# Conservation Plan for
# Stanley Park's Hollow Tree

Prepared at the Request of Vancouver Park Board
by the Stanley Park Hollow Tree Conservation Society

October 14, 2008

The Stanley Park Hollow Tree is a unique and famous gathering place
where, for generations, people from all over the world
have stood in its unforgettable, yet intimate, natural hollow
to be photographed, to marvel at the grandeur of nature and
to reflect on our relationship to the environment, the past and our future.

- Vancouver Heritage Commission Subcommittee for the Hollow Tree

# Contents

# 1. Background and Introduction

Left alone, the remains of a once-giant cedar, now known as the Stanley Park Hollow Tree, will eventually fall down. This important Vancouver landmark, once a foremost tourist attraction, has not been a massive tree for a very long time. But it is large enough to cause harm were it to fall; and given its degree of tilt, it is possible that time is not far off. For this reason, Vancouver Park Board staff wisely brought this potential risk to the attention of Park Board on March 31, 2008.

**The Hollow Tree in March 2008**

The question of how best to move forward with the Hollow Tree was considered by Park Board at that meeting and was subsequently considered again at the June 9, 2008 meeting, where input from the Vancouver Heritage Commission Subcommittee for the Hollow Tree was heard. Both times the Park Commissioners voted to take down the tree

and lay it to rest on the ground. At the July 7, 2008 meeting, however, Park Board responded to public opinion opposing its position, as described in the meeting minutes:

**MOTION**

Commissioner Zlotnik stated that he would like to bring forward an item of New Business for the Board to consider concerning the Hollow Tree. The Chair sought agreement from the Board to adjust the Agenda to hear this Motion.

Moved by Commissioner Zlotnik,

**WHEREAS there has been concern about the Hollow Tree being taken down in Stanley Park; and**

**WHEREAS the Vancouver Park Board has previously voted to have the Hollow Tree taken down; and**

**WHEREAS the Vancouver Park Board needs an engineering report confirming that the Hollow Tree can be stabilized and made safe in an upright position on its current site;**

**THEREFORE be it resolved that the Board delay taking down the tree for 150 days to allow for a committee chaired by Lorne Whitehead to obtain from an independent engineering firm a suitable answer to maintain the Hollow Tree in its current location in an upright position within 90 days, and the committee has a further 60 days to raise funds required to implement an approved plan; and**

**Be it further resolved that the Board will not provide any funds for the retention of the Hollow Tree in its present position.**

**- Carried.**

(Commissioner Houghton contrary)

The Committee referred to in this motion has now been incorporated under the Society Act of British Columbia as the Stanley Park Hollow Tree Conservation Society. It consists of a number of volunteer professionals with a diverse range of established expertise suitable for tackling the challenge of conserving the Hollow Tree. The members are listed in Appendix 1. Their work has been motivated by the results of a preliminary study carried out by several of them and others in their former capacity as the Vancouver Heritage Commission's Hollow Tree Subcommittee, during the period of Park Board debate mentioned above. That preliminary report, which provides more detailed background, is presented in Appendix 2.

The present Conservation Plan responds to Park Board's resolution. It outlines a plan for conserving the Hollow Tree with the following goal:

**To safely retain the Stanley Park Hollow Tree,**
**in situ, upright and with its appearance substantially unchanged,**
**as a significant lasting heritage landmark in Vancouver.**

This plan develops these ideas in a manner that is consistent with best practices in heritage conservation and engineering. It leads to a recommendation for affordably and safely achieving this goal. It begins with a description of the value of the Hollow Tree, the general considerations for heritage conservation, the current state of the tree, and how these factors were considered together, without a pre-conceived outcome, in the case of the Hollow Tree. It then goes on to explain the conclusion mentioned above and to outline a plan for achieving it, as well as the resources required.

## 2. The value of the Hollow Tree

### *A Tangible Link with Nature*

The Hollow Tree is an ancient western red cedar (the Provincial tree of British Columbia) that serves as a tangible link with the natural environment of the pre-contact era. The Hollow Tree provides a scale for human experience and history; the tree says "this is what this place once was" and enables people who visit to measure "progress" – from such forests a mighty city grew! The tree also provides scale in a different way, as a natural "wonder" because of its size, verticality, and age: it's so big (we can fit inside it!), and people are so small; it's so old, and we're so young – this is a scale of another kind; a measure of the brevity of human history that humbles us.

### *From Tree to Landmark Monument*

The Hollow Tree is both a cultural and a natural landmark. The recent debate over what to do with it reflects this. If it were no more than a natural resource in the last stage of its life, then perhaps it should have been allowed to die a natural death; to fall down and return to the earth. But as a cultural resource (i.e. something that is particularly valued by society), intervention can be justified.

The Hollow Tree is both a natural and a cultural resource: it was once a living tree and then became a hollow snag which people valued and turned into a cultural landmark through their repeated visits, photography, and descriptions. It is a piece of popular art, which we have all created by visiting, touching, going inside, and snapping pictures.

The transformation into a landmark was formalized by the presence of professional photographers, who were encouraged by the Park Board in the early twentieth century to set up shop at the Hollow Tree and take pictures of visitors; by travel writers who wrote magazine articles and guidebooks about Vancouver; and by the City and the Province, which continue to use the Hollow Tree to promote tourism. The 2010 Vancouver Olympic Committee uses the Hollow Tree to promote the Winter Olympic Games: in the new mythology of the games, mascots Quatchi and Miga meet at the Hollow Tree!

Over time the tree's landmark status meant that efforts were made to preserve it. In the 1930s its top was trimmed back to reduce wind exposure. In the mid-1960s further trimming was carried out and metal bars were introduced inside the tree to re-enforce it. At the same time a concrete curb was also built around the tree to keep cars out. As a result of these modifications the landmark tree gradually became a monument.

