

Chasing The MIRE Unicorn



d.



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Art: Ramona L. Graham

Overview

- Background
- Why Cross-sections?
- Goals 1.0
- <record screeching> GIS-T 2018
- Goals 1.1

GIS in Transportation Article

- There are a ton of MIRE elements
- No data model
- Automation is difficult
- Two things are needed...



July 2018

A Newsletter from the Federal Highway Administration (FHWA)

www.gis.fhwa.dot.gov



DDOT Using Centerlines for Safety and Beyond

Article by James Graham, GIS and Applications Manager at District Department of Transportation

Introduction

At the 2017 FHWA Highway Information Seminar (HIS), representatives from several states gathered to discuss a great variety of topics: roadway GIS inventory, spatial analysis, traffic data modeling, Big Data, pavement data, and a multitude of other topics. One of these discussions involved the future of data collection and how states might implement new approaches to make the process more efficient. The heart of the conversation was that programs should strive to 'make things once and use them a bunch,' and that GIS data should fulfill a multiplicity of uses while reducing 'one-off,' static data products.¹

The Model Inventory of Roadway Elements (MIRE) Report is a 'comprehensive listing of data elements needed for safety analysis.'² Looking beyond its rather staggering size (there are over 200 individual data items), the District Department of Transportation (DDOT) sees MIRE as an opportunity to take a look at our systems of record (namely, the linear referencing system, or LRS) and reflect how we can improve them to 'make things once, then use them a bunch.'

This article suggests two primary approaches to aid in the automated extraction of a large number of MIRE data elements (81, estimated), however the benefits go beyond MIRE. DDOT contends that the LRS centerline should be regarded as more than simply 'where the centerlines come from.' Taking a new look at what's possible with LRS can yield additional data in support of MIRE and potentially much more.

Background: FHWA's MIRE Report

The 'MIRE Report' ('MIRE 1.0') lists individual safety data elements and describes the data collection requirements for those elements.

The report states unequivocally: simply having high quality crash data is not enough. Detailed GIS roadway and traffic data are essential elements, enabling a more comprehensive safety data analysis and providing more context and understanding to the

Upcoming Events

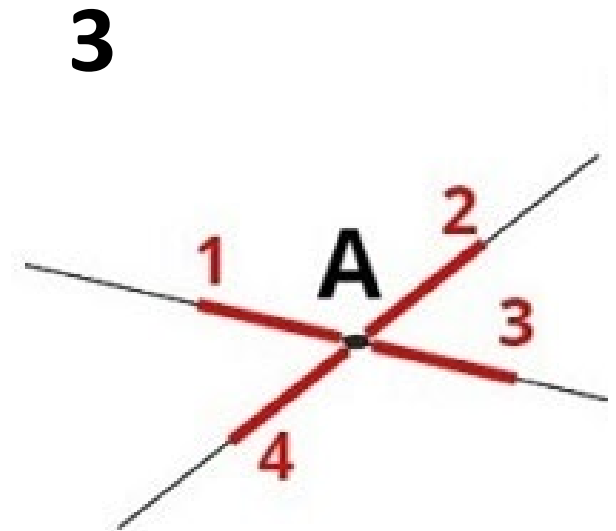
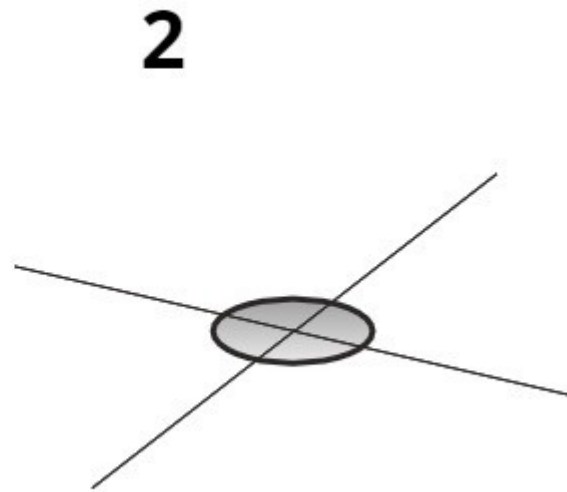
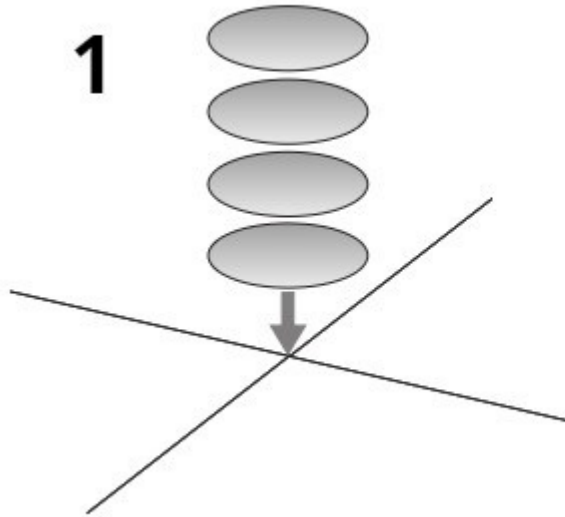
- MidAmerica GIS Consortium (MAGIC) announced its 2018 symposium marking the network's 30th anniversary. April 23-26, Omaha, Nebraska

For more events, see

www.gis.fhwa.dot.gov/events.asp.

