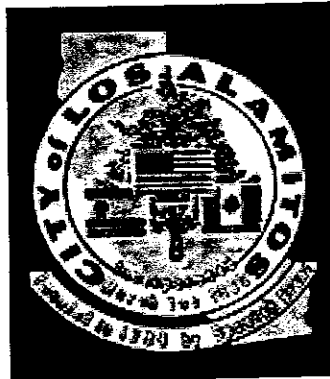


# City of Los Alamitos

## PAVEMENT MANAGEMENT PROGRAM Executive Summary



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## **Purpose**

The purpose of this report is to assist City of Los Alamitos policy makers in utilizing the results of the MicroPAVER Pavement Management System (PMS). Specifically, this report links the PMS recommended repair program to the City's projected budget to improve overall maintenance and rehabilitation strategies. This report assesses the adequacy of the projected revenues to meet the maintenance and rehabilitation (M&R) needs recommended by the PMS program. It also maximizes the return from expenditures by:

- (1) implementing a multi-year road M&R program;
- (2) developing a preventative maintenance program; and
- (3) selecting the most cost effective repairs.

This report assists the City of Los Alamitos with identifying M&R priorities specific to the City's needs. This study examines the overall condition of the road network and highlights options for improving the current network-level Pavement Condition Index (PCI). These options are developed by conducting "what-if" analyses using the City's pavement management system database. By varying the budget amounts available for pavement maintenance and repair, one can see how different funding strategies can impact the City's roads over the next seven years.

## Current Pavement Condition

The City is responsible for the repair and maintenance of approximately 34.5 centerline miles of pavements. The pavement condition index, or PCI, is a measurement of pavement grade or condition and ranges from 0 to 100. A newly constructed or overlaid road would have a PCI of 100, while a failed road would have a PCI of 10 or less.

A condition survey was performed on the City's pavement network of approximately 34.5 centerline miles. As a result, a total of 179 sections have been inspected. After the survey was completed, all the pavement condition data were entered into the MicroPAVER PMS database and a PCI was calculated for each street section. The overall average PCI for the network is 82, which is in the "Very Good" condition category. Table 1 summarizes the condition of the roadway network in the City of Los Alamitos.

**Table 1. Pavement Condition Summary for Los Alamitos Roadways (2006)**

Condition Category	PCI Range	Percent Area of Roadways
Excellent	86-100	53.0%
Very Good	71-85	20.0%
Good	56-70	17.0%
Fair	41-55	5.0%
Poor	26-40	4.0%
Very Poor	11-25	0.0%
Failed	0-10	1.0%

## Present Cost to Repair the Road Network

The MicroPAVER Pavement Management System (PMS) is designed to achieve an optimal network PCI in the *Excellent* condition category. In other words, the system will recommend maintenance treatments in an attempt to bring the roads in the City of Los Alamitos to an *Excellent* condition.

As shown in Table 1, 73% of the City's roads have a PCI of 71 to 100, which is in the *Very Good* and *Excellent* condition categories. Why then, does it cost so much to repair the city's roads, and why bother improving them?

First, how much it costs to repair and maintain a pavement depends on its current PCI. In *Very Good* and *Excellent* categories, it costs very little to apply preventive maintenance treatments such as slurry seals and chip seals which can extend the life of a pavement by correcting minor faults and reducing further deterioration. Treatments of this sort are applied before pavement deterioration has become severe and usually cost approximately \$0.23 to \$0.30 per square foot. About three quarters of the city's roadway network would benefit from these relatively inexpensive, life-extending treatments.

As noted in Table 1, 22% of the City's road network falls into the *Good to Fair* condition categories. Pavements in this range show some form of distress or wear that require more than a life-extending treatment. By this point, a well-designed pavement will have served approximately 75% of its life, and the quality of the pavement has dropped by about 40%. The road surface may require a thin or thick overlay, which typically costs about \$1.50 to \$1.95 per square foot.

About 5% of the City's road network fall into the *Poor to Failed* PCI ranges. These pavements are near the end of their service lives and often exhibit severe forms of distress such as potholes, extensive cracking, etc. At this stage, a roadway usually requires either thick overlay or reconstruction. The costs for these treatments range from about \$1.95 to \$8.20 per square foot.

