Takoma Park City Council Meeting – September 21, 2016
Agenda Item 4

Work Session
Report on Pavement Condition Study

Recommended Council Action
Receive information

Context with Key Issues
A component of the City's program for maintaining street pavement is the regular evaluation of surface conditions. The City Council established a funding level of $500,000 per year to maintain City streets with a goal of resurfacing each street within a 20 year cycle or before the pavement condition fell to below fair.

The City has completed Pavement Condition Evaluations in 2004, 2011 and most recently in June, 2016. The most recent report is attached below. These evaluations serve as the basis for scheduling resurfacing projects. The current evaluation process uses a digital technology, rather than a manual visual survey.

In the most recent survey, street condition ratings were as follows:

Excellent	23%
Satisfactory	34%
Fair	22%
Poor	15%
Very Poor	6%
Serious	1%

It is important to note that percentage of Poor, Very Poor and Serious rated streets is primarily due to delayed street maintenance in the New Hampshire Gardens neighborhood (Ward 6). 3 of the 6 streets rated Serious, 13 of the 17 sections rated Very Poor, and 14 of the 54 sections rated Poor are located there. WSSC will be resurfacing those streets as a condition of their permit.

City staff will provide additional information at the Council meeting comparing this recent pavement evaluation with previous reports and updating the Council on the street resurfacing program. Additionally, a list of all streets and their pavement condition ratings will be provided, as well as a listing of the annual street resurfacing expenditures since 2004, when the City established the resurfacing funding level and 20 year goal.

Council Priority
Fiscally Sustainable Government; Engaged Responsive and Service Oriented Government

Prepared by: Daryl Braithwaite, Public Works Director
Approved by: Suzanne R. Ludlow, City Manager Posted: 2016-09-16

Environmental Impact of Action
Maintaining roads in good condition reduces particulate pollution from failing road surfaces and improves safety for vehicles and other non-motorized road users.

Fiscal Impact of Action
Not applicable

Attachments and Links
Pavement Management Report

Prepared by: Daryl Braithwaite, Public Works Director
Approved by: Suzanne R. Ludlow, City Manager Posted: 2016-09-16

ERoadInfo
Pavement Management Report
For the City of Takoma Park, MD

Enterprise Information Solutions, Inc.
961 Mercantile Drive, Suite C
Hanover, MD 21045

Table of Contents

1. Executive Summary

This report provides an assessment of the surface condition of the 35 centerline miles of streets maintained by City of Takoma Park, Maryland. The report provides information for the following functional activities:

1. Current pavement condition inspection was conducted in accordance with ASTM D6443, Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys.
2. Planning and programming for pavement maintenance, repairs and structural improvements.

The field team was comprised of Jeff Martin, Channy Omkar and John Terry. The Field survey was conducted in June, 2016. Andy Shaw was the project manager and responsible for the engineering analysis.

The overall condition of the city's road network is Satisfied, with an overall weighted average PCI value is 69.1. In the following sections, detailed recommendations for roads that need major repair and preventative maintenance will be presented.

2. Background

Advancements in computers, software and pavement management technology have provided the tools to manage pavement economically. A pavement management system provides a systematic, consistent method for determining maintenance and rehabilitation (M&R) needs and priorities, as well as the optimal time for repair, by predicting future pavement condition.

An essential concept in pavement management is tracking the deterioration of the pavement surface condition over time. The Pavement Condition Index (PCI) is used to quantify the pavement condition into a value in the range of 1 to 100, with 100 being a perfect, newly constructed road and 1 as a road that is has failed and is near an un-paved road.

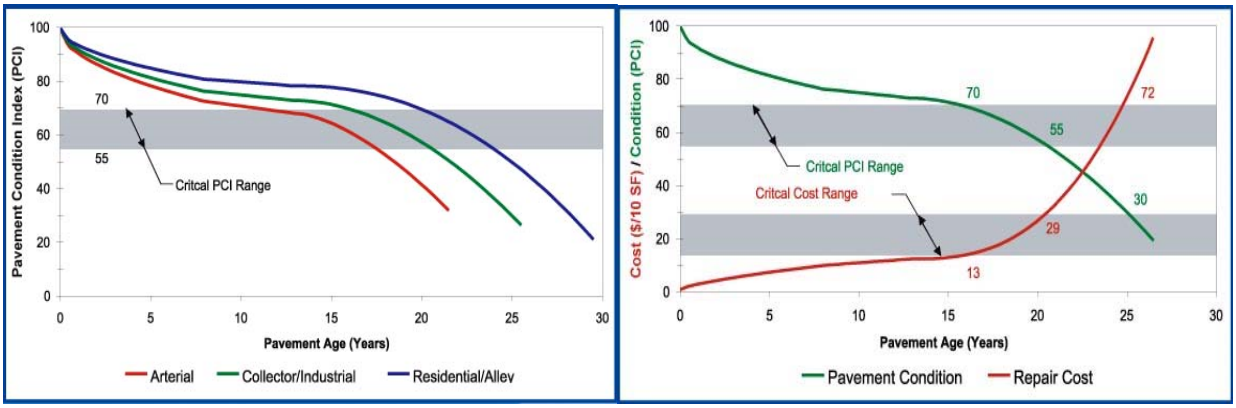
3. Pavement Management Concepts

3.1 Pavement Condition Deterioration and Cost for Repair

The following two diagrams show two of the most basic concepts of pavement management.

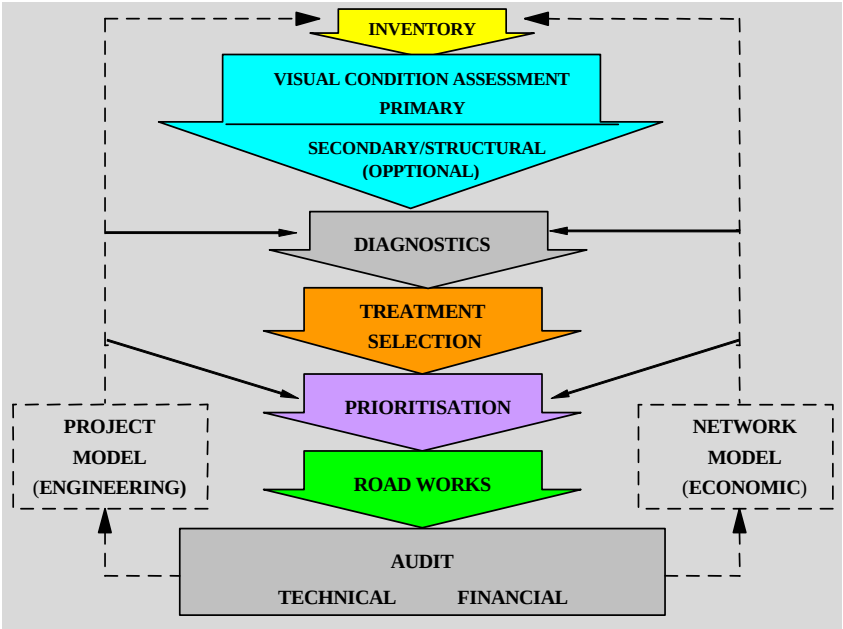
A deterioration curve illustrates how the overall condition of the pavement changes as it ages. When first built, the pavement is typically in very good condition. In general, the condition slowly decreases in the first few years of service, from very good to good. As the pavement approaches the end of its service life the rate of deterioration accelerates at a faster rate. The figure below shows a generic deterioration curve.

Research has shown that when certain maintenance techniques are applied too early or too late, they are not cost effective. For example: crack-sealing roads that have extensive structural damage is not cost effective. Therefore, it is imperative that the correct repair alternative be selected for the specific condition of each road segment.



3.2 Pavement Condition Survey and Rating Procedure

The following flow chart shows the steps involved in planning and collecting inventory, condition rating information and using eRoadInfo Pavement Management system to compile and analyze the information.



A team of two technicians systematically drove eRoadInfo asset condition rating vehicle on the road segment listings provided by the city collecting digital photos and visual pavement asset condition data. The condition rating is based on severity and extents for each type of distress observed on the road.

The following table shows the type of distresses identified by the pavement condition rating process:

eRoadInfo Distress Types (3 Severities, 1-100 Extents)

Asphalt	Concrete
Alligator Cracking	BLOW-UP/SHATTER
Base Failure/Settlement	CORNER BREAK
Bleeding	DIVIDED SLAB
Block cracking	DURABILITY CRACKING
Bumps/Sag	FAULTING
Corrugation	JOINT SEAL DAMAGE
Edge Cracking	LANE/SHOULDER DROP
Joint reflection cracking	LINEAR CRACKING
Lane Shoulder drop	CUT
Long. Cracking	SMALL PATCH
Patching/Utility Cut	POLISHED AGGREGATE
Polished Aggregate	POPOUTS
Pothole	PUMPING
Trans/Thermal Cracking	PUNCHOUT
Rutting	RAILROAD CROSSING
Raveling	SCALING/CRAZING
Shoving	SHRINKAGE CRACKING
Slippage Cracking	CORNER SPALLING
Wheel Path Cracking	JOINT SPALLING
Drainage	DRAINAGE

ERoadInfo pavement management system compiles the data and calculates the PCI value based on FHWA SHRP Distress Identification Manual and ASTM D6433 PCI Deduction Curves:

Deduction is based on severity and extent for each distress

A maximum number of deductions are determined

A corrected total deduct value is determined by combining the distresses

Following is an example of the deduction curve showing the deduction values for alligator cracking on asphalt pavement.

