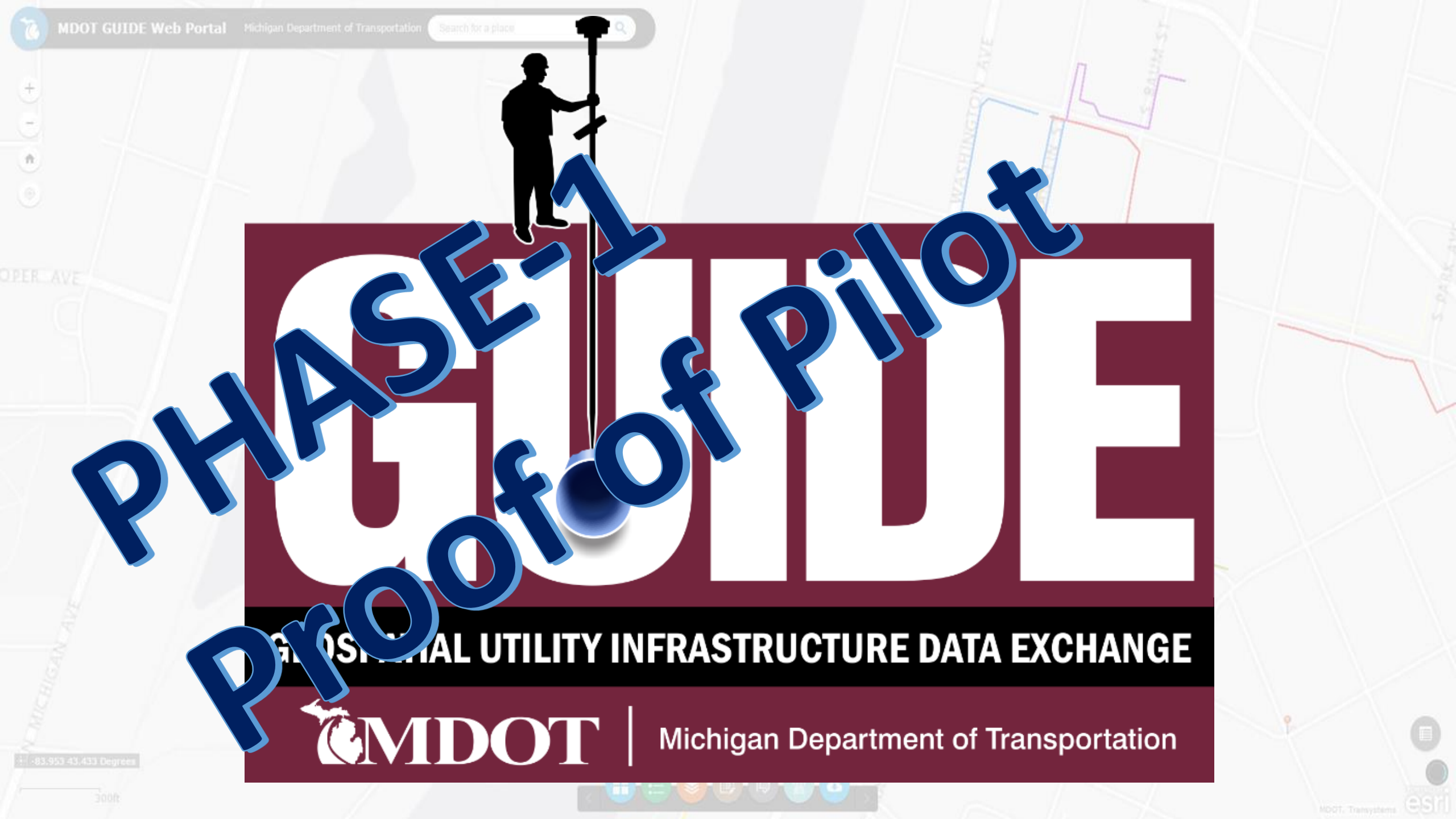
2018 County Engineer's Workshop

October 2, 2017

Geospatial Utility Infrastructure Data Exchange (GUIDE)

CRA County Road Association OF MICHIGAN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Proof of Pilot
GUIDE
GEOSPATIAL UTILITY INFRASTRUCTURE DATA EXCHANGE
MDOT
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at&t

Consumers Energy
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DTE Energy

811
MISS DIG System, Inc.
www.missdig.org 1-800-482-7171

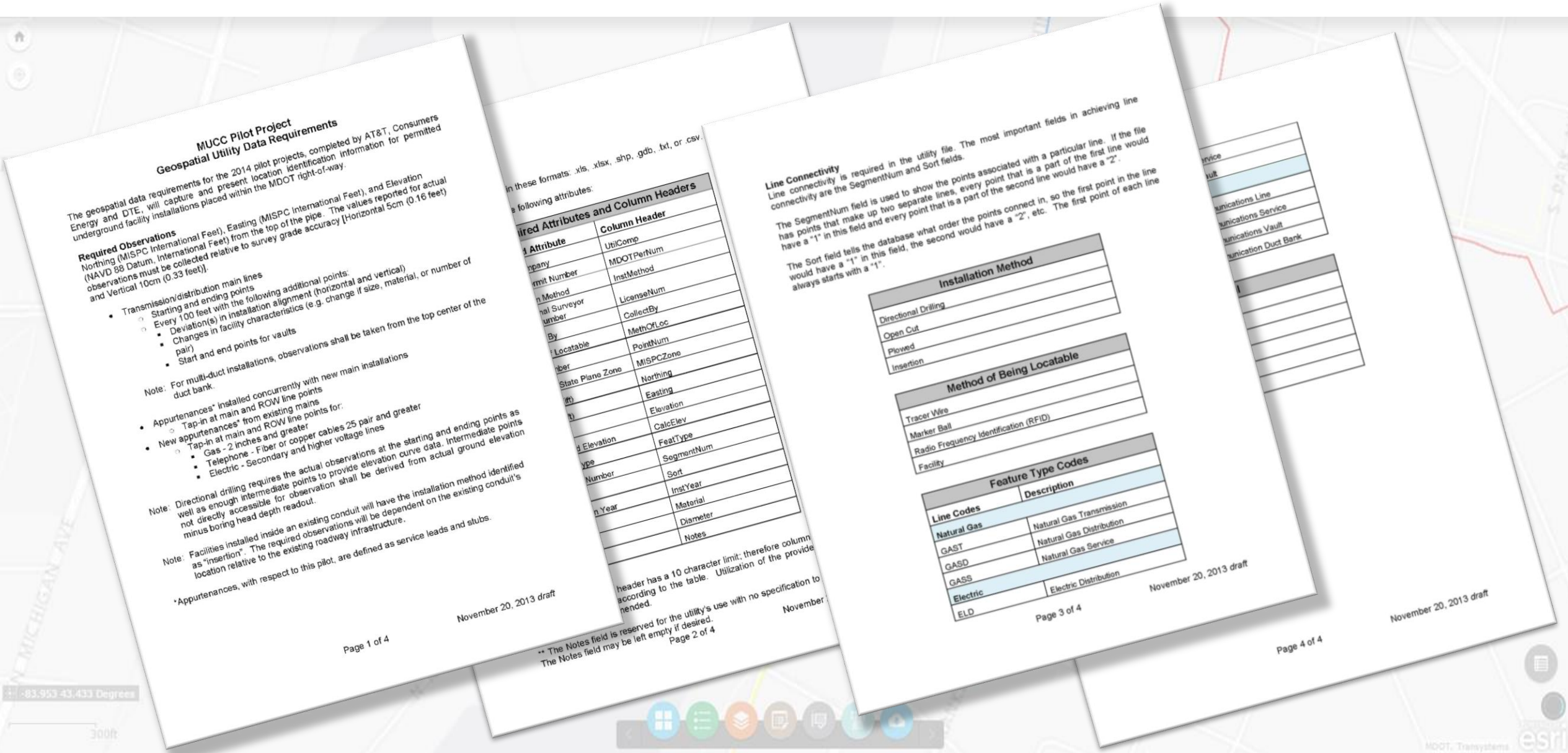
mita
Michigan Infrastructure & Transportation Association

MDOT

Considerations

- What location data to capture
- Degree of accuracy
- Who collects the geospatial data
- What will the standards be
- Value of additional information

Draft Requirements Document



MUCC Pilot Project
Geospatial Utility Data Requirements

The geospatial data requirements for the 2014 pilot projects, completed by AT&T, Consumers Energy and DTE, will capture and present location identification information for permitted underground facility installations placed within the MDOT right-of-way.

Required Observations
Northing (MISPC International Feet), Easting (MISPC International Feet), and Elevation (NAVD 88 Datum, International Feet) from the top of the pipe. The values reported for actual observations must be collected relative to survey grade accuracy [Horizontal 5cm (0.16 feet) and Vertical 10cm (0.33 feet)].

- Transmission/distribution main lines
  - Starting and ending points
  - Every 100 feet with the following additional points:
    - Deviation(s) in installation alignment (horizontal and vertical)
    - Changes in facility characteristics (e.g. change if size, material, or number of pair)
    - Start and end points for vaults

Note: For multi-duct installations, observations shall be taken from the top center of the duct bank.

- Appurtenances* installed concurrently with new main installations
  - Tap-in at main and ROW line points
- New appurtenances* from existing mains
  - Tap-in at main and ROW line points for:
    - Gas - 2 inches and greater
    - Telephone - Fiber or copper cables 25 pair and greater
    - Electric - Secondary and higher voltage lines

Note: Directional drilling requires the actual observations at the starting and ending points as well as enough intermediate points to provide elevation curve data. Intermediate points not directly accessible for observation shall be derived from actual ground elevation minus boring head depth readout.

Note: Facilities installed inside an existing conduit will have the installation method identified as "insertion". The required observations will be dependent on the existing conduit's location relative to the existing roadway infrastructure.

*Appurtenances, with respect to this pilot, are defined as service leads and stubs.

Page 1 of 4

November 20, 2013 *draft*

in these formats: .xls, .xlsx, .shp, .gdb, .txt, or .csv.

following attributes:

ired Attributes and Column Headers	
t Attribute	Column Header
npany	UtiComp
rmit Number	MDOTPerNum
n Method	InstMethod
nal Surveyor	LicenseNum
umber	CollectBy
By	MethOfLoc
Locatable	PointNum
nber	MISPCZone
State Plane Zone	Northing
ft)	Easting
ft)	Elevation
d Elevation	CalcElev
ype	FeatType
Number	SegmentNum
	Sort
n Year	InstYear
	Material
	Diameter
	Notes

header has a 10 character limit; therefore column
according to the table. Utilization of the provide
mended.

** The Notes field is reserved for the utility's use with no specification to
The Notes field may be left empty if desired.

Page 2 of 4

November

Line Connectivity
Line connectivity is required in the utility file. The most important fields in achieving line connectivity are the SegmentNum and Sort fields.

The SegmentNum field is used to show the points associated with a particular line. If the file has points that make up two separate lines, every point that is a part of the first line would have a "1" in this field and every point that is a part of the second line would have a "2".

The Sort field tells the database what order the points connect in, so the first point in the line would have a "1" in this field, the second would have a "2", etc. The first point of each line always starts with a "1".

Installation Method
Directional Drilling
Open Cut
Plowed
Insertion

Method of Being Locatable
Tracer Wire
Marker Ball
Radio Frequency Identification (RFID)
Facility

Feature Type Codes	
Line Codes	**Description**
Natural Gas	Natural Gas Transmission
GAST	Natural Gas Distribution
GASD	Natural Gas Service
GASS	
Electric	Electric Distribution
ELD	

Page 3 of 4

November 20, 2013 *draft*

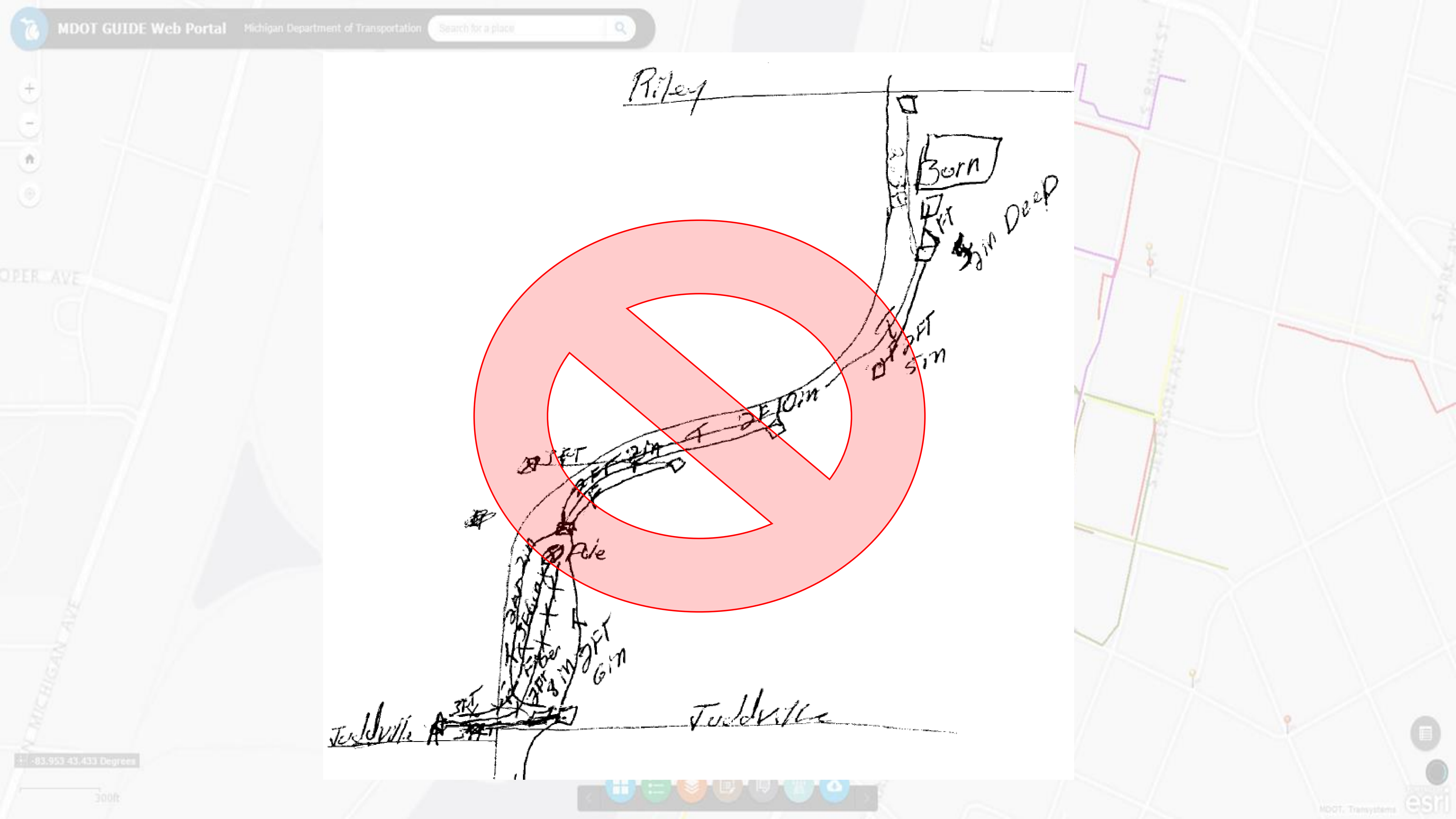
unications Line
unications Service
unications Vault
unication Duct Bank

Page 4 of 4

November 20, 2013 draft

Anticipated Benefits

- Efficiencies in project coordination
  - Better decision making
  - Improved communication



