CHRISTOPHER BUCKLEY, AICP CITY PLANNING CONSULTING
HISTORIC PRESERVATION, URBAN DESIGN, ZONING ORDINANCES, DESIGN GUIDELINES
1017 SAN ANTONIO AVENUE, ALAMEDA , CA. 94501 PHONE: (510) 523-0411 FAX: (510) 523-1039
EMAIL: cbuckleyAICP@att.net

February 3, 2025

Mayor and Councilmembers
City of Alameda
2263 Santa Clara Avenue
Alameda, CA 94501

Dear Mayor Ashcraft and Councilmembers:

The following comments modify and expand the January 27 comments I sent to the Planning Board and Public Utilities Board, which were copied to the City Council and Historical Advisory Board.

1. **The 2010 Alameda Master Street Tree Plan's (MSTP's) species designations for "Major Streets" and "Neighborhoods", should be retained.** At the January 30 virtual workshop, the consultant advised that the species designations for Major Streets and Neighborhoods are not being retained. The consultant explained that when responding to street tree planting requests, staff can refer to the Appendix C tree species matrix to identify appropriate species for the planting site.

   It is surprising that the consultant is not retaining the Major Street and Neighborhood designations. The designations were designed to result in the "right tree for the right place" based on factors such as existing trees, soil characteristics, and salt air exposure. The designations were also intended to serve an important urban design function by using street trees to create a defining image for each major street and to a lesser extent each neighborhood.

   At the January 27 Planning Board meeting, concern was expressed that the Major Street designations might result in a single species for each street. This concern is unfounded, since the 2010 MSTP shows multiple species for each Major Street, except for Central Avenue, where continuing the existing London PlaneTrees is shown.

   Not using the Major Street and Neighborhood designations for determining tree selection and instead making the selections in response to each request on a case by case basis seems much less efficient than using the Major Street and Neighborhood designations. Under the consultant's methodology, staff would need to review the Appendix C matrix information for each species and sort out which species are appropriate for the site. But the Major Street and Neighborhood designations have already done this work.

   Since the matrix has deleted some species and added others, the Major Street and Neighborhood designations should be revised to reflect the tree matrix changes. Revisions to the Major Street and Neighborhood designations to reflect new information set forth in the UFP concerning such factors not addressed in the 2010 MSTP as water table levels and salt water intrusion would also be appropriate. It was expected that the consultant would make these changes as part of the UFP, but this was not the case.

2. **The MSTP's limitation of the 25' standard to high voltage lines and to nonmajor streets should be retained.** Volume 1, Section 5.2.3 (Page 69) of the Draft UFP states that "tree species with a maximum potential height of 25 feet are considered appropriate to plant under

utility lines". This is a significant change from the MSTP that applies the 25 foot height only to "high voltage" electrical lines (as opposed to lower voltage "secondary" lines) and exempts "Major Streets" from the 25 foot height requirement. The MSTP also calls for new trees under high voltage lines to have a spreading (decurrent) growth form rather than a strong central leader (excurrent) growth form to help minimize high voltage line conflicts.

The MSTP's limitation of the 25' standard to high voltage lines and to nonmajor streets should be retained. Applying the 25' standard to such streets as Central Avenue would radically compromise this iconic streetscape. The pruning that has been performed on Central Avenue for the past several decades to address the high voltage lines has preserved this streetscape.

Regarding secondary electrical, street trees over 25 feet in height in Alameda and elsewhere have managed to coexist with secondary electrical lines with, to my knowledge, no major conflicts and little or no pruning for decades. Allowing such coexistence is consistent with California Public Utilities Commission General Order 95 (which sets the state standards for electrical line clearances) that calls for pruning for secondary electrical clearance only if tree branches are abrading or exerting tension on the secondary line.

Alameda Municipal Power (AMP) has advised that they are proposing this change to maintain system reliability, and reducing the need for frequent tree trimming. However, I am unaware of significant power outages caused by tree branches interfering with secondary electrical lines and AMP's proposed 2 1/2 year pruning cycle for street trees appears sufficiently frequent to address any conflicts between tree branches and secondary electrical before these conflicts become problematic.

Finally, the proposed 25' standard will significantly inhibit the City's ability to meet its tree canopy coverage goals. As part of the city's climate resilience plan, trees larger than 25' will be needed to help reduce temperatures and the heat island effect. Small trees do not provide enough shade to make a substantial difference. Also, if there is a plan to underground electrical lines within the next 15 years or so for a particular area, then an exception for that area should be made to the 25' height limit on the assumption that the lines will be undergrounded before the trees will grow tall enough to create conflicts.

3. Related to the above, working with AMP, **the UFP should identify long-term strategies for overhead utility line modifications to minimize tree/utility line conflicts**, including:

a. Use of specially **insulated "tree wire" or armored cable** that eliminates the need for most tree pruning for both primary (high voltage) and secondary electrical lines; and

b. **Utility line reconfigurations** that reduce conflicts with trees, such as:
   i. alley arms; and

   ii. reducing the cross-sectional area of construction and therefore the amount of tree central canopy that must be kept pruned to provide adequate line clearance such as:

      a) attaching high-voltage wires directly to poles using brackets, rather than cross arms; or
      b) vertical configuration.

At a minimum, exploration of the above provisions with AMP should be included in the UFP as a future action step.

4. **Clarifications and modifications to the Appendix C Species Matrix.**

   a. **Provide a procedure for planting species not on the list** if the species is considered well-suited to site constraints and otherwise considered desirable. See MSTP provisions.

   b. **Must all park, open space and other non-street trees be selected from the list?** For example, Atlas Cedar is not on the list, but has a very good track record in parks and other non-sidewalk tree locations. Also, parks and other open spaces are better locations than sidewalk trees for trying out species with minimal local track records.

   c. **Some species on the existing MSTP matrix are not included on the list.** Can explanations be provided why these were removed? Species that should be considered for retention include: New Zealand Christmas Tree, London Plane (see discussion below), European Beech (probably only for parks and medians), "Saratoga" Ginkgo (subject to limiting future Gingko Plantings as discussed in the Plan), "Saratoga" Sweet Bay (or Laurel), and Frontier, Triumph and Patriot Hybrid Elm. It is good that many species have been added, although some of these do not have local track records and should therefore probably be considered "experimental" as discussed for the MSTP matrix.

      Curiously, the list includes American Elm without the proviso that varieties resistant to Dutch Elm Disease (DED) be used, although the list also includes the Valley Forge" and "Princeton" varieties, which ARE resistant to DED. **Non DED-resistant American Elm should be deleted from the list.** "Valley Forge" should also be deleted because of its highly problematic growth form but "Jefferson" and "New Harmony" should be added, since their growth forms are more manageable than "Valley Forge" and "Princeton".

   d. **Identify which species are suitable as street trees vs. limited to parks and other non- sidewalk locations.**

   e. Can the matrix include: **tolerance of recycled water and ratings for: (A) carbon dioxide storage; and (B) improving air quality in terms of ozone, nitrogen dioxide, particulate matter and sulfur dioxide.** (See the West Oakland Reforestation Plan, including I-Tree data.)

   f. **Do the *'s have the same meaning as in the MSTP matrix?** An explanation of the *'s should be provided.

   g. **The minimum planting area sizes for sidewalk trees in the MSTP matrix should be retained.** The UFP Appendix C matrix has radically increased the planting area sizes for many species that have performed well as street trees in 3 foot and 4 foot wide planting strips. For example, the planting area widths for Pin Oak and Silver Linden are shown in the UFP matrix as "greater than 10 feet" compared to 3 feet in the MSTP.

      At the January 30 virtual meeting, the consultant explained that the revised planting

area sizes were based on what is needed for optimal performance for each species and primarily applicable to non-sidewalk situations, such as parks and medians. A**pplying the Appendix C planting area widths to sidewalks in most cases eliminates continued use of large-growing species such as Shumard Oak, Silver Linden, Elms, and Red Maple and limits the selection of street trees to small species.** Ca.100 year old specimens of these and other large-growing species have managed to perform reasonably well as street trees throughout Alameda and nearby communities in planting areas as little as 3' wide although with periodic sidewalk damage repair.

h. The Plan correctly notes that London Plane is overused in Alameda, and that existing mature specimens are in decline and/or poor health. However, **since London Plane is an iconic tree on several Alameda streets, such as Central Avenue, Mozart Street, Verdi Street and portions of Park Avenue, Planting of new London Plane should continue on these streets as replacements for removed trees**, but **only** for these and possibly a limited number of other specially designated streets as identified on the MSTP.

A likely reason for the decline of so many London Plane specimens is that as a species, its population is one of the oldest in Alameda. So it is not surprising that a disproportionate percentage of the London Plane population is in decline. Root cuts for sidewalk repairs appear to be a contributing factor. Anthracnose may be another contributing factor, but can be addressed through use of anthracnose-resistant varieties, such as "Columbia", which is also resistant to powdery mildew.

It is surprising that London Plane is not considered drought tolerant, since numerous large and apparently healthy specimens can be found at locations throughout the bay area with no irrigation as well as parts of Europe, such as southern Italy, southern France and Spain, with hot summers and a little or no summer rainfall.

i. The following species in the matrix should be considered drought tolerant: Turkish Hazel, Ginkgo, Southern Live Oak, Swamp Myrtle, and possibly Black Birch. I can provide justification in a follow up email or discussion.

j. Some of the species included in the Cal Poly Select Tree List are not included in the matrix and vice versa. Which list is definitive? The two lists also sometimes use different botanical names for the same species.

5. The Appendix Q guidelines for developing a protected tree ordinance are disappointing and need more development to adequately address private property trees. The Guidelines read to address street trees rather than private property trees and repeat much of the language in the City's existing street tree removal procedure. The intent of the ordinance is to extend the protection of private property trees beyond the existing protections for coast Live Oak to include other species. The ordinance should also include definitions for key terminology, such as "removal", include criteria for assessing the trade-offs between development related tree removals and adjusting the project design to avoid removals, and provide an improved penalty structure.

The Appendix R list of ordinances from other communities with brief summaries of their provisions is helpful, but an analysis should have been provided. At the January 30 workshop, staff advised that another consultant contract will be developed to establish more definitive parameters for the ordinance and possibly development of the ordinance itself.

6. **The Appendix I spacing guidelines for street trees is hard to read and requires a color printer.** It should be redesigned so that content can be communicated in black-and-white. The existing spacing guidelines in the MSTP are better and provide exceptions that should be continued.

7. **The draft UFP has at least several typos and incorrect cross-references that should be corrected.**

Please contact me if you have questions or would like to discuss these comments.

Christopher Buckley, AICP
City Planning Consulting
Phone: (510) 523-0411
Email: cbuckleyAICP@att.net

cc: Historical Advisory Board, Jennifer Ott, Danielle Mieler, Tim Haines, Allen Tai, Matt Nowlen, Erin Smith

ALAMEDA MASTER STREET TREE PLAN

CITY COUNCIL

Beverly Johnson, Mayor
Doug De Haan, Vice Mayor
Lena Tam, Councilmember
Marie Gilmore, Councilmember
Frank Matarrese, Councilmember

CITY STAFF

Matthew Naclerio, Public Works Director
Barbara Hawkins, Project Manager and City Engineer, Public Works Department
Shilpa Patel, Junior Engineer, Public Works Department
Todd Williams, Public Works Supervisor, Public Works Department

CONSULTANTS

Charlie Lanfranco, Tanaka Design Group, San Francisco
Melanie Gentles, Certified Arborist
Zoë Lonergan, Book Cover and Document Designer

Improving our urban forest is no simple task, and requires the ideas, time, and expertise of many people. This project is the result of extensive collaboration and teamwork among those within and outside Alameda's urban forest. Special thanks go to the residents of the Alameda urban forest who enthusiastically attended meetings and provided feedback, so that this plan could reflect their vision for the forest in which they live. We would particularly like to thank Chris Buckley for his time, dedication and draft reviews.

THE CITY OF ALAMEDA'S MASTER STREET TREE PLAN
VOLUME 1

CHAPTER 1

INTRODUCTION

1.0 / EXECUTIVE SUMMARY

The City of Alameda's Master Street Tree Plan (MSTP) is a community based Master Plan document covering all topics concerning the street trees of Alameda.

The MSTP provides detailed information about the status of the city's street trees and guidelines for its maintenance and expansion. This plan is intended for use by citizens, builders, City staff, and utility companies. This MSTP serves as an update and expansion to the previous Master Tree Plan written in 1989.

The goals of the MSTP are to:

- Improve the condition of the existing urban forest by adhering to the industry's best practices for maintenance;
- Increase public safety and decrease municipal liability by first mitigating safety concerns, then following a routine, proactive maintenance schedule;
- Expand canopy cover through strategic species selection using the devised tree matrix;
- Preserve protected trees that are significant to the city's identity;
- Reduce conflicts between trees and city infrastructure;
- Cultivate an attractive and functional street landscape design that uses scientifically researched, cost-effective technologies and strategies; and
- Enhance community involvement in the improvement of Alameda's urban forest.

1.1 / INTRODUCTION

We Californians may think of ourselves as outdoorsy nature-lovers, but about 98% of us live in urban areas. Even so, we are still forest dwellers, enjoying our lives among the trees that line our streets and spread their canopies in parks and gardens. But city life is not easy for forests. Rising pollution levels, climate change, construction, and urban sprawl are just some of the ways that cities threaten the health and existence of trees. Yet increasingly, we are realizing just how much we need the forest around us.

The ongoing construction so common to urban areas like Alameda can obliterate a city's sense of permanence and stability. The abundance of existing trees in Alameda makes it easy for residents to take them for granted; the "sense of place" a tree provides is usually not appreciated until the tree is taken down. This is not unlike the loss of a special building in a fire—however, there is a critical difference. To replace the visual impact of the tree takes a generation, while replacing that of the building often takes less than a year. An ongoing effort to cover the city with enduring trees is an effective solution to restore the feeling of security. This is one of the many reasons that cities throughout North America are becoming increasingly conscious of the importance of trees, and it is the incentive for the City of Alameda investing in its future by actively managing its urban forest with thoughtful foresight.

Unlike a natural forest, the urban forest does not have the opportunity to sustain itself. It exists in an environment that is constantly under the manipulation and influences of mankind. As a result, the amount and quality of human care an urban forest receives is vital to its longevity and health.

Sustainable urban forests result when naturally occurring and planted trees in cities are managed to provide the inhabitants with a constant level of economic, social, environmental, and ecological benefits today and into the future. Of course, healthy, well-managed trees provide greater amounts of these benefits than forests that are poorly maintained and less healthy.

ALL street trees are wiithin the public right-of-way and require specific city approvals and permits for the planting, pruning and removal of a street tree. Section 23-3 of the Alamaeda Municipal Code provides additional information regarding these requirements.

The City of Alameda is blessed with an abundance of trees. They are a major part of Alameda's heritage and define much of its character. In earlier days, Alameda was referred to as "Encinal de San Antonio"—later shortened to "The Encinal"—because of the large number of live oak trees in the city. Even the contemporary name "Alameda" translates into tree-related phrases; one of the Spanish translations is "a grove or lane of poplar trees," while another translation is "a public promenade bordered with trees." Although both of these phrases may be incorrect translations, they do accurately describe the city, whereby it is clear that the City of Alameda has always inspired thoughts of a lush, green, plant-filled environment. The maintenance and protection of fine old trees links the past with the present, binding this heritage to the future. The adoption of the Historical Tree designation

is evidence of the concern for Alameda's environmental heritage, refer to existing city ordinance for further information. This MSTP is dedicated to the principle that today's decisions and actions about trees are a part of tomorrow's environmental heritage. Therefore, the choice of trees to plant is an important one. New trees planted today affect the quality of the environmental heritage for years to come.

This Master Street Tree Plan (MSTP) provides information on the present status of Alameda's street trees, and suggests some effective means by which the city can safeguard and expand its urban forest through street tree management.

MSTP goals, such as increasing tree canopy, improving public safety, and providing native habitat, must be balanced with other goals such as accommodating growth and facilitating transportation. The MSTP is the City of Alameda's plan to integrate management of the many issues and opportunities posed by Alameda's tree resource. Additionally, all natural systems change over time. If the City and its residents want these changes to enhance the urban forest, they must be actively managed. Nationally-based studies repeatedly support the fact that the resource deteriorates when human intervention is not a proactive part of urban street trees' existence. This decline can be seen in many of Alameda's street tree corridors where it is evident that trees have been planted in places that either don't allow for growth or that conflict with sidewalks and power lines. Proactive management is needed to keep the city trees sustainable and in balance with other urban priorities.

WHO WILL USE THIS MASTER PLAN?

- City Managers: to unify the City's approach to street tree management
- City Council: to plan, implement, manage and maintain the council's street trees
- Landowners and Developers: to assist in the selection and planting of appropriate street tree species
- Contractors: to maintain and plant street trees.
- The General Public: to foster awareness of the benefits of street trees.

AREAS NOT COVERED BY THIS MSTP

A number of areas have been excluded from this version of the MSTP. With the exception of the naval grounds, which are under the control and management of separate authorities, all private developments are not included. These areas will hopefully be incorporated in future revisions of this MSTP. The City Parks have been excluded as they are the subject of separate studies. These studies will include consideration of the street trees in conjunction with other design elements. The major developments at the former Alameda Naval Base and Northpoint have been excluded, as they have separate master plans that control the planting of street trees within those developments, but will be equalized to use the Tree Matrix.

1.2 / MASTERPLAN GOALS AND ACTIONS

These following priorities for Alameda's urban forest were established through communication with city staff and residents during several information-gathering meetings early on in the project.

YES TO

- Tree protection
- More trees
- Long lived trees
- Healthier trees
- Dynamic urban forests
- Sustainable urban forests
- Protect healthy trees while providing for infrastructure stability and public safety
- Replant new trees species mix where existing trees cannot be safely retained
- Maintain successful tree species corridors by planting younger trees
- Proactively pre-plant trees before trees become high risk

NO TO

- Wholesale tree felling
- Short-term tree-less streets
- False eveness plantings
- High risk trees
- Sidewalk and utility conflicts

Based on these priorities, goals and action items were established by Alameda's city staff.

The goals and actions have been divided into two groups: long-term goals and short-term goals. Each goal statement is followed by the supporting rationale for the goal, which is then followed by short and long-term actions needed to achieve the goal. Implementation will require policy, program, and budget coordination, as well as long-term and stable funding. The timeline definitions for implementing the proposed actions are as follows:

- Short-term actions will be done within the next five years. Typically, these are actions that are either already partially implemented, that are budget-neutral, or that have already allocated new funding.
- Long-term actions will be accomplished in 25 years. These are actions that might require operational restructuring or reorganization, limited additional funding, or "tooling-up" on the part of internal or external partners.

SHORT-TERM GOALS AND ACTION ITEMS

Short-Term Goal 1: Encourage and maintain a balance between tree-lined streets and safe utility and transportation corridors.

Action A: Provide improved guidelines and standards for utility design, which will coexist with established and future tree plantings.
Action B: Trees shall be planted and maintained in locations where street trees do not conflict with standards for sight distance triangles and traffic sign placement.

Short-Term Goal 2: Maintain and update the public street tree inventory.

Action A: Update GIS tree inventory on an ongoing basis to reflect plantings, removals and maintenance.
Action B: Expand the current street tree inventory to include all city maintained street trees and plantable spaces.
Action C: Conduct a complete street tree inventory every 10 years.

Short-Term Goal 3: Train city maintenance employees in arborculture practices.

Action A: Create a position for, and hire, a City Arborist to coordinate and oversee all tree-related activities.
Action B: Hire and train a city tree crew to perform street tree maintenance in a manner that best follows the Best Management Practices as outlined in the MSTP.

Short-Term Goal 4: Create and maintain a comprehensive list of street trees to be recommended in future plantings.

Action A: Adopt and enforce an approved street tree list.
Action B: Revise the list of recommended street trees every five years to reflect the successes and failures of the existing street tree population.

Short-Term Goal 5: Coordinate street tree design and selection in the permits and review process.

Action A: Provide and encourage effective coordination and compliance with applicable design and development standards for each type of land use or street type associated with the establishment and maintenance of public trees.

Short-Term Goal 6: Develop a public tree ordinance that presents planting and maintenance standards for all street trees within public right of way.

Action A: Encourage continual input from the public and from City departments with regard to street tree standards and procedures associated with the planting, removal, and maintenance of public street trees.
Action B: Review and update procedures, and standards for establishing and maintaining the City's street trees.

LONG-TERM GOALS AND ACTION ITEMS

Long-Term Goal 1: Sustain and expand a healthy urban forest that benefits the community with improved safety, air quality, erosion control, storm water retention, temperature reduction, and aesthetics, while also enhancing wildlife resources.

Action A: Fill in all available planting spaces for an increase in the street tree population within the next 25 years. Based on available funding plant tree species appropriate for the location by using the planting palettes and tree matrix in this MSTP. The city would need to aim to plant 200 street trees a year in order to meet this goal.
Action B: Mitigate all hazardous street trees by following the tree maintenance and removal guidelines in this MSTP.

Long-Term Goal 2: Work toward no net loss of the overall community urban forest cover; in the long term, to work toward measurable gain.

Action A: Mitigate the net loss of healthy forest canopy cover on publicly owned lands. In the long term, the City will achieve measurable gain with consideration of species performance, practicality, and maintenance requirements.

Long-Term Goal 3: Discourage the unnecessary removal of existing healthy trees in the design, construction, or reconstruction of street projects, and other property development.

Action A: Develop tree planting, and removal standards.
Action B: Removal of trees in unavoidable construction condition to be approved only by PW Director.

Long-Term Goal 4: Shift from a reactive, hazard-based maintenance program to a proactive, cyclic maintenance program.

Action A: Continue to expand support for the street tree program and maintenance crew.
Action B: Maintain city street trees on a five-year cycle, using the city's existing maintenance zones. New plantings should be addressed until established.

Long-Term Goal 5: Establish funding mechanisms for the expansion and sustainability of the City's street tree program.

Action A: Allocate funds and research alternative funding sources to ensure the sustainability of the street tree maintenance program.
Action B: Create incentives for property owners to share in the cost of planting street trees in front of their property.

1.3 / BACKGROUND TO ALAMEDA'S URBAN FOREST

CLIMATE

Alameda is part of the Bay Area coastal climate zone, experiencing a warm, moist summer/autumn and a cool, wet winter/spring. The city of Alameda has a mild climate during summer, when temperatures tend to be in the 60s, and a cool climate during winter, when temperatures are usually in the 50s. The warmest month of the year is September, with an average maximum temperature of 74.60 degrees Fahrenheit, while the coldest month of the year is January, with an average low temperature of 44.70 degrees Fahrenheit. Temperature variations between night and day tend to be fairly limited during both summer and winter, with differences around 15 and 13 degrees Fahrenheit, respectively.

The annual average precipitation in Alameda is 22.94 inches. Winter months tend to be wetter than summer months. The wettest month of the year is January, with an average rainfall of 4.85 inches. Alameda experiences more moderate rainfall than other coastal areas, and selected trees must tolerate a longer succession of drier days between rains. The predominant wind direction is from the Pacific throughout the year. Wind can have a significant impact on the health and form of a tree, particularly in exposed locations such as along the coast or where surrounding buildings and structures create wind tunnel effects.
Alameda is located in Zone 9 of the USDA Hardiness Zone Map, which identifies the climatic region where the average annual minimum temperature is between 40 and 50 degrees Fahrenheit. Tree species selected for planting in Alameda should be appropriate for this zone. In addition, species should be urban-tolerant, and rated as relatively free from insect pests and disease. According to Sunset's Western Garden Book, Alameda lies in Climate Zone 17, which is dominated by ocean influences about 98% of the time. The climate is mild without extreme high or low temperatures, characterized by cool, wet winters and cool summers with fog or wind. Certain interior sections of the city could be typified as Sunset Zone 16, with more heat than the maritime-dominated Sunset Zone 17. As part of northern and central California's chilly winter areas influenced by the coast, the main growing season is from March to December. Rain typically comes from fall through winter. Typical winter lows range from 28 degrees to 21 degrees Fahrenheit. Maritime air often influences the zone, giving it cooler, moister summers than Zone 14. In the Bay Area region, winter lows usually don't drop below 40, but temperatures in the 20s have been recorded. Snow is extremely rare. Nighttime temperatures during the summer usually fall no lower than the mid-50s. Precipitation averages 24 inches per year, while temperatures are moderate with a mean July high reading of 73 degrees F and a mean January high temperature of 57 degrees F. The potential growing season is long, with usually 360 days per year without a killing frost.

TREE SPECIES

In addition to considering site characteristics, such as availability of space, soil pH, and irrigation, species-specific features must also be scrutinized. A major consideration for street trees is the amount of litter dropped by mature trees. Species such as willow (*Salix* spp.) have weak wood and typically drop many small branches during a growing season. Others, such as American sweetgum

Photo of an Alameda street in 2007.

Same street as above after proposed urban forest unfill.

(*Liquidambar styraciflua*) drop high volumes of fruits. In certain species, such as Maidenhair (*Ginkgo biloba*) and Osage-orange (*Maclura pomifera*), female trees produce offensive or large fruit; male trees, however, produce no fruit. Furthermore, a few species of trees, including Hawthorn (*Crataegus* spp.), may have substantial thorns. These species should be avoided in high-traffic areas.

Seasonal color should also be considered when planning tree plantings. Flowering varieties are particularly welcome in the spring, and deciduous trees that display bright colors in autumn can add a great deal of interest to surrounding landscapes. Above all, tree species should be selected for their durability and low-maintenance characteristics. These attributes are highly dependent on site features as well as species characteristics. Matching a species to its favored climatic and soil conditions is the most important task when planning for a low-maintenance landscape, because plants that are well-matched to their environmental and site conditions are more likely to resist pathogens and insect pests, therefore requiring less maintenance overall. Refer to the Street Tree Matrix for additional tree species and cultivars suitable for planting in Alameda.

SOILS

The majority of Alameda is located on a sandy island. The rest of the soils are comprised of bay mud that was dredged up to provide additional land and open deep-water container ship passage in the water. These bay mud soils are clay-rich, fine textured, basic, and moderately infertile. They provide good structural support for trees but because the island soils have a high water level and the bay muds are saturated this often affects the depth of root growth.

Operations that filled marshland soil have had an immense environmental impact on Alameda, with the earliest ones beginning before 1870. Prior to these landfills, the city encompassed approximately 2,200 acres of high ground and 1,000 acres of marshland. According to Imelda Merlin in Alameda: Historical Geography of a California City, Alameda in 1964 comprised two and one-half times as much area as it had in 1850. The non-fill areas are typified by the Baywood soil series, according to the Soil Conservation Service's 1981 study of Alameda County. In the western part of Alameda, the Baywood series soils are composed of "deep, somewhat excessively drained soils that formed in sandy eolian deposits that derived from old beach deposits." In most cases, the soil becomes more acidic as depth increases. There is little variation in soil structure between soils taken at different depths; it is sand or loamy sand throughout.

The material that was used to fill the marshland consist of beach sands that were dredged from the outlying areas of Alameda Naval Air Station and Oakland Airport. In some of these fill areas there is a perched water table. The highly alkaline soil condition created by this high water table, combined with the addition of unknown materials during fill operations, compounds the problems of tree establishment in these areas.

Photo of an Alameda street in 2007

Same street as above after proposed urban forest infill

TOPOGRAPHY

The topography of the city of Alameda is mostly flat land along the San Francisco Bay floodplain, with most of the city only a couple of meters above sea level.

TREE POPULATION

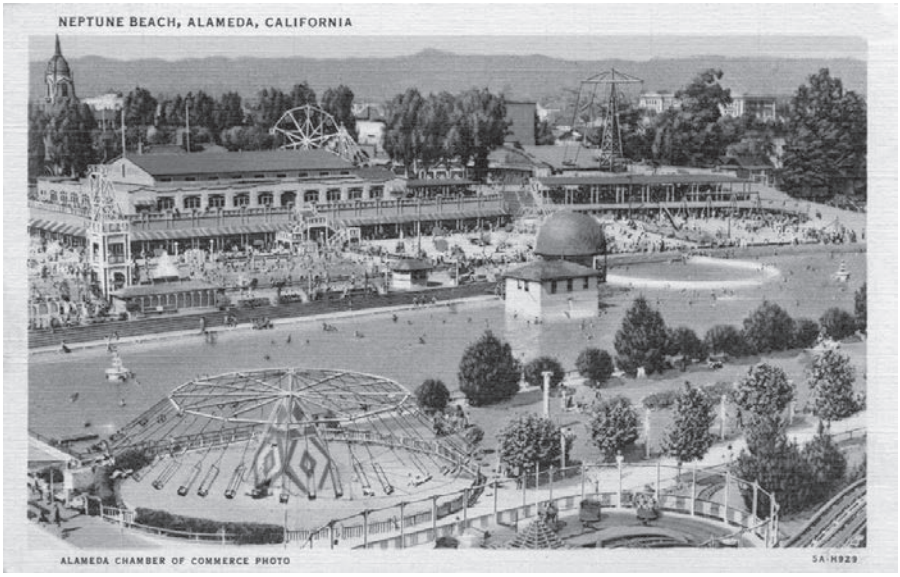
Most of today's large trees were planted during the first decade of the 20th century, and thanks to those who had such foresight, Alameda became known throughout the Bay Area as a city of trees. However, by the mid- to late 1970s, vehicular traffic had increased to the point that several street widening projects were proposed, requiring the removal of dozens of trees along the major arterials. These projects, together with the pruning of many trees that had matured enough to interfere with power lines, had a detrimental effect on Alameda's street trees.

In 1989, Thomas J. Pehrson of Urban Forestry Consultants and Barrie Coate was commissioned to conduct the first citywide street tree inventory and analysis. The resulting Master Tree Plan helped guide the revitalization of Alameda's street population for almost two decades. In 2008, Tanaka Design Group was commissioned to conduct a revised inventory and analysis of all street trees throughout the city. This recently completed tree inventory found over 12,000 street trees in the City of Alameda. Although a formal inventory of trees on public properties other than city streets has not been undertaken, it can be assumed there are two to three trees on these properties for each street tree, which would make the total public tree population somewhere between 36,000 and 48,000 trees.

The current tree inventory uses a GIS-based system that lists street trees by their own unique ID number, species, size, and health condition. The first non-computerized tree inventory was completed in 1989 and was not continually updated as work was done on Alameda's tree population. It is therefore desirable that the new inventory be continually maintained and included as a layer of the City's existing GIS maps.

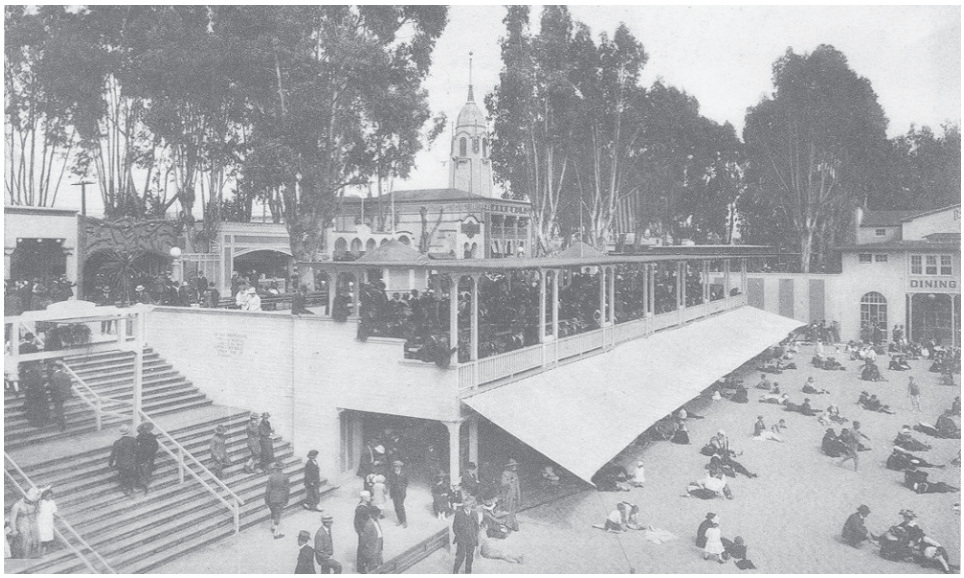
BENEFITS OF THE STREET TREES AND THE COMMUNITY FOREST

The many benefits of urban trees that were once considered qualitative and subjective are now being scientifically quantified. The environmental benefits trees provide, such as producing oxygen and removing air pollutants, may be the most obvious. Trees can also reduce air temperatures and consequently affect air quality, since the emissions of many pollutants are temperature-dependent. Planted in the right location around buildings, trees can reduce heating and cooling energy costs. Tree canopy can also reduce storm water runoff and contribute to substantial savings in the long-term construction costs for storm water facilities. The reduction in storm water volume can help improve the water quality of the San Francisco Bay by reducing pollutant runoff. Street trees contribute valuable wildlife habitat as well. Alameda's street trees provide significant economic benefits to the community. The environmental services the trees provide can be quantified and individual trees can be extremely valuable components of a city's landscape. The value of individual trees in the landscape can be appraised—many of the majestic, mature trees of Alameda's urban forest have an estimated appraised value in the tens of thousands



Plantings at Neptune Beach, Alameda, California (Circa 1912)

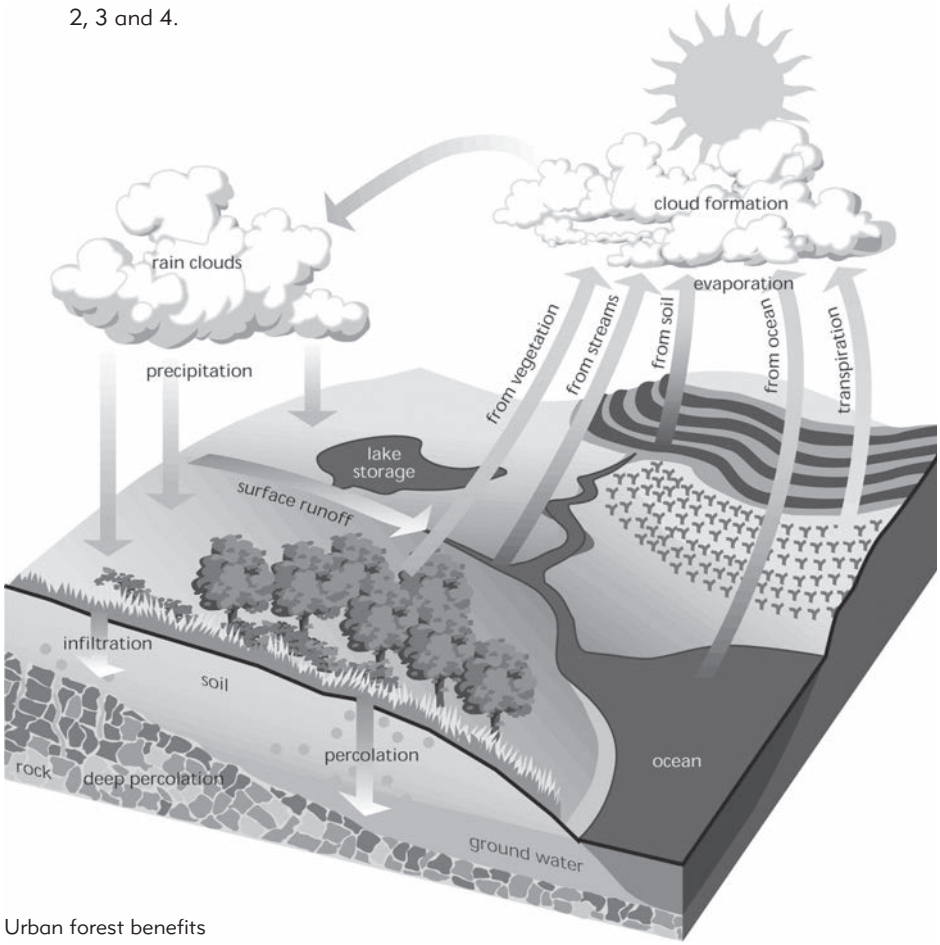
Plantings at Neptune Beach, Alameda, California (Circa 1912)



of dollars. Street trees are one of the key factors making Alameda a desirable place to shop, work, visit, and live. The following list gives several economic reasons why it makes sense to continue the stewardship of Alameda's street trees.

- The net cooling effect of a healthy mature tree is equivalent to 10 room-sized air conditioners operating 20 hours a day (U.S. Department of Agriculture).
- Trees properly placed around buildings can reduce air conditioning needs by 30 to 50%, and up to 65% in the case of mobile homes (USDA Forest Service).
- Shading an air conditioning unit can increase its efficiency by 10% (ASHREA The American Society of Heating, Refrigerating and Air-Conditioning Engineers).
- Trees can be a stimulus to economic development, attracting new business and tourism. Commercial retail areas are more attractive to shoppers, apartments rent more quickly, tenants stay longer, and space in a wooded setting is more valuable to sell or rent (The National Arbor Day Foundation).
- Healthy, mature trees add an average of 10% to a property's value (California Association of Realtors).
- The planting of trees means improved water quality, resulting in less runoff and erosion. This allows more recharging of the ground water supply. Wooded areas help prevent the transport of sediment and chemicals into streams (USDA Forest Service).
- In laboratory research, visual exposure to settings with trees has produced significant recovery from stress within five minutes, as indicated by changes in blood pressure and muscle tension (Texas A&M University).

Conclusion: The following appendices are results from the tree study: Appendix 2, 3 and 4.



Urban forest benefits

CHAPTER 2

TREE INVENTORY

1.1 / INTRODUCTION

We Californians may think of ourselves as outdoorsy nature-lovers, but about 98% of us live in urban areas. Even so, we are still forest dwellers, enjoying our lives among the trees that line our streets and spread their canopies in parks and gardens. But city life is not easy for forests. Rising pollution levels, climate change, construction, and urban sprawl are just some of the ways that cities threaten the health and existence of trees. Yet increasingly, we are realizing just how much we need the forest around us.

The abundance of existing trees in Alameda makes it easy for residents to take them for granted; the "sense of place" a tree provides is usually not appreciated until the tree is taken down. This is not unlike the loss of a special building in a fire—however, there is a critical difference. To replace the visual impact of the tree takes a generation, while replacing that of the building often takes less than a year. An ongoing effort to cover the city with enduring trees is an effective solution to maintain a city's sense of permanence and stability. This is one of the many reasons that cities throughout North America are becoming increasingly conscious of the importance of trees, and it is the incentive for the City of Alameda to invest in its future by actively managing its urban forest with thoughtful foresight.

Unlike a natural forest, the urban forest does not have the opportunity to sustain itself. It exists in an environment that is constantly under the manipulation and influences of city residents. As a result, the amount and quality of human care an urban forest receives is vital to its longevity and health.

Sustainable urban forests result when naturally occurring and planted trees in cities are managed to provide the inhabitants with a constant level of economic, social, environmental, and ecological benefits today and into the future. Of course, healthy, well-managed trees provide greater amounts of these benefits than forests that are poorly maintained and less healthy.

BENEFITS OF THE STREET TREES AND THE COMMUNITY FOREST

The many benefits of urban trees that were once considered qualitative and subjective are now being scientifically quantified. The environmental benefits trees provide, such as producing oxygen and removing air pollutants, may be the most obvious. Trees can also reduce air temperatures and consequently affect air quality, since the emissions of many pollutants are temperature-dependent. Planted in the right location around buildings, trees can reduce heating and cooling energy costs. Tree canopy can also reduce storm water runoff and contribute to substantial savings in the long-term construction costs for storm water facilities. The reduction in storm water volume can help improve the water quality of the San Francisco Bay by reducing pollutant runoff. Street trees contribute valuable wildlife habitat as well. Alameda's street trees provide significant economic benefits to the community. The environmental services the trees provide can be quantified and individual trees can be extremely valuable components of a city's landscape. The value of individual trees in the landscape can be appraised—many of the majestic, mature trees of Alameda's urban forest have an estimated appraised value in the tens of thousands of dollars. Street trees are one of the key factors making Alameda a desirable place

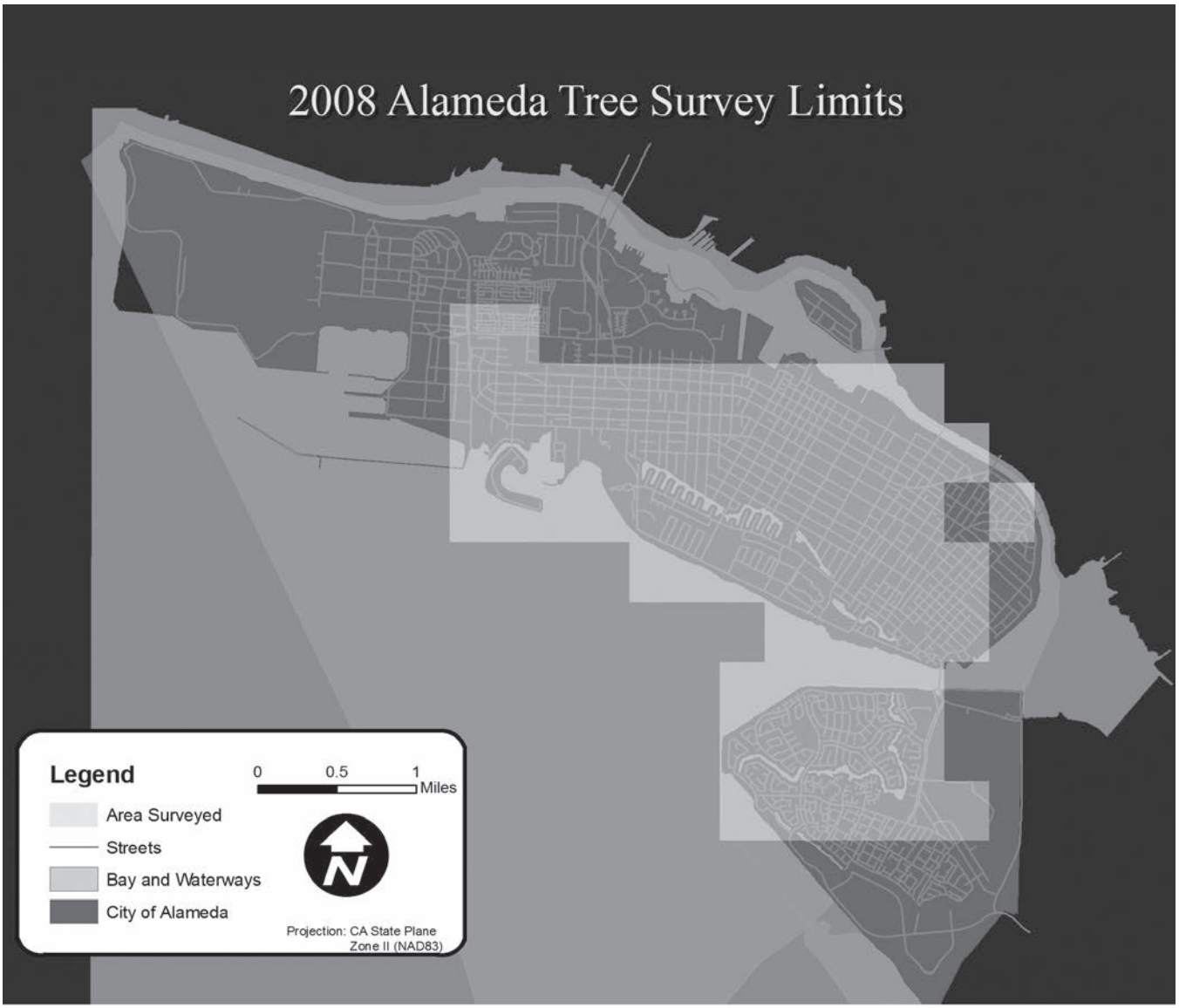

2008 Alameda Tree Survey Limits
Legend
0
0.5
1
Miles
Area Surveyed
Streets
Bay and Waterways
City of Alameda
N
Projection: CA State Plane
Zone II (NAD83)

Figure 2.1

to shop, work, visit, and live. The following list gives several economic reasons why it makes sense to continue the stewardship of Alameda's street trees.

- The net cooling effect of a healthy mature tree is equivalent to 10 room-sized air conditioners operating 20 hours a day (U.S. Department of Agriculture).
- Trees properly placed around buildings can reduce air conditioning needs by 30 to 50%, and up to 65% in the case of mobile homes (USDA Forest Service).
- Shading an air conditioning unit can increase its efficiency by 10% (ASHREA The American Society of Heating, Refrigerating and Air-Conditioning Engineers).

Table 2.0 / Components of the Neighbourwoods© tree inventory used in the 2008 tree inventory. * indicates characteristics that were analyzed only in Priority trees.

	TREE CONDITION	CONFLICTS
TREE ID	Unbalanced crown*	Overhead Wires Structures
Unique tree ID number	Reduced height*	Sidewalks
Inventory date	Weak or yellow foliage*	Other trees
Genus	Defoliation*	Traffic Signs
Species	Dead or broken branches*	
Cultivar	Poor branch attachment*	**OTHER**
	Lean*	Plantable spots
MEASUREMENTS	Trunk scars*	
Diameter at breast height (DBH)	Branch or pruning scars*	
Percent of crown over hard surface	Conks*	
Number of stems	Rot/cavity – trunk*	
Height class	Rot/cavity - branch*	
Planting strip width	Crack*	
	Confined space*	
	Girdling roots*	
	Root trenching*	

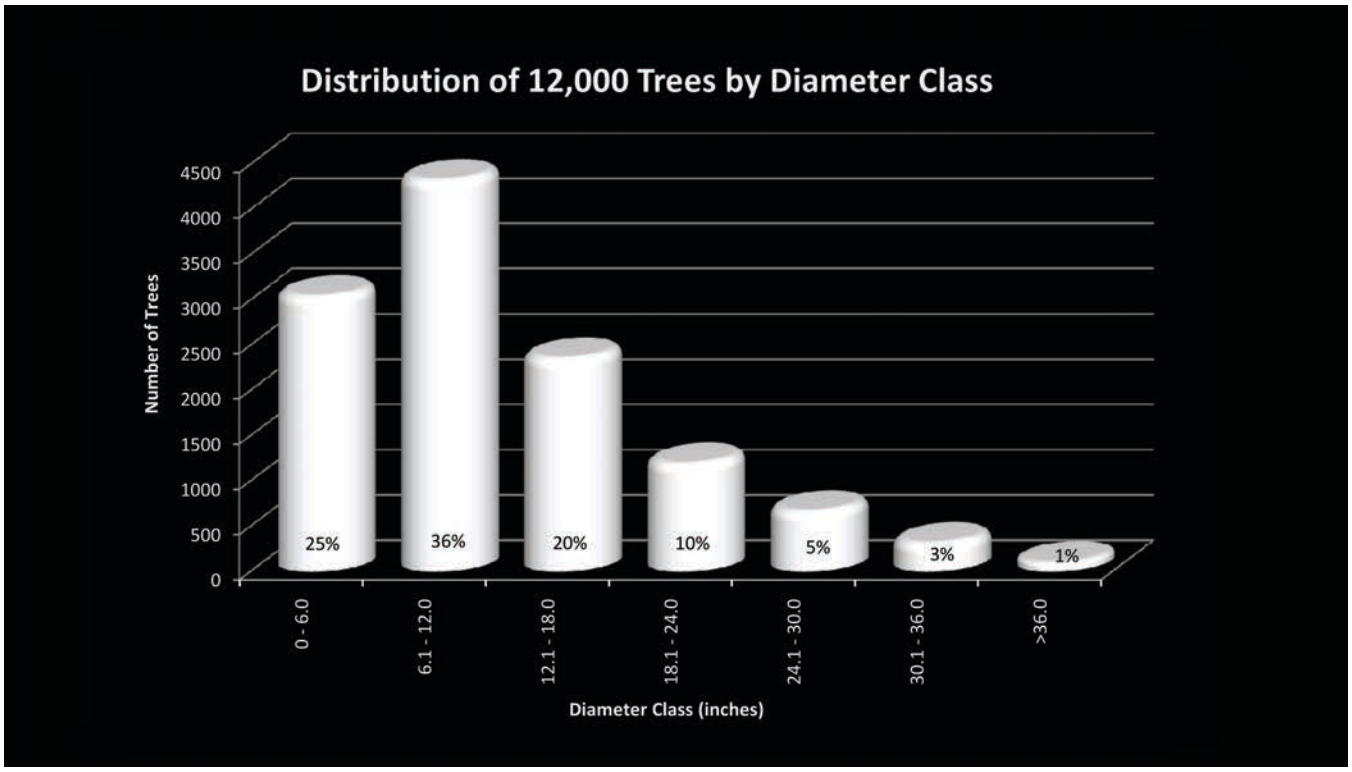
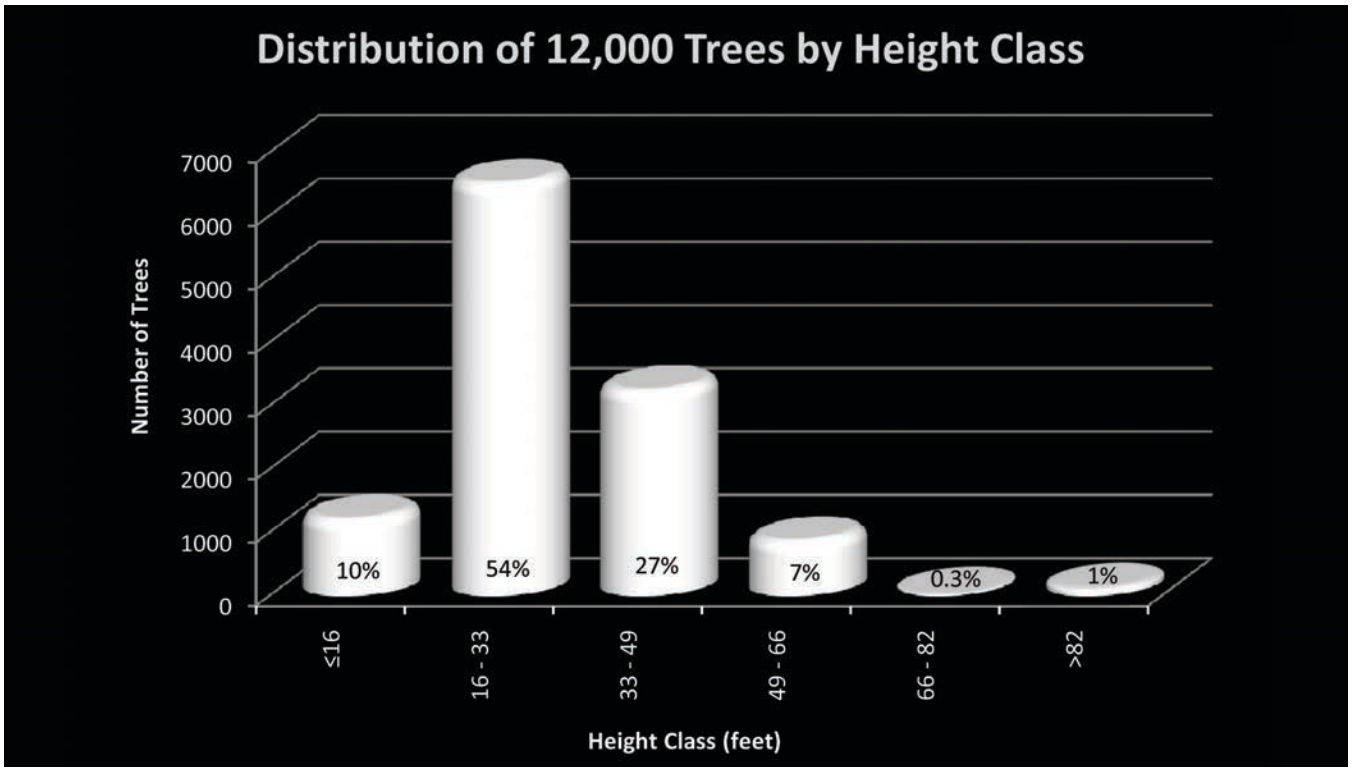


Figure 2.2

Figure 2.3



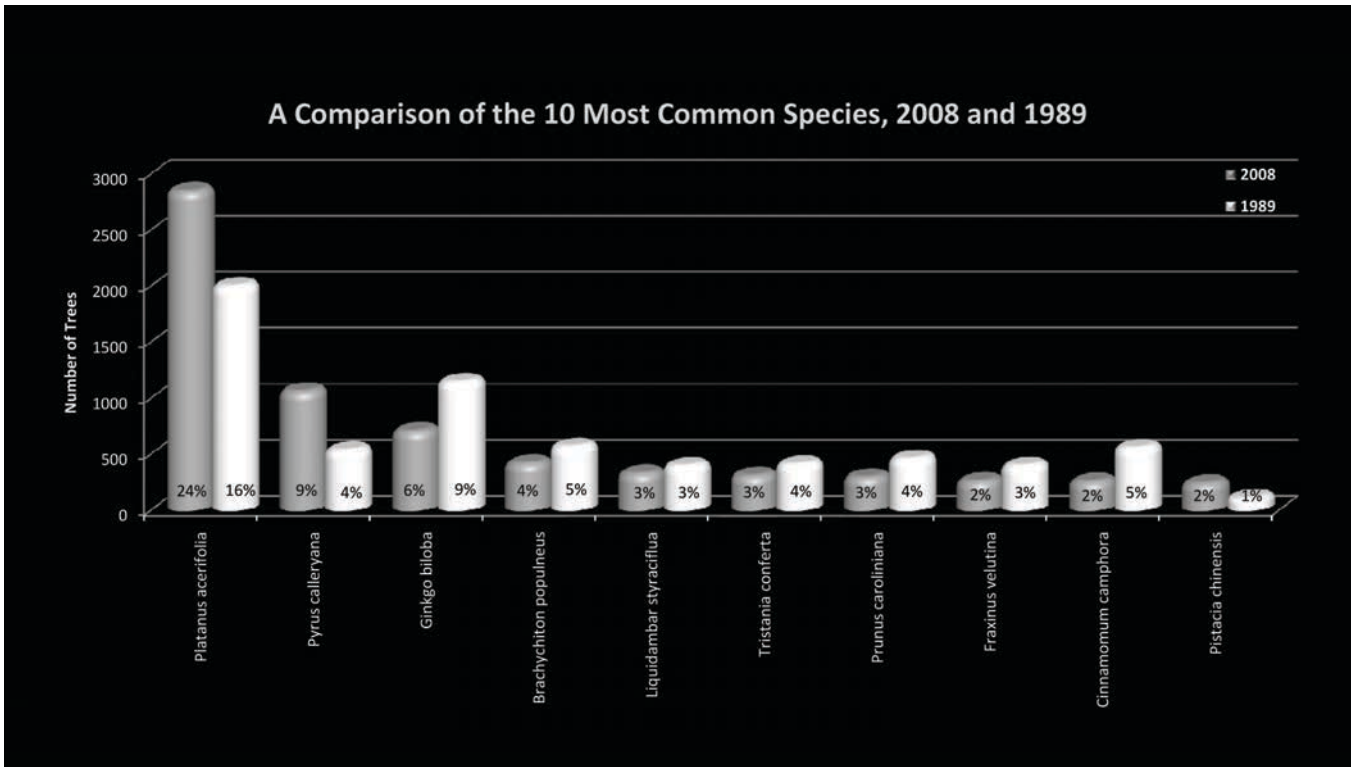
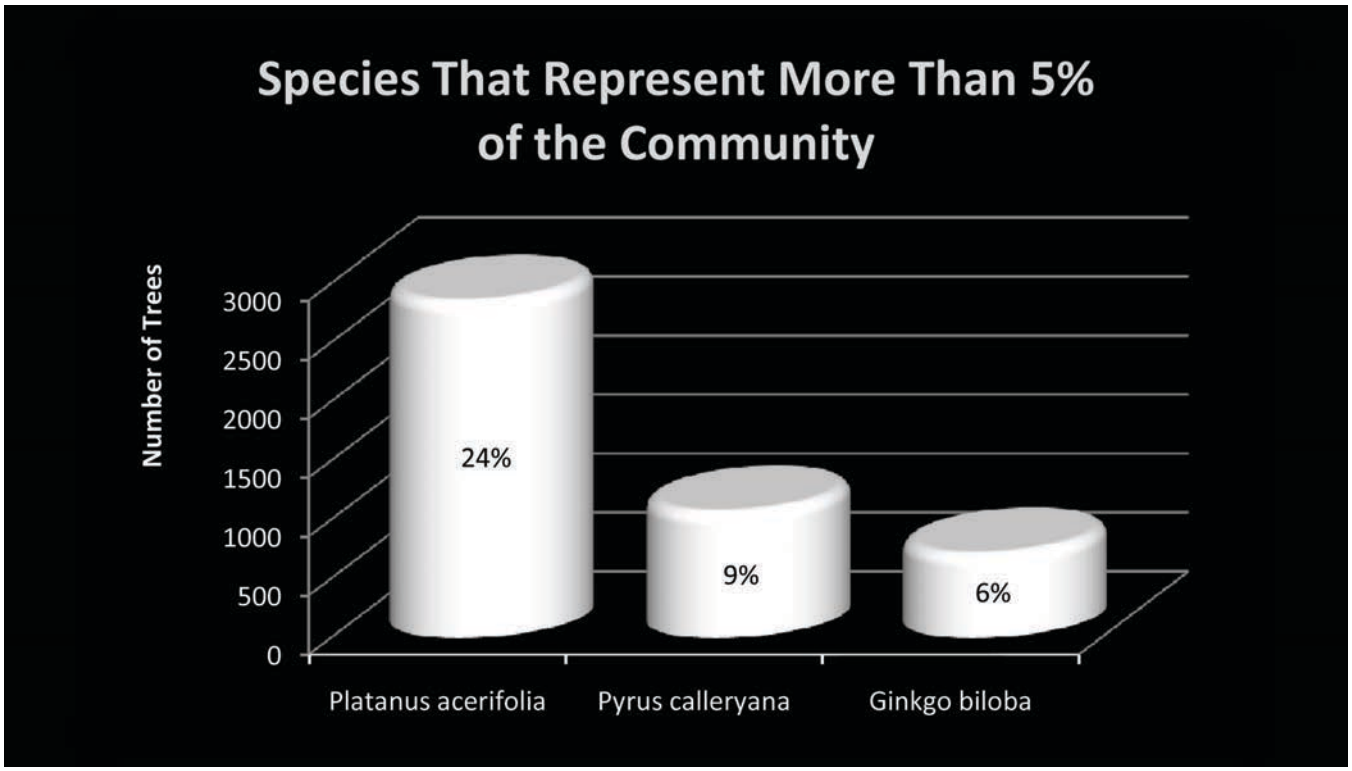


Figure 2.4

Figure 2.5



- Trees can be a stimulus to economic development, attracting new business and tourism. Commercial retail areas are more attractive to shoppers, apartments rent more quickly, tenants stay longer, and space in a wooded setting is more valuable to sell or rent (The National Arbor Day Foundation).
- Healthy, mature trees add an average of 10% to a property's value (California Association of Realtors).
- The planting of trees means improved water quality, resulting in less runoff and erosion. This allows more recharging of the ground water supply. Wooded areas help prevent the transport of sediment and chemicals into streams (USDA Forest Service).

The City of Alameda is blessed with an abundance of trees. They are a major part of Alameda's heritage and define much of its character. In earlier days, Alameda was referred to as "Encinal de San Antonio"—later shortened to "The Encinal"—because of the large number of live oak trees in the city. Even the contemporary name "Alameda" translates into tree-related phrases; one of the Spanish translations is "a grove or lane of poplar trees," while another translation is "a public promenade bordered with trees." Although both of these phrases may be incorrect translations, they do accurately describe the city that has always inspired thoughts of lush, green, plant-filled neighborhoods. The maintenance and protection of fine old trees links the past with the present, binding this green heritage to the future. The adoption of the Historical Tree designation is evidence of the concern for Alameda's environmental heritage. (Refer to existing city ordinance for further information).

This MSTP is dedicated to the principle that today's decisions and actions about trees are a part of tomorrow's environmental heritage. Therefore, the choice of trees to plant is an important one. New trees planted today affect the quality of the environmental heritage for years to come.

This Master Street Tree Plan (MSTP) provides information on the present status of Alameda's street trees, and suggests some effective means by which the city can safeguard and expand its urban forest through street tree management.

MSTP goals, such as increasing tree canopy, improving public safety, and providing native habitat, must be balanced with other goals such as accommodating growth and facilitating transportation. The MSTP is the City of Alameda's plan to integrate management of the many issues and opportunities posed by Alameda's tree resource. Additionally, all natural systems change over time. If the City and its residents want these changes to enhance the urban forest, they must be actively managed. Nationally-based studies repeatedly support the fact that the urban tree resource deteriorates when human intervention is not a proactive part of urban street trees' existence. This decline can be seen in many of Alameda's street tree corridors where it is evident that trees have been planted in places that either don't allow for growth or that conflict with sidewalks and power lines. Proactive management is needed to keep the city trees sustainable and in balance with other urban priorities.

WHO WILL USE THIS MASTER PLAN?

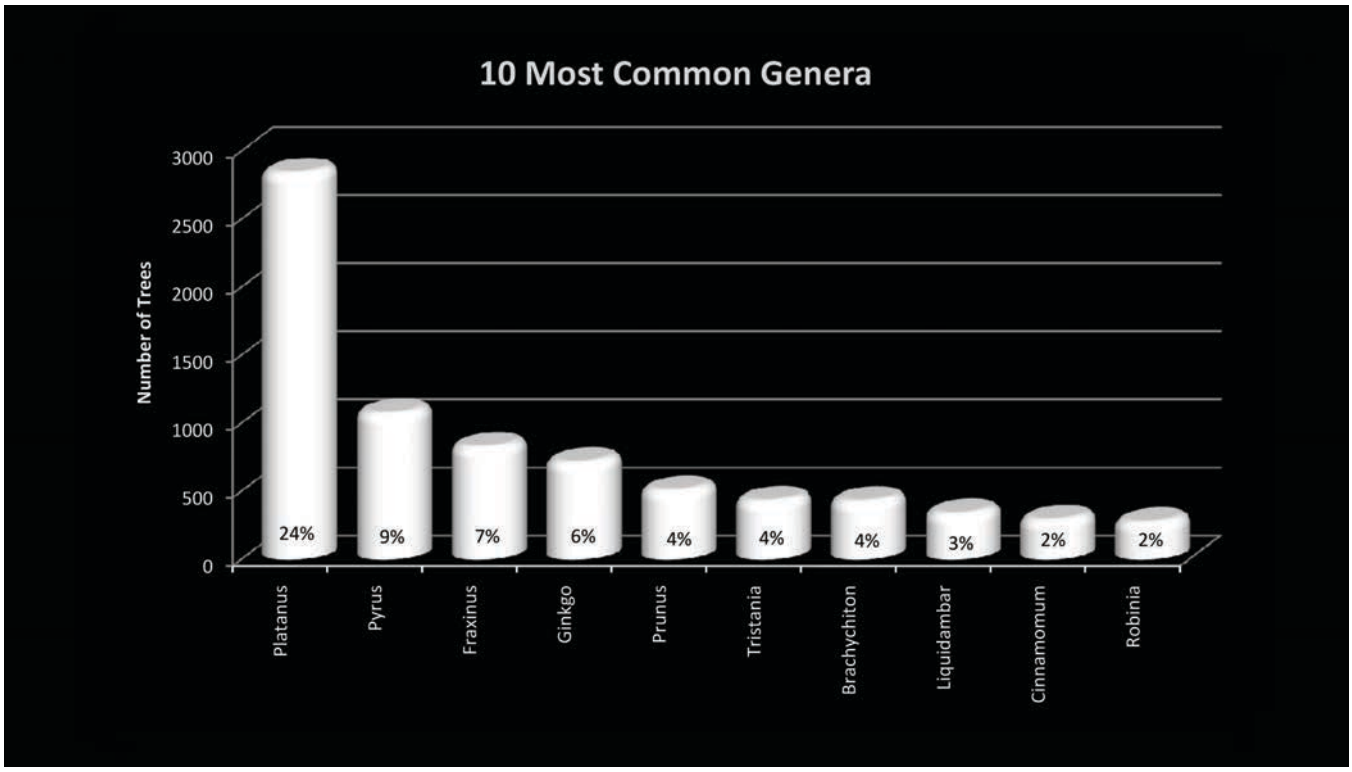
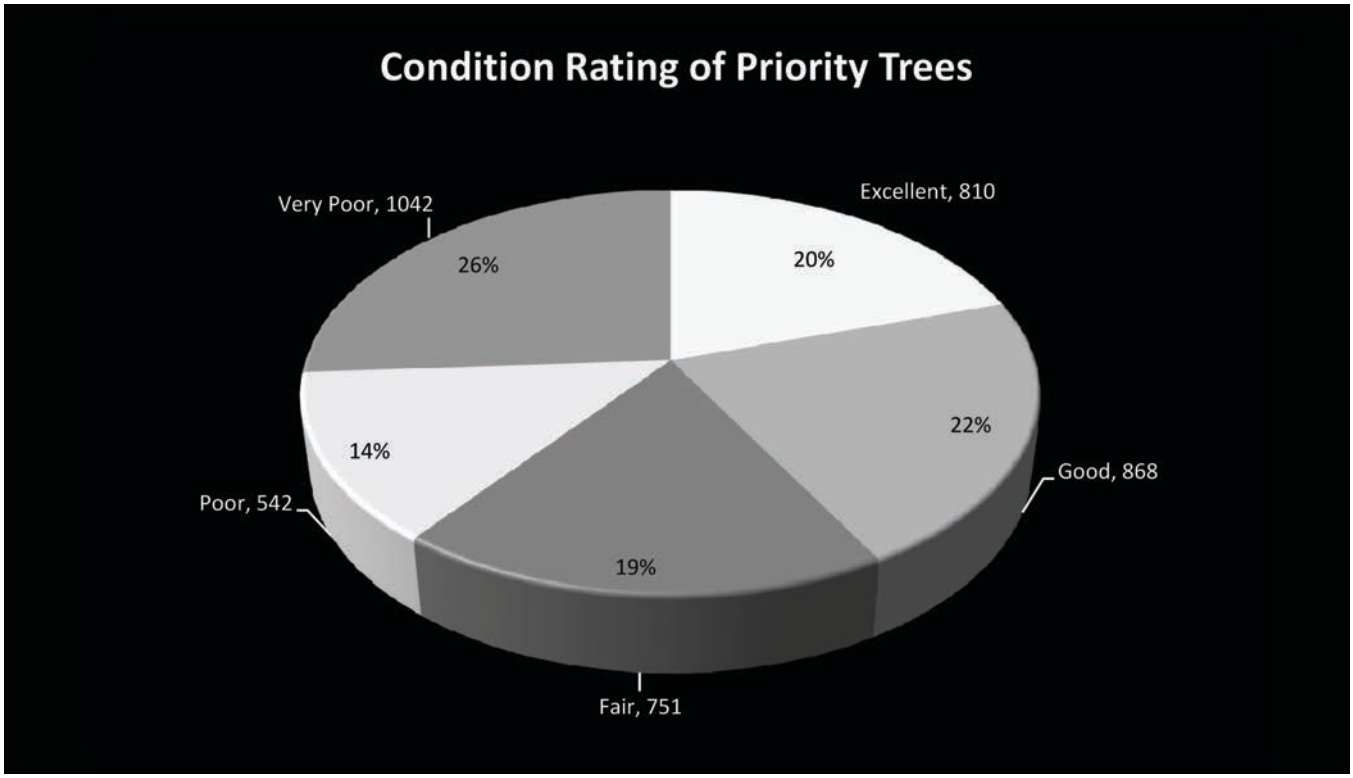


Figure 2.6

Figure 2.7



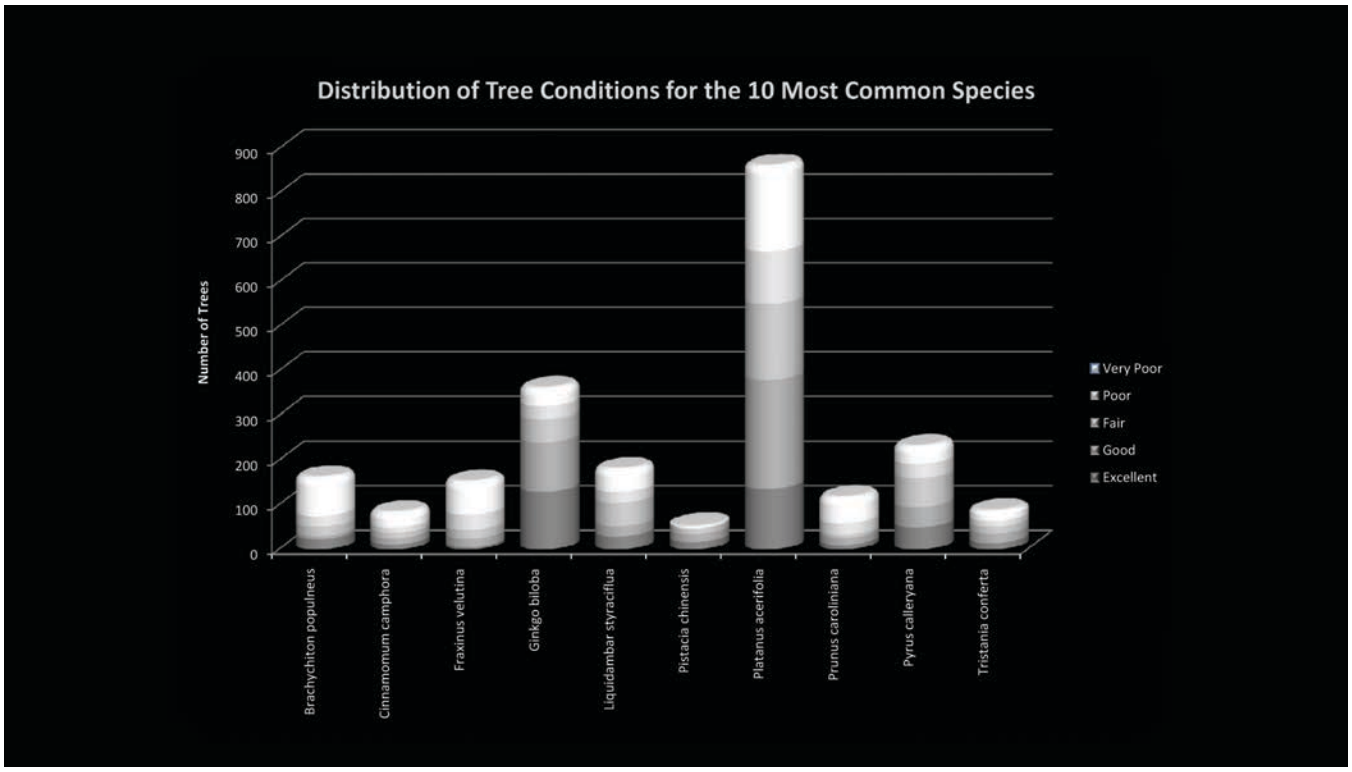
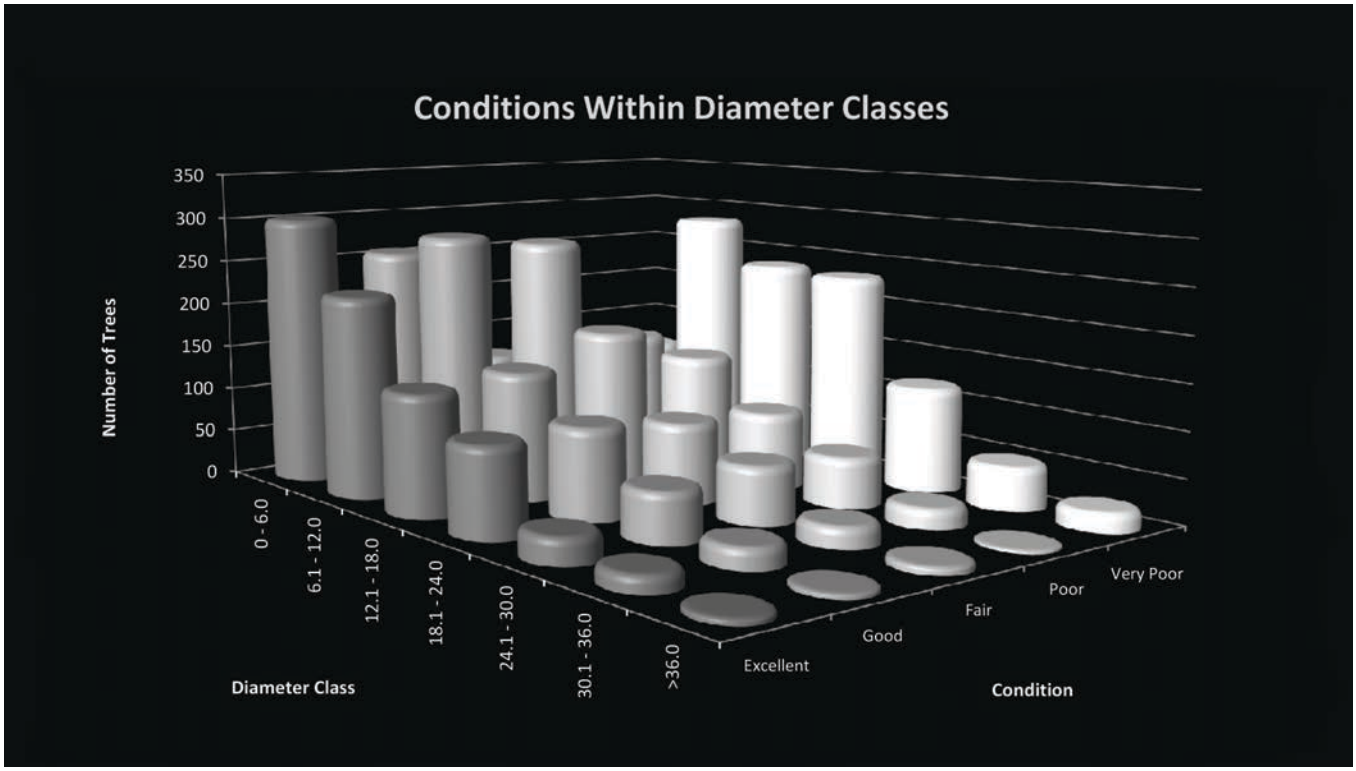


Figure 2.8

Figure 2.9



- City Managers: to unify the City's approach to street tree management
- City Council: to plan, implement, manage and maintain the council's street trees
- Landowners and Developers: to assist in the selection and planting of appropriate street tree species
- Contractors: to maintain and plant street trees.
- The General Public: to foster awareness of the benefits of street trees.

