

# Arborist OnSite®

Horticultural Consulting, Inc.

---

[www.arboristonsite.com](http://www.arboristonsite.com)  
[Robert@arboristonsite.com](mailto:Robert@arboristonsite.com)

## ISA Certified Arborist Report

### Submitted To:

West Coast Arborists Inc.  
8524 Commerce Ave. Suite B  
San Diego, California 92121

### Project Location:

City of Encinitas  
402 second street  
Encinitas, California

### Submitted By:

Robert Booty, Registered Member # 487  
ISA Qualified Tree Risk Assessor  
The American Society of Consulting Arborists  
ISA Certified Arborist WC-4286  
March 25, 2018

## Limits of Assignment

This assignment is limited to one Ficus Tree #5049. My investigation, trunk imaging at two elevations on the trunk to determine the internal health of the tree. Ground penetrating radar can not identify the presence of structural defects in roots located below ground, such as cracks or girdling roots that can be associated with tree failures. GPR can evaluate only depth, location and depending on the MHz of the antenna, targeting root size. Because trees continually change, this evaluation is valid only for the date of this inspection.

## Disclaimer

Although studies have shown ground penetrating radar to have a high degree of accuracy<sup>1</sup> for below-ground root identification, these are not photographs but images of predicted root targets or changes in wood composition as in the case of trunk imaging . Arborist OnSite endeavors to use equipment that generates useful information to prepare reports that will reflect its best judgment in light of the facts as it knows them.

## Assignment

I have been retained by Michael Palat who is the Area Manager for west coast arborists. I have been requested to utilize ground penetrating radar for trunk imaging on one Ficus tree to evaluate the internal condition of the tree.

## Observations

I visited the site February 15, 2018. The Ficus tree is located at the curb strip and is designated as a city street tree. The tree is mature with co-dominant and multiple branch attachments originating at about 76 inches in height of the main trunk, some have included bark. Health appears to be good.

## Conclusions

I performed two trunk imaging scans. The first one a sector or partial scan at about 36 inches from its base. I was also requested to perform a second scan on a structural branch where there was concern regarding included bark and having organic material and water collecting at the attachment. Both scans were sector or partial scans due to the uneven trunk surface verses the dimensions of the antenna. The results of both scans indicated no changes to the wood composition in those areas. My concern would be the co-dominant stems originating at the same point on the trunk. And any possible girdling roots.

---

<sup>1</sup> Nina Bassuk, "Ground-Penetrating Radar Accurately Locates Tree Roots in Two Soil Media Under Pavement" Arboriculture & Urban Forestry, International Society of Arboricultural 2011.

## Methodology

### How does it work?

Ground-Penetrating Radar (GPR) is an established technology that has been used worldwide for over 30 years. Radar is an object-detection system that uses *electromagnetic waves* – specifically *radio waves* – to identify the range, altitude, direction, or speed of both moving and fixed objects. When an electromagnetic wave<sup>2</sup> emitted from a small surface transmit antenna / receiver encounters a boundary between objects with different electromagnetic properties, it will reflect, refract, and or diffract from the boundary in a predictable manner. Radar waves or signals are reflected especially well by materials of considerable *electrical conductivity*.

The radar signals that are reflected back towards the antenna are the desirable ones that create the image and make radar work. An air-filled tree trunk (*with a decayed hollow*) or a partially air-filled incipient (early stage) decay zone inside a cell wall within a tree are excellent reflectors for detection by GPR systems. Use of GPR instrumentation for internal tree trunk decay detection and below ground root locating is one of its latest uses in the field of tree risk assessment.

Its uses today seem endless. When you look at the weather report, you are looking at a Doppler weather radar scan; it will tell you where the heaviest amounts of rain will fall in your area. It works like this, the radar signal, as it passes through the clouds is reflected back to a transmit receiver antenna that measures the density of the moisture in them and the speed they are traveling. You can then determine approximately when it will start raining and how much rain will fall in a given area. Radar is used in aviation, automobiles, law enforcement and locating objects below ground.

