National Performance Management Research Data Set (NPMRDS)
Descriptive Metadata Document
Revision 2.0

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Contents

1 Revision History

Table 1. Document Revision History

Revision	Date	Overview	Modified by
0.1	June 5, 2017	Initial draft	Rick Schuman, Shawn Turner, and Jonathan Corrales
1.0	July 6, 2017	Incorporates review comments	Rick Schuman, Shawn Turner, and Jonathan Corrales
1.1	October 24, 2018	Added information on shapefiles	Jonathan Corrales, Jim Williams, Justin Ferri
1.2	November 19, 2021	Updated information for Appendix A attributes	Quianna Mohondro, Tom Jones
2.0	July 5, 2022	Updated for new contract, including 4 attributes with _unidir suffix to Appendix A	Tom Jones

2 NPMRDS Overview

The National Performance Management Research Data Set (NPMRDS) is a vehicle probe–based travel time data set acquired by the Federal Highway Administration (FHWA) for its use in various performance measurement programs, such as its Freight Performance Measures, Urban Congestion Report, and other programs. The NPMRDS is also provided to state departments of transportation (DOTs) and metropolitan planning organizations (MPOs) for their performance management activities. This document includes a high-level description of the NPMRDS, how it is created and analyzed, and its intended users and uses.

2.1 What is the NPMRDS?

The NPMRDS is an archived speed and travel time data set procured and sponsored by FHWA, including associated location referencing data. NPMRDS covers the National Highway System (NHS) and roadways near 26 key border crossings with Canada (20 crossings) and Mexico (6 crossings) — defined in this document as the NPMRDS Road Network (see Figure 1 below). This document addresses the current NPMRDS dataset, containing data from January 1, 2017 onward[1] supplied by the team consisting of the University of Maryland (UMD) CATT Laboratory, INRIX, 1Spatial Consulting, the Texas A&M Transportation Institute (TTI), and KMJ Consulting — collectively referred to as the UMD team.

2.2 Who can use the NPMRDS?

The NPMRDS can be used by individuals from federal agencies, DOTs, MPOs, and authorized organizations working under contract to these agencies. Each organization must execute a Data Sharing Agreement (DSA) to gain access to the NPMRDS data portal at https://npmrds.ritis.org/. An agency may grant a contractor the right to use the data for work performed for the agency as defined in the data sharing agreement.

2.3 How is the NPMRDS created?

INRIX, a member of the UMD team, is responsible for creating the NPMRDS dataset of calculated speeds and travel times for over 400,000 specific road segments across the NPMRDS Road Network for every 5-minute period of every day. INRIX leverages source data from millions of connected vehicles, trucks, and mobile devices that anonymously supply location and movement data used by INRIX to generate real-time traffic speeds and travel times across the nation's key roadways. INRIX has implemented a special process to create the NPMRDS dataset: a path-processing algorithm described in detail below to meet NPMRDS requirements. The NPMRDS dataset is based exclusively on actual reported vehicle data — no imputation is included. As described below, path processing allows for better use of the underlying source data to maximize road coverage and accuracy of reported speeds and travel times on many non-interstate NHS facilities.

[1] There is a legacy NPMRDS dataset that provided similar data prior to 2017, which is not the subject of this document.

2.4 How is the NPMRDS accessed?

Data is made available to registered users in weekly updates. Access is provided through the Massive Data Downloader (MDD) of the NPMRDS portal at https://npmrds.ritis.org. Individual users from eligible organizations are welcome to register for unique account credentials, but all eligible organizations must fully execute an NPMRDS DSA before accessing the NPMRDS MDD. The NPMRDS MDD will provide several options for users to tailor data extraction to meet their needs and reduce the amount of superfluous data provided. Options include the ability to download data in 5-minute or 15-minute intervals. The 15-minute option provides data to State DOTs and MPOs that directly supports calculating the federally-required congestion and freight measures as defined in subparts E, F, and G of 23 CFR 490.

2.5 What is new in NPMRDS?

Some new features available in NPMRDS starting in 2022 are:

- Adheres to the following monthly data completeness commitments, 5 of which are improved (see details in Section 4.4):
    - Interstate Truck Coverage – Total: 65%
    - Interstate Truck Coverage – Peak (M-F, 6a-8p): 75%
    - Interstate All-Vehicles – Total: 80%
    - Interstate All-Vehicles – Peak: 85%
    - Non-Interstate All Vehicles – Total: 30%
    - Non-Interstate All Vehicles – Peak: 45%
- Provides estimated unidirectional lane count and unidirectional AADT and Truck AADT values

Some features available in NPMRDS since 2017 are:

- Uses path-processing which results in higher data quality and coverage
- Includes a sample size indicator for each vehicle type which specifies the number of reporting devices contributing to the speed and travel time record
- Includes optional epochs filled with nulls for better data management
- Contains TMC Path and HPMS Segment Conflation which results in accurate location referencing
- Includes separate travel times on internal and external TMC paths for greater spatial granularity
- Includes new fields including UTC timestamps and data density for all vehicle types

3 NPMRDS Road Network

Figure 1 shows the nationwide road coverage of the NPMRDS Road Network. Over 400,000 road segments are uniquely defined across this network using TMC location codes. Spanning more than 220,000 centerline miles, the NPMRDS Road Network includes all roads with TMC location codes[2] for the NHS as defined by the states in their most recent annual Highway Performance Management System (HPMS) submittal. The NPMRDS Road Network also includes all TMC-covered roadways within five miles of either side of the border crossings with Canada (20 crossings) and Mexico (six crossings).

