



U.S. Department of Transportation  
Federal Highway Administration

# AEGIST Webinar Series

## Spatial Data Governance to Support Enterprise Business Needs

### Webinar 1

February 11, 2021

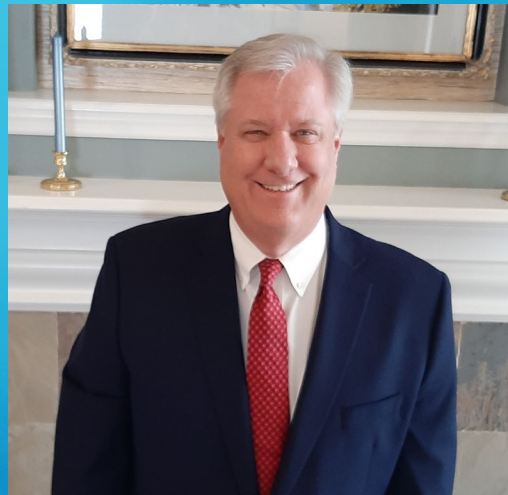
1 – 4 PM EST





U.S. Department of Transportation  
**Federal Highway Administration**

# Introduction



**Joseph Hausman**  
Federal Highway Administration  
Office of Planning



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WSP USA



**Lisa Saldin**  
Public Involvement  
Coordinator  
WSP USA

# About AEGIST

## Pooled Fund Study (PFS): FHWA and 15+ States Enhancing Enterprise Data Management and Governance Practices

### ■ Spatial Data Modeling

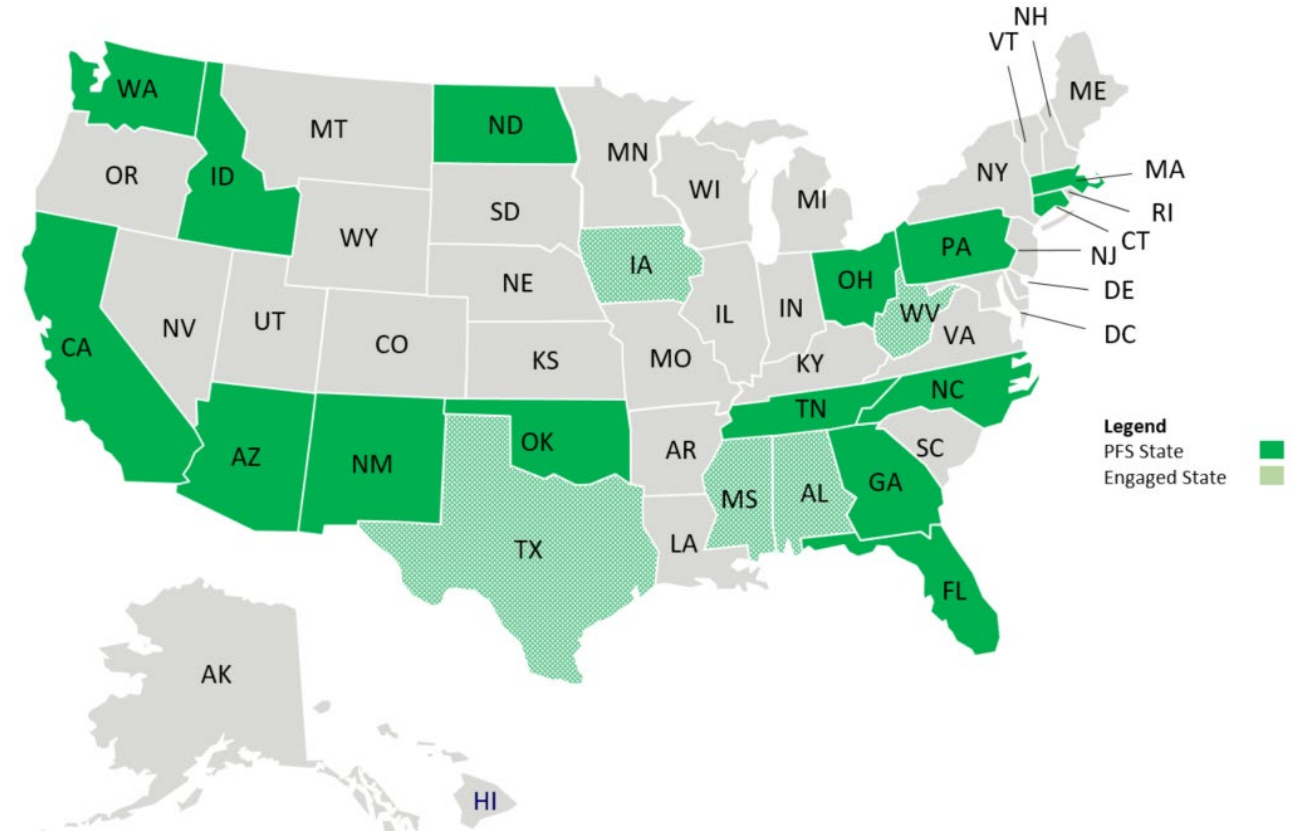
- » Linear Referencing System & Data Models, Data Structures
- » Spatial Referencing Data Models and Structures
- » Data Quality, Availability, Readiness (FAIR), Authoritative Sources

### ■ Spatial Data Integration and Engineering

- » Integrating and Engineering Business Data using LRS.GIS
- » Data Conflation, Integration using LRS.GIS
- » Data Hubs and Data Engineering Platforms for Preparing Data

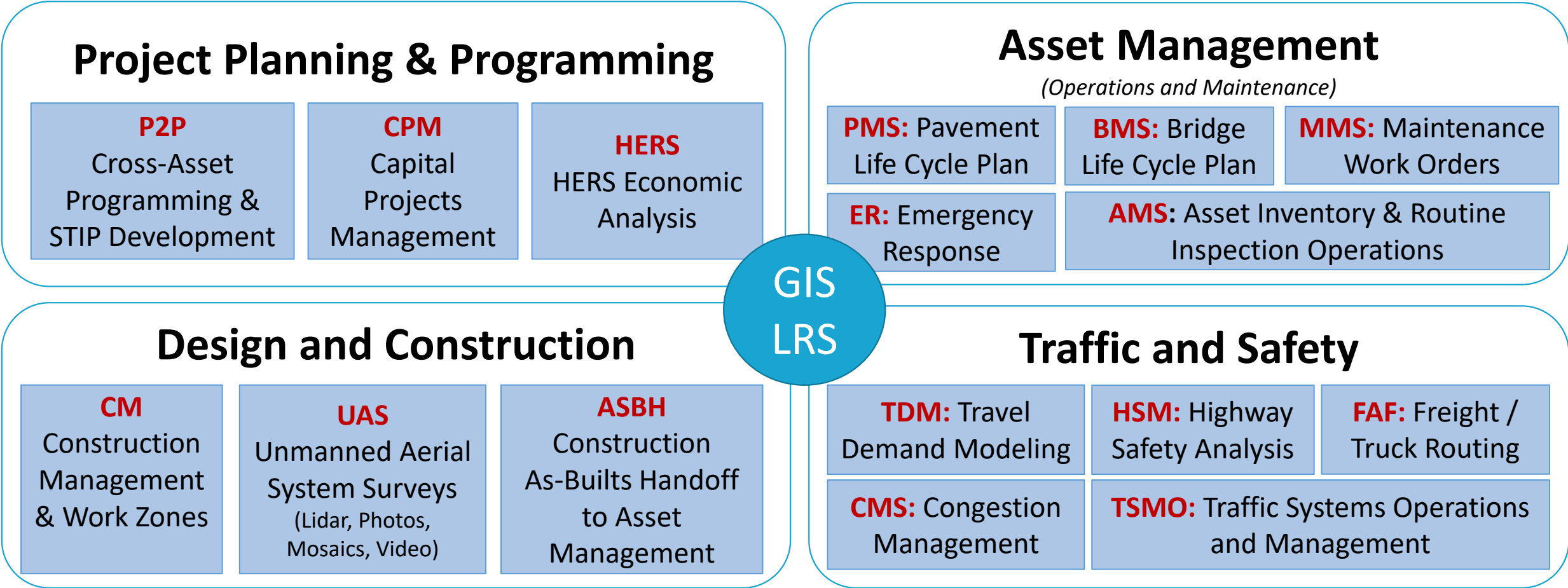
### ■ Spatial Data Analytics

- » Spatial Statistics, Econometrics, AI/ML, System of Engagement
- » Federal, State Reporting: HPMS 9.0 with MIRE: Standard APIs
- » Open Data Portals, Data Sharing and Use for Business Intelligence



# Roads and Assets Data Modeling Use Cases

## Classified by Business Functions



# Webinar Objective

- FHWA AEGIST Vision: Spatial Data Governance
  - » State DOT Data Governance Councils, Data Offices at DOTs Integrating and Managing Enterprise Data
  - » Spatial Data Engineering and Delivery Platforms: Management and Governance
  - » State GIS Offices, Local Agencies, Other Federal State and Local GIS Stakeholders
  - » Open and Proprietary Spatial Data Platforms, Services, Portals
- State Presentations: Spatial Data Governance to Support Enterprise Business Needs
  - » [Ohio DOT](#)
  - » [New York State DOT](#)
  - » [Florida DOT](#)
- Next Steps
  - » AEGIST 2021 Calendar



# Goal: Integrating Data Models using LRS-GIS



Figure 4. Graphic. Geometric and non-geometric BIM for infrastructure data models used during the planning and programming phase.

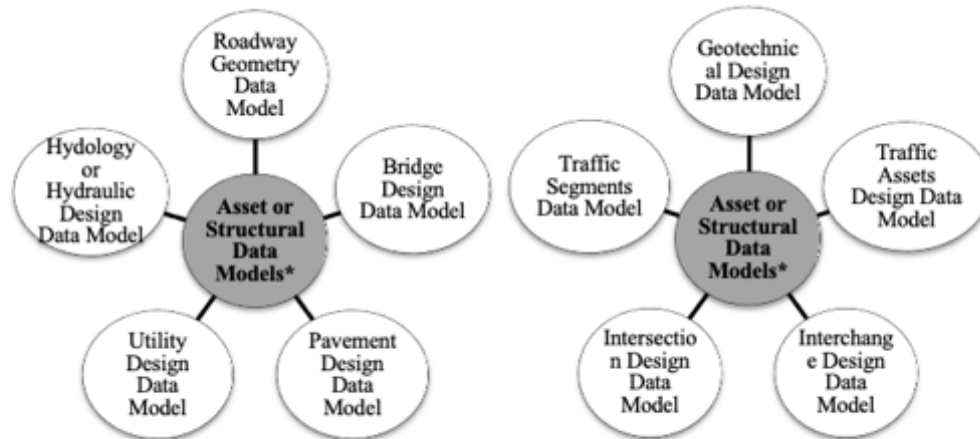


Figure 5. Graphic. Geometric and non-geometric data models created, updated, used, and managed during the design phase.

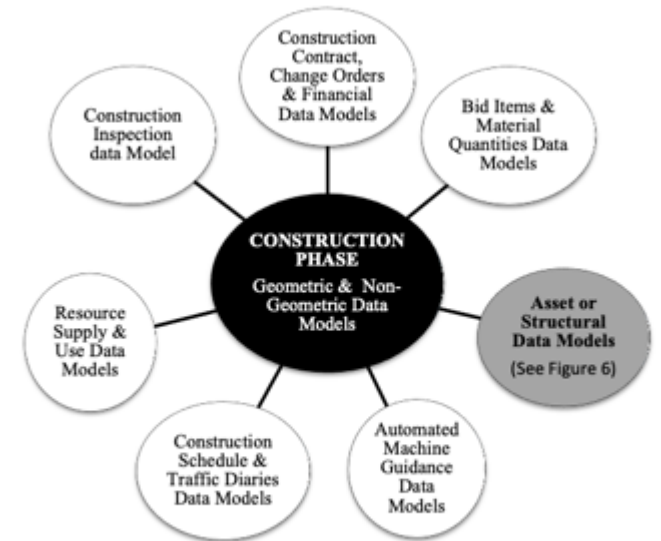
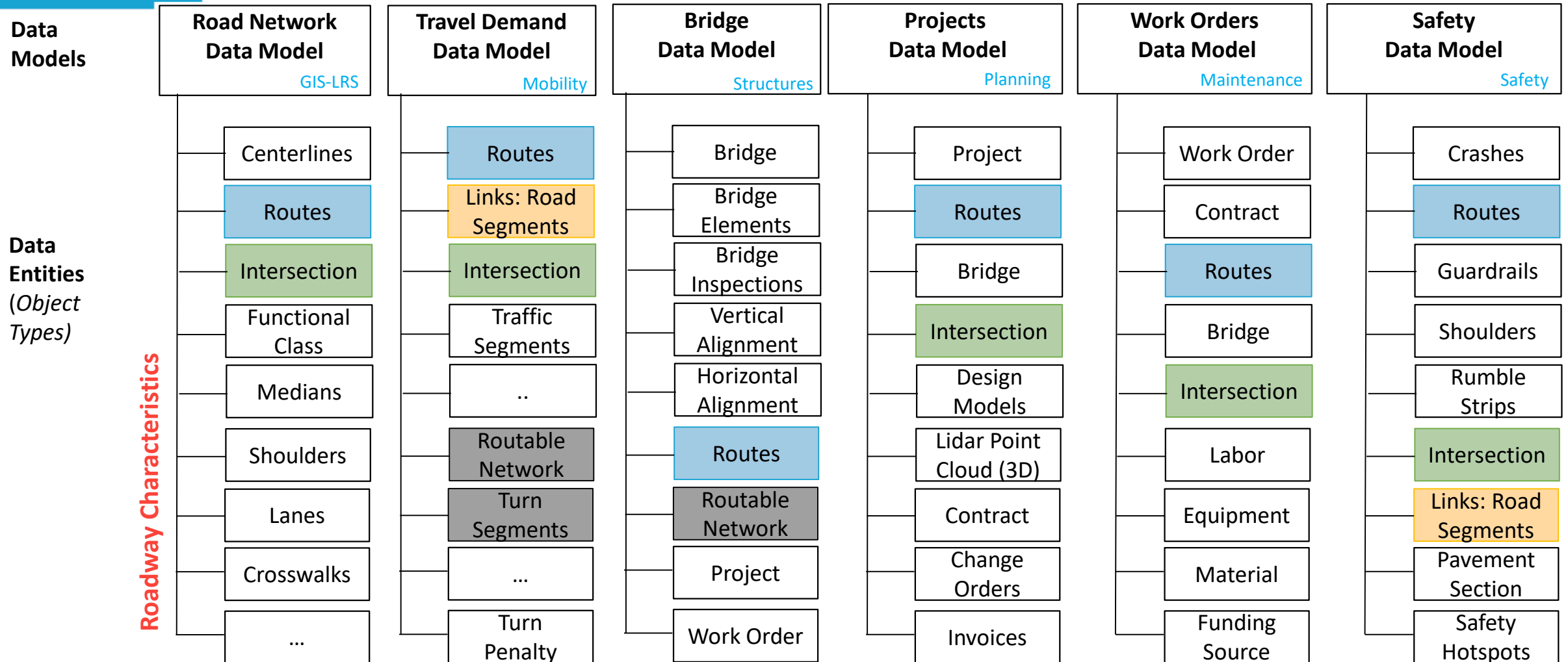


Figure 6. Graphic. Geometric and non-geometric data models created, updated, used, and managed during construction phase.

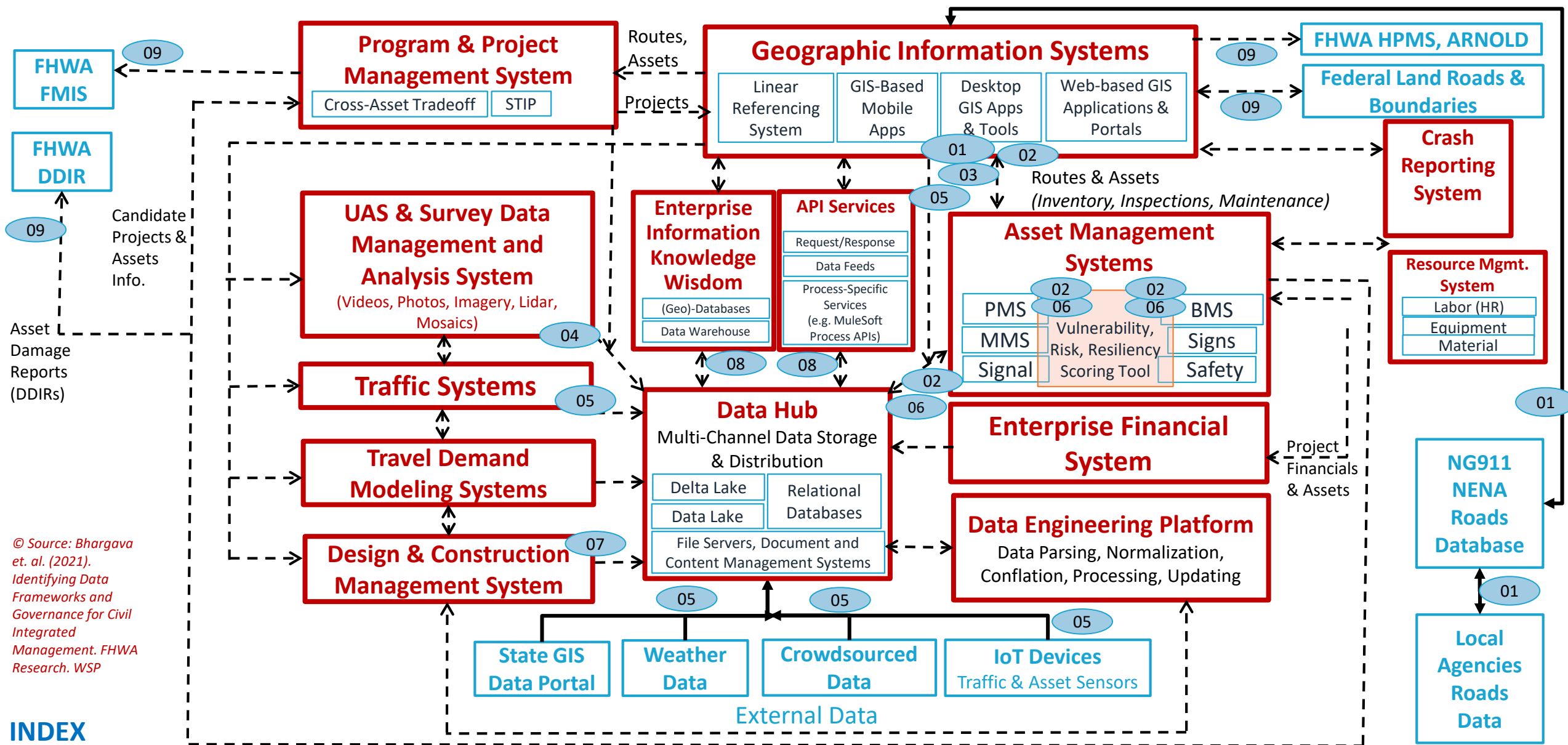


Figure 7. Graphic. Geometric and non-geometric BIM for infrastructure data models used during the O&M phase.

# Spatial Data Models Governance in Enterprise BTRS, TIMS, TAMS-DST Publication Databases (for consistent use of data models across agency)



# Template: Spatial Data Modeling, Management, Delivery/Exchange using for Supporting Business Users



© Source: Bhargava et. al. (2021). Identifying Data Frameworks and Governance for Civil Integrated Management. FHWA Research. WSP

## INDEX

- 01: [Routes and Assets Data] from Road Inventory Systems → LRS, Road Inventory, Asset & Project Systems, Data Hub
- 02: [Asset Inventory, Condition and Work History, Plans Data] from AMS → Data Hub & Vulnerability Analysis Systems
- 03: [Asset Damages Data] from Asset Inspection & Damage Assessment Apps → Asset Management System, GIS
- 04: [Survey, Inspection Data] from UAS → AMS, GIS, Design, Construction, Data Hub Systems
- 05: [Incident, Traffic & Asset Data] from Weather, Traffic and Asset Systems to Data Hub, Warehouse, GIS, BI
- 06: [Repair Projects and Work Plan/Requests Data] from Vulnerability Analysis & DDIR Apps → PPMS & AMS
- 07: [As-Built Asset Data] Design, Construction → LRS and Asset Management Systems
- 08: [Processed and Integrated Data for Analytics] from Data Hub → Data Warehouse & BI Systems
- 09: [Roads and Assets, Projects, Damages] from DOT Systems → FHWA HPMS, FMIS, DDIR Systems



# BUILDING INFORMATION MODELING (BIM) FOR INFRASTRUCTURE

## Data Management & Governance

### - Data Portfolio (Architecture)

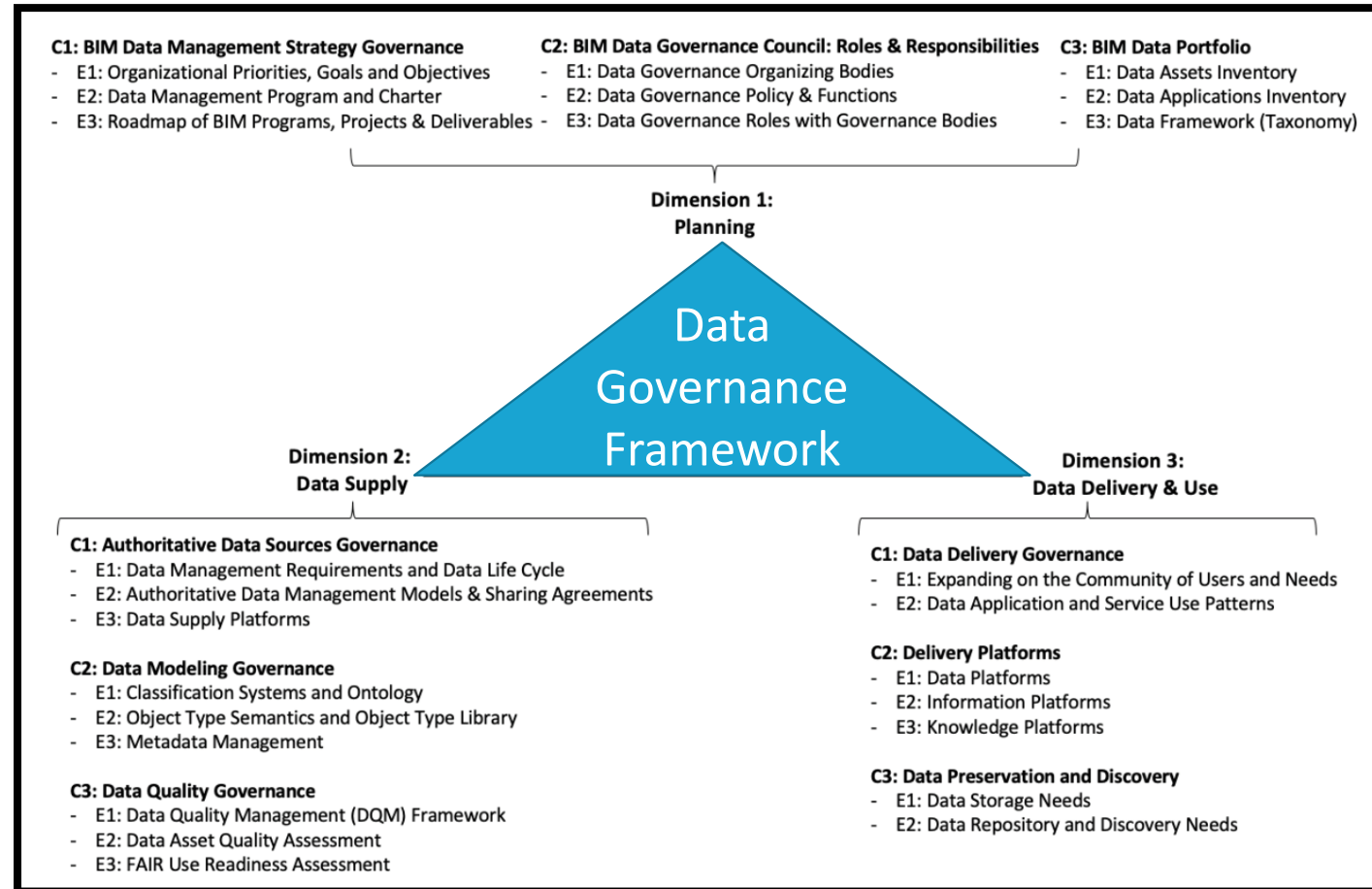
- Data Assets Inventory
- Data Applications and Use Patterns
- Data Modeling

### - Data Supply

- Authoritative (Master) & Reference Data Management Systems and Models (including Content & Document Data Management)
- Data Quality

### - Data Delivery and Use for Analytics & Decision Support

- Data Integration & Interoperability
- Data Sharing and Delivery Platforms
- Data Security
- Data Storage & Archival (Preservation)
- Data Warehousing & Business Intelligence
- Reporting and Analytics



© Source: Bhargava et al. (2021). Identifying Data Frameworks and Governance for Civil Integrated Management. FHWA Research. WSP



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# Ohio Department of Transportation

**Ian Kidner**  
GIS Program Manager



**John Puente**  
Administrator, Chief  
Data Officer

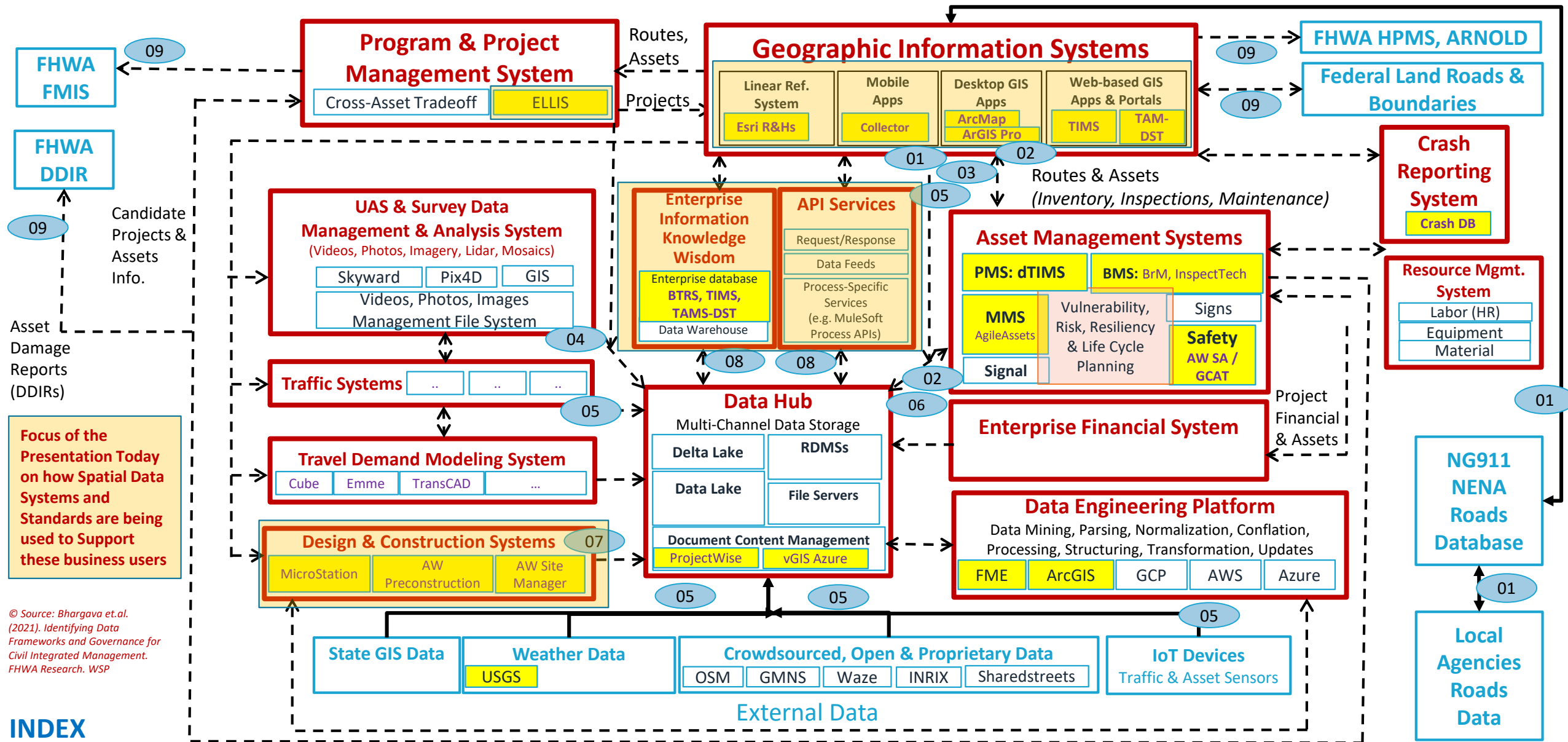


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The background of the slide is a solid blue color. On the left side, there is a large, semi-transparent blue location pin icon. Inside the circular part of the pin, there is a white crosshair with a small circle at its center. A white horizontal arrow points from the center of the crosshair to the right. Below the pin, a white road with a dashed center line and a solid edge line recedes into the distance. The overall aesthetic is clean and modern, with a focus on data and navigation.

# Enterprise Data Systems and Dataflows

# OHIO DOT VISION (DRAFT): Spatial Data Modeling, Management, Delivery/Exchange using for Supporting Business Users



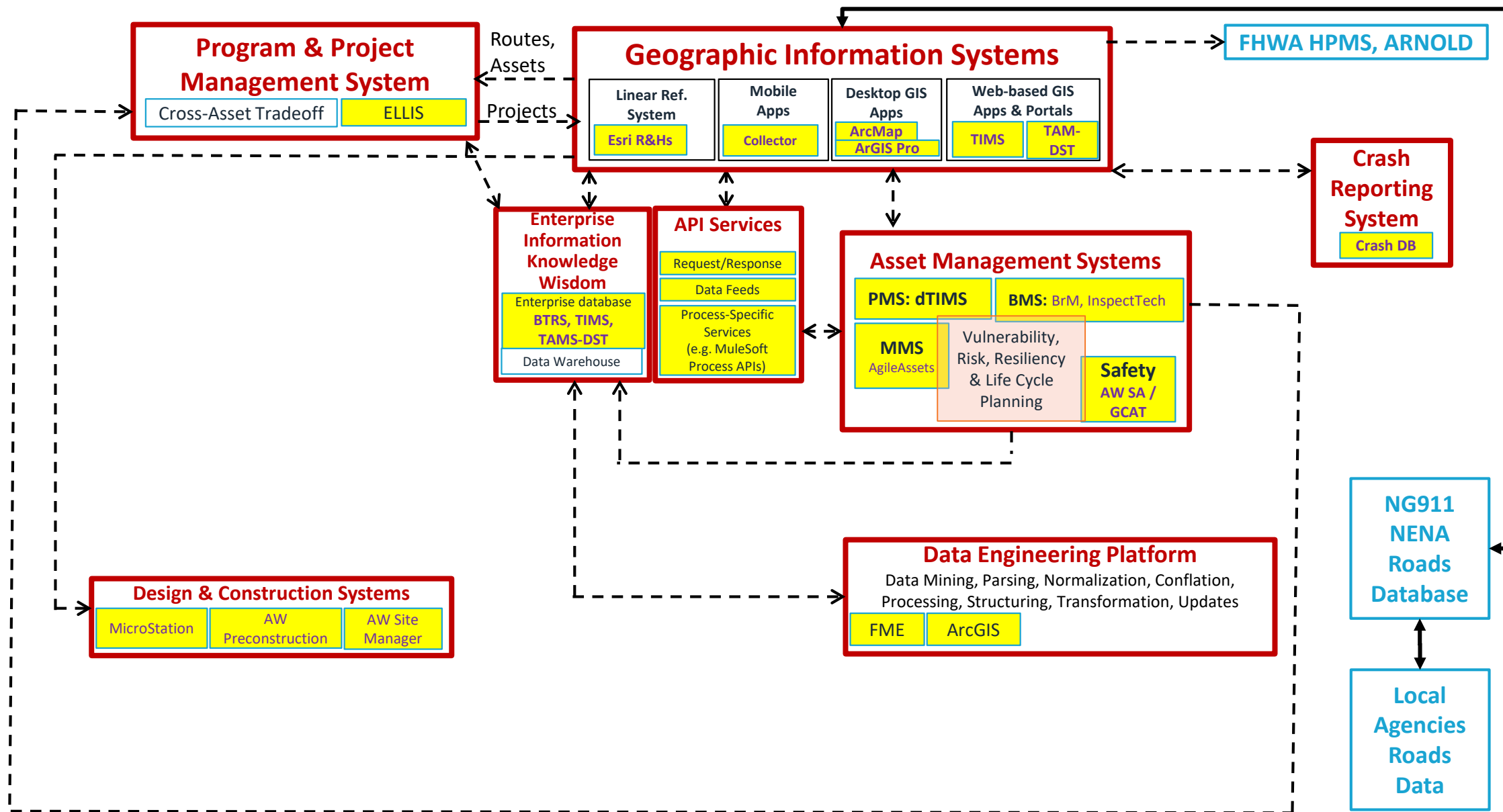
Focus of the Presentation Today on how Spatial Data Systems and Standards are being used to Support these business users

© Source: Bhargava et al. (2021). Identifying Data Frameworks and Governance for Civil Integrated Management. FHWA Research. WSP

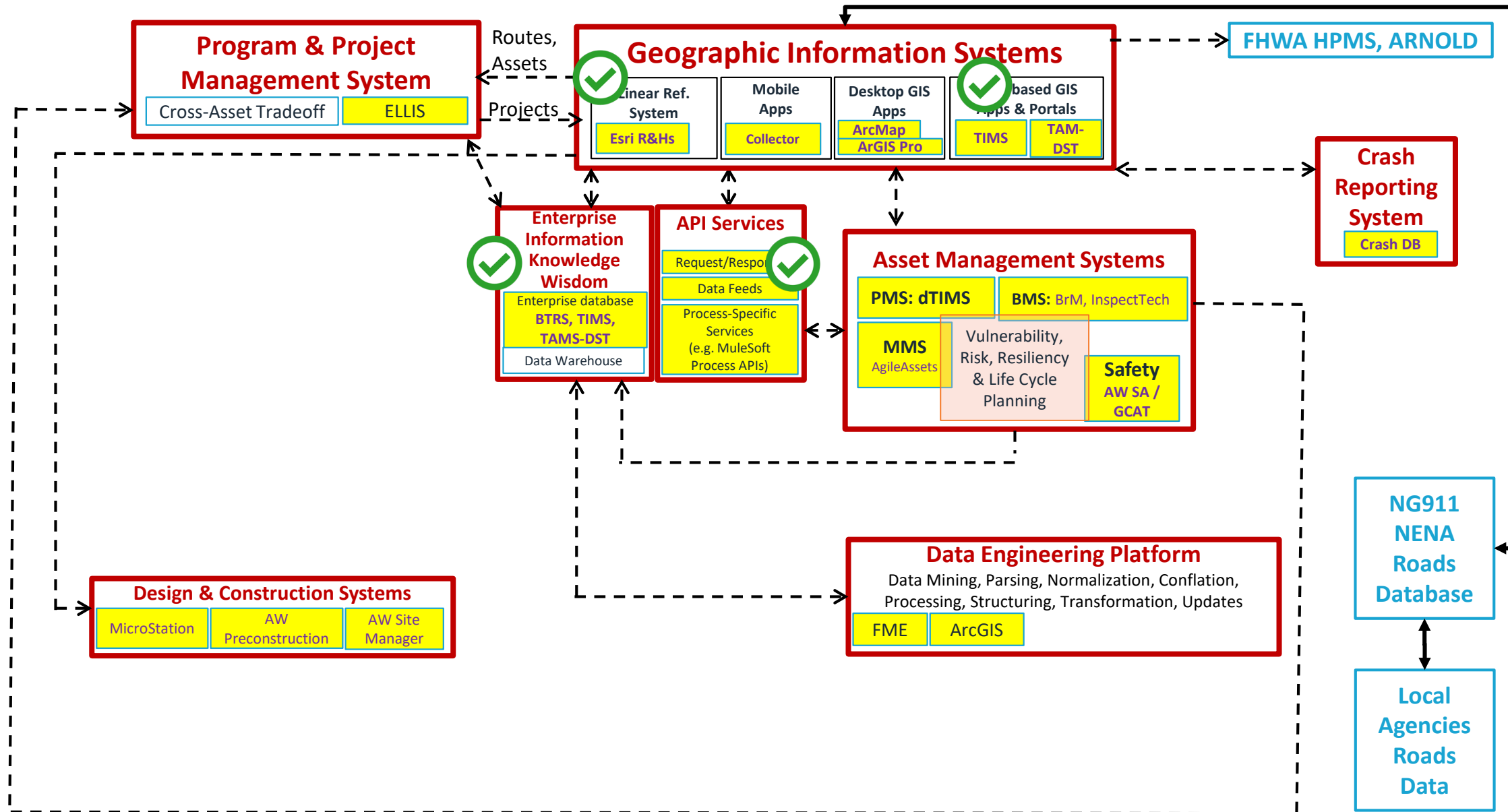
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# OHIO DOT: Spatial Data Modeling, Management, Delivery/Exchange using for Supporting Business Users



# OHIO DOT: Spatial Data Modeling, Management, Delivery/Exchange using for Supporting Business Users



# LRS/RI Development & Distribution

## Creating and Sharing Enterprise Data Models with Business Users

- What are the routes and measures values in the linear referencing system?
- At a certain location, if two routes overlap, which is primary and which is secondary?
- How did a route change from one year to the next?
- How did an intersection change from one year to next?
- What are the measure values of an intersection on a certain route?
- What are the roadway characteristics at a certain location in the network?
  - » Lane width, shoulder width, number of lanes, etc. (HPMS and MIRE attributes)

# LRS/RI Development & Distribution: Pre-2014

- LRS/RI Management

- » GeoMedia (LRS) & DBASE (attributes)
- » Separate DBASE tables for State System (IR, US, SR), County/Township, Municipal

- LRS/RI Distribution

- » Base Transportation Reference System (BTRS)
  - Series of mainframe validations & enterprise table creation
  - Home grown system (early 2000s)
  - Utilized “BTRS\_LINK” field for tracking changes
  - Worked well, but very labor intensive (approx. 3 months processing time)



# LRS/RI Development & Distribution: 2014 ->

- LRS/RI Management

- » Move to ESRI Roads & Highways
- » Consolidated separated DBASE tables for State System (IR, US, SR), County/Township, Municipal

- LRS/RI Distribution

- » Base Transportation Reference System (BTRS)
  - R&H project began modernization project to move away from BTRS
  - Shift validations to front end processes (daily FME tools for QAQC)
  - Develop custom API for data distribution

# LRS/RI Development & Distribution: 2014 ->

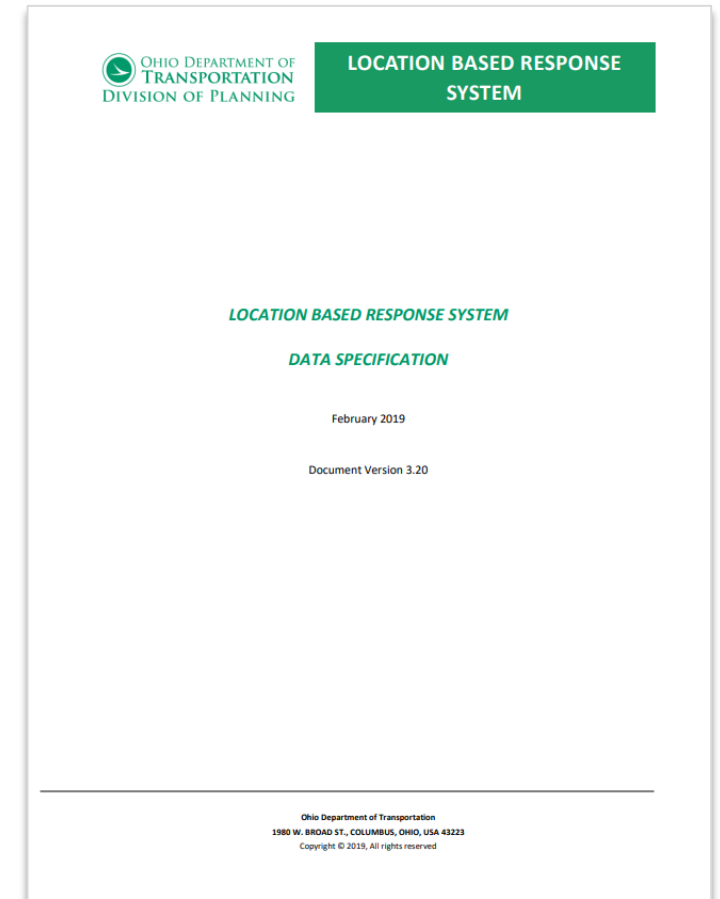
## Why Custom API vs. ESRI R&H event layer integration?

- Tech. Capability vs. Business Need vs. Timing
  - » Initial R&H Implementation project challenges
    - Challenging scope
    - R&H maturity
    - Requirements alignment with capabilities
  - » LBRS Project re-started

# LRS/RI Development & Distribution: 2014 ->

## Location Based Response System (LBRS)

- State / County partnership to develop
  - » Street Centerline, address ranges
- Originally started around 2005
  - » Varying levels of participation
  - » Re-started to complete specification state-wide
- Current Project
  - » Data QAQC & Conflation 40+ counties into ODOT R&H (RIMS)



# LRS/RI Development & Distribution: 2014 ->

## Custom API for LRS/RI Distribution

### ■ Tech Stack

- » Java/Groovy
- » Spring Boot
- » Hibernate-Spatial
- » Java Topology Suite
- » GeoTools

### ■ Benefits

- » Code Reuse
- » Enables cross-platform accessibility
- » New Features
  - Supports 3-decimal log points
  - Provides entire network to enterprise (Muni previously excluded)
- » Provides Capabilities Developers Struggle with
  - Attribute / segmentation collapsing
  - Conflation
  - Spatial capabilities
  - Temporal (access to geometry back to 2008)
- » Enables more frequent publishing

# LRS/RI Development & Distribution: 2014 ->

## Custom API for LRS/RI: Endpoints

### ■ Routes

- » Route Search - supports autocomplete interfaces as well
- » Domain Data Lookup - Provides various domain values for applications such as list of counties, districts, etc. Often used in a web application for dropdown lists.
- » Route Boundary Data for use with validating routes
- » RI Event Data
- » Supports ability to select specific attributes
- » Will collapse segmentation so that segmentation is minimized

# LRS/RI Development & Distribution: 2014 ->

## Custom API for LRS/RI: Endpoints

### ■ Streets

- » Relates LRS to street names
- » Users can provide a street name and get back the relationship between route ID

### ■ Spatial

- » Closest Point
  - Returns GEOJSON and can be used for locating route/log point based on a using providing a Coordinate
- » CRS (County-Route-Section) Conversion
  - Convert from one CRS to Another

# LRS/RI Development & Distribution: 2014 ->

## Custom API for LRS/RI: Endpoints

### ■ Conflation

- » Given a year, route, point or linear event measures and target year, Returns that section in the target year.
- » Can go forward or backward, multiple years
- » To make easy, has been wrapped into an FME Custom Transformer.

	CHANGE_TYPE_TXT	FROM_PERP_YR	FROM_NLF_ID	FROM_CTL_3D_BEGIN_NBR	FROM_CTL_3D_END_NBR	TO_NLF_ID	TO_CTL_3D_BEGIN_NBR	TO_CTL_3D_END_NBR
1	TRANSFER_ROUTE_SEGMENT	2018	CPRECR00357**C	0	1.011	CPRECR00028**C	0	1.012
2	TRANSFER_ROUTE_SEGMENT	2018	CPRECR00357**C	1.011	2.043	CPRECR00028**C	1.012	2.043
3	TRANSFER_ROUTE_SEGMENT	2018	MPREMR00008**C	0	0.069	MPREMR00010**C	0	0.067
4	TRANSFER_ROUTE_SEGMENT	2018	MPREMR00008**C	0.069	0.1	MPREMR00010**C	0.067	0.112
5	TRANSFER_ROUTE_SEGMENT	2018	MPREMR00009**C	0	0.041	MPREMR00008**C	0	0.039
6	TRANSFER_ROUTE_SEGMENT	2018	MPREMR00009**C	0.041	0.08	MPREMR00008**C	0.039	0.1
7	TRANSFER_ROUTE_SEGMENT	2018	MPREMR00010**C	0.06	0.09	MPREMR00009**C	0	0.031
8	TRANSFER_ROUTE_SEGMENT	2018	MPREMR00011**C	0	0.09	MPREMR00013**C	0	0.087
9	TRANSFER_ROUTE_SEGMENT	2018	MPREMR00012**C	0	0.12	MPREMR00014**C	0	0.111
10	TRANSFER_ROUTE_SEGMENT	2018	MPREMR00013**C	0	0.04	MPREMR00016**C	0	0.038
11	TRANSFER_ROUTE_SEGMENT	2018	MPREMR00014**C	0	0.039	MPREMR00023**C	0.058	0.099
12	TRANSFER_ROUTE_SEGMENT	2018	MPREMR00014**C	0.042	0.104	MPREMR00023**C	0.099	0.165
13	TRANSFER_ROUTE_SEGMENT	2018	MPREMR00014**C	0.104	0.17	MPREMR00023**C	0.165	0.235
14	TRANSFER_ROUTE_SEGMENT	2018	MPREMR00015**C	0	0.152	MPREMR00017**C	0	0.152

RIMS_PERPETUATION_AUDIT		
PERPETUATION_AUDIT_ID	varchar(40)	<pk>
VERSION_ID	numeric(6,0)	
FROM_PERP_YR	numeric(4,0)	
TO_PERP_YR	numeric(4,0)	
FROM_NLF_ID	char(14)	
TO_NLF_ID	char(14)	
FROM_SLM_BEGIN_NBR	numeric(7,3)	
FROM_BACKSTATION_BEGIN_CD	char(1)	
FROM_SLM_END_NBR	numeric(7,3)	
FROM_BACKSTATION_END_CD	char(1)	
FROM_CTL_BEGIN_NBR	numeric(7,3)	
FROM_CTL_END_NBR	numeric(7,3)	
FROM_LEAVE_IND	char(1)	
FROM_REENTER_IND	char(1)	
FROM_GAP_LEAVE_IND	char(1)	
FROM_GAP_REENTER_IND	char(1)	
TO_SLM_BEGIN_NBR	numeric(7,3)	
TO_BACKSTATION_BEGIN_CD	char(1)	
TO_SLM_END_NBR	numeric(7,3)	
TO_BACKSTATION_END_CD	char(1)	
TO_CTL_BEGIN_NBR	numeric(7,3)	
TO_CTL_END_NBR	numeric(7,3)	
TO_LEAVE_IND	char(1)	
TO_REENTER_IND	char(1)	
TO_GAP_LEAVE_IND	char(1)	
TO_GAP_REENTER_IND	char(1)	
CHANGE_TYPE_TXT	varchar(64)	
CHANGE_NOTES_TXT	varchar(255)	
FROM_CTL_3D_BEGIN_NBR	numeric(7,3)	
FROM_CTL_3D_END_NBR	numeric(7,3)	
TO_CTL_3D_BEGIN_NBR	numeric(7,3)	
TO_CTL_3D_END_NBR	numeric(7,3)	

# LRS/RI Development: Future / In-Progress

## Network Routing (nodes / links)

### RIMS RH (Transactional): Esri Roads & Highways Schema

LRS SEGMENTS Table ~ Esri R&Hs Routes  
LRSN\_COUNTY\_NETWORK

LRS_CURRENT_SEGMENT_ID	SPLIT_JUR_OVERLAP_ID
PERP_YEAR	
NLF_ID	SPLIT_JURISDICTION_CD
JURISDICTION	
COUNTY	SPLIT_JUR_INVERSE_IND
ROUTE_TYPE	COUNTY_LEFT
ROUTE_NUMBER	COUNTY_RIGHT
EXTENSION_CODE	TOWNSHIP_LEFT_FIPS
DESCRIPTION_CODE	TOWNSHIP_RIGHT_FIPS
DIRECTION_CODE	
DISTRICT	MUNICIPAL_LEFT_FIPS
	MUNICIPAL_RIGHT_FIPS
CTL_BEGIN	
CTL_END	STATE_LEFT
SEGMENT_LENGTH_NBR	STATE_RIGHT
LEAVE_IND	
	DIVIDED_HIGHWAY
REENTER_IND	STREET_DIR_SUFFIX_CD
	STREET_SPEC_SUFFIX_CD
	STREET_NAME_TXT
	STREET_SUFFIX_CD
PRIMARY_OVERLAP_ID	STREET_DIRECTION_PREFIX_CD
	GAS_TAX_CODE
PRIMARY_IND	DIRECTION
	GEOMETRY
OVERLAP_INVERSE_IND	



### RIMS Publication

RIMS_LRS_HISTORY	
PERP_YEAR_NBR	numeric(4,0)
DISTRICT_NBR	numeric(2,0)
NLF_ID	char(14)
NLF_ID_ST	varchar(25)
JURISDICTION_CD	char(1)
COUNTY_CD	char(3)
ROUTE_TYPE_CD	char(2)
ROUTE_NBR	char(5)
ROUTE_SUFFIX_CD	char(1)
ROUTE_EXTENSION_CD	char(1)
CARDINALITY_CD	char(1)
CTL_BEGIN_NBR	numeric(8,3)
CTL_END_NBR	numeric(8,3)
CTL_2D_BEGIN_NBR	numeric(8,3)
CTL_2D_END_NBR	numeric(8,3)
STL_BEGIN_NBR	numeric(8,3)
STL_END_NBR	numeric(8,3)
STL_2D_BEGIN_NBR	numeric(8,3)
STL_2D_END_NBR	numeric(8,3)
SEGMENT_LENGTH_2D_NBR	numeric(8,3)
SEGMENT_LENGTH_NBR	numeric(8,3)
LEAVE_REENTER_TYPE_CD	varchar(25)
LEAVE_IND	char(1)
REENTER_IND	char(1)
PRIMARY_IND	char(1)
OVERLAP_INVERSE_IND	char(1)
SHAPE	geometry
PRIMARY_OVERLAP_ID	varchar(40) <fk>
LRS_HISTORY_ID	varchar(40) <pk>

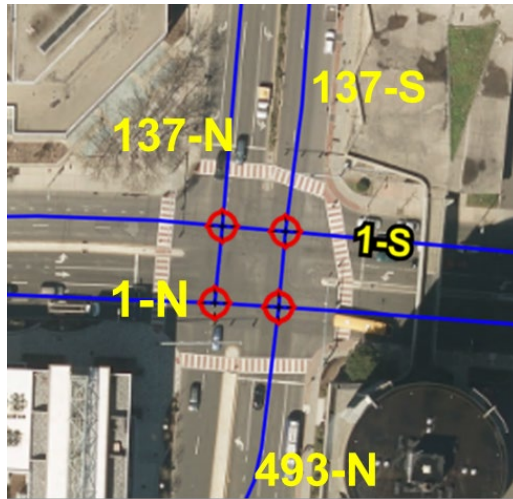
- Initial testing / prototyping
- Able to create basic node / link network using FME
- Basic routing capability (i.e. shortest path) works
- Need to define requirements, cost values, etc.