AREAS NOT COVERED BY THIS MSTP

A number of areas have been excluded from this version of the MSTP. All private developments are not included. These areas will hopefully be incorporated in future revisions of this MSTP. The City Parks have been excluded as they are the subject of separate studies. These studies will include consideration of the street trees in conjunction with other design elements. The major developments at the former Alameda Naval Base and Northpoint have been excluded, as they have separate master plans that control the planting of street trees within those developments, but will be equalized to use the Tree Matrix.

ALL street trees are wiithin the public right-of-way and require specific city approvals and permits for the planting, pruning and removal of a street tree. Section 23-3 of the Alamaeda Municipal Code provides additional information regarding these requirements.

1.2 / MASTERPLAN GOALS AND ACTIONS

These following priorities for Alameda's urban forest were established through communication with city staff and residents during several information-gathering meetings early on in the project.

YES TO

- Tree protection
- More trees
- Long lived trees
- Healthier trees
- Dynamic urban forests
- Sustainable urban forests
- Protect healthy trees while providing for infrastructure stability and public safety
- Replant new trees species mix where existing trees cannot be safely retained
- Maintain successful tree species corridors by planting younger trees
- Proactively pre-plant trees before trees become high risk

NO TO

- Wholesale tree felling
- Short-term tree-less streets
- False eveness plantings
- High risk trees
- Sidewalk and utility conflicts

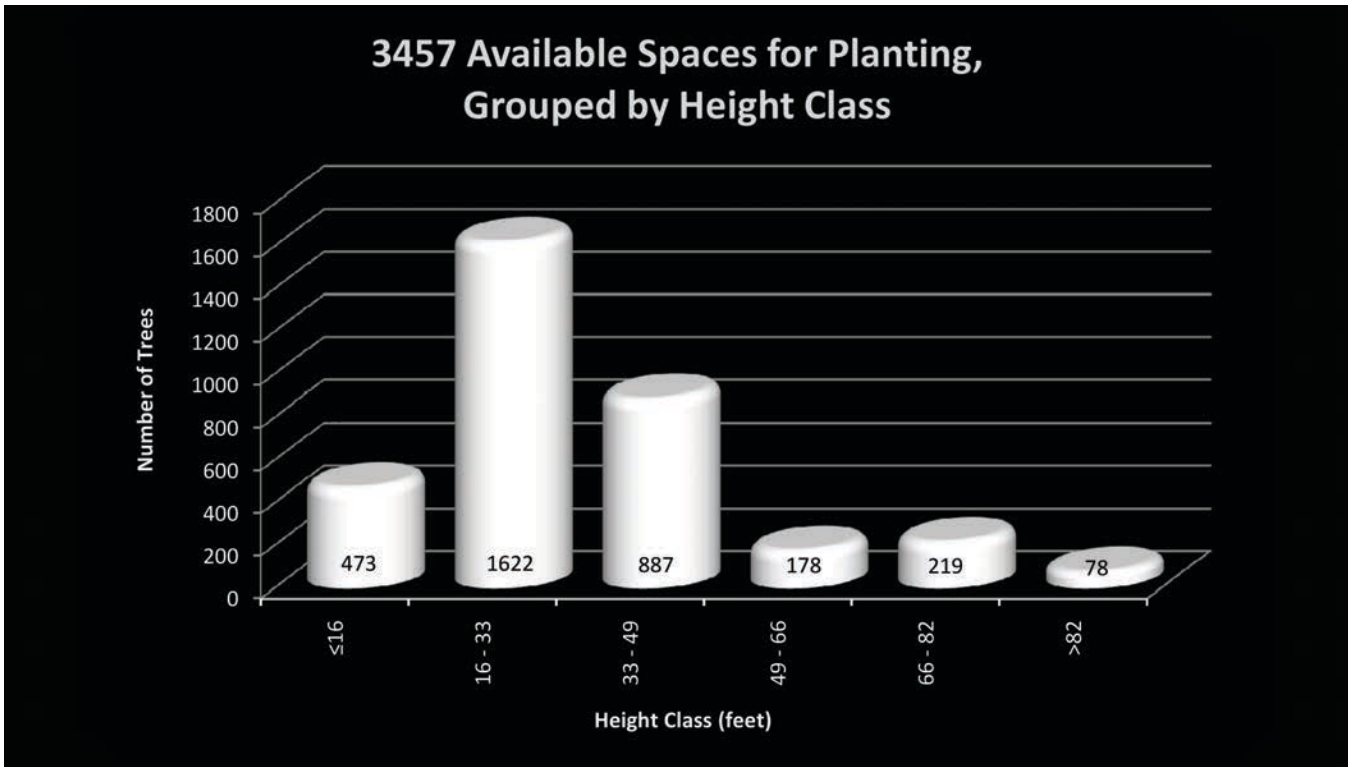


Figure 2.10

Figure 2.11

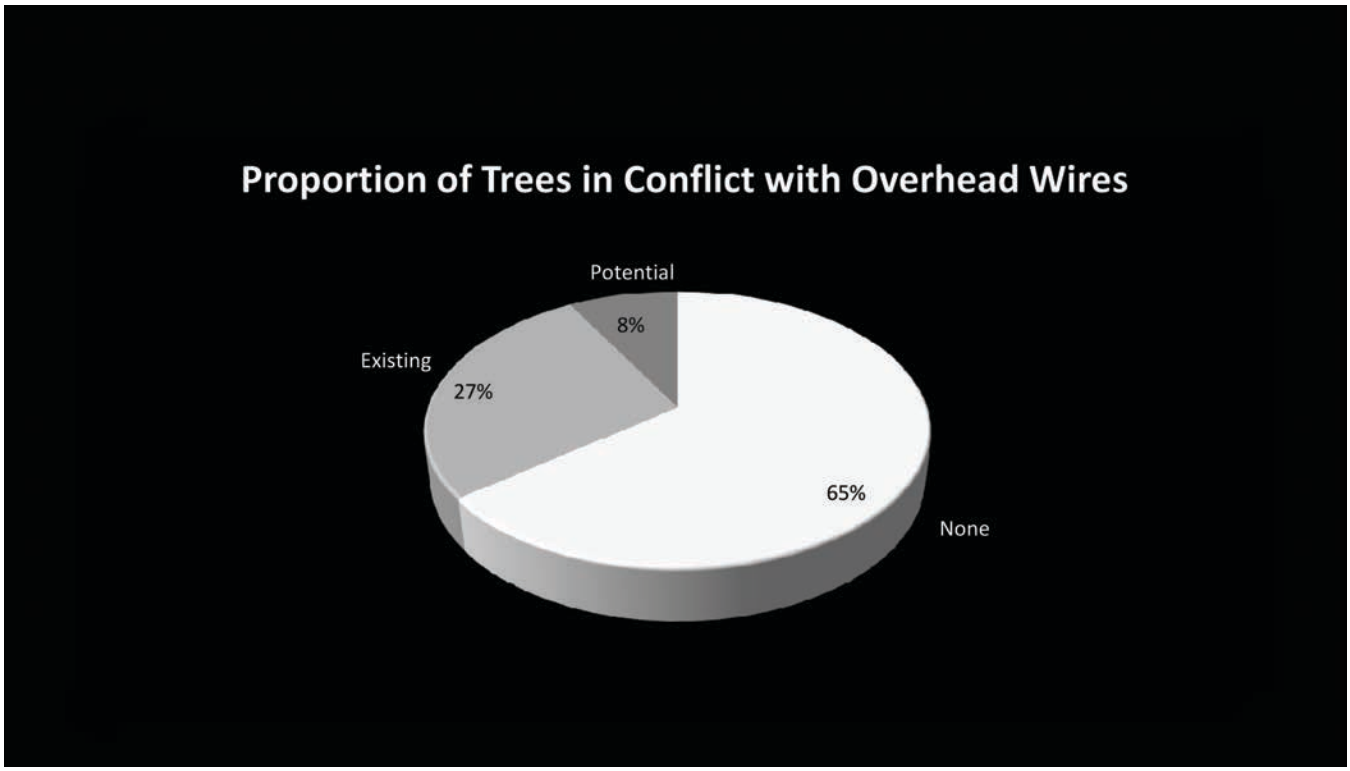
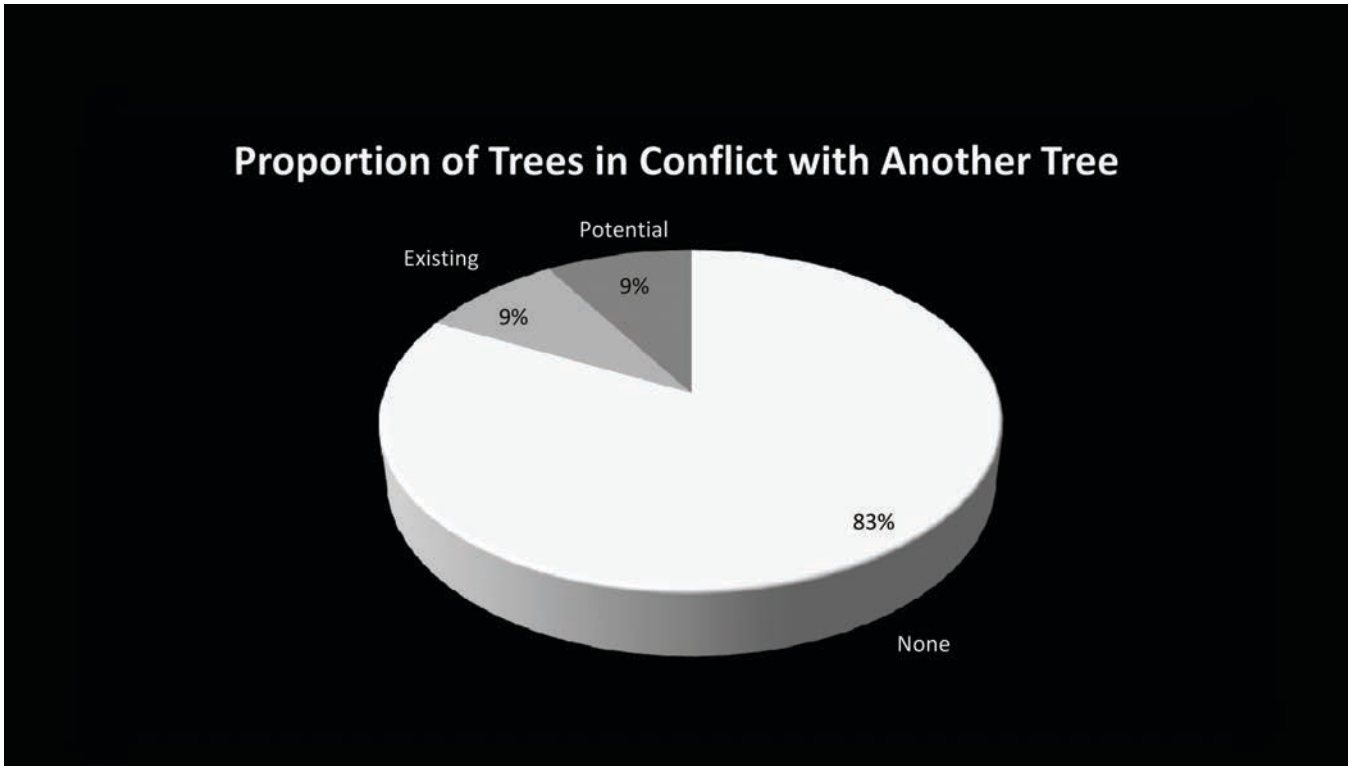


Figure 2.12

Figure 2.13



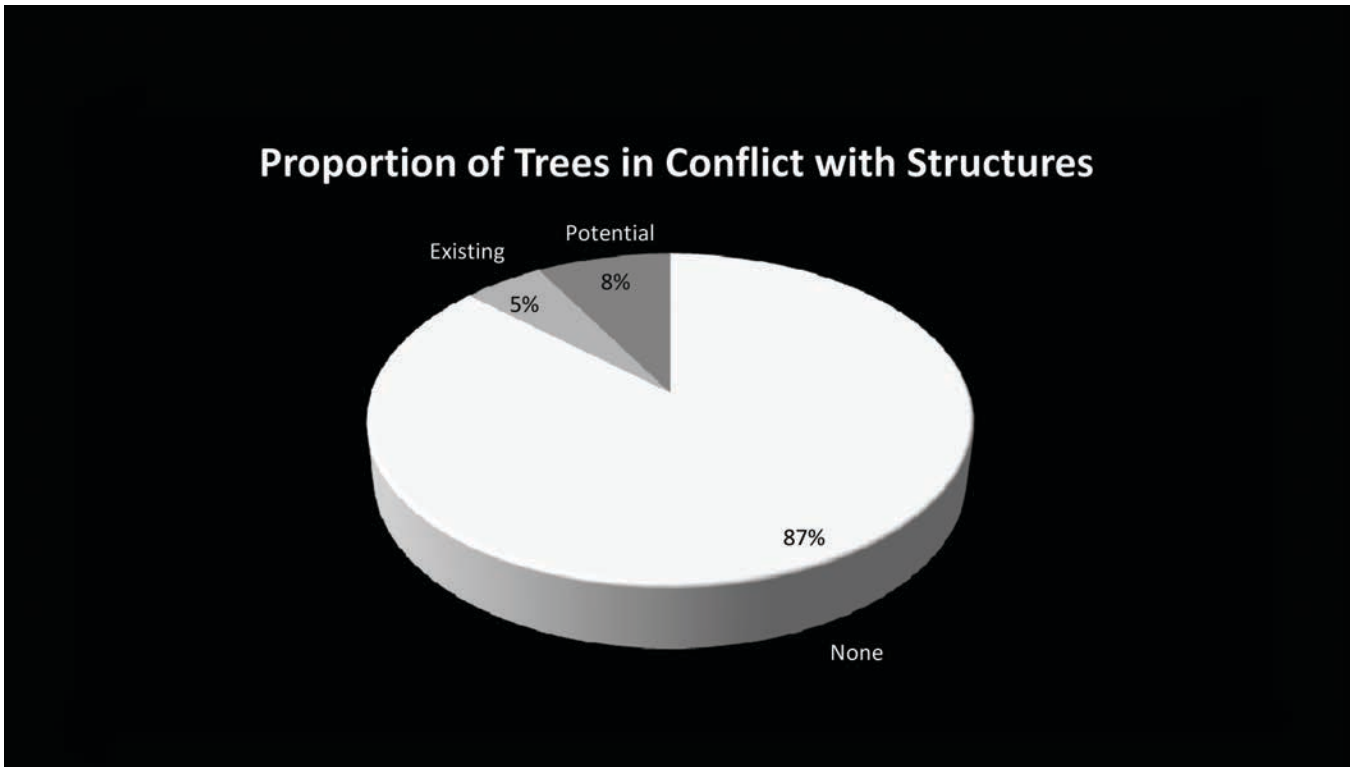


Figure 2.14

Figure 2.15

Based on these priorities, goals and action items were established by Alameda's city staff.

The goals and actions have been divided into two groups: long-term goals and short-term goals. Each goal statement is followed by the supporting rationale for the goal, which is then followed by short and long-term actions needed to achieve the goal. Implementation will require policy, program, and budget coordination, as well as long-term and stable funding. The timeline definitions for implementing the proposed actions are as follows:

- Short-term actions will be done within the next five years. Typically, these are actions that are either already partially implemented, that are budget-neutral, or that have already allocated new funding.
- Long-term actions will be accomplished in 25 years. These are actions that might require operational restructuring or reorganization, limited additional funding, or "tooling-up" on the part of internal or external partners.

SHORT-TERM GOALS AND ACTION ITEMS

Short-Term Goal 1: Encourage and maintain a balance between tree-lined streets and safe utility and transportation corridors.

Action A: Provide improved guidelines and standards for utility design, which will coexist with established and future tree plantings.
Action B: Trees shall be planted and maintained in locations where street trees do not conflict with standards for sight distance triangles and traffic sign placement.

Short-Term Goal 2: Maintain and update the public street tree inventory.

Action A: Update GIS tree inventory on an ongoing basis to reflect plantings, removals and maintenance.
Action B: Expand the current street tree inventory to include all city maintained street trees and plantable spaces.
Action C: Conduct a complete street tree inventory every 10 years.

Short-Term Goal 3: Train city maintenance employees in arborculture practices.

Action A: Create a position for, and hire, a City Arborist to coordinate and oversee all tree-related activities.
Action B: Hire and train a city tree crew to perform street tree maintenance in a manner that best follows the Best Management Practices as outlined in the MSTP.

Short-Term Goal 4: Create and maintain a comprehensive list of street trees to be recommended in future plantings.

Action A: Adopt and enforce an approved street tree list.
Action B: Revise the list of recommended street trees every five years to reflect the successes and failures of the existing street tree population.

Short-Term Goal 5: Coordinate street tree design and selection in the permits and review process.

Action A: Provide and encourage effective coordination and compliance with applicable design and development standards for each type of land use or street type associated with the establishment and maintenance of public trees.

Short-Term Goal 6: Develop a public tree ordinance that presents planting and maintenance standards for all street trees within public right of way.

Action A: Encourage continual input from the public and from City departments with regard to street tree standards and procedures associated with the planting, removal, and maintenance of public street trees.
Action B: Review and update procedures, and standards for establishing and maintaining the City's street trees.

LONG-TERM GOALS AND ACTION ITEMS

Long-Term Goal 1: Sustain and expand a healthy urban forest that benefits the community with improved safety, air quality, erosion control, storm water retention, temperature reduction, and aesthetics, while also enhancing wildlife resources.

Action A: Fill in all available planting spaces for an increase in the street tree population within the next 25 years. Based on available funding plant tree species appropriate for the location by using the planting palettes and tree matrix in this MSTP. The city would need to aim to plant 200 street trees a year in order to meet this goal.
Action B: Mitigate all hazardous street trees by following the tree maintenance and removal guidelines in this MSTP.

Long-Term Goal 2: Work toward no net loss of the overall community urban forest cover; in the long term, to work toward measurable gain.

Action A: Mitigate the net loss of healthy forest canopy cover on publicly owned lands. In the long term, the City will achieve measurable gain with consideration of species performance, practicality, and maintenance requirements.

Long-Term Goal 3: Discourage the unnecessary removal of existing healthy trees in the design, construction, or reconstruction of street projects, and other property development.

Action A: Develop tree planting, and removal standards.
Action B: Removal of trees in unavoidable construction condition to be approved only by PW Director.

Long-Term Goal 4: Shift from a reactive, hazard-based maintenance program to a proactive, cyclic maintenance program.

Action A: Continue to expand support for the street tree program and maintenance crew.
Action B: Maintain city street trees on a five-year cycle, using the city's existing maintenance zones. New plantings should be addressed until established.

Long-Term Goal 5: Establish funding mechanisms for the expansion and sustainability of the City's street tree program.

Action A: Allocate funds and research alternative funding sources to ensure the sustainability of the street tree maintenance program.

Action B: Create incentives for property owners to share in the cost of planting street trees in front of their property.

1.3 / BACKGROUND TO ALAMEDA'S URBAN FOREST

CLIMATE

Alameda is part of the Bay Area coastal climate zone, experiencing a warm, moist summer/autumn and a cool, wet winter/spring. The city of Alameda has a mild climate during summer, when temperatures tend to be in the 60s, and a cool climate during winter, when temperatures are usually in the 50s. The warmest month of the year is September, with an average maximum temperature of 74.60 degrees Fahrenheit, while the coldest month of the year is January, with an average low temperature of 44.70 degrees Fahrenheit. Temperature variations between night and day tend to be fairly limited during both summer and winter, with differences around 15 and 13 degrees Fahrenheit, respectively.

The annual average precipitation in Alameda is 22.94 inches. Winter months tend to be wetter than summer months. The wettest month of the year is January, with an average rainfall of 4.85 inches. Alameda experiences more moderate rainfall than other coastal areas, and selected trees must tolerate a longer succession of drier days between rains. The predominant wind direction is from the Pacific throughout the year. Wind can have a significant impact on the health and form of a tree, particularly in exposed locations such as along the coast or where surrounding buildings and structures create wind tunnel effects.
Alameda is located in Zone 9 of the USDA Hardiness Zone Map, which identifies the climatic region where the average annual minimum temperature is between 40 and 50 degrees Fahrenheit. Tree species selected for planting in Alameda should be appropriate for this zone. In addition, species should be urban-tolerant, and rated as relatively free from insect pests and disease. According to Sunset's Western Garden Book, Alameda lies in Climate Zone 17, which is dominated by ocean influences about 98% of the time. The climate is mild without extreme high or low temperatures, characterized by cool, wet winters and cool summers with fog or wind. Certain interior sections of the city could be typified as Sunset Zone 16, with more heat than the maritime-dominated Sunset Zone 17. As part of northern and central California's chilly winter areas influenced by the coast, the main growing season is from March to December. Rain typically comes from fall through winter. Maximum winter lows range from 28 degrees to 21 degrees Fahrenheit. Maritime air often influences the zone, giving it cooler, moister summers than Zone 14. In the Bay Area region, winter lows usually don't drop below 40, but temperatures in the 20s have been recorded. Snow is extremely rare. Nighttime temperatures

during the summer usually fall no lower than the mid-50s. Precipitation averages 24 inches per year, while temperatures are moderate with a mean July high reading of 73 degrees F and a mean January high temperature of 57 degrees F. The potential growing season is long, with usually 360 days per year without a killing frost.

SOILS

The majority of Alameda is located on a sandy island. The rest of the soils are comprised of bay mud that was dredged up to provide additional land and open deep-water container ship passage in the water. These bay mud soils are clay-rich, fine textured, alkaline, and moderately infertile. They provide good structural support for trees but because the island soils have a high water level and the bay muds are saturated this often affects the depth of root growth.

Operations that filled marshland soil have had an immense environmental impact on Alameda, with the earliest ones beginning before 1870. Prior to these landfills, the city encompassed approximately 2,200 acres of high ground and 1,000 acres of marshland. According to Imelda Merlin in Alameda: Historical Geography of a California City, Alameda in 1964 comprised two and one-half times as much area as it had in 1850. The non-fill areas are typified by the Baywood soil series, according to the Soil Conservation Service's 1981 study of Alameda County. In the western part of Alameda, the Baywood series soils are composed of "deep, somewhat excessively drained soils that formed in sandy eolian deposits that derived from old beach deposits." In most cases, the soil becomes more acidic as depth increases. There is little variation in soil structure between soils taken at different depths; it is sand or loamy sand throughout.

The material that was used to fill the marshland consist of beach sands that were dredged from the outlying areas of Alameda Naval Air Station and Oakland Airport. In some of these fill areas there is a perched water table. The highly alkaline soil condition created by this high water table, combined with the addition of unknown materials during fill operations, compounds the problems of tree establishment in these areas.

TOPOGRAPHY

The topography of the city of Alameda is mostly flat land along the San Francisco Bay floodplain, with most of the city only a couple of meters above sea level.

TREE POPULATION

Most of today's large trees were planted during the first decade of the 20th century, and thanks to those who had such foresight, Alameda became known throughout the Bay Area as a city of trees. However, by the mid- to late 1970s, vehicular traffic had increased to the point that several street widening projects were proposed, requiring the removal of dozens of trees along the major arterials. These projects, together with the pruning of many trees that had matured enough to interfere with power lines, had a detrimental effect on Alameda's street trees.

In 1989, Thomas J. Pehrson of Urban Forestry Consultants and Barrie Coate was commissioned to conduct the first citywide street tree inventory and analysis. The resulting Master Tree Plan helped guide the revitalization of Alameda's street population for almost two decades. In 2008, Tanaka Design Group was commissioned to conduct a revised inventory and analysis of all street trees throughout the city. This recently completed tree inventory found over 12,000 street trees in the City of Alameda. Although a formal inventory of trees on public properties other than city streets has not been undertaken, it can be assumed there are two to three trees on these properties for each street tree, which would make the total public tree population somewhere between 36,000 and 48,000 trees.

The current tree inventory uses a GIS-based system that lists street trees by their own unique ID number, species, size, and health condition. The first non-computerized tree inventory was completed in 1989 and was not continually updated as work was done on Alameda's tree population. It is therefore desirable that the new inventory be continually maintained and included as a layer of the City's existing GIS maps.

2.0 / METHODS

TREE INVENTORY

The 1989 tree inventory identified the location, composition and condition of City-maintained street trees on Alameda's main island. At that time, 12,222 street trees were identified and inspected. Data collected from each tree included: street address, species, height, trunk diameter at breast height (DBH), canopy spread, condition (infestations, diseases, manmade damages), maintenance needs (type of pruning), and physical constraints of each tree's growing space.

In 2008, 12,000 trees were surveyed across the main island and the newly developed Bay Farm Island. At the time of the current inventory, city funds did not allow for a complete inventory of all of the City's street trees, which is estimated at approximately 15,000 trees. A two-tiered tree assessment system was used to maximize the number of trees visited while collecting detailed information about the condition of some trees. Approximately 40% of the trees were surveyed using a 16-point health assessment. These trees are referred to as 'Priority' trees, and are scattered throughout the city. The health assessment followed the Neighbourwoods© protocol developed at the University of Toronto by Dr. Andrew Kenney and Dr. Danijela Puric-Mladenovic. Neighbourwoods© was designed to assist communities in conducting an inventory and evaluation of the state of their urban forest. It provides a standardized procedure for collecting information on tree location, species, size and condition, as well as site characteristics and potential conflicts with other urban infrastructure (Table 2.0, Appendix 2). The other 60% of the trees were also identified, measured, and assessed for conflicts with infrastructure, but were assigned a more general health rating (good, fair, poor) based on a visual scan of the tree's condition. Available spots for planting were also identified throughout the city.

Improved technology, such as advanced database programs and Geographical Information Systems (GIS), allowed for major improvements in methodology and

analysis between 1989 and 2008. Each tree's location was recorded using Global Positioning System (GPS). All information was collected using Trimble's Juno™ ST handheld computer with built-in GPS receiver, loaded with ArcPad 7.1 software (ESRI, 2006). The geodatabase and corresponding map was created and runs in ArcGIS 9.2 (ESRI, 2008). The City of Alameda had existing GIS data for the City streets, water features, building footprints, property boundaries, and street addresses. These were all used as layers in the map of the tree inventory. High resolution aerial photos form the background of the map, and were acquired from the California Spatial Information Library. Data analysis was done in ArcGIS 9.2 and Microsoft Excel 2007.

STAKEHOLDERS' MEETINGS

A crucial element in developing this MSTP was soliciting information from stakeholders of Alameda's urban forest. Stakeholder input was used to assist Tanaka Design Group in identifying opportunities, issues, actions, and goals for the MSTP. Three methods of gathering public input were used: conducting public meetings with City residents, interviewing City employees, and soliciting comments through an online questionnaire. Seven public forums were hosted by Tanaka Design Group and Alameda Public Works Department. At the first public forum,

CHAPTER 3

PLANTING GUIDELINES

INTRODUCTION

Tree planting is a major component of any city tree program. Tree species and planting location designations are significant components of a municipal tree planting program because of the long-term impact these decisions hold. It is important to develop an overall planting strategy, initially concentrating on streets and blocks with the greatest need for improvement. The success of a continuing tree planting program will be judged by the post-planting health of the trees and the amount of money spent on planting and maintaining the new trees. With a small amount of planning, healthy trees with greater life expectancies can be established with minimal initial investment and minor maintenance costs.

Tree planting fulfills two main purposes -
1) Tree planting should equal or exceed tree removals as funding allows; however, tree removals for health and safety reasons will not be deferred if this goal cannot be met.
2) As funding becomes available, increase the number of trees and the amount of canopy with a goal of improving climate and esthetics for the City's residents and businesses.

PLANTING STRATEGY-SHORT TERM

Immediately replanting trees, after dead and hazardous tree removal is considered replacement planting and is a top short-term priority. A second short-term goal is restorative planting - to fill in all immediately available plantable spots identified in this plan as funding becomes available. The objective is to accomplish this within a ten years timeframe. Streets and blocks with the greatest need for improvement and insuffcient canopy coverage should be a restorative planting priority.

PLANTING STRATEGY-LONG TERM

Once replacement and restorative plantings are completed, the City may actively search for and create additional locations for tree placement with Goal 2 in mind. At best, new tree planting in one year may exceed tree removals for all reasons in the same year by a ratio of (1.5:1), and at minimum, removals and new plantings may be equal in number. Tree planting may never lag behind tree removal in number, and budget and levels of service may be allocated accordingly. Trees planted by volunteer groups on city property with city knowledge and permission will count towards these numbers.

TREE SPECIES AND PLANTING LOCATION DESIGNATIONS

Tree species and planting location designations are significant components of a municipal tree planting program because of the long-term impact these decisions hold.

The 2008 Alameda street tree inventory documented 3,457 locations available for immediate street tree plantings. This Geographic Information Systems (GIS) dataset provides the exact location of each plantable space in the form of a city map, as well as the maximum tree height and canopy width that would be appropriate in each location. This dataset gives City managers a starting point for a city - wide

planting program. When selecting a tree species to be planted in a known location along a city street, one should consult with the Planting Palette for that location (Volume 2 Chapter 1), and the Tree Matrix located at the end of this document. The Planting Palette provides details of the built and planted landscape surrounding the planting location, as well as a list of tree species recommended for planting. A precise tree species (and in some cases, cultivar) should be selected from this recommended planting list with the help of the Tree Matrix. For each of the trees listed in the tree matrix, details are given about the trees characteristics and its preferred microsite conditions. The physical constraints of the available planting space, and/or the limited number of recommended tree species in the given Planting Palette may make the species selection process quite simple. However, several situations may arise when a City manager, contractor, landscape architect, planner, or resident must carefully consider several factors before deciding on a street tree planting. These factors are discussed in this chapter, and include:

- a desire for species diversity,
- esthetic criteria of the planting ,
- physical constraints of the available planting space, and,
- the type of urban development surrounding the planting location.
- Optimize tree canopy where there are physical constraints and limited planting space.

Beautiful home in Alameda, California (circa1912)

3.0 / TREE SPECIES DIVERSITY

Tree plantings in historic districts and new developments add greatly to the esthetic appeal of Alameda. However, species diversity in new plantings should be a primary concern. The dangers (such as disease and insect infestation) of planting monocultures have proven to be devastating throughout the United States. The goal should be to maintain species diversity throughout the city such that no one species represents more than 5%, and that no one genus comprises more than 10% of the total population. The frequency of the 10 most common street tree species in Alameda can be found in Volume 1 section 2.1 of this MSTP ("Results of the Tree Inventory").

The variety of trees available and suitable for planting in the urban environment far exceeds what is commonly seen in urban areas. The tendency is to only plant what is immediately available from nurseries. Yet with advanced notification, several nurseries would be willing to grow many of the less commonly produced trees found on the Tree Matrix. Of course, such advanced planning is not always possible, so both neighborhood and major street planting palettes incorporate commonly available tree species and those less commonly available.

A goal of this MSTP is to establish representatives of all species in the Tree Matrix. To ensure this:

1. A tree nursery order may be prepared in the year prior to planting, when possible.
2. At least 10 trees of each species or cultivar maybe planted along Alameda's streets, and monitored yearly for their success.
3. Experimental species may be tested in neighborhood locations throughout the city in sites appropriate to the species.

3.1 / ESTHETIC CRITERIA OF A STREET TREE PLANTING

The inclusion of living plants along city streetscapes to enhance both larger urban design and more detailed architectural design is one of the valuable reasons for designing with street trees. Some of the esthetic uses of trees in the landscape include softening line and mass, and unifying diverse architectural elements.

TREE SPECIES

In addition to considering site characteristics, such as availability of space, soil pH, and irrigation, species-specific features must also be scrutinized. A major consideration for street trees is the amount of litter dropped by mature trees. Species such as willow (*Salix* spp.) have weak wood and typically drop many small branches during a growing season. Others, such as American sweetgum (*Liquidambar styraciflua*) drop high volumes of fruits. In certain species, such as Maidenhair (*Ginkgo biloba*) and Osage-orange (*Maclura pomifera*), female trees produce offensive or large fruit; male trees, however, produce no fruit. Furthermore, a few species of trees, including Hawthorn (*Crataegus* spp.), may have substantial thorns. These species should be avoided in high-traffic areas.

Seasonal color should also be considered when planning tree plantings. Flowering varieties are particularly welcome in the spring, and deciduous trees that display bright colors in autumn can add a great deal of interest to surrounding landscapes. Above all, tree species should be selected for their durability and low-maintenance characteristics. These attributes are highly dependent on site features as well as species characteristics. Matching a species to its favored climatic and soil conditions is the most important task when planning for a low-maintenance landscape, because plants that are well-matched to their environmental and site conditions are more likely to resist pathogens and insect pests, therefore requiring less maintenance overall. Refer to the Street Tree Matrix for additional tree species and cultivars suitable for planting in Alameda.

Although diversity is important in a street tree population, a single-species planting of the same age provides esthetic unity to a neighborhood or street. A goal of this MSTP is to establish uniform plantings of large trees along identified major streets, while recommending a diverse mixture of species within neighborhood residential streets.

BLOCK-WIDE PLANTING PATTERNS

In situations where entire blocks are planted at once, there exists the opportunity for implementing tree planting patterns. Several schemes are possible, but an alternating planting pattern of two or three species is generally the most effective and practical pattern. Where alternative species are proposed, trees should be alternated whenever possible. In locations where several planting sites exist in a row, it is preferable that trees be used with equal frequency with a minimum ratio of 1:3. If possible, a maximum of four instances of the same species should be used consecutively before changing to an alternate species. Please refer to Volume 2 Section 1.1 of this MSTP ("Major Streets of Alameda") for further details on planting patterns to be used along Alameda's major streets.

When deciding on a block-wide planting pattern, one may want to consider the Formal, Informal, and Combined planting concepts:

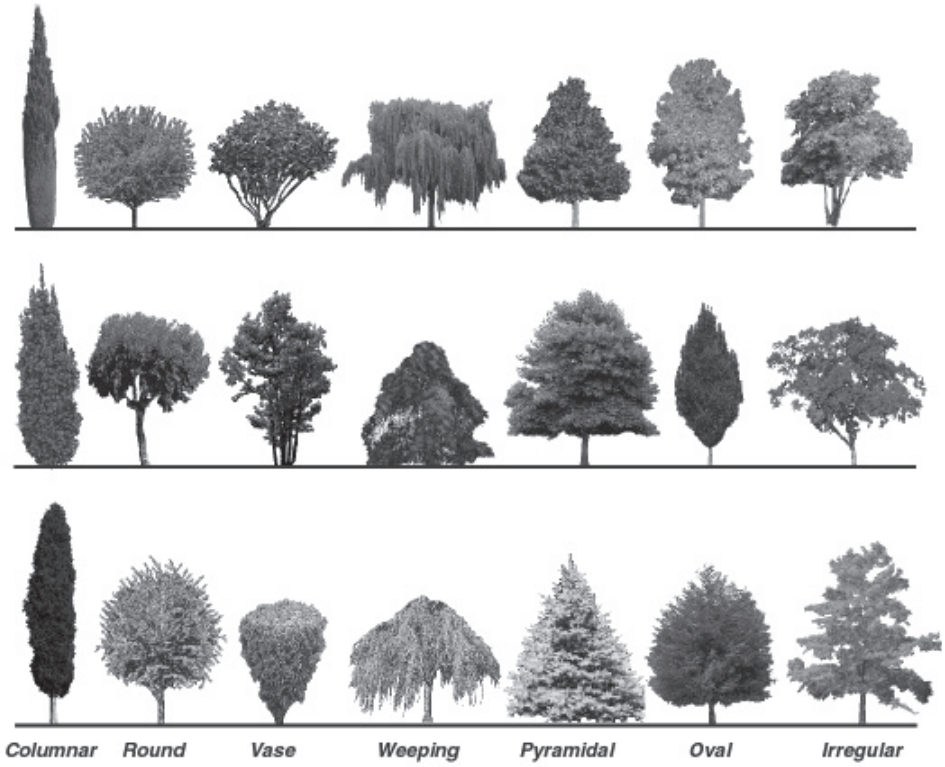
- Formal plantings generally utilize the same species of trees or species with similar form on both sides of the street for a distance of several blocks. A prominent example of this design style is the Central Avenue tree planting.
- Informal plantings emphasize randomness, a large number of species, and irregular spacing. An informal planting concept is most appropriate for large street planting areas such as boulevard medians. As a general rule, informal plantings in strips adjacent to streets are applicable only if the area for planting is large (20 feet wide or more). Without sufficient width in the planting strip, the desired informal effect cannot be achieved. The medians along Island Drive are examples of this.
- Combined plantings include elements of both formal and informal planting concepts. Generally, one species of tree is used on both sides of the streets for the majority of the planting, with a different species (of different size, form, color, or texture) used to accent some particular feature such as an intersection, building, or entryway. The early streetscape plantings in Alameda shown on historic postcards are examples of a combined planting, where one species was established along the block with a smaller, more ornamental tree used to highlight each intersection.

There are opportunities to employ all three of these planting concepts in the City of Alameda. However, formal and combined concepts are the most appropriate for the majority of the City's plantings.

Central Avenue at Park St., Alameda (circa 1912)

Beautiful residence in Alameda, California (circa 1912)

Figure 3.0 / Examples of various tree forms to consider when selecting a species for planting.



VISUAL CHARACTERISTICS OF A TREE SPECIES

Trees are design elements, with each tree bearing its own inherent visual characteristics. These include form, natural color, and texture as well as seasonal changes such as fall color and spring flowers. Some trees are bright and lively, such as a sugar maple, while others are statelier, darker, and more somber, like many of the native oaks.

Street trees need to have a form that allows traffic and pedestrian movements around the tree and that is appropriate to physical constraints such as power lines. Adjacent buildings should also be given consideration in the selection of species. In general, columnar or pyramidal trees should be favored in front of multi-story or commercial buildings, especially those with shallow setbacks. Conversely, broad-spreading trees could be favored in front of single-story buildings with deep setbacks, especially low-slung buildings such as bungalows. Figure 3.0 gives examples of tree forms that should be considered when selecting a tree to reflect its surroundings.

Deciduous trees provide shade in the summer and then offer sunlight in the winter when they lose their leaves. They give a sense of the seasons and can produce spectacular autumn displays. Evergreen trees maintain their foliage throughout the year, providing year-round screening, greenery, and shelter from winds. An advantage of deciduous trees is that they renew their leaves annually, allowing them to shed foliage that has become affected by disease and pollution. Where appropriate, deciduous trees should be selected to provide solar access to properties on the south-facing, northern side of the street.

3.2 / PHYSICAL CONSTRAINTS OF THE AVAILABLE PLANTING SPACE

In addition to the ecological and esthetic criteria, it is important to consider the constraints of the tree's physical surrounding. The physical limitations of an available planting space are perhaps the most obvious determinants of tree species to be planted. Street trees will typically be planted on a planting strip, but they can also be located in medians, islands, tree pits, and bump-outs.

PLANTING STRIPS

A planting strip helps separate pedestrians from traffic lanes. The wider the planting strip the larger a tree can be, and the greater the buffering capacity for pedestrians. When planted in a strip large enough to accommodate the mature growth of the trees, planting strips are the ideal planting location for street trees.

TREE PITS

Planting street trees in pits with tree grates is a common planting option in areas with confined planting spaces and high pedestrian traffic, like downtown Alameda. Alameda has successfully planted many trees with this planting option, though it generally has a higher installation cost and a slightly higher cost for long-term maintenance. Cast-iron tree grates cost approximately $300 - $400 each, and they have to be cleaned out every year and widened every couple years as the trees grow. Once the trees grow large enough, the grate has to be removed completely.

ISLANDS OR BUMP-OUTS

This planting option is often preferred over planting in tree pits when there is adequate space for the islands. This option eliminates the tree grates and their future maintenance, while gaining valuable soil volume for the tree's roots. The problem with this option is that it impedes drainage, sometimes eliminates parking spaces, and it makes it difficult to clean leaves off the streets with a mechanical street sweeper.

SIDEWALK

When the curb, sidewalk, and other street improvements are already installed, or if the planting strip is too narrow, the only place to plant a street tree is behind the sidewalk. Planted behind the sidewalk, the tree no longer buffers the pedestrians from the traffic lane, and it becomes more difficult to obtain the canopy effect of street trees over the roadway. However, placing the tree behind the sidewalk can potentially make more soil volume available to the roots of the tree.

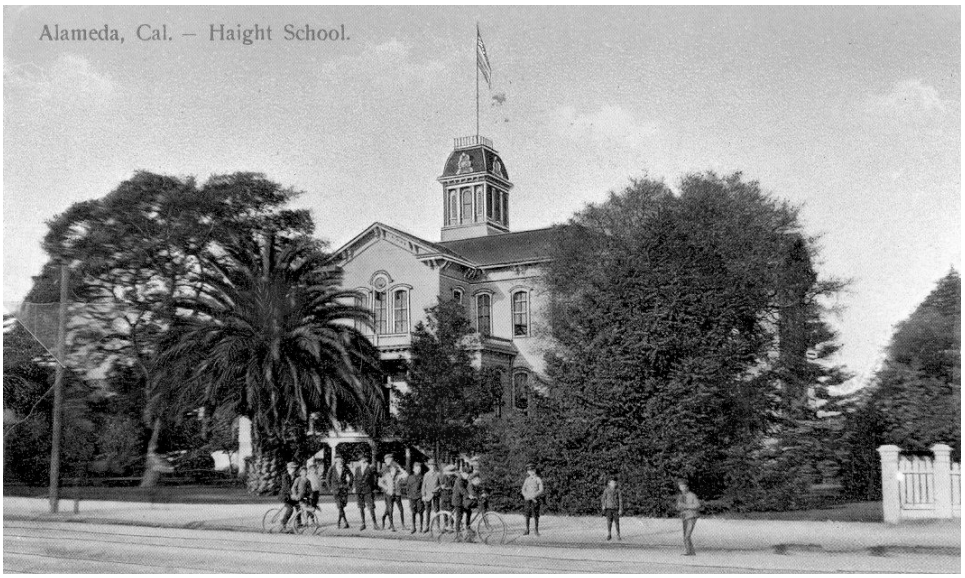
MEDIANS

This planting option is particularly effective at making a very wide street much more pedestrian-scaled. Unfortunately, Alameda often lacks sufficient right-of-way width to be able to incorporate medians into the city's streetscape. The most prominent existing medians in Alameda are on Encinal and Bay Farm Island.

Future reconfiguration of streets to reduce the road and parking width and increase landscape and pedestrian areas may lead to opportunities for tree planting in locations other than the existing planting strip, subject to traffic safety and parking considerations. This would result in substantial benefits to the streetscape. In particular, expanded planting strips enable tree planting away from overhead power lines, thereby reducing the substantial negative impacts of power line and tree interference.

The majority of Alameda has overhead power lines on one side of the road, which has a major impact on the performance of the trees. When trees are overpruned the overall form and health of the tree is impacted. New trees under high voltage power lines need to be selected so that their mature height does not encroach on high voltage utility lines or they can be pruned using CPUC standards. Except for major streets, species and cultivars that at mature height do not exceed 25 feet are recommended especially on streets where the width is less than 36'.

Tree selection should also take into account the impact on street lighting, as trees can significantly impact the level of lighting—and therefore safety—in the street. The presence of underground services restricts the space available for tree roots, which is a particular consideration when the tree is planted.



Alameda, California. Haight School (circa 1911)

3.3 / TYPES OF DEVELOPED LANDSCAPE SURROUNDING STREET TREES

The compositional elements of the developed landscape are buildings, pavement, and introduced plants. Trees serve as landmarks, pinpointing or emphasizing locations. The plane trees of Central Avenue are an example of such landmarks, demonstrating how street trees bring harmony to a street of varied uses and architectural forms. Trees can also reinforce the importance of streets relative to their size and scale; other trees can humanize the scale of parking lots and shopping centers, as with the west end of the Alameda Towne Centre.

The question of what trees to plant in this developed landscape becomes an issue of design. Because the relationship to natural woodlands is diminished, the selection of trees must relate to the visual and functional roles to be served. The following design guidelines are divided into four types of developed landscape: the commercial zone, residential areas, industrial property and institutional property.

COMMERCIAL ZONES

The hub of Alameda's central business district is Park Street, with retail and office buildings radiating primarily north and south. In addition to Park Street, other major business venues are on Webster, Lincoln and Encinal Avenue. These and other streets provide an opportunity for further streetscape connections. Carefully developed tree planting schemes should become an integral part of any expansion plans. When selecting trees for commercial zones, several general considerations are important:

- The form and size of the tree should allow freedom of movement for both cars and pedestrians
- The lowest permanent branches eventually must be able to clear eight feet over sidewalks and 13.5" or more feet over streets, depending upon the proximity of truck traffic
- Multi-trunked and small, low-branching trees should be avoided
- Trees that have deep root systems should be used. Trees that create excessive litter should be avoided

Tree planting situations in the commercial zone of Alameda fall into four broad categories:

a. Street trees for the major boulevards and primary access roads
b. Street trees for secondary commercial streets
c. Street trees for pocket parks and walkways
d. Trees for parking areas

Each situation has its own design determinants from which criteria for tree selection can be developed.

a. Street Trees for the Major Boulevards and Primary Access Roads
The principal design requirements for street trees relate to scale, reinforcement of street unity, and shade. On wide streets, trees should be large in scale so

that they will occupy a large volume and balance the scale of the street. Small-scaled trees would not make a sufficient visual impact on such a street. Trees placed closely together (25 to 35 feet) also unify the streetscape by giving it reinforced form and character.

Each major street might be treated a little differently, but schemes adopted should echo the historic planting character of Alameda, including both mixed and unified plantings.

A commercial street is a linear composite of many architectural forms and styles. The resulting visual diversity can border on chaos, as there is no single unifying element or theme to give harmony to the whole. Tree plantings can effectively counterbalance this chaotic diversity and provide a pleasingly harmonious character to the street.

To minimize distractions and provide the proper landscape environment for these key gateway streets, Alameda should prioritize work to place all utility lines on these streets underground.

b. Street Trees for Secondary Commercial Streets

Most of these streets (for example, parts of Santa Clara Avenue, San Jose Avenue, San Antonio Avenue, and Oak Street) are narrow and less important as access streets to Park Street. At their current state, they should have a greater focus on pedestrian orientation than street tree canopy coverage. While serving various businesses is obviously a necessity, streets that also handle pedestrian traffic need more attention to this important use. The design criteria for such streets include small-scale, narrow planting spaces that provide shade over pedestrian walks. Each street can be planted with a variety of species of a small- to medium- sized canopy tree, thereby providing a unique character to these specific streets. When space permits, both sides of the street could be planted with erect, oval-shaped trees, which are best suited for the narrowest spaces. Uniform planting on both sides of these streets is of less importance because street width is already scaled down. For effective shading, planting should be concentrated on south- and west-facing building facades and walks; north-facing buildings need little extra shade protection.

c. Street Trees for Pocket Parks and Walkways

These spaces are small in scale and are related to the slow pace of walking. Close observation of detail is important in small spaces. Interesting shadow patterns on pavement, seasonal color, and sculptural form are desirable elements in tree selection here. Trees should generally be planted closely together, but the apparent size of a small space can be manipulated through varied tree spacing. Trees for these spaces need not branch at the height required for automobiles, and multi-trunked species can be used. Clearly defined pedestrian ways and linkages should become integrated into the central portion of the business district; they are especially important to include in future development.

d. Trees for Parking Areas

Parking lots can be significant sources of heat, air pollutants, water pollutants, and visual blight. As a result, many communities have enacted ordinances that

not only specify general landscape requirements (for example, one tree for every four parking spaces), but also require parking lots to have up to a 50% canopy cover after 15 years. Detailed studies have shown how effective such provisions are and the benefits that they provide the communities.

Unshaded parking lots can be characterized as miniature heat islands and sources of motor vehicle pollutants. Tree canopies can cool these "hot-spots" by direct shading of the ground surface and indirectly by the transpiration of water through leaves.

Not only do canopy cover provisions reduce pollution and surface temperatures, they also make the lot more inviting, thereby improving the business climate. It is often observed that in hot weather, shaded parking spaces will generally be filled first, even if one must walk further.

Generally, Alameda's parking lots are void of large canopy trees. Lots that have been landscaped almost exclusively rely on crape myrtles or other small trees that provide little shade.
Modifying Alameda's city ordinance to specify 40 to 50% canopy coverage over parking lots would make a dramatic improvement in future parking lots. Provisions to ensure this coverage is maintained should also be included.

Trees for parking areas fall into three basic use categories: trees for shade, definition, and screening.

- Shade trees should have a rounded, high-branched form and grow relatively quickly to cast a broad shadow. Low-branching, conical trees, particularly conifers, should be avoided in the active parking area.
- Definition, or delineator, trees are used to guide traffic, highlight entrances, terminate vistas, and indicate ends of parking bays. As such, they should be taller and more erect (pyramidal or ovoid forms) than the shade trees used.
- Screening trees may be smaller in size than shade or delineator trees. Both round and erect forms are appropriate. Low branching is important if sufficient planting space is available. Evergreen trees afford year-round screening; however, higher-branching trees can be effectively used if they are combined with low shrubs.

RESIDENTIAL AREAS

In the residential streets of Alameda, the functional uses of trees are less important considerations than in the commercial area. The harmonious character or theme that tree plantings can achieve becomes their dominant role. The repetition of tree types helps unify a street of varying architectural styles and garden plantings. A street with too many small, dissimilar, unrelated tree forms tends to appear disorderly. The most pleasing streets and neighborhoods in Alameda are those with strength of unity deriving from a consistent street tree theme.

Perhaps the best examples are the few blocks of Haight Avenue and Santa Clark Avenue, where the grand trees that were planted decades ago achieve a fine strength of character with younger, more recently planted trees that do not impinge on the overall texture of the streets. Additionally, the residential private gardens

bordering the streets usually reinforce this character. Other neighborhoods have a fine visual harmony, not necessarily because of regular street plantings, but because of the repetition of similar trees in a consistent fashion—for instance, portions of Willow Street. The decision of what trees to plant and how to plant them along residential streets is based upon qualitative questions relating to the desired street character:

- Should it be open and sunny or closed and canopied?
- Should the tree canopy give dense shadows or dappled light?
- Are formality and regularity, or informal consistency, important?
- Is seasonal color, or a varied green, more desirable?

In a residential landscape with various existing trees, a more cohesive appearance can be achieved with an apparent random planting of two or more distinct species. Planting can be used to screen views of utility lines and poles, shade driveways and south- or west-facing building walls, and separate open front yards from the street. A narrower street in an older neighborhood may have many large trees in the private gardens; here, a smaller tree might be used to give the street harmony without destroying its openness.

Utility poles and overhead wires are visually distracting elements in most Alameda neighborhoods. Of course, the best solution for eliminating this distraction is underground wiring—a very costly undertaking. However, trees planted along a street can significantly mask the prominence of power lines. Rights-of-way with randomly spaced trees planted forward on lots offset the regularity of utility pole spacing. The canopy of small- to medium-sized trees planted beneath wires can block the direct view of overhead lines.

The recommendation of specific trees for residential neighborhoods is more difficult than for commercial areas, which tend to have more definitive design criteria. Factors such as topography, soil, existing trees, and proximity to the coast and inland waterways all add to the more personal nature of residential areas and form a complexity of design determinants.

The following sections outline zoning-specific street tree planting considerations.

Single-Family Residential

The percentage of street tree canopy cover within Alameda's single-family neighborhoods varies widely. Some neighborhoods are characterized by large tree species while other neighborhoods have canopy cover characteristic of smaller tree species.

Single-family residential property areas hold the greatest opportunity for street tree canopy cover enhancement. Homeowners should be encouraged, perhaps through incentive programs, to care for their street trees and plant additional trees on their property for their own enjoyment and to benefit the overall community. Too many street trees in front of single-family properties are harmed by poor maintenance practices such as tree topping, girdling, volcano mulching, changing the soil grade, and lack of water. Information on tree maintenance practices should be made available to residents through printed material, classes, and the city web site.

Multi-Family Residential

Multi-family residential properties tend to be located along major transportation corridors and adjacent to the downtown core. Typically, much fewer street trees are planted in multi-family developments than in single-family ones. The greatest opportunity for trees begins with the designer and the developer. Planning for more street trees at the conceptive design level should be encouraged.

INDUSTRIAL PROPERTY

The street tree planting opportunities within the city's industrial areas vary widely but are generally fairly limited. A high percentage of property in industrial areas is needed for access, egress, and circulation space for large trucks and parking. These requirements significantly impact the opportunity for street tree plantings. In Alameda's industrial zones, the greatest opportunity to maximize street tree plantings is in expanded tree trenches. In this environment, even a few additional trees would have significant visual impact.

INSTITUTIONAL PROPERTY

The naval grounds and the college campus comprise Alameda's main institutional properties. The streetscapes found on these properties vary widely in design and use, often containing many park-like street tree plantings. Some of these trees are of significant size and character and highly valued by students, staff, and visitors. Additionally they provide nesting sites and habitats for birds. Institutional streets are highly designed landscapes, so the selection of tree species and their location in this landscape must reflect not just the streetscape, but the rest of the landscape as well. Significant planting opportunities exist throughout the range of institutional properties in Alameda. However it is outside the scope of this MSTP to provide a planting strategy for this zone.

CHAPTER 4

MANAGEMENT PLAN

This chapter of the Master Street Tree Plan presents goals, policies, standards and actions that may be adopted by the Alameda City Council, for management of Alameda's street trees for the foreseeable future. The intent of these goals is to maximize the net benefits of the existing street trees and extend Alameda's living canopy. Management priorities and recommendations required to work toward these goals are presented. The goals, policies, standards and actions herein have been adapted from the City of Davis Community Forest Management Plan (2002), a successful working document for a California municipality of similar size to the City of Alameda.

4.0 / MANAGEMENT POLICIES, STANDARDS AND ACTIONS

GOAL 1

To improve the quality of the Alameda's street trees over time in ways that will optimize environmental, economic, habitat, food and social benefits to the City and its neighborhoods.

Policy 1.1 Increase the existing tree canopy cover through implementation of the Tree Matrix for tree selection, and the Best Management Practices (BMPs) for tree placement, and care.

Policy 1.2 Ensure that the street tree population has a diverse mix of tree species and ages.

Actions

A. Work with the public and City staff to educate and encourage public awareness of the importance of tree species and age diversity within the Urban Forest.

GOAL 2

Promote planting and protection of the existing street tree resource.

Actions

A. Where funding permits, implement practices to reduce tree removals, such as systematic tree inspection and pruning.

B. Explore new methods of repairing sidewalks using alternative materials to provide safe and shady walkways while retaining large, healthy trees.

Policy 2.1 Expand existing comprehensive street tree inventory to include all street trees.

Actions

A. Complete identification, measurement, and comprehensive health assessment of all street trees for the City's GIS database. Continuously update inventory to develop work history of street trees.

B. Use the inventory as the basis for tree-related work scheduling.

Policy 2.2 Maintain clear criteria for tree removal, and implement practices to retain healthy and safe trees.

Actions

A. Street tree removal requests may be approved if one or more of the following conditions exist: **1)** tree is dead or in declining health that will result in its death within a year, **2)** tree is a safety concern because of its high potential for failure due to considerable dead or dying foliage, branches, roots, or trunk, **3)** tree is structurally unsound due to root pruning or crown damage, **4)** tree has reached an over-mature condition, is in declining health, and limits planting/growth of a replacement tree, **5)** tree is infected with a disease that cannot be treated successfully and/or there is strong potential that the pathogen could spread to other trees in the area, **6)** tree location is stated for the construction of public or private improvements, **7)** tree is causing damage to public or private

property, utilities, or drainage that cannot be mitigated by crown pruning, root pruning, irrigation, or other maintenance, **8)** uplifting roots create inmitigable ADA safety concern, **9)** sidewalk width surrounding tree needs to be reduced beyond ADA mandates.
(Note: When dealing with cracked curbs and sidewalks in the vicinity of street trees, the public works director is strongly encouraged to consider alternatives such as bumping out curbs and sidewalks away from trees: reducing sidewalk width near trees: and using interlocking sidewalk pavers. Tree removal is permissible only after all practical and reasonable alternatives have been considered.)
B. When a tree has been identified as high risk remove tree by decision of the PW Director if determined to be a safety hazard.
C. The City Council has discretion to identify special situations where a comprehensive tree removal and replacement program may be desirable.
At the time comprehensive program goes to council for approval, recommendations are to be guided by the MSTP.
D. Where new species are to replace currently planted species, a phasing plan is to be implemented if the site allows whereby no more than 10% of non high risk tree removal is allowed per year unless by City Council action.
E. Replace trees removed or lost to damage on site whenever practical or in a nearby available site with no net loss to the street tree population.

GOAL 3

Continue to maintain the City's street trees in a safe and healthy condition as cost-effectively as possible.

Policy 3.1 Follow the Best Management Practices (BMPs) for tree planting and care (Volume 2 Chapter 2), and make available to the public.

Actions

A. Review BMPs periodically to ensure they employ the most current industry standards.

Policy 3.2 Implement routine inspection for large street trees to reduce long-term tree care costs.

Actions

A. Record annual maintenance procedures in the GIS street tree inventory.

GOAL 4

Facilitate collaboration among City departments related to issues and projects involving trees.

Policy 4.1 Review existing Maintenance Division staffing levels. If budget allows, create City Arborist (and/or professional Urban Forester) job description and continue to maintain the position with a highly qualified urban forester.

Actions

A. Use the Tree Management Planning Tool/Level of Service (LOS) Matrix, Appendix 5, as a tool for establishing priorities, by the following recommended process, as allowed by city budget:

i. Establish minimum to optimum tree management budget range for the planning period (i.e. annual, 5-year, etc.).
ii. Review inventory data and existing street tree conditions. Establish number of street trees being managed.
iii. Prioritize program areas for planning period and rank importance in LOS matrix. Establish special management projects and prioritize.
iv. Modify generic LOS definitions as necessary for conditions (i.e. delete minimal LOS 1 and/or upgrade LOS 2,3,4 with additional special projects if adequate budget exists.
v. Evaluate budget demands for special projects.
vi. Evaluate best funding options, including capabilities of community based partners, grant availability, and comparative costs for private service contracts compared to staff costs.

B. In preparation for each new fiscal year, it is recommended if budget allows that the City Arborist will prepare an annual tree management plan for the street trees, including annual goals for new tree plantings, routine maintenance and pruning, tree removals and replacement program, task scheduling, public education programs, funding and resources, inspections, etc.

GOAL 5

Provide awareness of the importance of the Urban Forest; educate the community on proper tree planting and care; and encourage greater participation in tree planting and stewardship activities.

Policy 5.1 Promote awareness of the standards in the Master Street Tree Plan (MSTP).

Actions

A. Distribute MSTP to City Council, all City departments, public agencies and private partners. Make the plan available to the general public.
B. Develop educational material aimed at preventing the unwarranted and illegal pruning and removal of street trees.

Policy 5.2 Disseminate information and educate the public on the care and value of trees.

Actions

A. Develop and make available a general brochure to for residents in the City of Alameda on the City's tree care policies.
B. Organize and publicize annual Arbor Day activities.

Policy5.3 Amend existing City plans and ordinances to accept the provisions of this MSTP.

Actions

A. Identify current codes, statutes, and ordinances that require updating.
B. Implement amendments following adoption or updating of this MSTP.

4.1 / DETAILED MANAGEMENT PRIORITIES

There are five tree program management elements that must be addressed every year: High Risk Tree Abatement, Mature Tree Care, Young Tree Care, Tree Planting, and Program Administration. Although each of these programs is essential to the maintenance of Alameda's street trees, an annual and/or five-year plan for management priorities should be established to determine where available budget dollars will be spent.

PRIORITY 1: HIGH RISK TREE ABATEMENT

High Risk tree abatement, or removal of dead or dying street trees, is the highest budget priority due to potential public safety concerns. Dead and dying trees can be in danger of falling or losing major branches, with resultant property and/or personal injury concerns.

- **Recommendation:** Eliminate any backlog of high risk street trees. Maintain the City's ability to remove all dead/dying trees in a timely manner.

PRIORITY 2: MATURE TREE CARE

Mature tree care is a high priority for the tree management budget over the next five years. Large trees are the most significant component of Alameda's urban forest. They form the umbrella over streets, and create the backbone of the urban form. Although care of mature trees is the most costly management element, it is a priority because of the importance of safety and tree health issues; the consequences of lack of care are more immediate for large trees than smaller trees.

- **Recommendation:** Continue the current 5-year pruning cycle for larger trees.

PRIORITIES 3 AND 4: YOUNG STREET TREE CARE AND PLANTING

Young tree care and new tree planting are essential parts of street tree management. The health and stability of Alameda's future street tree population depends in large part on judicious tree selection today, as well as ongoing maintenance of young trees. These recommendations assume that City staff may be assisted in young tree care and planting activities by community based partners who can train volunteers and apply for outside grants, thereby producing a substantial cost savings to the City.

- **Recommendation:** Establish a young tree care program that inspects/prunes young trees once a year for the first five years after planting. Eliminate the backlog of any young street trees that are not receiving early training/pruning.
- **Recommendation:** Use city-funded tree planting for replacement trees, and seek outside grant money with the help of community based partners (such as Master Gardeners) for additional planting to reach the City's ultimate goal to have a tree planted at every identified site within the next twenty years.

PRIORITY 5: ADMINISTRATION

Administration refers to activities such as supervision, scheduling, coordination, planning and education overseen by the City's Maintenance Services Division. Current tasks performed by the maintenance supervisors are numerous and varied. They respond to public contact, including comments, work orders and special requests related to trees, and coordinate with other City departments such as Planning

& Building, Housing, and Alameda Municipal Power. Part of this coordination responsibility is to review proposed development and construction plans to ensure that adequate existing tree protection and ion measures are taken and that tree planting follows City guidelines.

- **Recommendation:** Expand the current level of Program Administration to include a position for a City arborist, if budget allows.

4.2 / LEVEL OF SERVICE MATRIX

The following Tree Management Planning Tool/Level of Service (LOS) Matrix, Appendix 5, has been developed to direct the prioritizing and budgeting of the annual tree management plan.

The purpose of the LOS Matrix is to identify priorities for care of City street trees along with identifying annual and long-term projected management costs. The LOS Matrix is designed to respond to budget levels from optimal (in adequate budget years) down to minimal service (to be used rarely and only for extremely lean budget years). When funding exceeds the optimal service levels for annual maintenance and administration needs, the five year plan may address additional long-term goals of the MSTP, such as promoting public awareness, updating the Best Management Practices with current industry standards, or other goals, priorities and actions contained in the recommendations above.

TREE MANAGEMENT PLANNING TOOL[1]

Levels of Service (L.O.S.) and Budget Determination for City-funded Tree Management

Program Area	Rank for Fiscal Year*	Potential Level of Service 1 (minimal)	Potential Level of Service 2	Potential Level of Service 3	Potential Level of Service 4 (optimal)	Staff Recommendation for Fiscal Year*
Planting		No new city-funded tree planting	Replace street tree removals only	Replace removals and plant on request; increase street tree population by 1/2 % per year	Replace removals and plant on request; increase street tree population by 1% per year; provide for special planting projects	
Young Tree Care		No young tree care	± 5-year cycle inspection/ pruning	± 3-year cycle inspection/ pruning	± 1-year cycle inspection/ pruning	
Mature Tree Care		± 12-year cycle inspection/ pruning	± 9-year cycle inspection/ pruning	± 7-year cycle inspection/ pruning	± 5-year cycle inspection/ pruning	
HIgh Risk Tree Abatement		Removals on property owner request only	Removals on request; maintain <5% 'dead of dying' backlog	Removals on request; maintain <2% backlog; fund special projects	Removals on request; maintain <1% backlog; fund removal/replacement programs; inventory and other special projects	
Administration (2008 dollars)		$2.50/tree admin budget or 0.25 supervisory arborists/ 10,000 trees	$3.50/tree admin budget or 0.40 supervisory arborists/ 10,000 trees	$4.25/tree admin budget or 0.50 supervisory arborists/ 10,000 trees	$5.00/tree admin budget or 0.65 supervisory arborists/ 10,000 trees	

1 developed by the City of Davis, 2002

* Column to be filled in annually when planning budget and proposed Level of Service.

4.3 / ANNUAL OPERATING PLAN FOR FY 2009

This FY 2009 Level of Service (LOS) matrix and resulting budget are based on the FY 2008 budget. The LOS matrix, with accompanying text, explains the issues and processes involved in developing recommendation for this time frame. It is included in this plan for its value at the present time and for reference as a model for future years' planning and budgeting.

The LOS Matrix compares current levels of service with four possible levels/budgetary demands for 2009: minimal care (LOS 1) through optimal care (LOS 4). The matrix includes five annual ongoing maintenance/program management areas: Tree Planting, Young Tree Care, Mature Tree Care, High Risk Tree Abatement, and Program Administration/Management.

Although each of these annual ongoing program areas is essential to the maintenance of the City's street tree population, they have been prioritized for budget consideration. Concern for public safety and responsible management of the existing street trees has been placed as the highest priority. The final column of the matrix proposes the recommended implementation strategy and budget for FY 2009.

The issues inherent in the management of each program area and related implementation standards are addressed in the text below, organized by budget priority.

1. HIGH RISK TREE ABATEMENT

High risk tree abatement, or removal of dead or dying street trees, has been given the highest budget priority for FY 2009.

During a typical year in Alameda, about 150 street trees require removal. These trees are removed on request by homeowners and City staff as well as in emergency removal situations such as following a storm.

Assuming current mortality rates in Alameda continue during the next year, 150 street trees will need to be removed due to normal aging of the population.

Therefore, to summarize the matrix, levels of service identified for high risk tree abatement are as follows:

Level of Service 1 (minimal): High risk tree removals on property owner's or City's request only; no backlog high risk tree removal.

Level of Service 2: High risk tree removals on property owner's or City's request; eliminate backlog of high risk trees in ten (10) years.

Level of Service 3: High risk tree removals on property owner's or City's request; eliminate backlog of high risk trees in five (5) years

Recommended level

Level of Service 4 (optimal): High risk tree removals on property owner's or City's request; eliminate any backlog of high risk trees with one-time capital expense in one (1) year.

2. MATURE TREE CARE

Mature street tree care is identified as the second highest priority for the tree management budget in FY 2009. Mature trees include all trees over four-inches diameter at breast height (4" DBH).

The Society of Municipal Arborists (SMA), the leading professional organization in the field of municipal urban forestry, established a minimum standard for pruning street trees at least once every eight years, with recommended pruning every five years for older trees.

The current Level of Service for mature trees in Alameda is about a five-year cycle. Approximately 2,500 trees are inspected and/or pruned each year. This equates to LOS 4. The recommended Level of Service for mature tree care is to maintain the current five-year pruning cycle.

Therefore, to summarize the matrix, the levels of service identified for mature tree care are as follows:

Level of Service 1 (minimal): Inspection/pruning of 1,250 trees/year; this equates to a ten (10) year cycle.

Level of Service 2: Inspection/pruning of 1,500 trees/year; this equates to an eight (8) year cycle.

Level of Service 3: Inspection/pruning of 2,000 trees/year; this equates to a six (6) year cycle.

Recommended level
Level of Service 4 (optimal): Five-year inspection/pruning cycle: 2,500 trees/year.

