

TO: James L. App, City Manager
FROM: Doug Monn, Public Works Director
SUBJECT: Pavement Management Program
DATE: December 19, 2006

NEEDS: For the City Council to consider an expanded and revised Pavement Management Program.

- FACTS:**
1. In the last eight years the City of Paso Robles' road system has increased nearly 50% to over 150 miles of paved surface.
 2. As the City's roadway network is one of its most valuable assets, the City Council directed staff to develop a comprehensive Pavement Management Program.
 3. The final Pavement Management Program was routed to approximately 80 contractors and engineers, in addition to utility companies and the Home Builders Association for review and comments.
 4. The City received two comments, one from MGE Underground (contractor) and a second from the Gas Company. Their comments are discussed under "Analysis and Conclusions."

ANALYSIS &

CONCLUSION: The proposed plan includes three categories: Design of New Streets, Construction of New Streets, and Maintenance and Protection of Existing Streets. The full Pavement Management Program with details is attached. The following is a brief summary of the program contents:

Design of New Streets. It is critical that streets be designed to accommodate the volume and type of traffic expected to use them. For example, street structure for arterials and collectors would be designed to accommodate heavy trucks and large volumes of traffic, while residential street design standards are less stringent given they are mostly limited to neighborhood traffic.

The structural section (aggregate base and asphalt concrete) required for new streets is contingent on two factors: traffic index (TI) which is an indication of the volume and type of traffic that will be using the street, and soils resistivity (R-value) which is the soil's ability to withstand the long-term weight a street will experience. R-value is not determined by the compaction of the sub-soils but by the soils make up itself. The higher the required traffic index, the greater R-value (soils bearing capacity) that must be achieved to support it.

If approved, the plan will require roadway designers to test underlying soils for their bearing values (R-values). The amount of aggregate base required to supplement the soils bearing capacity or required R-value would be linked to the test results. The Pavement Plan establishes that a minimum of twelve (12) inches of aggregate base would need to be placed under any road surface regardless of the soil bearing capacity. In soils demonstrating unacceptable bearing capacities, sufficient base would be added beyond the twelve (12) inch minimum, or until the soil obtains the proper R-value to support the required Traffic Index. Increasing design standards for "IP" and "R" values will better sustain actual and/or projected traffic volumes and extend the life expectancy of new or reconstructed streets.

Construction of New Streets. The plan provides two (2) recommendations relative to the construction of new streets.

1. *Developers to Install Full Street Structure.* In the initial stages of construction or in multiphase subdivisions, concrete trucks and heavy construction vehicles needing to access the project use residential streets. The weights associated with these vehicles accelerate the deterioration of these roads reducing life expectancy by as much as ten years. The plan will require developers to install the full structure section using an increased Traffic Index factor of 5 (as opposed to 4 as presently required) to compensate for the impact of construction traffic.

The plan also recommends the City adopt a Traffic Index of 8.0 for the construction/reconstruction of arterials and 7.0 for collectors. Arterials and collectors serve the largest concentration of vehicle traffic and are the preferred route for trucks and buses. Implementation of an increased Traffic Index for the construction/reconstruction of these roads will extend their life cycle and eventually eliminate the need for designated truck routes given that they provide the most direct routes from the City's commercial and industrial centers to highways 101 and 46.

2. *Compaction of New Streets.* Proper compaction of asphalt concrete has a direct relation to the construction life of a street. Currently the City requires that both the aggregate base and asphalt concrete be compacted to 95% minimum. Sub-soils used to backfill around pipelines and utilities deep beneath the streets are compacted to 90%.
3. Under the Pavement Management Program, the current standard of compacting of sub-soils to 90% and aggregate base to 95% would remain; however, compaction of asphalt after rolling would be increased from 95% to an average of 96.5%. The recommended change is consistent with current Caltrans standards resulting in a denser, longer-lasting street section.

Maintenance and Protection of Existing Streets. The third category addresses the maintenance and protection of the City's existing streets to maintain a Pavement Index of 70 on a scale of 100 (70% of a new):

- a. adopt utility trench repair standards;
- b. establish a specific budget to maintain the City streets

1. *Utility Repair Standards.* The trench repair standards proposed are designed to mitigate the impact of utility trenches on the life and durability of streets. They are based on independent studies (performed by the University of Cincinnati). The implementation of these standards will result in longer paving life of streets and therefore neutralize the costs driven by premature repair of asphalt that has been trenched and patched inadequately.

MGE Comments. MGE Underground commented that the City's proposed requirement to install a "T" patch incorporating a 36-inch minimum paveout on either side of a trench is excessive. The idea of a "T" patch is based on research by the University of Cincinnati, which concluded that when a pipeline trench is excavated, the area of impact to the existing street extends to three feet outside the edge of the trench. The proposed patch detail would address this impact reducing the potential for premature failure of the street because of a patch being installed.

