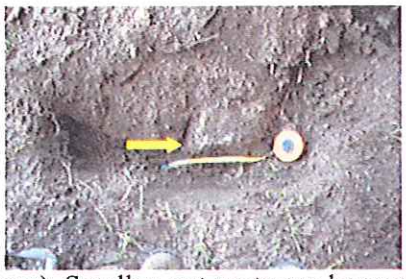
Root pruning: AG excavated Trench 1, which is the primary trench located along the southern side of the tree, to measure the number and size of roots cut during trenching. AG found a large number of small roots severed along the entire length of Trench 1. AG also found and measured a large root 80 cm from the root collar. This root measured 160 mm diameter at the cut. The loss of these small and large roots reduces the structural stability of the tree. Research has indicated that small roots near the surface, as was observed in this instance, provide significant structural support and removal of these roots may result in loss of structural support greater than 20%.[1] These roots, including the large root that was severed on the southern side of the tree, are primarily located in transverse orientation to the tree lean, which reduces its importance in terms of structural support to off-set the lean. However, these roots provide significant support during strong southerly winds. Given the size, location and development of the large root that was cut, it likely provided significant support during strong southerly winds.



Large Root Severed (arrow). Smaller, cut roots can be seen throughout excavation

AG excavated Trench 2, which is located approximately 3 meters northeast of this tree. AG observed small roots severed along the trench line of Trench 2. The number and size of roots was significantly smaller than those observed along Trench 1, which is to be expected given that Trench 2 is further from the tree. Given the smaller number and size of these roots, and their distance from this tree, it is not projected that their cutting significantly impacts the structural integrity of the supporting root system.

Root collar: The root collar does not show signs of significant damage or poor condition at this time. Specific findings and conclusions relative to the root collar are as follows:

Wounds: minor Decay/cavity: none observed

Insects/Disease: No signs or symptoms were observed

[1] T. Fourcaud, J.-N. Ji, Z.-Q. Zhang, and A. Stokes. **Understanding the Impact of Root Morphology on Overturning Mechanisms: A Modelling Approach.** Ann. Bot., May 1, 2008; 101(8): 1267 - 1280.

Cracks/seam: A seam in the bark at the root collar was observed on the west side of the tree. This seam extends high up along the trunk. This seam, which appears to be an old stress crack area, has compartmentalized and currently tests as sound.

Root Collar Seam

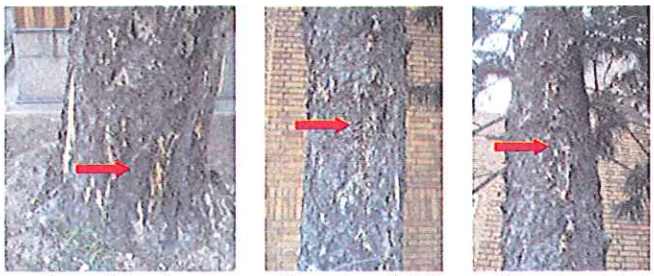
Sap flow: Minor sap flow was observed originating at the root collar. Sap flow has dried and crystallized indicating that it had occurred some time ago.

Trunk: The trunk does not show signs of significant damage or poor condition at this time. Specific findings and conclusions relative to the trunk are as follows:

Wounds: minor Decay/cavity: none observed. Resistograph negative

Insects/Disease: No signs or symptoms were observed

Cracks/seam: Seams in the trunk were observed on the west and east sides of the tree. The seam on the west side initiated at the root collar and extended up the trunk, vertically to a point approximately 8 meters high. This seam was not continuous, but was only interrupted for short distances along the trunk. Signs of historic sap flow were observed emanating from this seam. Woundwood that closed the seam was observed along the entire seam. This seam, which appears to be an old stress crack area, has compartmentalized and currently appears sound. Resistograph measurements at several points along the seam found no decay, cavities or deep cracks associated with these seams.



Low Trunk ~ 3 meters high ~ 5 meters high

Trunk Seam West Side of Tree

Trunk Seam East Side of Tree

Sap flow: Moderate sap flow was observed along the trunk. A significant amount of this sap flow appeared to be very recent and resulting from drilling tests by others.

Scaffold branches: Architecture of this tree is generally normal for this species with many of the scaffold branches shorter than the length normal for this species. The scaffold branches and crown of this tree do not show signs of significant damage or poor condition at this time. Specific findings and conclusions relative to the scaffold branches and crown are as follows:

Included bark: none observed Wounds: minor Decay/cavity: none observed

Cracks/seam: none observed Sap flow: none observed

Deadwood: very low amount of small branches

Insects/Disease: no signs or symptoms were observed

Excessive end weight: moderate due to stress from tree height

Targets:
Primary targets that are within the fall zone of this tree and tree parts are people within the walkway, vehicles traveling along the roadway, and landscape features. Exposure to potential tree hazards is relatively high due to the frequent use of the roadway.

Risk Rating: **High**
This tree currently presents a high risk to targets within the fall zone. The part most likely to fail in the near future is the entire tree during windy conditions. The potential for failure is moderate to high due to the location and extent of the root cutting. The risk to people and vehicles along the roadway is high due to the frequency of traffic.

