The Road Forward

A Vision for Net Zero Carbon Emissions for the Asphalt Pavement Industry

Going Gr$$n

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Thank you, Michigan!

Gold Club (50+ Years)

- Ace-Saginaw Paving Co.
- Ajax Paving Industries
- Cadillac Asphalt LLC, A CRH Co.
- Payne & Dolan Inc., A Walbec Group Co.
- Rieth-Riley Construction Co. Inc.

30-Plus Club

- Asphalt Paving Inc.
- Bacco Construction
- Bolen Asphalt Paving
- Central Asphalt Inc.
- Michigan Paving & Materials Co. A CRH Co.

Members

- Angelo Iafrate Construction Co.
- BASF Corporation
- Detroit Stoker Co.
- Edward C. Levy Co.
- J. Rettenmaier USA LP
- Kalin Construction Co., Inc.
- Maxx Services, LLC
- Plante Moran
- SME
- Superior Asphalt Inc.
- Triaso U.S.
- Warner Petroleum Corp.
- Zep, Inc.

State Advisor: James Klett, Michigan Paving & Materials, a CRH Co.

An Industry-Wide Vision

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PARTNERS

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WIRTGEN GROUP
LEGACY INFRASTRUCTURE GROUP
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Colorbiotics
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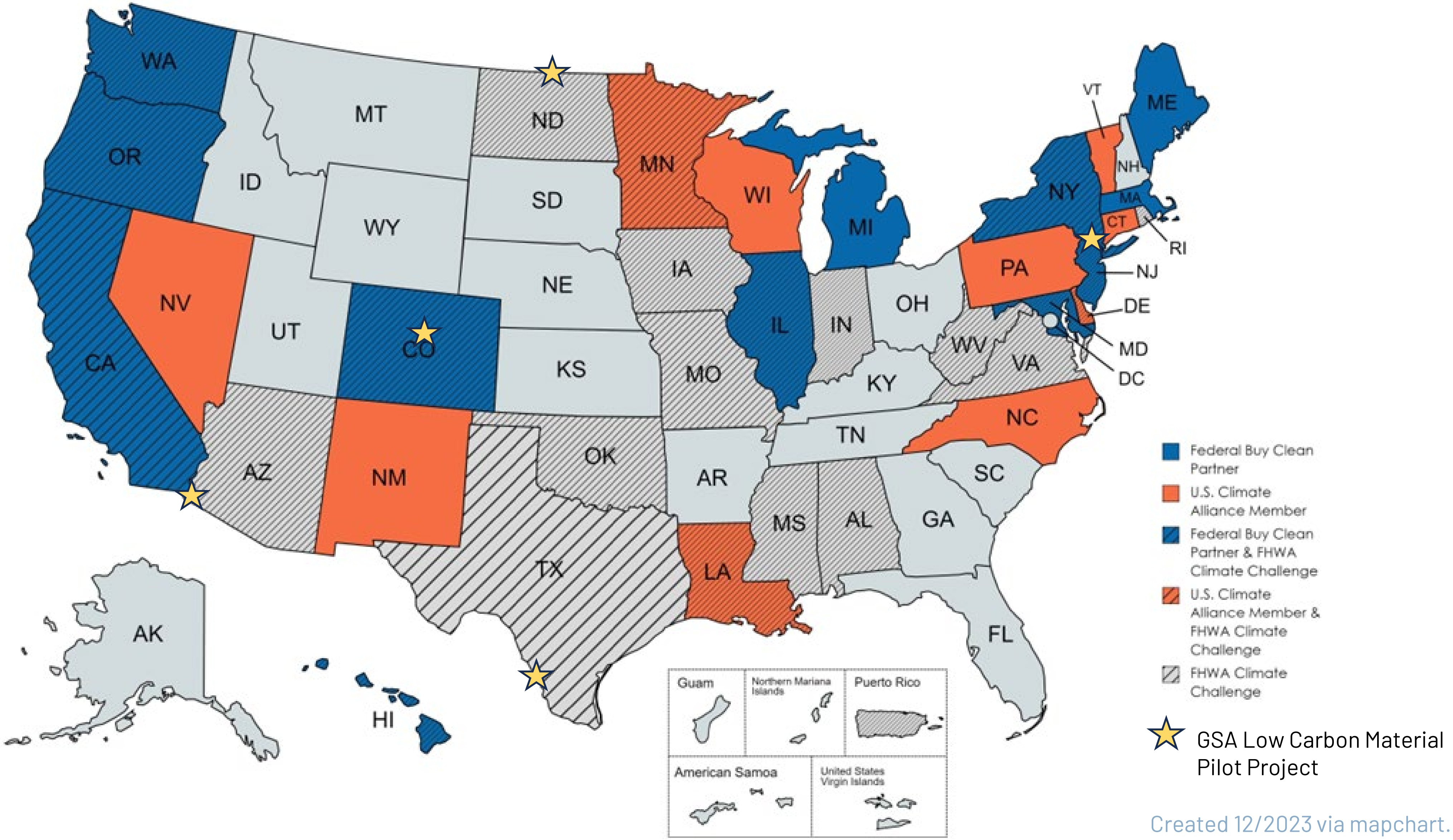
GEORGE REED INC. GENERAL ENGINEERING CONTRACTORS SINCE 1944
SUMMIT Materials

Buy Clean & Low Carbon Initiatives



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Inflation Reduction Act

EPA

- $250 million to standardize EPDs and help industry develop EPDs
- $100 million to develop “low-embodied carbon construction material labeling program”

DOT/FHWA

- $2 billion to procure construction products and materials with “substantially lower” embodied carbon
  - Federal-aid Highways, Federal Lands, etc.
  - Differential Cost or Incentive

Inflation Reduction Act

EPA Interim Determination of Substantially Lower Embodied Carbon

- **Best performing 20%** of similar materials/products
  - If not available locally, then best performing 40%
  - If not available locally, then better than estimated industry average
  - **GSA and FHWA will define these thresholds** based on published EPDs
- Also, report **ENERGY STAR** Energy Performance Score (currently under development for asphalt plants)

https://www.epa.gov/inflation-reduction-act/inflation-reduction-act-programs-fight-climate-change-reducing-embodied

