Law Director
THOMAS LOBE, L.P.A.
Director of Finance
FRANK J. BRICHACEK, JR.
Assistant Finance Director
DEBBIE DOLES
Engineer
PIETRO A. DI FRANCO, P.E., SI.
LEED AP, CPESC
Building Commissioner
FREDRIC WYSS, JR.
Safety Director
ROBERT M. WEGER

City of Willoughby Hills

35405 Chardon Road, Willoughby Hills, Ohio 44094-9195
Phone (440) 946-1234 FAX 975-3535

Robert M. Weger, Mayor

Council
CHRISTOPHER L. BIRO
NANCY E. FELLOWS
DAVID M. FIEBIG
JENNIFER SOMMERS GREER
CHRISTOPHER HALLUM
JOHN PLECNIK
RAYMOND C. SOMICH

Council Clerk
VICTORIA A. SAVAGE, CMC

Memorandum

TO:	Robert Weger	- Mayor
FROM:	Pietro DiFranco, P.E.	- City Engineer
DATE:	April 7, 2015	
CC:	Tom Lobe Frank Brichacek Mark Grubiss	- Director of Law - Director of Finance - Service Department Superintendent
RE:	Contractor Award Recommendation Pleasant Valley Rd Resurfacing	

Attached, please find the tabulation and evaluation of bids received for the above referenced project.

Contract award is recommended to Specialized Construction, Inc., as the lowest and best bidder, in the amount of $160,868.25, with alternates, which is below the published Engineer's Estimate of $169,000.00.

The alternate bid includes recycling and rejuvenation of the existing asphalt pavement, which will significantly strengthen the pavement, extend its service life, and reduce the amount of future preventative maintenance and repairs.

Feel free to contact me with any questions or comments.

Attachments:
1. Bid Evaluation
2. Bid Tabulation
3. Structural Number (SN) Comparison: (Mill & Overlay) vs. (Recycle & Overlay)
4. Intro pages 1-4 of "Basic Asphalt Recycling Manual", 2001, FHA & ARRA

City of Willoughby Hills Bid Evaluation Form

Project:
PLEASANT VALLEY RD
RESURFACING

Date: 4/7/15
(Bid Opening Date: 3/26/15 @ 11:30 AM)

No.	Bidders	Form	Bond	NC Affidavit	BQ	DTA	Addendums	Preliminary Const. Sched.	AOS Findings for Recovery*	Bid Amount (BASE)	Bid Amount (ALT)	Earliest Start Date	Consecutive Days to Completion
1	Ronyak Paving, Inc.	X	X	X	X	X	1			$132,769.75	$170,754.05	05/15/15	30
2	Chagrin Valley Paving, Inc.	X	X	X	X*1	X	1			$143,756.25	$175,644.50	05/01/15	60
3	Barbicas Construction Co., Inc.	X	X	X	X	X	1			$147,511.50	$257,326.45	04/20/15	45
4	Specialized Construction, Inc.	X	X	X	X	X	1			$152,035.00	$160,868.25	05/04/15	55
5	Burton Scot Contractors, LLC	X	X	X	X*1	X*2	1			$170,598.00	$227,068.55	05/04/15	60
6	Karvo Paving Company	X	X	X	X	X	1			$178,454.25	$187,414.25	05/26/15	60
7													
8													
9													
10													
11													
12													
13													
14													
	Engineer's Opinion of Probable Construction Cost									$169,000.00			

* Auditor of State (AOS) Findings of Recovery confirmation only required per ORC section 9.24 for municipal projects receiving state or federal funding.

Notes:
*1 Missing corporate seal
*2 Missing notary seal

Reference Checks:
Specialized Construction has past experience working with City and Engineer.

Contractor Phone Interview:
N/A

Recommendation:
I, Pietro DiFranco, P.E., City Engineer, recommend to the Mayor/Service Director award of the above referenced project to Specialized Construction, Inc. with the lowest and best bid with alternates of **$160,868.25**.

City of Willoughby Hills
Pleasant Valley Rd Resurfacing

BID TABULATION (Bid Opening on March 26, 2015 at 11:30 p.m.)