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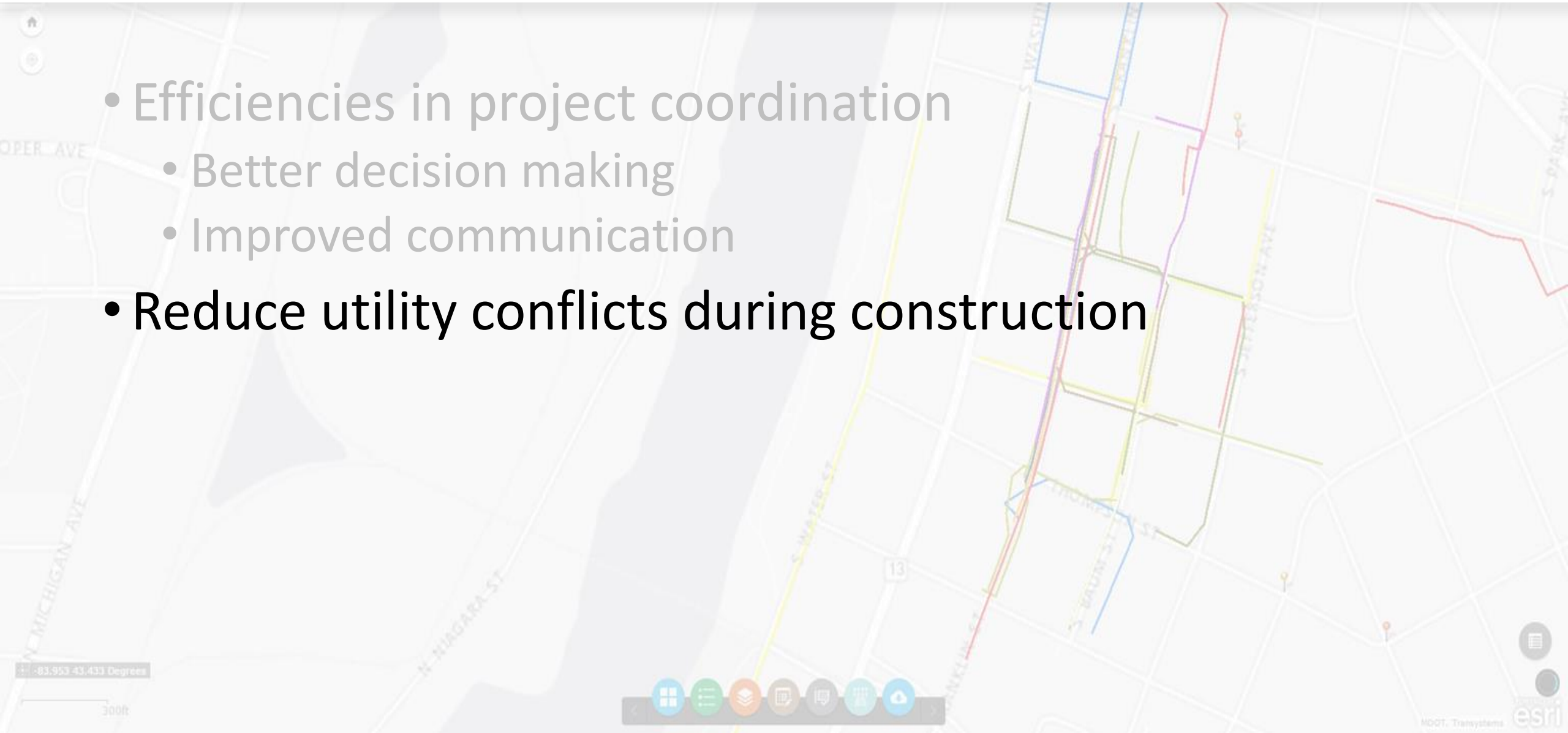
Michigan Department of Transportation
Search for a place
Riley
Barn
3in Deep
3FT
5in
10in
Pole
6in
Juddville
Juddville

Anticipated Benefits

- Efficiencies in project coordination
  - Better decision making
  - Improved communication
- Reduce utility conflicts during construction



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Contract Modification

Contract:900000-1234567, Full depth concrete reconstruction

Cont. Mod. Number	Revision Number	Cont. Mod. Date	Electronic File Created	Net Change
		2013	Yes	$250,000.00

Route	Managing Office	District
Any M-Route	Any MDOT TSC	000

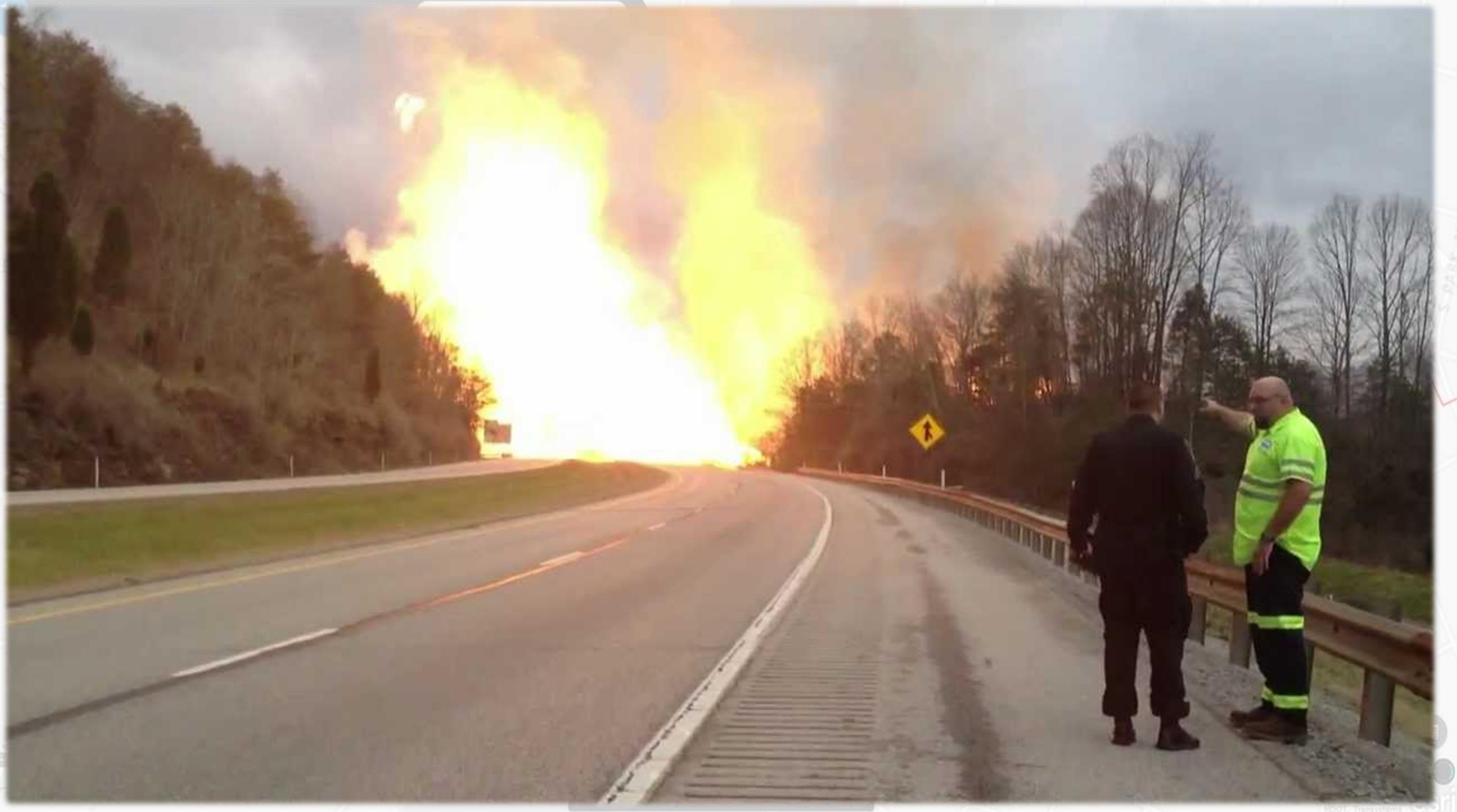
Contract Location
Any MDOT route

Short Description

Utility Conflict #1

Anticipated Benefits

- Efficiencies in project coordination
  - Better decision making
  - Improved communication
- Reduce utility conflicts during construction
- Develop accurate data on new utility infrastructure
- Reduce public impacts - user delay costs
- **Improve safety - reduce impacts to high risk utilities**



Requirements

- Data Acquisition
  - Accurate
  - Absolute
  - Repeatable
- Required Observations
  - Traditional Const. Methods
  - Trenchless Technologies
  - Insertion
- File Specifications
- File Attributes


Responsibility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Federal Highway Administration
innovation
ingenuity
Every Day Counts
imagination
invention
STIC
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Consumers Energy

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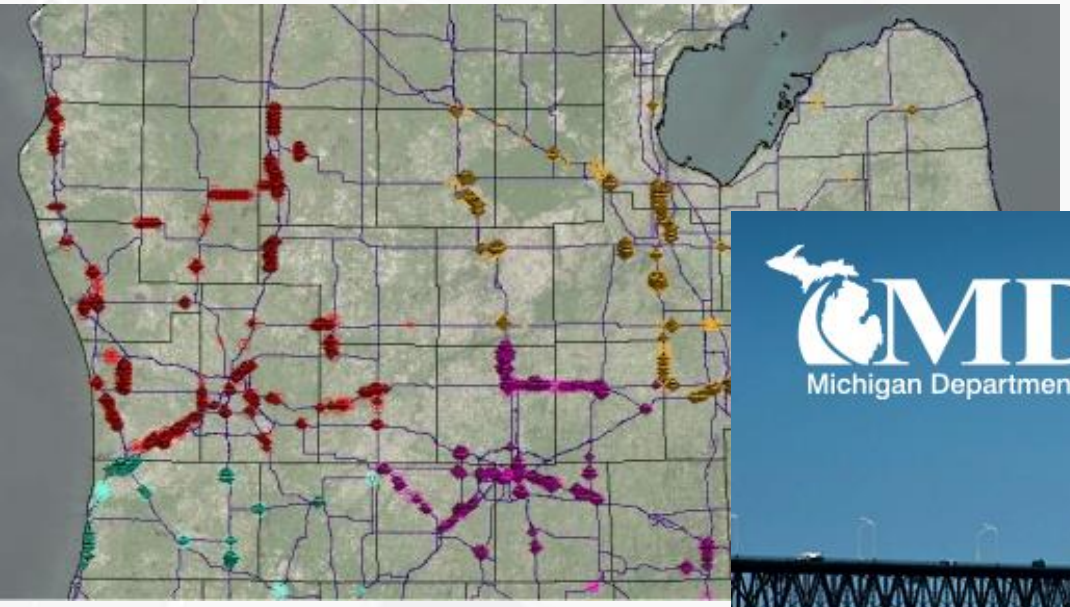
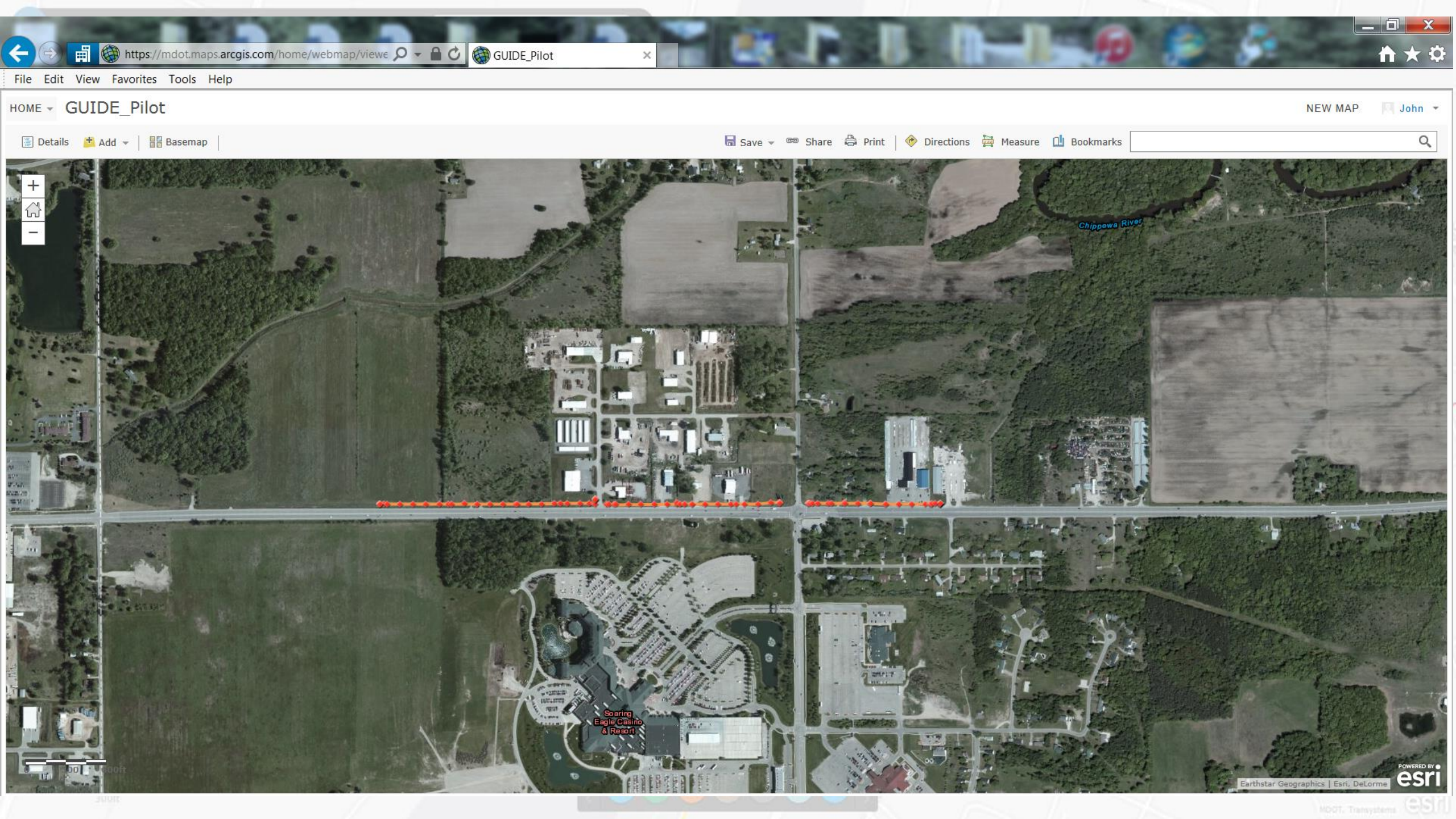
en Bay
44°30'N
Barri
Guelph
Burlingt
43°30'N
Brantford
vaukee
Grand Rapids
Flint
Sarnia
London
84°30'W
83°30'W
Lansing
enosha
Clinton
ukegan
42°30'N
Chatham-Kent
Ann Arbor
Windsor
Erie
Cicero
Gary
South Bend
Toledo
41°30'N
Parma
29.5mi
esri
geonames.org
Position 43°11'01"N 83°50'08"W, Altitude 229.53 Miles

Data Repository

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GUIDE_Pilot
File Edit View Favorites Tools Help
HOME
GUIDE_Pilot
NEW MAP
John
Details
Add
Basemap
Save
Share
Print
Directions
Measure
Bookmarks
Chippewa River
Soaring Eagle Casino & Resort
Earthstar Geographics | Esri, DeLorme
POWERED BY esri

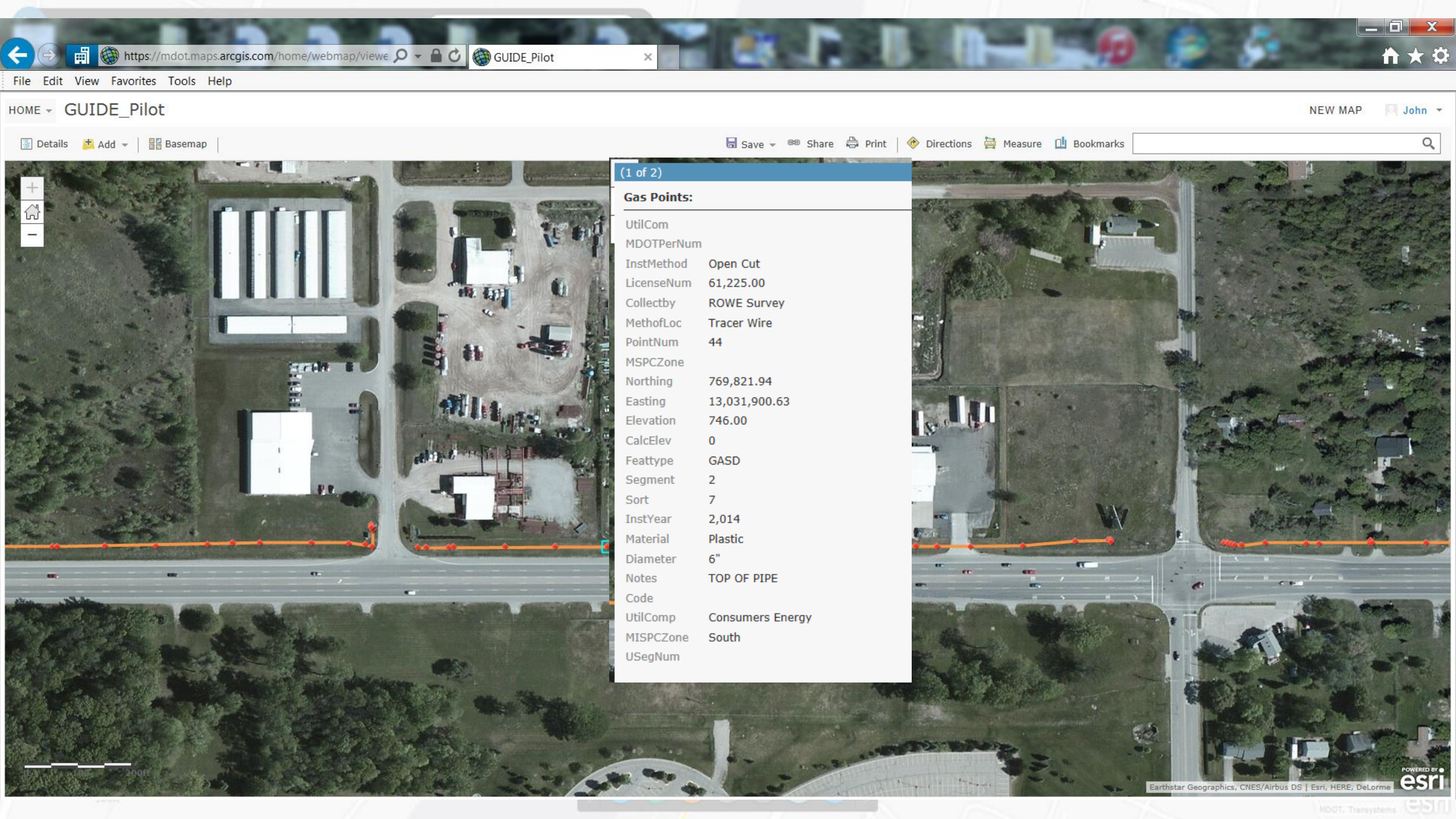
https://mdot.maps.arcgis.com/home/webmap/viewe

