Indiana DOT 20 year Plan

Asset Management Innovations

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NATIONAL PAVEMENT PRESERVATION CONFERENCE
nppc23
IMPACTS AND BENEFITS FROM PAVEMENT PRESERVATION

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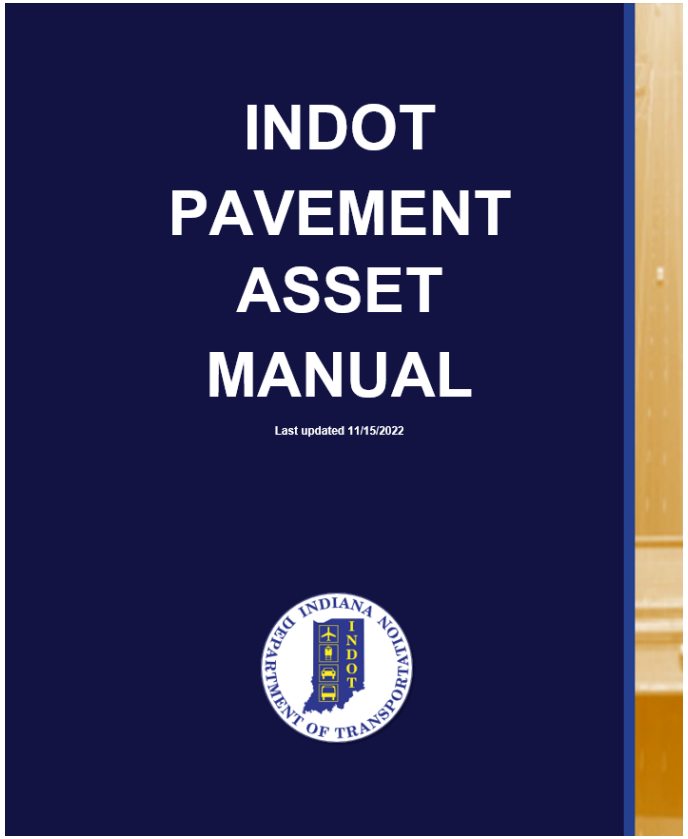
National Center for Pavement Preservation
MICHIGAN STATE UNIVERSITY

AASHTO TSP2 PAVEMENT PRESERVATION

ROCKY MOUNTAIN WEST PAVEMENT PRESERVATION PARTNERSHIP
SOUTHEAST PAVEMENT PRESERVATION PARTNERSHIP
MIDWESTERN PAVEMENT PRESERVATION PARTNERSHIP
NORTHEAST PAVEMENT PRESERVATION PARTNERSHIP

INDOT Pavement Asset Management Manual



- Definitions of asset inventory
- Business rules
  - Call process
  - Project prioritization
- Asset management strategies
  - Treatment triggers/resets
  - Deterioration curves
- Data governance

Asset Inventory

Road Category		Sub-Category		Description
A	Interstates	A1	Urban and/or High-Volume Interstates	Interstate with average daily traffic >40,000 vpd
		A2	Rural Interstates	Interstate with average daily traffic <40,000 vpd
B	Freeways and Principal Arterials	B1	Urban and/or High-Volume NHS Roads	Freeway or principal arterial with average daily traffic >5,000 vpd (per lane)
		B2	Rural High-Volume	Freeway or principal arterial with average daily traffic <5,000 per lane
C	Remaining Roads	C1	Urban Low-Volume	Any other INDOT-owned road with average daily traffic >5,000 vpd
		C2	Rural Low-Volume	Any other INDOT-owned road with average daily traffic <5,000 vpd

Influencing Factors:

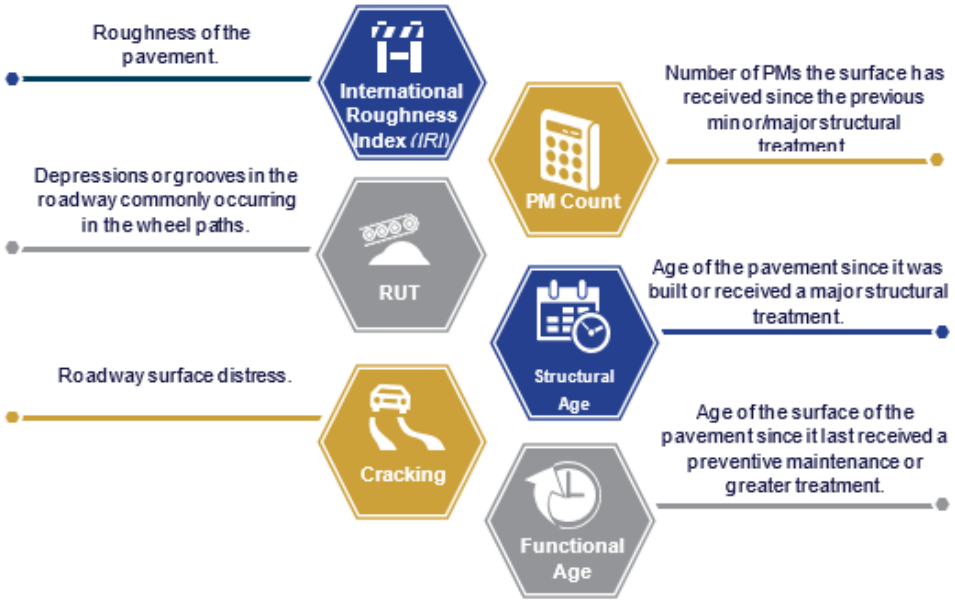
- Functional classification
- Traffic characteristics
- Asset management strategies

