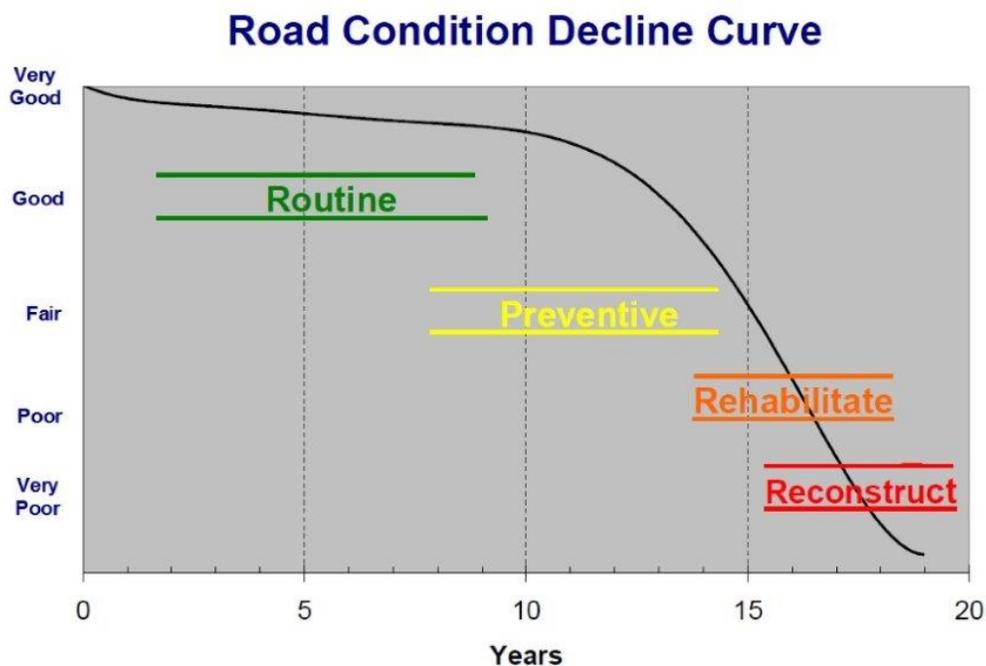


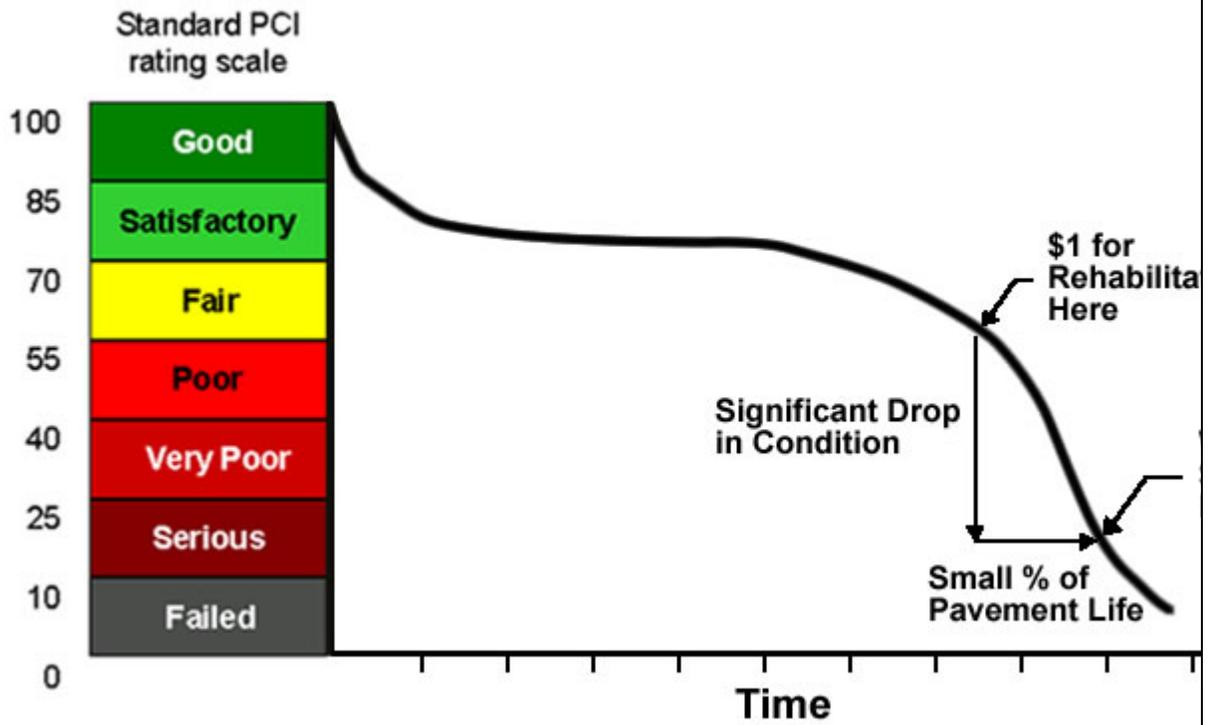
# COST EFFECTIVE ROAD MAINTENANCE MARCH 2015

