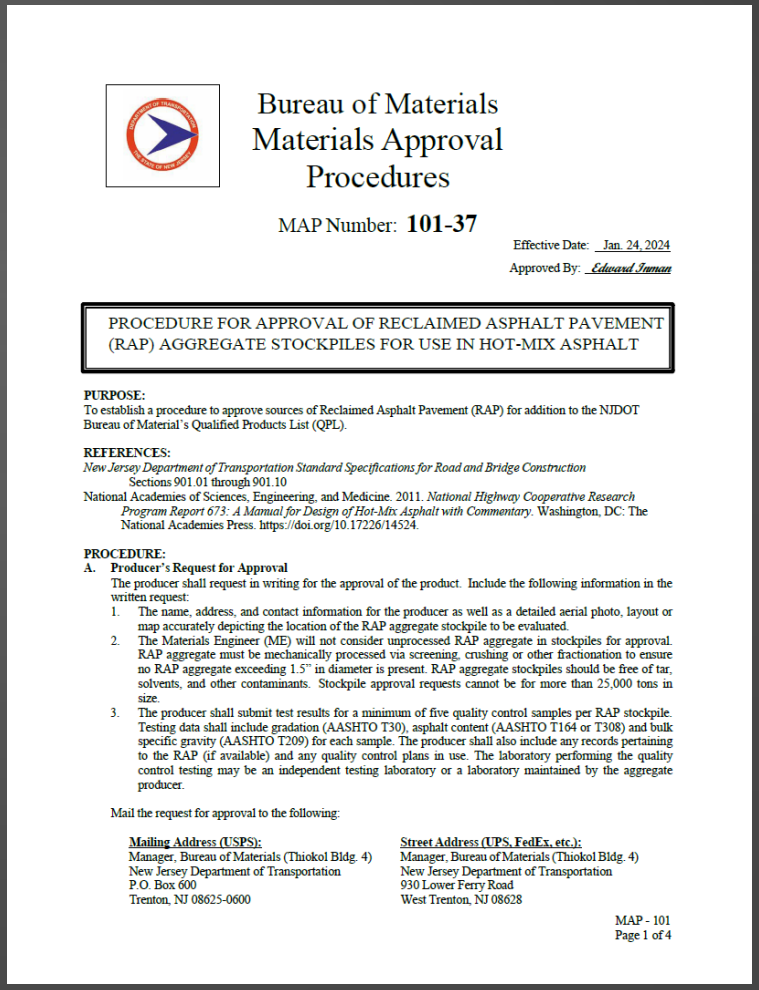
A LOOK BACK AT THE NJDOT RAP STOCKPILE APPROVAL PROCESS

NJAPA CONFERENCE – MARCH 10, 2026

RYAN RATHBUN

GEOLOGIST

NJDOT BUREAU OF MATERIALS & RESEARCH TESTING



Bureau of Materials
Materials Approval Procedures

MAP Number: **101-37**

Effective Date: Jan. 24, 2024

Approved By: *Edward Inman*

PROCEDURE FOR APPROVAL OF RECLAIMED ASPHALT PAVEMENT (RAP) AGGREGATE STOCKPILES FOR USE IN HOT-MIX ASPHALT

PURPOSE:
To establish a procedure to approve sources of Reclaimed Asphalt Pavement (RAP) for addition to the NJDOT Bureau of Material's Qualified Products List (QPL).

REFERENCES:
New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction
Sections 901.01 through 901.10
National Academies of Sciences, Engineering, and Medicine. 2011. *National Highway Cooperative Research Program Report 673: A Manual for Design of Hot-Mix Asphalt with Commentary.* Washington, DC: The National Academies Press. https://doi.org/10.17226/14524.

PROCEDURE:
A. Producer's Request for Approval
The producer shall request in writing for the approval of the product. Include the following information in the written request:
1. The name, address, and contact information for the producer as well as a detailed aerial photo, layout or map accurately depicting the location of the RAP aggregate stockpile to be evaluated.
2. The Materials Engineer (ME) will not consider unprocessed RAP aggregate in stockpiles for approval. RAP aggregate must be mechanically processed via screening, crushing or other fractionation to ensure no RAP aggregate exceeding 1.5" in diameter is present. RAP aggregate stockpiles should be free of tar, solvents, and other contaminants. Stockpile approval requests cannot be for more than 25,000 tons in size.
3. The producer shall submit test results for a minimum of five quality control samples per RAP stockpile. Testing data shall include gradation (AASHTO T30), asphalt content (AASHTO T164 or T308) and bulk specific gravity (AASHTO T209) for each sample. The producer shall also include any records pertaining to the RAP (if available) and any quality control plans in use. The laboratory performing the quality control testing may be an independent testing laboratory or a laboratory maintained by the aggregate producer.