Road Category Benefits:

- Consistent performance expectations
- Similar risk profile
- More strategic investments

Asset Management Strategies

- INDOT Pavement Asset Management methodology
- Unique to pavement type and road category



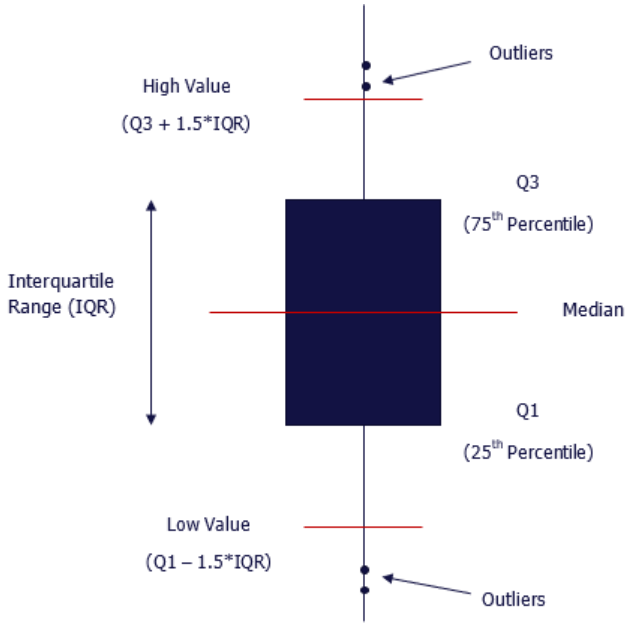
B1 – HMA Example

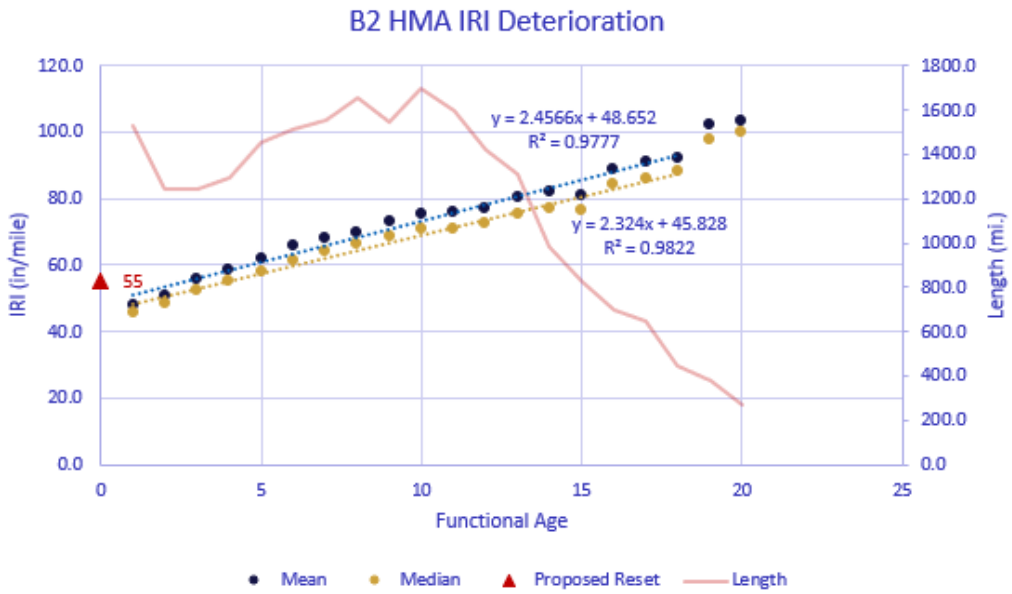
HMA – B1 Timing Triggers			
PM Count	Structural Age	Functional Age	Treatment
0	<=30	16	Preventive Maintenance
0	>30 & <=80	14	Preventive Maintenance
0	>80 & <90	12	Preventive Maintenance
0	>=90	12	Major Structural
>=1	<37	14	Preventive Maintenance
>=1	>=37 and <90	12	Minor Structural