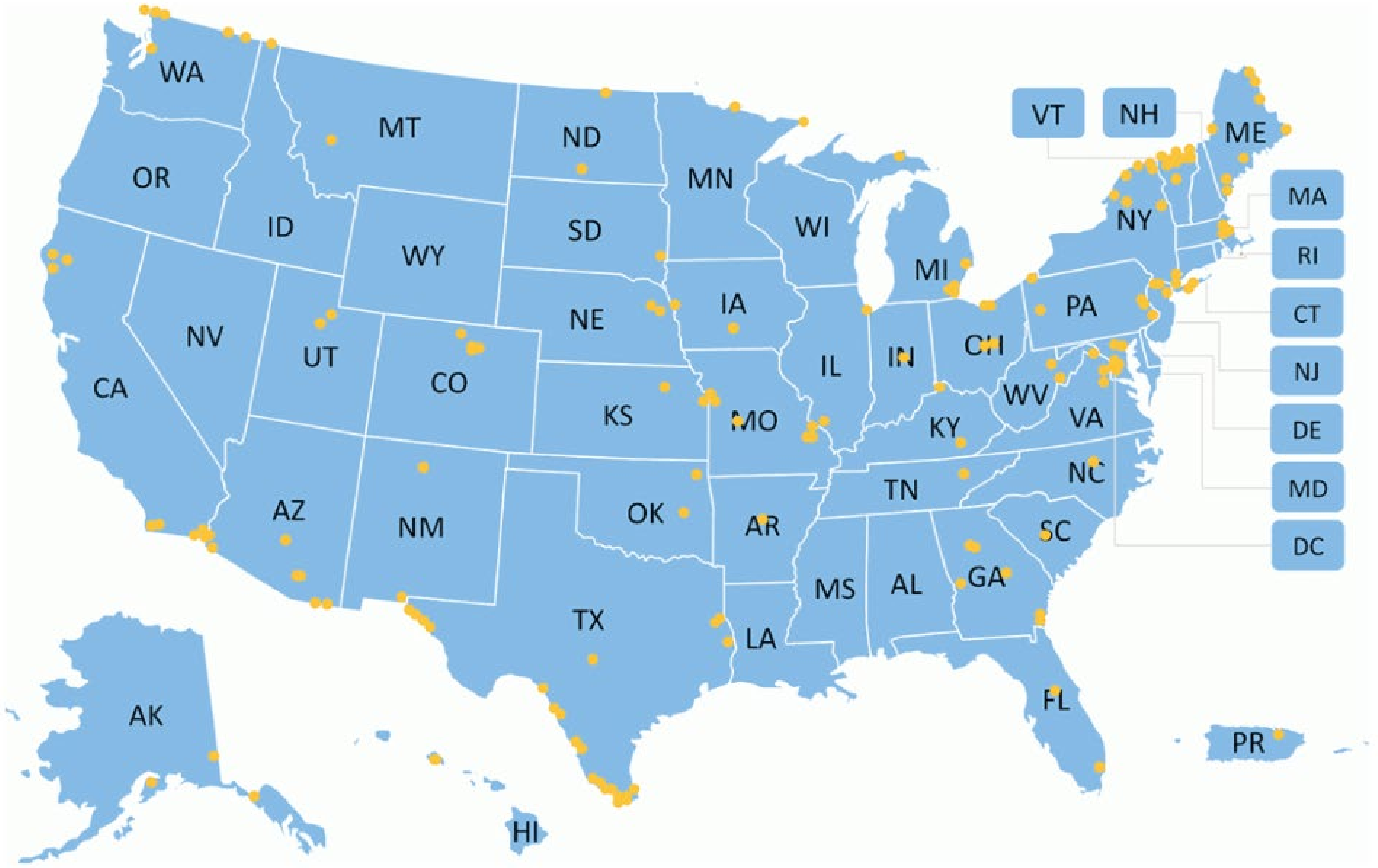
Pilot Low Carbon Material Standard

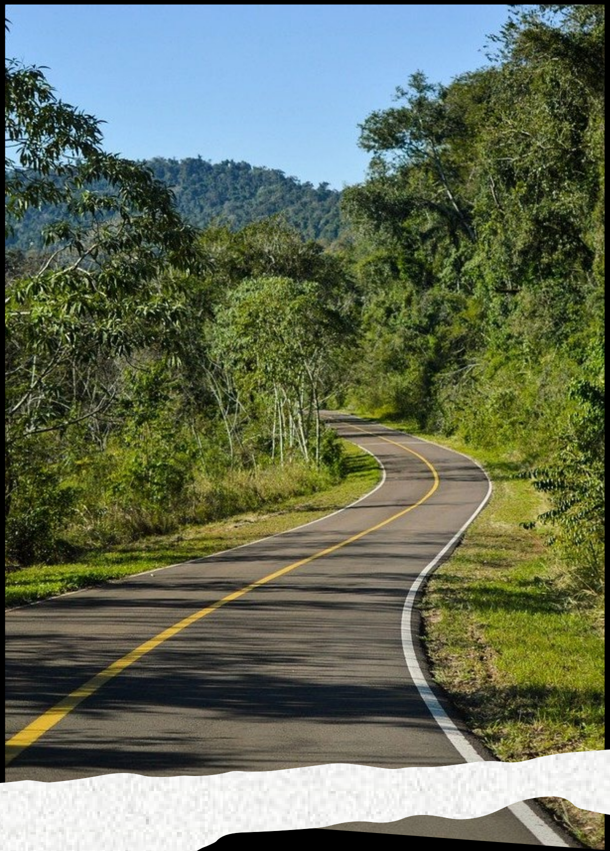
- Pilot Projects in CO, AZ, ND, and TX

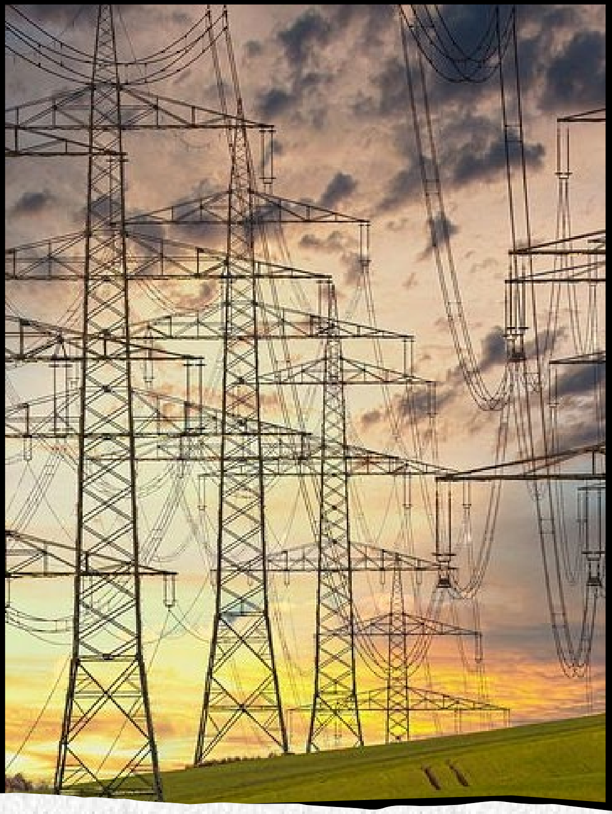
GSA IRA Limits for Low Embodied Carbon Asphalt - May 16, 2023 (EPD-Reported GWPs, in kilograms of carbon dioxide equivalent per metric ton - kgCO_2e/ t)		
Top 20% Limit	**Top 40% Limit**	**Better Than Average Limit**
55.4	**64.8**	**72.6**

- Same limits apply to all mix types

Low-embodied carbon projects





Industry Goals

Net Zero Production and Construction

- Operational control
- Warm Mix Asphalt
- Alternative construction scheduling

Industry Goal 1 | Scope 1 Emissions

Achieve net zero carbon emissions during asphalt production and construction by 2050.

OPERATIONAL TIPS:
THE ROAD FORWARD TO LOWER EMISSIONS AND HIGHER PROFITS

INSULATING TO PREVENT LOSS OF THERMAL ENERGY, REDUCE FUEL USE, AND REDUCE COST

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AsphaltPavement.org/Forward

Win-win situations abound on the asphalt pavement industry's road toward reducing carbon emissions. To reach net zero carbon, the industry must understand, identify, and continue to reduce both the carbon intensity of materials used in, and energy consumption associated with, the production of asphalt pavement mixtures. As stewards of finite resources and an industry committed to reaching net zero carbon emissions by 2050, we can take immediate actions to help meet our reduction goals while also increasing a company's profitability and competitiveness.

By insulating its pipes, Granite Construction reduced the energy intensity for its hot oil systems to an average of

450K BTUS

per hour, reducing energy consumption by

55%

One method to reduce carbon emissions is to improve your company's energy efficiency, or the amount of energy consumed per unit of production. For an asphalt plant, energy comes in the form of electricity and fuel consumption, causing either indirect emissions (at the power plant), or direct emissions (stack and tailpipe emissions). These emissions have a direct impact on operations by increasing both your operating cost and your business's environmental impact. One great tip to implement is installing insulation around pipes, storage tanks, and drums to prevent loss of thermal energy and reduce fuel usage. Just as insulation works in homes to reduce heating and cooling costs while improving comfort, insulation of hot oil pipes at asphalt plants can increase safety, lower costs, and conserve energy.

In 2011, Granite Construction Inc. headquartered in Watsonville, Calif. conducted a sustainability audit and calculated that within 1-year the investment in insulation of hot oil pipes at an asphalt plant would result in 100% payback of the initial cost, recovered from the lower energy bills. After the audit, Granite Construction decided to pilot the project at ten of its asphalt plants and insulated all hot oil pipes bigger than 1-inch in diameter. The cost to insulate the hot oil heater pipes was $15,000 per plant in 2011.

Upon review of the pilot plant's initial cost and energy savings data, which turned out better than originally estimated with a payback period of 180 days, Granite Construction led a companywide initiative and, over the next 24 months, installed insulation at all fifty of the

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OPERATIONAL TIPS:
THE ROAD FORWARD TO LOWER EMISSIONS AND HIGHER PROFITS

ELECTRIC HEATED TANK FARM LOWERS ENERGY USAGE

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Reaching net zero greenhouse gas (GHG) emissions by 2050 can seem daunting. Luckily, existing technologies and new innovations can be leveraged to assist the industry in exploring ways to answer the call while keeping an eye on the margin. Orlando Paving Company, which is owned by VINCI Construction, is meeting the challenge with the electrification of its Landstreet asphalt plant tank farm, replacing the traditional hot oil system to deliver on both corporate sustainability goals and public commitments to reduce energy consumption.

