Lemon Eucalyptus Arborist Report
1424 State Street, Santa Barbara

Prepared for:

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June 2, 2017

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SUMMARY

Arbor Services, Inc. was contracted by Grafskoy Hindeloopen Limited L.L.C. to prepare an Arborist Report for all of the Lemon Eucalyptus (27) located at 1424 State Street, Santa Barbara. The trees are to be phased out and replaced over a three-year period as part of a larger landscape upgrade. The commercial property is located within the El Pueblo Viejo Historic District, thus requires a permit for landscape modifications from the City of Santa Barbara Historic Landmark Commission (HLC). The assignment was to 1) assess individual tree condition; 2) conduct individual tree risk assessments and; 3) provide a three year phase out plan for all of the trees. The assessment results indicated that the subject trees were in fair to poor condition with a moderate to high risk factor for branch and/or full tree failure. Each Eucalyptus was assigned a phase out year (1, 2 or 3) prioritized by individual hazard rating, probability of failure and health. Recommendations also emphasized the need for selecting replacement species that were drought tolerant, parking lot appropriate and suitable for the small planter spaces to ensure long term sustainability.

INTRODUCTION

Background/History

In February 2017, Arbor Services, Inc. was contacted by Marc Winnikoff, Grafskoy Hindeloopen Limited, L.L.C to prepare an Arborist Report for twenty-seven Lemon Eucalyptus located throughout the parking lot of 1424 State Street (see *March 2011 Land Survey*). The report would be a component of a landscape design permit application being prepared for the property by Arcadia Studio Landscape Architect, Bob Cunningham. The client's goal is to proactively phase out the Lemon Eucalyptus to mitigate failure risk and diversify the age and species of the landscape tree inventory.

The commercial property is within the El Pueblo Viejo Historic District of Santa Barbara, therefore landscape modifications are subject to review by the Historic Landmark Commission. A majority of the subject trees were likely planted around 1972 when a gated fountain area was added to the property (Conrad, Days, Nelson, and Oglesby, 2016). The proposed landscape design by Arcadia Studio calls for the replacement of the aged Lemon Eucalyptus over a three year period with a more diverse tree palette suitable for the site's history and planting conditions.

Assignment

The following consulting services were contracted by Grafskoy Hindeloopen Limited, L.L.C. with Arbor Services, Inc. for the all of the Lemon Eucalyptus (27) located at 1424 State Street, Santa Barbara:

1. Conduct Level I Risk Assessment and evaluate overall condition of each tree.
2. Photo document each tree and highlight visible defects of concern.
3. Prepare a three-year tree phase-out plan with an emphasis on safety first, followed by condition/plant health second and aesthetic third.
4. Prepare Arborist Report to include individual tree assessment observations, Risk Scores and three-year tree phase out plan. Include two photographs of each subject tree to meet HLC requirements.

Limits of Assignment

Detailed documentation of failure incidents was unavailable for the subject trees with the exception of work conducted by Arbor Services, Inc. A history of root zone disturbance such as trenching, root pruning or grading was unavailable at the time of report preparation. Individual tree root density and health was restricted to the small open soil areas. Given the duration of the drought and heat island effect known to parking lots, examining root conditions below the asphalt would have been helpful for the assessment of each tree, but beyond the scope of the project.

Purpose and Use of Report

The Arborist Report serves as a component of the tree removal application being submitted to the City of Santa Barbara, Historic Landmark Commission. The report also serves as documentation of the subject trees' current condition.

Testing and Analysis

The assessment was conducted over multiple site visits between March 11, 2017 to March 30, 2017 by Leigh Christman, Certified Tree Risk Assessor/Certified Arborist and Karen Christman, Certified Arborist. Two to four photos were taken of each subject tree to document defects, condition and targets. Multiple visitations also allowed for observation of pedestrian and vehicular activity. A shovel was utilized for excavation of exposed root zone areas to observe soil moisture and density. Assessment methodology is based on standards set forth by the International Society of Arboriculture (ISA) and American Society of Consulting Arborists (ASCA).

