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December 9, 2023

The City of Grass Valley
c/o Tim Kiser
125 E Main Street
Grass Valley, CA 95945

Dear City of Grass Valley,

Per your request, I have prepared a tree failure risk assessment and root damage risk assessment for the three redwood trees next to the police department building. This assessment is based on a 5-year time frame.

I have concluded that the three redwood trees are moderate risk for whole tree failure and a high risk for root damage to hardscape. It is possible within the 5-year timeframe for whole tree failure to occur, and if whole tree failure were to occur, it is somewhat likely to cause severe damage. These trees are high risk for root damage to hardscape. It is probable within the next 5-year timeframe that the damage will continue to occur and is very likely to cause severe damage. I recommend these trees be removed.

It is important to note that once these trees have been removed the stumps will either need to be ground out or treated and killed with an herbicide or the trees will grow back from the stumps and root damage will continue. If trees are replanted, they should be small stature trees more appropriate for the small size of the planting site. I also recommend that the damage that has been caused by the roots be inspected by a qualified professional to determine if and what repairs need to be made to the retaining walls, stairs, and parking lot.

Background

On December 6, 2023, I met with Tim Kiser, City Manager, to look at three redwood trees at the police department, on the west side of the building by the stairs to the parking lot. There was a concern that the trees could fail due to asymmetrical rooting and a concern about the root damage to the retaining wall the trees are planted above. I performed a basic, level 2 visual inspection and assessment of the trees.

A Basic, Level 2 Visual Tree Inspection and Risk Assessment following ANSI Standards consists of a qualitative visual inspection of the trees and surrounding site, and a synthesis of the information collected. This Tree Risk Assessment is based on a 5-year inspection interval. Please be aware that Tree Risk Assessment considers known targets and visible tree conditions and represents the conditions of the trees at the time of these

inspections. In addition, the time frame for risk categorization should not be considered a “guarantee period” for the risk assessment.

The basic premise of tree risk assessment is to help tree risk managers make an educated decision on how to reduce their risk to tolerable levels. All trees provide benefits, and all trees pose some risk. Usually, the benefits provided by trees outweigh the risks they pose. The only way to eliminate all tree risk is to eliminate all trees.

Tree Risk Assessment Methodology

There are three components to a Tree Risk Assessment: likelihood of failure, likelihood of impact, and consequences of failure and impact. For each combination of tree part and target, I rated each of these components. Then I combined them according to International Society of Arboriculture (ISA) Best Management Practice for Tree Risk Assessment using the tables in Figures 1 and 2 (page 6) to produce a risk rating for each tree part and target combination. Lastly, I assigned an overall failure risk rating and root risk rating for each tree equal to the risk rating of the tree part and target combination with the highest risk rating. I followed this process for my risk assessment of each of the 3 redwood trees.

Targets

I assessed multiple targets. For tree failure risk and for tree root impact risk, I assessed the targets as either the retaining wall, the steps, the curb, the drain, the building, the foundation, and parking lot. These are all fixed targets and are not practical to move.

People and cars are mobile targets traveling through these areas. They have a frequent occupancy rate in the tree failure target zone. In addition, root damaged hardscape features may increase tripping risk in these areas.

The target zone is defined as the area in which the tree is more likely to fall if it were to fail, or the roots are most likely to grow. For trees in which the direction of fall was not clear, I assessed the likelihood of impact by assessing all possible directions the tree could fall as weighted equally. For whole tree failure, I defined the target zone as 1.5 x tree height. For branch failure, I defined the target zone as 2X the dripline of the canopy. These trees are growing in heavy clay soils. Average root length is twice the tree height. I assessed the likelihood of impact by assessing all targets within twice the height of the tree. For this assignment, I determined target zones by visual approximation only.

Tree Information

There are three redwood trees growing from the planter bed between the police department building and the parking lot. The first redwood tree is a 36-inch DBH (Diameter at breast height) tree on the far left of the stairs if standing in the parking lot facing the building. This tree is in good health. It was planted within a few feet of the retaining wall which is on two sides of it and the parking lot is on the other sides. The trunk is now within 5 feet of the eave of the building. Due to the planting location, the tree’s primary structural defect is an asymmetrical root system which is already causing root damage to the retaining wall. This tree is a moderate risk for whole tree failure and a high risk for root damage to hardscape. It is possible within the 5-year

