



**Stream Buffer Averaging and Enhancement
Plan**

for

**Green Mountain PRD Phase 2
City of Camas, Washington**

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SIGNATURES

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TABLE OF CONTENTS

INTRODUCTION	1
PROJECT DESCRIPTION	1
Stream Buffer Averaging	2
Stream Buffer Enhancement	2
Stormwater Outfall Enhancement	2
ASSESSMENT OF IMPACTS	5
LOCAL REGULATORY AUTHORITY	5
Avoidance and Minimization	5
Mitigation	5
SITE DESCRIPTION	11
METHODS	12
PLAN DESCRIPTION	12
Avoidance Measures	12
Minimization Measures	13
Mitigation Measures	13
Stream Buffer Averaging	13
Stream Buffer Enhancement	13
Stormwater Outfall	14
15-foot Proposed Sanitary Sewer Easement to City of Camas	14
Goals, Objectives, and Performance Standards	15
Vegetative Structure	15
Habitat Structure	16
Long-term Protection	16
RESPONSIBLE PARTIES	17
FUNCTIONAL ASSESSMENT	17
Existing Conditions	17
Vegetation	17
Soils	18
Habitat	18
Proposed Conditions	18
Vegetation	18
Soils	18
Habitat	18
Wildlife Analysis	19
IMPLEMENTATION PLAN	19
Planting Schedule and Equipment	19
Specifications for Site Preparation, Planting, and Maintenance	21
Prepare Mitigation Areas	21
Install Large Woody Material	21

Install Natural Barriers and Habitat Signs.....	21
General Plant Specifications	21
Plant Bareroot/Containerized Trees and Shrubs	21
Install Bird Boxes.....	22
Maintain Mitigation Areas	22
MONITORING PLAN	23
Monitoring Plots.....	23
Vegetation	23
Fauna	23
Soils and Hydrology	24
Monitoring Report.....	24
ADAPTIVE MANAGEMENT PLAN	24
REFERENCES	25

LIST OF TABLES

Table 1. Stream Buffer Impact/Averaging and Proposed Mitigation	4
Table 2. Existing Advance Oak Mitigation Area Impacts and Proposed Mitigation	4
Table 3. Stream Summary	12
Table 4. Performance Standards for Vegetation by Monitored Year	16
Table 5. Plant Specifications for Stream Buffer Averaging and Enhancement.....	20
Table 6. Plant Specifications for Stormwater Outfall	20

FIGURES

Figure 1	Vicinity Map
Figure 2	Existing Conditions
Figure 3	Proposed Conditions
Figure 3a	Proposed Conditions Detail
Figure 4	Stream Crossing Details
Figure 5	Cross Section A-A'
Figure 6	Planting Details

INTRODUCTION

Ecological Land Services, Inc. (ELS) was contracted by CLB Washington Options Solutions to prepare this mitigation plan for Phase 2 of the Green Mountain Planned Residential Development into single-family residential lots with park, trails, and open space (PRD, City File No. SUB14-02). Phase 2 requires crossing a Type Np (non-fish, perennial) stream for access to a portion of the subdivision which lies north of the stream.

Parcels involved with this mitigation plan include portions of Clark County Parcel Numbers 173178000, 986037307, 172555000, and 172557000. The project area falls within portions of Sections 17, 20, and 21, Township 2 North, Range 3 East of the Willamette Meridian (Figure 1). This report describes mitigation activities in accordance with the *City of Camas Municipal Code (CMC) Fish and Wildlife Habitat Conservation Areas Chapter 16.61* and *Sensitive Areas and Open Space Chapter 18.31*. Mitigation activities associated with impacts to wetland buffers related to Phase 2 have been discussed in accordance with *CMC Wetlands Chapter 16.53*, within the *Wetland Buffer Averaging and Enhancement Plan* (ELS 2016b).

PROJECT DESCRIPTION

Phase 2 of the Green Mountain PRD development includes constructing 230 single-family residential lots with parks, trails, and open space (Figure 3). Access to Phase 2 of the PRD from NE 28th Street will be accomplished by constructing NE Boxwood Street. NE Boxwood Street will cross a Type Np (non-fish, perennial) stream (Stream A), and its associated buffer, as well as an advance oak mitigation establishment/enhancement area described in the *Oregon White Oak Advance Mitigation Plan for Green Mountain Mixed Use PRD* (City File No. SUB14-02) (ELS 2016d) and an addendum (ELS 2016c). NE Boxwood Street will be 52 feet wide at the stream crossing, consisting of a 30-foot wide paved section, 5-foot curbs/landscape strips, and a 6-foot sidewalk on each side.

The stream will be crossed with a bottomless arch culvert, which will be 6- to 8-feet in diameter to completely span the ordinary high water mark (OHWM); the actual culvert diameter may be adjusted based on final engineering design. No fill will be placed below the OHWM of Stream A and the culvert will have an approximate clearance over the stream of 2.5 feet. The crossing will have retaining walls waterward of the sidewalk on both sides of the street through the buffer area. The footings will be reinforced with non-shrink grout and slotted concrete, with the size to be determined by the final engineering design. The culvert will span between the retaining walls, following the natural direction of the stream (Figures 3 and 4). An 18-inch water main will be installed a minimum of 1/2-foot above the bottomless arch culvert, which will run below NE Boxwood Street. Overall, the top of the pavement on NE Boxwood Street will be approximately 47.5 inches above the highest elevation of the bottomless arch culvert. All areas with removal of native soil will be backfilled with gravel and compacted to match existing grade. Additionally, one 15-foot sanitary sewer easement for the City of Camas is proposed crossing Stream A. No engineering design is available at this time; however the stream crossing has been identified and evaluated within this plan.

STREAM BUFFER AVERAGING

A total of 3,328 square feet of outer stream buffer will be averaged-out (removed from buffer) to 25 feet, and this 3,328 square feet will be averaged-in (added to existing buffer) to the existing stream buffer at a 1:1 ratio.

STREAM BUFFER ENHANCEMENT

To compensate for the 3,759 square feet of impacts to the inner 25 feet of the stream buffer due to the road crossing and pedestrian trail, a total of 11,277 square feet will be added to the stream buffer through stream buffer addition at a 3:1 ratio. All buffer addition areas will be enhanced with native trees and shrubs and habitat features.

Overall, a total of 17,694 square feet of buffer will be added/averaged-in to the existing stream buffer. Areas contiguous with the existing advance oak mitigation areas will be enhanced with native shrubs and trees and habitat features, for a total of 11,277 square feet. Placing the stream buffer enhancement areas along the existing advance oak mitigation will create a more contiguous and ecologically appropriate design.

STORMWATER OUTFALL ENHANCEMENT

One stormwater outfall is proposed within the stream buffer, with up to 250 square feet of impact. The design of this outfall is preliminary and the location will be determined with the final engineering design. All stormwater will be treated prior to release from the stormwater facility. Table 1 summarizes the impacts and proposed mitigation associated with the stream crossing, pedestrian trail, and stormwater outfall.

Table 1. Stream Buffer Impact/Averaging and Proposed Mitigation

Critical Area	Type	Impact/Average Area	Impact/Average Area (sq. ft.)	Mitigation			
				Type	Ratio	Location	Area (sq. ft.)
Stream A	Np	Outer Buffer (outer 25 ft.)	Average-Out 3,328	Average-in	1:1	Stream A	3,328
		Inner Buffer (inner 25 ft.)	3,759	Buffer addition & enhancement	3:1	Stream A, enhancement contiguous with the advance oak mitigation areas	11,277
Stream A	Np	Buffer at outfall	250	Enhancement	1:1	Release point of treated water	250
Total Buffer Addition/Averaging-in							14,605
Total Buffer Enhancement (shown in bold at far right column)							11,527

Table 2. Existing Advance Oak Mitigation Area Impacts and Proposed Mitigation

Critical Area	Location	Impact Area (sq. ft.)	Mitigation			
			Type	Ratio	Location	Area (sq. ft.)
Advance Oak Mitigation Area	Advance oak mitigation establishment/enhancement area	3,089	Replacing oak establishment/enhancement area	1:1	Stream A original future neighborhood circulator location	3,089
Total						3,089¹

¹ Details on oak mitigation area replacement/enhancement are provided in an addendum to the *Oregon White Oak Mitigation Plan for Green Mountain Mixed Use PRD – Phase 1* (ELS 2016d).

ASSESSMENT OF IMPACTS

Impacts associated with road installation within the inner 50 percent (inner 25 feet) of the stream buffer will be permanent. Impacts include a nominal decrease of stream shading due to minor tree removal and an increase in surface runoff due to impervious surface coverage. The current stream buffer has a sparse overstory canopy, with all tree cover within the inner portions of the buffer. The outer portion of the buffer consists of former golf course, which continues to be mowed, where there will be no impacts from vegetation removal. All runoff from impervious surfaces within the stream buffer will be directed away from the stream, to stormwater detention facilities for treatment.

LOCAL REGULATORY AUTHORITY

Per *CMC Chapter 16.61, Fish and Wildlife Habitat Conservation Areas*, habitats that include aquatic ecosystems must establish stream buffers. The Type Ns stream onsite has a buffer of 50 feet. The project's stream and stream buffer impacts result from constructing (Table 1):

- one road crossing to provide vehicular access to land north of the stream,
- a compacted gravel trail for pedestrian access,
- and a stormwater outfall.

Stream buffer averaging and enhancement is proposed to mitigate for these impacts. Impacts to the advance oak mitigation area will be fully replaced and are addressed in a separate addendum (ELS 2016c). This mitigation plan meets the general mitigation sequencing and performance standards as required in *CMC 16.61.030* as applicable to the project (in italics) as follows:

Per *CMC 16.51.170, General Provisions - Mitigation Sequencing*:

Applicants shall demonstrate that reasonable efforts have been examined with the intent to mitigate impacts to critical areas. When an alteration to a critical area is proposed, mitigation can be accomplished through a variety of methods. Generally, avoiding the impact altogether is the preferred option. Methods to reduce impacts and mitigate for them should follow a series of steps taken in sequential order:

AVOIDANCE AND MINIMIZATION

Avoiding the critical areas and regulated buffers was a primary consideration when designing the PRD. All wetlands have been avoided; stream buffer impacts have been limited to a single road crossing and a small section of pedestrian trail. Both road and trail are the minimal width necessary to accomplish the crossing. The pedestrian trail has been placed on existing golf cart path as much as possible. The riparian corridor of Stream A bisects the central portion of Phase 2, greatly limiting options for access to the rest of the PRD without a stream crossing.