# LRS/RI Development: Future / In-Progress



## Intersections



### Intersection/Navigation Points: GDF Junctions

INTER PT_ID	Valency (GDF)	Routes & Measures	Geom. (XYZ)
002421	2	Relate Table	X <sub>1</sub> ,Y <sub>1</sub> ,Z <sub>1</sub>
000257	2	Relate Table	X <sub>2</sub> ,Y <sub>2</sub> ,Z <sub>2</sub>
000258	2	Relate Table	X <sub>3</sub> ,Y <sub>3</sub> ,Z <sub>3</sub>
000018	3	Relate Table	X <sub>4</sub> ,Y <sub>4</sub> ,Z <sub>4</sub>

### Intersection Points Relate Table: Route Measures

INTER PT_ID	Route	Measure
002421	137-S	0.00
002421	1-N	6.93
000257	137-S	0.01
000257	1-S	6.93
000258	1-S	0.0
000258	137-N	0.01
000018	137-N	0.01
000018	1-N	6.94
000018	493-N	0.34

RIMS_INTERSECTIONS	
INTERSECTION_EVENT_ID	varchar(36) <pk>
OBJECTID	int
INTERSECTION_ID	varchar(36)
PERP_YEAR_NBR	numeric(4)
PERP_DATE	datetime
RETIRE_DT	datetime
VALID_IND	char(1)
LOCAL_ONLY_IND	char(1)
GEOMETRY	geometry
RETIRED_IND	char(1)
MODIFIED_IND	char(1)
ADDED_IND	char(1)

RIMS_CROSS_ROUTE_PTS	
CROSS_ROUTE_ID	varchar(36) <pk>
INTERSECTION_EVENT_ID	varchar(36) <fk>
OBJECTID	int
NLF_ID	char(14)
CTL_NBR	numeric(7,3)
PRIMARY_IND	char(1)
GEOMETRY	geometry

RIMS_CROSS_ROUTE_LEGS	
CROSS_ROUTE_LEG_ID	varchar(36) <pk>
CROSS_ROUTE_ID	varchar(36) <fk>
OBJECTID	int
NLF_ID	char(14)
APPROACH_ANGLE	numeric(8,3)
APPROACH_ANGLE_ENG	numeric(8,3)
LEG_DIRECTION	varchar(10)
CTL_NBR	numeric(7,3)
CTL_BEGIN_NBR	numeric(7,3)
CTL_END_NBR	numeric(7,3)
GEOMETRY	geometry
SEGMENT_LENGTH	numeric(7,3)
GEOM_LENGTH_METERS	numeric(7,3)
PRIMARY_IND	char(1)

PERP_YEAR_NBR	NLF_ID	CTL_NBR	PRIMARY_IND	INTERSECTION_EVENT_ID	INTERSECTION_ID	GEOM
2017	SPRESR00503**C	5.24 Y		0124fe76-6364-40cd-9067-faea4e05cce4	0124fe76-6364-40cd-9067-faea4e05cce4	POINT (425182.530000000119 183835.23000000004)
2017	TPRETR00315**C	4.41 Y		0124fe76-6364-40cd-9067-faea4e05cce4	0124fe76-6364-40cd-9067-faea4e05cce4	POINT (425182.530000000119 183835.23000000004)
2018	SPRESR00503**C	5.24 Y		255acd42-2b38-4b80-a8ad-f6b89752c543	0124fe76-6364-40cd-9067-faea4e05cce4	POINT (425182.53000000757 183835.23000329174)
2018	TPRETR00315**C	4.41 Y		255acd42-2b38-4b80-a8ad-f6b89752c543	0124fe76-6364-40cd-9067-faea4e05cce4	POINT (425182.53000000757 183835.23000329174)
2019	SPRESR00503**C	5.24 Y		2600b5b8-7a19-4e54-9f74-2cb1dea97a18	0124fe76-6364-40cd-9067-faea4e05cce4	POINT (425192.11000007368 183844.3400032892)
2019	TPRETR00315**C	4.369 Y		2600b5b8-7a19-4e54-9f74-2cb1dea97a18	0124fe76-6364-40cd-9067-faea4e05cce4	POINT (425192.11000007368 183844.3400032892)

Temporal Intersections Data Model for storing the Routes and Measure Values

# LRS/RI Development: Future / In-Progress

## Interchange IDs

- Currently managed in legacy Access DB format
  - » Manually updated
- Need to define requirements
  - » Full business use / needs not well understood currently
    - Assets interaction, Safety areas of influence, reporting, etc.
- Anticipate:
  - » Fully automated creation via FME
  - » Association with the intersection file(s)



# Tools

- TIMS
- TAM-DST
- SLD

# Ohio Transportation Information Mapping System (TIMS)

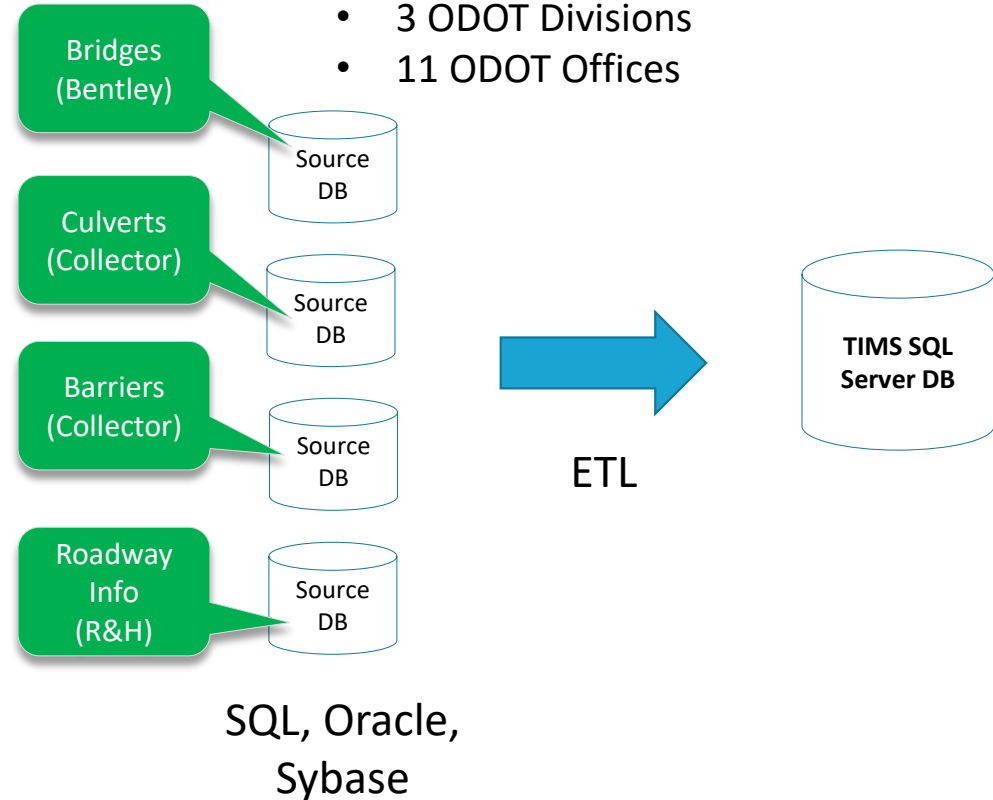
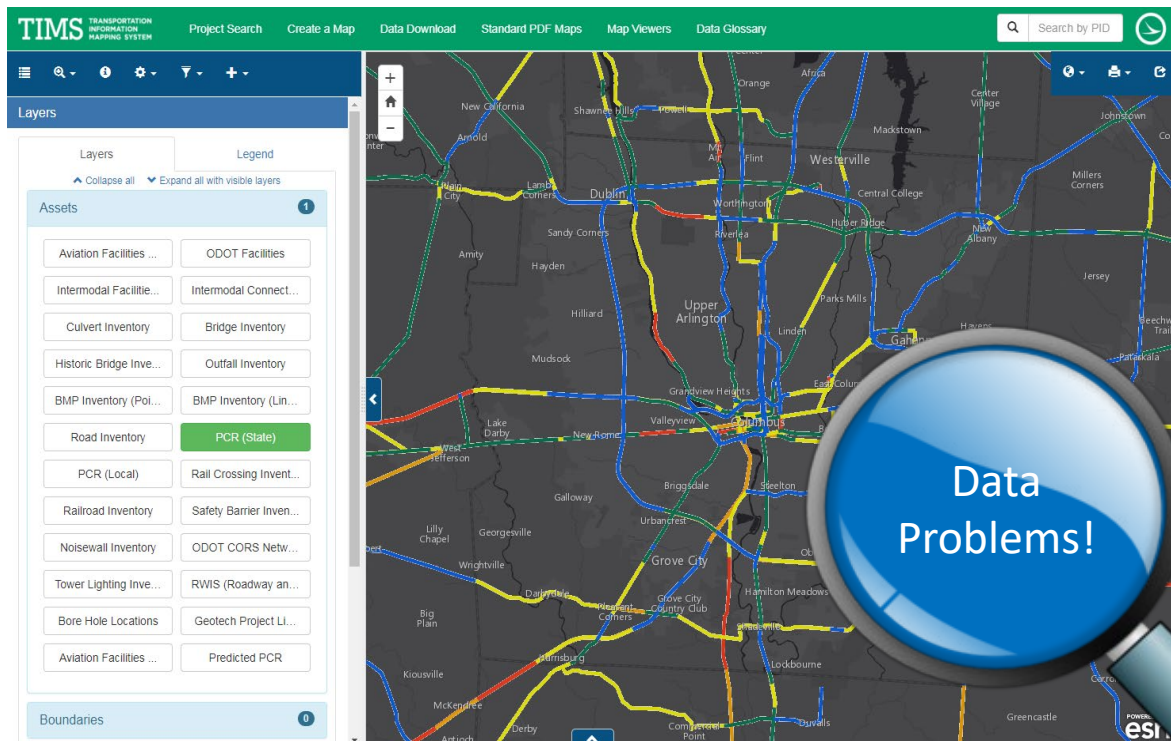
<https://gis.dot.state.oh.us/tims>

## What's In It For Me?

Access/Excel/Flat -> SQL  
Minor DB standards

- Transparency
- Enable sharing
- Increase data usage
- Increase data value
- Exposes issues

- Information Portal
- User friendly
- Business Areas **want** their data available here
- 80+ Datasets
- 5 Agencies (State/Fed)
- 3 ODOT Divisions
- 11 ODOT Offices



# Transportation Asset Management Decision Support Tool

**ODOT TAMDST**  
Transportation Asset Management  
Decision Support Tool

PREFERENCES FILTERS CONDITION MAP REPORTS ?

**PREFERENCES** [CLOSE]

**ASSET TYPES**  
Select a checkmark to enable an asset data.

PAVEMENT BRIDGE CULVERT BARRIER SIGN BMP

**REPORT TYPES**  
Select a checkmark for the reports you want to generate.

INVENTORY CONDITION PERFORMANCE INVESTMENT MAINTENANCE PLANNING

**TOOLTIPS**  
Show formatted tooltips throughout the application.

**ASSET TYPES**  
Click icon(s) to turn on or off data for available assets.

PAVEMENT BRIDGE CULVERT BARRIER SIGN BMP

LESS ASSETS

**INVENTORY**  
Asset Valuation  
Inventory Summary  
Inventory Detail  
Asset History Grid

**CONDITION**  
Condition Summary  
Condition Detail  
Poor Condition List  
Predicted PCR  
Years to Deficiency

**PERFORMANCE**

**MAINTENANCE COST HISTORY**  
Provides historic maintenance expenditure data.

Maintenance Category: All

Maintenance Expenditure per Year

Maintenance Category	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
PAVEMENT	\$716,200	\$716,200	\$716,200	\$716,200	\$716,200	\$716,200	\$716,200	\$716,200	\$716,200	\$716,200	\$716,200	\$716,200
MISCELLANEOUS												
ROADWAY	\$631,000	\$631,000	\$631,000	\$631,000	\$631,000	\$631,000	\$631,000	\$631,000	\$631,000	\$631,000	\$631,000	\$631,000
BRIDGE	\$491,800	\$491,800	\$491,800	\$491,800	\$491,800	\$491,800	\$491,800	\$491,800	\$491,800	\$491,800	\$491,800	\$491,800
VEGETATION	\$167,800	\$167,800	\$167,800	\$167,800	\$167,800	\$167,800	\$167,800	\$167,800	\$167,800	\$167,800	\$167,800	\$167,800
DRAINAGE	\$157,500	\$157,500	\$157,500	\$157,500	\$157,500	\$157,500	\$157,500	\$157,500	\$157,500	\$157,500	\$157,500	\$157,500
SIGNS	\$134,500	\$134,500	\$134,500	\$134,500	\$134,500	\$134,500	\$134,500	\$134,500	\$134,500	\$134,500	\$134,500	\$134,500
TRAFFIC	\$114,400	\$114,400	\$114,400	\$114,400	\$114,400	\$114,400	\$114,400	\$114,400	\$114,400	\$114,400	\$114,400	\$114,400
EARTHWORK	\$59,400	\$59,400	\$59,400	\$59,400	\$59,400	\$59,400	\$59,400	\$59,400	\$59,400	\$59,400	\$59,400	\$59,400
PAVEMENT MARKINGS	\$4,372	\$5,950	\$41,264	\$16,275	\$8,937	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500
OTHER	\$23,342	\$17,184	\$13,902	\$27,516	\$11,000	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500
GUARDRAIL/BARRIER	\$8,228	\$7,527	\$3,895	\$1,202	\$2,792	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500
SNOW & ICE	\$863	\$5,277	\$4,476	\$4,504	\$396	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500
BARRIER		\$10,245	\$5,983	\$396		\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500

Maintenance Year(s) Including: 2008 2019

View exported data on map

Last updated: 10/16/2020, 9:27:36 PM

by Year

Year	Expenditure
2008	\$2.4M
2009	\$2.7M
2010	\$2.1M
2011	\$2.2M
2012	\$3.0M
2013	\$3.1M
2014	\$3.4M
2015	\$3.0M
2016	\$1.2M



# Transportation Asset Management Decision Support Tool

## REPORTS



 **BARRIER**
 **SIGN**
 **BMP**

**LESS ASSETS**

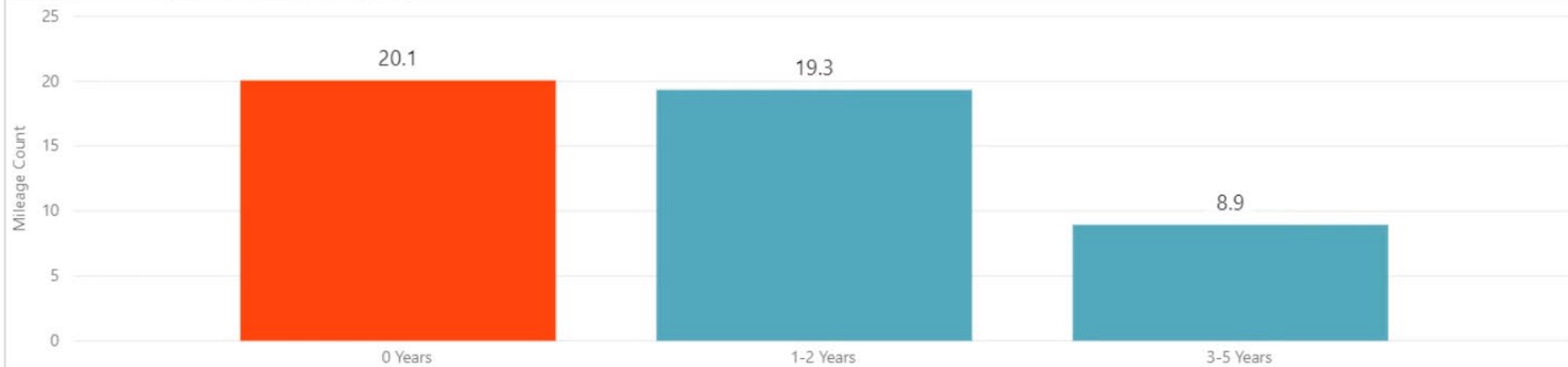
- ^ **INVENTORY**
  - Asset Valuation
  - Inventory Summary
  - Inventory Detail
  - Asset History Grid
- ^ **CONDITION**
  - Condition Summary
  - Condition Detail
  - Poor Condition List
  - Predicted PCR
  - Years to Deficiency
- ^ **PERFORMANCE**
  - Treatment Performance
  - Capital Project History
  - Poor Performers List
- ^ **INVESTMENT**
  - Asset Expenditure
  - Maintenance Cost History
- ^ **MAINTENANCE**
  - Ready to Pave

### YEARS TO DEFICIENCY

Shows years and scores leading to a deficient rating on a road segment and its condition rating in a given year. The report is meant to help prepare for capital projects that address maintenance and repairs.

*Last updated:*  
10/16/2020, 9:27:36 PM

Mileage Count per Deficiency Category



[View exported data on map](#)

**Mileage Count (Choose 1)**

Directional Miles

**Deficiency Year**

All

PCR Segments per Deficiency Category

Deficiency Category	NLFID	District	County	Route	CTL Begin	CTL End	Policy System	Direction	Rated Year	Rating Score	Deficiency Year	Deficiency PCR	Years Until Deficient
3-5	SFRAUS00033**C	6	FRA	US33	8.770	8.790	General		2018		2021	59	3
0	SFRAIR00270**N	6	FRA	IR270	45.520	45.530	Blank	DOWN	2019	60	2019	60	0
0	SFRAIR00270**N	6	FRA	IR270	45.530	45.740	Blank	DOWN	2019	60	2019	60	0
0	SFRAIR00270**N	6	FRA	IR270	45.740	45.870	Blank	DOWN	2019	60	2019	60	0

# Transportation Asset Management Decision Support Tool

## REPORTS



- Asset Valuation
- Inventory Summary
- Inventory Detail
- Asset History Grid
- CONDITION**
- Condition Summary
- Condition Detail
- Poor Condition List
- Predicted PCR
- Years to Deficiency
- PERFORMANCE**
- Treatment Performance
- Capital Project History
- Poor Performers List
- INVESTMENT**
- Asset Expenditure
- Maintenance Cost History**
- MAINTENANCE**
- Ready to Pave
- Gap Projects
- Labor/Materials/Equipment
- PLANNING**
- Planned Expenditures
- Scoping Report

### MAINTENANCE COST HISTORY

Provides historic maintenance expenditure detail.

Last updated:  
10/16/2020, 9:27:36 PM

**Maintenance Category**

All ▼

**Maintenance Activity**

All ▼

**Maintenance Costs**

**\$30,065,921**

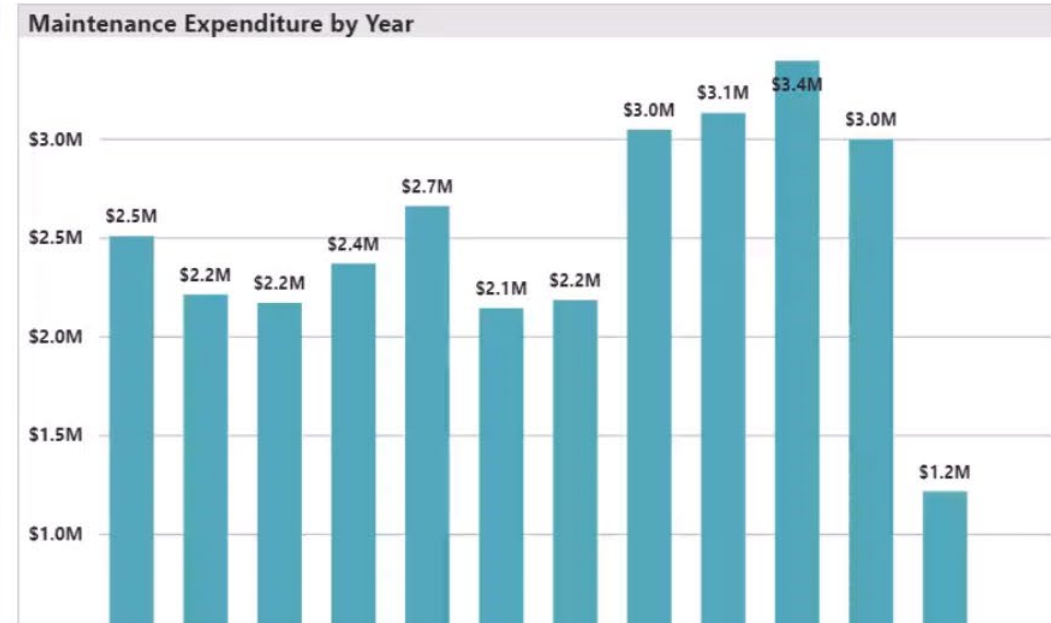
**Maintenance Year(s) Including**

2008 2019



[View exported data on map](#)

Maintenance Expenditure per Year by Maintenance Category						
Maintenance Category	2008	2009	2010	2011	2012	
PAVEMENT	\$716,203	\$621,172	\$812,869	\$845,305	\$1,001,140	\$8
MISCELLANEOUS		\$455	\$370	\$7,920	\$3,521	\$,
ROADWAY	\$631,037	\$512,923	\$293,284	\$464,356	\$464,139	\$3
BRIDGE	\$491,807	\$477,202	\$327,555	\$487,825	\$471,218	\$2
VEGETATION	\$167,888	\$140,353	\$199,115	\$155,907	\$225,491	\$2
DRAINAGE	\$157,592	\$102,865	\$110,814	\$88,161	\$160,351	\$2
SIGNS	\$134,580	\$153,422	\$196,153	\$155,952	\$155,164	\$1
TRAFFIC	\$114,493	\$77,846	\$135,388	\$73,745	\$85,922	\$1
EARTHWORK	\$59,486	\$82,100	\$33,327	\$37,308	\$73,182	\$
PAVEMENT MARKINGS	\$4,372	\$5,950	\$41,264	\$16,275	\$8,937	\$
OTHER	\$23,342	\$17,184	\$13,902	\$27,516	\$11,000	
GUARDRAIL/BARRIER	\$8,228	\$7,527	\$3,895	\$1,202	\$2,792	\$
SNOW & ICE	\$863	\$5,277	\$4,476	\$4,504		
BARRIER		\$10,245		\$5,983	\$396	
SIGNAL S/LIGHTING						





# Data from Pavement Management System

## REPORTS

- Asset Valuation
- Inventory Summary
- Inventory Detail
- Asset History Grid**
- ^ CONDITION
- Condition Summary
- Condition Detail
- Poor Condition List
- Predicted PCR
- Years to Deficiency
- ^ PERFORMANCE
- Treatment Performance
- Capital Project History
- Poor Performers List
- ^ INVESTMENT
- Asset Expenditure
- Maintenance Cost History
- ^ MAINTENANCE
- Ready to Pave
- Gap Projects
- Labor/Materials/Equipment
- ^ PLANNING
- Planned Expenditures
- Scoping Report

### ASSET HISTORY GRID

Displays a combination of Pavement, Road Inventory and Traffic data for road segments and their rating scores over a range of years.

Last updated:  
10/16/2020, 9:27:36 PM

#### Attribute Selection

- Pavement
  - PCR
  - Structural Deduct
  - Average IRI
  - Bleeding
  - Block Trans Cracking
  - Brick Deter
  - Corner Break
  - Corrugation
  - Crack Deduct
  - Crack Seal Def
  - Edge Cracking
  - Faulting
  - Joint Erosion
  - Joint Ref Cracking
  - Joint Slit Damage
  - Joint Spalling
  - Long Cracking
  - Long Joint Cracking
  - Long Joint Spal
  - Patching
  - PCR Deduct
  - Popout

#### Rated Year(s) Including



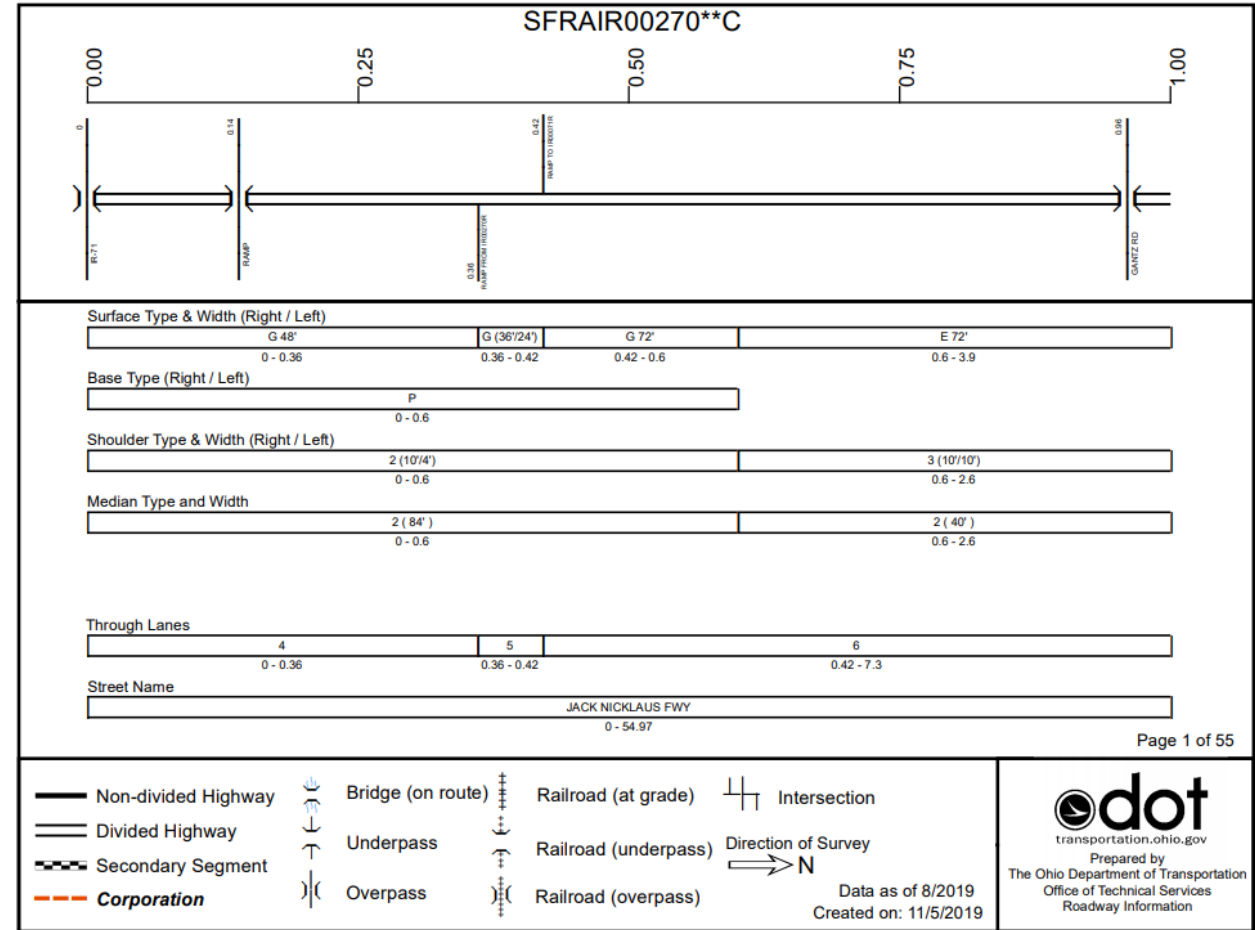
[View exported data on map](#)

Asset History Grid: Right click to drillthroughs.

NLFID	District	County	Route	CTL Beg	CTL End	Direction	Attribute Selection	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
SFRAIR00071**C	6	FRA	IR71	0.000	3.420	UP	PCR	82	74	70	68	98	98	97	94	93	88	82	82
				3.420	3.430	UP	PCR	82	75	70	70	99	97	84	81	85	82	74	80
				3.430	4.750	UP	PCR	82	75	70	70	99	97	84	81	85	82	74	80
				4.750	6.960	UP	PCR	82	75	70	70	99	97	84	81	85	82	74	80
				6.960	7.670	UP	PCR	82	75	70	70	99	97	84	81	85	82	74	80
				7.670	8.540	UP	PCR	82	75	70	70	99	97	84	81	85	82	74	80
				8.540	8.620	UP	PCR	82	75	70	70	99	97	84	81	85	82	74	80
				8.620	9.200	UP	PCR	82	75	70	70	99	97	84	81	85	82	74	80
				9.200	9.760	UP	PCR	89	86	82	81	98	97	97	91	85	84	82	82
				9.760	10.020	UP	PCR	89	86	82	81	98	97	97	91	85	84	82	82
				10.020	10.050	UP	PCR	89	86	82	81	98	97	97	91	85	84	82	82
				10.050	11.280	UP	PCR	81	74	73	72	98	97	92	90	91	86	84	84
11.280	13.800	UP	PCR	81	74	73	72	98	97	92	90	91	86	84	84				

# Straight Line Diagrams (SLD)

- Automated SLD PDF creation using Python
- <https://www.transportation.ohio.gov/wordpress/portal/gov/odot/programs/technical-services/resources/sld>
- Now included in annual LRS/RI publication



# AEGIST Objectives Summary

## Pooled Fund Study (PFS): FHWA and 16+ States Enhancing Enterprise Data Management and Governance Practices

### ■ Spatial Data Modeling

- » Linear Referencing System & Data Models, Data Structures
- » Spatial Referencing Data Models and Structures
- » Data Quality, Availability, Readiness (FAIR), Authoritative Sources

R&H, Intersections, Interchanges,  
Network Routing, LBRS

### ■ Spatial Data Integration and Engineering

- » Integrating and Engineering Business Data using LRS.GIS
- » Data Conflation, Integration using LRS.GIS
- » Data Hubs and Data Engineering Platforms for Preparing Data

LRS / RI API, LBRS

### ■ Spatial Data Analytics

- » Spatial Statistics, Econometrics, AI/ML, System of Engagement
- » Federal, State Reporting: HPMS 9.0 (with MIRE and Intersections)
- » Open Data Portals, Data Sharing and Use:

TIMS, TAMDST, SLD



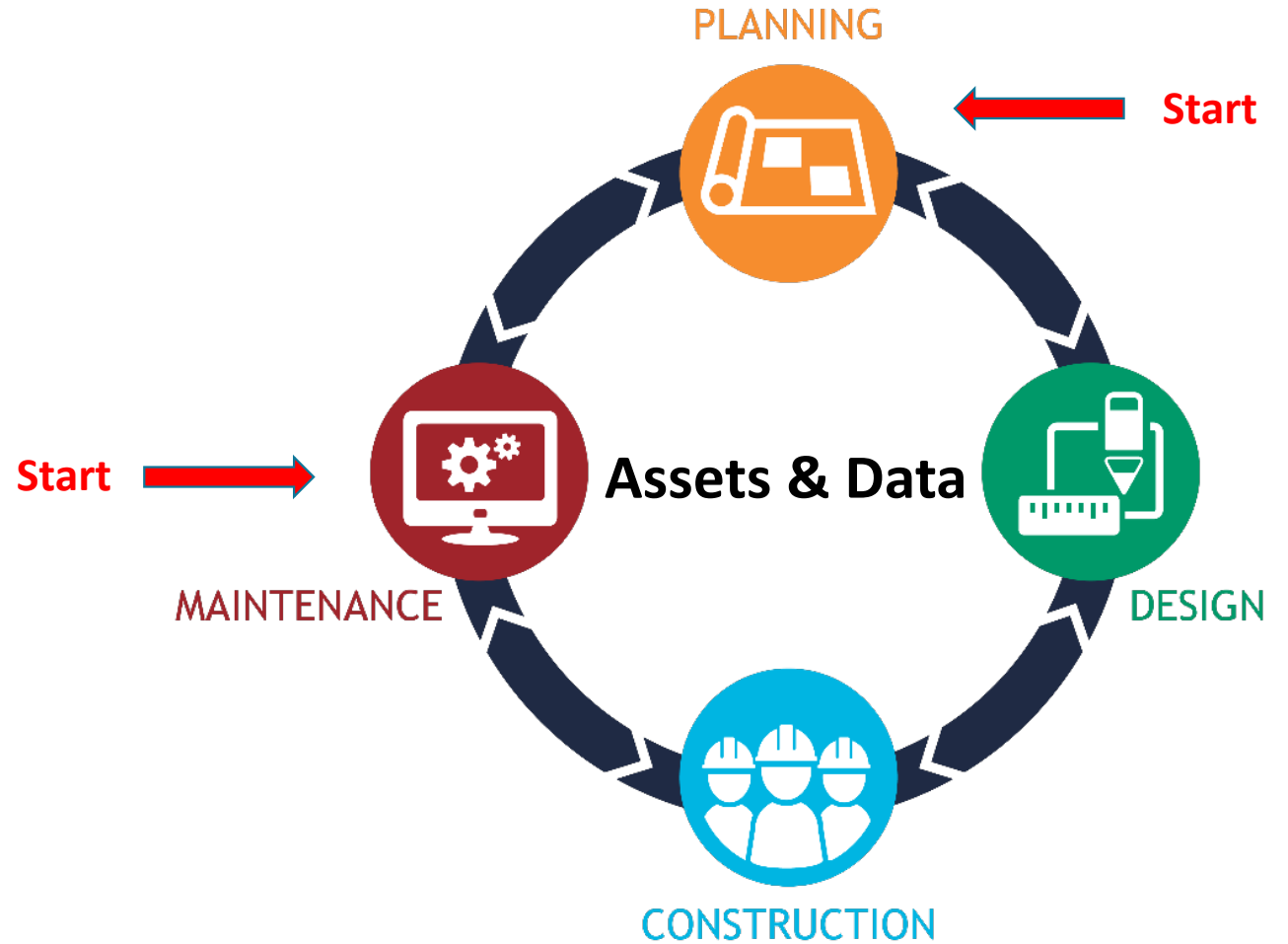
# Asset Management and Data Governance

## Transportation Asset Management

- Manage the Asset Lifecycle

## Data Governance

- Manage the Data Lifecycle



# TAM Audit Group

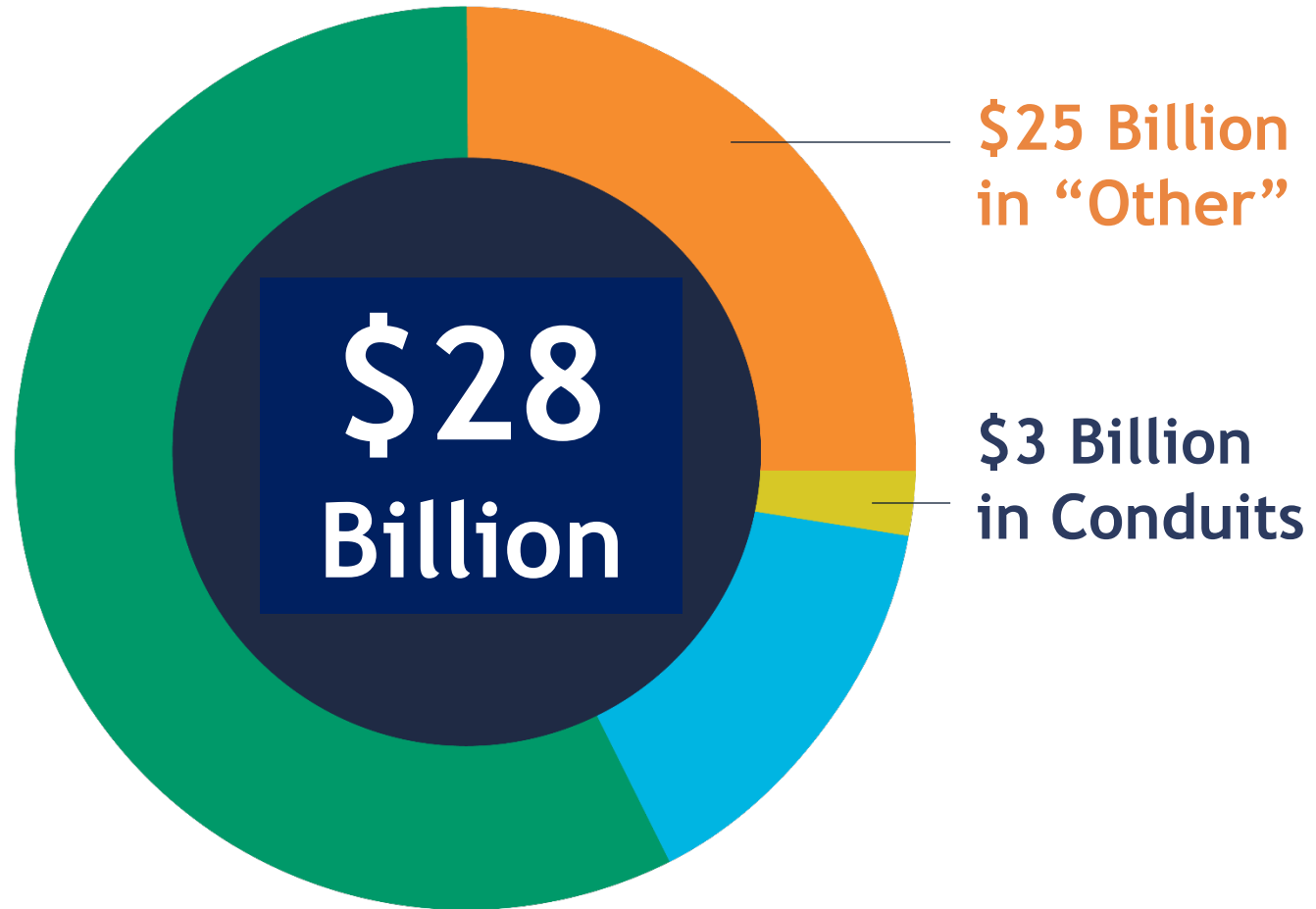


ESRI Image

# ODOT Transportation Assets – Ancillary

14 Asset Categories  
- 53 Asset Types

- BMPs
- Geo Hazards
- ITS and Signals
- BMPs
- Mire Intersections
- Underdrains
- Noise Walls
- Overhead Signs
- Barrier
- Retaining Walls
- Highway Lighting
- ADA Rights of Way .....