HMA – B1 Condition Triggers						
Rut (in)	IRI (in/mile)	Cracking (%)	PM Count	Structural Age	Functional Age	Treatment
>0.3	-	-	-	-	-	Minor Structural
<=0.3	IRI >=150 or Cracking >=60		>=1	<37	9	Preventive Maintenance
			>=1	>37	9	Minor Structural
			0	-	9	Preventive Maintenance

Annual Deterioration Analysis

- Examine condition data for 0.1-mile segments (2014 – 2021, both directions) versus age
- Develop deterioration curves based on statistical quartiles. (Interquartile range method to remove outliers)
- More normalized data and increased reliability
- Resets determined by project level data





Pavement Quality Index (PQI)

What is it and why do it?

- Index for each condition component (IRI, cracking, and rut) on scale of 0 – 100
- Threshold ranges established for “Good”, “Fair” and “Poor” at 100 – 70, 70 – 30, and 30 – 0, respectively.
- Ratings are a function of road category which aligns better with user expectation and management strategies
- Normalizes pavement condition across the various road categories and leads to more relevant qualitative definitions of “Good”, “Fair”, and “Poor”

PQI_{IRI} Definition

A's	IRI	PQI
Good	0	100
	40	100
	50	100
	60	100
	70	100
	80	90.0
	90	80.0
Fair	100	70.0
	110	60.0
	120	50.0
	130	40.0
Poor	140	30.0
	150	20.0
	160	10.0
	170	0.0
	180	0.0
	190	0.0
	200	0.0
	210	0.0
	220	0.0
	230	0.0
	240	0.0
	250	0.0

B's	IRI	PQI
Good	0	100
	40	100
	50	100
	60	100
	70	100
	80	100.0
	90	100.0
	100	85.0
Fair	110	70.0
	120	60.0
	130	50.0
	140	40.0
Poor	150	30.0
	160	25.7
	170	21.4
	180	17.1
	190	12.9
	200	8.6
	210	4.3
	220	0.0
	230	0.0
	240	0.0
	250	0.0

C's	IRI	PQI
Good	0	100
	40	100
	50	100.0
	60	100.0
	70	100.0
	80	100.0
	90	100.0
	100	100.0
	110	90.0
	120	80.0
Fair	130	70.0
	140	62.0
	150	54.0
	160	46.0
	170	38.0
Poor	180	30
	190	25.0
	200	20.0
	210	15
	220	10.0
	230	5.0
	240	0.0
	250	0.0

Overall Pavement Condition – $PQI_{Overall}$

How is it defined?

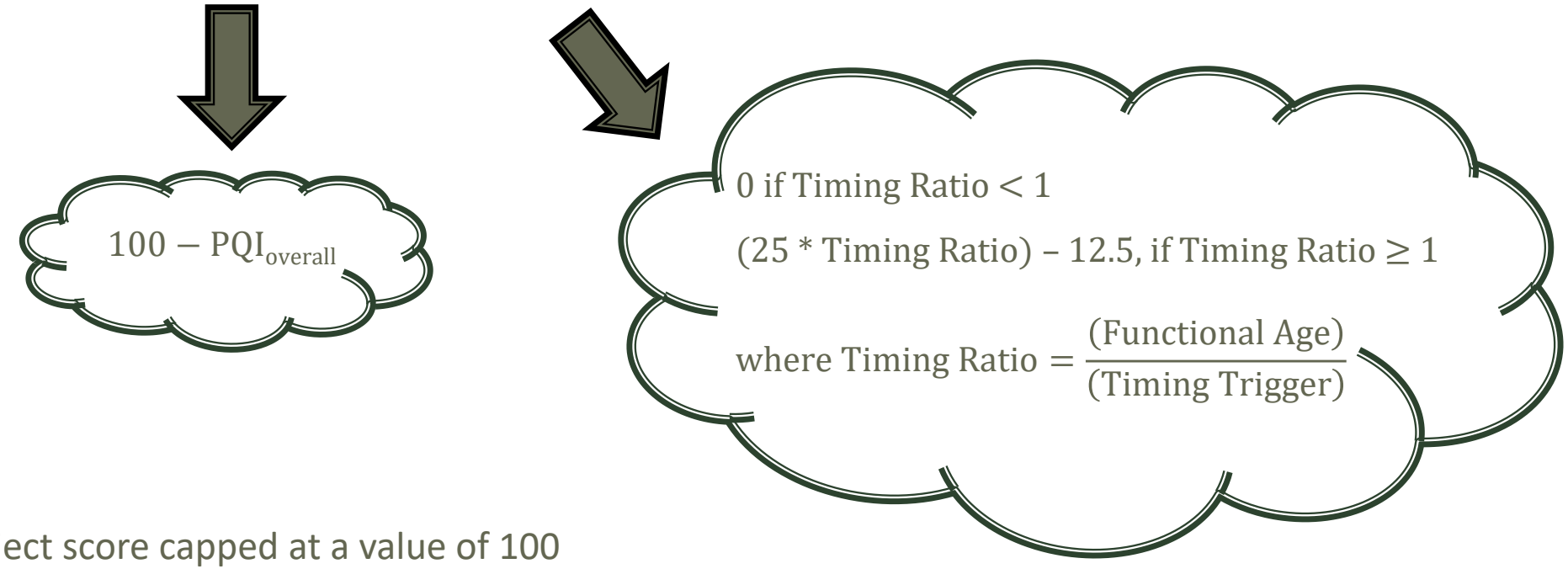
- $PQI_{overall}$ is a composite rating of component indices weighted most to roughness and least to rutting/faulting
- Composite Index on scale of 0 – 100 with the following categorical definitions:
  - **"Good"** ranging 100 – 70
  - **"Fair"** ranging 70 – 30
  - **"Poor"** ranging 30 – 0
- Normalizes pavement condition across the various road categories and leads to more relevant qualitative definitions