### *Official Recognition and Protection of the Tree*

The cultural value of the Hollow Tree has received official recognition at both the municipal and federal levels. The Hollow Tree is listed as a Municipal Heritage Resource on the Vancouver Heritage Register. Listing on the Register means that any proposed interventions should be referred to the City's Heritage Commission, which is charged with advising City Council on the management of heritage resources.

At the federal level, Stanley Park has been designated as a National Historic Site and the Hollow Tree identified as a Level 1 Cultural Resource – the highest level of recognition, one of the resources that "symbolize or represent the site's national historic significance."

When the Park Board participated in the development of Parks Canada's Commemorative Integrity Statement for Stanley Park, it agreed to manage the resources that contribute to the national historic significance of the Park. A site is said to possess commemorative integrity when the resources that symbolize its importance are not impaired or under threat, when the reasons for its significance are effectively communicated to the public, and when the heritage value of the historic place is respected by all persons whose decisions or actions affect the site.

An important step in managing a heritage resource is to articulate why it is valued and what specifically is valued. This is done by preparing a Statement of Significance. The statement is used to guide decisions about management of the resource.
The following Statement of Significance for the Hollow Tree has been prepared at the request of the City's Heritage Commission.

### *Stanley Park Big Hollow Tree Statement of Significance*

#### *Description*

*The Stanley Park Big Hollow Tree, estimated to be at least 700 years old, is the remaining snag of a Western Red Cedar tree and is approximately 12 metres (58 feet) in circumference. The tree has an exceptionally large hollow core. It is located on Stanley Park Drive in the western portion of the park, in Vancouver, B.C.*

#### *Heritage Value*

*One of the most popular tourist destinations in Stanley Park, the Big Hollow Tree is significant for its aesthetic, scientific, historical/cultural, and social values, notably for its role as an historic and iconic monument widely known to the citizens of Vancouver and visitors to the city.*

#### *Aesthetic significance*

*Famous for its great size, hollow form, and worn exterior contours, the aesthetic value of the Tree is key to its overall heritage value. It is world renowned for providing the visitor with the singular experience of entering into a skylit space within a natural (formerly) living object. The Hollow Tree is valued for its material qualities, particularly the effects of natural slow decay, and its accessible surfaces, worn smooth with more than a century of intense human contact.*

***Scientific significance***

*The oldest tree in Stanley Park, the Big Hollow Tree is significant for its age and for its ongoing survival in the face of storms and human interventions in the landscape.*

*The Tree's scientific name is Thuja plicata or Western Red Cedar. It is valued as an indicator species of the Coastal Western Hemlock biogeoclimatic zone and as the Cedar tree with the largest diameter growing within the coastal forest ecosystem of the Pacific Northwest. It is a representation of the first growth that originally existed in Stanley Park, a result and an example of the natural forces that have and will continue to change the Park.*

***Historical/cultural significance***

*The Western Red Cedar has been part of local First Nations culture for centuries, used extensively in First Nations art and technology, and as the building material of choice by newcomers to the West Coast because of its resistance to decay.*

*The Tree is a record of the first post-contact encounters and relationships with the west coast forest, particularly through the lens of the late 19$^{th}$ century romantic notions of wilderness. As part of Stanley Park's pristine first growth, it emerged as one of the wonders of the local natural world early in the history of the cultivation of Stanley Park as a naturalistic urban park.*

*As a culturally modified living organism that is an important cultural artifact, the Hollow Tree represents both sides of the relationship between the natural environment and the cultural elements of Stanley Park. It has become a monument through public process, a formerly living tree, now non-living snag, transformed into a cultural icon through thousands of visits, photographs and acts of physical contact.*

***Social significance***

*The most photographed site in Stanley Park, the Hollow Tree is important for its use as the premier traditional park feature to document pleasure excursions into the park, reflecting the ability of people around the world to experience the tree either first hand or through picture postcards. The image of visitors in carriages, automobiles and on foot photographed inside the hollow displays the central role of the Tree in the city's mythology. The continuing attempts, beginning in the 1960s, to keep the tree solid and upright attest to its importance to the park and to the collective memory of the people of Vancouver, as well as to the current importance of environmental stewardship.*

*The Hollow Tree remains an icon in the popular culture of Vancouver, representing the unique identity of Stanley Park, and playing a continuing role in the perception of the Park, and Vancouver, worldwide. A replica of the Hollow Tree, made from a fallen cedar tree from Stanley Park, was used as a portal to the B.C.-Canada pavilion at the 2008 Beijing Olympics, while mascots for the Vancouver 2010 Olympics were presented photographing each other in the hollow of the Hollow Tree in classic Vancouver tradition, both testaments to the perceived power of the Tree to project Vancouver's unique setting to the world.*

***Character Defining Elements***

*Character-defining elements of the Hollow Tree include:*

*Its original physical characteristics:*

- *Its large size, contributing to the tree's monumental presence within Stanley Park, and with the largest diameter of any tree within the Park*
- *The age of the tree, about over 700 years old*
- *Its impressively large hollow core*
- *The complex internal shape arising from natural decay and erosion of the tree's interior core*
- *Opening to the sky*
- *Substantial vertical height and stature, much taller than remaining old logging stumps, indicative of its initial great height*
- *The form of the tree, with its wider base and narrowing trunk*
- *The vertical ridged texture of the tree, with its distinctive root forms*
- *Location, aspect and physical setting adjacent to the main ring road around Stanley Park, a determinant of the way the Tree was first viewed and experienced*
- *Physical association with other large-scale and impressive trees within the Park*
- *Its species, Thuja plicata, with its tendency to form a hollow core*

*Its evolved physical characteristics:*

- *11° tilt of the tree*
- *Signs of decay of wood material*
- *Signs of fire on the interior of the tree*
- *Sawn-off top*
- *Smooth surface*
- *Cabling, bolts and braces that have been added to stabilize the trunk*
- *Carving and grafitti that symbolize people's identification with the tree*

*Its associative characteristics:*

- *The long and ongoing focus of human attention on the tree*
- *The long and ongoing traditions of visiting the tree, entering the hollow core of the tree, or of having one's photograph taken in or near the tree*
- *The importance of the tree to both residents of Vancouver and visitors to the city*

# 3. Standards for the Conservation of the Hollow Tree

Since the Hollow Tree is a valued cultural resource as well as an ancient tree, it should be conserved by paying respect to best heritage conservation practices. These are set out in the *Standards and Guidelines for the Conservation of Historic Places*, a manual prepared by the federal government's Parks Canada and circulated as part of the Historic Places Initiative. (www.pc.gc.ca/docs/pc/guide/nldclpc-sgchpc/index_e.asp.) The Province of BC and the City of Vancouver have both accepted this manual as the guide for heritage resource management. The manual is also intended to be followed for the conservation of National Historic Sites, which Stanley Park has been designated.

