Appendix A:
Condition Assessment for Existing Assets

- Pavement Maintenance
- Roadway Markings and Striping
- Sidewalks, Curbs and Gutters
- Streetlights
- Street Landscape
- Street Tree Maintenance and Care
- Traffic Control and Streetname Signs
- Traffic Signals and Intelligent Transportation Systems

Pavement Maintenance

Asset Profile

San Jose has approximately 2,300 thirty-foot equivalent miles of paved roads. Their primary purpose is to safely and efficiently carry vehicular traffic. As a whole, this asset is valued at $1.2 billion.

The City uses the Bay Area Metropolitan Transportation Commission's Pavement Management System (PMS). The PMS applies a Pavement Condition Index (PCI), which rates streets from 0 to 100. A street rated 100 would be in excellent condition and one rated at 0 would have exhausted its useful life and be in need of complete reconstruction.

By the end of 2004-05, the City will have 84% of its pavement infrastructure rated at a PCI of 50 or above. Figures 1, 2, and 3 illustrate pavement sections with PCI ratings of approximately 90, 45, and 25, respectively.

The life expectancy of the pavement is affected by the constant exposure to traffic loads and to the environment. As the pavement deteriorates, it starts to exhibit cracks and localized pavement failures (potholes). Left unattended, the pavement surface will degenerate and allow air and moisture to intrude into the sub-base, compromising the structural integrity of the street. When the structural integrity of a street is gone, it has, in essence, "failed". The street can no longer carry traffic loads effectively. Most paved roads are designed for a 20 to 25 year life. Meaning, if no maintenance is performed during its service life, a brand new road would "fail" in 20 to 25 years, and hence, need costly reconstruction.

Figure 1 – PCI 90

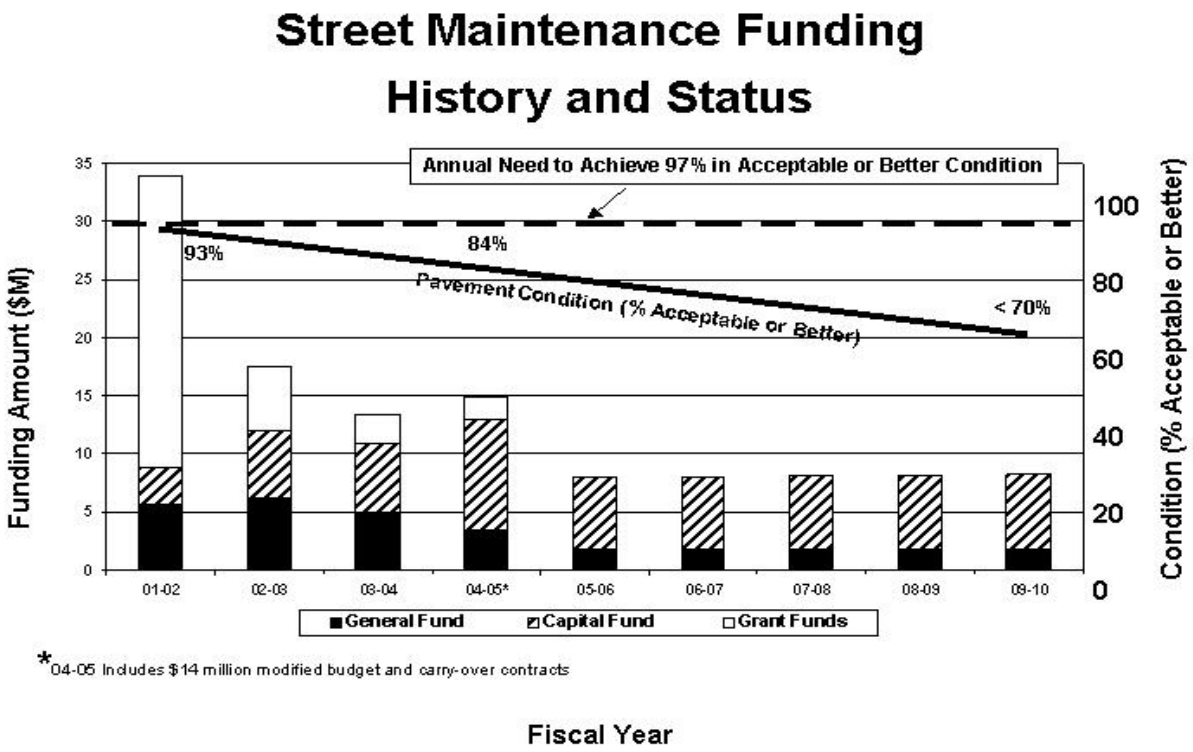
Figure 2 – PCI 45

Figure 3 – PCI 25

Investment Profile

Over the last few years, the Pavement Maintenance program has experienced a large

drop-off in federal, state, and local grant funding. Coupled with grant funding drop-off has been increasing pressure to reduce expenses in the City's General Fund. Altogether, these fiscal pressures have reduced the Pavement Maintenance program's funding from a high of $29.9 Million in 2001-02 to $9.3 Million in the current fiscal year, and down to $8.0 Million in fiscal year 2005-06. The 2005-06 General Fund contribution is down to $1.9 million in 2005-06, its lowest level in the last ten years. The chart below illustrates past, present, and future funding and its expected effects on the overall condition of the City's pavement infrastructure.