OBSERVATIONS

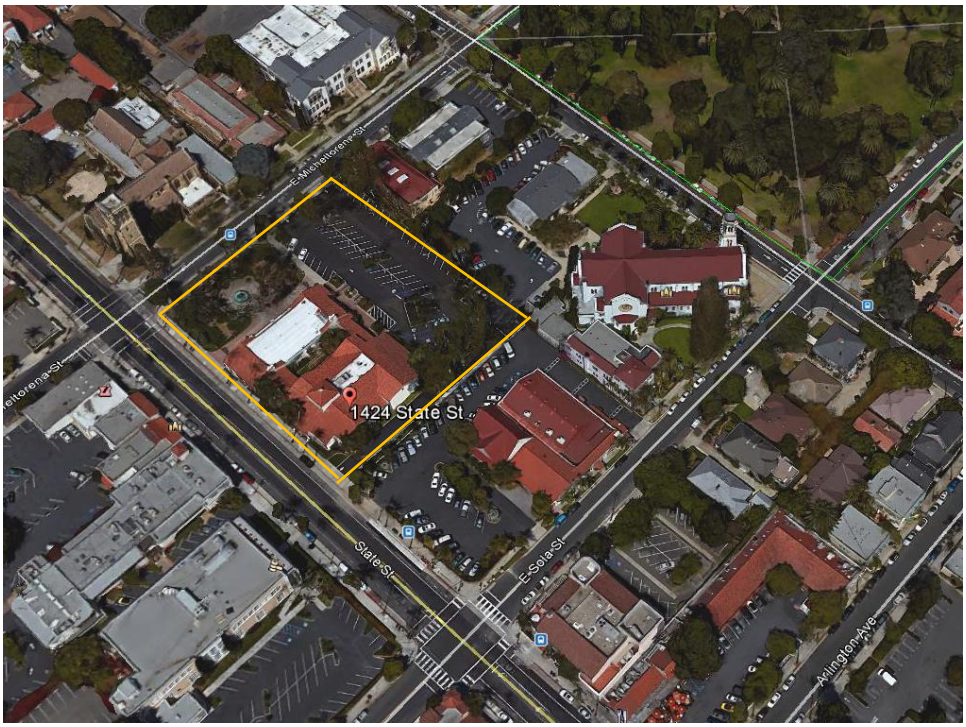

Figure 1: Aerial view of 1424 State Street, Santa Barbara as indicated with yellow box (Google Earth, 2017)

The commercial property is located in the "State Street Plaza" section of the El Pueblo Viejo Historic District (Figure 1). Notre Dame School, Trinity Episcopal Church, Our Lady of Sorrows Catholic Church, Welch-Rice-Haider Funeral Chapel and Santa Barbara Yoga Center are within the immediate neighborhood. It is an active parking lot with an attendant during the week. It is also utilized after business hours and on weekends from the adjacent churches/school and yoga center.

Fifteen of the Lemon Eucalyptus are in narrow planters along the northeast property (Land Survey, 2011). They overhang adjacent properties and are in close proximity to the high voltage power lines and other overhead utility lines. Sixteen parking stalls are within their dripline and root zone. Three Lemon Eucalyptus are on the east property line, also in a narrow planter. Their canopies overhang the parking stalls of two properties and access roadway for 1424 State Street. The remaining nine Lemon Eucalyptus are in planter islands within the center of the parking lot overhanging multiple stalls.

Table 1: Data Collected in May 2017 for Lemon Eucalyptus (27) located at 1424 State Street, Santa Barbara (Christman, L)

Tree Number[1]	DBH[2] (inches)	Crown Spread (feet)	Approx. Tree Height (feet)	Tree's Critical Root Zone (CRZ) Diameter (feet)	Live Crown Ratio [LCR] (%)	Critical Root Zone Under Pavement (%)
8	17	30	65	34	50	90
9	16	23	40	32	50	80
10	24	37	80	48	40	90
11	16	43	50	32	50	80
12	10	10	40	20	20	70
13	18	21	55	36	30	80
14	20	48	80	40	40	80
15	8	11	40	16	30	50
16	8	20	40	16	30	50
17	10	15	40	20	30	50
18	9	15	40	18	40	50
19	18	37	70	38	50	90
20	21	49	70	42	50	90
21	14	27	75	28	60	90
22	17	31	70	34	50	90
23	4	12	25	8	50	50
24	19	36	70	38	40	90
25	22	45	70	44	50	90
26	15	54	50	30	50	90
27	14	60	55	28	40	90
28	12	46	50	24	40	90
29	15	53	50	30	40	90
30	12	19	40	24	50	90
31	11	31	35	22	60	90
32	14	54	45	28	40	90
33	15	30	45	30	50	90
34	17	57	70	34	40	85

1-Tree Numbers correspond to larger inventory not included in this report 2-Diameter at Breast Height

The subject trees are within the mature to overmature **Age Class** and approximately 30 to 40 years old with some being predisposed to entering or in the **Mortality Spiral**. A majority of the trees have **root crowns** buried up to six inches below ground level. There is an active drip irrigation system within the planters and the open soil areas are mulched. At the time of the assessment, the top six to eight inches of soil was dry and compacted. A majority of the trees, as noted in Table 1 have **Live Crown Ratios (LCR)** less than 50%. More than 50% of the trees have more than 85% of their root zone under pavement (15 trees are 90%). Notable defects and targets for each individual tree are noted below with corresponding photographs in the Appendices of this report.

