Safer Sidewalks, Mature Trees

A Madrona Demonstration Project

Overview of the Issues, Scope of the Opportunity, and Goals:

Safer Sidewalks, Mature Trees exists to find and implement a comprehensive corridor plan for innovative sidewalk repair that, in alignment with urban forestry goals, retains as many existing street trees as possible. At present, the strategy will be focused on the 5 blocks of 34th between E Cherry and E Pike, and 1 block of Union between 34th and 33rd.

This 6-block corridor—home to residents, an electric bus route, a nearby school and library, and the neighborhood's central business district—is also home to 68 street trees (as of 9/15/12). According to SDOT records available, that number was 81 in 2007 (a loss of approximately 13 street trees in 5 years, not including one tree that was cut down and then replaced by a new tree in an adjacent location).[1] Presumably, tree loss has occurred largely because of sidewalk or property damage caused by tree roots.

The majority of trees along the corridor are red "Sunset" maples (*Acer rubrum*), others are Sugar maples (*Acer saccharum*) planted like many others in Seattle in the late-60s to mid-70s as part of city arborist Marvin Black's plan to increase urban forestry. Because of the cultivars chosen and the planting conditions offered at the time, hard and thick roots have grown too superficially, heaving sidewalks in many locations.

Today, we face a corridor badly in need of sidewalk repair. But, because of the prevalence of this issue city wide, repairs have been piecemeal with a narrow focus on single problem areas (e.g., single blocks or isolated trees) rather than comprehensive strategies. Solutions seem to be approached from a black and white perspective (keep the tree or fix the sidewalk, but not both) and seem to prioritize cost over other factors like urban forestry or community preference. There is considerable discrepancy between SDOT's evaluation of the health of the trees and independent arborist evaluation (discussed below). The Madrona community including Business Owners of Madrona (BOOM), has voiced its desire to find a sidewalk repair solution that does not involve removal of existing street trees wherever possible and that adds to the canopy by planting new trees in vacant locations. SSMT sees the 900 block of 34thas the perfect opportunity for a pilot of innovative strategies. The rationale is both aesthetic and economic.

[1] http://web1.seattle.gov/SDOT/StreetTrees/ compared with current survey (see corridor map)

Aside from the beauty of their canopy, these trees reduce traffic speed, cut traffic noise, make the corridor more appealing to pedestrians, improve business revenue, improve air quality, reduce crime, and increase property values between 5 and 20%.[2] However, we recognize they do not come without a cost, particularly in the form of maintenance. Just like historic buildings, trees and landscapes are not self-maintaining and require ongoing care--just as our children, our cars and computers, and our infrastructure do. Due to the current economic climate, the city's capacity (personnel, funding) to offer creative, comprehensive solutions to tree and sidewalk maintenance is extremely limited. Thus, the primary goal of SSMT is to leverage community capacity toward partnerships and collaboration the end result of which will be development of a comprehensive corridor solution using innovative strategies for sidewalks repair, meeting federal guidelines for safety and accessibility, with the joint goal of preserving healthy existing trees, and replanting as many new trees along the arterial as possible. If a partnership is achieved, the efforts to carry out the comprehensive plan will be shared by the city and the community.

Document Purpose

This document is meant to serve as both a current assessment of the corridor and a vision for its future. It includes a map of the corridor, assessment by a certified independent arborist of the 3 street trees currently in jeopardy along the 900-block, and an initial proposal for pro-tree sidewalk repair strategies that have been successfully used elsewhere and which we'd like to pilot in Madrona.

It is SSMT's hope that this will serve as a draft plan to be fleshed out in collaboration with both independent consultants and SDOT professionals toward a win-win strategy for Madrona and the city of Seattle.

Brief History and Action Plan for SSMT

Residents and business owners of Madrona (BOOM) have formed an action committee "*Safer Sidewalks, Mature Trees – Madrona Demonstration Project*" to facilitate the study, planning, and funding of innovative sidewalk repair along Madrona's main arterials. The committee plans to produce a "win-win" comprehensive, up-to-code design that improves safety and access while retaining beauty, focusing on preservation, and honoring history.

The project is underway and will occur in three phases:

PHASE 1: SETTING THE STAGE FOR INNOVATION – APRIL 2012 – OCTOBER 2012

- Formation of an unincorporated association (complete 6/5/12),
- Raising community awareness (began 5/10/12),

[2] http://www.frinkpark.org/trees.htm

- Nomination of existing tree canopy along 34th as a collection of trees, via Heritage Tree program (complete 4/18/2012) – this step was meant to communicate the importance of tree canopy to our community
- Begin fundraising (community donations began arriving 5/30/12); fundraising, NMF and other grant applications will occur beyond Phase 1 dates (i.e., application for Small and Simple Project funds to be submitted 10/8/12).
- Partner with SDOT to delay action in anticipation of independent study.

