

- Lesson 1
  - Overview of the HPMS Data Model
- Lesson 2
  - Dataset Requirements and Specifications
- Lesson 3
  - Geospatial Component of the Data Model

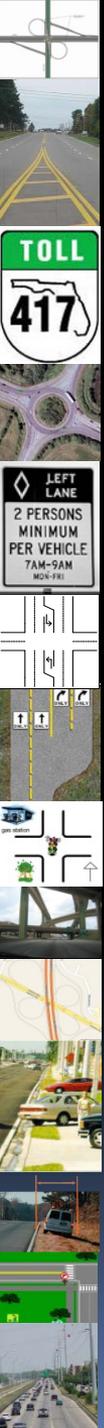
## Module II

# DATA MODEL AND REQUIRED DATASETS

# Learning Outcomes for Module II

- You will be able to:
  - Describe the structure of the HPMS Data Model
  - Identify the various HPMS datasets
  - Explain how geo-referencing is performed in HPMS

# Lesson 1

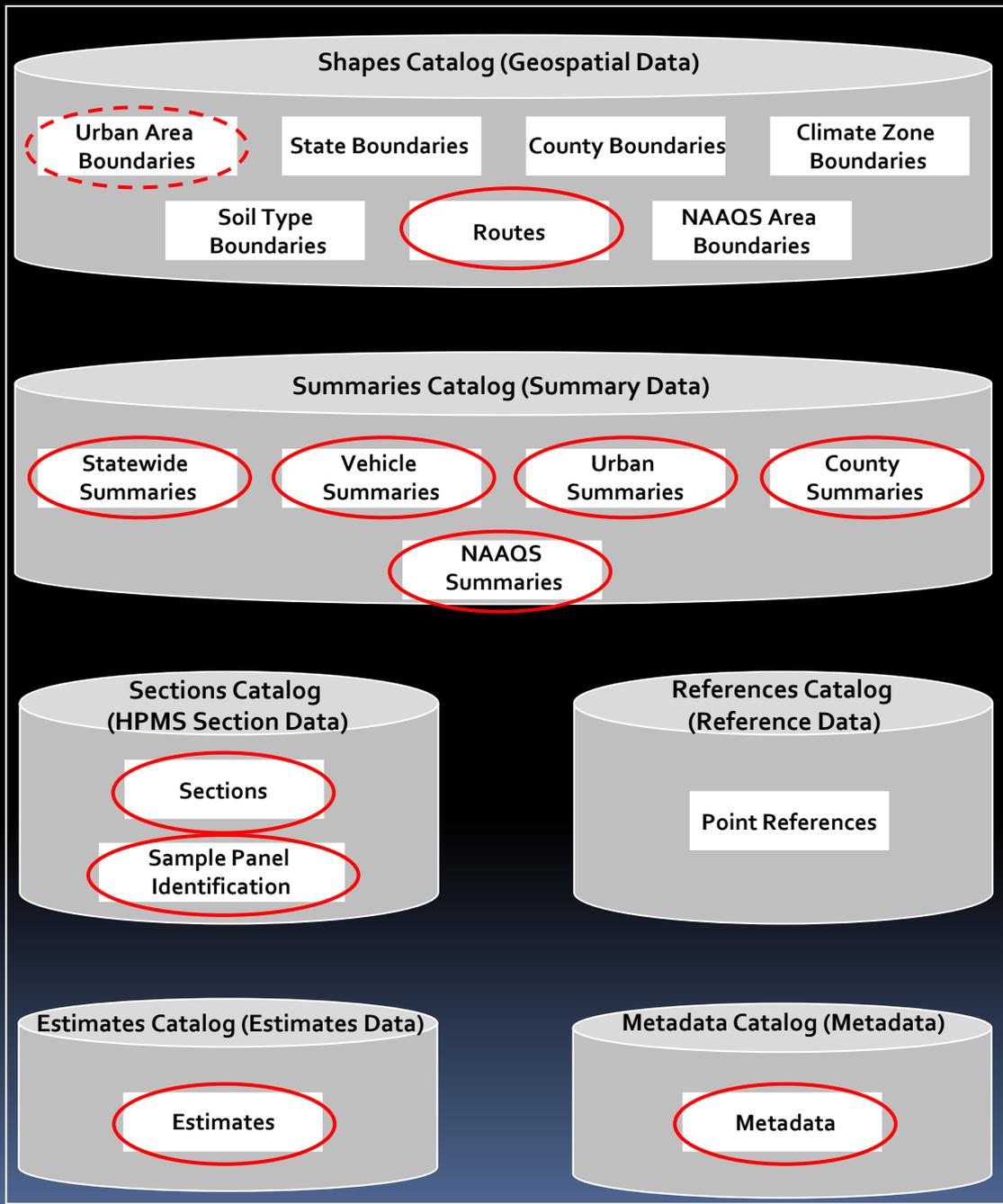
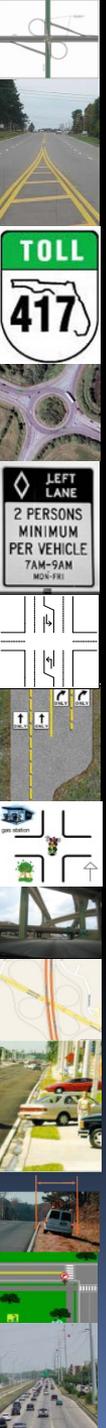


