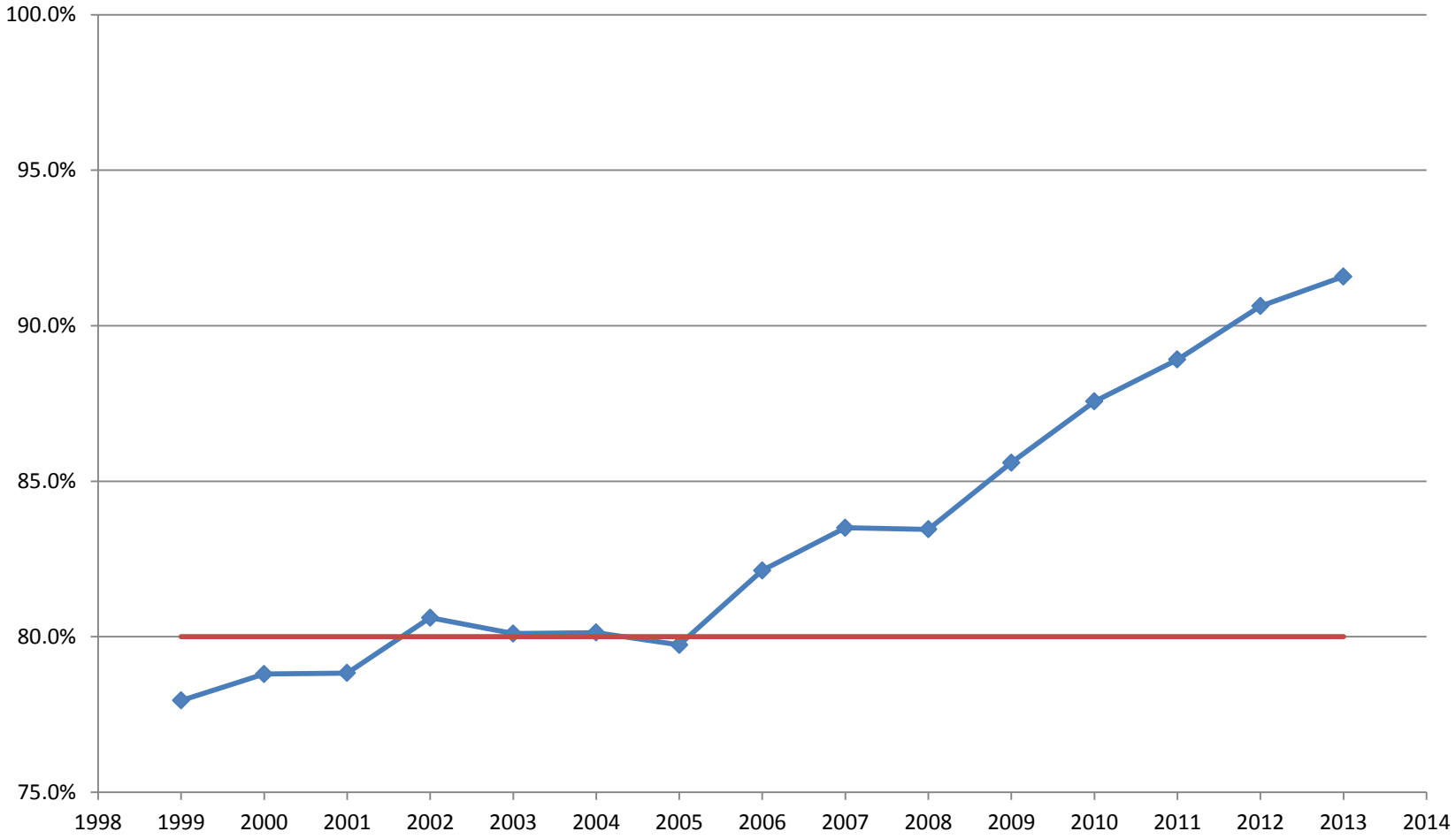
Florida Department of
TRANSPORTATION

Florida's Return on Investment from Pavement Research and Development

- Florida's pavement condition has improved from 80% meeting standards in 2005 to 92% in 2013
- These improving trends were incorporated into FDOT's pavement condition forecasting system.
- Consequently, approximately $300 million per year in resurfacing funds have been reallocated to new capacity beginning in 2012 for the next five year work program.