PHASE 2: CONSULTATION AND PLANNING, THE STUDY PHASE – JUNE 2012 – APRIL 31, 2013

- Drawing in part from two successful models: LA's *Healthy Trees, Smooth Sidewalks* Case Study, and New York City's *Street Trees and Sidewalks* Pilot Program, as well as other current knowledge and emerging trends we will engage consultants for the following study:
    - Sidewalk Survey = we plan to refer to SDOT's assessment of problem sidewalks in Madrona as well as conducting an independent survey of the sidewalks along 34th, Union, and Cherry
    - Tree Evaluation = Consultation with Favero Greenforest, Certified Independent Arborist. Consultation to include individual case evaluation for all "problem" trees along 34th and Union *including the 3 remaining trees along the 900 block*. Assessment phase 1 (900 block) occurred on 9/20, report to be received by 9/28. Phase 2 (remaining 23 trees) to commence after MCC draft review and should funding be received.
    - Sidewalk Engineering Strategy Exploration = this will include review of emerging innovations, consultation with landscape architects, civil engineers, storm water engineers, SDOT, and Urban Planners with relevant expertise. (Several relevant consultants have been contacted and/or retained. Some consultants have already donated time for draft development. Consultant bids will be requested upon SDOT partnership with SSMT and MCC.)

PHASE 3: ECONOMIC PLAN, COMMUNITY EDUCATION/COMMUNICATION, AND IMPLEMENTATION – JANUARY 2013 – PROJECT COMPLETION

- *Safer Sidewalks, Mature Trees* is currently investigating a number of City, Neighborhood, and alternative funding opportunities. Two grants have been submitted to date, and funding will include private donations and grants, and may include other vehicles as well. The economic plan will be compiled once bids for implementation are received.

- *SSMT* will partner with Madrona Community Council to ensure community involvement and communication for successful project participation and completion.

Careful documentation of these phases with an eye on replicability and long-term funding for maintenance will be included.

Overall corridor assessment

SDOT's Liz Ellis and Dave Allen provided the community with a copy of their street tree map of the corridor at an informational gathering called by SSMT on 4/16/2012. The map identifies the trees funded for removal on the 900 block (brown dot) as well as those causing notable sidewalk damage (blue dot), presumably future candidates for removal though not yet funded.

SSMT members assessed the corridor to verify tree count, location, sidewalk measurements and sidewalk damage. There were discrepancies between the map and the current conditions along the corridor. For example, SDOT's map indicated the presence of several trees where they had already been cut down. As such, we offer an updated assessment noting where trees have been removed since the map was created, and where trees exist that are not indicated on the map.

Attachment A*: Corridor Map, current as of 10/1/12*. See legend.

Measurements were taken along the entire 6-block corridor and under current conditions, nowhere did a site exist adjacent to a tree (or otherwise) that could not accommodate at least 48 inches of sidewalk (required per ADA). Careful inspection by SSMT volunteers also revealed locations where private property landscaping or right-of-way landscaping encroaches on sidewalk space (*see Attachment A*). This could be mitigated on a case-by-case basis as necessary to ensure the full 48 inches are free of vegetation.

Thus, contrary to SDOT's assessment that the sidewalk depth does not offer enough room for a 4-foot planting space, measurements along the corridor conducted independently indicate room to meet the 48-inch accessibility requirement *and* offer a four-foot planting space for existing trees (or new replantings). This will be even more achievable if SDOT is amenable to reducing arterial street depth without impacting parking in favor of "buying" more room for street trees (further discussion below in *Recommendations*).

Tree evaluation

On their map, SDOT indicated 29 corridor street trees as causing significant sidewalk damage (blue dots). This number is actually 26 because 3 of 29 trees mapped have been removed already. Of the 26, three are slated to be removed in

early October 2012 completing removal of all 9 trees along the 900 block of 34th. Of the 6 trees already removed, one has been replaced on the north end of the 900 block in a curb bulb. If the 3 trees are removed as planned, another replacement tree will likely be planted at the south end. Replacements are Paperbark Maples (*Acer griseum*) a much smaller, slower growing cultivar unlikely to produce any kind of canopy similar to the current canopy.

There is a potential conflict of interest related to using only internal-to-SDOT tree evaluation to guide sidewalk repair project. Sidewalk repair and street tree maintenance budgets conflict with tree preservation and urban forestry goals and an independent expert assessment is necessary to offer a conflict-free perspective.

SSMT hired an independent arborist, Favero Greenforest (ISA, ASCA, PNW-ISA certified), to conduct two phases of tree evaluation. Each phase will include assessing the health of the trees, their probable lifespan, the damage they are causing, and recommendations regarding root pruning and alternative sidewalk repair. Each tree was also graded on a modified version of *Innovative Sidewalk Repair in the City of Los Angeles: A Case Study*. The goal is to produce a comprehensive, independent assessment of corridor trees so that engineering strategies will appropriately focus on preserving healthy, stable, valuable trees and replacing those that are otherwise.

The two phases of independent assessment are as follows:

Phase 1: Evaluation (conducted 9/20/12) of the 3 trees along the 900 block of 34th. A sub-goal of the Phase 1 assessment is to produce a template for evaluation of additional corridor trees.

SDOT's evaluation of these 3 trees concluded they should not be retained because they are either not healthy enough, would not survive root pruning or are not valuable enough to preserve. This assessment is in stark contrast to that of the independent arborist.

See Attachment B: *"Greenforest, Inc. Consulting Arborist Report RE: Assessment of Three Street Trees: 900 Block of 34 Ave"*

Phase 2: TBD of the additional 23 trees noted by SDOT as problematic. This phase will launch once funding is secured. Should SDOT or others request additional assessment of the remaining trees beyond that offered in the Phase 1 template, those assessments will be included here.