MITIGATION

Mitigation in the form of buffer averaging and enhancement within the riparian corridor is proposed for Phase 2 of the PRD. The goal of this averaging and enhancement plan is

to minimize habitat impacts, disruptions, alterations, and maintain functions of stream buffer within the project site. The following standards are set forth and required according to *CMC 16.61.030, Performance Standards – General Requirements*.

1. *CMC 16.61.030 (A)(1)(a and b) - Applicants proposing activities subject to this chapter shall demonstrate that the activity:*

a. *Substantially maintains the level of habitat functions and values as characterized and documented using best available science, and;*

The proposed mitigation plan uses the best available science to maintain and enhance the level of habitat functions after impacting the stream buffer. This is achieved by adding buffer to the riparian corridor for no net loss of buffer area and enhancing the buffer with native trees and shrubs along the riparian corridor and adjoining previously installed advance oak mitigation areas. The enhancement areas are proposed at a 3:1 ratio to thoroughly replace the habitat functions and values of impacted areas. These areas will provide more protection to the stream from surrounding human use, which will help protect valuable habitat and water quality functions provided by riparian corridors. Installing shrubs where the stormwater outfall releases treated stormwater will help to impede erosion, filter out sediments, and shade the water.

b. *Minimizes habitat disruption or alteration beyond the extent required to undertake the proposal.*

For unavoidable disruptions and alterations to the habitat, construction activities will be designed to minimize impacts to every extent practicable within the stream buffer. Temporary construction fencing will be installed along the boundaries of the critical areas and associated buffers bordering the development to demarcate the areas and to prevent damage from heavy equipment during construction.

2. *CMC 16.61.030 (A)(2)(a) - If it is determined that habitat designation under this chapter will incur a net loss in functions and values, all losses shall be mitigated on-site as a first priority, and off-site thereafter.*

All mitigation for stream buffer impacts will take place onsite.

a. *Where on-site mitigation that could adequately address the loss is infeasible, the applicant shall consult with a qualified habitat restoration specialist, the city, and the Washington State Department of Fish and Wildlife regarding offsite mitigation. Mitigation shall prioritize the preservation and restoration of Lower Washougal River instream and riparian habitat, and should be guided by the Washougal River Subbasin chapter of the Lower Columbia Salmon Recovery Plan.*

The proposed mitigation plan consists only of onsite mitigation. No offsite mitigation will be required.

4. *CMC 16.61.030 (A)(4)(a through t) - Subject to individual circumstances, potential mitigation measures may include, but are not limited to, the following:*

a. Establishment of buffers;

The buffer addition, buffer averaging, and enhancement areas consist solely of stream buffers. These buffers will be demarcated with signage and natural barriers.

b. Requirement of a performance bond, when necessary to ensure completion and success of the proposed mitigation;

If necessary to satisfy City requirements, the Applicant will prepare a cost estimate for financial assurances and secure a performance bond.

c. Avoiding the impact all together by not taking a certain action or parts of an action;

Access to the southern portion of the Phase 2 development requires a stream crossing with a vehicular road and pedestrian trail. The culvert design for the stream crossing took into account the size and flow of the stream, and a bottomless arch culvert was chosen to avoid any impacts below the OHWM.

d. Exploring alternative onsite locations to avoid or reduce impacts of activities;

Avoiding impacts to the riparian corridor was a primary consideration when designing Phase 2 of the PRD. However, the stream crossing is necessary as the southern portion of Phase 2 is completely isolated by the stream corridor bisecting the entire phase. The originally proposed road crossing, which was indicated in the *Oregon White Oak Advance Mitigation Plan*, was not a viable location due to an intersection spacing requirement at NE Boxwood and NE 28th/NE Goodwin to maximize spacing from the proposed road to the neighboring Green Mountain Estates development. The only practicable alternative was to move the intersection west, and cross the advance oak mitigation, then replace the plantings contiguous with the east end of this mitigation (described in the *Addendum to the Oregon White Oak Advance Mitigation Plan* (ELS 2016c). The majority of the pedestrian trails proposed are located outside of the stream buffer, and existing golf cart paths were utilized to the maximum extent practicable within the stream buffer.

e. Preserving important vegetation and natural habitat features by establishing buffers or by limiting clearing or alteration;

The existing native vegetation will be maintained, except for clearing non-native vegetation for installing native trees and shrubs as well as constructing the necessary road crossing and pedestrian trail. As feasible, all plantings within the advance oak mitigation area will be transplanted as indicated in Figure 5 of the *Addendum to the Oregon White Oak Advance Mitigation Plan*, (ELS 2016c), contiguous with the existing advance oak

mitigation plantings. Additional plants will be installed, if needed, to make up any deficiencies in plant quantities.

- f. *Replacing invasive exotic plants with native species (refer to the Clark County Native Plant Communities Guide or other relevant publications for guidance);*

Enhancement areas are designed to establish indigenous, non-invasive shrubs and tree species. Non-native, invasive species, namely Himalayan blackberry and reed canarygrass, will be cleared from the enhancement areas prior to plant installation and controlled as a part of maintenance, thereafter.

- g. *Prohibiting introduction of invasive plant species in habitat areas;*

Performance standards 1g, 1h, and 1i address non-native invasive plant within the mitigation areas and control measures if they are found.

- h. *Enhancing, restoring, or replacing vegetation or other habitat features and functions;*

The stream buffer addition and enhancement areas will compensate for buffer impacts due to the stream crossing. To compensate for these impacts, riparian functions will be enhanced through native plantings, installing bird boxes, and placing a minimum of 4 pieces of LWM near the road crossing.

- i. *Using native plants where appropriate when planting within habitat areas (refer to the Clark County Native Plant Communities Guide or other relevant publications for guidance);*

Trees and shrubs that are commonly associated with southwestern Washington riparian corridors will be planted within the buffer enhancement areas.

- j. *Managing access to habitat areas, including exclusionary barriers for livestock, if needed;*

Signs and natural barriers will be installed along the outer portion of critical areas where they adjoin residential lots and roads. A minimum of 4 horizontal logs over 12-inches DBH and at least 10 feet long will be placed as LWM near the road crossing to deter entrance into the stream buffer and enhancement areas (Figure 3a).

- k. *Using existing stream crossings whenever a review of suitability, capacity, access and location, habitat impacts of alternatives, maintenance, liability, and economics indicate the existing crossing is feasible;*

Existing stream crossings located in the immediate vicinity of the proposed crossing consist of approximately 6- to 8-feet wide golf cart paths. Utilizing these trails was not practicable for installing a road. However, these existing cart paths were used in the design of pedestrian trails throughout

the open space tracts within Phase 2. Crossing the stream with one full-width road had no economically feasible alternatives. This crossing was necessary to provide access north of the stream and was designed to have the least environmental impacts possible.

- l. Constructing new stream crossings, when necessary, in conformance to the water crossing structure standards in WAC 220-110-070 (Hydraulic Code Rules), which are incorporated by reference;*

The stream crossing has been designed in accordance with the above referenced WAC, and the disturbance of bank vegetation has been limited to only that necessary for road installation. Footings for the bottomless arch culvert will be buried sufficiently deep so they will not become exposed by potential scour within the culvert, and fill above the OHWM will be protected from erosion to the 100-year peak flow. Prior to any ground disturbing activities related to the stream crossing and culvert installation, a hydraulic project approval will be applied for and approved by the Washington Department of Fish and Wildlife. All disturbed areas will be protected from erosion within seven calendar days after completing the project, using vegetation or similar means. Excavation for and placement of the foundation and superstructure will be outside the OHWM. All spoils will be placed within uplands outside of any critical areas.

- m. Seasonally restricting construction activities;*

Exposed soils may be seeded to stabilize soils or for weed control, as site conditions warrant. The enhancement areas will be planted during the late fall to early spring, when plants are dormant and will have the best success of transplanting.

- n. Implementing best management practices and integrated management practices;*

The most recent available guidance from the Washington Department of Fish Wildlife riparian habitat management (Knutson & Naef 1997) was used to prepare this PRD Phase 2 stream buffer addition and enhancement plan.

- o. Monitoring or review of impacts and assurance of stabilization of the area;*

A 10-year monitoring plan is proposed.

- p. Establishing performance measures or bonding;*

Performance standards have been established. Refer to the *Goals, Objectives, and Performance Standards* section for specific information.

- q. *Establishing conservation covenants and other mechanisms to ensure long-term preservation or maintenance of mitigation actions;*

A conservation covenant or similar legal mechanism will be executed and recorded for the mitigation areas. The covenant, absent amendment by mutual agreement between the grantor and the City, will prohibit development of the area identified in the covenant, but will allow for maintenance and further mitigation opportunities. This performance standard shall be considered satisfied upon administrative approval of the covenant by the City, execution of the covenant by the grantor, and the covenant's recording in Clark County.

- r. *Utilizing low-impact development techniques;*

The most recent available data on stream crossing techniques were used during design of the culvert and road crossing. A bottomless arch culvert was used to avoid all impacts below the OHWM of Stream A.

- s. *Promoting water quality by limiting the use of lawn and garden chemicals in habitat areas; and/or*

Lawn and garden chemicals will be used sparingly, if at all, and only as necessary to control invasive plants within the buffer enhancement and addition areas.

- t. *Avoiding topsoil removal and minimizing topsoil compaction.*

Topsoil will be retained in the buffer addition and enhancement areas. Prior to planting, the enhancement areas will be ripped and tilled at planting locations, where appropriate, to loosen compacted soil.