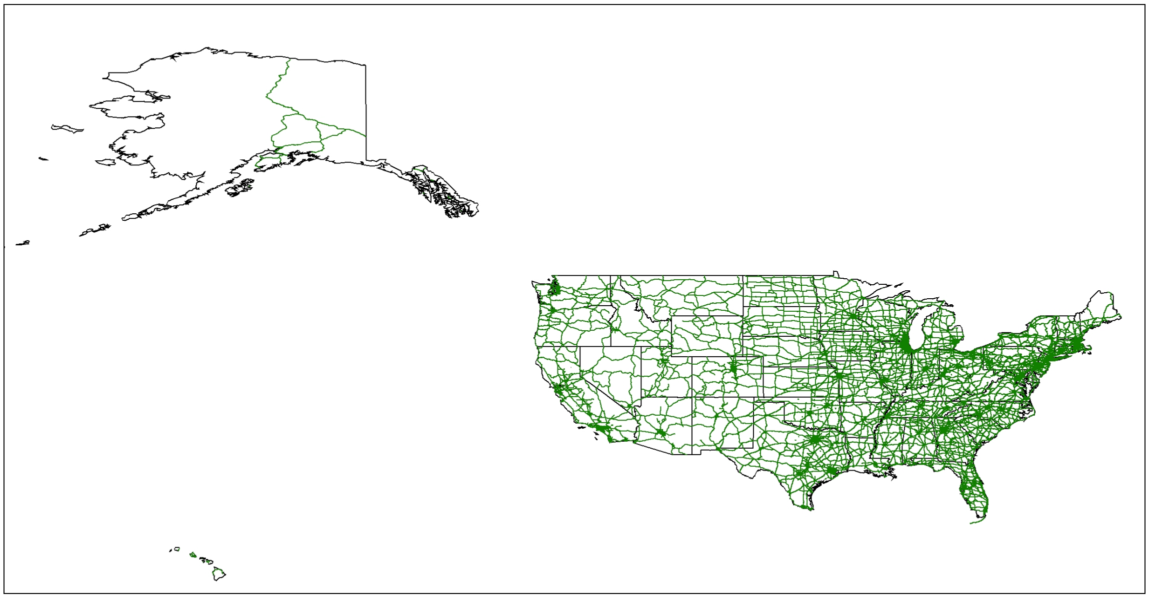

Figure 1.The nationwide road coverage of the NPMRDS road network.

3.1 Location Referencing Metadata and Shapefiles

Appendix A provides the label, name, and description of each attribute provided for every TMC location-referencing segment included in the NPMRDS Road Network. The metadata is a combination of attributes for each specific TMC segment and relevant HPMS data related to route, inventory, network type and traffic volume attributes. It is crucial to note that TMC segment attributes are for a particular travel direction, whereas standard HPMS attributes assigned to that TMC segment (indicated in the Appendix A table) are for *both travel directions*. As HPMS is based on roadway centerlines which are commonly bidirectional, but NPMRDS is based on road segments which are always unidirectional, NPMRDS users should take care to ensure they correctly apply HPMS values in their calculations.

[2] Definitions of roadway networks are constantly changing and evolving. Ideally, 100% of the NHS would be covered by TMC location codes. This is not and has never been the case. As of July 2021, roughly 98% of the NHS road mileage as currently defined in the 2019 HPMS network as NHS have TMC codes in the current version of the TMC table. INRIX has outlined a process to update and maintain the NPMRDS Road Network to improve and maximize coverage in the coming years.

Beginning in 2022, NPMRDS portal users requesting an MDD export have the option of including four additional attributes with names ending with _unidir. These attributes provide estimates of unidirectional values in accordance with FHWA guidelines, and are now available for NPMRDS data since 2017.

Every dataset created by the NPMRDS MDD will include a TMC configuration table including all TMC segments for the selected roadway(s) and the attributes for each listed in Appendix A. Additionally, users have access to shapefiles for all states, the District of Columbia, and Puerto Rico.