Recommendations:

It is not disputed that were we to plan Madrona's central corridor today, we would do many things differently. That said, there is historical, physical, economic, and aesthetic value to maintaining and, in the same style, beautifying the streetscape. The vast majority (95%) of community members agree (*See Attachment C: Survey results from community assessment*) that the canopy offered by our mature trees is an irreplaceable and vital asset to Madrona. Preservation of healthy trees is critical to the community. Below SSMT offers several strategies, some which have been used by SDOT, others have not. These strategies are offered by SSMT as focal strategies to be integrated into a comprehensive corridor plan (to be drawn up by landscape architects and other professional consultants following community approval).

Strategies considered by SSMT meet the following criteria*:

- Have been piloted in other regions (whether locally or nationally) with success
- Meet regulations for accessibility per ADA or other right-of-way standards
- Improve permeable surface area in keeping with storm water retention strategies
- Provide for ample air/water movement through soil thus reducing surface roots or roots gathering at broken sidewalks, and improving overall tree health
- Offer reasonable lifespan (20+ years) with an overall reduction in long-term maintenance costs
- Are aesthetically pleasing

Strategies may be used in combination or individually, per collaborative professional recommendation for the comprehensive design.

TerraWalk® Unit pavers:

- TerraWalk pavers are the next generation of modular, rubber, sidewalk paver tiles used to replace broken concrete sidewalks around the trees. The first product "Rubbersidewalks" was created by a public inspector for Santa Monica Public Works after he became disenchanted by the miles of sidewalks needing repair and the hundreds of trees being cut down because the city was no longer willing to spend money to fix sidewalks.[3] Rubbersidewalks were used by SDOT in a few applications, but were difficult to install and have not worn well.
- TerraWalks are a different composition of recycled material that is harder but lighter, more durable, and pavers click together like Legos rather than with dowels (which were problematic) like the prior

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* Strategies in this document are focused on tree preservation, as opposed to root-zone strategies (which could be explored at a later date) meant to offer optimal planting conditions for new trees

[3] http://www.lhdesignbuild.com/article-1734.aspx

product. TerraWalks were installed by the City of Kirkland in 2010 in a high-traffic retail corridor. (*See Attachment D: Photos of the Kirkland Installation*) SSMT contacted the DPD, Public Works, and landscape design professionals involved in the project. They report being very pleased with the product. There apparently were some issues ordering the volume needed for their project, but the installation was smooth and the wear has been great.

- Reports suggest TerraWalks wear better than concrete in wet and cold weather and do not crack. They are also porous, allowing water and air to pass through to roots below. When roots heave the pavers, there is no need to excavate and re-pour concrete; the paver can simply be adjusted by itself with a fraction of the effort of repairing concrete sidewalks.
- TerraWalks are best installed in linear (rather than curvy) applications, making Madrona's corridor an excellent pilot location for SDOT. They also allow for creative sidewalk cutouts (circular or angled, rather than square) to accommodate major anchor roots and improve tree stability. They can be customized for the tree.
- SSMT estimates use of TerraWalks in 10' long x 4' wide segments wherever sidewalks are in need of repair and trees are maintained along the corridor. (n=24 locations) Actual square footage TBD. *See Attachment E: Budget* for details.

Root Bridging:

- In several cases along the corridor, roots have expanded above the natural grade extending beyond the planting space. If arborists determine these trees are not good candidates for root pruning, yet they are Grade A trees (otherwise healthy and have a useful life of more than 20 years), they may be good candidates for root bridging.
- SSMT has reviewed root bridging with metal (as used along Cherry near MLK), wood decking or wood-like alternatives, and concrete poured over a base constructed of support material. (*See Attachment F: Root Bridging*) for photos of various alternatives.

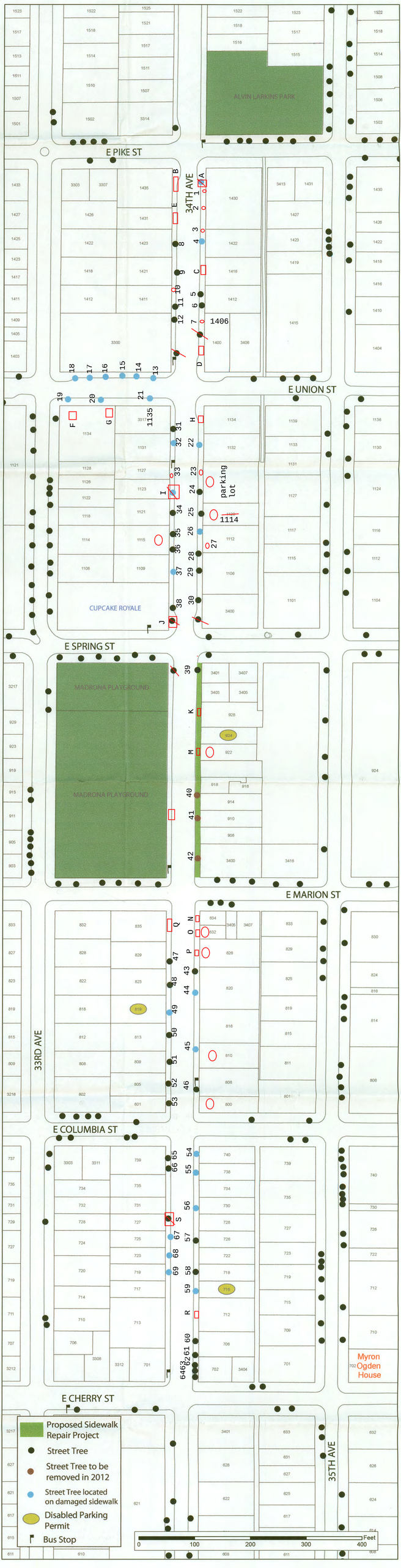
Extend planting space:

- While evaluating sidewalk alternatives, SSMT volunteers discovered an unusual possibility: Sidewalk width could be increased by decreasing arterial width, re-pouring the curb into the street.
- Option: Increase sidewalk depth by 2 feet along 34th between Cherry and Pike by reducing street width (leaving 8 feet for shared bike/park lane and 11 feet for arterial traffic and bus lane (mirroring the plans for the east side of 34th Ave e.g. between Olive and Pine). There is no significant grade change requiring additional bike "hill climb" space on the east side of the street.
    - Curbs along 34th are in disrepair and are much shorter (likely because of repaving) than the standard 6 inches. It is standard

practice to re-curb when pouring new sidewalks, so it is likely there is some budget already set aside for this expense. Re-curbing the corridor would not only create a uniform appearance, it could offer additional height to the grade of the street thereby requiring a few less inches of excavation to replace sidewalks.
    - Re-curbing the corridor as part of the plan will also increase the planting space to city standard of 5 feet (or more), allowing ample room to replace trees along the corridor.
- Extend the planting space between trees parallel to sidewalk for increased permeable surface.
- This idea is unique and SSMT volunteers could not find photos of this kind of project to offer as an example.

Next Steps:

SSMT requests that any work done to the Madrona central corridor be done as part of a comprehensive plan. A grant application is being submitted 10/8/12 for $20,000 to support corridor improvements. Sidewalk repair along the 900 block is slated to begin October 6, 2012. SSMT requests that, should the repairs proceed, they do so in a way that aligns with the above recommendations (e.g., using TerraWalk installation). SSMT urges community members to voice their desire for a comprehensive approach that capitalizes on the opportunity to try innovative strategies that retain and improve the beauty of Madrona and its part of our urban forest. Harvard leadership guru Ronald Heifetz discusses "technical solutions" in his book *LeadershipWithout Easy Answers* . These are usually temporary and ineffective at solving underlying, often stubborn problems--yes, such as tree roots undermining concrete sidewalks. The proposed demonstration project for Madrona is really an adaptive approach that has the likely potential of solving immediate problems but also providing a creative long-term solution for the Madrona neighborhood that addresses both sidewalk safety and the retention of enormously important mature trees with their attendant beauty, environmental, and economic benefits. The decision here does not have to be TREES OR SIDEWALKS. It can be TREES AND SIDEWALKS. Let's move forward with a creative solution that Madrona and Seattle can be proud of and not simply go back to "business as usual."


E PIKE ST
34TH AVE
ALVIN LARKINS PARK
E UNION ST
parking lot
CUPCAKE ROYALE
E SPRING ST
MADRONA PLAYGROUND
E MARION ST
33RD AVE
E COLUMBIA ST
Myron Ogden House
E CHERRY ST
35TH AVE
Proposed Sidewalk Repair Project
Street Tree
Street Tree to be removed in 2012
Street Tree located on damaged sidewalk
Disabled Parking Permit
Bus Stop
0
100
200
300
400
Feet

Legend:

Tree ID (1, 2, 3, etc.)
Possible tree replacement site ID (A, B, C, etc.)

Existing tree not on SDOT MAP ……

Tree Shown on SDOT map but not existing…….

Tree shown on map not existing add tree……..

Possible new tree site……

Property owner landscaping encroaching……..

Greenforest Incorporated
Consulting Arborist

9/27/2012

Aly Frei
Safer Sidewalks, Mature Trees: A Madrona Demonstration Project

RE: Assessment of Three Street Trees: 900 Block of 34th Ave

Dear Ms. Frey:

Recently, Seattle Department of Transportation (SDOT) removed 6 mature street trees from the east side of the 900 block of 34th Avenue in the Madrona neighborhood of Seattle. The sudden removal of these trees has resulted in a substantial loss for many residents, and SDOT has identified another 26 trees they plan to remove over the next several years as part of the sidewalk repair project. Three trees of which are slated for removal this year.

You contacted me and contracted my services as a consulting arborist. A group of Madrona neighbors have organized the coalition *Safer Sidewalks, Mature Trees* (SSMT), which exists to find and implement an innovative solution to repairing sidewalks along the main arterials of the Madrona neighborhood, and that does not destroy or severely impact the current mature canopy of existing street trees.

My assignment is to inspect and assess the three trees proposed for removal this year. The purpose of this report is to establish the current condition of these trees, estimate future growth rate and remaining useful life, and recommend whether these trees are good candidates for root pruning and alternative sidewalk construction.

This report is to be used by SSMT to initiate a dialogue with SDOT and establish a protocol for creating safer sidewalks while preserving the mature street trees.

I inspected the three subject trees on 9/20/2012. I measured tree height, canopy width, trunk diameter (DBH), live crown ratio (LCR), and current growth rate. I evaluated both tree health and structure. I also graded each tree on a modified version of *Innovative Sidewalk Repair in the City of Los Angeles: A Case Study*. I measured the horizontal distance of obvious sidewalk lift, counted the number of shims installed at lifted sidewalk panels, and photographed each tree.

