

CRITICAL AREA STUDY

Hagstrom Residence: Watercourse Buffer Reduction

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March 2017

The Watershed Company Reference Number:
160735

Cite this document as:

The Watershed Company. March 2017. Critical Area Study,
Hagstrom Residence: Watercourse Buffer Reduction.

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CRITICAL AREA STUDY

HAGSTROM RESIDENCE

1 INTRODUCTION

This critical area study is prepared as part of a proposal to permit proposed site improvements at 7428 SE 71st Street in Mercer Island, Washington (parcel number 5368000300). Proposed site improvements include the replacement and partial relocation of the existing single-family residence.

The site contains two watercourses, including piped and open-channel segments, and the Lake Washington shoreline. The applicant proposes to reduce the standard watercourse buffers through enhancement, while the new residence will be located farther from the shoreline in accordance with the Mercer Island Shoreline Master Program (SMP). This report is intended to satisfy the requirements of the Mercer Island City Code (MICC). It provides a description of existing site conditions, proposed watercourse buffer reductions, proposed shoreline enhancement, and mitigation sequencing to ensure no net loss of critical area or buffer functions.

2 EXISTING CONDITIONS

2.1 Setting

The subject parcel (parcel number 5368000300) is located at 7428 SE 71st Street in Mercer Island, Washington; in Section 25 of Township 24 North, Range 4 East of the Public Land Survey System (PLSS). The property is approximately 0.35 acres in size and situated in the Mercer Island sub-basin of the Cedar-Sammamish Watershed (Water Resource Inventory Area [WRIA] 8; Figure 1). The subject parcel is zoned residential (R-15).

The subject parcel currently includes an existing 3,330-square foot single-family residence with attached garage built in 1971, a paved driveway, maintained lawn areas, scattered ornamental plantings, and substantial areas composed of bare dirt and gravel.

The entire parcel is mapped as Kitsap silt loam, two to eight percent slopes, by the Natural Resources Conservation Service (NRCS) Web Soil Survey (USDA 2017). Two watercourses, referred to for the purpose of this report as Watercourses A and B, and the Lake Washington shoreline are located on the property (Figure 2). No other critical areas are present on the property.

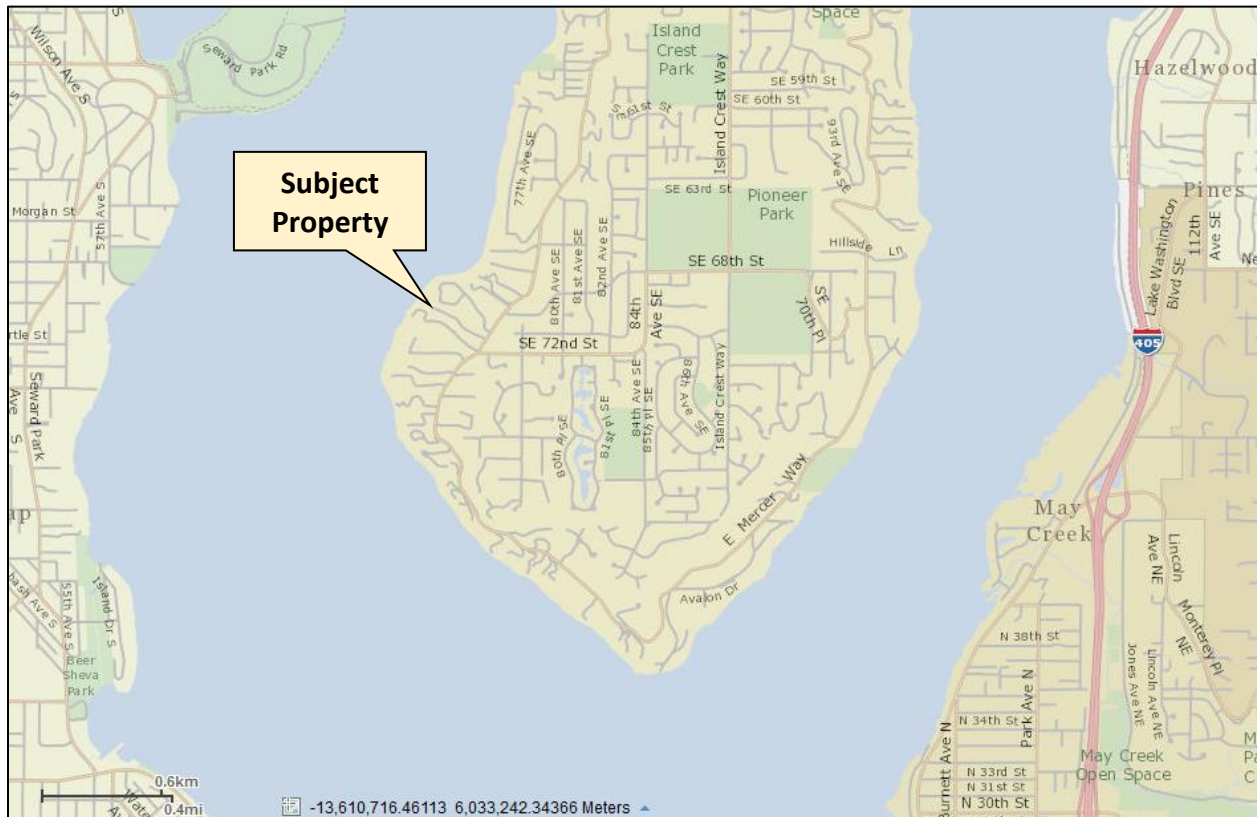


Figure 1. A vicinity map showing the location of the site (source: King County iMAP).

2.2 Watercourse A

Watercourse A is a partially piped, partially open channel watercourse located adjacent to the northeast property boundary. Watercourse A alternates piped and open channel segments throughout its length, with the last open channel segment extending approximately 10 feet onto the subject property, after which point it enters a pipe that carries flow beneath the existing residence before discharging into Lake Washington on the subject property shoreline. The open channel segments are intermittently flowing and non-fish-bearing based on the small channel size, small contributing basin, steep gradients (more than 20%), and ephemeral nature, with flows likely only present during rain events and including mostly stormwater runoff. The open channel segments are classified as Type 3, while the piped segment is classified as a “piped watercourse.”

2.3 Watercourse B

Watercourse B is a piped watercourse located primarily beneath SE 71st Street before it turns north adjacent to the western boundary of the subject property. This portion of the watercourse runs parallel to, and approximately five feet west of, the subject property boundary before discharging into Lake Washington just west of the northwest property corner.

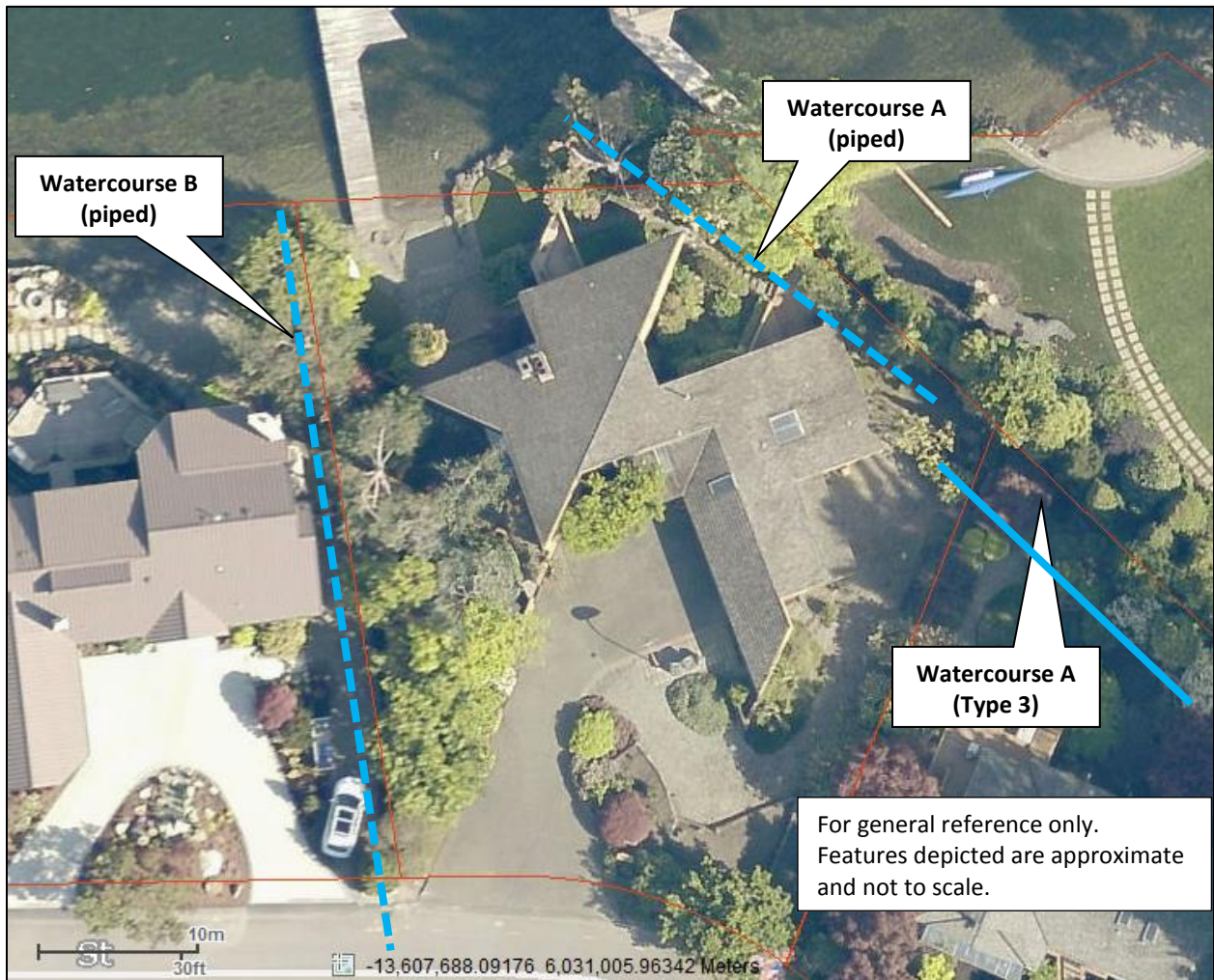


Figure 2. An aerial view of the subject property (source: King County iMAP).

2.4 Watercourse Buffers

The buffer areas around both watercourses are highly degraded on the property. The Watercourse A buffer area is nearly entirely unvegetated. The standard buffers for both the piped and open channel segments extend well into the existing structure, while remaining areas are mostly bare dirt and gravel (Figures 3 and 4). These areas provide

essentially no buffer function, as they do not act to reduce flows, trap or remove sediments and pollutants, or provide habitat for terrestrial wildlife or shade and organic input for aquatic organisms. The existing residence is located within approximately 10 feet of the open-channel segment of Watercourse A at its closest point.



Figure 3: Watercourse A buffer to be enhanced, facing northwest (7/27/2016).



Figure 4: Watercourse A buffer to be enhanced, facing south (7/27/2016).

The Watercourse B buffer has a vegetated canopy of native and non-native trees and a few widely spaced ornamental shrubs. However, the buffer contains no understory, with bare soil and exposed tree roots comprising the ground level (Figure 5). The trees that are present in the Watercourse B buffer are regularly topped to maintain view corridors as required by neighborhood covenants. Since the entirety of Watercourse B is piped, the buffer area currently provides no functional protection. In the unlikely event that Watercourse B is daylighted, the existing vegetation would provide shade for the watercourse, but the lack of subcanopy and groundcover plants limits the buffer's ability to reduce surface flows into the watercourse or provide water quality protection through filtration and filtering of sediment and pollutants. The existing residence is located within approximately 15 feet of Watercourse B at its closest point.