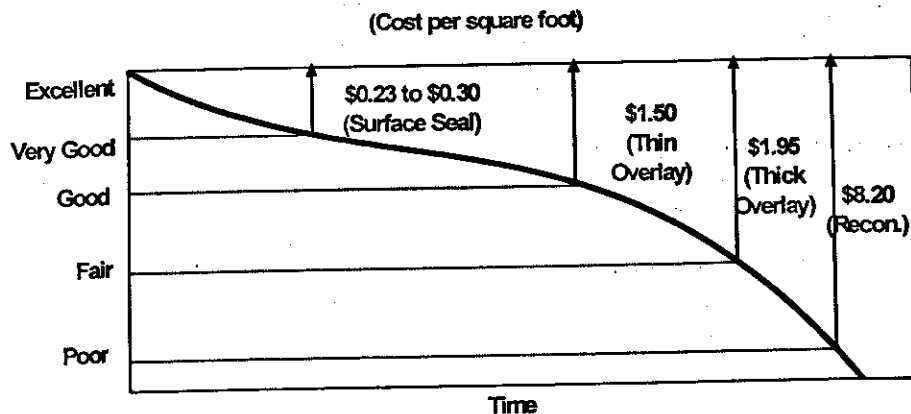
One of the key elements of a pavement management repair strategy is to keep roads in the *Excellent to Fair* categories from deteriorating rapidly. This is particularly true for roads in the *Fair* range, because they are at the point where pavement deterioration accelerates if left untreated.

## Impacts of Deferring the Needed Pavement Maintenance

Using the PMS budget scenario module, both the overall PCI for the pavement network and the amount of "unfunded" maintenance and rehabilitation (M&R) backlog can be evaluated for a given funding level over a period of time. Unfunded costs consist of pavement maintenance and rehabilitation (M&R) that is needed but cannot be allocated due to lack of funding. Shrinking budgets have forced many cities and counties to defer much-needed road maintenance. By deferring M&R, not only does the frequency of citizens' complaints about the condition of the network increase, but also the cost to repair these roads rises as well.

Figure 1 below demonstrates that pavement maintenance follows the old colloquial saying of "pay me now, or pay more later." History has shown that it costs much less to maintain roads in good condition than to repair roads until they have failed. By allowing pavements to deteriorate, roads that once cost only \$0.23 to \$0.30 per square foot to have a surface seal may soon cost \$1.50 to \$1.95 per square foot to overlay and upwards \$8.20 per square foot to reconstruct.

Figure 1. Cost to Maintain Pavements Over Time



## Budget Needs

Based on the principle that it costs less to maintain roads in good condition than bad, the MicroPAVER Pavement Management System strives to develop an M&R strategy that will improve the overall condition of the network to an optimal PCI level, which depends on the City's maintenance and rehabilitation policies. Although the average PCI for the City is 82, which is in the *Very Good* condition category, about 10% of the network exhibits significant load related distresses. If these issues are not addressed, the quality of the road network will inevitably accelerate to decline. In order to correct these deficiencies, a cost-effective maintenance and rehabilitation strategy must be implemented.

The first step in developing a cost-effective maintenance and rehabilitation (M&R) strategy is to determine, assuming unlimited revenues, the M&R "needs" of the City's road network. Using an unlimited budget scenario, maintenance needs over the next seven years were estimated at approximately \$5.835 million. If the City of Los Alamitos follows the funding strategy recommended by the MicroPAVER PMS, the average network PCI will be improved to 91.1 at the end of the seven-year analysis period. In the meantime, all maintenance backlogs will be eliminated. As a comparison, the network PCI will deteriorate to 63.6 if there are no any pavement treatments. The results of the budget needs analysis are summarized in the table below.

**Table 2. Summary of Results from Needs Analysis**

Year	2007	2008	2009	2010	2011	2012	2013	Total
PCI w/ Treatment (Unlimited Budget)	95.59	95.42	94.54	92.38	91.03	91.47	91.10	-
PCI without any Treatments	81.77	79.11	76.24	73.48	70.29	67.07	63.59	-
Budget Needs (\$)	4,214,344	102,834	50,123	0	13,873	1,264,368	189,037	5,834,579
Preventive Maintenance (\$)	1,296,003	18,619	0	0	0	1,170,745	51,320	2,536,687
Rehabilitation (Major M&R) (\$)	2,918,341	8,4215	50,123	0	13,873	93,623	137,717	3,297,892

Table 2 shows the level of expenditures required to raise the City's pavement condition to an optimal network PCI and greatly eliminate the current unfunded maintenance. The results of the budget needs analysis represent the ideal funding strategy recommended by the MicroPAVER program. Of the \$5.835 million in M&R needs shown, \$2.537 million (about 43.5%) is earmarked for global preventive maintenance or life-extending treatments, while \$3.298 million (about 56.5%) is allocated for the more costly rehabilitation and reconstruction treatments.