GUIDE_Pilot

File Edit View Favorites Tools Help

HOME GUIDE_Pilot NEW MAP John

Details Add Basemap Save Share Print Directions Measure Bookmarks

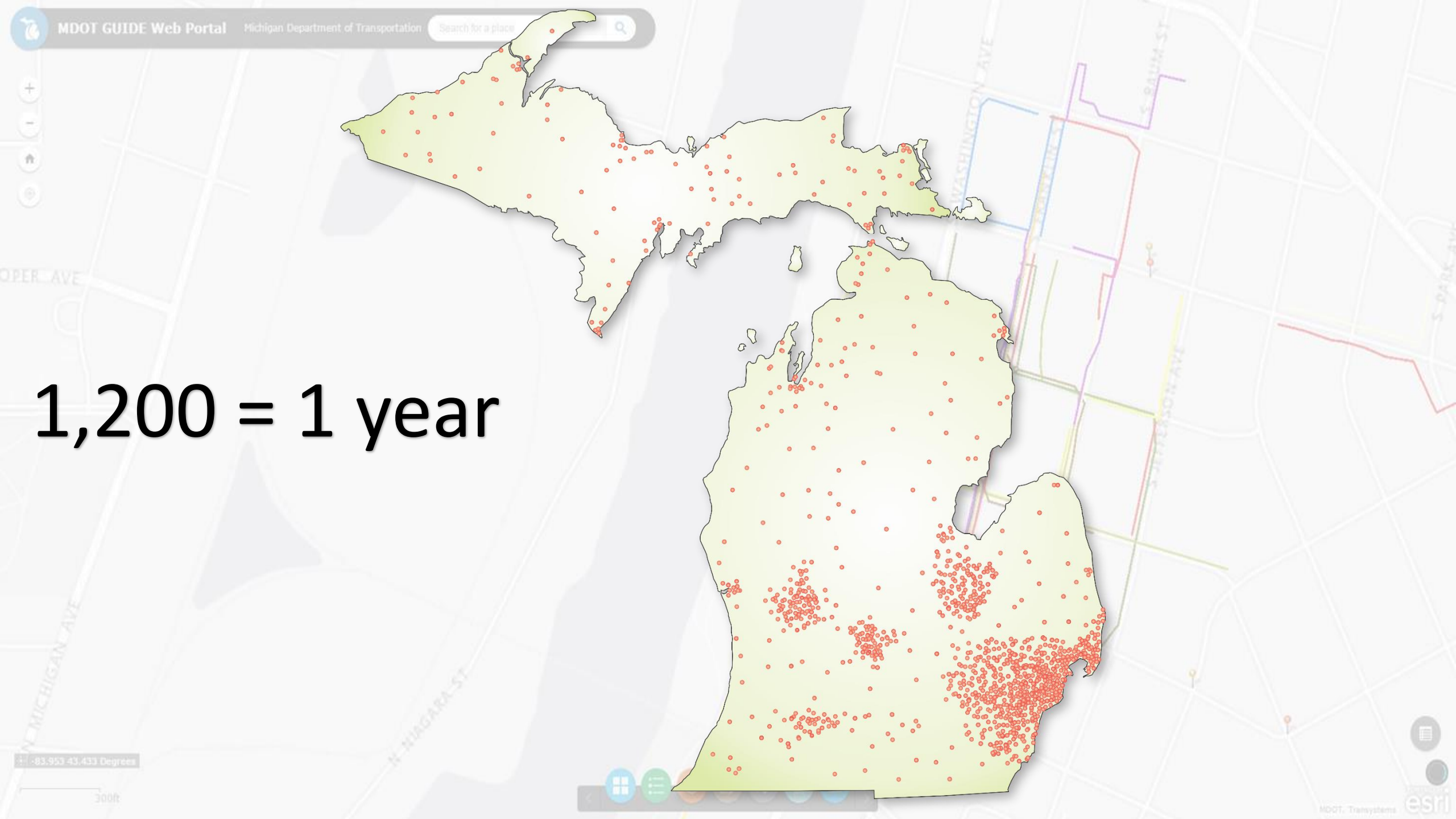

https://mdot.maps.arcgis.com/home/webmap/viewe
GUIDE_Pilot
File Edit View Favorites Tools Help
HOME
GUIDE_Pilot
NEW MAP
John
Details
Add
Basemap
Save
Share
Print
Directions
Measure
Bookmarks
(1 of 2)
Gas Points:
UtilCom
MDOTPerNum
InstMethod Open Cut
LicenseNum 61,225.00
Collectby ROWE Survey
MethofLoc Tracer Wire
PointNum 44
MSPCZone
Northing 769,821.94
Easting 13,031,900.63
Elevation 746.00
CalcElev 0
Feattype GASD
Segment 2
Sort 7
InstYear 2,014
Material Plastic
Diameter 6"
Notes TOP OF PIPE
Code
UtilComp Consumers Energy
MISPCZone South
USegNum
Earthstar Geographics, CNES/Airbus DS | Esri, HERE, DeLorme
POWERED BY esri

2013 Underground Utility Permits for **Utility Company** Applicants		
Utility	# of Permits	% of Total
Consumers Energy	114	10%
DTE Companies	101	9%
AT&T	322	29%
All Others	559	51%
TOTAL	1,096	100%

2013 Underground Utility Permits for **Governmental Agency** Applicants		
Utility Type	# of Permits	% of Total
Watermain	42	41%
Sanitary Sewer	34	33%
Storm Sewer	10	10%
Communication or Electric	16	16%
TOTAL	102	100%

Combined TOTAL	**1,198 New Underground Permits**

1,198 New Underground Utility Permits Every Year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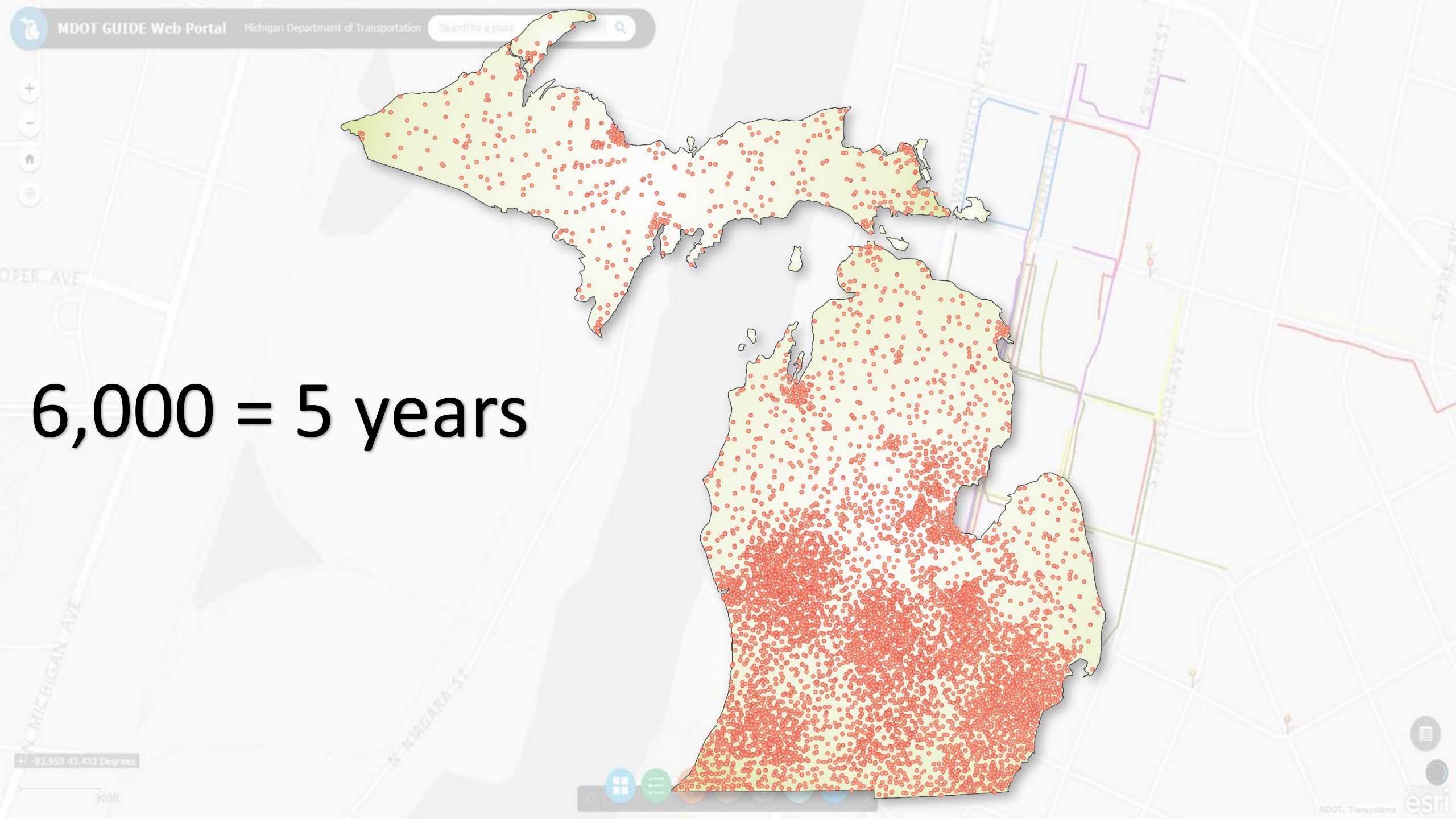
1,200 = 1 year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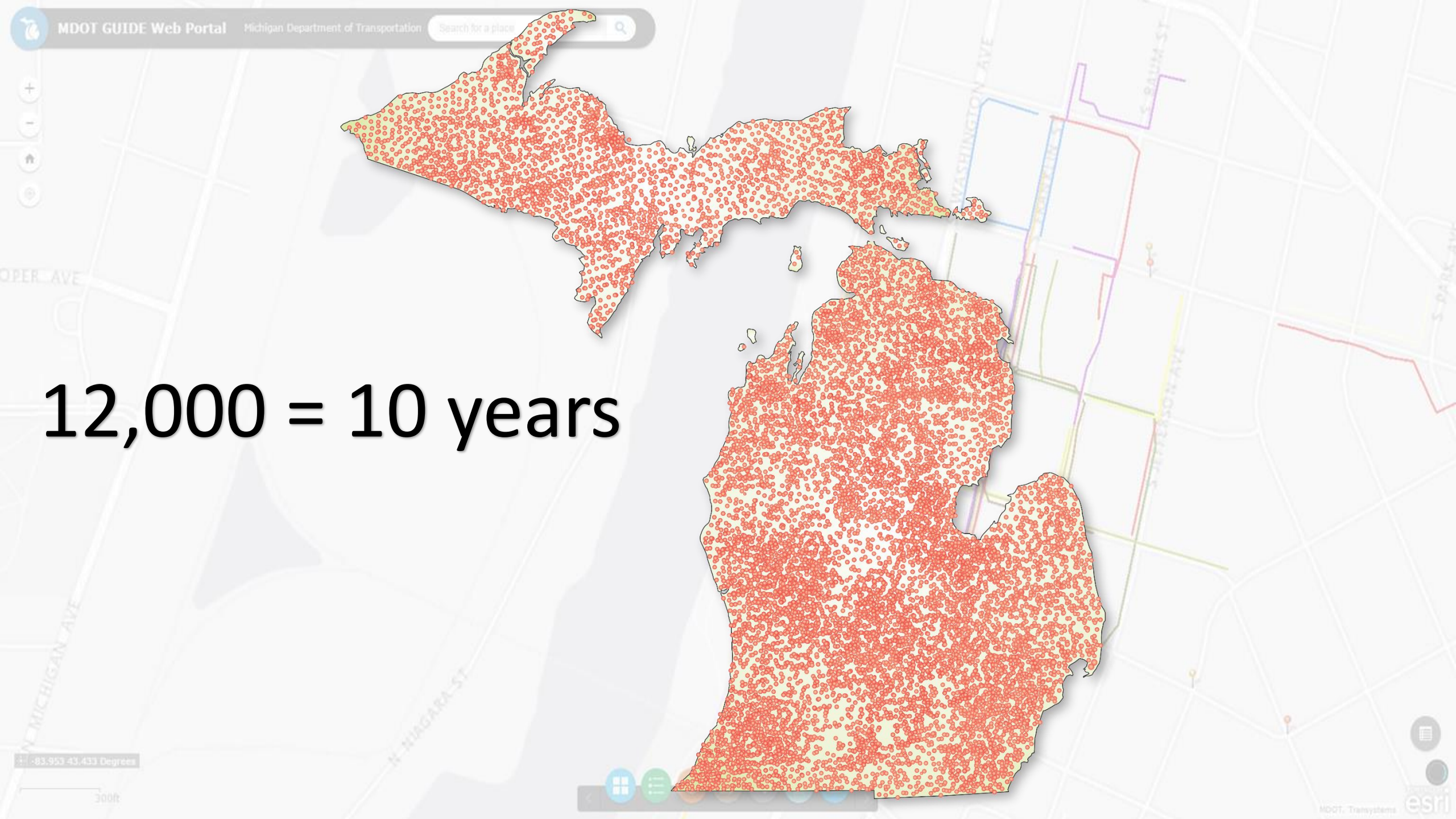
6,000 = 5 years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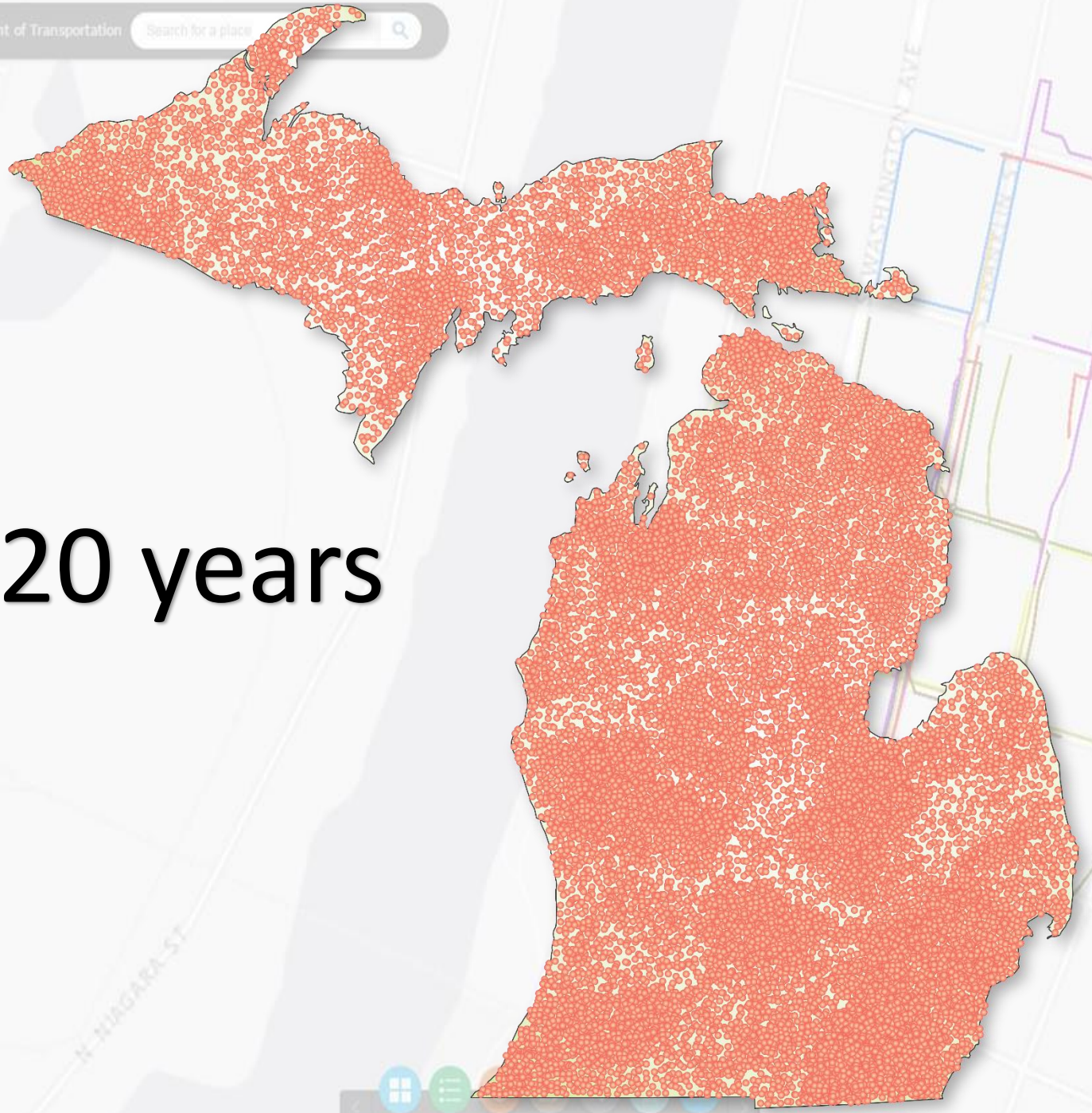
Search for a place
12,000 = 10 years



24,000 = 20 years

MICHIGAN UTILITY COORDINATION COMMITTEE'S GEOSPATIAL UTILITY INFRASTRUCTURE DATA EXCHANGE 2014 PILOT INITIATIVE

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U.S. Department of Transportation
Federal Highway Administration

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State Transportation Innovation Councils

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GEOSPATIAL UTILITY INFRASTRUCTURE DATA EXCHANGE
MUCC A MICHIGAN UTILITY COORDINATION COMMITTEE INITIATIVE

Report Prepared by:

Eric Barden, P.S.