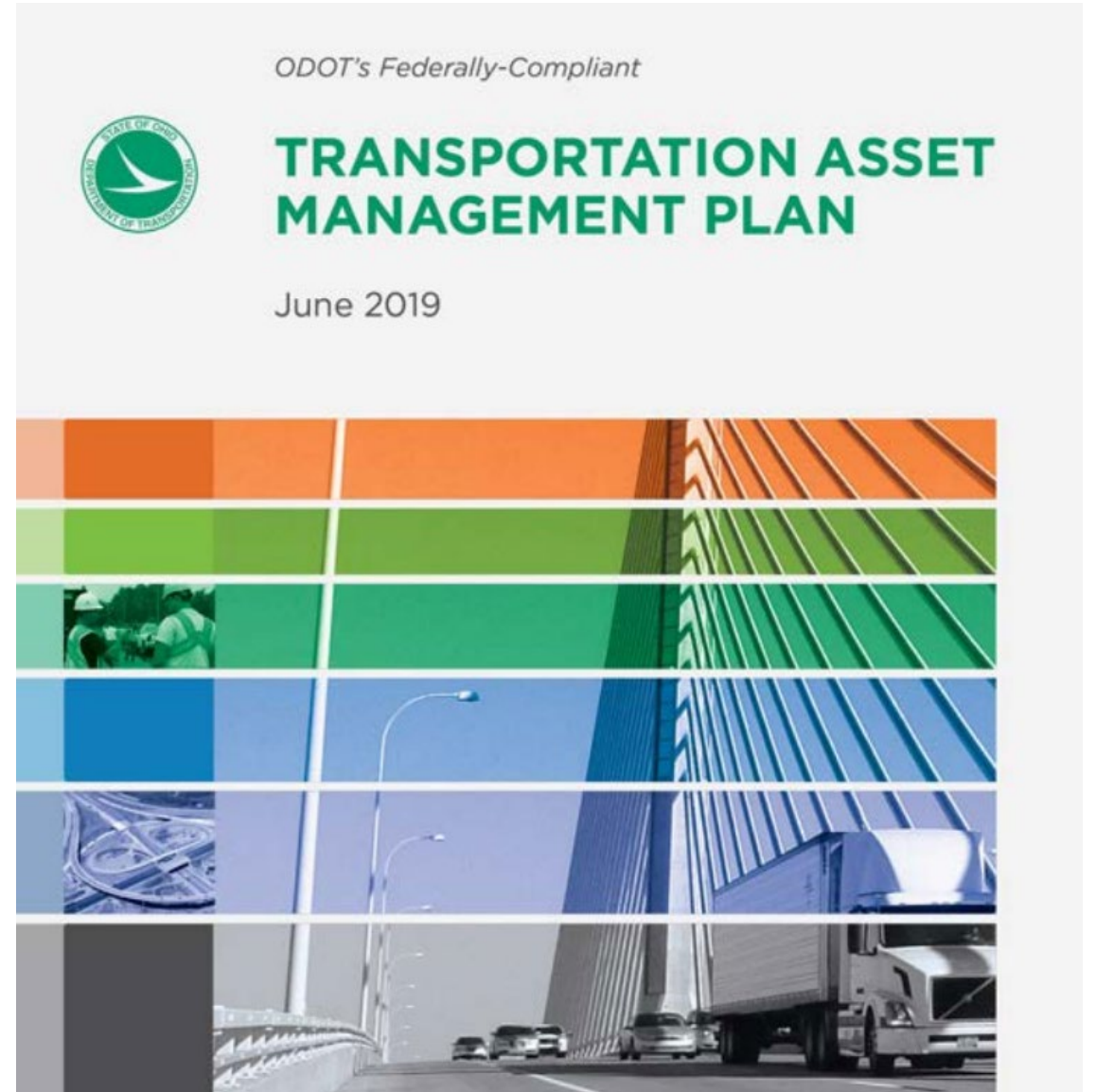
**872,000 Active Assets**

# Pre-Transportation Asset Management Plan (TAMP)

## ODOT Technology Council

### Needs

- Needed a Formal Process Analyze Asset Requests
  - Provide Asset Summary Reports
  - Assist Businesses in Developing Solution Options
  - Mechanism to Prioritize Application Requests
- 
- Transportation Asset Management Audit Group (TAMAG)



# Transportation Asset Management Audit Group (TAMAG)

## TAM Audit Group Responsibilities – 15 Member Committee

- Asset Oversight
- Create Enterprise Standards – **Data Integrity**
- Liaison between Business, Tech Council and Districts
- Provide Asset Collection Equipment
- Business & Stakeholder Requirements
- In-House products using ESRI Collector and Web Apps
- COTS Product Research
- RFI and RFP Subject Matter Experts (SME)
- Inclusion in Vendor Selection Committees

*The Ohio Department of Transportation*



## Transportation Asset Management (TAM) Audit Group Charter

July 14, 2016



# Transportation Asset Management Audit Group (TAMAG)

## Tools

- **ODOT Collector Handheld Application (field workers)**
- **Web editing tools (Mid-Level Management)**
- **Reports (Everyone)**
  - **QC**
  - **Data Entry Errors**
  - **PowerBI and Excel**
- **Executive Dashboard**
- **TIMS – Public Facing Website**
- **GQL Models**

**\* Tools are Identical for all Assets**

Collector Enterprise Assets
Asset Categories and Types
<b>Conduits</b>
1. Culverts (Point)
2. Storm Sewers (Point)
<b>ADA Rights of Way</b>
3. ADA Ramps (Point)
4. Refuge Islands (Point)
5. Pedestals (Point)
1. Ped Buttons (feature of Pedestals)
6. Sidewalk Approaches (Point)
7. Pedestrian Crossing (Point)
8. Accessible Parking (Point)
<b>ITS Signals Phase 1 (Intelligent Traffic Systems)</b>
9. Pull Boxes (Point)
10. Devices (Point)
11. Power Services (Point)
12. Cabinets (Point)
13. Power Service Lines (Linear)
14. Communication Lines (Linear)
<b>Retaining Walls</b>
15. Retaining Walls (linear)
<b>BMPs</b>
16. Constructed Wetland (Point)
17. Bioretention Cell (Point)
18. Underground Detention (Point)
19. Retention Basin (Point)
20. Infiltration Basin (Point)
21. Infiltration Trench (Point)
22. Manufactured System (Point)

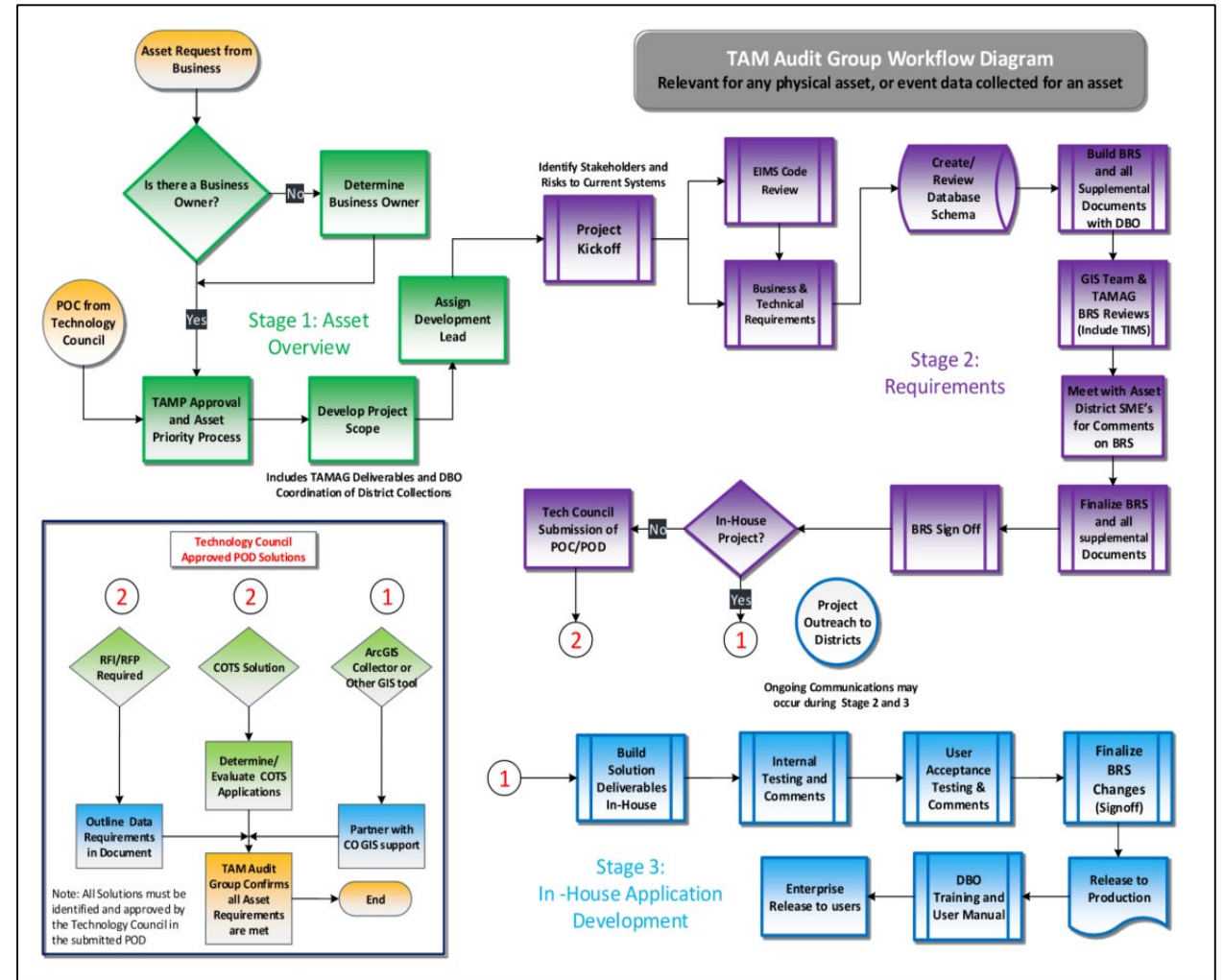
# Transportation Asset Management Audit Group (TAMAG)

- Process

- All Asset Collections Required to Participate
- All Assets have a DBO Identified
- Repeatable
- All New or Enhanced Data Collections
- TAMAG Standards – **Data Integrity**
- Update LRS Data to Assets Annually

- Deliverables:

- Business Requirements Specifications (BRS)
- Technical Requirements Document (TRD)
- Asset Lifecycle Document
- User Roles – **Security**
- Report Templates
- Data Model – **Data Integrity**
- User Manual (DBO) – **Business Glossary & Data Catalog**
- Collector Workflow
- Application Development



# Transportation Asset Management Audit Group (TAMAG)

## ODOT Standard Attribute Requirements

### TAM Audit Group Standard Attributes

- LRS Based – Locational Information
  - Includes Domain Values
- Across all Assets – Physical and Events
  - Integrations
  - Consistency
  - Data Integrity



### Organizational LRS Standards

OBJECTID	System	(System generated value in ESRI ArcSDE databases)
NLF_ID	Char (14)	(Network Linear Feature Identifier – Follow guidelines)
ODOT_DISTRICT	Char (2)	(District Number: 01, 02...leading zero)
CRS	Char (14)	(County Route Section w/no leading zeros in route)
COUNTY	Char (10)	(County Full Name)
COUNTY_CD	Char (3)	(County three letter Code)
ROUTE_TYPE	Char (2)	(Formally Route Designation: US, IR, SR)
ROUTE_NBR	Char (5)	(Route ID; 5 characters to account for local systems)
ROUTE_SUFFIX	Char (1)	(For routes such as 309D or 115A)
CTL_BEGIN_NBR	Number (7.3)	(County Begin Point – Both point and linear)
CTL_END_NBR	Number (7.3)	(County End point - linear)
STL_BEGIN_NBR	Number (7.3)	(State Begin Point – Both point and linear)
STL_END_NBR	Number (7.3)	(State End Point - Linear)
LATITUDE_DD_BEGIN	Decimal Degrees (6 positions) (8, 6)	
LONGITUDE_DD BEGIN	Decimal Degrees (6 positions) (8, 6)	
LATITUDE_DD_END	Decimal Degrees (6 positions) (8, 6)	
LONGITUDE_DD END	Decimal Degrees (6 positions) (8, 6)	
PERP_YEAR	Number (4,0)	(Year of published LRS = CY year - 1)



### Functional Standards

QC_COMPLETE	Char (1)	(QC Complete Y/N. Default Value 'N')
STATUS	Char (1)	(Proposed, Retired, Cancelled, Inactive or Active)
INSTALLATION_DATE	Date	(Date the asset was installed/constructed)
PROJECTION	WGS84 Mercator Auxiliary Sphere (m)	(Required for mapping, not an attribute in DB)
PID_NBR	Int (10,0)	(Capital Projects Unique Project Identifier)
AWARD_DATE	Date	(ELLIS date assigned for project award to contractor)
ASSET_OWNER	Char(1)	(Entity that owns the asset)
MAINTAIN_RESPONSIBLE	Char(1)	(Entity that has Maintenance Responsibility on asset)
MUNI_FIPS_CODE	Vchar (75)	(Municipality Federal Information Processing Code)
TWP_FIPS_CODE	Vchar (75)	(Township Federal Information Processing Code)
MAINTAIN_REQUIRED	Char (1)	(Y/N, Default Value 'N')
MAINTAIN_COMPLETE	Char (1)	(Y/N, Default Value 'Null')
LET_PLANS_URL	Vchar (150)	(URL to PID Project Construction Plan Set)
INTERSECTION_ID	TBD	(To be used with any asset in an intersection)
LEG_ID	TBD	(Identifies intersection leg the asset is associated with)
INTERCHANGE_ID	TBD	(To be used with any asset related to an interchange)

### Data Governance Standards

- Enterprise Data Elements (EDE)
- Critical Data Elements (CDE)
- Functional Data Elements (FDE)

# Asset Lifecycle Diagram – TAMAG

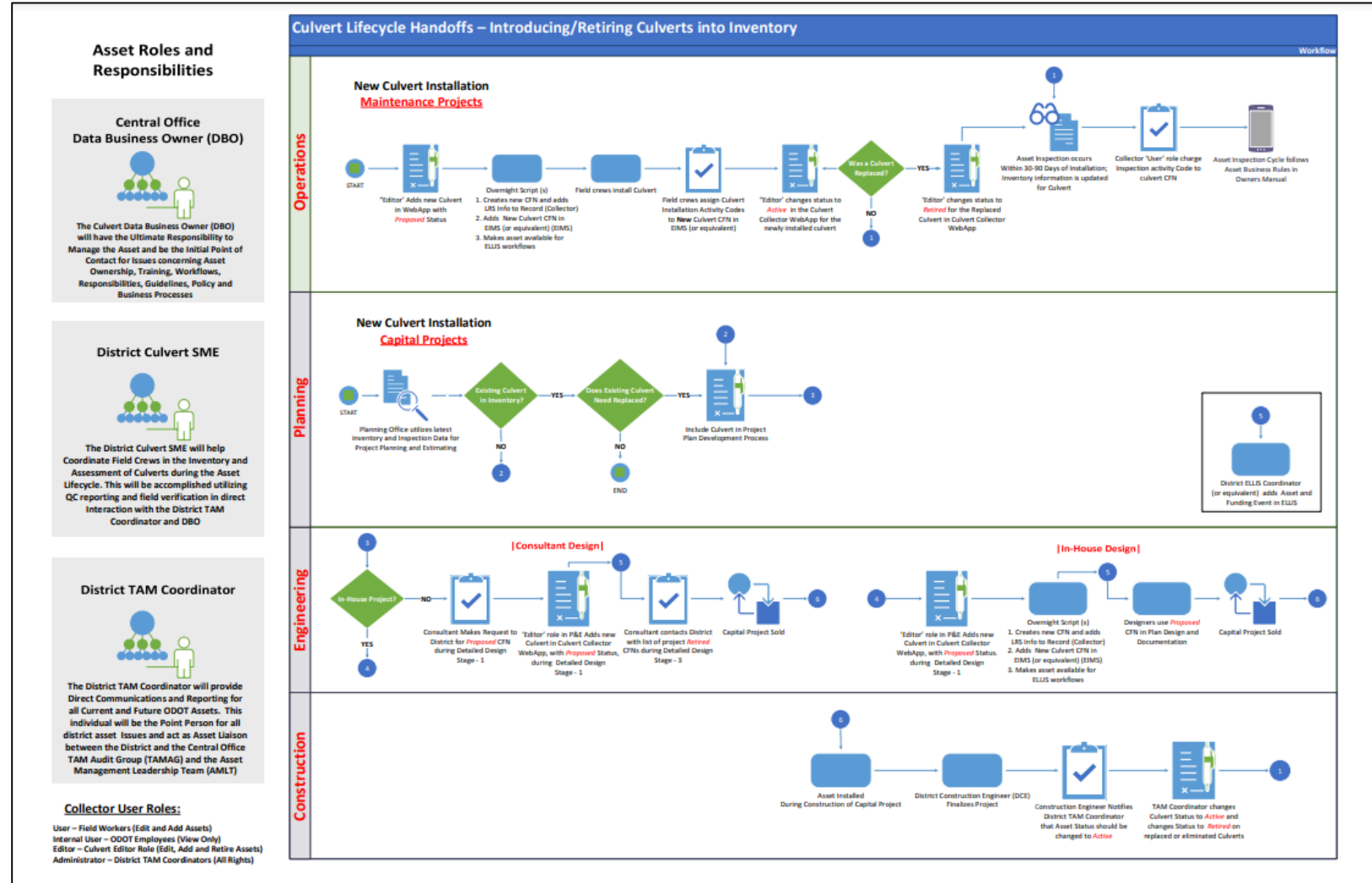
## Tracks Responsibilities (Handoffs)

- Phases of the PDP and Maintenance
  - Operations
  - Capital Projects

## Defines Roles



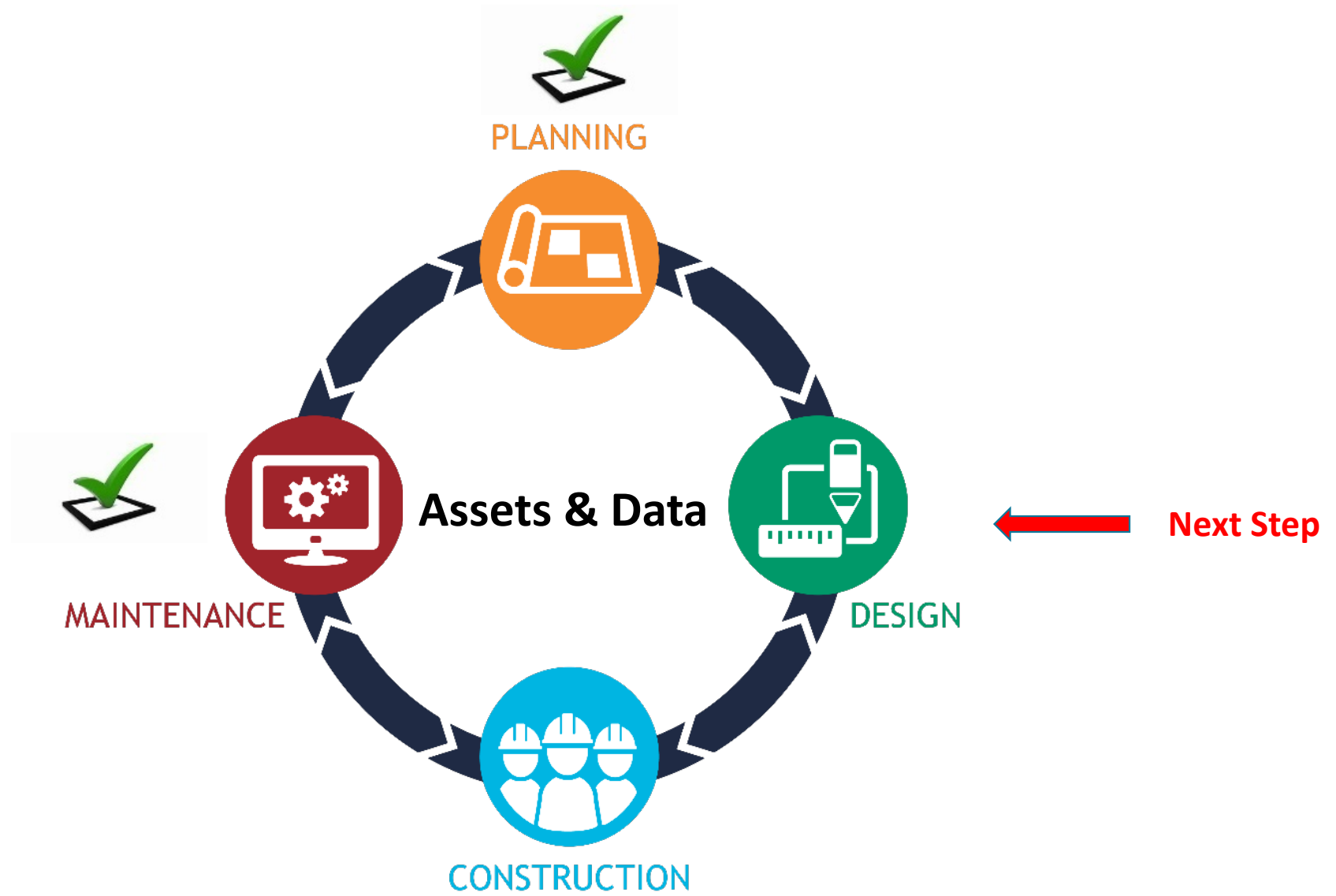
- Data Business Owner
- Asset Subject Matter Experts
- District TAM Coordinator (TAMC)



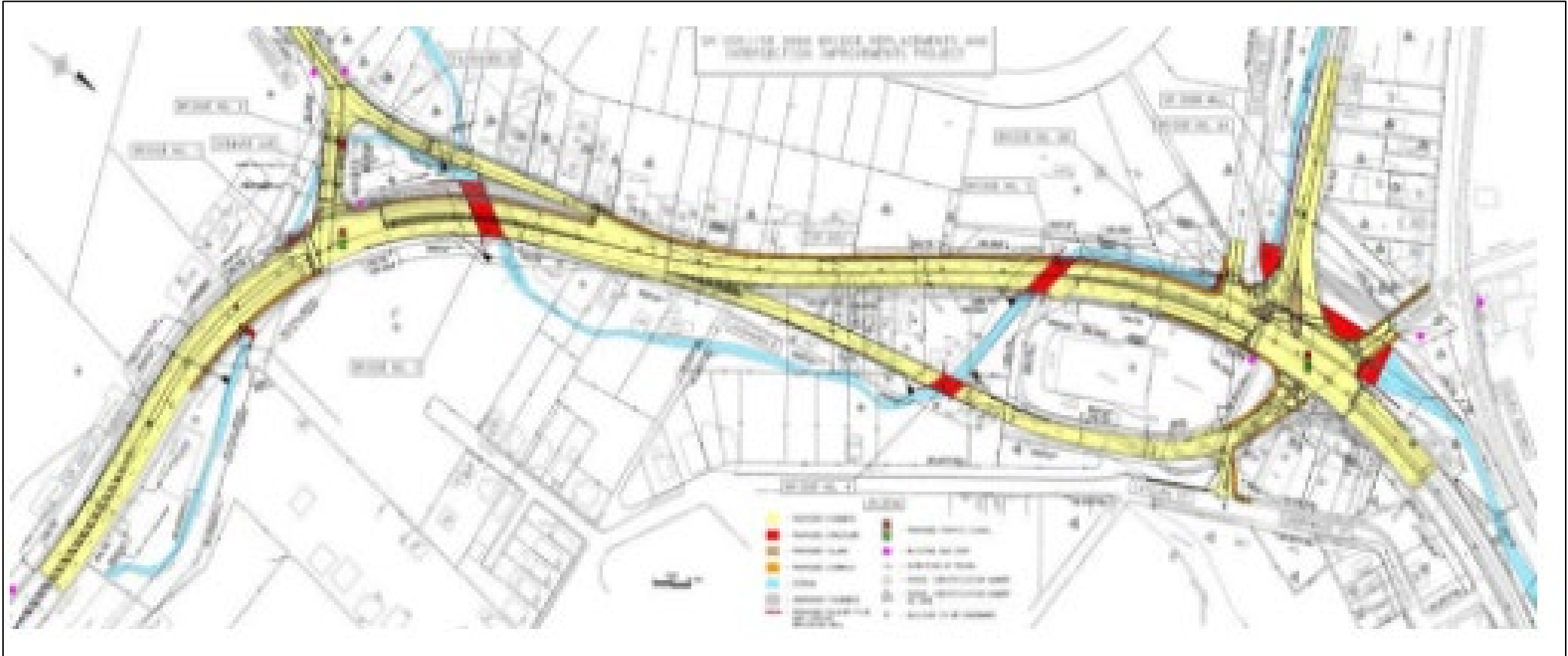
# Transportation Asset Management Audit Group (TAMAG)

## Annually Prioritized Projects

Calendar Year Anticipated Rollout QTR	Data Business Owner (DBO)	DBO Contact	Stage	In Production Date	Current Status	Next Steps Required	Goal for Next Month	Collection/Update Cycle
7(2020)	Geotech	Steve Taliaferro	Stage 3		Application Development	Application Development	Application Development	As Required by Tier Level
10(2020)	Maintenance	Jeff Syar	Stage 3		Application Development	Application Development	Application Development	
2(2021)	Hydraulics	Jeff Syar	Stage 3		Enhancement (#3) Requirements Gathering Completed	In Development Que for Spring of 2020 Release	N/A	Based off General Appraisal (GA), and update cycle outlined in Asset Owners Manual
3(2020)	Traffic Engineering	Charlie Fisher	Stage 2		N/A	N/A	N/A	TBD
	Diversity	Sarah Wade			Initial Project was completed by contracting the inspections of ODOT state-wide facilities			TBD
	Environmental	Matt Perlik	Stage 1		Established Monthly meeting with OES to map high level project needs / hire consultant to perform assessment	Evaluate assessment, determine long-range strategy	Monitor assessment progress	TBD
	Environmental	Matt Perlik	Stage 1		Established Monthly meeting with OES to map high level project needs / hire consultant to perform assessment	Evaluate assessment, determine long-range strategy	Monitor assessment progress	TBD
	Pavement				Email to business on 8-26-16 to	Pending: Follow-up with vendor		



# DGN to GIS

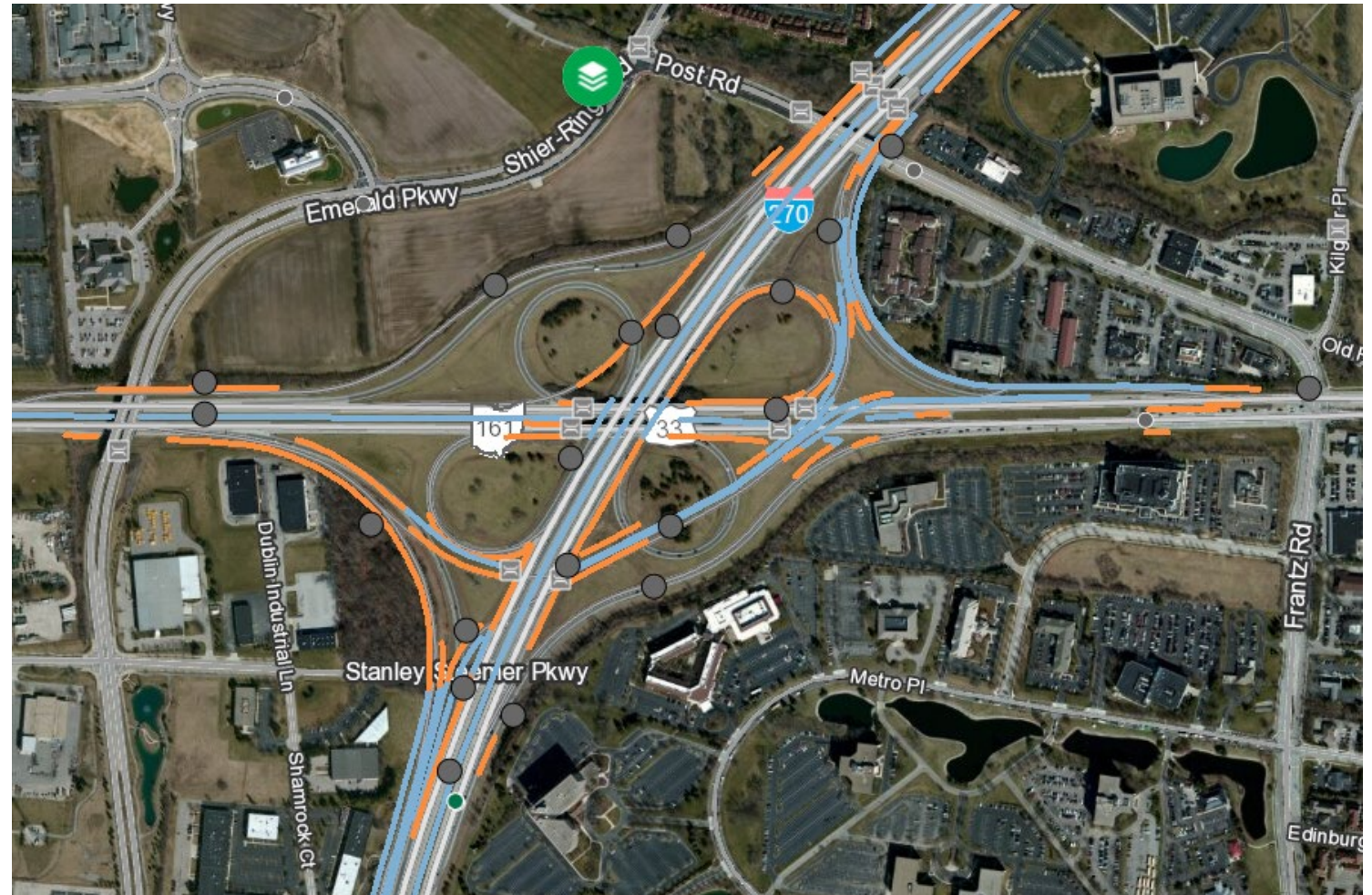
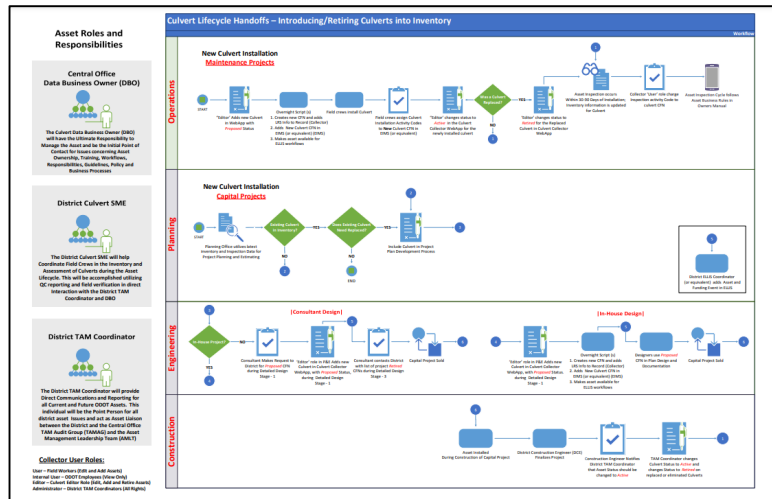


# Asset Lifecycle Diagram – DGN to GIS

100's of Potential Asset in a Capital Project

## Reasons to Automate – DGN to GIS

- Manual Process
- Very Time Consuming
- Individual Collector Web Applications





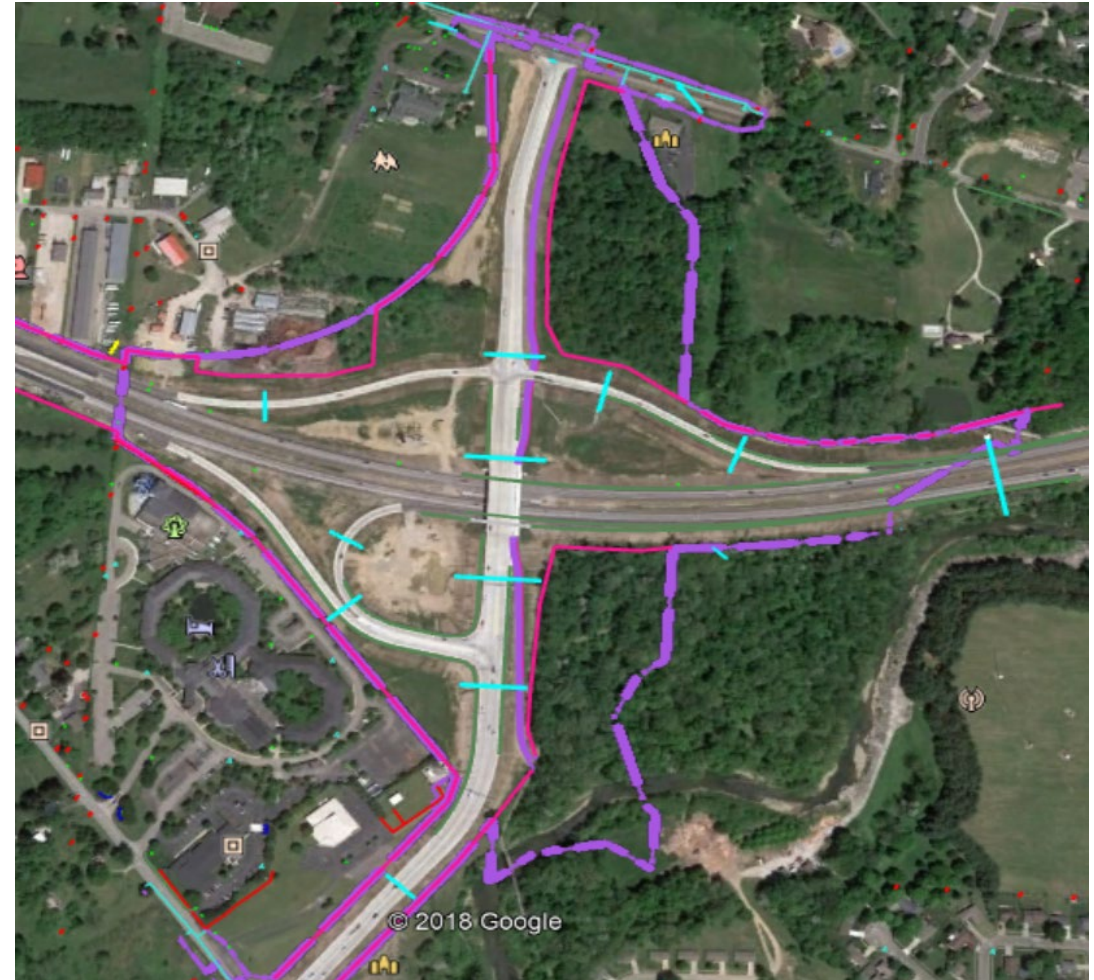
# Project History – DGN to GIS

## Item 623, As Per Plan Note

- Standardize ??
- New Item in Spec Book ??
- Would provide 'As Built' info – Sort of

## DGN to GIS request from Executive Staff

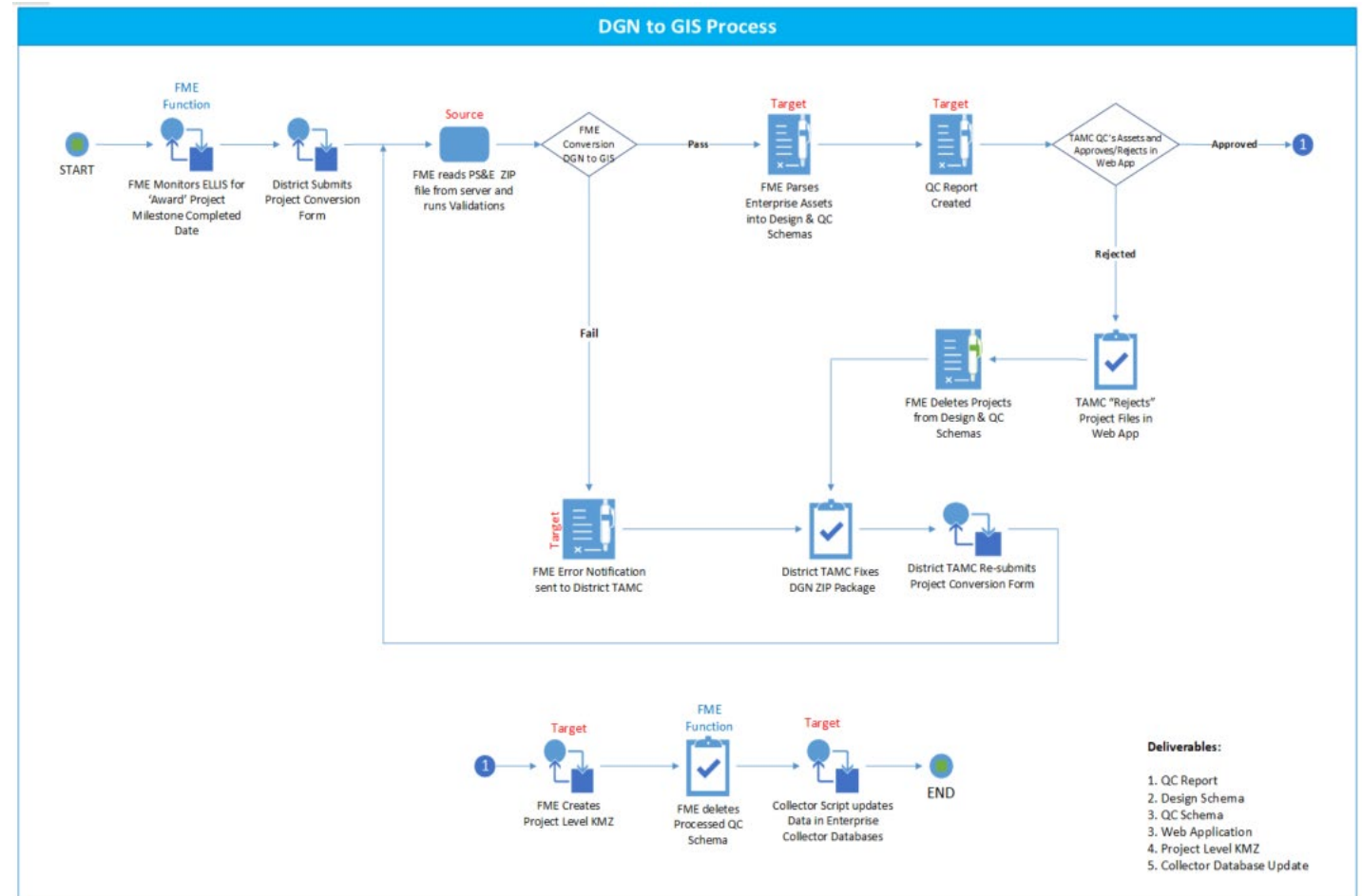
- Central Office Deputy Directors
  - Planning
  - Engineering
  - Construction



# Process – DGN to GIS

- Feature Manipulation Engine (FME)
- Database Schemas (3)
  - Staging -> Design -> QC
- Automatic Notifications to TAMCs
- PowerBI Detailed Reporting
- QC Web Application for TAMCs
- Project Level KMZs
- ‘As Designed’ Project GIS Data
  - Can be referenced back into MicroStation Designs
- Push Enterprise Assets to ODOT Collector!

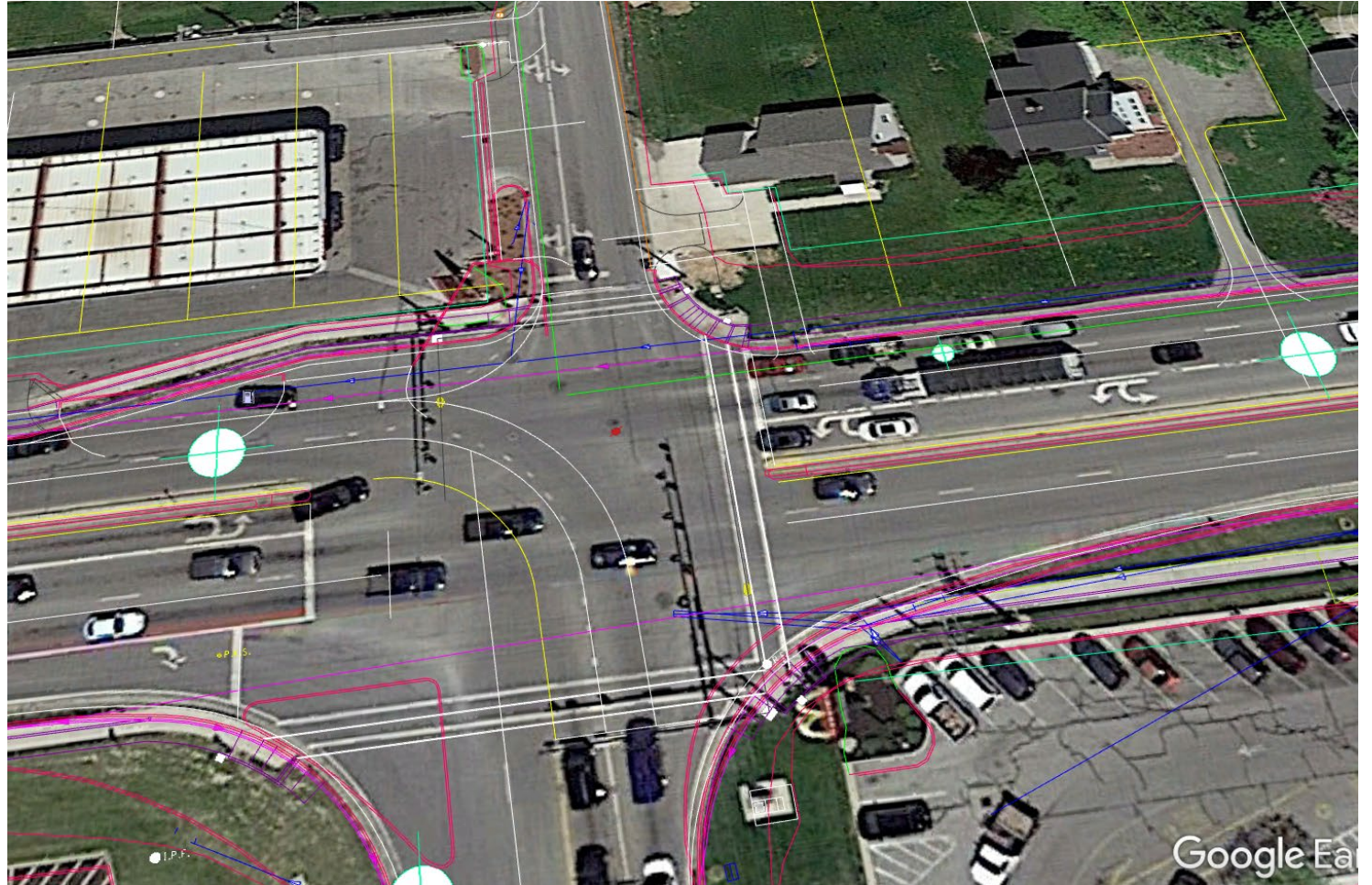
## Workflow Map and Target Deliverables

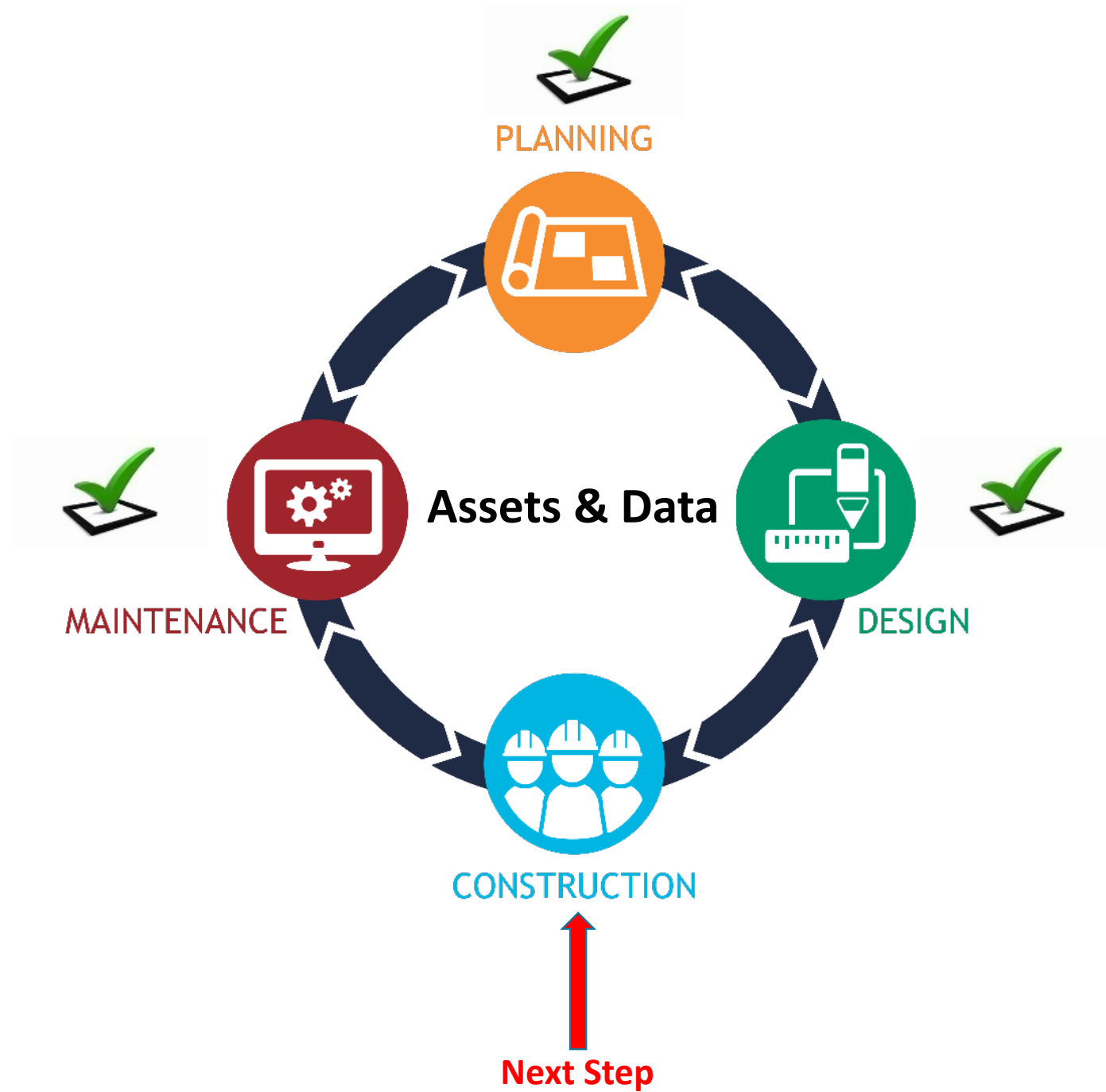


# Advantages – DGN to GIS

- **Non-Enterprise Assets**
  - R/W
  - Driveways
  - Underground Utilities
  - Striping (GIS)
  - Sidewalk
  - Curb and Gutter
- **Sources**
  - Design Files
  - ELLIS (Project Management App)
  - Site Manager (Construction App)

## Project Designs Translated to GIS





# Augmented Reality



# Augmented Reality – vGIS Pilot

## SaaS Middleware

- Microsoft Azure Cloud
  - State and Local Government Cloud Available (FedRamp)
- Licensed per Device

## Planning Tool: GPS Accuracy

- Out of the box 6" (Horizontal)
  - Uses device GPS
- External Antennas - Bluetooth
  - Trimble R2
  - RTK (Survey Grade)

## Device Options

- iOS
  - 556 iPads in TAM
- Android
- Microsoft HoloLens



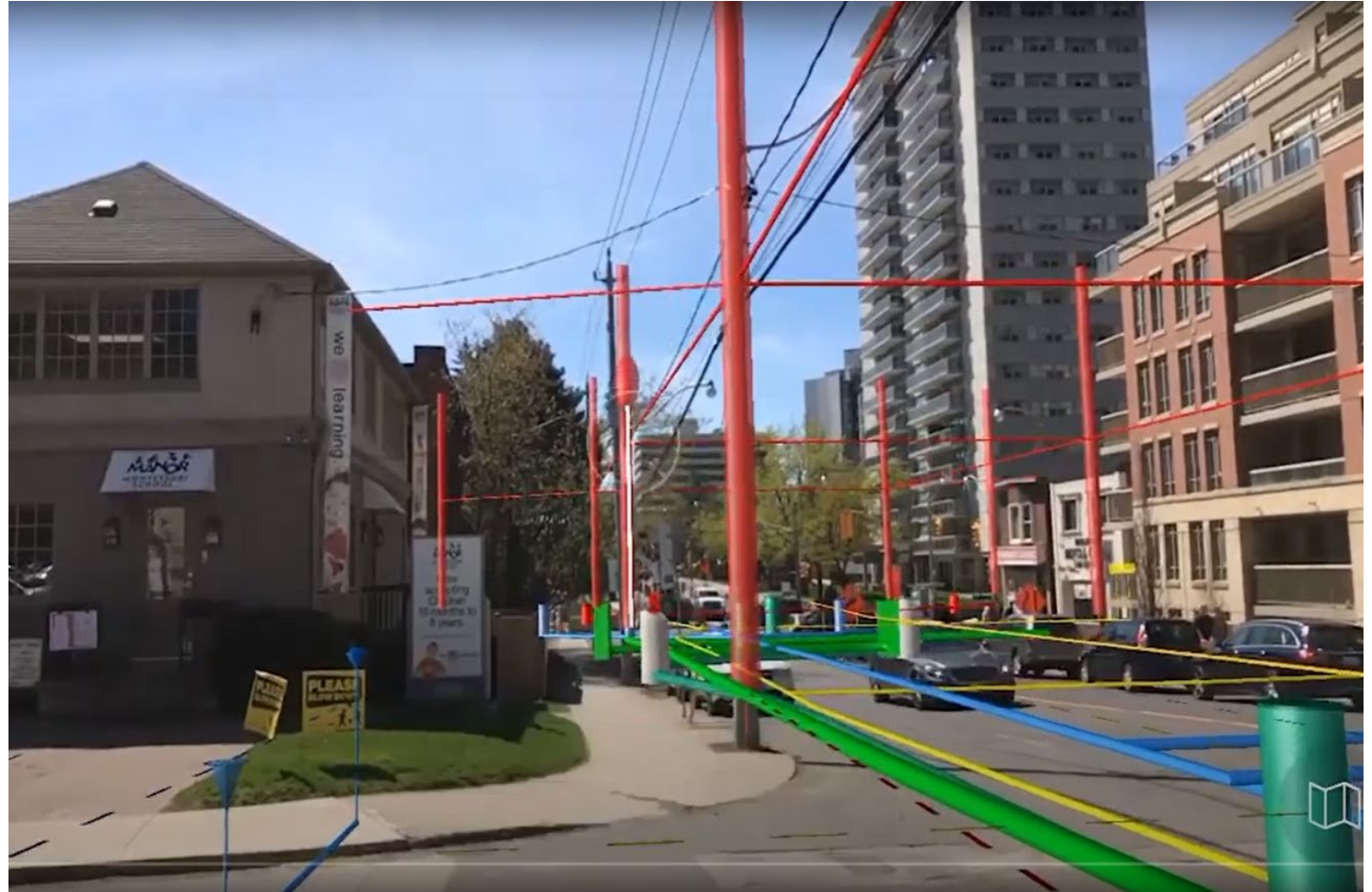
# Augmented Reality – vGIS Pilot

- **ESRI ArcGIS**
  - Feature/Map Services
  - Scene Services
- **Bentley Twin or BIM**
  - .dgn, dwg, .ifc or .skp
- **Digital Twin**
- **Shapefiles**
- **File Geodatabase**
- **KML**
- **WFS, WMS/WMTS**



# Augmented Reality – vGIS Pilot

- **User Configurations**
  - **Lines, Points & Shapes**
    - **Weights**
    - **Styles**
    - **Colors**
  - **Configure Z values for 2D Designs**
  - **300' Buffer for Assets**