### How does radar distinguish between decayed and healthy wood?

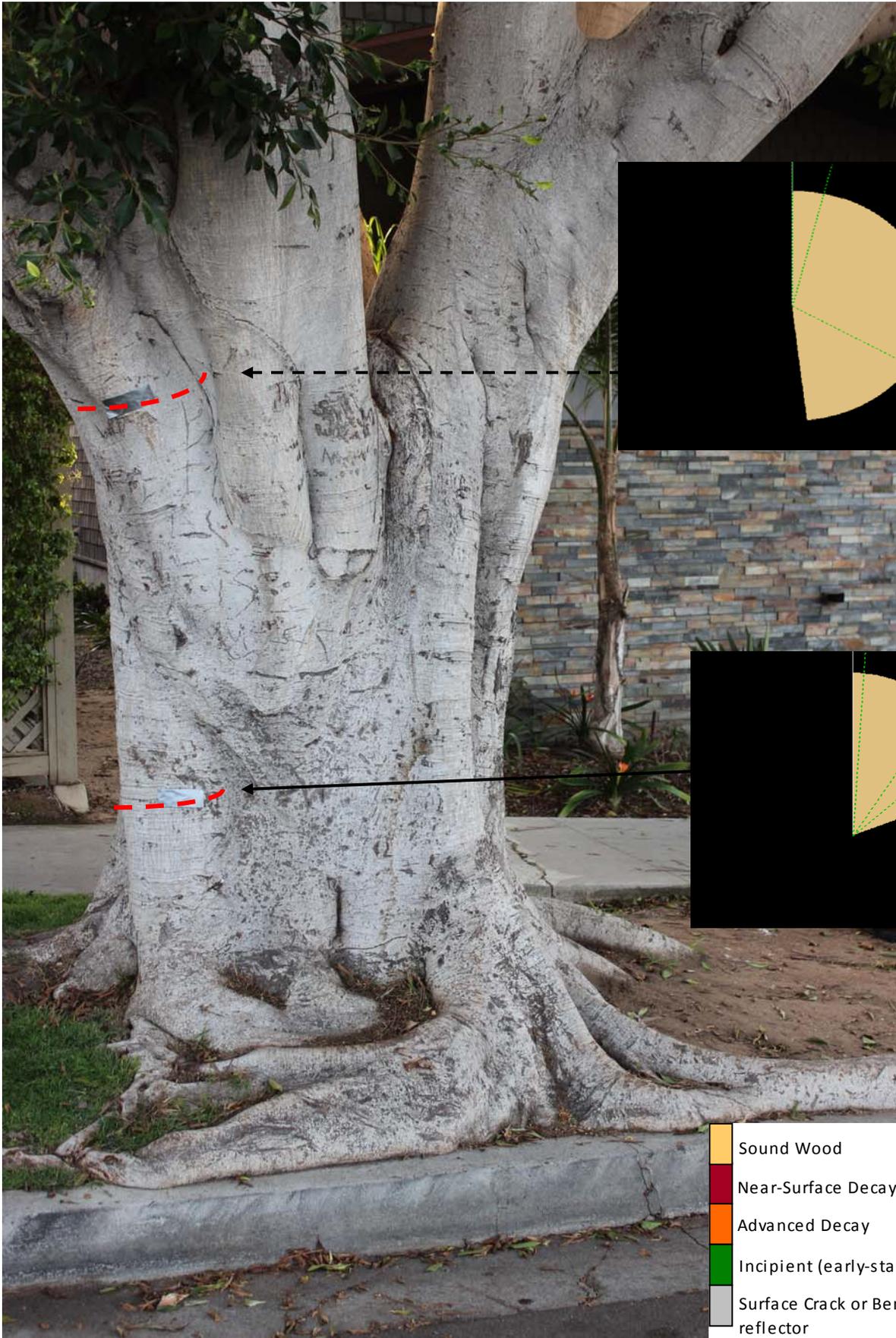
Wood decay fungi<sup>3</sup> decompose lignified cell walls in living wood tissue by using enzymatic and non-enzymatic systems. In time this creates a microscopically detectable hollow or void within the cell walls of the wood, thereby reducing normal wood strength. Radar imaging can identify these small microscopic changes (voids) in the wood composition; they reflect a radio wave from them. It's the loss of the woods mechanical strength by these wood digesting organisms that is inherently linked to hazardous situations, often resulting to injuries or property damage.

