

CITY COUNCIL AGENDA ITEM
CITY OF SHORELINE, WASHINGTON

AGENDA TITLE:	Annual Road Surface Maintenance Program – A Combined Pavement Preservation Approach
DEPARTMENT:	Public Works Department
PRESENTED BY:	Mark Relph, Public Works Director Jesus Sanchez, Operations Manager Brian Breeden, Maintenance Supervisor

PROBLEM / ISSUE STATEMENT

The purpose of this staff report is to inform the Council of the results of a Pavement Management System Study of the City's *Annual Road Surface Maintenance Program* and its condition ratings of Shoreline's city streets. In recent years, the City has relied upon the exclusive use of Hot Mix Asphalt (HMA), or "asphalt overlays" to maintain our street system. The Pavement Management Study is designed to examine our current practices and determine an optimal pavement maintenance treatment and rehabilitation program within the constraints of continual increases in costs and limited financial resources.

BACKGROUND

History:

The City of Shoreline has 345.15 lane miles of paved surfaces with an estimated replacement value of \$380 million. From the time of the City's incorporation until 1999, hot mix asphalt (HMA) "overlays" of two (2) to three (3) inches in thickness were completed according to King County criteria and their county-wide pavement management ratings. The "overlay program" consisted in most cases of placing the asphalt layer directly on native soils. This strategy likely reduced the initial cost of the overlay, but has limited the long-term performance of the road surface. The Shoreline area prior to incorporation received an average of 3.77 lane miles of overlay each year. This pavement management approach was insufficient and thus allowed roads to deteriorate at a steady rate with progressively increasing deferred maintenance costs.

In February 1999, Public Works staff introduced to Council the concept of Pavement Management Systems (PMS). Included was an analysis of our own pavement network utilizing Measurement Research Corporation's (MRC) distress survey data. This survey data identified the severity of different types of cracking, the amount of loose rock, rutting, potholes and asphalt failures. The city's pavement condition was rated using a scale from 0-100 with zero being the worst condition and 100 being the best. Today, the City has an overall average rating of 71 PMI.

Staff presented a long-term strategy to optimize available funds, improve the overall condition of our pavement network and get more work done with limited funds. Council concurred that it would be necessary to increase the overlay budget of \$400,000 adopted during the 1999 budget process to \$590,000 to bring road conditions to an appropriately maintained service level. In 2001, that amount increased to \$700,000 annually. Since that time the annual budget allocation included inflationary growth to a high point of \$888,000 in 2009.

Prior to 2003 and the passage of I-776 the City received a \$15 vehicle license fee collected and distributed by King County that was dedicated for the operation and preservation of local streets and for the construction of new streets. At that time the City collected approximately \$500,000 annually from this revenue source. Sixty-three percent (63%) of voters in Shoreline voted "No" on I-776, but the initiative passed on a state-wide basis. As a result of the vehicle license fee being eliminated additional unrestricted revenues were allocated towards the maintenance of the City's transportation system and reductions were made in other non-transportation programs.

The only other dedicated revenue source for the maintenance and preservation of the City's transportation system at that time was fuel taxes. Fuel tax collections have gone up and down over the years primarily because it is based on the number of gallons sold, not on the cost of the fuel purchased. In 2003 the City collected \$1,112,082 in fuel taxes and in 2010 collections were at \$1,176,558, a 5.8% increase in seven years. At the same time asphalt has more than doubled in price and inflation grew by 18%.

Maintaining the City's transportation system includes the maintenance and operation of the City's road surfaces, street lights, traffic signals, right-of-ways, medians, signage, and sidewalks and fuel tax collections are not adequate to fund these needs. The City spends an average of \$3.5 million annually in these areas. As a result unrestricted funds (taxes from the General Fund) have been allocated to achieve the level of funding from 2003 to 2010, including allocations to help fund the City's pavement preservation program.

Recognizing the importance of maintaining the City's road pavement, the City Council authorized the creation of the Shoreline Transportation Benefit District (TBD) in July 2009. Through the TBD the City collects a \$20 vehicle license fee from vehicle owners living in Shoreline. These funds are dedicated to the City's road surface maintenance program. The TBD started collecting this fee in February 2010. Total collections in 2010 were \$590,517. In 2011 collections are targeted at \$600,000.

