EVALUATION OF EDMONDS MARSH AND SHELLABARGER MARSH BUFFER ZONES

Prepared for

Edmonds City Council
121 - 5th Avenue North
Edmonds, WA

June 1, 2018

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1 Introduction

The Edmonds Marsh (Marsh) is a tidally influenced[1] wetland occupying approximately 23 ac in the heart of Edmonds, Washington (Figure 1); it is the remnant of a once much larger (40-ac) estuarine wetland along the shores of Puget Sound (Sea-Run Consulting et al. 2007). The western portion of the Marsh supports saltmarsh plants; it is brackish in winter months, when the downstream tide gate typically is closed, and saline in spring and summer months, when the tide gate is typically open (Sea-Run Consulting et al. 2007). The eastern portion of the Marsh is a predominantly freshwater system fed by two tributary creeks—Willow Creek and Shellabarger Creek. The drainage basin of Willow Creek is approximately 393 ac in size, and encompasses residential land to the south and east of Edmonds Marsh (Shannon & Wilson 2015). The drainage basin of Shellabarger Creek is approximately 378 ac in size, and encompasses residential and commercial land to the north, east, and south of Edmonds Marsh. Including the two creeks, the Edmonds Marsh drainage basin is approximately 900 ac.

The Marsh is connected to Puget Sound via Willow Creek, which currently flows out of the Marsh into an approximately 2,200-ft-long system of ditches, pipes, culverts, and flood gate infrastructure prior to discharging via a submerged outfall into the sound. The City of Edmonds (City) plans to daylight Willow Creek, a project that will improve hydraulic and habitat connectivity between the Marsh and Puget Sound.

Edmonds Marsh is home to over 200 bird species. While fish are not currently known to use the Marsh, coho salmon (*Oncorhynchus kisutch*), cutthroat trout (*Oncorhynchus clarkii*), sculpins, and threespine stickleback (*Gasterosteus aculeatus*) were observed in Willow Creek in 1995 (Sea-Run Consulting et al. 2007). One of the goals of the Willow Creek daylighting project is to promote the use of the Marsh and its tributary creeks by juvenile Chinook salmon (*Oncorhynchus tshawytscha*).

Shellabarger Marsh (also known as Shellabarger Marsh), an approximately 5-ac freshwater wetland located on the east side of State Route (SR) 104, was once part of Edmonds Marsh(Sea-Run Consulting et al. 2007). Although highway construction divided the original Edmonds Marsh, the two marshes remain hydraulically connected by two culverts beneath SR 104 (Sea-Run Consulting et al. 2007).

[1] The Marsh is tidally influenced when the tide gate downstream of the marsh is open, typically in spring and summer months from April through September (Sea-Run Consulting et al. 2007).

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N

0 0.05 0.1 Miles

0 400 800 Feet

Figure 1. Edmonds and Shellabarger Marsh Vicinity Map

Prepared by mikey, 6/1/2018; W:\Projects\Edmonds Marsh\Data\GIS\Maps and Analyses\Buffer_Zone_Evaluation\Fig 1_6862_Edmonds and Shellabarger Marsh Vicinity Map.mxd