Gas Company Comments. The Gas Company commented that the City's proposed "T-cut" standard is excessive. Staff recommends that The Gas Company be exempted from the City's proposed T-cut standard for the following reasons:

- a. The Gas Company has a Franchise Agreement with the City that includes their guarantee to trench repairs for life.
- b. The Gas Company verifies their compaction work with the use of Dynamic Cone Penetrometer. Each bell hole is compacted in (4) 1-inch lifts to insure proper compaction of their trench.
- c. There is no recorded Gas Company related patch failure.
- d. This exemption would apply only to repairs made by the Gas Company, not its contractors.

Appendix A attached includes exhibits and details that are proposed to address utility trench repairs.

2. *Protection of Existing Streets.* The cost to maintain pavement in good condition can be reduced through the implementation of a comprehensive on-going maintenance program. Regular preventative maintenance slows the deterioration process, increasing the value of the road system while extending the period between major reconstruction projects. The plan recommends the City devote a greater percentage (70%) of its annual street maintenance budget towards preventive maintenance and the remainder towards heavy maintenance or reconstruction. Extending the life of the newer streets through increased maintenance will slow their deterioration and, in the long term, result in more maintenance funds being made available for reconstruction of existing streets.

POLICY

REFERENCE: Capital Improvement Program

FISCAL

IMPACT: The City currently budgets \$400,000 to maintain its streets. The proposed Pavement Management Program recommends that the City appropriate an additional \$2,600,000 annually in order to maintain its street system at a level of 70 on a scale of 100.

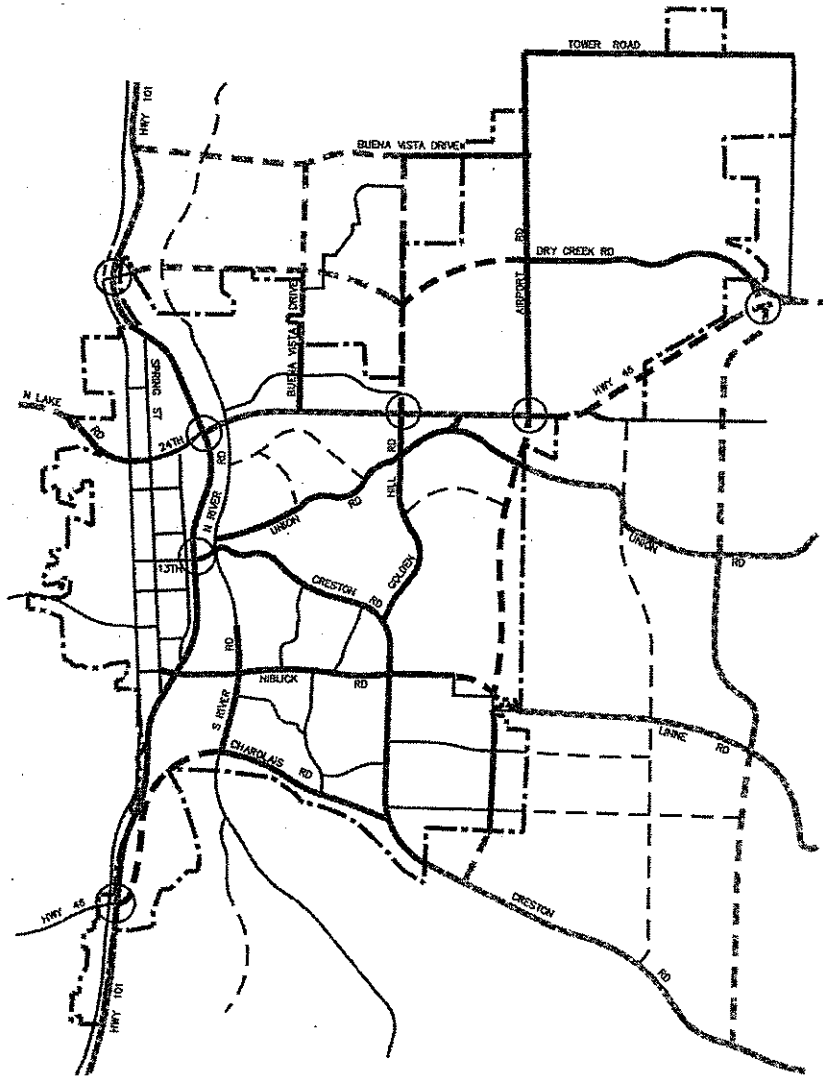
- OPTIONS:**
- a. Adopt the attached Pavement Management Program deferring any allocation of financial resources to the standard budget process.
 - b. Amend, modify, or reject the above option.

Prepared by:

Ditas Esperanza, P.E., Capital Projects Engineer

Attachments (1)

- 1) Pavement Management Program



PAVEMENT MANAGEMENT PROGRAM

June 2006



City of El Paso de Robles

Public Works Department

PROPOSED PAVEMENT MANAGEMENT PROGRAM

ANALYSIS OF THE CITY'S STREET SYSTEM

The City of Paso Robles currently maintains approximately 148.3 centerline miles of roadways. Of the 148.3 centerline miles, 31.8 are arterials and 18.8 are collectors. This represents 7,428,956 square feet of arterial pavement, 3,638,702 square feet of collector pavement, 16,818,281 square feet of residential pavement, and 461,178 square feet of alleys in the Business District, for a total system of 28,347,117 square feet.

