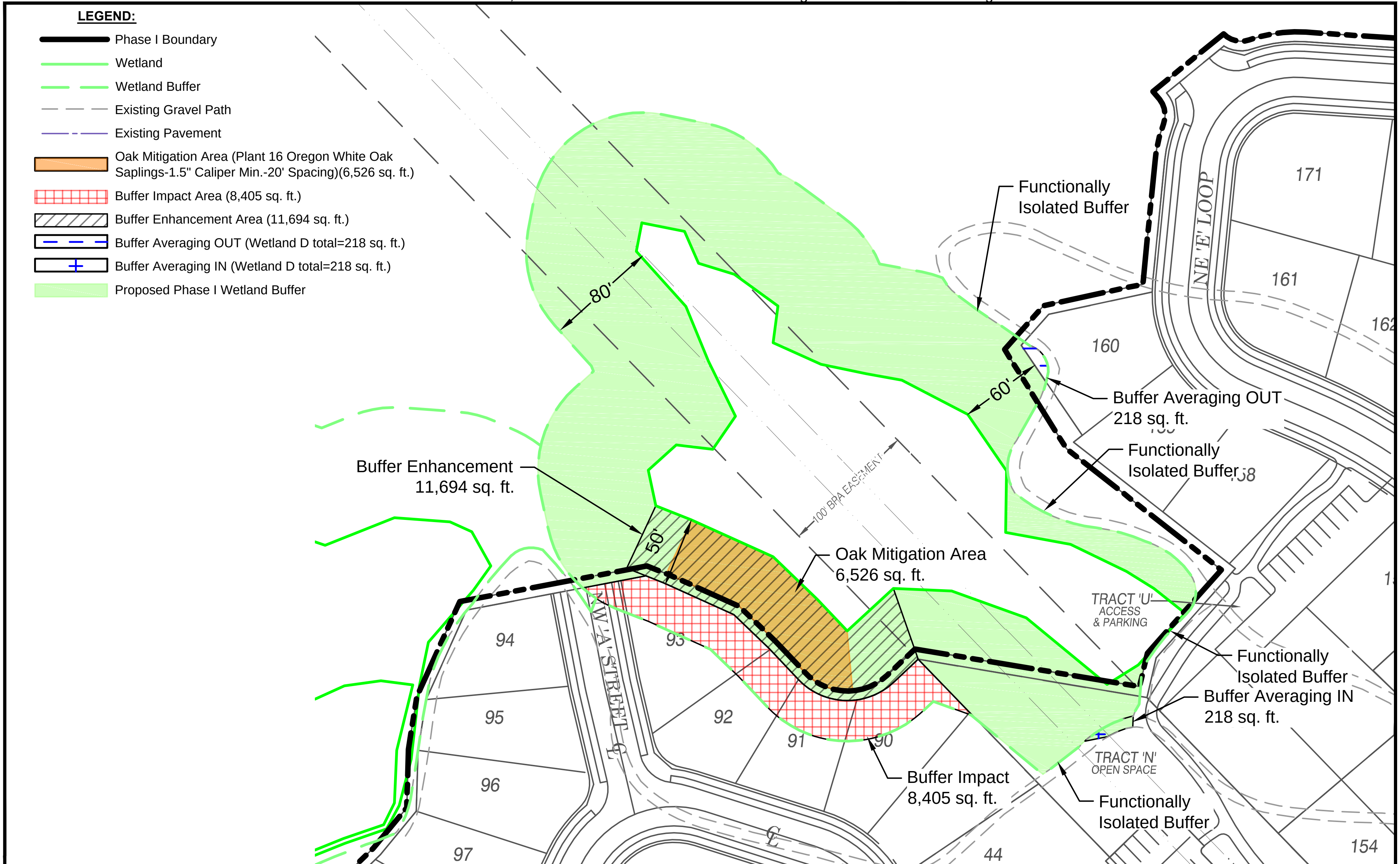


ECOLOGICAL LAND SERVICES, INC.
1157 3rd Ave., Suite 220
Longview, WA 98632
Phone: (360) 578-1371 Fax: (360) 414-9305

DATE: 12/19/14
DWN: JKJ
REQ. BY: CS
PRJ. MGR: AA/CS
CHK:
PROJECT NO:
2048.01

Figure 11
MITIGATION DETAIL B
Green Mountain Mixed Use PRD - Phase 1
Green Mountain Land, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.

12/19/2014 2:01 PM S:\ELS\WA\Clark\Camas\2048-Green Mountain Land, LLC\2048.01-Green Mountain\2048.01-Figures\2048.01 DL-PH1.dwg Jennifer



N
W
E
S

0 100 200

SCALE IN FEET

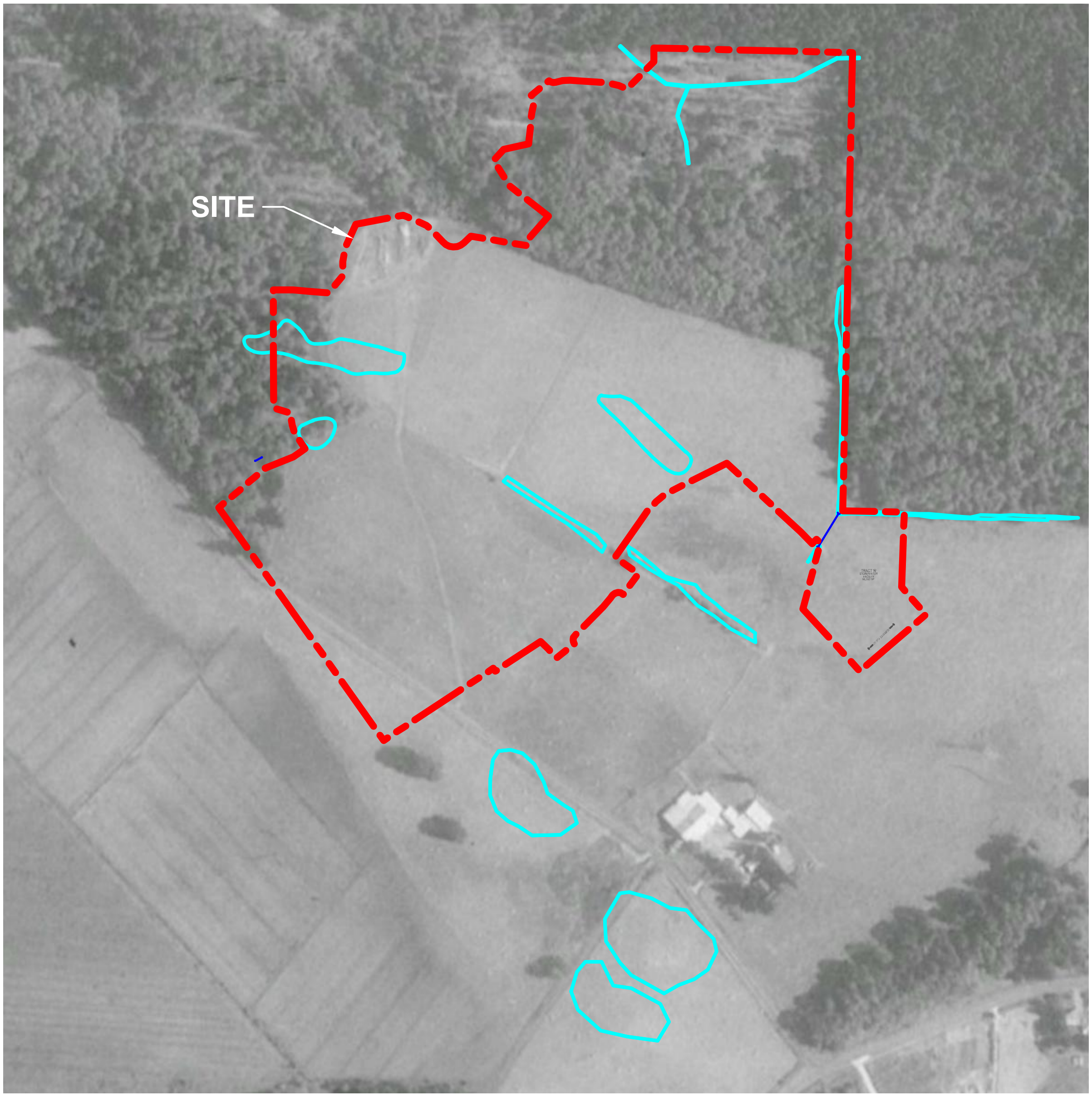
1" = 100'

ECOLOGICAL LAND SERVICES, INC.

1157 3rd Ave., Suite 220
Longview, WA 98632
Phone: (360) 578-1371 Fax: (360) 414-9305

DATE: 12/19/14
DWN: JKJ
REQ. BY: CS
PRJ. MGR: AA/CS
CHK:
PROJECT NO: 2048.01

Figure 12
MITIGATION DETAIL C
Green Mountain Mixed Use PRD - Phase 1
Green Mountain Land, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.



LEGEND:

- Phase I Boundary
- Manmade Pond/Ditch

NOTE(S):

1. Aerial photo (July 15, 1990) provided by Google Earth™.

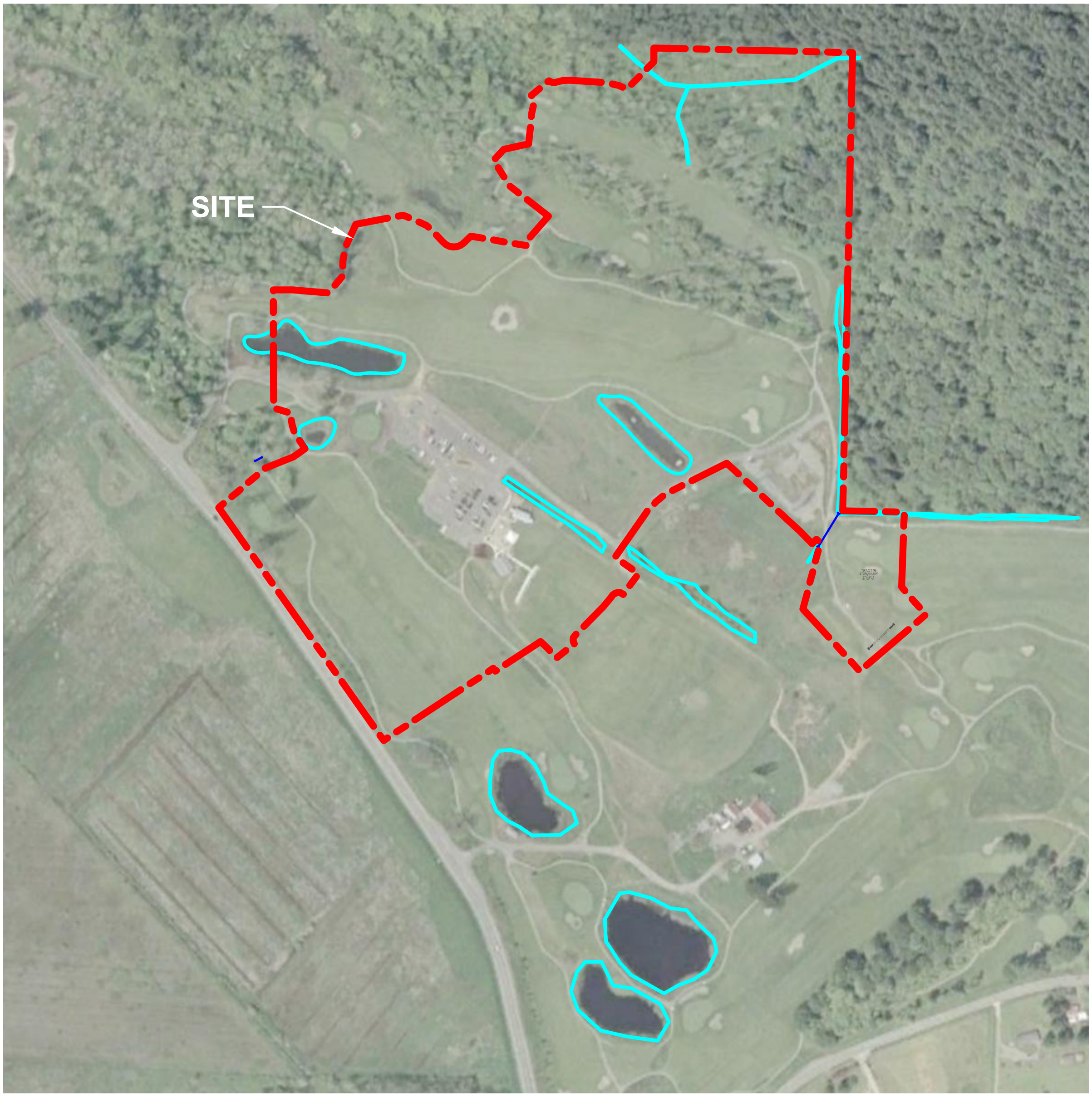
Figure 13
HISTORIC AERIAL PHOTO-1990
Green Mountain Mixed Use PRD - Phase 1
Green Mountain Land, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.

DATE: 12/19/14
DWN: JKJ
REQ. BY: CS
PRJ. MGR: AA/CS
CHK:
PROJECT NO: 2048.01

ECOLOGICAL LAND SERVICES, INC.
1157 3rd Ave., Suite 220
Longview, WA 98632
Phone: (360) 578-1371 Fax: (360) 414-9305

0 500 1000
SCALE IN FEET
1" = 500'

N
W E
S



LEGEND:

Phase I Boundary

Manmade Pond/Ditch

NOTE(S):

1. Aerial photo (May 1, 2002) provided by Google Earth™.

Figure 14
HISTORIC AERIAL PHOTO-2002
Green Mountain Mixed Use PRD - Phase 1
Green Mountain Land, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.

DATE: 12/19/14
DWN: JKJ
REQ. BY: CS
PRJ. MGR: AA/CS
CHK:
PROJECT NO: 2048.01

ECOLOGICAL LAND SERVICES, INC.
1157 3rd Ave., Suite 220
Longview, WA 98632
Phone: (360) 578-1371 Fax: (360) 414-9305

0 500 1000
SCALE IN FEET
1" = 500'

N
W E
S

EXHIBIT 52

7013 3020 0000 4440 0932

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)
For delivery information visit our website at www.usps.com®

OFFICIAL USE — LONGVIEW WA 98632

Postage	$ $1.19	0360
Certified Fee	$3.30	11
Return Receipt Fee (Endorsement Required)	$0.00	Postmark Here
Restricted Delivery Fee (Endorsement Required)	$0.00	DEC 19 2014
Total Postage & Fees	$ $4.49	12/19/2014

Sent To: DAVE BURLINGAME, COWLITZ TRIBE
Street, Apt. No.; or PO Box No.: PO BOX 2547
City, State, ZIP+4: LONGVIEW, WA 98632-8594

PS Form 3800, August 2006 — See Reverse for Instructions

7013 3020 0000 4440 0925

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)
For delivery information visit our website at www.usps.com®

OFFICIAL USE — OLYMPIA WA 98504

Postage	$ $1.19	0360
Certified Fee	$3.30	11
Return Receipt Fee (Endorsement Required)	$0.00	Postmark Here
Restricted Delivery Fee (Endorsement Required)	$0.00	DEC 19 2014
Total Postage & Fees	$ $4.49	12/19/2014

Sent To: GRETCHEN KAHLER, DAHP
Street, Apt. No.; or PO Box No.: PO BOX 48343
City, State, ZIP+4: OLYMPIA, WA 98504-8343

PS Form 3800, August 2006 — See Reverse for Instructions

7013 3020 0000 4440 0956

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)
For delivery information visit our website at www.usps.com®

OFFICIAL USE — BAY CENTER WA 98527

Postage	$ $1.19	0360
Certified Fee	$3.30	11
Return Receipt Fee (Endorsement Required)	$0.00	Postmark Here
Restricted Delivery Fee (Endorsement Required)	$0.00	DEC 19 2014
Total Postage & Fees	$ $4.49	12/19/2014

Sent To: RAY GARDNER, CHINOOK NATION
Street, Apt. No.; or PO Box No.: PO BOX 368
City, State, ZIP+4: BAY CENTER, WA 98527

PS Form 3800, August 2006 — See Reverse for Instructions

7013 3020 0000 4440 0963

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)
For delivery information visit our website at www.usps.com®

OFFICIAL USE — TOPPENISH WA 98948

Postage	$ $1.19	0360
Certified Fee	$3.30	11
Return Receipt Fee (Endorsement Required)	$0.00	Postmark Here
Restricted Delivery Fee (Endorsement Required)	$0.00	DEC 19 2014
Total Postage & Fees	$ $4.49	12/19/2014

Sent To: JOHNSON MENINICK, YAKAMA NATION
Street, Apt. No.; or PO Box No.: PO BOX 151
City, State, ZIP+4: TOPPENISH, WA 98948

PS Form 3800, August 2006 — See Reverse for Instructions

7013 3020 0000 4440 1007

U.S. Postal Service™
CERTIFIED MAIL™ RECEIPT
(Domestic Mail Only; No Insurance Coverage Provided)
For delivery information visit our website at www.usps.com®

OFFICIAL USE — GRAND RONDE OR 97347

Postage	$ $1.19	0360
Certified Fee	$3.30	11
Return Receipt Fee (Endorsement Required)	$0.00	Postmark Here
Restricted Delivery Fee (Endorsement Required)	$0.00	DEC 19 2014
Total Postage & Fees	$ $4.49	12/19/2014

Sent To: DAVID HARRELSON, GRAND RONDE
Street, Apt. No.; or PO Box No.: 9615 GRAND RONDE ROAD
City, State, ZIP+4: GRAND RONDE, OR 97347-0038

PS Form 3800, August 2006 — See Reverse for Instructions

EXHIBIT 53

IMPACT FEE / SDC ESTIMATE FOR GREEN MOUNTAIN MIXED USE PRD

Unit Type	Single Family	Condo/Townhouse	Apartment	Commercial (90,000 SF)
POD (From Master Plan)	C, D, E, F, G	B	A, H	A, H
Unit Count / Effective ERUs (1,372 total)	764	217	319	72
Square footage (average)	2,000	1,800	1,000	1,250
Evergreen School Impact Fee	$ 6,989.14	$ 6,989.14	$ 2,678.72	n/a
Traffic Impact Fee (Camas North District)	$ 7,289.00	$ 3,716.00	$ 4,788.00	separate calc below*
Parks & Open Space Impact Fee	$ 2,290.00	$ 2,290.00	$ 1,717.00	n/a
Fire Impact Fee	$ 400.00	$ 360.00	$ 200.00	$ 500.00
Water SDC (North UGA) @ 5/8"**	$ 4,873.00	$ 4,873.00	$ 4,873.00	$ 4,873.00
Sewer SDC (North UGA)**	$ 4,420.00	$ 4,420.00	$ 4,420.00	$ 4,420.00
Total for each Unit/ERU Type	**$ 26,261.14**	**$ 22,648.14**	**$ 18,676.72**	**$ 9,793.00**
Sub-total by Unit Type	**$ 20,063,510.96**	**$ 4,914,646.38**	**$ 5,957,873.68**	**$ 705,096.00**
Total Commerical Traffic Impact Fee (Camas North District)*				$ 594,048.00
TOTAL BY UNIT TYPE	**$ 20,063,510.96**	**$ 4,914,646.38**	**$ 5,957,873.68**	**$ 1,299,144.00**
TOTAL IMPACT FEES FOR PRD	**$ 32,235,175.02**			

*** Per CMC 3.88.060, TIF = T (1-B-D) C A, so TIF = 560 (1 - .34 - .26) x $4,420 x .6 = $594,048**
****assuming 5/8" per commercial ERU**

CMC 18.23.070 (B)(10) - Preliminary Master Plan - Requirements
"The calculation of all applicable impact fees. This shall be coordinated with the city prior to submission of the preliminary master plan."

Source of Data - Impact Fee Schedule dated Dec. 2013
http://www.ci.camas.wa.us/images/DOCS/BUILDING/REPORTS/impactfeeschedule.pdf

EXHIBIT 54

RESOLUTION NO. 1315

A RESOLUTION approving a Development Agreement between the City of Camas and Green Mountain Land LLC superseding and replacing the Pre-Annexation Agreement dated May 22, 2008, and the Development Agreement dated December 21, 2009.

WHEREAS, Green Mountain Land LLC is the owner of certain real property located within the City of Camas and subject to a Pre-Annexation Agreement dated May 22, 2008 and recorded under Clark County Auditor's File No. 4458438, and a Development Agreement dated December 21, 2009 and recorded under Clark County Auditor's File No. 4636619; and

WHEREAS, the parties have negotiated a Development Agreement which is intended to supersede and replace the aforementioned Pre-Annexation Agreement and Development Agreement; and

WHEREAS, the Development Agreement sets forth certain development standards that will govern the development of the property and sets forth the procedure for the submission of development applications consistent with the subsequent adoption by the City of additional planning; and

WHEREAS, the City Council has conducted a public hearing on the proposed Development Agreement on December 15, 2014, at which time it considered testimony from all interested parties; and

WHEREAS, the City Council finds that the agreement has been reviewed by the Director of Community Development and has been found to meet applicable planning requirements; and

WHEREAS, the City Council desires to approve the Development Agreement;

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF CAMAS AS FOLLOWS:

I

That certain Development Agreement between the City of Camas and Green Mountain Land LLC relating to certain real property located within the City's municipal boundary is hereby approved, and the Mayor is authorized and instructed to sign the agreement on behalf of the City.

II

The Development Agreement shall be recorded with the Clark County Auditor, pursuant to the requirements of RCW 36.70(b).190.

ADOPTED BY THE COUNCIL OF THE CITY OF CAMAS AND APPROVED BY THE MAYOR this 15th day of December, 2014.

SIGNED: ____________________
Mayor

ATTEST: Peter Capell
Clerk

APPROVED as to form:

____
City Attorney

EXHIBIT 55

5134733 AGR
RecFee - $196.00 Pages: 75 - LANDERHOLM
Clark County, WA 01/06/2015 11:23

RETURN ADDRESS

Randall Printz
Landerholm
PO Box 1086
Vancouver, WA. 98666

Please print neatly or type information

Document Title(s)

Development Agreement

Reference Numbers(s) of related documents:

none

Additional Reference #'s on page ____

Grantor(s) (Last, First and Middle Initial)

City of Camas, Green Mountain Land LLC

Additional grantors on page ___

Grantee(s) (Last, First and Middle Initial)

City of Camas, Green Mountain Land LLC

Additional grantees on page ____

Legal Description (abbreviated form: i.e. lot, block plat or section, township, range, quarter/quarter)

Sections 17, 20 and 21 T2N, R3E

Additional legal is on page ____

Assessor's Property Tax Parcel/Account Number

172555-000, 172557-000, 172553-000, 172559-000, 173178-000
172341-000, 171727-000, 171704-000 173165-000

Additional parcel #'s on page ____

The Auditor/Recorder will rely on the information provided on this form. The staff will not read the document to verify the accuracy or completeness of the indexing information provided herein.

I am requesting an emergency nonstandard recording for an additional fee as provided in RCW 36.18.010. I understand that the recording processing requirements may cover up or otherwise obscure some part of the text of the original document.

Stacey Shields

Signature of Requesting Party

After recording, return to:

RANDALL B. PRINTZ
Landerholm, Memovich,
Lansverk & Whitesides, P.S.
P.O. Box 1086
Vancouver, WA 98666-1086

Space Above for Recording Information Only

DEVELOPMENT AGREEMENT

This Development Agreement (the "Agreement") is made and entered into by and between the CITY OF CAMAS, a Washington Municipal Corporation (hereinafter referred to as the "City") and Green Mountain Land LLC (hereinafter referred to as the "Owner") (and collectively referred to as "Parties").

RECITALS

WHEREAS, Owner owns or controls certain real property which is located within the City's municipal boundary and which is more fully described in the attached Exhibit "A", (hereinafter referred to as the "Property"); and,

WHEREAS, the City and the Owner recognize this area will develop over a period of years and wish to provide predictability about the development standards that will apply to the Property over the course of its full development in order to increase efficient use of urban services; provide compatibility amongst the various phases of the Property as they develop; and to allow for substantial environmental review to occur prior to any development, recognizing that Washington's State Environmental Policy Act discourages piecemeal review; and,

WHEREAS, the City is a Washington Municipal Corporation with annexation powers, and land use planning and permitting authority over all land within its corporate limits; and,

WHEREAS, the Washington State Legislature has authorized the execution of Development Agreements between local governments and a person having ownership or control of real property within its jurisdiction pursuant to RCW 36.70B.170(1); and,

WHEREAS, pursuant to RCW 36.70B.170, a Development Agreement may set forth the development standards and other provisions that shall apply to, govern and vest the development, use and mitigation of the development of real property for the duration specified in the agreement; which statute provides:

> (1) A local government may enter into a Development Agreement with a person having ownership or control of real property within its jurisdiction. A city may enter into a development agreement for real property outside its boundaries as part of a proposed annexation or a service agreement. A development agreement must set forth the development standards and other provisions that shall apply to and govern and vest the development, use, and mitigation of the development of the real property for the duration specified in the agreement. A development agreement shall be consistent with applicable development regulations adopted by a local government planning under chapter 36.70A RCW; and

WHEREAS, the legislative findings supporting the enactment of this section provide:

> The legislature finds that the lack of certainty of the approval of development projects can result in a waste of public and private resources escalate housing costs for consumers and discourage the commitment to comprehensive planning which would make maximum efficient use of resources at the least economic cost to the public. Assurance to a development project applicant that upon government approval the project may proceed in accordance with existing policies and regulations, and subject to conditions of approval, all as set forth in a development agreement, will strengthen the public planning process, encourage private participation and comprehensive planning, and reduce the economic cost of development. Further, the lack of public facilities and services is a serious impediment to development of new housing and commercial uses. Project applicants and local governments may include provisions and agreements whereby applicants are reimbursed over time for financing public facilities. It is the intent of the legislature by RCW 36.70B.170 through 36.70B.210 to allow local governments and owners and developers of real property to enter into development agreements; and

WHEREAS, for the purposes of this Agreement, "Development Standards" includes, but is not limited to, all of the standards listed in RCW 36.70B.170(3); and,

NOW, THEREFORE, THE PARTIES HERETO AGREE AS FOLLOWS:

Section 1. Development Agreement. This Agreement is a Development Agreement to be implemented under the authority of and in accordance with RCW 36.70B.170 through RCW 36.70B.210. It shall become a contract between the Owner and the City upon its approval by ordinance or resolution following a public hearing as provided for in RCW 36.70B.170; and upon execution by all parties.

Section 2. Term of Agreement. This Agreement shall be valid through December 31, 2029; unless extended or terminated by mutual consent of the Parties; provided however, if this Agreement or any initial land use applications related to the Property and filed within one year of the effective date of this Agreement, are appealed, the term of this Agreement shall be tolled for the time during which the appeal is pending or 18 months, whichever is less.

Section 3. Previous Agreements. The parties agree that the Pre-Annexation Agreement dated May 22, 2008 and recorded under Clark County Auditor's No. 4458438 and the Agreement dated December 21, 2009, between GM Camas LLC and the City, recorded under Clark County Auditor's No. 4636619 are intended to be completely superseded by this by this Agreement with respect to the Property and those agreements will no longer apply to the Property or be binding on the parties.

Section 4. Vesting. Any land use applications submitted with respect to the Property during the term of this Amendment, shall be vested to: (1) the following zoning, land use regulations and Development Standards in effect on the effective date of this Agreement, unless otherwise provided for in this Agreement: CMC title 13 Divisions I, II, and IV; CMC title 14.02.050 and resolution 1193 adopting the 2012 SMMWW; CMC title 16.01-16.21; CMC 16.31; CMC Title 17 and CMC Title 18. Any land use approvals affecting the Property issued after the effective date of this Agreement shall remain in effect during the term of this Agreement, regardless of the time period that they would have otherwise been valid for; provided however, that preliminary plat approvals shall be valid for a period of seven years from the date of the approval, regardless of whether the end of such seven years occurs during or after the term of this Agreement. Nothing in this section shall preclude the City from extending such preliminary plat approval beyond seven years if the City determines such act is appropriate. An archeological pre-determination report shall be required for the project with an application for a Planned Residential Development. The City, based upon review of the archeological predetermination report, may require additional surveys, studies, or mitigation. The City is currently considering amendments to its zoning code that would (a) expressly provide for commercially zoned property to be included in a Planned Residential Development under certain prescribed conditions. While nothing in this Amendment shall be construed as indicating or requiring that the City will adopt such regulations, in the event that the City does adopt such regulations, the Property may be developed utilizing those regulations without waiving any of the rights vested under this Agreement. The vesting provided for under this Agreement shall not apply to System Development Charges, Impact Fees or application or review fees.

Section 5. Master Plan. Attached as Exhibit "B" and incorporated by reference herein, is a Mixed Use Master Plan (Master Plan). The Master Plan will provide the Parties with predictability regarding the future development of the Property including any associated offsite improvements related to transportation or utilities. Future development of the Property shall be generally consistent with the Master Plan. Planning standards that the Owner may utilize for the Master Plan are provided for in Section 5.6. The property shall be developed with a maximum of 1,300 dwelling units and reserve a net 8.8 acres of undeveloped land for construction of commercial uses within the Urban Village area. At the sole discretion of the City, for each additional full acre of net developed commercial land within the Urban Village area beyond the initial 8.8 acres, an additional residential bonus of 40 units may be granted and applied to the overall property. In no event, shall more than 1400 dwelling units be developed on the Property. It is contemplated by the parties that due to the number of years it will likely take the project to fully build out, changing market conditions, future urban growth boundary expansion considerations and other factors, the parties may wish to revisit some portions of the Master Plan, including raising the maximum number of residential units or commercial square footage. While nothing contained herein shall be construed to obligate either party to amend the Master Plan, it is recognized that future evolution of the City may warrant consideration of such issues.

Section 5.1 SEPA. Pursuant to the State Environmental Policy Act (SEPA), piecemeal environmental review is to be discouraged. As such, the Parties wish for SEPA review to be accomplished as part of the Agreement for as many of the Master Plan's potential adverse environmental impacts as can be reasonably analyzed, based upon current information submitted with this Agreement, including, but not limited to, the conceptual master plan, traffic study, tree analysis, GIS data as to the general presence of wetlands on some portions of the Property, ELS letter addressing off site impacts of storm water to surrounding plant and wetland communities. This may be done under the Consolidated Review provisions of SEPA. The SEPA checklist attendant with this Agreement identifies various potential adverse impacts including transportation, parks, trees, wetlands sewer, water and storm water. The Checklist also identifies a variety of technical reports or information that provides a basis for the proposed mitigation or partial mitigation of these impacts. It is the intent of this Agreement and its attendant SEPA process, to have the City issue a Threshold Determination (as that term is utilized in RCW 43.21C) on the identified impacts of the implementation of the Master Plan. Impacts that are identified at future stages of the development, i.e., Planned Residential Development approval or Preliminary Plat approval, that have been previously analyzed through this or other SEPA processes, shall not be re-analyzed; provided the future identified adverse impacts are substantially similar to and of the same or less intensity as those previously analyzed under this or other SEPA processes. Nothing in this Section shall preclude the City from requesting information on the potential adverse environmental impacts associated with a specific preliminary plat application that have not been previously analyzed as required under the State Environmental Policy Act.

Section 5.2 Parks. The Master Plan includes an extensive park/open space/trail network that can easily be accessed on foot, bike or by auto. This network provides developed and undeveloped areas of active and passive recreation, connected by a trail system that runs throughout the project. Attached as Exhibit "C", which is incorporated by reference herein, is a parks/open space/trail plan and summary sheet which describes the major components of the recreational network. It is anticipated that, (assuming appropriate amendments are made to the Parks Plan and Park Impact Fee program that provides PIF credits in an amount acceptable to the Owner) future development phases of the Property shall implement the applicable parks/open space/trail portion of the Master Plan, or something substantially similar thereto. The Parties agree that a park in this area that would in whole or in part be Park Impact Fee Creditable. However, as of the date of this Agreement, specificity as to the size of the park or the extent of improvements of the park; or the amount of Park Impact Fee credits that would be available for park land dedication or construction of improvements has not yet been determined. Because of these factors, the Parties agree to work together through the Parks Plan update and Park Impact Fee program update to arrive at an agreement regarding the size and improvements of the park to be created by the Owner and the amount of Park Impact fee Credits that would be issued to the Owner for the construction and dedication of the park.

Section 5.3 Transportation. Kittelson and Associates Transportation Engineers and the City have analyzed the transportation impacts of the full development of the Property as depicted in the Master Plan. The attached analysis includes consideration of the transportation impacts of 1,300 hundred residential units. The Property at full development will increase the existing number of PM peak hour trips on the transportation system by 1,365 trips. Based upon Kittelson's and the City's analysis, the future development of the Property (PRD and Preliminary Plat approval) shall be conditioned upon the mitigation measures and timing of construction as provided for in Exhibit "D", which is attached hereto and incorporated herein. The Property shall be vested during the term of this Agreement with 1,365 PM peak hour and 13,980 average daily trips and no additional off site transportation mitigation or analysis will be required during the term of this Agreement; provided however, that in the event the Owner proposes uses or intensities of uses that would cause the total number of PM Peak or Average Daily trips to exceed the number of trips analyzed as part of this Agreement, then the City may require additional transportation analysis and lawful mitigation. The transportation vesting provided for in this Section shall be subject to the mitigation measures and the timing provided for in Exhibit "D". Some of the transportation improvements (either on Goodwin Road, Ingle Road or off site) may be on the City's Transportation Capital Facility Plan. The Owner or successor in interest to the Property, upon construction of such qualifying transportation improvement, shall receive Transportation Impact Fee Credits, but only if such improvements are eligible for Credits under the City's applicable Capital Facilities Plan and Transportation Impact Fee programs.

Section 5.4 Tree Preservation. The Property has been previously logged and portions cleared for a golf course, but there remain a large number of trees of varying species on the Property. In order to enhance the ability to preserve trees in a predictable manner, the Parties wish to provide a comprehensive tree preservation plan for the future development of the Property, rather than through a piece meal approach whereby tree preservation is determined on a phase by phase basis as the Property develops over many years. In addition to the preservation of nearly five thousand trees, over 2,000 trees will be planted in conjunction with the development of the property consistent with the City's landscape requirements. Attached as Exhibit "E", which is incorporated by reference herein, is a Comprehensive Tree Preservation Plan for the Master Plan. Future development phases of the Property shall implement and be consistent with the Comprehensive Tree Preservation Plan for each tree area identified in Exhibit E, or something substantially similar thereto, as approved by the City. Compliance with the Tree Preservation Plan provided for in Exhibit "E" in a future PRD or other design or application for the development of the Property, will be deemed to satisfy the City's tree preservation regulations for the project as whole, including CMC 17.19.030. At the time any Preliminary Plat or Site Plan Review application, is applied for, the development applicant shall provide a report from a certified arborist or biologist regarding the health of the trees to remain in the development applied for to assure that no trees will be left standing that will cause an unreasonable risk of harm to future residents of the project.

Section 5.5 Planning Standards. The Parties: in recognizing the critical area constraints on the Property, particularly slopes and wetlands; the desire to reduce impacts to those critical areas; the Property's variety of different zoning designations, densities and uses; and, the desire to create a neighborhood environment that will offer a variety of housing types that will be functionally integrated through pedestrian, open space and trail connectivity, have created planning standards to enhance the Property's ability to achieve these and other goals. These standards may be used in addition to those that would otherwise be available through the City's PRD or density transfer provisions. Attached as Exhibit "F" is a set of these Planning Standards relating to various identified portions of the Conceptual Master Plan that may be used in the development of the property.

Section 5.6 Existing Covenant The parties agree the existing Conservation Covenant, recorded with the Clark County auditor under file #9608010075, shall expire and no longer apply to the Property upon approval of planned Residential Development of the entire property. Such PRD application shall be reviewed in absence of consideration of the covenant, but instead evaluate critical areas based upon current analysis and regulations. Notwithstanding the expiration of the Conservation covenant, the City may, as part of a development review process, require separate conservation covenants to be recorded as part of mitigating any critical or sensitive area impacts.

Section 6 Storm Water Regulations. With respect to Storm water Standards only, during the term of this Agreement the Property shall adhere to and be regulated by the rules and regulations and ordinances that are in effect on the date of this Agreement; specifically, CMC title 14.02.050 and resolution 1193 adopting the 2012 SMMWW. The Parties recognize that there may be opportunities for regional storm water strategies or facilities in the North Lacamas Lake area. The Parties agree to continue to explore with each other and with interested third parties options for regional storm water strategies / facilities in this area.

Section 6.1. The City shall have no liability for any damages or losses suffered by the Owner or the Owner's successors if a federal or state agency takes action that voids, nullifies or preempts the City's agreement to permit vesting under this Agreement. Owner and Owner's successors shall further indemnify and hold harmless the City of Camas from any and all liability, including third party liability, under any applicable state or federal regulations including, but not limited to, the Clean Water Act, for any actual or alleged violation of said regulations arising from the City's agreement to allow the vesting described in this Section 6.1 or in the event said third party or agency challenges the adoption of this Agreement within the applicable timeframes. In such event, the City, in its sole discretion, may require the owner or the owner successors to post a bond in an amount deemed reasonably sufficient to cover all costs and expenses associated with any claim or action for liability as described herein, including reasonable attorney's fees to be incurred by the City in defending any third party claim. Upon notice of any claim or action for liability against City relating to this Section, the City shall timely notify Owner or Owner's successors of their duties for indemnification of the City. Within ten (10) days of such notice, Owner may, at Owner's sole discretion, revoke its vested rights to the City's current storm water standards arising under this section by giving written notice of such revocation to the City. Upon such revocation, the Owner shall have no further liability to the City or obligation to indemnify the City. The Owner may choose to waive the vesting provided for in Section 6, if it notifies the City in writing. In that event, any fully complete development application submitted to the City and relating to the Property, shall vest to the storm water rules and regulations in effect at the time such application is submitted to the City. If the Owner chooses to waive the vesting provided for in Section 6, then all vested rights created in Section 6, shall become null and void, but such choice shall not affect any other provisions of this Agreement.

Section 7 Streetscape. Owner agrees to incorporate into its development application submittal package streetscape standards for primary streets within the Property addressing street specifications, tree spacing and species, sidewalk separation, trash receptacles, benches and other street amenities that will create an inviting, safe passage for not only vehicular but pedestrian traffic. Owner streetscape standards will be consistent with the streetscape standards identified in Exhibit "G" or to the adopted streetscape standards, at the City's sole discretion, at the time of development approval. At the time of application, Owner shall further be required to meet the current City minimum Street standards in CMC 17.19 and the Camas Design Standards Manual.

Section 8 Significant Views. The property includes land (Green Mountain) that is recognized as an important scenic and forested backdrop to Lacamas Lake as viewed from roads and vistas around the lake, which in turn plays a role in defining the City's character. The City's Comprehensive Plan identifies the goal of "preserving the scenic and aesthetic quality of shoreline areas and vistas to the greatest extent possible." The Comprehensive Plan also identifies as a strategies to achieve these goals: establishment and maintenance of a permanent open space network and greenways; and, preserving the visual integrity of the wooded hillsides that provide the backdrop for the City; including the preservation of natural vegetation, minimizing disruption of soils and slopes, maintaining drainage patterns and encouraging wildlife habitats. As such, any development application under this Amendment shall comply with CMC 16.33 including any necessary mitigation plan, prepared and reviewed in accordance with CMC 16.33. Compliance with this section shall include, but not be limited to, review of any Development Application for consistency with the policies under CMC Section 16.33.010(B) and may be conditioned or denied to mitigate views impacts consistent with CMC Section 16.33.010(B)(4), (5).

Section 9 Golf Course. The parties acknowledge that a portion of the property is currently utilized as a golf course and related uses, subject to a conditional use permit. Nothing contained within this Amendment shall be construed as an indication on the part of the City that such use is prohibited or constrained in any manner and such use may continue after the execution of this Agreement.

Section 10. Remedies. Should a disagreement arise between the City and Developer regarding the interpretation and application of this Agreement, the parties agree to attempt to resolve the disagreement by first meeting and conferring. If such meeting proves unsuccessful to resolve the dispute, the disagreement may be resolved by judicial action filed in the Clark County Superior Court.

Section 11. Performance. Failure by either party at any time to require performance by the other party of any of the provisions hereof shall in no way affect the parties' rights hereunder to enforce the same, nor shall any waiver by a party of the breach hereof be held to be a waiver of any succeeding breach or a waiver of this non-waiver clause.

Section 12. Venue. This Agreement shall be construed in accordance with and, governed by, the laws of the State of Washington. The parties agree to venue in the Superior Court for Clark County, State of Washington, to resolve any disputes that may arise under this Agreement.

Section 13. Severability. If any portion of this Agreement shall be invalid or unenforceable to any extent, the validity of the remaining provisions shall not be affected thereby.

Section 14. Inconsistencies. If any provisions of the Camas Municipal Code are deemed inconsistent with the provisions of this Agreement, the provisions of this Agreement shall prevail.

Section 15. Binding on Successors and Recording. The rights and obligations created by this Agreement are assignable and shall be binding upon and inure to the benefit of Owner, the City, and their respective heirs, successors and assigns. Only Owner and the City or their assigns shall have the right to enforce the terms of this Amendment. This Agreement shall be recorded against the real property indicated on Exhibit "A" with the Clark County Auditor.

Section 16. Recitals. Each of the recitals contained herein are intended to be, and are incorporated as, covenants between the parties and shall be so construed.

Section 17. Amendments. This Agreement may only be amended by mutual agreement of the parties. Pursuant to RCW 36.70B.170(4), the City reserves the authority to impose new or different regulations to the extent required by a serious threat to public health and safety.

Exhibits:

Exhibit A:	Legal Description of Property
Exhibit B:	Master Plan
Exhibit C:	Park Plan
Exhibit D:	Transportation Mitigation
Exhibit E:	Tree Plan
Exhibit F:	Planning Standards
Exhibit G:	Streetscape Standards

IN WITNESS WHEREOF, the parties hereto have caused this Amendment to be executed as of the dates set forth below:

CITY OF CAMAS	GREEN MOUNTAIN LAND LLC
By ______________	By ______________
Title Mayor	Title Manager

STATE OF WASHINGTON)
) ss.
County of Clark)

I certify that I know or have satisfactory evidence that John O'Neil is the person who appeared before me, and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute this instrument and acknowledged it as the Manager of GREEN MOUNTAIN LAND, LLC to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

DATED: December 22, 2014.

Linda N Gill

NOTARY PUBLIC for the State of Washington,
Residing in the County of Clark
My Commission Expires: 5-28-16

LINDA N. GILL
COMMISSION EXP.
NOTARY
PUBLIC
MAY 28, 2016
STATE OF WASHINGTON

STATE OF WASHINGTON)
) ss.
County of Clark)

I certify that I know or have satisfactory evidence that Scott Higgins is the person who appeared before me, and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute this instrument and acknowledged it as the Mayor of the CITY OF CAMAS, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

DATED: December 16, 2014.

LEISHA A. COPSEY
NOTARY PUBLIC
STATE OF WASHINGTON
COMMISSION EXPIRES
AUGUST 30, 2015

Leisha A. Copsey

NOTARY PUBLIC for the State of Washington,
Residing in the County of Clark
My Commission Expires: 8/30/15

OLSON ENGINEERING INC.

LAND SURVEYORS
ENGINEERS

(360) 695-1385
1111 Broadway
Vancouver, WA
98660

EXHIBIT A

LEGAL DESCRIPTION FOR GREEN MOUNTAIN LAND, LLC
PERIMETER

May 27, 2014

A parcel of land in the South half of Section 17, the East half of Section 20, and the West half of Section 21, all in Township 2 North, Range 3 East of the Willamette Meridian in Clark County Washington, described as follows:

BEGINNING at the Northeast corner of the Southeast quarter of said Section 17;

THENCE North 89° 22" 57" West, along the North line of the South half of said Section 17, a distance of 3514.78 feet, more or less, to the centerline of Northeast Ingle Road;

THENCE South 01° 53' 59" West, along said centerline, a distance of 477.58 feet to a point on a 335.00 foot radius curve to the left;

THENCE along said centerline, and along said 335.00 foot radius curve to the left (the long chord of which bears South 19° 58' 22" East, a distance of 249.60 feet), an arc distance of 255.77 feet;

THENCE South 41° 50' 43" East, along said centerline, a distance of 141.81 feet to a 675.00 foot radius curve to the right;

THENCE along said centerline, and along said 675.00 foot radius curve to the right (the long chord of which bears South 33° 13' 03" East, a distance of 202.52 feet), an arc distance of 203.29 feet;

THENCE South 24° 35' 23" East, along said centerline, a distance of 57.61 feet to a point on a 1200.00 foot radius curve to the left;

THENCE along said centerline, and along said 1200.00 foot radius curve to the left (the long chord of which bears South 28° 02' 22" East, a distance of 144.41 feet), an arc distance of 144.50 feet;

THENCE South 31° 29' 20" East, along said centerline, a distance of 190.47 feet;

THENCE South 30° 43' 55" East, along said centerline, a distance of 678.85 feet;

OLSON ENGINEERING INC.

LAND SURVEYORS
ENGINEERS

(360) 695-1385
1111 Broadway
Vancouver, WA
98660

THENCE South 29° 58' 13" East, along said centerline, a distance of 238.24 feet to a point which bears South 59° 56' 15" West from a 1/2" iron pipe marking the Northwest corner of that parcel of land conveyed to Keith and Gloria Bakker by deed recorded under Auditor's File No. G 646584, records of Clark County;

THENCE leaving said centerline, North 59° 56' 15" East, a distance of 21.66 feet to said iron pipe on the North line of said Bakker parcel;

THENCE continuing North 59° 56' 15" East, along said North line, a distance of 329.81 feet to a 3/4" iron pipe and the Northeast corner thereof;

THENCE South 33° 49' 02" East, along the East line of said Bakker parcel, a distance of 667.95 feet to a 3/4" iron pipe at the Southeast corner thereof;

THENCE South 49° 37' 59" West, along the South line of said Bakker parcel, a distance of 353.18 feet, more or less, to the centerline of Northeast Ingle Road;

THENCE South 40° 25' 24" East, along said centerline, a distance of 178.15 feet to a point which bears South 06° 18' 14" West from a 1/2" iron pipe on an Easterly line of that parcel of land conveyed to James M. Bartmess by deed recorded under Auditor's File No. 8911140220, records of Clark County;

THENCE North 06° 18' 14" East, along said Easterly line, a distance of 71.63 feet to said iron pipe and to an angle point;

THENCE North 86° 45' 59" East, along the Southerly line of said Bartmess tract, a distance of 9.94 feet to the Northwest corner of that parcel of land conveyed to Ronald and Rhonda Warman by deed recorded under Auditor's File No. 9004270087, records of Clark County;

THENCE North 86° 58' 36" East, along the North line of said Warman parcel, a distance of 790.14 feet to the Northeast corner thereof;

THENCE South 02° 04' 33" West, along the East line of said Warman parcel, a distance of 973.64 feet, more or less to the Northeasterly right-of-way line of Northeast Ingle Road as conveyed to Clark County by deed recorded under Auditor's File No. 4217481 D, said point being 30.00 feet from, when measured perpendicular to, the centerline of said Road;

THENCE South 40° 25' 24" East, along said right-of-way line, a distance of 353.90 feet to a point on a 2030.00 foot radius curve to the right;

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS

(360) 695-1385
1111 Broadway
Vancouver, WA
98660

THENCE along said right-of-way, and along said 2030.00 foot radius curve to the right (the long chord of which bears South 37° 00' 37" East, a distance of 241.71 feet), an arc distance of 241.85 feet;

THENCE South 33° 35' 50" East, along said right-of-way, a distance of 1043.01 feet to a point on a 830.00 foot radius curve to the right;

THENCE along said right-of-way, and along said 830.00 foot radius curve to the right (the long chord of which bears South 23° 12' 47" East, a distance of 299.21 feet), an arc distance of 300.85 feet;

THENCE South 12° 49' 45" East, along said right-of-way, a distance of 392.70 feet to a point on a 770.00 foot radius curve to the left;

THENCE along said right-of-way, and along said 770.00 foot radius curve to the left (the long chord of which bears South 29° 32' 51" East, a distance of 443.01 feet), an arc distance of 449.36 feet;

THENCE South 46° 15' 59" East, along said right-of-way, and the Southerly projection thereof, a distance of 39.01 feet, more or less, to a point on the centerline of Northeast Goodwin Road;

THENCE North 43° 58' 00" East, along said centerline, a distance of 494.48 feet to a point on a 955.00 foot radius curve to the right;

THENCE along said centerline, and along said 955.00 foot radius curve to the right (the long chord of which bears North 56° 56' 15" East, a distance of 428.71 feet), an arc distance of 432.40 feet;

THENCE North 69° 54' 30" East, along said centerline, a distance of 354.84 feet to a point on a 955.00 foot radius curve to the right;

THENCE along said centerline, and along said 955.00 foot radius curve to the right (the long chord of which bears North 80° 35' 44" East, a distance of 354.20 feet), an arc distance of 356.26 feet to a point on the South line of the Northwest quarter of said Section 21;

OLSON ENGINEERING INC.

LAND SURVEYORS
ENGINEERS

(360) 695-1385
1111 Broadway
Vancouver, WA
98660

THENCE South 88° 43' 02" East, along said South line, a distance of 987.61 feet to the Southeast corner of said Northwest quarter;

THENCE North 01° 27' 15" East, along the East line of said Northwest quarter, a distance of 1314.56 feet to the North line of the South half of the Northwest quarter of said Section 21;

THENCE North 88° 42' 01" West, along said North line, a distance of 1800.91 feet, more or less, to the East line of the T.J. Fletcher Donation Land Claim No. 51;

THENCE North 01° 13' 25" East, along said East line, a distance of 1315.09 feet, more or less, to the North line of the Northwest quarter of said Section 21;

THENCE North 88° 40' 59" West, along said North line, a distance of 830.93 feet to the Northwest corner of said Section 21;

THENCE North 01° 45' 50" East, along the East line of the Southeast quarter of said Section 17, a distance of 2650.46 feet to the POINT OF BEGINNING.

SUBJECT TO county roads.

EXCEPT that parcel conveyed to Green Mountain Resorts, Inc. by deed recorded under Auditor's File No. 9311050364, also known as Mountain Glen Subdivision, recorded in Book "J" of Plats, at Page 199, records of Clark County.

ALSO EXCEPT that parcel of land conveyed to R. Lon and Rachelle Combs, recorded under Auditor's File No. 4150099 D, records of Clark County.

Z:\8000\8900\8930\8938\Legal Descriptions\8938.0008leg-Perimeter.doc
JMB

GREEN MOUNTAIN

CONCEPTUAL MASTER PLAN FOR A MIXED USE PRD

CAMAS, WASHINGTON
GREEN MOUNTAIN LAND, LLC. 11/19/14

EXHIBIT B

TOTAL SITE AREA 283.3 AC

SITE AREA TABLE

R10 ZONE	119.7 AC
R6 ZONE	54.8 AC
MF10 ZONE	93.0 AC
CC ZONE	15.8 AC

RESIDENTIAL DENSITY CALCULATION

R-10	119.7 @ 4.3 / ACRES = 515 UNITS
R-6	54.8 @ 7.2 / ACRES = 395 UNITS
MF-10	93.0 @ 10 / ACRES = 930 UNITS
TOTAL	1840 UNITS

DENSITY TABLE

POD	ACRES	APPROXIMATE LOT SIZE RANGE	MAXIMUM UNITS/LOTS
A	12.2 (A1-A3)	HD	219
B	15.5 (B1-B5)	1000-3000	217
C	11.9 (C1-C2)	3000-5000	95
D	41.3 (D1-D6)	4000-6000	309
E	26.5 (E1-E4)	4200-7200	172
F	28.6 (F1-F4)	5250-9000	157
G	30.0 (G1)*	15,000-40,000	31
H	15.4 (CC)		100
TOTALS	181.4 AC		1300

*40% OF G (TOTAL 50 ACRES) TO BE PRESERVED OPEN SPACE

PARK & OPEN SPACE	89.3 ± AC
NEIGHBORHOOD CIRCULATOR	8.2 ± AC
ARTERIAL & COLLECTOR FRONTAGE DEDICATION (GOODWIN & INGLE)	1.8 ± AC

URBAN VILLAGE AREA (H, A1, A2, A3, B5)
A COMMERCIAL, MIXED USE AND RESIDENTIAL COMMUNITY CENTER (± 33.5 AC GROSS, 24.2 AC NET)

CIRCULATION COMPONENTS

ARTERIAL

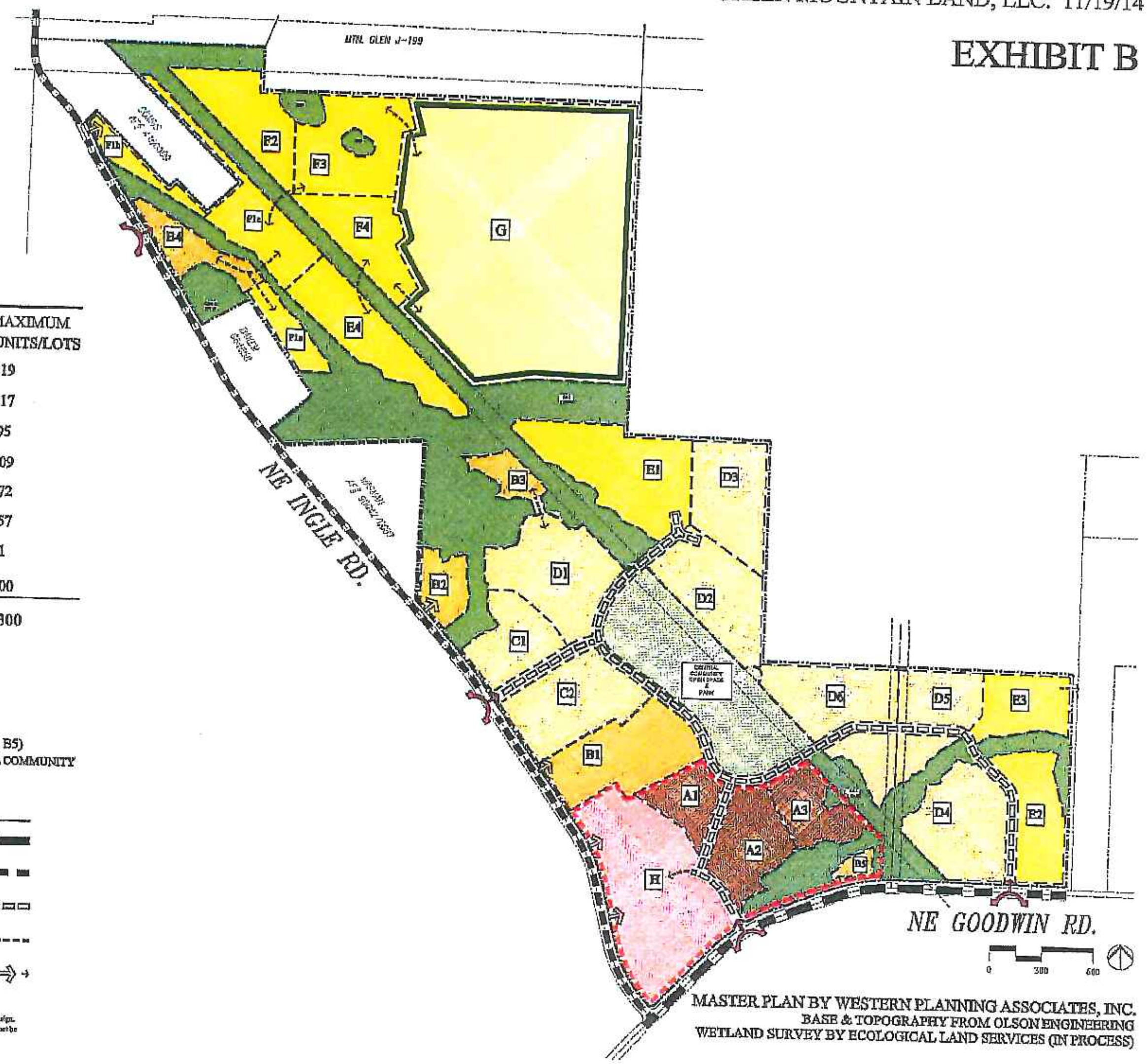
COLLECTOR

NEIGHBORHOOD CIRCULATOR
LOCATION SHOWN IS APPROXIMATE & SUBJECT TO ADJUSTMENT

NEIGHBORHOOD CONNECTOR
LOCATION SHOWN IS APPROXIMATE & SUBJECT TO ADJUSTMENT

COMMUNITY ENTRIES & ACCESS POINTS
LOCATION SHOWN IS APPROXIMATE & SUBJECT TO ADJUSTMENT

NOTE:
The precise location and number of units within the pods are approximate due to the preliminary nature of the design. While unit numbers per pod may change, the total number of units of the proposed Mixed Use Master Plan will not be exceeded, absent express consent from the City after appropriate regulatory process.