## OVERVIEW OF THE HPMS DATA MODEL

# Lesson 1 Introduction

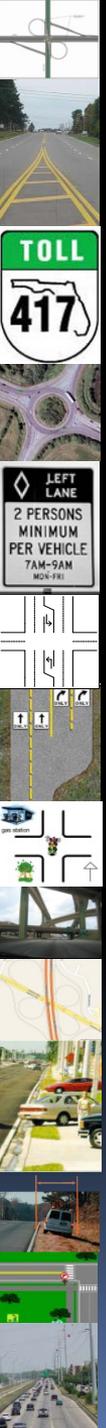
- HPMS Data Model
  - Product of the 2010+ Reassessment
  - Transitional implementation in 2010
  - Full implementation in 2011
- Model improves HPMS program workflow
- GIS-enabled model enhances data management and analysis capabilities

# HPMS Data Model Structure



# Benefits of the Data Model

- Spatially enables HPMS data for analysis purposes
- Exploits spatial relationships that exist between data elements
- Achieves flexibility in terms of data management
- Allows for the incorporation of external data



# Purpose of Catalogs

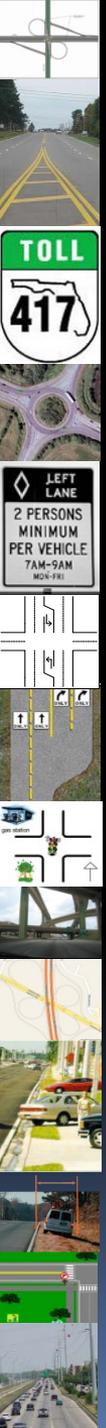
- Shapes Catalog
  - Identifies various geospatial datasets
- Sections Catalog
  - Identifies roadway attribute data
  - Identifies sample panel location information
- Summaries Catalog
  - Identifies area-wide data for lower functional system roadways

# Purpose of Catalogs, cont.

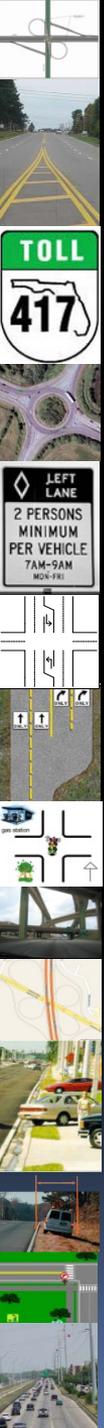
- References Catalog
  - Identifies grade-separated interchange data
- Estimates Catalog
  - Identifies estimates for pavement-related data attributes
- Metadata Catalog
  - Identifies supplemental information for traffic, pavement, and ramp data

# Lesson 1 Summary

- HPMS Data Model consists of 6 catalogs and 17 datasets
- The States are required to develop and submit datasets to FHWA annually
- GIS component adds enhanced data management/analysis capabilities

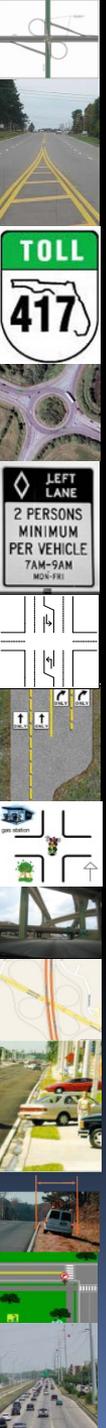


# Lesson 1



Questions???