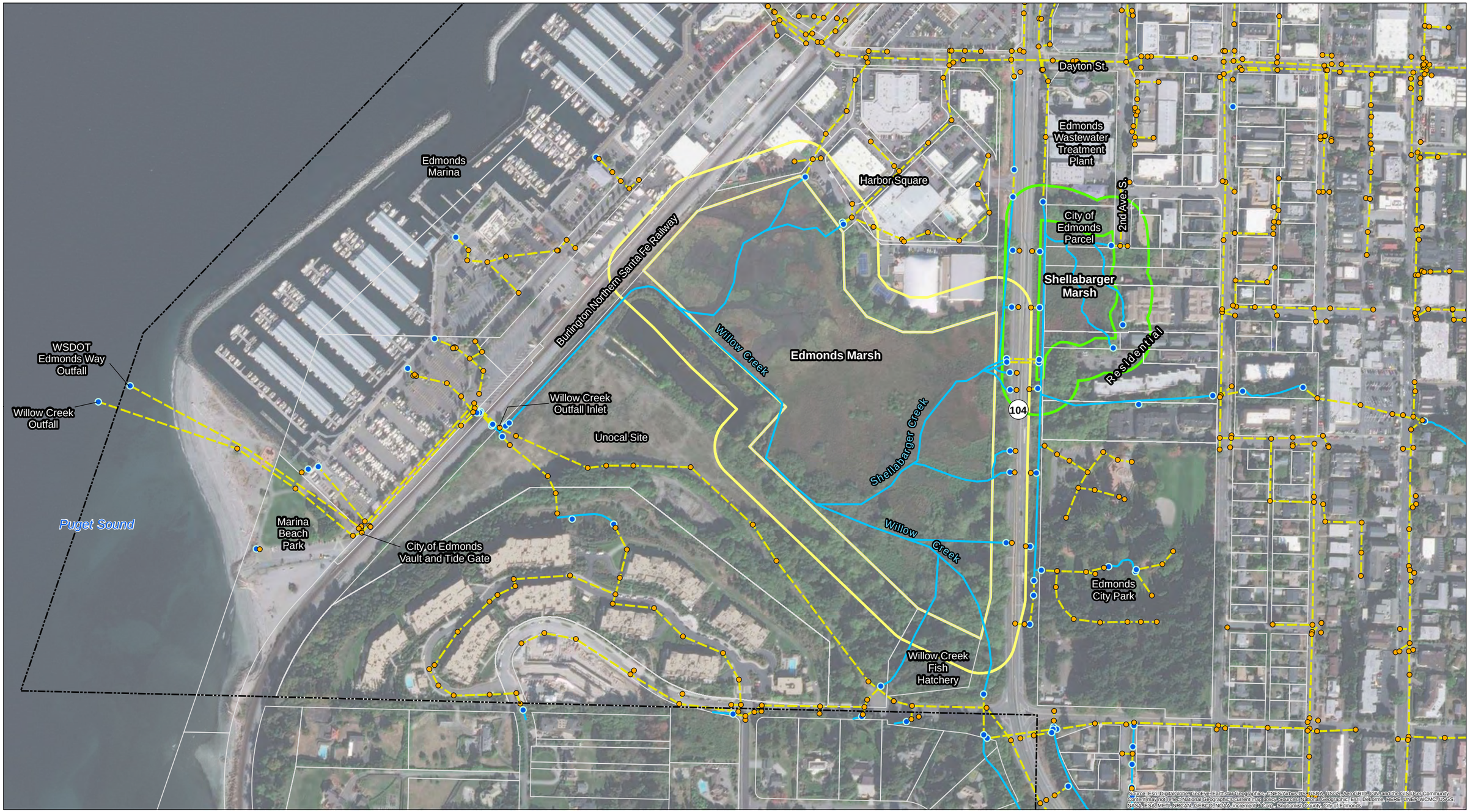
Under the City's current Shoreline Master Program (SMP) regulations, the buffers for Edmonds Marsh and Shellabarger Marsh are 110 ft wide with an additional 15-ft building setback. For the purposes of this document, "buffer zone" refers to the 125-ft-wide area extending from the outer edge of the marsh boundaries (as shown on Figure 2). The term "buffer zone" is used for this entire area, regardless of the land cover and land use within the zone (i.e., it is used to account for both vegetated and non-vegetated, developed portions of the buffer zones).

The purpose of this document is to provide:

- An initial evaluation of the current conditions of the buffer zones surrounding Edmonds Marsh and Shellabarger Marsh
- A preliminary assessment of the ability of the buffer zones to provide a range of ecological functions
- Initial recommendations for improving the ecological functioning of the vegetated portions of the buffer zones

This evaluation is based on observations made during a qualitative site reconnaissance conducted on April 23, 2018, as well as information provided in a companion document identifying buffer zone widths that best support ecosystem functions. Section 2 summarizes of current conditions within the buffer zones, and Section 3 recommends possible habitat enhancements.

This initial evaluation of current conditions within the Edmonds Marsh and Shellabarger Marsh buffer zones, as well as the preliminary assessment of their ability to provide ecological functions, will be further developed after completion of a year-long baseline monitoring study to be initiated in summer 2018.



Prepared by: mikey, 6/1/2018; W:\Projects\Edmonds Marsh\Data\GIS\Maps and Analyses\Buffer_Zone_Evaluation\Fig 2_6850_Stormwater and site features.mxd

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N

0 0.05 0.1 Miles

0 250 500 Feet

- Storm structure
- Storm culvert
- Storm line
- Storm ditch/creek
- Shellabarger Marsh w/ 125-ft buffer
- Edmonds Marsh w/ 125-ft buffer
- Parcel
- City of Edmonds boundary

Figure 2. Stormwater and surface water features and buffer zone boundaries

2 Current Conditions within the Edmonds Marsh and Shellabarger Marsh Buffer Zones

The current conditions of the Edmonds Marsh and Shellabarger Marsh buffer zones were evaluated during a qualitative site reconnaissance conducted on April 23, 2018, photographs of which are included in Appendix A. Information on land ownership, stormwater infrastructure, and topography provided by the City were also used in the assessment. The following subsections describe conditions within the different buffer zones of Edmonds Marsh and Shellabarger Marsh, and an initial assessment of their existing and potential ecological functions. The main functions of interest are related to water quality and wildlife habitat.

A buffer zone provides maximum water quality improvements (e.g., removal of sediment, nutrients and toxic substances) when water flowing through it is dispersed, moving slowly, and not channelized. Vegetated portions of the buffer zones can intercept precipitation and allow it to infiltrate, which reduces the quantity of stormwater discharging directly into the marshes. However, most of the stormwater flowing into Edmonds Marsh and Shellabarger Marsh does so through pipes and outfalls and via Willow and Shellabarger creeks (Figure 2) (Sea-Run Consulting et al. 2007; Shannon & Wilson 2015), limiting the ability of the buffer zones to provide water quality benefits.[2] In such developed urban watersheds, upstream source control and water quality improvement efforts (e.g., rain gardens, stormwater treatment systems) may be needed as the primary means of improving water quality. Where there are opportunities for the buffer zones to provide water quality improvements, they are described in Section 3.