$$PQI_{\text{overall}} = (0.5 * PQI_{\text{IRI}}) + (0.3 * PQI_{\text{\% Cracking}}) + (0.2 * PQI_{\text{RUT}}) \quad \text{for HMA}$$

$$PQI_{\text{overall}} = (0.5 * PQI_{\text{IRI}}) + (0.3 * PQI_{\text{\% Cracking}}) + (0.2 * PQI_{\text{Faulting}}) \quad \text{for Concrete}$$

Investment Prioritization

$$\textbf{Project Score} = \textbf{Benefit Score} + \textbf{Timing Score}$$



- Maximum project score capped at a value of 100
- Scoring components projected to the intended year of score
- Timing trigger noted in asset strategies is a function of past PM treatments count and functional age

Why a 20 Year Plan?

INDOT Goal - Excellence in Core Service Delivery

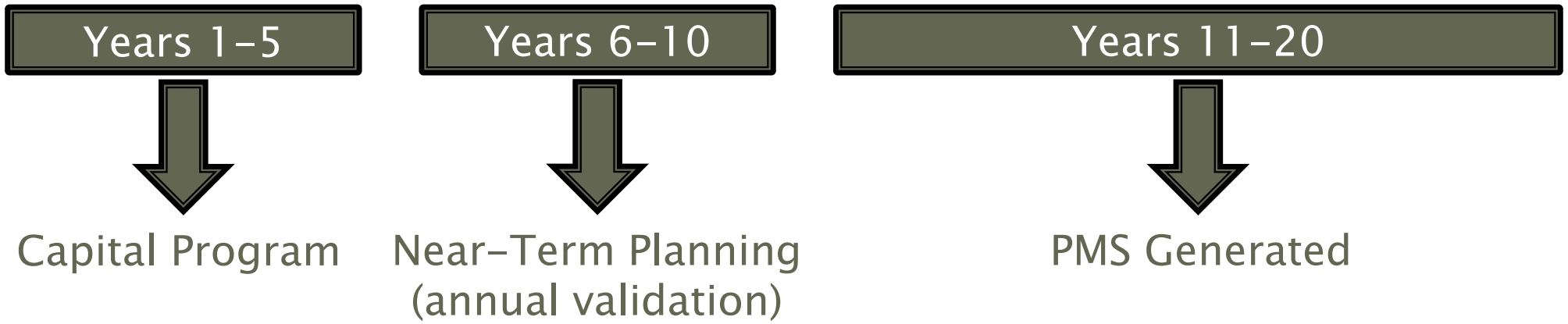
Deliver on 20-Year Plan Commitments

- Prioritize taking care of what we have.
- Finish major projects.
- Maximize federal and state funding opportunities.
- Build and maintain a safe transportation network for all users and workers.

Commit to Process Adherence Excellence

- Follow processes and procedures.
- Deliver core services effectively and efficiently.
- Build on our commitment to great government service.