Since the vehicle license fee will not fully fund the road surface maintenance program, the City continues to allocate a portion of General Fund revenues (primarily a portion of gambling taxes) to provide a basic level of funding annually.

DISCUSSION

Pavement Preservation Approach:

Today after completing a Pavement Management System study, it is clear that the Pavement Management Program is not funded adequately to maintain current street pavement conditions. Limited resources and increasing material costs require new approaches to preserve and protect the investment in our street infrastructure and earn the highest return on future maintenance dollars. This is not necessarily a novel approach; rather it is a "re-tooling" of our pavement management approach at a time when resources are limited.

With today's material cost increases and limited revenues, applying overlays exclusively to all road surfaces is no longer a viable approach. What is viable and important today is to protect the infrastructure investments we have made over the years post incorporation. We can do this by adopting a strategy of pavement preservation that uses cost effective surface treatments to maintain our street system.

As Figure 1 shows, well-constructed pavement surface condition remains high for many years, but once pavement condition begins to drop, it drops rapidly.

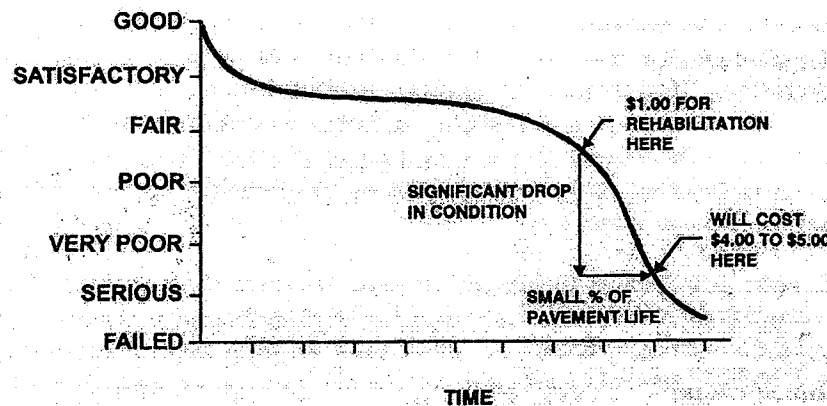


Figure 1—Pavement Condition Lifecycle (Source American Public Works Association, 1983)

Agencies can take advantage of the typical pavement condition lifecycle to apply low-cost surface treatments to streets while pavement condition is still relatively high. These inexpensive maintenance treatments delay the onset of rapid deterioration and allow agencies to maximize pavement performance.

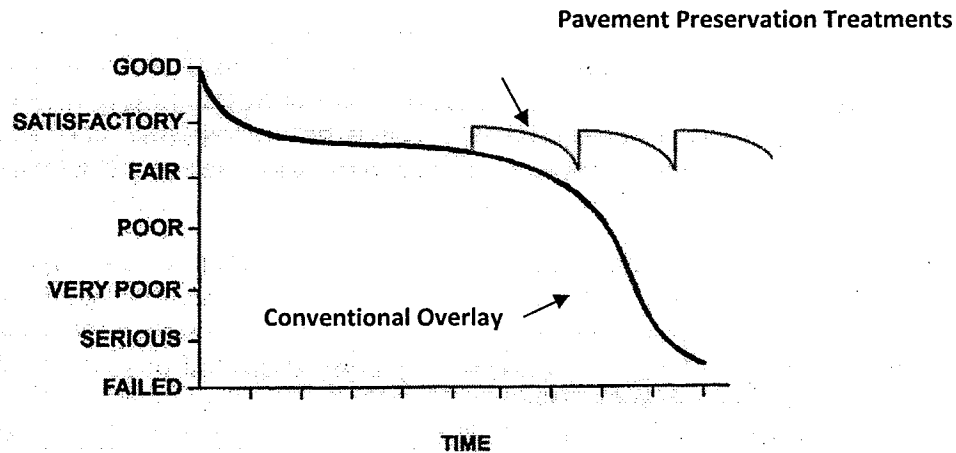


Figure 2—Pavement Preservation Concept Illustrated

Shoreline joins a long list of municipalities across the region such as Mountlake Terrace, Bothell, Lynnwood, Seattle and Everett, which have adopted a similar approach toward protecting their pavement. A normal road surface maintenance application of HMA generally has a life span of about 18-20 years. In order to maintain an even longer life, surface treatments need to be applied to prevent deterioration. These treatments called Bituminous Surface Treatments, or BSTs, are the most common approach to preserving and increasing the life of road surfaces.