VINCI calculated that electrifying thermal processes can reduce carbon emissions from natural gas usage of 342 pounds per kWh to 1.6 pounds of carbon per kWh for electric, a reduction of

99.5%

Located in Orange County, Orlando Paving Company's operation is surrounded by a vibrant community where tourists from around the world come to see iconic skyscrapers, arenas, theatres, galleries, shopping, and attractions. As a local business, ensuring a positive relationship with neighbors is core to Orlando Paving Company's mission.

The asphalt pavement industry can use two methods to reduce GHG emissions: reducing consumption of raw materials and reducing energy consumption. On average, asphalt facilities use 88 kilowatt hours (kWh) per ton (equivalent to approximately 300,000 Btu/ton). Orlando Paving Company set a goal to reduce energy consumption by 20% to 70 kWh/ton to reduce its environmental footprint and cut operating costs.

VINCI Construction, Orlando Paving's parent company, completed an extensive analysis of the benefits of using electric at its asphalt facilities. VINCI calculated that electrifying thermal processes can reduce carbon emissions from natural gas usage of 342 pounds per kWh to 1.6 pounds of carbon per kWh for electric, a 99.5% reduction. Practically, not all components can utilize electricity; therefore the burner at Landstreet uses natural gas to dry the aggregate, reducing emissions over alternative fuel sources.

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OPERATIONAL TIPS:
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PAVING UNDER STOCKPILES PAYS OFF ENVIRONMENTALLY & ECONOMICALLY

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Contractors are continuously searching for the latest technical innovations that will make their plants more efficient and cost-effective to operate. Governments and citizens, especially young people, want transparency, and are calling for companies to be greener and develop sustainability goals. With new industry goals centered around carbon neutrality in 2050, it is fortunate that increasing profitability and reducing emissions often go together.

~ 50%

of the energy required to produce asphalt mixtures is is to remove water.

Reducing moisture by 1% can reduce fuel consumption by

~ 10%

One of the most impactful asphalt plant efforts is reducing aggregate moisture, and one way to do this is to pave the stockpile area. According to Greg Renegar, President, Astec Industries, approximately 50% of the energy required to produce asphalt mixtures is to remove water. Reducing moisture by 1% can reduce fuel consumption by approximately 10%. In addition, a 1% moisture reduction can also increase production – by approximately 12%. Finally, a paved stockpile area will decrease aggregate loss by preventing aggregate contamination caused by stockpiled material being comingled with the underlying material. Unpaved stockpiles can result in a 3% aggregate loss per year.

Michigan Paving & Materials, A CRH Co., had leftover mix after conducting trial runs and decided to use it to pave under a portion of their stockpile area at their Grand North asphalt plant in Comstock Park, Mich. For comparison purposes, the company left unpaved a similar aggregate stockpile at a plant eight miles away in Grand Rapids. Since the plants are geographically close together, both experience the same levels of precipitation annually.

The fine aggregate in the stockpile that was paved accounts for about 20% (80,000 tons) of the plant's annual production. Michigan Paving measured the moisture in the stockpile from April through November 2020 and found that the percentage of moisture in the paved stockpile was 4.6% while the unpaved stockpile averaged 5.2% moisture. A detailed analysis found that the lower moisture content resulted in a 14,400 BTU per ton reduction in natural gas fuel usage, saving the company $0.13 per ton, for a total of $10,165 annually. Paving under the

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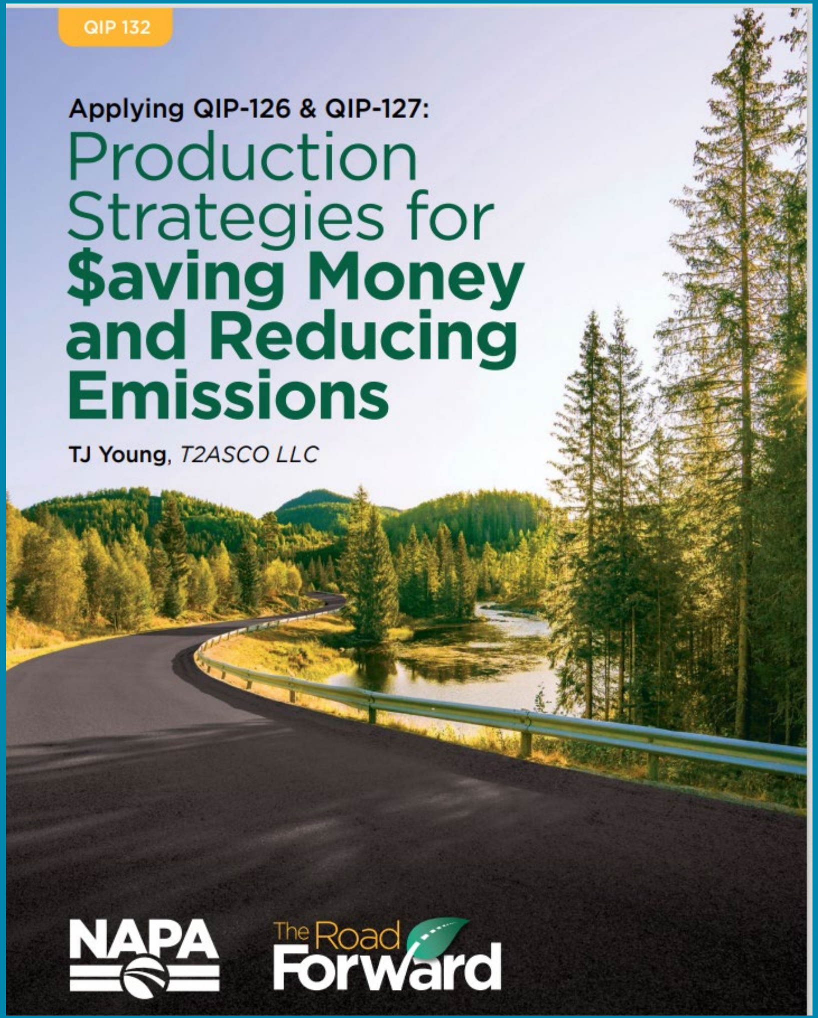
Net Zero Production and Construction

- Hot oil heater & insulation efficiency
- Drying efficiency
- Stockpile moisture
- Target drying fuel consumption expectations



