# A Case Study from Huntington WV: Collecting, Extracting and Visualizing Assets using a Mobile Mapping Foundation

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Vice President, Transcend

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# Introduction

- Stakeholders
  - KYOVA Interstate Planning Commission
  - West Virginia DOT
  - FHWA
- Data Consumers
  - KYOVA Data Holder
  - Pilot Project Extended to other MPOs
  - DOT Planning Division, Engineering Division
  - Engineering Consultants

# Overview

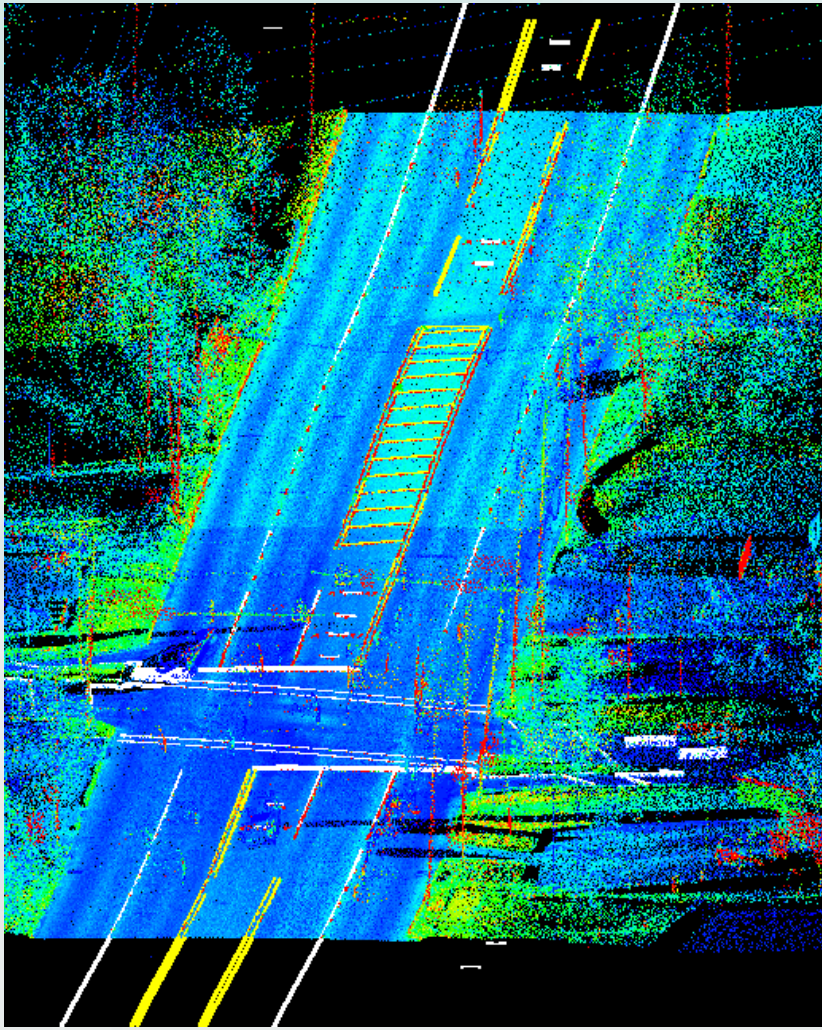
- Products
  - Comprehensive Video Log
  - Accurate, Complete LiDAR Point Cloud
  - Rear Camera Pavement Camera
- Features Extracted
  - Sidewalks
  - Local Signage
  - Traffic Signals
  - Trees in Planting Containers
  - Storm Sewer Inlets
- Data Uses
  - Asset Inventory
  - Sidewalk Assessment
  - As- Is Conditions for Engineering Projects

# MIRE Elements
# 127 out of 202

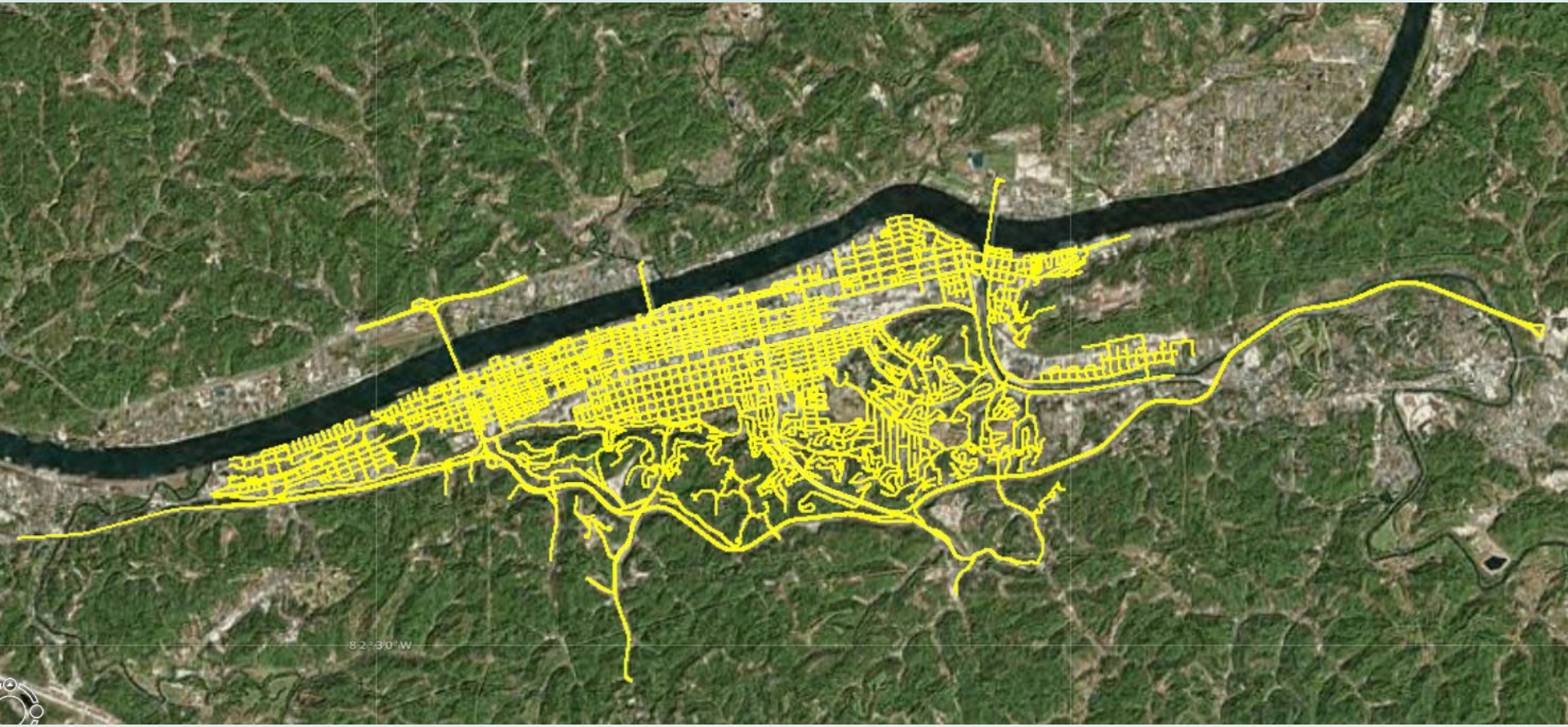
## I. Roadway Segment Descriptors

## I.B. Segment Classification

23. Surface Type
24. Total Paved Surface Width
31. Number of Through Lanes
32. Outside Through Lane Width
33. Inside Through Lane Width
34. Cross Slope
35. Auxiliary Lane Presence/Type
36. Auxiliary Lane Length
37. HOV Lane Presence/Type
38. HOV Lanes
39. Reversible Lanes
40. Presence/Type of Bicycle Facility
41. Width of Bicycle Facility
42. Number of Peak Period Through Lanes
43. Right Shoulder Type
44. Right Shoulder Total Width



# City of Huntington- Project Scope

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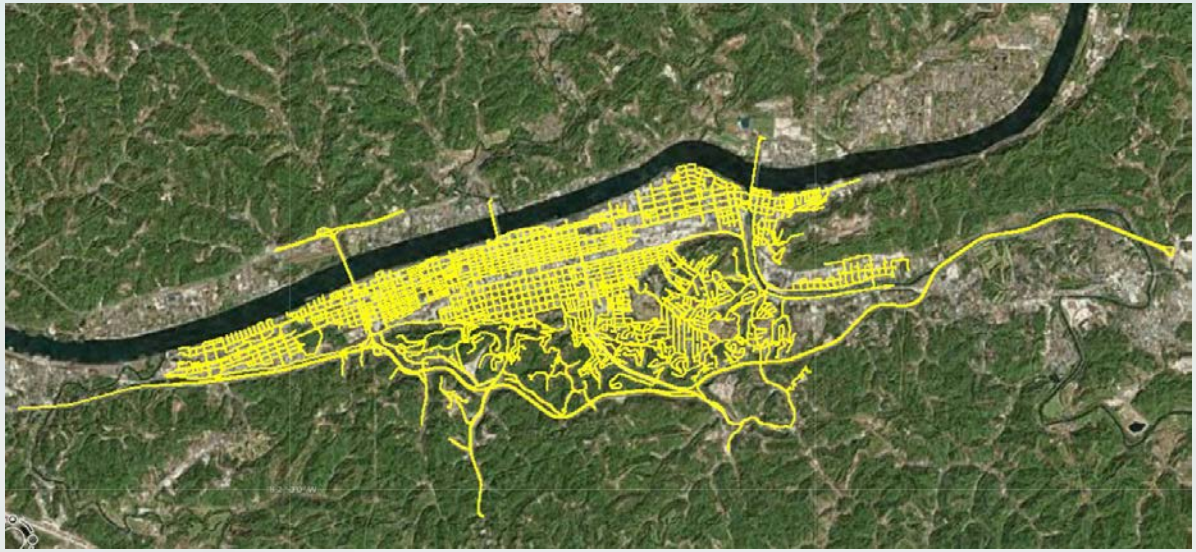
# City of Huntington- Project Scope

- 281 Linear Miles
- 5 Days of Scanning
- 40 Hours of Post Processing
- 8 Weeks of Extraction



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# City of Huntington- Project Scope

- Local Signs 10,336
- Signals 1,064
- Storm Inlets 3,374
- Tree Planters 259
- Sidewalks 964,358.92 feet

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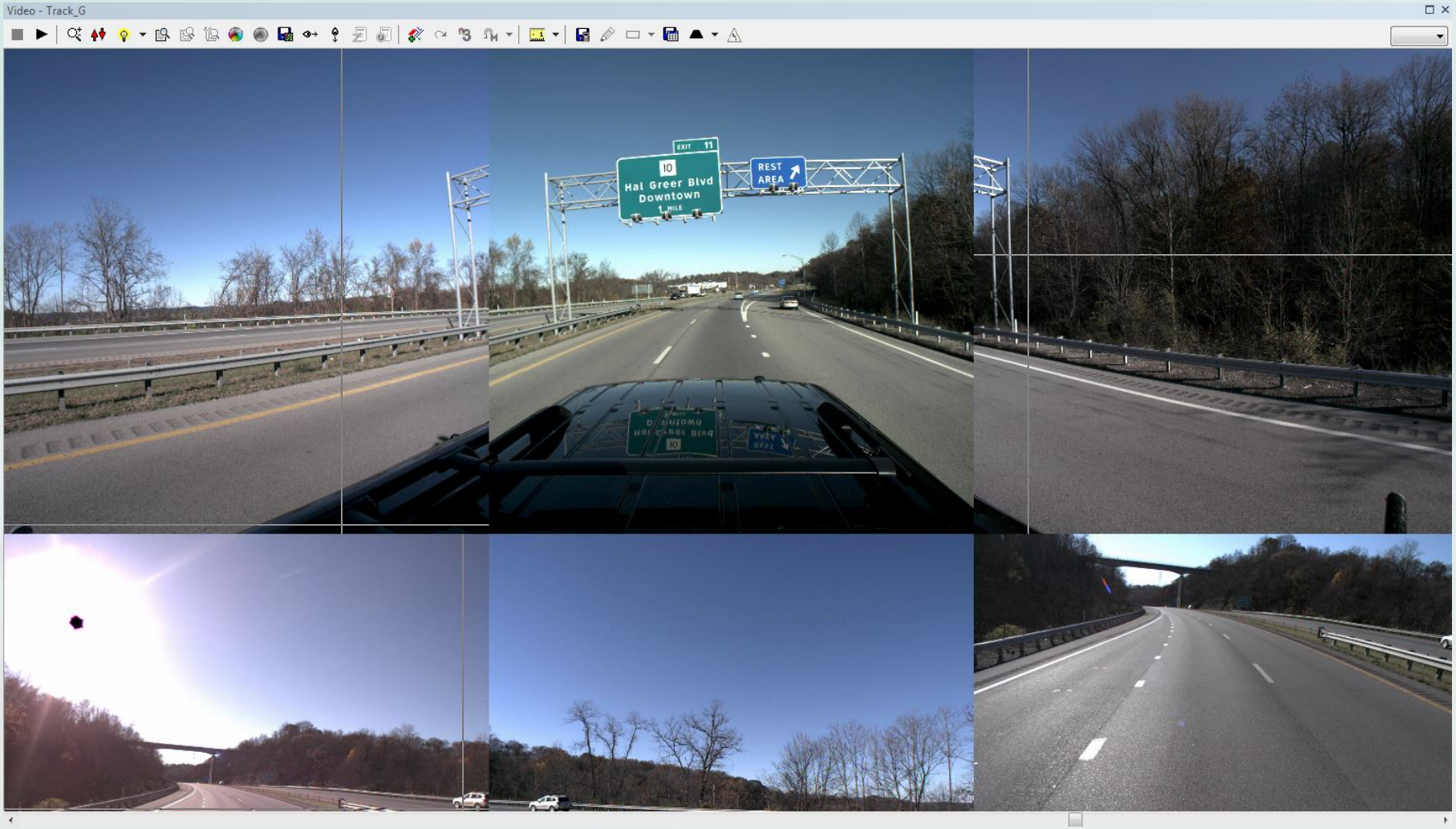
# City of Huntington- Results

