MEMORANDUM

Date: September 9, 2015
To: Lacey Hatch, City of Bellevue
From: Sarah Sandstrom and Dan Nickel, The Watershed Company
Project Number: 070613
Project Name: Bellevue SMP

Subject: Overview of the Basis for and Application of the Residential Vegetation Conservation Provisions for the Proposed City of Bellevue Shoreline Master Program

The purpose of this memorandum is to summarize the basis for and application of the vegetation conservation standards in the Shoreline Residential environment designation for the proposed City of Bellevue Shoreline Master Program (SMP). The proposed approach to vegetation conservation was developed based on the city's strong desire to ensure that mitigation required of shoreline homeowners is supported by science and meets the standards of nexus and rough proportionality.

The proposed approach is based on a simplified version of Habitat Equivalency Analysis (HEA), which is used by the National Marine Fisheries Service's (NMFS) and U.S. Fish and Wildlife Service's (USFWS) to calculate mitigation credits and debits for listed species. Both debits and credits are calculated based on the area and relative ecological value of the existing and proposed landcover (SMP 20.25E.065.F.8.c). The location and type of mitigation required is correlated with the location and type of impact.

The proposed approach incorporates the following inputs:

- Baseline level of shoreline ecological functions (value);
- Final level of shoreline ecological functions (value); and
- Area of impact and/or mitigation.

The proposed approach omits calculations that explicitly consider temporal factors used in the HEA analysis in order to simplify calculations and make the approach easily understandable and implementable by homeowners.

The ecological value for each type of land cover is assigned within a range from 0 (no function) to 1 (maximum function) (Figure 1). Values are generally based on recognized functions. Shoreline ecological functions and potential impacts to these functions from upland development are summarized in Table 1. The precise value of each type of land cover type,

described in SMP Chart 20.25E.065.F.8.d (summarized in Table 2) is somewhat subjective; however, the relative values of different land cover types are fairly well established.

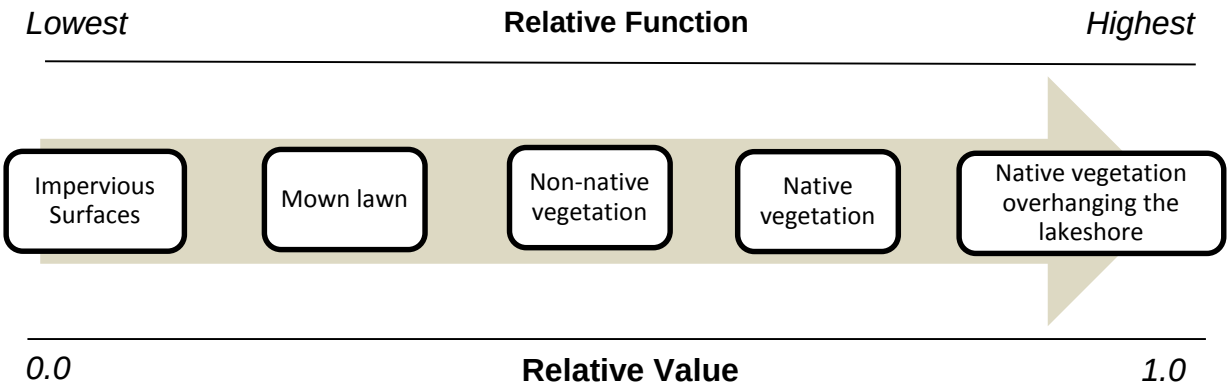

Figure 1. Conceptual model of the continuum of lakeshore landcover values

Table 1. Shoreline vegetation functions and impacts from development.

Function	Characteristics	Area of interest	Impacts
Water quality	• Vegetative structure helps slow, infiltrate, and treat runoff [1–3] • Vegetative cover and root structure limits surface erosion and encourages infiltration [1,2]	Up to 30-100 feet from the water, depending on slope (and soils)	• Mown lawn grasses do not withstand overland flow conditions [1,3–5] • Chemical applications of fertilizer and pesticides can be transported into the lake[5–7] • Impervious surfaces concentrate and direct stormwater more rapidly to lake, thereby limiting infiltration and treatment capacity [2,8]
Fish habitat	• Vegetation that overhangs and drops into the shoreline provides physical structure preferred by juvenile Chinook salmon [9] • Secondarily, native shoreline vegetation provides insect foraging opportunities and organic detritus [10–12]	Immediately adjacent to the shoreline (primarily within 10 feet)	Hardscape (i.e. patios, structures), lawn, and maintained, ornamental plantings provide little if any habitat benefits.
Wildlife habitat	• Mature trees adjacent to the lake provide perches and nesting sites for raptors [13] • Native shrubs provide natural food source and	Anywhere within shoreline jurisdiction	• Tree removal limits wildlife habitat [13,14,16] • Temporal losses from the removal of large trees are significant

Function	Characteristics	Area of interest	Impacts
	structure for native wildlife [14,15]		• Non-native vegetation does not support the diversity of native wildlife to the same extent as native plant communities [14–17]

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Table 2. Values by landcover type proposed in draft SMP 20.25E.065.F.8.d

Land cover type	Standard value	Mitigation planting types
Impervious surface	0.0	Not allowed as mitigation planting for removal of Land Cover having a value of greater than 0.2.
Mown lawn, annual or perennial gardens, noxious species/weeds	0.1	
Bare ground or pervious features	0.15	
Non-native vegetation, 25-50 feet from OHWM	0.25	Shoreline vegetation replacement, enhancement, or retention.
Non-native vegetation, 0-25 feet from OHWM	0.3	
Native vegetation, 25-50 feet from OHWM	0.6	
Rain garden/swale, 0-200 feet from OHWM	0.7	
Native vegetation, 0-25 feet from OHWM	0.8	
Native overhanging vegetation, 0-10 feet from OHWM	1.0	

