Consulting Arborist's Report
December 11, 2017

Campus Tree Evaluation

For: 92nd Street Elementary School

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Introduction

Background

The 92nd Street Elementary School is a rather limited size for its population, so that each tree is important, but space for the roots is very confined. Los Angeles Unified School District is planning campus improvements, updates and landscaping. The campus has a mixture of old and young trees in various conditions and health status. Some trees at the 92nd Street Elementary School have broken and dropped limbs. The planned construction will likely impact mature and young trees. The district and designers would like to save as many existing trees as is safe and reasonable.

This consultant inspected, measured the trees and took photographs on December 4, 2017.

Assignment

Mr. Ammar Sarsam of HPI Architecture, contacted this consultant and asked that I provide an arboricultural evaluation of all 42 trees' health and condition, professional opinions and report as appropriate. Arborgate Consulting reviewed all the existing trees on campus; provided an assessment of their health, a risk assessment, recommendations for protection, and pruning recommendations.

Tree Map


Grape St
Ninety-Second Street Elementary School
E 95th St
Anzac Ave
E 92nd
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Summary

When buildings are built, trenches are dug, and new paving installed near existing mature trees, some trees may deserve to be saved and some may not, but all will suffer some health impacts – visible or not. Roots spread much further than the dripline, more shallow and much longer than many people imagine. With early planning, monitoring and observing certain precautions, valuable large trees may be preserved. Trees as large as the ones found on this site are irreplaceable and are valuable campus landmarks, establishing a sense of continuity in the history of the campus. They can provide an instant benefit after the new building, hardscape and landscape are installed. Sound and healthy large trees in favorable locations will justify more expense to preserve, since they can easily be worth tens of thousands of dollars and still have a good remaining lifespan. Trees like the large Ficus trees can have "value" beyond what any appraisal formula would yield.

There are limits to how close roots can be cut without sacrificing health or stability. Although I am a tree advocate, I know that the lives of people are more important than trees and I will recommend the removal of any tree that cannot be made reasonably safe. At present there are four trees with high risk levels. Three of the four can be made reasonably safe with corrective pruning, but one needs to be removed quickly. Future construction could raise the risk level of other trees, if the tree protection measures are not followed.

In the recommendations chapter separate clearances for health and safety are provided, so that campus administrators can opt to risk a tree's health, but not go so far as to put people at risk due to loss of stability. Clearances are developed to keep an

acceptable loss rate, but some trees defy the odds and survive despite exceeding the standards. Regardless, reports do not save trees unless they are implemented.

Prior to my and inspection, the trees on campus already had a number of failures, injuries and stress factors. The tree map above shows the locations of the trees I was to inspect. The campus staff and LAUSD administration consider these important trees and desired a professional opinion on which trees are worthy and safe to retain and how to protect them during construction.

Protecting trees during construction requires *good* fencing, more than orange plastic fencing, to protect their root zones from compaction, trenching and pollution. Most of the trees have less open root space than they would need to remain healthy into old age. Compacted soil under paving may have some roots growing there, but they are much less healthy and dense. Trees like Ficus tend to create new root space by breaking up the paving, but that would be a danger to the students. To mitigate the effects of confined root space, existing compaction and construction compaction, vertical mulching and a reduction of paved area will be needed. The needs of trees and paving are not compatible when considered on a long term basis. If the surface roots can be protected, replacing large areas of paving around trees with good organic mulch will reduce water use and increase root health and tree health as well as stability.

Planning for large trees and their long term survival will require protecting the existing trees and providing ample space for their ever increasing root space needs. If, after construction, the remaining protected trees had too many roots cut, they will decline and die over the following years. This can take years and the trees may look terrible over that time. If even more roots were cut, they may topple suddenly during a storm or Santa Ana wind. The clearances are minimums. Long term growth and health requires even more space. Good root *and* soil protection will be needed from here on, especially during landscaping when trenching for irrigation may cut additional roots. Supervision or work around the trees through the whole process is essential.

Observations

General Findings

The 92nd Street Elementary School campus is located in Los Angeles, north of the 105 Freeway and East of the 110 Freeway. The site is nearly flat. Most of the site soil is heavily compacted due to years of foot traffic and paving. The heavy soil compaction causes trees to be shallow rooted.

The most abundant tree species around this site are the Chinese elm (10), *Ulmus parviflora*; then the rusty leaf fig (7), *Ficus rubiginosa*; crape myrtles (7, *Lagerstroemia indica*; and the southern magnolia (6), *Magnolia grandiflora*. The Chinese elms are mostly between the classrooms on the west side. The rusty leaf figs are along the south and west edges of the campus playground. Most of the crape myrtles are on the north and west edges.

For many trees, crowding has caused some unnatural one-sided growth as they reach for sunlight around their neighbor. A number of trees have crowded roots, due to being in small cutouts in the paving. The younger trees have not been affected by root crowding. The health of many older trees in cutouts has declined due to reduced gaseous exchange and reduced return of organic matter to the soil. The small planter openings are also be limiting soil moisture by increasing water runoff and decreasing water infiltration.

The larger specimen trees include the rusty leaf figs, with an average trunk diameter of 30.6 inches, and the deodar cedars, *Cedrus deodara*, with an average trunk diameter of 28 inches. Past pruning of the rusty leaf figs included lion-tail pruning, i.e. stripping out inner growth and leaving the weight and wind load concentrated at branch ends, but allowed limbs to grow long, creating a longer

lever arm. Lion-tail pruning has left large gaps of the inner branching and concentrated foliage at the branch ends. This has led to several limb failures in both the Ficus and the deodar cedars.

Several trees have large amounts of included bark in the branch crotches, making for weak branch attachments. Such limbs need to be removed or reduced. Sprouts (epicormic shoots) indicate over-pruning or heading. Sprouts are weakly attached as well, but can be spaced and reduced to correct some of the lion-tail pruning.

