West Virginia Department of Transportation

Highway Performance Monitoring System (HPMS) Reference Manual

West Virginia Department of Transportation
Performance Management
8-27-2021

This is a working document that should be periodically updated to provide up-to-date references for the unit and the current state of the program.

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1. Overview

Highway Performance Monitoring System (HPMS) is a national program that includes the inventory information for all the Nation's public roads as certified by the State's Governors annually. Each state is required to annually furnish all data per the reporting requirement specified in HPMS Field Manual published by Federal Highway Administration (FHWA).

HPMS data are used for assessing highway system performance under U.S. DOT and FHWA's strategic planning and performance reporting process. The data form the basis of the analyses that support *the Condition and Performance (C&P) Report to Congress* and a substantial portion of annual statics publication by FHWA. HPMS data are also used to calculate performance measures.

HPMS program is managed at the federal level by Federal Highway Administration (FHWA), Office of Highway Policy. At State level, the West Virginia Department of Transportation (WVDOT), the program is managed by Performance Management. HPMS unit is responsible for completing the annual HPMS submittal by June 15th of each year.

This reference manual was documented as supplemental guides to the HPMS field Manual, December 2016 version, published by FHWA, WVDOT HPMS Guidance Manual prepared by Cambridge Systematics in September 2018, and HPMS Software Guide for Version 8.0 by FHWA. Any revisions of HPMS field manual, new data requirements, or updates are provided as Errata Sheet by FHWA to State DOTs prior to the submittal year.

All dates, examples and screenshots in this manual are from 2019, and 2020 data submittal after FHWA started two different data submittals dues (April and June) in 2019.

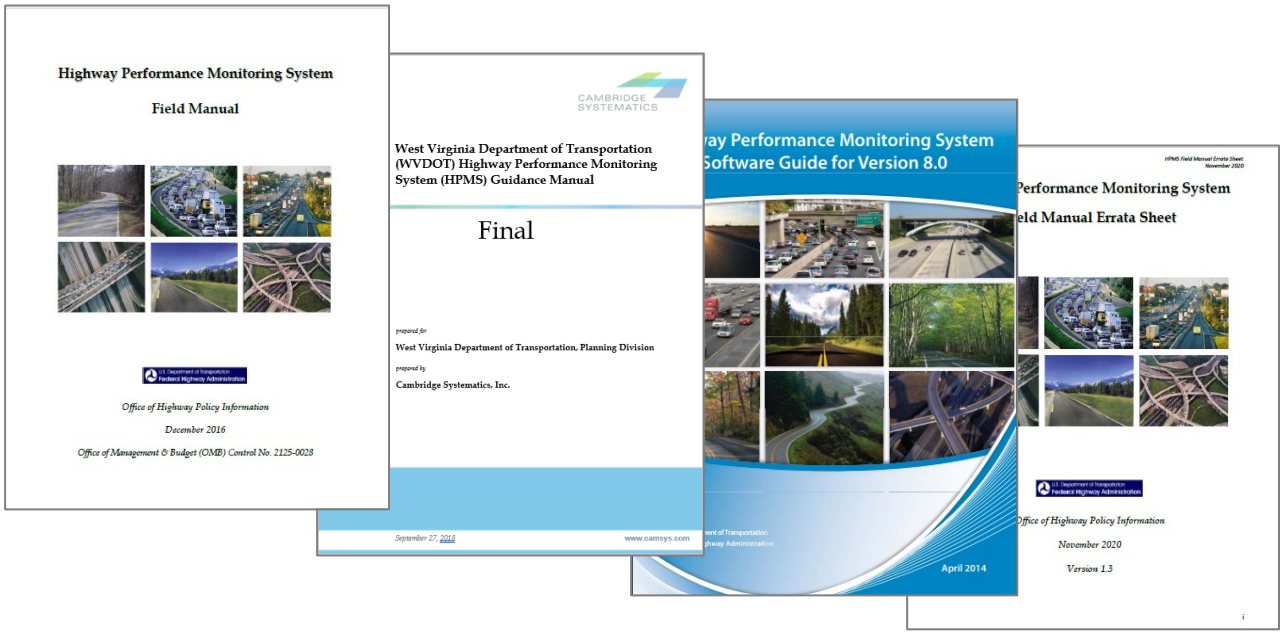


Figure 1 HPMS Field Manual Dec.2016, WVDOT HPMS Guidance Manual Sep. 2018, HPMS Software Guide for Version 8.0, and HPMS Field Manual Errata Sheet Nov. 2020

2. Reporting Requirements

2.1 Component Data Sets

The data required for annual submittal includes:

- **Full Extent Data** – Limited data on all public roadway system such as the National Highway System (NHS) or entire functional system, which includes the Federal-aid system.
- **Sample Panel Data** – More detailed data for designated section of the Federal-aid system
- **Partial Extent Data** – Data items reported on a Full Extent basis for some functional systems and on a Sample Panel basis for other functional systems.
- **Statewide Summary Data** – Area wide summary information primarily for lower functional system roads
- **Linear Referencing System (LRS) Data** – A spatial reference for the Full Extent and Sample Panel data on selected highway functional system. (Please see next section for details.)

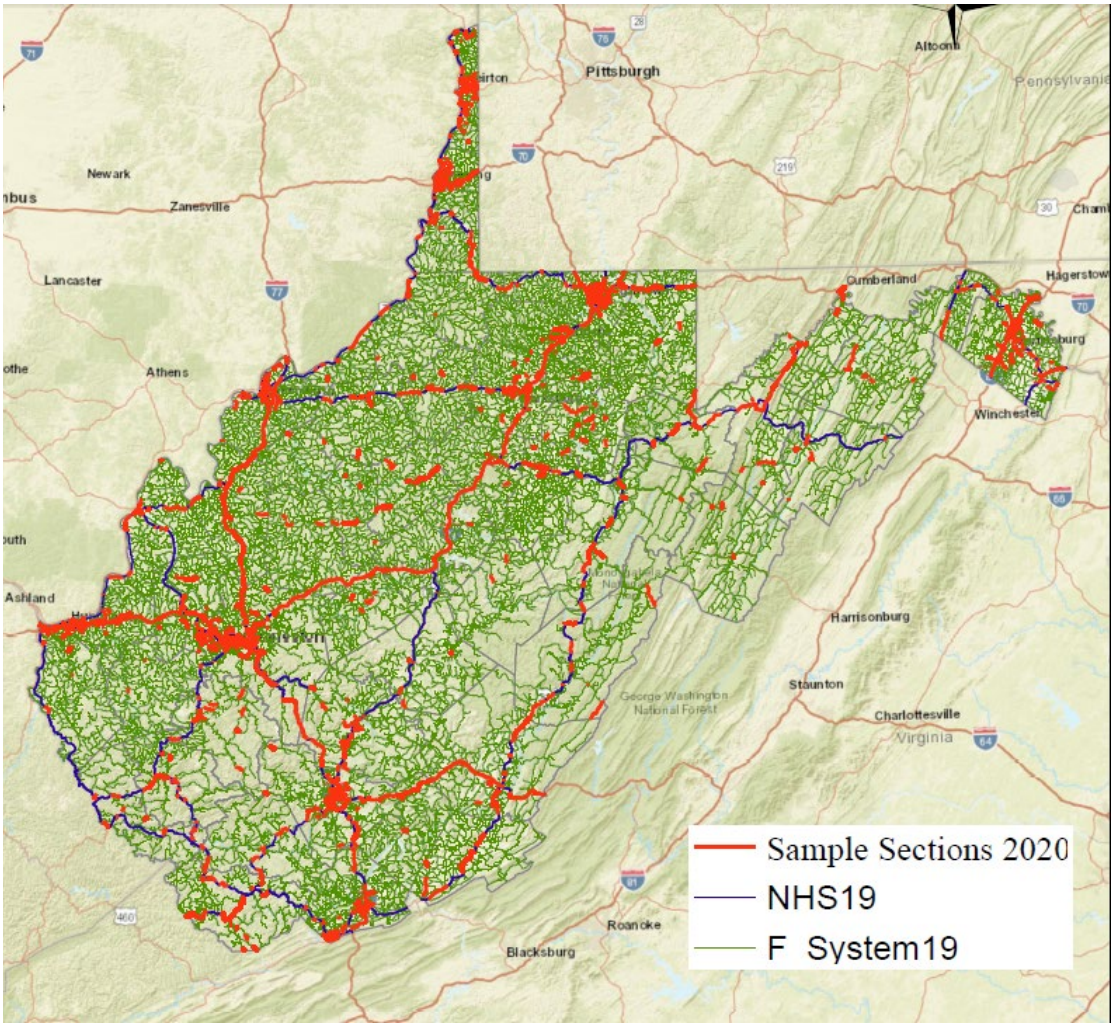


Figure 2 HPMS data items in different required extents.

2.2 Data Model Structure and Required Datasets

HPMS data model has been developed within a Geographic Information System (GIS) framework. In the data model below, circled items must be developed by State and submitted to FHWA.

Urban Area Boundaries is only submitted to FHWA when it has changed since the previous HPMS submittal, and after those changes have been approved by FHWA. Updates to Urban Area boundaries typically occur following the most recent decennial census.

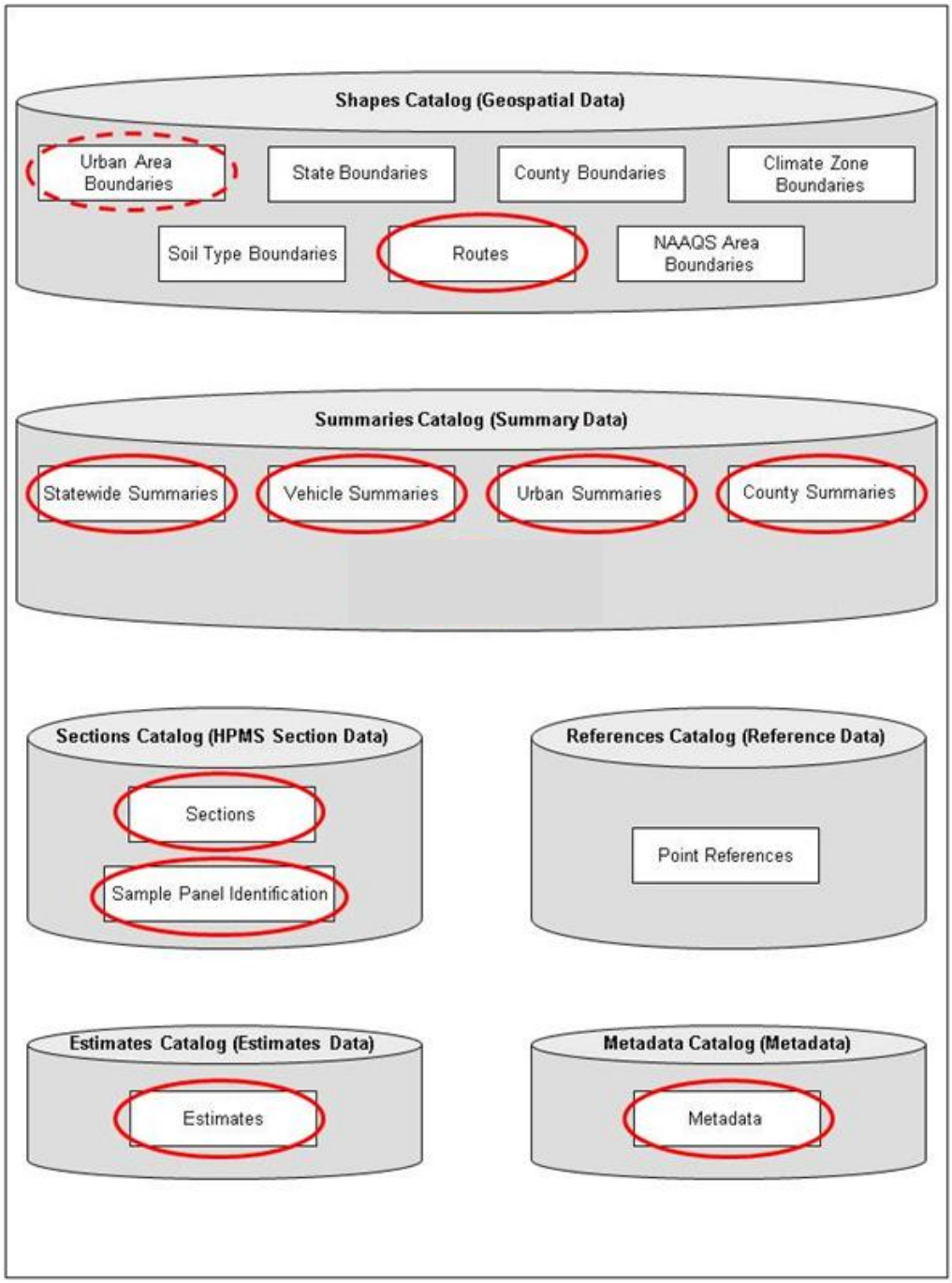


Figure 3 HPMS Data Model Structure (Resource: HPMS Field Manual 2016)

2.3 Submission Deadlines

a) 4/15, Bi-directional Interstate Pavement and Related Data Items Submission (April Due)

Required data items are listed below;

- 1 F_System
- 2 Urban_Code
- 3 Facility_Type
- 4 Structure_Type
- 7 Through_Lanes
- 47 IRI
- 48 PSR (only for sections missing IRI)
- 49 Surface_Type
- 50 Rutting
- 51 Faulting
- 52 Cracking_Percent
- 64 NHS
- 70 Dir_Through_Lanes

Beside these data items, Routes Dataset (Dominant route LRS network) was imported to run LRS validations and check if they can make event data or not. These data items were submitted on 4/14/2021 using online HPMS software (HPMS V8).

The data submitted for April due will be locked on HPMS software for any updates.

b) 6/1, Certified Public Road Mileage Submission

The annual Certified Public Road Mileage (CPRM) represent the state's public road mileages as of December 31st of the previous calendar year (= data year).

The following items effect the mileage calculation* in HPMS software

- 1 F_System
- 2 Urban_Code
- 3 Facility_Type
- County Summary (The mileage in subtotal should match with State Summary.)

To finalize vehicle traveled miles, please pay attention to VMT in State Summary and Urban Summary for 6-Minor Collector and 7-Local during CPRM calculation. The CPRM letter was delivered electronically on 6/1/2021 due to Covid-19 circumstances, instead of mailed to the West Virginia Division of FHWA in Charleston, WV.

c) 6/15, All Required Data Items Submission (June Due)

All other data which is not listed above for April due, and non-interstate pavement data are required to submit in June due. The Travel Time Metrics (TTM) data also must be submitted any time before this final big due date. All data items and TTM data were submitted on 6/15/2021.

NOTE: HPMS unit must finalize other data items which is NOT listed on this list to data-QA/QC and run required reports. For example, AADT is not listed as required data items for April due. However, to enable the submit function in HPMS software, we must run PM2 validation. PM2 validation will be available after creating Table of Potential Samples (TOPS) and AADT is one of five data items to create TOPS.

For data submittal sequence and data-lock in HPMS software, please see Chapter 5 (5.1).

2.4 Submittal Software

The annual HPMS submittal is to be transmitted to FHWA via a web-based HPMS application.

a) HPMS Submittal Software (HPMS 8.0)

Highway Performance Monitoring System Version 8.0 (HPMS 8.0) is the software used for input, analysis, and processing of HPMS data. Access to HPMS 8.0 has been granted through the User Profile Access Control System (UPACS).

HPMS 2020 data submission in 2021 is the last data submission using HPMS 8.0.

HPMS 9.0 release is planned to be Winter 2022, and State DOT will be required to use HPMS 9.0 for HPMS 2021 data submission in 2022.

In March 2021, FHWA announced that "**There will be no change to the reporting requirements in content and format" in HPMS 2021 data submission in HPMS 2022**. With the development of next version HPMS software (HPMS 9.0), they decided not to have any changes in requirement.

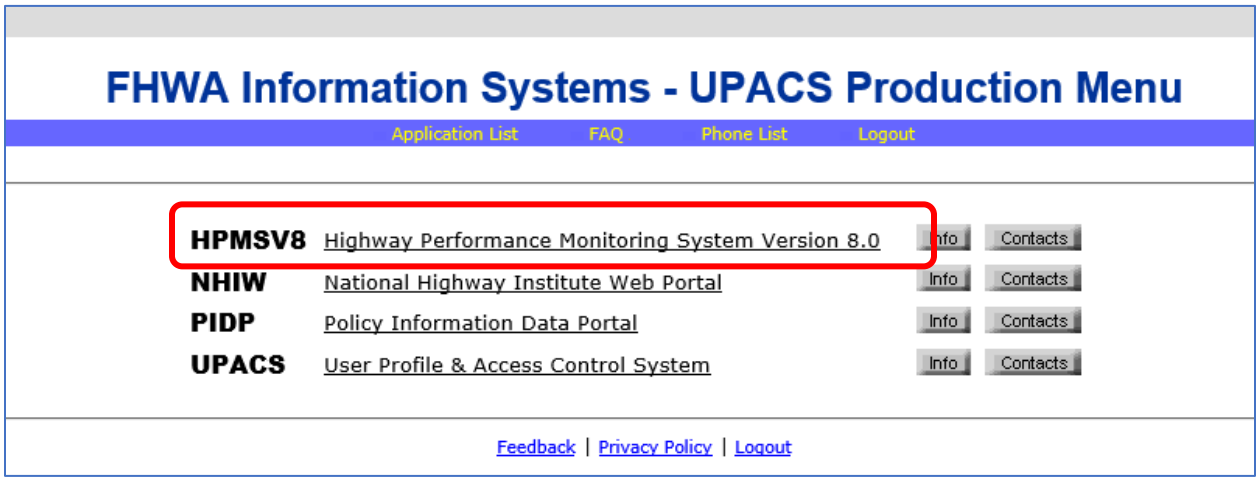


Figure 4 UPACS Production Menu for HPMS V8

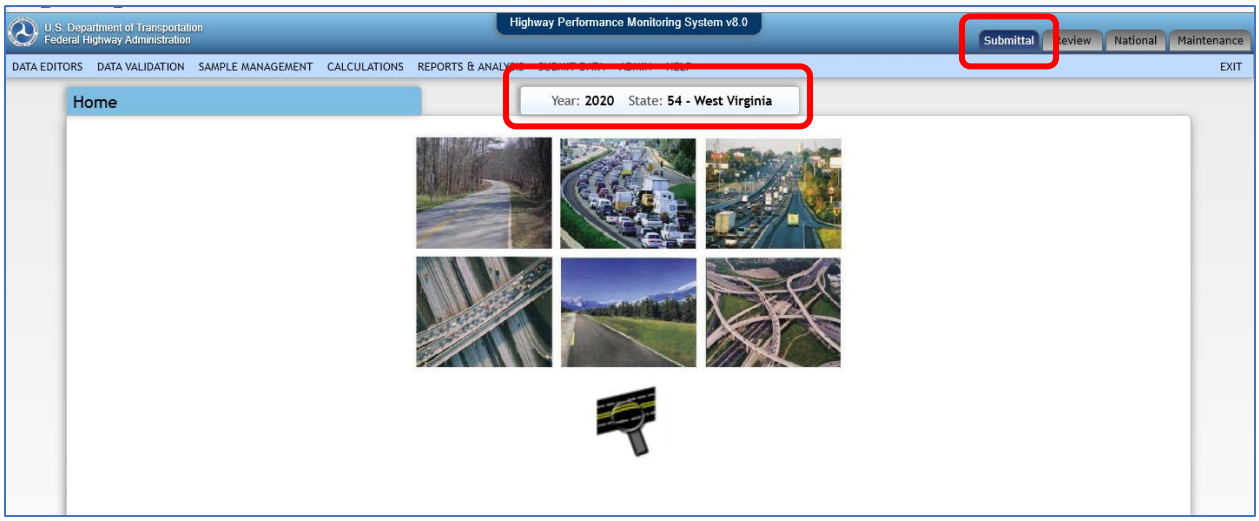


Figure 5 HPMS Main Entry Screen

b) UPACS and ORC Process

To be able to access to HPMS v8, an UPACS account and registering for ORC Level 2 credentials will be needed.

User Profile and Access Control System (UPACS) is the single sign-on security system used to access certain nationwide FHWA applications. All State DOTs, Metropolitan planning organizations (MPOs), and other select nonfederal government agencies and their contractors are required to be authenticated thorough the Operational Research Consultants (ORC) process for access to FHWA application through UPACS.

ORC is a Federal Government approved eAuthentication™ service center that enables users to get access to FHWA applications using login identifications (identity Level 2 credentials) established from their verification process. All FHWA applications accessed through ORC require Level 2 credentials.

You may contact to FHWA Division office (Charleston, WV) and state HPMS coach in FHWA (D.C.) while you start the process described below.

https://fhwaapps.fhwa.dot.gov/upacsp/images/UPACS_ORC_Message.pdf?popupTitle=ORC Process Information&helpFile=

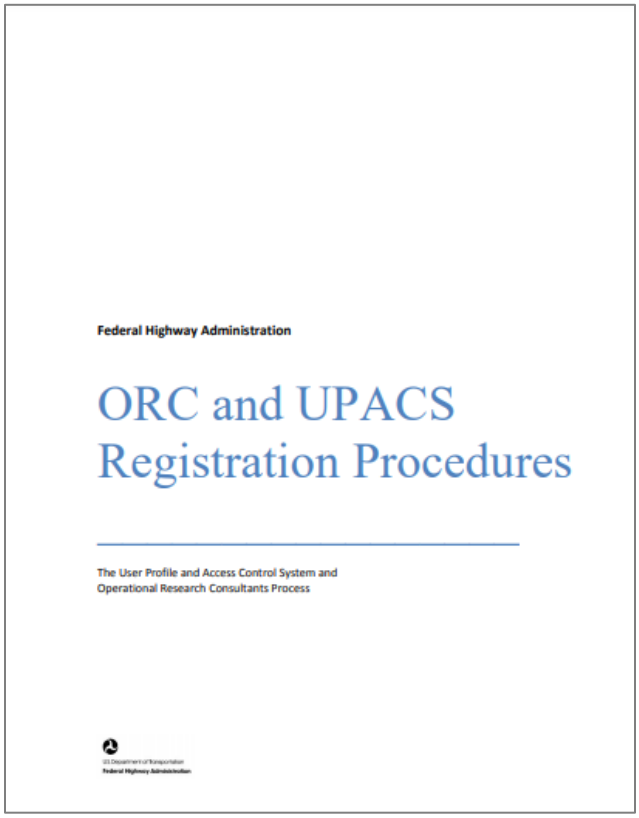
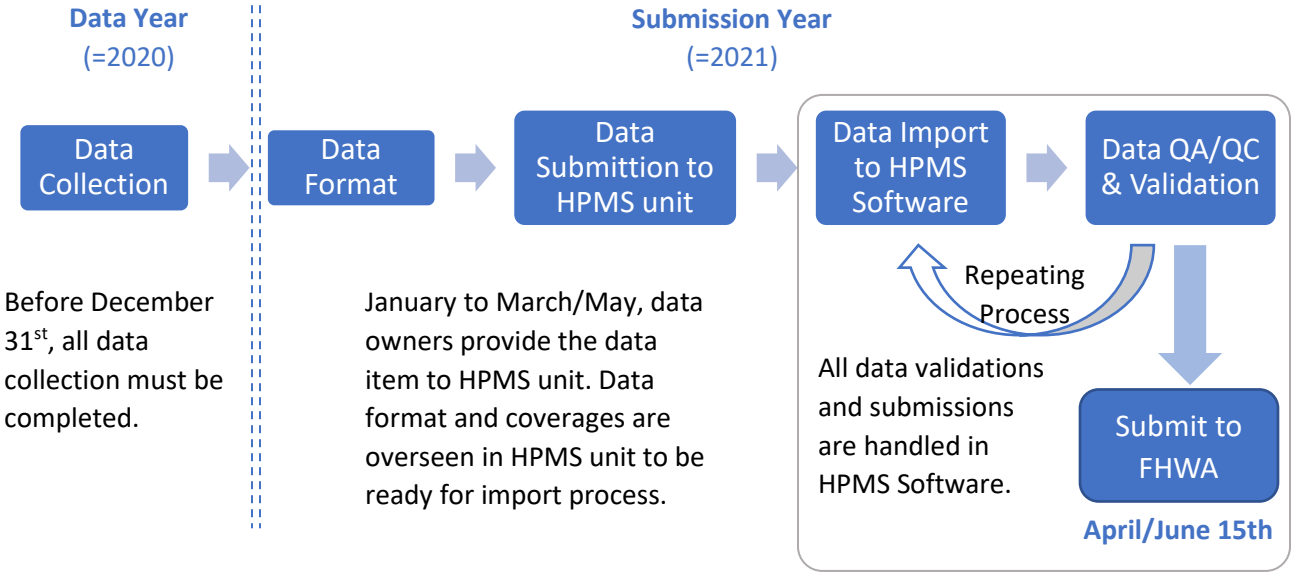


Figure 4 Guide for PRC and UPACS Registration published by FHWA

3. Data Process at WVDOT

3.1 General Timeline



3.2 Data Process

a) WVDOT High-Level Data Process

HPMS unit annually receives data managed in different databases from several data owners or data providers.