In addition to standard mitigation credits and debits, in order to incentivize improvement in shoreline landcover, the SMP includes provisions for "enhancement" credits, which apply to infill plantings in areas not presently meeting mitigation standards (SMP 20.25E.065.F.8.e); "conservation" credits, which apply to maintenance (and avoidance) of existing high quality mature vegetation (SMP 20.25E.065.F.8.f); "dock grating" credits for converting the nearshore 30 feet of an existing dock from solid to grated decking (SMP 20.25E.065.F.8.h); and "advance" credits, which provide an incentive to improve landcover conditions prior to any development action (SMP 20.25E.065.F.8.i).

Significant trees are considered separately from other landcover types because their values are not easily quantified on an area basis. Instead, simple replacement ratios are proposed, which account for the temporal lag between planting and replacement of functions, particularly for larger trees. One of the primary functions identified for significant trees was their use as perches and nesting sites. In order to ensure that any tall tree species that are removed are replaced with species that will reach similar heights, a replacement tree list was developed, which includes only tree species that typically grow to over 50 feet in height.

The proposed approach provides a direct relationship between the nature and extent of impacts and the mitigation required. It provides flexibility for a landowner, yet the approach incentivizes avoidance and minimization of impacts to existing conditions and implementation of mitigation actions with the highest value for shoreline functions.

Examples of Application of Vegetation Mitigation Approach

Example One: New patio

Project: Installation of 400 SF concrete patio adjacent to residential structure. Patio will replace mown lawn as well as ornamental shrubs. The entire patio falls within 30-50′ from the shoreline.

Summary of impacts and mitigation: The following example would require mitigation because it increases impervious surface coverage within the Vegetation Conservation Area. Two options for generating credits are shown below and in the figure.

Debit Table: Impacts

Impact Zone	Nature of Impact	Area (SF)	Land cover removed (Value)	Land cover installed (Value)	Total impact
0-25 ft					
25-50 ft	Replace lawn and non-native vegetation with impervious structure	300	Mown lawn (0.1)	Impervious surface (0.0)	(300 SF)*(0.0 – 0.1)= **-30**
		100	Non-native vegetation (0.25)	Impervious surface (0.0)	(100 SF)*(0.0 – 0.25)= **-25**

Total Debit: -55

Credit Table: Mitigation Option A

Impact Zone	Mitigation planting option	Area (SF)	Land cover removed (Value)	Land cover installed (Value)	Total mitigation
25-50 ft	Planting native overhanging vegetation in place of lawn in 0-25 ft	61	Mown lawn (0.1)	Native overhanging vegetation (1.0)	(61 SF)*(1.0 – 0.1) = **55.8**

