

# **FOREST MANAGEMENT PLAN HOLMAN HIGHWAY WIDENING PROJECT**

**Prepared for**

**City of Monterey  
Caltrans**

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**Introduction:**

The City of Monterey proposes to widen and upgrade Route 68 (Holman Highway) from two lanes to three/four lanes from approximately 0.1 miles west of the Community Hospital of Monterey Peninsula (CHOMP) entrance to State Route 1 and Route 68 junction. Improvements to SR 1 south bound off and on-ramps are also included in the project as well as improved access to the Pebble Beach entrance. A total of 12 alternatives are being considered for the design.

**Purpose:**

This Forest Management Plan (FMP) will evaluate the quality and quantity of forest resources in and around the project area. Potential impacts to the forest will be discussed. Mitigations will then be recommended to offset any potential impacts from construction activities on these specific forest resources. We will also consider this forested area in the context of the forests of the Monterey Peninsula as a whole. This FMP will recommend measures that will enhance and encourage its sustainability for the benefit of present and future generations.

**Regulatory Framework and Applicable Policies:**

The City of Monterey has enacted a Tree Protection Ordinance (Resolution No. 89-01) to protect trees around construction sites and to insure consistency in decisions. The intent is to preserve trees worthy of protection and to review construction plans and look at alternatives such that the native forest in the City is afforded the greatest feasible and reasonable protection. The tree protection standards of the ordinance are followed in this FMP.

The forest that will be impacted by this project is under the City of Monterey's jurisdiction but is located within the borders of the County of Monterey as well. The County has tree protection standards that are outlined in Chapter 20 of the Monterey County Coastal Implementation Plan and the Del Monte Forest Land Use Plan (DMF LUP). The proposed project is immediately adjacent to the Del Monte Forest.

The DMF LUP designates portions of the Del Monte Forest as Environmentally Sensitive Habitat Areas (ESHAs). ESHAs are defined as

*Environmentally sensitive habitat areas in which plant or animal life or their habitats are rare or especially valuable due to their special role in an ecosystem.*

Protections and restrictions of the nature and type of land uses within and adjacent to designated ESHAs is codified in the Open Space Advisory Committee (OSAC) Plan maintenance standards. Policy 11 states:

*Contiguous areas of undisturbed land in open space uses shall be maintained wherever possible to protect environmentally sensitive habitat areas and associated wildlife values. To this end, development parcels immediately adjacent to designated environmentally sensitive habitat areas shall be planned to keep development intensity immediately adjacent to sensitive habitats as low as possible, consistent with other planning criteria (e.g. drainage design, roadway design, and public safety).*

These guidelines will also be followed in recommending mitigation measures.

The native Monterey pine forest is considered sensitive by the City of Monterey and the California Department of Fish and Game (CDFG) due to its limited distribution within the region and state. Monterey pine is a United States Fish and Wildlife Service "Species of Concern". Further biological research and field study is needed to resolve the conservation status of the taxa. The species is classed as 1B by the California Native Plant Society (CNPS). It is thus considered rare, threatened, or endangered in California and elsewhere due to its limited or vulnerable habitat, their low numbers of individuals per population, or their limited number of populations.

### **Monterey Pine Resource Assessments**

There is a large body of information, assessments and research on the Monterey pine forest. A brief summary of the more recent and important information follows, however, the reader is referred to the documents themselves for a more detailed discussion.

1. In 1993, the Pebble Beach Company retained Huffman and Associates to evaluate Monterey Pine and its habitat in its natural range. Its purpose was to recommend policies and practices to maintain and enhance the continued genetic sustainability of the native Monterey pine stands. The report concluded that the native Monterey pine forest in Monterey County was sustainable because of the protections already in place in the existing geographically and environmentally varied stands.

Data collected in the Huffman report indicated that the negative impacts from forest edge characteristics diminished with distance such that a stand of less than 20 acres was more affected by the edge effects of urbanization and development. Therefore 20 acres was selected as the minimum size necessary to contribute to sustainability.