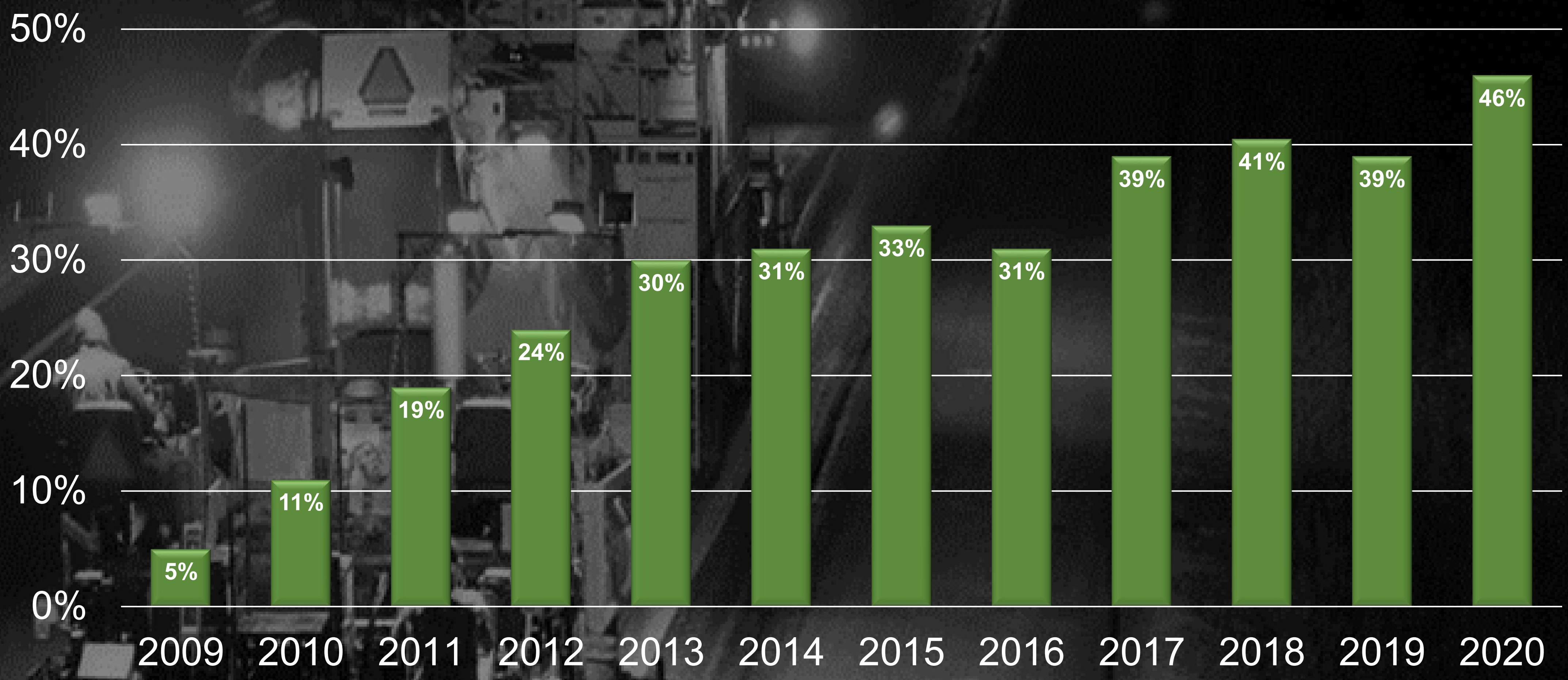
Net Zero Production and Construction

- Planning
- Scheduling
- Management/Execution

- Includes a tactical checklist

Warm Mix Asphalt (WMA) Technologies

Percentage of Total Asphalt Production in the U.S.

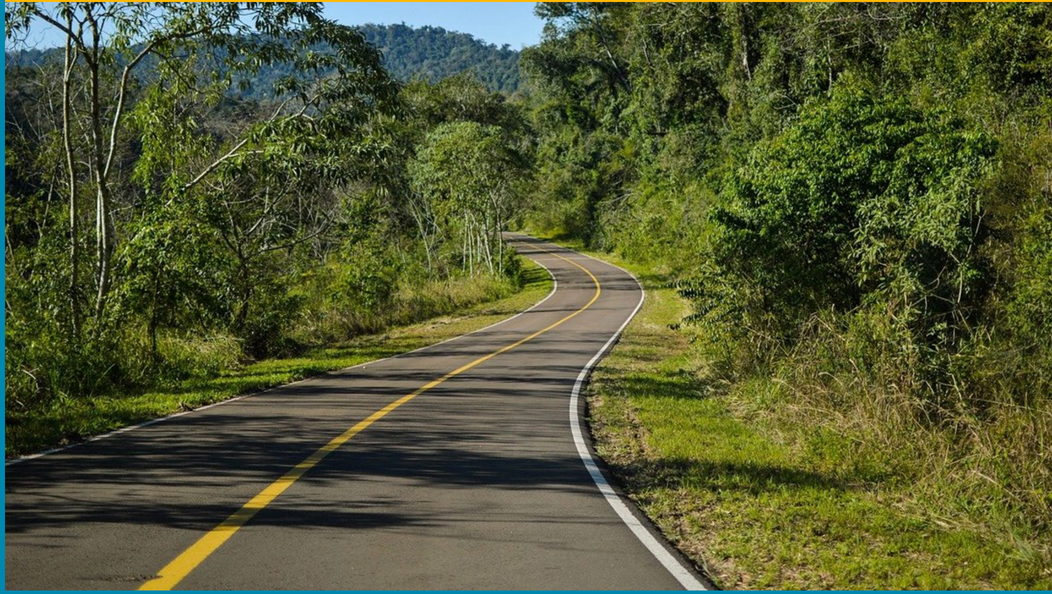


Pavement Quality, Durability, and Use

- Perpetual pavements
- Rolling resistance
- Contract incentives for improved quality and improved vehicle fuel economy

Industry Goal 2 | Downstream Scope 3 Emissions

Partner with customers to reduce emissions through pavement quality, durability, longevity, and efficiency standards by 2050



Net Zero Materials Supply Chain

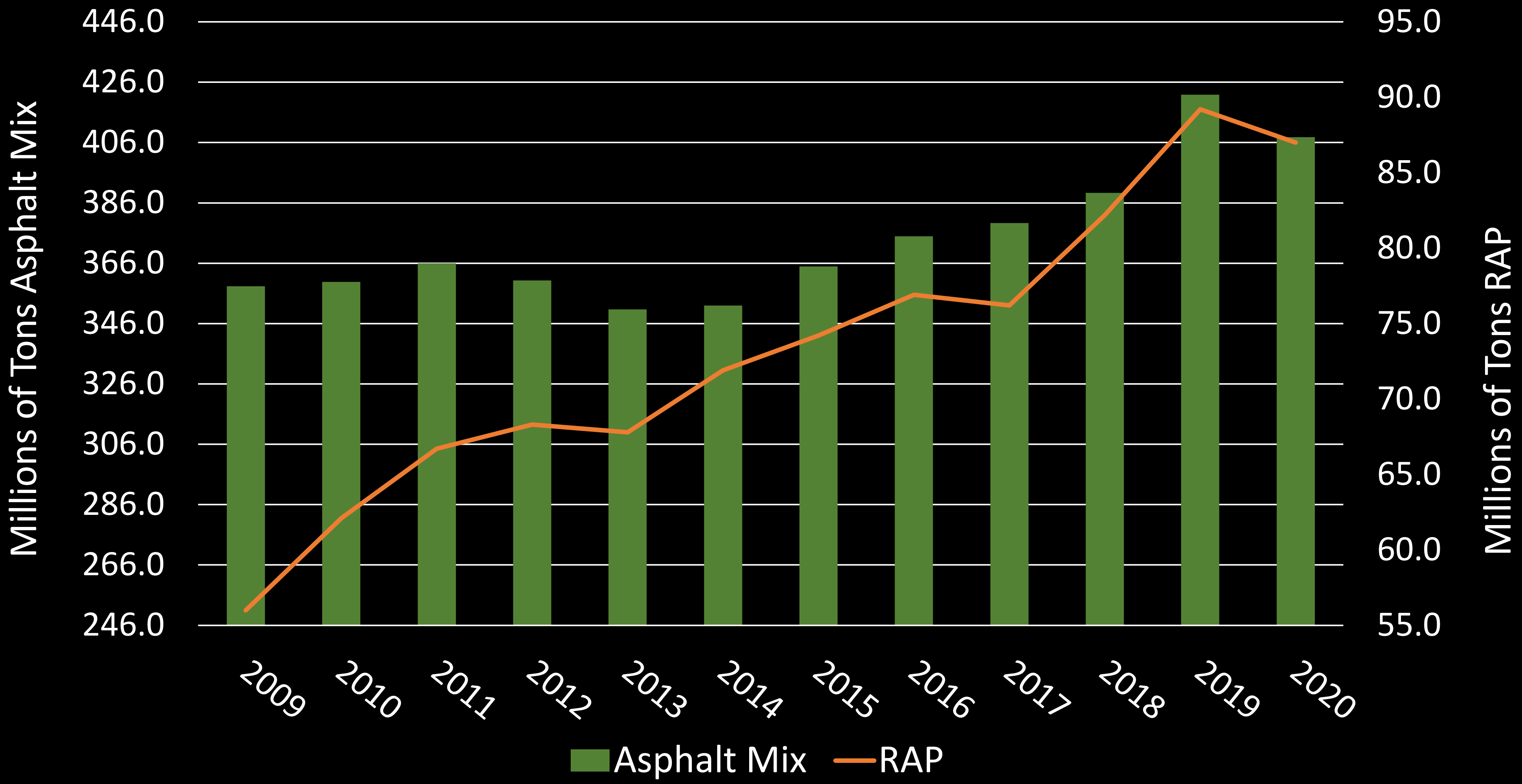
- More recycled material
- Balanced Mix Design
- New technology and materials

Industry Goal 3 Upstream Scope 3 Emissions

Develop a net zero materials supply chain by 2050

Asphalt Mix and RAP Tonnage

Total Production and Use in the U.S.