MASTER PLAN BY WESTERN PLANNING ASSOCIATES, INC.
BASE & TOPOGRAPHY FROM OLSON ENGINEERING
WETLAND SURVEY BY ECOLOGICAL LAND SERVICES (IN PROCESS)

GREEN MOUNTAIN
CONCEPTUAL PARK & OPEN SPACE PLAN

CAMAS, WASHINGTON
GREEN MOUNTAIN LAND, LLC. 11/19/14

EXHIBIT C

LEGEND

PARKS & OPEN SPACE AREAS
(+ 89 *)

CENTRAL COMMUNITY OPEN SPACE & PARK
(14 AC)

COMMUNITY TRAIL SYSTEM
(LOCATION SHOWN IS CONCEPTUAL)

REGIONAL TRAIL- TYPICAL EASEMENT WIDTH 24 FEET ** PLUS SWITCHBACK AREAS
8' WIDE AT CENTRAL PARK, PAVED
6' WIDE FLAT UP TO 8% TRAIL GRADE, PAVED
4' WIDE IN STEEP TERRAIN (8%- 16% TRAIL GRADE), COMPACTED GRAVEL

T29 / T30 / SU14- TYPICAL EASEMENT WIDTH 24 FEET** PLUS SEITCHBACK AREAS
6' WIDE FLAT UP TO 8% TRAIL GRADE, COMPACTED GRAVEL
4' WIDE IN STEEP TERRAIN (8% - 16% TRAIL GRADE), COMPACTED GRAVEL

NEIGHBORHOOD TRAILS EASEMENTS IN COMMON AREA TRACTS
6' WIDE FLAT UP TO 8% TRAIL GRADE, PAVED
4' WIDE IN STEEP TERRAIN (8% - 16% TRAIL GRADE), COMPACTED GRAVEL

** WHERE NOT ADJACENT TO A PUBLIC RIGHT OF WAY

* DOES NOT INCLUDE POCKET PARKS

Exhibit D

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING / PLANNING
610 SW Alder Street, Suite 700, Portland, OR 97205 503.228.5230 503.273.8169

MEMORANDUM

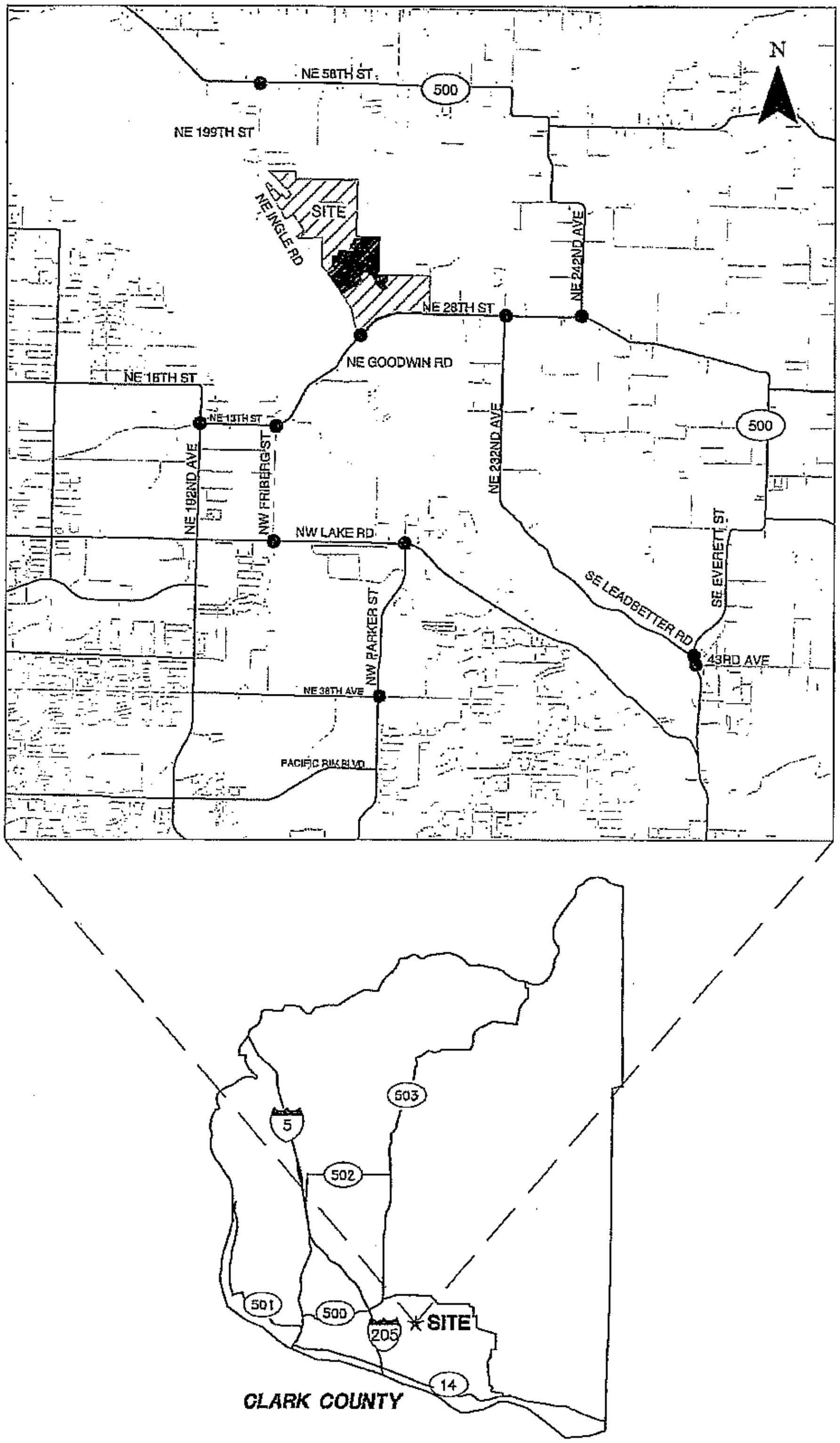
Date:	November 20, 2014	Project #: 13865
To:	Curleigh Carothers, P.E.; City of Camas	
cc:	Ryan Lopossa, P.E.; City of Vancouver Jeff Barsness, P.E.; Washington State Department of Transportation David Jardin, Clark County Randy Printz, Landerholm Law Firm John Schmidt and John O'Neil; Green Mountain Land, LLC	
From:	Chris Brehmer, P.E., Kelly Laustsen, and Ribeka Toda; Kittelson & Associates, Inc.	
Project:	Green Mountain Master Plan	
Subject:	Transportation Impact Analysis	

This memorandum documents the results of the transportation impact analysis prepared by Kittelson & Associates, Inc. (KAI) for the proposed Green Mountain Master Plan development to be located at the northeast corner of NE Ingle Road and NE Goodwin Road in Camas, Washington. This study concludes that Phase 1 of the site can be developed as proposed while maintaining safe and acceptable traffic operations at the study intersections assuming provision of an eastbound left-turn lane on NE Goodwin Road at NE Ingle Road. Further transportation improvements are recommended to accommodate full build-out of the proposed development. The methodology of our analysis, pertinent findings, and our recommendations are documented in this memorandum.

INTRODUCTION

Green Mountain Land, LLC is in the process of preparing a master plan to establish a mixed-use development on the 283-acre site. Green Mountain Golf Course is currently located on a large portion of the property; otherwise the site is vacant. The site is currently zoned for a mix of residential uses (R-10, MF-10 and R-6) and Community Commercial (CC). Figure 1 illustrates the site vicinity map.

The master plan proposes eight phases of development, with the sequence and timing of phases largely market dependent. It is expected that Phase 1 will be completed by 2018 and full master plan build-out will be assumed by 2029 for traffic impact assessment purposes.



- Study Intersections

Site Vicinity
Camas, Washington

Figure
1

H:\proj\file\13865 - Green Mountain Master Plan\dwgs\figs\13865_traffic study -Nov update.dwg Nov 20, 2014 - 2:24pm - lclausisen Layout Tab: 1_SV

Figure 2 illustrates a conceptual image of the master plan site vision. A mix of residential and commercial uses is planned in accordance with the zoning, with a mixed use village proposed to better integrate the commercially zoned portion of the property. The village would be located at the southwest corner of the project and will encompass approximately twenty-four acres. Further project details are provided later in this report.

SCOPE OF THE REPORT

This analysis identifies the transportation-related impacts associated with the proposed Green Mountain Master Plan development and was prepared in accordance with City of Camas transportation impact analysis requirements. The study scope and overall study area for this project were selected based on a review of the local transportation system and direction provided by City of Camas, City of Vancouver, Clark County, and Washington Department of Transportation (WSDOT) staff.

Operational analyses were performed at the following intersections:

- NE 199th Avenue/NE 58th Street (SR 500, WSDOT maintained)
- NE 192nd Avenue/NE 13th Street (City of Vancouver maintained)
- NW Friberg Street/NE Goodwin Road
- NE Ingle Road/NE Goodwin Road
- NE 232nd Avenue/NE 28th Street
- NE 242nd Avenue (SR 500)/NE 28th Street (WSDOT maintained)
- NW Friberg Street/NW Lake Road
- NW Parker Street/NW Lake Road
- NE Everett Street (SR 500)/SE Leadbetter Road
- NW Parker Street/NE 38th Avenue
- NE Everett Street (SR 500)/NE 43rd Avenue (WSDOT maintained)
- Site-Access Driveways

GREEN MOUNTAIN

CONCEPTUAL MASTER PLAN FOR A MIXED USE PRD

CAMAS, WASHINGTON

GREEN MOUNTAIN LAND, LLC. 11/19/14

EXHIBIT B

TOTAL SITE AREA 283.3 AC

SITE AREA TABLE

R10 ZONE	119.7 AC
R6 ZONE	54.8 AC
MF10 ZONE	93.0 AC
CC ZONE	15.8 AC

RESIDENTIAL DENSITY CALCULATION

R-10	119.7 @ 4.3 / ACRES – 515 UNITS
R-6	54.8 @ 7.2 / ACRES – 395 UNITS
MF-10	93.0 @ 10 / ACRES – 930 UNITS
TOTAL	1840 UNITS

DENSITY TABLE

POD	ACRES	APPROXIMATE LOT SIZE RANGE	MAXIMUM UNITS/LOTS
A	12.2 (A1-A3)	HD	219
B	15.5 (B1-B5)	1000-3000	217
C	11.9 (C1-C2)	3000-5000	95
D	41.3 (D1-D6)	4000-6000	309
E	26.5 (E1-E4)	4200-7200	172
F	28.6 (F1-F4)	5250-9000	157
G	30.0 (G1)*	15,000-40,000	31
H	15.4 (CC)		100
TOTALS	181.4 AC		1300

*40% OF G (TOTAL 30 ACRES) TO BE PRESERVED OPEN SPACE.

PARK & OPEN SPACE	89.3 ± AC
NEIGHBORHOOD CIRCULATOR	8.2 ± AC
ARTERIAL & COLLECTOR FRONTAGE DEDICATION (GOODWIN & INGLE)	1.8 ± AC

URBAN VILLAGE AREA (H, A1, A2, A3, B5)
A COMMERCIAL, MIXED USE AND RESIDENTIAL COMMUNITY CENTER (± 33.5 AC GROSS, 24.2 AC NET)

CIRCULATION COMPONENTS

ARTERIAL

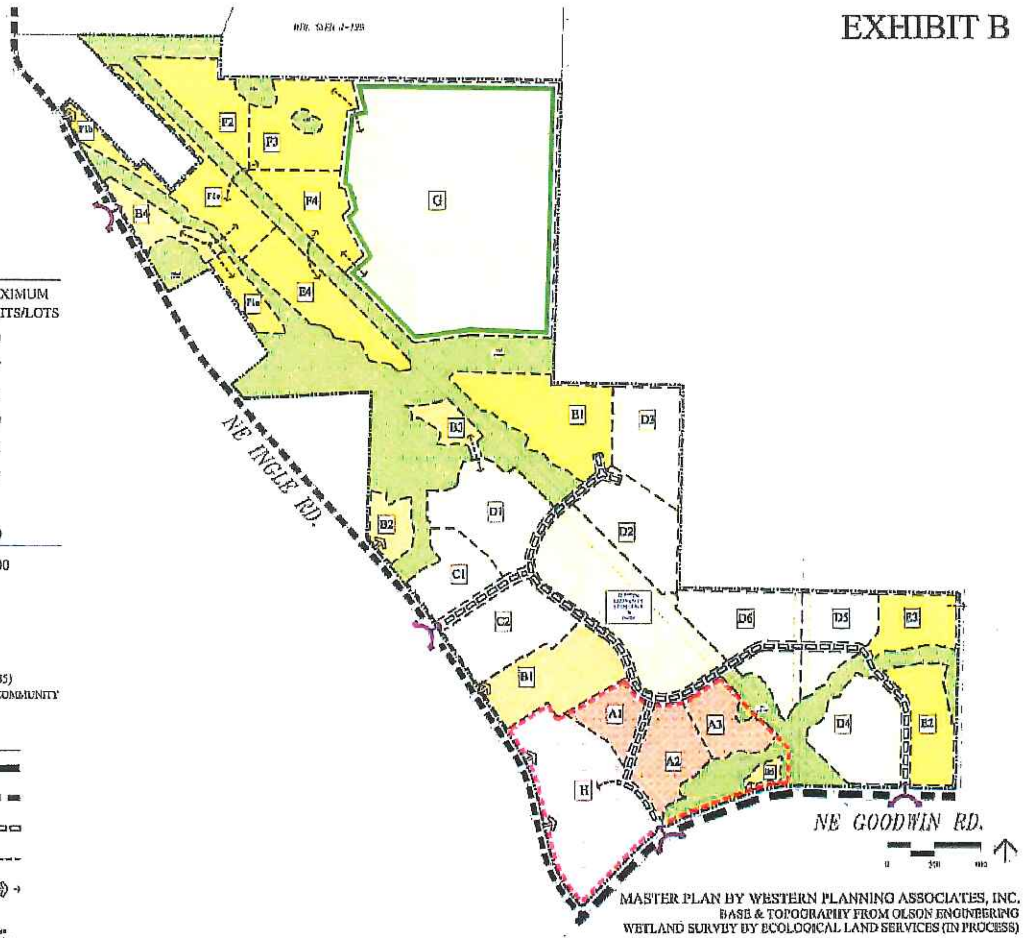
COLLECTOR

NEIGHBORHOOD CIRCULATOR

NEIGHBORHOOD CONNECTOR

COMMUNITY ENTRIES & ACCESS POINTS

NOTE



MASTER PLAN BY WESTERN PLANNING ASSOCIATES, INC.
BASE & TOPOGRAPHY FROM OLSON ENGINEERING
WETLAND SURVEY BY ECOLOGICAL LAND SERVICES (IN PROCESS)

Plan provided by Western Planning Associates, 11/19/14

Conceptual Master Plan
Camas, Washington

Figure 2

H:\projfile\13865 - Green Mountain Master Plan\dwgs\figs\13865_traffic study.dwg Jun 19, 2014 - 11:42am - kkaustsen Layout Tab: 2_SP

As required by the City of Camas, a transportation impact study was prepared to address the following transportation issues:

- Year 2014 existing land use and transportation system conditions within the site vicinity during the weekday a.m. and p.m. peak hours;
- Planned developments and transportation improvements in the study area;
- Trip generation and distribution estimates for the proposed development;
- Forecast year 2018 background traffic conditions without the proposed development during the weekday a.m. and p.m. peak hours;
- Forecast year 2018 total traffic conditions with the completion of Phase 1 of the proposed development during the weekday a.m. and p.m. peak hours;
- Forecast year 2029 background traffic conditions without the proposed development during the weekday a.m. and p.m. peak hours;
- Forecast year 2029 total traffic conditions with full build-out and occupancy of the proposed development during the weekday a.m. and p.m. peak hours;
- Level of service analyses for the study intersections; and
- On-site access and circulation.

Conclusions and recommendations are provided following the operational analysis.

ANALYSIS METHODOLOGY

All level of service analyses described in this report were performed in accordance with the procedures stated in the *2000 Highway Capacity Manual* (Reference 1). A description of level of service and the criteria by which they are determined is presented in *Appendix "A"*. *Appendix "A"* also indicates how level of service is measured and what is generally considered the acceptable range of level of service.

To ensure that this analysis was based on a reasonable worst-case scenario, the peak 15 minute flow rate during the peak hour analysis periods was used in the evaluation of all intersection levels of service. For this reason, the analysis reflects conditions that are only likely to occur for 15 minutes out of each average peak hour. Traffic conditions during other weekday hours and throughout the weekend will likely be better than those described in this report.

At the City of Vancouver-maintained NE 192nd Avenue/NE 13th Street intersection, the peak 15-minute flow rate was assessed by applying the peak 15-minute volume across the hour and not applying a peak hour factor in accordance with guidance provided by the City.

Operating Standards

The study intersections are each operated and maintained by one of three impacted jurisdictions: WSDOT, the City of Vancouver, or the City of Camas. Each of these jurisdictions has their own operating standards. WSDOT requires LOS "E" or better for non-HSS (Highways of Statewide Significance) in urban areas, City of Vancouver requires LOS "E" or better and a v/c ratio of less than 0.95 for signalized intersections. The City of Camas requires LOS "D" or better and a v/c ratio of 0.90 or better for all intersections. Table 1 lists the study intersections, the responsible jurisdiction, and the corresponding operating standard.

Table 1: Operating Standards at Study Intersections

ID	Study Intersection	Jurisdiction	Standard
1	NE 199th Avenue/NE 58th Street (SR 500)	WSDOT	LOS "C" for non-HSS in rural area[1]
2	NE 192nd Avenue/NE 13th Street	Vancouver	LOS "E" and v/c ratio less than 0.95
3	NW Friberg Street/NE Goodwin Road	Camas	LOS "D" and v/c of 0.90 or better
4	NE Ingle Road/NE Goodwin Road	Camas	LOS "D" and v/c of 0.90 or better
5	NE 232nd Avenue/NE 28th Street	Camas	LOS "D" and v/c of 0.90 or better
6	NE 242nd Avenue (SR 500)/NE 28th Street	WSDOT	LOS "C" for non-HSS in rural area[1]
7	NW Friberg Street/NW Lake Road	Camas	LOS "D" and v/c of 0.90 or better
8	NW Parker Street/NW Lake Road	Camas	LOS "D" and v/c of 0.90 or better
9	NE Everett Street (SR 500)/SE Leadbetter Road	WSDOT	LOS "C" for non-HSS in rural area[1]
10	NW Parker Street/NE 38th Avenue	Camas	LOS "D" and v/c of 0.90 or better
11	NE Everett Street (SR 500)/NE 43rd Avenue	WSDOT	LOS "C" for non-HSS in rural area[1]

[1]The City of Camas TIF Update applied the WSDOT standard for facilities in urban areas (LOS "E" for non-HSS in urban area). Based on conversations with WSDOT, the standard for rural areas is currently applicable to the WSDOT study intersections.

Source: City of Camas Traffic Impact Fee Update (Reference 2)

Turn Lane Guidelines

For roadways under Washington State jurisdiction, such as SR 500, WSDOT has defined traffic-volume based turn lane guidelines within the *WSDOT Design Manual* (Reference 3). Left-turn lane guidelines are provided in section 1310.04(2)(a) while right-turn lane guidelines are provided in section 1310.04(3).

EXISTING CONDITIONS

The existing conditions analysis identifies site conditions and the current operational and geometric characteristics of roadways within the study area. These conditions will be compared with future conditions later in this report.

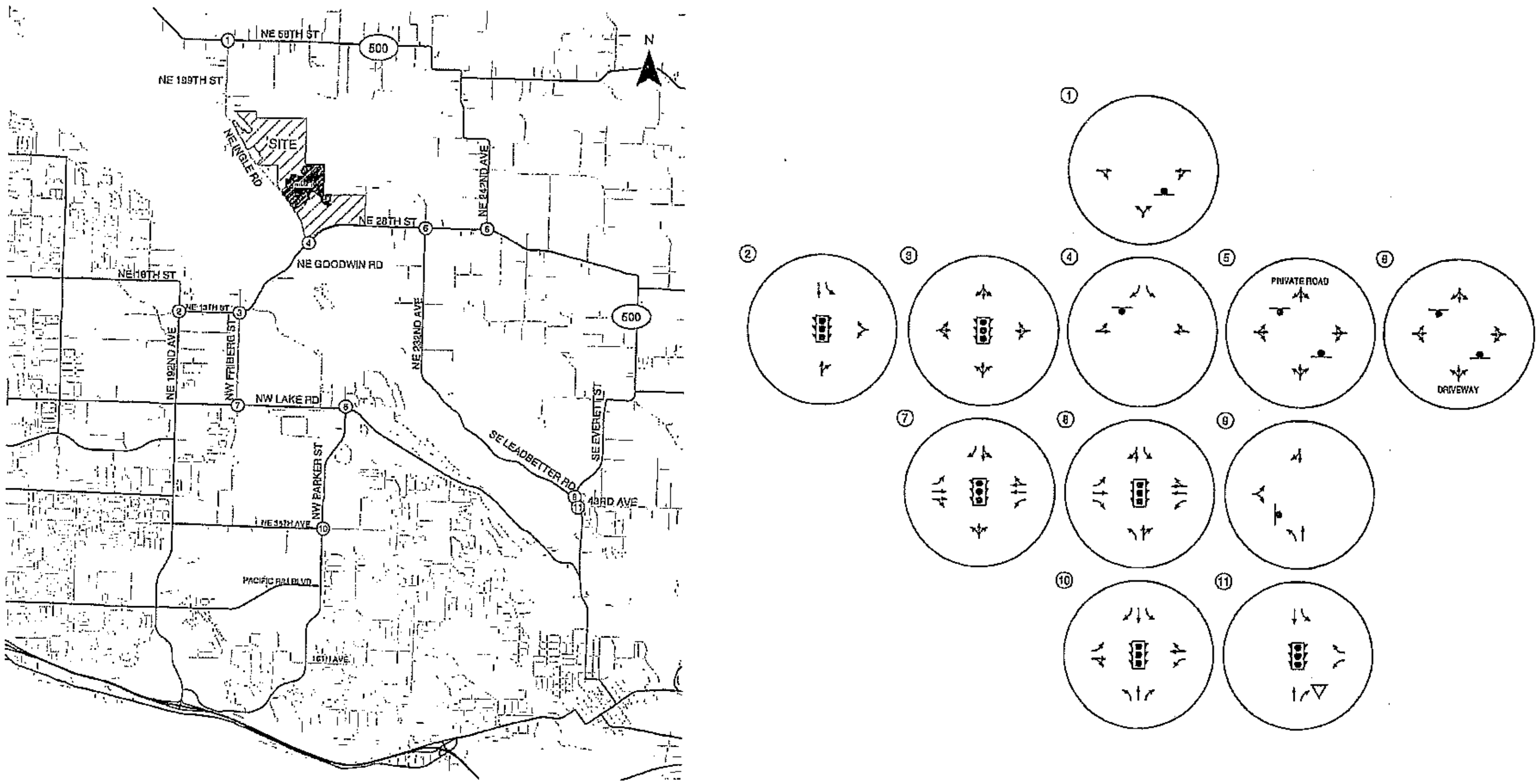
The site of the proposed development and surrounding study area was visited and inventoried in March 2014. At that time, information was collected regarding site conditions, adjacent land uses, existing traffic operations, and transportation facilities in the study area.

Site Conditions and Adjacent Land Uses

The area encompassed by the master plan site is largely undeveloped. The southwest corner of the property is occupied by the Green Mountain Golf Course, a portion of which is proposed to remain open after completion of the Phase 1 master plan development. The areas surrounding the site are also largely undeveloped, with a few single family homes situated along NE 28th Street, NE 199th Avenue, and SR 500.

Transportation Facilities

Table 2 provides a summary of key transportation facilities in the site vicinity and Figure 3 illustrates the existing lane configurations and traffic control devices at the study intersections.



- STOP SIGN
- TRAFFIC SIGNAL
- YIELD SIGN

Existing Lane Configurations and Traffic Control Devices
Camas, Washington

Figure
3

KITTELSON & ASSOCIATES, INC.

Table 2: Existing Transportation Facilities and Roadway Designations

Roadway	Classification[1]	Cross-Section	Speed Limit (mph)	Side-Walks?	Bicycle Lanes?	Median?	On-Street Parking?
NE 13th Street / NE Goodwin Road / NE 28th Street	Arterial	5-lane	40	Yes	Yes	Yes	None
SR 500	Non-HSS[2]	2-lane	50	None	None	None	None
NE Ingle Road / NE 199th Avenue	Collector	2-lane	50	None	None	None	None
NE 192nd Avenue	Arterial	2-lane	40	Partial	None	None	None
SE 192nd Avenue	Arterial	5-lane	40	Partial	None	None	None
NW Friberg Street / NE 202nd Avenue	Arterial	2-lane	40	Partial	None	None	None
SE 1st Street / NW Lake Road	Arterial	5-lane	40	Yes	Yes	Yes	None
NW Parker Street	Arterial	5-lane	35	Yes	Yes	None	None
NE Everett Road	Arterial	2-lane	35	None	None	None	None
NW Pacific Rim Blvd./ SE 34TH Street	Arterial	5-lane	40	Yes	None	Yes	None

[1] Source: City of Camas Traffic Impact Fee Update (Reference 2)
[2] HSS = Highways of Statewide Significance

Pedestrian and Bicycle Facilities

Neither sidewalks nor striped bicycle facilities are provided in the vicinity of the site on either NE Ingle Road or NE Goodwin Road/NE 28th Street.

Transit Facilities

The C-Tran *Camas Connector* Dial-A-Ride service currently operates within a portion of the study area, with a northern boundary of Lake Road, western boundary of Parker Street, and eastern boundary of SR 500. This service operates by accepting telephone calls from riders to be taken to a location inside a defined boundary. The hours of operation are Monday through Friday from 5:30 a.m. to 9:15 a.m. and 2:00 p.m. to 7:00 p.m. No service is available on holidays (Reference 4).

Crash Analysis

The crash histories of the study intersections were reviewed in an effort to identify potential intersection safety issues. Crash records were obtained from WSDOT. The data represents records between January 1, 2008 and November 30, 2013. The crash rate was calculated to determine the number of crashes per million entering vehicles (MEV). Generally speaking, a crash rate greater than 1.0 crashes per MEV suggests locations where crash patterns should be reviewed in greater detail.

A brief discussion of the crash data at key intersections is presented after Table 3. There were no fatalities reported at the study intersections during the time periods studied. *Appendix "B" contains the crash data.*

As shown in Table 3, the two intersections where the highest crash rates were observed were NE 199th Avenue/NE 58th Street and NE Ingle Road/NE Goodwin Road. At all other intersections, the observed crash rates are well below 1.0 crash per million entering vehicles.

Table 3: Intersection Crash Histories (1/1/2008 - 11/30/2013)

Intersection	Total	Collision Type						Severity		Crash Rate Crashes/ MEV[2]
		Rear End	Turn -ing	Angle	Pedes -trian	Fixed Object	Road way Ditch	PDO[1]	Injury	
1. NE 199th Ave / NE 58th St (SR 500)	7	0	0	4	0	3	0	5	2	0.57
2. NE 192nd Ave / NE 13th St	8	1	6	0	0	1	0	4	4	0.27
3. NE Friberg St / NE Goodwin Rd	5	1	3	1	0	0	0	3	2	0.32
4. NE Ingle Rd / NE Goodwin Rd	16	4	0	5	1	4	2	11	5	1.03
5. NE 232nd Ave / NE 28th St	3	0	0	1	0	2	0	2	1	0.25
6. NE 242nd Ave (SR 500)/ NE 28th St	4	0	0	2	0	1	1	2	2	0.30
7. NW Friberg St / NW Lake Rd	6	3	0	1	0	2	0	6	0	0.24
8. NW Parker St / NW Lake Rd	3	0	1	0	0	2	0	3	0	0.12
9. NE Everett St (SR 500)/ SE Leadbetter Rd	5	0	0	0	0	3	2	2	3	0.54
10. NW Parker St / NE 38th Ave	9	0	5	4	0	0	0	6	3	0.29
11. NE Everett St (SR 500) / NE 43rd Ave	7	1	5	0	0	1	0	3	4	0.36

[1] PDO = Property Damage Only |[2] MEV = Million Entering Vehicles

NE 199th Avenue/NE 58th Street (SR 500)

The second highest crash rate, 0.57, occurs at the intersection of NE 199th Avenue/NE 58th Street. There have been seven reported collisions, including four angle collisions and three fixed-object collisions at this intersection. The crash data was reviewed in an effort to identify potential trends. Three of the angle crashes involved vehicles making a northbound left turn from NE 199th Avenue to NE 58th Street; another involved an eastbound vehicle turning right from NE 58th Street to NE 199th Avenue. Of the three fixed object collisions, two involved utility poles and one involved a domestic animal. Collisions with domestic animals are challenging to eliminate and one of the collisions with the utility poles involved a driver asleep at the wheel. Four of the seven crashes occurred during wet road surface conditions. Given the relatively low number of reported collisions and the unusual nature of three of the seven collisions (the three fixed-object collisions), there are no safety-based mitigation measures recommended at this intersection at this time in conjunction with site development. If an eastbound right-turn lane is added to the intersection in the future (which is currently warranted as will be described later in this report), it may provide safety benefits.

NE Ingle Road/NE Goodwin Road

The highest crash rate, 1.03, occurs at the intersection of NE Ingle Road/NE Goodwin Road. There have been reported collisions including 4 four rear-end collisions, 5 five angle collisions, 4 fixed-object collisions (involving a utility pole, a mailbox, a boulder, and a wood sign post), 2 roadway ditch collisions, and a pedestrian collision at this intersection. As discussed later in this report, the Green Mountain Master Plan proposes to construct an exclusive eastbound left-turn lane on NE Goodwin Road at NE Ingle Road in conjunction with the Phase 1 site development. Providing an eastbound left-turn lane and potential related reconfiguration of the southbound stop bar location (refer to sight distance discussion below) in conjunction with Phase 1 site development could provide a safety benefit at this intersection.

Two of the angle collisions involved vehicles exceeding reasonably safe speeds while making a westbound right-turn at the intersection. One of the recommended mitigation measures for the 2029 full build-out scenario of the proposed development is the addition of a westbound right-turn lane at this intersection, which could provide a safety benefit for turning vehicles. Additional long-term mitigation measures anticipated in conjunction with site development include constructing a three-lane roadway section on NE Goodwin Road along the site frontage and signalizing the intersection when warranted.

Intersection Sight Distance

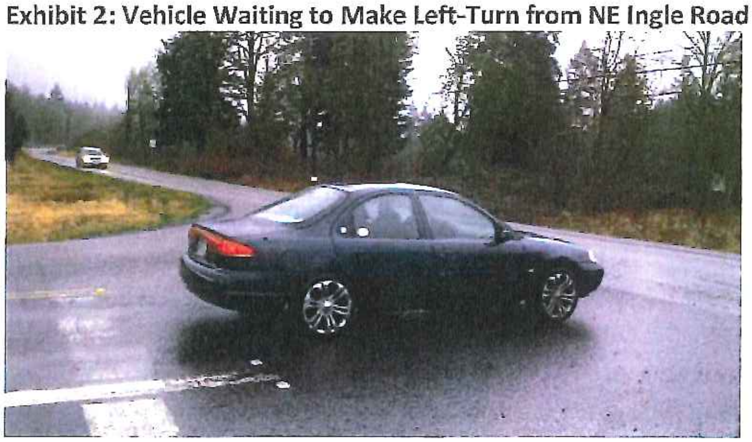
Intersection sight distance was observed at the study intersections and was found to meet applicable city or WSDOT standards, with the exception of the sight distance at the NE Ingle Road/NE Goodwin Road intersection. As shown in Exhibit 1 below, the stop bar on NE Ingle Road is set back approximately 25 feet from the edge of NE Goodwin Road.

Exhibit 1: Stop Bar on NE Ingle Road at NE Goodwin Road

Image source: Google Maps (right image)

As indicated in Exhibit 2, vehicles currently pull past the stop bar to obtain sufficient sight distance to then execute a turning maneuver. Regardless of the proposed site development, we recommend that the City of Camas consider potential improvements to enhance the intersection sight distance, such as relocating the stop bar closer to NE Goodwin Road.

Exhibit 2: Vehicle Waiting to Make Left-Turn from NE Ingle Road to NE Goodwin Road



Existing Traffic Operations

Manual turning-movement counts were conducted at the study intersections in March and April 2014. The counts were conducted on a typical mid-week day during the morning peak period (7:00 to 9:00 a.m.) and the evening peak period (4:00 to 6:00 p.m.) per City requirements. Individual intersection peak hours were then identified for operational analysis purposes.

Figures 4 and 5 provide a summary of the existing turning-movement counts, which are rounded to the nearest five vehicles per hour for the weekday a.m. and p.m. peak hours, respectively. *Appendix "C" contains the traffic count worksheets used in this study.*

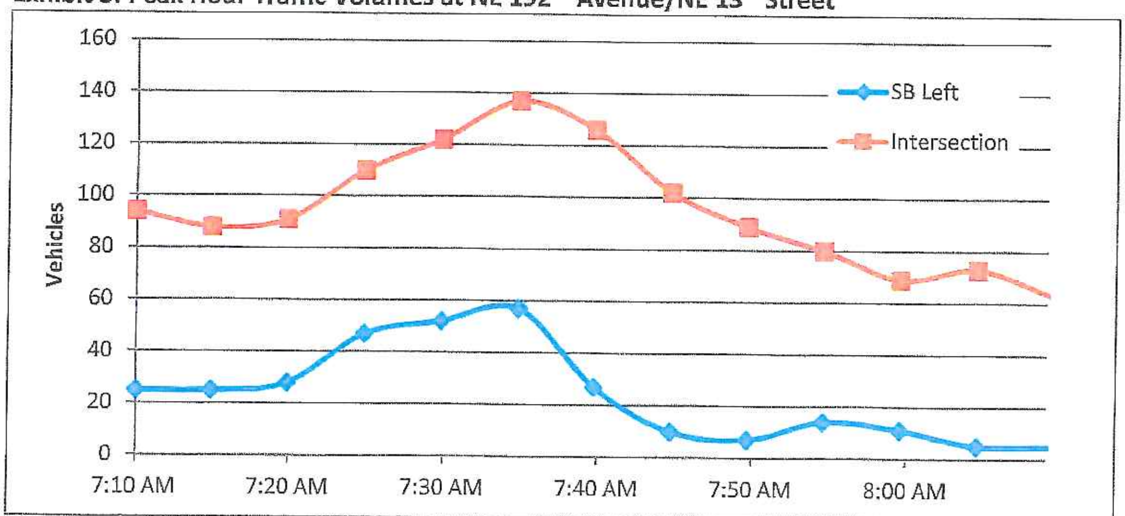
As shown in Figures 4 and 5, the study intersections operate acceptably during both study periods. *Appendix "D" contains the existing conditions traffic operations worksheets.*

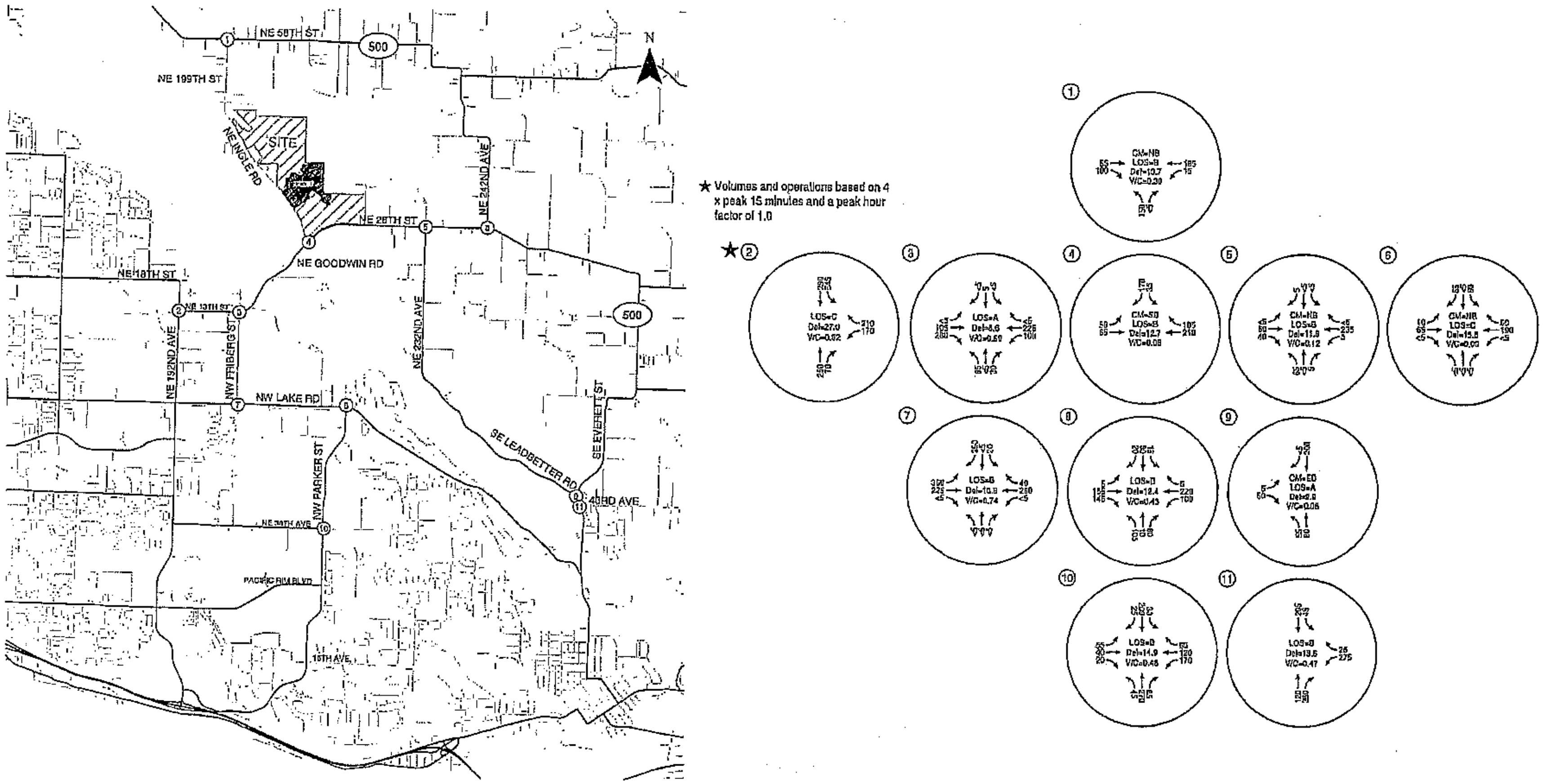
Operations at NE 192nd Avenue / NE 13th Street

As noted in the "Analysis Methodology" section, analysis of the City of Vancouver-maintained NE 192nd Avenue/NE 13th Street intersection involved application of the peak 15-minute flow rate across the hour and not applying a peak hour factor. This analysis methodology is in accordance with guidance provided by the City.

During the weekday AM peak hour, significant peaking occurs at the intersection related to vehicles accessing Union High School on NW Friberg Street. In particular, the southbound left-turning volume peaks in advance of the school start at 7:45 AM, as shown in Exhibit 3. During this "peak of the peak" period, queueing for the southbound left-turn lane sometimes exceeds the available striped storage (approximately 160 feet). Based on field observation, heightened delays and queueing for the southbound left-turn movement are contained to about fifteen minutes in advance of the school start, during which time some southbound left-turning vehicles do not clear through the intersection during each cycle. After this time, volumes decrease significantly and left-turning vehicles consistently clear through the intersection in a single cycle.

Exhibit 3: Peak Hour Traffic Volumes at NE 192nd Avenue/NE 13th Street



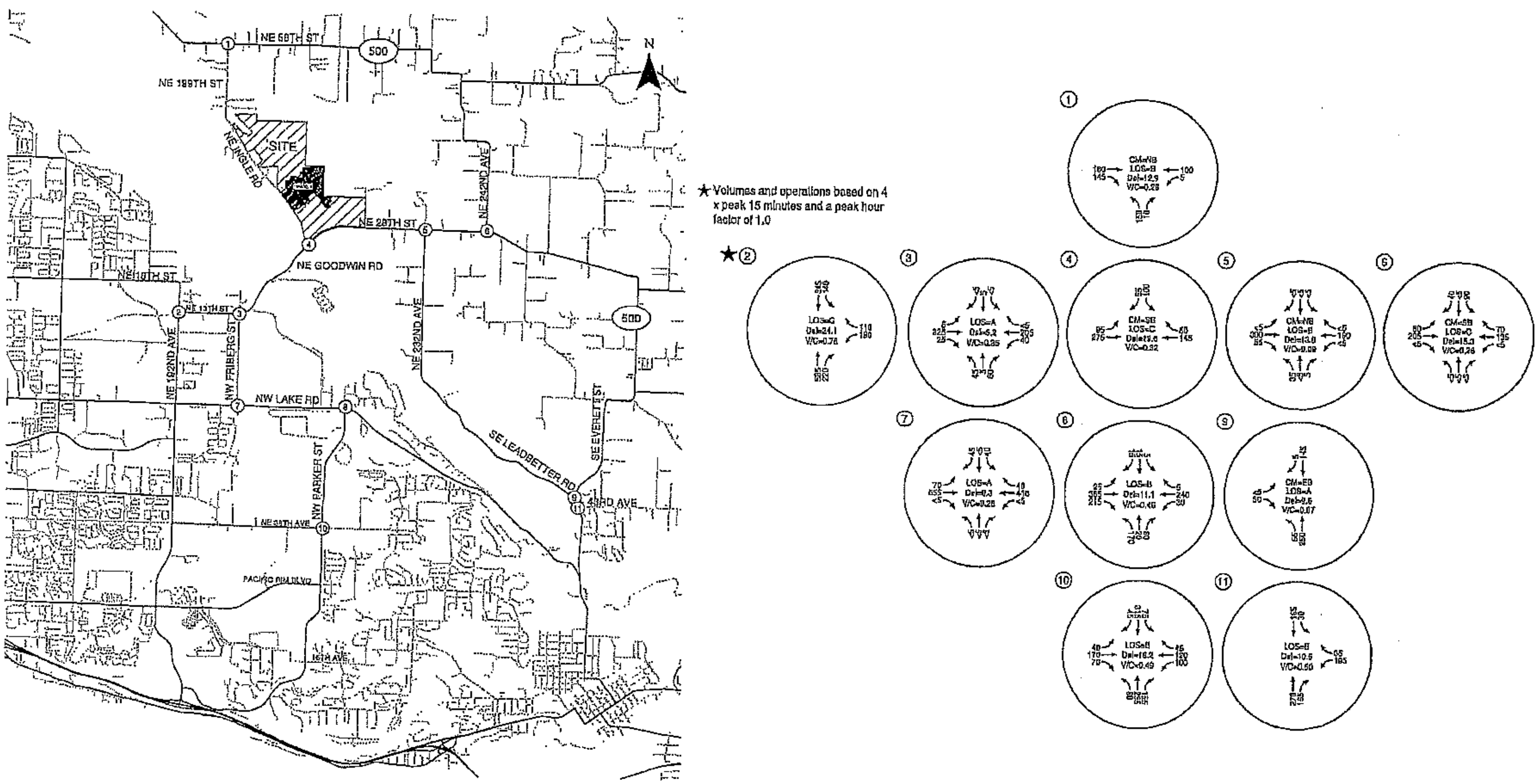


CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG) / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

Existing Intersection Operations
Weekday AM Peak Hour
Camas, Washington

Figure 4

KITTELSON & ASSOCIATES, INC.



CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

Existing Intersection Operations
Weekday PM Peak Hour
Camas, Washington

Figure 5

TRAFFIC IMPACT ANALYSIS

The traffic impact analysis identifies how the study area's transportation system will operate upon phased build-out of the proposed master plan site. A horizon year of 2018 was selected to assess conditions with build-out of Phase 1 while a 15-year 2029 horizon year was assumed for site build-out. The impact of site-generated weekday a.m. and p.m. peak hour trips was examined as follows:

- Planned developments and transportation improvements in the study area were identified and accounted for;
- Trip generation and distribution estimates for the proposed development were prepared for Phase 1 and full build-out of the proposed development;
- Forecast year 2018 background traffic conditions without the proposed development were analyzed at the study intersections;
- Forecast year 2018 total traffic conditions with completion of Phase 1 of the proposed development were analyzed at the study intersections;
- Forecast year 2029 background traffic conditions without the proposed development were analyzed at the study intersections;
- Forecast year 2029 total traffic conditions with full build-out and occupancy of the proposed development were analyzed at the study intersections; and
- On-site circulation and site-access operations were evaluated.

Proposed Development Plan

Green Mountain Land, LLC is proposing to master plan the 283-acre site with mixed-use development. Green Mountain Golf Course is currently located on a large portion of the master plan property. We understand that a portion of the existing Green Mountain Golf Course may remain temporarily available for use after completion of Phase 1 site development and that, ultimately, the golf course will be closed prior to full master plan build-out. No effort has been made to account for "credit" for existing trips to and from the golf course for the purposes of this transportation impact analysis report.

The master plan proposes eight phases of development, with the sequence and timing of phases to be finalized pending market conditions. It is expected that Phase 1 will be completed by 2018 and full master plan build-out is assumed by 2029 for traffic impact assessment purposes. A mix of residential and commercial uses is planned in accordance with the zoning, with a mixed use village proposed to better integrate the commercially zoned portion of the property. The application seeks approval of an overlay zone for a portion of the site intended for an urban village. The village would be located at the southwest corner of the project and will encompass approximately twenty-four acres.

For traffic impact study purposes, Phase 1 is assumed to consist of a residential component with 215 single-family detached homes. Full build-out of the master plan residential component assumed construction of up to 536 apartment units and 764 single-family detached homes. The retail portion of the proposed development plan was assumed to develop after Phase 1 and was assumed to be a 90,000 square-foot shopping center for trip generation purposes[1].

Access to Phase 1 development is anticipated along NE Ingle Road, with additional access added to NE Goodwin Road during later stages of the development. Final details of the number and location of site access points will be defined during preparation of individual site plan applications, therefore appropriate planning level assumptions have been made for master planning purposes. The proposed master plan anticipates two public street neighborhood circulator connections to NE Goodwin Road serving the site in conjunction with two public street neighborhood circulator connections along NE Ingle Road. The commercial site is expected to have direct driveway access to NE Ingle Road. Some residential areas (not individual residence driveways) not served by the anticipated neighborhood circulator facilities may also seek direct access to NE Ingle Road or NE Goodwin Road as appropriate.

Trip Generation

Trip generation estimates for the proposed development were generated based on information provided in the standard reference manual *Trip Generation, 9th Edition* published by the Institute of Transportation Engineers (ITE – Reference 7). The internal and pass-by trip rates applied to each land use were also determined from ITE's *Trip Generation, 9th Edition.* Table 4 summarizes the daily, weekday a.m., and weekday p.m. peak-hour trips for the Phase 1 assumed development while Table 5 summarizes the complete master plan site trip generation estimate. All daily trips have been rounded to the nearest ten and all peak hour trips have been rounded to the nearest five trips.

[1] The unit mix for phase 1 and buildout was developed based on a reasonable worst-case scenario. Final development may result in a less-intense mix of residential units.

Table 4: Trip Generation Estimate – Phase 1

Land Use	ITE Code	Size	Daily	Weekday AM Peak Hour			Weekday PM Peak Hour		
				Total	In	Out	Total	In	Out
Single-Family Detached Housing	210	215 units	2,050	160	40	120	215	135	80

Table 5: Trip Generation Estimate – Build-out (Includes Phase 1)

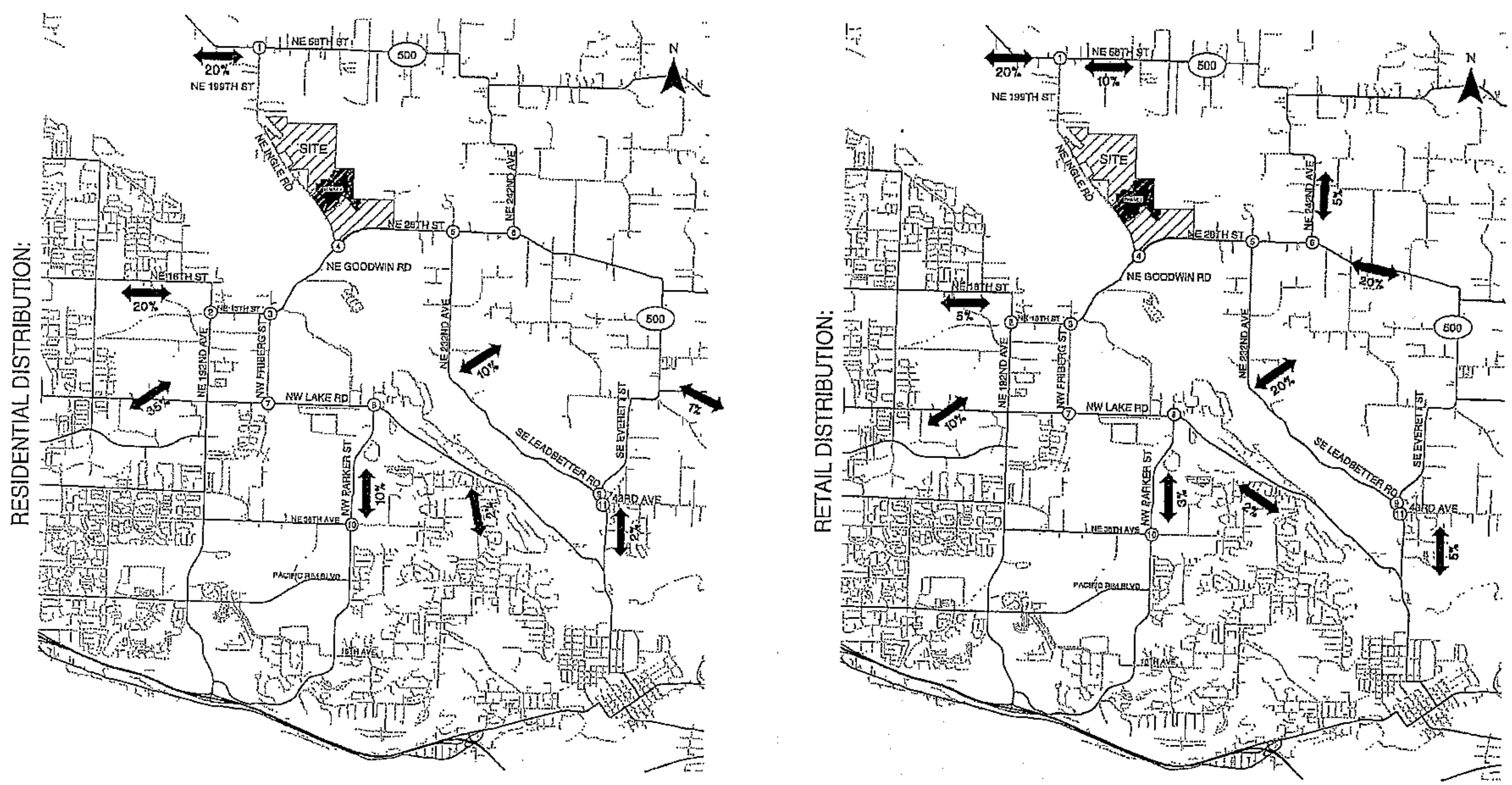
Land Use	ITE Code	Size	Daily	Weekday AM Peak Hour			Weekday PM Peak Hour		
				Total	In	Out	Total	In	Out
Apartment	220	536 units	3,570	275	55	220	330	215	115
Single-Family Detached Housing	210	764 units	7,270	575	145	430	765	480	285
Total Residential (1,300 units)			**10,840**	**850**	200	650	1,095	695	400
Internalization (6% Daily, 5% PM)			630	0	0	0	60	30	30
Shopping Center	820	90,000 square feet	6,340	145	90	55	560	270	290
Internalization (10% Daily, 11% PM)			*630*	*0*	*0*	*0*	*60*	*30*	*30*
Pass-By Trips (34%)			*1,940*	*50*	*25*	*25*	*170*	*85*	*85*
Total Trips			17,180	995	290	705	1,655	965	690
Less Internalization			*1,260*	*0*	*0*	*0*	*120*	*60*	*60*
Less Pass-by trips			*1,940*	*50*	*25*	*25*	*170*	*85*	*85*
Net New Trips for Full Build-out			***13,980***	***945***	***265***	***680***	***1,365***	***820***	***545***

Trip Distribution

The distribution of site-generated trips onto the study area roadway system was estimated based on a review of surrounding roadway characteristics, existing uses, the 2035 travel demand model maintained by the Southwest Washington Regional Transportation Council (RTC), and review agency guidance. Trip distribution patterns were developed separately for the residential and retail trips. Figure 6 illustrates the trip distribution patterns for the residential and retail trips.