# Lesson 2



## DATASET REQUIREMENTS AND SPECIFICATIONS

# Lesson 2 Introduction

- States are required to develop/submit at most 11 datasets annually
  - Geospatial (2)
  - Non-Geospatial (9)
- Datasets have specific requirements
  - File Structure
  - File Format
  - Field Names
- Datasets convey roadway and system-wide attribute information

# Datasets

- Stored as tables in FHWA's database
- Contain various fields of information
- Descriptors:
  - Field Constraints
  - Field Names ("English" and database names)
  - Data Types
  - Field Descriptions
- States are required to use field names specified by FHWA (i.e., database names)





# State Boundaries Dataset

Field Name	Description
State Code	State FIPS code
State Abbreviation	State name abbreviation
State Name	State name
Shape	Polygon feature

- Polygon feature dataset
- Depicts boundaries for each State
- Maintained by FHWA

# County Boundaries Dataset

Field Name	Description
State Code	State FIPS code
County Code	County FIPS code
County Name	County name
Shape	Polygon feature

- Polygon feature dataset
- Depicts boundaries for each County
- Maintained by FHWA

# Climate Zone Boundaries Dataset

Dataset Requirements  
and Specifications

Field Name	Description
Climate Zone	Climate zone code
Climate Zone Name	Climate zone description
Shape	Polygon feature

- Polygon feature dataset
- Depicts LTPP climate zone boundaries
- Maintained by FHWA

# Soil Type Boundaries Dataset

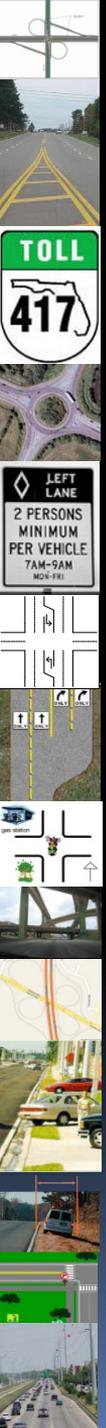
Field Name	Description
Soil Type	Soil type code
Soil Type Name	Soil type description
Shape	Polygon feature

- Polygon feature dataset
- Depicts AASHTO-defined soil zone boundaries
- Maintained by FHWA

# NAAQS Area Boundaries Dataset

Field Name	Description
NAAQS Area Name	NAAQS area name
Pollutant Standard	Pollutant standard/type
Shape	Polygon feature

- Polygon feature dataset
- Depicts EPA-defined non-attainment and maintenance area boundaries
- Maintained by FHWA



# STATE-PREPARED DATASETS



# Routes Dataset

Field Name	Description
Year_Record	Year for which the data apply
State_Code	State FIPS code
Route_ID	Unique ID for the linear feature
Comments (optional)	Text descriptor for the route
<i>Shape</i>	<i>Line feature</i>

- Line feature dataset
- Depicts the States' public roadway networks
- Developed and submitted by the States

# Routes Dataset Requirements

- File Format Options:

- ESRI Shapefile or Geodatabase
- Intergraph GeoMedia Access Warehouse

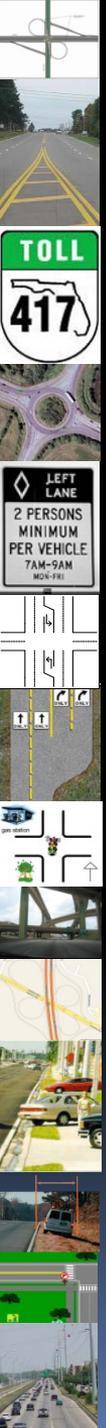
- Data Format Requirements:

- Centerline geometry (for undivided highways)
- Dual carriageway geometry (for divided highways)
- Spatial Reference must be assigned
  - Projected or unprojected coordinates
- Linear measures – miles, feet, etc.
- Reference Scale - 1:100,000 or better





# Routes Dataset Example



# Urban Area Boundaries Dataset

Field Name	Description
Year_Record	Year for which the data apply
Urban_Code	Census urban code
Urban_Name	Urbanized area name
Census_Pop	Census population
Census_Land_Area	Census land area (in square miles)
Shape	<i>Polygon feature</i>

- Polygon feature dataset
- Depicts Census-defined urbanized area boundaries
- Maintained by FHWA
- ***States are required to submit adjusted urbanized area boundaries***



# Sections Dataset

Field Name	Description
Year_Record	Year for which the data apply
State_Code	State FIPS code
Route_ID	Unique ID for the linear feature
Begin_Point	Beginning Milepoint
End_Point	Ending Milepoint
Data_Item	HPMS Data Item
Section_Length	Section length
Value_Numeric	Numeric value for the data item
Value_Text	Text value for the data item
Value_Date	Date value for the data item
Comments	Comment(s) for State-use

