Gilles Consulting
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# FIELD REPORT

**Date of Site Visit:** **May 30, 2019** **Date of Report:** **June 10, 2019**

**Project Name:** **Air Spade Trench Root Exploration for Driveway**

**Project Address:** **4825 East Mercer Way, Mercer Island, WA 98040**

**Building Permit #:** **Not yet assigned.**

**Contact:** **Sang Hou**

**REASON FOR THE SITE VISIT:**

To determine the extent of the roots present under the proposed driveway. Specifically what roots from the two large *Exceptional* Fir Trees are present, and; where the roots are in relation to the existing surface grade and the proposed driveway elevation grade?

**SPECIFIC CONCERNS**

The specific concerns are how to build a driveway, bring in utilities, bring in supplies to build the proposed new home, as well as to haul out spoils and waste, all with minimal damage or long-term harm to the two large and beautiful *Exceptional* Douglas Fir trees, tagged # 916 & 917.

The City Mercer Island staff and design team members for the owner met on April 18, 2019. The purpose of the meeting was to discuss the proposed driveway and its impact on the two large trees. At this meeting it was agreed that the owner would hire a professional team to use an air spade to blow a trench to the depth of the proposed driveway excavation and to document the roots of the Fir trees that were found. It was agreed that the north end of this trench would coincide with the north end of the proposed driveway and would be a minimum of 20 feet from the base of the closer of the two trees.

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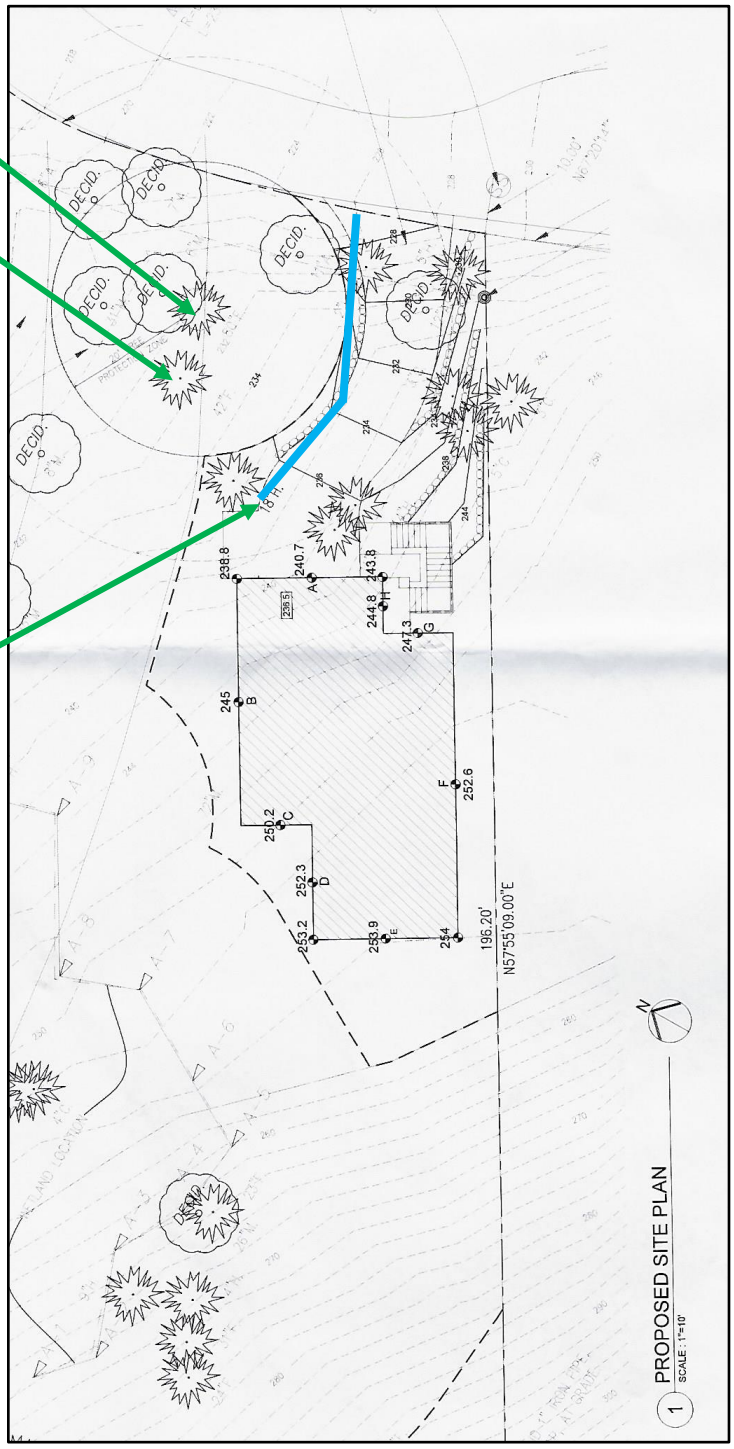
Orientation Sketch: This sketch, taken from the proposed site plan shows the location of the 2 trees, the location of the proposed driveway, and the approximate location of the air spade trench,.