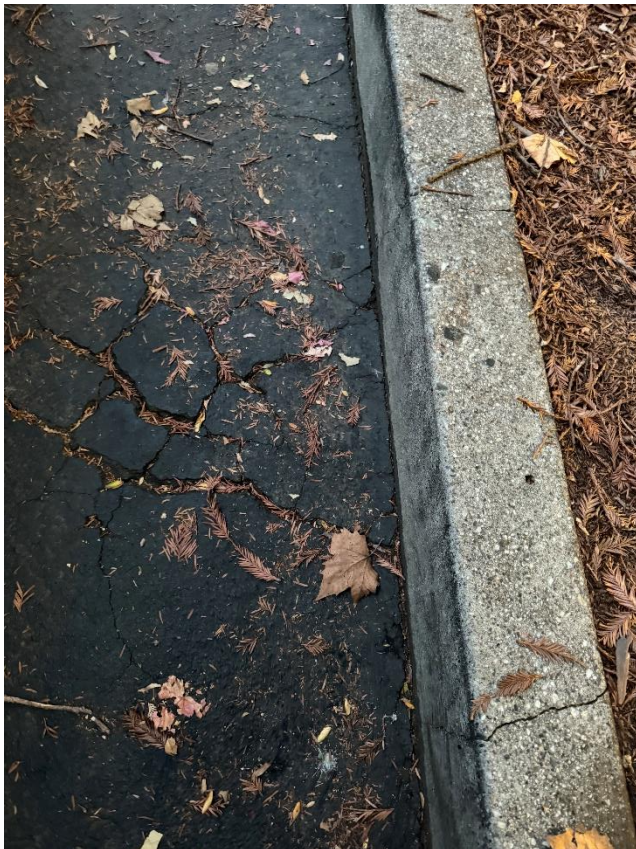
timeframe for whole tree failure to occur, and if whole tree failure were to occur, it is somewhat likely to cause severe damage. The tree is high risk for root damage to hardscape. It is probable within the next 5-year timeframe that the damage will continue to occur and is very likely to cause severe damage. I recommend this tree be removed.

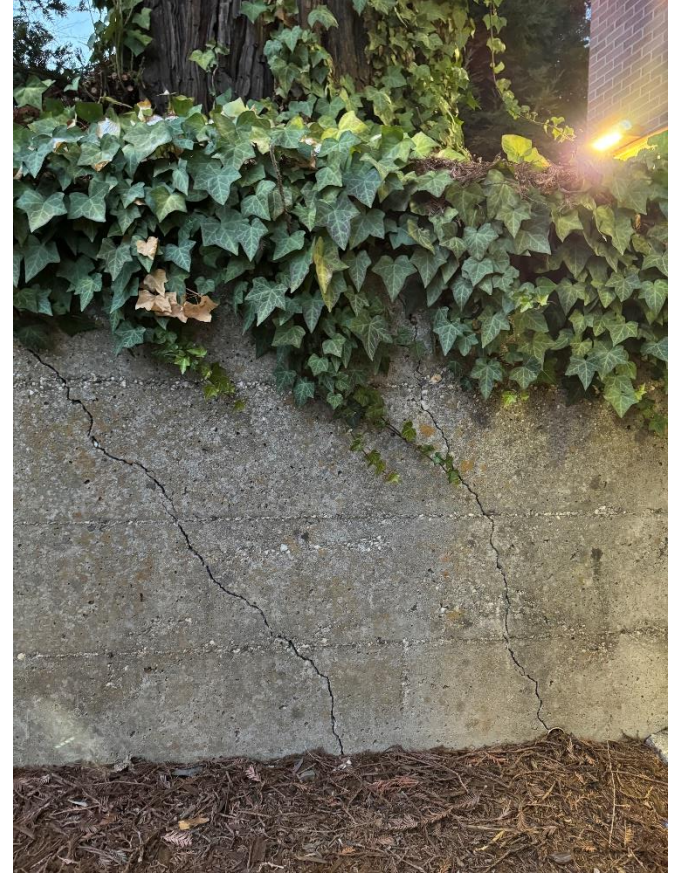
The second redwood tree is 35-inch DBH on the left of the stairs if standing in the parking lot facing the building. This tree is in good health. It was planted within a few feet of the retaining wall, which is on two sides of it, and the parking lot and stairs are on the other sides. The trunk is now within 10 feet of the eave of the building. Due to the planting location, the tree's primary structural defect is an asymmetrical root system which is already causing root damage to the retaining wall and stairs. This tree is a moderate risk for whole tree failure and a high risk for root damage to hardscape. It is possible within the 5-year timeframe for whole tree failure to occur, and if whole tree failure were to occur, it is somewhat likely to cause severe damage. The tree is high risk for root damage to hardscape. It is probable within the next 5-year timeframe that the damage will continue to occur and is very likely to cause severe damage. I recommend this tree be removed.