3.2 Interpreting TMC Codes

A TMC Code consists of nine characters that define a unique segment and direction of roadway. The TMC Code detailed here provides the following information:

- Example TMC code: 125+05272
- The first character ("1" in this example) refers to the Country Code. The United States has the Country Code "1", Canada has "C", and Mexico has "F".
- The second and third characters ("25" in this example) refer to the Location Table Name. North America is covered with 35 distinct tables. This configuration allows for the final six digits of the TMC Code to be reused, as well as allowing the table coverage to grow in density while still maintaining the geographic integrity of the coding scheme.
- The fourth character ("+" in this example) identifies both the direction of travel and whether the TMC segment type is "internal" or "external." The meanings of the possible values ("+," "-," "P," and "N") are described in the following section.
- The fifth through ninth characters ("05272" in this example) refer to the specific Location ID in the Location Table that is tied to a specific interchange, intersection, boundary, or decision point. In many cases four distinct TMC segments in close proximity on the road network share this same five-digit Location ID, with each preceded by either "+," "-," "P," or "N."

3.3 Internal and External TMC segments

TMC location coding describes two segment types for nearly every Location ID—internal and external. The internal segment refers to the area just past the decision point, or intersection, at which the Location ID was placed (for example, a freeway off ramp), while the external segment refers to the section of the road leading up the decision point. To maximize possible data precision, speed and travel time data is computed and provided distinctly for both internal segment and external segment — i.e., data is reported separately for the two segments. As traffic congestion is often caused by traffic exiting at a decision point, the external and internal segments corresponding to that Location ID may have substantially different speed profiles.

Figure 2 illustrates the difference between internal (labeled with 'P' or 'N') and external (labeled with a '+' or '-') TMC segments.

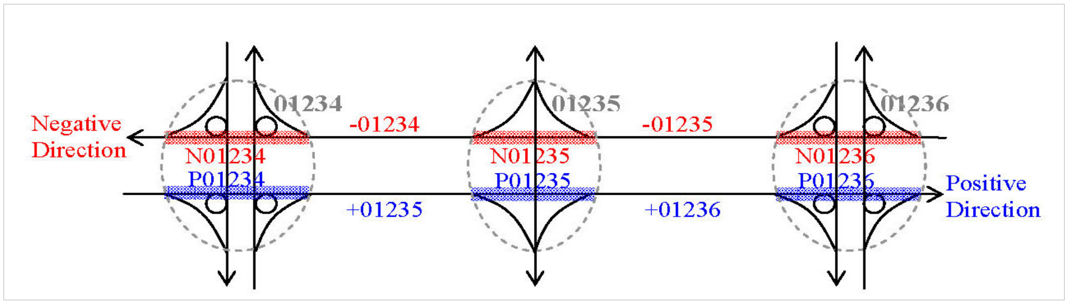

Figure 2. TMC segments with internal and external segments.

While there are several situations where this does not apply (for instance, inner and outer loop road geometry), the typical convention for identifying the travel direction for the segment and whether the segment is internal or external is:

- "P" = Northbound or Westbound, internal segments
- "N" = Southbound or Eastbound, internal segments
- "+" = Northbound or Westbound, external segments
- "-" = Southbound or Eastbound, external segments

While typical, not every five-digit Location ID has both an internal and an external TMC segment associated with it. Two external TMC segments can be adjacent to each other. This is common at state or county borders. Since a border is essentially zero length, there is no internal segment at the border, but rather a transition between two external segments in each direction. Other atypical TMC configurations include smaller roads which cross at a point and therefore have only "external" TMC segments, complex interchanges where "internal" TMC segments overlap, and at highway merge points where there may be two sets of TMC segments (one for each highway) over the same stretch of road.

4 NPMRDS Data

This section describes the speed and travel time datasets in detail, including the fields and format of the fields available in the dataset, how it is created, sources of the probe data that are used to create it, and specific commitments related to availability, completeness, and quality.

4.1 NPMRDS Dataset Format

The data fields available for download from the NPMRDS MDD are shown in Table 1. To reduce the size of a given dataset, users can choose to exclude some fields from their download.

Data records are available for every TMC and every 5-minute epoch where one or more reporting vehicles has provided valid data. In cases where the only reporting vehicles are trucks, all vehicle and freight vehicle fields have data while the passenger vehicle fields contain null. In cases where the only reporting vehicles are non-trucks, all vehicle and passenger vehicle fields have data while the freight vehicle fields contain null.