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PRIORITIZING RAP
SAVES ROAD OWNERS MONEY, REDUCES EMISSIONS, AND IMPROVES PERFORMANCE

How to capture the highest value from infrastructure investments

Introduction

Reclaimed asphalt pavement (RAP) is a valuable material sourced from processes like milling or the removal of asphalt pavements. By detailing the economic, environmental, and performance advantages of RAP, this paper illustrates both the importance of giving priority to RAP utilization in new asphalt mixture production and why using RAP in aggregate replacement and shoulder construction provides a lower return on investment to the road owner.

Cost-Efficiency through Aggregate and Asphalt Binder Replacement

The incorporation of RAP in asphalt mixture production yields substantial cost savings. The aggregate and asphalt binder within RAP can efficiently replace virgin materials, resulting in reduced financial and environmental burdens associated with acquiring these natural resources.

Compared side by side, the savings achieved using one ton of RAP in a common asphalt surface mixture against the use of RAP as shoulder gravel are overwhelming.

Table 1: Costs of Virgin Materials (NAPA)

	Material	% of Market	Cost/Ton 2021
Asphalt Binder	Unmodified	90	$490.65
	Modified	10	$614.01
	Weighted Average*		$519.45
Aggregate	Crushed Stone	90	$11.79
	Sand and Gravel	10	$8.98
	Weighted Average		$11.51

**The asphalt binder weighted average calculation takes into account that 37 states provide unmodified binder index pricing, while only 5 states provide both modified and unmodified binder pricing.*

The comparisons demonstrate how impactful capturing the asphalt binder replacement value of RAP is when utilized in the production of asphalt mix. As shown in Table 2, road owners save three times more by using RAP in a mix (valued at a cost equivalent to replacing *both* virgin aggregate and virgin asphalt binder in a new asphalt mixture) compared to using it as aggregate alone.

Table 2: Cost Savings of One Ton of RAP, Based on Use (Williams et al, 2023)

Material	% Agg.	% AC	Aggregate Cost Savings, $/Ton	Asphalt Binder Cost Savings, $/Ton	Total Cost Savings, $/Ton
RAP in Asphalt Mix	95	5	$10.93	$25.97	$36.90
RAP in Aggregate	100	0	$11.79	$0	$11.79

Sustainable Resource Management and Environmental Advantages

Utilizing RAP in new asphalt mixture production plays a unique role in conserving precious natural resources. By reducing the demand for new aggregates and virgin asphalt binders, using RAP significantly extends the lifespan of valuable resources, aligning with sustainability practices and policies, as well as global initiatives that champion environmentally responsible construction methods.

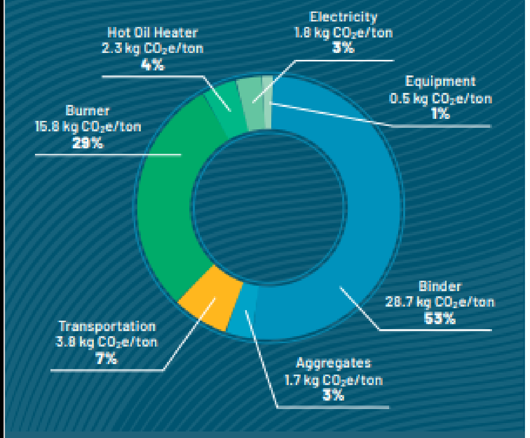
Integrating RAP into asphalt mixtures yields substantial environmental advantages. RAP use can conservatively lead to a 15% reduction in upstream energy requirements for asphalt production, accompanied by a notable 10-20% decrease in greenhouse gas emissions. These reductions are attributed to the decreased need for producing raw materials (aggregates and asphalt binder), as well as reduced raw material transportation to the asphalt plant.

Simple Mix from a Typical Plant

Materials (A1)
- 95% aggregate
- 5% asphalt binder

Transport (A2)
- 22 miles by truck

Plant Energy (A3)
- Burner fuel - Natural Gas
- 289,000 Btu/ton
- 3.3 kWh/ton - Average grid



Total = 54.7 kg CO_2e/ton

Figure 1: Levers to Reduce Emissions at a Typical Mix Plant (NAPA)

Figure 1 demonstrates that processing the asphalt binder component accounts for 53% of emissions, though it represents just 5% of the mix. Meanwhile, the emissions associated with the aggregate account for just 3% of emissions, while representing 95% of the mix. By using RAP as a substitute for asphalt binder and aggregate (saving 28.7 kg emissions), as opposed to only aggregate (saving just 1.7 kg emissions), road owners save 16 times more upstream emissions associated with virgin material procurement.

Enhanced Pavement Performance

Incorporating RAP into asphalt mixtures does not lead to a degradation in quality. With an engineered mix design and stringent RAP quality control, the performance of asphalt mixtures can be elevated through RAP incorporation in new asphalt mixes. When executed correctly, asphalt mixtures with RAP can match or even surpass the performance of asphalt mixes composed solely of virgin materials (West et al, 2011), resulting in longer-lasting pavements, minimizing maintenance needs and repairs, and generating long-term cost efficiencies.

Conclusion

Given the substantial cost savings, sustainable resource management, environmental gains, and performance enhancements, road owners would be wise to prioritize use of RAP in new asphalt mixture production. Rigorous quality assurance and adept mix design practices are pivotal in maximizing these advantages. By prioritizing the use of RAP, the asphalt pavement industry can reduce costs for road owners and reduce emissions for communities, while enhancing pavement performance for roadway users—enabling road owners to improve the sustainability of their asphalt pavements.

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West, R., et al. Use of Data from Specific Pavement Studies Experiment 5 in the Long-Term Pavement Performance Program to Compare Virgin and Recycled Asphalt Pavements. Transportation Research Record: Journal of the Transportation Research Board, January 2011.

Williams, B.A., J.R. Willis, & J. Shacat. (2022). *Annual Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2021, 12th Annual Survey* (IS 138). National Asphalt Pavement Association, Greenbelt, Maryland. DOI:10.13140/RG.2.2.23149.26081

5 BENEFITS OF ASPHALT PAVEMENT MILLING

Milling is a fundamental practice in the maintenance and rehabilitation of asphalt pavements. This paper explores the multifaceted benefits of milling, highlighting its role in restoring pavement geometry, facilitating material recycling, removing deteriorated materials, aiding in surface preparation, and preserving existing infrastructure. By exploring each benefit, this paper illustrates the significance of milling as an essential component of modern pavement management strategies.

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1 RESTORATION OF PAVEMENT GEOMETRY

Milling provides an efficient and effective method for the restoration of pavement geometry. Automation on the milling machine allows for the removal of the upper layers of existing pavement, facilitating the restoration of the original surface grade. This process eliminates drainage issues, revitalizes pavement cross-slopes, and reinstates profiles, ultimately enhancing driving comfort and ensuring consistent road quality and safety.

2 MATERIAL RECYCLING

A paramount advantage of milling lies in its capacity for material recycling. The extraction of reclaimed asphalt pavement (RAP) during milling provides a valuable resource that can be reused and incorporated into the production of new asphalt mixtures. By utilizing RAP, the demand for new raw materials is reduced, lowering costs and promoting environmental sustainability. Prioritizing the integration and use of RAP into new asphalt mixes is essential for maximizing economic value and minimizing environmental impact.

For more insights and in-depth analysis, please refer to the following NAPA resources:

PUBLICATIONS:

- RAP Benefits for Pavement Owners
- Best Practices for RAP and RAS Management (QIP-129)
- Recycling Hot-Mix Asphalt Pavements (IS-123)
- Use of RAP & RAS in High Binder Replacement Asphalt Mixtures: A Synthesis (SR-213)
- Designing HMA Mixtures With High RAP Content: A Practical Guide (QIP-124)
- How to Increase RAP Usage and Ensure Pavement Performance

WEBINARS:

- Beyond the Basics: Milling for Quality
- Best Practices for Milling and Profiling

3 REMOVAL OF DETERIORATED MATERIAL

Milling is an efficient method for the removal of deteriorated asphalt pavement material unsuitable for integration into new pavement sections—including materials exhibiting severe cracking, rutting, stripping, or other forms of pavement failure that may compromise the longevity of the rehabilitated pavement. The selective removal of deteriorated material is critical to ensuring the overall service life of the pavement.

4 SURFACE PREPARATION

A crucial aspect of milling is its impact on surface preparation. The process leaves behind a surface macrotexture, facilitating robust interlayer bonding with overlays. This texture augments the longevity and performance of the newly applied pavement layer, ensuring its resilience against the rigors of traffic and environmental conditions.