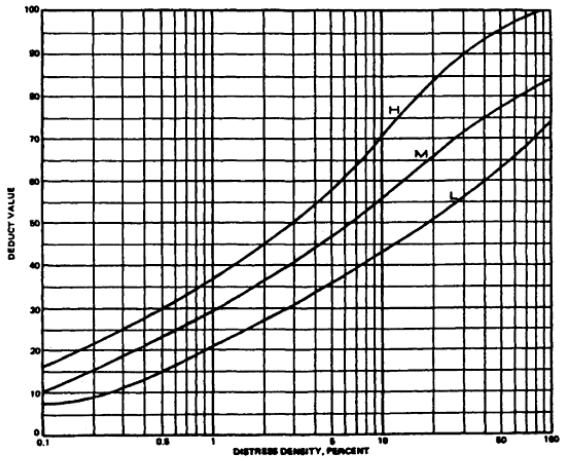


Figure 3-18. AC Pavement Deduct Curve for the Alligator Cracking Distress.

3.3 PCI Determination

When the pavement condition survey has been completed for every pavement segment, the distresses will be used to calculate the Pavement Condition Index (PCI). eRoadInfo system follows the PCI calculation process according to the ASTM D6433 standard. The PCI calculation is based on deduct values – weighing factors from 0 to 100 that indicate the impact each distress has on pavement condition. A deduct value of 0 indicates that a distress has no effect on pavement performance, whereas a value of 100 indicates an extremely serious distress.

The deduction value for each distress is determined by the corresponding deduction curve. For example, above is a deduction curve for alligator cracking on asphalt pavement. Based on the severity and extent percentage, the deduction value can be identified for the distress. eRoadInfo system computerized the deduction curves for about 19 distress types for both asphalt and concrete pavement.

The deduction values are added together as the Total Deduction Value (TDV). Based on the number of distresses and the TDV, a Corrected Deduction Value (CDV) is generated to take into consideration fact that when multiple distresses exist on the road, the final deduction value is less than the pure sum of the deductions. The final PCI is calculated by subtracting the CDV from 100. The PCI calculation is automated by the eRoadInfo system. A newly constructed road will have a PCI close to 100 while a PCI value 0 will represent a failed pavement.

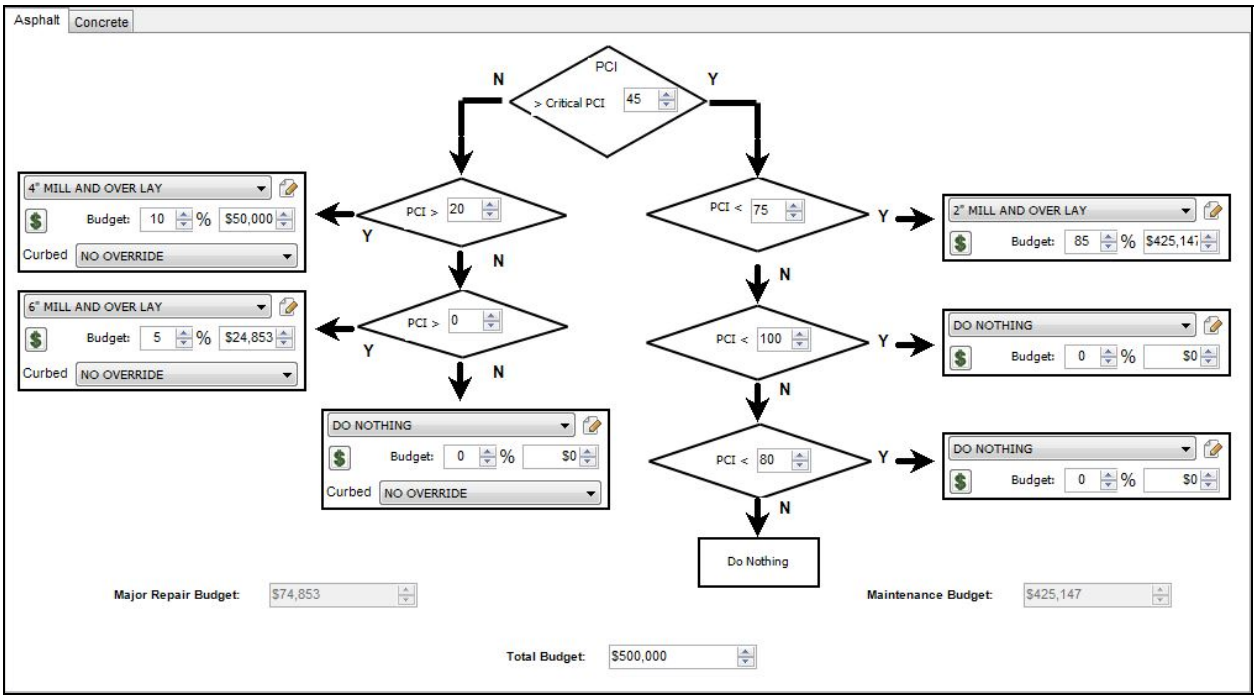
3.4 Repair Method and Priority Determination

The system is deployed with a template of repair methods. The Takoma Park City staff will continue to refine the list of repair method to closely resemble their desired repair methods for the road network.

ID	Name	Quantit	UnitCost	UnitID	MRCategory
-1	NO OVERRIDE	0	$0.00	SQ.YD.	Do Nothing
0	DO NOTHING	0	$0.00	SQ.YD.	Do Nothing
1	STOP-GAP PATCHING	0	$1.00	SQ.YD.	Stop-Gap/Emerger
2	CRACK FILL	0	$0.50	SQ.YD.	Maintenance
3	SLURRY SEAL	1	$1.75	SQ.YD.	Maintenance
4	MICROSURFACING	1	$6.34	SQ.YD.	Maintenance
5	CAPESEAL	1	$8.00	SQ.YD.	Maintenance
6	DOUBLE CHIP SEAL	1	$3.00	SQ.YD.	Maintenance
7	CURB REVEAL MILLING & THIN OVERLAY	1	$7.40	SQ.YD.	Maintenance
8	OVERLAY (2.0 ")	1	$12.12	SQ.YD.	Major Repair
9	MILL AND RESURFACE 2.0"	1	$15.18	SQ.YD.	Major Repair
10	LOCALIZED BASE REPAIR & REPAVE	0	$18.00	SQ.YD.	Maintenance
11	COLD-IN-PLACE RECYCLING	1	$15.81	SQ.YD.	Major Repair
12	FDR W/ 2.5" OVERLAY	1	$23.69	SQ.YD.	Major Repair
13	TOTAL RECONSTRUCTION	1	$45.00	SQ.YD.	Major Repair
14	TOTAL RECONSTRUCT W/ C&G	1	$55.00	SQ.YD.	Major Repair
33	Full Depth Repair (Concrete)	1	$60.00	SQ.YD.	Major Repair
34	Partial Depth Repair 3" (Concrete)	1	$30.00	SQ.YD.	Major Repair
35	Localized/Joint Repair (Concrete)	0	$50.00	SQ.YD.	Major Repair
36	Concrete Overlays/Whiting (Concrete)	0	$40.00	SQ.YD.	Maintenance
37	AC Overlay (Concrete)	0	$40.00	SQ.YD.	Major Repair
38	Crack Seal (Concrete)	0	$5.00	SQ.YD.	Maintenance
40	Patching - AC Leveling	0	$10.00	SQ.YD.	Do Nothing
41	Patching - AC Shallow	0	$20.00	SQ.YD.	Do Nothing
42	Patching - AC Deep	0	$50.00	SQ.YD.	Do Nothing
43	CHIP SEAL	0	$3.00	SQ.YD.	Do Nothing
44	6" MILL AND OVER LAY	0	$37.70	SQ.YD.	Major Repair
45	4" MILL AND OVER LAY	0	$26.82	SQ.YD.	Major Repair
46	2" MILL AND OVER LAY	0	$14.40	SQ.YD.	Major Repair

The determination of the repair method follows a decision tree structure, based on the PCI value and the distresses on each road segment. The pavement maintenance and repair methods (M&R) are grouped into three categories: emergency Stop Gap, Maintenance and Repair. Each category can be assigned with separate budget amount. A critical PCI is defined as the PCI value at which the rate of PCI loss increases at a faster rate and / or the cost of repair increases significantly. Historical data may be needed to determine the critical PCI value. A “Do Nothing” threshold is defined as the PCI value above which the road is in very good condition and do not need any repair work.

Following is a decision tree example showing a set of repair methods selected. Each repair method can be further configured by the end user to fit their particular needs. Unit cost values for each repair method can also be configured to reflect local and current cost.