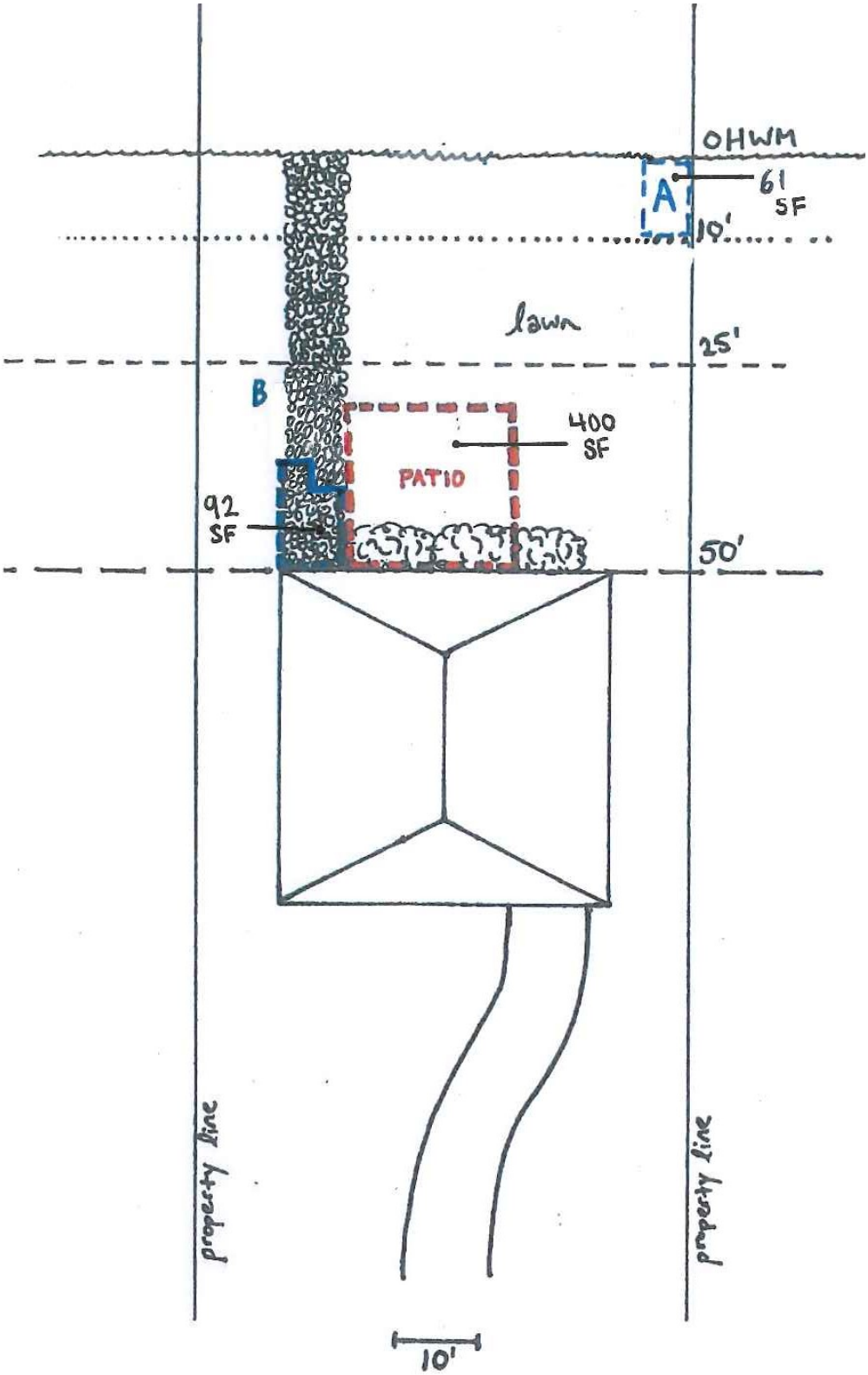
Total Credit Option A: 55.8

Credit Table: Mitigation Option B

Impact Zone	Mitigation planting option	Area (SF)	Land cover removed (Value)	Land cover installed (Value)	Total mitigation
25-50 ft	Planting native vegetation in place of impervious path in 25-50 ft	92	Impervious surface (0.0)	Native vegetation (0.6)	(92 SF)*(0.6-0.0)=55.2

Total Credit Option B: 55.2

Example One: New Patio



Example Two: House expansion, partially over existing impervious surface

Project: Homeowner desires to expand residence waterward to 25 feet from the OHWM. Existing conditions within the setback include mown lawn, non-native vegetation, a concrete patio, and a concrete walkway.

Summary of impacts and mitigation: In this example, all impacts fall within 25-50 feet. Mitigation is required because the project increase impervious surface area within the Vegetation Conservation Area. No debit is calculated for expanding the structural footprint over the existing impervious surface. Two options for generating credits are shown below and in the figure.

Debit Table: Impacts

Impact Zone	Nature of Impact	Area (SF)	Land cover removed (Value)	Land cover installed (Value)	Total impact
0-25 ft					
25-50 ft	Increase in impervious surface	1,325	Mown lawn (0.1)	Impervious surface (0.0)	(1,325 SF)*(0.0 – 0.1) = **-132.5**
					Total Debit: -132.5

Credit Table: Mitigation Option A

Impact Zone	Mitigation planting option	Area (SF)	Land cover removed (Value)	Land cover installed (Value)	Total mitigation
25-50 ft	Planting native overhanging vegetation in place of lawn (0-25 ft)	50	Mown lawn (0.1)	Native overhanging vegetation (1.0)	(50 SF)*(1.0 – 0.1) = **45**
25-50 ft	Planting native overhanging vegetation in place of non-native vegetation (0-25 ft)	117	Non-native vegetation (0.25)	Native overhanging vegetation (1.0)	(117 SF)*(1.0-0.25) = **87.75**
					Total Credit Option A: 132.75