DATE: 3/26/15

No.	Description	Units	Quant.	Engineer's Estimate Unit Pr.	Engineer's Estimate Total	Ronyak Paving, Inc. 14376 N. Cheshire St. Burton, OH 44021 440-834-1058 Unit Pr.	Total	Chagrin Valley Paving, Inc. 17290 Munn Road Chagrin Falls, OH 44023 440-543-2253 Unit Pr.	Total	Barbicas Construction Co., Inc. 124 Darrow Rd Akron, OH 44305 330-733-9101 Unit Pr.	Total	Specialized Construction, Inc. 711 Harvard Ave Cuyahoga Hts, OH 44105 216-271-3363 Unit Pr.	Total	Burton Scot Contractors, LLC 11330 Kinsman Road Newbury, OH 44065 440-564-1011 Unit Pr.	Total	Karvo Paving Company 4524 Hudson Dr. Stow, OH 44224 330-929-9616 Unit Pr.	Total
1	Pre & Post Construction Photographs, SPCL	LS	1	$ 2,000.00	$ 2,000.00	$ 1,500.00	$ 1,500.00	$ 900.00	$ 900.00	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 1,000.00	$ 900.00	$ 900.00	$ 900.00	$ 900.00
2	Mobilization, ODOT ITEM 624	LS	1	$ 8,000.00	$ 8,000.00	$ 5,500.00	$ 5,500.00	$ 30,330.00	$ 30,300.00	$ 10,000.00	$ 10,000.00	$ 5,000.00	$ 5,000.00	$ 10,000.00	$ 10,000.00	$ 20,000.00	$ 20,000.00
3	2" Asphalt Milling with Removal & Disposal, ODOT ITEM 254	SY	5,685	$ 4.50	$ 25,582.50	$ 1.65	$ 9,380.25	$ 1.25	$ 7,106.25	$ 2.05	$ 11,654.25	$ 3.00	$ 17,055.00	$ 3.00	$ 17,055.00	$ 2.45	$ 13,928.25
4	Pavement Interlayer ODOT ITEM 422 Chip Seal with Polymer Binder and Aggregate Modification (over 3/8")	SY	5,685	$ 2.40	$ 13,644.00	$ 2.50	$ 14,212.50	$ 3.00	$ 17,055.00	$ 3.75	$ 21,318.75	$ 3.00	$ 17,055.00	$ 4.15	$ 23,592.75	$ 3.00	$ 17,055.00
5	Partial Depth Pavement Repair (Ave. 4" depth), ODOT ITEM 251	SY	600	$ 50.00	$ 30,000.00	$ 35.00	$ 21,000.00	$ 30.00	$ 18,000.00	$ 40.00	$ 24,000.00	$ 40.00	$ 24,000.00	$ 30.00	$ 18,000.00	$ 45.00	$ 27,000.00
6	Aggregate Base [illegible], ODOT ITEM 411	CY	25	$ 50.00	$ 1,250.00	$ 40.00	$ 1,000.00	$ 35.00	$ 875.00	$ 45.00	$ 1,125.00	$ 30.00	$ 750.00	$ 90.00	$ 2,250.00	$ 35.00	$ 875.00
7	Asphalt Concrete Surface Course (1-1/2"), ODOT ITEM 448, Type 1, PG 64-22	CY	198	$ 180.00	$ 35,640.00	$ 158.00	$ 31,284.00	$ 142.00	$ 28,116.00	$ 160.00	$ 31,680.00	$ 175.00	$ 34,650.00	$ 200.00	$ 39,600.00	$ 186.00	$ 36,828.00
8	Asphalt Concrete Intermediate Course, (1-1/4") ODOT ITEM 448, Type 2, PG 64-22	CY	277	$ 160.00	$ 44,320.00	$ 125.00	$ 34,625.00	$ 114.00	$ 31,578.00	$ 130.00	$ 36,010.00	$ 155.00	$ 42,935.00	$ 150.00	$ 41,550.00	$ 146.00	$ 40,442.00
9	Tack Coat Between Intermediate and Surface Courses of Asphalt, 0.05 gal per SY, ODOT Item 407	Gal	285	$ 2.00	$ 570.00	$ 2.00	$ 570.00	$ 2.00	$ 570.00	$ 2.50	$ 712.50	$ 2.00	$ 570.00	$ 1.85	$ 527.25	$ 2.00	$ 570.00
10	Valve Box Adjusted to Grade, ODOT ITEM 611	EA	1	$ 200.00	$ 200.00	$ 650.00	$ 650.00	$ 400.00	$ 400.00	$ 75.00	$ 75.00	$ 50.00	$ 50.00	$ 550.00	$ 550.00	$ 100.00	$ 100.00
11	Monument Box Adjusted to Grade, ODOT ITEM 611	EA	1	$ 200.00	$ 200.00	$ 650.00	$ 650.00	$ 750.00	$ 750.00	$ 100.00	$ 100.00	$ 50.00	$ 50.00	$ 675.00	$ 675.00	$ 100.00	$ 100.00
12	24" Stop Line, Type 2, ODOT ITEM 644	LF	64	$ 7.00	$ 448.00	$ 5.00	$ 320.00	$ 4.00	$ 256.00	$ 4.00	$ 256.00	$ 5.00	$ 320.00	$ 5.00	$ 320.00	$ 4.00	$ 256.00
13	4" Yellow Double Center Line, ODOT ITEM 644	MI	0.44	$ 1,200.00	$ 528.00	$ 2,450.00	$ 1,078.00	$ 2,500.00	$ 1,100.00	$ 2,000.00	$ 880.00	$ 2,500.00	$ 1,100.00	$ 2,450.00	$ 1,078.00	$ 2,500.00	$ 1,100.00
14	Maintaining Traffic, ODOT ITEM 614	LS	1	$ 6,000.00	$ 6,000.00	$ 9,500.00	$ 9,500.00	$ 6,000.00	$ 6,000.00	$ 7,500.00	$ 7,500.00	$ 7,000.00	$ 7,000.00	$ 12,000.00	$ 12,000.00	$ 17,300.00	$ 17,300.00
15	Asphalt Concrete for Maintained Traffic, SPCL	CY	10	$ 25.00	$ 250.00	$ 150.00	$ 1,500.00	$ 75.00	$ 750.00	$ 120.00	$ 1,200.00	$ 50.00	$ 500.00	$ 250.00	$ 2,500.00	$ 200.00	$ 2,000.00
16				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
17				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
18				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
19				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
20				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
21				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
22				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
23				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
24				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
25				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
26				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
27				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
28				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
29				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
30				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
31				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
32				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
33				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
34				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
35				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
36				$ -	$ -		$ -		$ -		$ -		$ -		$ -		$ -
37																	
	BID TOTALS (Base)				$ 158,632.50		$ 133,709.75		$ 143,756.25		$ 147,511.50		$ 152,035.00		$ 176,508.00		$ 178,454.25