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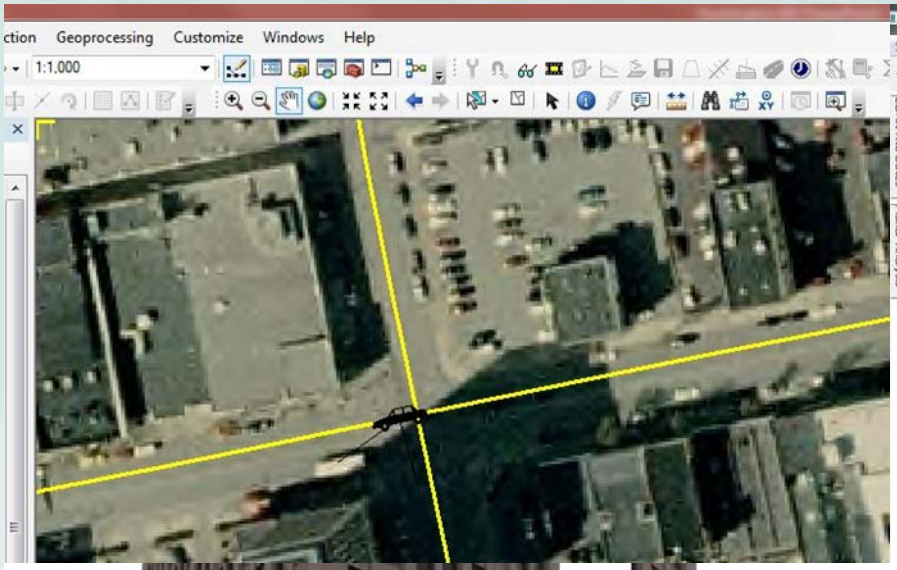
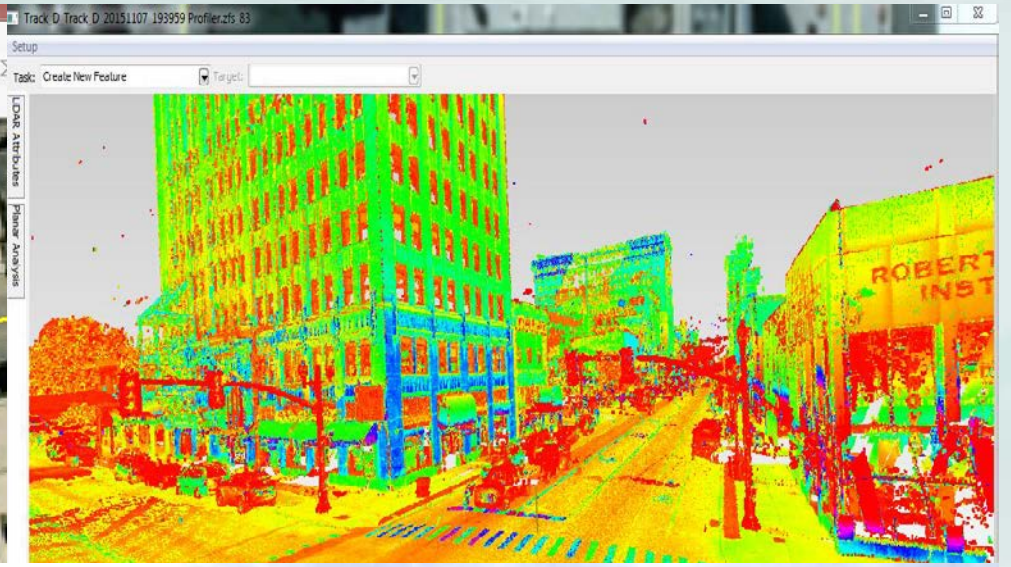
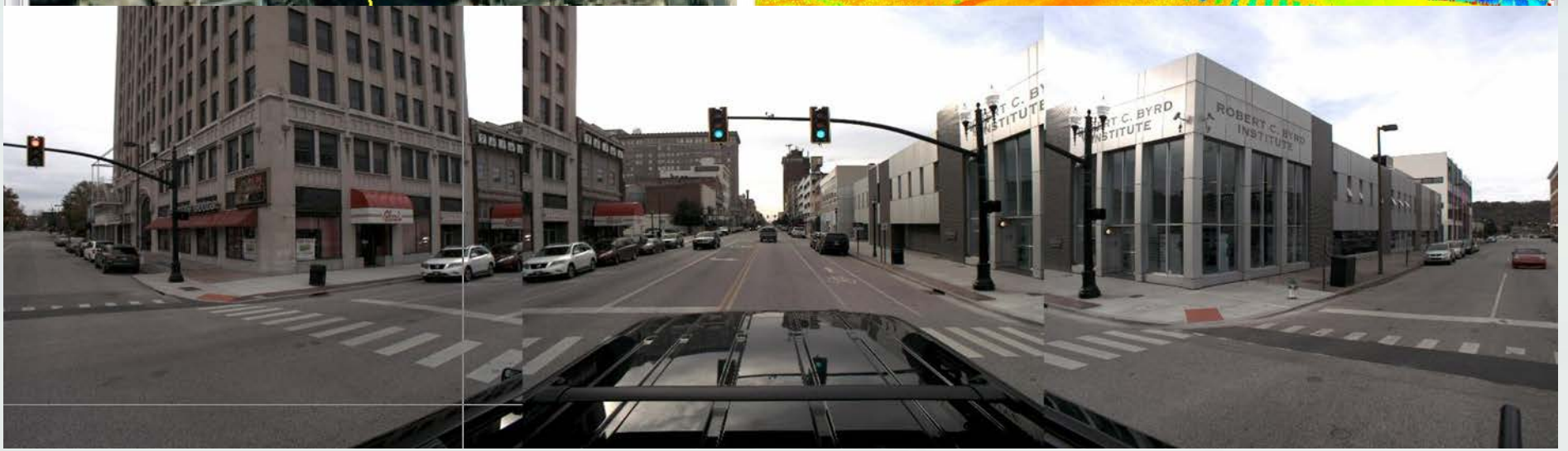
# City of Huntington- Results

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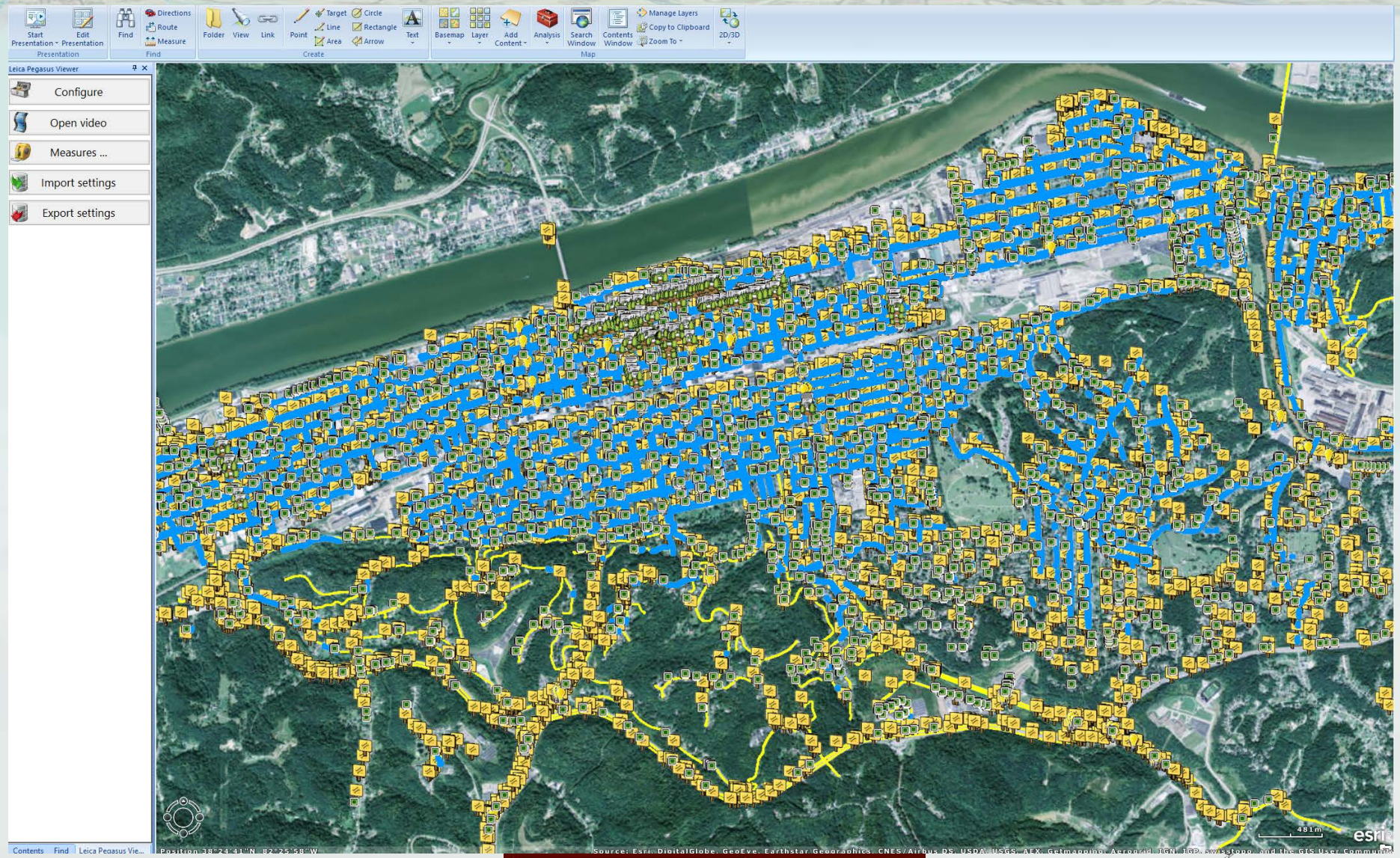
# City of Huntington- Results

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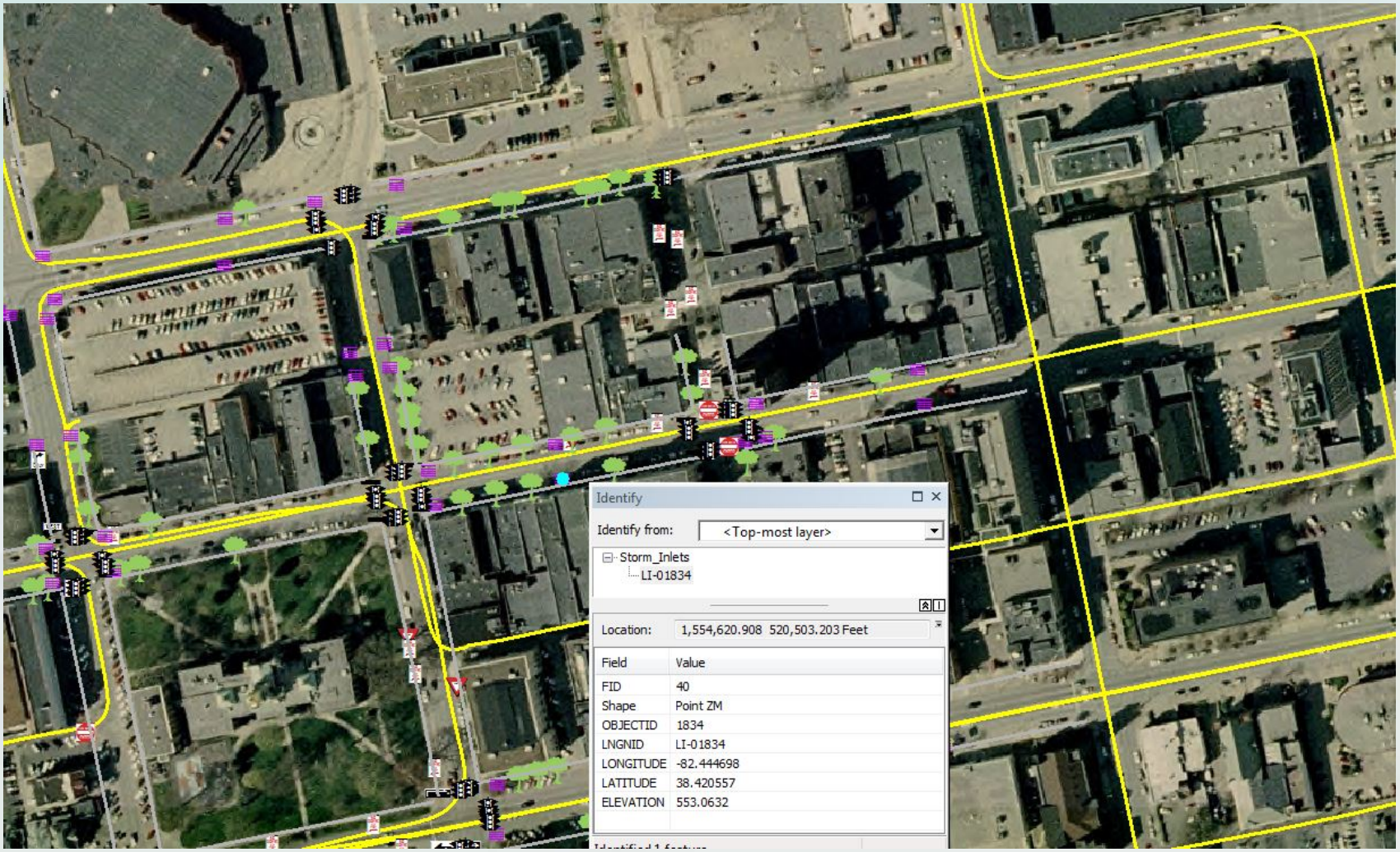
# City of Huntington- Results