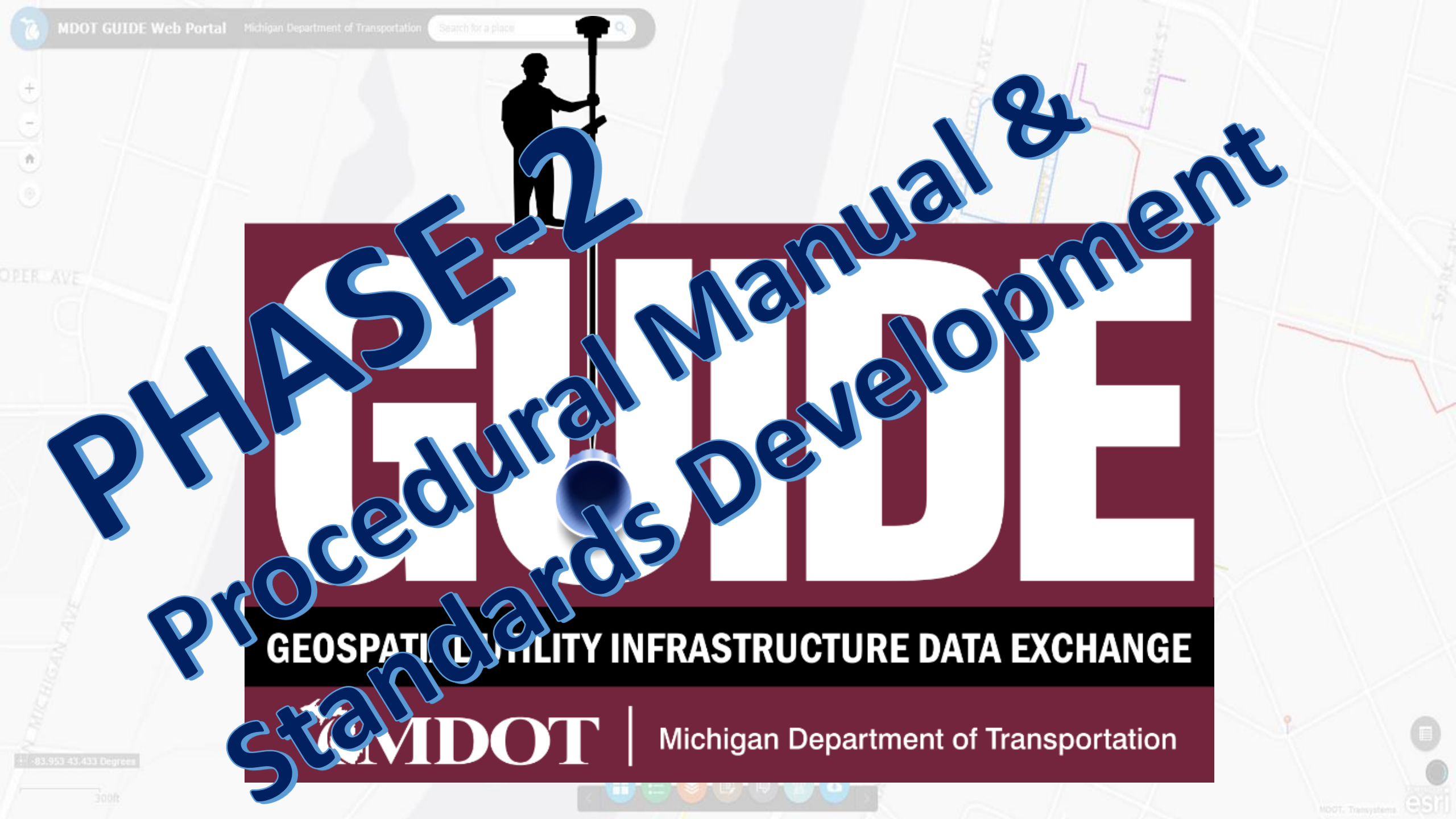
Principal | Geospatial Services

Spicer group
www.spicergroup.com

March 2015

Pilot Outcomes

- Comprehensive Statewide Standards
- Development of Centralized Data Repository
- Stakeholder Buy-In
- Proof of Program
  - Statewide, More Utilities, Etc.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Michigan Department of Transportation
PHASE-2
Procedural Manual &
Standards Development
GUIDE
GEOSPATIAL UTILITY INFRASTRUCTURE DATA EXCHANGE
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Federal Highway Administration
innovation
ingenuity
Every Day Counts
imagination
invention
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PHASE 2 - Objectives & Outcomes

- Comprehensive Procedural Manual and Accompanying Standards
- Guide Web Portal - Repository
- Data Collection App (Proposed Innovation)

Utility Type	Feature Code	Description of Utilities
Brine	BRNE	Brine transmission, distribution, service lines, and appurtenances within defined size parameter
Chilled Water	CHW	Chilled water transmission, distribution, service lines, and appurtenances within defined size parameter
Communication	COMM	All communication facilities, including fiber optic, copper, coaxial, including appurtenances within defined size parameter
Gas	GAS	Natural gas transmission, distribution, service lines, and appurtenances within defined size parameter
Electric	ELEC	Secondary electric or higher voltage
Pipe	PIPE	Pipeline facilities, including crude oil, refined oil, or all other types of oil pipeline transmission, distribution, service lines, and appurtenances within defined size parameter
Propane	PROP	Propane transmission, distribution and service lines, and appurtenances within defined size parameter
Sanitary Sewer	SANI	Sanitary sewer facilities including all mains, collection system, forcemains, services and leads, including appurtenances within defined size parameter. (Combined sewer is classified as sanitary sewer)
Steam	STEA	Steam transmission, distribution, service lines, and appurtenances within defined size parameter
Storm Sewer	STRM	Storm sewer facilities including all mains and collection system, including appurtenances within defined size parameter. (Excludes underdrain)
Water	WATR	Water transmission, distribution, service lines, and appurtenances within defined size parameter. (Excludes irrigations systems)
Other	OTHR	This designation can be used for those facilities not covered by the above feature codes, including but not limited to industrial facilities of all types and discovered utilities where the type of utility is unknown.

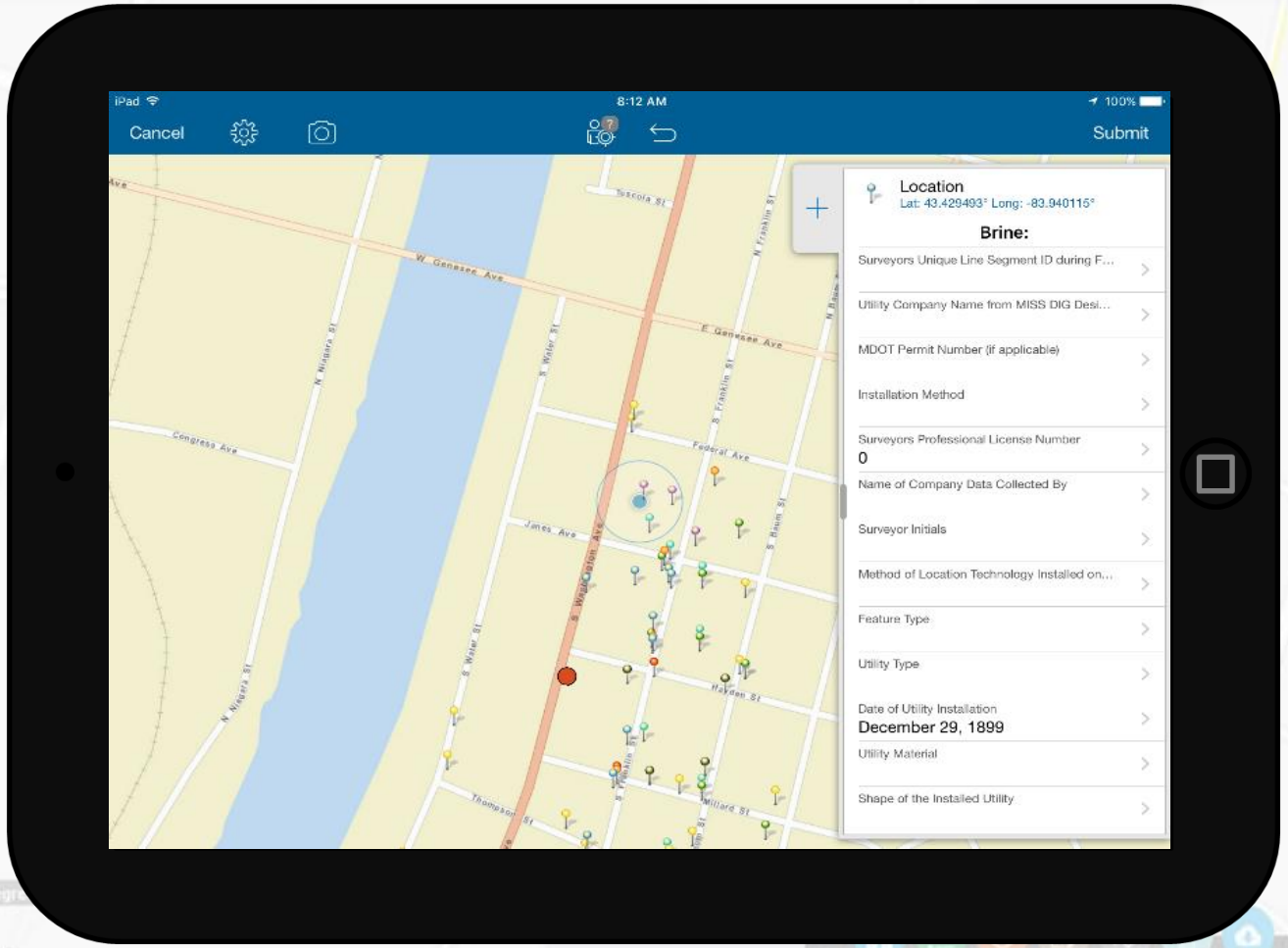
Field Name	Alias Name
OBJECTID	OBJECTID
SHAPE	SHAPE
AssetID	Unique Global Asset ID (auto generated)
SegID	Surveyors Unique Line Segment ID during Field coding
UtilComp	Utility Company Name from MISS DIG Design Ticket Database
MDOTPer	MDOT Permit Number (if applicable)
InstMeth	Installation Method
LicNum	Surveyors Professional License Number
CollecBy	Name of Company Data Collected By
SurvInit	Surveyor Initials
MethLoc	Method of Location Technology Installed on Utility

Field Name	Alias Name
FeaType	Feature Type
UtilType	Utility Type
InstDate	Date of Utility Installation
UtilMat	Utility Material
FacShape	Shape of the Installed Utility
UtilDia	Utility Diameter
ParaQT	Quantity of Same Size Utility Installed
Encas	Encasement (Yes or No)
SueQL	Equivalent SUE Quality Level
EncasMat	Encasement Material
EncasDia	Encasement Diameter
Notes	Any Special Notes
SHAPE_Length	SHAPE_Length

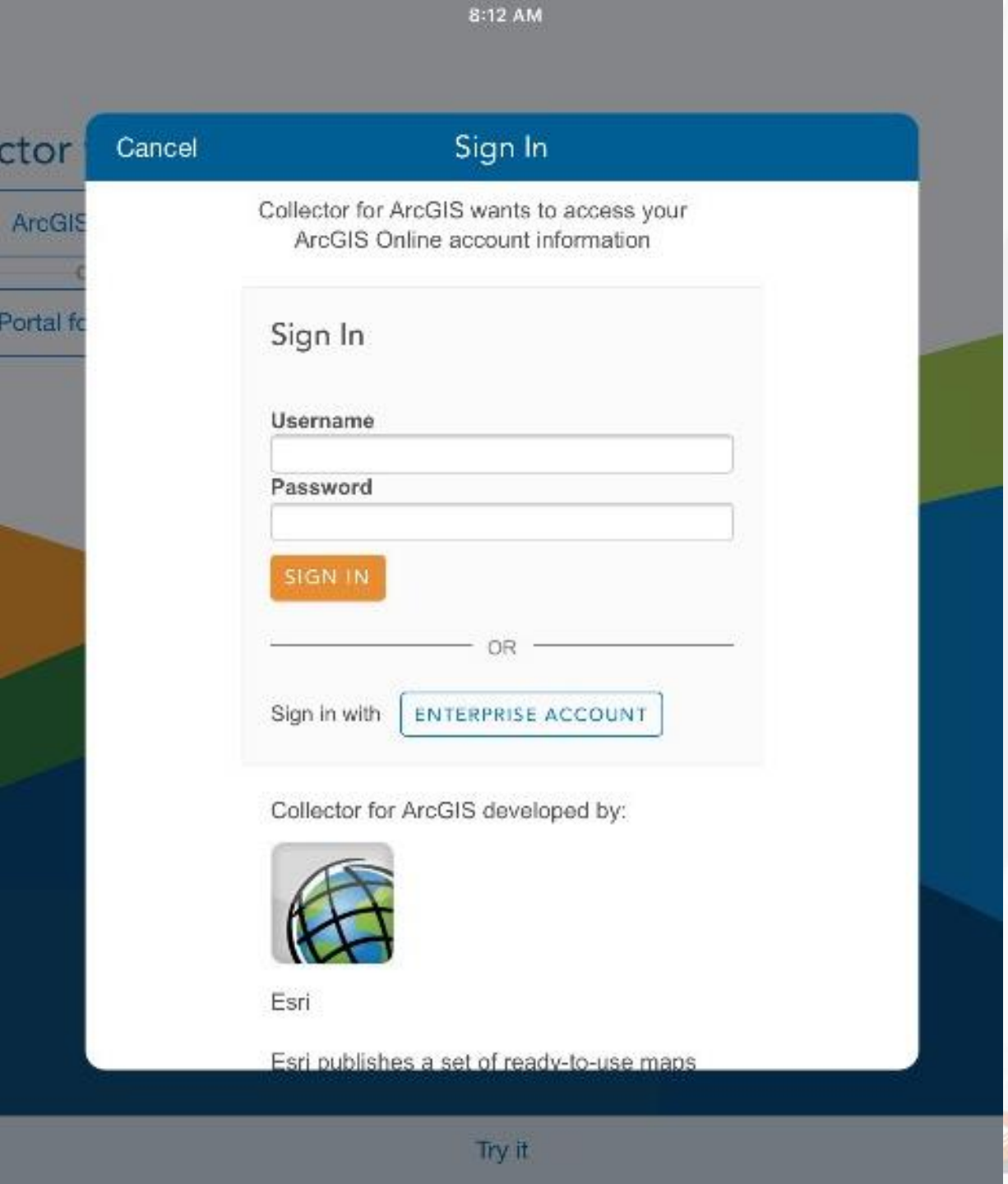
Data Formats – Industry Standard GIS Format