The largest tree, a rusty leaf fig cultivar, *Ficus rubiginosa Microphylla*, is a large and health specimen. It has been lion-tailed, leaving the weight of the limbs more concentrated near the ends. Lion-tailing also eliminates trees' "old age insurance", meaning that because trees often develop longer and longer limbs as they age and the weight becomes cantilevered more and more end heavy, it becomes necessary to "drop-crotch" or reduce such long limbs by cutting them back to a good sized interior limb. If most of the interior limbs have been stripped out, there may be no good place to cut them back to. Without the ability to reduce much end weight, those limbs with included bark may need to be entirely removed. Ficus tolerate heavy pruning and this tree is healthy enough to tolerate heavy pruning. This tree should be able to remain in place with appropriate protection measures, but it will need more professional pruning to correct the overly-long, poorly-attached, end-heavy limbs. This is a large and attractive specimen worth good care and more effort.

There is a large healthy Shamel ash, *Fraxinus uhdei*, with 38" trunk diameter. It is growing in a 10 x10 foot cutout east of the kindergarten building. This species is notorious for root damage and even a 10 x 10 foot cutout is not enough root room.

The crape myrtles are multi-trunked, and fairly attractive. However, they have not been trained. There are too many trunk and they have included bark between them. These are small trees, mostly out of the busy areas of the campus and thus have low risk. Although they are small trees, they are beyond the stage where they could benefit from spacing the trunk and training the branching.

The six southern magnolias are young and have not been trained yet. However, as they came from the nursery they had a strong dominant central trunk, which is an ideal form. At this time no additional pruning is needed, except to maintain that form for as long as possible. Magnolias are large shallow rooted trees and appreciate a 2-3" deep layer of mulch. They also have a proportionately wider root crown. As a result of these characteristics, the 8 x 8 foot cutouts will not be adequate for long.

Few of the trees have adequate amounts or adequate coverage of mulch. Mulch will increase root health and soil water retention. It will also protect shallow, exposed roots and, by increasing root density, maximize root utilization of small spaces. Mulch presents no danger to students, and is cleaner than muddy soil.

Common abbreviations in the following matrix include:

1s=one-sided
2long = too long
Brk = broken limb
Circ = circling roots
CO = cutout
Cod=codominant
Cr=crowding or crowded, CrS = crowded scaffolds
Db=dieback
DBH – Diameter at breast height, i.e. 4.5'
Dk = decay, DkT = decayed trunk
DL=Dog-leg
EH=end heavy
epi = epicormic shoots
FC=flush cut
Hd = headed
Inc=included bark
Inj=injury
Lt=lion-tailed
MB = mower blight, root injury
NC = narrow crotch angles
OP=over pruned
OL = over-lifted
PSHB = Polyphagous shot-hole borer
RF = root flare, 1sRF = 1-sided root flare
Sh = shallow roots
Sml = small
Sp=sparse
Tinj = trunk injury
TO – tear out
WW = weed whip damage
Xing = crossing branches

"m" preceding an abbreviation indicates a minor problem.

Matrix of Findings

map#	Species	DBH	Health	Structure	Likely fail	Likely impact	Consequences	Risk	Comments
1	Magnolia grandiflora	9	B	B	improb	unlikely	negligible	Low	Sh
2	Ficus r. Microphylla	45	B	C	possible	unlikely	severe	Low	Lt cod CrS epi
3	Magnolia grandiflora	6.7	B	C	improb	unlikely	negligible	Low	Sh circ
4	Ficus rubiginosa	25	C	C-	possible	somewhat	severe	Moderate	Cod DL FC Lt
5	Ficus rubiginosa	26	C	C	possible	somewhat	severe	Moderate	sml hanger, FC Lt, Tinj
6	Ficus rubiginosa	28	B	C-	possible	somewhat	severe	Moderate	WW cod DL
7	Ficus rubiginosa	25	B	C	possible	somewhat	severe	Moderate	WW cod 2long
8	Ficus rubiginosa	39	B	C	possible	somewhat	severe	Moderate	DL FC Lt 2long
9	Ficus rubiginosa	26	B	D	probable	somewhat	severe	Moderate	Brks cod 2long epi

map#	Species	DBH	Health	Structure	Likely fail	Likely impact	Consequences	Risk	Comments
10	Afrocarpus falcatus	12	B	C	improb	unlikely	minor	Low	2long cod inc leans
11	Afrocarpus falcatus	12	C	C	improb	unlikely	minor	Low	Sp cod leans
12	Afrocarpus falcatus	11	B	C	improb	unlikely	minor	Low	Cod leans
13	Magnolia grandiflora	9	B	C	possible	unlikely	negligible	Low	Cod Xing, 8x8' CO
14	Cupaniopsis anacardioides	16	B	C	improb	somewhat	significant	Moderate	Cod inc FC
15	Magnolia grandiflora	4.5	C	B	improb	unlikely	negligible	Low	FC 8x8' CO
16	Magnolia grandiflora	5.4	B	B	improb	unlikely	negligible	Low	PSHB 8x8' CO
17	Magnolia grandiflora	8	B	B	improb	unlikely	negligible	Low	8x8' CO
18	Cupaniopsis anacardioides	16	A	C	possible	somewhat	significant	Moderate	Cod inc, old scars on T
19	Ulmus parviflora	34	C	D	possible	likely	severe	High	Hd big cankers, 8x8' CO
20	Ulmus parviflora	13.5	B	C	improb	somewhat	severe	Moderate	Cod 4x4' CO, lifts paving
21	Citrus cultivar	6	C-	C	improb	unlikely	negligible	Low	Cod epi aphids
22	Citrus cultivar	6	C-	C	improb	unlikely	negligible	Low	Cod epi aphids
23	Ulmus parviflora	17.3	C	C-	improb	unlikely	significant	Low	Cod DL 2long
24	Fraxinus udhei	38	B	C	improb	unlikely	significant	Low	Cod CrS mLt 10x10' CO
25	Morus alba cv	14	B	D	probable	somewhat	significant	Moderate	FC Dk shear crk 1sRF
26	Handroanthus sp	10	C	C	improb	somewhat	minor	Low	Cod, low head
27	Ulmus parviflora	18	B	C	possible	somewhat	severe	Moderate	Cod Lt epi
28	Ulmus parviflora	18	B	C	improb	somewhat	severe	Moderate	Root injury 1s
29	Ulmus parviflora	17	B	C-	possible	likely	severe	High	leans cod lifts paving
30	Ulmus parviflora	14.5	C	C	improb	somewhat	severe	Moderate	leans OL DL 1sRF cod
31	Ulmus parviflora	16	C	D	possible	somewhat	severe	Moderate	Cod TO DL Lt
32	Ulmus parviflora	18	C-	D	Imminent	somewhat	minor	Low	Cod DL 2long
33	Ulmus parviflora	21	C	D	Imminent	somewhat	severe	Moderate	1s cod DL 2long
34	Lagerstroemia indica	3+4+4	B	C	improb	unlikely	negligible	Low	NC cod inc