Lemon Eucalyptus Assessments

Eucalyptus #8 (Figure 2 & 3)
17 in. dbh, 30 ft. canopy spread, 65 ft. height

Eucalyptus #8 has a nine degree lean over parking lot and driveway with medium **trunk taper.**

Target Zone: Public sidewalk, driveway, parking stalls, neighboring structure to the northeast, high voltage power lines, utility lines, water main, backflow device and first block of East Michelltorenta Street

Eucalyptus #9 (Figure 4 & 5)
16 in. dbh, 23 ft. canopy spread, 40 ft. height

Eucalyptus #9 leans five degrees. The **canopy** is unbalanced with normal canopy density and medium vigor. There is a large section of dead/missing bark on branches and trunk in the upper canopy as indicated in Figure 4 and 5. **Heartwood** decay is possible.

Target Zone: Parking stalls, driveway and neighboring structure to the northeast

Eucalyptus #10 (Figure 6 & 7)
24 in. dbh, 37 ft. canopy spread, 80 ft. height

Eucalyptus #10 has a relatively large crown size with over-extended branches. It leans over the driveway and parking stalls. There are dead branches less than two inches in diameter in approximately 10% of the canopy. It has a broken, hanging branch four inches in diameter. There is evidence of previous limb failures. High lever arm effect present. There is a crack on the north side of the root crown (Figure 7). Lack of trunk flare may indicate a possible girdling root.

Target Zone: Parking stalls, driveway and neighboring structure to the northeast

Eucalyptus 11 (Figure 8 & 9)
16 in. dbh, 43 ft. canopy spread, 50 ft. height

Eucalyptus #11 has a seven degree lean as documented in Figure 8. It is has a narrowly attached **codominant branch** (Figure 9) that is inherently weak. There is evidence of previous branch failures. Foliage is normal and the tree is of medium vigor with normal canopy density.

Target Zone: Parking stalls, driveway and neighboring structure to the northeast

Eucalyptus 12 (Figure 10 & 11)
10 in. dbh, 10 ft. canopy spread, 40 ft. height

Eucalyptus #12 has low vigor with 80% canopy dieback and a sparse canopy. Fifty percent of the trunk has dead/missing bark. It leans five degrees and has an unbalanced canopy. **Sapwood** and heartwood decay is likely. Trunk taper is also low. There are cracks in the trunk and it has a low LCR.

Target Zone: Parking stalls, driveway and neighboring structure to the northeast

Eucalyptus 13 (Figure 12 & 13)
18 in. dbh, 21 ft. canopy spread, 55 ft. height

Eucalyptus #13's vigor is low with 20% dead twigs/branches approximately four inches in diameter within the canopy. It has weak attachments and leans seven degrees. Trunk taper is low and 100% of the live foliage is in the upper 30% of the canopy (low LCR) creating high lever arm effect.

Target Zone: Parking stalls, driveway and neighboring structure to the northeast

Eucalyptus 14 (Figure 14 & 15)
20 in. dbh, 48 ft. canopy spread, 80 ft. height

Ten percent of Eucalyptus #14's canopy has dead twigs/branches that are less than one inch in diameter. There is a hanging, dead branch approximately one inch in diameter. There is major crown asymmetry with codominant branches approximately 14 inch in diameter 30 feet above ground level. Included bark and **sapwood** decay is possible. The Eucalyptus leans 14 degrees over the parking lot. There is a heavy load on the side of the lean. The lower branches are twisted and reversed.

Target Zone: Parking stalls, driveway, utility lines, utility pole and high voltage

Eucalyptus 15 (Figure 16 & 17)
8 in. dbh, 11 ft. canopy spread, 40 ft. height

More than 10% of Eucalyptus #15 has dieback in branches less than one inch in diameter. There is evidence of being previously **topped** and **lion-tailed**, possibly by Southern California Electric (SCE) line clearing contractors. **Trunk taper** is low with no flare on the north side of the root crown.

Target Zone: Parking stalls, driveway, utilities and high voltage

Eucalyptus 16 (Figure 18 & 19)
8 in. dbh, 20 ft. canopy spread, 40 ft. height

Eucalyptus #16 has a history of small diameter branch failures. Ten percent of the crown has twig/branch dieback. It has an unbalanced crown structure with evidence of previous lion-tailing and repeated topping for SCE line clearance. It has a reverse trunk taper two feet above ground level. There are similar diameter and over-extended branches present.

Target Zone: Parking stalls, driveway and utility lines

Eucalyptus 17 (Figure 20 & 21)
10 in. dbh, 15 ft. canopy spread, 40 ft. height

Eucalyptus #17 has a history of small diameter branch failure. Ten percent of the crown has twig/branch dieback. Cracks are noted on the trunk and sapwood damage is likely. There is reverse trunk taper three feet above ground level. There is a possible interior crack and sapwood damage/decay. Dead and missing bark is present on branches. Over-extended branches, similar sized branches and **burls** are also present. It has been repeatedly topped for SCE line clearance.

Target Zone: Parking stalls, driveway and utility lines

Eucalyptus 18 (Figure 22 & 23)
9 in. dbh, 15 ft. canopy spread, 40 ft. height

Eucalyptus #18 is in close proximity to the utility power pole. It has been repeatedly topped for required high voltage line clearance by SCE contractors.

