Superior NW Enterprises

January 22, 2019

Project: Pre-construction assessment for lot re-development at 8359 Juanita Drive, Kirkland, WA. Parcel number 3760500222.

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Objectives: Evaluate health of existing trees and establish criteria for the preservation of those to be retained.

Description: The original house on the subject property was built in 1946. The previous owners remodeled it extensively when they purchased it in 1996. They continued to make changes to both the yard and the house over the years including the removal of the majority of the large trees by 2007 (Figures 1-3). The owners of the 7246 property to the east removed their large trees around the same time. This may have been partially due to the major storm which struck the area in fall of 2006.

The 7226 property to the west changed hands in 2010 and the new owners immediately tore down the old house and built a much larger one (Figures 3 and 4). This renovation included the removal of the majority of the large trees on that parcel. The same thing happened to the 7246 property in 2014 (Figure 5).

By the time the Miller family purchased the subject property in 2019 there were only a handful of larger trees left on their lot and the neighboring ones. They have been working with Rick Jones Associates and RKK Construction on a proposal to tear down the existing house and replace it with another which will somewhat occupy the same footprint (Figures 6 and 7). Knowing the Mercer Island would require a tree protection plan RKK reached out to Tree Harmony who in turn contacted Superior NW Enterprises. The request was to assess the significant trees present on the property, along with any within 20' of the borders, as to their health, stability, and overall suitability for retention. No significant trees were designated for removal according to the plan set.

The following itemized tree list begins front left (SE) corner of the parcel and their numerical designations are reflected in Figure 8. Diameters were measured at the standard height of 54" above grade (DSH) during the August 2020 site visit. Those in the neighboring yards were conservatively estimated to the tree's favor. Heights were estimated.

1) Western Red Cedar (*Thuja plicata*) 43" DSH, 70' tall standing 29' N of 32nd Street and 7' E of the 7226 driveway (Figure 9). The driveway for the subject property currently curves around the tree at 13.5' radial distance but there is a dogleg parking spot which extends beneath this tree and the #2 cedar. The SW corner of the asphalt for the spot is 3' from the base of this tree and there are signs of uplift (Figure 10). The tree is 20' N of the high voltage lines and its south side canopy has been pruned for proper clearance. It has a low, full canopy which exhibits average new growth and color in the lower half but is beginning to show stunting in the upper quarter.

2) Western Red Cedar 42" DSH, 75' tall standing 16' N of the #1 tree. Its diameter measurement was taken 2" below standard as the tree bifurcates right at the 54" mark. The two stems press/grow together until fully separating above the 9' level (Figure 11). The 18" diameter subordinate rises in the NW quadrant, separates again at the 14' mark, and has a 10" spar growing to the west over the neighbor's driveway while its other 12" diameter section grows up the north side of the tree crowding through the branches as shown in Figure 12. The cedar's base is 7' off the neighbor's driveway and 6' NW of the parking spot's NW corner. The existing lawn begins 10' east of the tree. It also has a full, low canopy with average new growth and color from bottom to top.

3) Only a stump present at the time of this assessment at indicated location on the original survey (Figure 13).

4) Douglas Fir (*Pseudotsuga menziesii*) approximately 36" DSH, 80' tall standing 16' N of the NW corner of the subject property and slightly east of it. Tree is in fair condition with average color and new growth. A handful of its branches on the south side extend over the client's yard. Not noted on original survey.

5) Pacific Dogwood (*Cornus nuttalli*) 8" and 10" DSH, 35' tall, 8' spread standing just outside the north fence line and 32' E of the NW corner. Good condition with decent new growth and color and no symptoms of anthracnose showing.

6) There was a line of three small stumps where these trees were indicated originally.

7) Douglas Fir approximately 32" DSH, 90' tall standing 15' N of the fence and 68' E of the NW corner of the fence. The tree has a couple of broken branches noticeable on the south side and a handful which are over extended. Fair condition.

8) Pacific Madrone (*Arbutus menziesii*) approximately 20" DSH standing 11' NNE of the NE fence corner. The tree was cut/broke off near the 18' level some time ago and has three new leaders rising above this point to about 40' tall (Figure 14). The tree leans to the NW from the base and has good new growth and color. None of its canopy extends as far as the fence line.

9) Portuguese Laurel 7" and 7" standing 8' E of the NE fence corner. Some of the foliage reaches the fence and has been pruned back. Good condition.