map#	Species	DBH	Health	Structure	Likely fail	Likely impact	Consequences	Risk	Comments
35	Lagerstroemia indica	4+5+5	B	C	improb	unlikely	negligible	Low	NC cod inc
36	Lagerstroemia indica	3+9	B	C	improb	unlikely	negligible	Low	NC cod inc
37	Cedrus deodara	29	B	C	probable	likely	significant	High	2long DL
38	Cedrus deodara	27	B	C	probable	likely	significant	High	2long brks Xing
39	Lagerstroemia indica	3,3,3,3,3	B	C	improb	unlikely	negligible	Low	NC CrT
40	Lagerstroemia indica	5,3,3,3,4	B	C	improb	unlikely	negligible	Low	NC CrT Xing
41	Lagerstroemia indica	3,3,3,2,2	B	C	improb	unlikely	negligible	Low	Xing
42	Lagerstroemia indica	3.5+4	B	C	improb	unlikely	negligible	Low	Okay

DBH = diameter at breast height, i.e. 4.5 feet above grade.

Photographic Documentation

#1 Magnolia

#2 Ficus rubiginosa ‘Microcarpa’

#3 Magnolia

#4 Ficus

#5 Ficus

#6 Ficus

#7 Ficus. Note children do play and sit under these trees.

#8 Ficus is quite large

#9 Ficus has dropped limbs before.

#9 Ficus – note broken limb and past lion-tailing

#10 Fern pine (Afrocarpus)

#11 fern pine

#12 Fern pine

#13 Magnolia – note small cutout.

#14 Carrotwood (Cupaniopsis)

#14 Carrotwood – note included bark and old flush cuts.

#15 Magnolia

#16 Magnolia

#17 Magnolia – note symptom of polyphagous shot hole borer.

#17 Magnolia

#18 Carrotwood – note scars on trunk and included bark

#19 Elm – should be removed, due to large cankers from anthracnose.

#20 elm

#23 elm is one-sided

#24 Shamel ash

#25 Mulberry

#25 Mulberry – note decay at base of limb at old flush cut and shear crack in back

#26 Pink trumpet tree (Handroanthus)

#27 Elm

#28 Elm is codominant and lion-tailed

#29 Elm – note severe lean appears stable.

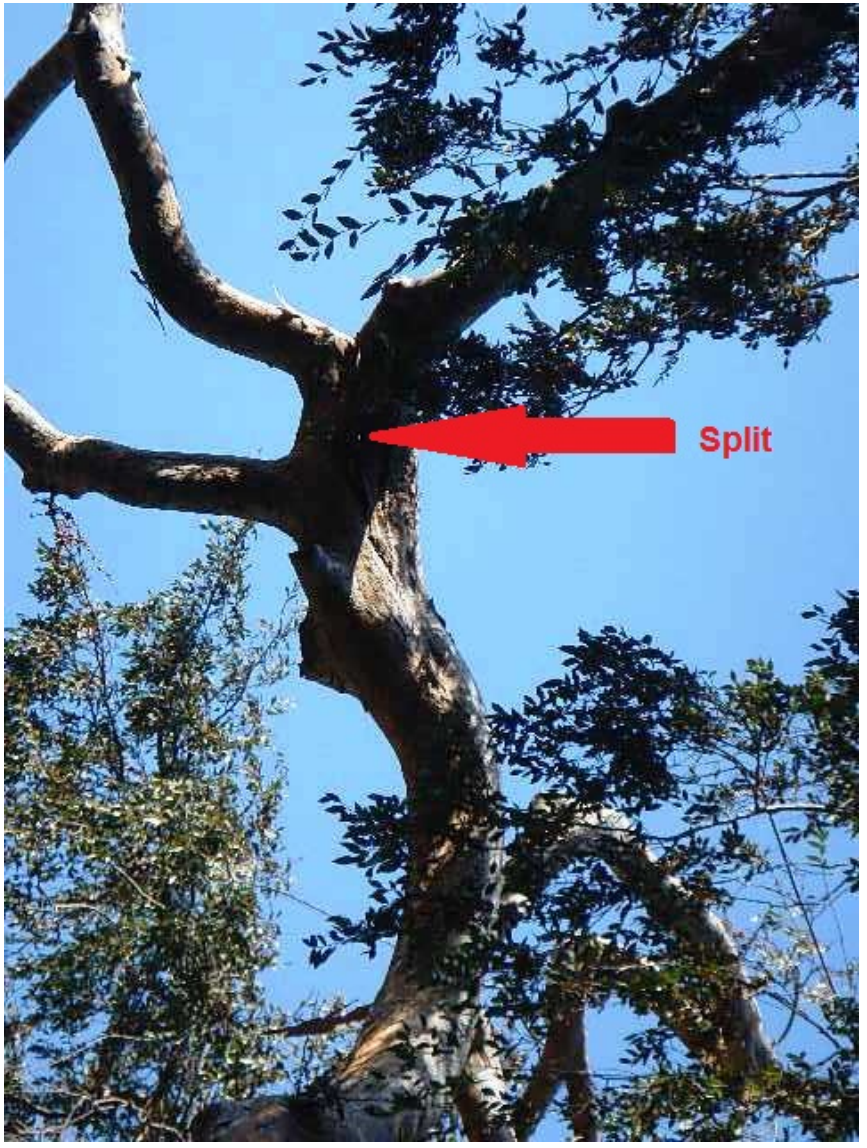
#30 Elm – note lean

#31 Elm is codominant and has dogleg scaffold limbs.