- B. *CMC 16.61.030 (B) - Nonindigenous Species Shall not be Introduced via Mitigation. No plant, wildlife, or fish species not indigenous to the region shall be introduced, via mitigation, into a habitat conservation area.*

Existing non-native, invasive species will be controlled as part of the mitigation plan; none will be intentionally introduced via mitigation. See Table 5 for the native vegetation proposed for the enhancement areas.

- C. *CMC 16.61.030 (C)(1 through 3) - Mitigation Should Result in Contiguous Corridors. In accordance with a mitigation plan, mitigation sites should preferably be located by the following and in priority order:*

1. *On-site and contiguous to wildlife habitat corridors; or*

Mitigation areas will be onsite, within Phase 2 of the PRD. The stream buffer addition and enhancement areas will be contiguous with Stream A's buffer, which includes an established riparian habitat that connects to other wetlands. Enhancement will take place contiguous with the advance oak mitigation areas to provide contiguous and ecologically appropriate mitigation. Additionally, the bottomless arch culvert will have approximately 2.5 feet of clearance above the stream, and the footings are

set above the OHWM, leaving room for small mammals to travel beneath the road.

2. *Off-site that is adjacent to the subject site and contiguous to wildlife habitat corridors; or*

Does not apply. Mitigation areas will be onsite, within Phase 2 of the PRD.

3. *Mitigation within the natural open space network, as identified in the comprehensive plan and open space plan, may be allowed for off-site mitigation or in place of on-site mitigation, where development and mitigation will result in an isolating effect on the habitat.*

Mitigation areas will be onsite, within Phase 2 of the PRD.

SITE DESCRIPTION

The majority of the study area is located north of NE Goodwin Road, south of NE 48th Circle (on the southwest slope of Green Mountain), and east of NE Ingles Road (Figures 1 and 2). The former Green Mountain Golf Course, which closed in February 2016, encompasses a large portion of the PRD. The northwestern corner of the PRD is an undeveloped mixed deciduous-coniferous forest. Topography slopes generally to the south and southwest, with the lowest topography being in the southern corner of the site. Surrounding land use includes residential and forested areas to the north and east, and residential and agricultural uses to the south and west.

The Phase 2 PRD has the following critical areas:

Oregon White Oaks - Approximately 65 Oregon white oak trees were inventoried within the PRD Phase 2 boundaries, outside of the Phase 1 development. Most of the Oregon white oak trees within Phase 2 are located within the riparian corridor. Oak impacts are addressed in the *Oregon White Oak Advance Mitigation Plan for Green Mountain Mixed Use PRD* and an addendum (ELS 2016c).

Streams - Two streams are located within the boundaries of Phase 2 development (Table 2). Details of the stream and stream buffer to be impacted are summarized in Table 3.

Wetlands - Seven wetlands are located within the Phase 2 boundaries, and are all avoided in the Phase 2 development. Please refer to the *Critical Areas Report for Green Mountain PRD Phase 2* for specific details regarding onsite wetlands (ELS 2016a). Wetland buffer impacts are addressed in the *Wetland Buffer Averaging and Enhancement Plan for Green Mountain PRD Phase 2* (ELS 2016b).

Stream A - Stream A originates offsite to the east, flows southwesterly through the southern portion of the study area, and drains offsite to the south into a roadside ditch along NW Goodwin Road (Figure 2; Table 3). It ultimately drains into a stormwater grate and culvert beneath NW Goodwin Road. This stream has flow year round, and therefore, is considered perennial, is not known to be used by fish, and does not meet the physical criteria to be used by fish. Stream A is approximately 3- to 7-feet wide.

at bank-full-width, and consists mainly of riffles with no apparent pools. Stream substrate consists of mainly small cobble and sand/sediment. Stream A is not mapped on the DNR Forest Practice Map. The stream buffers to be impacted consist of mainly sparse forest canopy within the inner 50 percent of the buffer and mowed grasses within the outer 50 percent. The single stratum of non-native grasses increases surface runoff during periods of precipitation, which can lead to an increase in nutrients, suspended sediments, and sedimentation within the stream. The project does not impact Stream B or its buffer. Stream B is addressed in the critical areas report (ELS 2016a).

Table 3. Stream Summary

Stream Name	DNR Stream Type	Stream Buffer Width ¹ (feet)
Stream A	Type Np (non-fish, perennial)	50
Stream B	Type Ns (non-fish, seasonal)	25

¹According to *CMC 16.61.040(D)*, stream buffer widths shall be measured outward, on the horizontal plane, from the ordinary high water mark. This determination is preliminary until reviewed, modified and/or approved by the City of Camas.

METHODS

The OHWM of Streams A and B were determined using standard methodology as described in the Washington State Department of Ecology (Ecology) manual: *Determining the Ordinary High Water Mark on Streams in Washington State* (Olson & Stockdale 2010). The main indicator used to determine the OHWM was scour along the bank of the streams. The OHWM of the streams onsite were flagged with consecutively numbered flagging during site visits in February and March 2016. Stream OHWM flags were surveyed by Olson Engineering, Inc.

PLAN DESCRIPTION

This plan describes a series of mitigation measures that will be implemented to avoid, minimize, and compensate for impacts to the inner and outer riparian buffer of Stream A. Impacts to the inner riparian buffer result from installing a paved road across Stream A and a stormwater outfall. Outer riparian buffer impacts consist of installing the paved road, as well as constructing a compacted gravel trail for pedestrian access.

AVOIDANCE MEASURES

Avoiding impacts to critical areas, including Oregon white oaks, wetlands, wetland buffers, and Streams A and B, including their associated buffers, was the primary consideration when designing Phase 2 of the PRD. The project does not impact any wetlands and avoids both streams, except for the minimal necessary for a road crossing, pedestrian trail crossing, and stormwater outfall. Access to the southern portion of Phase 2 development required a stream crossing, which was designed to be the minimal footprint necessary. The required trails within the open space tracts were placed utilizing existing golf cart trails where practicable. No oaks are proposed for

removal in relation to the stream crossing. Additionally, the culvert design for the stream crossing took into account the size and flow of the stream, and a bottomless arch culvert was chosen to avoid any impacts below the OHWM. To avoid impacts to the stream during constructing the crossing and installing the culvert, the following avoidance measures will be implemented:

- Culvert installation will take place during the dry season when stream flow is at its lowest volume (July 1 through September 30).
- Stream channel below the OHWM and flow will remain undisturbed.
- Clearing limits will be demarcated with silt fencing or similar erosion control measures.
- After the culvert is installed, a net or similar mechanism will be deployed above the water to catch any potential falling materials from road construction.
- Construction access and staging areas will avoid all critical areas onsite and located within uplands.
- Best management practices, including silt fencing or similar measures will be utilized to control sedimentation and general ground disturbance.
- If any inadvertent fill is placed within the stream, work will be ceased immediately until the situation is rectified.

MINIMIZATION MEASURES

In addition to the avoidance measures made possible by the preliminary plat redesign, the following minimization measures will further reduce impacts to the riparian buffer and Stream A, and minimize habitat disruption beyond the extent required to undertake the proposal. The minimization measures are as follows:

1. Install temporary construction fencing as needed around the mitigation and construction areas.
2. Design site grading to avoid construction activity to every extent practicable within the riparian buffer and mitigation areas.

MITIGATION MEASURES

Stream Buffer Averaging

A total of 3,328 square feet of outer stream buffer will be averaged-out to 25 feet, and an equal square footage will be averaged-in to the existing stream buffer, as allowed per *CMC 16.61.040(D)(2)(a)*.

Stream Buffer Enhancement

To compensate for 3,759 square feet of inner riparian buffer impacts, 11,277 square feet of stream buffer will be added to the existing stream buffer and an equivalent square footage of the stream buffer along the advance oak mitigation areas will be enhanced at a 3:1 ratio. Native riparian plants and habitat features will be installed within the enhancement areas to create a contiguous and more ecologically appropriate mitigation design.

At least 4 horizontal logs that are larger than 12-inches diameter breast height (DBH), and a minimum of 10 feet long will be placed as large woody material (LWM) within the stream buffer adjacent to the stream crossing to deter foot-traffic into the stream buffer.

Stormwater Outfall

One stormwater outfall with 250 square feet of impact is proposed within the stream buffer, as allowed by *CMC 16.61.040(E)(9)*. Once the location of the outfall is known, 250 square feet of area downslope of the outfall will be enhanced with 20 native shrubs. Shrub installation will help to impede erosion, filter out sediments, and shade the water and replace impacted buffer functions.

The averaged and enhanced riparian buffers will be protected in perpetuity with a conservation covenant or similar legal mechanism to ensure long-term preservation or maintenance of the mitigation actions, as required by *CMC 16.61.030(A)(4)(q)*. The critical area buffers will be physically demarcated by natural barriers and permanent signs will be installed along the boundaries of the critical areas and associated buffers bordering the development.

15-foot Proposed Sanitary Sewer Easement to City of Camas

One 15-foot sanitary sewer easement to the City of Camas is proposed crossing Stream A within Phase 2 (Figure 3a). No engineering designs are available at this time, however stream crossings with underground facilities are allowed per *CMC 16.61.040(E)(6)*, stating that new underground utility lines and facilities may be permitted to cross watercourses in accordance with an approved critical area report if they comply with the following standards:

- a. *Installation shall be accomplished by boring beneath the scour depth and hyporheic zone (sediments underlying the surface stream) of the water body;*

If boring is the only ecologically practicable option, then it will be performed below the scour depth and hyporheic zone of the stream.

- b. *The utilities shall cross at an angle greater than sixty degrees to the centerline of the channel in streams or perpendicular to the channel centerline whenever boring under the channel is not feasible, and shall be contained within the footprint of an existing road or utility crossing where possible; and*

The applicant's preference is to trench the facility crossing, and all impacts associated with these actions are temporary. Any bare soils present after trenching will be seeded with a native seed mix or mulched. The crossing will be designed to meet the standards listed above. The facility crossing cannot be contained within the footprint of an existing road or utility crossing, as none are present in this area or nearby.