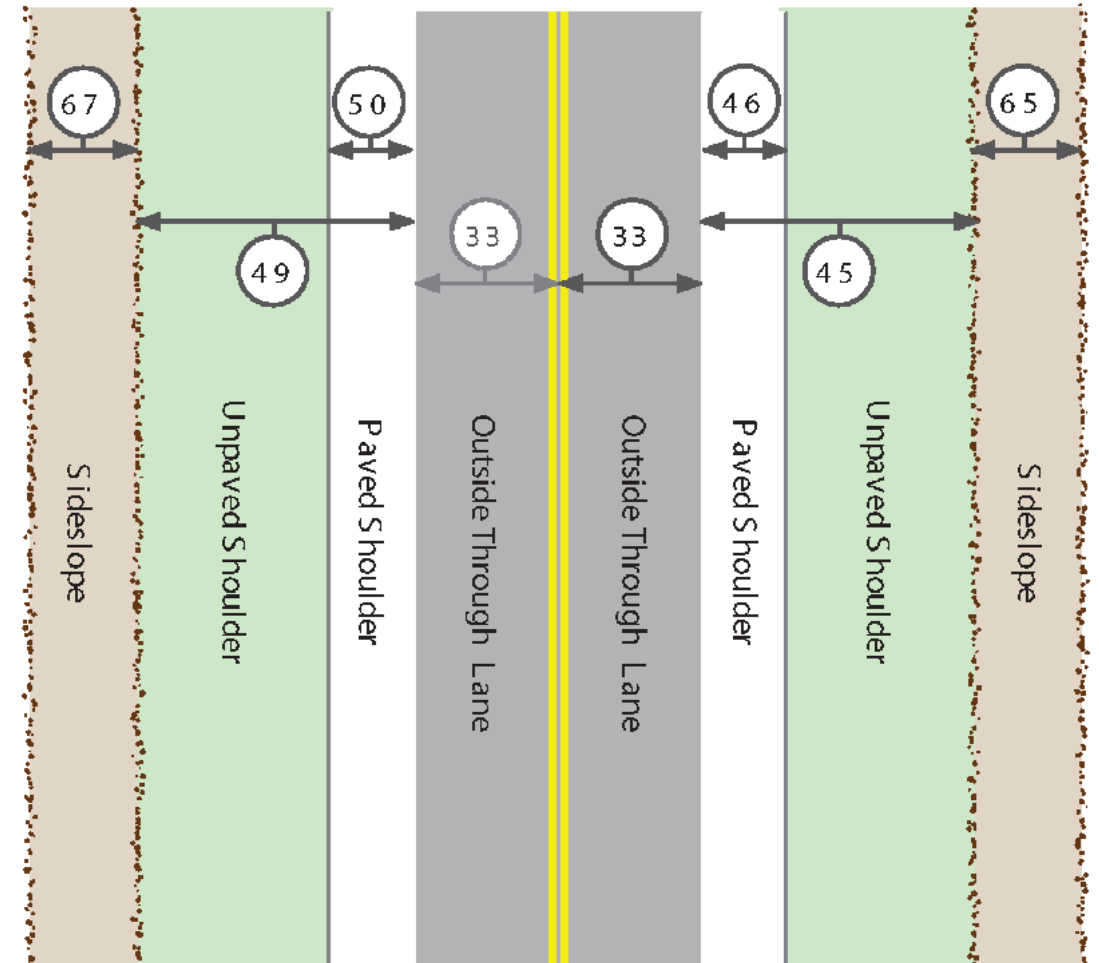
https://www.gis.fhwa.dot.gov/documents/Newsletter_July2018.asp#article

