

Using Recycled Asphalt Pavement (RAP) in Seal Coats

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RAP Piles Everywhere

- Milling or Micro-milling creating RAP
- Current use is 10-25% RAP content in HMA
- Remainder becomes property of the contractor or gets hauled to a NDDOT Maintenance site



Find an
Innovative Use
for RAP


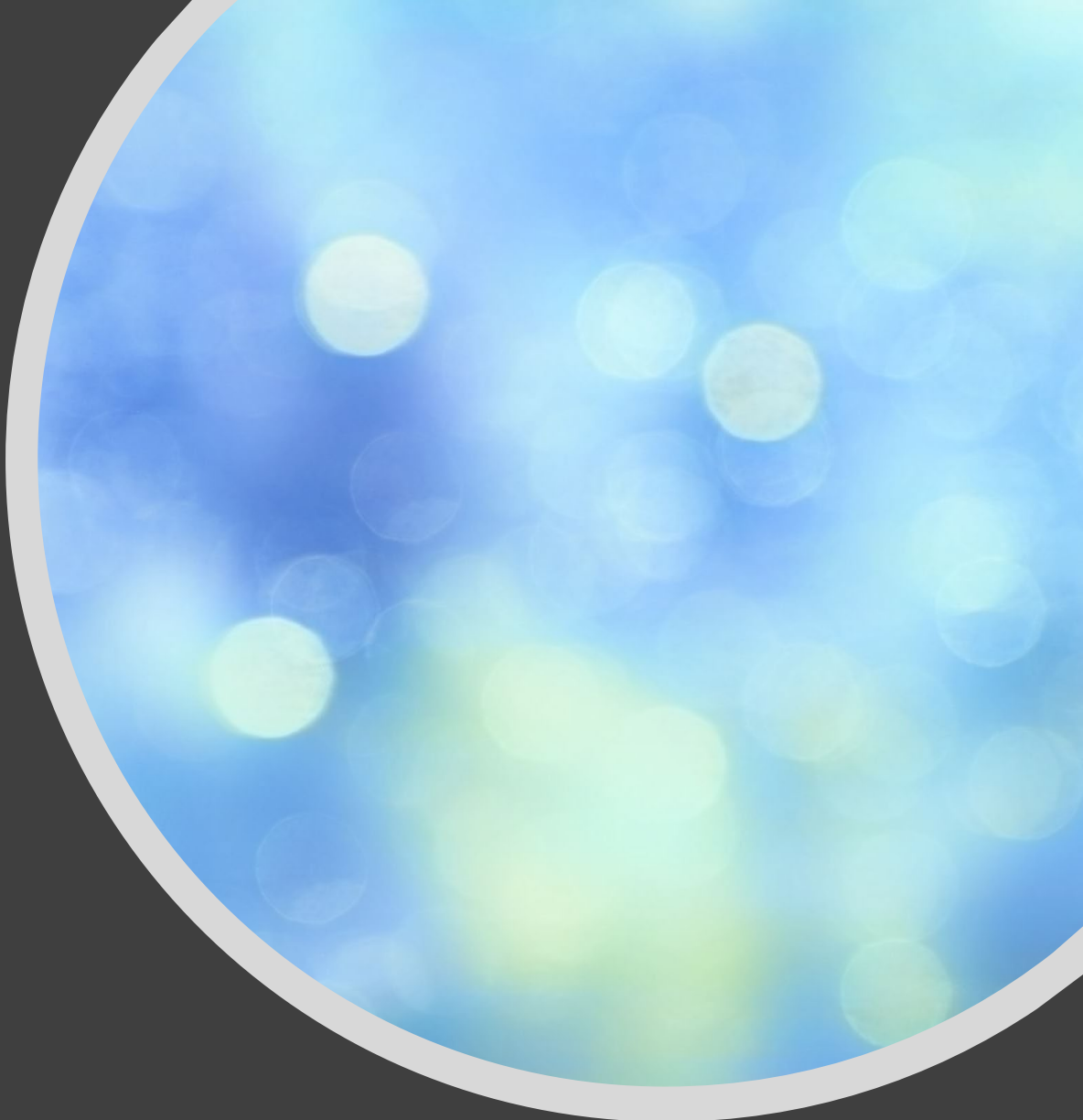
Presentation at Pavement
Preservation Conference