No.	ALTERNATES Description	Units	Quant.	Engineer's Estimate Unit Pr.	Total	Ronyak Paving, Inc. Unit Pr.	Total	Chagrin Valley Paving, Inc. Unit Pr.	Total	Barbicas Construction Co., Inc. Unit Pr.	Total	Specialized Construction, Inc. Unit Pr.	Total	Burton Scot Contractors, LLC Unit Pr.	Total	Karvo Paving Company Unit Pr.	Total
3A	Single Pass Asphalt Recycling, SPCL	SY	5,685	$ 4.50	$ 25,582.50	$ 8.50	$ 48,322.50	$ 7.25	$ 41,216.25	$ 15.65	$ 88,970.25	$ 6.00	$ 34,110.00	$ 5.11	$ 29,050.35	$ 6.00	$ 34,110.00
4A	Cyclean [illegible], SPCL	Gal	14,213	$ 3.00	$ 42,639.00	$ 2.35	$ 33,400.55	$ 2.25	$ 31,979.25	$ 5.40	$ 76,750.20	$ 2.25	$ 31,979.25	$ 6.00	$ 85,278.00	$ 2.25	$ 31,979.25
5A	Tack Coat Between Base & Intermediate Courses of Asphalt, 0.075 gal per SY, ODOT Item 407	Gal	427	$ 2.00	$ 854.00	$ 2.00	$ 854.00	$ 2.00	$ 854.00	$ 2.50	$ 1,067.50	$ 2.00	$ 854.00	$ 1.85	$ 789.95	$ 2.00	$ 854.00
	ALTERNATE SUB-TOTALS				$ 69,075.50		$ 82,577.05		$ 74,049.50		$ 166,787.95		$ 66,943.25		$ 115,118.30		$ 66,943.25
	BID TOTALS (w/ALTERNATE = BASE - Items 3-4-5 + ALTS)				$ 168,481.50		$ 170,754.05		$ 175,644.50		$ 257,326.45		$ 160,868.25		$ 227,068.55		$ 187,414.25

Notes:

STRUCTURAL NUMBER (SN) COMPARISON: (MILL & OVERLAY) VS. (RECYCLE & OVERLAY)