Target Zone: Parking stalls, driveway and utility lines

Eucalyptus 19 (Figure 24 & 25)
18 in. dbh, 37 ft. canopy spread, 70 ft. height

More than 10% of Eucalyptus #19's crown has dieback for twig/branches less than one inch in diameter. It has an unbalanced canopy structure and leans seven degrees towards the parking area. Defects include numerous inherently weak "dog-leg" branches. There is a reverse taper of the trunk 10 feet above ground level. The root crown has cracks. One hundred percent of the live foliage is in the upper 50% of tree canopy increasing lever arm effect.

Target Zone: Dumpster enclosure, driveway, parking stalls, gas main, utility pole, utility lines and underground utilities

Eucalyptus 20 (Figure 26 & 27)
21 in. dbh, 49 ft. canopy spread, 70 ft. height

Less than 10% of Eucalyptus #20's crown has dieback of twigs/branches less than one inch in diameter and smaller. There are over-extended branches and evidence of previous failures. Defects of concern include "dog-legs" and "elbow" formation of branches up to four inches in diameter. Other defects of concern include multiple cracks and **fiber buckling** in the lower trunk. Limited soil volume exists with more than 90% of the tree's CRZ under pavement.

Target Zone: Parking stalls and driveway

Eucalyptus 21 (Figure 28 & 29)
14 in. dbh, 27 ft. canopy spread, 75 ft. height

Eucalyptus #21 has dieback of branches less than two inches in diameter in 10% of its canopy. Canopy symmetry is unbalanced with a codominant branch 25 feet above ground level. Notable defects include branch cracking, evidence of previous failures and over-extended branches. One hundred percent of live foliage is in the top 50% of the tree canopy contributing to an increased lever arm effect. It is a low soil volume planter with more than 90% of the tree's CRZ under pavement.

Target Zone: Parking stalls, driveway and neighboring structure to the northeast

Eucalyptus 22 (Figure 30 & 31)
17 in. dbh, 31 ft. canopy spread, 70 ft. height

Eucalyptus #22 has dieback of twig/branches less than two inches in diameter in 10% of the canopy. The crown is unbalanced with over-extended branches. There is a damaged limb approximately six inches in diameter in the upper northeast canopy with evidence of previous failures and branch cracks. The Eucalyptus leans towards the adjacent high voltage pole. There is significant **response growth** at the west root crown and lack of flare on the northeast side. This may indicate a girdling root on the tension side of the lean.

Target Zone: Parking stalls, driveway, neighboring parking stalls and property

Eucalyptus 23 (Figure 32 & 33)
4 in. dbh, 12 ft. canopy spread, 25 ft. height

Approximately 10% of the canopy has branch/twig dieback. Eucalyptus #23's trunk has a lesion and a possible cavity present that is 10% of the circumference of the root crown (Figure 33). There is dead/missing bark in some branches.

Target Zone: Driveway

Eucalyptus 24 (Figure 34 & 35)
19 in. dbh, 36 ft. canopy spread, 70 ft. height

The lower trunk of Eucalyptus #24 has long, vertical cracks. It leans 10 degrees and has codominant stems of approximately the same diameter. There is evidence of previous failures. Branches are over-extended and weak attachments are present. The root collar has cracks possibly from a recent severe wind event. Soil volume is limited with more than 75% of the root system CRZ under pavement. The planter curb is cracked as noted in Figure 35.

Target Zone: Driveway, neighboring parking stalls and property

Eucalyptus 25 (Figure 36 and 37)
22 in. dbh, 45 ft. canopy spread, 70 ft. height

Eucalyptus #25 has up to 10% canopy dieback for twigs/branches up to two inches in diameter. It has over-extended branches and a history of previous failures. The trunk has visible cracks and leans six degrees. There are codominant stems. Seventy-five percent of the root collar is buried to a depth of approximately eight inches. Oozing lesion and cracking is present within the root collar area. Atypical surface roots are growing on to the curb.

Target Zone: driveway, neighboring property and parking stalls

Eucalyptus 26 (Figure 38 & 39)
15 in. dbh, 54 ft. canopy spread, 50 ft. height

Eucalyptus #26 is in a small circumference planter island with more than 90% of its CRZ covered in pavement. There is 10% canopy dieback of branches up to one inch in diameter. A broken branch approximately one inch in diameter is hanging in the canopy. Branches exhibit missing/dead bark, cracks and are over-extended. Twenty feet above ground level are multiple branches of similar diameter at the same junction.

Target Zone: Parking stalls and driveway

Eucalyptus 27 (Figure 40 & 41)
14 in. dbh, 60 ft. canopy spread, 55 ft. height

Small branch (one inch or less in diameter) dieback was found in 10% of the canopy. Some branches exhibit missing/dead bark and evidence of previous failures. Similar diameter and over-extended branches are present. There are multiple weakly attached branches. The trunk leans six degrees with cracks present. The canopy is asymmetric. The root collar is buried up to eight inches with cracking and lack of flare. Eucalyptus #27 shares the small island planter with another tree. More than 90% of its CRZ is under asphalt.