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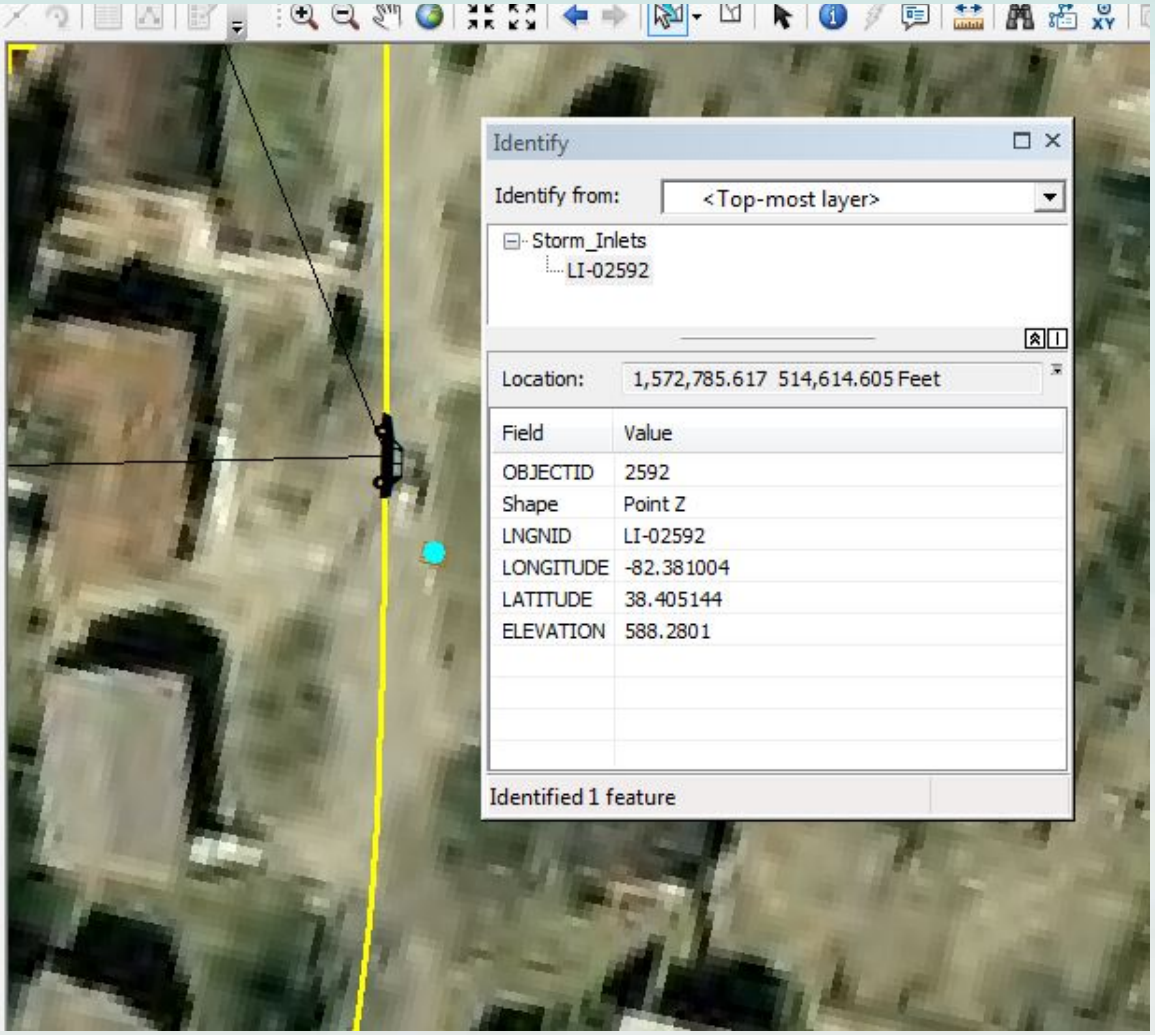
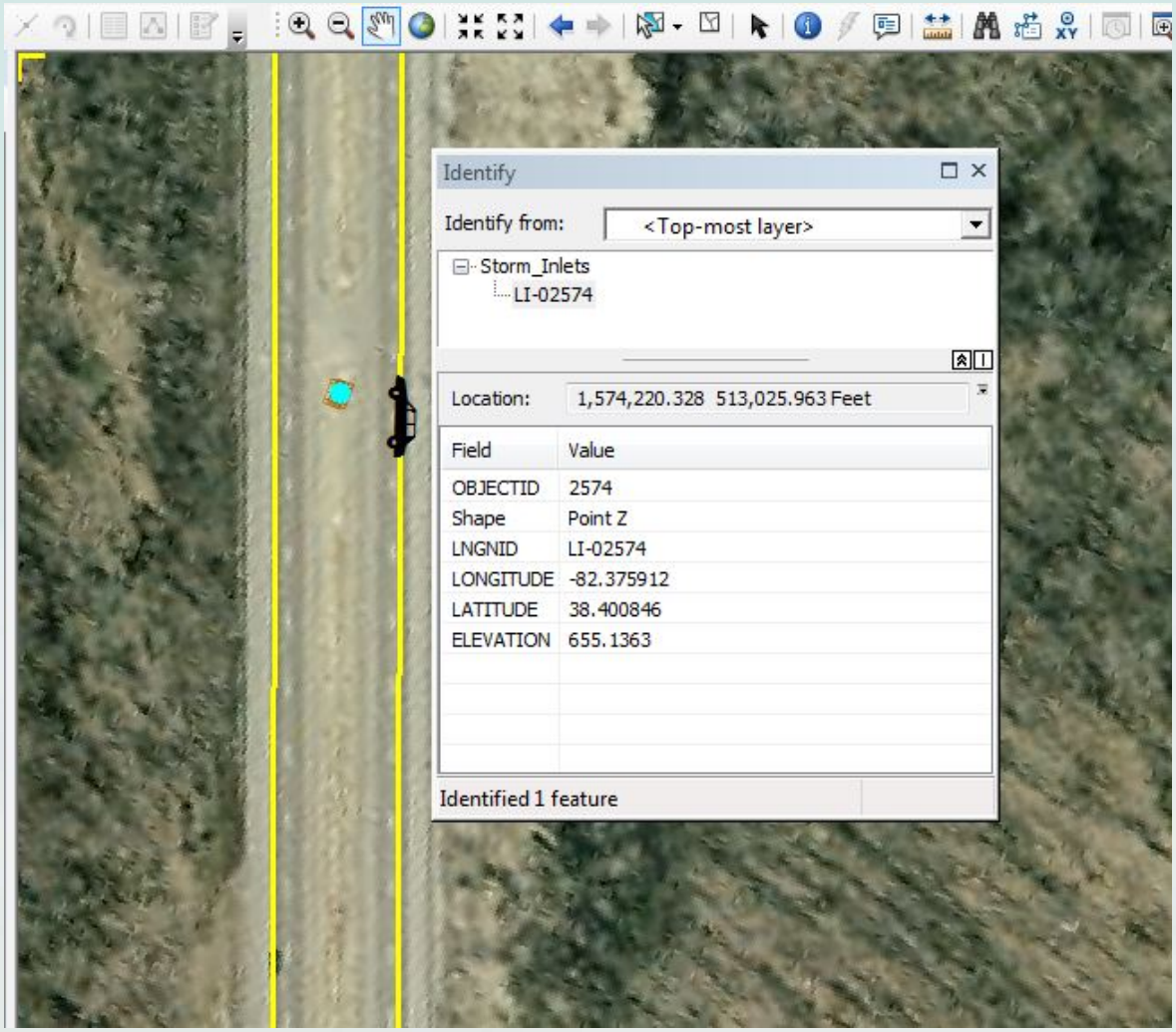
# City of Huntington- Results



# City of Huntington- Results

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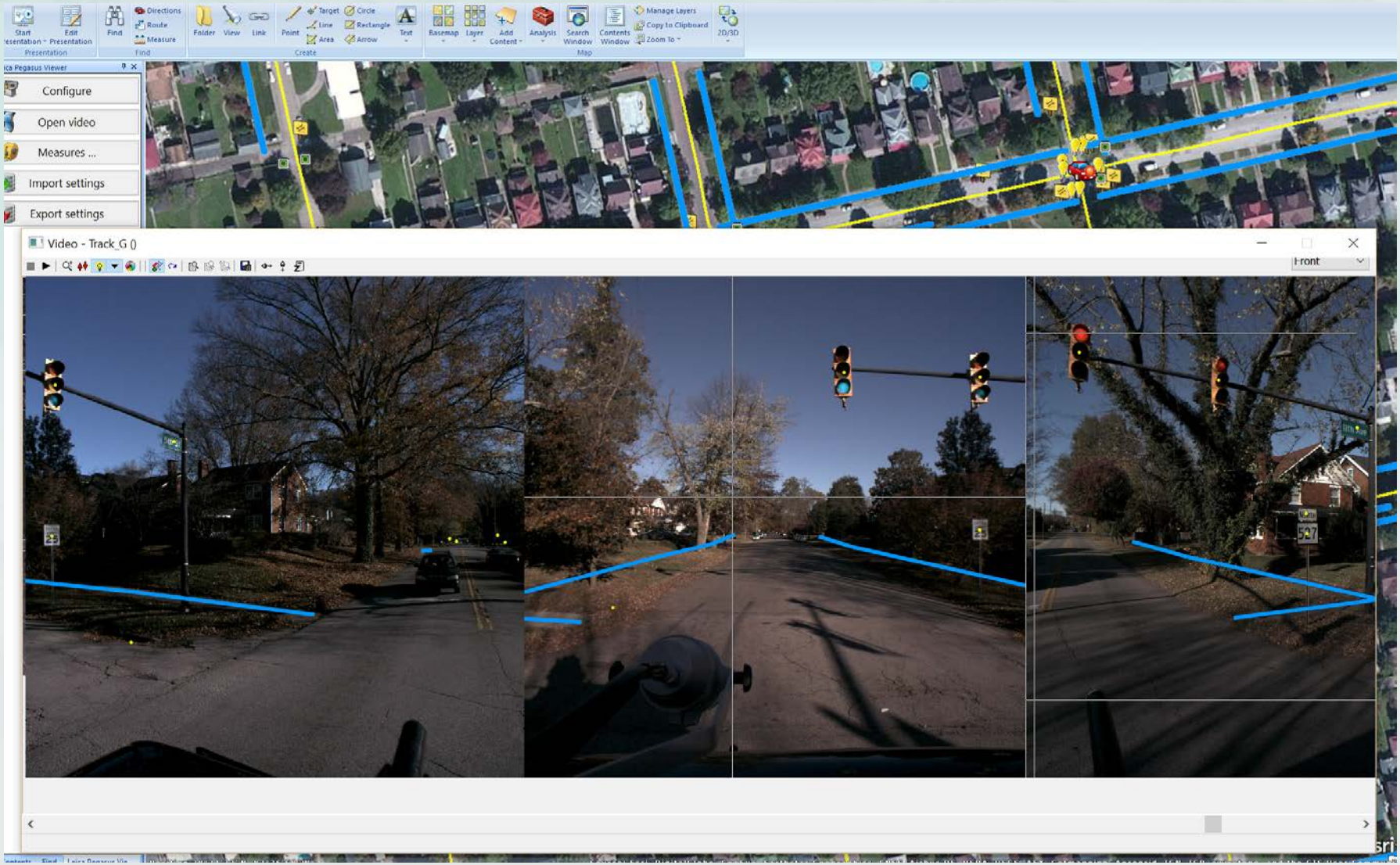
# City of Huntington