Simplified Data Collection

Utilizing Collector for ArcGIS

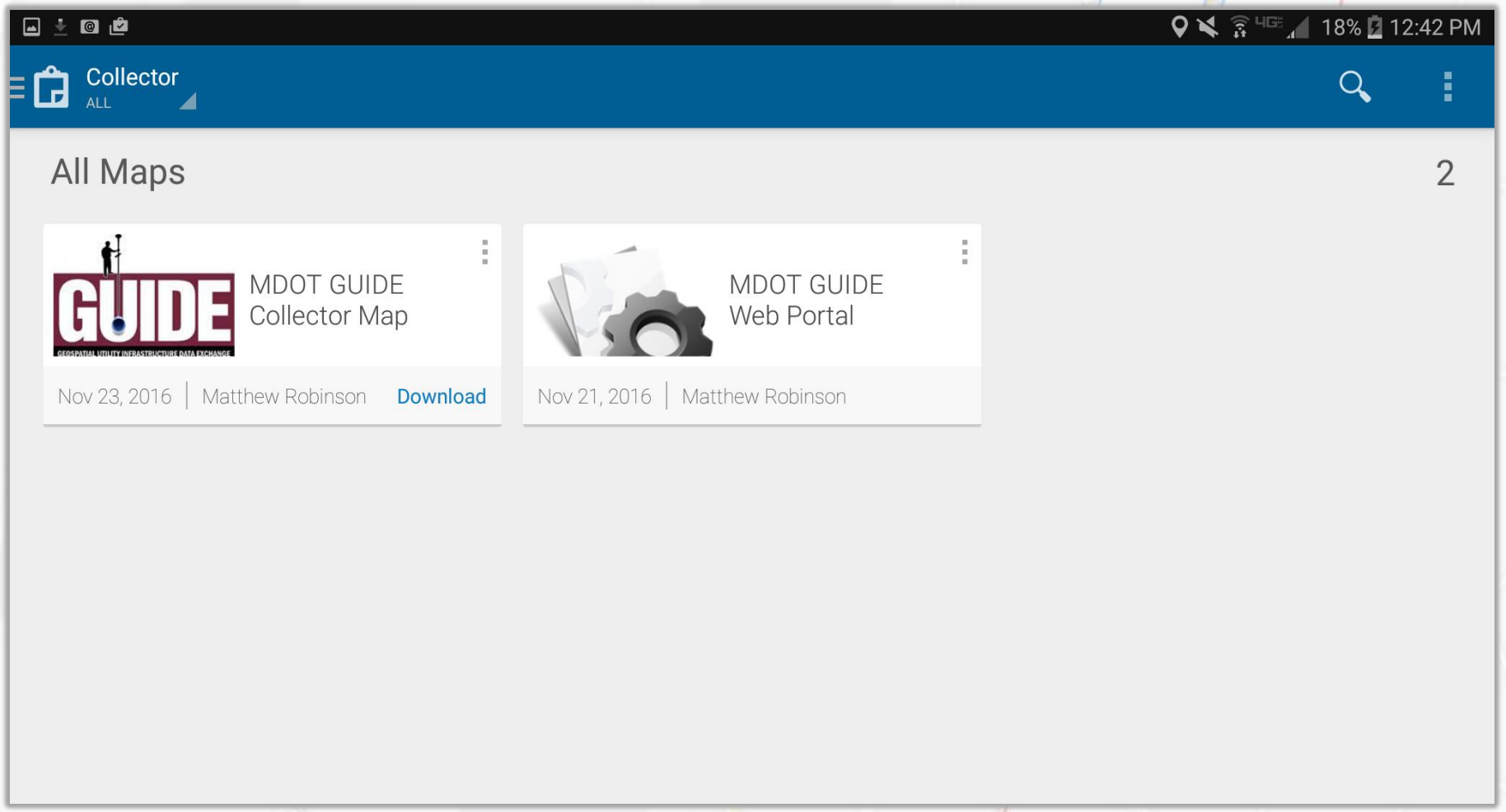


Windows 10

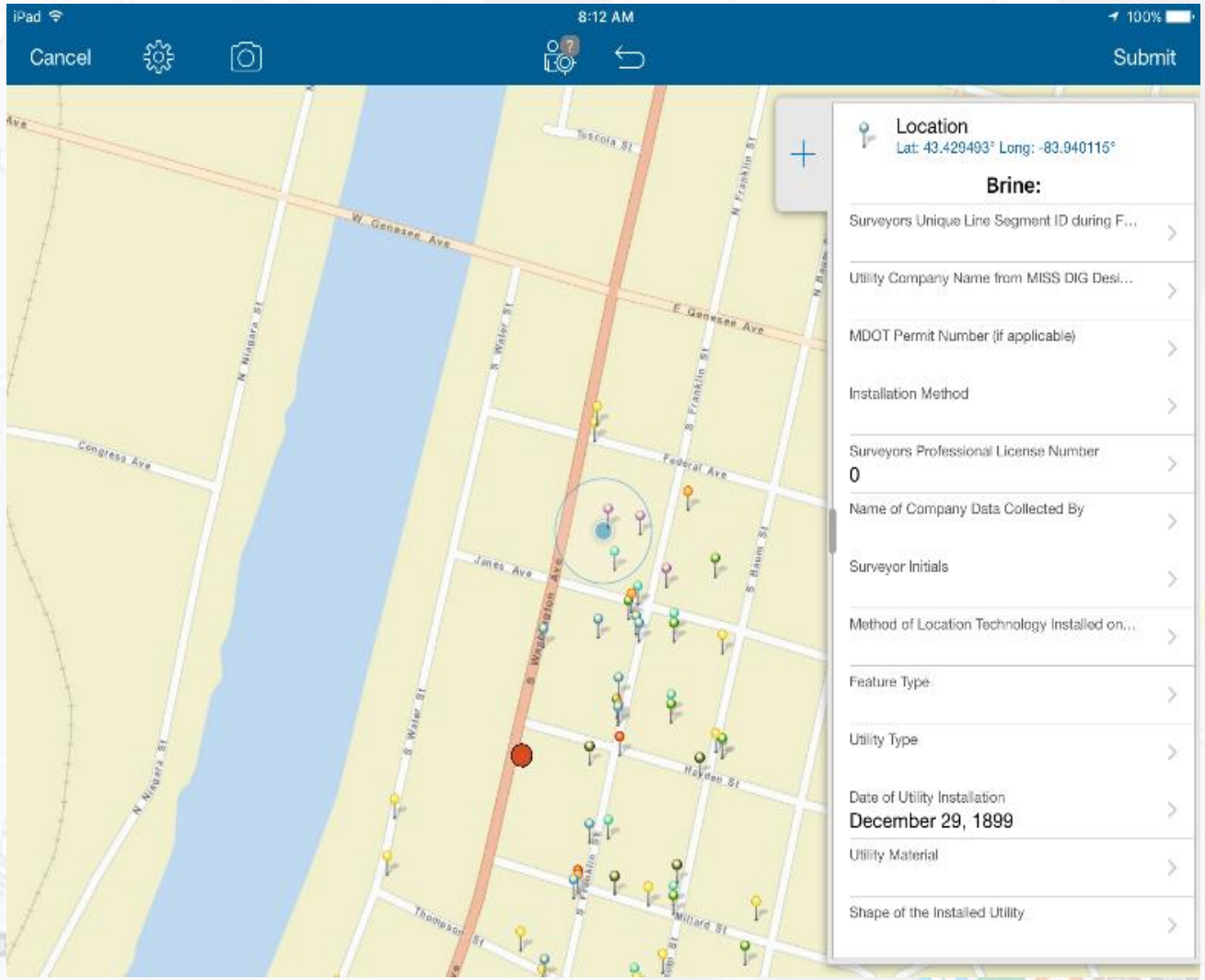


Sign in to MDOT's SDE

Connect to the GUIDE Collector Map



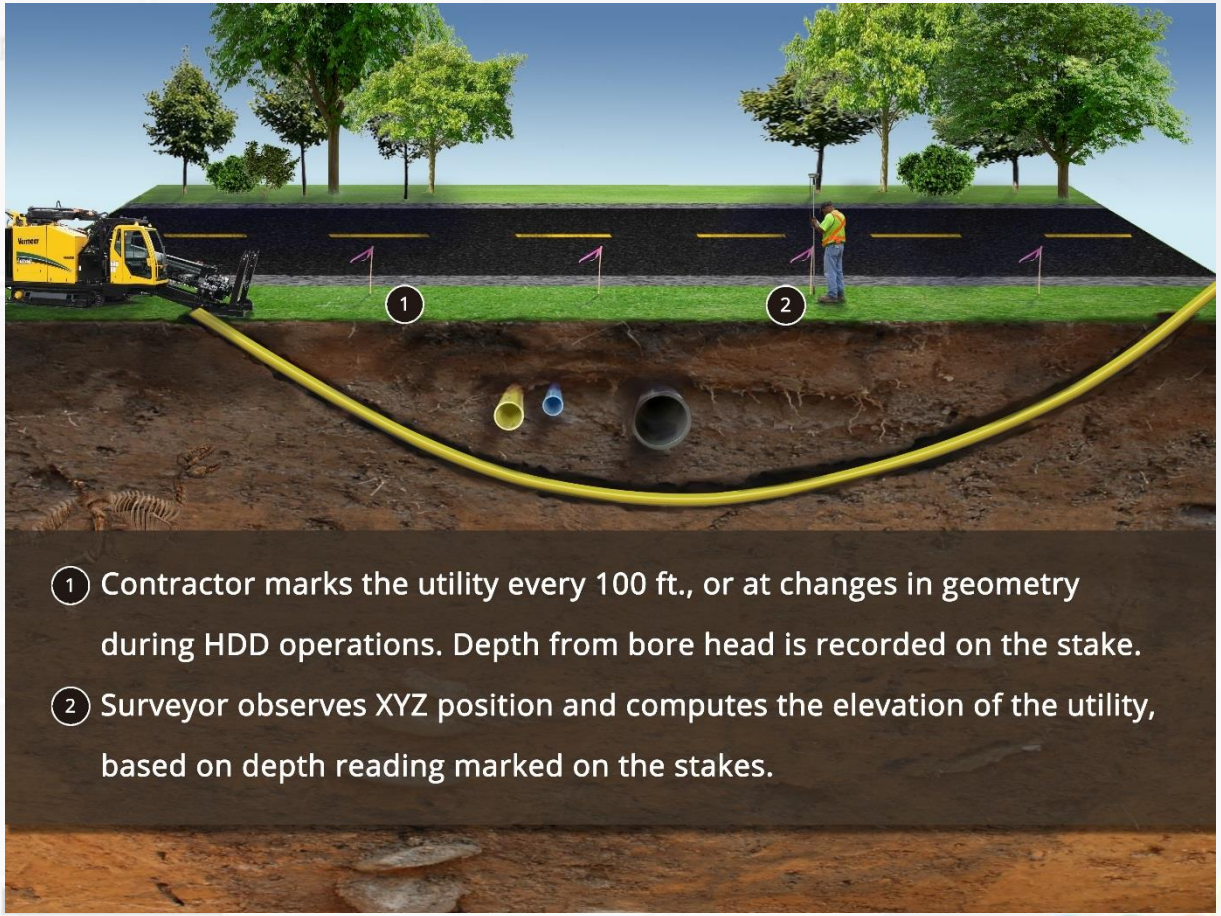
Create Collector Pins and Populate Attributes



- One PIN for each utility segment surveyed
- Populate attributes from preconfigured dropdowns and stores that PIN

Surveyor Surveys each Utility Segment

Indirect Survey Measurement



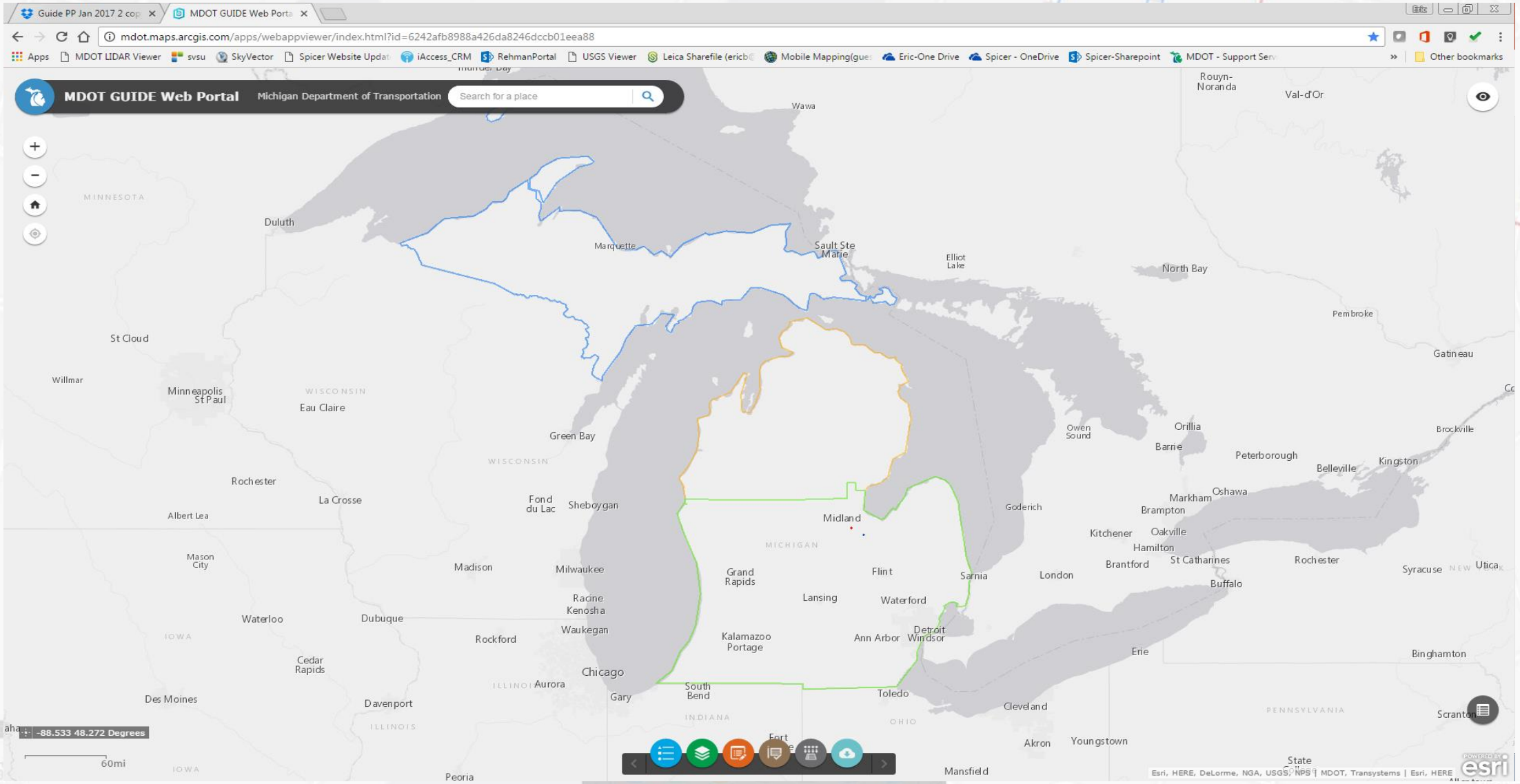
1. Contractor marks the utility every 100 ft., or at changes in geometry during HDD operations. Depth from bore head is recorded on the stake.
2. Surveyor observes XYZ position and computes the elevation of the utility, based on depth reading marked on the stakes.

Direct Survey Measurement

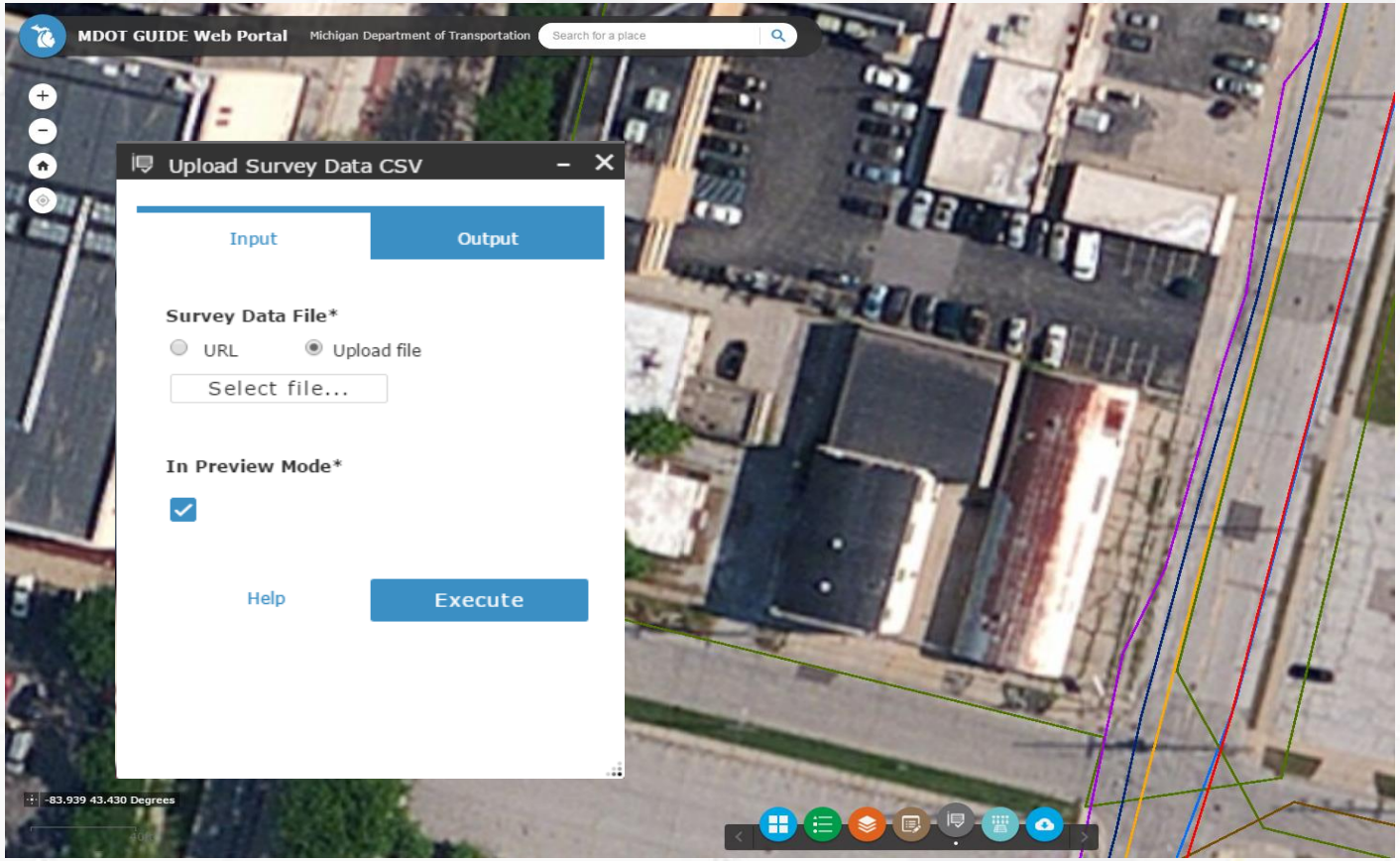
Surveyor Validates Collected Data and Creates CSV File