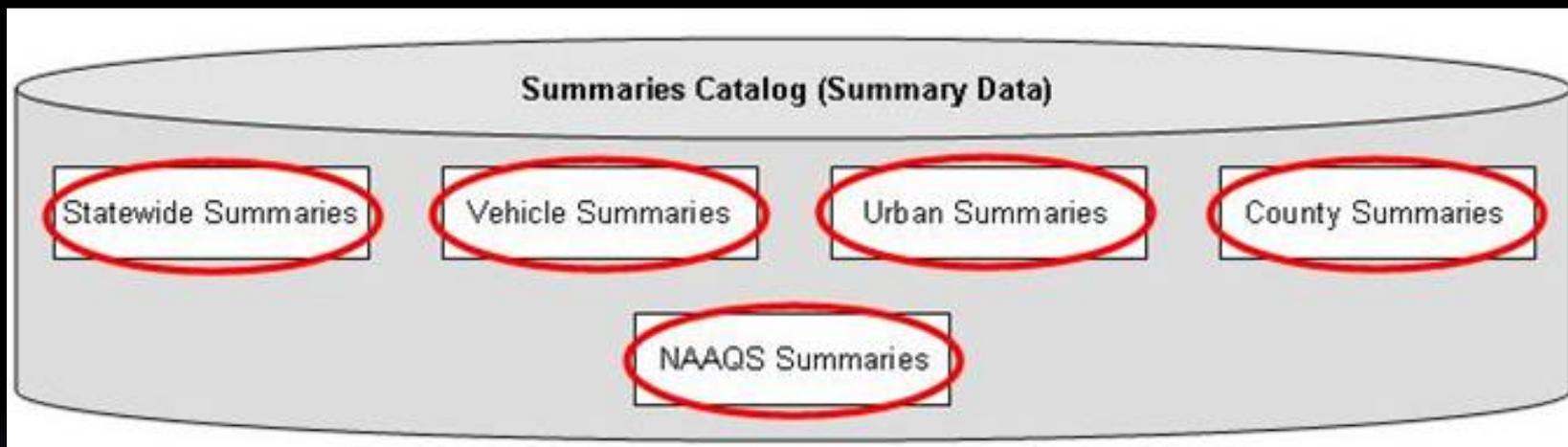
- Non-geospatial dataset
- Developed/submitted by the States
- Contains roadway section-level attribute data
- Extent: All Federal-aid roads and NHS routes

# Sample Panel Identification Dataset

Field Name	Description
Year_Record	Year for which the data apply
State_Code	State FIPS code
Route_ID	ID for the linear feature
Begin_Point	Beginning Milepoint
End_Point	Ending Milepoint
Section_Length	Section length
Sample_ID	Sample Identifier
Comments	Comment for State use

- Non-geospatial dataset
- Developed/submitted by the States
- Contains the geographic limits of the sample panel (i.e., all sample panel sections)
- Used in conjunction with Sections dataset to create sample data file

# Summaries Catalog



# Statewide Summaries Dataset

Field Name	Description
Year_Record	Calendar year for the data
State_Code	State FIPS code
RMC_VMT	Travel for Rural Minor Collectors
RL_VMT	Travel for Rural Locals
SU_VMT	Travel for Small Urban Locals
Rural_Pop	Rural Population
Rural_Land_Area	Rural Land Area
SU_Pop	Small Urban Population
SU_Land_Area	Small Urban Land Area
Paved_RMC_Length	Paved Rural Minor Collectors
Paved_RL_Length	Paved Rural Locals
Paved_UL_Length	Paved Urban Locals
Unpaved_RMC_Length	Unpaved Rural Minor Collectors
Unpaved_RL_Length	Unpaved Rural Locals
Unpaved_UL_Length	Unpaved Urban Locals

- Non-geospatial dataset
- Developed/submitted by the States
- Contains demographic, system length, and VMT data
- Extent: All urban, small urban, and rural public roads, classified as minor collector or local

# Vehicle Summaries Dataset

Field Name	Description
Year_Record	Calendar year for the data
State_Code	State FIPS code
FS_Group	Highway System Group
Pct_MC	Percent of motorcycle VMT
Pct_Cars	Percent of passenger car VMT
Pct_Lgt_Trucks	Percent of light truck VMT
Pct_Buses	Percent of bus VMT
Pct_SU_Trucks	Percent of single-unit truck VMT
Pct_CU_Trucks	Percent of combination-Truck VMT

- Non-geospatial dataset
- Developed/submitted by the States
- Contains travel activity data summarized by vehicle type and highway system group
- Extent: All public roads

# Urban Area Summaries Dataset

Field Name	Description
Year_Record	Calendar year for the data
State_Code	State FIPS code
Urban_Code	Census urban code
Local_VMT	Local travel
State_Portion_Pop	Population for State portion
State_Portion_Land	Land area for State portion

- Non-geospatial dataset
- Developed/submitted by the States
- Contains demographic, and VMT data for urbanized areas
- Extent: All urbanized area public roads classified as local