Trip Assignment

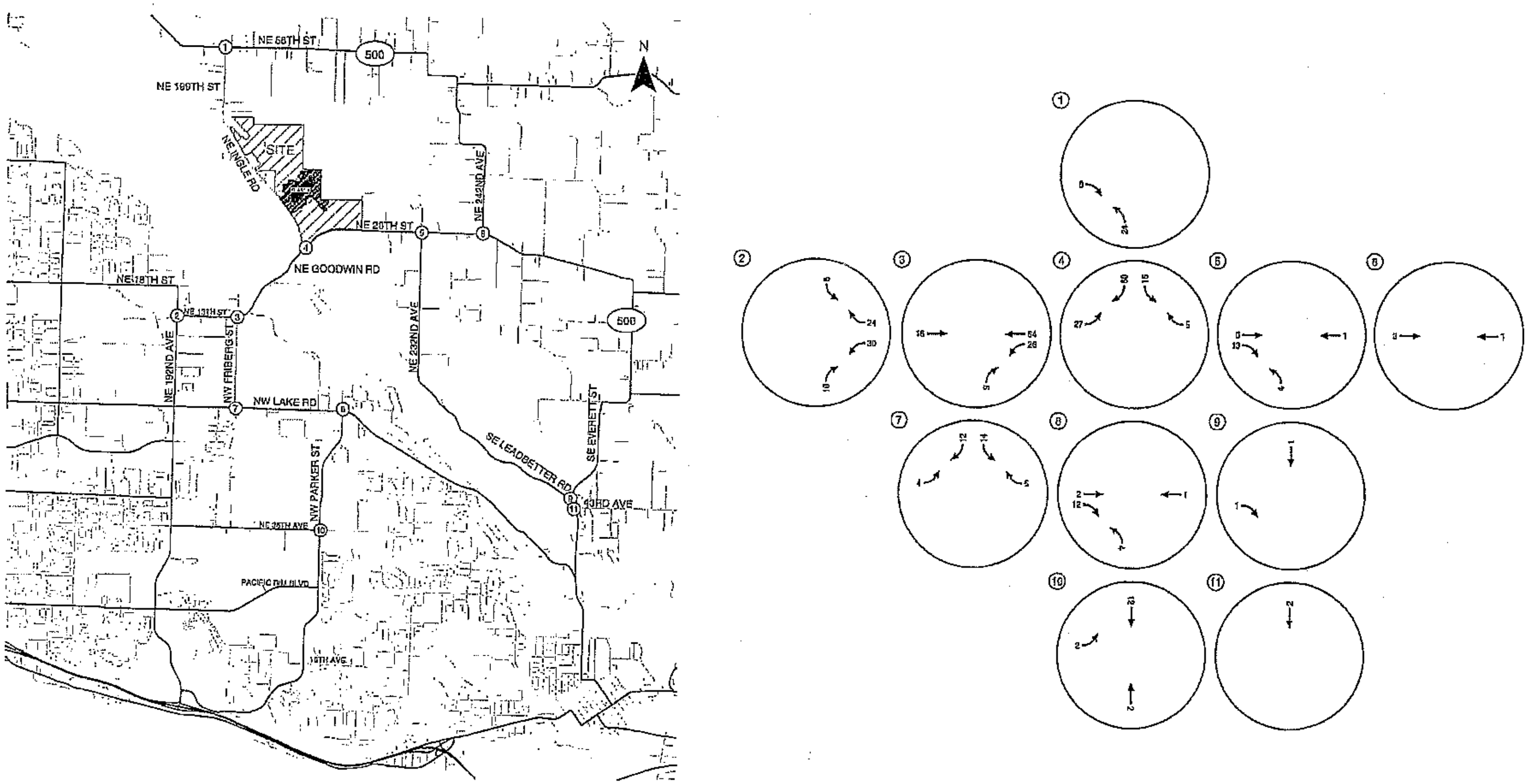
The weekday a.m. and p.m. peak hour site trips shown in Tables 4 and 5 were assigned to the roadway network based on the trip distribution patterns shown in Figure 6. Figures 7 through 10 show the assignment of site-generated trips during the weekday a.m. and p.m. peak hours for Phase 1 and at Build-out. Note that the site-generated build-out volumes shown in Figures 9 and 10 include the Phase 1 site-generated trips and thus reflect the total number of trips generated. *A figure showing the assignment of pass-by trips is provided in Appendix "E".*



Estimated Trip Distribution Pattern
Camas, Washington

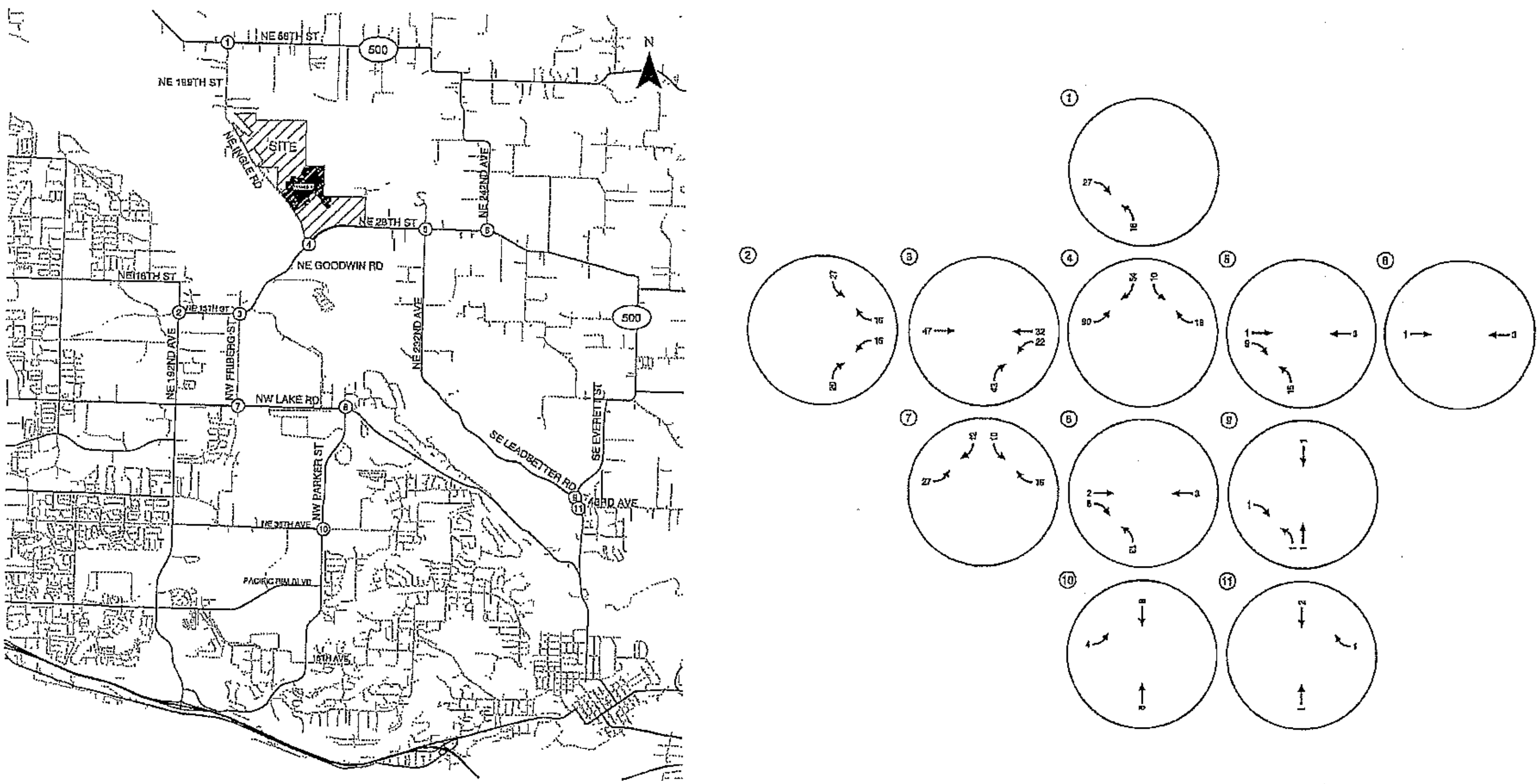
Figure 6

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING



Total Estimated Trip Assignment - Phase 1
Weekday AM Peak Hour
Camas, Washington

Figure 7

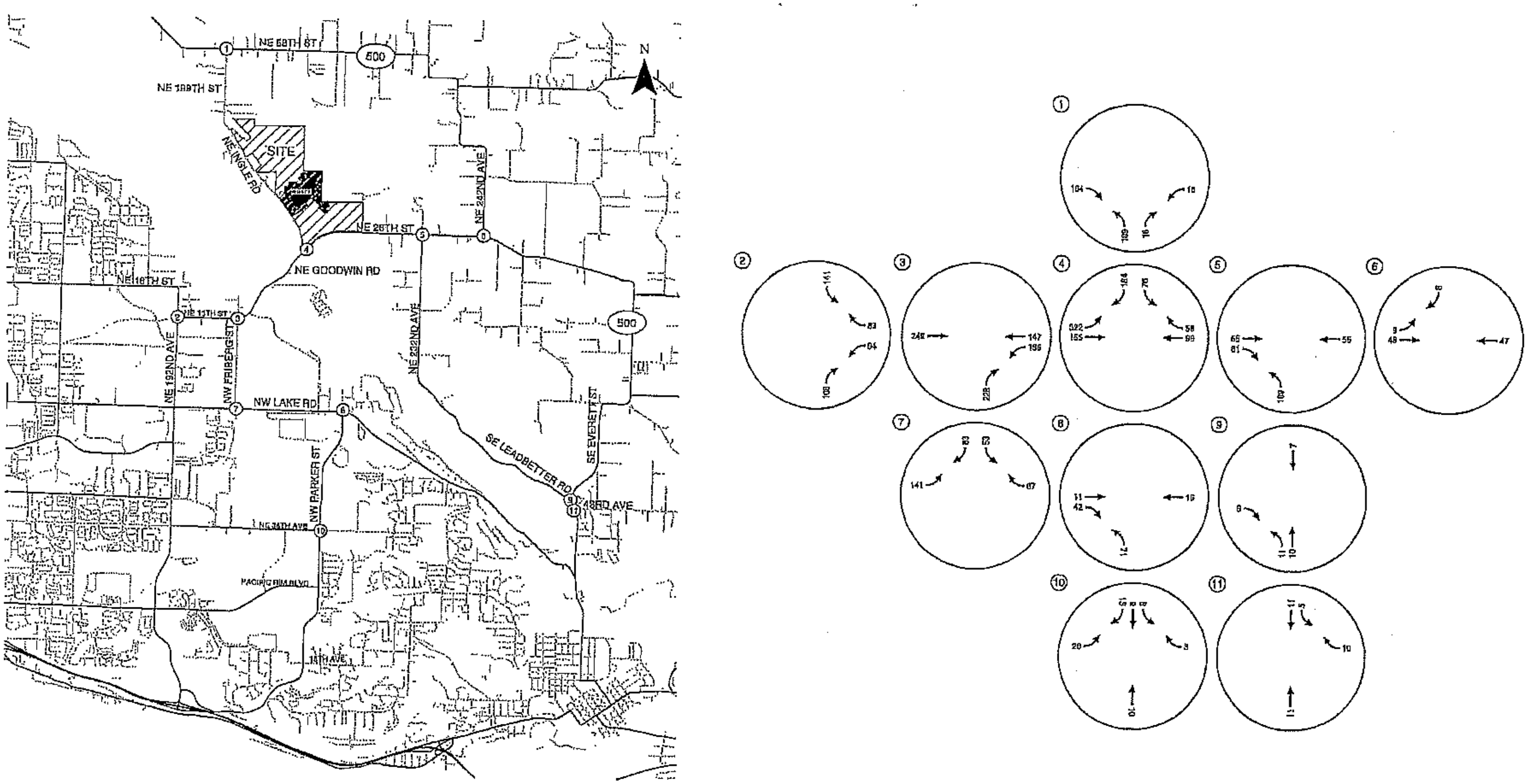


Total Estimated Trip Assignment - Phase 1
Weekday PM Peak Hour
Camas, Washington

Figure 8

Total Estimated Trip Assignment - Full Build-Out
Weekday AM Peak Hour
Camas, Washington

Figure 9



Total Estimated Trip Assignment - Full Build-Out
Weekday PM Peak Hour
Camas, Washington

Figure 10

2018 Background Traffic Conditions

The 2018 background traffic analysis projects how the study area's transportation system will operate during the year that Phase 1 of the proposed development is expected to be completed. This analysis includes traffic growth due to previously approved in-process developments within the study area, but does not include traffic from any of the proposed Green Master Plan development phases. Per agency direction, no growth was applied to City of Camas roadways and a 2% growth rate was applied to City of Vancouver roadways (Reference 8).

Planned Developments and Transportation Improvements

City of Camas staff identified 13 local development projects that are approved but not yet occupied. These in-process developments include:

- Lake Hills
- Two Creeks
- The Summit at Columbia Vista
- Parker Village
- The Hills at Round Lake
- North Hills Subdivision
- Brady Road Subdivision
- Deerhaven Subdivision
- Hadley's Glen
- Millshore Downs
- Fisher Creek Campus
- Lacamas Prairie
- 192nd Plaza West

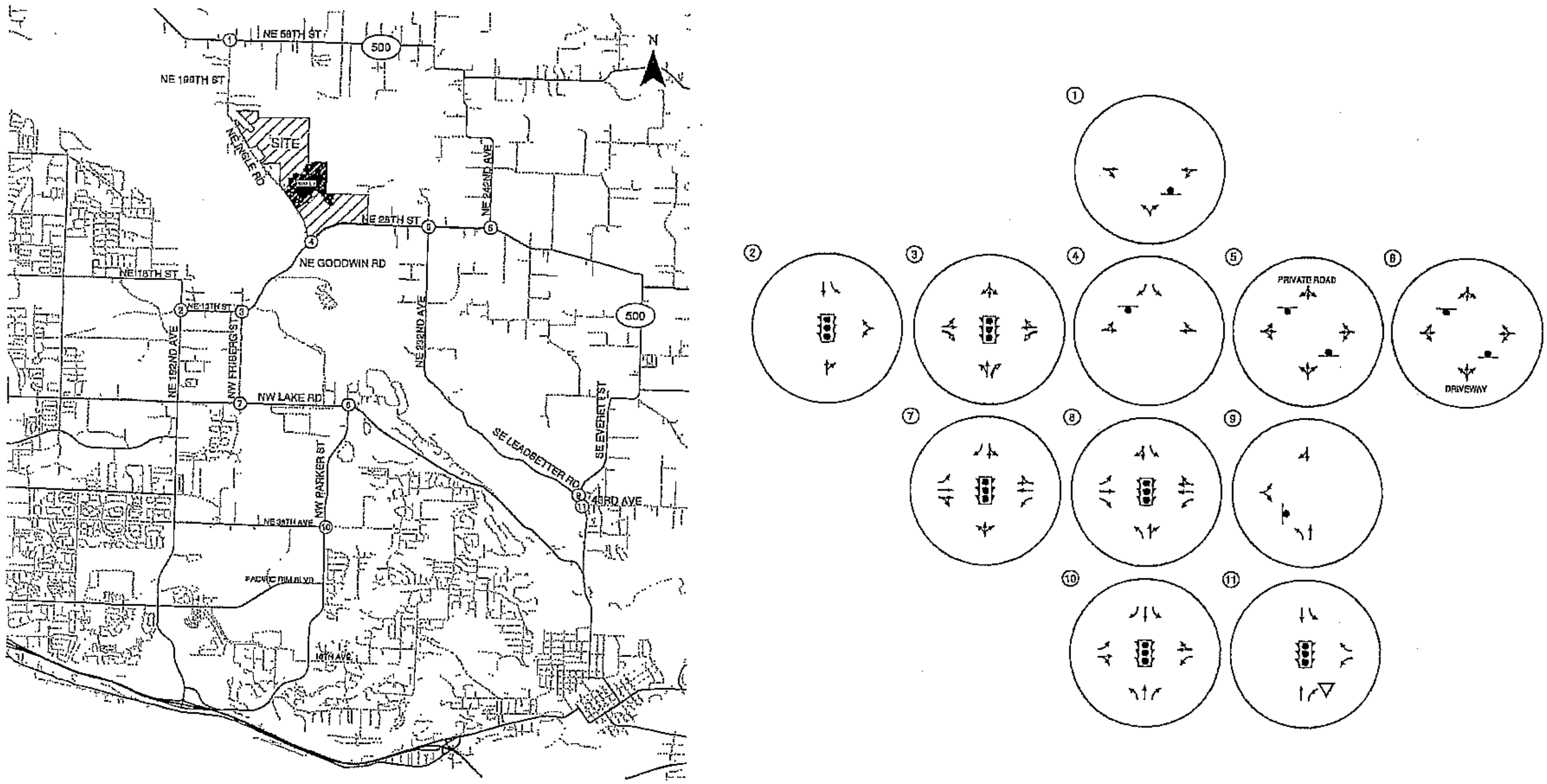
Appendix "F" contains the data received pertaining to the in-process trips.

Planned and funded transportation improvements within the study area include the widening of NW Friberg Street (between Lake Road and NE 13th Street) and the addition of a westbound left-turn lane, northbound right-turn lane, and eastbound right-turn lane at the NW Friberg Street/NE Goodwin Road intersection. Figure 11 shows the lane configuration and traffic control devices assumed in the 2018 analysis.

Traffic Operations

Figures 12 and 13 summarize the year 2018 background traffic operations analysis results at the study intersections for the weekday a.m. and weekday p.m. peak-hours, respectively. The projected turning movement counts are rounded to the nearest five vehicles per hour. As shown, the study intersections operate acceptably during the weekday a.m. and weekday p.m. peak periods in the 2018 background conditions.

Appendix "G" contains the 2018 background conditions traffic operations worksheets.

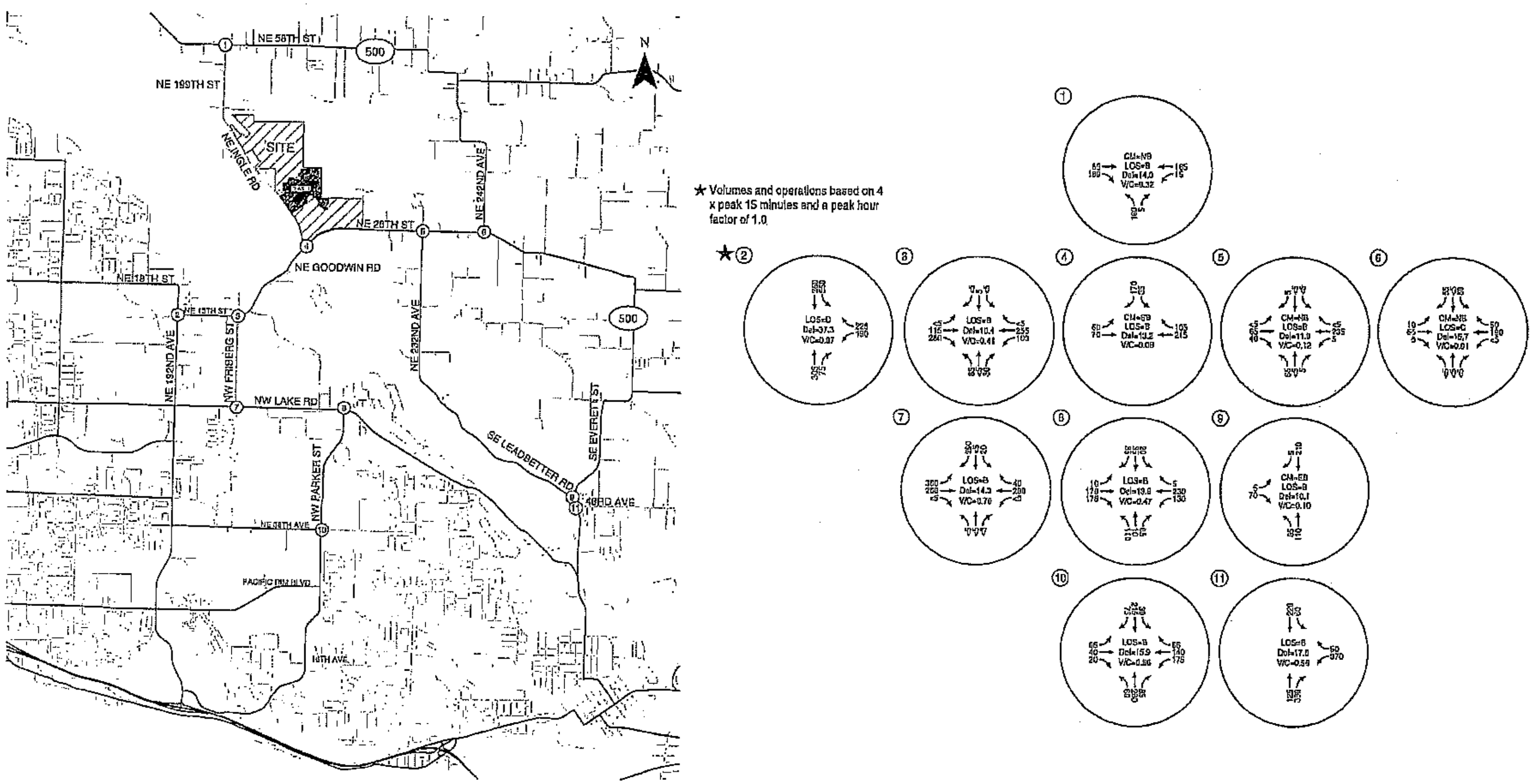


- STOP SIGN
- TRAFFIC SIGNAL
- YIELD SIGN
- PLANNED IMPROVEMENT

Year 2018 Lane Configurations and Traffic Control Devices
Camas, Washington

Figure 11

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

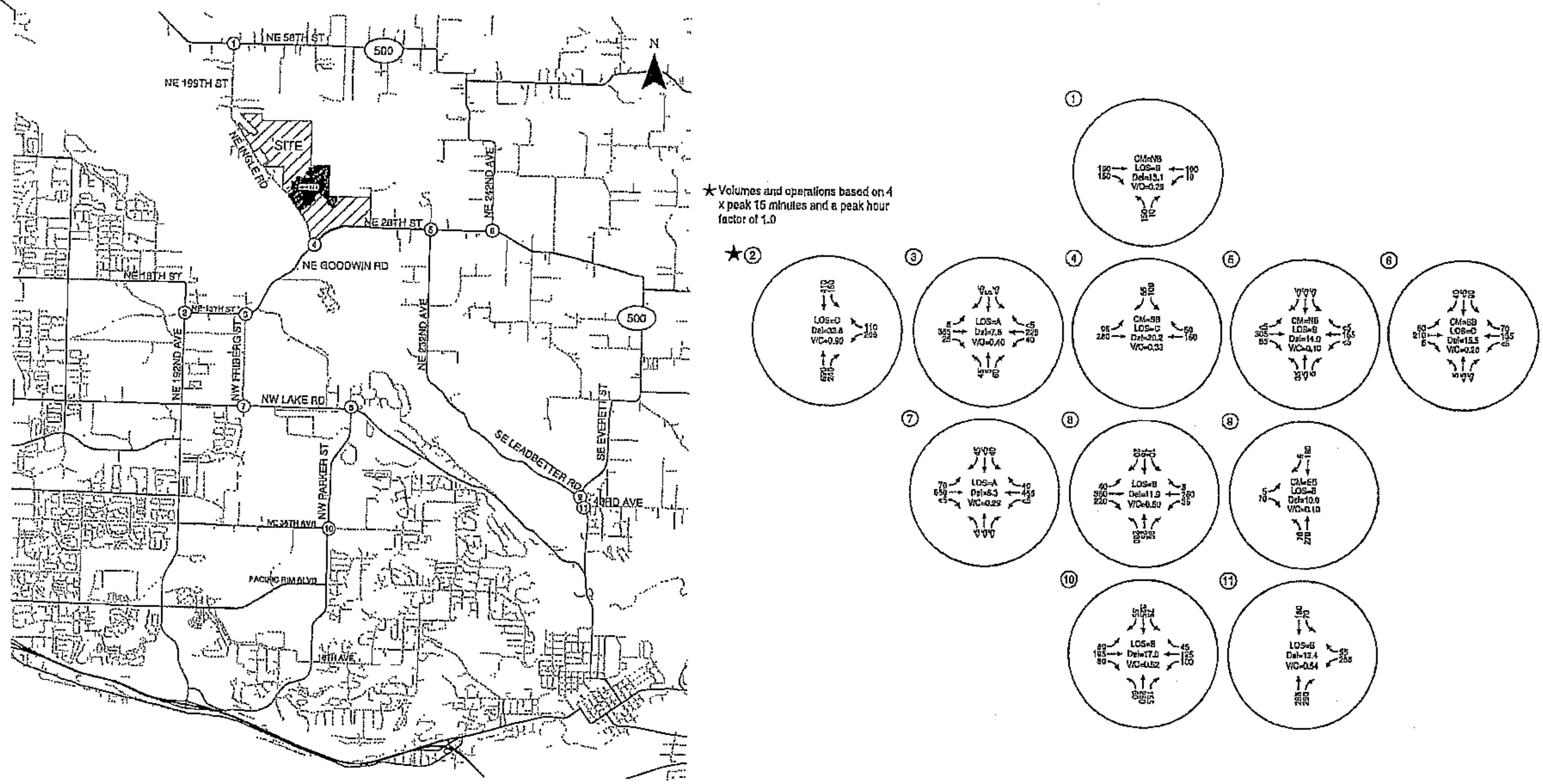


CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

2018 Background Conditions
Weekday AM Peak Hour
Camas, Washington

Figure 12

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING



CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG) / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

2018 Background Conditions
Weekday PM Peak Hour
Camas, Washington

Figure 13

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

2018 Total Traffic Conditions

The year 2018 total traffic analysis forecasts how the study area's transportation system will operate with the addition of traffic from Phase 1 of the proposed development. Phase 1 site-generated trips were added to the 2018 background traffic volumes at the study intersections to arrive at the total traffic volumes.

All lane configurations are consistent with background conditions with the exception of the intersection of NE Ingle Road/NE Goodwin Road. The developer proposes to construct an exclusive eastbound left-turn lane on NE Goodwin Road at NE Ingle Road in conjunction with the Phase 1 site development. Consequently, provision of the turn lane was assumed for the total traffic analysis.

Traffic Operations

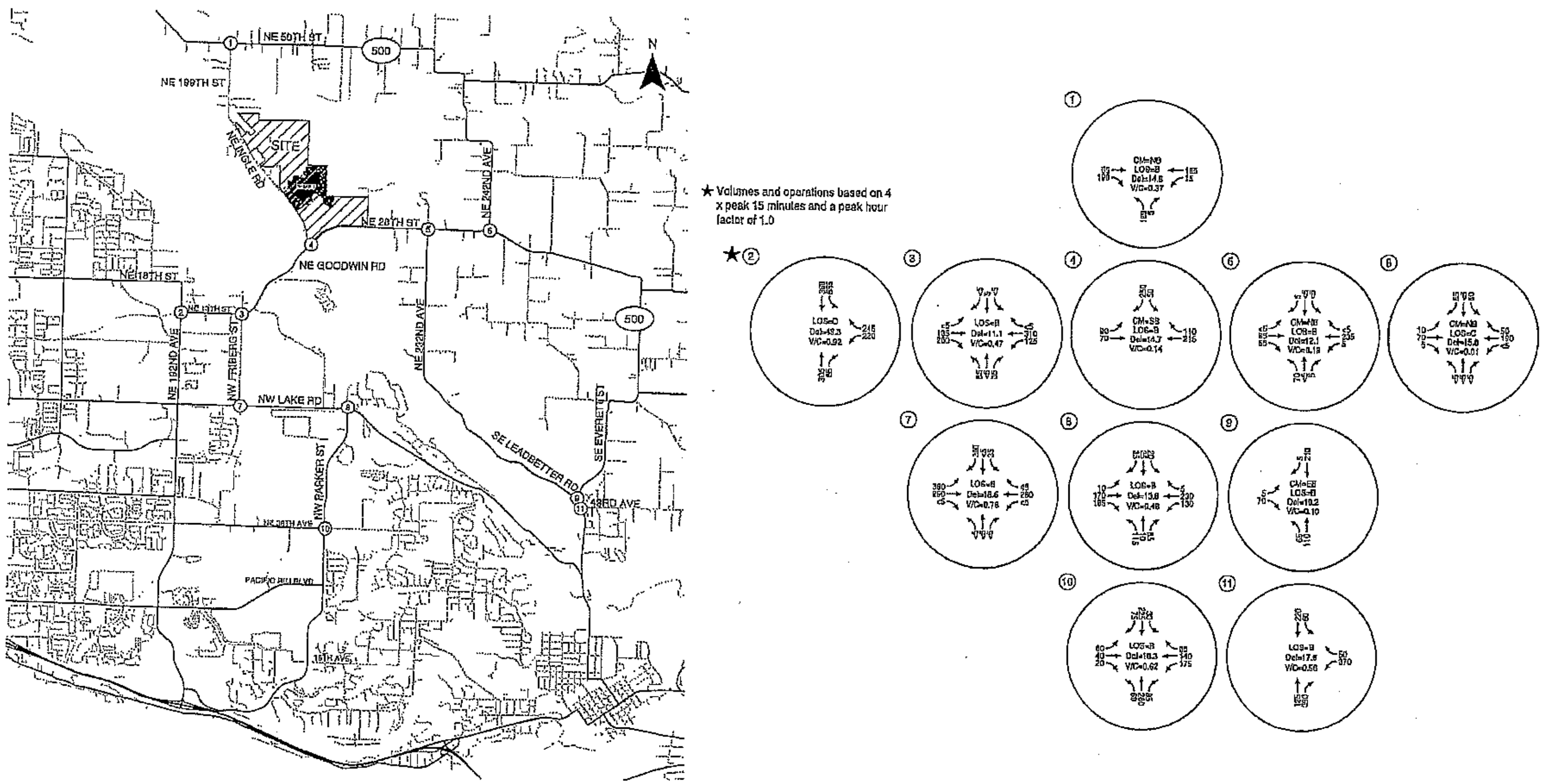
Figures 14 and 15 summarize the year 2018 total traffic operations analysis results at the study intersections for the weekday a.m. and weekday p.m. peak-hours, respectively. The projected turning movement counts are rounded to the nearest five vehicles per hour. As shown, all but one of the study intersections are forecast to operate acceptably during the weekday a.m. and p.m. peak periods under 2018 total traffic conditions. The southbound movement at the intersection of NE Ingle Road/NE Goodwin Road is anticipated to operate at a LOS E during the weekday p.m. peak hour. Operations at this intersection could be mitigated with the addition of an eastbound right-turn lane. Based on a sensitivity analysis, this mitigation is triggered by the 203rd unit to be constructed. Up until this point, the southbound left-turn lane is forecast to operate at a LOS D. Table 6 provides the operations at NE Ingle Road/NE Goodwin Road during the weekday PM peak hour supporting the sensitivity analysis.

Table 6: NE Ingle Road/NE Goodwin Road Operations Assessment – weekday PM peak hour

Scenario	Critical Movement	LOS	V/C ratio
2018 Background Conditions	SBL	C	0.33
2018 Background + 200 Homes	SBL	D	0.52
2018 Background + 203 homes	SBL	E	0.53
2018 Total Traffic (215 homes)	SBL	E	0.53
2018 Total Traffic (2015 homes) – mitigated[1]	SBL	D	0.51

Notes: LOS = Level of Service; v/c ratio = volume-to-capacity ratio
[1]Mitigation includes provision of westbound right-turn lane

Appendix "H" contains the 2018 total traffic conditions traffic operations worksheets. Appendix "I" contains the traffic operations worksheets supporting the sensitivity analysis at NE Ingle Road/NE Goodwin Road.

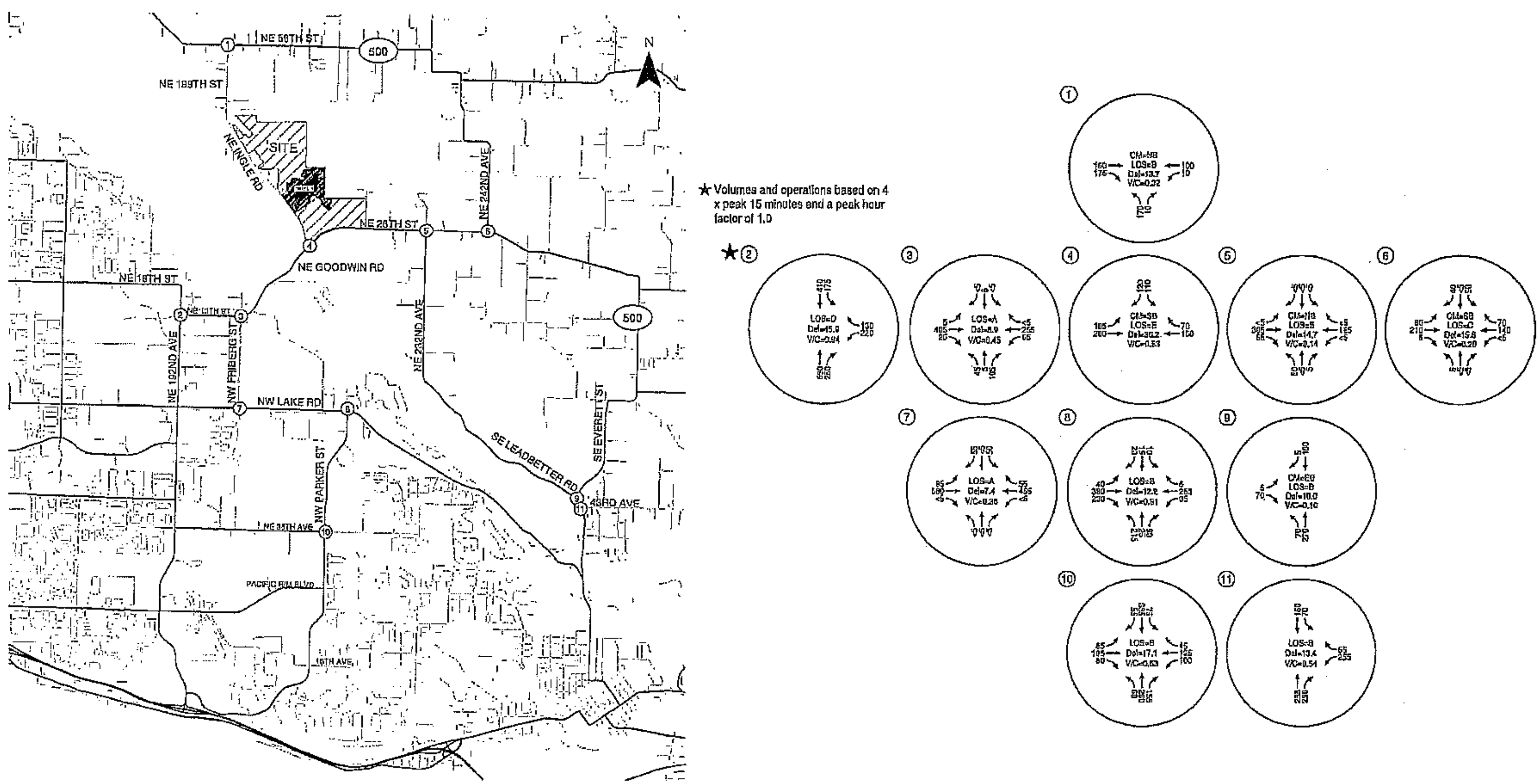


CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING / PLANNING

2018 Total Traffic Conditions (Phase 1)
Weekday AM Peak Hour
Camas, Washington

Figure 14



CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

2018 Total Traffic Conditions (Phase 1)
Weekday PM Peak Hour
Camas, Washington

Figure
15

KITTELSON & ASSOCIATES, INC.

2029 Background Traffic Conditions

The 2029 background traffic analysis identifies how the study area's transportation system will operate with regional growth, including completion of Phase 1 development. No further funded transportation improvement projects were identified at the study intersections that would be in place prior to the year 2029. In addition to the previously described in-process development, a one percent annual growth rate was applied to the 2018 background traffic volumes on City of Camas roadways to account for regional growth in the area per staff direction. Continued use of a two percent annual growth rate was assumed to the City of Vancouver roadways (NE 192nd Avenue).

The same lane configurations used in the 2018 analysis were assumed, with the exception of the configuration at NE Ingle Road/NE Goodwin Road. As previously noted, the developer proposes to construct an exclusive eastbound left-turn lane at the intersection in conjunction with the Phase 1 site development so this turn lane was assumed for the 2029 analysis. Signal timings were optimized with the assumption that signals in the area will be re-timed in the next fifteen years. In addition, some peak hour factors (PHF) were increased to account for future traffic changes, including:

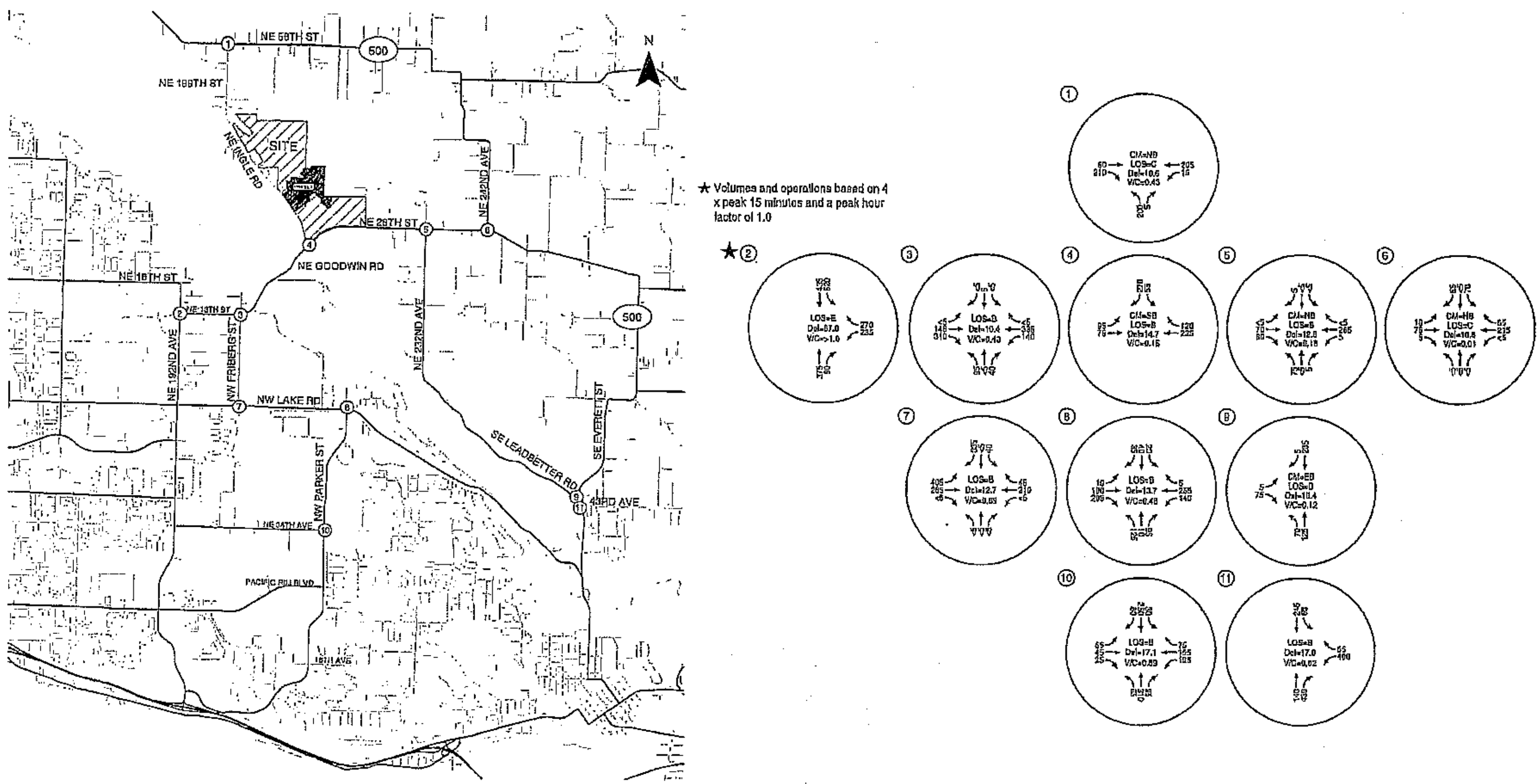
- PHF increased to 0.80 in the a.m. peak hour at NW Friberg Street/NE Goodwin Road and NE 242nd Avenue/NE 28th Street
- PHF increased to 0.75 in the a.m. peak hour at NW Friberg Street/NW Lake Road; NW Parker Street/NW Lake Road; and NW Parker Street/NE 38th Avenue

Traffic Operations

Figures 16 and 17 summarize the year 2029 background traffic operations analysis results at the study intersections for the weekday a.m. and weekday p.m. peak-hours, respectively. As illustrated in the figures, all but two of the study intersections are forecast to operate acceptably:

- The intersection of NE 192nd Avenue/NE 13th Street is projected to operate at a LOS E and over-capacity during the weekday a.m. peak hour and LOS F and over-capacity during the p.m. peak hour.
- The southbound approach to the intersection of NE Ingle Road/NE Goodwin Road is projected to operate at a LOS E during the weekday p.m. peak hour (with provision of the westbound right-turn lane recommended in conjunction with Phase 1 site development).

Appendix "J" contains the 2029 background conditions traffic operations worksheets.

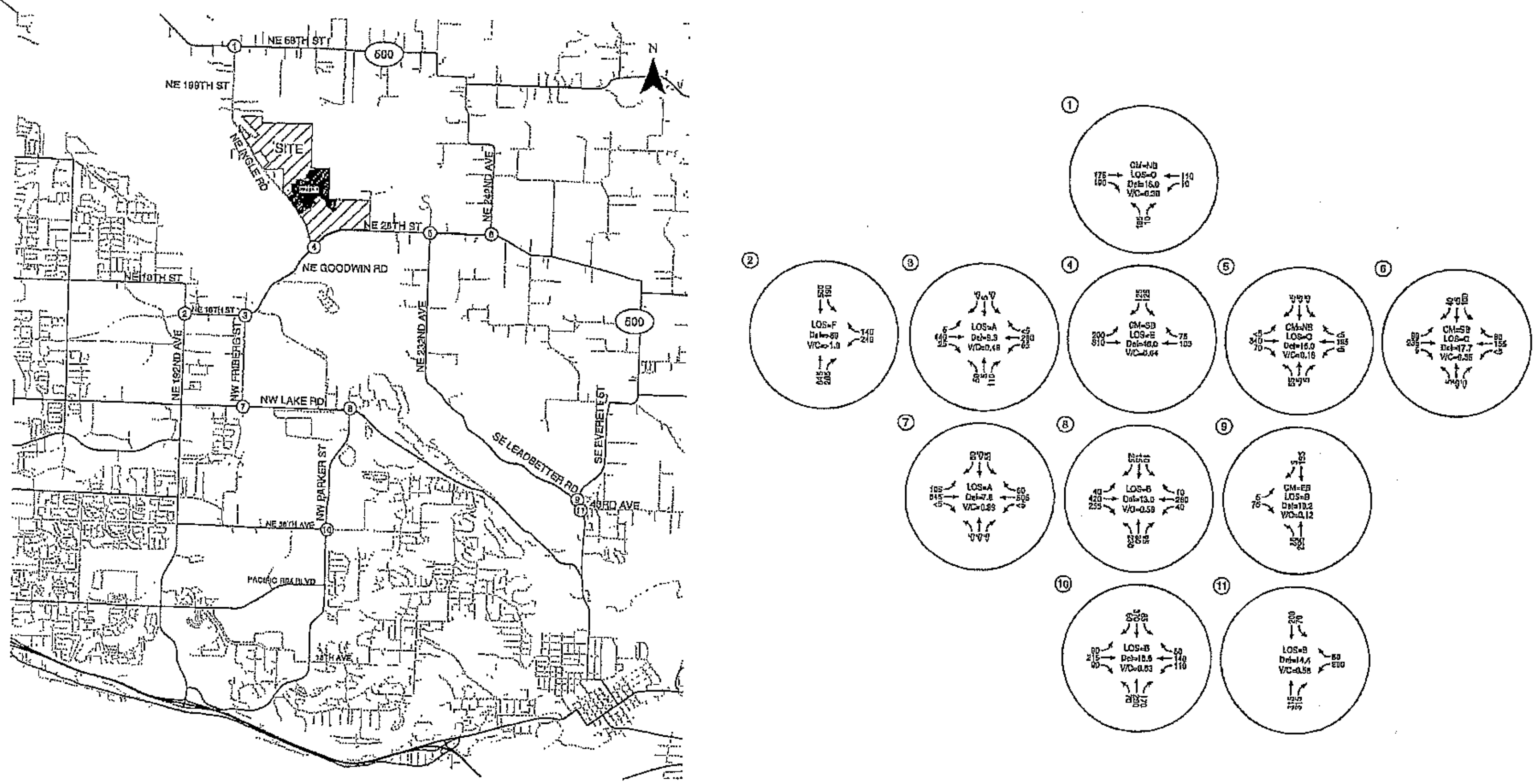


CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG) / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

2029 Background Conditions
Weekday AM Peak Hour
Camas, Washington

Figure 16

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING



CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

2029 Background Conditions
Weekday PM Peak Hour
Camas, Washington

Figure 17

2029 Total Traffic Conditions

The year 2029 total traffic analysis forecasts how the study area's transportation system will operate with full build-out of the proposed master plan development. The year 2029 background traffic volumes were added to the full build-out site-generated traffic to arrive at the total traffic volumes.

Traffic Operations

Figures 18 and 19 summarize the year 2029 total traffic operations analysis results at the study intersections for the weekday a.m. and weekday p.m. peak-hours, respectively. The projected turning movement counts are rounded to the nearest five vehicles per hour. As shown, the following study intersections do not meet standards during either the weekday a.m. or p.m. peak periods:

- NE 199th Avenue/NE 58th Street (SR 500) (weekday a.m. and p.m. peak hours)
- NE 192nd Avenue/NE 13th Street (weekday a.m. and p.m. peak hours, previously was failing during background a.m. and p.m. peak hours)
- NE Ingle Road/NE Goodwin Road (weekday a.m. and p.m. peak hours, previously was failing during background p.m. peak hour)

Potential mitigation measures for these intersections are discussed later in the report.

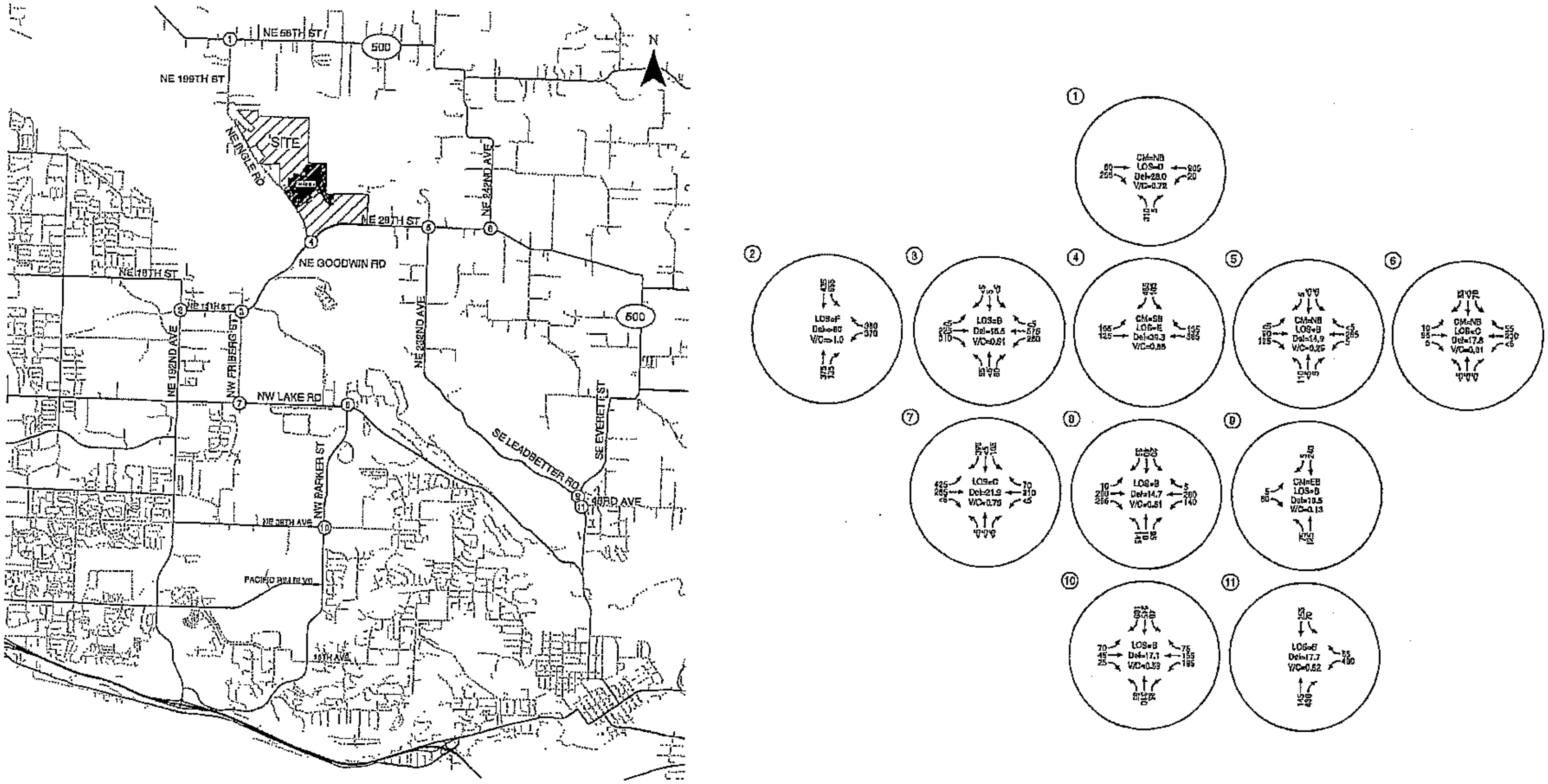
Appendix "K" contains the 2029 total traffic conditions traffic operations worksheets.

Turn-Lane Considerations

As referenced under the "Analysis Methodology," roadways under Washington State jurisdiction are subject to the turn lane guidelines contained in the *WSDOT Design Manual* (Reference 3). The potential need for turn-lanes at each study intersection was reviewed for the analysis scenarios. Intersections that meet turn-lane guidelines are further discussed below.

NE 199th Avenue/NE 58th Street (SR 500)

Traffic volumes at the intersection of NE 199th Avenue/NE 58th Street (SR 500) meet WSDOT's guidelines for an eastbound right-turn lane on NE 58th Street under existing conditions and all future scenarios during both the weekday a.m. and p.m. peak hour. Construction of a right-turn lane could require right-of-way acquisition and will likely impact one or more private driveways along NE 58th Street (depending on the length of the deceleration lane constructed).