Ground penetrating radar is one of the latest non-invasive forensic technologies used for wood decay analyses; its sensitivity to hollows, internal cracks or voids enables it to detect and create an image of these small internal molecular changes in wood density and composition. Incipient decay or *early-stage* decay is the very beginning of the biodegradation process of living wood tissue by decay causing pathogens; radar imaging can detect these minute early changes.

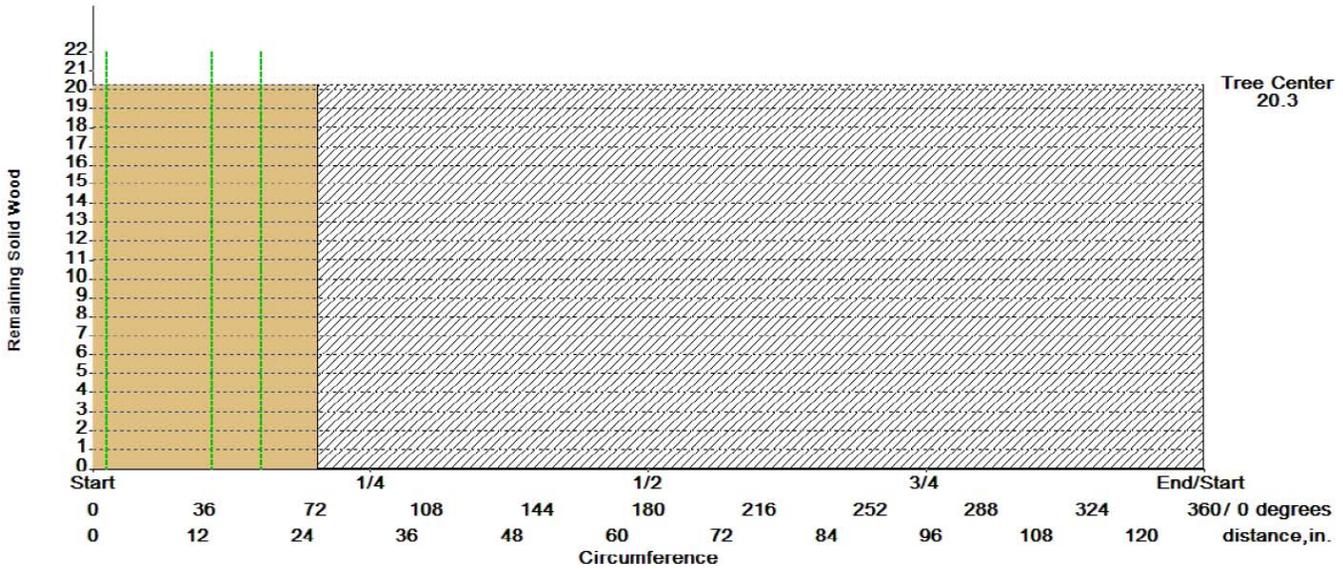
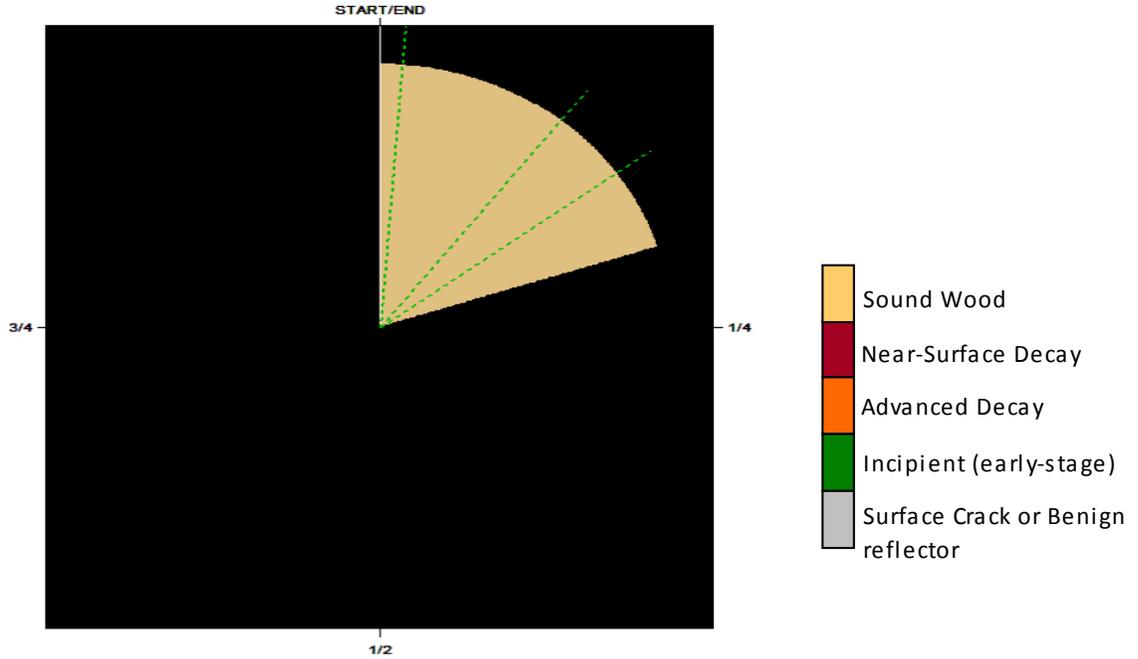
---