Experts recommend as a standard for street maintenance that we address a minimum of 10% of our entire road system annually through our maintenance program. Ten percent (10%) represents about 35 miles per year. At current funding levels, our current pavement maintenance program allows us to complete about 3% of total recommended maintenance program.

By re-tooling to a Pavement Preservation approach and using BST applications, we can increase the coverage of road surfaces receiving regular maintenance and thereby prolong the life of our good roads (PMI ratings of 70 or higher).

BST Treatments:


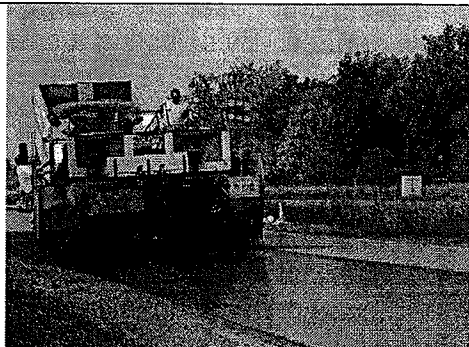



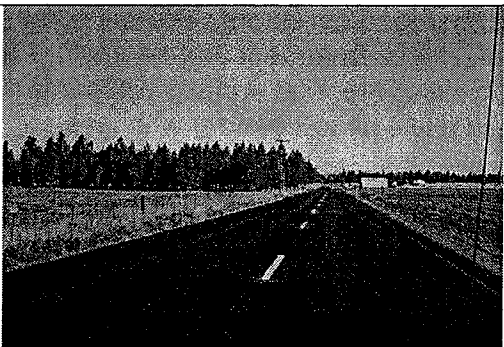
Bituminous Surface Treatments (BSTs) consist of two-part application of asphalt and cover aggregate (small rock) used mainly on low volume roads. BSTs are widely used to extend the life of the road, create a new wearing course, and water proof existing pavement. BST applications also increase the surface friction of the pavement, which provides better traction and improves stopping distances.

Costs for a BST application are generally 10% to 25% of the cost of a typical asphalt overlay and thus can cover a much larger road surface area.

Unlike asphalt overlays, BST treatments tend to have a coarse finished road surface. This is due to two reasons: 1) BSTs use a narrow range of stone sizes while HMA mixtures consist of a wider range, and 2) typical BST aggregates used in the region are relatively large. Most people would probably not notice the difference, but we can control BST surface texture by using a specification that requires the right range of aggregate sizes and their relative distribution.

BST Construction Sequence:

The following is a brief description of the basic elements of BST construction. Not shown is the sweeping to the existing pavement surface to thoroughly clean the pavement prior to project start.

	
Step 1—Spray Asphalt at Desired Shot Rate	Step 2—Spread Aggregate at Design Spread Rate
	
Step 3—Rubber Tire Rollers	Step 4—Sweep Excess Aggregate
	
Step 5—Fog Seal	Step 6—Striping

Potential Community Concerns with BSTs:

Generally, when the BST application is applied there is excess or loose aggregate, which is swept and removed within a few hours once the application has cured. Small amounts of aggregate will continue to loosen after traffic has begun to use that roadway; however regularly scheduled street sweeping will keep loose rock to a minimum until the final application of an asphalt or “fog” seal is placed a few days later. This final application binds

the aggregate surface and reduces any loose material. After this step, the road surface is ready for pavement markings and striping.

Community concerns generally come from residents who are not familiar with the BST process, or if a larger aggregate is used the resulting rougher texture on their streets. Some people might notice the change in the surface if they roller skate or skate board across the surface. By selecting a specification size of smaller aggregate of $\frac{1}{4}$ minus, instead of standard $\frac{3}{8}$ to $\frac{1}{2}$ size, the road surface texture would be less rough, and may help mitigate a rough course condition.