4.0 Recommendations

Action must be taken to reasonably minimize the risk of tree failure and resulting high potential for personal injury and property damage. There are 3 alternatives that AG recommends for consideration to reasonably reduce risk of failure of this tree as follows:

1. Cable the tree to a structure or the ground. Two cables, constructed of steel materials, attached to the trunk and then to a structure or anchored in the ground, could provide adequate support comparable or exceeding the pre-trenching condition. The cables should be aligned to provide support of the tree from the northeastern and southeastern quadrants. The type and size of cable and cable attachments must be engineered to effectively support the load of the tree. The cable must be attached 2/3 up the height of the tree, which is approximately 16 meters, and affixed so that the cable is a 45° to 90° angle to the lower trunk. AG understands that the structures and topography present significant challenges to this solution and would require engineering expertise that is beyond the scope of AG's expertise.

2. Should cabling prove impractical and tree preservation is desired, it is recommended to reduce the crown height of this tree by approximately 20%. AG believes that topping is the only other practical option that will preserve the tree and significantly reduce structural stress on the damaged root system, reduce target exposure and reasonably reduce risk of whole tree failure. Crown reduction will not eliminate the risk of whole tree failure. Removal of a significant section of the crown top results in the significant reduction of the weight of the wood mass, moisture weight load from precipitation, and structural stress from wind loads. Crown reduction also reduces the number of targets exposed by making the tree smaller. The actual amount of risk reduction depends upon the amount of the top removed. AG recommends approximately 20% reduction in an effort to reduce risk of failure while minimizing the potential impact on tree health. It is impractical to accurately quantify the precise reduction of risk from this crown reduction. However, AG's extensive experience and understanding of biomechanical engineering, and industry research has clearly demonstrated that proper crown reduction reduces the risk of failure.

   Topping of trees is considered an inappropriate and generally prohibited tree management practice. Topping cuts should not be conducted unless they are the only alternative to reasonably reduce risk and preserve an exceptionally valuable tree, and are approved and managed by a Qualified Arborist. Whenever topping cuts are conducted, it must be understood that the tree's natural defenses often are not effective and decay often results. However, AG's experience with this species finds that it often compartmentalizes topping wounds with little decay. Epicormic sprouts that develop at the cutting site do not possess strong attachments for a period of time and may fail during wind events. The combination of decay and weak attachments of resulting sprouts may increase tree hazards in the future and require pruning of the sprouts or removal of the tree at some time in the future due to resulting structural defects. Should this crown reduction option be selected, it is critical to understand that regular monitoring and maintenance of the wound and resprouting branches must be conducted by a Qualified Arborist.

3. Felling, also referred to as tree removal, is recommended if cabling or topping are determined to be impractical or undesirable. AG believes that if cabling or topping are not conducted, that this tree poses an unreasonable risk to public safety at this time and should be felled.

Action Time Frame: It is recommended that risk mitigation measures be conducted prior to exposure of this tree to heavy rain and strong winds that are associated with the rainy season.

If this tree is retained, then it must be regularly monitored by a Qualified Arborist. The heavy root pruning recently conducted may have a significant, negative impact on tree health. Decay and further structural weaknesses may develop at the sites of large root wound. AG has also found that root damage increases the susceptibility of this species to termite attack.

5.0 Assessment Limitations and Further Information

This report, its findings and recommendations are submitted with the following understanding:

- Arborists are specialists in tree management and care who use their education, knowledge, training and experience to inspect and assess tree health and condition, and identify measures that reduce risk of personal injury or property damage from trees exhibiting defects.
- This assessment is based upon the information provided by the Client, and AG's education, knowledge, training, experience and diligent field investigation. Arborists cannot detect every condition that could possibly lead to the structural failure or decline in the health of a tree. Trees are living organisms that fail in ways we do not fully understand and cannot always predict. 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.
- This assessment is based on predictions of tree behavior during normal weather conditions and the condition of the tree at the time of the field inspection. Normal weather conditions are defined as wind less than 35 knots (65 kph) in speed and rainfall that does not saturate the soil and destabilize the tree root system. Changes to tree or site conditions after completion of the field inspection that are caused by severe weather, construction, accidents, insects, disease or other agents may change the structural integrity of a tree or tree part and increase risk. These types of future changes in condition and their impact on the tree cannot be reasonably predicted during a risk assessment.
- This assessment is restricted to the designated tree and did not assess any other nearby trees that may present potential hazards to people or property.
- Recommendations for risk reduction treatments may involve considerations beyond the scope of the arborist's services such as cost, public sensitivity, property management considerations, and other issues. This assessment did not consider these

factors, but focused on the structural integrity of this tree and its relative risk to the public at the time of this inspection and during normal weather conditions.

- Trees can be managed, but they cannot be controlled. To live, work and play near trees is to accept some degree of risk. The only way to eliminate risk from trees is to remove trees, but this is not recommended unless required by a Qualified Arborist because it also eliminates the multitude of benefits provided by trees.
- Clients may choose to accept or disregard the recommendation of the arborist, or to seek additional advice.

If there are any questions or further information required, please contact Kevin K. Eckert at keckert@arborglobal.com.

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