5 MAINTAINING GRADE WITH EXISTING INFRASTRUCTURE

Milling plays a vital role in maintaining or reestablishing curb and gutter lines. In urban settings where proper drainage is imperative, this function is of paramount importance. Additionally, milling under bridges ensures that the essential clearances required for vehicles traveling on the road or highway are preserved, even after the application of new asphalt layers.

SUMMARY

The benefits of milling in asphalt pavement maintenance and rehabilitation are diverse and far-reaching. From geometric restoration to material recycling, surface preparation, and infrastructure preservation, milling is an indispensable technique in modern pavement management. Its role in enhancing the longevity, sustainability, and overall performance of asphalt pavements cannot be overstated. By recognizing and capitalizing on the benefits of milling, transportation agencies and industry professionals can optimize their pavement management strategies and contribute to a more sustainable and resilient road network.

The Road Forward

I suppose it is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail.

Abraham Maslow

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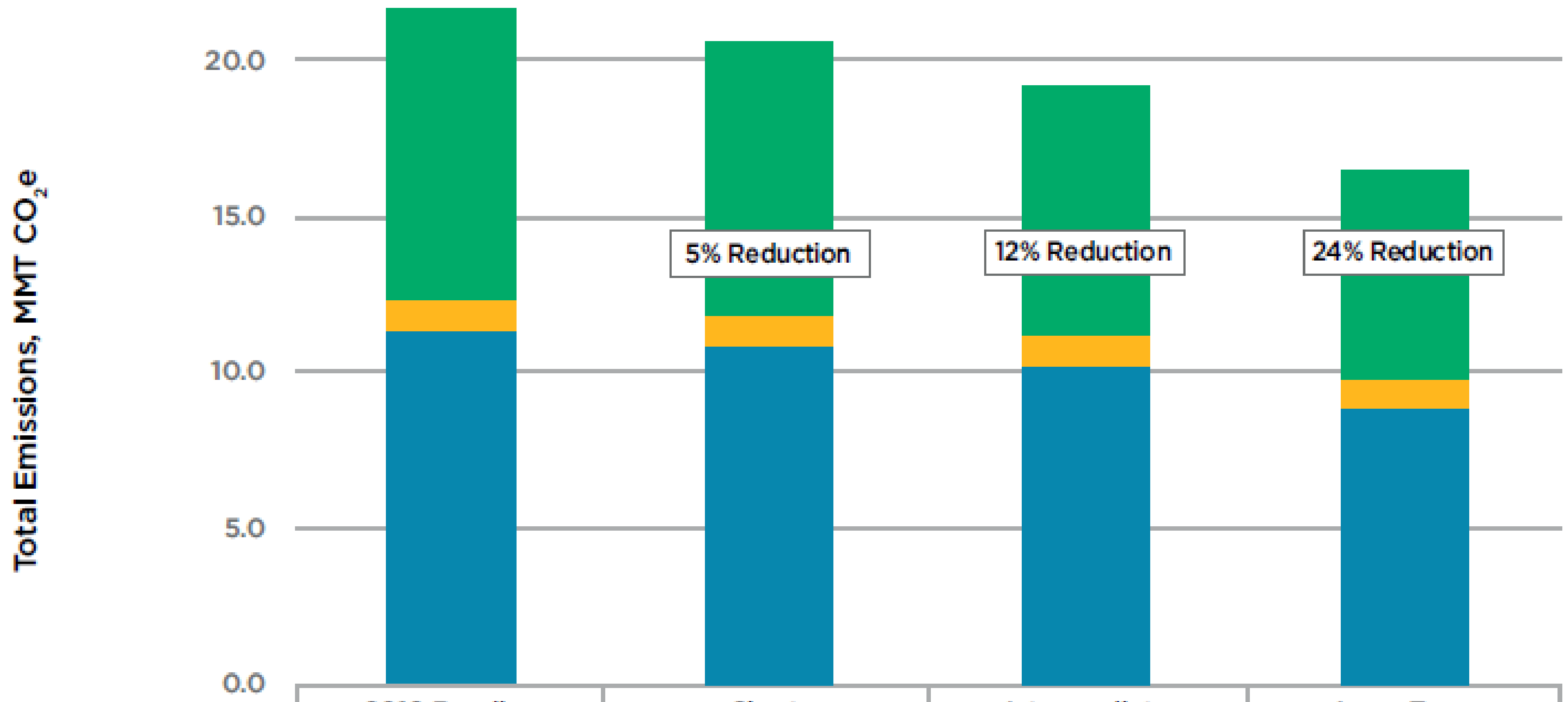
Emissions Reduction Scenarios

Parameter	2019 Baseline	Short-Term	Intermediate	Long-Term
RAP Content	21%	25%	30%	40%
Natural Gas Consumption as Percentage of Fuel Combusted	69%	72%	75%	90%
Aggregate Moisture Content Reduction	N/A	0.25%	0.50%	1.0%
Asphalt Mix Production Temperature Reduction	N/A	10 °F	25 °F	40 °F
Reduction in Electricity Consumption Intensity	3.32 kWh/ton	5%	10%	20%

Results - Emissions Reduction Scenarios



	2019 Baseline	Short	Intermediate	Long-Term
Total (A1-A3)	21.7	20.6	19.1	16.5
Mix Production (A3)	9.4	8.8	8.0	6.8
Transportation (A2)	1.0	1.0	1.0	0.9
Raw Materials (A1)	11.3	10.8	10.1	8.8

What is an EPD?

- **Environmental Product Declaration**
  - **Quantified** environmental information on the **life cycle** of a product to enable **comparisons** between products fulfilling the **same function***
- **"Nutrition label" for environmental impacts**
- **Independently verified**

EPD "Nutrition" Label

Your Building Product

Amount per Unit

LCA IMACT MEASURES	TOTAL
Primary Energy (MJ)	12.4
Global Warming Potential (kg CO² eq)	0.96
Ozone Depletion (kg CFC- 11 eq)	1.80E-08
Acidification Potential (mol H⁺ eq)	0.93
Eutrophication Potential (kg N- eq)	6.43E-04
Photo-Oxidant Creation Potential (kg 03 eq)	0.121

Your Product's Ingredients: Listed Here

https://westcoastclimateforum.com/cfpt/concrete/strategy1

*Source: ISO 14025:2006. **EPDs from different Product Categories should NOT be compared to each other.**