SegID	Northing	Easting	Elevation	FeaType	InstDate	SurvInit
BRNE1	703939.19	13237052.58	590.49	BRNE	20160411	ESB
BRNE1	703888.14	13237038.68	590.36	BRNE	20160411	ESB
BRNE1	703859.94	13237039.62	589.92	BRNE	20160411	ESB
BRNE1	703796.66	13237025.21	589.83	BRNE	20160411	ESB
BRNE1	703778.01	13237012.06	590.19	BRNE	20160411	ESB
BRNE1	703777.99	13237012.12	590.19	BRNE	20160411	ESB
BRNE1	703722.40	13237002.11	590.07	BRNE	20160411	ESB
BRNE1	703691.66	13236998.08	589.85	BRNE	20160411	ESB
BRNE2	703662.36	13236989.41	589.92	BRNE	20160411	ESB
BRNE2	703662.26	13236989.49	589.93	BRNE	20160411	ESB
BRNE2	703612.85	13236976.84	590.02	BRNE	20160411	ESB
BRNE2	703578.78	13236968.13	590.01	BRNE	20160411	ESB
BRNE2	703543.96	13236952.33	590.47	BRNE	20160411	ESB
BRNE2	703516.02	13236947.02	590.22	BRNE	20160411	ESB
BRNE2	703515.59	13236946.87	590.17	BRNE	20160411	ESB
BRNE2	703378.13	13236921.71	590.30	BRNE	20160411	ESB
BRNE2	703182.69	13236880.50	590.26	BRNE	20160411	ESB

GUIDE Web Portal

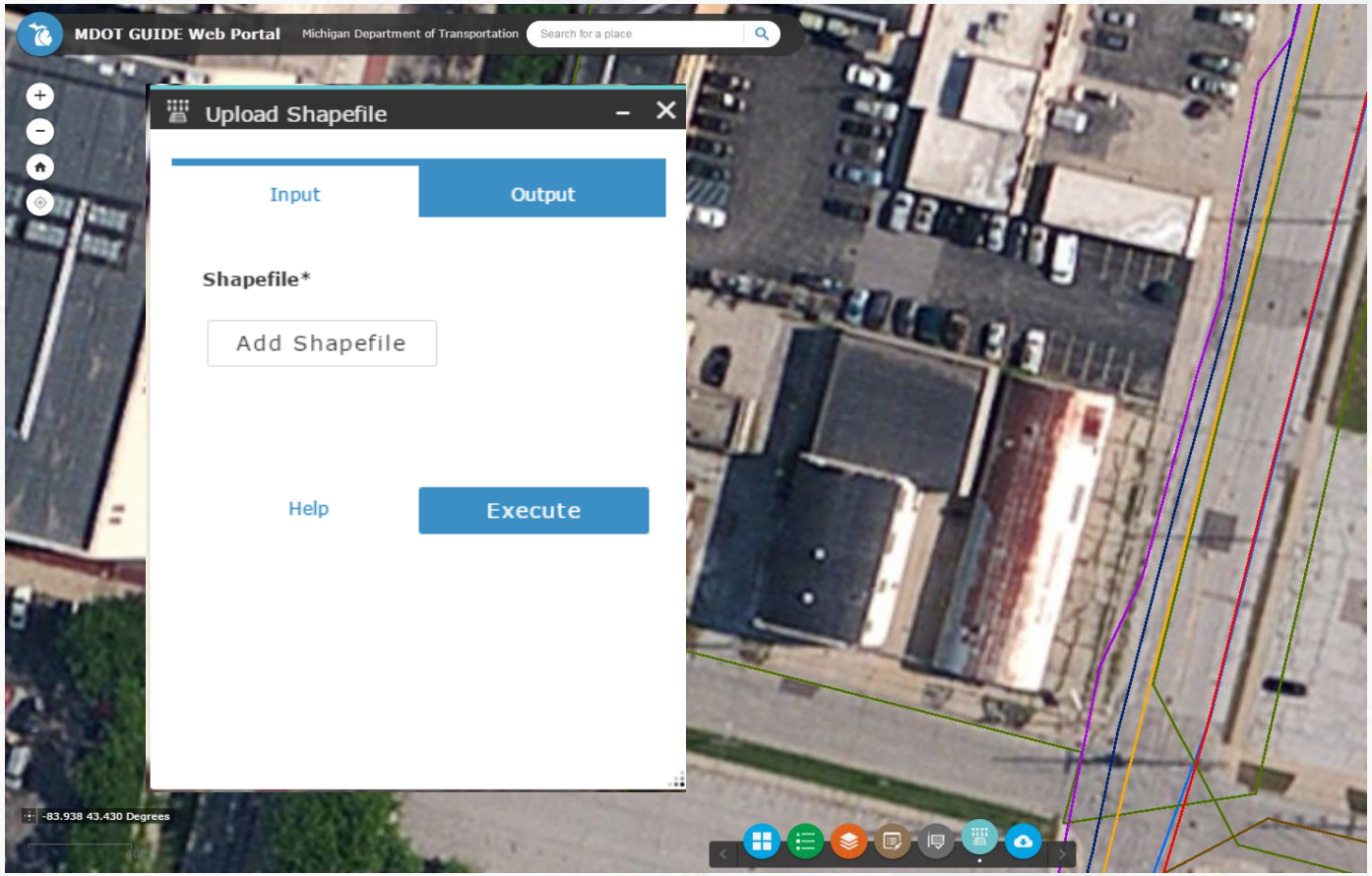


Upload Data to Web Portal



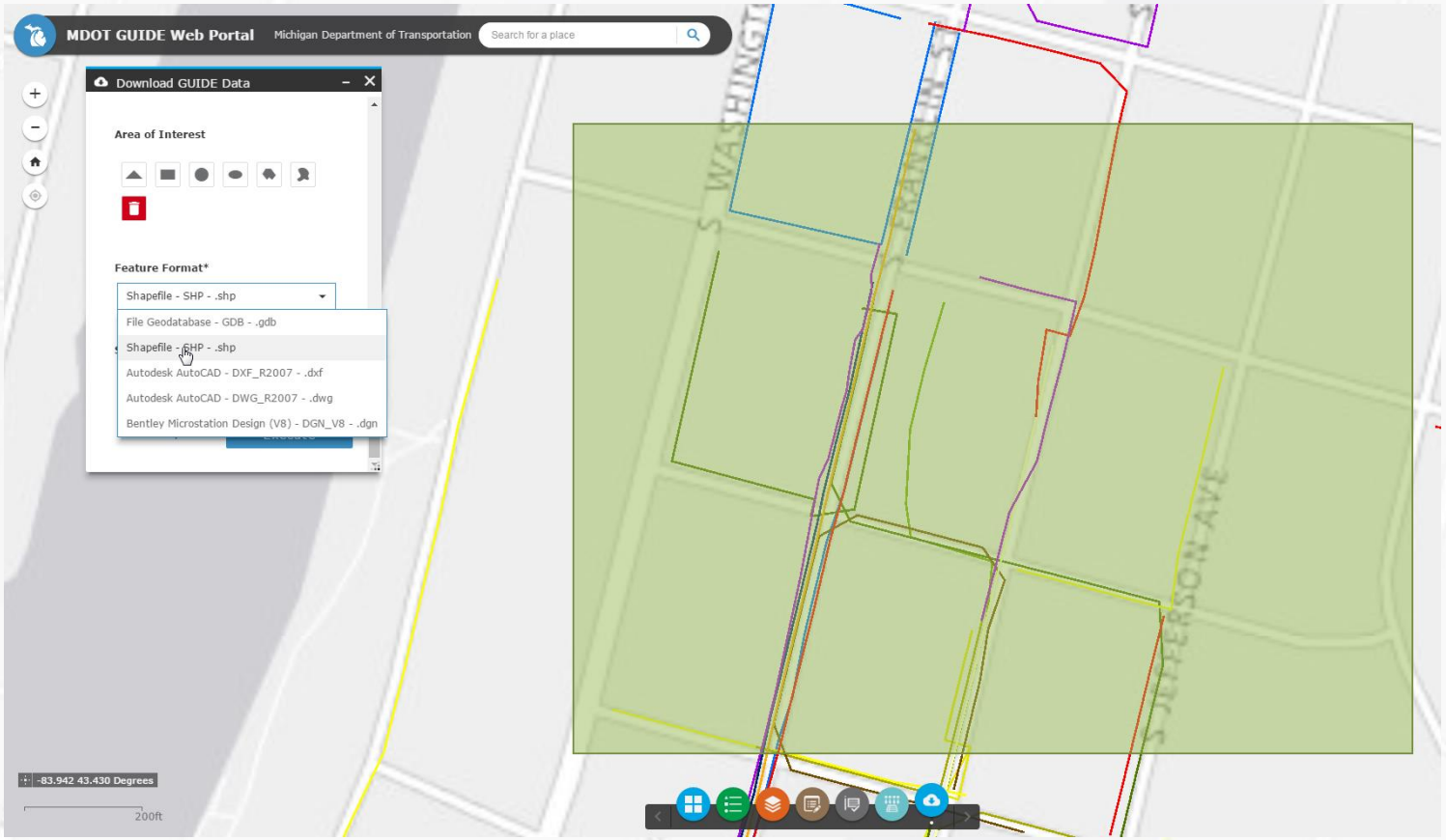
- Upload CSV file using preview feature to validate linear feature geometry
- Uncheck “Preview”, and upload to save permanently
- MDOT permit approval agent is notified of spatial data submittal

Upload Data to Web Portal cont…



- Collector for ArcGIS is not required
- Surveyors can upload SHP files directly
- SHP files will be validated by geoprocessing tools before upload
- MDOT permit approval agent is notified of spatial data submittal

Download Data from GUIDE Portal



- Download by AOI
- 3D data in various formats
- Shapefiles
- Geodatabase
- DGN
- DWG/DXF

Geospatial Utility Infrastructure Data Exchange Procedural Manual

U.S. Department of Transportation
Federal Highway Administration

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GEOSPATIAL UTILITY INFRASTRUCTURE DATA EXCHANGE
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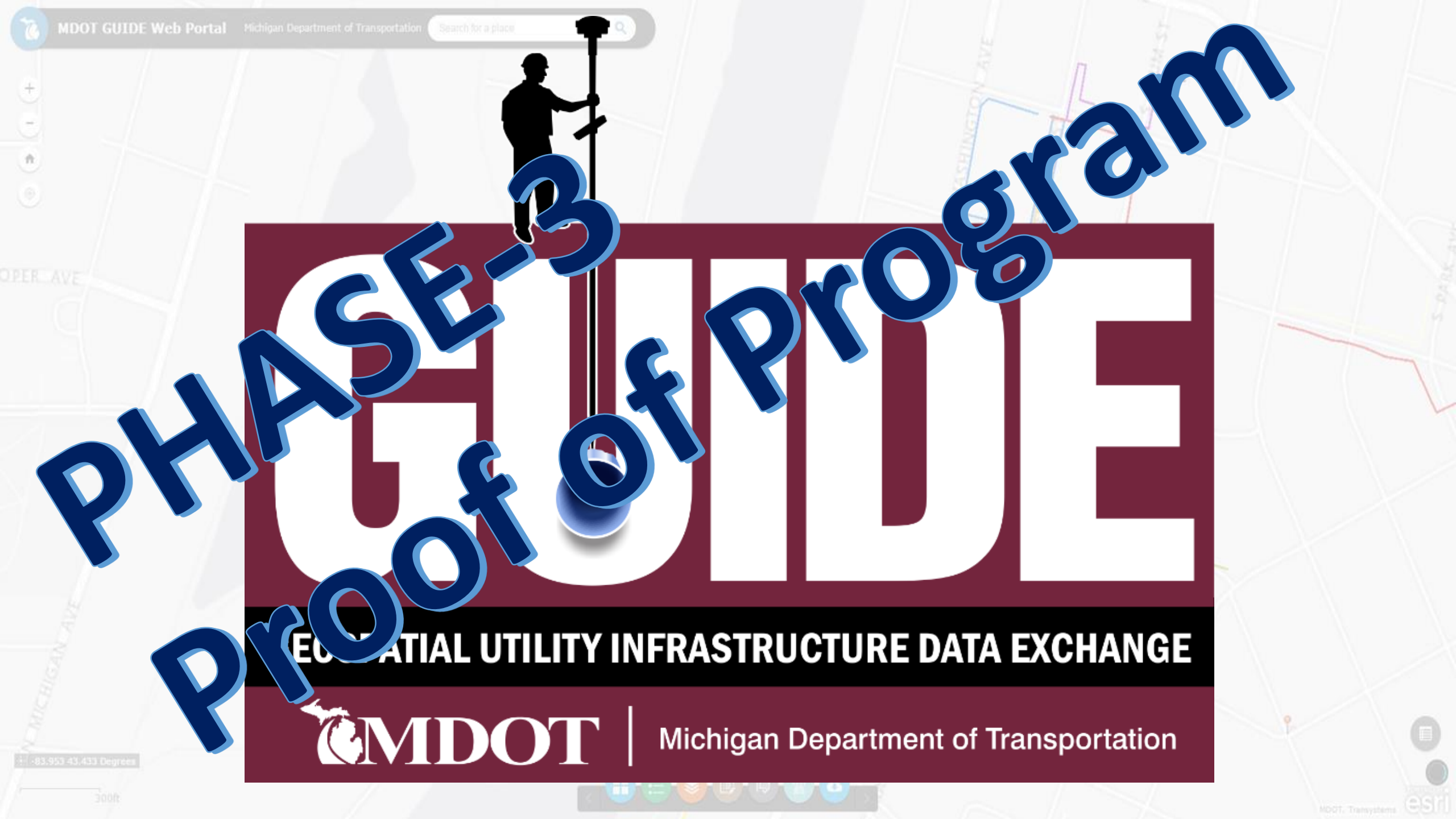
STIC
State Transportation Innovation Council

Prepared by:
Eric Barden, P.S.