Percent of State Highway System Meeting Standards



Statewide Pavement Performance

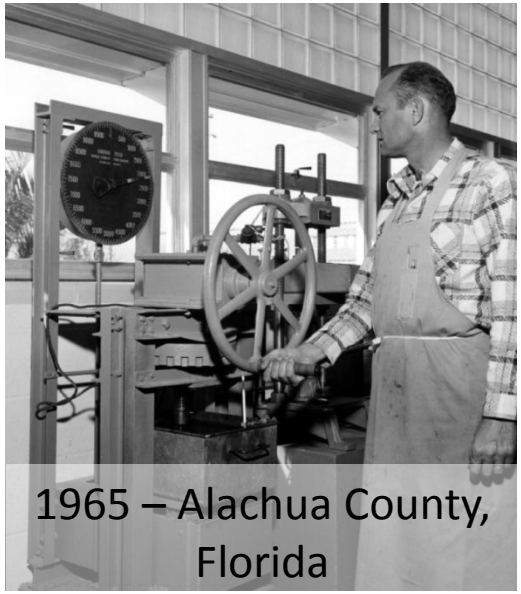
Why the improvement in performance?

A combination of factors…..

Historical Evolution of Asphalt in Florida

- **Prior to 1960:** Variety of surface treatments and miscellaneous asphalt products used
  - Minimal mix design requirements
  - Minimal testing
- **1960's:**
  - Adopted Hubbard-Field Design Method for fine graded (sand) mixes
    - Visual design for coarser mixes
    - Minimal testing
  - Penetration graded asphalt

1917 – Polk County, Florida



1965 – Alachua County, Florida

Historical Evolution of Asphalt in Florida

- **1970's:**
  - Adopted Marshall Mix Design Method
  - Developed categories of mixes:
    - Base/Leveling/Structural
  - Adopted Friction Course mixes
    - Highway Safety Act of 1966
    - Used polish resistant aggregate
    - Dense graded (lower volumes and speeds)
    - Open graded (higher volumes and speeds)
  - **1973** - Changed to viscosity graded asphalts (AC-20)


1956 – Martin County, FL

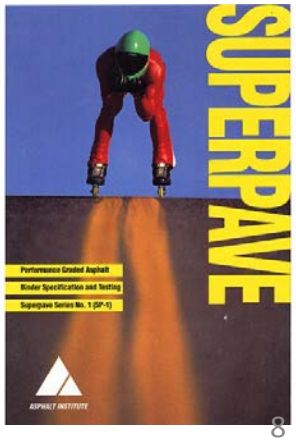
Historical Evolution of Asphalt in Florida

- **Early 1980's:**
  - Began milling and resurfacing
    - Conserved resources
    - Reduced costs
    - Removed substandard materials

- **Mid 1980's: Began to see performance problems:**
  - 50 Blow Marshall Design due to soft aggregate in Florida:
    - Weaker mixes → Rutting problems
    - Low density targets → Cracking problems
  - Raveling Open Graded Friction Courses

Historical Evolution of Asphalt in Florida

- **1980's Changes**:
  - Changed viscosity grade AC-20 to AC-30
  - Began monitoring mixture volumetrics
- **Late 1990's**:
  - Adopted Superpave Mix Design System
    - Stronger mixes
    - Simplified system: 9.5mm, 12.5 mm, 19.0 mm mixes
  - Began using polymer modified asphalt binders
    - PG 76-22
    - Excellent rutting and cracking resistance
  - Increased density requirement
    - Changed from nuclear density to roadway cores



Historical Evolution of Asphalt in Florida

- 1990's (cont'd):
  - Modified open graded friction courses (to FC-5 from FC-2)
    - Began using modified binders
      - Higher binder contents
    - Larger aggregate size
      - 1/2" vs. 3/8"
    - Increased layer thickness
      - 3/4" vs. 1/2"
    - Added stabilizing fibers
    - Added hydrated lime
    - Increased tack rate
  - Restricted usage