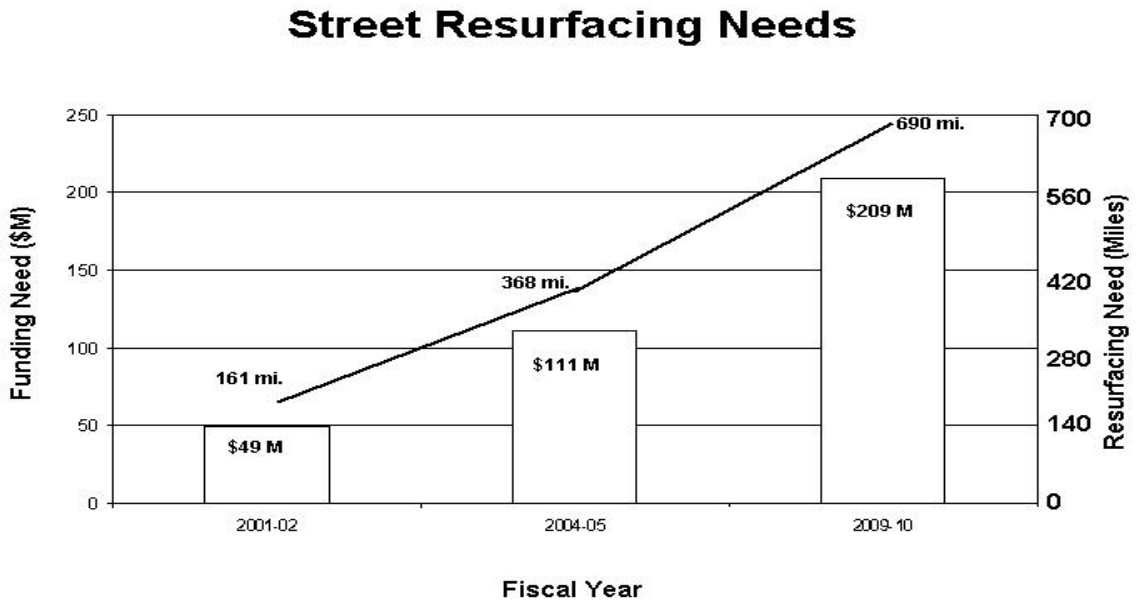
An optimal pavement maintenance program, utilizing regularly scheduled preventive maintenance processes, would achieve a goal of having 97% of all pavement assets rated with a PCI of 50 or above and would require approximately $30 million annually.

As a result of declining funding, preventive street sealing activities have not been able to keep up with annual needs. Since 2001-02, an average of 106 miles have been preventively sealed each year, short of the 250 miles needed to achieve the program's condition goal. Additionally, 202 miles of streets that were identified as needing resurfacing have been deferred and placed on a backlog list. Based on the network's current condition rating there are still another 90 of miles of streets currently in need of resurfacing that are yet to be identified.

Projections

Based on the projected funded levels, streets will have to wait an average of 46 years between sealing treatments. This will become problematic, as deterioration rates indicate that streets that have not been sealed within 15 years will require resurfacing when they are finally addressed.

Overall, the condition of the pavement infrastructure will decline to below 70% with a PCI rating of 50 or above by the end of 2009-10. This translates to having more than 30% of our entire pavement infrastructure in need of resurfacing. The total cost of resurfacing needs would be at least $209 million, up from $49 million in 2001-02.



Technology Advancements & Efficiencies

City staff remains very active in pavement industry organizations and continues to test new treatments and innovative management ideas. For example, this fiscal year, in order to stretch the dollars available and to address some of the streets in need of resurfacing, staff applied a special polymer modified asphalt product on 3 miles of qualifying streets and is monitoring its effectiveness to determine future use of the product. In addition, the cost benefits and environmental impacts of using rubberized products are being investigated and will also be tested this coming summer. Due to the increasingly limited resources available in 2005-06 and beyond, staff will be utilizing proven methods in different ways than previously used in order to maximize the number of miles that can be preventively sealed.

Roadway Markings & Striping

Asset Profile

San Jose's Roadway Markings and Striping assets consist of painted messages, curbs, directional arrows, lane striping, and crosswalk markings and other reflective devices on the roadway surface. Their primary purpose is to safely channel and direct the traveling public. A system wide inventory completed in 2004 determined that there are approximately 6 million square feet of painted devices and 500,000 reflective markers.

Roadway markings and striping should be clearly visible to the traveling public under all conditions. Federal requirements are now in place that dictate the level of visibility acceptable on all roadways. On average, approximately 60% of the City's roadway markings and striping assets will meet visibility guidelines during fiscal year 2004-2005. Figure 1 illustrates a painted message that meets visibility guidelines and Figure 2 shows a deficient device that would not be visible at night.

