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HPMS IRI and Pavement Distress Data Reporting

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U.S. Department of Transportation
Federal Highway Administration
Office of Highway Policy Information

Introduction

- **Status of pavement performance management rule (PM2) implementation**
- **PM2 Standard Operating Procedures (SOP) document**
- **Current PM2 HPMS IRI and Distress Data Item Reporting Items**
- **“Pavement Report Card”**
- **HPMS Pavement Metadata**



PM2 Final Rule Implementation Status

- As yet un-issued.
- Latest estimate for release: December 2016 (?)
- Updated *HPMS Field Manual & SOP* document to accompany release
- Origins in MAP-21 (& FAST Act) legislative bills.
 - “...data elements that are necessary to collect and maintain standardized data to carry out a performance-based approach.”
 - PM2 data “housed” in HPMS
 - Report on Conditions
 - Set targets and monitor achievement
 - Sets minimum conditions
 - Pavement Condition Measures: % good, % poor for Interstate & non-Interstate NHS
- Possible/probable changes from proposed rule...



PM2 Standard Operating Procedures (SOP)

- Document to describe FHWA steps to process performance measures from time when data sets are available to time of publication of calculated measures.
- Guide to ensure consistency and transparency in measure calculation and progress evaluation to effectively carryout requirements per the law.
- Serves as reference describing FHWA roles and responsibilities to implement the law.
- Will reflect final rule when issued.
- Detailed and illustrated guide of complete step-by-step process



PM2 “Big Picture” Relationships

- **Data Requirements**

- Type of data to be collected
- Methods of data collection
- Extent and frequency of collection



- **Pavement Metrics**

- Calculated using collected data
- Based on sections of highway pavement
- Reported in HPMS



- **Pavement Measures**

- Calculated using metrics reported in HPMS
- Used by State to report condition of Interstate & non-Interstate NHS



HPMS Pavement Data Items

- **To be used for PM2:**
 - **IRI (MRI)**
 - **Surface Type**
 - **Rutting**
 - **Faulting**
 - **Cracking Percent**



HPMS PM2 “Data Report Card”

- **Resides in HPMS Software**
- **Developed by Max Grogg (FHWA)**
- **Tool to indicate QA/QC issues and display PM2 data as submitted to HPMS: “what would State’s data look like if the rule were implemented today...”**
- **Set of reports for Interstate & for non-Interstate NHS.**
 - **Interstate reports example follows:**



HPMS 8.0.1

EXPANDED SAMPLE LANE MILES RATING (INTERSTATE)

Stage: Submit

Year: 2015

State:

Date: 06/17/2016

LANE MILES EXPANDED SAMPLE GOOD	5,840.313
LANE MILES EXPANDED SAMPLE FAIR	1,973.944
LANE MILES EXPANDED SAMPLE POOR	37.510
LANE MILES EXPANDED SAMPLE MISSING SURFACE TYPE	0.000
TOTAL	7,851.767
SAMPLE SIZE	96.55 %



HPMS 8.0.1

DATA CHECK AND PAVEMENT DATA QUANTITY (INTERSTATE)

Stage: Submit

Year: 2015

State:

Date: 06/17/2016

DATA CHECK

FIPS CODE	STATE NAME	STATE ABBREVIATION	
PREVIOUS YEAR HM-41 INTERSTATE CENTERLINE MILES			1,867.420
SUBMITTED DATA INTERSTATE CENTERLINE MILES			1,867.415
DELTA			-0.005
PREVIOUS YEAR HM-43 INTERSTATE LANE MILES			7,884.615
SUBMITTED DATA INTERSTATE LANE MILES			7,885.530
DELTA			0.915
DATA QUANTITY - PAVEMENT			
TOTAL INTERSTATE LANE MILES BASED ON EXPANDED SAMPLES MISSING CRACKING PERCENT DATA			0.000
TOTAL INTERSTATE LANE MILES BASED ON EXPANDED SAMPLES MISSING FAULTING DATA			0.000
TOTAL INTERSTATE LANE MILES BASED ON EXPANDED SAMPLES MISSING IRI DATA			0.000
TOTAL INTERSTATE LANE MILES BASED ON FULL EXTENT MISSING IRI DATA			41.631
TOTAL INTERSTATE LANE MILES BASED ON EXPANDED SAMPLES MISSING RUTTING DATA			0.000
TOTAL INTERSTATE LANE MILES BASED ON EXPANDED SAMPLES WHERE SURFACE TYPE IS NOT PROPERLY CODED. A CODING OF 1 FOR UNSURFACED OR BLANK IS NOT ACCEPTABLE ON THE INTERSTATE.			0.000
TOTAL INTERSTATE LANE MILES WHERE THROUGH LANES IS CODED AS A 1, 2, OR 3. ALTHOUGH THIS IS POSSIBLE AT INTERSTATE TERMINAL SECTION OR SOME INTERCHANGES THESE SECTIONS SHOULD BE VERIFIED.			10.546
TOTAL INTERSTATE LANE MILES BASED ON FULL EXTENT EXCLUDING SECTIONS CODED AS A BRIDGE			7,733.058
TOTAL INTERSTATE LANE MILES BASED ON EXPANDED SAMPLES EXCLUDING SECTIONS CODED AS A BRIDGE			7,851.767

ITEMS SHADED ORANGE ARE HPMS PAVEMENT PERFORMANCE DATA IMPROVEMENT ZONES WHERE DATA SHOULD BE VERIFIED OR CORRECTED

HPMS 8.0.1

PAVEMENT DATA QUALITY - IRI
(INTERSTATE)

Stage: Submit

Year: 2015

State:

Date: 06/17/2016

TOTAL INTERSTATE LANE MILES BASED ON FULL EXTENT WHERE IRI YEAR DOES NOT EQUAL YEAR_RECORD. IRI DATA IS REQUIRED TO BE COLLECTED AND REPORTED ANNUALLY ON THE INTERSTATE ALONG WITH THE DATE OF COLLECTION. IRI YEAR SHOULD EQUAL YEAR_RECORD	41.631
% INTERSTATE LANE MILES IRI YEAR DOES NOT EQUAL YEAR_RECORD. CUTOFF VALUE TO FLAG FOR VERIFICATION IS 0.00%	0.54 %
TOTAL INTERSTATE LANE MILES BASED ON FULL EXTENT WHERE IRI IS LESS THAN 30.0 INCHES/MILE. ALTHOUGH VALUES LESS THAN 30.0 INCHES PER MILE ARE POSSIBLE THEY ARE NOT LIKELY AND SHOULD BE VERIFIED. YOU MAY WISH TO REFER TO THE ATTACHED IRI CUMULATIVE DISTRIBUTION.	73.762
% INTERSTATE LANE MILES IRI LESS THAN 30.0 INCHES PER MILE. AVERAGE VALUE IS 1.15%, CUTOFF VALUE TO FLAG FOR VERIFICATION IS 0.00%	0.95 %
TOTAL INTERSTATE LANE MILES BASED ON FULL EXTENT WHERE IRI IS GREATER THAN 400.0 INCHES/MILE. ALTHOUGH VALUES GREATER THAN 400.0 INCHES PER MILE ARE POSSIBLE THEY ARE NOT LIKELY AND SHOULD BE VERIFIED. YOU MAY WISH TO REFER TO THE ATTACHED IRI CUMULATIVE DISTRIBUTION.	0.000
% INTERSTATE LANE MILES IRI GREATER THAN 400.0 INCHES PER MILE. AVERAGE VALUE IS 0.02%, CUTOFF VALUE TO FLAG FOR VERIFICATION IS 0.00%	0.00 %

ITEMS SHADED ORANGE ARE HPMS PAVEMENT PERFORMANCE DATA IMPROVEMENT ZONES WHERE DATA SHOULD BE VERIFIED OR CORRECTED

HPMS 8.0.1

**PAVEMENT DATA QUALITY - CRACKING PERCENT
(INTERSTATE)**

Stage: Submit

Year: 2015

State:

Date: 06/17/2016

TOTAL INTERSTATE LANE MILES BASED ON EXPANDED SAMPLES WHERE CRACKING PERCENT IS REPORTED AS 0.00%. MULTIPLE STATES REPORTED VERY HIGH VALUES FOR THEIR PAVEMENTS AND THESE SHOULD BE VERIFIED. YOU MAY WISH TO REFER TO THE ATTACHED CRACKING PERCENT CUMULATIVE DISTRIBUTION.	6,822.376
% INTERSTATE LANE MILES ON EXPANDED SAMPLES WHERE CRACKING PERCENT IS REPORTED AS 0.00%. AVERAGE IS 46.43% WITH A SD OF 33.02%, CUTOFF VALUE TO FLAG FOR VERIFICATION IS 79.45%	86.89 %
TOTAL INTERSTATE LANE MILES BASED ON EXPANDED SAMPLES WHERE CRACKING PERCENT IS REPORTED > 0.00% AND < 1.00%. THIS MAY BE AN INDICATION THAT A STATE MAY HAVE A PROBLEM CONVERTING DECIMAL TO PERCENTAGES. CRACKING PERCENT IS TO BE REPORTED IN MULTIPLES OF 5%. MULTIPLE STATES REPORTED VERY HIGH VALUES FOR THEIR PAVEMENTS AND THESE SHOULD BE VERIFIED.	0.000
% INTERSTATE LANE MILES ON EXPANDED SAMPLES WHERE CRACKING PERCENT IS REPORTED > 0.00% AND < 1.00%. AVERAGE IS 3.81% WITH A SD OF 11.22%, CUTOFF VALUE TO FLAG FOR VERIFICATION IS 15.03%	0.00 %
TOTAL INTERSTATE LANE MILES BASED ON EXPANDED SAMPLES FOR PAVEMENTS CODED AS HMA WHERE CRACKING PERCENT IS REPORTED GREATER THAN 50.00%. CRACKING PERCENT FOR HMA IS LIMITED TO WHEELPATH AND THEREFORE SHOULD NOT EXCEED 50.00%. MULTIPLE STATES REPORTED VERY HIGH VALUES FOR THEIR PAVEMENTS AND THESE SHOULD BE VERIFIED.	0.000
% INTERSTATE LANE MILES ON EXPANDED SAMPLES FOR HMA PAVEMENTS WHERE CRACKING PERCENT IS REPORTED GREATER THAN 50.00%. AVERAGE IS 0.16% WITH A SD OF 0.54%, CUTOFF VALUE TO FLAG FOR VERIFICATION IS 0.00%	0.00 %
TOTAL INTERSTATE LANE MILES BASED ON EXPANDED SAMPLES WHERE CRACKING PERCENT IS REPORTED AS 100.00%. MULTIPLE STATES REPORTED VERY HIGH VALUES FOR THEIR PAVEMENTS AND THESE SHOULD BE VERIFIED. YOU MAY WISH TO REFER TO THE ATTACHED CRACKING PERCENT CUMULATIVE DISTRIBUTION.	0.000
% INTERSTATE LANE MILES ON EXPANDED SAMPLES WHERE CRACKING PERCENT IS REPORTED AS 100.00%. AVERAGE IS 0.25% WITH A SD OF 0.75%, CUTOFF VALUE TO FLAG FOR VERIFICATION IS 1.00%	0.00 %

ITEMS SHADED ORANGE ARE HPMS PAVEMENT PERFORMANCE DATA IMPROVEMENT ZONES WHERE DATA SHOULD BE VERIFIED OR CORRECTED

HPMS 8.0.1

**PAVEMENT DATA QUALITY - FAULTING AND RUTTING
(INTERSTATE)**

Stage: Submit

Year: 2015

State:

Date: 06/17/2016

TOTAL INTERSTATE LANE MILES BASED ON EXPANDED SAMPLES WHERE SURFACE TYPE IS JOINTED PCC AND FAULTING IS EQUAL TO 0.00. MULTIPLE STATES REPORTED VERY HIGH VALUES AND THIS DATA SHOULD BE VERIFIED. YOU MAY WISH TO REFER TO THE ATTACHED FAULTING CUMULATIVE DISTRIBUTION.	1,379.367
% INTERSTATE LANE MILES BASED ON EXPANDED SAMPLES WHERE SURFACE TYPE IS JOINTED PCC AND FAULTING IS EQUAL TO 0.00. AVERAGE IS 51.78% WITH A SD OF 31.60%, CUTOFF VALUE TO FLAG FOR VERIFICATION IS 83.38%	95.24 %
TOTAL INTERSTATE LANE MILES BASED ON EXPANDED SAMPLES WHERE SURFACE TYPE IS JOINTED PCC AND FAULTING IS GREATER THAN 1.00 INCH. MULTIPLE STATES REPORTED VERY HIGH VALUES AND THIS DATA SHOULD BE VERIFIED. YOU MAY WISH TO REFER TO THE ATTACHED FAULTING CUMULATIVE DISTRIBUTION.	0.000
% INTERSTATE LANE MILES BASED ON EXPANDED SAMPLES WHERE SURFACE TYPE IS JOINTED PCC AND FAULTING IS GREATER THAN 1.00 INCH. AVERAGE IS 0.29% WITH A SD OF 1.67%, CUTOFF VALUE TO FLAG FOR VERIFICATION IS 0.00%	0.00 %
TOTAL INTERSTATE LANE MILES BASED ON EXPANDED SAMPLES WHERE SURFACE TYPE IS HMA AND RUTTING IS EQUAL TO 0.00. MULTIPLE STATES REPORTED VERY HIGH VALUES AND THIS DATA SHOULD BE VERIFIED. YOU MAY WISH TO REFER TO THE ATTACHED RUTTING CUMULATIVE DISTRIBUTION.	3,666.679
% INTERSTATE LANE MILES BASED ON EXPANDED SAMPLES WHERE SURFACE TYPE IS HMA AND RUTTING IS EQUAL TO 0.00. AVERAGE IS 11.11% WITH A SD OF 22.20%, CUTOFF VALUE TO FLAG FOR VERIFICATION IS 33.31%	57.26 %
TOTAL INTERSTATE LANE MILES BASED ON EXPANDED SAMPLES WHERE SURFACE TYPE IS HMA AND RUTTING IS GREATER THAN 1.00 INCH. MULTIPLE STATES REPORTED VERY HIGH VALUES AND THIS DATA SHOULD BE VERIFIED. YOU MAY WISH TO REFER TO THE ATTACHED RUTTING CUMULATIVE DISTRIBUTION.	0.000
% INTERSTATE LANE MILES BASED ON EXPANDED SAMPLES WHERE SURFACE TYPE IS HMA AND RUTTING IS GREATER THAN 1.00 INCH. AVERAGE IS 0.00% WITH A SD OF 0.01%, CUTOFF VALUE TO FLAG FOR VERIFICATION IS 0.00%	0.00 %
TOTAL INTERSTATE LANE MILES ON EXPANDED SAMPLES WHERE RUTTING IS REPORTED ON SURFACE TYPE = PCC OR CRCP	1,448.334
MANY STATES REPORT ALL DISTRESSES REGARDLESS OF SURFACE TYPE. VALUES OTHER THAN 0% OR 100% SHOULD BE VERIFIED AS THIS MAY BE AN ERROR OR THE RESULT OF DIFFERENT SOURCES OF REPORTING DATA	100.00 %
TOTAL INTERSTATE LANE MILES ON EXPANDED SAMPLES WHERE FAULTING IS REPORTED ON SURFACE TYPE = HMA OR CRCP	6,403.433
MANY STATES REPORT ALL DISTRESSES REGARDLESS OF SURFACE TYPE. VALUES OTHER THAN 0% OR 100% SHOULD BE VERIFIED AS THIS MAY BE AN ERROR OR THE RESULT OF DIFFERENT SOURCES OF REPORTING DATA	100.00 %

ITEMS SHADED ORANGE ARE HPMS PAVEMENT PERFORMANCE DATA IMPROVEMENT ZONES WHERE DATA SHOULD BE VERIFIED OR CORRECTED

**HPMS 8.0.1 PAVEMENT DATA QUALITY - BRIDGE AND SECTION LENGTH
(INTERSTATE)**

Stage: Submit
Year: 2015
State:
Date: 06/17/2016

BRIDGE LOCATION

PER MAP-21 BRIDGES ARE EXCLUDED FROM THE PERFORMANCE MEASURE CALCULATION. THE ABILITY TO ACCURATELY LOCATE BRIDGES IN HPMS IS VERY IMPORTANT IN THE CORRECT CALCULATION OF PAVEMENT CONDITION.

COUNT OF MAINLINE INTERSTATE BRIDGES FROM NBI INVENTORY	2,078
TOTAL INTERSTATE LANE MILES OF BRIDGES IN NBI INVENTORY	335.314
TOTAL LANE MILES ON FULL EXTENT BASIS CODED AS A BRIDGE IN HPMS	152.472

SECTION LENGTH

DISTRESS DATA SHOULD BE REPORTED IN SECTIONS 0.1 MILE IN LENGTH OR SHORTER	
TOTAL INTERSTATE LANE MILES WHERE SECTION LENGTH IS GREATER THAN 0.1 MILE	2,085.06
CUTOFF VALUE FOR VERIFICATION IS 0.00%	26.44 %

ITEMS SHADED ORANGE ARE HPMS PAVEMENT PERFORMANCE DATA IMPROVEMENT ZONES WHERE DATA SHOULD BE VERIFIED OR CORRECTED

HPMS 8.0.1 DISTRESS DATA DISTRIBUTION - IRI AND CRACKING PERCENT

Stage: Submit

Year: 2015

State:

Date: 06/17/2016

IRI

The Cumulative and Frequency Distribution of Interstate IRI graph is based on full extent of Interstate IRI data, bridges are excluded.

Blanks are listed separately and printed at the bottom the graph.

For comparison to the national distribution see your 2013 HPMS Pavement Performance Data Report Card.