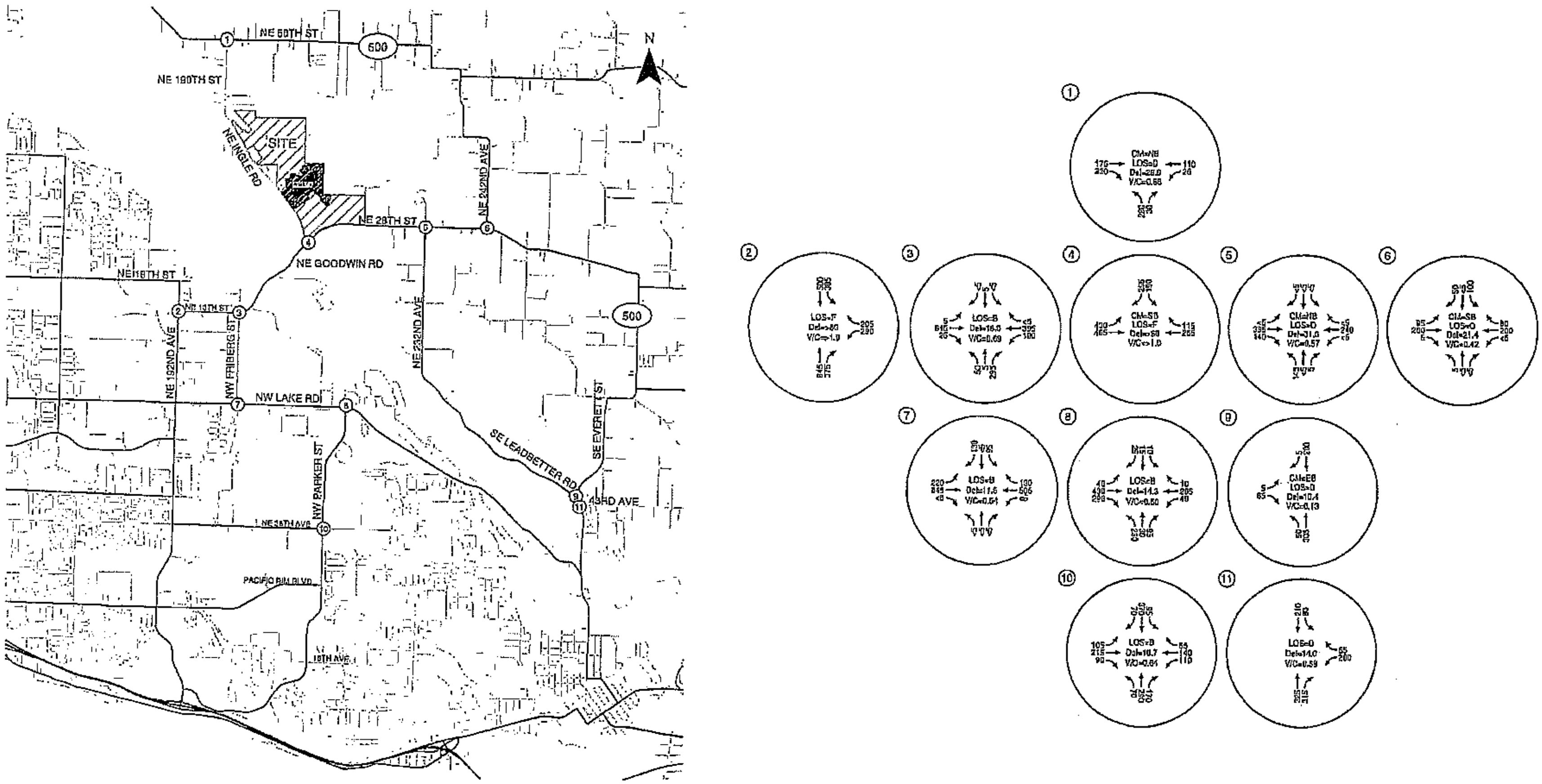


CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

2029 Total Traffic Conditions (Build Out)
Weekday AM Peak Hour
Camas, Washington

Figure 18

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING



CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG)/CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG)/CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

2029 Total Traffic Conditions (Build Out)
Weekday PM Peak Hour
Camas, Washington

Figure
19

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

The table below assesses volumes at the intersection for various horizon year scenarios and the impact of the proposed development.

Table 7: NE 199th Avenue/NE 58th Street (SR 500) Eastbound Right-Turn Lane Assessment

Scenario	Eastbound Right-Turn (EBRT) Volume	Meets Guideline?	Development-Added EBRT Trips	Impact of Development
2014 Existing Traffic – AM Peak	180	Yes		
2014 Existing Traffic – PM Peak	145	Yes		
2018 Background Traffic – AM Peak	180	Yes	8 (Phase 1)	4%
2018 Background Traffic – PM Peak	150	Yes	27 (Phase 1)	18%
2029 Background Traffic – AM Peak	210	Yes	45 (Build-out)	21%
2029 Background Traffic – PM Peak	190	Yes	138 (Build-out)	73%

The recorded crash history at the intersection was reviewed to identify potential safety issues that an eastbound right-turn lane might address. No crashes were reported involving vehicles making an eastbound right-turn. Given the lack of crash history and the relatively small impact of Phase 1, no improvements are recommended in conjunction with Phase 1. Nonetheless, given the amount of site-generated traffic that will be added to the eastbound right-turn movement as future phases of the master plan build-out, if right turn crashes materially increased, it is possible that a nexus could be established between requiring construction of an eastbound right-turn lane and traffic volume increases attributable to master plan trip development. Accordingly, we recommend that future site plan applications prepared subsequent to Phase 1 provide an updated assessment as to the potential need for providing a right-turn taper or lane at the intersection.

NE 242nd Avenue (SR 500)/NE 28th Street

Traffic volumes at the intersection of NE 242nd Avenue (SR 500)/NE 28th Street meet WSDOT's guidelines for a left-turn lane on the eastbound approach under existing conditions and all future scenarios during the weekday p.m. peak hour. The table below assesses volumes at the intersection for each horizon year scenario and the impact of the proposed development. *As shown in the table, the Phase 1 development does not add any trips to the eastbound left-turn lane*. The trips generated by build-out of the master plan development are from the retail component and total less than 10.

Table 8: NE 242nd Avenue (SR 500)/NE 28th Street Eastbound Left-Turn Lane Assessment

Scenario	Eastbound Left-Turn Volume	Meets Guidelines? (Recommended Storage)	Development-Added Trips	Impact of Development
2014 Existing Traffic – AM Peak	10	No		
2014 Existing Traffic – PM Peak	80	Yes (100 feet)		
2018 Background Traffic – AM Peak	10	No	0 (Phase 1)	0%
2018 Background Traffic – PM Peak	80	Yes (100 feet)	0 (Phase 1)	0%
2029 Background Traffic – AM Peak	10	No	2 (Build-out)	20%
2029 Background Traffic – PM Peak	90	Yes (100 feet)	9 (Build-out)	10%

The recorded crash history at the intersection was reviewed to identify potential safety issues that an eastbound left-turn lane might address. While two angle crashes were reported from vehicles making a southbound left-turn, no crashes were reported involving vehicles making an eastbound left-turn.

Based on our review of the information provided above, we find no basis for recommending improvements to the NE 242nd Avenue (SR 500)/NE 28th Street intersection in conjunction with Phase 1 site development. We base this conclusion on the proposed development adding no trips to the left-turn movement in question, the lack of crash history related to left-turns, and the general lack of a nexus given the small trip impact of the proposed Phase 1 development at this location.

Planned Future Intersection Improvements

The *2012 City of Camas Traffic Impact Fee Update Report* (Reference 2) identifies the future need to widen NE 28th Street to have a center left-turn lane from Ingle Road to NE 242nd Avenue. A related project would create a new NE 242nd Avenue extension south of NE 28th Street. Given the City's planned improvements, we recommend the City of Camas make a finding that the traffic impact fee payments made by the master plan for Phase 1 and future phases of the project mitigate development impacts at the intersection, and therefore require no additional mitigation.

Recommended Mitigations

As discussed above, all study intersections meet operating standards under existing and 2018 background and total traffic conditions for both the weekday a.m. and p.m. peak hours. Four intersections do not meet operating standards in 2029 under background and/or total traffic conditions; each is discussed below.

NE 199th Avenue/NE 58th Street (SR 500)

The minor street northbound left-turn at the intersection of NE 199th Avenue/NE 58th Street (SR 500) is projected to not meet current WSDOT standards in the 2029 total traffic conditions during the weekday a.m. and p.m. peak hours. The intersection is projected to operate at a volume-to-capacity (v/c) ratio of 0.72 and LOS D during the a.m. peak hour and v/c ratio of 0.70 and LOS D during the p.m. peak hour. It is therefore not within WSDOT's LOS requirement (LOS C) for non-HSS facilities in rural areas. The intersection is three-legged and stop-controlled on the northbound approach. The northbound left-turn is the critical movement at the intersection, with all other movements operating at a LOS A and well under capacity. During both the weekday a.m. and p.m. peak hours, the northbound left-turn is 3 seconds or less over the delay threshold between LOS C and LOS D. In the event that the area around the intersection urbanizes before build-out, the WSDOT performance standard will shift to LOS E and the intersection would operate within WSDOT standards.

As discussed in the *Turn-Lane Considerations* section above, the intersection currently meets warrants for an eastbound right-turn lane, which would improve operations for northbound left-turning vehicles to a LOS C during the 2029 total traffic conditions. As also discussed above, it is expected that a nexus might ultimately be established between requiring construction of an eastbound right-turn lane and traffic volume increases attributable to master plan trip development, based on LOS and delay at the intersection. Accordingly, we recommend that future site plan applications prepared subsequent to Phase 1 provide an updated assessment as to the potential need for providing a right-turn taper or lane at the intersection, considering both the need for a right-turn taper or lane and delay with the northbound left-turn.

Appendix "L" contains the traffic operations worksheets supporting the potential mitigations at NE 199th Avenue/NE 58th Street (SR 500).

NE 192nd Avenue/NE 13th Street

The intersection of NE 192nd Avenue/NE 13th Street is projected to not meet standards in the 2029 background conditions and the 2029 total traffic conditions during both the weekday a.m. and p.m. peak hours. The intersection operates over-capacity in all four of these scenarios and at a LOS F during the weekday p.m. peak hour in the background conditions and weekday a.m. and p.m. peak hours in the total traffic scenarios.

Potential Future City of Vancouver Improvements

The City of Vancouver has identified NE 192nd Avenue as ultimately requiring five travel lanes (two southbound through lanes, a center left-turn lane, and two northbound through lanes) and includes the widening on the City's Traffic Impact Fee (TIF) program project list. Because no near-term funding has been programmed for the future five-lane section, the existing section was assumed to be in place in 2029 for the purposes of this traffic study. Widening by the City of Vancouver or others in the interim would add capacity and change the intersection operations.

In the event that NE 192nd Avenue is widened to five lanes through the NE 13th Street intersection, the intersection is projected to meet City of Vancouver intersection operating standards under 2029 background conditions. To mitigate total traffic conditions, a westbound right-turn lane would also be required. In the event that 192nd Avenue is not widened, a northbound right-turn lane and westbound right-turn lane would be sufficient to mitigate 2029 total traffic conditions (mitigation assumes maintaining operations equivalent to or better than those experienced under 2029 background conditions with site build-out but does not fully accommodate forecast queuing).

Potential Master Plan Development Mitigation Options

As noted above, the provision of a northbound right-turn lane and westbound right-turn lane would offer more than sufficient capacity to mitigate the impact of the master plan site build-out while also providing additional capacity to allow for future growth and development. Therefore, we recommend the Green Mountain Master Plan provide a proportionate share contribution towards the construction of a northbound right-turn lane and a westbound right-turn lane on NE 13th Avenue. The City of Vancouver has successfully administered pro-rata share contribution collection systems at other intersections, allowing each development impacting a failing intersection to contribute a "fair-share" of the mitigation cost.

Appendix "M" identifies a proposed proportionate cost sharing methodology. Under this methodology, each trip would be assessed a fee of $391. Therefore the Green Mountain development contribution at full build-out would be approximately $123,600. *Details of the cost estimate, capacity generated by the improvements, and impact of the proposed development supporting the proportionate share calculations are provided in Appendix "M."*

It should be noted that the NE 192nd Avenue/NE 13th Street intersection is listed on the City of Vancouver's TIF program project list. In the case of the Green Mountain Master plan, any TIF credits issued by the City of Vancouver would only be redeemable for development impacts in Vancouver (not Camas).

NE Ingle Road/NE Goodwin Road

The intersection of NE Ingle Road/NE Goodwin Road is projected to not meet City of Camas intersection operating standards in the 2029 background conditions during the weekday p.m. peak hour and the 2029 total traffic conditions during both the weekday a.m. and p.m. peak hours. In order to mitigate 2029 background conditions, a two-way left-turn lane could potentially be provided east of the intersection to facilitate southbound left-turns, which are the critical movement at the intersection.

The City's long-term plans anticipate significant reconstruction of the intersection and the approaching roadways as recorded in the 2012 *City of Camas Traffic Impact Fee Update* (Reference 2). Identified improvement needs include:

- Installation of a traffic signal at NE Ingle Road/NE Goodwin Road;
- The extension of a new collector roadway from NE Ingle Road south to NE 232nd Avenue;
- Widening of NE Goodwin Road from two to three lanes between NE Ingle Road and NE 232nd Avenue; and
- Widening of NE Goodwin Road from two to five lanes NE between Friberg Street and NE Ingle Road.

Considering the Green Mountain Master Plan project location and traffic impacts at the intersection, we recommend the following series of mitigations in conjunction with the proposed development:

- Construct an eastbound left-turn lane on NE Goodwin Road at NE Ingle Road with the first Phase 1 trip.
- Construct a westbound right-turn lane on NE Goodwin Road at NE Ingle Road with the 203rd Phase 1 trip (prior to occupancy of 203rd single family home on site). The right-turn lane should provide at least 100 feet of storage. (Note, in the long-term future, the City could consider restriping the right-turn lane to a shared through/right lane when widening of NE Goodwin Road west of NE Ingle Road develops two westbound receiving lanes).
- Construct a three-lane roadway section (with center two-way left-turn lane) on NE Goodwin Road along the site frontage in conjunction with standard frontage improvements as adjacent development occurs.
- Upon completion of Phase 1 site development (including construction of the eastbound left-turn lane and westbound right-turn lane on NE Goodwin Road at NE Ingle Road with Phase 1), the developer shall monitor the need for installation of a traffic signal with each future site plan application at the intersection and construct a traffic signal when the intersection no longer satisfies City of Camas performance standard (LOS "D" and v/c of 0.90 or better) *and* the intersection volumes meet traffic signal warrants (subject to direction from the City of Camas).

- The monitoring effort is recommended to require preparation of then-current traffic counts, assessment of traffic signal warrants based on build-out of the then-current site plan application (and all other approved development), and a summary report prepared by a licensed professional engineer. The study should consider potential turn movement re-routing that is expected to occur at the NE Goodwin Road/NE Ingle Road intersection as new connections to the master plan site are made to NE Goodwin Road east of NE Ingle Road.

On-site Circulation and Operations

We recommend that a detailed review of on-site circulation and operations be prepared in conjunction with each future site plan application. This review will provide an opportunity to consider site-specific details when they become available and should include consideration of vehicular, pedestrian, and delivery vehicle paths.

On-site landscaping, signage and any above-ground utilities should be provided appropriately to ensure that adequate sight distance is provided and maintained and should be considered as part of future site plan applications.

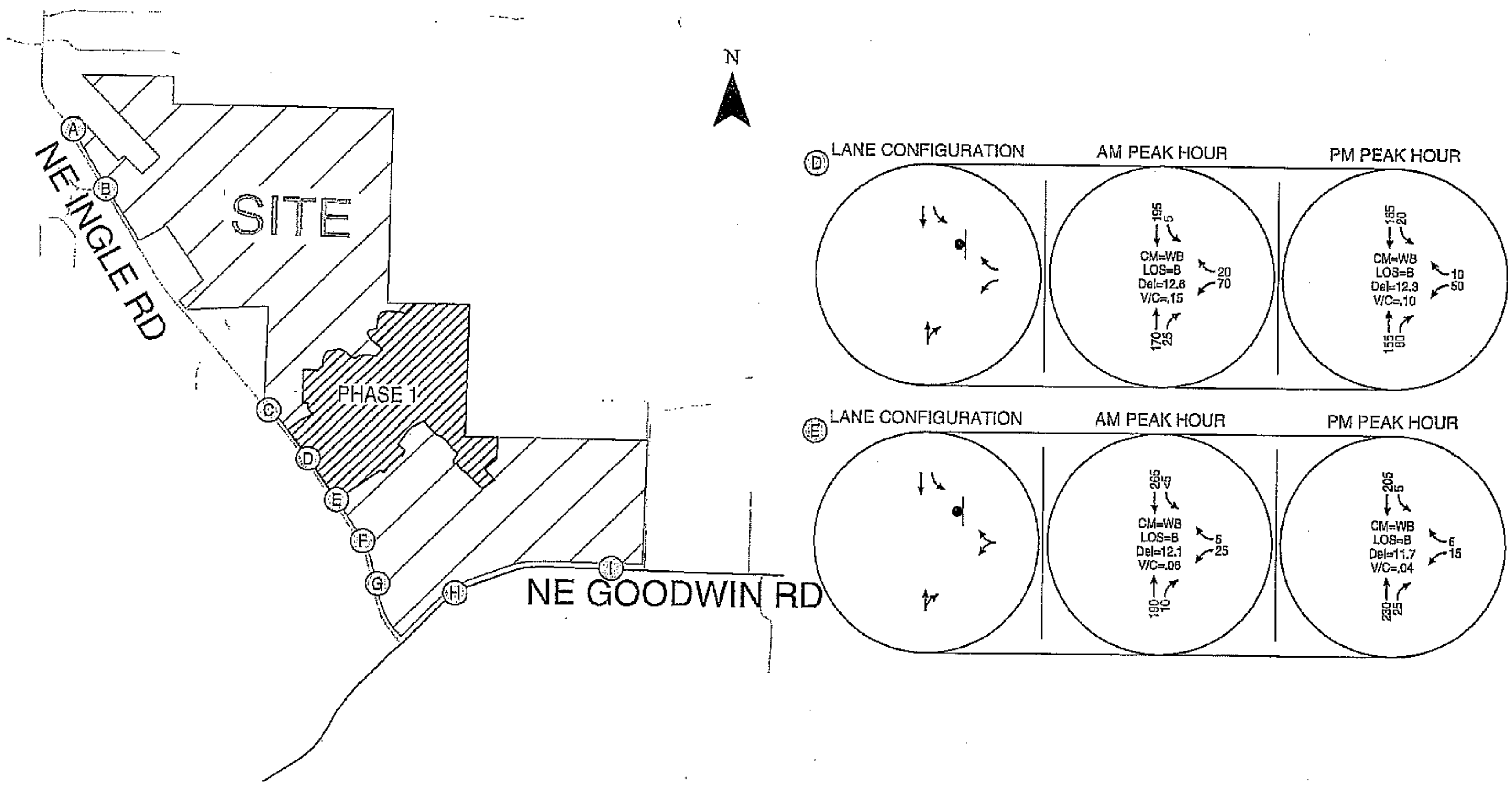
Access Requirements

The City of Camas requires a minimum intersection spacing of 330 feet on three lane collector streets. This spacing should be maintained with the proposed development.

Phase 1 Access Operations

The portion of the site that will be developed with Phase 1 is noted in Figure 2. As seen, two access points are proposed for the Phase 1 development. The proposed lane configuration at these accesses and operations is shown in Figure 20. The developer has proposed to maintain access to the existing golf course in conjunction with the Phase 1 development. The existing gravel maintenance only access will be improved to provide an interim main access to the remaining portion of the golf course (reduced to eight holes). The proposed interim golf course access is located approximately 400 feet south of the proposed southern access, which meets the City's intersection spacing requirements for a collector street noted above.

Appendix "N" contains the traffic operations worksheets for the Phase 1 access operations.



- STOP SIGN

CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

2018 Site Access Lane Configurations and Operations (Phase 1)
Camas, Washington

Figure 20

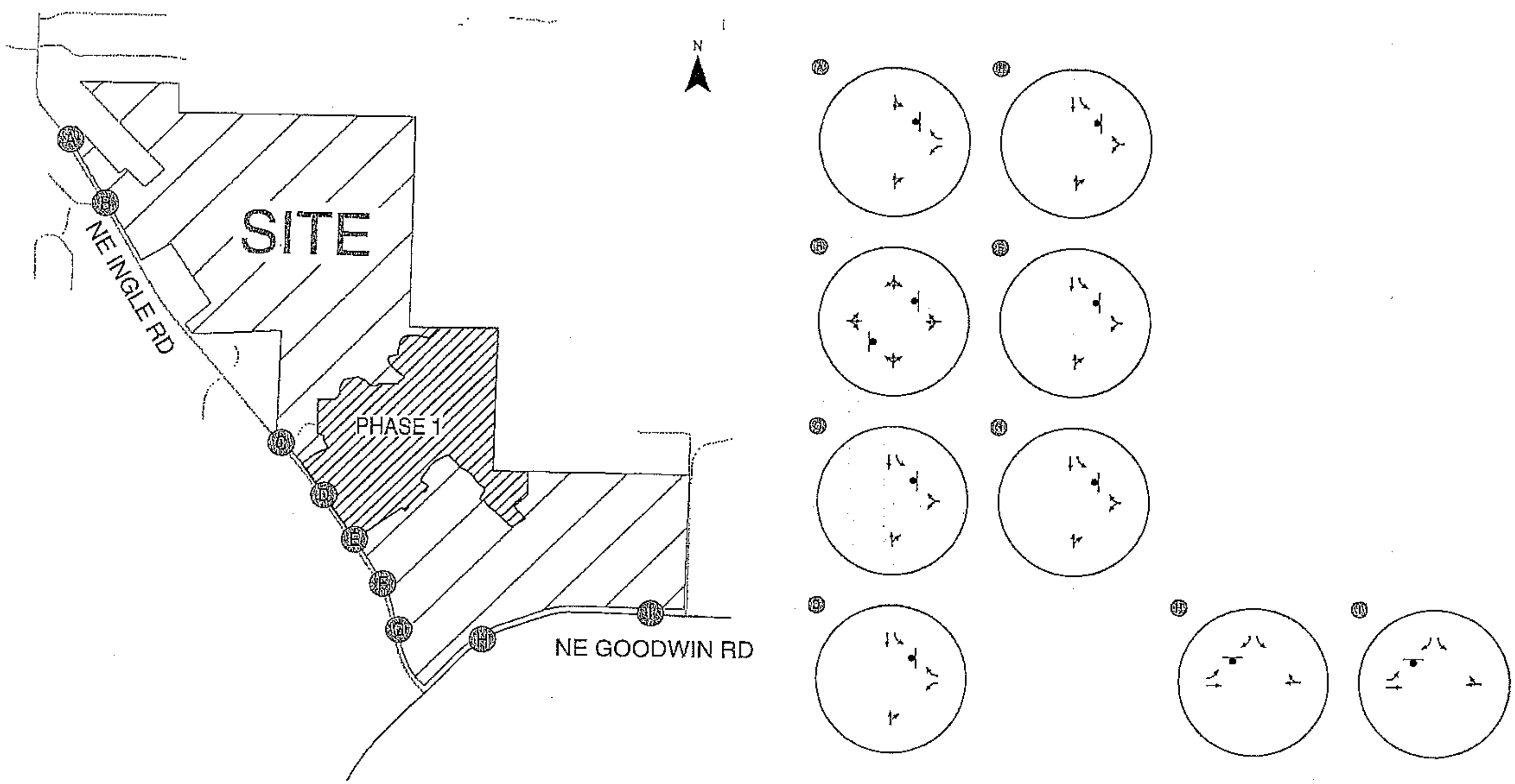
KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

H:\projfile\13865 - Green Mountain Master Plan\dwgs\figs\13865_traffic study -Nov update.dwg Nov 20, 2014 - 2:34pm - klaustsen Layout Tab: 20_ph1SA

Build-out Access Operations

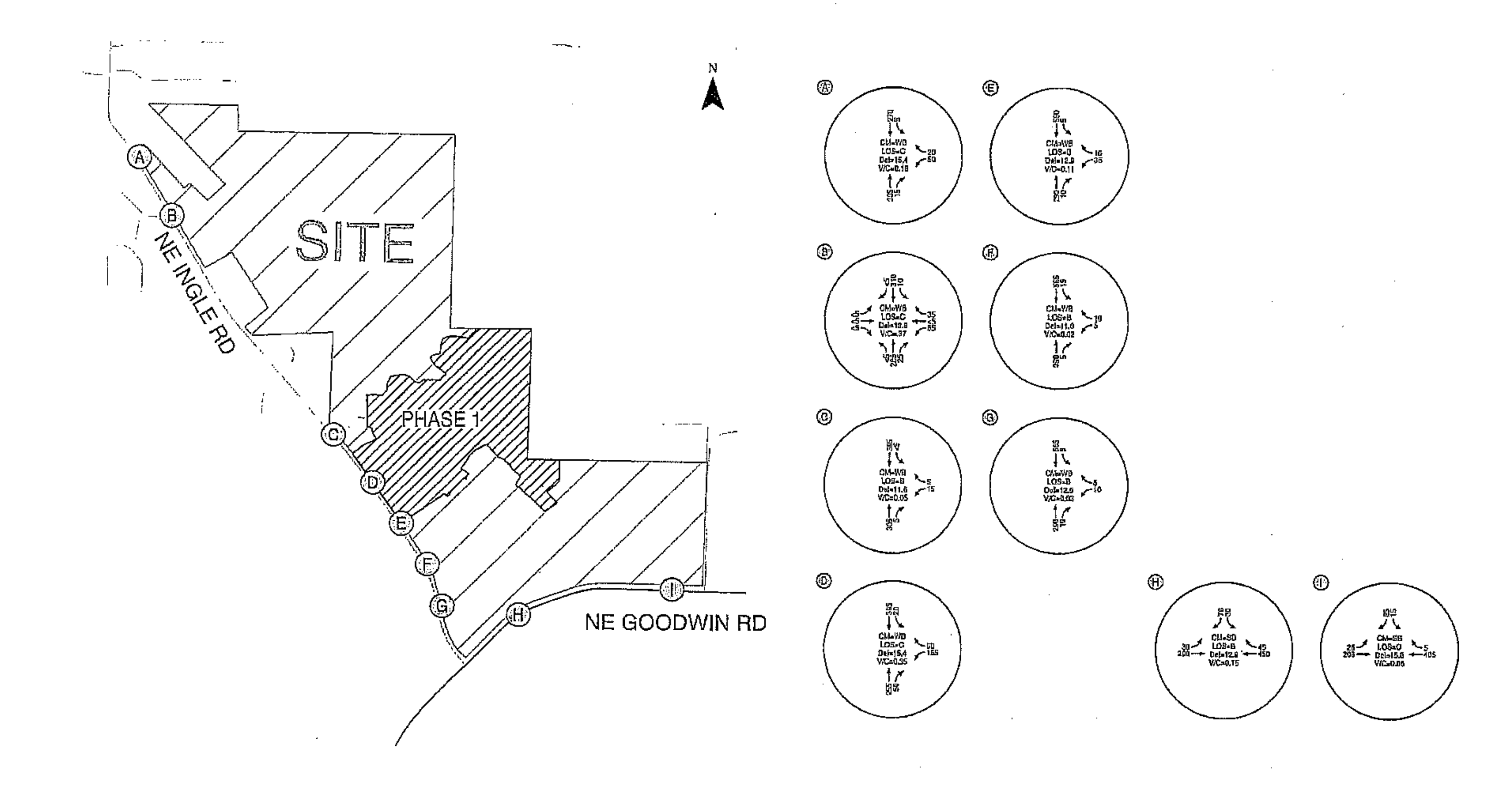
An additional five access points on NE Ingle Road and two access points on NE Goodwin Road are anticipated with full build-out of the development. The exact location of the access points may change as the plans for the development are refined. We assessed operations at these access points assuming the lane configuration shown in Figure 21. As seen in the figure, we expect NE Ingle Road will be developed with a center two-way left-turn lane (TWLTL) through access "C" and NE Goodwin Road will be developed with a TWLTL along the site frontage. Operations at the site accesses for the weekday a.m. and p.m. peak hours are shown in Figures 22 and 23. As seen in the figures, all access points operate at a LOS "C" or better, with the exception of the eastern access on NE Goodwin Road. The southbound left-turn movement at this intersection operates at a LOS D during the weekday p.m. peak hour.

We recommend further evaluation of potential right-turn deceleration lane needs be considered at the time of site plan application. This evaluation should consider the potential need for southbound left-turn lanes or northbound right-turn lanes along NE Ingle Road at the remaining access points as well as corresponding turn lane queue storage requirements. *Appendix "O" contains the traffic operations worksheets for the full build-out access operations.*



Site Access Lane Configurations and Traffic Control Devices (Buildout)
Camas, Washington

Figure 21

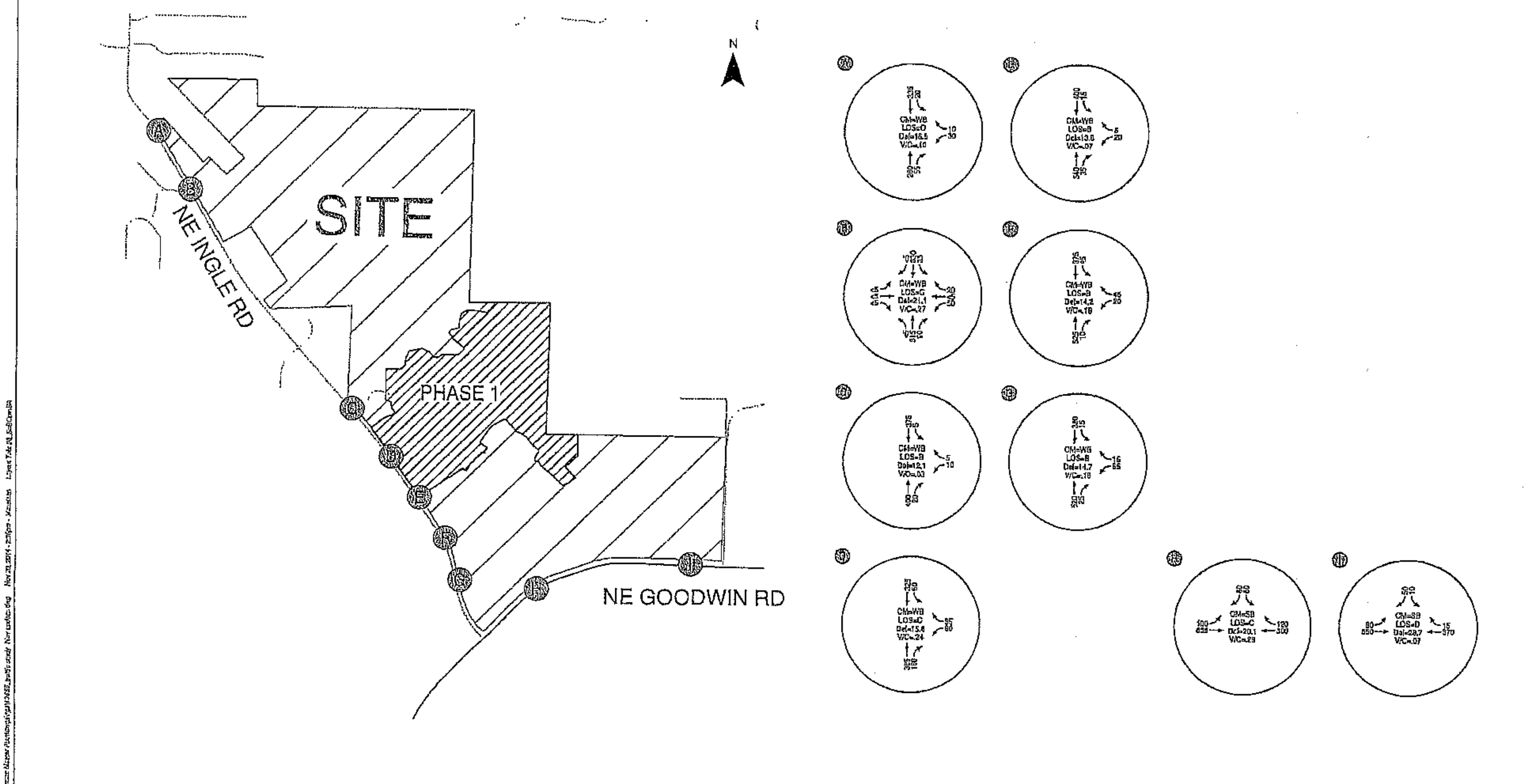


CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

2029 Site Access Operations (Build Out)
Weekday AM Peak Hour
Camas, Washington

Figure 22

KITTELSON & ASSOCIATES, INC.



CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

2029 Site Access Operations (Build Out)
Weekday PM Peak Hour
Camas, Washington

Figure 23

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

TRANSPORTATION COMPLIANCE LETTER

This master plan traffic study documents the transportation implications of the proposed development at build-out. There are on-site access, circulation, turn lane, and driveway location and design considerations that will need to be addressed when specific site plan applications are made. Further, the phasing and timing of master plan build-out is likely to evolve over time to adapt to market conditions. Accordingly, it is recommended that a transportation compliance letter be prepared for each preliminary plat or site plan application to address on-site transportation, access and pedestrian standards and to ensure that the mitigation measures provided for in this report are applied at the appropriate phase of development. The transportation compliance letter should also document the trip generation of each phase of development to ensure that the total number of trips generated from future development does not exceed the number of trips vested under the Development Agreement.

We recommend each transportation compliance letter could document:

- The number of site-generated trips (daily, weekday a.m. peak hour, weekday p.m. peak hour) estimated to be used by the then-current proposed site development application.
- The number of site-generated trips (daily, weekday a.m. peak hour, weekday p.m. peak hour) previously used by approved site development applications on the master plan site.
- An accounting of the number of site-generated trips (daily, weekday a.m. peak hour, weekday p.m. peak hour) remaining assuming approval of the then-current site plan application.
  - Note: In the event that a future site plan application is projected to use more trips than were previously assumed through the master plan, additional traffic capacity/concurrency analysis would be triggered (unless a traffic count cordon-study of the master plan campus demonstrates the number of trips generated by the site is less than projected by standard ITE trip rates and thus the overall development impact actually is less than or equal to the number of trips assumed by the master plan).
- Evaluation of outstanding mitigation needs (as appropriate consistent with the Master Plan recommendations) at the intersections of:
  - Need for an eastbound right-turn lane at NE 199th Avenue/NE 58th Street (SR 500)
  - NE Ingle Road/NE Goodwin Road (including traffic signal warrant analysis)

FINDINGS AND RECOMMENDATIONS

Based on the results of the transportation impact analysis, Phase 1 of the Green Mountain Master Plan (estimated to generate 2,050 daily trips and 215 net new p.m. peak hour trips) can be developed while maintaining acceptable levels of service and safety at the study intersections without any required off-site mitigations. The primary findings and recommendations of this study are summarized below.

Existing Conditions

- All of the study intersections currently operate acceptably during the weekday a.m. and p.m. peak hours.

Proposed Development Activities

- Phase 1 site development includes 215 residential units. It is estimated to generate 160 net new a.m. peak hour trips (40 in and 120 out) and 215 net new p.m. peak hour trips (135 in and 80 out).
- Build-out of the site development includes 1,300 residential units and 90,000 square feet of retail use. Build-out (including Phase 1) is collectively estimated to generate a total of 995 net new a.m. peak hour trips (290 in and 705 out) and 1,655 net new p.m. peak hour trips (965 in and 690 out).
- Access to Phase 1 of the site will be provided via two full movement driveways on NW Ingle Road. In the future when the site is built out, access will be provided on both NW Ingle Road and NW Goodwin Road.

Year 2018 Background Traffic Conditions

- Year 2018 background conditions (without construction of the Green Mountain mixed-use development) were estimated assuming completion of approved in-process developments within the study area and an annual 2% growth rate on City of Vancouver roadways.
- Operational analyses indicate that the study intersections are forecast to continue to operate acceptably.

Year 2018 Total Traffic Conditions

- Year 2018 total traffic conditions were estimated assuming completion of approved in-process developments within the study area plus Phase 1 of the proposed development.
- Operational analyses indicate that the study intersections are forecast to continue to operate acceptably under 2018 total traffic conditions with one exception:
    - The southbound movement at the intersection of NE Ingle Road/NE Goodwin Road is projected to operate at a LOS E during the weekday p.m. peak hour. This failure is triggered by the 203rd single family residential unit in Phase 1 of the development.

Year 2029 Background Traffic Conditions

- Year 2029 background conditions (with construction of only Phase 1 of proposed development but no further phases) were estimated assuming the same in-process developments included in the 2018 analysis as well as a one percent growth rate on City of Camas roadways and two percent growth rate on City of Vancouver roadways.
- Operational analyses indicate that the study intersections are forecast to continue to operate acceptably under year 2029 background traffic conditions with two exceptions:
    - The intersection of NE 192nd Avenue/NE 13th Street is projected to operate at a LOS E and over-capacity during the weekday a.m. peak hour and LOS F and over-capacity during the weekday p.m. peak hour,
    - The southbound approach to the intersection of NE Ingle Road/NE Goodwin Road is projected to operate at a LOS F during the weekday p.m. peak hour.

Year 2029 Total Traffic Conditions

- Year 2029 total traffic conditions were estimated assuming year 2029 background traffic and complete build-out of the proposed Green Mountain development.
- Operational analyses indicate that the study intersections are forecast to continue to operate acceptably under year 2029 total traffic conditions, with the exception of:
    - NE 199th Avenue/NE 58th Street (SR 500) (weekday a.m. and p.m.)
    - NE 192nd Avenue/NE 13th Street (weekday a.m. and p.m.)
    - NE Ingle Road/NE Goodwin Road (weekday a.m. and p.m.)

Turn-Lane Considerations

- An assessment of turn-lane need was conducted for each study intersection.
- The intersection of NE 199th Avenue/NE 58th Street (SR 500) meets WSDOT's guidelines for a right-turn lane on the eastbound approach under existing conditions and all future scenarios during both the weekday a.m. and p.m. peak hour.
  - The crash history indicates that no crashes were recorded between 2008-2013 involving vehicles making an eastbound right-turn.
  - Given the lack of crash history related to eastbound right-turns and the relatively small impact of Phase 1 (eight eastbound right-turn trips during the weekday a.m. peak hour, 27 eastbound right-turn trips during the weekday p.m. peak hour), no improvements are recommended in conjunction with Phase 1.
  - In the future, the provision of a right-turn taper or lane could be considered if suggested by the crash history at the intersection.
- The intersection of NE 242nd Avenue (SR 500)/NE 28th Street meets WSDOT's guidelines for a left-turn lane on the eastbound approach under existing conditions and all future scenarios during the weekday p.m. peak hour.
  - The crash history indicates that no crashes were recorded between 2008-2013 involving vehicles making an eastbound left-turn.
  - The City's long-term plans include a traffic signal and southbound left-turn lane at NE 242nd Avenue (SR 500)/NE 28th Street.
  - Given the lack of recorded crash history, the small impact of the proposed development (no Phase 1 eastbound left-turns and less than 10 at master plan build-out), and future improvement plans at this intersection, no turn-lane improvements are recommended with Phase 1 site development.

Recommendations

- Regardless of the proposed master plan application, we recommend that the City of Camas consider potential improvements to the intersection of NE Ingle Road/NE Goodwin Road to address intersection sight distance limitations associated with the location of the stop bar, such as relocating the stop bar.
- The following improvements should be provided in conjunction with site development:
  - Phase 1 Site Development

        - An eastbound left-turn lane with 100 feet of storage should be provided at NE Ingle Road/NE Goodwin Road.
        - A westbound right-turn lane on NE Goodwin Road at NE Ingle Road prior to occupancy of the 203rd single family home in Phase 1. The right-turn lane should provide at least 100 feet of storage.
        - On-site and off-site landscaping and any above ground utilities at the site-access driveways and internal roadways should be provided appropriately to ensure that adequate sight-distance is maintained.
    - For Phase 1 and all future phases, a Transportation Compliance Letter as described above should be prepared by a licensed professional engineer and submitted with the then-current site plan application.
    - Full Build-Out of Site Development (items to be assessed in Transportation Compliance Letter unless otherwise mitigated):
        - Future site plan applications should provide an updated assessment as to the potential need for providing an eastbound right-turn taper or lane at the 199th Avenue (SR 500)/NE 58th Street intersection unless otherwise deemed mitigated by the project or others.
        - Pay a proportionate "fair-share" financial contribution towards capacity mitigations at the intersection of NE 192nd Avenue/NE 13th Street. This contribution would partially fund the eventual construction of a northbound right-turn lane on NE 192nd Avenue and a westbound right-turn lane on NE 13th Avenue.
- Mitigations will be needed to improve NE Ingle Road/NE Goodwin Road in 2029. We recommend the following:
    - The applicant construct a three-lane section (with center two-way left-turn lane) on NE Goodwin Road along the site frontage.
    - The applicant assess traffic volumes and signal warrants at NE Ingle Road/NE Goodwin Road with each phase of development and construct a traffic signal and related appurtenances when the intersection no longer satisfies City of Camas performance standard (LOS "D" and v/c of 0.90 or better) and intersection volumes meet traffic signal warrants.

- On-site and off-site landscaping and any above ground utilities at the site-access driveways and internal roadways should be provided appropriately to ensure that adequate sight-distance is maintained.

We trust this letter adequately addresses the traffic impacts associated with the proposed Green Mountain Master Plan development. Please contact us if you have any questions or comments regarding the contents of this report or the analysis performed.

REFERENCES

1. Transportation Research Board 2000. Highway Capacity Manual. 2000.

2. DKS Associates. *City of Camas Traffic Impact Fee Update*. May 2012.

3. Washington State Department of Transportation. *Design Manual*. July 2013.

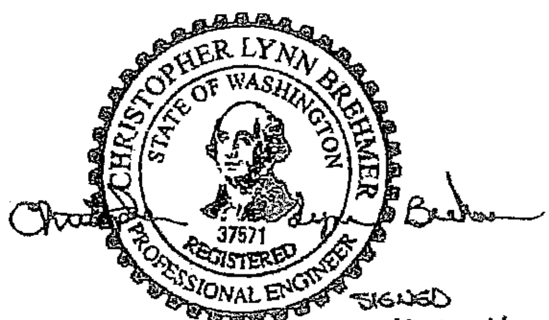
4. C-Tran. http://www.c-tran.com. May 2014.

5. Oregon Department of Transportation Research Section. *SPR 667 Assessment of Statewide Intersection Safety Performance*. June 2011.

6. American Association of State Highway and Transportation Officials. *Highway Safety Manual*. 2010.

7. Institute of Transportation Engineers. *Trip Generation Manual, 9th Edition*. 2012.

8. City of Vancouver. *Traffic Study Guidelines.* December 2013.

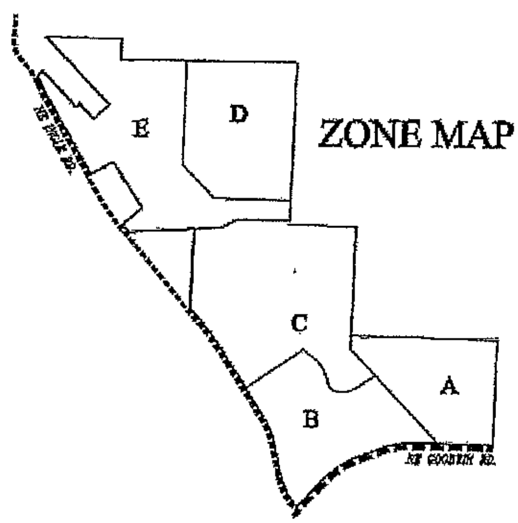


SIGNED
11-20-14

EXHIBIT E

Tree Preservation Plan

Zone	Pods Included in Zone	Total Trees in Zone	Trees Preserved	Percentage of Trees Preserved
Zone A (Southeast)	D4, D5, D6 E2, E3	170	90	39%
Zone B (South)	H (CC), A1, A2, A3, B5	342	265	77%
Zone C (Central)	B1, B2, B3, C1, C2, D1, D2, D3, E1	1,454	488	34%
Zone D (Northeast)	G	3,524	2,345	67%
Zone E (Northwest)	B4, E4, F1, F2, F3, F4	4,040	1,571	39%
<u>**Total Site**</u>		<u>**9,589**</u>	<u>**4,759**</u>	<u>**50%**</u>



The Tree Preservation Plan is based on a complete tree survey of the entire Property. This survey finds that nearly 9,600 trees are present on the property. The Property has been divided into five "zones" that identify five distinct areas of future development. The zones were established to assure that acceptable numbers of trees were preserved throughout the Property, not just in one isolated area rendering the remaining portions of the site bare of trees. The percentage of trees protected in a given zone varies from 34% to 77%, with the net result being that at least 50% of the existing trees on the Property will be preserved.

Compliance with the Tree Preservation Plan will take place with each future development application (Preliminary Plat or Site Plan Review), at which time the applicant will demonstrate that the number of trees protected will meet or exceed the amount listed in the "Trees Preserved" column in the above table. In the event that a given development application covers only part of a zone, the applicant shall demonstrate that the current development application will not preclude the preservation of the minimum number of trees required to be preserved for that zone when the zone is fully developed. In addition to the trees that will be preserved, thousands of trees will be planted as part of the development's landscape requirements, including in parks, open spaces, streetscapes, and residential areas.

Consistent with Camas City code, Oregon White Oak trees over 20" dbh are considered habitats of local importance, as well as Oregon White Oaks that form a grove of one acre or larger. Such oaks shall be considered jurisdictional for the purposes of this Tree Preservation Plan. Any jurisdictional Oregon White Oak trees shall be mitigated for at a 2:1 stem count ratio and installed within an appropriate area on site. Oregon white oak trees installed as mitigation will be 1.5" caliper at a minimum. Where possible, oaks will be planted within vegetation voids associated with riparian corridors, oak groves and green space to increase oak habitat connectivity across the site. The location of oak plantings shall be at the direction of a professional biologist or certified arborist.

EXHIBIT F

URBAN VILLAGE AREA - Mixed Use, Community Commercial, A and B PODs

Urban Village Area	Minimum of 8.8 acres with ground floor Employment/Commercial Use (as provided for in 18.07.030 Table 1). Allow horizontal and vertical Mixed Use PODs H, A1, A2, A3, B5 and 100 Units at the Village Center

DENSITY and DIMENSIONS - Camas MF zones and Green Mountain C, B and A PODS

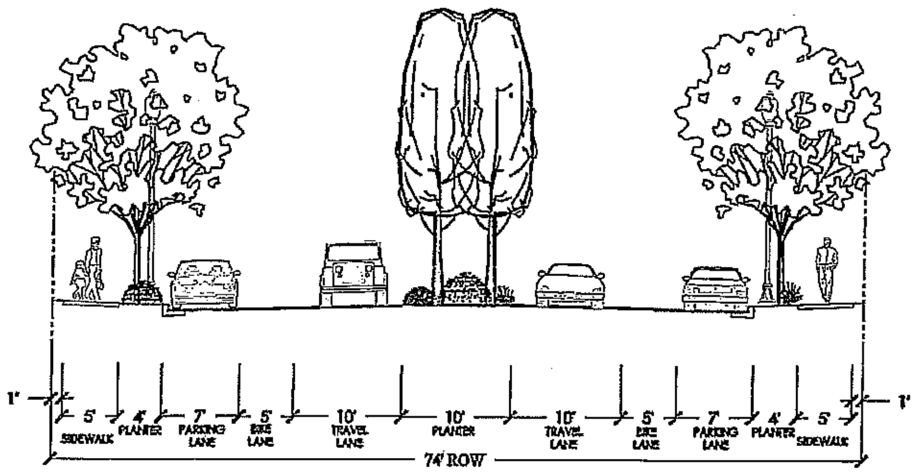
The bold, italic,and underlined standards are the Density, Dimension and use standards for the Green Mountain Project C, B and A pods.

C Pod – 6-10 units/acre – 3000-5000 SF lots **B Pod** – 6-18 units/acre – 1000 -3000 SF lots **A Pod** – 12-24 units/acre

	MF-10	C PODs	MF-18	B PODs	MF-24	A PODs
DENSITY						
Max. du/gac	10	10	18	18	24	24
Min. du/gac	6	6	6	6	6	12
STANDARD LOTS						
Min. lot SF	3,000	3,000 *[a]*	2,100	***1,000[a]***	1,800	***1,000[a]***
Min. lot width	30	30	20	20	20	20
Min. lot depth	70	70	60	***50***	60	***50***
Max.Floor Area per du	No Max	No Max	No Max	No Max	No Max	No Max
SETBACKS						
Min.front/at garage	15/18	***10***/18	10/18	***6/3@OS***/18	10/18	***None***
Min. side	3 [1]	3	3 [1]	3	3 [1]	
Min. side Flanking Street	15	***10***	15	***10***	15	***None [d]***
Min. rear *(garage @alley)*	10	***10[b][c]***	10	***10[b] [c]***	10	***None [c]***
LOT COVERAGE, Max.	55%	55%	65%	***None***	75%	***None***
BUILDING HEIGHT, Max.	35 [2]	35	45 [2]	45	45 [2]	***60***

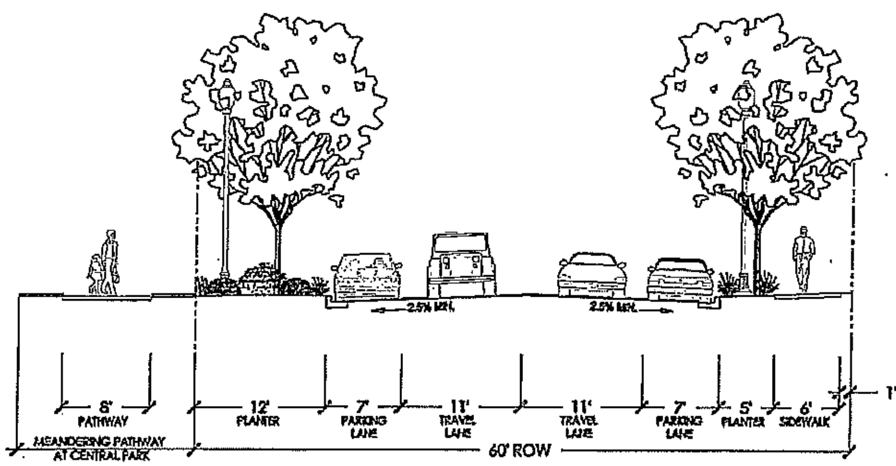
a. Single Family Detached homes to be permitted. For SFD in A POD apply setbacks in B POD.
b. 10 feet for front access garage.
c. Minimum rear yard for alley accessed garage is either 3' or 18'.
d. Franchise utilities to be located in front or side yard easements abutting right of way.

1. The non-attached side of a dwelling unit shall be three feet, Otherwise a zero-lot line is assumed.
2. Maximum building height: three stories and a basement but not to exceed maximum building height.



NOTE: REPLACE PARKING WITH LANDSCAPED CURB EXTENSION AT SELECT INTERSECTIONS

ENTRY BOULEVARD

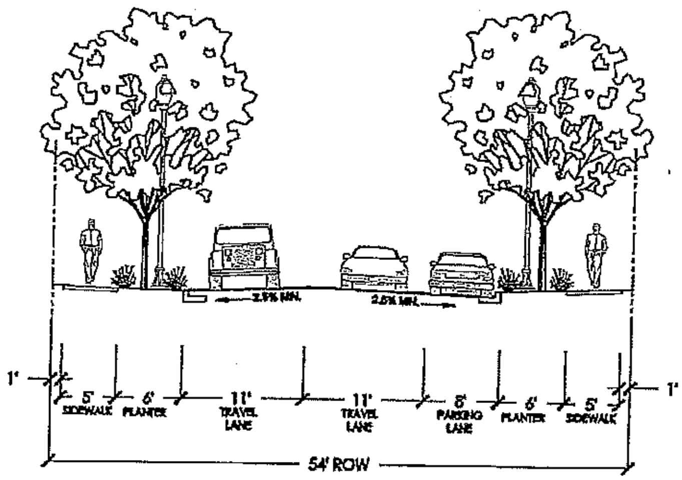


CIRCULATOR STREET AT CENTRAL PARK

EXHIBIT G

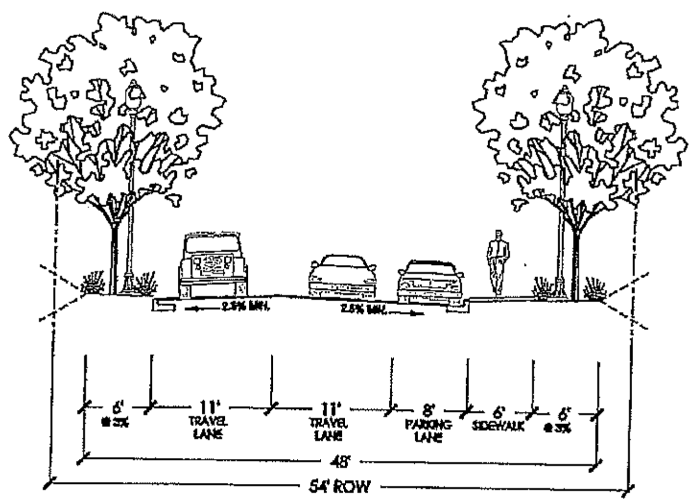
11/14/14

1 OF 2



CIRCULATOR STREET

AT D & E PODS



CIRCULATOR STREET

AT ENVIRONMENTALLY SENSITIVE FRONTAGE OR CROSSING & AT STREET GRADES GREATER THAN 12%

EXHIBIT G

11/14/14

2 OF 2

EXHIBIT 56

Notice of Proposed Development
Green Mountain Mixed Use PRD & Phase 1 Subdivision
A request to master plan an approximately 284 acre site for a planned mixed use (residential and commercial) development and for preliminary plat approval of Phase 1 to subdivide a portion of the property into 201 residential lots.
Types of permit applications on file and being considered by the City of Camas – Planned Residential Development, Preliminary Subdivision, SEPA, Wetland Review, Steep Slope Review, Wildlife Habitat, Streams and Watercourses, Archaeological Review
For information regarding this project:
Green Mountain Land, LLC
17933 NW Evergreen Parkway, Suite 300
Beaverton, OR 97006 (503) 597-7100
City Contact:
Robert Maul
City of Camas Community Development Department
616 NE 4th Avenue Camas, WA 98607
rmaul@cityofcamas.us (360) 817-1568
Public Hearing Schedule:
(Will be filled in 14 or more days prior to a hearing)
Hearing Date/Time:
Hearing Location:
01.21.2015 14:04

EXHIBIT 57

City of Camas
WASHINGTON

Community Development Department

January 29, 2015

Landerholm Law Firm
Attn: Randy Printz
805 Broadway, Suite 1000
Vancouver, WA 98660

RE: Green Mountain PRD (SUB14-02)

Dear Mr. Printz,

This letter is to inform you that the above application submitted on December 30th, 2014, has been deemed technically complete in accordance with Camas Municipal Code (CMC) §18.55.130.