Submission through TRIP -
Steph Weigel

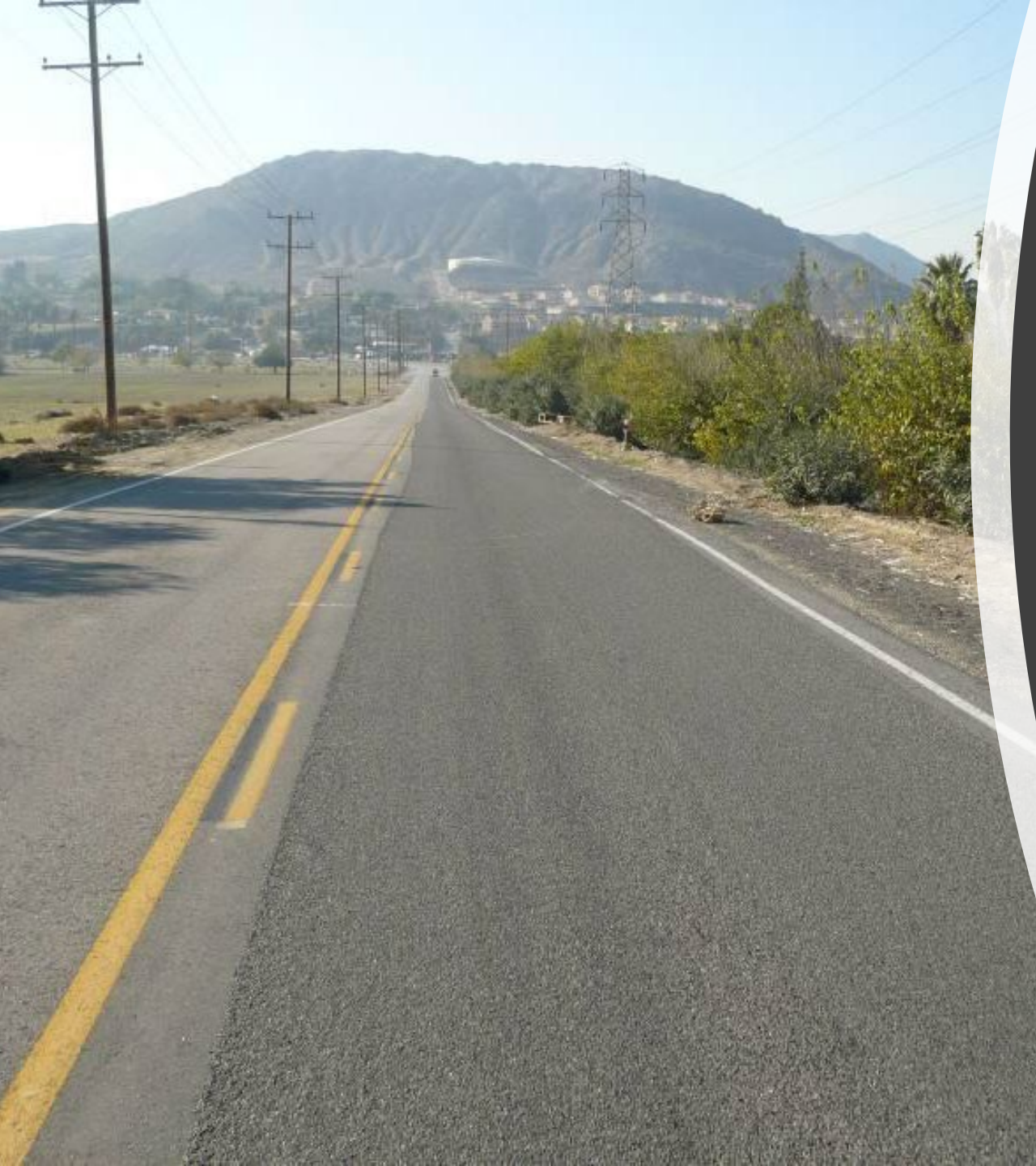
RAP Chip Seal and RAP
Slurry Seal used in CA

The Perfect Candidate??

