High Performance Hot Mix Asphalt Intersections

Develop A Strategy

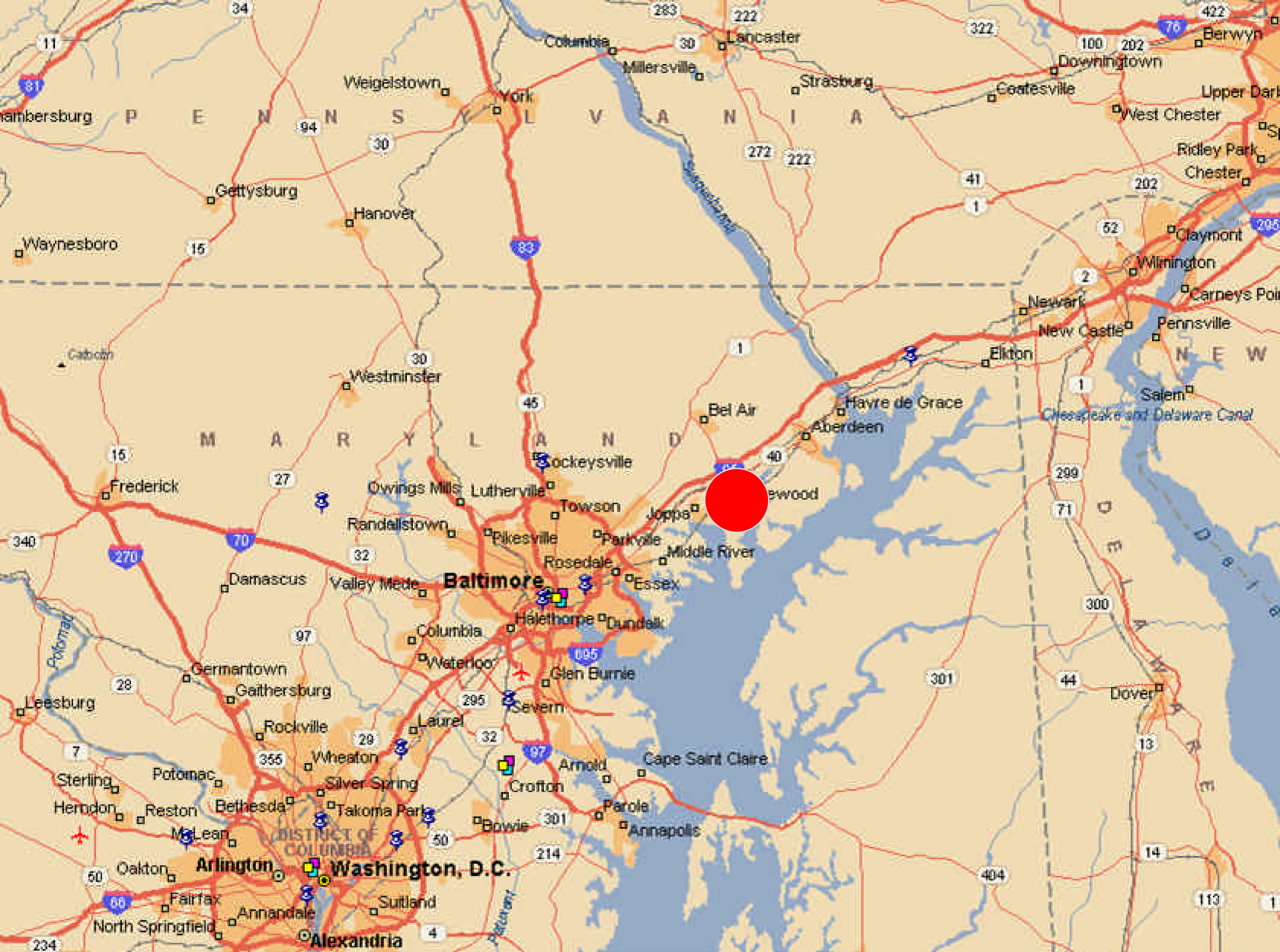
- **Recognize that intersections may need to be *treated differently* than posted-speed pavements.**

Intersection Strategy

- Assess the problem (if rehabilitating)
- Ensure structural adequacy
- Materials selection, mix design and quality control
  - SUPERPAVE Mix Design System
- Practice proper construction techniques

MD Intersection Competition

- MD SHA formed a "Rutting Team" in 1993
- No solutions found
- In 1994 two intersections on RT 40 given to HMA & PCC industries
  - Use any available technology - can ignore MD DOT specs
  - Work within a budget
  - Best performance wins



PENNSYLVANIA
MARYLAND
NEW
DELAWARE
Columbia
Lancaster
Millersville
Strasburg
Weigelstown
York
Coatesville
Downingtown
Berwyn
West Chester
Ridley Park
Chester
Claymont
Wilmington
Newark
New Castle
Pennsville
Elkton
Salem
Chesapeake and Delaware Canal
Gettysburg
Hanover
Waynesboro
Westminster
Bel Air
Havre de Grace
Aberdeen
Cockeysville
Owings Mills
Lutherville
Towson
Joppa
Frederick
Randallstown
Pikesville
Parkville
Middle River
Rosedale
Baltimore
Essex
Damascus
Valley Mede
Halethorpe
Dundalk
Columbia
Waterloo
Glen Burnie
Germantown
Gaithersburg
Leesburg
Severn
Rockville
Laurel
Wheaton
Arnold
Cape Saint Claire
Sterling
Potomac
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Annandale
North Springfield
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Dover
Potomac