Table 2. Data Fields Available for NPMRDS

Field Name	Type	Example	Data Field Description
datasource	Text	NPMRDS (Passenger vehicles)	The data set this record comes from. This field is included only when choosing to merge data sets into a single CSV file.
tmc_code	Text	107-12541	The unique 9-digit value identifying the TMC segment.
measurement_tstamp	Date	5/1/2017 12:00:00 AM	Date of data record, in “MM/DD/YY HH:NN:SS A” format. The date is in the local time of the TMC segment to which the record pertains.
speed	Number	40	Integer speed in mph, the harmonic mean speed for all reporting vehicles on the segment.
average_speed	Number	45	The historical average speed for the roadway segment for that hour of the day and day of the week in miles per hour.
reference_speed	Number	50	The calculated "free flow" mean speed for the roadway segment in miles per hour. This attribute is calculated based upon the 95th-percentile of observed speeds on that segment between 10pm and 5am, which establishes a reliable proxy for the speed of traffic at free flow for that segment.
travel_time_minutes	Number	3	Travel time recorded in minutes as an integer. It is the ratio between the segment length and the harmonic average speed for all reporting vehicles on the segment.
data_density	Text	C	Data density indicator, where: A = 1 to 4 reporting vehicles B = 5 to 9 reporting vehicles C = 10 or more reporting vehicles

NPMRDS users have the option to request data in 15-minute increments in addition to the 5-minute default option. When the 15-minute option is selected, three 5-minute epochs are aggregated. In these cases, the following happens:

- UTC Timestamp: will indicate the beginning of the 15-minute interval
- Epoch: Epochs will be synchronized with the UTC Timestamp, thus will skip forward in increments of three in any downloaded dataset
- Speed and Travel Time fields: Average travel times (computed using arithmetic mean for 5-minute bins) will be calculated using harmonic averages for 15-minute bin
- Data Density fields: for each field, the minimum possible reporting vehicles in each 5-minute epoch is added together and the total data density Indicator over the 15-minute increment is the appropriate indicator value. Examples include:
    - 5-minute increments with values of A, A, A = A (3 reporting vehicles is the lowest possible total)

- 5-minute increments with values of A, A, B = B (7 reporting vehicles is the lowest possible total)
- 5-minute increments with values of A, B, B = C (11 reporting vehicles is the lowest possible total)

4.2 NPMRDS Dataset Sources

Providing datasets required for NPMRDS at high quality with maximum spatial and temporal completeness requires GPS data on an enormous scale. As the first company in the US to use GPS data to generate speed and travel time data at scale in real-time using GPS, INRIX has built on that foundation to establish the most diverse and robust GPS source data portfolio in the industry. Initial agreements with "source data" providers were executed in 2006, some of which are still in effect.

From inception, INRIX has intentionally established a 'network' of GPS data suppliers. This approach continues for three primary reasons: (1) reduces the risk of a potentially catastrophic impact of losing access to a single data supplier, (2) allows for the mix of source data to evolve with the overall market, from connected trucks, to adding mobile app/device data, to the emergence of connected cars, and (3) leads to the most cost-effective, complete data portfolio, allowing us to pass efficiencies on to our customers. The integration of a variety of sources is key to data quality, as no single data source type can provide the accuracy, driving profile, coverage, or scalability that is required to consistently cover the NPMRDS road network across hours/days of the week for passenger and truck datasets.

The continued increase in INRIX's GPS source data has allowed the contract team to increase data completeness commitments beginning in 2022 that were previously in place from 2017 through 2021.

Best efforts have been and continue to be made to identify 'trucks' — ideally larger freight-carrying vehicles — to then allow the three different datasets to be generated: 'all vehicles', 'trucks', and 'passenger' (which include school buses, other passenger buses, and pickup trucks; generally all vehicles not defined as 'trucks').

4.3 NPMRDS Dataset Processing

The path-processing algorithm, created by INRIX, is used to meet NPMRDS requirements. There are three primary reasons path-processing is the preferred approach for this project and for traffic data processing in general:

1. Ensures all reporting probes contribute equally to the dataset:
    - INRIX receives data from vehicles and devices with variable reporting frequencies. Some data is provided to INRIX at 1-second update rates, while other sources can have as much as 3 minutes between data reports. Most data are provided to INRIX by sources with temporal granularity between 15 seconds and one minute.

    - With variable update rates, point processing weights reporting devices significantly differently: high reporting rate sources influence results more than lower reporting rate vehicles (e.g. in point processing, 1-second refresh rate data would provide 60 reports for every one report for 1-minute refresh rate data).
    - Further, slow vehicles provide more data points on a segment than faster moving vehicles as they simply spend more time on a segment, skewing results to the slow side in point processing.
    - Path Processing normalizes the incoming data by point-pairing across a consistent period for all reporting devices and treats each reporting device's path as equal to other reporting devices regardless of reporting rate or relative speed.
2. Improves data accuracy: space mean speed avoids the inherent instability possible in instantaneous speed reports, especially on arterials.
3. Increases coverage: allows for reporting of data on short segments a reporting device traverses even if an instantaneous speed report is not created on that segment, increasing coverage while still maintaining accuracy.

The steps below summarize key steps in INRIX's approach to applying path-processing specifically to generate NPMRDS datasets. Also included are descriptions of filtering processes applied to improve data quality by identifying and filtering out "noisy" source data and results.