20 Year Plan Composition

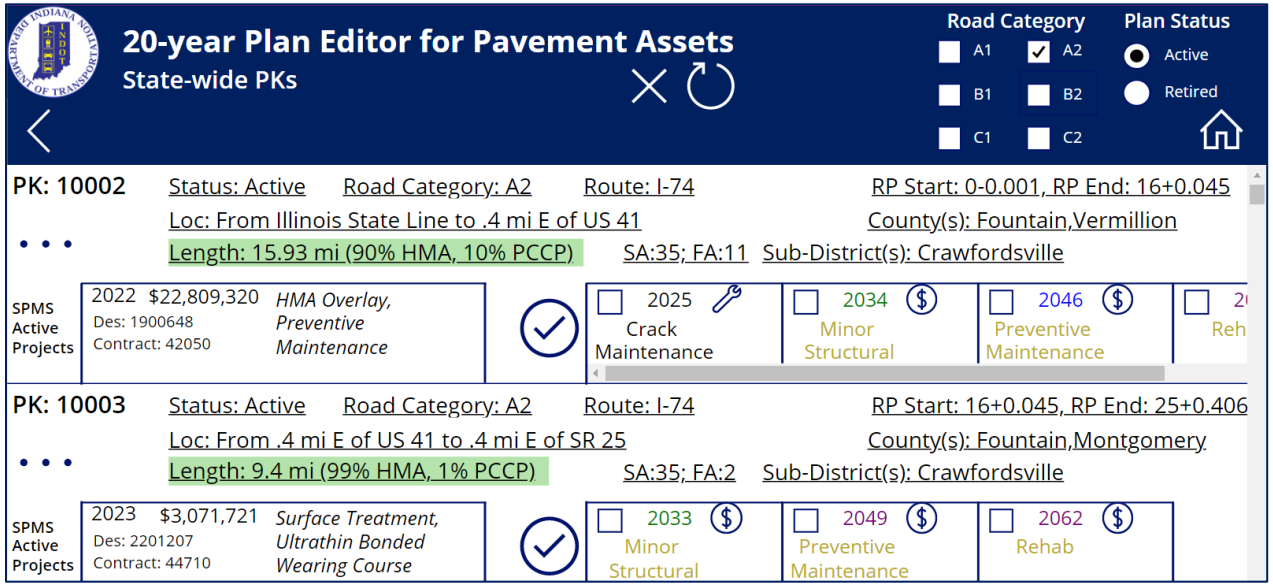


- Capital Program: investments currently funded
- Near-term planning: planned capital and maintenance investments, field verified
- PMS generated: software generated investments (optimized on benefit) given funding constraints

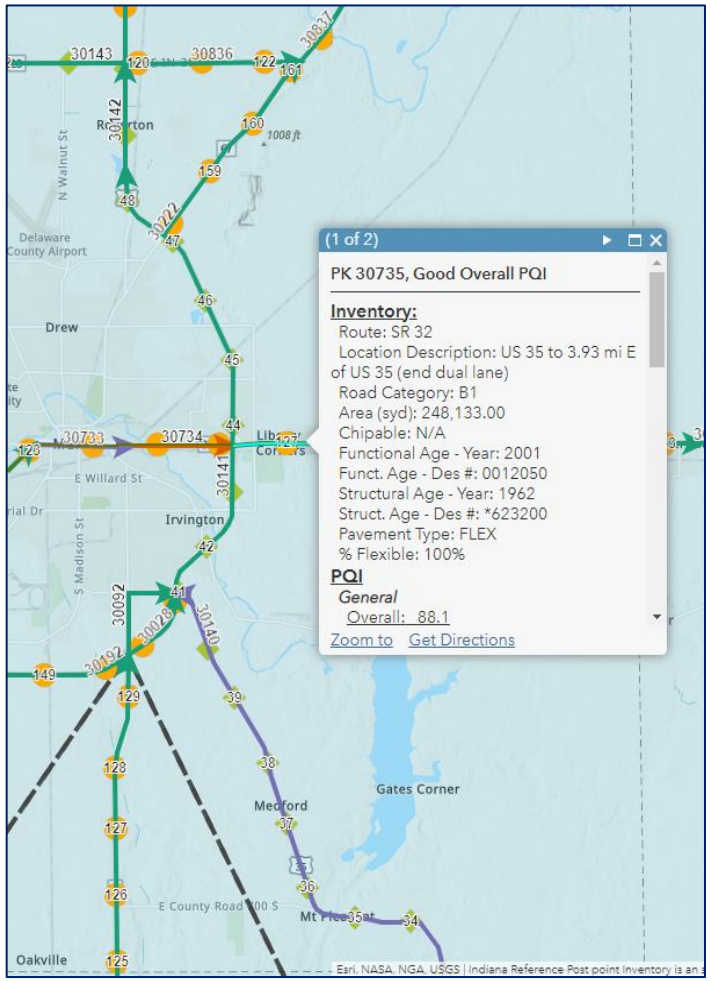
Annual Plan Validation

- Compare condition data with site observations to ensure accuracy of 20 year plan investments in the near-term planning window
- Provide feedback on data domains (e.g. surface type, pavement history)
- Use GIS and Power App Plan Editor to view asset information and make changes to the plan