Staff is reviewing the materials and will contact you in the next few weeks to schedule a public hearing.

Sincerely,

Robert Maul
Planning Manager

EXHIBIT 58

Community Development Department

Notice of Application

Green Mountain Planned Residential Development and Subdivision

File No. SUB14-02

NOTICE IS HEREBY GIVEN that an application for a Planned Residential Development for 1,300 master-planned community and a subdivision for the first 201 lots of that development. The application was submitted on December 30th, 2014, and was deemed technically complete on January 29th, 2015. A public hearing is required for Planned Residential Development and Subdivision, and will be scheduled at a later time. A separate public notice will be mailed to all property owners within 300-feet of the subject development and published in the Post Record, at least 15 days prior to the scheduled hearing.

LOCATION: The 283 acre site is zoned single-family (R-6 and R-10), Multi-family (MF-10), and Community Commercial (CC) and located at the northeast corner of the intersection at NE Goodwin Road and NE Ingle Rd. Parcel Numbers 172555-000, 172557-000, 172553-000, 172559-000, 173178-000, 172341-000, 171727-000, 171704-000, and 173165-000. Legal description: NE1/4, S20, NW1/4 S21, SE1/4, S17, SE1/4, S20, SW1/4, S17, SW1/4, S21, T2N, R3E; Camas, Washington.

APPLICATION MATERIALS: The application included the following: Recorded Development Agreement, project narrative; preliminary plan set; proposed phasing plan, Geo-tech report, storm water report, traffic report, wetland report and other required submittal documents. These documents are available for viewing at the Community Development Department (616 NE 4th Avenue, Camas, WA) during regular business hours.

Questions/Comments: For questions related to this application, please contact Robert Maul, Planning Manager, at (360) 817-1568 ext. 4255 or by email at communitydevelopment@cityofcamas.us.

Published in the Post Record on February 10, 2015 Legal Publication # 528602
Posted at the Camas Post Office, Camas City Hall, Camas Library, City of Camas web site at: http://www.cityofcamas.us
Mailed to property owners within 300-feet on February 10, 2015

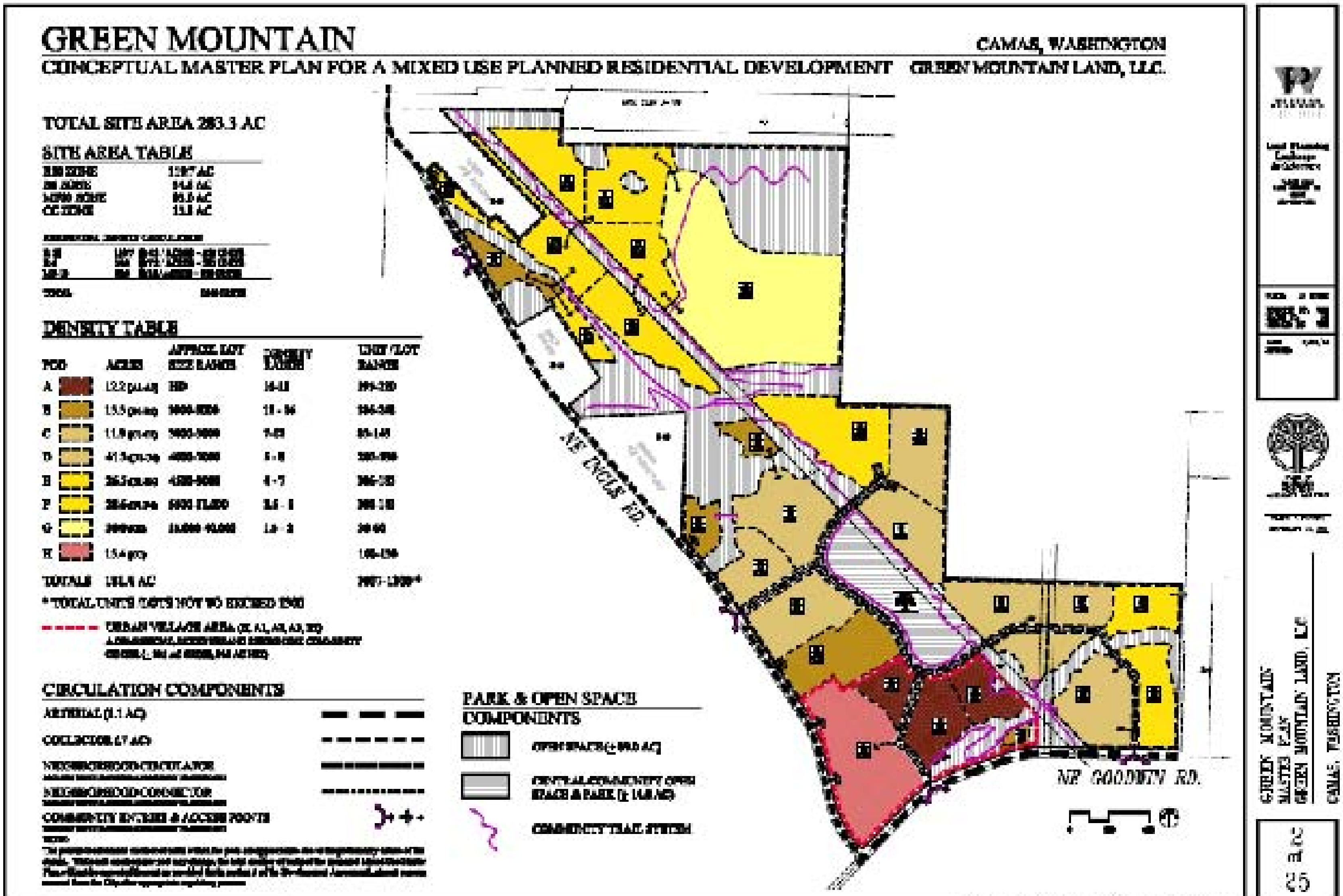

GREEN MOUNTAIN
CAMAS, WASHINGTON
CONCEPTUAL MASTER PLAN FOR A MIXED USE PLANNED RESIDENTIAL DEVELOPMENT
GREEN MOUNTAIN LAND, LLC.
SITE AREA TABLE
DENSITY TABLE
CIRCULATION COMPONENTS
PARK & OPEN SPACE COMPONENTS
COMMUNITY TRAIL SYSTEM
NE INGLE RD.
NE GOODWIN RD.
GREEN MOUNTAIN
MASTER PLAN
GREEN MOUNTAIN LAND, LLC
CAMAS, WASHINGTON

EXHIBIT 59

City of Camas WASHINGTON

State Environmental Policy Act
Determination of Non-Significance

CASE NO: SEPA14-21

APPLICANT: Green Mountain Land, LLC
17933 NW Evergreen Parkway, Suite 300
Beaverton, OR 97006

CONTACT: Randy Printz
Landerhold Law Firm
805 Broadway, Suite 1000
PO Box 1086
Vancouver, WA 98666

REQUEST: The applicant is proposing a Planned Residential Development (PRD) on 282 acres for up to 1,300 dwelling units and including 8.8 acres of mixed use Commercial space.

LOCATION: The PRD is located on 9 lots totaling 282 approx. acres. Parcel numbers 171727-000, 172341-000, 171704-000, 172555-000, 172557-000, 172533-000, 172559-000, 172165-000 and 173178-000. The site is locted at the Northeast corner of the intersection of NE Goodwin Road and NE Ingle Road.

LEGAL DESCRIPTION: SW and SE ¼'s of Section 17, the NE and SE ¼'s of Section 20, and the NW and SW ¼'s of Section 21, Township 2 North, Range 3East of the Willamette Meridian, Clark County.

SEPA DETERMINATION: Determination of Non-Significance (DNS)

COMMENT DEADLINE: March 17th, 2015, at 5:00 p.m.

As lead agency under the State Environmental Policy Act (SEPA) Rules [Chapter 197-11, Washington Administrative Code (WAC)], the City of Camas must determine if there are possible significant adverse environmental impacts associated with this proposal. The options include the following:

- DS = Determination of Significance (The impacts cannot be mitigated through conditions of approval and, therefore, requiring the preparation of an Environmental Impact Statement (EIS).

- MDNS = Mitigated Determination of Non-Significance (The impacts can be addressed through conditions of approval), or;

- DNS = Determination of Non-Significance (The impacts can be addressed by applying the Camas Municipal Code).

Published in the Post Record on March 3, 2015 Legal publication No. 530020
Posted on bulletin boards at Camas City Hall, Camas Post Office, Camas Library and on the City's website.

Determination:

Determination of Non-Significance (DNS). The City of Camas, as lead agency for review of this proposal, has determined that this proposal does not have a probable significant adverse impact on the environment. An Environmental Impact Statement (EIS) is not required under RCW 43.21C.030(2)(e). This decision was made after review of a completed environmental checklist, and other information on file with the City of Camas.

Date of Publication & Comment Period:

Publication date of this DNS is **March 3rd, 2015**, and is issued under WAC 197-11-340. The lead agency will not act on this proposal until the close of the 14-day comment period which ends on **March 17th, 2015**. Comments may be sent by email to communitydevelopment@cityofcamas.us.

SEPA Appeal Process:

An appeal of any aspect of this decision, including the SEPA determination and any required mitigation, must be filed with the Community Development Department within fourteen (14) calendar days from the date of the decision notice. The letter of appeal should contain the following information.

1. The case number designated by the City of Camas and the name of the applicant; and,
2. The name and signature of each person or group (petitioners) and a statement showing that each petitioner is entitled to file an appeal as described under Section 16.31.060 of the Camas Municipal Code. If multiple parties file a single petition for review, the petition shall designate one party as the contact representative with the City Planner. All contact with the City Planner regarding the petition, including notice, shall be with this contact person.

The appeal request and appropriate fee of **$330** must be submitted to the Community Development Department between 8:00 a.m., and 5:00 p.m., Monday through Friday, at the address listed below:

Appeal to the City of Camas SEPA Official
Community Development Department
616 NE Fourth Avenue
Camas, Washington 98607

Responsible Official: Robert Maul (360) 817-1568

______________________________	**March 3rd, 2015**
Robert Maul, Planning Manager and Responsible Official	**Date of publication**

EXHIBIT 60

proud past, promising future

CLARK COUNTY
WASHINGTON

DEPARTMENT OF ENVIRONMENTAL SERVICES

December 9, 2014

City of Camas, SEPA Official
Community Development Department
616 NE Fourth Avenue
Camas, WA 98607

RE: Green Mountain Development Agreement Modification (SEPA14-15)

To Whom It May Concern:

Thank you for the opportunity to provide input on the aforementioned development agreement and associated future planned residential development. As you are aware, Clark County owns 360 acres of land in the Green Mountain area immediately east of the planned development. These properties are part of the county's Legacy Lands program and were acquired through the Washington Department of Natural Resources' Trust Land Transfer program.

As part of the Legacy Lands program, these properties are managed for sustainable forestry, wildlife habitat, recreation, and open space. The entire 360 acres has been mapped by the Washington Department of Fish and Wildlife as a Biodiversity Area according to the 2008 Priority Habitats and Species List. Much of the property contains a primitive trail network maintained by a local equestrian trail-riding group. In addition, Clark County Environmental Services has developed a comprehensive forest management plan for the properties and certified that management plan under the Forest Stewardship Council's Sustainable Forestry Initiative. Forest thinning operations commenced on these properties as of October 2014.

Green Mountain is also one of the components of Clark County's Conservation Areas Acquisition Plan recently re-adopted by the Board of Clark County Commissioners on March 25th, 2014. An excerpt of this plan reads, "*...shared priorities for Clark County, Camas, and other partners include expanding and linking the system of parks and open space within the Lacamas Corridor, with special emphasis on trails, shoreline and forestlands as development occurs on the east side of Lacamas Lake. The Regional Trail and Bikeway Systems Plan calls for a Camp Bonneville Trail that extends from the Lacamas Heritage trailhead on Goodwin Road through Green Mountain and into the Camp Bonneville conservation area which is located in the Upper Lacamas Creek subarea. Partners within the Lower Lacamas Creek subarea should explore opportunities to make trail connections to Green Mountain, improve public access, and expand public ownerships to include additional forestlands and high points on Green*

Mountain. Local partners should support efforts to conserve high value habitat within and adjacent to the Lacamas Prairie Natural Area".

In addition, a specific project opportunity listed in the plan is to "...*Acquire 70-100 acres on the west side of county's Green Mountain Trust Land Transfer ownership, including high points on Green Mountain and trail connections from Camp Currie and Lacamas Heritage Trail.*"

With the planned development abutting the west boundary of Clark County's Legacy Lands properties, the Department of Environmental Services has the following concerns, comments, and questions:

1) As Green Mountain Land, LLC and the City of Camas move through the planned residential development approval, Clark County would appreciate the opportunity to coordinate permanent trail access to our Legacy Lands properties from the west. A regional trail from Goodwin Road to the top of Green Mountain is strongly encouraged, as well as a connecting trail from the development to the County's Green Mountain properties. A public overlook on the top of Green Mountain is also encouraged.

Clark County feels that clarification of the contemplated components of the Green Mountain Conceptual Park & Open Space Plan is needed. This conceptual plan does not designate Open Space areas on the steep slopes of Pods G and E-1 from the Conceptual Master Plan, with the exception of an Open Space corridor connecting to the Southwest corner of County owned AP 171493-000. The Conceptual Master Plan does note, however, that 40% of Pod G will be preserved as Open Space. The Park & Open Space Plan should identify specific areas on the steep slopes of Green Mountain to be preserved.

The Park & Open Space Plan also designates a trail along the power line corridor that traverses the LLC property from Goodwin Road up to the main BPA power line corridor. Unfortunately the map scale makes it difficult to discern whether this is proposed as a regional trail or a neighborhood trail. Also trail connections are shown from the corridor through the Open Space between pods G and E-1 to the county-owned parcel and also through pod G to what appears to be the top of Green Mountain. Again it is difficult to discern whether these are contemplated as neighborhood trails or regional trails. As mentioned above, Clark County strongly encourages the development of regional trails in these areas.

2) Considering the fact that Green Mountain is mapped as a Biodiversity Area, it is difficult at this time to understand the scope of impacts on fish and wildlife habitat in the vicinity of Green Mountain. As this planned development moves through the approval process and prepares platting information and covenants, conditions, and restrictions documentation, Clark County strongly encourages including notifications to make future residents aware of the biodiversity area designation and priority wildlife habitat in open spaces and on adjacent county properties.

3) As mentioned above, Clark County Environmental Services has developed and certified a comprehensive forest management plan for its properties in the vicinity of Green Mountain and commenced commercial thinning operations as of this year. Considering the county's forestry interests in this area, several components of the Green Mountain Land, LLC SEPA Checklist should be amended. First, in section B.7.b of the checklist, County forest management operations may occasionally generate noise that could be heard on the LLC property and future planned residential development.

Second, according to section B.8.b.1 of the checklist no known working forest lands will affect or will be affected by the planned residential development. As discussed above, County Assessor Parcel #171493-000 is designated FR-2, has a current comprehensive forest management plan and sustainable forestry certification, and forest thinning operations are planned to continue into the future.

Finally, according to section B.8.b.m of the checklist no measures are proposed to ensure the proposal is compatible with nearby agricultural and forest lands of long-term commercial significance. Clark County strongly recommends additional platting information and covenants, conditions, and restrictions documentation to notify future residents of the possibility for forest management operations on adjacent county properties. In addition, adequate landscape buffers or open space areas should be incorporated into the planned residential development to buffer future residents from these forest management operations.

We appreciate the opportunity to comment on the SEPA Determination of Non-significance and modification to the Development Agreement and look forward to future coordination on this project. If you or the developers of this proposal have any questions regarding these comments, please do not hesitate to get in touch with me.

Sincerely,

Don Benton
Director of Environmental Services
Clark County Environmental Services

Kevin Tyler
Division Manager
Clark County Environmental Services

EXHIBIT 61

dahp
protect the past, shape the future

Allyson Brooks Ph.D., Director
State Historic Preservation Officer

March 19, 2015

Ms. Sarah Fox
Planner I
City of Camas
616 NE 4th Avenue
Camas, WA 98607

In future correspondence please refer to:
Log: 022415-19-CL
Property*: Cultural Resources Investigation of the Green Mountain Mixed use PRD Project Area, Clark County, Washington*, SEPA14-21 Green Mountain Subdivision, Planned Residential Development
Re: Archaeology-More Information Required, Additional Archaeological Survey, Testing and Permits from DAHP Required

Dear Ms. Fox:

Thank you for contacting the Washington State Department of Archaeology and Historic Preservation (DAHP). The above referenced project has been reviewed on behalf of the State Historic Preservation Officer. We have no map showing where exact development will take place. There are multiple recorded archaeological sites on project parcels some of which were not addressed in the above cultural resources survey. Specifically in TPN 172557-000, archaeological sites 45CL1091, 45CL1096 are present. TPN 172553-000 contains 45CL1057 and TPN 173178-000 contains 45CL1090 and 45CL1058. TPN 172165-000 was never surveyed. In addition, all of those parcels contain recorded isolated artifacts. These isolated artifacts (isolates) have not been subjected to additional survey to determine that they are truly isolated artifacts and they may in fact be indicative of additional archaeological sites.

Please be aware that archaeological sites are protected from disturbance on both public and private lands in Washington State. Both RCW 27.44 and RCW 27.53.060 require that a person obtain a permit from our Department before excavating, removing, or altering Native American human remains or archaeological resources in Washington. Failure to obtain a permit is punishable by civil fines and other penalties under RCW 27.53.095, and by criminal prosecution under RCW 27.53.090.

Chapter 27.53.095 RCW allows the Department of Archaeology and Historic Preservation to issue civil penalties for the violation of this statute in an amount up to five thousand dollars, in addition to site restoration costs and investigative costs per site damaged.

There is ample evidence that this project area contains abundant precontact and historic resources. The above survey is sufficient for presence/absence for subdivision purposes but should be elevated to the next level of reconnaissance, formal archaeological testing and if necessary mitigation such as data recovery and/or archaeological monitoring for development.

The following recommendations were made in the cultural resources report prepared by ASCC in 2014:

1) ASCC will record one new multi-component site at the location of the Lechtenberg-Gratton Farm complex. This site (Field ID# ASCC-13905-A) comprises the prehistoric finds in STPs 2, 3, 5, and 7 as well as the historic finds in STPs 2, 3, and 7 (Figure 36).

2) The findings in STPs 13 and 19 will be recorded as one new prehistoric site (Field ID# ASCC-13905-B).

3) The findings in STP-31 will be recorded as an expansion of the previously recorded site on the Warman property, Site 45CL720.

4) Within the project area, further archaeological study of the above resources is recommended in order to better define their horizontal and vertical boundaries, to assess their contextual integrity, and to judge their potential for yielding significant data. This next phase of research will require an excavation permit from DAHP based on a formal research design. The proposed course of fieldwork should include (but not necessarily be limited to) the controlled excavation of 50x50cm test units.

5) To address the outlying prehistoric finds in STPs 11, 22, 26, and 34, additional shovel testing should be carried out in order to establish whether these finds represent extensions of the sites proposed above, previously recorded sites (45CL720 or 45CL426), distinct new sites, isolated finds, or a combination thereof.

6) ASCC defers to O'Brien's 1993 determination of the Lechtenberg-Gratton stone spring house as eligible for listing on the NRHP. Therefore, ASCC recommends that the Lechtenberg-Gratton stone spring house be preserved, ideally by leaving it in situ. The other remaining farm outbuildings (the stables, sheds, pump house, and milking house) have been thoroughly inventoried and evaluated (O'Brien 1993b), and ASCC sees no need to recommend further work prior to their demolition or alteration.

We are curious why they were not implemented. Since much of the archaeological material does not have well-defined boundaries it will be difficult for the proponent to avoid.

- **At this time boundary delineation and formal archaeological testing under a permit from DAHP (RCW 27.53) and a formal research design are required prior to any ground disturbance.**

- **We agree with recommendations above which should also be implemented.**

- **The current survey did not and could not, since there were no development plans at the time of the survey, adequately identify archaeological resources that may be destroyed by development. Addition survey should be undertaken based on development plans.**

We recommend consultation with DAHP's Built Environment Unit regarding the historic buildings and structures of the Lechtenberg-Gratton Farm Complex.

Thank you for the opportunity to review and we look forward to receiving the supplemental survey report and DAHP permit applications.

Sincerely,

Gretchen A Ka

Gretchen Kaehler
Assistant State Archaeologist, Local Governments Archaeologist
(360) 586-3088
gretchen.kaehler@dahp.wa.gov

cc. Alex Gall, Principal, ASCC
dAVe Burlingame, Cultural Resources, Cowlitz Tribe
Dave Harrelson, THPO, Grand Ronde Tribes
Johnson Meninick, Cultural Resources, Yakama Nation
Richard Bellon, Archaeologist, Chehalis Tribe
Sally Bird, Cultural Resources, Warm Springs Tribes
Michael Houser, State Architectural Historian, DAHP
Stephenie Kramer, Permit and Violations Coordinator , DAHP

EXHIBIT 62

Allyson Brooks Ph.D., Director
State Historic Preservation Officer

Ms. Sarah Fox
Planner
City of Camas
616 NE 4th Avenue
Camas, WA 98607

In future correspondence please refer to:
Log: 022415-19-CL
Property: Cultural Resources Investigation of the Green Mountain Mixed use PRD Project Area, Clark County, Washington
Re: Archaeology – Revised Comments, Permits from DAHP Required

Dear Ms. Fox:

Please see this revised letter. I did not review a more recent report for this project and was in error in my first letter. Please accept this as our final comment for this project.

Archaeological Services of Clark County (ASCC) prepared *Cultural Resources Investigation of the Green Mountain Mixed Use PRD Project Area, Clark County, WA* which included additional survey and boundary delineation and made the following recommendations. Our requirement/concurrences are bolded:

Site 45CL1057
Containing both historic and pre-contact components, Site 45CL1057 is centered on the above-ground remains of the Lechtenberg-Gratton Farm, a location relatively undisturbed by the ca. 1998 construction of the Green Mountain Golf Course. ASCC recommends controlled archaeological testing of the pre-contact component of Site 45CL1057. ASCC does not interpret the site's historic component as significant.

We agree with the recommendation for additional archaeological work. The DAHP permit application should be submitted for formal archaeological testing with the purpose of determining appropriate mitigation eg. archaeological data recovery, archaeological monitoring and/or Inadvertent Discovery Plan. We do not concur the historic archaeological component is not significant and provisions for historical archaeology should be included in the above permit application. Archaeological evidence often refines archival information such as that contained in O'Brien (1993)

ASCC recommends that the Lechtenberg-Gratton stone spring house be preserved, either in situ (ideally) or in a new location. The stone building represents a unique piece of Clark County's 19th-century heritage, and ASCC's opinion is that its historical, architectural, and aesthetic characteristics will retain value within the proposed community.

We concur with the recommendation and would like to see the structure preserved. If this is not possible we recommend consultation with DAHP as to whether further documentation of any of the structure at the Lechtenberg-Gratton Farm is warranted.

Site 45CL426

ASCC's professional opinion is that Site 45CL426 has very little potential to yield additional, non-redundant data. Since only the disturbed portions of the site will be impacted by the proposed project, ASCC's professional opinion is that further archaeological work at Site 45CL426 is unwarranted, and that project activities at the site can proceed as planned. Any proposed ground disturbance within the site will require an excavation permit from DAHP, entailing a consultation process with interested parties (including relevant Tribes) to formalize an appropriate research design.

We concur that if the site cannot be avoided then an excavation permit from DAHP will be required under RCW 27.53. Permit conditions for appropriate archaeological work can be finalized at a later date.

Site 45CL1058

Given the small size of the site and the fact that projectile points are often found as isolates in Clark County, ASCC considers the site to offer little potential for additional data. However, to address the possibility of an association with Site 45CL1056, ASCC recommends the excavation of a single 50x50cm test unit at Site 45CL1058 prior to any ground disturbance. This controlled excavation will serve to test both the possible relationship with the neighboring site and the site's overall potential for data.
Any proposed ground disturbance within the site will require an excavation permit from DAHP, entailing a consultation process with interested parties (including relevant Tribes) to formalize an appropriate research design.

We concur that if the site cannot be avoided then an excavation permit from DAHP will be required under RCW 27.53. Permit conditions for appropriate archaeological work can be finalized at a later date..

Site 45CL720

This site is set entirely within green space where no development is proposed, due in large part to habitat issues. Given that no impacts are proposed to Site 45CL720, ASCC recommends no further study of the site at this time. As above, this will require an excavation permit via consultation with DAHP and other interested parties.

We concur that if the site cannot be avoided then an excavation permit from DAHP will be required under RCW 27.53. Permit conditions for appropriate archaeological work can be finalized at a later date.

Site 45CL1096

To address the possibility that intact site deposits lie preserved below the layers of golf course fill, ASCC recommends archaeological monitoring of initial ground disturbance within the boundaries of Site 45CL1096, specifically to the point where intact soils are first revealed. Here, the presence of any features or diagnostic artifacts in a primary context would constitute evidence for site significance.
Any ground disturbance within the boundaries of Site 45CL1096 will require an excavation permit from DAHP, entailing a consultation process with interested parties.

DAHP concurs with the above.

Site 45CL535

ASCC found no remains of the Green Mountain Mine Site except for the amphitheater-like quarry itself. ASCC recommends no further archaeological work at Site 45CL535, but also recommends that impacts to the mine should be avoided. As ASCC understands development plans, no impacts are forthcoming. Set on a boulder-strewn scarp poorly suited to development, the mine's location appears as green space on existing project plans. Should any ground-disturbing impacts be slated at the site, project proponents will require a DAHP excavation permit that addresses mitigation for these impacts.

DAHP concur with the above.

Site 45CL1091

Per Washington State law, any project-related ground disturbance at Site 45CL1091 will require consultation with DAHP and the issuance of a DAHP excavation permit.

DAHP concurs with the above.

Site 45CL1090

This site consists of two pieces of CCS debitage found in disturbed/fill sediments. For the reasons discussed under Site 45CL1091, ASCC recommends no further work at Site 45CL1090. No site integrity is apparent, and the artifacts may have been pushed here with fill sediment taken from elsewhere. As above, any disturbance to this site will require consultation with DAHP and the issuance of a DAHP excavation permit.

We concur that if the site cannot be avoided then an excavation permit from DAHP will be required under RCW 27.53. Permit conditions for appropriate archaeological work can be finalized at a later date.

Isolated Finds

ASCC has identified six isolate finds within the project area.

Isolates do not require permits from DAHP because by definition they are archaeological sites.

Please

Sincerely,

Gretchen Kaehler
Local Governments Archaeologist
(360) 586-3088
gretchen.kaehler@dahp.wa.gov

cc. Alex Gall, Principal, ASCC
dAVe Burlingame, Cultural Resources, Cowlitz Tribe
Dave Harrelson, THPO, Grand Ronde Tribes
Johnson Meninick, Cultural Resources, Yakama Nation
Richard Bellon, Archaeologist, Chehalis Tribe
Sally Bird, Cultural Resources, Warm Springs Tribes
Michael Houser, State Architectural Historian, DAHP
Stephenie Kramer, Permit and Violations Coordinator , DAHP

EXHIBIT 63

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Peter Goldmark - Commissioner of Public Lands

RECEIVED
MAR 06 2015
BY:

Caring for
your natural resources
... now and forever

March 5, 2015

City of Camas, SEPA Official
Community Development Department
616 NE Fourth Avenue
Camas, WA 98607

Re: Green Mountain Development Agreement Modification (SEPA 14-21)

Dear Mr. Maul:

Thank you for the opportunity to comment on the Environmental Checklist and SEPA Determination of Non-Significance (DNS) for the Green Mountain Subdivision, Planned Residential Development (SEPA14-21) proposal. It is our understanding that the proposal is located in a portion of Sections 17, 20 and 21, Township 2 North, Range 3 East of the Willamette Meridian, Clark County. We have reviewed the DNS and Environmental Checklist. Based on this information we have the following initial comment.

As indicated in the Environmental Checklist, during development approximately 4,800 trees may be removed and other existing vegetation will be removed in areas where construction activities will occur. Based on this information, a conversion Forest Practices Application (FPA) will be needed for the timber removal phase of the project (RCW 76.09 and WAC 222). The FPA will need to meet the requirements of the Forest Practices Act and its rules.

If you have questions regarding this letter, please contact us at our Castle Rock office at (360) 577-2025.

Sincerely,

Bruce C. Chandler

Bruce C. Chandler
Forest Practices Forester
Pacific Cascade Region

c: Green Mountain Land LLC, Applicant
Randall Printz, Applicant's Contact Person
Scott Hancock, Forest Practice Forester
Jim Shank, Forest Practices Columbia District Manager
DNR SEPA Center
SEPA File 3/5/15 ba

EXHIBIT 64

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47775 • Olympia, Washington 98504-7775 • (360) 407-6300
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

March 17, 2015

City of Camas, SEPA Official
Community Development Department
PO Box 1055
Camas, WA 98607

Your address is in the **Salmon-Washougal** watershed

Dear SEPA Official:

Thank you for the opportunity to comment on the determination of nonsignificance for the Green Mountain Subdivision, Planned Residential Development Project (SEPA14-21) located on Northeast Goodwin Road and Northeast Ingle Road as proposed by Green Mountain Land, LLC. The Department of Ecology (Ecology) reviewed the environmental checklist and has the following comment(s):

AIR QUALITY/GREENHOUSE GAS: Gail Sandlin (360) 407-6860

The SEPA checklist should include a discussion of the potential impact of greenhouse gas emissions from 1300 dwelling unit complex. See Ecology's guidance document, page 11, under Residential Development at: http://www.ecy.wa.gov/climatechange/docs/sepa/20110603_SEPA_GHGinternalguidance.pdf.

REVIEWER: Sonia Mendoza
WATER QUALITY CONTACT: Sheila Pendleton-Orme (360) 690-4787

Erosion control measures must be in place prior to any clearing, grading, or construction. These control measures must be effective to prevent stormwater runoff from carrying soil and other pollutants into surface water or stormdrains that lead to waters of the state. Sand, silt, clay particles, and soil will damage aquatic habitat and are considered to be pollutants.

Any discharge of sediment-laden runoff or other pollutants to waters of the state is in violation of Chapter 90.48 RCW, Water Pollution Control, and WAC 173-201A, Water Quality Standards for Surface Waters of the State of Washington, and is subject to enforcement action.

The following construction activities require coverage under the Construction Stormwater General Permit:

1. Clearing, grading and/or excavation that results in the disturbance of one or more acres **and** discharges stormwater to surface waters of the State; and

2. Clearing, grading and/or excavation on sites smaller than one acre that are part of a larger common plan of development or sale, if the common plan of development or sale will ultimately disturb one acre or more **and** discharge stormwater to surface waters of the State.
   a) This includes forest practices (including, but not limited to, class IV conversions) that are part of a construction activity that will result in the disturbance of one or more acres, **and** discharge to surface waters of the State; and
3. Any size construction activity discharging stormwater to waters of the State that Ecology:
   a) Determines to be a significant contributor of pollutants to waters of the State of Washington.
   b) Reasonably expects to cause a violation of any water quality standard.

If there are known soil/ground water contaminants present on-site, additional information (including, but not limited to: temporary erosion and sediment control plans; stormwater pollution prevention plan; list of known contaminants with concentrations and depths found; a site map depicting the sample location(s); and additional studies/reports regarding contaminant(s)) will be required to be submitted.

You may apply online or obtain an application from Ecology's website at: http://www.ecy.wa.gov/programs/wq/stormwater/construction/ - Application. Construction site operators must apply for a permit at least 60 days prior to discharging stormwater from construction activities and must submit it on or before the date of the first public notice.

Ecology's comments are based upon information provided by the lead agency. As such, they may not constitute an exhaustive list of the various authorizations that must be obtained or legal requirements that must be fulfilled in order to carry out the proposed action.

If you have any questions or would like to respond to these comments, please contact the appropriate reviewing staff listed above.

Department of Ecology
Southwest Regional Office

(SM:15-1011)

cc: Sheila Pendleton-Orme, VFO/WQ
Gail Sandlin, AQP
Joyce Smith, HQ/WQ
Green Mountain Land, LLC (Applicant)

EXHIBIT 65

Traffic Operations, Public Works

REVIEW COMMENTS RESOLUTION FORM

Study Name: Green Mountain Master Plan (County)	Project No.:	Date 10/23/14
Study Reviewer: Bill Gilchrist, P.E.	Phone No.: (360) 487-7717	Reviewing Section: Traffic
Consultant/Engineer: Kittelson & Associates, Inc., Chris Brehmer, P.E.	Phone No.: (360) 567-3002	Project Phase:

Comm No.	Page No.	Comment	Consultant's Response/Resolution	Consultant's Initials
1	General	This study uses the HCM 2000 methodology for analyzing intersection operations. Please see the excerpt below from the HCM 2000 below where I have highlighted the limitations of this analysis method. If there is a queue as I describe in the next comment, the delay for the non-conflicting through movement is not analyzed properly.		
2	General	Additionally, you are not showing a queuing analysis. This is another concern with the HCM 2000 methodology as it does not provide this in a chapter 18 analysis such as what you have provided. I performed a queuing analysis and I am concerned about the southbound left turn lane on NE 192nd Ave at SE 13th Street. The queue far exceeds the pocket length in the existing condition (see my analysis below). This left turning movement would need to have a dual left turn to mitigate the queue.		
3	5	You mention that you are using the peak 15-minute flow rate in your analysis. However, you are not using the peak 15-minute flow rate. You are using the peak hour volume with a PHF. The analysis that I have attached uses the peak 15-minute flow rate with no PHF. This more accurately depicts the turning movement volumes in the worst 15 minute period for each movement. Whereas the average peak hour turning movement volumes with a PHF evenly distributes the effect of the peak 15 minutes to each tuning movement at the intersection and can grossly underestimate the volumes (such as what happened to the southbound left-turning movement in comment number 2).		
4	General	In addition to the southbound dual left-turn lane pocket suggested above, I agree with all suggested mitigations proposed for the NE 192nd Ave at NE 13th St intersection.		

I. INTRODUCTION

SCOPE OF THE METHODOLOGY

Background and underlying concepts for this chapter are in Chapter 10

This chapter contains a methodology for analyzing the capacity and level of service (LOS) of signalized intersections. The analysis must consider a wide variety of prevailing conditions, including the amount and distribution of traffic movements, traffic composition, geometric characteristics, and details of intersection signalization. The methodology focuses on the determination of LOS for known or projected conditions.

The methodology addresses the capacity, LOS, and other performance measures for lane groups and intersection approaches and the LOS for the intersection as a whole. Capacity is evaluated in terms of the ratio of demand flow rate to capacity (v/c ratio), whereas LOS is evaluated on the basis of control delay per vehicle (in seconds per vehicle). Control delay is the portion of the total delay attributed to traffic signal operation for signalized intersections. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Appendix A presents a method for observing intersection control delay in the field. Exhibit 10-9 provides definitions of the basic terms used in this chapter.

A lane group is indicated in formulas by the subscript i

Each lane group is analyzed separately. Equations in this chapter use the subscript i to indicate each lane group. The capacity of the intersection as a whole is not addressed because both the design and the signalization of intersections focus on the accommodation of traffic movement on approaches to the intersection.

See Chapter 10 for description of quick estimation method

The capacity analysis methodology for signalized intersections is based on known or projected signalization plans. Two procedures are available to assist the analyst in establishing signalization plans. The first is the quick estimation method, which produces estimates of the cycle length and green times that can be considered to constitute a reasonable and effective signal timing plan. The quick estimation method requires minimal field data and relies instead on default values for the required traffic and control parameters. It is described and documented in Chapter 10.

A more detailed procedure is provided in Appendix B of this chapter for estimating the timing plan at both pretimed and traffic-actuated signals. The procedure for pretimed signals provides the basis for the design of signal timing plans that equalize the degree of saturation on the critical approaches for each phase of the signal sequence. This procedure does not, however, provide for optimal operation.

The methodology in this chapter is based in part on the results of a National Cooperative Highway Research Program (NCHRP) study (*1, 2*). Critical movement capacity analysis techniques have been developed in the United States (*3–5*), Australia (*6*), Great Britain (*7*), and Sweden (*8*). Background for delay estimation procedures was developed in Great Britain (*7*), Australia (*9, 10*), and the United States (*11*). Updates to the original methodology were developed subsequently (*12–24*).

LIMITATIONS TO THE METHODOLOGY

The methodology does not take into account the potential impact of downstream congestion on intersection operation. Nor does the methodology detect and adjust for the impacts of turn-pocket overflows on through traffic and intersection operation.

II. METHODOLOGY

Exhibit 16-1 shows the input and the basic computation order for the method. The primary output of the method is level of service (LOS). This methodology covers a wide range of operational configurations, including combinations of phase plans, lane

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	168	212	260	68	544	288
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0	200	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.925		0.972			
Flt Protected	0.978				0.950	
Satd. Flow (prot)	1704	0	1811	0	1787	1863
Flt Permitted	0.978				0.285	
Satd. Flow (perm)	1704	0	1811	0	536	1863
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	43		11			
Link Speed (mph)	40		40			40
Link Distance (ft)	1014		670			618
Travel Time (s)	17.3		11.4			10.5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	0%	2%	2%	1%	2%
Adj. Flow (vph)	168	212	260	68	544	288
Shared Lane Traffic (%)						
Lane Group Flow (vph)	380	0	328	0	544	288
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Number of Detectors	1		2		1	2
Detector Template	Left		Thru		Left	Thru
Leading Detector (ft)	20		100		20	100
Trailing Detector (ft)	0		0		0	0
Detector 1 Position(ft)	0		0		0	0
Detector 1 Size(ft)	20		6		20	6
Detector 1 Type	Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0		0.0	0.0
Detector 1 Queue (s)	0.0		0.0		0.0	0.0
Detector 1 Delay (s)	0.0		0.0		0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	NA		NA		pm+pt	NA
Protected Phases	6		4		3	8
Permitted Phases					8	

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Detector Phase	6		4		3	8
Switch Phase						
Minimum Initial (s)	5.0		5.0		5.0	5.0
Minimum Split (s)	23.0		22.0		10.0	10.0
Total Split (s)	40.0		60.0		40.0	60.0
Total Split (%)	28.6%		42.9%		28.6%	42.9%
Maximum Green (s)	35.0		55.0		35.0	55.0
Yellow Time (s)	4.0		4.0		4.0	4.0
All-Red Time (s)	1.0		1.0		1.0	1.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.0		5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	1.0		1.0		1.0	1.0
Recall Mode	None		Min		None	Min
Walk Time (s)	5.0		5.0			
Flash Dont Walk (s)	13.0		12.0			
Pedestrian Calls (#/hr)	0		0			
Act Effct Green (s)	21.1		18.9		42.4	42.4
Actuated g/C Ratio	0.28		0.25		0.57	0.57
v/c Ratio	0.74		0.70		0.90	0.27
Control Delay	33.2		36.0		32.0	9.5
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	33.2		36.0		32.0	9.5
LOS	C		D		C	A
Approach Delay	33.2		36.0			24.2
Approach LOS	C		D			C
90th %ile Green (s)	34.8		30.4		32.0	67.4
90th %ile Term Code	Gap		Gap		Gap	Hold
70th %ile Green (s)	26.1		23.5		22.0	50.5
70th %ile Term Code	Gap		Gap		Gap	Hold
50th %ile Green (s)	20.4		18.7		16.8	40.5
50th %ile Term Code	Gap		Gap		Gap	Hold
30th %ile Green (s)	15.8		14.3		13.0	32.3
30th %ile Term Code	Gap		Gap		Gap	Hold
10th %ile Green (s)	11.0		9.6		9.4	24.0
10th %ile Term Code	Gap		Gap		Gap	Hold
Queue Length 50th (ft)	132		124		134	58
Queue Length 95th (ft)	324		304		#367	138
Internal Link Dist (ft)	934		590			538
Turn Bay Length (ft)					200	
Base Capacity (vph)	903		1396		984	1806
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.42		0.23		0.55	0.16

Intersection Summary	
Area Type:	Other

Cycle Length: 140
Actuated Cycle Length: 74.6
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 28.9 Intersection LOS: C
Intersection Capacity Utilization 82.8% ICU Level of Service E
Analysis Period (min) 15
90th %ile Actuated Cycle: 112.2
70th %ile Actuated Cycle: 86.6
50th %ile Actuated Cycle: 70.9
30th %ile Actuated Cycle: 58.1
10th %ile Actuated Cycle: 45
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: NE 192nd Ave & NE 13th St

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	192	108	584	220	140	344
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0	200	
Storage Lanes	1	0		0	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.951		0.963			
Flt Protected	0.969				0.950	
Satd. Flow (prot)	1729	0	1794	0	1787	1863
Flt Permitted	0.969				0.159	
Satd. Flow (perm)	1729	0	1794	0	299	1863
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	19		16			
Link Speed (mph)	40		40			40
Link Distance (ft)	1014		670			618
Travel Time (s)	17.3		11.4			10.5
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	0%	2%	2%	1%	2%
Adj. Flow (vph)	192	108	584	220	140	344
Shared Lane Traffic (%)						
Lane Group Flow (vph)	300	0	804	0	140	344
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Number of Detectors	1		2		1	2
Detector Template	Left		Thru		Left	Thru
Leading Detector (ft)	20		100		20	100
Trailing Detector (ft)	0		0		0	0
Detector 1 Position(ft)	0		0		0	0
Detector 1 Size(ft)	20		6		20	6
Detector 1 Type	Cl+Ex		Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0		0.0		0.0	0.0
Detector 1 Queue (s)	0.0		0.0		0.0	0.0
Detector 1 Delay (s)	0.0		0.0		0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	NA		NA		pm+pt	NA
Protected Phases	6		4		3	8
Permitted Phases					8	

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Detector Phase	6		4		3	8
Switch Phase						
Minimum Initial (s)	5.0		5.0		5.0	5.0
Minimum Split (s)	23.0		22.0		10.0	10.0
Total Split (s)	40.0		60.0		40.0	60.0
Total Split (%)	28.6%		42.9%		28.6%	42.9%
Maximum Green (s)	35.0		55.0		35.0	55.0
Yellow Time (s)	4.0		4.0		4.0	4.0
All-Red Time (s)	1.0		1.0		1.0	1.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.0		5.0		5.0	5.0
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	1.0		1.0		1.0	1.0
Recall Mode	None		Min		None	Min
Walk Time (s)	5.0		5.0			
Flash Dont Walk (s)	13.0		12.0			
Pedestrian Calls (#/hr)	0		0			
Act Effct Green (s)	19.4		55.4		67.9	67.9
Actuated g/C Ratio	0.20		0.57		0.70	0.70
v/c Ratio	0.84		0.78		0.43	0.26
Control Delay	55.3		24.9		10.0	6.8
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	55.3		24.9		10.0	6.8
LOS	E		C		B	A
Approach Delay	55.3		24.9			7.8
Approach LOS	E		C			A
90th %ile Green (s)	29.1		55.0		12.8	72.8
90th %ile Term Code	Gap		Max		Gap	Hold
70th %ile Green (s)	22.8		55.0		8.8	68.8
70th %ile Term Code	Gap		Max		Gap	Hold
50th %ile Green (s)	19.1		55.0		6.6	66.6
50th %ile Term Code	Gap		Max		Gap	Hold
30th %ile Green (s)	15.9		55.0		5.1	65.1
30th %ile Term Code	Gap		Max		Gap	Hold
10th %ile Green (s)	11.9		55.0		5.0	65.0
10th %ile Term Code	Gap		Max		Min	Hold
Queue Length 50th (ft)	166		343		24	68
Queue Length 95th (ft)	278		#771		59	143
Internal Link Dist (ft)	934		590			538
Turn Bay Length (ft)					200	
Base Capacity (vph)	638		1027		747	1779
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.47		0.78		0.19	0.19

Intersection Summary	
Area Type:	Other

Cycle Length: 140
Actuated Cycle Length: 97.4
Natural Cycle: 75
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 25.4 Intersection LOS: C
Intersection Capacity Utilization 81.6% ICU Level of Service D
Analysis Period (min) 15
90th %ile Actuated Cycle: 111.9
70th %ile Actuated Cycle: 101.6
50th %ile Actuated Cycle: 95.7
30th %ile Actuated Cycle: 91
10th %ile Actuated Cycle: 86.9
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: NE 192nd Ave & NE 13th St

Intersection 192nd Av & NE 13th St
ICU 197
Date Doc't 10.08.12
Controller

Free Timing Parameters

Phase Mov't	Φ1	Φ2	Φ3 SBLT	Φ4 NB	Φ5	Φ6 WB	Φ7	Φ8 SB
Min Green			5	5		5		5
Gap Extension			1.0	1.0		1.0		1.0
Max Green 1			35	55		35		55
Max Green 2			55	55		55		55
Walk				5		5		
Ped Clearance				12		13		
Yellow			3.5	4.0		4.0		4.0
All Red			2.2	1.4		1.8		1.4
Leading Phase			Yes	No		Yes		Yes
Sim Gap								
Dual Entry				X				X
Min Recall				X				X

Notes: The SBLT is Protected-Permissive; The protected SBLT (Φ3 Green Arrow) will only activate if there is occupancy on the stop bar detector and at the same time occupancy on the advance detector located 55 feet behind the stop bar.

EXHIBIT 66

State of Washington
DEPARTMENT OF FISH AND WILDLIFE

Region 5 Office: 2108 SE Grand Blvd, Vancouver, WA 98661, (360) 696-6211, TTY (800) 833-6388
Main Office Location: Natural Resources Building · 1111 Washington Street SE · Olympia, WA

March 17, 2015

City of Camas SEPA Official
Community Development Department
616 NE Fourth Avenue
Camas, WA 98607

RE: WDFW Comments on Green Mountain Planned Residential Development

Dear City of Camas SEPA Official:

Thank you for the opportunity to comment on the proposed **Green Mountain Planned Residential Development** project. The Washington Department of Fish and Wildlife (WDFW) has reviewed this land division proposal and offers the following comments for your consideration.

We are concerned that the proposed project will result in reduced fish and wildlife habitat functionality for the Oregon white oak woodlands and the Green Mountain Biodiversity Area found on the site. We also have concerns about potential impacts to landscape connectivity in the area, Townsend's big-eared bat and Bradshaw's lomatium, and wetlands. WDFW staff is available to discuss these items and provide technical assistance regarding effective setbacks, mitigation, etc.

Oregon White Oak Woodlands

Oak Mitigation

Oregon white oak woodlands are identified by WDFW as a Priority Habitat on the Priority Habitats and Species (PHS) list. WDFW maps indicate that Oregon white oak woodlands exist on the subject property. WDFW has published management recommendations[1] to help planners decide what should be done to protect these resources when land use decisions are made.

The applicant submitted a report titled "Critical Areas Report, Buffer Modification, and Tree Preservation Plan For Green Mountain Mixed Use PRD - Phase 1 City of Camas, Washington" authored by Ecological Land Services, Inc. (ELS) dated December 2014. The ELS report includes an "Appendix B, Tree Preservation Plan (Development Agreement Exhibit E)" which states:

[1] http://wdfw.wa.gov/publications/00030/

> *Consistent with Camas City code, Oregon White Oak trees over 20" dbh are considered habitats of local importance, as well as Oregon White Oaks that form a grove of one acre or larger. Such oaks shall be considered jurisdictional for the purposes of this Tree Preservation Plan. Any jurisdictional Oregon White Oak trees shall be mitigated for at a 2:1 stem count ratio and installed within an appropriate area on site. Oregon white oak trees installed as mitigation will be 1.5" caliper at a minimum.*

In contrast to the above paragraph, Camas Municipal Code indicates that a critical area report for a habitat conservation area shall contain "A discussion of any federal, state, or local special management recommendations, including Department of Fish and Wildlife habitat management recommendations, that have been developed for species or habitats located on or adjacent to the project area[2]." Camas Municipal Code also states that applicants proposing activities subject to this chapter shall demonstrate that the activity substantially maintains the level of habitat functions and values as characterized and documented using best available science[3].

The ELS report does not:

- Contain discussion or demonstration that the proposed mitigation will maintain the level of habitat functions and values currently on the site,
- Discuss this habitat in terms of the WDFW management recommendations document.

Instead, the ELS report only states that the "Phase 1 development fully complies with the Tree Preservation Plan." from the Development Agreement (DA). The proposed oak mitigation ratio in the DA does not appear to be supported by scientific rationale. The existing Oregon white oak habitat appears to contain medium and large trees, well-formed crowns, and connectivity to the adjacent biodiversity area. Trees of this kind typically provide cavity habitat for cavity-nesting birds and mammals, and food in the form of acorns, insects, and leaves.

WDFW believes that a 2:1 stem count will not replace functions of mature oak trees removed. For every mature oak tree cut and replaced by two 1.5" caliber saplings, hundreds of square feet of valuable oak canopy will be lost[4]. The proposed monitoring will ensure that the new trees will survive for a period of five years. In contrast it may take 50-100 years for these new trees to grow to a size that they are producing as many acorns and providing as structurally complex a canopy as what is currently present.

The proposed temporal loss of habitat function warrants additional avoidance of existing oak trees. If avoidance cannot be accomplished, then WDFW recommends additional mitigation. A mitigation ratio around 5:1 based on area of canopy lost replaced to area planted with oak habitat (not stem count) is typically more appropriate. Mathematically, replacing the basal area of one 20-inch DBH tree would take 178 trees 1.5 inches in diameter.

Oak Designation as a Fish and Wildlife Habitat Conservation Area (FWHCA)

---

[2] CMC 16.61.020 (C) (3)
[3] CMC 16.61.030 (A) (1)
[4] Assuming an existing canopy radius of 10 feet, canopy area would be 314 square feet, replaced by two saplings which may have a canopy radius of 1 - 2 feet at time of planting for an area of 6.28 - 26 feet (2-8% of 314, which would mean a loss of 92-98 percent of habitat at time of planting).

The ELS report discounts several individual Oregon white oak trees, deeming them non-jurisdictional because of their size (<20 inches DBH). However the ELS report lacks discussion of these trees in terms of the WFDW PHS definition. Also the ELS report only discusses individual trees, without discussion of whether the area of oaks meets definitions related to the size of the overall stand. Consideration of oak groves/stands may lead to designation of additional areas as "jurisdictional."

We are not clear on how the Oregon white oak woodlands on this site fit into definitions presented in Camas Municipal Code and in WDFW's Priority Habitats and Species (PHS) list. CMC 16.61.010 (A) (2) states that Priority Habitats and Species as identified by WDFW are considered Fish and Wildlife Habitat Conservation Areas (FWHCAs). Within the WDFW PHS list, the definition of Oregon white oak woodland states that "In urban or urbanizing areas, single oaks or stands < 0.4 ha (1 ac) may also be considered a priority when found to be particularly valuable to fish and wildlife."

Both the DA and Camas Municipal Code also include a definition of Oregon white oak as a habitat of local importance that is related to grove size. Stands of Oregon White Oak trees greater than one acre are considered habitats of local importance when they are found to be valuable to fish and wildlife, are used by priority species, or have a large canopy[5].

Where Oregon white oak woodland exists, WDFW considers the entire stand – oak trees plus all associated trees and understory vegetation – to be the priority habitat. This is in contrast to the notion that only the oak trees themselves warrant protection. We recommend assessing and mitigating impacts to the habitat at this community level.

Master Plan

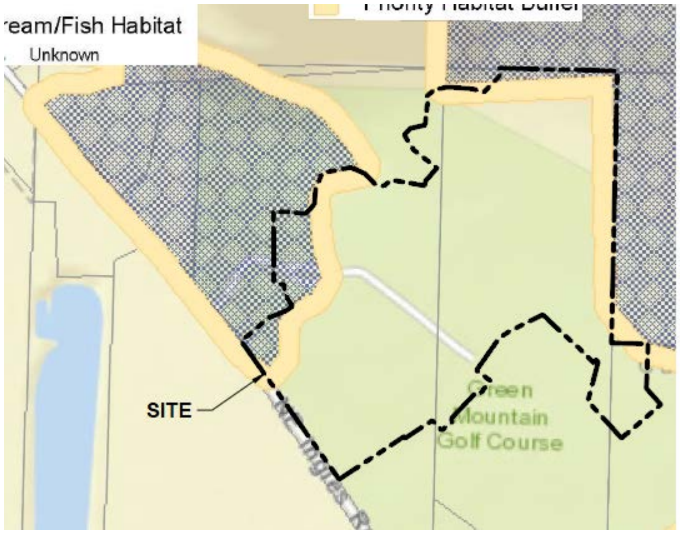
Thus far the discussion of Oregon white oak woodland has been limited to habitats and impacts associated with Phase 1 only. With its current layout, the overall master plan has the potential to impact additional Oregon white oak woodland. The proposed "Open Space" areas do include most of the remaining mapped oak habitat. These areas will require further analysis as subsequent phases undergo development review.