Each tree has a single trunk with an excurrent structure arising approximately 10 feet from grade. The trees have been pruned to accommodate for the overhead power

4547 South Lucile Street, Seattle, WA 98118 Tel. 206-723-0656

lines, and there are no open wounds or weak attachments associated with prior pruning. One tree has a wounded scaffold branch above the curb from being struck by a vehicle. Shoots low and inside the canopy are growing from .5 -1.0 inch per year. Shoots in the canopy top are growing 6-8 inches per year. I observed no obvious structural defects with these trees.

It is my opinion that all three subject trees are healthy, and structurally sound. They have several years of remaining useful life as street trees, and I recommend root pruning and alternative sidewalk construction to assure their preservation.

Given the current health of these trees, I expect continued growth, both canopy volume and trunk diameter. As trees reach maturity, growth rate slows: particularly vegetative shoots. I expect the trunks on these trees to approach 24" DBH within the next 20 years, and shoot growth to continue, but to slow to 2-3 inches per season.

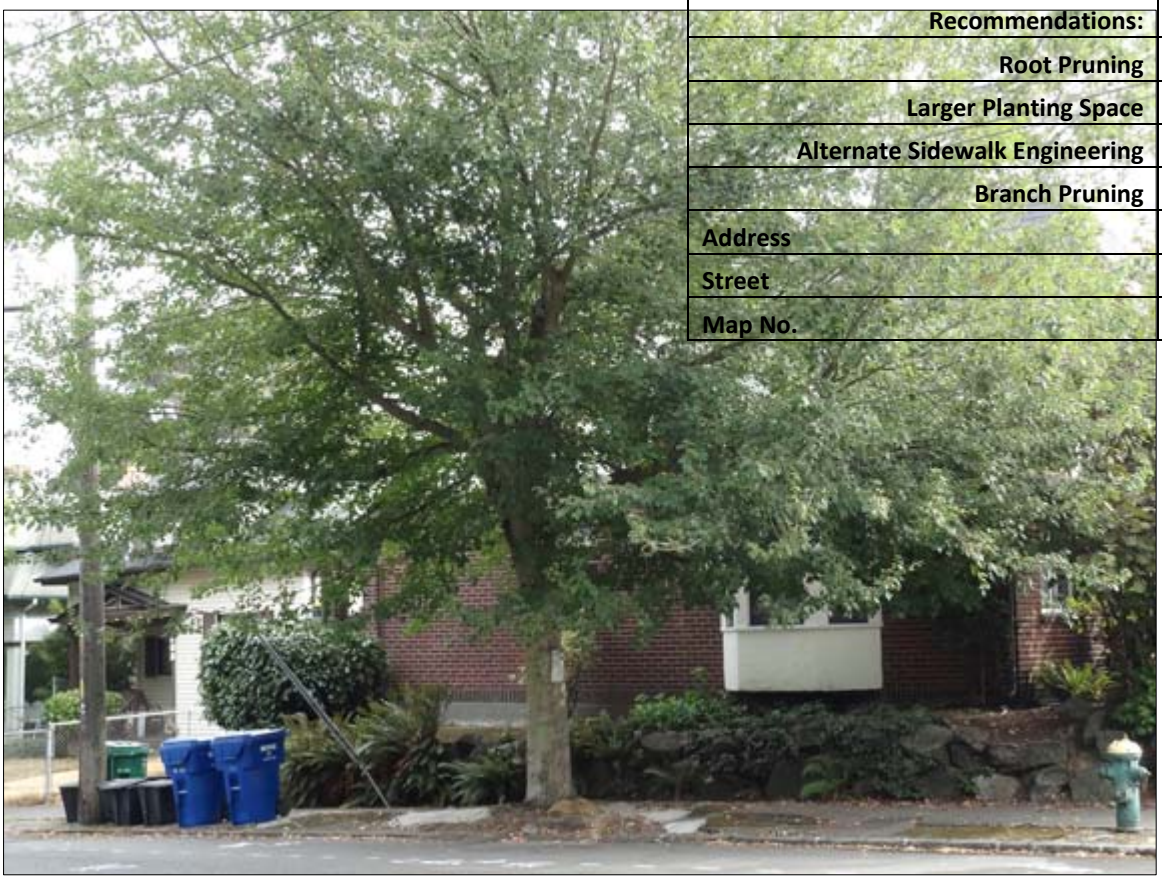
Sidewalk lift on all three trees extends 10 to 25 feet on either side of the trunk. Roots this distance and even closer to the trunk can be pruned without jeopardizing tree stability. It is challenging to assess the potential for root pruning without fully knowing how many roots are present beneath the sidewalk, or exactly how far the roots extend.

I graded each tree using a modified version of Innovative Sidewalk Repair in the City of Los Angeles: A Case Study. All subject trees are considered to have significant aesthetic and environmental attributes and/or historical importance.