The City engaged the services of Pavement Engineering Inc. to perform evaluation of all the streets in the City's system to establish a Pavement Condition Index (PCI) for each road segment and is summarized below:

	Area (SF)	Centerline Miles	Weighted PCI
Arterials	7,428,956	31.8	69.2
Collectors	3,638,702	18.8	55.4
Residential	16,818,281	93.5	63.8
Alleys	461,178	4.3	48.6
	28,347,117	148.3	63.9

The overall current weighted average PCI for the City's streets is 63.9. Most cities in California try to maintain an average PCI of 70 or above. It is recommended that the City adopt a policy to maintain its residential streets at a PCI level of 70, its alleys at a PCI level of 65, and its arterials and collectors at 80.

RECOMMENDED PROGRAM

Staff recommends a Pavement Maintenance Program to address the City's street system in three categories: Design of New Streets, Construction of New Streets, and Maintenance and Protection of Existing Streets.

A. Design of New Streets

It is critical that streets are designed adequately for the volume of traffic and type of vehicle that is expected to use the roads. In other words, the street structure for arterials and collectors should be designed to accommodate heavy trucks and large volumes of traffic. Residential street design standards can be a little less stringent since these streets typically are limited only to neighborhood traffic.

The structural section (aggregate base and asphalt concrete) required to be installed for new streets is contingent on two factors: traffic index (TI) which is an indication of future truck loading and is a function of the volume and type of traffic that will be using the street, and soils resistivity (R-value) which is the in situ soils characteristic that can withstand the anticipated long-term weight that the street will experience.

PROPOSED PAVEMENT MANAGEMENT PROGRAM

1. Traffic Index

Traffic Index (TI) is based on the expected number of vehicles and the type of vehicles to travel the streets in the design life. Heavier vehicles have more impact on pavement. Currently, the City's standards are as follows:

Arterial streets	TI = 7.0
Collector and west side streets	TI = 6.0
Local and rural streets	TI = 5.0
Cul-de-sac and hillside streets	TI = 4.0

Staff proposes that the City's streets be designed with the following Traffic Index:

Arterials (which would also serve as truck routes)	TI = 8.0
Commercial streets and collectors	TI = 7.0
All other streets including alleys	TI = 6.0

2. Soil Resistivity (R-value)

Soil strength is measured in the lab and a number (the R-value) that represents the soil strength is established. In San Luis Obispo County, where poor soils are common, this number can be as low as 5 (the lowest possible). The roadway designer shall have soil samples tested for actual value and the measured R-value shall be used in the calculation of the pavement design. However, if no test is performed, the R-value can be assumed to be 5 and the structural section can be calculated accordingly to include a minimum of 12 inches of aggregate base material. The lower 6 inches may be a Class III sub-base material in accordance with Caltrans Standards.

B. Construction of New Streets

Two policies are proposed for consideration with regards to the construction and acceptance of new streets as part of the City's network of streets as outlined below.

1. Developers to Install Full Street Structure

In a multiphased subdivision or during the initial stages of construction, residential roads are used by concrete trucks and construction vehicles which accelerate the deterioration of these roads and decrease their life expectancy as these roads were neither designed nor constructed to receive this type of traffic. Therefore, the life expectancy of roads in these tracts, which would normally be 20 years, is drastically reduced.

It is proposed that the City adopt a policy to require developers to install the full structure section prior to acceptance of public improvements.

PROPOSED PAVEMENT MANAGEMENT PROGRAM

In addition, it is also proposed that the aggregate base below the curb be at the same depth as the roadbed.

2. Compaction of New Streets

It has been proven that proper compaction of asphalt concrete has a direct relation to the construction life of a street. Currently the City requires that asphalt concrete be compacted at 95% minimum. It is proposed that the City require that the compaction after rolling shall have an average of 96.5% with no one test below 96%. All testing shall conform to Caltrans Testing Methods and Specifications.

C. Maintenance and Protection of Existing Streets

The following policies are proposed to address the maintenance and protection of the City's existing streets: adopt utility trench repair standards, establish a truck route street system, and establish a specific budget to maintain the City streets.

1. Utility Repair Standards

The trench repair standards proposed are designed to mitigate the impact of utility trenches on the life and durability of streets. The implementation of these standards will result in longer paving life of streets and therefore neutralize the costs driven by premature repair of asphalt that has been trenched and patched inadequately.