Some notes on terminology used in this section and in the *Standards and Guidelines*:

- The Hollow Tree is considered a 'historic place' in the language of the manual, because it has been officially recognized as possessing cultural heritage value.
- The 'character-defining elements' of the Hollow Tree are identified in the Statement of Significance, reproduced in Section 2 of this document.
- 'Conservation' is the general term used for all approaches to retaining and protecting historic places. 'Restoration' is one particular kind of conservation treatment. Other approaches, which are not recommended in this Conservation Plan for the Hollow Tree, include Preservation (which would stabilize the tree as is, with its 11-degree tilt of the Hollow Tree) and Rehabilitation (which would upgrade it for a new use).

The conservation approach being selected for the Hollow Tree is 'Restoration' to its appearance in the early twentieth century, when it was a major tourism attraction. Restoration is defined in the *Standards and Guidelines*:

> **Restoration:** the action or process of accurately revealing, recovering or representing the state of a historic place or of an individual component, as it appeared at a particular period in its history, while protecting its heritage value.

The following Standards for Conservation and Restoration Projects from the *Standards and Guidelines* are particularly applicable to the restoration of the Hollow Tree:

**1.** Conserve the heritage value of a historic place. Do not remove, replace, or substantially alter its intact or repairable character-defining elements. Do not move a part of a historic place if its current location is a character-defining element.

**3.** Conserve heritage value by adopting an approach calling for minimal intervention.

**7.** Evaluate the existing condition of character-defining elements to determine the appropriate intervention needed. Use the gentlest means possible for any intervention. Respect heritage value when undertaking an intervention.

**8.** Maintain character-defining elements on an ongoing basis. Repair character-

defining elements by reinforcing their materials using recognized conservation methods. Replace in kind any extensively deteriorated or missing parts of character-defining elements, where there are surviving prototypes.

**9.** Make any intervention needed to preserve character-defining elements physically and visually compatible with the historic place, and identifiable upon close inspection. Document any intervention for future reference.

**13.** Repair rather than replace character-defining elements from the restoration period. Where character-defining elements are too severely deteriorated to repair and where sufficient physical evidence exists, replace them with new elements that match the forms, materials and detailing of sound versions of the same elements.

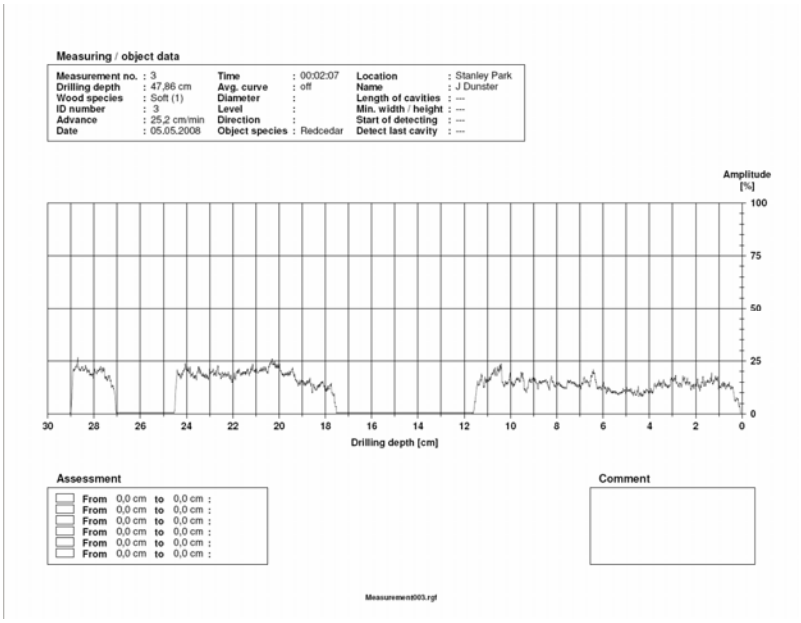
The recommendations for the conservation of the Hollow Tree that follow in the remainder of this Proposal follow best conservation practices in general, and these standards in particular.

# 4. The Present Condition of the Hollow Tree

The Conservation Society recognized the need to conduct a comprehensive physical investigation into the present condition of the Hollow Tree, in order to see what kind of intervention might be feasible. The Park Board had not investigated the properties of the tree prior to its decision to take the tree down.

The study carried out for the Park Board by DNA Engineering, reproduced in Appendix 3, describes the state of the tree, including its 11-degree tilt, without an internal study of the wood. The report concluded that the tree was insufficiently safe to allow public access. As a result, Park Board placed a barricade around the Hollow Tree to prevent any hazard to the public.

A second stage of study took place during the period of Park Board deliberation. Consulting arborist and professional forester Julian Dunster, a member of the Conservation Society, carried out a preliminary inspection of the Hollow Tree, including testing the wood making up the base region of the tree up to a height of 6 ft. (See the illustration below depicting one of the preliminary Resistograph measurements he took.) Dr. Dunster concluded, based on his many years of experience, that the higher reaches also have sufficient quantities of sound wood to ensure that the major pieces comprising the tree are not in any danger of disintegration. However, it will be necessary to discretely and firmly connect the major pieces to one another to maintain the integrity of the Hollow Tree as a whole.