Figure 1 – Meets Visibility Guidelines

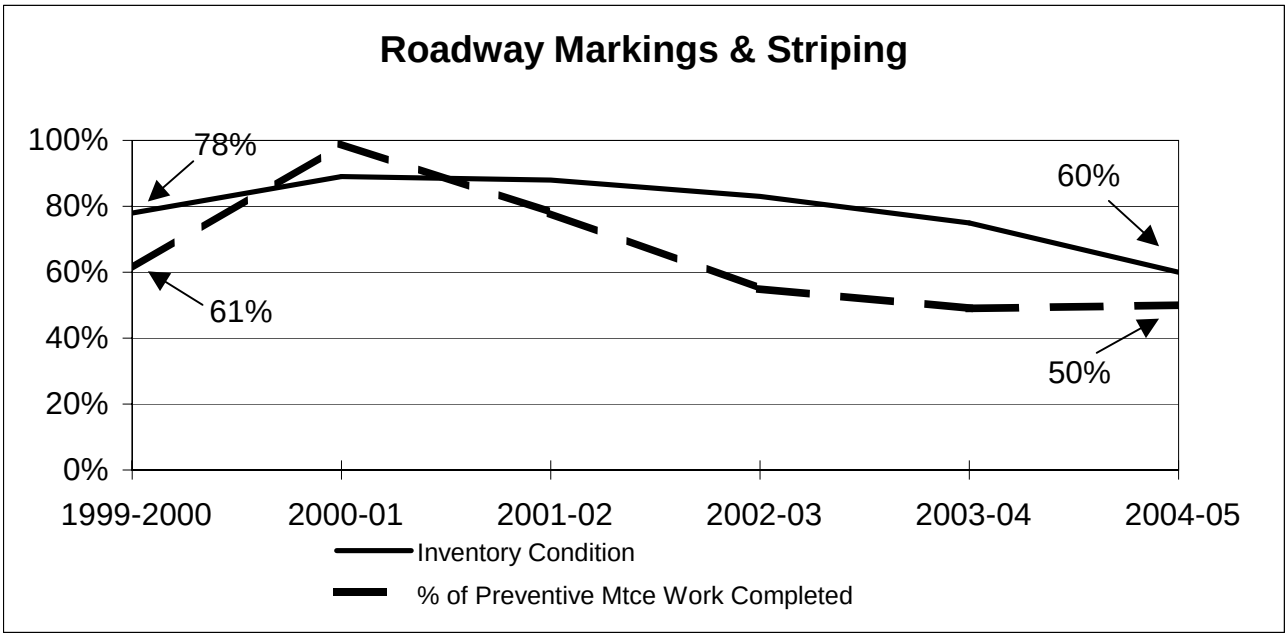
The City's roadway markings and striping have an average life expectancy from one to three years, depending on traffic volumes, before they become deficient and ineffective. Therefore, it is necessary that more than half of the City's markings and striping be repainted annually – a 2-year cycle – in order to sustain a system where 90% of devices meet visibility guidelines.

Figure 2 – Not Properly Visible

Investment Profile

San Jose is investing about $1.3 million annually on the Roadway Markings and Striping program. Funding is allocated to perform preventive and corrective maintenance activities, and to install new devices as deemed necessary by the City Traffic Engineer. Currently, less than one-third of the City's roadway markings and striping are painted annually – a 3-year cycle – primarily through the preventive maintenance program. Since fiscal year 2001-02, a combination of funding reductions and increases in the demand for corrective maintenance and new installations has directly impacted the amount of preventive maintenance performed. As a result, the overall condition of the City's markings and striping has declined. Figure 3 on the next page describes how the reductions in funding and preventive maintenance have impacted the condition of this critical asset.

To establish the prescribed preventive maintenance frequency and achieve the desired outcome of 90% of roadway markings and striping meeting visibility guidelines, it is recommended that the annual funding for the entire program be $1.6 million.



Projections

At current funding levels, the condition of the roadway markings and striping infrastructure over the next two to three years will continue to average 60% meeting visibility guidelines each year. While costs of deferred maintenance do not compound over time, the potential liability to the City and costs associated to society are significant.

Technology Advancements & Efficiencies

In 1998, the Roadway Markings Team entered a three-year service agreement with the City as part of a public/private competition program. During this period, the Roadway Markings Team:

- Increased overall production by 260%;
- Increased preventive maintenance quantities by 32%;
- Improved the condition of the City's markings and striping from 57% to 89%, and;
- Achieved unit costs 40-60% less than the private sector.

Today, the Roadway Markings Team continues to perform at the same high standards established during the service agreement. In addition, new industry technologies are constantly evaluated and employed. For example, new marking and striping materials are tested and evaluated each year in various areas of the City. The team performs quarterly reflectivity testing and tracks performance. As a result, the Roadway Markings Team has modified material specifications to require the application of more durable paints on City streets. These changes have increased the effective lifetime of each device and reduced the demand and cost of maintenance.

Sidewalks, Curbs & Gutters

Asset Profile

There are nearly 4,000 miles of sidewalks, curbs and gutters in the City of San Jose. Sidewalks enhance community livability by offering safe pedestrian travel ways adjacent to most streets within the City, while curbs and gutters provide delineation of the edge of street pavement and drain water from the streets into the storm sewer system. Along with the parkstrips and street trees, the responsibility to maintain these assets belongs to the abutting property owner.

Normal maintenance might include repair or replacement of damaged or displaced concrete (usually caused by street tree roots), abatement of weeds or debris, and the trimming of the trees and shrubs. Sidewalks and access to sidewalks are receiving increased attention in recent years with the development and implementation of Federal and State requirements to offer access of sidewalks to the disabled community.

Although there is no condition measure of the City's sidewalks, data is available for curbs and gutters. In 2001, City staff performed a random sample inspection of 2% of the city's curbs and gutters. From the data gathered, the following estimates were made:

- 48,000 lineal feet (approximately 9 miles) had severe damage
- 225,000 lineal feet (approximately 43 miles) had moderate damage
- 300,000 lineal feet (approximately 57 miles) had minor damage.

Figure 1 – Damaged Curb & Gutter

Considering the amount of curbs and gutters repaired or replaced since the survey, and the fact that damage to curbs and gutters continues throughout the City due to normal tree growth, it is estimated 250,000 lineal feet (approximately 47 miles), or just over 1% of curbs and gutters, are severely or moderately damaged and warrant repair or replacement. Figure 1 illustrates curbs and gutters in these conditions.

Effective and properly maintained sidewalks provide a clear and unobstructed choice of travel for pedestrians and individuals using wheelchairs. Other than displaced or damaged concrete, sidewalk obstructions typically consist of overgrown landscaping, untrimmed trees, or placement of foreign objects into the pubic right-of-way. The property owner typically removes these obstructions once they are notified. Displaced or broken concrete is repaired either by removing and replacing the displaced section

of concrete or by grinding down the displaced section to remove the vertical separation between concrete sections. Figures 2 and 3 are examples of sidewalks requiring remove and replace and grind repairs.

Figure 2 – Remove & Replace

Figure 3 – Grind

Grinds represent approximately 1/2 of sidewalk repairs performed and are a fraction of the expense of removing and replacing the sidewalk. The majority of grinds however, are temporary repairs and will require the sidewalk to be repaired again within five years.