Nearly all complaints regarding rough patches in streets are in reference to temporary repairs. Temporary repairs are typically comprised of cutting back the asphalt or a cold patch. Cold asphalt has lower stability and is compacted by on-going traffic and therefore is left a little higher than adjacent grade. Cold asphalt may compact below adjacent grade resulting in annoying bumps. Temporary repairs need to be monitored in order to be effective and to limit disruption and traffic comfort. A temporary trench repair standard is also included for consideration in addition to a monitoring program to assign responsibility for on-going maintenance and timely permanent pavement replacement.

Research by the University of Cincinnati indicates that the area of impact to an existing street extends to three feet outside the edge of the trench. A trench repair standard that accounts for these impacts is proposed.

Appendix A attached includes exhibits and details which are proposed to address utility trench repairs.

2. Truck Route

The wear factor to a road's surface caused by a single large truck is equal to 15,000 automobiles traveling over the same road surface. Arterial road structures are designed to accommodate

PROPOSED PAVEMENT MANAGEMENT PROGRAM

large volumes of traffic and large, heavy trucks. Street structure in residential areas are designed much less in comparison. It is recommended that the City adopt a Traffic Index of 8.0 for all arterials. With this change, the arterial roads will become the City's designated "Truck Routes."

3. Protection of Existing Streets

Good pavement management means that the cost to maintain pavement in a good or excellent condition is relatively low, as long as work is done before the condition of rapid deterioration begins. Once pavement has begun to deteriorate rapidly, the cost to restore the pavement to excellent condition increases rapidly to the point where it may not make economic sense to spend money on routine maintenance. It is proposed that the City adopt a policy to use its annual street maintenance budget towards preventive maintenance and the remainder towards heavy maintenance or reconstruction. These policies that are proposed would allow the citizens of Paso Robles to have streets that are well maintained and last a long time.

The attached chart illustrates that the City should appropriate 2.5 million dollars annually in order to maintain its street system at a level that will extend the life of the streets. Two scenarios are proposed on how this annual budget should be used.