- c. *The utility route should avoid paralleling the stream or following a down-valley course near the channel; and*

The utility route does not parallel the stream or follow a down-valley course near the channel.

- d. *Installation shall not increase or decrease the natural rate of shore migration or channel migration.*

This installation will not increase or decrease the natural rate of shore migration or channel migration, as the stream has downcut banks, and does not have adequate flow to cause large amounts of channel migration.

GOALS, OBJECTIVES, AND PERFORMANCE STANDARDS

The goal of this stream buffer averaging and enhancement plan is to replace any lost functions of the riparian buffer due to road construction, compacted gravel trail installation, and stormwater outfall placement. To accomplish this, the following objectives and performance standards are appropriate to ensure the success of the onsite mitigation.

Vegetative Structure

Buffer Enhancement Area

Objective 1. Establish a multi strata stream buffer consisting of native shrubs and trees to compensate for impacts to the existing stream buffer and to enhance vegetative structure and habitat functions.

Performance Standard 1a. Planted native trees and shrubs in the enhancement areas will achieve at least 90 percent survival in Year 1. Dead plants will be replaced if this performance standard is not met.

Performance Standard 1b. Planted native trees and shrubs in the enhancement areas will achieve at least 80 percent survival in Year 2. Dead plants will be replaced if this performance standard is not met.

Performance Standard 1c. Planted native trees and shrubs in the enhancement areas will achieve at least 75 percent survival in Year 3. Dead plants will be replaced if this performance standard is not met.

Performance Standard 1d. By Year 5, the enhanced stream buffer will have a minimum 25 percent cover by native trees and 10 percent cover by native shrubs. Dead plants will be replaced if this performance standard is not met.

Performance Standard 1e. By Year 7, the enhanced stream buffer will have a minimum 35 percent cover by native trees and 15 percent cover by native shrubs. Dead plants will be replaced if this performance standard is not met.

Performance Standard 1f. By Year 10, the enhanced stream buffer will have a minimum 50 percent cover by native trees and 30 percent cover by shrubs. Dead plants will be replaced if this performance standard is not met.

Performance Standard 1g. In all years, non-native invasive plant species, except for reed canarygrass, will not exceed 10 percent cover within the mitigation area.

Performance Standard 1h. In all years, non-native invasive plant species infestations covering 200 square feet or more, but not sampled as a part of the

monitoring methods, will be documented by species and location, and control measures will be implemented.

Performance Standard 1i. In all years, state-listed Class A noxious weeds, non-native knotweeds (*Polygonum cuspidatum*, *P. polystachyum*, *P. sachalinense*, and *P. bohemicum*), and English ivy (*Hedera helix*) will be eradicated from the mitigation area.

Habitat Structure

Objective 2. Install habitat features to favor small mammals and birds to compensate and improve riparian habitat functions.

Performance Standard 2a. A minimum of 4 horizontal logs over 12-inches DBH and 10 feet long will be placed adjacent to the stream crossing. The performance standard is completed when the horizontal logs are installed and documented in the first annual monitoring report.

Performance Standard 2b. Install a minimum of three bird boxes within the enhancement areas. This performance standard is completed when the bird boxes are installed and documented in the first annual monitoring report.

Table 4. Performance Standards for Vegetation by Monitored Year

	Percent Survival and Cover					
	Year 1	Year 2	Year 3	Year 5	Year 7	Year 10
Tree Strata						
Survival	90%	80%	75%	--	--	--
Cover ¹	--	--	--	25%	35%	50%
Shrub Strata						
Survival	90%	80%	75%	--	--	--
Cover ¹	--	--	--	10%	15%	30%
Invasive Plants						
Cover of non-native, invasive plants, excluding reed canarygrass	<10%	<10%	<10%	<10%	<10%	<10%

¹ Includes naturally recruited species.

Long-term Protection

Objective 3. Provide signage between the development and the critical area buffers.

Performance Standard 3a. Install signs on metal or wood posts at minimum of 100-foot intervals or 1 per lot along the boundary of the critical areas bordering the development. The signs will state language similar to the following: "critical area

buffer” and “please respect native plants and wildlife, protection of this natural area is in your care.” This performance standard is completed when signs are installed and documented in the first annual monitoring report.

Performance Standard 3b. Install natural barriers where needed around the boundary of the critical areas bordering the development. This performance standard is completed when the natural barriers are installed and documented in the first annual monitoring report.

Objective 4. Provide legally binding protection for the mitigation areas.

Performance Standard 4a. A conservation covenant or similar legal mechanism will be executed and recorded for the mitigation areas. The covenant, absent amendment by mutual agreement between the grantor and the City, will prohibit development of the area identified in the covenant, but will allow for maintenance and further mitigation opportunities. This performance standard shall be considered satisfied upon administrative approval of the covenant by the City, execution of the covenant by the grantor, and the covenant’s recording in Clark County.

Performance Standard 4b. The covenant referenced in Performance Standard 3a shall be referenced in the project’s Covenants, Codes, and Restrictions.

RESPONSIBLE PARTIES

The Applicant or its successors or assigns will be responsible for implementing this stream buffer averaging and enhancement plan, which includes preserving existing critical areas onsite and extending the existing riparian habitat corridor, planting native trees and shrubs, installing bird boxes, and physically and legally protecting the mitigation areas. Neither the Applicant nor any successor or assign shall be responsible for or be required to mitigate the effects of acts of nature that damage or kill trees, including fungal disease, windthrow or ice storms. The Applicant or its successors and assigns) also will conduct the prescribed maintenance and monitoring during the 10-year monitoring period or longer if warranted by contingency actions.

FUNCTIONAL ASSESSMENT

EXISTING CONDITIONS

The Green Mountain property was converted into a golf course in 1990 and expanded the year after. The golf course closed in spring 2016, but the site continues to be regularly mowed. Stream A and the riparian corridor bisect the central portion of Phase 2.

Vegetation

Riparian Buffer

The inner 50 percent of the riparian corridor consists of mainly deciduous/oak associations, with the overstory dominated by of Oregon white oak trees (*Quercus garryana*) and Oregon ash (*Fraxinus latifolia*). The shrub stratum in the riparian corridor consists of native shrubs commonly associated with oak woodlands and riparian areas

in southwest Washington, including common snowberry (*Symphoricarpos albus*), beaked hazelnut (*Corylus cornuta*), redosier dogwood (*Cornus sericea*), vine maple (*Acer circinatum*), black twinberry (*Lonicera involucrata*), oceanspray (*Holodiscus discolor*), Douglas hawthorn (*Crataegus douglasii*), nootka rose (*Rosa nutkana*), peafruit rose (*Rosa pisocarpa*), pacific ninebark (*Physocarpus capitatus*), and western serviceberry (*Amelanchier alnifolia*). Himalayan blackberry (*Rubus armeniacus*), Oneseed hawthorn (*Crataegus monogyna*), and English holly (*Ilex aquifolium*) are noteworthy invasive shrubs. The outer 50 percent of the stream buffer consist of mainly mowed grasses.

Soils

The National Resources Conservation Service map depicts the six soil units onsite as Cove silty clay loam, 0 to 3 percent slopes (CvA), Dollar loam, 0 to 5 percent slopes (DoB), Lauren gravelly loam, 0 to 8 percent slopes (LgB), McBee silt loam, coarse variant, 0 to 3 percent slopes (MIA), and Olympic stony clay loams, 3 to 30 and 30 to 60 percent slopes (OmE and OmF, respectively) (NRCS 2014).

Habitat

Riparian Buffer

The existing habitat conditions for the stream buffer addition areas consist of mowed grasses, which provide little to no habitat features. Wildlife observed consisted of songbirds. Because these areas were former golf course which are still mowed for maintenance, little to no habitat features are present in these areas.

PROPOSED CONDITIONS

Vegetation

The vegetation proposed within the riparian buffer enhancement areas will primarily consist of native, non-invasive species associated with riparian corridors within southwestern Washington. Areas proposed for enhancement will be contiguous with the existing advance oak mitigation, to provide a more contiguous and ecologically appropriate stream buffer. Non-native, invasive species will be controlled following the performance standards (1g, 1h, and 1i).

Soils

Soils within the mitigation areas will be ripped and/or tilled in preparation for individual plantings, but otherwise will not be impacted and may improve over time as will no longer be part of an active golf course.

Habitat

Invasive, non-native plants will be removed from the mitigation areas, and native species associated with southwestern Washington riparian corridors will be planted. The proposed multi-strata native trees and shrubs will improve vegetative structure in the largely mowed grass areas, which will benefit wildlife habitat over the long-term. A minimum of 4 horizontal logs over 12-inches DBH and longer than 10 feet will be placed

as LWM, and will be placed within the stream buffer along NE Boxwood Street to deter entrance into the stream buffer. Bird boxes will also be installed to improve wildlife functions.

WILDLIFE ANALYSIS

The proposed plan has been designed with specific elements to avoid or minimize impacts to the existing habitat of wildlife species or evidence of species that were observed onsite. The trees and shrubs specified will provide nesting, roosting, and escape habitat for birds (and some mammals). Many of the fruits, seeds, twigs, and leaves of the planted trees and shrubs will provide a food source for birds, mammals, and insects. In addition, bees frequent bigleaf maple flowers as a nectar source. Bird boxes are also proposed with varied diameter entry holes which will offer immediate nesting habitat to promote wildlife habitat functions. The native plants, large woody material, and bird boxes proposed will benefit all wildlife species common to the area, including insects, amphibians, birds, and mammals.

IMPLEMENTATION PLAN

PLANTING SCHEDULE AND EQUIPMENT

The native trees and shrubs will be installed in the enhancement areas during the late fall to early spring when the plants are dormant and the soil moisture conditions are favorable for planting. The trees and shrubs are intended to create a multi-strata riparian buffer that provides wildlife habitat, protection, and better food availability for wildlife. The enhancement areas will mimic the less disturbed, existing native understory habitat onsite (Figure 6).

The following equipment may be used to prepare and install plants within the enhancement areas: brush hog, weed eater, tractor, rototiller, tree shovel, garden shovel, and power auger. Heavy equipment will avoid the drip zone of preserved and planted trees and shrubs to prevent soil compaction.