Investment Profile

Along with street trees and parkstrips, San Jose property owners are responsible to maintain the sidewalk, curb and gutter adjacent to their own property. To assist property owners with the cost of sidewalk repairs, the City manages a sidewalk grant program, which reimburses property owners for the repair of sidewalks in front of owner-occupied homes. When adjacent curbs and gutters meet a severe condition and the affected area adversely impacts safe pedestrian traffic, their repair or replacement costs are also eligible for reimbursement. Up to $1,000 for mid-block properties and $2,000 for corner properties is granted.

Citizen requests for sidewalk and curb and gutter inspection generate approximately 4,000 locations for sidewalk repairs or clearance of obstructions and another 150 curb and gutter repairs and replacements annually. The FY 04-05 budget for the sidewalk grant program is $1.5 million and is proposed to be cut to $750,000 in FY 05-06 budget (and possibly eliminated in 2006-07). To stay within the FY 05-06 proposed budget, the grant cap is being proposed to be reduced to $500 per repair for mid-block properties and $1,000 for corner properties. At this time, no other funding is available to specifically perform curb and gutter repair or replacements citywide. In fiscal year 05-06, it is being proposed that $500,000 be allocated ongoing from the Storm Capital Improvement Program to address severe curb and gutter damage that causes significant storm water ponding or localized flooding.

While it is difficult to quantify the total need for sidewalk repairs, the level of citizen requests in the sidewalk grant program indicates that all qualified grant applicants could be fully reimbursed at an annual cost of $2 million. Although there is a total of $18 million of needed curb and gutter repairs and/or replacement currently in San Jose, a $1 million annual program would adequately address both citizen requests and the most severe cases of curb and gutter damage.

Technology Advancements & Efficiencies

In 1999 the Sidewalk Section created and implemented a Sidewalk Complaints database that provides for the timely tracking of all sidewalk and curb and gutter complaints and repairs. The section is in the process of implementing the use of handheld inspection devices that will allow for electronic processing of inspection information into the program's database, minimizing data entry error and reducing program costs.

Streetlights

Asset Profile

San Jose's Streetlights consist of standard roadway lighting, lighting for pedestrian walkways, and decorative lighting, such as the uplighting along the palm trees in Downtown. There are approximately 57,000 streetlights throughout the City. Three primary services are necessary to properly manage the City's streetlighting system: corrective maintenance for existing streetlight devices, streetlight pole and fixture replacement or refurbishing, and installation of new streetlights.

Corrective maintenance on existing streetlights includes repair of streetlight outages and damaged or knocked down streetlights. Each year, maintenance staff respond to approximately 10,000 streetlight outage repair requests from the public and other sources. The City has a goal of resolving 98% of streetlight outages in seven days from the date reported. Currently, approximately 60% of outages are resolved in seven days over the course of a fiscal year. In some cases, it can take up to 60 days to resolve a streetlight outage.

A program to replace or refurbish old and dilapidated streetlight poles and fixtures ensures the structural integrity and attractive aesthetics of the streetlight. There is currently no program to replace or refurbish existing streetlight poles. However, such a program existed between 1998 and 2002 where approximately 1,700 streetlight poles and fixtures were refurbished. Through this program, previously painted poles that were damaged, rusted, or otherwise deficient were removed from a location, stripped, repaired, and galvanized, then reinstalled in place of another dilapidated pole. Figures 1 and 2 illustrate the difference between old painted poles and newly refurbished poles.

Figure 1 – Dilapidated Streetlight Poles

Figure 2 – Refurbished Streetlight Poles

It is estimated that 36,000 painted poles exist throughout City neighborhoods that will eventually need to be repainted, replaced, or refurbished. It is estimated that approximately 5,000 of these poles are currently in this state. In addition, there are approximately 4,000 painted poles in the downtown that have received some amount of painting, but an ongoing program does not exist.

City staff also responds to requests from residents and Council for new street light improvements in older neighborhoods as recommended to meet the Street Lighting Standards for Private Developments. These requests have been managed within the Strong Neighborhood Initiative (SNI), Community Development Block Grants, (CDBG), and the Street Light Request programs funded through the Traffic Capital Improvement program. There is currently a backlog of approximately 60 minor requests for new streetlights (8 streetlights or less) and the Street Light Request program receives approximately 30 new requests annually.

Investment Profile

San Jose is investing about $1.7 million annually on the Streetlight maintenance program, not including electricity charges, which are approaching $4.0 million annually. Funding is allocated to perform corrective maintenance activities, exclusively. To achieve the desired outcome of 98% of streetlight outages repaired within seven days and to establish a pole painting maintenance program, it is recommended that the annual funding be increased to $2.1 million. To re-establish the pole-refurbishing program and effectively deal with the growing number of dilapidated poles and fixtures, an annual investment of at least $500,000 is required.

The City is currently investing $250,000 for minor streetlight installation requests. However, due to tight capital funds and the maintenance cost impacts of installing new streetlights, the program for addressing these requests is tenuous at best. There are currently no new plans to augment this funding. To eliminate the backlog of minor requests, a one-time investment of $2 million is required. To adequately deal with new requests received on an annual basis, ongoing funding or $1.1 million per year is necessary.

Projections

With current funding all streetlight outages would continue to get repaired annually without a backlog. However the repair times during peak work loads from October through February could take up to 60 days with the average being 40 days. Customer complaints would increase substantially. Over the course of a year, it is estimated that 60% of outages would be resolved in seven days.

An area of great concern is increasing costs for electricity. At approximately $4.0 million this fiscal year, the cost to energize the streetlight system has become a problem that can no longer be ignored. A proposal to reduce electricity costs by nearly $500,000 by shutting off approximately 5,500 streetlights is under consideration.

