

Critical Area Report and Mitigation Plan: NW Green Homes SFR (RUE)

Site Address: 13401 Marksman Street SW, Olympia, WA



Prepared For:
NW Green Construction

Tax Parcel Number: 13609120100

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EXECUTIVE SUMMARY

Site Location: 13401 Marksman Street SW, Olympia, WA

Tax Parcel: 13609120100

Acreage: 9.55

Legal Description: 9-16-3W S2 N2 NW NE LESS CO RD ON E FILE #856506

Zoning: RRR1/5, Rural Residential/Resource

Wetland Field Study Conducted: February 16, 2023

Project Description: single-family home with appurtenances

Critical Area Buffers

- Mima mound and degraded prairie cover eastern half of the parcel – required 50 foot buffer encumbers the entire eastern end of property
- Oak woodland along stream corridor – all trees receive 5 foot protection off dripline (plus 15 foot construction setback)
- Type F stream bisects the parcel = 200 foot plus 50 foot riparian management zone (plus 15 foot construction setback)

Proposed Project

A single family home site is proposed near the southeast corner of property immediately off Marksman Street SW. The entire eastern portion of the property is encumbered with a critical area buffer protecting mima mound/prairie habitat. The applicant will submit a RUE application with a proposed prairie enhancement plan.

Proposed Mitigation

- Remove culvert from stream
- Enhance 3,500-square-feet of degraded prairie habitat near the proposed home site

1.0 SUMMARY

West Fork Environmental (WFE) conducted a critical area study to delineate and establish appropriate buffer widths for critical area habitat on the parcel at 13401 Marksman Street in Olympia, WA (Figure 1). The applicant requested this study to support permitting requirements for a single-family home. This evaluation identified critical areas, including wetlands and streams that occur on or within 300 feet of the subject property. It also provides a mitigation plan for proposed impacts to prairie habitat and for removal of an unpermitted culvert in the stream on-site.

2.0 SITE DESCRIPTION AND LAND USE

2.1 Site Conditions

The undeveloped 9.55-acre parcel is located at 13401 Marksman Street SW, Olympia, WA and identified by Thurston County as parcel number 13609120100. The legal description is Section 09 of Township 16 North, Range 03 West. The property is positioned west of the Mima Mounds Natural Area Preserve and east of Capital Forest. The heavy Scots broom growth in the mounds was mowed in spring 2022 after the landowners purchased the property. The western half of the parcel is forested, and the Washington Department of Fish and Wildlife (WDFW) shows an Oregon white oak woodland running through the parcel along a mapped stream corridor.

Other similarly sized parcels to the north and south along Marksman Street SW contain single-family homes on similarly size lots. Most of the properties along the street graded the mima mound features when homes were constructed, but the mounds on the subject parcel remain intact (Figure 2 and 3).

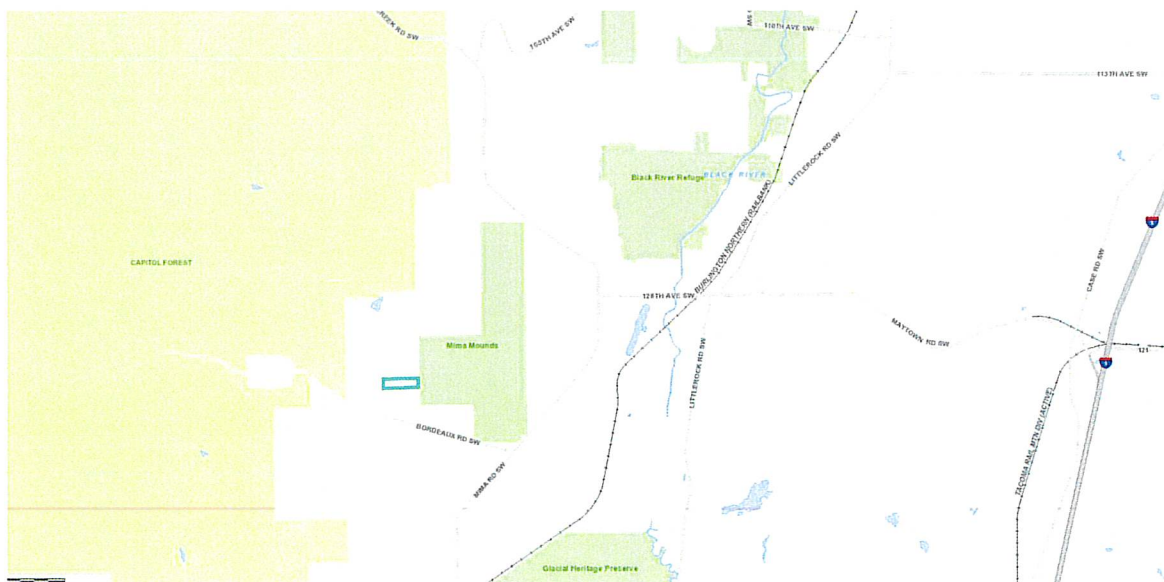


Figure 1. Vicinity Map – 13401 Marksman Street, Olympia, WA (Thurston County, Parcel 13609120100).

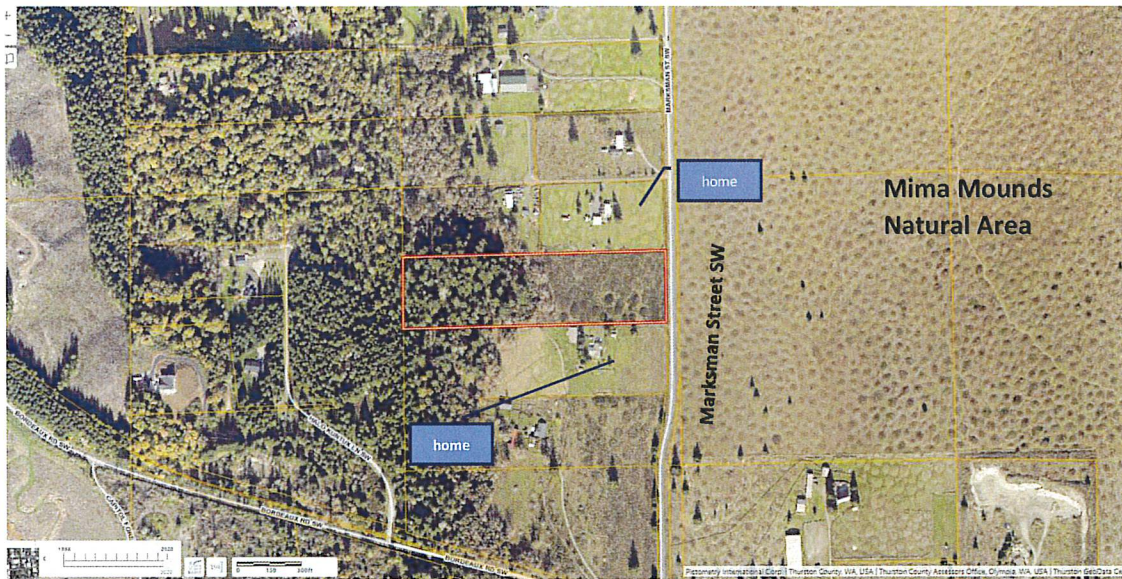


Figure 2. Current conditions on the subject parcel. The Mima Mounds Natural Area is immediately east.

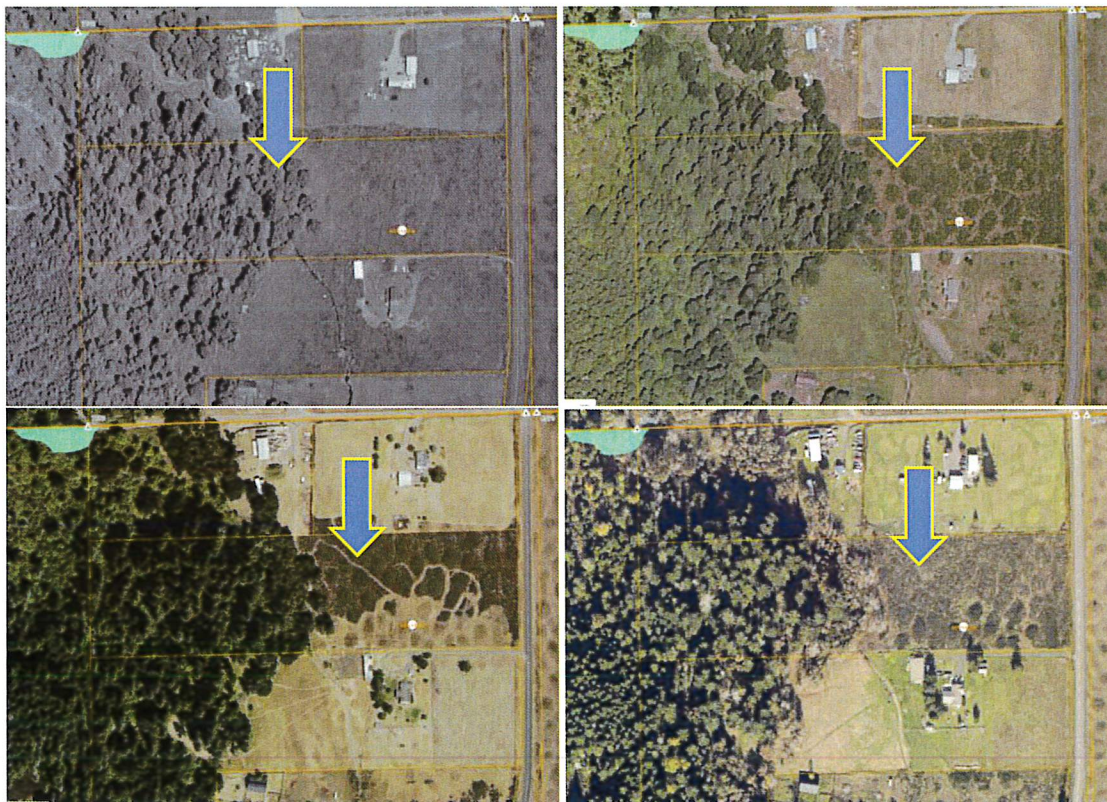


Figure 3. Aerial photos (1996 – upper left, 2003 – upper right, 2015 – lower left, and 2020 – lower right). The subject property has residential homes on the parcels north and south of it.

3.0 METHODS

3.1 Stream and Wetland

On February 16, 2023, a routine wetland determination was performed on the subject property and visually within 300 feet of the property. We walked the property and tested areas with a common vegetation character to determine the extent of wetland habitat.

3.1.1 Background materials

Background data on the subject parcel was collected from the following sources before the site assessment.

- Thurston County GeoData Center - parcel boundaries, 2-foot contour, existing potential wetland and streams,
- United States Department of Agriculture NRCS Soil Map,
- USFWS Fish and Wildlife Service National Wetland Inventory (NWI) mapper,
- Washington Department of Natural Resources Stream Type map
- Washington Department of Fish and Wildlife (WDFW) Priority Habitat and Species Database,
- Washington Department of Natural Resources Natural Heritage – Rare Plants Map
- Google Earth historical aerial photos.

3.1.2 Wetland Assessment

West Fork assessed areas on the parcel that could contain wetland characteristics utilizing the Routine Determination Method described in the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys and Coast Region* (US Army Corps of Engineers 2008) and *Washington State Wetland Identification and Delineation Manual* (Washington Department of Ecology 1997) by staff trained in evaluating these areas. Potential wetland features were examined for the presence of indicators of hydrophytic vegetation, hydric soils, and wetland hydrology. In addition to the on-site visit, National Resource Conservation Service (NRCS) soil survey data, National Wetland Inventory (NWI) maps, and GIS data from the Thurston County GIS site were utilized to aid in the determination.

Under Thurston County municipal code:

"Wetland" or "wetlands" means areas that are inundated or saturated by surface water 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, and other areas meeting the definition of wetland under RCW 36.70A.030, as amended. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from non-wetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from non-wetland areas in order to mitigate conversion of natural wetlands. Areas below the ordinary high water mark (OHWM) of a water body, including but not limited to marine waters, lakes, ponds, streams, and rivers, may also qualify as wetlands if they meet the criteria of the 1987 U.S. Army

Corps of Engineers Wetlands Delineation Manual and the 2008 Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region."

Plant species were identified using taxonomy in a *Field Guide to the Common Wetland Plants of Western Washington & Northwestern Oregon* by Sarah Spear Cooke, Editor and the U.S. ACOE State of Washington Wetland plant list (http://wetland-plants.usace.army.mil/nwpl_static/data/DOC/lists_2016/States/pdf/WA_2016v1.pdf) and *Plants of the Pacific Northwest Coast* by Jim Pojar and Andy MacKinnon, Editors. Our assessment used the 1987 federal method, where a series of vegetation indicators and tests were conducted to determine if the wetland criteria for hydrophytic vegetation was met. Vegetative indicator status is listed below:

- Obligate Wetland (OBL) – highly likely to be in a natural wetland
- Facultative Wetland (FACW)—most likely to be present in a natural wetland
- Facultative (FAC)—can be present in both a natural wetland and non-wetland environment
- Facultative Upland (FACU)—may be present in a natural wetland, but most likely to be seen in non-wetland conditions
- Obligate Upland (UPL)—most likely to occur in non-wetland conditions

Soil test pits were excavated to 16-20 inches below the surface to evaluate soil characteristics and hydrological conditions throughout the property. Soil color was evaluated using the *Munsell Color Chart* (Munsell Color, 1988). We characterized the soil profile and assessed hydric soil indicators as outlined in the Regional Supplement datasheets. A GPS location was recorded at test pit locations using a Garmin GPSMap 64.

3.1.3 Stream Assessment

Thurston County municipal code defines streams as (TCC 24.03):

"Streams" means those areas of Thurston County where surface waters flow sufficiently to produce a defined channel or bed. A "defined channel or bed" is an area which demonstrates clear evidence of the passage of water and includes but is not limited to bedrock channels, gravel beds, sand and silt beds and defined-channel swales. The channel or bed need not contain water year-round. This definition is not meant to include irrigation ditches, canals, storm or surface water runoff devices or other entirely artificial watercourses unless they are used by salmon or used to convey streams naturally occurring prior to construction.

The ordinary high water mark (OHWM) of the stream was determined using Washington State Department of Ecology guidance (2016) regarding field indicators used to establish the location along streams. GPS waypoints were recorded using a handheld Garmin GPSMap 64. Under TCC municipal code,

" Ordinary high water mark" means the mark on all lakes, streams and tidal waters which is found by examining the bed and banks and ascertaining where the presence and action of waters are so common and usual, and so long continued in all ordinary years, as to mark upon the soil a character distinct from that of the abutting upland; provided, that in any area where the ordinary high water mark cannot be found, the ordinary high water mark adjoining salt water shall be the line of mean high tide and the ordinary high water mark adjoining fresh water shall be the line of mean high water. "

3.2 Prairie Plant Study and Oak Delineation

On April 28, 2022, May 12, 2022, August 14, 2023, and September 26, 2023, we conducted a prairie plant survey for those species identified in the Thurston County CAO. This study evaluated the extent of diagnostic prairie plant species, mima mounds or Oregon white oak (*Quercus garryana*) on the property.