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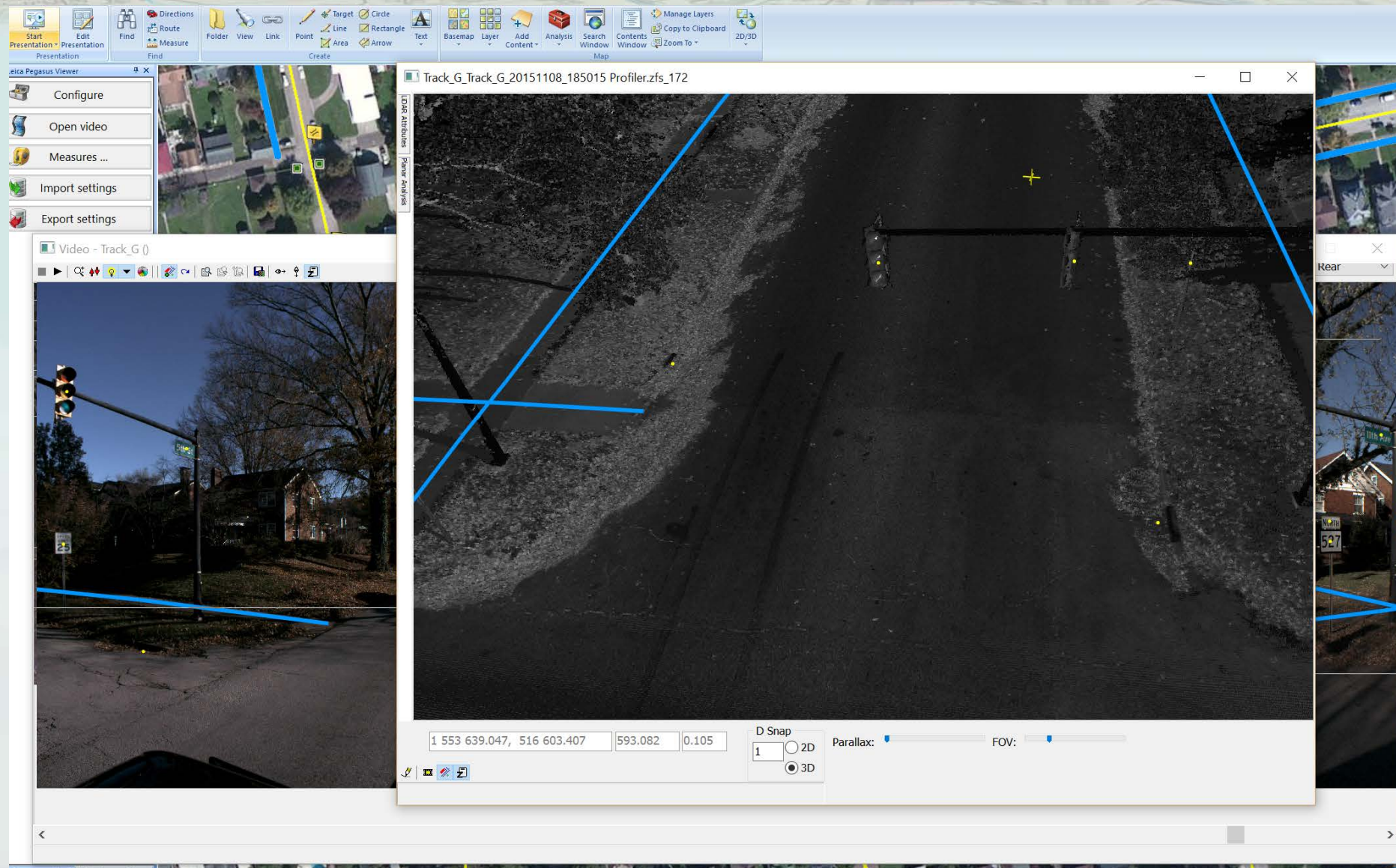


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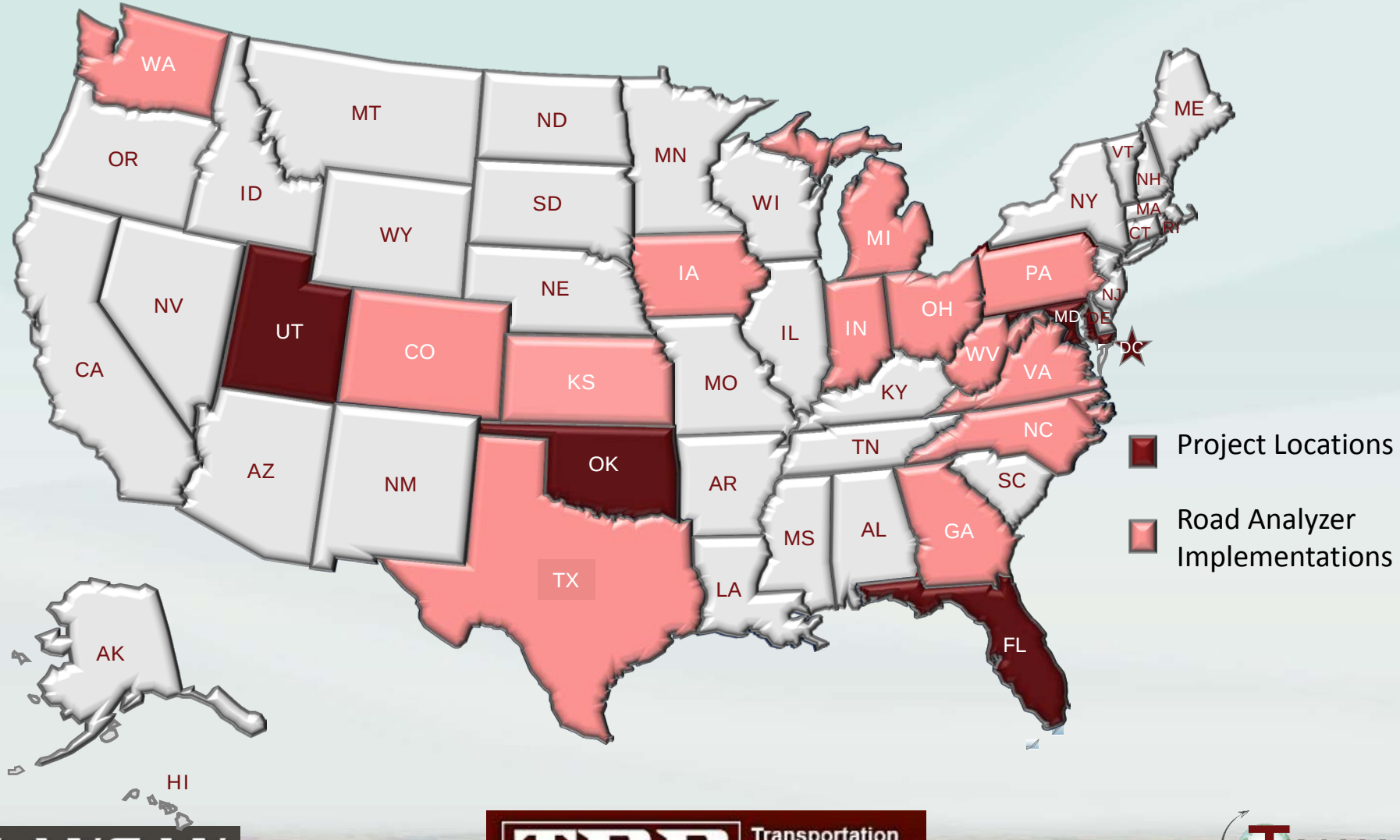
# What is Road Analyzer?

- Road Analyzer is a tool for visualizing and analyzing assets and events that occur along a route.
- It's a web browser application.
- It does not require GIS or DB expertise to use it.
- Connect to your data source via ArcGIS Server map services, and get started.

# Transcend Road Analyzer Locations

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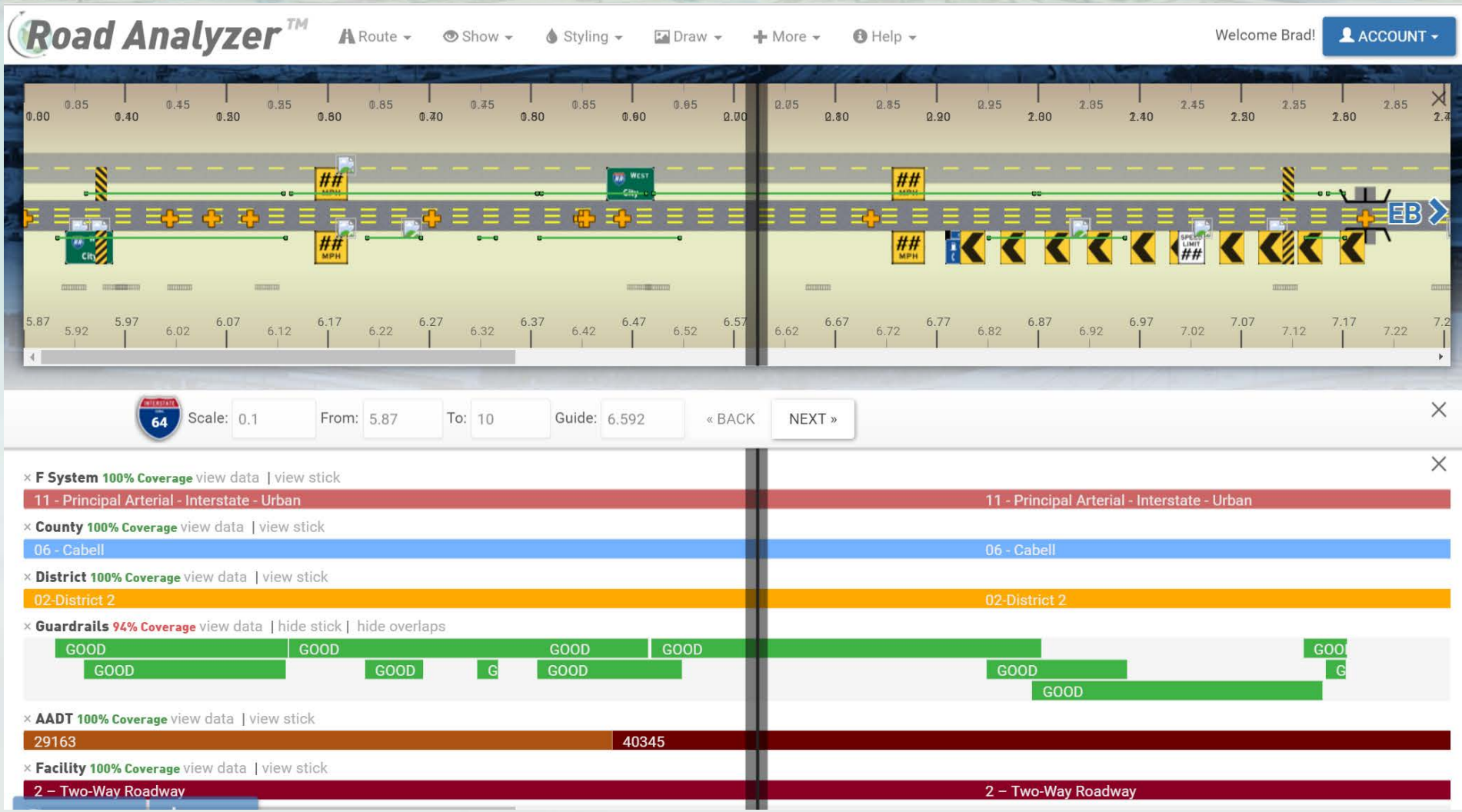
# Road Analyzer