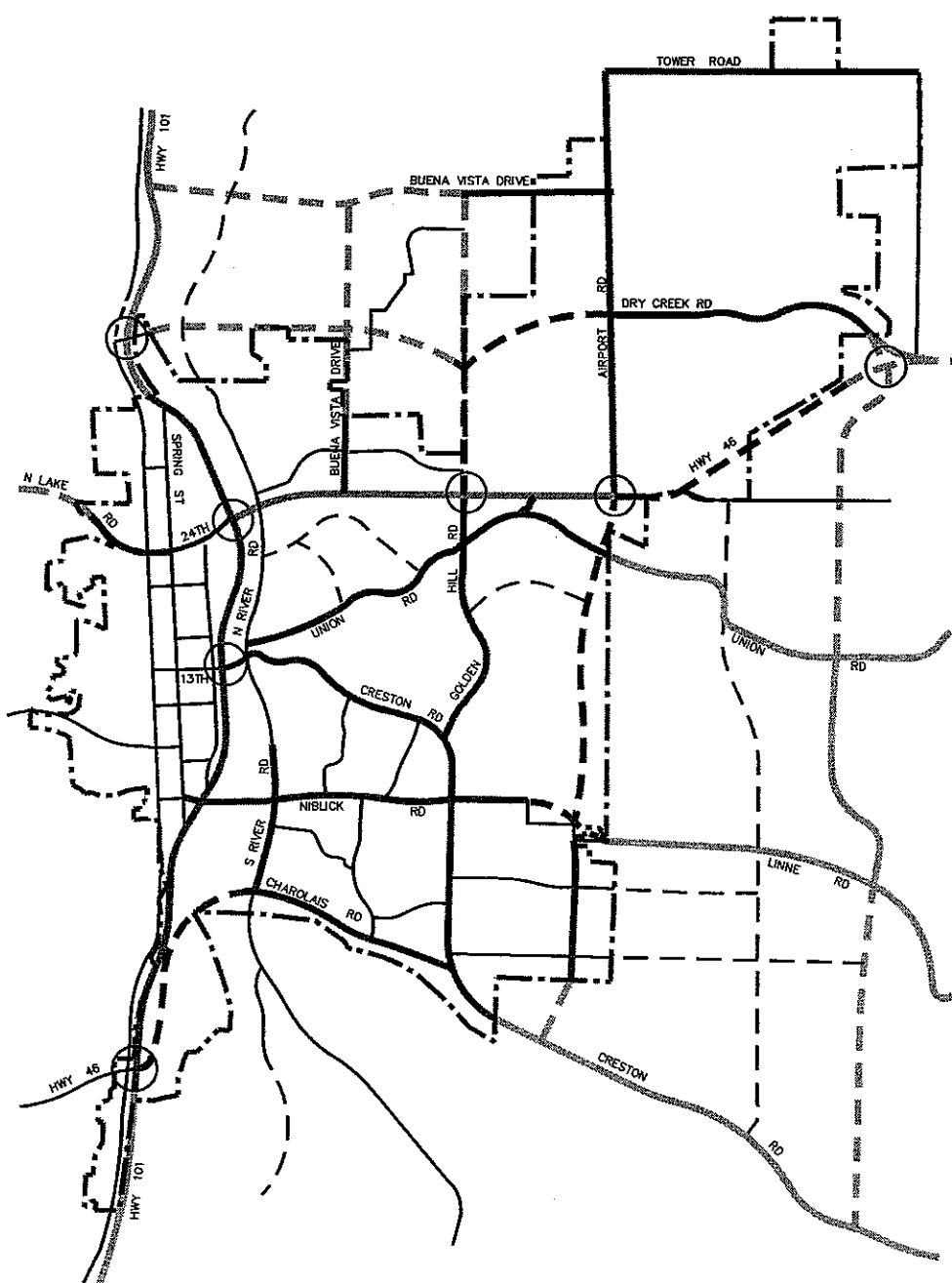
a) Worst case first

As has been past practice, the City could continue to fund major rehabilitation of its streets by performing work on its worst streets first. However, as has been noted, this is costly and while the worst streets are being repaired, other streets which are in fairly good condition could deteriorate rapidly beyond the point where it is possible to extend their design life.

b) Expenditure by categories

A second scenario that could be implemented is to apply certain percentages of its annual budget as follows:

- 20% towards slurry seal or light overlay to maintain arterials and collectors at a PCI level of 80 and residential streets at 70
- 70% towards major reconstruction of streets
- 10% towards maintenance of the City's downtown alleys



LEGEND:

Existing Outside City Limits	Proposed Outside City Limits	Existing Inside City Limits	Proposed Inside City Limits	
				U.S. 101 Freeway (4 lanes)
				Arterial (6 Lanes) or 4 Lane Freeway to Airport Rd.
				Arterial (4 Lanes)
				Collector
				City Limit Line
				Interchange (Grade Separated)