Figure 5: Watercourse B buffer to be enhanced, facing north (7/27/2016). Watercourse B is located just offsite to the west (left).

2.5 Lake Washington Shoreline

The existing shoreline area is mostly mowed lawn grasses and a few ornamental shrubs. A small sandy beach and gravel/concrete paver walkway are located landward of an existing dock in the northwest corner of the property. The existing residence is located within approximately 15 feet of the ordinary high water mark (OHWM) of the lake at its closest point. The lake is considered a shoreline of the state, and on the subject property is designated as Urban Residential under the SMP.



Figure 6: Lake Washington shoreline to be enhanced, facing east (7/27/2016).

2.6 Wildlife Habitat Conservation Areas

The only non-aquatic wildlife habitat conservation areas designated by the City of Mercer Island are specific to those areas used by bald eagles for nesting, breeding, feeding, and survival. Lake Washington is a common feeding area for bald eagles, but no known bald eagle nests are documented within 1.25 miles of the subject property. No bald eagle nests were visually observed in the vicinity, either.

3 REGULATIONS

3.1 Local Critical Areas Regulations

In the City of Mercer Island, watercourses are regulated under the Mercer Island City Code (MICC), Chapter 19.07 – Environment. Watercourse buffers are designated based on the watercourse classification (MICC 19.07.070). Watercourses in Mercer Island are classified as one of four types based on fish use, permanence of flow, and whether the watercourse is piped. Non-fish-bearing, intermittent streams, such as the open channel segment of Watercourse A, are classified as Type 3 and require a standard buffer width

of 35 feet. All of Watercourse B and the lower section of Watercourse A are piped. Piped watercourses require a standard buffer with of 25 feet.

Watercourse buffers may be reduced through a variety of enhancement measures in accordance with MICC 19.07.070.B.2, provided a smaller buffer will result in no net loss of watercourse and buffer function. Type 3 watercourse buffers may be reduced to a minimum of 25 feet, while for piped watercourses the minimum buffer width is determined on a case-by-case basis by the City.

Under MICC 19.07.030.A.10, existing single-family residences may be expanded or reconstructed in buffers, provided the following are satisfied:

- a. *The applicant must demonstrate why buffer averaging or reduction pursuant to MICC 19.07.070(B) will not provide the necessary relief;*
- b. *Expansion within a buffer is limited to 500 square feet beyond the existing footprint that existed on January 1, 2005;*
- c. *The expansion is not located closer to the critical area than the closest point of the existing residence;*
- d. *The functions of critical areas are preserved to the greatest extent reasonably feasible consistent with best available science;*
- e. *Impacts to critical areas are mitigated to the greatest extent reasonably feasible so that there is no net loss in critical area functions;*
- f. *Drainage capabilities are not adversely impacted; and*
- g. *The city may require a critical area study or restoration plan for this exemption.*

3.2 Local Shoreline Master Program Regulations

Projects located within 200 feet of shorelines of the state (Lake Washington) are also regulated under the Mercer Island Shoreline Master Program (MICC 19.07.110). Single-family residences in the Urban Residential shoreline designation are allowed under a Shoreline Exemption. All structures in the shoreline zone must be set back at least 25 feet from the OHWM. The maximum impervious surface coverage allowed is 10% between 0 and 25 feet from the OHWM and 30% between 25 and 50 feet from the OHWM (MICC 19.07.110.E.1, Table C). Additionally, legal nonconforming uses and structures may continue, and structures 25 feet landward from the OHWM that were legally created may be maintained, repaired, renovated, remodeled and completely replaced to the extent that nonconformance is not increased (MICC 19.07.110.B.1).

4 PROJECT PURPOSE AND APPROACH

The purpose of the project is to remove and reconstruct an existing single-family residence. In order to achieve the purpose of the project and protect the shoreline, watercourses, and buffer areas located on the property, the new residence will be located farther from the Lake Washington OHWM and will incorporate enhancement of the watercourse buffer areas. The proposed reduction will result in no net loss of critical area or buffer functions by replacing areas of degraded buffer with a dense, native shrub and groundcover community. The proposed project will result in a net decrease of impervious area within watercourse buffers.

Much of the new residence will be located within the footprint of the existing residence. However, due to the extent of buffer encumbrances on the property, buffer reduction alone is not sufficient to allow for construction of a new residence, while still relocating it farther from the shoreline. Therefore, the project will incorporate buffer mitigation for unavoidable impacts in accordance with the allowance for residential replacement and expansion within buffers under MICC 19.07.030.A.10. This provision allows a maximum 500 square-foot expansion of single-family residential homes within critical area buffers.

4.1 Mitigation Sequencing

The project has been designed to avoid, minimize and compensate for impacts to the greatest extent possible given the constraints of the site. The following describes how the mitigation sequencing requirements of the MICC have been met.

Avoid

The project area contains two watercourses and their associated buffers, in addition to the shoreline zone. Direct impacts to critical areas will be avoided. Buffer impacts will be avoided to the extent possible through thorough site planning and by reducing and enhancing standard watercourse buffers. Buffer averaging is not a feasible option given the lot size relative to the existing and proposed structures, particularly since buffers encroach on the property from three sides. Impacts to the Watercourse B buffer will be avoided by reducing the standard buffer where necessary such that proposed site improvements occur outside of the buffer. Specifically, a portion of the Watercourse B buffer will be reduced from 25 feet to 14 feet in width, resulting in a total area reduction of 732 square feet. It is not feasible to avoid all buffer impacts for Watercourse A, even with buffer reduction, since the existing and proposed structures are well within the minimum 25-foot buffer allowed for Type 3 watercourses under MICC 19.07.070.B.1.

Minimize

Impacts to the reduced critical areas buffers will result from relocation of the new structure. The new location will be farther from the lakeshore, with a portion of the new residence extending beyond the existing footprint and into the standard 25/35-foot buffers for the piped and open channel sections of Watercourse A, respectively. These impacts are minimized by maintaining the minimum existing distance (10 feet) between the structure and the open channel segment of Watercourse A. Proposed expansion will be located in a low-functioning buffer area that is composed of unvegetated dirt and gravel.

Mitigate

Mitigation of impacts from the increased footprint of the structure will be achieved through buffer enhancement and removal of existing impervious area. Under this proposal, 357 square feet of new impervious area is proposed within the Watercourse A buffer, and 510 square feet of existing impervious area will be removed. This yields a net decrease of 153 square feet of impervious area from the Watercourse A buffer. The remaining 1,535 square feet of severely degraded Watercourse A buffer will be enhanced with native small tree, shrub, and groundcover plantings.

Buffer function will be enhanced in the reduced Watercourse B buffer by removing 190 square feet of existing impervious area and replacing that area, as well as the sparse landscaped area currently dominating the rest of the buffer, with a dense, native small tree, shrub, and groundcover community. Large trees are not feasible at this location due to the required view corridors per neighborhood covenants. A total of 1,411 square feet of buffer enhancement is proposed to compensate for the 732 square feet in buffer reduction, for an impact-to-mitigation ratio of nearly 2:1 for Watercourse B.

Monitor

A five-year monitoring and maintenance plan is proposed to ensure the success of planted mitigation areas over time.

5 IMPACT ASSESSMENT

The proposal is to reconstruct and expand the existing residence, including decks, from a footprint of 4,148 square feet to 5,209 square feet.

Unavoidable impacts to the Type 3 Watercourse A buffer are limited to an unvegetated buffer area composed of compact dirt and gravel. The total expansion of the new

residence into the watercourse buffer, and associated removal of impervious area from elsewhere in the buffer, will result in a net decrease of 153 square feet of impervious area within the Watercourse A buffer. Additionally, a total of 1,535 square feet of degraded Watercourse A buffer will be restored and enhanced to further ensure an improvement in overall buffer function post-construction. The area to be enhanced is similar in character to the impact areas, in that it is devoid of vegetation and composed entirely of compact dirt and gravel. With these changes, a net improvement of on-site buffer function is expected.

Through buffer reduction with enhancement, the proposed site improvements will occur outside of the reduced Watercourse B buffer. Additionally, the proposed driveway will be relocated entirely outside of the standard Watercourse B buffer, resulting in a decrease of 190 square feet of impervious surface from that area.

The proposed residence will be moved farther from the shoreline than the existing residence, so that no portion of the proposed residence will be located within the inner 25-foot shoreline buffer. Due to relocation of the residence, 268 square feet of impervious surface will be removed from the shoreline buffer. Additionally, a total of 1,908 square feet of inner shoreline buffer will be enhanced.

Table 1 summarizes the area of proposed buffer impacts and mitigation. The proposal will result in a net reduction of 611 square feet of impervious surface area in critical area buffers (including both watercourses and the Lake Washington shoreline). A total of 4,854 square feet of buffer will be enhanced through planting.

Table 1: Summary of impact and mitigation areas.

Feature	Impervious Removed	New Impervious	Reduction Area	Enhancement Area
Watercourse A Buffer	510 sf	357 sf	N/A	1,535 sf
Watercourse B Buffer	190 sf	N/A	732 sf	1,411 sf
Shoreline Buffer (25-foot)	268 sf	0 sf	N/A	1,908 sf
Total	968 sf	357 sf	732 sf	4,854 sf

5.1 No net loss

Without mitigation, a slight decrease in hydrologic, water quality, and habitat function could be anticipated to occur under the proposed project due to the partial reduction of the Watercourse B buffer. The net reduction in impervious area alone would likely result in an improvement of these functions in the Watercourse A buffer. The mitigation

and restoration plan (see Chapter 6) is designed to ensure an improvement in ecological function as a result of the proposed project.

The existing watercourse buffers, particularly the Watercourse A buffer, provide very little protective functions. Proposed mitigation will benefit on-site buffer functions by reducing the amount of impervious surface area in the buffer and increasing the ability of the buffer vegetation to store/trap sediments and nutrients. This will also allow the buffers to better attenuate flood flow during heavy rain and will improve cover and forage opportunities for wildlife. The neighboring property owner to the west has noted surface water runoff from the existing residence, through the Watercourse B buffer and onto his property, as a concern relevant to this project. Surface runoff flows relatively unimpeded through the Watercourse B buffer since little to no groundcover is present. The proposed enhancement plan will greatly increase the density of shrubs and groundcover in the buffer, providing a vertical structure to slow runoff during storm events. Tilling compost into the compacted soil structure will further improve the permeability of the buffer and increase its infiltration capacity.

MICC 19.07.070.B.2.b lists ten mitigation options for watercourse buffer reduction. The following briefly summarizes the applicability of each option to the proposed project:

i. Permanent removal of impervious surfaces and replacement with native vegetation;

The project will remove a net total of 153 square feet of impervious surfaces from the Watercourse A buffer. The Watercourse B buffer will be reduced, but 190 square feet of existing driveway will be removed from the standard/reduced buffer. Native vegetation will be installed throughout the Watercourse A and B buffers.

ii. Installation of biofiltration/infiltration mechanisms such as bioswales, created and/or enhanced wetlands, or ponds supplemental to existing storm drainage and water quality requirements;

Bioinfiltration mechanisms are not proposed due to site constraints and limited area. Enhancement of the buffer areas, and removal of pollutant-generating impervious surface (driveway) from the Watercourse B buffer will provide significant improvement to water quality and hydrology functions.

iii. Removal of noxious weeds, replanting with native vegetation and five-year monitoring;

Noxious weeds are not present in significant quantities. Non-native ornamental plants will be removed from buffer areas. The buffers will be planted with native vegetation, and a five-year monitoring program is proposed.