3.2.1 Prairie Review

Thurston County municipal code identifies prairie habitat as a critical habitat and provides the following definition of these habitats (24.03). If an application for use on a site contains prairie habitat, then a Critical Areas Report evaluating the potential impacts should be prepared.

"Prairie" or "westside prairie," means herbaceous, non-forested (forested means greater than or equal to sixty percent forest canopy cover) plant communities that can either take the form of a dry prairie where soils are well-drained or a wet prairie. In parts of the Puget Trough, prairies can sometimes be recognized by mounded topography commonly referred to as Mima Mounds. Mima Mounds are a unique geologic feature of prairie habitat in Thurston County.

According to Thurston County Critical Areas Ordinance (CAO 24.25), the parcel contains soil types associated with prairies. Transects were walked throughout the parcel and a list of plant species encountered during the survey was recorded as detailed in Thurston County's prairie review guidance (Figure 13). CAO listed target prairie plants were noted and a GPS waypoint was collected at each observation. The location of mima mounds was reviewed in the field and compared to LiDar imagery of the parcel. GPS waypoints were collected on top of mound features and mapped.

The 2022 Thurston County Community Planning Field Screening Guidelines for Prairie Habitat¹ document states that *"If at any point at least three different plant species, totaling in at least 25 plants each or meeting the presence/absence criteria based on imperiled butterfly use, are encountered within 5 meters of each other, the area in question meets the criteria be established as occurrence of prairie."* If prairie habitat is detected, the landowner may avoid impact by moving the footprint to a different location or developing a HMP when avoidance is not possible.

3.2.2 Oak Delineation Methods

Under Thurston municipal code, oak habitat is identified as an important habitat and species and assessment of these areas is required in development applications and the site plan. The subject parcel has mapped oak habitat ("oak-dominant forest or woodland canopy") (WDFW oak habitat, Figure 11).

24.25.065 - Important habitats and species.

Important animal and plant species, their habitats of primary association, and other important habitats protected under this chapter are:

*4. Oregon white oak (*Quercus garryana*) woodlands, stands, and individual trees meeting the following criteria are subject to this section:*

a. Oak woodlands, as defined in [Chapter 24.03](#) TCC.

b. Oak Savanna, as defined in [Chapter 24.03](#) TCC.

c. Individual oak trees and stands of oak or oak conifer associations less than one acre in size that are located within one-half mile of a stand meeting the criteria in this subparagraph.

¹ <https://www.thurstoncountywa.gov/planning/planningdocuments/2020-prairie-inspection-guidelines.pdf>

"Oak habitat" means stands of Oregon white oak (Quercus garryana) or Oregon white oak /conifer associations where canopy coverage of the oak component of the stand is twenty-five percent or more; or where total canopy coverage of the stand is less than twenty-five percent, but oak accounts for at least fifty percent of the canopy coverage. The latter is often referred to as oak savanna. Oak habitat includes oak savannas and oak woodlands.

"Oak savanna" means an oak habitat with a community of widely spaced Oregon white oak trees (Quercus garryana) where total canopy coverage is less than twenty-five percent but where Oregon white oak accounts for at least fifty percent of the canopy coverage above a layer of native prairie grasses and forbs. The spacing of these trees is widely scattered so that there is no closed canopy and groups of trees. In degraded habitat, trees may be more widely spaced above a layer of non-native vegetation on developed property.

"Oak woodlands" means those stands of Oregon white oak (Quercus garryana) or Oregon white oak/conifer associations where the crown cover of the Oregon white oak component of the stand is greater than or equal to twenty-five percent. In degraded habitat, the Oregon white oak component of the stand may be less than twenty-five percent, or the canopy coverage may be less than fifty percent.

Thurston County Municipal code requires protection of oak woodland habitat, individual oak trees including the root systems of trees in TCC 24.25.070 – *Tree protection*.

A. A tree protection area extending a minimum of five feet beyond the dripline of conifer trees twelve inches or greater in diameter (at four and one-half feet above the ground), stands of trees, and Oregon white oak, shall be established and protected from disturbance during site development. The approval authority may require that the protection area be extended for oak trees if necessary to ensure the trees' survival, based upon a recommendation of an arborist or urban forester.

B. Tree protection areas shall be identified on all applicable site development and construction drawings submitted to the county.

C. Temporary fencing at least thirty inches tall shall be erected in areas of activity along the perimeter of the tree protection areas prior to the initiation of any clearing or grading. The fencing shall be posted with signage clearly identifying the tree protection area. If the perimeter of the tree protection area is more than 0.25 miles in length, the perimeter of the protection area may be staked and flagged rather than fenced. The fencing or stakes shall remain in place throughout site development.

D. Clearing, grading, filling or other development activities are prohibited within the tree protection area.

E. Vehicle travel, parking and storage of construction materials and fuel is prohibited in tree protection areas

F. The county may approve the use of alternate tree protection techniques that provide an equal or greater level of protection.

In addition, TCC 24.01.035 (G) requires that a 15-foot construction setback be added to the tree protection buffer.

G. Construction Setbacks. Construction activity must occur outside of the critical area and associated buffer unless specifically authorized pursuant to this title. Structures or uses requiring a permit shall be set back a minimum of fifteen feet from wetland buffers, riparian

habitat areas, marine buffers, important habitat buffers, priority species conservation areas, and landslide hazards area buffers unless the applicant demonstrates to the approval authority's satisfaction that the proposed construction activity will not encroach into the protected area. Structures and uses not requiring a building permit are required to observe the setbacks and other requirements of this title.

4.0 RESULTS

4.1 Background Results

4.1.1 Soils

NRCS Soil Map showed the following soil types on the parcel: Spanaway-Nisqually complex 2 to 10% slopes (USDA Soil Mapping Tool, Figure 5). This soil is not listed as hydric soil in Thurston County CAO 24.30-5 (Table 12).

SPANAWAY SERIES

The Spanaway series consists of very deep, somewhat excessively drained soils that formed in glacial outwash. They are on terraces and plains. Slopes are 0 to 15 percent. The mean annual precipitation is about 1,270 millimeters. The mean annual temperature is about 10°C.

TYPICAL PEDON: Spanaway gravelly sandy loam - fern-grass prairie.

RANGE IN CHARACTERISTICS: Solum thickness is 35 to 70 cm. The mean annual soil temperature is 9 to 12°C. These soils are usually moist but are dry in the moisture control section for 75 to 90 consecutive days following summer solstice. The umbric epipedon is 25 to 50 cm thick. Rock fragments are 35 to 85 percent, with 35 to 60 percent gravel, 0 to 60 percent cobbles and 0 to 5 percent stones

GEOGRAPHIC SETTING: Spanaway soils are on glacial outwash terraces and plains at elevations of about 30 to 150 meters. Slopes are 0 to 15 percent. These soils formed in glacial outwash. These soils are in a maritime climate with cool, dry summers and mild, wet winters. The mean annual precipitation is 890 to 1,650 mm. The mean annual temperature is about 10.5°C. The frost-free season is 150 to 200 days

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Somewhat excessively drained; slow runoff; high saturated hydraulic conductivity.

USE AND VEGETATION: Used for woodland, pasture, cropland, homesites and wildlife habitat. Native vegetation is Douglas-fir, Oregon white oak, shore pine, and red alder with an understory of salal, western bracken fern, western sword fern, scotch broom, common snowberry, red huckleberry, Oregon-grape, rose, creambush oceanspray, Indian plum, Solomons-seal and Idaho fescue.

4.1.2 Thurston County Geodata Center Wetlands and Streams

Thurston County GeoData showed a potential wetland about 260 feet northwest of the northwest parcel corner (Figure 6). No mapped wetland or streams were identified on the subject parcel in GeoData.

4.1.3 United States Fish and Wildlife Service – National Wetlands Inventory (NWI)

The NWI wetlands mapper showed a riverine wetland corridor through the center of the parcel (Figure 7). No other wetland habitat was mapped in the area.

4.1.4 Washington Department of Natural Resources – Rare Plant List

The WADNR Natural Heritage program provides a map of known and potential rare plant locations. Figure 9 shows that the parcel potentially contains cup lichen (*Cladonia cilata*), maritime reindeer lichen (*Cladonia portentosa* spp. *pacifica*) and white top aster (*Sericocarpus rigidus*). These species are known to be located in the Mima Mound Reserve which has similar habitat.

The University of Washington Herbarium lichen curator (Dr. Katherine Glew) was consulted regarding the lichen species in 2023. WFE sampled lichen from within the proposed building envelope and sent them to Dr. Glew for identification given the rarity of these species and specialized identification required. Alphandary et al. (2012) showed that these lichen species were present in the Mima Mounds Natural Area Preserve using a carefully gridded sampling plan. The figure below from their paper shows the location where these lichen were located (blue arrow in A points to the subject parcel) with several locations near the subject property.

4.1.5 WDFW PHS Database

The Washington Department of Fish and Wildlife maintains a database of Priority Habitat and Species. The map showed **Townsend's Big-eared bat** and a **sensitive location for Taylor's Checkerspot butterfly** on the subject property (Figure 10). The Mima Mounds Natural Area Preserve is across the street from the subject parcel and provides habitat for prairie associated species.

4.1.6 Topography

The eastern portion of the parcel is covered with mima mounds. Mounds do not occur west of the stream that flows through the center of the parcel. West of the stream, the upland forest slopes up to a bench at the western end of the parcel (Figure 2).

4.1.7 Rainfall

Rainfall totals in early 2023 were slightly lower than normal as recorded at the Olympia Regional Airport (Figure 12). A total of 1.43 inches accumulated in the 10 days before our survey (from February 6 to February 16) while an average of 2.03 inches is typically recorded. A standard WETS analysis of precipitation data showed that conditions were normal at the time of our survey.

Table 1. Monthly precipitation data for Olympia, Washington.								
Month	WETS <30%	WETS Average	WETS >30%	2022/23 (in)	Condition	Condition Value	Month Weight Value	Product
November	5.58	8.13	9.69	8.18	N	2	3	6
December	5.76	7.89	9.28	7.73	N	2	2	4
January	4.76	7.54	9.1	3.7	D	1	1	1
							Sum	11
							Conclusion	Normal
Source: AgACIS for OLYMPIA AP, WA								
Sum 6-9 = drier than normal								
Sum 10-14 = normal								
Sum 15-18 = wetter than normal								

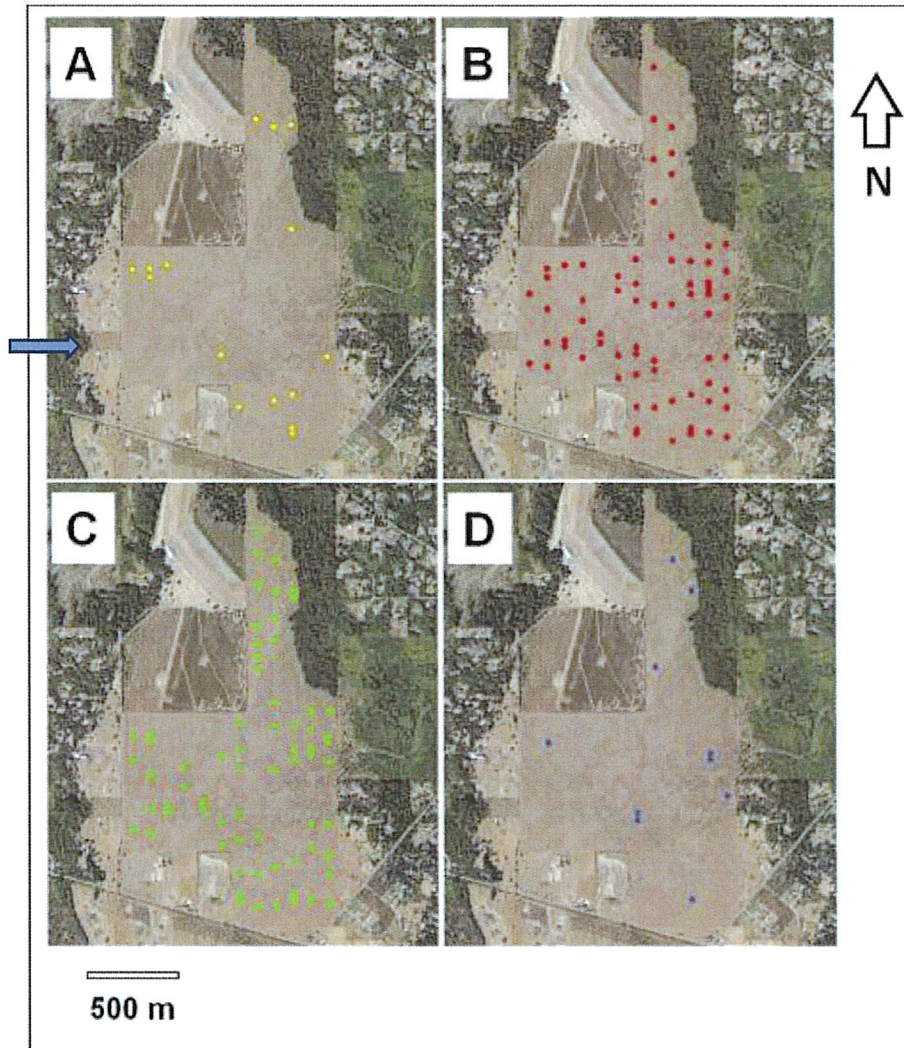


Figure 3. Spatial distributions of reindeer lichens at Mima Mounds, with presences at 106 sample points denoted by filled circles, absences not depicted. Key: A = *Cladonia ciliata* usnic chemotype, B = *C. ciliata*, C = *C. portentosa*, and D = *C. rangiferina*.

4.2 Field Results

Using the Routine Determination Method, we located one stream but did not find wetland habitat on or within 315 feet of the proposed project area. We were able to assess the offsite isolated patch northwest of the subject parcel that is depicted in Thurston GeoData (Figure 6). TP-6 was collected in that area which we determined the area to be an oak woodland. Data were collected at six test plots to determine if positive wetland indicators were present in the vegetation, soils, and hydrology characteristics (Figure 4, test plot data).

4.2.1 Stream A

A seasonal stream flows south across Bordeaux Road towards the Bordeaux housing development and appears to dissipate into the prairie soils. The Washington DNR stream typing maps indicate the channel is a Type F stream (Figure 8). We evaluated the stream connectivity using accessible roads. It appears that agriculture and development have altered the landscape such there is not a stream channel connection south of the Bordeaux neighborhood. However, it is possible that this stream connects to Mima Creek (fish stream to the west) at higher flows through wetland habitat downstream of Bordeaux Road (see photo below). For this reason, it is designated as a Type F stream channel.