For road segments above the critical PCI, and below the "Do Nothing" threshold, it is sent into the right side of the decision tree for Maintenance category. If there is structural distress, then depending upon the funding availability, there can be two options, either a Resurfacing/Pavement Restoration or Crack Seal maintenance can be applied to the road. For the roads with no structural distress, it is judged by whether it has a high cracking percentage extent. If it is true, it is typically recommended for chip seal maintenance on it. If no high cracking, then it is judged by whether it has high polished aggregate and bleeding conditions, if so, Slurry/Micro Seal maintenance is recommended. If no high polished aggregate and bleeding exists and it has a low cracking extent, then it would be recommended to perform Crack Seal, otherwise, no repair is needed on this road.

For road segments below the critical PCI, it is sent into the right side of the decision tree for repair category. If there is still funding available, depending upon whether the PCI value is above a certain PCI level, Resurfacing or Reconstruction can be applied to the road. If there is no funding available, then emergency stop-gap repair will be applied to address any safety issue.

Each road is assigned a priority index by the total of the PCI value and a priority adjustment based on the road functional classification. The lower the value, the higher the priority the road has. Here following is a default priority adjustment table:

Classification	Priority Adjustment Factor
Interstate	7
Major Arterial	10
Minor Arterial	15
Major Collector	22
Minor Collector	30
Local	40
Alley	100

In other words, given the same PCI value, a more important road such as a major arterial segment will receive a lower priority ranking value, and hence listed in front of a minor road segment such as a local street.

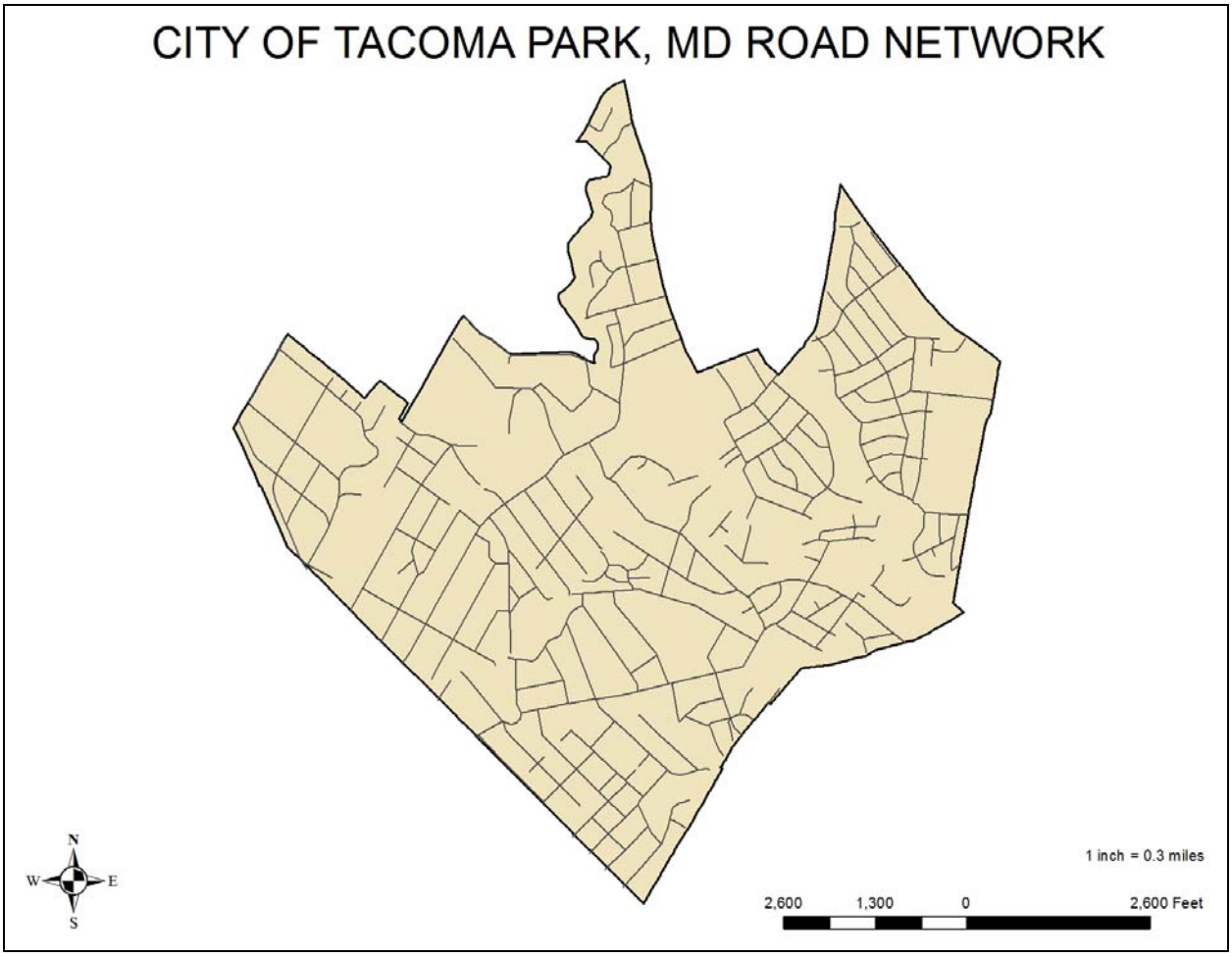
These types of maintenance strategies and procedures can be set in the eRoadInfo software and support the changing needs and conditions of the City. It is understood that the models only take into consideration what input it is given and it will return results based on those inputs. The pavement management staff will need to be trained to fully understand the implementation of the system to best utilize the models to reflect the real-world maintenance practices of the City.

4. Pavement Condition Survey Result

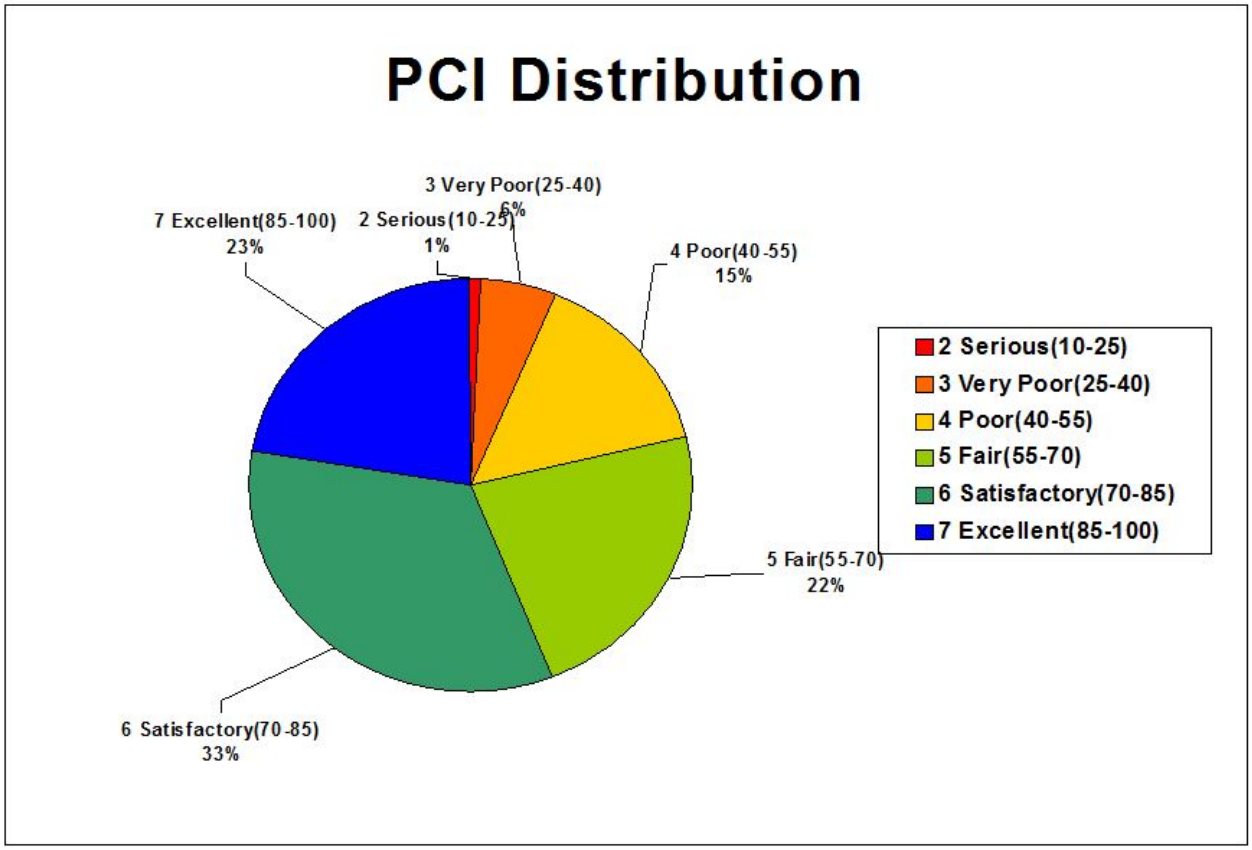
4.1 Overall Pavement Conditions

The overall condition of the city's road network is Satisfied.

The overall weighted average PCI value is 69.1.