<sup>2</sup> Daniels, D.J. 1996, Surface-Penetrating Radar. The Institute of Electrical Engineers, ISBN 0-85296-0.

<sup>3</sup> Giovanni Nicolitti, Paolo Gonthier, Fabio Guglielmo and Matteo M. Garbelotto 2009. A Biomolecular Method for the Detection of Wood Decay Fungi: A Focus on Tree Stability Assessment. Arboriculture & Urban Forestry, Scientific Journal of the International Society of Arboriculture.



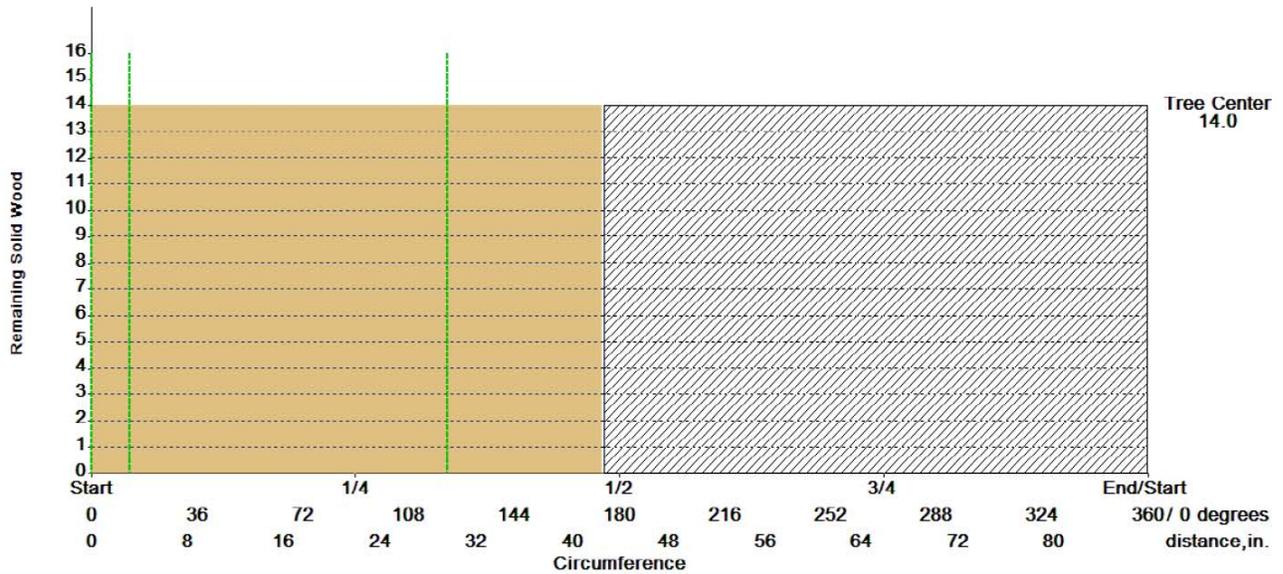
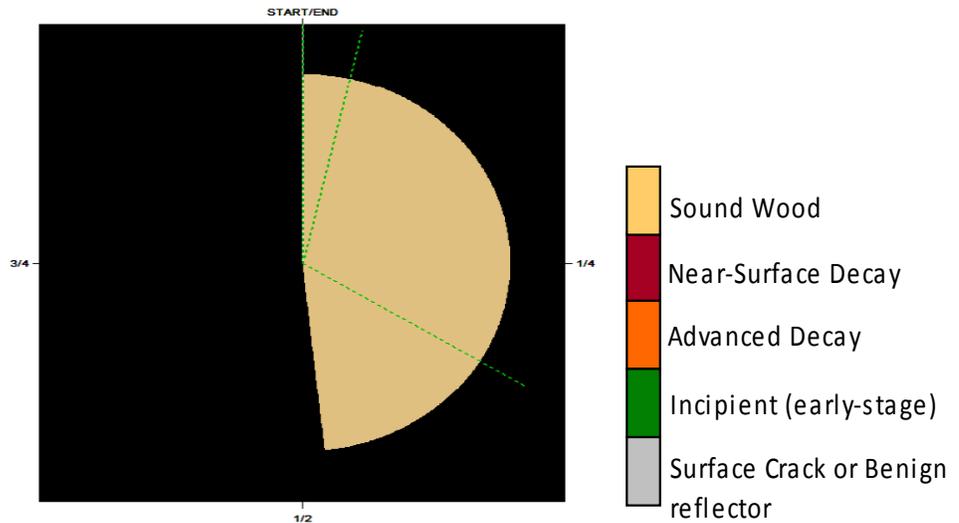
E Tree 5049 402 Second Street Date February 15, 2018 Ficus Tree  
Trunk Diameter 40.5 inches Elevation 3 feet