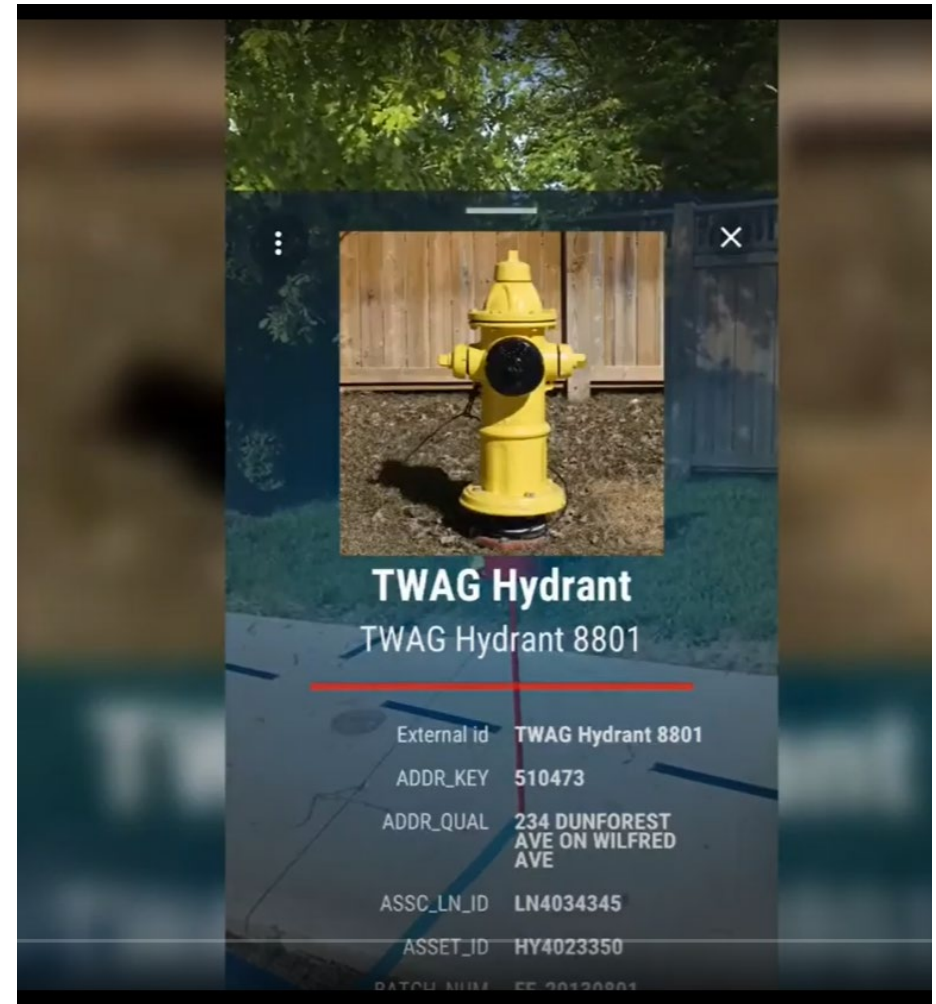
**DGN to GIS Design Translations**



# Augmented Reality – vGIS Pilot

## ODOT Collector Infrastructure

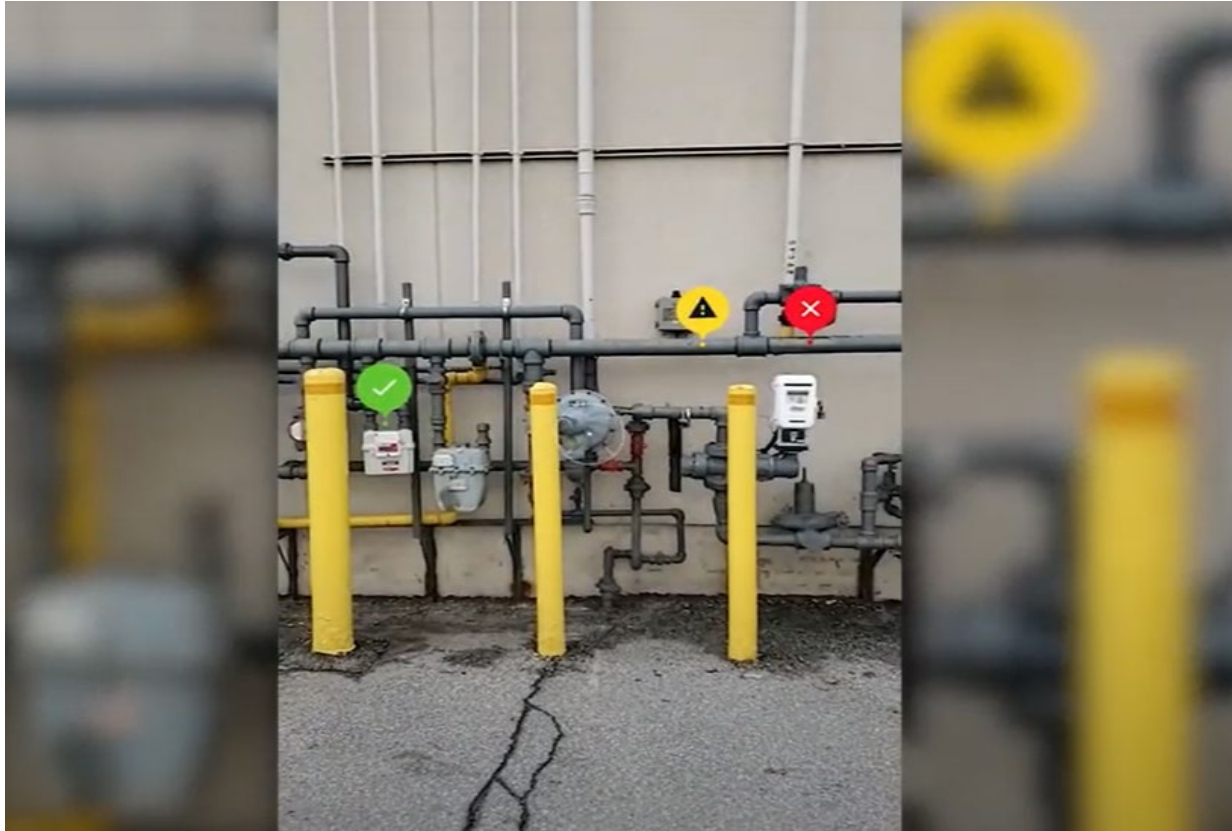
- View Asset Records
- Edit Asset Records
- Adjust GPS Locations
  
- Utilizes Web Service URLs



**Direct Connection to ODOT Collector Infrastructure**

# Reality Mesh – Construction

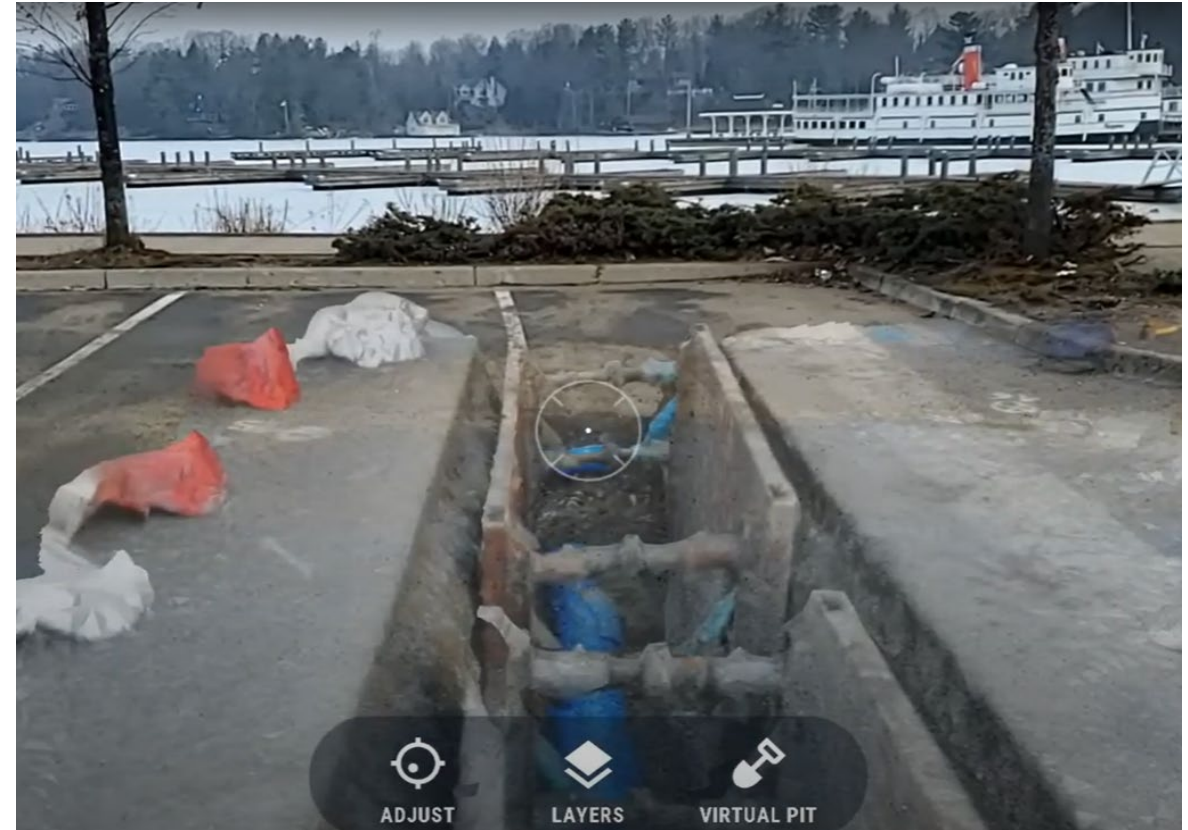
## Asset Tags



**Maintenance Asset Tagging for Repair**

## GPS Photos

## GPS Videos



**Construction 'As Built' and Utilities in R/W**

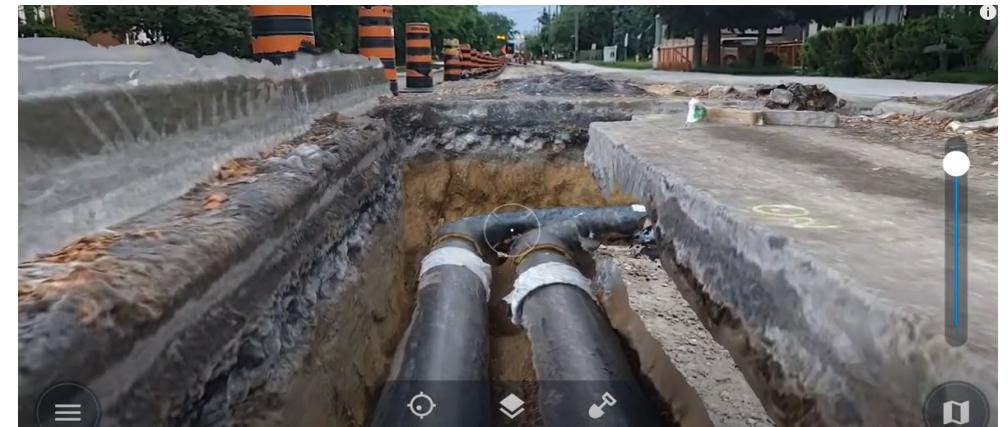
# Augmented Reality – vGIS Pilot

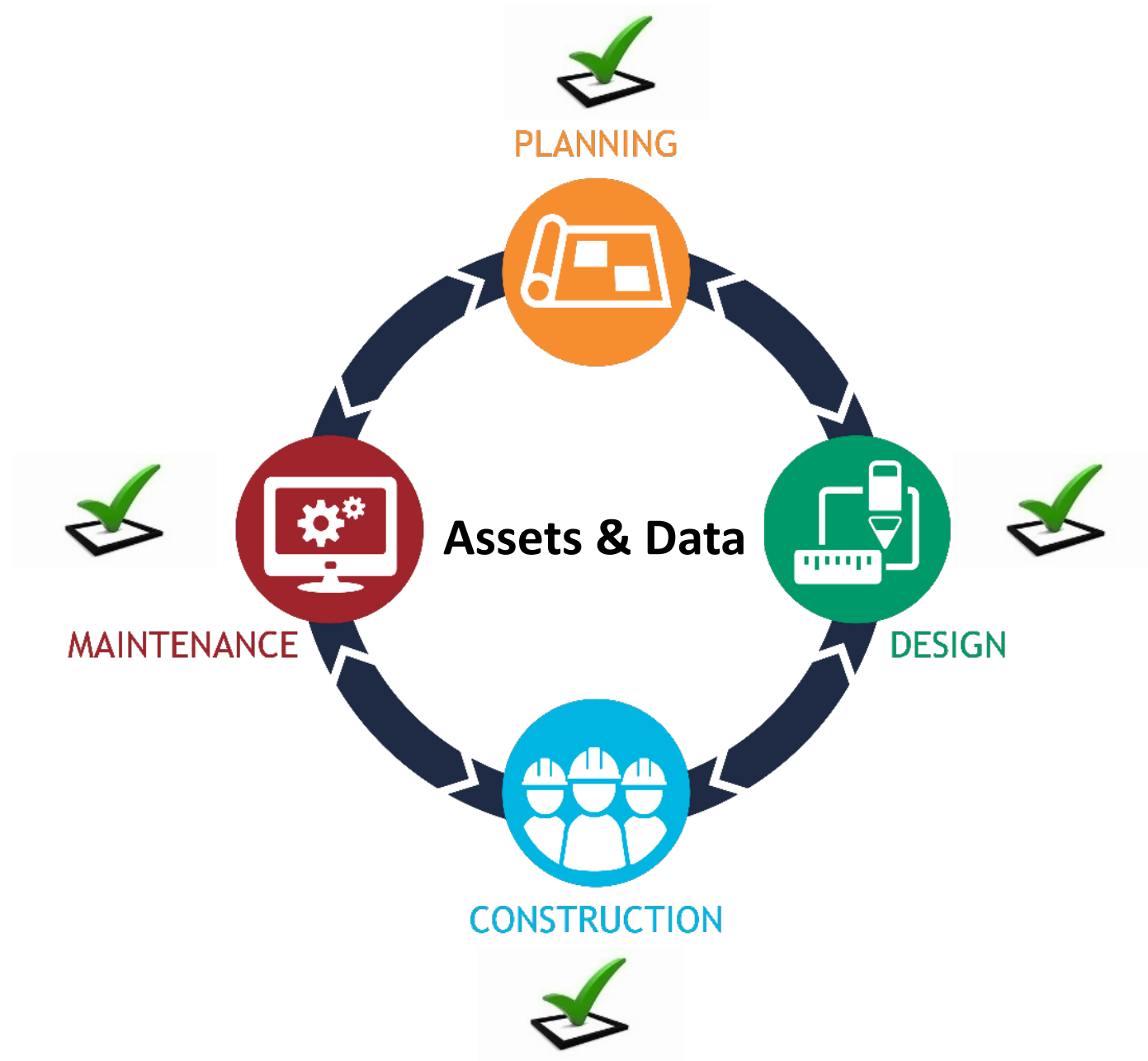
## Use Cases

- Construction Projects – As Built Designs
- Facilities – Underground Utility and Communication Lines
- Collector – View & Edit Assets
- Planning - Project Scoping Field Reviews & Estimates
- Utility Companies in ODOT Rights of Way – As Built Designs

## Pilot

- Implementation and Procurement Jan. - April
- Pilot April - April
- Unlimited Devices





# Data Governance

**\*\* Built Program off success of the TAM Program and TAMAG Efforts \*\***

## *Data Governance*

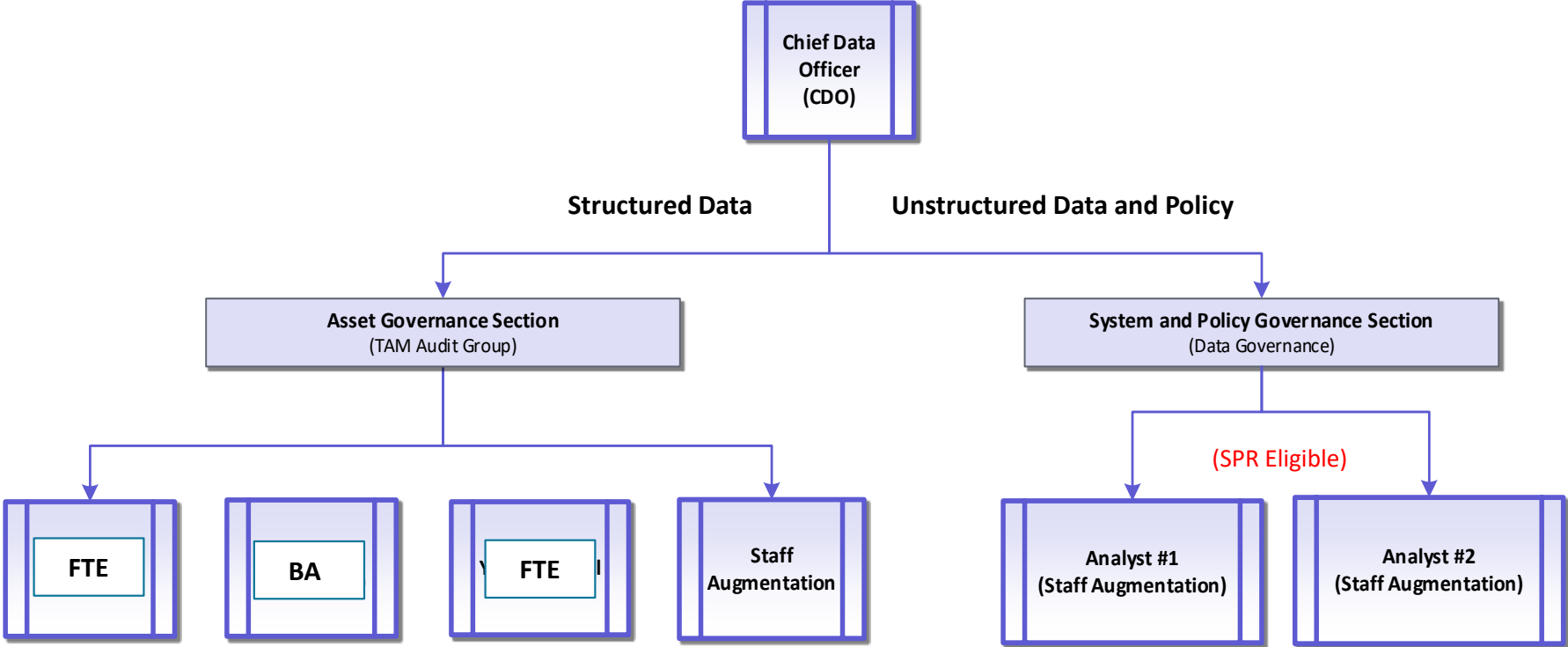
**Overarching policy and procedures to maximize the availability, integration, usability, quality and security of data**

**It is a business competency that engages ODOT's workforce at Executive, Strategic, Tactical, and Operational levels to create, implement and maintain data standards for making better decisions**

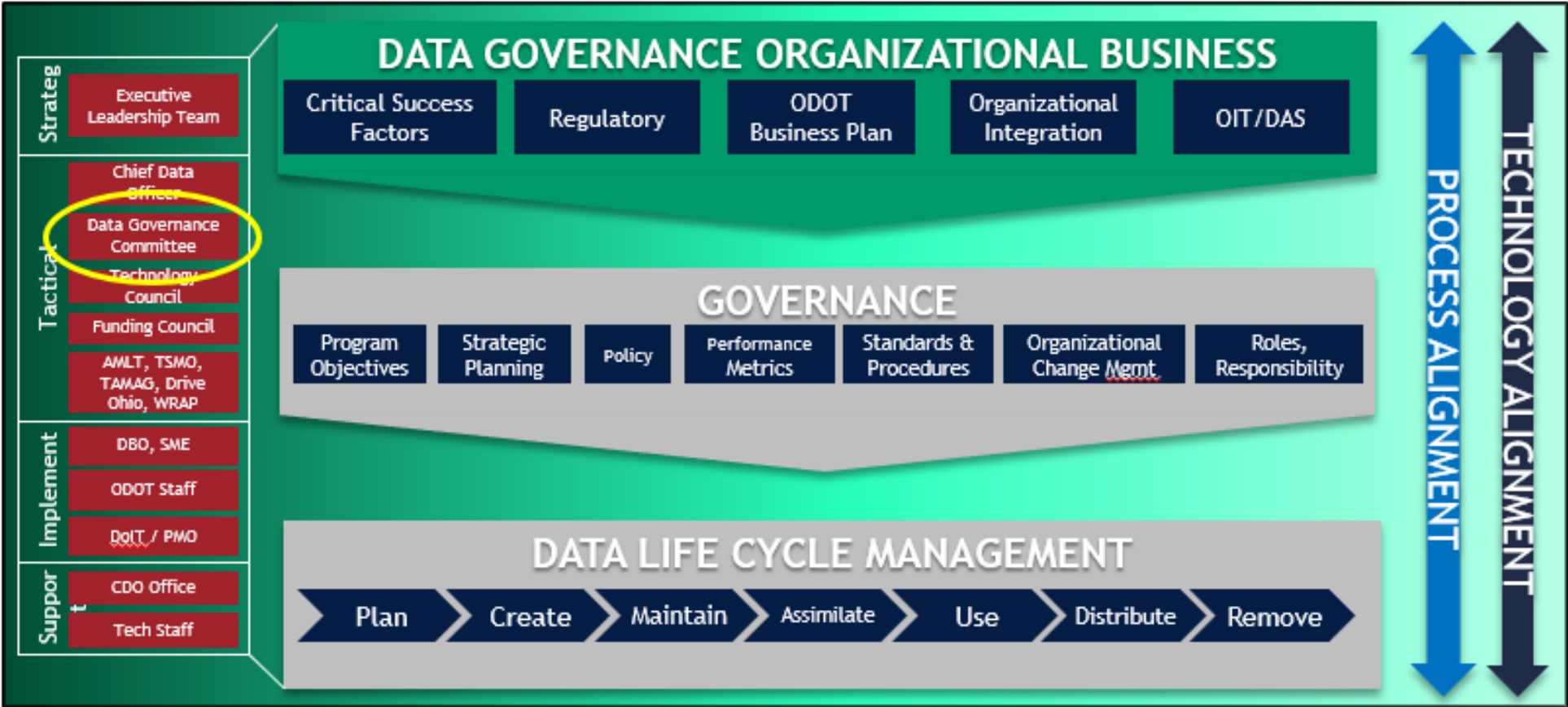
**ODOT DEFINITION**

# Data Governance – Office

## Data Governance



# Data Governance – Framework



**Framework Definition:** Establishes guidelines and rules of engagement for business and management activities of enterprise data. Formalizes data life cycle interactions between people, process, and technologies to support positive outcomes

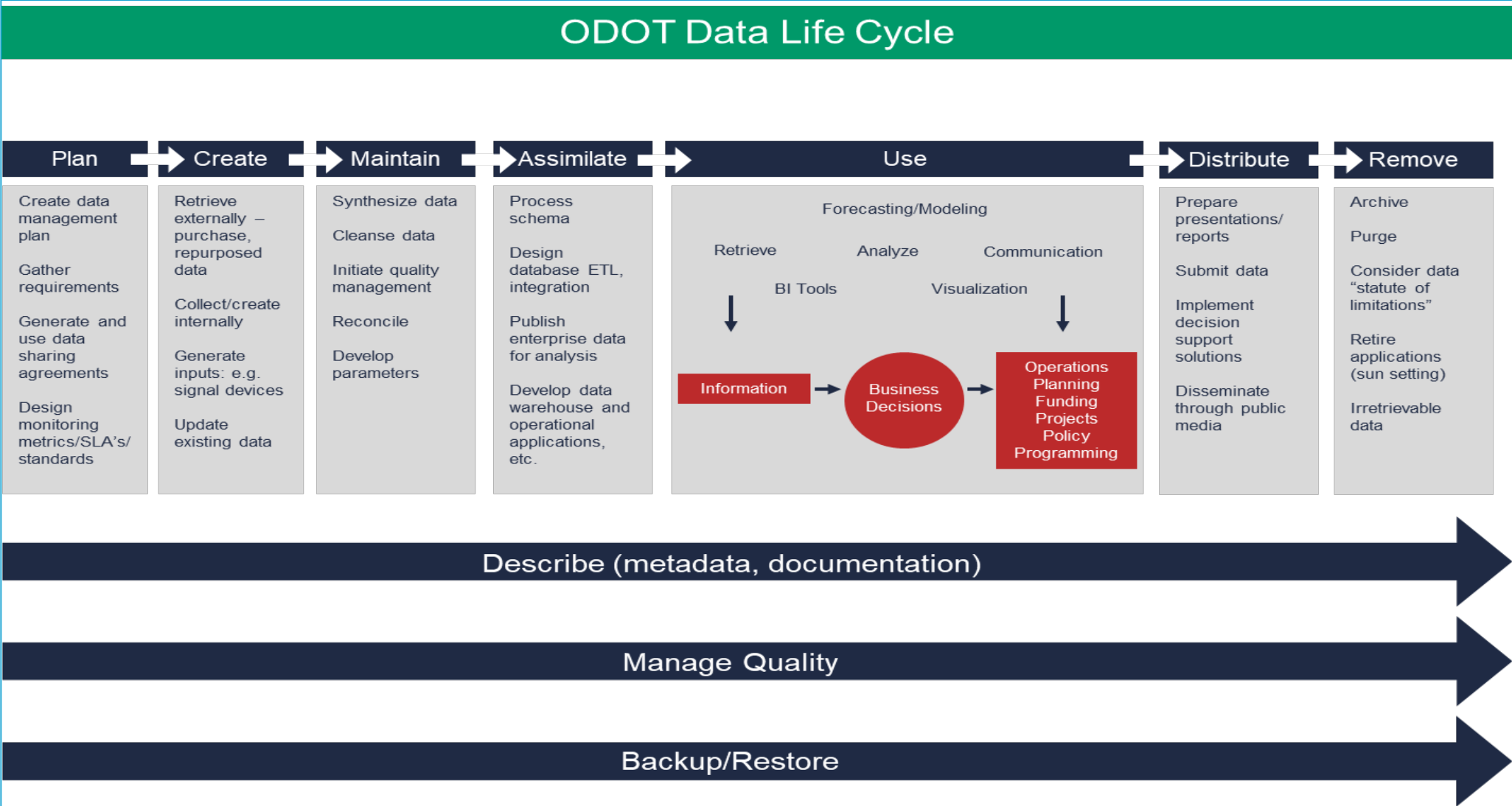
# Data Governance – Roles and Responsibilities

## High Level Responsibility by Governance Area

Level	Role	GOVERNANCE AREA						
		Program Objectives	Strategic Planning	Policy	Performance Metrics	Standards & Procedures	OCM	Roles & Responsibilities
Strategic	Executive Leadership	Mission Vision	CSF Leadership	Approve Endorse	Endorse Embrace Input	Support Empower	Sponsor Support	Empower Leadership
Tactical	Chief Data Officer	Plan Develop Implement Monitor	Plan Develop Implement Monitor	Plan Develop Implement Monitor	Plan Develop Implement Monitor	Plan Develop Implement Monitor	Align across ODOT Continuous Improvement	Define Support Monitor
	DG Committee							
	Technology Council							
	Funding Council							
	Initiatives							
Implement	DBO, SME	Business Functions Manage Programs Subject Matter Expert	Execute Plan Provide Feedback Adhere to Strategy	Enforce Adhere Communicate	Collect Monitor Report	Enforce	Communicate Direction Orientation Onboarding Training	Data Business Ownership Adhere to Policy Education
	ODOT Staff							
	DoIT / PMO							
Support	CDO Office	Accountability Meta Data	Execute Plan Provide Feedback	Research/Input Implement Enforce	Collect Monitor Report	Formalize Enforce	Plan Develop Deliver	Program Management Partnerships Consult/Support Provide IT Resources
	Tech Staff							



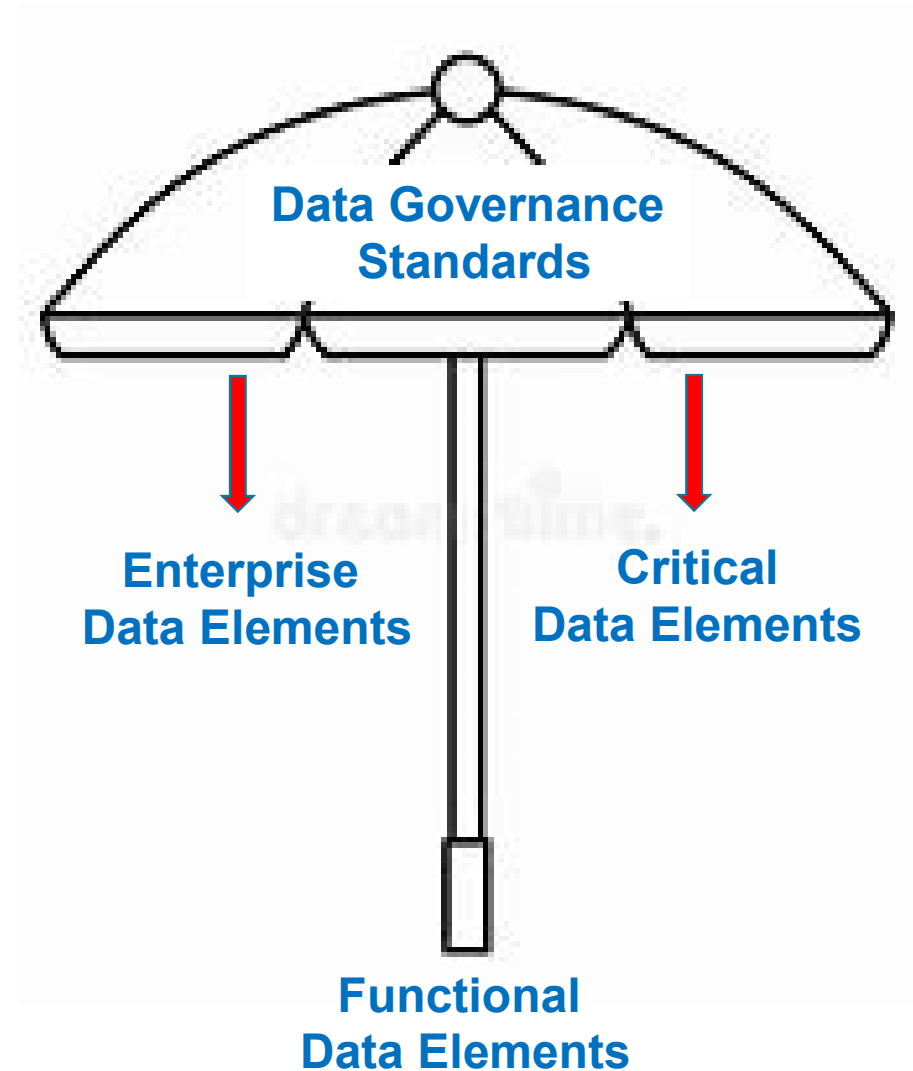
# Data Governance



# Data Governance - Standards

## Enterprise Standards

- Used TAMAG Standards as Template
- Source System/Table
  - Naming Conventions
  - Types
  - Domain Values
  - Descriptions
- Dashboards – Business Intelligence (BI)



CDE's are considered data elements that are sourced or created in primary business systems or collections, but used throughout the organization to make important decisions or references vital to ODOT business functions.

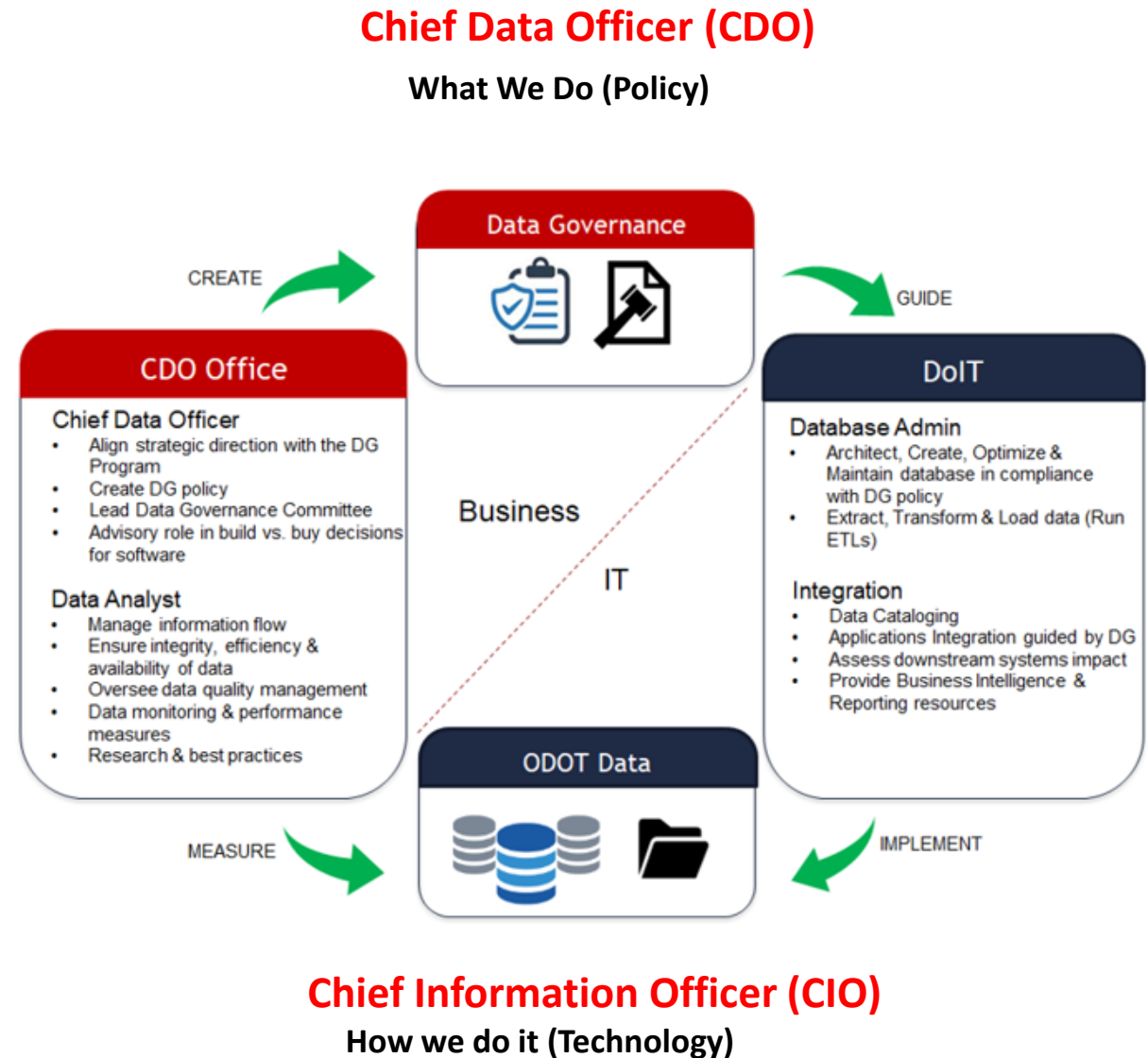
# Data Governance - IT Relationship

## Coordination

- Database Group - Warehouse
- Project Management Office - Projects
- Event Streaming Platform – Governance
- Dashboards – Business Intelligence (BI)



People, Process, and Technology



# Data Governance – 2020 Roadmap

CY Q1 - 2020	CY Q2 - 2020	CY Q3 - 2020	CY Q4 - 2020																
<p><b>Chief Data Officer (CDO)</b></p> <table border="1"> <tr> <td data-bbox="384 357 810 421">Appointment/Hire</td> <td data-bbox="810 357 1235 421">Prepare Data Analyst posting</td> <td data-bbox="1235 357 1661 421">Hire Data Analysts</td> <td data-bbox="1661 357 2135 421"></td> </tr> <tr> <td colspan="2" data-bbox="384 421 1235 485">Create, review and finalize DG policy</td> <td colspan="2" data-bbox="1235 421 2135 485">Oversee DG Policy</td> </tr> <tr> <td data-bbox="384 485 810 549">DG Roadmap</td> <td data-bbox="810 485 1235 549">Plan Tactical Implementation</td> <td colspan="2" data-bbox="1235 485 2135 549">Implement &amp; Support DG</td> </tr> <tr> <td data-bbox="384 549 810 656"></td> <td data-bbox="810 549 1235 656">Form DG Committee</td> <td data-bbox="1235 549 1661 656"></td> <td data-bbox="1661 549 2135 656">Review Tech to Support DG</td> </tr> </table>				Appointment/Hire	Prepare Data Analyst posting	Hire Data Analysts		Create, review and finalize DG policy		Oversee DG Policy		DG Roadmap	Plan Tactical Implementation	Implement & Support DG			Form DG Committee		Review Tech to Support DG
Appointment/Hire	Prepare Data Analyst posting	Hire Data Analysts																	
Create, review and finalize DG policy		Oversee DG Policy																	
DG Roadmap	Plan Tactical Implementation	Implement & Support DG																	
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<p><b>Data Analyst</b></p> <table border="1"> <tr> <td colspan="2" data-bbox="384 728 1235 806">Appointment/Hire</td> <td colspan="2" data-bbox="1235 728 2135 806"></td> </tr> <tr> <td colspan="4" data-bbox="384 806 2135 871">Implement &amp; Support DG</td> </tr> <tr> <td colspan="2" data-bbox="384 871 1235 949">Data Analysis &amp; Research</td> <td colspan="2" data-bbox="1235 871 2135 949">Performance Measurement</td> </tr> <tr> <td colspan="2" data-bbox="384 949 1235 1056"></td> <td colspan="2" data-bbox="1235 949 2135 1056">Review Tech to Support DG</td> </tr> </table>				Appointment/Hire				Implement & Support DG				Data Analysis & Research		Performance Measurement				Review Tech to Support DG	
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Implement & Support DG																			
Data Analysis & Research		Performance Measurement																	
		Review Tech to Support DG																	
<p><b>Project Activities</b></p> <table border="1"> <tr> <td data-bbox="384 1056 810 1329"> <ul style="list-style-type: none"> <li>Establish DG Framework</li> <li>Review Enterprise Architecture (EA)</li> <li>Create DG Policies &amp; Standards</li> </ul> </td> <td data-bbox="810 1056 1235 1329"> <ul style="list-style-type: none"> <li>Create DG Policies &amp; Standards</li> <li>Establish DG Committee</li> <li>Review Skill-sets Needed to Support DG</li> </ul> </td> <td data-bbox="1235 1056 1661 1329"> <ul style="list-style-type: none"> <li>Priority System Assessment</li> <li>Data Warehouse &amp; BI Assessment</li> </ul> </td> <td data-bbox="1661 1056 2135 1329"> <ul style="list-style-type: none"> <li>Transition DG Activities to CDO Office</li> </ul> </td> </tr> </table>				<ul style="list-style-type: none"> <li>Establish DG Framework</li> <li>Review Enterprise Architecture (EA)</li> <li>Create DG Policies &amp; Standards</li> </ul>	<ul style="list-style-type: none"> <li>Create DG Policies &amp; Standards</li> <li>Establish DG Committee</li> <li>Review Skill-sets Needed to Support DG</li> </ul>	<ul style="list-style-type: none"> <li>Priority System Assessment</li> <li>Data Warehouse &amp; BI Assessment</li> </ul>	<ul style="list-style-type: none"> <li>Transition DG Activities to CDO Office</li> </ul>												
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U.S. Department of Transportation  
Federal Highway Administration

# Question & Answer

**Ian Kidner**  
GIS Program Manager



**John Puente**  
Administrator, Chief  
Data Officer



U.S. Department of Transportation  
Federal Highway Administration

# New York State Department of Transportation & Office of Information Technology Services



**Pat Kemble**  
Highway Data  
Section Supervisor

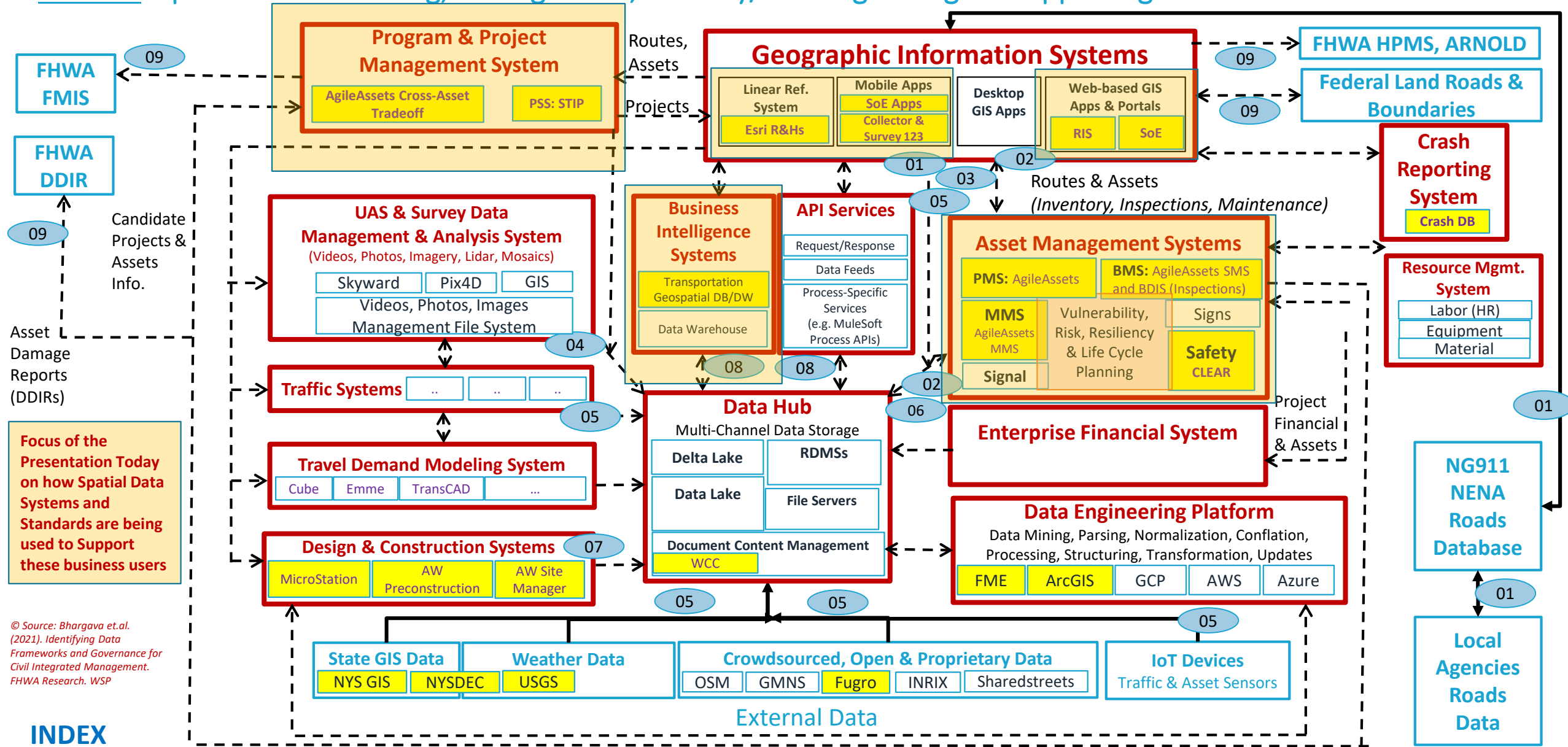


**Kevin Hunt**  
Geographic  
Information  
Systems Manager,  
Transportation

# New York Presentation Outline

- NYSDOT's Enterprise Linear Referencing System (ELRS) – the foundational system of record
  - » Roadway Inventory System v2 (RIS 2.0) – Smart Entry Engine
  - » Event Editors
  - » Roadway Data Mart
  - » Project Planner for NYSDOT Program Management
- Geospatial Data Warehouse (GDW) and SoE Applications for Business Users (Kevin)
  - » Data Standards, ETL Standards. Geospatial data made available to business users, apps and reporting tools
  - » NYSDOT's System of Engagement: "NYSDOT Maps and Apps"
- ELRS System Integrations supporting Enterprise Asset Management and Highway Safety
  - » EAMP - PMS, SMS, MMS
  - » CLEAR

# NYS DOT: Spatial Data Modeling, Management, Delivery/Exchange using for Supporting Business Users



Focus of the Presentation Today on how Spatial Data Systems and Standards are being used to Support these business users

© Source: Bhargava et al. (2021). Identifying Data Frameworks and Governance for Civil Integrated Management. FHWA Research. WSP

## INDEX

- 01: [Routes and Assets Data] from Road Inventory Systems → LRS, Road Inventory, Asset & Project Systems, Data Hub
- 02: [Asset Inventory, Condition and Work History, Plans Data] from AMS → Data Hub & Vulnerability Analysis Systems
- 03: [Asset Damages Data] from Asset Inspection & Damage Assessment Apps → Asset Management System, GIS
- 04: [Survey, Inspection Data] from UAS → AMS, GIS, Design, Construction, Data Hub Systems
- 05: [Incident, Traffic & Asset Data] from Weather, Traffic and Asset Systems to Data Hub, Warehouse, GIS, BI
- 06: [Repair Projects and Work Plan/Requests Data] from Vulnerability Analysis & DDIR Apps → PPMS & AMS
- 07: [As-Built Asset Data] Design, Construction → LRS and Asset Management Systems
- 08: [Processed and Integrated Data for Analytics] from Data Hub → Data Warehouse & BI Systems
- 09: [Roads and Assets, Projects, Damages] from DOT Systems → FHWA HPMS, FMIS, DDIR Systems





Enterprise Linear Referencing System (ELRS)

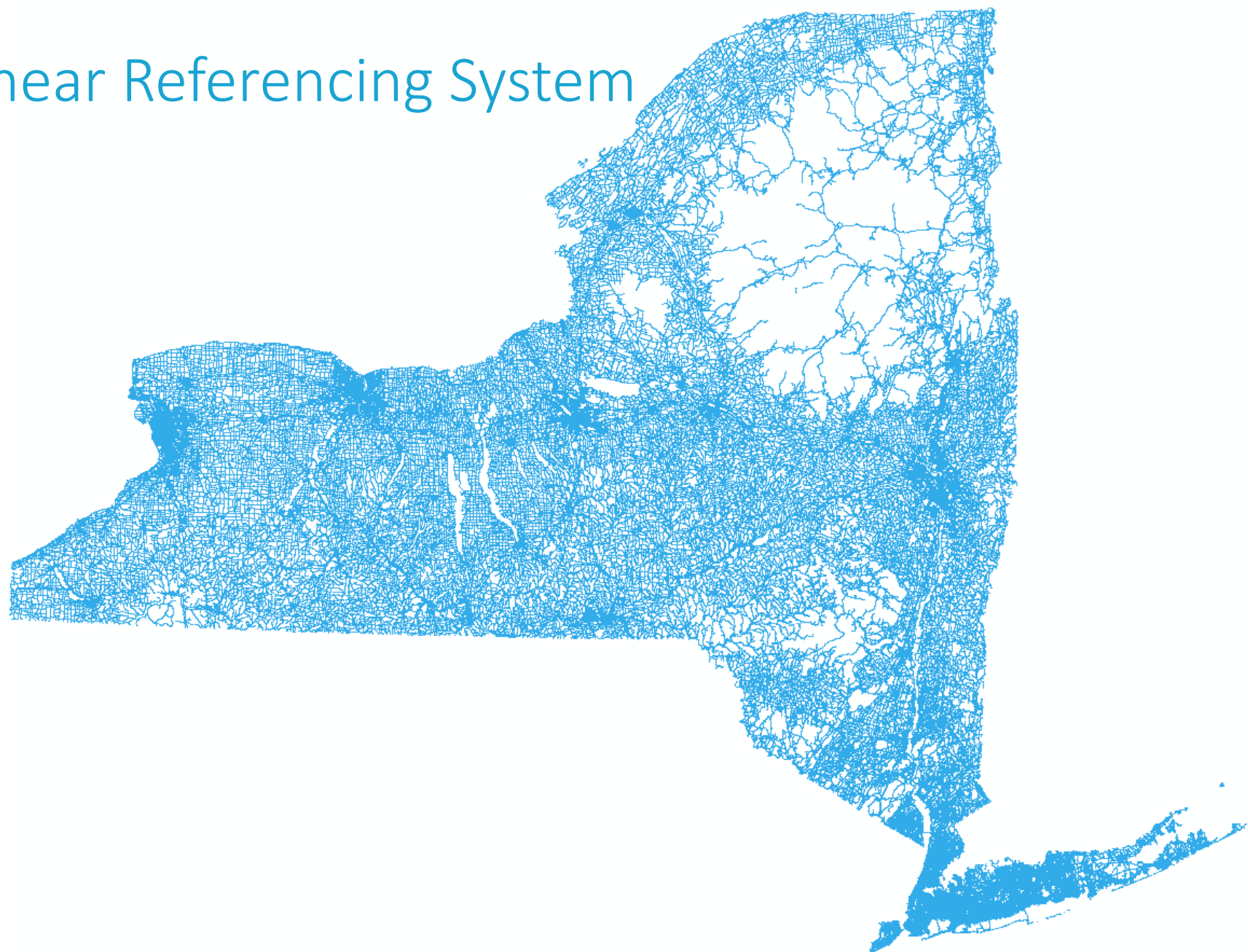
Roadway Inventory System v2 (RIS)