Prepared By: Pietro DiFranco

Date: 4/7/2015

THEORETICAL ASSUMPTIONS FOR EXAMPLE		
Functional Classification	7 (Local Road)	NOACA
Average Daily Traffic	1,750	Google Earth (Eddy)
Subgrade CBR	5	Average Assumed
Number of Lanes	2	Local
24-Hour Truck %	18%	ODOT Section 402-1
Directional Distribution (%D)	0.50	ODOT Table 202-1
Lane Factor (%LF)	95%	ODOT Table 202-1
Ratio of B:C (Commercial Vehicles)	2:1	ODOT Table 202-1
ESAL Conversion Factor (CF)	0.79 & 0.48	ODOT Table 202-1
Reliability Level	85%	ODOT Fig. 201-1
Overal Standard Deviation	0.49	ODOT Fig. 201-1
Design Serviceability Loss	2.0	ODOT Table 201-1

Original Pavement (Assumed)

Inches		C	SN
3.5	Asphalt Surface Course	0.43	1.51
5.0	Asphalt Base Course	0.36	1.80
6.0	Aggregate Base	0.14	0.84
14.5			4.15

Base Bid (Mill 2" Away & Overlay 3" New)

Inches		C	SN
3.0	Asphalt Surface Course	0.43	1.29
6.5	Ex. Asphalt - Oxidized & Weathered	0.23	1.50
6.0	Aggregate Base	0.14	0.84
15.5			3.63

Alternate Bid (Recycle 6" & Overlay 3")

Inches		C	SN
3.0	Asphalt Surface Course	0.43	1.29
6.0	Recycled & Rejuvenated Asphalt	0.36	2.16
2.5	Ex. Asphalt - Oxidized & Weathered	0.23	0.58
6.0	Aggregate Base	0.14	0.84
17.5			4.87

B-ESAL = (ADT) x (%T24) x (%D) x (%LF) x (%B) x (CF)
= (1,750) x (0.18) x (0.50) x (0.95) x (2/3) (0.79) = 78.8

C-ESAL = (ADT) x (%T24) x (%D) x (%LF) x (%C) x (CF)
= (1,750) x (0.18) x (0.50) x (0.95) x (1/3) (0.48) = 23.94

TOTAL = 78.8 + 23.9 = 102.7 ESAL / Day

ESAL Design Period = (102.7 ESAL / Day) x (365.25 days / year) x (20 years) = 750,223 ESAL

Using ODOT Design Charts 402-2 & 402-3, SN = 3.2 < 3.40, therefore OK

Using ODOT Design Charts 402-2 & 402-3, SN = 4.87, & Working Backwards:

ESAL Design Period = (102.7 ESAL / Day) x (365.25 days / year) x (# years) = 8,000,000 ESAL

= Theoretical Design Service Life increases by 10-fold when compared to mill & overlay, however should not be assumed to realistically last over 100 years, since many factors affect Service Life, including subgrade, weather, surface & subsurface drainage, traffic characteristics, design characteristics, construction quality, material quality, regular preventative maintenance & repairs, etc... However this can be interpreted as extending Service life, reducing future maintenance, and re-using existing resources and ,minimizing waste.