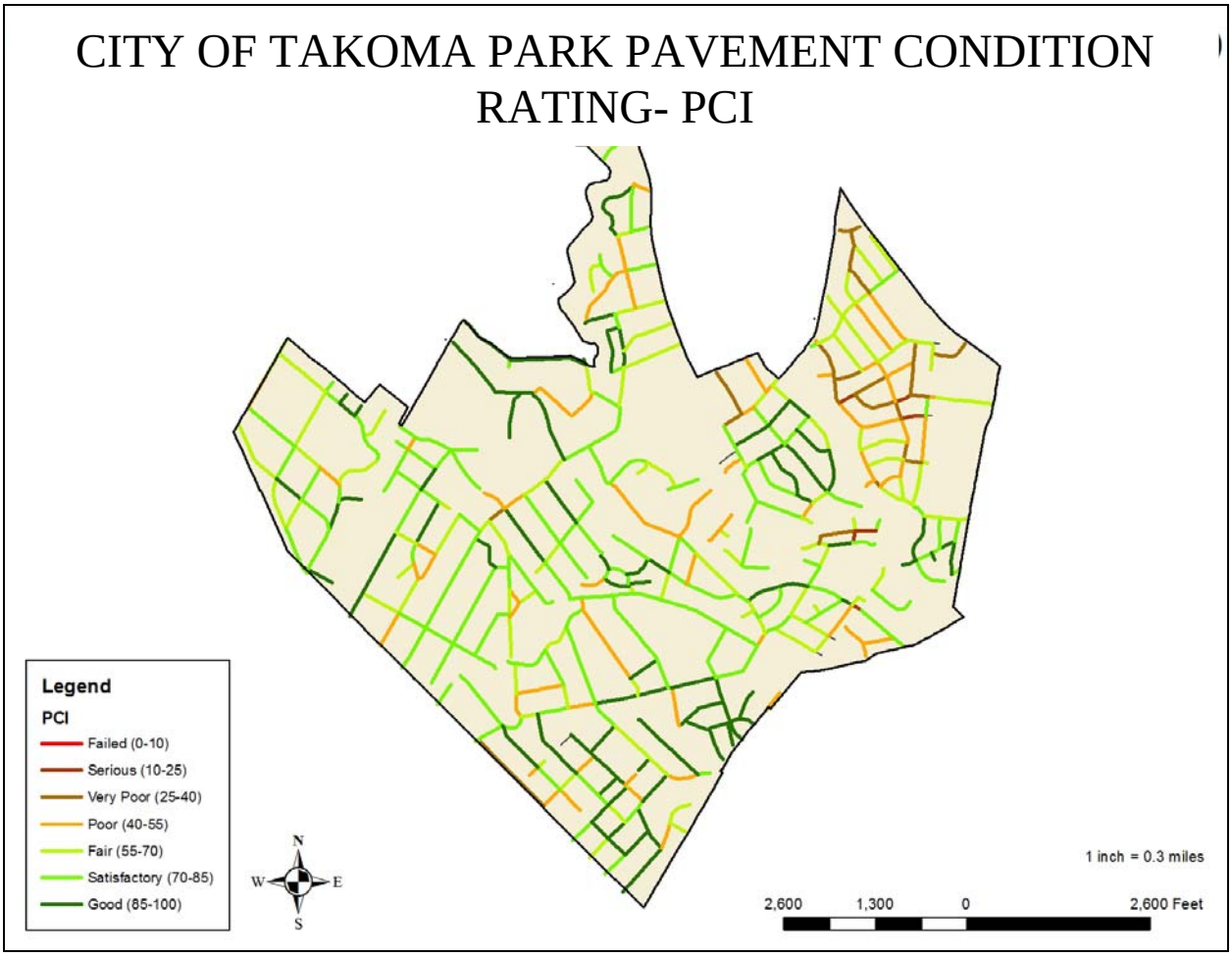
Following is a chart showing the PCI distribution of roads:



PCI Range	Total Length (Mile)	Percentage
Excellent	15.29	23%
Fair	15.07	22%
Poor	10.20	15%
Satisfactory	22.94	34%
Serious	0.54	1%
Very Poor	3.81	6%
Total	**67.84**	**100%**

(Source: _vw_Summary_PCI)

4.2 Map of Road Conditions



CITY OF TACOMA PARK, MD ROAD NETWORK (COLOR BY PCI)

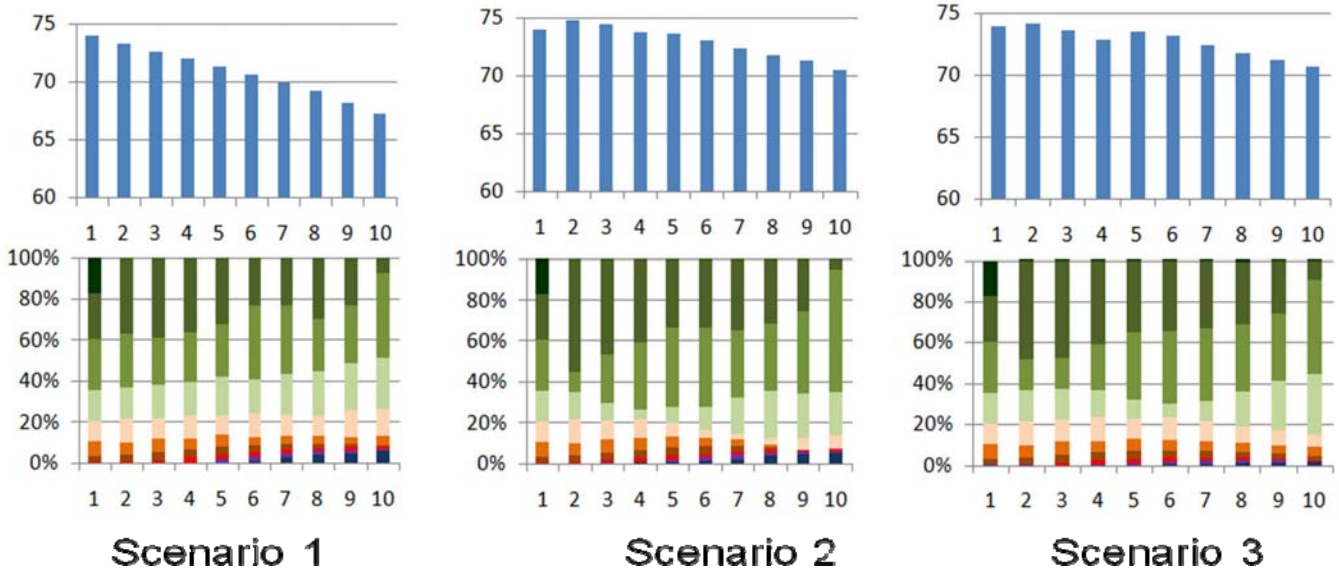
5. Pavement Maintenance Budget Optimization

The eRoadInfo system exports the pavement condition rating to an optimization module that takes the pavement condition information and runs through the different scenarios to answer questions like the following:

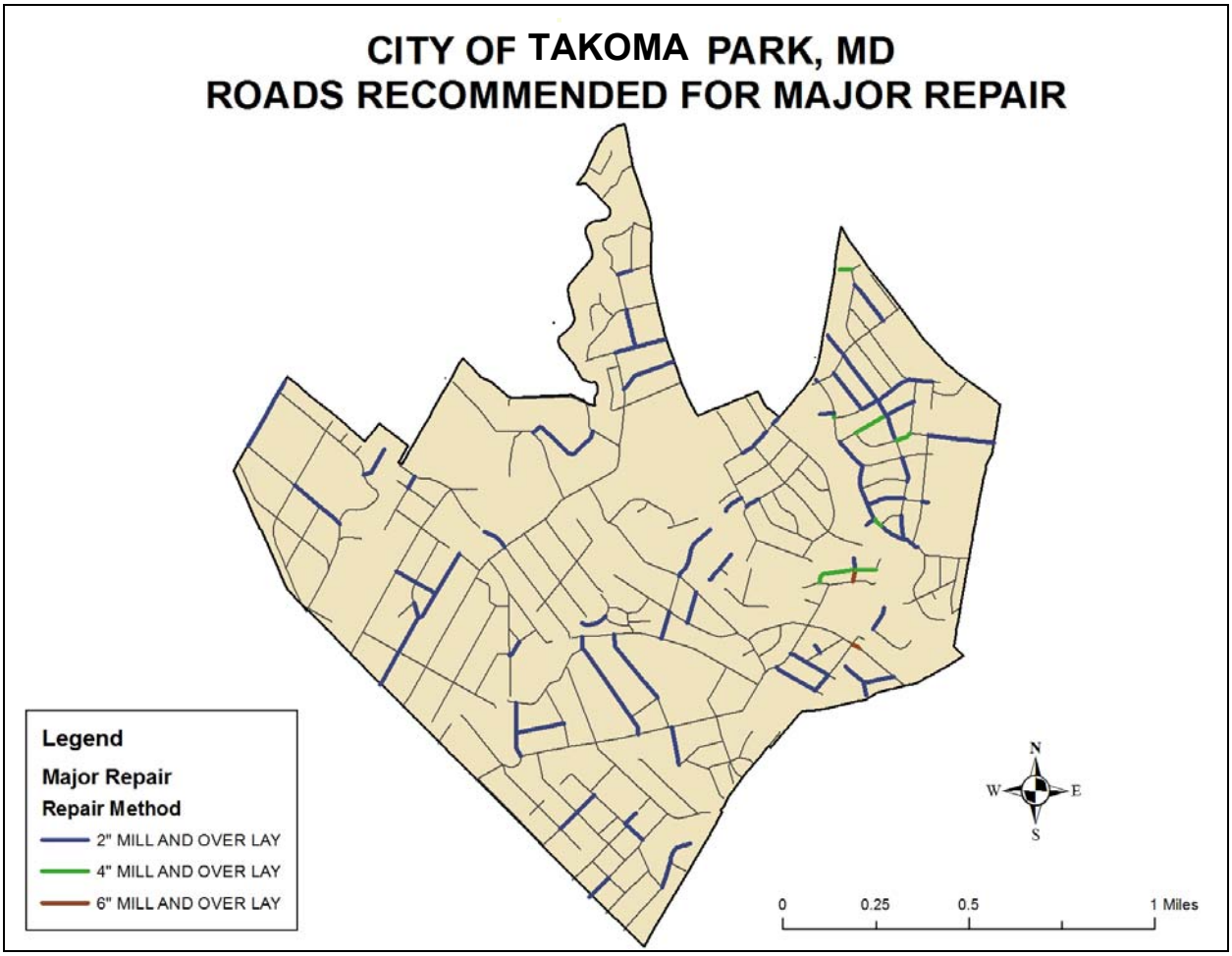
- What is the best allocation of the budget, among road re-construction, overlay and preventative repair, to produce the highest PCI level 5 years from now?
- How will the road condition be 5 years from now if we spend 1 million, 2 million, or 3 million for road maintenance?
- How much annual budget do we need to maintain a PCI level of 75?