According to the University of New Hampshire technology transfer Center the goal of a Road Surface Management Plan should be the following:

- **Maximize Return on Investment (ROI) for each dollar spent on road maintenance**
- **Maintain highest possible town-wide road quality**
- **Generate long term budgetary estimates and work plans**



The above chart is from the Maine RSMS 11 Program. The TIME element on the above chart will vary greatly from road to road depending on how well it was initially constructed.



Similar chart from the Corp of Engineers Website “MicroPAVER” topic.

The TIME element on the above chart will vary greatly from road to road depending on how well it was initially constructed.

### **Repair Strategies:**

There are many repair strategies that used on Town Highways. The better the condition of the road the least expensive the repair strategy. The following repair strategies have been used in the attached Capital Plan.

- **No Maintenance:** No work is required
- **Routine Maintenance:** This is the most cost effective use of funds and includes ditching, cleaning culverts and patching.
- **Preventative:** This strategy includes crack filling, chip seals, shimming, overlays or a combination of these depending on the nature of the road surface.
- **Rehabilitate:** This strategy includes milling/shimming/overlaying or reclamation of the existing pavement followed by 4” of new pavement. It is important to review the existing base material prior to any type of rehabilitation, as an undesirable base will not adequately support a reclaim project even if stabilized with cement, asphalt or chloride.
- **Reconstruct:** This includes the complete excavation of the existing pavement and inadequate base material, installation of new drain pipes and underdrains where appropriate, installation of fabric as needed, 1.5’ to 2’ of new gravel base (depending on the road) and new pavement (2.5” minimum base, 1.5” minimum top)
- **Defer:** It is important to recognize when a road has gone beyond the point of rehabilitation than it should be classified as a candidate for Reconstruction. There are cases where capital funds can be saved on this type of road by simply deferring maintenance until the road has reached the end of its useful life. Deferring can free up Capital funding for use on other roads. If selected appropriately deferred roads can save money by preventing overlays and reclamations on roads that will not hold up. Deferring a road needing Capital Improvements may require a shim or shim/chip seal to hold the road in place long enough for the Capital Improvement.

### **Repair Concepts:**

According to the Chart from the Maine Local Roads Center on the previous page, it is more cost effective to take care of the good roads than to address the poor or failed roads. For this reason it is imperative to preserve the GOOD roads (Preventative Category) with chip seals and or pavement overlays prior to the significant drop in condition.

According to the University of New Hampshire technology transfer the guiding principals of a Road Surface Management Plan should be as follows:

- **Use money as efficiently as possible**
- **Make repair decisions based on road surveys**
- **Avoid “worst first” methodology”**
- **Avoid arbitrary repair selection**
- **Prepare multi – year road maintenance plan**

A Vermont Local Roads article printed in December 2011 titled “Pay now or later: Tips for saving dollars for the long haul” points out the following:

- **“Spending money before rapid depreciation is money well spent”**
- **“Providing good foundations is good road management”**
- **“Cheaper is not always better”**
- **“It may mean the Town does not accomplish all it wants to”**

# Low Cost Budgeting for Town Highway Projects

Preventative Maintenance Chip Seals	Cost (\$/SY)	Cost (\$/mile)	Life Expect.* (years)	Avg. Yearly Cost (\$/mile-year)
3/8" Chip Seal (conventional)	\$2.40	\$31,000	8	\$3,875
<b>3/8" Chip Seal (10% rubber)</b>	<b>\$3.30</b>	<b>\$43,000</b>	<b>10</b>	<b>\$4,300</b>
3/8" Chip Seal (20% rubber)	\$4.20	\$55,000	12	\$4,600
Bonded Wearing Coarse (Interstate)	\$6.00	\$80,000	12+	\$6,700
Road posting (paved and gravel roads)	\$0.00	\$0		labor
<b>Benefits of rubber chip seal:</b>	Life expectancy is longer, can sweep in 1/2 to 1 hour vs 5 days. Minimal loose stone with rubber added.			
* Life Expectancy: This may vary by 2 years +/-, depending on the road condition and traffic.				
NOTE: Costs per mile based on 22' width road and a minimum of 20,000 SY contract				