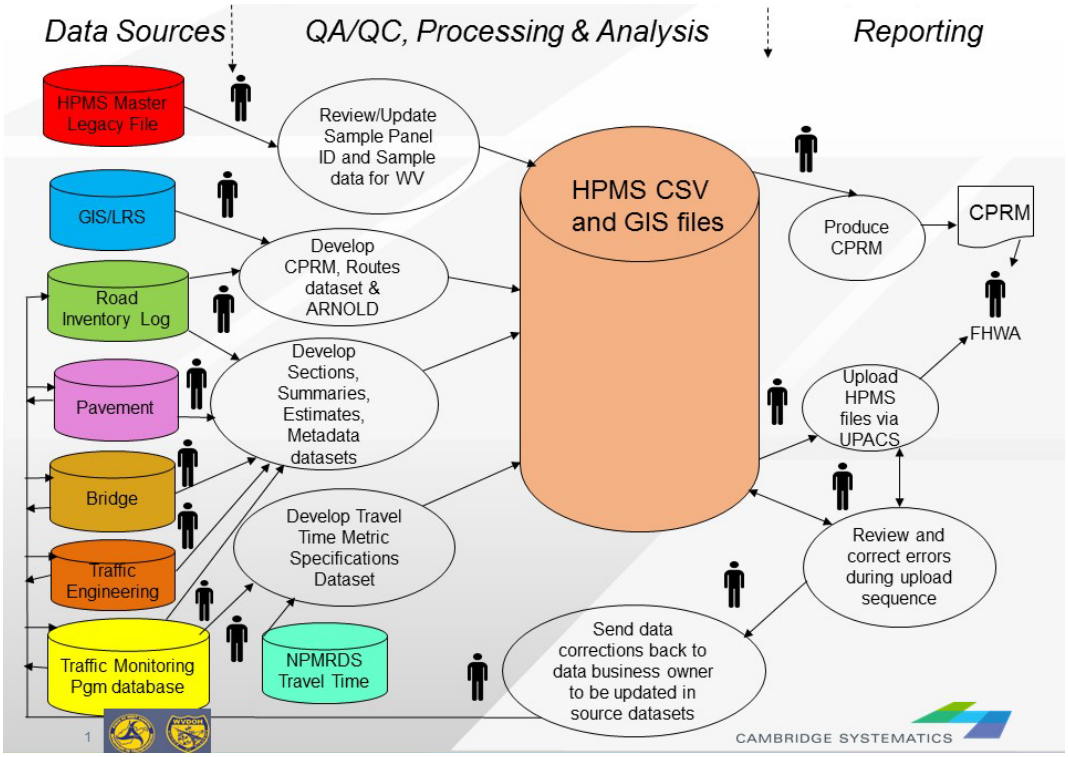


Figure 5 Diagram shows HPMS High-level Data Process at WVDOT (Source: WVDOT HPMS Guidance Manual)

b) Data Flow

The context data flow diagram below describes how the data is collected and processed at WVDOT.

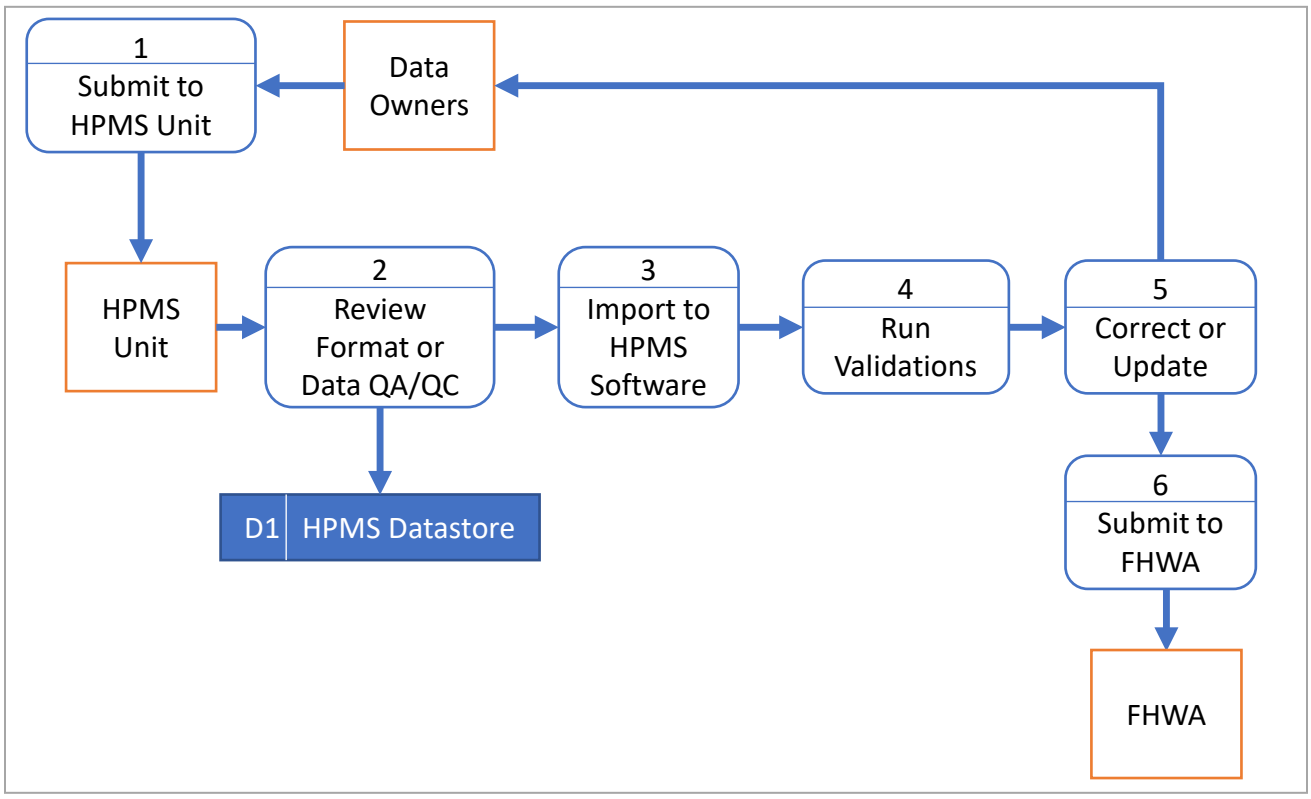


Figure 6 Context Data Flow Diagram (Level 0) for HPMS Data Process at WVDOT

Entities

- Data Owners Responsible to maintain and provide data for HPMS. Not all data owners are same as data collectors or data providers at WVDOT. (Please see next sections.)
- HPMS Unit Responsible to receive data and submit to FHWA.
- FHWA Office of Highway Policy Information, FHWA, where HPMS unit submit all required data via HPMS software. In case of CPRM, it is FHWA Division Office in Charleston, WV.

Processes

1. All data provides or data owners send required data to HPMS Unit before internal due.
2. HPMS unit review the format and data coverages before import.
3. HPMS unit import data into HPMS Software. Import validation will check any errors in format.
4. HPMS unit run all required validations in HPMS software.
5. HPMS unit send data with errors to data owners for data correction and updates.
6. HPMS unit submit all HPMS required data to FHWA via HPMS Software.

Datastore

- D1 HPMS Datastore Folders in FTP server where HPMS unit mainly uses to store HPMS data.

3.3 Data Review Sequence

There is a recommended order of import for the HPMS datasets (refer to Chapter 7 of the HPMS Field Manual, December 2016). However, the state DOTs have some degree of flexibility in the order of import. WVDOT should follow the instructions in the most recent HPMS submittal software manual for logging into UPACS, accessing the HPMS submittal website and navigating to the Application Menu for HPMS to begin the import process.

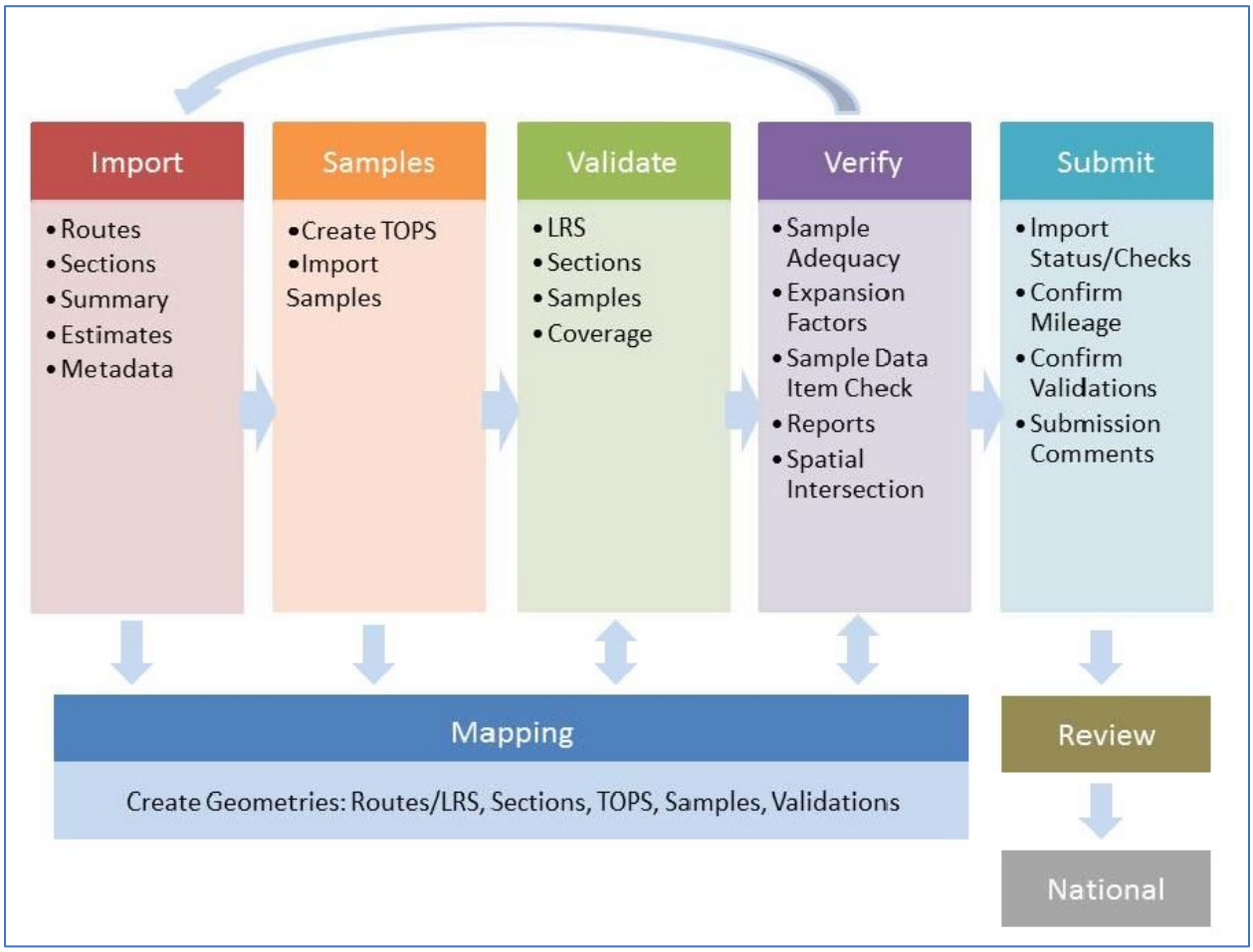


Figure 7 Software Workflow Diagram described in HPMS Field Manual 2016

Please refer Chapter 5 for detailed submittal sequence used in April-June 2021.

4. Required Data

There are three sources of data for the national HPMS database.

- Data that are to be developed and supplied by the States
- Data that are obtained by FHWA from other non-State sources
- Data that are generated or calculated by FHWA

This chapter describes that the data components which WVDOT is responsible to submit to FHWA.

4.1 Shapes Catalog

a) Routes

Route datasets is one of the Shapes Catalog (Geospatial Data) and prepared by Geographic Information System Section, LRS unit. It includes all public roads in West Virginia which is also termed "All Public Roads Network (ARNOLD)".

Please see more information for ARNOLD reference:

https://www.fhwa.dot.gov/policyinformation/hpms/documents/arnold_reference_manual_2014.pdf

The route dataset must be linear referenced and provided in shapefile format. (Currently HPMS v8 only accept Esri shapefile format.)

Please see HPMS Filed Manual 2016, p 3-7, for format and data requirement details.

Dominant_Routes

FID	Shape *	ROUTEID	Label	SubRoute	SignSystem	SuppCode	Route	CountyCode	District	BMP	EMP	Shape_Leng	Comments	Year_Recor	State_Code
0	Polyline ZM	0100001000000	1	00	0	00	0001	01	07	0	0.145	233.067591		2020	54
1	Polyline ZM	0100002000000	2	00	0	00	0002	01	07	0	0.418	672.506968		2020	54
2	Polyline ZM	0100003000000	3	00	0	00	0003	01	07	0	0.28	450.217149		2020	54
3	Polyline ZM	0100004000000	4	00	0	00	0004	01	07	0	0.086	138.589702		2020	54
4	Polyline ZM	0100005000000	5	00	0	00	0005	01	07	0	0.181	290.819166		2020	54
5	Polyline ZM	0100006000000	6	00	0	00	0006	01	07	0	0.151	242.702012		2020	54
6	Polyline ZM	0100007000000	7	00	0	00	0007	01	07	0	0.156	251.30449		2020	54
7	Polyline ZM	0100008000000	8	00	0	00	0008	01	07	0	0.173	278.792677		2020	54
8	Polyline ZM	0100009000000	9	00	0	00	0009	01	07	0	0.593	954.477445		2020	54
9	Polyline ZM	0100010000000	10	00	0	00	0010	01	07	0	0.086	138.798356		2020	54

Figure 8 The figure shows the required attribute fields, Year_Record, State_Code, and Route_ID.

The LRS dataset we receive from LRS unit generally includes all dominant routes and some other transportation related information. Trails and railroads are part of LRS dataset and FHWA advice WVDOT not to exclude, leave as it is.

b) Urban Area Boundaries (UABs)

UABs is one of Shapes catalog. Each time the Census generates new urban boundaries for decennial census, the FHWA will acquire and use them for performance measure, and metric evaluation, mapping, and analysis purpose. At a State option, they can adjust (expand) the Census UABs for transportation purposes.

UABs is only submitted to FHWA when it has changed since the previous HPMS submittal, and after those changes have been approved by FHWA.

Please see HPMS Filed Manual 2016, p 3-9, for format and data requirement details.

4.1 Sections Catalog

a) Section

Section dataset is one of the most important datasets that provides detailed information for full extent and sample extent. There are 70 data items listed in HPMS Field Manual. (Table 2.1, page 2-2 to 2-4).

To ensure to obtain the latest data requirements, please check the latest issued errata sheets.

The figure below shows an example that HPMS Field Manual 2016 has extent information, and it is updated by errata sheets. Required extent was updated from FE + R to FE + R*.

HPMS unit receive section datasets from various entities within WVDOT and data collection vendors. When FHWA notifies any new or update data requirement to State DOTs, HPMS unit needs to share the information with related data owners.

HPMS Field Manual 2016, Table 2.1 Page 2-2

Data Item Type	Item Number	Data Item	Extent
	1	Functional System	FE + R
	2	Urban Code	FE + R
	3	Facility Type	FE + R
	4	Structure Type	FE**

HPMS Field Manual Errata Sheet ver 1.3 Page3

2-2	**'Table 2.1: Data Items to be Reported** - Data Item 1: Functional System	1 | Functional System | FE + R | |	1 | Functional System | **FE + R*** | |

Figure 9 Screenshots shows extent updates from HPMS Field Manual 2016 and HPMS Filed Manual Errata Sheets ver 1.3.

Please also see HPMS Filed Manual 2016, p 4-10 to 4-13, and Errata Sheets for data items, related submission deadlines and required reporting formats.

Data Item Type	Data Item No.	Database-Specific Data Item Name	Data Item Name	Extent		Due Date	LRS Reporting Req. for Divided Highways
	1	F_System	Functional System	FE + R		April 15#	I&NI
	2	Urban_Code	Urban Code	FE + R		April 15#	I or I&NI*
	3	Facility_Type	Facility Type	FE + R		April 15#	I&NI
	4	Structure_Type	Structure Type	FE**		April 15#	I or I&NI*
	5	Access_Control	Access_Control	FE*	SP*	June 15	

Figure 10 Screenshots shows the Table 4.2 in HPMS Field Manual 2016, Table 4.2

b) Sample Panel Identification

Sample panel data consist of data items that are reported for a select portion of a given roadway system. Sample panel data is used to monitor trends and impacts in performance data over time, and for analysis in support of national budgeting for highway improvements through *the Conditions and Performance (C&P) report to* Congress.

Sample panel is determined based on HPMS submitted data and HPMS unit maintains and finalizes it after the June due in WVDOT. Please see Chapter 7.3 for sample maintenance process, format, and data requirement details.

Please see HPMS Field Manual 2016, p 3-12, for required tables for all sample panel sections.

4.2 Summaries Catalog

The summaries catalog comprised of the following four datasets:

- Statewide Summaries
- Vehicle Summaries
- Urban Area Summaries
- County Summaries

These summaries are prepared and provided to HPMS units. Some summaries data effects statewide reports and CPRM calculation, so they need to be reviewed and validated earlier (preferably in April) than actual their due dates (6/15).

Summary data can either be imported as a file in Character Separated Value (CSV) format or entered manually on-screen via HPMS software web application. HPMS unit receives CSV files from data owners and updates the values HPMS software if needed.

Please see HPMS Field Manual 2016, p 3-13 to 3-18, and Errata Sheet for required format and attributes.

4.2 Estimates

Estimates dataset contains the statewide estimates to be used as default inputs for FHWA pavement deuteriation model.

Please see HPMS Field Manual 2016, p 3-22 to 3-24, for required tables for all required format and attributes.

NOTE: Estimates is the area where WVDOT can improve the accuracy by reviewing and updating the values.

4.3 Metadata Catalog

Metadata contains the data that captures and explains variability in the collection and reporting of traffic and pavement data in HPMS.

Traffic metadata is prepared by Traffic Monitoring unit and provided to HPMS unit.

FHWA recommended the revision of pavement attributes in metadata to all State DOTs in fall 2020. At WVDOT, the pavement data collection vendor, Michael Baker International, reviewed, and updated metadata values.

Please see HPMS Field Manual 2016, p 3-26 to 3-31, for required tables for all required format and attributes.

4.4 Responsible Office

HPMS units receives data from various data owners and providers. The table below shows the responsible entities in WVDOT to provide data in 2020.

Please note that some Geometry data items has * next to Item Number. These data items are required for sample sections and collected biannually by Michael Baker International (MBI) based on 5-year pavement data collection contract. The year MBI does not collect the data on sample sections, Highway Data Service unit in GeoSpatial Infrastructure Section will collect the data, and GIS Programming unit will format and provide data to HPMS unit. 2020 was the year MBI didn't conduct the data collection, and HPMS unit should receive these geometry data items from MBI in 2021.

This is one of special cases in HPMS data procedure at WVDOT where the data owner is not same as data collector neither data provider, thus close and transparent communication between HPMS unit and these related offices is very important.

Table 1 shows the responsible offices for datasets and data items for 2021 calendar year, and this table needs to be updated periodically.

Table 1 List of Data and Responsible Office at WVDOT for HPMS 2020 Data

Item No	Data Item	Data Providers
	Routes (LRS)	Geographic Information System Section (LRS unit)
1	F_System	Geospatial Infrastructure Section (GIS Programming unit)
2	Urban_Code	Geospatial Infrastructure Section (GIS Programming unit)
3	Facility_Type	Geospatial Infrastructure Section (GIS Programming unit)
4	Structure_Type	Maintenance Division (Bridge Management Section)
5	Access_Control	Geospatial Infrastructure Section (GIS Programming unit)
6	Ownership	Geospatial Infrastructure Section (GIS Programming unit)
7	Through_Lanes	Geospatial Infrastructure Section (GIS Programming unit)
8	HOV_Type	n/a

9	HOV_Lanes	n/a
10	Peak_Lanes	Geospatial Infrastructure Section (GIS Programming unit)
11	Counter_Peak_Lanes	Geospatial Infrastructure Section (GIS Programming unit)
12	Turn_Lanes_R	Geospatial Infrastructure Section (GIS Programming unit)
13	Turn_Lanes_L	Geospatial Infrastructure Section (GIS Programming unit)
14	Speed_Limit	Traffic Engineering Division
15	Toll_Charged	Geospatial Infrastructure Section (GIS Programming unit)
16	Toll_Type	Geospatial Infrastructure Section (GIS Programming unit)
17	Route_Number	Geospatial Infrastructure Section (GIS Programming unit)
18	Route_Signing	Geospatial Infrastructure Section (GIS Programming unit)
19	Route_Qualifier	Geospatial Infrastructure Section (GIS Programming unit)
20	Alternative_Route_Name	Geospatial Infrastructure Section (GIS Programming unit)
21	AADT	Performance Management Division (Traffic Monitoring Unit)
22	AADT_Single_Unit	Performance Management Division (Traffic Monitoring Unit)
23	Pct_Peak_Single	Performance Management Division (Traffic Monitoring Unit)
24	AADT_Combination	Performance Management Division (Traffic Monitoring Unit)
25	Pct_Peak_Combination	Performance Management Division (Traffic Monitoring Unit)
26	K_Factor	Performance Management Division (Traffic Monitoring Unit)
27	Dir_Factor	Performance Management Division (Traffic Monitoring Unit)
28	Future_AADT	Performance Management Division (Traffic Monitoring Unit)
29	Signal_Type	Traffic Engineering Division
30	Pct_Green_Time	Geospatial Infrastructure Section (GIS Programming unit)
31	Number_Signals	Geospatial Infrastructure Section (GIS Programming unit)
32	Stop_Signs	Geospatial Infrastructure Section (GIS Programming unit)
33	At_Grade_Other	Geospatial Infrastructure Section (GIS Programming unit)
34*	Lane_Width	Operation Division (Asset Management Section) / Michael Baker International
35*	Median_Type	Geospatial Infrastructure Section (GIS Programming unit)
36*	Median_Width	Geospatial Infrastructure Section (GIS Programming unit)
37*	Shoulder_Type	Operation Division (Asset Management Section) / Michael Baker International
38*	Shoulder_Width_R	Geospatial Infrastructure Section (GIS Programming unit)
39*	Sholuder_Width_L	Geospatial Infrastructure Section (GIS Programming unit)
40	Peak_Parking	Geospatial Infrastructure Section (GIS Programming unit)
41	Widening_Obstacle	Geospatial Infrastructure Section (GIS Programming unit)
42	Widening_Potential	Geospatial Infrastructure Section (GIS Programming unit)

43*	Curves_A through Curves_F	Geospatial Infrastructure Section (GIS Programming unit)
44	Terrain_Type	Geospatial Infrastructure Section (GIS Programming unit)
45*	Grades_A through Grade_F	Geospatial Infrastructure Section (GIS Programming unit)
46	Pct_Pass_Sight	Geospatial Infrastructure Section (GIS Programming unit)
47	IRI	Operation Division (Asset Management Section) / Michael Baker International
48	PSR	n/a
49	Surface_Type	Operation Division (Asset Management Section) / Michael Baker International
50	Rutting	Operation Division (Asset Management Section) / Michael Baker International
51	Faulting	Operation Division (Asset Management Section) / Michael Baker International
52	Cracking_Percent	Operation Division (Asset Management Section) / Michael Baker International
54	Year_Last_Improv	Districts
55	Year_Last_Construction	Districts
56	Last_Overlay_Thickness	Districts
57	Thickness_Rigid	Districts
58	Thickness_Flexible	Districts
59	Base_Type	Districts
60	Base_Thickness	Districts
61	Climate_Zone	not required
62	Soil_Type	not required
63	County_Code	Geospatial Infrastructure Section (GIS Programming unit)
64	NHS	Geospatial Infrastructure Section (GIS Programming unit)
65	STRAHNET_Type	Geospatial Infrastructure Section (GIS Programming unit)
66	Truck	Geospatial Infrastructure Section (GIS Programming unit)
67	Future_Facility	Geospatial Infrastructure Section (GIS Programming unit)
68	Maintenance_Operations	Geospatial Infrastructure Section (GIS Programming unit)
69	Capacity	Not required
70	Dir_Through_Lanes	Geospatial Infrastructure Section (GIS Programming unit)
71	Travel Time Code	Performance Management Division (Traffic Monitoring Unit)
Sample	Sample Panel	Performance Management Division (HPMS Unit)
Summary	Statewide Summary	Geospatial Infrastructure Section (GIS Programming unit)
	Vehicle Summary	Performance Management Division (Traffic Monitoring Unit)

	Urban Summary	Geospatial Infrastructure Section (GIS Programming unit)
	County Summary	Used 2019 Miles and estimated VMT based on 2020 AADT
	NAAQS Summary	Not required
Estimates	Estimates	Geospatial Infrastructure Section (GIS Programming unit)
Metadata	Metadata (Traffic)	Performance Management Division (Traffic Monitoring Unit)
	Metadata (Pavement)	Operation Division (Asset Management Section) / Michael Baker International

5. Data Submission Sequence at WVDOT

As described in Chapter 2, there are three federal reporting deadlines related to HPMS. Whilw HPMS unit prepares required data for early dues (April, and CPRM), still some June due data items must be imported in HPMS software and finalized for data validation's and running report's purposes.