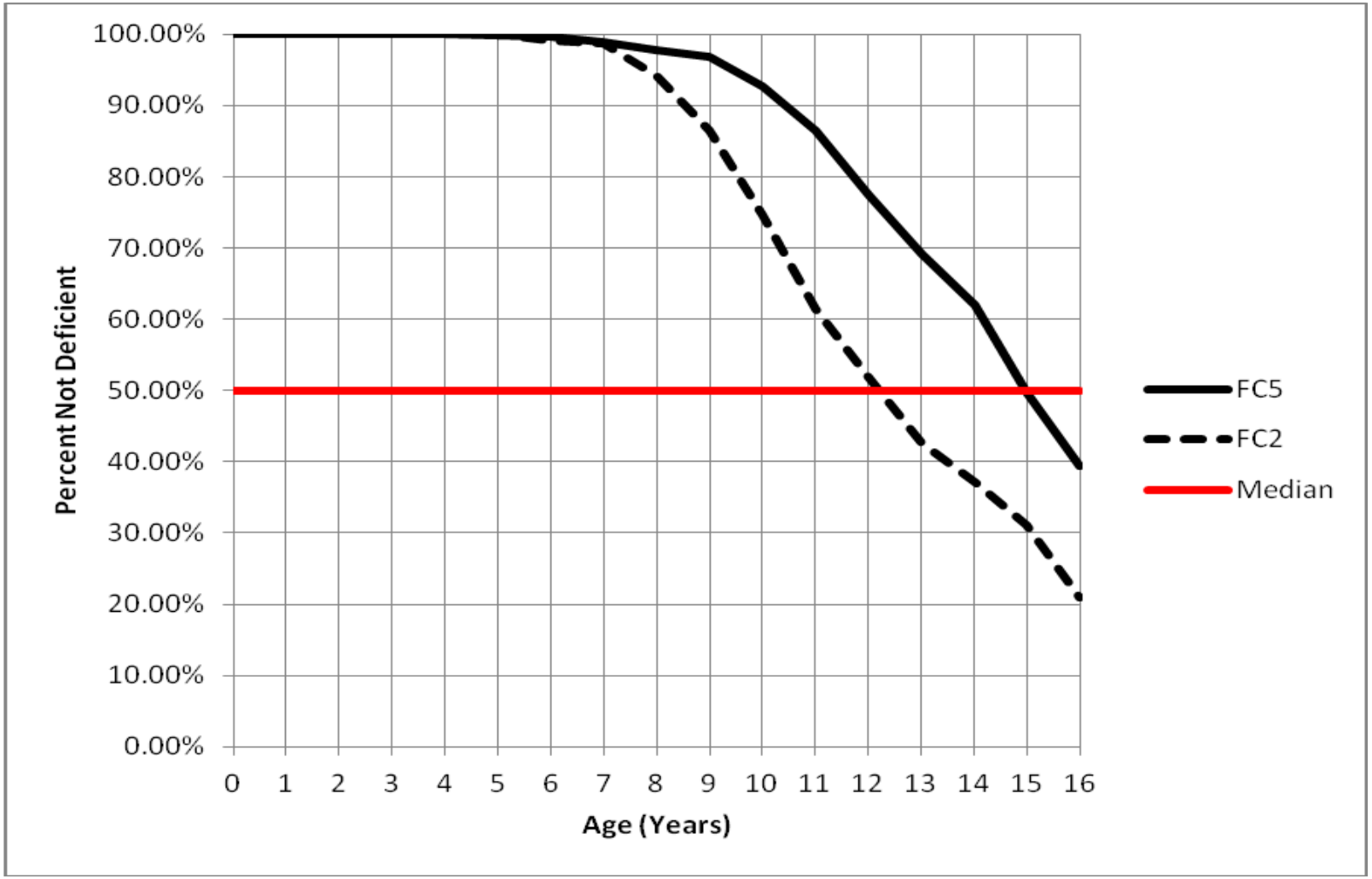
Historical Evolution of Asphalt in Florida

- **2002:**
  - Adopted Contractor Quality Control (CQC) Specs
    - Shifted QC requirements to contractor
    - Created Percent Within Limits (PWL) acceptance system
    - Resulted in higher quality material being produced
  - Adopted New Technician Training Program
- **2004:**
  - Adopted Three Year Warranty Specifications
    - Criteria based on good performing pavements:
      - Rutting; Cracking; Raveling; Smoothness

This is NOT in Florida!

Neither is this…

Survival comparison of FC-2 versus FC-5 open graded friction courses.