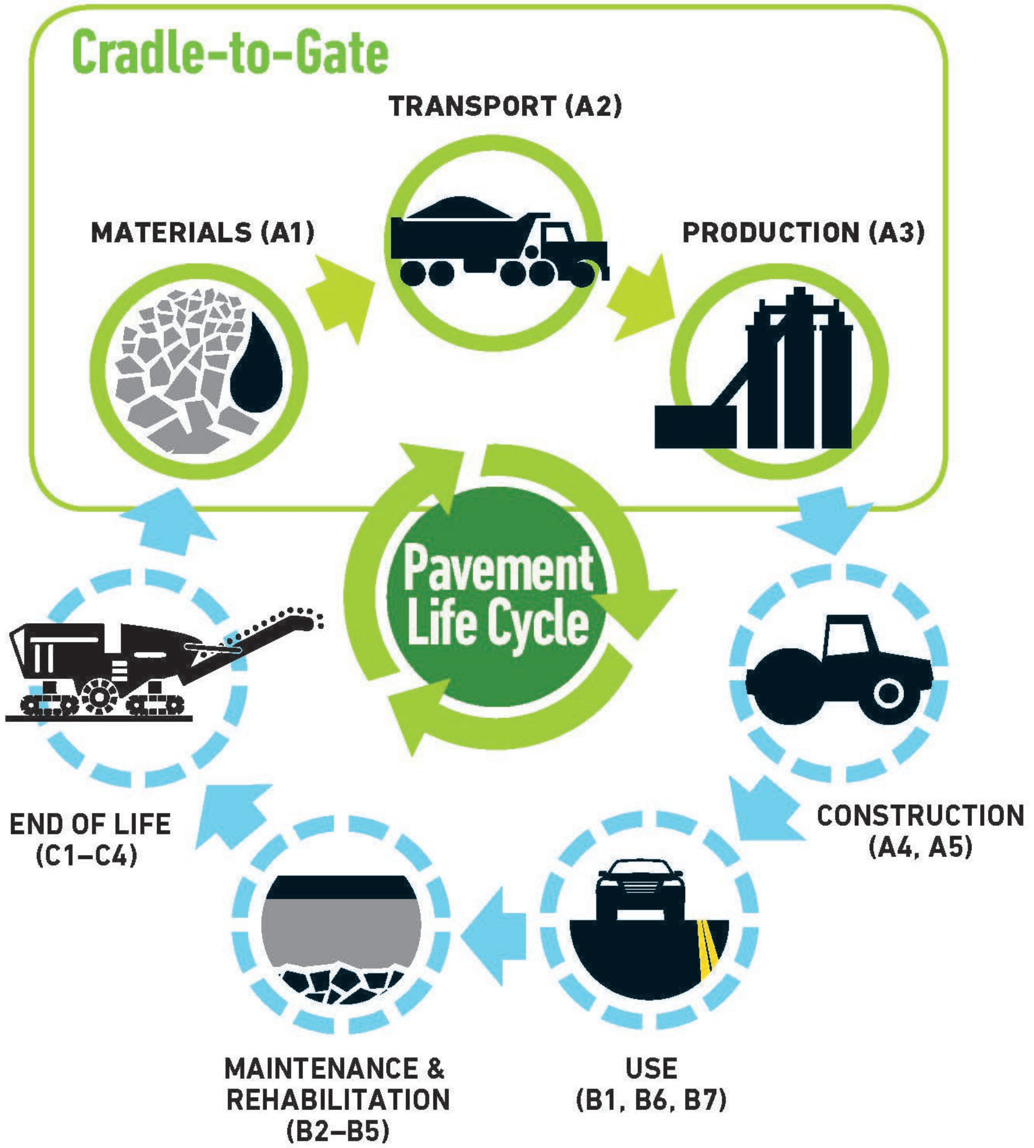
Life Cycle Framework – LCA and EPDs

Cradle-To-Grave LCA

LCA PAVE

EPDs

Emerald ECO LABEL



FHWA Benchmarking Approach

- Industry is empowered to establish its own benchmarks
- Agencies implement industry benchmarking approach
  - Paid for by FHWA grants

NAPA Approach: Deconstruct the Benchmark by Life Cycle Phase

A1

Mix Design

Design

A2

Aggregate Transport

Transport

A3

Climate Region + Production

Production

Total

Total

A1: Impact of *Mix Specifications* on GWP

Starting Point: **36.6** kg CO2e/tonne mix

Use adjustment factors

A1 Material	Mass balanced with	GWP Intensity kg CO_2e/tonne ingredient (*/shtn)	Adjustment factor for using ingredient for additional 1% of mixture by mass kg CO_2e/tonne mixture (*/shtn)
Neat Binder	Aggregate	631.51 (573.06)	**+6.30 (+5.71)**
3.5% SBS Modified Binder	Aggregate	758.71 (688.49)	**+7.57 (+6.86)**
Lime	Aggregate	1389.0 (1259.9)	**+13.87 (+12.58)**
RAP	Aggregate + Neat Binder	0.781 (0.710)	**-0.357 (-0.325)**
Aggregate (USLCI, prescribed)	Neat Binder	1.94 (1.761)	**-6.30 (-5.71)**

9.5mm Superpave

Baseline Mix Design, US Avg A2/A3

A1	A2	A3	Total
94.5% Aggregate 5.5% Binder	Transport	Production	
36.6 kg CO2e	**Transport**	**Production**	**Total**

GSA

72.6

64.8

55.4

9.5mm Superpave: Michigan

Standard Mix, US Average A2, Dry Freeze Average A3

A1	A2	A3	Total
94.5% Aggregate 5.5% Binder			
36.6 kg CO2e	**Transport**	**Production**	**Total**

A2: Impact of *Aggregate Availability* on GWP

Some states have different benchmarks

A2 by State	Florida kg CO2 e/tonne (kg CO2 e/shtn)	Louisiana kg CO2 e/tonne (kg CO2 e/shtn)	All Others kg CO2 e/tonne (kg CO2 e/shtn)
20%	3.3 (3.0)	15.7 (14.2)	0.21 (0.18)
40%	18.7 (17.0)	24.0 (21.8)	1.4 (1.2)
50%	36.9 (33.5)	28.7 (26.0)	2.5 (2.2)
Average	41.3 (37.5)	28.9 (26.2)	3.9 (3.5)

9.5mm Superpave: Michigan

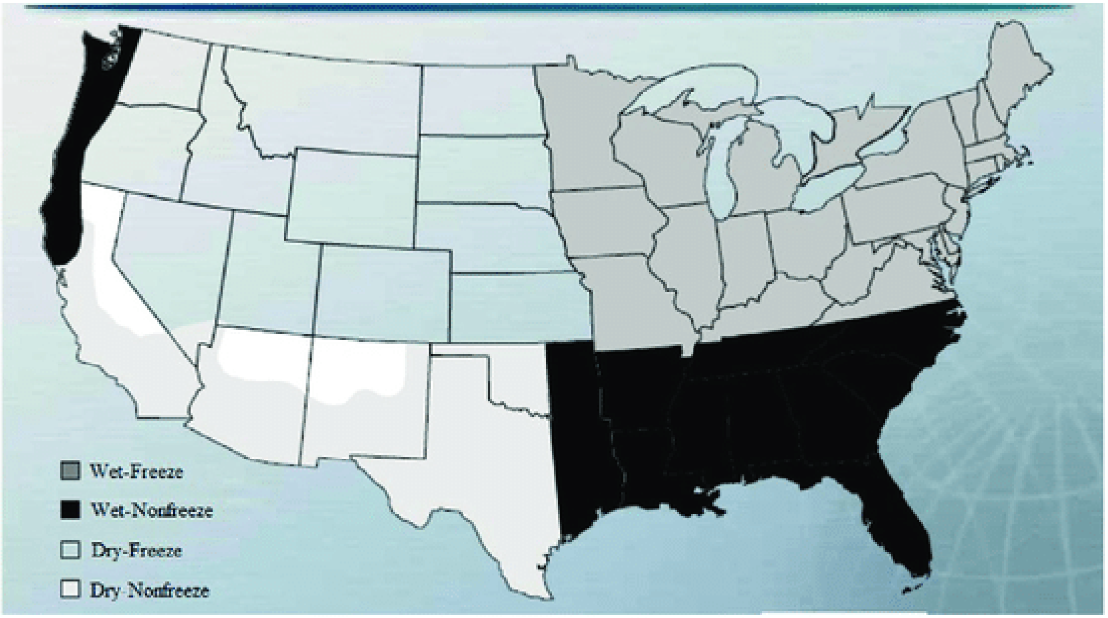
Standard Mix Design, US Average A2, Dry Freeze Average A3

A1	A2	A3	Total
94.5% Aggregate 5.5% Binder			
36.6 kg CO2e	**3.9** kg CO2e	**Production**	**Total**

A3: Impact of Climate Region on GWP

4 Climate Regions

- Wet Freeze
- Wet No-Freeze
- Dry Freeze
- Dry No-Freeze



Objective 2: Phase-by-phase Benchmarking

A3: Impact of *Climate* on GWP

Benchmarks differ by climate region

A3 by AASHTO Region	Wet No freeze kg CO_2e/tonne (kg CO_2e/shtn)	Wet Freeze kg CO_2e/tonne (kg CO_2e/shtn)	Dry No freeze kg CO_2e/tonne (kg CO_2e/shtn)	Dry Freeze kg CO_2e/tonne (kg CO_2e/shtn)
20%	23.2 (21.0)	20.9 (19.0)	17.5 (15.9)	21.9 (19.9)
40%	25.4 (23.0)	22.8 (20.6)	20.0 (18.1)	23.6 (21.4)
50%	26.1 (23.7)	23.6 (21.4)	21.8 (19.8)	25.8 (23.4)
Average	27.5 (25.0)	24.6 (22.3)	23.0 (20.8)	27.1 (24.6)

9.5mm Superpave: Michigan

Standard Mix Design, US Average A2, Dry Freeze Average A3

A1	A2	A3	Total
94.5% Aggregate 5.5% Binder	National Average	Wet Freeze	
36.6 kg CO2e	**3.9** kg CO2e	**24.6** kg CO2e	**65.1**