- iv. *Habitat enhancement within the watercourse such as log structure placement, bioengineered bank stabilization, culvert removal, improved salmonid passage and/or creation of side channel or backwater areas;*

Not applicable. Both watercourses are entirely (Watercourse B) or mostly (Watercourse A) piped. The open channel segment of Watercourse A is ephemeral and does not provide fish habitat. Log placement and creation of side channels/backwater areas are typically proposed as enhancement of fish habitat.

- v. *Use of best management practices (e.g., oil/water separators) for storm water quality control exceeding standard requirements;*

Not applicable. No pollutant-generating impervious surfaces are proposed in the standard or reduced buffers.

- vi. *Installation of pervious material for driveway or road construction;*

Not applicable. Proposed driveway areas will not be located in standard or reduced buffers. Total driveway surface area will be reduced from existing conditions upon project completion.

- vii. *Use of "green" roofs in accordance with the standards of the LEED Green Building Rating System;*

A green roof is not proposed due to the high rates of failure and cost/difficulty maintaining these features. Enhancement of the buffer areas will provide a greater, more naturally sustainable improvement to water quality and hydrology functions.

- viii. *Restoration of off-site area if no on-site area is possible;*

Not applicable. Restoration/enhancement will occur on-site.

- ix. *Removal of sources of toxic material that predate the applicant's ownership;*

Not applicable. Toxic materials are not present on-site.

- x. *Opening of previously channelized and culverted watercourses on-site or off-site.*

This option is not feasible. Daylighting Watercourse A would increase buffer encumbrances on the neighboring private property to the east, and Watercourse B is located entirely on the neighboring private property to the west.

Table 2 below summarizes how the proposed mitigation will achieve no net loss of ecological functions on-site.

Table 2. Summary showing no net loss of critical area buffer functions with proposed conditions.

Critical Area Buffer Function	Existing Conditions	Proposed Conditions	Determination
Water Quality	The current water quality function of the watercourse buffers is limited by impervious and otherwise sparsely vegetated buffer areas. The lakeshore buffer is narrow and mostly mowed lawn, which provides very little structure to trap and filter sediments and pollutants.	Vegetative density to be substantially increased in critical area buffers through planting of native shrubs and groundcovers. The width of the lakeshore buffer area will be expanded and planted with native shrubs and groundcover.	Increasing amount of dense, rigid vegetation will improve the ability to slow surface water flowing towards the watercourses and lakeshore and help filter and capture nutrients and sediments that might otherwise enter the waterbodies. In the unlikely event that the piped watercourse segments are ever daylighted, this ability of the buffer to provide these functions will be increased as they would provide shade which helps reduce water temperatures and maintain dissolved oxygen levels.
Hydrology	The current hydrologic function of the critical area buffers is limited by impervious and otherwise sparsely vegetated areas and mowed lawn, which provides very little attenuation of stormwater flows.	Vegetative density to be substantially increased in critical area buffers through planting of native shrubs and groundcovers. Compost will be incorporated into the compact, nutrient-poor soil. The lakeshore buffer will be expanded and planted with native shrubs and groundcover.	The addition of dense shrubs and groundcover plants will help attenuate flood flow during heavy rain events. Incorporation of compost into the compact soils will increase the permeability and infiltration capacity of the buffers, further reducing surface runoff volumes. In the unlikely event that the piped watercourse segments are ever daylighted, this ability of the buffer to provide these functions will be increased.
Habitat	The habitat function of the critical area buffers is limited by low understory vegetative density, low structural diversity, and prevalence on non-native plant species and mowed lawn.	Vegetative density to be substantially increased in critical area buffers through planting of native shrubs and groundcover.	Planting native shrub and groundcover plants will increase vegetative density and structural diversity, improving cover and forage opportunities for wildlife. The diversity of habitat niches will be improved with increasing structural complexity and density.

<p>Overall</p>	<p>Low functioning critical area buffer exist in the project area. Existing vegetated areas are characterized by a very sparsely vegetated understory. Other buffer areas are completely unvegetated and/or are existing impervious areas.</p>	<p>Reduction in impervious area, decompaction and incorporation of compost into soil profile, planting of dense shrubs and groundcover in existing vegetated and unvegetated watercourse buffer areas.</p>	<p>The proposed project is expected to improve ecological functions over existing conditions, which are highly degraded. This includes habitat, hydrology, and water quality functions of the critical area buffers. Overall an improvement in functions is expected.</p>
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6 MITIGATION AND RESTORATION PLAN

6.1 Overview

A comprehensive five-year maintenance and monitoring plan is included as part of the buffer enhancement. The plan specifies appropriate species for planting and planting techniques, describes proper maintenance activities, and sets forth performance standards to be met yearly during monitoring. This will ensure that enhancement/restoration plantings will be maintained, monitored, and successfully established within the first five years following implementation.

Proposed restoration begins with incorporating compost into the enhancement area. This will be followed by installation of native shrub and groundcover species suitable to the site (Appendix A). Nine native small tree/shrub species and five native groundcover species are proposed in the mitigation area. The plan calls for new plantings within the inner 25-foot shoreline buffer area and the watercourse buffers. Native plantings are intended to increase native plant cover, improve native species diversity, increase vegetative structure, and provide food and other habitat resources for wildlife.

Specifications for items in **bold** can be found under Section 6.7, "Material Specifications and Definitions."

6.2 Goals

1. Enhance shoreline and watercourse buffers.
 - a. Reduce the amount of impervious surface area within watercourse buffers.
 - b. Establish dense and diverse native small tree, shrub, and groundcover vegetation throughout the mitigation areas.

6.3 Performance Standards

The standards listed below will be used to judge the success of the plan over time. If the standards are met at the end of the five-year monitoring period, the City shall issue release of the performance bond.

1. Survival:
 - a. 100% survival of all installed trees and shrubs at the end of Year One. This standard may be met through establishment of installed plants or by replanting as necessary to achieve the required numbers.
 - b. 80% survival of all installed trees and shrubs at the end of Year Two. This standard may be met through establishment of installed plants or by replanting as necessary to achieve the required numbers.
 - i. Survival beyond Year Two is difficult to track. Therefore, a diversity standard is proposed in place of survival (see #3, below).
2. Native vegetation cover in planted areas:
 - a. Achieve at least 60% cover of native plants by the end of Year 3. Volunteer species may count toward this standard. Total native plant cover must include a minimum of 40% tree and shrub cover.
 - b. Achieve at least 80% cover of native plants by the end of Year 5. Volunteer species may count toward this standard. Total native plant cover must include a minimum of 60% tree and shrub cover.
3. Species diversity in planted areas:
 - a. Establish at least six native small tree/shrub species and four native groundcover species throughout the enhancement areas by Year 5. Volunteer species may count toward this standard. "Establishment" is considered at least five healthy, individual plants of a given species present within the mitigation areas.
4. Invasive species standard: No more than 10% cover of invasive species in the planting area in any monitoring year. Invasive species are defined as any Class A, B, or C noxious weeds as listed by the King County Noxious Weed Control Board.

6.4 Monitoring Methods

This monitoring program is designed to track the success of the mitigation site over time by measuring the degree to which the performance standards listed above are being met. An as-built plan will be prepared within 30 days of substantially complete construction of the mitigation areas. The as-built plan will document conformance with these plans and will disclose any substitutions or other non-critical departures. The as-

built plan will establish baseline plant installation quantities, photopoints, and three 50-foot monitoring transects that will be used throughout the monitoring period to measure the performance standards.

Monitoring will occur twice annually for five years. The first monitoring visit will take place in the spring. This visit will record necessary weeding, invasive control, and other maintenance needs. The **restoration specialist** will then notify the owner and/or maintenance crews of necessary early season maintenance. The late-season visit will occur in late summer or fall and will record the following and be submitted in an annual report to the City:

1. General summary of the spring visit.
2. First- and second-year counts of surviving and dead/dying plants by species in the planting areas.
3. Estimates of native species cover using cover class method.
4. Estimates of invasive species cover using cover class method.
5. Counts of established native species to determine species richness.
6. Photographic documentation at permanent photopoints.
7. Intrusions into the planting areas, erosion, vandalism, trash, and other actions detrimental to the overall health of the mitigation areas.
8. Recommendations for maintenance in the mitigation areas.
9. Recommendations for replacement of all dead or dying plant material with same or like species and number as on the approved plan.

6.5 Construction Notes and Specifications

General Notes

The **restoration specialist** will oversee the following:

1. Clearing, soil decompaction, and compost incorporation;
2. Invasive weed clearing; and
3. Plant material inspection.
 - a) Plant delivery inspection.
 - b) 50% plant installation/layout inspection.
 - c) 100% plant installation inspection.

Work Sequence

1. Clear the planting area of all invasive woody vegetation including but not limited to Himalayan blackberry, English ivy, and English laurel.
2. Roto-till 2 inches of **compost** into the upper 9 inches of the soil.
3. All plant installation will take place during the dormant season (October 15th to March 1st).
4. Layout vegetation to be installed per the planting plan and plant schedule.
5. Prepare a planting pit for each plant and install per the planting details.
6. Mulch each tree and shrub with a circular **wood chip mulch** ring, 4 inches thick and extending 9 inches from the base of the plant (18-inch diameter).
7. Install a temporary or permanent irrigation system as needed to ensure that all plants receive at least one inch of water per week from June 1st – September 30th. Maintain irrigation system in working condition for at least two summers after initial plant installation.

6.6 Maintenance

This site will be maintained for five years following completion of the plant installation.

1. Replace each plant found dead in the summer monitoring visit during the upcoming fall dormant season (October 15th to March 1st).
2. Follow the recommendations noted in the spring monitoring site visit.
3. Invasive species maintenance plan:
 - a) Himalayan blackberry, English ivy, English laurel, and other invasive woody vegetation will be grubbed out by hand on an ongoing basis, with care taken to grub out roots except where such work will jeopardize the roots of installed or volunteer native plants.
 - b) If it is likely that hand removal will not be completely effective or will damage desirable species, then application of an herbicide approved for use in aquatic areas may be used. Herbicide applications must be conducted only by a state-licensed applicator. Applications should be done between mid-spring and mid-summer to maximize uptake by plants. Application should be a targeted method such as spot spray (preferred for Himalayan blackberry), or wick.
4. At least twice yearly, remove by hand all competing weeds and weed roots from beneath each installed plant and any desirable volunteer vegetation to a distance of 12 inches from the main plant stem. Weeding should occur as needed during the

spring and summer. Frequent weeding will result in lower mortality and lower plant replacement costs.

5. Do not weed the area near the plant bases with string trimmer (weed whacker). Native plants are easily damaged or killed, and weeds easily recover after trimming.
6. Apply slow release granular **fertilizer** to each installed plant annually in the spring (by June 1) of Years 2 through 5.
7. Mulch the weeded areas beneath each plant with **wood chip mulch** as necessary to maintain a minimum 4-inch-thick, 18-inch-diameter mulch ring.
8. The temporary irrigation system will be operated to ensure that plants receive a minimum of one inch of water per week from June 1st through September 30th for the first two years following installation. Irrigation beyond the second year may be needed based on site performance or significant replanting.