Maryland Asphalt Association Strategy

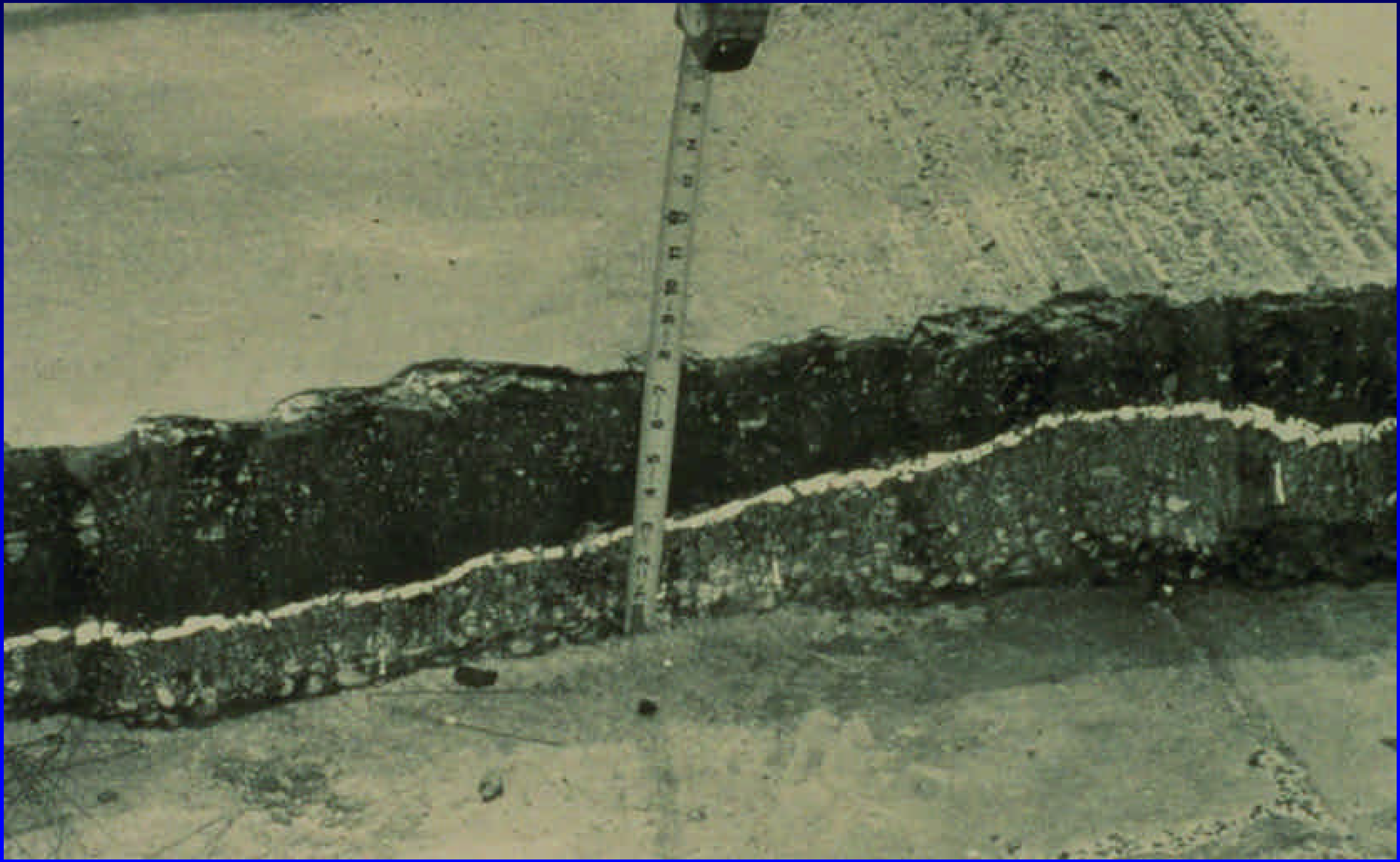
- Form Task Force
  - MD Asphalt Association
  - NAPA
  - Asphalt Institute
- Perform forensic analysis on existing roadway before deciding on a solution
- Consider new technology