Intersection Model



MIRE Cross-sections

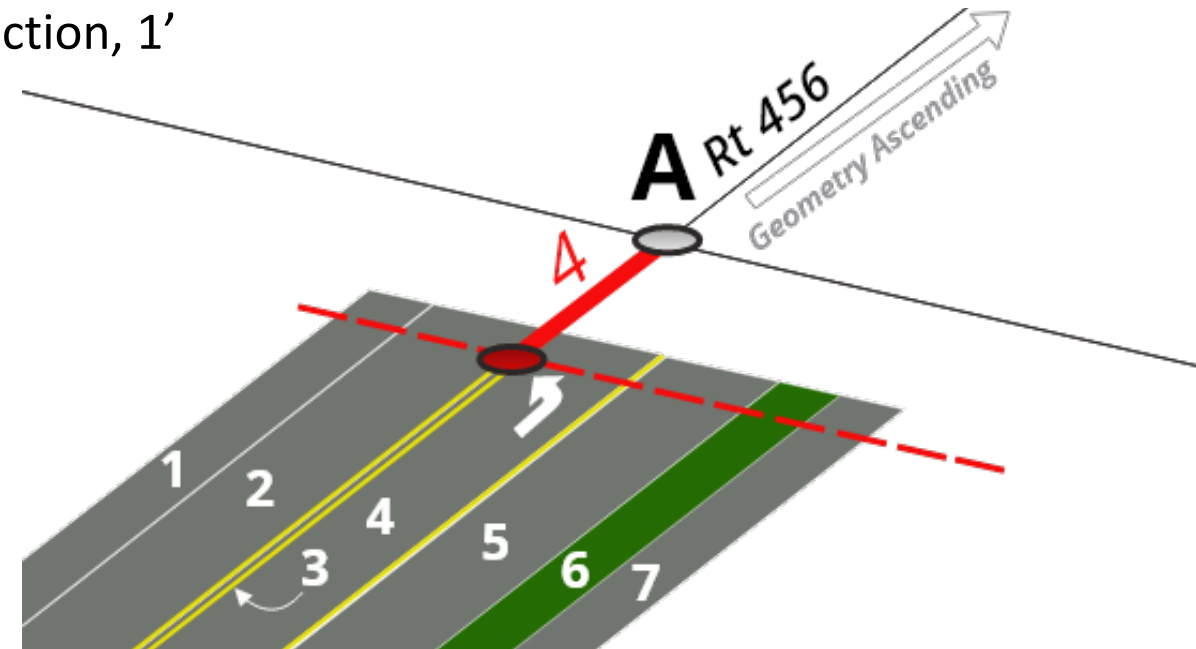
- 33 Outside Through Lane Width
- 45 Right Shoulder Total Width
- 46 Right Paved Shoulder Width
- 49 Left Shoulder Total Width
- 50 Left Paved Shoulder Width
- 65 Right Sideslope Width
- 67 Left Sideslope Width