Huffman estimated that the historic extent of Monterey pine forest in and around the Monterey Peninsula at 11,000 to 12,000 acres. They found that there were protected stands well distributed throughout the historic range of the species, and that 2,500 acres of the protected acreage was in stands greater than 20 acres in size. They also found that the stands were located in many different soil types and over half were natural forest stands of the highest genetic and habitat value.

A key recommendation that followed from their findings was that developers be required to prepare forest conservation plans for each geographically distinct population and individual forest management plans for all significant protected stands within each population. Huffman concluded that these requirements were already the current practice in the Monterey County Coastal Zone.

2. In 1994, CDFG and the Nature Conservancy hired Jones and Stokes Associates (JSA) to do a literature review, field studies, and map analysis on Monterey pine as a species and the Monterey pine forest community. A conservation plan was prepared for CDFG and the CNPS in a report prepared in 1996.

JSA estimated that the historical Monterey pine forest was 18,000 acres. They described the remaining stands as poorer quality than Huffman. Huffman recommended preserving larger stands well-distributed over the species natural range. JSA recommended preserving representative stands of Monterey pine forest from each of six marine terraces of different

ages. According to their theory, each of the terraces supports differing habitat types and genetic variation. This concept is refuted in the Zander report discussed below.

3. In August 1999, the Monterey Bay Chapter of CNPS submitted a petition to the California Fish and Game Commission to list the Monterey pine as threatened under the California Endangered Species Act. The Fish and Game Commission determined that the petition met the necessary requirements and referred it to CDFG for a mandatory three month review. Extensive information was submitted by members of the public regarding the petition, much of it suggesting the petition be denied. On December 14, 1999, CNPS withdrew its petition because of the large amount of time it would take to review the scientific information submitted. To date resubmission of the petition has not occurred.

4. Biological resources of the Del Monte Forest, Monterey Pine and Monterey Pine Forest Habitat, Del Monte Forest Preservation and Development Plan prepared for the Pebble Beach Company by Zander Associates (December 2002).

This document is a plan for the preservation and build out of the Pebble Beach Company lands within the Del Monte Forest. It complies with the regulations and policies discussed above and summarizes and reviews the other studies discussed in this FMP. In summary, the plan is for build out/urbanization on a portion of the ownership while retaining in open space the largest feasible area of Monterey pine forest in stands greater than 20 acres in size.

5. There are several other estimates (other than those mentioned above) of the historic and current geographic distribution of Monterey pine on the Monterey Peninsula. In summary they are:

- a) In 1960 Scott estimated the extent of Monterey pine forest in 1931 was 6,000 acres.
- b) In 1959 McDonald estimated 12,000 acres.
- c) 1966 Roy estimated the range between 8,000-12,000 acres.

## **Monterey Pine**

Monterey pine (*Pinus radiata*) is a relatively fast growing tree, especially during its first 30 to 40 years. The normal life span under conditions favorable to the species is 80-100 years. Some specimens will live over 100 years but that is the exception not the rule. The maximum age is in the neighborhood of 150 years. The tree is subject to wind throw; especially when the canopy of the forest is opened or one of a number of pests attacks the tree.

There are a total of five natural stands of Monterey pine, three in California at Ano Nuevo Point, Cambria, and the Monterey Peninsula. The other two locations are islands off the coast of Baja, Mexico, Cedros and Guadalupe islands.

Monterey pine is considered a "closed cone" pine, such trees thought to require fire to open the cone and release the seeds to germinate. In fact, they can reproduce profusely in the absence of fire, the casual factor likely being sunlight reaching the forest floor and heating the cones. This is observed in many areas on the Monterey Peninsula where disturbed areas, man induced or natural, are colonized by a multitude of seedlings.

Monterey pine has become the most widely planted pine in the world because it is the fastest growing of the genus. It has been introduced as a landscape tree in many locations along the coast of California and elsewhere, where it has thrived. It has been widely planted as a commercial tree for lumber production throughout the world. When planted for timber, it is often managed on a very short "rotation", 20 to 40 years. New Zealand, Australia, Chile, Spain, and Argentina are just some of the countries where it is widely used for lumber.