5.1 April Due 4/15

a) Required Dataset and Data Items

The data items listed below are the required to submit before the end of April 15th, April due.

For pavement performance analysis purposes, WVDOT reports both directions of travel associated with its divided **Interstate** roadway sections, then following data items are reported in both the inventory and non-inventory direction.

- Route Dataset
- 1 F_System
- 2 Urban_Code
- 3 Facility_Type
- 4 Structure_Type
- 7 Through_Lanes
- 47 IRI
- 48 PSR (only for sections missing IRI)
- 49 Surface_Type
- 50 Rutting
- 51 Faulting
- 52 Cracking_Percent
- 64 NHS
- 70 Dir_Through_Lanes

b) Necessary Processes and Related Data Items

To submit these required data, HPMS unit must run two processes in HPMS software for data validation.

- AADT
- Create TOPS (Table of Potential Samples)
- Create Geometry
- Input Metadata for Interstate pavement report method
  (WVDOT reports both Inventory and non-inventory direction and input "2". Rest of Metadata can be submitted in June.)

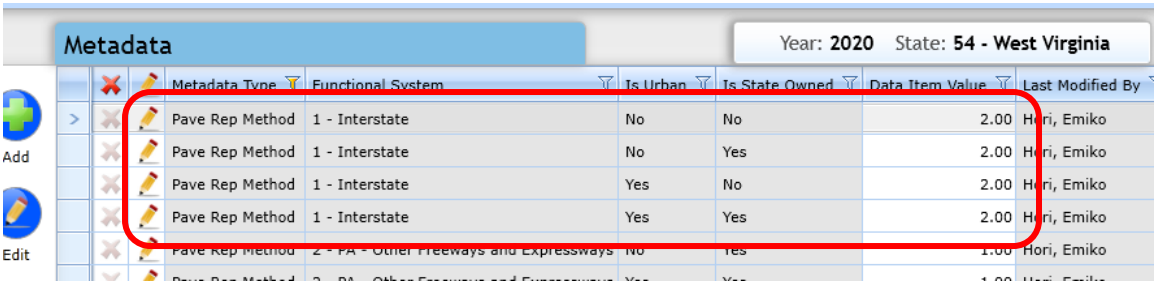


Figure 11 Screenshot shows Metadata input screen in HPMS software,

- Run PM2 Validation
- Type Submittal Comment

The TOPS is developed based on the geospatial intersection of five key data items. (AADT, F_System, Urban_Code, Through_Lanes, and Facility_Type). Thus, AADT also must be reviewed, validated, and finalized before the April due, even AADT itself is required for June due.

c) Key Reports

- Extent & Travel Report on Interstate
- Consistency Report
- Pavement Report Card (PRC)
- Validation Summary

Once April data submission is completed in HPMS Software, **pavement and related data items on Interstate section will be locked for FHWA Headquarter reviews.** FHWA will unlock pavement data only if FHWA requests or allows State DOT to re-submit the data for necessary correction and updates. Other related inventory data items can be unlocked if State DOT contact to state HPMS coach in FHWA, but it is not recommended since it will affect CPRM calculation in HPMS software.

d) Submission in HPMS Software

Interstate PM2 option should be used to submit Interstate Pavement data before April 15th submission due. To enable "Submit Data" button in HPMS software, Metadata (pavement report method for interstate) must be inputted and PM2 Validation needs to be cleared.

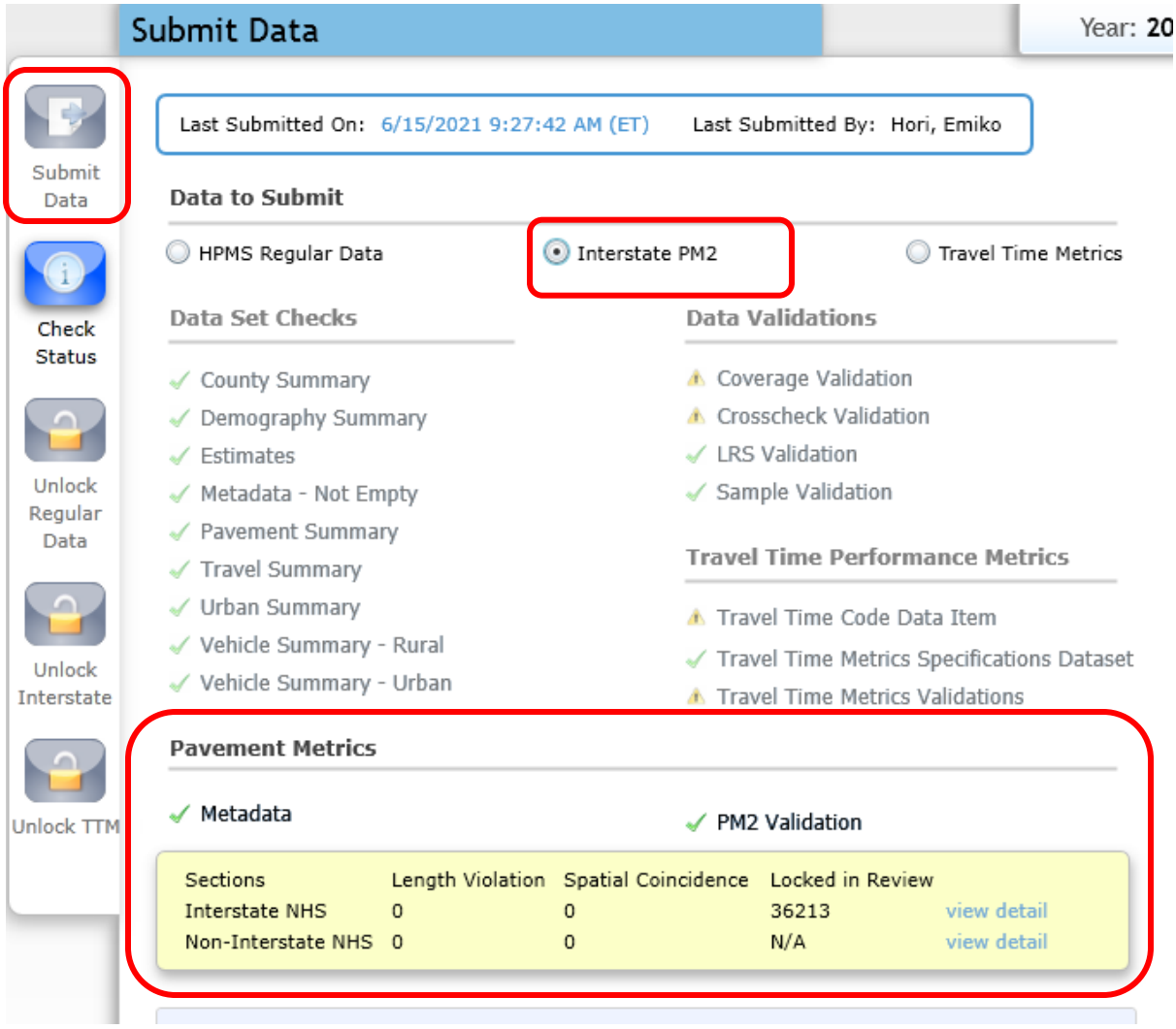


Figure 12 Submittal Screen in HPMS software for Interstate data submission option for April due

5.2 CPRM Due 6/1

a) Required Dataset and Data Items

Public road mileage certifications are due no later than June 1st of each year to FHWA Headquarters, Office of Highway Policy Information. The certification, called CPRM Report in WVDOT, are provided to FHWA Field Division Office in Charleston, WV.

The data items listed below are required to calculate CPRM in HPMS Software.

- 1 F_System
- 2 Urban_Code
- 3 Facility_Type
- County Summary (The mileage in subtotal should match with State Summary.)

After the April submission, the first three data items listed above should be already imported, validated, and finalized in HPMS software. Once County Summary is imported and re-run Create Tops, HPMS software should calculate and display the mileages in Submit Data tab.

b) Necessary Processes and Related Data Items

- Check Certified Miles in Submit Data tab

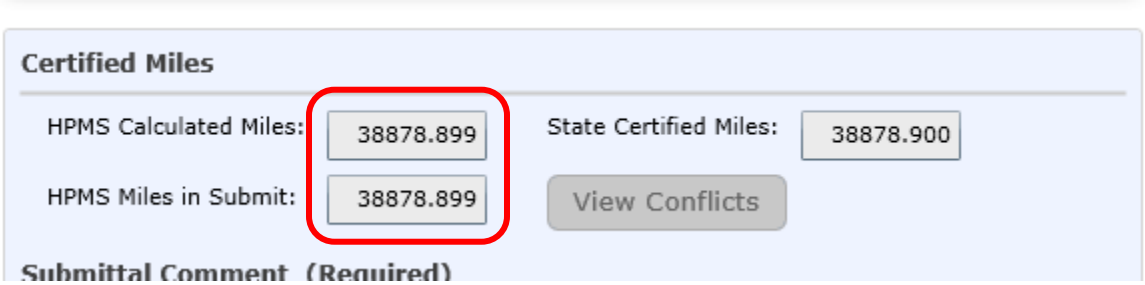


Figure 13 Certified Miles screen in Submit Data tab in HPMS software, showing HPMS 2020 CPRM

- Calculate Total in Pavement tab, in Statewide Summary page
- State Summary
- Urban Summary (for VMT calculation)
- Vehicle Summary (for VMT calculation)
- Ownership
- Submittal Comments

c) Key Reports

- Extent and Travel Report – Statewide Summary
- Extent and Travel Report – Urbanized Area Summary
- Ownership

d) CPRM Report Delivery

The certifications shall be provided in an electronic format via email send to the FHWA Office of Highway Policy Information official electronic mailbox (HPInfoMail@dot.gov.) At WVDOT, HPMS unit delivers both a mail and an email to FHWA WV Division Office copying FHWA state DOT coach. (2021 was the exception which HPMS unit sent only the email due to COVID19 circumstances.)

Please see details for CPRM Calculation in HPMS Software in Page 88 Software Guide.

5.3 June Due 6/15

a) Required Dataset and Data Items

Any data items and summary which are not submitted in April.

b) Necessary Processes and Related Data Items

Run all validations and reports, and Submittal Comments.

c) Key Reports

All reports.

d) Submission in HPMS Software

HPMS Regular Data option should be used to submit all data items, summary files, and route dataset before June 15th submission due.

Once Certified Public Road mileages match with HPMS calculated mileages, we contact to our state HPMS coach in FHWA and submit buttons will be enabled. All validations must be run before the data submission. All data checks and validation must be cleared or warning only.

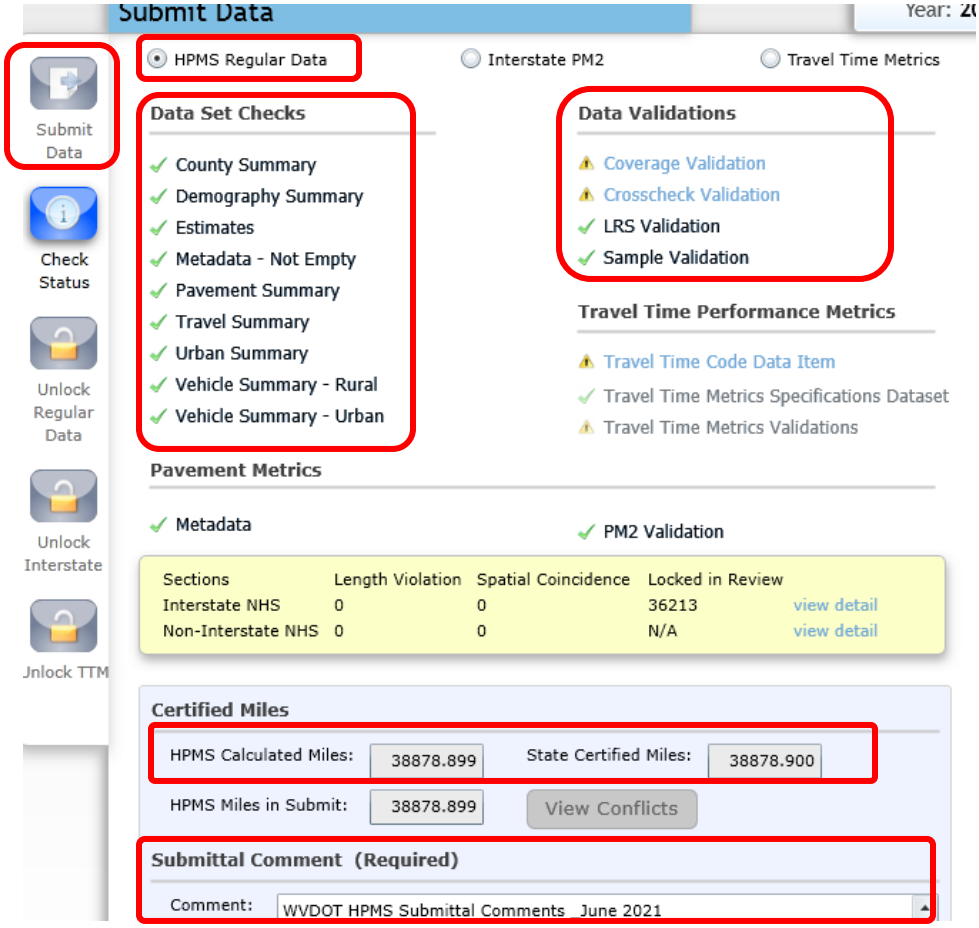


Figure 14 Submittal Screen in HPMS Software for June due

After data submission was completed via HPMS software, HPMS unit sends a notification email to HPMS state coach in FHWA headquarter copying FHWA WV Division Office.

5.4 Travel Time Metrics

Travel Time Metrics (TTM) data submission is an independent process from any other data submittal sequence. Submission due is June 15th, and TTM can be submitted via HPMS software any time before the June due.

Same as other submission, validations area must be cleared or warning only. Once HPMS unit imports TTM files and validation results are available, all errors and warnings need to be share with Traffic Monitoring Unit immediately. there are any comments, HPMS unit should include in the Submittal Comment.

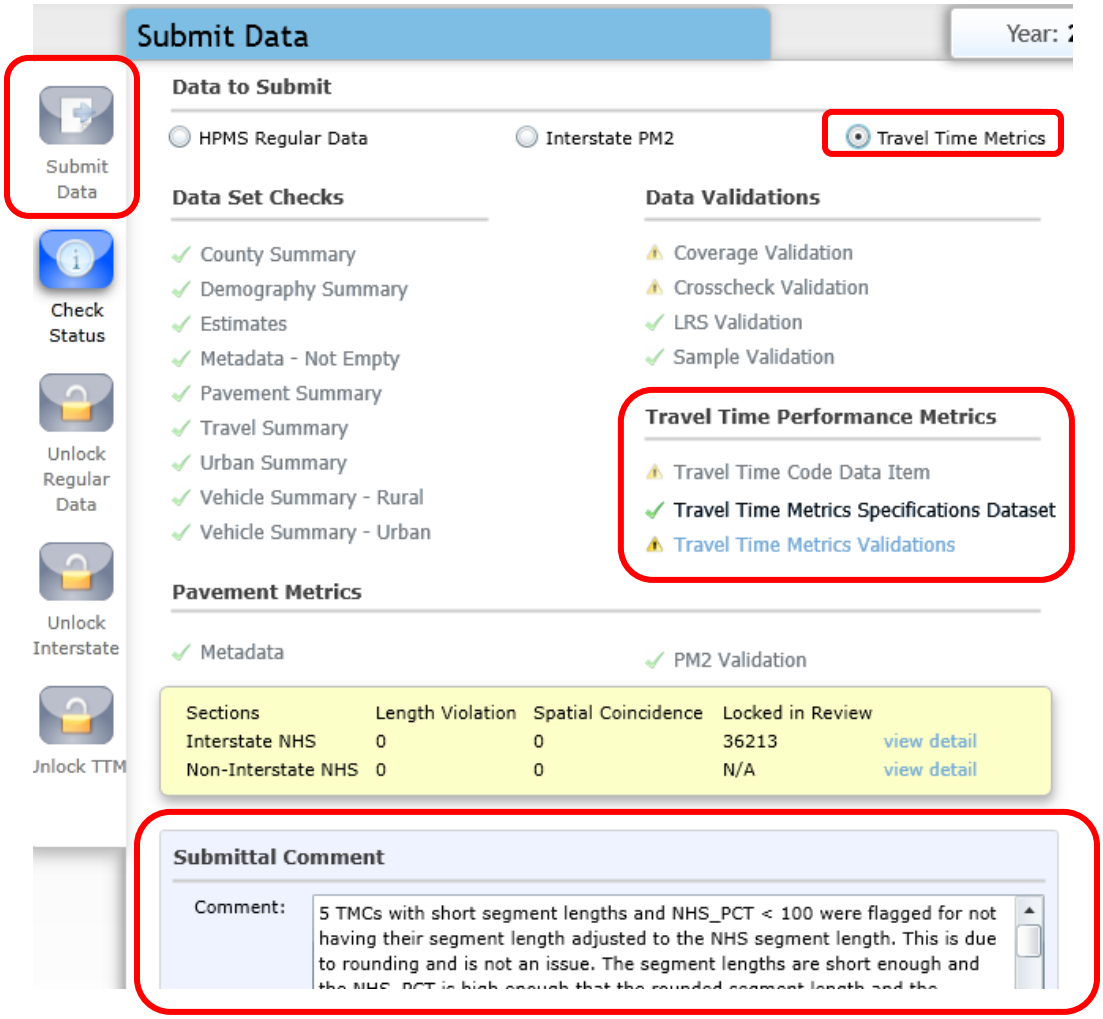


Figure 15 Submittal Screen in HPMS Software for Travel Time Metrics data submission

There is a separate HPMS supplemental manuals by FHWA and validation rules set in HPMS software for TTM. (Please see the reference page.) The validation rules are updated annually and shared by FHWA before the HPMS submittal due.

5.5 Submittal Comments

Submittal Comments are required to use if the State DOT want to flag any issues or deficiencies. For example, any validation errors left or drastic change in submittal data, and the State has specific reasons or explanations to share with FHWA, Submittal Comments and attachment function should be utilized.

Please note that this "Submittal Comment" is different from "Comments" field in section data set. The Comments field is available for State DOTs to use their own internal communication or leaving notes, while Submittal Comments are designed and prepared for a formal communication tool in HPMS Software between State DOTs and FHWA headquarters. Anything left in Comments field in section data set are NOT reviewed by FHWA.

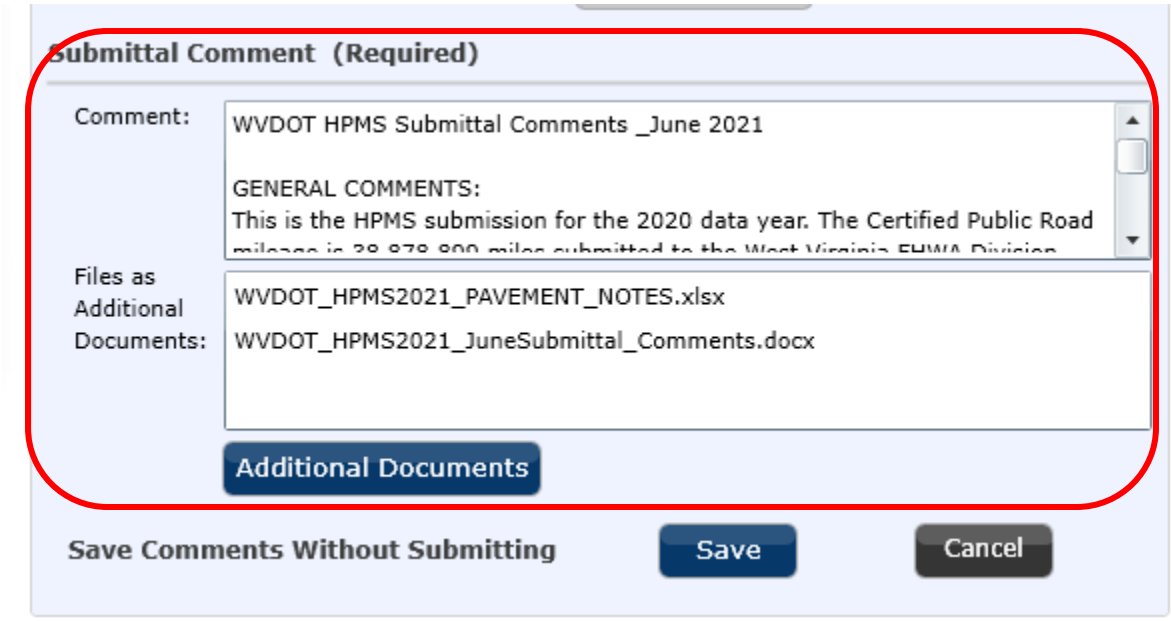


Figure 16 Screen Shots shows the Submittal Comments and other support documents attached for WVDOT HPMS2020 submission

6. Data Review at WVDOT

6.1 Data Acquisition

In early – mid January, HPMS unit send a data request email to data owners.

The email includes information listed below,

- Required data items and datasets with responsible data owners (providers)
- Due dates when HPMS unit need to receive the data
- Required data format
- References which are the latest available at the time

<u>These data requirements are subject to change and must be reviewed and updated by HPMS unit every year.</u>

To meet federal deadlines, HPMS unit needs to review the data in both coverage and quality, run the required reports and validations in HPMS software before finalizing the datasets. Thus, the internal data submission dues at WVDOT are set two to three months ahead of federal HPMS dues in April and June.

HPMS unit also must be aware of the relationship between data items. For instance, Traffic Monitoring Unit will need F_System, Urban_Code, and Facility_Type for AADT preparation. Depend on the year, it is necessary to assist communications between data owners to meet federal deadlines.

- Example email from HPMS year 2021 (HPMS 2020 data submission)
  (Please note that the responsible office name and organization name are the subject to change.)

Hello,

I am sending this email to request you to provide following data for the 2021 Highway Performance Monitoring Systems (HPMS) reporting 2020 datasets. Please refer your division/section for requested data items, due dates, and submit data accordingly.

Please send data to Emiko.Hori@wv.gov

1. Submission Date

i) February 19th, 2021

The data items highlighted in blue below are needed **by Friday, 2/19/2021**.