Before - Eastbound Rutting

Before - 1.5” Rutting per Year

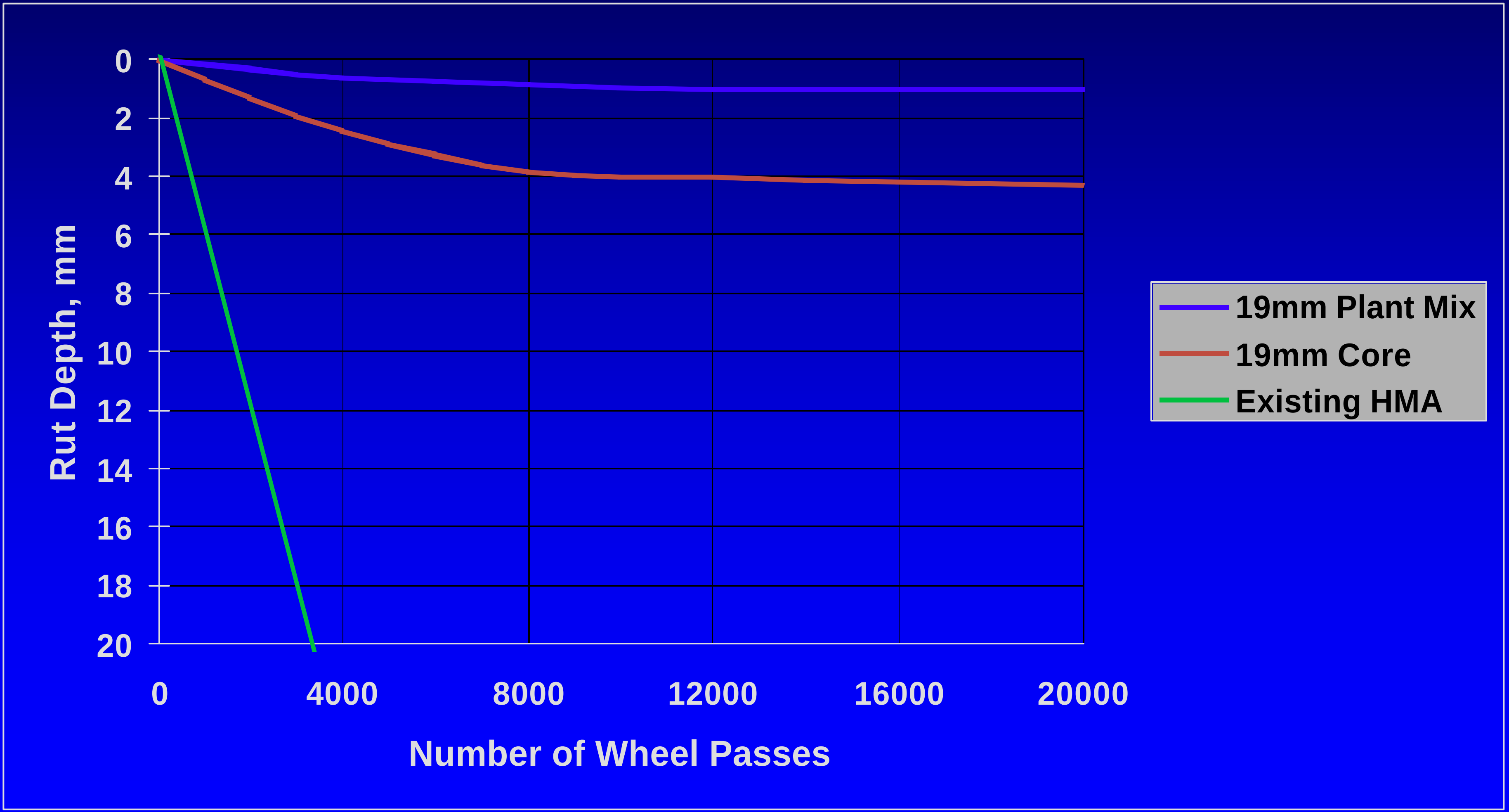
Before - Westbound RT 40

Forensics - Roadway Trench

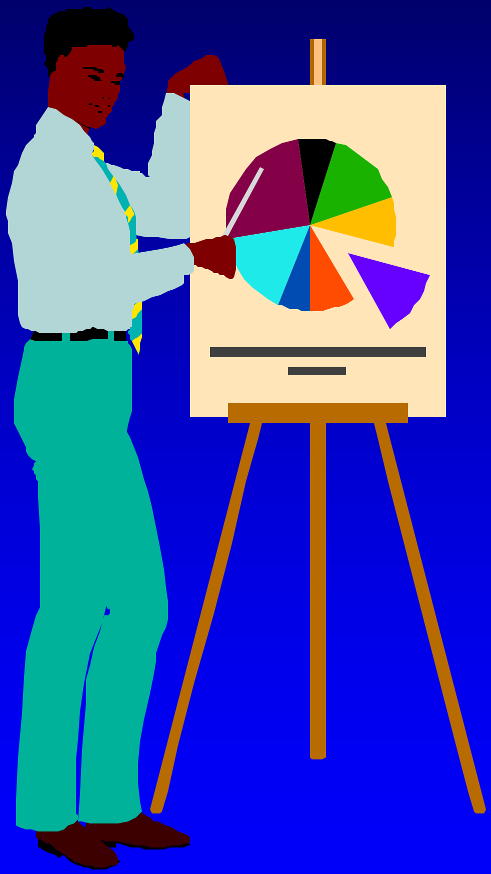


Forensics - 10” Roadway Cores

Forensics - Hamburg Wheel Tracking Device Testing

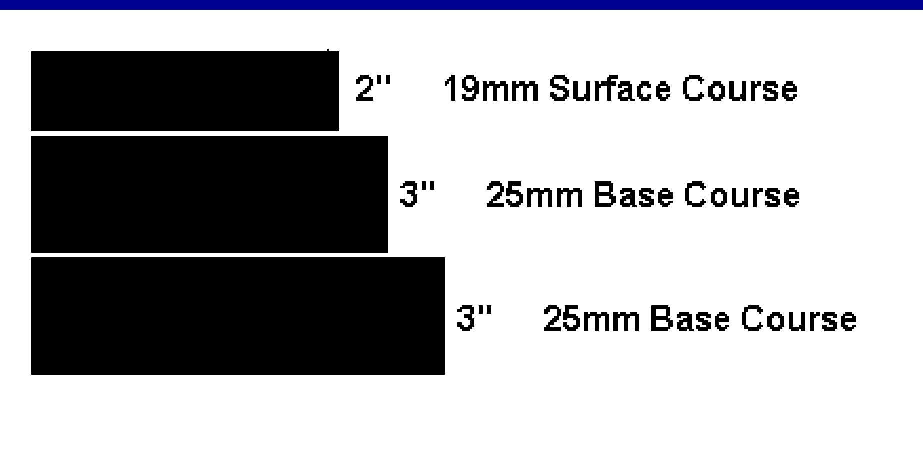


Pavement Design



- Rutting was evident almost to bottom of existing 8” HMA in trench
- Remove and replace all 8” of existing HMA
- Use SUPERPAVE mixes rather than MD SHA mixes
  - Coarser aggregate structure
  - Specify asphalt binder to meet both climatic and traffic conditions

Pavement Design Selection



- Section 1 - 8”
  - Mill 8” & Pave 8”
  - Test Section to be compared to PCC intersection
- Section 2 - 5”
  - Mill 5” & Pave 5”
  - Compare performance to 8” section
- Section 3 - 2”
  - Mill 2” & Pave 2”
  - Cosmetic improvement