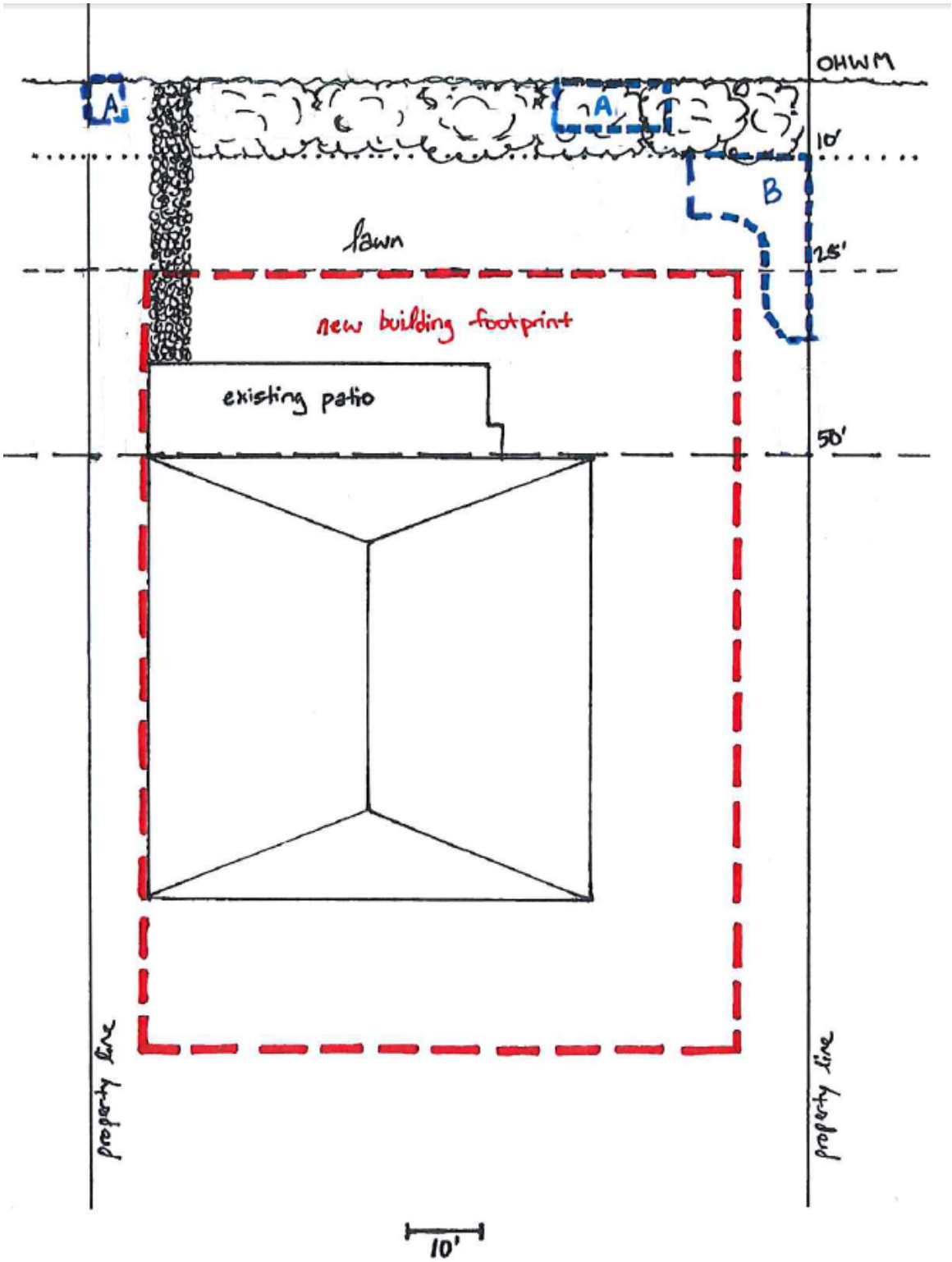
Credit Table: Mitigation Option B

Impact Zone	Mitigation planting option	Area (SF)	Land cover removed (Value)	Land cover installed (Value)	Total mitigation
25-50 ft	Planting native vegetation (0-25 ft)	150	Mown lawn (0.1)	Native vegetation (0.8)	(150 SF)*(0.8 – 0.1) = **105**

Impact Zone	Mitigation planting option	Area (SF)	Land cover removed (Value)	Land cover installed (Value)	Total mitigation
25-50 ft	Planting native vegetation (25-50 ft)	55	Mown lawn (0.1)	Native vegetation (0.6)	(55 SF)*(0.6 – 0.2) = **27.5**

Total Credit Option B: 132.5

Example Two: House expansion, partially over existing impervious surface



Example Three: Use of Enhancement and Conservation Credits

Project: Homeowner desires to expand residence waterward to 25 feet from the OHWM. Existing conditions within the setback include native trees, shrubs, and groundcover. Native vegetation along the shoreline does not meet cover standards for mitigation planting; however, native vegetation along the western property line does meet these standards, and includes native trees, shrubs, and groundcover, with 90 percent areal coverage. Trees do not meet the definition of Significant trees.

Summary and estimate of total impacts: Mitigation is required because the project increase impervious surface area within the Vegetation Conservation Area. In this example, the homeowner uses enhancement and conservation credits to help offset debits. The homeowner will enhance the existing native vegetation along the shoreline with infill plantings. For areas meeting the native vegetation mitigation planting standards, the homeowner will receive a conservation credit. In order to increase the value of the existing native shoreline vegetation further, the homeowner will plant native red-twig dogwood at the property corners. Additionally, the homeowner will plant native vegetation in place of lawn so that the credits equal debits generated.