2.1 EDMONDS MARSH NORTHERN BUFFER ZONE – ALONG HARBOR SQUARE PROPERTY

The area referred to here as the northern buffer zone of Edmonds Marsh begins at the edge of the Burlington Northern Santa Fe (BNSF) railroad right-of-way and extends eastward to SR 104, following the northern, curved boundary of the Marsh, as shown on Figure 2. Owned by the Port of Edmonds, this area contains buildings, paved areas, and recreational facilities (e.g., tennis courts and a paved trail) associated with the Harbor Square property. The gradient of the vegetated portion of the northern buffer zone is relatively steep (greater than 20% in some areas) as the topography transitions quickly from the developed upland area to the Marsh (Figure 3).

[2] No obvious areas of sheet flow migration to either Shellabarger Marsh or Edmond's Marsh were observed during the site reconnaissance, but the weather conditions were dry that day. Visiting the marshes and their buffer zones during a heavy rain event would reveal more about the ability of the buffer zones to handle and potentially treat incoming stormwater surface flows.

Edmonds Marina
Harbor Square
Edmonds Wastewater Treatment Plant
2nd Ave. S.
City of Edmonds Parcel
Shellabarger Marsh
Burlington Northern Santa Fe Railway
Residential
104
Edmonds Marsh
Unocal Site
Marina Beach Park
Edmonds City Park
Willow Creek Fish Hatchery

LiDAR ground slope (Percent)
- ≤ 5
- > 5 and ≤ 10
- > 10 and ≤ 20
- > 20

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N

0 0.05 0.1 Miles

0 200 400 Feet

- Storm structure
- Storm culvert
- Storm line
- Storm ditch/creek
- Shellabarger Marsh w/ 125-ft buffer
- Edmonds Marsh w/ 125-ft buffer
- Parcel
- City of Edmonds boundary

Figure 3: Edmonds Marsh and Shellabarger Marsh buffer zone gradients

Prepared by mikey, 6/1/2018; W:\Projects\Edmonds Marsh\Data\GIS\Maps and Analyses\Buffer_Zone_Evaluation\Fig 3_6864_Edmonds Marsh and Shellabarger Marsh buffer zone gradients.mxd

Vegetation in the northern buffer zone consists of both native and non-native species, with a relatively dense tree canopy ringing the eastern two-thirds of this buffer zone (Photo 1 in Appendix A). The understory includes a variety of native shrubs, many of which appear to have been planted relatively recently (Photo 2 in Appendix A).

Native species observed in the northern buffer zone canopy (overstory vegetation layer) include Pacific willow (*Salix lucida* ssp. *lasiandra*), Scouler's willow (*Salix scouleriana*), red alder (*Alnus rubra*), and paper birch (*Betula papyrifera*). Native species observed in the understory include western red cedar (*Thuja plicata*) seedlings, common snowberry (*Symphoricarpos albus*), red-flowering currant (*Ribes sanguineum*), red-osier dogwood (*Cornus sericea*), thimbleberry (*Rubus parviflorus*), mock orange (*Philadelphus* sp.), Oregon grape (*Mahonia nervosa*), twinberry (*Lonicera involucrata*), cascara (*Rhamnus purshiana*), stinging nettle (*Urtica dioica*), sword fern (*Polystichum munitum*), lady fern(*Arthyrium filix-femina*), osoberry (*Oemleria cerasiformis*), red elderberry (*Sambucus racemosa*), vine maple (*Acer circinatum*), and salmonberry (*Rubus spectabilis*). The diversity of native plants in the understory of the northern buffer zone has been enhanced by recent restoration efforts. Ornamental plantings are also present in the northern buffer zone, particularly along the northern side of the paved pedestrian path, as are areas of invasive species including reed canarygrass (*Phalaris arundinacea*).

Stormwater enters Edmonds Marsh from the Harbor Square property and Dayton Street via two stormwater outfalls (Figure 2). After exiting the outfall, the stormwater flows through small drainage ditches (approximately 20 to 30 ft long) located near the lowest portion of the northern buffer zone (nearest the Marsh perimeter). The water then flows into patches of cattail (*Typha latifolia*) and other emergent vegetation at the Marsh perimeter (Photo 3 in Appendix A).

Wildlife observed from the northern buffer zone included Song Sparrow (*Melospiza melodia*) using the buffer area; a rabbit, a Red-winged Blackbird (*Agelaius phoeniceus*), Great Blue Heron (*Ardea herodias*), and flock of Killdeer (*Charadrius vociferus*) (foraging on the mudflats) within the Marsh interior; and a Bald Eagle (*Haliaeetus leucocephalus*) flying overhead.