Target Zone: Parking stalls and driveway

Eucalyptus 28 (Figure 42 & 43)
12 in. dbh, 46 ft. canopy spread, 50 ft. height

Eucalyptus #28 is sparse with few interior branches. Approximately 10% of the canopy exhibits dieback of limbs less than one inch in diameter. Over-extended branches and multiple weakly attached branches are present. There is evidence of previous failures. Similar diameter branches attached at a singular junction are present. Eucalyptus #28 leans six degrees and has an asymmetric canopy. Cracking and codominant stems are present. The subject Eucalyptus shares a small island planter with Eucalyptus #27. More than 90% of its root zone is under pavement. The curb has multiple cracks.

Target Zone: Parking stalls and driveway

Eucalyptus 29 (Figure 44 & 45)
15 in. dbh, 53 ft. canopy spread, 50 ft. height

Eucalyptus #29 has approximately 10% canopy dieback with branches up to three inches in diameter. The canopy is unbalanced with evidence of previous failures. Similar branches and over-extended branches are present. The tree leans 10 degrees and external trunk cracks are present. Possible internal cracks may be present in the lower five feet of trunk and root crown.

Target Zone: Parking stalls, driveway and structure

Eucalyptus 30 (Figure 46 & 47)
12 in. dbh, 19 ft. canopy spread, 40 ft. height

There is dieback of twigs/branches up to four inches in diameter in approximately 10% of Eucalyptus #30's canopy. A two inch diameter hanging, broken branch is present. The trunk has a four degree lean. There is dead/missing bark on the branches. Sapwood damage/decay is present. The Eucalyptus has an abundance of **epicormics**.

Target Zone: Parking stalls, bicycle racks and driveway

Eucalyptus 31 (Figure 48 & 49)
11 in. dbh, 31 ft. canopy spread, 35 ft. height

Eucalyptus 31 has small branch dieback in approximately 10% of its canopy. It leans nine degrees. There is a deformity with adaptive growth (indicating possible internal crack), approximately 15 feet above ground level. The tree has a history of branch failures. There are codominant stems of equal size as noted in Figure 49 that are inherently weak. Other defects include **epicormics**, over-extended branches and dense branch ends.

Target Zone: Parking stalls, light pole and driveway

Eucalyptus 32 (Figure 50 & 51)
14 in. dbh, 54 ft. canopy spread, 45 ft. height

Eucalyptus #33 is low vigor with a sparse canopy. Approximately 15% of the canopy has dieback or twig/branches less than three inches in diameter. The canopy is unbalanced. There is a weak attachment approximately eight inches in diameter 10 feet above ground level. Some branches have missing/dead bark. Previous branch failures are evident. The root crown is buried approximately eight inches and 90% of the CRZ is under pavement.

Target Zone: Parking stalls, sidewalk, utility lines and driveway

Eucalyptus 33 (Figure 52 & 53)
15 in. dbh, 30 ft. canopy spread, 45 ft. height

Eucalyptus #33 has few interior branches. Dead branches less than two inches in diameter make up less than 10% of the overall canopy. The tree has an unbalanced structure and sap ooze present 20 feet above ground level on the trunk. Cracks on a branch approximately three inches in diameter are visible in the upper canopy. Eucalyptus #33's trunk leans 22 degree southeast over the driveway. Ninety percent of its root zone is under pavement. There is a depression/lack of trunk flare from a possible girdling root (Figure 53).

Target Zone: Parking stalls and driveway

Eucalyptus 34 (Figure 54 & 55)
17 in. dbh, 57 ft. canopy spread, 70 ft. height

Eucalyptus #34 is located at the main parking lot entrance. Approximately 10% of its canopy has small twig/branch dieback. Crown density is sparse and there are few interior branches. The canopy structure is unbalanced. The trunk has a six degree lean with prominent codominant stems of the same size (Figure 55) approximately 25 feet above ground level. There is evidence of previous failures and weak attachments (greater than 10 inches in diameter). The root collar is buried approximately 10 inches below ground level. There are cracks on the southern lower trunk. Approximately 85% of the CRZ is under pavement.

Target Zone: Parking stalls and driveway

DISCUSSION

Lemon Eucalyptus (*Corymbia citriodora,* formerly *Eucalyptus citriodora*) are native to Queensland, Australia where they grow in open forests (Muller, 2005). They can reach heights up to 100 feet and have an open crown with long slender branches. The Lemon Eucalyptus is a fast-growing evergreen. Its adaptability and beauty likely made it a popular skyline tree approximately 30 to 40 years ago in the greater Santa Barbara area. Similar Lemon Eucalyptus plantings are at the University of California, Santa Barbara, Santa Barbara City College and the Goleta Resource Center.