3. YOUNG TREE CARE

Conscientious care of young trees is a prudent and cost-saving measure in the long run, because trees that are frequently inspected and pruned in the first six years of growth need much less attention and costly maintenance when mature. Young trees are defined as trees newly planted to about four-inch (4") DBH, assuming the time frame encompassing planting through three years after planting. Regular watering and basin adjustment, mulching, stake adjustment and removal, pruning to remove broken and dead wood, establish central leader, select lowest permanent branch, establish scaffold branches, and other maintenance is provided to young trees.

London plane, flowering pears, elms and Red maple should probably be pruned when 2, 3 and possibly 4 years old before reverting to a less frequent cycle. Young trees in intense commercial areas (eg. Park and Webster Streets) probably need pruning

every year for the first 3-5 years and probably at 2-3 year intervals thereafter until all temporary lower branches are removed.

The Society of Municipal Arborists (SMA) established a minimum standard for pruning young trees once every three years, or two prunes during the first six years. In practice, a more optimal goal is to create a two-year prune cycle, or four prunes in the first six years, which will more readily establish healthy, long-lived mature trees. The pruning sequence recommended by Dr. Larry Costello (UC Cooperative Extension) in his publication "Training Young Trees for Structure and Form" is to properly train young trees by inspecting/pruning at the time of planting, one year later, then three and five years after planting. To meet this goal will require starting newly planted trees on this program, as well as increasing pruning of existing young trees over the next five years to bring all trees to the same level of care.

Alameda currently has about 2,300 trees sized 0-4" DBH. Many of these are smaller tree species or slower growing trees (eg. Gingkos) that could be pruned less often than every two years. To reach the optimal two-year cycle, approximately 1,150 trees will need to be inspected/pruned annually. Alameda does not have a young tree care program established, and records are sparse on the level of service provided to young trees.

The recommended Level of Service for young tree care is LOS 3, representing a two-year cycle of 1,150 trees/year, with no elimination of backlog.

Therefore, to summarize the matrix, the levels of service identified for young tree care are as follows:

Level of Service 1 (minimal): No young tree care.

Level of Service 2: Four-year cycle, 575 trees/year.

Recommended level
Level of Service 3: Two year cycle, 1,150 trees/year.

Level of Service 4 (optimal): Two year cycle with backlog elimination in first year. One year cycle for very fast growing species, e.g. London plane, elms etc. and trees in high intensity commercial area.

4. TREE PLANTING

New tree planting on an annual basis is an important element of perpetuating the street tree population. Failure to plant trees on a regular basis will reduce age diversity and leave gaps in canopy cover. Replacement of removed trees and filling in vacant street tree sites are the major goals of new tree planting.

The 2008 street tree inventory identified 3,457 vacant planting sites. In addition to vacant tree locations, approximately 150 trees/year are removed due to damage or health concerns. Therefore, to achieve full stocking over the next 20 years, approximately 150 replacement trees and 175 trees in vacant sites must be planted each year (325 trees/year) for 20 years.

The optimal LOS 4 plants 500 trees/year to reach full stocking in 10 years, at an average cost of $253 to $351/tree. In the short-term due to higher priority of high risk tree removal and mature tree care, it is acceptable to reduce tree planting funds as necessary if budgetary constraints demand. Therefore, Level of Service 2 is recommended, provided that each site is in accordance with MTP spacing criteria.

Therefore, to summarize the matrix, the levels of service identified for tree planting are as follows:

Level of Service 1 (minimal): No new plantings.

Recommended level
Level of Service 2: Replace removals only. 150 trees/year.

Level of Service 3: Replace removals (150 trees/year) and plant 175 trees/year in vacant sites to reach full stocking in 20 years. 325 trees/year.
Level of Service 4 (optimal): Replace removals (150 trees/year) and plant 350 trees/year in vacant sites to reach full stocking in 10 years. 500 trees/year.

5. ADMINISTRATION

Administration refers to activities overseen by the City's Maintenance Division, such as supervision, coordination, planning and education. Currently there is one full time maintenance supervisor, and no arborist on staff. It is recommended that the City create a position for a full-time City Arborist, whose duties would include selecting contractors to fulfill tree maintenance and planting needs, filling job orders, and supervising pest management and staff training. Additionally, the City Arborist's role is to educate developers, contractors, designers and residents concerning tree-related policies and benefits of healthy trees. As part of his/her interactions with the public, the City Arborist is responsible for replying to phone requests, inspections, monitoring projects and diagnosing tree problems.

There is no national standard for this service, however, these activities are fundamental to effective implementation of street tree programs. Based on other municipal street tree programs in California, 1 full-time supervisory arborist for every 20,000 street trees is recommended and corresponds to LOS 4. LOS 4 is recommended, which will provide the desired level of oversight needed to enforce ordinances, educate stakeholders, and guide a model program. However, for the next five years the goal is to continue to contract out registered consulting Arborist services while gathering support and funding for a full-time City arborist in 2014.

Recommended level
Level of Service 1: One Maintenance Supervisor per 20,000 trees
Level of Service 2: 0.5 City Arborist and 0.5 Maintenance Supervisor per 20,000 trees
Level of Service 3: One City Arborist per 20,000 trees
Level of Service 4: One City arborist and one Maintenance Supervisor per 20,000 trees

PROPOSED LEVEL OF SERVICE MATRIX FOR STREET TREE MAINTENANCE, FY 2009

Program Area:	Current (2007) Level of Service for Alameda Street Trees		Potential Level of Service 1 (minimal)		Potential Level of Service 2		Potential Level of Service 3		Potential Level of Service 4 (optimal)		Recommended for FY 2009	
Tree Planting	LOS: 1-2 (35 trees planted in 2007)	Budget Impact: unknown	No new plantings	Budget Impact: TBD	Replace removals only (150 trees/yr)	Budget Impact: TBD	Replace removals and plant 175 vacant spaces (325 trees/yr)	Budget Impact: TBD	Replace removals and plant 350 vacant spaces (500 trees/yr)	Budget Impact: TBD	LOS: 2 Replace removals only	Budget Impact: TBD
Young Tree Care	LOS: 3 (estimated 2-year cycle, 1,250 trees/yr @ $40/tree)	Budget Impact: unknown	No young tree care	Budget Impact: TBD	Prune 575 trees/yr (4-year cycle)	Budget Impact: TBD	Prune 1,150 trees/yr (2-year cycle)	Budget Impact: TBD	Prune 2,300 trees (2-year cycle and eliminate backlog in 1 yr.)	Budget Impact: TBD	LOS: 3 Prune 1,150 trees/year	Budget Impact: TBD
Mature Tree Care	LOS: 4 (5-year cycle, 2,500 trees/yr @ $69/tree)	Budget Impact: unknown	Prune 1,250 trees/yr (10-year cycle)	Budget Impact: TBD	Prune 1,500 trees/yr (8-year cycle)	Budget Impact: TBD	Prune 2,000 trees/yr (6-year cycle)	Budget Impact: TBD	Prune 2,500 trees/year (5-year cycle)	Budget Impact: TBD	LOS: 4 5-year cycle, 2,500 trees/year	Budget Impact: TBD
Hazard Tree Abatement	LOS: 1 (150 trees/yr)	Budget Impact: unknown	Remove on request only (150 trees/year)	Budget Impact: TBD	Remove on request (150/yr) and eliminate backlog of hazard trees in 10 yrs (35/yr). Total 185 trees @ $300/tree	Budget Impact: TBD	Remove on request (150/year) and eliminate backlog in 5 yrs (70/yr). Total 220 trees @ $300/tree	Budget Impact: TBD	Remove on request (150/yr) and eliminate backlog in 1 yr (350 trees). Total 500 trees @ $300/tree	Budget Impact: TBD	LOS: 4 (150/yr @ $300/tree and one-time removal of 350 trees to eliminate backlog)	Budget Impact: TBD
Admin-istration	LOS: 1 (1 maint. supervisor/ 20,000 trees, contract arborist as needed)	Budget Impact: unknown	1 maint. supervisor/ 20,000 trees, contract arborist as needed	Budget Impact: TBD	0.5 City Arborist, 0.5 maint. supervisor/ 20,000 trees	Budget Impact: TBD	1 City Arborist/ 20,000 trees	Budget Impact: TBD	1 City Arborist, 1 Maint. Supervisor/ 20,000 trees	Budget Impact: TBD	LOS: 1 1 maint. supervisor/ 20,000 trees, contract arborist as needed	Budget Impact: TBD
Misc. Tree Maintenance	unknown		TBD		TBD		TBD		TBD		TBD	
Total Budget Impact	unknown (sum of all budget impacts for 2007 LOS)		TBD (sum of all budget impacts using LOS 1)		TBD (sum of all budget impacts using LOS 2)		TBD (sum of all budget impacts using LOS 3)		TBD (sum of all budget impacts using LOS 4)		TBD (sum of all budget impacts using recommended LOS)	

CHAPTER 5

BUDGET

5.0 / FUNDING A STREET TREE PROGRAM

Based on recent research by the Society of Municipal Arborists (McGannon, "Urban Forestry Programs Across America," City Trees, July/August, 2001), there is a $5.00 per capita standard budget required to support staffing levels for a comprehensive street tree program that performs tree planting, maintenance, emergency services, public relations, and supervision. Alameda's 2000 census population was near 72,000, and it is projected to be 80,000 in less than 10 years. Given these population figures and the national standard, Alameda's general funding level should be between $360,000 and $400,000 annually. Specific budgetary recommendations are made on a yearly basis using the Tree Management Planning Tool (Appendix 5). The 2008 FY budget was approximately $350,000, and is detailed in the table below.

STREET TREE EXPENDITURES FOR FISCAL YEAR 2008

Street Tree Expenditures	**$Total**
Mature Tree Care	**171 842**
Young Tree Care	**50 000**
Arborists' Services (diagnosis, reports, etc.)	**2 500**
Bay Street Homeowners' Assoc. (Elm Tree Care)	**3 000**
Bee Hive Removal	**1 000**
Misc. Tree Care	**32 000**
Tree Plantings and Removals	**75 000**
Insect Pest Treatment	**4 000**
Grand Total	**339 342**
Average $ / tree / year	**22.62**
Average $ / capita (population 72,000)	**4.71**

The budget for the street tree program varies from year to year. Resources available are often inadequate to create a comprehensive street tree program and accomplish the goals that the MSTP aims to achieve. With greater and more secure funding, the City could move from a reactive to a proactive management approach, provide greater services, and increase street tree canopy coverage.

There are various funding mechanisms and sources the City can consider to support increasing staff levels, public education efforts, tree protection, maintenance, planting activities, and other components of a truly progressive, comprehensive street tree management program.

5.1 / POTENTIAL FUNDING SOURCES

Expanding funding for a comprehensive street tree program makes it possible to increase the number of projects accomplished and reduce reliance on limited municipal funds. Leveraging municipal funds through partnerships with other sources of funding from state, federal, and local organizations will increase the number of partners with a vested interest in sustaining a healthy street tree population. Potential sources of additional funding have been identified as follows:

A. ESTABLISH AN ALAMEDA STREET TREE TRUST FUND

A special account could be created to deposit all street tree funds, which would be restricted to use by the street tree program. The funds in this account would be managed by the City, subject to the annual budget process, and would follow normal purchasing policies and procedures. This innovative funding mechanism does not rely on City general funds but rather on the collection and deposit of monies from various sources.

Establishing a Street Tree Trust Fund can facilitate the compliance of tree mitigation requirements by encouraging equitable contributions for replacement trees. Expenditures from this trust fund would require authorization by the city manager or designee. Not less than 80% of the Trust Fund shall be expended on tree replacement and restoration during each fiscal year. However, if the city manager or designee determines that there are insufficient reserves in the Trust Fund to implement a viable tree replacement program, funds may be carried over to the next fiscal year. The Trust Fund would serve as the City's primary funding source for city-sponsored street tree restoration efforts. The Trust Fund monies could also be leveraged when applying for grants.

Potential sources of money for the Street Tree Trust Fund include, but are not limited to, the following:

- **Cost Sharing**

The issue of how to pay for street tree planting should be presented to the City Council for possible solutions. For example, establishing a cost share policy could prompt neighborhoods to do infill plantings that cannot be accomplished with existing resources. Additionally, sharing the cost of tree planting gives the property owner a sense of "ownership" that will likely encourage the follow-up care (e.g., watering and mulching) that is essential for tree survival in the first few years following planting. The drawback is that some citizens will not pay to plant trees, resulting in gaps in the street tree canopy. Because of the irregularity of cost share plantings, diverse species planting plans are the best method for maintaining thematic regularity along streets with tree gaps.

- **Damage Compensation**

When a resident illegally removes or vandalizes a street tree, an automobile damages a street tree, or construction equipment destroys a group of public trees, the City of Alameda can seek compensation for the damages, or landscape value of the trees. Generally, the compensation is collected from the insurance company of the person responsible for the damage or directly from the business that caused

the damage to public trees. The compensation funds can be used to remedy the specific damage or to fund replacement plantings when the damages are too great.

• Permit and Plan Review and Inspection Fees (to the extent permitted under California Code)

Municipalities commonly require private developers and businesses to support the administrative time needed for proper and professional plan review and site inspection tasks. In light of the city's goal to protect and enhance the urban forest, charging specifically for the time and arboricultural expertise needed to approve permit applications, review plans, and make site inspections might be a viable option to support the salary and benefits of additional full- or part-time urban forestry positions. The city should perform a job analysis to determine the time spent performing review and inspection tasks, and investigate what other nearby or similarly sized cities are charging for such a task.

• Developers' Fees (to the extent permitted under A California Code)

Developers could be required to pay a set amount per project to support Alameda's overall street tree program. The fee could be a percentage of the total project cost, based on the number of housing units built or based on the area of land being developed. It is suggested that this fee would be paid and deposited in the Street Tree Trust Fund before the project is approved. Large development could be conditioned to set up private maintenance service district to manage operating and construction cost to tree maintenance without development on public right of way.

• Private Donations/Corporate Sponsorships

Alameda is fortunate to have generous citizens who care about the quality of life in their city. The Recreation and Parks Department, for example, has received sizable private donations to improve park facilities. The Street Tree Trust Fund could also solicit citizens for private donations to support tree planting, tree care, and public education activities. A major source of donations could be from businesses and corporations who wish to sponsor non-profit environmental activities. All potential contributors should be reminded that any donations might be tax-deductible.

• Fund-Raising Activities

With the support of volunteers, the City can hold various fund-raising events throughout the year. Popular large events include competitive and social runs and walks. Tree-related and Alameda-related merchandise could be commissioned and sold both at City events and online. Restaurants can have special Tree Nights where a small percentage of the patrons' bills is donated back to the City for tree planting. Even small efforts, such as school and church bake sales and yard sales, can be encouraged to raise funds for trees in the community.

• Public awareness and volunteer training

California ReLeaf and California Department of Forestry and Fire protection award grants to grassroots groups across California for education, public awareness, tree planting and care, and volunteer development.

B. OTHER FUNDING TOOLS

The following sources of revenue are appropriate for inclusion in Alameda's Street Tree Bank, but are viable sources of funding for the comprehensive street tree program:

1. Landscape Assessment District
Property owners vote to assess themselves the extra tax to maintain a specific landscape feature.

2. Public/Private Partnerships
It is important that the City recognizes that its ability to single-handedly spearhead new tree planting efforts is constrained based on routine citywide Public Works obligations. As a result, the City should vigorously pursue public/private partnerships with local, private, not-for-profit entities offering expertise in horticulture, such as tropical botanical gardens, tree and plant societies, and garden clubs.

3. Adopt a Tree Program
Residents may participate in the Adopt-A-Tree Program by making a tax-deductible contribution to the Public Works department which will go toward planting a new tree or trees. Additionally, participants agree to water the tree for the first two years.

APPENDICES

APPENDIX 1 / STREET TREE PLANTING AND STAKING SPECIFICATIONS

1. ALL WORK SHALL BE PERFORMED BY PERSONS FAMILIAR WITH THIS TYPE OF WORK AND UNDER THE SUPERVISION OF A QUALIFIED PLANTING FOREMAN.
2. CONTRACTOR SHALL VERIFY THAT ADEQUATE DRAINAGE EXISTS PRIOR TO PLANTING.
3. CONTRACTOR SHALL VERIFY THE LOCATION OF ALL UTILITIES PRIOR TO PLANTING.
4. TREES SHALL BE 7 TO 10 FEET HIGH SUPPLIED IN FIFTEEN GALLON CONTAINERS. TREES SHALL HAVE A MINIMUM OF 1.5 INCH TRUNK DIAMETER AT BREAST HEIGHT.
5. ALL TREES SHALL CONFORM TO THE STANDARDS SET FORTH IN THE MOST RECENT *AMERICAN STANDARDS FOR NURSERY STOCK* PUBLISHED BY THE AMERICAN ASSOCIATION OF NURSERYMEN (A.A.N.).
6. TREES SHALL HAVE A STRAIGHT STRONG TERMINAL LEADER, UNCUT AND UNBROKEN. THE MAIN TRUNK SHALL HAVE ACCEPTABLE LATERAL GROWTH ALONG ITS LENGTH SHORTER AND SMALLER IN DIAMETER THAN THE MAIN TRUNK.
7. ALL TREES THAT, IN THE OPINION OF THE CITY ENGINEER, ARE DISEASED, INSECT INFECTED, OR HAVE GIRDLING ROOTS, WILL BE REJECTED.
8. TREES WITH ROOT FLARE COVERED BY MORE THAN 1.5 INCHES OF SOIL WILL BE REJECTED PRIOR TO INSTALLATION.
9. PLANTING MIXTURE FOR THE BACKFILL SHALL HAVE NO SOIL AMENDMENTS.
10. IN PARKWAY STRIPS SET PLANTER TOP 1.5 INCHES BELOW SIDEWALK GRADE. IN LAWNS OR GROUNDCOVER AREAS SET PLANTER TOP FLUSH WITH FINISHED GRADE. IN LAWN AREAS THERE SHALL BE A 2 FOOT MULCH RING CLEARANCE BETWEEN EDGE OF LAWN AND TREE.
11. STAKING OF TREE IS NOT RECOMMENDED, EXCEPT ON WINDY SITES, FOR LARGE EVERGREEN TREES, OR IN AREAS WITH HEAVY TRAFFIC. IF STAKING IS DONE, FLEXIBLE HOSE - NOT TIES AND WIRES - SHOULD BE USED. NAIL FLEXIBLE TREE STRAP TO EACH SIDE OF THE STAKE IN TEARDROP FIGURE WITH 1 INCH MAX GALVANIZED ROOFING NAIL.
12. TREE STAKES TO BE REMOVED AFTER TWO YEARS.
13. AT PLANTING PRUNE ONLY CROSSING LIMBS, CO-DOMINANT LEADER, BROKEN, DISEASED OR DEAD BRANCHES, AND ANY BRANCHES THAT POSE A HAZARD TO PEDESTRIANS WHILE PRESERVING FORM AND CHARACTER OF TREE. DO NOT CUT LEADER. DO NOT PRUNE IN ORDER TO REDUCE CANOPY SIZE.
14. DO NOT WRAP TRUNK OF TREE.
15. A ROOT COLLAR EXCAVATION FOR ALL TREES SPECIFIED WILL BE DONE BY THE CITY ENGINEER TO ENSURE THAT TREES WERE NOT PLANTED OR GROWN TOO DEEPLY AT THE NURSERY. LANDSCAPE CONTRACTORS SHALL HAVE SUPPLIERS MARK GROUND LEVEL LINE ABOVE ROOT BALL. IF CITY ENGINEER DETERMINES THAT THERE IS EXCESSIVE SOIL OVER THE ROOT CROWN, THE TREES WILL BE REJECTED.
16. MULCH SHALL BE 3" DEEP UNLESS OTHERWISE NOTED.
17. TREES SHALL BE WATERED TWICE WEEKLY. ALL TREES NOT MEETING WITH THE APPROVAL OF THE CITY ENGINEER AT THE END OF THAT PERIOD SHALL BE REPLACED BY THE CONTRACTOR.
18. DEEP WATERING TUBES.

1 TREE PLANTING NOTES

NO.	REVISED	BY	APP.

DATE: AUGUST 24, 2008

SCALE: NOT TO SCALE

CITY OF ALAMEDA
CALIFORNIA
ENGINEERING DEPARTMENT

Tree Planting Details

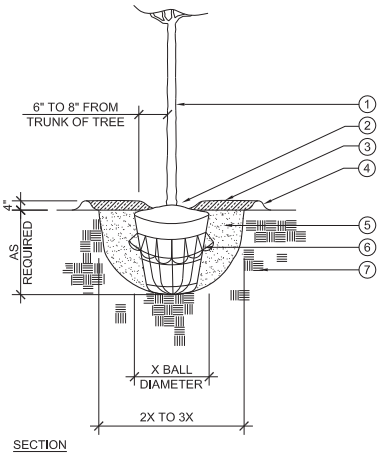
APPROVED BY:

CITY ENGINEER

REG. C.E. NO. _____

DATE _____

Exhibit 1



LEGEND

1. TREE TRUNK. (OPTIONAL)
2. ROOTBALL CROWN TO BE 2" ABOVE SURROUNDING FINISH GRADE.
3. 3" MULCH RING DIRECTLY OVER PLANTING HOLE (KEEP CLEAR FROM TRUNK - DO NOT MOUND BASE OF TREE)
4. PLANTER SAUCER EDGE.
5. PLANTING MIX OR BACKFILL.
6. WIRE BASKET OPTIONAL.
7. EXISTING SOIL.

NOTES

A. CUT AND REMOVE TOP ⅓ OF WIRE BASKET, TURN DOWN TOP ⅓ OF BURLAP: REMOVE ALL CORD & TWINE FROM BASE OF TRUNK: IF NONDEGRADEABLE WRAP IS USED, REMOVE TOTALLY.

B. LOOSEN EXTERIOR OF THE ROOT BALL AND THE ROOT MATT AT THE BOTTOM OF THE BALL, CUT ALL MAJOR CIRCLING ROOTS.

2 GENERAL TREE PLANTING

NO.	REVISED	BY	APP.

DATE: AUGUST 24, 2008

SCALE: NOT TO SCALE

CITY OF ALAMEDA
CALIFORNIA
ENGINEERING DEPARTMENT

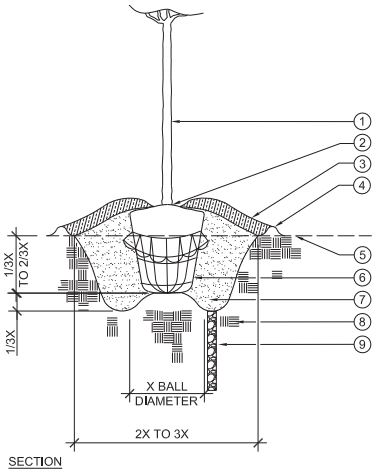
Tree Planting Details

APPROVED BY:

CITY ENGINEER

REG. C.E. NO. _____

DATE _____



LEGEND

1. TREE TRUNK.
2. ROOTBALL CROWN TO BE 2" ABOVE SURROUNDING FINISH GRADE.
3. 3" MULCH RING DIRECTLY OVER PLATING HOLE.
4. PLANTER SAUCER EDGE.
5. EXISTING GROUND LINE.
6. WIRE BASKET OPTIONAL.
7. PLANTING MIX BACKFILL.
8. EXISTING SOIL.
9. CHIMNEY DRAIN, 8" DIA. HOLE X 5' DEEP. BACK FILLED WITH DRAIN ROCK. DRILL ON DOWNHILL SLOPE OF ROOTBALL FOR DRAINAGE.

3 TREE PLANTING IN WET / HEAVY SOILS

NO.	REVISED	BY	APP.

DATE: AUGUST 24, 2008

SCALE: NOT TO SCALE

CITY OF ALAMEDA
CALIFORNIA
ENGINEERING DEPARTMENT

Tree Planting Details

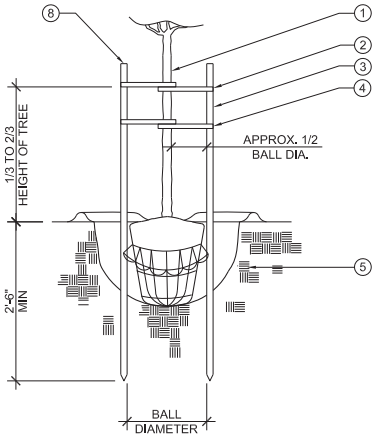
APPROVED BY:

CITY ENGINEER

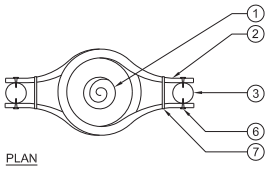
REG. C.E. NO. _____

DATE _____

Exhibit 3



SECTION



PLAN

LEGEND

1. TREE TRUNK.
2. CUT SEMI-RIGID GARDEN HOSE. UPON INSTALLATION.
3. 2" DIAMETER LODGEPOLE TREE STAKE.
4. ONLY USE SECOND TIE IF TREE SIZE IS 24" BOX OR LARGER OR AS REQUIRED.
5. EXISTING SOIL.
6. 1" GALVANIZED ROOFING NAIL.
7. PLASTIC ZIP TIE.
8. CUT TOP OF STAKE AS REQUIRED TO CLEAR LOWEST BRANCH BY 6".

NOTES

TREE STAKES FOR ALL STREET TREES SHALL BE PARALLEL TO STREET.

4 TREE STAKING

NO.	REVISED	BY	APP.

DATE: AUGUST 24, 2008

SCALE: NOT TO SCALE

CITY OF ALAMEDA
CALIFORNIA
ENGINEERING DEPARTMENT

Tree Planting Details

APPROVED BY:

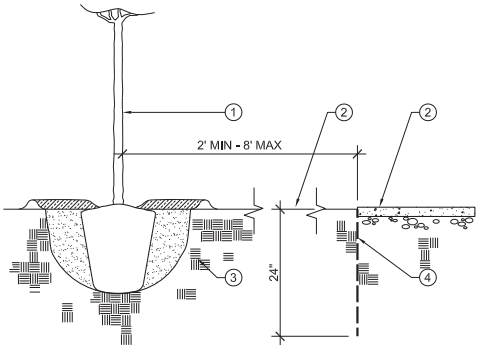
CITY ENGINEER

REG. C.E. NO. _____

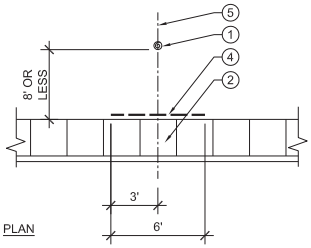
DATE _____

LEGEND

1. TREE TRUNK.
2. ADJACENT PAVING, CURB, CURB AND GUTTER, OR PATH.
3. EXISTING SOIL.
4. ROOT BARRIER: CONTRACTOR SHALL USE DEEP ROOT LINEAR ROOT BARRIER #22-29-18-P / HIGH DENSITY POLYETHYLENE, MANUFACTURED BY DEEP ROOT CORP. (7354 BOLSA AVE. WESTMINSTER CA 92683) OR EQUAL. SET TOP FLUSH WITH FINISHED GRADE.
5. CENTER LINE OF TREE.
6. 2' MINIMUM FOR NEW PLANTER STRIP.



SECTION



PLAN

5 ROOT CONTROL BARRIER

NO.	REVISED	BY	APP.

DATE: AUGUST 24, 2008

SCALE: NOT TO SCALE

CITY OF ALAMEDA
CALIFORNIA
ENGINEERING DEPARTMENT

Tree Planting Details

APPROVED BY:

CITY ENGINEER

REG. C.E. NO. _____

DATE _____

Exhibit 5

APPENDIX 2 / COMPONENTS OF THE NEIGHBOURWOODS© TREE INVENTORY

UNBALANCED CROWN

The growth of trees in forest conditions usually results in them having long, straight, trunks. However, open grown urban trees develop wider crowns with lower branching. They often have irregular or unbalanced crowns because of past damage, management practices, restricted growing space, conflict with buildings, or a lack of light. This can result in structural weakness and high risk problems.

If the tree crown were unbalanced, lopsided, or developed as a flag, the tree would get points for unbalanced crown. A tree might have an unbalanced crown but straight trunk or it can have both an unbalanced crown and a leaning stem. In the latter case, both of these problems should be recorded separately.

Three classes are established for unbalanced crown.

0 here are no signs that the crown is unbalanced or lopsided; crown normally developed.
1 Crown slightly asymmetrical due to restricted growing space or lack of light.
2 Crown is asymmetrical, unbalanced or lopsided.
3 Crown is severely asymmetrical to the point where it clearly places damaging stress on the main stem or root system.

REDUCED HEIGHT

Reduced height refers to topping, pollarding, or similar damage caused by windstorms, snow, or vandalism. Topping, or any maintenance practices that result in removing a large portion of the crown, may weaken tissues from the trunk to the roots. The loss of parts of the live crown can be expected to be followed by dying-back of the root system (and vice versa). Topping also stimulates excessive sprouting. Sprouts are poorly attached to the main branch. As sprouts increase in size, they may become high risk. Topping is often done to reduce conflicts between the tree's crown and utilities. In many cases though, topping may exacerbate conflicts between a tree and utilities.

Dramatic reduction of the crown volume results also in large stubs that are points for disease and pest entrance and the development of epicormic shoots.

The degree of reduced height is ranked in three classes relative to the amount of crown removed. These three classes are recorded using the following rating:

0 There are no signs that tree height has been reduced. Crown has not been topped or pollarded.

1 Less than 1/4 of the crown volume removed.

2 1/4 to 1/2 of the crown volume removed.

3 More than 1/2 of the crown volume removed leaving behind only a few stubs.

WEAK OR YELLOWING FOLIAGE

The presence of pest, diseases, or physiological problems can reflect on leaf colour or size. A tree is considered to have weak foliage/yellowing leaves if it has thin foliage, is off-colour, or has smaller leaves than what is normal. Looking from the side, the overall crown can be more transparent or lighter green to yellow. However, keep in mind that some tree species such as Honey Locust, Black Locust, and Ashes normally have more transparent crowns than species such as Maples, Elms, Beeches, etc. (As a rule of thumb, species with compound leaves have more transparent crowns.). Similarly, some cultivars have different leaf colour or shape than what is typical for the species. For example, the youngest foliage of Honey Locust 'Sunburst' has lighter green (almost yellow) leaves compared to the older leaves or those typical for other Honey Locust.

Weak or yellowing foliage may be a symptom of a number of problems. It may be caused by pests or disease in parts of the tree other than the leaves. In addition, drought, confined root spaces, soil compaction, girdling roots, poor nutrition, etc., might be the cause of weak foliage. In such cases, maintenance measures such as soil aeration, fertilizing, and watering might help the tree to recover.

When examining a tree for weak foliage or yellowing leaves, you should be considering the portions of the crown not affected by dieback, topping, or pollarding. In other words, a tree may have lost a large portion of its crown, but the remaining parts appear to be healthy. In such situations, you would not record anything in this category. On the other hand, a tree may have a full crown with no history of topping, pollarding, or storm damage, but the leaves on the crown tend to be either small or chlorotic (yellow). In this case, you should record the degree of defect. Remember, it would also be possible for a tree to have both weak/yellowing foliage as well as reduced height. In such cases, record both in the appropriate columns. The reason the Neighbourwoods program differentiates between crown loss and symptoms ofa weak crown is that a tree may recover from the latter. However, crown dieback, topping, and pollarding, while perhaps compensated by regrowth in other parts of the crown, represent a long-term loss of photosynthetic area.

The degree of weak/yellowing leaves is grouped in three classes relative to normal foliage for the species in question. These three classes are recorded using the following rating:

0 Leaves normal size, colour, and texture
1 Leaves appear to be somewhat smaller than normal; pale in colour
2 Leaves are significantly smaller than what is normal; pale foliage; thinning of foliage; the crown is significantly more "transparent" than typical for the species.
3 Leaves are dramatically smaller than normal and/or leaf colour is dramatically different; the crown is very transparent; the tree appears to be in a serious state of decline.

DEFOLIATION

Crown defoliation is one of the main indices monitored for tree condition of both forest and urban trees. It usually indicates serious problems with trees of either a physiological or pathological nature. Defoliation is the term used to describe a situation where part of the leaf mass is missing and bare branches and twigs remain. Dieback (death of shoot and branches, generally from the tip to base) falls into this category as well.
During the tree inventory, only the amount of crown that has lost foliage should be recorded. It should be noted that bare twigs or dead branches in the inner crown are not considered for the ratings of crown defoliation. If the tree has a full complement of foliage or the tree exhibits no visible crown damage, there is no need to record anything on the inventory sheet. Similarly, if a large tree has one or two small branches without leaves nothing is entered in the space.

Three classes of crown defoliation are recorded using the following rating:

0 Tree crown not defoliated (healthy). Allow for minor twig defoliation, which is normal in a healthy tree.
1 Between trace amounts of defoliation and less than 1/4 of the crown having lost its leaves - crown slightly defoliated.

2 1/4 to 1/2 of the crown had lost its leaves - crown moderately defoliated.

3 More than 1/2 of the crown without leaves - crown severely defoliated

LARGE DEAD OR BROKEN BRANCHES OR STUBS

Dead or broken branches can be the points where rot begins and can constitute a safety concern in themselves. Dead branches or stubs greater than 7 cm in diameter (about the size of a pop can) should be considered. (A stub is a short piece of a branch still attached to a tree after a branch has broken off or after improper pruning).

The evaluation of dead or broken branches is based on the approximate size and number of dead branches, limbs, or stubs. Three classes of dead or broken branches are defined using the following rating:

0 Tree does not have major dead branches; small branches within the inner crown should not be considered. The tree may have one or more minor dead or broken branches or stubs.
1 At least one dead or broken branch, or stub greater than 7cm in diameter is present. Its diameter is less than 1/4 of the diameter of the next order branch or main stem at the point of attachment.
2 The tree has one or more dead or broken branches or stubs BUT its diameter is 1/4 to 1/2 of the diameter of the next order branch or main stem at the point of attachment.
3 The tree has one or more dead or broken branches or stubs which is (or was) a main branch (a scaffold branch. i.e. the diameter is more than 1/2 of the diameter of the main stem at the point of attachment).

POOR BRANCH ATTACHMENT (V- SHAPED FORK)

Poor branch attachment can be recognized as a sharp angle where major branches join to the main trunk of the tree. If the angle where they join is more like a narrow V than a U, then the union should be examined for included bark. Included bark occurs where two stems or main branches grow at such an acute angle that the bark from both stems becomes imbedded making an extremely weak branch union. When branches or co-dominant stems (two or more stems growing at the same rate, from more or less the same position) with included bark increase in size, they may split from the trunk. Poor branch attachment also includes situations when a number of branches are attached to the main stem at the same position. This could occur as a result of pollarding, topping or a failure to properly prune the tree when it was young. Epicormic shoots following topping, pruning or storm damage have poor attachment as well.

Three classes for poor attachment can be recognized:

0 Branches properly attached, there are no signs of poor attachment

1 A V-shaped union between a minor branch and the main stem (the diameter of the branch is 1/2 of the diameter, or less, than the branch or main stem where it is attached). There is no evidence of included bark, but the angle of the fork is such that there is a potential for this to appear as the tree grows. This category also includes epicormic shoots following topping, pruning or storm damage, etc.

2 As in 1, but the branch is more than 1/2 of the diameter of the branch or main stem where it is attached, and there is evidence of included bark but no breakage. This category also includes trees with epicormic shoots resulting from poor pruning or breakage, and multiple trunks or co-dominant stems. Multiple stems are trunks of equal size and/or relative importance arising from the base of the tree, co-dominant stems are major branches of similar diameter arising in the crown of the tree.

3 As in 2, but with evidence of a crack between the stems.

LEAN

The trunk is a physiological and structural connection between the crown and root system. Serious trunk lean can cause structural problems and may cause the tree to fail. This is especially apparent if some soil cracking and/or uprooting is also observed. Some species that are on the border between being either small trees or tall shrubs have a tendency to exhibit lean. This can be the case with Russian Olive, Serviceberry, French Lilac, Hawthorns, Japanese Maple, Staghorn Sumac, etc. However, the leaning trunk of such species is usually not serious.

Three classes of leaning can be recognized using the following rating:

0 The tree is virtually vertically positioned over the base of the stem (Figure 1).
1 Slight or minor lean (< 15° from vertical) but no apparent danger (Figure 2).

2 Slight or minor lean (< 15° from vertical) with some evidence of root mounding or soil cracking on the side of the tree away from the lean (Figure 3).

3 Serious lean (>15° from vertical) with some evidence of root mounding or soil cracking on the side of the tree away from the lean.

Tree pruning is an old practice for regulating tree size and the shape of a tree's crown and for removing dead or damaged branches. It is an essential part of tree maintenance in an urban environment. Excessive pruning and flush cuts (a poor pruning practice in which both the branch and stem tissue are removed) can weaken the defense system of a tree.
Any process of removing dead or live branches and limbs will leave a scar. Proper pruning scars will form circular wound-wood around the cut and old pruning scars may eventually heal over leaving a distinct knob. When pruning cuts are made improperly, wound-wood may form only to the sides of the wound, or partly about the wound. These scars may also form a point of entry for wood rotting organisms.

The amount and quality of pruning has been classified using the following rating:

0 Tree has not been pruned.
1 One or more pruned minor branches or stubs. Diameter of the pruning scar is less than 1/4 of the diameter of the next order branch or main stem at the point of attachment. Proper pruning.
2 Diameter of the scar is 1/4 to 1/2 of the diameter of the next order branch or main stem at the point of attachment.
3 One or more pruned main (scaffold) branches. Diameter is more than 1/2 of the diameter of the main stem at the point of attachment. One or more flush cuts.

BASAL/TRUNK SCAR(S)

A scar is formed when the bark of a tree is damaged to such an extent that the wood underneath is exposed. As such, they can form the point where decay begins. Scars may be old and show some signs of healing over or they may be relatively new. Damaged bark alone does not necessarily constitute a risk to the tree. Damage to the bark that exposed the wood at some time should be considered a scar.

The most frequent cause of scars on urban trees is vandalism. Other causes include: the girdling of trunks by lawnmower damage; the bark of trees growing near driveways and parking lots have been repeatedly injured by vehicles, bicycles, etc; lightning; frost cracks; or sunscald. The size of the scar relative to the size of the tree is important. For example, a 5 cm scar on a tree with a diameter of 10 cm is more serious than a 5 cm scar on a tree of 50 cm "diameter breast height" (dbh). As a rule-of-thumb, scars that have widths greater than 1/8 of the circumference of the stem on small trees (less than 30 cm dbh) and any scars greater than 10 cm wide on larger trees (more than 30 cm dbh) should be recorded.

Stems may also become cracked due to frost. These cracks may heal over and the scar tissue will form a long ridge along the stem. These cracks are classified the same way as scars. In this category, we are most interested in damage appearing near the base of the tree, below the crown. Other similar damage higher up are covered under other categories.

The presence of scars has been grouped in three classes using the following rating:

0 The tree does not have any scars.
1 One or more scars with a width totaling 1/8 to 1/4 of the circumference, OR a scar less than 1/8 but more than 50 cm in length.
2 One or more scars with a width totaling 1/4 to 1/2 of circumference, OR 1/8 to1/4 the circumference but more than 50 cm in height.
3 One or more scars with a width totaling more than 1/2 of circumference of the stem, OR it is between 1/4 to1/2 the circumference but more than 50 cm in height.

CONKS

A conk is the external sign of wood rotting fungus. These may appear as crusts or flat "hoof-shaped" brackets on stems and branches. Conks are a sign of rot and an indication that the tree may have some serious internal defects that will affect its longevity and could result in the tree becoming a safety concern. (Note: While the presence of conks indicates the presence of rot, it is possible that a tree will have serious rot without conks being visible.)

Conks are recorded either as presence or absence:

0 The absence of conks
1 The presence of conks

ROT/CAVITY

In the advanced stages of decay, wood is consumed by fungi and insects resulting in rot and/or cavities. Rot might develop from bark wounds, breakage, and pruning wounds. Cavities often form after flush cuts or stub cuts. Older trees occasionally have large cavities or rot in their trunks and main branches. Either way, rot and/or cavities indicate serious decay and structural problems.

The rotten wood may be soft enough that it can be crumbled between your fingers. It may be wet and spongy or dry and powdery. Trees may have a scar, but the wood is still gray and hard. In such cases, a scar should be recorded, but not rot. Any large cavities or holes in the main stem or main branches should be recorded as well. Three classes of rot/cavity can be recorded using the following rating:

0 Tree does not have any sign of rot or cavity
1 Rot/cavity is 1/8 to 1/4 of the diameter of the trunk or major branch.
2 Rot or cavity is 1/4 to 1/2 of diameter of the trunk or major branch.
3 Rot or cavity is more than 1/2 of diameter of the trunk or major branch.

CRACKS

A crack is deep split through the bark, extending into the wood of the tree. Cracks are physical separations of the wood. They can occur in stems and branches and they may even extend up from the roots into the lower stem. Cracks are considered to be the number one high risk defect because they indicate the structural weakness of a tree. For example, when a tree has two cracks in the same segment of the stem, the stem can be separated into two sections of wood, which move independently from each other. One section slides over the other creating tension and the crack elongates.

One of the most common reasons for cracks and splits on tree trunks is frost cracking. Frost cracks originate at a point where the trunk was physically injured in the past. Trees growing on poorly drained soils are particularly prone to frost cracks. Frost cracks often close during summer, only to re-open in succeeding winters. If cracks are only in the bark, they will not seriously damage it, although they do provide openings where certain disease organisms may enter the tree, particularly if the tree is in a weakened condition. Maples and sycamores are very prone to frost cracks while apples, ornamental crabapples, ash, beech, horse chestnut and tulip tree are susceptible. Isolated trees are more subject to frost cracks than trees in groups or in forest settings.

In some cases when a scar or cavity forms, the wound will not heal properly at the edges. The wound tissue may roll inward as it grows, failing to close. This process will continue and outward pressure will be exerted on the stem, causing a crack to form.

The evaluation of cracks is based on the number of cracks (splits), where they occur and if they are in contact with another defects such as, rot or a cavity. Three classes of cracks are defined using the following rating:

0 Tree does not have major cracks either on trunk or major branches.

1 One minor crack extends into the stem, major stubs or a branch of significant size. A minor crack is one that enters the wood (not just in the bark) but does not extend more than _ of the distance to the centre of the stem. No "Ram's Horn" (Figure 1)

2 Two or more minor cracks occur in the same general area of the stem, but there are no other defects in contact with the cracks; The crack condition is more serious than class 1, but less than class 3.

3 A crack(s) is in contact with another defect (e.g. rot, poor branch attachment, lean); Tree has one deep crack where one-half or more of the tree diameter is structurally compromised; A crack has "Ram's Horn" (Figure 3) appearance; Crack(s) in the tangential (horizontal) plane.

CONFINED SPACE FOR ROOT SYSTEMS

The root system of a tree is often depicted as the mirror image of the crown but it can extend beyond the drip line as much as two to three times the diameter of the crown. (The drip line is an imaginary line on the ground under the outer edge of the crown of the tree). The major portion of the absorbing root system of a mature tree

is within the top 90 cm of soil, and most of the fine roots that are active in water and nutrient absorption are in the top 30 cm.

Trees growing on urban spaces such as streets, parking lots, commercial and other areas usually do not have enough space for their roots. They exist in the space that is left over after the other infrastructure is in place, or they may be planted in containers and median strips. Trees growing in such spaces are more subject to girdling roots, drought effect, and other secondary problems such us pests and disease.

If a building foundation, or other structure (curbs, retention walls, containers, paving etc.) is presently restricting the full growth of the tree's roots, this should be indicated using the following criteria:

0 No obstruction or conflicts are apparent in the area within the drip line of the tree.
1 An obstruction exists which would eliminate root development in an area less than 1/4 of the area within the dripline of the tree.
2 An obstruction exists which would eliminate root development in an area between 1/4 and 1/2 of the area within the drip line of the tree.
3 An obstruction exists which would eliminate root development in an area more than 1/2 of the area within the drip line of the tree.

EXPOSED/SURFACE ROOTS

Exposed or surface roots are often seen on urban trees. Often this problem is related to compacted soil condition or soil erosion or is a result of heavy use of the space close to the tree.

Roots under the drip-line of the tree that are exposed to the surface can be grouped as following:

0 There are no exposed roots.
1 1/4 of roots close are surfaced or exposed.
2 1/4 to 1/2 of roots are surfaced or exposed.
3 More than 1/2 of roots below the entire canopy (drip line) are surfaced or exposed.

ROOT TRENCHING/CUTTING

Roots may be lost directly when the soil surface near trees is lowered, or when trenches are dug for underground utilities, or for the construction of curbs, sidewalks, foundations, etc. The roots that are left after trenching may be insufficient to supply the crown with nutrients and water. A tree so affected will be more subject to drought, have poor growth (shoot extension) and leaves may be smaller than usual and may be chlorotic. Eventually, the loss of root mass may be balanced by crown dieback and the tree may die prematurely. The loss of a substantial proportion of the root system may also affect the stability of the tree. Remember that there may be only between five and 10 major roots attached to the tree at the root collar. If one of these is severed, all roots beyond that point will be lost representing 10 to 20% of the root system.

Any signs of trench digging or root cutting associated with other excavation should be noted. As mentioned above, the extent of a tree's root system may exceed two to three times the width of the crown. Such unobstructed conditions are seldom achieved in the urban environment, so we can use the extent of the perimeter of the crown (the drip-line) as a conservative estimate of the extent of the root system. For the purposes of this classification, consider the area delineated by the drip-line as the rooting area.

0 There are no signs of root trenching or cutting within the rooting area.
1 Up to 1/4 of the root system has been cut during trenching or excavation.
2 Between 1/4 and 1/2 of the root system has been cut during trenching or excavation.
3 More than 1/2 of the root system has been cut during trenching or excavation.

GIRDLING ROOTS

The normal pattern of tree root growth is horizontal to the ground surface and radially away from the trunk. The pattern of girdling roots is to grow tangentially to the trunk, and in many cases, upwardly. This abnormal root growth causes physiological stress on the expanding tissues as the trunk and roots grow in diameter. Eventually the root collar and roots may become constricted causing decline in the condition of the tree and even resulting in the death of the tree.

Girdling root symptoms are found more often on park, street, yard, and trees in nursery trees than on forest trees. Some tree species such as transplanted Norway Maples seem more prone to the problem than others. Sugar Maples, Oaks, Elms and Pines are also prone to girdling roots.

Many symptoms can indicate girdling roots. These include weak foliage and defoliation. However, the focus here will be on symptoms such as abnormal swelling of the trunk (expanding trunk restricted by a girdling root), and the lack of normal butt flare at least part way around the base of the tree. Trees with a root that girdles the lower trunk usually have little or no flare on one side of the tree at the ground line. You should keep in mind that if soil is spread around a tree, the butt flare may also be buried. In this case, the effect will be the same all around the tree. In some cases, girdling roots can be easily seen on the surface (girdling roots below the root collar).

Girdling root problems on the tree should be recorded using the following criteria:

0 There are no signs of girdling roots on the surface or on the trunk
1 Girdling roots on the surface but there is no trunk-swelling yet
2 Between 1 and 3.
3 Atypical butt swelling either with girdling roots seen at the soil surface or not.

CONFLICTS

While forest trees compete for growing space with each other, urban trees compete directly with each other, buildings, above-ground and below-ground infrastructure and indirectly with people. These conflicts illustrate the growing condition of a tree but they may also indicate remedial action that could help the tree. In this case, conflicts are considered "existing" or "potential". An existing conflict means that part of the tree is currently in contact with the obstruction to the point that either

the tree or obstruction may be damaged. Potential conflict means that the tree and the obstruction will be touching within 3-5 years (within the next inspection cycle).

In each of these cases, a P in the appropriate column should be entered if there is potential for the tree to come into conflict (contact) with the particular item. If a conflict already exists, an E in the appropriate column needs to be written. If there is no conflict, the appropriate cell on the Data Collection Form is left empty. The computer program will consider this as a default value N (no conflict) that will be automatically entered into the cell. Otherwise, P or E should be typed in or picked up from drop-down list.

Conflict with Overhead Wires

Conflicts with overhead power and telephone wires can be common along some streets. Yet, this is not uncommon for other urban spaces such as yards, parking lots, or commercial areas. Conflict with overhead wires can cause many problems for both trees and wires and it can create maintenance problems and high risk situations.

N There are no conflicts.
E The branches of a tree are currently within 0.5 meters of electrical, telephone, or other wires. **P** At some point (within the inspection cycle), as the tree grows, such a conflict could occur.

Conflict with Structure

Trees are often planted close to buildings without taking into consideration their biological needs and actual size. Consequently, when they become large enough, they are often blamed for causing damage to the structure. However, the damage to trees caused by close growth to buildings is often neglected. Conflict between trees and structures can cause maintenance and high risk problems. Conflicts with structure include buildings, fences, etc.

Conflicts with structures can be grouped as follows:

N There are no conflicts
E Tree is already touching the structure.
P There is potential for the tree to come into contact with the structure within the next inspection cycle.

Conflict with Sidewalk

N There are no conflicts.
E The sidewalk already shows signs of being lifted by stem or root growth.
P A tree's stem, at some point in its life, would be within 0.5 m of a sidewalk.

Conflict with Other Tree

Urban trees are usually solitary initially having no competition with other trees. This results in the development of broad crowns. At some point however, conflict may occur when tree crowns start to touch each other and compete for space and light.

Conflicts with other tree(s) should be recorded as:

N There are no conflicts.
E The tree in question is currently touching the crown of another tree.
P There is potential for existing conflict (E) to occur within the inspection cycle.

Conflict with Traffic Signs

Street trees sometimes screen traffic signs and as such create an unsafe situation for motorists. If the tree is screening the sign or if there is a chance that this will happen in the near future, this conflict should be recorded.

Conflicts with traffic signs should be recorded as:

N There are no conflicts
E The tree in question is currently screening or touching the sign
P There is potential for existing conflict (E) to occur within the inspection cycle.

APPENDIX 3 / 40 LARGEST STREET TREES OUT OF THE 12,000 SURVEYED, BASED ON DIAMETER

Tree ID	Scientific Name	DBH (Inches)	Height Class
5218	Eucalyptus nicholii	41.0	4
5849	Platanus acerifolia	41.1	4
9873	Platanus acerifolia	41.1	4
10596	Eucalyptus nicholii	41.1	4
2621	Phoenix canariensis	41.4	3
122	Liquidambar styraciflua	41.5	4
2615	Phoenix canariensis	41.5	5
11596	Liquidambar styraciflua	41.5	3
11996	Robinia pseudoacacia	41.5	3
2268	Liquidambar styraciflua	41.6	4
11985	Robinia pseudoacacia	41.6	3
4437	Pinus pinea	41.7	3
9992	Platanus acerifolia	41.7	3
41	Platanus acerifolia	41.9	4
2616	Phoenix canariensis	41.9	4
5195	Platanus acerifolia	41.9	4
11129	Liquidambar styraciflua	41.9	5
9827	Platanus acerifolia	42.4	4
2614	Phoenix canariensis	42.7	4
8683	Tilia tomentosa	43.0	4
5191	Platanus acerifolia	43.1	4
4345	Cordyline australis	43.2	2
8486	Pinus pinea	43.3	2
11101	Liquidambar styraciflua	43.3	5
8483	Pinus pinea	43.4	2
10122	Cinnamomum camphora	43.7	3
7323	Sequoia sempervirens	43.9	4
10926	Pinus pinea	44.0	2
5208	Platanus acerifolia	44.1	4
10893	Pinus pinea	44.1	2
9454	Platanus acerifolia	44.2	4
5017	Pinus pinea	44.4	2
4463	Phoenix canariensis	46.3	4
6	Schinus molle	46.5	2
7941	Pinus canariensis	46.6	4
6118	Platanus acerifolia	46.7	4
9810	Robinia pseudoacacia	47.3	3
7822	Pinus pinea	48.3	2
2471	Liquidambar styraciflua	50.2	4
5213	Eucalyptus nicholii	52.2	3

APPENDIX 4 / GENERA PRESENT ALONG PUBLIC STREETS IN ALAMEDA, 2008

Genus	# of Trees
Acaci	102
Acer	264
Acmena	1
Acrocomia	1
Aesculus	69
Albizia	6
Alnus	230
Arbutus	1
Betula	2
Brachychiton	429
Callistemon	19
Calocedrus	5
Carpinus	9
Castanea	1
Cedrus	6
Celtis	41
Ceratonia	196
Cercis	4
Cinnamomum	291
Cordyline	39
Cornus	2
Crataegus	176
Cupaniopsis	1
Cupressus	1
Eriobotrya	14
Eucalyptus	101
Fagus	2
Ficus	14
Fraxinus	828
Geijera	194
Ginkgo	715
Gleditsia	24
Grevillea	9
Gymnocladus	1
Jacaranda	67
Juglans	1
Juniperus	3
Koelreuteria	205
Lagerstroemia	124
Ligustrum	222
Liquidambar	337
Liriodendron	120
Lithocarpus	1
Lophostemon	1
Lyonothamnus	3
Magnolia	126
Maytenus	14
Melaleuca	48
Metrosideros	241
Michelia	1
Morus	4
Myoporum	118
Nerium	3
Nyss	2
Olea	1
Persea	4
Phoenix	12
Photinia	6
Pinus	188
Pistacia	249
Pittosporum	169
Platanus	2815
Podocarpus	2
Populus	12
Prunus	506
Pseudotsuga	1
Pyrus	1076
Quercus	233
Rhus	3
Robinia	272
Sapium	140
Schinus	19
Sequoia	54
Sophora	30
Syagrus	1
Thuja	5
Tilia	97
Trachycarpus	3
Tristania	430
Ulmus	94
Washingtonia	120
Yucca	1
Zelkova	18

APPENDIX 5 / SPECIES PRESENT ALONG PUBLIC STREETS IN ALAMEDA, 2008

Genus	# of Trees
Acacia longifolia	3
Acacia melanoxylon	99
Acer buergeranum	20
Acer japonica	6
Acer macrophyllum	13
Acer negundo	6
Acer nigrum	9
Acer palmatum	54
Acer platanoides	38
Acer pseudoplatanus	6
Acer rubrum	102
Acer saccharinum	2
Acer saccharum	8
Acmena smithii	1
Acrocomia rubrum	1
Aesculus carnea	44
Aesculus hippocastanum	25
Albizia julibrissin	6
Alnus cordata	66
Alnus rhombifolia	164
Arbutus unedo	1
Betula pendula	2
Brachychiton populneus	429
Callistemon citrinus	17
Callistemon viminalis	2
Calocedrus decurrens	5
Carpinus betulus	9
Castanea dentata	1
Cedrus deodara	6
Celtis occidentalis	1
Celtis sinensis	40
Ceratonia siliqua	196
Cercis occidentalis	4
Cinnamomum camphora	267
Cinnamomum glanduliferum	24
Cordyline australis	39
Cornus florida	2
Crataegus laevigata	121
Crataegus lavallei	33
Crataegus phaenopyrum	22
Cupaniopsis anacardioides	1
Cupressus sempervirens	1

Genus	# of Trees
Eriobotrya deflexa	4
Eriobotrya japonica	10
Eucalyptus camaldulensis	12
Eucalyptus citriodora	1
Eucalyptus cladocalyx	2
Eucalyptus ficifolia	24
Eucalyptus nicholii	49
Eucalyptus polyanthemos	2
Eucalyptus rudis	8
Eucalyptus sideroxylon	3
Fagus sylvatica	2
Ficus macrophylla	3
Ficus nitida	11
Fraxinus americana	6
Fraxinus angustifolia	192
Fraxinus glabra	1
Fraxinus holotricha	133
Fraxinus latifolia	1
Fraxinus ornus	11
Fraxinus oxycarpa	120
Fraxinus palmatum	1
Fraxinus uhdei	91
Fraxinus undulatum	1
Fraxinus velutina	271
Geijera parviflora	194
Ginkgo biloba	715
Gleditsia triacanthos	24
Grevillea robusta	9
Gymnocladus dioica	1
Jacaranda mimosifolia	67
Juglans regia	1
Juniperus chinensis	3
Koelreuteria bipinnata	152
Koelreuteria paniculata	53
Lagerstroemia indica	124
Ligustrum lucidum	222
Liquidambar styraciflua	337
Liriodendron tulipifera	120
Lithocarpus densiflorus	1
Lophostemon confertus	1
Lyonothamnus floribundus	3
Magnolia grandiflora	125

Genus	# of Trees
Magnolia soulangiana	1
Maytenus boaria	14
Melaleuca linariifolia	1
Melaleuca quinquenervia	47
Metrosideros excelsus	241
Michelia doltsopa	1
Morus alba	4
Myoporum laetum	118
Nerium oleander	3
Nyssa sylvatica	2
Olea europaea	1
Persea americana	1
Persea borbonia	3
Phoenix canariensis	12
Photinia fraseri	6
Pinus canariensis	73
Pinus pinea	105
Pinus radiata	10
Pistacia chinensis	249
Pittosporum acerifolia	1
Pittosporum undulatum	168
Platanus acerifolia	2301
Platanus occidentalis	513
Platanus racemosa	1
Podocarpus gracilior	2
Populus fremontii	2
Populus nigra	10
Prunus blireiana	1
Prunus caroliniana	302
Prunus cerasifera	198
Prunus serrulata	3
Prunus yedoensis	2
Pseudotsuga caroliniana	1
Pyrus calleryana	1073
Pyrus kawakamii	3
Quercus agrifolia	79
Quercus coccinea	1
Quercus ilex	1
Quercus laurifolia	3
Quercus palustris	55
Quercus robur	3
Quercus rubra	78
Quercus saponaria	3
Quercus shumardii	1
Quercus suber	7
Quercus virginiana	2
Rhus lancea	3
Robinia ambigua	44
Robinia pseudoacacia	228
Sapium sebiferum	140
Schinus molle	4
Schinus terebinthifolius	15
Sequoia sempervirens	54
Sophora japonica	30
Syagrus romanzoffianum	1
Thuja occidentalis	3
Thuja plicata	2
Tilia cordata	60
Tilia tomentosa	37
Trachycarpus fortunei	3
Tristania conferta	318
Tristania laurina	112
Ulmus americana	78
Ulmus parvifolia	11
Ulmus wilsoniana	5
Washingtonia robusta	120
Yucca australis	1
Zelkova serrata	18

APPENDIX 6 / TREE MANAGEMENT PLANNING TOOL[1]

Levels of Service (L.O.S.) and Budget Determination for City-funded Tree Management

Program Area	Rank for Fiscal Year*	Potential Level of Service 1 (minimal)	Potential Level of Service 2
Planting		No new city-funded tree planting	Replace street tree removals only
Young Tree Care		No young tree care	± 5-year cycle inspection/ pruning
Mature Tree Care		± 12-year cycle inspection/ pruning	± 9-year cycle inspection/ pruning
HIgh Risk Tree Abatement		Removals on property owner request only	Removals on request; maintain <5% 'dead of dying' backlog
Administration (2008 dollars)		$2.50/tree admin budget or 0.25 supervisory arborists/ 10,000 trees	$3.50/tree admin budget or 0.40 supervisory arborists/ 10,000 trees

1 developed by the City of Davis, 2002

* Column to be filled in annually when planning budget and proposed Level of Service.

Potential Level of Service 3	**Potential Level of Service 4 (optimal)**	**Staff/Tree Commission Recommendation for Fiscal Year***
Replace removals and plant on request; increase street tree population by 1/2 % per year	Replace removals and plant on request; increase street tree population by 1% per year; provide for special planting projects	
± 3-year cycle inspection/ pruning	± 1-year cycle inspection/ pruning for fast growing species	
± 7-year cycle inspection/ pruning	± 5-year cycle inspection/ pruning	
Removals on request; maintain <2% backlog; fund special projects	Removals on request; maintain <1% backlog; fund removal/replacement programs; inventory and other special projects	
$4.25/tree admin budget or 0.50 supervisory arborists/ 10,000 trees	$5.00/tree admin budget or 0.65 supervisory arborists/ 10,000 trees	

APPENDIX 7 / TREE BENEFITS CALCULATION

The equation to determine the value of all annual benefits (B) of a tree is:

B = E + AQ + CO2 + H + A, where:

E = value of net annual energy savings (cooling and heating)
AQ = value of annual air quality improvement (pollutant uptake, avoided power plant emissions, and BVOC emissions)
CO2 = value of annual CO2 reductions (sequestration, avoided emissions, release due to tree care and decomposition)
H = value of annual stormwater runoff reductions (water quality and flood control)
A = value of annual aesthetics and other benefits

THE SUM OF COSTS CALCULATIONS

On the other side of the cost-benefit equation are costs for tree planting and management. Expenditures that are borne by property owners (irrigation, pruning, and removal) and the community (pollen and other health care costs).

For the purposes of this Master Street Tree Plan, the estimated average tree for Alameda
was a medium-sized tree, based upon the professional review and opinion of the consulting arborists. Average net benefits were set at $22 per tree.

APPENDIX 8 / BEST RANKED TREES FOR IMPROVING AIR QUALITY

(Source: Local Governments for Sustainability: **www.iclei.org**)

Ozone	Carbon Monoxide	Overall
English Elm Ulmus procera	**American Linden** Tilia americana	**English Elm** Ulmus procera
European Linden Tilia europea American	**American Beech** Fagus grandifolia	**European Linden** Tilia europea American
Beech Fagus grandifolia	**Silver Linden** Tilia tomentosa	**Tulip Tree** Liriodendron tulipifera
Yellow Birch Betula alleghaniensis	**Yellow Birch** Betula alleghaniensis	**Dawn Redwood** Metasequoia glyptostrobides
Tulip Tree Liriodendron tulipifera	**Redmond Lindontil** Tilia eucjlora	**American Beech** Fagus grandifolia
American Linden Tilia americana	**English Elm** Ulmus procera	**Yellow Birch** Betula alleghaniensis
European Beech Fagus sylvatica	**Gingko** Ginko biloba	**European Beech** Fagus sylvatica
Dawn Redwood Metasequoia glyptostrobides	**Tulip Tree** Liriodendron tulipifera	**American Linden** Tilia americana
Paper Birch Betula papyrifera		**American Elm** Ulmus americana

APPENDIX 9 / MAJOR STREETS - AND NEIGHBOURHOOD TREE SPECIES RECOMMENDATIONS

MAIOR STREET	2009 EXISTING TREES	2009 MSTP
Atlantic Avenue & Clement Avenue	Eucalyptus nicholi-wilow-leaved peppermint, ceratonia silqua-carob, Liquidambar Styraciflua-sweetgum.	Tristannia conferta-brisbane box, Platanus x acerifolia columbia and yarwood - London plane tree.
Broadway	Fraxinus velutina var. glabra- Modesto ash.	Gymnocladus dioica 'Espresso' - seedless Kentucky coffee tree. Acer rubrum - red maple. 'October Glory', 'Brandywine', and possibly other varieties (but not 'Red Sunset' or 'Morgan'). Do not use 'Brandywine' under high voltage lines. Ulmus 'Frontier' and 'Princeton' - frontier hybrid elm and Princeton American elm.
Buena Vista	Fraxinus holotricha 'Moraine' - Moraine ash; Liriodendron tulipifera - tuliptree.	Tilia tomentosa - silver linden. Ulmus 'Frontier' and 'Princeton' - frontier hybrid elm and Princeton American elm. Ulmus - various American and hybrid elms. 'Accolade', 'Commendation', 'Jefferson', 'New Harmony', 'Patriot', 'Triumph', 'Washington', 'Frontier' and 'Princeton'.
Central Avenue	Platanus x acerlflla 'Columbia' and 'Yarwood' - London plane tree.	Platanus x acerifolia 'Columbia' and 'Yarwood' - London plane tree.
Doolittle Drive	Platanus x acerifolia 'Yarwood' - London plane tree; Acacia melanoxylon - black acacia; Populus nigra 'Italica' - Lombardy poplar.	Platanus x acerifolia 'Columbia' and 'Yarwood' -London plane tree.Tilia tomentosa - silver linden. Metrosideros excelsus - New Zealand Christmas tree.
Encinal Avenue	Fraxinus velutina var. glabra - Modesto ash; Fraxinus oxycarpa 'Raywood' - Raywood ash; Fraxinus holotricha 'Moraine' - Moraine ash.	Acer rubrum - red maple. 'October Glory', 'Brandywine', and possibly other varieties Gymnocladus dioica 'Espresso' - seedless Kentucky coffee tree.
Fernside Boulevard	Tilden Way to High Street: Ginkgo biloba -maidenhair tree; Fraxinus holotricha 'Moraine' -Moraine ash. High Street to Encinal Avenue: Platanus x acerifolia - London plane tree Encinal Avenue to Otis Drive: Fraxinus holotricha 'Moraine' - Moraine ash.	Platanus x acerifolia 'Columbia' and 'Yarwood' - London plane tree. *Gymnocladus dioica - seedless Kentucky coffee tree. 'Espresso' variety. Tilia tomentosa - silver linden (especially good for small planting areas).
Gibbons Drive	Liquidambar styraciflua - Sweetgum.	Acer rubrum - red maple. 'Brandywine' and possibly other varieties Quercus coccinea - scarlet oak. *Quercus falcata - southern red oak.
Grand Street	North of Otis Drive: Acer platanoides - Norway maple; Pyrus calleryana 'Bradford' - Bradford pear;Robinia pseudoacacia - black locust. South of Otis Drive: Eucalyptus rudis - swamp gum; Corymbia ficifolia - red-flowering gum; Eucalyptus nicholii - wilow-leaved peppermint.	North of Lagoon: Acer rubrum - red maple. 'October Glory', 'Brandywine', and possibly other varieties , Acer nigrum- black maple, Acer saccharum-sugar maple, 'Commemoration' and possibly other varieties (but not 'Greem mountain'), Quercus coccinea-scarlet oak, Quercus falcata - southern red oak South of Lagoon: Corymbia ficifolia - red-flowering gum.

MAIOR STREET	2009 EXISTING TREES	2009 MSTP
Harbour Bay Parkway	Doolittle Avenue to Maitland Avenue: - Populus nigra 'Italica' - Lombardy poplar; Eucalyptus rudis - swamp gum; Myoporum laetum - Myoporum. Maitland Avenue to South Loop Road: Alnus rhombifolia . white alder; Pinus pinea - stone pine. South Loop Road to End: Phoenix canariensis -Canary Island date palm.	Retain existing planting scheme, but consider substituting. Fagus sylvatica (European beech) for the existing Alnus rhombifolia (white alder).
High Street	Fraxinus velutina var. glabra - Modesto ash; Fraxinus holotricha 'Moraine' - Moraine ash; Fraxinus oxycarpa 'Raywood' - Raywood ash.	Gymnocladus dioica 'Espresso' - seedless Kentucky coffee tree. Koelreoteria bipinnata-Chinese flame tree, Pistachia chinesis 'Keith Dave'- Chinese pistache.
Island Drive	Doolittle to Mecartney Road medians: Pinus radiata Monterey pine; Alnus rhombifolia - white alder; Pinus pinea - stone pine; Platanus x acerifolia - London plane tree; Prunus cerasifera - purple leaf plum. Streetscape: Pinus contorta - lodgepole pine; Pinus pinea - stone pine; Prunus cerasifera - purple leaf plum; Populus nigra 'Italica' - Lombardy poplar. Mecartney Road to Fir Avenue: Ginkgo biloba -maid-enhair tree. Fir Avenue to Catalina: Eucalyptus polyanthemos - silver dollar gum; Quercus ilex - holly oak; Ginkgo biloba - maidenhair tree.	North of Mecartney Road: Retain existing Populus nigra 'Italica' (Lombardy poplars) and substitute Fagus sylvatica (European beech) for the existing Alnus rhombifolia (white alders). South of Mecartney Road: Quercus coccinea - scarlet oak. Tilia tomentosa - silver linden. Corymbia ficifolia - red-flowering gum. Ginkgo biloba 'Fairmount', 'Saratoga' and possibly other varieties, but not 'Autumn Gold' - maidenhair tree.
Lincoln Avenue Marshall Way Pacific Avenue Tilden Way	Brachychiton populneus - boUle tree; Cinnamomum camphora - cam-phor; Prunus caroliniana - Carolina cherry laureL. St. Charles Avenue to Sherman Avenue: Chinese pistache trees have been planted to replace laurel figs killed by the 1990 frost. The low-branching and initially awkward structure of this species will have to be monitored carefully in order for these trees to function properly in this small commercial district. Marshall Way/ Pacific Avenue: Cinnamomum cam-phora - camphor; Tristania conferta - Brisbane box.	Tilia tomentosa - silver linden. Ulmus 'Accolade', 'Commendation', 'Jefferson', 'New Harmony', 'Patriot', 'Triumph', 'Washington', and possibly other varieties - various American and hybrid elms. Metrosideros excelsus - New Zealand Christmas tree. Pistacia chinensis 'Keith Davey' - Chinese pistache. Quercus coccinea - scarlet oak.
Main Street	Prunus caroliniana-Carolina laurel cherry, Alnus rhombifolia-white alder, Koelreuteria bipinnata-chinese flame tree.	To be deferred and coordinated with Alameda Point development.

MAIOR STREET	2009 EXISTING TREES	2009 MSTP
Marina Village Parkway	Acacia baileyana - Bailey acacia; Alnus cordata -Italian alder; Platanus x acerifolia - London plane tree; Myoporum laetum - Myoporum; Pinus eldarica - Afghan pine; Populus nigra 'Italica' . Lombardy poplar.	Platanus x acerifolia 'Yarwood' - London plane tree. Fagus sylvatica - European beech.
Mecartney Road	Eucalyptus rudis - swamp gum; Ceratonia siliqua - carob; Cinnamomum camphora - camphor. Island Drive to Aughinbaugh Way: Platanus x acerifolia - London plane tree; Acacia baileyana -Bailey acacia; Prunus cerasifera - purple leaf plum; Pinus pinea - stone pine; Pinus radiata -Monterey pine; Populus nigra 'Italica' - Lombardy poplar.	Gymnocladus dioica 'Espresso' - seedless Kentucky coffee tree. Platanus x acerifolia 'Columbia' and 'Yarwood' - London plane tree. Corymbia ficifolia - red-flowering gum.
Otis Drive	Bay Farm Island Bridge to Park Street: Myoporum laetum - Myoporum; Crataegus laevigata - English hawthorn; Ligustrum lucidum - glossy privet. Park Street to Westline Drive: Tristania conferta -Brisbane box; Eucalyptus rudis - swamp gum.	Corymbia ficifolia - red-flowering gum. Metrosideros excelsus - New Zealand Christmas tree. Pyrus calleryana 'Aristocrat', and possibly other varieties Tilia tomentosa - silver linden. For use where bay mud soils are not present.
Park Street	The frost in the winter of 1990 damaged and kiled nearly all the laurel figs in the business district of Park Street; they have recently been replaced with swamp myrtle. There are stil several cherry laurels and glossy privets throughout the business district. The large parkways between Otis Drive and San Jose Avenue are perfect sites for large-stature trees.	North of Clinton Avenue (in commercial district): Ginkgo biloba ' Fairmount' - maidenhair tree. Lagerstroemia indica x L. fauriei 'Tuscarora' and possibly other varieties - crape myrtle. South of Clinton Avenue: Ginkgo biloba 'Fairmount' or 'Saratoga' - maidenhair tree. Do not plant 'Fairmount' under high voltage lines. Quercus coccinea - scarlet oak. Quercus falcata - southern red oak. Do not plant under high voltage lines.
Robert Davey, Jr. Drive (formerly Brideway Road)	Platanus x acerifolia - London plane tree; Alnus rhombifolia - white alder; Acacia baileyana - Bailey acacia; Prunus cerasifera - purple leaf plum; Pinus pinea - stone pine; Pinus radiata - Monterey pine,	Platanus x acerifolia - London plane tree, 'yarwood' or 'Columbia'. Fagus sylvatica (European beech) to replace the existing Alnus rhombifolia (white alder).
Santa Clara Avenue	Cinnamomum camphora - camphor; Ceratonia siliqua - carob; Prunus caroliniana - Carolina cherry laurel. Recently planted coast live oak and Brisbane box.	Keep the all-evergreen look established by the surviving camphor trees by planting the following: Tristania conferta - Brisbane box (not under high voltage lines). Corymbia ficifolia - red-flowering gum. Metrosideros excelsus - New Zealand Christmas tree. Quercus virginiana – southern live oak.