6.7 Material Specifications and Definitions

1. **Compost:** Cedar Grove Compost or equivalent product. 100% vegetable compost with no appreciable quantities of sand, gravel, sawdust, or other non-organic materials. Quantity required: 30 cubic yards.
2. **Fertilizer:** Slow release, granular phosphorous-free fertilizer. Follow manufacturer's instructions for application. Keep fertilizer in a weather-tight container while on site. Note that fertilizer is to be applied only in Years 2 through 5 and **not in the first year**.
3. **Restoration specialist:** The Watershed Company [(425) 822-5242] personnel or other person qualified to evaluate environmental restoration projects.
4. **Wood chip mulch:** Chipped woody material approximately 1 inch minimum to 3 inches in maximum dimension (not sawdust or coarse hog fuel). Mulch shall not contain appreciable quantities of garbage, plastic, metal, soil, and dimensional lumber or construction/ demolition debris. Pacific Topsoil [(800) 844-7645] sells suitable woodchip mulch called "Wood Chip Mulch" at many of their locations. Note: Arborist woodchips generally contain weed seeds and are not a reliable alternative. Quantity required: 3.2 cubic yards.

7 SUMMARY

The applicant proposes the removal and reconstruction of a single-family residence, located partially within areas currently encumbered by two watercourse buffers. In

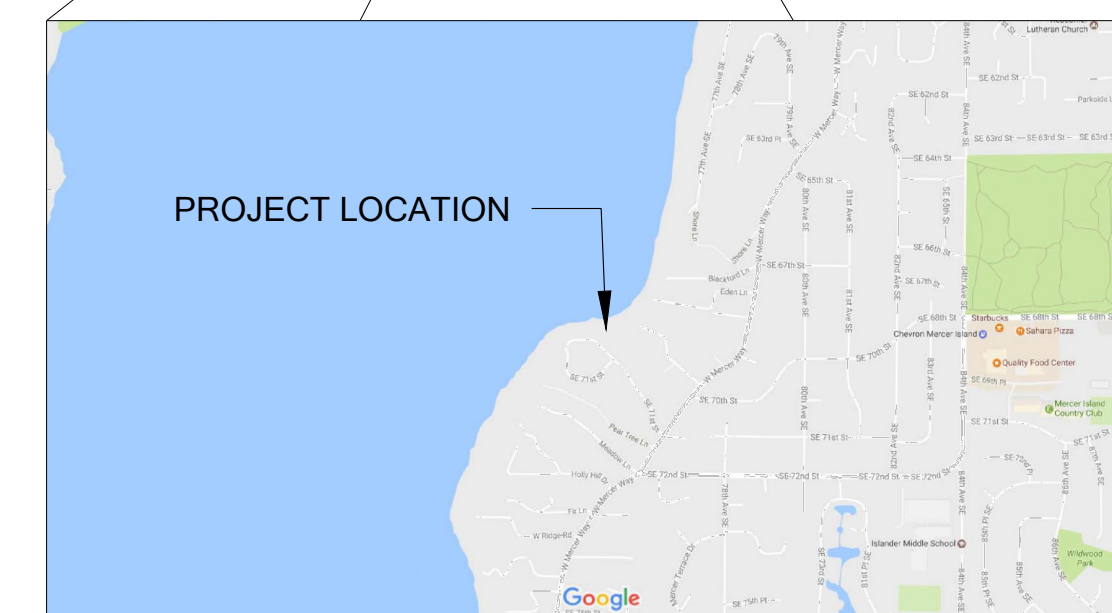
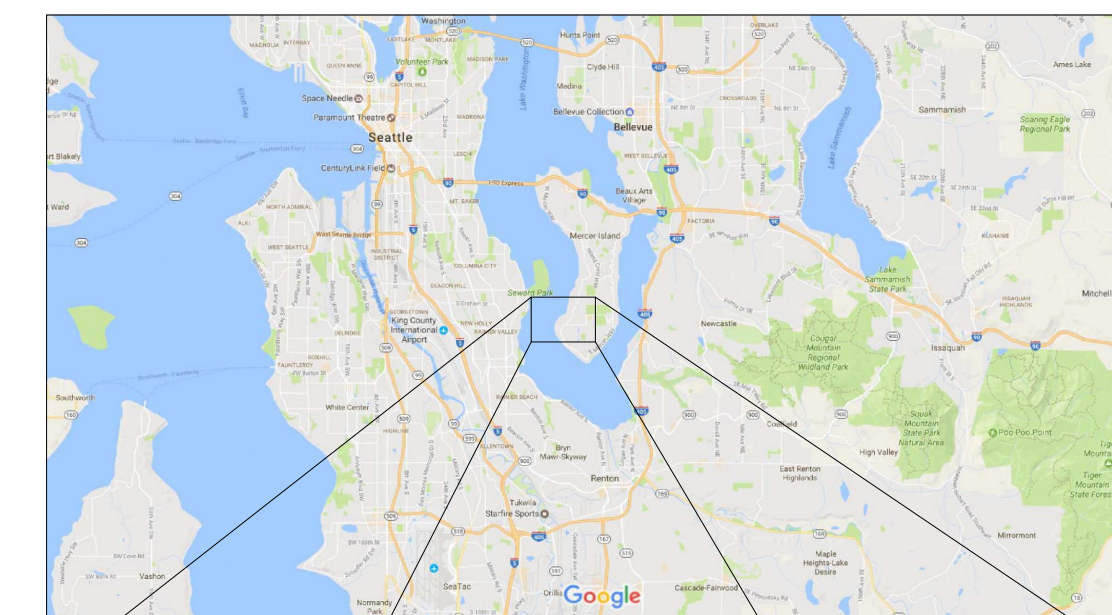
order to avoid development within buffer areas to the degree possible, a reduction of the Watercourse B buffer is proposed through the buffer reduction allowances outlined in MICC 19.07.070. Reduction of the buffer will be mitigated through the installation of native plantings and decompaction of the existing soil surface. Construction of those areas of the house within the Watercourse A buffer will be completed under the allowed alteration for expansion of a single-family residence within a buffer (MICC 19.07.030.A.10). Total impervious area within the Watercourse A buffer will be reduced by 153 square feet, and an enhancement plan has been developed that details the plantings proposed to mitigate for the allowed buffer impacts and buffer reduction. A total of 2,946 square feet of native plantings is proposed within the watercourse buffers. An additional 1,908 square feet of shoreline buffer (including overlapping watercourse buffer not included in the 2,946 square feet) will be enhanced with native plantings to further improve shoreline buffer function, while satisfying the maximum impervious surface coverage requirements of the MICC 19.07.110.E.1.

The mitigation plantings and soil decompaction within the watercourse buffers will increase water quality, hydrology, and habitat functions. The proposed planting plan incorporates a diversity of native plant species, including small trees, shrubs, and groundcover plants. The proposed plan will provide better protection of the on-site critical area functions and values than exists under current conditions.

Finally, a comprehensive five-year maintenance and monitoring plan has been prepared. This plan will ensure that proposed enhancement plantings will be maintained, monitored, and successfully established within the first five years following implementation. Overall, a net gain in on-site critical area functions and values is the expected result of the project.

APPENDIX A

Mitigation and Restoration Plan



VICINITY MAPS

SHEET INDEX

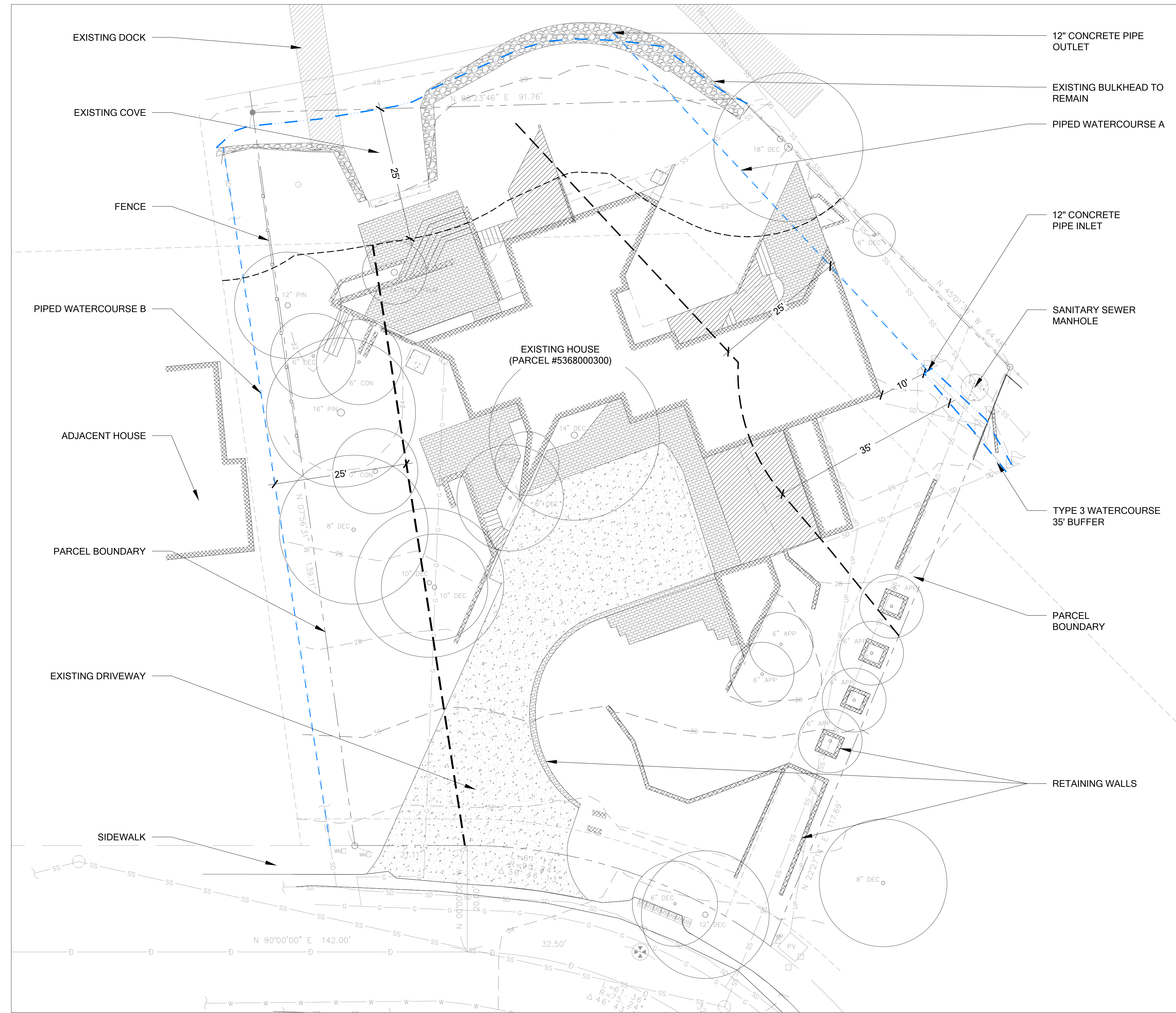
- 1 EXISTING CONDITIONS
- 2 TESC PLAN
- 3 IMPACTS AND MITIGATION PLAN
- 4 MITIGATION PLAN NOTES
- 5 GRADING PLAN
- 6 LARGE WOODY DEBRIS DETAILS
- 7 PLANTING PLAN
- 8 PLANT INSTALLATION DETAILS AND NOTES