10) Big Leaf Maple (*Acer macrophyllum*) approximately 24" DSH standing 5' E of the laurels. The tree has visible open decay pockets along the south side of the trunk and it appears to have broken off around the 20' level sometime in the past. It currently reaches 45' tall and has a roughly 18' spread. New growth and color decent but the tree has weak structure.

There are a number of small caliper ornamental trees and shrubs scattered about the yard. There are also large hedges running down the east side of the property and a section along the south side.

Methods: Tree assessment is both an art and a science. To properly perform, an arborist must have an extensive background in biology, tree mechanics, and tree structure that is equal parts academic and field knowledge. It takes years of study to recognize and correctly diagnose the subtle signs trees exhibit before their failure, whether it be partial or total. The process begins with a visual inspection (visual tree assessment, VTA) which is followed up as necessary with soundings, core testing, and/or other detection means. Each tree is examined and evaluated according to several factors including species type, size, vigor, injuries present, root and grade disturbance, deadwood, location and extent of decay, stem taper, exposure, and targets that are at risk.

Analysis: There are two levels of impact at this site, primary and secondary. The primary area includes the environs immediately within the boundaries of the proposed new construction and the regions within ten feet of those boundaries. In this case, as the existing driveway will be removed, the two cedars will be within this zone. They are of special concern and will be addressed below.

The secondary impact area includes the trees which have root systems extending within the construction area. This region, the Critical Root Zone (CRZ), is a radial area extending out from the tree a distance equal to one foot per inch of diameter. For example, the #4 fir, with a 36" DSH, has a theoretical 36' radial CRZ. Even though this tree stands in the neighbor's yard it potentially has roots which extend as much as 20' into the client's yard.

Typically intrusion within the Critical Root Zone is strongly discouraged by the tree care industry. However trenching type incursion, that is excavation that will occur along only one sector of a tree's CRZ, can reach significantly into the root growth area without having a detrimental long term effect. What does have to be absolutely protected is a tree's Structural Root Plate (SRP). This radial area is again related to the diameter inches of the tree in question but not quite in a direct proportion as in the CRZ. Figure 15 on the next page illustrates the relationship.

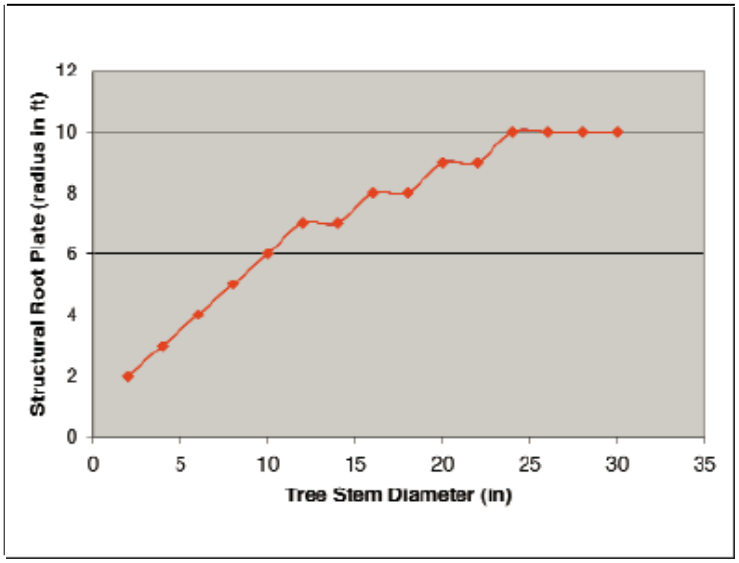

Figure 15. Size of the Structural Root Plate in relation to tree stem diameter. Note that the SRP levels off at 10' for any tree over 24" in diameter. (Coder, 1996)

In the case of the #1 cedar mentioned above, the demolition of the existing driveway will come to as close as 3' from the base of the tree. From Figure 15 the Structural Root Plate for a 43" DSH tree is given as 10' so the demolition of the parking spot will be well within this tree's SRP. Likewise the #2 tree is technically within the primary impact zone, being just 6' from the corner of the parking pad.

The asphalt slab of the drive will have to be lifted carefully off both cedars' roots and conceptually neither will be damaged during the process. Therefor the SRPs for both trees will be considered as undamaged for this project.

Of special note, when the west side neighbor's home was built their new driveway was constructed mostly within the path of the original. While it absolutely is set inside the west side of both cedars' SRPs, there is a more than even chance that the two cedars' plate did not push past the east edge of the original because of compaction issues.