# County Summaries Dataset

Field Name	Description
Year_Record	Calendar year for the data
State_Code	State FIPS code
County_Code	County FIPS code
F_System	Functional System
Urban_Code	Census urbanized area code
Ownership	Ownership Code
RMC_L_System_Length	Rural minor collector and local roadways length within county

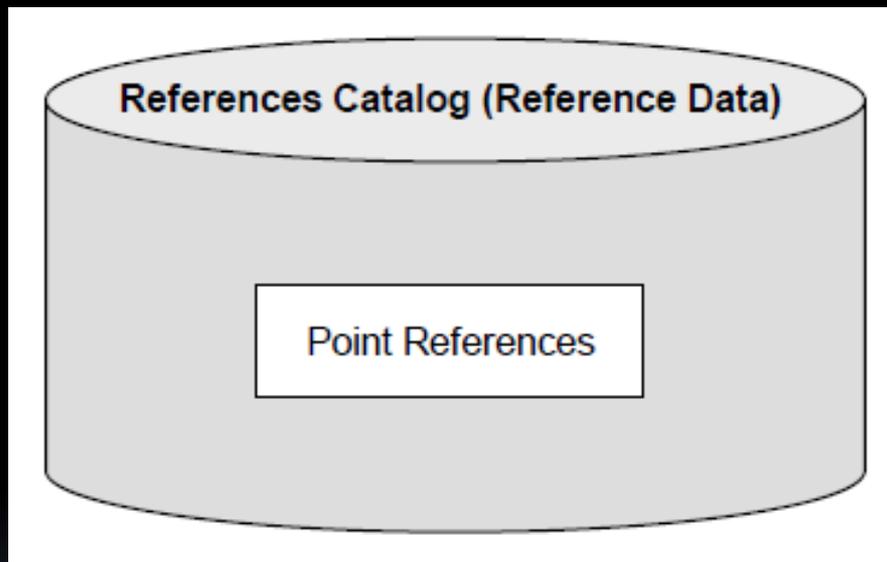
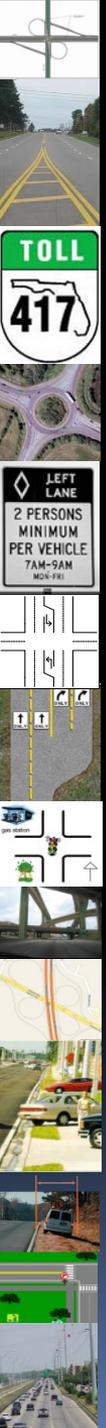
- Non-geospatial dataset
- Developed/submitted by the States
- Contains system length data summarized by County
- Extent: All public roads classified as rural minor collector or local

# NAAQS Summaries Dataset

Field Name	Description
Year_Record	Calendar year for the data
State_Code	State FIPS code
Pollutant_Stnd	Pollutant standard/type
RMC_L_System_Length	Rural minor collector and local system length
RMC_L_System_Travel	Rural minor collector and local system travel

- Non-geospatial dataset
- Developed/submitted by the States
- Contains system length and travel data, summarized by non-attainment or maintenance area
- Extent: All public roads classified as rural minor collector or local

# References Catalog

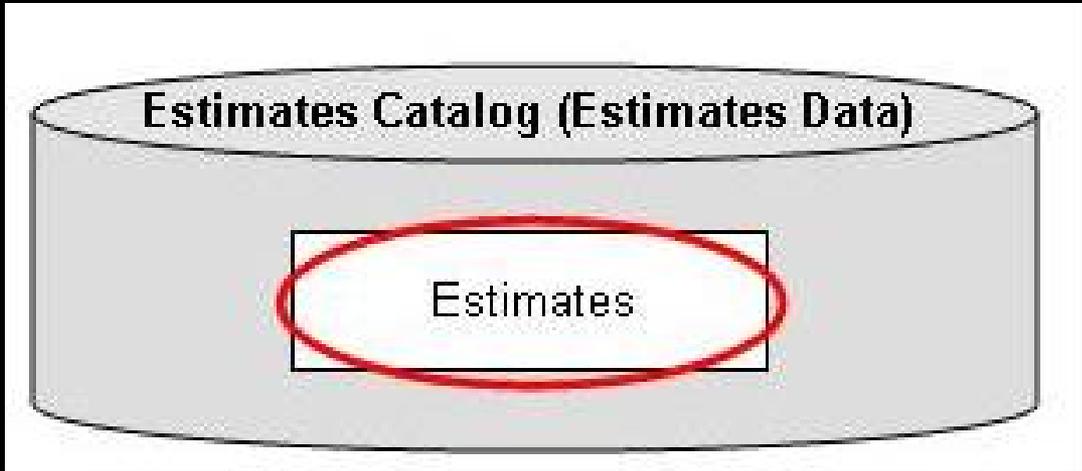
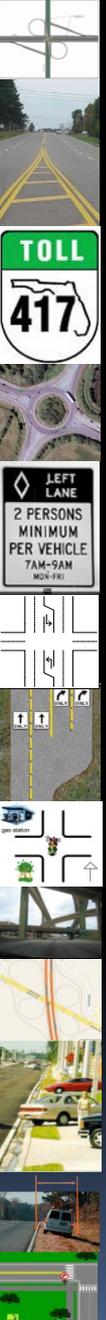