2.2 EDMONDS MARSH EASTERN BUFFER ZONE – ALONG STATE ROUTE 104

The eastern buffer zone of Edmonds Marsh is largely occupied by SR 104 (Figure 2 and Photo 5 in Appendix A), with a relatively dense strip of established shrubs and trees between the highway and the Marsh. Quite narrow in the northern portion of the eastern buffer zone, this strip consists of a canopy of red alder and a single Douglas fir (*Pseudotsuga menziesii*) with an understory of Himalayan blackberry (*Rubus armeniacus*), Scotch broom (*Cytisus scoparius*), and Pacific willow. Near the location where Shellabarger Creek passes via the double culverts from Shellabarger Marsh to Edmonds Marsh (Figure 2), cattails extend from the Marsh all the way to the sidewalk along the highway. The invasive species bittersweet nightshade (*Solanum dulcamara*),

Himalayan blackberry, and reed canarygrass are also present in this area. A small clump of native black gooseberry (*Ribes divaricatum*) and a small quantity of salmonberry were also observed. The strip of trees and shrubs is wider south of the Shellabarger Creek culverts, and widens further moving south toward the Willow Creek Fish Hatchery). The forest here consists of a mix of native trees including red alder, water birch, Douglas fir, bigleaf maple (*Acer macrophyllum*), and western hemlock (*Tsuga heterophylla*). Some of the alder trees in this area are dying, providing standing snag habitat for birds, insects, and other wildlife (Photo 6 in Appendix A). The understory in this southern portion of the eastern buffer zone has a significant quantity of Himalayan blackberry, as well as bigleaf maple saplings and ivy. Traffic noise made it difficult to detect bird vocalizations within this buffer zone.

A drainage ditch within a grassy area just to the north of the eastern buffer zone running adjacent and parallel to SR 104 (Photo 4 of Appendix A and Figure 2) carries stormwater from the highway, Dayton Street, and other areas to the north. Dense vegetation (primarily cattails) was observed within the ditch. Ultimately, this ditch flows into the eastern buffer zone and then joins Shellabarger Creek near the location where the creek flows into Edmonds Marsh. The gradient of the eastern buffer zone in the vicinity of the drainage ditch is generally 10% or less (Figure 3).

2.3 EDMONDS MARSH SOUTHERN BUFFER ZONE – AT WILLOW CREEK FISH HATCHERY

The southern buffer zone, which includes the portion of the buffer located on the Willow Creek Fish Hatchery property, is owned by the City. Two small structures (Photo 8 of Appendix A shows one of the buildings) and a fish rearing pond are located on the property, which is operated by Sound Salmon Solutions. The gradient of the southern buffer zone ranges from ≤5% to greater than 20%; the slope becomes less steep moving south to north (toward the Marsh) within this zone (Figure 3).

This buffer zone contains relatively high-quality forested upland and wetland habitat, and also appears to be heavily used by birds. The western branch of Willow Creek flows south to north through the hatchery property, and the eastern branch of Willow Creek flows south to north just beyond its eastern boundary (Figure 2). The creek carries surface water from its 393-ac basin to the Marsh; however, there are no storm drain outfalls that discharge within the southern buffer zone itself.

The canopy within the buffer zone contains a mix of native tree species, including red alder, bigleaf maple, Douglas fir, western red cedar, and western hemlock (see Photo 7 of Appendix A). The understory contains a variety of native shrub and ground cover species, including salmonberry, ososberry, red-osier dogwood, red-flowering currant, vine maple, western red cedar seedlings and saplings, red elderberry, stink currant (*Ribes bracteosum*), lady fern, fringecup (*Tellima grandiflora*), youth on age *(Tolmiea menziesii)*, lily-of-the-valley (*Convallaria majalis*), western bleeding heart (*Dicentra*

formosa), and a good number of skunk cabbages (*Lysichitum americanum*) beneath the tree canopy along Willow Creek (Photo 9 of Appendix A).

Invasive species were also observed within the southern buffer zone, for the most in sparse and non-dominant patches. The most commonly observed invasive shrub species was Himalayan blackberry, which was found throughout the zone. A few patches of English ivy (*Hendra helix)* and a few scattered seedlings of English holly (*Ilex aquifolium*) were observed, as were reed canarygrass and Herb Robert (*Geranium robertianum*) along the trails.

In addition to a diverse mix of native plants, the southern buffer zone also contains a relatively large amount of large woody debris (LWD), both standing and on the ground. This feature no doubt contributed to observed woodpecker and sapsucker activity. During the site reconnaissance, a downy woodpecker (*Pecoides pubescens*) was heard, and a pileated woodpecker (*Dryocopus pileatus*) was seen. In addition, an abundance of woodpecker holes were observed in standing snags (Photo 10 of Appendix A), and sapsucker holes were observed in downed wood. Other bird species observed in the southern buffer zone include MacGillivray's Warbler (*Geothlypis tolmiei*), Pine Siskin (*Spinus pinus*), Anna's Hummingbird (*Calypte anna*), Spotted Towee (*Pipilo maculatus*), kinglets (Regulidae family), American Robin (*Turdus migratorius*), Bewick's Wren (*Thryomanes bewickii*), chickadees (*Poecile* sp.), and song sparrow (*Melospiza melodia*). Near where the western branch of Willow Creek enters the emergent portion of Edmonds Marsh, a song sparrow was observed carrying nesting material, indicating that the southern buffer zone also provides nesting habitat as well as foraging habitat.