Following is a quick report showing the optimization of a $6 million budget to achieve the maximum PCI value with three different repair scenarios.

Repair Method	PCI Range	Budget Scenario 1	Budget Scenario 2	Budget Scenario 3
CRACK FILL	75-85	$ 200,000	$ 800,000	$ 600,000
SLURRY SEAL	65-75	$ 200,000	$ 700,000	$ 300,000
THIN OVERLAY	55-65	$ 500,000	$ 1,000,000	$ 300,000
THICK OVERLAY	40-55	$ 2,000,000	$ 1,400,000	$ 1,750,000
MILL & RESURFACE	25-40	$ 1,000,000	$ 1,500,000	$ 1,750,000
TOTAL RECONSTRUCTION	<25	$ 2,000,000	$ 500,000	$ 1,000,000
Localized Base Repair		$ 100,000	$ 100,000	$ 300,000
Total		**$ 6,000,000**	**$ 6,000,000**	**$ 6,000,000**



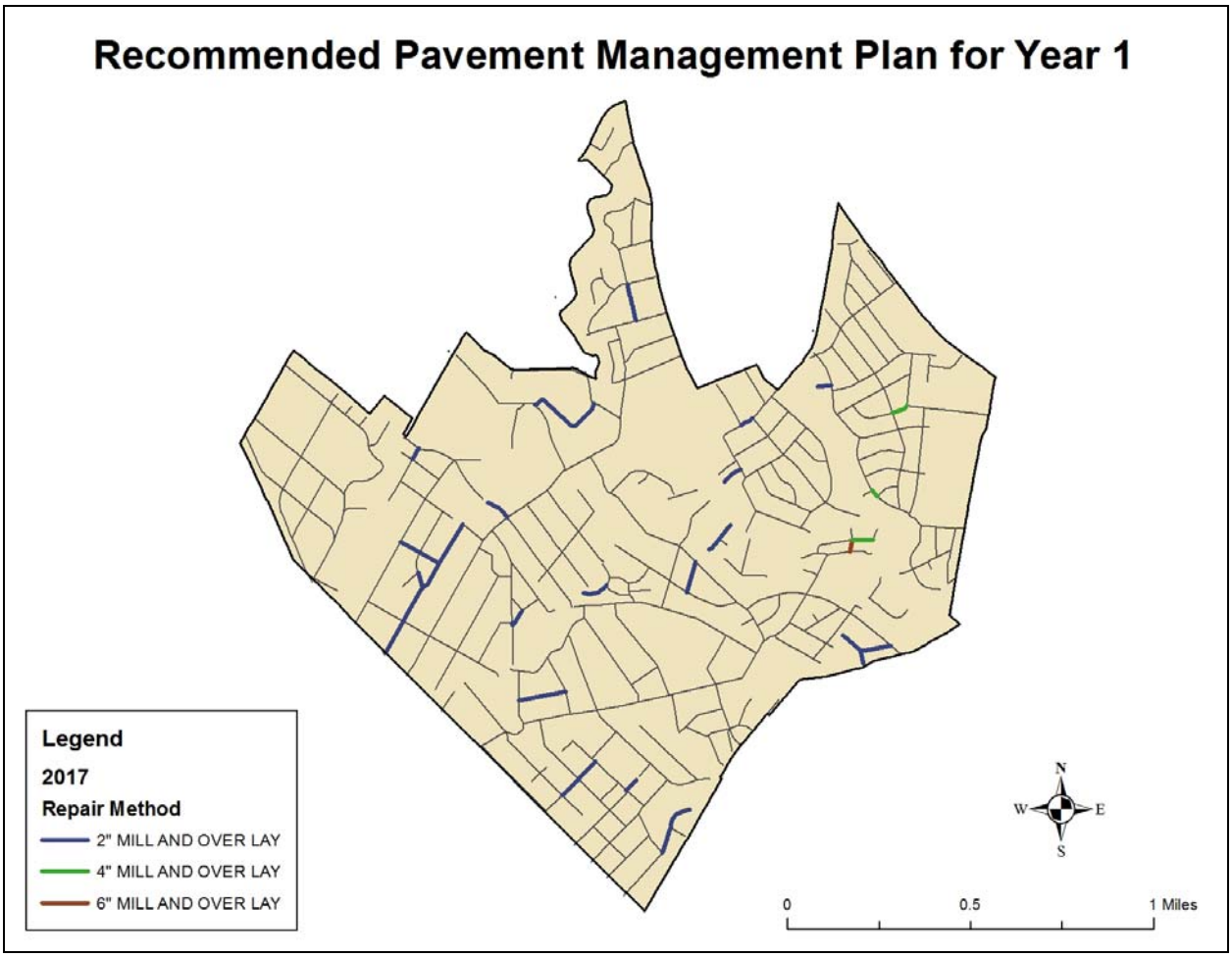
6. Repair Recommendations



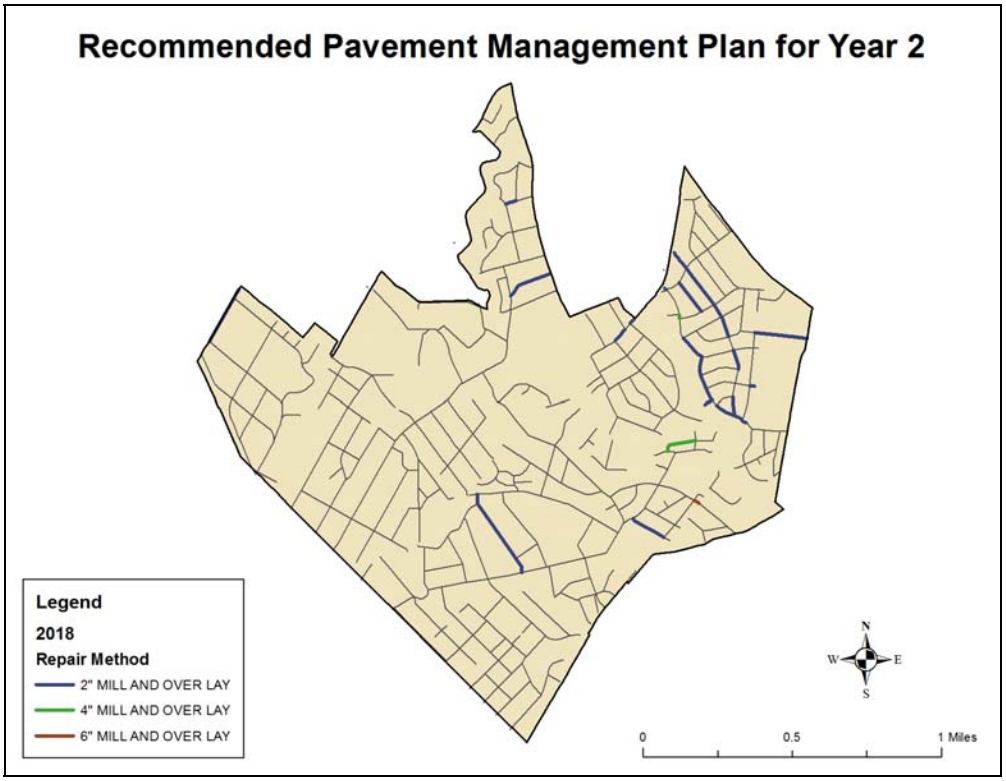
7. Multi-Year Pavement Management Plan

Based on the selected optimal repair strategy and set repair budget, the eRoadInfo system can generate a multi-year pavement management plan. Following is an example of a 3-year pavement management plan.