## Cost-Effectiveness of Treatments

The cost-effectiveness of preventative maintenance treatments is demonstrated in Figures 2 and 3 (below), which compare the current condition of the network, and the M&R needs estimated by the program. The portion of the network in the *Very Good* to *Excellent* conditions – 73% of the City's road network - requires \$2.537 million of work, whereas the 10% in the *Fair* to *Failed* condition needs \$1.752 million in expenditures to bring them up to the most desirable condition possible.

Figure 2. Network Area by Condition (Present)

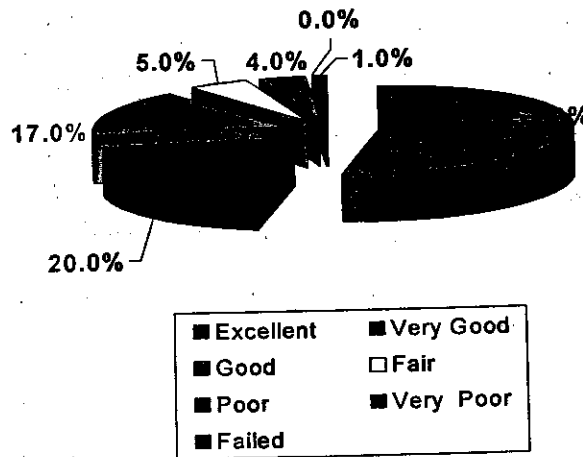
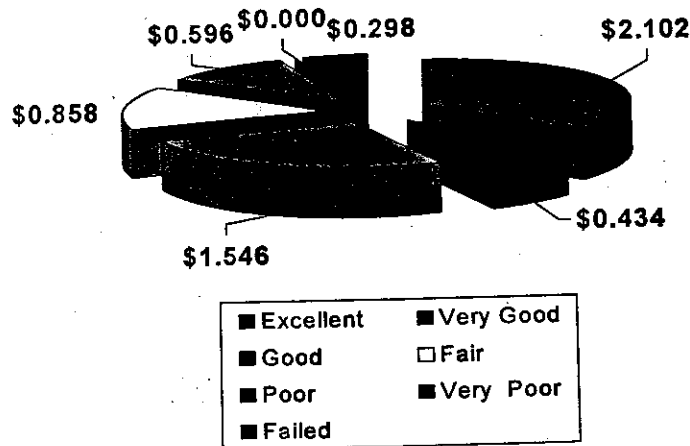


Figure 3. Maintenance Needs by Condition (\$5.835 millions over 7 Years)



## Budget Scenarios

Having determined the maintenance and rehabilitation (M&R) needs of the City's road network, the next step is to compare the existing and proposed budgets with the budget needs. Using the PMS budget scenario module, the impacts of various budget scenarios can be evaluated. The system projects the effects of the different scenarios on pavement condition (PCI) and unfunded maintenance (backlog). By examining the effects on these indicators, the advantages and disadvantages of different funding levels and maintenance strategies become clear. The following scenarios were run for the purposes of this report:

**Scenario 1: \$200k/year** – In this scenario, \$200k per year is spent for the next seven years. The condition of the network will decrease to a PCI of 67.5 at the end of the seven-year analysis period. In the meantime, the maintenance backlog will increase to approximately \$12.9 million in seven years.

**Scenario 2: \$500k/year** – In this scenario, \$500k per year is spent for the next seven years. The condition of the network will decrease to a PCI of 76.3 at the end of the seven-year analysis period. In the meantime, the maintenance backlog will increase to approximately \$9.6 million in seven years.

**Scenario 3: Unlimited Budget** – In this scenario, the budget is defined as the "needs" where the budget is not constrained. This scenario will need a total amount of \$5.835 million in the next seven years, and it will allow the City to improve the condition of the network to a PCI of 91.1 and eliminate the maintenance backlog.