- <u>Step 1: Determine Snapped Points on NPMRDS Roadway Coverage</u>
    - Step 1a: For each reported point, "snap" to a segment, based on the latitude and longitude location of the point, adding a TMC ID to latitude and longitude, vehicle ID and timestamp ("Snapped Points"). Also, determine an offset distance from the end of the segment to be used in future calculations.
    - Filters: De-duplicate questionable Snapped Points and eliminate non-NPMRDS road coverage.
        - If there are duplicate points for the same location and time, eliminate all but one point.
        - If the same reporting device has multiple snapped points with the same timestamp, but with different latitude and longitudes, eliminate all points.
        - If the TMC ID is not associated with the NPMRDS Road Network, eliminate all points.
- <u>Step 2: Log Average Travel Speed to Each TMC Segment for each Reporting Vehicle and Device</u>
    - Step 2a: For a snapped point, find the most recent previous snapped point from the reporting device.
    - Step 2b: Determine if the previous snapped point is within 5 minutes. If so, continue; if not, stop.
    - Step 2c: If the current and previous snapped points are on the same TMC segment, continue "walking" the snapped points from the vehicle until the last point from this vehicle on the TMC segment is found. Take the first and last snapped points from the vehicle on the TMC segment and compute the Average Travel Speed by determining the distance traveled between points and the time elapsed between reports. For the TMC ID, log the Average Travel Speed and the minute timestamp (the minute timestamp is

logged as the minute when the reporting device would be at the midpoint of the TMC segment given the Average Travel Speed).

  - Step 2d: If the current and previous snapped points are not on the same TMC segment, determine if there are any TMC segments, which were traversed between the two TMCs. If so, compute the Average Travel Speed by determining the total distance traveled across all segments during the time elapsed between reports. For each TMC segment traversed, log the Average Travel Speed (same speed for each segment) and the minute timestamp (the minute timestamp is logged as the minute when the reporting device would be at the midpoint of the TMC segment given the Average Travel Speed).
  - Filters: Eliminate erroneous or questionable Average Travel Speeds.
    - If the Average Travel Speed is negative, eliminate it as bad data.
    - If the Average Travel Speed is less than 3 MPH, eliminate it as stopped or non-motorized data.[3]
    - If the Average Travel Speed is greater than 100 MPH, eliminated it as bad data.
- Step 3: Establish an Average Travel Time for an Epoch by Vehicle Type
  - Step 3a: To determine an Average Travel Time for all Vehicles, calculate the Epoch harmonic Average Travel Speed for all logged Average Travel Speed values for all 5-minutes of the Epoch, then compute the Epoch Average Travel Time based on the segment length.
  - Step 3b: To determine an Average Travel Time for Trucks, repeat Step 3a, but only for logged Average Travel Speeds from reporting devices associated with trucks.
  - Step 3c: To determine an Average Travel Time for Passenger Vehicles, repeat Step 3a, but only for logged Average Travel Speeds from reporting devices associated with passenger vehicles.

4.4 NPMRDS Data Availability and Completeness

Speed and Travel Time datasets will become available on a weekly basis via the NPMRDS MDD. Updated versions of location reference data will be made available when TMCs and/or HPMS attributes are updated.

In an effort to provide the maximum amount of high-quality data, beginning in 2022 INRIX has committed to improved data completeness targets as follows (defined as cumulative miles with travel time data over the entire month, measured nationwide):

- Interstate Truck Coverage – Total: 65%
  (improved in 2022 from 60%)
- Interstate Truck Coverage – Peak (M-F, 6a-8p): 75%
  (improved in 2022 from 70%)

[3] Applying this filter eliminates artificially low speeds from being generated erroneously; this filter could also in some cases cause severe congestion to be underreported, but experience suggests that erroneous slow speed reports would occur far more often without this filter than severe congestion would be underreported applying this filter.

- Interstate All-Vehicles – Total: 80%
  (improved in 2022 from 75%)
- Interstate All-Vehicles – Peak: 85%
- Non-Interstate All Vehicles – Total: 30%
  (improved in 2022 from 25%)
- Non-Interstate All Vehicles – Peak: 45%
  (improved in 2022 from 35%)

4.5 NPMRDS Data Quality and Validation

The UMD team commits to meet the following data accuracy specifications during the project:

For truck and all vehicle datasets:

- In each of the speed ranges of 0-30, 30-45, 45-60, and over 60 MPH (as determined by ground truth data)
- Interstate data accurate to within 7 MPH Average Absolute Speed Error (AASE) and 5 MPH Speed Error Bias (SEB)
- Non-Interstate and Border data accurate to within 10 MPH AASE and 5 MPH SEB

In 2008, UMD defined and has since been executing the nation's first and largest probe vehicle data validation program as part of the I-95 Corridor Coalition's Vehicle Probe Project (VPP), leveraging portable Bluetooth and Wi-Fi readers for ground truth data collection and creating purpose-built software for analysis and reporting. VPP is a multi-state traffic monitoring system based on "infrastructureless" vehicle probe technology. The first of its kind in terms of geographic scope, procurement methodology, and technology, this multi-year project has influenced a major industry shift from sensor-based detection to outsourced traffic data. UMD has published over 50 validation reports, primarily focused on determining speed error and speed bias of the licensed real-time speed and travel time data, the same metrics to be measured in NPMRDS.