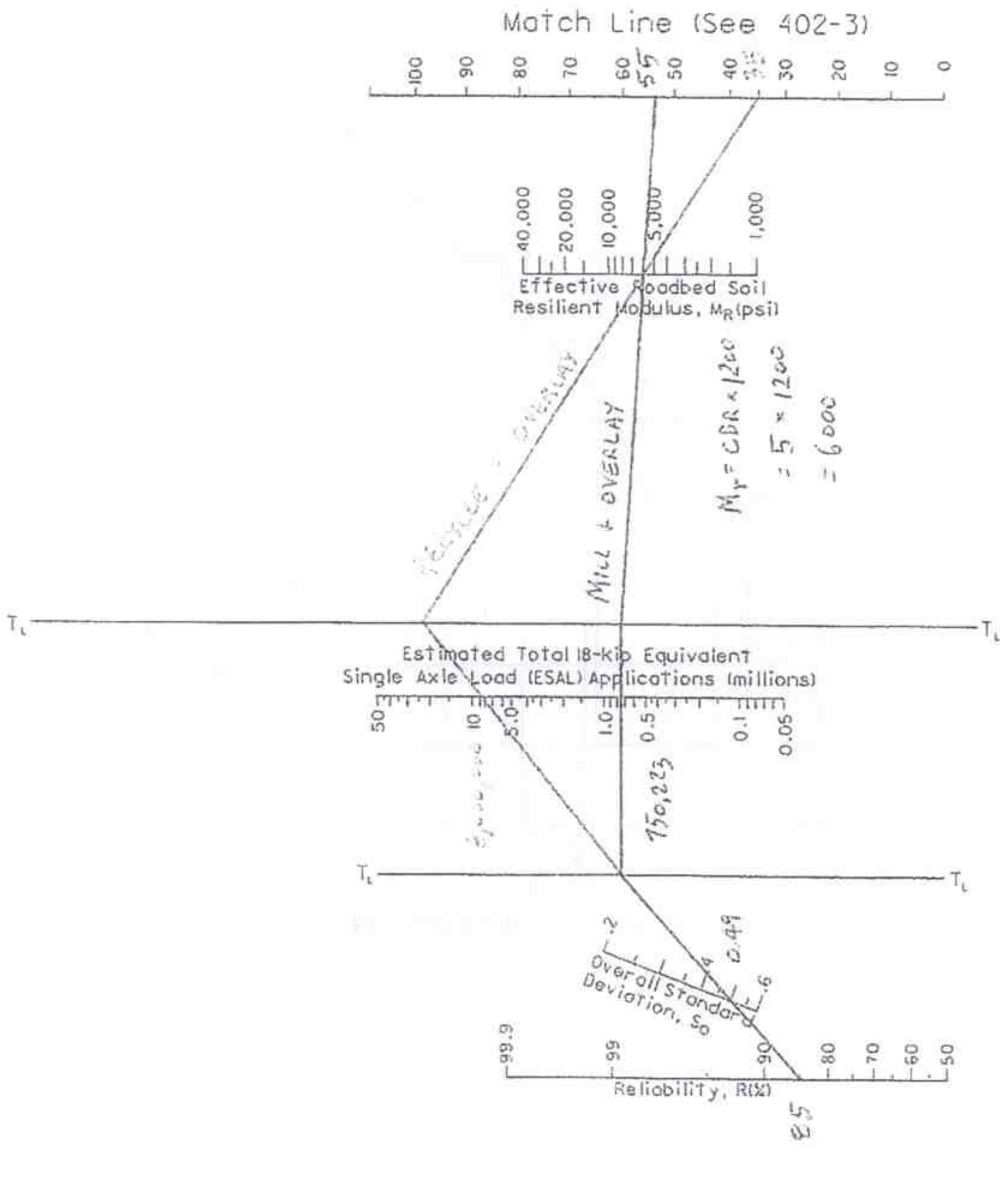
Conclusions:

1 The Alternate Bid option (Recycle & Overlay) results in 2 additional inches of pavement compared to the Base Bid (Mill & Overlay), or 13% more; and 3 additional inches compared to the existing Original Pavement.
2 The Alternate Bid option (Recycle & Overlay) results in a structural number (SN) 1.24 units greater than the Base Bid (Mill & Overlay), or 34% more; and is greater than the Original Pavement design.
3 The Alternate Bid option (Recycle & Overlay) rejuvenates and re-uses the existing aspahlt, reduces waste to be hauled away in the Base Bid (Mill & Overlay), and seals the recycled asphalt base course, thereby extending the service life & reducing maintenance.

References:

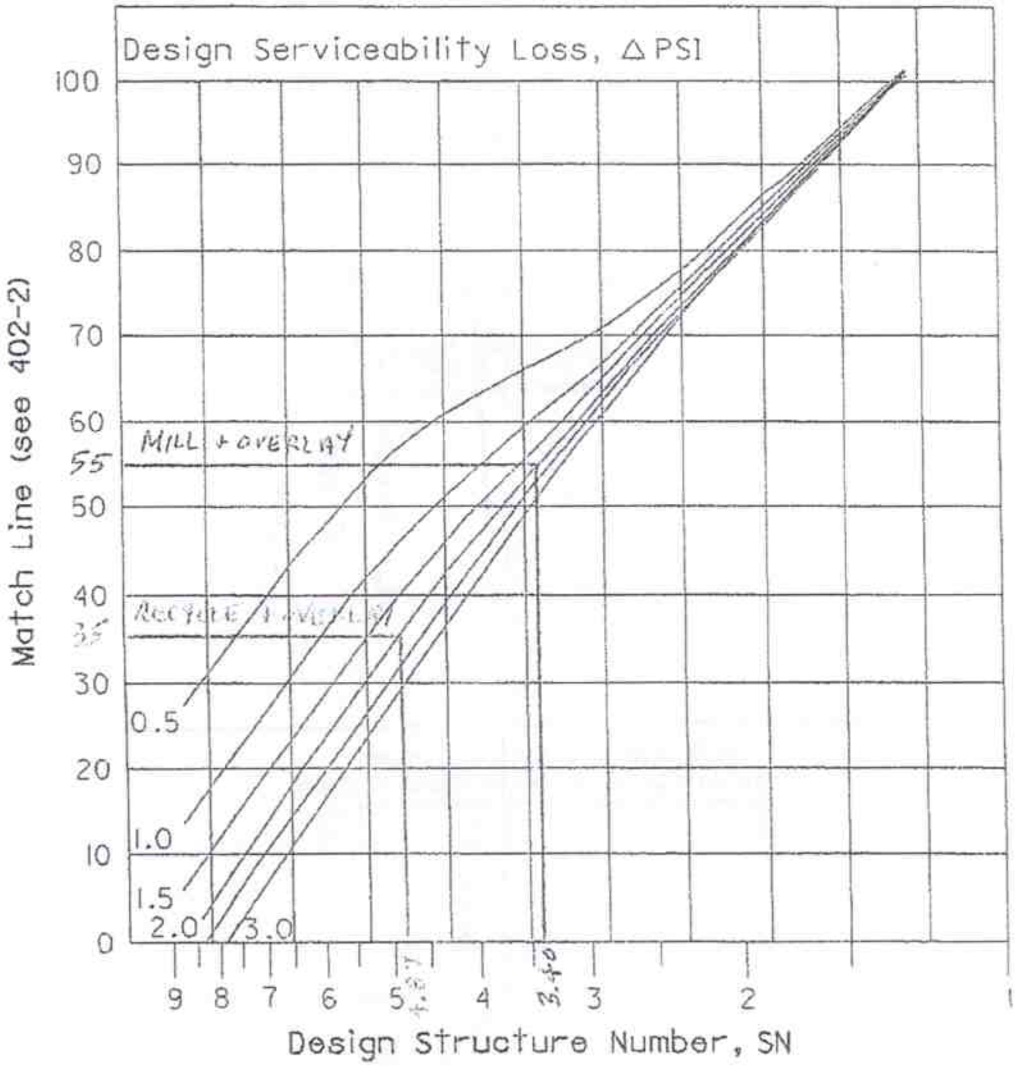
1 Pavement Design Manual, 2014 - Ohio Department of Transportation (ODOT)
2 Basic Asphalt Recycling Manual, 2001 - Federal Highway Administration (FHA) & Asphalt Recycling and Reclamation Association (ARRA)

Flexible Pavement Design Chart Segment 1	402-2 July 2008
	Reference Section & Figure 402, 402-1(step 3)



DiFranco
4/7/2015

Flexible Pavement Design Chart Segment 2	402-3 July 2008
	Reference Section & Figure 402, 402-1(step 3)



DiFranco
4/7/2015

BOOKMARKS

Chapter 1

INTRODUCTION

The growing demand on our nation's roadways over that past couple of decades, decreasing budgetary funds, and the need to provide a safe, efficient, and cost effective roadway system has led to a dramatic increase in the need to rehabilitate our existing pavements. The last 25 years has also seen a dramatic growth in asphalt recycling and reclaiming as a technically and environmentally preferred way of rehabilitating the existing pavements. Asphalt recycling and reclaiming meets all of our societal goals of providing safe, efficient roadways, while at the same time drastically reducing both the environmental impact and energy (oil) consumption compared to conventional pavement reconstruction.

The Board of Directors of the Asphalt Recycling and Reclaiming Association (ARRA), in their ongoing commitment of enhancing and expanding the use of asphalt recycling and reclaiming, recognized a need for a "Basic Asphalt Recycling Manual". The manual was needed in order to expose more owners, specifying agencies, consultants, and civil engineering students to the value and current methods of asphalt recycling. To fill that need, this manual was produced to serve as a handy one-stop reference to those starting out in one of the various forms of asphalt recycling. In addition, it is hoped that this manual will provide additional useful information to those already involved in asphalt recycling.

This manual is not written in such detail so that one could use it to completely evaluate, design, specify, and/or construct an asphalt recycling project. It does however, provide information on:

- various asphalt recycling methods
- benefits and performance of asphalt recycling
- procedures for evaluation potential projects
- current mix design philosophies
- construction equipment requirements and methods
- Quality Control/Quality Assurance, inspection and acceptance techniques
- specification requirements
- definitions and terminology

Sufficient information is provided so that a rational decision can be made with respect to the feasibility and/or cost benefits of asphalt recycling. From that point, detailed design issues will need to be addressed by those experienced in asphalt recycling techniques prior to the final project design, advertising, tendering or letting and construction.

