San Francisco Bay Area Green Initiatives

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Metropolitan Transportation Commission

- 9 counties, 100 cities
- 25 transit agencies
- 42,000 lane miles of local roads
- Average PCI = 67
- LSR Capital Maintenance Need: $36 billion (2017- 2040)

2006 California Legislation

- **Global Warming Solutions Act**
  - Requires GHG emissions in CA to drop to 1990 levels by 2020
  - Goal = 80% emissions reduction 2050
- **Sustainable Communities Strategy (SCS)**
  - Requires integration of land use and transportation planning to reduce emissions from light duty vehicles

Bay Area Green Paving Initiatives

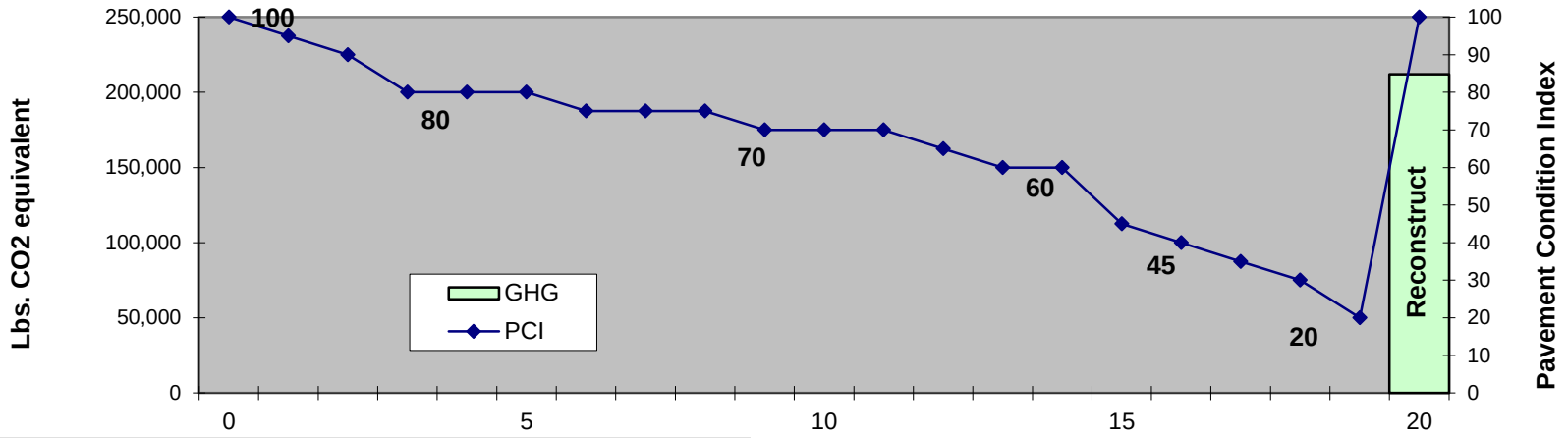
1. PM Performance Measures
2. Rubberized Asphalt Performance
3. Cold In Place Recycling

Initiative #1 – Preventive Maintenance

Preventive Maintenance

- Roadway repair is inevitable. The best way to limit emissions from pavement maintenance is to keep roads in good condition with preventive maintenance.

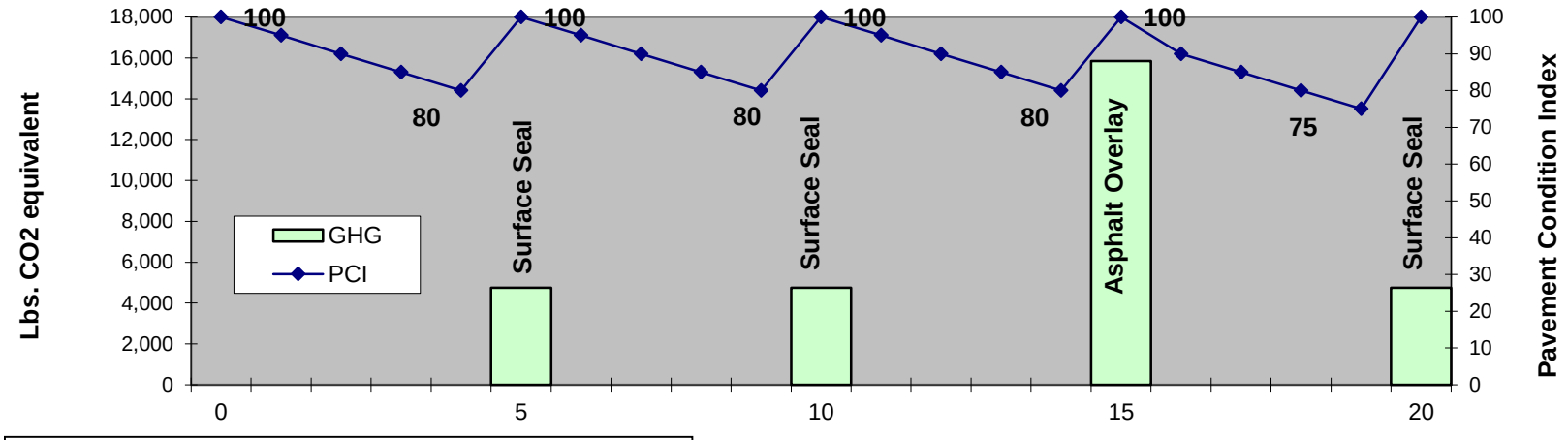
Preventive Maintenance



Total Lifecycle GHG emissions/lane mile = **212,100** lbs. of CO2e

Emissions Data Source: Jim Chehovits & Larry Galehouse; *Energy Usage and Greenhouse Gas Emissions of Pavement Preservation Processes for Asphalt Concrete Pavement;,* 2010