#32 & 33 Elms (right to left)

#33 Elm is codominant, one-sided, and doglegs.

#32 Elm has 2 hangers



#32 Elm also has a split at a codominant end.

#34 to 36 Crape myrtles (front to back) – note narrow crotches.

Deodars and crape myrtles at north end.

Testing & Evaluation

Visual Analysis of Tree Condition

All the subject trees were evaluated for condition of the trunk, its lean, scaffold limbs, secondary branching, foliage density, and root crown condition. The root crown was examined, as far as it was visible, without excavation. Surface roots were noted for weed whip damage, i.e. caused by string trimmers or lawn mowers, was damaging the upper surface of the shallow roots and trunks.

The health was evaluated on a visual basis. If there were no nutrient deficiency symptoms, the foliage was full and dense, there were few dead twigs or limbs, and there were no pest or disease symptoms, it was assumed that they were healthy. To the degree that symptoms or problems existed, the trees were rated on a five point scale (A to F). The best condition is termed “A“ or excellent. If there were only a couple minor problems the condition is called “B“or good. If the health was such that the tree was not in jeopardy, but it was not good, the condition is called “C “or fair. If the tree was in decline, but might be recuperated, the condition is called “D“or poor. “F” is dead or as good as dead. The condition of the structure, i.e. trunk, scaffold limbs and branches were evaluated on a similar five point scale.

The trunk diameter was measured with a Biltmore stick. The measurements were taken at 4.5 feet (DBH) to be in conformity with industry standards. If a tree branched low and the narrowest point of the trunk was below 4.5 feet, the diameter was measured there, i.e. at the narrowest point.

No internal testing was done, but if decay testing is desired, Shigometer, Resistograph and Picus sonic tomography are available.

Discussion

The preservation of trees should be based not only on the soundness, health and value of the trees, but how well they fit the new design and use of the site. The preservation decision must be based on an accurate forecast of the extra stresses imposed on trees during the construction period and landscaping, and the probable end condition of the trees.

The main stresses and risks of construction are:

- Ignoring arborist reports and instructions
- Soil compaction
- Lack of water
- Change of grade in the root zone
- Physical damage to the roots and upper structure
- Spilling or dumping of potentially toxic construction wastes
- Lack of pest control and other care
- Dust

In the consideration of the recommendations included in this report, it was assumed that no matter what level of protection is given the trees from here on, there will be considerable stress imposed on the trees related to construction. It was also considered that the new site use will allow students and staff to hold activities or pass beneath the weakened trees.

Decay, e.g. in #25, that may have been held in check can advance when the trees' reserve carbohydrates are reduced or depleted by construction impacts, or just by aging. Large roots cut for irrigation, underground utilities and footings can immediately render trees less stable during storms and strong winds. Large roots cut inside the root plate are also more likely to decay back into the base of the trunk.

Pruning

Topping, heading and over pruning result in sprout growth. These epicormic sprouts form from dormant buds and ray traces in the area of the cambium and have a weak attachment just in the outer growth ring. Normal branches are laminated on year after year with alternating branch and trunk tissue and have a very strong attachment. The shoots can be kept small to minimize the risk of their breaking out, but this will reduce the amount of green foliage and therefore the amount of food (carbohydrates from photosynthesis) that the trees get. This sort of "starvation" will prevent the tree from forming good new growth rings, healthy roots and strong compartmentalization.

Lion-tail pruning can only be corrected by keeping more internal shoots and grooming them to become permanent branches. This will take several years of annual pruning and more thought and better supervision than is usually applied to maintenance pruning. Older trees of low vigor will take even longer. Without the ability to significantly reduce end weight, those limbs with included bark may need to be entirely removed. When such limbs begin to show signs of sagging and there is no good place to cut back to, they must be removed back to the branch collar.

Careful pruning *can* reduce the risk of limb failure in such cases, but careless or unprofessional pruning will probably make matters worse. A balance needs to be struck, based on the health of the tree and how many shoots need to be removed and how soon they need to be removed. To achieve such a balance will usually require good supervision by a certified arborist, but more appropriately by a board certified master arborist or registered consulting arborist.

Soil Compaction

One of the major impacts of construction is soil compaction, both deliberate and circumstantial. Soil compaction is already at a near critical level due to the paving and turf. The compaction of the soil at a developed site is beneficial for the construction of footings, structures, and paving, but almost fatal to the roots of trees. This soil compaction often goes well beyond the limits of the footings. Evidence linking compaction to the poor health and death of trees is graphic. Root systems are very demanding and simply will not grow in compacted soil. Natural forest soils are a living ecosystem, dependant upon a critical amount of air and water filled pores spaces. A number of the necessary symbiotic partners of tree roots will not survive in less than ten percent pore space.

Converting the areas with surface roots to mulch beds will eliminate the need to mow, increase root depth, and reduce root injuries. Using good green-waste mulch would improve the health of the soil and roots. The campus's own green waste from pruning could be chipped and spread to save money, improve the soil, and minimize land fill problems.

Lack of Water

Water may be disconnected or shut down during construction. Dry soil has benefits and drawbacks. Wet or moist soil compacts more easily, but the trees need water to survive. During construction trees may receive at best light watering from a hose or water trucks, which is far less than most mature trees need. The ficus, elms, deodars, and fern pines could probably tolerate lack of supplemental irrigation for a year or more. However, the magnolias and crape myrtles are not drought tolerant.

Areas with foot or equipment traffic should be kept dry as dry as possible when the equipment traffic level is high and watered when it is low. Wet soil run over by equipment will be excessively compacted. Once compacted, the usual methods of compaction reduction cannot be used without damaging the roots in the soil. Its too late. Prevention and protection is the only realistic way to reduce soil compaction.