To be able to calculate Certified Mileages and validate all data for Performance Measure Requirements in timely manner, please submit FULL EXTENT data together. (Please do not split files into Interstate and non-Interstate NHS). If the data items are required to report on sample sections, please submit in a same file too.

ii) March 19th, 2021

Non-pavement, sample, and summary data are needed **by Friday, 3/19/2021.**

2. Data Required

Traffic Engineering

- 14 Speed Limit (HPMS sample sections only)
- 29 Signal Type (HPMS sample sections only)

Bridge Management

- 4 Structure type *Inventory & non-inventory direction*

Pavement Management

- 34 Lane Width (HPMS sample sections only)
- 35 Median Type (HPMS sample sections only)
- 36 Median Width (HPMS sample sections only)
- 37 Shoulder Type (HPMS sample sections only)
- 38 Right Shoulder Width (HPMS sample sections only)
- 39 Left Shoulder Width (HPMS sample sections only)
- 43 Curve Classification (HPMS sample sections only)
- 45 Grade Classification (HPMS sample sections only)
- 47 IRI *Inventory & non-inventory direction*
- 49 Surface Type *Inventory & non-inventory direction*
- 50 Rutting *Inventory & non-inventory direction*
- 51 Faulting *Inventory & non-inventory direction*
- 52 Cracking Percent *Inventory & non-inventory direction*
- Metadata (only Pavement data portion)

System Performance (Traffic Analysis & Modeling)

- 21 Annual Average Daily Traffic
- 22 Single-Unit Truck & Bus AADT
- 23 Percent Peak Single-Unit Trucks & Buses (HPMS sample sections only)
- 24 Combination Truck AADT
- 25 Percent Peak Combination Trucks (HPMS sample sections only)
- 26 K-Factor (HPMS sample sections only)
- 27 Directional Factor (HPMS sample sections only)
- 28 Future AADT (HPMS sample sections only)
- 71 Travel Time Code (Travel Time Reporting Segment)
- Vehicle Summary
- Metadata (only Traffic data portion)

GTI (GIS)

- Routes Dataset (ARNOLD)

(Only this dataset was asked to submit before 1/29 Friday due to validation process.)

GTI (Programing Reporting)

- 1 Functional System *Inventory & non-inventory direction*
- 2 Urban Code *Inventory & non-inventory direction*
- 3 Facility Type *Inventory & non-inventory direction*
- 5 Access Control
- 6 Ownership *Inventory & non-inventory direction*
- 7 Through Lanes
- 10 Peak Lane (HPMS sample sections only)
- 11 Counter Peak Lanes (HPMS sample sections only)
- 12 Right Turn Lanes (HPMS sample sections only)
- 13 Left Turn Lanes (HPMS sample sections only)
- 15 Toll Charged
- 16 Toll Type
- 17 Route Number *Inventory & non-inventory direction*
- 18 Route Signing
- 19 Route Qualifier
- 20 Alternative Route Name
- 29 Signal Type (HPMS sample sections only)
- 30 Percent Green Time
- 31 Number of Signalized Intersections
- 32 Number of Stop Sign-Controlled
- 33 Number of Intersections, Type – Other
- 34 Lane Width (HPMS sample sections only)
- 35 Median Type (HPMS sample sections only)
- 36 Median Width (HPMS sample sections only)
- 37 Shoulder Type (HPMS sample sections only)
- 38 Right Shoulder Width (HPMS sample sections only)
- 39 Left Shoulder Width (HPMS sample sections only)
- 40 Peak Parking (HPMS sample sections only)
- 41 Widening Obstacle (HPMS sample sections only)
- 42 Widening Potential (HPMS sample sections only)
- 43 Curve Classification (calculation on sample section)
- 44 Terrain Type (HPMS sample sections only)
- 45 Grade Classification (Calculation on sample section)
- 46 Percent Passing Sight Distance (HPMS sample sections only)
- 63 County Code
- 64 National Highway System *Inventory & non-inventory direction*
- 65 Strategic Highway Network
- 66 National Truck Network
- 67 Future Facility
- 68 Maintenance Operation
- 70 Directional Through Lane *Inventory & non-inventory direction*

- County Summary
- Estimate
- Statewide Summary
- Urbanized Areas Summary

3. Format Required for data items:

Each data item is prepared and submitted in Character Separated Value format using "|" as shown below. (HPMS Field Manual, Page 4-8)

Ex) 2009|41|000100200S00|0|0.75|AADT|0.75|14800||

4. Links for resources:

- HPMS Filed Manual - Dec. 2016 -
- HPMS Field Manual Errata Sheet v1.3 - Nov. 2020 - (The latest requirement changes are listed)
- HPMS Field Manual Supplemental Guidance -Travel Time Metrics-
- Sample sections 2020
- Sample sections 2020 in shapefile

These documentation can be downloaded from the link below.

ftp://gis.transportation.wv.gov/TMA/HPMS2020data_21sub/Reference2020/

(We will share 2020 route dataset in shapefile at same location as soon as it become available.)

Please feel free to contact me in case you have any questions.

Thank you,

6.2 Format

HPMS unit receives most of dataset and data items in format and ready for Import process in HPMS Software. In this section, the process will be explained how HPMS unit prepare, review, updates the data for Import after they receive data from data owners.

Format requirements and details are described in Chapter 3 (summary) and 4 (section data) in HPMS Field Manual, and Chapter 3 in WVDOT HPMS Guidance Manual.

Generally, HPMS unit receives the data or information as listed below.

a) Formatted

- Geospatial Infrastructure Section (GIS Programming unit) – Inventory and Geometry Data
- Geographic Information System Section (LRS unit) – Route Dataset
- Michael Baker International / Asset Management Section – Pavement Data

These data owners send their required data in required format, and they are ready to import into HPMS Software.

b) Updates from previous year

- Traffic Engineering – Speed_Limit, Signal_Type
- Bridge Management – Structure_Type

These data owners send any updates or changes from previous year. HPMS unit will apply the changes into previous year's section data, and format for import process. The changes could be communicated via email, or sometime their updated database was shared.

When HPMS unit formats the data items, especially for the sample section, please be aware that different calculation method must be applied depends on data item. Please see details for calculation method in Page 4-13, in HPMS Field Manual.

HPMS 2019 was the data year both traffic engineering and bridge management groups shared their latest database. HPMS unit analyzed their data, transformed to LRS data, and formatted in csv. If the data coverage or quality needs to be reviewed in future, HPMS unit can compare with 2019 submittal data and conduct data assessment.

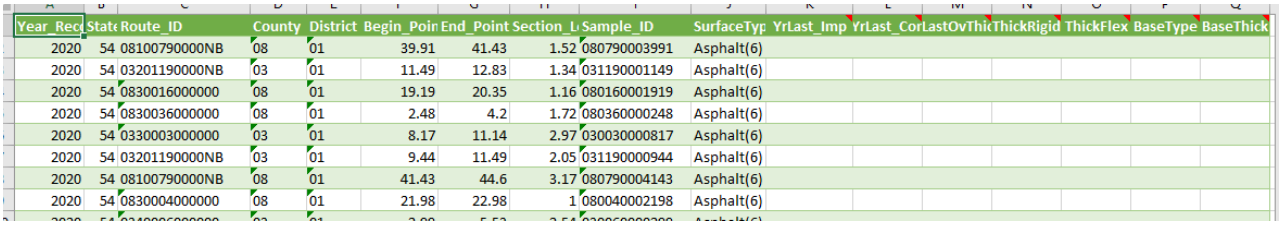
Notes for Bridge Data: The data format which Bridge management group prepared for National Bridge Inventory (NBI) is not same as HPMS submission. While NBI counts a bridge as one structure with a point feature, HPMS will report a bridge as a section (Linear referenced line features) with begin and end point. If one bridge (structure) includes both Inventory and non-Inventory directions, the mileage of bridge must be doubled for both direction in HPMS.

The bridge mile data submitted to NBI will be compared in Pavement report card in HPMS. Please see the detail in chapter for Reports.

c) Exceptions – Pavement Data Items from Districts

HPMS unit provides the list of sample sections to ten districts so that they can fill the pavement data items on sample sections.

- All 10 Districts – Year_Last_Improv, Year_Last_Construction, Last_Overlay_Thickness, Thickness_Rigid, Thickness_Flexible, Base_Type



Year_Rec	State	Route_ID	County	District	Begin_Poin	End_Point	Section_L	Sample_ID	SurfaceTyp	YrLast_Imp	YrLast_Cor	LastOvThic	ThickRigid	ThickFlex	BaseType	BaseThick
2020	54	08100790000NB	08	01	39.91	41.43	1.52	080790003991	Asphalt(6)							
2020	54	03201190000NB	03	01	11.49	12.83	1.34	031190001149	Asphalt(6)							
2020	54	0830016000000	08	01	19.19	20.35	1.16	080160001919	Asphalt(6)							
2020	54	0830036000000	08	01	2.48	4.2	1.72	080360000248	Asphalt(6)							
2020	54	0330003000000	03	01	8.17	11.14	2.97	030030000817	Asphalt(6)							
2020	54	03201190000NB	03	01	9.44	11.49	2.05	031190000944	Asphalt(6)							
2020	54	08100790000NB	08	01	41.43	44.6	3.17	080790004143	Asphalt(6)							
2020	54	0830004000000	08	01	21.98	22.98	1	080040002198	Asphalt(6)							

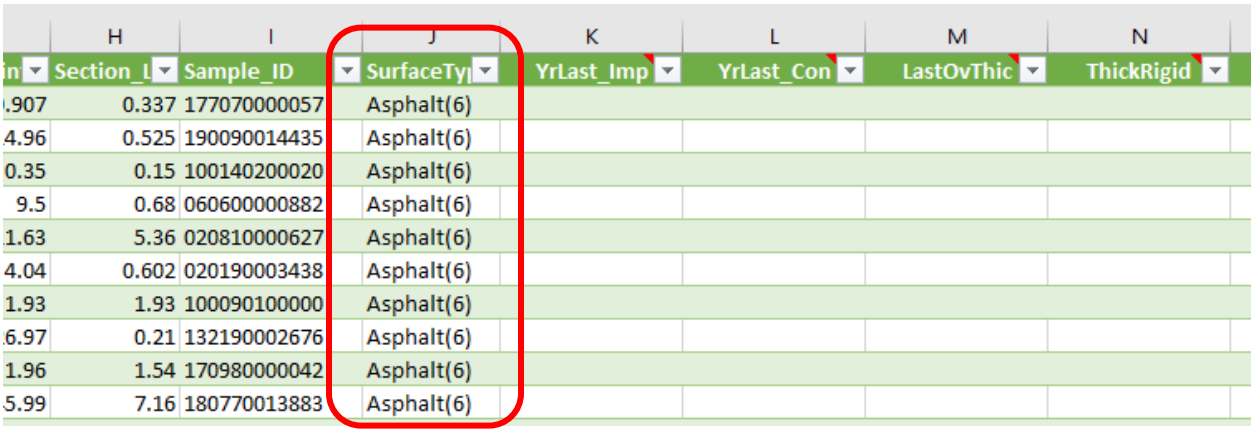
Figure 17 Screenshot of a spreadsheet shared with district 1 for HPMS2020, showing sample sections information and data item column

When districts fill out data, they will need to know or validate surface type information for the sample sections, because surface type determines other data item which should be reported. #49 Surface_Type should be available from Michael Baker International as a part of pavement data deliverables. Including surface type information for the sample sections will help both data coverage and quality.

Ex.)

Surface Type = 6 (AC Overlay) → Asphalt pavement group → Report "Thickness_Felxible"

Surface Type = 3 (JPCP) →Concrete pavement group → Report "Thickness_Rigid"



	H	I	J	K	L	M	N
n	Section_L	Sample_ID	SurfaceTyp	YrLast_Imp	YrLast_Con	LastOvThic	ThickRigid
.907	0.337	177070000057	Asphalt(6)				
4.96	0.525	190090014435	Asphalt(6)				
0.35	0.15	100140200020	Asphalt(6)				
9.5	0.68	060600000882	Asphalt(6)				
1.63	5.36	020810000627	Asphalt(6)				
4.04	0.602	020190003438	Asphalt(6)				
1.93	1.93	100090100000	Asphalt(6)				
6.97	0.21	132190002676	Asphalt(6)				
1.96	1.54	170980000042	Asphalt(6)				
5.99	7.16	180770013883	Asphalt(6)				

Figure 18 Screenshot showing that surface type included in district's worksheet

The data request email will be sent to Central Reporting unit from HPMS unit, and it will be forwarded to proper personnel in each district. Once HPMS unit received the data, all ten districts' data will be combined, and formatted for each data items. **Please note that each data item has different coding requirements.**

6.3 Import in HPMS Software

In HPMS software, import processes are mainly separate into two groups.

- Section Data
- Datasets

As the figure below shows, most of summary and other datasets use own special import options, while sections will be repeatedly used for section data imports.

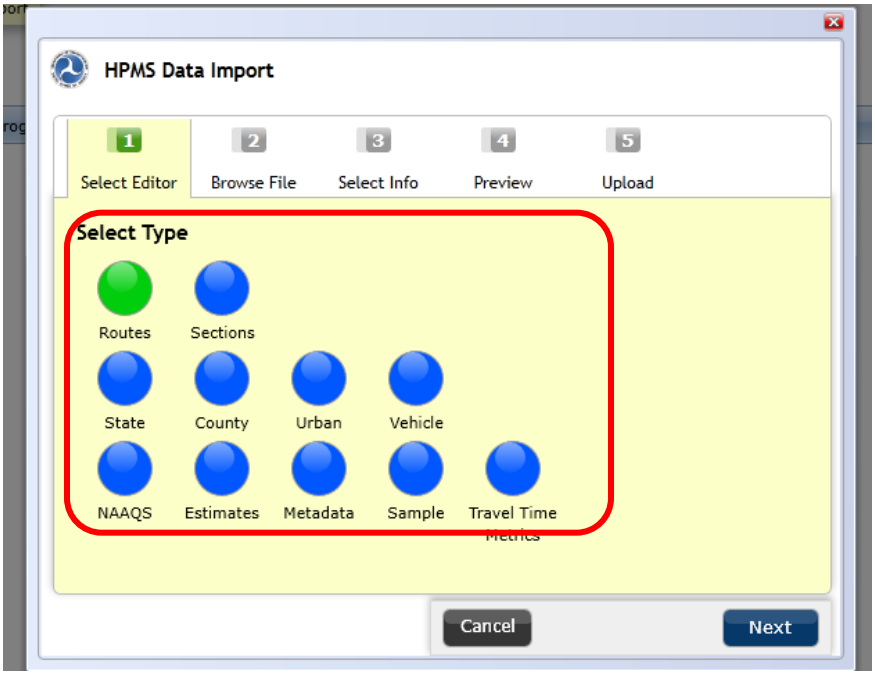
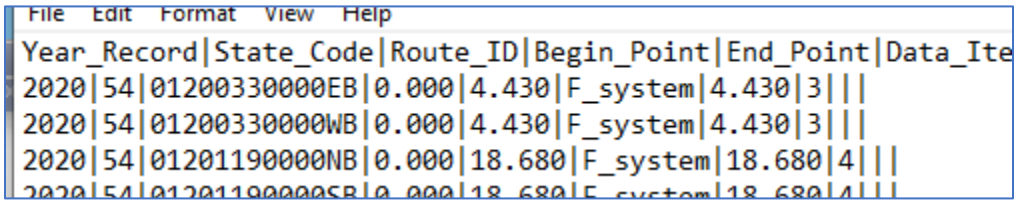


Figure 19 HPMS Software Import screen, Routes dataset import option is selected

a) Section Data Import

There is a sections data reporting requirements, and details are described in page4-2 to 4-8 in HPMS Field Manual 2016, including required format.


File Edit Format View Help

```
Year_Record|State_Code|Route_ID|Begin_Point|End_Point|Data_Ite
2020|54|01200330000EB|0.000|4.430|F_system|4.430|3|||
2020|54|01200330000WB|0.000|4.430|F_system|4.430|3|||
2020|54|01201190000NB|0.000|18.680|F_system|18.680|4|||
```

Figure 20 Screenshot of raw formatted F_System file in csv for HPMS 2020

Even following the formatting requirements, many things can be caught as errors or warnings. For example, figure below shows that there are 533 records of Median_Width data item were imported, but 55 records were rejected.

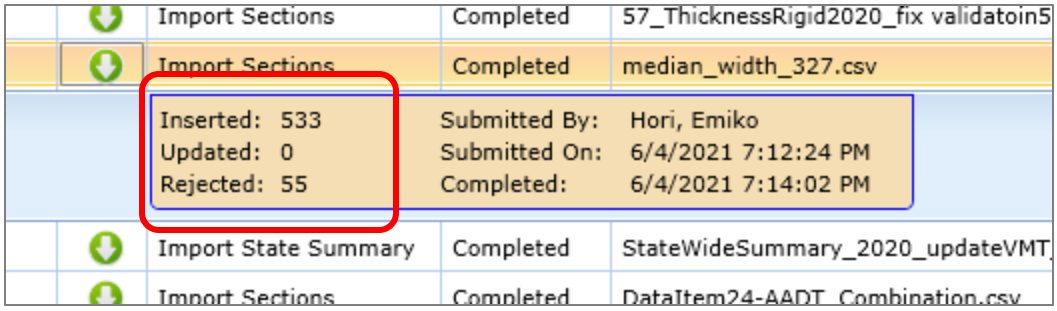


Figure 21 Screenshot of HPMS import history with import errors

When there are rejected records, HPMS unit can check Import Section Report. As shown below, there are two types of messages are listed.

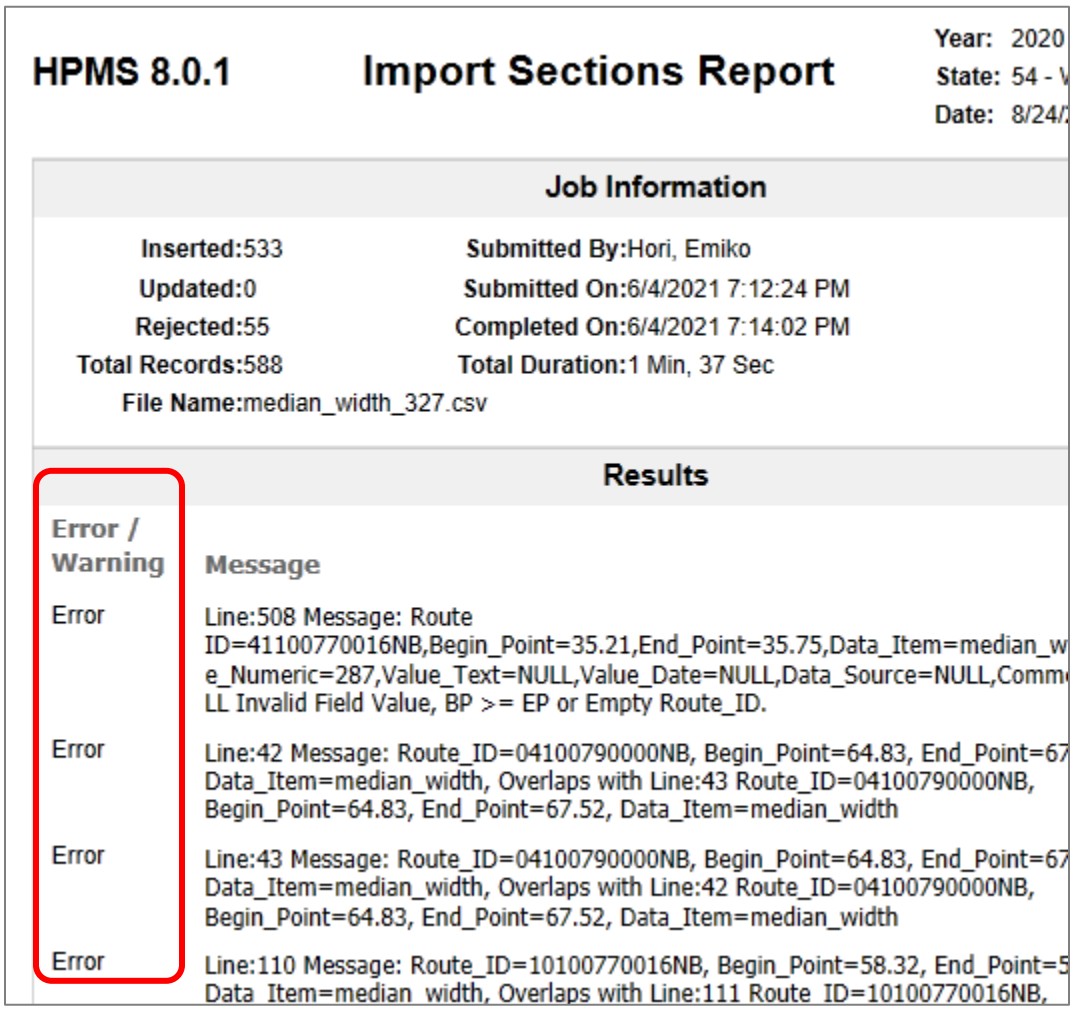


Figure 22 Import Sections Report example with 55 errors, (Duplicates and overlaps are found in this case.)

- Error
  A problem(s) was detected, and the record was rejected. → Need to be solved
- Warnings
  Concern was found, but the record was imported.

To avoid import errors, HPMS unit can review the things listed below.

- Index raw needs to be on top ("Year_Record|State_Code|Route_ID|Begin_Point|End_Point|Data_Item|Section_Length|Value_Numeric|Value_Text|Value_Date|Comments").
- Year record must match with data year.
- State code must be "54" which is for West Virginia.
- Character "|" separated (CSV), not comma "," separated.
- Data item name must match as "Database-Specific Data Item Name" in HPMS manual.
- No overlap is allowed.
- For TOPS data items only, data must be concatenated.
- Extra spaces after the last records will be caught as errors.
- Comments section is only for state use. Any notes left in this section **will NOT** be reviewed by FHWA

b) Copy Previous (Selected) Year Data

There is a function which copies the data records from previous year. This option will simply copy what was submitted in selected year. "Copy selected Data Item" is the option name and this can be helpful when there is no change compared to previous (or selected) year.

Note: Be aware that "Copy all Data Items" option is selected by default. Make sure that select right data item and year.

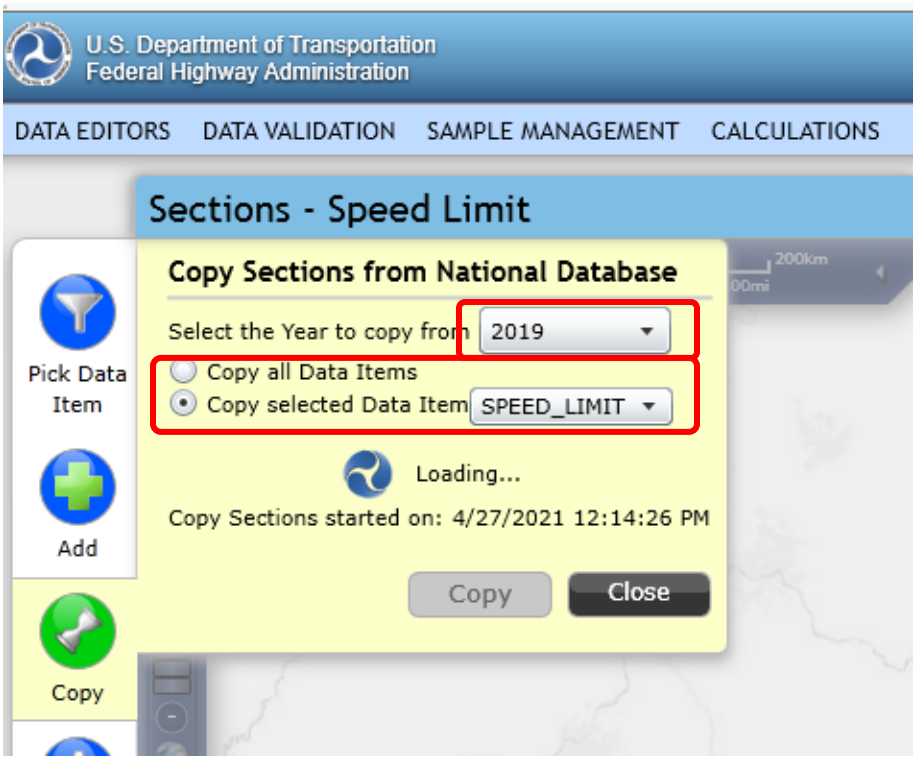


Figure 23 Screenshot of Copy function in Sections tab in HPMS Software, showing copying Speed_Limit data from HPMS 2019 submission for HPMS2020

6.4 Processes and Validations

There is a set of data processes and validations available and required to run in HPMS software for data review before data submission.