Event Editor

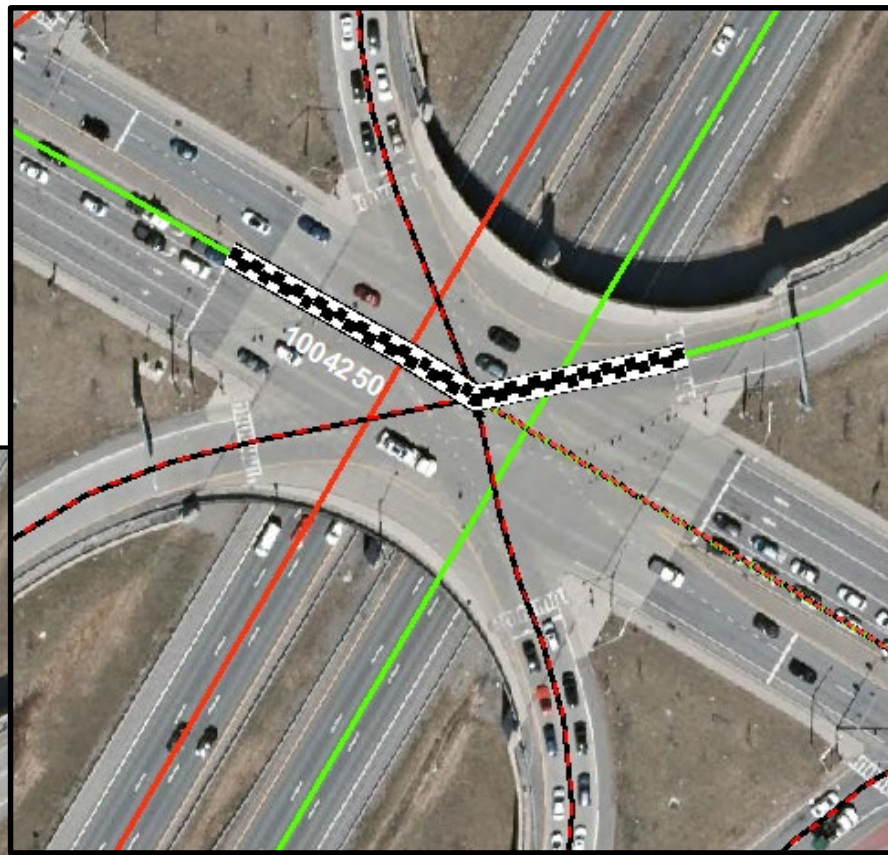
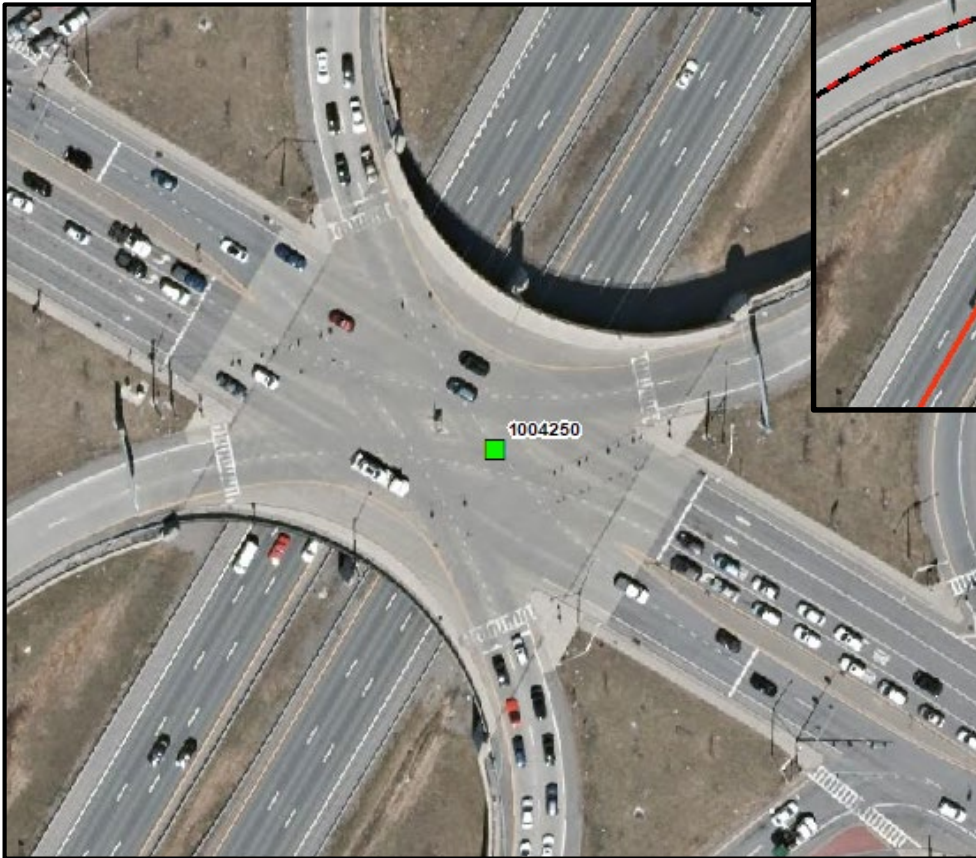
NYSDOT Project Planner

# NYSDOT Enterprise Linear Referencing System (ELRS)

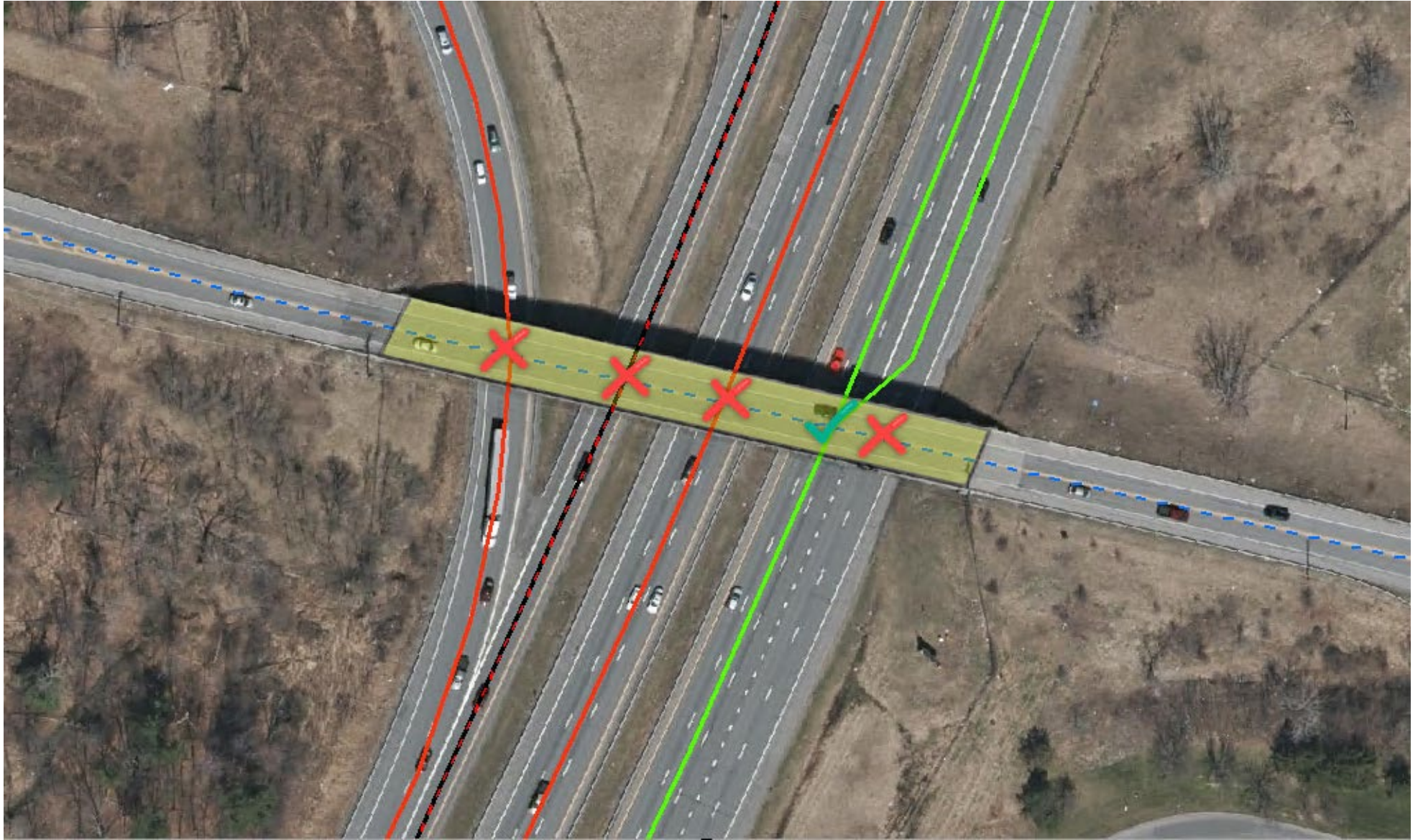
- R&H's on 10.7.1
- 197,700+ Route ID's
- 127,767 miles
- Average  $\approx$  0.65 miles
- County Based\*



# ELRS?



# ELRS!



# NYSDOT Enterprise Linear Referencing System

- Changes for the “Enterprise”

- » Asset Management

- Guiderail
- Pavement
- Culverts
- Signs

- » Plow Beats

- » Crash Locations



# NYS DOT Enterprise Linear Referencing System

- Changes for ARNOLD/CLEAR



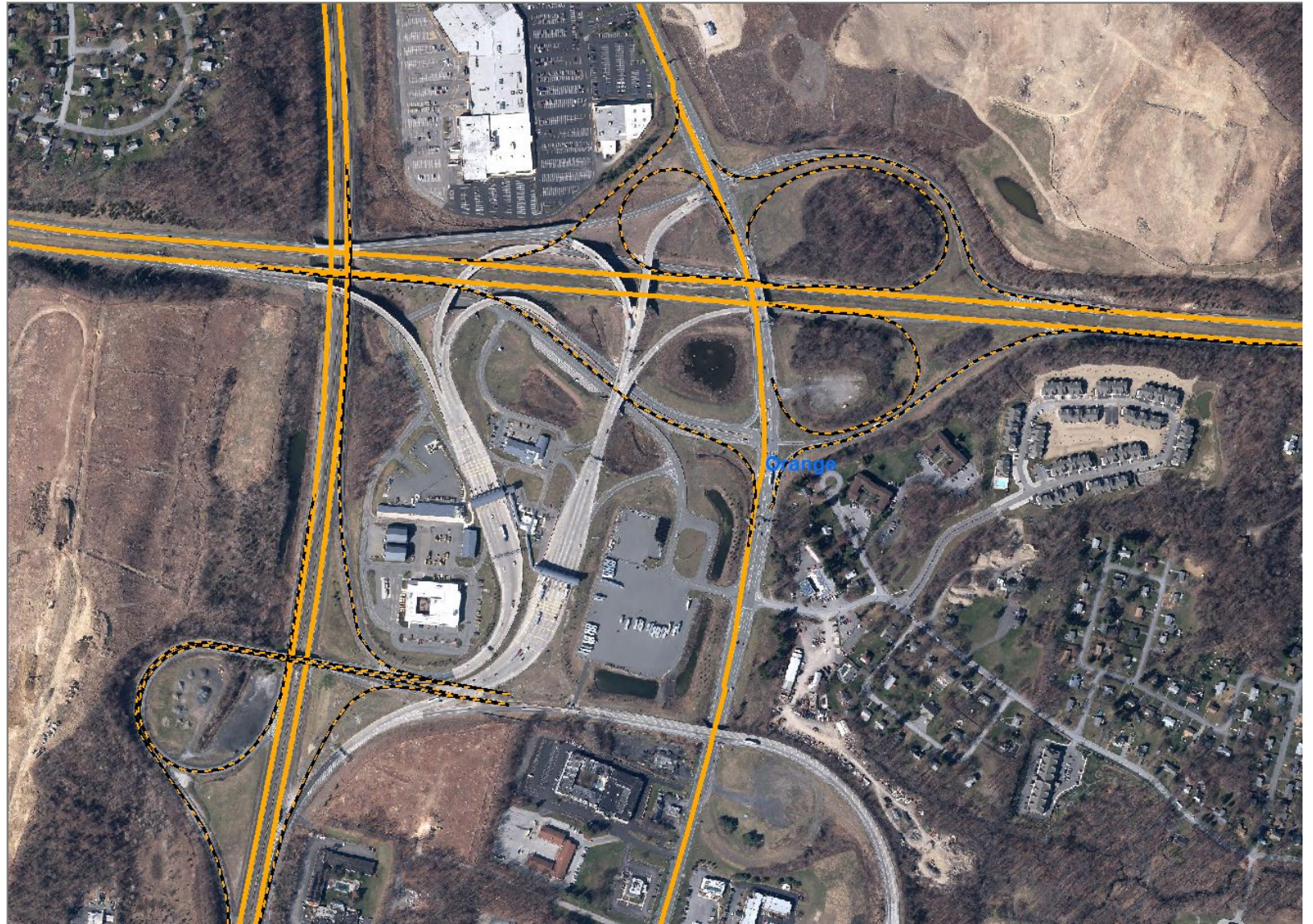
# ELRS - Updating

- Older Update Process

- » Regional Input
- » Local Highway Inventory
- » Chance
- » Orthoimagery

- Newer Update Process

- » Project Planner Events
- » Data Collection Vehicle Analysis
- » DGN to GIS



# RIS 2.0 R&Hs Event Editing – Smart Entry Engine (SEE)



Input search values, or use map selection tools to get roadway data.

Show Segments

DOT ID / Route ID (GIS ID)  
100495

Roadway Type  
Route

Route Signing  
1

Route Number  
87

Route Suffix  
None

Route Qualifier  
No qualifier

Road Number

Jurisdiction

Region

County

Municipality

Geo Code

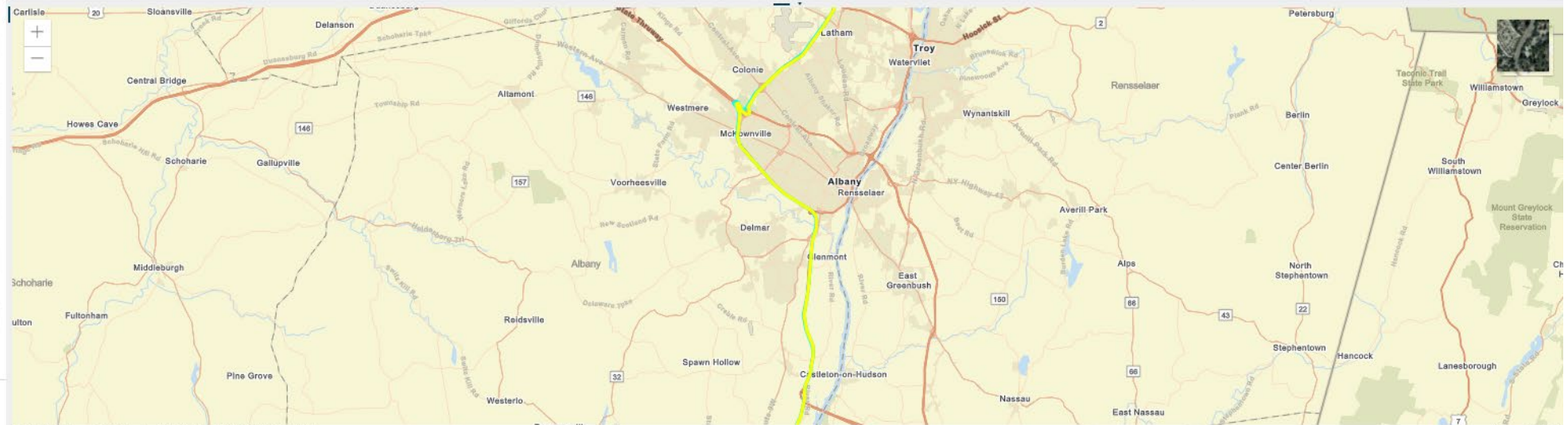
Road Name

Start Mile Point

End Mile Point

Clear Search

DOT ID / Route ID (GIS ID)	Route ID (GIS ID)...	DOT ID	County Order	Direction	County	Route Signing	Route Number	Route Suffix	Route Qualifier	Roadway Type	Parkway	Roadway Feature
9	100495051	100495	05	1 - Primary Direct...	111 - ULSTER	I	87	None	No qualifier	Route	No	
10	100495052	100495	05	2 - Reverse Direct...	111 - ULSTER	I	87	None	No qualifier	Route	No	
11	100495061	100495	06	1 - Primary Direct...	39 - GREENE	I	87	None	No qualifier	Route	No	
12	100495062	100495	06	2 - Reverse Direct...	39 - GREENE	I	87	None	No qualifier	Route	No	
13	100495071	100495	07	1 - Primary Direct...	1 - ALBANY	I	87	None	No qualifier	Route	No	
14	100495072	100495	07	2 - Reverse Direct...	1 - ALBANY	I	87	None	No qualifier	Route	No	
15	100495081	100495	08	1 - Primary Direct...	91 - SARATOGA	I	87	None	No qualifier	Route	No	
16	100495082	100495	08	2 - Reverse Direct...	91 - SARATOGA	I	87	None	No qualifier	Route	No	
17	100495091	100495	09	1 - Primary Direct...	113 - WARREN	I	87	None	No qualifier	Route	No	
18	100495092	100495	09	2 - Reverse Direct...	113 - WARREN	I	87	None	No qualifier	Route	No	
19	100495101	100495	10	1 - Primary Direct...	31 - ESSEX	I	87	None	No qualifier	Route	No	
20	100495102	100495	10	2 - Reverse Direct...	31 - ESSEX	I	87	None	No qualifier	Route	No	
21	100495111	100495	11	1 - Primary Direct...	19 - CLINTON	I	87	None	No qualifier	Route	No	
22	100495112	100495	11	2 - Reverse Direct...	19 - CLINTON	I	87	None	No qualifier	Route	No	





# RIS 2.0 R&Hs Event Editing – Smart Entry Engine (SEE)

GIS ID	DOT ID	Dir	RTE	CO	County	Beg	*End	Len...	Olap	Begin Desc	End Desc	Station	Sta. (O...	*FC	HPMS	*Maint...	Owin...	*Muni	Owner	UAC	MPO	Name	Thru Ln	Thru Ln A...
1	100495071	100495	1 - Pri...	I 87	07	ALBANY	0.000	0.040	0.040		Greene/A...	110251	0251	1-Rural Principal Arterial Interstate		31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
2	100495071	100495	1 - Pri...	I 87	07	ALBANY	0.040	0.270	0.230			110251	0251	1-Rural Principal Arterial Interstate		31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
3	100495071	100495	1 - Pri...	I 87	07	ALBANY	0.270	0.380	0.110		RAVENA ...	110251	0251	11-Urban Principal Arterial Interstate		31 - N...	31 - N...	0180 - ...	73477-...		CDTC-...	NYS Thru...	2	12.50
4	100495071	100495	1 - Pri...	I 87	07	ALBANY	0.380	0.714	0.334		RAVENA ...	110251	0251	11-Urban Principal Arterial Interstate	8000014	31 - N...	31 - N...	1414 - ...	73477-...		CDTC-...	NYS Thru...	2	12.50
5	100495071	100495	1 - Pri...	I 87	07	ALBANY	0.714	0.742	0.028			110251	0251	11-Urban Principal Arterial Interstate	8000014	31 - N...	31 - N...	1414 - ...	73477-...		CDTC-...	NYS Thru...	2	12.50
6	100495071	100495	1 - Pri...	I 87	07	ALBANY	0.742	0.750	0.008			110251	0251	11-Urban Principal Arterial Interstate	8000014	31 - N...	31 - N...	1414 - ...	73477-...		CDTC-...	NYS Thru...	2	12.50
7	100495071	100495	1 - Pri...	I 87	07	ALBANY	0.750	1.380	0.630		RAVENA ...	110251	0251	11-Urban Principal Arterial Interstate	8000014	31 - N...	31 - N...	1414 - ...	73477-...		CDTC-...	NYS Thru...	2	12.50
8	100495071	100495	1 - Pri...	I 87	07	ALBANY	1.380	2.200	0.820		RAVENA ...	110251	0251	11-Urban Principal Arterial Interstate	1015035	31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
9	100495071	100495	1 - Pri...	I 87	07	ALBANY	2.200	2.282	0.082			110251	0251	11-Urban Principal Arterial Interstate	1015035	31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
10	100495071	100495	1 - Pri...	I 87	07	ALBANY	2.282	2.290	0.008			110251	0251	11-Urban Principal Arterial Interstate	1015035	31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
11	100495071	100495	1 - Pri...	I 87	07	ALBANY	2.290	3.380	1.090			110251	0251	11-Urban Principal Arterial Interstate	1015035	31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
12	100495071	100495	1 - Pri...	I 87	07	ALBANY	3.380	3.380	0.000			110251	0251	11-Urban Principal Arterial Interstate	1015035	31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
13	100495071	100495	1 - Pri...	I 87	07	ALBANY	3.380	3.380	0.000			110251	0251	11-Urban Principal Arterial Interstate	1015035	31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
14	100495071	100495	1 - Pri...	I 87	07	ALBANY	3.380	3.380	0.000			110251	0251	11-Urban Principal Arterial Interstate	1015035	31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
15	100495071	100495	1 - Pri...	I 87	07	ALBANY	3.380	3.380	0.000			110251	0251	11-Urban Principal Arterial Interstate	1015035	31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
16	100495071	100495	1 - Pri...	I 87	07	ALBANY	3.380	3.380	0.000			110251	0251	11-Urban Principal Arterial Interstate	1015035	31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
17	100495071	100495	1 - Pri...	I 87	07	ALBANY	3.380	3.380	0.000			110251	0251	11-Urban Principal Arterial Interstate	1015035	31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
18	100495071	100495	1 - Pri...	I 87	07	ALBANY	3.380	3.380	0.000			110251	0251	11-Urban Principal Arterial Interstate	1015035	31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
19	100495071	100495	1 - Pri...	I 87	07	ALBANY	3.380	3.380	0.000			110251	0251	11-Urban Principal Arterial Interstate	1015035	31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
20	100495071	100495	1 - Pri...	I 87	07	ALBANY	3.380	3.380	0.000			110251	0251	11-Urban Principal Arterial Interstate	1015035	31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
21	100495071	100495	1 - Pri...	I 87	07	ALBANY	3.380	3.380	0.000			110251	0251	11-Urban Principal Arterial Interstate	1015035	31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
22	100495071	100495	1 - Pri...	I 87	07	ALBANY	3.380	3.380	0.000			110251	0251	11-Urban Principal Arterial Interstate	1015035	31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
23	100495071	100495	1 - Pri...	I 87	07	ALBANY	3.380	3.380	0.000			110251	0251	11-Urban Principal Arterial Interstate	1015035	31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
24	100495071	100495	1 - Pri...	I 87	07	ALBANY	3.380	3.380	0.000			110251	0251	11-Urban Principal Arterial Interstate	1015035	31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
25	100495071	100495	1 - Pri...	I 87	07	ALBANY	3.380	3.380	0.000			110251	0251	11-Urban Principal Arterial Interstate	1015035	31 - N...	31 - N...	0180 - ...			CDTC-...	NYS Thru...	2	12.50
26	100495071	100495	1 - Pri...	I 87	07	ALBANY	5.410	5.450	0.040			110253	0253	11-Urban Principal Arterial Interstate		31 - N...	31 - N...	0071 - ...	970-Al...		CDTC-...	NYS Thru...	2	12.50

**Roadway Segment Editor Validations**

- 24. [ERROR]: ROUTE\_ID: 100495071; Beg: 15.240; End: 15.248; If Functional Class in ("01", "11"), Acc should be "1-Full Control of Access"
- 25. [ERROR]: ROUTE\_ID: 100495071; Beg: 15.248; End: 15.410; If Functional Class in ("01", "11"), Acc should be "1-Full Control of Access"
- 26. [ERROR]: ROUTE\_ID: 100495071; Beg: 16.250; End: 16.380; If Functional Class in ("01", "11"), Acc should be "1-Full Control of Access"
- 27. [ERROR]: ROUTE\_ID: 100495071; Beg: 17.220; End: 17.240; If Functional Class in ("01", "11"), Acc should be "1-Full Control of Access"
- 28. [ERROR]: ROUTE\_ID: 100495071; Beg: 17.240; End: 17.390; If Functional Class in ("01", "11"), Acc should be "1-Full Control of Access"
- 29. [ERROR]: ROUTE\_ID: 100495071; Beg: 17.390; End: 17.690; If Functional Class in ("01", "11"), Acc should be "1-Full Control of Access"
- 30. [ERROR]: ROUTE\_ID: 100495071; Beg: 18.250; End: 18.270; If Functional Class in ("01", "11"), Acc should be "1-Full Control of Access"
- 31. [WARNING]: ROUTE\_ID: 100495071; Beg: 18.270; End: 18.410; Interstate Routes (Functional Class 01 & 11) should have a Posted Speed Limit >= 40 MPH
- 32. [WARNING]: ROUTE\_ID: 100495071; Beg: 18.410; End: 18.590; Interstate Routes (Functional Class 01 & 11) should have a Posted Speed Limit >= 40 MPH
- 33. [ERROR]: ROUTE\_ID: 100495071; Beg: 18.590; End: 18.591; Description break must exist at end milepoint of segment
- 34. [ERROR]: ROUTE\_ID: 100495071; Beg: 18.591; End: 18.740; Description break must exist at begin milepoint of segment
- 35. [ERROR]: ROUTE\_ID: 100495071; Beg: 18.820; End: 18.887; Description break must exist at end milepoint of segment
- 36. [ERROR]: ROUTE\_ID: 100495071; Beg: 18.887; End: 18.890; Description break must exist at begin milepoint of segment
- 37. [ERROR]: ROUTE\_ID: 100495071; Beg: 20.580; End: 20.600; Pavement Layer should be in (6,7,8,9) for Pavement Type of "C"
- 38. [ERROR]: ROUTE\_ID: 100495071; Beg: 21.310; End: 21.313; Pavement Layer should be in (6,7,8,9) for Pavement Type of "C"
- 39. [ERROR]: ROUTE\_ID: 100495071; Beg: 21.313; End: 21.330; Pavement Layer should be in (6,7,8,9) for Pavement Type of "C"
- 40. [ERROR]: ROUTE\_ID: 100495071; Beg: 21.330; End: 21.340; Pavement Layer should be in (6,7,8,9) for Pavement Type of "C"
- 41. [ERROR]: ROUTE\_ID: 100495071; Beg: 25.030; End: 25.034; Description break must exist at end milepoint of segment
- 42. [ERROR]: ROUTE\_ID: 100495071; Beg: 25.034; End: 25.230; Description break must exist at begin milepoint of segment
- 43. [ERROR]: ROUTE\_ID: 100495071; Beg: 25.230; End: 25.233; Description break must exist at end milepoint of segment
- 44. [ERROR]: ROUTE\_ID: 100495071; Beg: 25.233; End: 25.280; Description break must exist at begin milepoint of segment

# RIS 2.0 R&Hs Event Editing – Smart Entry Engine (SEE)

Input search values, or use map selection tools to get HPMS data.

HPMS Sample ID

Region

1 - Albany

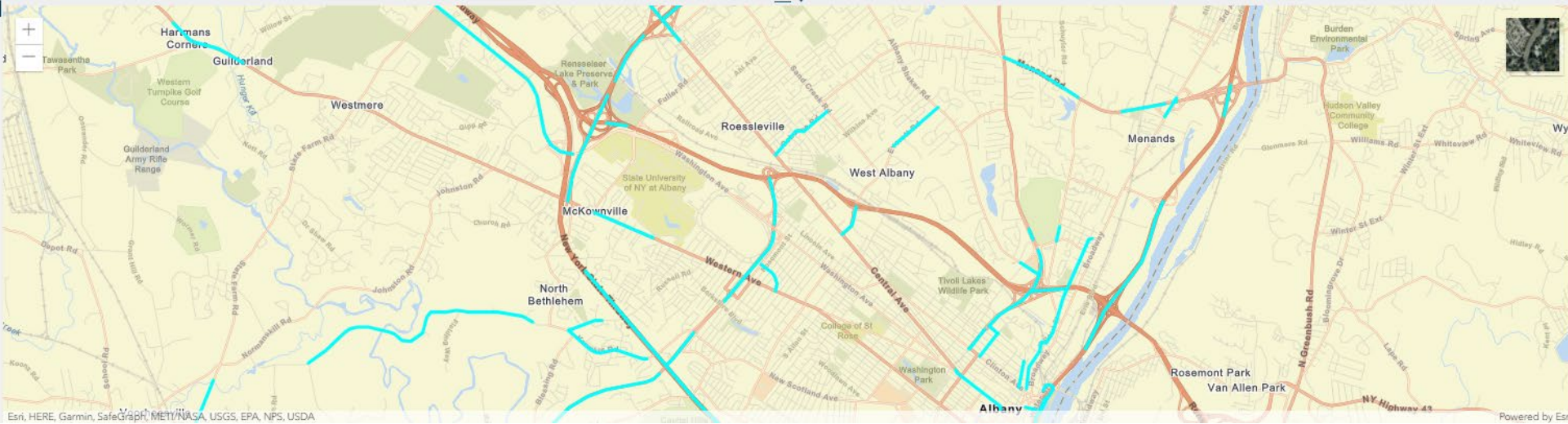
County

ALBANY

Clear Search

HPMS Sample ID...	Route_ID (GIS_ID)	DOT ID	County Order	Direction	County	Route Signing	Route Number	Route Suffix	Route Qualifier	Roadway Type	Begin MP	End MP	Length
333333	100348011	100348	01	0 - Primary D...	ALBANY	NY	378	None	No qualifier	Route	0.000	0.886	0.886
444444	100081021	100081	02	0 - Primary D...	ALBANY	NY	146	None	No qualifier	Route	7.460	7.980	0.520
999888	100348011	100348	01	0 - Primary D...	ALBANY	NY	378	None	No qualifier	Route	1.930	1.966	0.036
1007252	100147201	100147	20	0 - Primary D...	ALBANY	US	20	None	No qualifier	Route	2.850	5.860	3.010
1015035	100495071	100495	07	1 - Primary D...	ALBANY	I	87	None	No qualifier	Route	1.380	3.730	2.350
1016910	100079021	100079	02	0 - Primary D...	ALBANY	NY	145	None	No qualifier	Route	0.510	2.130	1.620
2011005	100495071	100495	07	1 - Primary D...	ALBANY	I	87	None	No qualifier	Route	23.510	24.760	1.250
2011055	100468081	100468	08	0 - Primary D...	ALBANY	NY	7	None	No qualifier	Route	7.590	7.846	0.256
2011056	100468081	100468	08	0 - Primary D...	ALBANY	NY	7	None	No qualifier	Route	4.400	7.310	2.910
2011105	100514081	100514	08	0 - Primary D...	ALBANY	US	9	None	No qualifier	Route	2.620	2.950	0.330

1 2 3 4 5 6 7 8 9 10 ... 1 - 10 of 110 Items



# RIS 2.0 R&Hs Event Editing – Smart Entry Engine (SEE)

Smart Entry Engine (SEE) HPMS ▾

2/8/2021
Version: ELRS.Pat ?
Reconcile and Post
Patrick

Home / HPMS

HPMS Samples Traffic Growth Rate Estimate Catalog Summary Vehicle Catalog Metadata Catalog

Input search values, or use map selection tools to get HPMS data. Show Segments

Maintain HPMS Samples

HPMS Sample ID

Region

1 - Albany

County

ALBANY

Clear

County	DOT ID	Route	Signing	Route No	Suffix	Qualifier	Road No	Geo Code	From	To	Length	Sample_ID
ALBANY	100468	100468081	NY	7		No qualifier		0187	4.400	7.310	2.910	2011056

10. Number of Peak Lanes: 3.00

31. Num At-Grade Inters. Signals: 0.00

40. Peak Parking: 3-No Parking Allowed or nor

54. Last Improvement Year:

**Curves:**

43. Length Class A Curves: 2.88

**Total Curves Length:** 2.880

**Grades:**

45. Length Class A Grades: 0.00

**Total Grades Length:** 2.880

11. Counter Peak Lanes: 2.00

32. Num At-Grade Inters. Stop Signs: 0.00

41. Widening Obstacle: X-No obstacles

55. Last Construction Year:

12. Right Turning Lanes: 1-No intersections exist.

33. Num At-Grade Inters. Other: 0.00

42. Widening Potential: 9.00

59. Base Type: 8-Fractured PCC

13. Left Turning Lanes: 1-No intersections exist.

37. Shoulder Type: 2-Bituminous Concrete

44. Type of Terrain: 1-Level

60. Base Thickness: 8.00

29. Prevailing Type of Signalization: 5-None

38. Shoulder Width - Right:

46. Percent Passing Sight Distance: 0.00

30. Typ. Peak Percent Green Time: 0.00

39. Shoulder Width - Left: 4.00

Run Validations
Clear
Cancel

Route Qualifier	Roadway Type	Begin MP	End MP	Length
No qualifier	Route	0.000	0.886	0.886
No qualifier	Route	7.460	7.980	0.520
No qualifier	Route	1.930	1.966	0.036
No qualifier	Route	2.650	5.860	3.010
No qualifier	Route	1.380	3.730	2.350
No qualifier	Route	0.510	2.130	1.620
No qualifier	Route	23.510	24.760	1.250

HPMS Validations

1. (10) Number of Peak Lanes is a required field
2. (10) Number of Peak Lanes should be > 0 and <= 99
3. (11) Counter Peak Lanes is a required field
4. (11) Counter Peak Lanes should be greater than 0
5. (12) Right Turning Lanes should be 1 if (31) Number At-Grade Intersection Signals is null or 0, otherwise (12) Right Turning Lanes should be 2,3,4,5,6
6. (13) Left Turning Lanes should be 1 if (31) Number At-Grade Intersection Signals is null or 0, otherwise (13) Left Turning Lanes should be 2,3,4,5,6
7. (31) Number At-Grade Intersection Signals is a required field
8. (32) Number At-Grade Intersection Stop Signs is a required field
9. (33) Number At-Grade Intersections Other is a required field
10. (37) Shoulder Type must be 1-None or 7-No shoulder in front of curb based on selection on Peak Parking Control
11. (40) Peak Parking must be one of (1,2,3)
12. (41) Widening obstacle should have a specific value based on (42) Widening Potential
13. (42) Widening Potential is a required field
14. (42) Widening potential should have a specific value based on (41) Widening Obstacle
15. (43) Length Class A Curves is a required field
16. (43) Length Class A Curves should be greater than 0
17. (43) Length Class B Curves is a required field
18. (43) Length Class C Curves is a required field
19. (43) Length Class D Curves is a required field
20. (43) Length Class E Curves is a required field
21. (43) Length Class F Curves is a required field
22. (44) Type of Terrain must be either (1,2,3)
23. (45) Length Class A Grades is a required field
24. (45) Length Class A Grades should be greater than 0

# RIS 2.0 R&Hs Event Editing – Smart Entry Engine (SEE)



Traffic Station ID

Region

1 - Albany

County

ESSEX

Clear Search

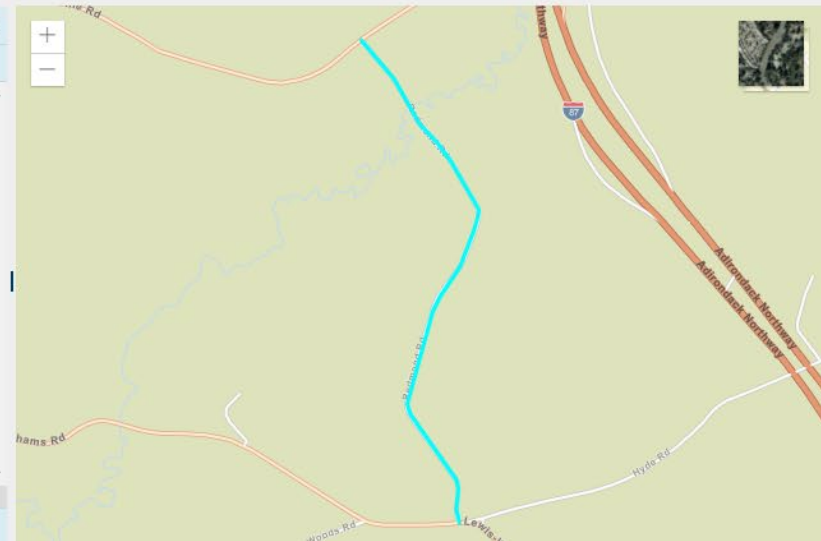
Station #	Region	County	Region Co...	Station Type	Route Name	Road Name	Station Lin...	PDIRDIR	FG	P Lanes	NP Lanes	Latitude	Longitude	CC Station	Off Network	Roadway T...	Retired
126083	1 - Albany	ESSEX	12	0-No Virtu...		HURRICAN...		P-Pos	30	1	1	44.217821	-73.639579		<input type="checkbox"/>	Road	
126084	1 - Albany	ESSEX	12	0-No Virtu...		N WOODS...		P-Pos	30	1	1	43.810638	-74.011752		<input type="checkbox"/>	Road	
126091	1 - Albany	ESSEX	12	0-No Virtu...		DORSEY TE...		E-East	40			0	0		<input checked="" type="checkbox"/>		
126092	1 - Albany	ESSEX	12	0-No Virtu...		SCHAFFER ...		N-North	30	1	1	44.23347	-73.77372		<input type="checkbox"/>	Road	
126093	1 - Albany	ESSEX	12	0-No Virtu...		BRAINARD...		N-North	30	1	1	44.24945	-73.52046		<input type="checkbox"/>	Road	
126094	1 - Albany	ESSEX	12	0-No Virtu...		REDMOND...		P-Pos	30	1	1	0	0		<input type="checkbox"/>	Road	
126095	1 - Albany	ESSEX	12	0-No Virtu...		DONNELLY...		E-East	30	1	1	43.77375	-73.92787		<input type="checkbox"/>	Road	
126096	1 - Albany	ESSEX	12	0-No Virtu...		TITUS RD		E-East	30	1	1	44.06145	-73.50833		<input type="checkbox"/>	Road	
126097	1 - Albany	ESSEX	12	0-No Virtu...		WHITE CH...		N-North	30	1	1	43.97383	-73.48809		<input type="checkbox"/>	Road	
126098	1 - Albany	ESSEX	12	0-No Virtu...		SOPER RD		E-East	30	1	1	44.51153	-73.4605		<input type="checkbox"/>	Road	

1 2 3 4 5 6 7 8 9 10 ...

1 - 10 of 291 items

Segment Summary Show Segments

Route ID (...)	DOT ID	County ...	Direction	Route S...	Route ...	Road N...	Route S...	Route ...	Roadw...	Begin ...	End MP	Length
105485011	105485	ESSEX	0 - Pri...					No qua...	Road	0	1.1456...	1.1456...



1

1 - 1 of 1 items

# RIS 2.0 R&Hs Event Editing – Smart Entry Engine (SEE)

The screenshot shows the 'Smart Entry Engine (SEE)' interface for 'Batch Maintenance Jobs'. A table lists various batch jobs with columns for Date Uploaded, Job ID, File Type, File Name, Status, User, Comments, and Reports. An 'Import Batch File' dialog box is open, showing a 'File Type' dropdown menu with options like 'Inventory', 'Traffic Station', and 'Miscellaneous'. The dialog also has a 'Comments' text area and 'Cancel' and 'Import' buttons.

- Misc. discussion –
  - » Batch Loading with validations
  - » Permissions

	A	B	C	D	E	F	G	H	I	O	P	Q	R	S	T	U	
1	GIS ID	DOT ID	Dir	RTE	CO	County	Beg	*End	Length	*FC	HPMS	*Maint Jur	Owning Jur	*Muni	Owner	UAC	MPO
82	100495071	100495	1	187	07	ALBANY	18.74	18.75	0.01	11-Urban Principal Arterial Interstate		31 - NYS Thruway	31 - NYS Thruway	2001 - Albany - C - ALBANY		970-Albany	
83	100495071	100495	1	187	07	ALBANY	18.75	18.82	0.07	11-Urban Principal Arterial Interstate		31 - NYS Thruway	31 - NYS Thruway	2001 - Albany - C - ALBANY		970-Albany	
84	100495071	100495	1	187	07	ALBANY	18.82	18.8867934	0.0667934	11-Urban Principal Arterial Interstate		31 - NYS Thruway	31 - NYS Thruway	2001 - Albany - C - ALBANY		970-Albany	
85	100495071	100495	1	187	07	ALBANY	18.8867934	18.89	0.0032066	11-Urban Principal Arterial Interstate		31 - NYS Thruway	31 - NYS Thruway	2001 - Albany - C - ALBANY		970-Albany	CDTC-Cap
86	100495071	100495	1	187	07	ALBANY	18.89	19.03	0.14	11-Urban Principal Arterial Interstate		01 - NYSDOT	01 - NYSDOT	2001 - Albany - C - ALBANY		970-Albany	CDTC-Cap
87	100495071	100495	1	187	07	ALBANY	19.03	19.07	0.04	11-Urban Principal Arterial Interstate		01 - NYSDOT	01 - NYSDOT	2001 - Albany - C - ALBANY		970-Albany	CDTC-Cap
88	100495071	100495	1	187	07	ALBANY	19.07	19.1	0.03	11-Urban Principal Arterial Interstate		01 - NYSDOT	01 - NYSDOT	2001 - Albany - C - ALBANY		970-Albany	CDTC-Cap
89	100495071	100495	1	187	07	ALBANY	19.1	19.27	0.17	11-Urban Principal Arterial Interstate		01 - NYSDOT	01 - NYSDOT	2001 - Albany - C - ALBANY		970-Albany	CDTC-Cap
90	100495071	100495	1	187	07	ALBANY	19.27	19.273	0.003	11-Urban Principal Arterial Interstate		01 - NYSDOT	01 - NYSDOT	2001 - Albany - C - ALBANY		970-Albany	CDTC-Cap
91	100495071	100495	1	187	07	ALBANY	19.273	19.3	0.027	11-Urban Principal Arterial Interstate		01 - NYSDOT	01 - NYSDOT	2001 - Albany - C - ALBANY		970-Albany	CDTC-Cap

# RIS 2.0 R&Hs Event Editing – Structures RCE

NYSDOT Structure Location Editor – QA - v10.7.1.3052 - https://elrsqa SVC/gkemble

Map Edit Review

Layer: Bridge  
Return attribute set

Attribute Set: Default  
Version: ELRS.Structures

Point Events Line Events Event Replacement

Reconcile and Post

Target Version: ELRS.Lockroot

Release all locks on post

Reconcile Reconcile and Post

Save Options

Retire edited events and create new events effective Today

Merge coincident events with the same attributes that are edited

Note: The defaults for these options can be changed in the Save options tab of Table Properties.

OK Cancel

Layers

- Markup
- Tunnel
- Large Culvert
- Bridge
- [all other values]
- Not Edited
- Not Edited
- Not Edited
- Not Edited
- Not Edited
- Not Edited
- Not Edited
- Not Edited
- Not Edited
- Not Edited
- Not Edited
- Milepoint
- Milepoint
- Milepoint
- Redline
- BRIDGE REF DATA
- Reference Marker
- Street Segment
- CityTownVII
- County Shoreline
- GPO Imagery
- 2020
- 2018
- 2017
- 2016
- 2015
- 2014
- World Dark Gray Base
- World Dark Gray Reference

Bridge

OBJECTID	EVENT_ID	ROUTE_ID	FROM_MEASURE	TO_MEASURE	BIN	CARRIED	CROSSED	FLAG	BDIS FEATURE	STATUS	NOTES	FROM_DATE	TO_DATE	AUD_USER_CREATE
5160	{741599b1-8ce6-4665-8f8c-308b777b14f8}	100468081	3.204	3.248	1004250	7	7 11081032	871 87111082049	Yes	1	BDIS Ln -0.01 RIS Ln	1/1/2007	<null>	<null>

Page 1 of 1 | 1 | Record 1 to 1 | Total 1 Records

Event Attributes

POWERED BY esri  
NYS ITS GIS Program Office

# ELRS Governance

## Assign privileges to roles

Role: Admin Users

425 of 427 Privileges Assigned

Group	Privilege
app-mgr (42)	
app-mgr	Query Apps
app-mgr	Get App
app-mgr	Query App Profile
app-mgr	Get App Profile
app-mgr	Create App Profile
ELRS.ELRS.Ev_Maint_SnowPlow_Muni	
ELRS.ELRS.Ev_Maint_SnowPlow_State	
ELRS.ELRS.Ev_Pln_ProjectLocation	
ELRS.ELRS.Ev_RIS_AccControl	
ELRS.ELRS.Ev_RIS_Bike_Ln_Wid_P	
ELRS.ELRS.Ev_RIS_Bike_Ln_V	
ELRS.ELRS.Ev_RIS_Bus_Ln_V	
ELRS.ELRS.Ev_RIS_Bus_Ln_V	
ELRS.ELRS.Ev_RIS_HPMS_Sample	
ELRS.ELRS.Ev_RIS_HPMS_Shldr_Type	
ELRS.ELRS.Ev_RIS_HPMS_Shldr_Wid_L	
ELRS.ELRS.Ev_RIS_HPMS_Shldr_Wid_R	
ELRS.ELRS.Ev_RIS_HPMS_Tu	
ELRS.ELRS.Ev_RIS_HPMS_Tu	
ELRS.ELRS.Ev_RIS_HPMS_Sample	
ELRS.ELRS.Ev_RIS_HPMS_Shldr_Type	
ELRS.ELRS.Ev_RIS_HPMS_Shldr_Wid_L	
ELRS.ELRS.Ev_RIS_HPMS_Shldr_Wid_R	
ELRS.ELRS.Ev_RIS_HPMS_Turn_Ln_L	
ELRS.ELRS.Ev_RIS_HPMS_Turn_Ln_R	

Version: sde.DEFAULT | Reconcile and Post | Patrick

- sde.DEFAULT
- ELRS.OPPM
- ELRS.Cathy
- ELRS.Joffa
- ELRS.Upada
- ELRS.HPMS
- ELRS.Tina
- ELRS.Structures
- "SVC\KPIANKA".HDS\_GENERAL\_EDITING\_JOB\_58564
- ELRS.Safety
- ELRS.Traffic
- "SVC\FWANG".HDS\_GENERAL\_EDITING\_JOB\_59767
- "SVC\CJCLARK".HDS\_GENERAL\_EDITING\_JOB\_60567
- ELRS.Maintenance
- ELRS.Saad
- ELRS.Lockroot
- ELRS.Pat
- ELRS.Caitlin
- ELRS.Kelsey

# NYSDOT Project Planner – Leveraging LRS to support the Capital Program

The screenshot displays the NYSDOT Project Planner interface. The main map shows an aerial view of a road project area with a red dashed boundary and blue highlighted road segments. A 'Milepoints (31 results)' pop-up window is open, listing various milepoint ranges and their corresponding road names. The interface includes a top navigation bar with the project name and user information, and a left sidebar with a list of project assets.

**NYSDOT Project Planner**  
OPPM ID: 1915 (PIN: 480637) 480637 - NYSDOT BRIDGE PREVENTATIVE MAINTENANCE - 2017  
User: Kovacs, Henry (DOT)

**Milepoints (31 results)**

Milepoint Range	Road Name	Action
100370011	EMPIRE BLVD	Image
100444011	NY590	Image
100679011	Empire Blvd	Image
143889011	WARRENTON ST	Image
273453011	NY404 to NY590 N	Image
273454011	NY590 NB to NY404	Image
276656011	NY590 SB to NY404	Image
276657011	NY404 to NY590 SB	Image
100370011		Image
100444011		Image
100370011	EMPIRE BLVD	Image
100444011	NY590	Image
273453011	NY404 to NY590 NB	Image
273454011	NY590 NB to NY404	Image
276656011	NY590 SB to NY404	Image
276657011	NY404 to NY590 SB	Image
100444012	NY 590	Image
100679011	Empire Blvd	Image

Submit Assets to OPPM | Project requires update!

43.176 -77.530 Degrees  
Scale 1 : 4,993

NYSDOT ITS GIS Program Office | NYSDOT Office of Information Technology Services GIS Program Office (GPO) | Primavera | esri



# NYSDOT Project Planner – an “internal” ELRS interface

- 2017-2018 – Designed and developed to allow NYSDOT Program Management to locate projects for the new Oracle Primavera Portfolio Management (OPPM) System using the Enterprise Linear Referencing System.
- The NYSDOT Project Planner is a custom developed Esri application that runs on ELRS (Roads and Highways) infrastructure and maintains project locations as “internal events” in the Roads and Highways geodatabase.
- Leverages structure locations already maintained in the ELRS.



# NYSDOT Project Planner feeds locations into OPPM

Program Managers initiate a new project in the OPPM interface...

ORACLE PRIMAVERA Portfolio Management

Status: ✔ In Queue: 8,500 Actions; In progress: 5,081 Actions; 47% completed

Form: 3. Project Detail Form Item: 6V2253- VPP NY 245 Ontario C/L to Rushville Data as of: Today

Form Item Clipboard Collaborate View User Setup ✕ ? Save | Reset | New | Spelling | Print | Mail | Hint

General Cost Categories & Funding Events Cost & Funding SOW/Accomplishments Project Det... Project Schedule **Location** Project Comments Fiscal Impacts Project Statuses

1. PIN 2. OPPM Internal ID

912643

3. GIS Landing

Project Planner URL Link: <https://gissor.dot.ny.gov/nysdotprojects/?pid=912643>

Project Planner URL Link View Only:

#	GIS Status	GIS Status Date	GIS ID	Friendly Name	Asset Location Element	Location ID	Begin Milepoint	End Milepoint	Total Lane Miles	Total Centerline Miles	GIS BIN	GIS CIN	GIS SIN	UTM Northing	UTM Easting	Is Interstate?