## **Genetics**

There have been many studies of the genetic diversity among and between the California populations of Monterey pine (Ano Nuevo, Monterey Peninsula, and Cambria). Characteristics studied include chromosome and DNA comparisons, oleoresin composition, cone size, growth rates under varying environmental conditions, and susceptibility to disease. Of note is the Plessas and Strauss 1986 study. They found 94.9 percent of the genetic variability was found within distinct individual stands, 3.5 percent

between the 3 populations noted above, and only 1.6 percent between stands within a given population. The reader is referred to the Zander report for a more detailed treatment of this subject.

## Pests

According to the USDA Forest Service, there are 72 insect and fungal diseases that attack Monterey pine, of which 17 are common. Most of these agents have evolved with the native stands and do not pose a serious threat to the survival of the species. They are important in the life cycle and functioning of the forest by recycling nutrients and producing woody debris and cavities for many wildlife species.

In the following discussion, only those pests found in or near the Holman Forest will be discussed. Though these pests are found in and around the forest of the proposed project area, none of the infestations is considered severe or critical to survival of the forest. Pests are normally found in all forests, though if the stands are healthy, the pest population will not increase to where it threatens the stand as a whole or large portions thereof. The pests will be discussed in descending order of their presence.

The Sequoia pitch moth (*Synanthedon sequoiae*) occurs from California to British Columbia, Idaho, and Montana. It infests most conifer species but causes relatively minor damage and is more of an aesthetic problem. The larvae bore into the cambium causing masses of pitch to form. More often it attacks trees with pruning wounds or other injuries. It is recognized by yellow/reddish pitch masses. It is sometimes confused with bark beetle attack, the difference being that there is no emergent hole in the center of the pitch mass whereby the bark beetle leaves the trunk. It is quite common in the Holman forest and the rest of the Monterey pine population on the peninsula.

Western dwarf mistletoe (*Arceuthobium littorum*) is also very common in the Holman forest. It is an evergreen parasitic plant that grows on many native and landscape trees in California. The shoots are nonwoody, segmented, and have small scalelike leaves. The seeds are spread mostly by their discharge from the fruit, which can propel seeds a relatively long distance (30 to 40 feet). After the seed germinates it grows through the bark and into the xylem and phloem (water and nutrient conducting tissues) of the tree. Healthy trees can tolerate a few infections while heavily

infested trees will be reduced in vigor and are then prone to other, more lethal insects or diseases.

Pine Pitch Canker (*Fusarium circinatum*), a native of the southeastern U.S., was identified in 1986 in Santa Cruz County. It has since spread up and down the coast, to at least San Diego to the south, and San Francisco to the north. While it is still too soon to judge, there is concern that this could be a threat to the health and survivability of the Monterey pine forest. When Pitch Canker attacks and weakens a tree, aggressive bark beetles are implicated in its death.

The disease is characterized by exudation of resin from branches and the main stem. The most obvious symptom is die back of the tips of branches. It was originally thought to kill the tree in many if not most cases. As the fungus has been observed over time, it has been shown that some trees have resistance to it. Also, some individuals have significant die back of branch tips that would have been recognized as leading to death in the earlier days of its recognition. In many of these trees, the disease is halted and the tree appears to remain relatively healthy though the unsightly dead tips remain.

Several beetles have been implicated as possible vectors for the disease: twig beetles (*Pityophthorus* spp.), engraver beetles (*Ips* spp.), and cone beetles (*Conophthorus radiatae*).

The red turpentine beetle (*Dendroctonus valens*) generally attacks the bottom eight feet of the main stem. There were a number of attacks observed on Monterey pine in the forest. It is not considered an aggressive tree killer but it does cause damage and weakens the tree to make it more susceptible to other more lethal bark beetles such as engraver beetles (*Ips* sp.) which initially cause tops to die, or the Western pine beetle (*Dendroctonus brevicomis*).