**Analyst Notes;** No decay detected.



**E Tree 5049 402 Second Street Date February 15, 2018 Ficus Tree  
Trunk Diameter 28 inches Elevation 76 Inches**



**Analyst Notes;** No decay detected.



## Arborist Disclosure / Performance of Services

1. **Disclosure.** Arborists are tree specialists who use their education, knowledge, training and experience to examine trees, recommend measures to enhance the beauty and health of the trees and attempt to reduce the risk of living near trees. Arborists cannot detect every condition that could possibly lead to the structural failure of a tree.

Since trees are living organisms, conditions are often hidden within the tree and below ground. Arborists cannot guarantee that a tree will be healthy or safe under all circumstances, or for a specific period of time. Likewise, remedial treatments cannot be guaranteed. Trees can be managed but they cannot be controlled. To live near trees is to accept some degree of risk and the only way to eliminate all risk associated with trees is to eliminate all trees.

2. **Indemnification from current and future tree failures.** Although radar imaging has no known harmful physical effects on trees the client agrees to indemnify, defend and hold Arborist OnSite Inc. and TreeRadar inc. harmless from and against any and all claims, liabilities, suits, demands, losses, costs and expenses, including, but not limited to, reasonable attorneys' fees and all legal expenses and fees incurred through appeal, and all interest thereon, accruing or resulting to any and all persons, firms or any other legal entities on account of any damages or losses to property or persons, including injuries or death, or economic losses, arising out of the Services and/or this Agreement, *except to the extent that said damages or losses are caused by Consultant's gross negligence or willful misconduct.* This indemnity, shall survive any expiration or termination of this Agreement with regard to any claims arising during, or related to, facts or circumstances that occurred during the term of this Agreement or any extension thereof.

No warranty, representation or guarantee, express or implied, is intended by this agreement. Consultant is not responsible for the completion or quality of work that is dependant upon or performed by Client or third parties not under the direct control of Consultant or for their acts or omissions or for any damages resulting there from.