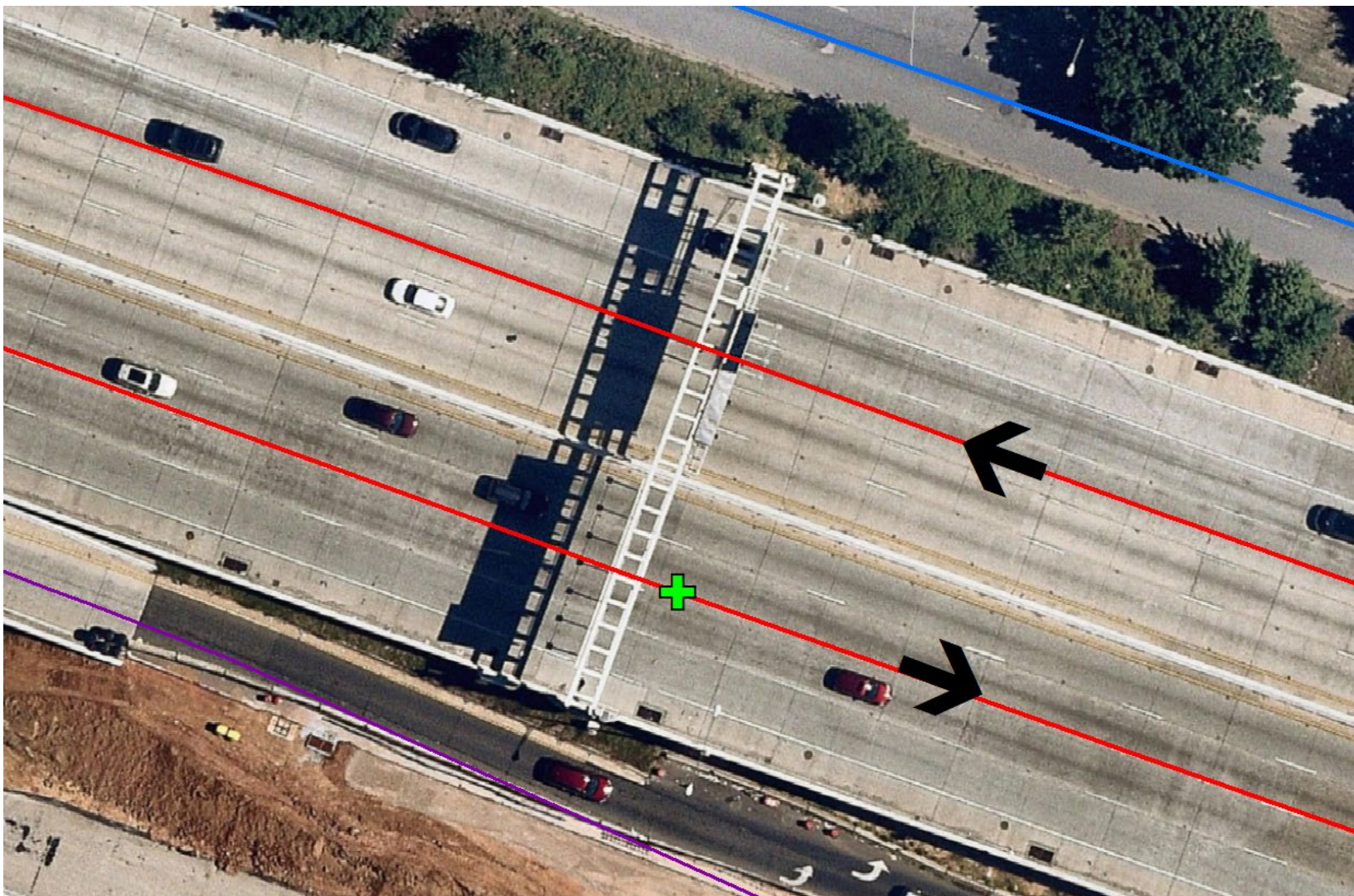
Cross-section Data in our LRS

- **Roadway Section Events:**

- **Section 1:** parking lane, inbound, 8'
- **Section 2:** through lane, inbound, 11'
- **Section 3:** centerline (double-yellow), no direction, 1'
- **Section 4:** left turn lane, outbound, 10'
- **Section 5:** through lane, outbound, 11'
- **Section 6:** bike lane, outbound, 5'
- **Section 7:** parking lane, outbound, 8'



Send a point to the DDOT LRS SOE...



Custom Server Object Extension (SOE)

- Modified for cross-section events

About DDOT Cross Section Data:

<https://wiki.ddot.dc.gov/display/GIS/Cross-section+Data>

Access Web Service:

<https://rh.dcgis.dc.gov/dcgis/rest/services/DDOT/RoadwayBlocks/MapServer/exts/DdotLrsExtensions/getPointOnRoute>

The screenshot shows a web browser window with the ArcGIS REST Services Directory. The breadcrumb navigation is: Home > services > DDOT > RoadwayBlocks (MapServer) > DdotLrsExtensions > getPointOnRoute. The main heading is "getPointOnRoute(DDOT/RoadwayBlocks)". Below this is a form with the following fields and values:

Field	Value
x	-77.0133807
y	38.8770546
inSR	4326
outSR	4326
routeType	Street
includeSectionEvents	True
returnNearestMatchOnly	True
searchRadius	50
Format (f)	html

At the bottom, there are two buttons: "getPointOnRoute (GET)" and "getPointOnRoute (POST)".


```
"roadwayAttributes": {  
  "crossSections": {  
    "totalSectionWidth": 43,  
    "section1": {  
      "sectionType": "Lane: Through",  
      "sectionWidth": 11,  
      "sectionDirection": "Outbound (with centerline geometry)",  
      "sectionPavementType": "Concrete"},  
    
```

When the smoke cleared...