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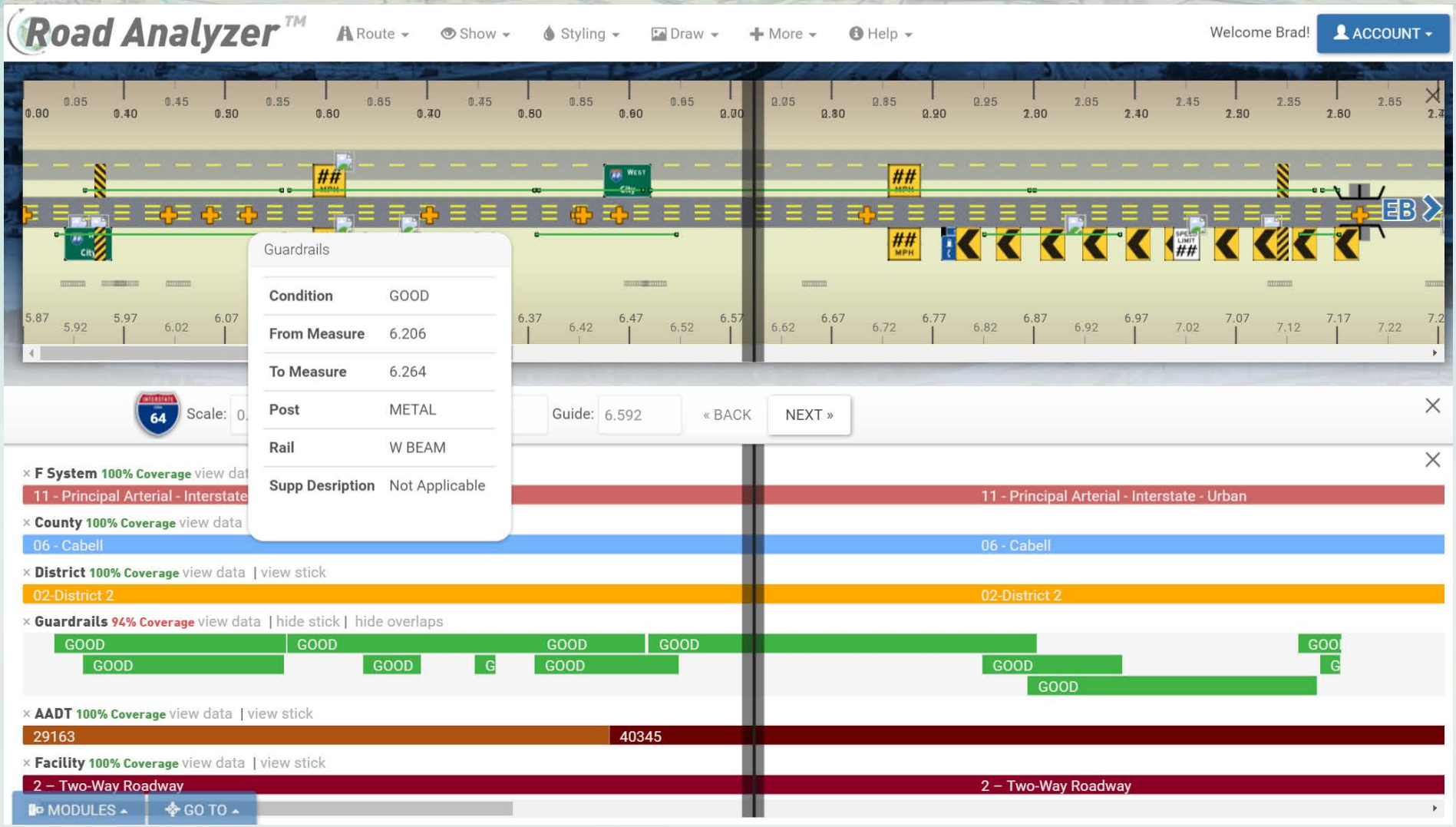
# Road Analyzer

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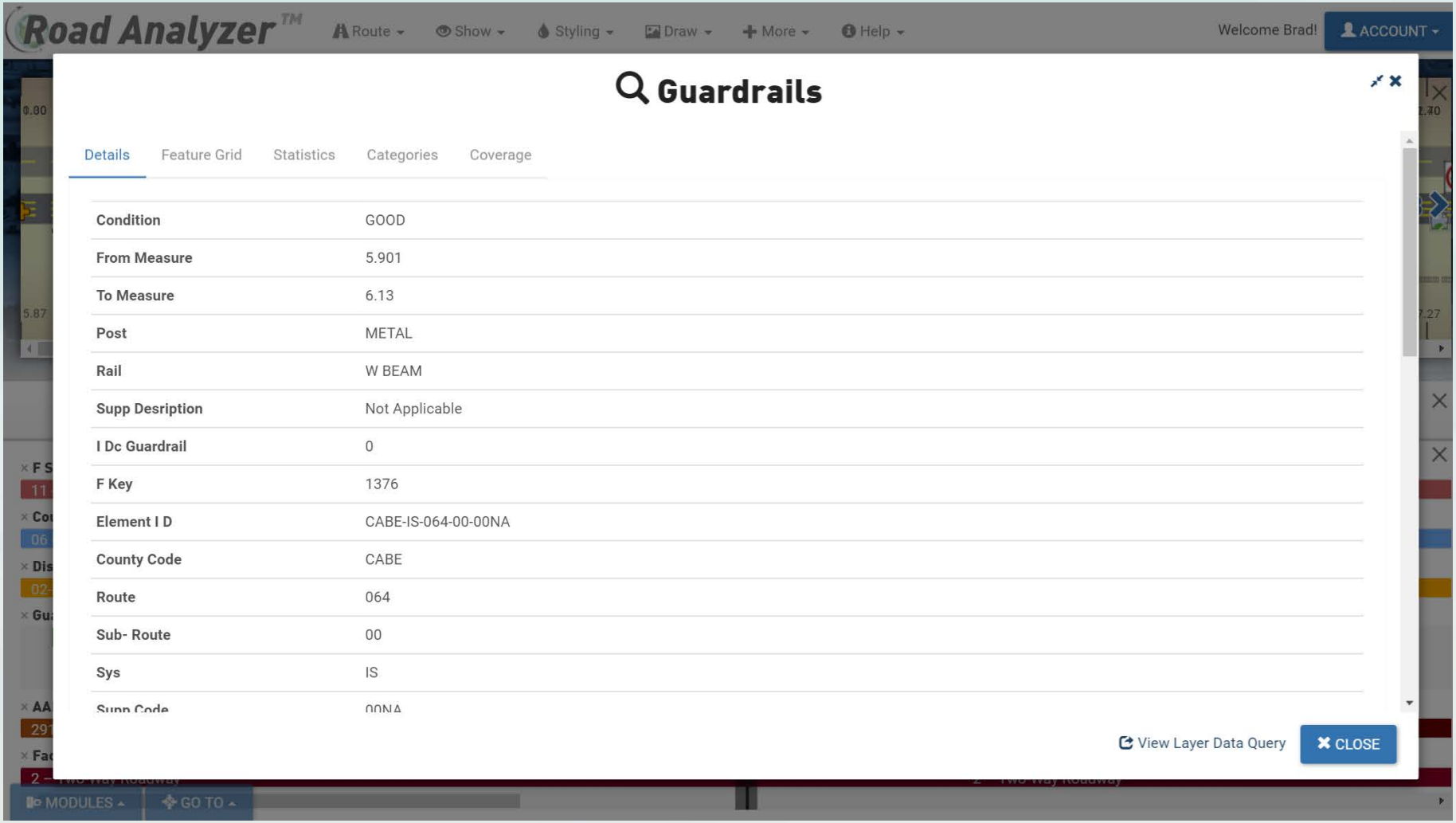
# Road Analyzer

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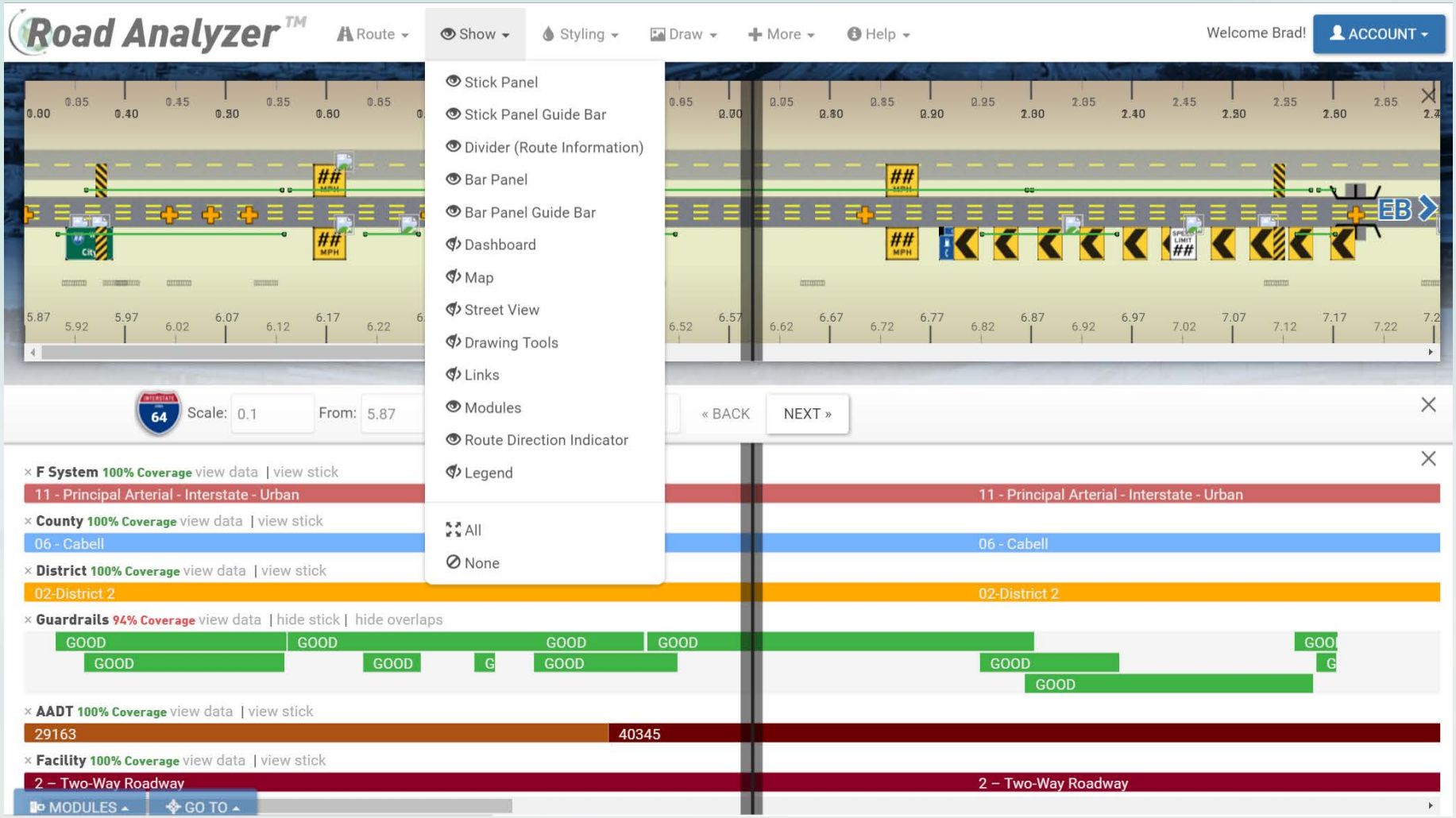
# Road Analyzer

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# Survey Grade Accuracy Process

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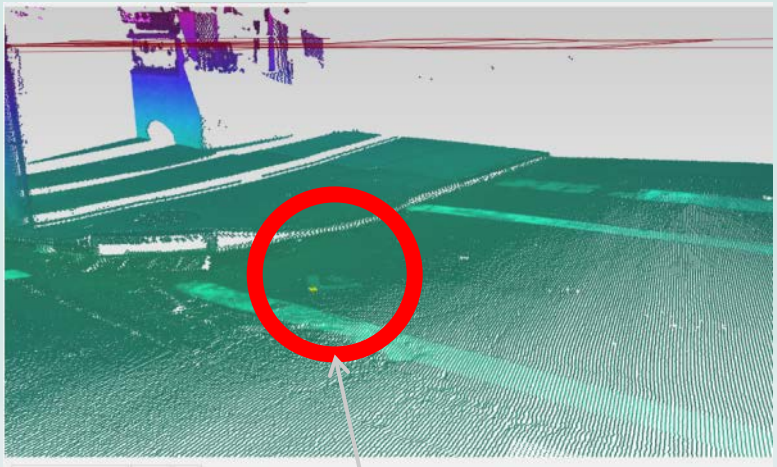
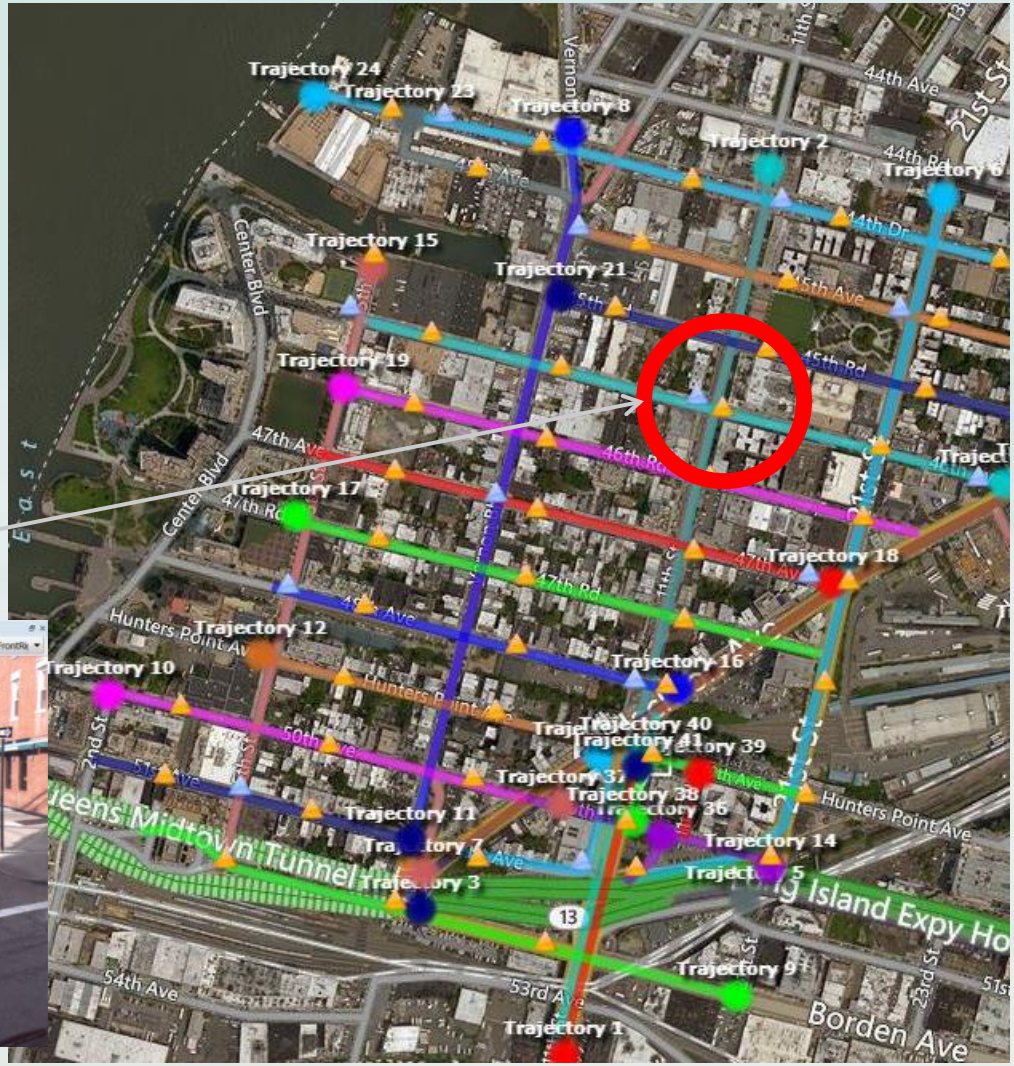
# Acquisition Pre/Post Planning