Conks (fruiting bodies) caused by red ring rot or white pocket rot (*Phellinus pini*) were observed within the forest. This fungus is one of the most damaging heart rot organisms in the western United States.

The best indicator is the perennial fruiting body, though they vary in shape, size and texture. They are normally thin, shell-shaped to hoof-shaped ranging from 1 to 12 inches long, ½ to 4 inches wide, and ¼ to 5 inches tall.



The upper surface is usually furrowed concentrically and dark brown to blackish in color. The lower surface is rusty-brown with circular pores. A velvety margin often separates the two surfaces.

Several fruiting bodies may be present on a single tree, most commonly arising from knots or branch stubs. By the time the conk is visible, the heart rot has advanced about 10 feet both up and down the bole.

A few trees with Western gall rust (*Peridermium harknessi*) were noted in the forest. This fungus first appears as a small swelling in the bark of a limb or stem. This becomes visible about one year after infection occurs. The swelling causes the cells to divide rapidly, resulting in a soft, woody, globose or ball-shaped gall.

Usually the galls live only a few years because the host bark is disrupted to the point that it dies, thus killing the twig, limb or stem on which it grows. Trunk galls on young trees usually prove fatal. Limb galls on older trees do little damage as they kill only the one limb they are on. Removing the cankers as they appear can control gall rust.

There are a small number of oak trees (*Quercus agrifolia*) in the understory of the forest, and a few have leaves being eaten by the California Oakworm (*Phryganidia californica*). This is a minor problem and presents no threat to the overall health of the oak portion of the forest.

Of greater concern with any disruption of the forest is Oak Root Fungus (*Armillaria mellea*). No indications of the fungus were observed at the time of writing this report, but the fungus is often present in forest soils. It is a wood rotting pathogen that kills the cambium (water and nutrient conducting tissues) of host trees. It generally only attacks weakened or stressed trees. Any activity that creates wet, anaerobic conditions can lead to spread of the disease. Compacting soils, depositing fill near trees, and changing drainage patterns during road construction all have the potential to create such conditions. Attacks of this fungus often lead to death of the tree and there is no effective treatment once it is established.

### **The Holman Highway Forest**

Mark Thomas & Company prepared the plans and mapped the trees by species and DBH class. They also prepared the figures and tables for this

report. Roy Webster of Webster and Associates evaluated the forest stand as a whole and the condition of individual trees and wrote this report. He also did the tree coring to establish ages and growth rates of the trees. Forestry fieldwork was done in September and October 2003. All trees greater than 5 inches DBH were mapped, measured, and evaluated for this report.

The construction project is to take place in an urbanized Monterey pine forest that is composed of two distinct populations.

Areas 7, 8, 9, and the south half of 6 (Figure 1 appended to this report) is mostly even aged, young, and very likely a planted forest of about 35 to 40 years of age as indicated by increment cores taken from the trees. A range is presented because the annual rings of some years were difficult to read. The stand of trees is densely spaced and would benefit from thinning to increase growing space and produce a healthier forest. The area of planted forest is approximately 8 acres.

The other areas (1, 2, 3, 4, 5 and north half of 6) contain an all age native stand, with the older trees in the 80 to 100 year range. There were also some small, young, planted Coast Redwood (*Sequoia sempervirens*) and Monterey Cypress (*Cupressus macrocarpa*) in areas 1, 3, and 6. The area of native forest is about 2 acres.

Both areas have a minor component of Coast Live Oak.

Growth over both stands is from 3 to 10 annual rings per inch, the closer growing, younger, shorter trees (planted stand) generally growing slower than the more widely spaced, older, taller trees (dominant or co-dominant crown class; native stand). This is the reverse of what one would expect in a natural forest unaffected by man's intervention.

