

The Use of RAP at The City of Phoenix

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Historical RAP Usage in Phoenix

“The Land of No RAP”

Agency	RAP Usage				Specifications
	Asphalt Concrete		Unbound Base	Other	
	Surface	Non-surface			
ADOT	Yes	Yes	Yes	Miscellaneous asphaltic concrete	ADOT's Policy and Procedure Directive No.20 for the use of RAP in asphaltic concrete
CALTRANS	Yes	Yes	Yes	Shoulder backing	2015 California State Transportation Agency, Department of Transportation, Caltrans, 2015
MAG	Yes	Yes	Yes	-	2017 Maricopa County DOT Supplement to the MAG Uniform Standard Specifications
City of Mesa	No	Yes	Yes	Shoulder Backfills	2016 Amendments to MAG Uniform Standard Specifications and EVAC
City of Phoenix	No	No	Conditional	Dust control; Dirt street stabilization	2015 City of Phoenix Supplement to 2015 MAG Uniform Standard Specifications

Adapted from Arredondo, ASU, 2018

- Dust Suppression and Mitigation - asphalt millings
 - Alleys
 - Shoulders
- Prohibited for use in pavement materials
- Industry attempts to convince Phoenix failed
 - General lack of trust - low bid procurement
 - No cost / benefit analysis
 - Unsure about quality of products
 - Lack of Performance Testing

Rethinking Value

The background features a dark grey field on the left and a complex, layered geometric pattern on the right. This pattern consists of overlapping triangles and polygons in various shades of maroon, from deep burgundy to bright magenta. A thin, dark grey line runs diagonally across the lower right portion of the image, intersecting the geometric shapes.



#Asphalt #WorldWideWaste #BusinessInsider

Roads Can Be Recycled Forever, Why Don't More Cities Do It? | World Wide Waste | Business Insider

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https://www.youtube.com/watch?v=fKunfiL_Kyc&t=125s

Rethinking Use of RAP



RAP is the most recyclable material in the U.S.



Reduces the need for virgin materials (aggregate and asphalt binder).



Reduces total energy and greenhouse emissions.



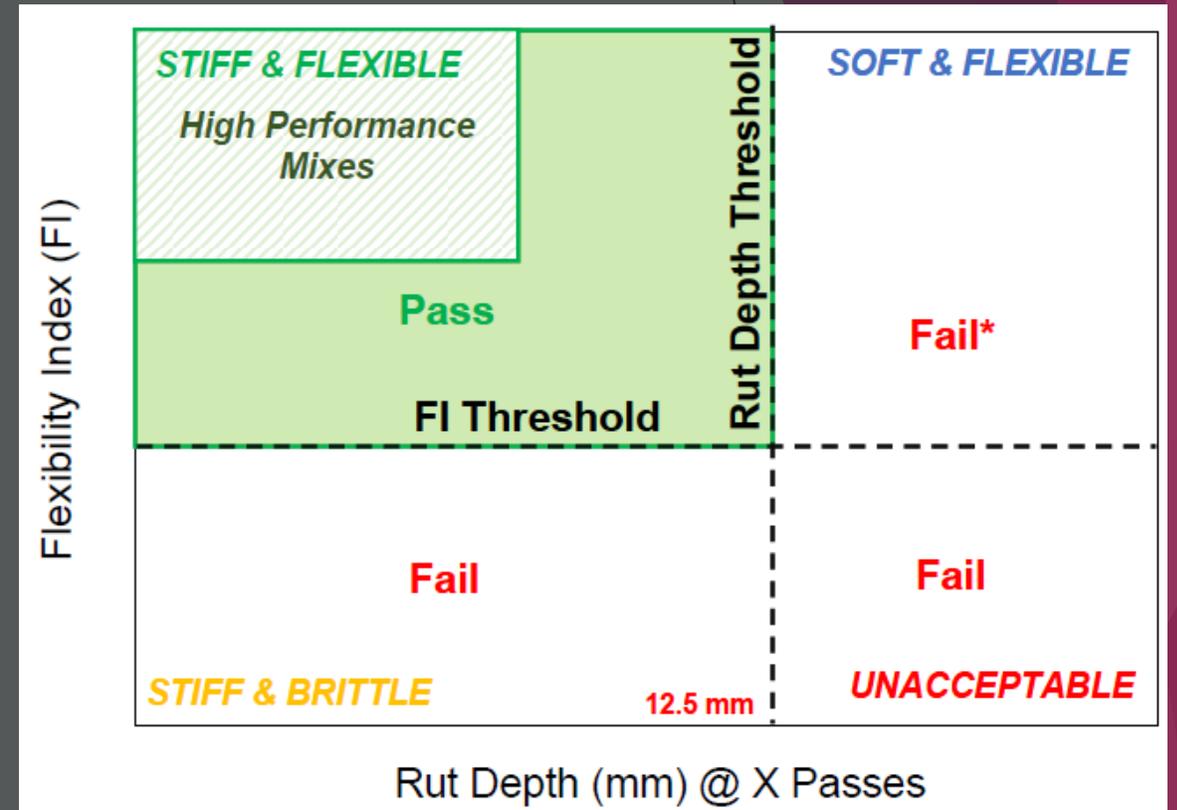
Saves landfill space each year.