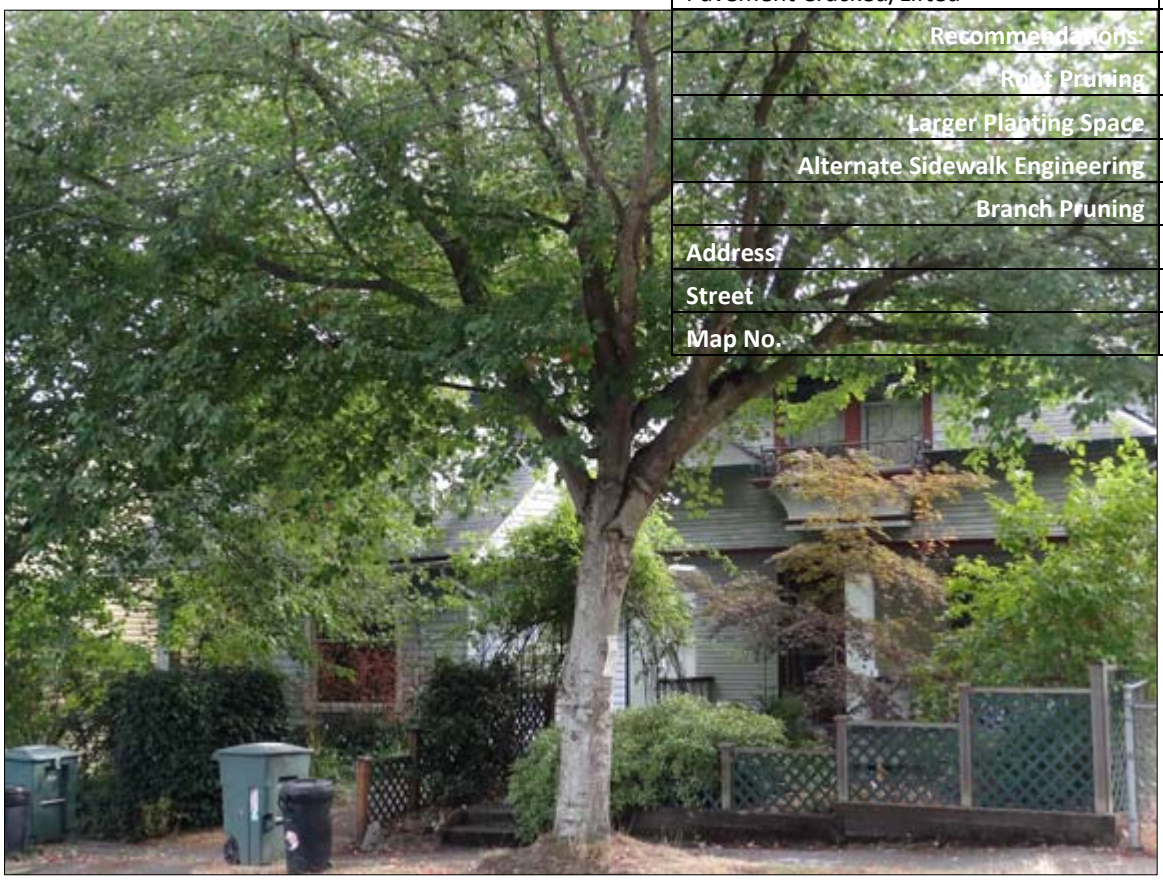
- A – Tree is healthy, structurally stable, and has an expected remaining useful life of twenty years.
- B – Tree is healthy, structurally stable, and has an expected remaining useful life five to twenty years.
- C – Tree vitality is senescent, is creating extensive structural damage, and/or is the improper species for given site constraints.
- D – Tree is declining in health and will likely live five years or less, or is structurally unsound and has a high failure potential.
- F – Tree is dead.

Following is specific data and photographs for each of the three subject trees.

Tree No. (SDOT)	**TRE-60048**
Species	Red maple
Dbh	16.25"
Tree Height	45'
Canopy Width	46''
LCR	75%
Health	Excellent
Structure	Good
Grade	A
Defects	None Visible
Growth Rate (Expected)	.5 - 6"
Sidewalk Lift (Horizontal Distance)	24'
Shims Installed	5
Curb Lift	Yes
Pavement Cracked/Lifted	Yes
Recommendations:	
Root Pruning	Yes
Larger Planting Space	Yes
Alternate Sidewalk Engineering	Yes
Branch Pruning	No
Address	3402
Street	Marion
Map No.	42



Tree No. (SDOT)	TRE-60049
Species	Red maple
Dbh	16.75"
Tree Height	51'
Canopy Width	38'
LCR	75%
Health	Excellent
Structure	Good
Grade	A
Defects	None Visible
Growth Rate (Expected)	.5 - 6"
Sidewalk Lift (Horizontal Distance)	20'
Shims Installed	4
Curb Lift	No
Pavement Cracked/Lifted	No
Recommendations:	
Root Pruning	Yes
Larger Planting Space	Yes
Alternate Sidewalk Engineering	Yes
Branch Pruning	No
Address	910
Street	34th
Map No.	41



Tree No. (SDOT)	TRE-60050
Species	Red maple
Dbh	17.5"
Tree Height	58'
Canopy Width	33'
LCR	80%
Health	Excellent
Structure	Good
Grade	A
Defects	None Visible
Growth Rate (Expected)	.5 - 6"
Sidewalk Lift (Horizontal Distance)	26'
Shims Installed	5
Curb Lift	No
Pavement Cracked/Lifted	No
Recommendations:	
Root Pruning	Yes
Larger Planting Space	Yes
Alternate Sidewalk Engineering	Yes
Branch Pruning	No
Address	914
Street	34th
Map No.	40

Sincerely,

GreenForest, Inc.