Table 5. Plant Specifications for Stream Buffer Averaging and Enhancement

Species	Spacing (feet on center)	Size	Quantity (18,473 sq. ft.)
Tree Stratum			
Bigleaf maple (<i>Acer macrophyllum</i> , FACU)	10	1 gal minimum	15
Oregon ash (<i>Fraxinus latifolia</i> , FACW)	10	1 gal minimum	15
Red alder (<i>Alnus rubra</i> , FAC)	10	1 gal minimum	15
Oregon white oak (<i>Quercus garryana</i> , FACU)	14	1 gal minimum	15
Total Trees			60
Shrub Stratum			
Tall understory			
Vine maple (<i>Acer circinatum</i> , FAC)	6	1 gal minimum	70
Black hawthorn (<i>Crataegus douglasii</i> , FAC)	6	1 gal minimum	70
Oceanspray (<i>Holodiscus discolor</i> , FACU)	6	1 gal minimum	70
Mid-understory			
Nootka rose (<i>Rosa nutkana</i> , FAC)	6	1 gal minimum	70
Peafruit rose (<i>Rosa pisocarpa</i> , FAC)	6	1 gal minimum	70
Common snowberry (<i>Symphoricarpos albus</i> , FACU)	6	1 gal minimum	70
Total Shrubs			420

Table 6. Plant Specifications for Stormwater Outfall

Species	Spacing (ft on center)	Size	Quantity (up to 250 sq. ft.)
Shrub Stratum			
Redosier dogwood (<i>Cornus sericea</i> , FACW)	4	1 gal minimum	10
Nootka rose (<i>Rosa nutkana</i> , FAC)	4	1 gal minimum	10
Total Shrubs			20

SPECIFICATIONS FOR SITE PREPARATION, PLANTING, AND MAINTENANCE

Prepare Mitigation Areas

- Install silt fencing where necessary to control runoff from the development.
- Install temporary construction fencing along the boundary of the mitigation areas bordering the development.
- Mechanically remove existing non-native species, namely Himalayan blackberry, English holly, and reed canarygrass within the mitigation areas. Selectively apply herbicide by hand as necessary to control regrowth of invasive plants.
- Rip or till soils in plant locations as needed to loosen compact soils and clear existing vegetation in planting areas.

Install Large Woody Material

- Install a minimum of 4 pieces of LWM along the stream crossing areas.

Horizontal Log Specifications

- a. Preferably Oregon white oak, Oregon ash, and/or bigleaf maple;
- b. At least 12-inches diameter for at least 10 feet in length;
- c. With lateral branches retained;
- d. Of hard to medium decay, and;
- e. With ends rough cut, mashed or ripped.

Install Natural Barriers and Habitat Signs

- As needed, install natural barriers where the critical areas adjoin residential lots.
- Install durable, plastic critical area signs at a minimum of 100-foot intervals or 1 per lot on metal or wood posts where the critical areas border the development.

General Plant Specifications

- Plant the native trees and shrubs during the late fall to early spring (October-March) at the spacing identified in Table 3.
- Group the plants in uneven patches dominated by a single species, with patches interspersed among one another.
- All plant materials will be kept cool and moist prior to installation.
- All plant materials will have well developed roots and sturdy stems, with an appropriate root to shoot ratio.
- No damaged or desiccated roots or diseased plants will be accepted.

Plant Bareroot/Containerized Trees and Shrubs

- Dig the receiving hole several inches wider than the size of the root system.
- Position the planted species' root collar so that they are at or slightly above the level of the surrounding soil to allow for settling.
- Back the hole with soil.

- Gently compact the soil around the planted species to eliminate air spaces.
- Install a minimum of 3-inch depth by 4-foot diameter mulch layer around the base of planted species. The mulch will be comprised of chipped, clean wood. Avoid placing mulch directly against plant stems.
- Install tree shelters as needed.
- Irrigate all newly installed plants as site and weather conditions warrant.

Install Bird Boxes

- Install a minimum of 3 cedar bird boxes in each mitigation area. The bird boxes will have variable diameter holes to target different bird species (Link 1999) and will be at least 12 feet above the ground surface on posts or existing trees.

Maintain Mitigation Areas

The planted trees and shrubs will be maintained as often as necessary to ensure that the specified performance standards are met. The maintenance includes the following:

- Inspect the plantings at least once annually, or more often as appropriate, and maintain to achieve the performance standards specified in the subsection titled “Mitigation Goals, Objectives, & Performance Standards.”
- Irrigate planted trees and shrubs during the dry season for the first 2 to 3 years after planting. Water should be delivered at a minimum rate of 1 gallon every 4 weeks (Campbell 2004). Adjust as necessary based on site and weather conditions.
- Remove competing vegetation from around the base of plant species during first 2 to 3 years after planting and as needed thereafter.
- Replace mulch as needed to suppress competing vegetation.
- Inspect tree shelters to ensure they are upright, stable, and likely to remain so for another year (Clements *et al.* 2011, Devin and Harrington 2010). Ensure that the terminal shoot of the planted species is not ensnared in the wall of the tree shelter. Remove tree shelters when species is robust enough to withstand browse or shelter is impeding growth.
- Replace dead or failed plants to meet the minimum annual performance standards (Table 2). Replaced plants will be installed as described for the original installation.

Minor corrective actions will be undertaken as necessary as a part of routine maintenance and will be documented in the subsequent monitoring report. Corrective actions include, but are not limited to, the following:

- Replant trees or shrubs.
- Implement a fertilizing schedule.
- Repair damaged limbs or prune dead branches.
- Substitute the anti-herbivore device, such as installing a different type of tree shelter, painting lower stems with sanded latex paint, or spraying herbivore deterrent.

MONITORING PLAN

This buffer averaging and enhancement plan establishes a 10-year monitoring plan with quantitative performance standards. The monitoring will commence the first growing season after the mitigation areas are completed and extend for a 10-year period, beginning with Years 0 (as-built), 1, 2, 3, 5, 7, and 10. The goal of the monitoring will be to determine if the previously stated performance standards are being met (Table 2). Reports in years 1, 2, 3, 5, 7, and 10 will be submitted to City of Camas by December 31 of each monitored year. The Year 1 monitoring report will include as-built figures depicting the plant installation.

MONITORING PLOTS

During the first annual monitoring event, monitoring plots will be established as follows:

- A minimum of 2 monitoring plots in the stream buffer enhancement areas

The monitoring plots will be staked with metal t-posts and identification tags. Their locations will be identified by GPS and placed on an as-built site map that will accompany the monitoring reports. Permanent photo points will be established at each monitoring plot and directions documented on the site map.

Vegetation

To assess the status of the vegetation within the enhancement areas, the vegetation monitoring will measure the following:

1. Total density of planted native trees and shrubs (to determine survival rate) within a 15-foot radius from the metal t-post
2. Percent aerial cover of planted and naturally recruiting native trees and shrubs within a 15-foot radius from the metal t-post
3. Percent aerial cover of naturally occurring herbaceous plants within a 5-foot radius from the metal t-post
4. Percent aerial cover of non-native, invasive plants within a 15-foot radius from the metal t-post
5. Change in the plant community over time (documented at each designated photo point)

Fauna

To assess the development of wildlife habitat within the oak mitigation areas, wildlife monitoring will document the following:

1. Usage of bird boxes
2. Insect use
3. Amphibian use
4. Bird use
5. Mammal use
6. Level of herbivory

Soils and Hydrology

If the planted species show poor or failed growth, soil moisture and soil nutrients may also be monitored during the growing season. If necessary, soil moisture will be monitored monthly during the growing season and soil nutrients will be assessed annually during the growing season. Corrective actions will be taken as appropriate based on the soil moisture and soil nutrient data. These actions include, but are not limited to, a revised irrigation schedule and a fertilization schedule.

MONITORING REPORT

The annual monitoring reports will contain at least the following:

- Location map and as-built figures and revised plant quantity table as needed
- Historic description of project, including dates of plant installation, current year of monitoring, and restatement of performance standards
- Description of monitoring methods
- Documentation of bird boxes, natural barriers, and critical area signs
- Documentation of plant survival, cover, and overall development within the enhancement areas
- Assessment of non-native, invasive plant species and recommendations for management
- Assessment of site hydrology and soils, only if they appear to be limiting plant survival
- Assessment of surrounding land use, use by humans, and use by wild and domestic animals
- Observations of wildlife, including, insects, amphibians, birds, and mammals
- Photographs from permanent photo points
- Summary of maintenance and contingency measures proposed for the next season and completed for the past season

ADAPTIVE MANAGEMENT PLAN

If the performance standards are not met by the fifth year of monitoring, or at an earlier time if necessary, an adaptive management plan will be developed and implemented. All adaptive management actions will be undertaken only after consulting and gaining approval from the City of Camas. The Applicant (or Successor as assigned) will complete an adaptive management plan that describes 1) the need for adaptive management, 2) proposed actions, 3) time-frame for completing actions, and 4) any additional maintenance and monitoring, if necessary.