Paso Robles Circulation Element Update

Figure CE-1

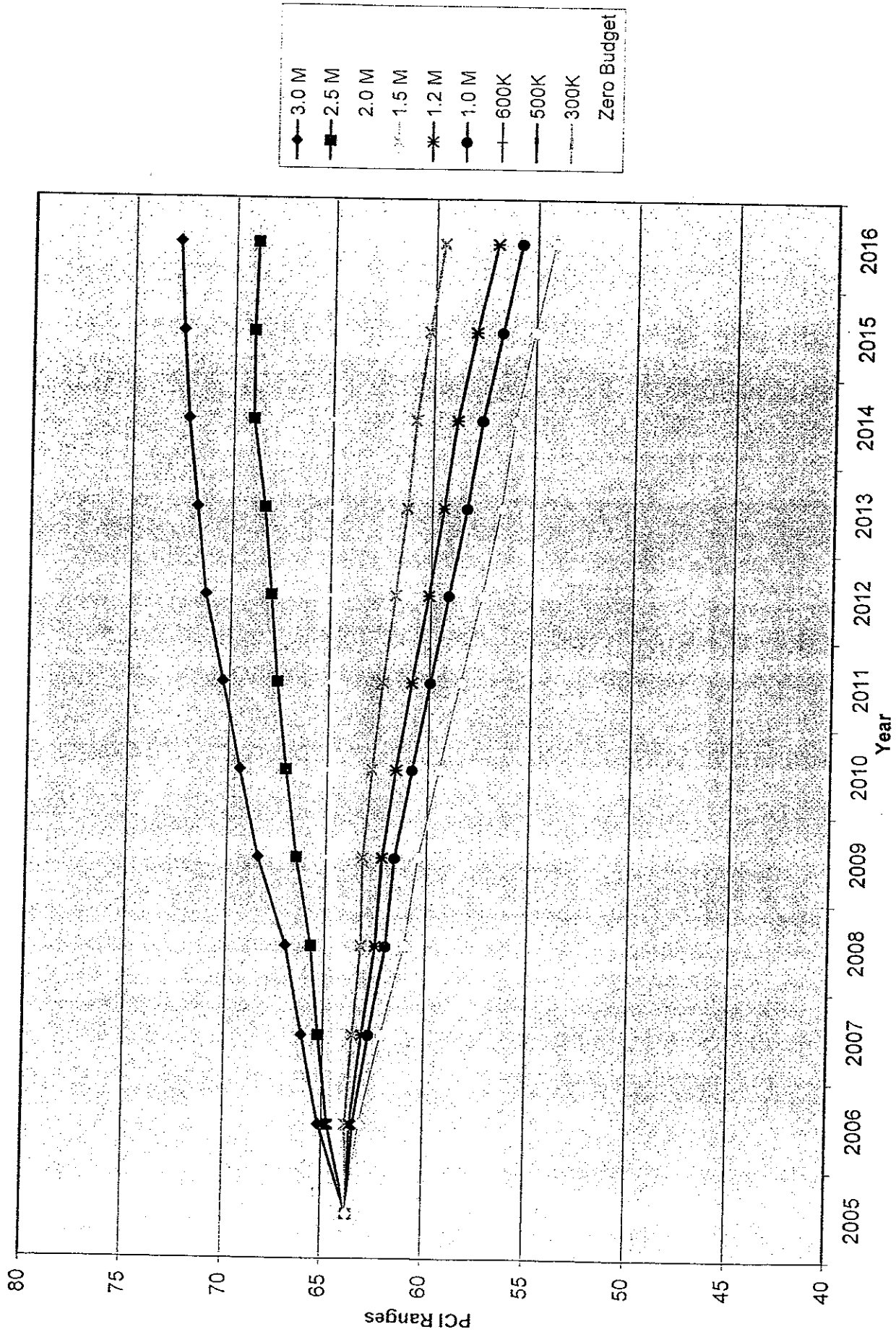
Circulation Element Map

As amended by Resolution NO. 02-50 on April 2nd, 2002



File: 337EX06.DWG(12DEC03)25-5307-01

Budget Projections By Year



PROPOSED PAVEMENT MANAGEMENT PROGRAM

APPENDIX A

Proposed Utility Trench Repair Standards

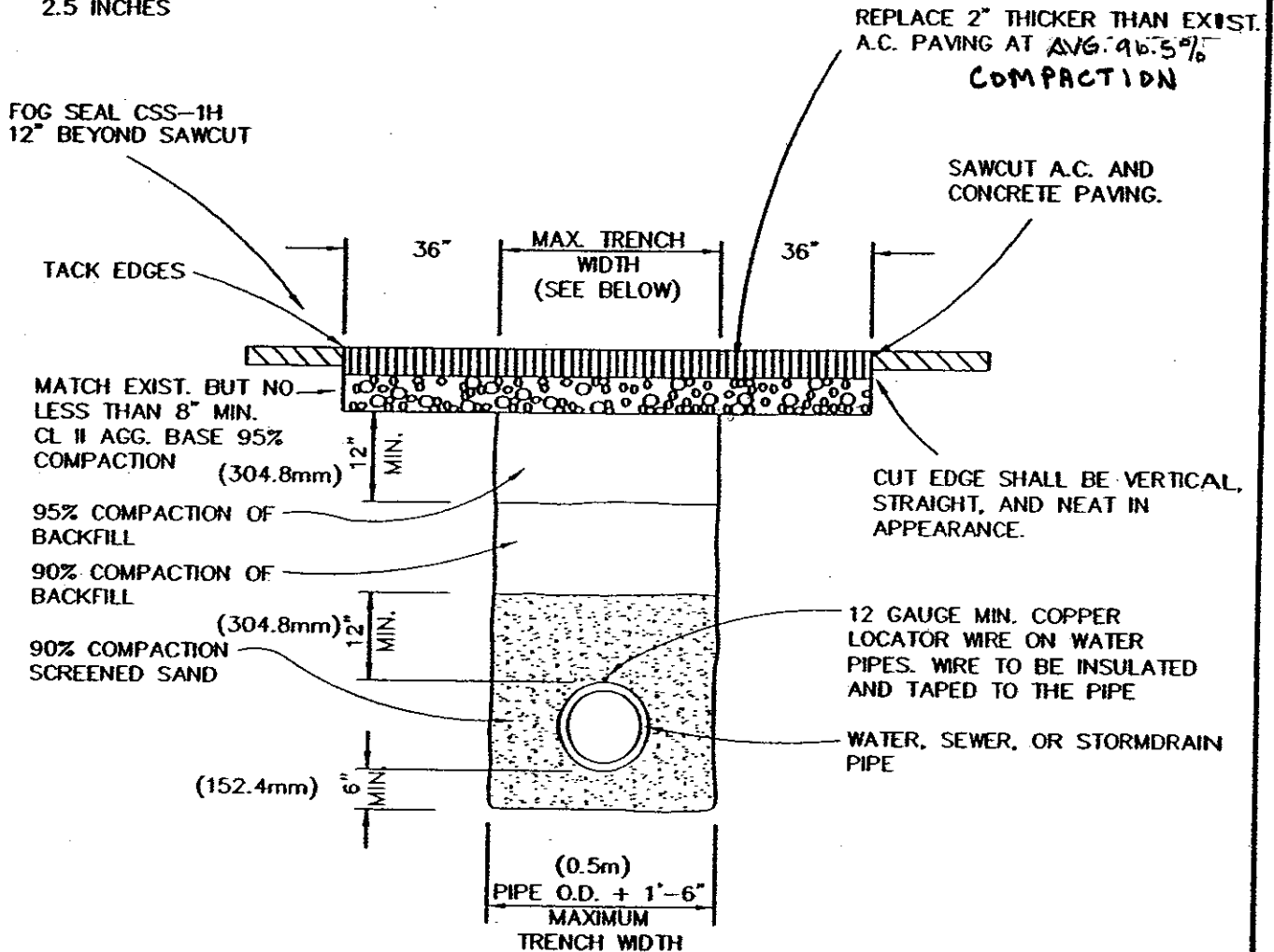
- **Exhibit A**
- **Exhibit B**
- **Exhibit C**