On the subject property, the stream flows south through an Oregon white oak woodland (*Quercus garryana*). The channel width is 6 to 8 feet and is contained within clearly defined banks. At the southern end of the parcel, there is a 6 foot diameter culvert in the channel that was placed by a previous owner (see site photos). No wetland habitat was observed along the stream on the subject parcel or visually on neighboring properties. There are barbed wire fences across the stream at both north and south property lines and we did not have access to adjacent properties.



Photos: Channel path at Bordeaux Road south of the homes along Marksman (left – looking upstream, right – looking downstream).

4.2.2 Mima Mounds

Mima mound features cover the eastern portion of the parcel meaning the criteria for designated prairie is met (Figure 4 and 15). The SE corner of the parcel immediately off Marksman Street SW is the most disturbed portion of the property and would be the best location for minimizing disturbance to the mima mounds. The eastern side of the parcel was mowed in 2022 which removed the well-established scotch broom that covered the eastern half of the parcel providing an initial positive prairie habitat enhancement step.

4.2.3 CAO Listed Prairie Plants

Six of the target prairie plant species identified in the Thurston County CAO were detected on the parcel (Figure 14). Common camas was scattered throughout the eastern portion of the parcel and was densest between the mima mounds. The other five CAO prairie plant species were observed in lower density in a few locations. The eastern portion of the property was mowed in 2022 but had a thick

scotch broom cover for decades based on aerial photo imagery. A list of plant species observed on the parcel were recorded during the survey (Table 2).

- Common camas (*Camassia quamash*) – scattered in eastern half of parcel
- Henderson’s shooting star (*Dodecatheon hendersonii*) – a few plants near oak woodland in north central
- Spring gold (*Lomatium utriculatum*) – a few plants in south central
- Western buttercup (*Ranunculus occidentalis*) – a few plants near oak woodland in north central
- Long-stolen sedge (*Carex inops*) – scattered in eastern half of parcel
- Nuttall’s larkspur – (*Delphinium nuttallii*) – on east side of stream in southern portion of parcel

Table 2. List of plant species observed on the subject parcel.

Common Name	Scientific Name	Common Name	Scientific Name
Douglas-fir	<i>Pseudotsuga menziesii</i>	Pacific dogwood	<i>Cornus nuttallii</i>
Western redcedar	<i>Thuja plicata</i>	Oregon ash	<i>Fraxinus latifolia</i>
Oregon white oak	<i>Quercus garryana</i>	Sword fern	<i>Polystichum munitum</i>
Snowberry	<i>Symphoricarpos albus</i>	Himalayan blackberry	<i>Rubus armeniacus</i>
Oceanspray	<i>Holodiscus discolor</i>	Scots broom	<i>Cytisus scoparius</i>
Indian plum	<i>Oemleria cerasiformis</i>	Ribwort	<i>Plantago lanceolata</i>
Oregon grape	<i>Mahonia aquifolium</i>	Self-heal	<i>Prunella vulgaris</i>
Salal	<i>Gaultheria shallon</i>	Common dandelion	<i>Taraxacum officinale</i>
Red huckleberry	<i>Vaccinium parvifolium</i>	Oxeye daisy	<i>Leucanthemum vulgare</i>
Serviceberry	<i>Amelanchier alnifolia</i>	Catsear	<i>Hypochaeris radicata</i>
Vine maple	<i>Acer circinatum</i>	Colonial bentgrass	<i>Agrostis capillaris</i>
Common foxglove	<i>Digitalis purpurea</i>	Red fescue	<i>Festuca rubra</i>
Shepard’s purse	<i>Capsella bursa-pastoris</i>	Siberian miner’s lettuce	<i>Claytonia sibirica</i>
Woodland strawberry	<i>Fragaria vesca</i>	Miners lettuce	<i>Claytonia perfoliata</i>
Dove’s foot geranium	<i>Geranium molle</i>	Trillium	<i>Trillium ovatum</i>
Cleavers	<i>Gallium aparine</i>	Coastal manroot	<i>Marah oregana</i>

4.2.4 WA DNR Rare Plant List – Lichen species

The WADNR Natural Heritage Program map showed that two rare lichen species were potentially on the property. The curator of lichen at the UW Herbarium provided identification of seven samples from the proposed development area. We did not sample the entire property because most of the area will be protected. Samples were collected from the eastern portion of the property to characterize the patches that we observed (Figure 16, Table 3). Dr. Glew found that samples 1, 4, 6 were cup lichen (*Cladonia ciliata*) and that samples 2 and 3 were maritime reindeer lichen (*Cladonia portentosa*).

Table 3. Latitude and Longitude of lichen samples.

Sample	Latitude	Longitude	GPS ID	Identification	WA DNR Natural Heritage Status ²
1	46.89316	-123.061	3730	<i>Cladonia ciliata</i> var. <i>tenuis</i> . Both are UV- & P+yellow to reddish.	Endangered (rank – critically imperiled)
2	46.89302	-123.062	3731	<i>Cladonia portentosa</i> var. <i>pacifica</i>	Threatened (rank – imperiled)
3	46.89288	-123.062	3732	<i>Cladonia portentosa</i> var. <i>pacifica</i>	Threatened (rank – imperiled)
4	46.89325	-123.062	3733	<i>Cladonia ciliata</i> var. <i>tenuis</i> . Both are UV- & P+yellow to reddish.	Endangered (rank – critically imperiled)
5	46.89347	-123.062	3734	<i>Cladonia furcata</i>	none
6	46.89335	-123.062	3735	<i>Cladonia ciliata</i> var. <i>ciliata</i>	Endangered (rank – critically imperiled)
7	46.89282	-123.062	3736	<i>Cladonia furcata</i>	none

5.0 REGULATORY CONSIDERATIONS

5.1 Stream Buffer

The stream is a modeled Type F stream under Washington DNR stream typing maps (Figure 8). Thurston County requires a 200 foot buffer, Table 24.25-1 below (plus 15 foot construction setback) (Figure 4).

Table 24.25-1. Standard Freshwater Riparian Habitat Area Widths	
Stream type	Standard Riparian Habitat Area Width
Type F streams greater than 20 feet in width (for all stream types, width is defined as bankfull width)	250'
Type F streams from 5—20 feet wide	200'
Type F streams less than 5 feet wide	150'
Type Np and Ns streams draining to Type S or F streams or directly to Puget Sound	150'
Type Np and Ns streams with high mass wasting potential	225'
Other streams not listed above, including streams without a surface connection to other waters	100'

Thurston County code requires an additional 50-foot riparian management zone on Type S and F streams as described in TCC 24.25.040—*Riparian Management Zones* (see TCC excerpt below).

Riparian management zones shall be established along the outer boundary of riparian habitat areas of Type S and F streams as specified in this section. Consistent with Table 24.25-3 and TCC 24.25.220, uses and activities within riparian management zones shall be conducted to prevent damage to the riparian and stream habitat. Riparian management zones include the following:

A. Fifty-foot Management Zone. The area extending landward from the outer boundary of the riparian habitat area for a distance of fifty feet, measured on the horizontal plane;

5.2 Prairie Habitat

Thurston County's Community Planning Field Screening Guidelines for Prairie Habitat describes protection of mima mound features. TC municipal code states that mima mounds will be preserved to the greatest practicable extent even in the absence of native prairie flora. Thurston County may require

² https://www.dnr.wa.gov/publications/amp_nh_lichens.pdf

a Habitat Management Plan that details mitigation sequencing for the development proposal. It is possible a reasonable use exception (RUE) may be needed depending on the project proposal.

When prairie habitat is identified, TCC 24.25.075—*Important habitats and species—identification and buffers* states that a buffer of 50 feet will be applied to the delineated area. The prairie buffer encumbers the entire eastern portion of the property.

D. Prairie Habitat. The approval authority, in consultation with the WDFW and DNR Natural Heritage Program, shall establish buffers for prairie habitat that extend outward from the outer boundary of the habitat the greater of fifty feet, measured on the horizontal plane, or the minimum distance recommended in the critical area report, whichever is greater. When setting the buffer width, the approval authority shall consider the recommendation and supporting rationale in the applicant's critical area report and the following:

- 1. The habitat functions and their sensitivity to disturbance, the risk that the adjacent proposed land use poses for those functions (e.g., from noise, light, stormwater runoff, introduction of invasive or non-native plant species, pesticides, herbicides, and domestic animals) and, if applicable,*
- 2. The minimum buffer width necessary to protect adjacent properties from fire management practices on prairies. If fire is included within the critical area report as a management element for prairie habitat, the applicant shall:*
 - a. Submit a fire management plan to the Thurston County Fire Marshal and the appropriate fire district for technical review and approval; and*
 - b. Notify the Thurston County Fire Marshal and the appropriate fire district prior to setting fires as part of the fire management plan.*

1.2 Introduction

When a development application is received for a property mapped with glacial outwash soils known to support prairie habitat, as indicated in Thurston County Geodata (**Appendix A, Figure 2**, p. 15), a site visit must be conducted to screen for prairie critical areas (**Chapter 17.15.730, 24.40.010, 24.35.266 and 280 TCC**). These site visits entail a thorough screening process to determine whether prairie habitat, based on floristic composition, may be present and/or potentially impacted by proposed land use activities (**Chapter 24.05.027 Thurston County Code (TCC)**). Current CAO policy does not give Thurston County the authority to restrict development solely based on the presence of certain soils (**24.03.010 TCC**), although soil types trigger a need for prairie review and may result in the requirement of a Critical Areas report in some instances (**Chapter 25.35.260 (C) TCC**).

Mima-type mounds, described as “unique geologic features” in the CAO prairie definition (**Chapter 24.03.010 TCC**), are considered important prairie features due not only to their unique formation, but also to the heterogenous topography and microclimates these formations provide, which support mating and nectaring behaviors of imperiled butterflies such as the Oregon branded skipper and the valley silverspot (Ann Potter, pers. Comm.). Additionally, deeper soils on Mima mound tops and swales between the mounds sustain rare prairie flora during periods of drought (DelMoral, 1976; Sprenger, 2008). Therefore, Mima mounds shall be preserved to the greatest practicable extent even in the absence of native prairie flora (**24.03, Table 24.5-4 TCC**).

In the event that the appropriate number or presence of at least three plant species from Thurston County’s CAO target prairie plant list (**Tables 24.25-7 and 24.25-8, Appendix 24.25-1 in Chapter 24.25 TCC**) or Mima mounds or are detected within an area of proposed development, mitigation sequencing or an HMP may be required (**Chapter 24.35.260 TCC**). Alternative options to an HMP, as well as diagnostic prairie plant lists, are described later in this document (**Section 3, “When an HMP is Not Required,”** and in **Figure 3., Tables 1 and 2** (p. 8-10).

5.3 Oregon White Oak Woodland

An Oregon white oak (*Quercus garryana*) woodland is located along the stream corridor and protected under TCC 24.25.065 (Figure 15). Individual trees were not counted but the continuous dripline was mapped by collecting GPS waypoints to establish a tree protection zone. The stream was flowing during our surveys and does not appear to connect to a stream system downstream, but likely has connectivity through wetland habitat (per conversation with Thurston County planning). This portion of the parcel would be considered an “oak woodland” and protected under TCC 24.25.065. Forest habitat sloped up from the oak dominated area and was predominantly Douglas-fir with native understory species.

6.0 PROPOSED PROJECT

6.1 Description

The landowner proposes a single-family home, onsite septic with a drain field, well and driveway in the southeastern corner of the parcel. Driveway access will be off Marksman Street SW. The site was selected because it is the most disturbed area on the property. The remainder of the property will be maintained in natural condition and a portion of the prairie habitat will be enhanced at a 1:1 ratio.

6.2 Development Impacts

6.2.1 Direct Impacts

Home Site: Direct impacts to mima mound prairie habitat are unavoidable because the entire eastern end of the property is covered with the features. The home site at southeastern end of the property is

proposed in the most disturbed area. The proposed location minimizes impacts to the mima mound prairie habitat, the stream, and the oak woodland that bisects the property.

The home site was selected to minimize impact to mima mound prairie habitat. Direct impacts to two mima mounds are unavoidable. The seasonal stream and its buffer habitat would not be impacted, and no Oregon white oak trees would be impacted through this proposal.

6.3 Reasonable Use

The project will require reasonable use exception (RUE) consideration described under TCC 24-45. Under TCC 24.45.030—*Review Criteria*, a hearing examiner will approve or approve with conditions, the RUE if criteria are met. As described in TCC 24-45.010,

“a reasonable use exception is required when adherence to the provisions of this title would deny all reasonable use of the subject property as a whole, due to the property's size, topography, or location relative to the critical area and any associated buffer. A reasonable use exception shall only be granted if no other reasonable alternative method of development is provided under this title and the Thurston County Code. The reasonable use exception shall comply with all provisions of this chapter.”

6.3.1 RUE Review Criteria

TCC 24.45.030 - Review criteria outlines seven review criteria that,

The hearing examiner shall approve, or approve with conditions, the reasonable use exception if:

A. No other reasonable use of the property as a whole is permitted by this title; and

The entire eastern half of the subject property is encumbered with mima mounds habitat. The required 50-foot buffer covers nearly the entire eastern portion of the parcel. The primary use of the property is RRR 1/5 zoning for single-family residential use. Any land use in the eastern portion of the subject property would impact mima mounds directly because the only access is from Marksman Street SW. There is not sufficient area outside of prairie buffers for a residence and necessary appurtenances. Therefore, no other reasonable use of the property is permitted without approval of a RUE.

B. No reasonable use with less impact on the critical area or buffer is possible. At a minimum, the alternatives reviewed shall include a change in use, reduction in the size of the use, a change in the timing of the activity, a revision in the project design. This may include a variance for yard and setback standards required pursuant to Titles 20, 21, 22, and 23 TCC; and

The home and septic are proposed in the southeastern portion of the parcel to minimum disturbance to mima mound habitat as much as possible. While there is a portion of the property outside of critical area buffers in the western portion of the property, there is no access to this area. Driveway access to the western side of the parcel would disturb at least 6,500 sq ft of prairie habitat including twelve mima mound features, cross a stream, and pass through an area under the canopy of protected Oregon white oak. Instead, the applicant proposes disturbing a minimal amount of critical area habitat by concentrating development near Marksman Street SW. This will provide adequate area for a family home and preserve the functions of the remainder of habitat on the property.

C. The requested use or activity will not result in any damage to other property and will not threaten the public health, safety or welfare on or off the development proposal site, or increase public safety risks on or off the subject property; and

Other parcels along Marksman Street SW contain single family homes similar to that proposed in this project. Development is consistent with regulations and proposed in a manner to protect public health and safety. No increase in public safety will result from the proposed use.