Preventive Maintenance



Total Lifecycle GHG emissions / lane mile = **30,100** lbs. of CO2e

Emissions Data Source: Jim Chehovits & Larry Galehouse; *Energy Usage and Greenhouse Gas Emissions of Pavement Preservation Processes for Asphalt Concrete Pavement;*,2010

Preventive Maintenance

- Savings from one lane mile over the life-cycle of the pavement = 182,000 lbs. of CO2
- Equivalent to annual emissions from 15 cars
- Times 42,000 lane miles = 7.6 million lbs. of CO2, or annual emissions from 630,000 cars

PM Performance

- Allocation Formula
  - 25% Population
  - 25% Lane Miles
  - 25% Shortfall
  - 25% Preventive Maintenance Performance
- Performance Score Determined with StreetSaver®
  - PM Score = Recommended vs. Actual % of Budget spent on preventive maintenance

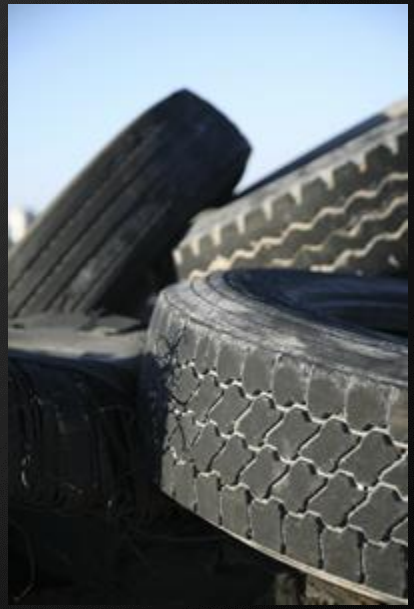
PM Performance

- Treatments applied to pavements above PCI 65-70 qualified as PM
- Jurisdictions not penalized for existing network condition or budget size
- Score was weighted by jurisdictions' combined share of other three factors
- Weighted performance ratio determined jurisdiction's share for 25% of available funding

Initiative #2 –
Rubberized Asphalt Performance

Rubberized Asphalt Concrete (RAC)

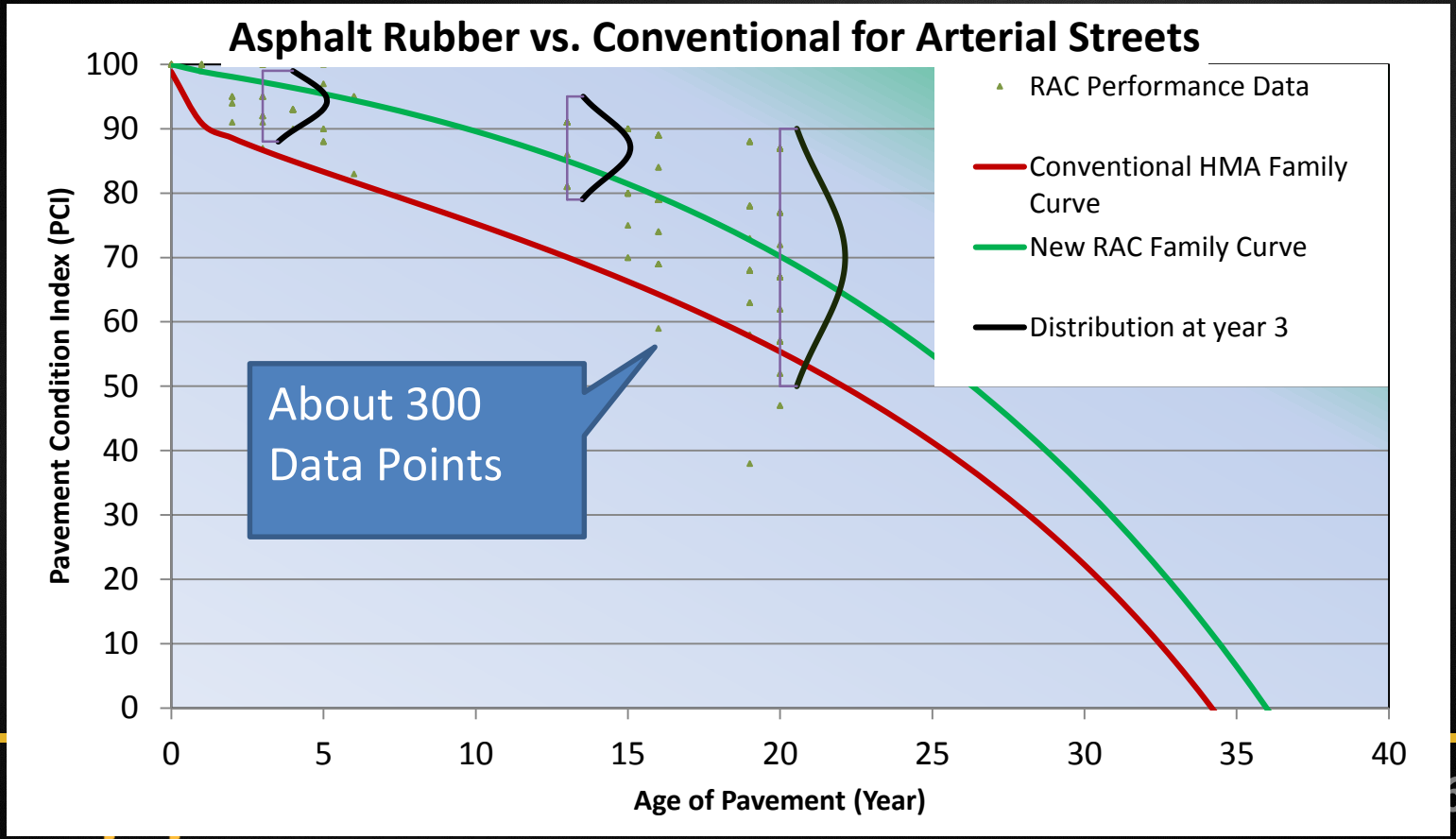
- Utilizes recycled waste tires
  - On avg. 2,000 tires / lane mile
- Improved binder properties for better performance
  - Can be used at reduced thickness
  - Longer durability means less frequent maintenance
    - Claims to last 50% longer than traditional mixes
- There is no performance model for RAC!