None of the other trees on or near the site have SRPs which will be affected by the excavation work occurring on the site.

The chart shown in Figure 16 below is used to determine what percentage of a tree's Critical Root Zone will be affected by trenching type incursion. In general trees can sustain losses of up to 30% of the overall area within their CRZ without having long term detrimental results.

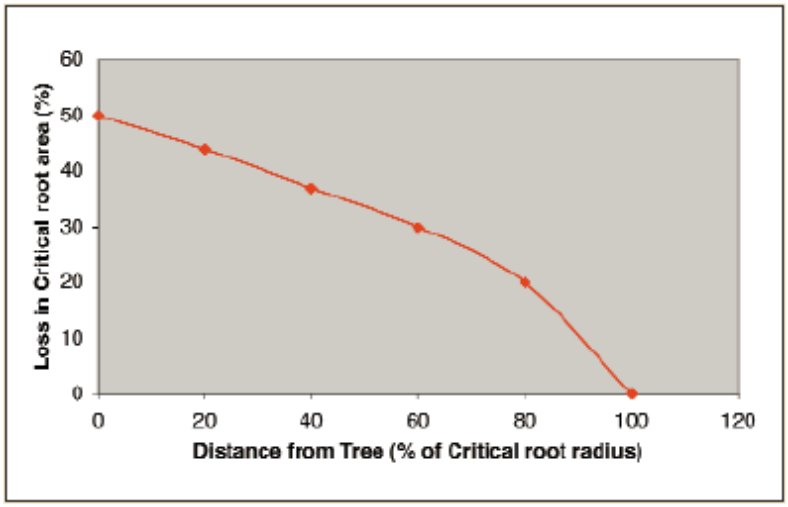

Figure 16. Chart giving the loss in critical root area as a function of the radial distance to the CRZ disturbance. (Coder 1996)

Using the #1 cedar as the example, with the driveway demolition being 13' from the tree's base and it having a 43" DSH, there will be impact at a linear distance equal to 30% of the tree's CRZ (13'/43'). The chart shows that this could equate to a 40% loss of the cedar's Critical Root Area (CRA) *if the asphalt removal cuts completely through roots beneath*. The existing driveway has constrained the root spread for this tree to some extent but it is more likely than not the tree simply crossed under the driveway to take advantage of nutrients on the other side.

So it is vitally important to be extremely careful when removing the asphalt near the trees as to disturb the roots as little as possible. This is especially true because the two cedars have had to compensate for being limited to 55% of their normal rooting space due to the neighbor's driveway. The roots in the subject yard are likely to be found to be much more concentrated than normal. So any impact will be magnified.

If the driveway removal is done correctly the #1 cedar should end up with a net gain in rooting space.

The proposed entrance path is set 24' east of the trees. If this walkway is poured concrete rather than materials which can 'float' over the existing roots then this cut line would equate to impact at 56% of the #1 cedar's CRZ and a potential loss in the neighborhood of 31% CRA. Which could realistically be much greater based on root density.

If the path can be made of pavers set on a permeable base and limited compaction done the first cedar will definitely come out positively post construction.

The second cedar has a more complicated scenario. While the asphalt removal will add some space to its east side the driveway has had less of an impact on this tree as it matured as it cuts to the east before the tree's centerline. The existing house's closest corner is 35' away from the tree.

The excavation for the SW corner of the proposed home foundation will be just 13' N of the #2 cedar and even with its center line. The result is essentially a full cut line running on the north side of the tree. From the chart in Figure 16 it results in a potential loss of at least 40% of the tree's CRA. It could in reality be closer to a 55% impact based on the concentration factor due to the neighbor's driveway and the existing driveway forcing the roots into the proposed impact zone.

Discussion: The cedars are the only trees which will experience construction impact during this project. To determine the exact extent of the two tree's root systems an air spade should be employed before project onset.

A trench 2' wide and 18" deep should be carved along the path of the proposed entrance walk and another should be exposed 13' north of the #2 tree. Once these are completed a more definitive understanding of the project impact is possible. While theoretically both trees have roots, in high density, stretching throughout the front yard sometimes trees don't read the manual. It may be there are few if any roots in the proposed impact zones.