MAJOR STREET	EXISTING TREES	2009 MSTP
Shoreline Drive	Pittosporum undulatum - mock orange; Myoporum laetum - Myoporum; Metrosideros excelsus - New Zealand Christmas tree.	Washington robusta-Maxican fan Plam, Italian Cypress
Webster Street	Pyrus calleryana 'Aristocrat' - flowering pear. Lagerstroemia indica	Pyrus calleryana 'Aristocrat' - flowering pear. Lagerstroemia indica x L. fauriei 'Tuscarora' - crape myrtle. Use as an accent tree.
Constitution Way Eighth Street West Line Drive	Eighth Street: Washingtonia robusta - Mexican fan palm; Robinia pseudoacacia - black locust; Fraxinus holotricha 'Moraine' - Moraine ash. Constitution Way: Magnolia grandiflora - southern magnolia; Alnus rhombifolia - white alder; Prunus x blireiana - flowering plum; Jacaranda mimosifolia - Jacaranda. Westline Drive: Eucalyptus rudis -swamp gum; Pittosporum undulatum - mock orange.	Constitution Way and Eighth Street north of Central: Tristania conferta - Brisbane box. Platanus x acerifolia 'Columbia' and 'Yarwood' - London plane tree. Magnolia grandiflora 'Russett' and possibly other varieties - southern magnolia. Eighth Street between Central and Portola: Washingtonia robusta - Mexican fan palm. West Line Drive: Corymbia ficifolia - red-flowering gum. Tristania conferta - Brisbane box. Platanus x acerifolia 'Columbia' and 'Yarwood' - London plane tree.

NEIGHBORHOOD	PLANTING STRIP	1989 MSTP	2009 MSTP
Ballena Bay		Alnus cordata, Eucalyptus rudis, Metrosideros excelsus	Carpinus betulus 'Fastigiata' - fastigiate hornbeam. Metrosideros excelsus - New Zealand Christmas tree.
Bay Farm Island	2-7 feet	Alnus rhombifolia, Fraxinus angustifolia, Platanus x acerifolia*, Prunus cerasifera, Pyrus calleryana, Tristania conferta.	Acer campestre - hedge maple; Tristania laurina - swamp myrtle; Metrosideros excelsus - New Zealand Christmas tree; Aesculus hippocastanum 'Baumannii' - Baumann's horsechestnut; Corymbia ficifolia – red-flowering gum; Jacaranda mimosifolia - Jacaranda; Quercus coccinea,- scarlet oak; Quercus palustris - pin oak; Quercus suber - cork oak.
Bay Mound	2-7 feet	Cinnamomum camphora, Crataegus laevigata, Fraxinus oxycarpa, Fraxinus uhdei, Fraxinus velutina, Geijera parviflora, Ginkgo biloba, Metrosideros excelsus*, Myoporum laetum, Platanus x acerifolia, Prunus caroliniana, Pyrus calleryana, Sapium sebiferum.	Acer buergeranum - Trident maple; Acer campestre - hedge maple; Aesculus x carnea - red horsechestnut; Corymbia ficifolia - red-flowering gum; Metrosideros excelsus - New Zealand Christmas tree; Acer saccharum 'Commemoration' - sugar maple; Carpinus betulus 'Fastigiata' and 'Frans Fontaine' - hornbeam; Jacaranda mimosifolia - Jacaranda; Quercus palustris – pin oak; Ulmus americana 'Princeton' - elm.
Bay View	3-7 feet	Fraxinus oxycarpa, Myoporum laetum*Brachychiton populneus, Cinnamomum camphora, Liquidambar styraciflua, Platanus x acerifolia*, Pyrus calleryana.	
Central East	2-6 feet	Ceratonia siliqua, Ginkgo biloba, Platanus x acerifolia*	Tristania conferta -Brisbane box; Acer nigrum - black maple; Acer buergeranum - Trident maple; Aesculus x carnea - red horsechestnut; Carpinus betulus 'Frans Fontaine' - hornbeam; Nyssa sylvatica - black tupelo; Tilia tomentosa 'Green Mountain' and 'Sterling' - silver linden.
Crown Beach	3-5 feet	Platanus x acerifolia , Washingtonia robusta*	Missing
East Central	2-6 feet	Fraxinus velutina, Ginkgo biloba, Ligustrum lucidum, Platanus x acerifolia*	Commercial areas: Carpinus betulus 'Frans Fontaine' - hornbeam; Acer nigrum 'Greencolumn' - black maple. Residential areas: Metrosideros excelsus - New Zealand Christmas tree, Jacaranda mimosifolia - Jacarand; Pistacia chinensis 'Keith Davey' - Chinese pistache; Quercus suber - cork oak; Ulmus 'Frontier' - elm.
East End	2-5 feet	Brachychiton populneus, Ginkgo biloba, Liquidambar styraciflua, Platanus x acerifolia*, Prunus caroliniana, Pyrus calleryana	Metrosideros excelsus - New Zealand Christmas tree; Acer saccharum 'Commemoration' - sugar maple; Pistacia chinensis 'Keith Davey' - Chinese pistache; Tristaniopsis laurina (formerly Tristania laurina) - swamp myrtle; Lagerstroemia indica x L. fauriei 'Tuscarora' - crape myrtle; Prunus x blireiana 'Natchez' - flowering plum.Quercus coccininea, Acer rubrum 'october glory' &brandy wine.

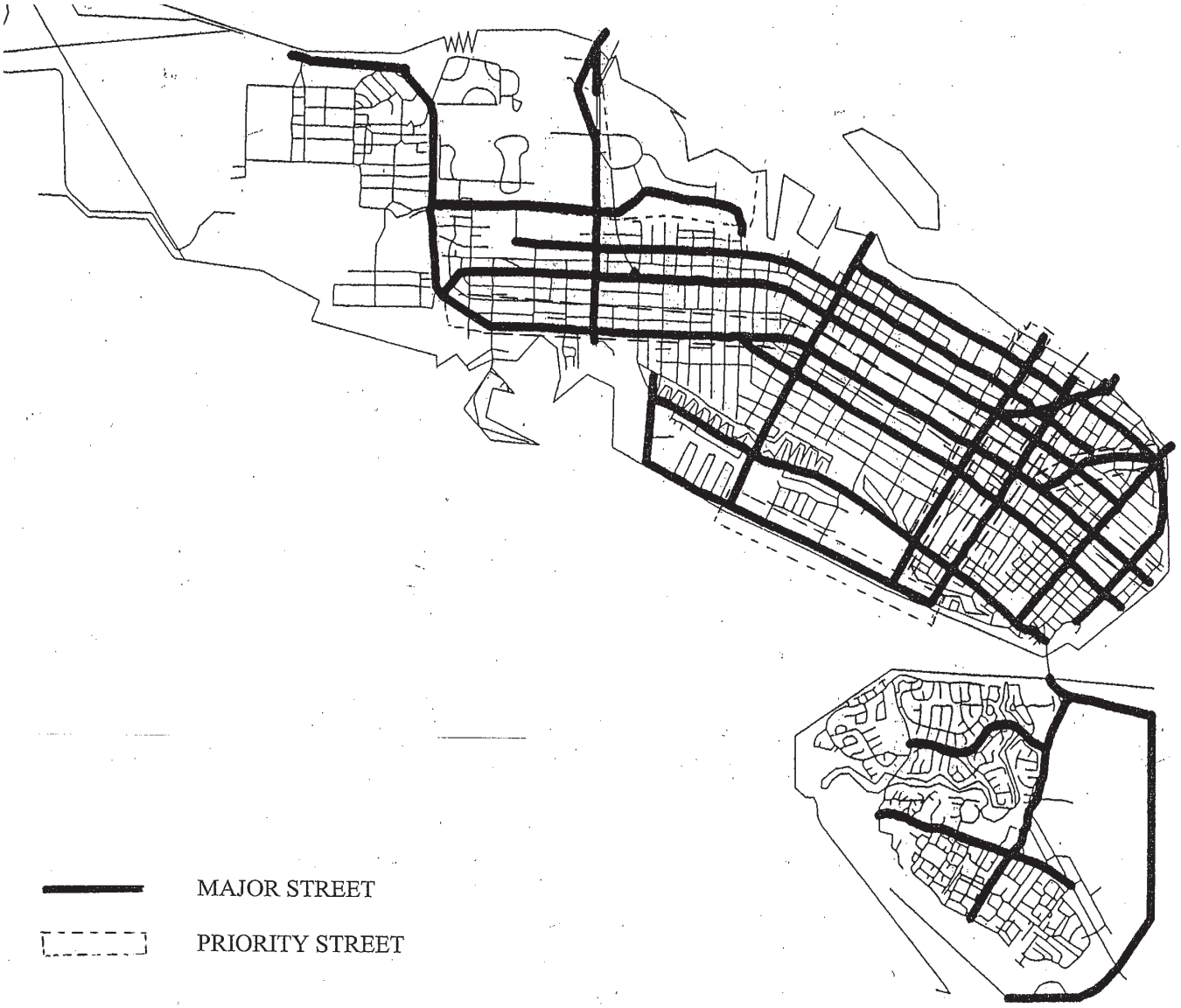
NEIGHBORHOOD	PLANTING STRIP	1989 MSTP	2009 MSTP
Fernside	2-6 feet	Ginkgo biloba*, Liquidambar styraciflua	Acer x freemanii 'Autumn Blaze' - Freeman maple; Acer nigrum 'Green Column' - black maple; Acer rubrum 'October Glory' and 'Brandywine' - red maple; Tristania conferta - Brisbane box; Carpinus betulus 'Fastigata' and 'Frans Fontaine' - hornbeam. Platnus to planter strip > 5' , silver linden
Gold Coast	2-6 feet	Ginkgo biloba, Liquidambar styraciflua, Platanus x acerifolia , Prunus caroliniana, Pyrus calleryana, Robinia pseudoacacia*, Ulmus procera, Washingtonia robusta	Ginkgo biloba 'Saratoga' - Saratoga maidenhair tree; Magnolia grandiflora 'Russet' - southern magnolia; Magnolia grandiflora 'St. Mary'- southern magnolia; Prunus x yedoensis - Yoshino cherry; Quercus palustrus - pin oak; Quercus shumardii - Shumard oak; Tilia tomentosa 'Greenmountain' or 'Sterling' - silver linden; Acer rubrum 'October Glory' and 'Brandywine' - red maple; Ulmus 'Frontier' - elm.
Jackson Park	3-7 feet	Fraxinus velutina, Platanus x acerifolia *	Acer x freemanii 'Autumn Blaze' - Freeman maple; Acer buergeranum - Trident maple; Acer campestre - hedge maple; Acer nigrum 'Green Column' - black maple; Carpinus betulus 'Fastigiata' - fastigiate hornbeam; Koelreuteria bipinnata - Chinese flame tree. Jacaranda mimosifolia- Jacaranda, Podocarpus gracilior-fern pine
Lagunaria	2-5 feet	Alnus cordata*, Ginkgo biloba*, Platanus x acerifolia , Pyrus calleryana,Tristania conferta	Corymbia ficifolia - red-flowering gum; Podocarpus gracilior - African fern pine; Quercus coccinea - scarlet oak; Quercus palustris - pin oak; Quercus suber - cork oak
Northside East	2-5 feet	Brachychiton populneus, Liriodendron tulipifera, Pittosporum undulatum, Platanus x acerifolia , Pyrus calleryana*	Tilia tomentosa 'Green Mountain' & 'Sterling' - silver linden; Acer rubrum 'October Glory' & randywine' - red maple; Aesculus hippocastanum 'Baumannii' – Baumann's horsechestnut; Prunus x yedoensis - Yoshino cherry; Quercus palustris - pin oak; Tristaniopsis laurina - swamp myrtle; Ulmus 'Princeton' - elm.
Northside West	2-13 feet	Brachychiton populneus, Liquidambar styraciflua, Magnolia grandiflora, Pistacia chinensis, Platanus x acerifolia, Pyrus calleryana*	"Carpinus betulus 'Fastigiata' - fastigiate hornbeam; Cercis canadensis - eastern redbud; Nyssa sylvatica - black tupelo; Pistacia chinensis - Chinese pistache;Jacaranda mimosifolia - Jacaranda; Podocarpus gracilior - African fern pine; Ulmus 'Frontier' - elm; Lagerstroemia indica x L. fauriei 'Natchez' & 'Tuscarora'- crape myrtle"
Park Street North	2-5 feet	Platanus occidentalis, Pyrus calleryana	Acer nigrum 'Green Column' - black maple; Aesculus x carnea - red horsechestnut; Carpinus betulus 'Fastigiata' - fastigiate hornbeam; Ginkgo biloba 'Fairmount' - maidenhair tree; Lagerstroemia indica x L. fauriei 'Tuscarora' and 'Natchez' - crape myrtle; Prunus sargentii'Columnaris' sargent cherry, Prunus yedoensis-Yoshino flowering cherry

NEIGHBORHOOD	PLANTING STRIP	1989 MSTP	2009 MSTP
South Central	2-6 feet	Brachychiton populneus, Ceratonia siliqua, Geijera parviflora, Ginkgo biloba, Jacaranda mimosifolia, Ligustrum lucidum, Platanus x acerifolia*, Pyrus calleryana, Quercus rubra.	Koelreuteria bipinnata - Chinese flame tree; Nyssa sylvatica - black tupelo; Pistacia chinensis - Chinese pistache; Quercus shumardii - Shumard oak; Acer rubrum 'October Glory' and 'Brandywine' - red maple; Acer saccharum 'Commemoration' - sugar maple; Jacaranda mimosifolia - Jacaranda; Prunus x yedoensis - Yoshino cherry; Quercus suber - cork oak.
South Shore			Metrosideros excelsus - New Zealand Christmas tree; Tristania conferta - Brisbane box; Tilia tomentosa 'Green Mountain' & 'Sterling' - silver linden; Lagerstroemia indica x L. fauriei 'Natchez' & 'Tuscarora' - crape myrtle
West Central	2-6 feet	Brachychiton populneus, Pistacia chinensis, Platanus x acerifolia*, Pyrus calleryana	Acer buergeranum - Trident maple; Acer campestre - hedge maple; Aesculus x carnea - red horsechestnut; Koelreuteria bipinnata - Chinese flame tree; Magnolia grandiflora 'Russet' - southern magnolia; Magnolia grandiflora 'St. Mary' - southern magnolia; Ginkgo biloba 'Saratoga' & 'Fairmount' - maidenhair tree; Podocarpus gracilior - African fern pine; Tilia tomentosa 'Green Mountain' & 'Sterling' - silver linden.
West End	2-6 feet	Brachychiton populneus, Cinnamomum camphora, Koelreuteria bipinnata*, Pyrus calleryana	Carpinus betulus 'Fastigiata' - fastigiate hornbeam; Cercis canadensis - eastern redbud; Koelreuteria bipinnata - Chinese flame tree; Tristaniopsis laurina - swamp myrtle; Acer nigrum 'Greencolumn' - black maple; Acer rubrum 'October Glory' & 'Brandywine' - red maple; Aesculus hippocastanum 'Baumannii' - Baumann's horsechestnut; Ulmus 'Princeton' - elm.
West End Central	3-6 feet	Brachychiton populneus*, Pyrus calleryana	Acer x freemanii 'Autumn Blaze' - Freeman maple; Acer saccharum 'Commemoration' - sugar maple; Jacaranda mimosifolia - Jacaranda; Podocarpus gracilior - African Fern pine; Quercus coccinea - scarlet oak; Quercus suber - cork oak; Lagerstroemia indica x L. fauriei 'Natchez' & 'Tuscarora' - crape myrtle.
West End North			
Woodstock		Acacia melanoxylon*, Platanus x acerifolia	For sites four feet or larger, use: Aesculus hippocastanum 'Baumannii' - Baumann's horsechestnut; Podocarpus gracilior - African Fern pine. For small, constrained planting sites use: Tilia tomentosa 'Green Mountain' & 'Sterling' - silver linden; Pistacia chinensis 'Keith Davey' - Chinese pistache.
Bisness District of Alameda			Acer nigrum 'Green Column' - black maple; Ginkgo biloba 'Fairmount' - maidenhair tree; Metrosideros excelsus - New Zealand Christmas tree; Quercus palustris - pin oak; Acer rubrum 'Armstrong' - red maple; Pyrus calleryana 'Aristocrat' and 'Chanticlear' - Bradford pear; Lagerstroemia indica x L. fauriei 'Natchez' and 'Tuscarora' - crape myrtle.

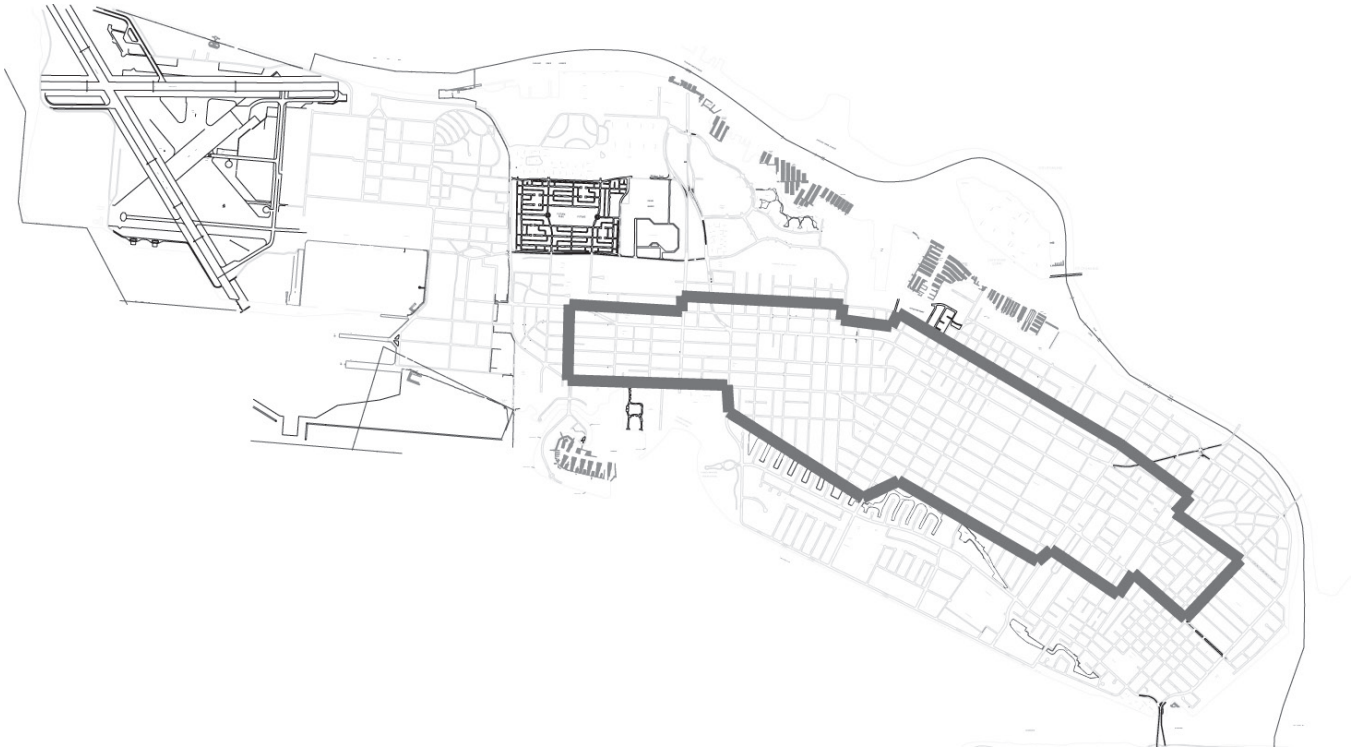
APPENDIX 10 / CITY OF ALAMEDA NEIGHBORHOODS MAP

APPENDIX 11 / CITY OF ALAMEDA ENTRY GATEWAYS MAP

APPENDIX 12 / CITY OF ALAMEDA - MAJOR STREETS OVERALL MAP



APPENDIX 13 / CITY OF ALAMEDA - SPECIAL PLANTING ZONE MAP



• Species American Elm, London Plane, Scarlet Oak, Southern Red Oak and Shumard Oak can be planted in less than 5' planter strip but not less than 3'. If located within marked area.

GLOSSARY

When the following words and phrases are used in this MSTP, they shall have the following meanings unless a different meaning is clearly required by the context:

Associated Vegetation shall mean native or non-native shrubs and ground covers within city parks, rights-of-ways, and open spaces.

City shall mean the government of Alameda.

Arborist shall mean the contracted or City employee who is a current certified arborist by the International Society of Arboriculture and is responsible for administering and enforcing the provisions of this chapter.

High Risk Tree shall mean any public tree rated as such by the City according to the tree high risk evaluation standards established by the International Society of Arboriculture.

Maintain or maintenance shall mean the entire care of trees within City rights-of-ways and open spaces, as well as the preparation of ground, fertilizing, mulching, planting, disease and insect control, trimming, pruning, staking, root control, watering, leaf litter, weed removal, and removal of dead and dying trees.

Master Street Tree Plan shall mean a document adopted by council that presents street tree inventories, maintenance recommendations, recommended street tree lists, a master design plan for street tree plantings, and urban forestry program goals.

Street Trees shall mean all trees and woody plants within public rights-of-ways.

Planting shall mean to install public trees permanently in the ground.

Planting Strip shall mean the area available for planting including tree pits between the street curbs, the edge of the traveled portion of roadway, and the property line.

Property Owner shall mean the person owning such property as shown by the records of the Assessor's Office of Alameda County, California.

Pruning shall mean cutting or removing any part of the branching structure of a plant in either the crown, trunk, and/or root areas.

Removal shall mean removal of a tree within City rights-of-ways and open spaces.

Street Tree Standards and Specifications Manual shall mean a document adopted by council that presents required standards and specifications for public tree planting, maintenance, and removal. Currently, such a document does not exist. If funding is available this may be available in the future.

BIBLIOGRAPHY

American National Standards Institute. "Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices (pruning)." ANSI A300 (Part 1) –Pruning.

American National Standards Institute. "American Standard for Nursery Stock." ANSI Z60.1.

American National Standards Institute. "Pruning, Repairing, Maintaining, and Removing Trees, and Cutting Brush – Safety Requirements." ANSI Z133.1.

Bratton, N.J & K.L.Wolf. "Trees and Roadside Safety in U.S. Urban Settings, Paper 05-0946." In "Proceedings of the 84th Annual Meeting of the Transportation Research Board (January 9-13, 2005)." Transportation Research Board of the National Academies of Science. Washington, DC.

Burden, D. 2006. Urban Street Trees. 22 Benefits. Specific Applications. [online] Glatting Jackson and Walkable Communities Inc. Available from: www.ufei.org/files/pubs/22Benefits ofUrbanStreetTrees.pdf [cited June 2008]

Centre for Urban Forest Research. 2007. Why Shade Streets? The unexpected benefit. Davis: USDA Forest Service (Published 2007). Available from: http://www.fs.fed.us/psw/programs/ cufr/products/cufr_673_WhyShadeStreets_10-06.pdf [cited June 2008]

City and County of San Francisco. Street Tree Planting Permitting Process. 2007: San Francisco, Department of Public Works. Available from: www.sfgov.org/site/sfdpw_index. asp?id=33090 [cited June 2008]

City of Davis. 2002. Community Forest Management Plan. Available from: http://cityofdavis. or/pgs/trees/pdfs/CFMP-Final-Sept2002-toc.pdf [cited June 2008].

City of Portland. 1995. "Portland's Urban Forestry Management Plan, public review draft." Portland Parks and Recreation and the Urban Forestry Management Plan Technical Advisory Committee. Portland, OR.

Clark, J. R., N. P. Matheny, G. Cross & V. Wake. 1997. A Model of Urban Forest Sustainability. Journal of Arboriculture, 23 (1), 17-30.

Council of Tree and Landscape Appraisers. 2000. "Guide for Plant Appraisal." 9th Edition. 143pp.

Dwyer, John F., Gregory E. McPherson, Herbert W. Schroeder, and Rowan A. Rowntree. 1992. Assessing the Benefits and Costs of the Urban Forest. Journal of Arboriculture 18(5).

Gilman, Edward & Sharon Lilly. 2002. Best Management Practices: Tree Pruning. International Society of Arboriculture. Champaign, IL. 35p.

Keating, Janice. 2002. Trees: The Oldest New Thing in Stormwater Treatment Stormwater. Vol. 3 (2).

McPherson, G., S. Maco, J. Simpson, P. Peper, Q. Xiao, AM. VanDerZanden, N. Bell. 2002. Western Community Tree Guide: Benefits, Costs and Strategy Planning.

Miller, R.W. 1997. Urban Forestry: Planning and Managing Urban Green Spaces. Prentice Hall. Upper Saddle River, NJ. 188p.

Moll, G. 1989. Improving the health of the urban forest. In Moll, G. and S. Ebenreck (eds.). Shading Our Cities, pp. 119-130. A Resources Guide for Urban and Community Forests. Island Press. Washington.

Nowak, David J. 2004. The Effects of Urban Trees on Air Quality. USDA Forest Service, Syracuse , NY. Available from: http://www.fs.fed.us/ne/syracuse/TREE%20Air%20Qual.pdf. [Cited June 2008].

Richards, N.A. 1983. Diversity and stability in street tree populations. Urban Ecology 7: 159-171.

Ulrich, Roger S. and Robert F. Simons. 1986. Recovery from Stress During Exposure to Everyday Outdoor Environments. In The Costs of Not Knowing. Edited by Wineman et. al.

Wolf, K. 1998. Enterprising landscapes: Business districts and the urban forest. In C. Kollin, Engineering Green: Proceedings of the 11th National Urban Forest Conference. Washington, DC: American Forests.

Wolf, K. 1998. Trees in Business Districts: Positive Effects on Consumer Behavior! - Fact Sheet 5. Available from: http://www.cfr.washington.edu/research.envmind/consumer.html [Cited June 2008].

Wolf, K. 2003. Youth and Mental Health: Work Projects in Urban Green Space. In C. Kollin (ed.), Engineering Green: Proceedings of the 11th National Urban Forest Conference. Washington, DC: American Forests.

Wolf, K. 2005a. Business District Streetscapes, Trees and Consumer Response. Journal of Forestry, 103 (8) 396-400.

Wolf, K. 2005b. Civic Nature: Valuation: Assessments of Human Functioning and Well-Being in Cities. In: Forging Solutions: Applying Ecological Economics to Current Problems, Proceedings of the 3rd Biennial Conference of the U.S. Society for Ecological Economics (July 20-23,2005). Tacoma, WA: Earth Economics.

WEB SITES:

International Society of Arboriculture:
http://www.isa-arbor.com/home.aspx

Center for Urban Forest Research, Pacific Southwest Research Station, USDA Forest Service:
http://cufr.ucdavis.edu/

Human – Environment Research Laboratory, University of Illinois at Urbana Champaign:
http://www.herl.uiuc.edu/

National Arbor Day Foundation:
http://www.arborday.org/

Urban Forestry South. USDA Forest Service, Western Region: http://www.urbanforestrywest.usda.gov/

i. ALAMEDA STREET TREE MATRIX

Tree Species	Common Name	Foliage		Flower/Fruit								
		Deciduous/Evergreen	Fall Color	Flower Color	Flower Period	Fruit	Fruiting Period	Shape	Growth Rate Per Year (once established)	Height at Maturity (feet)	Spread at Maturity (feet)	Trunk Diameter at Breast Height at Maturity (inches)	Longevity (years)
Acer buergeranum	Trident Maple	D	Red or orange	Yellow	Spring	Brown winged seed, 0.5-1.5"	Summer	Rounded, spreading with a low canopy	24-36"	25	25	20	50-100
Acer campestre 'Queen Elizabeth'*	Hedge Maple	D	Gold	Inconspicuous	Spring	Brown winged seed, 0.5-1.5"	Summer or Fall	Upright	12-36"	35	35	25	50-100
Acer x freemanii 'Autumn Blaze'	Autumn Blaze Hybrid Maple	D	Red	Inconspicuous	Spring	Brown winged seed, 1.5-3"	Fall	Conical or oval, erect of spreading with a high canopy	36"	50	40	30	50-100
Acer nigrum 'Green Column'	Black Maple	D	Gold	Inconspicuous	Spring	Brown winged seed, 0.5-1.5"	Fall	Oval or rounded	24"	65	50	25	50-100
*Acer palmatum**	Japanese Maple	D	Red, gold, orange, bronze, purple or multicolor	Inconspicuous	Spring	Brown winged seed, 0.5-1.5"	Summer	Rounded, umbrella or vase	12-24"	25	25	15	50-100
*Acer paxii**	Evergreen Maple	E	N/A	Inconspicuous	Spring	Brown winged seed, 0.5-1.5"	Summer	Rounded, erect or spreading with a low canopy	12"	35	35	20	50-100
Acer rubrum 'Armstrong'*	Scarlet Maple	D	Yellow or red	Red	Spring	Brown winged seed, 1.5-3"	Summer	Columnar, erect	36"	45	15	25	50-100
Acer rubrum 'Bowhall'*	Bowhall Maple	D	Red, gold or orange	Red	Spring	Red winged seed, 1.5-3"	Summer	Upright, narrow	36"	40	15	25	50-100
Acer rubrum 'Brandywine'	Brandywine Maple	D	Deep red	Red	Spring	Seedless	N/A	Oval	36"	40	30	25	50-100
Acer rubrum 'Frank Jr.'*	Redpointe Maple	D	Red	Red	Spring	Brown winged seed, 1.5-3"	Summer	Broadly pyramidal	36"	45	30	25	50-100
Acer rubrum 'October Glory'	October Glory Maple	D	Deep red	Red	Spring	Red winged seed, 1.5-3"	Summer	Oval or rounded	36"	40	35	25	50-100
Acer rubrum 'Somerset'*	Somerset Maple	D	Red	Red	Spring	Seedless	N/A	Oval or rounded	36"	45	35	25	50-100
Acer rubrum 'Sun Valley'*	Sun Valley Maple	D	Red	Red	Spring	Seedless	N/A	Oval, densely branched	36"	40	35	25	50-100
Acer saccharum 'Autumn Splendor'* *Acer saccharum* 'Bonfire' *Acer saccharum* 'Commemoration' *Acer saccharum* 'Crescendo'* *Acer saccharum* 'Fall Fiesta'*	Sugar Maple	D	Orange or yellow	Inconspicuous	Spring	Brown winged seed, 1.5-3"	Summer	Oval or rounded, erect or spreading	8-18"	65	40	30	>100
Aesculus carnea 'Briotti'	Red Horsechestnut	D	No change in leaf color	Showy, fragrant, red or rose	Spring	Brown capsule, 0.5-1.5"	Summer or Fall	Rounded or Umbrella, erect or spreading with a low canopy	12-18"	35	30	20	50-100
Aesculus hippocastanum 'Baumannii'	European Horsechestnut	D	Gold	White	Spring	Seedless	N/A	Oval or rounded	12-24"	65	40	25	50-100

* trees to be considered on an experimental basis, as they have yet to be proven as successful street trees in Alameda (see discussion in sec. 3.2)
** minimum planter width may be less if tree is located within area marked in Appendix 13

Microsite Conditions									Root Zone Mgt.		Nursery Status			Litter Issue	Pests & Diseases	Comments
Tolerates Full Sun	Tolerates Shade	Requires Good Drainage	Tolerates Poor Drainage	Tolerates Moist Soil	Drought Tolerant	Tolerates Sprinklers	Seaside Tolerance	Tolerates Alkaline Soil	Minimum Planter Width (feet)	Hardscape Damage Potential	Nursery Availability	Nursery Origin	Stock Type			
✓	✓			✓			✓	✓	3	Moderate	Good	California	Container		Susceptible to aphids, root rot and verticillium wilt.	A good Japanese Maple substitute. Does not get good fall color in Alameda.
✓	✓	✓			✓	✓		✓	3	Low	Poor	Oregon	B&B and bareroot		Susceptible to verticillium wilt and tar spot.	Suitable for use in parking lot islands and sidewalk tree pits.
✓	✓	✓		✓		✓			4	Moderate	Good	California	Container		Susceptible to aphids, beetle borers and scales, oak root rot, root rot, sooty mold and verticillium wilt.	A fast growing hybrid of Red and Silver maple. Fall color in Alameda has been variable. Develops chlorosis in alkaline soils.
✓	✓	✓			✓	✓			3	Moderate	Good	Oregon	Container		Susceptible to anthracnose, oak root rot, phytophthora, powdery mildew, root rot and verticillium wilt.	Reputed to be one of the toughest maples for street tree use. Tolerant of severe heat and drought once established.
	✓	✓		✓		✓	✓		3	Low	Good	California and Oregon	B&B and container		Resistant to oak root fungus. Susceptible to root rot, verticillium wilt and sun scorch.	Use as understory with larger trees. Green-leaf varieties can tolerate more sun.
	✓			✓			✓	✓	3	Low	Poor				Susceptible to aphids, root rot and verticillium wilt.	
✓	✓		✓	✓	✓	✓	✓		3	Moderate	Good	California and Oregon	Bareroot and container		Susceptible to beetle borers and scales, oak root rot, phytophthora, root rot and verticillium wilt.	Not to be planted under high voltage lines.
✓	✓		✓	✓	✓	✓	✓		3	Moderate	Good	California and Oregon	Bareroot and container		Susceptible to beetle borers and scales, oak root rot, phytophthora, root rot and verticillium wilt.	Not to be planted under high voltage lines.
✓	✓		✓	✓	✓	✓	✓		3	Moderate	Good	California and Oregon	Bareroot and container		Susceptible to beetle borers and scales, oak root rot, phytophthora, root rot and verticillium wilt.	Very good fall color and a possible *Liquidambar* substitute. Colors ten day later than most *A. rubrum* cultivars.
✓	✓		✓	✓	✓	✓	✓		3	Moderate	Good	California and Oregon	Bareroot and container		Susceptible to beetle borers and scales, oak root rot, phytophthora, root rot and verticillium wilt.	
✓	✓		✓	✓	✓	✓	✓		3	Moderate	Good	California and Oregon	Bareroot and container		Susceptible to beetle borers and scales, oak root rot, phytophthora, root rot and verticillium wilt.	Very good fall color and a possible *Liquidambar* substitute. The last of the *A. rubrum* cultivars to color in the fall.
✓	✓	✓		✓	✓	✓	✓		3	Moderate	Good	California and Oregon	Bareroot and container		Susceptible to beetle borers and scales, oak root rot, phytophthora, root rot and verticillium wilt.	
✓	✓	✓		✓	✓	✓	✓		3	Moderate	Good	California and Oregon	Bareroot and container		Susceptible to beetle borers and scales, oak root rot, phytophthora, root rot and verticillium wilt.	
✓	✓		✓				✓	✓	3	Moderate	Good	Oregon	Bareroot		Susceptible to beetle borers and scales, anthracnose, oak root rot, powdery mildew, root rot and verticillium wilt.	
✓	✓		✓	✓		✓	✓	✓	3	Moderate	Good	California and Oregon	Container	Flowers, dry fruit, leaves	Susceptible to beetle borers, chlorosis, powdery mildew and rust.	Horizontal branching required pruning in early years.
✓		✓		✓		✓		✓	4	Moderate	Poor			Flowers, leaves	Susceptible to white-marked tussock moth and japanese beetle, leaf blotch, scorch, powdery mildew and leaf spot.	

Tree Species	Common Name	Foliage		Flower/Fruit								
		Deciduous/Evergreen	Fall Color	Flower Color	Flower Period	Fruit	Fruiting Period	Shape	Growth Rate Per Year (once established)	Height at Maturity (feet)	Spread at Maturity (feet)	Trunk Diameter at Breast Height at Maturity (inches)	Longevity (years)
*Alsophila australis**	Australian Tree Fern	E	N/A	N/A	N/A	N/A	N/A	Rounded or vase, erect or spreading with a low canopy	35"	25	25	15	<50
*Angophora costata**	Gum Myrtle	E	N/A	Showy, white	Summer	Brown capsule, 0.25-0.5"	Fall	Conical or rounded, erect or spreading with high canopy	24"	50	40	25	50-100
Betula nigra 'Heritage'*	Heritage River Birch	D	Gold	Inconspicuous	Spring	Catkins	Spring	Pyramidal	24-36"	45	30	30	50-100
Carpinus betulus 'Fastigata'	European Hornbeam	D	Red, gold or multicolor	Inconspicuous	Spring	Brown winged seed, 0.25-0.5"	Winter or Summer	Columnar or conical, erect with low canopy	12-24"	35	40	15	50-100
Carpinus betulus 'Frans Fontaine'	European Hornbeam	D	Red, gold or multicolor	Inconspicuous	Spring	Brown winged seed, 0.25-0.5"	Winter or Summer	Columnar or conical, erect with low canopy	12-24"	35	15	15	50-100
*Carpinus caroliniana**	American Hornbeam	D	Red, gold, orange or multicolor	Inconspicuous	Spring	Small winged seed, 0.25-0.5"	Winter or Summer	Rounded or umbrella, erect with a low canopy	12-24"	35	30	20	50-100
*Cercis canadensis**	Eastern Redbud	D	Gold	Pink	Spring	Brown pods, 1.5-3"	Summer	Rounded or Umbrella, erect or spreading with a low canopy	36"	25	25	10	<50
*Chionanthus retusus**	Chinese Fringe Tree	D	Gold	White	Summer	Purple drupe, 0.5-1.5"	Fall or Winter	Rounded or umbrella, spreading	24"	20	15	15	<50
*Corylus colurna**	Turkish Hazel	D	Yellow	Green or yellow	Winter	Small brown nut enclosed in leafy bracts, edible, 0.25-0.5"	Fall	Oval or umbrella, erect or spreading and covers an extensive area	12-24"	60	35	25	50-100
Corymbia ficifolia	Red Flowering Gum	E	N/A	Showy, orange, pink, red or rose	Spring, Summer, Fall or Winter	Brown capsule, 0.5-1.5"	Spring, Summer or Fall	Rounded, erect or spreading with a low canopy	24"	35	30	30	50-100
Crataegus x 'Vaughn'*	Vaughn Hawthorn	D	Red or orange	White	Spring	Red pome, 0.25", persisting through winter	Fall	Oval, erect or spreading with a low canopy	24-36"	25	20	15	50-100
*Cupressus sempervirens**	Italian Cypress	E	N/A	Inconspicuous	Spring	Brown cone, 0.5-1.5"	Fall	Columnar, erect	36"	50	30	25	50-150
Fagus sylvatica	European Beech	D	Bronze	Inconspicuous	Spring	Brown nut in spiny husk, 0.5-1.5", edible	Fall	Broadly pyramidal to broadly oval	24"	60	50	35	50-100
Ginkgo biloba 'Fairmont'	Fairmont Maidenhair Tree	D	Gold	Inconspicuous	Winter	Fruitless	N/A	Pyramidal with dominant leader	12-24"	50	25	40	>100
Ginkgo biloba 'Golden Colonnade'*	Golden Colonnade Maidenhair Tree	D	Gold	Inconspicuous	Winter	Fruitless	N/A	Narrow, conical	12-18"	45	25	25	>100
Ginkgo biloba 'Magyar'*	Magyar Maidenhair Tree	D	Gold	Inconspicuous	Winter	Fruitless	N/A	Narrow, pyramidal	12-18"	50	25	25	>100

* trees to be considered on an experimental basis, as they have yet to be proven as successful street trees in Alameda (see discussion in sec. 3.2)

** minimum planter width may be less if tree is located within area marked in Appendix 13

Microsite Conditions									Root Zone Mgt.		Nursery Status			Litter Issue	Pests & Diseases	Comments
Tolerates Full Sun	Tolerates Shade	Requires Good Drainage	Tolerates Poor Drainage	Tolerates Moist Soil	Drought Tolerant	Tolerates Sprinklers	Seaside Tolerance	Tolerates Alkaline Soil	Minimum Planter Width (feet)	Hardscape Damage Potential	Nursery Availability	Nursery Origin	Stock Type			
✓	✓	✓		✓			✓	✓	2	Low	Poor			Leaves	Susceptible to spider mites and root rot.	Grows best in partial shade. Also know as *Cyathea australis* , *C. cooperi* , *Alsophila cooperi* and *Sphaeropteris cooperi.*
✓			✓	✓	✓	✓	✓	✓	3	Moderate	Poor			Exfoliating bark	Resistant to oak root fungus.	Tolerates smog.
✓	✓	✓		✓		✓			3	Low	Good	California	Container		Susceptible to leaf miner, leaf spot and scorch.	Heritage Birch requires an acid to neutral soil, and will turn chlorotic in alkaline soil. Prefers moist soil. Reportedly resistant to Bronze Birch Borer.
✓	✓			✓	✓	✓	✓		3	Low	Good	California and Oregon	Bareroot and container	Dry fruit	Resistant to verticillium wilt. Susceptible to aphids, scales, oak root rot and root rot.	Needs very little pruning to maintain good form. 2" leaves produce a handsome texture, and the winter twig pattern is attractive.
✓	✓			✓	✓	✓	✓		3	Low	Good	California and Oregon	Bareroot and container	Dry fruit	Resistant to verticillium wilt. Susceptible to aphids, scales, oak root rot and root rot.	Needs very little pruning to maintain good form. 2" leaves produce a handsome texture, and the winter twig pattern is attractive. 'Frans Fontaine' is more slender than 'Fastigata'.
✓	✓	✓		✓			✓		3	Low	Good	California and Oregon	Bareroot and container	Dry fruit	Resistant to verticillium wilt. Susceptible to oak root rot and root rot.	Often multi-stemmed. Requires a moderate amount of water.
✓	✓			✓			✓	✓	3	Low	Good	California and Oregon	Container	Dry fruit	Susceptible to caterpillars and scales, anthracnose, crown rot, oak root rot, phytophthora, root rot and verticillium wilt.	Showy pink flowers bloom best in full sun, and with moderate moisture. It may require light top pruning (not topping) of vigorous top shoots to maintain its height below 25'.
✓	✓			✓			✓	✓	3	Low	Good	California and Oregon	Container	Wet fruit		Its fragrant spring flowering is quite impressive, and is attractive in fall, when the reddish berries are seen amongst the yellow fall foliage. This is a very clean looking tree. It is easily maintained below 25' in height.
✓	✓	✓		✓			✓		3	Moderate	Good	Oregon	Bareroot	Dry fruit	Susceptible to chlorosis, powdery mildew and sooty mold.	
✓	✓	✓		✓	✓	✓	✓	✓	3	Moderate	Good	California	Container	Dry fruit	Resistant to Texas root rot and verticillium. Susceptible to beetle borers and thrips, oak root rot, phytophthora and root rot.	Red flowering gum is very desirable as a flowering accent tree, with its profusion of bright flower clusters in late summer, and sporadically throughout the year. Has fragrant leaves.
✓				✓	✓			✓	2	Low	Poor			Wet fruit	Resistant to verticillium. Susceptible to aphids, beetle borers, scales and spider mites, fire blight, oak root rot, powdery mildew, root rot, rust and sooty mold.	Branches with thorns. The foliage is reddish purple when unfolding, changing to lustrous dark green at maturity and turning to orange, scarlet and purple in autumn. The white flower clusters in early June are effective for 7 to 10 days. The fruit persists all winter.
✓	✓		✓	✓	✓	✓		✓	3	Moderate	Good	California	Container	Dry fruit	Resistant to Texas root rot. Susceptible to spider mites, gummosis, phytophthora and root rot.	
✓			✓	✓		✓	✓	✓	4	Moderate	Good	Oregon	Container and B&B	Dry fruit	Resistant to verticillium. Susceptible to aphids and spider mites, canker, oak root rot, phytophthora, root rot and sooty mold.	Limit plantings to wide medians.
✓	✓	✓		✓		✓	✓	✓	3	Moderate	Good	California and Oregon	Bareroot and container		Resistant to oak root fungus. Susceptible to anthracnose.	Ginkgo is a smog tolerant and hardy tree. Not to be planted in East end of city due to large existing Gingko population. 'Fairmont' is faster growing than other Ginkgo varieties.
✓	✓		✓	✓		✓	✓	✓	4	Moderate	Good	California and Oregon	Bareroot and container		Resistant to oak root fungus. Susceptible to anthracnose.	Ginkgo is a smog tolerant and hardy tree. Not to be planted in East end of city due to large existing Gingko population.
✓	✓		✓	✓		✓	✓	✓	4	Moderate	Good	California and Oregon	Bareroot and container		Resistant to oak root fungus. Susceptible to anthracnose.	Ginkgo is a smog tolerant and hardy tree. Not to be planted in East end of city due to large existing Gingko population.

Tree Species	Common Name	Foliage		Flower/Fruit								
		Deciduous/Evergreen	Fall Color	Flower Color	Flower Period	Fruit	Fruiting Period	Shape	Growth Rate Per Year (once established)	Height at Maturity (feet)	Spread at Maturity (feet)	Trunk Diameter at Breast Height at Maturity (inches)	Longevity (years)
Ginkgo biloba 'Princeton Sentry'*	Princeton Sentry Maidenhair Tree	D	Gold	Inconspicuous	Winter	Fruitless	N/A	Narrow, columnar, erect	12-18"	50	20	25	>100
Ginkgo biloba 'Saratoga'	Saratoga Maidenhair Tree	D	Gold	Inconspicuous	Winter	Fruitless	N/A	Conical or oval, erect or spreading and covers an extensive area	12-18"	50	30	25	>100
Gymnocladus dioecia 'Espresso'*	Kentucky Coffee Tree	D	Gold	Inconspicuous	Summer	Fruitless	N/A	Oval to vase shaped with upright arching branches	24-36"	50	35	30	50-100
Jacaranda mimosifolia	Jacaranda	E	N/A	Showy blue or lavender	Spring, Summer or Fall	Brown capsule, 1.5-3"	Summer or Fall	Oval, rounded, umbrella or vase, spreading with a high canopy	24"	40	60	25	<50-100
Koelreuteria bipinnata	Chinese Flame Tree	D	Bronze or gold	Yellow	Summer or Fall	Prolific red-pink capsules, 1.5-3""	Fall	Rounded, umbrella or vase	18-24"	35	35	20	50-100
Lagerstromia x 'Natchez' *Lagerstromia* x 'Tuscarora'	Hybrid Crape Myrtle	D	Red, gold, orange or multicolor	'Natchez' has white flowers. 'Tuscarora' has pink flowers.	Summer	Brown capsule, 0.25-0.5"	Fall	Oval, rounded, umbrella or vase, erect or spreading with a low canopy	12-24"	25	15	15	50-100
Laurus nobilis 'Saratoga'	Sweet Bay	E	N/A	Yellow-green	Spring	Black berry, 0.5"	Summer	Conical or oval	12-24"	35	20	25	50-150
*Livistona australis**	Australia Palm	E	N/A	Cream	Spring	Black or brown drupe, 0.5-1.5"	Summer or Fall	Fan palm, erect with a high canopy	12"	50	30	20	50-100
Lophostemon confertus	Brisbane Box	E	N/A	Showy, white	Spring	Brown capsule, 0.25-0.5"	Summer	Oval or rounded, erect or spreading and covers and extensive area	24-36"	50	30	25	50-100
Magnolia grandiflora 'Russet' *Magnolia grandiflora* 'St. Mary'	Southern Magnolia	E	N/A	Showy, fragrant, white	Spring, Summer or Fall	Purple or red follicle, 3" long	Summer or Fall	Oval, rounded or umbrella, erect or spreading	24"	65	60	50	>100
Metrosideros excelsus	New Zealand Christmas Tree	E	N/A	Showy, red	Spring or Summer	Brown capsule, 0.25-0.5"	Summer or Fall	Oval or rounded, erect or spreading with a low canopy	18-24"	35	35	30	50-100
Nyssa sylvatica 'Red Rage'* *Nyssa sylvatica* 'Forum'*	Sour Gum	D	Red, orange or multicolor	Inconspicuous	Spring	Black drupe, 0.5-1.5"	Fall or Winter	Conical or oval, erect or spreading with a high canopy	12-18"	65	25	30	>100
*Persea americana**	Avocado	E	N/A	Showy green	Spring	Medium-large fruits, edible	Fall	Rounded, spreading	12-36"	50	40	15	50-100
*Persea borbonia**	Redbay	E	N/A	Inconspicuous	Spring	Persistent, blue, 0.25-0.5"	Fall	Rounded, spreading	12-36"	50	50	20	50-100
*Persea indica**	Avocado	E	N/A	Inconspicuous	Spring	Black, 0.5-1"	Fall	Rounded, spreading	12-36"	30	40	15	50-100

* trees to be considered on an experimental basis, as they have yet to be proven as successful street trees in Alameda (see discussion in sec. 3.2)

** minimum planter width may be less if tree is located within area marked in Appendix 13

Microsite Conditions									Root Zone Mgt.		Nursery Status			Litter Issue	Pests & Diseases	Comments
Tolerates Full Sun	Tolerates Shade	Requires Good Drainage	Tolerates Poor Drainage	Tolerates Moist Soil	Drought Tolerant	Tolerates Sprinklers	Seaside Tolerance	Tolerates Alkaline Soil	Minimum Planter Width (feet)	Hardscape Damage Potential	Nursery Availability	Nursery Origin	Stock Type			
✓	✓		✓	✓		✓	✓	✓	4	Moderate	Good	California and Oregon	Bareroot and container		Resistant to oak root fungus. Susceptible to anthracnose.	'Princeton Sentry' has fragrant flowers in Spring. Ginkgo is a smog tolerant and hardy tree. Not to be planted in East end of city due to large existing Gingko population.
✓	✓		✓	✓		✓	✓	✓	4	Moderate	Good	California and Oregon	Bareroot and container		Resistant to oak root fungus. Susceptible to anthracnose.	Ginkgo is a smog tolerant and hardy tree. Not to be planted in East end of city due to large existing Gingko population.
✓	✓		✓	✓	✓	✓		✓	3	Moderate	Good	Oregon	Bareroot		Resistant to oak root fungus.	
✓		✓		✓			✓	✓	3	Low	Good	California	Container	Flower and dry fruit	Resistant to oak root fungus. Susceptible to aphids, phytophthora and root rot.	Well-adapted to Alameda's sandy soils. Place where it will get frequent watering. Neighborhood specific. Reported to have weak branch strength.
✓	✓	✓		✓	✓	✓	✓	✓	4	Moderate	Good	California	Container	Dry fruit	Susceptible to beetle borers and scales.	Becomes a round-headed tree requiring little pruning at maturity, but needs training when young, as it tends to form multiple leaders.
✓	✓			✓	✓	✓	✓	✓	3	Low	Good	California	Container	Flowers, dry fruit	Resistant to powdery mildew. Susceptible to aphids and sooty mold.	'Tuscarora' has multiple stems.
✓	✓	✓		✓	✓		✓	✓	4	Moderate	Good	California	Container	Dry fruit	Susceptible to psyllids and scales, phytophthora and root rot.	Dense canopy of fragrant leaves. Early pruning needed to train a good shape; pruning needed less frequently with age. Requires removal of suckers.
✓	✓			✓	✓	✓	✓	✓	4	Moderate	Poor			Dry fruit	Resistant to Texas root rot. Susceptible to pigeons.	Fan palm with dark, shiny leaves. Needs moderate watering.
✓	✓		✓	✓	✓	✓	✓	✓	3	Low	Good	California	Container	Dry fruit	Susceptible to scales, phytophthora and root rot.	Previously known at *Tristanis conferta* . Drought resistant once established. Smog tolerant. The red peeling bark and foliage are reminiscent of native Arbutus. Use like a small Eucalyptus tree with few structural problems. Extensive fruit drop from mature trees sometimes causes complaints.
✓	✓			✓	✓		✓	✓	5	High	Good	California	Container	Leaves	Resistant to oak root fungus. Susceptible to aphids, scales and spider mites, root rot and verticillium wilt.	Not to be planted near drain inlets, as leaves may obstruct drainage. Only to be planted in wide planter strips or medians.
✓	✓	✓		✓	✓	✓	✓	✓	4	Moderate	Good	California	Container	Dry fruit	Susceptible to phytophthora and root rot.	Smog tolerant. Leave low trunk twigs to encourage strong structure. Not to be planted in small planter strips.
✓	✓		✓	✓	✓	✓	✓		4	Low	Good	Oregon	B&B and container	Dry fruit	Susceptible to fusarium, phytophthora, root rot, rust and verticillium wilt. Also susceptible to lime-induced chlorosis in alkaline soils.	Should use only suggested varieties to ensure good form and color.
✓	✓	✓		✓		✓	✓	✓	2	Low	Poor			Leaves	Susceptible to phytophthora root rot, mites, scales and leaf spot.	Drainage is a concern with this species. Amending soil with mulch and gypsum may suppress root rot.
✓	✓	✓		✓	✓	✓	✓	✓	5	Low	Poor			Fruit and leaves	Susceptible to borer, scales and sooty mold.	Redbay is a rugged and adaptable plant suitable to many landscape applications. Unfortunately, the wood is reportedly brittle and subject to wind damage. Pruning to keep lateral branches less than half the diameter of the trunk will increase the tree's longevity and help prevent branches from separating from the trunk.
✓		✓		✓		✓	✓		2	Low	Poor			Leaves	Susceptible to phytophthora root rot.	Might be a good substitute for Camphor if fruiting can be limited, perhaps by using Guatemalan varieties, and/or limiting selections to varieties with Type A or Type B flowers. Potential for sidewalk damage needs to be assessed. Seems to thrive in Alameda as a yard tree. Does not do well with high water table and winds. Only to be planted inland. Amending soil with mulch and gypsum may suppress root rot.

Tree Species	Common Name	Foliage		Flower/Fruit									
		Deciduous/Evergreen	Fall Color	Flower Color	Flower Period	Fruit	Fruiting Period	Shape	Growth Rate Per Year (once established)	Height at Maturity (feet)	Spread at Maturity (feet)	Trunk Diameter at Breast Height at Maturity (inches)	Longevity (years)
Phoenix canariensis	Canary Island Palm	E	N/A	Yellow	Spring	Orange or yellow drupe, 0.5-1.5"	Fall	Feather palm, erect and covers an extensive area	12"	65	25	35	50-100
Pistachia chinensis 'Keith Davey'	Chinese Pistache	D	Red, orange, gold or multicolor	Inconspicuous	Spring	Prolific red or blue drupe, 0.5"	Summer or Fall	Oval, rounded or umbrella, erect or spreading with a high canopy	12-18"	65	50	25	>100
Platanus acerifolia 'Bloodgood'** *Platanus acerifolia* 'Columbia'** *Platanus acerifolia* 'Yarwood'**	London Planetree	D	Bronze or gold	Inconspicuous	Spring or Winter	Brown seed balls, 0.5-1.5"	Summer	Oval , rounded or umbrella, erect or spreading and covers an extensive area	36"	70	50	35	>100
Podocarpus gracilior	Fern Pine	E	N/A	Inconspicuous	Spring	Purple drupe, 0.25-0.5"	Fall	Oval or rounded, erect and covers an extensive area	12-24"	50	35	30	>100
Prunus sargentii 'Columnaris'*	Columnar Sargent Cherry	D	Red, gold or bronze	Showy pink	Spring	Purple, red or black drupe, 0.25-0.5"	Fall, Winter or Summer	Columnar or vase, erect	12-36"	35	20	20	40
*Prunus yedoensis**	Yoshino Flowering Cherry	D	Bronze or gold	Showy, fragrant pink or white	Spring or Winter	Black drupe, 0.25-0.5"	Winter or Summer	Oval, rounded or umbrella, erect or spreading with a low canopy	36"	35	30	20	<50-100
Pyrus calleryana 'Aristocrat' *Pyrus calleryana* 'Chanticleer'	Callery Pear	D	Red, gold, purple or multicolor	Showy, fragrant, white	Spring	Brown pome, 0.25-0.5"	Summer	Oval or rounded, erect or spreading, low or high canopy	24"	35-50	45	20	50-100
*Quercus coccinea***	Scarlet Oak	D	Red	Inconspicuous	Spring	Acorns, 0.5-1.5"	Fall or Winter	Oval, rounded or umbrella, erect or spreading and covers an extensive area	24"	60	60	40	>100
Quercus falcata, ****	Southern Red Oak	D	Bronze	Inconspicuous	Spring	Acorns	Fall	Oval or rounded	24"	65	60	40	>100
*Quercus palustris**	Pin Oak	D	Bronze, red gold or multicolor	Inconspicuous	Spring	Acorns, 0.5-1.5"	Fall or Winter	Conical, rounded	24"	65	35	30	>100
*Quercus shumardii***	Shumard Oak	D	Red, gold, orange or multicolor	Inconspicuous	Spring	Acorns, 0.5-1.5"	Fall	Oval, rounded or umbrella, erect or spreading and covers an extensive area	24-36"	65	45	30	>100
Quercus suber	Cork Oak	E	N/A	Inconspicuous	Spring	Prolific acorns, 0.5-1.5"	Fall or Winter	Oval, rounded or umbrella, erect or spreading and covers an extensive area	24"	70	45	50	>100
*Quercus virginiana**	Southern Live Oak	E	N/A	Inconspicuous	Spring	Acorn, 0.5-1.5"	Fall or Winter	Oval, rounded or umbrella, erect or spreading with a high canopy	24-36"	60	60	50	>100

* trees to be considered on an experimental basis, as they have yet to be proven as successful street trees in Alameda (see discussion in sec. 3.2)

** minimum planter width may be less if tree is located within area marked in Appendix 13

Microsite Conditions									Root Zone Mgt.		Nursery Status			Litter Issue	Pests & Diseases	Comments
Tolerates Full Sun	Tolerates Shade	Requires Good Drainage	Tolerates Poor Drainage	Tolerates Moist Soil	Drought Tolerant	Tolerates Sprinklers	Seaside Tolerance	Tolerates Alkaline Soil	Minimum Planter Width (feet)	Hardscape Damage Potential	Nursery Availability	Nursery Origin	Stock Type			
✓		✓		✓	✓	✓	✓	✓	4	Low	Good	California	Container	Dry fruit and leaves	Resistant to Texas root rot. Susceptible to pigeons, *Fusarium* and root rot.	This is probably the most useful of available palms for street side uses. It should be used in areas broad enough to not only prevent the lateral expansion of the trunk from breaking pavement, but also to prevent the fruit from making a mess on the sidewalk areas.
✓	✓	✓		✓	✓	✓		✓	3	Low	Good	California and Oregon	Container	Dry fruit	Resistant to oak root fungus. Susceptible to root rot and verticillim wilt.	Requires pruning in the first 2-4 years to prevent clearance problems caused by horizontal branch growth. One of the best fall coloring trees for this climate. Not for use in heavily watered lawns. 'Keith Davey' has a more uniform structure and is easier to maintain than other varieties.
✓	✓			✓	✓	✓		✓	5	Moderate	Good	California and Oregon	Bareroot and container		'Yarwood' resistant to powdery mildew. 'Bloodgood' resistant to anthracnose. 'Columbia' resistant to both.	Will grow in almost any soil. Needs very little pruning to achieve semi-open habit and good form.
✓	✓	✓		✓	✓	✓	✓	✓	4	Moderate	Good	California	Container	Dry fruit	Susceptible to black scale.	Produces a round or oval, upright form covered with narrow blue-green foliage and a fairly dense canopy. The excellent branching is easily shaped into well structured crowns. Hardscape damage has been noted in the few mature trees in CA. Can be messy when leaves drop.
✓		✓		✓		✓			3	Low	Good	Oregon	Container		Susceptible to caterpillars, aphids, borer and scales. Trees in heavy soil sometimes subject to root rot.	This species of cherry is far better adapted to urban tree use than the more commonly used cultivars. It will tolerate poor soil. Branches don't droop, and are susceptible to breakage. First planted in Alameda in 2005.
✓		✓		✓			✓	✓	3	Low	Good	California and Oregon	Bareroot and container	Flower and dry fruit	Susceptible to caterpillars, canker, crown rot, oak root rot, phytophthora, root rot, rust and verticillium wilt.	On clay soils, plant on slopes or in raised beds.
✓	✓	✓		✓	✓	✓	✓	✓	3	Moderate	Good	Californiaa nd Oregon	Bareroot and container	Dry fruit	Fairly resistant to fire blight, oak root fungus and verticillium wilt. Susceptible to whiteflies.	'Aristocrat' only to be planted in business districts of Park St. and Webster. Requires annual pruning at the beginning to establish good structure and prevent splitting later on. Very good fall color.
✓	✓			✓	✓	✓	✓	✓	4	Moderate	Good	California and Oregon	Bareroot and container	Acorns	Resistant to verticillium wilt. Susceptible to caterpillars and scales.	This is the most colorful of the Eastern Oaks, with a reliable brilliant red color in the fall. Many specimens hold most brown leaves all winter. Possible Liquidambar substitute. Best in deep, rich soil.
✓		✓		✓	✓	✓			5	Low	Good	Oregon	Bareroot		Susceptible to caterpillars.	Appears to produce reliable red fall color with consistent upright growth habit. Does not appear subject to aphids. Possible alternative to Q. coccinea where a taller and less spreading tree is desired. Possible Liquidambar substitute.
✓	✓		✓	✓	✓	✓	✓		3	Low	Good	California and Oregon	Bareroot and container	Acorns	Resistant to verticillium wilt. Susceptible to scales, anthracnose, and occasional chlorosis, especially in clay soils.	Some branches hang very low, and may cause clearance problems unless kept pruned. Highly variable growth forms may be problematic. Brown leaves tend to hang on the tree of some specimens in winter. May become chlorotic in alkaline soil.
✓	✓			✓	✓	✓	✓	✓	5	Moderate	Good	California and Oregon	Bareroot and container	Acorns	Resistant to verticillium wilt. Susceptible to beetle borers, beetle leaves, caterpillars, insect galls, leaf miner and scales.	More easily transplanted than Scarlet Oak. Not as prone to iron deficiency as Pin Oak.
✓	✓	✓		✓	✓		✓	✓	8	Moderate	Good	California	Container		Resistant to verticillium wilt. Susceptible to phytophthora and root rot.	Does not like having persistently wet roots, therefore, cannot be planted in grass, or near irrigation. Leaf drop in spring may seem abnormal, but is typical pattern for the tree. Bark is the source of commercial cork.
✓	✓		✓	✓		✓	✓	✓	6	Moderate	Good	California	Container	Acorns	Resistant to verticillium wilt. Susceptible to insect galls, oak root rot, phytophthora and root rot.	Best in deep, rich soil, but widely adapted to a variety of soil types.

Tree Species	Common Name	Foliage		Flower/Fruit								
		Deciduous/Evergreen	Fall Color	Flower Color	Flower Period	Fruit	Fruiting Period	Shape	Growth Rate Per Year (once established)	Height at Maturity (feet)	Spread at Maturity (feet)	Trunk Diameter at Breast Height at Maturity (inches)	Longevity (years)
*Rhus lancea**	African Sumac	E	N/A	Inconspicuous	Summer	Red or yellow drupe, 0.25-0.5"	Fall	Rounded or umbrella, spreading or weeping with a low canopy	24"	25	25	30	50-100
*Taxodium distichum**	Bald Cypress	D	Bronze or orange	Inconspicuous	Summer or Fall	Fragrant, Brown cone, 0.5-1.5"	Summer or Fall	Conical, erect or spreading and covers an extensive area	24-36"	65	40	35	50-100
*Taxodium mucronatum**	Montezuma Cypress	E	N/A	Inconspicuous	Summer or Fall	Fragrant, Brown cone, 0.5-1.5"	Summer or Fall	Conical, erect or weeping and covers an extensive area	36"	65	50	50	50-100
Tilia tomentosa 'Green Mountain' *Tilia tomentosa* 'Sterling'	Silver Linden	D	Gold	Showy, fragrant, yellow or white	Summer	Gray capsule, 0.25-0.5"	Fall	Conical, oval or umbrella, erect or spreading with high canopy and extensive area	18-48"	50	40	25	50-100
Tristania laurina 'Elegans'	Swamp Myrtle	E	N/A	Showy, yellow	Spring or Summer	Brown capsule, 0.25-0.5"	Summer or Fall	Oval or rounded, erect or spreading with a low canopy	12"	25	20	15	<50-100
Ulmus americana 'Jefferson'*,** *Ulmus americana* 'New Harmony'*,** *Ulmus americana* 'Princeton'** *Ulmus americana* 'Valley Forge'*,**	American Elm cultivars	D	Yellow	Inconspicuous	Spring	Green, wafer-like seedpods, 0.25-0.5"	Spring	Upright or spreading, vase shape	36"	70	60	80	>100
Ulmus 'Frontier'	Frontier Elm	D	Burgundy	Inconspicuous	Spring	Green, wafer-like seedpods, 0.25-0.5"	Spring	Broadly oval	36"	40	30	25	unknown
Ulmus 'Morton'*	Accolade Elm	D	Yellow	Inconspicuous	Spring	Green, wafer-like seedpods, 0.25-0.5"	Spring	Upright, vase-shaped with arching limbs	36"	70	60	unknown	unknown
Ulmus 'Morton Glossy'*	Triumph Elm	D	Yellow	Inconspicuous	Spring	Green, wafer-like seedpods, 0.25-0.5"	Spring	Upright oval to vase	36"	55	45	unknown	unknown
Ulmus 'Morton Stalwart'*	Commendation Elm	D	Yellow	Inconspicuous	Spring	Green, wafer-like seedpods, 0.25-0.5"	Spring	Upright oval	36"	60	50	unknown	unknown
Ulmus 'Patriot'*	Patriot Elm	D	Yellow	Inconspicuous	Spring	Green, wafer-like seedpods, 0.25-0.5"	Spring	Stiffly upright, narrow vase shape	36"	50	40	unknown	unknown
Washingtonia robusta	Mexican Fan Palm	E	N/A	Inconspicuous	Summer	Edible black drup, 0.25-0.5"	Fall or Winter	Fan palm, erect and covers an extensive area	18-24"	>65	15	20	50-100

* trees to be considered on an experimental basis, as they have yet to be proven as successful street trees in Alameda (see discussion in sec. 3.2)

** minimum planter width may be less if tree is located within area marked in Appendix 13

Microsite Conditions									Root Zone Mgt.		Nursery Status			Litter Issue	Pests & Diseases	Comments
Tolerates Full Sun	Tolerates Shade	Requires Good Drainage	Tolerates Poor Drainage	Tolerates Moist Soil	Drought Tolerant	Tolerates Sprinklers	Seaside Tolerance	Tolerates Alkaline Soil	Minimum Planter Width (feet)	Hardscape Damage Potential	Nursery Availability	Nursery Origin	Stock Type			
✓	✓			✓	✓		✓	✓	4	Low	Good	California	Container	Dry fruit	Susceptible to root rot and verticillium wilt.	A dense shade tree, rather graceful with its arching branches and weeping foliage. It is tough and reliable in dry conditions, though it looks best with regular deep watering. It may require regularly scheduled light pruning (but not topping) of vigorous top shoots to maintain its height below 25 feet.
✓	✓		✓	✓		✓	✓	✓	4	Moderate	Good	Oregon	Bareroot and container	Dry fruit	Resistant to oak root fungus. Susceptible to beetle borers and beetle leaves, phytophthora and root rot.	Plant only in wide medians.
✓	✓			✓	✓			✓	5	Moderate	Poor			Dry fruit	Susceptible to beetle borers and beetle leaves.	Fairly drought tolerant, but needs ample water when young. Plant only in wide medians.
✓	✓	✓		✓	✓	✓	✓	✓	3	Low	Good	Oregon	Bareroot and container	Dry fruit	Susceptible to root rot, sooty mold and verticillium wilt.	Light green leaves with silver undersides move in any breeze. Faster growing than most Lindens, with good yellow fall color in Alameda. Unlike other Lindens, does not appear subject to aphids.
✓	✓			✓				✓	2	Low	Good	California	Container	Dry fruit and flowers	Susceptible to scales.	It is useful where only small planter spaces are available. Easily pruned to any form.
✓	✓		✓	✓	✓	✓	✓	✓	6	High	Good	Oregon	Bareroot	Dry seeds	Resistant to Dutch elm disease and elm leaf beetle.	
✓	✓			✓		✓		✓	3	Low	Good	California and Oregon	Bareroot and container	Dry seeds	Resistant to Dutch elm disease and elm yellows.	This is a hybrid between *U. carpinifolia* and *U. parvifolia* .
✓	✓			✓	✓	✓	✓	✓	6	Moderate	Good	Oregon	Bareroot and container	Dry seeds	Resistant to elm yellows, elm leaf beetle, elm leaf miner and Dutch elm disease.	This is a hybrid between *U. japonica* and *U. wilsoniana.*
✓	✓			✓		✓		✓	4	Moderate	Good	Oregon	Bareroot	Dry seeds	Resistant to Dutch elm disease.	This is a hybrid between *U. wilsoniana* , *U. japonica* and *U. pumila* .
✓	✓			✓		✓		✓	5	Moderate	Good	Oregon	Bareroot	Dry seeds	Resistant to Dutch elm disease.	This is a hybrid between *U. wilsoniana* , *U. pumila* and *U. carpinifolia* .
✓	✓			✓		✓		✓	4	Moderate	Good	Oregon	Bareroot	Dry seeds	Resistant to Dutch elm disease.	This is a hybrid between *U. wilsoniana, U. carpinifolia* , *U. glabra* and *U. pumila* .
✓	✓	✓		✓	✓	✓	✓	✓	3	Low	Good	California	Container	Dry fruit and leaves	Resistant to Texas root rot. Susceptible to beetle borers and pigeons.	A moderately invasive species. Use for special situations, such as on Burbank Street and to preserve views on Shoreline Drive. Planting at each of these locations should be at the same time to establish uniformity.

ii. DEFINITION OF TERMS IN THE TREE MATRIX

TREE SPECIES

Botanical names (Genus and species) are the Latin nomenclature for a plant, by which it is identified in nurseries. Using botanical names insures the acquisition of the exact plant desired, because common names of plants are not consistent from place to place. The botanical name used in this category consists of two parts, genus and species. Cultivars are horticulturally or agriculturally derived varieties of a plant, and they are usually cultivated for specific characteristics such as color, lack of or production of fruit, or unique foliage characteristics.