### 3. **TreeRadar™ / Arborist OnSite® Disclaimer**

1. **Use at Customer's Risk.** TreeRadar™ and Arborist OnSite® endeavors to use equipment that generates useful information and, when provided, to prepare reports that will reflect its best judgment in light of the facts as it knows them, TreeRadar™ or Arborist OnSite® does not guarantee the outcome of its efforts or the structural integrity of any tree. Any report prepared by Arborist OnSite® or equipment and data analysis services provided by TreeRadar™ is used strictly at your sole risk

2. **Disclaimer of Warranties.** You expressly understand and agree that:

(a) Your use of TreeRadar™ equipment or Arborist OnSite's® use of ground penetrating radar technology services, are at your own risk. Such services are provided on an "as is and "as available" basis. TreeRadar™ and Arborist OnSite® expressly disclaims all warranties of any kind, expressed or implied, including but not limited to implied warranties of merchantability, fitness for a particular purpose and non-infringement. TreeRadar™ and Arborist OnSite® make no warranty that the equipment will be error-free or the data results obtained from the use of this equipment will be reliable.

Neither TreeRadar™ or Arborist OnSite® shall not be liable for any direct, indirect, incidental, special, consequential or exemplary damages, including but not limited to damages for goodwill, injury to body or property, death or other losses even if TreeRadar™ or Arborist OnSite® has been advised of the possibility of such damages resulting from the use or reliance TreeRadar™ equipment or Arborist OnSite's® use of ground penetrating radar technology.

4 **General Conditions.** Client acknowledges that it has read and agrees to the General Conditions contained in this document which are incorporated herein and made a part of this Agreement and report and shall apply to all services performed by Consultant. If this document is attached to another form of agreement whose terms and conditions conflict with this Agreement the General Conditions contained in this document shall prevail.

## **Assumptions and Limiting Conditions**

1. Any legal description provided to the consultant is assumed to be correct. No responsibility is assumed for matters legal in character nor is any opinion rendered as to the quality of any title.
2. The consultant can neither guarantee nor be responsible for accuracy of information provided by others, information not provided or disclosed.
3. The consultant shall not be required to give testimony or to attend court by reason of this consultation/reports unless subsequent written arrangements are made, including payment of an additional fee for services.
4. Loss or removal of any part of this report invalidates the entire report/evaluation.
5. Possession of this report or a copy thereof does not imply right of publication or use for any purpose by any other than the persons(s) to whom it is addressed without written consent of this consultant.
6. This report represents the opinion of consultant, and the consultant's fee is in no way contingent upon the reporting upon any pre-determined findings.
7. Sketches, diagrams, graphs, photos, ect., in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering reports or surveys.
8. This report has been made in conformity with acceptable evaluation/diagnostic reporting techniques and procedures, as recommended by the International Society of Arboriculture.
9. No tree described in this report was climbed, unless otherwise stated. Arborist OnSite® cannot assume responsibility for any defects which could only have been discovered by climbing. A full root collar or root crown inspection, consisting of excavating the soil around the tree to uncover hidden defects or disease involving the root collar and major buttress roots, was not performed, unless otherwise stated. Arborist OnSite® cannot accept responsibility for any root defects which could only have been discovered by such an inspection.

## Certification of Performance

I, Robert Booty, certify:

- That I have personally inspected the tree(s) and/or the property referred to in this report, and have stated my findings accurately. The extent of the evaluation and or appraisal is stated in the attached report and the terms and conditions;
- That I have no current interest in the vegetation or the property that is the subject of this report, and I have no personal interest or bias with respect to the parties involved;
- That the analysis, opinions and conclusions stated herein are my own, and are based on current scientific procedures and facts;
- That my compensation is not contingent upon the reporting of a predetermined conclusion that favors the cause of the client or any other party, nor upon the results of the assessment, the attainment of stipulated results, or the occurrence of any subsequent events;
  - That my analysis, opinions, and conclusions were developed and this report has been prepared according to commonly accepted arboricultural practices;
- That no one provided significant professional assistance to the consultant, except as indicated within the report.

I further certify that I am a Registered Member of the American Society of Consulting Arborists, and I am an International Society of Arboriculture Certified Arborist. I have been involved in the practice of arboriculture and the care and study of trees for over 49 years.

Signed: Robert Booty

Date: April 3, 2018