During the site reconnaissance, the interior of Edmonds Marsh was also accessed by following Willow Creek beyond the forested buffer zone and into the emergent portion of the Marsh. Near the transition from the forested wetland to the emergent area, a very dense monoculture of bittersweet nightshade was observed. This patch appears to have been established for some time, as several layers of dead vines were observed beneath this year's growth. The plant is beginning to climb the sparse, scrubby red alders growing in this area. The nightshade patch ends farther out in the Marsh, as cattail become the dominant species.

2.4 EDMONDS MARSH SOUTHWEST BUFFER ZONE – ALONG UNOCAL PROPERTY

The southwest buffer zone of Edmonds Marsh includes the area from the western boundary of the Willow Creek Fish Hatchery northwest to the BNSF railway line (Figure 2). This buffer zone is located on the Unocal Property, which is owned by Chevron. The gradient of the eastern portion of this zone is relatively gentle (generally 10% or less); slope increases moving westward into the filled and developed portion of the Unocal site (Figure 3). Although access to this buffer zone was restricted, it was surveyed to the extent possible from the western portion of the Willow Creek Fish Hatchery property, the Point Edwards Community Trail, a lookout point within the

Point Edwards neighborhood (see Photo 11 of Appendix A), and the interior of the Marsh.

The eastern portion of this buffer zone contains forested upland and forested wetland habitat (Shannon & Wilson 2015) whose quality appears similar to that of the forested areas on the hatchery property. Tree species observed within the southwest buffer zone include bigleaf maple, red alder, Douglas fir, and western red cedar. A portion of this buffer zone (the northwest side, near the BNSF railway line) contains a stormwater detention pond associated with the Unocal site. Pine trees and salmonberry were also observed growing on the berm that separates the stormwater pond from the Marsh (see Photo 12 of Appendix A). Stormwater is reportedly pumped out of the pond into Willow Creek periodically (Shannon & Wilson 2015).

2.5 EDMONDS MARSH NORTHWEST BUFFER ZONE – ALONG BNSF RAILWAY LINE

Access to the northwest buffer zone was also restricted as this area lies within the BNSF railway right-of-way. This buffer zone is unvegetated and restoration opportunities do not appear to be feasible given current land uses and access restrictions. However, riparian plantings of approximately 0.5 ac are planned as part of the Willow Creek Daylighting project for the portion of the Willow Creek channel adjacent to the southwest of the northwest buffer zone (Shannon & Wilson 2015). There are no stormwater outfalls located in the northwest buffer zone.

2.6 SHELLABARGER MARSH BUFFER ZONES

Shellabarger Marsh is surrounded primarily by residential development, both single-family homes as well as apartment and condominium buildings (Figure 1). The western side of Shellabarger Marsh is bordered by SR 104. The City's wastewater treatment plant is located to the north of Shellabarger Marsh, but most of the built facility is beyond the northern buffer zone (Figure 1). The gradient of the Shellabarger Marsh buffer zones is variable (Figure 3), but is ≤10%) over much of the area.

The northern buffer zone is located on an undeveloped parcel of land owned by the City and vegetative cover in this area is relatively dense, with both native and non-native plants, except for an unpaved east-west access path between 2nd Avenue S and SR 104 and a small park containing outdoor exercise equipment. The native species here appear to have been planted (along the perimeter of the access path) and to have seeded in naturally (in areas closer to the marsh). Native species present include red alder, Scouler's willow, Pacific willow, osoberry, evergreen huckleberry (*Vaccinium ovatum*), and sword fern. Non-native species in the northern buffer zone include cherry laurel (*Prunus laurocerasus*), English holly, and English ivy, the latter growing not only on the ground but also climbing some of the trees.

The western buffer zone of Shellabarger Marsh is largely occupied by SR 104, with a narrow strip of mostly non-native vegetation growing between the marsh and the road (Photo 13 of Appendix A). The vegetation here is a mix of cattails, reed

canarygrass, other grass species, and Himalayan blackberry. Pacific willow is also present toward the southern end of the western buffer zone, and to the east of the Edmonds Park Apartments and associated parking lot. In this same general vicinity, where the double culverts pass under SR 104 (Figure 2), a large dense patch of bittersweet nightshade is present, mixed with Himalayan blackberry and reed canarygrass (Photo 14 of Appendix A). Moving south from this area Himalayan blackberry is dominant beneath a canopy of Pacific willow.