The trenching, if it is done, should be completed before the protection fencing is erected. While it may seem over the top, the fence for the two cedars should be set at the extent of their CRZs and only moved under arborist oversite. This will prevent inadvertent damage, make sure that any and all impacts to the trees are documented, and ensure that any roots found are pruned correctly and not simply torn out with an excavator.

If in any way possible the asphalt under and around the cedars should be removed by hand rather than by an excavator to minimize impact and preserve as many of the roots as possible.

Once the driveway is lifted, assuming this is done early in the demolition stage, 6-8" of arbormulch should be laid down around the two trees out to at least 25'. It may be beneficial for the trees to have a deep root feed before the project starts to help with stress issues (and before the mulch is laid down).

Under no circumstances should materials be stored in or around the trees and no vehicles should be parked in the protection zone after the driveway is removed.

A simple fence place across the back yard at least 10' south of the fence line should suffice for protection purposes for the rest of the trees. It is understood that the existing wood walkways and decks will be removed and the fencing can be installed after.

The subordinate spar on the #2 cedar will have to be excised. This section will only take energy away from the main stem and will interfere with proper branch, and possibly stem, formation. It may be easier to complete this task before the project starts and while there is plenty of space to the north side.

The small architectural wall at the SW corner of the house should be excluded from the plans to alleviate the root impact it will cause. Either that or its placement could be explored with the air spade to expose what roots may be in its place and a decision made at that time.

These two cedars are some of the only large trees left in the neighborhood and it would be a shame to lose one or both through negligence.

Waiver of Liability Because the science of tree assessment is constantly broadening its understanding, it cannot be said to be an exact science. Every tree is different and performing tree risk assessment is a continual learning process. Many variables beyond the control, or immediate knowledge, of the arborist involved may adversely affect a tree and cause its premature failure. Internal cracks and faults, undetectable root rot, unexposed construction damage, interior decay, and even nutrient deficiencies can be debilitating factors. Changes in circumstance and condition can also lead to a tree's rapid deterioration and resulting instability. All trees have a risk of failure. As they increase in stature and mass their risk of breakdown also increases, eventual failure is inevitable.

While every effort has been taken to provide the most thorough and accurate snapshot of the trees' health, it is just that, a snapshot, a frozen moment in time. These findings do not guarantee future safety nor are they predictions of imminent events. It is the responsibility of the property owner to adequately care for the tree(s) in question by utilizing the proper professionals and to schedule future assessments in a timely fashion.

This report and all attachments, enclosures, and references, are confidential and are for the use of the Scott Sinclair, Tree Harmony Arborists, Jason Koehler, RKK Construction, and their representatives only. It may not be reproduced, used in any way, or disseminated in any form without the prior consent of the clients concerned.

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Qualified Tree Risk Assessor
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Figure 1. Aerial view of the subject property circa 2002 showing the original houses with larger trees present.

Figure 2. Aerial photo circa 2005 showing the changes which occurred to the 7238 house and property.

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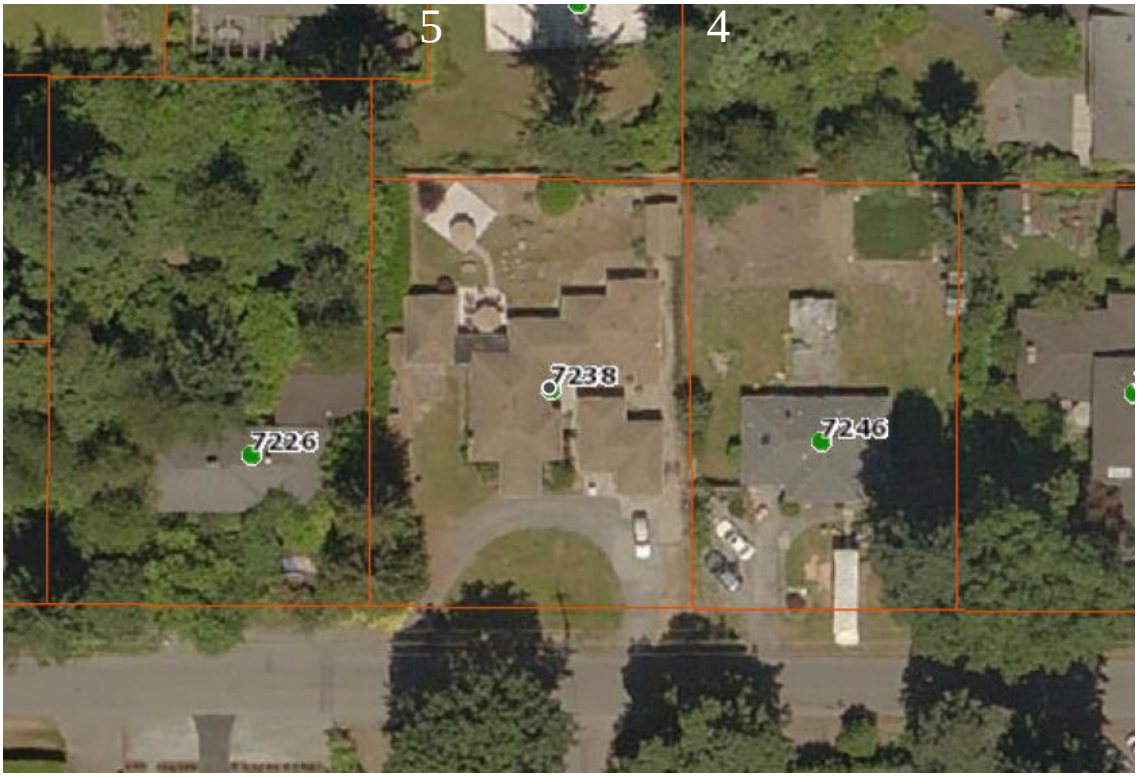