**An example of Resistograph measurements taken on the Hollow Tree**

On the strength of that initial observation and the Park Board resolution of July 3 allowing the Society to study the tree, considerable additional investigation has taken place, with the relevant costs covered by $25,000 in initial donations to the Conservation Society.

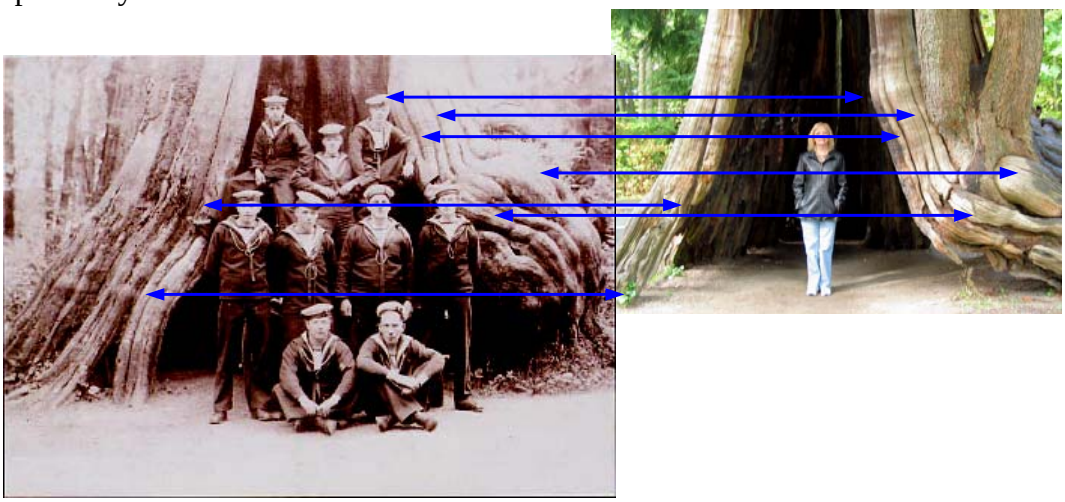
***Temporary Stabilization of the Hollow Tree***

In order to enable the safe investigation of the mechanical and structural properties of the Hollow Tree, and thus enable this Conservation Plan to be developed with confidence, it was necessary to stabilize the Hollow Tree. This was done on July 25, 2008.

An engineering plan to do so was developed by Cascade Engineering and a work plan devised by Macdonald & Lawrence Timber Framing, as shown in Appendix 4. The work involved installing two temporary support timbers and two temporary guy wires to completely, and redundantly, prevent the tree from falling, even if all support from the ground were to be lost. The stabilization project went very well, as described in Appendix 4.

***Photographic Analysis***

We compared photographs of the Hollow Tree from the early 1900s with more recent ones to determine the manner in which the tree has tilted. The photos below show two front view photographs that have been adjusted to the same scale. It is clear that the overall shape of the Hollow Tree has remained very stable over that period, and that the front of the tree has descended approximately 1 m, resulting in the current 11-degree tilt. This is encouraging news, as some had thought that the tree had largely collapsed onto itself. We now see that what had once been viewed as a narrowing of the front opening was primarily a result of the descent of the front of the tree.



**Historic and recent front views showing the front of the tree has descended 1 m. to cause the present 11 degree tilt of the tree.**

The three views below were taken from the north. Again it is clear that the tree has tilted as one unit, and importantly it is possible to see that it has tilted, effectively, about approximately a north-south axis passing through the center of the tree.

**Historic and recent side views showing the tree was originally vertical and has rotated 11 degrees about a central north-south axis.**

***Wood Strength Analysis***

***"Western Red Cedar is a fascinating wood – it contains strong natural preservatives. As a result, even an ancient cedar tree that stopped living long ago may have much solid wood inside. In other words, the external appearance tells us little about the interior strength, but modern testing methods allow us to determine what lies inside."***

***-Dr. J. Dunster, Tree Risk Expert***

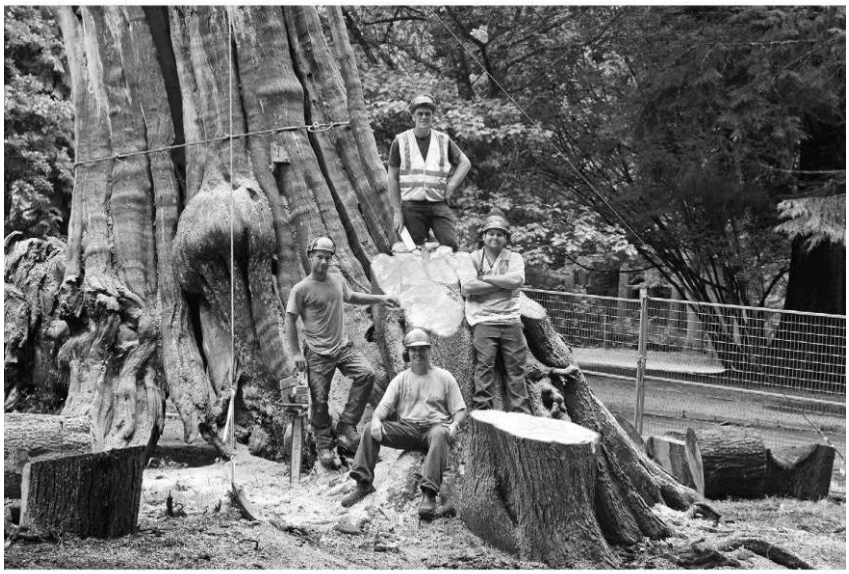
The resistograph testing mentioned above established the important conclusion that the wood making up the solid portions of the Hollow Tree is primarily sound. We also wished to carry out a laboratory test of the strength of the wood, but according to best conservation practise we did not remove any of the wood of the Hollow Tree. Instead, we obtained a sample of the inner wood of an ancient red cedar stump found on private property. Just as with the Hollow Tree, the exterior surface appears very weathered, but where there was firm wood, it was very sound. We cut a clear piece of that ancient wood, measuring 1" by 1" by 16" and its strength was measured by Professor Frank Lam in the UBC Faculty of Forestry. Professor Lam was pleasantly surprised to find that this wood was as strong, if not stronger, than Western Red Cedar harvested from living trees today. This is not particularly surprising, as the wood that makes up the trunk of any tree, living or dead, is not truly alive, just as is the case for human finger nail material or hair. Until wood rots, it lasts indefinitely. In the case of Western Red Cedar, rot may only penetrate inward very slowly and where the rot has not reached, the wood can remain very solid. To put it

another way, the old weathered look of the Hollow Tree is like grey hair on a healthy person – mainly superficial and, for many, charming.