Plan Editor



Validation Map



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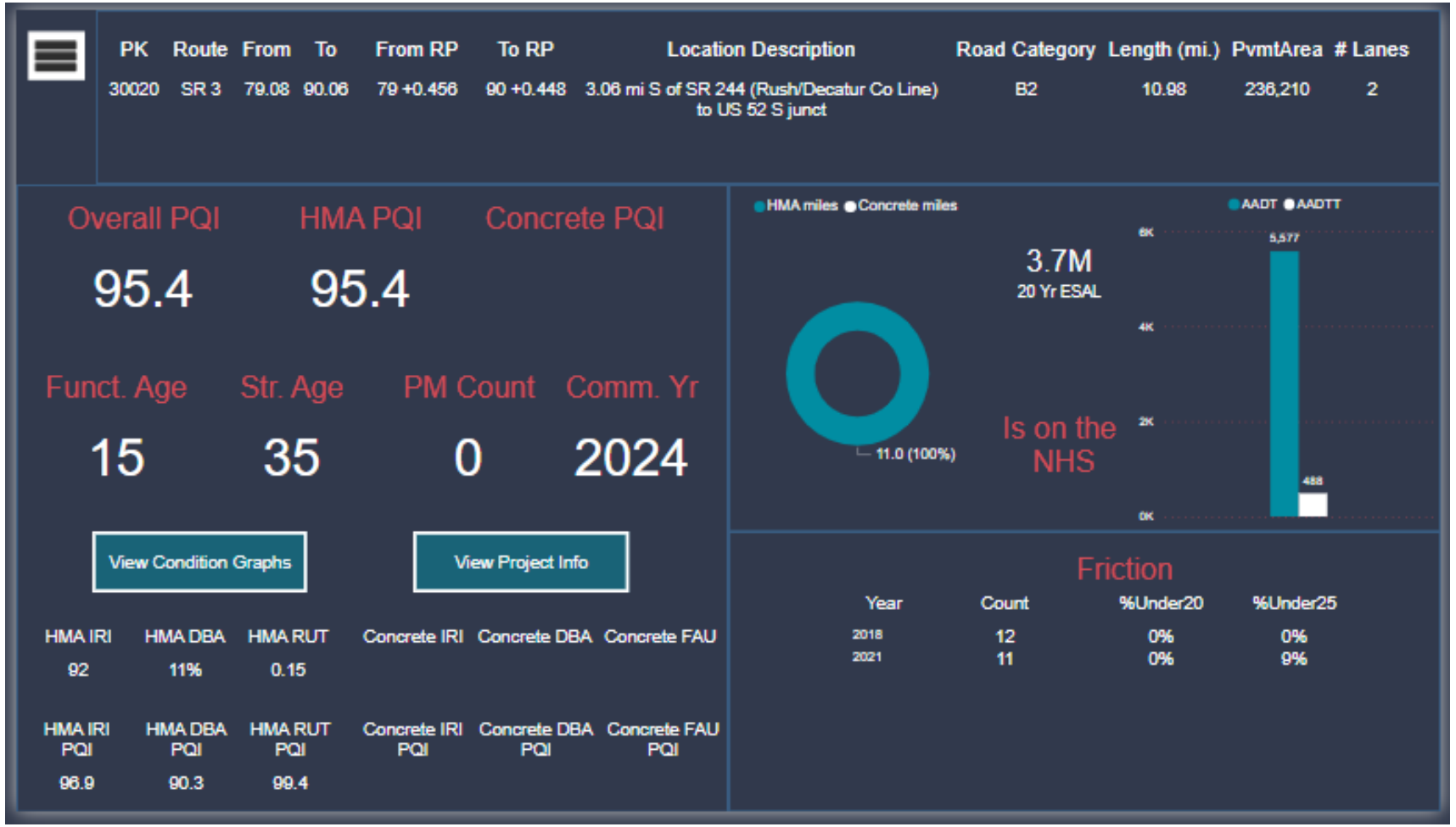
Pavement Management Analytics



Dashboard Features

- Inventory Info.
- Traffic Characteristics
  - AADT/AADTT
  - 20yr ESAL
- Pavement History
- Condition Data
  - IRI
  - RUT
  - Cracking
  - Friction
- Additional Details