When evaluating the distribution in regard to the quality of the data, consider the shape of the distribution rather than whether your distribution is better or worse than average. When evaluating the distribution consider especially the tails, 0-10% and 90-100%.

CRACKING PERCENT

The Cumulative and Frequency Distribution of Interstate Cracking Percent graph is based on HPMS sample data, bridges are excluded.

Blanks are listed separately and printed at the bottom the graph.

For comparison to the national distribution see your 2013 HPMS Pavement Performance Data Report Card.

When evaluating the distribution in regard to the quality of the data, consider the shape of the distribution rather than whether your distribution is better or worse than average. When evaluating the distribution consider especially the tails, 0-10% and 90-100%.

FAULTING

The Cumulative and Frequency Distribution of Interstate Faulting graph is based on HPMS sample data, bridges are excluded.

Blanks are listed separately and printed at the bottom the graph.

For comparison to the national distribution see your 2013 HPMS Pavement Performance Data Report Card.

When evaluating the distribution in regard to the quality of the data, consider the shape of the distribution rather than whether your distribution is better or worse than average. When evaluating the distribution consider especially the tails, 0-10% and 90-100%.

RUTTING

The Cumulative and Frequency Distribution of Interstate Rutting graph is based on HPMS sample data, bridges are excluded.

Blanks are listed separately and printed at the bottom the graph.

For comparison to the national distribution see your 2013 HPMS Pavement Performance Data Report Card.

When evaluating the distribution in regard to the quality of the data, consider the shape of the distribution rather than whether your distribution is better or worse than average. When evaluating the distribution consider especially the tails, 0-10% and 90-100%.

HPMS 8.0.1

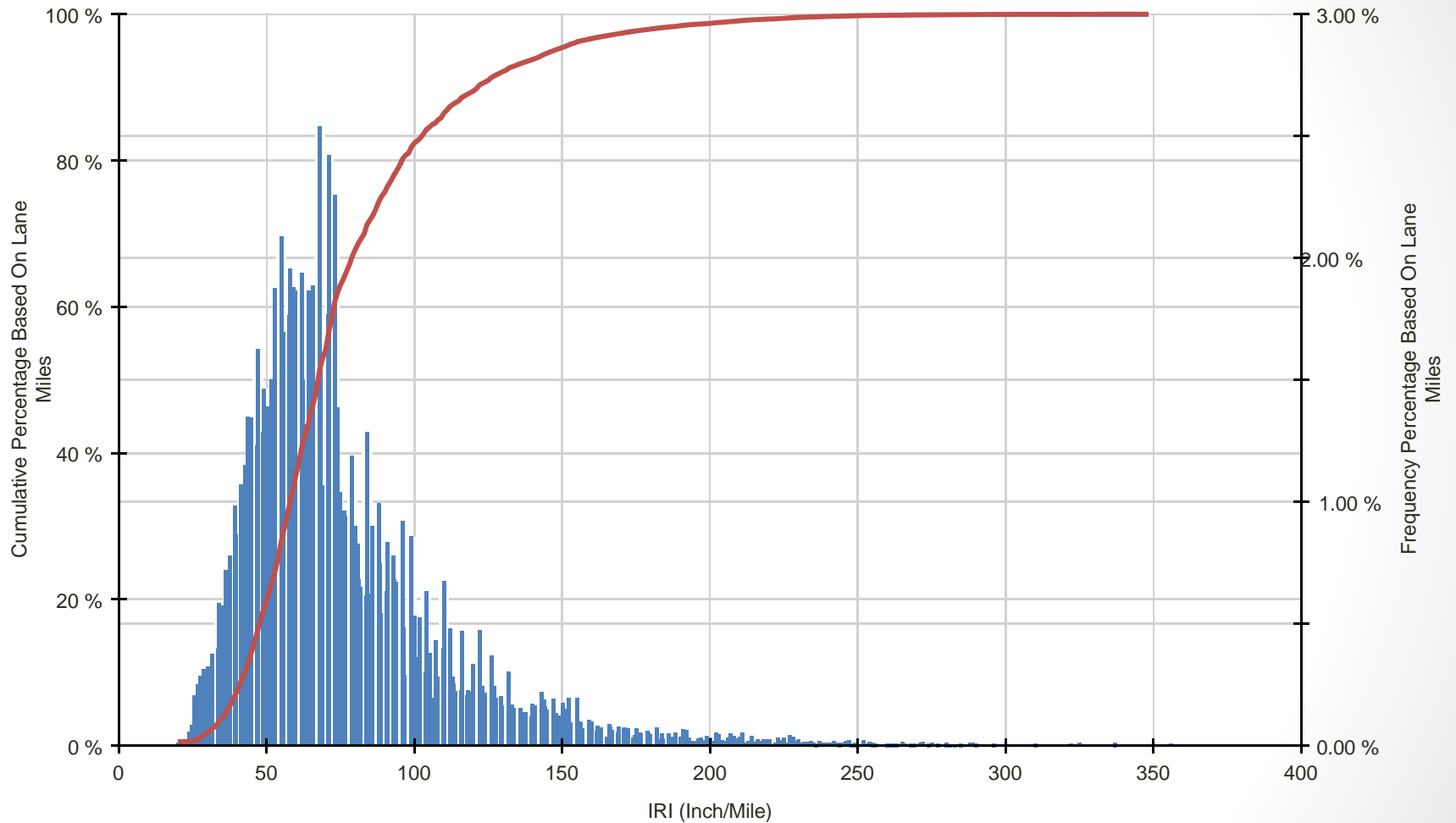
CUMULATIVE AND FREQUENCY DISTRIBUTION - IRI (INTERSTATE)

Stage: Submit

Year: 2015

State:

Date: 06/17/2016



(Frequency of Missing IRI = 0.538%, missing data is included in the cumulative distribution graph.)