D. The proposed reasonable use is limited to the minimum encroachment into the critical area and/or buffer necessary to prevent the denial of all reasonable use of the property; and

The applicant considered multiple locations for the home and it was determined that the SE corner of the parcel nearest the road provided the minimum impact to critical area habitat. The minimum amount necessary for a reasonable home is proposed and denial of this would prevent all reasonable use of the property. The proposal seeks to protect as many of the mima mound features as possible and enhance prairie habitat. No action would result in further degradation of potential prairie habitat by continued growth of invasive weeds.

E. The proposed reasonable use shall result in minimal alteration of the critical area including but not limited to impacts on vegetation, fish and wildlife resources, hydrological conditions, and geologic conditions; and

The development has been positioned in the most disturbed portion of the parcel near Marksman Street SW. This location will still impact two mima mounds which is the minimum necessary to allow reasonable use of the property. The applicant proposes to enhance prairie habitat over 3,500 sq ft immediately behind the home site and to protect the remaining prairie area by fencing the home site, resulting in improvement in >98% of the total on-site prairie habitat.

F. A proposal for a reasonable use exception shall ensure no net loss of critical area functions and values. The proposal shall include a mitigation plan consistent with this title and best available science. Mitigation measures shall address unavoidable impacts and shall occur on-site first, or if necessary, off-site; and

Unavoidable impacts to mima mound prairie habitat will occur at the home site. The parcel is directly across the street from Mima Mounds Natural Area. A mitigation strategy detailed in Section 7.0 (Critical Area Report) considered the best available science, consulted agency staff and other experts, and provides measures to control invasive species, enhance native prairie vegetation and monitor and maintain the plan. Nonnative Scots broom was mowed in 2022 and will continue to be controlled as described. In addition, native prairie seed will be sown for to encourage establishment of herbaceous prairie species.

G. The reasonable use shall not result in the unmitigated adverse impacts to species of concern; and

The subject property is directly across Marksman Street SW from the Mima Mound Natural Area where endangered Taylor's Checkerspot and other prairie species are mapped. To our knowledge, no endangered plant or animal species occur within the development area. The DNR Natural Heritage Program mapped two rare lichen species as possibly occurring on the property. We sampled within and near the proposed development area and documented the presence of these lichen species. The mitigation plan addresses minimization of impact and efforts to mitigate unavoidable impacts to these lichen.

H. The location and scale of existing development on surrounding properties shall not be the sole basis for granting or determining a reasonable use exception.

The intended use of the parcel is residential. The proposed plan was developed independent of surrounding properties and is not listed as reason for this permitting request.

7.0 CONCEPTUAL MITIGATION

7.1 Impact Avoidance and Minimization - Mitigation Sequencing

The property is currently undeveloped. The applicant proposes the home and septic system location near Marksman Street in the most disturbed habitat. As described in the project description, direct impacts to < 3,500 sq ft of mima mound prairie habitat are unavoidable. A conceptual mitigation plan is proposed to provide a prairie set-aside area and maintain no-net-loss of functions and values of the critical area habitat (Figure 17).

Mitigation of impacts include the following elements which are applied in sequence, in order of preference (TCC 24.01.37).

A. Avoiding the impact altogether by not taking a certain action or parts of an action;

There are no alternatives to avoid impact to mima mound habitat and buffer on the property due to the only access being off Marksman Street SW. The intended use of the parcel is residential and given the extent of habitat, impact is unavoidable. A RUE is required for use of the property.

B. Minimizing impacts by limiting the degree or magnitude of the action and its implementation, by using appropriate technology, or by taking affirmative steps to avoid or reduce impacts;

Impacts to the critical area habitat will be minimized by implementing best management practices (BMPs) during construction. Only the area needed for the project will be disturbed. The remaining buffer will be maintained in natural prairie and oak woodland vegetation. A fence will be placed behind the proposed home site to ensure no machinery enters the protected habitat.

C. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;

The mima mound prairie habitat on the property is degraded and was covered with thick Scots broom prior to mowing in spring 2022. Management of Scots broom and seeding of native prairie species will enhance the mima mound habitat which is directly across the street from the Mima Mounds Natural Area. The details of this are provided in the Prairie Enhancement section. In addition, the culvert that was placed in the stream by a previous owner will be removed. Two rare lichen species (listed by WA DNR Natural Heritage Program) were found on the property. Mitigation for unavoidable impacts to these species at the project site is addressed in the mitigation plan.

D. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;

The proposed home site in the southeastern portion of the parcel will retain the greatest block of prairie habitat possible (98% of current). Residential use will be concentrated to this area and the remainder of the property will be protected. The stream and oak woodland will remain undisturbed.

E. Compensating for the impact by replacing, enhancing, or providing substitute resources or environments; and/or

The majority of the mima mound prairie area will be enhanced by removal of Scots broom and other non-natives and seeding of native prairie mix. See the Prairie Enhancement section.

F. Monitoring the impact and taking appropriate corrective measures.

The non-native Scots broom control and planting described in the Prairie Enhancement section will be monitored and maintained according to the agreed performance standards for five growing seasons following implementation.

7.2 Culvert Removal

The applicant will remove the existing culvert that was placed in the stream before they purchased the property. This work will be conducted during the driest portion of the year to reduce impacts on instream habitat. Care will be taken to use the lightest machinery necessary. The machinery will need to drive through the mima mounds to the stream channel to remove the culvert. The following best practices will be followed:

- Work will be conducted when the stream flow is dry or nearly dry
- Care will be taken to minimize disturbance to the streambank
- Care will be taken to minimize disturbance to Oregon White oak (*Quercus garryana*), any disturbed oak seedlings will be carefully moved to the side and replanted.
- Any disturbed soils from machinery will be reseeded with prairie seed (see below)

7.3 Proposed Prairie Enhancement Plan

The applicant proposes a mitigation enhancement plan to improve degraded prairie habitat conditions in the eastern portion of the parcel immediately near the proposed home site. This action will meet the requirements of no-net-loss of habitat function. The extent of prairie and oak woodland habitats are limited in Thurston County and this particular site is directly across the street from the Mima Mounds Natural Area that provides habitat for endangered prairie species such as the Checkerspot butterfly. As such, it is an important patch of habitat to protect for the long-term conservation of prairie habitat in Thurston County.

7.3.1 Proposed Protection and Enhancement

- 1) Set aside 186,000 sq ft (4.25 acres) of mima mound and prairie habitat.
 - a. A fence will be constructed behind the residence to keep residential use from impacting the mima mound habitat.
- 2) Management of invasive weeds, including Scot's broom (*Cytisus scoparium*), Himalayan blackberry (*Rubus armeniacus*) by mowing in the fall or hand cutting
- 3) Enhancement of 3,500 sq ft of prairie immediately near the proposed home site
 - a. Removal of Scot's broom and Himalayan blackberry will be by hand pulling
 - b. Reseed prairie seed in 3,500-square-feet of habitat

- 4) Transplant a few lichen patches from the building footprint to mitigate impacts on DNR Natural Heritage listed lichen species
 - a. Carefully move select patches before the project starts. The patches and locations for placement will be clearly marked in the field.

7.3.2 Schedule

The mitigation planting effort will begin upon Thurston County approval of the project.

7.3.3 Planting Plan

Best available science indicates that native prairie plants germinate and can be reseeded successfully (Table 4). Seed can be purchased from the Thurston County Conservation District³ or the Washington Native Plant Nursery.

The Washington Native Plant Nursery recommends seeding in the fall and lightly raking the seed into the soil. If seeds are planted in the spring, they may require water to ensure successful establishment. If the desired species are not available, then those with similar ecological functions are acceptable.

Table 4. Recommended seed for prairie restoration and enhancement.

Common Name	Scientific Name	Quantity	Cost	Total
Idaho fescue	<i>Festuca idahoensis</i>	2 lb	\$32.50/lb	\$65.00
Long-stolen sedge	<i>Carex inops</i>	4 packet	\$14.33/g	\$57.32
Crown brodiaea	<i>Brodiaea coronaria</i>	3 packet	\$6.50/g	\$19.50
Slender cinquefoil	<i>Potentilla gracillis</i>		\$6.50/g	\$19.50
Western buttercup	<i>Ranunculus occidentalis</i>		\$6.88/g	\$20.64
Oregon sunshine	<i>Eriophyllum lanatum</i>		\$6.88/g	\$20.64
Spring gold	<i>Lomatium utriculatum</i>		\$6.50/g	\$19.50
Farewell to spring	<i>Clarkia amonena</i>		\$7.00/packet	\$21.00
Total cost				\$243.10

*Cost estimates for trees and shrubs are from Native Plant Sale – Olympia, WA (<https://store.thurstoncd.com/>) and Washington Native Plant Nursery (<https://www.cnlm.org/native-seed-nursery/>).

7.3.4 Maintenance and Performance Standards

The landowner will be responsible for performing the required maintenance duties on the site to ensure success of the project. Maintenance duties will include competing vegetation management (primarily Scot's broom and Himalayan blackberry).

The following performance standards will be evaluated:

- A. Cover of Scot's broom and Himalayan blackberry will not increase within the prairie set-aside during the monitoring period.
- B. Distribution of native prairie species will show positive increase by the third year or further seeding will be conducted.
- C. Lichen transplant locations will be monitored

³ <https://store.thurstoncd.com/product-category/prairie-friendly/>

7.3.5 Monitoring and Contingency

The prairie enhancement will be monitored for five years. A baseline analysis will be conducted in spring 2024 and used to describe conditions through the monitoring period. Field visits will be conducted as follows:

- Immediately following home construction
- April/May in 1st and 2nd year
- April/May and August in 3rd, 4th and 5th year

Photo points will be established to document conditions through the monitoring period. These will document the general appearance and progress of the prairie restoration and enhancement. The planting area will be monitored to record vigor and growth. Observations of wildlife use will be recorded (direct observations or other signs).

7.4 Mitigation Functional Analysis

TCC municipal code 24.45.030 describes that a RUE proposal will ensure no net loss of critical area functions and values. The prairie set-aside and enhancement strategy outlined above is consistent with this intent and the best available science while maintaining the intended use of the property. Best available science details factors include preserve/increase the native prairie species present, reduce invasive weedy species outcompeting native species (presence and coverage), reduce conifer encroachment in prairie and oak habitat, and ensure habitat supports possible priority species use. Table 5 summarizes existing and proposed mitigation measures to demonstrate no net loss of prairie function is expected. The control of invasive plants will benefit the degraded prairie habitat. No action will result in further growth of invasive Scot's broom and Himalayan blackberry.

Table 5. Functional analysis of prairie habitat associated with the proposed project.

<i>Factor</i>	<i>Existing Condition</i>	<i>Proposed Condition</i>	<i>Analysis (+, - or 0)</i>
Onsite Prairie Habitat	Mima mound (degraded plant condition, heavy invasive plants)	Mima mound, reduction in invasive plants and increase in enhanced native species	+1
Density of CAO prairie species	6 species, low density	8+ species, with reduced invasive competition	+1
Coverage of invasive weeds	Scot's broom Him. BB	Removed and maintained	+1
Habitat for PHS prairie species (Taylor's checkerspot)	Degraded, invasives	Higher density of native plant species	+1
Overall Functional Value			+4

8.0 CLOSING

West Fork Environmental conducted a critical area review on the subject parcel and concludes that critical areas including a seasonal stream, oak woodland and prairie habitat should be considered in the site plan proposal. The eastern half of the parcel contains mima mounds and the property is bisected by an oak woodland along the seasonal stream. Thurston County advised that proposals that disturb oak

woodland or mima mounds require a RUE (TCC 24.25.070). The stream requires a 200-foot buffer plus 50-foot riparian zone and 15-foot construction setback under TCC 24.25.020.

The applicant will seek a RUE to allow the minimum necessary area for a reasonable residential home site near Marksman Street SW. The site plan should consider minimization of impacts to critical area and buffers. As required under the RUE criteria, a mitigation plan is proposed to enhance remaining prairie habitat on the parcel. This is a unique opportunity to enhance existing degraded prairie habitat near a protected conservation area where endangered **Taylor's Checkerspot** butterfly occurrence is mapped. The existing prairie habitat is degraded with a heavy component of **Scot's broom**. If no action is taken, the degradation of this habitat will continue.

The critical areas evaluation detailed in this report were performed consistent with generally accepted professional consulting practices. WFE completed the determination of wetlands reported in this document for use by NW Green Construction. This determination is based on scientific methods and our best professional judgement. Final approval of conclusions detailed in this report are dependent on review with local, state, and federal regulatory agencies. The content and data put forth in this report were collected and prepared by the undersigned. No outcomes are warranted by this report. Please call our office at (360) 753-0485 with questions or if you require any additional information.



Heidy Barnett
Professional Biologist

9.0 REFERENCES

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Washington State Department of Fish and Wildlife. Priority Habitat and Species Database (PHS Online).
<http://apps.wdfw.wa.gov/phsontheweb/>. (February 2023)

Figure 4. Test plot locations, stream edge GPS points, and Thurston County regulatory buffer plus 15-foot construction setback on the subject parcel. Mima mound prairie and oak woodland habitat delineated in spring 2022 and displayed below.