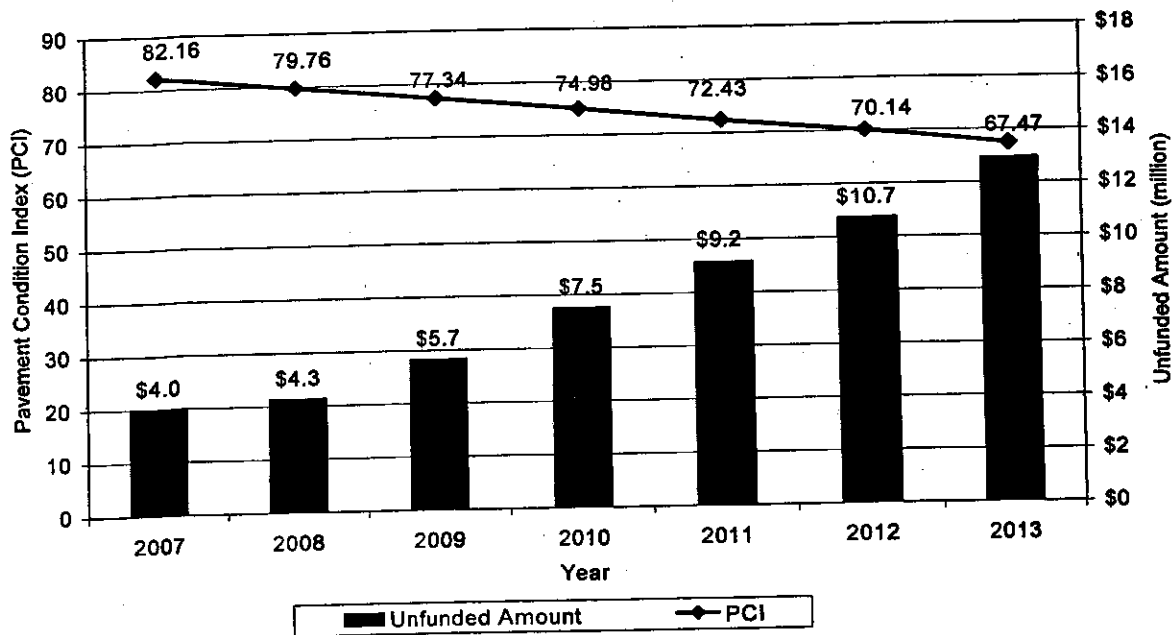
## Scenario 1: \$200k/year

In this scenario, \$200k per year is applied for the next seven years. The analysis results indicate that the network PCI will decrease to 67.5 from its current level of 82 over a seven-year period. In the meantime, the backlog of work will be nearly \$13 million in 2013. The results of the budget scenario analysis for Scenario 1 are summarized in Table 3 and Figure 4.

Table 3. Summary of Results from Scenario 1 (\$200k/yr)

Year	2007	2008	2009	2010	2011	2012	2013	Total
Budget (million)	\$0.200	\$0.200	\$0.200	\$0.200	\$0.200	\$0.200	\$0.200	\$1.400
Unfunded (million)	\$4.014	\$4.279	\$5.660	\$7.515	\$9.161	\$10.731	\$12.946	-
PCI	82.16	79.76	77.34	74.98	72.43	70.14	67.47	-

Figure 4. PCI vs. Unfunded Amount for Scenario 1 (\$200k/yr)