Its popularity waned over the last twenty years as the Lemon Eucalyptus matured revealing its unpredictable tendency to shed large and small branches even in non-wind events despite regular pruning. It is no longer a recommended skyline tree for parking lots or densely populated areas. Recently, many commercial and institutional settings in greater Santa Barbara such as Whole Foods Market and the YMCA, have been phasing out Eucalyptus in response to catastrophic branch and whole tree failures.

The subject Lemon Eucalyptus assessed for this report are in poor to fair condition with Moderate to High Risk ratings, as detailed in Table 2. Structural defects common to the species, Age Class, duration of the drought and other environmental factors have contributed to their steady decline and elevated hazard risk.

Canopy dieback of 10% or greater is noted in more than 50% of the trees. Given the lack of root zone exposure (Table 1) and low soil volume of the planters, supplemental irrigation during the six years of drought was limited and impossible to effectively administer. A "heat island" effect from the surrounding pavement retaining heat, as noted by Watson and Himelick (1997) likely contributed to further water stress and associated problems.

Available root space is critical for the longevity and vitality of landscape trees. A tree's root system provides stability, carbohydrate storage and nutrient/water uptake. It radiates outward from trunk in predominately the top two feet of soil. In restrictive growing areas such as parkways and parking lots "when the root system cannot increase in size," according to Watson and Himelick (1997) "crown growth will slow but not stop." As with the subject Eucalyptus, the proportionally smaller root system's ability to sufficiently uptake needed water/nutrients for the canopy diminishes, thus elevating water stress. Symptoms include, but are not limited to branch dieback and stunted growth as noted in several of the subject Lemon Eucalyptus such as #12 and #30. Cement gutters, walls and footings also physically obstruct root development and trunk growth as observed with Lemon Eucalyptus #24 and #25.

Structurally, a disproportionally smaller root system elevates the potential for a full tree failure. Dunster (2009) emphasizes that "in the long term, restricted root growth compromises the stability of the tree, and catastrophic whole tree failure can occur." He continues to note that there are species that tolerate low volume, restrictive planting sites, but that "this is an exception." Eucalyptus are not tolerant of these conditions. Recent catastrophic whole tree eucalyptus failures in restrictive growing sites have occurred at the Goleta Resource Center, UCSB and throughout the Santa Barbara area during recent months.

Factors observed that predispose the various subject trees include, but are not limited to defective root crown, restrictive root zone growing space, asymmetric canopy structure and leans. While these trees have the ability to generate adaptive growth to support themselves, these physiological processes are interrupted by lack of water, low soil volume, pest infestations and improper cultural practices.

Table 2: Individual Tree Condition, Risk Rating for Tree Part of Concern and Recommended Phase Out Year for 27 Lemon Eucalyptus at 1424 State Street, Santa Barbara (Christman, 2017).

Tree Number[1]	Condition	Risk Rating for Condition/s of Concern[5]	Phase Out Removal Year
8	Fair	**High-**Branch	1
9	Poor	**High**-Root Failure **Moderate** -Weak Attachments	2
10	Fair	**High**- Root Crown	1
11	Poor	**Moderat**e- Root Crown- **Moderate** -Extended Branch-	2
12	Poor	**Low**- Dead Branch	1
13	Poor	**Low**- Dead Branch	2
14	Poor	**High**- Root Crown	1
15	Poor	**Low**-Branches less than 4 inch diameter	3
16	Poor	**Low**-Branches less than 4 inch diameter	3
17	Poor	**Low**-Branches less than 4 inch diameter	3
18	Poor	**Low**-Branches less than 4 inch diameter	3
19	Poor	**High-**Root Crown	1
20	Poor	**High-**Root Crown	1
21	Poor	**High-**Top of Tree	1
22	Poor	**High-**Branches **Moderate-**Root Crown	3
23	Fair	**Low-**Root Crown	3
24	Fair	**High-**Root Crown	1
25	Fair	**High-**Root Crow **High-**Codominant Branch	1
26	Poor	**Moderate-**Root Crown	2
27	Fair	**Moderately High-**Root Crown	2
28	Poor	**Moderately High-**Root Crown	2
29	Poor	**High-**Root Crown	1
30	Poor	**Moderately High-**Root Crown	1
31	Poor	**Moderately High-**Root Crown **High-** Branch less than 8 inch diameter	2
32	Poor	**Moderate-**Root Crown **High-** Branch less than 8 inch diameter	2
33	Poor	**Moderate-**Root Crown **High**-Codominant Stem **High-** Branch less than 8 inch diameter	2
34	Poor	**High**-Codominant Stem **Moderate**-Root Crown	1

1-Tree Numbers correspond to larger inventory not included in this report

As noted in Table 1, a majority of the subject trees have a low Live Crown Ratio (LCR). This commonly occurs in parkway and parking lot trees from repeatedly being Crown Raised. Trees with full foliar growth extending from the top to bottom of the trunk (high LCR) have more photosynthetic material to generate incremental wood growth needed for strength throughout the tree (Dunster, 1995). Trees with a low LCR, such as the subject Eucalyptus can have diminished strength and ability to defend against the spread of decay. There is also an increase in the lever arm effect which contributes to the probability of root and/or whole tree failure.