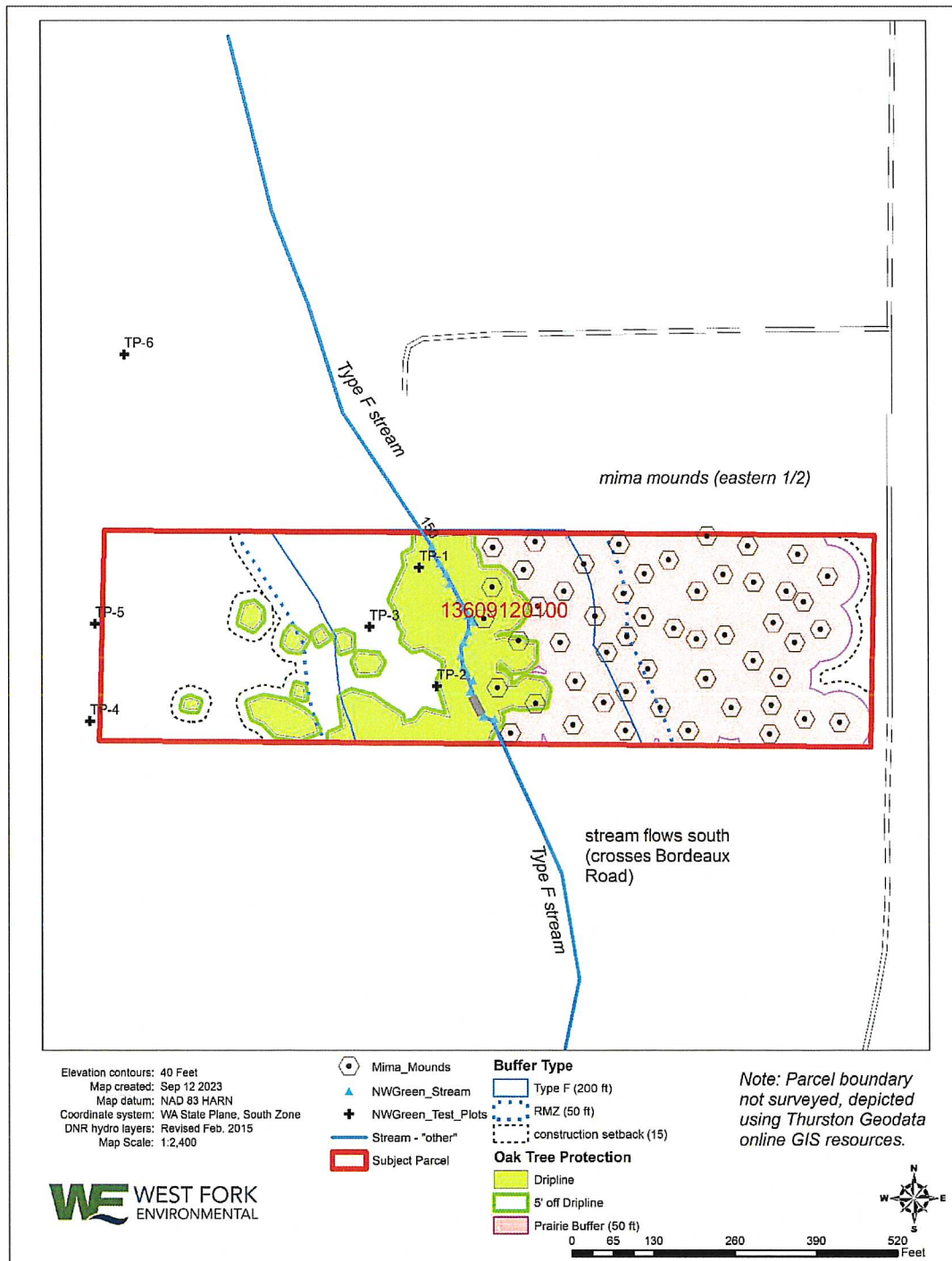
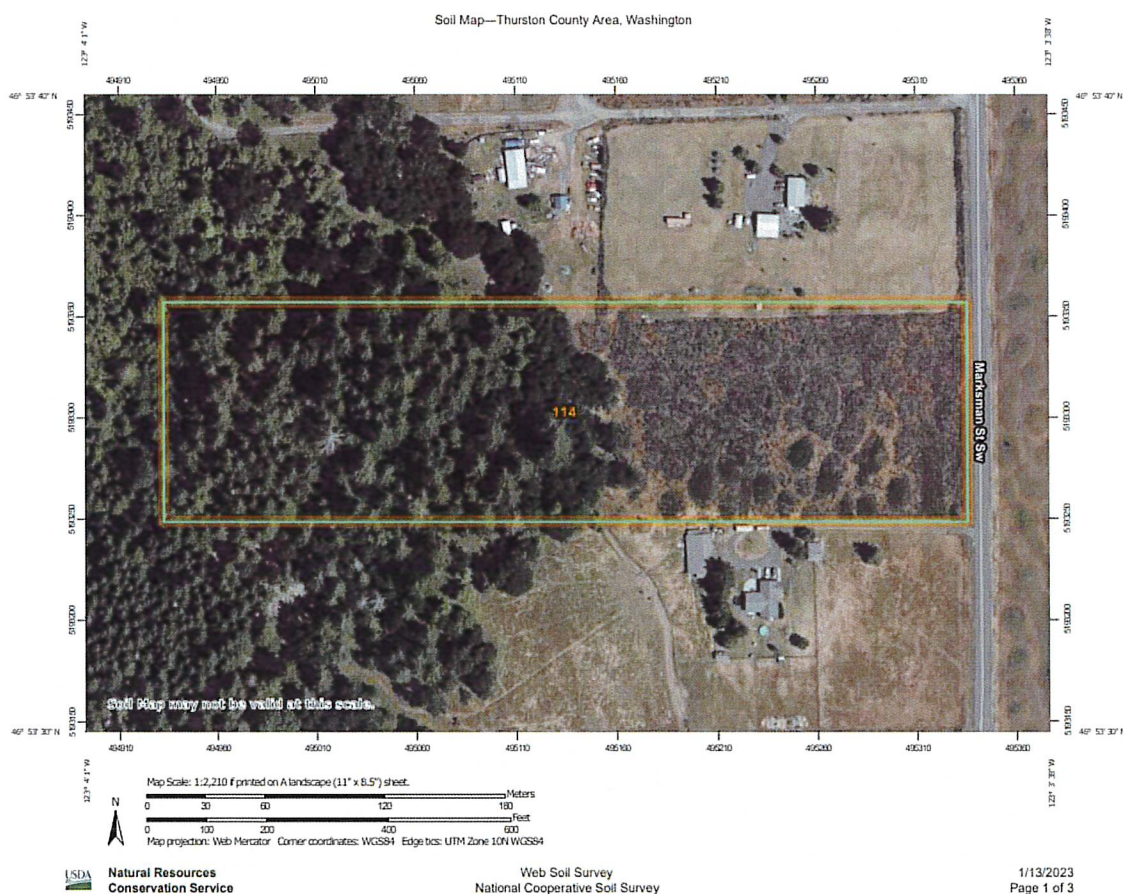


Figure 5. Soils map for subject parcel.



Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
114	Spanaway-Nisqually complex, 2 to 10 percent slopes	10.9	100.0%
Totals for Area of Interest		10.9	100.0%

Figure 6. Thurston County Geodata Map of subject parcel showing potential wetland areas.

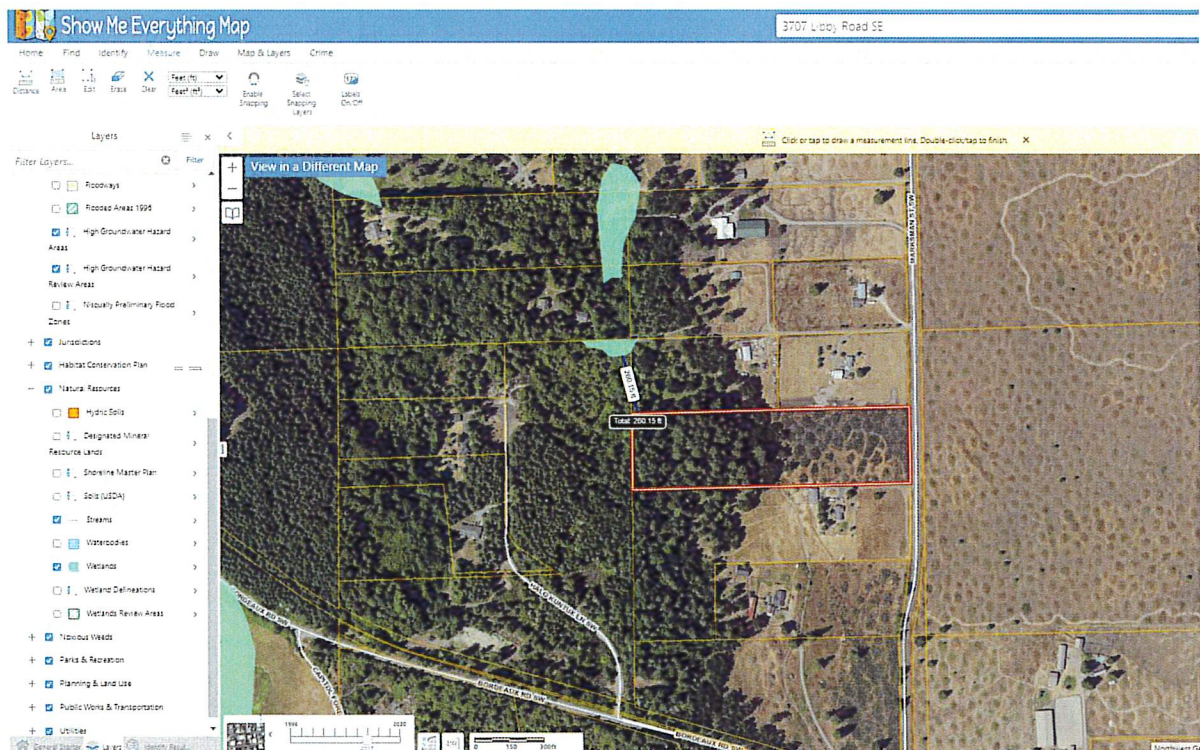


Figure 7. National Wetland Inventory Map (subject parcel outlined in red).

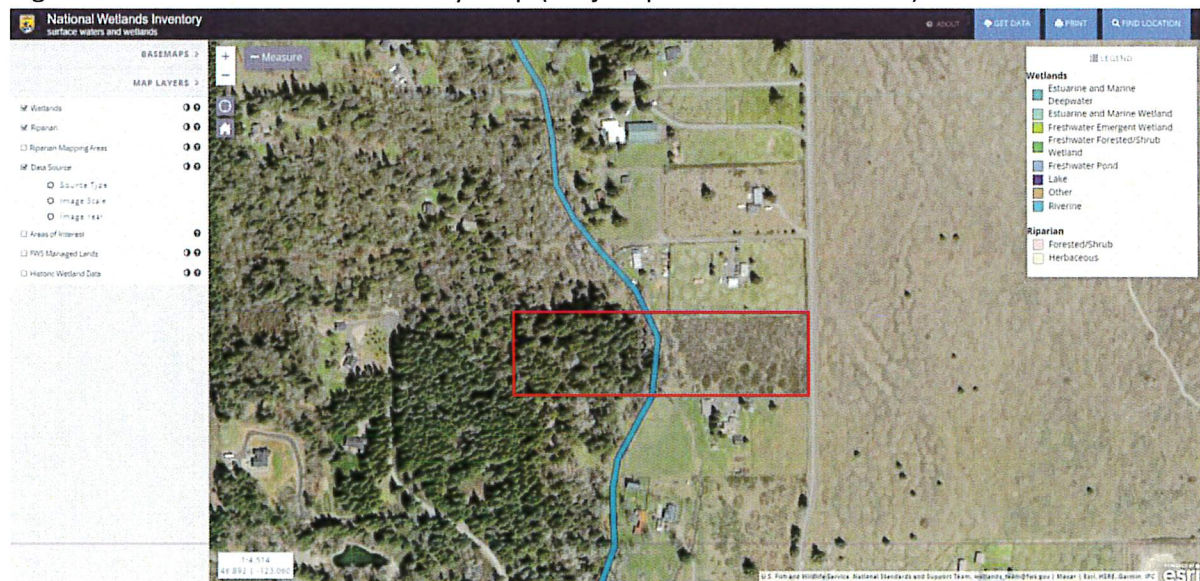


Figure 8. Washington Department of Natural Resources Stream Type Map – modeled Type F stream.

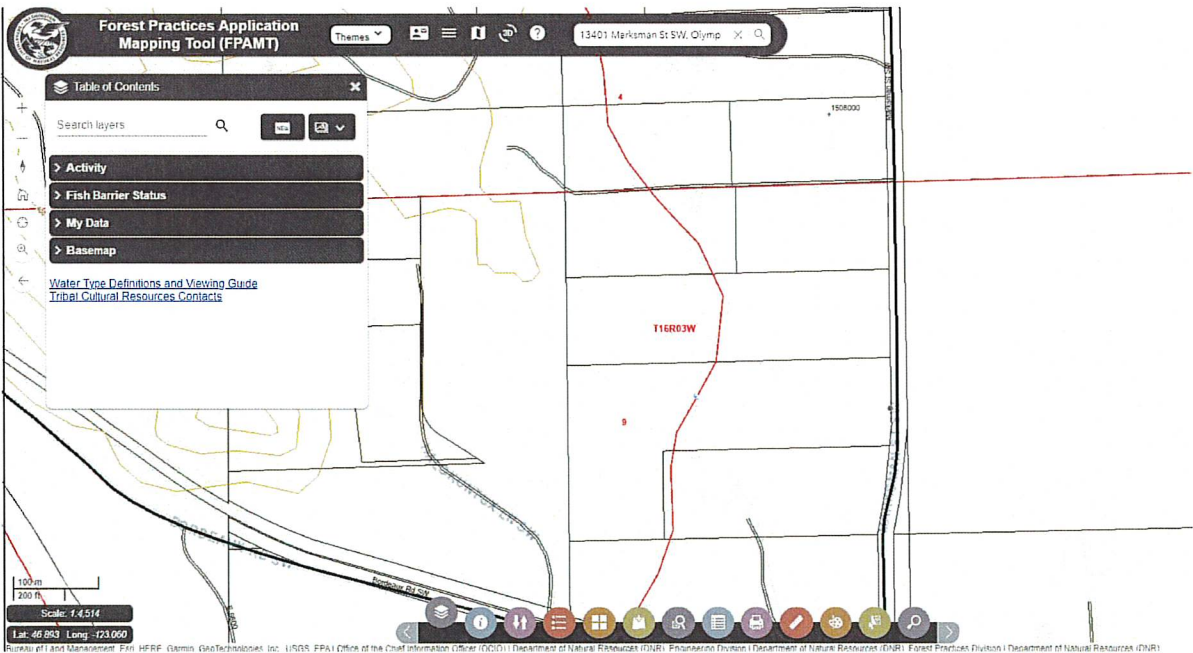


Figure 9. Washington Dept. of Natural Resources Natural Heritage – Rare Plant Location. Maritime reindeer lichen, White top aster, and Cup lichen are mapped over the property and are known to be present in Mima Mounds Reserve.