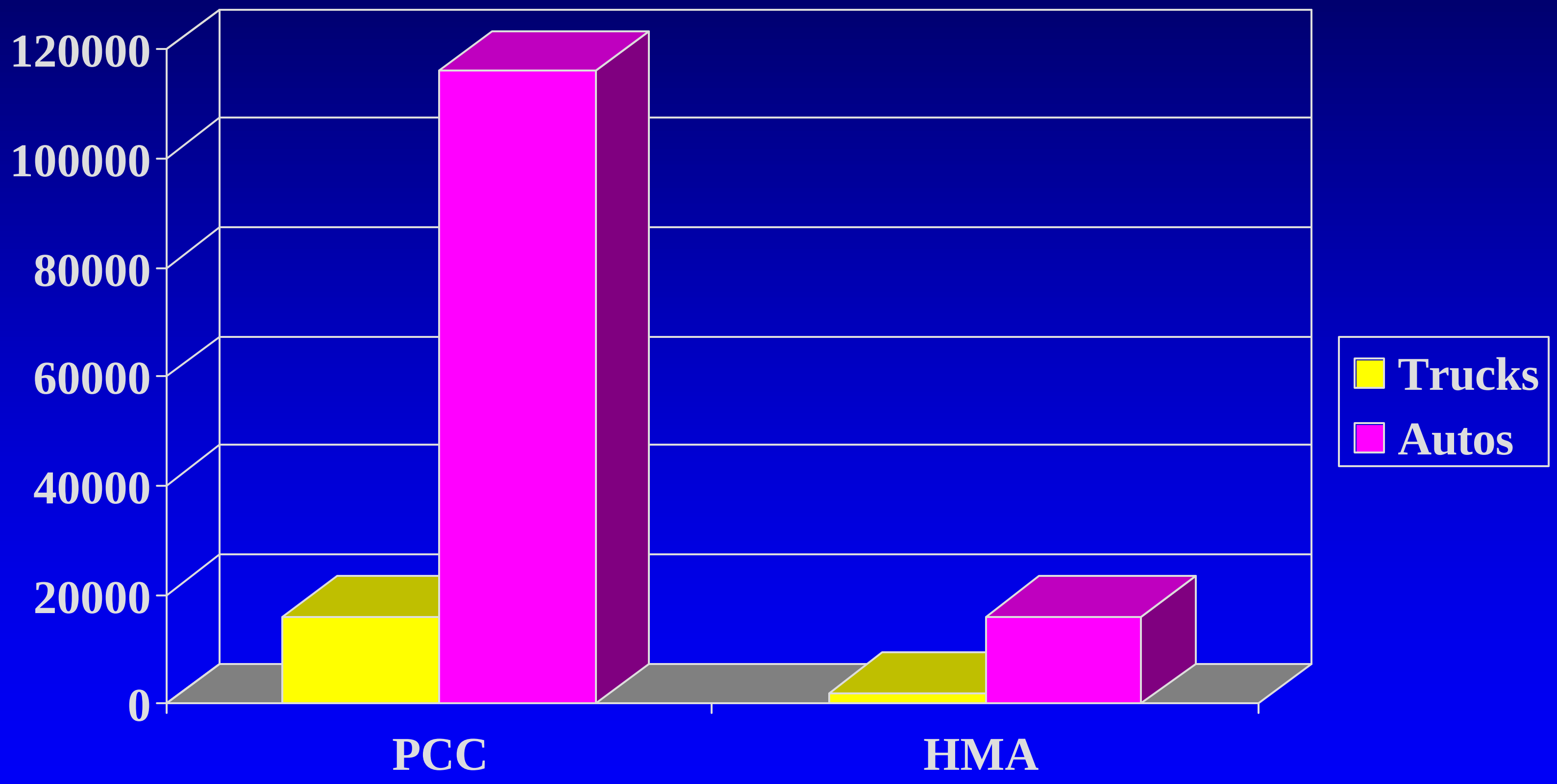
Asphalt Binder Selection

- Standard Climatic Grade - PG 64-22
- Traffic Data
  - 20 year ESAL's = 12.8 million
  - 12% Trucks
- "Bump" asphalt binder two grades for stopped traffic
- Selected asphalt grade was PG 76-22
- Used a stabilized SBS polymer modified asphalt

Paving Schedule

- All work done at night - 7:00PM to 6:00AM
- Avoided rush hours
- Little or no traffic disruption
- Work accomplished in 8 nights - 15,000sy of milling & paving
- PCC intersection -12 days and nights (24 hour lane closure) - for 1700sy of paving

Vehicles Affected by Work Zone



US RT 40 - ADT 29,000

- 12% Trucks

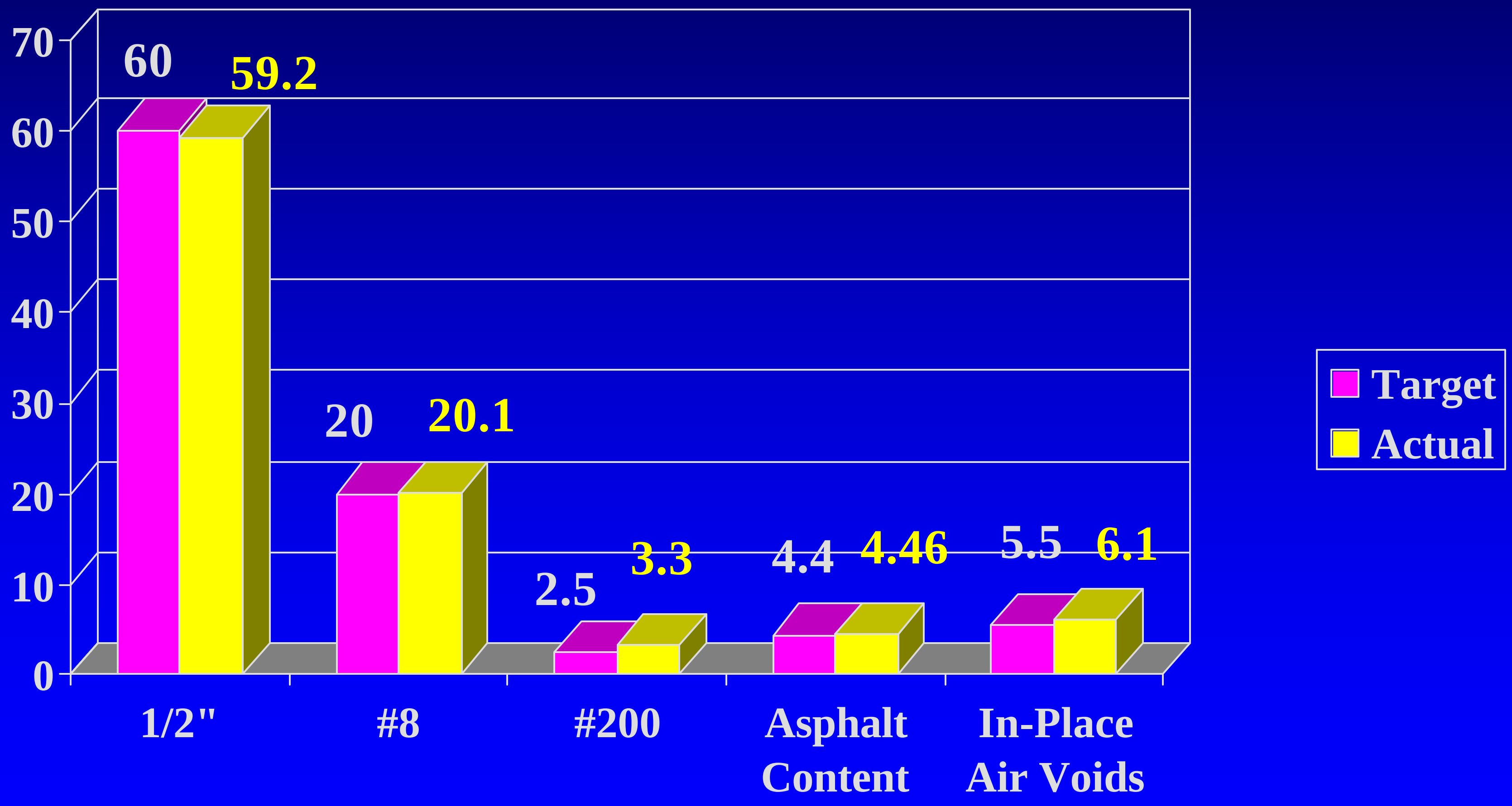
Maintenance of Traffic

- Placed temporary HMA ramps at all entrances after milling operation

Compaction

- Used 2 double drum vibratory rollers
- High frequency, low amplitude
- NO TENDER ZONE
- Achieved density