Testing



- Project NCHRP 20-07/Task 406
- ▶ *Development of a Framework for Balanced Mix Design* was completed by NCAT on August 30, 2018

- This framework was used to select the IFIT and Hamburg tests for a balance analysis



City of Phoenix RAP Research & Testing Initiatives

- ▶ Phase I: Laboratory evaluation
- ▶ Phase II: Evaluation of laboratory and field performance
- ▶ **Mix Design:** Developed hot mix asphalt specification
- ▶ **Study:** Develop QA/QC and monitoring of test sections



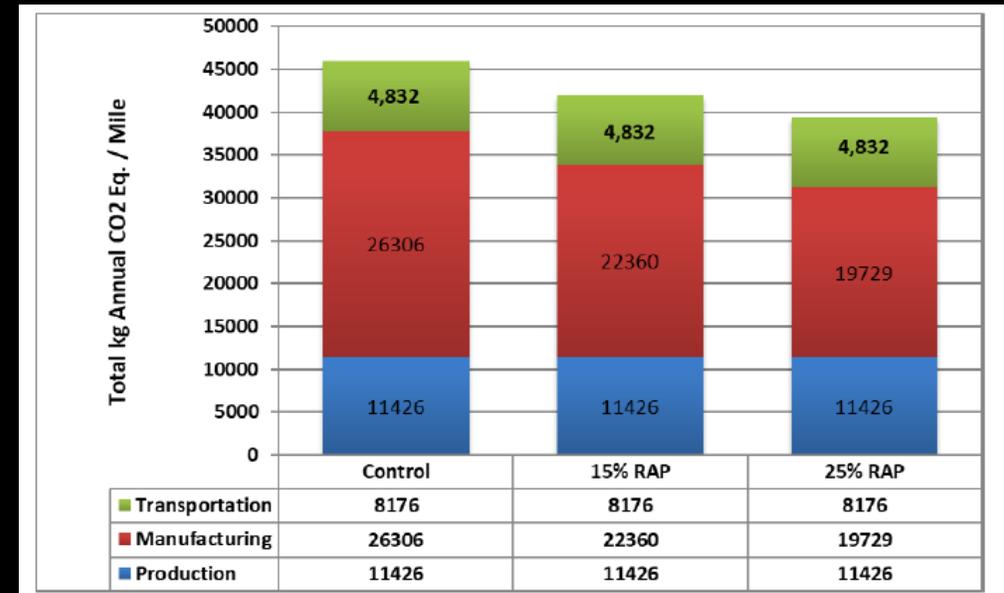
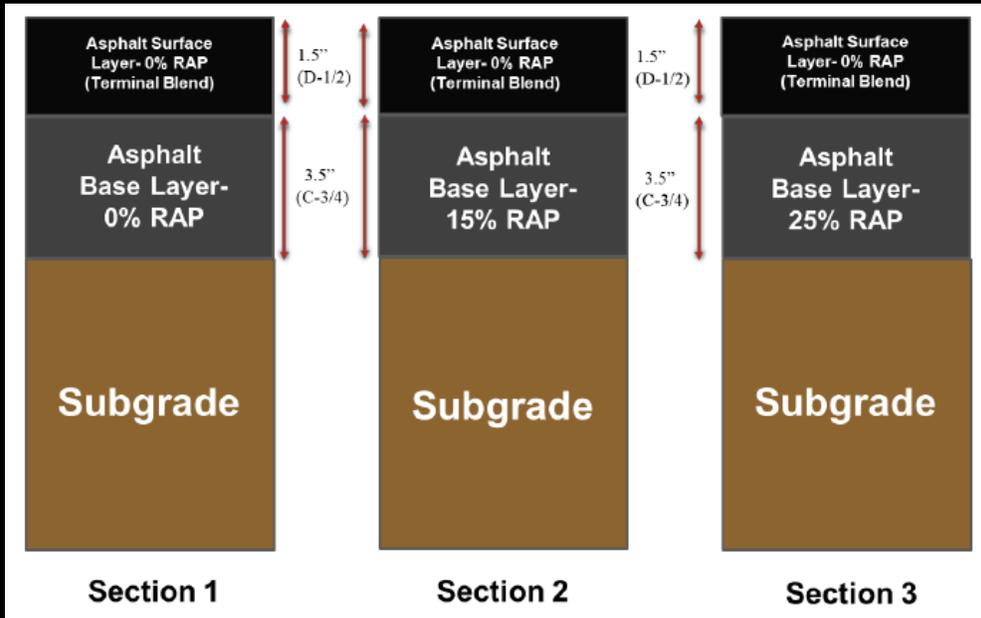
15th Ave Pilot Project