January 2017

Spicer group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Proof of Program
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SHRP2 Implementation Assistance Program, Round 7, Utility Bundle

- **3D Utility Location Data Repository (R01A)**
- Utility Locating Technologies (R01B)
- Identifying and Managing Utility Conflicts (R15B)

Consultants

Consultant 1

- Training
- General Support
- Revisions (Manual, Supporting Files, Collector App. Etc.)
- Quality Assurance

Consultant 2 Prein&Newhof

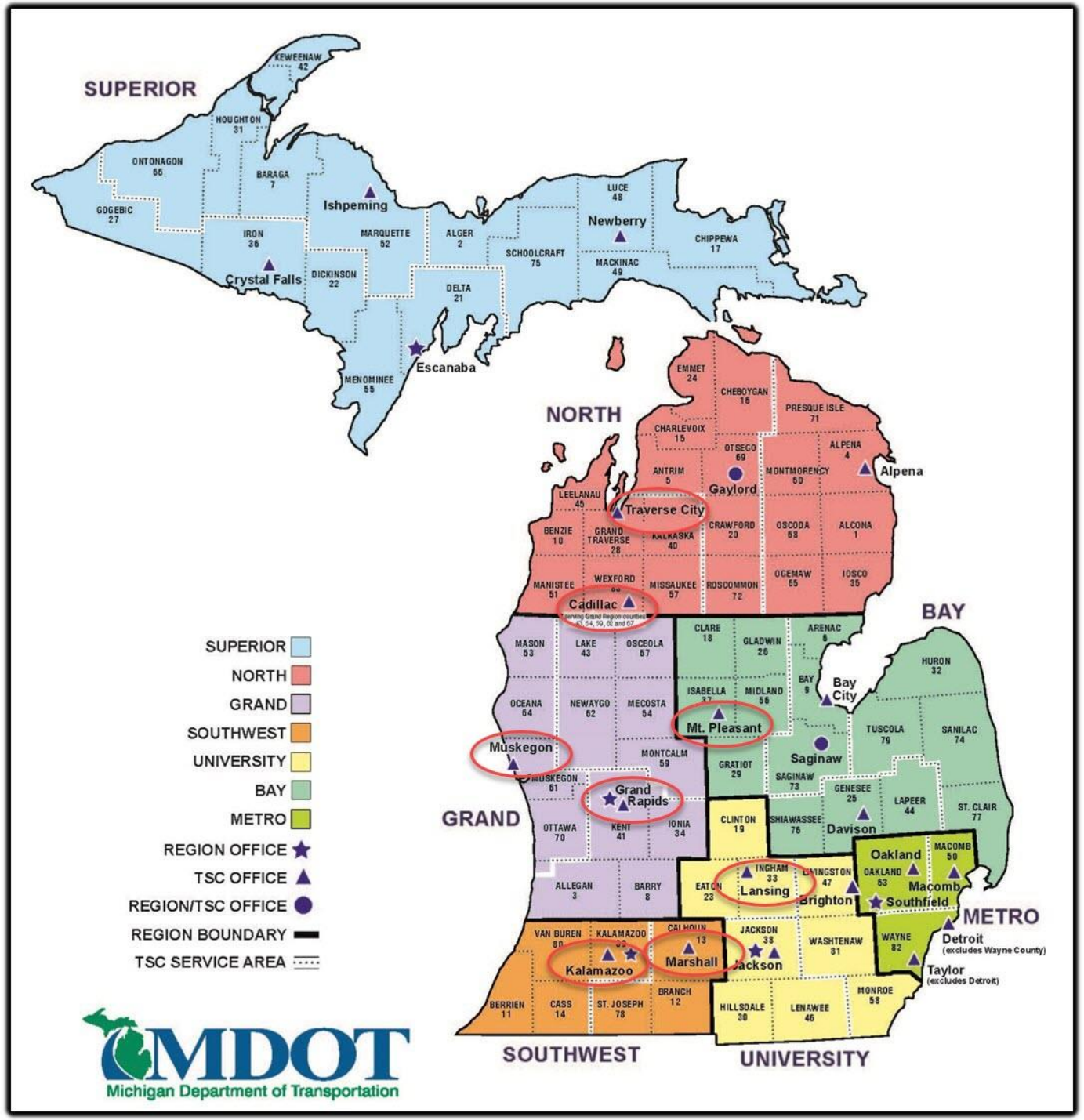
- Field Collection
- Process Validation
- Suggest Revisions
- Document “Proof of Program”

May 16, 2017 Kickoff Meeting

- Consultants & TSC Staff

Data Collection Focus Areas

- Kalamazoo
- Grand Rapids
- Cadillac



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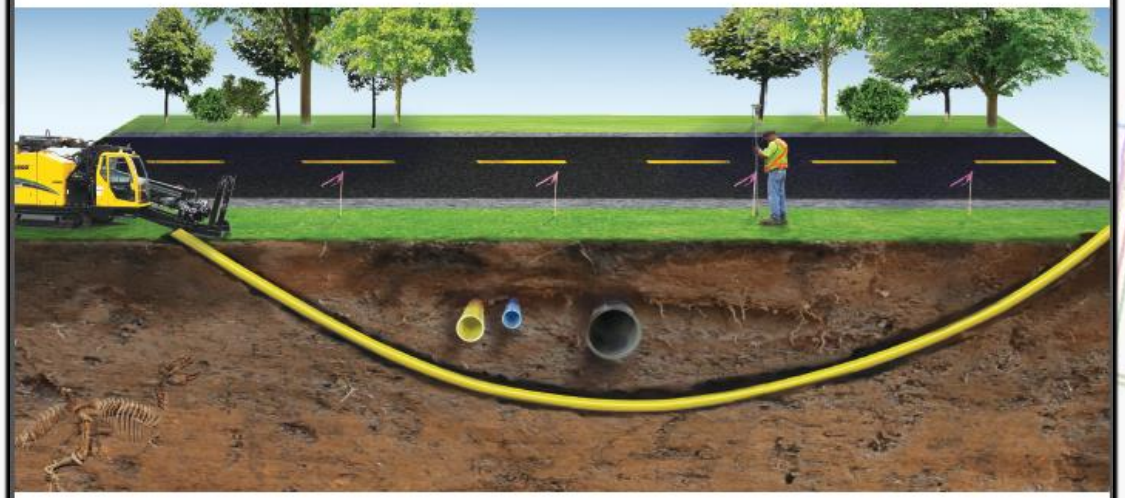
MDOT | Michigan Department of Transportation

SPECIAL CONDITIONS FOR UNDERGROUND UTILITY INSTALLATIONS



This permit has been selected to participate in the Michigan Department of Transportation's (MDOT) Geospatial Utility Infrastructure Data Exchange (GUIDE) proof of implementation initiative. GUIDE requires that the location of new underground utility installations be surveyed in X, Y and Z at the time of installation. In addition, various defined attributes will be recorded denoting the utility owner, size, type, etc. This data will be formatted and saved to MDOT's spatial database, where the data will be managed in a highly secure environment with controlled access.

MDOT Responsibilities:

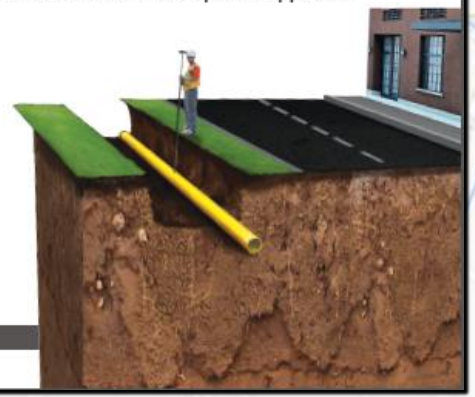
- Educate permit applicant on GUIDE and share best practices for coordinating the data collection.
- Data collection will be completed by a MDOT Survey Consultant at no cost to the permit applicant.

Permit Applicant Responsibilities:

- Participate in a pre-construction meeting.
- Fully cooperate and coordinate the installation activities with MDOT and its survey consultant.
- Participate in a post construction meeting and/or survey.

Additional Details:

The permit applicant's name, permit details, construction photos and GUIDE data may be included in a final report documenting the GUIDE proof of implementation results.



GUIDE

GEOSPATIAL UTILITY INFRASTRUCTURE DATA EXCHANGE

MDOT | Michigan Department of Transportation

EARN 3.0 CEH
GUIDE Phase III Data Collection Process Training

Tuesday, May 23rd, 2017
9:00a.m.-12:00p.m.
Michigan Department of Transportation
Office of Aeronautics
2700 Port Lansing Road
Lansing, MI 48906-2160

The Michigan Department of Transportation (MDOT) is undertaking phase III of its Geospatial Utility Infrastructure Data Exchange (GUIDE) initiative. Phase III involves field data collection and process validation of the January 2017 draft GUIDE Procedural Manual. The procedural manual defines the attributes and spatial accuracy in which permitted underground utility installations need to be collected, recorded and submitted for approval and storage. Industry representatives will participate in hands on training, walking them through the complete data collection process using Collector for ArcGIS and established surveying procedures.

Participants should come prepared with the following:

1. Laptop computer
2. Tablet device running Collector for ArcGIS (Android, Ios, or Windows10 only)

One set of user credentials will be provided for each participating organization. Credentials will allow each organization to connect to MDOT's spatial database engine through Collector for ArcGIS and the GUIDE web portal in order to contribute data to the proof of program phase.

Presented by:

Nick Lefke - Utility Coordination Specialist - MDOT

Mr. Lefke has statewide responsibilities overseeing the department's entire utility coordination program. He has been the GUIDE Project Manager since conception.

Eric Barden, PS – Spicer Group, Inc.

Mr. Barden is the principal in charge of Spicer Group's geospatial services group, and has been assisting MDOT in the development of the GUIDE standards and procedural manual.

Proof of Program

Initial Findings / Results:

- Challenges coordinating data collection
- Field data collection is the easy part
- Geodatabase modifications
- Modifications to improve web portal

GUIDE Proof of Program

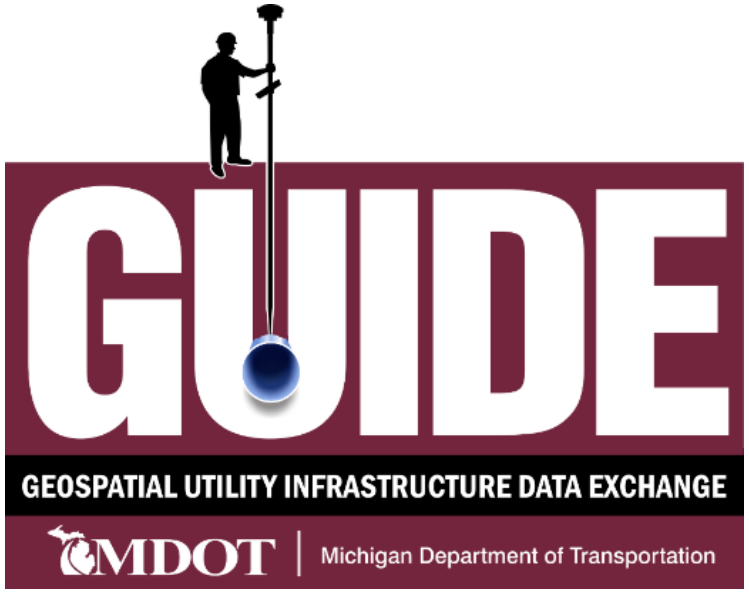
2018

MDOT
Michigan Department of Transportation

U.S. Department of Transportation
Federal Highway Administration

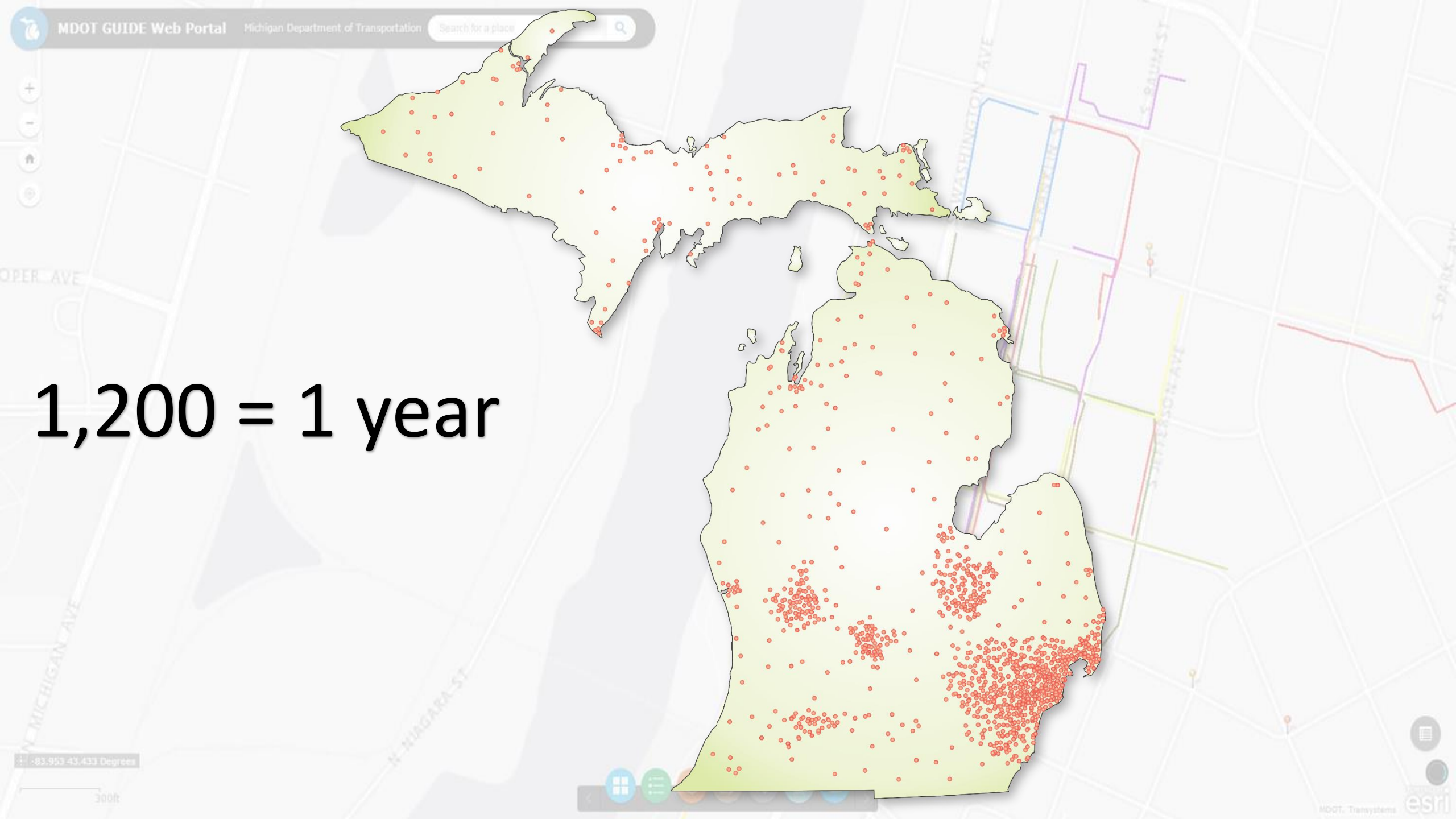
American Association of State Highway and Transportation Officials
AASHTO
The Voice of Transportation

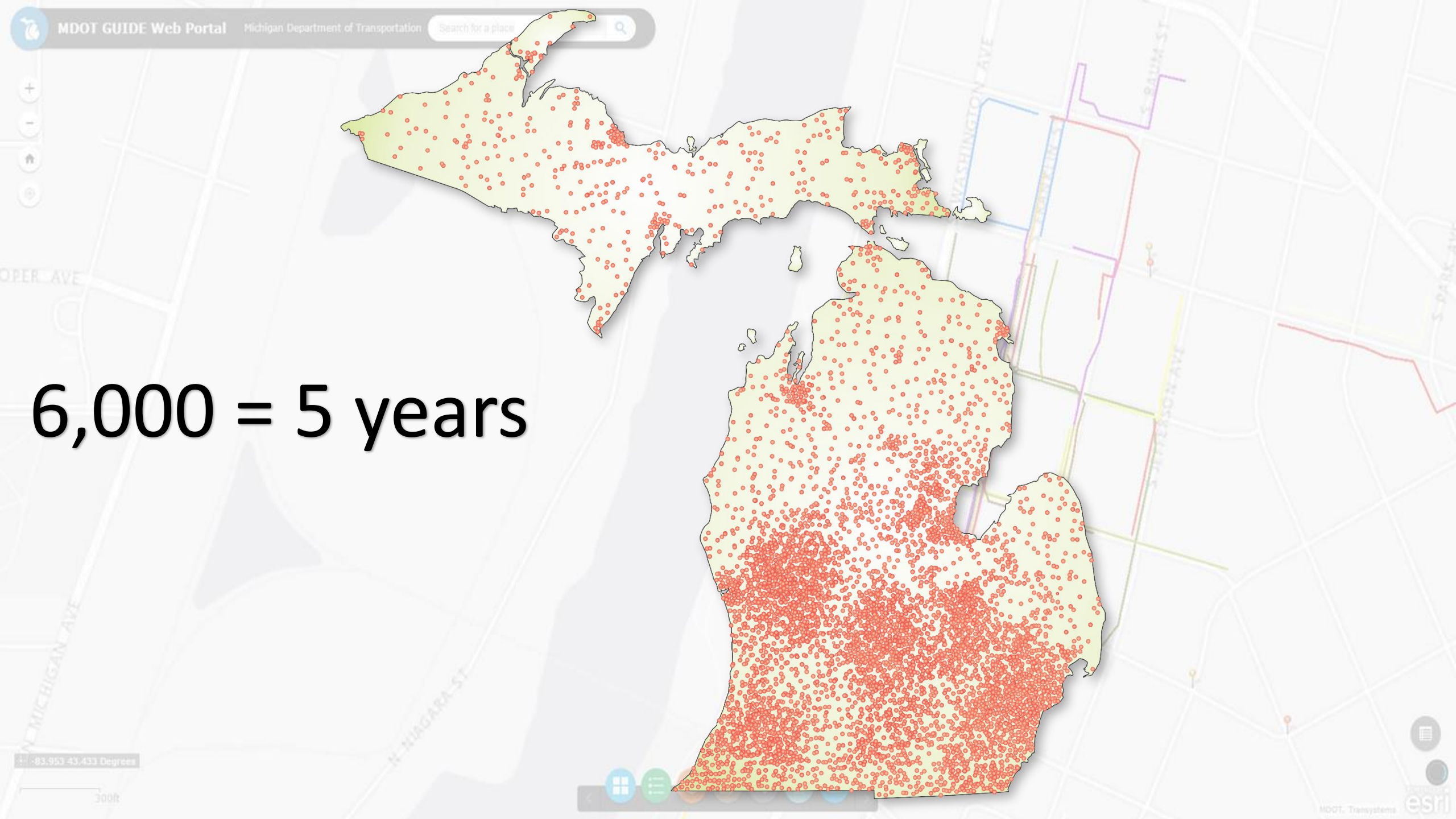
SHRP 2
STRATEGIC HIGHWAY RESEARCH PROGRAM
Accelerating solutions for highway safety, renewal, reliability, and capacity