Each function and details are described in Chapter 4 in HPMS Software guide. (Validation rules and errors are listed in Appendix.) This section describes how each function work and correspond each other in the sequence of data reviews in HPMS submission.

a) Required Process before Validations

- Create TOPs
- Geometry (Create Geometries) – this function is available on both Data Validation tab and Sample Management tab in HPMS software.

Before running any validations in HPMS software and to ensure the accurate values in reports, TOPS need to be created and run Create Geometry. Thus 5 TOPs data items (F_System, Urban_Code, Facility_Type, Through_Lane, and AADT) must be imported before any processes in HPMS.

Anytime new data was added, or a record(s) was updated, or deleted, TOPs must be re-created and run Geometry process.

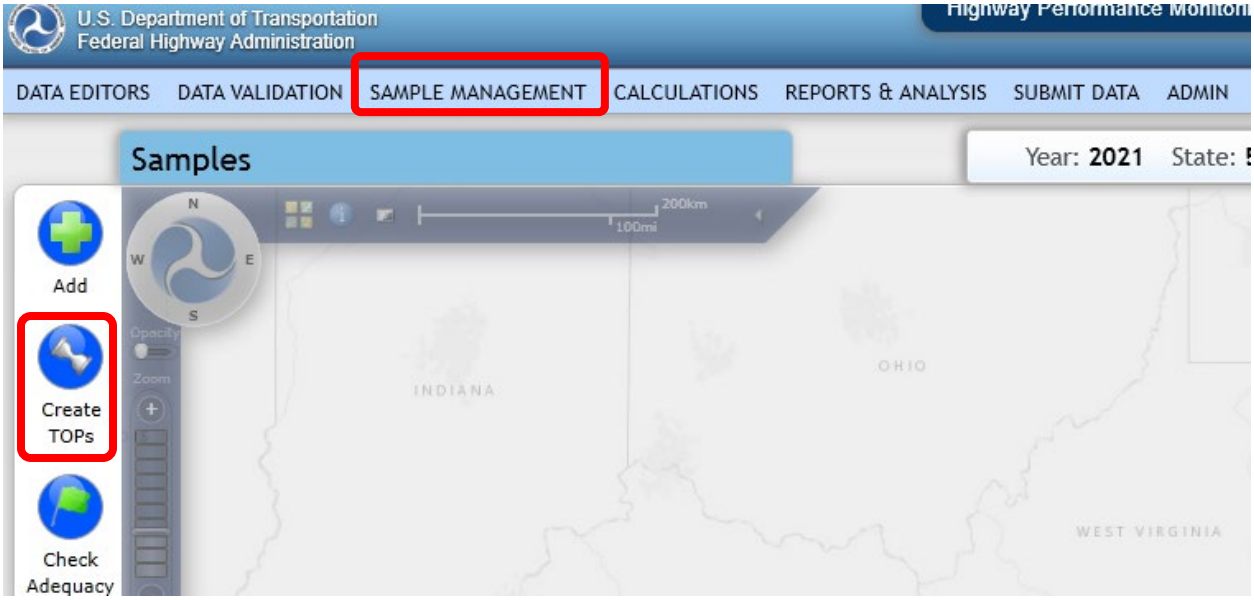


Figure 24 Screenshots for HPMS software running "Create TOPs function" in Samples tab

After creating Geometry, the small globe next to the records will display in color if the geometry for the section was created successfully. If it is in grey, geometry was not created, and the data may need further review. Using this attribute, you can only the records which failed to match with LRS. This is available in both Sections table in Sections tab (Data Editors), and Validation table in Data Validation tab.

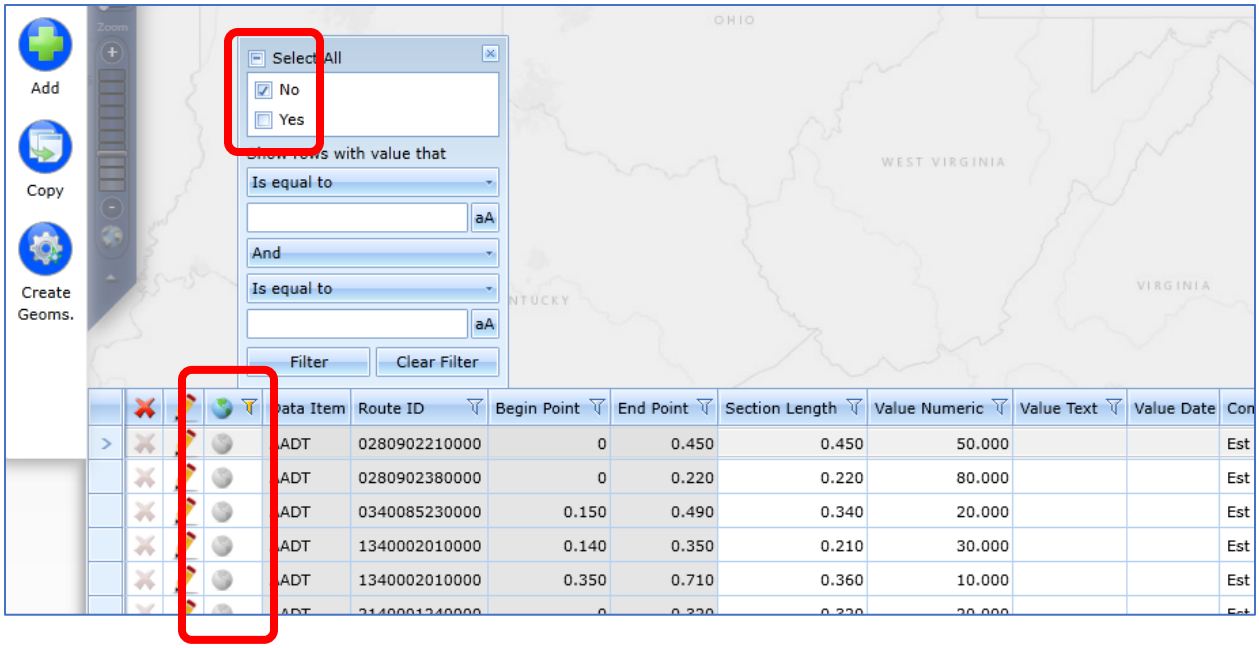


Figure 25 Sections table shows the list of AADT records failed to create geometry (query function is used)

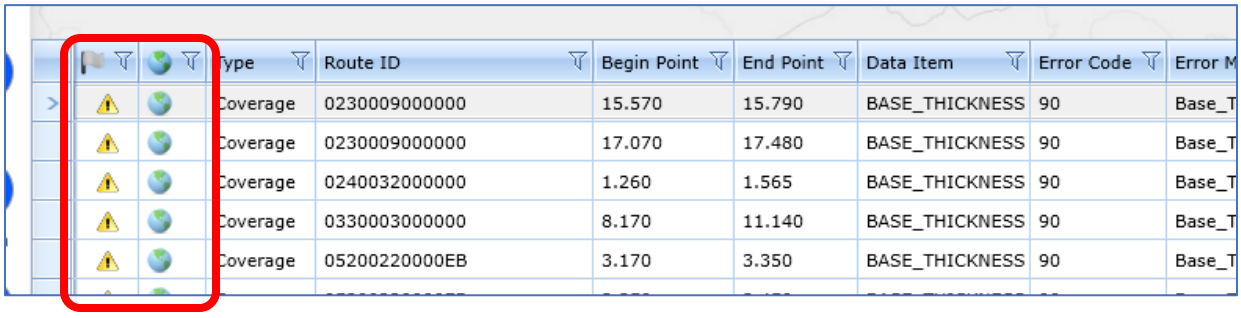


Figure 26 Validation table shows the list of Base_Thickenss WARNING records with geometry successfully created

b) Validations

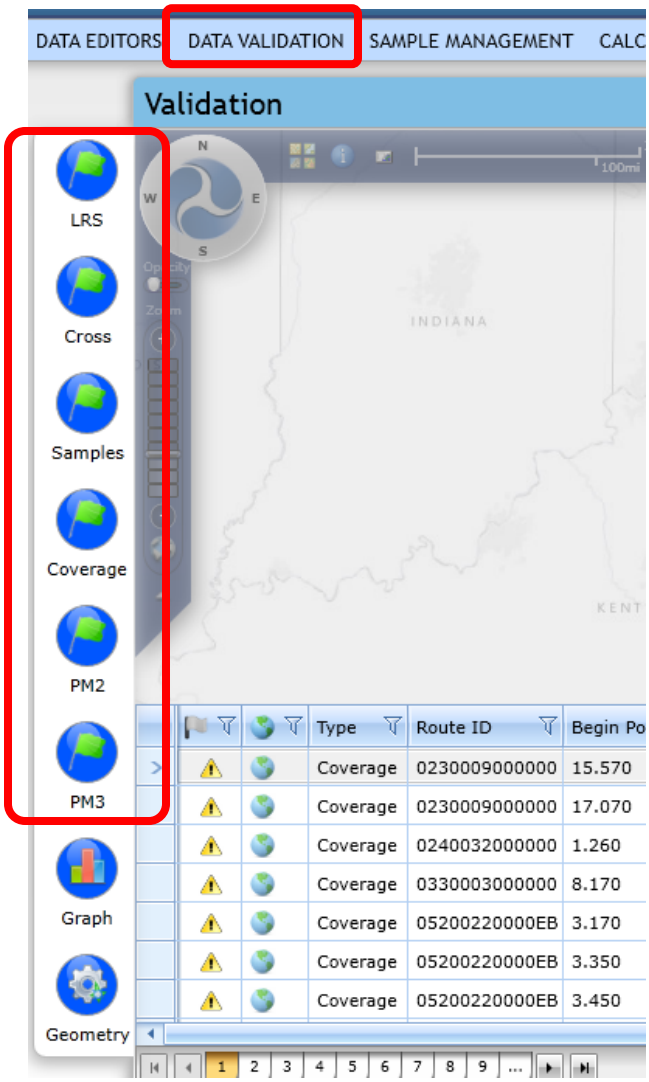


Figure 27 Screenshot of HPMS software showing validation option in Data validation tab

- LRS
  Check location of data items if they are within LRS extents.
- Cross Check
  Compare the data items values against to other related data items values.
  Check any abnormal values. (Out of expected ranges)
- Samples
  Check the sample location against to TOPs boundary or LRS extents.
  Verify the spatial location per HPMS filed Manual rules.
- Coverage
  Assess the Sample location with related data items logically.
  Ensure that the sample data items are reported and meet the requirement in the field manual
- PM2
  Check for Performance Management pavement condition requirements.
- PM3
  Check for Performance Management Travel Time Metrics requirements.

Validations will output 2 types of flags, error and warning. Once validations were run, all errors and warnings will be listed in Validation screen. Error must be solved and cleared so that submission function will be available in Submit screen. With warning, the records will be still used for HPMS, and submission function will be available, but any numerous warnings should be addressed in Submission Comments.

Validation results in Validation screen correspond with the information in Submittal screen. If any Errors are left in Validation table, the submittal screen keep red "**x**" next to validation name. Unless solving issues and clear all errors, (Warning can be left as it is, if they are not significant.) Submission button will be keep locked. Once all status became green check or yellow warning, Submit Data button will be

unlocked. (Depends on the year, HPMS contact must contact HPMS Coach in FHWA HQ. Please attend the HPMS webinar and keep the latest available information for HPMS software.)

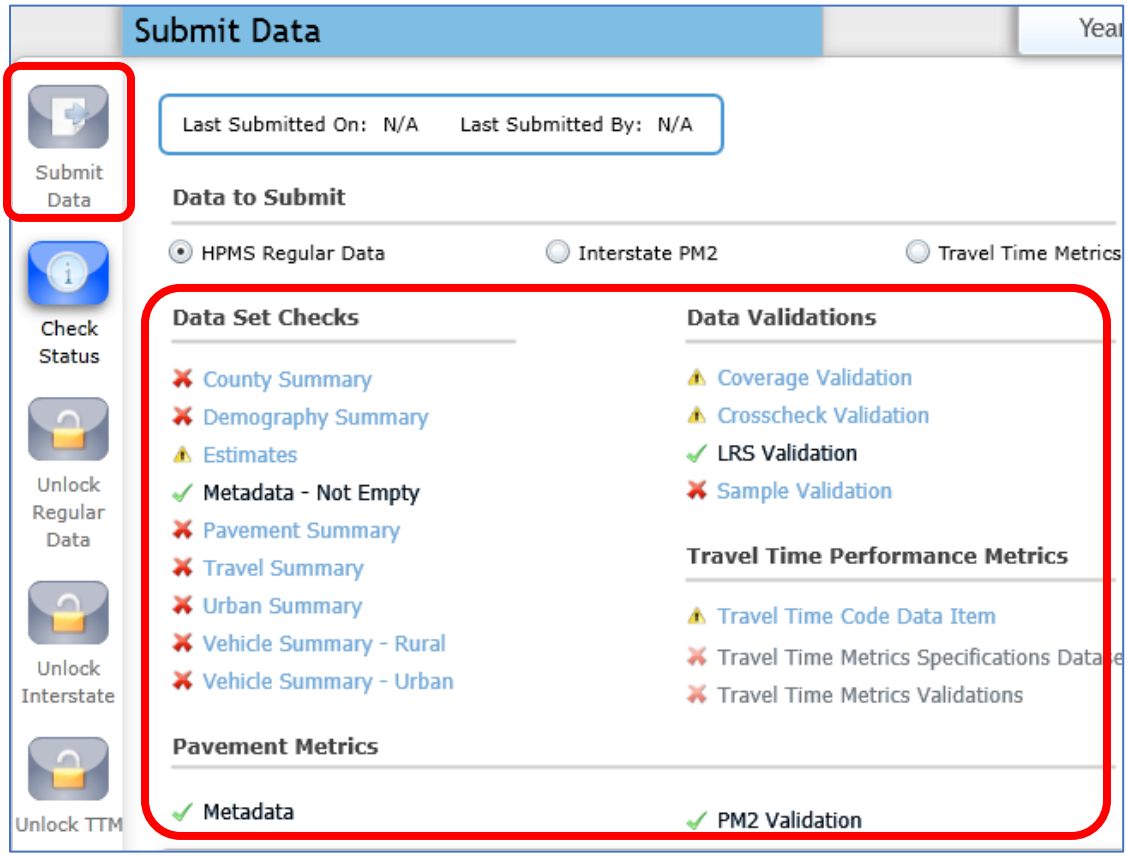


Figure 28 Screenshots of Submit Data tab shows summary of validation status

c) Validation Rules

Every year, before the HPMS submission due dates, FHWA will share the latest validation rules with the State DOTs.

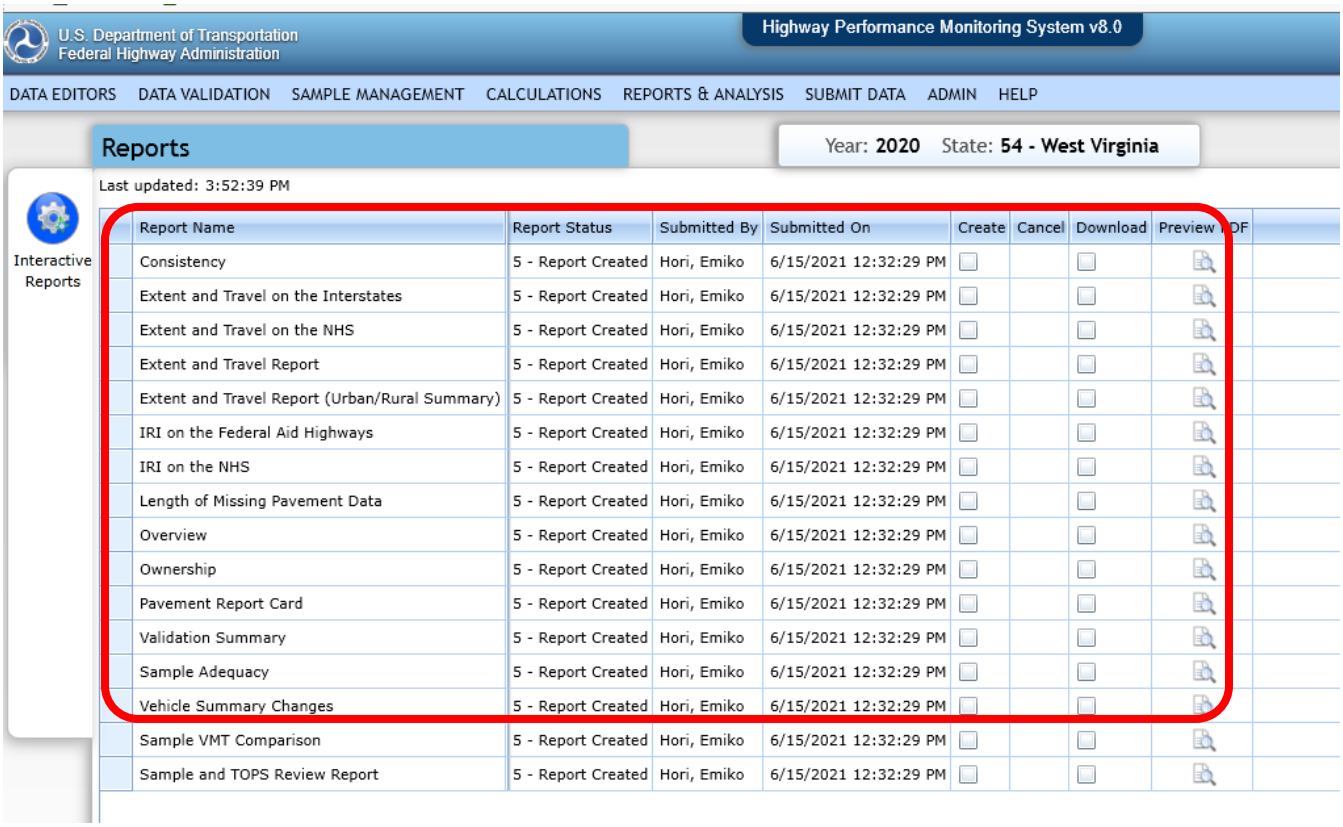
	Software Error #	Data Item must exist	2020 Validation (2019 Data Year)	2021 Validation (2020 Da
4	43	Turn_Lanes_L	Sample and Urban_Code < 99999 and Access_Control >1	Sample and Urban_Code
5	44	Speed_Limit	Sample	Sample
6	45	Toll_Charged	Toll_Type is not Null	Toll_Type is not Null
7	46	Toll_Type	Toll_Charged is not Null	Toll_Charged is not Null
8	114	Route_Number	Either Value Numeric or Value Text of Route_Number Must Exist where (F_System in (1,2,3,4) or NHS) and Facility_Type (1,2) and Route_Signing in (2,3,4,5,6,7,8,9) OR F_System=1 AND Facility_Type=6 AND Dir_Through_Lanes > 0 AND (IRI IS NOT NULL OR PSR IS NOT NULL)	Either Value Numeric or Facility_Type (1,2) and R Dir_Through_Lanes > 0 A
9	115	Route_Signing	(F_System in (1,2,3,4) or NHS) and Facility_Type (1,2)	(F_System in (1,2,3,4) or
0	116	Route_Qualifier	(F_System in (1,2,3,4) or NHS) and Facility_Type (1,2)	(F_System in (1,2,3,4) or
1		Alternative_Route_Name		
2	51	AADT	Facility Type in (1,2,4) AND (F_System in (1,2,3,4,5) or (F_System = 6 and Urban Code <99999) or NHS)	Facility Type in (1,2,4) A
3	52	AADT_Single_Unit	((F_System in (1) or NHS) and Facility_Type (1,2)) OR (Sample)	((F_System in (1) or NHS
4	53	Pct_Peak_Single	Sample	Sample
5	54	AADT_Combination	((F_System in (1) or NHS) and Facility_Type (1,2)) OR (Sample)	((F_System in (1) or NHS
6	55	Pct_Peak_Combination	Sample	Sample
7	56	K_Factor	Sample	Sample

Figure 29 List of Software Validation shared by FHWA for coming submission

6.5 Reports

HPMS Software generates both static and interactive reports. Details and computing process for each report are described in HPMS Software Guide in Appendix B.

Before creating these reports, ensure all validation results are updated with latest data available in HPMS software. Even the new records were added or updated, if validation is not run, the report will be created based on old validation results.



Report Name	Report Status	Submitted By	Submitted On	Create	Cancel	Download	Preview PDF
Consistency	5 - Report Created	Hori, Emiko	6/15/2021 12:32:29 PM				
Extent and Travel on the Interstates	5 - Report Created	Hori, Emiko	6/15/2021 12:32:29 PM				
Extent and Travel on the NHS	5 - Report Created	Hori, Emiko	6/15/2021 12:32:29 PM				
Extent and Travel Report	5 - Report Created	Hori, Emiko	6/15/2021 12:32:29 PM				
Extent and Travel Report (Urban/Rural Summary)	5 - Report Created	Hori, Emiko	6/15/2021 12:32:29 PM				
IRI on the Federal Aid Highways	5 - Report Created	Hori, Emiko	6/15/2021 12:32:29 PM				
IRI on the NHS	5 - Report Created	Hori, Emiko	6/15/2021 12:32:29 PM				
Length of Missing Pavement Data	5 - Report Created	Hori, Emiko	6/15/2021 12:32:29 PM				
Overview	5 - Report Created	Hori, Emiko	6/15/2021 12:32:29 PM				
Ownership	5 - Report Created	Hori, Emiko	6/15/2021 12:32:29 PM				
Pavement Report Card	5 - Report Created	Hori, Emiko	6/15/2021 12:32:29 PM				
Validation Summary	5 - Report Created	Hori, Emiko	6/15/2021 12:32:29 PM				
Sample Adequacy	5 - Report Created	Hori, Emiko	6/15/2021 12:32:29 PM				
Vehicle Summary Changes	5 - Report Created	Hori, Emiko	6/15/2021 12:32:29 PM				
Sample VMT Comparison	5 - Report Created	Hori, Emiko	6/15/2021 12:32:29 PM				
Sample and TOPS Review Report	5 - Report Created	Hori, Emiko	6/15/2021 12:32:29 PM				

Figure 30 Reports & Analysis screen where available reports are listed for State DOT

These static reports will be available both in pdf and csv format for further review.

In this section, some key reports are discussed. All reports must be run and reviewed thoroughly, however there are some values which determine whether WVDOT meets the requirements for HPMS and Performance Measure. Reviewing these figures also helps to improve both data coverage and quality before finalizing datasets.

a) Consistency Report

- Lengths are miles (centerline single mileages), not lane miles.
- The miles should match with what in CPRM report.
- The miles for four data items should be same.
- Lengths for Rural Minor Collectors and Local roadways reported in County Summary file are NOT included in this report.