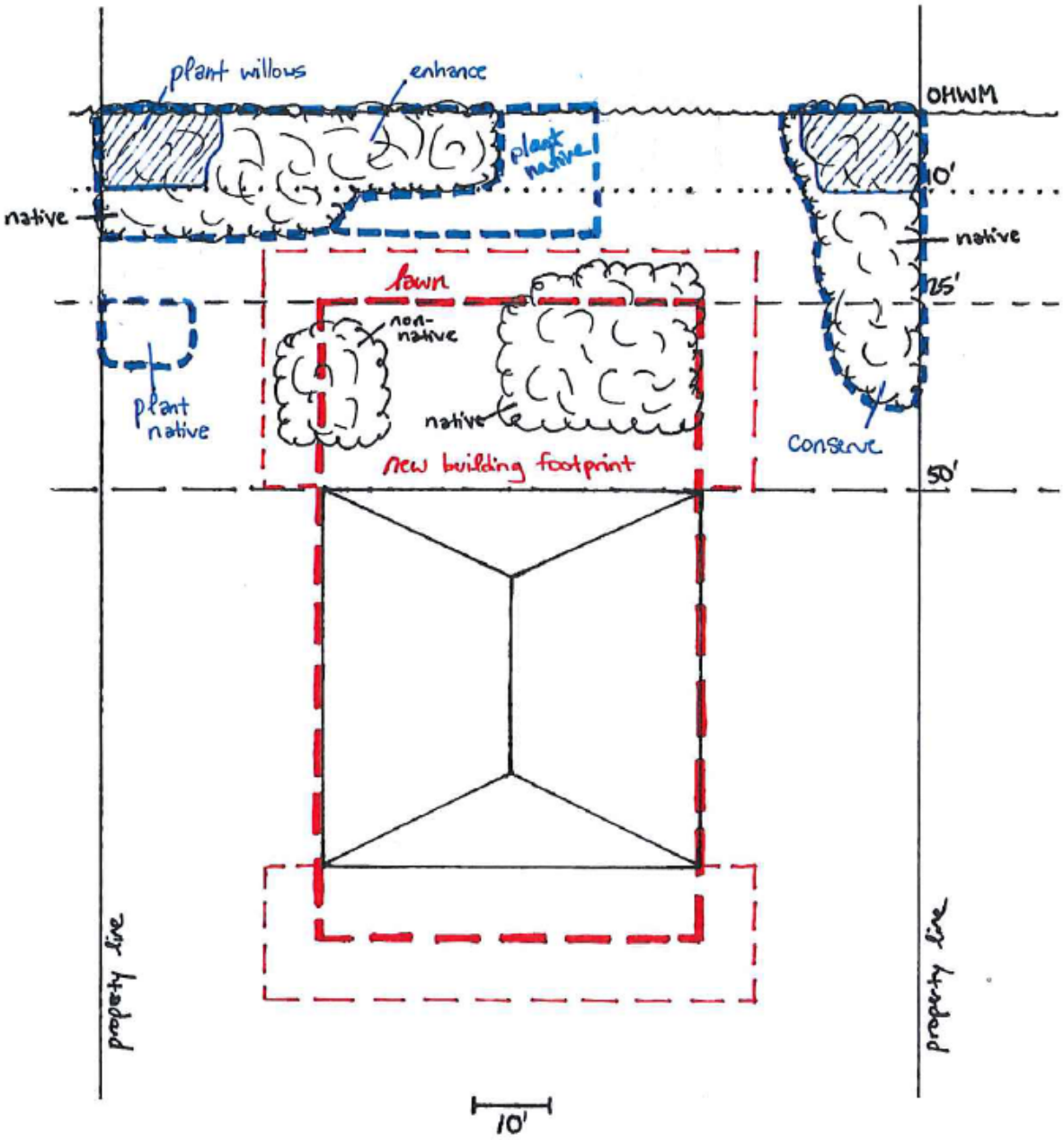
Debit Table: Impacts

Impact Zone	Nature of Impact	Impact Area (SF)	Land cover removed (Value)	Land cover installed (Value)	Total impact
Zone 1 (0-25 ft)	Area of native vegetation that will be replaced by lawn	100	Native shrub 0-25 ft (0.8)	Lawn (0.1)	(100 SF)*(0.1 – 0.8) = **-70**
Total Zone 1 Debits					**70**
Zone 2 (25-50 ft)	Replace non-native shrubs with impervious surface	125	Non-native shrubs (0.25)	Impervious surface (0.0)	(125 SF)*(0.0 – 0.25) = **-31.25**
	Replace native shrubs with impervious surface	440	Native shrub 25-50 ft (0.6)	Impervious surface (0.0)	(440 SF)*(0.0-0.6) = -**264**
	Replace non-native shrub with lawn	90	Non-native shrubs (0.25)	Lawn (0.1)	(90 SF)*(0.1-0.25) = **-13.5**
	Replace lawn and pervious area with impervious surface	725	Lawn/ bare ground (0.1)	Impervious surface (0.0)	(725)*(0.1-0.0) = **-72.5**
Total Zone 2 Debits					**381.25**
Debits from Zone 1 and 2 Combined					**451.25**
				Total Debits:	**451.25**

Credit Table: Mitigation Option

Impact Zone	Mitigation planting option	Mitigation Area (SF)	Land cover removed (Value)	Land cover installed (Value)	Total mitigation
Zone 1 (0-25 ft)	*Enhancement credit* for infill planting of native vegetation to meet cover and density standards	570	NA	NA	570 SF*0.15 enhancement = **85.5**
	Conservation credit for native vegetation 0-25 feet from OHWM	225	NA	NA	225 SF*0.15 conservation value = **33.75**
	Plant willows within existing native vegetation area (0-10 ft from OHWM)	300	Native vegetation (does not need to be removed) (0.8)	Native overhanging vegetation (1.0)	300 SF*(0.8-1.0) = **60**
	Replace bare ground with native vegetation 0-25 feet from OHWM	332	Bare ground (0.15)	Native vegetation (0.8)	332 SF*(0.8-0.15) = **215.8**
Total Credits from Zone 1					**395.05**
Zone 2 (25-50 ft)	*Conservation credit* for native vegetation 25-50 feet from OHWM	125	NA	NA	125 SF*0.15 enhancement = **18.75**
	Replace bare ground with native vegetation 25-50 feet from OHWM	95	Bare ground (0.2)	Native vegetation (0.6)	95 SF*(0.6-0.2) = **38**
Total Credits from Zone 2					**56.75**
Credits from Zone 1 and 2 Combined					**451.8**

Example Three: Use of Enhancement and Conservation Credits



Example Four: Use of Advance Credits

Project: Homeowner plants native vegetation along the shoreline in place of existing lawn. Five years later, the landowner applies the advance credits to debits generated from an addition to her house.

Summary and estimate of total impacts: After five years, the initial credit of 270 is valued at 351. The homeowner can use the advance credits when debits are generated.