# Point References Dataset

Field Name	Description
Year of Record	Year for which the data apply
State Code	State FIPS code
Route ID	Route identifier
Route Point	Route milepoint
Data Item	Attribute (Future Use)
Value Numeric	Numeric value for the data item
Value Text	Text value for the data item
Value Date	Date value for the data item

- Non-geospatial dataset
- Developed by FHWA
- Contains location of grade-separated interchanges on the Federal-aid system

# Estimates Catalog

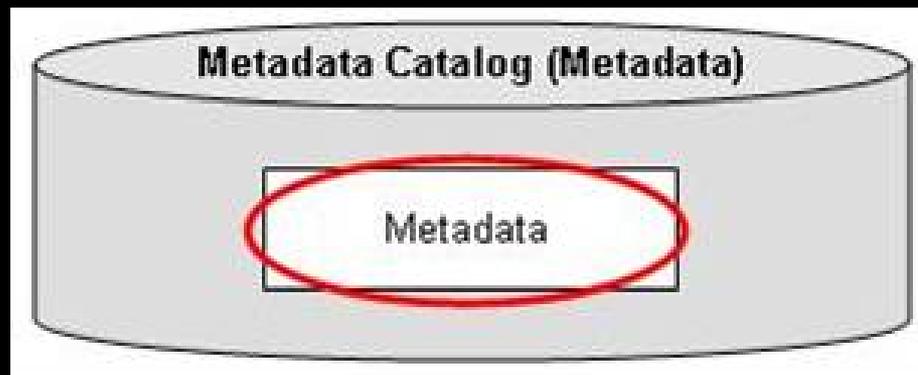
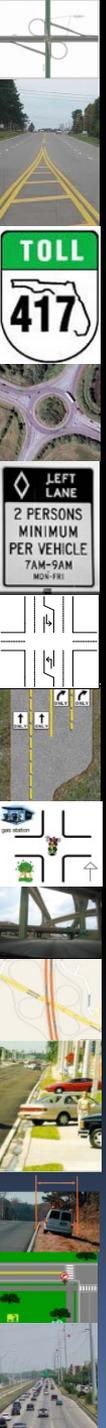


# Estimates Dataset

Field Name	Description
Year_Record	Calendar year for the data
State_Code	State FIPS code
Estimate_Type	Estimates Type
F_System	FHWA Approved Functional System
Is_Urban	Rural or Urban Area
Is_State_Owned	On-State/Off-State System
Value_Numeric	Numeric Value for Estimate

- Non-geospatial dataset
- Developed/submitted by the States
- Contains estimated values for various pavement-related data items

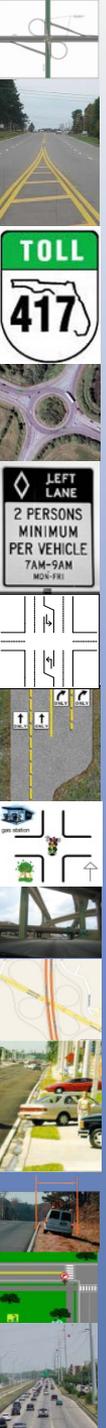
# Metadata Catalog



# Metadata Dataset

Field Name	Description
Year_Record	Calendar year for the data
State_Code	State FIPS code
Metadata_Type	Metadata Type
F_System	FHWA Approved Functional System
Is_Urban	Rural or Urban Area
Is_State_Owned	On-State/Off-State System
Value_Numeric	Numeric Value for Metadata

- Non-geospatial dataset
- Developed/submitted by the States
- Contains supplemental information on traffic and pavement data



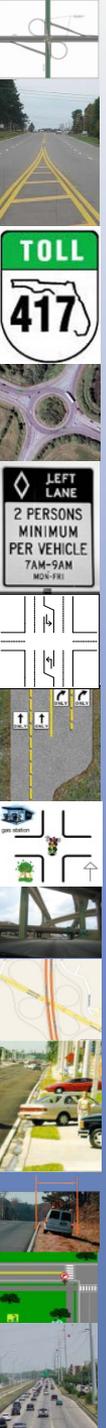
1) At most, the States are required to develop and submit (to FHWA) how many datasets annually?