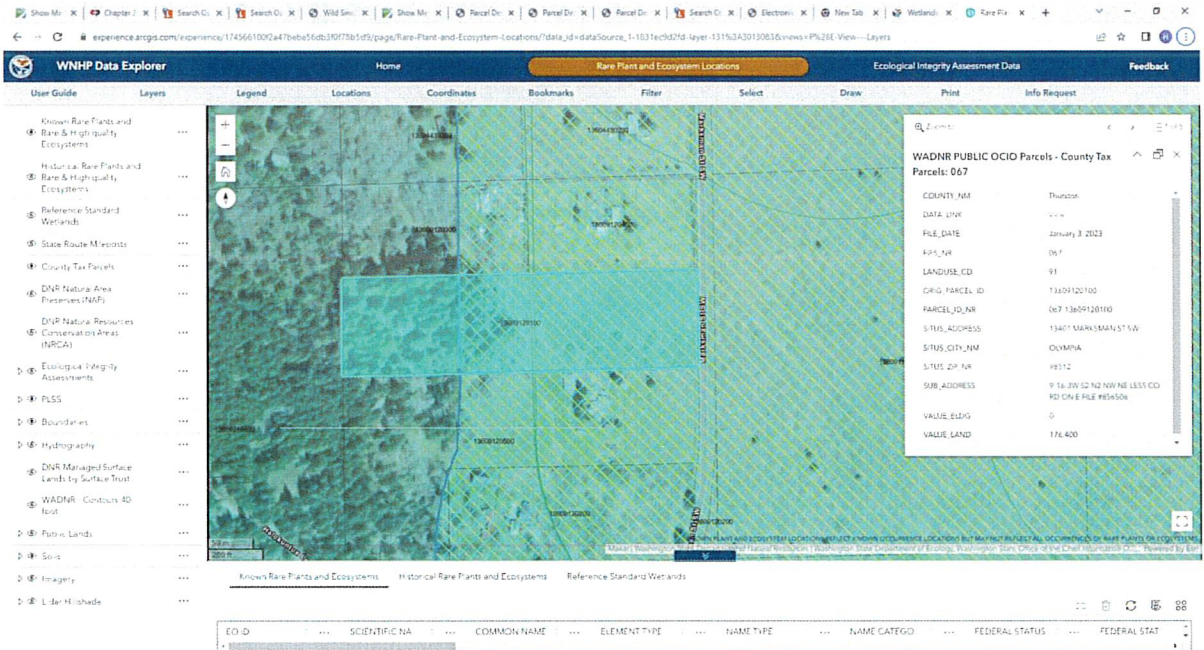


Figure 10. Washington Department of Fish and Wildlife Priority Habitat and Species Report for subject parcel.



Priority Habitats and Species on the Web



Report Date: 01/13/2023, Parcel ID: [13609120100](#)

User Comments/Notes:

Enter comments here

PHS Species/Habitats Overview:

Occurrence Name	Federal Status	State Status	Sensitive Location
Townsend's Big-eared Bat	undefined	Candidate	Yes
Taylor's Checkerspot	Endangered	Endangered	Yes

Figure 11. WDFW mapped oak habitat near the subject parcel and hillshade topography showing mima mound features in eastern half of the parcel.

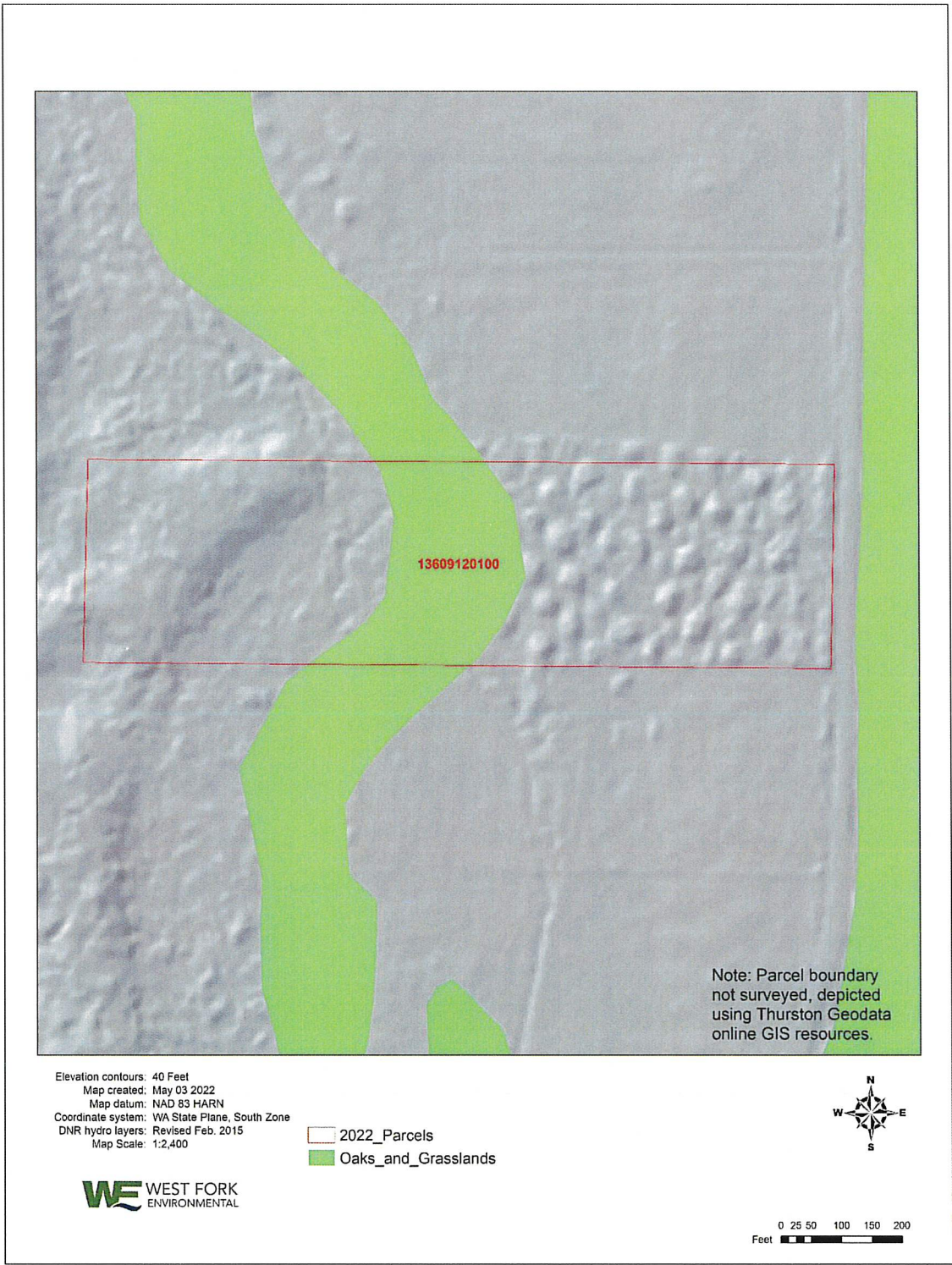


Figure 12. Rainfall Accumulation February 6, 2023, through February 16, 2023
(<https://efotg.sc.egov.usda.gov/#/state/WA>).

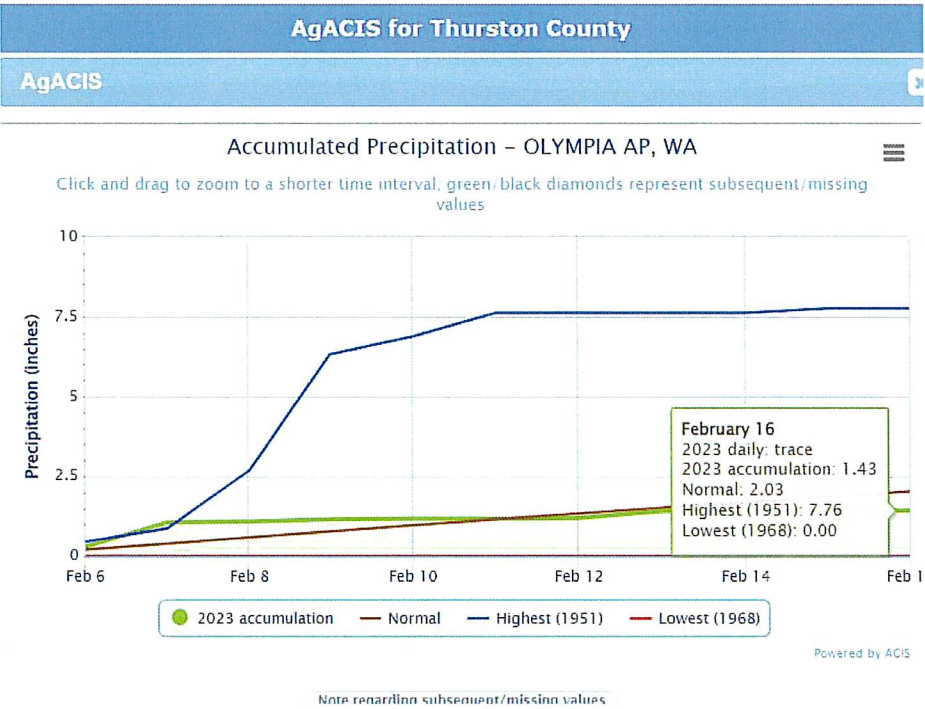


Figure 13. Soil type and prairie plant study survey transects on subject parcel.

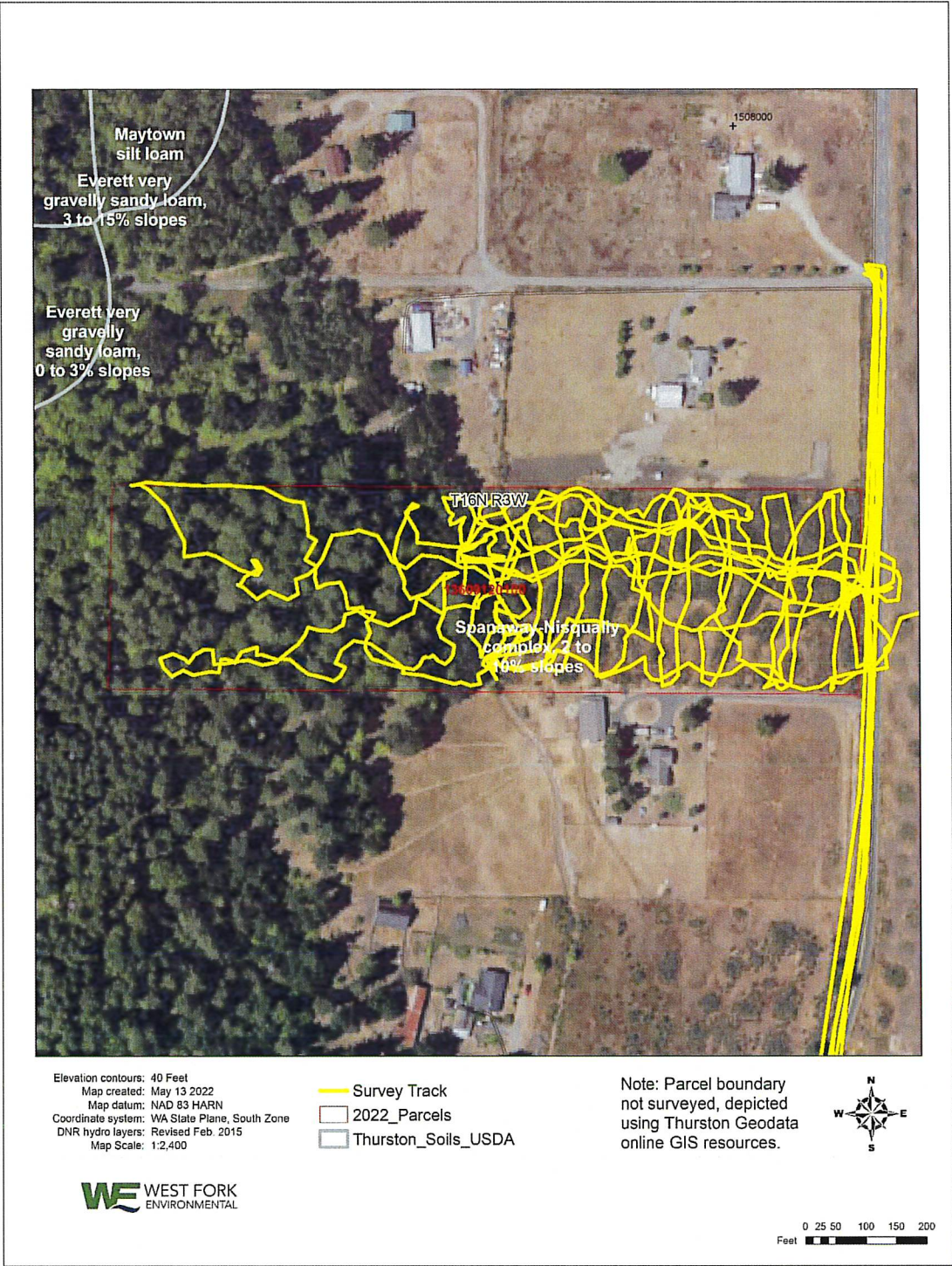


Figure 14. Location of CAO prairie plants on the parcel.

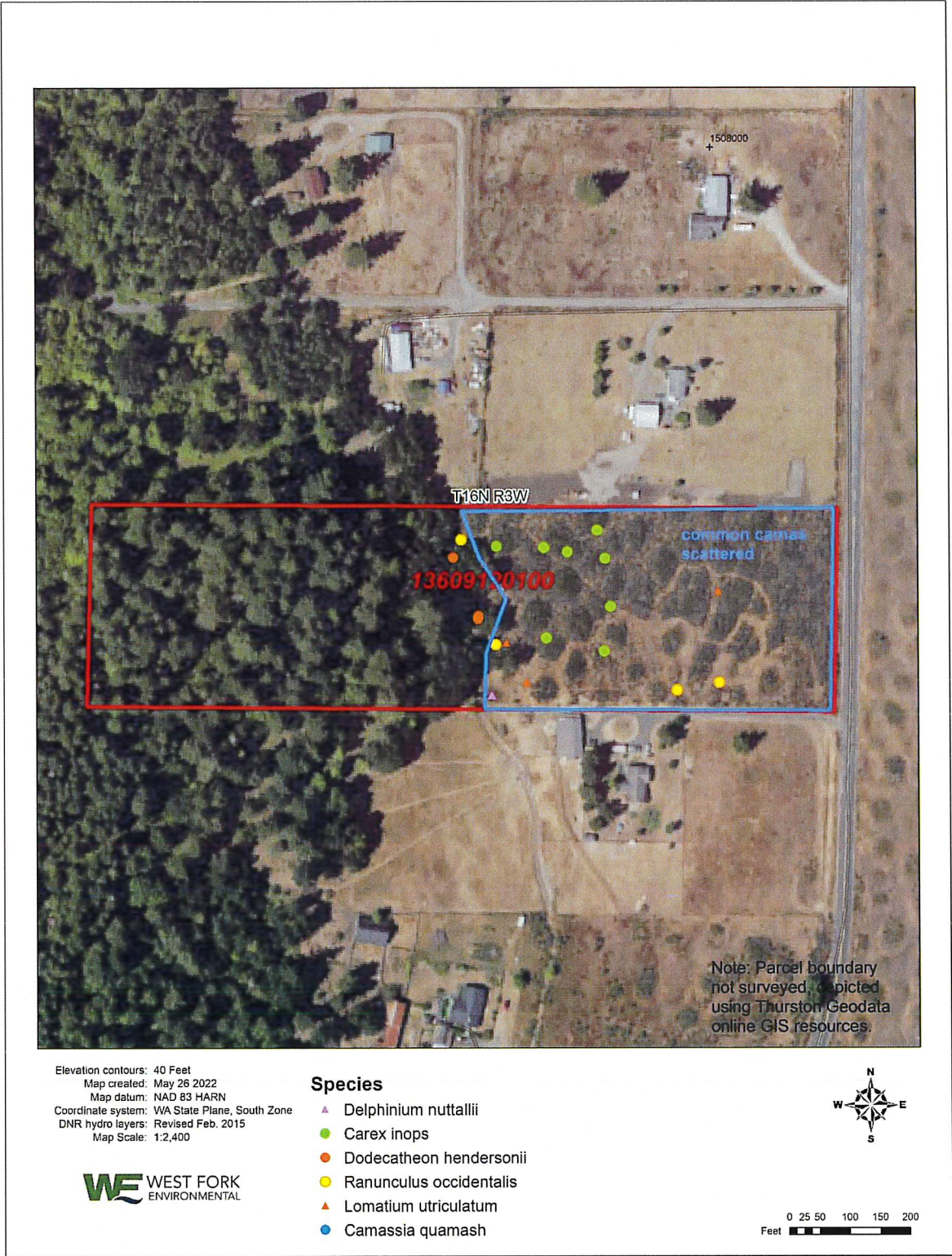


Figure 15. Location of mima mounds (plus 50-foot buffer) and Oregon oak protection zone on the parcel. Once a development plan is prepared for the western portion, a more careful evaluation of the forested habitat could reveal additional saplings or younger trees.