By Favero Greenforest, M. S.

ISA Certified Arborist # PN -0143A
ASCA Registered Consulting Arborist® #379
PNW-ISA Certified Tree Risk Assessor #579

Attachment C: Survey results from community assessment

Response Summary

Total Started Survey: 223
Total Finished Survey: 223 (100%)

PAGE: MADRONA STREET TREES AND SIDEWALK REPAIR

1. I urge SDOT to work with the Madrona community to find an alternative to removal of trees while also repairing the sidewalks. I am not in favor of tree removal unless the tree is acutely unhealthy.

Create Chart Download

	Response Percent	Response Count
Yes - I want a solution that repairs the sidewalks without removing trees.	**95.1%**	**212**
No - I am in favor of repaired sidewalks at the expense of the trees.	4.5%	10
Other (please specify) Show Responses	0.4%	1
	answered question	**223**
	skipped question	**0**

Attachment D: Photos of Kirkland Installation of TerraWalks

Attachment E: Madrona Sidewalk Improvement DRAFT Preliminary Budget

SOURCES of funding			
Neighborhood Grant			20,000
Neighborhood Fundraising			4,000
SDOT			40,724
Gap		0	
		total sources:	64,724
USES			
Assumptions:			
Number of Trees where Sidewalk needs replacement		24	
Square Feet of Sidewalk Repair/Planting Strip per Tree		40	
Total Square Feet of Sidewalk Replacement Cost		960	
Number of Replacement Trees		20	
Direct Construction Costs			
Demo Existing	per square foot	$ 3.00	2,880
Saw Cutting		$ 1.20	1,152
Root Trimming		$ 1.40	1,344
Dump Fees		$ 0.10	96
Terrewalk Installed		$ 13.27	12,739
Replacement Tree Soil Prep		$ 0.50	400
Replacement Tree Saw Cut		$ 1.20	960
Replacement Trees		$ 150.00	3,000
Construction Contingency (10%)		10%	2,257
Washington State Sales Tax (8.4%)		8.40%	1,896
Permit Processing Fees			5,000
			31,724
Indirect Construction Costs			
Third Party Reports			
Soils Testing			1,000
Civil Engineer			6,000
Landscape Architect			4,000
Arborist			3,000
			14,000
Other Costs			
Legal			2,000
Third Party costing/Engineer Review of Plans			1,000
Soft Cost Contingency			10,000
Inspection			1,000
Project Management Fee			-
Capitalized Maintenance Reserves			5,000
			19,000
		total Uses:	64,724

Attachment F: Root Bridging

http://www.walterreeves.com/gardening-q-and-a/tree-sidewalk-root-protection/

http://www.permatill.com/commercial-applications.php?cat=38

http://hort.ufl.edu/woody/bridging-roots.shtml

ROI COMPARISON CALCULATOR

Enter Site Scope Ft² Here:		[1 yard = 9 Ft²]

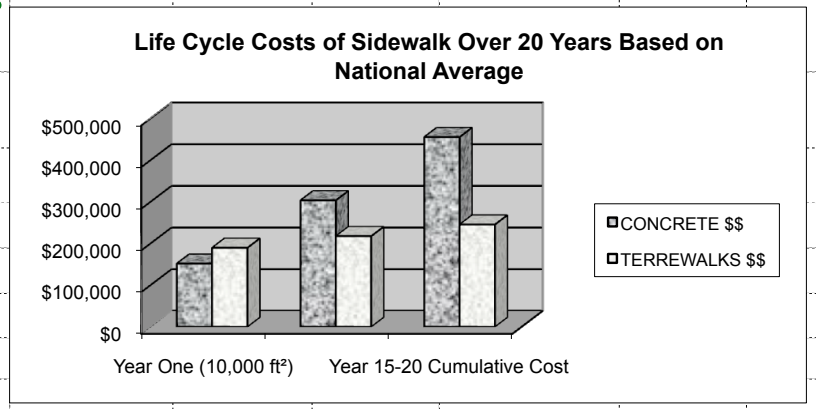
ENTER YOUR OWN COSTS BELOW

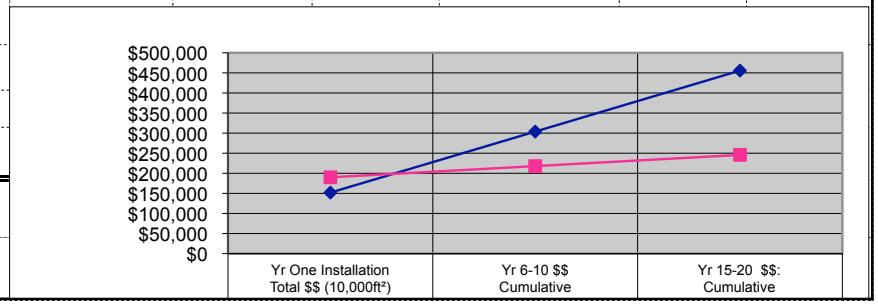
	CONCRETE SIDEWALKS Per Ft² National Average*	Concrete Sidewalk, Total Job, National Average	Your CONCRETE SIDEWALK Costs Per Ft²	Your CONCRETE SIDEWALK Costs Total	TERREWALKS Cost per Ft²	TERREWALKS Cost Total Site	Cost Difference National Average	Cost Savings for Your City
Cost Per Ft², Year One, Initial Installation :	**$15.19**	$0	$15.00	$0.00	**$18.97**	$0	$0	**$0**
Cost per Ft², Year 6-10, Cumulative:	**$30.38**	$0	$30.00	$0.00	**$21.76**	$0	$0	**$0**
Cost per Ft², Year 11-20, Cumulative:	**$45.57**	$0	$45.00	$0.00	**$24.55**	$0	$0	**$0**