Another possible concern of BST treatments might be the limited potential for loose stones to cause damage to resident's vehicles, particularly windshields or headlight lenses. This can occur if there are excessive traffic speeds on a road section, particularly before the BST application is allowed to cure. Street sweeping will play a large part in mitigating damage caused by loose rock during initial application. By increasing the sweeping rotations during the curing process, this should lessen the impact of loose rock.

In order for the community to accept the use of BST treatments on residential and collector streets, we plan to develop a BST system that is specifically tailored for use on the Shoreline system. This will be accomplished by a specific approach to the materials and their placement with a targeted public outreach and education program.

The material specifications will focus on two issues; aggregate sizes and their relative percentages, plus the type of asphalt binder. The aggregate will be of such size to more closely match what is seen with overlays. This should meet the public's expectations of past maintenance practices. The asphalt binder will be a "rapid set" which promotes a quicker cure time and allows traffic back on the street within a couple of hours.

The public outreach program will be about the BST system and will be the key to our residents understanding the system and what to expect. Ultimately, our outreach program is intended to inform and gain acceptance of such treatments on residential and neighborhood collectors. We will communicate to the residents that we have developed a road surface treatment that seeks to preserve their infrastructure investment and extend the life cycle of the road surface while minimizing roughness. Likewise, this is an approach that would allow us to do more with less.

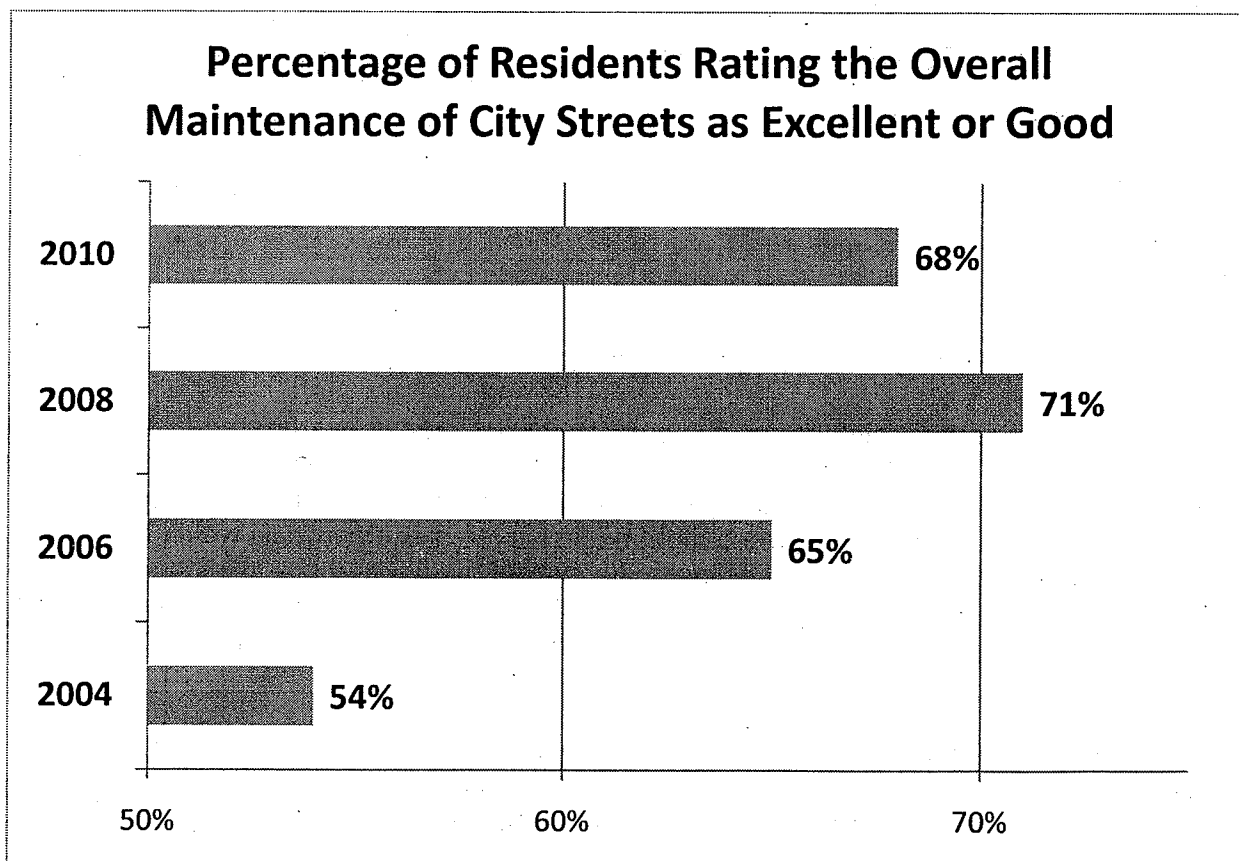
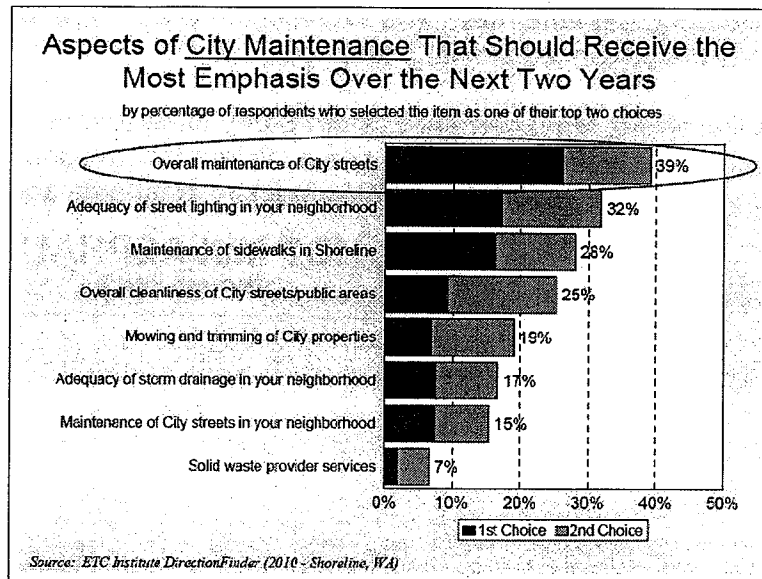
Pavement Preservation Recommendation:

Pavement Preservation is the more efficient, alternative approach to the high cost of traditional asphalt overlays. Today's high cost of materials for overlays, coupled with a shortfall in revenues, has many public agencies turning to Pavement Preservation as a solution to balance the need to maintain street networks within a limited budget. By adopting the Pavement Preservation strategy, we will be able protect the infrastructure investments made over the past ten years in road surface maintenance and extend the life of our pavement going forward. Overlays will continue to be used but only when a structural element is needed to preserve the deteriorated streets (rating of 40 or less). On higher volume streets such as Aurora Avenue and 175th, overlay thickness will be based on a structural design to build strength into the road section and minimize the road closures over the long term. BST applications are fast becoming one of the key tools in the "tool box" for road maintenance. With a BST program, Shoreline would be able to protect 10-15 miles of road surfaces annually, within existing budget versus two to three miles per year of overlay applications.

FINANCIAL IMPACT:

Council has historically budgeted approximately \$800K to \$900K annually as part of the Capital Improvement Program (CIP) to the specific project of the *Annual Road Surface Maintenance Program*. This program is intended to provide the majority of the contracted work necessary for proper road surface maintenance. In recent years, this work has been contracted with King County to exclusively perform asphalt overlays. The long-term concern has been whether or not the City can maintain pavement management goals in light of increasing costs and limited revenues.

The citizens of Shoreline have continued to emphasize the importance of street maintenance through the biennial Citizen Satisfaction Survey. The 2010 survey results have shown citizens believe the street maintenance "should receive the most emphasis over the next two years".