Other defects such as over-extended limbs and codominant stems as noted in the *Lemon Eucalyptus Assessment,* further elevate individual risk ratings. Pruning to mitigate such hazards is limited without inflicting further harm or elevating future hazard potential. The removal of no more than 25% of a healthy tree's leaf bearing canopy is an ISA and ANSI standard. Mature trees are "less tolerant to severe pruning," according to ISA research (2001). Not only does it diminish a tree's ability to photosynthesize, but the larger wound may not **compartmentalize**, thus be unable to fend off the spread of decay. In some of the subject trees such as Eucalyptus #31 and #34 removal of defective branching would further lower LCR and denude the canopy without significantly lowering the hazard potential. In trade terms "there is simply nothing to work with."

Lastly, the subject trees are predominately in a **mature** to **overmature** Age Class which further contributes to their current condition and hazard rating. Even with arboricultural intervention, a tree growing in a cultivated landscape can have a potentially lower lifespan than in its natural environment (Matheny & Clark, 1998). The rate of wood loss (decay) starts to exceed, the rate of new wood development. Thus, a diminished ability to defend, strengthen and maintain resulting in higher instances of branch, limb and root failure. The historic Italian Stone Pines on East Anapamu Street are example of this. Three of the mature to overmature trees toppled from root failure in early 2017 in a wind event. Despite pruning and a supplemental watering program, the root system was unable to support the mass of the trees. Constricted planters and pavement covering the CRZ, a similar situation as the subject Eucalyptus contributed to the failure.

Root failures are especially dangerous given that the footprint of impact is the same size as the tree and all its parts. The full force of a fallen tree, especially a 50 foot to 80 foot Eucalyptus (Hazard Zone extends 1.5 x height from trunk of tree) is capable of catastrophic damage to those targets within the hazard zone. The clean-up of the before mentioned Stone Pines, for example required a front end loader to effectively manage the thousands of pounds of fallen wood.

CONCLUSION

The subject trees are in fair to poor condition with a Moderate to High Risk Rating. Several are likely entering the Mortality Spiral where net biomass declines and vulnerability to pests, disease and branch/root failures increases. Given the Age Class, size, condition and constant occupation of the parking lot, continued branch and/or possible full tree failures are highly probable with significant consequences. Reasonable care and due diligence dictates proactively phasing out the Lemon Eucalyptus over a three year period and replanting with three or more site suitable species is highly recommended. The highest removal priorities, as outlined in the Recommendations below shall be based on Hazard Rating, probability of failure and health.

RECOMMENDATIONS

The following phase-out plan is based on the observations and data collected from March 11 to March 30, 2017 for this report at 1424 State Street. In addition to the detailed explanation below, Table 2 and Appendices photos lists the phase-out year for each tree.

Phase I (8, 10, 12, 14, 19, 20, 21, 24, 25, 29, & 34)
The Lemon Eucalyptus that are somewhat of an imminent threat to persons and other high value targets include Lemon Eucalyptus #8, #19 and 25. Eucalyptus 10, 14, 24 and 25 are the largest trees of the inventory with significant lean, defects at the root crown of buttress roots. Lemon Eucalyptus #20 exhibits lean and root crown defects as well. Lemon Eucalyptus #21 is of an imminent threat to the high voltage power line under its tallest branch leader. It has in inherently weak point approximately 20 feet from the top. The other Eucalyptus for Year One removal due to imminent threat of failure with severe consequences are #34 and #29. Phase I are recommended for removal within one year of publication of this report.

Phase II (9, 11, 13, 26, 27, 28, 30, 31, 32, & 33)
The Lemon Eucalyptus with probable risk of branch or whole tree failure #9, #11, #13, #26, #27, #28, #30, #31, #32, & #33. Each of these trees has been subject to the same stress factors as the Phase I trees, but can be reasonably phased out within two years due to their size, location and condition.

Phase III (15, 16, 17, 18, 22 & 23)
Due to diminished size, probability of failure and relatively lower significance of consequences, Lemon Eucalyptus #15, #16, #17, #18, #22 and #23 can be removed in year three.

Replacement Tree Species Installation, Selection and Maintenance

As described in the Discussion section of the report, long term tree stability and health depends on proper root development as it matures. The existing planter beds should be able to support a root system for the projected above ground biomass. Watson and Himelick (1997) recommend up to two cubic feet of soil for each foot of crown projection area in non-severe above and below ground conditions. Given the limited exposed CRZ area available and the heat island effect of the parking lot, this volume should be higher to compensate for anticipated water stress even if the trees species is known to be drought tolerant. Thus, tree selection will require finding species suitable for the low soil volume planters and predominately paved surface. Biomass replacement through foliar volume rather than matching the height of the current inventory is recommended for long-term safety and sustainability. A successful model of this transition can be seen at the Wholefoods Market, Santa Barbara landscape which now has a diverse tree species palette rather than a Lemon Eucalyptus monoculture.