FAST

Florida's Analysis System for Targets

FAST Provides

- Improved section level condition forecasts of the SHS.
- The ability to calculate future resurfacing allocations based on forecasted conditions.
- Prioritized list of candidate resurfacing projects.
- Impact analysis for different funding scenarios and policy decisions.

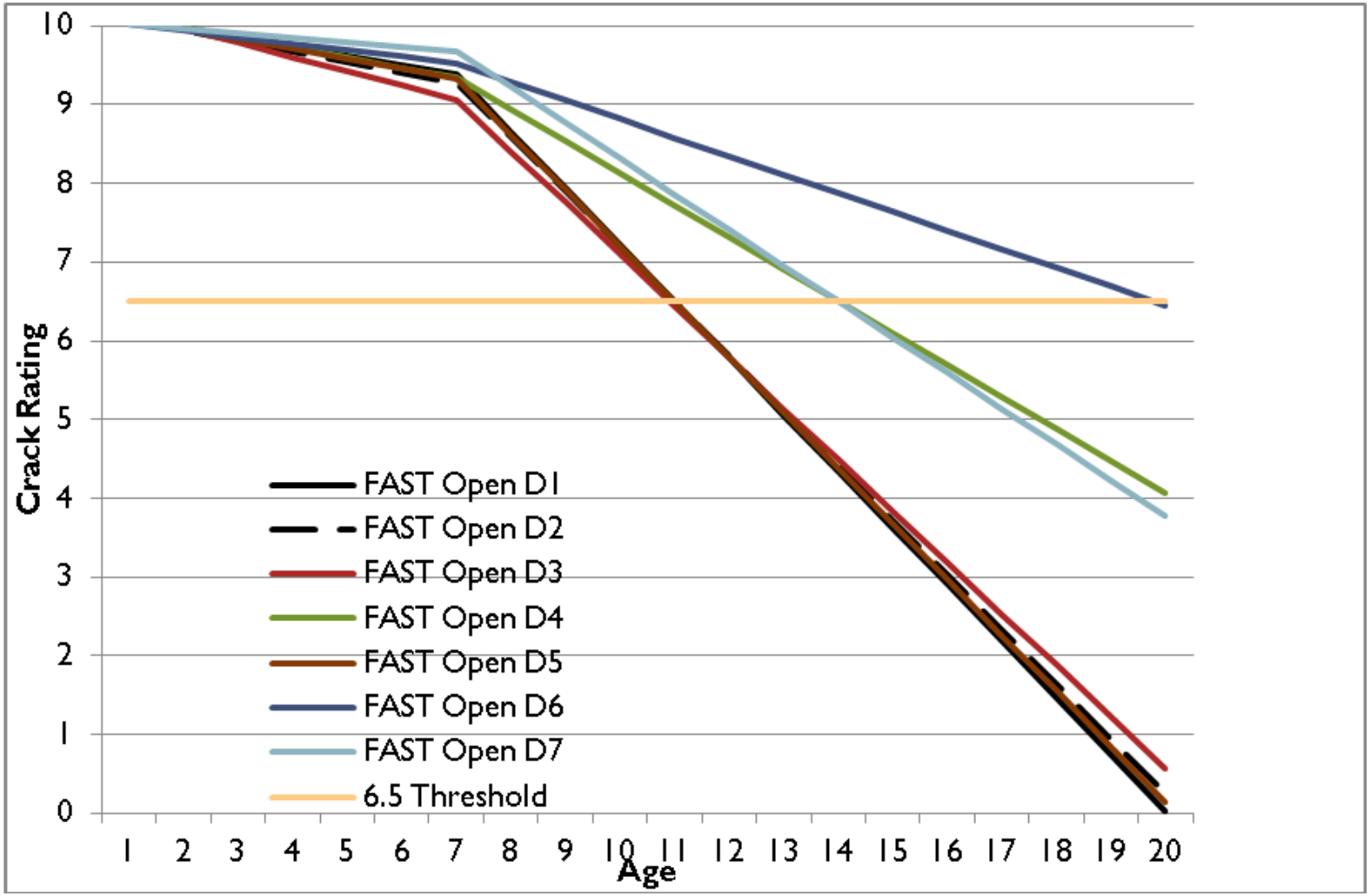
Why Use FAST?