ASU / City of Phoenix RAP Phase II

NOTE: This map is to be used for reference purposes only (do not scale).
The City of Phoenix accepts no liability for information contained on this map.

0.1 mi

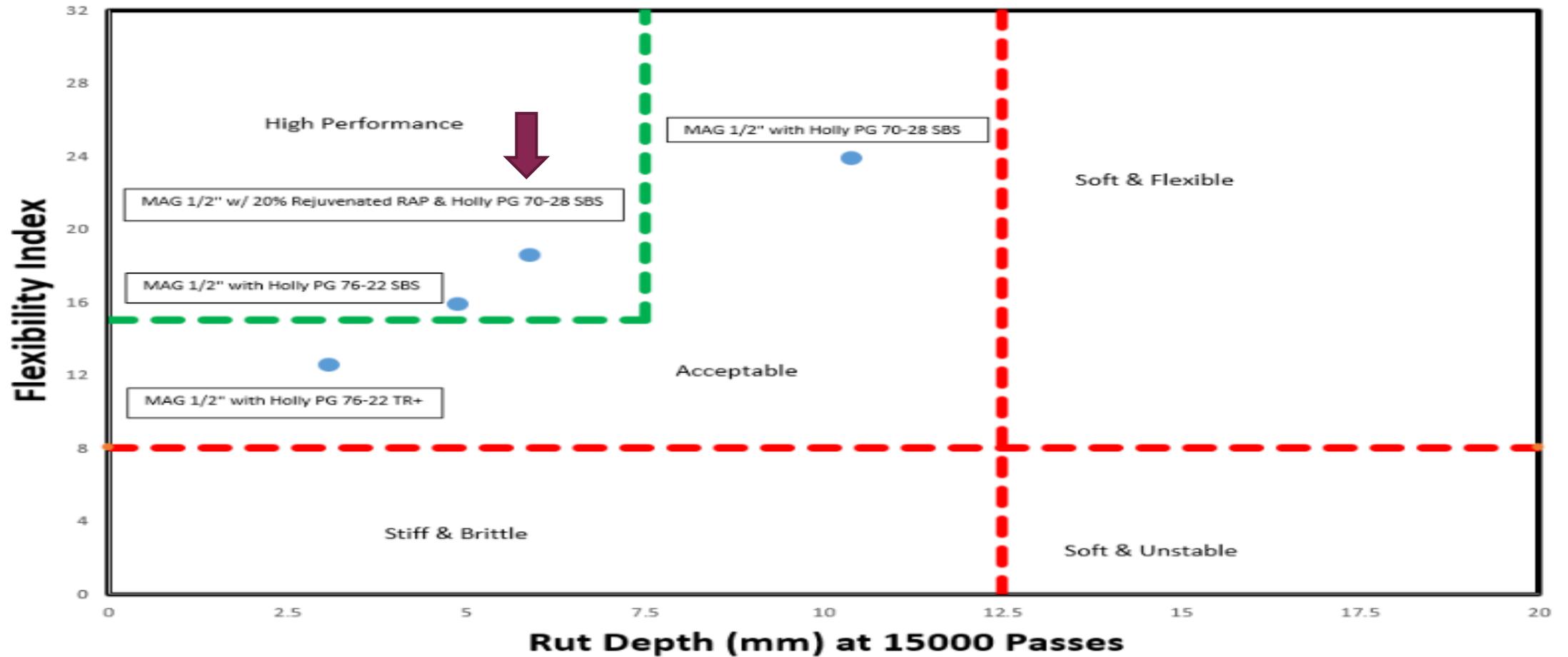
Date: 11/19/2018



Zalghout, Kaloush, Campbell, et al, ASU, 2019

Rejuvenated RAP HMA Mix

Example of Interaction Plot for Flexibility Index vs Rut Depth





RAP Surface Course

Decided to trial 20% RAP AC
mixes for mill & overlay
program

Additional Projects

2021 Calendar Year RAP Overlay Location				
Street	From	To	Contractor/ Supplier	Tonnage
27th Avenue	Camelback	Bethany	Sunland/ Soltera	3,075
Beardsley	20th St	32nd St	ViaSun - Southwest Asphalt	4,200
56th Street	Bell	SR101	MR Tanner/ Southwest Asphalt	5,534
Camelback	SR51	24th St	Talis/ Hanson or Southwest Asphalt	3,221
				16,030

- ▶ RAP stockpiles stored in the City of Phoenix North Yard (Central Ave. and Union Hills Rd) & South Facility were processed.
- ▶ Contractor to perform the screening operation of RAP
- ▶ RAP material is currently used as Type II Slurry and Micro Seal fine aggregate