Figure 3. Aerial photo circa 2007 showing the trees missing from the two properties.

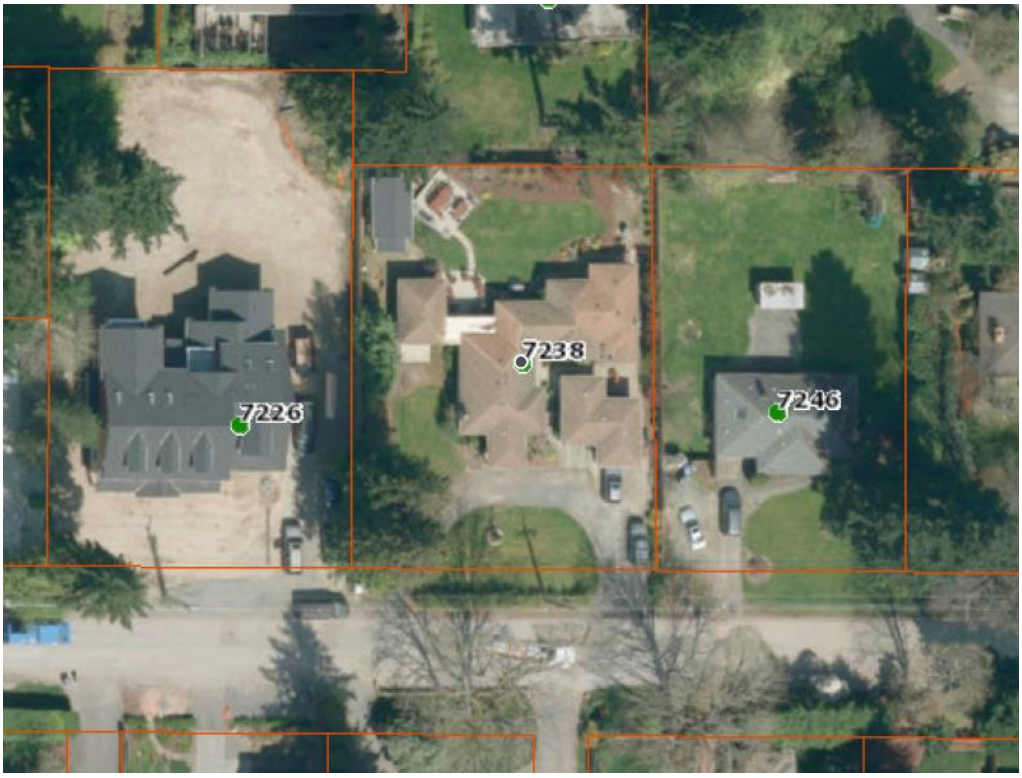

Figure 4. Aerial photo circa 2012 showing the 7226 new home and missing trees.

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Figure 5. Aerial photo circa 2017 showing the new house on the 7246 property.