Green Mountain Biodiversity Area

Phase 1

Within the ELS Report, Figure 5, "Clark County Critical Areas" is unclear. The depiction of the mapped Green Mountain Biodiversity Area is inaccurate. It should include the northern portion of Phase 1.

[5] CMC 16.61.010(A)(3)(a)

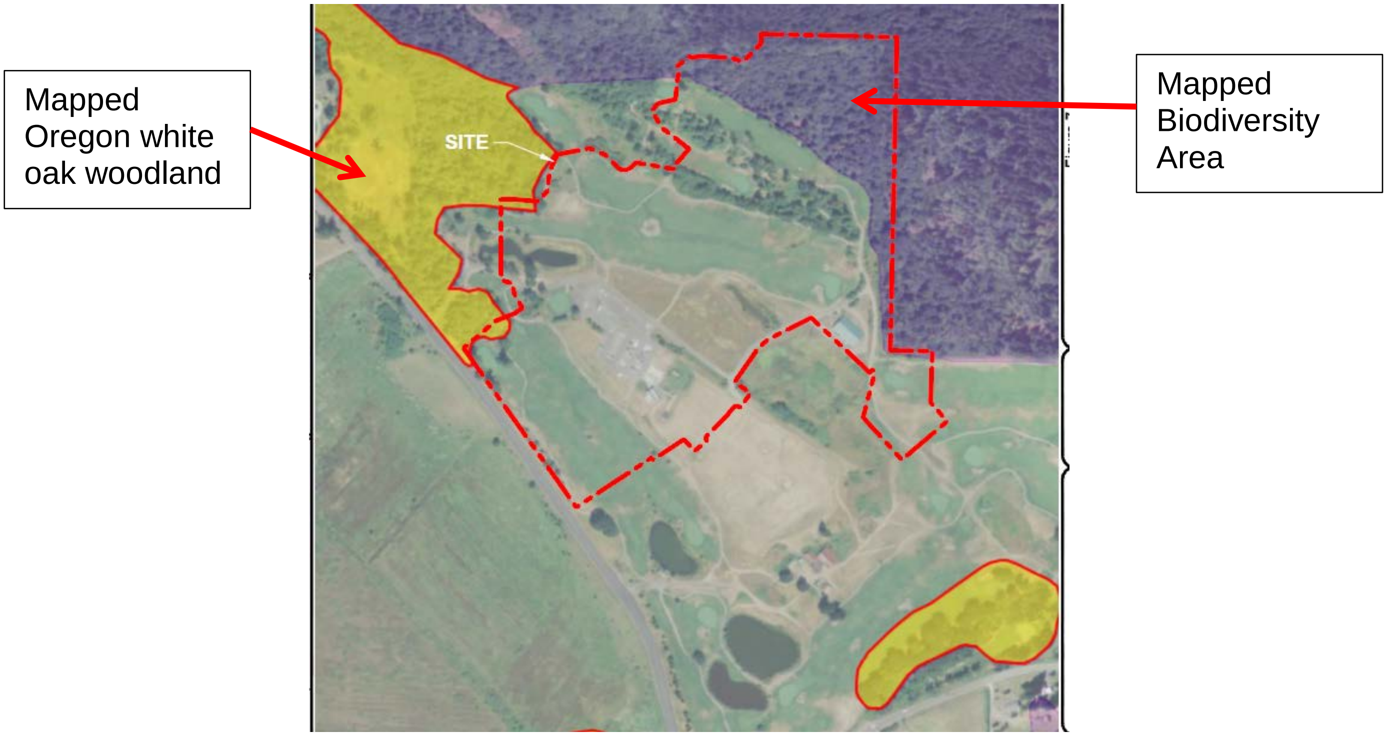


Detail from Figure 5 from ELS Report

Current maps available through Clark County GIS show the biodiversity area extending into the northern portion of the site.

PHS Areas and Buffers, Clark County GIS

Within the ELS report, Figure 7, “WDFW Priority Habitat and Species,” is more accurate. The site contains mapped Oregon white oak woodland and the Green Mountain Biodiversity Area. The biodiversity area extends into the northern portion of the site 250 to 600 feet. Under “Priority Habitats and Species Mapping”, the ELS report incorrectly states that “A biodiversity area and corridor is mapped by the WDFW northeast of the project site consisting of large mature conifer forest (Figure 7).” In fact this biodiversity area extends into the northern portion of the site by 250 to 600 feet.



Detail from Figure 7

The description of this Green Mountain Biodiversity Area in PHS database is as follows:

> *Mature conifer forest of large size (approx 300 acres) located within rapidly expanding development. High value as refugia/remnant habitat. Regular small concentration of blacktail deer.*

Existing maps show the Green Mountain Biodiversity Area extending into the northern portion of Phase 1. The ELS report does not contain a discussion of this area as to why it does or does not meet the definition of a biodiversity area, except to say that ELS does not concur with the WDFW biodiversity area as mapped by WDFW. We would encourage the applicant to consult with WDFW in the matter of interpreting the biodiversity area designation. Additional analysis is required before determining that this area does not meet the definition of a biodiversity area.

Master Plan

Outside of Phase 1, the Green Mountain Biodiversity Area does exist as an older conifer forest. This area serves as an important wildlife movement corridor between Cascade foothills to NE and Lacamas Creek to the south and west. With its current layout, the overall master plan has potential to impact additional acreage within the mapped biodiversity area. These areas will require further analysis and mitigation as subsequent phases undergo development review.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is listed as a State Candidate species, and a Federal Species of Concern. A hibernaculum is documented within the same township as this project[6]. The ELS report states that biologists were unable to locate caves or hibernaculum within their study area. In the context of the project master plan, WDFW strongly encourages the applicant to consult with WDFW staff to determine if this feature is on-site prior to development.

Bradshaw's Lomatium

SEPA Item B4 (P8) states that "Investigation of the Applicant's site by qualified biologists did not find any Bradshaw's Lomation on the Applicant's site." Bradshaw's lomatium, (*Lomatium bradshawii*) has been confirmed on a site in the vicinity of the proposed project. If suitable habitat exists on-site, we recommend revisiting the site at a time of year when this plant may be more detectable.

Wetlands

Wetland Ratings

Camas Municipal Code 16.53.020 states that "wetlands shall be rated according to the Washington State Department of Ecology (ecology) wetland rating system found in Washington State Wetland Rating System for Western Washington—2014 Update (Revised, Ecology Publication #14-06-029, October 2014) **or most current edition.**" [emphasis added]

Effective January 1, 2015, The Washington State Department of Ecology updated the Washington State Wetland Rating System for Western Washington[7]. The wetland rating forms included in the ELS report are based on the 2004 version and should be updated for consistency with the 2014 version.

---

[6] WDFW Sensitive Data Policy (POL-5210) prohibits release of information on Townsend's big-eared bat locations at any finer than a township-level scale.
[7] http://www.ecy.wa.gov/programs/sea/wetlands/ratingsystems/

Buffer Reduction with Enhancement

The ELS report proposes to use provisions of CMC 16.53.050(C)(1)(c) to reduce the wetland buffer. The proposal includes buffer enhancement. In addition to enhancement, CMC 16.53.050(C)(1)(c) refers to 16.53.050(C)(1)(a), which also calls for lower impact land uses. Under that section, the buffer widths can be reduced if a 100-foot wide corridor is maintained and "Measures to minimize the impacts of the land use adjacent to the wetlands are applied, such as infiltration of stormwater, retention of as much native vegetation and soils as possible, direction of noise and light away from the wetland, and other measures that may be suggested by a qualified wetlands professional." The ELS report does not contain a discussion of measures to minimize the impacts of the land use as called for in this section.

Again, we thank you for the opportunity to provide input. Please contact me should you have any questions or need additional information.

Sincerely,

George Fornes, Habitat Biologist
WDFW Habitat Program
George.Fornes@dfw.wa.gov, 360-906-6731

cc: Dave Howe, WDFW Region 5 Habitat Program Manager
Keith Folkerts, WDFW Land Use Policy Lead
Francis Naglich, Ecological Land Services, Inc.

EXHIBIT 67

Lauren Hollenbeck

From:	Denette <denette.goe@gmail.com>
Sent:	Thursday, February 26, 2015 5:23 PM
To:	Robert Maul
Subject:	Regarding purposed development along ingles road

Who this may concern
I have grown up in camas and I would like to know the hearing date of this purposed development. I am highly aware that there are wildlife in this area and that concerns me. !

Feel free to call me or reply by email. Thank you for your time.
Sincerely,

Denette

Sent on a Boost Samsung Galaxy S® III

Exhibit 68

Lauren Hollenbeck

From: Phil Bourquin
Sent: Thursday, March 19, 2015 9:57 AM
To: Juli Bradley; David Gast; Cassi Marshall
Cc: Randy Curtis; Jerry Acheson; Robert Maul; Susan Newlove; Peter Capell
Subject: Parks Development Review Committee - Green Mountain PRD Notes

Committee:

Thank you all for meeting with Robert Maul and I last week to review the Green Mountain PRD proposal. Great first meeting! The following are draft notes, please let me know if anything is missing, incorrect, or needs to be clarified further.

- Project appears to plan for the appropriate trails, public viewing area atop Green Mountain, and a neighborhood park as called for in the Parks and Open Space Plan. The committee appreciated seeing regional trail connection that is tied into the local community as well as seeing the development of a viewing areas atop Green Mountain. *(In discussions with a rep. of the applicant, the top of green mountain is heavily forested. The City has identified the desire to protect the natural backdrop of Lacamas Lake including Green Mountain).* Additional discussion on balancing a viewing area with the natural backdrop should occur with the committee prior to final construction plan approvals on the GM trails.

- The committee was concerned with construction of trails on steep slopes. It was noted the plans indicate slopes up to 16% which they felt were too steep. They recommended that the design minimize slopes and not exceed 8- 12% except where it is determined to not to otherwise be practicable.

- Where trails cannot meet ADA, the committee is interested in offsetting this with design efforts elsewhere to incorporate ADA accessibility in trail design, picnic areas, viewing platforms, etc.

- The committee would like to see the trail on Green Mountain connect to the adjacent County lands and would like to see this coordinated with the County Parks Dept.

- The location of the park within the community is supported. There is some concern as to the amount of usable area and how it ultimately is improved. The connectivity of the park to the larger trail networks is applauded. The Parks Board will ultimately need to be involved in the review of the Park Design and improvements. The Park would be a City Park and the Committee would support improvements being Impact Fee Creditable.

- The committee is interested in walking the site with the developer at some point prior to finalizing construction plans.

Phil Bourquin
Community Development Director
Ph. 360.817.1562 ext. 4254
Email: pbourquin@cityofcamas.us
City of Camas Washington
Live, Work, Recreate and Educate

EXHIBIT 69

Lauren Hollenbeck

From: Francis Naglich <Francis@eco-land.com>
Sent: Friday, April 24, 2015 4:15 PM
To: Robert Maul
Cc: george.fornes@dfw.wa.gov; John Schmidt (john.schmidt@metlandgroup.com); John O'Neil (john@metlandgroup.com); Randall B. Printz (randy.printz@landerholm.com); Mara McGrath
Subject: Update on WDFW Comments and Responses, Green Mountain PRD and Phase 1 Proposed Development

Hello Robert,

Ecological Land Services, Inc. (ELS) met with WDFW Habitat Biologist George Fornes on April 22, 2015 regarding several habitat items related to the proposed Green Mountain Planned Residential Development, including the preliminary plat for Phase 1..

Below you will find a short summary of those discussions. Over the next week we are going to finish preparing a letter (the draft is 7-8 pages long) that addresses in detail each of the items in the WDFW's 3/17/15 letter. Based on the very productive discussion we had with George and the suggestions he was able to provide, we are confident that WDFW will be able to support the mitigation measures identified in the letter. We will send the letter to George for his review prior to sending it to the City. The letter will be a combination of facts, clarifications, and mitigation measures. To simplify the drafting of the City' staff report and conditions of approval, the draft staff report could perhaps simply say "Applicant to meet all mitigation measures provided for in the letter from ELS dated…"

Oregon White Oak Habitat
After meeting with George Wednesday, ELS is preparing a revised oak habitat mitigation plan for the Phase 1 development impacts to oak trees and potential habitat. Mitigation ratios were the main focus of the discussion and we are confident that a revised plan will satisfy George's questions and concerns regarding oak habitat mitigation. The plan will involve greater mitigation than is required by either Camas City Code or the Tree Preservation Plan in the DA. ELS anticipates a condition of approval stating that such a detailed plan will be required. Based upon the conditions provided for in the letter, a detailed mitigation plan with exact planting areas, maintenance plan, monitoring provisions, and legal protection will then be provided to the City concurrently with the City's review of the civil engineering plans and prior to construction.

We also discussed with George the overall PRD master plan and potential impacts and mitigation for oak habitat in future phases of the development. All parties agreed that an advanced oak mitigation plan for future phases was a good idea. A conceptual advanced mitigation plan will also be presented in the forthcoming letter.

Green Mountain Biodiversity Area
The young, deciduous forested area in the northern part of Phase 1, which is mapped as within the Green Mountain Biodiversity Area, doesn't meet the definition of Biodiversity Area. George concurred based on his aerial photo analysis. However, the section of the PRD to the north and outside of Phase 1 is forested and is mapped as within the Green Mountain Biodiversity Area. This forested section of the PRD will need further investigation and analysis to determine its status. We discussed assessing the forested area with WDFW and ELS biologists at a later date prior to any development of that area.

Townsend's Big-eared Bat

The developable portions of Phase 1 do not contain topography suitable for caves. George's main concern was potential habitat outside of the Phase 1 project area, but within the PRD. This area will need to be surveyed by WDFW and ELS biologists prior to any development in the potential habitat area.

Bradshaw's Lomatium
The documented Bradshaw's lomatium is outside the boundaries of Phase 1 and the PRD. The closest known location is about 0.25 miles from the nearest PRD boundary. George didn't believe that there was suitable habitat within Phase 1 or the PRD for the lomatium, concurring with findings by ELS biologists and onsite maintenance staff knowledgeable about plants.

Wetlands
Wetland Rating
George concurred that use of Ecology's 2004 rating was appropriate as the *Critical Areas Report* was submitted on December 31, 2014.

Wetland Buffer Reduction with Enhancement
ELS provided text to supplement the Dec 2014 *Critical Areas Report* that explains how *CCC 16.54.050(C)(1)(a)* and *(b)* would be met. George advised that we check with the City about any typical design elements for *CCC 16.53.050(C)(1)(a) Lower Impact Land Uses.*

Let me know if you have any questions or concerns. Thanks and have a good weekend!

Francis Naglich, MES | President, Wetland Biologist
1157 3rd Avenue, Suite 220 | Longview, WA 98632
P: 360-578-1371 ext. 104 F: 360-414-9305 | M: 360-431-3990
www.eco-land.com | francis@eco-land.com

ECOLOGICAL LAND SERVICES, INC.

APPLCIANTS SUPPLEMENTAL RESPONSE TO COMMENTS

On April 1, 2015 the City provided the Applicant with a short list of questions/comments relating to the Applicant's PRD application. The Applicant appreciates the City's early review of the application and provides the following clarifications.

- *The TIS presumes that there will be two access points out onto Ingle Road with the Phase I improvements (+/- 203 lots). The plans show only one access point. The applicant should review the report and its recommendations and submit a revised TIS or an addendum letter addressing what impacts if any this may have on the study, timing of off-site improvements/turn lanes, other report recommendations, etc.*

Kittleson and Associates has reviewed and analyzed this issue and has prepared a supplement to the Traffic Impact Analysis to address this issue. The supplement is being submitted concurrently with this response. The Kittelson analysis finds that the intersection of the access for Phase 1 and Ingle Road operates at a level of service well within the City's level of service standards; and finds that no material safety issues are presented with the Applicant's proposed design of phase 1.

- *Pod "F1b" in the north part of the project appears to be totally isolated from the rest of the development, the roadway network and the trail system.*

This Pod is a narrow portion of the Applicant's property that lies between the Coombs property to the north and an open space area to the south. It abuts Pod F1c to the east. This Pod will likely be accessed directly off of Ingle road due to the critical areas to the south. The precise access location will be determined at the time of the Pod's development in conjunction with a preliminary plat approval process through the City.

Pod F1b has been part of the cumulative analysis for the entire PRD and will be governed by the master Covenants, Conditions and Restrictions governing the PRD. While legally permissible to permit this pod independently of the PRD as a stand-alone subdivision, there would be no public purpose served by doing so. By having Pod F1b part of the PRD, it will be governed by the rules of the PRD, share compatible architecture with other areas of the PRD and have access over the trails and rights to other amenities of the PRD. It will also share in any dues or assessments uniformly assessed upon the homes in the PRD to enhance and maintain the common areas, landscaping and community center. All of the pods identified in the PRD application are identical to the PODs identified in the master plan incorporated into the Development Agreement approved by the City Council.

- *Along with the previously mentioned MF pods B1 and B2 not being interior to the development, pods B4 and B5 are also not located to the interior of the development.*

The City's code, specifically CMC 18.23.030(F), provides that the multi-family component of the PRD be *"ideally developed toward the interior"* of the PRD *"to ensure compatibility with existing single family residences"* that border the PRD. The vast majority, (in excess of 90%) of the multi-family units of the PRD are located in the interior of the PRD, most notably in the urban village. There are no *"existing single family residences"* that border either Pod B4 or B5. Pod B5 is a very small pod (the smallest by far in the PRD) and is adjacent to a major arterial. It is surrounded by open space. Because of these factors, it is much better suited for multi-family development. Similarly, Pod B4 is adjacent to Ingle Road which is a collector level street designed to carry significant traffic. It too is surrounded by open space and critical areas. In light of these factors, the City's code does not prohibit the location of these pods, but does suggest that Planning Commission and the City Council be made aware of them. The City Council is aware of them as evidenced by its approval of the master plan incorporated into the Development Agreement containing all of these pods in their present location.

- *Pod B4, a multi-family pod, is located on the northern portion of the project in the R-10 zone. The application discusses how the development becomes less dense as you move north.*

If the project were broken up into four or five sections from south to north, there is a clear and substantial decrease in density as the project moves north. Much like there are minor anomalies to a slope analysis where a two foot section of a 100 foot section of the slope might be 40%, but the overall slope from top to bottom is 8 percent, here there are minor anomalies designed into the project as necessary or appropriate, that while present, do not change the overall character of the density distribution of the project.

- *The regional T-27 Trail which is PIF creditable and is required to be a minimum of 12' wide and paved per the PROS plan (we also like to have the regional trails as ADA compliant to the maximum extent feasible). The plan calls for an 8' wide paved trail at the central park area, a 6' wide paved trail from flat up to 8% trail grade and a 4' wide gravel section in steeper terrain. The city may have difficulty justifying/granting PIF credits on trail segments that don't meet the PROS plan.*

The trail specifications proposed in the PRD application are those which were approved by the City Council through the Development Agreement process. See Exhibit C to the Development Agreement. The amount of Park Impact Fee credits will be determined prior to or at the time of construction.

- *The preliminary utility plans do not identify a method of solids collection for the sanitary sewer flows from the development.*

The Applicant has spent several months working with City staff on a public private partnership to comprehensively plan and build a sanitary sewer system for the North Urban Growth Boundary. Agreements are close to being complete to bring this plan to fruition. The system that will be born out of this effort will no longer require the presence or maintenance of individual solids tanks. Prior to that system being constructed, the Applicant is utilizing a traditional system for phase 1 that does contain tanks for solids. The preliminary location of those tanks is provided in the pdf drawing submitted concurrently with this response. The ultimate location of the tanks will be determined at final engineering.

- *The pump station is not located on the applicant's property – it appears to be located on city property.*

The sewer plan referenced above that is being developed by the City identifies a pump station west of the Applicant's property on property owned by the City. Pursuant to long standing discussions with the City, the Applicant will construct the necessary portions of that pump station at the location identified by the City.

- *Other than the narrowed entry roadway and 28' wide paved interior streets there does not appear to be any other traffic calming elements proposed within this project.*

Most if not all of the streets in the PRD are curvilinear in nature to reduce traffic speeds. There are no long straight runs of streets currently proposed anywhere in the PRD.

- *Lots 70 – 75 don't have access to a public street. It appears that they are accessed in the front by a private alley identified as Tract D and access to the rear via a 10' wide Tracts C & E.*

While the identified lots do not abut a public street, each of them has access to a public street by way of the alleys and tracts. The alleys are in compliance with the City's code and the homes will be sprinkled.

- *If an interior roadway connection to the northerly half of the development is not feasible it may be helpful to include substantive evidence to that fact.*

Olson Engineering indicates that the northern portion of the Green Mountain PRD is separated from the southern portion by steep slopes. They indicate that while the length of the steep slopes varies, it is in the 200'-300' range with gradients in the 50%-60% range. Olson Engineering indicates that these slopes make it impractical to construct a connector street connecting the northern and southern portions of the project with an internal road way.

- *Access related to CMC 18.23.100(G)*

CMC 18.23.100(G) provides:

> *The proposed development shall provide at least two access points (where a PRD does not have access to a primary or secondary arterial), that distributes traffic to adjacent streets in an acceptable manner.*

The proposed PRD does have access and proposes access to Goodwin Road, which is identified by the City as an arterial street. Additionally, the PRD has at least four access points to the surrounding street network. The TIA prepared by Kittelson and Associates demonstrates that with the identified proposed mitigation, there will be no level of service deficiencies resulting from the development of the PRD.

The Applicant appreciates the opportunity to further address or clarify any aspects of its proposal.

EXHIBIT 71

SCALE: 1"=150'

-150 0 150 300

J:\data\8000\8900\8930\8938\Engineering\Prelim\Phase 1\8938.e.Border.Prelim.Ph1 Grading S.dgn
M:\Microstation V8\pen tables\OCE table setup\oce graderos.tbl

PLOT 11"X17"	SEPTIC TANK LOCATIONS	SCALE: 1"=150'
		DATE: 04/20/15
		ISSUED BY: RWP
OLSON ENGINEERING INC. LAND SURVEYORS ENGINEERS 1111 BROADWAY, VANCOUVER, WA 98660 360-695-1385 503-289-9936	PROJECT: GREEN MOUNTAIN	JOB NO. 8938.01.01
		DWG. NO. 1 OF 1

EXHIBIT 72

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING / PLANNING
610 SW Alder Street, Suite 700, Portland, OR 97205 P 503.228.5230 F 503.273.8169

MEMORANDUM

Date: April 22nd, 2015 Project #: 13865.0

To: Wes Heigh, City of Camas

cc: Randy Printz, Landerholm Law Firm
John O'Neil, Green Mountain Land, LLC

From: Chris Brehmer, P.E. and Kelly Laustsen

Project: Green Mountain Master Plan Development

Subject: Phase 1 Access Assessment

CHRISTOPHER LYNN BREHMER
STATE OF WASHINGTON
37571
REGISTERED PROFESSIONAL ENGINEER

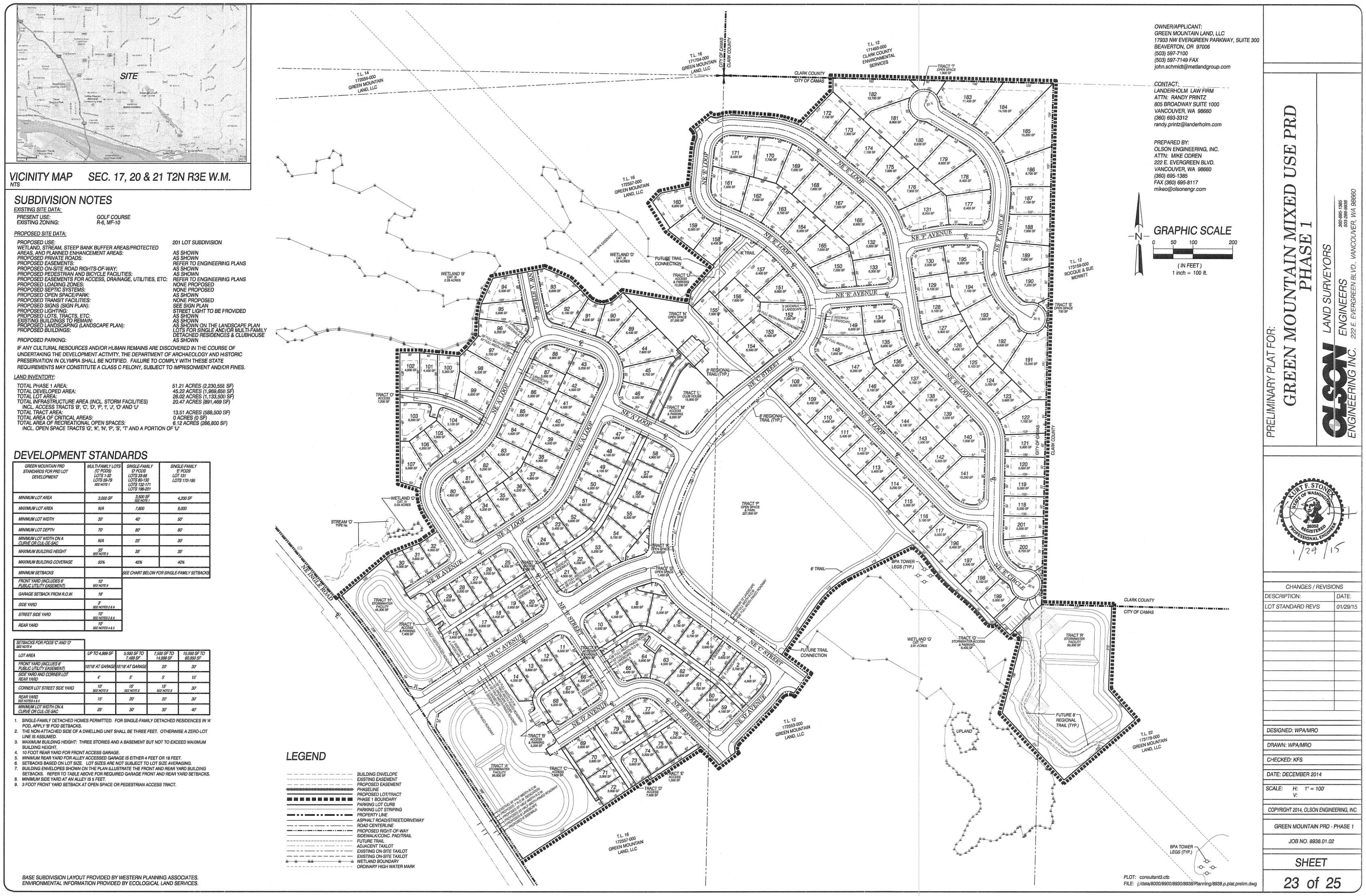
Signed 4-22-15

This memorandum presents a supplement to the June 2014 transportation impact analysis (TIA) for the Green Mountain Master Plan development to be located at the northeast corner of NE Ingle Road and NE Goodwin Road in Camas, Washington. Specifically, it assesses the implication of providing one access for the Phase 1 development, as opposed to the two access locations assumed in the TIA. Figure 1 provides a preliminary site plan for the Phase 1 development, showing the single access on NE Ingle Road.

The TIA assumed two access points for the Phase 1 development with exclusive southbound left-turn lanes at each access, as shown in Figure 2. Operations were re-assessed under 2018 total traffic conditions assuming a single site access, with an exclusive southbound left-turn lane. The access is subject to the City of Camas operating standards, which require LOS "D" or better and a volume-to-capacity (v/c) ratio of 0.90 or better for all intersections. As shown in Figure 2, the proposed access operates acceptably during the weekday AM and PM peak hours, with the stop-controlled westbound approach operating at LOS "B". Operational worksheets are provided in *Attachment A.* Therefore, based on this assessment, a single access to the Phase 1 development area with a southbound left-turn lane on Ingle Road satisfies City operating standards and no additional improvements are needed.

We trust this memorandum adequately addresses the traffic impacts associated with providing a single access at the Phase 1 development of the Green Mountain Master Plan development. Please contact us if you have any questions or comments regarding the contents of this memorandum or the analysis performed.

FILENAME: ||KITTELSON.COM|FS|H_PORTLAND|PROJFILE|13865 - GREEN MOUNTAIN MASTER PLAN|PHASE 1 SINGLE ACCESS|13865_GREEN MOUNTAIN_PHASE 1 ACCESS ASSESSMENT.DOCX

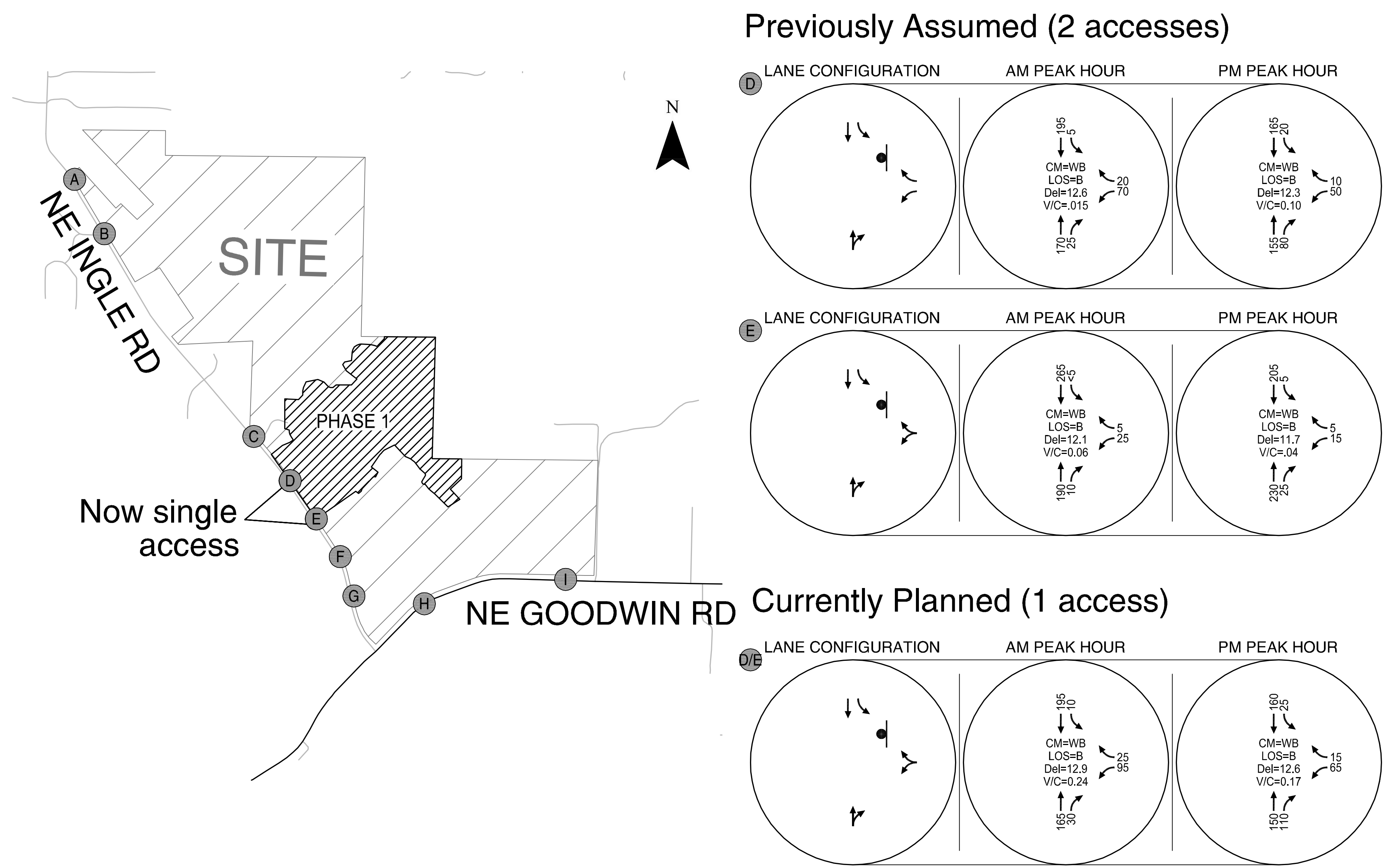


Plan provided by Olson Engineering, 4/7/2015

Preliminary Site Plan - Phase 1
Camas, Washington

Figure
1

H:\profile\13865 - Green Mountain Master Plan\dwgs\figs\13865_traffic study -Nov update.dwg Apr 15, 2015 - 1:40pm - klaustsen Layout Tab: 1_upd site plan



- STOP SIGN

CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIG) / CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIG / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL

2018 Site Access Lane Configurations and Operations (Phase 1)
Camas, Washington

Figure 2

C:\Users\klaustsen\Desktop\13865_traffic study -Nov update.dwg Apr 22, 2015 - 2:13pm - klaustsen Layout Tab: 2_phase 1 access

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

Attachment A: Synchro Output Sheets

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	96	24	165	32	8	194
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	113	28	194	38	9	228
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	460	213			232	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	460	213			232	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	80	97			99	
cM capacity (veh/h)	559	832			1348	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	141	232	9	228
Volume Left	113	0	9	0
Volume Right	28	38	0	0
cSH	598	1700	1348	1700
Volume to Capacity	0.24	0.14	0.01	0.13
Queue Length 95th (ft)	23	0	1	0
Control Delay (s)	12.9	0.0	7.7	0.0
Lane LOS	B		A	
Approach Delay (s)	12.9	0.0	0.3	
Approach LOS	B			

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	24.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	64	16	149	108	27	158
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	75	19	175	127	32	186
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	488	239			302	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	488	239			302	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	86	98			97	
cM capacity (veh/h)	529	805			1270	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	94	302	32	186
Volume Left	75	0	32	0
Volume Right	19	127	0	0
cSH	568	1700	1270	1700
Volume to Capacity	0.17	0.18	0.03	0.11
Queue Length 95th (ft)	15	0	2	0
Control Delay (s)	12.6	0.0	7.9	0.0
Lane LOS	B		A	
Approach Delay (s)	12.6	0.0	1.2	
Approach LOS	B			

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	32.3%	ICU Level of Service	A
Analysis Period (min)	15		

EXHIBIT 73

Community Development Department

Notice of Public Hearing and Special Meeting

Green Mountain Subdivision and Planned Residential Development

(City File No's SUB14-02, SEPA14-21, DA14-01, CA14-04 and ARCH14-10)

NOTICE IS HEREBY GIVEN that a public hearing will be held on a preliminary approval for the Green Mountain Planned Residential Development (PRD) for 1,300 residential units and commercial, as well as preliminary approval for a plat for the first phase of the residential portion at 201 lots. The PRD is located on 9 lots totaling 282 approximate acres and includes parcel numbers 171727-000, 172341-000, 171704-000, 172555-000, 172557-000, 172533-000, 172559-000, 172165-000 and 173178-000. The site is located at the Northeast corner of the intersection of NE Goodwin Road and NE Ingle Road.

PUBLIC HEARING:

The Green Mountain PRD and first phase subdivision will be considered at a public hearing on **May 12, 2015 at 7:00 pm.**, or soon thereafter, before the Planning Commission in the City Council Chambers, 616 NE 4th Avenue, Camas, Washington. The meeting agenda and supporting materials to include a staff report will be available on the city's website generally a week prior to the meeting at https://camas.legistar.com/Calendar.aspx,

APPLICATION MATERIALS:

Application materials include (in part): a project narrative, environmental studies, engineering reports, and preliminary plat drawings, as required for a complete application pursuant to Camas Municipal Code (CMC) §18.55.110 and CMC§17.11.030(B). Contact Community Development staff to review the full application and supporting materials at the Camas Municipal Center, at 616 NE 4th Avenue, Camas.

COMMENT INFORMATION:

Parties interested in commenting on the preliminary plat application may testify in person at the hearing, or may submit written comments by regular mail (616 NE 4th Avenue, Camas), or by email to communitydevelopment@cityofcamas.us. If anyone prefers to submit written comments for staff to submit on their behalf at the hearing, those comments must be received by the City Clerk prior to 5:00 p.m., May 12, 2015.

Any questions may be directed to Robert Maul, Planning Manager, at (360) 817-7255.

Published in the Post Record on April 28, 2015 Legal Publication No. 533827
Posted at the Camas Post Office, Camas City Hall, Camas Library, City of Camas web site at: http://www.cityofcamas.us
Mailed to property owners within 300-feet of the proposal on **April 28, 2015**

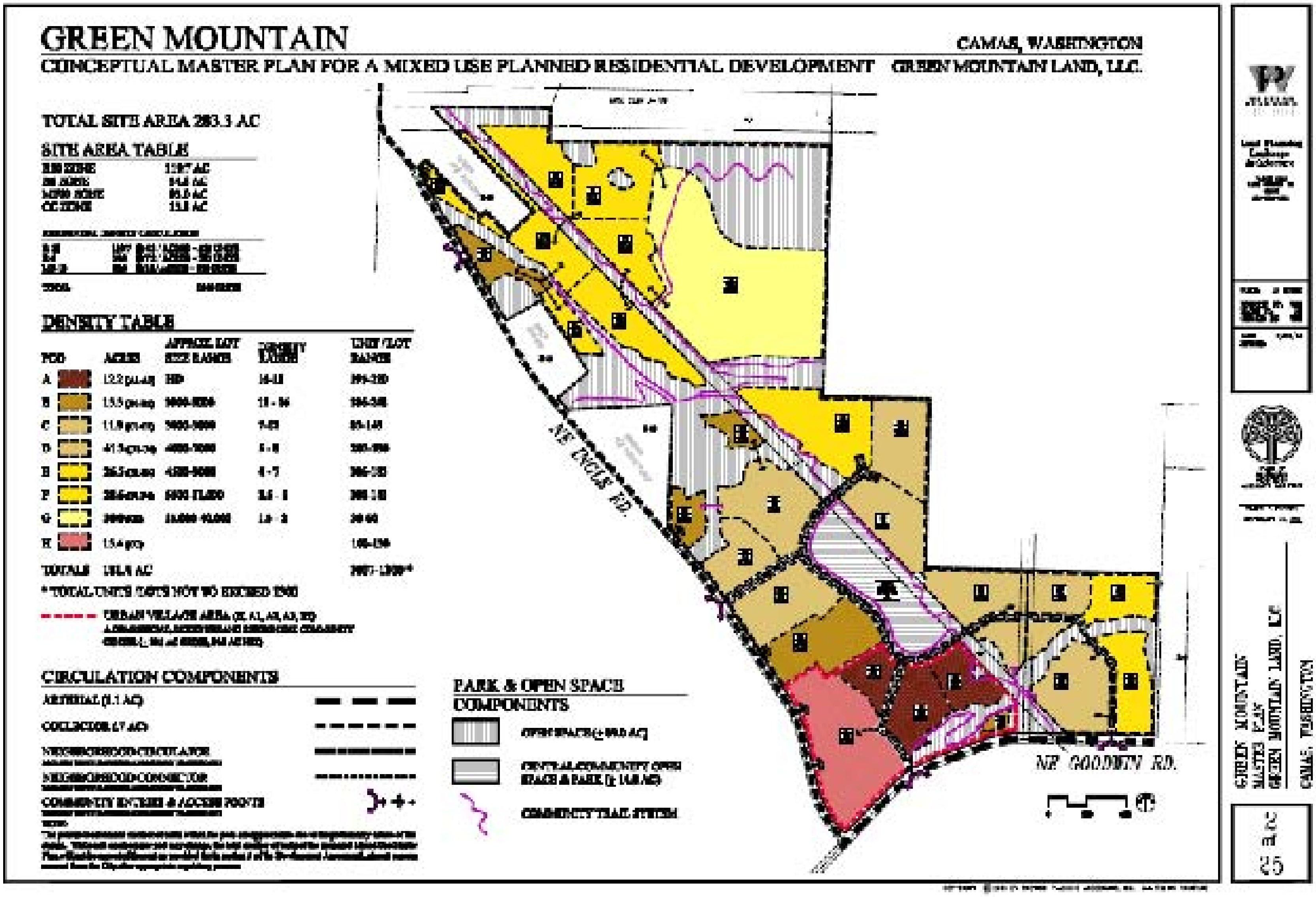

GREEN MOUNTAIN
CAMAS, WASHINGTON
CONCEPTUAL MASTER PLAN FOR A MIXED USE PLANNED RESIDENTIAL DEVELOPMENT
GREEN MOUNTAIN LAND, LLC.
SITE AREA TABLE
DENSITY TABLE
CIRCULATION COMPONENTS
PARK & OPEN SPACE COMPONENTS
COMMUNITY TRAIL SYSTEM
NE INGLE RD.
NE GOODWIN RD.
GREEN MOUNTAIN
MASTER PLAN
GREEN MOUNTAIN LAND, LLC
CAMAS, WASHINGTON

EXHIBIT 74

Lauren Hollenbeck

From: Randall B. Printz [mailto:randy.printz@landerholm.com]
Sent: Monday, May 04, 2015 8:12 PM
To: Steve Wall
Cc: Robert Maul; Curleigh (Jim) Carothers; Wes Heigh
Subject: RE:

Thanks Steve. Robert raised a couple of issues last Friday I believe with Kurt Stonex, so I want to address these in addition to the sewer issue; the latter of which I will address under separate cover. These are in no particular order, but should be made a part of the record in addition to the other supplemental responses we have provided to the City.

Trails (easements or tracts.)
We will put the trails in tracts and dedicate them to the City since they are on the City's trails plan for public use.

Lots 73-76.
The question here is what will be developed adjacent to these lots on the other side of the sidewalk. I suggest the following as a condition of approval to address this issue: At the time of preliminary plat approval for that portion of Pod B1 that is adjacent to lots 73-76 in Phase 1D of Pod C, the type and orientation of the residential units to be constructed in Pod B1 shall be considered, in order to assure such units are generally compatible with the units on lots 73-76 in Phase D1 of Pod C.

Maximum lot size
The PRD table provides minimum and maximum lot sizes for each of the Pod types within the PRD. Phase 1 proposes some lots that are in excess of the maximum lot size (9,000 sq. ft.) provided for in the PRD table. There is nothing in the PRD code that would require such a maximum lot size and the Applicant arbitrarily chose a maximum lot size in the original development of the PRD, prior to the design of the preliminary plat for phase 1. Generally, maximum lot sizes are imposed in urban jurisdictions to assure that density targets are met. In this case, the Green Mountain PRD contains a wide array of densities. Even with some lots that exceed the proposed maximum lot size, the project meets the City's density targets. Since there is no requirement for the PRD to have a maximum lot size and because the PRD meets the City's density targets, the Applicant has removed the maximum lot size from the PRD standards. The attached table should be made a part of the record and eliminates the maximum lot size from the PRD standards.

Thanks guys. Let me know if any questions

From: Steve Wall [mailto:SWall@cityofcamas.us]
Sent: Monday, May 04, 2015 4:08 PM
To: Randall B. Printz
Cc: Robert Maul; Curleigh (Jim) Carothers; Wes Heigh
Subject: RE:

Hey Randy – Sorry, been at work today but haven't even been in my office until just now. I believe Robert has let you know that we're still plugging away on things and reviewing and commenting internally on a draft. Would definitely agree that it would be ideal to get you something to review prior to the staff report being issued, I'm just not sure we're going to be in that position with the hearing date schedule we've got. I would certainly give you the option of sending me a few thoughts on what you envisioned, but you may be better served waiting to see what we've drafted and then responding. In regards to sewer, I think we have a pretty good feel for where you guys stand on going south so hopefully we won't be too far apart.

Robert will probably be keeping you up to date on status as we roll into tomorrow.

Steve

Steve Wall, P.E.
Public Works Director

Ph: 360-817-7899
Cell: 360-624-2763
Email: swall@cityofcamas.us

From: Randall B. Printz [mailto:randy.printz@landerholm.com]
Sent: Monday, May 04, 2015 7:28 AM
To: Robert Maul; Steve Wall
Cc: 'stacey@cascadiadevelopmentpartners.com' (stacey@cascadiadevelopmentpartners.com)
Subject:

Good morning. I hope you are both well. I know you are scrambling to finish Staff Report. Steve, if you could give me a call this morning, I would like to see if we can develop some language for the conditions of approval for sewer. I don't think it will be that difficult and I have given it some thought. I want to be sure that we allow for the design and mechanism's we are working through with the DA, but I also need to have some way to preserve our argument that we have a right to take everything to the south in the unlikely event that we don't end up with a deal. I have some language in mind, but would like to talk to you first.

Robert, I know you had a couple of additional questions. I know your draft is not yet final, but if you could even just email me this morning your draft proposed conditions of approval, that would be really helpful. Obviously, the City can choose to propose any conditions of approval that it deems appropriate; however, it has been my experience, and I believe yours as well, that if we can agree on the language of those conditions prior to the staff report being issued, it will save a lot of potential angst at the hearing. This is particularly true where you have a lay body like a PC, rather than a hearings examiner. If you could give me a call when you get in to discuss this, that would be great. Thanks guys.

Randall B. Printz | Attorney
LANDERHOLM
Legal advisors. Trusted advocates.
805 Broadway Street, Suite 1000
P.O. Box 1086
Vancouver, WA 98666-1086
T: 360-696-3312 | T: 503-283-3393 | F: 360-696-2122
www.landerholm.com

Green Mountain PRD PODs A-G and corresponding Camas Zones

	A POD	**B POD**	**C POD**
DENSITY	**MF-24**	**MF-18**	**MF-10**
Max. du/gross ac	24	18	10
Min. du/gross ac	6	6	6
STANDARD LOTS			
Min. lot SF	~~1,800~~ ***1,000 [a]***	~~2,100~~ ***1,000[a]***	3,000 ***[a]***
Min. lot width	20	20	30
Min. lot depth	~~60~~ ***50***	~~60~~ ***50***	70
Max. Floor Area per du	No Max	No Max	No Max
SETBACKS			
Min. front/at garage	~~10/18~~ ***None***	~~10~~ ***6/3@OS***/18	~~15/18~~ ***10***/18
Min. side	3 [1]	3 [1] ***[d]***	3 [1] ***[d]***
Min. side Flanking Street	~~15~~ ***None [e]***	~~15~~ ***10 [d]***	~~15~~ ***10 [d]***
Min. rear ***(garage @alley)***	~~10~~ ***None [e]***	10 ***[b][c]***	10***[b][c]***
LOT COVERAGE, Max.	~~75%~~ ***None [c]***	~~65%~~ ***None***	55%
BUILDING HEIGHT, Max.	~~45[2]~~ ***60***	45 [2]	35 [2]

a. Single Family Detached homes to be permitted. For SFD in A POD apply B Pod setbacks.

b. 10 foot rear yard for front access garage.

c. Minimum rear yard for alley accessed garage is either 4' or 18'.

d. Minimum side yard at alley is 5'.

e. Franchise utilities to be located in front or side yard easements abutting right of way.

1. The non-attached side of a dwelling unit shall be three feet, otherwise a zero-lot line is assumed.
2. Maximum building height: three stories and a basement but not to exceed maximum building height.

Density Transfer Lots	**D POD**	**E POD**	**F POD**	**G POD**
DENSITY	**R-5**	**R-6**	**R-7.5**	**R-20**
Max. du/gross ac.	8.7	7.2	5.8	2.1
DENSITY TRANSFER LOTS				
Min. lot size (sq. ft.)	3,500 ***[a]***	4,200	5250	14,000
Min. lot width	40	50	60	90
Min. lot depth	80	80	80	100
LOT COVERAGE, Max.	45%	40%	40%	30%
BUILDING HEIGHT, MAX. (ft.)	35	35	35	35
SETBACKS **based on ~~avg.~~ lot size**	Up to 4,999 sq. ft.	5,000 to 7,499 sq. ft.	7,500 to ***14,999*** sq. ft.	15,000 to ***60,000*** sq. ft.
Min. front/at garage	~~15~~ ***10/18***	~~20~~ ***15/18***	20	30
Min. side and corner lot rear yard (ft.)	~~5~~ ***4***	5	5	15
Min. side yard flanking a street	~~15~~ ***10[d]***	~~20~~ ***15[d]***	~~20~~ ***15***	30
Min. rear ***(garage @alley)***	~~20~~ ***15[b][c]***	~~25~~ ***20[b][c]***	~~25~~ ***20[b][c]***	30
Min. lot frontage on a cul-de-sac or curve (ft.)	25	30	30	40

a. Single Family detached homes to be permitted.

b. 10 foot rear yard for front access garage.

c. Minimum rear yard for alley accessed garage is either 4' or 18'.

d. Minimum side yard at alley is 5'.

NOTE: POD lot sizes are not subject to lot size averaging.

05/04/15

EXHIBIT 75

ORDINANCE NO. 15-008

AN ORDINANCE amending Camas Municipal Code Chapter 18.23, to allow for limited commercial uses within a planned residential development.

THE COUNCIL OF THE CITY OF CAMAS DO ORDAIN AS FOLLOWS:

Section I

Section 18.23.020 – Definitions, of the Camas Municipal Code, is hereby amended to define "planned residential development" as follows:

18.23.020 – Definitions.

"Planned residential development" (hereinafter referred to as a PRD) means a development constructed on land of at least ten acres in size, designed and consistent with an approved master plan. A PRD is comprised of two primary components: single-family and multifamily units. The single-family component shall contain only single-family detached residences on lots equal to or greater than four thousand square feet. The multifamily component may contain either attached or detached single-family residences on lots smaller than four thousand square feet, or it may contain, but may not be limited to, duplexes, rowhouses, apartments, and designated manufactures homes, all developed in accordance with Section 18.23.030(A) of this chapter. Secondary components include park and recreational amenities, accessory uses, and limited commercial uses as provided in this Chapter

Section I

Subsections 18.23.030(A), (D), (E), and (G) – Scope, of the Camas Municipal Code, are hereby amended to provide as follows:

18.23.030 – Scope.

A. A PRD may be allowed in all R and MF zoning districts. Where residentially zoned land is contiguous to lands zoned for commercial uses, the City may, subject to a Development Agreement, provide for the inclusion of the commercial area into the PRD for the purposes of establishing continuity community design, pedestrian and commercial circulation, street scape standards and design, and effective transitions between commercial and residential uses.

D. Permissible uses within a PRD include any use listed as a permitted use or condition use in the applicable zones, as per CMC Chapter 18.07, when approved as part of a master plan. Notwithstanding an approved master plan, incidental accessory buildings, incidental accessory structures, and home occupations may be authorized on a case by case basis.

E. A minimum of fifty percent to a maximum of seventy percent of the overall permitted residential density of the PRD must be single-family homes.

G. Density standards and bonuses for the residential portion of a PRD shall be in accordance with CMC Sections 18.23.040 and 18.23.050.

Section III

This ordinance shall take force and be in effect five (5) days from and after its publication according to law.

PASSED BY the Council and APPROVED by the Mayor this 16th day of March, 2015.

SIGNED: Scott
Mayor

SIGNED: Peter Capell
Clerk

APPROVED as to form:

City Attorney

EXHIBIT 76

ECOLOGICAL LAND SERVICES, INC.

May 5, 2015

Robert Maul, Planning Director
City of Camas
161 NE 4th Avenue
Camas, WA 98607

Re: Green Mountain Planned Residential Development and Phase 1 Response to WDFW Comments

Dear Mr. Maul:

Please accept this as a response to George Fornes' letter on behalf of the Washington Department of Fish and Wildlife (WDFW), dated March 17, 2015, regarding Oregon white oak woodlands, Green Mountain Biodiversity Area, Townsend's big-eared bat, Bradshaw's lomatium, and wetlands.

Oregon White Oak Woodlands

Ecological Land Services, Inc. biologists identified 20 Oregon white oaks on or immediately adjacent to the proposed Phase 1 project area. The regulations applicable to these oaks are found in the City's code, which was adopted through a formal public process, including review by the WDFW. While WDFW recommends that all the oaks within Phase 1 be considered priority habitat based on its management recommendations[1], the regulations applicable to this project are found in CCC *16.61.010(A) (3)(a)(i)* and *CCC 16.61.010(A)(3)(a)(ii)*. Specifically, these regulations require that oaks greater than 20 inches diameter breast height (dbh) be classified as habitats of local importance (*CCC 16.61.010(A) (3)(a)(i)*) and that oak stands greater than one acre, when found to be valuable to fish and wildlife (*CCC 16.61.010(A) (3)(a)(ii),* are regulated as priority habitat. The Applicant's proposal complies with the applicable requirements of the City's code.

The oaks to be impacted on Phase 1 are located on or adjacent to an active golf course. While the oaks by themselves have the potential to provide overstory habitat, the understory is heavily impacted by planted grass, regular mowing of the golf course fairways and rough, and other landscaping and maintenance activities. Few native species are present and understory structure is virtually non-existent. From an ecological standpoint, the understory lacks species diversity and habitat structure, providing low functions.

AVOIDANCE AND MINIMIZATION

Avoiding the regulated oaks and oak groves was a primary consideration when designing the PRD, including Phase 1. The Applicant and engineering team have re-examined the proposed Phase 1 grading plan, which was created after finalizing the design of Phase 1, to determine if any oaks could be avoided. Oak 2, a 22.5-inch dbh tree, will now be avoided because of its

[1] Larsen, E. and J.Morgan 1998. Management recommendations for Washington's priority habitats: Oregon white oak woodlands. Washington Department of Fish and Wildlife. Olympia, Washington. 37 pgs.

proximity to the site boundary and its location in which minimal grading is proposed. The remaining oaks lie in areas that require 2- to 3.5-feet of grading and cannot be reasonably avoided. The grading plan for subsequent phases has not been created; however, oaks will be avoided where reasonably possible as provided for in the City's code.