- Previous Department policy was to set targets for the new outer year of the Work Program based on the most recent PCS data.
- Future targets were distributed to each district based on their proportion of the total deficient lane miles in the current year.
- FAST allows the resurfacing lane miles to be allocated using the projected deficiencies for the new outer year of the Work Program.

How does FAST work?

- Predictive equations based on the historical performance of pavements ***in each District*** are used to predict the performance of pavements within that District.
- Does not require extensive historical data
- Uses statistical techniques to develop algorithms

Predicted crack rating vs age by district for open graded surfaces.



Predicted crack rating vs age by district for dense graded surfaces.

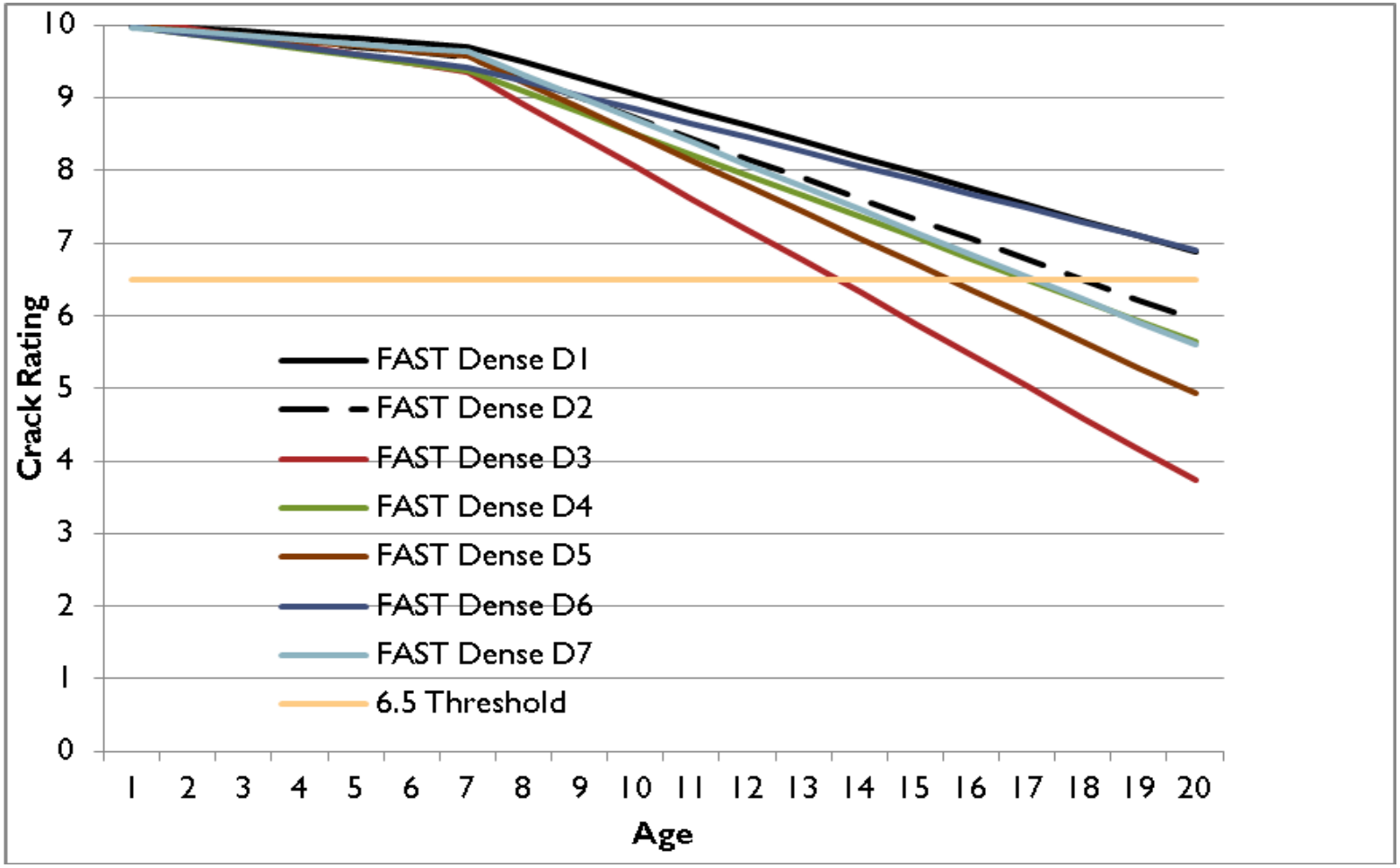
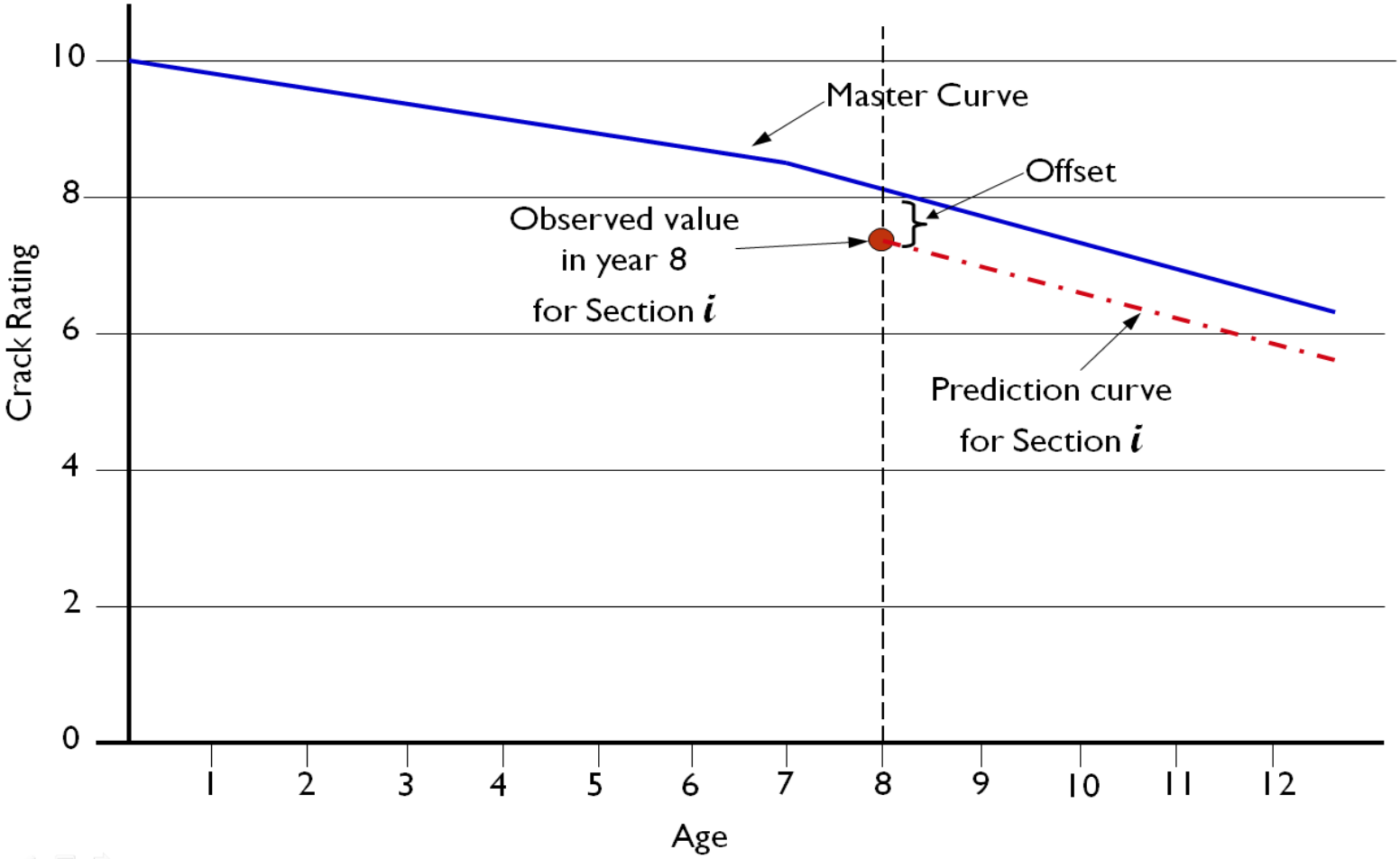