Advance Mitigation

Impact Zone	Mitigation planting option	Mitigation Area (SF)	Land cover removed (Value)	Land cover installed (Value)	Total mitigation
0-25 ft	Plant native vegetation in place of lawn	270	0.15	0.8	270 SF*(0.8-0.15) = **175.5**
Total Credits from Zone 1					**175.5**
25-50 ft					
Total Credits from Zone 2					**0**
Credits from Zone 1 and 2 Combined					**175.5**

Advance Credit Maturation

Year After Planting	Credit at Start of Year	5% of initial value	Credit at End of Year
1	175.5	8.775	184.275
2	184.275	8.775	193.05
3	193.05	8.775	201.825
4	201.825	8.775	210.6
5	210.6	8.775	219.375

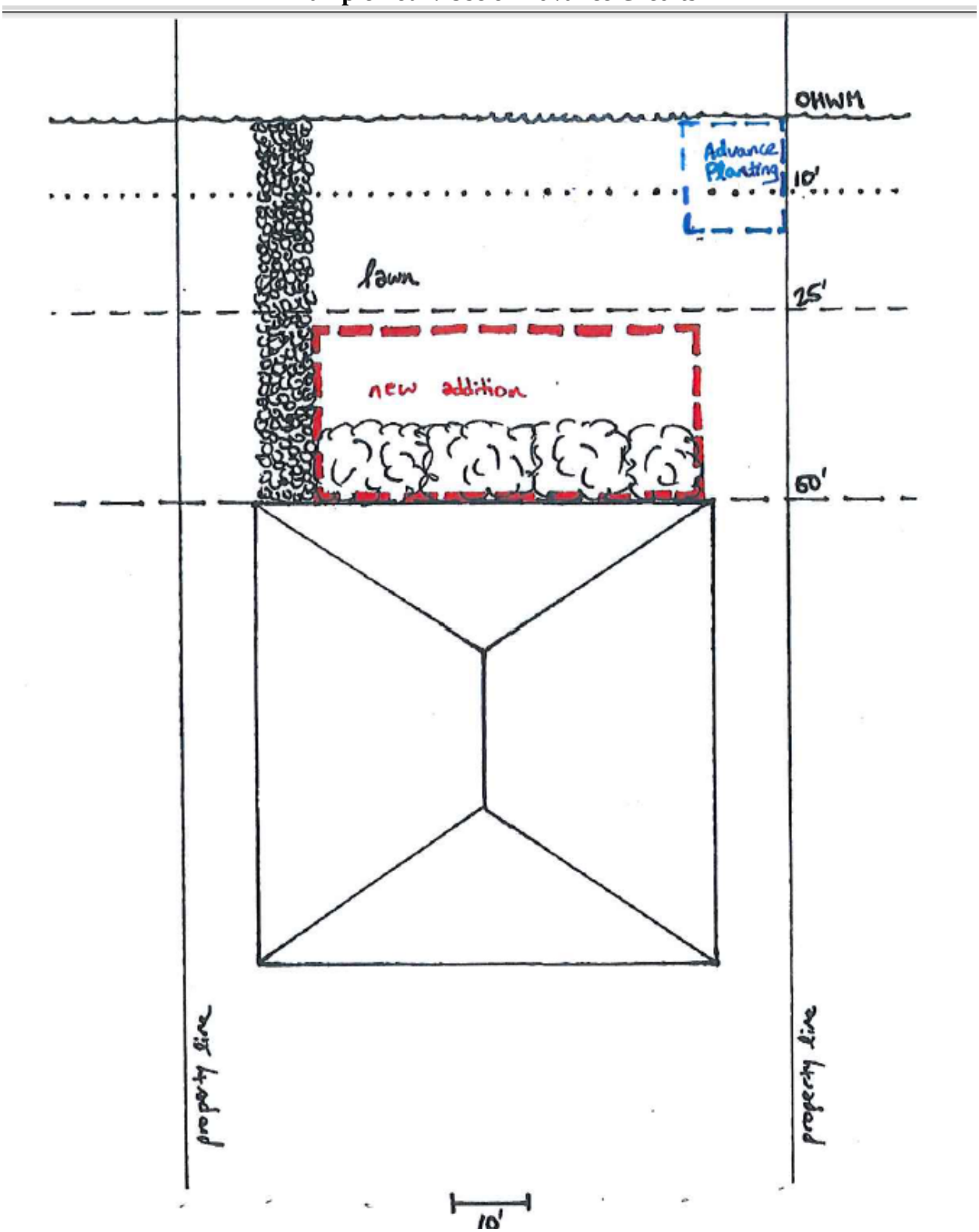
Total Debits at the End of Year 5: 219.375

Impacts Table

Impact Zone	Nature of Impact	Impact Area (SF)	Land cover removed (Value)	Land cover installed (Value)	Total impact
25-50 ft	Replace non-native shrubs with impervious surface	500	Non-native vegetation (0.25)	Impervious surface (0.0)	(500 SF)*(0.0 – 0.25) = **-125**
	Replace lawn with impervious surface	625	Mown lawn (0.15)	Impervious surface (0.0)	(625 SF)*(0.0 – 0.15) = **-93.75**

Total Debits: 218.75

Example Four: Use of Advance Credits



Example Five: Development in the Residential Canal Environment

Project: Homeowner desires to expand residence waterward to 25 feet from the OHWM. Existing conditions within the setback include mown lawn, non-native vegetation, a concrete patio, a pool, and a concrete walkway.

Summary and estimate of total impacts: No debit is calculated for expanding the structural footprint over the existing impervious surface or pool. One option for generating credits is shown below and in the figure.