The third redwood tree is 40-inch DBH and is on the right side of the stairs if standing in the parking lot facing the building. This tree is in good health. It was planted within a few feet of the retaining wall which is on two sides of it and the parking lot is on the other sides. The trunk is now within 4 feet of the eave of the building. Due to the planting location, the tree's primary structural defect is an asymmetrical root system which is already causing root damage to the retaining wall, curb, and parking lot. This tree is a moderate risk for whole tree failure and a high risk for root damage to hardscape. It is possible within the 5-year timeframe for whole tree failure to occur, and if whole tree failure were to occur, it is somewhat likely to cause severe damage. The tree is high risk for root damage to hardscape. It is probable within the next 5-year timeframe that the damage will continue to occur and is very likely to cause severe damage. I recommend this tree be removed.

It is important to note that once these trees have been removed the stumps will either need to be ground out or treated and killed with an herbicide or the trees will grow back from the stumps and root damage will continue. If trees are replanted, they should be small stature trees more appropriate for the small size of the planting site. I also recommend that the damage that has been caused by the roots be inspected by a qualified professional to determine if and what repairs need to be made to the retaining walls, stairs, and parking lot.

Photos





Figures

Likelihood of Failure	Likelihood of impacting Target			
	<i>Very Low</i>	<i>Low</i>	<i>Medium</i>	<i>High</i>
<i>Imminent</i>	Unlikely	Somewhat likely	Likely	Very likely
<i>Probable</i>	Unlikely	Unlikely	Somewhat likely	Likely
<i>Possible</i>	Unlikely	Unlikely	Unlikely	Somewhat likely
<i>Improbable</i>	Unlikely	Unlikely	Unlikely	Unlikely

Figure 1: Risk assessment matrix (1 of 2). This matrix synthesizes the likelihood of failure and the likelihood of impacting the target.

Likelihood of Failure & Impact	Consequences			
	<i>Negligible</i>	<i>Minor</i>	<i>Significant</i>	<i>Severe</i>
<i>Very likely</i>	Low	Moderate	High	Extreme
<i>Likely</i>	Low	Moderate	High	High
<i>Somewhat likely</i>	Low	Low	Moderate	Moderate
<i>Unlikely</i>	Low	Low	Low	Low

Figure 2: Risk assessment matrix (2 of 2). This matrix synthesizes the likelihood of failure & impact and the consequences of impact.

Glossary of Terms

Level 1: Limited Visual Assessment - Involves a visual assessment of trees near specified targets, conducted from one side, looking for obvious defects. Level one assessment is the fastest, but least thorough means of assessment, and is best of large populations of trees when time and resources are limited. This type of assessment is often done on a specified schedule or immediately after storms to rapidly assess a large number of trees.

Level 2: Basic Assessment - Involves a detailed visual assessment of trees and the surrounding site, and a synthesis of the information collected. Level 2 is the most commonly performed assessment and is ground based. Inspection of all sides of the tree from some distance, as well as close up is part of a basic assessment. Simple tools may also be used to gain some useful information, including measuring devices, binoculars, magnifying glass, mallet, probe, digging tools for minor excavation, compass and camera.

Level 3: Advanced Assessment – Involves a detailed assessment of tree parts, defects, targets or site conditions. Level 3 assessments are usually performed in conjunction with or after a basic assessment if additional information is needed. Advanced assessments might include aerial inspection, assessment for internal decay, root assessment, measuring change of lean and load testing.

Target – People, property, or activities that could be injured, damaged, or disrupted by a tree failure.

Static Target - A target that cannot be easily relocated. It is present 24 hours per day, seven days per week. Building and landscape fixtures are considered static targets.

Movable target - A target that may be relocated as a mitigation strategy.

Mobile target - A target that is constantly moving or stopping intermittently. Such targets include people, animals, bicycles, and vehicles.

Target zone: The area in which a tree or tree part can reasonably be expected to fall if it were to fail.

Occupancy rate: The amount of time that a mobile target is present in the target zone.

There are four possible ratings:

- 1) Constant: Within the assessed time frame, the target is always or nearly always present in the target zone, 20-24 hours per day.
- 2) Frequent: Within the assessed time frame, the target is present in the target zone for a large portion of the day, month, week, or year, averaging 4-20 hours per day.
- 3) Occasional: Within the assessed time frame, the target is infrequently or intermittently present in the target zone, averaging 0.25-4 hours per day.
- 4) Rare: Within the assessed time frame, the target is present in the target zone for a very small portion of time, averaging 0.25 hours per day or less.

Likelihood of failure - The chance that a tree or tree part could fall within a specified time frame.