Asphalt recycling provides an additional rehabilitation method for maintaining existing roadways. The benefits of asphalt recycling include:

- reuse and conservation of non-renewable natural resources
- preservation of the environment and reduction in land filling
- energy conservation
- reduction in user delays during construction

- shorter construction periods
- increased level of traffic safety within construction work zone
- preservation of existing roadway geometry and clearances
- corrections to pavement profile and cross-slope
- no disturbance of the subgrade soils unless specifically planned such as for Full Depth Reclamation (FDR)
- improved pavement smoothness
- improved pavement physical properties by modification of existing aggregate gradation, and asphalt binder properties
- mitigation or elimination of reflective cracking with some methods
- improved roadway performance
- cost savings over traditional rehabilitation methods

It is important to recognize that asphalt recycling is a powerful method to rehabilitate pavements. When properly applied, it has long term economic benefits—allowing owner agencies to stretch their available funds while providing the traveling public with a safe and reliable driving surface.

It is also important to recognize that, although asphalt recycling technology and methods has advanced, not all roadways are appropriate candidates for asphalt recycling. With the almost endless supply of roadways needing rehabilitation, it would be a disservice to the public and the industry to use poor judgement in attempting an inappropriate recycling project. Hopefully, with this manual and the advice of those experienced in asphalt recycling, only projects that are suitable candidates will be undertaken.

The primary focus of the manual is on the in-place and cold recycling of asphalt pavements. Hot recycling of asphalt pavements through various types of asphalt plants is a well established recycling method. There is a wide variety of information on the subject available from well established sources and therefore has not been covered in any detail in this manual.

1.1 BACKGROUND

Population growth and economic development have resulted in an extensive network of asphalt paved roadways in the last 50 to 70 years. Many thousand of miles (kilometers) were constructed to meet the demands of increased traffic and the majority of these roads are near/at/or past the end of their original design life.

When the roadway network was rapidly expanding, the initial construction cost was the most important issue, with little or no attention being paid to the ongoing maintenance costs. However, as the roadway network has matured, as the traffic volume and gross vehicle weights have increased, and as funds have become more tightly budgeted, increased emphasis has been placed on preventive maintenance and preservation of the existing roadways. In many jurisdictions, the funds available have not been able to keep pace with the increased preventive maintenance and preservation costs as the roadway network aged. This has resulted in a significant reduction in the condition and the level of service provided by the roadways within the network. This has in turn resulted in increased overall preventive maintenance and more expensive rehabilitation/reconstruction costs.