Mail the request for approval to the following:

Mailing Address (USPS):
Manager, Bureau of Materials (Thiokol Bldg. 4)
New Jersey Department of Transportation
P.O. Box 600
Trenton, NJ 08625-0600

Street Address (UPS, FedEx, etc.):
Manager, Bureau of Materials (Thiokol Bldg. 4)
New Jersey Department of Transportation
930 Lower Ferry Road
West Trenton, NJ 08628

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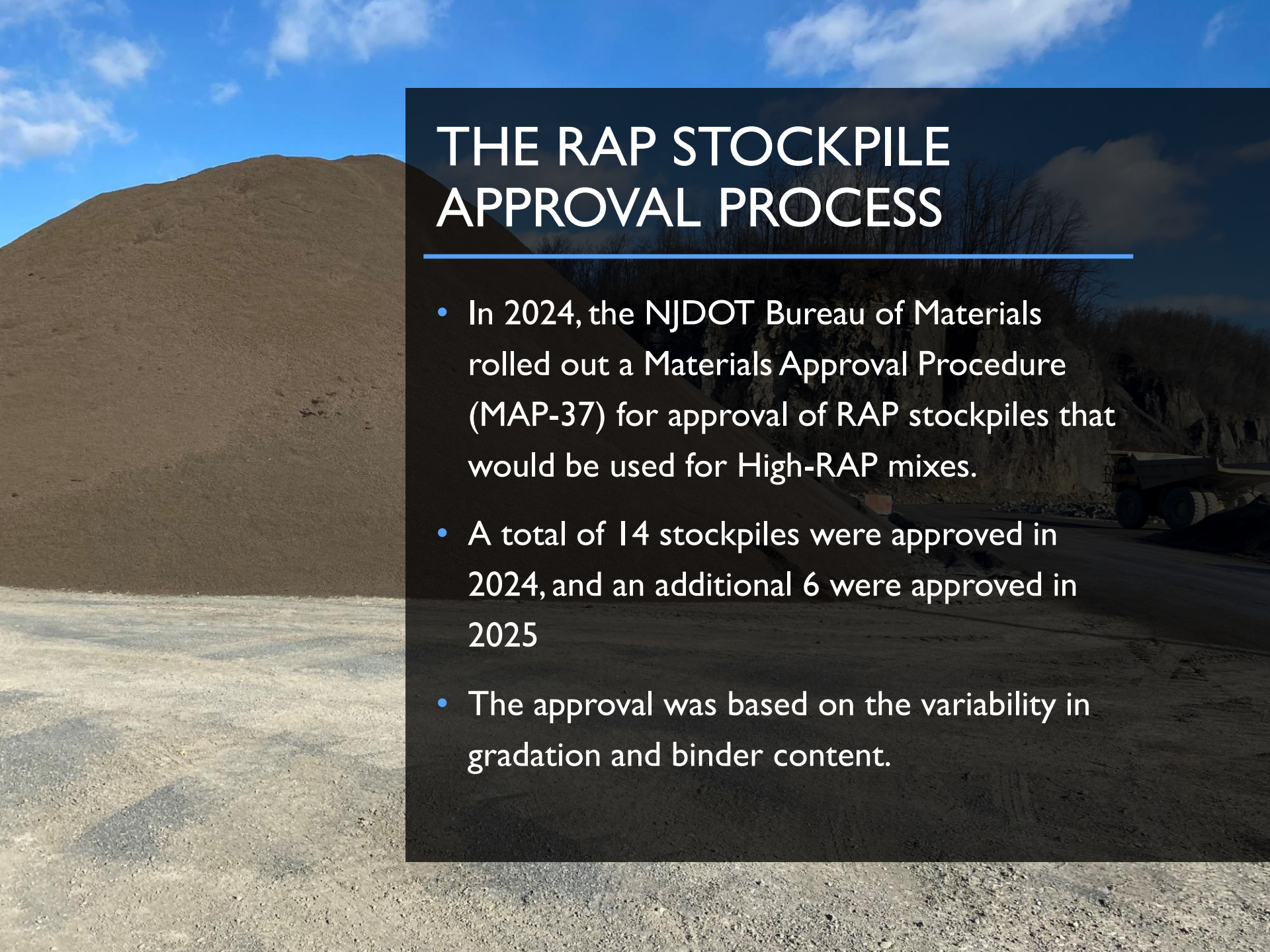
RECYCLED ASPHALT PAVEMENT IN NEW JERSEY

- Recycled Asphalt Pavement (RAP) is the reusable asphalt and aggregates removed from surface pavements during reconstruction and resurfacing operations.
- RAP is one of the most highly recycled materials in the country (based on tonnage) and can be incorporated into pavements across the State.
- Due to the drastic discrepancy between supply and demand, RAP stockpiles throughout New Jersey are uncharacteristically large and should be targeted for reuse (The high supply and low demand is unique to NJ).
- RAP Stockpiles are potentially highly variable in type, quality and aggregate characteristics.

NO TWO STOCKPILES ARE ALIKE

- RAP stockpiles are typically blended sources of pavements that can have highly variable properties in terms of binder and aggregates.
- The variability of consensus properties are based on factors such as stockpile size, proximity to locally available aggregates, age of RAP material, quality of recycled pavements.
- Based on the RAP inventory, the Department created a RAP stockpile approval process that established minimal levels of stockpile variability to be used on Department projects.