REVISIONS

DESCRIPTIONS	BY	DATE	APPROVED

EXHIBIT "A"

MINIMUM PAVEMENT DEPTHS ARE AS FOLLOWS:
 LOCAL STREETS 4" (2 LIFTS)
 COLLECTOR STREETS 5" (2 LIFTS)
 ARTERIAL STREETS 6" (3 LIFTS)
 LIFTS SHALL BE PLACED IN DEPTHS NOT TO EXCEED 2.5 INCHES



NOTES:

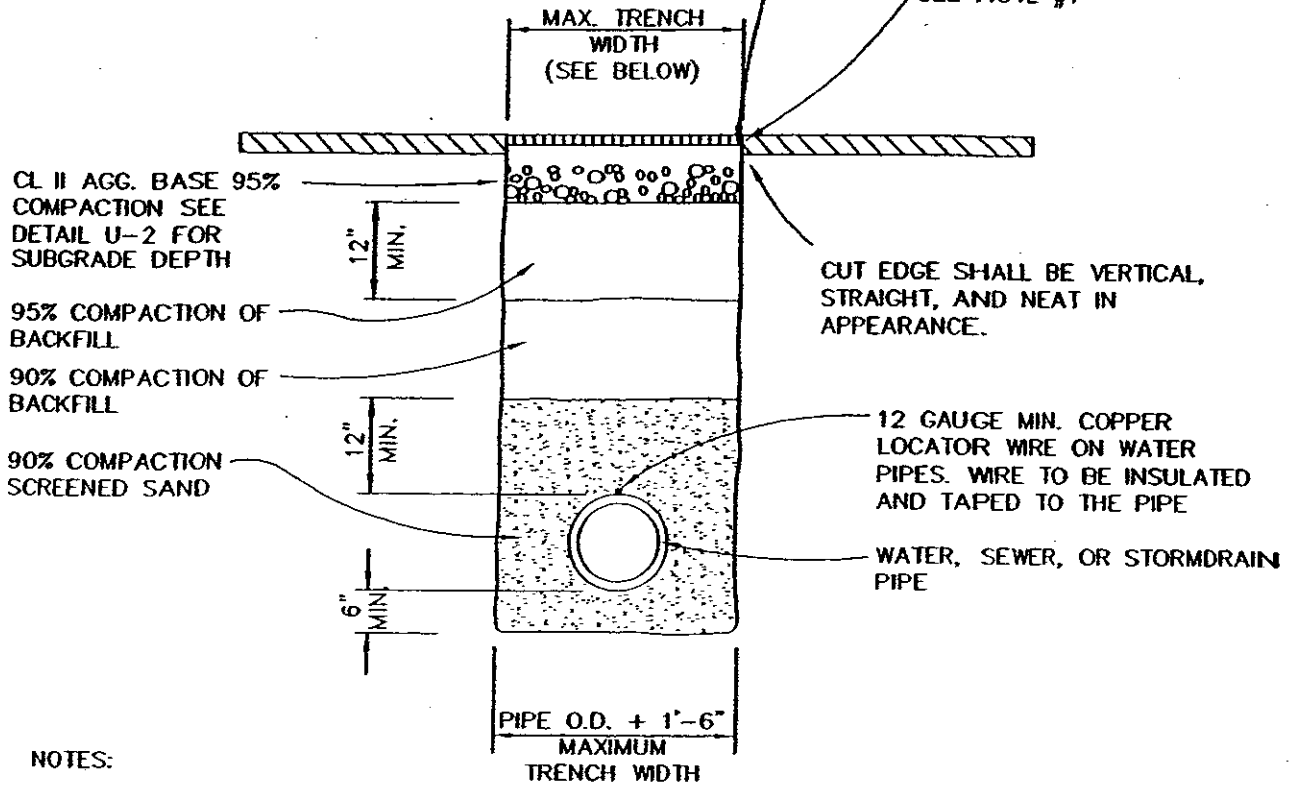
1. No. 12 AWG LOCATOR WIRE REQUIRED ON ALL WATER MAINS AND SERVICES, TAPED TO TOP OF PIPE (AND SEWER FORCE MAINS).
2. NO ROCKS OR OLD PAVEMENT MAY BE DEPOSITED WITH BACKFILL.
3. SEE STANDARD U-2A FOR TEMPORARY PATCHES.
4. FINISH SURFACE SHALL MATCH EXISTING GRADE WITH A TOLERANCE OF 0.25 INCHES ABOVE ADJACENT GRADE.
5. A SEPARATE CITY RIGHT-OF-WAY ENCROACHMENT PERMIT IS REQUIRED.