While costs of deferred maintenance do not compound over time for streetlights, poles and fixtures do have a limited life and will require replacement at some point. At current funding levels, the physical condition of the streetlight infrastructure will continue to gradually decline each year. It is estimated that poles have a 40-year life cycle and fixtures have a 20-year life cycle. Approximately 14,000 poles and luminaires will hit these targets within five years.

Without dedicated funding at adequate levels to address minor requests for new streetlights, it is projected that the backlog of requests will increase by 30 per year.

Technology Advancements & Efficiencies

In the fall of 2004 the Streetlight section implemented a new maintenance management system to replace the 22-year-old VAX system. The new system provides better access to management data for staff and more accurate, higher quality data for inventory control, customer service, and continuous improvement efforts.

Engineering and maintenance staff from several departments are continuing to evaluate new streetlighting technologies, such low-energy LED lights and solar powered lights. While these technologies appear to be several years away from being a cost-effective alternative to current standard products, they show promise for the future in lowering energy and maintenance costs.

Street Landscape

Asset Profile

Street landscapes contribute to community livability by helping to provide safe and aesthetically pleasing streetscapes for San Jose residents and visitors to enjoy. City crews maintain 210 acres of median and roadside landscapes throughout the City, mowing turf, trimming shrubs and groundcovers, removing weeds and litter, replacing dead and unhealthy plants, watering, repairing irrigation systems, and pruning trees.

In addition to these landscapes, there are also landscapes built and maintained by funding from Maintenance Assessment Districts (MAD's). Property owners within the MAD's pay special assessment taxes in order to have landscapes in their area that are designed and maintained at a much higher level than regularly maintained landscapes.

Figure 1 – Good Condition

Street landscapes are highly visible and help to make City streets attractive and pleasant to drive. Figure 1 is an example of how street landscapes can make a positive contribution to the look and feel of City streets.

Sustaining the condition and appearance of street landscapes requires frequent and ongoing maintenance. Currently, landscapes are watered regularly and serviced approximately every three weeks for general cleanup and weed abatement. Beyond these regular activities, street landscape maintenance also addresses less frequent, but more costly, needs such as replacing dead or unhealthy plant material and repairing and/or replacing deteriorated irrigation systems.

Most street landscapes are built by developers as part of their overall development plan, as approved by the City. Landscapes are also built by or in conjunction with City, state, and regional capital improvement projects. With the additional 8 acres expected to be added by the end of 2004-05, the landscape inventory will have increased by 37 % (59 acres) since 1998. Unfortunately, while the number of acres of street landscapes has risen, the resources to maintain them have fallen.

Identifying funding to maintain newly built street landscapes has long been a challenge. To help mitigate the effects of the ever-growing inventory, Council approved a policy in 1995 requiring new median landscapes to be ultra low (Type 1) maintenance designs, with the exception of the Downtown and Redevelopment areas.

While these Type 1 areas are less costly to maintain, they are not as aesthetically pleasing.

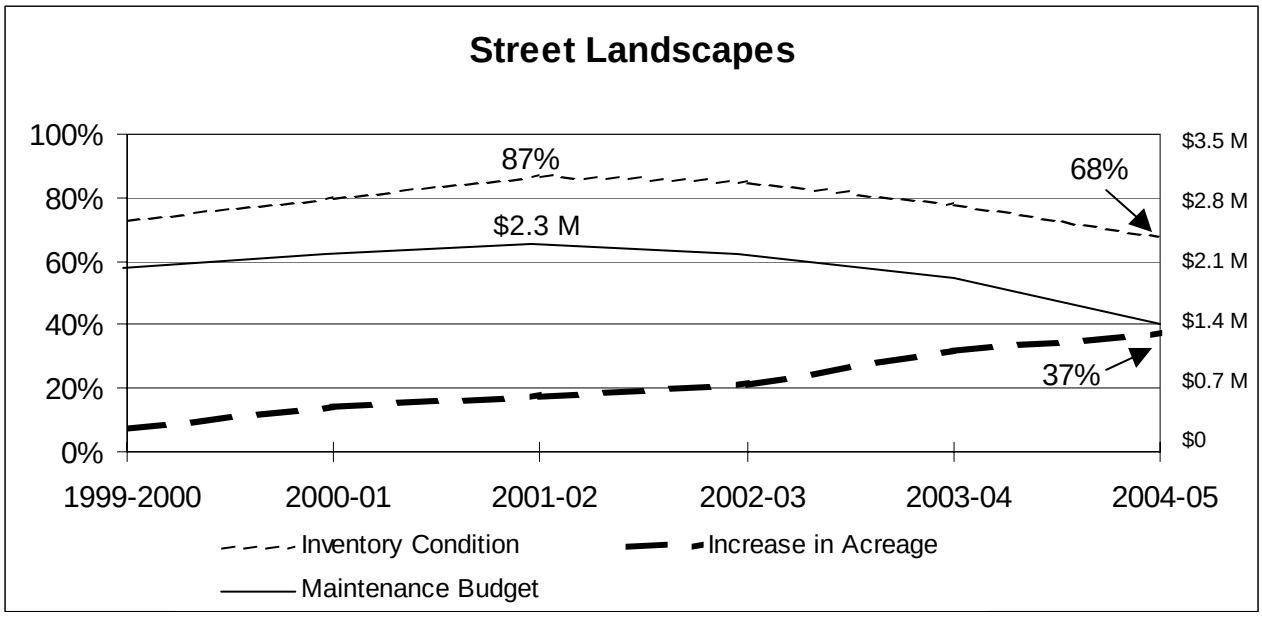
The landscape maintenance program's goal is to maintain 90% of street landscapes in good or better condition. The increasing inventory, coupled with the diminishing maintenance resources, has led to a reduction in the condition of street landscapes. By the end of fiscal year 2004-05, it is anticipated that 68% of the street landscapes will be maintained in good or better condition, down from 78% in fiscal year 2003-04 and 85% in fiscal year 2002-03. Figure 2 is an example of a street landscape in poor condition.