Micro-mill on ND 34
created a RAP pile in
Napoleon



26 miles on ND 3
needed a seal coat
North of Napoleon



Project Created

- Bid April 13, 2018
- Special Provision for RAP Chip Seal
- 10-mile test section
- 16-mile control section



Special Provision Highlights

- Process Chips at the Napoleon Section
- Contractor could screen or crush
- Construct a 1000' test section
- 23 lb/SY chips and 0.30 Gal/SY Oil

Gradations

Sieve Size	Micro-mill 20 Ft/Min	Micro-mill 25 Ft/Min	CI 41 Chips
	% passing	% passing	NDDOT 816 Spec
3/8 inch	87.5	76.8	100
No. 4	51.5	45	20-70
No. 8	28.2	17.9	0-17
No. 16	14.5	7.3	
No. 200	0.5	1.1	0-1.5

RAP Chips	
Sieve Size	% passing
3/8 inch	100
No. 4	20-70
No. 8	0-17
No. 200	0-2



Bid Prices:

- \$40 / Ton RAP Chips
- \$45 / Ton CI 41 Chips
- CRS-2P emulsion was the same price
- Application rate:
 - 0.40 Gal/SY for Chips
 - 0.30 to 0.32 Gal/SY for RAP.



Failure to Launch

- Several Chip Seals not completed in 2018
- RAP Chip Seal was one of them
- Had to wait another year...



Concerns we had with RAP Chips

- Able to process/make?
- Would they come out of the spreader?
- Will they stay on the road?



Let's try this

- June 2019 started screening RAP
- June 11-13 Chip Seal on Control Section
- June 13 RAP Chip Seal test sections



Screening Operation

- Power screen worked... sort of
- Made 3 piles: RAP Chips, Fines, Oversized
- Ran oversized back thru the power screen

Contractor agreed to 4 Test Sections

We both agreed to Push the limits

Typical application rates for Chip Seal on NDDOT project:
0.40 Gal/SY Oil and 24 lb/SY Chips

Typical application rates for RAP Chip Seal in CA:
0.28 Gal/SY and 22 lb/SY Chips



Test Section 1

0.34 Gal/SY oil

21.5 LB/SY chips



Test Section 2

0.30 Gal/SY oil

16.5 LB/SY chips



Test Section 3

0.28 Gal/SY oil

14.5 LB/SY chips



Test Section 4

0.30 Gal/SY oil

13.5 LB/SY chips

Quote from
Superintendent
after test sections

“As crazy as this
sounded, it might
actually work”





Which Rate Did we
Choose?

0.32 Gal/SY oil

21 LB/SY chips

Control Section

0.40 Gal/SY CRS2P

23 LB/SY Chips

Fog Coat

Picture taken: May 6, 2020



RAP Chip Seal

0.32 Gal/SY CRS2P

21 LB/SY Chips

No Fog

Picture taken: May 6, 2020



RAP Chip Seal

0.32 Gal CRS2P

21 LB/SY Chips

Fog Coat

Picture taken: May 6, 2020





What Worked?

- Able to Produce RAP Chips
- Chips came out of Spreader
- Application Rates

What Needs Improvement?

- Time it took to make RAP Chips
- Ride Issues at overlaps



RAP Chips



Fines

What are we going to do with all those fines???