NOTES

- 1. CRITICAL AREAS DELINEATED BY THE WATERSHED COMPANY ON JULY 27, 2016. THIS DID NOT INCLUDE THE DELINEATION OF THE LAKE WASHINGTON ORDINARY HIGH WATER MARK.
- 2. SURVEY RECEIVED ON SEPTEMBER 13, 2016 FROM TERRANE, 10801 MAIN STREET, SUITE 102, BELLEVUE, WA 98004. (425)-458-4488
- 3. VERTICAL DATUM: NAD83

LEGEND

- OHWM (FROM OTHERS)
- PIPED WATERCOARSE
- SHORELINE SETBACK
- STREAM BUFFER



EXISTING CONDITIONS

SCALE: 1" = 10'-0"



**HAGSTROM RESIDENCE
MITIGATION PLAN
PREPARED FOR
COLLIN HAGSTROM
7428 SE 71ST STREET
MERCER ISLAND, WA 98040**

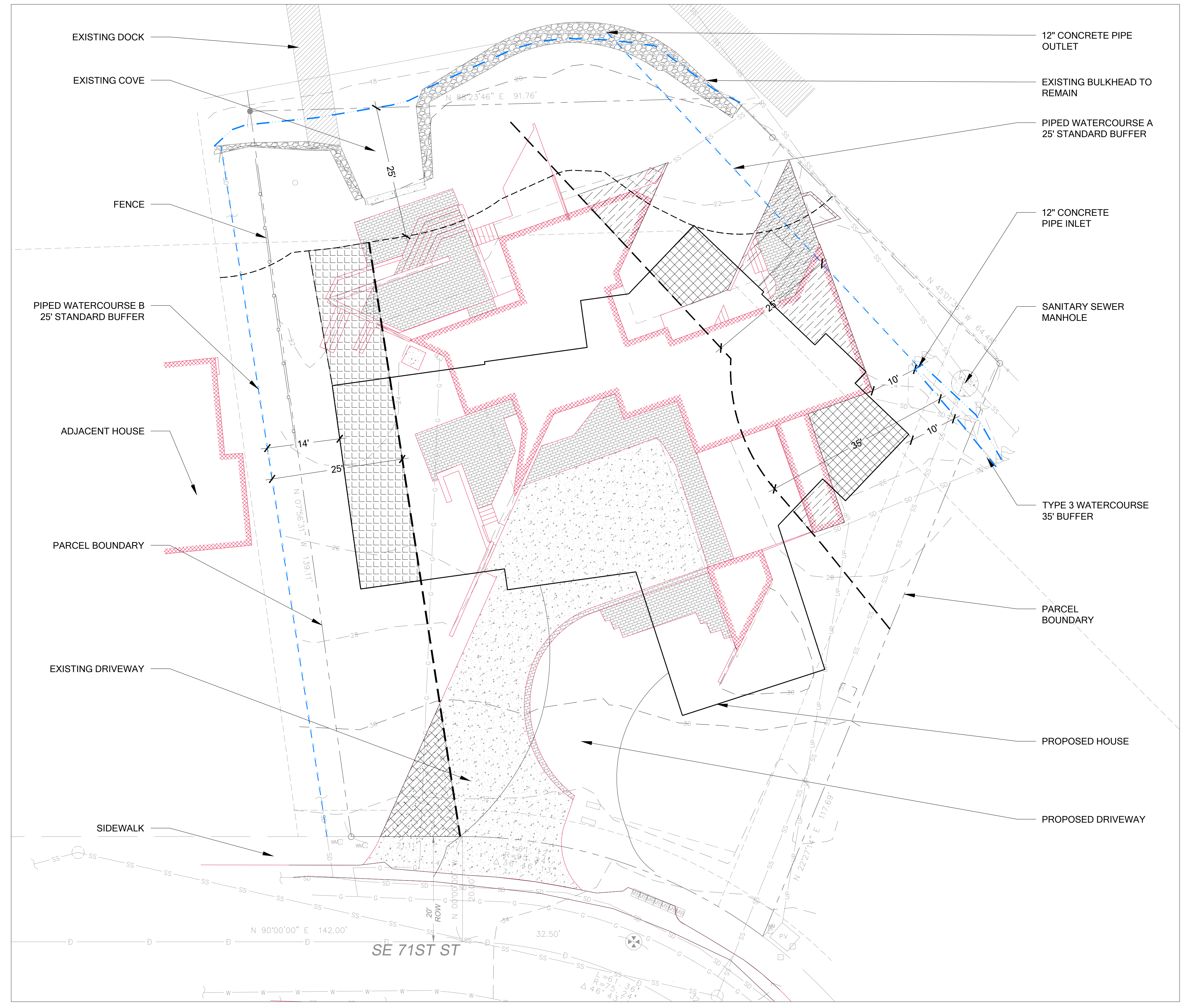
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SHEET SIZE:
ORIGINAL PLAN IS 22" x 34".
SCALE ACCORDINGLY.

PROJECT MANAGER: RK
DESIGNED: KMB
DRAFTED: KMB
CHECKED: MF

JOB NUMBER: 160735
SHEET NUMBER: W1 OF 7

**HAGSTROM RESIDENCE
MITIGATION PLAN
PREPARED FOR
COLLIN HAGSTROM
7428 SE 71ST STREET
MERCER ISLAND, WA 98040**



- NOTES**
1. A TOTAL OF 144 SQUARE FEET OF IMPERVIOUS SURFACE WILL BE REMOVED FROM WATERCOURSE A BUFFER.
 2. A TOTAL OF 190 SQUARE FEET OF IMPERVIOUS SURFACE WILL BE REMOVED FROM WATERCOURSE B BUFFER.
 3. EXISTING HOUSE FOOTPRINT IS SHOWN IN RED.

- LEGEND**
- OHWM (FROM OTHERS)
 - SHORELINE SETBACK
 - STREAM BUFFER
- WATERCOURSE A BUFFER IMPACTS**
- IMPERVIOUS TO BE REMOVED FROM BUFFER (501 SF)
 - IMPERVIOUS PROPOSED WITHIN BUFFER (357 SF)
- WATERCOURSE B BUFFER IMPACTS**
- BUFFER TO BE REDUCED (732 SF)
 - REDUCED BUFFER
 - IMPERVIOUS TO BE REMOVED FROM BUFFER (190 SF)

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JOB NUMBER:
160735

SHEET NUMBER:
W2 OF 7

IMPACTS ASSESSMENT
SCALE: 1" = 10'-0"



**HAGSTROM RESIDENCE
MITIGATION PLAN
PREPARED FOR
COLLIN HAGSTROM
7428 SE 71ST STREET
MERCER ISLAND, WA 98040**



NOTES
1. PROPOSED RAIN GARDEN IS NOT PART OF THE PROPOSED MITIGATION. IT SHALL TREAT STORMWATER RUN-OFF FROM PROPOSED DRIVEWAY.

LEGEND
 - - - - OHWM (FROM OTHERS)
 - - - - SHORELINE SETBACK
 - - - - STREAM BUFFER
 [Blue Hatched] SHORELINE SETBACK MITIGATION
 [Blue Hatched] BUFFER ENHANCEMENT (1,819 SF)
 [Blue Hatched] WATERCOURSE A BUFFER MITIGATION
 [Green +] BUFFER ENHANCEMENT (1,535 SF)
 [Green +] WATERCOURSE B BUFFER MITIGATION
 [Green Grid] BUFFER ENHANCEMENT (1,411 SF)
 - - - - REDUCED BUFFER

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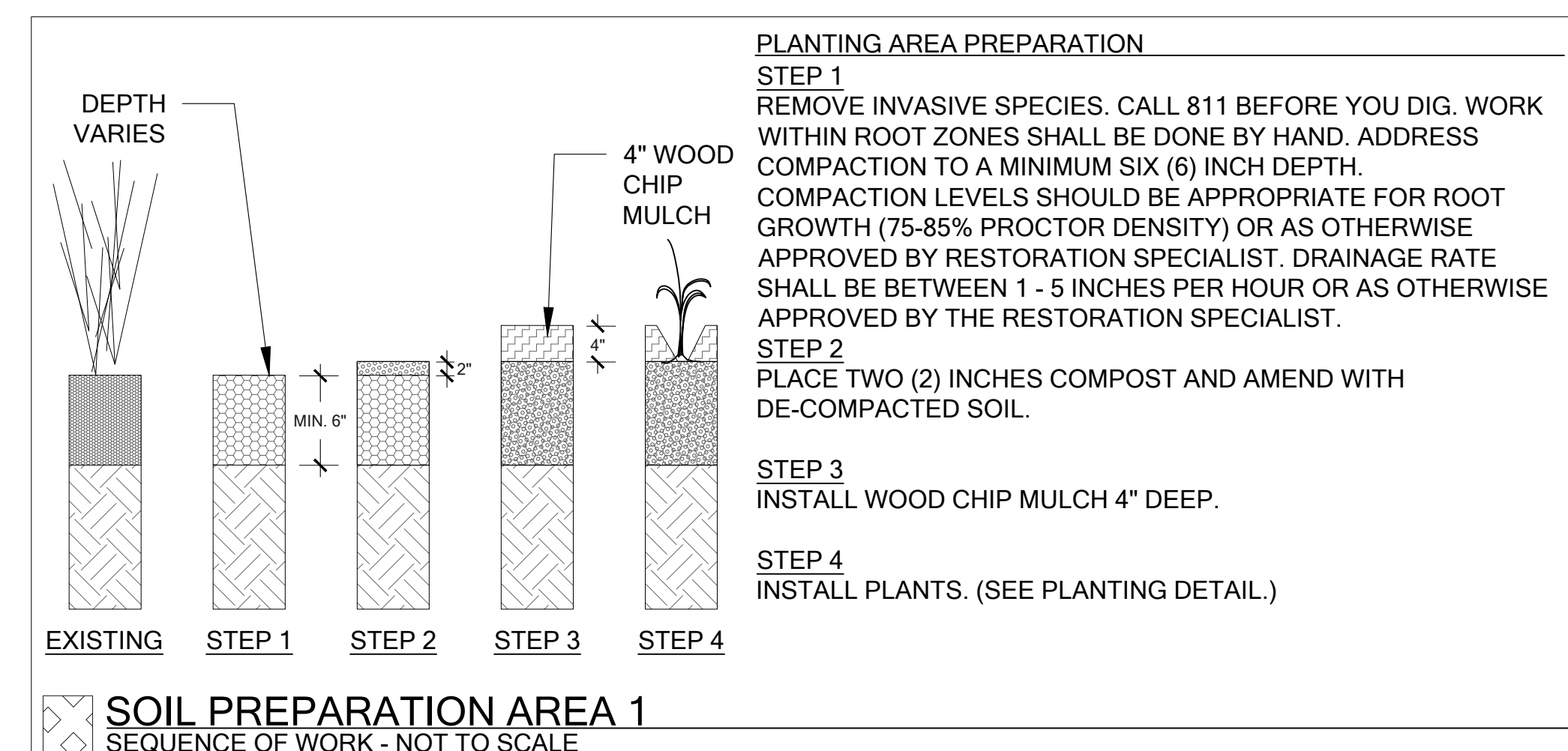
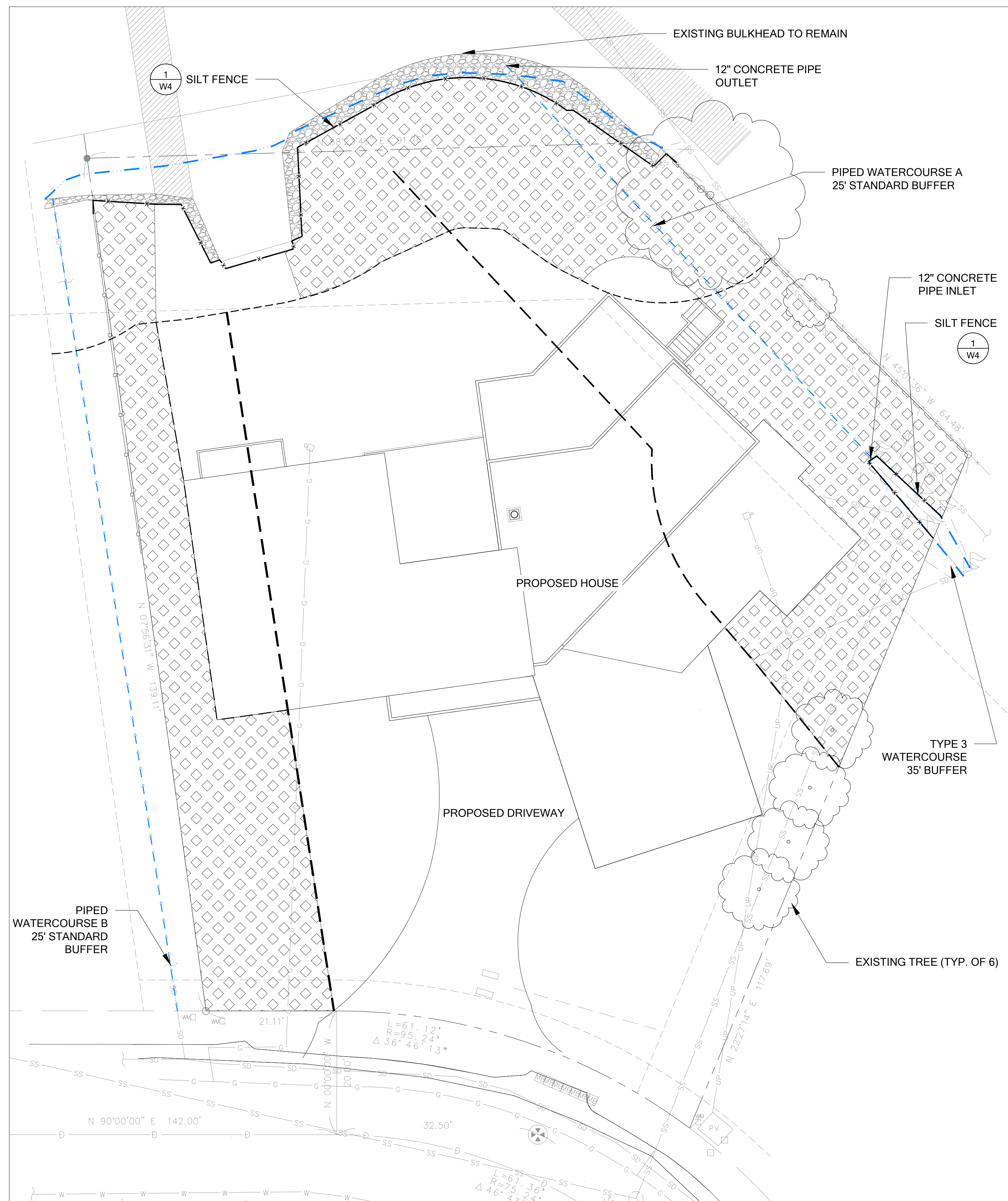
PROJECT MANAGER: RK
DESIGNED: KMB
DRAFTED: KMB
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JOB NUMBER: 160735
SHEET NUMBER: W3 OF 7