COMMON NAME

Common names of plants vary tremendously from place to place, and are not a reliable identifying feature. Common names are usually of local value, because they derive from laymen gardeners who create names based on some visible characteristic, or reference to a local individual.

FOLIAGE

Deciduous: The tree loses its leaves once a year, usually in the fall.

Evergreen: The tree loses its 2-3 year old leaves, usually over a protracted time, most often in spring.
Fall Color: The tree produces attractive fall foliage color.

FLOWER/FRUIT

Flower Color: If the tree has ornamental flowers, its colors are listed.

Flowering Period: Flowering period by season.

Fruit: If the tree produces fruit, it will be described here.

Fruiting Period: Fruiting period by season.

GROWTH/STATURE

Suitable for Planting Under Power Lines: Trees that are suitable to plant under high voltage power lines must be able to withstand puc pruning requirements without jeopardizing health or structural integrity of tree.

Shape: This category identifies the generally definable shape tree canopies take as they mature. As with height, care and urban environments will provide many influencing variables. Tree shapes are defined as follows in this database:

- Columnar = erect and almost parallel, resembling a column
- Conical = oval at the base, elongated and tapering to a narrower width at the top

- Fan Palm = fan shaped leaves with venation of the leaves extending like the ribs of a fan
- Oval = appearing elliptical, resembling an egg
- Rounded = ball-like or circular
- Umbrella = branches extending outward and down, as an umbrella does
- Vase = a narrow base, widening and arching outward towards the top

Growth Rate per Year (Once Established): Growth Rate (in inches) identifies the maximum relative rate a tree will grow. As with height, urban environments will provide many influencing variables.

Height at Maturity: The maximum height (in feet) to which the species or cultivar may potentially grow in an urban setting. Urban environments may inhibit the potential of a tree to reach the maximum height it would in a natural setting. It is important, though, to consider overhead restrictions before planting a tree.

Spread at Maturity: The maximum canopy width (in feet) to which the species or cultivar may potentially grow in an urban setting.

Trunk Diameter at Breast Height at Maturity: The maximum diameter of the trunk (in inches) when measured at breast height (4.5 feet above ground level) to which the species may potentially grow in an urban setting.

Longevity: The typical lifespan of the species in an urban setting is given in years. Longevity is an important consideration for long-term shading, screening, beauty and value of a property. Short-lived trees may also be wonderful shade trees, and can be useful where permanence is not the ultimate goal. Longevity may vary depending on proper selection of adapted species, care the tree receives, risk of mechanical damage, and the presence or lack of diseases and pests.

MICROSITE CONDITIONS

Tolerates Full Sun: The tree tolerates 6 or more hours of direct sunlight per day.

Tolerates Shade: The tree tolerates exposure to high light, but less than 2 hours of direct sunlight per day.

Requires Good Drainage: The tree requires good drainage. A soil which drains at the rate of 0.05 inches per hour or more will provide the preferred balance of air, water, and solids ideal for root growth. The very sandy or sandy loam top soils generally found in Alameda are ideal for a broad range of species.

Tolerates Poor Drainage: These trees can grow in soils that drain at a rate less than 0.05 inches per hour, such as the clay soils found throughout the fill areas of Alameda.

Tolerates Moist Soil: These trees can tolerate damp soil most of the year.

Drought Tolerant: These trees are not adversely affected by prolonged periods with little or no rainfall, once established.

Tolerates Sprinklers: These are trees that do not react adversely to sprinkler irrigation. Sprinkler watering can favor diseases such as Phytophthora or Armillaria, especially in soils with poor drainage. Some of the native Oak species are particularly susceptible to these diseases. Other species have a natural tendency to grow shallow roots. If they are sprinkler watered, their roots tend to remain even nearer to the surface (where the water is), increasing the likelihood that they will blow over in string winds.

Seaside Tolerance: Trees with a checkmark in this column do well when planted along the seaside in this climatic zone.

Tolerates Alkaline Soil: These are species that will not be significantly inhibited by growing in soils with pH levels of 7.5-8.7, assuming the high pH levels are caused by high calcium, magnesium, and slightly elevated levels of boron and sodium.

ROOT ZONE MANAGEMENT

Minimum Planter Width: This is the minimum planter space, in feet, in which the species should be used without a root barrier if pavement damage is to be avoided. Even trees listed as tolerant of very small spaces can, in very shallow soils or with sprinkler watering, cause pavement damage.

Hardscape Damage Potential: Hardscape Damage Potential attempts to qualify the tendency trees have of causing damage with their roots. Root damage is usually caused when tree roots remain close to the surface of the soil. Tree roots can cause costly damage to paving, structures and even underground utilities. Because roots nearer the tree trunk will enlarge earlier and grow more rapidly, care should be taken to space trees appropriately from structures. Local environmental and tree care conditions, such as soil type or watering habits, can affect a tree's root development. Long, deep waterings can encourage downward root growth. Shallow soils will force roots to grow horizontally rather than vertically.

NURSERY STATUS

Nursery Availability: If the species is grown in California or Oregon, it is listed as having Good availability. If the species was not found to be grown by any major nurseries in California or Oregon, it is listed as having Poor availability. This fact should not deter use of the species or cultivar, only warn the municipal personnel that they may need to source smaller suppliers, or order the tree six months or more in advance.

Nursery Origin: This indicates the state that the tree grower's operation is likely to be located. Again, this should not deter the use of the species or cultivar.

Stock Type: This notes the method by which this species is commonly sold by growers.

LITTER ISSUE

Fruits, flowers, leaves, twigs and bark can be considered litter if they tend to fall with frequency, long duration and abundance. These plant droppings create maintenance hassles when the trees are located over drives, walkways, patios or planting areas which are meant to be kept relatively clean. Problems can include hazardous slippery or bumpy surfaces, staining of surfaces, and smothering of small plants to the point of preventing their growth. However, except for fruits that are sizable and/or wet, most litter is tolerable. Some litter may be left as mulch and contribute to the improvement of the soil. If the tree drops excessive amounts of any of the mentioned plant parts, it is noted here. The fruit type, wet or dry, is also identified.

PESTS AND DISEASES

These notes identify pests and diseases by which this species might by threatened or resistant. Different plants attract different pests, and some pests will require special and regular treatments to prevent damage to the tree or its fruit. Disease resistance is a genetic characteristic that determines the tree's ability to resist disease. Trees that are resistant to a disease either do not contract the disease or show little or few symptoms of the disease. Possessing low-level disease symptoms does not significantly affect the health of the tree nor its aesthetic qualities. Because not all trees have been tested for all pests or diseases, much data is not known or documented. This field makes no claim of listing all pests and diseases of any particular tree.

COMMENTS

These are special notes as to how this particular species or cultivar will perform as a street tree.

ALAMEDA MASTER STREET TREE PLAN

CITY COUNCIL

Beverly Johnson, Mayor
Doug De Haan, Vice Mayor
Lena Tam, Councilmember
Marie Gilmore, Councilmember
Frank Matarrese, Councilmember

CITY STAFF

Matthew Naclerio, Public Works Director
Barbara Hawkins, Project Manager and City Engineer, Public Works Department
Shilpa Patel, Junior Engineer, Public Works Department
Todd Williams, Public Works Supervisor, Public Works Department

CONSULTANTS

Charlie Lanfranco, Tanaka Design Group, San Francisco
Melanie Gentles, Certified Arborist
Zoë Lonergan, Book Cover and Document Designer

Improving our urban forest is no simple task, and requires the ideas, time, and expertise of many people. This project is the result of extensive collaboration and teamwork among those within and outside Alameda's urban forest. Special thanks go to the residents of the Alameda urban forest who enthusiastically attended meetings and provided feedback, so that this plan could reflect their vision for the forest in which they live. We would particularly like to thank Chris Buckley for his time, dedication and draft reviews.

THE CITY OF ALAMEDA'S MASTER STREET TREE PLAN
VOLUME 2

CHAPTER 1

PLANTING PALETTES

1.0 / HOW TO USE THE PLANTING PALETTES

As an essential part of effectively using this MSTP, tree selection criteria are discussed with an emphasis on choosing the right tree for the right place. Such decisions are genuine design problems to be solved, and instead of using a subjective approach ("What's my favorite tree?"), an objective process is presented. Specifically, trees can be considered to have three major categories of selection criteria—visual (aesthetic), functional (utilitarian), and viability (soil or ecological). These factors are interrelated and one or more may be dominant given the particular planting situation, but all three must be considered.

To employ these criteria, a developer, city manager, or resident selects a tree species for a particular street or neighborhood by using the appropriate planting palette and the Tree Selection Matrix (located at the end of this MSTP). The appropriate tree species should be procured, planted, and established as set out in Tree Planting Guidelines in Volume 2 Chapter 2, Aboricultural Best Practices. The Tree Matrix will be updated every five years as experimental trees are evaluated, poorly performing species are removed and new species are recommended for inclusion.

1.1 / MAJOR STREETS OF ALAMEDA

Streets leading into Alameda and heavily traveled corridors crossing through town have been identified as major throughways of the city. They are treated separately from Alameda's neighborhoods because of their high visibility and importance to the city's functions, character, and atmosphere. Each major street has a specific tree palette. In general, tree species were assigned to create a uniform planting, which will provide continuity through a variety of land uses and reinforce the street's identity and the street's place in the hierarchy of Alamada's streets. Refer to the following individual street descriptions for specific recommendations. Each description contains a visual analysis of existing boulevard characteristics, existing trees, and planting recommendations. A location map accompanies each boulevard description. Changes to the tree selections for major streets must be approved by the planning board.

GOALS FOR THE TREES ALONG MAJOR STREETS

- Protect healthy trees while providing for infrastructure stability and public safety.
- Replant new trees where existing trees cannot be safely retained.
- Proactively pre-plant trees in vacant sites.
- Plant the largest species appropriate for the site.
- Perform tree removals in phases to retain an acceptable level of canopy cover.
- Where feasible, enlarge planting areas.
- Provide wildlife habitat.
- Foster neighborhood transition plans and communication regarding infrastructure conflicts.

PARAMETERS USED IN SELECTING TREE SPECIES FOR MAJOR STREETS

1. Street trees are used to emphasize the continuity of major streets and to give each street a distinct identity. For example, the main island's five central east/west major streets (Encinal, Central, Santa Clara, Lincoln, and Buena Vista Avenues) have similar development patterns along their frontages, but can be individualized with street trees using the following general schemes:

Encinal Avenue: Mixed deciduous, such as maple trees.
Central Avenue: Single-species London Plane trees.
Santa Clara Avenue: Mixed broadleaf evergreens.
Lincoln Avenue: Mixed broadleaf evergreens and deciduous.
Buena Vista Avenue: Mixed deciduous of similar appearance such as elm trees and silver lindens.

2. In most cases, use a unique species palette with a maximum of six species (not including medians) for the entire length of each major street. In developing the street species palette, it is important to continue existing distinctive species plantings, such as the London plane trees on Central, except where the species are undesirable, as with the bottle trees on Lincoln Ave or the Liquidambars on Gibbons Drive. In the few cases where a street is divided into sections of radically different character or environmental conditions, such as Grand Street north and south of the lagoon, different palettes may be used for each section, provided

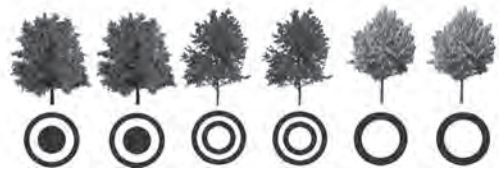
*Tree species have been selected from the tree matrix at the end of the MSTP

at least one stronger species is used in all sections to maintain an element of continuity throughout.

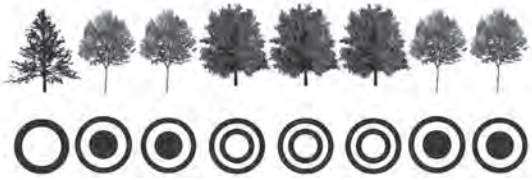
3. Where possible, select trees with ultimate height of at least 40 feet for streets with width of 36' or more. Though there are many site constraints, tree plantings should maximize the height and canopy spread of the tree planted. Conflicts with traffic lights, other infrastructure or major architectural elements may require planting smaller trees. For the streets with widths 36' or less conflicts with overhead high voltage wires require that plantings should be short stature. For streets wider than 36' a balance is needed between maximizing street tree canopy, the placement of trees to minimize utility line and infrastructure conflict enhancing neighborhood character.

4. Incorporate into the palette any large tree species that are currently used frequently, except where the existing trees are undesirable. Distribute different species as evenly as possible along the entire length of the street to maintain continuity. Even distribution is important, but strict symmetry is not necessary. A repeating pattern that allows for variations in planting spaces on both sides of the street is optimal. Possible patterns include:

Pairs: 2a-2b-2c-2a, (2a = 2 of tree species a), with two trees from each recommended species planted along each side of the street. This pattern accommodates variations.



Pyramid: 1a, 2b, 3c, 2b, 1a, where 'a' has the largest mature size of the three planted species.



Alternating: 1a, 1b, 1a, 1b, 1c, 1b, 1c, 1a, 1c, 1a, for a random alternating pattern.

In situations where entire blocks may be planted at once, there exists the opportunity for implementing one of the above patterns of tree planting. In locations where several planting sites exist in a row, trees should be used with equal frequency at a minimum ratio of 1:3. The goal is to plant no more than four instances of the same species consecutively before changing to an alternate species.

5. Select trees from the Tree Matrix that are particularly suitable for major streets. Selected trees should have a local track record that demonstrates their long-term reliability. However, trees that appear promising but have not yet established such a track record can still be selected for "limited use" if:

> **a.** Such trees do not account for more than 15% of the planting sites along the entire street or within a 1200-foot segment of the street (approximately three blocks); and
> **b.** The "limited use" trees are needed to serve a specific design function that trees with established track records are not able to serve. Examples of such design functions include trees that are needed to maintain visual continuity with existing trees where the existing trees are undesirable and where none of the trees with established track records can serve this function.

See Table 3.0 for a list of recommended trees for major streets, including the trees for "limited use."

6. For medians less than 6' trees are not to be planted. Each median should require specific designs that are well coordinated with trees selected for sidewalk planting and sight distance. Site size must be considered before selecting a species.

7. Maximize the potential of constrained planting areas. Where existing sidewalk planting strips, tree wells, or other curbside planting areas are not wide enough for large trees, either:

> **a.** Widen the curbside planting area into the sidewalk by reducing the sidewalk width to a 42-inch minimum sidewalk where possible, but maintain a greater width in high pedestrian areas, or
> **b.** Plant the trees along the back of the sidewalk with approval from the property owner but still within the public right of way. Where space is limited, tree cutouts along the back of the sidewalk are acceptable.

8. For streets close to the shoreline with bay mud fill conditions, the major street recommendations focus on trees generally considered well suited to shorelines with high water tables and muddy soils.

9. Consideration should also be given to adjacent buildings in the selection of species. In general, columnar or pyramidal trees should be favored in front of multi-story or commercial buildings, especially those with shallow setbacks. Conversely, broad spreading trees could be favored in front of one-story buildings with deep setbacks, especially low-step buildings, such as bungalows. There may be street sections where street trees should not be used. A list of these locations should be identified by the Planning Board.

Table 1.0 / Recommended List of Trees for Major Streets

Acer nigrum — black maple.

Acer rubrum — red maple. 'October Glory', 'Brandywine', and possibly other varieties (but not 'Red Sunset' or 'Morgan').

Acer saccharum — sugar maple. 'Commemoration' and possibly other varieties (but not 'Green Mountain').

Corymbia ficifolia — red-flowering gum.

***Fagus sylvatica* — European beech. Use on major streets with sufficient planting space, and only as a substitute for 'Alnus rhombifolia' (white alder) where a tree similar to the white alder is desired.

Ginkgo biloba — maidenhair tree. 'Fairmount', 'Saratoga', and possibly other varieties, but not 'Autumn Gold'.

**Gymnocladus dioica* 'Espresso' — seedless Kentucky coffee tree.

Koelreuteria bipinnata – Chinese flame tree

***Lagerstroemia indica x L. fauriei* — Crape Myrtle. 'Tuscarora' and possibly other varieties. Use only as accent trees along Park Street and Webster Street.

Magnolia grandiflora — southern magnolia. 'Russett' and possibly other varieties. Use only in the largest planting spaces and not near drain inlets.

Metrosideros excelsus — New Zealand Christmas tree. Use only in large planting spaces.

Pistacia chinensis — Chinese pistache. 'Keith Davey' variety.

Platanus acerifolia — London plane tree. 'Columbia' and 'Yarwood' varieties.

Pyrus calleryana — flowering pear. 'Aristocrat' and possibly other varieties (but not 'Bradford' or other varieties with a strong tendency to develop multiple V-crotches). Use only where currently growing such as along Webster Street.

Quercus coccinea — scarlet oak.

**Quercus falcata* — southern red oak.

**Quercus virginiana* — southern live oak.

Tilia tomentosa — silver linden.

Tristania conferta — Brisbane box.

**Ulmus* spp. — various American and hybrid elms. *'Accolade', *'Commendation', 'Frontier', *'Jefferson', *'New Harmony', *'Patriot', 'Princeton', *'Triumph', *'Washington', and possibly other varieties.

***Washingtonia robusta* — Mexican fan palm. Use only in special situations, such as on Shoreline Drive or Eighth Street between Central and Portola.

**Trees that have not yet established a local track record and which are, therefore, designated only for "limited use."*

***Trees for special use only. See specific comments for each tree.*

ATLANTIC AVENUE & CLEMENT AVENUE

The oldest portion of Atlantic Avenue is at its western end. It is characterized by former naval air station housing, low-cost housing built in the 1940s to 1950s, a school site, and a wide railroad easement with chain link fencing along the south side. Buildings date from prior to 1909 until 1954 near the intersection with Webster Street.

Across Main Street, the new residential development neighborhood Bay Port is nearly completed. On this side of the street, the developer has planted a selection of London plane trees alternating with locust trees planted behind the sidewalk. These trees provide a wonderful pedestrian passage along the housing development and toward the industrial and naval section of the street. Toward Webster Street along the College of Alameda there are new London plane trees connecting the development street trees and the large trees on the college campus. Overall, the street image is no longer uneven and chaotic. The street image is highly split between the northern tree plantings and the vacant, though planned, southern side. With a continued commitment by the City of Alameda to complete the broad street plantings on the south side of the street, a beautiful, lush streetscape can be expanded along this section of the street.

From Webster to Constitution Way, Atlantic Avenue was completely landscaped in the late 1980s with dense street tree planting that reinforces the circulation patterns there. These trees are now maturing well and, though still juvenile, can be expected to create a mature tree canopy over the next 30 years. The development consists of one- and two-story commercial buildings.

Beyond Constitution to Sherman Street, a uniform streetscape image is created by dense street tree plantings that include medians. Chain-link fencing combines with street trees to screen the commercial-industrial uses built in the 1980s. Integrated landscape plantings reinforce the sense of identity. This pattern continues past office development sites, with entries emphasized by accent trees, until Atlantic becomes Sherman Street at the eastern end.

While mentioned in the 1989 Master Plan, Clement Avenue is not a significant street on its own. For this reason Atlantic Avenue and Clement Avenue are to be treated as the same street, since they will eventually be connected as the city's major waterfront arterial. Clement Avenue is currently an industrial district with no planting strips. Most of Clement Avenue presents a special challenge because the six-foot sidewalks with many zero-setback buildings are too narrow for street trees. A further complication is high voltage wires on both sides of the street. To plant street trees on Clement, it will likely be necessary to either: (i) widen the sidewalks; (ii) plant trees in the parking lane; and/or (iii) plant trees and cutouts on the back of the sidewalk (but still in the right-of-way), as has been done along the Alameda Marina frontage. For these reasons, no detailed review or recommendations are made for Clement Avenue at this time. However, as development continues throughout the area, landscape setbacks that allow for street-lined tree corridors should be encouraged.

Existing Trees
Eucalyptus nicholii - willow-leaved peppermint
Ceratonia siliqua - carob
Liquidambar styraciflua - sweetgum

Planting Recommendations:
Tristania conferta - Brisbane box (Not under high voltage lines).
Platanus acerifolia 'Columbia' and 'Yarwood' - London plane tree (not appropriate for Clement Avenue until redevelopment guidelines are implemented)

Design Recommendations
Atlantic Avenue: Complete a broad street planting between Main Street and Webster Street on the south side of the street. Connect to the new street planting promenade along Main Street.

Clement Avenue: Plant street trees where possible to increase urban forest canopy.

BROADWAY

Broadway is an important north/south corridor on the eastern side of Alameda, with four lanes for most of its length. It is characterized by mostly single-family residences built from approximately the 1890s to the 1920s, along with a few multi-family units built in the 1940s and 1950s; some buildings even date from prior to 1872.

Broadway has a strong planting palette of uniform street trees. It has one area of commercial and high-density housing at Central Avenue; after Central, Broadway reverts back to its former residential pattern. At Tilden Way, Broadway crosses the railroad and land uses become industrial and commercial. It terminates at Blanding Avenue at a one-story commercial center built in the 1980s and 1990s. Broadway is representative of the west-end palette with many middle-aged trees, and the street appears to have three distinct segments in terms of tree consistency. Broadway is most consistent with its tree canopy north of Santa Clara, and then less so until Encinal, and least of all south of Encinal. In its prime, Broadway is a signature Alameda street with marked complexity in both age and species selection.

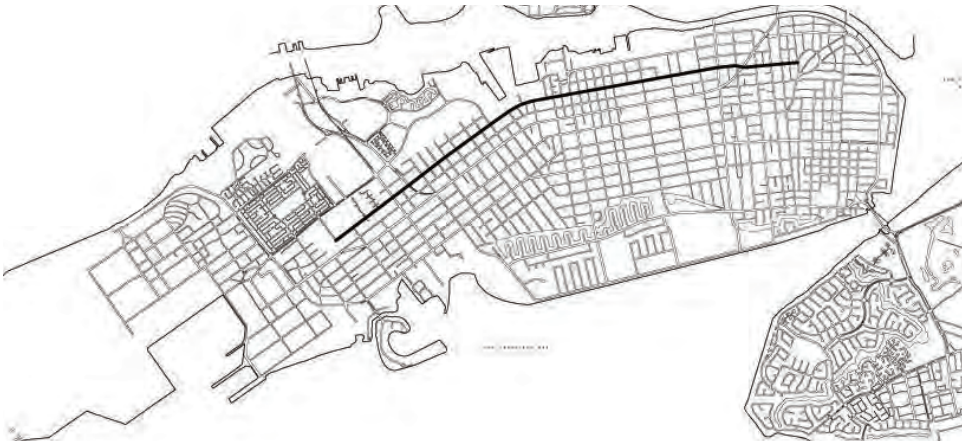
Existing trees
Fraxinus velutina var. glabra - Modesto ash

Planting Recommendations
**Gymnocladus dioica* 'Espresso' - seedless Kentucky coffee tree
Acer rubrum - red maple. 'October Glory', 'Brandywine', and possibly other varieties (but not 'Red Sunset' or 'Morgan'). Do not use 'Brandywine' under high voltage lines
Ulmus 'Frontier' and 'Princeton' - frontier hybrid elm and Princeton American elm

Design Recommendations
Since ash should not be continued due to the borer threat, include trees such as seedless Kentucky Coffee Tree to differentiate Broadway from High Street, which is also dominated by Modesto ash that will require removal. Improve planting consistency south of Santa Clara Avenue. Prioritize planting in available planting spots. Broadway should be considered a priority street. Priority actions should include removing trees that are in decline and planting new ones.

*Experimental or trial.

BUENA VISTA AVENUE



Buena Vista Avenue is a major east/west boulevard that travels along the north side of the city. At its western end, Buena Vista is made up of high-density multi-family residences, two- to four-story buildings built in the 1950s and 1960s. There are young and mature street trees of various species with common landscape areas surrounding the buildings. Many young trees have been planted along this stretch of street just east of Webster, and with careful maintenance, they will mature into a nice street canopy. Beyond Webster, the newly planted young trees are replaced by dense plantings of mature, large-stature street trees among single-story residences dating approximately from the late 1870s to the early 1900s, and two-story multi-family buildings built in the 1970s. The image changes towards the east as the quantity of mature street trees varies.

A different atmosphere altogether begins at the Sherman Street industrial complex and railway along the north side with Buena Vista Park to the south. This industrial complex is being developed as an adaptive reuse project, and future improvements will likely include street tree plantings along the north side of the street. Between Ohlone and Hibbard, new residential development has added a selection of fine street trees that will mature nicely with conscientious pruning and maintenance. This continues for several blocks before reverting back to mostly 1870s to early 1900s single–family houses to 1950s multi-family residential. Toward its eastern end, Buena Vista Avenue contains bungalows built between 1910 and 1925. Beyond Park Street, Buena Vista becomes a residential collector street. All along Buena Vista Avenue, the street trees are not as bleak as they were in the last Master Plan, and these trees should mature and fill out to create a beautiful streetscape.

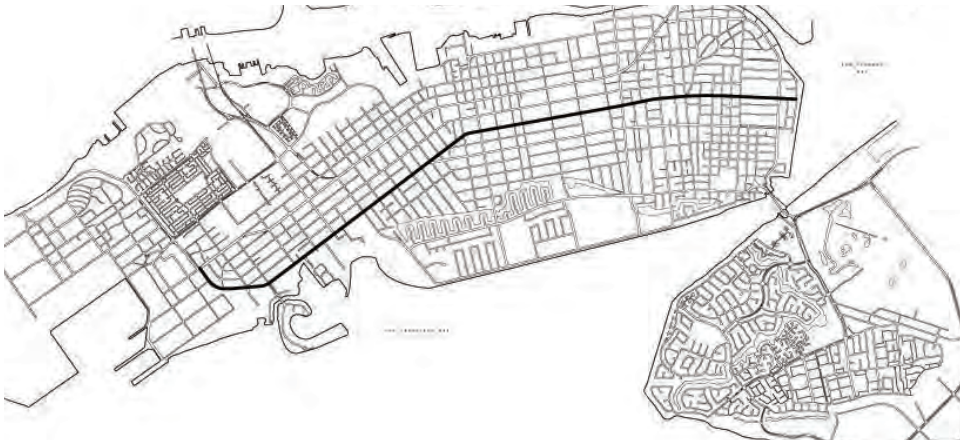
Existing Trees
Fraxinus holotricha 'Moraine' - Moraine ash
Liriodendron tulipifera - tuliptree

Planting Recommendations
Tilia tomentosa - silver linden
Ulmus hybrids and cultivars - various American and hybrid elms including 'Accolade', 'Commendation', 'Jefferson', 'New Harmony', 'Patriot', 'Triumph', 'Washington', 'Frontier' and 'Princeton'

Design Recommendations

As the renovation and adaptive use project is completed along Buena Vista at Sherman Street in the industrial complex, street trees must be included in the development plans to connect the street canopy along the entire length of the street.

CENTRAL AVENUE



Central Avenue is a major boulevard without medians, with primarily four lanes. It has the most consistent mature street tree plantings that exist today in Alameda. Central Avenue presents a very striking, harmonious streetscape dominated by large-stature London plane trees, with sidewalks on both sides of the street and a strong residential character. The homes range in age from approximately 1883 to 1910, predominantly from the 1890s and later. Central bounds the north ends of the Park Avenue and Burbank-Portola Heritage Areas, with street trees forming an archway over the street.

Central Avenue has been and continues to be a major east/west arterial through the city. At the western end of Central, beyond the Webster Street business district, there are varied species and fewer street trees planted, especially on the south side. This area was largely built during the 1940s to 1950s, except for high-density housing built in the 1970s along the marina side, toward the south. West of Third Street, there are no street trees and the street loses its uniform image, terminating with the naval air station storage yards at Main Street. Traveling eastward from Webster, Central Avenue is strongly residential, constructed during the late 1880s to 1909, the 1920s, and the 1940s, with one-story corner markets and other local services occasionally interspersed. Near Park Avenue there are a few commercial establishments. Beyond Park, Central continues as a uniformly residential street where established street trees prevail. Beyond Fernside Boulevard, the street image changes slightly because the residences were built in the 1950s, and because of variations in street tree planting design and species.

Existing Trees
Platanus acerifolia 'Columbia' and 'Yarwood'
- London plane tree

Planting Recommendations
Platanus acerifolia 'Columbia' and 'Yarwood'
- London plane tree

Design Recommendation

Continue strong single-species plantings from Grand Avenue out to the Encinal High School where there is a culvert with the sewer line under the sidewalk. Proactively remove older plane trees that are in decline and replace with younger plane trees and proactively replant existing vacant planting sites. This will maintain sustainable canopy coverage and prevent removals in large numbers when the trees begin to decline severely and become safety concerns.

DOOLITTLE DRIVE

Doolittle Drive is an important connector route from southern Alameda to the Nimitz Freeway to the east. It is an open, spacious roadway adjacent to the Alameda Municipal Golf Courses. The golf courses and clubhouse date from approximately 1926 and later. The northern right-of-way screens the former City dump beyond, established in approximately 1961. Island Drive, the main boulevard into Bay Farm Island, intersects Doolittle Drive's western end just before the Bay Farm Island Bridge; Doolittle crosses the Oakland-Alameda border, has two lanes, continues along the San Leandro Bay, and is very open and spacious, affording varied shoreline views. The street seems to borrow its image from the adjacent open, park-like golf course.

Existing Trees
Platanus acerifolia 'Yarwood' - London plane tree
Acacia melanoxylon - black acacia
Populus nigra 'Italica' - Lombardy poplar

Planting Recommendations (south side only)
Platanus acerifolia 'Columbia' and 'Yarwood' - London plane tree
Tilia tomentosa - silver linden
Metrosideros excelsus - New Zealand Christmas tree

Design Recommendations
The existing London plane trees are not doing well. The cause should be determined and if it appears they are unsuitable for this location, the City should plant only silver linden and New Zealand Christmas trees.

ENCINAL AVENUE

Encinal Avenue is primarily residential, though it is an important east/west boulevard through the city. It has a mixture of different uses, from small businesses to older residential homes. The western portion was built mostly from the 1880s to 1910, with buildings dating as early as 1877; there are also some buildings from the 1930s. Traveling east, the character changes to mostly commercial with single-story corner markets (some from the 1890s) and other local services mixed with two-story residences built in the 1920s and 1930s.

Encinal begins at its intersection with Central Avenue. From Central traveling east, the image of street tree plantings varies. A few large-stature mature trees are spotted among new large-stature trees of various species and size, though these younger London plane trees are beginning to conflict with the overhead power lines. This problem is especially visible between Willow and Walnut. In several places along Encinal, such as at Park across from the Alameda High School, the street loses its consistency as the plantings are discontinuous, and the streetscape consequently loses its identity. This pattern continues to Oak Street, then between Oak Street and Park Avenue the street image changes as land use is devoted to one- and two-story commercial buildings. The street trees in this area have become small-stature trees, and the street is lined with Victorian-style lampposts.

Beyond Park, the pattern reverts to mostly single-family homes built from approximately 1890 to 1910. Along the far eastern alignment of Encinal south of High Street, there is a wide median that is treated like a park, planted with large-stature, mature trees and turf. Though there are not many street trees, the median planting gives a distinct, park-like image to this end of Encinal. Beyond Fernside Boulevard, the image is similar to that of Central Avenue past Fernside, with young street trees planted and homes built in the 1950s to 1960s. The Historic Business Districts, including Station and Versailles, are a highlight of Encinal.

Existing Trees
Fraxinus velutina var. *glabra* - Modesto ash
Fraxinus oxycarpa 'Raywood' - Raywood ash
Fraxinus holotricha 'Moraine' - Moraine ash

Planting Recommendations

Acer rubrum - red maple. 'October Glory', 'Brandywine', and possibly other varieties

**Gymnocladus dioica* 'Espresso' - seedless Kentucky coffee tree. Pistacia Chinensis< Acer Nigrum and Tristania Conferta.

Design Recommendations

Priority plantings should occur along Encinal, a beautiful and surprising street with a wonderful mix of residential areas, small businesses, and schools. Do not continue to plant ash trees, due to the borer threat. Instead, use seedless Kentucky coffee trees, combined with other species. Distinct planting strategies should be used to highlight and celebrate the Historic Business Districts.

The two-foot wide sidewalk planting strips along Encinal between High Street and Fernside Boulevard are too narrow to comfortably accommodate large street trees. The median strip in that area may be newly designed with wild grasses, perennial flowers, and dense native low-water ground cover to create a much more complex and rich plant tapestry. Being one of the largest and most unusual medians in the city of Alameda, the Encinal median should be celebrated as a charming neighborhood surprise.

*Experimental or trial.

FERNSIDE BOULEVARD

Fernside Boulevard begins at its intersection with Tilden Way, close to the Fruitvale Avenue Bridge. In general, Fernside is made up of one- and two-story residences, built from 1910 to the 1930s. It has some medium- to large-stature street tree plantings that are established, and beyond the High Street intersection there are uniform, dense street tree plantings. The residences here mostly date from 1910 to the 1950s.

This pattern continues around the curve to the southern alignment of Fernside, where single-family housing along the east was built in the 1950s to 1960s with a few multi-family buildings and a school site. The dense uniform London plane trees north of Central change radically at Lincoln Park; from here on, conscientious plantings in vacant planting spots has not continued except for some brand new plantings across from the school south of Encinal. Fernside Boulevard is the easternmost route along the Alameda mainland, and it connects many important streets to the surrounding neighborhoods.

Existing Trees
Tilden Way to High Street:
Ginkgo biloba - maidenhair tree
Fraxinus holotricha 'Moraine' - Moraine ash
High Street to Encinal Avenue:
Platanus acerifolia - London plane tree
Encinal Avenue to Otis Drive:
Fraxinus holotricha 'Moraine' - Moraine ash

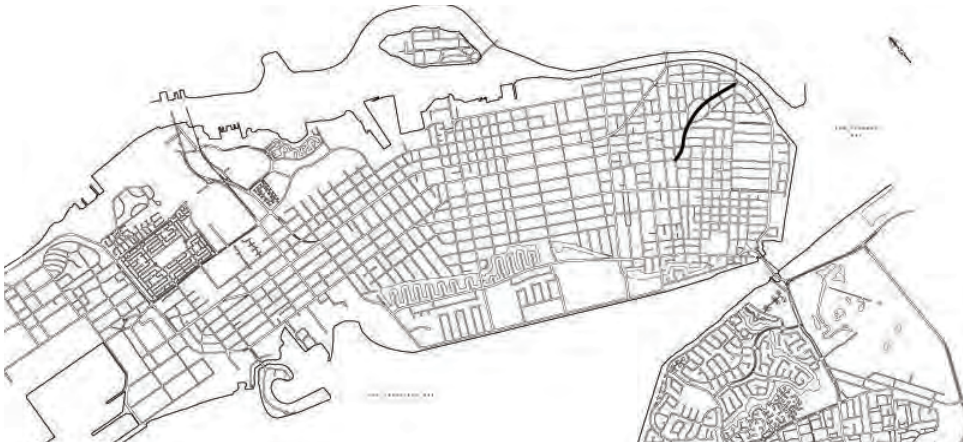
Planting Recommendations
Platanus acerifolia 'Columbia' and 'Yarwood' - London plane tree (for planter strips with minimum 5 foot widths)
**Gymnocladus dioica* 'Espresso' - seedless Kentucky coffee tree
Tilia tomentosa - silver linden (especially good for small planting areas)

Design Recommendations
Connect the continuous dense London plane tree plantings with the newer plantings south of Encinal. Create a clear tree connection from Lincoln Park through

to Fernside Boulevard so that the park can actively spill out onto Fernside, much like it does on High Street. Right now the Fernside park entrance feels like a back entrance, neglecting the Fernside neighborhood. A change in plantings will result in a more equitable park orientation to both sides. The two-foot-wide planting strips along Fernside south of Garfield Avenue and East Shore Drive to Encinal Avenue are too narrow to comfortably accommodate large street trees. Widening the sidewalk into the roadway by at least 2' should be considered at a future time.

*Experimental or trial.

GIBBONS DRIVE



The street tree plantings and architecture along Gibbons Drive create a very uniform streetscape image. It is a residential collector street that runs through the neighborhood. Its image is well integrated with its single-family 1920s- and 1930s-era residential atmosphere. Some additional residences were built in the 1950s to 1960s. The large, mature, uniform, and dense *Liquidambar* street tree plantings create a majestic canopy. This magnificent image is further enhanced by the curving nature of the street, which directs attention towards the line of street trees and provides an interesting view along the street. This continuity of character endures throughout the entire length of Gibbons Drive.

Existing Trees
Liquidambar styraciflua - Sweetgum.

Planting Recommendations
One of the following species should be selected to replace the *Liquidambar* monoculture:
Acer rubrum - red maple. 'Brandywine' and possibly other varieties
Quercus coccinea - scarlet oak
**Quercus falcata* - southern red oak

Design Recommendations and Keys to Transition Success

- *Liquidambar styraciflua* are not recommended as urban street trees. Declining or high risk *Liquidambar* trees should be removed
- Healthy *Liquidambar* trees should be kept as long as possible with community cost sharing, streetscape changes and root pruning
- Initiate phased introduction of proven street tree species
- Provide sufficient planting and rooting space
- Abide by existing 5% annual tree removal rule per block face

Gibbons should be considered a priority street. Gibbons Drive from Versailles Avenue to High Street is lined on both sides with magnificent, mature *Liquidambar styraciflua* (American sweetgum) trees. Several factors make this street the pride of Alameda residents. One is the massive size of this species, combined with the fine foliage and branch canopy it creates for the adjacent homes. The other is

the ambience of maturity, grace, and permanence contributed by trees of this stature. Additionally, tall trees with dense canopies like the *Liquidambar* trees are favored by Cooper's hawks for nesting. Unfortunately, the *Liquidambar* trees are increasingly in decline. The continued maintenance cost of these declining, mature trees will only increase as high risks associated with limb failures increase. The species also destroys pavement, driveways, water mains, and house foundations with aggressive root systems, and drops large quantities of hard seed pods. Even young, this tree has an inherently poor branching structure that allows splitting of the limbs despite excellent pruning.

For these reasons, the *Liquidambar* need to be carefully and systematically removed over the next 20 years to begin the process of establishing a new street canopy. If the trees are not removed and replaced incrementally, then a neighborhood-wide removal will have to take place when all the trees become safety concerns.

The continuity of size and yellow, red, and orange fall colors should be maintained with careful selection of alternative species. It is therefore important to plant the largest possible new trees, selected for not only for their mature size, but also for their fall color. Residents should be educated about the watering and fertilizing practices on adjacent property to encourage successful establishment of the new recommended species palette. Where possible, the tree rooting area should be increased. Planting trees on the home sides of the sidewalk while replacing the sidewalk to the curbside is also a long-term option residents and the City may investigate. The additional rooting space will encourage healthier growing conditions for faster growing and larger mature trees.

*Experimental or trial.

GRAND STREET

Grand Street is a north/south boulevard running through the heart of Alameda. Grand Avenue's northern extremity crosses three railroad lines and terminates in a boat ramp into the Alameda Inner Harbor, where it is surrounded by marinas and maritime land uses. At its southern end beyond Otis Drive, development from the 1950s and 1960s created one-story single-family residences until the street reaches the Bay at Shoreline Drive, where there are multi-family buildings. In general, Grand Street is strongly residential in character with a more expansive feeling and scale than many other streets in Alameda. It contains some of the finest examples of Victorian and Edwardian architecture that exist in the city. These buildings mostly date from approximately the late 1880s to 1909, and the earliest were built prior to 1872.

The cohesive streetscape image is a direct result of this architectural predominance in addition to the dense, mostly mature, medium- to large-stature street tree plantings. The architectural continuity is derived from the height, complex ornamentation, and loving protection of the Victorian residences; their setback from the street; and the continuity of the landscape surrounding the buildings. This connection between the residential landscape and the diverse mature street trees reflects the highest standard of streetscape landscaping in the city. While not all residential areas have such extensive street-facing landscape opportunities, the wonderfully complex street plantings of young and mature trees should be used as a template for other streets. South of Santa Clara, the mixture of smaller ornamental trees, evergreens, and broadleaf deciduous trees is simply mesmerizing. Postcards from the early 20th century show a similar planting palette, and the continued success of that planting fashion reveals a method for sustainably cultivating a long-term street tree program.

Existing trees
North of Otis Drive:
Acer platanoides - Norway maple
Pyrus calleryana 'Bradford' - Bradford pear
Robinia pseudoacacia - black locust

South of Otis Drive:
Eucalyptus rudis - swamp gum
Corymbia ficifolia - red-flowering gum
Eucalyptus nicholii - willow-leaved peppermint

Planting Recommendations
North of lagoon:
Acer rubrum - red maple, 'October Glory', 'Brandywine', and possibly other varieties
Acer nigrum - black maple
Acer saccharum - sugar maple, 'Commemoration' and possibly other varieties (but not 'Green Mountain')
Quercus coccinea - scarlet oak
**Quercus falcata* - southern red oak

South of lagoon:
Corymbia ficifolia - red-flowering gum

Design Recommendations
Extend the planting success from south of Santa Clara to the northern part of Grand Street. The recommendation emphasizes maples north of the lagoon because the maple had been Grand Street's signature tree and significant numbers remain. Maples were also designated for Grand Street in the existing street tree plan. Although slower growing than red maple, sugar maple is included because it and Norway maple were the maples historically used on Grand Street. Norway maple, however, does not perform well in the Bay Area. Black maple is similar to sugar maple, but is faster growing. Scarlet oak and southern red oak are included to provide more diversity of species, but with a maple-like appearance.

The maples and oaks were limited to north of the lagoon because they may not perform well in the fill soil south of the lagoon, especially with the potentially high soil salinity. However, their potential south of the lagoon should be verified. Red-flowering gum was included to provide a large-stature tree south of the lagoon. The maples will perform this function north of the lagoon.

*Experimental or trial.

HARBOR BAY PARKWAY

Harbor Bay Parkway forms the entrance into Harbor Bay Business Park, an imposing office, research, and development center at the south end of Bay Farm Island. Development here began in the 1980s and is ongoing, though construction of the Alameda Municipal Golf Courses and their clubhouse, which border much of the north end of Harbor Bay Parkway, began in the 1920s. Harbor Bay Parkway has four lanes with a wide central median along its northern alignment. On its east and south sides, the street abuts Oakland International Airport, which is chain-link fenced and unscreened for much of the length. A dynamic, linear image is created along the golf courses and northern airport edge with vertical, large-stature, mature street trees.

The business park developments include a spacious, landscaped right-of-way, densely planted with trees. The industrial nature of the airport property abruptly intrudes upon the park-like character created by the business park landscape. On the other hand, the western end of Harbor Bay Parkway runs along the edge of the San Francisco Bay; it terminates at the beginning of Shoreline Park, a public promenade at the water's edge that has magnificent views of the San Francisco skyline. This end is reminiscent of the Shoreline Drive beachfront. In total, the street has three distinct streetscape images, created by the linear, park-like feeling along the golf courses, the industrial zone with no real identity at the southeastern edge, and the open, spacious, park-like character at the business developments and shoreline park.

Existing trees
Doolittle Avenue to Maitland Avenue:
Populus nigra 'Italica' - Lombardy poplar
Eucalyptus rudis - swamp gum
Myoporum laetum - Myoporum

Maitland Avenue to South Loop Road:
Alnus rhombifolia - white alder
Pinus pinea - stone pine

South Loop Road to End:
Phoenix canariensis - Canary Island date palm

Planting Recommendations
Retain existing planting scheme for those species in the tree matrix, but consider substituting *Fagus sylvatica* (European beech) for the existing *Alnus rhombifolia* (white alder).

HIGH STREET

High Street is a major north/south boulevard that lies on the eastern side of mainland Alameda. It comprises single-family residences built primarily in the 1920s to 1930s, but it also contains buildings dating back as early as 1885. Its streetscape image is fairly cohesive, and the strongest undercurrent is its buildings of similar architectural style. This is coupled effectively with generally uniform street tree plantings. High Street includes a few commercial properties, a school site, and park. South of Encinal, the street plantings are excellent.

Existing Trees
Fraxinus velutina var. *glabra* - Modesto ash
Fraxinus holotricha 'Moraine' - Moraine ash
Fraxinus oxycarpa 'Raywood' - Raywood ash

Planting Recommendations
**Gymnocladus dioica* 'Espresso' - seedless Kentucky coffee tree
Koelreuteria bipinnata – Chinese flame tree
Pistachia chinensis 'Keith Davey' – Chinese pistache

Design Recommendations
Conscientious plantings in available vacant planting spaces will improve street canopy consistency north of Encinal. Do not continue planting ash trees, due to the borer threat. Use species such as Chinese flame tree, Chinese pistache, and seedless Kentucky coffee tree instead.

*Experimental or trial.

ISLAND DRIVE

Island Drive is the main arterial and entrance into the southern end of Alameda and Bay Farm Island. The northern end of Island Drive has a strong, park-like character created by its generous width, wide medians, landscaped walkways on both sides, and sweeping views across the Alameda Municipal Golf Courses and clubhouse, built in 1926. From the Otis-Doolittle Drive Bridge, built in 1951, to Mecartney Road, where multi-family residential gives way to commercial development on either side, development occurred during the 1970s and 1980s.

Beyond Mecartney Road, the streetscape character changes significantly to an older, one-story residential neighborhood built from the late 1950s to 1960s with no median, varied street tree plantings, and walls and sidewalks on both sides. Beyond Fir Avenue, the street image changes again, with two-story townhouses built in the 1970s surrounded by common landscape grounds. Although the many street trees are still young, the landscape treatment creates an identifiable residential image.

Existing Trees
Doolittle to Mecartney Road medians:
Pinus radiata - Monterey pine
Alnus rhombifolia - white alder
Pinus pinea - stone pine
Platanus acerifolia - London plane tree
Prunus cerasifera - purple leaf plum

Streetscape:
Pinus contorta - lodgepole pine
Pinus pinea - stone pine
Prunus cerasifera - purple leaf plum
Populus nigra 'Italica' - Lombardy poplar

Mecartney Road to Fir Avenue:
Ginkgo biloba - maidenhair tree

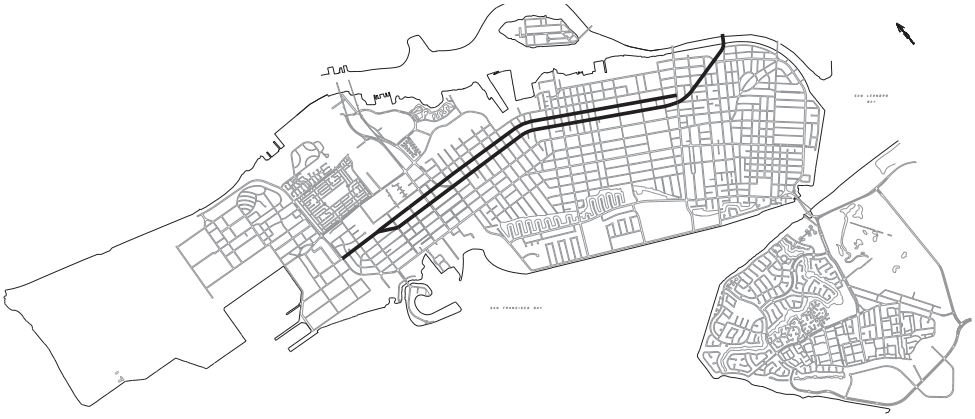
Fir Avenue to Catalina:
Eucalyptus polyanthemos - silver dollar gum

Quercus ilex - holly oak
Ginkgo biloba - maidenhair tree

Planting Recommendations
North of Mecartney Road:
Retain existing *Populus nigra* 'Italica' (Lombardy poplars) and substitute *Fagus sylvatica* (European beech) for the existing *Alnus rhombifolia* (white alders)

South of Mecartney Road:
Quercus coccinea - scarlet oak
Tilia tomentosa - silver linden
Corymbia ficifolia - red-flowering gum.
Ginkgo biloba 'Fairmount', 'Saratoga' and possibly other varieties, but not 'Autumn Gold' - maidenhair tree

LINCOLN AVENUE – TILDEN WAY – MARSHALL WAY – PACIFIC AVENUE



Lincoln Avenue in combination with Pacific Ave (West of 4th Street) Marshall Way (between 4th and 5th Streets) and Tilden Way (East of Park Street) is a major four-lane east/west street through mainland Alameda. It is the widest street in Alameda, with parallel parking along both sides of the street. Lincoln stretches from the Naval Air Station at its western end to the Fruitvale Bridge at its eastern terminus. Its development comprises one- and two-story residences dating mainly from approximately the 1890s through the 1950s. It contains buildings built as early as 1872. There are one-story commercial properties occurring primarily along Lincoln's center and at a few intersections.

Lincoln Avenue has a strong neighborhood identity. The corner markets and stores strongly reinforce Lincoln's character and give it human scale. Some of the comer markets date from the late 1800s to early 1900s. Currently, the street is modestly enhanced by street tree plantings that vary in health, species, and continuity. Beyond Webster and after the curve towards the western end of the island, planting consistency is much better than on the eastern end; the median at Sherman is especially well designed.

Many of the vacant planting spots and some entire planting strips have been covered in asphalt. Lincoln will clearly benefit from not only more consistent plantings but also improved planting conditions. As a major cross street, Lincoln has tremendous potential to become a wonderful street.

Existing Trees
Brachychiton populneus - bottle tree
Cinnamomum camphora - camphor
Prunus caroliniana - Carolina cherry laurel

St. Charles Street to Sherman Street:
Chinese pistache trees have been planted to replace laurel figs killed by the 1990 frost. The low-branching and initially awkward structure of this species will have

*Experimental or trial.

to be monitored carefully in order for these trees to function properly in this small commercial district.

Marshall Way/Pacific Avenue:
Cinnamomum camphora - camphor
Tristania conferta - Brisbane box

Planting Recommendations
Tilia tomentosa - silver linden
Ulmus 'Princeton', 'Frontier', *'Accolade', *'Commendation', *'Jefferson', *'New Harmony', *'Patriot', *'Triumph', *'Washington', and possibly other varieties - various American and hybrid elms
Metrosideros excelsus - New Zealand Christmas tree
Pistacia chinensis 'Keith Davey' - Chinese pistache
Quercus coccinea - scarlet oak

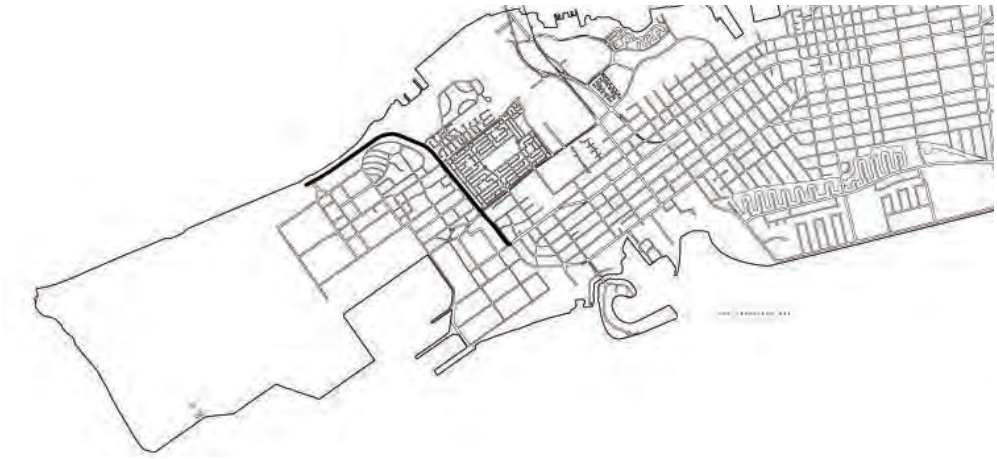
Design Recommendations
Plant closely placed ornamental trees. Strong seasonal color would nicely compensate for the absence of a large overhanging canopy.

Lincoln should be considered a priority street. Priority actions should include removing trees that are in decline.

Tilden Way: Currently there are no planter strips. If planned reconstruction of the street is completed then planting recommendations can be implemented.

*Experimental or trial.

MAIN STREET



Housing development along Main Street occurred mostly during the late 1800s to 1920s and in the 1950s. Along the entire west alignment of Main Street is Alameda Naval Air Station land, which is chain-link fenced and which includes storage yards as well as military housing and offices. When the first Master Tree Plan was drafted in 1989, there were no sidewalks, medians, or curbs along the east side. Currently, a new bike and pedestrian path runs along the eastern side, north of Atlantic Avenue. There are extensive plantings, and the landscape appears well established.

On the western side, the naval base is slated for development, so improved street trees will necessarily be a part of that new development. Also, there is a portion of the old Main Street alignment dislocated from the present Main Street by a wide, barren easement. From Atlantic to Pacific Avenue, Main Street changes to four lanes without medians. The housing here dates from approximately 1890 to 1904 and later. The connection of the buildings to the street is weak because the old Main Street alignment is separated from the new Main Street. It would create a more positive image if enhanced by uniform street tree planting and/or streetscape development, such as pedestrian walkways and connections from the old street alignment to the new.

At the northern end of Main Street is the Alameda Ferry Station terminal, built on an open, exposed site on the Inner Harbor. There is also a general industrial zone at the piers. This site is interrupted by Naval Air Station land for several blocks to the south, then it meets private land again at Hollister Circle, where low-cost housing is located. The wide, barren right-of-way zone along the eastern right-of-way would benefit from street tree planting, which would create a positive streetscape image and mitigate the harshness and chaos of the area. Hopefully, all these plantings will coincide with the new development planned for the naval base.

Existing Trees
Prunus caroliniana - Carolina laurel cherry
Alnus rhombifolia - white alder
Koelreuteria bipinnata - Chinese flame tree

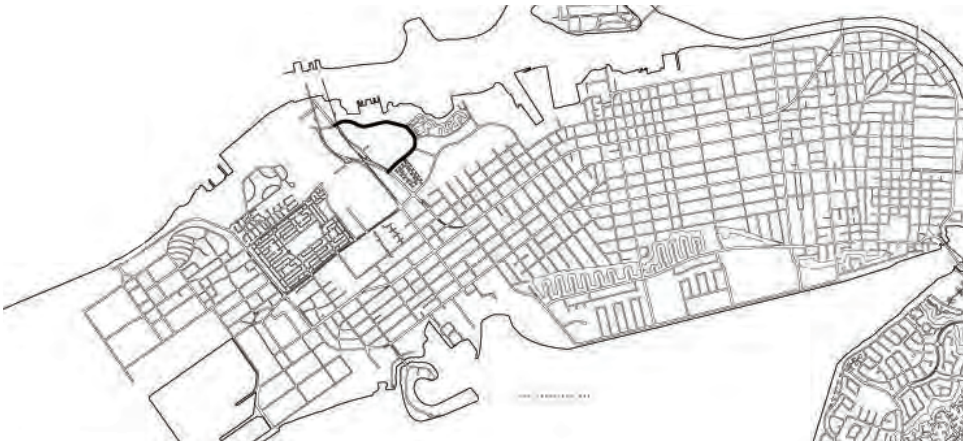
Planting Recommendations

To be deferred and coordinated with Alameda Point development using the Tree Matrix.

Design Recommendations

Carefully connect all future developments in the historic naval base with the surrounding street tree plantings. Main Street is currently a serious misnomer, as it actually feels like an end street. Careful streetscape design and mid-block plantings along the naval base could create a beautiful entrance parkway for the development at former navy site.

MARINA VILLAGE PARKWAY



This street has well-defined circulation and a strong sense of streetscape image. Street tree landscape plantings and medians were planned as a unit. The northern end of Marina Village Parkway relates to the Marina and estuary, and includes renovated offices that were former World War II Liberty ship construction sites. Marina Village Parkway changes to shopping center and townhouse developments toward the south. The street changes to four lanes without a median, but continues its integrated, consistent streetscape to Constitution Way.

Existing Trees
Acacia baileyana - Bailey acacia
Alnus cordata - Italian alder
Platanus acerifolia - London plane tree
Myoporum laetum – Myoporum
Pinus eldarica - Afghan pine
Populus nigra 'Italica' - Lombardy poplar

Planting Recommendations
Platanus acerifolia 'Yarwood' - London plane tree
Fagus sylvatica - European beech.

MECARTNEY ROAD

Mecartney Road is an important boulevard in Bay Farm Island. West of Island Drive to its terminus at Aughinbaugh Way, Mecartney presents a strong streetscape image, very similar to the northern end of Island Drive and of the same era: 1970s and 1980s multi-family development. It has wide landscaped medians and four lanes of traffic. From Island Drive east, Mecartney is a minor residential collector route through single-story residential development dating from approximately 1909 to the 1920s, 1930s, 1950s, and 1960s. There is little streetscape image because of few and small-scale street trees, no medians, and little attention paid to the pedestrian experience along its length. At Holly Street, the residences change to multi-family housing and the street image continues to lack identity.

Existing Trees
Eucalyptus rudis - swamp gum
Ceratonia siliqua - carob
Cinnamomum camphora - camphor
Fraxinus species - ash

Island Drive to Aughinbaugh Way:
Platanus acerifolia - London plane tree
Acacia baileyana - Bailey acacia
Prunus cerasifera - purple leaf plum
Pinus pinea - stone pine
Pinus radiata - Monterey pine
Populus nigra 'Italica' - Lombardy poplar

Planting Recommendations
**Gymnocladus dioica* 'Espresso' - seedless Kentucky coffee tree.
Platanus acerifolia 'Columbia' and 'Yarwood' - London plane tree
Corymbia ficifolia - red-flowering gum

Design Recommendations
Do not continue planting ash trees, due to the borer threat. Use ash-like species instead, such as seedless Kentucky coffee tree.

OTIS DRIVE

Otis Drive is an important east/west collector route that runs along the south side of mainland Alameda. Its eastern end is characterized by two lanes with small-stature mature street trees, which provide a unique identity but seem too small for the scale of the street. More trees should be planted where vacancies allow, speeding the process of strengthening the streetscape. There is a strong neighborhood character, with single-family development dating from the 1930s and 1940s on the east side, and from the 1960s to the west. Here, the lagoons lie south of, and are not visible from, Otis.

At Grand, the street tree plantings increase in number and consistency. At Park Street, the roadway changes to four lanes, surrounded by dense, multi-family housing and commercial one-story buildings. Just beyond Park, the lagoons switch to the north side of Otis and become the primary focus of the multi-family housing. The current lagoon landscaping along the northern side of Otis is excellent, and should be maintained with pride by the City. Also at Park Street, there is the relatively new mall development, Alameda Towne Center, with many small street trees that should, with careful maintenance, mature into a strong street tree canopy along the mall. The residences along here were built mostly in the 1960s. The western end of Otis Drive has a more definite streetscape identity; though the street trees are of varying stature and age, a pattern continues until the terminus of Otis at Westline Drive, across from the Robert Crown Memorial State Beach entrance.

Existing Trees
Bay Farm Island Bridge to Park Street:
Myoporum laetum - Myoporum
Crataegus laevigata - English hawthorn
Ligustrum lucidum – glossy privet

Park Street to Westline Drive:
Tristania conferta - Brisbane box
Eucalyptus rudis - swamp gum
Pyrus Calleryana - flowering pear

*Experimental or trial.

Planting Recommendations
Corymbia ficifolia - red-flowering gum
Metrosideros excelsus - New Zealand Christmas tree
Pyrus calleryana 'Aristocrat' - flowering pear
Tilia tomentosa - silver linden. For use where bay mud soils are not present

Design Recommendations
Significant work has been completed along Otis Drive. Planting vacancies should be filled in to maximize the benefits of the already completed work.

PARK STREET

Park Street is one of the major commercial streets in Alameda, and it has a very strong sense of identity. It successfully deals with circulation and the combination of pedestrian and vehicular ways. The architecture dominates the streetscape, ranging from vintage 1880s to 1909 Victorian and Edwardian to 1920s and newer structures. The street trees from Central to Times Way were replaced with Gingko and Crape Myrtle as part of the phase 1 streetscape project. Phase 2 is scheduled to begin in 2009 and will modify the plantings between Times Way and Lincoln as well as between Central and Encinal.

From Encinal southward, the commercial buildings are primarily from the 1880s to 1920s, and they match the residential character to which the street transitions at its southern end. Here, there are medium- to large-stature trees and a change to two lanes from four; these changes strengthen the residential character of the streetscape.

There are also many new trees between Encinal and Otis that have tremendous street canopy potential. Beyond Otis Drive, there is a single-story shopping center development that continues to Shoreline Drive without street trees or residential buildings. In 1989, the end of Park Street was completely divided from the older portion, as there was no consistency between the old and the new parts of the street. As a result of tree plantings by the City, there is currently a much better connection between the old and new parts of Park Street.

Existing trees

The frost in the winter of 1990 damaged and killed nearly all the laurel figs in the business district of Park Street; some of them have recently been replaced with swamp myrtle, which proved unsatisfactory due to litter and difficulty achieving 15' vertical clearance to maintain visibilty of store signage. In 2005-2006, phase 1 of the streetscape project installed Gingkos and Crape Myrtle. There are still several cherry laurels and glossy privets throughout the business district. The large parkways between Otis Drive and San Jose Avenue are perfect sites for large-stature trees.

Planting Recommendations

North of Clinton Avenue (in commercial district): *Ginkgo biloba* ' Fairmount' - maidenhair tree

Lagerstroemia indica x *L. fauriei* Crape Myrtle 'Tuscarora' and possibly other varieties

South of Clinton Avenue:

Ginkgo biloba 'Fairmount' or 'Saratoga' - maidenhair tree. Do not plant 'Fairmount' under high voltage lines.

Quercus coccinea - scarlet oak

**Quercus falcata* - southern red oak. Do not plant under high voltage lines.

Design Recommendations

Continue to maintain younger trees, and plant new trees in existing vacant locations.

Park Street should be considered a priority street. Priority actions include removing trees that are in decline and planting new ones.

Phase 3 of the streetscape project will select trees from the tree matrix for the remaining portion of the commercial development, north of Lincoln.

*Experimental or trial.

ROBERT DAVEY JR. DRIVE (formerly BRIDGEWAY ROAD)

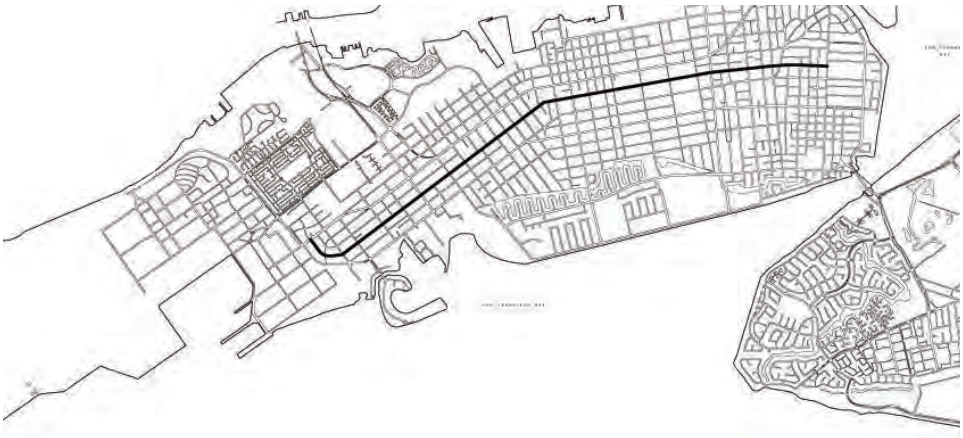
Robert Davey Jr. Drive is a residential collector road between Island Drive and the developments at the northwestern end of Bay Farm Island. It was planned in conjunction with other Bay Farm Island development initiated in the 1970s and has a similar character to Island Drive and Mecartney Road, though it is smaller in scale.

Although rear residential lots here back onto the street, there are attractive wood fences and landscaped pathways that mitigate the separation. These fences meander along the length of Robert Davey Jr. Drive, echoing the curved nature of the street itself and presenting an inviting, park-like experience for either vehicular or pedestrian use.

Existing trees
Along sidewalks:
Platanus acerifolia - London plane tree
In medians:
Alnus rhombifolia - white alder
Acacia baileyana - Bailey acacia
Prunus cerasifera - purple leaf plum
Pinus pinea - stone pine
Pinus radiata - Monterey pine

Planting Recommendations
Platanus acerifolia - London plane tree, 'Yarwood' or 'Columbia'
Fagus sylvatica - European beech. Use to replace the existing *Alnus rhombifolia*

SANTA CLARA AVENUE



Santa Clara Avenue is a major east/west boulevard through mainland Alameda. At its extreme western end, it sets a good example of strong streetscape character for a smaller, residential collector street. Its identity is created and reinforced by homes of similar type and character, and by a streetscape that supports the residential intent of the area. There are two lanes, sidewalks on both sides, and uniform, large-stature street tree plantings that enhance the scale of the residences. The homes are single-story and were built from approximately 1880 to 1930. Additionally, some date from prior to 1872, when the City of Alameda started keeping official records.
Progressing east along Santa Clara Avenue, the mature street trees have begun to die out and have been removed in places. Further on, new medium-stature trees replace the trees that were removed. Because of varying tree age and species, the uniform image of the street starts to break down and it loses some of its identity.

At the Webster Street intersection, the housing changes to two-story multi-family mingled with one-story single-family residential. Beyond Webster at Eighth Street, we begin to see fewer street trees of various species and age. Further east past Stanton, there are areas of multi-family housing, schools, and churches, though most development remains single-family residential. Overall, Santa Clara Avenue has a strongly residential character, which could be enhanced by a more uniform street tree planting along its length. Since 1989, the character of Santa Clara has not changed significantly. Santa Clara still has tremendous potential, since it has a natural scale ideal for a strong streetscape and canopy coverage.

Existing Trees
Cinnamomum camphora - camphor
Ceratonia siliqua - carob
Prunus caroliniana - Carolina cherry laurel
Quercus agrifolia - coast live oak
Tristania conferta - Brisbane box

Planting Recommendations
Keep the all-evergreen look established by the surviving camphor trees by planting the following:

Tristania conferta - Brisbane box
Corymbia ficifolia - red-flowering gum
Metrosideros excelsus - New Zealand Christmas tree
Quercus virginiana – southern live oak

Design Recommendations
Santa Clara should be another priority street, because of the street's wonderful natural scale and tremendous potential. Priority actions should include removing trees that are in decline and planting new ones.

SHORELINE DRIVE

The nature of Shoreline Drive is very different from other streets as it affords sweeping views of the San Francisco Bay and the San Francisco skyline. This street is also unique in that it serves public beaches along its length. It is protected from some buffeting at its southern end by the Bay Farm Island land mass.

The land that fronts Shoreline Drive was created by landfill in the mid-1950s to the 1960s. It is characterized by multi-family residential buildings built in the 1950s on the north end, which range from two- to four-story and which all face the bay. The residential character is interrupted at its eastern end for several blocks by one- and two-story commercial developments. Its streetscape image is dominated by its wide-open feeling and bay view, which help to mitigate the height of the buildings along its north side, versus the horizontal character of the beach on the south.

Existing trees
Pittosporum undulatum - mock orange
Myoporum laetum - Myoporum
Metrosideros excelsus - New Zealand Christmas tree

Planting Recommendations
In order to protect views from the adjacent apartments The City should only plant *Washingtonia robusta* (Mexican fan palm). If *W. robusta* are planted, they should be planted all at once to ensure uniform height. Some of the existing *Metrosideros excelsus* may have become too large and dense for view protection. If there is a desire to maintain them, some of them may need to be removed so that there is more separation between the trees to maintain view corridors. Minimum spacing may range from a minimum of 40' and maximum of 60' to maintain 20' separation between cannopies. A 30' maximum tree spacing is generally too close to preserve views, especially for spreading species like M. Excelsus which would require up to 60' of tree spacing. So it may be necessary to space so that a 30 degree view corridor is provided. The removals could be phased over time as the trees mature. A detailed discussion of view corridors is in the following "Design" section of the Master Street Tree Plan. Italian Cypress is recommended as a possible alternative to M. Excelsus but spacing would have to be modified to a 20' rule.

Design Recommendations

Due to the unique conditions along Shoreline Drive, the street deserves a carefully considered streetscape plan. Both sides of the street should be oriented towards the bay, trees that severely obstruct residents' views should be removed where appropriate. An ideal Shoreline planting palette would connect the residential side of the street with the beach side of the street using beach grasses and native plantings.

Shoreline Drive should be considered a priority street. Priority actions should include removing trees that are in decline.

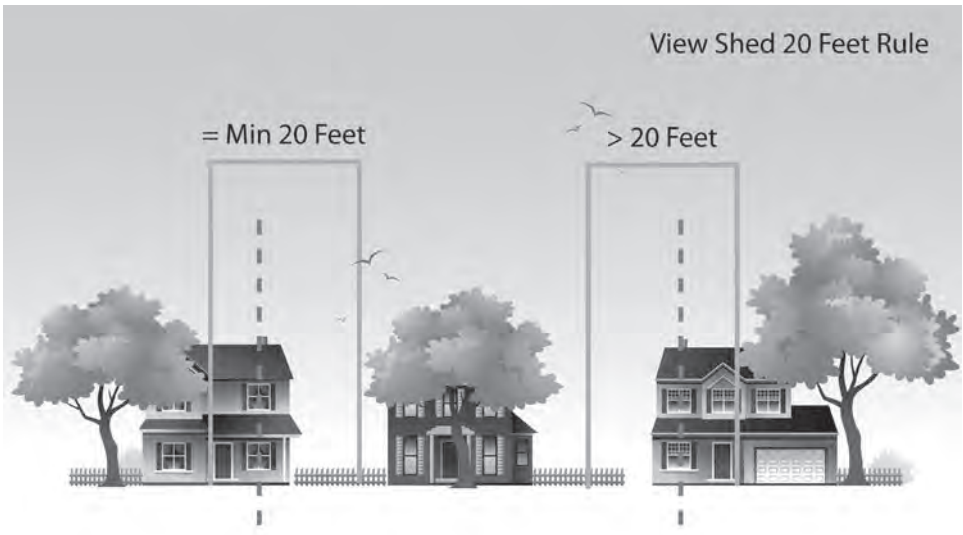
Private Views and Public Trees

Many homes are located along Shoreline Drive. These homes often would have dramatic views of the San Francisco skyline and the San Francisco Bay, were it not for trees in the public right of way. The City has never adopted an official policy that negotiates conflicts between public street trees and private views. Currently, street trees can be pruned for private views but cannot be topped or removed solely for that purpose. To improve coastal view sheds, the following guidelines are suggested:

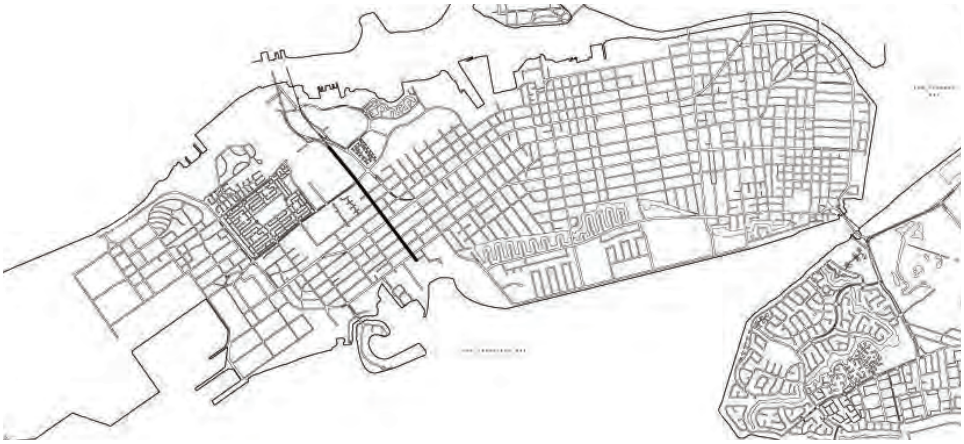
- Existing healthy trees shall not be removed.
- Replacement tree plantings must be from the Shoreline Drive planting palette which include monoculture of W. robusta or a semperuirens 'stricta' or a mix of W. robusta and M. excelsus.
- No more than 10% of the trees will be removed in any year.
- Responsibility rests with the property owner to petition the City to change tree spacing and modify the established view shed.
- Removal of existing street trees to increase view shed should follow the Min 20 Feet Rule for W. Robusta and Italian Cypress (see Figures 1.1A and B)

Figure 1.1 A / Before removal of street trees to provide coastal views.