QC Test Results - 25mm Mix



Completed 25mm Base Paving

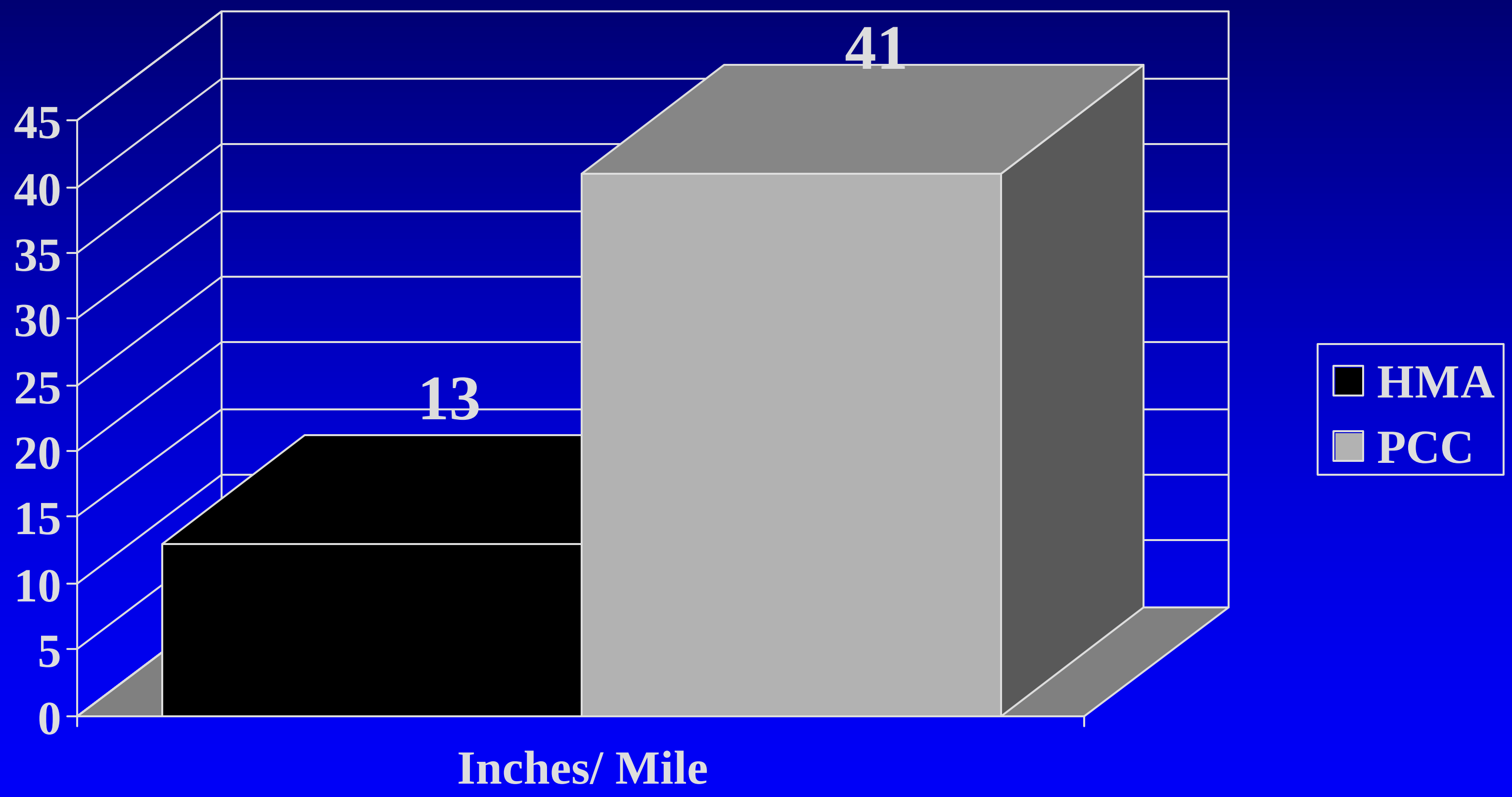
After - RT 40 Eastbound

After - RT 40 Eastbound

Performance Testing - Ride

- Used California Type Profilograph
- Measured both HMA intersection and PCC intersection one year after paving