As the project proceeds, an important component will be specific verification of wood strength at all points of attachment of the foundation to the Hollow Tree, to any supplemental structures tying major portions of the Hollow Tree to one another, and to verify continuous runs of solid wood between such points, and further to verify that all major portions of the structure are redundantly and securely connected together. This is a routine procedure for ensuring safety in an around such structures.

***Removal of the Adjacent Rotting Hemlock***

One immediate problem at the site contrasted substantially with the resilience of western red cedar. On the immediate west edge of the Hollow Tree (opposite from its natural opening) a hemlock tree had been growing for a comparatively short time (perhaps 90 years). It was dying and in the professional opinion of arborist Julian Dunster its removal would soon be required for safety reasons, because hemlock rots very quickly and not just at the surface but throughout the structural interior. That process had already commenced and was accelerating. Moreover, the hemlock's presence would prevent assessment of the Hollow Tree and its subsequent rotting would soon harm any conservation investment in the Hollow Tree. Park Board staff concurred but reasoned that they should not assist with the removal of the hemlock; they suggested that the Conservation Society should do so. We complied with this recommendation and the removal was carried out by Burly Boys Tree Service as a voluntary contribution to the project, on August 3, 2008.



**Removal of the rotting hemlock hazard, August 3, 2008**

***Root Structure***

The root structure of the Hollow Tree has been studied by means of careful non-damaging excavation. It was found that the peripheral roots that spread visibly outward are providing no support and probably have not done so for a very long time because long ago they rotted away underground. (A much faster process due to presence of moisture and soil microbes.) In contrast, further inside, and close to a central pivot line, there are several large vertical roots extending deeply into firm soil. These support the weight of the Hollow Tree, but because they are close to the center line, they do not provide quite enough torsional stability to prevent very slow tipping over many years. This observed situation with the roots is consistent with the photographic record of the tipping.

About 18 inches of peripheral root is buried underground at the front, which means that if we tip the tree back, there will not be a huge gap created at the front. And at the back, where straightening of the tree would cause the peripheral roots to move downward, there is room for this to occur.

***Deflection Response Test***

To test the feasibility of this idea of righting the tree, we carried out a small deflection test in which we employed a carefully controlled hydraulic jack to raise one of the support timbers 3 inches. At all times we measured the force required to achieve the displacement and we gathered force vs. displacement data. This data displayed a characteristic called hysteresis that provides evidence that the ground was yielding to the small displacements we introduced. We also employed quantitative imaging methods to observe the resultant deflection patterns in the Hollow Tree. These showed that the Hollow Tree deflected as one solid unit, rotating that small amount back around its original pivot line. Although these observations do not guarantee that the tree can be pivoted all the way back, they do make this seem very likely. The photo below depicts some of the mathematical analysis of the observed deflection, with movements exaggerated by a factor of 10.

**10X deflection representations. Red dots show observed displacement and the black arrows and cyan dots depict the best fit rotation.**

# 5. Conservation Approach

As mentioned in Section 3, it has been determined that the most appropriate conservation approach is to restore the Hollow Tree to its appearance in the early 20th century, when it was most highly valued by Vancouver's residents and was a major tourism attraction. This conservation approach provides a basis for making subsequent decisions as to how to carry out the work.

It is important that all interventions to the Hollow Tree follow best heritage conservation practices, as described in the *Standards and Guidelines for the Conservation of Historic Places in Canada*, while also being guided by the results of the Society's physical investigation. This section identifies the main conservation issues that were resolved in this manner.

The fundamental principle in heritage conservation is to maintain heritage values, which are identified in the Statement of Significance. This is done by respecting and retaining the Character-defining Elements. The Statement of Significance and the Character-defining Elements are reproduced in Section 2 of this proposal. From this standpoint the following questions were considered:

**1. Keep the tree standing or take it down?**

In forestry terminology the Hollow Tree is a snag (a standing tree that is no longer living) – a part of the forest with an ecological significance quite distinct from so called deadfall – a tree lying on the forest floor. From this perspective, the question is, should we artificially convert a natural snag into a deadfall? From a heritage perspective, the height, stature, hollow core, and view up to the sky are all defined as character-defining elements. These features can be retained only by keeping the tree upright. The soundness of the wood revealed by the wood strength analysis and the discovery of several large vertical roots extending deep into undisturbed soil show that the tree is sufficiently strong to support itself, with suitable reinforcement, for many years to come. These factors all clearly favour keeping the Hollow Tree standing.

**2. Replicate the tree?**

The Conservation Society considered very briefly the idea of removing the Hollow Tree and replacing it with a fabricated replica. This would preserve some aspects of the Hollow Tree experience – and the experience is a character-defining element – and would offer the possibility of longer life. However, it would fail on many other counts. Most important among them, the *Standards and Guidelines* indicate that replication (also called reconstruction) is not considered to be good heritage conservation, and is permissible only when it is not feasible to conserve the authentic resource. The physical analysis indicated that conservation is indeed feasible, so replication is not favoured.