MITIGATION

To mitigate for the oaks being removed, we recommend a two-fold strategy of: 1) oak establishment/understory enhancement; and 2), oak preservation/understory enhancement. WDFW's letter commented that the proposed 2:1 stem count ratio was not adequate to replace the functions of mature oak to be removed and that temporal loss of habitat function was a concern. To address these issues, we propose direct establishment of oaks and enhancement of the understory, as well as a separate oak preservation and understory enhancement area. The two-fold approach will replace oak habitat on a canopy cover basis after approximately 10 years. This will preserve and enhance a mature oak grove to offset temporal loss and protect oak habitat over the long-term. We propose mitigating half of the impacts through establishment/ enhancement at a 4:1 and the other half of the impacts through preservation/enhancement at a 6:1.

Oak Establishment/Enhancement Area

The proposed oak establishment/enhancement area is located around the buffers of Wetlands B and D, much of which is currently part of an active golf course. Once the mitigation area is established, the existing high intensity land use will cease and the buffers will return to more natural conditions. To replace oaks removed, large caliper (minimum 1.5-inch diameter) ball & burlap oaks will be planted within the establishment/enhancement area along with overstory trees commonly associated with western Washington oak woodlands and appropriate for this site (Table 1)[2]. This will compensate for 50 percent of the oak canopy cover removed and replace all of the oak habitat (based on overstory canopy cover) after about 10 years (Table 2; Exhibits A and B). The oaks and associated trees will offer greater wildlife habitat than currently exists on the site. The trees will also provide a valuable food source for wildlife when they reach reproductive maturity. In the long-term, cavities, snags, and downed trees will provide good wildlife habitat.

The approximately 6,500 square foot (0.15 acre) oak planting area that was originally proposed in the southern buffer of Wetland D[3] will be expanded to accommodate additional area for planting trees and shrubs appropriate for western Washington oak woodlands. Figure 2 shows potential oak mitigation areas in the buffers of Wetlands B and D that set aside a larger area for mitigation than is actually needed (Exhibit B). The precise planting area will be determined at a later date pending further analysis of ecological and site layout considerations. Any extra area not used for the Phase 1 mitigation may be used for advance mitigation for the subsequent phases.

[2] Larsen and Morgan 1998
[3] Ecological Land Services, Inc. Dec 2014

Native shrubs commonly associated with western Washington oak woodlands (Table 1)[3] will be installed within the establishment/enhancement area to bolster species diversity and habitat structure. Thus, the understory will benefit from removing the existing land use, planting native shrubs, and allowing native colonizing species to take root in the area. Although most species of oaks do not produce acorns for several decades[4], natural oak regeneration will be possible in the future under protected status of the oak establishment/enhancement area. These elements will improve the habitat functions of the understory beyond its existing low functions.

To ensure its long-term protection, the oak establishment/enhancement area will be protected in perpetuity with a conservation covenant or similar legal mechanism once the surrounding development has been developed per the PRD plan.

Table 1. Planting specifications for the oak establishment/understory enhancement area

Species	Approximate Spacing (feet on center)	Plant Material Specifications	Approx. Quantity
Tree stratum			
Bigleaf maple (*Acer macrophyllum,* FACU)	10	18-36 inch bareroot	
Oregon ash (*Fraxinus latifolia*, FACW)	10	18-36 inch bareroot or container	To be determined
Oregon white oak (*Quercus garryana,* FACU)	14	1.5-inch caliper B&B	
		Tree Density	Approx. 200 trees/acre
Shrub stratum			
Western serviceberry (*Amelanchier alnifolia*, FACU)	6-7	18-36 inch bareroot	
Oceanspray (*Holodiscus discolor*, FACU)	6-7	18-36 inch bareroot	
Tall Oregon-grape (*Mahonia aquifolium*, FACU)	6-7	12 to 18 inch bareroot or container	To be determined
Nootka rose (*Rosa nutkana*, FAC)	6-7	18-36 inch bareroot	
Common snowberry (*Symphoricarpos albus*, FACU)	6-7	18-36 inch bareroot	
		Shrub Density	Approx. 500 shrubs/acre

[4] Loftis, D. and C. McGee, eds. 1993. Oak Regeneration: Serious problems, Practical recommendations. General Technical Report SE-84. Ashville, North Carolina. U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station.

Oak Preservation/Enhancement Area
The oak preservation/enhancement area is proposed to compensate for 50 percent of the oak canopy impacts by setting aside existing oak habitat along a riparian corridor in the southern PRD (Table 2; Exhibits A and B). The exact boundaries of this mitigation area shown on Figure 2 are to be determined pending ecological and site design considerations. The oak preservation/enhancement area will mitigate for temporal loss, protect oak habitat, and enhance the understory with native shrubs commonly associated with oak woodlands. To enhance species diversity and habitat structure, native shrubs will be installed in selected portions of the understory that are more open and will benefit from an understory stratum.

The area is well suited for preservation because a portion of it lies within the outer 50 percent of a Type Np stream buffer that could be subject to future development through buffer averaging. The oak preservation/enhancement area has greater plant species diversity across all strata with an overstory *and* understory habitat structure, unlike the species diversity and habitat structure associated with the impacted oaks; thus, the preservation/enhancement area will exceed the habitat functions currently provided by the oaks to be impacted. By preserving an established and well developed oak stand, **the project will lower the temporal loss and risk of failure with strictly replacement-based mitigation**. Like the oak establishment/ enhancement area, the oak preservation/enhancement area will be protected in perpetuity with a conservation covenant or similar legal mechanism once the surrounding development has been developed per the PRD plan. The conservation covenant will allow for future plantings of oaks, if ecologically appropriate, and would need to accommodate the following:

1. Trails per the PRD plan and/or the City of Camas Parks & Open Space Plan
2. Unavoidable road crossings to allow access to inner part of the site

Table 2. Oregon white oak habitat impacts and mitigation

Impacts		Mitigation						
Total Oaks[1]	**Estimated Oak Canopy Cover (sf)**[2]	**Type**	**Canopy Impact Break-down**	**Ratio (canopy cover)**	**Required Canopy Cover (sf)**[3]	**Required Area (acres)**	**Goals**	**Location/ Notes**
19	15,400	Oak Establishment/ Understory Enhancement	7,700 (50% impact)	4:1	30,800	0.7	▪ To replace oak habitat at approx. 10 yrs ▪ To enhance understory diversity and structure	▪ Establish area in Wetlands B & D buffers ▪ Plant native understory shrubs
		Oak Preservation/ Understory Enhancement	7,700 (50% impact)	6:1	46,200	1.1	▪ To offset temporal loss ▪ To protect oak habitat ▪ To enhance understory diversity and structure	▪ Preserve oak stand along Type Np stream ▪ Plant native understory shrubs

[1] Oak 1, 7, 9, 55, 58, 64, and 121 are locally regulated oaks that are proposed to be removed.
[2] We estimated canopy cover of 1,000 square feet per tree or an estimated drip diameter of about 32 feet per tree. The estimated canopy cover errs on the high side, as some of the oaks do not have completely circular canopies.
[3] The canopy cover within the oak preservation/enhancement area is based on an estimate of 1,000 square feet per tree for oaks 20 inches dbh and 700 square feet per tree for oaks 20 inches. See Exhibits A and B.

MITIGATION RATIOS RATIONALE

Mitigation ratios on a few projects (generally public projects) provided as examples by the WDFW have ranged from 5:1 to 8:1 based on amount of canopy cover removed[5]. We propose a 4:1 for oak habitat establishment, which we believe accomplishes the goal of increasing the quality of oak habitat over a reasonable period of time and is more consistent with mitigation ratios typically applied to a private development. The ratio is warranted because:

- Large oak (1.5-inch caliper, ball & burlap) trees will be planted. A 6:1 ratio for canopy cover was required for a residential project in Klickitat County and oaks were specified to be 3 feet tall or a 2 gallon container. The ball & burlap oaks proposed for the Phase 1 mitigation will be considerably larger and are anticipated to outpace the growth of a smaller tree with proper planting and maintenance. Based on our analysis of estimated growth rates of oaks in the area, oaks can be expected to grow approximately 0.7 feet/year. Thus, we anticipate a 7-foot increase in canopy cover over a 10 year period for properly planted and maintained oak trees. The large caliper ball & burlap oak should achieve approximately 75 percent canopy cover after 10 years.

[5] Information provided by George Fornes, WDFW, April 22, 2015 email

- The establishment area will be coupled with a preservation area at a 6:1. Coupling direct establishment with preservation is similar to the WSDOT SR14 widening project, which both restored and preserved oak habitat (Mitigation ratios were higher with this state-funded project).

Advance Oak Mitigation

Outside of Phase 1, the subsequent phases of the PRD will also impact oaks; the exact number to be determined pending ecological considerations and site design constraints (Exhibits A and B). Avoidance will always be considered as it is one of the regulatory factors in identifying oaks that may or may not be appropriate to remove; green spaces and parks are already planned in areas with high concentrations of oaks. To be proactive, the Applicant proposes to establish potential advance oak mitigation areas within the Type Np stream corridor and several associated wetland buffers in the southern PRD. Other advanced mitigation areas may be identified onsite as well, including, but not limited to, any surplus buffer area around Wetlands B and D not used for Phase 1 mitigation. Advanced mitigation could potentially take place offsite as well, which would involve further consultation with WDFW.

The advance mitigation is proposed at a 2:1 ratio based on canopy cover impacts. This ratio is warranted because oak and associated trees and shrubs will be established many years before future phases are to be developed. Furthermore, the advance mitigation will have lower temporal loss and risk of failure than concurrent mitigation. Specific annual performance standards will have to be met before credits can be "withdrawn" from the advance mitigation site. An advance oak mitigation plan will be prepared in consultation with WDFW and will be submitted within 6 months of the approval of the PRD, creating the possibility for the first advanced mitigation plantings to take place in the fall/winter of 2015-2016.

Green Mountain Biodiversity Area

The northern portion of Phase 1 is mapped as the Green Mountain Biodiversity Area. According to the WDFW, the area is mapped because it consists of mature conifer forest of large size (approximately 300 acres) located within rapidly expanding development, with high value as refugia/remnant habitat and regular small concentrations of blacktail deer. The area in the northern portion of the site that is mapped as a biodiversity area differs in species, age class, and community structure from offsite forest to the north that is mapped as the same biodiversity area; thus it does not meet the regulatory criteria to be classified as a biodiversity area.

Offsite Mapped Area

The forested area immediately north of the northern project boundary consists of a mature coniferous forest dominated by Douglas-fir. We estimate the stand to be 70 to 75 years. This mature Douglas-fir forest provides a nearly 100 percent coniferous overstory cover. The understory consists of native shrubs and herbaceous species. Understory density is low because of shading by the overstory. This area is within the mapped Green Mountain Biodiversity Area and meets the PHS designation as we understand it.

ONSITE MAPPED AREA

In contrast, the area that lies within the mapped Green Mountain Biodiversity Area in the northern portion of Phase 1 differs from the dense coniferous forest located in the mapped area offsite. The young forested area onsite is comprised of approximately 15 percent coniferous trees and 85 percent deciduous. The mixed deciduous overstory is 20 to 25 years and dominated by red alder and black cottonwood in the overstory. Douglas-fir and grand fir, the only two species of conifer observed, occupy subordinate positions in the overstory, along with Scouler willow and bigleaf maple. The understory is notably denser than the offsite mapped area because it receives more sunlight than the understory offsite to the north. Shrubs and herbaceous species are fairly dense in the northern portion of Phase 1, and are predominately native (although English holly and Himalayan blackberry are present). Although this area falls within the mapped Green Mountain Biodiversity Area, it is a young, mixed deciduous forest that is structurally different from the offsite mapped area and does not meet the PHS designation of a *mature conifer forest*.

Both the onsite mapped area and offsite logged area have different species composition, age class, and structure from the offsite coniferous forested area to the north and do not satisfy the criteria necessary to be classified as a Biodiversity Area. At some point in the future, the mapped Biodiversity Area will likely need to be amended by WDFW after ground-truthing because there is a discrepancy between the mapping and forest types on the ground (young mixed deciduous forest onsite and the land to the immediate east of the Phase 1 project area that was logged about 5 years ago and has current logging activity are mapped as within the designated Green Mountain Biodiversity Area). Prior to developing subsequent phases in the forested area north of Phase 1, the area will be surveyed by ELS and WDFW biologists to determine its Biodiversity Area status.

Townsend's Big-Eared Bat

The developable areas within Phase 1 do not support topography suitable caves. However, rock outcrops and areas that may contain caves exist in the northern part of the PRD and outside of the Phase 1 project area. Thus, any cave or cave-like feature, if present, would be located in areas that are topographically steep, within the BPA powerline easement, or otherwise non-developable areas. Ecological Land Services biologists and the Applicant have surveyed the proposed Phase 1 project area extensively and no caves or hibernaculums were located within the developable areas. Based on the lack of caves or hibernaculums within the proposed developable area and the lack of bats observed during field investigations, no known bat habitat will be impacted by Phase 1. Field surveys with WDFW biologists will be conducted prior to development of subsequent phases in areas with potential habitat.

Bradshaw's Lomatium

Bradshaw's lomatium (*Lomatium bradshawii*) usually occupies remnant low-elevation grasslands and prairies in wet, seasonally flooded areas adjacent to streams and small rivers[6].

[6] Washington Natural Heritage Program rare plant information. Online at: http://www1.dnr.wa.gov/nhp/refdesk/fguide/pdf/lobr.pdf.

The lomatium is typically found in transitional areas between wetlands and uplands. This type of habitat may be present in undisturbed stream and wetland buffers onsite; however, the majority of the site is actively used as a golf course. The species typically blooms late April through the first week of May, although flowering may be earlier this spring because of the drier conditions. Fruits are set mid-May to early July and are helpful in positively identifying the species.

Bradshaw's lomatium has been identified in southern Clark County. The nearest identified population is approximately 0.25 miles from the closest PRD boundary[5].

Rare plant surveys were conducted by Ecological Land Services biologists during the species' flowering period in April and May 2009[7] and periodic site visits in 2013 and 2014. No Bradshaw's lomatium were identified within the PRD boundaries during these surveys. Additionally, the superintendent for the golf course has a Bachelor's of Science in Horticulture and extensive knowledge of the site and its plants. He can positively identify Bradshaw's lomatium and has never observed the species within the boundaries of the PRD during his many years as superintendent at the course.

Wetlands

Wetland Ratings

The *Critical Areas Report* was submitted on December 31, 2014[8]. The Department of Ecology adopted a new wetland rating system that went into effect January 1, 2015. The City's code incorporates the most recent version of Ecology's regulations on this issue. Because the application was submitted to the City prior to Ecology's adoption of the new regulations, under *RCW 58.17.033*, the application is required to be subject to those rules and regulations in effect at the time of the application submittal. Thus, Ecology's 2004 wetland rating system was used in this case.

Wetland Buffer Reduction with Enhancement

The combined buffer reduction allowed under *CCC 16.53.050(C)(1)(c)* and described in the December 2014 *critical areas report* meets the requirements of *CCC 16.53.050 (C)(1)(a) Lower Impact Land Uses* and *CCC 16.53.050 (C)(1)(b) Restoration* in the following ways:

CCC 16.53.050(C)(1)(a) Lower Impact Land Uses. The buffer widths recommended for proposed land uses with high-intensity impacts to wetlands can be reduced to those recommended for moderate-intensity impacts if both of the following criteria are met:

i. *A relatively undisturbed, vegetated corridor at least one hundred feet wide is protected between the wetland and any other priority habitats that are present as defined by the Washington State Department of Fish and Wildlife; and*

   This criteria is met because the wetland is located near the offsite mapped Green Mountain Biodiversity Area.

---

[7] Ecological Land Services, Inc. July 2009. Rare Plant Survey for Green Mountain, Camas, Washington. Prepared for GM Camas, LLC.

[8] Ecological Land Services, Inc. Dec 2014

ii. *Measures to minimize the impacts of the land use adjacent to the wetlands are applied, such as infiltration of stormwater, retention of as much native vegetation and soils as possible, direction of noise and light away from the wetland, and other measures that may be suggested by a qualified wetlands professional.*

Stormwater is being detained and treated according to the most recent *Stormwater Management Manual for Western Washington*. The wetland buffer area to be enhanced is located in part of an active golf course, and is not dominated by native plants. Native shrubs are proposed to enhance the existing vegetation. Native soils will not be disturbed, except as necessary to plant the proposed shrubs. Street lights and outdoor residential lighting will be fitted with glare protectors to minimize light impacts. Additional measures to minimize dust impacts are described below.

Table 2. Measures to minimize disturbance impacts

Disturbance	Measures to minimize disturbance impacts	Specific measures to minimize disturbance impacts
Lights	▪ Direct lights away from the wetland	Street lights will be directed away from the wetland and appropriate glare protections will be installed. Outside residential lighting will have appropriate glare protections or be low-wattage to avoid light impacts.
Change in water regime	▪ Infiltrate or treat new runoff from surfaces	All stormwater runoff will be treated per the most recent *Stormwater Management Manual for Western Washington*. Hydrology to existing wetlands will be maintained.
Dust	▪ BMPs for dust	A gravel construction access will be constructed. Silt fencing will be temporarily installed around the boundaries of the construction area where runoff may occur. Contractor will follow BMPs to control sediment from all ground-disturbing activities.

CCC 16.53.030(C)(1)(b) Restoration. Buffer widths may be reduced up to twenty-five percent if the buffer is restored or enhanced from a pre-project condition that is disturbed (e.g. dominated by invasive species), so that functions of the post-project wetland and buffer are equal or greater. To the extent possible, restoration should provide a vegetated corridor of a minimum one hundred feet wide between the wetland and any other priority habitat areas as defined by the Washington State Department of Fish and Wildlife. The habitat corridor must be protected for the entire distance between the wetland and the priority habitat area by some type of permanent legal protection such as a covenant or easement.

The December 2014 *Critical Areas Report* described the proposed enhancement plan for the southern buffer of Wetland D. The buffer to be enhanced is located in a part of an active golf course that is dominated by non-native grass species. The enhancement plan specifies native shrubs and herbaceous species to enhance the existing plant community and improve the species diversity and habitat structure beyond its existing low conditions[9]. The enhanced buffer will be protected in perpetuity with a conservation easement or similar legal mechanism once the surrounding development has been developed per the PRD plan.

We can be contacted at 350-578-1371 with any questions or concerns.

Respectfully,

Mara McGrath

Mara McGrath
Ecologist

Francis Naglich
President/Wetland Biologist

cc: John Schmidt, Metropolitan Land Group, LLC
Randy Printz, Landerholm

Attachments:

Figure 1 Site Map

Figure 2 Oak Mitigation Details

Exhibit A Oak Summary by Phase, Oak Detail by Pod

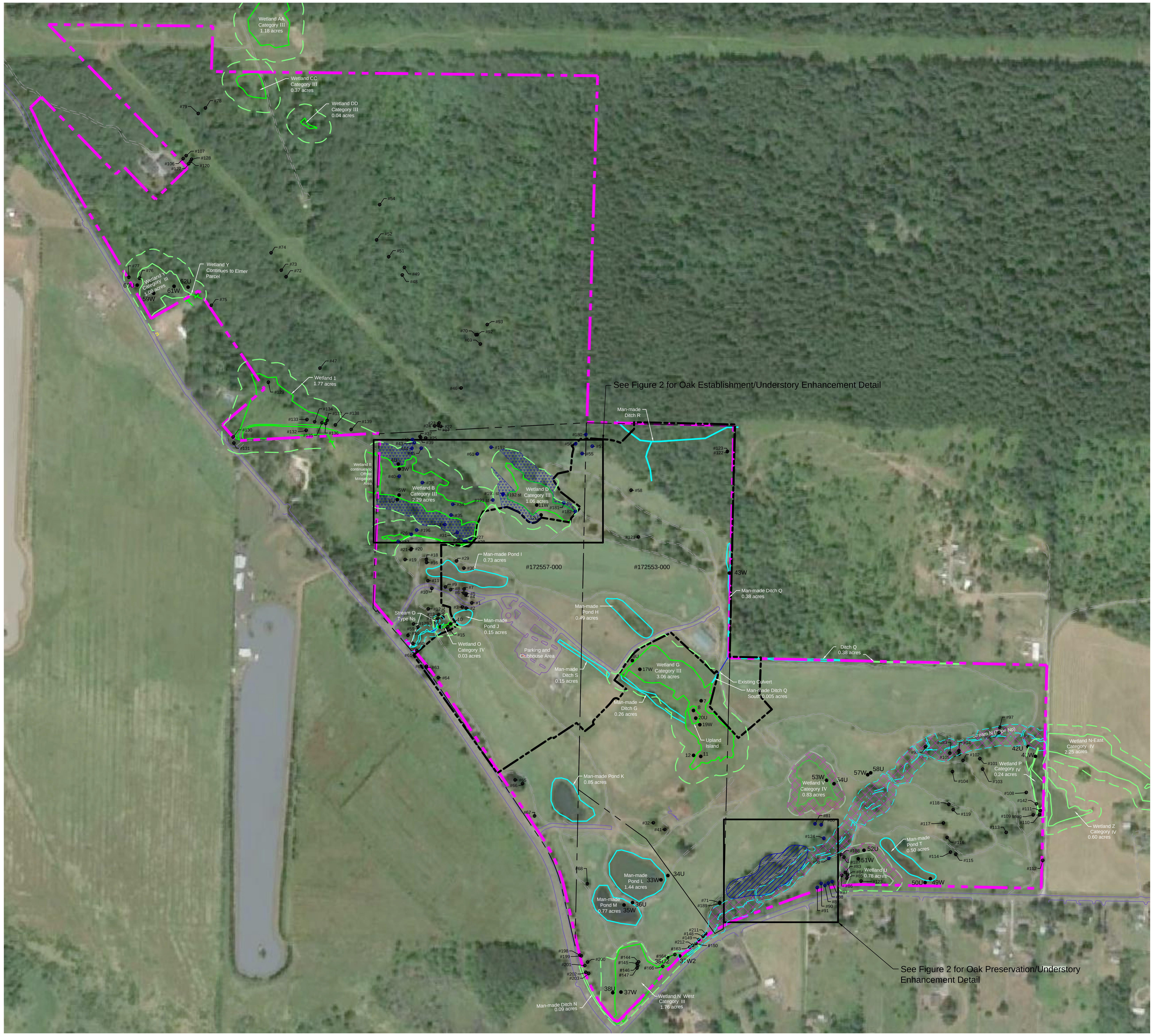
Exhibit B Concurrent and Advance Mitigation Summary

[9] Table 5 in Ecological Land Services, Inc. Dec 2014

Attachments

Figure 1	Site Map
Figure 2	Oak Mitigation Details
Exhibit A	Oak Summary by Phase, Oak Detail by Pod
Exhibit B	Concurrent and Advance Mitigation Summary

5/5/2015 12:49 PM S:\ELS\WA\Clark\Camas\2048-Green Mountain Land, LLC\2048.01-Green Mountain\2048.01-Figures\2048.01_DL-PH1.dwg cpayne



LEGEND:

- PRD Boundary
- Phase I Boundary (Approx. 53 acres)
- Taxlot Boundary
- Wetland
- Wetland Buffer
- Man-made Pond or Ditch
- Stream
- Stream Buffer
- Existing Gravel Path
- Existing Pavement
- #22 Oak Tree
- Tree Survey (WRG Design)
- 9 Test Plot
- Oak Preservation/Understory Enhancement Area (Approx. 1.6 acres) Of the total possible preservation/enhancement area, 1.1 acres to be used
- Oak Establishment/Understory Enhancement Area (Approx. 2.7 acres) Of the total possible establishment/enhancement area, 0.7 acres to be used
- Potential Advance Oak Mitigation Areas (Gross 7.1 acres, Net Approx. 5.7 acres) Of the total possible advance oak mitigation areas, 2.3 acres to be used

NOTES:
1. Aerial photo from Google Earth™.
2. Site surveyed by WRG Design, 2007.
3. See Figure 2 for oak mitigation details.

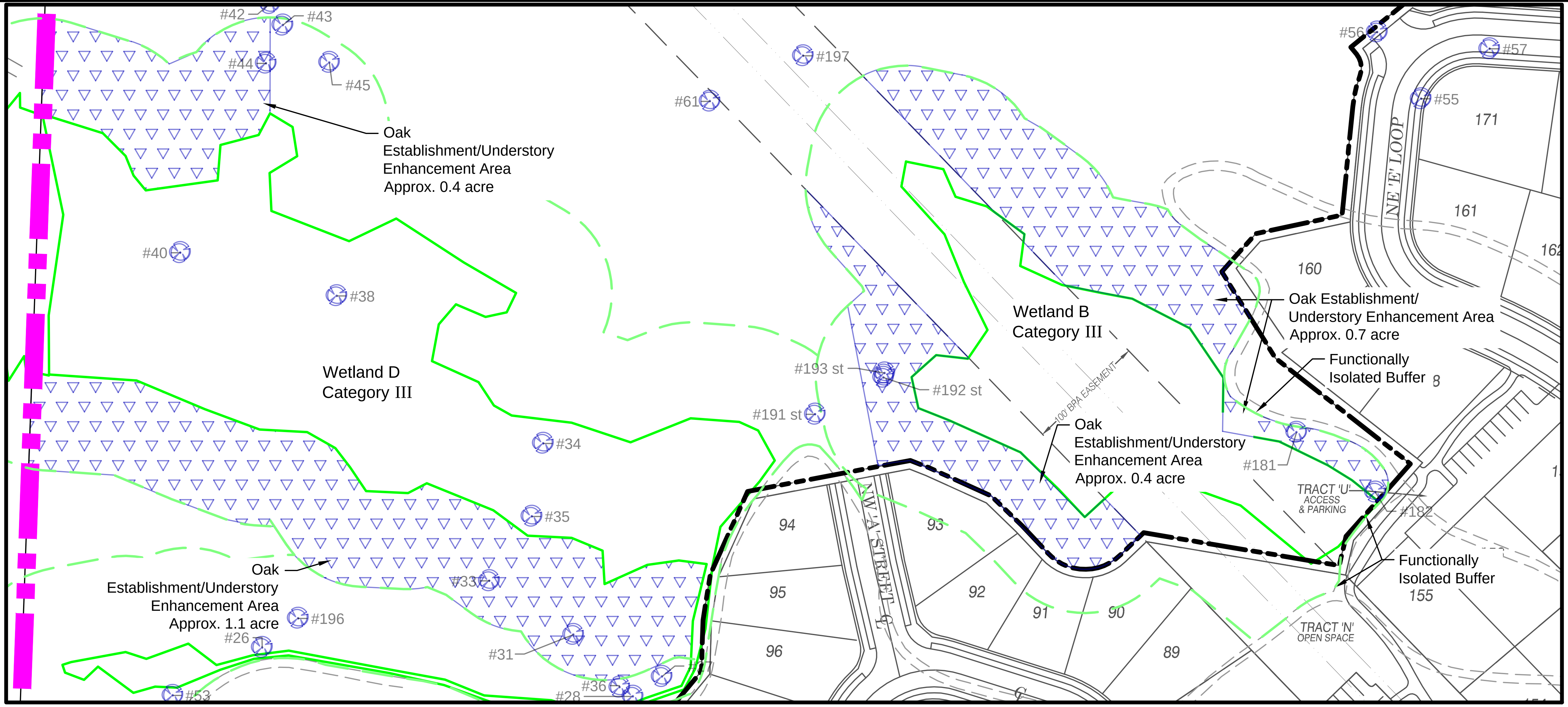
N

0 250 500
SCALE IN FEET
1" = 250'

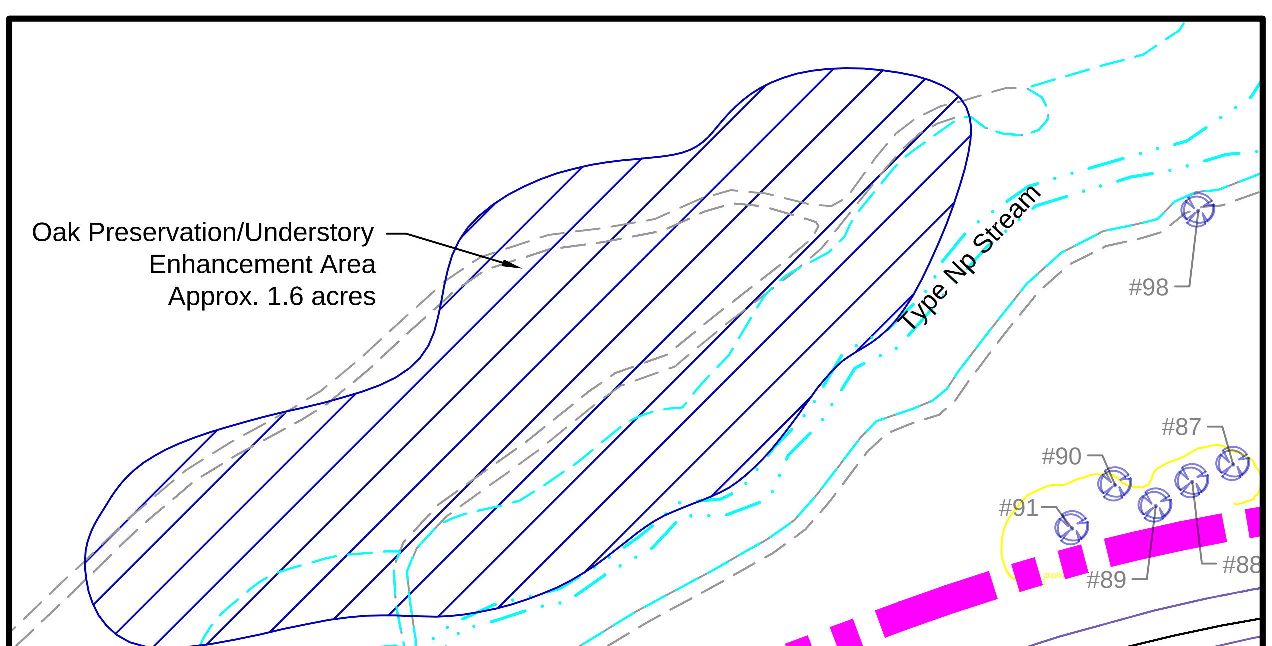
ECOLOGICAL LAND SERVICES, INC.
1157 3rd Ave., Suite 220
Longview, WA 98632
Phone: (360) 578-1371 Fax: (360) 414-9305

DATE: 5/5/15
DWN: JKJ
REQ. BY: CS
PRJ. MGR: AA/CS
CHK:
PROJECT NO: 2048.01

Figure 1
SITE MAP
Green Mountain Mixed Use PRD - Phase 1
Green Mountain Land, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.



Oak Establishment/Understory Enhancement



Oak Preservation/Understory Enhancement

LEGEND:

PRD Boundary

Phase I Boundary

Wetland

Wetland Buffer

OHWM of Type Np Stream

50' Stream Buffer

Existing Gravel Path

Existing Pavement

Oak Establishment/Understory Enhancement Area (Approx. 2.7 acres)
Of the total possible establishment/enhancement area, 0.7 acres to be used

Oak Preservation/Understory Enhancement Area
(Approx. 84 Oak Trees with an Average DBH of 12" Covering 1.6 acres)
Of the total possible preservation/enhancement area, 1.1 acres to be used

#81 Existing Oak Tree

Figure 2
OAK MITIGATION DETAILS
Green Mountain Mixed Use PRD - Phase 1
Green Mountain Land, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.

DATE: 5/5/15
DWN: JKJ
REQ. BY: CS
PRJ. MGR: AA/CS
CHK:
PROJECT NO: 2048.01

ECOLOGICAL LAND SERVICES, INC.
1157 3rd Ave., Suite 220
Longview, WA 98632
Phone: (360) 578-1371 Fax: (360) 414-9305

SCALE IN FEET
1" = 100'
0 100 200

Exhibit A
Oak Tally

Oak Summary by Phase

Phase	Total Oaks	Total Canopy Cover (sf)
Phase 1	19	15,400
Other Phases	52	49,400

Oak Detail by Pod

Pod	Number of Oaks	Oak Id.	Diameter (inches)	Est canopy cover (sf)	Notes
A1	2	32	32.6	1,000	
		41	37.5	1,000	
A2	2	71	33.0	1,000	
		189	32.0	1,000	
A3	3	80	24.0	1,000	Broken upper trunk
		81	28.5	1,000	
		124a	20.2	1,000	
		124b	24.0		
B1	3	65	50.0	1,000	
		66	48.0	1,000	
		67	66.0	1,000	Downed oak
B2	0	0			
B3	1	61	19.0	700	
B4	0	0			
B5	3	188	24.1	1,000	
		98	26.7	1,000	
		86	19.7	1,000	
C1	8	1	25.0	1,000	Phase 1
		3	15.0	700	
		4	14.5	700	
		5	17.5	700	
		6	19.5	700	
		62	18.0	700	
		63	13.0	700	
		64	25.0	1,000	
C2	0	0			Phase 1
D1	5	7	31.7	1,000	Phase 1
		8a	18.0	700	
		8b	18.0		
		9	22.0	1,000	
		29	12.0	700	
		30	18.0	700	
D2	1	121	26.0	1,000	Phase 1
D3	2	122	8.0	700	Phase 1
		123	10.0	700	
D4	7	116	18.5	700	
		115	18.4	700	
		114	22.7	1,000	
		117	14.7	1,000	
		119	26.6	1,000	
		118a	16.6		
		118b	18.5		
		118c	23.7	1,000	
		104	26.8	1,000	
E1	3	58	26.1	1,000	Phase 1
		55	21.3	1,000	
		57	13.0	700	

Exhibit A
Oak Tally

Pod	Number of Oaks	Oak Id.	Diameter (inches)	Est canopy cover (sf)	Notes
E2	5	101	19.0	700	
		103	17.7	700	
		113	18.7	700	
		109	17.0	700	Snag
		108	21.8	1,000	Snag
E4	3	72	24.0	1,000	
		73a	25.0	1,000	
		73b	31.0		
		74a	13.0		
		74b	23.0	1,000	
		74c	30.0		
F1a	0	0			
F1b	0	0			
F1c	5	106	22.0	1,000	
		107	14.0	700	
		120	28.0	1,000	
		127	23.0	1,000	
		128	19.0	700	
F2	2	78	35.0	1,000	
		79	25.0	1,000	
F3	0	0			
F4	0	0			
G	9	93	16.0	700	
		70	14.0	700	
		92	15.0	700	
		69a	16.0	700	
		69b	16.0		
		48	16.0	700	
		49a	14.0	700	
		49b	14.0		
		51	13.0	700	
		52	13.0	700	
		54	18.0	700	
H	7	68		1,000	
		198		1,000	
		199		1,000	
		200		1,000	
		201		1,000	
		202		1,000	
		203		1,000	
				64,800	

Total Oaks all Pods =	**71**
Total Phase 1 Oaks =	**19**
Total Advance Mitigation Oaks =	**52**

NOTE: Trees with multi-trunks listed as a,b,c etc.

Exhibit B
Concurrent and Advance Mitigation Summary

Phase 1 Concurrent Mitigation								
	No. Oaks	**Avg. Canopy Cover (sf)**	**Canopy Cover Impacted (sf)**					
Total oaks impacted in Phase 1	19							
Jursidictional oaks (> 20 inches dbh)	7	1,000	7,000					
Non-jurisdictional oaks (< 20 inches dbh)	12	700	8,400					
Total canopy to mitigate for in Phase 1			**15,400**					
	Location			**Mitigation ratio (to 1)**	**Area Required (sf)**	**Area Required (acres)**	**Available acres in target mitigation area**	**Surplus in target mitigation area (acres)**
Use establishment/enhancement to mitigate for 50% of the impact	Buffers of Wetlands B and D		7,700	4	30,800	0.7	2.7	2.0
Use preservation/enhancement of existing oak grove to mitigate for other 50%	Type Np stream corridor		7,700	6	46,200	1.1	1.6	0.5

Advance Oak Mitigation								
	No. Oaks		**Canopy Cover Impacted (sf)**	**Mitigation ratio (to 1)**	**Area Required (sf)**	**Area Required (acres)**	**Available acres in target mitigation area (with 20% area reduction)**	**Surplus in target mitigation area (acres)**
Total oaks impacted in phases outside of Phase 1	52		49,400	2	98,800	2.3	5.7	3.4

Note:

1. Canopy cover estimated based on 1,000 sf for oaks > 20 inches dbh and 700 sf for oaks < 20 inches.
2. Advance oak mitigation area total reduced by 20 percent to account for future site design and/or ecological constraints.

EXHIBIT 77

Gray & Osborne, Inc.
CONSULTING ENGINEERS

TECHNICAL MEMORANDUM

TO:	CITY OF CAMAS
FROM:	MALLORY TAYLOR, P.E.
DATE:	NOVEMBER 20, 2013
SUBJECT:	HYDRAULIC MODEL FIRE FLOW RESULTS, GREEN MOUNTAIN CITY OF CAMAS, CLARK COUNTY, WASHINGTON G&O #13493.00

This memorandum discusses the results of running the hydraulic model for fire flow availability for the Green Mountain area. The model was run on November 19, 2013, by Mallory Taylor and the results were checked by Tom Zerkel.

A conceptual water master plan for Green Mountain was added to the Camas hydraulic model to determine available fire flow. The Attachment shows the conceptual master plan for the Green Mountain development.

2015 maximum day demands were applied to the model, with all reservoirs operating and the PRV at Payne Road open and set at 30 psi. The conceptual master plan shows the range of proposed units for the development, which range from 1,524 to 1,779 single-family residential units. Demands were applied to the Green Mountain development based on the Water System Plan ERU value of 296 gpd/ERU. Using the high projection of units for a conservative estimate, the demand for the development totals approximately 527,000 gpd (1,779 units x 296 gpd/ERU). This demand was distributed evenly among the nodes in the new development.

Figure 1 shows the pipe and node ID map for the proposed Green Mountain development. This development will be served off of the 544 Zone through the Lacamas Booster Pump Station (BPS), the Lacamas Reservoir, the 855 Zone through the Payne Road PRV, and Well 9 (when operating).

The highest elevation for the proposed development is Node J4-104 at 500 feet. Per the conceptual plan, this area will be served by a BPS. The BPS was not included in the hydraulic model, and this corresponding node was not considered when looking at pressure drops through the 544 Zone during fire flow conditions.

The following scenarios show the available fire flows during 2015 maximum day demands with the Payne Road PRV open and set at 30 psi.

8513 NE Hazel Dell Avenue, Suite 106 Vancouver, Washington 98665 (360) 571-3350 Fax (360) 571-4547

SCENARIO 1

Scenario 1 assumes that the development is constructed with 8-inch water mains and no improvements or upgrades to the existing distribution piping. See the attached Figure 2.

TABLE 1

Scenario 1 Fire Flow Data

Node	Elevation (feet)	Flow (gpm)	Residual Pressure (psi)	Static Pressure (psi)
J4-101	370	710	20	49
J4-102	290	830	20	84
J4-103	270	1,080	20	83
J4-432	227	1,255	20	111
J-5061	200	980	20	123.2

SCENARIO 2

Scenario 2 assumes 18-inch extension improvements along Goodwin Road and Ingle Road are made. See the attached Figure 3.

TABLE 2

Scenario 2 Fire Flow Data

Node	Elevation (feet)	Flow (gpm)	Residual Pressure (psi)	Static Pressure (psi)
J4-101	370	850	20	49
J4-102	290	965	20	84
J4-103	270	1,270	20	93
J4-432	227	1,147	20	112
J-5061	200	1,028	20	123

SCENARIO 3

Scenario 3 assumes the extension improvements along Goodwin Road and Ingle Road are made from Scenario 2, and that portions of the 8-inch line along Goodwin Road and Ingle Road are upsized. See the attached Figure 4.

TABLE 3

Scenario 3 Fire Flow Data

Node	Elevation (feet)	Flow (gpm)	Residual Pressure (psi)	Static Pressure (psi)
J4-101	370	1,159	20	50
J4-102	290	1,460	20	85
J4-103	270	1,764	20	94
J4-432	227	1,745	20	113
J-5061	200	1,725	20	124

Scenario 3 meets the minimum fire flow requirements of 1,000 gpm for 60 minutes for single-family residences. Although the hydraulic model shows that an 18-inch transmission main meets residential fire flow requirements below an elevation of 370 feet, the City will want to consider installing a 24-inch transmission main to serve the NUGA and the future Green Mountain Reservoir, per the WSP.

The Department of Health and City standards for water distribution systems are to meet the peak hourly demand of the system while providing a minimum pressure of 30 psi system-wide. Under peak daily demand with a fire flow, the system is designed to maintain a minimum pressure of 20 psi system-wide. Although the peak hourly demand pressure may currently be higher than these standards, the developer must recognize that the City may not provide pressure higher than 30 psi in the future. The developer may design their system for whatever pressure they wish; however, they must recognize and be responsible for conditions when the pressure may be less than currently exists.

ATTACHMENT

GREEN MOUNTAIN CONCEPTUAL MASTER PLAN

GREEN MOUNTAIN
CONCEPTUAL MASTER PLAN

WATER TRANSMISSION MAIN CONCEPT DRAWING
10/10/13 BY OLSON ENGINEERING

CAMAS, WASHINGTON
GREEN MOUNTAIN LAND, LLC. 08/12/13

TOTAL SITE AREA 281.6 AC

SITE AREA TABLE

R10 ZONE	119.5 AC
R6 ZONE	54.0 AC
MF ZONE	92.8 AC
CC ZONE	15.3 AC (13.2 AC)
TOTAL SITE AREA	281.6 AC

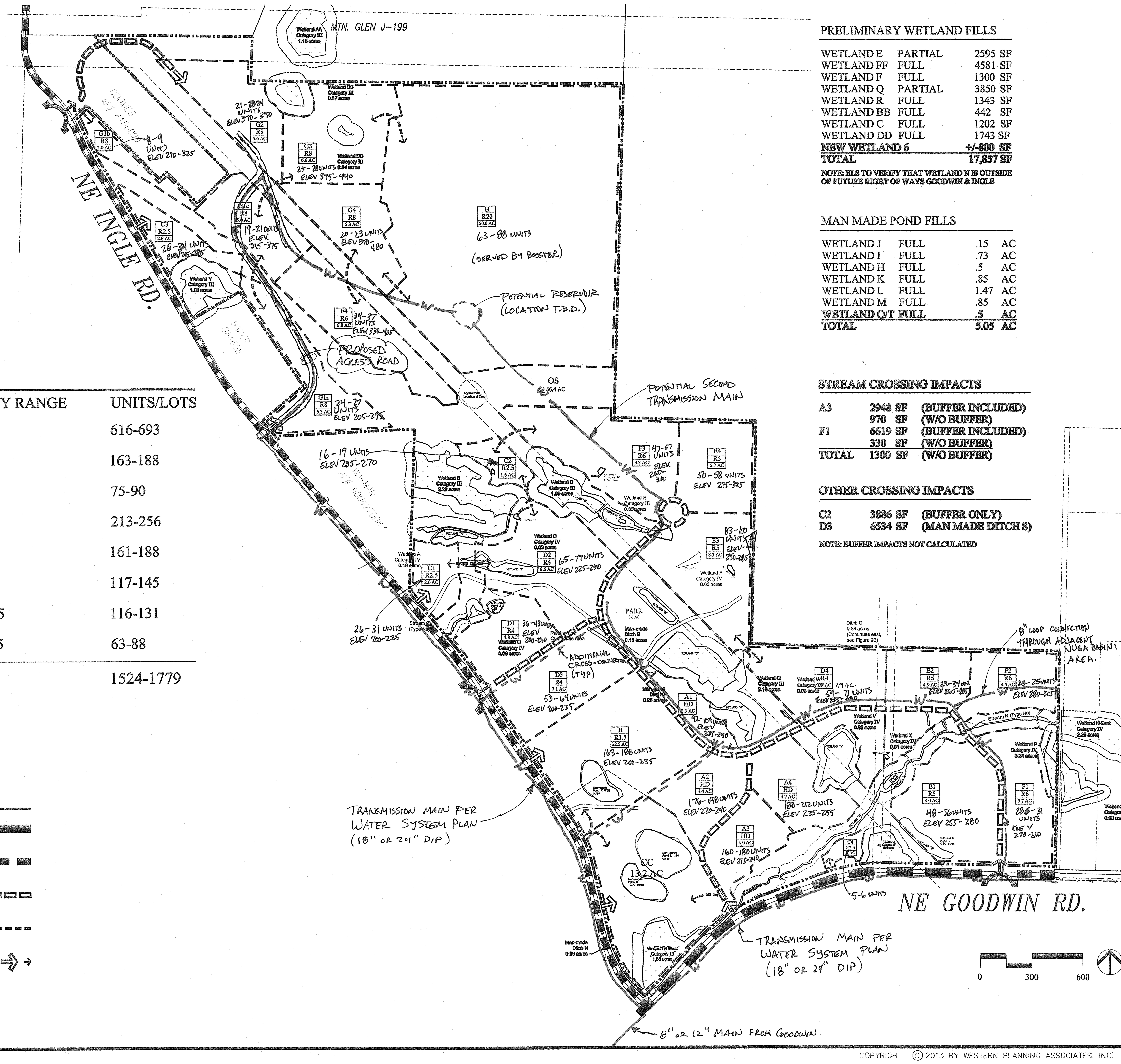
DENSITY TABLE

POD	ACRES	AV LOT SF	DENSITY RANGE	UNITS/LOTS
A	15.4	HD	40-45	616-693
B	12.5	1500	13-15	163-188
C	7.5	2500	10-12	75-90
D	28.4	4000	7.5-9	213-256
E	26.9	5000	6-7	161-188
F	26.3	6000	5-5.5	117-145
G	30.9	8000	3.75-4.25	116-131
H	50.0	20,000	1.25-1.75	63-88
TOTALS	197.9 AC			1524-1779

PARK & OPEN SPACE 70.0 ± AC

CIRCULATION COMPONENTS

ARTERIAL
COLLECTOR
NEIGHBORHOOD CIRCULATOR
NEIGHBORHOOD CONNECTOR
COMMUNITY ENTRIES & ACCESS POINTS



PRELIMINARY WETLAND FILLS

WETLAND E	PARTIAL	2595 SF
WETLAND FF	FULL	4581 SF
WETLAND F	FULL	1300 SF
WETLAND Q	PARTIAL	3850 SF
WETLAND R	FULL	1343 SF
WETLAND BB	FULL	442 SF
WETLAND C	FULL	1202 SF
WETLAND DD	FULL	1743 SF
NEW WETLAND 6		+/-800 SF
TOTAL		17,857 SF

NOTE: ELS TO VERIFY THAT WETLAND N IS OUTSIDE OF FUTURE RIGHT OF WAYS GOODWIN & INGLE

MAN MADE POND FILLS

WETLAND J	FULL	.15 AC
WETLAND I	FULL	.73 AC
WETLAND H	FULL	.5 AC
WETLAND K	FULL	.85 AC
WETLAND L	FULL	1.47 AC
WETLAND M	FULL	.85 AC
WETLAND Q/T	FULL	.5 AC
TOTAL		5.05 AC

STREAM CROSSING IMPACTS

A3	2948 SF	(BUFFER INCLUDED)
	970 SF	(W/O BUFFER)
F1	6619 SF	(BUFFER INCLUDED)
	330 SF	(W/O BUFFER)
TOTAL	1300 SF	(W/O BUFFER)

OTHER CROSSING IMPACTS

C2	3886 SF	(BUFFER ONLY)
D3	6534 SF	(MAN MADE DITCH S)

NOTE: BUFFER IMPACTS NOT CALCULATED

DRAFT

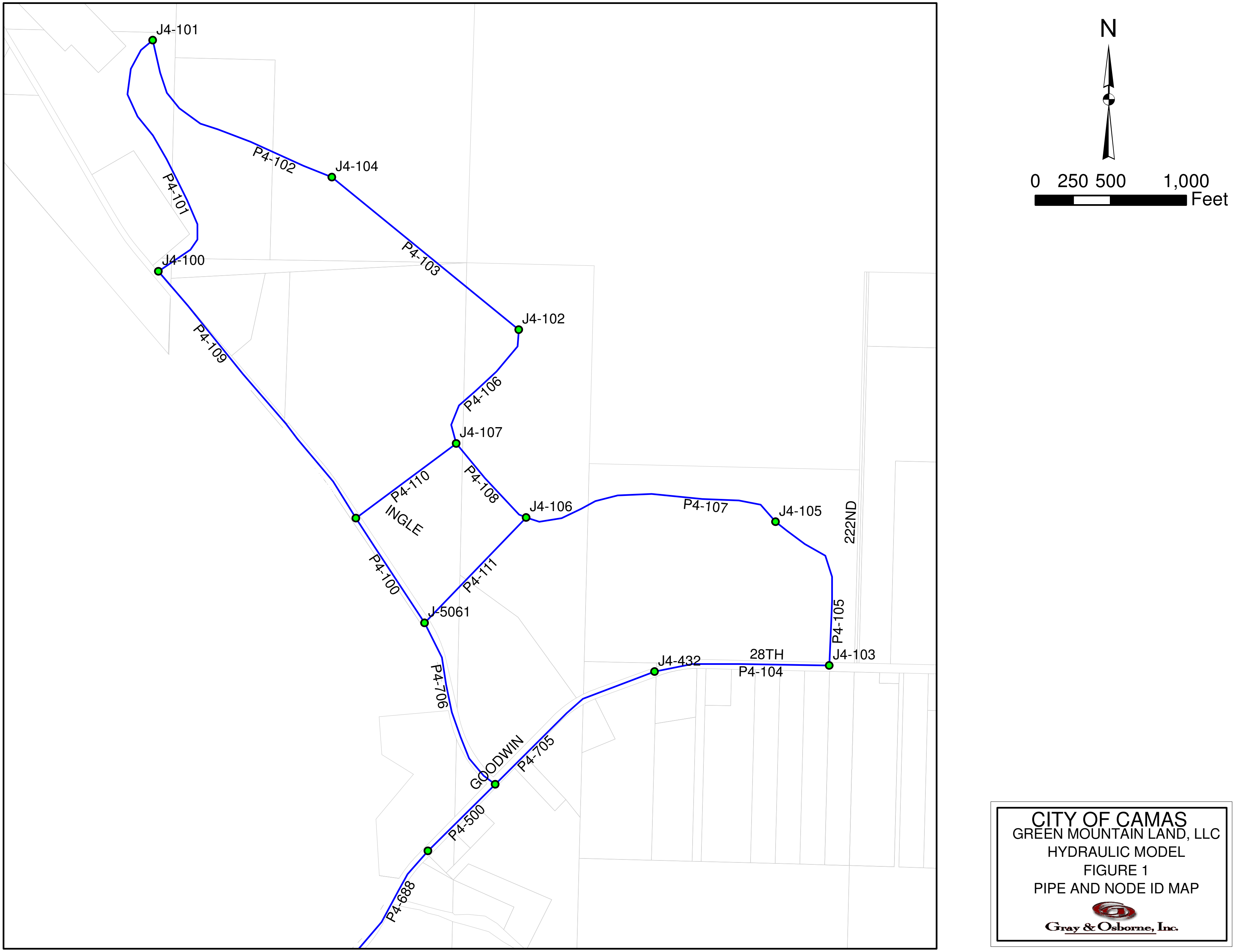
WESTERN PLANNING ASSOCIATES
Land Planning
Landscape Architecture
P.O. BOX 2392
LAKE OSWEGO, OR
97035
503-294-0222

SCALE: AS NOTED
DESIGNED BY: WFH
DRAWN BY: SH
CHECKED BY: WFH
DATE: 09/19/13
REVISED:

STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
WILLIAM F. HORNING
CERTIFICATE NO. 382

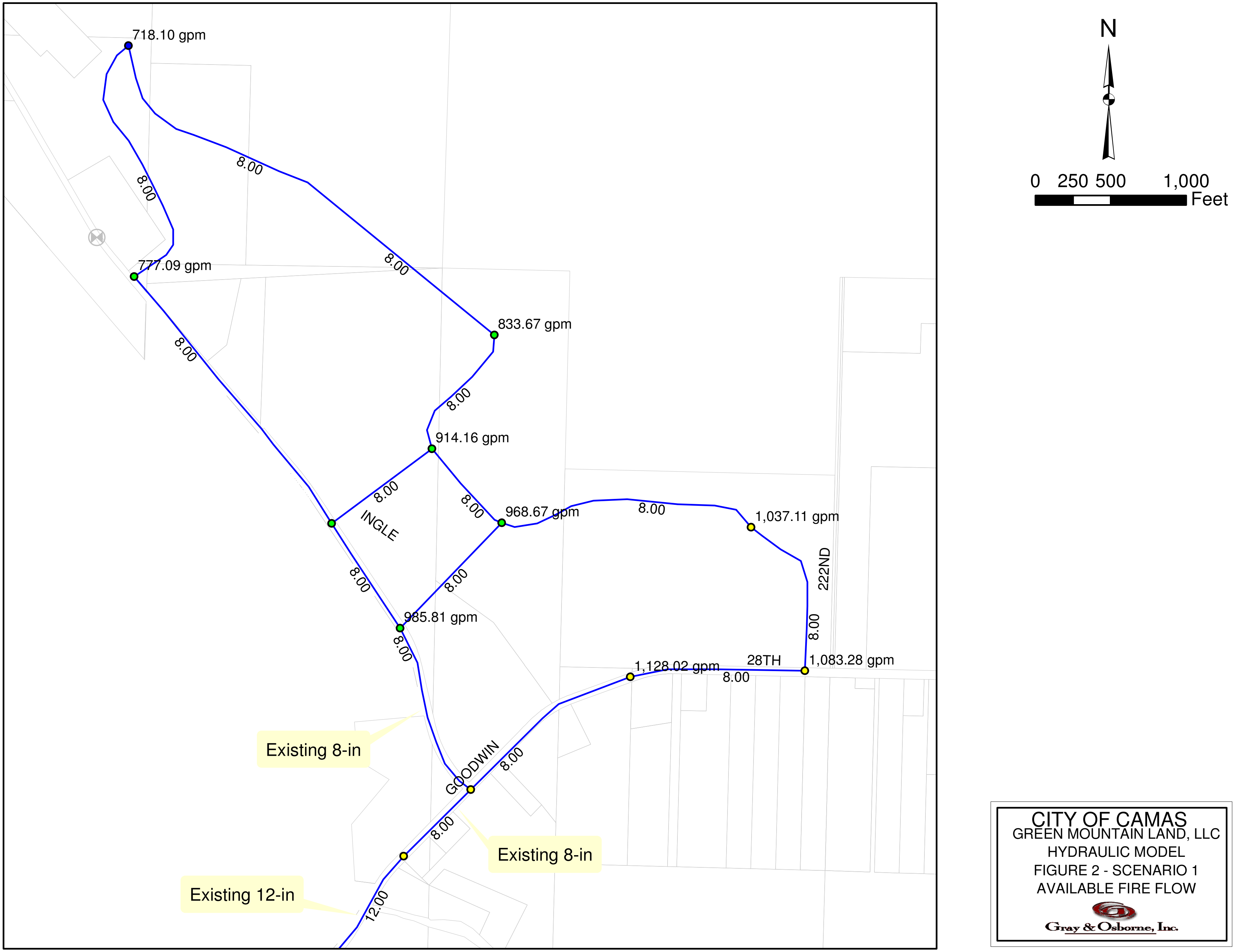
GREEN MOUNTAIN
CONCEPTUAL MASTER PLAN
GREEN MOUTAIN LAND, LLC.
CAMAS, WASHINGTON

1 of 2



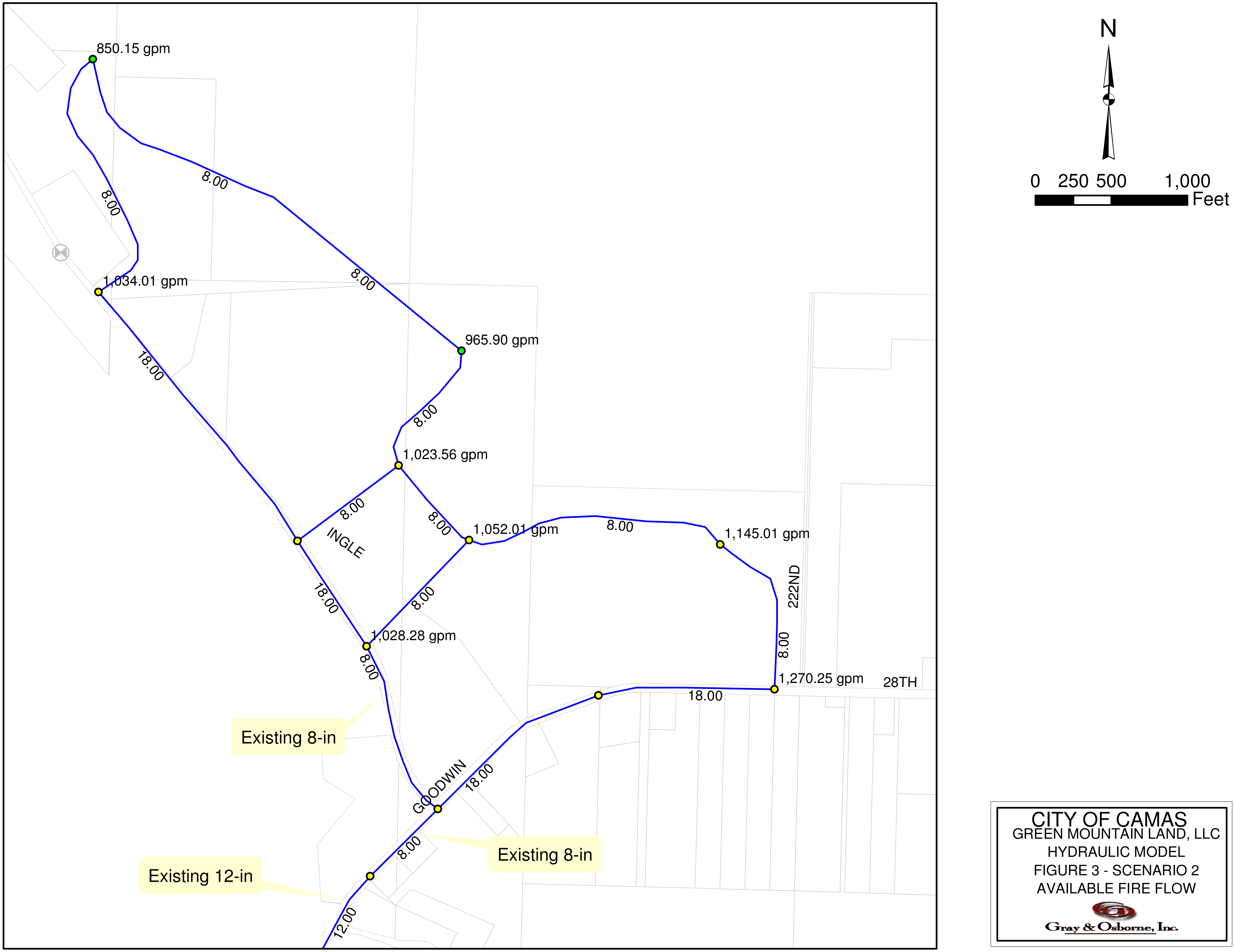
CITY OF CAMAS
GREEN MOUNTAIN LAND, LLC
HYDRAULIC MODEL
FIGURE 1
PIPE AND NODE ID MAP

Gray & Osborne, Inc.