The southern buffer zone of Shellabarger Marsh was surveyed from the Edmonds Park Apartments parking lot, which is located within the southern buffer zone. Native vegetation in this area includes Pacific willow, which dominates the canopy, as well as stinging nettle, curly dock (*Rumex crispus*), and common horsetail (*Equisetum arvense*). Himalayan blackberry and reed canarygrass, both non-native invasive plants, appeared to dominate the understory. English ivy was also present in this area and climbing some of the Pacific willow trees. Immediately adjacent to the parking lot were a few western red cedar, as well as a variety of ornamental plantings.

The eastern buffer zone of Shellabarger Marsh was surveyed as much as possible from the 2nd Avenue S street end. Second Avenue S itself is located within the eastern buffer zone, as are many residential buildings, both single-family and multi-family. A few ornamental willow trees grow in this portion of the buffer zone, along with Scouler's willow, and red alder, and a thicket of Himalayan blackberry and reed canarygrass. Channelized surface water flow transverses a portion of the eastern buffer zone, adjacent to a large condominium building (Figure 2).

Wildlife observed while surveying the Shellabarger Marsh buffer areas included Marsh Wren (*Cistothorus palustris*) and Red-winged Blackbird, which were heard vocalizing from the marsh interior, as well as American Crow (*Corvus brachyrhynchos*), Song Sparrow, and Black-capped Chickadee, which were seen within the buffer areas. Traffic noise in this area, particularly immediately adjacent to SR 104, interfered with the ability to hear bird vocalizations.

3 Habitat Enhancement Recommendations by Zone

In most cases, the vegetated portions of the Edmonds Marsh and Shellabarger Marsh buffer zones are narrower than the widths recommended in the literature (as discussed in the companion review document) for providing the following ecological functions:

- Improving water quality (removing sediment, nutrients, and toxic substances)
- Protecting habitat and maintaining habitat connectivity
- Maintaining an appropriate microclimate for Marsh species
- Providing inputs of LWD to support Marsh functioning
- Preventing disturbance by human activity

However, the buffer zones still provide ecological value, and their functions can likely be improved through restoration and enhancement activities. The following subsections provide buffer zone-specific recommendations for habitat enhancements that could be implemented within the existing vegetated areas of the buffer zones.

3.1 Edmonds Marsh Northern Buffer Zone – along Harbor Square Property

Although only a portion of the Edmonds Marsh northern buffer zone is vegetated, the existing vegetation appears to be of high quality in terms of native species diversity, and provides a visual screen between human activity and the Marsh interior. Habitat restoration efforts already conducted in this zone have certainly contributed to its diverse mix of native plants. As the young plants recently installed in the understory continue to grow, they will provide a denser buffer between the pedestrian path and the Marsh; they will also provide a source of conifer trees to grow and replace the overstory alder and willow as they naturally decline over time. If the vegetated portion of the northern buffer zone were ever to be widened, it would likely further reduce disturbance to wildlife using the Marsh.

In general, the most effective water quality benefits are realized when buffers are wide, gently sloping, and densely vegetated, primarily because these characteristics lengthen the time it takes surface water to flow from the outer edge of the buffer zone to the wetland Widening the flow paths of the two drainage ditches within the northern buffer zone, and planting additional native emergent plants (e.g., slough sedge [*Carex obnupta*], other native wetland plants that tolerate partial shade) between the storm drain outfalls and the Marsh may also boost the ability of this area to provide water quality improvements. An additional recommendation for the northern buffer zone is to further evaluate areas where stormwater may be flowing through the buffer zone as sheet flow.

Very little LWD was observed within the northern buffer zone. LWD provides valuable habitat for a variety of different species and contributes to the maintenance of microclimate conditions. Manual placement of LWD in the forested portion of this buffer zone, up to and including the Marsh edge, could boost the area's habitat and microclimate functions. LWD installation in the northern buffer zone could occur concurrently with the Willow Creek Daylighting project, if LWD were already being transported to the area and distributed with heavy machinery. The forested buffer and edge of the Marsh are relatively accessible in this zone given the proximity of the Harbor Square parking lot and the paved pedestrian walkway. LWD in this buffer zone could also provide more of a screen between the Marsh and the developed upland areas.

3.2 EDMONDS MARSH EASTERN BUFFER ZONE – ALONG SR 104

The southern portion of the eastern buffer zone (the area between the hatchery property and the highway) would benefit from removal of Himalayan blackberry and other invasive species, and from the installation of native shrubs and groundcover plants in the understory. Native tree species tolerant of shade and moisture (such as Oregon ash [*Fraxinus latifolia*] or western hemlock) could also be installed to help replace the declining alder in this area. If habitat restoration efforts are to be conducted within the hatchery property, they could perhaps be extended into the eastern buffer zone.

In the middle portion of the eastern buffer zone, where buffer vegetation grows in a very narrow strip along the highway, the current recommendation is to leave the existing thicket of Himalayan blackberry. While this plant is invasive and generally not desirable in natural areas, it provides an effective barrier to people and domesticated animals, as well as food, nesting sites, and shelter for birds and small mammals (USFS 2018). Himalayan blackberry is also hearty, even in a harsh environment like that found along the SR 104 corridor.[3] Invasive species control efforts in this area could be focused on removing Scotch broom before it spreads to other areas.