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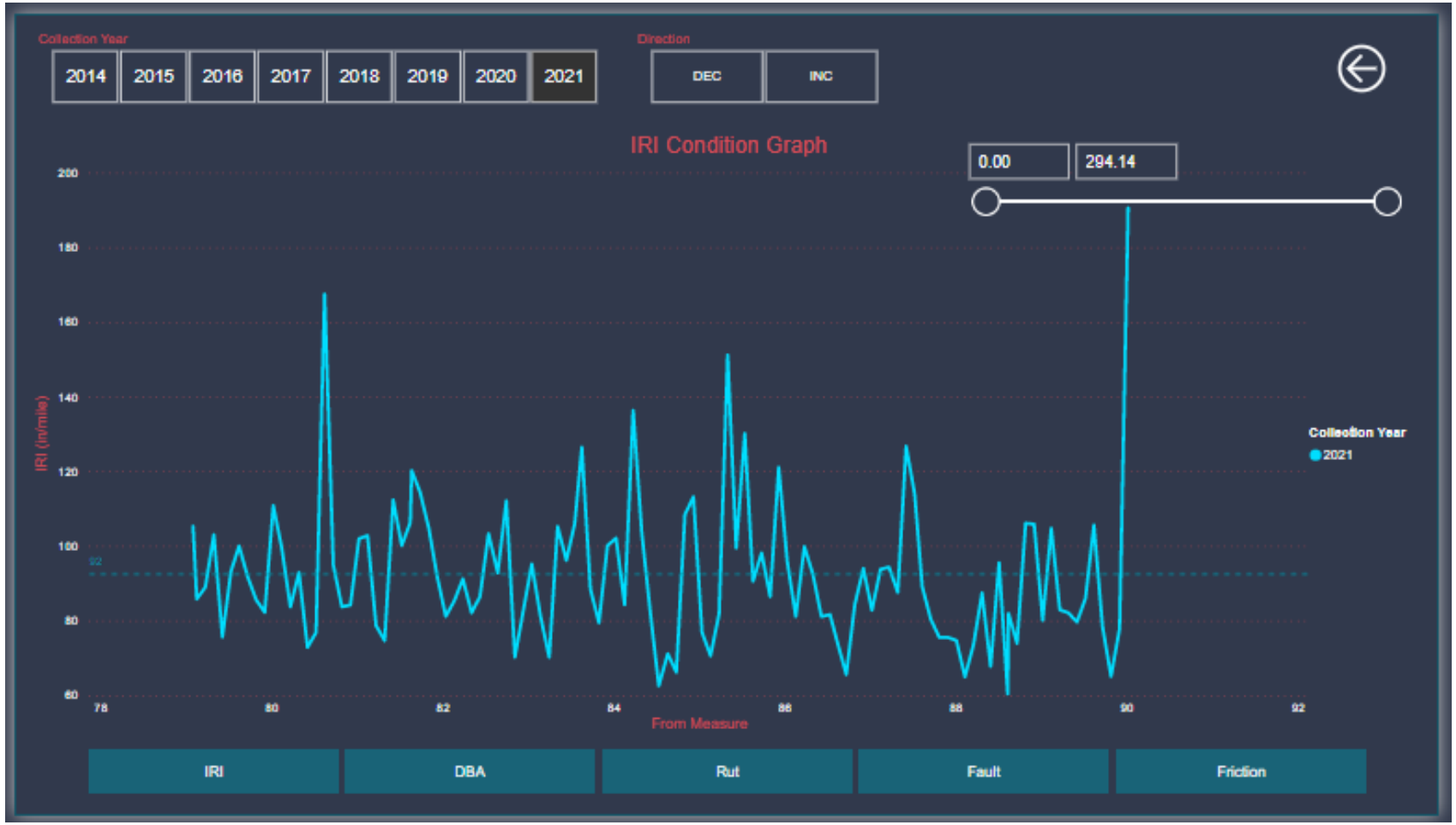
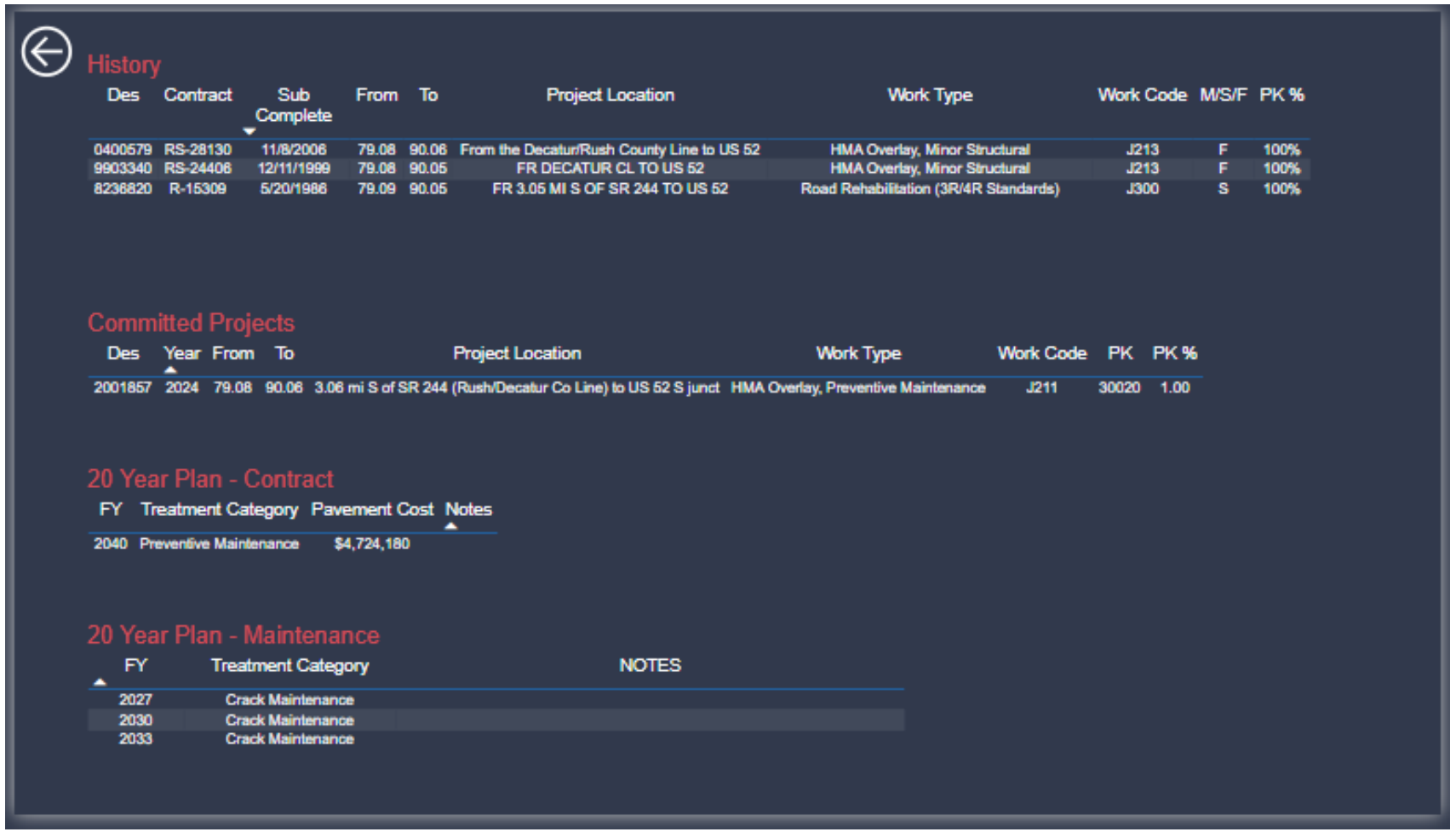