\*\*\*\*\* POPULATE DATA BELOW ONLY IF THE PROJECT WILL NOT BE MAPPED IN THE PROJECT PLANNER \*\*\*\*\*

...and start the Project Planner application

# NYSDOT Project Planner – adding LRS locations to a project

The screenshot displays the NYSDOT Project Planner interface. The browser address bar shows the URL [gissorqa.dot.ny.gov/nysdotprojects/?pid=1915](https://gissorqa.dot.ny.gov/nysdotprojects/?pid=1915). The application header includes the title "NYSDOT Project Planner", the project ID "OPPM ID: 1915 (PIN: 480637) 480637 - NYSDOT BRIDGE PREVENTATIVE MAINTENANCE - 2017", and the user name "User: Kovacs, Henry (DOT)".

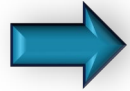
On the left side, there is a list of assets:

Asset ID	Asset Type	Actions
1063789	Bridges	[Icons]
4443210	Bridges	[Icons]
1048760	Bridges	[Icons]
1026070	Bridges	[Icons]
1048780	Bridges	[Icons]
1073451	Bridges	[Icons]
1073441	Bridges	[Icons]
1073442	Bridges	[Icons]
1073452	Bridges	[Icons]

The main map area shows an aerial view of a road project with yellow lines indicating the project boundaries. A search bar at the top left of the map area contains the text "Find assets...". Below the search bar are buttons for "Select on map" and "Add Non-Highway Asset". The map includes a scale bar at the bottom left showing "43.177 -77.540 Degrees" and "Scale 1 : 3,260". The Esri logo is visible in the bottom right corner of the map area.

Bridges, Large Culverts and Overhead Sign Structures may be added to the project

# NYSDOT Project Planner – adding LRS locations to a project



The screenshot shows the NYSDOT Project Planner web application. The browser address bar displays `gis.sora.dot.ny.gov/mysdotprojects/?pid=1915#`. The page title is "NYSDOT Project Planner" and the user is identified as "User: Kovacs, Henry (DOT)". The main content area features a satellite map with a red dashed polygon outlining a project area. A "Create Milepoint Asset by Polygon" dialog box is open on the left, showing "Selected Milepoint: 100679011" and "Create" and "Cancel" buttons. A "Milepoints (31 results)" list is displayed in the center, containing the following entries:

- 100370011, EMPIRE BLVD [View](#)
- 100444011, NY590 [View](#)
- 100679011, Empire Blvd [View](#)
- 143889011, WARRENTON ST [View](#)
- 273453011, NY404 to NY590 N [View](#)
- 273454011, NY590 NB to NY40 [View](#)
- 276656011, NY590 SB to NY40+ [View](#)
- 276657011, NY404 to NY590 SE [View](#)
- 100370011 [View](#)
- 100444011 [View](#)

The map includes a scale of 1:4,893 and coordinates 43.180 -77.536 Degrees. The Esri logo is visible in the bottom right corner of the map area.

One or more roadway segments may be added to the project by defining the project area

# NYSDOT Project Planner – adding LRS locations to a project

The screenshot shows the NYSDOT Project Planner interface. The main map displays an aerial view of a road network with a project area outlined in red. A list of milepoints is visible on the left side of the map, and a pop-up window shows details for the selected milepoints.

**NYSDOT Project Planner**  
OPPM ID: 1915 (PIN: 480637) 480637 - NYSDOT BRIDGE PREVENTATIVE MAINTENANCE - 2017  
User: Kovacs, Henry (DOT)

**Milepoints (31 results)**

Milepoint	Description	Action
1063789	Bridges	[Icons]
4443210	Bridges	[Icons]
1048760	Bridges	[Icons]
1026070	Bridges	[Icons]
1048780	Bridges	[Icons]
1073451	Bridges	[Icons]
1073461	Bridges	[Icons]
1073462	Bridges	[Icons]
1073452	Bridges	[Icons]
100370011	Roads, Routes, Ramps	[Icons]
EMPIRE BLVD		
100444011	Roads, Routes, Ramps	[Icons]
NY590		
273453011	Roads, Routes, Ramps	[Icons]
NY404 to NY590 NB		
273454011	Roads, Routes, Ramps	[Icons]
NY590 NB to NY404		
276656011	Roads, Routes, Ramps	[Icons]
NY590 SB to NY404		
276657011	Roads, Routes, Ramps	[Icons]
NY404 to NY590 SB		
100444012	Roads, Routes, Ramps	[Icons]
NY 590		
100679011	Roads, Routes, Ramps	[Icons]
Empire Blvd		

Submit Assets to OPPM Project requires update!

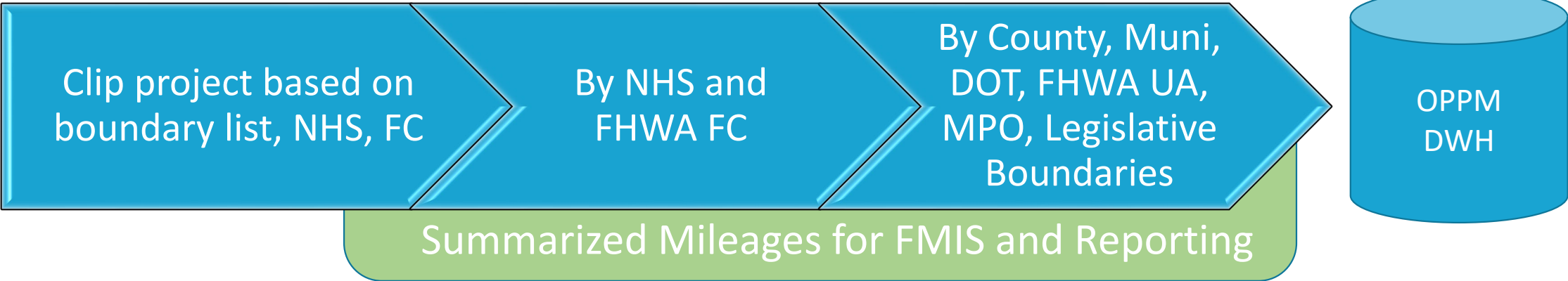
One or more roadway segments may be added to the project by defining the project area

# NYS DOT Project Planner – Geo-Enrichment for Project Data

The “Submit to OPPM” button uses the identified location to generate:



Nightly Data Warehouse update:



# NYSDOT Project Planner feeds locations into OPPM

Program Managers initiate a new project in the OPPM interface...

ORACLE PRIMAVERA Portfolio Management Status: ✔ In Queue: 8,500 Actions; In progress: 5,081 Actions; 47% completed

Form:  Item:  Data as of:

Form | Item | Clipboard | Collaborate | View | User | Setup |

Save | Reset | New | Spelling | Print | Mail | Hint

General | Cost Categories & Funding Events | Cost & Funding | SOW/Accomplishments Project Det... | Project Schedule | **Location** | Project Comments | Fiscal Impacts | Project Statuses

1. PIN  2. OPPM Internal ID

3. GIS Landing

Project Planner URL Link:

Project Planner URL Link View Only:

#	GIS Status	GIS Status Date	GIS ID	Friendly Name	Asset Location Element	Location ID	Begin Milepoint	End Milepoint	Total Lane Miles	Total Centerline Miles	GIS BIN	GIS CIN	GIS SIN	UTM Northing	UTM Easting	Is Interstate?
1	Insert	Jan 27, 2021	100198021	NY 245	33fe94d2-4302...	1	6.700	10.700	8.00	4.00	-	-	-	-	-	No
2	Insert	Jan 13, 2021	100198021	NY 245	e8fa648b-0b83...	2	0.000	6.700	13.40	6.70	-	-	-	-	-	No

\*\*\*\*\* POPULATE DATA BELOW ONLY IF THE PROJECT WILL NOT BE MAPPED IN THE PROJECT PLANNER \*\*\*\*\*



# NYS DOT Project Planner – Geo-Enrichment for Project Data

The “Submit to OPPM” button uses the identified location to generate:

ORACLE PRIMAVERA Portfolio Management

Form: 3. Project Detail Form Item: 108973 - ROUTE 4 OVER THE HUDSON

Form Item Clipboard Collaborate View User Setup

General Cost Categories & Funding Events **Cost & Funding** SOW/Accomplishments Project Det...

3. Scope Of Work - (Add "Primary Scope of Work" to only one row)

#	Scope Of Work	Scope of Work Percentage	Primary Scope of Work	FMIS Improvement Types
1	Pavement: Concrete Pavement Repair, Li...	20	-	06 - 4R - Restoration & Rehabilitation
2	Pavement: Mill and Fill	10	-	01 - New Construction Roadway
3	Pavement: Single Course Overlay	50	Primary Scope of Work	05 - 4R - Maintenance Resurfacing
4	Pavement Marking	10	-	05 - 4R - Maintenance Resurfacing
5	Pedestrian Facility (Highway): Improve/R...	10	-	28 - Facilities for Pedestrians and Bicycles
6	Pavement: Mill and Fill	5	-	01 - New Construction Roadway
7	Bridge: Deck Overlay or Rehab	5	-	59 - Bridge Resurfacing
8	Pavement: Cold-in-Place Recycling w/Ov...	5	-	05 - 4R - Maintenance Resurfacing
9	Pavement: Single Course Overlay	5	-	05 - 4R - Maintenance Resurfacing
10	-	-	-	-

1. Base Year (SFY start)

2015

2. Base Year Override

2015

3. Planned Funding By Asset

#	Match Group	Cost Category	Suppl... Seque...	Planned Funding Date	Total Planned Funding By	Fund Use	Federal Fund Source	Federal Fund Source Total	Fed - %	State Fund Source	State Fund Source Total	State - %	Include Marchiselli	Planning Target	Fixed Amount Indicator	Location ID	GIS ID	Begin Milepoint	Ending Milepoint	BIN/CIN/...	Is Intersta...	Scope Of Work	FMIS Improvement	Asset Location Element
1	-	SCOPING	0	Aug 28, 2019	100,000.00	ON ST...	-	0.00	0.00	SDF	100,000.00	100.00	No	Regional	No	-	-	-	-	-	-	Bridge: Vertic...	15 - Prelimin...	-
2	-	PRELIMINA...	0	Jun 17, 2020	1,200,000.00	ON ST...	-	0.00	0.00	SDF	1,200,000.00	100.00	No	Regional	No	-	-	-	-	-	-	Bridge: Vertic...	15 - Prelimin...	-
3	1	DETAILED D...	0	Jan 11, 2022	2,500,000.00	ON ST...	NHPP	2,000,000.00	80.00	SDF	500,000.00	20.00	No	Regional	No	-	-	-	-	-	-	Bridge: Vertic...	15 - Prelimina...	-
4	3	CONSTRUC...	0	May 18, 2023	3,200,000.00	ON ST...	NHPP	2,560,000.00	80.00	SDF	640,000.00	20.00	No	Regional	No	2	100366021	26.173	26.220	4001020	No	Bridge: Vertic...	14 - Bridge R...	77f15edd-4d...
5	3	CONSTRUC...	0	May 18, 2023	3,200,000.00	ON ST...	NHPP	2,560,000.00	80.00	SDF	640,000.00	20.00	No	Regional	No	1	100366031	0.000	0.058	4001020	No	Bridge: Vertic...	14 - Bridge R...	77f15edd-4d...
6	2	CONSTRUC...	0	May 18, 2023	200,000.00	ON ST...	NHPP	160,000.00	80.00	SDF	40,000.00	20.00	No	Regional	No	2	100366021	26.173	26.220	4001020	No	Bridge: Vertic...	17 - Construc...	77f15edd-4d...
7	2	CONSTRUC...	0	May 18, 2023	200,000.00	ON ST...	NHPP	160,000.00	80.00	SDF	40,000.00	20.00	No	Regional	No	1	100366031	0.000	0.058	4001020	No	Bridge: Vertic...	17 - Construc...	77f15edd-4d...



# Challenges working with the Enterprise Linear Referencing System

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- Complexities in the ELRS (Roads and Highways) extend into systems that leverage it:
  - » Route Concurrencies
  - » Unintended retirements
  - » Temporality (see below)
- FHWA maintains Project Locations on an annual HPMS snapshot of the LRS network.
  - » We are maintaining project locations on the current Milepoint LRS network
  - » Program Management sometimes needs to adjust Milepoint location to allow a project to be accepted by FMIS



Enterprise Data Management

Geospatial Data Warehouse (GDW)

System of Engagement (SoE)

# The NYSDOT System of Engagement Project

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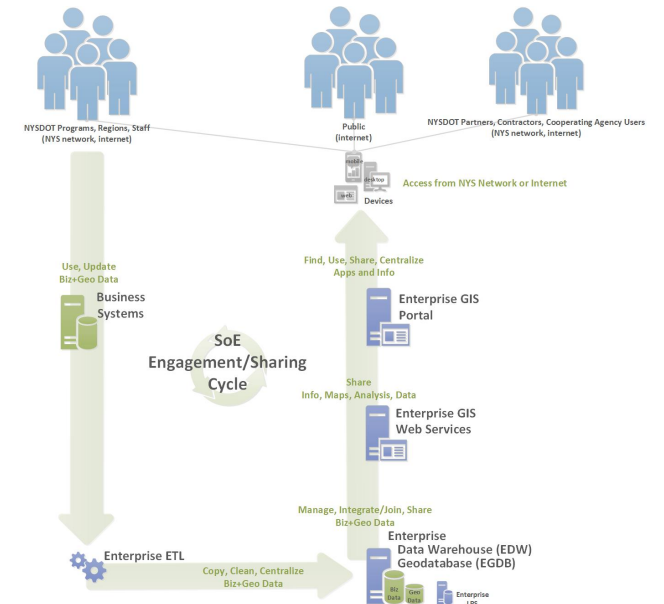
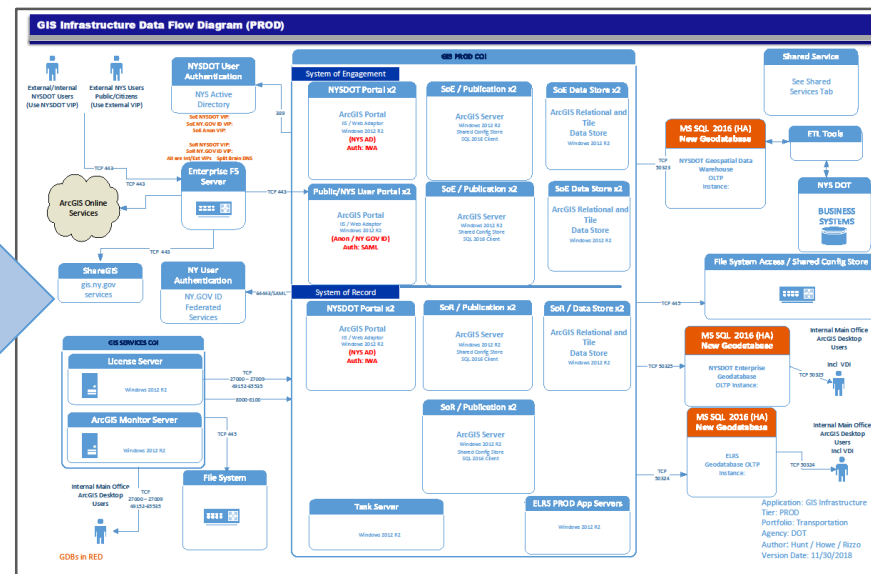
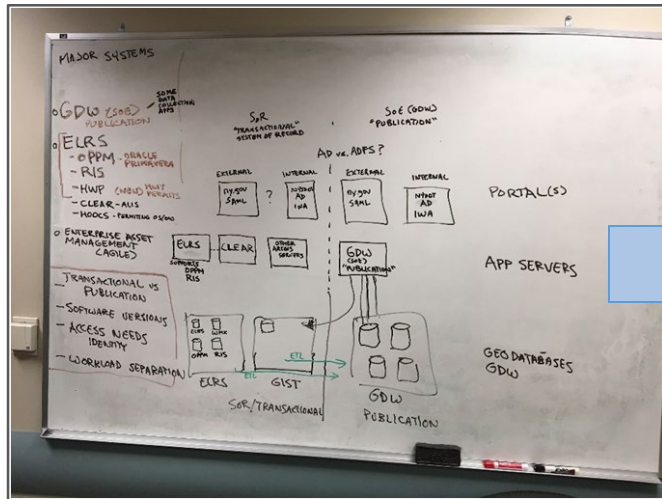
**Goal:** Make Commonly Requested Data Widely Available

*Make data from NYSDOT systems of record and other authoritative sources widely available through an ever-growing library of maps, apps, and other data service*

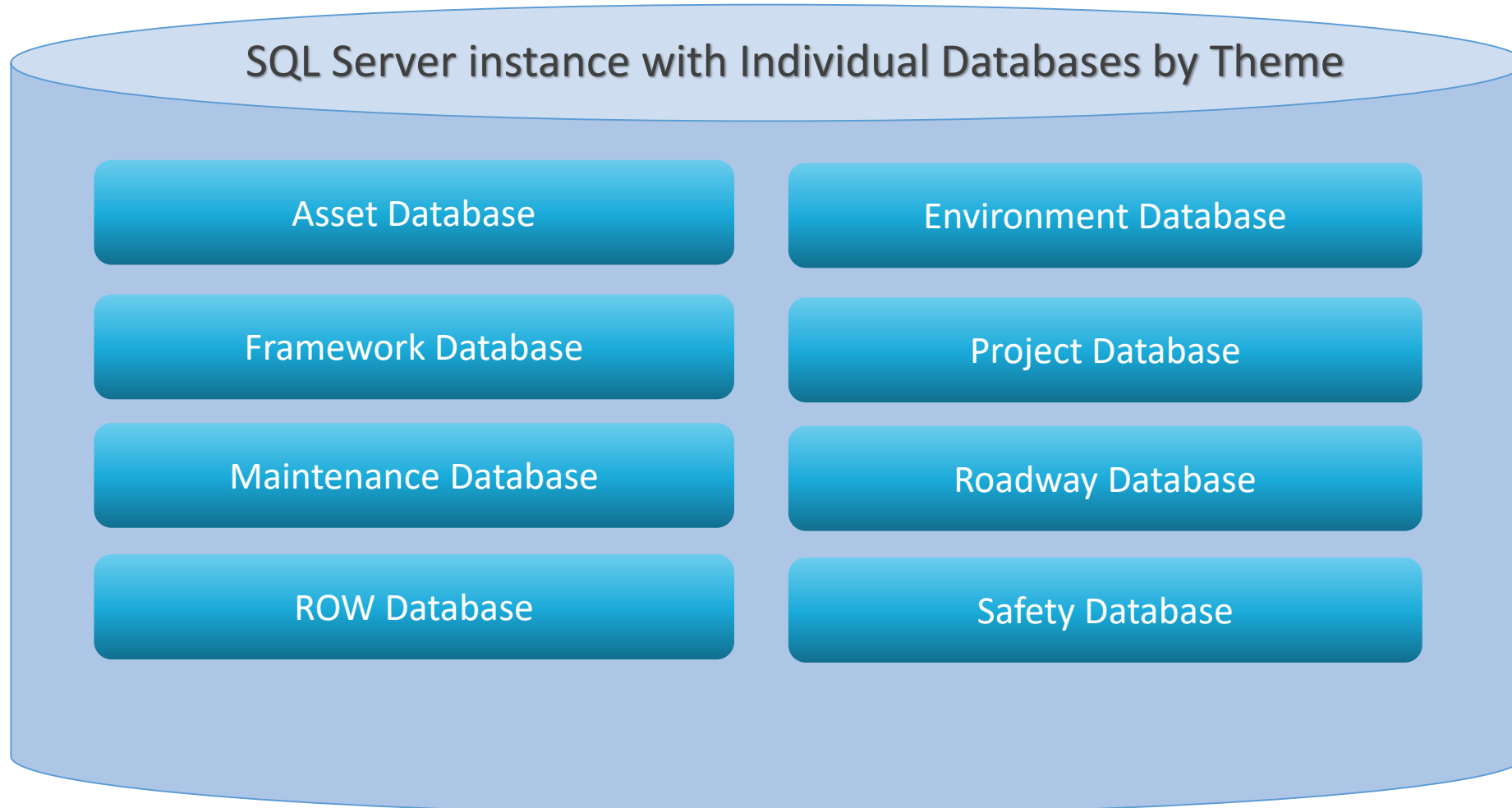


# The NYSDOT System of Engagement Project

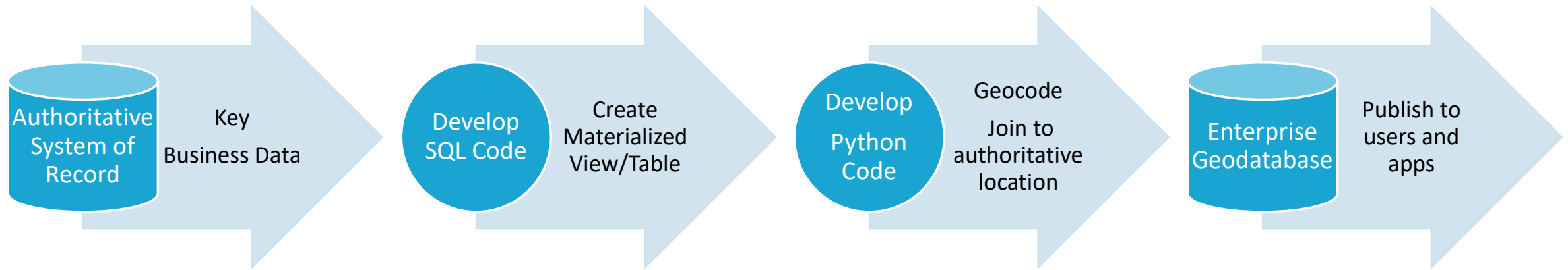
- 2018 – Redesign and build a robust NYSDOT Enterprise GIS System Environment
  - » Application Server Platform
  - » Geodatabase Servers (SQL Server 2016)
  - » Rearchitect Data Management and ETL



# The NYSDOT Geospatial Data Warehouse (GDW)



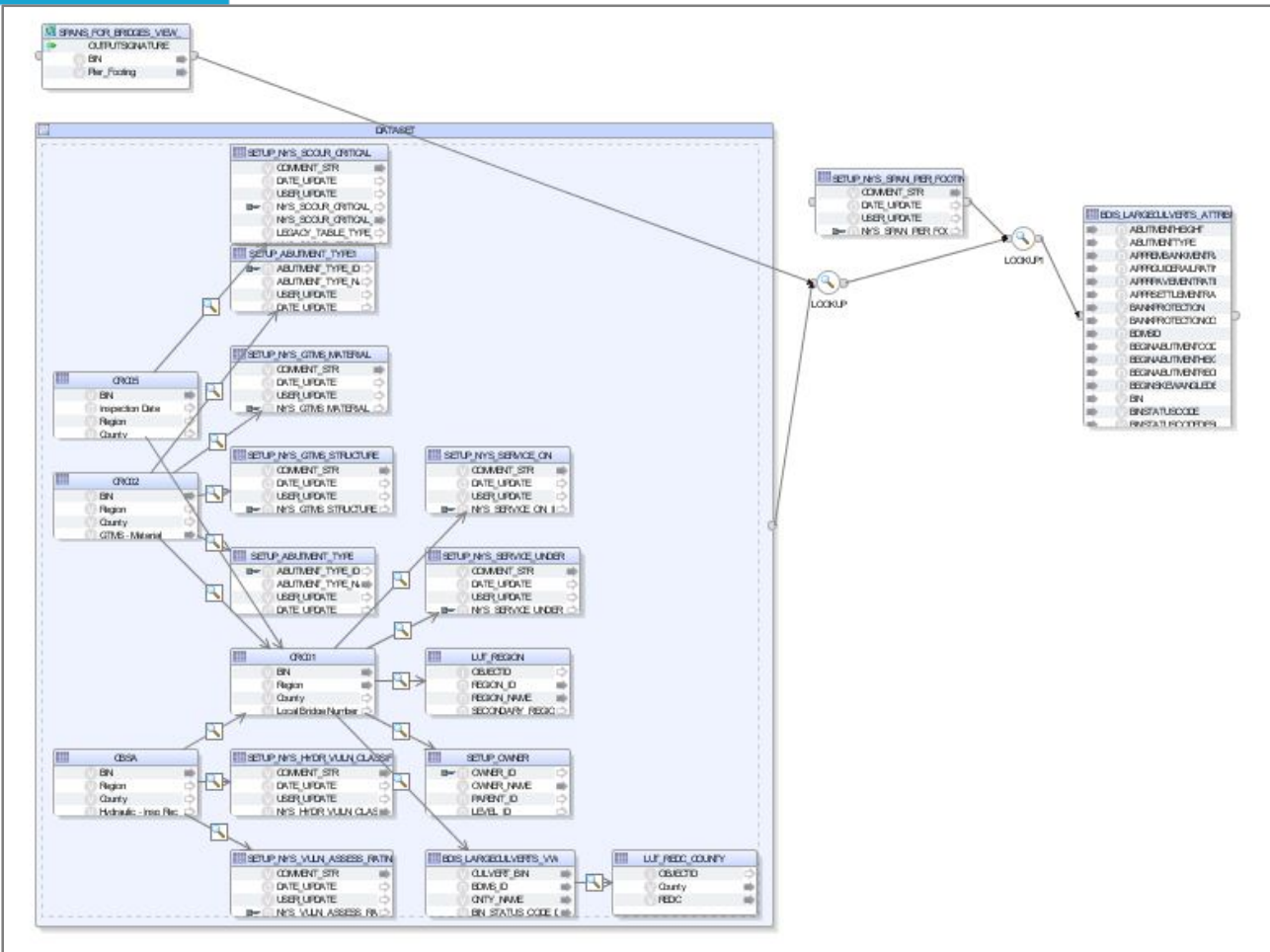
# The old way to build enterprise geospatial datasets



Custom code to maintain for each NYSDOT system of record

Too inefficient and unsustainable for enterprise data management

# Documented business data ETL – Oracle Data Integrator (ODI)



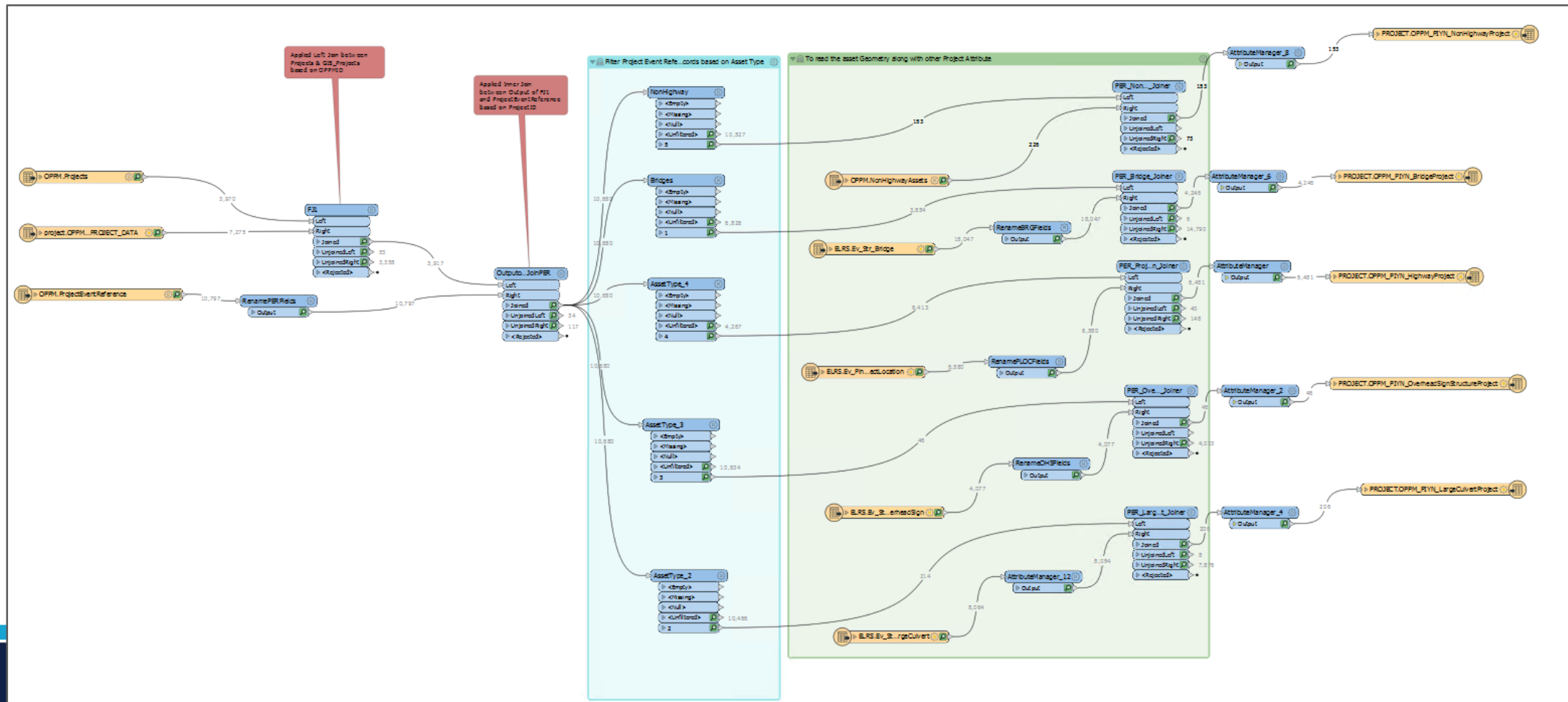
Advantages to an industry standard Extract, Transform, Load Tool:

- A visual, documented workflow
- Standardized ETL
- Efficient
- More Transferable

But ODI doesn't do Esri geodatabases

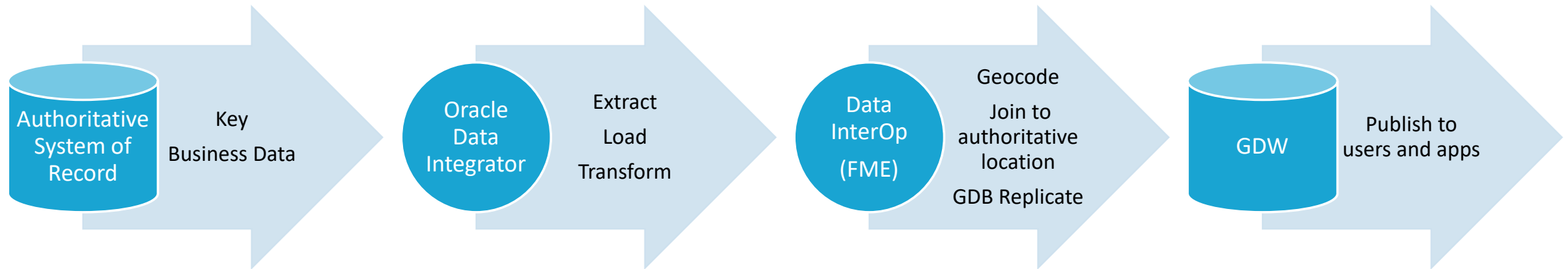
- Doesn't create the 'ObjectID' column (required in GDB)

# Documented geospatial ETL - Esri Data Interoperability (FME)





# A standard to access authoritative business data



- Visual, documented ETL processes
- Industry standard
- More easily maintained

# GDW Data Standards established

---

- NYSDOT worked with Esri during the System of Engagement Project to establish general data standards for the Geospatial Data Warehouse
- Purpose: This document outlines the standards for NYSDOT System of Engagement Transportation Geodata Warehouse (GDW) and includes standard best practices for all databases. This document will provide a framework for creating new feature classes, tables and feature services that will feed the GDW/Open Data Portal.
  - **Field Format Standards**
  - **Standard Fields for Services**
  - **Geometry Requirements for Feature Classes**
  - **Metadata Requirements**

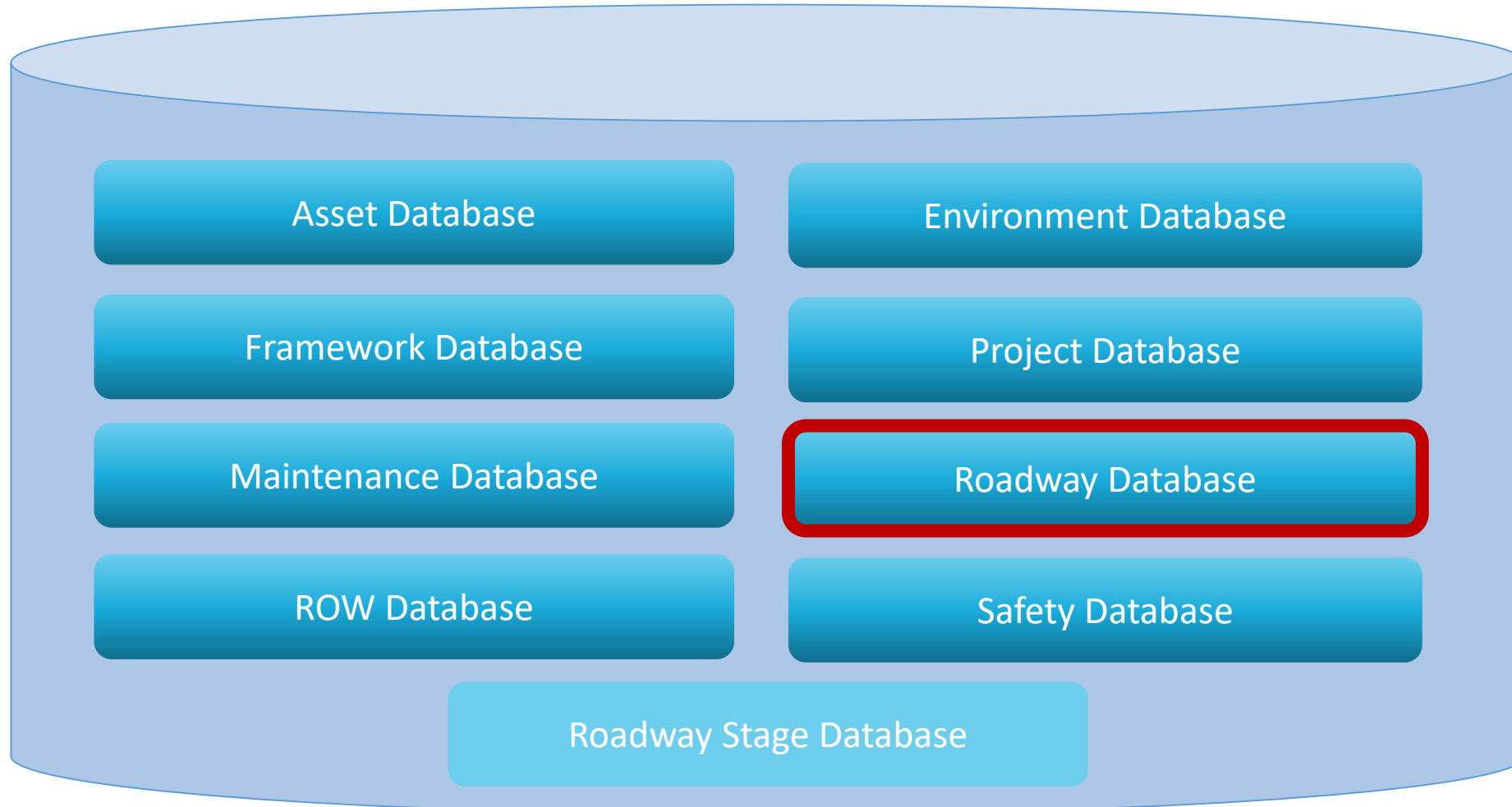


# GDW Data Standards

- A guide for new datasets in the GDW and a measure for existing datasets
- Plenty of feature classes in the GDW do not yet meet the GDW Data Standards
- Sharing standards with NYS GIS and ITS peers for consideration in new layers and IT systems.

FIELD NAME	FIELD ALIAS	FIELD TYPE	LENGTH	EXAMPLE	NOTES
Address1	Address Line (1)	Text	100		If dataset doesn't need 2 address lines, then just call it 'Address'
Address2	Address Line (2)	Text	100		
AddressCity	Address City	Text	60		
AddressCountry	Address Country	Text	6	Canada or USA only	Only include if Canada-based fields exist in SoR data.
AddressState	Address State	Text	2		
AddressZipCode	Address Zip Code	Text	10	01234-5678	
AreaAcre	Area (Acres – UTM83-18N)	Double			For polygon geometry only.
AreaSquareMeter	Area (Square Meters – UTM83-18N)	Double			For polygon geometry only.
AreaSquareMile	Area (Square Miles- UTM83-18N)	Double			For polygon geometry only.
BeginLatitude	Latitude Start (DD – WGS84)	Double			Generally, for use in business data tables only. Decimal degrees. Where necessary, could be generated/updated nightly during ETL.
BeginLongitude	Longitude Start (DD- WGS84)	Double			Generally, for use in business data tables only. Decimal degrees. Where necessary, could be generated/updated nightly during ETL Decimal degrees.
BIN	BIN	Text	7		Bridge Identifier Number = NBI Field #8

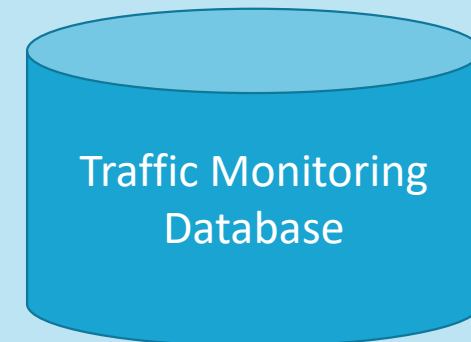
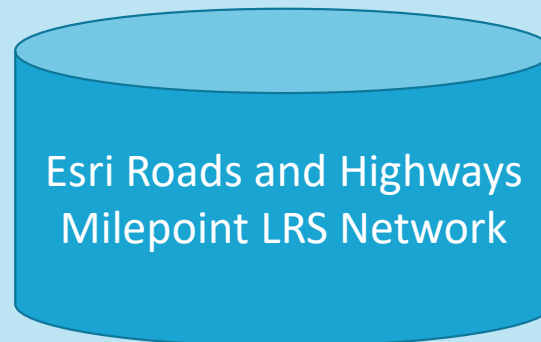
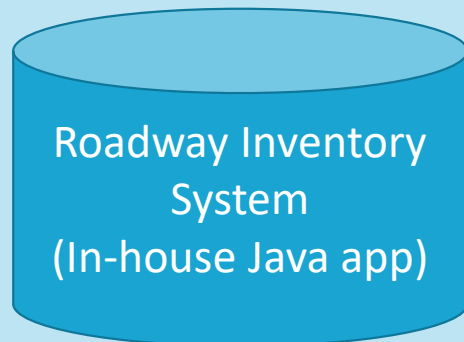
# The Roadway Data Mart (RDM)



# Roadway Data Mart – Current Roadway Systems

- Historically NYSDOT managed pavement and roadway inventory in the same in-house system – NYSDOT Roadway Inventory System (2010)
- Now transitioning to Pavement Management in Agile Assets and Roadway Inventory Maintenance in Esri Roads and Highways

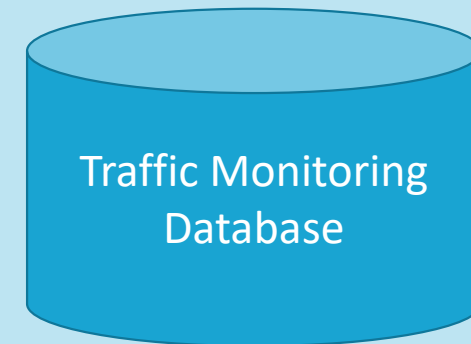
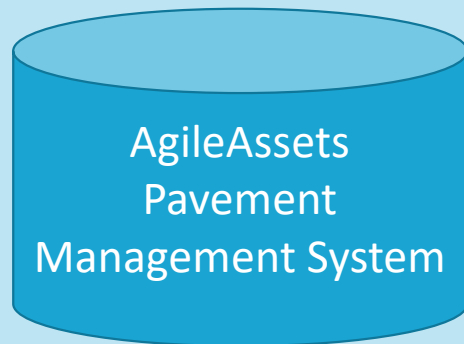
## Transactional Roadway Systems of Record – Through 2021



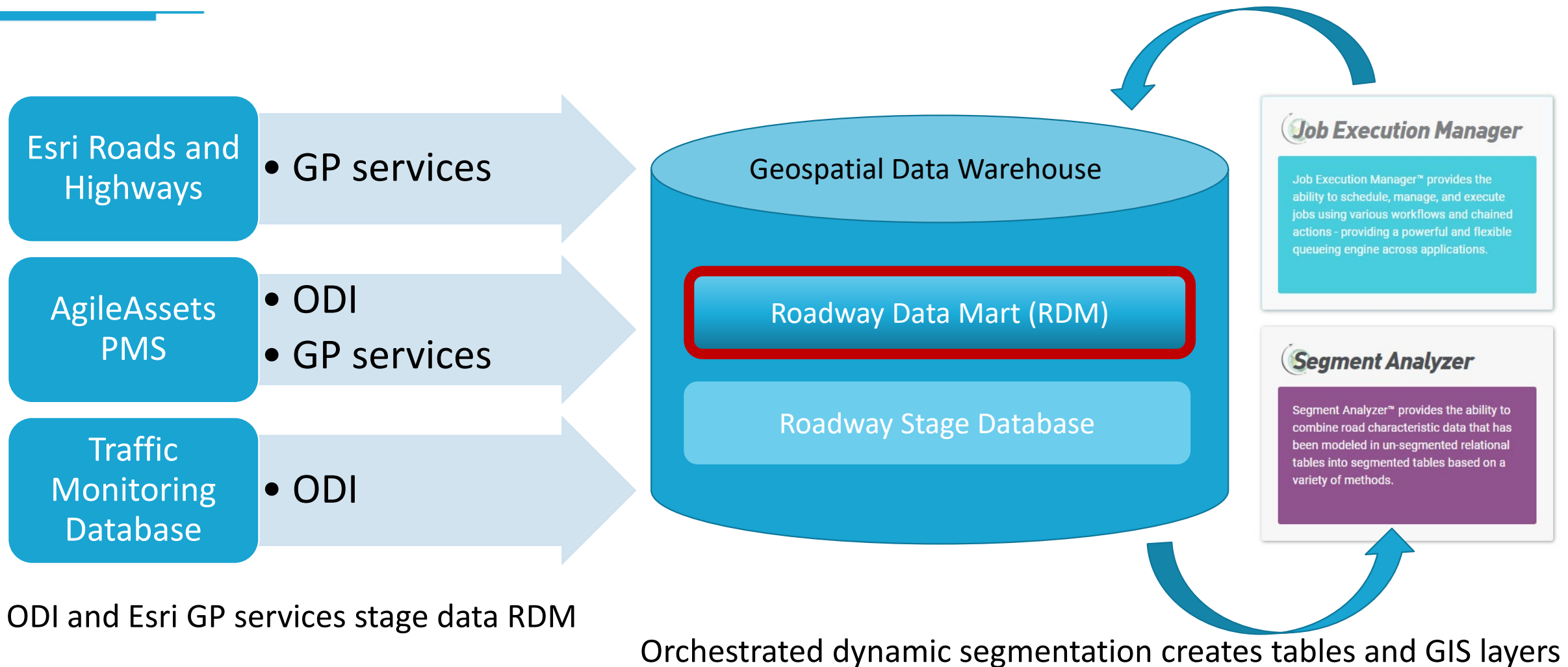
# Roadway Data Mart – Geospatial data management with new capabilities

- NYSDOT would need to update the existing Roadway Inventory System warehouse to meet new data warehousing needs.
- Designed to publish roadway data from two separate LRS environments
- Simultaneously support traditional reporting, business intelligence and GIS services.

Transactional Roadway Systems of Record – beginning in 2021

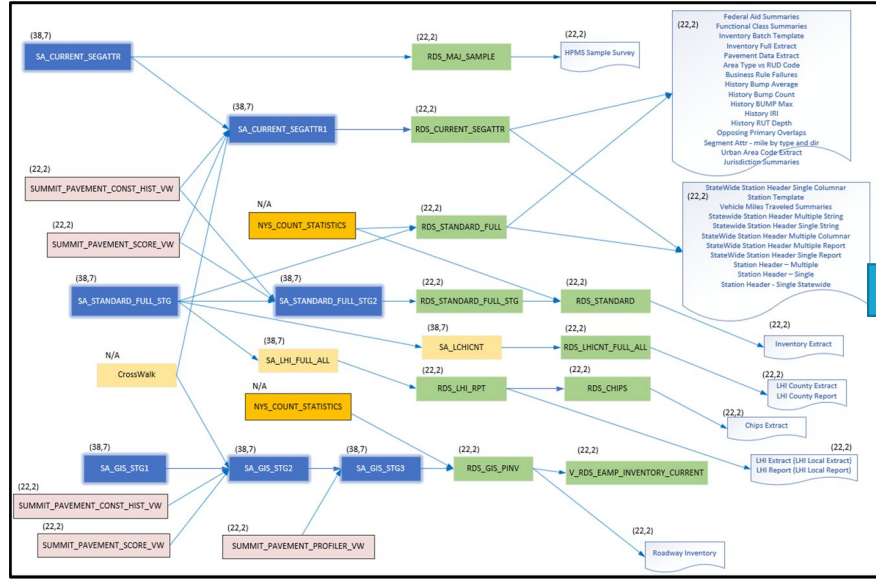


# Roadway Data Mart – The refresh process



# Roadway Data Mart – One authoritative source for reporting and geospatial

Reporting and BI



13-LHI Report\_2018-12-01-06-17-40.pdf - Adobe Acrobat Reader DC

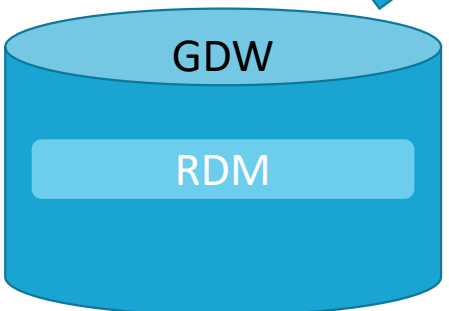
New York State Department of Transportation  
Local Roads Listing

Municipality: Town of Berne  
Albany County

Jurisdiction: Town

Geocode: 0068  
NYS DOT Region: 1

DOT ID	Route	Road/Street Name	Start of Section	End of Section	Req. MI*	Est. MI*	Length	DIV	No. of Lanes	One Way	Pvt	Shldr	Med	Med	Func	Class	NHS
100971	BEAVER RD	BRADT HOLLOW RD	CR13	0.00	1.96	1.96	1	U	10	3	None					9	
100972	BETTS LA	SR 157	END	0.00	0.06	0.06	2	A	20	2	None					9	
100973	BLUE FARMER LA	SR443	END	0.00	0.13	0.13	1	U	12	3	None					9	
100974	BOECHER LA	SR443	END	0.00	0.34	0.34	2	U	14	2	None					9	
100975	BOLSTER LA	CR6	END	0.00	0.60	0.60	1	U	13	3	None					9	
100976	BRADT HOLLOW RD	PCASLEY RD	SR443	0.00	5.80	5.80	2	U	16	5	None					9	
100977	BRIDGE RD	ALB CL	BRADT HOLLOW RD	0.00	0.93	0.93	2	A	18	4	None					9	
100978	BROOKHAVEN DR	CR14	SR443	0.00	1.25	1.25	2	A	16	5	None					9	
259058	BROOKHAVEN EXT	BROOKHAVEN DR	SR443	0.00	0.15	0.15	2	A	14	2	None					9	
100979	BUSH DR	ELM DR	CR 303	0.00	0.75	0.75	2	A	18	5	None					9	
100981	CAMP LA	DEAD END	CR14	0.00	0.34	0.34	2	U	14	3	None					9	
100980	CANADAY RD	SCHOHARIE/ALB C	CR9 BRADT HOLLOW	0.00	0.41	0.41	2	U	18	4	None					9	
100982	CASS HILL RD	CR412	BERNE TL	0.00	1.15	1.15	2	U	18	4	None					9	
100983	CHASE RD	SR157A	RABER RD	0.00	0.14	0.14	1	U	16	3	None					9	
100984	CHRYSLER RD	END	KAEHLER	0.00	0.10	0.10	1	O	10	3	None					9	
100985	CHURCH RD	CR 1	WESTERLO TL	0.00	0.57	0.57	2	A	20	4	None					9	
100986	CIRCLE DR	END	CR303	0.00	0.14	0.14	2	A	15	3	None					9	
100987	COOGAN RD	CR1	END	0.00	0.30	0.30	1	U	10	2	None					9	
100988	COOK HILL RD	CR10	BRADT HOLLOW RD	0.00	1.96	1.96	1	U	12	3	None					9	
100989	CRANE LA	SR157A	END	0.00	0.51	0.51	1	A	12	2	None					9	
100990	DUCK HILL RD	GILF HILL RD	BERNE TL	0.00	0.23	0.23	1	U	12	3	None					9	
100991	DUTCH SETTLEMENT PT 1	KNOX TN LN	KNOX TN LN	0.00	0.10	0.10	2	A	14	3	None					8	
262758	DUTCH SETTLEMENT PT 2	BERNE TN LN	CR 9	0.00	0.05	0.05	2	A	14	3	None					8	
100992	DYER RD	SR 443	END	0.00	0.72	0.72	1	U	10	3	None					9	



ArcCatalog - \dots\DOT\_GIS\Connections\GDW\Dev\gdw\_roadway\_roadway.sde\GDW\_Roadway\roadway.RIS\_SUFF

File Edit View Go Geoprocessing Customize Windows Help

Contents Preview Description

ArcToolbox

- 3D Analyst Tools
- Analysis Tools
- Data Management Tools
- Aviation OS Tools
- Aviation Tools
- Cartography Tools
- Conversion Tools
- Coverage Tools
- Data Interoperability Tools
- Data Management Tools
- Data Reviewer Tools
- Editing Tools
- Geocoding Tools
- Geostatistical Analyst Tools
- Linear Referencing Tools
- Location Referencing Tools
- Multidimension Tools
- Network Analyst Tools
- Parcel Fabric Tools
- Production Mapping Tools
- Schematics Tools
- Server Tools
- Space Time Pattern Mining Tools
- Spatial Analyst Tools
- Spatial Statistics Tools
- Tracking Analyst Tools
- Workflow Manager Tools

Preview: Geography

591276.1206 4737370.2953 Meters

NYS DOT Maps & Apps

Pavement Viewer

Layers List

- International Roughness Index (IRI)
- Average IRI
- Very Rough (220+)
- Rough (171 - 220)
- Fair (121 - 170)
- Smooth (61 - 120)
- Very Smooth (0 - 60)
- Surface Score
- Excellent (0 - 10)
- Good (7 - 8)
- Fair (6)
- Poor (0 - 5)
- Last Work Type
- Corrective Maintenance
- Preventive Maintenance
- Reconstruction
- Rehabilitation
- Reference Marker
- Pavement Work Order History
- Bridges
- NYS Streets

Pavement NY7

Year	2017
Average IRI	121.00
Surface Score	7.00
Dominant Distress	Al - Isolated Alligerming
Work Type	Single Course HMA
Work Year	2001
Work Category	Preventive Maintenance
Years at Current Score	8.00
Route	NY7
Road Name	Co Rd
Zoom to	

Desktop and Web GIS



# NYSDOT Maps and Apps

**NEW YORK** Department of Transportation  
RCOL=1285VC

## NYSDOT Maps & Apps

### What's New?

Welcome to the NYSDOT Maps & Apps Portal. The purpose of this site is to make data from NYSDOT systems of record and other authoritative sources widely available through an ever-growing library of maps, apps, and other data services.