- **29 out 38 FDE**

Roadway Segment	Intersection
<input checked="" type="checkbox"/> RHDD-70 - MIRE 012: Segment Identifier DONE	<input checked="" type="checkbox"/> RHDD-122 - MIRE 110: Unique Junction Identifier DONE
<input checked="" type="checkbox"/> RHDD-66 - MIRE 008: Route Number DONE	<input checked="" type="checkbox"/> RHDD-124 - MIRE 112: Location Identifier for Road 1 Crossing Point DONE
<input checked="" type="checkbox"/> RHDD-67 - MIRE 009: Route/Street Name DONE	<input checked="" type="checkbox"/> RHDD-125 - MIRE 113: Location Identifier for Road 2 Crossing Point DONE
<input checked="" type="checkbox"/> RHDD-76 - MIRE 021 & 022: Federal Aid/Route Type DONE	<input checked="" type="checkbox"/> RHDD-23 - MIRE 116: Intersection/Junction Geometry DONE
<input checked="" type="checkbox"/> RHDD-75 - MIRE 020: Rural/Urban Designation DONE	<input checked="" type="checkbox"/> RHDD-130 - MIRE 121: Intersection/Junction Traffic Control TO DO
<input checked="" type="checkbox"/> RHDD-78 - MIRE 024: Surface Type DONE	<input checked="" type="checkbox"/> RHDD-103 - MIRE 081: Annual Average Daily Traffic (AADT) DONE
<input checked="" type="checkbox"/> RHDD-68 - MIRE 010: Begin Point Segment Descriptor DONE	<input checked="" type="checkbox"/> RHDD-257 - MIRE 129: Unique Approach Identifier DONE
<input checked="" type="checkbox"/> RHDD-69 - MIRE 011: End Point Segment Descriptor DONE	
<input checked="" type="checkbox"/> RHDD-71 - MIRE 013: Segment Length DONE	Interchange/Ramp
<input checked="" type="checkbox"/> RHDD-73 - MIRE 018: Direction of Inventory DONE	<input checked="" type="checkbox"/> RHDD-53 - MIRE 168: Unique Interchange Identifier TO DO
<input checked="" type="checkbox"/> RHDD-74 - MIRE 019: Functional Class DONE	<input checked="" type="checkbox"/> RHDD-140 - MIRE 187: Location Identifier for Roadway at Beginning Ramp Terminal TO DO
<input checked="" type="checkbox"/> RHDD-91 - MIRE 055: Median Type DONE	<input checked="" type="checkbox"/> RHDD-142 - MIRE 191: Location Identifier for Roadway at Ending Ramp Terminal TO DO
<input checked="" type="checkbox"/> RHDD-77 - MIRE 023: Access Control DONE	<input checked="" type="checkbox"/> RHDD-45 - MIRE 177: Ramp Length DONE
<input checked="" type="checkbox"/> RHDD-105 - MIRE 093: One/Two-Way Operations DONE	<input checked="" type="checkbox"/> RHDD-48 - MIRE 185: Roadway Type at Beginning Ramp Terminal TO DO
<input checked="" type="checkbox"/> RHDD-79 - MIRE 032: Number of Through Lanes DONE	<input checked="" type="checkbox"/> RHDD-49 - MIRE 189: Roadway Type at Ending Ramp Terminal TO DO
<input checked="" type="checkbox"/> RHDD-103 - MIRE 081: Annual Average Daily Traffic (AADT) DONE	<input checked="" type="checkbox"/> RHDD-250 - MIRE 181: Ramp AADT TO DO
<input checked="" type="checkbox"/> RHDD-104 - MIRE 082: AADT Year DONE	<input checked="" type="checkbox"/> RHDD-251 - MIRE 182: Year of Ramp AADT TO DO
<input checked="" type="checkbox"/> RHDD-65 - MIRE 004: Type of Governmental Ownership DONE	<input checked="" type="checkbox"/> RHDD-58 - MIRE 172: Interchange Type TO DO

GIS-T 2018

Workshop presentation by Ron Brush (New Century Systems) on NoSQL.

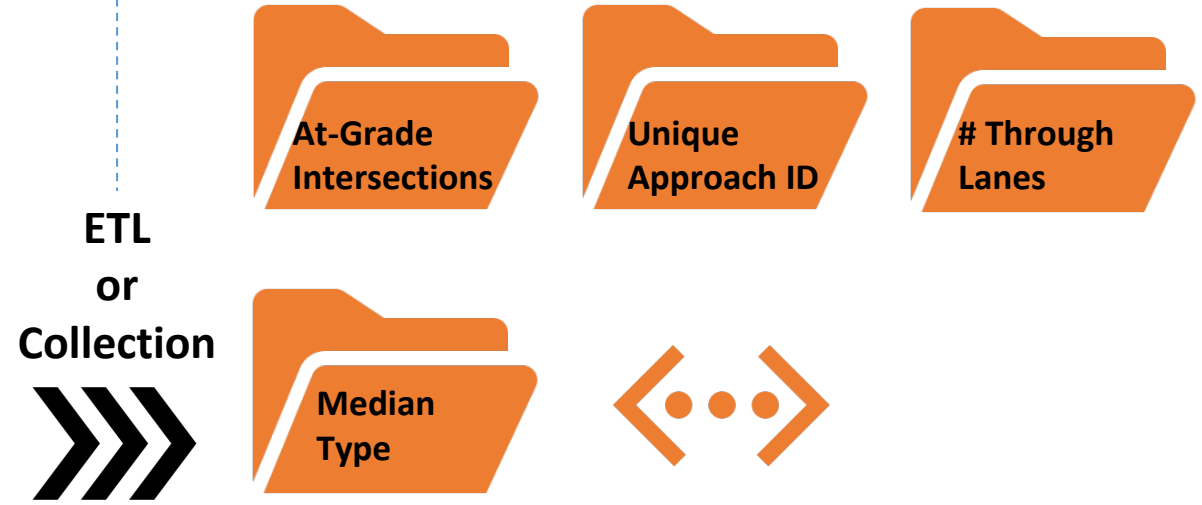
Made us **completely** rethink
how we are approaching MIRE