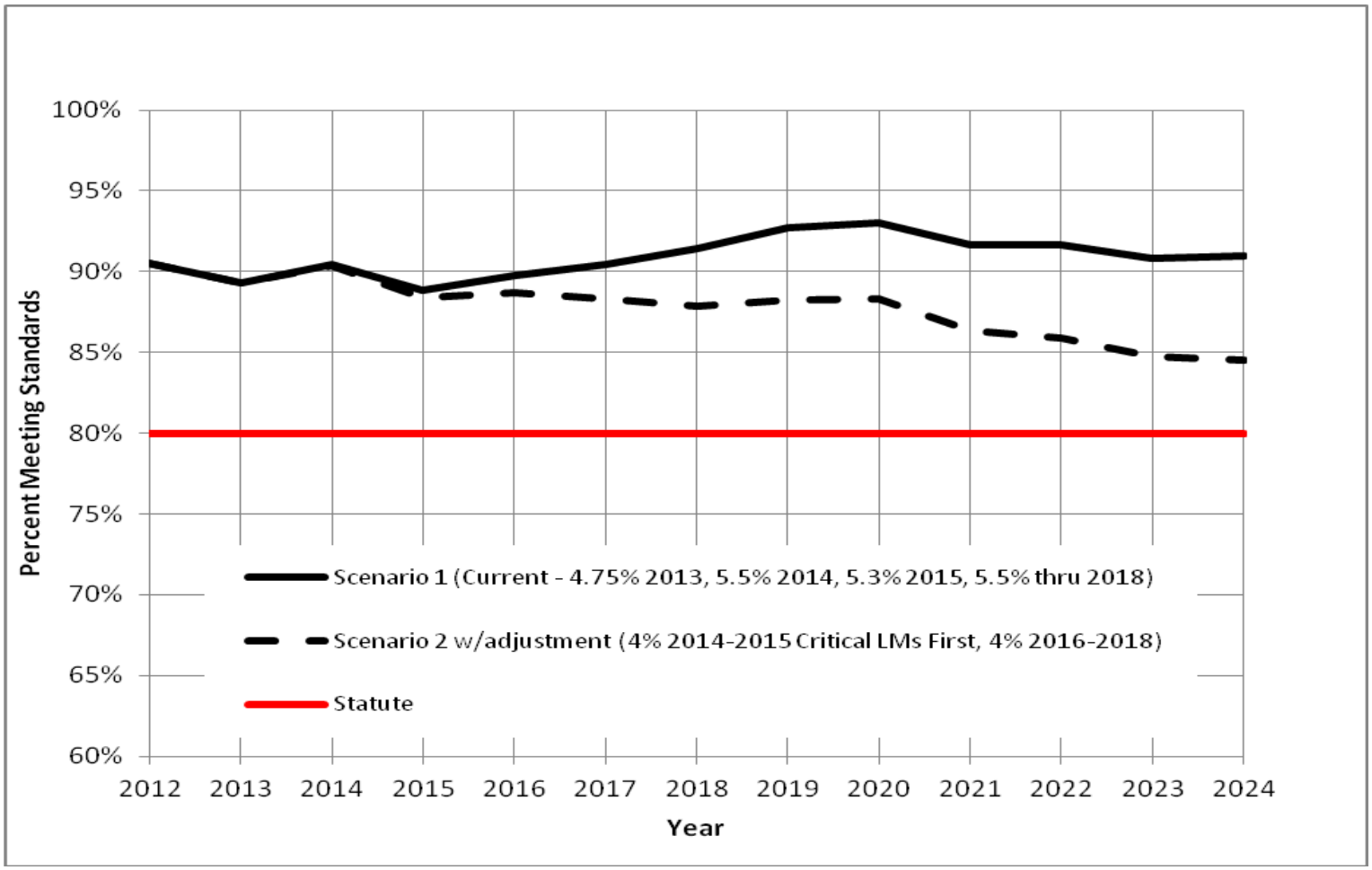
Illustration of offset calculation and application.