When considering your costs:

1) The largest overlooked cost in considering sidewalk expense is cost of management, urban forestry and contingency. 2) Also consider the hidden costs of running heavy equipment, delivery delays, need for large crews, etc. 3) Consider the human and financial impact of a trip and fall injury and legal action. 4) Consider public good will and support for providing safe, attractive sidewalks, preserving trees and reducing carbon emissions.

	National Average Concrete	Enter your own costs here:	TERREWALKS costs:
Demo existing	$3.00		$3.00
Saw cutting	$1.20		$1.20
Root trimming	$2.80		$1.40
Dump fees	$0.20		$0.10
Strip/backfill	$0.10		$0.00
Form setting	$0.20	5	$0.00
Geotextile, spikes	$0.00		$0.62
Shipping	$0.00	3	$0.45
Material	$1.50		$8.50
Place/finishing	$1.00	7	$0.70
Management, contingency	$5.19		$3.00
Year One Cost Ft ² to Install: Per Sq Ft	$15.19	$15.00	$18.97
Year 6-10 & Year 15-20 Cost Ft ² to Replace: Per Sq Ft	$15.19	$15.00	$2.79





**The national average figures represent data collected from two US cities over 14 years, on 21 tree lined streets. Substantial costs were incurred each time concrete sidewalks needed attention, including grinding, patching and replacement.*

CONCRETE $$	$151,900	$303,800	$455,700
TERREWALKS $$	$190,000	$217,900	$245,800

Supplement 2: Additional Corridor Assessment Numbered Trees with Rating

Madrona Street Trees - 34th Ave Between Pike and Cherry + Union Between 34th and 33rd

This Tree Numbering System Correllates to Map

Will require repair soon

Rating Key:

1 Tree and Sidewalk are Good
2 Sidewalk Could be Improved & Heaving is Minimal (repair unlikely to damage roots)
3 Sidewalk Needs to be Replaced &Heaving is Significant (trees will likely need root pruning)
4 Sidewalk Needs to be Replaced & Heaving is so Significant that Bridging or Removal may be Necessary)

Existing Tree #	Address adjacent	Rating	
1	1430	2	
2	1430	2	
3	b/w 1422-1430	2	
4	1422	3	
5	1412	1	
6	1412	1	
7	1406 (address not shown on SDOT map)	1	
8	1423	1	
9	1421	2	
10	1411	1	
11	1411	2	
12	3300	2	
13	3300	3	Remove Blocks in Tree Well
14	3300	2	Remove Blocks in Tree Well
15	3300	2	
16	3300	2	
17	3300	2	
18	3300	3	
19	3300	3	
20	3300	3-4?	
21	3300	3-4?	
22	1132	2	
23	parking lot	2	Plants Encroaching on Sidewalk
24	parking lot	2	
25	1114/1120	2-3	
26	1116	2	Spindley Tree
27	private	3	Tree on Private Property, but disrupting sidewalk
28	1106	2	
29	1106	2	
30	3400	2	Make Tree Well Bigger
31	1135-1139	2	1135 34th: Driftwood shop
32	1137-1135	1	
33	1127	2	
34	1121	3	
35	1115	2	
36	1115	2	
37	1109	3	
38	cupcake	1	
39	3401 (northeast 900)	1	New Tree
40	914	4	
41	910	3	
42	3400	3-4?	
43	822	2-3?	Sidewalk is Bad Close to Curb, but Accessible Part of Sidewalk is OK. Raise Curb?
44	820	2-3?	Sidewalk is Bad Close to Curb, but Accessible Part of Sidewalk is OK. Raise Curb?
45	810	2	
46	806	2	
47	829	2	
48	823	2	Remove Blocks in Tree Well
49	819	3?	Handicap
50	813	2	
51	809	2	
52	805	3	
53	801	1	New Tree
54	740	3-4?	5 Ft Replacment Planting Strip
55	738	3-4?	Incline
56	730	3-4?	Curb Area is Bad
57	726	3	
58	718	1	
59	715	3-4?	
60	706	3	
61	706	1	not SDOT
62	702	1	not SDOT
63	702	1	not SDOT
64	702	1	not SDOT
65	739	2	
66	739	1-2?	
67	725	2	
68	723	3	
69	719	2	

New Tree Possiblity

Tree Well#	Notes
A	Widen Existing Tree Well
B	Widen Existing Tree Well
C	Near Leaf Art Printed in Sidewalk
D	Existing Curb Bulb, Bike Rack, Yellow Curb, Lamp Post
E	Planting Strip has Room for a New Tree
F	By Library - Tree Planting Possibility?
G	Madrona Market
H	Mailbox, Bike Rack
I	Tree Well is Filled, Concrete Could Be Removed
J	Bike Rack
K	
L	
M	
N	Water Meters in Planting Strip
O	
P	
Q	
R	Water Meters in Planting Strip
S	
T	In Front of Park