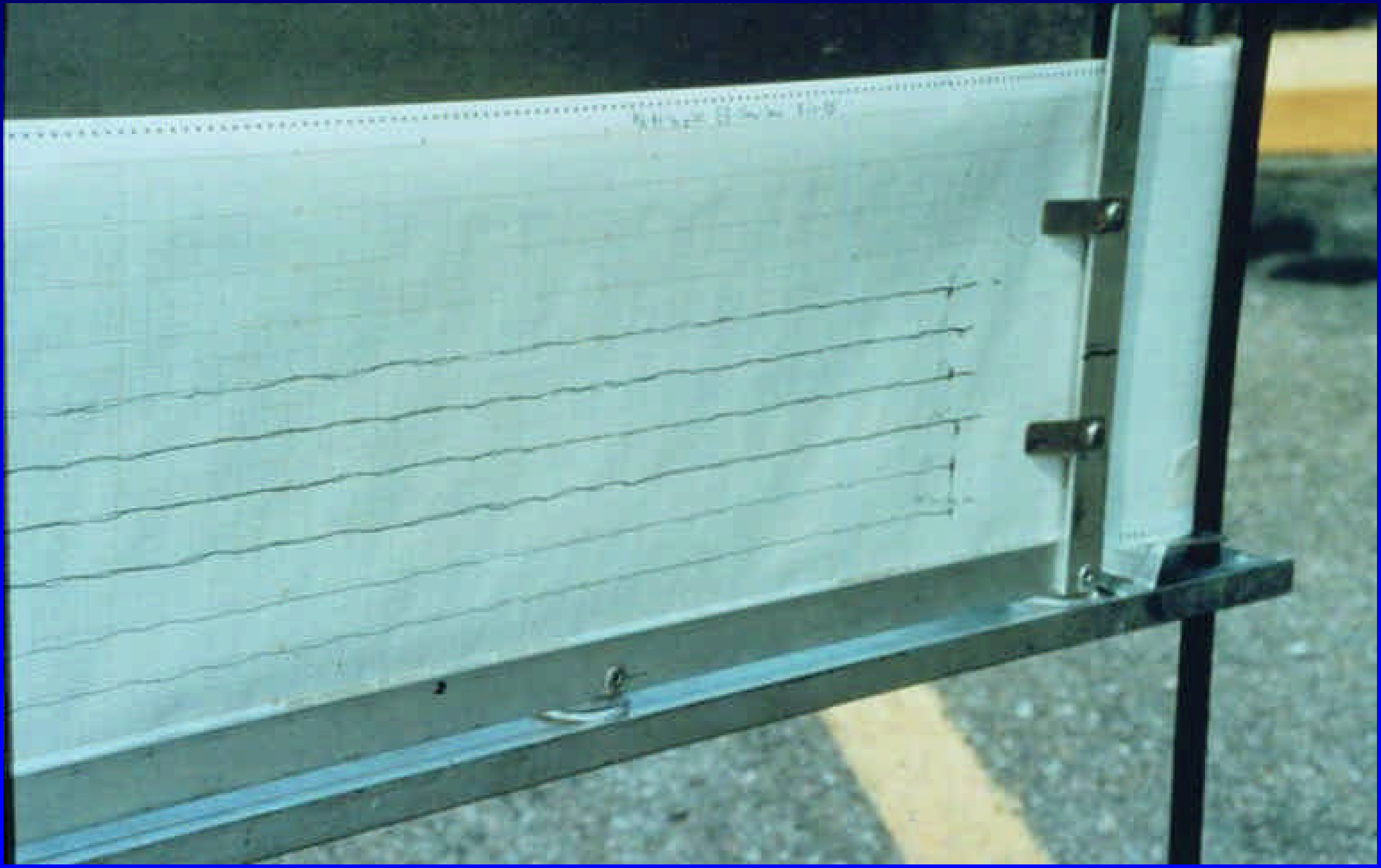
Ride Testing - Results



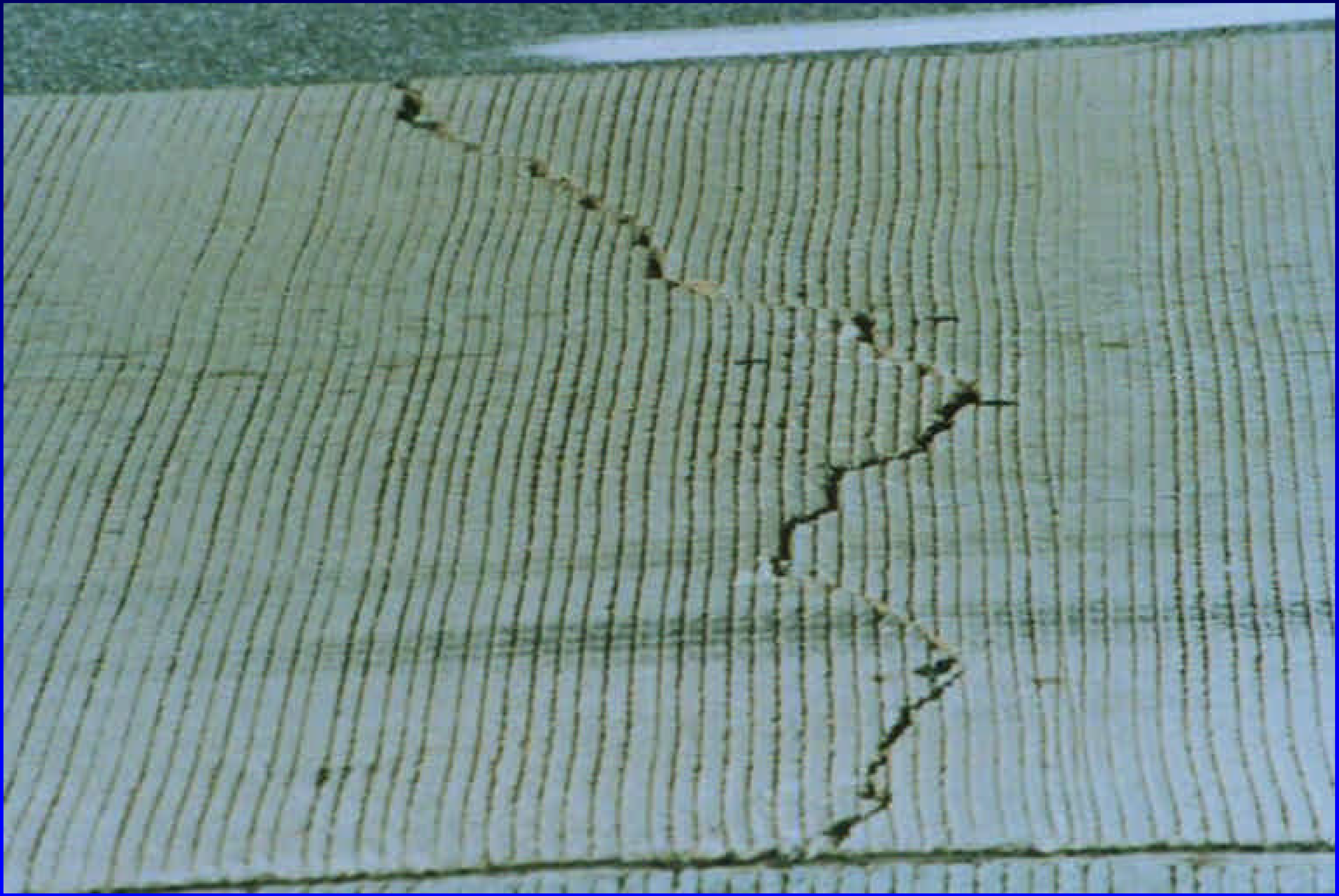
Performance Testing - Rutting

- Transverse Profilograph
- Pen holding device follows roadway surface
- Pen draws profile on chart paper
- After 5 years - 1/16” rutting

Performance Testing - Rutting



PCC Performance - After 4 Years (6.25” Whitetopping)



PCC Performance - March 2000

Conclusions

- Intersections require special treatment
- Develop a strategy
  - Forensic investigation
  - Structural strength
  - Aggregate structure
  - Correct Asphalt Binder grade
  - Good construction practices

How do they compare?