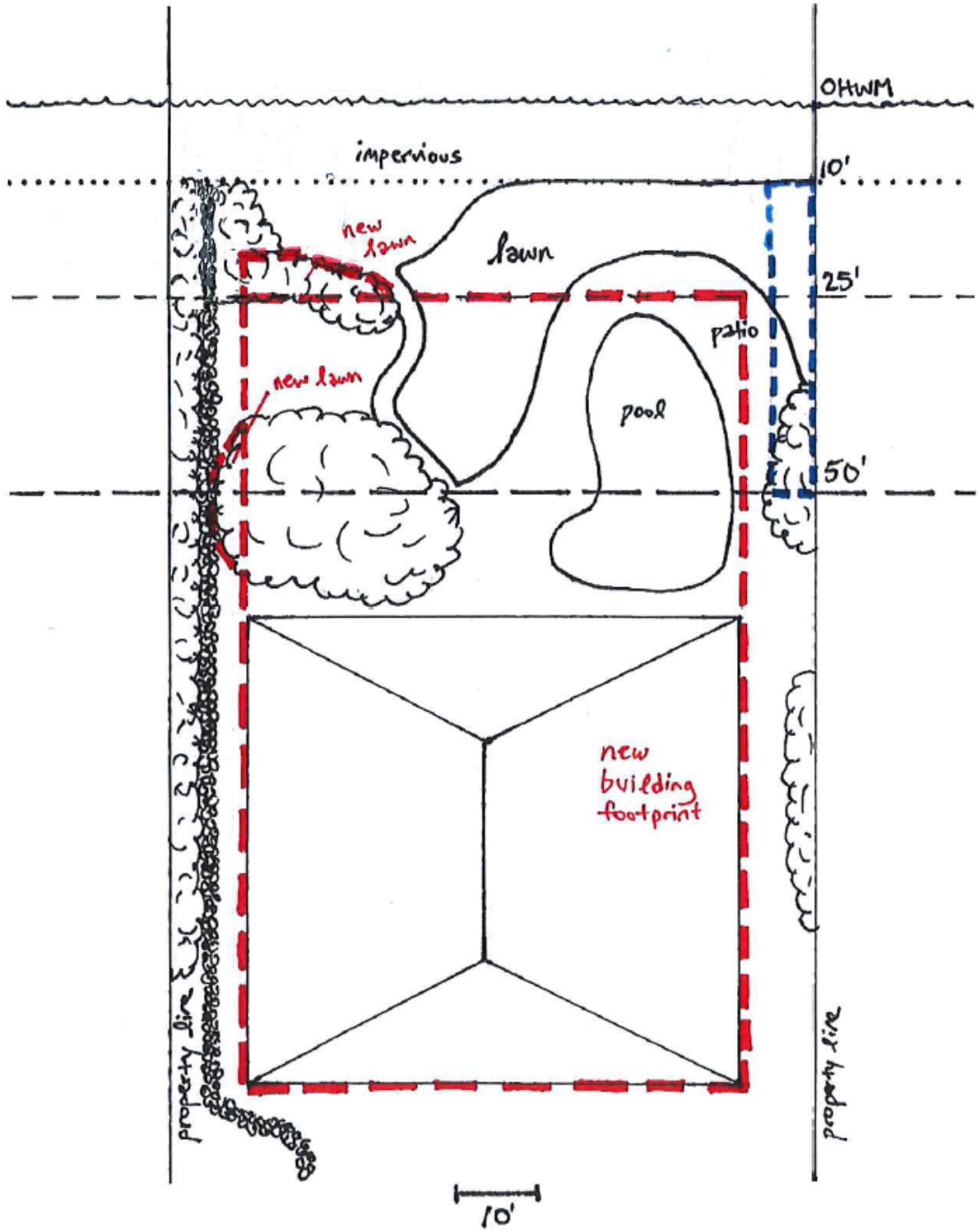
Debit Table: Impacts

Impact Zone	Nature of Impact	Impact Area (SF)	Land cover removed (Value)	Land cover installed (Value)	Total impact
0-25 ft	Replace non-native shrubs with lawn	76	Lawn (0.1)	Impervious surface (0.0)	(76 SF)*(0.0 – 0.1) = **-7.6**
Total Zone 1 Debits					**7.6**
25-50 ft	Replace non-native shrubs with impervious surface	254	Non-native shrubs (0.25)	Impervious surface (0.0)	(254 SF)*(0.0 – 0.25) = **-63.5**
	Replace lawn with impervious surface	570	Lawn (0.1)	Impervious surface (0.0)	(570 SF)*(0.0 – 0.1) = **-57**
Total Zone 2 Debits					**120.5**
				Total Debits:	**128.1**

Credit Table: Mitigation Option A

Impact Zone	Mitigation planting option	Mitigation Area (SF)	Land cover removed (Value)	Land cover installed (Value)	Total mitigation
0-25 ft	Plant native vegetation in place of lawn (Zone 1)	75	Lawn (0.1)	Native vegetation (0.8)	(106 SF)*(0.8 – 0.1) = **52.5**
Total Zone 1 Credits					**52.5**
25-50 ft	Plant native vegetation in place of lawn (Zone 2)	45	Lawn (0.1)	Native vegetation (0.6)	(42 SF)*(0.6 – 0.1) = **22.5**
	Plant native vegetation in place of impervious surface (Zone 2)	45	Impervious surface (0.0)	Native vegetation (0.6)	(45 SF)*(0.6 – 0.0) = **27**
	Plant native vegetation in place of non-native vegetation (Zone 2)	75	Non-native vegetation (0.25)	Native vegetation (0.6)	(72 SF)*(0.6 – 0.25) = **26.25**
Total Zone 2 Credits					**75.75**
				Total Credit Option B:	**128.25**