DRAWN BY: JAC	CITY OF PASO ROBLES ENGINEERING DIVISION	DRAWING NO.
DESIGNED BY:		U-2
DATE: 12/01/03	PIPE IN TRENCH DETAIL	
FILE NAME: PR-U-2.DWG		

REVISIONS			
DESCRIPTIONS	BY	DATE	APPROVED

2" TEMPORARY A.C. PAVING

EXHIBIT "B"



NOTES:

1. WHEN A TEMPORARY PATCH IS USED, THE INITIAL WIDTH OF THE SAWCUT SHALL BE NO GREATER THAN THAT NECESSARY TO CONDUCT THE EXCAVATION. THE DEPTH OF THE TEMPORARY PATCH SHALL BE 2 INCHES.
2. THE FINISHED SURFACE OF THE TEMPORARY PATCH SHALL, IN ALL CASES, BE LEVEL WITH, OR NO GREATER THAN 1/2 INCH ABOVE, THE ADJACENT GRADE OF THE EXISTING STREET.
3. A TEMPORARY PATCH WILL BE MONITORED ON A DAILY BASIS AND SHALL BE IMMEDIATELY RESTORED TO STANDARD AS IT COMPACTS.
4. IN NO CASE SHALL A TEMPORARY PATCH BE LEFT WITHOUT PERMANENT REPAIR FOR MORE THAN 30 CALENDAR DAYS. THE PERIOD OF THE TEMPORARY PATCH MAY BE REDUCED AS DETERMINED BY THE CITY ENGINEER, SUCH AS IN THE CASE OF ARTERIAL STREETS OR THOSE SERVING HIGH TRAFFIC VOLUMES.
5. No. 12 AWG LOCATOR WIRE IS REQUIRED ON ALL WATER MAINS AND SERVICES, TAPED TO TOP OF PIPE (AND SEWER FORCE MAINS).
6. NO ROCKS OR OLD PAVEMENT MAY BE DEPOSITED WITH BACKFILL.
7. SEE STANDARD U-2 FOR PERMANENT TRENCH REPAIR DETAILS.
8. A SEPARATE CITY RIGHT-OF-WAY ENCROACHMENT PERMIT IS REQUIRED.

DRAWN BY: JAC	CITY OF PASO ROBLES ENGINEERING DIVISION	DRAWING NO.
DESIGNED BY:		
DATE: 12/01/03	TEMPORARY TRENCH REPAIR	U-2A
FILE NAME: PR-U-2A.DWG		

EXHIBIT "C"

CITY STANDARD DETAILS AND SPECIFICATIONS

It is recommended that the following text be added to the City Standard Details and Specifications under Section IV, Streets:

F. Utility Trench Repair

1. **Monitoring Program** - All excavations into existing City street paving shall be repaired in accordance with City Standard Drawings U-2 and U-2A. A City right-of-way encroachment permit will be required prior to excavation in any City right-of-way. The contractor shall sign an acknowledgement that he/she has a copy of the City trench repair standards (temporary and finish) and shall make an estimate of the square feet of trench repair based upon the standard for finished repairs. All street patches will be subject to a nine-month warranty period, or as determined by the City Engineer. A refundable cash deposit as determined by the City Engineer per square foot of trench repair will be required with the encroachment permit. All trench repairs shall be logged and placed in a data base stating the location, size of patch, contractor, date permit was issued and date accepted as complete.
2. **Inspections** - A minimum of two inspections are required for each repair. One after preparation and prior to paving, and one final inspection. Inspection time will be billed to the deposit on an hourly basis. Soil compaction tests conducted by a Soils Engineer retained by the contractor, shall be provided upon inspection of the trench preparation and subgrade.

Should the trench repair fall out of compliance with the City Standards during the period of the warranty, the contractor shall be responsible for any necessary repairs and or restoration. After the warranty period the deposit, less the cost of inspections, may be refunded to the contractor, providing the trench repair complies with the following findings:

- The surface of the patch is level with or no higher than 0.25 inches above the grade of the original pavement surface.
- No apparent crack at sawcut line (1/16-inch maximum).
- No apparent pavement raveling.
- No apparent pavement cracking.

If the trench repair is found to be inadequate, based on the criteria stated above, the contractor shall forfeit the deposit and the City shall make the necessary repairs.

3. **Temporary Patches** - Temporary patches will be monitored on a daily basis by the responsible contractor and shall be immediately restored to standard as they compact. In no case shall a temporary patch be left without permanent repair for more than 30 calendar days. The allowed period of the temporary patch may be reduced as

determined by the City Engineer, such as in the case of arterial streets or those serving high traffic volumes.

4. **Pavement Overlay Required** - Complete street paving overlays will be required where certain projects involve multiple excavations into one street. If one particular project causes three excavations with a 300 foot stretch of a given street, that street must be subject to a complete asphalt overlay of a minimum depth of 1.75 inches (0.15 feet). The overlay shall extend for a minimum length of 100 feet or 20 feet beyond the last cut at each end of the excavated area. The 1.75 inches depth of asphalt may be subtracted from the depth of the asphalt in the trench repair as long as the depth of repair matches or exceeds the depth of the existing asphalt.