UMD leverages the same staff, approach, and software to provide a robust NPMRDS data validation program that exceeds the Solicitation's basic requirements. This approach has several advantages that will improve the results, minimize associated costs, and reduce overall risk in establishing a first-class validation.

5 Shapefiles

5.1 NULL in Shape Files

There are inconsistencies between GIS software providers concerning null values and zeros. GDAL/OGR (open source library for reading and writing shapefiles) supports null values; however, Esri software will represent those nulls as zeros. The 2017 NPMRDS shapefile was compiled using Esri ArcGIS. Subsequent shapefiles have been compiled using QGIS. **For NPMRDS shapefiles, all zero values in the following columns within 2018 and later NPMRDS shapefiles should be considered NULL:**

- F_System
- urban_code
- Facility_Type
- Structure_Type
- Through_Lanes
- Route_Number
- Route_Signing
- Route_Qualifier

5.2 File Composition

Shapefiles published since 2018 include the following constituent files:
Mandatory files

- .shp — shape format; the feature geometry itself

- .shx — shape index format; a positional index of the feature geometry to allow seeking forwards and backwards quickly

- .dbf — attribute format; columnar attributes for each shape, in dBase IV format

Other files

- prj — projection format; the coordinate system and projection information, a plain text file describing the projection using well-known text format

The following were constituent files included with the 2017 shape files:

- sbn and.sbx — a spatial index of the features

- cpg — used to specify the code page (only for .dbf) for identifying the character encoding to be used

The spatial index files, in particular, are specific to Esri Software.

5.3 Online references

https://en.wikipedia.org/wiki/Shapefile
https://www.esri.com/en-us/arcgis/about-arcgis/overview
https://www.qgis.org/en/site/

6 More Information

For additional information or technical assistance regarding the NPMRDS, please contact us at npmrds@ritis.org.

7 Appendix A – NPMRDS Road Network Configuration Attributes

CAUTION: NPMRDS users should note that TMC segment attributes are for a particular travel direction, whereas the standard HPMS attributes assigned to that TMC segment (indicated in the Appendix A table) are for both travel directions.

Table 3. NPMRDS Road Network Configuration Attributes Table

Attribute Label	Attribute Name	Attribute Description
Tmc	TMC Path Identifier	The unique 9-digit value identifying the TMC Segment.
TmcType	Type of TMC Code	"P1" is the typical TMC Code. "P3" indicates national, state, and county boundaries, rest areas, toll plazas, major bridges, etc. "P4" is for ramps.
RoadNumber	Common name or route number	The roadway number, for TMC Segments on numbered roadways.
RoadName	Associated Road Name	Name of Roadway according to source data.
Intersection	Associated Street	The cross street and/or interchange associated with the internal segment of 5-digit Location ID.
TmcLinear	Associated Linear TMC	A reference to the "Linear TMC" that includes the TMC Segment. Typically, several TMC Segments are part of a Linear TMC, which usually represents a road corridor through a single county. The purpose of this column is to provide assistance for filtering and locating TMC Segments and simplifying the process of linking consecutive TMC Segments. Note that care must be taken when linking consecutive TMC Segments in the exception cases where multiple TMC Codes refer to the same stretch of road.
Country	Country	The country in which the TMC Segment is located.
State	State	The postal abbreviation of the state to which the TMC Segment is assigned.
Road_order	Numerical road order of TMC code	Numerical ordering of the TMC segments in relation to other segments in the same Linear TMC or collection of Linear TMCs comprising a single road. This column is generated internally by CATT Lab to enable partial road selection.
Timezone_name	Timezone name	The database name of the time zone where the majority of segment length lies. This is calculated internally by the CATT Lab.
County	County	The county to which the TMC Segment is assigned.
Zip	Postal Code	The 5-digit zip code to which the TMC Segment is assigned.
Direction	Direction	The overall direction of the roadway.
StartLat	Beginning Latitude	The latitude of the beginning of the TMC Segment.
Type	Point Location Type	The TMC location characterized by the road class, type and subtype using ISO 14819-3 standard definitions.

Attribute Label	Attribute Name	Attribute Description
Isprimary	Denotation of overlapping segments	A value of 0 indicates overlapping TMCs.
StartLong	Beginning Longitude	The longitude of the beginning of the TMC Segment.
EndLat	Ending Latitude	The latitude of the end of the TMC Segment.
EndLong	Ending Longitude	The longitude of the end of the TMC Segment.
Miles	Length of Segment	The length of the TMC Segment along the road in miles.
FRC	Road class (TMC FRC)	The class or group of roads to which the road belongs (assigned by TMC Consortium).
Border_Set	Border Set	A code to indicate whether the TMC path is within a 5-mile radius of the FHWA-designated US-Canada and US-Mexico border crossings. (Y=Yes, N=No)
Active_start_date	TMC Code Start Date	The date that an assigned TMC segment became active and began reporting data.
Active_end_date	TMC Code End Date	Where applicable, the date an assigned TMC segment was retired and stopped reporting data.