Implementation Challenges

- Resources
- Utility Resistance
- Varying Standards
- Legal Considerations


MDOT GUIDE Web Portal
Michigan Department of Transportation
1,200 = 1 year


MDOT GUIDE Web Portal
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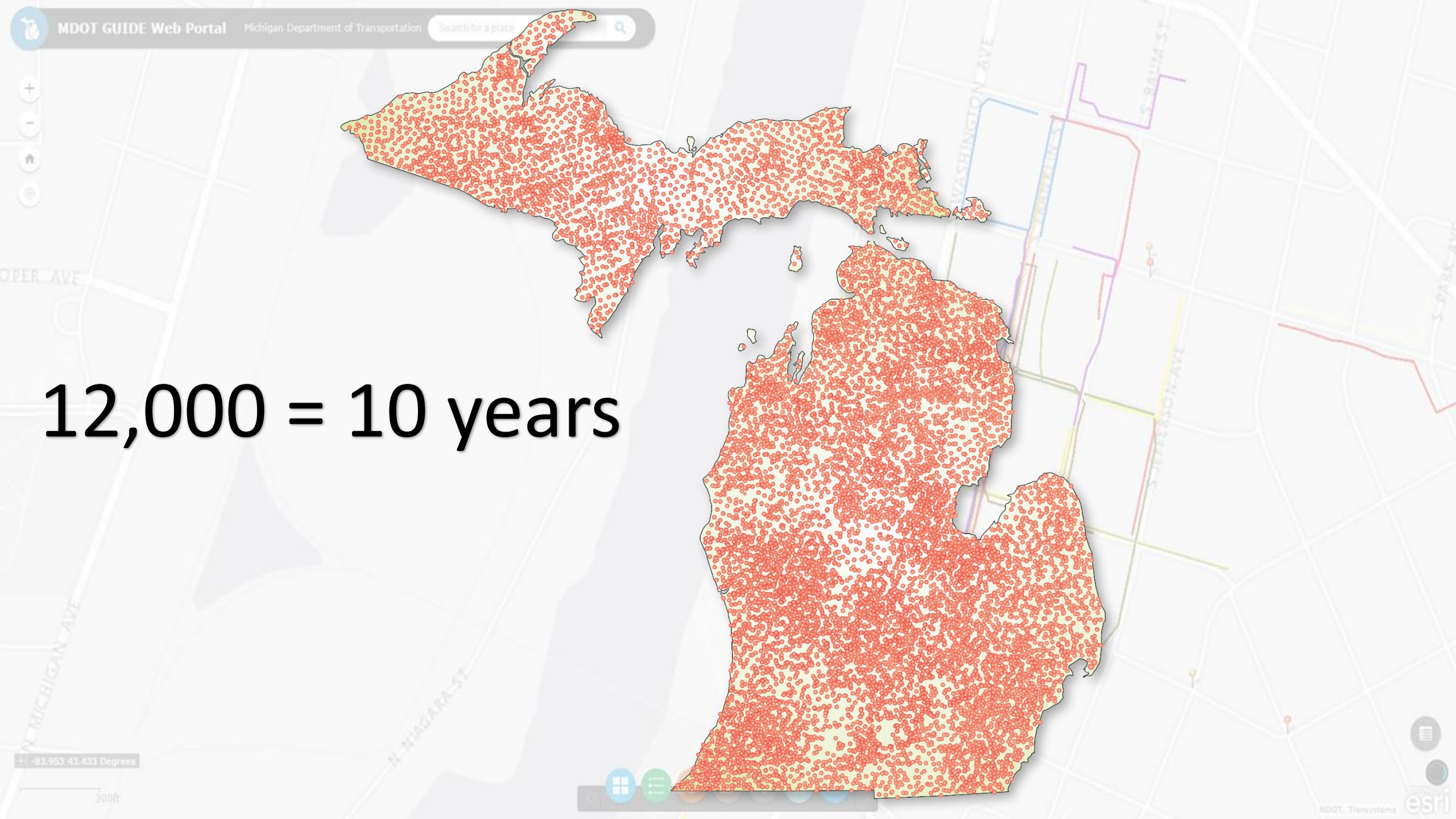
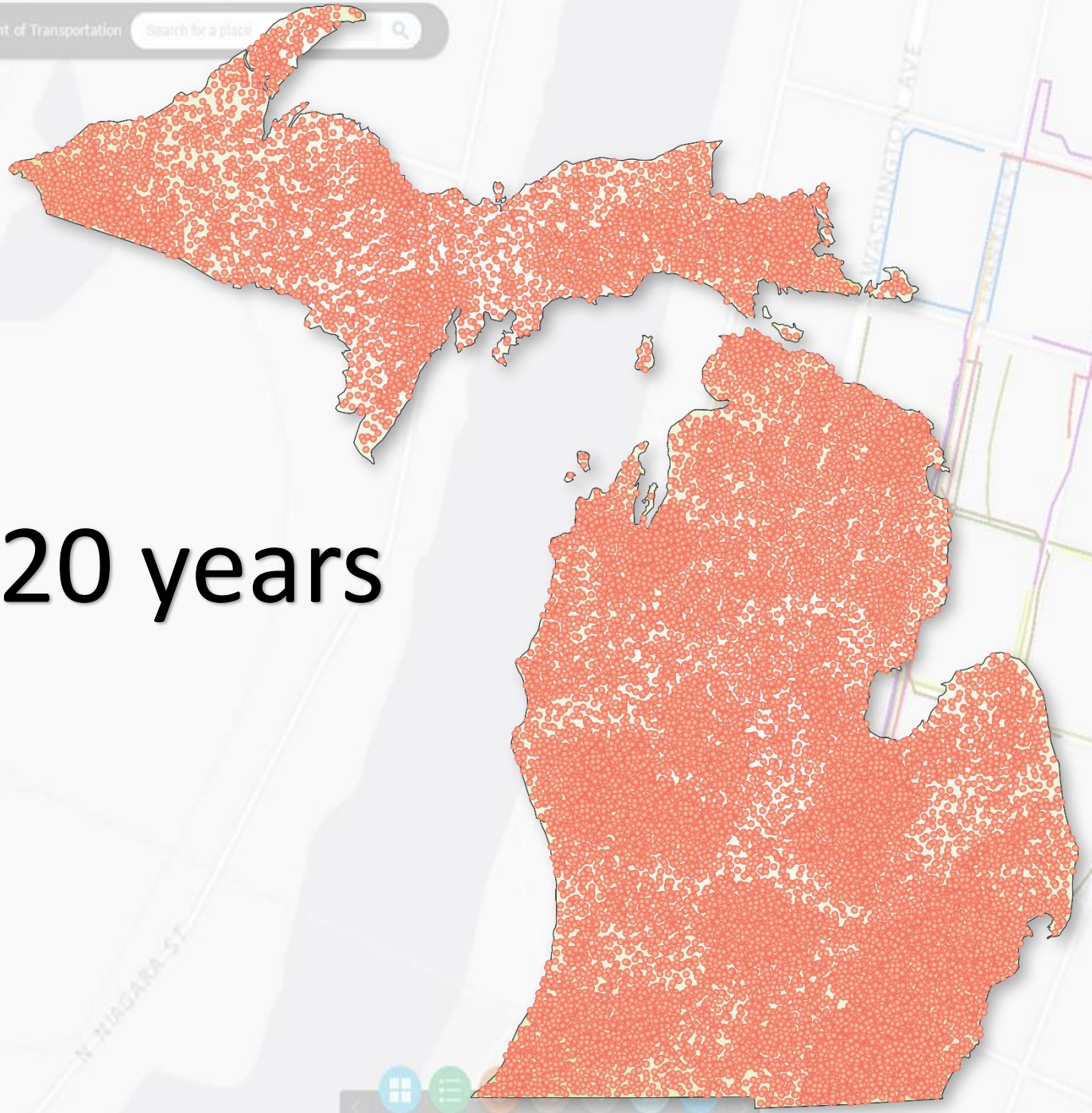
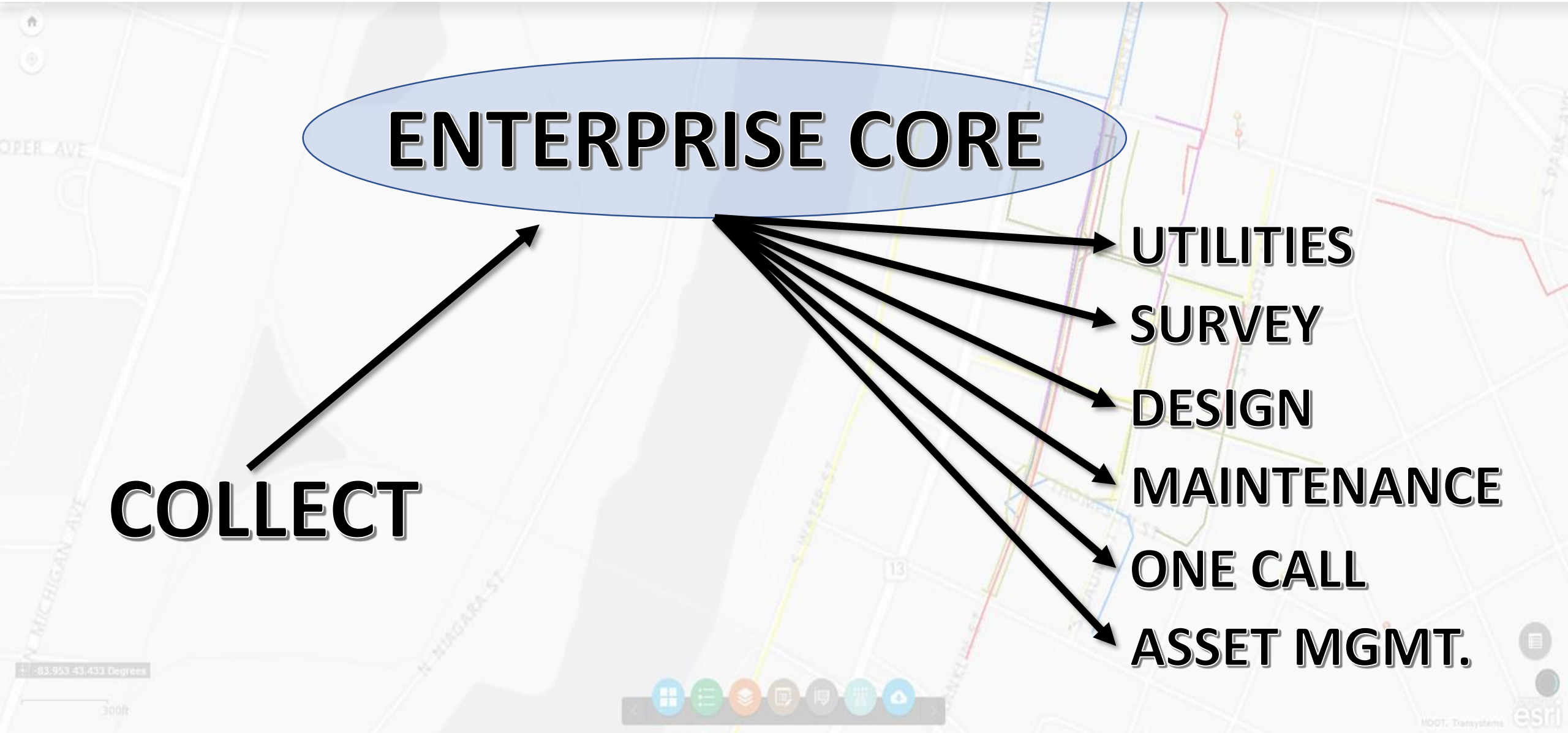
6,000 = 5 years

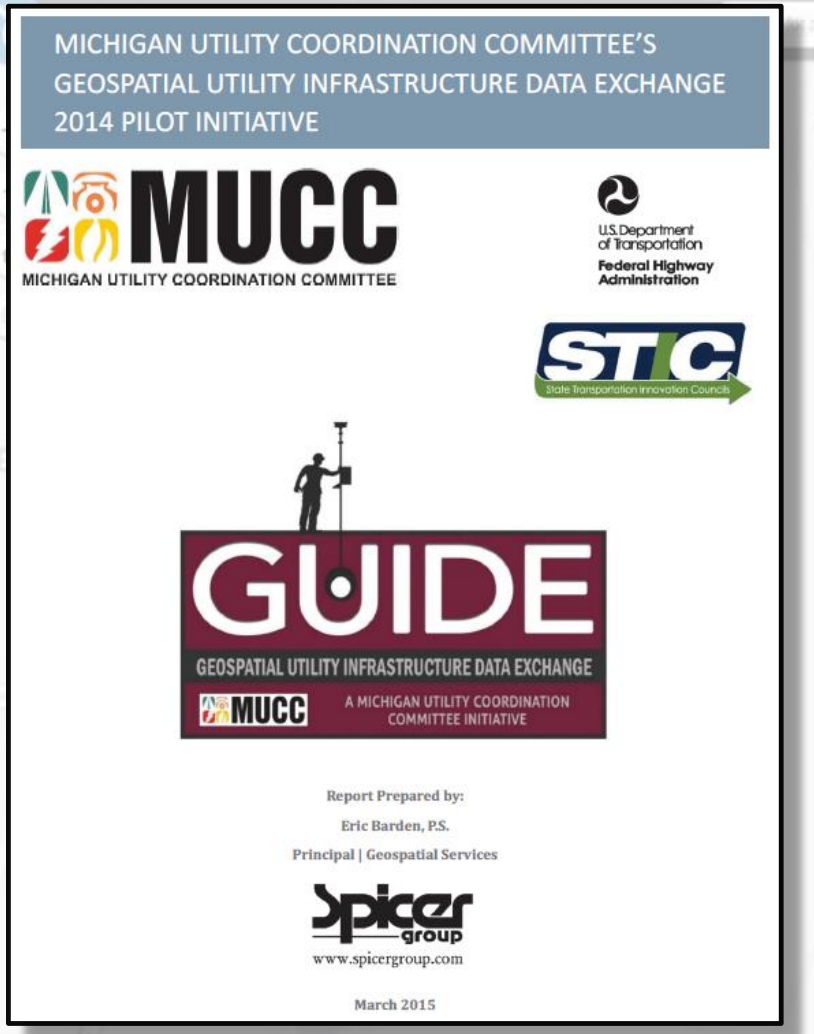

MDOT GUIDE Web Portal
Michigan Department of Transportation
Search for a place
12,000 = 10 years



24,000 = 20 years

Collect data once, collect it for everyone!





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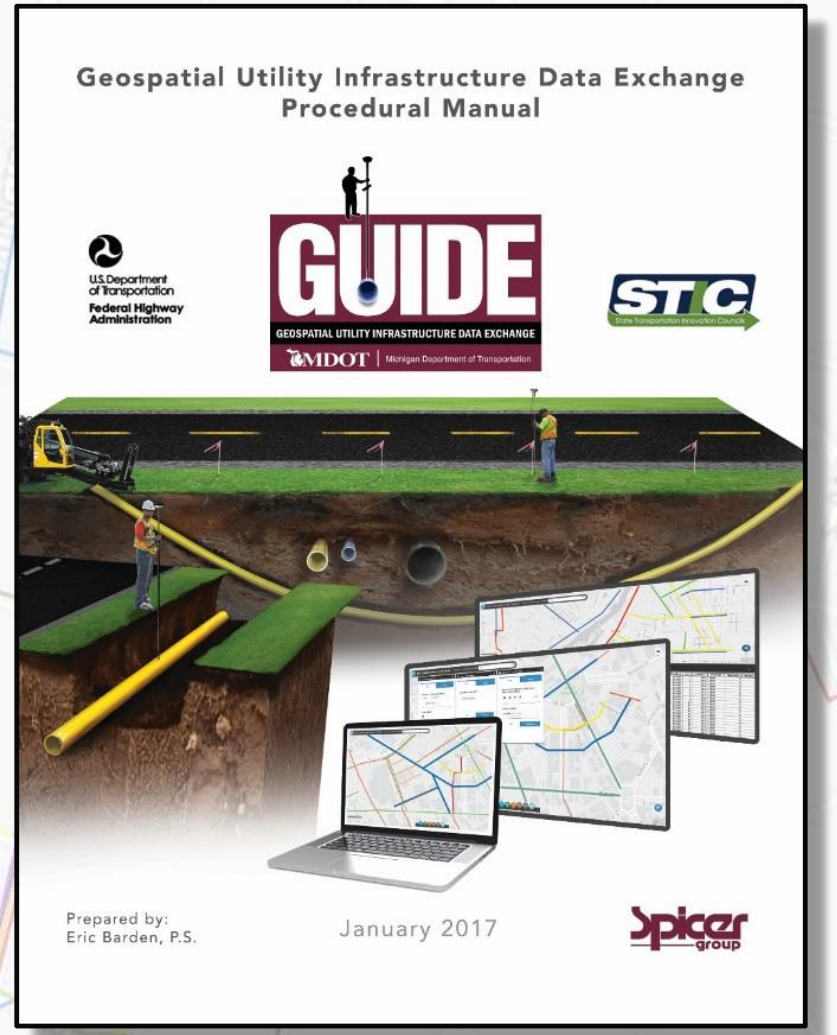

http://www.michigan.gov/documents/mdot/GUIDE2014_510082_7.pdf

http://www.michigan.gov//documents/mdot/GUIDE_Procedural_Manual__2017_Draft_547744_7.pdf