Survey Control Points

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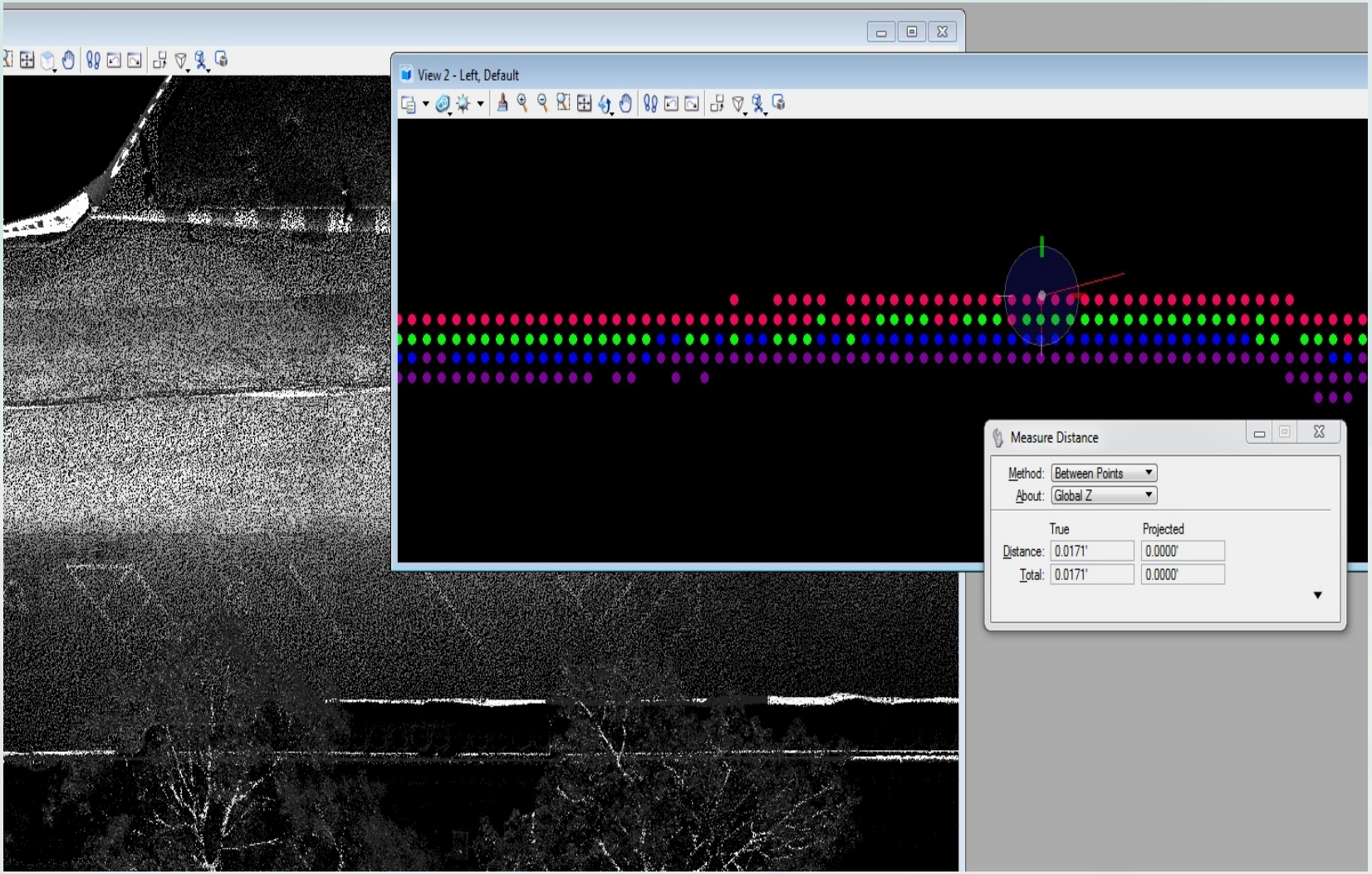
# Initial Results

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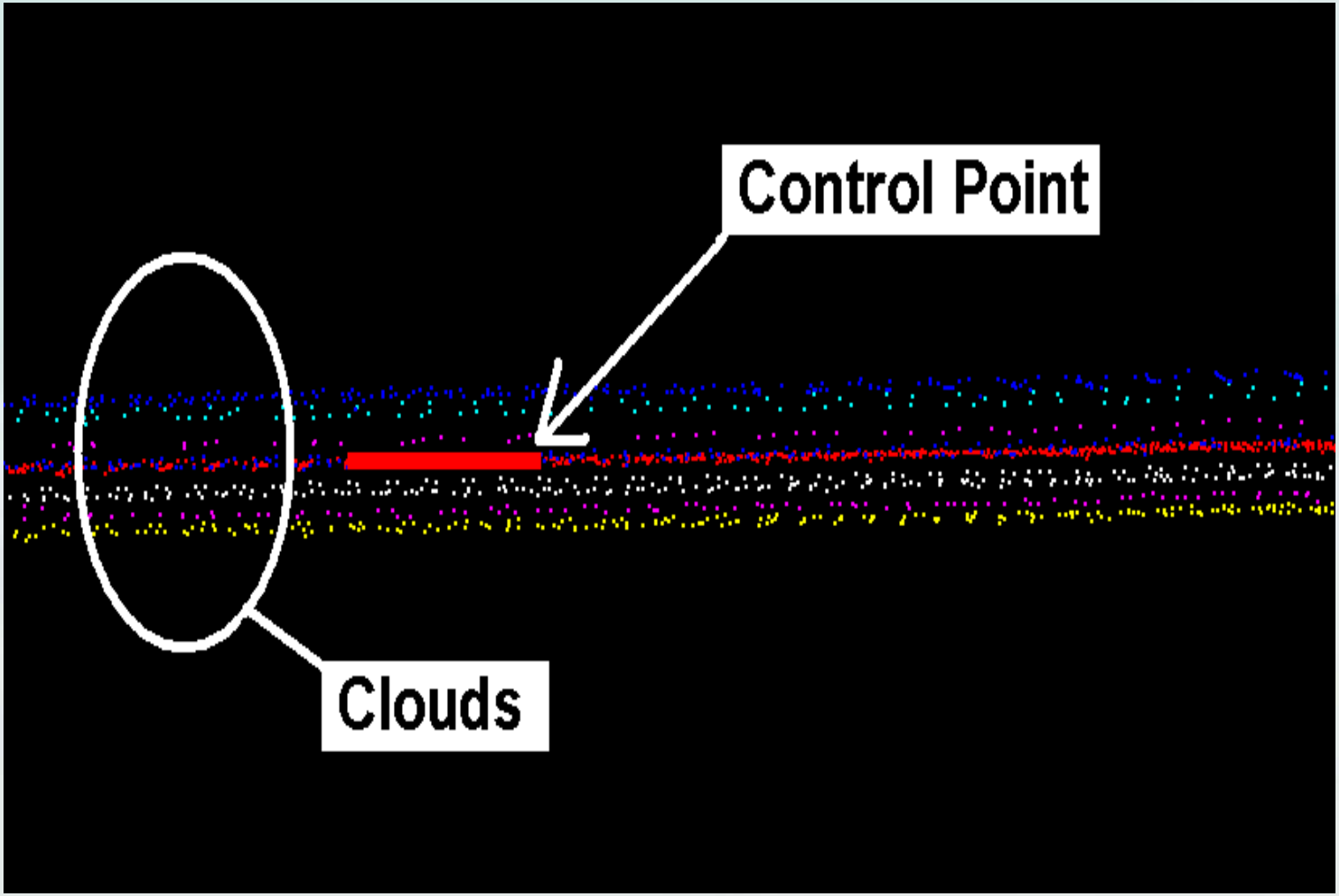
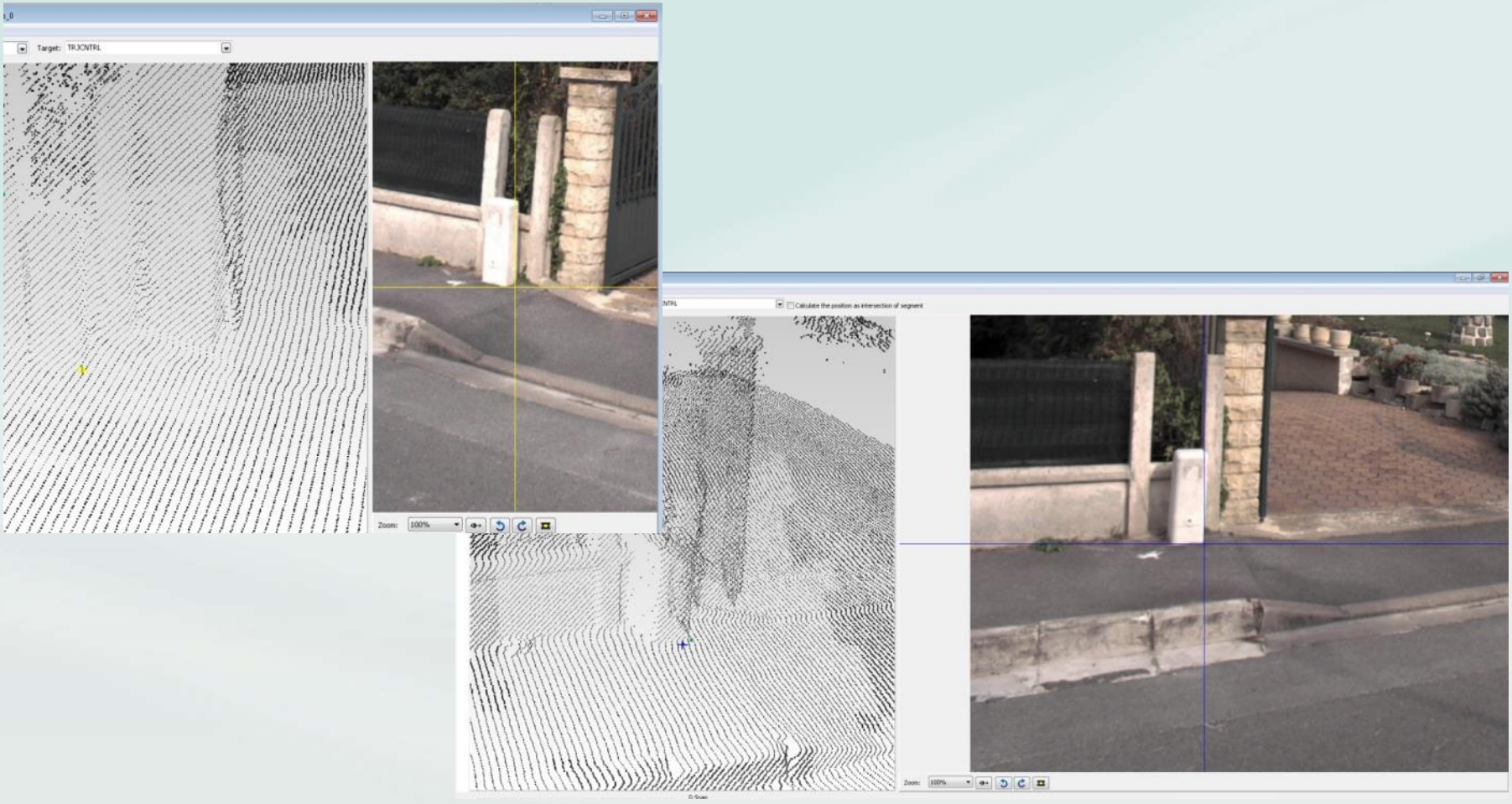
# Clouds and Control Alignment