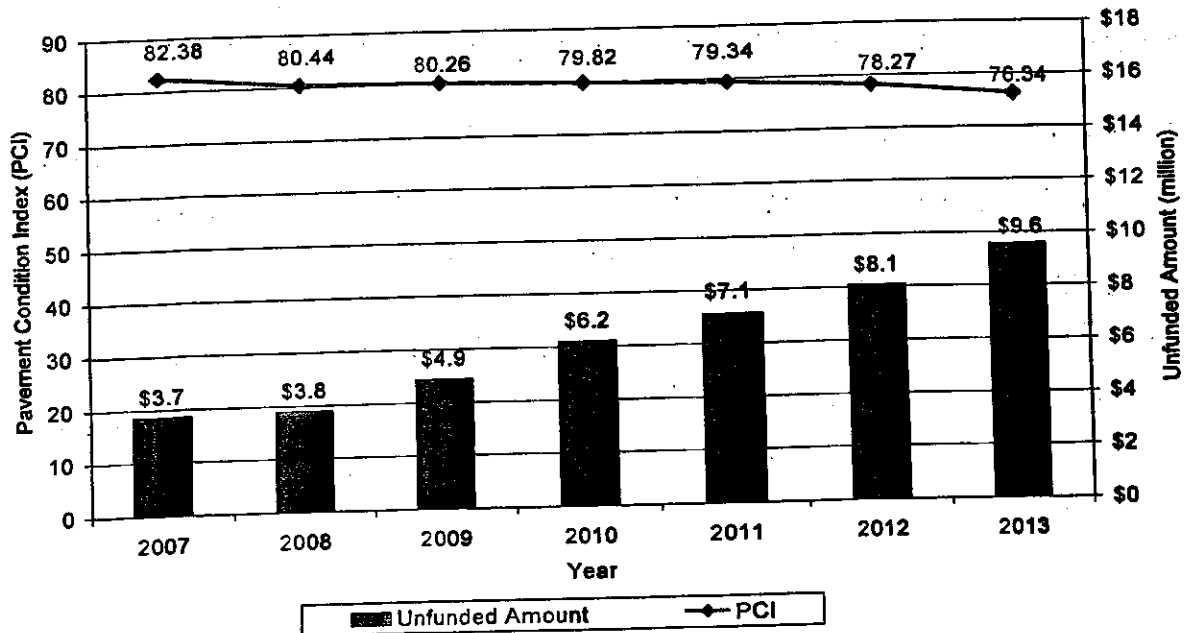
## Scenario 2: \$500k/year

In this scenario, \$500k per year is applied for the next seven years. The analysis results indicate that under this scenario the network PCI will decrease to 76.3 from its current level of 82 over a seven-year period. The backlog of work that is unfunded will increase to approximately \$9.6 million in the same time period. What this implies is that the City is "not catching up" the rate at which the roads are deteriorating. The results of the budget scenario analysis for Scenario 2 are summarized in Table 4 and Figure 5.

**Table 4. Summary of Results from Scenario 2 (\$500k/yr)**

Year	2007	2008	2009	2010	2011	2012	2013	Total
Budget (million)	\$0.500	\$0.500	\$0.500	\$0.500	\$0.500	\$0.500	\$0.500	\$3.500
Unfunded (million)	\$3.715	\$3.797	\$4.874	\$6.204	\$7.135	\$8.075	\$9.583	-
PCI	82.38	80.44	80.26	79.82	79.34	78.27	76.34	-