The drainage ditch north of and extending into the eastern buffer zone presents a possible opportunity for enhancing stormwater quality functions, if stormwater continues to be conveyed through the ditch after the Dayton Street Pump Station has been constructed. The drainage ditch is adjacent and parallel to SR 104, and carries stormwater from the highway, Dayton Street, and other areas to the north (Figure 2). As the gradient in at least a portion of this area is relatively low (generally ≤10% as shown on Figure 3), the ditch is filled with cattails (which are known to help filter sediments and other stormwater pollutants), and as stormwater flows via the ditch for

[3] Eventually, restoration efforts could focus on replacing the Himalayan blackberry with native roses or additional black gooseberry plants, which would also be expected to provide a good barrier to disturbance, etc.

approximately 600 ft prior to entering Shellabarger Creek, this drainage feature may represent an area where stormwater quality function is currently being provided. If stormwater could be better dispersed within the grassy area and buffer zone, rather than simply flowing through the ditch, further enhancement of water quality might be possible.

3.3 EDMONDS MARSH SOUTHERN BUFFER ZONE – AT WILLOW CREEK FISH HATCHERY

The primary recommendation for the southern buffer zone is to protect and maintain the relatively high-quality habitat already present. This zone contains dense native vegetation in the canopy, understory, and groundcover layers, as well as a relatively large quantity of LWD—all features noted as being important for providing habitat to a range of wildlife species (McMillan 2000). Indeed, an array of native bird species were observed to be using the southern buffer zone.

The diversity of native plants present in this zone appears to be largely "natural," meaning that for the most part, the plants here appear not to have been planted by people, but rather to reflect a remaining intact forest still dominated by native plants. As such, this community may provide a good example on which to base planting schemes for restoration efforts elsewhere in the buffer zones of Edmonds Marsh and Shellabarger Marsh. This area may also be able to provide native, local planting stock for such restoration efforts, if seeds or cuttings could be harvested conservatively and propagated for out-planting.

Invasive species growing in the southern buffer zone should be monitored and controlled to protect the integrity of the existing high-quality habitat. However, it is also recommended that such activities be conducted with care, and that any vegetation removal efforts be conducted outside of the breeding season. A few relatively isolated patches of English ivy were observed during the site reconnaissance; these should be controlled before they begin to spread or climb nearby trees. The large patch of bittersweet nightshade observed within the Marsh should also be monitored to prevent its spread into the buffer zone and riparian corridors of Willow Creek. Ultimately, this patch may need to be controlled. Consultation with other municipalities that have dealt with similar infestations of bittersweet nightshade in wetlands may be helpful in determining a control approach.

Finally, while a relatively large quantity of LWD was observed within the southern buffer zone, little to no LWD was observed within the Willow Creek channels (Photo 9 of Appendix A). The placement of LWD within the creek channels, or natural recruitment of LWD in the event that streamside trees should fall, would provide beneficial habitat complexity within the stream.

3.4 EDMONDS MARSH SOUTHWEST BUFFER ZONE – ALONG UNOCAL PROPERTY

The primary recommendation for the southwest buffer zone currently is to conduct a more thorough evaluation of existing conditions. Additional surveys may possible during a baseline study of the Marsh to be initiated in summer 2018, either by evaluating additional portions of the southwest buffer zone from the Marsh interior, or by obtaining Chevron's permission for direct access to the property. Physical access appears to be feasible from the hatchery property, if such permission were to be granted. Much of this buffer zone appears to contain habitat similar to the southern buffer zone. If so, it would represent a relatively high-quality and contiguous forested buffer habitat.

3.5 EDMONDS MARSH NORTHWEST BUFFER ZONE – ALONG BNSF RAILWAY LINE

There are currently no recommendations for habitat enhancements in the northwest buffer zone, as this zone is completely developed and as access is generally restricted by BNSF. Approximately 0.5 ac of riparian plantings will be installed along the portion of the Willow Creek channel adjacent to the southwest of the northwest buffer zone as part of the Willow Creek Daylighting project (Shannon & Wilson 2015).

3.6 SHELLABARGER MARSH BUFFER ZONES

Habitat enhancement possibilities are currently relatively limited in the eastern and western buffer zones of Shellabarger Marsh given the presence of large, multi-family residential developments and SR 104. However, water quality enhancements might be possible with improvements to vegetation and flow conditions in the area where channelized surface water now flows out of a culvert and through a portion of the eastern buffer zone (adjacent to a large condominium building) prior to entering Shellabarger Marsh (Figure 2). s. In addition, the City has recently been offered the opportunity to purchase the parcel of land immediately adjacent to the south of its undeveloped parcel within the northern buffer zone of Shellabarger Marsh (VanLoveren et al. 2018). The parcel for sale is undeveloped, covers approximately 0.67 ac, and includes portions of Shellabarger Marsh and its eastern buffer zone (Figure 1).