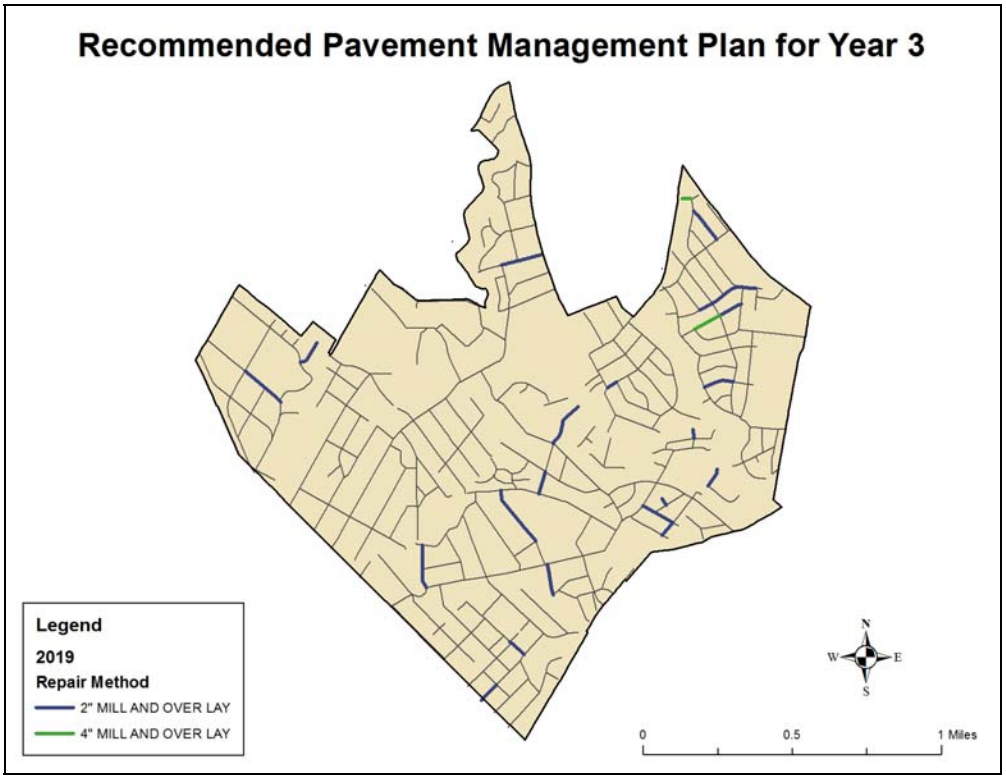
Year 1



Year 2

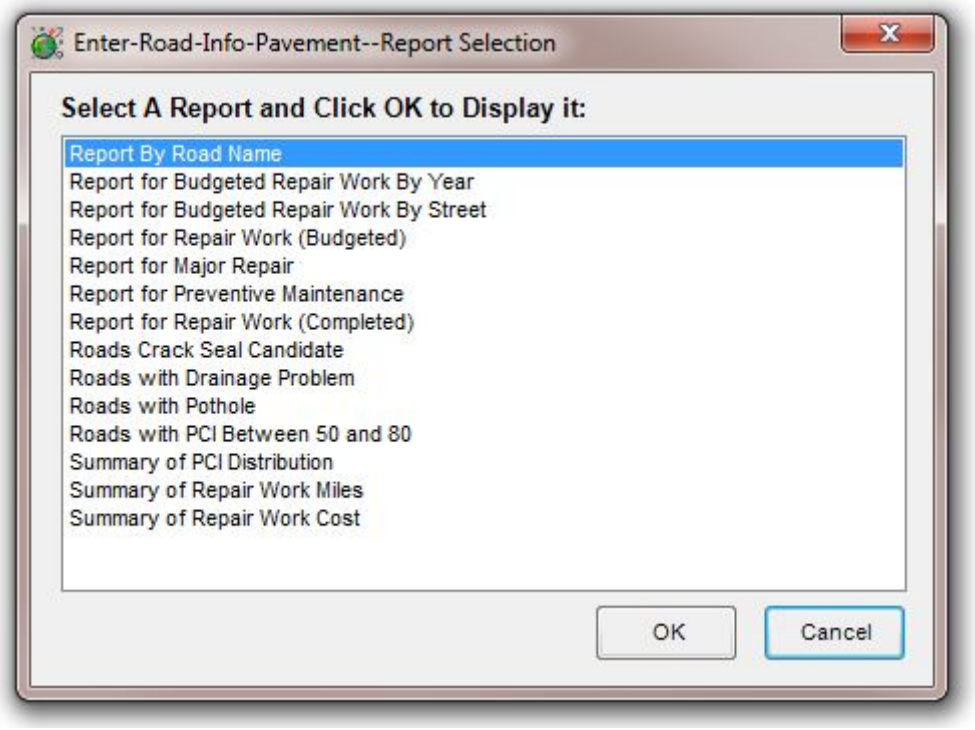

Recommended Pavement Management Plan for Year 2
Legend
2018
Repair Method
2" MILL AND OVER LAY
4" MILL AND OVER LAY
6" MILL AND OVER LAY
N
W
E
S
0
0.5
1 Miles

Year 3


Recommended Pavement Management Plan for Year 3
Legend
2019
Repair Method
2" MILL AND OVER LAY
4" MILL AND OVER LAY
N
W
E
S
0
0.5
1 Miles

8. Reports

The eRoadInfo system provides a number of reports out-of-the-box. Here is a list of them:



8.1 Report by Road Name

The report of recommended repair list, ordered by road name, is attached as an appendix to this report.

8.2 Report for Major Repairs

Report for Major Repair

Road Name	From/To	Repair Method/Override	PCI	Priority	Func Class	Repair Cost	Accum Cost	Width (ft)	Length (ft/mile)	Segment ID
2" MILL AND OVER LAY										
GENEVA AVE	HILLTOP RD - RITCHIE AVE	2" MILL AND OVER LAY	47.8	1	Unknown	$45,924	$45,924	24	1,196 0.226	409
CRESCENT PL	CRESCENT PL - PARK AVE	2" MILL AND OVER LAY	48.9	2	Unknown	$9,356	$55,279	24	244 0.046	158
MONTGOMERY AVE	PINE AVE - HICKORY AVE	2" MILL AND OVER LAY	49.3	3	Unknown	$26,443	$81,722	24	689 0.130	91
BIRCH AVE	BARCLAY AVE - CEDAR AVE	2" MILL AND OVER LAY	50.2	4	Unknown	$8,987	$90,709	24	234 0.044	207
GRANT AVE	MAPLE AVE - Dead End	2" MILL AND OVER LAY	50.3	5	Unknown	$14,103	$104,812	24	367 0.070	281
CIRCLE AVE	COCKERVILLE AVE - Dead End	2" MILL AND OVER LAY	50.6	6	Unknown	$8,084	$112,896	24	211 0.040	34
KENTLAND AVE	Dead End - HOPEWELL AVE	2" MILL AND OVER LAY	49.8	7	Unknown	$13,251	$126,147	24	345 0.065	139
KENTLAND AVE	HOPEWELL AVE - Dead End	2" MILL AND OVER LAY	52.1	8	Unknown	$7,168	$133,315	24	187 0.035	122
ASPEN AVE # 2	BOYD AVE - LINCOLN AVE	2" MILL AND OVER LAY	51.1	9	Unknown	$17,515	$150,830	24	456 0.086	221
SECOND AVE	COCKERVILLE AVE - ALLEGHENY AVE	2" MILL AND OVER LAY	46.1	10	Unknown	$13,591	$164,421	24	354 0.067	46
SECOND AVE	ALLEGHENY AVE - WESTMORELAND AV	2" MILL AND OVER LAY	57.8	11	Unknown	$12,639	$177,060	24	329 0.062	35
CHANEY DR	FLOWER AVE - Dead End	2" MILL AND OVER LAY	52	12	Unknown	$11,759	$188,819	24	306 0.058	307
S MANOR CIR	Dead End - N MANOR CIR	2" MILL AND OVER LAY	52.1	13	Unknown	$14,550	$203,369	24	379 0.072	195
CHESTNUT AVE	HODGES LA - GRANT AVE #2	2" MILL AND OVER LAY	52.5	14	Unknown	$7,597	$210,966	24	198 0.037	358
ASPEN AVE	ASPEN CT - Dead End	2" MILL AND OVER LAY	52.9	15	Unknown	$8,376	$219,342	24	218 0.041	330
ASPEN AVE	Dead End - ASPEN CT	2" MILL AND OVER LAY	53.5	16	Unknown	$10,125	$229,467	24	264 0.050	258
SLIGO MILL RD	ORCHARD AVE - SHERIDAN ST	2" MILL AND OVER LAY	47.4	17	Unknown	$14,373	$243,840	24	374 0.071	9
SLIGO MILL RD	SHERIDAN ST - Dead End	2" MILL AND OVER LAY	59.1	18	Unknown	$16,778	$260,618	24	437 0.083	19
GLENSIDE CT #2	GLENSIDE DR - Dead End	2" MILL AND OVER LAY	53.4	19	Unknown	$8,045	$268,663	24	210 0.040	418
ROANOKE AVE	KENNEBEC AVE - HOUSTON AVE	2" MILL AND OVER LAY	53.8	20	Unknown	$21,392	$290,054	24	557 0.106	470
HOPEWELL AVE	KENTLAND AVE - LARCH AVE	2" MILL AND OVER LAY	53.9	21	Unknown	$17,043	$307,097	24	444 0.084	125
CEDAR AVE	Dead End - TULIP AVE	2" MILL AND OVER LAY	45.7	22	Unknown	$20,493	$327,590	24	534 0.101	148
CEDAR AVE	BIRCH AVE - DOGWOOD AVE	2" MILL AND OVER LAY	50.8	23	Unknown	$16,747	$344,337	24	436 0.083	218
CEDAR AVE	TULIP AVE - BIRCH AVE	2" MILL AND OVER LAY	58	24	Unknown	$21,552	$365,889	24	561 0.106	194
CEDAR AVE	DOGWOOD AVE - OLD PHILADELPHIA A	2" MILL AND OVER LAY	62.8	25	Unknown	$25,466	$391,355	24	663 0.126	259
DOGWOOD AVE	CEDAR AVE - BIRCH AVE	2" MILL AND OVER LAY	49.9	26	Unknown	$12,255	$403,610	24	319 0.060	233
DOGWOOD AVE	BIRCH AVE - HOLLY AVE	2" MILL AND OVER LAY	58.8	27	Unknown	$12,439	$416,049	24	324 0.061	322
CARROLL AVE	GREENWOOD AVE - CENTRAL AVE	2" MILL AND OVER LAY	47.7	28	Unknown	$7,641	$423,690	24	199 0.038	395
PARK AVE	SPRUCE AVE - CRESCENT PL	2" MILL AND OVER LAY	71.2	172	Unknown	$1,287	$2,508,316	24	34 0.006	149