**3. Stand the tree upright or retain the 11-degree tilt?**

The goal of restoring the tree to its appearance a century ago, combined with photographic data showing a vertical appearance at that time, leads to the conclusion that the tree should be tipped back to a vertical orientation, if possible. The photographic analysis indicated that the tree has tilted as one unit, and the deflection response test showed that it is feasible to return it to an upright position. Also, as the DNA Engineering report notes, if the tree were to be left leaning, forces would continue to transfer from the ground to new supports, which would apply unnatural torsion to the sub-component pieces of the tree. Over time, the effect of those forces could threaten the integrity of the tree as a whole. In summary, conservation theory, physical investigation, and principles of structural dynamics all support returning the Hollow Tree to its upright position.

**4. Should the new interventions be subtle or prominent?**

The tree must be stabilized in order to keep it upright over the long term. Two alternative approaches can be taken: concealing the new interventions as much as is feasible or making them a prominent feature of the work. The external bracing system proposed by DNA Engineering, which would have made the bracing very visible, is an example of the second approach. The *Standards and Guidelines*, however, say that new interventions should be subordinate to the historic resource, which indicates a preference for the first approach.

**5. Should the life of the tree be prolonged with the application of preservatives?**

The Hollow Tree will continue to deteriorate, even if very slowly, in the generations ahead. A number of preservatives and consolidants could be applied to retard the process of decay. Good arguments can be made for and against the application of these chemicals. The Society will address the alternatives at a later date, after resolving all the details for righting and stabilizing the tree. In the meantime, no actions should be taken that would irreversibly impair future freedom of choice in this regard.

**6. Documentation**

Good conservation practice and good technical practice both dictate that the Hollow Tree should be thoroughly documented before, during, and after the conservation process. To achieve this, the Society has retained the services of Dan Pierce, a film-maker who is completing his studies at Simon Fraser University. Pierce has already demonstrated his talent, as the film he made for graduation has been accepted into the Montreal and Vancouver Film Festivals for 2008.

Pierce will document the physical work and the process of conserving the Hollow Tree. He will also document the intangible heritage of the Tree by means of a series of filmed interviews with stakeholders and the general public.

# 6. The Proposed Conservation Plan: Methods and Options

The preceding section could be summarized by saying the recommendation of the Stanley Park Hollow Tree Conservation Society, in concurrence with the Vancouver Heritage Committee, is

**To safely retain the Stanley Park Hollow Tree,**
**in situ, upright and with its appearance substantially unchanged,**
**as a significant lasting heritage landmark in Vancouver.**

Based on the information that has been learned recently, and was described in Section 4, it is now clear that this plan is readily achievable.

We envision the process proceeding in five stages. Stage 1, temporary stabilization and characterisation is already complete. The remaining stages are as follows:

**2a. Installation of jacking equipment**

In this step, the temporary support timbers will be modified to include hydraulic extension jacks that will allow the tree to be deflected the required 4 feet as determined by analysis of the properly scaled photographs. The technical difficulty will be comparable to that of the temporary stabilization, with higher material costs for the hydraulic controls. The same wood framing and engineering firms are ready to proceed as soon as Park Board approval is provided and the required funding is in place.

**2b. Righting the Hollow Tree**

The jacks will then be used to bring the Hollow Tree back to its original vertical orientation. It may be necessary to proceed quite slowly to avoid causing undue deformation to the Hollow Tree. The previous deflection response test suggests that this is feasible. In the worst case, this may require loosening of the soil on one side of some of the major roots.

**3. Installing foundation micro-piles**

Once the tree is straightened, it will be necessary to prevent it from tipping again – i.e., to stabilize it permanently. Additional reinforcement will be needed in the foundation. The optimum solution is to use steel micro-piles – a well-established, non-invasive means of invisibly anchoring to the firm ground below. A group of local firms (engineering, construction and supply) have offered to provide the foundation work free of charge.

**4. Connecting the Hollow Tree the foundation micro-piles**

The next step is to secure the tree to the micro-pile foundation elements in a structurally sound and aesthetically pleasing manner. This involves design and installation of suitably discrete attachment hardware.

**5. Finalization**

Finally, we will replace all temporary wood and steel support hardware with a more aesthetically pleasing solution that is respectful of the overall heritage value of the piece. The Society is investigating the feasibility of a single, hollow bronze ring, with an opening at the front, that bolts through the inside of the pieces that make up the tree, at a height of about 20 feet. This would allow an unobstructed view of the sky from inside the tree, and would replace the complex web of steel rods and plates currently carrying out the same purpose. Rather than being purely utilitarian, there is also the possibility of the bronze ring having a decorative or artistic aspect that helps to commemorate the significance of the site.

**Engineering Certification:**

The investigative work discussed in the previous section made use of engineering design and certification services from Cascade Engineering Group, who have considerable expertise in such matters. The following letter provides their assessment of the appropriateness of this plan and their willingness to provide the required ongoing engineering design and certifications as the project proceeds:

cascade engineering group

25 YEARS 1980 2005

Susan Mundick
General Manager, Vancouver Park Board
2099 Beach Avenue
Vancouver, BC
V6G 1Z4

Dear Ms. Mundick,

**Re: Conservation Proposal for Stanley Park's Hollow Tree submitted by the Stanley Park Hollow Tree Conservation Society**

I am a registered Professional Engineer in the Province of British Columbia and both I and my firm Cascade Engineering have considerable expertise with projects involving human safety and structural engineering design of complex wooden structures and foundations.

As you will note in Appendix 4 of the above referenced proposal, my firm provided the engineering services and approval required for the recent work that successfully stabilized and enabled the safe characterization of the Hollow Tree. During that process one of our team members, Robin Zirnhelt, spent time at the Hollow Tree site and also became familiar with the overall restoration objectives for the project.

I am encouraged by the results of the subsequent testing, as described in the proposal, and I feel confident that the restoration approach is sound and has a good chance of success.