- ADK Travel Corridor Viewer**
- Aviation Facilities Viewer**
- Bridge Viewer**
- Certified Business Enterprise Viewer**
- Environmental Viewer**
- Facility Viewer**

- Flood Watch Viewer**
- Maintenance Viewer**
- Material Suppliers Viewer**
- NYS Bike Route Viewer**
- Pavement Viewer**
- Permits Viewer**
- Situational Assets Viewer**
- Surface Waters Viewer**
- Traffic Data Viewer**
- Traffic Signal Viewer**
- Winter Ops**  
NOTE: Winter Ops will return in the early Fall for the 20/21 Winter season.

- A combination of agency and public facing applications that provide easily consumed authoritative information.

# Traffic Signal Viewer – simple access to authoritative data

The screenshot shows the NYSDOT Traffic Signal Viewer web application. The browser address bar displays the URL: `gisportal.dot.ny.gov/portal/apps/webappviewer/index.html?id=cb5fc88fa7944832989f5fb71751aad6`. The application title is "Traffic Signal Viewer".

**Filter by Location:**

- NYSDOT Region Number is: - empty -
- County is: - empty -
- Municipality is: - empty -

**Filter by Signal Features:**

- Signal Type is: 3-Color Signal
- Utility Company is: National Grid
- Maintenance Responsibility is: - empty -
- Owner is: - empty -
- Responsible Entity is: - empty -

**Legend:**

- Traffic Signals**
  - 3-Color Signal (Orange diamond)
  - Beacon (Blue diamond)
  - Flasher (Green diamond)
  - ITS Location (Blue diamond)
  - Master (Green diamond)
  - Navigation Lights (Yellow diamond)
  - Street Light (Purple diamond)
  - Other (Grey diamond)
- DOT Boundaries**
  - DOT Regions (Black square)
  - DOT Residencies (Red square)
- All Traffic Signal Locations**
  - Traffic Signals (Grey diamond)

**Signal Information Pop-up:**

Signal 01-11-71

**Signal ID: 01-11-71**  
**Region: 1 (Albany)**  
**Location: NY 005 and Lishakill Rd**  
**"Rte 5 (Central Ave) @ LISHAKILL RD"**  
**Colonie, Albany County**

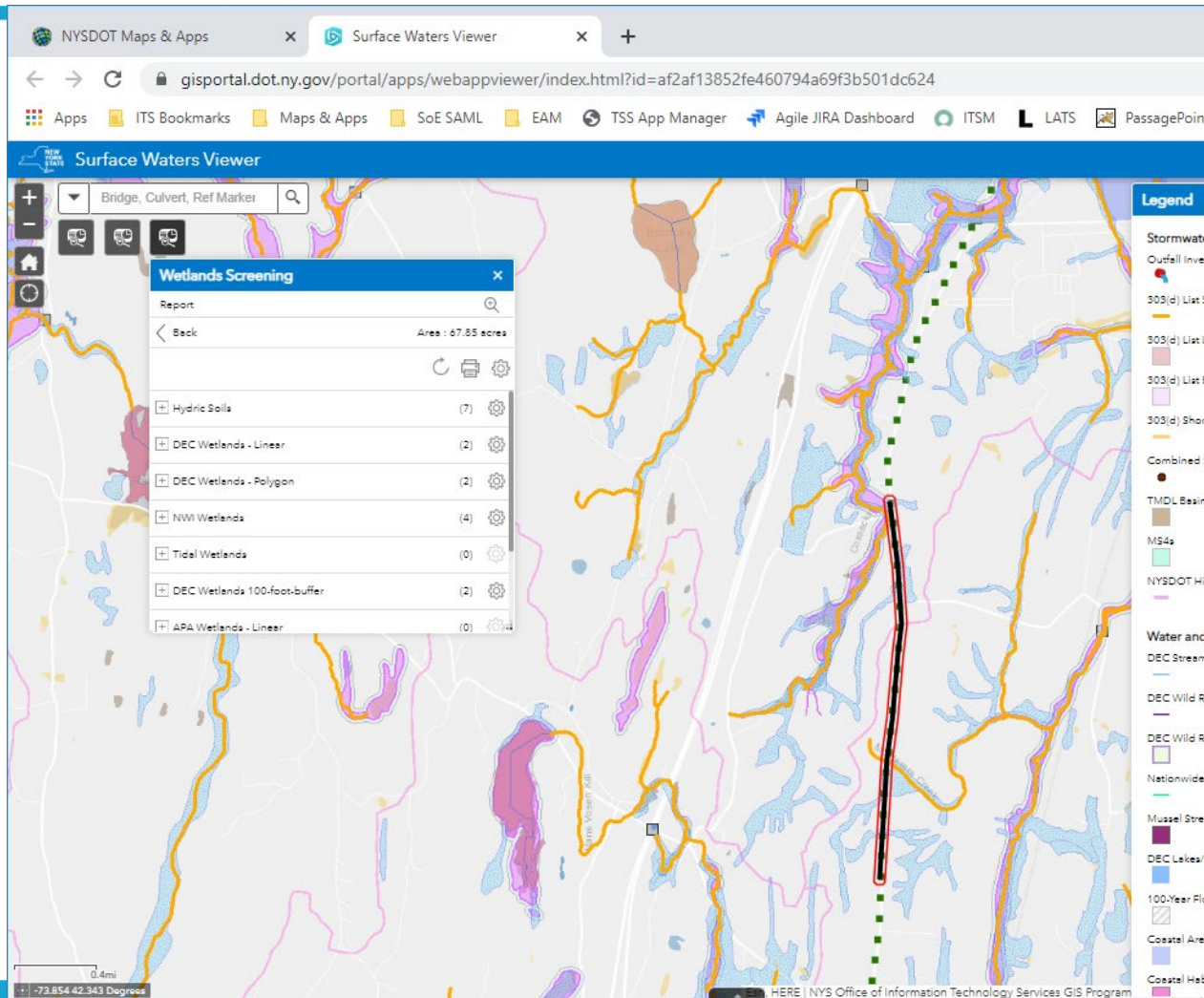
**Signal Information:**

Signal Shop Number:	1
Signal Type:	3-Color Signal
Signal Purpose:	Standard
Responsible Entity:	State Forces

[Zoom to](#)



# Surface Waters Viewer – with Preliminary Screening



## Summary

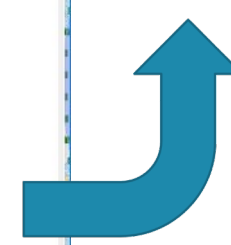
Name	Count	Area(acres)	Length(mi)
Hydric Soils	7	11.93	N/A
DEC Wetlands - Linear	2	N/A	0.10
DEC Wetlands - Polygon	2	0.41	N/A
NWI Wetlands	4	1.13	N/A
Tidal Wetlands	0	0	N/A
DEC Wetlands 100-foot-buffer	2	2.00	N/A
APA Wetlands - Linear	0	N/A	0
APA Wetlands - Polygon	0	0	N/A
APA Wetlands - Linear Cover Types	0	N/A	0
APA Wetlands - Cover Types	0	0	N/A

## Hydric Soils

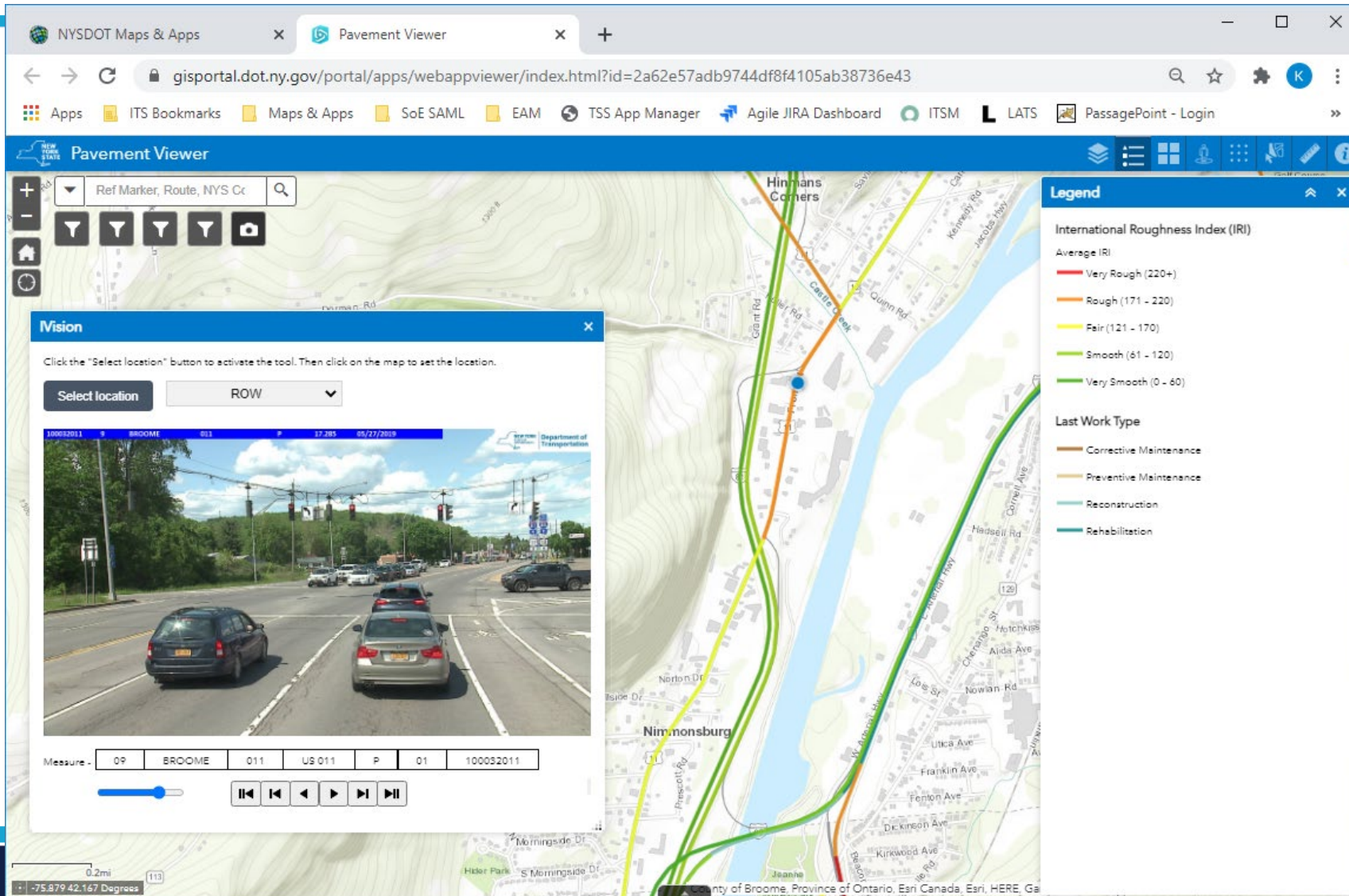
#	Map Unit Symbol	Component Name	Hydric Rating	Drainage Class	Hydrologic Soil Group	Area(acres)
1	Co	Covington	Yes	Poorly drained	D	10.48
2	Wa	Wayland	Yes	Poorly drained	B/D	0.79
3	HvC	Madalin	Yes	No Data	No Data	0.66

## DEC Wetlands - Linear

#	LENGTH	Wetland ID	Class	Length(mi)
1	2220.81005859	HN-105	1	0.05
2	3088.30004883	HN-105	1	0.05



























# Pavement Viewer



- IRI
- Pavement Score
- Work Orders
- Projects
- NYSDOT Photolog

# Reusable authoritative data services

The screenshot shows a web browser window with the URL `gisportal.dot.ny.gov/hosting/res...`. The page title is "ArcGIS REST Services Directory" and the breadcrumb is "Home > services". There are links for "JSON" and "SOAP". The main content area shows "Folder: /" and "Current Version: 10.71". A link "View Footprints In: ArcGIS Online Map Viewer" is present. A "Folders:" section lists various categories: Assets, CulturalResources, Environmental, Facility, Framework, Hosted, Maintenance, Photos, Projects, RightOfWay, Roadways, Safety, Structures, System, and Utilities. Three blue arrows point from the "Folders:" list to the corresponding rows of service cards on the right.

 <b>Aviation Facilities Viewer</b> SEE INFO  OPEN APP 	 <b>Bridge Viewer</b> SEE INFO  OPEN APP 	 <b>Flood Watch Viewer</b> SEE INFO  OPEN APP 
 <b>Maintenance Viewer</b> SEE INFO  OPEN APP 	 <b>Material Suppliers Viewer</b> OPEN APP 	 <b>NYS Bike Route Viewer</b> OPEN APP 
 <b>Pavement Viewer</b> SEE INFO  OPEN APP 	 <b>Permits Viewer</b> COMING SOON 	 <b>Surface Waters Viewer</b> SEE INFO  OPEN APP 

Published from  
the GDW

...and reused  
across  
applications.

# App Data Details document source and update frequency

## Data Details - Winter Ops

### Data Summary

The table below is a summary of the data in the Winter Ops application

Layer	Source	Update Frequency (Last Update)
Snow Plows	Verizon, LiGO, Web Tech & Samsara AVL	Real Time
Help Trucks - Networkfleet	Verizon Networkfleet AVL	Real Time
511NY - Accidents/Incidents	511 NY	Real Time
511NY - Cameras	511 NY	Real Time
511NY - Closures	511 NY	Real Time
Winter Travel Advisory	511 NY	Real Time
NOAA nowCoast Radar	NOAA	Real Time
NDFD Snow Fall Prediction	National Weather Service	Hourly
NWS Forecast	National Weather Service	Real Time
NYS_Mesonet	NYS Mesonet	Real Time
NYS Boundaries	NYS GIS Program Office	As Needed
DOT Boundaries	ITS Transportation GIS Group	As Needed
REDC	ITS Transportation GIS Group	As Needed
Snow Plow Beats	NYSDOT Transportation Maintenance	As Needed
Salt Stockpile - Capacity Available	NYSDOT Transportation Maintenance	Nightly
World Traffic Service	Esri, HERE	Real Time

## Data Details – Flood Watch Viewer

### Data Summary

The table below is a summary of the data in the Flood Watch Viewer

Layer	Source	Update Frequency (Last Update)
Bridges	<ul style="list-style-type: none"> <li>NYSDOT Bridge Data Information System</li> <li>Structures Inventory Group Bridge Feature Class</li> </ul>	Nightly
Flood Watch and Debris Prone Bridges	<ul style="list-style-type: none"> <li>NYSDOT Bridge Data Information System</li> <li>Structures Inventory Group Bridge Feature Class</li> </ul>	Nightly
Large Culverts	<ul style="list-style-type: none"> <li>NYSDOT Bridge Data Information System</li> <li>Structures Inventory Large Culvert Feature Class</li> </ul>	Nightly
Debris Prone Large Culverts	<ul style="list-style-type: none"> <li>NYSDOT Bridge Data Information System</li> <li>Structures Inventory Large Culvert Feature Class</li> </ul>	Nightly
DOT Regions	ITS Transportation GIS Group	As Needed
DOT Residencies	ITS Transportation GIS Group	As Needed
Metropolitan Planning Organizations	ITS Transportation GIS Group	As Needed
NOAA Radar Imagery	NOAA	Real Time
NWS River Gauges	National Weather Service	Real Time
NWS Watches and Warnings	National Weather Service	Real Time
NYS Civil Boundaries	NYS GIS Program Office	As Needed (2018)
NYS Streets	NYS GIS Program Office	Weekly
REDC	ITS Transportation GIS Group	As Needed
Reference Markers	Enterprise Linear Referencing System	Nightly
River Forecast Center – Hourly Quantitative Precipitation Estimates	National Weather Service River Forecast Center	Hourly
USGS – WaterWatch Hourly Stream Flow	USGS	Hourly
Waterways and Watersheds	Esri World Hydro Reference Overlay	As Available (2018)

# Service and Source documentation maintenance

**Service Name:** [Traffic Signals](#)

**Rest Endpoint:** [https://...dot.ny.gov/hosting/rest/services/Assets/Traffic\\_Signals/MapServer](https://...dot.ny.gov/hosting/rest/services/Assets/Traffic_Signals/MapServer)

**Manager:** <https://...dot.ny.gov/hosting/manager/#f=Assets>

**Apps:** Traffic Signal Viewer

**Supporting Pro Project:** [\\...\\ProProjects\\\\_Internal\\_SOE\\Assets\\TrafficSignals.aprx](\\...\\ProProjects\\_Internal_SOE\\Assets\\TrafficSignals.aprx)

**Layers:**

**ETL Type:** ODI + Data Interop

**Source System:** Cartegraph

**Source Table Name(s):** See ODI job

**ODI Job name:** CG\_TRAFFICSIGNAL

**ODI Job Scheduled Time:** 4:00am

**ODI Output Table Name(s):** GDW\_Asset.CG\_TRAFFICSIGNAL

**Brief overview/description of ODI Job:** Combines multiple attributes from Cartegraph tables into a single CG\_TRAFFICSIGNAL table.

**FME/Python Job Name and File Location:**

- D:\Jobs\GDW\_Asset\TrafficSignals\TrafficSignal\_Cartegraph\_GDW.fmw

**FME/Python Input(s):**

- GDW\_Asset.CG\_TRAFFICSIGNAL

**FME/Python Output(s):**

- GDW\_Asset.TrafficSignal

**Scheduled Task Name:** Traffic\_Signals

**Scheduled Task Time:** 4:30am

**Brief Overview/Description of FME/Python:** This workbench pulls the output of Traffic Signal data from CarteGraph created by ODI. It performs some cleanup and standardization of attribute names and data. Builds point geometry based on valid UTM X/Y pairs and writes them out to a feature class. Additional notes are annotated within the workbench.

Map Service Layer	GDW Geodatabase Object (Feature Class/Table)
Traffic Signals (0)	GDW_Asset.TrafficSignal

# Lessons

---

- A System of Engagement can be an effective vehicle toward better and more sustainable data management and governance processes.
  - » A few useful app examples allow stakeholders to recognize value of sound data management practices
- Go in with eyes wide open. Developing and maintaining a System of Engagement is a major commitment for decision makers, subject matter experts, users, GIS and IT resources.
- Be flexible and transparent. There will be times when the desired data management practice falls victim to reality...data quality problems, schedule conflicts, resource issues.
  - » There will be an opportunity to revisit it.







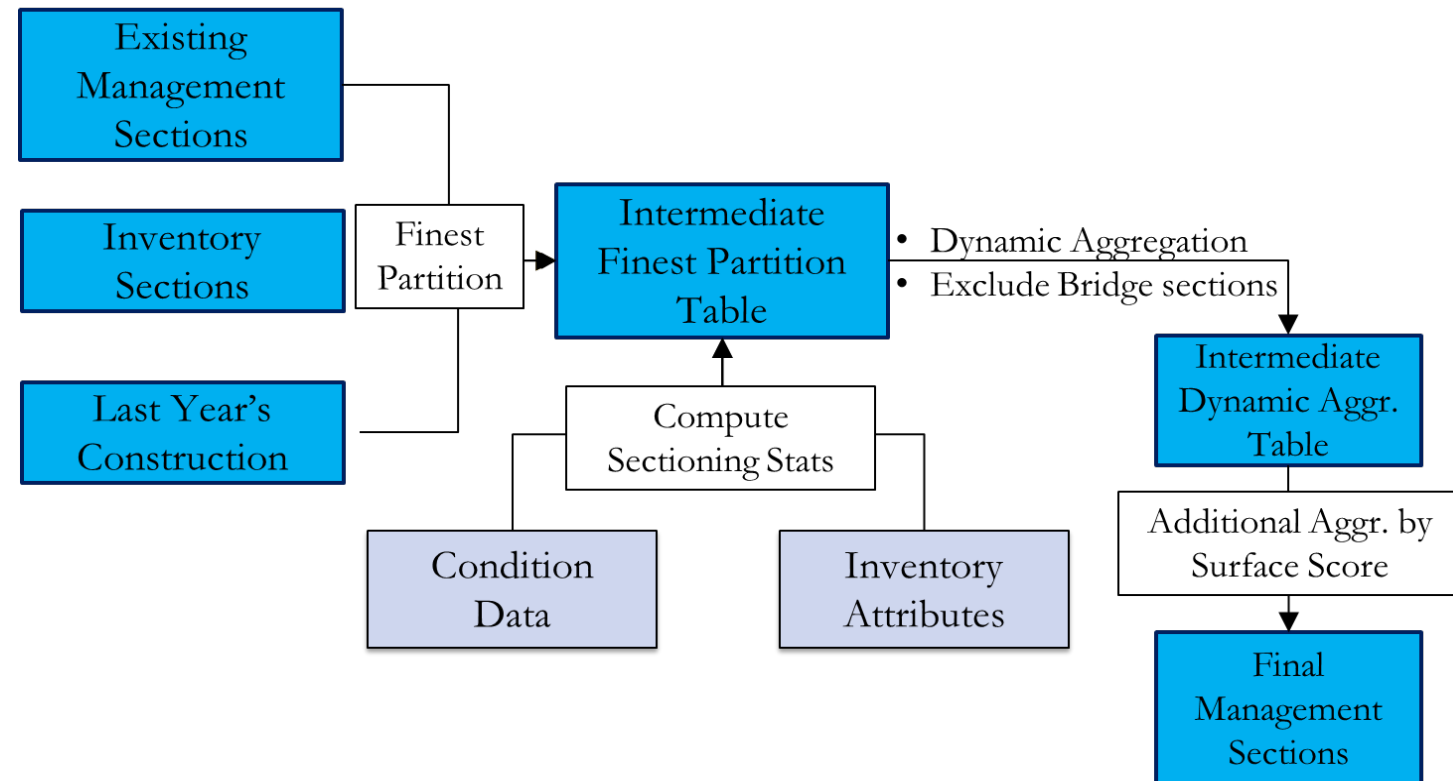
## Enterprise Linear Referencing System External System Integrations

Enterprise Asset Management  
Program (EAMP)  
(PMS, SMS, MMS, Portfolio Mgmt)

Crash Location, Evaluation, Analysis  
and Reporting (CLEAR)

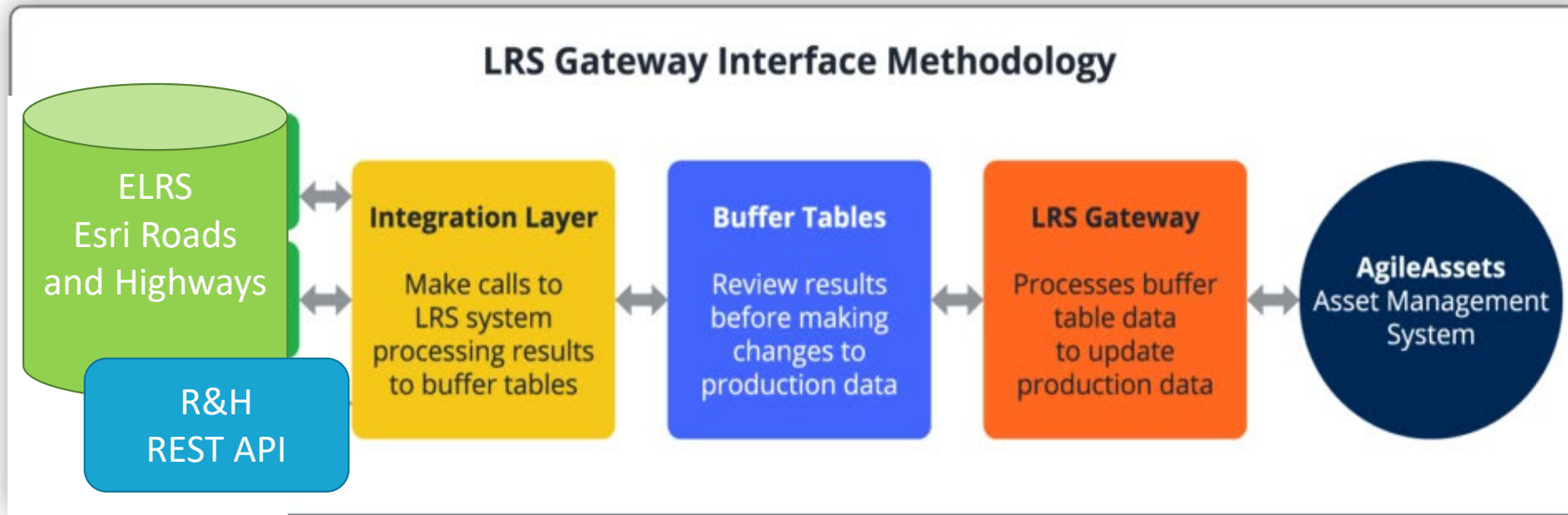
# Pavement Management System

- Pavement Management Database and Analysis
  - » SoR for Pavement Condition Data
- Pavement Performance Analysis
- Work Program Management
- Pavement Score Generation
  - » Decision Tree
  - » PCI at a later date
- Network Optimization



# LRS Gateway – and external ELRS integration

- Updates the EAMP LRS network and external events maintained inside the system
- Provides the common location reference for asset data within the Enterprise Management System



- » Pavement
- » Structures
- » Roadside Assets

# Structures Management System

- Bridge Data Information System (BDIS)

- » Bridge and Culvert Inventory and Inspection
- » Inspection Scheduling
- » Flag Tracking
- » Load Rating
- » Vulnerability Analysis
- » Federal Reporting
- » Daily Extract

- Secondary Structural Asset Inventory and Inspection

- » Retaining Walls
- » Noise Barriers
- » Overhead Sign Structures
- » Historic Bridges

# Structures Management System

Bridges & Culverts ▾ OSS ▾ Secondary Assets ▾ Reports ▾ Utilities ▾ Setup ▾

Structure Manager > Bridges & Culverts > Bridge Inventory > Bridge Inventory - Edit ☆

Save Data Retrieve Data

Enter BIN Here:  Find BIN: 1002622 Feature Carried: 871 87111082008 Feature Crossed: 5 5 11141049 Date Updated: 5/30/19

Select BIN Actions ▾

Insert New Inventory Record Cancel Edits

BIN	Region	County
1002622	01 - Region 01 - ALBANY	1 - County 1 - ALBANY

General Inspection Bridge Safety Summary of Changes Submit Inventory

Identification Structure Details Safety/Utilities Posting **Feature Carried** Feature Crossed Span Inventory SSU Inventory Work History Photographs Border Bridge Proposed Improvement Historic Bridge Data Subsets NBI Items Location

Feature Carried Actions ▾

* Feature Number	* Feature Over Under On	Bridge Feature Type	National Highway System Feature
1	1 - Feature carried on the bridge	11 - Interstate	1 - Bridge does carry a route on the NHS.
Feature Description	Secondary Description	Milepoint	Overlap Route 1
871 87111082008	NORTHBND	20.58	
Overlap Route 2	State Highway Number	Highway Type	Route Description
	57-12	1 - Interstate	1 - Mainline
Federal Aid System	Feature Functional Classification	Toll Type	Strategic Highway (STRAHNET) Designation
02 - Interstate, Urban, Open to Traffic	11 - Urban - Principal Arterial - Interstate	3 - On a Free Road or Non-Highway	1 - The Feature is on an Interstate STRAHNET route.
National Network for Trucks Feature	Number of Lanes	Lane Count on Left Side	Lane Count on Right Side
1 - The Feature is part of the National Network For Trucks	4	0	4
Lanes Vary Code	Minimum Lane Width (ft)	Annual Average Daily Traffic (Vehicle Count)	AADT Year
2 - Number of lanes or tracks does not vary	11.8	59525	2013
Future Annual Average Daily Traffic (Vehicle Count)	Future Year Recorded	Annual Average Daily Truck Traffic Percentage	Maximum Vertical Clearance (ft)
70495	2038	7%	99
Maximum Vertical Clearance (in)	Minimum Vertical Clearance (ft)	Minimum Vertical Clearance (in)	Total Horizontal Clearance (ft)
99	99	99	74.4
Detour Length (mi)	* Predominant Feature	User Update	Date Update
1	<input checked="" type="checkbox"/>	IMPORT_2516	7/10/19

<< 1 >> Row 1 of 1 total rows

# Structures Management System

Bridges & Culverts ▾ OSS ▾ Secondary Assets ▾ Reports ▾ Utilities ▾ Setup ▾

Structure Manager > Bridges & Culverts > Bridge Inventory > Bridge Inventory - Edit ☆

Save Data Retrieve Data

Enter BIN Here:  Find BIN: 1002622 Feature Carried: 871 87111082008 Feature Crossed: 5 5 11141049 Date Updated: 5/30/19

Select BIN Actions ▾

Insert New Inventory Record Cancel Edits

BIN	Region	County
1002622	01 - Region 01 - ALBANY	1 - County 1 - ALBANY

General Inspection Bridge Safety Summary of Changes Submit Inventory

Identification Structure Details Safety/Utilities Posting Feature Carried **Feature Crossed** Span Inventory SSU Inventory Work History Photographs Border Bridge Proposed Improvement Historic Bridge Data Subsets NBI Items Location

Feature Crossed Actions ▾

* Feature Number	2	* Feature Over Under On	2 - Feature passes under the bridge	Bridge Feature Type	09 - State Highway	Feature Description	5 5 11141049
Milepoint	4.9	State Highway Number	176	Highway Type	3 - State	Secondary Description	
Route Description	1 - Mainline	Federal Aid System	04 - Other Federal-Aid Primary, Urban	Feature Functional Classification	14 - Urban - Other Principal Arterial	Toll Type	3 - On a Free Road or Non-Highway
Strategic Highway (STRAHNET) Designation	0 - The Feature is not a STRAHNET route.	National Network for Trucks Feature	1 - The Feature is part of the National Network For Trucks	Number of Lanes	8	Minimum Vertical Clearance of Lift Bridge (ft)	
Maximum Vertical Clearance (ft)	15	Maximum Vertical Clearance (in)	9	Minimum Vertical Clearance (ft)	15	Minimum Vertical Clearance (in)	3
Total Horizontal Clearance (ft)	95	Minimum Horizontal Clearance Left (ft)	6	Minimum Horizontal Clearance Right (ft)	6	Annual Average Daily Traffic (Vehicle Count)	25041
AADT Year	1999	Future Annual Average Daily Traffic (Vehicle Count)	35057	Future Year Recorded	2019	Substructure Protection Type	N - Navigation Control item coded 0, or Feature not a water
Navigation Agency Control	N - Bridge is not over water	Maximum Vertical Clearance Navigation (ft)	0	Minimum Navigation Horizontal Clearance (ft)	0	Stream Bed Material	1 - No Waterway
Bank Protection Type	01 - No Bank Protection	Current Velocity in English Standard	0	Factors Affecting Stream Flow	1 - Not Applicable	Detour Length (mi)	0
Predominant Feature	<input checked="" type="checkbox"/>	User Update	LLFULFORD	Date Update	5/16/18		

<<< 1 >>> Row 1 of 1 total rows

# Maintenance Management System

- Daily Maintenance Work Reporting
  - » Labor
  - » Equipment
  - » Materials
  - » Work Accomplishments)
- Time and Attendance Reporting
- Work Management
  - » Work Requests
  - » Work Orders
  - » Projects
- Signal Crew and Signal Lab Management
- AVL Integration
- Snow and Ice Operations
- Mobile Data Collection
- Secondary Assets

# Maintenance Management System

Table Of Contents

- Layers
  - ReferenceMarkers
  - ADARamps
  - Dropinlets
  - Signals
  - Signs
  - Bridge
  - Latest\_Milepoint\_December
    - <all other values>
    - ROADWAY\_TY, DIRECTION
      - Roads P
      - Roads R DNE
      - Ramps
      - Routes P
      - Routes R
      - Not in RIS
  - Milepoint
  - 2016 Pavement
  - 2017 Pavement
  - BridgeDecks
  - DrainageDitches
  - Guiderails
  - Medians
  - NoiseWalls
  - OnRouteParking
  - RetainingWalls
  - RumbleStrips
  - Shoulders
  - Sidewalks
  - Latest NYS Orthoimagery



Identify

Identify from:

- Signs
  - PEDESTRIAN

Location: 42

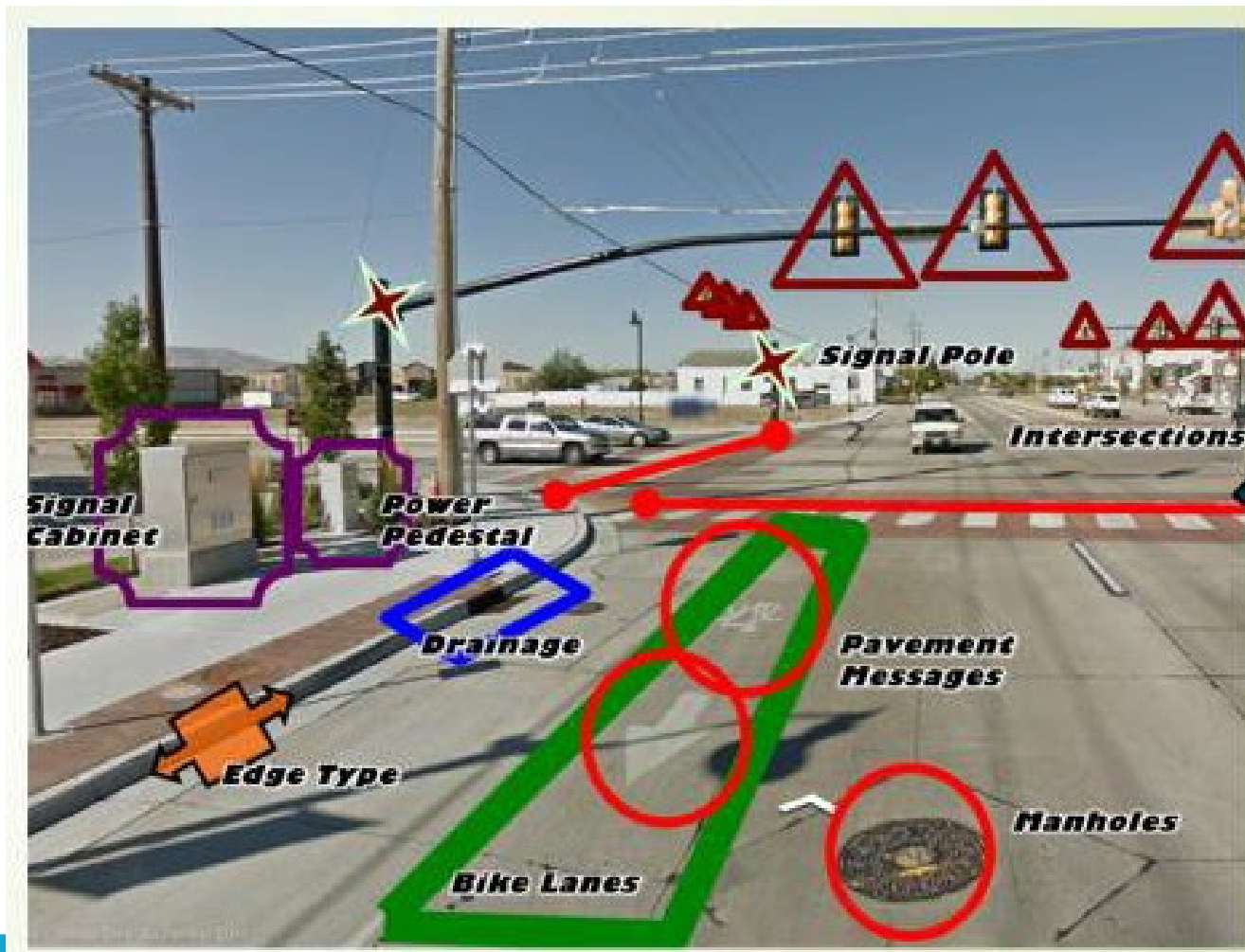
Field	Value
SIGN_WIDTH	9
SIGN_TEXT	
SIGN_SUPPORT_TYPE	Type B
SIGN_HEIGHT	12
SIDE_OF_ROAD	Right
Shape	Point
ROUTE	011
REGION	9
PANEL_HEIGHT	3.437
OFFSET	1.633
OBSTRUCTED_VIEW	No
OBJECTID	34168
NUMBER_OF_POSTS	1
MUTCD_STANDARD_SIZE	<null>
MUTCD_SHAPE	RECTANGLE
MUTCD_NAME	PEDESTRIAN SIGNS
MUTCD_CODE	R.10-3E
MUTCD_CATEGORY	REGULATORY
MP	13.127
LONGITUDE	-75.916003
LATITUDE	42.103401
IVISION_IMAGE	<a href="https://s3.amazonaws.com/ny17-85082/RearLeft/17510YIZV70/00001">https://s3.amazonaws.com/ny17-85082/RearLeft/17510YIZV70/00001</a>
ID_SIGN_ASSEMBLY	39156
ID_SIGN	39156
GISID	100032011
FILENAME	7510YIZV
DIR	P
DATE_	5/1/2017
COUNTY	BROOME
COMMENTS	
COLLECTIONTYPE	I

Identified 1 feature



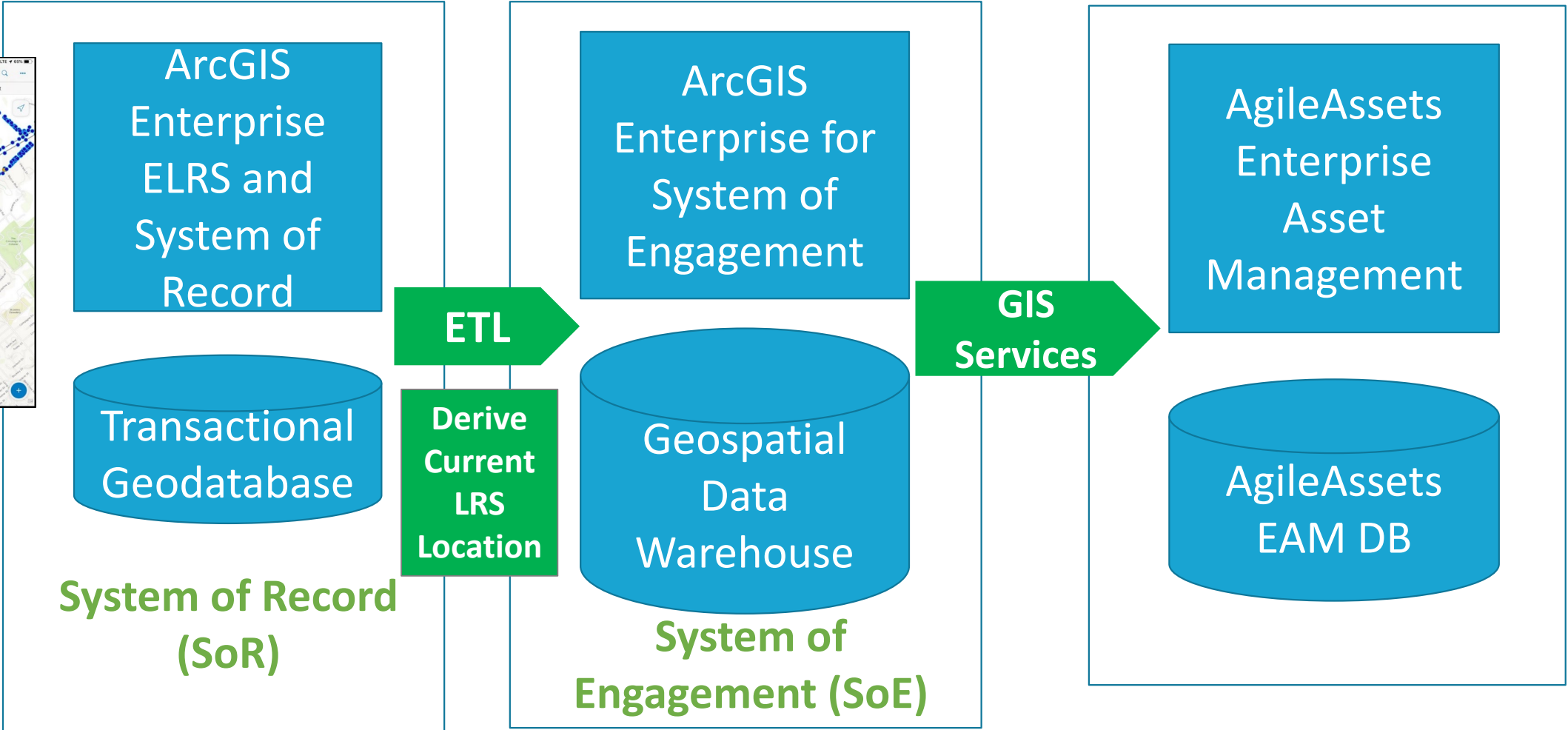
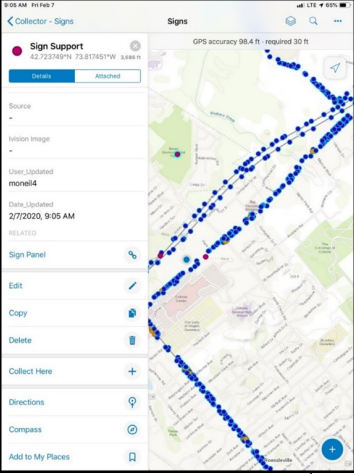
# Secondary (Roadside) Assets

– authoritative location is geometry



- Drainage Systems (linear)
- Drainage Systems (point)
- Facilities
- Guiderails
- Sidewalks / Ramps
- Sign Supports and Panels
- Signals
- Small Culverts
- Audible Roadway Delineators
- Retaining & Noise Walls

# Secondary Asset Workflow



# Crash Location, Evaluation, Analysis and Reporting (CLEAR) ELRS integration

---

- Using an annual report version of the Enterprise Linear Referencing System.
- Crashes are automatically located on the Milepoint LRS network based on the date of the crash.
- The roadway inventory is used to apply roadway and traffic information to each crash to support evaluation, analysis and reporting.
- A subset of the roadway inventory attributes are dissolved to form the network of “facility types” as specified in the FHWA Highway Safety Manual methodology.



# Crash Location, Evaluation, Analysis and Reporting (CLEAR)

**NEW YORK** Department of Transportation  
CLEAR Intersection Inventory Maintenance

Find address or place

Attribute Entry Points Legs R&H Attributes **Area of Influence** Versions Safety

Show AOI  Show Points  Show Legs

Intersection Legs

<input type="checkbox"/> Show All	From Date	Angle	Direction	Approach	MEV	Status
	Feb 1, 2021	9.63909538	N	Y	0	Draft
	Feb 1, 2021	276.16374038	W	Y	0	Draft
	Feb 1, 2021	196.67470039	S	Y	0	Draft

Generate Area of Influence Save Discard Changes

● Draft version, draft created 2/1/21 Exit

Powered by Esri

Milepoint LRS network provides the basis for intersection maintenance

Defines new intersections

Used to define intersection approaches and associate supporting inventory and traffic data.