a. 6

**b. 11**

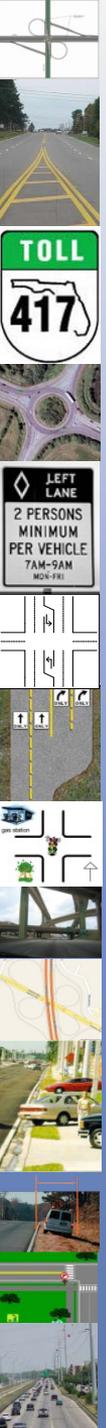
c. 69

d. 1



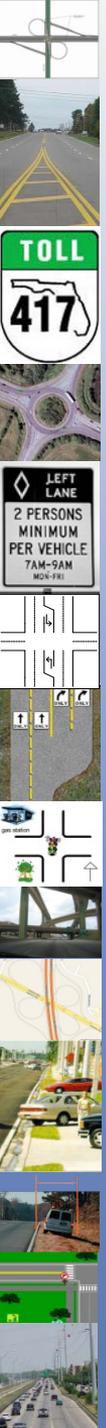
2) The LRS network that the States are required to develop and submit (to FHWA) annually must contain line-work (i.e. geometry) for which of the following?

- a. All Federal-aid roads
- b. The National Highway System (NHS)
- c. Principal Arterials only
- d. Both a and b



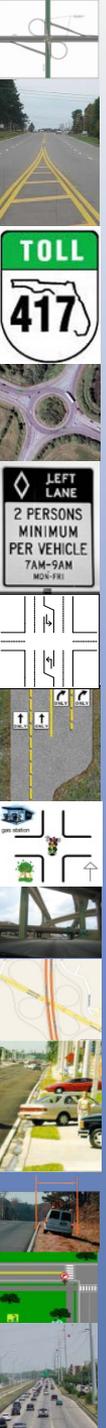
3) Which of the following datasets must contain travel and system length data summarized by EPA non-attainment or maintenance area?

- a. Urban Summaries dataset
- b. NAAQS Summaries dataset
- c. Statewide Summaries dataset
- d. None of the above



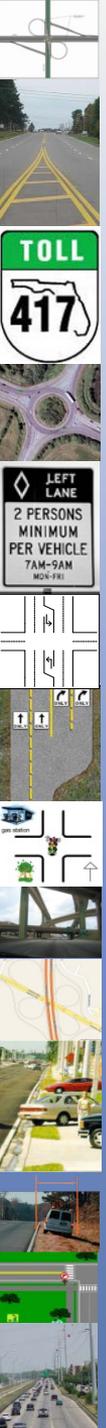
4) Which geospatial dataset is the States responsible for preparing and submitting annually?

- a. Routes
- b. Urban Area Boundaries
- c. Both a and b
- d. None of the above



5) Which of the following fields in the Routes dataset must contain a unique value for each record?

- a. Route ID
- b. Year of Record
- c. Beginning Milepoint
- d. Both a and c



6) The States are required to develop and submit the Urban Area Boundaries dataset to FHWA annually.

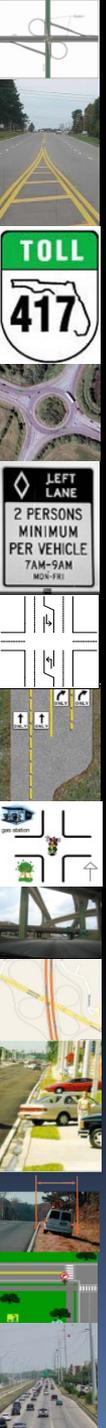
a. True

b. False

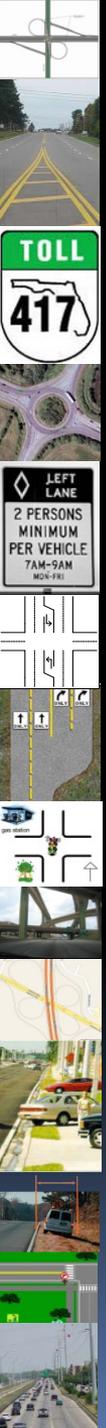


# Lesson 2 Summary

- State-prepared datasets consist of geospatial and non-geospatial data
- Each dataset has specific file structure and format requirements
- Datasets provide information on a section-level and area-wide basis

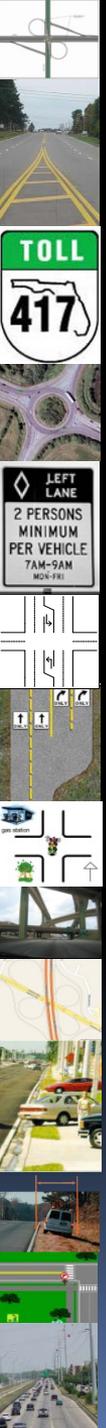


# Lesson 2



Questions???