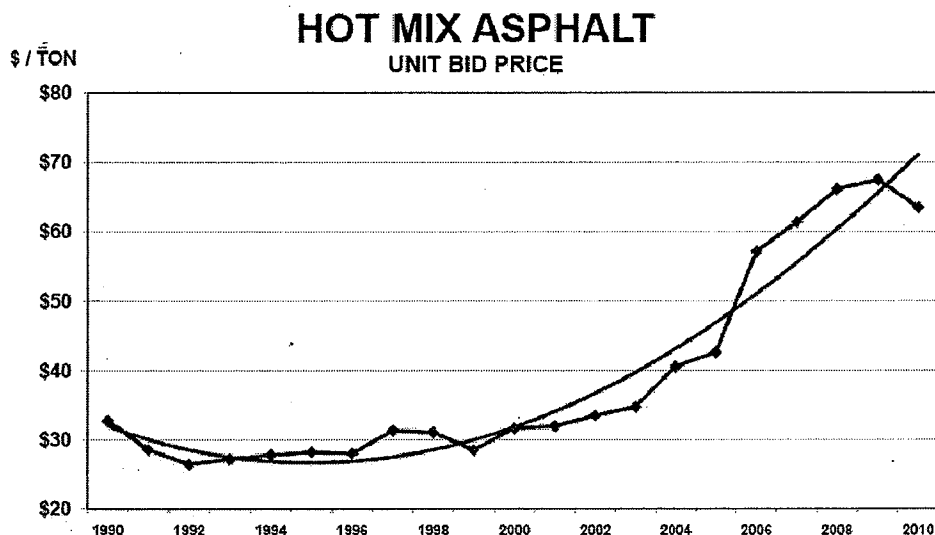


In addition, the survey results indicate the citizens have street maintenance as one of the

highest overall satisfaction rates of any of City service. Staff has used this feedback to seek out opportunities to maximize our efficiency and maintain our high level of service.

The price of asphalt materials throughout our nation has seen historic increases in recent years. The cost per lane mile of asphalt overlay has more than doubled over the last six years. In 2004, the City cost per lane mile averaged \$54,000, while 2010 will reach as high as \$160,000 per lane mile. The Washington State Department of Transportation (WSDOT) has also experienced similar challenges.

This Pavement Management System Study analyzes the trends in cost and evaluates other maintenance techniques to propose a system that maximizes our limited resources. As noted later in the report, to maintain industry standards and meet the City's commitment to



Washington State
Department of Transportation

For more information, please call the WSDOT Construction Office at (360) 705-7822
or visit <http://www.wsdot.wa.gov/biz/construction>

1/5/2011

street maintenance¹, the current program of exclusively using asphalt overlays would require a total budget of approximately \$5.6 million.

The recommendation for maintenance is a combination of asphalt overlays and Bituminous Surface Treatments (BSTs). While overlays will always have their place, BSTs provide a lower cost alternative while still obtaining the desired outcomes. Unfortunately, even if the City relied exclusively upon BSTs, the budget necessary to meet the goals would be approximately \$2.1 million. This still eclipses the current budget and is a challenge for just about every road maintenance program in the country. However, the proposed approach of using overlays and BSTs in combination is a more efficient approach with the City's limited resources.

The 2011 budget for Annual Road Surface Maintenance Program is approximately \$970,033 (\$675,000 adopted 2011 budget plus \$295,000 in unspent funds from 2010) pending Council approval of a budget amendment in April 2011. The 2011 program is

¹ Providing some level of surface treatment at least once every ten years.

intending to perform approximately three (3) lane-miles of asphalt overlay and approximately eight (8) lane-miles of BSTs.

RECOMMENDATION

No action is required. This staff report is for informational purposes only.

Approved By: City Manager _____ City Attorney _____

SUMMARY

The City's Pavement Management System has been proven to be an effective tool for planning and prioritizing street maintenance, repair and rehabilitation work. One of the key benefits is that it allows staff to forecast budget requirements for pavement system management. In the past, the Pavement Management System was effective in developing the annual budget for street rehabilitation and preventative maintenance using a combination of overlays and surface seals. As we adopt a Pavement Preservation approach to manage the City's street system, the Pavement Management System will allow Staff to predict the timing of preventive maintenance treatments and annual funding levels required to maintain the desired pavement score.

RECOMMENDATION

No action is required. This staff report provides updated information to the Council on the pavement condition ratings of City of Shoreline streets.