**Figure 5. PCI vs. Unfunded Amount for Scenario 2 (\$500k/yr)**



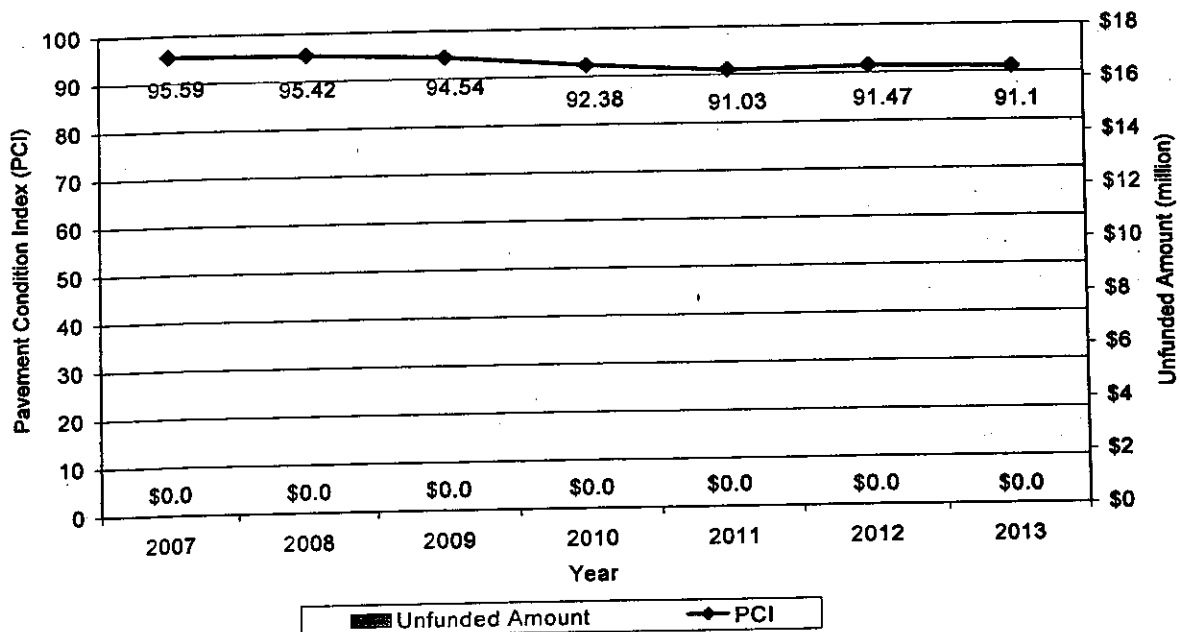
### Scenario 3: Unlimited Budget

In this scenario, the same amounts as identified in the needs analysis, \$5.835 million over the next seven years, were used. The analysis results indicate that the network PCI will increase to 91.1 from its current level of 82 over a seven-year period. In the meantime, all the backlog of work will be eliminated. The results of the budget scenario analysis for Scenario 3 are summarized in Table 5 and Figure 6.

**Table 5. Summary of Results from Scenario 3 (Unlimited Budget)**

Year	2007	2008	2009	2010	2011	2012	2013	Total
Budget (million)	\$4.214	\$0.103	\$0.050	\$0.000	\$0.014	\$1.264	\$0.189	\$5.835
Unfunded (million)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
PCI	95.59	95.42	94.54	92.38	91.03	91.47	91.10	-

**Figure 6. PCI vs. Unfunded Amount for Scenario 3 (Unlimited Budget)**



## Discussion

Figure 7 (below) illustrates the change in PCI over time for the three budget scenarios. Note that the Unlimited Budget, which represents the City's ideal budget, reaches a network PCI of over 90 at the end of the seven-year period. By comparison, the network PCI decreases to 67.5 and 76.3 for the budget of \$200k/year and \$500k/year, respectively.