# LiDAR Point Cloud Alignment



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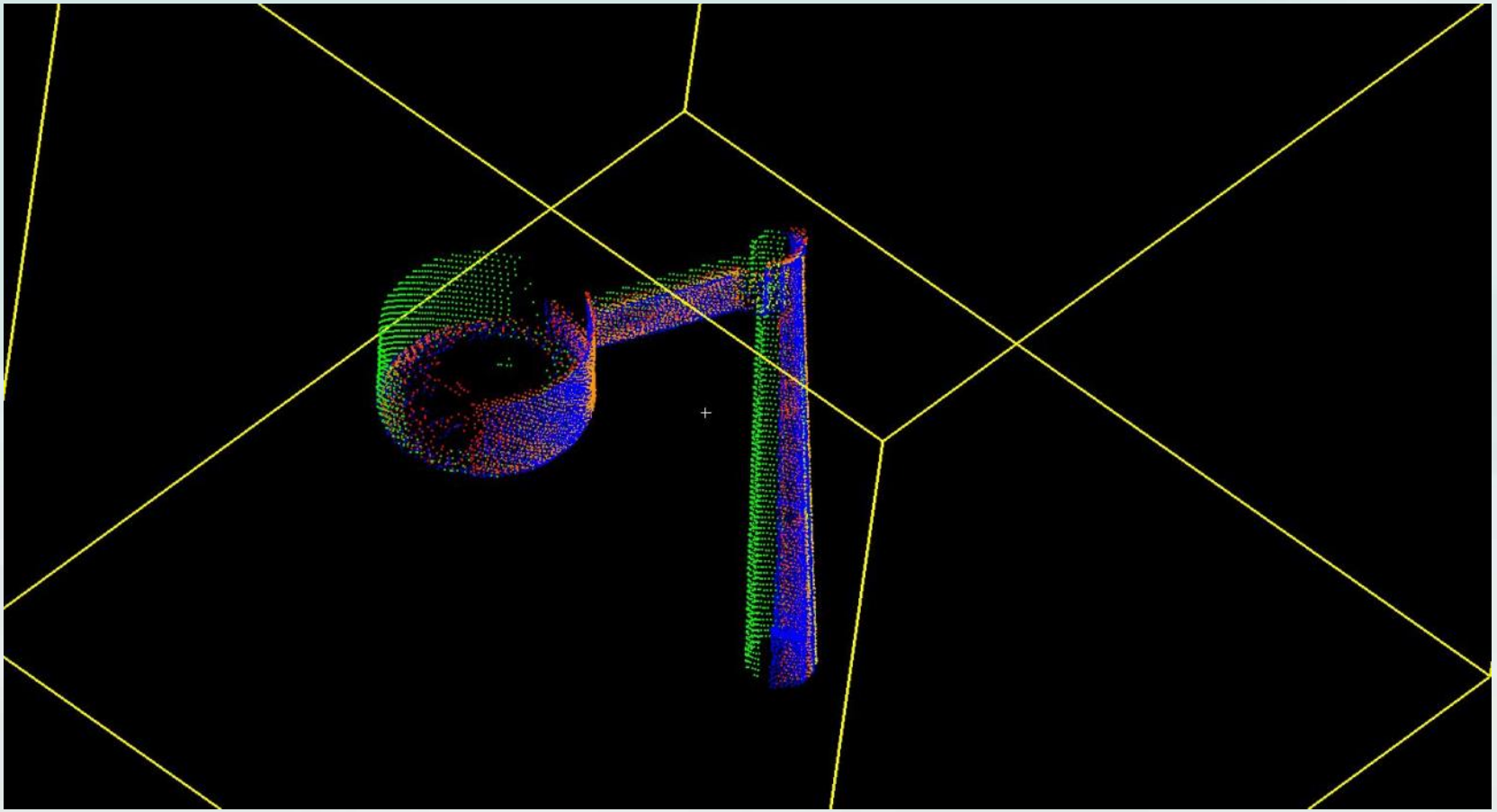
# 3D Alignment



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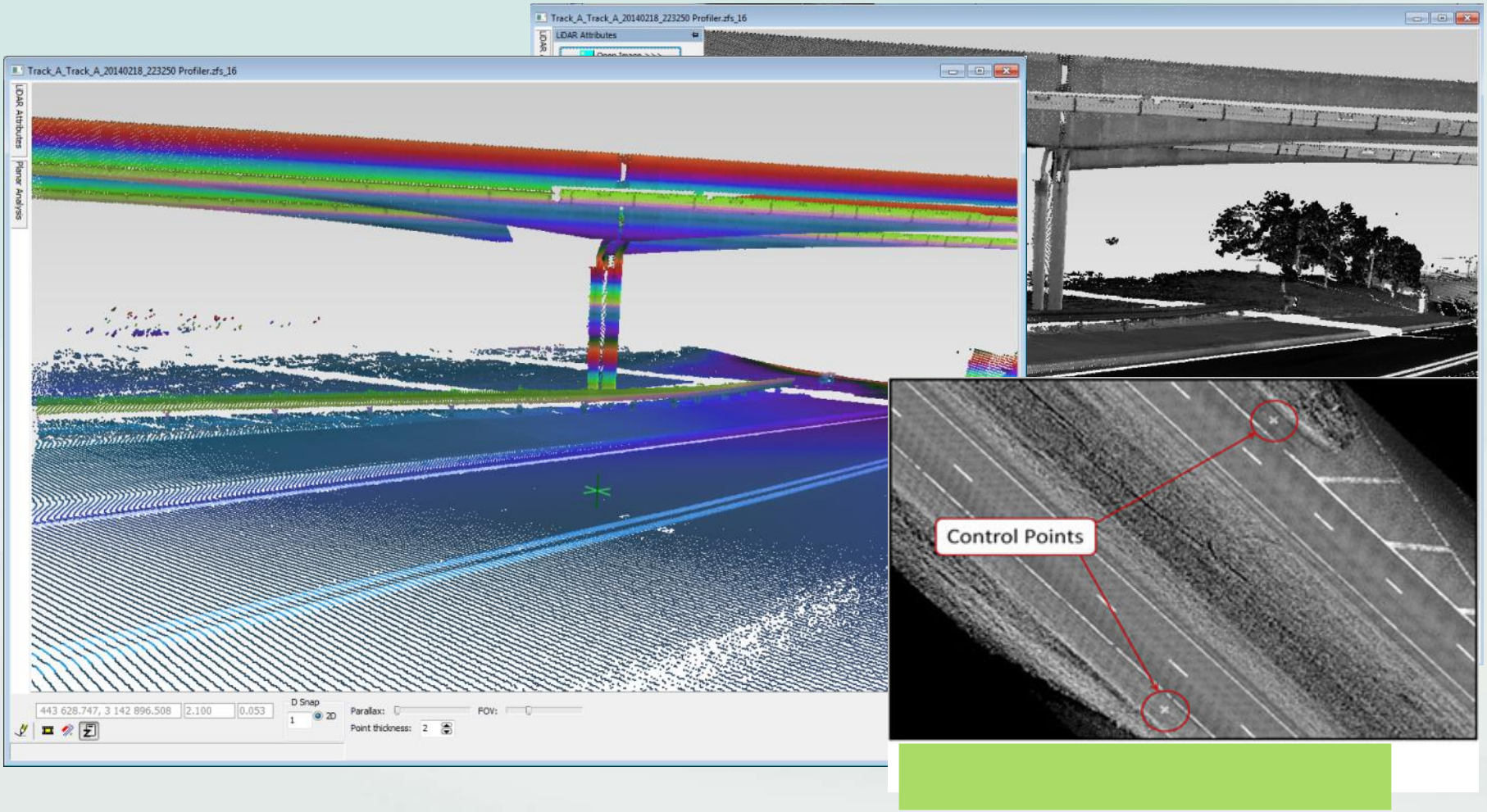
# Final Registration

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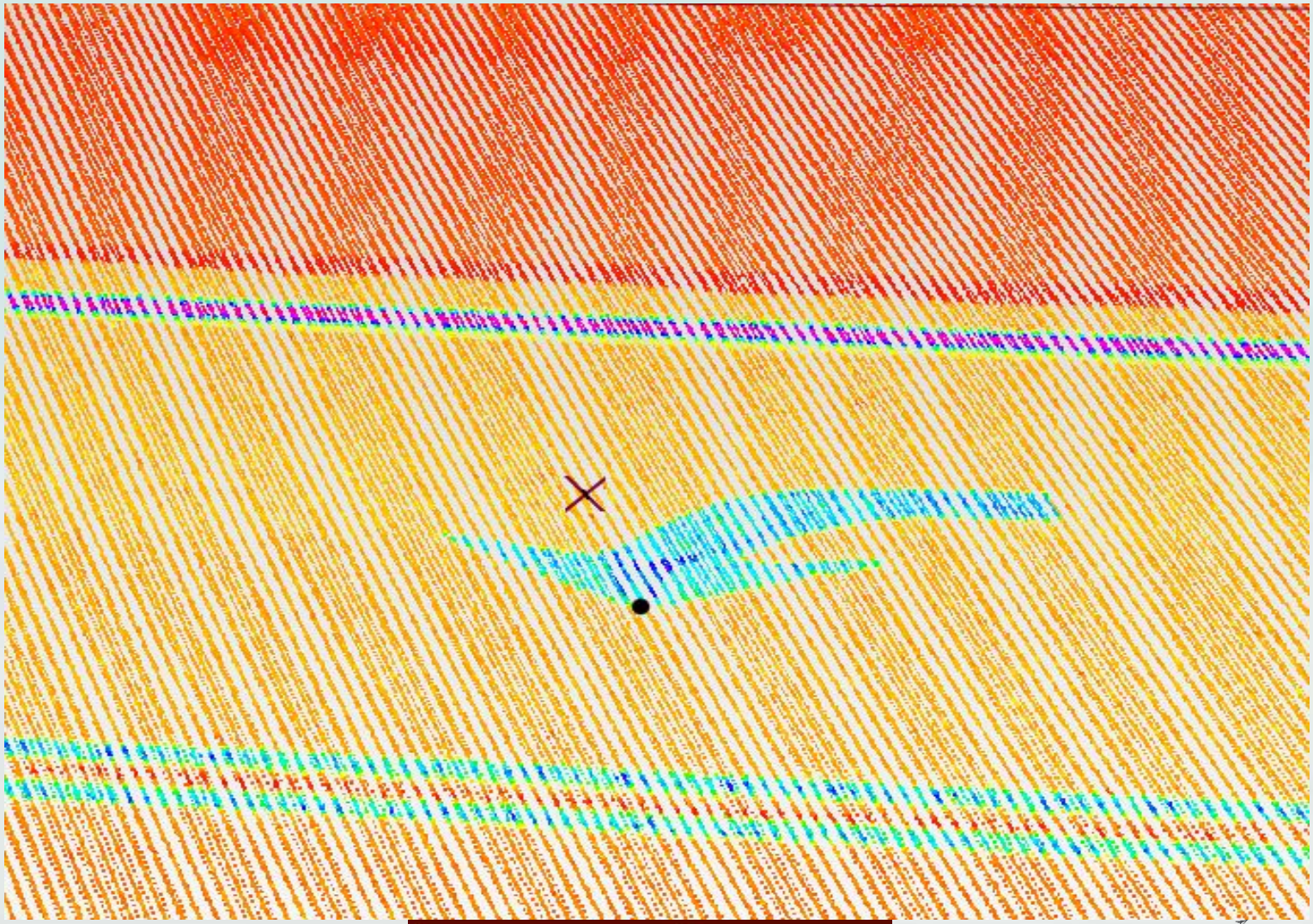
# Registration Results