REFERENCES

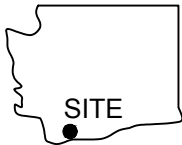
- Campbell, B.H. 2004. *Restoring Rare Native Habitats in the Willamette Valley: a landowner's guide for restoring oak woodlands, wetlands, prairies, and bottomland hardwood and riparian forests*. Oregon Department of Fish and Wildlife & Defenders of Wildlife, West Coast Office. West Linn, Oregon.
- City of Camas Municipal Code. 2008. *Critical Areas Ordinance Chapter 16.53 – Wetlands*. September 2016.
- City of Camas Municipal Code. 2008. *Critical Areas Ordinance Chapter 16.61 – Fish and Wildlife Habitat Conservation Areas*. September 2016.
- Clements, D.R., S. Luginbill, D.A. Jordan, R.V. Dragt, and R.K. Pelant. 2011. *Techniques to Promote Garry Oak Seedling Growth and Survival in Areas with High Levels of Herbivory and Competition*. Northwest Science 85(2): 172-181.
- Cornell Lab of Ornithology. 2003. *All About Birds*. Online database <<http://www.birds.cornell.edu/programs/AllAboutBirds/BirdGuide>>. Accessed February 22, 2005.
- Ecological Land Services, Inc. 2009. *Breeding Bird Survey for GM Camas, LLC*. Camas, Washington. July 13.
- Ecological Land Services, Inc. 2016a. *Critical Areas Report for Green Mountain PRD Phase 2*. Camas, Washington.
- Ecological Land Services, Inc. 2016b. *Wetland Buffer Averaging and Enhancement Plan for Green Mountain PRD Phase 2*. Camas, Washington.
- Ecological Land Services, Inc. 2016c. *Addendum to the Oregon White Oak Advance Mitigation Plan*. Camas, Washington.
- Ecological Land Services, Inc. 2016d. *Oregon White Oak Advance Mitigation Plan for Green Mountain Mixed Use PRD*. Camas, Washington.
- Knutson, K. L., and V. L. Naef. 1997. *Management recommendations for Washington's priority habitats: riparian*. Wash. Dept. Fish and Wildl., Olympia. 181pp.
- Link, R. 1999. *Landscaping for Wildlife in the Pacific Northwest*. University of Washington Press and the Washington Department of Fish and Wildlife. Seattle, Washington.
- Natural Resource Conservation Service (NRCS). 2015. *Soil Survey of Clark County, Washington*. Online document. <http://www.or.nrcs.usda.gov/pnw_soil/wa_reports.html>. September 2016.

Olson, P. & Stockdale, E. 2010. *Washington State Department of Ecology: Determining the Ordinary High Water Mark on Streams in Washington State*. Second Review Draft. Ecology Publication #08-06-001.

Figures

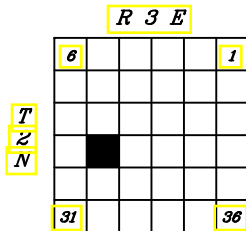
Figure 1	Vicinity Map
Figure 2	Existing Conditions
Figure 3	Proposed Conditions
Figure 3a	Proposed Conditions Detail
Figure 4	Stream Crossing Details
Figure 5	Cross Section A-A'
Figure 6	Planting Details

WASHINGTON



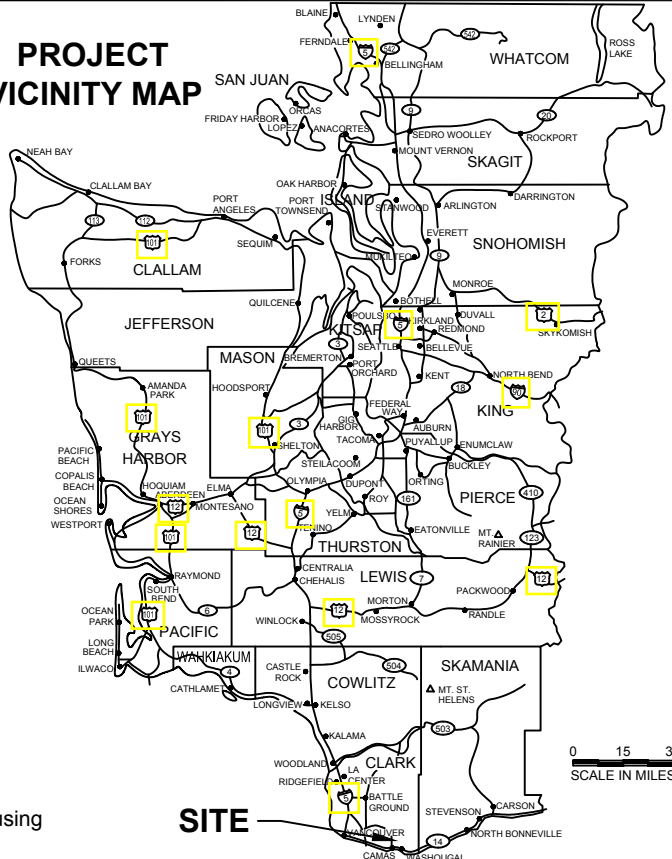
45.6471° Latitude
-122.4560° Longitude

LOCATION MAP



NOTE:
USGS topographic quadrangle map reproduced using
MAPTECH Inc., Terrain Navigator Pro software.

PROJECT VICINITY MAP



SITE

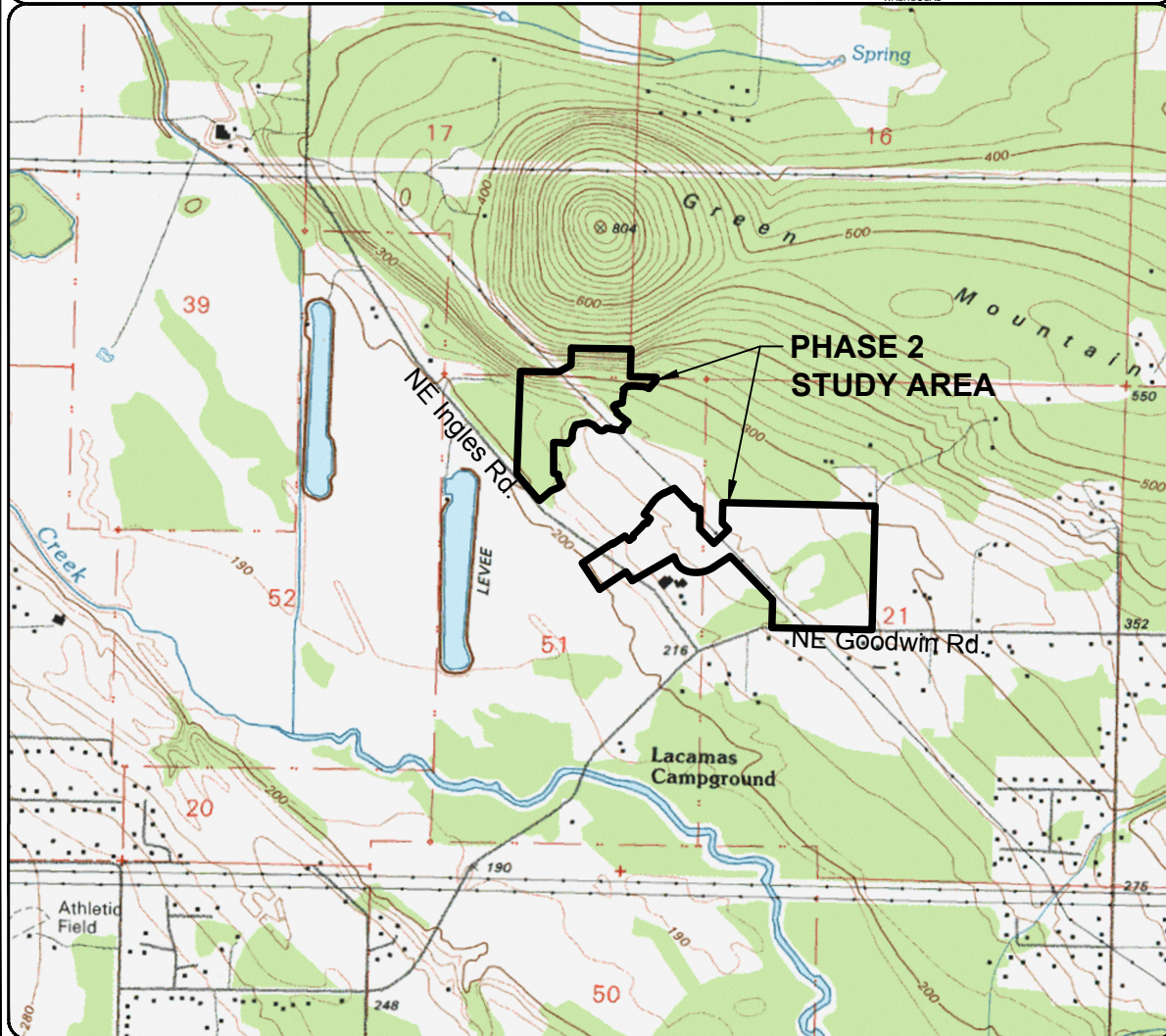
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SCALE IN MILES

Figure 1
VICINITY MAP

Green Mountain Mixed Use PRD Phase 2
CLB Washington Options Solutions LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.

DATE: 11/17/16
DWN: JKJ
REQ. BY: MM
PRJ. MGR: MM
CHK:
PROJECT NO: 2415.01

1157 3rd Ave., Suite 220A
Longview, WA 98632
Phone: (360) 578-1371
Fax: (360) 414-9305
www.eco-land.com