Figure 7. Pavement Condition Index per Scenario by Year

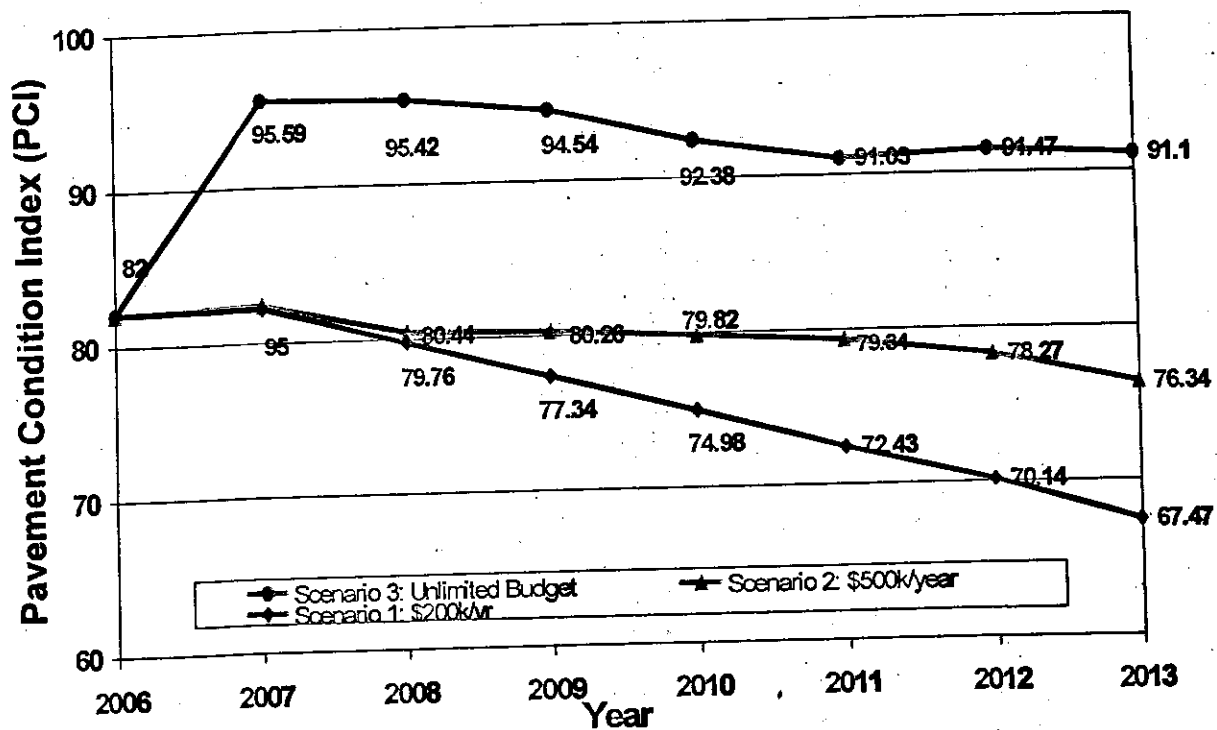
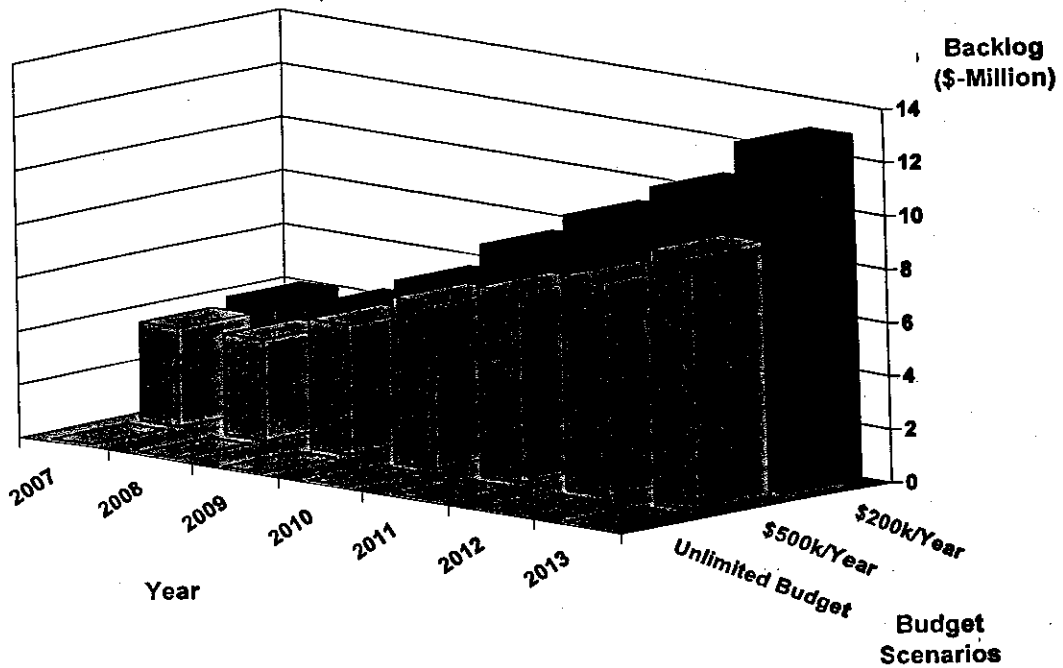


Figure 8 illustrates the change in unfunded maintenance and rehabilitation (M&R) over time for the different budget scenarios. Note that the backlog for scenario 3 (Unlimited Budget), which represents the City's ideal budget, is eliminated. By comparison, the work backlog increases significantly to \$12.9 million and \$9.6 million in seven years for the budget of \$200k/Year and the budget of \$500k/Year, respectively.

**Figure 8. Unfunded Maintenance per Scenario by Year**



## Summary

Overall, Los Alamitos has a sound roadway network, which is in "Very Good" condition with an average PCI of 82. Approximately 90% of the City's roadways are in the "Good" or "Excellent" condition category. However, the remaining 10% of the streets require a significant amount of money to bring them up into better condition categories. With the City's projected budget of \$200k per year or \$500k per year over the next seven years, the average PCI of the network is expected to decrease, with an existing unfunded maintenance backlog not being addressed. *The backlog will result in increased future costs, since more capital-intensive treatments will be necessary (such as overlay and reconstruction) as streets are unfunded where less expensive treatments (such as slurry seals) are currently feasible.*

It is recommended that the City increase its expenditure for pavement maintenance and rehabilitation to a minimum of \$500k per year. While not completely adequate, it will slow down the rate of deterioration in the pavement network. Every effort should be made to increase the investment on road repairs. An additional benefit would be fewer citizen complaints and more cost-effective expenditures of maintenance funds.

In order to properly maintain the pavement management database, it is recommended that the pavement treatment unit costs should be reviewed and updated regularly to reflect the new techniques and changing costs so the budget analysis results can be reliable and accurate.