HPMS 8.0.1

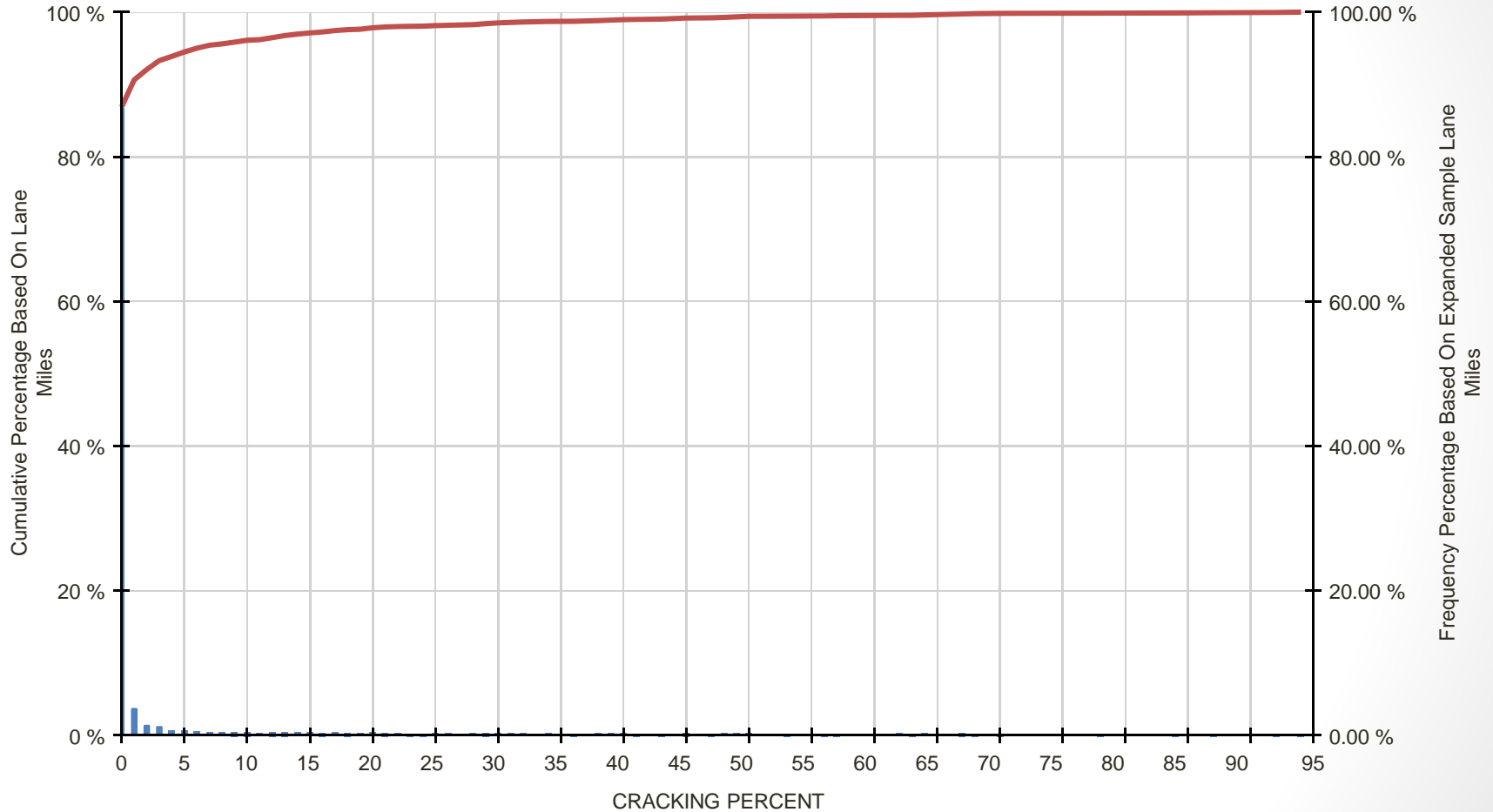
CUMULATIVE AND FREQUENCY DISTRIBUTION - CRACKING PERCENT (INTERSTATE)

Stage: Submit

Year: 2015

State:

Date: 06/17/2016



(Frequency of Missing CRACKING_PERCENT = 0.000%, missing data is included in the cumulative distribution graph.)