Tree installation should also adhere to ANSI and ISA guidelines (Appendices: *New Tree Planting*). Given the current soil compaction and likely low fertility, planting holes should be three times the root ball width for optimum root establishment. Standards also call for a shallow planting hole no deeper than the root ball to prevent decay and promote optimum root development.

Finally, the newly planted trees should receive regular maintenance in accordance to ISA guidelines that favors the proactive elimination of defects and encourages favorable canopy structure. Seasonal monitoring by a Certified Arborist is also recommended.

GLOSSARY

Age Class—Classification of tree into categories of young, mature, overmature/declining based on relative growth rate.

Burls—Outgrowth on the trunk, branch or roots: not usually considered a defect (Dunster et al, 2013)

Canopy-- Stems and foliage above ground level of tree (Oxford, 1997)

Codominant Stem—Stems of nearly equal diameter arising from common junction and lacking normal branch union (Dunster et al, 2013)

Critical Root Zone—Root zone of tree necessary for survival (Watson & Neely, 1994)

Crown Rot—Disease or decay at the base of a tree or root crown (ISA, 2005).

Diameter at Breast Height (DBH)—Diameter of trunk, measured at breast height (54 inches above ground) [Matheny & Clark, 1994)

Epicormic—Shoots which result from adventitious or latent buds (Matheny & Clark, 1994)

Fiber Buckling—A long transverse failure in compression of the outer wood of a stem as it sways in a strong wind. The resulting adaptive growth rise to a characteristic ring like bulge around the stem (Wilson, P., 2016)

Heartwood—Inner, nonfunctional xylem tissues that provide structural strength to the trunk and chemical defense against disease causing organisms (ISA, 2005)

Lever Arm—The distance between the applied force and the point where the object will bend.

Lion-tailed—Inappropriate pruning practice removing an excessive number of inner and/or lower lateral branches (Dunster et al, 2013)

Live Crown Ratio—ratio of height of the crown containing live foliage to the overall height of the tree (ISA, 2005)

Mature— Complete in natural development (Oxford, 1997)

Mortality Spiral—Sequence of stressful events or conditions causing the decline and eventual death of a tree (ISA, 2005)

Root Crown— Part of tree where root system joins stem/stems (Shigo, 1997)

Sapwood—Outer wood (xylem) that actively transports water and minerals (ISA, 2005)

Topped—Inappropriate pruning technique used to reduce tree size; characterized by intermodal cuts (Dunster et al, 2013)

Trunk Taper—Relative change in diameter with length: reflects ability of stem or branch to evenly distribute stress (Matheny & Clark, 1994)

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ARBORIST DISCLOSURE STATEMENT

Arborists are tree specialists who use their education, knowledge, training, and experience to examine trees, recommend measures to enhance health and beauty of trees, and attempt to reduce the risk of living near trees. Clients may choose to accept or disregard the recommendations of the arborist, or to seek additional advice.

Arborists cannot detect every condition that could possibly lead to the structural failure of a tree. Trees are living organisms that fail in ways we do not fully understand. Conditions are often hidden within the trees and below ground. Arborists cannot guarantee that a tree will be healthy or safe under all circumstances, or for a specified period of time. Likewise, remedial treatments, like any medicine, cannot be guaranteed.

Treatment, pruning and removal of trees may involve considerations beyond the scope of the arborist's services such as property boundaries, property ownership, site lines, disputes between neighbors, and other issues. Arborists cannot take such considerations into account unless complete and accurate information is disclosed to the arborist. An arborist should then be expected to reasonably rely upon the completeness and accuracy of the information provided.

Trees can be managed, but they cannot be controlled. To live near trees is to accept some degree of risk. The only way to eliminate all risk associated with trees is to eliminate all trees.

Certification of Performance

I, Leigh Christman, certify:

- That I have personally inspected the tree(s) and/or the property referred to in this report, and have stated my findings accurately. The extent of the evaluation and appraisal is stated in the attached report and the Terms of the Assignment;
- That I have no current or prospective interest in the vegetation or the property that is the subject of this report and have no personal interest or bias with respect to the parties involved;
- That the analysis, opinions, and conclusions were developed and this report has been prepared according to commonly accepted arboricultural practices;
- That no one provided significant professional assistance to the consultant, except as indicated within the report;
- That my compensation is not contingent upon the reporting of a predetermined conclusion that favors the cause of the client or any other party.

I further certify that I am a member of the American Society of Consulting Arborists, and acknowledge, accept, and adhere to the ASCA Standards of Professional Practice. I am an International Society of Arboriculture Certified Arborist, and Certified Tree Risk Assessor. I have been involved in the practice of arboriculture and the study of trees for more than thirty years.

Signed: _____

Date: _____

Appendices

Photo Documentation of Individual
Lemon Eucalyptus at 1424 State Street, Santa Barbara