Proposed Site Plan:

Tree # 916

Tree # 917

Approximate location of the air spaded trench



## METHODOLOGY

A tprofessional crew was hired to create a trench down from existing grade to the estimated depth of the excavation required for a driveway that meets design standards for steepness. A survey crew put in a re-bar pin with a plastic cap that is 20 feet south of the southernmost part of the closest tree. (This is tree # 916 and is the larger of the two Firs.) The trench was placed there as a tangent from the road, up the slope past the tree then followed the approximate edge of the driveway over to tree # 913, a Western Hemlock in rather poor condition.

## OBSERVATIONS

On Thursday, May 30, 2019 the crew showed up with two pickup trucks, two air compressors, hoses, and two air spades. The crew set up and began work at approximately 10:15 AM. (This was later than scheduled due to problem traffic on I-405 that morning.)

- Crew members guided each other to get the vehicle tires as close to the edge of the asphalt as safely possible to minimize road blockage.
- Cones were set up next to the trucks and compressors.
- Cones were put on the downslope side to mark the sharp drop off edge of the roadway.
- If needed, vehicles were guided through the choke point as they came along.
- We estimated that approximately 30 vehicles passed up or down the road while the work was going on.
    - This included one vehicle that made four round trips.

<u>The Trench</u>

The crew worked from opposite ends of the trench towards the middle. When the trench got too deep for the air spade to blow the soil out of the trench, hand shovels were utilized to remove the loosened soil.

- Specific Observations:
    - Soil:
        - 4 to 8 inches of duff was observed.
        - Then a mix of mineral soil made up mostly of silt, sand, and gravel went to a depth of approximately 28 to 32 inches.
        - Then the typical hard blue clay of the region was encountered.
            - The air spade operators plunged the air spades into the clay approximately 12 to 14 inches in multiple locations.
            - They found a solid layer of clay down to that depth.
    - Roots:
        - In the top 16 inches of soil many roots were encountered. However, only 4 roots from the large Fir trees were found.

- The rest of the roots encountered were from nearby shrubs and the invasive English Ivy and English Holly.

- Douglas Fir Tree Roots:
  - Four root were found.
  - Diameters measured with a standard Spencer DBH tape), are:
    - Root # 1: 2.9”
    - Root # 2: 4.6”
    - Root # 3: 3.7”
    - Root # 4: Estimated to be 2.5”
  - Roots #’s 1 – 3 were in close proximity to each other and are growing in the duff layer or just at the bottom of the duff.
  - Root # 4 was directly under the other three and firmly attached to the top of the clay layer. Therefore, its diameter was estimated.

Photo # 1: Looking up the street at the coned off vehicles as they set up to work.

Photo # 2: Looking west from the road at the trench being blown and shoveled. Note the tarp under the soil in the roadside ditch to capture the soil as it moved down. This soil was then put back up into the trench. The roots observed appear to be from the adjacent shrubs.

Photo # 3: Looking down into the trench. At approximately 26 to 34 inches below the surface solid blue clay was encountered. In a few random places the operators forced their way into the clay to a depth of 44 to 46 inches. They encountered solid clay at those depths also.