There are also opportunities within the northern buffer zone, which is located on land owned by the City that is primarily already vegetated with trees and shrubs (both native and non-native species). Vegetation enhancement in the northern buffer zone could include removal of non-native (including cherry laurel, English holly, and English ivy), and installation of native shrubs, groundcover plants, and shade tolerant trees. As some of the red alder trees in this area are in decline, providing a source of seedlings that will ultimately grow to replace them would be important to ensuring forest succession.

Vegetation enhancement opportunities were also identified within the southern buffer zone of Shellabarger Marsh. A portion of this zone (between the apartment buildings

and SR 104) contains a small patch of forested wetland. While Pacific willow are dominant in the canopy, the understory is dominated by a mix of non-native plants (Himalayan blackberry, reed canarygrass, and some English ivy). Removing invasive plants and installing native shrubs and understory trees in this area would improve the quality of the habitat. Restoration efforts in the vegetated portion of the southern buffer zone could be extended south into Edmonds City Park if such activities were acceptable to the residential land owners in this area. Such restoration efforts would encompass a daylighted portion of the Shellabarger Creek channel (Figure 2).

4 Conclusion

This initial evaluation of conditions within the buffer zones Edmonds Marsh and Shellabarger Marsh buffer zones will be further developed after completion of the year-long baseline monitoring study to be initiated in summer 2018. The baseline monitoring study will provide additional information, both qualitative and quantitative, providing insight into the current ecological functions of the marshes and their buffer zones. The baseline monitoring study plan is under development, with the assistance of stakeholder groups such as the Save Our Marsh community group, the Port of Edmonds, Washington State Department of Transportation (WSDOT), and the City.

Data to be collected as part of the baseline study include water level and basic water quality parameters (e.g., temperature and salinity), observations of marsh sediment and upland soil characteristics, vegetation surveys, invertebrate and bird surveys, and other wildlife observations. In addition, photo stations will be used to visually document conditions within the marshes and their buffer zones during different seasons of the year. The baseline monitoring data will be used to elaborate the initial ideas for potential habitat restoration and enhancement projects suggested in this document.

5 References

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APPENDIX A. PHOTO LOG

Photo No.:	1
Date:	April 23, 2018

Description: View to the southeast from the boardwalk located near the Harbor Square property. The photo shows the strip of primarily native trees and shrubs along the eastern portion of the northern buffer zone in the background, with emergent and mudflat habitat within the marsh interior in the foreground.

Photo No.:	2
Date:	April 23, 2018

Description: A close-up view of the vegetated strip located in the eastern portion of the northern buffer zone.

Photo No.:	3
Date:	April 23, 2018

Description: View of one of the storm drain outfalls that discharges to Edmonds Marsh within the northern buffer zone. After exiting the outfall, stormwater flows through an unlined ditch into the marsh.

Photo No.:	4
Date:	April 23, 2018

Description: View to the south from the drainage ditch located adjacent to Highway 104, just north of the eastern buffer zone.

Photo No.:	5
Date:	April 23, 2018

Description: View to the south along SR 104 showing the relatively narrow strip of vegetation within the northern portion of the Edmonds Marsh eastern buffer zone.

Photo No.:	6
Date:	April 23, 2018

Description: View to the west (toward the interior of Edmonds Marsh) from the southern portion of the eastern buffer zone. The photo shows the declining condition of alder trees present in this area, as well as the dense growth of Himalayan blackberry in the understory.

Photo No.:	7
Date:	April 23, 2018

Description: View to the northeast from Pine Street showing the entrance to the Willow Creek Fish Hatchery. The background of the photo provides a good representation of the forest conditions within the southern buffer zone.

Photo No.:	8
Date:	April 23, 2018

Description: View to the north from one of the buildings associated with the hatchery. With the exception of the hatchery buildings, pools, and access road, most of the southern buffer zone is heavily vegetated, as visible in the background of the photo.

Photo No.:	9
Date:	April 23, 2018

Description: View to the north from the southern buffer zone, within the Willow Creek Fish Hatchery property. The photo shows Willow Creek flowing toward Edmonds Marsh, and the surrounding forested wetland habitat.

Photo No.:	10
Date:	April 23, 2018

Description: One of the standing snags with abundant woodpecker holes located in the southern buffer zone.

Photo No.:	11
Date:	April 23, 2018

Description: View of the southwest buffer zone, looking north from the lookout at Point Edwards.

Photo No.:	12
Date:	April 23, 2018

Description: View to the northwest along the Willow Creek channel adjacent to the Unocal stormwater detention pond. Represents conditions within the southwest buffer zone.

Photo No.:	13
Date:	April 23, 2018

Description: View to the southwest of Shellabarger Marsh western buffer zone, along Highway 104.

Photo No.:	14
Date:	April 23, 2018

Description: View of the southern end of Shellabarger Marsh western buffer zone. Pacific willow are seen growing in the background, while reed canarygrass, bittersweet nightshade, and Himalayan blackberry are seen in the foreground.