9/23/2016 9:33:57 AM Detail Report Major Repair Page 1 of 2

8.3 Report for Roads with Pothole

Roads with Pothole

Road Name	From/To	Repair Method/Override	PCI	Priority	Func Class	Repair Cost	Accum Cost	Width (ft)	Length (ft/mile)
JACKSON AVE	GLENSIDE DR - HOLTON LA	6" MILL AND OVER LAY	17.06	1	Unknown	$25,488	$25,488	24	254 0.048
LANE #2	HEATHER LA - HEATHER AVE	6" MILL AND OVER LAY	18.9	2	Unknown	$17,432	$42,920	24	173 0.033
LANE #2	HEATHER LA - HEATHER AVE	6" MILL AND OVER LAY	18.9	2	Unknown	$17,432	$42,920	24	173 0.033
KINGWOOD DR	NEW HAMPSHIRE AVE SERV RD - WILD	6" MILL AND OVER LAY	19.54	3	Unknown	$35,706	$78,626	24	355 0.067
LARCH AVE	650 ft (0.12 Mi) NW of HOPEWELL AVE -	6" MILL AND OVER LAY	19.81	4	Unknown	$10,666	$89,292	24	106 0.020
LARCH AVE	650 ft (0.12 Mi) NW of HOPEWELL AVE -	6" MILL AND OVER LAY	19.81	4	Unknown	$10,666	$89,292	24	106 0.020
HEATHER LA	HEATHER AVE - LANE #2	4" MILL AND OVER LAY	27.16	2	Unknown	$42,830	$63,977	24	599 0.113
HEATHER LA	HEATHER AVE - LANE #2	4" MILL AND OVER LAY	27.16	2	Unknown	$42,830	$63,977	24	599 0.113
HOLTON LA	HAMMOND AVE - NEW HAMPSHIRE AVE	4" MILL AND OVER LAY	30.08	4	Unknown	$18,270	$99,802	24	256 0.048
KIRKLYNN AVE	COLE AVE - GLENSIDE DR	4" MILL AND OVER LAY	30.65	7	Unknown	$29,341	$212,438	24	410 0.078
WILDWOOD DR	HOLTON LA - KINGWOOD DR	4" MILL AND OVER LAY	31.36	9	Unknown	$18,063	$247,993	24	253 0.048
ALLEY #4	NEW HAMPSHIRE AVE SERV RD - Dead	4" MILL AND OVER LAY	35.33	11	Unknown	$39,542	$304,899	24	553 0.105
WINDING HILL WAY	Dead End - Dead End	4" MILL AND OVER LAY	36.32	13	Unknown	$38,811	$438,736	24	543 0.103
WINDING HILL WAY	Dead End - Dead End	4" MILL AND OVER LAY	36.32	13	Unknown	$38,811	$438,736	24	543 0.103
MAPLE AVE	PHILADELPHIA AVE - GRANT AVE	4" MILL AND OVER LAY	38.77	27	Unknown	$21,065	$809,284	24	295 0.056
POPLAR AVE	4TH AVE - GUDE AVE	4" MILL AND OVER LAY	40.25	30	Unknown	$32,514	$909,993	24	455 0.086
HOUSTON AVE	BRIGHTON AVE - KENNEBEC AVE	4" MILL AND OVER LAY	42.82	39	Unknown	$54,881	$1,175,848	24	767 0.145
ROANOKE AVE	HOUSTON AVE - HUDSON AVE	4" MILL AND OVER LAY	42.83	42	Unknown	$36,193	$1,240,656	24	506 0.096
CARROLL AVE	GARLAND AVE - GARLAND AVE	4" MILL AND OVER LAY	43.48	35	Unknown	$9,576	$1,059,981	24	134 0.025
CEDAR AVE	Dead End - TULIP AVE	2" MILL AND OVER LAY	45.71	22	Unknown	$20,493	$327,590	24	534 0.101
SECOND AVE	COCKERVILLE AVE - ALLEGHENY AVE	2" MILL AND OVER LAY	46.08	10	Unknown	$13,591	$164,421	24	354 0.067
WOODLAND AVE	ELM AVE - CIRCLE AVE	2" MILL AND OVER LAY	46.47	76	Unknown	$21,347	$1,126,625	24	556 0.105

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8.4 Sample Detailed Road Report

Detailed road report for specific road segment can be generated from the software as the following.

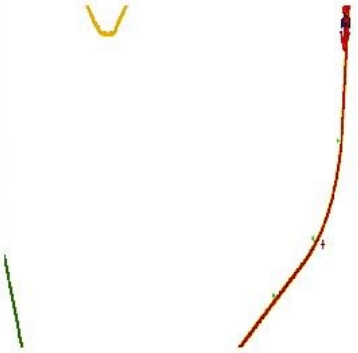
MAPLE AVE

GRANT AVE - LEE AVE

Segment ID 279

Repair_Method	*Width (ft)*	*Length (Ft)*	*PCI*	*Functional Class*	*Priority_Rank*	*Repair_Cost*
2" MILL AND OVER LAY	24	340	51.97	Unknown	101	$13,050

LONG/TRANS CRACKING	Low	6.96%
LONG/TRANS CRACKING	Medium	1.40%
LONG/TRANS CRACKING	High	0.23%
ALLIGATOR CRACKING	Low	0.28%
ALLIGATOR CRACKING	Medium	3.25%
RAVELING	High	2.91%