All trees to remain should be deep watered before construction begins and kept well irrigated inside the fenced protection zone during construction.

Change of Grade in the Root Zone

Proposed grading plans are unknown to this consultant; however without controls, the grade level near some trees may be changed. The soil level within the protection zone must remain unchanged. Changing the grade around trees is a significant health risk.

Having the proper proportion of air and water in the soil is related to proper watering and avoiding soil compaction. As you go deeper in the soil, the amount of available oxygen naturally drops off rapidly. When roots are deprived of adequate oxygen they quickly die. For the fine feeder roots of a tree this can happen in a matter of minutes. When soil is piled on top of the root system, available oxygen is excluded and the soil compacted. The soil is permanently compressed below, so the effect can last after a pile of soil is removed.

Piles of soil or spoils from trenches and footings can severely compact the soil below, and the equipment used to remove the piles can further compact the soil. Since much of the damage is already done, the best we can do is make sure the original grade is restored and that only track mounted small equipment is used to remove soil piles. This work must also be done when the soil in the haul route is dry.

Physical Damage to the Roots and Structure

Damage to the upper structure of trees seems to always happen on job sites unless secure fencing is in place out to the dripline. Not everyone on a construction site knows about or is concerned about trees. Only physical barriers work, and they need to be supplemented by the cooperation and help of the construction superintendent or inspectors.

Without real fencing, versus orange plastic snow fence, physical injuries to the trunk and branches are likely. Well secured chain link fence is about the only thing that seems to work. Shallow roots are more likely to be damaged during construction. Without controls, trenching for utilities or sprinkler lines is likely to damage roots. Beyond reducing the trees' health, such impacts could also destabilize the trees. Utilities need to be planned to avoid the root zones of trees. Tunneling may be needed to avoid ruining a valuable specimen. Although many people believe mature trees depend on strong, deep tap roots, it is a myth.

Many times trees that people have gone to great measures to preserve through development are severely injured when landscaping is installed under them. Digging holes for shrubs and ground covers can injure main lateral roots, causing extensive damage. Nicking the roots can also open up roots to infection. Roto-tilling can also destroy a large percentage of the feeder roots.

Spilling of Potentially Toxic Construction Wastes

Oil and hydraulic fluid from construction equipment, cement, form oil, acid washes, paint and solvents are toxic to tree roots. Soil pollution also includes concrete debris, asphalt, form oil, and hydraulic fluid. Again, without fencing and active controls, such dumping is likely. Many times debris is just buried on job sites. Concrete debris, some base materials and sand can also be harmful to soils. Concrete debris increases the alkalinity of the soil as do base materials that contain concrete or lime. Sand and gravel disrupt the capillary spread of water in the soil and can create a "perched water table" if enough material is buried. Even the Port-a Johns can pollute the soil by the detergents used to clean them.

Lack of Pest Control and Other Care

Construction can last for more than a year on projects such as this. During this time the pest cycles come and go, especially in spring. Dust accumulates on leaf surfaces and in leaf pores. Most often pest control is put on hold or blocked by fencing until construction is finished. However this is a stressful and demanding time for the trees. Pests can further deplete the reserves of trees and allow decay to advance. Drought stressed trees are more vulnerable to borers and certain other pests.

The polyphagous shot-hole borer (PSHB) is spreading quickly and has already killed tens of thousands of trees. One magnolia (#16) appears to be infested and infected. It spreads a Fusarium disease and there is no effective treatment approved so far. The Huntington Botanic Garden said that almost a third of their 900 species are vulnerable. UCI is losing all their sycamores, about 1,600 trees. No preventative treatment is known to be effective, so the best that can be done is to recommend that only trees known to be resistant be planted. Ficus, crape myrtles, deodars and magnolias are thought to be resistant. The elms are considered "non-reproductive hosts".

Dust

Construction creates copious amounts of dust. The trees, on the other hand, do not benefit from dust. Dust can block the pores the leaves breathe through (stomata) and dust blocks sunlight, reducing photosynthesis. The trees will need to be kept clean. Strict dust control measures may help, but dust is inevitable.

Risk

Risk was assessed on all campus trees according to *American National Standards Institute A300, part 9* and ISA, *Best Management Practices – Tree Risk Assessment*. A level 2 assessment was done, meaning that each tree was examined from all around, but from the ground and without internal testing. For this assessment the children were considered as the primary possible "target".

The data listed in the spreadsheet was run through the following matrix from the ISA Best Management Practices publication to arrive at the risk level, i.e. low, moderate, high or extreme.

Likelihood of failure and impact	**Consequences**			
	Negligible	Minor	Significant	Severe
Very likely	Low	Moderate	High	Extreme
Likely	Low	Moderate	High	High
Somewhat	Low	Low	Moderate	Moderate
Unlikely	Low	Low	Low	Low

Recommendations

Removals

Remove elm #19 immediately and stump grind.

The following matrix shows the radius of protection needed around each tree going forward. One column is for maintaining the health of the trees, which should be provided unless LAUSD administrators are willing to risk killing certain trees for a chance of possibly preserving them. Removing trees after the site is in use will be more expensive and disruptive. Consider though that it is impossible to predict where all the roots are, and many times trees with work inside the health clearance radius do survive. However, testing by Bartlett Tree Research has shown that there are predictable limits beyond which stability is reduced. The column called "stability clearance" is a column that must not be tested here.

Prior to demolition, meet on site with the contractor and clearly mark all trees to be removed. Impress on the demolition contractor that if there are adjoining trees to remain, the roots of the tree to be removed must be cut by a trencher prior to being grubbed out. Otherwise the roots of the adjoining tree may be damaged or ripped up with the roots of the removed tree.

Desirable trees that the district wants to save should have more extensive study done to determine as precisely as possible the extent and depth of their root systems. In addition, an accurate survey, versus GPS, needs to be done to verify or know there will be sufficient room to preserve these trees before construction begins. Deep water trees to be remain before construction begins.