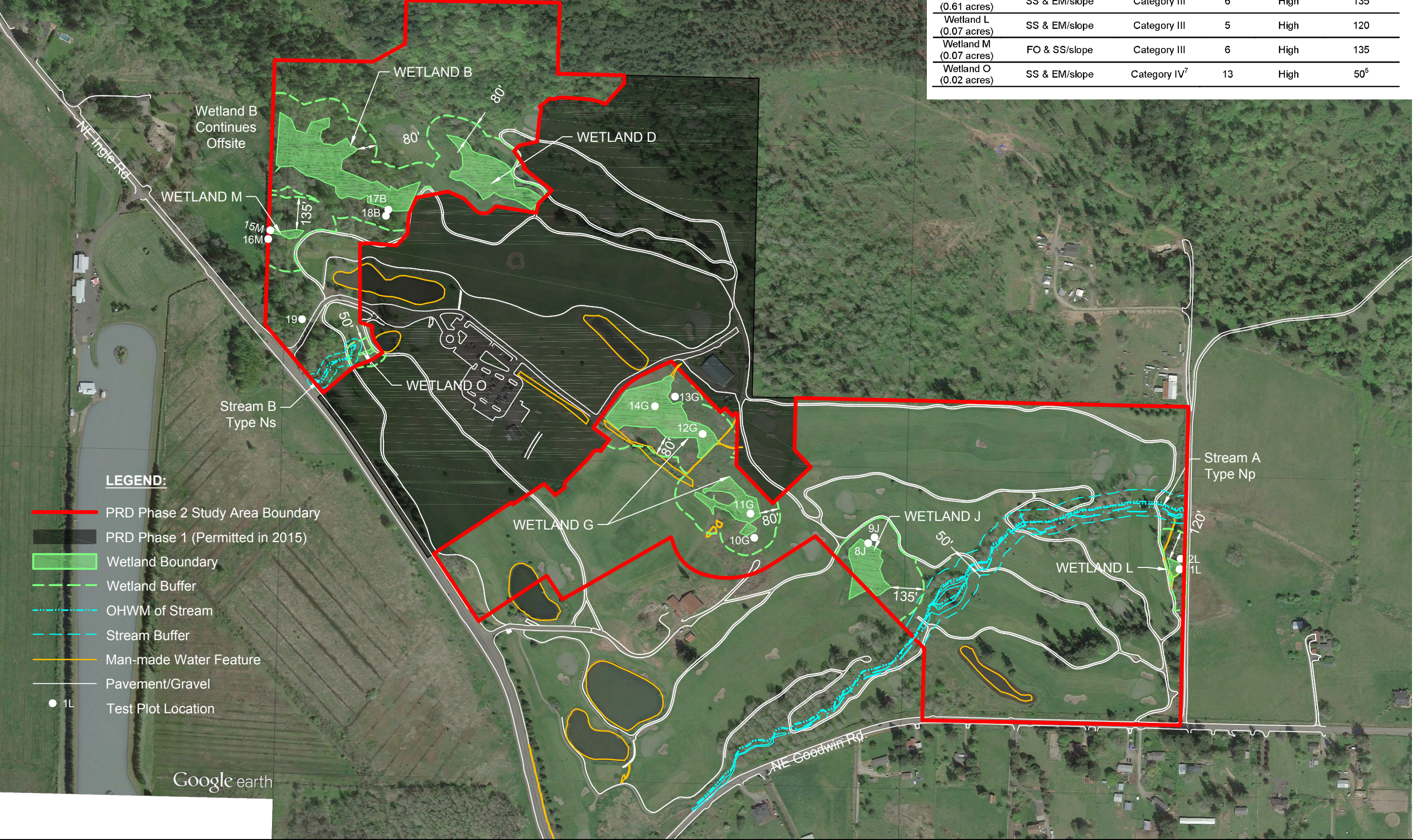
**PHASE 2
STUDY AREA**



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NOTE(S):

1. Aerial photo provided by Google Earth™.
2. Wetlands delineated on February 29 and March 1, 2016. Wetland flags surveyed by Olson Engineering.
3. Streams and man-made water features mapped using a hand-held GPS unit with ±0.5m accuracy.
4. Man-made water features considered exempt from jurisdictional regulation.
5. Wetlands B, D, G, and O vested per City File No. SUB14-02.



Wetland Name (size)	Cowardin Classification ¹ /HGM	State/Local Classification ²	Habitat Score ²	Proposed Land Use Intensity ³	Standard Buffer Width ⁴ (feet)
Wetland B (4.48 acres onsite)	FO, SS, EM/slope	Category III ⁷	21	High	80 ⁵
Wetland D (0.99 acres)	SS & EM/depressional	Category III ⁷	18	High	80 ⁵
Wetland G (1.94 acres)	SS & EM/slope	Category III ⁷	16	High	80 ⁵
Wetland J (0.61 acres)	SS & EM/slope	Category III	6	High	135
Wetland L (0.07 acres)	SS & EM/slope	Category III	5	High	120
Wetland M (0.07 acres)	FO & SS/slope	Category III	6	High	135
Wetland O (0.02 acres)	SS & EM/slope	Category IV ⁷	13	High	50 ⁵

DATE: 11/17/16
DWN: KJ
REQ. BY: MM
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CHK:
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Ecological Land Services

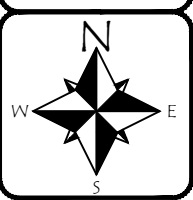
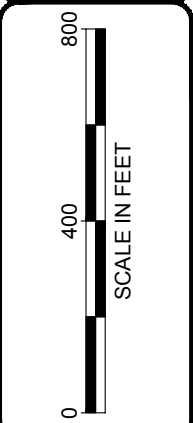
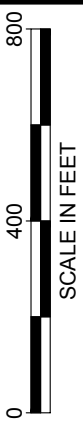
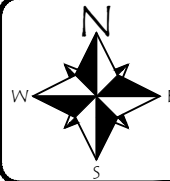


Figure 2
CRITICAL AREAS MAP
Green Mountain Mixed Use PRD Phase 2
CLB Washington Options Solutions, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.

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NOTE(S):

1. Aerial photo provided by Google Earth™.
2. Wetlands and streams delineated on February 29 and March 1, 2016.
Wetland flags surveyed by Olson Engineering.
3. Man-made water features considered exempt from jurisdictional regulation.
4. Wetlands B, D, G, and O vested per City File No. SUB14-02.
5. Phase 2 site design by Olson Engineering.


















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DATE: 11/17/16
DWN: JKJ
REQ. BY: MM
PRJ. MGR: MM
CHK:
PROJECT NO:
2415.01

Figure 3
PROPOSED CONDITIONS MAP
Green Mountain Mixed Use PRD Phase 2
CLB Washington Options Solutions, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.

1. Preliminary site design by Olson Engineering.

1. Wetlands and streams delineated on February 29 and March 1, 2016. Wetland flags surveyed by Olson Engineering.
2. Man-made water features considered exempt from jurisdictional regulation.
3. Wetlands B, D, G, and O vested per City File No. SUB14-02.
4. Phase 2 site design by Olson Engineering.

-  PRD Phase 2 Study Area Boundary
-  Wetland Boundary
-  Wetland Buffer
-  OHWM of Stream
-  Stream Buffer
-  Man-made Water Feature
-  Existing Pavement/Gravel
-  Stream Buffer Averaging OUT (3,328 sq. ft.)
-  Stream Buffer Impact (3,759 sq. ft.)
-  Stream Buffer Addition/Average IN (14,605 sq. ft.)
-  Stream Buffer Enhancement (11,277 sq. ft.)
-  Outfall to be Installed in Stream Buffer (250 sq. ft.)
-  Proposed Bird Box Location (3 total)
-  Proposed Large Woody Material Location (4 total)
-  Buffer Boundary Signage

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A horizontal scale bar with a black border. The text "SCALE IN FEET" is written vertically in the center. The bar has alternating black and white segments. Numerical markings are placed at the top: "0" at the left end, "100" at the midpoint, and "200" at the right end.

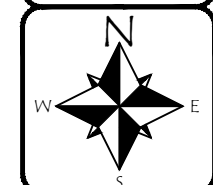
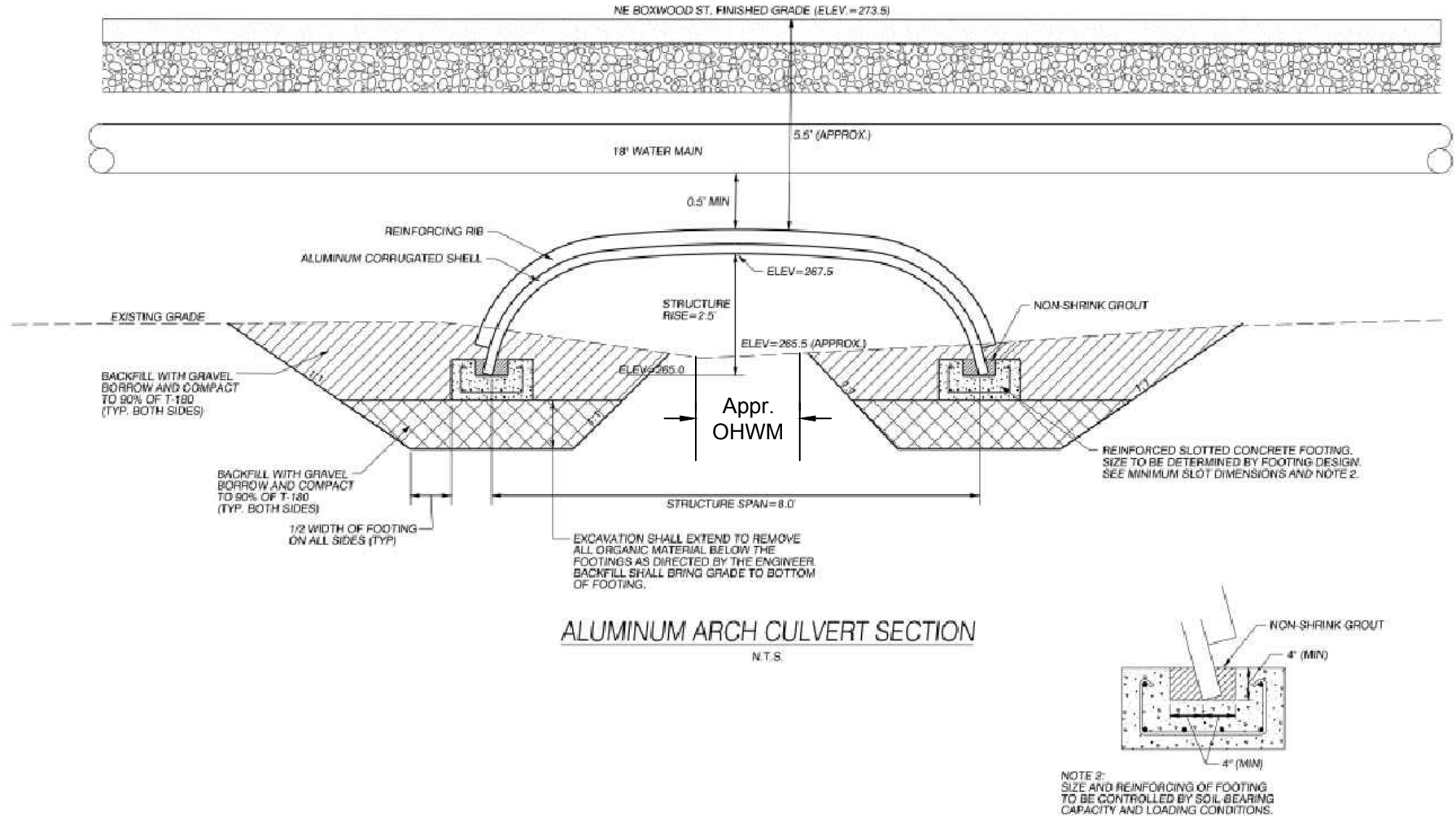


Figure 3A

PROPOSED CONDITIONS DETAIL

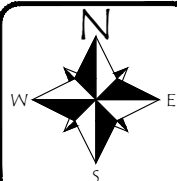
Green Mountain Mixed Use PRD Phase 2
CLB Washington Options Solutions, LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.