Report Generated On - 06/17/2016 8:38:00 AM

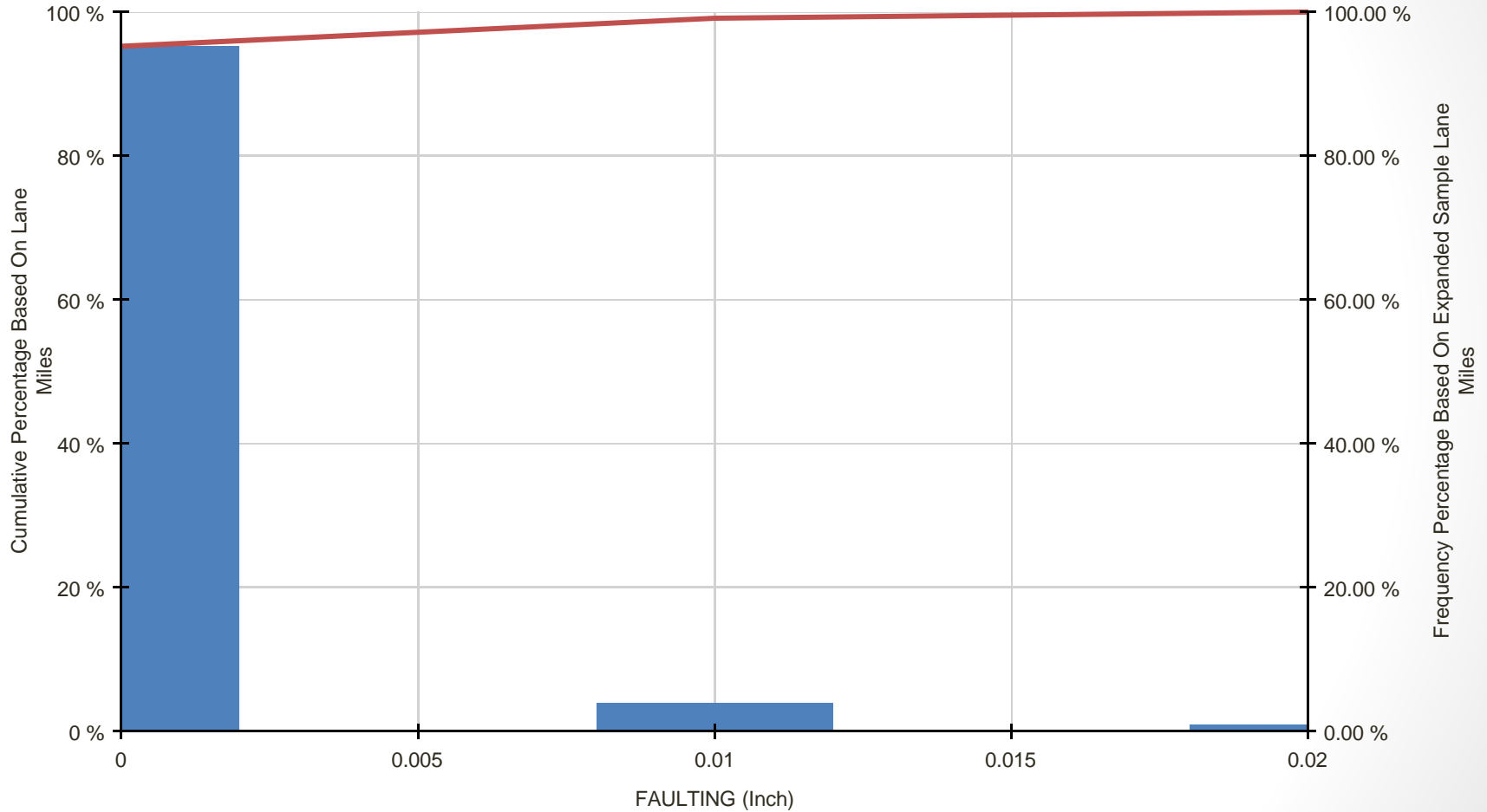
CUMULATIVE AND FREQUENCY DISTRIBUTION - FAULTING (INTERSTATE)

Stage: Submit

Year: 2015

State:

Date: 06/17/2016



(Frequency of Missing FAULTING = 0.000%, missing data is included in the cumulative distribution graph.)

HPMS 8.0.1

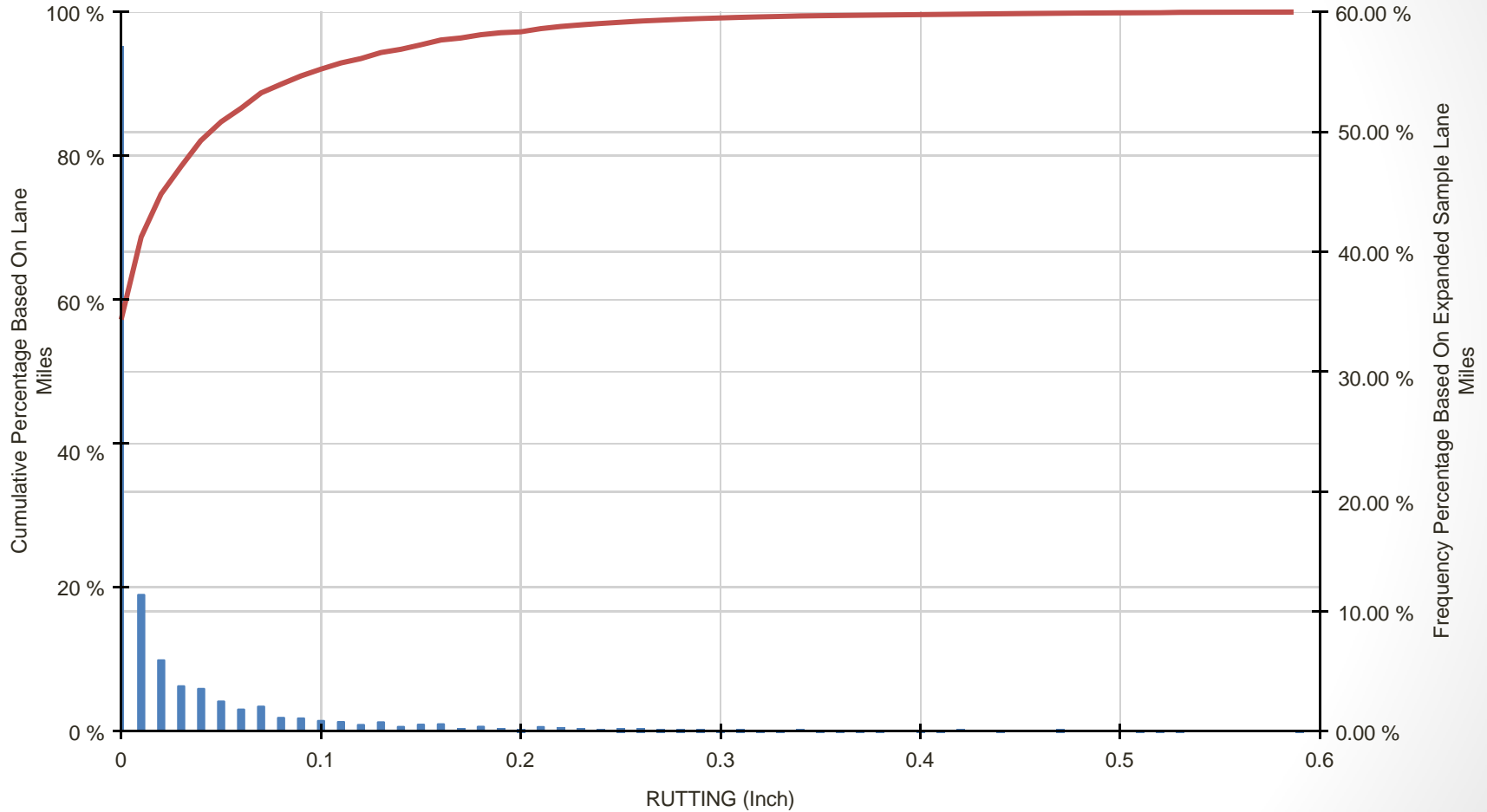
CUMULATIVE AND FREQUENCY DISTRIBUTION - RUTTING (INTERSTATE)

Stage: Submit

Year: 2015

State:

Date: 06/17/2016



(Frequency of Missing RUTTING = 0.000%, missing data is included in the cumulative distribution graph.)