HPMS 8.0.1 **Consistency Report**

Stage: Submit
Year: 2020
State: 54 - West Virginia
Date: 06/15/2021

F System	Length AADT (Miles)	Length Through Lanes (Miles)	Length Ownership (Miles)	Length Control (Miles)
1 - Interstate	555.610	555.610	555.610	555.610
2 - PA - Other Freeways and Expressways	14.719	14.719	14.719	14.719
3 - PA - Other	1,419.392	1,419.392	1,419.392	1,419.392
4 - Minor Arterial	2,074.734	2,074.654	2,074.734	2,074.734

Figure 31 Consistency Report showing mileage comparison between 4 data items

b) Ownership

- Miles is computed based on Ownership data items, and ownership category in County summary
- CPRM report category miles should match with miles in this report
  → Lookup the coding requirements for data item "Ownership" in Chapter 4 in HPMS Field Manual
  - State – Ownership =1, 4 (only F_system=1 to 6), 11, 31,
  - Public (Federal) – Ownership = 63, 64, 66, 70, 73, 74
  - Public (Municipal) – Ownership = 4 (only F_system = 7)

HPMS 8.0.1 **Ownership Report**

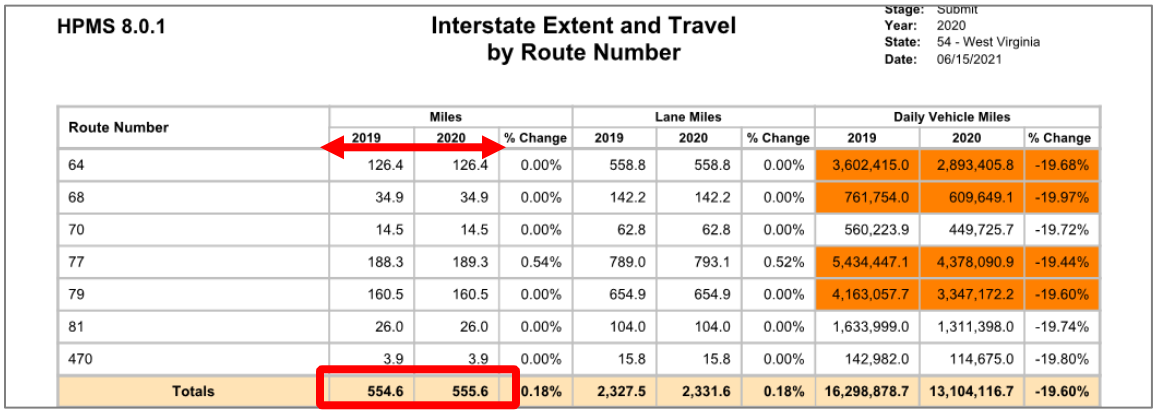
Stage: Submit
Year: 2020
State: 54 - West Virginia
Date: 06/15/2021

City or Municipal Highway Agency	Miles
1 - Interstate	0.000
2 - PA - Other Freeways and Expressways	0.000
3 - PA - Other	4.680
4 - Minor Arterial	45.371
5 - Major Collector	226.068
6 - Minor Collector	0.170

Figure 32 Ownership Report showing City or Municipal mileage by Functional Class, (Ownership = 4)

c) Extent & Travel Report

- Interstate – Use for April submission data and miles review
- Statewide (Urbanized Area Summary and Statewide Summary) – Use for CPRM and June submission data and miles review
- The miles should match with what in CPRM report.
- Detect possible abnormal values in Through_Lanes by reviewing Lane Miles
- Any mile changes from previous year must be reviewed (Any interstate, or NHS mile change needs to be addressed to FHWA and approved by FHWA. HPMS unit also should mentioned in submittal comments.)
- Any area highlighted in orange shows significant change and must be reviewed carefully



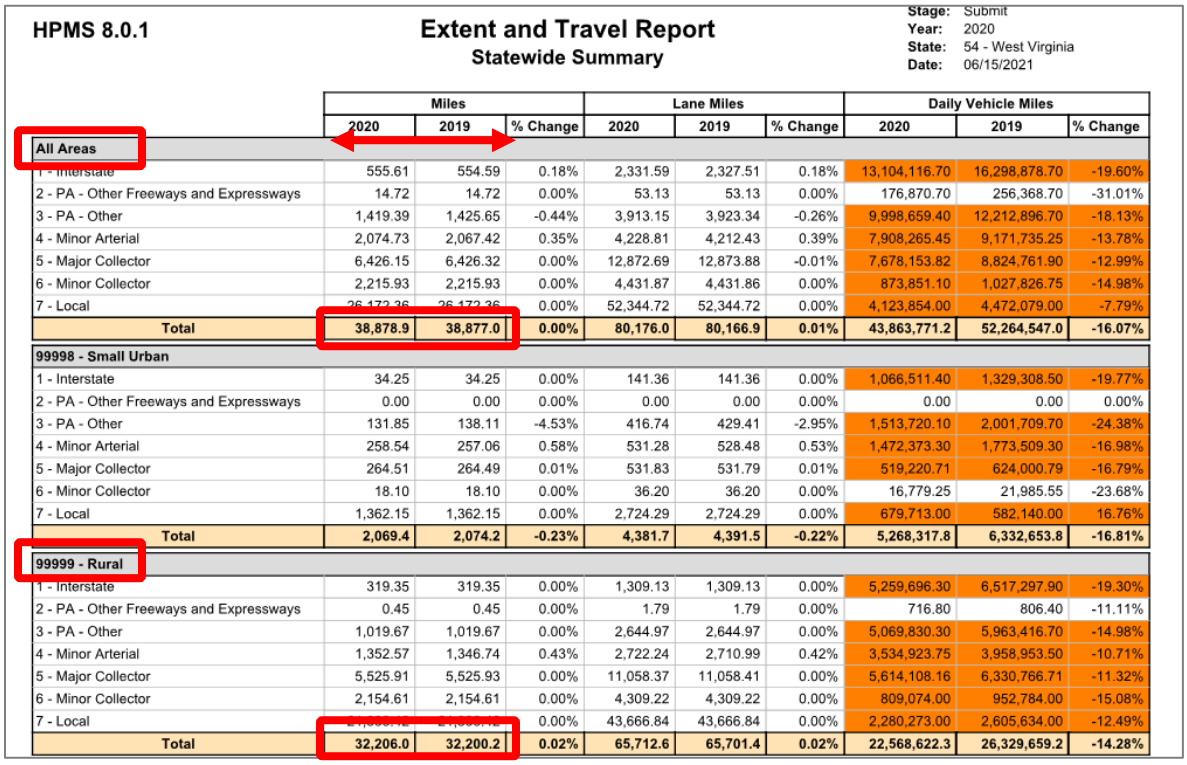
HPMS 8.0.1

Interstate Extent and Travel by Route Number

Stage: Submit
Year: 2020
State: 54 - West Virginia
Date: 06/15/2021

Route Number	Miles			Lane Miles			Daily Vehicle Miles		
	2019	2020	% Change	2019	2020	% Change	2019	2020	% Change
64	126.4	126.4	0.00%	558.8	558.8	0.00%	3,602,415.0	2,893,405.8	-19.68%
68	34.9	34.9	0.00%	142.2	142.2	0.00%	761,754.0	609,649.1	-19.97%
70	14.5	14.5	0.00%	62.8	62.8	0.00%	560,223.9	449,725.7	-19.72%
77	188.3	189.3	0.54%	789.0	793.1	0.52%	5,434,447.1	4,378,090.9	-19.44%
79	160.5	160.5	0.00%	654.9	654.9	0.00%	4,163,057.7	3,347,172.2	-19.60%
81	26.0	26.0	0.00%	104.0	104.0	0.00%	1,633,999.0	1,311,398.0	-19.74%
470	3.9	3.9	0.00%	15.8	15.8	0.00%	142,982.0	114,675.0	-19.80%
Totals	**554.6**	**555.6**	**0.18%**	**2,327.5**	**2,331.6**	**0.18%**	**16,298,878.7**	**13,104,116.7**	**-19.60%**

Figure 33 Extent & Travel Report Interstate only



HPMS 8.0.1

Extent and Travel Report
Statewide Summary

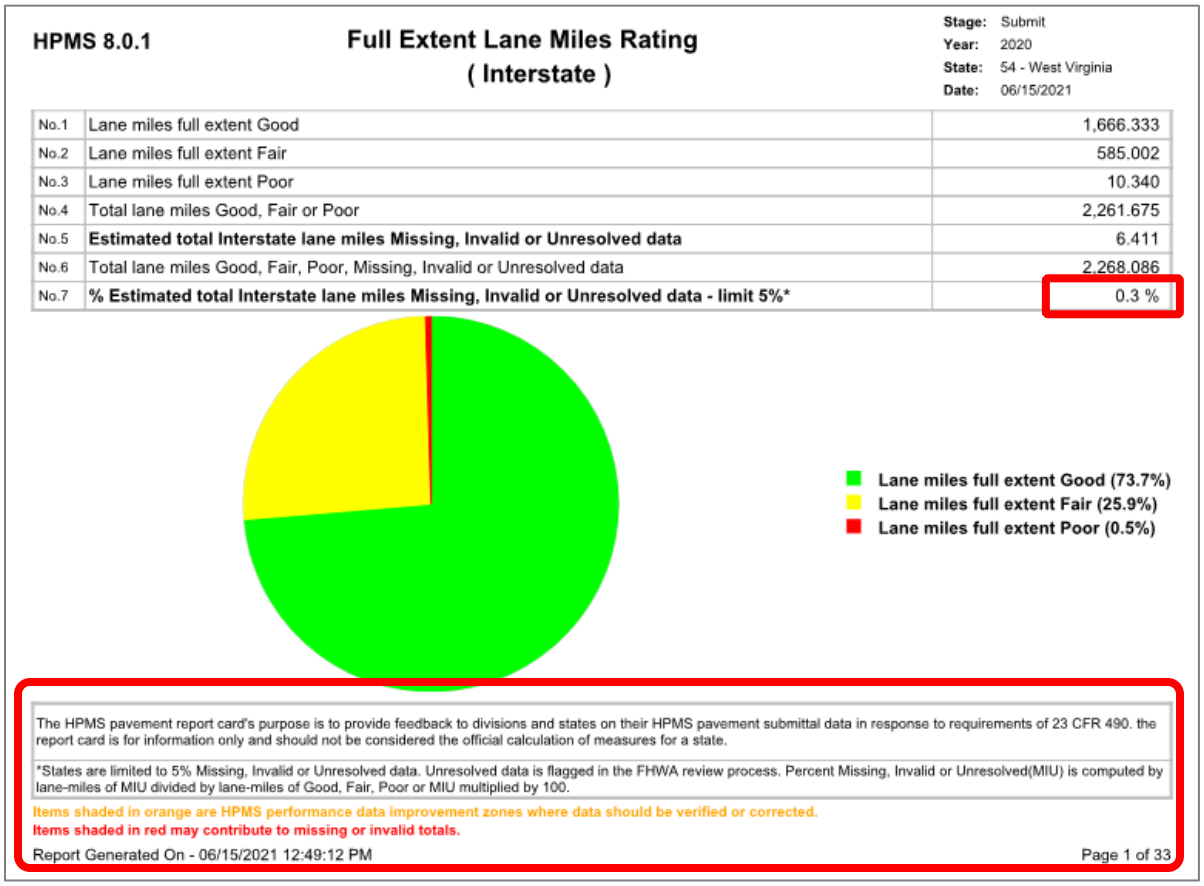
Stage: Submit
Year: 2020
State: 54 - West Virginia
Date: 06/15/2021

	Miles			Lane Miles			Daily Vehicle Miles		
	2020	2019	% Change	2020	2019	% Change	2020	2019	% Change
All Areas									
1 - Interstate	555.61	554.59	0.18%	2,331.59	2,327.51	0.18%	13,104,116.70	16,298,878.70	-19.60%
2 - PA - Other Freeways and Expressways	14.72	14.72	0.00%	53.13	53.13	0.00%	176,870.70	256,368.70	-31.01%
3 - PA - Other	1,419.39	1,425.65	-0.44%	3,913.15	3,923.34	-0.26%	9,998,659.40	12,212,896.70	-18.13%
4 - Minor Arterial	2,074.73	2,067.42	0.35%	4,228.81	4,212.43	0.39%	7,908,265.45	9,171,735.25	-13.78%
5 - Major Collector	6,426.15	6,426.32	0.00%	12,872.69	12,873.88	-0.01%	7,678,153.82	8,824,761.90	-12.99%
6 - Minor Collector	2,215.93	2,215.93	0.00%	4,431.87	4,431.86	0.00%	873,851.10	1,027,826.75	-14.98%
7 - Local	26,172.36	26,172.36	0.00%	52,344.72	52,344.72	0.00%	4,123,854.00	4,472,079.00	-7.79%
Total	**38,878.9**	**38,877.0**	**0.00%**	**80,176.0**	**80,166.9**	**0.01%**	**43,863,771.2**	**52,264,547.0**	**-16.07%**
99998 - Small Urban									
1 - Interstate	34.25	34.25	0.00%	141.36	141.36	0.00%	1,066,511.40	1,329,308.50	-19.77%
2 - PA - Other Freeways and Expressways	0.00	0.00	0.00%	0.00	0.00	0.00%	0.00	0.00	0.00%
3 - PA - Other	131.85	138.11	-4.53%	416.74	429.41	-2.95%	1,513,720.10	2,001,709.70	-24.38%
4 - Minor Arterial	258.54	257.06	0.58%	531.28	528.48	0.53%	1,472,373.30	1,773,509.30	-16.98%
5 - Major Collector	264.51	264.49	0.01%	531.83	531.79	0.01%	519,220.71	624,000.79	-16.79%
6 - Minor Collector	18.10	18.10	0.00%	36.20	36.20	0.00%	16,779.25	21,985.55	-23.68%
7 - Local	1,362.15	1,362.15	0.00%	2,724.29	2,724.29	0.00%	679,713.00	582,140.00	16.76%
Total	**2,069.4**	**2,074.2**	**-0.23%**	**4,381.7**	**4,391.5**	**-0.22%**	**5,268,317.8**	**6,332,653.8**	**-16.81%**
99999 - Rural									
1 - Interstate	319.35	319.35	0.00%	1,309.13	1,309.13	0.00%	5,259,696.30	6,517,297.90	-19.30%
2 - PA - Other Freeways and Expressways	0.45	0.45	0.00%	1.79	1.79	0.00%	716.80	806.40	-11.11%
3 - PA - Other	1,019.67	1,019.67	0.00%	2,644.97	2,644.97	0.00%	5,069,830.30	5,963,416.70	-14.98%
4 - Minor Arterial	1,352.57	1,346.74	0.43%	2,722.24	2,710.99	0.42%	3,534,923.75	3,958,953.50	-10.71%
5 - Major Collector	5,525.91	5,525.93	0.00%	11,058.37	11,058.41	0.00%	5,614,108.16	6,330,766.71	-11.32%
6 - Minor Collector	2,154.61	2,154.61	0.00%	4,309.22	4,309.22	0.00%	809,074.00	952,784.00	-15.08%
7 - Local	21,980.42	21,980.42	0.00%	43,666.84	43,666.84	0.00%	2,280,273.00	2,605,634.00	-12.49%
Total	**32,206.0**	**32,200.2**	**0.02%**	**65,712.6**	**65,701.4**	**0.02%**	**22,568,622.3**	**26,329,659.2**	**-14.28%**

Figure 34 Extent & Travel Report showing the first page of Statewide Summary

d) Pavement Report Card (PRC)

- Length of miles should match with CPRM report
- Page 1 No.7 Interstate "Missing, Invalid or Unsolved data" **(MIU) must be under 5%**
  - Performance Measure Pavement condition data submittal requirement
  - Area highlighted in red in this report may contributes to MIU miles
  - Review Page 2 to 5 for detail condition information. To reduce MIU, HPMS unit needs review them and contact to data owner if any updates or data available to replace
- Page 6 No.4 Percent HPMS bridge lane miles comparison to NBI must be within 95%



HPMS 8.0.1

Full Extent Lane Miles Rating
(Interstate)

Stage: Submit
Year: 2020
State: 54 - West Virginia
Date: 06/15/2021

No.1	Lane miles full extent Good	1,666.333
No.2	Lane miles full extent Fair	585.002
No.3	Lane miles full extent Poor	10.340
No.4	Total lane miles Good, Fair or Poor	2,261.675
No.5	**Estimated total Interstate lane miles Missing, Invalid or Unresolved data**	6.411
No.6	Total lane miles Good, Fair, Poor, Missing, Invalid or Unresolved data	2,268.086
No.7	**% Estimated total Interstate lane miles Missing, Invalid or Unresolved data - limit 5%***	0.3 %

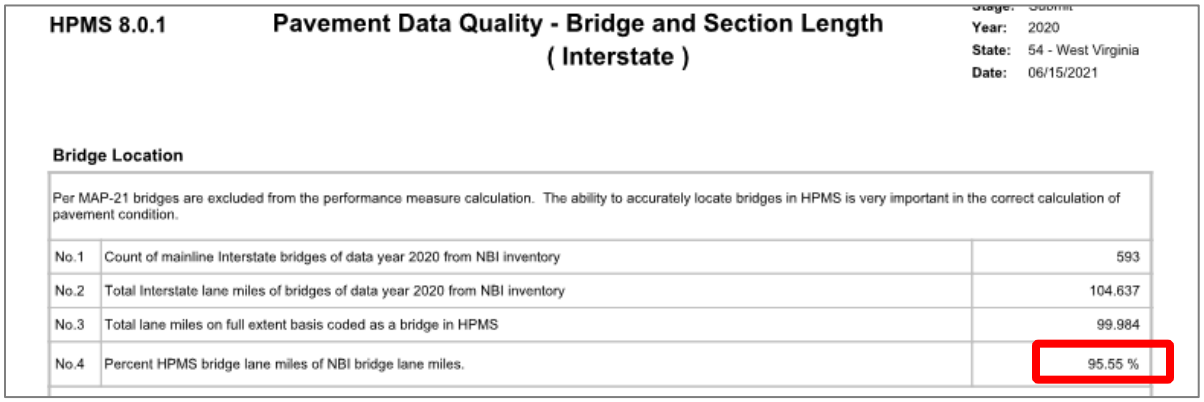
The HPMS pavement report card's purpose is to provide feedback to divisions and states on their HPMS pavement submittal data in response to requirements of 23 CFR 490. the report card is for information only and should not be considered the official calculation of measures for a state.

*States are limited to 5% Missing, Invalid or Unresolved data. Unresolved data is flagged in the FHWA review process. Percent Missing, Invalid or Unresolved(MIU) is computed by lane-miles of MIU divided by lane-miles of Good, Fair, Poor or MIU multiplied by 100.

Items shaded in orange are HPMS performance data improvement zones where data should be verified or corrected.
Items shaded in red may contribute to missing or invalid totals.

Report Generated On - 06/15/2021 12:49:12 PM

Figure 35 PRC showing MIU under 5% for Interstate-lane miles



HPMS 8.0.1

Pavement Data Quality - Bridge and Section Length
(Interstate)

Year: 2020
State: 54 - West Virginia
Date: 06/15/2021

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.

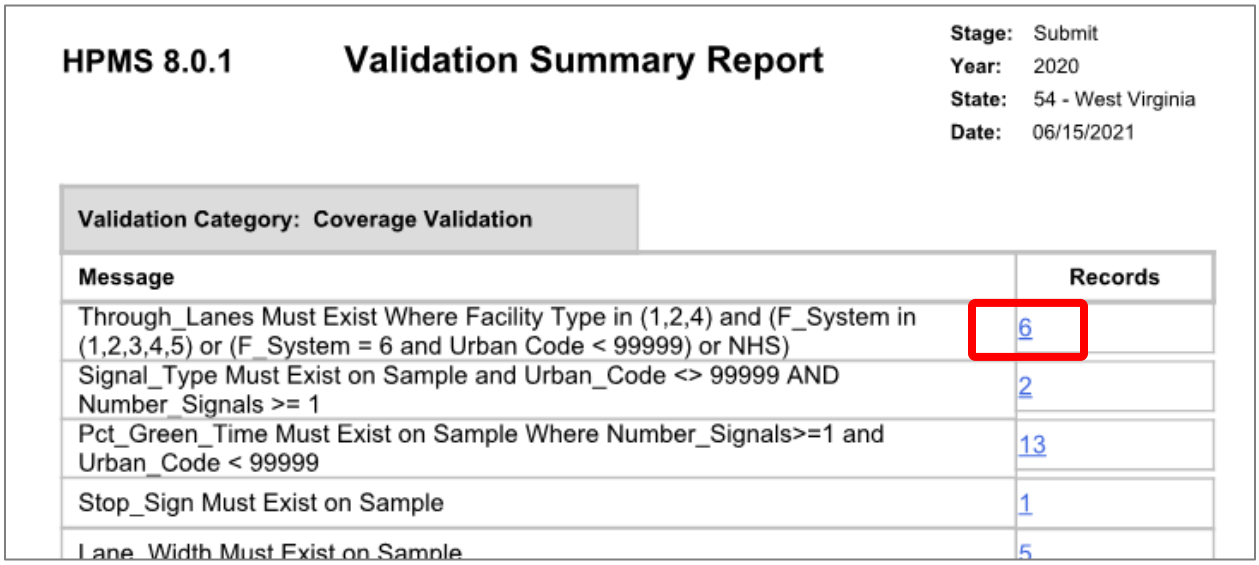
No.1	Count of mainline Interstate bridges of data year 2020 from NBI inventory	593
No.2	Total Interstate lane miles of bridges of data year 2020 from NBI inventory	104.637
No.3	Total lane miles on full extent basis coded as a bridge in HPMS	99.984
No.4	Percent HPMS bridge lane miles of NBI bridge lane miles.	95.55 %

Figure 36 PRC shows % of HPMS bridge lane miles of NBI bridge lane miles

e) Validation Summary

- This is the summary of all validation results which was run on HPMS software
- Same information can be exported to see detail information for corresponding section Data Editors > Export > Validation (Choose Spatial or Tabular Option)
- Validation Category: Cross Check Validation

  "IRI<30 OR >400 Should be Validated and Confirmed in Submission Comments"
  Any section with this error must have any explanation or supplemental information in Submission Comments
- Each error must be reviewed and HPMS unit contact data owner for data corrections or updates.



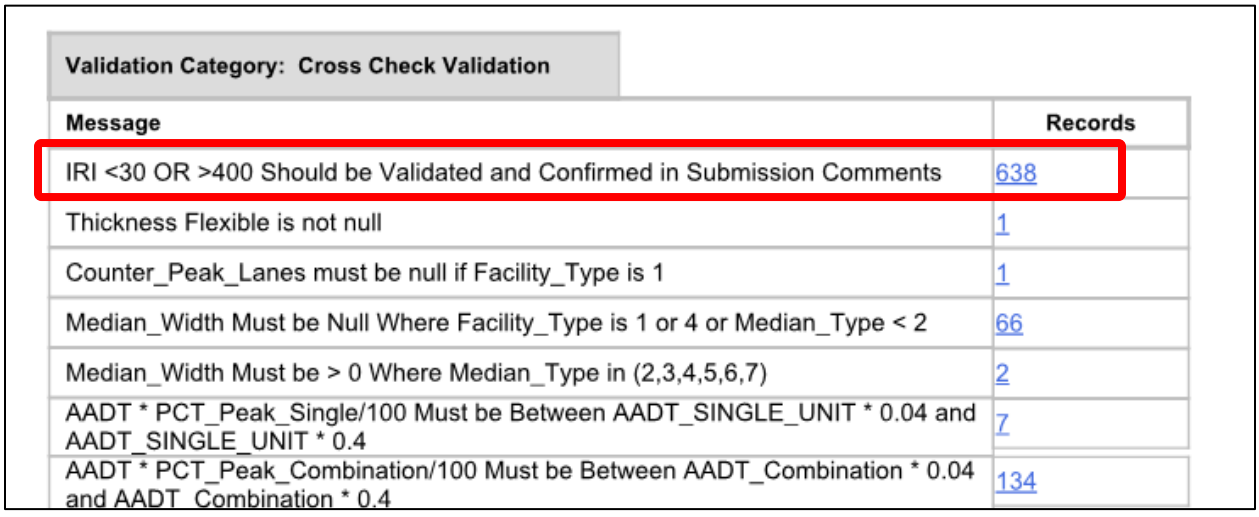
HPMS 8.0.1 **Validation Summary Report**

Stage: Submit
Year: 2020
State: 54 - West Virginia
Date: 06/15/2021

Validation Category: Coverage Validation

Message	Records
Through_Lanes Must Exist Where Facility Type in (1,2,4) and (F_System in (1,2,3,4,5) or (F_System = 6 and Urban Code < 99999) or NHS)	6
Signal_Type Must Exist on Sample and Urban_Code <> 99999 AND Number_Signals >= 1	2
Pct_Green_Time Must Exist on Sample Where Number_Signals>=1 and Urban_Code < 99999	13
Stop_Sign Must Exist on Sample	1
Lane_Width Must Exist on Sample	5

Figure 37 Validation Summary



Validation Category: Cross Check Validation

Message	Records
IRI <30 OR >400 Should be Validated and Confirmed in Submission Comments	638
Thickness Flexible is not null	1
Counter_Peak_Lanes must be null if Facility_Type is 1	1
Median_Width Must be Null Where Facility_Type is 1 or 4 or Median_Type < 2	66
Median_Width Must be > 0 Where Median_Type in (2,3,4,5,6,7)	2
AADT * PCT_Peak_Single/100 Must be Between AADT_SINGLE_UNIT * 0.04 and AADT_SINGLE_UNIT * 0.4	7
AADT * PCT_Peak_Combination/100 Must be Between AADT_Combination * 0.04 and AADT_Combination * 0.4	134

Figure 38 Validation Summary showing IRI errors which needs to be address in Submission Comments

7. Annual HPMS Unit Activities

7.1 Requrement Changes and Data Updates by FHWA

a) Requirement Changes

Any significant change or updates for HPMS requirement will be shared with State DOTs ahead of 1-2 years of data submission cycle. The new information could be shared by email, in HPMS webinar, or Highway Information Seminar or other informative session scheduled by FHWA headquarter.