Rubberized Asphalt Concrete (RAC)

- MTC partnered with Ca. Pavement Preservation Center and CalRecycle to:
  1. Quantify the benefits of using RAC
  2. Develop a performance model for pavement management systems
- Abundance of data from San Francisco Bay Area StreetSaver users made analysis possible

RAC Data Analysis



Rubberized Asphalt Concrete (RAC)

- Analysis showed superior performance of RAC over traditional HMA
- MTC is working to integrate an RAC overlay code with StreetSaver
- Other sustainable treatments will be studied and integrated as well

Initiative #3 –
Cold in Place Recycling

2012 Climate Initiatives Program - $80M

- Goals:
  - Meet GHG emission reduction requirements
  - Test innovative transportation strategies / technologies
    Promote co-benefits
  - Replicate successful projects

Climate Initiatives Showcase Project: Cold In Place Recycling

- Sonoma Co. and City of Napa joint project
- $2 M Climate Initiatives grant
- 13 miles of roadway
- Demonstration Project – Staff from 50+ agencies in attendance

https://www.youtube.com/watch?v=0ZXyt_oq6qg

Project / Program Evaluation

- Quantified estimates of change (before & after)
- Reduction of GHG emissions
- Project costs and benefits
- Project replication opportunity

GHG Analysis Basis

Emissions Source	Emissions (CO_2e)	Data Source
Hot Mix Asphalt	108 lbs / ton asphalt*	Bilal, Julian; Chappat, Michael; Colas Group; *Sustainable Development: The Environmental Road of the Future*; 2003
Cold In Place Recycling	20 lbs / ton asphalt*	Bilal, Julian; Chappat, Michael; Colas Group; *Sustainable Development: The Environmental Road of the Future*; 2003
1 Passenger Car (12,000 miles/ year)	5.5 metric tons / year or 6.1 tons / year or 12,125 lbs/ year	www.epa.gov/otaq/climate/420f05004.htm

**Emissions data has been converted from kg / metric ton to lbs / US ton*

GHG Reductions

For every lane mile of roadway that CIR is used vs. HMA, approx. 130,704 lbs. of GHG emissions are saved (equivalent to taking 11 cars off the road for one year).

Innovative Climate Programs

Cold in Place Recycling

Repaved two roadways in Napa using Cold in Place Recycling.

GHG Emissions Reduction: 493 tons/yr

Cost Effectiveness: -$2,477

Shore Power

Installed shore power technology at two berths at the Port of Oakland.

GHG Emissions Reduction: 534 tons/yr

Cost Effectiveness: $849

fleet.

GHG Emissions Reduction: not quantified

Cost Effectiveness: not quantified

Replication Opportunity

The potential emissions savings if all candidate streets in the region were paved using CIR vs. HMA is 1.6 billion lbs. of GHG, (equivalent to taking 143,096 cars off the road for one year).

Green Paving Initiatives on the Rise

- Data from Statewide Needs Assessment Sustainable Practices

Conclusion

"True sustainability means not only seeking new ideas but searching for innovative alternatives to existing methods"

--Sonoma County/Napa Climate Initiatives Proposal