NOTEWORTHY PROJECTS WITH RAP



- ▶ Buckeye Road from 51 Avenue to 59 Avenue - Rejuvenated RAP Overlay
- ▶ QS 39-35: From Union Hills Dr/Utopia Rd to 32 ST/36 St - Slurry Type II
- ▶ QS 35-33: From Greenway Rd/Paradise Ln to Cave Creek Rd/28 St - Slurry Type II
- ▶ QS 37-33: From Bell Rd/Grovers Ave to Cave Creek Rd/28 St - Slurry Type II
- ▶ Bell Rd: From 43 Ave to 51 Ave - Microsurfacing Type III
- ▶ Greenway Rd: From 19 Ave to 25 Dr - Microsurfacing Type III

Additional RAP Overlay Installations & Testing with Rejuvenators

- 2022 Paving Season includes testing of 2 rejuvenators
- Anova
- Hydrolene
- Multiple supplier mixes and contractors
- Sampling and performance testing ongoing
- 9 projects

Contractor	Supplier	#Anova Samples	# Hydrolene Samples
1	A	6	6
2	B	6	6
3	B	6	6
4	C	6	6

RAP Program

Treatment	Average per Year					
	Miles	Lane Miles	Aggregate (Tons)	RAP use	Replacement (Tons)	
					Agg. (Tons)	Miles
Mill and Overlay	109	683	199,949	20%	39,990	22
Microsurfacing	11	66	5,171	100%	5,171	11
Slurry Seal	70	209	12,645	100%	12,645	70

Thank you

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