PCC Performance - July 2000

- PCC installed in Spring 1995
- PCC removed July 2000 & replaced with SUPERPAVE

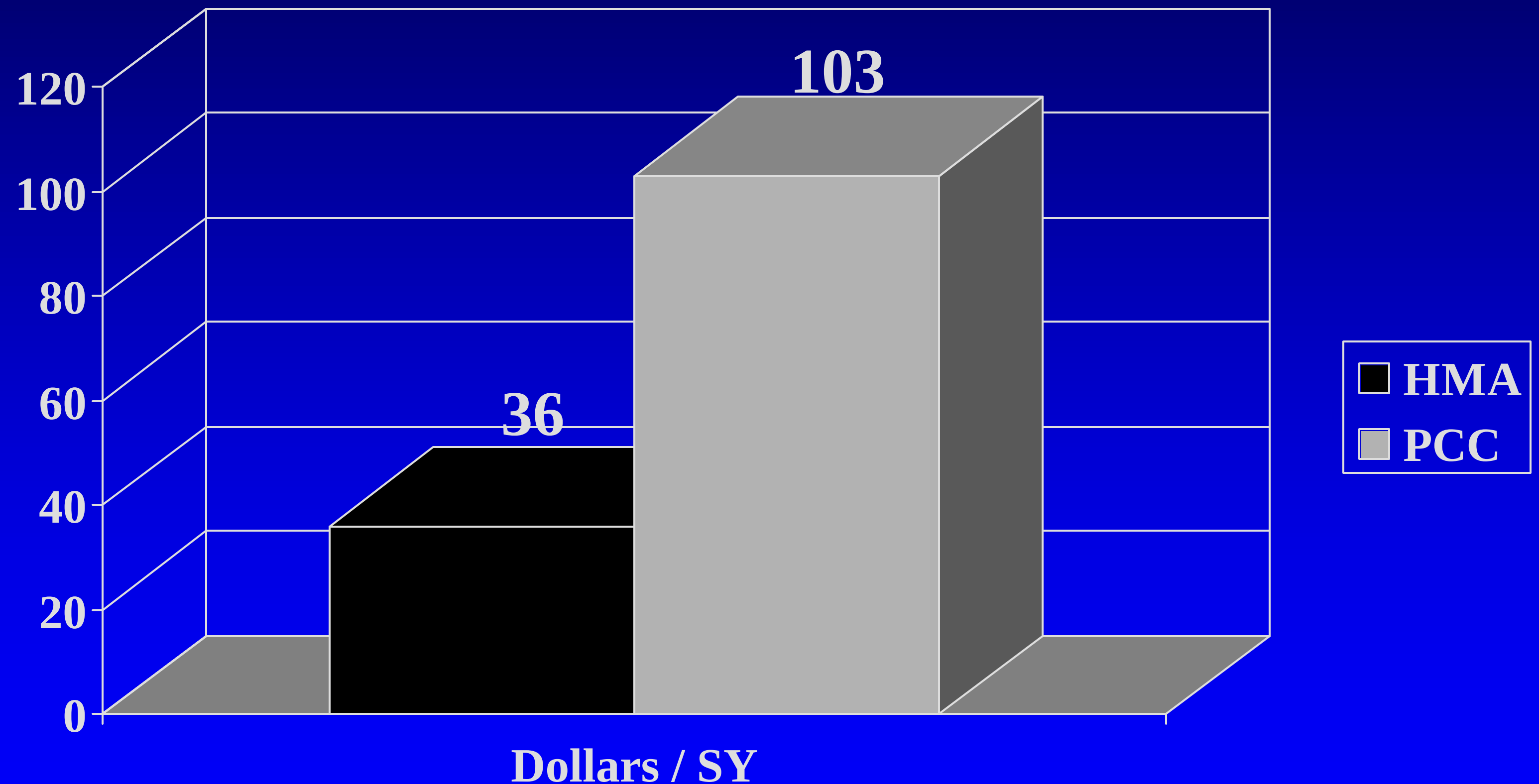
Conclusions

- SUPERPAVE provides excellent solutions for intersections at substantial cost savings compared to PCC

PCC Performance - July 2000

- **PCC required <u>288 hours</u> to install**
- **PCC removed and replaced with HMA in <u>22 hours</u>**

Initial Cost Comparison



PCC Performance - July 2000

Somerset Intersection Update

Kentucky Intersection Study

Somerset Statistics

Asphalt

- 8818 Square Yards
- Worked 7 evenings
- 5 inches milled and replaced
- Utilized PG 76-22
- Cost of $25.25 per square yard (48% less than concrete)
- Currently meets and exceeds performance expectations

Concrete

- 7865 Square Yards
- 38 Calendar days
- 4 inch white-topping inlay
- Cost of $50 per square yard
- Currently 108 cracked slabs
- Many slabs may require replacement in 2001