As is normal with the restoration of a natural object, the project and the associated engineering approvals will occur in stages. The following outlines our role in the staged restoration process:

- Stage 2 - jacking
  - assist with the selection of the hydraulic actuators
  - finalize and approve working drawings for incorporating the actuators into the bracing system
- Stage 3 – foundation
  - assist with the selection micro-piles to be used to hold the tree permanently in position
  - finalize the layout of the micro-piles
  - prepare detailed structural drawings as required
  - review the installation of the micro-piles
- Stage 4 – attachment
  - from the structural drawings produced above, assist with the fabrication of the attachment hardware
  - review the installation of the attachment hardware connecting Hollow Tree to micropiles
  - carry out analysis of requirement for reinforcement brackets to maintain the integrity of the existing tree structure

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- Stage 5 – finalization
  - design subtle reinforcement brackets to replace the current unsightly bracings
  - review the installation of the reinforcement brackets
  - carry out final site inspection and approve safety for public use

Although the Hollow Tree itself is unique, such a staged engineering process is quite normal and my firm is able and willing to perform this service. Indeed we would be most pleased to participate in the restoration of such a prominent Vancouver landmark and look forward to doing so once Park Board approves moving ahead with this plan.

I would be pleased to answer any questions you may have regarding this matter.

Yours sincerely,


Adrian N. Wilson, Ph.D., P.Eng.

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# 7. Resources Required for the Conservation Plan

The required resources for the conservative path are grouped into the following categories as listed below. The largest single cost, the overall design services, is being provided on a voluntary basis by the members of the Conservation Society. In all likelihood, many of the other costs may be provided on an in-kind basis by interested firms and individuals, and we also know that some donors would, if necessary be willing to contribute. In collaboration with Heritage Vancouver, the Conservation Society intends to work to arrange the necessary contributions to restore the Hollow Tree and seeks a partial contribution by Park Board in order to show its support and appreciation for this effort, as this will substantially enhance the feasibility of the required fundraising.

- **Analysis costs**
  The analysis work leading to this proposal was paid for by donations already provided, totalling $25,000. Additionally, approximately 200 hours of volunteer professional labour has been invested, at a value of approximately $25,000.
- **Overall design**
  This is the ongoing work of the authors of this proposal, the Stanley Park Hollow Tree Conservation Society. The members are prominent professionals whose consulting rates are being waived. We estimate that this future work will total approximately 600 hours for project completion, representing an in-kind contribution of approximately $75,000.
- **Off-site professional services**
  In order to have utmost confidence in the required certifications, we feel that we should not seek an in-kind contribution in this area but should instead pay one or more engineering and consulting firms with experience in projects involving public risk and civil engineering of this type. We have identified suitable firms for this purpose. Some savings arise from the fact that this will be building on the preliminary design already commissioned by the Conservation Society; we expect the required fee to be approximately $20,000.
- **On-site professional services**
  Similar reasoning applies to professional services that will be required for coordination of activities at the site and for ongoing safety assurance. We estimate this component also to be $10,000.
- **On-site labour**
  There will be a need for on site semi-skilled labour, on a highly variable basis. This is expected to contribute only modestly to the cost, perhaps amounting to $10,000.
- **Materials**
  Most of the materials will not actually be consumed, so there is a good chance that they will be provided on an in-kind basis. We estimate that the commercial value of

the materials required would be in the order of $40,000 and anticipate that $30,000 will be provided on an in-kind basis.

- **Contingency**
  We feel it is prudent to identify a contingency amount of about $10,000.

These costs are summarised in the following table:

| **Item** | **Cost** | **Previous In Kind** | **Previous Cash Donation** | **Future In Kind** | **Future Cash Required** |
|---|---|---|---|---|---|
| Analysis | $50,000 | $25,000 | $25,000 | | |
| Design | $75,000 | | | $75,000 | |
| Off site professional services | $20,000 | | | | $20,000 |
| On site professional services | $10,000 | | | | $10,000 |
| Site Labour | $10,000 | | | | $10,000 |
| Materials | $40,000 | | | $30,000 | $10,000 |
| Contingency | $10,000 | | | | $10,000 |
| **Total** | **$215,000** | **$25,000** | **$25,000** | **$105,000** | **$60,000** |

## 8. Fundraising plan

Thus the total project cost is $215,000 of which $155,000 is, or will be, covered as follows: Previous in-kind donations of $25,000; previous cash donations of $25,000; future in-kind donations pledged at approximately $105,000. This leaves a remaining cash requirement of $60,000, which the Stanley Park Hollow Tree Conservation Society intends to raise.

On a separate but related note, we believe that the landscaping and information material provided at the site should be the responsibility of the Park Board, just as is the case at any other place in the Park.

The Society will access the required additional cash through:

- Public fundraising
- Grant support for conservation (e.g. Heritage Legacy Fund of BC)
- Grant support for documentation / film-making

Our goal, which we believe is readily achievable based on our success to date, is to raise the required funds by December 31 and to have the project complete in time for the 2009 summer tourist season.

# 9. Conclusions and Next Steps

To summarize, the Stanley Park Hollow Tree is a cultural heritage landmark that should be conserved because it has a strong base of public support and it is practical to do so.

The practicality of such conservation has been established by expert analysis of all relevant factors including the wood strength, analysis of the history of the tilt, examination of roots, and measuring the response to a deflection test.

Expert analysis of best conservation practise led to the conclusion that the most appropriate conservation approach is restoration to the appearance in the early 20$^{th}$ century and the proposed conservation plan and budget indicate that goal is feasible.

Therefore, the recommended next steps are as follows:

1. October 27, 2008 Park Board approves Restoration of the Hollow Tree according to the plan described herein.
2. October 28 to December 31, 2008 the Stanley Park Hollow Tree Conservation Society, in collaboration with Heritage Vancouver and with the support of Vancouver Park Board, accesses the required cash donation and in-kind pledges to enable the project to be completed.
3. January 1, 2009 to May 31, 2009, the conservation steps outlined in this report are carried out in parallel with Park Board site preparation activities.
4. June 2009 Park Board, VANOC and Provincial officials hold opening ceremony aimed at increasing tourism and recognizing donors.