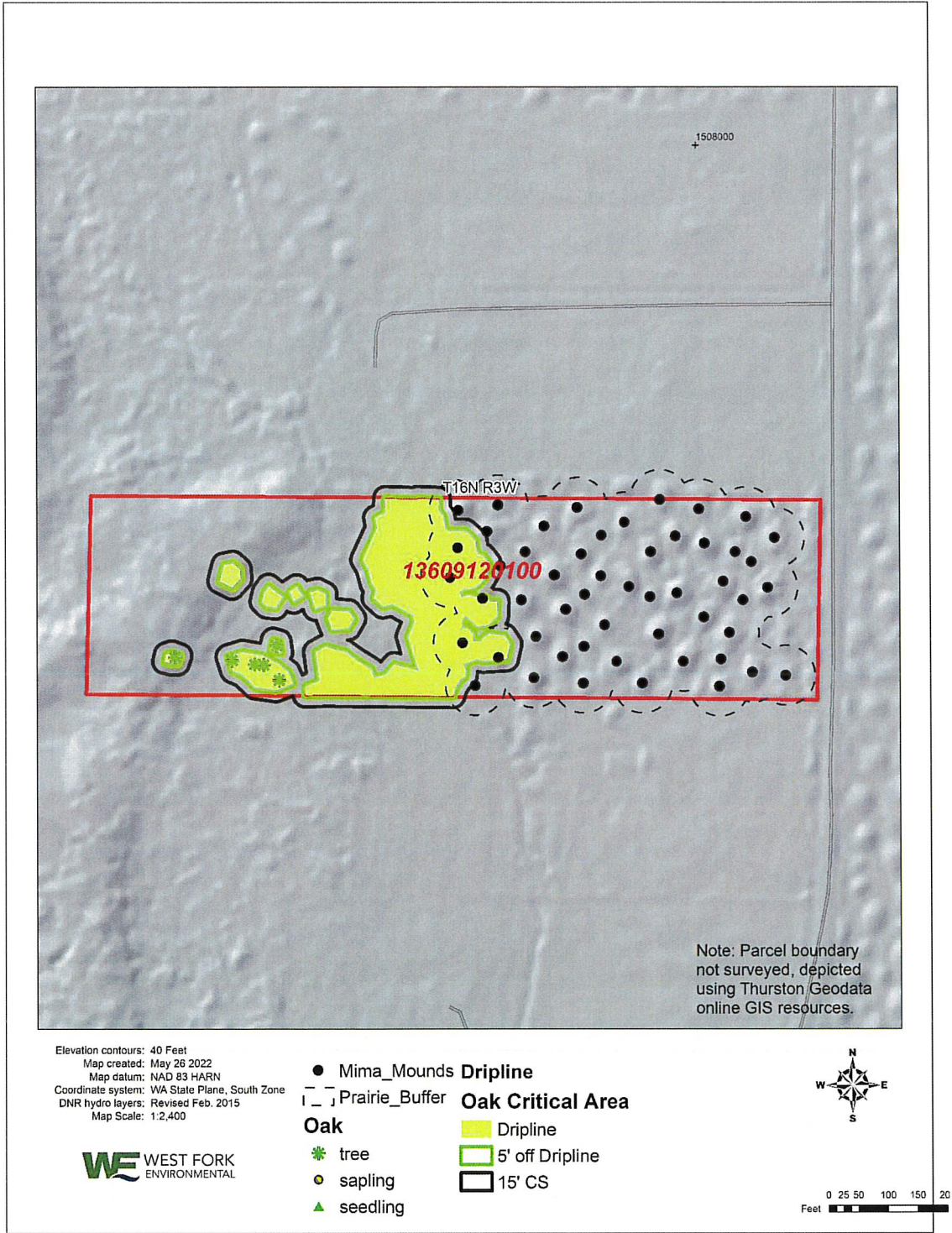


Figure 16. Lichen Samples collected September 2023 and identified by the Univ. of Washington Herbarium curator of lichen.

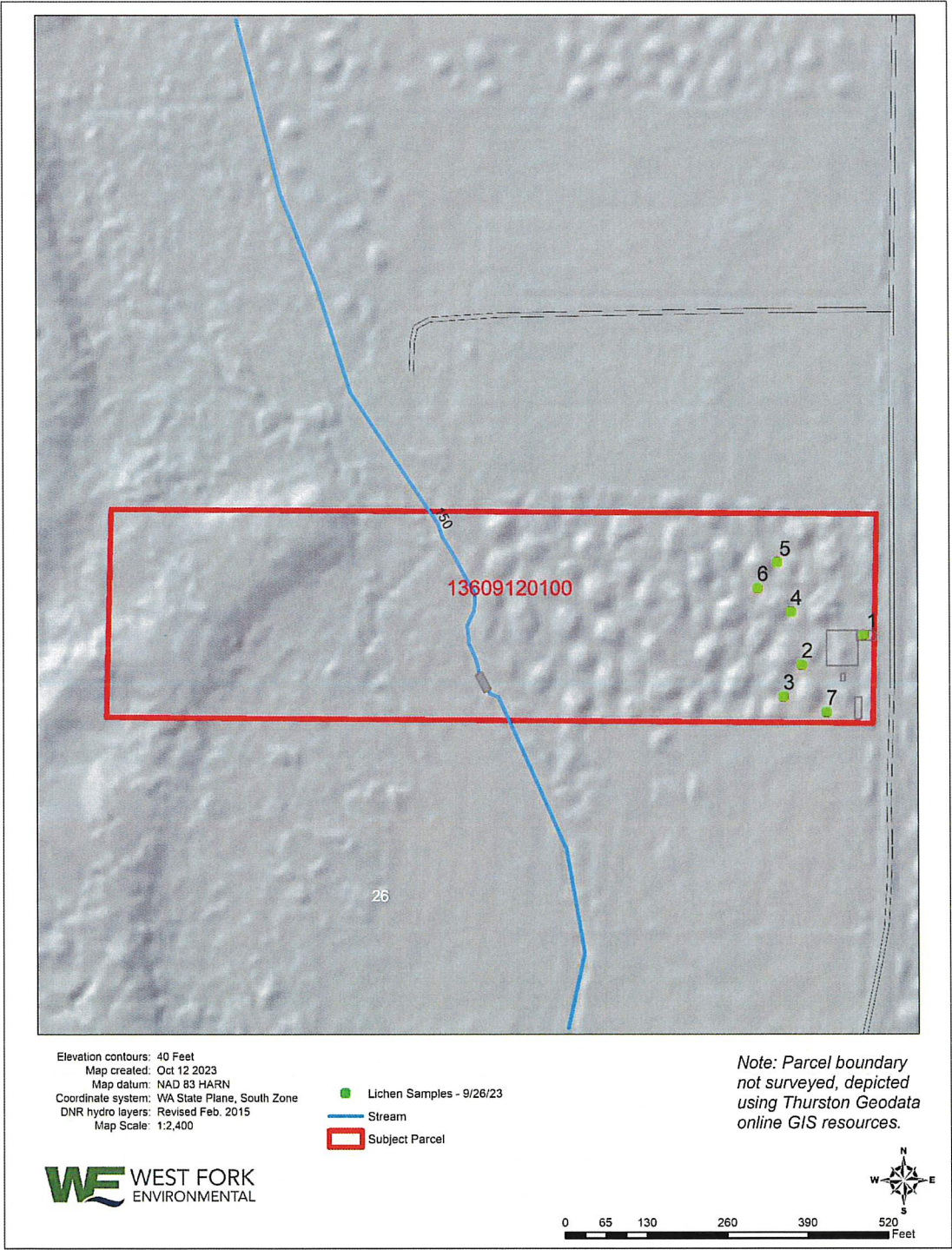
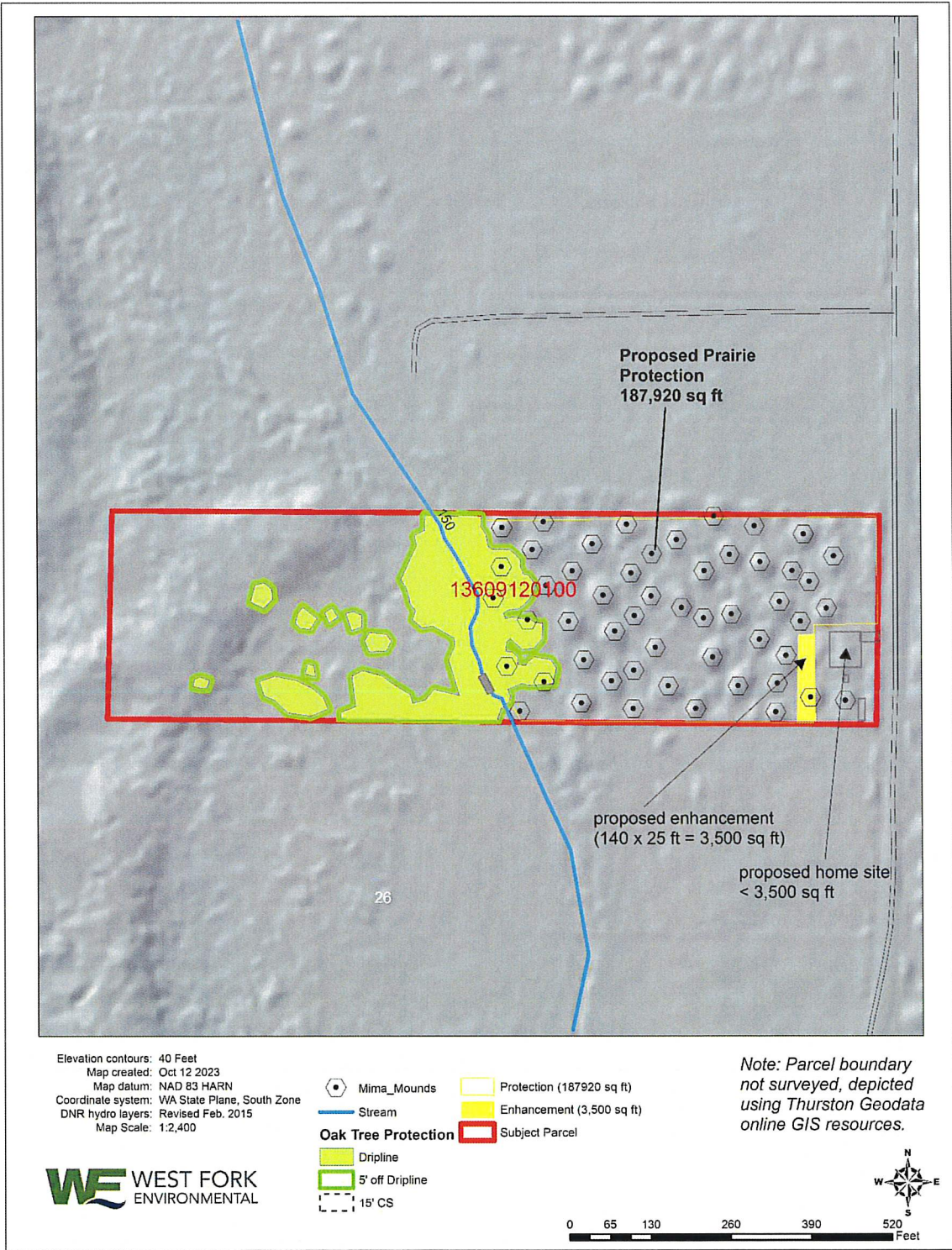


Figure 17. Proposed <3,500 sq ft home site and prairie enhancement area.



Site Photos



View of subject parcel looking west from Marksman Road (left) and oak woodland along the seasonal stream (right).



Mima Mounds Natural Area is directly across Marksman Street SW from the property (left). Forest habitat to the west of property (right).



Seasonal stream - a corrugated metal culvert is located in the stream channel (Figure 3). The stream is contained in banks and did not have associated wetland habitat. Barbed wire fences were observed at both north and south ends of property.



Culvert in stream – looking south (left) and view of proposed driveway access over the culvert – looking west (right). The culvert will be removed as part of the mitigation proposal.



TP-1



TP-2



TP-3



TP-4



TP-5





TP-6



View of parcel looking west from Marksman Street – the SE corner of the parcel pictured here has the highest disturbance and provides the best opportunity to minimize impact on critical area habitat.



Oak woodland runs through the center of the parcel.



Shrub understory in Douglas-fir dominated forest.



Mima mound topography on parcel. Mowing in spring 2022 removed tall scotch broom.



SE corner has the most disturbed area in the mima mound features.



Spring gold (left) and common camas (right) – CAO listed prairie species observed on parcel.



Henderson's shooting star (left) and western buttercup (right) – CAO listed prairie species observed on parcel.



Nuttall's larkspur – CAO listed prairie species observed on parcel.