Traditional LRS



MIRE Output



Question from a DDOT Planner:

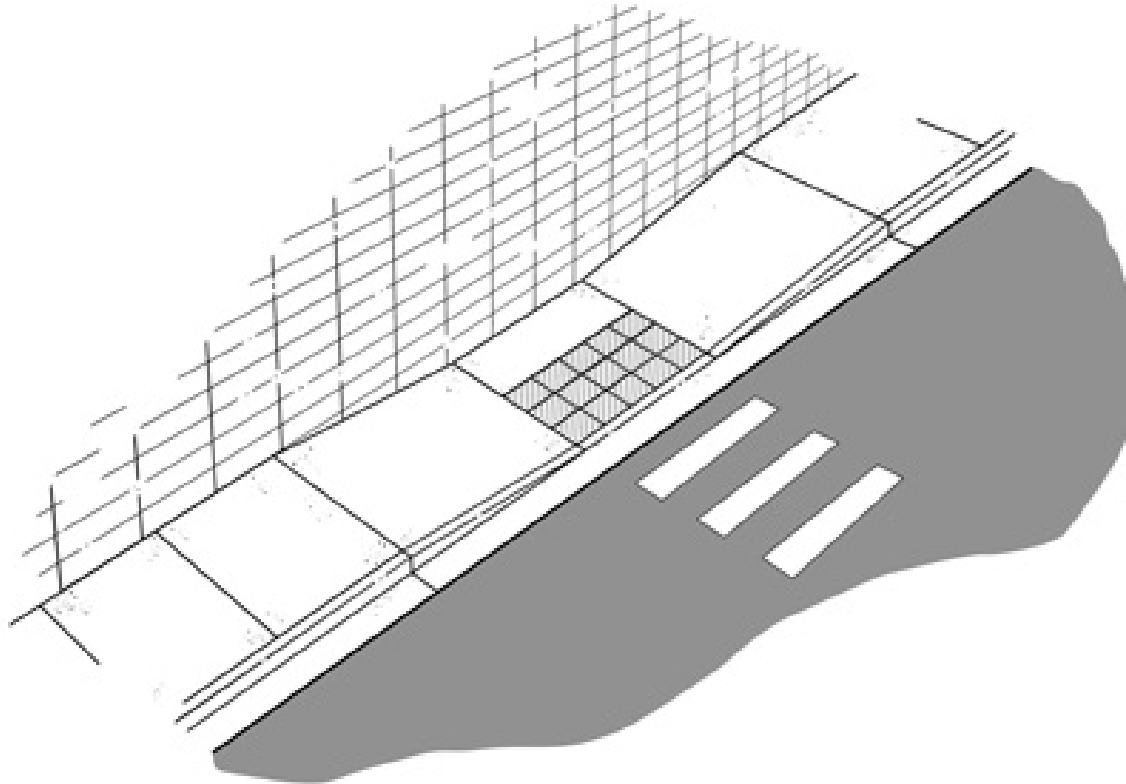
“I would like to look at every street in the District to see which ones we could install bike infrastructure on without taking away any parking. ”

-- Will Handsfield, February 28, 2019

Query for segments that have all of the following:

1. No Existing Bike Lanes **AND**
2. One way streets with parking on both sides **AND**
3. Minimum total width of 29' **AND**
4. Maximum width of 34'

ADA



Intersection Checklist:

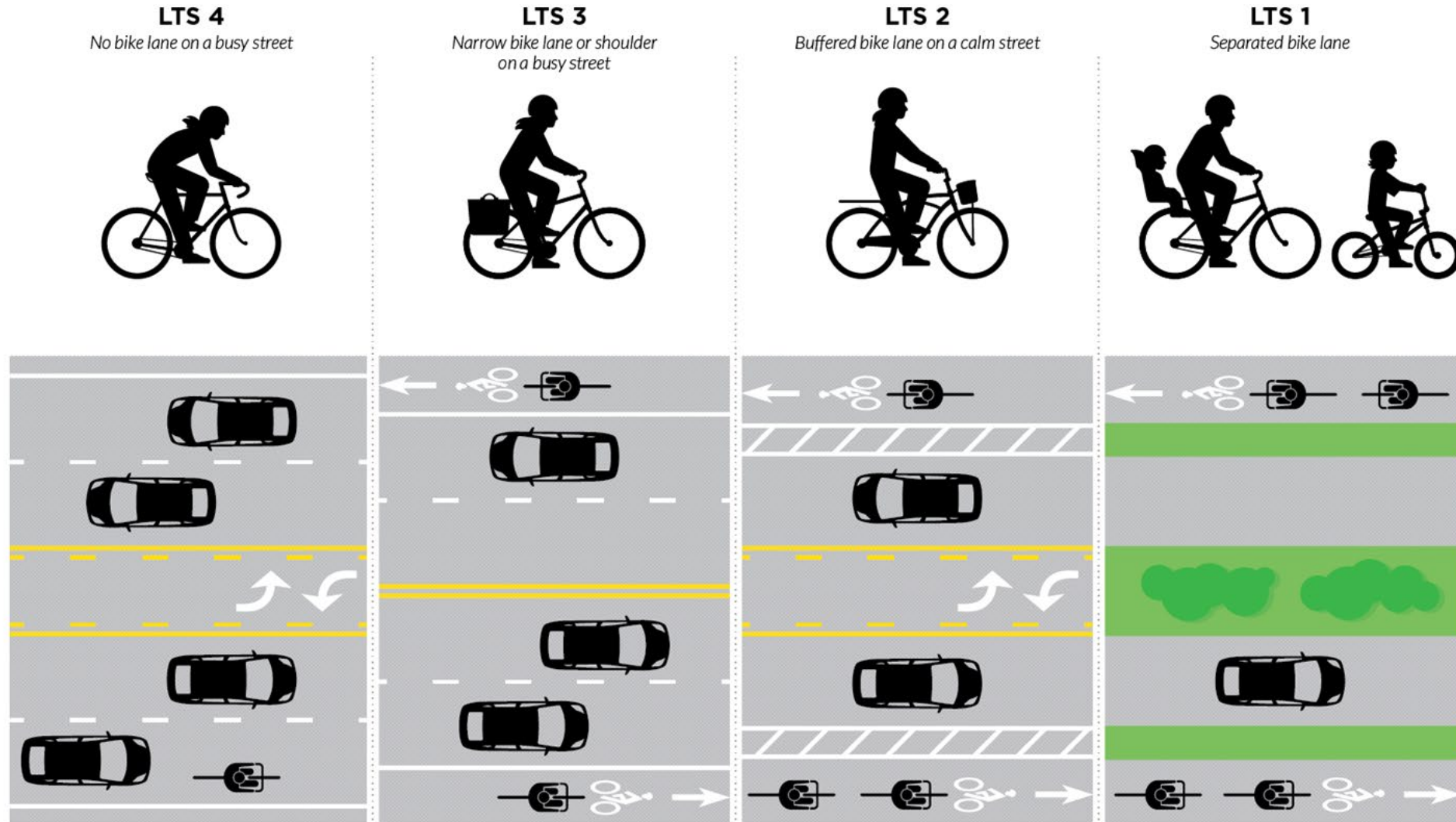
Name of primary street:	
Name of cross street:	
Total number of lanes on primary street:	
Total distance across primary street (measure with rolatape):	
Total number of lanes on cross street:	
Total distance across street (measure with rolatape):	
Are there any left turn only lanes?	yes---no
Are there any right turn only lanes?	yes---no
Is a right turn on red permitted?	yes---no
Is there a right turn island?	yes---no
Is parking permitted on the primary street?	yes---no
Is parking permitted on the cross street?	yes---no
How many corners have curb extensions (bulbouts)?	
Is there a median?	yes---no
If so, is it designed as a pedestrian refuge?	yes---no
Is it identifiable to people with vision impairments?	yes---no
Is it accessible to people with mobility impairments?	yes---no
Does the intersection have four way stop signs?	yes---no
Does the intersection have two way stop signs?	yes---no
Is the intersection signalized?	yes---no
Is there a pedestrian actuated control signal?	yes---no
Location of control:	
Information emitted: audible vibrotactile infrared	
Is there a high contrast between the button and post color?	yes---no
Is there a tactile arrow indicating the street crossing direction?	yes---no
Height of control:	
Dimension of pedestrian button?	
Is 5 lbs of force or less required to operate the signal?	yes---no
Is the crosswalk marked?	yes---no
If so, what are the conditions of the markings?	
Duration of WALK interval:	
Comments:	

Figure 3. FHWA Accessibility Intersection Checklist (18).