Interactive Data

- 8 years of condition data available
- 0.1-mile segmentation
- Direction specific
  - Both
  - Increasing
  - Decreasing
- Zoom to areas of interest

Pavement Management Analytics



History

Des	Contract	Sub Complete	From	To	Project Location	Work Type	Work Code	M/S/F	PK %
0400579	RS-28130	11/8/2006	79.08	90.06	From the Decatur/Rush County Line to US 52	HMA Overlay, Minor Structural	J213	F	100%
9903340	RS-24406	12/11/1999	79.08	90.05	FR DECATUR CL TO US 52	HMA Overlay, Minor Structural	J213	F	100%
8236820	R-15309	5/20/1986	79.09	90.05	FR 3.05 MI S OF SR 244 TO US 52	Road Rehabilitation (3R/4R Standards)	J300	S	100%

Committed Projects

Des	Year	From	To	Project Location	Work Type	Work Code	PK	PK %
2001857	2024	79.08	90.06	3.06 mi S of SR 244 (Rush/Decatur Co Line) to US 52 S junct	HMA Overlay, Preventive Maintenance	J211	30020	1.00

20 Year Plan - Contract

FY	Treatment Category	Pavement Cost	Notes
2040	Preventive Maintenance	$4,724,180	

20 Year Plan - Maintenance

FY	Treatment Category	NOTES
2027	Crack Maintenance	
2030	Crack Maintenance	
2033	Crack Maintenance	

Project Details

- Project History
- Capital program commitments
- Planned investments
  - Capital
  - Maintenance activities

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Where are we going?

- Increase data quality
- Integrate structural condition information into pavement management system
- Expand $PQI_{overall}$ concept to include not only surface condition information but pavement structure and subgrade as well

Thank you!