# CLEAR, MIRE, and the LRS

Integration of the ELRS and CLEAR inside of the RDM will allow for MIRE reporting

MIRE FDEs	Total Miles 113,916		Non Local Paved Roads <sup>1</sup> 36,982				Local Paved Roads <sup>2</sup> 66,902				Unpaved Roads 10,032				
			Completion Percentage - State Maintained <sup>3</sup>		Completion Percentage - Non State Maintained		Completion Percentage - State Maintained <sup>3</sup>		Completion Percentage - Non State Maintained		Completion Percentage - State Maintained <sup>3</sup>		Completion Percentage - Non State Maintained		
	Miles -		% Coverage Rptd	% Coverage Miles	% Actual	% Coverage Rptd	% Coverage Miles	% Actual	% Coverage Rptd	% Coverage Miles	% Actual	% Coverage Rptd	% Coverage Miles	% Actual	
ROADWAY SEGMENT	Data Source	% Coverage Rptd	% Coverage Miles	% Actual	% Coverage Rptd	% Coverage Miles	% Actual	% Coverage Rptd	% Coverage Miles	% Actual	% Coverage Rptd	% Coverage Miles	% Actual		
Segment Identifier (12)	TSM can derive from HDSB, LRS or TSM data?	100						100			100				
Route Number (8)	HDSB	100	15675	100.0	100	795	100.0								
Route/Street Name (9)	HDSB	100	15698	100.0	100	21284	100.0								
Federal Aid (21) /Route Type (22)	TSM can derive from HDSB data	100						N/A				N/A			
Rural/Urban Designation (20)	TSM can derive from HDSB data	100						100			100				
Surface Type (23)	HDSB	100	15698	100.0	99.8	21284	100.0	31.4	693	95.5	99.5	66161.0	100.0		
Begin Point Segment Descriptor (10)	TSM derived from LRS MP?	100						100			100				
End Point Segment Descriptor (11)	TSM derived from LRS MP?	100						100			100				
Segment Length (13)	TSM derived from LRS MP?	100						N/A				N/A			
Direction of Inventory (18)	TSM	100													
Functional Class (19)	HDSB	100	15698	100.0	100	21284	100.0	100	726	100.0	100	66176	100.0		
Median Type (54)	HDSB - HPMS/MIRE attribute differences	99.8	15688	99.9	98.7	21022	98.8								
Access Control (22)	TSM can derive from HDSB data	100						N/A				N/A			
One/Two Way Operations (91)	TSM can derive from HDSB data	100													
Number of Through Lanes (31)	HDSB	100	15698	100.0	100	21284	100.0	100	726	100.0	100	66176	100.0		
Average Annual Daily Traffic (79)	HDSB TSM - Local paved roads AADT TBD	99.1	15610	99.4	84.3	17956	84.4	24.9	128	17.6	16.8	11196	16.9		
AADT Year (80)	HDSB	99.1	15610	99.4	84.3	17956	84.4	N/A - Why not?							
Type of Governmental Ownership (4)	HDSB	100	15698	100.0	100	21284	100.0	100	726	100.0	100	66176	100.0		
INTERSECTION															
Unique Junction Identifier (120)	TSM Derived	100													
Location Identifier for Road 1 Crossing Point (122)	LRS MP?														
Location Identifier for Road 2 Crossing Point (123)	LRS MP?														
Intersection/Junction Geometry (126)	TSM	100													
Intersection/Junction Traffic Control (131)	TSM	100													
AADT for Each Intersecting Road (79)	HDSB TSM - Local paved roads AADT TBD	40.4	?	?	40.4	?	?				N/A				
AADT Year (80)	HDSB TSM - Local paved roads AADT TBD	40.4	?	?	40.4	?	?				N/A				
Unique Approach Identifier (139)	TSM Derived														
INTERCHANGE/RAMP															
Unique Interchange Identifier (178)	TSM Derived	100						CL Miles							
Location Identifier for Roadway at Beginning of Ramp Terminal (197) <sup>4</sup>	LRS MP?	100													
Location Identifier for Roadway at Ending Ramp Terminal (201) <sup>5</sup>	LRS MP?	100													
Ramp Length (187)	HDSB	100	1775	100.0	100	24	100.0								
Roadway Type at Beginning of Ramp Terminal (195) <sup>5</sup>	Can TSM derive from HDSB data? Freeway?	100									N/A				
Roadway Type at End Ramp Terminal (199) <sup>5</sup>	Can TSM derive from HDSB data? Freeway?	100									N/A				
Interchange Type (182)	TSM	100													
Ramp AADT (191)	HDSB	80.4	1640	92.4	59.7	10	41.7								
Year of Ramp AADT (192)	HDSB	80.4	1640	92.4	59.7	10	41.7								
Functional Class (19)	HDSB	100	1775	100.0	100	24	100.0								
Type of Governmental Ownership (4)	HDSB	100	1775	100.0	100	24	100.0								

- HDSB Collects this data - Some data items may be slightly different then the MIRE requirements. Other may need simple translation
- This data should be able to be derived/translated from HDSB, LRS, or TSM data
- TSM to collect/develop this data
- This data is not collected and plans have not been developed to collect/derive it
- Current Values less then 100%



# Summary

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- The Enterprise Linear Referencing System is realizing its vision as a common location reference for the agency...over time, through persistence and coordination
- A cooperative data governance structure is helping guide investments in NYSDOT's mission critical programs and systems
- A System of Engagement Program generates interest and support for investments in better enterprise data management
- Give authoritative data back to end users in a meaningful way





U.S. Department of Transportation  
Federal Highway Administration

# Question & Answer



**Pat Kemble**  
Highway Data  
Section Supervisor



**Kevin Hunt**  
Geographic  
Information  
Systems Manager,  
Transportation



U.S. Department of Transportation  
Federal Highway Administration

# Florida Department of Transportation



**Paul O'Rourke**  
Manager, Spatial Data &  
Analytics



# AGENDA

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- Overview of the FDOT data governance initiative: ROADS
- Description of the current state of the LRS
- Description of the future state of the LRS
- How current and future states relate to the spatial data governance components



## 2014: Agency-Wide Analysis

**IT Strategic Plan** – FDOT undertook an initiative to develop an enterprise-wide Information Technology Strategic Plan.

**IT Assessment** - The Office of Information Technology (OIT) sponsored a critical assessment of the Department's information technology capabilities, personnel and infrastructure.

**Technology Alignment** - The intent of the process was to align the Department's technology assets with its functional business units.

## 2015: ROADS Introduction

**ROADS** - In March 2015, the Reliable, Organized, and Accurate Data Sharing (ROADS) Initiative began.

**Goal** – The goal of the ROADS Initiative is to improve data reliability and simplify data sharing across FDOT to have readily available and accurate data to make informed decisions.



## Person-to-Person Sharing

A heavy reliance on getting data from individual(s) instead of accessing data directly from applications and reporting tools



## Extensive Manual Processing

A prevalence of manual, home grown processes for copying and transferring data (ex. spreadsheets)



## Limited or No Standardization

The extensive amount of effort required to match up information from multiple data sources.



## Lack of Sustainability

A data driven agency (ex. Big Data) poses new challenges.

ROADS: State of the FDOT Data



## Reliability

Ensuring information is secure, accurate, reliable and at the appropriate level to empower you do your job better.

## Accessibility

Providing the ability to access relevant business data more quickly and efficiently by knowing where to find it.

## Timeliness

Reducing the amount of time to locate the data you need and more time to analyze the data.

## Productivity

Effectively sharing information across our organization to enable better and faster decisions.

## Integration

Enabling a greater capability to link data together from different Districts, the FTE, functional areas and systems.

## Sharing

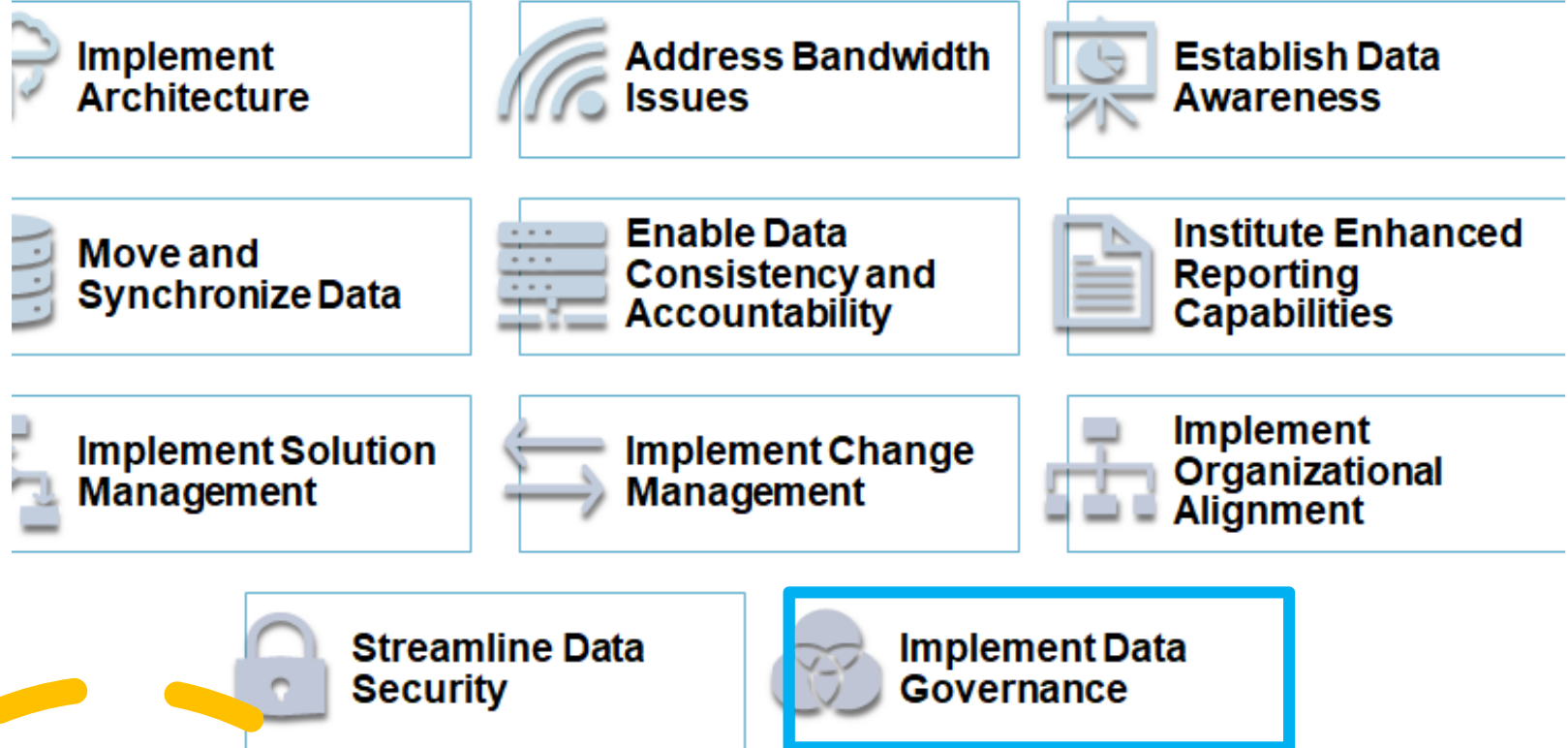
Removing barriers currently in place that prevent the efficient sharing of information.

# ROADS: Benefits to Enterprise Governance





# ROADS: Solutions



# ROADS: Data Governance Components

## FDOT

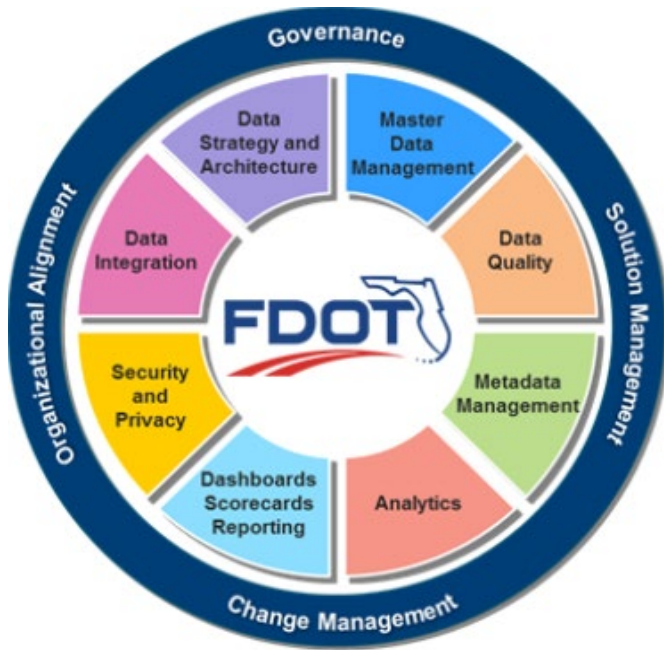
### Component Model

Effective data governance programs have many processes

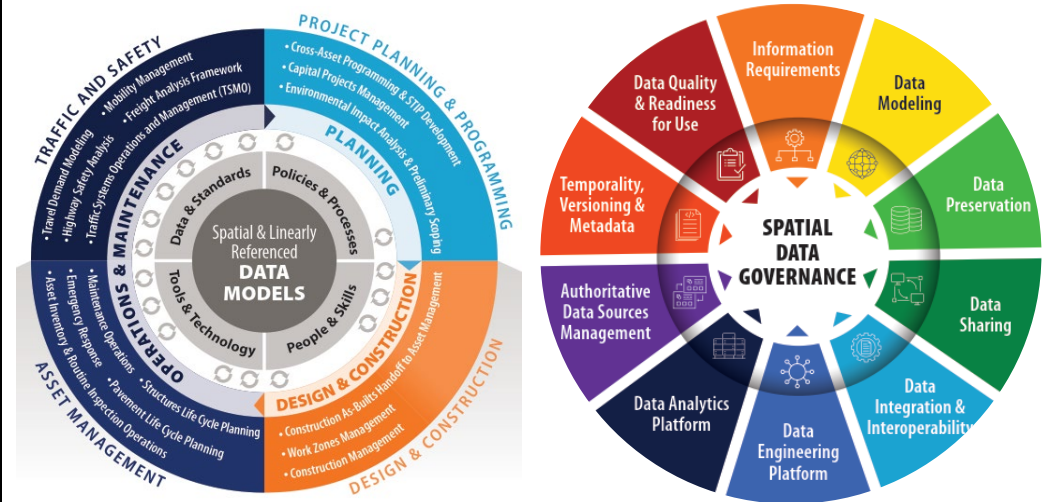
Each component is critical to the overall success of the program

The inner components are related

To achieve success, all components must be addressed



## FHWA



# ROADS: Projects





## ROADS: Projects

**BI/DW**

The Business Intelligence/Data Warehouse provides the tools and capabilities to improve the quality and accessibility of FDOT's data.

**ECTS**

The Enterprise Correspondence Tracking System, powered by GovQA, allows users to submit online requests, report issues and access self-help resources.

**EDMS**

The Electronic Document Management System, powered by eDOCS, provides secure storage, searching, and retrieval of documents and associated metadata.

**IAMG**

The Identity Access Management and Governance will help to ensure consistent access to resources across our diverse technology environments.

**IRAIS**

The Integrated Roadway Asset Identification System will incrementally replace the Roadway Characteristic Inventory, technical architecture and business processes.

**SoE**

The System of Engagement provides a single enterprise view where partners can consume, analyze and contribute to enterprise data.

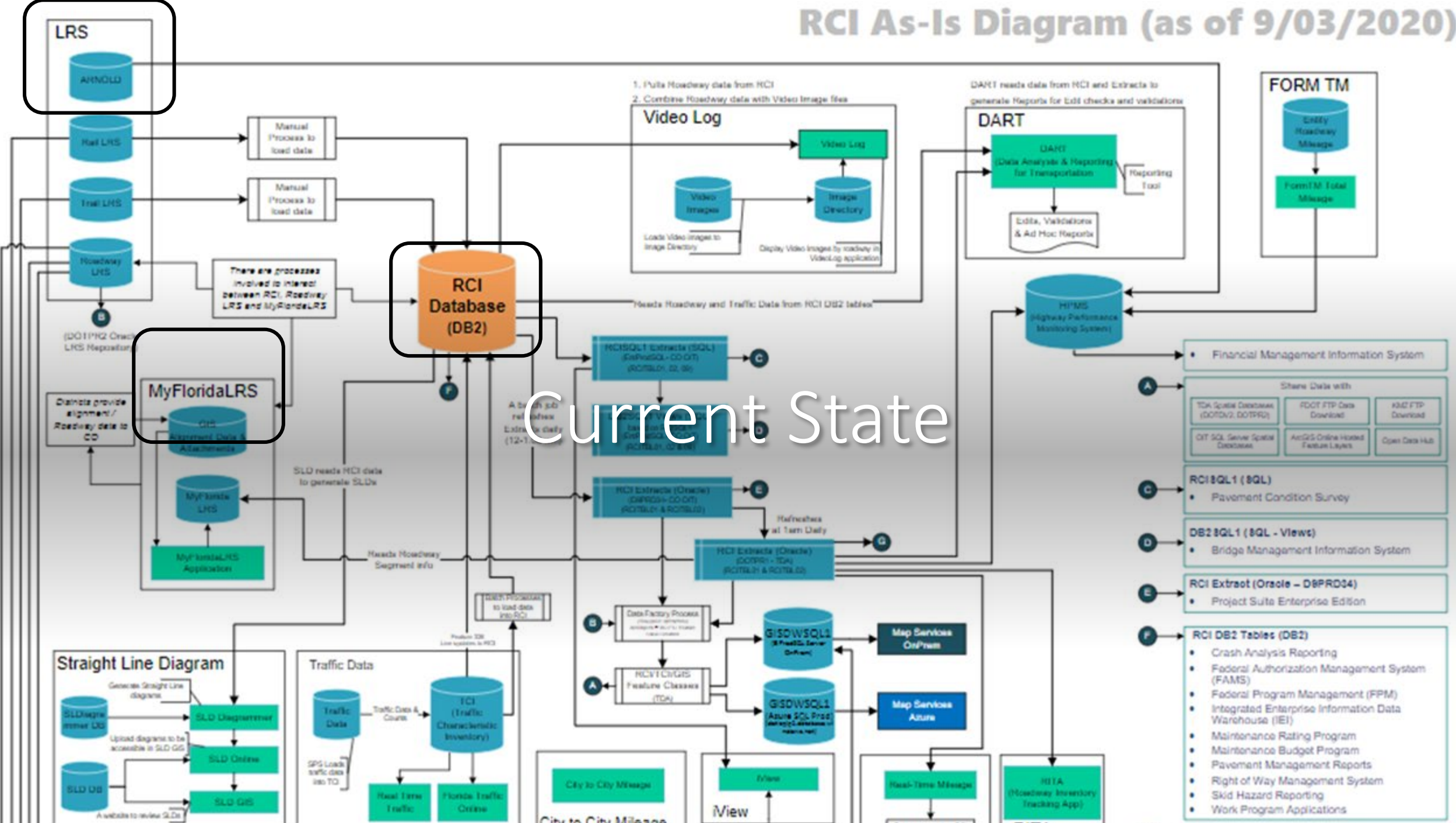
**WCMS**

The Website Content Management System provides authoring, collaboration and administrative tools to create and manage website content.

**WPPI**

The Work Program Integration Initiative is a commercial-off-the-shelf solution to support the FDOT work program.

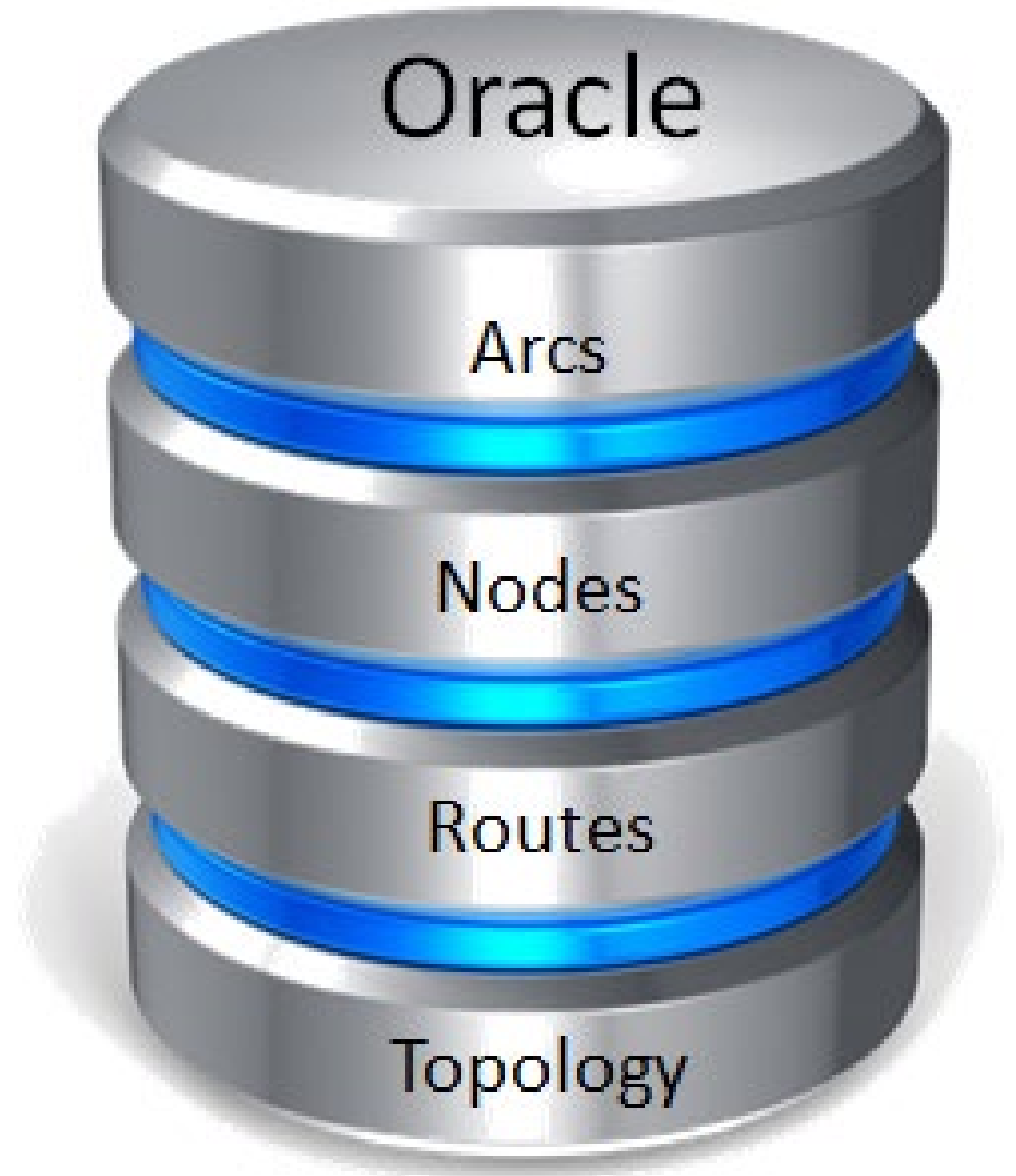
# RCI As-Is Diagram (as of 9/03/2020)



Current State

# Linear Referencing System (LRS)

- Feature dataset in Oracle
- Maintained with custom tools in ArcMap
- Edits coordinated with the FDOT District offices using MyFloridaLRS



DISTRICT: CO SORT BY: Date

Assigned to Me:

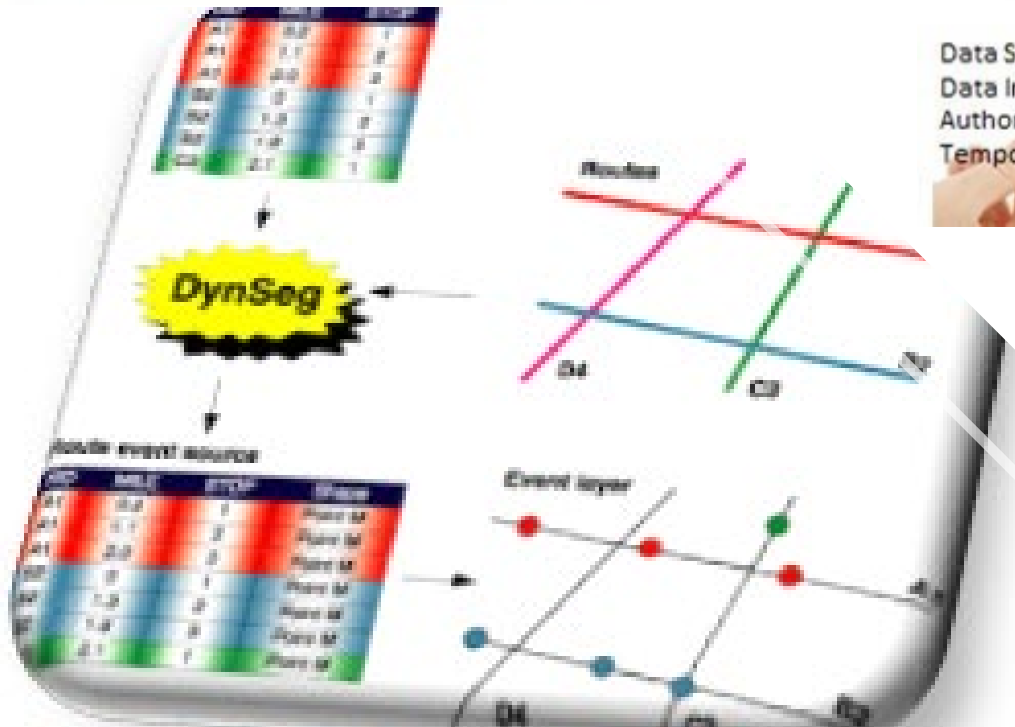
ID	Item	Status	Last Modified	Age
D5	SS-39	Active	10/13/2020	11 days
D1	KP#505	QA/QC	10/12/2020	8 days
D2	D2_013	QA/QC	10/12/2020	14 days
D1	KP#504	Draft	10/2/2020	
D5	SS-40	Draft	10/8/2020	
D1	KP#506	Draft	10/7/2020	

Draft:



# ArcGIS Online

Spatial Data Factory





## Utilizations of the LRS

- **Planning** – Use the LRS in conjunction with future alignments
- **Traffic** – Locate traffic data by roadway ID and milepoint using the LRS
- **ITS** – Uses the HERE network
- **Safety** – Locate crashes by roadway ID and milepoint using the LRS and the HERE network
- **Travel Demand Forecasting and Modeling** – Considering which network(s) to use (LRS, ARNOLD, HERE)



# Additional Use Cases

Local Agency Program  
Programming Freight  
Network Project  
Prioritization

Multimodal Data  
Analytics

Freight Facility  
Analysis

Truck Parking

Quality Assurance

Pavement Condition  
Survey

RCI Inventory

Emergency  
Management

Asset Management

Designations and  
Transfers

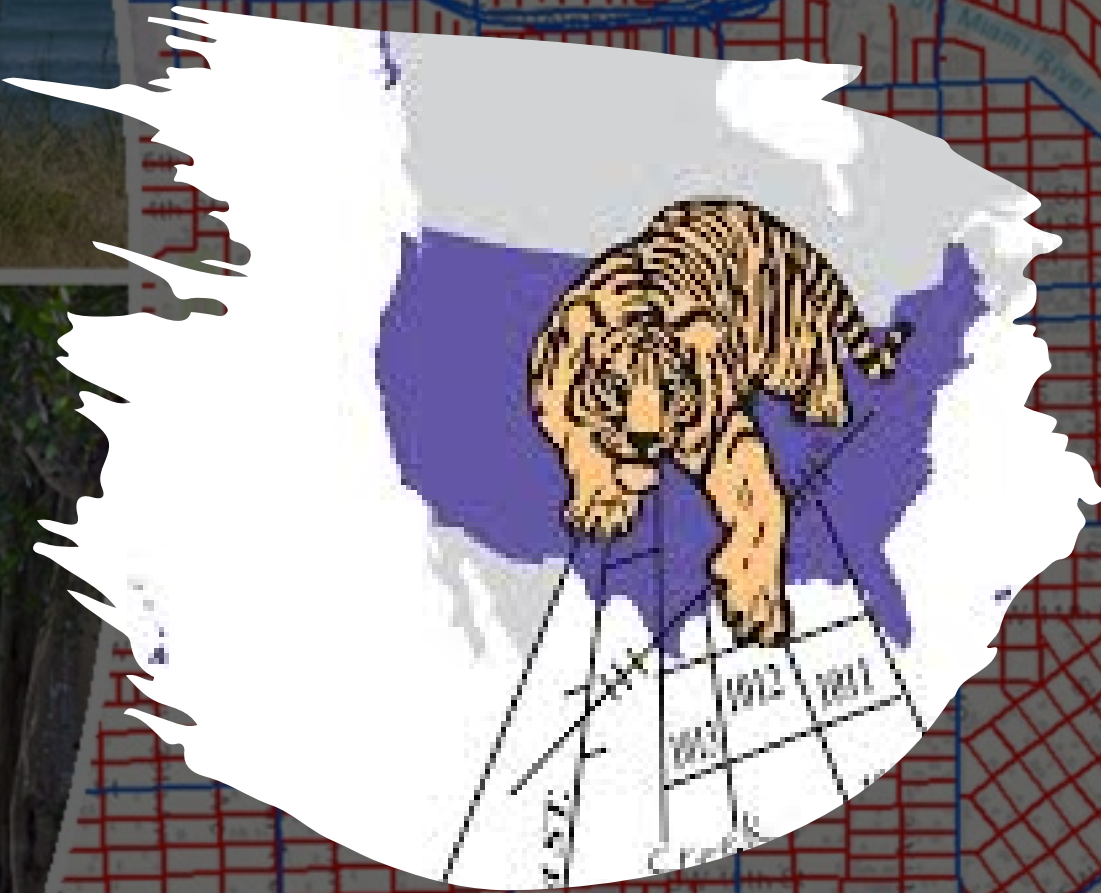
**Key Governance Components**

- Information Requirements
- Data Integration & Interoperability
- Data Engineering Platforms
- Data Analytics Platform



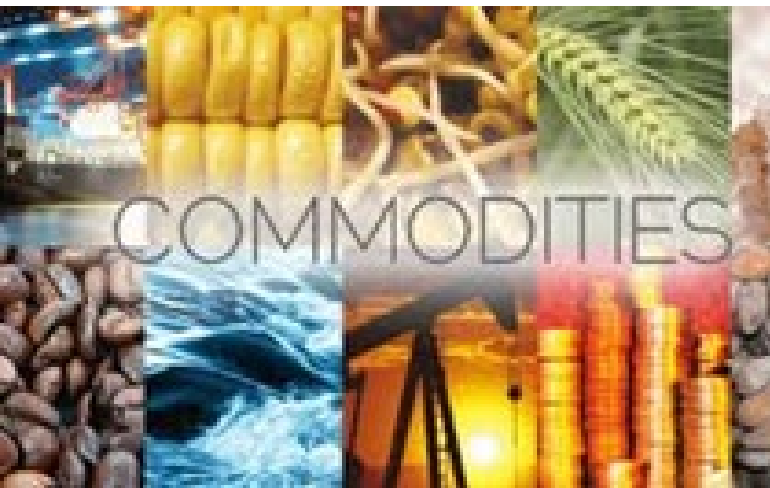
# ARNOLD

Merger of the current LRS with the latest Census TIGER data into one dataset



**Key Governance Components**

- Information Requirements
- Authoritative Data Sources Management
- Data Modeling
- Data Integration & Interoperability

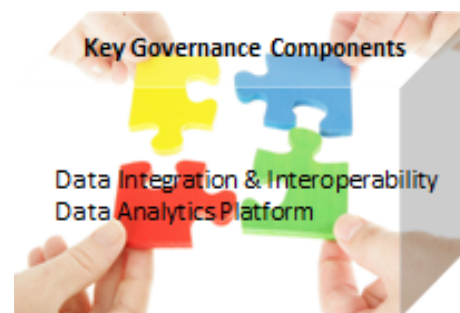


here



# Integration with External Sources

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**INRIX**



IHS Markit®



Bureau of Transportation Statistics

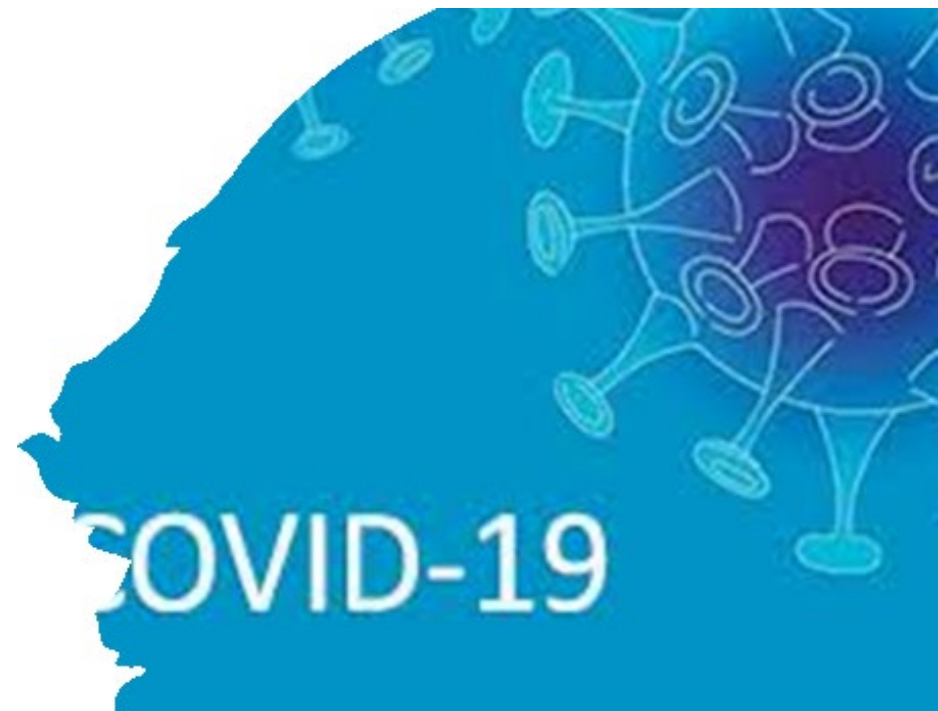




# Analysis of Infrastructure Projects



# Analysis of Current Events



# CORE ALRS

At a minimum, a StatewideRoutes LRS Network is recommended. More LRS Networks may be designed based on DOT need.

Simple feature class  
Calibration\_Point

Geometry: Point  
Contains M values: No  
Contains Z values: Yes

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
From_Date	Date	Yes			0	0	8
To_Date	Date	Yes			0	0	8
Network_ID	Short Integer	Yes					
Route_ID	String	Yes					
Measure	Double	Yes					
SHAPE	Geometry	Yes					

Simple feature class  
Centerline

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
Centerline_ID	Guid	Yes					
SHAPE	Geometry	Yes					
SHAPE_Length	Double	Yes					

Table  
Centerline\_Sequence

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
From_Date	Date	Yes			0	0	8
To_Date	Date	Yes			0	0	8
Network_ID	Short Integer	Yes					
Route_ID	String	Yes					
Centerline_ID	Guid	Yes					

Simple feature class  
Statewide\_Routes

Geometry: Polyline  
Contains M values: Yes  
Contains Z values: Yes

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
From_Date	Date	Yes			0	0	8
To_Date	Date	Yes			0	0	8
Route_ID	String	Yes					255
County	String	Yes					2
Section	String	Yes					6
SHAPE	Geometry	Yes					
SHAPE_Length	Double	Yes			0	0	

Future State

Event  
Federal\_System

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
From_Date	Date	Yes			0	0	8
To_Date	Date	Yes			0	0	8
Event_ID	String	Yes					
Route_ID	String	Yes					
From_Measure	Double	Yes					
To_Measure	Double	Yes					
Federal_Highway_Code	String	Yes		Federal_Highway_Code			
National_Highway_Connector	String	Yes					
Old_Federal_Highway	String	Yes		Old_Federal_Highway			
Specs_Systems	String	Yes		Specs_Systems			
Special_Highway_Network	String	Yes		Yes_No			
Travel_Way	String	Yes		Travel_Way			
Data_Source	String	Yes					
Data_Year	Short Integer	Yes		Data_Year			
Loc_Error	String	Yes					
From_Referent_Method	Short Integer	Yes		dReferentMethod			
From_Referent_Location	String	Yes					
From_Referent_Offset	String	Yes					
To_Referent_Method	Short Integer	Yes		dReferentMethod			
To_Referent_Location	String	Yes					
To_Referent_Offset	String	Yes					



Event  
Managed\_Lane

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
From_Date	Date	Yes			0	0	8
To_Date	Date	Yes			0	0	8
Event_ID	String	Yes					
Route_ID	String	Yes					
From_Measure	Double	Yes					
To_Measure	Double	Yes					
Ownership	String	Yes		Ownership			
Data_Source	String	Yes					
Data_Year	Short Integer	Yes		Data_Year			
Loc_Error	String	Yes					
From_Referent_Method	Short Integer	Yes		dReferentMethod			
From_Referent_Location	String	Yes					
From_Referent_Offset	String	Yes					
To_Referent_Method	Short Integer	Yes		dReferentMethod			
To_Referent_Location	String	Yes					
To_Referent_Offset	String	Yes					

Event  
HMS\_University

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
From_Date	Date	Yes			0	0	8
To_Date	Date	Yes			0	0	8
Event_ID	String	Yes					
Route_ID	String	Yes					
From_Measure	Double	Yes					
To_Measure	Double	Yes					
Functional_Category	String	Yes					
Functional_Class	String	Yes					
Proposed_Functional_Class	String	Yes					
Data_Source	String	Yes					
Data_Year	Short Integer	Yes		Data_Year			
Loc_Error	String	Yes					
From_Referent_Method	Short Integer	Yes		dReferentMethod			
From_Referent_Location	String	Yes					
From_Referent_Offset	String	Yes					
To_Referent_Method	Short Integer	Yes		dReferentMethod			
To_Referent_Location	String	Yes					
To_Referent_Offset	String	Yes					



Event  
Ownership

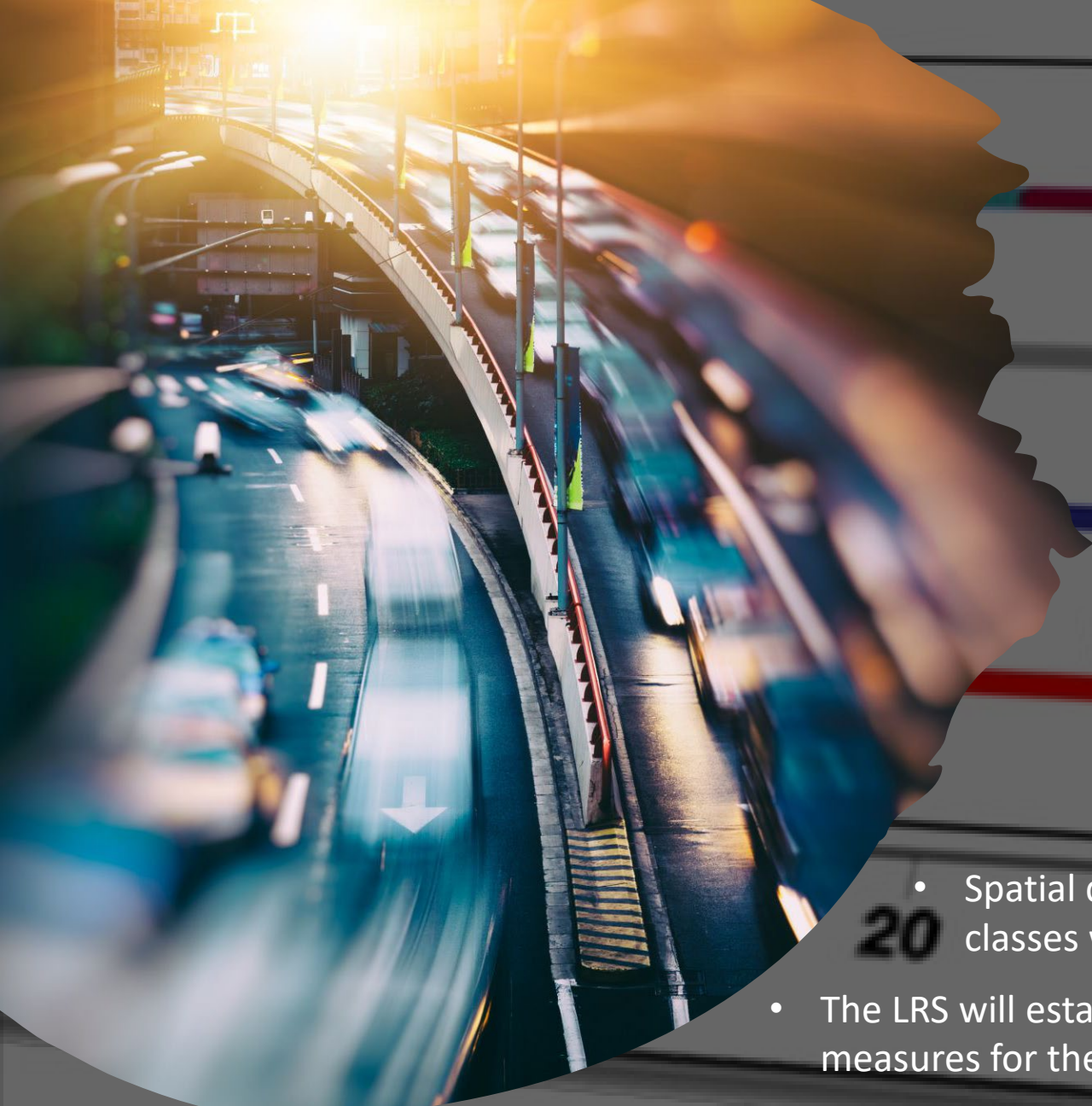
Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
From_Date	Date	Yes			0	0	8
To_Date	Date	Yes			0	0	8
Event_ID	String	Yes					
Route_ID	String	Yes					
From_Measure	Double	Yes					
To_Measure	Double	Yes					
Ownership	String	Yes		Ownership			
Data_Source	String	Yes					
Data_Year	Short Integer	Yes		Data_Year			
Loc_Error	String	Yes					
From_Referent_Method	Short Integer	Yes		dReferentMethod			
From_Referent_Location	String	Yes					
From_Referent_Offset	String	Yes					
To_Referent_Method	Short Integer	Yes		dReferentMethod			
To_Referent_Location	String	Yes					
To_Referent_Offset	String	Yes					

Event  
HOV\_Lane

Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
From_Date	Date	Yes			0	0	8
To_Date	Date	Yes			0	0	8
Event_ID	String	Yes					38

Event  
Roundabout

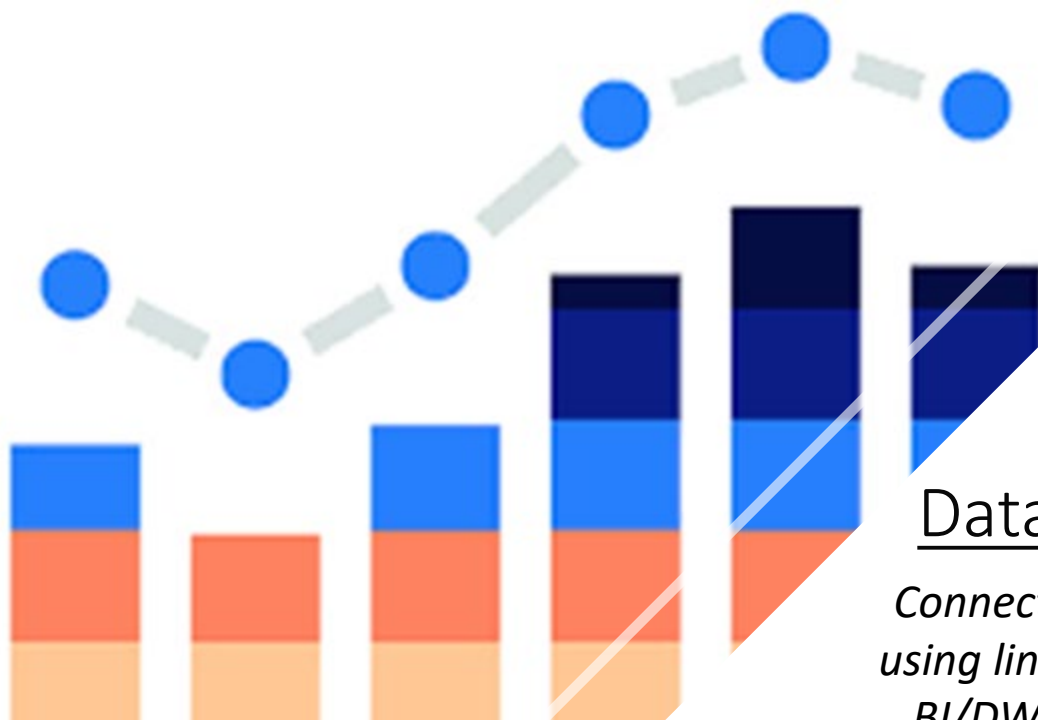
Field name	Data type	Allow nulls	Default value	Domain	Precision	Scale	Length
OBJECTID	Object ID						
From_Date	Date	Yes			0	0	8



# Esri Roads & Highways

- Spatial data will be comprised of feature classes within Roads & Highways.
- The LRS will establish the milepoint measures for the events.
- ARNOLD implementation within Roads & Highways is possible in the future.





## Data Warehouse

*Connecting business areas using linear referencing and BI/DW e.g., construction plans.*



*Event data may be stored in the Department's new data warehouse.*

**Key Governance Components**

- Information Requirements
- Data Modeling
- Data Preservation
- Data Sharing
- Authoritative Data Sources Management
- Data Integration & Interoperability
- Data Engineering Platform
- Temporality, Versioning & Metadata
- Data Quality & Readiness for Use

# Enterprise Data Management Handbook



Part of an agency-wide initiative to provide guidance for the data life cycle. Due for publication in 2021.



# Conclusion

- There is a *lot* going on at FDOT! ROADS, BI/DW, IRAIS.
- The ROADS initiative continues to promote data governance throughout the Department. We have a *great* foundation upon which to build.
- The FDOT LRS is going to change; this would be the time to ensure spatial data governance in support of the ROADS initiative.
- The pooled fund study can help ensure that FDOT is implementing the necessary components for spatial governance while providing insight into Roads and Highways.





U.S. Department of Transportation  
Federal Highway Administration

# Question & Answer



**Paul O'Rourke**  
Manager, Spatial Data &  
Analytics





U.S. Department of Transportation  
**Federal Highway Administration**

# Next Steps



**Joseph Hausman**  
Federal Highway Administration  
Office of Planning

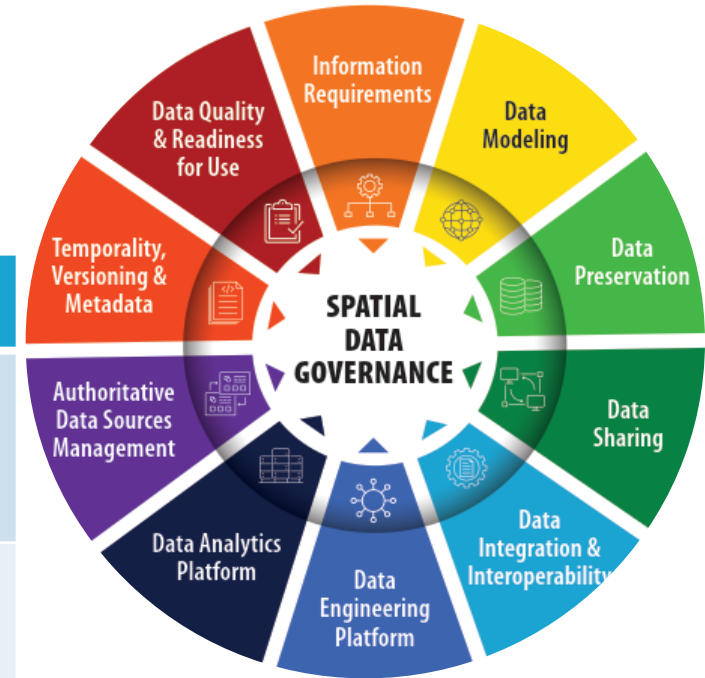


**Abhishek Bhargava**  
Data Scientist  
WSP USA



**Lisa Saldin**  
Public Involvement  
Coordinator  
WSP USA

# Next Steps: AEGIST Events & Goals in 2021



**AEGIST is a Multi-Year FHWA & States led PFS Project focused on Enhancement of Spatial Data Management and Governance Practices at Transportation Agencies**

	Feb	Mar	Apr	July	Aug	Sep	Nov	Dec
<b>Spatial Data Governance &amp; Management</b>	Webinar 1 <i>(Today)</i>				Webinar 2			PFS States Peer Exchange
Spatial Data Modeling		PFS States QTR Meet	GIS-T 2021 Workshop <i>(Aligned with HPMS, BIM Governance workshops)</i>					
Spatial Data Integration & Engineering				PFS States QTR Meet			PFS States QTR Meet	
Spatial Data Analytics			GIS-T Session Present			PFS States QTR Meet		

# AEGIST Implementation Activities at PFS States

	CA	CT	GA	ID	TN	PA	OH	KS	AZ	NC
<b>Spatial Data Governance, Management</b> <i>Strategy, Roadmap, Metadata, Data Portfolio &amp; Library, Workshops</i>										
<b>Spatial Data Modeling</b>										
Roads Data Modeling & Business Rules <i>DOT, Federal, Local: HPMS, ARNOLD, NG911</i>										
Intersections Data Model <i>HPMS 9.0, MIRE, GDF, IFC Roads Based</i>										
Data Quality Automation <i>HPMS, MIRE &amp; Assets</i>										
<b>Spatial Data Integration and Engineering</b>										
Roads Data Integration, Authoritative Data Mgmt. <i>DOT, Federal, Local Roads Data Sharing &amp; Federation</i>										
Road Network and Events Data Publication: Pilots <i>Data Model for Data Warehouses. Data Models &amp; Engineering in Data Hubs</i>										
<b>Spatial Data Analytics</b>										
Spatial Statistics, Econometrics, AI/ML, Optimization <i>Descriptive, Diagnostics, Predictive and Prescriptive Analytics; Image Analysis</i>										