72.6

64.8

55.4

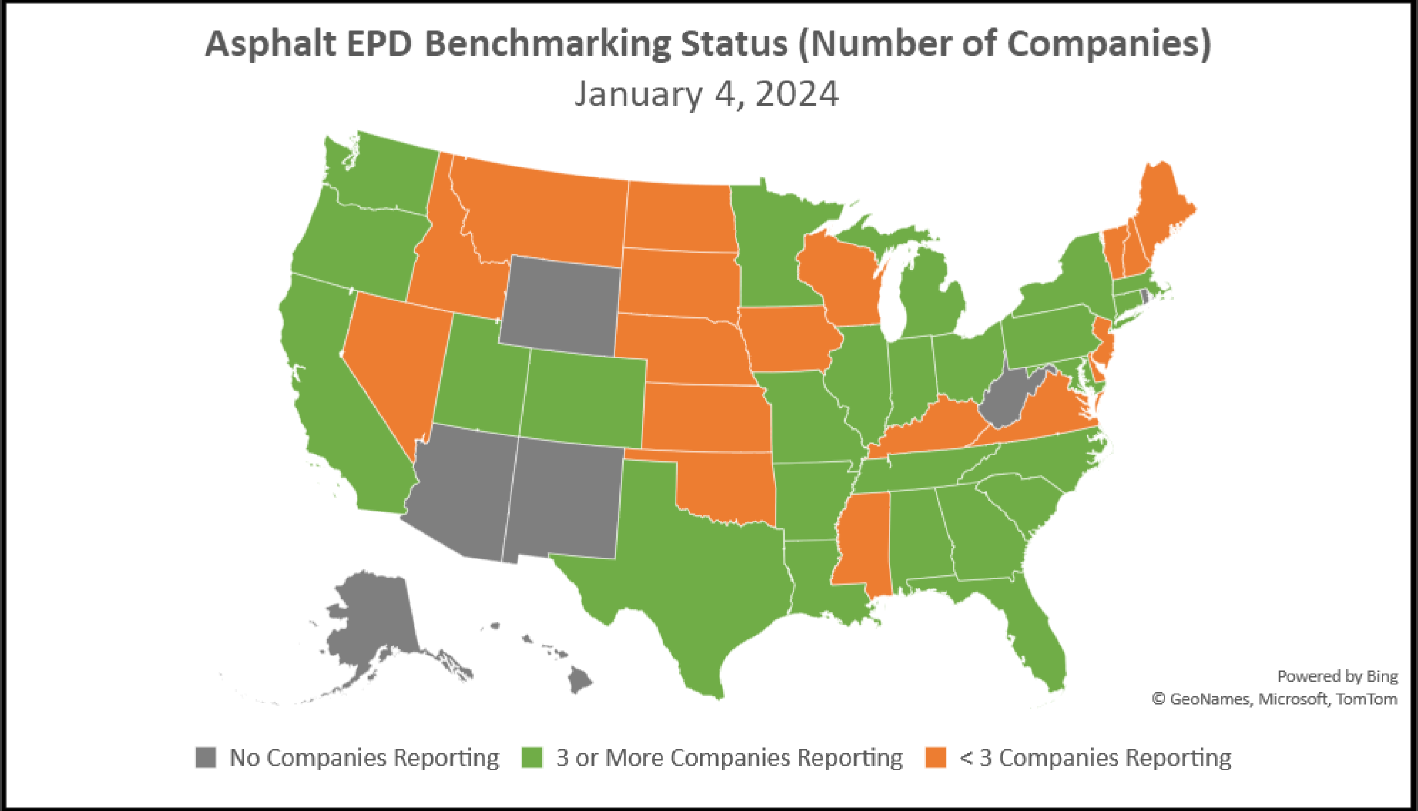
9.5mm Superpave: Michigan

Standard Mix Design, US Average A2, Dry Freeze Average A3

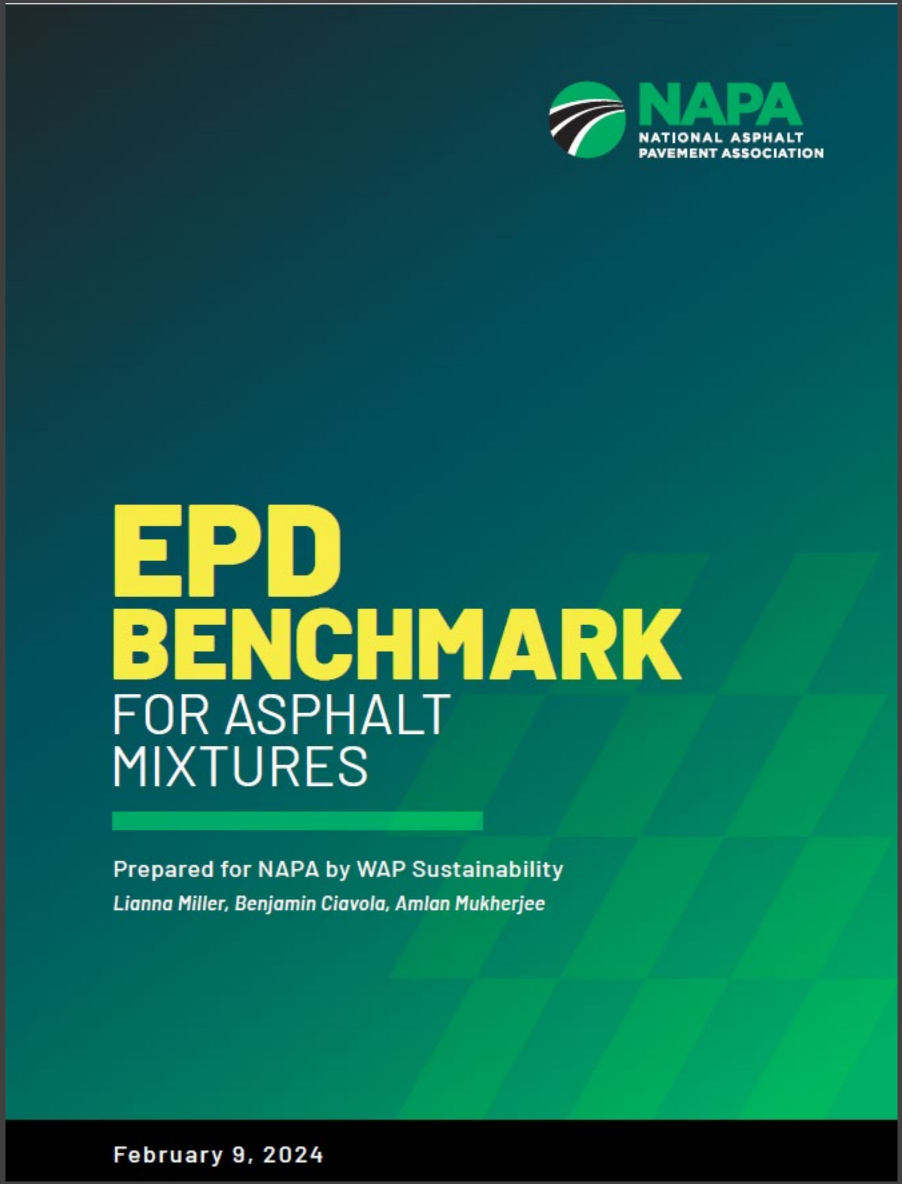
[all values in kg CO2 e. / tonne]	A1 (Baseline Mix)	A2 (National Benchmark)	A3 (Wet Freeze)	A1-A3 Total (Proposed Method)	Current A1-A3 GSA Thresholds
20%	36.6	0.2	20.9	**57.7**	55.4
40%		1.4	22.8	**60.8**	64.8
50%		2.5	23.6	**62.7**	x
Average		3.9	24.6	**65.1**	72.6

NAPA EPD Benchmarking Initiative

- No cost to participate
- Will enable agencies to develop reasonable estimates for industry averages based on:
  - local conditions
  - key parameters in their specifications
- *This is an interim solution*



Benchmarking data collection to re-open November 6 – March 15


NATIONAL ASPHALT PAVEMENT ASSOCIATION

EPD BENCHMARK FOR ASPHALT MIXTURES

Prepared for NAPA by WAP Sustainability

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February 9, 2024

EPA Low Carbon Construction Labeling Program

- Stakeholder feedback request out now
- These benchmarks could be used by EPA to develop a label for purchasers

Hey NAPA!

What should I know about environmental product declarations?