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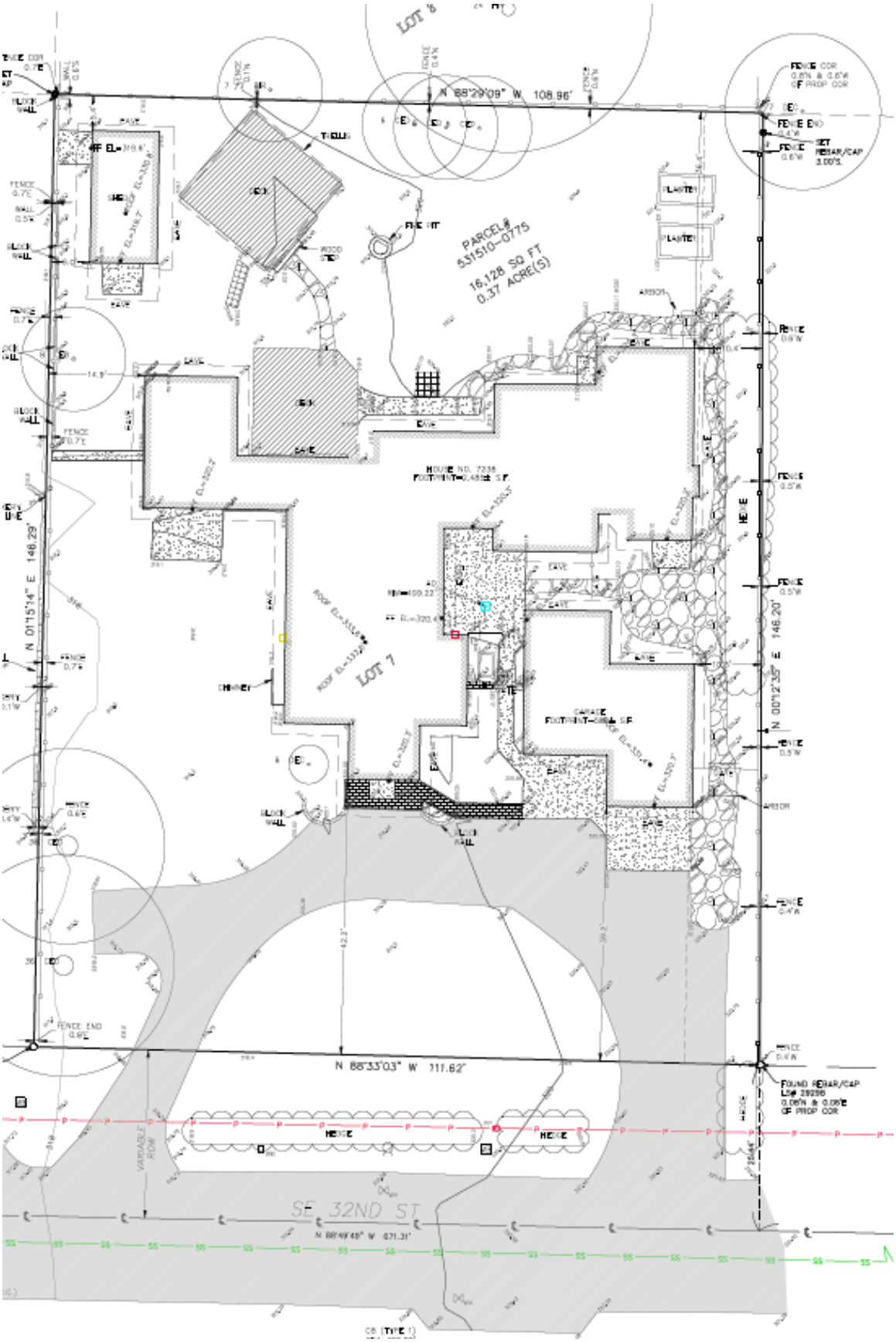

Figure 6. Excerpt from the survey showing the current layout of the property. Note that the #4 tree is not shown.