There are four possible ratings:

- 1) Imminent: Without regard to the assessed time frame, the tree or tree part is about to fail or has already started to fail.
- 2) Probable: Within the assessed time frame, the tree or tree part may fail in ordinary weather conditions.
- 3) Possible: Within the assessed time frame, the tree or tree part may fail in extreme weather.
- 4) Improbable: Within the assessed time frame, the tree or tree part may not fail, even in extreme weather.

Likelihood of impact - The chance that the subject tree would impact the target if it were to fail. This is primarily determined by the occupancy rate of the targets, the direction of the tree's fall, and any potential protection factors.

There are four possible ratings:

- 1) High: If the tree or tree part were to fail, it may be expected to impact the target.
- 2) Medium: If the tree or tree part were to fail, the chance of impacting the target is approximately 50/50.
- 3) Low: If the tree or tree part were to fail, it would be unlikely to impact the target.
- 4) Very Low: If the tree or tree part were to fail, the chance of impacting the target is remote.

Consequences of impact - The amount of damage or harm caused by a tree or tree part failing and impacting a target. It may be personal injury, property damage, or disruption of an activity.

There are four possible ratings:

- 1) Severe: Hospitalization or death of a person, or property damage over \$20,000.
- 2) Significant: Personal injury that does not require professional medical care, or property damage costing less than \$20,000 to repair.
- 3) Minor: Very minor personal injury, or property damage costing less than \$1,000 to repair.
- 4) Negligible: Property damage that can be easily repaired. No personal injury.

Risk Rating: The combination of likelihood of failure, likelihood of impact, and consequences of impact.

There are four possible ratings:

- 1) Extreme: access to the target zone should be restricted immediately and mitigation should take place as soon as possible.
- 2) High: mitigation should take place as soon as practical.
- 3) Moderate: mitigation should take place as soon as pruning cycle allows.
- 4) Low: The risk may be mitigated as pruning cycle allows, or the tree may be retained and monitored.

Timeframe: The period of time over which the risk is assessed. For this assignment, I used a timeframe of 5 years.

Limitations

I relied upon historical information regarding the site and the subject trees that you provided to me. For the purposes of this report, I assumed all of the information you gave me to be true. If any of the information provided to me is found to be inaccurate, the conclusions in this report may be invalidated.

My observations are based on a strictly visual inspection of the property, and some hidden or buried symptoms and signs may not have been observed. I did not conduct excavation, coring, or aerial inspection to make observations. Additional work would be needed to conduct root crown inspections and extent-of-decay analysis on the trees if these additional inspections are desired.

Although the condition of the trees will change throughout the year, my analysis is only based on the observations I gathered at the time of inspection. I do not guarantee the safety, health, or condition of the trees. There is no warranty or guarantee, expressed or implied, that problems or deficiencies in the trees may not arise in the future.

Arborists are tree specialists who use their knowledge, education, training, and experience to examine trees, recommend measures to enhance the beauty and health of trees, and attempt to reduce the risk of living trees. Clients may choose to accept or disregard the recommendations of the arborist, or to seek additional advice.

Arborists cannot detect every condition that could possibly lead to structural failure of a tree or damage caused by roots. Trees and roots are living organisms that grow and fail in ways not fully understood. Conditions are often hidden within trees and below ground. Arborists cannot guarantee that a tree will be healthy or safe under all circumstances, or for a specified period of time. Likewise, remedial treatments, like any medicine, cannot be guaranteed.

Treatment, pruning, and removal of trees may involve considerations beyond the scope of the arborist's services such as property boundaries, property ownership, site lines, disputes between neighbors, and other issues. Arborists cannot take such considerations into account unless complete and accurate information is disclosed to the arborist. An arborist should then be expected to reasonably rely upon the completeness and accuracy of the information provided.

Trees can be managed, but they cannot be controlled. To live near trees is to accept some degree of risk. The only way to eliminate all risk associated with trees is to eliminate all trees.

Conclusion

I have concluded that the three redwood trees are moderate risk for whole tree failure and a high risk for root damage to hardscape. It is possible within the 5-year timeframe for whole tree failure to occur, and if whole tree failure were to occur, it is somewhat likely to cause severe damage. These trees are high risk for root damage to hardscape. It is probable within the next 5-year timeframe that the damage will continue to occur and is very likely to cause severe damage. I recommend these trees be removed.

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If you have any further questions, please feel free to give my office a call.

Sincerely,



Aero Acton



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ISA Certified Arborist #WE-4022A
ISA Tree Risk Assessment Qualified
ASCA Tree & Plant Appraisal Qualification



Contractors State License Board
CSLB #799133