The health clearances given are based on formulas presented in *Trees and Development: a Technical Guide to Preservation of Trees during Construction*, by Matheny and Clark and published by the International Society of Arboriculture. The species, health, size and age of the trees are all considered, as well as site conditions.

Future Landscaping

To achieve a longer lasting landscape and lower maintenance costs, the landscape architects and site designers should attempt to provide as much root space as possible and still select smaller tree species. New planting spaces should have compaction resistant soil throughout. Root space around existing trees should be expanded and include vertical mulching to maximize root depth and volume.

Prior to construction, carefully remove the turf below trees along the playground edge and replace it with a 2-3" deep layer of well-composted, coarse-textured, green-waste type mulch, e.g. Aguinaga Forest Floor ½ to 1 ½ inch particle size. While removing the turf, be careful not to damage shallow roots.

The new landscape plan should be designed and installed to protect and improve the health and habitat of the valuable preserved trees. The trees closer to construction will essentially be in critical care for a decade or more. Once they are clearly recovered, more liberties can be taken with the surrounding landscape.

Irrigation in particular must be designed for the needs of the trees first. Spot bubblers will not serve the needs of mature trees. Deep watering devices sound helpful, but they require water to be drawn up through capillary action and the salts are deposited near the surface rather than being leached below the roots. Low precipitation systems will allow deep irrigation to leach salts and improve root health. Fewer heads will allow less trenching and less trenching causes less root damage. Trenches that approach trees directly toward the trunk will cut fewer roots than trenches passing their canopy as a tangent. Irrigation design around existing trees needs to be more specific and less schematic.

As much as possible, turf and other planting must be eliminated under these trees. Any shrubs must be planted outside the driplines of these trees or have the planting holes dug using AirSpades. Mulch beds will be the best way to improve root health and depth. Apply a 2-3" deep layer of well composted, coarse-textured green waste mulch, e.g Aguinaga Forest Floor ½ to 1½", below all the trees after removing construction debris, including sand, base material, gravel, asphalt and concrete debris. Do not use mulch containing manure or bark. Cover all the soil at least under the driplines and between surrounding paving areas, but do not apply against the trunks.

All trenches for the irrigation should be marked out and approved by this consultant prior to trenching. All soil disturbances within the critical/safety root zone must be prevented or very carefully controlled.

Pest Control

Retain a licensed pest control advisor to prepare a monitoring and prevention program for polyphagous shot-hole borers on the susceptible trees. The plan should include monthly visits and inspections. New trees selected for this site should be checked against the list of shot-hole borer susceptible species.

During construction the increase dust levels often lead to mite infestations. The monitoring program needs to check specifically for these pests, as well as many other possible ones.

Pruning

All pruning must be done by properly licensed and insured tree service that provides a certified arborist to supervise his crew. The project consulting arborist should oversee the pruning of sample trees of each species. The tree service must demonstrate ability to carry out an understanding of the instructions before allowing them to proceed. Do not allow the general contractor to cut on any trees for any reason. Clearance pruning should be done only by the properly licensed and insured tree service, with the general contractor's information of clearance needs.

Beyond clearance pruning, do not prune the more impacted trees for at least 3 years or until they resume normal growth. Focus on balance, subordination of codominant leaders, reducing the length of overly long limbs and control (not necessarily removal) of epicormic shoots. Do not remove more than the recommended limit in the matrix. All pruning must be done in fall or winter for the cedars, ash and elms. All the ficus and magnolias can be pruned in spring, or the ficus can be pruned in early summer.

Follow the recommendations in the matrix to follow and ANSI A300, part 1 pruning standards and the ISA supporting publication "Best Management Practices, Pruning".

Recommendations Matrix

Map #	Species	DBH	Health	Pruning recommendations	Season	*Max % foliage removal	*Health clearance	*Safety clearance
1	Magnolia grandiflora	9	B	minor reduction	spring	10%	9’	3.8’
2	Ficus r. microphylla	45	B	reduction	spring	30%	32’	18.8’
3	Magnolia grandiflora	6.7	B	reduction	spring	20%	6.7’	2.8’
4	Ficus rubiginosa	25	C	Heavy reduction	spring	40%	25’	10.4’
5	Ficus rubiginosa	26	C	Heavy reduction	spring	40%	26’	10.8’
6	Ficus rubiginosa	28	B	Heavy reduction	spring	40%	21’	11.7’
7	Ficus rubiginosa	25	B	Heavy reduction	spring	40%	18’	10.4’
8	Ficus rubiginosa	39	B	Heavy reduction	spring	40%	30’	16.3’
9	Ficus rubiginosa	26	B	Heavy reduction	spring	40%	19’	10.8’
10	Afrocarpus falcatus	12	B	minor reduction	spring	25%	12’	5’
11	Afrocarpus falcatus	12	C	minor reduction	spring	20%	12’	5.’
12	Afrocarpus falcatus	11	B	minor reduction	spring	25%	11’	4.6’
13	Magnolia grandiflora	9	B	deadwood, cut Xing	spring	20%	9’	3.8’
14	Cupaniopsis anacardioides	16	B	subordination + reduction	spring	25%	12’	6.7’
15	Magnolia grandiflora	4.5	C	okay	spring	0%	4.5’	1.9’
16	Magnolia grandiflora	5.4	B	okay	spring	0%	5.4’	2.3’
17	Magnolia grandiflora	8	B	okay	spring	0%	8’	3.3’
18	Cupaniopsis anacardioides	16	A	reduction	spring	30%	12’	6.7’
19	Ulmus parviflora	34	C	REMOVE and stump grind	Fall	100%	n/a	14.2’
20	Ulmus parviflora	13.5	B	reduction	Fall	25%	13.5’	5.6’
21	Citrus cultivar	6	C-	deadwood	spring	5%	6’	2.5’
22	Citrus cultivar	6	C-	deadwood	spring	5%	6’	2.5’
23	Ulmus parviflora	17.3	C	reduction	Fall	10%	17.3’	7.2’
24	Fraxinus uhdei	38	B	reduction	spring	20%	30’	15.8’