In summary this is a stand that is urbanized, fragmented, and largely planted using an unknown seed source. It is bisected by major roads and surrounded by residential and commercial development. It does not in any meaningful way provide the values of a natural forest: watershed, wildlife, recreation, timber, or erosion control. It is thus considered a low quality stand of trees.

## Impacts

One of 12 alternatives or combinations thereof could be adopted for this project. It is the author's opinion that the most appropriate analysis is to focus on the alternative that will result in the largest area disturbed and largest number of trees removed. This worst case scenario presents the greatest potential for significant impacts to the forest. If adequate mitigation is designed for this option, it will also mitigate for those alternatives that are lesser in scope. Thus option 3BC will be the focus of the impacts evaluation.

Figure 1 is a map showing a breakdown by area that will be impacted from grading activities and wherein trees will need to be removed. Table 1 gives a breakdown of area of disturbance in acres and hectares by unit. Total area is 10.037 acres. Table 2 shows a breakdown of number of trees to be removed by area and dbh (diameter breast height) class. Total number of trees to be removed is 622. Table 3 is a presentation of the number of trees by species to be removed. Also appended to this report is a site plan showing location and size of trees including those to be removed and those retained.

The majority of the impacted forest is a planted one comprising 8 acres of the total 10 acres of disturbance (80%). In tree numbers, 75% or 467 trees to be removed are not native to the site. 2 acres (20%) and 155 trees (25%) thus are native to the site.

It is assumed that an additional 3% of the residual trees (18) may need to be removed because of negative impacts caused by adjacent construction. Roots of these trees will extend into the project area and will be cut or filled over. The exact number is unknown because the location of underground roots cannot be seen without root excavation. The greatest concern is for larger, older trees. Such individuals are more likely to have important anchoring roots severed and therefore become safety hazards. They are also less likely than younger healthy specimens to regenerate new roots quickly. From field experience and for purposes of mitigation, 14 inches (DBH) is chosen as the threshold where adjacent disturbance becomes critical and grading within 10 feet of the bole. Smaller trees with greater distance from disturbance than those set out here are more likely to live to maturity.

It should also be noted that the larger, older, mature/overmature trees in this stand are reaching the end of their expected life span. Though none was judged to be imminently in danger of failure, this species is known to be susceptible to windthrow. Older trees are also more likely to be attacked by the pests mentioned in the report. Some of these trees lean over the Holman Highway so there clearly is a target present. They are located in a high-risk environment. It is likely that in the next decade or two many of these trees would need to be removed as a safety precaution regardless of the proposed project.

### **Mitigation's**

If one uses the low-end estimate of the total range of Monterey pine on the Monterey peninsula, the project will result in the loss of 0.17 percent of the Monterey pine forest in this region. Using the high-end estimate there will be a loss of 0.06 percent. This is a loss of low quality forest. Since by far the greatest genetic variability of the species is within each individual stand of trees, this loss will have negligible affect on the genetic viability of the species. It is thus unlikely that the loss of 2 acres and 155 trees of the native forest and 8 acres and 467 trees of planted forest would result in a significant cumulative adverse affect.

The following mitigations are nonetheless proposed to compensate for the impacts accruing from the proposed project and to clearly bring impacts to an insignificant level.

- Replant a like number of removed trees by species with five gallon stock derived from a local, native seed source. The planting should not occur in the area surrounding the project as it would create an overcrowded, unhealthy forest. The trees should be planted in an alternative site owned or controlled by the City of Monterey or Caltrans, containing soils appropriate for planting Monterey pine. If an alternative site is not available, the cost of such replanting should go into an account to be used on other projects or settings for environmental enhancement. To establish the dollar amount of such replanting, the wholesale cost of the planting stock at the time of initiation of the project is multiplied by two to arrive at a cost "in the ground".
- An alternative mitigation is to place in a permanent conservation easement 20 existing acres of Monterey pine forest owned, controlled,

or acquired by the City or Caltrans. While ten acres will be converted from Monterey pine forest to urban use by the project, 20 acres is judged to be the smallest unit appropriate for protection per the Huffman report.