# Lesson 3

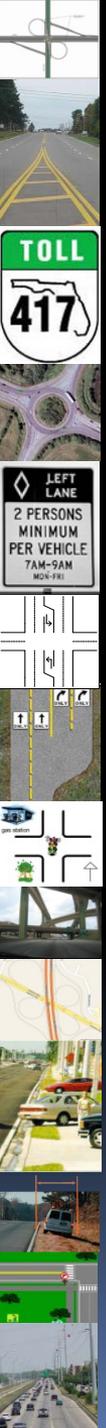


## GEOSPATIAL COMPONENT OF THE DATA MODEL



# GIS-enabled Data Uses

- Development of functional classification (FC) system maps
- Integration and analysis of various types of data
- QA/QC of HPMS section data attribute coding
- Generation of non-attainment area data





# Data Integration (e.g., HPMS + NBI)

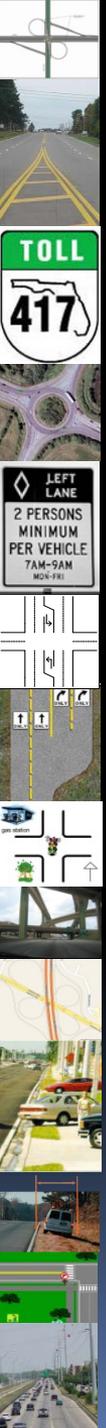
The screenshot displays a GIS application interface with the following components:

- Active Item:** NBI
- Active Query:** SELECT Rads.Map\_NBI\_WKB.\* FROM Rads.Map\_NBI\_WKB WHERE (AQC: 2205 AHC: 0)
- Map View:** Shows an aerial map of Frontage Road with data overlays. The legend indicates:
  - Data Layers:** HPMS (checked), Vertex (checked), Distance 1.
  - IRI Legend:**
    - < 95 (Green)
    - 95 - 170 (Yellow)
    - > 170 (Red)
  - Age Legend:**
    - 1 - 10 (Red)
    - 11 - 20 (Orange)
    - 21 - 30 (Yellow)
    - 31 - 40 (Light Green)
    - 41 - 50 (Teal)
    - 51 and up (Blue)
- Identify Results Panel:**
  - Matching Items:**
    - NBI (search completed)
      - STRUCTURE\_NUMBER\_008='F-11-N'
      - STRUCTURE\_NUMBER\_008='F-11-O'
    - HPMS (search completed)
  - Details for STRUCTURE\_NUMBER\_008='F-11-N':**

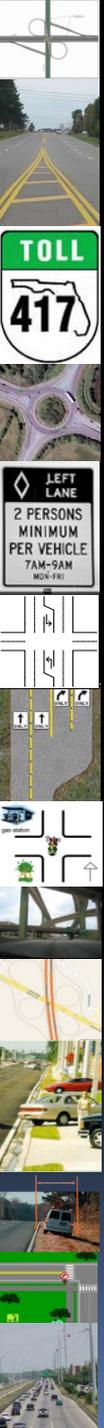
OBJECTID	66469
DATA_YEAR	2010
STATE_CODE_001	8
State_Name	Colorado
County_FIPS	08037
STRUCTURE_NUMBER	F-11-N
RECORD_TYPE_005A	1
ROUTE_PREFIX_005B	1
SERVICE_LEVEL_005C	1
ROUTE_NUMBER_005	70A
DIRECTION_005E	0
HIGHWAY_DISTRICT_C	32
COUNTY_CODE_003	037
PLACE_CODE_004	80040
FEATURES_DESC_006	VAIL ROAD
CRITICAL_FACILITY_01	
FACILITY_CARRIED_01	I 70 ML WBND
LOCATION	IN VAIL
MIN_VERT_CLR_010	99.99
MI_PT	175.994
BASE_HWY_NETWORK	1
LRS_INV_ROUTE_013A	000000070A
SUBROUTE_NO_013B	0
- Map Controls:** Chart, Categorization: Age, Data Table, Statistics.

# Lesson 3 Summary

- GIS-enabled data:
  - Benefits FHWA, the States and local agencies
  - Supports various analysis and reporting tasks
- GIS framework helps facilitate data integration for analysis purposes



# Lesson 3



Questions???

# Review: Learning Outcomes

- You should now be able to:
  - Describe the structure of the HPMS Data Model
  - Describe the various HPMS datasets
  - Explain how geo-referencing is performed in HPMS