Map #	Species	DBH	Health	Pruning recommendations	Season	*Max % foliage removal	*Health clearance	*Safety clearance
25	Morus alba cv	14	B	Heavy reduction	Fall	30%	10’	5.8’
26	Handroanthus sp	10	C	minor reduction	spring	10%	10’	4.2’
27	Ulmus parviflora	18	B	remove south limb	Fall	25%	18’	7.5’
28	Ulmus parviflora	18	B	balance by reduction	Fall	25%	18’	7.5’
29	Ulmus parviflora	17	B	balance by reduction	Fall	30%	17’	10.’
30	Ulmus parviflora	14.5	C	reduction	Fall	25%	14.5’	8.’
31	Ulmus parviflora	16	C	reduction	Fall	25%	16’	6.7’
32	Ulmus parviflora	18	C-	cut hangers + reduction	Fall	20%	18’	10’
33	Ulmus parviflora	21	C	cut hangers + reduction	Fall	20%	21’	8.75’
34	Lagerstroemia indica	3+4+4	B	Train, cut Xing	Fall	10%	6’	4’
35	Lagerstroemia indica	4+5+5	B	Train, cut Xing	Fall	10%	6’	4’
36	Lagerstroemia indica	3+9	B	Train, cut Xing	Fall	10%	6’	4’
37	Cedrus deodara	29	B	Heavy reduction	Fall	25%	29’	12.’
38	Cedrus deodara	27	B	Heavy reduction	Fall	25%	27’	11.3’
39	Lagerstroemia indica	3,3,3,3,3	B	Train, cut Xing	Fall	10%	7’	5’
40	Lagerstroemia indica	5,3,3,3,4	B	Train, cut Xing	Fall	10%	7’	5’
41	Lagerstroemia indica	3,3,3,2,2	B	Train, cut Xing	Fall	10%	7’	5’
42	Lagerstroemia indica	3.5+4	B	Train, cut Xing	Fall	10%	6’	5’

*Clearances and maximum foliage removal are shown for the purpose of possible relocation of paving, trenching or planting.

General Tree Preservation Recommendations

1. Protection Barrier: A protection barrier shall be installed around the tree or trees to be preserved. The barrier shall be constructed of 6' high chain-link fencing. The barrier shall be placed as far from the base of the tree(s) as possible, preferably at or beyond the dripline and the health clearance radius. The fencing shall be maintained in good repair throughout the duration of the project, and shall not be removed, relocated, or encroached upon without permission of the arborist involved.
2. Storage of Materials: There shall be NO storage of materials or supplies of any kind within the area of the protection zone. Concrete and cement materials, block, stone, sand and soil shall not be placed within the protection zone of the tree.
3. Fuel Storage: Fuel storage shall NOT be permitted within 150 feet of any tree to be preserved. Refueling, servicing and maintenance of equipment and machinery shall NOT be permitted within 150 feet of protected trees. Equipment that leaks hydraulic fluid shall be removed from the site immediately.
4. Debris and Waste Materials: Debris and waste from construction or other activities shall NOT be permitted within the protection zone. Wash down of concrete or cement handling equipment, in particular, shall NOT be permitted within 150 feet of protected trees.
5. Grade Changes: Grade changes can be particularly damaging to trees. Even as little as two inches of fill can cause the death of a tree. Lowering the grade can destroy major portions of a root system. Any grade changes proposed should be approved by a Registered Consulting Arborist before construction begins, and precautions taken to mitigate potential injuries.
6. Damages: Any damages or injuries should be reported to the project arborist as soon as possible. Severed roots shall be pruned cleanly to healthy tissue, using proper pruning tools. Broken branches or limbs shall be pruned according to International Society of Arboriculture "Best Management Practices – Pruning", and ANSI A-300, part 1 Pruning Standards.
7. Preventive Measures: Pruning of the tree canopies and branches should be done at the direction of the project arborist to remove any dead or broken branches, and to provide the necessary clearances for the construction equipment.

Appendix

A. Resume

B. Glossary

A. Resume GREGORY W. APPLEGATE, ASCA, ASLA

PROFESSIONAL REGISTRATIONS:

American Society of Consulting Arborists - Registered Consulting Arborist #365
International Society of Arboriculture - Certified Tree Risk Assessor #PNC-444
International Society of Arboriculture - Certified Arborist # WE-180a

EXPERIENCE:

Mr. Applegate is an independent consulting arborist. He has been in the horticulture field since 1963, providing professional arboricultural consulting since 1984 within both private and public sectors. His expertise includes appraisal, tree preservation, diagnosis of tree growth problems, construction impact mitigation, environmental assessment, expert witness testimony, hazard evaluation, pruning programs, species selection and tree health monitoring.

Mr. Applegate has consulted for insurance companies, major developers, theme parks, homeowners, homeowners' associations, landscape architects, landscape contractors, property managers, attorneys and governmental bodies.

Notable projects on which he has consulted are: Disneyland, Disneyland Hotel, DisneySeas-Tokyo, Disney's Wild Animal Kingdom, the New Tomorrowland, Disney's California Adventure, Disney Hong Kong project, Knott's Berry Farm, J. Paul Getty Museum, Tustin Ranch, Newport Coast, Crystal Court, Newport Fashion Island Palms, Bixby Ranch Country Club, Playa Vista, Laguna Canyon Road and Myford Road for The Irvine Company, MTA Expo Line, MWD-California Lakes, Paseo Westpark Palms, Loyola-Marymount campus, Cal Tech, Cal State Long Beach, Pierce College, The Irvine Concourse, UCI, USC, UCLA, LA City College, LA Trade Tech, Riverside City College, Crafton Hills College, MTA projects, and the State of California review of the Landscape Architecture License exam (re: plant materials)

EDUCATION:

Bachelor of Science in Landscape Architecture,
California State Polytechnic University, Pomona 1973
Arboricultural Consulting Academy (by ASCA)
Arbor-Day Farm, Kansas City 1995
Continuing Education Courses in Arboriculture
required to maintain Certified Arborist status and for ASCA membership