Figure 2 – Poor Condition

Investment Profile

In 2004-05, the City of San Jose is investing approximately $1.4 million annually on general street landscape maintenance, including over $400,000 for water utilities. This funding level provides for general landscape cleanup and maintenance, but for very limited plant replacement and irrigation system restoration work. 2004-05 inventory levels require an additional investment of $1.9 million annually to reach the 90% condition goal. This funding would provide $400k for plant replacement, $300k for contractual maintenance, and $1.2 million for restoration of staffing levels to account for the increased acreage over the last 3 years.

Figure 3 below describes how the reductions in funding and increased landscape acreage have impacted the overall condition of general street landscapes. The graph illustrates that the condition of street landscapes peaked at 87% in good or better condition in 2001-02 when the program was funded at $2.3 million. By the end of 2004-05, the inventory will have grown by 37% since 1998-99. This increase, along with the decrease in funding, will have driven the condition measure down to 68%.



Projections

As new landscapes are built each year with no allocated funding, there is a significant impact on service levels and the condition of all streetscapes citywide. Of particular concern are very large Light Rail Transit and Caltrans freeway landscape projects that are to be maintained by the City with no identified funding for maintenance. Overall, continued funding at the current level, along with the expected construction of new landscapes, will result in the percentage of landscaping in good condition falling to approximately 50% in the next three years. Weeds and litter will become prevalent, plant material will overgrow, irrigation systems will fail and plant loss will increase.

Technology Advancements & Efficiencies

In 1998, Council approved a Landscape Master Plan for Plant Replacement and Restoration of Street landscape. To improve overall staff efficiency and increase long-term landscape sustainability from 1998 to 2003, $1,750,000 was provided from the Traffic Capitol Fund to renovate old landscapes. Replacing antiquated irritation systems and installing lower maintenance landscape material thereby reduced staff time and maintenance costs in these areas. 13 acres of major median landscapes were renovated, contributing to the overall health and condition of the streetscape. This program was suspended in FY 2003-04, leaving approximately 27 acres of median and roadside landscapes still in need of major renovation work.

In 1998, the landscape maintenance program was reorganized to provide a more focused maintenance approach. The reorganized program focuses more maintenance resources on major street median landscapes to protect the City's investment and fewer resources on roadside landscapes. The reorganized program also emphasizes scheduled maintenance in specific work zones, which has improved crew efficiencies.

The landscape maintenance program also continues to coordinate with the Santa Clara County Correctional program to maximize the use of the Alternate Work Program, which utilizes the free labor of program participants for the cleanup of larger roadside landscapes.

Street Tree Maintenance and Care

Asset Profile

The urban forest of San José, which consists of over 300,000 street trees in the public right of way, beautifies neighborhoods and enhances community livability throughout the City. By the end of fiscal year 2004-05, 46% of the urban forest will be in optimal condition.

By Code, the property owners are responsible for the maintenance of their street trees. However, the City has traditionally assisted with a variety of services to supplement this maintenance by the property owners, such as managing the tree permit program, educating the public tree about trees and maintenance techniques, performing structural and clearance tree trimming, and addressing tree emergencies.

Studies by the Urban Forest Research Center of the U. S. Forest Service have determined that a 4-5 year street tree pruning cycle is the most cost effective and efficient method of trimming street trees. On that schedule, structural concerns with the tree are caught early while they are small, meaning that they are inexpensive to solve. Figure 1 is an example of a healthy, well-maintained urban forest.

Figure1 – Enhancing Community Livability

Investment Profile

Tree maintenance is a specialized science the cost of pruning can be significant. To prune large trees can often cost a homeowner from $500 to $1,000 per tree. Because of the great economies of scale, the City is able to get competitive bids for correctly pruning the same trees for under $100 per tree. Experienced City arborist inspectors oversee the contractual pruning, ensuring that the pruning meets professional standards and promotes a healthy tree.

An optimal program would trim approximately 68,000 trees annually at an annual cost of approximately $3 million. In fiscal year 2002-03, San José invested over $700,000 in structural tree trimming to assist property owners with the maintenance of their street trees. This level of funding provided a ten-year tree trimming cycle; although not optimum, it provided a very beneficial return on the healthy urban forest. Since that time the funding has progressively decreased, to the point where in fiscal year 2005-06,

structural trimming is proposed for elimination. During the next three to five years, this would result in the loss of mature trees from failure, increased property damage and a general decline in the urban forest. The condition of the urban forest is expected to decline to 40% in optimum health within the next five years.

Figure 2 – Tree Emergencies Can Be Costly

Since one of the major reasons to prune trees is to address potential safety concerns, reductions in tree trimming activities will result in more tree emergencies. Tree emergencies are costly to both the City and to its residents, as they often result in property damage and require additional staff time to clean up. Figure 2 is an example of the damage that can occur during a tree emergency.

Technology Advancements and Efficiencies

The Arborist's office continues to work with the Department of Public Works, developers, property owners, Our City Forest and tree nurseries to plant the proper tree in the spaces provided. These efforts reduce future maintenance costs and the number of tree failures. In addition, an inventory of the street trees is taken as the trees are pruned. Currently the inventory is approximately 12% complete and accessible on-line. Further advancements could be made if/when structural pruning resumes.

Traffic Control and Streetname Signs

Asset Profile

San Jose's Roadway Sign inventory consists of traffic control type signs and streetname signs. Some examples of these devices are shown in Figure 1. The primary purpose of the City's sign assets is to regulate, warn, and guide the traveling public. A traffic control sign inventory completed in 2004 determined that there are approximately 60,000 traffic control signs. It is estimated that there are 25,000 streetname signs.