MITIGATION PLAN
SCALE: 1" = 10'-0"

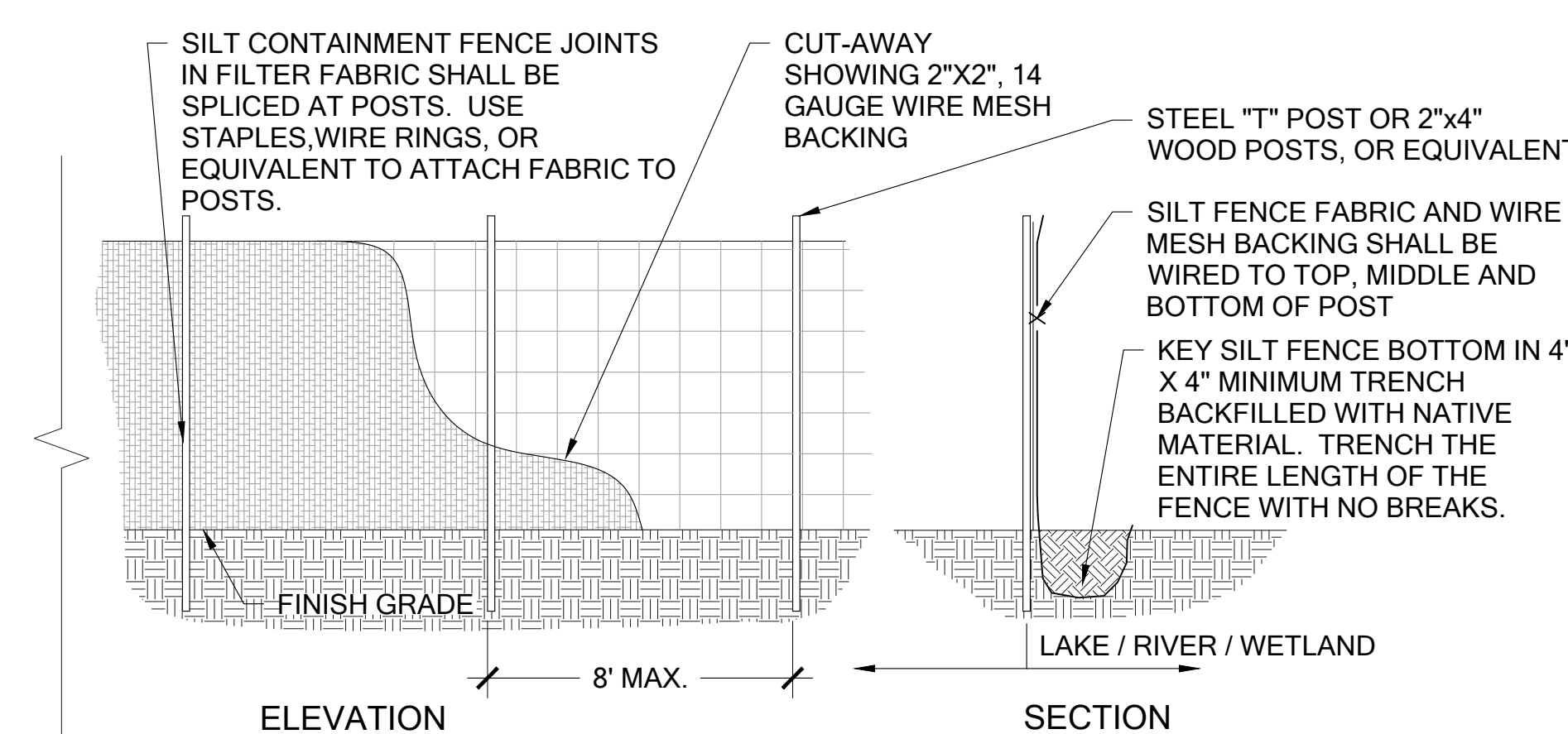


**HAGSTROM RESIDENCE
MITIGATION PLAN
PREPARED FOR
COLLIN HAGSTROM
7428 SE 71ST STREET
MERCER ISLAND, WA 98040**



SILT FENCE MAINTENANCE STANDARDS:

1. ANY DAMAGE SHALL BE REPAIRED IMMEDIATELY.
2. SEDIMENT SHALL BE REMOVED WHEN ACCUMULATION EXCEEDS 6" IN DEPTH.



1 SILT FENCE

Scale: NTS

- LEGEND**
- OHWM (FROM OTHERS)
 - SHORELINE SETBACK
 - STREAM BUFFER
 - REDUCED WATERCOURSE B BUFFER
 - ▨ SOIL PREPARATION AREA 1
 - x- SILT FENCE (DETAIL 1 SHEET W4)

- NOTES**
1. SILT FENCE SHALL BE INSTALLED PRIOR TO ANY CONSTRUCTION ACTIVITIES.

SUBMITTALS & REVISIONS

NO.	DATE	DESCRIPTION	BY
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JOB NUMBER: 160735

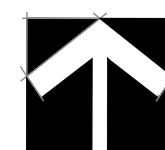
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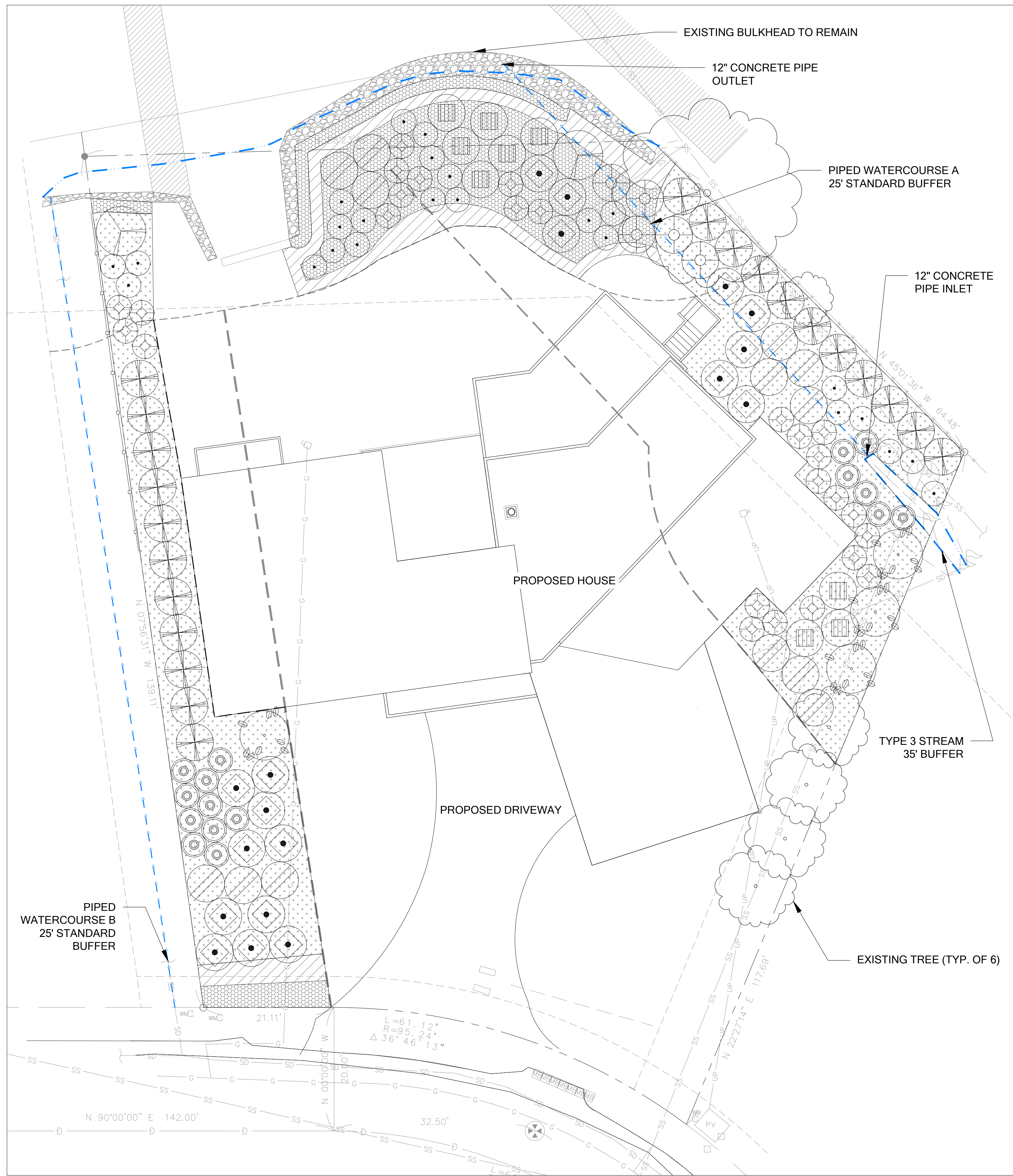
Know what's below.
Call before you dig.