The following attributes in this table are being integrated from FHWA's Highway Performance Monitoring System (HPMS). The HPMS is currently based on roadway centerlines and therefore the integrated standard HPMS attributes represent **BOTH TRAVEL DIRECTIONS**, whereas each TMC segment represents a particular direction of travel. NPMRDS users may need to adjust some HPMS centerline-based attributes (such as AADT and number of through lanes) accordingly for certain applications.

HPMS attributes and codes are defined in detail in Chapter 4 of the December 2016 *HPMS Field Manual*, https://www.fhwa.dot.gov/policyinformation/hpms/fieldmanual/.

We also provide four attributes, with a _unidir suffix in its name, reflecting estimated unidirectional values for thrulanes, aadt, aadt_singl, and aadt_combi.

F_System	Functional System (HPMS Attribute 1)	The FHWA approved Functional Classification System code. If multiple HPMS segments with different attribute values are assigned to a single TMC path, the value for the lowest functional class (maximum code value) is assigned. Attribute Value: Description 1: Interstate 2: Principal Arterial – Other Freeways and Expressways 3: Principal Arterial – Other 4: Minor Arterial 5: Major Collector 6: Minor Collector 7: Local
Urban_Code	Urban Code (HPMS Attribute 2)	The U.S. Census Urban Area Code. If multiple HPMS segments with different attribute values are assigned to a single TMC path, the predominant value by length is assigned. Attribute Value: Description <99998: Refer to U.S. Census Urban Area Code 99998: Small Urban Sections 99999: Rural Area Sections

Attribute Label	Attribute Name	Attribute Description
FacilType	Facility Type (HPMS Attribute 3)	The operational characteristic of the roadway. If multiple HPMS segments with different attribute values are assigned to a single TMC path, the predominant value by length is assigned. <u>Attribute Value: Description</u> 1: One-Way Roadway 2: Two-Way Roadway 4: Ramp 5: Non Mainlane 6: Non Inventory Direction 7: Planned/Unbuilt
StrucType	Structure Type (HPMS Attribute 4)	Code for roadway section that is a bridge, tunnel or causeway. If multiple HPMS segments with different attribute values are assigned to a single TMC path, the predominant value by length is assigned. <u>Attribute Value: Description</u> 1: Bridge 2: Tunnel 3: Causeway
ThruLanes	Through Lanes (HPMS Attribute 7)	The number of lanes designated for through-traffic in BOTH TRAVEL DIRECTIONS. If multiple HPMS segments with different attribute values are assigned to a single TMC path, the predominant value by length is assigned.
Route_Numb	Route Number (HPMS Attribute 17)	The signed route number. If multiple HPMS segments with different attribute values are assigned to a single TMC path, the predominant value by length is assigned.
Route_Sign	Route Signing (HPMS Attribute 18)	Code for the type of route signing. If multiple HPMS segments with different attribute values are assigned to a single TMC path, the predominant value by length is assigned. <u>Attribute Value: Description</u> 1: Not Signed 2: Interstate 3: U.S. 4: State 5: Off-Interstate Business Marker 6: County 7: Township 8: Municipal 9: Parkway Marker or Forest Route Marker 10: None of the Above

Attribute Label	Attribute Name	Attribute Description
Route_Qual	Route Qualifier (HPMS Attribute 19)	Code for the route signing descriptive qualifier. If multiple HPMS segments with different attribute values are assigned to a single TMC path, the predominant value by length is assigned. <u>Attribute Value: Description</u> 1: No qualifier or Not Signed 2: Alternate 3: Business Route 4: Bypass Business 5: Spur 6: Loop 7: Proposed 8: Temporary 9: Truck Route 10: None of the Above
AltRteName	Alternative Route Name (HPMS Attribute 20)	A familiar, non-numeric designation for a route. If multiple HPMS segments with different attribute values are assigned to a single TMC path, the predominant value by length is assigned.
AADT	Annual Average Daily Traffic (HPMS Attribute 21)	Annual Average Daily Traffic. If multiple HPMS segments with different attribute values are assigned to a single TMC path, the length-weighted average is assigned. See also the AADT_unidir attribute.
AADT_Singl	Single-Unit Truck & Bus AADT (HPMS Attribute 22)	Annual Average Daily Traffic for single-unit trucks and buses. If multiple HPMS segments with different attribute values are assigned to a single TMC path, the length-weighted average is assigned. See also the AADT_Singl_unidir attribute.
AADT_Combi	Combination Truck AADT (HPMS Attribute 24)	Annual Average Daily Traffic for Combination Trucks. If multiple HPMS segments with different attribute values are assigned to a single TMC path, the length-weighted average is assigned. See also the AADT_Combi_unidir attribute.