Figure 1

All signs should be clearly visible to the traveling public and should have good reflectivity at nighttime. Federal requirements are now in place that dictate the level of acceptable visibility. Since 1997, the City has invested well over $1 million in total to proactively replace faded or deficient traffic control signs. As a result, approximately 84% of the City's traffic control signs currently meet visibility guidelines. 45% of streetname signs currently meet visibility guidelines.

The City's traffic control signs have an average life expectancy of 8 years and streetname signs last about 15 years before they become deficient and ineffective. Therefore, it is necessary that approximately 7,500 of the City's traffic control signs and 1,700 of the streetname signs be replaced annually in order to sustain a system where at least 90% of all roadway signs meet visibility guidelines.

Investment Profile

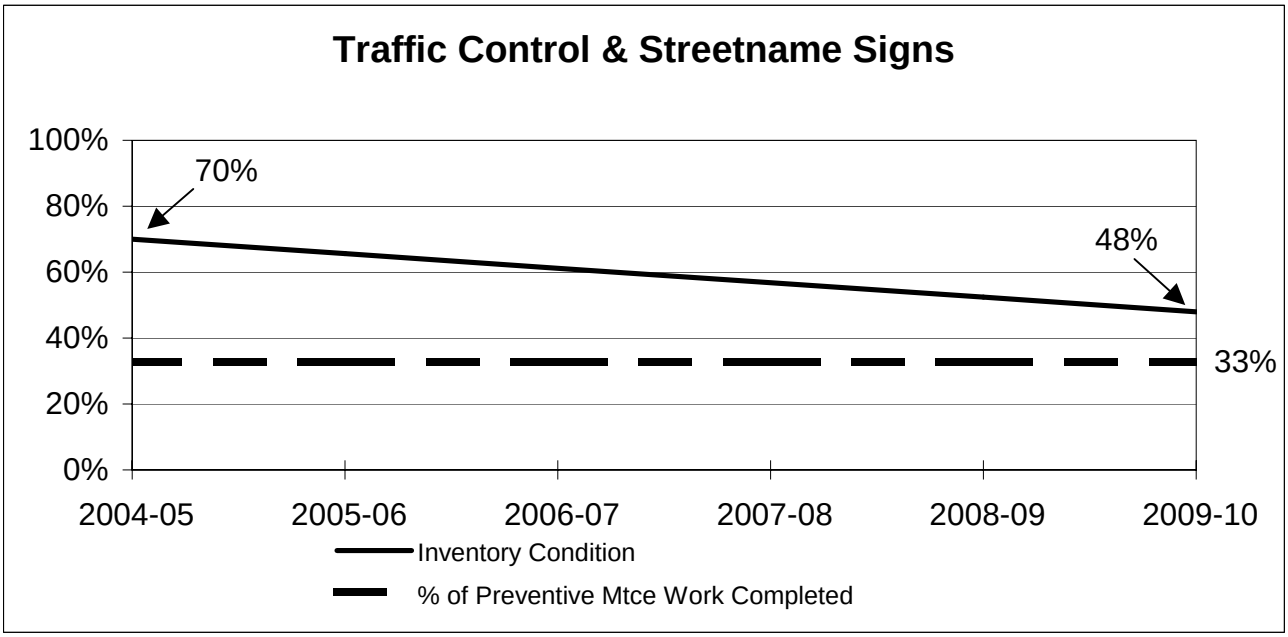
The City is currently investing about $1.1 million on the Sign Maintenance program for preventive and corrective maintenance activities, and to install new signs as deemed necessary by the City Traffic Engineer. Since fiscal year 2002-03, a combination of funding reductions and increases in the demand for new installations has directly impacted the amount of preventive maintenance performed on traffic control signs. Currently, about 3,000 of the City's traffic control sings are preventively maintained, or proactively replaced, annually. This is well short of the level needed to maintain acceptable visibility levels. Funding is not available to perform any preventive maintenance on streetname signs.

To achieve the desired outcome of 90% of traffic control and streetname signs meeting visibility guidelines, the preventive maintenance frequency for traffic control signs would need to increase from the current 20-year cycle to an eight-year cycle, and a preventive maintenance program would need to be established for streetname signs

on a 15 year cycle. It is recommended that the annual funding for the entire program be $1.5 million to accomplish these objectives.

Projections

Recent reductions in traffic sign preventive maintenance have not significantly affected the overall condition of the traffic sign infrastructure. This is due to the fairly long life cycle of a sign. However, if funding levels remain constant or continue to decline as projected, a more severe drop in the condition of the sign infrastructure will occur. It is estimated that in 5 years, approximately 60% of traffic control signs and less than 20% of streetname signs (48% combined) will meet visibility guidelines. The chart below illustrates the effect of inadequate preventive maintenance activities on the overall condition measure.



While the cost of deferred maintenance does not compound over time for signs, the cost of replacing signs on a proactive schedule is much more cost effective than replacing faded or deficient signs as they are reported. Signs are also critical to the safety of the traveling public and the potential liability to the City due to deficient signage is significant.

Technology Advancements & Efficiencies

In recent years, the efficiency in sign maintenance operations has improved dramatically through better data and information management, including the development of an inventory and work management system. In addition, new sign materials and industry innovations are regularly evaluated and employed. Since 1997,

the Sign Maintenance staff has modified sign specifications to require the use of more durable sign materials. These changes have increased the effective lifetime of each sign and reduced the demand and cost of maintenance.