- Trees approved for removal shall be clearly marked and removed in a manner that protects all residual trees.
- The perimeter of construction activities as shown on the approved plans shall be fenced to protect residual trees and vegetation. Where residual trees are clearly removed from construction and there is no chance of damage, it is not necessary to provide the fencing.
- Retained trees within 15 feet of the perimeter of the work area as shown on the approved plans shall be protected with boards or other suitable means to further protect the trunk from injury.
- All residual pine trees over 18 inches in diameter within 100 feet of the perimeter of the construction area shall be sprayed with Lindane, Sevin, or other comparable insecticide and wrapped with plastic on the lower eight feet of the bole to protect against beetle infestation.
- No additional fill, compaction or excavation should be allowed beyond the perimeter shown on the approved plans. Arrangements should be made to park equipment or store materials outside of the adjacent Monterey Pine Forest habitat.
- Before excavating stumps to be removed within 25 feet of the perimeter of the work area, first locate all roots within the top 2 feet of the surface by visual inspection and probing with a pick or shovel. Roots should be cut clean to avoid damaging roots of residual trees that may be intertwined with the stump being removed.
- The project should be periodically monitored by a Registered Professional Forester or Certified Arborist during construction to insure compliance with these standards as well as to determine if residual trees close to the perimeter are sufficiently healthy and free of damage to be retained. The retained forest should be monitored twice a year for three years after completion of construction to document and make

recommendations for treatment of retained trees. Every monitoring inspection after job completion should be documented by a report submitted to the City and Caltrans.

### **Tree Planting Specifications**

The mitigation section requires a 1:1 replacement of trees removed for the proposed project. It calls for planting 5 gallon or larger container stock. The following are guidelines for the tree planting.

Trees should be planted on 12-foot centers. The tree replacement will be considered successful if 90% of the planted trees survive at least 5 years. The replanting should be monitored 4 times a year for 2 years and 2 times a year for the following 3 years after completion of planting to document and make recommendations for treatment of the seedlings or replanting of dead or unhealthy seedlings. Every monitoring inspection after job completion should be documented by a report submitted to the City and Caltrans.

A qualified forester, arborist, or nurseryman should inspect the delivered seedlings for condition and health. Special attention should be paid to the quality and quantity of roots as well as color and conformation of the top.

The site of each planted seedling should have competing vegetation removed for at least 3 feet from the center of the hole. A hole should be dug that is about 2 inches less than the height of the root ball. The intent is to have the top of the root ball slightly higher than the level of the soil it was grown in. It is anticipated that the tree will sink slightly after planting. If the hole is too deep there could be a depression created around the tree that retains excessive moisture and leads to root or crown rots. The hole should be at least 1 foot wider than the root ball to allow backfill to be worked in and around the ball and to improve soil aeration for the roots.

The conventional container-grown trees should be tapped out of their containers carefully. Root systems of trees grown in containers have been forced to conform to the shape of the container. The encircling outer layer of roots should be cut in several places or removed to encourage new roots to grow out into the surrounding soil. If not removed such roots may eventually girdle the tree. Roots matted at the bottom of the root ball

should be cut and removed or straightened. Diseased, kinked, and broken roots should be pruned as well.

These specifications assume and recommend that the site of the replanting is a forest soil appropriate for the growth of Monterey Pine and Coast Live Oak replacement trees. If that is the case, the hole should be backfilled with the soil set aside from digging the hole. After placing the root ball in the hole, it should be filled half way with soil, tamped firmly, and watered to settle the soil. Then finish filling the hole with loose soil.

Provided that the trees are watered, they can be planted any time of year in this climate. For the first 2 years, deep watering should occur every 3 weeks during the summer months (May through October). After two years, unless there are unusual climatic conditions (drought), watering can be discontinued.