2023 Lichen Samples – sent to Burke Herbarium for identification to species

Sample 1 – *Cladonia ciliata* var. *tenuis*



Sample 2 – *Cladonia portentosa* var. *pacifica*



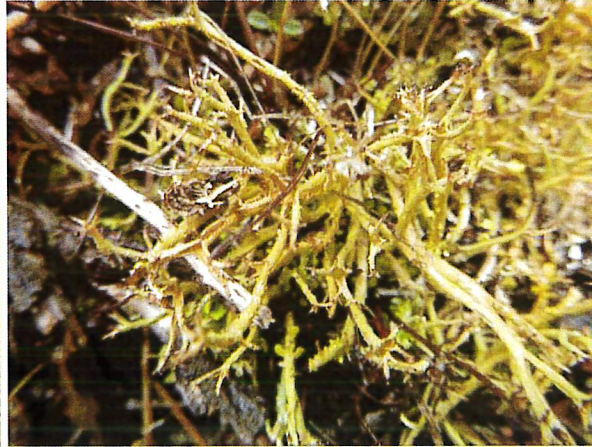
Sample 3 – *Cladonia portentosa* var. *pacifica*



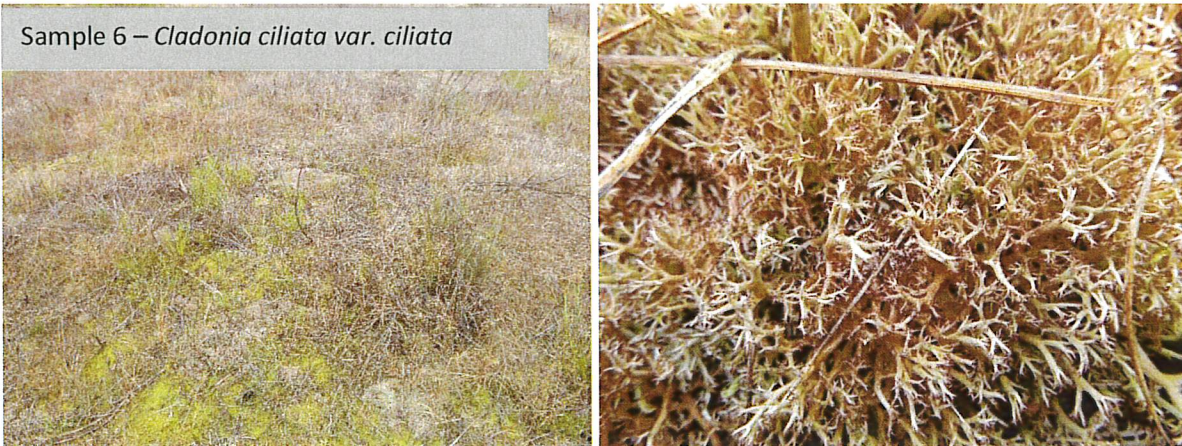
Sample 4 – *Cladonia ciliata* var. *tenuis*



Sample 5 – *Cladonia furcata*



Sample 6 – *Cladonia ciliata* var. *ciliata*



Sample 7 – *Cladonia furcata*



Appendix C:

Western Washington Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: 13401 Marksman St SW City/County: Olympia/Thurston Sampling Date: 2-16-23
 Applicant/Owner: NW Green Construction State: WA Sampling Point: TP-1
 Investigator(s): Heidy Barnett Section, Township, Range: Sec 09 T16N R03W
 Landform (hillslope, terrace, etc.): terrace (along stream) Local relief (concave, convex, none): none Slope (%): 0%
 Subregion (LRR): LRR A Lat: 46.893488 Long: -123.064169 Datum: NAD1983
 Soil Map Unit Name: Spanaway-Nisqually complex 2-10% slopes NWI classification: riverine
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
 Are Vegetation , Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes X 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 <u> </u> No <u>X</u>	Is the Sampled Area within a Wetland? Yes <u> </u> No <u>X</u>
Hydric Soil Present?	Yes <u> </u> No <u>X</u>	
Wetland Hydrology Present?	Yes <u> </u> No <u>X</u>	
Remarks: <u>along stream</u>		

VEGETATION – Use scientific names of plants.

sample plant	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:	
Tree Stratum (Plot size: <u>community</u>)				Number of Dominant Species That Are OBL, FACW, or FAC:	<u>0</u> (A)
1. <u>Quercus garryana</u>	<u>50</u>	<u>Y</u>	<u>FACU</u>	Total Number of Dominant Species Across All Strata:	<u>3</u> (B)
2. <u> </u>				Percent of Dominant Species That Are OBL, FACW, or FAC:	<u>0%</u> (A/B)
3. <u> </u>					
4. <u> </u>					
sample plant	<u>50</u> = Total Cover				
Sapling/Shrub Stratum (Plot size: <u>community</u>)				Prevalence Index worksheet:	
1. <u>Symphocarpus alba</u>	<u>20</u>	<u>Y</u>	<u>FACU</u>	Total % Cover of:	Multiply by:
2. <u>Rosa nutkana</u>	<u>10</u>	<u>N</u>	<u>FAC</u>	OBL species <u>0</u>	x 1 = <u>0</u>
3. <u> </u>				FACW species <u>0</u>	x 2 = <u>0</u>
4. <u> </u>				FAC species <u>10</u>	x 3 = <u>30</u>
5. <u> </u>				FACU species <u>100</u>	x 4 = <u>400</u>
sample plant	<u>30</u> = Total Cover			UPL species <u>0</u>	x 5 = <u>0</u>
Herb Stratum (Plot size: <u>community</u>)				Column Totals:	<u>110</u> (A) <u>430</u> (B)
1. <u>Polystichum munitum</u>	<u>30</u>	<u>Y</u>	<u>FACU</u>	Prevalence Index = B/A = <u>3.9</u>	
2. <u> </u>				Hydrophytic Vegetation Indicators:	
3. <u> </u>				-- 1 - Rapid Test for Hydrophytic Vegetation	
4. <u> </u>				-- 2 - Dominance Test is >50%	
5. <u> </u>				-- 3 - Prevalence Index is ≤3.0 ¹	
6. <u> </u>				-- 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet)	
7. <u> </u>				-- 5 - Wetland Non-Vascular Plants ¹	
8. <u> </u>				-- Problematic Hydrophytic Vegetation ¹ (Explain)	
9. <u> </u>				¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
10. <u> </u>					
11. <u> </u>					
sample plant	<u>30</u> = Total Cover			Hydrophytic Vegetation Present? Yes <u> </u> No <u>X</u>	
Woody Vine Stratum (Plot size: <u>community</u>)					
1. <u>none</u>					
2. <u> </u>					
% Bare Ground in Herb Stratum <u>0</u>	<u>0</u> = Total Cover				
Remarks: <u>Hydrophytic vegetation indicators were not present. Stream contained within banks.</u>					

Sampling Point: TP-1

HYDROLOGY

Primary Indicators (minimum of one required; check all that apply)

Western Mountains, Valleys, and Coast – Version 2.0

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: 13401 Marksman St SW City/County: Olympia/Thurston Sampling Date: 2-16-23
 Applicant/Owner: NW Green Construction State: WA Sampling Point: TP-2
 Investigator(s): Heidy Barnett Section, Township, Range: Sec 09 T16N R03W
 Landform (hillslope, terrace, etc.): terrace (along stream) Local relief (concave, convex, none): none Slope (%): 0%
 Subregion (LRR): LRR A Lat: 46.892977 Long: -123.064034 Datum: NAD1983
 Soil Map Unit Name: Spanaway-Nisqually complex 2-10% slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 <u>X</u>	Is the Sampled Area within a Wetland? Yes _____ No <u>X</u>
Hydric Soil Present?	Yes _____ No <u>X</u>	
Wetland Hydrology Present?	Yes _____ No <u>X</u>	
Remarks: <u>along stream</u>		

VEGETATION – Use scientific names of plants.

sample plant	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet:
Tree Stratum (Plot size: <u>community</u>)				
1. <u>Quercus garryana</u>	<u>40</u>	<u>Y</u>	<u>FACU</u>	Total Number of Dominant Species Across All Strata: <u>5</u> (B)
2. <u>Pseudotsuga menziesii</u>	<u>20</u>	<u>Y</u>	<u>FACU</u>	Percent of Dominant Species That Are OBL, FACW, or FAC: <u>20%</u> (A/B)
3. _____				Prevalence Index worksheet:
4. _____				
_____ = Total Cover	<u>60</u>			
Sapling/Shrub Stratum (Plot size: <u>community</u>)				
1. <u>Symphocarpus alba</u>	<u>15</u>	<u>N</u>	<u>FACU</u>	
2. <u>Oemleria cerasiformis</u>	<u>30</u>	<u>Y</u>	<u>FACU</u>	Total % Cover of: _____ Multiply by: _____
3. <u>Mahonia nervosa</u>	<u>2</u>	<u>N</u>	<u>FACU</u>	OBL species <u>0</u> x 1 = <u>0</u>
4. _____				FACW species <u>0</u> x 2 = <u>0</u>
5. _____				FAC species <u>10</u> x 3 = <u>30</u>
_____ = Total Cover	<u>47</u>			FACU species <u>112</u> x 4 = <u>448</u>
Herb Stratum (Plot size: <u>community</u>)				UPL species <u>0</u> x 5 = <u>0</u>
1. <u>Polystichum munitum</u>	<u>5</u>	<u>Y</u>	<u>FACU</u>	Column Totals: <u>122</u> (A) <u>478</u> (B)
2. _____				Prevalence Index = B/A = <u>3.9</u>
3. _____				Hydrophytic Vegetation Indicators:
4. _____				
5. _____				
6. _____				
7. _____				
8. _____				-- 1 - Rapid Test for Hydrophytic Vegetation
9. _____				-- 2 - Dominance Test is >50%
10. _____				-- 3 - Prevalence Index is ≤3.0 ¹
11. _____				-- 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet)
_____ = Total Cover	<u>5</u>			-- 5 - Wetland Non-Vascular Plants ¹
Woody Vine Stratum (Plot size: <u>community</u>)				-- Problematic Hydrophytic Vegetation ¹ (Explain)
1. <u>Rubus procerus</u>	<u>10</u>	<u>Y</u>	<u>FAC</u>	¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
2. _____				Hydrophytic Vegetation Present? Yes _____ No <u>X</u>
_____ = Total Cover	<u>10</u>			
% Bare Ground in Herb Stratum <u>0</u>				
Remarks: <u>Hydrophytic vegetation indicators were not present. Stream contained within banks.</u>				

SOIL

Sampling Point: TP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-18"	10YR 3/2	100					Loam	gravelly

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains.²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

Indicators for Problematic Hydric Soils³:

- ☐ Histosol (A1) ☐ Sandy Redox (S5)
☐ Histic Epipedon (A2) ☐ Stripped Matrix (S6)
☐ Black Histic (A3) ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
☐ Hydrogen Sulfide (A4) ☐ Loamy Gleyed Matrix (F2)
☐ Depleted Below Dark Surface (A11) ☐ Depleted Matrix (F3)
☐ Thick Dark Surface (A12) ☐ Redox Dark Surface (F6)
☐ Sandy Mucky Mineral (S1) ☐ Depleted Dark Surface (F7)
☐ Sandy Gleyed Matrix (S4) ☐ Redox Depressions (F8)

- ☐ 2 cm Muck (A10)
☐ Red Parent Material (TF2)
☐ Very Shallow Dark Surface (TF12)
☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

hydric soil indicators were not observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1) ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
☐ High Water Table (A2) ☐ Salt Crust (B11)
☐ Saturation (A3) ☐ Aquatic Invertebrates (B13)
☐ Water Marks (B1) ☐ Hydrogen Sulfide Odor (C1)
☐ Sediment Deposits (B2) ☐ Oxidized Rhizospheres along Living Roots (C3)
☐ Drift Deposits (B3) ☐ Presence of Reduced Iron (C4)
☐ Algal Mat or Crust (B4) ☐ Recent Iron Reduction in Tilled Soils (C6)
☐ Iron Deposits (B5) ☐ Stunted or Stressed Plants (D1) (**LRR A**)
☐ Surface Soil Cracks (B6) ☐ Other (Explain in Remarks)
☐ Inundation Visible on Aerial Imagery (B7) ☐ Frost-Heave Hummocks (D7)
☐ Sparsely Vegetated Concave Surface (B8)

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 (D7)

Field Observations:

- Surface Water Present? Yes _____ No X Depth (inches): >18"
 Water Table Present? Yes _____ No X Depth (inches): >18"
 Saturation Present? Yes _____ No X Depth (inches): >18"
 (includes capillary fringe)

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland hydrology indicators were not observed.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: 13401 Marksman St SW City/County: Olympia/Thurston Sampling Date: 2-16-23
 Applicant/Owner: NW Green Construction State: WA Sampling Point: TP-3
 Investigator(s): Heidy Barnett Section, Township, Range: Sec 09 T16N R03W
 Landform (hillslope, terrace, etc.): terrace (along stream) Local relief (concave, convex, none): none Slope (%): 0%
 Subregion (LRR): LRRA Lat: 46.893225 Long: -123.064474 Datum: NAD1983
 Soil Map Unit Name: Spanaway-Nisqually complex 2-10% slopes NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 <u>X</u>	Is the Sampled Area within a Wetland? Yes _____ No <u>X</u>
Hydric Soil Present?	Yes _____ No <u>X</u>	
Wetland Hydrology Present?	Yes _____ No <u>X</u>	
Remarks: <u>along stream</u>		

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: <u>community</u>)	sample plant	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>5</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>20%</u> (A/B)
1.	<u>Quercus garryana</u>	<u>20</u>	<u>Y</u>	<u>FACU</u>	
2.	<u>Pseudotsuga menziesii</u>	<u>30</u>	<u>Y</u>	<u>FACU</u>	
3.					
4.					
Sapling/Shrub Stratum (Plot size: <u>community</u>)		<u>50</u> = Total Cover			Prevalence Index worksheet: Total % Cover of: Multiply by: OBL species <u>0</u> x 1 = <u>0</u> FACW species <u>5</u> x 2 = <u>10</u> FAC species <u>5</u> x 3 = <u>15</u> FACU species <u>130</u> x 4 = <u>520</u> UPL species <u>0</u> x 5 = <u>0</u> Column Totals: <u>140</u> (A) <u>545</u> (B) Prevalence Index = B/A = <u>3.9</u>
1.	<u>Symphocarpus alba</u>	<u>50</u>	<u>N</u>	<u>FACU</u>	
2.	<u>Oemleria cerasiformis</u>	<u>10</u>	<u>Y</u>	<u>FACU</u>	
3.	<u>Mahonia nervosa</u>	<u>5</u>	<u>N</u>	<u>FACU</u>	
4.	<u>Physocarpus capitatus</u>	<u>10</u>	<u>N</u>	<u>FACW</u>	
5.					
Herb Stratum (Plot size: <u>community</u>)		<u>75</u> = Total Cover			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) -- 5 - 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.
1.	<u>Polystichum munitum</u>	<u>15</u>	<u>Y</u>	<u>FACU</u>	
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
Woody Vine Stratum (Plot size: <u>community</u>)		<u>15</u> = Total Cover			Hydrophytic Vegetation Present? Yes _____ No <u>X</u>
1.	<u>Rubus procerus</u>	<u>5</u>	<u>Y</u>	<u>FAC</u>	
2.					
% Bare Ground in Herb Stratum <u>0</u>		<u>5</u> = Total Cover			
Remarks: <u>Hydrophytic vegetation indicators were not present. Stream contained within banks.</u>					