Figure 1.1 B / Removal of street trees using the Min 20 Feet Rule allows for coastal views while maintaining same canopy cover.



WEBSTER STREET



Webster Street is one of the major commercial corridors in Alameda and has a strong sense of identity. This is the main entrance to the city, and it begins in an area of stores and small businesses (refer to the "City Entry Gateways" section for further discussion). Webster Street, which is entirely a business district, successfully manages circulation and the combination of pedestrian and vehicular ways. The architecture dominates the streetscape, with structures mostly built in the 1940s and later, along with some older buildings. Webster has a completely new streetscape with an extensive new planting program that includes many new trees, plantings, light fixtures, and bump-outs.

Existing Trees
Pyrus calleryana 'Aristocrat' - flowering pear
Lagerstroemia indica

Planting Recommendations
Pyrus calleryana 'Aristocrat' - flowering pear
Lagerstroemia indica x L. fauriei 'Tuscarora' - crape myrtle. Use as an accent tree.

WESTLINE - EIGHTH STREET - CONSTITUTION WAY

This major boulevard travels through three distinct eras in Alameda's history. Eighth Street represents the oldest portion, Westline Drive was built in the 1950s, and Constitution Way development has largely been completed in the last five years. Eighth Street has a very residential character and an attractive streetscape, with one lane of traffic each way. Within the Burbank-Portola Heritage Area, it is comprised mostly of Craftsman-style bungalows that date from 1912 to 1914. From Central Avenue north, there are also two-story apartments from the 1920s to 1930s, convincingly made to look like single homes, as well as a school site. There is a mix of evergreen and deciduous street trees, most of which are mature, medium- to large-scale trees.

Progressing towards Constitution, the streetscape development is much newer. The street changes to four lanes, and because houses face on side streets, ivy-covered privacy walls jog alongside the street. At its intersection with Shoreline Drive, Westline Drive is characterized by beach and park land with large park trees on the west side, in contrast to high-density housing to the east. This area was constructed during the 1950s to 1960s.

Portola Avenue is the location of the old seawall and what was once the southernmost edge of Alameda, prior to the formation of new land with fill soil south of the seawall in 1956. In 1964, Eighth Street was extended to what is now Shoreline Drive. This area still has a strong sense of identity created by the bungalow architecture, the uniform, mature palm tree plantings, and the adjacent parks. North of Buena Vista Avenue, Constitution Way, which previously had a disoriented feeling because of the varied land uses, has now developed a stronger pedestrian connection as the result of new plantings. At Marina Village Parkway, this identity gives way to a well-planned commercial development on the east. Eighth Street at Haight Street shows some wonderful street tree plantings.

Existing Trees
Eighth Street:
Washingtonia robusta - Mexican fan palm
Robinia pseudoacacia - black locust
Fraxinus holotricha 'Moraine' - Moraine ash 'Tilia'

Constitution Way:
Magnolia grandiflora - southern magnolia - sides
Alnus rhombifolia - white alder - median
Prunus x blireiana - flowering plum - median
Jacaranda mimosifolia - Jacaranda - median
Pistachia Chinensis - median
Platanus acerifolia - sides and median
Tristania conferta - sides

Westline Drive:
Eucalyptus rudis - swamp gum
Pittosporum undulatum - victoria bay

Planting Recommendations
Constitution Way north of Lincoln:
Tristania conferta - Brisbane box
Platanus acerifolia 'Columbia' and 'Yarwood' - London plane tree
Magnolia grandiflora 'Russett'- southern magnolia

Eighth Street north of Central:
Tristania conferta - Brisbane box

Eighth Street between Central and Portola:
Washingtonia robusta - Mexican fan palm

West Line Drive:
Corymbia ficifolia - red-flowering gum
Tristania conferta - Brisbane box
Platanus acerifolia 'Columbia' and 'Yarwood'
- London plane tree

1.2 / NEIGHBORHOODS OF ALAMEDA

The following section contains summaries of the existing tree populations within the 22 neighborhoods of Alameda that are identified by the US Census Bureau. Major streets that are found within neighborhoods are treated separately in the previous section of this plan. The discussion also contains recommendations for replacement tree species to be used in a variety of environments due to lack of availablility or problem with species identified in neighborhood palette. Changes to the neighborhood tree selection lists must be approved by the Public Works Director and must only include tree species drawn from the Tree Matrix at the end of this MSTP. Such changes must be approved by the Planning Board.

NEIGHBORHOOD TREE RECOMMENDATION PARAMETERS

The neighborhood recommendations presented in this section are based on the following parameters:

1. The tree selections are drawn from the non-experimental trees shown on the Tree Matrix and reflect the matrix information on such issues as minimum planting area size and seaside tolerance. Note, however, that the City of Alameda Tree Matrix's experimental trees can also be included as neighborhood trees as described below in "Experimental Trees."

2. The recommended trees from the 1989 Master Tree Plan neighborhoods lists are retained, except where: (a) they were deleted from the Tree Matrix, or (b) they were deleted from the 1989 neighborhood list because of the considerations listed below.

3. The total number of tree species recommended for each neighborhood ranges from two to ten, based primarily on the number of vacant planting sites, but also on achieving a balance between retaining existing desirable trees on the lists and offering residents a choice of trees as discussed in Item 4 below.

4. Each neighborhood list is designed for a greater planting complexity by recommending at least one each of the following: a large evergreen tree, a large deciduous tree, a small tree, a tree with spring flowers, and a tree with good fall color.

5. *Platanus acerifolia* is not shown on the neighborhood lists because it is overplanted in Alameda.

6. *Ginkgo biloba* is deleted from the 1989 planting lists for East Central and Northside East because it is also overplanted in the city. It also has not been added to any new neighborhoods.

7. *Pyrus calleryana* is not included in the neighborhood lists (except for commercial areas) because of continued maintenance concerns.

8. *Magnolia grandiflora* should only be used on a limited basis where planting areas are large enough. The neighborhood recommendations, therefore, assume a planting area size for *M. grandiflora* in five-foot wide planter strips. *Magnolia*

grandiflora planting recommendations have been retained in the three neighborhoods where it is already listed in the 1989 plan. All three neighborhoods have planting areas up to six feet wide. Additionally, *Magnolia grandiflora* is added to the Bayview/Shoreline neighborhood, which has a high number of large planting areas up to seven feet wide.

9. There was an effort to make significant use of all non-experimental trees in the approved Tree Matrix, while avoiding overuse of any one tree. Therefore, except for *Platanus acerifolia* and *Pyrus calleryana* (which have been overplanted), each non-experimental tree is used for at least two neighborhoods and up to a maximum of seven neighborhoods.

EXPERIMENTAL TREES

In addition to the species and varieties listed for each neighborhood, the species and varieties identified as "experimental" on the citywide Tree Species Matrix can be used in any neighborhood if they are provided the minimum planting area size shown in the matrix, and are well suited to the planting site's environmental conditions (drainage conditions, soil, seaside exposure, etc.). Although designated as experimental, all of these trees are believed likely to do well in Alameda as street trees, and their use is strongly encouraged. The objective is to establish approximately 10 street tree examples of each experimental species or variety in the city for ongoing monitoring and evaluation.
In some cases, the evaluation period may only last several years, but in other cases, such as where the tree's hardscape damage potential is not well known, a longer evaluation will be required. If the tree proves satisfactory after completion of the evaluation period, it is recommended that it be retained in the matrix on a non-experimental basis, added to the neighborhood tree lists, and possibly added to the major street designations. If the tree proves unsatisfactory, it will be removed from the matrix and not used further in Alameda.

SPECIAL NEIGHBORHOOD STREETS

Within some Alameda neighborhoods there are streets with an extraordinary developed tree character or pattern. Planting efforts along these neighborhood streets should strengthen and maintain this character. The following page shows the list of these special neighborhood streets and their existing species and recommended species.

STREET	LOCATION	EXISTING SPECIES
Alameda Ave.	1500 - 2100 block	Red Oak Species (*Quercus* spp.)
Bay St.	1100 - 1200 blocks	English Elm (*Ulmus procera*)
Burbank St.	1300 block	Mexican Fan Palm (*Washingtonia robusta*)
Eighth St.	1300 - block	California Fan Palm (*Washingtonia filifera*), Mexican Fan Palm (*Washingtonia robusta*)
Portola Ave.	800 block	Mexican Fan Palm (*Washingtonia robusta*)
Union St.	1400 block	Silver Linden (*Tilia tomentosa*)
Stanton St.	1500 block	Red Oak Species (*Quercus* spp.)
Johnson Ave.	2900 block	European Hornbeam (*Carpinus betulus*)
Mozart St. and Verdi St.	Entire length	London Planetree (*Platanus acerifolia*)
Bay St.	Lincoln Ave. - Eagle Ave.	Aristocrat Pear (*Pyrus calleryana* 'Aristocrat')
Chapin St.	Lincoln Ave. - Eagle Ave.	Sweetgum (*Liquidambar styraciflua*)
Sherman St.	Lincoln Ave. - Eagle Ave.	Brisbane Box (*Lophostemon confertus*)
Pacific Ave.	Bay St. - Wood St.	Aristocrat Pear (*Pyrus calleryana* 'Aristocrat')
Park Ave.	Entire length	London Planetree (*Platanus acerifolia*)
Grove St. and Fountain St.	Encinal Ave. - Jackson St.	Sweetgum (*Liquidambar styraciflua*)
Sherman St.	San Antonio Ave. - Encinal Ave.	Sweetgum (*Liquidambar styraciflua*)
Morton and St. Charles St.	San Antonio Ave. - Encinal Ave.	Black Locust (*Robinia pseudoacacia*)

RECOMMENDED SPECIES

Shumard Oak (*Quercus shumardii*), Scarlet Oak (*Quercus coccinea*)

Silver Linden (*Tilia tomentosa*), American Elm cultivars (*Ulmus americana*), Hybrid Elm (*Ulmus* spp.)

Mexican Fan Palm (*Washingtonia robusta*)

Mexican Fan Palm (*Washingtonia robusta*)

Mexican Fan Palm (*Washingtonia robusta*)

Silver Linden (*Tilia tomentosa* 'Sterling' or 'Green Mountain')

Shumard Oak (*Quercus shumardii*), Scarlet Oak (*Quercus coccinea*)

European Hornbeam cultivars (*Carpinus betulus* 'Frans Fontaine' and *C. betulus* 'Fastigata')

American Hornbeam (*Carpinus caroliniana*)

London Planetree cultivars (*Platanus acerifolia* 'Bloodgood', *P. acerifolia* 'Columbia', and *P. acerifolia* 'Yarwood')

Continue Pyrus Calleryana 'Aristrocat' or use Acer rubrum 'October Glory'

October Glory Maple (*Acer rubrum* 'October Glory'), Brandywine Maple (*Acer rubrum* 'Brandywine'), Scarlet Oak (*Quercus coccinea*)

Brisbane Box (*Lophostemon confertus*)

Silver Linden cultivars (*Tilia tomentosa* 'Green Mountain' and *T. tomentosa* 'Sterling') Pyrus Calleryana 'Aristicrat'

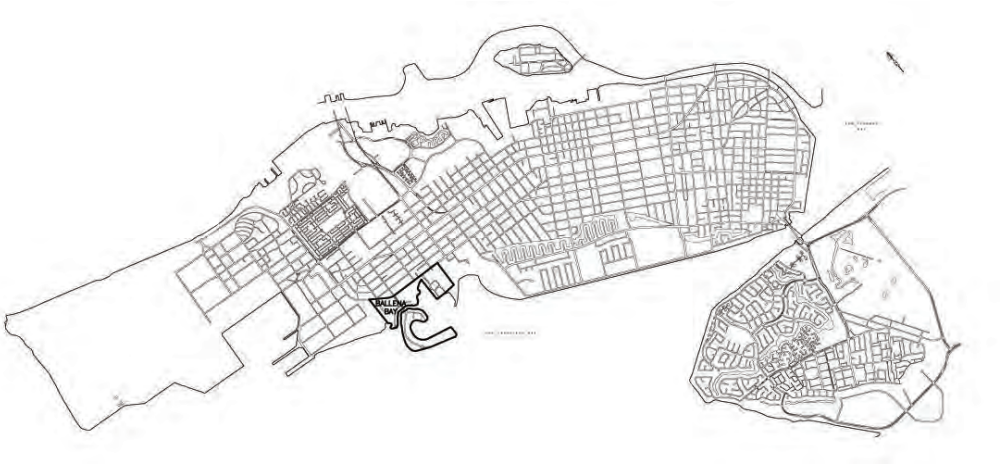
London Planetree cultivars (*Platanus acerifolia* , *P. acerifolia* 'Columbia', and 'Yarwood')

Acer ruburum 'October Glory', *Quercus coccina*

Acer ruburum 'October Glory', *Quercus coccina*

Kentucky Coffee Tree (*Gymnocladus dioecia* 'Espresso') *Koclreuteria Bipinata*

BALLENA BAY

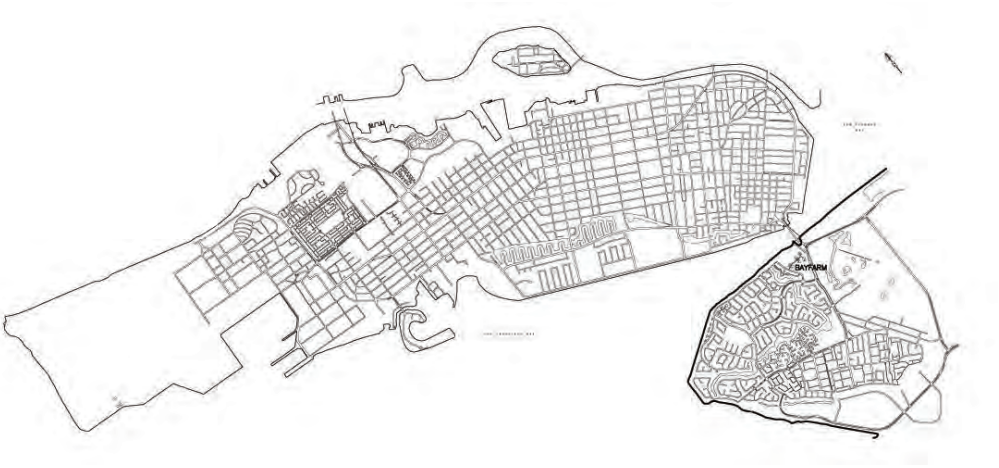


Street trees in this neighborhood are limited to Ballena Boulevard, Tideway, and Cola Ballena. This neighborhood was not surveyed in the 2008 tree inventory.

Existing Trees:
Alnus cordata
Eucalyptus rudis
Metrosideros excelsus

Planting Recommendations:
Carpinus betulus 'Fastigiata' - fastigiate hornbeam
Metrosideros excelsus - New Zealand Christmas tree

BAY FARM ISLAND



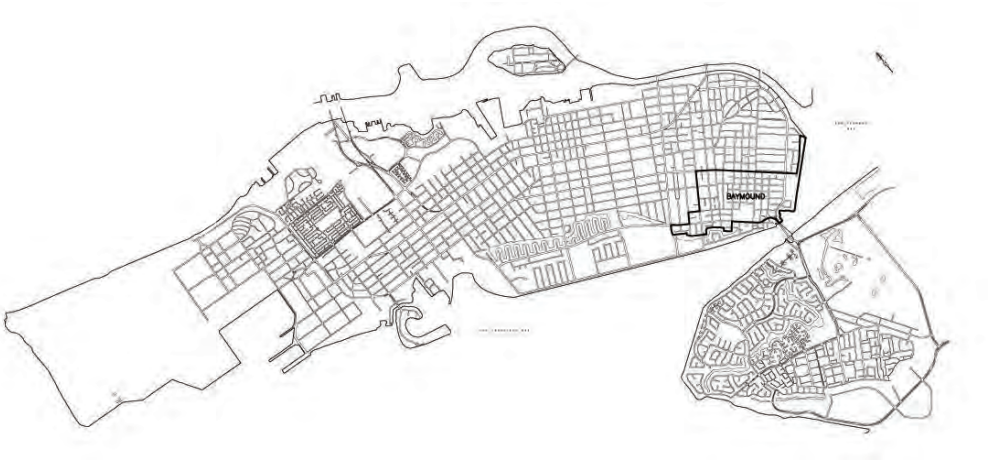
Total # trees surveyed: 3720
Vacant Sites: 455
Range of Planting Strip Widths: 2-7 feet (there are many trees in the wide medians on Island Drive and Mecartney Road, but only a few available spaces for planting in these locations).

Existing Trees:
Alnus rhombifolia
Fraxinus angustifolia
Platanus acerifolia
Prunus cerasifera
Pyrus calleryana
Tristania conferta

The absence of overhead utilities and the relatively large planting strips found here provide an opportunity for planting large-stature trees. Maintenance in this area is currently being shared by the homeowners' association and the City. In many of the new developments, trees are being planted at a spacing pattern far too dense for the eventual mature dimensions of these trees. Future thinning out of these trees may be necessary in order to maintain the overall health of this sub-population.

Improved planting scheme selections:
Acer campestre - hedge maple
Tristania laurina - swamp myrtle
Metrosideros excelsus - New Zealand Christmas tree *Aesculus hippocastanum* 'Baumannii' - Baumann's horsechestnut
Corymbia ficifolia - red-flowering gum
Jacaranda mimosifolia - Jacaranda
Quercus coccinea - scarlet oak
Quercus palustris - pin oak
Quercus suber - cork oak

BAY MOUND



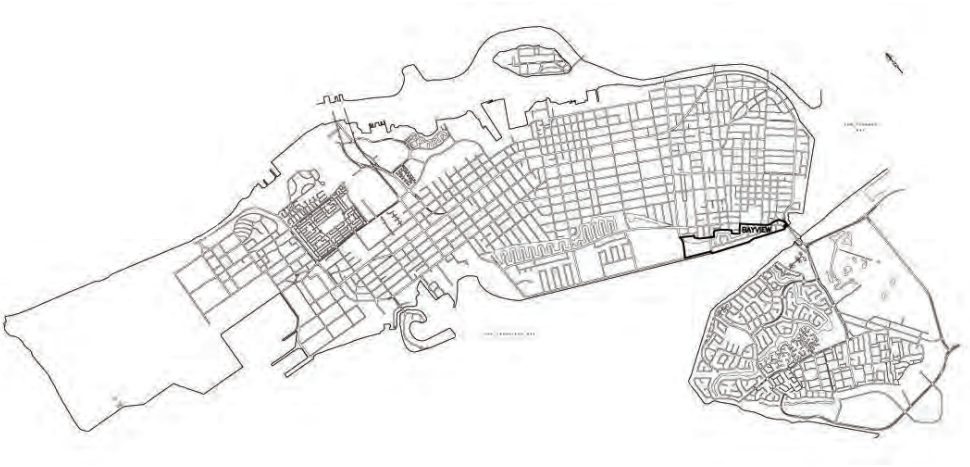
Total # trees surveyed: 1227
Vacant Sites: 429
Range of Planting Strip Widths: 2-7 feet

Existing Trees:
Cinnamomum camphora
Crataegus laevigata
Fraxinus oxycarpa
Fraxinus uhdei
Fraxinus velutina
Geijera parviflora
Ginkgo biloba
Metrosideros excelsus
Myoporum laetum
Platanus acerifolia
Prunus caroliniana
Pyrus calleryana
Sapium sebiferum

Five species comprise the majority of the tree population in this neighborhood. These trees are distributed fairly evenly between Camphor, Myoporum, Carolina Cherry, and Carob. Unfortunately, many of these species are notorious for uplifting sidewalks; they are also the species which will mature when they reach heights of 30 feet or less. The Camphor are mostly 12-18" diameter at breast height (DBH). Overall, the majority of the trees in the neighborhood are 3-6" DBH, indicating a young population. Because there are vacant planting sites available, there are many opportunities to change species diversity. New tree species could be planted, establishing a significant tree canopy in anticipation of removing the more destructive species such as Camphor, - Carob, and Indian Laurel Fig.

Planting Recommendations:
Acer buergeranum - trident maple
Acer campestre - hedge maple
Aesculus carnea - red horsechestnut
Corymbia ficifolia - red-flowering gum
Metrosideros excelsus - New Zealand Christmas tree
Acer saccharum 'Commemoration' - sugar maple *Carpinus betulus* 'Fastigiata' and 'Frans 'Fontaine' - hornbeam Pistacia chinesis
Jacaranda mimosifolia - Jacaranda
Quercus palustris – pin oak
Ulmus americana 'Princeton' - elm

BAY VIEW



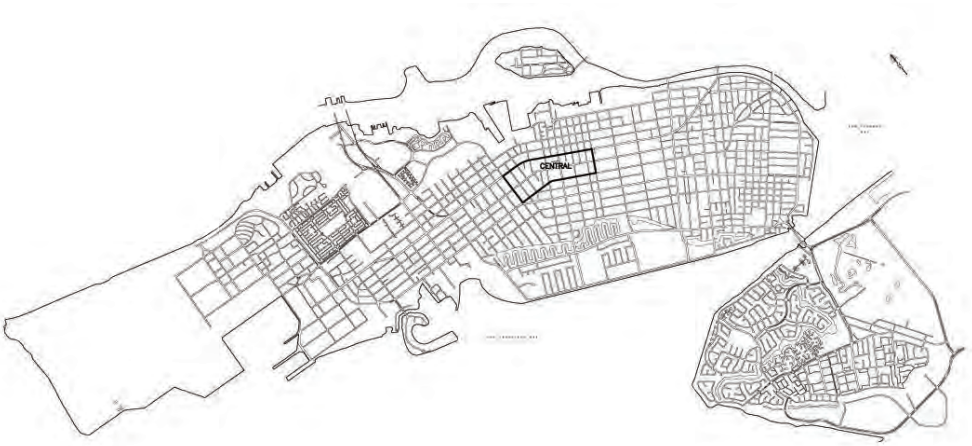
Total # trees surveyed: 59
Vacant Sites: 24
Range of Planting Strip Widths: 3-7 feet

Existing Trees:
Myoporum laetum

The public tree population in the Bayview area is limited due to lack of public easement.

Planting Recommendations:
Acer buergeranum - trident maple
Acer campestre - hedge maple
Aesculus carnea - red horsechestnut
Corymbia ficifolia - red-flowering gum
Metrosideros excelsus - New Zealand Christmas tree
Acer saccharum 'Commemoration' - sugar maple *Carpinus betulus* 'Fastigiata' and 'Frans 'Fontaine' - hornbeam Pistacia chinesis
Jacaranda mimosifolia - Jacaranda
Quercus palustris – pin oak
Ulmus americana 'Princeton' - elm

CENTRAL



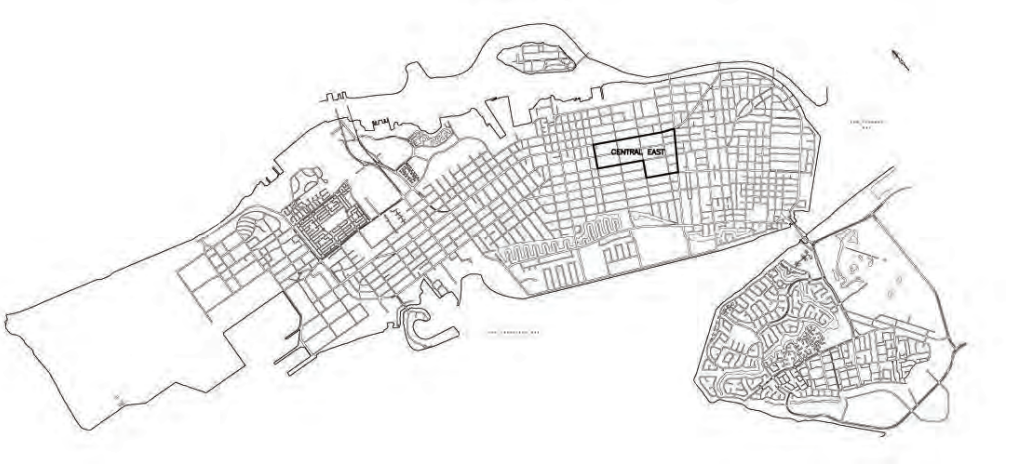
Total # trees surveyed: 384
Vacant Sites: 118
Range of Planting Strip Widths: 2-6 feet

Existing Trees:
Brachychiton populneus
Cinnamomum camphora
Liquidambar styraciflua
Platanus acerifolia
Pyrus calleryana

Excellent, deep soils and many mature trees typify this neighborhood. Many of the older trees are species that cause considerable concrete damage. Most trees are in the 6-12" and 12-18" DBH classes. Seventy percent of the planting sites are 3.5 feet wide, which is a fairly large space compared to the common planting sizes in other parts of the city. The main east/west streets are discussed in the "Major Streets" section of this report. The recommendations made here are meant for the comparatively narrow north/south streets.

Planting Recommendations:
Acer buergeranum - trident maple
Acer campestre - hedge maple
Aesculus carnea - red horsechestnut
Ginkgo biloba 'Saratoga' - Saratoga maidenhair tree
Koelreuteria bipinnata - Chinese flame tree
Podocarpus gracilior - fern pine
Tilia tomentosa 'Green Mountain' & 'Sterling' - silver linden

CENTRAL EAST



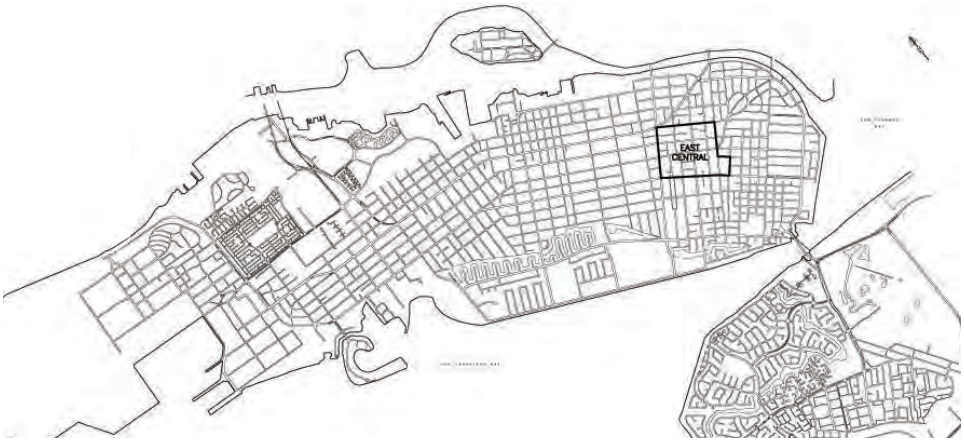
Total # trees surveyed: 195
Vacant Sites: 48
Range of Planting Strip Widths: 2-6 feet

Existing Trees:
Ceratonia siliqua
Ginkgo biloba
Platanus acerifolia

The major streets of this neighborhood are discussed in the "Major Streets" section. Sections of Oak, Willow, and Walnut Streets in this neighborhood do not have adequate growing space for street trees. New tree wells at least three feet wide should be installed along Oak, Willow, and Walnut Streets to improve planting options.

Planting Recommendations:
Tristania conferta - Brisbane box
Acer nigrum - black maple
Acer buergeranum - trident maple
Aesculus carnea - red horsechestnut
Carpinus betulus 'Frans Fontaine' - hornbeam
Nyssa sylvatica - black tupelo
Tilia tomentosa 'Green Mountain' and 'Sterling' - silver linden

EAST CENTRAL



Total # trees surveyed: 329
Vacant Sites: 55
Range of Planting Strip Widths: 2-6 feet

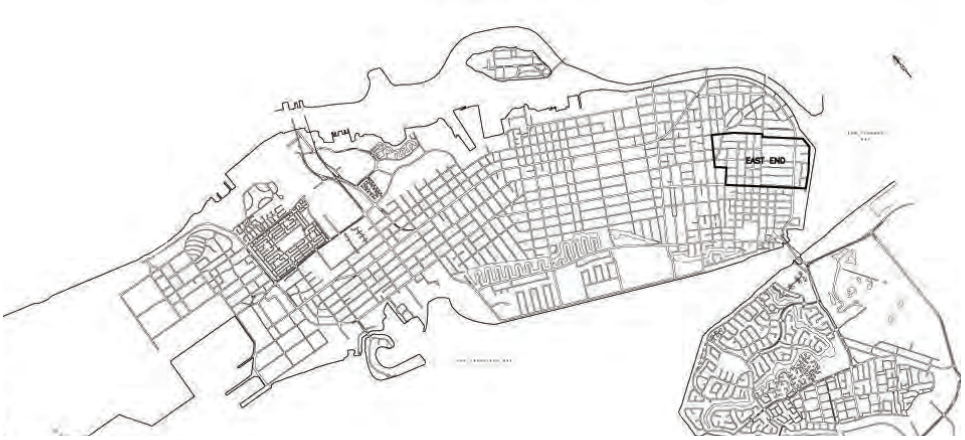
Existing Trees:
Fraxinus velutina
Ginkgo biloba
Ligustrum lucidum
Platanus acerifolia

London planes account for the majority of the neighborhood trees. The plane trees are fairly large, with the majority of them in the 18-24" and 24-30" DBH class. The inherently poor strength and branching structure of the Modesto ash, combined with the tendency of its roots to uplift the sidewalk, targets this species for removal and replacement with more site-appropriate trees. Recommended species for planting are primarily for streets running north to south, as most of the east to west major streets are treated under the "Major Streets of Alameda" discussion.

Planting Recommendations:
Commercial areas:
Carpinus betulus 'Frans Fontaine' - hornbeam
Acer nigrum 'Greencolumn' - black maple

Residential areas:
Metrosideros excelsus - New Zealand Christmas tree
Jacaranda mimosifolia - Jacaranda
Pistacia chinensis 'Keith Davey' - Chinese pistache
Quercus suber - cork oak
Ulmus 'Frontier' - elm

EAST END



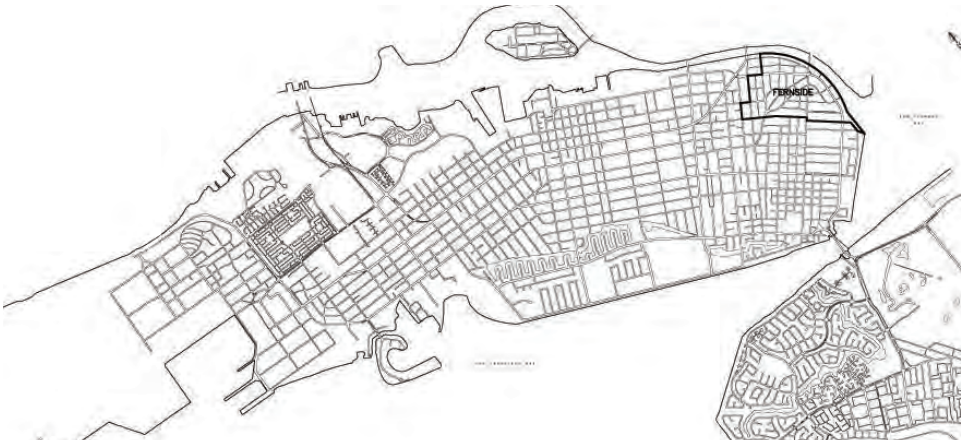
Total # trees surveyed: 532
Vacant Sites: 80
Range of Planting Strip Widths: 2-5 feet

Existing Trees:
Brachychiton populneus
Ginkgo biloba
Liquidambar styraciflua
Platanus acerifolia
Prunus caroliniana
Pyrus calleryana

The area is dominated by Ginkgo, plane tree, and Liquidambar species. The majority of the planting sites are 3 to 3.5 feet wide. The shallow rooting habits of Liquidambar can cause extensive sidewalk damage as they mature in size. The Liquidambars here are mature and are showing signs of decline.

Planting Recommendations:
Metrosideros excelsus - New Zealand Christmas tree
Acer saccharum 'Commemoration' - sugar maple
Pistacia chinensis 'Keith Davey' - Chinese pistache
Tristania laurina - swamp myrtle
Lagerstromia x 'Natchez' and 'Tuscarora' - crape myrtle
Quercus coccininea
Acer rubrum 'October glory' and Brandy wine

FERNSIDE



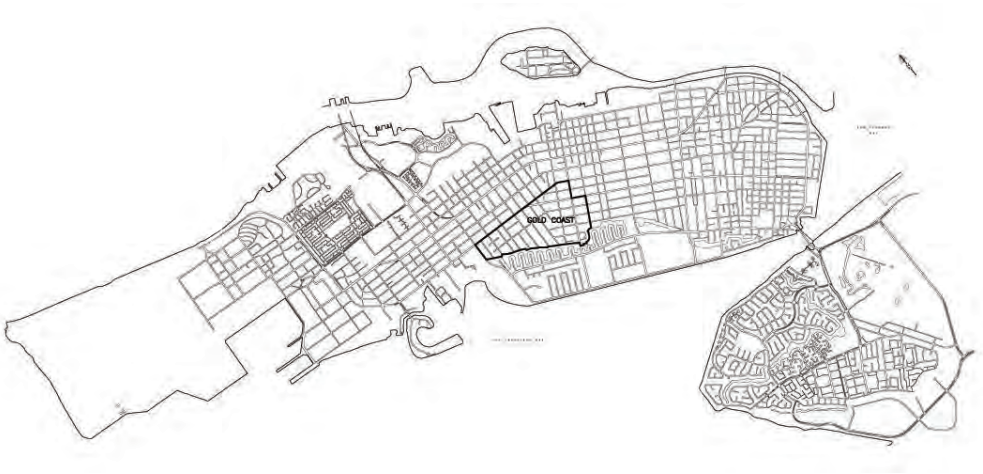
Total # trees surveyed: 501
Vacant Sites: 80
Range of Planting Strip Widths: 2-6 feet

Existing Trees:
Ginkgo biloba
Liquidambar styraciflua

Approximately half of this neighborhood's trees were surveyed in the 2008 tree inventory. This neighborhood is one of the most densely tree-populated areas of Alameda. In 1989, there were 868 trees with 59% being Ginkgos. The majority of these trees were newly planted in 1989; over 60% of the *Ginkgo* trees are currently less than 6" in diameter. All of the readily available cultivars of the species are seen here, such as fine specimens of 'Autumn Gold' at 3001 and 3009 Marina Drive. Two fine examples of 'Fairmount' may be seen at 2014 Harvard Avenue.

Planting Recommendations:
Acer x *freemanii* 'Autumn Blaze' - Freeman maple
Acer nigrum 'Green Column' - black maple
Acer rubrum 'October Glory' and 'Brandywine' - red maple
Tristania conferta - Brisbane box
Carpinus betulus 'Fastigata' and 'Frans Fontaine' - hornbeam
Platnus - for planter strip more than 5'
Silver Linden

GOLD COAST



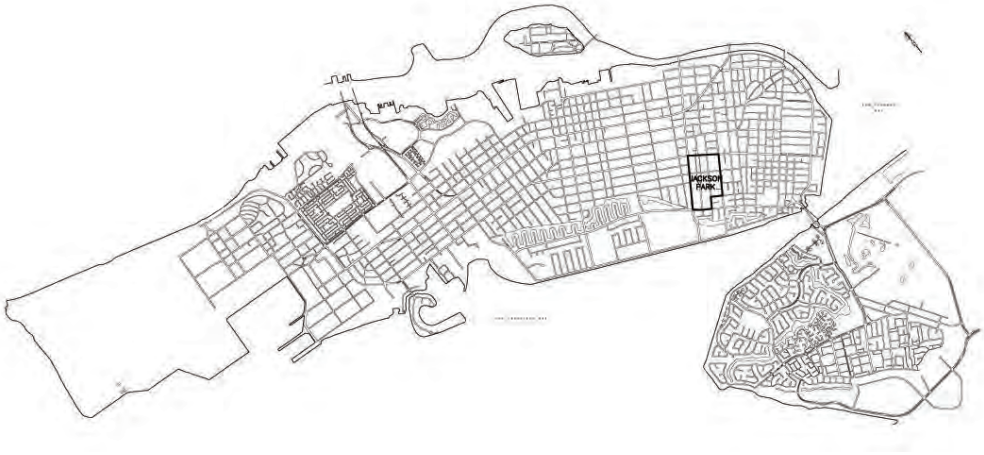
Total # trees surveyed: 1095
Vacant Sites: 232
Range of Planting Strip Widths: 2-6 feet

Existing Trees:
Ginkgo biloba
Liquidambar styraciflua
Platanus acerifolia
Prunus caroliniana
Pyrus calleryana
Robinia pseudoacacia
Ulmus procera
Washingtonia robusta

This neighborhood contains trees that have some of the largest average DBH measurements in the city. The trees are fairly evenly distributed, but the most frequent species is black locust. The next most frequent species are, in descending order: English elm, Mexican fan palm, Liquidambar, and London plane. Many of the Mexican fan palms are found along Burbank Street. The majority of these top five species are larger than 12" DBH, due in part to the area's exceptionally good soils. The larger sized trees, while very attractive and essential to the ambience of the neighborhood, also cause quite a bit of pavement damage. This neighborhood can continue to add to its already dense tree cover since a total of 232 new planting sites have been identified.

Planting Recommendations:
Ginkgo biloba 'Saratoga' - Saratoga maidenhair tree
Magnolia grandiflora 'Russet' - southern magnolia
Magnolia grandiflora 'St. Mary'- southern magnolia
Prunus yedoensis - Yoshino cherry
Quercus palustrus - pin oak
Quercus shumardii - Shumard oak
Tilia tomentosa 'Green Mountain' or 'Sterling' - silver linden
Acer rubrum 'October Glory' and 'Brandywine' - red maple
Ulmus 'Frontier' - hybrid elm

JACKSON PARK



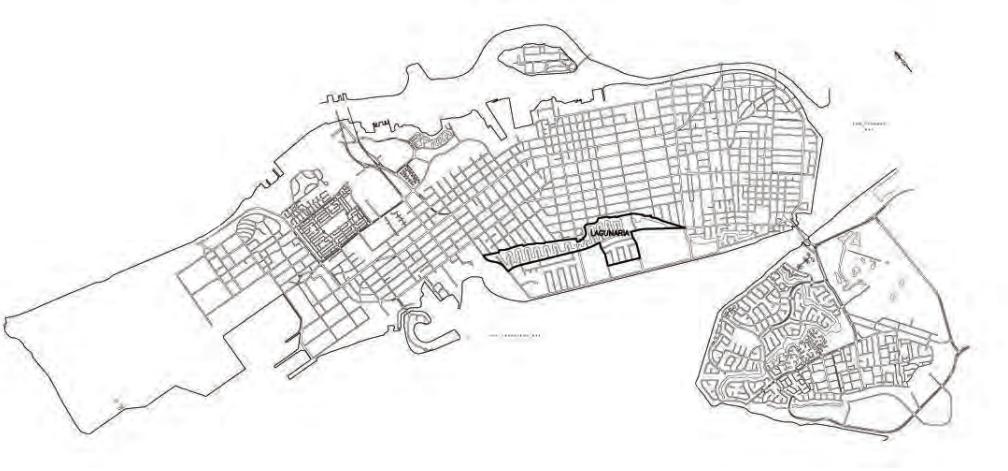
Total # trees surveyed: 170
Vacant Sites: 107
Range of Planting Strip Widths: 3-7 feet

Existing Trees:
Fraxinus velutina
Platanus acerifolia

This area is an eclectic mix of architectural styles ranging from two-and-one-half-story refurbished Victorians to large, modern buildings. A significant proportion of the planting strips have been paved over in this area. The London plane trees surrounding Jackson Park, although technically park trees, function as street trees and thus were included in the inventory. The trees that surround this park should remain London plane trees, with the proviso that the existing *Platanus acerifolia* trees be replaced with a disease-resistant cultivar, *Platanus acerifolia* 'Yarwood', or 'Columbia'.

Planting Recommendations:
Acer x *freemanii* 'Autumn Blaze' - Freeman maple
Acer buergeranum - Trident maple
Acer campestre - hedge maple
Acer nigrum 'Green Column' - black maple
Carpinus betulus 'Fastigiata' - fastigiate hornbeam
Koelreuteria bipinnata - Chinese flame tree
Jacaranda mimosifolia - Jacaranda
Podocarpus gracilior - fern pine

LAGUNARIA



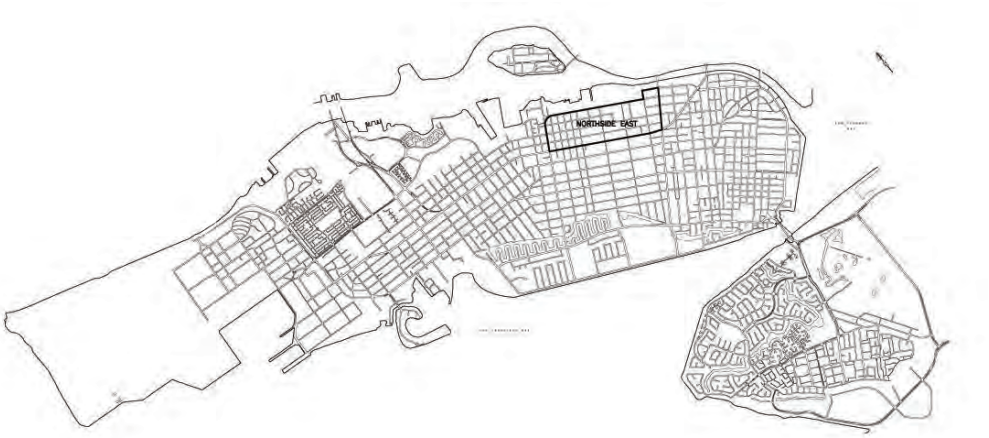
Total # trees surveyed: 288
Vacant Sites: 83
Range of Planting Strip Widths: 2-5 feet

Existing Trees:
Alnus cordata
Ginkgo biloba
Platanus acerifolia
Pyrus calleryana
Tristania conferta

The short cul-de-sacs north of Otis Drive are without the necessary easement for public street trees. Otis Drive is treated in the "Major Streets" section of this report. The portion of Lagunaria that contains trees is located in a small area south of Otis. The area is notable in that the majority of planting sites are 4.5 feet wide, which is quite a large space compared to those in other neighborhoods. Additionally, none of the planting sites here are obstructed by utility or other service wires. Similar to the Southshore neighborhood, the harshness of bay fill soils, a perched water table, and constant strong winds test the survival of any selected tree species.

Planting Recommendations:
Corymbia ficifolia - red-flowering gum
Podocarpus gracilior - fern pine
Quercus coccinea - scarlet oak
Quercus palustris - pin oak

NORTHSIDE EAST



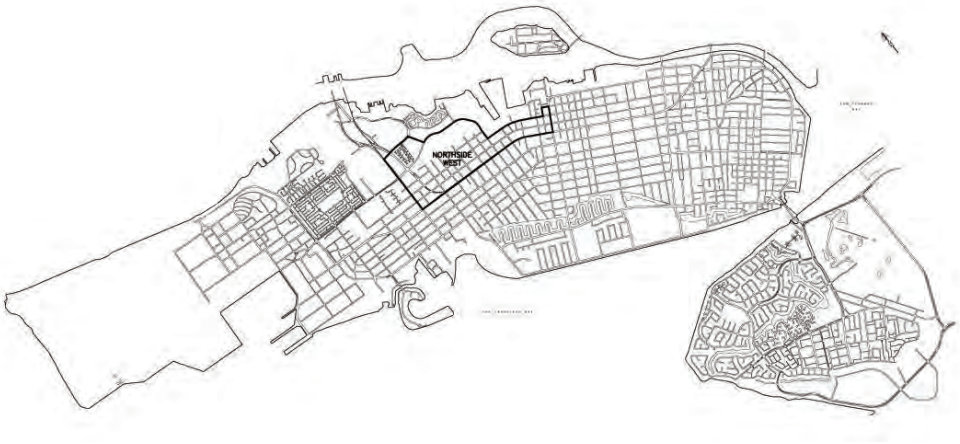
Total # trees surveyed: 450
Vacant Sites: 250
Range of Planting Strip Widths: 2-5 feet

Existing Trees:
Brachychiton populneus
Liriodendron tulipifera
Pittosporum undulatum
Platanus acerifolia
Pyrus calleryana

There are 450 trees in this neighborhood with an additional 250 available vacant sites. The soil quality in much of this area is exceptionally good, thus taller-growing species may be selected for these sites. Three of the four major east/west streets are dealt with in the "Major Streets of Alameda" section.

Planting Recommendations:
Tilia tomentosa 'Green Mountain' & 'Sterling' - silver linden
Acer rubrum 'October Glory' & 'Brandywine' - red maple
Aesculus hippocastanum 'Baumannii' – Baumann's horsechestnut
Prunus yedoensis - Yoshino cherry
Quercus palustris - pin oak
Tristania laurina - swamp myrtle
Ulmus 'Princeton' - American elm

NORTHSIDE WEST



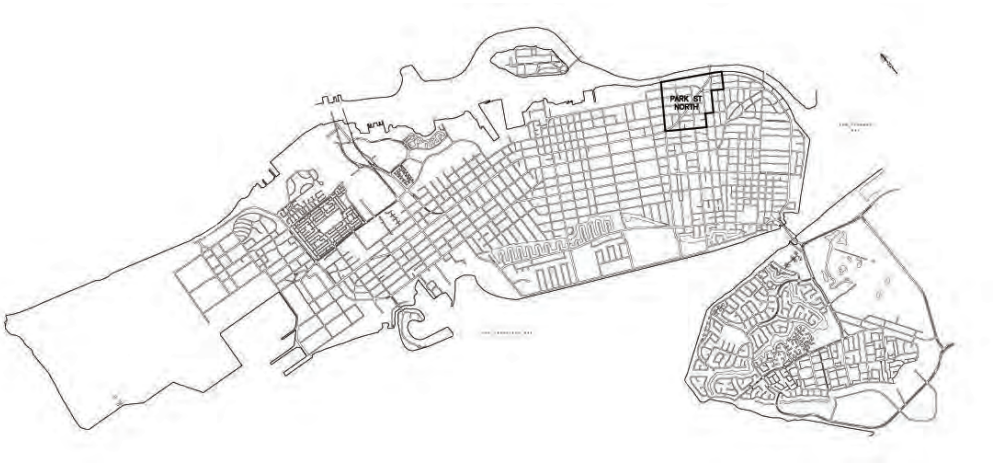
Total # trees surveyed: 772
Vacant Sites: 207
Range of Planting Strip Widths: 2-13 feet

Existing Trees:
Brachychiton populneus
Liquidambar styraciflua
Magnolia grandiflora
Pistacia chinensis
Platanus acerifolia
Pyrus calleryana

With one of the largest tree populations, tree species in this neighborhood are fairly diverse with the largest single species being aristocrat pear. The Brisbane box, the second most frequent species, is similar to the pear in its distribution among the diameter classes. Most of the trees are less than 6" DBH, with a slightly larger number in the 6-12" class. The majority of the existing and vacant planting sites are 3 - 3.5 feet wide. A large number of the sites are 5.5 feet wide, which provides a generous growing space.

Planting Recommendations:
Carpinus betulus 'Fastigiata' - fastigiate hornbeam *Cercis canadensis* - eastern redbud
Nyssa sylvatica - black tupelo
Pistacia chinensis - Chinese pistache
Jacaranda mimosifolia - Jacaranda
Podocarpus gracilior - African fern pine
Ulmus 'Frontier' - Frontier hybrid elm
Lagerstroemia x 'Natchez' and 'Tuscarora' - crape myrtle

PARK STREET NORTH



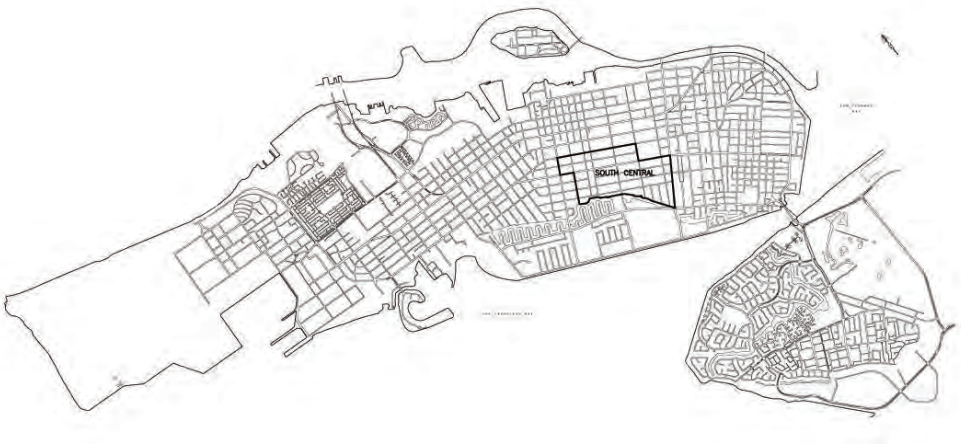
Total # trees surveyed: 69
Vacant Sites: 78
Range of Planting Strip Widths: 2-6 feet

Existing Trees:
Platanus occidentalis
Pyrus calleryana

The 69 trees in the neighborhood are distributed between 10 species; of these, the most common one is Bradford pear. The majority of these trees are less than 6" DBH. There are 78 vacant growing sites that can supplement the existing tree population. However, a majority of these planted and vacant sites are three feet wide, suitable only for small to medium stature trees.

Planting Recommendations:
Acer nigrum 'Green Column' - black maple
Aesculus carnea - red horsechestnut
Carpinus betulus 'Fastigiata' - fastigiate hornbeam
Ginkgo biloba 'Fairmount' - maidenhair tree
Lagerstroemia x 'Tuscarora' and 'Natchez' - crape myrtle
Prunus sargentii 'Columnaris' sargent cherry
Prunus yedoensis - Yoshino flowering cherry

SOUTH CENTRAL



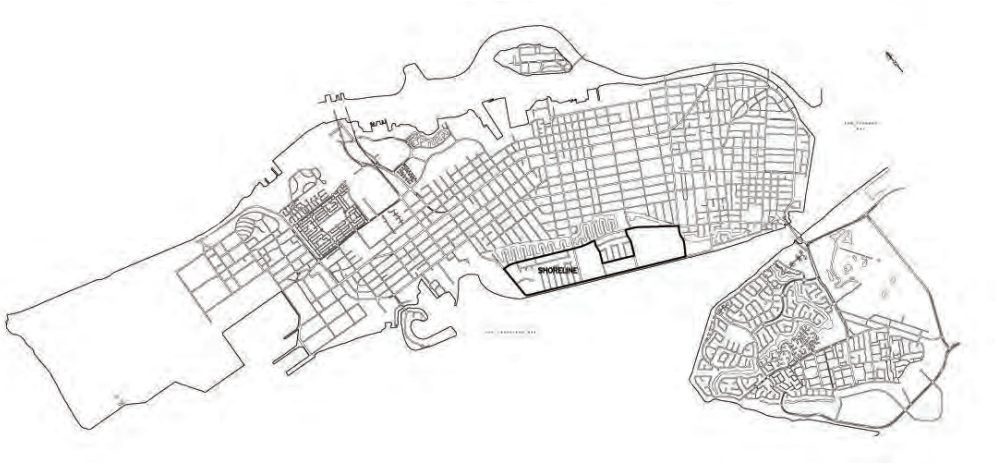
Total # trees surveyed: 616
Vacant Sites: 253
Range of Planting Strip Widths: 2-6 feet

Existing Trees:
Brachychiton populneus
Ceratonia siliqua
Geijera parviflora
Ginkgo biloba
Jacaranda mimosifolia
Ligustrum lucidum
Platanus acerifolia
Pyrus calleryana
Quercus rubra

There is relatively even species distribution of the 616 neighborhood trees. Most of the vacant planting spaces are either 3 or 3.5 feet wide.

Planting Recommendations:
Koelreuteria bipinnata - Chinese flame tree
Nyssa sylvatica - black tupelo
Pistacia chinensis - Chinese pistache
Quercus shumardii - Shumard oak
Acer rubrum 'October Glory' and 'Brandywine' - red maple
Acer saccharum 'Commemoration' - sugar maple
Jacaranda mimosifolia - Jacaranda
Prunus yedoensis - Yoshino cherry
Quercus suber - cork oak

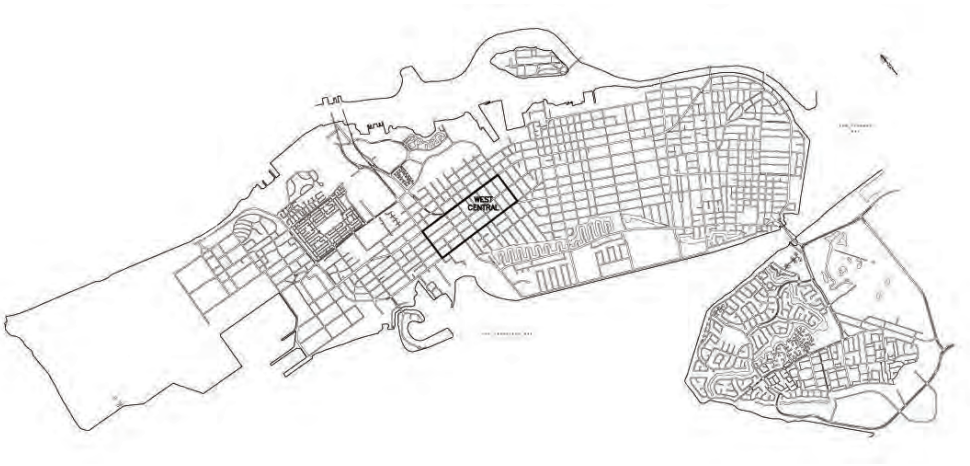
SOUTH SHORE



This area seems to possess better growing site conditions than many other neighborhoods; a majority of the planting sites (both occupied and vacant) are 4.5 feet wide and only a small fraction of the sites are obstructed by overhead wires. Although these particular conditions might allow for more flexibility in species selection, this area is typified by constant high velocity winds and poor soil. Appropriate tree species are those that are adapted to seaside environmental factors and tolerant to alkaline bay fill soils, which are sometimes covered with a layer of sand. Due to similar environmental factors, tree selections for Bayview and South Shore neighborhoods were combined in one recommendation.

Planting Recommendations:
Metrosideros excelsus - New Zealand Christmas tree
Tristania conferta - Brisbane box
Tilia tomentosa 'Green Mountain' & 'Sterling' -
silver linden
Lagerstroemia x 'Natchez' & 'Tuscarora' - crape myrtle

WEST CENTRAL



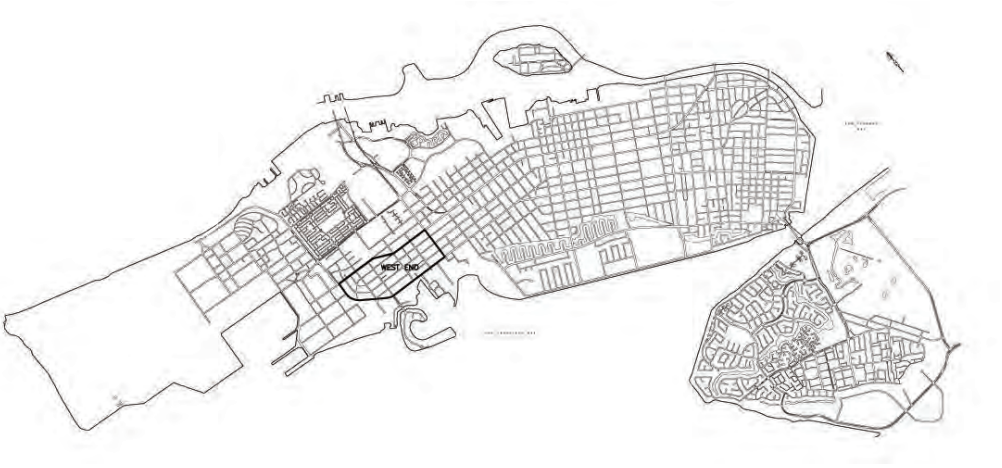
Total # trees surveyed: 265
Vacant Sites: 66
Range of Planting Strip Widths: 2-6 feet

Existing Trees:
Brachychiton populneus
Pistacia chinensis
Platanus acerifolia
Pyrus calleryana

This neighborhood has deep soils capable of growing large trees. The two most popular species in this neighborhood are the bottle tree and the London plane; they make up 40% of the total population of 265 trees. A large proportion of both tree populations are larger than 6" DBH; bottle trees are heavily skewed in the 6-12" class, while London planes are skewed in the 18-24" class. The majority of all available planting sites are either 3 or 3.5 feet wide. The main east/west streets are discussed separately in the "Major Streets" section of this report. Recommendations made here are meant for the comparatively narrower north/south streets.

Planting Recommendations:
Acer buergeranum - trident maple
Acer campestre - hedge maple
Aesculus x *carnea* - red horsechestnut
Koelreuteria bipinnata - Chinese flame tree
Magnolia grandiflora 'Russet' and 'St. Mary' - southern magnolia
Ginkgo biloba 'Saratoga' and 'Fairmount' - maidenhair tree
Podocarpus gracilior - fern pine
Tilia tomentosa 'Green Mountain' and 'Sterling' - silver linden

WEST END



Total # trees surveyed: 550
Vacant Sites: 284
Range of Planting Strip Widths: 2-6 feet

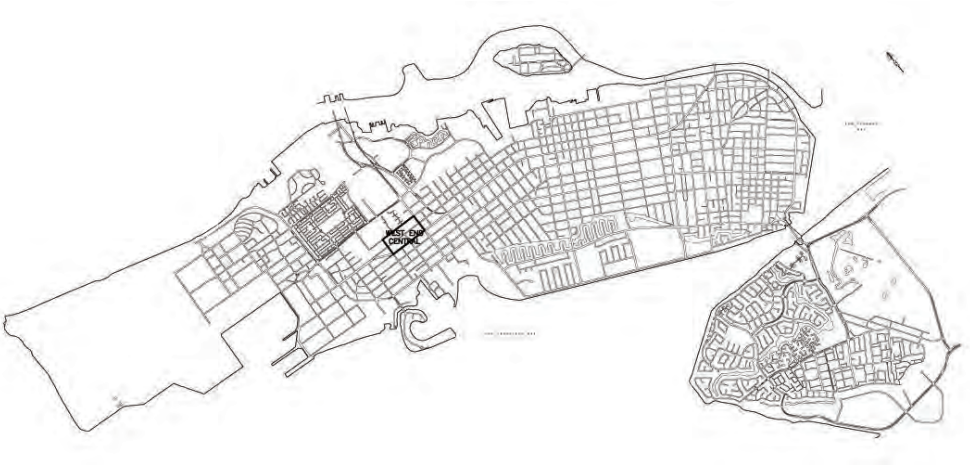
Existing Trees:
Brachychiton populneus
Cinnamomum camphora
Koelreuteria bipinnata
Pyrus calleryana

The most frequent species in this population of 550 trees are Chinese flame tree, camphor, Brisbane box, and bottle tree. Enough vacant planting sites were identified (284) to increase the existing tree population significantly. The majority of the planting sites are three feet wide.

Planting Recommendations:
Carpinus betulus 'Fastigiata' - fastigiate hornbeam
Cercis canadensis - eastern redbud
Koelreuteria bipinnata - Chinese flame tree
Tristania laurina - swamp myrtle
Acer nigrum 'Greencolumn' - black maple
Acer rubrum 'October Glory' & 'Brandywine' - red maple

Aesculus hippocastanum 'Baumannii' - Baumann's horsechestnut
Ulmus 'Princeton' - American elm

WEST END CENTRAL



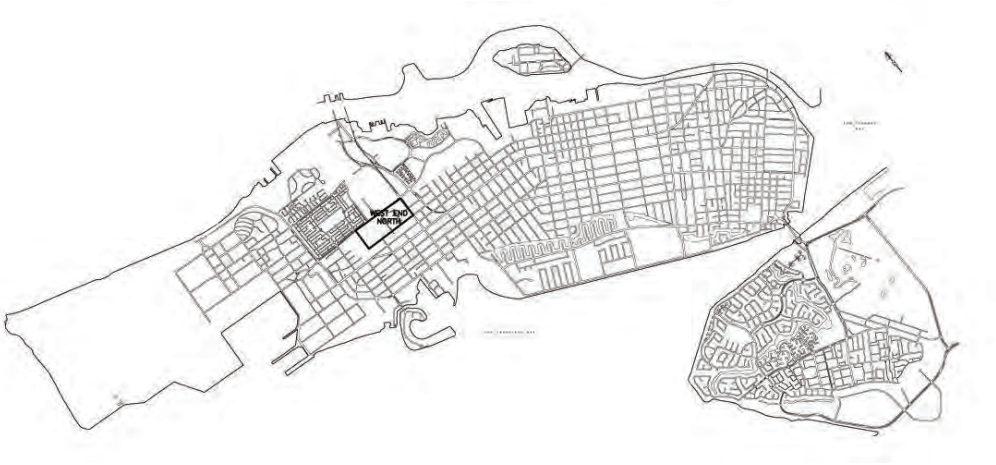
Total # trees surveyed: 80
Vacant Sites: 48
Range of Planting Strip Widths: 3-6 feet

Existing Trees:
Brachychiton populneus
Pyrus calleryana

This neighborhood is comprised of school grounds plus a mixture of apartments and older single-family homes. With only 80 trees in the neighborhood, bottle trees account for the majority. All of these trees are between 3 -18", with the majority being in the 6-12" DBH class. The majority of available planting sites are 3.5 to 5.5 feet wide, all generously sized growing spaces.

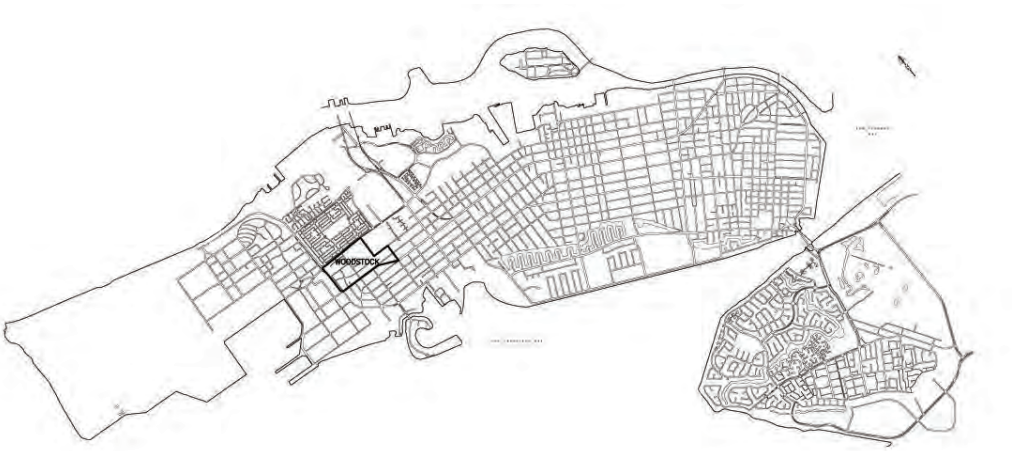
Planting Recommendations:
Acer x *freemanii* 'Autumn Blaze' - Freeman maple
Acer saccharum 'Commemoration' - sugar maple
Jacaranda mimosifolia - Jacaranda
Podocarpus gracilior - fern pine
Quercus coccinea - scarlet oak
Quercus suber - cork oak
Lagerstroemia x 'Natchez' and 'Tuscarora' -
crape myrtle

WEST END NORTH



In 1989, all West End North trees were *Ficus* and were of small diameter—all but one of the trees were smaller than 3" DBH. This small size indicates that the trees were young and were newly planted in 1989. There are currently no planting sites available, and, therefore, no recommendations for improved planting schemes.

WOODSTOCK



Total # trees surveyed: 150
Vacant Sites: 51
Range of Planting Strip Widths: 3-28 feet

Existing Trees:
Acacia melanoxylon
Platanus acerifolia

Of the 51 planting sites identified, 65% are 4.5 or 4 feet wide, which allows for planting larger-growing species that are not practical in other areas. Fourteen spaces are available in the wide tree lawn on the west side of Main Street.

Planting Recommendations:
Aesculus hippocastanum 'Baumannii' - Baumann's horsechestnut
Podocarpus gracilior - fern pine

For small, constrained planting sites use:
Tilia tomentosa 'Green Mountain' and 'Sterling' - silver linden
Pistacia chinensis 'Keith Davey' - Chinese pistache

1.3 / BUSINESS DISTRICTS OF ALAMEDA

Listed below are the appropriate plant selections for those commercial areas of Alameda not specifically addressed in either street or neighborhood plant selection discussions. The following trees can be pruned to allow for view corridors and growth above business signs:

Planting Recommendations:
Acer nigrum 'Green Column' - black maple
Ginkgo biloba 'Fairmount' - maidenhair tree
Metrosideros excelsus - New Zealand Christmas tree
Quercus palustris - pin oak
Acer rubrum 'Armstrong' - red maple
Pyrus calleryana 'Aristocrat' - flowering pear
Lagerstroemia x 'Natchez' and 'Tuscarora' - crape myrtle

CHAPTER 2

ABORICULTURAL BEST PRACTICES

Street trees must be properly planted and maintained in order for them to be a beautiful, valuable, and safe asset to the community.

This section provides detailed tree care guidelines that should be strictly enforced by Alameda's Department of Public Works. The guidelines incorporate the industry's best practices as written by the International Society of Arboriculture (ISA), and include details on:

- New tree planting
- Buying high-quality trees
- Pruning young trees
- Pruning mature trees
- Mature tree care
- Proper mulching technique
- Tree removals
- Insect and disease problems
- Protecting trees under construction

2.0 / NEW TREE PLANTINGS

PRIORITIZING NEW STREET TREE PLANTINGS

New street tree plantings should be prioritized as follows, where #1 are the highest priority plantings and #4 are the lowest priority plantings:

1. When an existing street tree has been removed and the now-vacant site is deemed suitable for another tree
2. Along the major streets of Alameda, as identified in the 2008 Street Tree Inventory
3. In neighborhoods where the number of vacant sites is high
4. In neighborhoods where the number of vacant sites is low

The filling in of planter strips with hardscape cannot be done without design review approval and an encroachment permit. Design review approval shall only be granted if street trees within the affected area are all planted in inappropriate locations with 3x mature tree radius of open space on both sides of the tree, and if pedestrian traffic is sufficient to justify a wider sidewalk.

NUMBER OF STREET TREES PER PROPERTY

The number of trees planted per property may vary somewhat, depending on the following factors:

1. Recommended spacing for selected tree species given mature dimensions
2. Proximity to street intersections and traffic control devices
3. Existing trees, shrubs, fences, and obstructions
4. Location of driveways, sidewalks, curbs, and gutters
5. Length of frontage
6. Utilities (lines and boxes)

Minimum Planting Dimensions

These design guidelines were developed from industry best practices and aim to maximize the success of street tree planting in the public domain. It should be noted that these guidelines are for new trees only and do not apply to existing trees.

New trees to be located along the street can be planted with the following minimum clearances:

- Trees planted in the planter strips can be an obstacle to the safe passage of pedestrians. For this reason, tree planting should not occur in planter strips that are less than the recommended widths that are in the tree matrix. The Tree Matrix defines the minimum width for each species.

- No tree shall be maintained in such a position or placed as to obstruct or interfere with the minimum sight line standards: Vision shall be clear between the elevations of three (3) feet and fifteen (15) feet above the average street grade with a triangle measuring twenty (20) feet from the corner along the two street curb lines

or 5' from curb return, whicjever is greater. This should create a 45 degree clear visibility triangle.

- New trees should be planted at a spacing of 20-40 feet, so that the crowns of mature trees will just touch.

Small trees: 20 feet to 26 feet spacing
Medium trees: 24 feet to 32 feet spacing
Large trees: 32 feet to 40 feet spacing

PLANTING THE TREE

The ideal time to plant trees and shrubs is in the late fall or winter during the dormant season after leaf drop, or in early spring before budbreak. Weather conditions are cool and allow plants to establish roots in the new location before spring rains and summer heat stimulate new top growth. Before planting a tree, be sure that all underground utilities are located prior to digging.

If the tree that is being planting is balled or bare-root, it is important to understand that its root system has been reduced by 90 to 95% of its original size during transplanting. As a result of the trauma caused by the digging, uprooting, storage, transportation and planting process, these trees commonly exhibit what is known as "transplant shock". Containerized trees may also experience transplant shock, particularly if they have circling roots that must be cut. Transplant shock is indicated by slow growth and reduced vigor following transplanting. Proper site preparation before planting, coupled with good follow-up care, reduces the duration of the transplant shock and allows the tree to quickly establish in its new location. By carefully following the nine simple steps outlined below, the City can significantly increase the likelihood of survival of its street tree plantings. A detailed diagrammatic planting specification is located in Appendix 1.

1. Dig a shallow, broad planting hole. Make the hole three times the diameter of the root ball if possible, but only as deep as the root ball. A wide hole is important because the roots on the newly planted tree must push through surrounding soil in order to establish. On most planting sites in new developments, the existing soil has been compacted and is unsuitable for healthy root growth. Breaking up the soil in a large area around the tree provides the newly emerging roots more room to expand into loose soil to hasten establishment.

2. Identify the trunk flare, the point where the roots spread at the base of the tree. This point should be partially visible after the tree has been planted. If the trunk flare is not partially visible, remove soil from the top of the root ball until part of the trunk flare is visible.

3. Remove any container, burlap, fabric, wire, or string from the tree's root zone. Inspect the root ball for circling roots, which should be removed with sharp hand pruners or a pruning saw. All remaining roots should be heading away from the trunk of the tree.