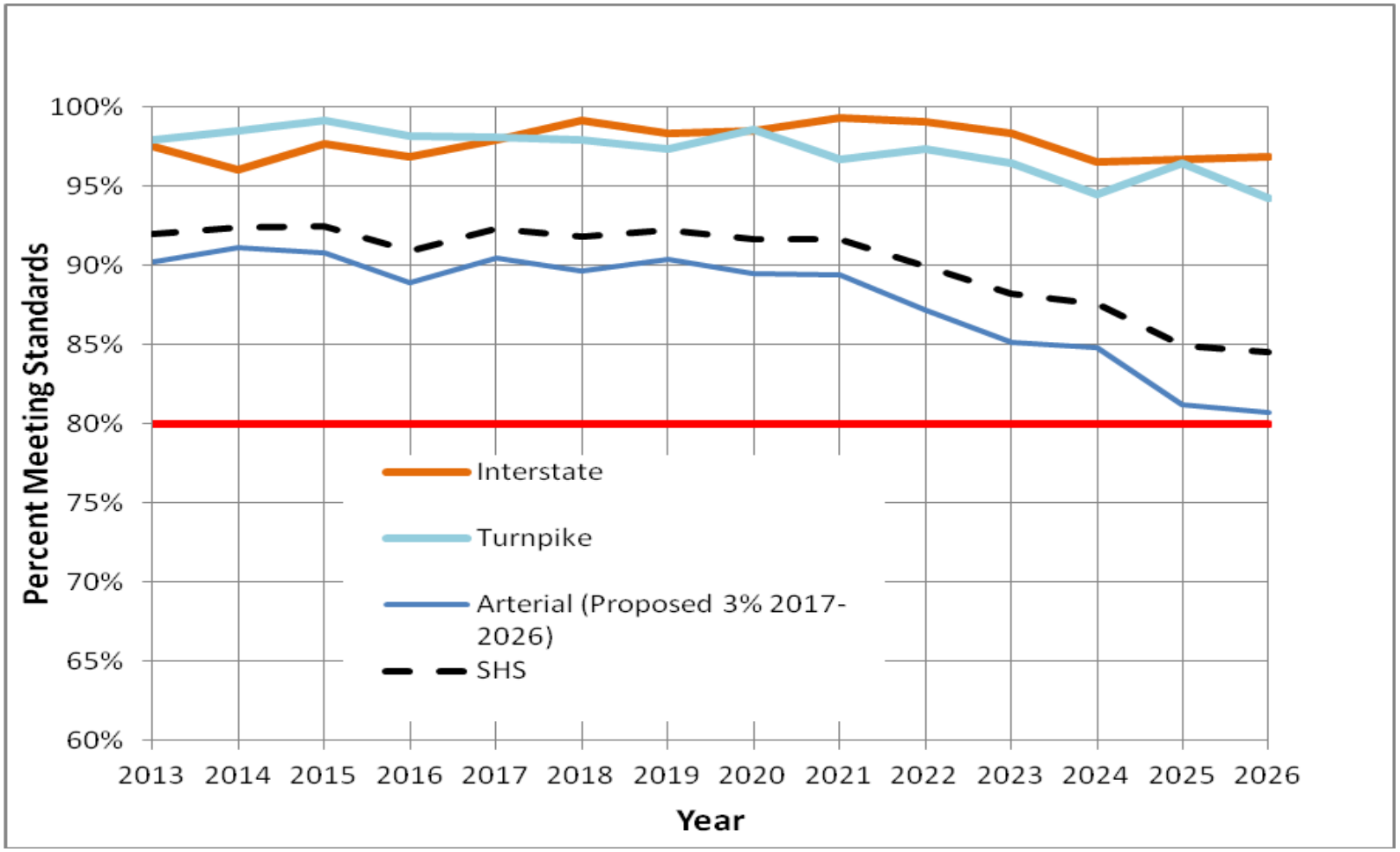
Impact Analysis

- FAST analyses of program level “what if” scenarios
  - Funding decisions
  - Policy decisions

Predicted system performance under 2012 resurfacing scenarios.



Predicted system performance under 2013 resurfacing scenario.



Conclusions

FAST provides FDOT engineers and managers the ability to predict the future condition of its highway system. The annually calibrated, section level detail provided by FAST allows the effects of research and development initiatives to be directly quantified for the future.

Conclusions

FAST has enabled FDOT to confidently reduce its resurfacing program and reallocate to capacity projects approximately $3 billion in non-essential resurfacing funds over the next ten years.

Conclusions

Florida's pavements are lasting longer and management is able to reallocate resources that would have been programmed for resurfacing to providing much needed new capacity.

Conclusions

Florida's experience has shown that there is an excellent return on investment for research and development into pavement materials and processes, construction methods and management, and pavement management technology.