## Appendix 4 Stanley Park Hollow Tree Conservation Society

The Stanley Park Hollow Tree Conservation Society is incorporated under the Society Act of British Columbia.

**Board Members:**

**1) Harold D. Kalman**, Ph.D., BCAHP
Principal, Commonwealth Historic Resource Management Limited
(604) 734-7505 kalman@chrml.com
Hal is a heritage planner and a principal of Canada's first and largest heritage consulting firm. He is President of the BC Association of Heritage Professionals, the BC member of the Historic Sites and Monuments Board of Canada, the former chair of the Vancouver Heritage Commission, and a former board member of the Association for Preservation Technology.

**2) Edward M. Lewin**

Edward M. Lewin Law Corporation
Suite 315, 2233 Burrard St.
Vancouver, BC V6J 3H9, Canada
Phone: (604) 738-1466
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**3) R. Bruce Macdonald,** B.A. Sc. (Civil Engineering), P.D.P (School Teaching)

Principal, Living History Historical Research & Consultation
Member, Vancouver Heritage Commission Sub-Committee (reviewing the heritage values of Vancouver's historic places)
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Bruce received a major Social Sciences and Humanities Research Council grant at SFU to produce an innovative history of Vancouver, "Vancouver: A Visual History," and works on Vancouver heritage issues. He has an abiding interest in the unique aspects of Vancouver, and first wrote about the Hollow Tree in 1990.

**4) Meg Stanley**, BA (Honours History), MA (Public History/Canadian History).
Historian, Commonwealth Historic Resource Management Limited
Vice-Chair, Friends of the City of Vancouver Archives, Member, City of Vancouver Archives Advisory Committee
308-2233 Burrard Street, Vancouver, British Columbia
604 734 7505 meg@chrml.com
Meg Stanley's work in the field of heritage conservation focuses on the intersection of history and the environment, built and natural. Her publications include an article about the Hollow Tree for Canada's national history magazine, *The Beaver*.

**5) Lorne A. Whitehead**, B.Sc. (Honours Physics), M.Sc. (Low Temperature Physics), Ph.D. (Applied Physics), P.Eng. (British Columbia, Electrical Engineering)
Professor and Leader of Education Innovation, University of British Columbia
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In his research capacity, Lorne specializes in finding innovative solutions to technical problems, and in his administrative responsibilities he employs the principles of innovation to help make organizational improvements.

**Other members:**

**6) Randolph A. Churchill,** Ph.D. (Engineering)

Project Manager, Macdonald & Lawrence Timber Framing Ltd.
1356 Ball Road, Cobble Hill, BC
(250 ) 743 - 8840 randy@macdonaldandlawrence.ca
Randy coordinates complicated heavy timber design, construction and installation projects.

**7) Julian Dunster**, B.Sc. (Forestry), M.Sc. (Forestry), Ph.D., (Regional Planning and Resource Development)
Registered Professional Forester in British Columbia (# 1708)
Professional Planner, with membership in the Canadian Institute of Planners and the Planning Institute of British Columbia
Certified Arborist with the International Society of Arboriculture (PNW 089)
Registered Consulting Arborist - American Society of Consulting Arborists (RCA # 378)
Certified Tree Risk Assessor # 1. PNW ISA and Lead Instructor in British Columbia
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Julian has delivered lectures on his work all over the world, with an emphasis on trees and environmental issues, conservation, and designs that will contribute to better environmental awareness. He has served on several Boards of Directors, audit committees, and panels, and has considerable expertise with non-profit groups in the environmental sector, helping them to develop strategies for promoting their goals, and deliver effective critiques and messages. He has published several books and numerous articles.

**8) Ian Green**
President, Greenheart Conservation
(778) 898-9694 ian@greenheart.ca
Greenheart is a world leader in developing, manufacturing and installing forest canopy walkways all around the world. As such, his firm routinely finds practical methods for managing human safety in civil engineering projects based in, on, and around large trees.

**9)** (Chair) **Karen Jarvis** B.A.P. (Bachelor Landscape Architecture), Dip.T. (Forest Resources Management), RPF
Professional Forester, Campbell Jarvis Landscape Forestry
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Karen specializes in visual resource management / landscape assessment in both urban and forest settings. She also serves in a volunteer capacity as a Commissioner with the Vancouver Heritage Commission, providing staff and Council with input regarding heritage applications, policy and practice.

**10) Gordon Macdonald**

Building Conservator, Macdonald & Lawrence Timber Framing Ltd.
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Gordon has 20 years of international experience in building conservation and complex timber structures.

**11) Neil A. McPhail**, B.A.Sc. (Mechanical Engineering), M.A.Sc. (Mechanical Engineering), P. Eng. (British Columbia and Ontario, Mechanical Engineering) Financial Engineering Manager, QuIC Financial Technologies Suite 1105, 1095 W. Pender St. Vancouver, BC Canada V6E 2M6
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At QuIC Neil manages a group of software engineers and mathematicians in the development of software for valuation and risk analysis of complex financial instruments/portfolios. He is also actively consulting in the areas of advanced display technologies, hybrid solar/electric day-lighting and GPS-controlled watercraft. Prior to QuIC, he was Vice President of Engineering for BrightSide Technologies, a successful high-technology startup company purchased by Dolby Laboratories in April 2007.

**12) Philip Robbins** B.Ed. (UBC), ECIAD Diploma in Fine Art (Honours), MA from the Royal College of Art (London)
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Philip's work draws on his extensive experience in a range of materials and processes, including metal, synthetics, and ceramics. His work has shown in Canada and the UK. He is a former member of the Public Art Advisory Committee for the City of Vancouver, and the District of North Vancouver.

**13) Jon Scott,** P.Eng. (Mech Eng - UBC)
Product development consultant - Self-employed
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Jon has worked in optical & mechanical product development for almost 30 yrs, and is inventor or co-inventor on approximately ten patents.