HPMS 2020 data submission in 2021 is the last data submission using HPMS 8.0.

HPMS 9.0 release is planned to be January 2022, and State DOT will be required to use HPMS 9.0 for HPMS 2021 data submission in 2022.

In March 2021, FHWA announced that "**There will be no change to the reporting requirements in content and format" in HPMS 2021 data submission in HPMS 2022**. With the development of next version HPMS software (HPMS 9.0), they decided not to have any changes in requirement.

b) Federal Miles

Every year, mileages information for federal owned are delivered to State DOTs by FHWA. In 2021, FHWA also started to deliver the data in GIS format.

Once WVDDOT received the Fed's mile information and data, HPMS unit should immediately share with GIS Programming unit and LRS unit so that they can prepare the necessary data (ownership information) for HPMS submission.

- Dates from 2021
- Excel format: Delivered by Tom Roff (WVDOT HPMS state coach) on 3/17/2021 via Email
- GIS format: Delivered by Tom Roff on 4/22/2021 via Email link (downloadable during limited time range)

c) Validation Rules in HPMS Software

Following the requirement changes or adding new function HPMS software, validation rules are updated annually, and they are share by FHWA before the HPMS submission.

- Dates from 2021
- Software update and validation rules: Delivered by Justin Clarke (FHWA HQ staff) on 4/1/2021 via email

d) Talking HPMS (HPMS webinar)

HPMS webinar is scheduled periodically by FHWA HQ, and serves as informative session and opportunity for State DOTs to have any Q&As. These event notifications are sent to POC (point of contact) for each state.

7.2 Highway Information Seminar (HIS)

Highway Information Seminar (HIS) is held in FHWA Head Quarter in DC every fall. The seminar provides training on the latest data needs as related to the Federal-Aid highway program to State and local agency personnel and FHWA Division employees who are responsible for collecting, processing, and submitting data and information to the FHWA.

HPMS unit is highly recommended to attend this seminar every year to ensure the latest information available to improve previous year data submission and prepare for next year.

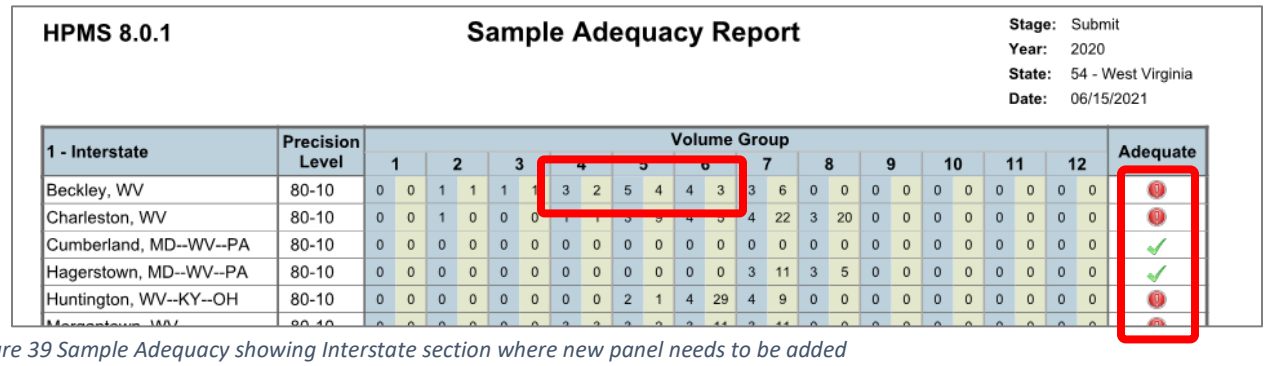
- 2021 Highway Information Seminar
  https://www.fhwa.dot.gov/policyinformation/his.cfm

7.3 Sample Maintenance

Sample maintenance is required activity for State DOTs and described in Chapter 6 in HPMS field Manuals. At WVDOT, sample maintenance is annually conducted shortly after the annual HPMS submittal in June.

a) Sample Adequacy Report Review

Sample Adequacy report should be created during annual HPMS submittal, and new sample will be added based on the numbers in the report.



HPMS 8.0.1

Sample Adequacy Report

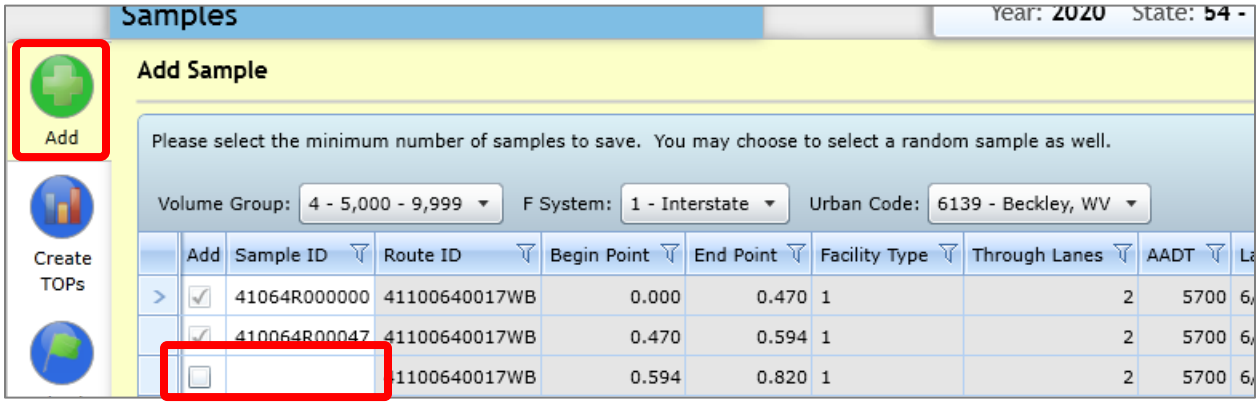
Stage: Submit
Year: 2020
State: 54 - West Virginia
Date: 06/15/2021

1 - Interstate	Precision Level	Volume Group 1	2	3	4	5	6	7	8	9	10	11	12	Adequate
Beckley, WV	80-10	0 0	1 1	1 1	3 2	5 4	4 3	3 6	0 0	0 0	0 0	0 0	0 0	
Charleston, WV	80-10	0 0	1 0	0 0	4 4	5 5	4 5	4 22	3 20	0 0	0 0	0 0	0 0	
Cumberland, MD--WV--PA	80-10	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	✓
Hagerstown, MD--WV--PA	80-10	0 0	0 0	0 0	0 0	0 0	0 0	3 11	3 5	0 0	0 0	0 0	0 0	✓
Huntington, WV--KY--OH	80-10	0 0	0 0	0 0	0 0	2 1	4 29	4 9	0 0	0 0	0 0	0 0	0 0	
Morgantown, WV	80-10													

Figure 39 Sample Adequacy showing Interstate section where new panel needs to be added

b) Adding New Sample Panel in HPMS Software

After reviewing where the new sample panel should be added, new sections will be added using in HPMS software.



Samples

Year: 2020 State: 54 -

Add Sample

Add

Create TOPs

Please select the minimum number of samples to save. You may choose to select a random sample as well.

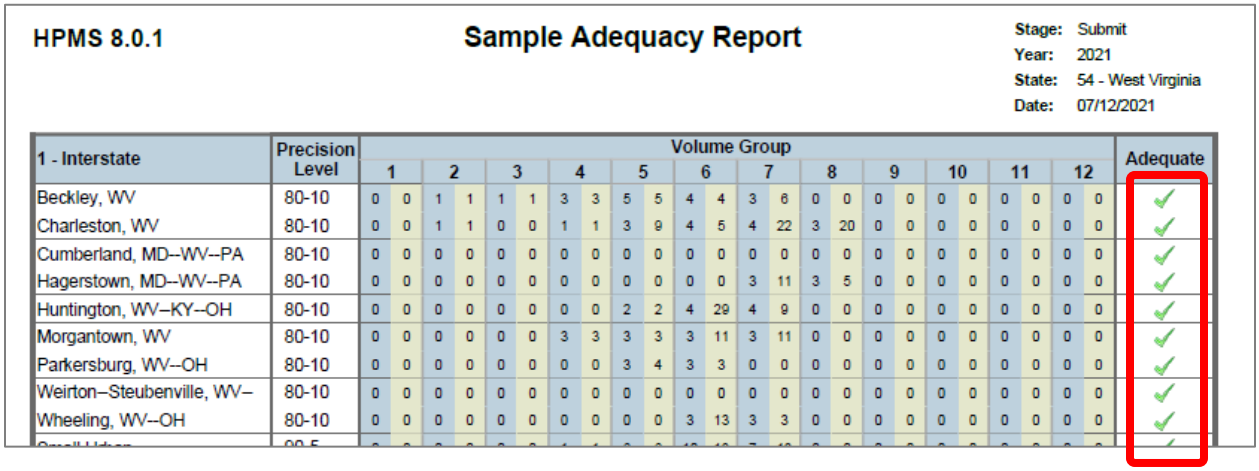
Volume Group: 4 - 5,000 - 9,999 F System: 1 - Interstate Urban Code: 6139 - Beckley, WV

Add	Sample ID	Route ID	Begin Point	End Point	Facility Type	Through Lanes	AADT	La
✓	41064R000000	41100640017WB	0.000	0.470	1	2	5700	6,
✓	41064R00047	41100640017WB	0.470	0.594	1	2	5700	6,
		41100640017WB	0.594	0.820	1	2	5700	6,

Figure 40 Add Sample screen shows where 3 sample panels are needed but only 2 samples exist

c) Run and Sample Adequacy Report (Second Time)

After adding proper numbers of sample panels, Sample Adequacy Reports should look like below with all green check.



HPMS 8.0.1 — **Sample Adequacy Report**

Stage: Submit
Year: 2021
State: 54 - West Virginia
Date: 07/12/2021

1 - Interstate	Precision Level	Volume Group 1		2		3		4		5		6		7		8		9		10		11		12		Adequate
Beckley, WV	80-10	0	0	1	1	1	1	3	3	5	5	4	4	3	6	0	0	0	0	0	0	0	0	0	0	✓
Charleston, WV	80-10	0	0	1	1	0	0	1	1	3	9	4	5	4	22	3	20	0	0	0	0	0	0	0	0	✓
Cumberland, MD--WV--PA	80-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	✓
Hagerstown, MD--WV--PA	80-10	0	0	0	0	0	0	0	0	0	0	0	0	3	11	3	5	0	0	0	0	0	0	0	0	✓
Huntington, WV--KY--OH	80-10	0	0	0	0	0	0	0	0	2	2	4	29	4	9	0	0	0	0	0	0	0	0	0	0	✓
Morgantown, WV	80-10	0	0	0	0	0	0	3	3	3	3	3	11	3	11	0	0	0	0	0	0	0	0	0	0	✓
Parkersburg, WV--OH	80-10	0	0	0	0	0	0	0	0	3	4	3	3	0	0	0	0	0	0	0	0	0	0	0	0	✓
Weirton--Steubenville, WV--	80-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	✓
Wheeling, WV--OH	80-10	0	0	0	0	0	0	0	0	0	0	3	13	3	3	0	0	0	0	0	0	0	0	0	0	✓

Figure 41 Sample Adequacy Report after the annual sample maintenance

d) Export and Format Sample ID

Samples is available in both csv and shapefile format to export in HPMS software.

Once sample section is exported, because new sample panel is named with GUI, HPMS unit need re-format Sample IDs.

Ex.) B4A21879638A → 410770004060
41: 2 digits - County Code
077: 3 digits - Route Number
00: 2 digits - Sub Route Number (or Supplemental Code if applicable)
040: 3 digits – Integer portion of Begin MP (**40**.6)
60: 2 digits – after decimal point of Begin MP (40.**6**)

e) Share Sample Section with FHWA, and Data Owner/Provider

Once Sample section for the data year is available, HPMS unit must share with FHWA and related office in WVDOT.

- FHWA Division Office in Charleston, WV (CC to FHWA HQ)
- Highway Data Service Unit at WVDOT (geometry data collector)
- Traffic Monitoring unit at WVDOT (traffic data owner)
- Michael Baker International (pavement and geometry data collector, CC to Mike Troyan)

In 2021, HPMS unit finalized and share the sample section 2021 with FHWA and other related offices shortly after the August 15th data lock down.

7.4 Data Request from FHWA

Once June HPMS submittal is completed, WVDOT HPMS unit is contacted from FHWA Division office for the data for Size and Weight Evaluation Report.

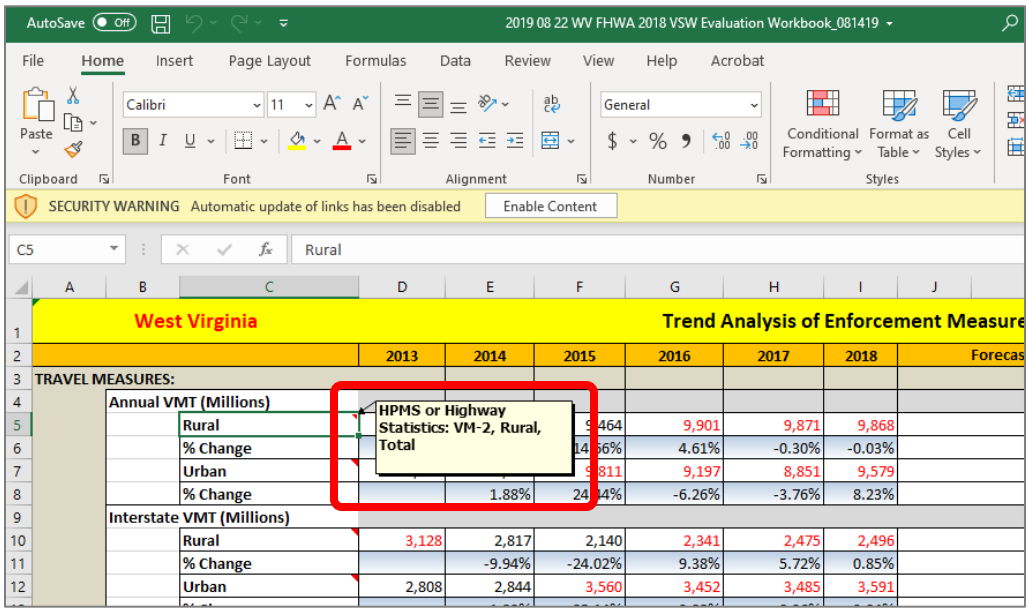


Figure 42 Screenshot of worksheet with notes attached for explanation

- VMT Use Extent and Travel (Urban-Rural Summary) report to get AADT, and multiply by 365 for Yearly, re-format in million
- Truck% Use HPMS Software State Summary screen to get each truck %
- IRI Use vehicle miles information in IRI on NHS Travel report

7.5 Review Score Card

The HPMS Score Card is a product of the Office of Highway Policy Information and was developed by FHWA's Data visualization Center. After annual HPMS submittal, HPMS unit use this score card to review both data coverage and quality to find area where WVDOT can improve for next year.

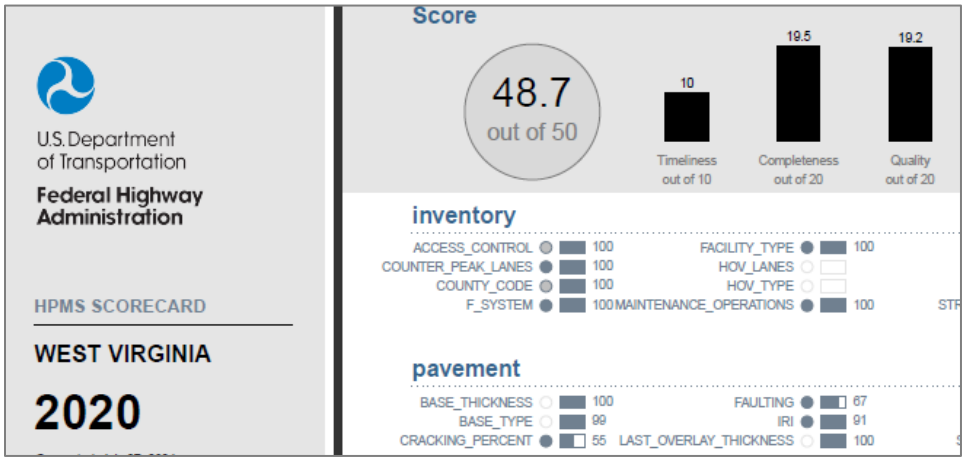


Figure 43 HPMS Score Card 2020 for West Virgina

Appendix

A) Submission Comments 2020

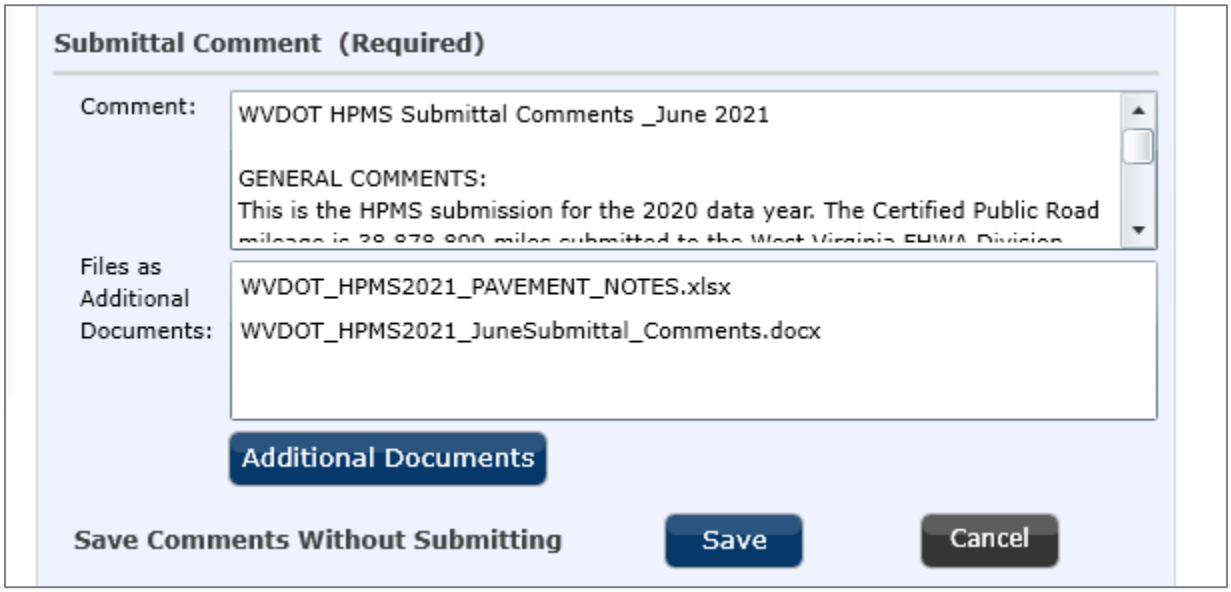


Figure 44 Screenshot of HPMS Submittal Comment for HPMS 2020

WVDOT HPMS Submittal Comments _June 2021

GENERAL COMMENTS:
This is the HPMS submission for the 2020 data year. The Certified Public Road mileage is 38,878.899 miles submitted to the West Virginia FHWA Division office on June 1st, 2021.

Data not reported in the WVDOT June 2021 HPMS submittal includes the following:

- HOV (HOV-Type, HOV-Lanes) – West Virginia does not have any HOV lanes
- Capacity – Data supplied by FHWA
- Climate–Zone – Data supplied by FHWA
- Soil Type – Data supplied by FHWA

LRS:
The Linear Referencing System submitted includes all dominant routes, crossovers, and non-inventory directions on dual geometry. Ramps and Non-State-owned roads that are open for public travel are also included.

STRUCTURE TYPE:

The 2020 submittal value for Structure Type includes data for all vehicular bridges greater than 20 feet, regardless of ownership, on our Interstate, US, State and County Route systems on both inventory and

non-inventory direction. Our Operation Division is still working to improve LRS location accuracy of all bridges.

PAVEMENT DATA:

Segments that were flagged as a Cross Check Error #4 (IRI <30 OR >400 Should be Validated and Confirmed in Submission Comments) were confirmed using WVDOH's web-based Pavement Data Viewer application that contains synchronized views of ROW imagery with downward facing views of pavement imagery. All segments with IRI <30 (56 segments) where found to be reasonable based on observed pavement condition and were located primarily on limited access highways with newer pavement in excellent condition. Of the segments with IRI >400 (582 segments):

- 327 segments (~56%) were found to be reasonable based on pavement conditions observed to be in generally poor condition.

- 175 segments (~30%) were collected at low speeds under thresholds for ideal IRI data collection. Typical causes were traffic control (stop signs, red lights, etc.), high traffic areas, roadway geometry (sharp curves, speed humps) and low clearances.

- 80 segments (~14%) contained one of the following flagged features, which contributed to abnormally high IRI values: bridges, railroads, construction areas, lane deviations.

We also confirm that inventory was conducted in 2020 using one pavement data collection vehicle, having a high-speed profiler and operators that were certified in accordance with AASHTO R56, operated in accordance of AASHTO R57 and maintained certification status throughout the 2020 data collection cycle.

Missing data for IRI, Rutting, Faulting, Cracking could not be collected on some segments due to construction and lane deviation. If we had older data for missing values on IRI, rutting, faulting, and cracking percent, we used it in the submittal. This caused errors on the Value Date for these records. Please see attached excel sheets for detailed notes for each section.

Metadata for pavement data collection was reviewed and updated by our data collection vendor.

Starting from 2018, WVDOT requested all districts to provide data for the following data items:

- Data Item 54 Year of Last Improvement
- Data Item 55 Year of Last Construction
- Data Item 56 Last Overlay Thickness
- Data Item 57 Thickness Rigid
- Data Item 58 Thickness Flexible
- Data Item 59 Base Type
- Data Item 60 Base Thickness

This is the third year since these items started to be collected and reported, therefore, we are missing a lot of records which should improve in the upcoming submissions.

FEDERAL PUBLIC MILEAGE:

The source of this data was the *Federal Agency & Indian Nation Owned Road Mileage Open-to-the-General Public by State and Information Source* report for 2020.

Data on Sample Section:
Missing data items for sample section due to switch to a new vendor. WVDOT revised our data collection cycle and plans to collect most of geometry data on all sample section in 2021, which will cover the 2022 submittal.

CURVE and GRADE data:
Curve and grade errors are due to the unavailability of data, within the specified limits for sample sections as noted in the validation reports. There are errors where the sum of the lengths does not equal the sample length. This is due to samples being split and no new curve or grade data collected on the split samples.

TRAFFIC Data:

Overall Traffic decrease including VMT due to COVID-19 Impacts from March 2020 to the end of the year.

7 segments with AADT * PCT_PEAK_SINGLE/100 is not between AADT_SINGLE_UNIT * 0.04 and AADT_SINGLE_UNIT * 0.4. This is correct even though it is flagged for a validation check.

96 segments with AADT * PCT_PEAK_COMBINATION/100 is not between AADT_COMBINATION_UNIT * 0.04 and AADT_COMBINATION_UNIT * 0.4. This is correct even though it is flagged for a validation check.

2945 Segments contain a directional code. Although the LRS ID denotes a specific direction, the AADT represents both directions combined, except for one-way ramps or other one-way facilities.

TRAVEL TIME METRICS:

5 TMCs with short segment lengths and NHS_PCT < 100 were flagged for not having their segment length adjusted to the NHS segment length. This is due to rounding and is not an issue. The segment lengths are short enough and the NHS_PCT is high enough that the rounded segment length and the rounded NHS adjusted segment length are equal to 3 decimals of accuracy. Example: For TMC 122N06719 with a rounded segment length of 0.019 (actual segment length = 0.019496) and a NHS_PCT of 99%, the NHS adjusted segment length is 0.019301. Both segment lengths round to 0.019 and are causing a flag even though the values have been adjusted for the NHS_PCT.

SAMPLE Management:

New samples will be added based on the information provided in the sample adequacy report and the expansion factor calculations.