CONCRETE FOOTING

NOTE(S):

1. Figure from: OLSON ENGINEERING.



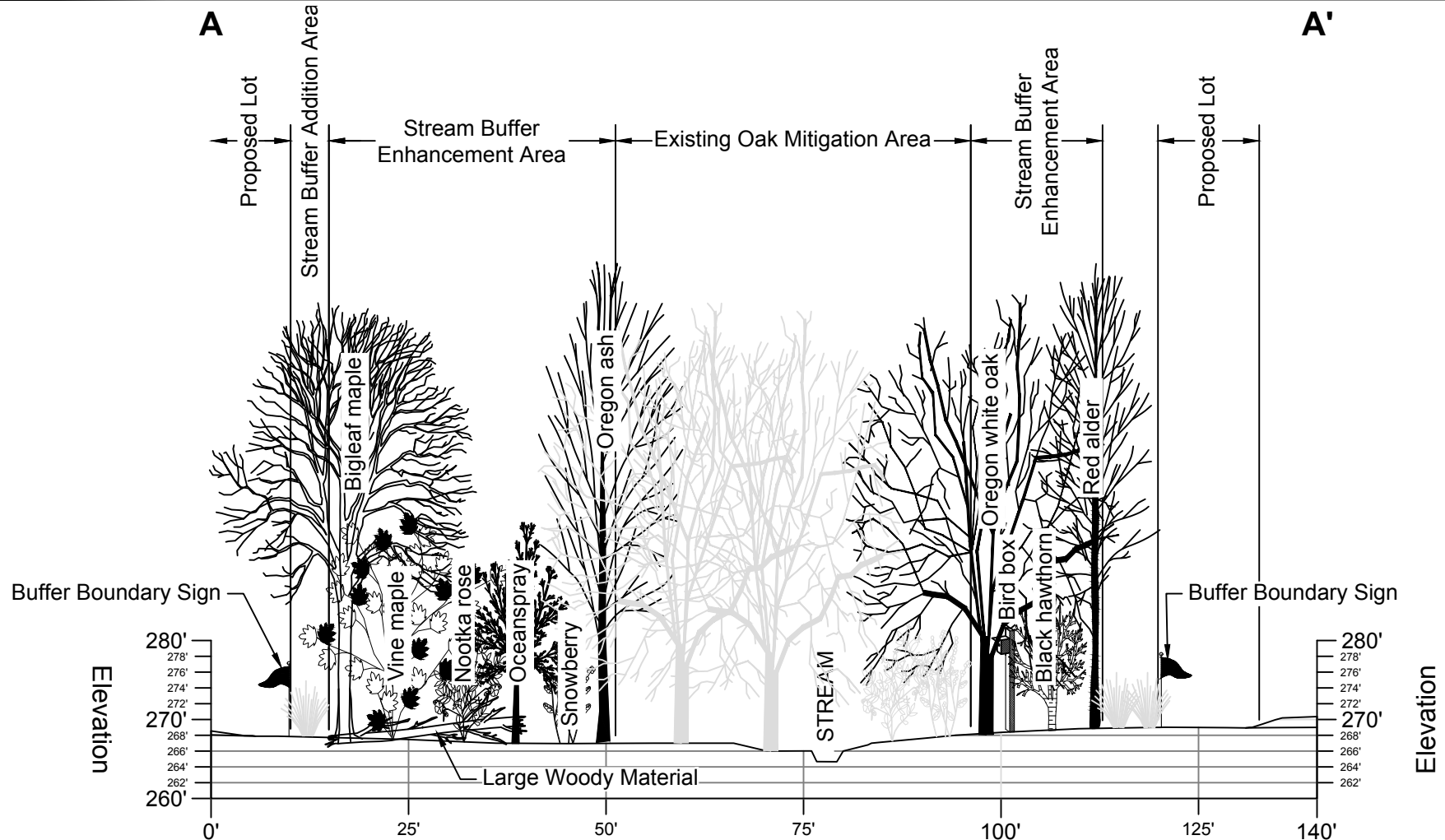
NOT TO SCALE



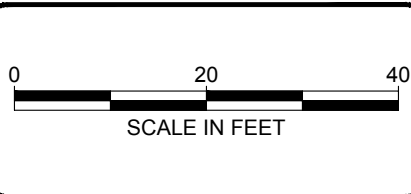
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DATE: 11/17/16
DWN: JKJ
REQ. BY: MM
PRJ. MGR: MM
CHK:
PROJECT NO:
2415.01

Figure 4
STREAM CROSSING DETAILS
Green Mountain Mixed Use PRD Phase 2
CLB Washington Options Solutions LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.



NOTE: Plants are not to scale and planting locations are approximate. Actual planting locations will be determined in the field with consideration to listed quantities and spacing to create the most natural look possible.

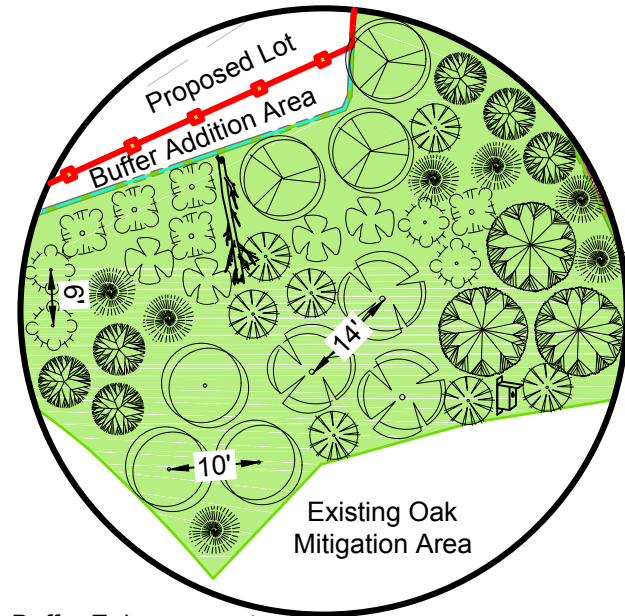
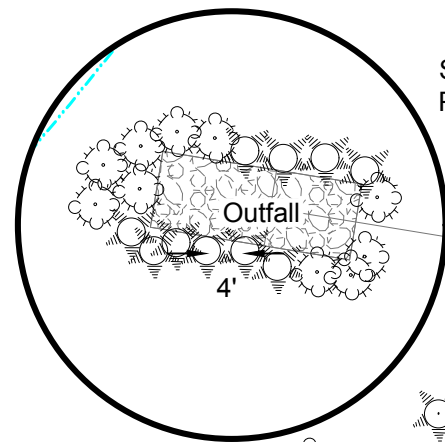


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Figure 5
CROSS SECTION A-A'
Green Mountain Mixed Use PRD Phase 2
CLB Washington Options Solutions LLC
City of Camas, Clark County, Washington
Section 20, Township 2N, Range 3E, W.M.

Stream Buffer Enhancement Planting Table

Buffer Enhancement
Planting DetailStormwater Outfall
Planting Detail

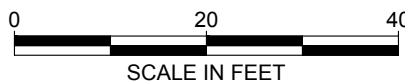
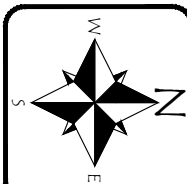
Stormwater Outfall Planting Table

Species	Spacing (ft on center)	Size	Quantity (up to 250 sq. ft.)
Shrub Stratum			
Redosier dogwood (<i>Cornus sericea</i> , FACW)	4	1 gal minimum	10
Nootka rose (<i>Rosa nutkana</i> , FAC)	4	1 gal minimum	10
Total Shrubs			20

Species	Spacing (feet on center)	Size	Quantity (18,473 sq. ft.)
Tree Stratum			
Bigleaf maple (<i>Acer macrophyllum</i> , FACU)	10	1 gal minimum	15
Oregon ash (<i>Fraxinus latifolia</i> , FACW)	10	1 gal minimum	15
Red alder (<i>Alnus rubra</i> , FAC)	10	1 gal minimum	15
Oregon white oak (<i>Quercus garryana</i> , FACU)	14	1 gal minimum	15
Total Trees			60
Shrub Stratum			
Tall understory			
Vine maple (<i>Acer circinatum</i> , FAC)	6	1 gal minimum	70
Black hawthorn (<i>Crataegus douglasii</i> , FAC)	6	1 gal minimum	70
Oceanspray (<i>Holodiscus discolor</i> , FACU)	6	1 gal minimum	70
Mid-understory			
Nootka rose (<i>Rosa nutkana</i> , FAC)	6	1 gal minimum	70
Peafruit rose (<i>Rosa pisocarpa</i> , FAC)	6	1 gal minimum	70
Common snowberry (<i>Symphoricarpos albus</i> , FACU)	6	1 gal minimum	70
Total Shrubs			420

LEGEND:

- OWHM of Stream
- Stream Buffer
- Existing Pavement/Gravel
- Stream Buffer Addition
- Stream Buffer Enhancement
- Stream Buffer Fencing/Riparian Habitat Signage
- Large Woody Material (4 total)
- Bird Box (3 total)



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Figure 6
PLANTING DETAILS
Green Mountain Mixed Use PRD Phase 2
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