THE RAP STOCKPILE APPROVAL PROCESS

- In 2024, the NJDOT Bureau of Materials rolled out a Materials Approval Procedure (MAP-37) for approval of RAP stockpiles that would be used for High-RAP mixes.
- A total of 14 stockpiles were approved in 2024, and an additional 6 were approved in 2025
- The approval was based on the variability in gradation and binder content.

THE METRICS

- The approval process was based off of testing criteria from the *National Highway Cooperative Research Program (NHCRP) Report 673 - A Manual for Design of Hot-Mix Asphalt with Commentary (2011).*
- The two parameters evaluated were binder content and gradation. The specifications were based off of standard deviations (σ)

RAP %	3/8" sieve σ (maximum)	No. 4 sieve σ (maximum)	No. 8/16 sieves σ (maximum)	No. 30/50 sieves σ (maximum)	No. 200 sieve σ (maximum)	Binder σ (maximum)
15%	9.5	8.2	7.0	5.6	3.5	0.5
20%	8.2	7.2	6.1	5.0	3.1	0.5
25%	7.2	6.4	5.5	4.5	2.8	0.5
30%	6.7	5.8	4.9	4.1	2.5	0.5
35%	6.1	5.3	4.5	3.8	2.4	0.5
40%	5.6	4.8	4.2	3.5	2.2	0.5
45%	5.2	4.5	3.9	3.2	2.0	0.5
50%	4.8	4.2	3.6	3.0	2.0	0.5

HOW THE CRITERIA WERE APPLIED

- The supplier tests and submits data for 5 RAP samples including binder content and gradation.
- The Department then takes 5 stockpile samples tests for the same parameters. The 10 data points are then combined to determine averages and standard deviations that are applied to the design charts.
- The design criteria are applied the lowest RAP percentage that corresponds to the average standard deviation calculated.
- Based on this chart a stockpile approved for a 50% RAP mix would have an average standard binder deviation less than 0.32.

THE OVERALL DATA (20 APPROVED PILES)

Sieve Size	Average σ	Maximum σ	Minimum σ	15% RAP σ	50% RAP σ
3/8"	2.1	7.3	0.4	9.5	4.8
No. 4	5.0	11.5	1.6	8.2	4.2
No. 8	3.3	7.2	1.5	7.0	3.6
No. 16	2.7	5.2	1.1	7.0	3.6
No. 30	2.2	4.4	0.8	5.6	3.0
No. 50	1.5	4.2	0.5	5.6	3.0
No. 100	1.0	3.7	0.2	4.0	2.0
No. 200	0.7	1.9	0.1	3.5	2.0
AC	0.3	0.6	0.1	0.5	0.3

WHAT WORKED?

- The lowest reported value σ would determine the maximum RAP permitted.
- This was generally successful when it came to evaluating the variability of RAP stockpile gradations. Some stockpiles were restricted to a maximum of 35% RAP in the High-RAP mix.
- In general , the highest variability was observed on the No. 4 and No. 8 sieves.
- The design charts placed the greatest emphasis on the #200 sieve of the gradation which was where the most variability was initially expected to be.

STOCKPILE STATISTICAL DATA

Sieve Size (mm)	Average % Passing	Std. Dev.	Max. Allowable RAP
12.500	100.0	0.0	-
9.500	97.5	0.8	50%
4.750	73.9	5.3	35%
2.360	56.4	4.6	35%
1.180	45.1	3.8	45%
0.600	35.3	2.8	50%
0.300	22.5	1.4	50%
0.150	13.1	0.9	50%
0.075	8.2	1.0	50%

WHAT DID NOT WORK?

- The average binder deviation typically was observed to have a large range (from 0.16 to 0.72).
- Based on the range of standard deviations observed, an adjustment was made to the approval process to allow a σ of 0.5 (30% RAP).
- A further wrinkle was that Suppliers are likely using different ovens with different correction factors when performing T308 compared to what the Department uses. This made analysis of binder content variability inconclusive.
- This variability in process casts doubt on how accurate the binder contents are in addition to how variable they are within a stockpile.

STOCKPILE STATISTICAL DATA			
AC Content	Average %	Std Dev.	Max. RAP
	6.6	0.298	50%

POTENTIAL CHANGES

- While reliance on the gradation criteria was largely productive, the binder content analysis was not as robust.
- The Department is exploring the possibility of implementing a T164 analysis of the binder content to better establish ignition oven correction factors.
- Having an appropriate correction factor to apply to the T308 data could yield more accurate binder content data from the stockpile.
- This will not only give a better indication of stockpile variability but could also be leveraged for better designs.

FINAL THOUGHTS

- The RAP stockpile approval process was effective in screening out some of the more highly variable RAP sources for use in High-RAP mixes.
- Review of the initial performance testing data from the High-RAP mixes constructed in 2024 was in general positive. While it is too early to say the approval process is correlated without direct data, it can potentially be inferred early on that it has been a positive impact.
- The Department will likely continue to roll out High-RAP projects in the future, and the stockpile approval process will be increasingly relied on as a tool to get better performing pavements.
- For further information contact Ryan.Rathbun@dot.nj.gov