The small roots present are from the invasive English Ivy and ground cover shrubs.

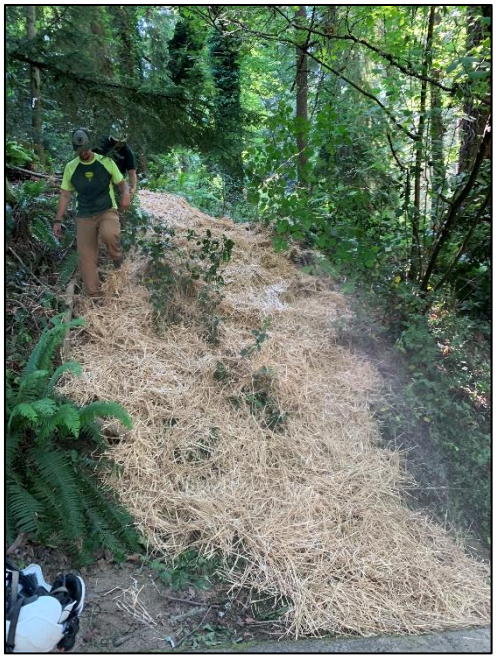
Tip of shovel.

Blue, impenetrable clay layer 26 to 34 inches below the surface.

Photo # 4: Looking down at the only Douglas Fir tree roots encountered from the two subject trees. A fourth root was encountered at the bottom of the trench at approximately 30 inches of depth. They measured 2.9", 4.6", 3.7", & an estimated 2.5".

Photo # 5: The last several feet of the trench showing roots of shrubs and the Hemlock in poor condition, but no Fir Roots.

Photo # 6: The crew finishing the day with a bale of straw covering the open soil to minimize erosion.



## The Four Douglas Fir Tree Roots

City Staff requested that we clearly mark the location of the only four roots that were encountered from trees # 916 & 917. Therefore, on May 30, a small length of the trench was left open where these four root are. I returned on June 4, 2019 and put in four pieces of lath with the roots numbered. Then I refilled the trench.

Photos # 7 & 8: The open portion of the trench on June 2, 2019 before and after the trench was filled and the root locations marked with lath.

**SOILS**

Once we had the data from the exploratory trench, I re-read the soils report. The report, titled, *Subsurface Exploration, Geologic Hazard, and Geotechnical Engineering Report, Hou Residence, Mercer Island, Washington* is dated July 13, 2017. It is a detailed report consisting of 25 pages.

It appears that there is no layer of soil below the clay where large tree roots could be growing. It appears to be clay down for a very long way—well below the ability of tree roots to grow.

**CONCLUSIONS**

Tree roots cannot grow in clay. They are unable to penetrate. In addition, the solid clay, often moist, is a barrier to air penetration. Tree roots cannot survive in anaerobic conditions—that is, soil without air. Therefore, I conclude that the four roots we encountered are the only ones extending out beyond 20 feet from the bases of the two Fir trees. It may be possible to excavate the driveway as required to meet steepness/grade requirements from the roadway to the proposed house.

**RECOMMENDATIONS**

1. The Driveway:
    a. Engineering:
        i. An engineer must develop a proposed driveway based upon the topographic survey and the proposed site plan that meets Mercer Island required design standards. Specific elements needed include but are not limited to:
            1. Construction methodologies that minimize root cutting and eliminate any other damage to the two trees.
            2. The finish grade elevations of the driveway within the driplines of the two trees.
            3. The required depth of excavation for the driveway.

2. Tree Care:
    a. Pre-Construction Tree Care:
        i. If the house and driveway are permitted, the trees will need care before any work is done.
        ii. This work includes:
            1. Treating the root zones with tree based fertilizer and beneficial microbes.
                a. Tree roots have different chemical requirements than do grasses. In fact, lawn fertilizers can harm

trees. Tree based fertilizers are specifically formulated to meet the complex needs of trees and promote healthy balanced growth.