Asphalt Pavement Sections

May 17, 2001

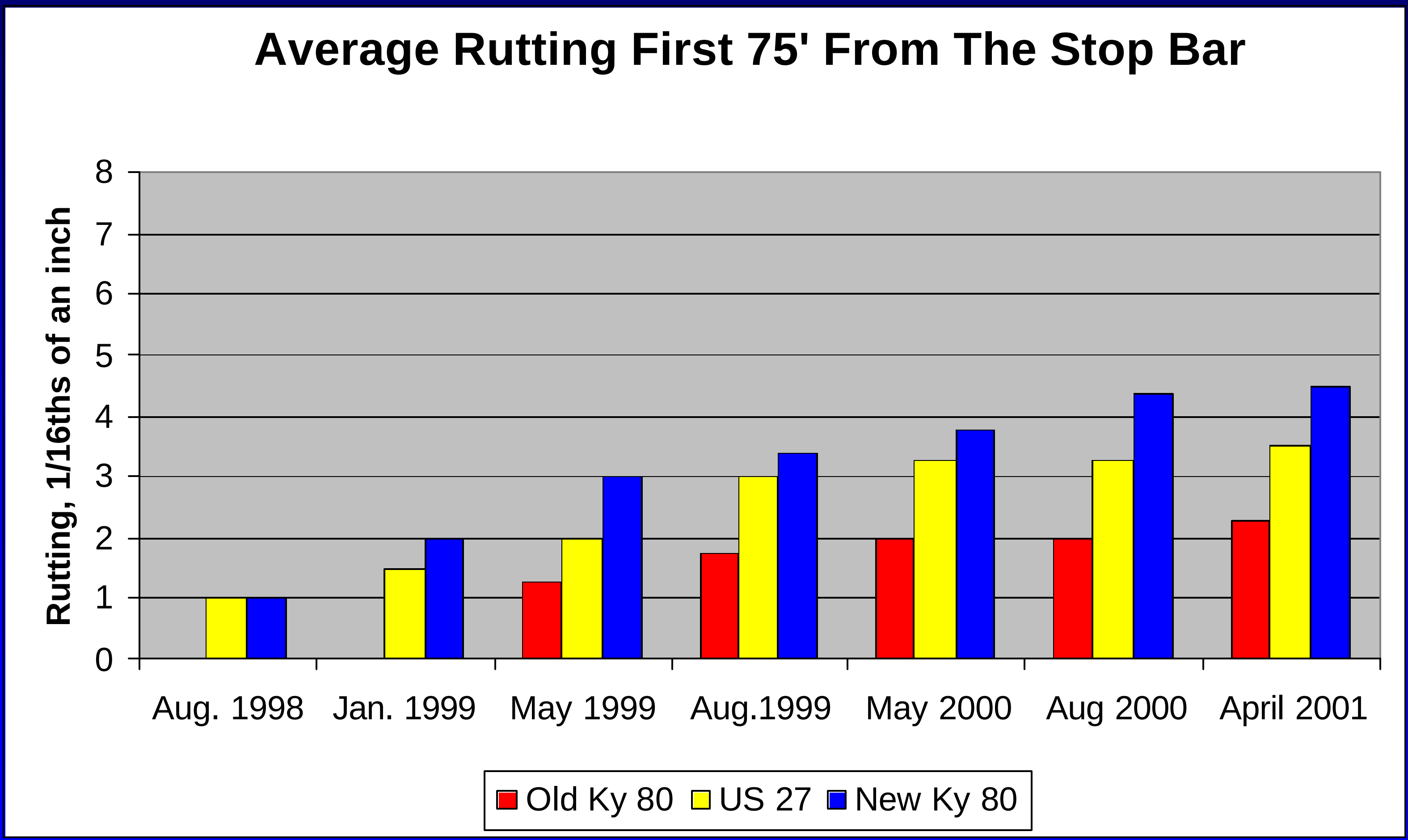
Asphalt Pavement Sections

May 17, 2001

Asphalt Pavement Sections

May 17, 2001

KTC Historical Data



PCC Sections

May 17, 2001

PCC Sections

May 17, 2001

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PCC Sections

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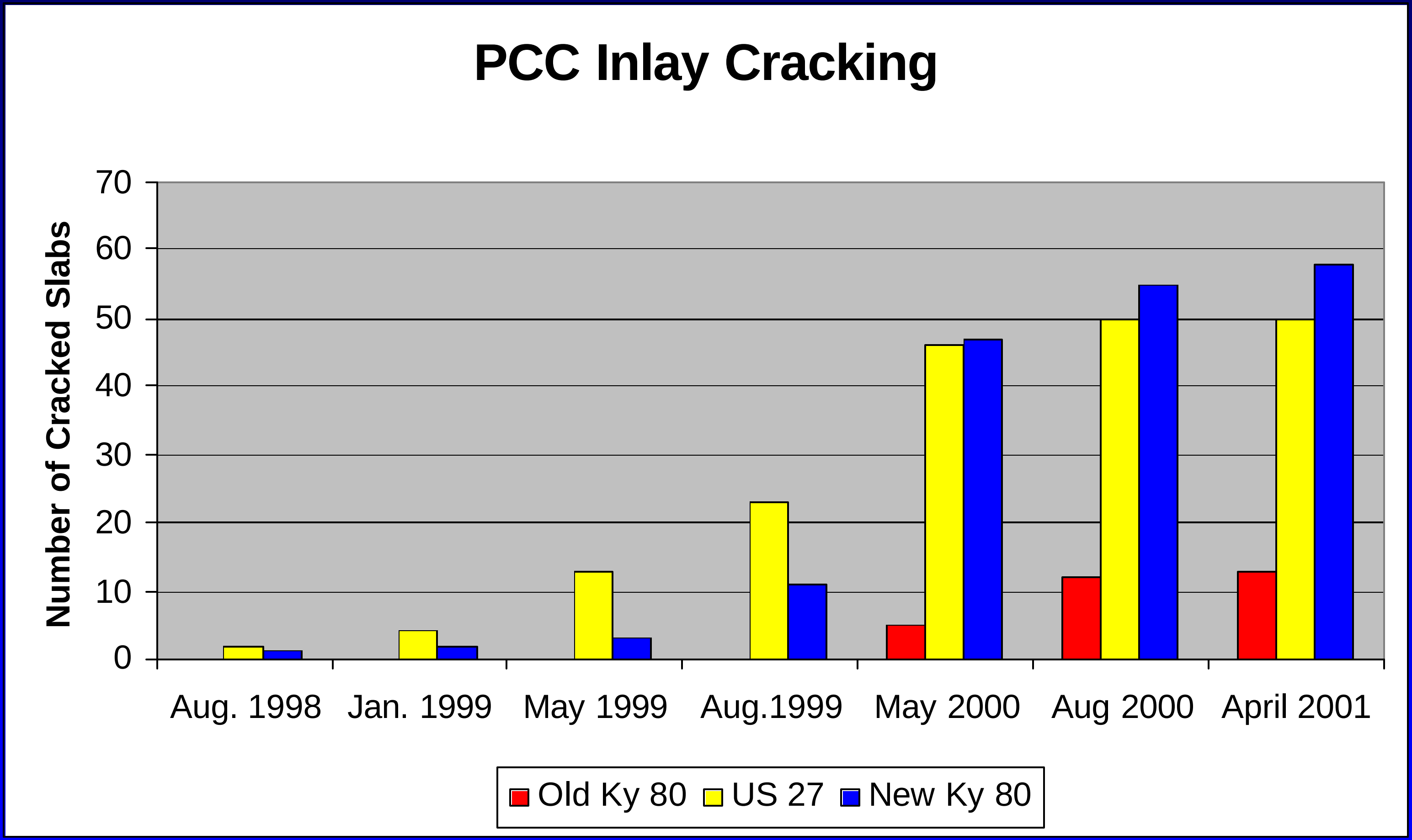
KTC Historical Data



I-10 Suwannee County Weight Stations

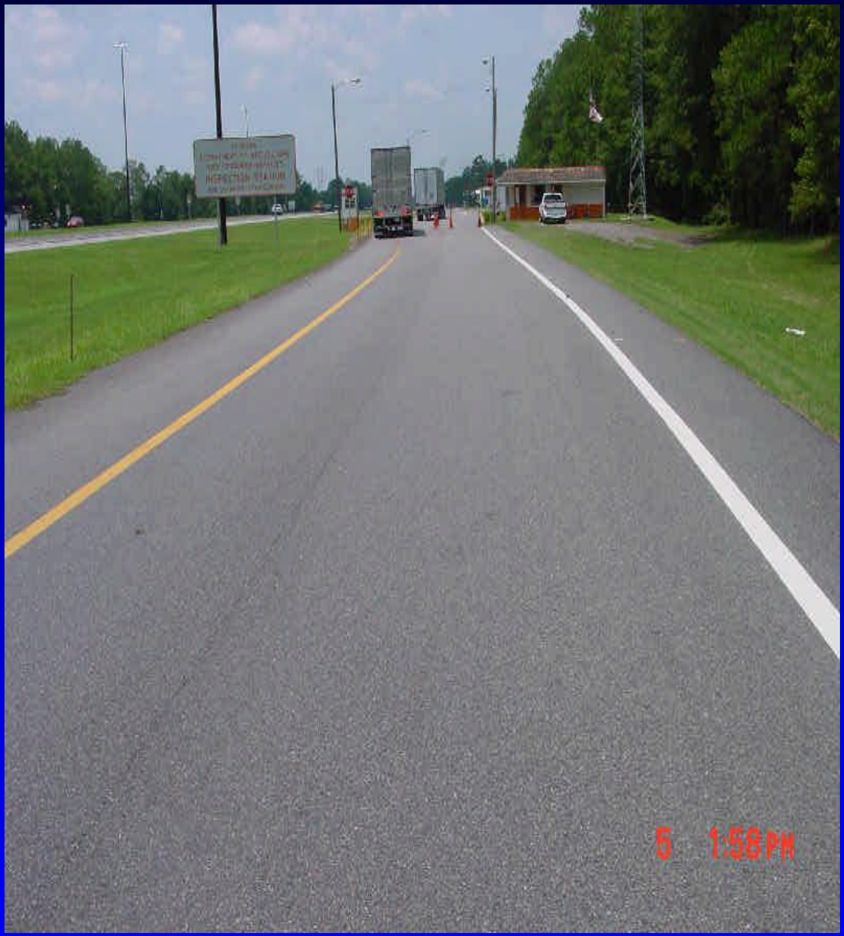
- Westbound Lane
  - SBS Modified HMA
    - PG 76-22
    - 12.5 mm TL 5 Mix Virgin
    - Two - 2 inch thick lifts
- Eastbound Lane
  - Ultra Thin Whitetopping

Westbound Station

Eastbound Station

Westbound Station

Eastbound Station



Westbound Station

Eastbound Station

Westbound Station

Eastbound Station

Summary

- Asphalt intersections work when designed and built properly.
- PCC does not always work, is expensive, and can cause congestion.
- PCC whitetopping performance tied to the quality of the underlying HMA
- HMA is the better choice.