Attribute Label	Attribute Name	Attribute Description
NHS	National Highway System (HPMS Attribute 64)	Code for a roadway that is a component of the National Highway System (NHS). If multiple HPMS segments with different attribute values are assigned to a single TMC path, the predominant "on-NHS" value (i.e., 1 through 9) by length is assigned. Attribute Value: Description 1: Non Connector NHS 2: Major Airport 3: Major Port Facility 4: Major Amtrak Station 5: Major Rail/Truck Terminal 6: Major Inter City Bus Terminal 7: Major Public Transportation or Multi-Modal Passenger Terminal 8: Major Pipeline Terminal 9: Major Ferry Terminal
NHS_Pct	Percent of TMC Path on NHS	The percentage of the TMC path length that is designated as NHS by HPMS (applicable when multiple HPMS segments assigned to a single TMC path). This attribute value is calculated by the NPMRDS Development Team and is not an HPMS attribute.
Strhnt_Typ	Strategic Highway Network (HPMS Attribute 65)	Code for a roadway section that is a component of the Strategic Highway Network (STRAHNET). If multiple HPMS segments with different attribute values are assigned to a single TMC path, the predominant value by length is assigned. Attribute Value: Description 1: Regular STRAHNET 2: Connector
Strhnt_Pct	Percent of TMC Path on STRAHNET	The percentage of the TMC path length that is designated as STRAHNET by HPMS (applicable when multiple HPMS segments assigned to a single TMC path). This attribute value is calculated by the NPMRDS Development Team and is not an HPMS attribute.
Truck	National Truck Network (HPMS Attribute 66)	Code for a roadway section that is a component of the National Truck Network (NTN) as defined by 23 CFR 658. If multiple HPMS segments with different attribute values are assigned to a single TMC path, the predominant value by length is assigned. Attribute Value: Description 1: Section is on the National Network (NN) 2: Other State-designated truck route (optional)

Attribute Label	Attribute Name	Attribute Description
ThruLanes_unidir	Estimated Unidirectional Thru Lanes	An estimate of the number of thru lanes in each direction based on the June 2018 *National Performance Measures for Congestion, Reliability, and Freight, and CMAQ Traffic Congestion*. For TMCs with a FacilType value of 2 or 6, this value is half of the thrulanes value—and when thrulanes is an odd number, thrulanes_unidir is a non-integer value, such as 1.5. For TMCs with a FacilType value of 1, 3, 4, or 5, this value is the same as the thrulanes value.
AADT_unidir	Estimated Unidirectional Average Annual Daily Traffic	An estimate of the unidirectional AADT based on the HPMS conflated attribute of AADT. For TMCs with a FacilType value of 2 or 6, this value is half of the aadt value, rounded up to the nearest integer. For TMCs with a FacilType value of 1, 3, 4, or 5, this value is the same as the aadt value.
AADT_Singl_unidir	Estimated Unidirectional Single-Unit Truck & Bus AADT	An estimate of the unidirectional Single-Unit Truck & Bus AADT based on the HPMS conflated attribute of AADT. For TMCs with a FacilType value of 2 or 6, this value is half of the aadt_singl value, rounded up to the nearest integer. For TMCs with a FacilType value of 1, 3, 4, or 5, this value is the same as the aadt_singl value.
AADT_Combi_unidir	Estimated Unidirectional Combination Truck AADT	An estimate of the unidirectional Combination Truck AADT based on the HPMS conflated attribute of AADT. For TMCs with a FacilType value of 2 or 6, this value is half of the aadt_combi value, rounded up to the nearest integer. For TMCs with a FacilType value of 1, 3, 4, or 5, this value is the same as the aadt_combi value.

8 Appendix B – Holiday Types

Table 4. Holiday Types

HolidayTypeId	Holiday
1	New Year's Day
1	Christmas Day
1	Christmas Eve
1	Independence Day
1	Labor Day
1	Memorial Day
1	Thanksgiving Day
1	Thanksgiving Friday
2	Last Week of December, Weekday
2	Dr. Martin Luther King, Jr. Day
2	Friday before Independence Day
2	President's Day
2	Veteran's Day
3	Friday before Labor Day
3	Friday before Memorial Day
3	Friday before MLK
3	Friday before President's Day
3	Special Friday before Christmas Eve
3	Special Friday before Monday 7 and 4
3	Special Friday before Sunday 7 and 4
3	Special Friday before Xmas Eve Saturday
3	Special Friday before Xmas Weekend
3	Special Thursday before Friday 7 and 4
3	Special weekday before Christmas Eve
3	Special weekday before Independence Day
3	Thanksgiving Wednesday