4. Place the tree at the proper depth in the hole. Before placing the tree in the hole, check to see that the hole has been dug to the proper depth. The top -most

major root emerging from the trunk flare should be located at the soil surface when the tree is placed in the hole (see Figure 5.0). The majority of the roots on the newly planted tree will develop in the top 12 inches of soil; if the tree is planted too deeply, new roots will have difficulty developing because of a lack of oxygen. To avoid damage when setting the tree in the hole, always lift the tree by the root ball and never by the trunk.

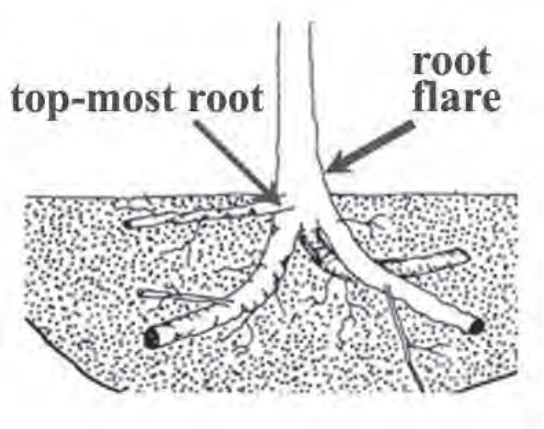


Figure 2.0

5. Straighten the tree in the hole. Before backfilling, have someone view the tree from several directions to confirm that the tree is straight. Once backfilling has begun, it is difficult to reposition the tree.

6. Fill the hole gently but firmly. Fill the hole about one-third full, and then gently but firmly pack the soil around the base of the root ball. Fill the remainder of the hole, taking care to firmly pack soil to eliminate air pockets that may cause roots to dry out. Continue this process until the hole is filled and the tree is firmly planted. It is not recommended to apply fertilizer at the time of planting.

7. Stake the tree using one of the methods outlined in the planting specifications (Appendix 1).

8. Build a watering basin around the tree that is at least several inches in diameter greater than the root ball. Water the tree. Ensure that the root ball and filled soil are moist.

9. Apply mulch - when feasible - to the base of the tree. Mulch is simply organic matter applied to the area at the base of the tree. It acts as a blanket to hold in moisture, moderate soil temperature, and reduces competition from grass and weeds. Some good choices are shredded bark, nut shells, or wood chips. A 2- to 4-inch layer is ideal, as more than 4 inches may cause a problem with oxygen and moisture levels. When placing mulch, be sure that the actual trunk of the tree is not covered, as that may cause decay of the living bark at the base of the tree. A mulch-free area 1 to 2 inches wide at the base of the tree is sufficient to avoid moist bark conditions and prevent decay.

10. Provide follow-up care. Keep the soil moist but not soaked; overwatering is just as harmful as underwatering. Long gentle soakings are more effective than

large volumes of water applied quickly to the root zone. When the soil is dry below the surface of the mulch, it is time to water. Continue until mid-fall, tapering off for lower temperatures that require less-frequent watering. Prune any branches damaged during transport or planting. Wait to begin structural pruning until after a full season of growth in the new location.

STREET TREE MAINTENANCE AND AUTHORITY

It is the authority of the Public Works Department to maintain all the public trees, and adjacent property owners should be forbidden to maintain these trees except to prevent imminent injury or damage to persons or property.

Tree maintenance by private homeowners or tree services should only be allowed through a permit system. This ordinance (23 - 3.2)should be clearly supported by amendments that set standards for proper planting and pruning, in order to tighten standards for the protection of City street trees. Ordinance changes should also require fencing of sensitive areas prior to construction and restriction of the areas where equipment and vehicles would be stored or driven. In addition, the ability to issue punitive fines should be established. Ordinance changes would add to construction costs, but the City would benefit by protecting City trees and avoiding the costs associated with repair and loss of trees.

Clear standards for the City's street tree canopy must be properly enforced in order for these changes to become ingrained within the residents' expectations. To address the growing need for adequate monitoring of tree code infringement, enforcement will be shared by PW and building department. PW will be responsible for enforcement in the public right of way where as the building department has authority to enforce protection of protected species on private property. Individuals who enforce city standards should be clearly trained to recognize code infractions.

2.1 / BUYING HIGH QUALITY TREES

Trees supplied for planting in Alameda must meet the following criteria (any tree not conforming to these standards will be rejected and a replacement will be required):

- **True to type:** The trees supplied and planted must be the species (and variety, where applicable) that the purchaser ordered.

- **Health and vigor**: The trees supplied must be healthy and vigorous at the time of delivery, exhibiting good annual branch growth and root structure.

- **Free from pests and disease:** Trees should not be diseased or show evidence of pest attack that could affect the long-term health of the tree or adjoining plantings.

- **Balance of crown**: This refers to the crown bulk on opposite sides of the stem axis, which indicates the tree's structural integrity and aesthetic qualities. Trees that have an asymmetrical crown (nominally an imbalance of > 20%) are generally undesirable.

- **Uniformity of growth**: Trees should be grown at a steady rate to produce a better quality tree with an even branch structure. Over-fertilization can often lead to irregular growth, which could cause aesthetic and structural problems.
- **Stem taper**: This is a measure of the tree's ability to be self-supporting. Trees with insufficient stem taper may need artificial support (staking) and are prone to damage by vandals and wind. Inadequate stem taper is generally a result of the tree not having enough space to grow at the nursery without the use of stakes.

- **Included bark**: If bark is folding into the joint or crotch of a tree as it grows (often due to damage), this may cause structural weakness that could increase the risk of limbs falling in a storm.

- **Apical dominance**: Tree species grown with a defined central leader will have an improved appearance and better structure. Trees that have been topped in the nursery and have several branches emerging from the same location on the trunk are less desirable.

- **Root division**: Strong root development will provide a sound structural base for the tree. Trees held at length in containers may produce too much secondary division, causing watering problems for the plant (i.e., hydrophobic).

- **Root direction**: Root distortion during a tree's development will cause future problems in the root system (e.g., spiraling roots in a small tree, if left untreated at planting, could strangle the developing roots).
- **Root ball occupancy**: It is important that the volume of the root ball at purchase be fully occupied by the root system and when shaking the root ball unsupported, at least 90% of soil volume should remain intact.

- **Non-suckering rootstock**: It is preferable that a naturally suckering tree species be grafted onto a non-suckering rootstock before planting.

- **Injuries:** Beware of injuries beneath trunk wraps. Never buy a tree without thoroughly checking the trunk. If the tree is wrapped, remove the wrap and inspect the trunk for wounds, incorrect pruning cuts, and insect injuries. Wrap can be used to protect the trunk during transit but should be removed after planting.

Nursery-grown trees come in the following three forms, which should be inspected carefully for the health of the root ball:

- **Bare-Root Stock:** Bare roots should not be crushed or torn. The ends of the roots should be clean cut. If a few roots are crushed, re-cut them to remove the injured portions; use sharp tools, make straight cuts, and do not paint the ends. The cuts should be made immediately before planting and watering.

- **Balled-in-Burlap Stock:** It should be possible to see the basal trunk flare. The flare is the spreading trunk base that connects with the roots. Root balls should be flat on top. Roots in soil in round bags often have many major woody roots cut or torn during the bagging process—avoid these trees. The diameter of the root ball should be at least 10 to 12 times the diameter of the trunk as measured 6 inches above the trunk flare.

- **Container-Grown Stock:** Roots should not twist or circle in the container. Remove the root ball from the container and inspect the exposed larger roots carefully to see whether they are twisting or turning in circles. Circling roots often girdle and kill other roots. If only a few roots are circling, cut them away with a sharp tool. Trunk flare should be obvious. Be on alert for trees planted too deeply in containers or trees "buried" in fabric bags. As with root-balled stock, it should be possible to see the basal trunk flare with container-grown plants. If the trunk flare has been buried, gently expose it before planting the tree, taking care not to damage the bark.

Circling roots on a container-grown tree

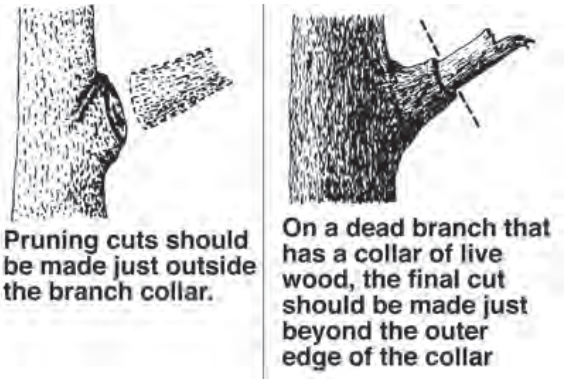
2.2 / PRUNING YOUNG TREES

Proper pruning is essential in developing a tree with a strong structure and desirable form. Trees that receive the appropriate pruning measures while they are young will require little corrective pruning when they mature. Assuming that the proper trees have been selected for each site, pruning young trees to improve branch structure is the most effective method of reducing maintenance costs as trees mature. At the time of planting, the only pruning that should be done is the removal of broken or dead branches. In the second growing season, minor pruning can be performed to remove branches with poor attachments. In subsequent years, selective pruning should be performed to achieve the proper spacing of branches.

Keep these few simple principles in mind before pruning a tree:

- Each cut has the potential to change the growth of the tree. Always have a purpose in mind before making a cut.
- Proper technique is essential. Poor pruning can cause damage that lasts for the life of the tree. Learn where and how to make the cuts before picking up the pruning shears.
- Trees do not heal the way people do. When a tree is wounded, it must grow over and compartmentalize the wound. As a result, the wound is contained within the tree forever.
- Small cuts do less damage to the tree than large cuts. For that reason, proper pruning (training) of young trees is critical. Waiting to prune a tree until it is mature can create the need for large cuts that the tree cannot easily cover.

- The belief that trees should be pruned when planted to compensate for root loss is misguided. Trees need their leaves and shoot tips to provide food and the substances that stimulate new root production. Unpruned trees establish faster and with a stronger root system than trees pruned at the time of planting.



Pruning cuts should be made just outside the branch collar.

On a dead branch that has a collar of live wood, the final cut should be made just beyond the outer edge of the collar

Making the Cut

Where a tree care worker makes a pruning cut is critical to a tree's response in growth and wound closure. For these reasons it is important to make pruning cuts just outside the branch collar. Because the branch collar contains trunk or parent branch tissues, the tree will be damaged unnecessarily if you remove or damage the branch collar. In fact, if the cut is large, the tree may suffer permanent internal decay from an improper pruning cut.

If a permanent branch is to be shortened, cut it back to a lateral branch or bud. Internodal cuts, or cuts made between buds or branches, may lead to stem decay, sprout production, and misdirected growth.

Pruning Tools

When pruning trees, it is important to have the right tool for the job. For small trees, most of the cuts can be made with hand pruning shears (secateurs). The scissor-types, or bypass blade hand pruners, are preferred over the anvil type because they make cleaner, more accurate cuts. Cuts larger than one-half inch in diameter should be made with lopping shears or a pruning saw. Never use hedge shears to prune a tree. Whatever tool tree care workers use, make sure it is kept clean and sharp.

Bypass pruning shears

Establishing a Strong Scaffold Structure

A good structure of primary scaffold branches should be established while the tree is young. The scaffold branches provide the framework of the mature tree. Properly trained young trees will develop a strong structure that requires less corrective pruning as they mature.

The goal in training young trees is to establish a strong trunk with sturdy, well-spaced branches. The strength of the branch structure depends on the relative sizes of the branches, the branch angles, and the spacing of the limbs. Naturally, those factors vary with the growth habit of the tree. Pin oaks and sweetgums, for example, have a conical shape with a central leader. Elms and live oaks are often wide-spreading without a central leader. Other trees, such as lindens and Bradford pears, are densely branched. Good pruning techniques remove structurally weak branches while maintaining the natural form of the tree.

Trunk Development

For most young trees, it is important to maintain a single dominant leader growing upward. Do not prune back the tip of this leader, and do not allow secondary branches to outgrow the leader. Sometimes a tree will develop double leaders known as co-dominant stems. Co-dominant stems can lead to structural weaknesses, so it is best to remove one of the stems while the tree is young.

The lateral branches growing on the sides contribute to the development of a sturdy, well-tapered trunk. It is important to leave some of these lateral branches in place initially, even though they may be pruned out later. These branches, known as

temporary branches, also help protect the trunk from sun and mechanical injury, while reducing the need for fertilizing (more leaf area means more photosynthesis). Temporary branches should be kept short enough so that they do not obstruct or compete with selected permanent branches.

Permanent Branch Selection

The strategy for training a young tree depends on its primary function in the landscape. Low branches, for example, often make a tree appear well-proportioned when young, but they are seldom appropriate for large-growing trees in an urban environment. Street trees must be pruned so that they allow at least 13.5' over roadways (15' if State Highway) of clearance for traffic, but most landscape trees require only about 8 feet of clearance. 15' is preferred in commercial area to avoid blocking street signs.

Newly planted trees should keep their lower temporary branches intact for as long as possible. Although they make the tree look a bit unruly, temporary branches and staking (due to tapered caliper) should be maintained for at least the first year.

The vertical and radial spacing of branches is very important. Branches selected as permanent scaffold branches must be well spaced along the trunk. Further, radial spacing of branches growing outward in each direction should be balanced. good rule of thumb for the vertical spacing of permanent branches is to maintain a distance equal to 3% of the tree's eventual height. Thus, a tree that will be 50 feet tall should have permanent scaffold branches spaced about 18 inches apart along the trunk. Avoid allowing two scaffold branches to grow one above the other on the same side of the tree.

Some trees have a tendency to develop branches with narrow angles of attachment and tight crotches. As the tree grows, bark can become enclosed deep within the crotch between the branch and the trunk. Such growth, called "included bark," weakens the attachment of the branch to the trunk and can lead to branch failure when the tree matures. Tree care workers should prune branches with weak attachments while they are young.

Avoid over-thinning the interior of the tree. The leaves of each branch must manufacture enough food to keep that branch alive and growing. In addition, each branch must contribute food to nurture the trunk and roots. Removal of too many leaves can "starve" the tree, reduce growth, and make the tree unhealthy. A good rule of thumb is to maintain at least half the foliage on branches growing in the lower two-thirds of the tree.

2.3 / PRUNING MATURE TREES

Pruning is the most common tree maintenance procedure. Although forest trees grow quite well with only nature's pruning, landscape trees require a higher level of care to maintain their safety and esthetics. Pruning should be done with an understanding of how the tree responds to each cut. Improper pruning can cause damage that will last for the life of the tree, or worse, shorten the tree's life.

Reasons for Pruning

Because each cut has the potential to change the growth of the tree, no branch should be removed without a valid reason. Common reasons for pruning are to remove dead branches, to remove crowded or rubbing limbs, and to eliminate safety concerns. Trees may also be pruned to increase light and air penetration to the inside of the tree's crown. In most cases, mature trees are pruned as a corrective or preventive measure.

Routine thinning does not necessarily improve the health of a tree. Trees produce a dense crown of leaves to manufacture the sugar used as energy for growth and development, so removal of foliage through pruning can reduce growth and stored energy reserves. Heavy pruning can be a significant health stress for the tree.

Yet if people and trees are to coexist in an urban or suburban environment, we sometimes have to modify the trees. Safety is a major concern, as well as esthetics— we want trees to complement other landscape plantings and lawns. Proper pruning, done with a clear understanding of tree biology, can maintain good tree health and structure while enhancing the esthetic and economic values of our landscapes.

When to Prune

Most routine pruning to remove weak, diseased, or dead limbs can be accomplished at almost any time during the year with little effect on the tree. However, growth is maximized and wound closure is fastest if pruning takes place before the spring growth flush. Some trees, such as maples and birches, tend to "bleed" if pruned early in the spring. It may be unsightly, but it is of little consequence to the tree.

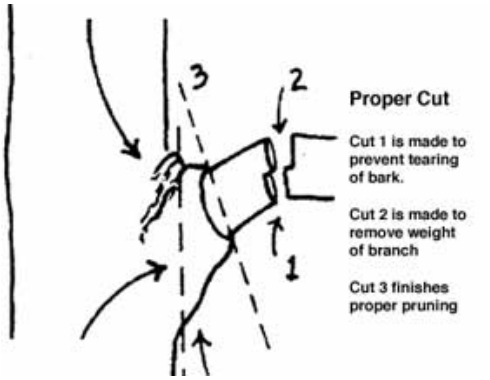
Heavy pruning just after the spring growth flush should be avoided. At that time, trees have just expended a great deal of energy to produce foliage and early shoot growth, so removal of a large percentage of foliage can stress the tree.

A few tree diseases, such as oak wilt, can be spread when pruning wounds allow spores access into the tree. Susceptible trees should not be pruned during active transmission periods.

Making Proper Pruning Cuts

Pruning cuts should be made just outside the branch collar. The branch collar contains trunk or parent branch tissue that should not be damaged or removed. If the trunk collar has grown out on a dead limb that is to be removed, make the cut just beyond the collar—do not cut the collar.

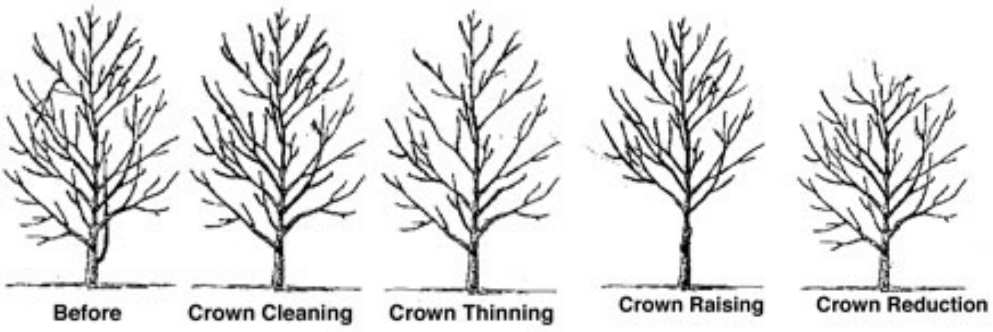
If a large limb is to be removed, its weight should first be reduced in order to avoid tearing the bark. This is done by making an undercut about 12 to 18 inches from the limb's point of attachment. Make a second cut from the top, directly above or a few inches farther out on the limb. Doing so removes the limb, leaving the 12- to 18-inch stub. Remove the stub by cutting back to the branch collar.



Pruning Techniques

Specific types of pruning may be necessary to maintain a mature tree in a healthy, safe, and attractive condition.

Cuts made along a branch should be made at a lateral branch or bud.



- **Cleaning** is the removal of dead, dying, diseased, crowded, weakly attached, and low-vigor branches from the crown of a tree.
- **Thinning** is the selective removal of branches to increase light penetration and air movement through the crown. Thinning opens the foliage of a tree, reduces weight on heavy limbs, and helps retain the tree's natural shape.
- **Raising** removes the lower branches from a tree in order to provide clearance for buildings, vehicles, pedestrians, and vistas.
- **Reduction** reduces the size of a tree, often to ensure clearance for utility lines. Reducing the height or spread of a tree is best accomplished by pruning back the leaders and branch terminals to lateral branches that are large enough to assume the terminal roles (i.e., at least one-third the diameter of the cut stem). Reduction is preferable to topping, as it helps maintain the form and structural integrity of the tree.

How Much Should Be Pruned?

The amount of live tissue that should be removed depends on the tree size, species, and age, as well as the pruning objectives. Younger trees tolerate the removal of a high percentage of living tissue better than mature trees do. An important principle to remember is that a tree can recover from several small pruning wounds faster than from one large wound.

A common mistake is to remove too much inner foliage and small branches. It is important to maintain an even distribution of foliage along large limbs and in the lower portion of the crown. Over-thinning reduces the tree's sugar production capacity and can create tip-heavy limbs that are prone to failure.

Mature trees should require little routine pruning. A widely accepted rule of thumb is never to remove more than one-quarter of a tree's leaf-bearing crown, though pruning even that much could have negative effects on a mature tree. The older and larger a tree becomes, the less energy it has in reserve to close wounds and defend against decay or insect attack. Removing even a single large-diameter limb can create a wound that the tree may not be able to close. The pruning of large, mature trees is therefore usually limited to removal of dead or potentially high risk limbs.

Wound Dressings

Wound dressings were once thought to accelerate wound closure, protect against insects and diseases, and reduce decay. However, research has shown that dressings do not reduce decay or speed closure, and they rarely prevent insect or disease infestations. Most experts recommend that wound dressings not be used.

Pruning Mature Trees

Pruning is the most common tree maintenance procedure next to watering. Pruning is often desirable or necessary to remove dead, diseased, or insect-infested branches and to improve tree structure, enhance vigor, or maintain safety. Because each cut can change the growth of, or cause damage to a tree, no branch should be removed without a valid reason.

Removing foliage from a tree has two distinct effects on its growth: reducing photosynthesis and possibly reducing overall growth. Consequently, pruning should always be performed sparingly. Overpruning is extremely harmful because without enough leaves, a tree cannot gather and process enough sunlight to survive.

However, the growth that does occur after pruning takes place on fewer shoots, so they tend to grow longer than they would without pruning. Understanding how the tree responds to pruning should assist tree care workers when selecting branches for removal.

Pruning mature trees requires special equipment, training, and experience. If the pruning work requires climbing, the use of a chain or hand saw, or the removal of large limbs, then using personal safety equipment such as protective eyewear and hearing protection is a must. Arborists can provide a variety of services to assist in performing the job safely and reducing risk of personal injury and damage to residences and property. They also are able to determine which type of pruning is necessary to maintain or improve the health, appearance, and safety of City street trees.

Big cuts can result in decay and cracks

STREET TREE MAINTENANCE GUIDELINES

1. Trees are to be pruned to develop proper structure, to improve health and vigor by deadwood removal, and for clearance of obstructing branches or foliage for pedestrians, bicycles, and vehicles. The intent of the trimming program is to prune trees for safety and health rather than cosmetic appearance. It is a Public Works Department policy NOT to pollard or top street trees because of the overall negative effect of these practices.

2. The Public Works Department will continue the program of regular street tree pruning and maintenance, where funds are available.

a. Any tree shall be top-pruned and the crown reduced by an appropriate amount PRIOR to any severe root pruning unless there is an immediate need to prune the roots. Root pruning and limb pruning should not occur in the same year.

b. Pruning shall take place under the guidance and direction of an arborist or recognized authority.

c. Regular pruning shall be done to thin and reduce the crown of any potential problem tree in order to reduce wind load.

d. All tools shall be disinfected if a diseased or infested tree is pruned or removed.

3. Utility companies shall operate in a manner to prevent damage to trees. Any person excavating in the public right-of-way shall not cut tree roots exceeding three inches without approval of a city "approved" aborist pruning. If this regulation is not followed, said party may be liable for tree damages and any subsequent damages from tree failure.

2.4 / MATURE TREE CARE

Tree Inspection

Tree inspection is an evaluation tool that calls attention to any change in the tree's health before the problem becomes too serious. If funding is sufficient by providing regular inspections of mature trees at least once a year, tree maintenance workers and supervisors can prevent or reduce the severity of future disease, insect, and environmental problems. During tree inspection, be sure to examine four characteristics of tree vigor: new leaves or buds, leaf size, twig growth, and absence of crown dieback (gradual death of the upper part of the tree).

A reduction in the extension of shoots (new growing parts), such as buds or new leaves, is a fairly reliable cue that the tree's health has recently changed. To evaluate this factor, compare the growth of the shoots over the past three years and determine whether there is a reduction in the tree's typical growth pattern.

Fertilization

Fertilization may not be necessary for the first growing season unless there are specific nutrient deficiencies. At the beginning of the second growing season, fertilizers can be applied to the root zone. Nitrogen is usually the limiting nutrient for plant growth. Soil analysis, particularly when combined with a foliar analysis, can determine when other elements are in short supply. Slow-release fertilizers applied in autumn will help root growth and will continue providing nutrients the following spring. Mature trees should not be placed on a scheduled fertilization program without a documented need. If soil analyses show a distinct and serious nutrient deficiency, or if the tree's root system or growing area has been damaged or contaminated, then the time and expense of fertilization may be worthwhile to save the tree. A certified arborist can determine if and when public trees need fertilization as well as the appropriate fertilizer formulation and delivery method.

Tree surgery

The requirement and extent of tree surgery should be determined on site by a certified arborist. Where tree surgery is considered necessary, give notice and obtain instructions. All pruning work should be in accordance with the International Society of Arboriculture Standards for Pruning.

Cabling and Bracing

Rather than remove or severely prune a mature tree if a structural defect is discovered, the use of structural support can reduce safety risks on a case by case basis. Cabling and bracing are the two most common forms of structural support for trees; other, less common forms of structural support are guying and propping. Structural support is infrequently recommended, but trees with special or historic significance can be spared from removal by using such techniques as cabling and bracing.

Primary Uses of Cabling and Bracing

Prevention: to reduce the chance of failure on a healthy tree with structural weakness (e.g., a specimen oak in good condition but having large limbs with V-crotches).

Restoration: to prolong the existence of a damaged tree (e.g., a large sugar maple that lost one of its leaders in a storm, leaving the others suddenly exposed and vulnerable to further damage).

Mitigation: to reduce the high risk potential of a tree (e.g., a picturesque multi-stemmed hickory that towers over a picnic shelter).

SPECIAL FERTILIZATION AND WATERING NEEDS IN ALAMEDA

The following are guidelines for providing water, nutrients and companion plants to trees under common soil conditions in Alameda. It should be noted, however, that trees may exhibit a variety of responses to their surroundings, and regular monitoring is necessary to insure that the tree is receiving the water and nutrients it needs.

Irrigating Trees in Sandy Soil

- Water generously 2 - 3 x per week on slow drip
- 20 gallons a week for 1st 2 years after planting
- 10 gallons a week for subsequent years
- The water you put in runs through the soil quickly. It travels straight down and does not spread to the side

Therefore, move your water source around in order to get all roots.

Fertilizing Trees in Sandy Soil

- Add high-nitrogen organic fertilizers as needed, up to once per season. Organic fertilizers include fish emulsion, kelp powder and lawn clippings. Don't pile lawn clippings too thick- just sprinkle a thin layer and allow to dry thoroughly. Remember that the soil cannot hold onto these nutrients so don't overdo it, it will just run off.
- Keep a good layer of wood chips and/or compost in the tree basin. Do not pile the mulch up against the tree trunk as this can cause crown rot and kill your tree.

Providing Companion Plants to Trees in Sandy Soil

Plants in the pea and bean family are nitrogen fixers (draw N from air and turn it into a usable form for plants). Other plants growing nearby can benefit from this. Annual plants in this family include:

- Climbing sweet pea (give the sweet pea something else to climb besides the tree!)
- Red clover
- Perennials such as native lupine shrubs

Irrigating Trees in Clay Soil

- Water 10-15 gallons per week with a slow drip
- The heavier the soil, the less water it may need
- Watch to see how fast the water drains and avoid creating a swampy condition. Roots need oxygen as well as water

- Try not to step on, or dig in, the soil when it is wet, because you can squeeze the oxygen out of it
- If clay soil dries out too much, water may just puddle on the surface. Try to keep the soil evenly moist without flooding it

Fertilizing Trees in Clay Soil

- Clay soil holds onto nutrients well, so you don't need to add chemical fertilizer
- Replenish mulch as often as needed to keep a thick layer. Do not pile mulch up against the tree trunk
- There is less of a need to add nitrogen than with sandy soil

Providing Companion Plants to Trees in Clay Soil

Clay soil needs more oxygen, so choose plants with tough roots to break up the clay. Keep them from growing too close to the tree to avoid crown rot.

- Chrysanthemums
- Mints
- Tubers (e.g. Iris)

ALAMEDA'S MATURE STREET TREE MAINTENANCE PROGRAM

An effective maintenance program, including regular inspections and the necessary follow-up care of mulching, fertilizing, and pruning, can detect problems and correct them before they become damaging or fatal. Considering that many tree species can live as long as 200 to 300 years, including these practices when caring for the trees in the City streetscape is an investment that will offer enjoyment and value for generations.

The decision to provide street tree maintenance should be based upon the following factors:

1. Public safety
2. Growth rate and structure of the individual tree
3. Time elapsed since last trimming
4. Geographic location

STREET TREE MAINTENANCE GUIDELINES

1. Department policy is to minimize the use of pesticides and use them only when other methods have failed to control the disease or pests. The City will comply with the Bay Friends Landscape Ordinance with regards to pesticides use.

2. Based upon evaluation by Public Works personnel, the structurally corrective techniques of cabling and bracing may be employed. Roots may be shaved only under the direct supervision of an Arborist or Authorized City Staff.

3. Root pruning is done when tree roots are damaging City-owned infrastructure including sidewalks, curbs, gutters, sewers, and storm drains. The root pruning

program aims to mitigate all severe root-caused sidewalk damage. Priority of repair locations will be based on severity of damage and sidewalk traffic use. The following techniques may be used to mitigate infrastructure damage caused by tree roots:

a. Root prune: Roots are either pruned by hand or with the aid of a root pruning machine, which can be used 12 to 24 inches below grade on the sidewalk or curbside. Use of the root pruning machine is more cost effective but can result in severing large anchor roots. Root pruning is effective but may need to be repeated on a three- to four-year cycle to control re-sprouting of severed roots.

b. Root prune with barriers: Roots are pruned as in (a) above, but a rigid plastic barrier of variable depth may be installed to force roots down. This method can be effective providing the barrier is deep enough and the environment for root growth is suitable at the greater depth. It has been experimentally shown that roots will resurface after going under the barrier, but that the cycle between subsequent root prunings should be lengthened.

c. Flexible root-controlling materials: Materials such as Biobarrier and Root Shield are used to control root growth. Both contain encapsulated, time-released Treflan, an herbicide that controls root growth. Root Shield is a sewer gasket material used to prevent root penetration of sewers, while Biobarer is a geotextile fabric that is buried wherever an obstruction to root growth is desired.

d. Material changes: The use of materials that are more flexible and less expensive to maintain than concrete is another alternative in solving the sidewalk damage problem. Decomposed granite and asphalt were tried but met with resistance by the public due to the non-traditional appearance.

e. Addition of drainage rock directly under the sidewalk reduces the potential for water to reach under here to the bottom of the sidewalk and thus discourages new roots from establishing themselves in that zone.

f. Design modification: In areas where the amount of growing space is severely restricted, the technique of bowing sidewalks or gutters or providing breaks in curb to accomodate trunk expansion, in conjunction with the above controlling methods has had successful results. Sidewalk-curb reconstruction of a monolithic design shall not be used in Alameda.

4. The city will respond promptly to a safety concern when a public tree is involved.

5. The tree removal is permissable only after all practical and reasonable alternatives have been considered.

Reducing Infrastructure Damage by Tree Roots - Alternatives to Root Pruning

Sidewalk cutouts

- Minimizes the sidewalk width
- Maintain ADA accessibility
- Limited availability in Alameda

Sidewalk meandering

- May require public easement from the property owner

Sidewalk ramping

- Requires ADA compliance
- Not viable near driveways

Flexible Paving Materials

- 3X Cost
- Changing industry standards
- Environmental concerns
- Increased frequency of lifting at joints
- Increased maintenance costs

Relocate Sidewalk to Parking Lane

- Remove sidewalk from inside of treeline, and place on street side
- Eliminates parking along the entire block - only feasable where sufficient parking exists
- Only possible on wide streets
- Few viable streets in Alameda
- Only possible where parking demand is low

Hardscape Damage is Preventable at Planting

- Select appropriate tree species
- Use larger planting spaces
- Increase distance from hardscape
- Also consider an extra layer of gravel under a repaired sidewalk to minimize new root growth directly under the sidewalk.
- Relocate curb into parking lane only where roadway width is sufficient and where drainage, travel lanes and parking space will not be impacted.
- Root shaving (as approved or directed by Arborist).

- minimizes future sidewalk uplift without actually severing tree roots.
- already used successfully as part of sidewalk repairs in Alameda.

2.5 / PROPER MULCHING TECHNIQUE

Mulches are materials placed over the soil surface to maintain moisture and improve soil conditions. Mulching is one of the most beneficial things that can be done for the health of a tree. Mulch can reduce water loss from the soil, minimize weed competition, and improve soil structure. Properly applied, mulch can give landscapes a handsome, well-groomed appearance; yet if it is too deep or if the wrong material is used, mulch can actually cause significant harm to trees and other landscape plants.

Mulching offers several benefits, especially for tree well-being. Trees that are properly mulched benefit from less drought stress and less root damage, and tend to grow faster and be more vigorous. Mulch also helps to hold moisture in the surface of the soil where most of the feeder roots are to be established.

Mulch should be applied to the surface of the soil around each newly planted tree. Mulch should never be piled up around the root collar (creating mulch volcanoes), but rather should be pulled away from the root collar. Mulch that buries the root collar provides shelter for insects, fungi, and mammals that could damage the tree. Mulch not only suppresses competition from grass and weeds, but it also provides a zone where turf maintenance is not needed, thereby keeping lawn mowers and string trimmers safely away and preventing mechanical damage. There are certain insect pests specifically drawn to wounded trees, and if a tree is already stressed, the additional injury can substantially reduce the tree's ability to sustain defense and maintain growth. A less visible impact is the effect on roots; decay from trunk damage can spread into the root system. It is recommended that all small diameter trees be mulched regularly. Large diameter trees should also be mulched where the mulch bed will not interfere with other uses of the area.

Generally speaking, mulch should be applied to an area three times the diameter of the root ball. As a rule of thumb, it is applied in a 2- to 4-inch layer in a 3-foot diameter circle around young trees and as far out as the drip line in mature trees. Mulch is placed in a saucer shape around the tree, meaning the outside edges are slightly higher than the inside, and it is never placed directly against the trunk. Application is usually once a year, as long as the 2- to 4-inch depth is not exceeded. When carefully and consistently applied, public trees will derive the benefits from mulch, avoid mechanical damage, and be more attractive.

Types of Mulch

Mulch is available commercially in many forms. The two major types of mulch are inorganic and organic. Inorganic mulch can include various types of stone, lava rock, pulverized rubber, geotextile fabrics, and other materials that do not decompose and do not need to be replenished often. On the other hand, inorganic mulch does not improve soil structure, add organic materials, or provide nutrients. For these reasons, the city should only use organic mulches.

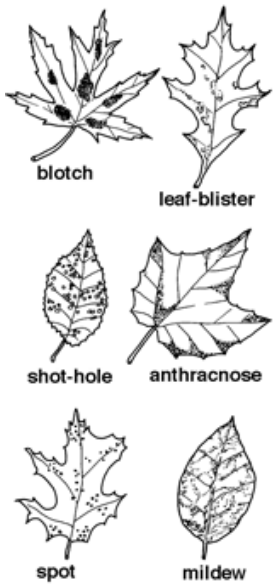
Organic mulches include wood chips, pine needles, hardwood and softwood bark, cocoa hulls, leaves, compost mixes, and a variety of other products usually derived from plants. Organic mulches decompose in the landscape at different rates depending on the material and climate; those that decompose faster must be replenished more often. Because the decomposition process improves soil

quality and fertility, many arborists and other landscape professionals consider that characteristic a positive one, despite the added maintenance.

Problems Associated with Improper Mulching

- Deep mulch can lead to excess moisture in the root zone, which can stress the plant and cause root rot.
- Piling mulch against the trunk or stems of plants can stress stem tissues and may lead to insect and disease problems.
- Some mulches, especially those containing cut grass, can affect soil pH levels. Continued use of certain mulches over long periods can lead to micronutrient deficiencies or toxicities.
- Mulch piled high against the trunks of young trees may create habitats for rodents that chew the bark and possibly girdle the trees.
- Thick blankets of fine mulch can become matted and may prevent the penetration of water and air. In addition, a thick layer of fine mulch can become like potting soil and may support weed growth.
- Anaerobic "sour" mulch may give off pungent odors, and the alcohols and organic acids that build up may be toxic to young plants.

2.6 / INSECTS AND DISEASES



Insects and diseases can threaten tree health. Where possible, as soon any abnormality in a tree's appearance is observed, an order should be issued to begin a careful examination of the problem. By identifying the specific symptoms of damage and understanding their causes, staff may be able to diagnose the problem and select an appropriate treatment.

Street trees can be predisposed to insect and disease problems since they are growing in unnatural and constrained environments. Therefore, it is prudent to include insect and disease monitoring where possible as a routine part of a street tree inspection program. It is only when particularly damaging insects such as gypsy moth and emerald ash borer are detected, when the levels of insect populations are extremely high, or when particularly virulent diseases are diagnosed that action must be taken. The type and extent of action depends on the type and extent of the insect or disease problem.

STRESS

Basic elements that influence plant health include sufficient water and light, and a proper balance of nutrients. Too much or too little of any of these environmental conditions may cause plant stress.
Environmental stress, such as air and water pollution, weakens plants and makes them more susceptible to insect and disease attack. Trees deal with environmental stresses, such as shading and competition for water and nutrients in their native environment, by adjusting their growth and development patterns to reflect the availability of the resources. Although trees adapt to living in stressful conditions in nature, the stresses they experience in the urban landscape are often more than they can handle, making them more susceptible to insects and diseases.

DIAGNOSIS

Correct diagnosis of plant health problems requires a careful examination of the situation.

1. **Accurately identify the plant.** Because many insects and diseases are plant-specific, this information can quickly limit the number of suspected diseases and disorders.

2. **Look for a pattern within the abnormalities.** It may be helpful to compare the affected plant with other plants on the site, especially those of the same species. Differences in color or growth may present clues as to the source of the problem. Varied damage patterns may indicate insects or diseases, while uniform damage over a large area (perhaps several plant species) usually indicates disorders caused by such factors as physical injury, poor drainage, or weather.

3. **Carefully examine the landscape.** The history of the property and adjacent land may reveal many problems. The number of species affected may also help distinguish between infectious pathogens that are more plant-specific as compared to chemical or environmental factors that affect many different species. Most living pathogens take a relatively long time to spread throughout an area, so if a large percentage of plants becomes diseased virtually overnight, a pathogen is probably not involved.

4. **Examine the roots.** Note their color—brown or black roots may signal problems. Brown roots often indicate dry soil conditions or the presence of toxic chemicals. Black roots usually reflect overly wet soil or the presence of root-rotting organisms.

5. **Check the trunk and branches.** Examine the trunk thoroughly for wounds because they provide entrances for pathogens and wood-rotting organisms. Wounds can be caused by weather, fire, lawn mowers, and rodents, as well as a variety of other environmental and mechanical factors. Large defects may indicate a potentially high risk tree.

6. **Note the position and appearance of affected leaves.** Dead leaves at the top of the tree are usually the result of environmental or mechanical root stress. Twisted or curled leaves may indicate viral infection, insect feeding, or exposure to herbicides. The size and color of the foliage may tell a great deal about the plant's condition. Make note of these and any other abnormalities.

DISEASES

Three things are required for a disease to develop:

- The presence of a pathogen (the disease-causing agent)
- Plant susceptibility to that particular pathogen
- An environment suitable for disease development

Diseases can be classified into two broad categories: those caused by infectious or living agents (diseases) and those caused by noninfectious or nonliving agents (disorders).

Examples of infectious agents include fungi, viruses, and bacteria. Noninfectious disorders, which account for 70 to 90% of all plant problems in urban areas, can be caused by factors such as nutrient deficiencies, temperature extremes, vandalism, pollutants, and fluctuations in moisture. Noninfectious disorders often produce symptoms similar to those caused by infectious diseases; therefore, it is essential to accurately distinguish between the two in order to give proper treatment.

INSECTS

Some insects can cause injury and damage to trees and shrubs. By defoliating trees or sucking their sap, insects can retard plant growth; by boring into the trunk and branches, they interfere with sap flow and weaken the tree structure. Insects may also carry some plant diseases.

However, the insect problem is often secondary to problems brought on by a stress disorder or pathogen. It is important to remember that most insects are beneficial rather than destructive. They help with pollination or act as predators of more harmful species. Therefore, killing all insects without regard to their kind and function can actually be detrimental to tree health.

Insects may be divided into three categories according to their method of feeding: chewing, sucking, or boring. Insects from each group have characteristic patterns of damage that will help determine the culprit and the proper treatment. Always consult a tree care expert to determine the nature of the insect problem or the proper treatment.

Chewing insects eat plant tissue such as leaves, flowers, buds, and twigs. Uneven or broken margins on the leaves, skeletonization of the leaves, and leaf mining often indicate damage done by these insects. Chewing insects can be beetle adults or larvae, moth larvae (caterpillars), or many other groups of insects. Observing the damage they cause will help in identifying the pest insect.

Sucking insects insert their beaks (probosces) into the tissues of leaves, twigs, branches, flowers, or fruit and then feed on the plant's juices. Some examples of sucking insects are aphids, mealy bugs, thrips, and leafhoppers. Damage caused by these pests is often indicated by discoloration, drooping, wilting, leaf spots (stippling), honeydew, or a general lack of vigor in the affected plant.

Boring insects spend time feeding somewhere beneath the bark of a tree as larvae. Some borers kill twigs and leaders when adults feed or when eggs hatch into larvae that bore into the stem and develop into adults. Other borers, known as bark beetles, mate at or near the bark surface, and adults lay eggs in tunnels beneath the bark.

TREATMENT

The treatment method used for a particular insect or disease problem will depend on the species involved, the extent of the problem, and a variety of other factors specific to the situation and local regulations. Always consult a professional about the nature of the problem or proper treatment.

Mulching

One of the simplest and least expensive things that can be done for stressed street trees may also be one of the most effective. Applying a 2- to 4-inch layer of organic mulch such as wood chips, shredded bark, or pine needles over the root system of a tree can enhance root growth. The mulch helps condition the soil, moderates soil temperatures, maintains moisture, and reduces competition from weeds and grass. The mulch should extend as far out from the tree as practical for the landscape site. Do not apply the mulch any deeper than 4 inches, and do not pile it against the trunk.

Improving Aeration of the Root Zone

a. Drilling holes/vertical mulching: Compaction of the soil and increases in grade both have the effect of depleting the oxygen supply to tree roots. If soil aeration can be improved, root growth and water uptake can be enhanced.

Holes drilled through the root system to improve aeration.

A common method of aeration of the root zone involves drilling holes in the ground. Holes are usually 2 to 4 inches in diameter and are made about 3 feet on center throughout the root zone of the tree. The depth should be at least 12 inches but may need to be deeper if the soil grade has been raised. Sometimes the holes are filled with peat moss, wood chips, pea gravel, or other materials that maintain aeration and support root growth. This process is called vertical mulching.

b. Radial aeration: More recent research has shown promising results with another method called radial aeration. Narrow trenches are cut with a compressed air gun in a radial pattern throughout the root zone. These trenches appear similar to the spokes of a wagon wheel. It is important to begin the trenches 4 to 8 feet from the trunk of the tree to avoid cutting any major support roots, and the trenches should extend at least as far as the drip line of the tree. If the primary goal is to reduce compaction, the trenches should be about 8 to 12 inches in depth. They may need to be deeper if the soil grade has been raised.

The narrow trenches can be backfilled with topsoil or compost, promoting greater root growth in the trenched area than in the surrounding soil. This treatment can give a tree the added boost it needs to adapt to the compacted soil or new grade. Vertical mulching and radial trenching are techniques that may improve conditions for root growth. If construction-damaged trees are to survive the injuries and stresses they have suffered, they must replace the roots that have been lost.

2.7 / PROTECTING TREES UNDER CONSTRUCTION

Trees are valuable assets. Unfortunately, when construction occurs in the name of progress, trees are often compromised in the process. Attempts to save trees during the construction process are often doomed unless protective measures are carefully implemented prior to, and strictly enforced during, construction. Trees are adversely affected both above and below ground by construction activities. Activities that damage trees during construction are trenching, soil compaction, and soil clearing and grading. Ultimately, a Tree Protection Plan should be developed specifically for all construction projects where trees are located. This project specific protection plan must note that protective street tree fencing shall be installed prior to any site work and that it be placed at, or outside of, the dripline to ensure survivability of existing street trees. It must also state that no site disturbing activities (e.g., cut, fill, parking, or material storage) shall take place inside the fenced area. To establish pruning limits the required Tree Protection Plan must diagram minimum height requirements of construction equipment and emergency vehicles for the construction site. An arborist, not construction personnel, should perform all pruning. Approved Tree Protection Plans that are not adhered to, and result in street tree damage or removal, should result in penalties for the construction contractor controlling the construction site.

METHODS AND TREATMENTS TO MINIMIZE ROOT LOSS

Stripping a site of organic surface soil during mass grading must restrict stripping of topsoil around trees. Any woody vegetation slated for removal and adjacent to protected trees should be cut at ground level and not pulled out by equipment. This will prevent tree root injury. When construction plans call for lowering grade, scarifying, preparing sub grade for fills and/or structures, it is important to use retaining walls with discontinuous footings to maintain natural grade as far as possible from street trees. Where possible, in proximity to existing street trees, excavate to finish grade by hand and cut exposed roots with a saw to avoid root wrenching and shattering by equipment, or cut with root pruning equipment. Soil outside of the cut face can be removed by equipment sitting outside the drip-line of the tree. In preparation of sub grade for pavement, encourage paving materials that requiring a minimum amount of excavation (e.g., reinforced concrete instead of asphalt). Design construction traffic patterns to avoid heavy loads adjacent to trees (i.e., heavy load bearing pavement requires thicker base material and sub-grade compaction). Specify minimum sub-grade compaction under pavement within drip-line (i.e., extra reinforcement in concrete or geotextile under asphalt may be needed). In excavation for footings, walls, and/or foundations, design walls/structures with discontinuous footings/pier foundations. Avoid slab foundations and use post and beam footings instead. Coordinate and consolidate trenching for utilities and/or drainage so that utility trench locations and timing are unified for different installation contractors. For utilities, excavate trenches by hand in areas with roots larger than 3 inches in diameter and tunnel under woody roots rather than cutting them where possible.

EXHIBIT 1 / TREE REMOVAL POLICY

A. GENERAL TREE REMOVAL POLICY

Although tree removal is a last resort alternative, there are circumstances when it is necessary. An arborist can help decide whether or not a tree should be removed. The City will remove street trees that are: dead; diseased with a rapidly spreading pathogen that poses an hazard to other trees; or presents an imminent threat to public safety or a declared public nuisance. In other cases, where application is made to remove a healthy tree, consid-eration will be based on the guidelines included in this policy. Tree removal within the public Right-of-Way for private projects will be included in the planning design review process for the project. Tree removal is permissible only after all practical and reasonable alternatives have been considered. There are three types of tree removal: those that do not require public posting as listed above, exempt tree removal and those that require public notice.

B. IMMEDIATE TREE REMOVAL-NOT POSTED

Trees that will not receive public noticing or posting include the following:
1. The tree is dead or presents an imminent threat to public safety as determined by a certified arborist.
2. The tree is determined by a certified Arborist to be infected with a rapidly spreading pathogen, such as Dutch Elm disease, that poses an immediate hazard to other trees.

C. EXEMPT TREE REMOVAL

Streetscape and other projects that have already received public input and City Council approval for tree removal will be exempt from posting.

D. POSTED TREE REMOVAL

Prior to the removal of any tree, except as listed in sections B and C, the City will post a public notice, allowing anyone to protest the removal of the tree. In addition, the city will notify adjacent property owners and post a notice on the city's web page. If a protest is filed, a public meeting will be held as discussed in section E2. Any person aggrieved by the final decision of the Public Works Director may pay the applicable appeal fee and appeal to the City Clerk within two weeks of the Director's decision. No more than 5% of the street trees in any given block face will be removed per year unless a greater percentage is approved by the City Council. Removal is proposed when the Public Works Director determines any of the conflicts listed below cannot be remedied.

1. Site modifications to be evaluated to resolve conflicts before tree removal is considered.

A. Modify private construction
B. Root pruning/shaving
C. Curb modification that provides for adequate drainage for entire block
D. Reduce sidewalk width near trees yet maintain ADA requirements

E. Meander sidewalk
F. Ramp sidewalk
G. Reduce curb width
H. Curb breaks
I. New technology to be evaluated as it develops

2. Types of conflicts

A. The tree is causing damage to private or public infrastructure that cannot be mitigated by practical and reasonable options as determined by an arborist.
B. The tree is causing persistent sidewalk and ADA safety concerns and cannot be mitigated by practical and reasonable options as determined by an arborist.
C. The tree has a disease other than in B2 above, or is in poor health.
D. The implementation of a tree phasing plan is needed to replace existing trees with more suitable species. Phased tree removal will occur only after a good faith effort is made to adhere to the maximum yearly tree removal percentage noted above. A comprehensive tree removal and proactive replanting plan shall be prepared and approved by City Council for phased removal. Example of conditions that would justify a phased removal plan include: a cluster of dead or dying trees as a result of a pathogen, or segments of excessive and or frequent tree related infrastructure damage that would require a whole row of trees to be removed.
E. The tree is in conflict with a private improvement plan. If a planning permit is required for the improvement, a street tree removal request must be identified on the planning permit application, which will require notification and removal approval as detailed in this policy prior to the planning permit being processed. All applications to the Planning Department for private improvements that impact the public Right-of-Way must include existing conditions within the public Right-of-Way on the submitted drawings. This includes trees, utility boxes, streetlight and other structures in the public Right-of-Way.
F. The removal is required to allow for the construction of public improvements when in consultation with an arborist, it is determined that there is no practical and or reasonable alternative available to retain the tree(s).

3. Tools that may be used to evaluate trees posted for removal.

A. Variables to be evaluated as part of tree removal decision.

1. Biological impacts of tree removal (see Volume 1, Appendix 4 "Protection of Important Nesting Habitat")
2. Tree Species characteristic
    a. Climate adaptability
    b. Growth characteristic
    c. Soil adaptability
    d. Resistance or tolerance to insects, diseases and other environmental conditions
    e. Tree is a rare or unusual species in Alameda
    f. Tree is an especially good example of its type in Alameda
3. Condition of target tree's roots, branches, trunk, foliage
    a. Structural Integrity
    b. Tree general health

4. The tree's potential to reach mature height
   a.Trees reach an economic and aesthetic height at maturity. Each tree species has a different optimal tree height and age. Site condition can enhance or reduce height potential.

5. The target tree is one of a limited number of large trees (i.e. trees over 40' tall) within the impact area. An impact area is defined as a distance equal to double the height of mature species.
6. The tree species is uniquely suited to the site or alternatively the optimal value is decreased at specific site.
   a. Urban Habitat/Urban forest
b. Environmental tolerance
   c. Property value
7. Value of tree as compared to cost to repair private and public damage by tree
8. Liability associated with tree.
9. Compliance with regulatory requirements, such as ADA
10. Value of tree as compared to future maintenance cost. A value analysis may be provided by an arborist on trees where the site cannot be modified and further analysis of the tree's impact is needed.

B. The model upon which the value analysis was developed is "A Guide for Plant Appraisals " published by the International Society of Arboriculture. A similar document may be used as the basis for value analysis. The variables listed above are to be considered when conducting the value analysis.

E. NOTIFICATION, PROTEST, APPEAL, REMOVAL, AND REPLACEMENT PROCEDURES

1. Notification Procedure

The Public Works Department shall not remove any street tree listed above in Section D, without first:

a. Posting said tree with a conspicuous notice, and
b. Notifying in writing the adjacent property owner and
c. Posting on the City's web page

The notice and letter must be dated three weeks before any action is taken. The notice and letter must contain the reason for the removal. A copy of this policy, which describes the protest and appeal procedure, will be available upon request and on the City's web page.

2. Protest Procedure

Any resident or property owner can protest the removal of a street tree by writing to the Public Works Director no later than three weeks from the date of posting. In the event of a protest:

a. The Public Works Director shall stop any removal action and reconsider the removal decision.

b. If the Public Works Director and the citizen lodging the protest cannot reach an agreement, a public hearing date will be identified within two weeks. All concerned parties can attend this hearing and present evidence or testimony.
c. After the meeting, the Director shall notify all concerned parties of his decision, in writing, within approximately two weeks after the hearing.

3. Appeal Procedure

Any resident or property owner can appeal the decision of the Public Works Director by writing to the Public Works Director or City Clerk, c/o City Hall. All appeals go before the City Council. There is an appeal fee, which is listed in the Master Fee Schedule.

4. Removal Procedure

a. If there is an appeal, the tree shall not be removed until the City Council has made the final decision. All Council decisions are final and not open to further appeal.

b. Any tree that is removed shall be replanted with a suitable replacement, provided the new site is in accordance with MSTP spacing criteria. If the tree site is not suitable, the nearest suitable site that complies with Appendix 3 "Preferred Distances Between City Infrastructure and Replacement trees" will be used.

F. PROTECTED TREE REMOVAL POLICY

No protected tree within the Public Right of Way shall be removed without a certificate of approval from the Historical Advisory Board. Protected trees shall include: the Palm trees in the public right of way on Burbank Street and Portola Avenue; any street tree on Thompson and Central Avenues; and any Coastal Live Oak (Quercus agrifolia) with a ten inch or greater diameter measured 4.5 feet above the ground. Applicants shall submit an arborist's report in a case where the health of the tree is the reason for the requested removal of the tree, or a contractor's report in a case where damage to foundation or other structure is the reason for the requested removal. Any protected street tree shall be replaced, at the applicant's expense, except those shown to be unhealthy or causing damage to private structures, to the satisfaction of the Public Works Director. Any Oak tree shall be replaced with a minimum of two Oak trees at sites in accordance with MSTP spacing criteria, 15 gallons or larger and to the satisfaction of the Planning and Building Director. (Alameda Municipal Code Sections 13 - 21.7)

G. REPLACEMENT PROCEDURE

a. In general, trees removed for cause shall be replaced within 60 to 90 days with the same or approved species, in containers no smaller than 15 gallons.
b. Tree species will be selected so that curb or sidewalk damage will be minimized.
c. The property owner will be notified that a new tree will be planted and that they will be responsible to water the tree.
d. The standard procedure is to install a special perforated pipe next to the new plantings, where soil conditions warrant, in accordance with tree planting guidelines.

CHAPTER 3

EDUCATION

3.0 / COMMUNITY OUTREACH AND EDUCATION

A well-directed education and outreach program begins with the community's recognition of the benefits the urban forest provides. This allows maintenance requirements to be understood in the context of the quality of trees and the health of the urban forest as a whole. Increased awareness of our standards for tree care help promote the implementation of current regulations and build advocacy. Clear communication among property owners, developers, and staff is necessary to ensure that all tree-related practices are of the highest standards. In addition, members of the community will appreciate how their actions on street trees may affect the urban forest and the benefits it provides.

The MSTP proposes a variety of methods for public outreach. If budget allows staff are encouraged to give tree care presentations regularly to a broad range of community groups and to work closely with tree care professionals. The City of Alameda Department of Public Works Street Tree Web site should also become a valuable source of information on tree care, planting programs, available resources, and who to contact for tree information.

OUTREACH

The City of Alameda has an important role in fostering residents' understanding of the environmental, economic, and community benefits of street trees, as well as proper methods of tree selection, planting, and care. As funding allows the City's Public Works department should continue to provide planting and removal information through the City's Web site, through other local media publications, and during volunteer events. Different departments within the City should communicate with the public about tree-related issues pertinent to their specific missions. For example, City Planning provides information on tree planting and protection requirements during development, while Public Works provides information about tree selection, care, and permit requirements in the rights-of-way. Training should be a prerequisite for receiving neighborhood tree-planting funds for planting trees under the direction of the PW Department in the rights-of-way.

Although the City has created a good foundation in these areas of outreach, the City of Alameda Building and Planning Department oversees private property issues, Recreation and Park Department has authority over park trees, Department of Public Works maintain the Street Tree Program and the Historical Advisory Board has authority to approve removal of protected trees. Because several departments manage different tree issues it is difficult for residents to know exactly who to contact with questions.

COMMUNITY OUTREACH AND COMMUNITY EDUCATION AT LARGE

The City of Alameda's street tree program should to be linked to the community, whose collective decisions have a cumulative impact on the vitality of the City's street trees. Educating and involving as much of the community as possible in enhancement and maintenance increases community awareness of the benefits of trees while encouraging support of the urban forest's long-term health and growth. If funding

exists Alameda's Public Works department shall develop educational tree planting and tree care information programs. Ways to enhance the programs include:

- Develop an Arbor Day program that focuses on partnerships with elementary schools.
- Expand educational opportunities during large civic events.
- Develop a tree steward program to enlist PW volunteers in the maintenance of young trees.
- Establish a program to partner with the PW Department to develop neighborhood "trained block captains" to advise, assist, and educate residents throughout the community on proper tree maintenance and the importance of trees, and to encourage new plantings.

EDUCATIONAL TOOLS

An important element of any successful urban forestry program is education. Governments and nonprofit organizations can work together to educate and inform property owners on how to plant and maintain their trees, and how to engage in development projects in ways that existing street trees. The educational tools discussed in this section are proven approaches to protecting urban street trees. Although implementing any of the recommendations previously described will require additional funds and a substantial effort, education and information dissemination are critical to the success of these efforts.

The measures discussed involve increasing awareness of many lesser known benefits and issues, including:

1. Street trees provide public and private health and safety benefits and are natural mechanisms to reduce many problems.

2. Street trees are not just attractive landscape decoration for people and habitat in which wildlife can live; they are an essential part of Alameda's natural heritage.

3. Street trees can be protected through both city ordinances and guidance; not all street tree ion strategies have to be legislated. Incentives and education can greatly promote proper street tree stewardship throughout the City and across the island.

4. All activities have some level of impact on our natural resources, and Alameda's residents have a personal responsibility to help their street trees. Education topics should range from the scientific inventory data gathered on Alameda's urban forest to more basic, consumer-oriented tree care, planting, and benefits information. The educational efforts should be offered to the following persons and groups:

Citizen Groups
Building Inspectors
City Council
APT Contractors
City Contractors/Subcontractors
Realtors
Home/Property Owners

Developers
Homeowner Associations
Landscape Architects

Citizen Education Program The goal of the Citizen Education Program is to increase knowledge regarding the importance of street trees and a sustainable urban tree canopy, as well as teaching maintenance and ion methods for existing trees within the City of Alameda. Urban forestry education can be provided to adults through Citizen Forester Workshops in partnership with local nonprofits and to youth through hands-on environmental education programs.

Adult Community Workshops Citizen Forester Workshops could empower and support community leaders and citizens alike to take personal responsibility for their urban forests by educating, training, and supporting citizens to plant and care for trees in their neighborhoods, thereby dramatically increasing tree survival. The program can be modeled after a highly successful urban forestry program in Los Angeles created by Tree People. That program boasts a 93% tree survival rate—an exceptional statistic for urban trees. The program utilizes and builds upon partnerships with successful government and nonprofit programs such as adopt-a-tree and hands-on tree care programs. The City of Alameda could work with community-based organizations to create an annual calendar of citizen education workshops to be held at parks, City offices, and community organizations.

YOUTH COMMUNITY WORKSHOPS

A Youth Community Workshop model is an after-school program that provides youth with opportunities to engage in citywide projects and pursue hands-on learning. The program could integrate hands-on urban forestry education into existing City of Alameda Recreation Department after-school programs throughout the City of Alameda. The City of Alameda may work with the local community-based organizations, and the Parks and Recreation Department to expand the already established local best practice model.

Community Framework Assessment A sustainable street tree program is a community asset that requires citizen input and volunteer participation. Community appreciation for the benefits and needs of street trees and engagement in planning, planting, and caring for street trees is essential to the long-term health of the this program. Without the active support and engagement of the community, urban street tree programs cannot succeed. This section describes the ways the community is currently informed about and participates in stewardship of the urban street trees.

PLANNING AND POLICY DEVELOPMENT

Alameda residents have opportunities to participate in street tree planning and policy development through public comment during major plan development, through participation in oversight and planning committees, and through the Planning Board. The planning board listens to citizen comments at board meetings and development workshops. Public Works has encouraged public involvement, including the request for public input on tree planting and maintenance programs as well as notifica-

tions of all tree removals. As the street tree master plan is implemented continuous outreach to the public is encouraged.

Volunteer Opportunities Neighborhood and civic groups are the major source of citizen involvement in tree planting and stewardship. Across the country, citizens involved in community outreach and volunteering praise and support these planting programs, but maintain that a successful community street tree planting and maintenance program must provide sufficient maintenance funds and materials for the post-planting period.

PARTNERSHIPS

Early in Alameda's history, a few people of vision rallied an entire city behind funding and building the foundation of Alameda's street tree and park system. In more recent times, in addition to working with neighborhood volunteers on tree programs, the City continues to partner with individual businesses, chambers of commerce, nonprofit organizations, the media, neighborhood councils, business improvement districts, and state and federal agencies. These partnerships illustrate that street trees and urban forestry is about community as much as it is about trees. The City of Alameda may therefore play an active role in the formation of a local nonprofit tree organization. Via contract, the staff at the nonprofit tree organization can organize volunteer recruitment, citizen forester training, and supervision support for City tree programs.

PUBLIC AWARENESS CAMPAIGN

Developing a sustainable street tree canopy requires educating the residents, local businesses, and developers of the value of learning more about trees and the Alameda street tree programs. The public awareness campaign should have several facets, including a unified marketing plan, a City Web site dedicated to "tree issues," and planting packets. The public awareness campaign could also create an Alameda Tree Person Award to recognize the best developer, neighborhood manager, contractor, or government employee who excels at street tree protection and reforestation, as well as a Blue Ribbon Tree Contest awarding the best tree in the city as part of Arbor Day events and programs.

MARKETING CAMPAIGN

Marketing materials could be developed with content guidance generated from the MSTP and the technical support of delegated volunteers. The content could be linked to a citywide marketing plan that would also integrate the distribution of planting packets to accompany newly planted street trees. A series of public service documents could be developed addressing a variety of "tree topics," including proper maintenance of trees, water conservation, healthy living environments, and the benefits of planting trees. The topic of "Healthy and Safe Trees" could be emphasized to dispel "tree myths." For example, many residents currently believe that trees, fruit, seeds, and leaves can be dangerous by leading to the destruction of property and creating unsafe walking conditions. The campaign could educate the public on planting the appropriate trees in different locations to minimize their negative impacts.

CITY WEB SITE

The City's Web site could have a page dedicated to providing information to the public regarding the City Master Street Tree Plan. The Web site could include information provided in tree planting packets and marketing materials, and could serve as a one-stop location for all information regarding tree plantings and removals. Any tree management website should include the Alameda Approved Tree Matrix and other necessary regulations. Additionally, a link to a read-only GIS map made available for citizens to review, make comments, and update through an online form. The form would include the tree's number and the corrections. This "open-source" GIS map could encourage citizens to actively understand Alameda's street tree program.

Citizens could also be able to register their contact information online in order to receive notification via e-mail on tree planting events, workshops, and regular "City of Alameda Green Updates."

DOOR HANGERS, EASEMENT FORMS, AND TREE PLANTING KITS

Prior to planting or removing a tree, Public Works employees or Maintenance Staff should leave door hangers outside residences so that residents can express a preference to a specific tree without City staff needing to meet residents in person.

Additionally, easement forms for sidewalk relocation or interior street tree species plantings could be developed to streamline the paper work necessary to provide different planting solutions for residents. When new trees are planted in front of residents' houses residents and homeowners could receive a tree planting packets. Packets could also be available at City of Alameda Public Works offices and other select locations. Packets could include contact information and brochures from all tree partners, seed packets, and coupons from local hardware stores and nurseries to purchase trees, tree care products, and landscaping materials at a discounted cost. Some brochure examples may include:

- Caring for your new tree
- Watering street trees
- How trees grow old
- How to kill a tree
- What do trees hate?
- What's so special about trees?

EDUCATION AND OUTREACH RECOMMENDATIONS

As funding allows, the city should:

1. Continue to pursue outside training and arborist certification opportunities for staff, including the most up-to-date training in high risk tree identification, tree protection, and plant appraisal.

2. Develop a "one-stop shopping" comprehensive Web site for tree information. Property owners, developers, and citizens could use the site to find out how trees

affect them and how they affect trees. Access to important information regarding the City's Approved Tree Matrix, regulations, and programs should be available, as well as read-only access to the GIS tree inventory data to encourage public inventory review.

3. Maintain a public presence at fairs and farmer's markets, and continue to hold events such as panel discussions and informational presentations for the community.

4. Continue to partner with city nonprofit organizations and other tree professionals in education and outreach efforts.

5. Expand upon and increase the availability of the City's street trees related literature.

6. Create a Citizen Forester citizen education program.

7. Partner with a nonprofit to develop tree planting volunteer programs.

8. Create an Arbor Day program.

9. Create a planting packet with coupons, seed packets, and tree care information.

10. Create an annual Tree Person award and a Blue Ribbon Tree award.

APPENDICES

APPENDIX 1 / STREET TREE PLANTING AND STAKING SPECIFICATIONS

1. ALL WORK SHALL BE PERFORMED BY PERSONS FAMILIAR WITH THIS TYPE OF WORK AND UNDER THE SUPERVISION OF A QUALIFIED PLANTING FOREMAN.
2. CONTRACTOR SHALL VERIFY THAT ADEQUATE DRAINAGE EXISTS PRIOR TO PLANTING.
3. CONTRACTOR SHALL VERIFY THE LOCATION OF ALL UTILITIES PRIOR TO PLANTING.
4. TREES SHALL BE 7 TO 10 FEET HIGH SUPPLIED IN FIFTEEN GALLON CONTAINERS. TREES SHALL HAVE A MINIMUM OF 1.5 INCH TRUNK DIAMETER AT BREAST HEIGHT.
5. ALL TREES SHALL CONFORM TO THE STANDARDS SET FORTH IN THE MOST RECENT *AMERICAN STANDARDS FOR NURSERY STOCK* PUBLISHED BY THE AMERICAN ASSOCIATION OF NURSERYMEN (A.A.N.).
6. TREES SHALL HAVE A STRAIGHT STRONG TERMINAL LEADER, UNCUT AND UNBROKEN. THE MAIN TRUNK SHALL HAVE ACCEPTABLE LATERAL GROWTH ALONG ITS LENGTH SHORTER AND SMALLER IN DIAMETER THAN THE MAIN TRUNK.
7. ALL TREES THAT, IN THE OPINION OF THE CITY ENGINEER, ARE DISEASED, INSECT INFECTED, OR HAVE GIRDLING ROOTS, WILL BE REJECTED.
8. TREES WITH ROOT FLARE COVERED BY MORE THAN 1.5 INCHES OF SOIL WILL BE REJECTED PRIOR TO INSTALLATION.
9. PLANTING MIXTURE FOR THE BACKFILL SHALL HAVE NO SOIL AMENDMENTS.
10. IN PARKWAY STRIPS SET PLANTER TOP 1.5 INCHES BELOW SIDEWALK GRADE. IN LAWNS OR GROUNDCOVER AREAS SET PLANTER TOP FLUSH WITH FINISHED GRADE. IN LAWN AREAS THERE SHALL BE A 2 FOOT MULCH RING CLEARANCE BETWEEN EDGE OF LAWN AND TREE.
11. STAKING OF TREE IS NOT RECOMMENDED, EXCEPT ON WINDY SITES, FOR LARGE EVERGREEN TREES, OR IN AREAS WITH HEAVY TRAFFIC. IF STAKING IS DONE, FLEXIBLE HOSE - NOT TIES AND WIRES - SHOULD BE USED. NAIL FLEXIBLE TREE STRAP TO EACH SIDE OF THE STAKE IN TEARDROP FIGURE WITH 1 INCH MAX GALVANIZED ROOFING NAIL.
12. TREE STAKES TO BE REMOVED AFTER TWO YEARS.
13. AT PLANTING PRUNE ONLY CROSSING LIMBS, CO-DOMINANT LEADER, BROKEN, DISEASED OR DEAD BRANCHES, AND ANY BRANCHES THAT POSE A HAZARD TO PEDESTRIANS WHILE PRESERVING FORM AND CHARACTER OF TREE. DO NOT CUT LEADER. DO NOT PRUNE IN ORDER TO REDUCE CANOPY SIZE.
14. DO NOT WRAP TRUNK OF TREE.
15. A ROOT COLLAR EXCAVATION FOR ALL TREES SPECIFIED WILL BE DONE BY THE CITY ENGINEER TO ENSURE THAT TREES WERE NOT PLANTED OR GROWN TOO DEEPLY AT THE NURSERY. LANDSCAPE CONTRACTORS SHALL HAVE SUPPLIERS MARK GROUND LEVEL LINE ABOVE ROOT BALL. IF CITY ENGINEER DETERMINES THAT THERE IS EXCESSIVE SOIL OVER THE ROOT CROWN, THE TREES WILL BE REJECTED.
16. MULCH SHALL BE 3" DEEP UNLESS OTHERWISE NOTED.
17. TREES SHALL BE WATERED TWICE WEEKLY. ALL TREES NOT MEETING WITH THE APPROVAL OF THE CITY ENGINEER AT THE END OF THAT PERIOD SHALL BE REPLACED BY THE CONTRACTOR.
18. DEEP WATERING TUBES.

1 TREE PLANTING NOTES

NO.	REVISED	BY	APP.

DATE: AUGUST 24, 2008

SCALE: NOT TO SCALE

CITY OF ALAMEDA
CALIFORNIA
ENGINEERING DEPARTMENT

Tree Planting Details

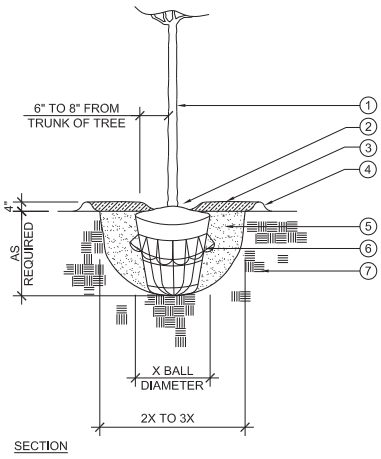
APPROVED BY:

CITY ENGINEER

REG. C.E. NO. _____

DATE _____

Exhibit 1



SECTION

LEGEND

1. TREE TRUNK. (OPTIONAL)
2. ROOTBALL CROWN TO BE 2" ABOVE SURROUNDING FINISH GRADE.
3. 3" MULCH RING DIRECTLY OVER PLANTING HOLE (KEEP CLEAR FROM TRUNK - DO NOT MOUND BASE OF TREE)
4. PLANTER SAUCER EDGE.
5. PLANTING MIX OR BACKFILL.
6. WIRE BASKET OPTIONAL.
7. EXISTING SOIL.

NOTES

A. CUT AND REMOVE TOP ½ OF WIRE BASKET, TURN DOWN TOP ½ OF BURLAP; REMOVE ALL CORD & TWINE FROM BASE OF TRUNK; IF NONDEGRADEABLE WRAP IS USED, REMOVE TOTALLY.

B. LOOSEN EXTERIOR OF THE ROOT BALL AND THE ROOT MATT AT THE BOTTOM OF THE BALL, CUT ALL MAJOR CIRCLING ROOTS.

2 GENERAL TREE PLANTING

NO.	REVISED	BY	APP.