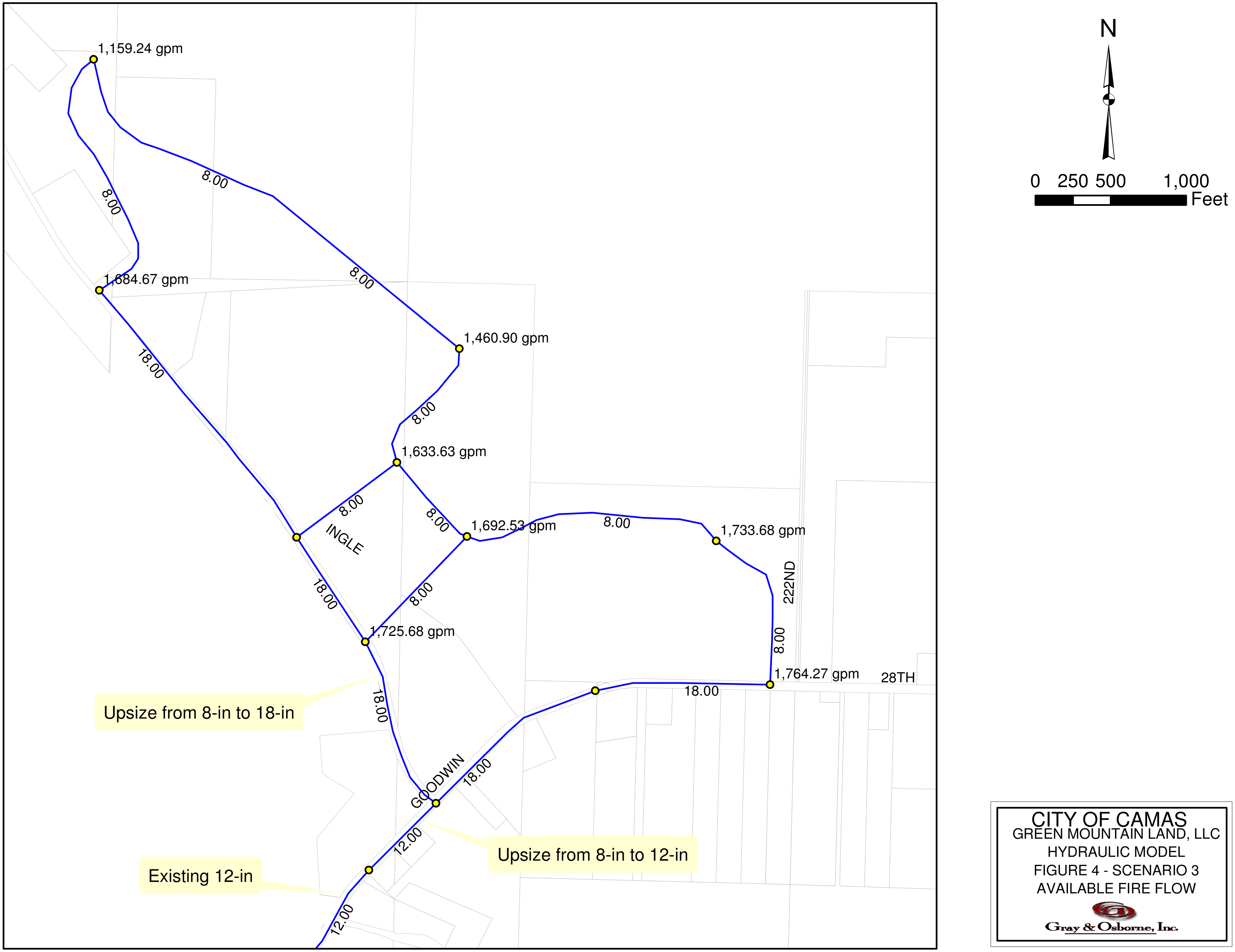
CITY OF CAMAS
GREEN MOUNTAIN LAND, LLC
HYDRAULIC MODEL
FIGURE 2 - SCENARIO 1
AVAILABLE FIRE FLOW

Gray & Osborne, Inc.



CITY OF CAMAS
GREEN MOUNTAIN LAND, LLC
HYDRAULIC MODEL
FIGURE 3 - SCENARIO 2
AVAILABLE FIRE FLOW

Gray & Osborne, Inc.



CITY OF CAMAS
GREEN MOUNTAIN LAND, LLC
HYDRAULIC MODEL
FIGURE 4 - SCENARIO 3
AVAILABLE FIRE FLOW
Gray & Osborne, Inc.

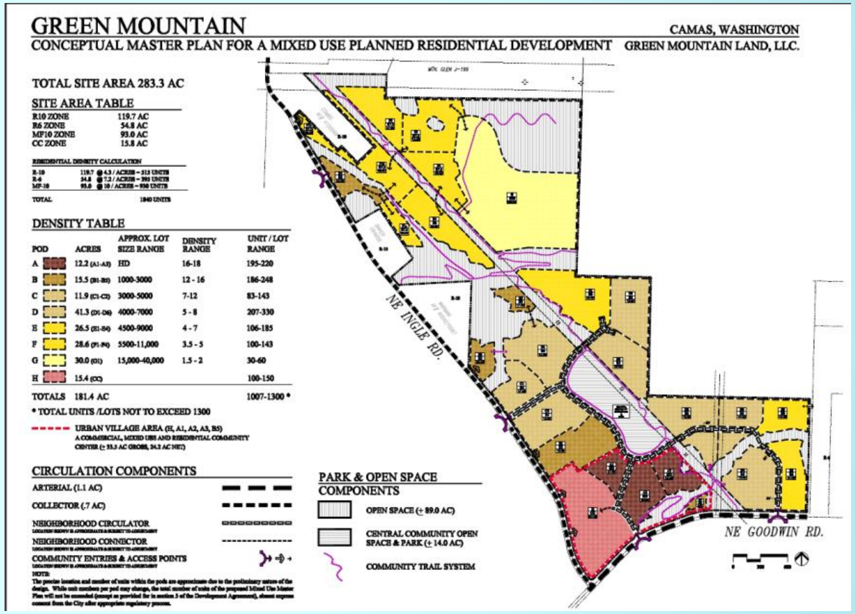
EXHIBIT 78

Green Mountain Planned Residential Development
SUB14-02

Planning Commission Public Hearing
5/12/2015

Project Background

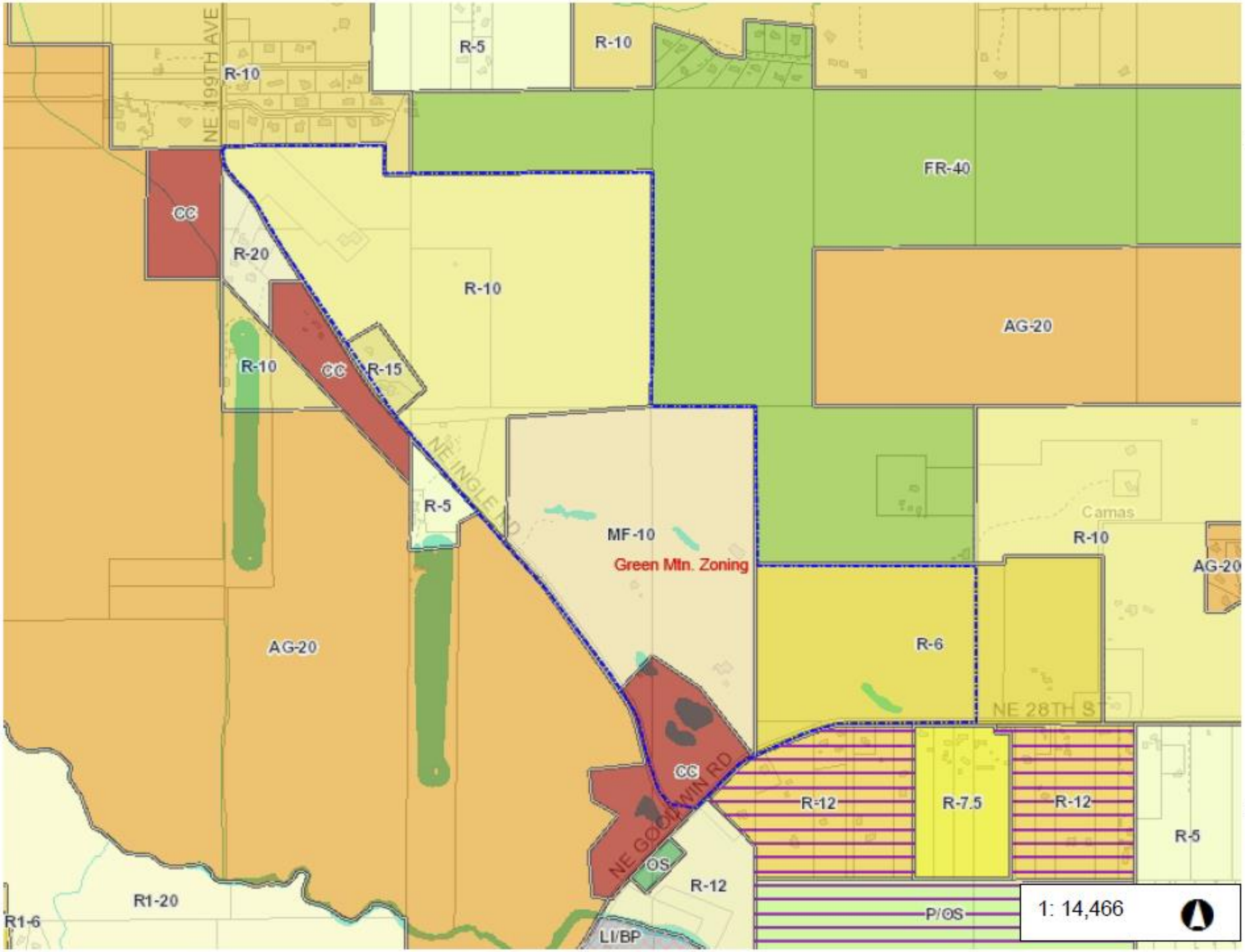
- Development Agreement
  - Vesting / Predictability
  - Master Planning
  - Transportation
  - Planning Standards
  - Parks Plan
  - Tree Preservation
- Application Submittal
  - PRD
  - Subdivision Phase 1
- Sewer



Site Location

NE Corner of NE Goodwin Rd. and NE Ingle Rd.

Zoning Map



Legend

Zoning Overlay

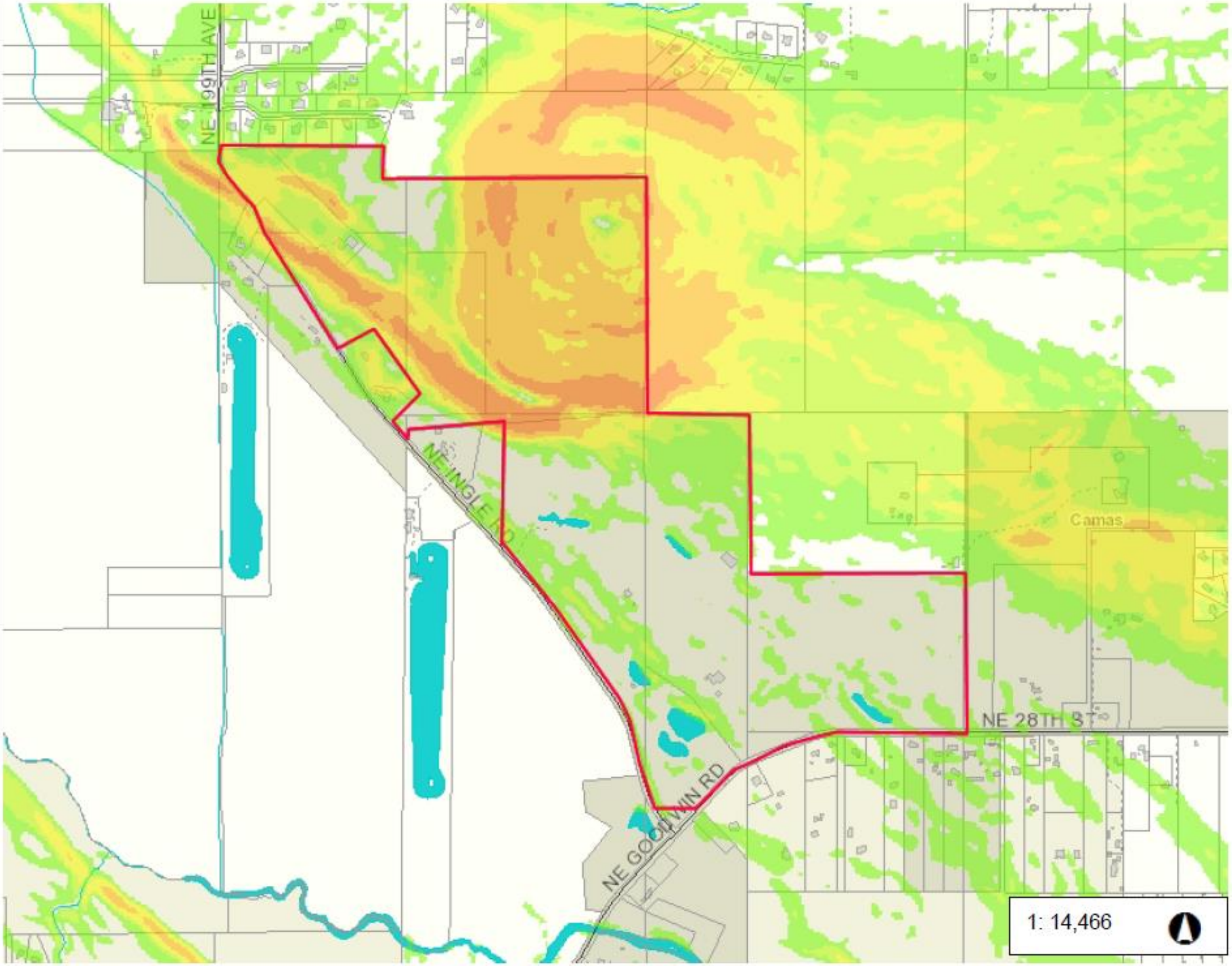
- Urban Reserve - 10 (UR-10)
- Industrial Urban Reserve - 20 (UR-
- Railroad Industrial Urban Reserve (
- Railroad Industrial Overlay District (
- Urban Holding - 10 (UH-10)
- Urban Holding - 20 (UH-20)
- Urban Holding - 40 (UH-40)
- Airport Environs Overlay
- Surface Mining Overlay District
- Existing Historic Resort
- Mill Creek Overlay District
- Highway 99 Overlay District
- Activity Center Overlay
- Transitional Area Overlay
- Single Family Residential Area Ove
- Mixed Residential Area Overlay
- Multifamily Residential Area Overla
- 78th Street Property
- Columbia River Gorge Scenic Area
- Mixed Use Overlay
- Vancouver - Multiple Overlays
- Sewer Capacity Overlay
- Infill Residential Development Area

Notes:

2,411.0 0 1,205.48 2,411.0 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere
Clark County, WA. GIS - http://gis.clark.wa.gov

General Slope Map



Legend

Slopes
- less than 5 Percent
- 5-10 Percent
- 10-15 Percent
- 15-25 Percent
- 25-40 Percent
- 40 - 100 Percent

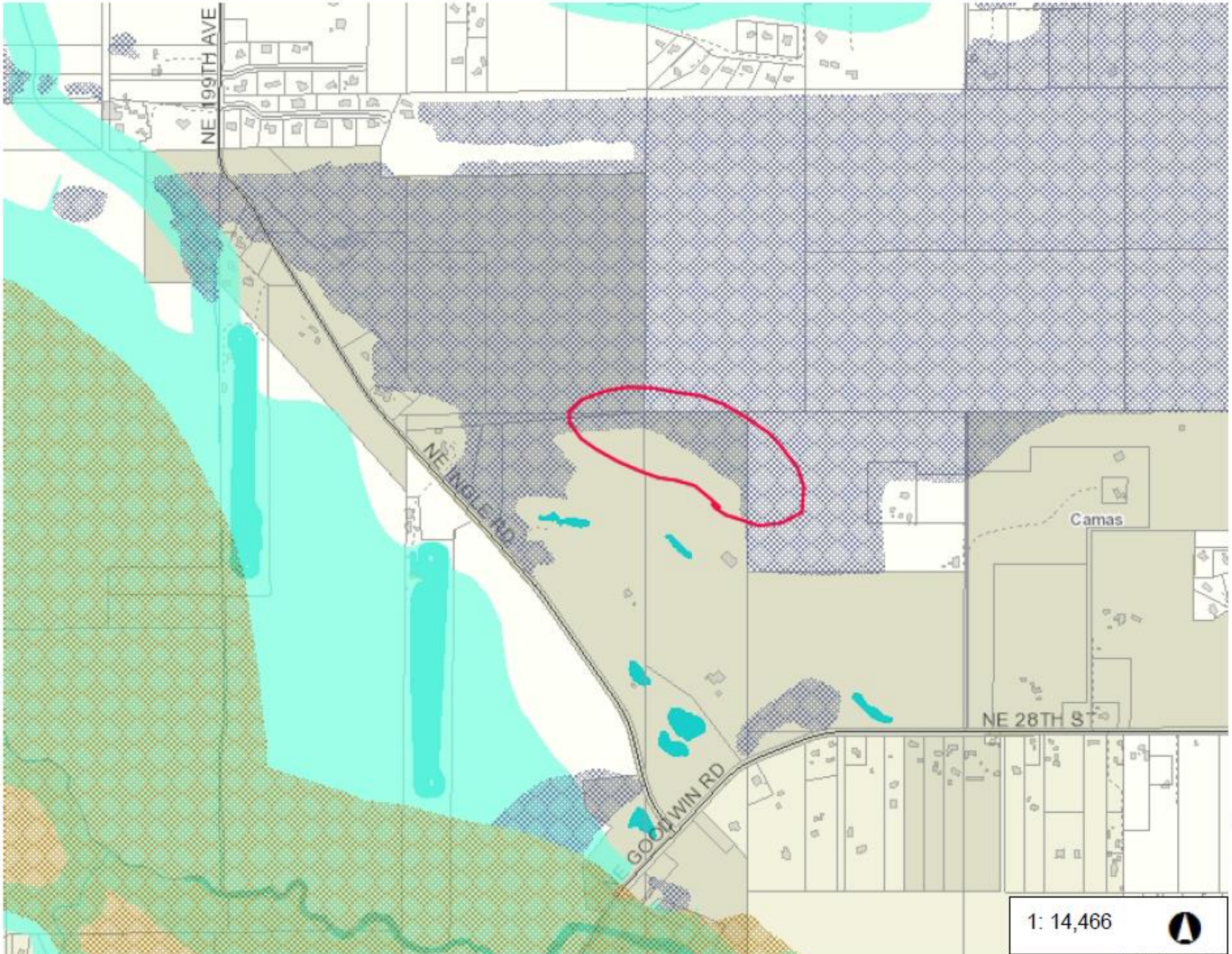
Building Footprints
Taxlots
Cities Boundaries
Urban Growth Boundaries

2,411.0 0 1,205.48 2,411.0 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere
Clark County, WA. GIS - http://gis.clark.wa.gov

Notes:

Biodiversity Map



Legend

Priority Habitat & Species Area

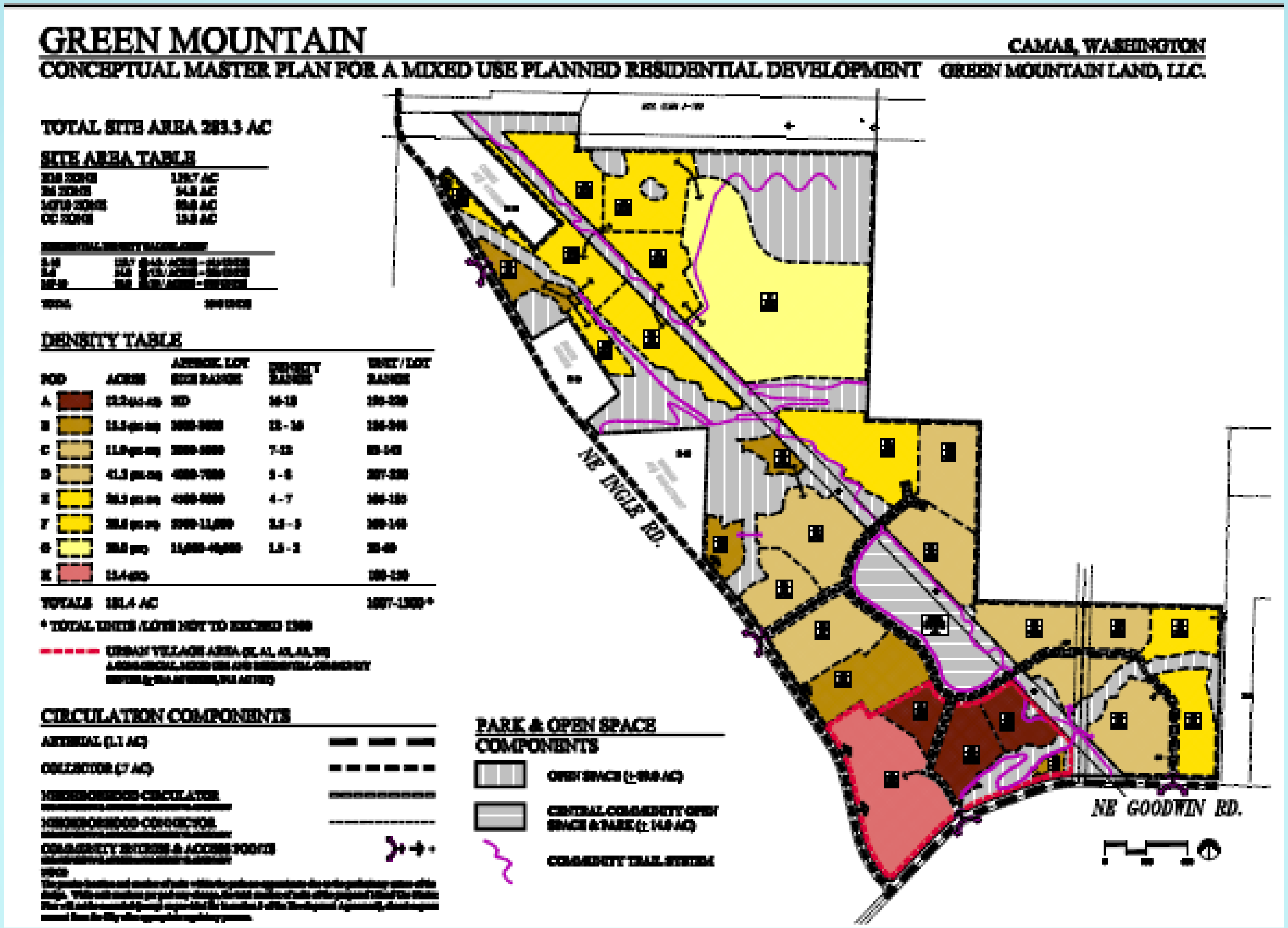
- Non-riparian Habitat Conservation A
- Species Area
- Riparian Habitat Conservation Area
- Building Footprints
- Taxlots
- Cities Boundaries
- Urban Growth Boundaries

Notes:

2,411.0 | 0 | 1,205.48 | 2,411.0 Feet

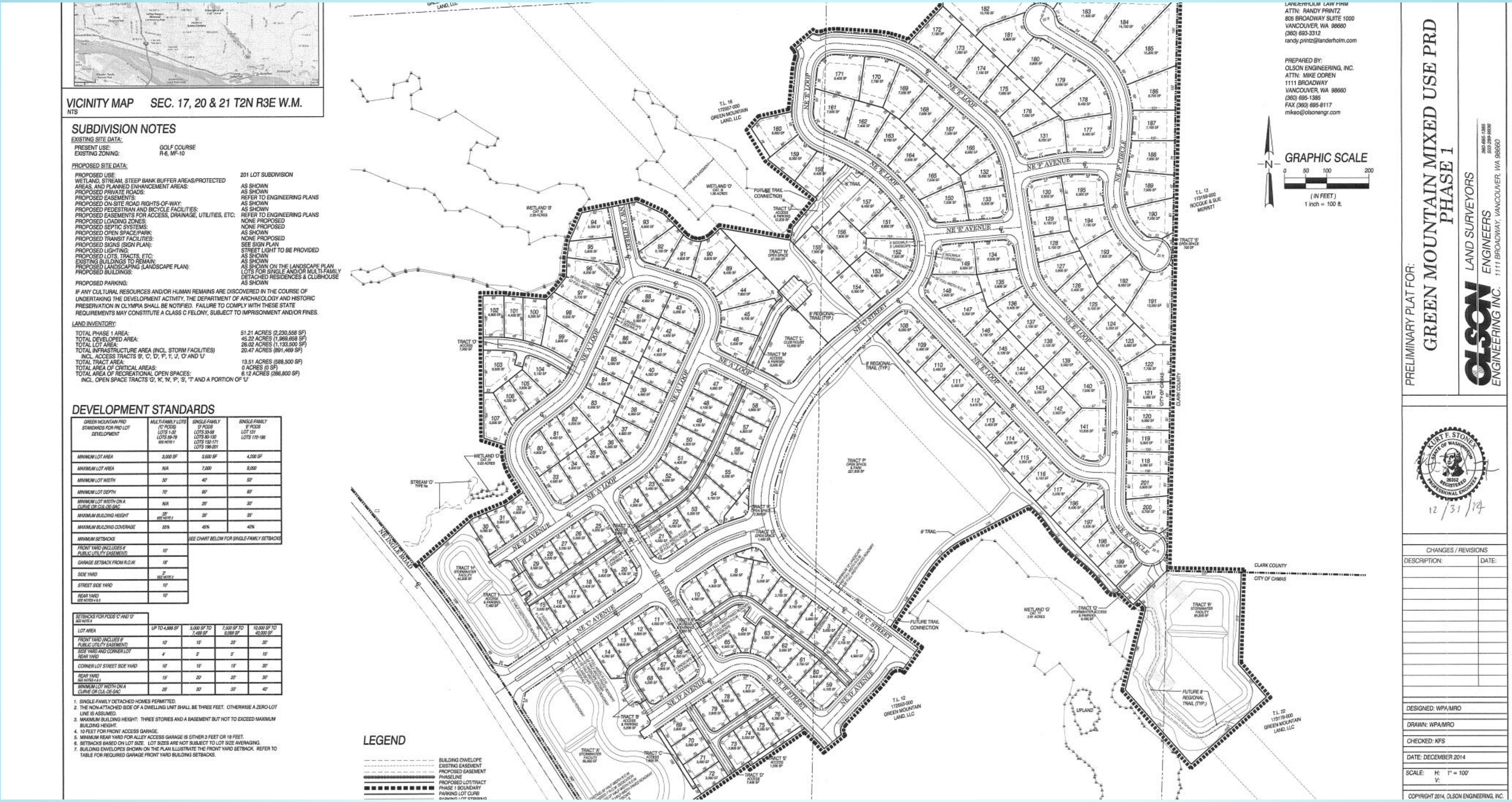
WGS_1984_Web_Mercator_Auxiliary_Sphere

Clark County, WA. GIS - http://gis.clark.wa.gov



PRD General Layout

Conceptual Master Plan

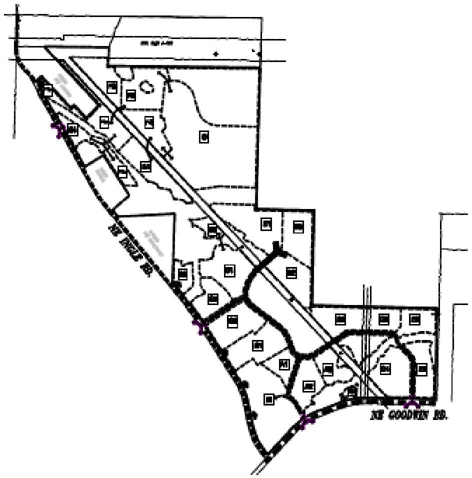


Phase 1

Preliminary Plat

GREEN MOUNTAIN
DEVELOPMENT STANDARDS & PHASING PLAN

CAMAS, WASHINGTON
GREEN MOUNTAIN LAND, LLC.



PLANNING UNITS

PLANNING STANDARDS

URBAN VILLAGE AREA

URBAN VILLAGE AREA - Mixed Use, Community Commercial, A and B PODS

Urban Village Area	[illegible]

DENSITY & DIMENSIONS

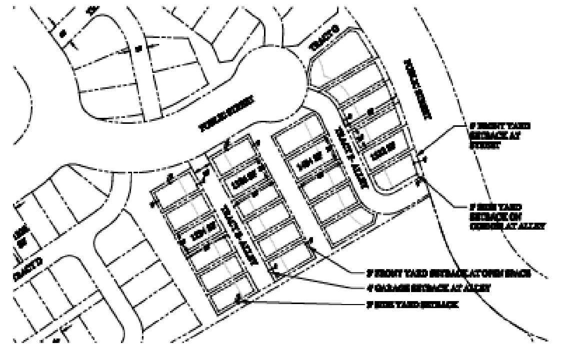
Green Mountain PRD PODs A-B and corresponding Camas Zones

	A POD	B POD	C POD
DENSITY	[illegible]	[illegible]	[illegible]
Max. du/gross ac	24	18	10
Min du/gross ac	6	8	6
STANDARD LOTS			
Min lot size	[illegible]	[illegible]	[illegible]
Min lot width	20	20	30
Min lot depth	60	60	70
Max. Floor Area ratio	No Max	No Max	No Max
SETBACKS			
Min front/garage	[illegible]	[illegible]	[illegible]
Min side	[illegible]	[illegible]	[illegible]
Min side/flanking street	[illegible]	[illegible]	[illegible]
Min rear	[illegible]	[illegible]	[illegible]
Lot coverage, Max	[illegible]	[illegible]	[illegible]
BUILDING HEIGHT, Max.	[illegible]	[illegible]	[illegible]

[illegible]

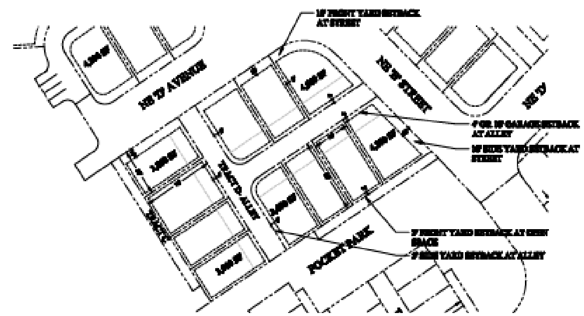
Density Transfer Lots	D POD	E POD	F POD	G POD
DENSITY	[illegible]	[illegible]	[illegible]	[illegible]
Max. du/gross ac	[illegible]	[illegible]	[illegible]	[illegible]
DENSITY TRANSFER LOTS				
Min lot size	[illegible]	[illegible]	[illegible]	[illegible]
Max. lot size	[illegible]	[illegible]	[illegible]	[illegible]
Min lot width	[illegible]	[illegible]	[illegible]	[illegible]
Min lot depth	[illegible]	[illegible]	[illegible]	[illegible]
LOT COVERAGE, Max.	[illegible]	[illegible]	[illegible]	[illegible]
BUILDING HEIGHT, MAX.	[illegible]	[illegible]	[illegible]	[illegible]
SETBACKS	[illegible]	[illegible]	[illegible]	[illegible]
Min front/garage	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Min rear	[illegible]	[illegible]	[illegible]	[illegible]
Min lot frontage	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]



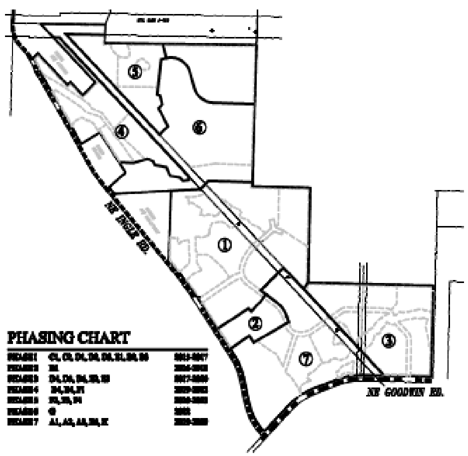
POD B- TYPICAL LOT & DEVELOPMENT PATTERNS

LOT DIMENSIONS & BUILDING ENVELOPES



POD C- TYPICAL LOT & DEVELOPMENT PATTERNS

LOT DIMENSIONS & BUILDING ENVELOPES



PHASING CHART

PHASE 1	[illegible]	[illegible]
PHASE 2	[illegible]	[illegible]
PHASE 3	[illegible]	[illegible]
PHASE 4	[illegible]	[illegible]
PHASE 5	[illegible]	[illegible]
PHASE 6	[illegible]	[illegible]
PHASE 7	[illegible]	[illegible]

PHASING PLAN

WESTERN PLANNING ASSOCIATES

Land Planning
Landscape
Architecture

SCALE: AS NOTED

DATE: 01/15/15

PRELIMINARY
STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
WILLIAM F. HORNING
CERTIFICATE NO. 382

GREEN MOUNTAIN
DEVELOPMENT STANDARDS & PHASING PLAN
GREEN MOUNTAIN LAND, LLC.
CAMAS, WASHINGTON

2014 Parks Plan Park Map

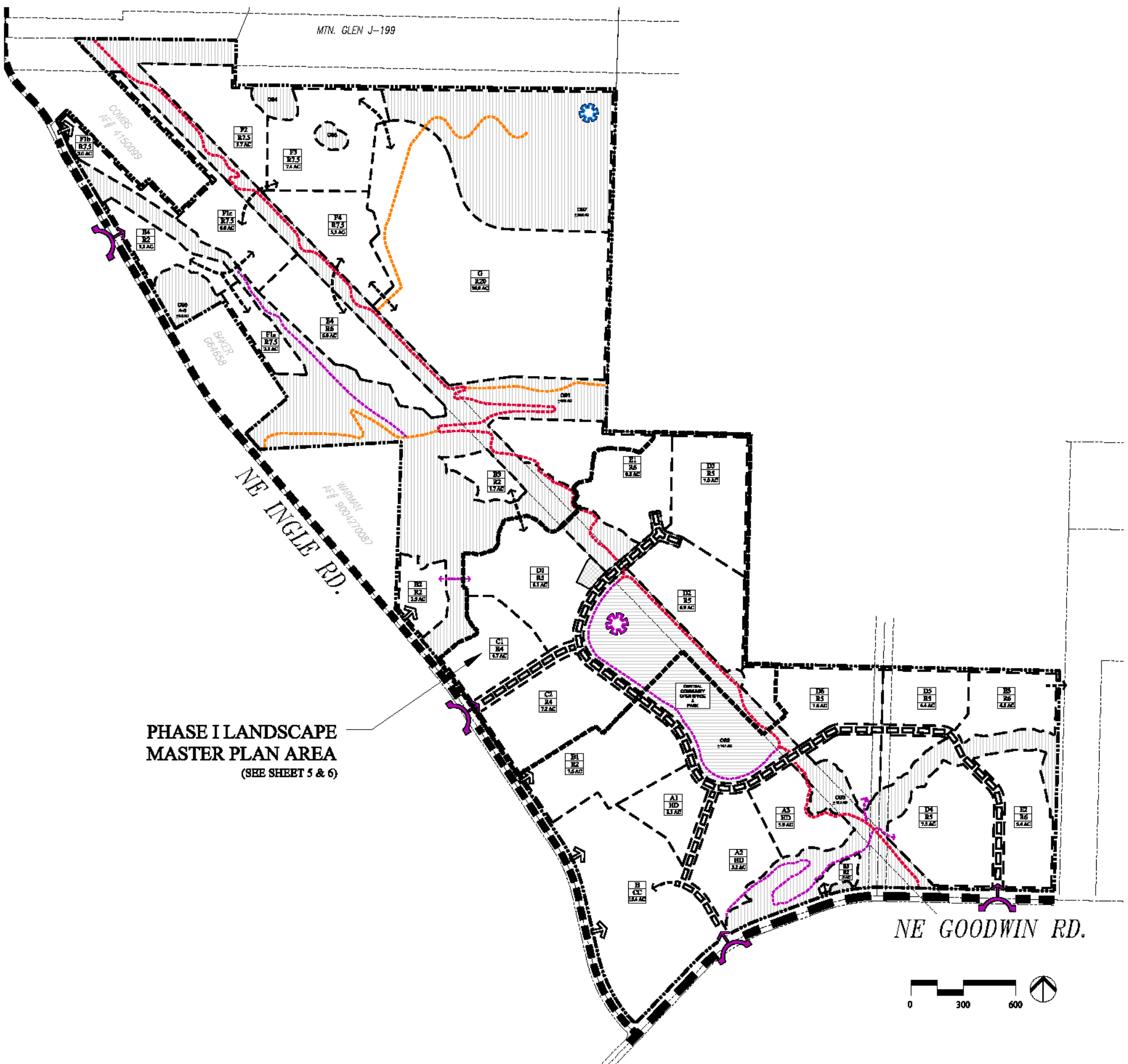
2014 Parks Plan Trail Map

GREEN MOUNTAIN

CONCEPTUAL OPEN SPACE, PARK & LANDSCAPE MASTER PLAN

CAMAS, WASHINGTON

GREEN MOUNTAIN LAND, LLC.



LEGEND

PARK & OPEN SPACE COMPONTENTS

PARKS & OPEN SPACE AREAS
(+ 89 * ACRES TOTAL)

CENTRAL COMMUNITY OPEN SPACE & PARK
[+14 AC]

TOP OF GREEN MOUNTAIN
[+20 AC]

COMMUNITY TRAIL SYSTEM
(LOCATION SHOWN IS CONCEPTUAL)

REGIONAL TRAIL T27
TYPICAL EASEMENT WIDTH 24 FEET ** PLUS SWITCHBACK AREAS
8' WIDE AT CENTRAL PARK, PAVED
6' WIDE FLAT UP TO 8% TRAIL GRADE, PAVED
4' WIDE IN STEEP TERRAIN (8%- 16% TRAIL GRADE), COMPACTED GRAVEL

T29 / T30 / SU14
TYPICAL EASEMENT WIDTH 24 FEET** PLUS SWITCHBACK AREAS
6' WIDE FLAT UP TO 8% TRAIL GRADE, COMPACTED GRAVEL
4' WIDE IN STEEP TERRAIN (8% - 16% TRAIL GRADE), COMPACTED GRAVEL

NEIGHBORHOOD TRAILS
EASEMENTS IN COMMON AREA TRACTS
6' WIDE FLAT UP TO 8% TRAIL GRADE, PAVED
4' WIDE IN STEEP TERRAIN (8% - 16% TRAIL GRADE), COMPACTED GRAVEL

* DOES NOT INCLUDE POCKET PARKS

** WHERE NOT ADJACENT TO A PUBLIC RIGHT OF WAY

LANDSCAPE MASTER PLAN COMPONENTS

ENTRY BOULEVARD

IDENTIFICATION & LANDSCAPED ENTRY

GREEN MOUNTAIN CLUB HOUSE

WESTERN PLANNING ASSOCIATES

Land Planning
Landscape
Architecture

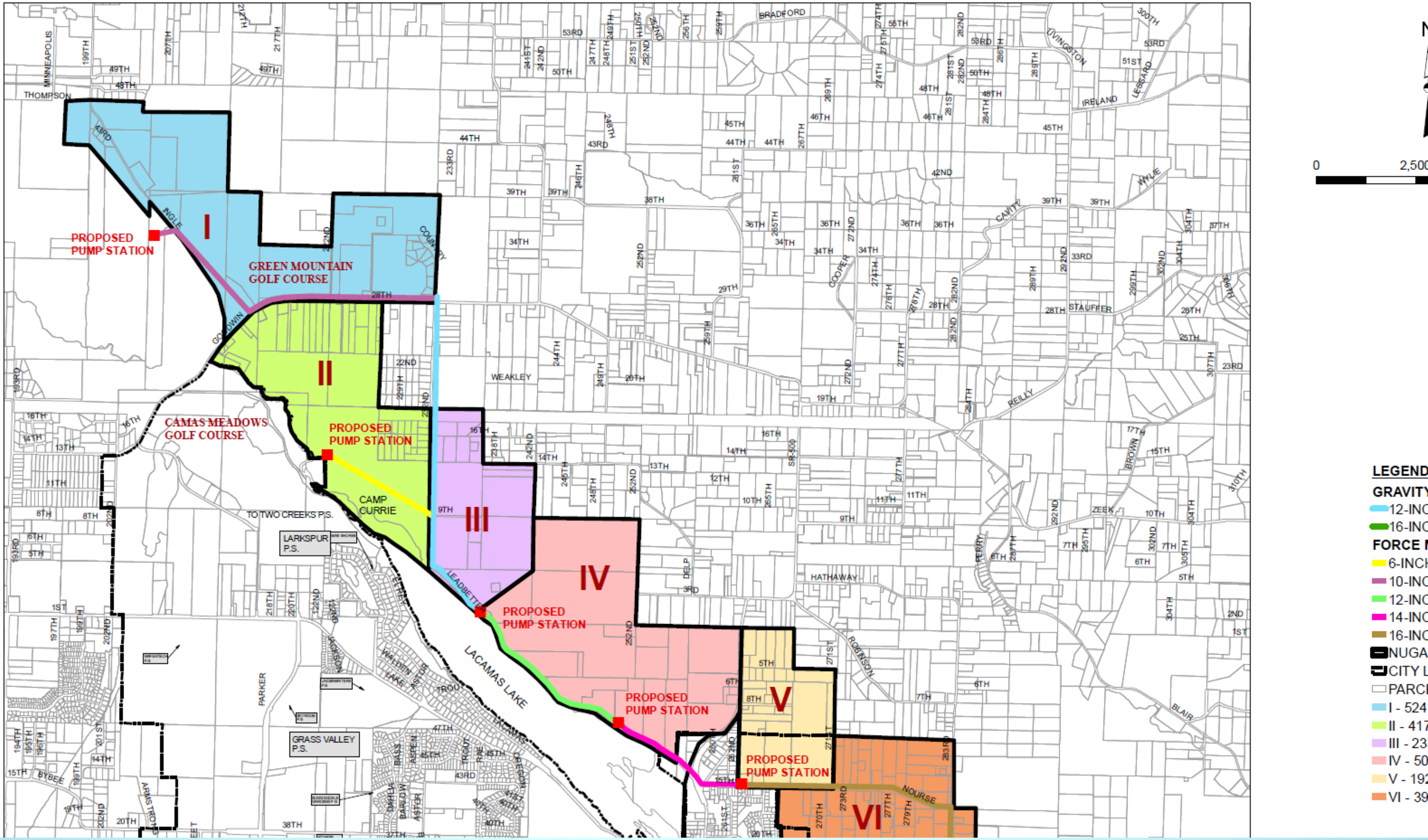
P.O.BOX 2392
LAKE OSWEGO, OR
97035
503-294-0222

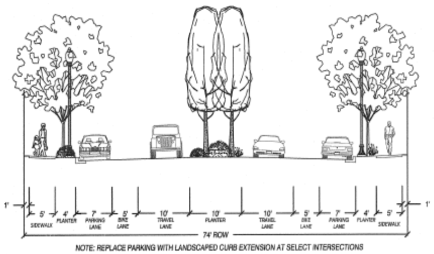
SCALE: AS NOTED
DESIGNED BY: WFH
DRAWN BY: SH
CHECKED BY: WFH

DATE: 01/14/15
REVISED:

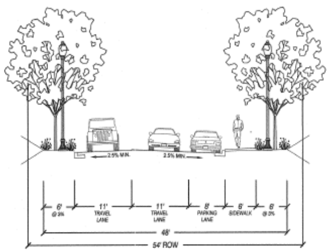
PRELIMINARY
STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
WILLIAM F. HORNING
CERTIFICATE NO. 382

GREEN MOUNTAIN
CONCEPTUAL OPEN SPACE, PARK & LANDSCAPE MASTER PLAN
GREEN MOUNTAIN LAND, LLC.
CAMAS, WASHINGTON

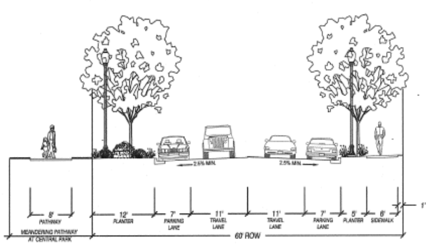

PROPOSED
PUMP STATION
I
GREEN MOUNTAIN
GOLF COURSE
II
PROPOSED
PUMP STATION
CAMAS MEADOWS
GOLF COURSE
CAMP
CURRIE
TO TWO CREEKS P.S.
LARKSPUR
P.S.
GRASS VALLEY
P.S.
III
IV
PROPOSED
PUMP STATION
LACAMAS LAKE
PROPOSED
PUMP STATION
V
PROPOSED
PUMP STATION
VI
THOMPSON
MINNEAPOLIS
INGLE
GOODWIN
28TH
WEAKLEY
LEADBETTER
BRADFORD
IRELAND
STAUFFER
HATHAWAY
NOURSE
LEGEND



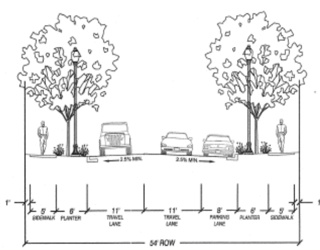
ENTRY BOULEVARD



CIRCULATOR STREET
AT D&E PODS



CIRCULATOR STREET
AT CENTRAL PARK



CIRCULATOR STREET
AT ENVIRONMENTALLY SENSITIVE FRONTAGE OR CROSSING &
AT STREET GRADES GREATER THAN 12%

OWNER/APPLICANT:
GREEN MOUNTAIN LAND, LLC
17933 NW EVERGREEN PARKWAY, SUITE 300
BEAVERTON, OR 97006
(503) 597-7100
(503) 597-7149 FAX
john.schmidt@metlandgroup.com

CONTACT:
LANDERHOLM LAW FIRM
ATTN: RANDY PRINTZ
805 BROADWAY SUITE 1000
VANCOUVER, WA 98660
(360) 693-3312
randy.printz@landerholm.com

PREPARED BY:
OLSON ENGINEERING, INC.
ATTN: MIKE ODREN
1111 BROADWAY
VANCOUVER, WA 98660
(360) 695-1385
FAX (360) 695-8117
mikeo@olsonengr.com

GRAPHIC SCALE
0 50 100 200

STREET SECTIONS FOR:
GREEN MOUNTAIN MIXED USE PRD
PHASE 1

OLSON ENGINEERING INC.
LAND SURVEYORS
ENGINEERS
1111 BROADWAY, VANCOUVER, WA 98660

12/31/14

CHANGES / REVISIONS	
DESCRIPTION:	DATE:

DESIGNED: WPA/MRO
DRAWN: WPA/MRO
CHECKED: KFS
DATE: DECEMBER 2014
SCALE: H: 1" = 100' V:

GREEN MOUNTAIN PRD - PHASE 1

Planning Commission
Rules of Procedure for Quasi-Judicial Hearings

Chair - Opens **the hearing** with the following:

1. The case number, applicant name, and address of the property;

   May use **Opening Statement** document for the following information.

2. Identify that the applicable approval criteria are addressed in the staff report
3. Explain how to testify (name, address, and relevancy to approval criteria)
4. Ask Planning Commission Members of any conflict of interest or ex-parte contacts
5. Ask for any public challenge to the partiality of any member
6. Summarize the sequenced events to be followed at the hearing as follows:

The hearing begins in the following order:

1. Staff presentation
2. Applicant presentation

Chair – Opens the hearing for public testimony:

1. Proponents (those testifying in support or neutral)
2. Opponents (those testifying in opposition)
3. Applicant rebuttal
4. City staff rebuttal or clarifications
5. Applicant's closing argument

Chair – Closes the public testimony portion of hearing.

Planning Commission deliberates on the case. They may question staff or the applicant.

- Commissioner proposes a motion.
- Another Commissioner seconds the motion, and then the Chair states the motion to the assembly.
- Chair calls for deliberation and/or discussion of the motion. (NOTE: Discussion must be confined to the motion before the commission).
- Chair calls for a vote on the motion and restates the motion, if there is no further discussion.

The Chair closes the hearing, (stating "This hearing is now closed.") upon a motion being passed by a majority of the Planning Commission.

In the event the Chair uses his or/her discretion to accept additional testimony or evidence after the close of the Public Testimony portion of the hearing, the Chair should reopen the Public Testimony portion of the hearing and may limit testimony to a specific issue and timeframe.