8.5 Recommended Repair Report for Year 2017

Report for Budgeted Repair Work

Road Name	From/To	Repair Method/Override	PCI	Priority	Func Class	Repair Cost	AccumCost	Width (ft)	Length (ft/mile)	Segment ID
		2017	**Total:**			**$488,941**				
6" MILL AND OVER LAY			**Sub Total:**			**$17,432**		**173** Ft	**0.03** Mi	
LANE #2	HEATHER LA-HEATHER AVE	6" MILL AND OVER LAY	19	2	Unknown	$17,432	$17,432	24	173 0.033	327
4" MILL AND OVER LAY			**Sub Total:**			**$46,532**		**651** Ft	**0.12** Mi	
HEATHER LA	LANE #2-GLENGARY	4" MILL AND OVER LAY	23	1	Unknown	$21,148	$21,148	24	296 0.056	328
HOLTON LA	WILDWOOD DR-HAMMOND AVE	4" MILL AND OVER LAY	22	3	Unknown	$16,654	$37,702	24	232 0.044	396
GLENSIDE DR	HAVERFORD DR-GLENSIDE DR	4" MILL AND OVER LAY	36	20	Unknown	$8,830	$46,532	24	124 0.023	119
2" MILL AND OVER LAY			**Sub Total:**			**$424,977**		**11,067** Ft	**2.10** Mi	
GENEVA AVE	HILLTOP RD-RITCHIE AVE	2" MILL AND OVER LAY	48	1	Unknown	$45,924	$45,924	24	1,196 0.226	409
CRESCENT PL	CRESCENT PL-PARK AVE	2" MILL AND OVER LAY	49	2	Unknown	$9,356	$55,279	24	244 0.046	150
MONTGOMERY AVE	PINE AVE-HICKORY AVE	2" MILL AND OVER LAY	49	3	Unknown	$26,443	$81,722	24	689 0.130	91
BIRCH AVE	BARCLAY AVE-CEDAR AVE	2" MILL AND OVER LAY	50	4	Unknown	$8,987	$90,709	24	234 0.044	207
GRANT AVE	MAPLE AVE-Dead End	2" MILL AND OVER LAY	50	5	Unknown	$14,103	$104,812	24	367 0.070	281
CIRCLE AVE	COCKERVILLE AVE-Dead End	2" MILL AND OVER LAY	51	6	Unknown	$8,084	$112,896	24	211 0.040	34
KENTLAND AVE	Dead End-HOPEWELL AVE	2" MILL AND OVER LAY	50	7	Unknown	$13,251	$126,147	24	345 0.065	139
KENTLAND AVE	HOPEWELL AVE-Dead End	2" MILL AND OVER LAY	52	8	Unknown	$7,168	$133,315	24	187 0.035	122
ASPEN AVE # 2	BOYD AVE-LINCOLN AVE	2" MILL AND OVER LAY	51	9	Unknown	$17,515	$150,830	24	456 0.086	221
SECOND AVE	COCKERVILLE AVE-ALLEGHENY AVE	2" MILL AND OVER LAY	46	10	Unknown	$13,591	$164,421	24	354 0.067	46
SECOND AVE	ALLEGHENY AVE-WESTMORELAND AV	2" MILL AND OVER LAY	58	11	Unknown	$12,639	$177,060	24	329 0.062	35
CHANEY DR	FLOWER AVE-Dead End	2" MILL AND OVER LAY	52	12	Unknown	$11,759	$188,819	24	306 0.058	307
S MANOR CIR	Dead End-N MANOR CIR	2" MILL AND OVER LAY	52	13	Unknown	$14,550	$203,369	24	379 0.072	195
CHESTNUT AVE	HODGES LA-GRANT AVE #2	2" MILL AND OVER LAY	52	14	Unknown	$7,597	$210,966	24	198 0.037	358

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Road Name	From/To	Repair Method/Override	PCI	Priority	Func Class	Repair Cost	AccumCost	Width (ft)	Length (ft/mile)	Segment ID
ASPEN AVE	ASPEN CT-Dead End	2" MILL AND OVER LAY	53	15	Unknown	$8,376	$219,342	24	218 0.041	330
ASPEN AVE	Dead End-ASPEN CT	2" MILL AND OVER LAY	54	16	Unknown	$10,125	$229,467	24	264 0.050	258
SUGO MILL RD	ORCHARD AVE-SHERIDAN ST	2" MILL AND OVER LAY	47	17	Unknown	$14,373	$243,840	24	374 0.071	9
SUGO MILL RD	SHERIDAN ST-Dead End	2" MILL AND OVER LAY	59	18	Unknown	$16,778	$260,618	24	437 0.083	19
GLENSIDE CT #2	GLENSIDE DR-Dead End	2" MILL AND OVER LAY	53	19	Unknown	$8,045	$268,663	24	210 0.040	418
ROANOKE AVE	KENNEBEC AVE-HOUSTON AVE	2" MILL AND OVER LAY	54	20	Unknown	$21,392	$290,054	24	557 0.106	470
HOPEWELL AVE	KENTLAND AVE-LARCH AVE	2" MILL AND OVER LAY	54	21	Unknown	$17,043	$307,097	24	444 0.084	125
CEDAR AVE	Dead End-TULIP AVE	2" MILL AND OVER LAY	46	22	Unknown	$20,493	$327,590	24	534 0.101	148
CEDAR AVE	BIRCH AVE-DOGWOOD AVE	2" MILL AND OVER LAY	51	23	Unknown	$16,747	$344,337	24	436 0.083	218
CEDAR AVE	TULIP AVE-BIRCH AVE	2" MILL AND OVER LAY	58	24	Unknown	$21,552	$365,889	24	561 0.106	194
CEDAR AVE	DOGWOOD AVE-OLD PHILADELPHIA AV	2" MILL AND OVER LAY	63	25	Unknown	$25,466	$391,355	24	663 0.126	259
DOGWOOD AVE	CEDAR AVE-BIRCH AVE	2" MILL AND OVER LAY	50	26	Unknown	$12,255	$403,610	24	319 0.060	233
DOGWOOD AVE	BIRCH AVE-HOLLY AVE	2" MILL AND OVER LAY	59	27	Unknown	$12,439	$416,049	24	324 0.061	322
CARROLL AVE	GREENWOOD AVE-CENTRAL AVE	2" MILL AND OVER LAY	48	28	Unknown	$7,641	$423,690	24	199 0.038	385
PARK AVE	SPRUCE AVE-CRESCENT PL	2" MILL AND OVER LAY	71	172	Unknown	$1,287	$424,977	24	34 0.006	146

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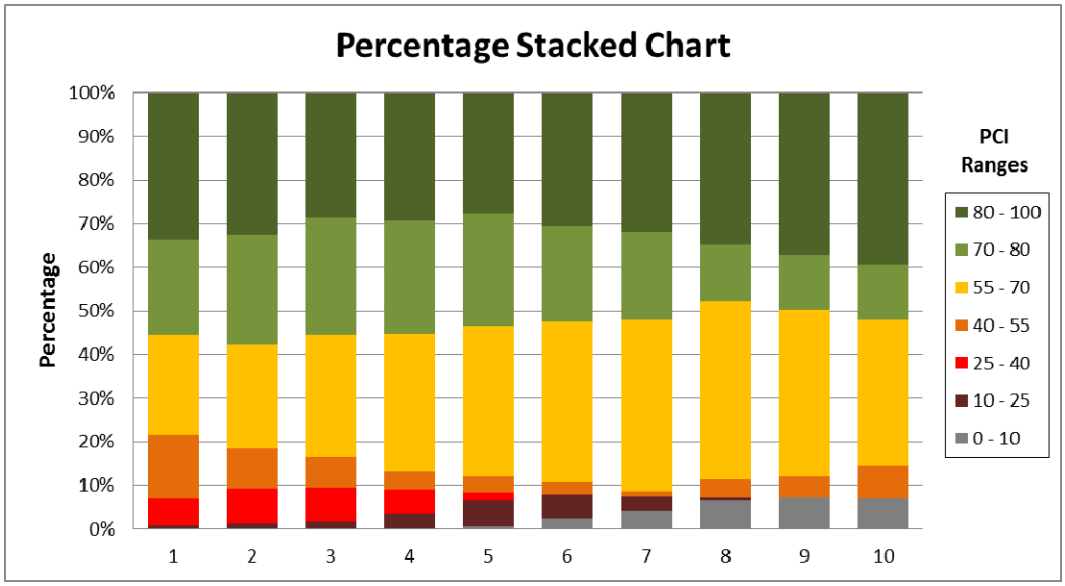
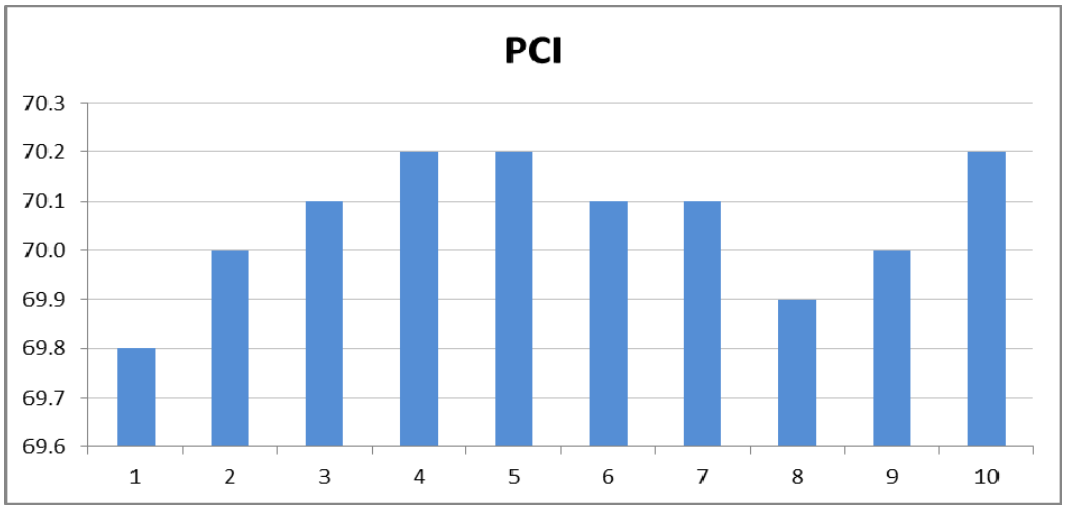
9. Pavement Condition Optimization

Shown below is the pavement condition optimization module that displays the pavement condition information for the next ten years. The optimized budget allocation of $500,000 per year is applied for both preventive maintenance and major repair throughout the City of Takoma Park, Maryland.





Overall PCI rating for the next ten years

10. Conclusion

The pavement condition rating and the initial analysis parameters is only the beginning of a fully successful pavement management program. Only a select number of strategies were populated to show the concepts and methods. With continued training and use, the City will have the opportunity to refine and complete the parameters used in the pavement management activities.

11. Appendix