**TABLE 1 – AREA IMPACTED BY TREE REMOVAL**

	(sm)	(ha)	(ac)
1	775.00	0.078	0.19
2	1520.50	0.152	0.38
3	1203.00	0.120	0.30
4	2007.80	0.201	0.50
5	1919.60	0.192	0.47
6	2351.40	0.235	0.58
7	14770.70	1.477	3.65
8	2720.70	0.272	0.67
9	13347.80	1.335	3.30
<b>TOTAL</b>		<b>4.06</b>	<b>10.04</b>

*Note: Please see Figure 1 for Area Index*



# FIGURE 1- AREA INDEX

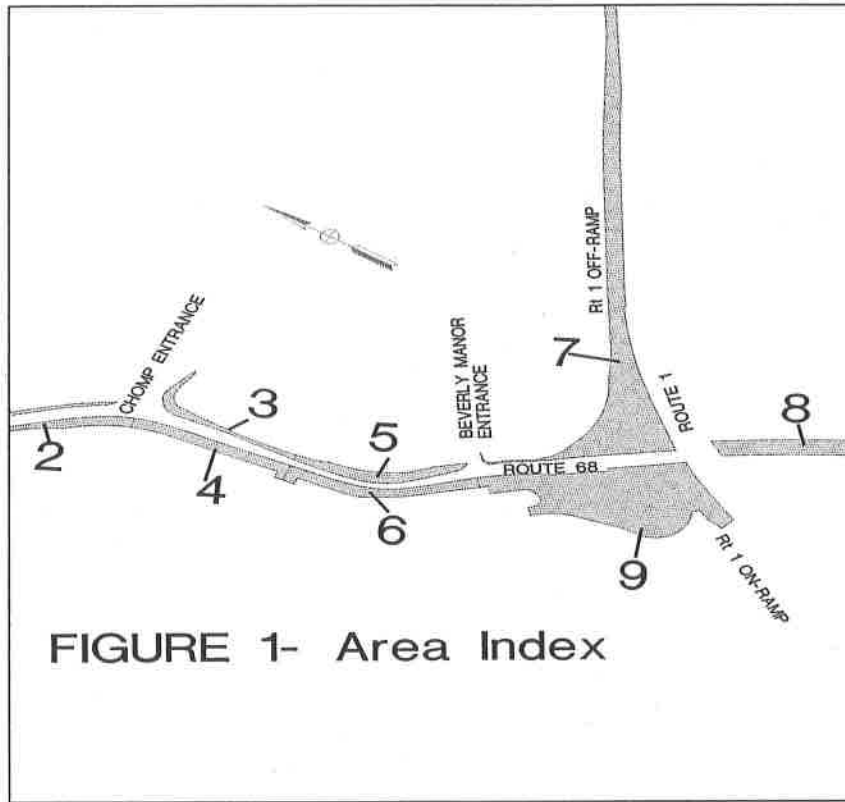


FIGURE 1- Area Index

**TABLE 2 – TREE SIZE  
CONVERSION TABLE**

Metric	English
150 mm	6 in
200 mm	8 in
250 mm	10 in
300 mm	12 in
350 mm	14 in
400 mm	16 in
450 mm	18 in
500 mm	20 in
550 mm	22 in
600 mm	24 in
650 mm	26 in
700 mm	28 in
750 mm	30 in
800 mm	32 in
850 mm	34 in
900 mm	36 in
950 mm	38 in
1000 mm	40 in

**TABLE 3 - TREE SPECIES**

	Pine	Oak	Dead	Misc.
Count 1	31	9		1
Count 2	44			1
Count 3	48	3		
Count 4	42			1
Count 5	14			
Count 6	21	1		
Count 7	109			1
Count 8	41			1
Count 9	27	10	1	
Count 10	46	5	1	
Count 11	51			
Count 12	21			
Count 13	48		2	
Count 14	38	2		
<b>Total</b>	<b>581</b>	<b>30</b>	<b>4</b>	<b>7</b>
<b>Grand Total</b>	<b>622</b>			

*Note:*

1. If take out the 4 dead trees, the grand total is 618 trees.
2. Counts are break-down of smaller areas for counting species of trees