Example Five: Development in the Residential Canal Environment



Example Six: Narrow lot with significant trees and native vegetation

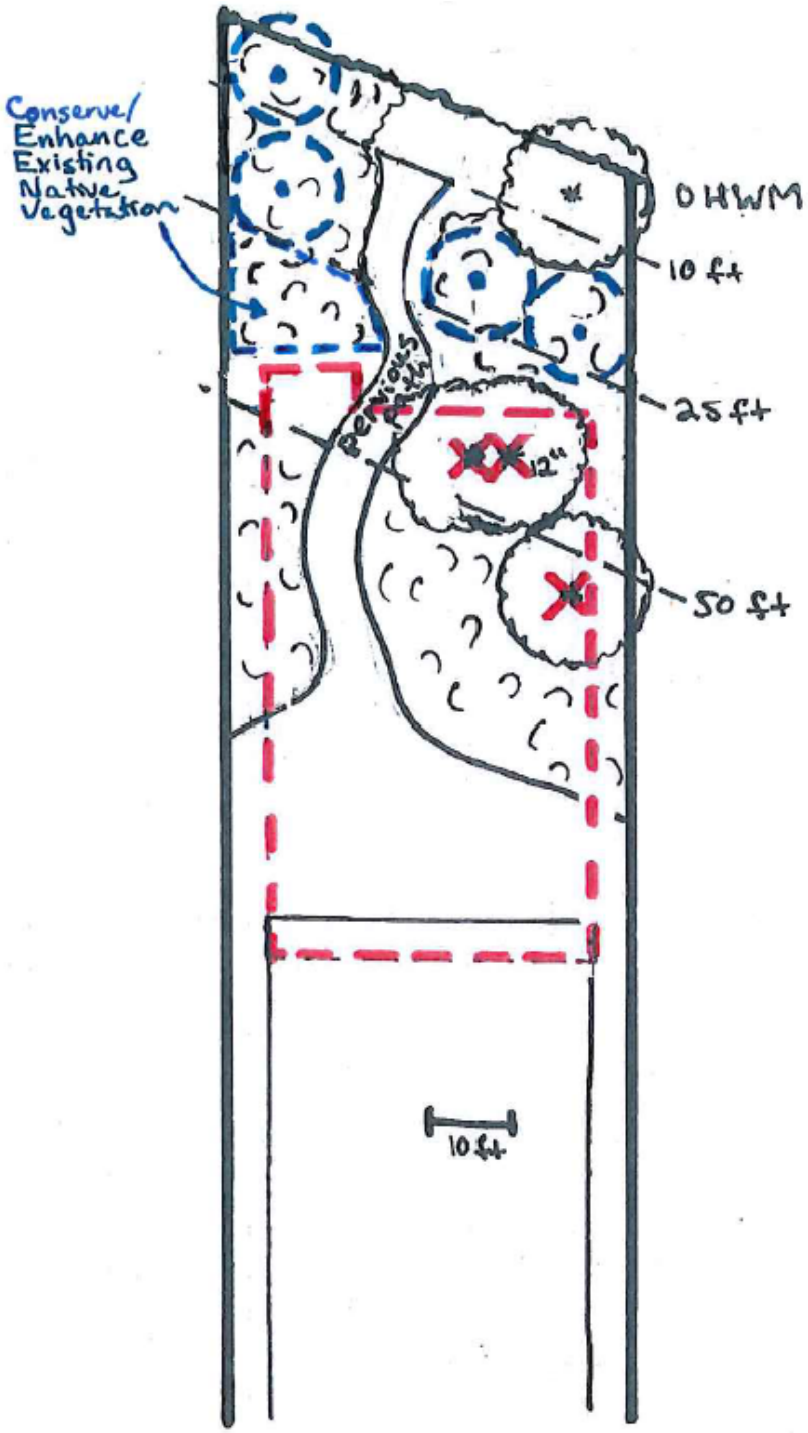
Project: Homeowner desires to expand residence waterward. Existing conditions within the setback native vegetation, three significant trees, and a pervious pathway. Two 12-inch diameter-at-breast-height (dbh) trees would be removed. Another 14-inch dbh tree would be removed from beyond 50 feet from the OWHM.

Summary and estimate of total impacts: Four trees would need to be planted to compensate for the loss of the two significant trees. These trees could be planted amidst existing native vegetation, although native vegetation within a 15-foot diameter of the tree would not qualify for conservation or enhancement credit. Replacement of significant trees is not required where the trunk is located outside of the vegetation conservation area, provided that the site landscape standards are met. However tree canopy that is removed within the vegetation conservation area is considered native or non-native vegetation. If most of the remaining native vegetation within the vegetation conservation area is enhanced or maintained, the house could partially extend into the 50-foot vegetation conservation area.

Debit Table: Impacts

Impact Zone	Nature of Impact	Impact Area (SF)	Land cover removed (Value)	Land cover installed (Value)	Total impact
Zone 2 (25-50 ft)	Replace native vegetation with impervious surface	60	Native vegetation (0.25)	Impervious surface (0.0)	(60 SF)*(0.0 – 0.25) = **-15**
	Replace pervious path with impervious surface	50	Bare ground (0.15)	Impervious surface (0.0)	(50 SF)*(0.0 – 0.15) = **-7.5**
Total Zone 2 Debits					**22.5**
				Total Debits:	**22.5**

Credit Table: Mitigation Option A

Impact Zone	Mitigation planting option	Area (SF)	Land cover removed (Value)	Land cover installed (Value)	Total mitigation
Zone 2 (25-50 ft)	*Enhancement/ Conservation credit* to meet cover, density, and composition standards	150	NA	NA	150 SF * 0.15 enhancement = **22.5**
Total Zone 2 Credits					**22.5**
				Total Credit Option A:	**22.5**

Example Six: Narrow lot with significant trees and native vegetation