SITE PREPARATION PLAN

SCALE: 1" = 10'-0"



**HAGSTROM RESIDENCE
MITIGATION PLAN
PREPARED FOR
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PLANTING SCHEDULE

SHRUBS	QTY	SPACING	SIZE
ACER CIRCINATUM / VINE MAPLE	4	ALL SHRUBS TO BE SPACED PER PLAN	5 GAL.
AMELANCHIER ALNIFOLIA / SERVICEBERRY	2		5 GAL.
CORNUS SERICEA / RED-OSIER DOGWOOD	5		1 GAL.
RIBES SANGUINEUM / RED-FLOWERING CURRANT	18		1 GAL.
ROSA PISOCARPA / CLUSTERED ROSE	13		1 GAL.
MYRICA CALIFORNICA / PACIFIC WAX MYRTLE	22		5 GAL.
VIBURNUM EDULE / Highbush-Cranberry	9		2 GAL.
VACCINIUM OVATUM / EVERGREEN HUCKLEBERRY	16		1 GAL.
SYMPHORICARPOS ALBUS / SNOWBERRY	24		1 GAL.
GAULTHERIA SHALLON / SALAL	27		1 GAL.
GROUNDCOVER AND PERENNIALS* *ALL SPECIES TO BE SPACED TRIANGULARLY			
DELPHINIUM MENZIESII / WESTERN LARKSPUR	30	24" O.C.	1 GAL.
FESTUCA IDAHOENSIS / ROEMER'S FESTCUE	90	24" O.C.	1 GAL.
ARCTOSTAPHYLOS UVA-URSI / KINNIKINNICK	180	24" O.C.	1 GAL.
POLYSTICHUM MUNITUM / SWORD FERN	150	24" O.C.	1 GAL.
MAHONIA NERVOSA / DULL MAHONIA (DWARF OREGON GRAPE)	150	24" O.C.	1 GAL.

LEGEND

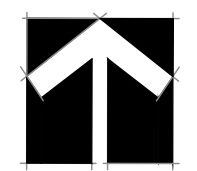
- OHWM (FROM OTHERS)
- SHORELINE SETBACK
- STREAM BUFFER
- REDUCED WATERCOURSE B BUFFER

NOTES

1. APPLICABLE EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO ANY CONSTRUCTION ACTIVITIES.
2. REFER TO DETAIL 2, SHEET W6 FOR PLANT SPACING LAYOUT. DETAIL.
3. REFER TO DETAIL 2, SHEET W6 FOR CONTAINER PLANTING DETAIL.

PLANTING PLAN

SCALE: 1" = 10'-0"



Know what's below.
Call before you dig.

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CHECKED: MF

JOB NUMBER: 160735
SHEET NUMBER: W4 OF 7

PLANT INSTALLATION SPECIFICATIONS

GENERAL NOTES

QUALITY ASSURANCE

- PLANTS SHALL MEET OR EXCEED THE SPECIFICATIONS OF FEDERAL, STATE, AND LOCAL LAWS REQUIRING INSPECTION FOR PLANT DISEASE AND INSECT CONTROL.
- PLANTS SHALL BE HEALTHY, VIGOROUS, AND WELL-FORMED, WITH WELL DEVELOPED, FIBROUS ROOT SYSTEMS, FREE FROM DAMAGE CAUSED BY TEMPERATURE EXTREMES, LACK OR EXCESS OF MOISTURE, INSECTS, DISEASE, AND MECHANICAL INJURY. PLANTS IN LEAF SHALL BE WELL FOLIATED AND OF GOOD COLOR. PLANTS SHALL BE HABITUATED TO THE OUTDOOR ENVIRONMENTAL CONDITIONS INTO WHICH THEY WILL BE PLANTED (HARDENED-OFF).
- TREES WITH DAMAGED, CROOKED, MULTIPLE OR BROKEN LEADERS WILL BE REJECTED. WOODY PLANTS WITH ABRASIONS OF THE BARK OR SUN SCALD WILL BE REJECTED.
- NOMENCLATURE: PLANT NAMES SHALL CONFORM TO FLORA OF THE PACIFIC NORTHWEST BY HITCHCOCK AND CRONQUIST, UNIVERSITY OF WASHINGTON PRESS, 1973 AND/OR TO A FIELD GUIDE TO THE COMMON WETLAND PLANTS OF WESTERN WASHINGTON & NORTHWESTERN OREGON, ED. SARAH SPEAR COOKE, SEATTLE AUDUBON SOCIETY, 1997.

DEFINITIONS

- PLANTS/PLANT MATERIALS. PLANTS AND PLANT MATERIALS SHALL INCLUDE ANY LIVE PLANT MATERIAL USED ON THE PROJECT. THIS INCLUDES BUT IS NOT LIMITED TO CONTAINER GROWN, B&B OR BAREROOT PLANTS; LIVE STAKES AND FASCINES (WATTLES); TUBERS, CORMS, BULBS, ETC.; SPRIGS, PLUGS, AND LINERS.
- CONTAINER GROWN. CONTAINER GROWN PLANTS ARE THOSE WHOSE ROOTBALLS ARE ENCLOSED IN A POT OR BAG IN WHICH THAT PLANT GREW.

SUBSTITUTIONS

- IT IS THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN SPECIFIED MATERIALS IN ADVANCE IF SPECIAL GROWING, MARKETING OR OTHER ARRANGEMENTS MUST BE MADE IN ORDER TO SUPPLY SPECIFIED MATERIALS.
- SUBSTITUTION OF PLANT MATERIALS NOT ON THE PROJECT LIST WILL NOT BE PERMITTED UNLESS AUTHORIZED IN WRITING BY THE RESTORATION CONSULTANT.
- IF PROOF IS SUBMITTED THAT ANY PLANT MATERIAL SPECIFIED IS NOT OBTAINABLE, A PROPOSAL WILL BE CONSIDERED FOR USE OF THE NEAREST EQUIVALENT SIZE OR ALTERNATIVE SPECIES, WITH CORRESPONDING ADJUSTMENT OF CONTRACT PRICE.
- SUCH PROOF WILL BE SUBSTANTIATED AND SUBMITTED IN WRITING TO THE CONSULTANT AT LEAST 30 DAYS PRIOR TO START OF WORK UNDER THIS SECTION.

INSPECTION

- PLANTS SHALL BE SUBJECT TO INSPECTION AND APPROVAL BY THE RESTORATION CONSULTANT FOR CONFORMANCE TO SPECIFICATIONS, EITHER AT TIME OF DELIVERY ON-SITE OR AT THE GROWER'S NURSERY. APPROVAL OF PLANT MATERIALS AT ANY TIME SHALL NOT IMPAIR THE SUBSEQUENT RIGHT OF INSPECTION AND REJECTION DURING PROGRESS OF THE WORK.
- PLANTS INSPECTED ON SITE AND REJECTED FOR NOT MEETING SPECIFICATIONS MUST BE REMOVED IMMEDIATELY FROM SITE OR RED-TAGGED AND REMOVED AS SOON AS POSSIBLE.
- THE RESTORATION CONSULTANT MAY ELECT TO INSPECT PLANT MATERIALS AT THE PLACE OF GROWTH. AFTER INSPECTION AND ACCEPTANCE, THE RESTORATION CONSULTANT MAY REQUIRE THE INSPECTED PLANTS BE LABELED AND RESERVED FOR PROJECT. SUBSTITUTION OF THESE PLANTS WITH OTHER INDIVIDUALS, EVEN OF THE SAME SPECIES AND SIZE, IS UNACCEPTABLE.

MEASUREMENT OF PLANTS

- PLANTS SHALL CONFORM TO SIZES SPECIFIED UNLESS SUBSTITUTIONS ARE MADE AS OUTLINED IN THIS CONTRACT.
- HEIGHT AND SPREAD DIMENSIONS SPECIFIED REFER TO MAIN BODY OF PLANT AND NOT BRANCH OR ROOT TIP TO TIP. PLANT DIMENSIONS SHALL BE MEASURED WHEN THEIR BRANCHES OR ROOTS ARE IN THEIR NORMAL POSITION.
- WHERE A RANGE OF SIZE IS GIVEN, NO PLANT SHALL BE LESS THAN THE MINIMUM SIZE AND AT LEAST 50% OF THE PLANTS SHALL BE AS LARGE AS THE MEDIAN OF THE SIZE RANGE. (EXAMPLE: IF THE SIZE RANGE IS 12" TO 18", AT LEAST 50% OF PLANTS MUST BE 15" TALL.)

SUBMITTALS

PROPOSED PLANT SOURCES

- WITHIN 45 DAYS AFTER AWARD OF THE CONTRACT, SUBMIT A COMPLETE LIST OF PLANT MATERIALS PROPOSED TO BE PROVIDED DEMONSTRATING CONFORMANCE WITH THE REQUIREMENTS SPECIFIED. INCLUDE THE NAMES AND ADDRESSES OF ALL GROWERS AND NURSERIES.

PRODUCT CERTIFICATES

- PLANT MATERIALS LIST - SUBMIT DOCUMENTATION TO CONSULTANT AT LEAST 30 DAYS PRIOR TO START OF WORK UNDER THIS SECTION THAT PLANT MATERIALS HAVE BEEN ORDERED. ARRANGE PROCEDURE FOR INSPECTION OF PLANT MATERIAL WITH CONSULTANT AT TIME OF SUBMISSION.
- HAVE COPIES OF VENDOR'S OR GROWERS' INVOICES OR PACKING SLIPS FOR ALL PLANTS ON SITE DURING INSTALLATION. INVOICE OR PACKING SLIP SHOULD LIST SPECIES BY SCIENTIFIC NAME, QUANTITY, AND DATE DELIVERED (AND GENETIC ORIGIN IF THAT INFORMATION WAS PREVIOUSLY REQUESTED).

DELIVERY, HANDLING, & STORAGE

NOTIFICATION

CONTRACTOR MUST NOTIFY CONSULTANT 48 HOURS OR MORE IN ADVANCE OF DELIVERIES SO THAT CONSULTANT MAY ARRANGE FOR INSPECTION.