BOOKMARKS

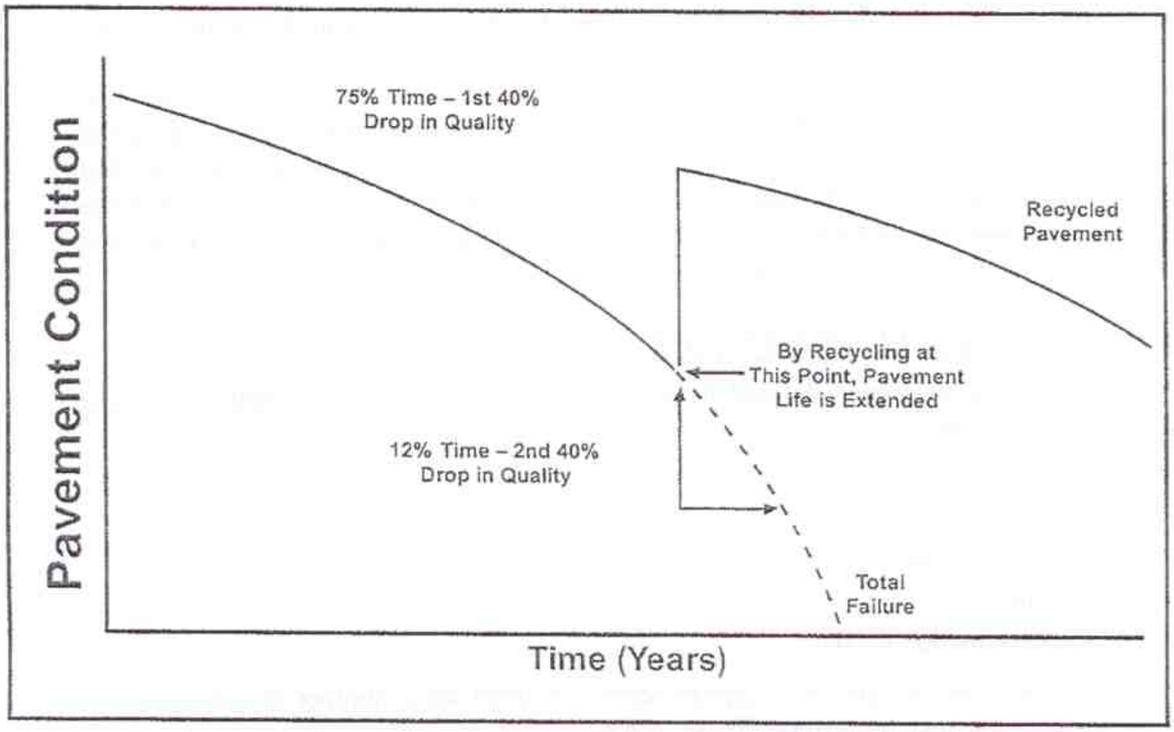


Figure 1-1: Pavement deterioration and recycling rehabilitation vs. time

It is well recognized that a sound infrastructure, including roadways, is required for a good economy with an adequate level of growth. Studies have indicated that if a roadway is maintained, at an acceptable level of service, it will ultimately cost the owner less. A World Bank study indicates that each \$1.00 expended at the first 40 percent drop in roadway quality will result in a savings of \$3.00 to \$4.00 compared to the expenditure which would be required at the 80 percent drop in quality, as indicated in Figure 1-1.

Since funding for preventive maintenance, preservation, rehabilitation, and reconstruction of roadways will have to compete with other demands on the public purse, innovation is required in order to do more with less. Asphalt recycling is one way of increasing the effectiveness of existing budgets in order to maintain, preserve, rehabilitate and reconstruct more miles (kilometers) of roadway for each dollar spent.

Asphalt recycling is not a new concept. Cold recycling/rehabilitation of roadways with asphalt binders dates to the early 1900's. The first documented case of asphalt recycling, in the form of Hot In-Place Recycling (HIR), was reported in the literature of the 1930's. However, only moderate advancements in asphalt recycling technology and equipment occurred until the mid 1970's

Two events of the 1970's rekindled the interest in asphalt recycling which has resulted in its worldwide use today. The petroleum crisis of the early 1970's and the development and introduction in 1975 of large scale cold planing equipment, complete with easily replaceable tungsten carbide milling tools, were the catalyst for renewed interest in asphalt recycling. Since that time, the equipment manufacturing and construction industries have been proactive in the development of asphalt recycling methods and technologies which have advanced exponentially in the last 25 years.

Society has become increasingly aware of the effects of all types of development on the environment. Many countries have already enacted legislation which requires that certain percentages of materials, particularly the ones used in roadway construction and rehabilitation, must be recycled or include recycled materials. By demonstrating the technical viability, the savings in energy and non-renewable natural resource (crude oil and granular materials) and the cost savings associated with asphalt recycling, progress towards one of society's goals of environmentally responsible construction processes will be achieved. It is noted, that asphalt pavements are presently the most commonly recycled material in North America.

1.2 ASPHALT RECYCLING METHODS

Five broad categories have been defined by ARRA to describe the various asphalt recycling methods. These categories are:

- Cold Planing (CP)
- Hot Recycling
- Hot In-Place Recycling (HIR)
- Cold Recycling (CR)
- Full Depth Reclamation (FDR)

Within these five broad categories of asphalt recycling, there are a number of sub-categories which further define asphalt recycling. These include:

- HIR
    - Surface Recycling (Resurfacing)
    - Remixing
    - Repaving
- CR
    - Cold In-Place Recycling (CIR)
    - Cold Central Plant Recycling (CCPR)
- FDR
    - Pulverization
    - Mechanical stabilization
    - Bituminous stabilization
    - Chemical stabilization

In addition, asphalt recycling methods can be used in conjunction with one another on some roadway rehabilitation projects. For instance, an existing roadway could have an upper portion removed via CP and the resultant Reclaimed Asphalt Pavement (RAP) could be stockpiled at the asphalt plant. The cold planed surface, once prepared, could be overlaid with hot mix asphalt (HMA) containing the RAP from the milled off layer. Alternatively, prior to the placement of the recycled mix, the exposed CP surface could have been HIR, CIR or FDR in order to mitigate or eliminate the effects of reflective cracking.