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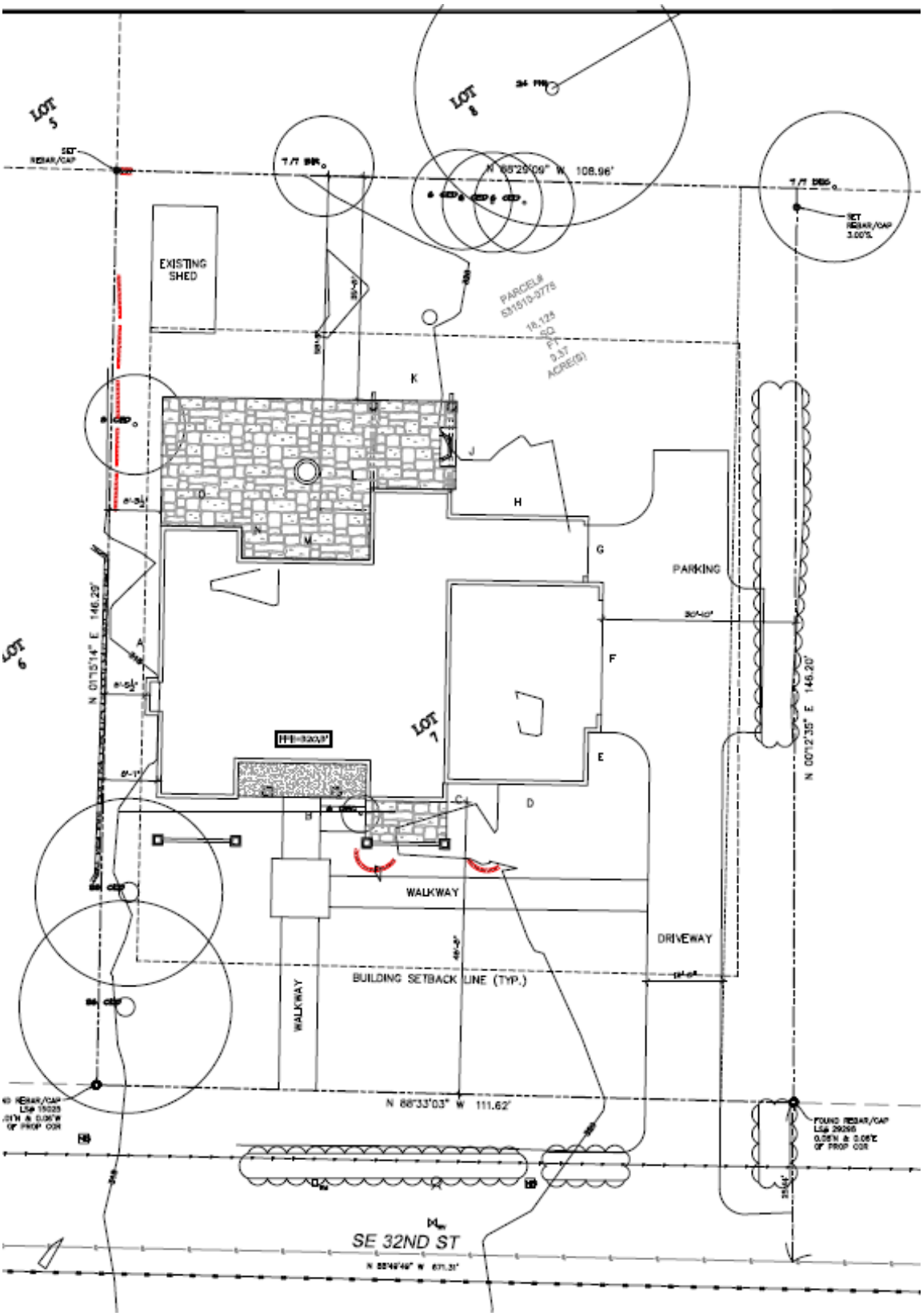

Figure 7. Excerpt from the proposed plan set showing the new layout. The #4 tree is not shown in this image either. Note the proximity of the SW corner of the new house to the #2 cedar. The circles around the trees are in no way representative of the extent of their Critical Root Zones.

Figure 8. Aerial photo circa 2019 showing the approximate locations of the trees noted in the study (yellow numerals). The #3 and #6 trees were not present at the time of the site visit.

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Figure 9. Photo taken during the August 2020 site visit looking north up the west fence line at the base of the #1 cedar. Note proximity of neighbor's driveway.

Figure 10. Photo of the base of the #1 tree showing the corner of the parking spot. Note the cracks indicative of root uplift.

Figure 11. Photo looking south at the base of the #2 cedar. Note parking pad with same vehicle as in Figure 10.

Figure 12. Photo looking up into the #2 tree and showing the bifurcation point of the subordinate spar. This stem should be removed to ensure the proper growth formation of the tree.

Figure 13. Photo of stump in the location indicated on the plan sheets.

Figure 14. Photo of the madrone standing in the neighbor's yard to the north. The circled area is where the tree broke and/or was cut.