2. Beneficial microbes come in two forms, bacteria and fungi. They are naturally occurring species that benefit trees.
    a. The bacteria breakdown the fertilizer and organic matter in the soil into forms more readily absorbed by the tree roots.
    b. The fungi form a symbiotic relationship with the tree roots. The tree feeds the fungi. The fungi help to increase the absorption of water and nutrients, help to protect the tree roots from pathogens, and increase the tree's resistance to drought.
3. This combination and support the trees through the stresses of construction.

iii. Irrigation:
1. A drip irrigation system will need to be installed to adequately hydrate the tree roots slated for retention. The system must be installed and inspected to prove adequate functionality prior to any construction activities.
2. The system must include a complex 24/7 timer. The timer must be able to slowly mete out the water to the proper depth, without overwatering, and then be turned off for two to four weeks at a time between irrigation events.
3. Details to be produced later.

iv. Tree Protection Fencing:
1. Prior to any work, Tree Protection must be installed and inspected, and approved.

b. Care During Construction:
i. The project arborist must be on site regularly inspecting the tree protection fencing, documenting adequate irrigation, and resolving any tree related conflicts.
ii. The tree will need to be treated with fertilizer and beneficial microbes every spring the construction process continues.

c. Post Construction Care:
i. The trees will need to be inspected once a year for three years after the home is completed and the occupancy permit issued.
ii. Close monitoring of the condition and reacting to any changes will be the key.
iii. An annual report documenting the evaluations will be sent to the City.

With this information the City should be able to determine whether or not the driveway and home proposed can be permitted.

**WAIVER OF LIABILITY**

There are many conditions affecting the stability of a slope. The work documented in this report and the recommendations contained herein are to document the roots of the trees present in the proposed driveway. It is not a guarantee against severe erosion or landslide. Tree, shrub, and groundcover roots cannot prevent deep-seated landslides from occurring. If a severe landslide occurs, all trees and vegetation will be swept away as part of the landslide. It is strongly recommended that a qualified geotechnical engineer be retained to review the recommendations involved in this report and the condition of the slope itself.

There are also many conditions affecting a tree's health and stability which may be present and cannot be ascertained, such as, root rot, previous or unexposed construction damage, internal cracks, stem rot and more which may be hidden. Changes in circumstances and conditions can also cause a rapid deterioration of slope stability. While I have used every reasonable means to examine the slope and all relevant factors, this tree management plan represents my opinion of the situation at this point in time. These findings do not guarantee future safety nor are they predictions of future events. It is the property owner/project manager's responsible to engage the services of a qualified geotechnical engineer to ascertain the conditions of the slope and actions that will enhance or destabilize the slope.

As conditions change, it is the responsibility of the property owners to schedule additional site visits by the necessary professionals to ensure that the long-term success of the project is ensured. It is the responsibility of the property owner to obtain all required permits from city, county, state, or federal agencies. It is the responsibility of the property owner to comply with all applicable laws, regulations, and permit conditions. If there is a homeowners association, it is the responsibility of the property owner to comply with all Codes, Covenants, and Restrictions (CC&R's) that apply to tree pruning and tree removal.

This tree evaluation is to be used to inform and guide the client in the management of their trees. This in no way implies that the evaluator is responsible for performing recommended actions or using other methods or tools to further determine the extent of internal tree problems without written authorization from the client. Furthermore, the evaluator in no way holds that the opinions and recommendations are the only actions required to insure that the tree will not fail. A second opinion is recommended. The client shall hold the evaluator harmless for any and all injuries or damages incurred if the evaluator's recommendations are not followed or for acts of nature beyond the

evaluator's reasonable expectations, such as severe winds, excessive rains, heavy snow loads, etc.

This report and all attachments, enclosures, and references, are confidential and are for the use of the client concerned. They may not be reproduced, used in any way, or disseminated in any form without the prior consent of the client concerned and Gilles Consulting.

Thank you for calling Gilles Consulting for your arboricultural needs.

Sincerely,


Brian K. Gilles, Consulting Arborist

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- *ISA Certified Arborist # PN-0260A, (1992 – 2016)*
- *ISA TRAQ Qualified*
- *ISA TRAQ Certified Instructor*

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- *ASCA Tree & Plant Appraisal Qualified*
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