DATE: AUGUST 24, 2008

SCALE: NOT TO SCALE

CITY OF ALAMEDA
CALIFORNIA
ENGINEERING DEPARTMENT

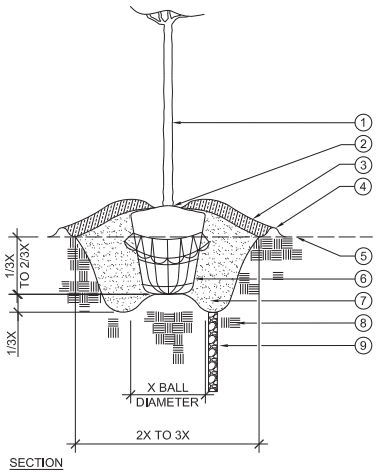
Tree Planting Details

APPROVED BY:

CITY ENGINEER

REG. C.E. NO. _____

DATE _____



LEGEND

1. TREE TRUNK.
2. ROOTBALL CROWN TO BE 2" ABOVE SURROUNDING FINISH GRADE.
3. 3" MULCH RING DIRECTLY OVER PLATING HOLE.
4. PLANTER SAUCER EDGE.
5. EXISTING GROUND LINE.
6. WIRE BASKET OPTIONAL.
7. PLANTING MIX BACKFILL.
8. EXISTING SOIL.
9. CHIMNEY DRAIN, 8" DIA. HOLE X 5' DEEP. BACK FILLED WITH DRAIN ROCK. DRILL ON DOWNHILL SLOPE OF ROOTBALL FOR DRAINAGE.

3 TREE PLANTING IN WET / HEAVY SOILS

NO.	REVISED	BY	APP.

DATE: AUGUST 24, 2008

SCALE: NOT TO SCALE

CITY OF ALAMEDA
CALIFORNIA
ENGINEERING DEPARTMENT

Tree Planting Details

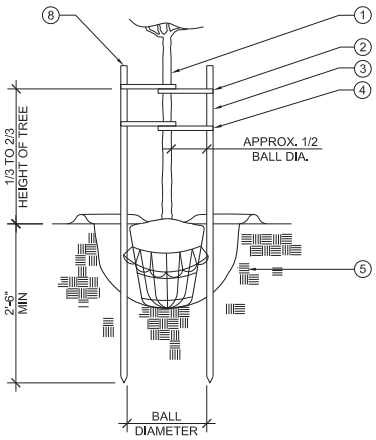
APPROVED BY:

CITY ENGINEER

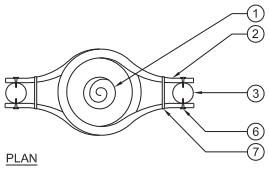
REG. C.E. NO. _____

DATE _____

Exhibit 3



SECTION



PLAN

LEGEND

1. TREE TRUNK.
2. CUT SEMI-RIGID GARDEN HOSE. UPON INSTALLATION.
3. 2" DIAMETER LODGEPOLE TREE STAKE.
4. ONLY USE SECOND TIE IF TREE SIZE IS 24" BOX OR LARGER OR AS REQUIRED.
5. EXISTING SOIL.
6. 1" GALVANIZED ROOFING NAIL.
7. PLASTIC ZIP TIE.
8. CUT TOP OF STAKE AS REQUIRED TO CLEAR LOWEST BRANCH BY 6".

NOTES

TREE STAKES FOR ALL STREET TREES SHALL BE PARALLEL TO STREET.

4 TREE STAKING

NO.	REVISED	BY	APP.

DATE: AUGUST 24, 2008

SCALE: NOT TO SCALE

CITY OF ALAMEDA
CALIFORNIA
ENGINEERING DEPARTMENT

Tree Planting Details

APPROVED BY:

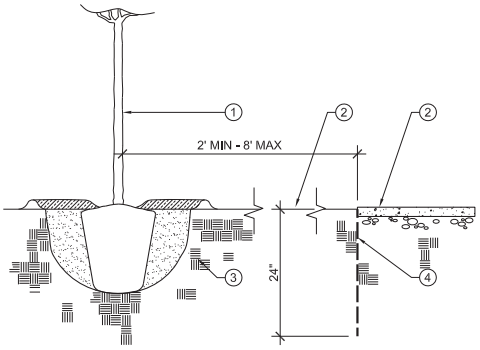
CITY ENGINEER

REG. C.E. NO. _____

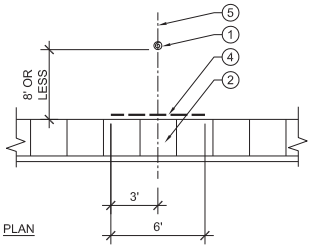
DATE _____

LEGEND

1. TREE TRUNK.
2. ADJACENT PAVING, CURB, CURB AND GUTTER, OR PATH.
3. EXISTING SOIL.
4. ROOT BARRIER: CONTRACTOR SHALL USE DEEP ROOT LINEAR ROOT BARRIER #22-29-18-P / HIGH DENSITY POLYETHYLENE, MANUFACTURED BY DEEP ROOT CORP. (7354 BOLSA AVE. WESTMINSTER CA 92683) OR EQUAL. SET TOP FLUSH WITH FINISHED GRADE.
5. CENTER LINE OF TREE.
6. 2' MINIMUM FOR NEW PLANTER STRIP.



SECTION



PLAN

5 ROOT CONTROL BARRIER

NO.	REVISED	BY	APP.

DATE: AUGUST 24, 2008

SCALE: NOT TO SCALE

CITY OF ALAMEDA
CALIFORNIA
ENGINEERING DEPARTMENT

Tree Planting Details

APPROVED BY:

CITY ENGINEER

REG. C.E. NO. _____

DATE _____

Exhibit 5

APPENDIX 2 / REQUIRED DISTANCES BETWEEN CITY INFRASTRUCTURE AND TREES

ITEM***	PREFERRED DISTANCE **
Street Intersection	20 feet from intersection of curb.
Street Light	12 feet from the pole.
Traffic Signal	25 feet clear radius from actual traffic signal.
Major Traffic Sign	15 feet from the front face of the sign PLUS all trees must maintain visibility of signs. (4)
Discretionary Street Sign	No closer than 5 feet behind or 10 feet in front of any street signs PLUS all trees must maintain visibility of signs.(3)
Line Power Pole	10 feet from the pole.
Driveways	10 feet from the edge of the driveway. (3' min from outer edge of mature tree)
Handicap Ramps	10 feet from ramp.
Fire Hydrants	8 feet from hydrant. (6' min from outer edge of mature tree)
Storm Water Inlet	10 feet from edge of inlet. (5' min from outer edge of mature tree)(1)
Marked Water, Gas, Electric, Telephone Main Lines	5 feet from lines.
Storm and Sanitary Sewer Service Branches	5 feet from service branch.
Water, Telephone, and Electrical Service Lines	5 feet from lines. (2' min from outer edge of mature tree)
Major Underground Service Junction	6 feet from edge of junction box.
Drainage ditches	No trees planted within drainage ditches unless there is no diversion of flow.
Bus Stops	No trees planted along the length of bus zone.(2)
Pedestrian Crossing	20 feet from the approach side of the crossing.
Parking Meters	4 feet in front of meter, near rear wheel space.

Notes:

1. No tree is to be planted between culvert opening and intersection.
2. No tree will be planted that conflicts with bus access along the length of the bus zone unless no conflict is determined between tree canopy and bus stop in consultation with AC transit
3. Discretionary street signs include signs with the street name and all maintenance related information such as street sweeping. Discretionary signs are to be placed to ensure visibility and may be moved to allow for maximum tree planting while ensuring sign visibility.
4. Major traffic signs include all traffic control signs such as turn prohibited, intersection lane control, stop, yield, and speed limit. If visibility is lacking for existing signs, the tree distance to the signs may be a nominal distance to provide better visibility but never less than a distance that is needed to maintain regulatory distance for adequate visibility as per the field condition per state or California MUTCD codes.

* These distances are for new trees only and do not apply to existing trees planted prior to adoption of the MSTP on 2/16/2010.

** In general the preferred distance is to be used but the minimum distance may be applied where there are other unavoidable constraints.

*** Tree is to be centered between curb and sidewalk and for sidewalks greater than 4 feet wide, at least 2 feet from curb line unless designated otherwise by City Staff.

**** Applications of these standards are to apply in most cases with a goal of providing one tree minimum per property and at least one tree for every 40' of frontage. On corner lots, this rule applies to both sides.

APPENDIX 3 / PROTECTION OF IMPORTANT NESTING HABITAT

Alameda's trees provide nesting habitat for birds of conservation concern, specifically raptors, herons, and egrets. During nesting season, tree actions should be avoided on or near trees containing active nests of these birds. Disturbing active nests is prohibited under California Fish and Game and U.S. Fish and Wildlife regulations. This Appendix applies to routine tree maintenance and do not applies to trees that are infected with a rapidly spreading pathogen or an imminent threat to public safety.

Definitions

1. An active nest is a nest that is in use in the current nesting season. Nests from previous nesting seasons that are not in use this nesting season are not active nests.
2. Nesting season is March 1 through September 1.
3. Tree actions are tree-related activities that include branch pruning, sidewalk removal for root shaving, tree removal that uses loud machinery such as chainsaws, pavement saws, chippers, or heavy equipment.

Guidelines

The following guidelines ensure protection of nesting habitat:

1. Active nests of the following species should not be disturbed:
    - Cooper's Hawk*
    - Sharp Shinned Hawk
    - Red Tailed Hawk*
    - Red Shouldered Hawk*
    - White Tailed Kite*
    - American Kestrel
    - Merlin
    - Great Horned Owl*
    - Western Screech Owl*
    - Barn Owl*
    - Great Blue Heron*
    - Green Heron
    - Black Crowned Night Heron
    - Great Egret*
    - Snowy Egret*
    - Σ Cattle Egret

* Active nests of this species were found in Alameda during three nest surveys 2007—2009.

2. To avoid disturbing active nests, tree actions should not be taken on trees containing an active nest or within 200 feet of a tree containing an active nest.

Identification of Active Nests

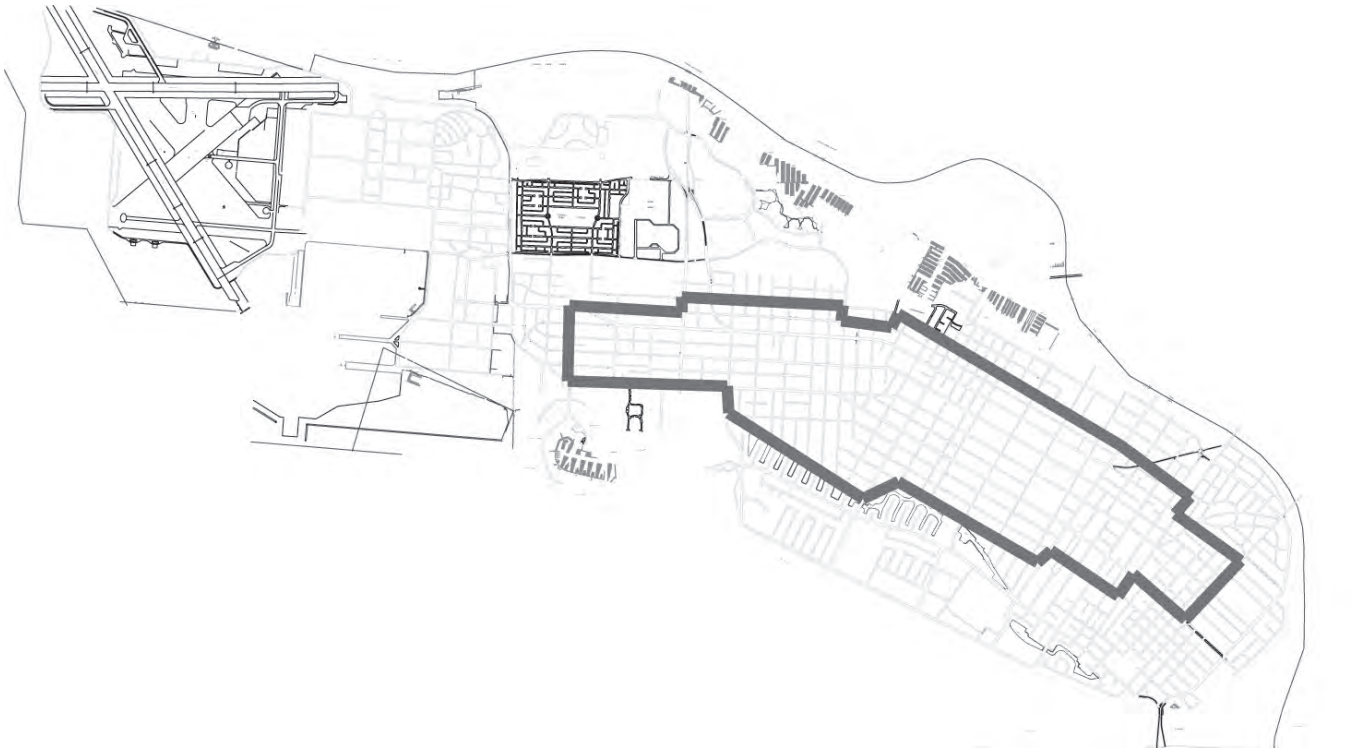
The City will work with the community to identify trees containing active nests and will schedule tree actions to avoid disturbing active nests.

Trees containing active nests will be tagged at the beginning of the nesting season. Tags will be removed at the end of the nesting season. City crews and contractors will avoid performing tree actions on trees containing tags or on trees within 200 feet of a tagged tree.

To simplify tagging, areas containing active nests year-after-year should be designated as nest protection zones. Tree actions will not be scheduled within 200 feet of a nest protection zone during nesting season. Trees containing active nests within a nest protection zone will not be tagged.

Nest Protection Zone		Repeated Nesting Species
1.	Washington Park	Cooper's Hawk
2.	Chapin Street, both sides between Pacific Avenue and Buena Vista Avenue	Cooper's Hawk
3.	Clinton Street both sides between Paru Street and Sherman Street	Cooper's Hawk
4.	Franklin Park	Cooper's Hawk
5.	Jackson Park	Cooper's Hawk, Barn Owl
6.	Gibbons Drive, both sides	Cooper's Hawk
7.	Heron rookery along lagoon pathway northwest of the Harbor Bay Landing Shopping Center	Great Egret, Snowy Egret
8.	Chuck Corica Golf Complex	Great Blue Heron, Red Tailed Hawk, Great Horned Owl

APPENDIX 4 / CITY OF ALAMEDA - SPECIAL PLANTING ZONE MAP



• Species American Elm, London Plane, Scarlet Oak, Southern Red Oak and Shumard Oak can be planted in less than 5' planter strip but not less than 3'. If located within marked area.

GLOSSARY

When the following words and phrases are used in this MSTP, they shall have the following meanings unless a different meaning is clearly required by the context:

Associated Vegetation shall mean native or non-native shrubs and ground covers within city parks, rights-of-ways, and open spaces.

City shall mean the government of Alameda.

Arborist shall mean the contracted or City employee who is a current certified arborist by the International Society of Arboriculture and is responsible for administering and enforcing the provisions of this chapter.

High Risk Tree shall mean any public tree rated as such by the City according to the tree high risk evaluation standards established by the International Society of Arboriculture.

Maintain or maintenance shall mean the entire care of trees within City rights-of-ways and open spaces, as well as the preparation of ground, fertilizing, mulching, planting, disease and insect control, trimming, pruning, staking, root control, watering, leaf litter, weed removal, and removal of dead and dying trees.

Master Street Tree Plan shall mean a document adopted by council that presents street tree inventories, maintenance recommendations, recommended street tree lists, a master design plan for street tree plantings, and urban forestry program goals.

Street Trees shall mean all trees and woody plants within public rights-of-ways.

Planting shall mean to install public trees permanently in the ground.

Planting Strip shall mean the area available for planting including tree pits between the street curbs, the edge of the traveled portion of roadway, and the property line.

Property Owner shall mean the person owning such property as shown by the records of the Assessor's Office of Alameda County, California.

Pruning shall mean cutting or removing any part of the branching structure of a plant in either the crown, trunk, and/or root areas.

Removal shall mean removal of a tree within City rights-of-ways and open spaces.

Street Tree Standards and Specifications Manual shall mean a document adopted by council that presents required standards and specifications for public tree planting, maintenance, and removal. Currently, such a document does not exist. If funding is available this may be available in the future.

BIBLIOGRAPHY

American National Standards Institute. "Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices (pruning)." ANSI A300 (Part 1) –Pruning.

American National Standards Institute. "American Standard for Nursery Stock." ANSI Z60.1.

American National Standards Institute. "Pruning, Repairing, Maintaining, and Removing Trees, and Cutting Brush – Safety Requirements." ANSI Z133.1.

Bratton, N.J & K.L.Wolf. "Trees and Roadside Safety in U.S. Urban Settings, Paper 05-0946." In "Proceedings of the 84th Annual Meeting of the Transportation Research Board (January 9-13, 2005)." Transportation Research Board of the National Academies of Science. Washington, DC.

Burden, D. 2006. Urban Street Trees. 22 Benefits. Specific Applications. [online] Glatting Jackson and Walkable Communities Inc. Available from: www.ufei.org/files/pubs/22Benefits ofUrbanStreetTrees.pdf [cited June 2008]

Centre for Urban Forest Research. 2007. Why Shade Streets? The unexpected benefit. Davis: USDA Forest Service (Published 2007). Available from: http://www.fs.fed.us/psw/programs/ cufr/products/cufr_673_WhyShadeStreets_10-06.pdf [cited June 2008]

City and County of San Francisco. Street Tree Planting Permitting Process. 2007: San Francisco, Department of Public Works. Available from: www.sfgov.org/site/sfdpw_index. asp?id=33090 [cited June 2008]

City of Davis. 2002. Community Forest Management Plan. Available from: http://cityofdavis. or/pgs/trees/pdfs/CFMP-Final-Sept2002-toc.pdf [cited June 2008].

City of Portland. 1995. "Portland's Urban Forestry Management Plan, public review draft." Portland Parks and Recreation and the Urban Forestry Management Plan Technical Advisory Committee. Portland, OR.

Clark, J. R., N. P. Matheny, G. Cross & V. Wake. 1997. A Model of Urban Forest Sustainability. Journal of Arboriculture, 23 (1), 17-30.

Council of Tree and Landscape Appraisers. 2000. "Guide for Plant Appraisal." 9th Edition. 143pp.

Dwyer, John F., Gregory E. McPherson, Herbert W. Schroeder, and Rowan A. Rowntree. 1992. Assessing the Benefits and Costs of the Urban Forest. Journal of Arboriculture 18(5).

Gilman, Edward & Sharon Lilly. 2002. Best Management Practices: Tree Pruning. International Society of Arboriculture. Champaign, IL. 35p.

Keating, Janice. 2002. Trees: The Oldest New Thing in Stormwater Treatment Stormwater. Vol. 3 (2).

McPherson, G., S. Maco, J. Simpson, P. Peper, Q. Xiao, AM. VanDerZanden, N. Bell. 2002. Western Community Tree Guide: Benefits, Costs and Strategy Planning.

Miller, R.W. 1997. Urban Forestry: Planning and Managing Urban Green Spaces. Prentice Hall. Upper Saddle River, NJ. 188p.

Moll, G. 1989. Improving the health of the urban forest. In Moll, G. and S. Ebenreck (eds.). Shading Our Cities, pp. 119-130. A Resources Guide for Urban and Community Forests. Island Press. Washington.

Nowak, David J. 2004. The Effects of Urban Trees on Air Quality. USDA Forest Service, Syracuse , NY. Available from: http://www.fs.fed.us/ne/syracuse/TREE%20Air%20Qual.pdf. [Cited June 2008].

Richards, N.A. 1983. Diversity and stability in street tree populations. Urban Ecology 7: 159-171.

Ulrich, Roger S. and Robert F. Simons. 1986. Recovery from Stress During Exposure to Everyday Outdoor Environments. In The Costs of Not Knowing. Edited by Wineman et. al.

Wolf, K. 1998. Enterprising landscapes: Business districts and the urban forest. In C. Kollin, Engineering Green: Proceedings of the 11th National Urban Forest Conference. Washington, DC: American Forests.

Wolf, K. 1998. Trees in Business Districts: Positive Effects on Consumer Behavior! - Fact Sheet 5. Available from: http://www.cfr.washington.edu/research.envmind/consumer.html [Cited June 2008].

Wolf, K. 2003. Youth and Mental Health: Work Projects in Urban Green Space. In C. Kollin (ed.), Engineering Green: Proceedings of the 11th National Urban Forest Conference. Washington, DC: American Forests.

Wolf, K. 2005a. Business District Streetscapes, Trees and Consumer Response. Journal of Forestry, 103 (8) 396-400.

Wolf, K. 2005b. Civic Nature: Valuation: Assessments of Human Functioning and Well-Being in Cities. In: Forging Solutions: Applying Ecological Economics to Current Problems, Proceedings of the 3rd Biennial Conference of the U.S. Society for Ecological Economics (July 20-23,2005). Tacoma, WA: Earth Economics.

WEB SITES:

International Society of Arboriculture:
http://www.isa-arbor.com/home.aspx

Center for Urban Forest Research, Pacific Southwest Research Station, USDA Forest Service:
http://cufr.ucdavis.edu/

Human – Environment Research Laboratory, University of Illinois at Urbana Champaign:
http://www.herl.uiuc.edu/

National Arbor Day Foundation:
http://www.arborday.org/

Urban Forestry South. USDA Forest Service, Western Region: http://www.urbanforestrywest.usda.gov/

i. ALAMEDA STREET TREE MATRIX

Tree Species	Common Name	Foliage		Flower/Fruit								
		Deciduous/Evergreen	Fall Color	Flower Color	Flower Period	Fruit	Fruiting Period	Shape	Growth Rate Per Year (once established)	Height at Maturity (feet)	Spread at Maturity (feet)	Trunk Diameter at Breast Height at Maturity (inches)	Longevity (years)
Acer buergeranum	Trident Maple	D	Red or orange	Yellow	Spring	Brown winged seed, 0.5-1.5"	Summer	Rounded, spreading with a low canopy	24-36"	25	25	20	50-100
Acer campestre 'Queen Elizabeth'*	Hedge Maple	D	Gold	Inconspicuous	Spring	Brown winged seed, 0.5-1.5"	Summer or Fall	Upright	12-36"	35	35	25	50-100
Acer x freemanii 'Autumn Blaze'	Autumn Blaze Hybrid Maple	D	Red	Inconspicuous	Spring	Brown winged seed, 1.5-3"	Fall	Conical or oval, erect of spreading with a high canopy	36"	50	40	30	50-100
Acer nigrum 'Green Column'	Black Maple	D	Gold	Inconspicuous	Spring	Brown winged seed, 0.5-1.5"	Fall	Oval or rounded	24"	65	50	25	50-100
*Acer palmatum**	Japanese Maple	D	Red, gold, orange, bronze, purple or multicolor	Inconspicuous	Spring	Brown winged seed, 0.5-1.5"	Summer	Rounded, umbrella or vase	12-24"	25	25	15	50-100
*Acer paxii**	Evergreen Maple	E	N/A	Inconspicuous	Spring	Brown winged seed, 0.5-1.5"	Summer	Rounded, erect or spreading with a low canopy	12"	35	35	20	50-100
Acer rubrum 'Armstrong'*	Scarlet Maple	D	Yellow or red	Red	Spring	Brown winged seed, 1.5-3"	Summer	Columnar, erect	36"	45	15	25	50-100
Acer rubrum 'Bowhall'*	Bowhall Maple	D	Red, gold or orange	Red	Spring	Red winged seed, 1.5-3"	Summer	Upright, narrow	36"	40	15	25	50-100
Acer rubrum 'Brandywine'	Brandywine Maple	D	Deep red	Red	Spring	Seedless	N/A	Oval	36"	40	30	25	50-100
Acer rubrum 'Frank Jr.'*	Redpointe Maple	D	Red	Red	Spring	Brown winged seed, 1.5-3"	Summer	Broadly pyramidal	36"	45	30	25	50-100
Acer rubrum 'October Glory'	October Glory Maple	D	Deep red	Red	Spring	Red winged seed, 1.5-3"	Summer	Oval or rounded	36"	40	35	25	50-100
Acer rubrum 'Somerset'*	Somerset Maple	D	Red	Red	Spring	Seedless	N/A	Oval or rounded	36"	45	35	25	50-100
Acer rubrum 'Sun Valley'*	Sun Valley Maple	D	Red	Red	Spring	Seedless	N/A	Oval, densely branched	36"	40	35	25	50-100
Acer saccharum 'Autumn Splendor'* *Acer saccharum* 'Bonfire' *Acer saccharum* 'Commemoration' *Acer saccharum* 'Crescendo'* *Acer saccharum* 'Fall Fiesta'*	Sugar Maple	D	Orange or yellow	Inconspicuous	Spring	Brown winged seed, 1.5-3"	Summer	Oval or rounded, erect or spreading	8-18"	65	40	30	>100
Aesculus carnea 'Briotti'	Red Horsechestnut	D	No change in leaf color	Showy, fragrant, red or rose	Spring	Brown capsule, 0.5-1.5"	Summer or Fall	Rounded or Umbrella, erect or spreading with a low canopy	12-18"	35	30	20	50-100
Aesculus hippocastanum 'Baumannii'	European Horsechestnut	D	Gold	White	Spring	Seedless	N/A	Oval or rounded	12-24"	65	40	25	50-100

* trees to be considered on an experimental basis, as they have yet to be proven as successful street trees in Alameda (see discussion in sec. 3.2)
** minimum planter width may be less if tree is located within area marked in Appendix 4

Microsite Conditions									Root Zone Mgt.		Nursery Status			Litter Issue	Pests & Diseases	Comments
Tolerates Full Sun	Tolerates Shade	Requires Good Drainage	Tolerates Poor Drainage	Tolerates Moist Soil	Drought Tolerant	Tolerates Sprinklers	Seaside Tolerance	Tolerates Alkaline Soil	Minimum Planter Width (feet)	Hardscape Damage Potential	Nursery Availability	Nursery Origin	Stock Type			
✓	✓			✓			✓	✓	3	Moderate	Good	California	Container		Susceptible to aphids, root rot and verticillium wilt.	A good Japanese Maple substitute. Does not get good fall color in Alameda.
✓	✓	✓			✓	✓		✓	3	Low	Poor	Oregon	B&B and bareroot		Susceptible to verticillium wilt and tar spot.	Suitable for use in parking lot islands and sidewalk tree pits.
✓	✓	✓		✓		✓			4	Moderate	Good	California	Container		Susceptible to aphids, beetle borers and scales, oak root rot, root rot, sooty mold and verticillium wilt.	A fast growing hybrid of Red and Silver maple. Fall color in Alameda has been variable. Develops chlorosis in alkaline soils.
✓	✓	✓			✓	✓			3	Moderate	Good	Oregon	Container		Susceptible to anthracnose, oak root rot, phytophthora, powdery mildew, root rot and verticillium wilt.	Reputed to be one of the toughest maples for street tree use. Tolerant of severe heat and drought once established.
	✓	✓		✓		✓	✓		3	Low	Good	California and Oregon	B&B and container		Resistant to oak root fungus. Susceptible to root rot, verticillium wilt and sun scorch.	Use as understory with larger trees. Green-leaf varieties can tolerate more sun.
	✓			✓			✓	✓	3	Low	Poor				Susceptible to aphids, root rot and verticillium wilt.	
✓	✓		✓	✓	✓	✓	✓		3	Moderate	Good	California and Oregon	Bareroot and container		Susceptible to beetle borers and scales, oak root rot, phytophthora, root rot and verticillium wilt.	Not to be planted under high voltage lines.
✓	✓		✓	✓	✓	✓	✓		3	Moderate	Good	California and Oregon	Bareroot and container		Susceptible to beetle borers and scales, oak root rot, phytophthora, root rot and verticillium wilt.	Not to be planted under high voltage lines.
✓	✓		✓	✓	✓	✓	✓		3	Moderate	Good	California and Oregon	Bareroot and container		Susceptible to beetle borers and scales, oak root rot, phytophthora, root rot and verticillium wilt.	Very good fall color and a possible *Liquidambar* substitute. Colors ten day later than most *A. rubrum* cultivars.
✓	✓		✓	✓	✓	✓	✓		3	Moderate	Good	California and Oregon	Bareroot and container		Susceptible to beetle borers and scales, oak root rot, phytophthora, root rot and verticillium wilt.	
✓	✓		✓	✓	✓	✓	✓		3	Moderate	Good	California and Oregon	Bareroot and container		Susceptible to beetle borers and scales, oak root rot, phytophthora, root rot and verticillium wilt.	Very good fall color and a possible *Liquidambar* substitute. The last of the *A. rubrum* cultivars to color in the fall.
✓	✓	✓		✓	✓	✓	✓		3	Moderate	Good	California and Oregon	Bareroot and container		Susceptible to beetle borers and scales, oak root rot, phytophthora, root rot and verticillium wilt.	
✓	✓	✓		✓	✓	✓	✓		3	Moderate	Good	California and Oregon	Bareroot and container		Susceptible to beetle borers and scales, oak root rot, phytophthora, root rot and verticillium wilt.	
✓	✓		✓				✓	✓	3	Moderate	Good	Oregon	Bareroot		Susceptible to beetle borers and scales, anthracnose, oak root rot, powdery mildew, root rot and verticillium wilt.	
✓	✓		✓	✓		✓	✓	✓	3	Moderate	Good	California and Oregon	Container	Flowers, dry fruit, leaves	Susceptible to beetle borers, chlorosis, powdery mildew and rust.	Horizontal branching required pruning in early years.
✓		✓		✓		✓		✓	4	Moderate	Poor			Flowers, leaves	Susceptible to white-marked tussock moth and japanese beetle, leaf blotch, scorch, powdery mildew and leaf spot.	

Tree Species	Common Name	Foliage		Flower/Fruit								
		Deciduous/Evergreen	Fall Color	Flower Color	Flower Period	Fruit	Fruiting Period	Shape	Growth Rate Per Year (once established)	Height at Maturity (feet)	Spread at Maturity (feet)	Trunk Diameter at Breast Height at Maturity (inches)	Longevity (years)
*Alsophila australis**	Australian Tree Fern	E	N/A	N/A	N/A	N/A	N/A	Rounded or vase, erect or spreading with a low canopy	35"	25	25	15	<50
*Angophora costata**	Gum Myrtle	E	N/A	Showy, white	Summer	Brown capsule, 0.25-0.5"	Fall	Conical or rounded, erect or spreading with high canopy	24"	50	40	25	50-100
Betula nigra 'Heritage'*	Heritage River Birch	D	Gold	Inconspicuous	Spring	Catkins	Spring	Pyramidal	24-36"	45	30	30	50-100
Carpinus betulus 'Fastigata'	European Hornbeam	D	Red, gold or multicolor	Inconspicuous	Spring	Brown winged seed, 0.25-0.5"	Winter or Summer	Columnar or conical, erect with low canopy	12-24"	35	40	15	50-100
Carpinus betulus 'Frans Fontaine'	European Hornbeam	D	Red, gold or multicolor	Inconspicuous	Spring	Brown winged seed, 0.25-0.5"	Winter or Summer	Columnar or conical, erect with low canopy	12-24"	35	15	15	50-100
*Carpinus caroliniana**	American Hornbeam	D	Red, gold, orange or multicolor	Inconspicuous	Spring	Small winged seed, 0.25-0.5"	Winter or Summer	Rounded or umbrella, erect with a low canopy	12-24"	35	30	20	50-100
*Cercis canadensis**	Eastern Redbud	D	Gold	Pink	Spring	Brown pods, 1.5-3"	Summer	Rounded or Umbrella, erect or spreading with a low canopy	36"	25	25	10	<50
*Chionanthus retusus**	Chinese Fringe Tree	D	Gold	White	Summer	Purple drupe, 0.5-1.5"	Fall or Winter	Rounded or umbrella, spreading	24"	20	15	15	<50
*Corylus colurna**	Turkish Hazel	D	Yellow	Green or yellow	Winter	Small brown nut enclosed in leafy bracts, edible, 0.25-0.5"	Fall	Oval or umbrella, erect or spreading and covers an extensive area	12-24"	60	35	25	50-100
Corymbia ficifolia	Red Flowering Gum	E	N/A	Showy, orange, pink, red or rose	Spring, Summer, Fall or Winter	Brown capsule, 0.5-1.5"	Spring, Summer or Fall	Rounded, erect or spreading with a low canopy	24"	35	30	30	50-100
Crataegus x 'Vaughn'*	Vaughn Hawthorn	D	Red or orange	White	Spring	Red pome, 0.25", persisting through winter	Fall	Oval, erect or spreading with a low canopy	24-36"	25	20	15	50-100
*Cupressus sempervirens**	Italian Cypress	E	N/A	Inconspicuous	Spring	Brown cone, 0.5-1.5"	Fall	Columnar, erect	36"	50	30	25	50-150
Fagus sylvatica	European Beech	D	Bronze	Inconspicuous	Spring	Brown nut in spiny husk, 0.5-1.5", edible	Fall	Broadly pyramidal to broadly oval	24"	60	50	35	50-100
Ginkgo biloba 'Fairmont'	Fairmont Maidenhair Tree	D	Gold	Inconspicuous	Winter	Fruitless	N/A	Pyramidal with dominant leader	12-24"	50	25	40	>100
Ginkgo biloba 'Golden Colonnade'*	Golden Colonnade Maidenhair Tree	D	Gold	Inconspicuous	Winter	Fruitless	N/A	Narrow, conical	12-18"	45	25	25	>100
Ginkgo biloba 'Magyar'*	Magyar Maidenhair Tree	D	Gold	Inconspicuous	Winter	Fruitless	N/A	Narrow, pyramidal	12-18"	50	25	25	>100

* trees to be considered on an experimental basis, as they have yet to be proven as successful street trees in Alameda (see discussion in sec. 3.2)

** minimum planter width may be less if tree is located within area marked in Appendix 4

Microsite Conditions									Root Zone Mgt.		Nursery Status			Litter Issue	Pests & Diseases	Comments
Tolerates Full Sun	Tolerates Shade	Requires Good Drainage	Tolerates Poor Drainage	Tolerates Moist Soil	Drought Tolerant	Tolerates Sprinklers	Seaside Tolerance	Tolerates Alkaline Soil	Minimum Planter Width (feet)	Hardscape Damage Potential	Nursery Availability	Nursery Origin	Stock Type			
✓	✓	✓		✓			✓	✓	2	Low	Poor			Leaves	Susceptible to spider mites and root rot.	Grows best in partial shade. Also know as *Cyathea australis* , *C. cooperi* , *Alsophila cooperi* and *Sphaeropteris cooperi.*
✓			✓	✓	✓	✓	✓	✓	3	Moderate	Poor			Exfoliating bark	Resistant to oak root fungus.	Tolerates smog.
✓	✓	✓		✓		✓			3	Low	Good	California	Container		Susceptible to leaf miner, leaf spot and scorch.	Heritage Birch requires an acid to neutral soil, and will turn chlorotic in alkaline soil. Prefers moist soil. Reportedly resistant to Bronze Birch Borer.
✓	✓			✓	✓	✓	✓		3	Low	Good	California and Oregon	Bareroot and container	Dry fruit	Resistant to verticillium wilt. Susceptible to aphids, scales, oak root rot and root rot.	Needs very little pruning to maintain good form. 2" leaves produce a handsome texture, and the winter twig pattern is attractive.
✓	✓			✓	✓	✓	✓		3	Low	Good	California and Oregon	Bareroot and container	Dry fruit	Resistant to verticillium wilt. Susceptible to aphids, scales, oak root rot and root rot.	Needs very little pruning to maintain good form. 2" leaves produce a handsome texture, and the winter twig pattern is attractive. 'Frans Fontaine' is more slender than 'Fastigata'.
✓	✓	✓		✓			✓		3	Low	Good	California and Oregon	Bareroot and container	Dry fruit	Resistant to verticillium wilt. Susceptible to oak root rot and root rot.	Often multi-stemmed. Requires a moderate amount of water.
✓	✓			✓			✓	✓	3	Low	Good	California and Oregon	Container	Dry fruit	Susceptible to caterpillars and scales, anthracnose, crown rot, oak root rot, phytophthora, root rot and verticillium wilt.	Showy pink flowers bloom best in full sun, and with moderate moisture. It may require light top pruning (not topping) of vigorous top shoots to maintain its height below 25'.
✓	✓			✓			✓	✓	3	Low	Good	California and Oregon	Container	Wet fruit		Its fragrant spring flowering is quite impressive, and is attractive in fall, when the reddish berries are seen amongst the yellow fall foliage. This is a very clean looking tree. It is easily maintained below 25' in height.
✓	✓	✓		✓			✓		3	Moderate	Good	Oregon	Bareroot	Dry fruit	Susceptible to chlorosis, powdery mildew and sooty mold.	
✓	✓	✓		✓	✓	✓	✓	✓	3	Moderate	Good	California	Container	Dry fruit	Resistant to Texas root rot and verticillium. Susceptible to beetle borers and thrips, oak root rot, phytophthora and root rot.	Red flowering gum is very desirable as a flowering accent tree, with its profusion of bright flower clusters in late summer, and sporadically throughout the year. Has fragrant leaves.
✓				✓	✓			✓	2	Low	Poor			Wet fruit	Resistant to verticillium. Susceptible to aphids, beetle borers, scales and spider mites, fire blight, oak root rot, powdery mildew, root rot, rust and sooty mold.	Branches with thorns. The foliage is reddish purple when unfolding, changing to lustrous dark green at maturity and turning to orange, scarlet and purple in autumn. The white flower clusters in early June are effective for 7 to 10 days. The fruit persists all winter.
✓	✓		✓	✓	✓	✓		✓	3	Moderate	Good	California	Container	Dry fruit	Resistant to Texas root rot. Susceptible to spider mites, gummosis, phytophthora and root rot.	
✓			✓	✓		✓	✓	✓	4	Moderate	Good	Oregon	Container and B&B	Dry fruit	Resistant to verticillium. Susceptible to aphids and spider mites, canker, oak root rot, phytophthora, root rot and sooty mold.	Limit plantings to wide medians.
✓	✓	✓		✓		✓	✓	✓	3	Moderate	Good	California and Oregon	Bareroot and container		Resistant to oak root fungus. Susceptible to anthracnose.	Ginkgo is a smog tolerant and hardy tree. Not to be planted in East end of city due to large existing Gingko population. 'Fairmont' is faster growing than other Ginkgo varieties.
✓	✓		✓	✓		✓	✓	✓	4	Moderate	Good	California and Oregon	Bareroot and container		Resistant to oak root fungus. Susceptible to anthracnose.	Ginkgo is a smog tolerant and hardy tree. Not to be planted in East end of city due to large existing Gingko population.
✓	✓		✓	✓		✓	✓	✓	4	Moderate	Good	California and Oregon	Bareroot and container		Resistant to oak root fungus. Susceptible to anthracnose.	Ginkgo is a smog tolerant and hardy tree. Not to be planted in East end of city due to large existing Gingko population.

Tree Species	Common Name	Foliage		Flower/Fruit								
		Deciduous/Evergreen	Fall Color	Flower Color	Flower Period	Fruit	Fruiting Period	Shape	Growth Rate Per Year (once established)	Height at Maturity (feet)	Spread at Maturity (feet)	Trunk Diameter at Breast Height at Maturity (inches)	Longevity (years)
Ginkgo biloba 'Princeton Sentry'*	Princeton Sentry Maidenhair Tree	D	Gold	Inconspicuous	Winter	Fruitless	N/A	Narrow, columnar, erect	12-18"	50	20	25	>100
Ginkgo biloba 'Saratoga'	Saratoga Maidenhair Tree	D	Gold	Inconspicuous	Winter	Fruitless	N/A	Conical or oval, erect or spreading and covers an extensive area	12-18"	50	30	25	>100
Gymnocladus dioecia 'Espresso'*	Kentucky Coffee Tree	D	Gold	Inconspicuous	Summer	Fruitless	N/A	Oval to vase shaped with upright arching branches	24-36"	50	35	30	50-100
Jacaranda mimosifolia	Jacaranda	E	N/A	Showy blue or lavender	Spring, Summer or Fall	Brown capsule, 1.5-3"	Summer or Fall	Oval, rounded, umbrella or vase, spreading with a high canopy	24"	40	60	25	<50-100
Koelreuteria bipinnata	Chinese Flame Tree	D	Bronze or gold	Yellow	Summer or Fall	Prolific red-pink capsules, 1.5-3""	Fall	Rounded, umbrella or vase	18-24"	35	35	20	50-100
Lagerstromia x 'Natchez' *Lagerstromia* x 'Tuscarora'	Hybrid Crape Myrtle	D	Red, gold, orange or multicolor	'Natchez' has white flowers. 'Tuscarora' has pink flowers.	Summer	Brown capsule, 0.25-0.5"	Fall	Oval, rounded, umbrella or vase, erect or spreading with a low canopy	12-24"	25	15	15	50-100
Laurus nobilis 'Saratoga'	Sweet Bay	E	N/A	Yellow-green	Spring	Black berry, 0.5"	Summer	Conical or oval	12-24"	35	20	25	50-150
*Livistona australis**	Australia Palm	E	N/A	Cream	Spring	Black or brown drupe, 0.5-1.5"	Summer or Fall	Fan palm, erect with a high canopy	12"	50	30	20	50-100
Lophostemon confertus	Brisbane Box	E	N/A	Showy, white	Spring	Brown capsule, 0.25-0.5"	Summer	Oval or rounded, erect or spreading and covers and extensive area	24-36"	50	30	25	50-100
Magnolia grandiflora 'Russet' *Magnolia grandiflora* 'St. Mary'	Southern Magnolia	E	N/A	Showy, fragrant, white	Spring, Summer or Fall	Purple or red follicle, 3" long	Summer or Fall	Oval, rounded or umbrella, erect or spreading	24"	65	60	50	>100
Metrosideros excelsus	New Zealand Christmas Tree	E	N/A	Showy, red	Spring or Summer	Brown capsule, 0.25-0.5"	Summer or Fall	Oval or rounded, erect or spreading with a low canopy	18-24"	35	35	30	50-100
Nyssa sylvatica 'Red Rage'* *Nyssa sylvatica* 'Forum'*	Sour Gum	D	Red, orange or multicolor	Inconspicuous	Spring	Black drupe, 0.5-1.5"	Fall or Winter	Conical or oval, erect or spreading with a high canopy	12-18"	65	25	30	>100
*Persea americana**	Avocado	E	N/A	Showy green	Spring	Medium-large fruits, edible	Fall	Rounded, spreading	12-36"	50	40	15	50-100
*Persea borbonia**	Redbay	E	N/A	Inconspicuous	Spring	Persistent, blue, 0.25-0.5"	Fall	Rounded, spreading	12-36"	50	50	20	50-100
*Persea indica**	Avocado	E	N/A	Inconspicuous	Spring	Black, 0.5-1"	Fall	Rounded, spreading	12-36"	30	40	15	50-100

* trees to be considered on an experimental basis, as they have yet to be proven as successful street trees in Alameda (see discussion in sec. 3.2)

** minimum planter width may be less if tree is located within area marked in Appendix 4

Microsite Conditions									Root Zone Mgt.		Nursery Status			Litter Issue	Pests & Diseases	Comments
Tolerates Full Sun	Tolerates Shade	Requires Good Drainage	Tolerates Poor Drainage	Tolerates Moist Soil	Drought Tolerant	Tolerates Sprinklers	Seaside Tolerance	Tolerates Alkaline Soil	Minimum Planter Width (feet)	Hardscape Damage Potential	Nursery Availability	Nursery Origin	Stock Type			
✓	✓		✓	✓		✓	✓	✓	4	Moderate	Good	California and Oregon	Bareroot and container		Resistant to oak root fungus. Susceptible to anthracnose.	'Princeton Sentry' has fragrant flowers in Spring. Ginkgo is a smog tolerant and hardy tree. Not to be planted in East end of city due to large existing Gingko population.
✓	✓		✓	✓		✓	✓	✓	4	Moderate	Good	California and Oregon	Bareroot and container		Resistant to oak root fungus. Susceptible to anthracnose.	Ginkgo is a smog tolerant and hardy tree. Not to be planted in East end of city due to large existing Gingko population.
✓	✓		✓	✓	✓	✓		✓	3	Moderate	Good	Oregon	Bareroot		Resistant to oak root fungus.	
✓		✓		✓			✓	✓	3	Low	Good	California	Container	Flower and dry fruit	Resistant to oak root fungus. Susceptible to aphids, phytophthora and root rot.	Well-adapted to Alameda's sandy soils. Place where it will get frequent watering. Neighborhood specific. Reported to have weak branch strength.
✓	✓	✓		✓	✓	✓	✓	✓	4	Moderate	Good	California	Container	Dry fruit	Susceptible to beetle borers and scales.	Becomes a round-headed tree requiring little pruning at maturity, but needs training when young, as it tends to form multiple leaders.
✓	✓			✓	✓	✓	✓	✓	3	Low	Good	California	Container	Flowers, dry fruit	Resistant to powdery mildew. Susceptible to aphids and sooty mold.	'Tuscarora' has multiple stems.
✓	✓	✓		✓	✓		✓	✓	4	Moderate	Good	California	Container	Dry fruit	Susceptible to psyllids and scales, phytophthora and root rot.	Dense canopy of fragrant leaves. Early pruning needed to train a good shape; pruning needed less frequently with age. Requires removal of suckers.
✓	✓			✓	✓	✓	✓	✓	4	Moderate	Poor			Dry fruit	Resistant to Texas root rot. Susceptible to pigeons.	Fan palm with dark, shiny leaves. Needs moderate watering.
✓	✓		✓	✓	✓	✓	✓	✓	3	Low	Good	California	Container	Dry fruit	Susceptible to scales, phytophthora and root rot.	Previously known at *Tristanis conferta* . Drought resistant once established. Smog tolerant. The red peeling bark and foliage are reminiscent of native Arbutus. Use like a small Eucalyptus tree with few structural problems. Extensive fruit drop from mature trees sometimes causes complaints.
✓	✓			✓	✓		✓	✓	5	High	Good	California	Container	Leaves	Resistant to oak root fungus. Susceptible to aphids, scales and spider mites, root rot and verticillium wilt.	Not to be planted near drain inlets, as leaves may obstruct drainage. Only to be planted in wide planter strips or medians.
✓	✓	✓		✓	✓	✓	✓	✓	4	Moderate	Good	California	Container	Dry fruit	Susceptible to phytophthora and root rot.	Smog tolerant. Leave low trunk twigs to encourage strong structure. Not to be planted in small planter strips.
✓	✓		✓	✓	✓	✓	✓		4	Low	Good	Oregon	B&B and container	Dry fruit	Susceptible to fusarium, phytophthora, root rot, rust and verticillium wilt. Also susceptible to lime-induced chlorosis in alkaline soils.	Should use only suggested varieties to ensure good form and color.
✓	✓	✓		✓		✓	✓	✓	2	Low	Poor			Leaves	Susceptible to phytophthora root rot, mites, scales and leaf spot.	Drainage is a concern with this species. Amending soil with mulch and gypsum may suppress root rot.
✓	✓	✓		✓	✓	✓	✓	✓	5	Low	Poor			Fruit and leaves	Susceptible to borer, scales and sooty mold.	Redbay is a rugged and adaptable plant suitable to many landscape applications. Unfortunately, the wood is reportedly brittle and subject to wind damage. Pruning to keep lateral branches less than half the diameter of the trunk will increase the tree's longevity and help prevent branches from separating from the trunk.
✓		✓		✓		✓	✓		2	Low	Poor			Leaves	Susceptible to phytophthora root rot.	Might be a good substitute for Camphor if fruiting can be limited, perhaps by using Guatemalan varieties, and/or limiting selections to varieties with Type A or Type B flowers. Potential for sidewalk damage needs to be assessed. Seems to thrive in Alameda as a yard tree. Does not do well with high water table and winds. Only to be planted inland. Amending soil with mulch and gypsum may suppress root rot.

Tree Species	Common Name	Foliage		Flower/Fruit									
		Deciduous/Evergreen	Fall Color	Flower Color	Flower Period	Fruit	Fruiting Period	Shape	Growth Rate Per Year (once established)	Height at Maturity (feet)	Spread at Maturity (feet)	Trunk Diameter at Breast Height at Maturity (inches)	Longevity (years)
Phoenix canariensis	Canary Island Palm	E	N/A	Yellow	Spring	Orange or yellow drupe, 0.5-1.5"	Fall	Feather palm, erect and covers an extensive area	12"	65	25	35	50-100
Pistachia chinensis 'Keith Davey'	Chinese Pistache	D	Red, orange, gold or multicolor	Inconspicuous	Spring	Prolific red or blue drupe, 0.5"	Summer or Fall	Oval, rounded or umbrella, erect or spreading with a high canopy	12-18"	65	50	25	>100
Platanus acerifolia 'Bloodgood'** *Platanus acerifolia* 'Columbia'** *Platanus acerifolia* 'Yarwood'**	London Planetree	D	Bronze or gold	Inconspicuous	Spring or Winter	Brown seed balls, 0.5-1.5"	Summer	Oval , rounded or umbrella, erect or spreading and covers an extensive area	36"	70	50	35	>100
Podocarpus gracilior	Fern Pine	E	N/A	Inconspicuous	Spring	Purple drupe, 0.25-0.5"	Fall	Oval or rounded, erect and covers an extensive area	12-24"	50	35	30	>100
Prunus sargentii 'Columnaris'*	Columnar Sargent Cherry	D	Red, gold or bronze	Showy pink	Spring	Purple, red or black drupe, 0.25-0.5"	Fall, Winter or Summer	Columnar or vase, erect	12-36"	35	20	20	40
*Prunus yedoensis**	Yoshino Flowering Cherry	D	Bronze or gold	Showy, fragrant pink or white	Spring or Winter	Black drupe, 0.25-0.5"	Winter or Summer	Oval, rounded or umbrella, erect or spreading with a low canopy	36"	35	30	20	<50-100
Pyrus calleryana 'Aristocrat' *Pyrus calleryana* 'Chanticleer'	Callery Pear	D	Red, gold, purple or multicolor	Showy, fragrant, white	Spring	Brown pome, 0.25-0.5"	Summer	Oval or rounded, erect or spreading, low or high canopy	24"	35-50	45	20	50-100
*Quercus coccinea***	Scarlet Oak	D	Red	Inconspicuous	Spring	Acorns, 0.5-1.5"	Fall or Winter	Oval, rounded or umbrella, erect or spreading and covers an extensive area	24"	60	60	40	>100
Quercus falcata, ****	Southern Red Oak	D	Bronze	Inconspicuous	Spring	Acorns	Fall	Oval or rounded	24"	65	60	40	>100
*Quercus palustris**	Pin Oak	D	Bronze, red gold or multicolor	Inconspicuous	Spring	Acorns, 0.5-1.5"	Fall or Winter	Conical, rounded	24"	65	35	30	>100
*Quercus shumardii***	Shumard Oak	D	Red, gold, orange or multicolor	Inconspicuous	Spring	Acorns, 0.5-1.5"	Fall	Oval, rounded or umbrella, erect or spreading and covers an extensive area	24-36"	65	45	30	>100
Quercus suber	Cork Oak	E	N/A	Inconspicuous	Spring	Prolific acorns, 0.5-1.5"	Fall or Winter	Oval, rounded or umbrella, erect or spreading and covers an extensive area	24"	70	45	50	>100
*Quercus virginiana**	Southern Live Oak	E	N/A	Inconspicuous	Spring	Acorn, 0.5-1.5"	Fall or Winter	Oval, rounded or umbrella, erect or spreading with a high canopy	24-36"	60	60	50	>100

* trees to be considered on an experimental basis, as they have yet to be proven as successful street trees in Alameda (see discussion in sec. 3.2)

** minimum planter width may be less if tree is located within area marked in Appendix 4

Microsite Conditions									Root Zone Mgt.		Nursery Status			Litter Issue	Pests & Diseases	Comments
Tolerates Full Sun	Tolerates Shade	Requires Good Drainage	Tolerates Poor Drainage	Tolerates Moist Soil	Drought Tolerant	Tolerates Sprinklers	Seaside Tolerance	Tolerates Alkaline Soil	Minimum Planter Width (feet)	Hardscape Damage Potential	Nursery Availability	Nursery Origin	Stock Type			
✓		✓		✓	✓	✓	✓	✓	4	Low	Good	California	Container	Dry fruit and leaves	Resistant to Texas root rot. Susceptible to pigeons, *Fusarium* and root rot.	This is probably the most useful of available palms for street side uses. It should be used in areas broad enough to not only prevent the lateral expansion of the trunk from breaking pavement, but also to prevent the fruit from making a mess on the sidewalk areas.
✓	✓	✓		✓	✓	✓		✓	3	Low	Good	California and Oregon	Container	Dry fruit	Resistant to oak root fungus. Susceptible to root rot and verticillim wilt.	Requires pruning in the first 2-4 years to prevent clearance problems caused by horizontal branch growth. One of the best fall coloring trees for this climate. Not for use in heavily watered lawns. 'Keith Davey' has a more uniform structure and is easier to maintain than other varieties.
✓	✓			✓	✓	✓		✓	5	Moderate	Good	California and Oregon	Bareroot and container		'Yarwood' resistant to powdery mildew. 'Bloodgood' resistant to anthracnose. 'Columbia' resistant to both.	Will grow in almost any soil. Needs very little pruning to achieve semi-open habit and good form.
✓	✓	✓		✓	✓	✓	✓	✓	4	Moderate	Good	California	Container	Dry fruit	Susceptible to black scale.	Produces a round or oval, upright form covered with narrow blue-green foliage and a fairly dense canopy. The excellent branching is easily shaped into well structured crowns. Hardscape damage has been noted in the few mature trees in CA. Can be messy when leaves drop.
✓		✓		✓		✓			3	Low	Good	Oregon	Container		Susceptible to caterpillars, aphids, borer and scales. Trees in heavy soil sometimes subject to root rot.	This species of cherry is far better adapted to urban tree use than the more commonly used cultivars. It will tolerate poor soil. Branches don't droop, and are susceptible to breakage. First planted in Alameda in 2005.
✓		✓		✓			✓	✓	3	Low	Good	California and Oregon	Bareroot and container	Flower and dry fruit	Susceptible to caterpillars, canker, crown rot, oak root rot, phytophthora, root rot, rust and verticillium wilt.	On clay soils, plant on slopes or in raised beds.
✓	✓	✓		✓	✓	✓	✓	✓	3	Moderate	Good	Californiaa nd Oregon	Bareroot and container	Dry fruit	Fairly resistant to fire blight, oak root fungus and verticillium wilt. Susceptible to whiteflies.	'Aristocrat' only to be planted in business districts of Park St. and Webster. Requires annual pruning at the beginning to establish good structure and prevent splitting later on. Very good fall color.
✓	✓			✓	✓	✓	✓	✓	4	Moderate	Good	California and Oregon	Bareroot and container	Acorns	Resistant to verticillium wilt. Susceptible to caterpillars and scales.	This is the most colorful of the Eastern Oaks, with a reliable brilliant red color in the fall. Many specimens hold most brown leaves all winter. Possible Liquidambar substitute. Best in deep, rich soil.
✓		✓		✓	✓	✓			5	Low	Good	Oregon	Bareroot		Susceptible to caterpillars.	Appears to produce reliable red fall color with consistent upright growth habit. Does not appear subject to aphids. Possible alternative to Q. coccinea where a taller and less spreading tree is desired. Possible Liquidambar substitute.
✓	✓		✓	✓	✓	✓	✓		3	Low	Good	California and Oregon	Bareroot and container	Acorns	Resistant to verticillium wilt. Susceptible to scales, anthracnose, and occasional chlorosis, especially in clay soils.	Some branches hang very low, and may cause clearance problems unless kept pruned. Highly variable growth forms may be problematic. Brown leaves tend to hang on the tree of some specimens in winter. May become chlorotic in alkaline soil.
✓	✓			✓	✓	✓	✓	✓	5	Moderate	Good	California and Oregon	Bareroot and container	Acorns	Resistant to verticillium wilt. Susceptible to beetle borers, beetle leaves, caterpillars, insect galls, leaf miner and scales.	More easily transplanted than Scarlet Oak. Not as prone to iron deficiency as Pin Oak.
✓	✓	✓		✓	✓		✓	✓	8	Moderate	Good	California	Container		Resistant to verticillium wilt. Susceptible to phytophthora and root rot.	Does not like having persistently wet roots, therefore, cannot be planted in grass, or near irrigation. Leaf drop in spring may seem abnormal, but is typical pattern for the tree. Bark is the source of commercial cork.
✓	✓		✓	✓		✓	✓	✓	6	Moderate	Good	California	Container	Acorns	Resistant to verticillium wilt. Susceptible to insect galls, oak root rot, phytophthora and root rot.	Best in deep, rich soil, but widely adapted to a variety of soil types.

Tree Species	Common Name	Foliage		Flower/Fruit								
		Deciduous/Evergreen	Fall Color	Flower Color	Flower Period	Fruit	Fruiting Period	Shape	Growth Rate Per Year (once established)	Height at Maturity (feet)	Spread at Maturity (feet)	Trunk Diameter at Breast Height at Maturity (inches)	Longevity (years)
*Rhus lancea**	African Sumac	E	N/A	Inconspicuous	Summer	Red or yellow drupe, 0.25-0.5"	Fall	Rounded or umbrella, spreading or weeping with a low canopy	24"	25	25	30	50-100
*Taxodium distichum**	Bald Cypress	D	Bronze or orange	Inconspicuous	Summer or Fall	Fragrant, Brown cone, 0.5-1.5"	Summer or Fall	Conical, erect or spreading and covers an extensive area	24-36"	65	40	35	50-100
*Taxodium mucronatum**	Montezuma Cypress	E	N/A	Inconspicuous	Summer or Fall	Fragrant, Brown cone, 0.5-1.5"	Summer or Fall	Conical, erect or weeping and covers an extensive area	36"	65	50	50	50-100
Tilia tomentosa 'Green Mountain' *Tilia tomentosa* 'Sterling'	Silver Linden	D	Gold	Showy, fragrant, yellow or white	Summer	Gray capsule, 0.25-0.5"	Fall	Conical, oval or umbrella, erect or spreading with high canopy and extensive area	18-48"	50	40	25	50-100
Tristania laurina 'Elegans'	Swamp Myrtle	E	N/A	Showy, yellow	Spring or Summer	Brown capsule, 0.25-0.5"	Summer or Fall	Oval or rounded, erect or spreading with a low canopy	12"	25	20	15	<50-100
Ulmus americana 'Jefferson'*,** *Ulmus americana* 'New Harmony'*,** *Ulmus americana* 'Princeton'** *Ulmus americana* 'Valley Forge'*,**	American Elm cultivars	D	Yellow	Inconspicuous	Spring	Green, wafer-like seedpods, 0.25-0.5"	Spring	Upright or spreading, vase shape	36"	70	60	80	>100
Ulmus 'Frontier'	Frontier Elm	D	Burgundy	Inconspicuous	Spring	Green, wafer-like seedpods, 0.25-0.5"	Spring	Broadly oval	36"	40	30	25	unknown
Ulmus 'Morton'*	Accolade Elm	D	Yellow	Inconspicuous	Spring	Green, wafer-like seedpods, 0.25-0.5"	Spring	Upright, vase-shaped with arching limbs	36"	70	60	unknown	unknown
Ulmus 'Morton Glossy'*	Triumph Elm	D	Yellow	Inconspicuous	Spring	Green, wafer-like seedpods, 0.25-0.5"	Spring	Upright oval to vase	36"	55	45	unknown	unknown
Ulmus 'Morton Stalwart'*	Commendation Elm	D	Yellow	Inconspicuous	Spring	Green, wafer-like seedpods, 0.25-0.5"	Spring	Upright oval	36"	60	50	unknown	unknown
Ulmus 'Patriot'*	Patriot Elm	D	Yellow	Inconspicuous	Spring	Green, wafer-like seedpods, 0.25-0.5"	Spring	Stiffly upright, narrow vase shape	36"	50	40	unknown	unknown
Washingtonia robusta	Mexican Fan Palm	E	N/A	Inconspicuous	Summer	Edible black drup, 0.25-0.5"	Fall or Winter	Fan palm, erect and covers an extensive area	18-24"	>65	15	20	50-100

* trees to be considered on an experimental basis, as they have yet to be proven as successful street trees in Alameda (see discussion in sec. 3.2)

** minimum planter width may be less if tree is located within area marked in Appendix 4

Microsite Conditions									Root Zone Mgt.		Nursery Status			Litter Issue	Pests & Diseases	Comments
Tolerates Full Sun	Tolerates Shade	Requires Good Drainage	Tolerates Poor Drainage	Tolerates Moist Soil	Drought Tolerant	Tolerates Sprinklers	Seaside Tolerance	Tolerates Alkaline Soil	Minimum Planter Width (feet)	Hardscape Damage Potential	Nursery Availability	Nursery Origin	Stock Type			
✓	✓			✓	✓		✓	✓	4	Low	Good	California	Container	Dry fruit	Susceptible to root rot and verticillium wilt.	A dense shade tree, rather graceful with its arching branches and weeping foliage. It is tough and reliable in dry conditions, though it looks best with regular deep watering. It may require regularly scheduled light pruning (but not topping) of vigorous top shoots to maintain its height below 25 feet.
✓	✓		✓	✓		✓	✓	✓	4	Moderate	Good	Oregon	Bareroot and container	Dry fruit	Resistant to oak root fungus. Susceptible to beetle borers and beetle leaves, phytophthora and root rot.	Plant only in wide medians.
✓	✓			✓	✓			✓	5	Moderate	Poor			Dry fruit	Susceptible to beetle borers and beetle leaves.	Fairly drought tolerant, but needs ample water when young. Plant only in wide medians.
✓	✓	✓		✓	✓	✓	✓	✓	3	Low	Good	Oregon	Bareroot and container	Dry fruit	Susceptible to root rot, sooty mold and verticillium wilt.	Light green leaves with silver undersides move in any breeze. Faster growing than most Lindens, with good yellow fall color in Alameda. Unlike other Lindens, does not appear subject to aphids.
✓	✓			✓				✓	2	Low	Good	California	Container	Dry fruit and flowers	Susceptible to scales.	It is useful where only small planter spaces are available. Easily pruned to any form.
✓	✓		✓	✓	✓	✓	✓	✓	6	High	Good	Oregon	Bareroot	Dry seeds	Resistant to Dutch elm disease and elm leaf beetle.	
✓	✓			✓		✓		✓	3	Low	Good	California and Oregon	Bareroot and container	Dry seeds	Resistant to Dutch elm disease and elm yellows.	This is a hybrid between *U. carpinifolia* and *U. parvifolia* .
✓	✓			✓	✓	✓	✓	✓	6	Moderate	Good	Oregon	Bareroot and container	Dry seeds	Resistant to elm yellows, elm leaf beetle, elm leaf miner and Dutch elm disease.	This is a hybrid between *U. japonica* and *U. wilsoniana.*
✓	✓			✓		✓		✓	4	Moderate	Good	Oregon	Bareroot	Dry seeds	Resistant to Dutch elm disease.	This is a hybrid between *U. wilsoniana* , *U. japonica* and *U. pumila* .
✓	✓			✓		✓		✓	5	Moderate	Good	Oregon	Bareroot	Dry seeds	Resistant to Dutch elm disease.	This is a hybrid between *U. wilsoniana* , *U. pumila* and *U. carpinifolia* .
✓	✓			✓		✓		✓	4	Moderate	Good	Oregon	Bareroot	Dry seeds	Resistant to Dutch elm disease.	This is a hybrid between *U. wilsoniana, U. carpinifolia* , *U. glabra* and *U. pumila* .
✓	✓	✓		✓	✓	✓	✓	✓	3	Low	Good	California	Container	Dry fruit and leaves	Resistant to Texas root rot. Susceptible to beetle borers and pigeons.	A moderately invasive species. Use for special situations, such as on Burbank Street and to preserve views on Shoreline Drive. Planting at each of these locations should be at the same time to establish uniformity.

ii. DEFINITION OF TERMS IN THE TREE MATRIX

TREE SPECIES

Botanical names (Genus and species) are the Latin nomenclature for a plant, by which it is identified in nurseries. Using botanical names insures the acquisition of the exact plant desired, because common names of plants are not consistent from place to place. The botanical name used in this category consists of two parts, genus and species. Cultivars are horticulturally or agriculturally derived varieties of a plant, and they are usually cultivated for specific characteristics such as color, lack of or production of fruit, or unique foliage characteristics.

COMMON NAME

Common names of plants vary tremendously from place to place, and are not a reliable identifying feature. Common names are usually of local value, because they derive from laymen gardeners who create names based on some visible characteristic, or reference to a local individual.

FOLIAGE

Deciduous: The tree loses its leaves once a year, usually in the fall.

Evergreen: The tree loses its 2-3 year old leaves, usually over a protracted time, most often in spring.
Fall Color: The tree produces attractive fall foliage color.

FLOWER/FRUIT

Flower Color: If the tree has ornamental flowers, its colors are listed.

Flowering Period: Flowering period by season.

Fruit: If the tree produces fruit, it will be described here.

Fruiting Period: Fruiting period by season.

GROWTH/STATURE

Suitable for Planting Under High Voltage Power Lines: Trees that are suitable to plant under high voltage power lines must be able to withstand puc pruning requirements without jeopardizing health or structural integrity of tree.

Shape: This category identifies the generally definable shape tree canopies take as they mature. As with height, care and urban environments will provide many influencing variables. Tree shapes are defined as follows in this database:

- Columnar = erect and almost parallel, resembling a column
- Conical = oval at the base, elongated and tapering to a narrower width at the top

- Fan Palm = fan shaped leaves with venation of the leaves extending like the ribs of a fan
- Oval = appearing elliptical, resembling an egg
- Rounded = ball-like or circular
- Umbrella = branches extending outward and down, as an umbrella does
- Vase = a narrow base, widening and arching outward towards the top

Growth Rate per Year (Once Established): Growth Rate (in inches) identifies the maximum relative rate a tree will grow. As with height, urban environments will provide many influencing variables.

Height at Maturity: The maximum height (in feet) to which the species or cultivar may potentially grow in an urban setting. Urban environments may inhibit the potential of a tree to reach the maximum height it would in a natural setting. It is important, though, to consider overhead restrictions before planting a tree.

Spread at Maturity: The maximum canopy width (in feet) to which the species or cultivar may potentially grow in an urban setting.

Trunk Diameter at Breast Height at Maturity: The maximum diameter of the trunk (in inches) when measured at breast height (4.5 feet above ground level) to which the species may potentially grow in an urban setting.

Longevity: The typical lifespan of the species in an urban setting is given in years. Longevity is an important consideration for long-term shading, screening, beauty and value of a property. Short-lived trees may also be wonderful shade trees, and can be useful where permanence is not the ultimate goal. Longevity may vary depending on proper selection of adapted species, care the tree receives, risk of mechanical damage, and the presence or lack of diseases and pests.

MICROSITE CONDITIONS

Tolerates Full Sun: The tree tolerates 6 or more hours of direct sunlight per day.

Tolerates Shade: The tree tolerates exposure to high light, but less than 2 hours of direct sunlight per day.

Requires Good Drainage: The tree requires good drainage. A soil which drains at the rate of 0.05 inches per hour or more will provide the preferred balance of air, water, and solids ideal for root growth. The very sandy or sandy loam top soils generally found in Alameda are ideal for a broad range of species.

Tolerates Poor Drainage: These trees can grow in soils that drain at a rate less than 0.05 inches per hour, such as the clay soils found throughout the fill areas of Alameda.
Tolerates Moist Soil: These trees can tolerate damp soil most of the year.

Drought Tolerant: These trees are not adversely affected by prolonged periods with little or no rainfall, once established.

Tolerates Sprinklers: These are trees that do not react adversely to sprinkler irrigation. Sprinkler watering can favor diseases such as Phytophthora or Armillaria, especially in soils with poor drainage. Some of the native Oak species are particularly susceptible to these diseases. Other species have a natural tendency to grow shallow roots. If they are sprinkler watered, their roots tend to remain even nearer to the surface (where the water is), increasing the likelihood that they will blow over in string winds.

Seaside Tolerance: Trees with a checkmark in this column do well when planted along the seaside in this climatic zone.

Tolerates Alkaline Soil: These are species that will not be significantly inhibited by growing in soils with pH levels of 7.5-8.7, assuming the high pH levels are caused by high calcium, magnesium, and slightly elevated levels of boron and sodium.

ROOT ZONE MANAGEMENT

Minimum Planter Width: This is the minimum planter space, in feet, in which the species should be used without a root barrier if pavement damage is to be avoided. Even trees listed as tolerant of very small spaces can, in very shallow soils or with sprinkler watering, cause pavement damage.

Hardscape Damage Potential: Hardscape Damage Potential attempts to qualify the tendency trees have of causing damage with their roots. Root damage is usually caused when tree roots remain close to the surface of the soil. Tree roots can cause costly damage to paving, structures and even underground utilities. Because roots nearer the tree trunk will enlarge earlier and grow more rapidly, care should be taken to space trees appropriately from structures. Local environmental and tree care conditions, such as soil type or watering habits, can affect a tree's root development. Long, deep waterings can encourage downward root growth. Shallow soils will force roots to grow horizontally rather than vertically.

NURSERY STATUS

Nursery Availability: If the species is grown in California or Oregon, it is listed as having Good availability. If the species was not found to be grown by any major nurseries in California or Oregon, it is listed as having Poor availability. This fact should not deter use of the species or cultivar, only warn the municipal personnel that they may need to source smaller suppliers, or order the tree six months or more in advance.

Nursery Origin: This indicates the state that the tree grower's operation is likely to be located. Again, this should not deter the use of the species or cultivar.

Stock Type: This notes the method by which this species is commonly sold by growers.

LITTER ISSUE

Fruits, flowers, leaves, twigs and bark can be considered litter if they tend to fall with frequency, long duration and abundance. These plant droppings create maintenance hassles when the trees are located over drives, walkways, patios or planting areas which are meant to be kept relatively clean. Problems can include hazardous slippery or bumpy surfaces, staining of surfaces, and smothering of small plants to the point of preventing their growth. However, except for fruits that are sizable and/or wet, most litter is tolerable. Some litter may be left as mulch and contribute to the improvement of the soil. If the tree drops excessive amounts of any of the mentioned plant parts, it is noted here. The fruit type, wet or dry, is also identified.

PESTS AND DISEASES

These notes identify pests and diseases by which this species might by threatened or resistant. Different plants attract different pests, and some pests will require special and regular treatments to prevent damage to the tree or its fruit. Disease resistance is a genetic characteristic that determines the tree's ability to resist disease. Trees that are resistant to a disease either do not contract the disease or show little or few symptoms of the disease. Possessing low-level disease symptoms does not significantly affect the health of the tree nor its aesthetic qualities. Because not all trees have been tested for all pests or diseases, much data is not known or documented. This field makes no claim of listing all pests and diseases of any particular tree.

COMMENTS

These are special notes as to how this particular species or cultivar will perform as a street tree.