RAP Chips



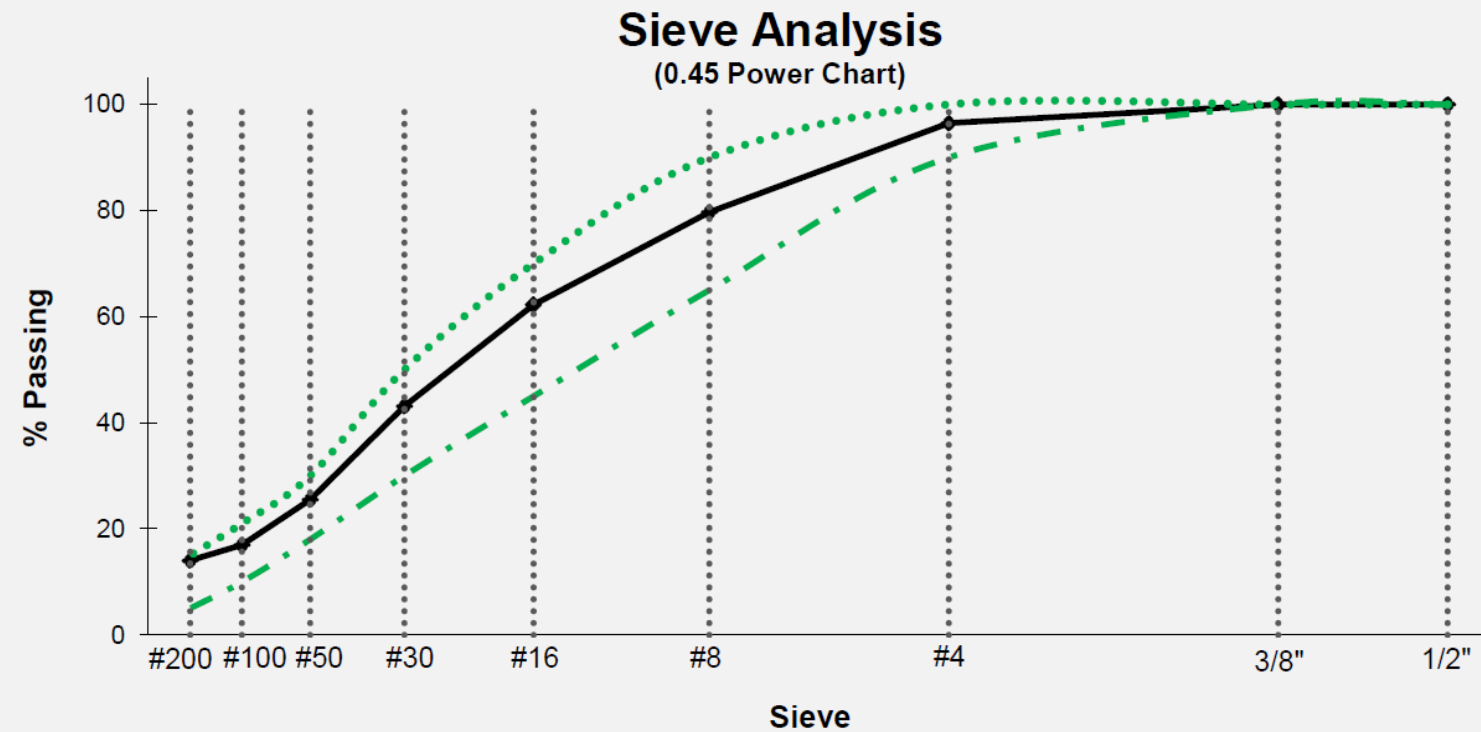
Fines

Astech (contractor) was doing a micro-surfacing project 12 miles from this picture. We discussed running a gradation on the fines to see what it was.

RAP Slurry Seal

RAP Chips were time consuming to make

DOT and Contractor ran gradations on Fines



RAP Slurry Seal

Fines material was a Type II
Micro-surfacing/Slurry Seal
Aggregate

Mix Design = 12% emulsion
CQS-1hP (Micro Oil)



RAP Slurry Seal

Placed 1.2 Miles in 3 hours

Future option to use RAP fines from Micro-milling as a Slurry/Micro Seal



What's Next?

The graphic features a stylized illustration of a road curving through a green, hilly landscape. Two blue road signs are visible on the right side of the road. The text 'NCAT TEST TRACK CONFERENCE' is overlaid on the top left of the illustration.

NCAT TEST TRACK CONFERENCE

JUNE 22-24, 2021

AUBURN, ALABAMA

What's Next?

- Test section project in 2023
- ND 1804/University Drive South of Bismarck
 - Double Chip Seal
 - Cape Seal
 - RAP Cape Seal
 - Double micro-surfacing
 - RAP Double micro-surfacing
 - Ultra thin bonded wear course
 - 4.75 mm NMAAS 0.75" Thin overlay
 - 9.5 mm NMAAS 1.25" Thin overlay



Questions?

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