PRESENT HPMS GUIDELINES REQUIRE THAT IRI DATA BE REPORTED IN SECTIONS NO LONGER THAN 0.1 MILE WHILE ALLOWING FOR SHORTER SECTIONS AT BRIDGES AND TERMINAL SECTIONS.

THE PERFORMANCE MANAGEMENT NPRM STATES THAT ALL FOUR METRICS SHOULD BE REPORTED IN 0.1 MILE SECTIONS. IF YOUR STATE REPORT IN OTHER PREDOMINANT LENGTH YOU MAY WISH TO INVESTIGATE IF THIS IS DUE TO VENDOR PREFERENCE OR DYNAMIC SEGMENTATION TAKING PLACE DURING UPLOADING TO THEIR PAVEMENT MANAGEMENT SYSTEM OR HPMS.

HPMS 8.0.1

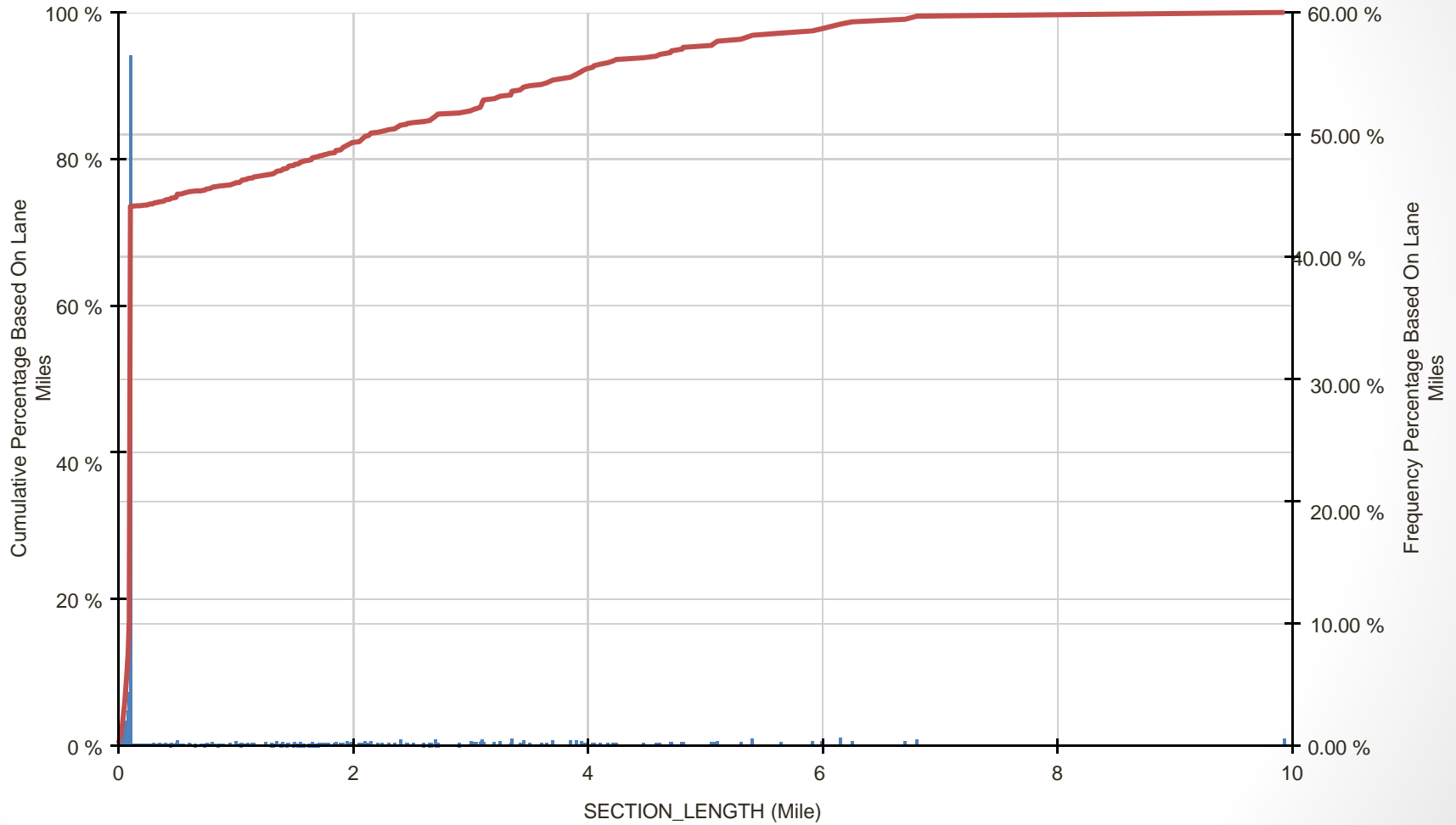
CUMULATIVE AND FREQUENCY DISTRIBUTION - SECTION LENGTHS (INTERSTATE)

Stage: Submit

Year: 2015

State:

Date: 06/17/2016



HPMS 8.0.1

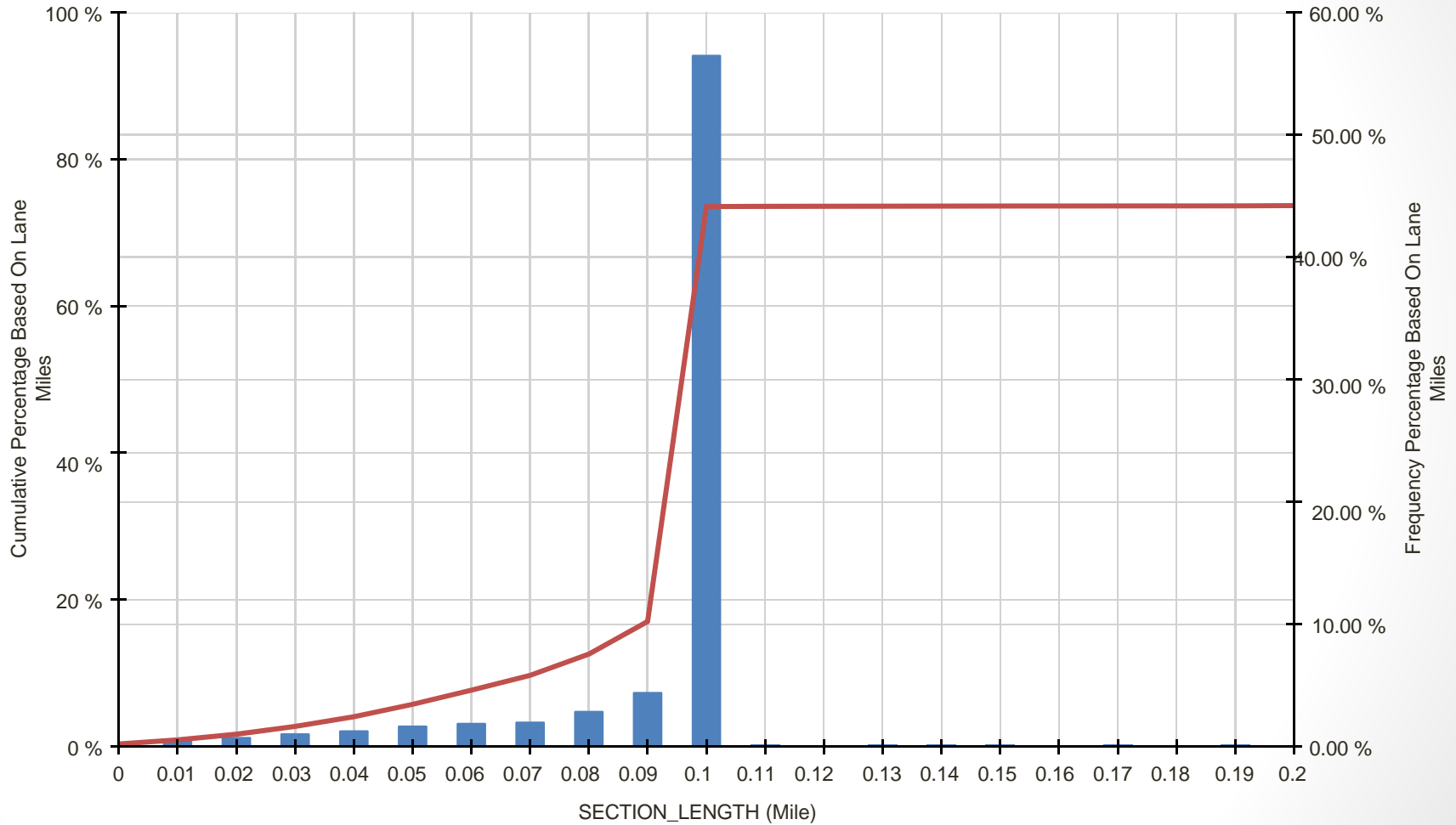
CUMULATIVE AND FREQUENCY DISTRIBUTION - SECTION LENGTHS - CLOSEUP 0.0 TO 0.2 MILE IN LENGTH (INTERSTATE)

Stage: Submit

Year: 2015

State:

Date: 06/17/2016



HPMS Pavement Metadata

- *HPMS Field Manual* updating pavement metadata
 - Adding and enhancing elements
 - Incorporating AASHTO references where relevant
 - P

- IRI:
 - Added 3-dimensional imaging system
 - Added and refined reporting & sampling interval referencing AASHTO M328-14
- Rutting:
 - Added 3-dimensional imaging system

Type			
IRI_Equip_Type			scanning
IRI_Report_Interval			
IRI_Sample_Interval			
	data point. These points, in turn, may be combined to create a final value in the reported profile. (Ref: AASHTO Designation M328-14; 3.1.18)		
Rutting_Method	Method (Manual or Automated) used to collect most of the rutting data.	Code	Description
		1	Manual
		2	Automatic
Rutting_Equip_Type	Type of equipment used predominately for collection of rutting data.	Code	Description
		1	3-dimensional imaging system/scanning laser
		2	Laser
		3	Other/Manual

HPMS Pavement Metadata

Rutting_Num_Sensors	Number of sensors for the equipment used predominately for collection of rutting data.	Code	Description
		1	Three (3) sensors
		2	Five (5) sensors
		3	Greater than five (>5) sensors
Rutting_Interval			foot.
Rutting_Trans_Prof			0.1 inch.
Faulting_Interval			0.1 inch.
Faulting_Method	5.2.5) Method (Manual or Automated) used to collect most of the faulting data.	Code	Description
		1	Manual
		2	Automatic
Faulting_Equipment_Type	Type of equipment used predominately for measuring the faulting data.	Code	Description
		1	Manual
		2	Laser
		3	3-dimensional imaging system/scanning laser
		4	Other

- Rutting:
 - Added transverse profile interval & refined intervals referencing AASHTO R48-10(2013) & PP70-14(2016)
- Faulting:
 - Refined interval referencing AASHTO R36-13
 - Added 3-dimensional imaging system

HPMS Pavement Metadata

Cracking_Pct_Equip	Type of equipment used predominately for measuring the percent of cracking (Cracking_Percent).	Code	Description
		1	Windshield survey
		2	Visual distress survey (side of road)
		3	Manually identify cracking from video
		4	Automated crack identification to detect cracking from video
			atic crack
		7	Other
Cracking_Method	Protocol used to identify pavement distresses.	Code	Description
		1	Long-Term Pavement Performance (LTPP)
		2	American Association of State Highway and Transportation Officials (AASHTO)
		3	Modified LTPP
		4	Modified AASHTO
		5	State developed protocol
		6	Other

- Cracking Percent:
 - Added 3-dimensional imaging system

Conclusion / Contact

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