PLANT MATERIALS

- TRANSPORTATION - DURING SHIPPING, PLANTS SHALL BE PACKED TO PROVIDE PROTECTION AGAINST CLIMATE EXTREMES, BREAKAGE AND DRYING. PROPER VENTILATION AND PREVENTION OF DAMAGE TO BARK, BRANCHES, AND ROOT SYSTEMS MUST BE ENSURED.
- SCHEDULING AND STORAGE - PLANTS SHALL BE DELIVERED AS CLOSE TO PLANTING AS POSSIBLE. PLANTS IN STORAGE MUST BE PROTECTED AGAINST ANY CONDITION THAT IS DETRIMENTAL TO THEIR CONTINUED HEALTH AND VIGOR.
- HANDLING - PLANT MATERIALS SHALL NOT BE HANDLED BY THE TRUNK, LIMBS, OR FOLIAGE BUT ONLY BY THE CONTAINER, BALL, BOX, OR OTHER PROTECTIVE STRUCTURE, EXCEPT BAREROOT PLANTS SHALL BE KEPT IN BUNDLES UNTIL PLANTING AND THEN HANDLED CAREFULLY BY THE TRUNK OR STEM.
- LABELS - PLANTS SHALL HAVE DURABLE, LEGIBLE LABELS STATING CORRECT SCIENTIFIC NAME AND SIZE. TEN PERCENT OF CONTAINER GROWN PLANTS IN INDIVIDUAL POTS SHALL BE LABELED. PLANTS SUPPLIED IN FLATS, RACKS, BOXES, BAGS, OR BUNDLES SHALL HAVE ONE LABEL PER GROUP.

WARRANTY

PLANT WARRANTY

PLANTS MUST BE GUARANTEED TO BE TRUE TO SCIENTIFIC NAME AND SPECIFIED SIZE, AND TO BE HEALTHY AND CAPABLE OF VIGOROUS GROWTH.

REPLACEMENT

- PLANTS NOT FOUND MEETING ALL OF THE REQUIRED CONDITIONS AT THE CONSULTANT'S DISCRETION MUST BE REMOVED FROM SITE AND REPLACED IMMEDIATELY AT THE CONTRACTOR'S EXPENSE.
- PLANTS NOT SURVIVING AFTER ONE YEAR TO BE REPLACED AT THE CONTRACTOR'S EXPENSE.

PLANT MATERIAL

GENERAL

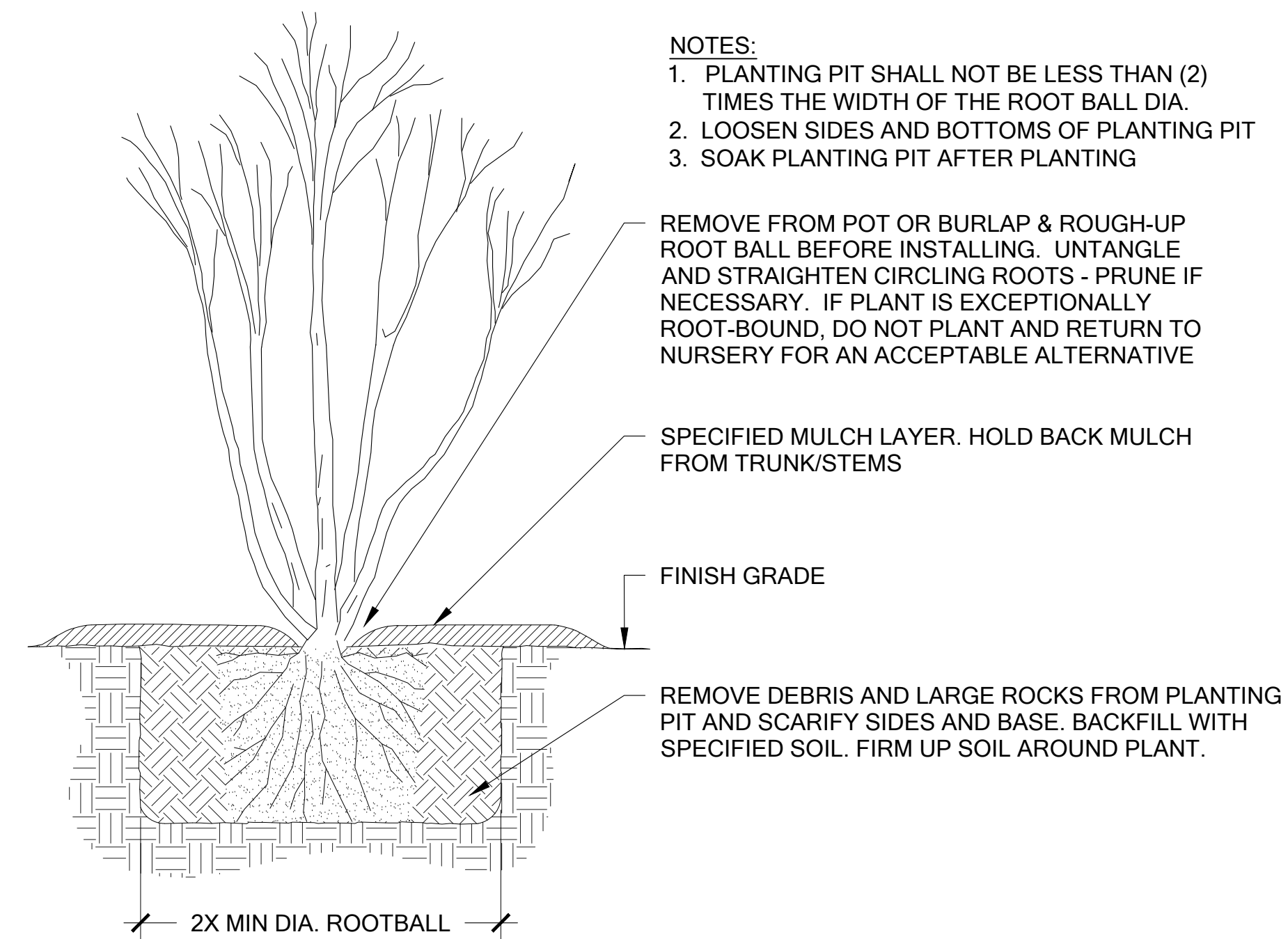
- PLANTS SHALL BE NURSERY GROWN IN ACCORDANCE WITH GOOD HORTICULTURAL PRACTICES UNDER CLIMATIC CONDITIONS SIMILAR TO OR MORE SEVERE THAN THOSE OF THE PROJECT SITE.
- PLANTS SHALL BE TRUE TO SPECIES AND VARIETY OR SUBSPECIES. NO CULTIVARS OR NAMED VARIETIES SHALL BE USED UNLESS SPECIFIED AS SUCH.

QUANTITIES

SEE PLANT LIST ON ACCOMPANYING PLANS AND PLANT SCHEDULES.

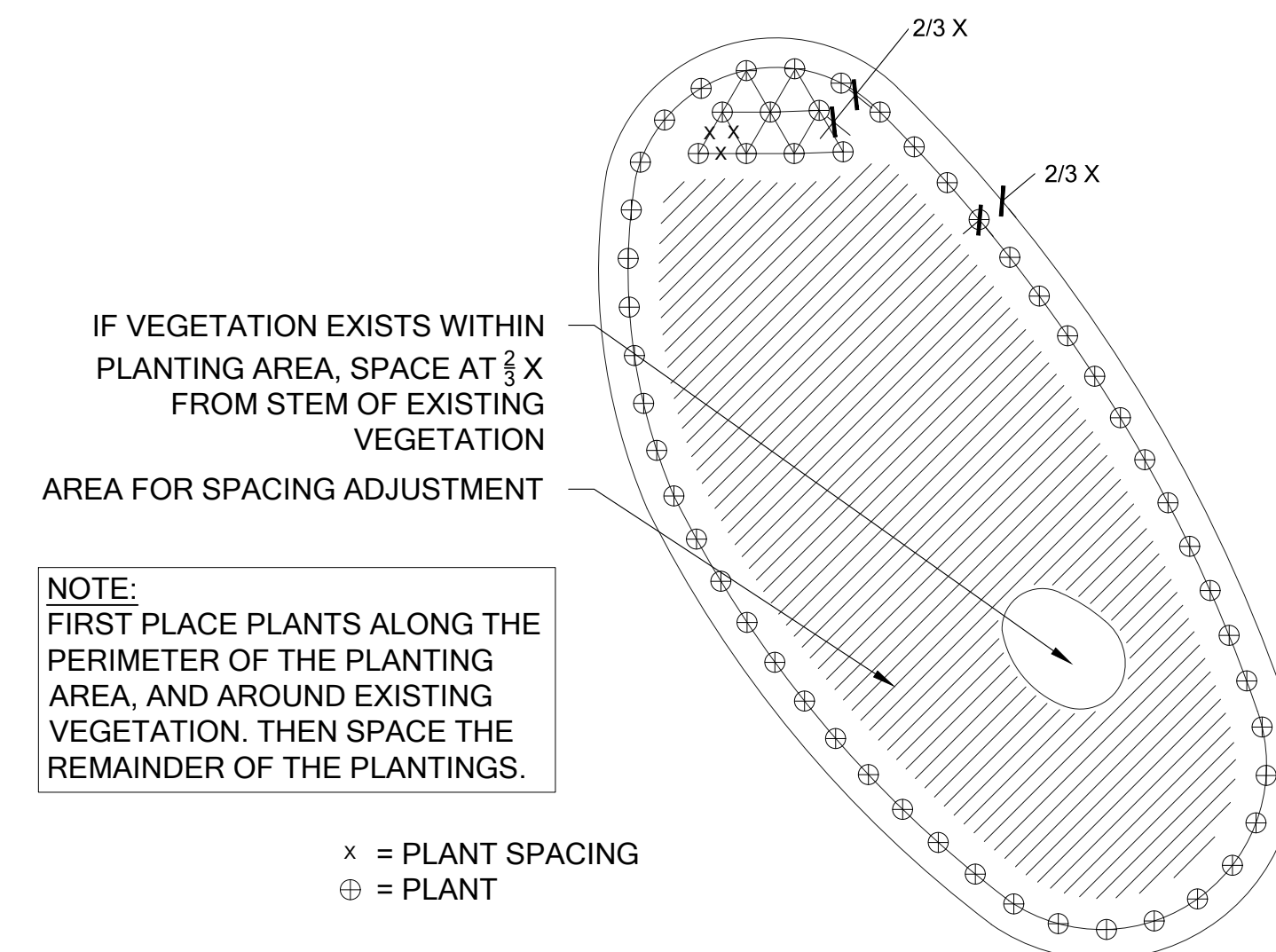
ROOT TREATMENT

- CONTAINER GROWN PLANTS (INCLUDES PLUGS): PLANT ROOT BALLS MUST HOLD TOGETHER WHEN THE PLANT IS REMOVED FROM THE POT, EXCEPT THAT A SMALL AMOUNT OF LOOSE SOIL MAY BE ON THE TOP OF THE ROOTBALL.
- PLANTS MUST NOT BE ROOT-BOUND; THERE MUST BE NO CIRCLING ROOTS PRESENT IN ANY PLANT INSPECTED.
- ROOTBALLS THAT HAVE CRACKED OR BROKEN WHEN REMOVED FROM THE CONTAINER SHALL BE REJECTED.



1 TREE AND SHRUB PLANTING

Scale: NTS



2 PLANT SPACING

Scale: NTS

PLANT INSTALLATION DETAILS AND NOTES

SCALE AS NOTED



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HAGSTROM RESIDENCE

MITIGATION PLAN
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