Preventative Maintenance Paving	Cost (\$/TON);(\$/SY)	Cost (\$/mile)	Life Expect.* (years)	Avg. Yearly Cost (\$/mile)
Shim (1/2" - 400 Tons/mile)	\$75/TON	\$30,000	5	\$6,000
Overlay (1" - 750 Tons/mile)	\$75/TON	\$60,000	10	\$6,000
Shim/Overlay (1.5" - 1,150 Tons/mile)	\$75/TON	\$90,000	10	\$9,000
Shim/Chipseal (traditional)	\$2.40/SY	\$61,000	10	\$6,100
Shim/Chipseal (10% rubber)	\$3.30/SY	\$73,000	10	\$7,300
Shim/overlay/Chipseal (10% rubber)	\$4.20/SY	\$133,000	10	\$13,300
The following is in addition to paving	(\$/SY)			
Micromill (remove high spots)	\$1.00	\$13,000	10	\$1,300
Mill (up to 2")	\$2.50	\$32,000	10	\$3,200
* Life Expectancy: This may vary by 2 years +/-, depending on the road condition and traffic.				
NOTE: Costs per mile based on 22' width road and a minimum of 20,000 SY contract				

Rehabilitation & Reconstruction	Cost (\$/mile)	Life Expect.* (years)	Avg. Yearly Cost (\$/mile)
<b>Rehabilitation</b>			
Reclaim, 4" pavement	\$300,000	20	\$15,000
Reclaim + (includes minimal: ditching, reclaim, tree removal, traffic control, new culverts, 4" mix)	\$400,000	20	\$20,000
Reclaim, stabilize base, 4" pavement	\$350,000	25	\$14,000
Reclaim, add 6" gravel, 4" pavement	\$400,000	25	\$16,000
Reclaim, add 12" gravel, 4" pavement	\$500,000	30	\$17,000
<b>Reconstruction</b>			
(includes: ditching, reclaim, tree removal, traffic control, new culverts, 4" mix)	\$1,000,000	50	\$20,000
* Life Expectancy: This may vary by 5 years +/-, depending on the road condition and traffic.			
NOTE: Costs per mile based on 22' width road			

MINIMUM RECOMMENDED BUDGET: GOOD Cond.	FAIR Cond.	POOR Cond.	Very Poor Condition	
Preservation \$/mile pavement	\$5,300/MILE	\$7,300/MILE	\$9,000/MILE	\$12,000/MILE
Plus Capital Work	\$	\$\$	\$\$\$	\$\$\$\$\$

**Chip Seal Advantages:**

1. Pavement Preservation at the lowest cost (\$43,000/mile vs \$60,000/mile)
2. Extends time between overlays
3. Provides good skid resistance
4. Provides an effective moisture barrier against water intrusion that can weaken the base
5. Reduces oxidation in the underlying pavement, resulting in less need for crack filling
6. Reduces the need to crack fill, particularly when applied early to a newer pavement
7. Salt brine holds longer

**Chip Seal Disadvantages:**

1. Loose stones shortly after application could crack windshields. Utilization of the rubber application drastically reduces this possibility as the chip seal can be swept in as little as 1 hour with a 10% minimum rubber chip seal.

# Truck Distributer Spraying Asphalt



# Truck Distributer Spraying Asphalt



# Spreader Application of Treated Aggregate



# Spreader Application of Treated Aggregate



# Immediate Rolling for Proper Embedment



# Immediate Rolling for Proper Embedment



# Same Day Sweeping and Re-Opening to Traffic



# Road Surface Two Months After Chip Seal



# Road Surface 1 Year After Chip Seal



# Road Surface 10 Years After Chip Seal

(Reclaim, excavation of inferior material, fabric installation, installation of reclaim material, 12" new gravel, base pavement, top pavement, chip seal)



# Chip Sealed Streets in Charlestown (2014)



# Chip Sealed Streets in Charlestown (2014)