PROFESSIONAL AFFILIATIONS:

American Society of Landscape Architects (ASLA), Full member
American Society of Consulting Arborists (ASCA), Full member
International Society of Arboriculture (ISA), Regular member
California Tree Failure Report Program, UC Davis, Participant
Street Tree Seminar (STS), Member

COMMUNITY AFFILIATIONS:

Horticulture Advisory Committee, Saddleback College (1988 until present)
Landscape Architecture License Exam, Reviewer, Cal Poly Pomona (1986-90)
American Institute of Landscape Architects (L.A.) Board of Directors (1980-82)
California Landscape Architect Student Scholarship Fund - Chairman (1985)
International Society of Arboriculture - Examiner-tree worker certification (1990)
Guest lecturer at UCLA, Cal Poly, Saddleback College, & Palomar Junior College

B. Glossary

Arboriculture	The cultivation and care of trees and shrubs.
Caliper	Diameter of a tree trunk. Larger trees are usually measured at 4½ feet (see DBH) Trees with calipers 4 inches and below are measured at 6 inches above grade. Trees above 4 inches, but still transplantable are measured at 12 inches above grade.
Cambium	A thin layer of actively growing and dividing cells, located between the xylem (sapwood) and bark of a plant; the part responsible for lateral growth of a tree stem or branch.
Codominant	stems: two or more vigorous and upright branches of relatively equal size that originate from a common point, usually where the leader has been lost or removed.
Compaction	(Soil Compaction) The compression of soil, causing a reduction of pore space and an increase in the density of the soil. Tree roots cannot grow in compacted soil.
Crotch	The union of two or more branches; the axillary zone between branches.
Crown	The upper portions of a tree or shrub, including the main limbs, branches, and twigs.
DBH	Diameter of the trunk, measured at breast height or 54 inches above the average grade. Syn. = caliper.
Decay	Progressive deterioration of organic tissues, usually caused by fungal or bacterial organisms, resulting in loss of cell structure, strength, and function. In wood, the loss of structural strength.
Decline	Progressive reduction of health or vigor of a plant.
Decurrent	Referring to crowns which are made up of a system of codominant scaffold branches. Lacking a central leader.
Dieback	Progressive death of buds, twigs and branch tissues, on individual limbs, or throughout the canopy.
Drop-crotch	Reduction cuts meant to shorten a limb or branch by cutting back to an inner branch that can serve as the new end of the limb.
Epicormic	Epi - upon; cormic – stem. Branches that are upon the stem, i.e. sprouting from either dormant buds in the cambial zone, or from buds sprung anew from ray traces. Epicormic shoots are a sign that energy reserves have been lowered.

Grading	Also Regrading. Intentional altering of topography and soil levels, using machinery.
Hanger	broken, hanging limb hung up in tree, but has not fallen
Hazardous condition	The combination of a likely failure of a tree or tree part with the presence of a likely target.
Heading	Pruning techniques where the cut is made to a bud, weak lateral branch or stub.
Included bark	Bark or cortex tissue that is included or trapped between close-growing branches. Usually found in narrow or tight crotches.
Leader	A dominant upright stem, usually the main trunk. There can be several leaders in one tree.
Limb	A large lateral branch growing from the main trunk.
Reduction cut	A pruning cut meant to shorten a limb or branch by cutting it back to an inner branch that will serve as the new end of the limb or branch.
Root crown	Area at the base of a tree where the roots and stem merge (synonym - root collar)
Root plate	The stiff primary roots close to the trunk and able to provide compressive support.
Root system	The portion of the tree containing the root organs, including buttress roots, transport roots, and fine absorbing roots; all underground parts of the tree.
Root zone	The area and volume of soil around the tree in which roots are normally found. May extend to three or more times the branch spread of the tree, or several times the height of the tree.
Scaffold	large, main branches that form the main structure of the crown.
Sprout	Also water sprout. A shoot or stem that grows from the bark of a tree; adventitious or secondary growth.
Stress	"Stress is a potentially injurious, reversible condition, caused by energy drain, disruption, or blockage, or by life processes operating near the limits for which they were genetically programmed." Alex Shigo
Subordination	Pruning to reduce the size and growth rate of a branch or leader in relation to other branches or leaders.
Target	People or property potentially affected by tree or limb failure.
Value	Value is the present worth of future benefits. Value is not necessarily cost.
Wound	Any injury which induces a compartmentalization response.

Disclaimer

Good current information on tree preservation has been applied. However, even when every limb and root is inspected, inspection involves sampling, therefore some areas of decay or weakness may be missed. Weather, winds and the magnitude and direction of storms are not predictable and some failures may still occur despite the best application of high professional standards. Future tree maintenance will also affect the trees health and stability and is not under the supervision or scrutiny of this consultant. Continuing construction activity such as trenching will also affect the health and safety, but are unknown and unsupervised by this consultant. Trees are living, dynamic organisms and their future status cannot be predicted with complete certainty by any expert. This consultant does not assume liability for any tree failures involved with this property.

Certification

I, Gregory W. Applegate, certify to the best of my knowledge and belief:

That the statements of fact contained in this report are true and correct. That the report analysis, opinions, and conclusions are limited only by the reported assumptions and limiting conditions, and are my personal unbiased professional analysis, opinions and conclusions.

That I have no present or prospective interest in the vegetation that is the subject of this report, and I have no personal interest or bias with respect to the parties involved.

That my compensation is not contingent upon the reporting or a predetermined reporting that favors the cause of the client, the attainment of stipulated result, or the occurrence of a subsequent event.

That my analysis, opinions, and conclusions were developed, and this report has been prepared, in conformity with the standards of arboricultural practice.

That I have made a personal inspection of the plants that are the subject of this report. No one provided significant professional assistance to the person signing this report.

Arborgate Consulting, Inc.
Gregory W. Applegate  Date 12-11-17
Registered Consulting Arborist #365