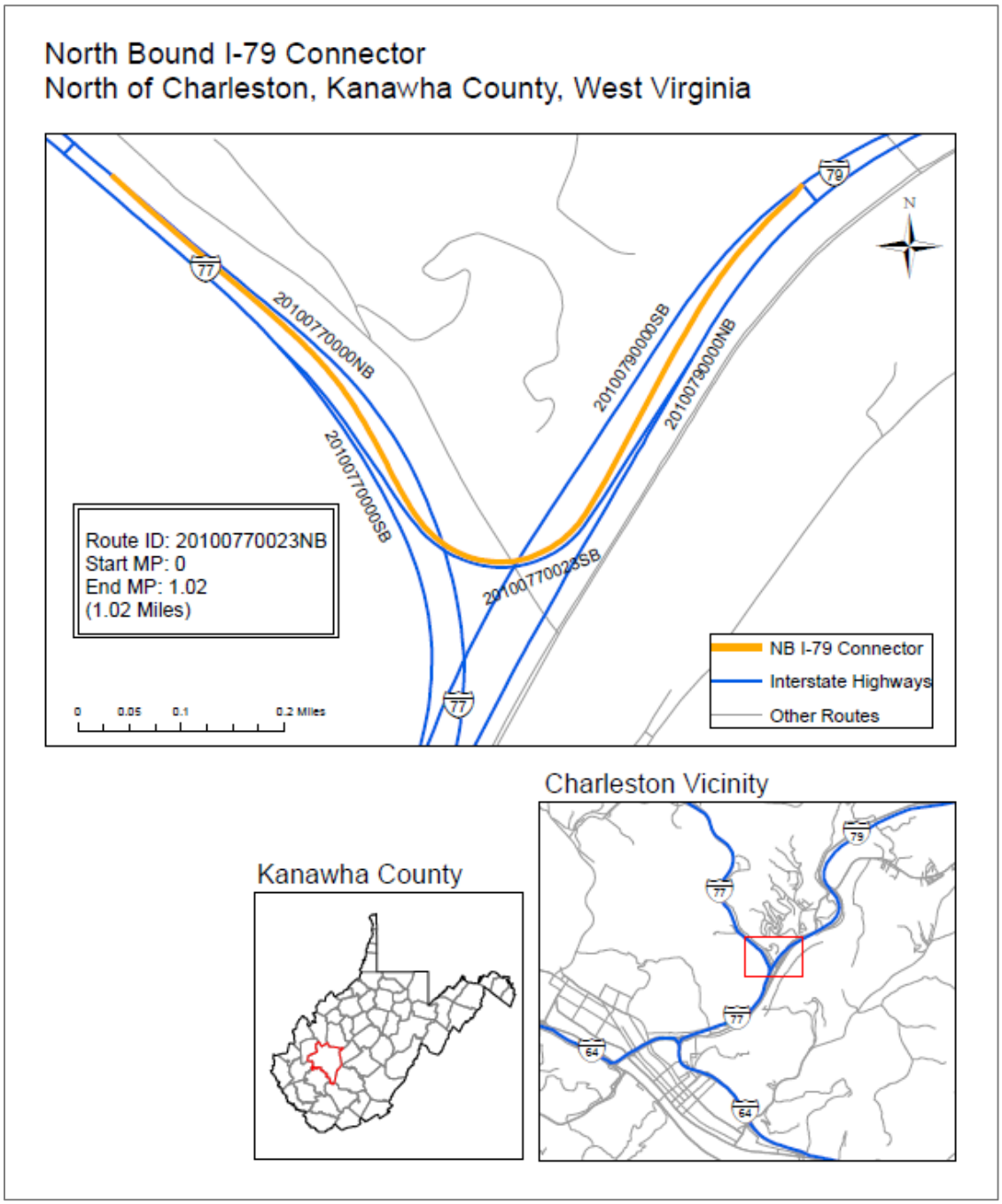
Following are comments from April Interstate Pavement data submission:

In 2020, West Virginia Department of Transportation revised state Road Inventory Log (RIL) and total Interstate miles was updated from 554.59 to 555.61.

The 1.02 miles increase was due to include an Interstate connector between I-77 and I-79. This connector is a part of existing Interstate roads, but never counted in RIL. When we reached out to

FHWA, they stated that this would be a technical correction to already approved Interstate route and no documentation needed.

The route section is 20100770023NB, mile point 0 to 1.02. (The corresponding non-inventory section is 20100770023SB, mile point 0 to 1.31.)



For questions regarding the WVDOT HPMS 2020 data submittal, please contact:
Emiko Hori at (304) 414 – 6921 or email to Emiko.Hori@wv.gov
Gehan Elsayed at (304) 414 – 6912 or email to Gehan.M.Elsayed@wv.gov

B) Copy of CPRM letter 2020

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
Division of Highways
1900 Kanawha Boulevard East • Building Five • Room 110
Charleston, West Virginia 25305-0430 • (304) 558-3505

Byrd E. White, III
Secretary of Transportation/
Commissioner of Highways

Jimmy Wriston, P. E.
Deputy Secretary/
Deputy Commissioner

June 1, 2021

Ms. Brigitte Mandel
Acting Division Administrator
Federal Highway Administration
154 Court Street
Charleston, West Virginia 25301

Dear Ms. Mandel:

This is to certify that as of December 31, 2020, the West Virginia Annual Public Road Mileage is 38,878.899 miles as required by Section 402(c) of Title 23, United States Code. This mileage is broken down into three categories based on responsibility for maintenance of the roads:

• State Public Mileage	34,980.740 miles
• Federal Public Mileage	918.992 miles
• Municipal Public Mileage	2,979.167 miles
Total	38,878.899 miles

The following is a summary of the changes since our last year's submission:

- A net increase of 1.9 miles due to the regular processing of Commissioner's Orders for additions, changes, and abandonments as well as ongoing mileage corrections needed when refining our linear referencing system (LRS).

- The updates consist of 1.02 miles increase in Interstate miles. With a guidance of Federal Highway Administration, a connector between I-77 and I-79 was added as a technical correction to the already-approved Interstate route.

Please find attached to this letter a detailed summary report of the West Virginia Certified Public Road Mileage and a map for the location of the added Interstate connector. Should you have any questions, please contact Gehan Elsayed, P.E., Ph.D., at (304) 414-6912, or by e-mail at Gehan.M.Elsayed@wv.gov.

Sincerely,

Byrd E. White, III
Secretary of Transportation

BEW:Eh

Attachment

E.E.O./AFFIRMATIVE ACTION EMPLOYER

West Virginia Certified Public Mileage

Mileages as of December 31, 2020

Prepared by West Virginia DOT - Division of Highways

Public Mileage - State

(includes Turnpike, Interstate, US, WV, CO, HARP, State Park/Forest, Fed Aid Non-State(FANS))

State Public Mileage for Certification Subtotal:	**34,980.740**

Public Mileage - Federal

National Forest Service *Jefferson, George Washington, Monongahela National Forests*	663.970
National Park Service *New River Gorge, Bluestone National Scenic River, Gauley River National Recreation Area, Harpe's Ferry National Park*	31.000
US Fish & Wildlife Service *Canaan Valley National Wildlife Refuge, Ohio River Islands Wildlife Refuge, White Sulphur Springs National Fish Hatchery*	10.132
US Corp of Engineers	182.000
Army	8.000
Navy	23.890
Federal Public Mileage for Certification Subtotal:	**918.992**

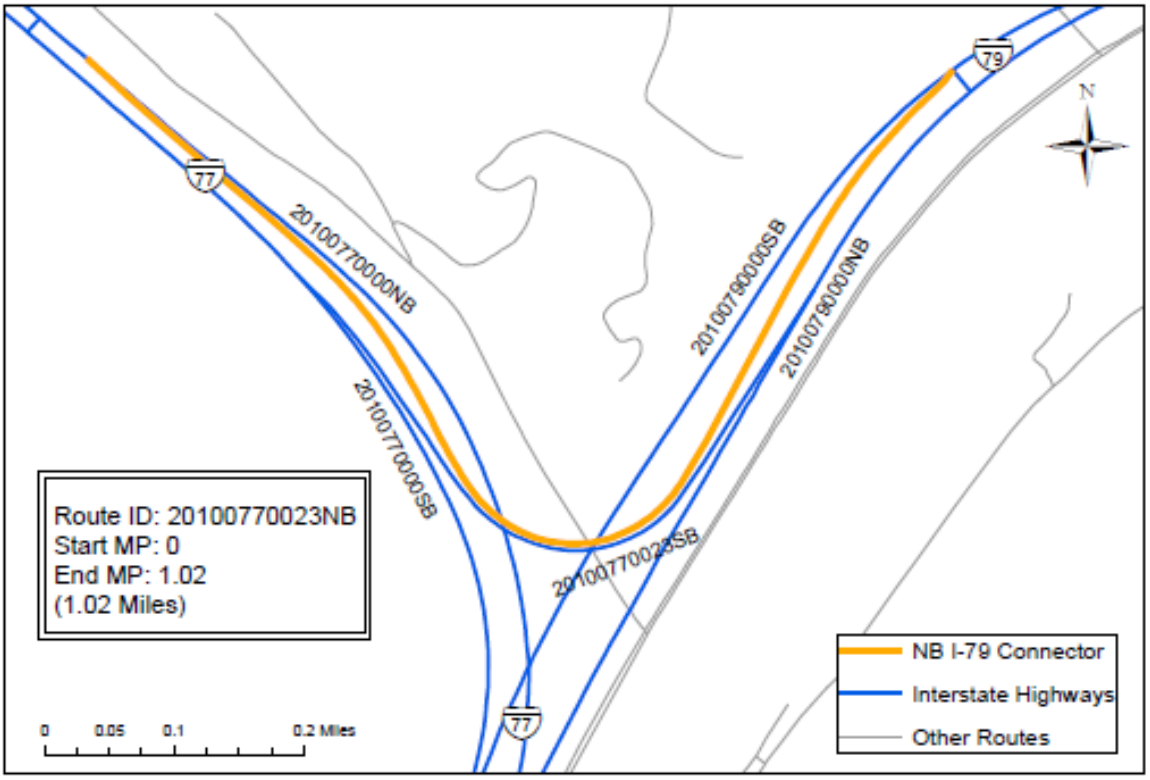
Municipal Public Mileage

(does not include FANS)

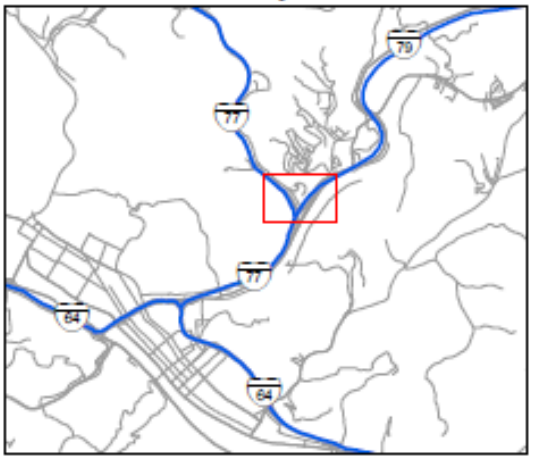
Municipal Public Mileage for Certification Subtotal:	**2,979.167**

TOTAL PUBLIC ROAD MILES FOR CERTIFICATION 38,878.999

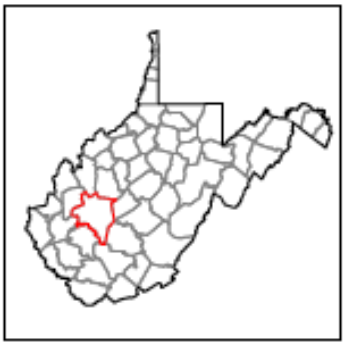
North Bound I-79 Connector
North of Charleston, Kanawha County, West Virginia



Charleston Vicinity



Kanawha County



Jim Justice
Governor of West Virginia

May 28, 2021

Ms. Brigitte A. Mandel
Acting Division Administrator
FHWA West Virginia Division
154 Court Street
Charleston, WV 25301

Dear Ms. Mandel:

I, Jim Justice, Governor of the State of West Virginia, do hereby appoint Byrd E. White, III, Secretary of Transportation, as my designee, where permissible, in matters dealing with the Federal Highway Administration on subject matter governed by 23 CFR 460.3(a) public road mileage.

Sincerely,

Jim Justice
Governor

State Capitol | 1900 Kanawha Blvd., East, Charleston, WV 25305 | (304) 558-2000

C) Data Import Timeline 2020

DataItem	QA/QC performed	Date	Notes	Follow up
Route Dataset	import	2/3/21	no M values	
Route Dataset	import	2/8/21	Second import, M values fixed	possibly issues if any loop has section data
IRI	import	2/9/21	November delivery	
Rutting	import	2/9/21	November delivery	
Faulting	import	2/9/21	November delivery	
Cracking_Percent	import	2/9/21	November delivery	
Surface_Type	import	2/9/21	October delivery	
Surface_Type	import	2/22/21	January delivery for sample section, duplicates	3/9 re-import
F_system	import	3/1/21	beginMP=EndMP, overlaps	3/4 re-import
Urban_Code	import	3/1/21	overlaps	3/4 re-import
Facility_Type	import	3/1/21	overlaps	3/4 re-import
Ownership	import	3/1/21	overlaps	3/4 re-import
Thorough_Lane	import	3/1/21	overlaps	3/4 re-import
NHS	import	3/1/21	Null values	3/4 re-import
Dir_ThroughLane	import	3/1/21	no error	3/4 re-import
F_system	import	3/4/21	re-import	
Urban_Code	import	3/4/21	re-import	
Ownership	import	3/4/21	re-import	
Through_Lanes	import	3/4/21	re-import	
Dir_ThroughLanes	import	3/4/21	re-import	
Facility_Type	import	3/4/21	re-import	
NHS	import	3/4/21	re-import	
Surface_Type	import	3/9/21	test import for sample, 3 (acceptable/same values) updated values	
Cracking_Percent	import	3/9/21	test import for sample, asking update to MB for duplicates	3/19 re-import
Rutting	import	3/9/21	test import for sample, asking update to MB for duplicates	3/19 re-import

Faulting	import	3/9/21	test import for sample	
IRI	import	3/9/21	test import for sample, asking update to MB for duplicates	3/19 re-import
Structure_Type	Copy	3/11/21	Used Copy function from 2019 Structure data	
IRI	import	3/19/21	Delete all IRI and re-import NHS section	
IRI	import	3/19/21	re-import sample section delivered 3/19	
Cracking_Percent	import	3/19/21	Delete all CrackingPercent and re-import NHS section	
Cracking_Percent	import	3/19/21	re-import sample section delivered 3/19	
Rutting	import	3/19/21	Delete all Rutting and re-import NHS section	
Rutting	import	3/19/21	re-import sample section delivered 3/19	
AADT	import	3/19/21		
	create TOPS	3/19/21		
	create geometry	3/19/21		
MetaData	Manual Input	3/19/21	Pavement Reporting Method for Interstate	
	PM2 Validation	3/19/21		
	PRC Report	3/19/21		
Dir_ThroughLanes	import	3/27/21	re-import after deleting 8 section with GIS error	
Urban_Code	import	3/27/21	re-import after deleting 8 section with GIS error	
Ownership	import	3/31/21	re-import after deleting 8 section with GIS error	
F_system	import	4/1/21	re-import after deleting 8 section with GIS error	
Facility_Type	import	4/1/21	re-import after deleting 8 section with GIS error	
Through_Lanes	import	4/1/21	re-import after deleting 8 section with GIS error-2 new no geometry	
AADT_Single_Unit	import	4/1/21		
Pct_Peak_Single	import	4/1/21		
AADT_Combination	import	4/1/21		
Pct_Peak_Combination	import	4/1/21		
K_Factor	import	4/1/21		
Dir_Factor	import	4/1/21		

Future_AADT	import	4/1/21		
Sample section	import	4/8/21		
Facility_Type	import	4/8/21	re-import after fix I-79 connector (code and length in SB)	
	Create TOPS	4/8/21		
	Geometry	4/8/21		
F_System	import	4/8/21	re-import after fix I-79 connector (length in SB)	
	Create TOPS	4/8/21		
	Geometry	4/8/21		
NHS	import	4/12/21	re-import after fix I-79 connector (length in SB)	
Dir_Through_Lanes	import	4/13/21	re-import after fix I-79 connector (length in SB)	
Ownership	import	4/13/21	re-import after fix I-79 connector (length in SB)	
AADT	import	4/13/21	re-import after fix I-79 connector (length in SB)	
Through_Lanes	import	4/13/21	to report only inventory direction (Interstates only)	
	Create TOPS	4/13/21		
	Create Geometry	4/13/21		
	LRS Validation	4/13/21		
	Cross Check Validation	4/13/21		
	Coverage Validation	4/13/21		
	PM2 Validation	4/13/21		
Submit April Data		4/14/21		
Speed Limit	Copy	4/28/21	copy 2019 data to export in sample section 2020 for review	
Access_Control	import	4/28/21		
At_Grade_Other	import	4/28/21		
Counter_Peak_Lanes	import	4/28/21	Overlaps	5/5 re-import
County_Code	import	4/28/21		
Future_Facility	import	4/28/21		
Maintenance_Operation	import	4/28/21	Number converting issues	5/5 re-import
Number_Signals	import	4/28/21		
Pct_Green_Time	import	4/28/21		

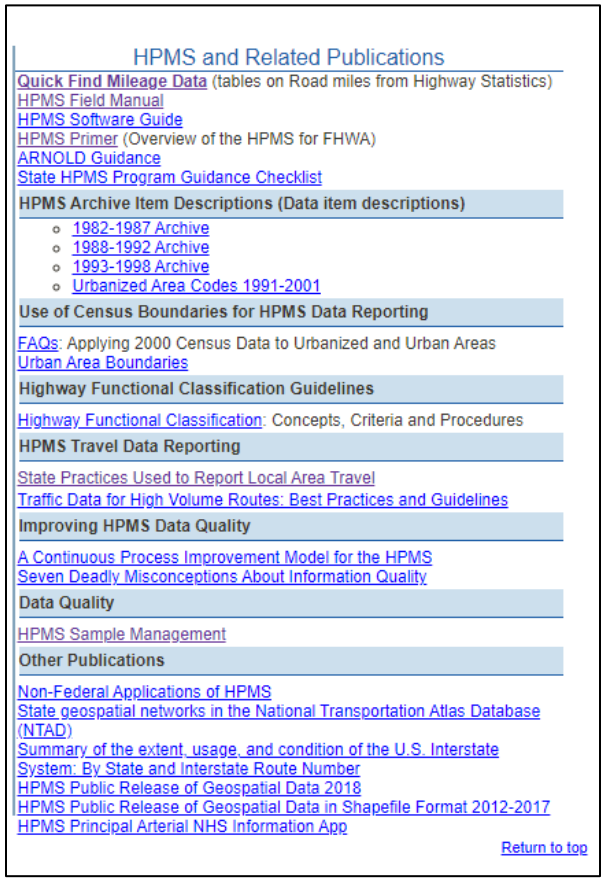
Pct_Pass_Sight	import	4/28/21		
Peak_Lanes	import	4/28/21	Overlaps	5/5 re-import
Peak_Parking	import	4/28/21		
Route_Number	import	4/28/21		
Route_Qualifier	import	4/28/21		
Route_Signing	import	4/28/21		
Stop_Signs	import	4/28/21		
STRAHNET_Type	import	4/28/21		
Terrain_Type	import	4/28/21		
Toll_Charged	import	4/28/21		
Toll_Type	import	4/28/21		
Truck	import	4/28/21		
Turn_Lanes_L	import	4/28/21		
Turn_Lanes _R	import	4/28/21	Formatting Issues	5/5 re-import
Widening_Obstacle	import	4/28/21		
Widening_Potential	import	4/28/21		
Through_Lanes	import	5/5/21	to report only inventory direction (non-Interstates portion)	
Peak_Lanes	import	5/5/21	re-import	
Counter_Peak_Lanes	import	5/5/21	re-import	
Maintenance_Operation	import	5/5/21	re-import	
Estimate	Copy	5/6/21	copy 2019 data	
Signal_Type	Copy	5/6/21	copy 2019 data to export in sample section 2020 for review	
Year_Last_Improv	Copy	5/6/21	copy 2019 data	
Year_Last_Construction	Copy	5/6/21	copy 2019 data	
multiple data items	Manual Input	5/10/21	F_system, Urban_Code, Ownership were updated after validation	
MetaData	import	5/10/21	Pavement part was imported based on updated data by MB	
County_Summary	import	5/10/21	formating, data issues	
State Summary	import	5/17/21		
Urban Summary	import	5/17/21		
Lane_Width	import	5/18/21	use both MBI (2020&2019) and GIS Programming	
Medien_Type	import	5/18/21	use both MBI (2020&2019) and GIS Programming	

Medien_Width	import	5/18/21	use both MBI (2020&2019) and GIS Programming	
Shoulder_Type	import	5/18/21	use both MBI (2020&2019) and GIS Programming	
Shoulder_Width_R	import	5/18/21	use both MBI (2020&2019) and GIS Programming	
Sholuder_Width_L	import	5/18/21	use both MBI (2020&2019) and GIS Programming	
Curves_A through F	import	5/18/21	MBI	
Grades_A through F	import	5/18/21	MBI	
Year_Last_Improv	import	5/19/21	use both GIS programming2019 and district2019, and district2020	
Submit Travel Time Metrics Data				
Mileage related data and summary	multiple import	5/24/21	F_system, Urban_Code, Facility_Type, County summary, State summary	HPMS Calculated Miles: 39162.649
County_Summary		5/28/21	2019 County_Summary was improted	
State_Summary		5/28/21	2019 State_Summary (unpaved/paved mile only) was updated	HPMS Calculated Miles: 38878.899
Submit Public Certified Road Mileage : 38878.899 using 2019 county summary				
Speed Limit	imported	6/4/21	imported new data for 2020, no validation error	
All traffic data items	importes	6/4/21		
Submit June Data		6/15/21		

Reference

FHWA website

- Latest HPMS Publication
  https://www.fhwa.dot.gov/policyinformation/hpms.cfm
    - HPMS Field Manual (with Errata Sheet)
    - HPMS Software Guide
    - Overview
    - ARNOLD Guidance
    - State Checklist
    - Urban Area Boundaries
    - Functional Classification Guidelines
    - Sample Management



HPMS and Related Publications

Quick Find Mileage Data (tables on Road miles from Highway Statistics)
HPMS Field Manual
HPMS Software Guide
HPMS Primer (Overview of the HPMS for FHWA)
ARNOLD Guidance
State HPMS Program Guidance Checklist

HPMS Archive Item Descriptions (Data item descriptions)

- 1982-1987 Archive
- 1988-1992 Archive
- 1993-1998 Archive
- Urbanized Area Codes 1991-2001

Use of Census Boundaries for HPMS Data Reporting

FAQs: Applying 2000 Census Data to Urbanized and Urban Areas
Urban Area Boundaries

Highway Functional Classification Guidelines

Highway Functional Classification: Concepts, Criteria and Procedures

HPMS Travel Data Reporting

State Practices Used to Report Local Area Travel
Traffic Data for High Volume Routes: Best Practices and Guidelines

Improving HPMS Data Quality

A Continuous Process Improvement Model for the HPMS
Seven Deadly Misconceptions About Information Quality

Data Quality

HPMS Sample Management

Other Publications

Non-Federal Applications of HPMS
State geospatial networks in the National Transportation Atlas Database (NTAD)
Summary of the extent, usage, and condition of the U.S. Interstate System: By State and Interstate Route Number
HPMS Public Release of Geospatial Data 2018
HPMS Public Release of Geospatial Data in Shapefile Format 2012-2017
HPMS Principal Arterial NHS Information App

Return to top

- HPMS Frequently Asked Questions
  https://www.fhwa.dot.gov/policyinformation/hpms/faqs.cfm

- Annual Highway Information Seminar (HIS)
  2021 HIS will be virtual using MS Teams.
  https://www.fhwa.dot.gov/policyinformation/his.cfm

- The data share by FHWA in webinar and emails
  (The latest data is saved on
  ftp://gis.transportation.wv.gov/TMA/HPMS2020data_21sub/Reference2020/)
    - HPMS software validations
    - TTM validations (PM3)
    - Federal lands mileages
    - HPMS supplemental guidance (TTM)

WVDOT Data

(The latest data is saved on
ftp://gis.transportation.wv.gov/TMA/HPMS2020data_21sub/Reference2020/)

- Routes dataset
  (Please see https://transportation.wv.gov/SDMT/GIS/Pages/DataCatalog.aspx for Route ID definition)
- Sample data in excel
- Sample data in shapefile

WVDOT HPMS Manuals

- WVDOT HPMS Manual Final 092718
- WVDOT HPMS Supplemental Guide
- HPMS Reference List (this document)