Traffic Signals and Intelligent Transportation Systems

Asset Profile

The purpose of San Jose's traffic signal and Intelligent Transportation Systems (ITS) is to safely and efficiently move people and goods by providing viable choices in travel modes, convenient commutes to work, and efficient access to major activity centers. The traffic signal and ITS systems currently consists of the following assets:

- 864 Traffic Signals and associated controller equipment
- 73 closed circuit traffic monitoring cameras
- 17 changeable message signs
- 55 miles of fiber optic communication cables
- 120 miles of copper communication cables
- 33 speed radar signs
- 13 lighted crosswalks
- A state of the art traffic control center

All of these devices are part of an integrated system that requires a complex set of services to manage, operate, adjust and maintain. It is the preventive maintenance and operations services, such as the proactive replacement of old, ineffective devices or the proactive retiming of a traffic signal that provides the most cost-effective way to ensure that the systems are providing the greatest benefit to the traveling public. It is these services that are currently under funded and having the greatest impact on the systems.

While the life cycle of the traffic signal and ITS systems hardware, cabling, and underground facilities is many decades, the critical active equipment designed to control and operate the systems has a much shorter life span and requires more frequent replacement. The table below describes the useful life cycle, average age, and total replacement costs for these critical assets that exist in the City today.

Asset	Useful Life Cycle (in years)	Average Age (in years)	Total Replacement Cost
Traffic Signal Controllers & Electronic Equipment	20	15	$5,000,000
Closed Circuit Cameras	10	8	$200,000
Changeable Message Signs	10	12	$600,000
Traffic Control Center	10	15	$10,000,000
Speed Radar Signs	10	2	$300,000
Lighted Crosswalks	10	2	$130,000

In general, the most critical and costly traffic signal and ITS systems assets have passed or are quickly approaching the end of their useful life cycle. The full affects of this aging infrastructure have been minimal thus far, but will require attention in the coming years as they fall into disrepair, completely fail, or become obsolete.

In addition to considering the need to replace aging assets, it is essential that they are well maintained, properly inspected, and adjusted during their lifetime to fully utilize the capabilities of the systems. The following table describes the activities needed to achieve the most efficient and safest system.

Activity	**Prescribed Frequency**	**Current Frequency**
Field inspection and adjustment of traffic signal controller equipment	Semi-Annually	No schedule established; occurs sporadically
Testing and repair of traffic signal safety and conflict monitoring equipment	Annually	Annually
Field inspection and maintenance of traffic signal hardware and wiring systems	Bi-Annually	None
Review and retiming of traffic signal timing arterial synchronization plans	Bi-Annually	Approximately every 10 years (90 signals annually)
Field inspection and maintenance of ITS devices and communications devices	Bi-Annually	None
Field inspection and maintenance of uplit crosswalks, speed radar signs, and other traffic safety type devices	Semi-Annually	None

Based on the current frequency of activity describe above, it is apparent that the proper level of preventive maintenance and operational review activities are not being performed. This is having an adverse affecting the operational condition of our traffic signal and ITS assets. The following summarizes our annual levels of preventive maintenance and operational review activities:

- Approximately 42% of traffic signal preventive maintenance activities are being completed
- Approximately 10% of traffic signal timing plans are being proactively reviewed and retimed
- 0% of ITS and communications device preventive maintenance activities are being completed
- Approximately 15% of traffic impacts due to incidents and events are managed

Investment Profile

San Jose is currently investing about $3.8 million annually ($2.1 million for traffic signal maintenance and $1.7 million for operations) to maintain and operate the traffic signal and ITS systems. It is estimated that approximately $2.4 million is needed annually to meet the prescribed traffic signal and ITS system preventive maintenance schedules and another $2.5 million to properly review and retime the traffic signals and arterial corridors. This represents an annual need of $4.9 million and an annual shortfall of $1.1 million for the critical preventive maintenance and operations services.

Regarding the replacement of aging traffic signal and ITS systems devices, proposals are currently being considered to increase the level of capital funding for major systems rehabilitation. It is proposed that approximately $1.4 million be allocated indefinitely to perform portions of this work and to invest in other improvements, such as the conversion of traffic signal green and yellow incandescent lamps to LED modules. Unfortunately, a significant shortfall for the proper replacement or rehabilitation of the systems still exists. It is estimated that approximately $16 million is needed to address backlogged and expected needs.

Projections

Further reductions are proposed for fiscal year 2005-06, dropping funding to around $3.3 million (signal maintenance will drop to $1.75 million; signal operations will drop to $1.58 million) and directly impacting traffic signal preventive maintenance and traffic signal retiming to a greater extent. This would further reduce the funding shortfall to $XX million per year, and when compounded with a growing inventory, would lead to a drastic decline the operational efficiency and overall condition of the traffic signal and ITS systems. While costs of deferred maintenance do not grow over time, the costs of traffic congestion, travel delays, additional fuel consumption, and liability for ineffective traffic control devices are tremendous.

Technology Advancements & Efficiencies

In 1988, the City began the employment of innovative technology solutions to effectively manage and operate its transportation network. The sixteen million dollar Traffic Signal Management Program implemented a state of the art traffic control center to reduce travel delay, and improve maintenance and repair response times. The Program resulted in annual fuel savings of 3.2 million gallons per year, a 16% reduction in stops and delays, and reduction of over 800 tons of air pollutants. Over the last decade, the City has employed advanced technology to improve traffic conditions around the Mineta San Jose International Airport, manage downtown event traffic, as well as support regional traffic management operations. These investments have resulted in average travel time saving of 10 to 15%, increased safety, and improved workflow productivity.

Between 1997 and 1999, all red traffic signals indicators were converted from incandescent lamps to LED type lamps to reduce energy and maintenance cost. In addition, approximately 200 traffic signals have been fully converted to red, yellow and green LED's. Over the next two years, the remaining traffic signals are proposed to be fully converted to LED indicators saving the city over $700K annually in energy cost.

Other technology advances, such as video assisted vehicle detection, are being implemented in San Jose under certain circumstances. While many of these advancements are in the early stages of development, they hold great promise for the future in terms of greater functionality at lesser operations and maintenance costs.