LEVEL OF TRAFFIC STRESS



INCREASING LEVEL OF COMFORT, SAFETY, AND INTEREST IN BICYCLING FOR TRANSPORTATION



Modeling Many-to-Many Relationships

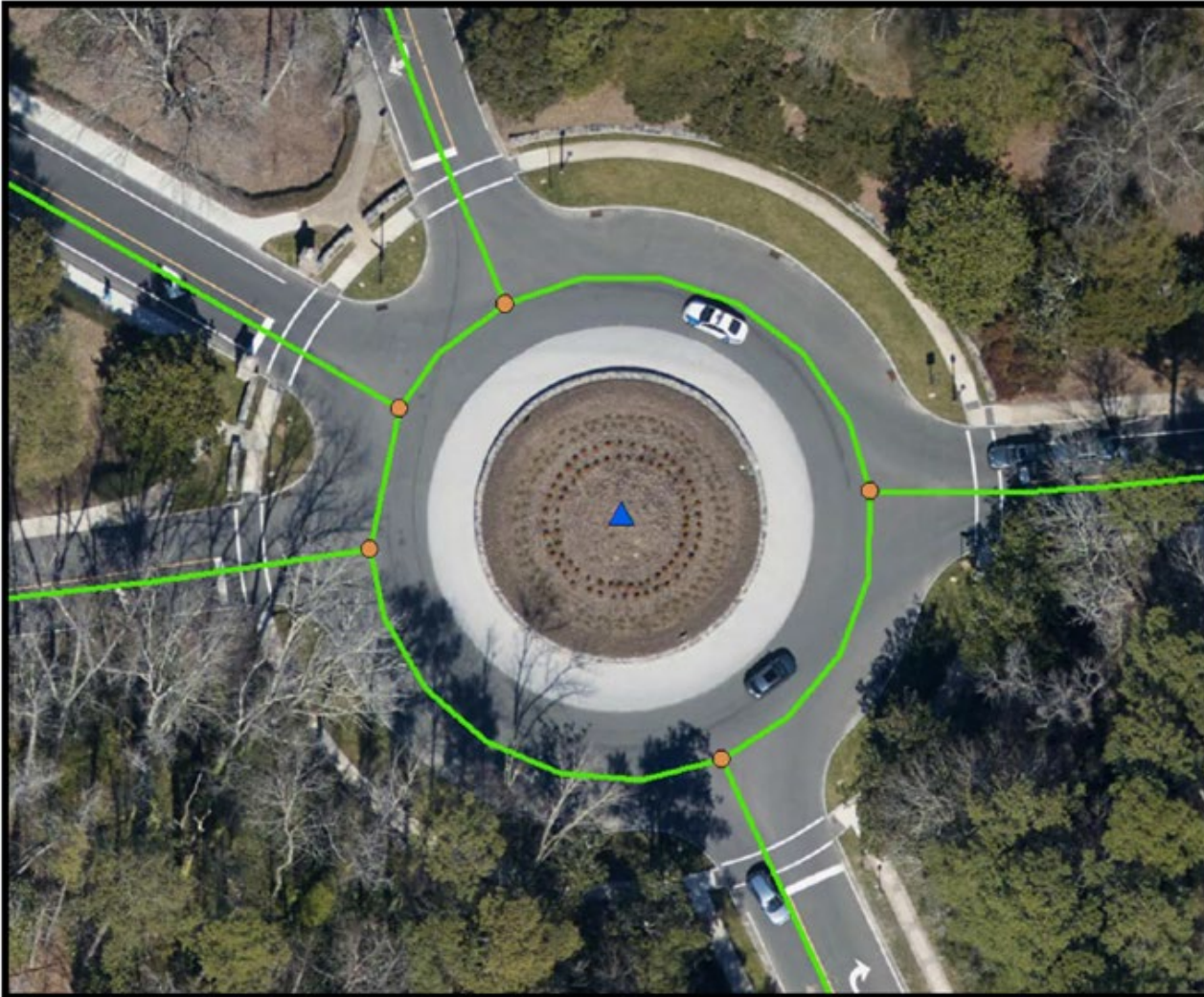


- 1 Roundabout has multiple Approaches
- 1 Road approaches 2 Roundabouts
- 1 Roundabout has multiple arcs

What is NOSQL?

- Graph database (Facebook, LinkedIn, others)
- Ability to model complex nested objects
- Multiple geographic representations of the same thing
- Highly flexible and easy to change
- Just makes more sense

NoSQL Data Model for Traffic Circle



“NoSQL Data Modeling” – Ron Brush, New Century Software, GIS-T, 2018

What's next?

- NHTSA Grant-funded Project: **NoSQL MIRE Data Modeling**
 - **Build NoSQL Database**
 - **Create Web app to visualize and query**
- Complete LRS to GIS Routable Network
- **Will present findings at next GIS-T**

Thank You!

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