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# Accuracy Results

| Track_C Southbound Median Shoulder | | | | | | |
|---|---|---|---|---|---|---|
| POINT ID | XGCP | YGCP | ZGCP | DX | DY | DZ |
| 1051 | 13372033.091 | 112115.844 | 579.935 | 0.041 | -0.027 | 0.035 |
| 1047 | 13371811.690 | 111725.857 | 579.823 | 0.025 | 0.001 | 0.000 |
| 1043 | 13371306.490 | 110842.915 | 579.844 | 0.008 | -0.003 | 0.020 |
| 1039 | 13371039.180 | 110375.070 | 579.867 | -0.003 | -0.031 | 0.017 |
| 1035 | 13370558.360 | 109534.277 | 579.852 | 0.000 | -0.025 | 0.033 |
| 1031 | 13370335.659 | 109145.008 | 579.935 | 0.000 | -0.004 | 0.026 |
| 1131 | 13370054.931 | 108652.054 | 579.747 | 0.024 | -0.021 | 0.009 |
| 1027 | 13369612.129 | 107877.567 | 580.361 | -0.014 | -0.008 | 0.033 |
| 1022 | 13369404.219 | 107514.404 | 580.898 | -0.003 | 0.007 | 0.037 |
| 1017 | 13368887.231 | 106610.416 | 581.787 | 0.003 | -0.016 | 0.016 |
| 1013 | 13368632.339 | 106160.718 | 582.167 | -0.007 | 0.034 | 0.031 |
| 1009 | 13368135.499 | 105291.591 | 583.130 | 0.032 | 0.010 | 0.027 |
| 1005 | 13367882.651 | 104849.465 | 583.725 | 0.047 | 0.001 | 0.029 |
| 1001 | 13367392.900 | 103992.887 | 594.785 | 0.019 | -0.012 | 0.001 |

| Track_D Northbound Median Shoulder | | | | | | |
|---|---|---|---|---|---|---|
| POINT ID | XGCP | YGCP | ZGCP | DX | DY | DZ |
| 902 | 13363061.781 | 86129.772 | 581.710 | -0.004 | 0.012 | -0.002 |
| 906 | 13363159.281 | 86617.368 | 581.617 | 0.015 | -0.021 | -0.016 |
| 910 | 13363356.719 | 87591.010 | 581.892 | 0.000 | 0.044 | -0.030 |
| 914 | 13363450.121 | 88072.128 | 581.669 | 0.018 | 0.004 | 0.022 |
| 918 | 13363642.110 | 89030.153 | 581.605 | -0.005 | 0.009 | 0.002 |
| 921 | 13363739.449 | 89515.941 | 581.263 | 0.015 | 0.012 | 0.002 |
| 926 | 13363935.561 | 90494.116 | 580.308 | -0.024 | 0.022 | 0.017 |
| 930 | 13364034.580 | 90989.682 | 579.765 | 0.016 | 0.004 | 0.032 |
| 934 | 13364272.290 | 92172.905 | 579.197 | 0.024 | 0.000 | 0.000 |
| 938 | 13364302.720 | 92327.113 | 579.175 | -0.047 | -0.017 | -0.016 |
| 942 | 13364388.570 | 92751.619 | 579.753 | -0.021 | 0.031 | -0.030 |
| 946 | 13364587.861 | 93435.327 | 579.537 | -0.021 | 0.004 | -0.037 |
| 950 | 13364734.649 | 93827.932 | 579.256 | -0.026 | 0.008 | -0.030 |
| 1121 | 13364787.890 | 93969.513 | 579.147 | -0.027 | 0.014 | -0.032 |

| Track C<br>**Validation Comparison Statistics** | DX | DY | DZ |
|---|---|---|---|
| Variance | 0.00032 | 0.00020 | 0.00034 |
| Std Deviation | 0.018 | 0.014 | 0.018 |
| NSSD accuracy (dx, dy, dz) | 0.044 | 0.035 | 0.036 |
| | | | |
| Number of Samples | 41 | 41 | 41 |
| Confidence Level | | 95% | 95% |
| Percent Control points with accuracy of +/- 0.06' | 100% | 0.018 | 100% |
| Avg/mean Control Error | 0.008 | -0.012 | 0.022 |
| Positive Max Error | 0.047 | 0.034 | 0.051 |
| Negative Max Error | -0.036 | -0.035 | -0.028 |
| | | | |
| RMSE for Sample (RMSE(dx, dy,dz)) | 0.018 | 0.014 | 0.018 |
| FGDC/NSSDA: Accuracy | 0.044 | 0.035 | 0.036 |

| Track D<br>**Validation Comparison Statistics** | DX | DY | DZ |
|---|---|---|---|
| Variance | 0.00031 | 0.00035 | 0.00038 |
| Std Deviation | 0.018 | 0.019 | 0.019 |
| NSSD accuracy (dx, dy, dz) | 0.043 | 0.046 | 0.038 |
| | | | |
| Number of Samples | 41 | 41 | 41 |
| Confidence Level | | 95% | 95% |
| Percent Control points with accuracy of +/- 0.06' | 100% | 0.018 | 100% |
| Avg/mean Control Error | -0.004 | 0.007 | -0.014 |
| Positive Max Error | 0.028 | 0.051 | 0.032 |
| Negative Max Error | -0.047 | -0.038 | -0.051 |
| | | | |
| RMSE for Sample (RMSE(dx, dy,dz)) | 0.018 | 0.019 | 0.019 |
| FGDC/NSSDA: Accuracy | 0.043 | 0.046 | 0.038 |

# Accuracy Results

Track_C

| POINT ID | XGCP | YC |
|---|---|---|
| 1051 | 13372033.091 | 1121 |
| 1047 | 13371811.690 | 1117 |
| 1043 | 13371306.490 | 1108 |
| 1039 | 13371039.180 | 1103 |
| 1035 | 13370558.360 | 1095 |
| 1031 | 13370335.659 | 1091 |
| 1131 | 13370054.931 | 1086 |
| 1027 | 13369612.129 | 1078 |
| 1022 | 13369404.219 | 1075 |
| 1017 | 13368887.231 | 1066 |
| 1013 | 13368632.339 | 1061 |
| 1009 | 13368135.499 | 1052 |
| 1005 | 13367882.651 | 1048 |
| 1001 | 13367392.900 | 1039 |

Track_D

| POINT ID | XGCP | YC |
|---|---|---|
| 902 | 13363061.781 | 861 |
| 906 | 13363159.281 | 866 |
| 910 | 13363356.719 | 875 |
| 914 | 13363450.121 | 880 |
| 918 | 13363642.110 | 890 |
| 921 | 13363739.449 | 895 |
| 926 | 13363935.561 | 904 |
| 930 | 13364034.580 | 909 |
| 934 | 13364272.290 | 921 |
| 938 | 13364302.720 | 923 |
| 942 | 13364388.570 | 927 |
| 946 | 13364587.861 | 934 |
| 950 | 13364734.649 | 938 |
| 1121 | 13364787.890 | 939 |

Track C

| Validation Comparison Statistics | DX | DY | DZ |
|---|---|---|---|
| Variance | 0.00032 | 0.00020 | 0.00034 |
| Std Deviation | 0.018 | 0.014 | 0.018 |
| NSSD accuracy (dx, dy, dz) | 0.044 | 0.035 | 0.036 |
| | | | |
| Number of Samples | 41 | 41 | 41 |
| Confidence Level | | 95% | 95% |
| Percent Control points with accuracy of +/- 0.06' | 100% | 0.018 | 100% |
| Avg/mean Control Error | 0.008 | -0.012 | 0.022 |
| Positive Max Error | 0.047 | 0.034 | 0.051 |
| Negative Max Error | -0.036 | -0.035 | -0.028 |
| | | | |
| RMSE for Sample (RMSE(dx, dy,dz)) | 0.018 | 0.014 | 0.018 |
| FGDC/NSSDA: Accuracy | 0.044 | 0.035 | 0.036 |

| DX | DY | DZ |
|---|---|---|
| 0.00032 | 0.00020 | 0.00034 |
| 0.018 | 0.014 | 0.018 |
| 0.044 | 0.035 | 0.036 |
| | | |
| 41 | 41 | 41 |
| | 95% | 95% |
| 100% | 0.018 | 100% |
| 0.008 | -0.012 | 0.022 |
| 0.047 | 0.034 | 0.051 |
| -0.036 | -0.035 | -0.028 |
| | | |
| 0.018 | 0.014 | 0.018 |
| 0.044 | 0.035 | 0.036 |

Track D

| Validation Comparison Statistics | DX | DY | DZ |
|---|---|---|---|
| Variance | 0.00031 | 0.00035 | 0.00038 |
| Std Deviation | 0.018 | 0.019 | 0.019 |
| NSSD accuracy (dx, dy, dz) | 0.043 | 0.046 | 0.038 |
| | | | |
| Number of Samples | 41 | 41 | 41 |
| Confidence Level | | 95% | 95% |
| Percent Control points with accuracy of +/- 0.06' | 100% | 0.018 | 100% |
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| Positive Max Error | 0.028 | 0.051 | 0.032 |
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| | | | |
| RMSE for Sample (RMSE(dx, dy,dz)) | 0.018 | 0.019 | 0.019 |
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| DX | DY | DZ |
|---|---|---|
| 0.00031 | 0.00035 | 0.00038 |
| 0.018 | 0.019 | 0.019 |
| 0.043 | 0.046 | 0.038 |
| | | |
| 41 | 41 | 41 |
| | 95% | 95% |
| 100% | 0.018 | 100% |
| -0.004 | 0.007 | -0.014 |
| 0.028 | 0.051 | 0.032 |
| -0.047 | -0.038 | -0.051 |
| | | |
| 0.018 | 0.019 | 0.019 |
| 0.043 | 0.046 | 0.038 |

# CADD/GIS & Modeling

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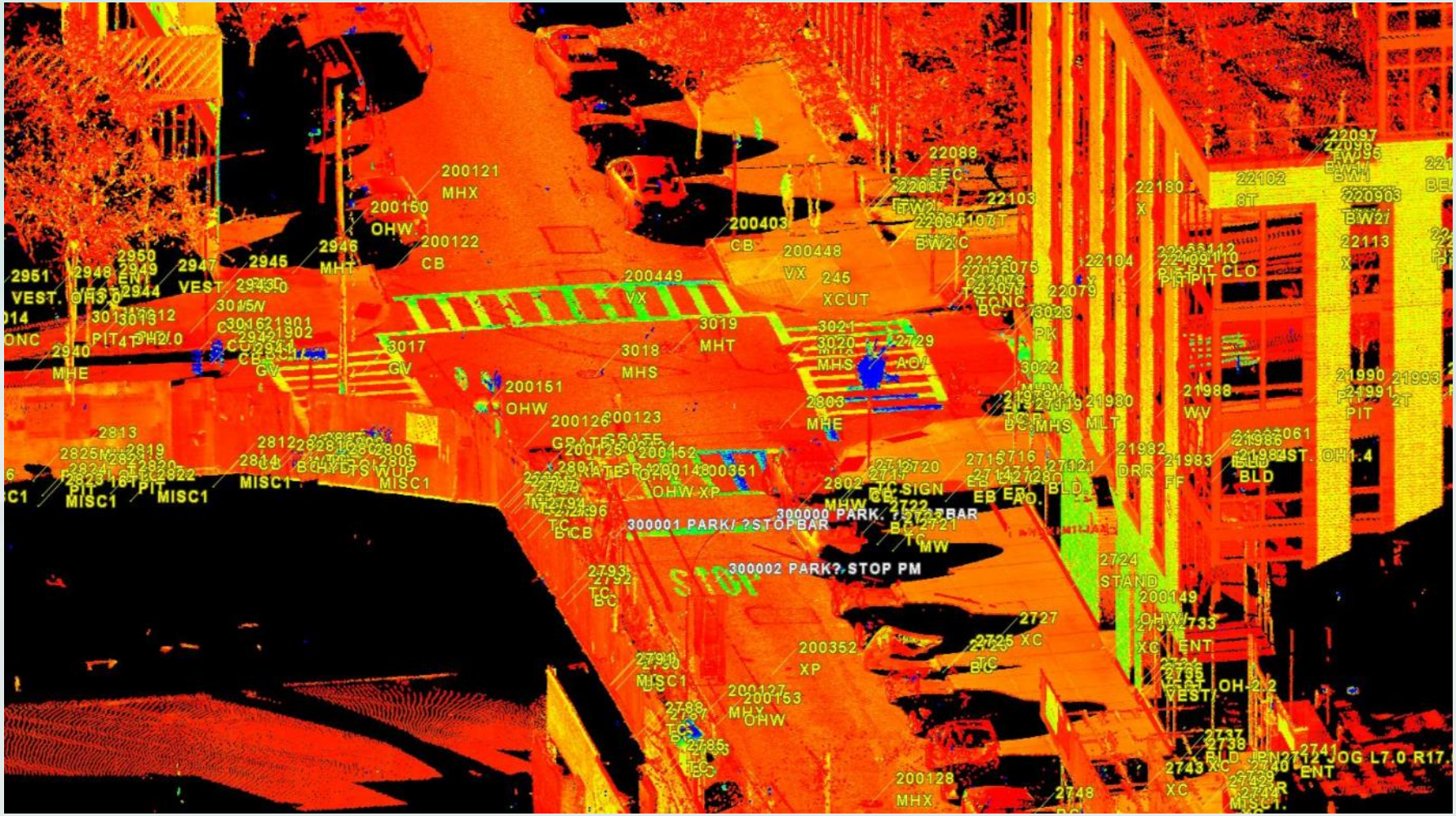
# Cyclone Virtual Surveyor

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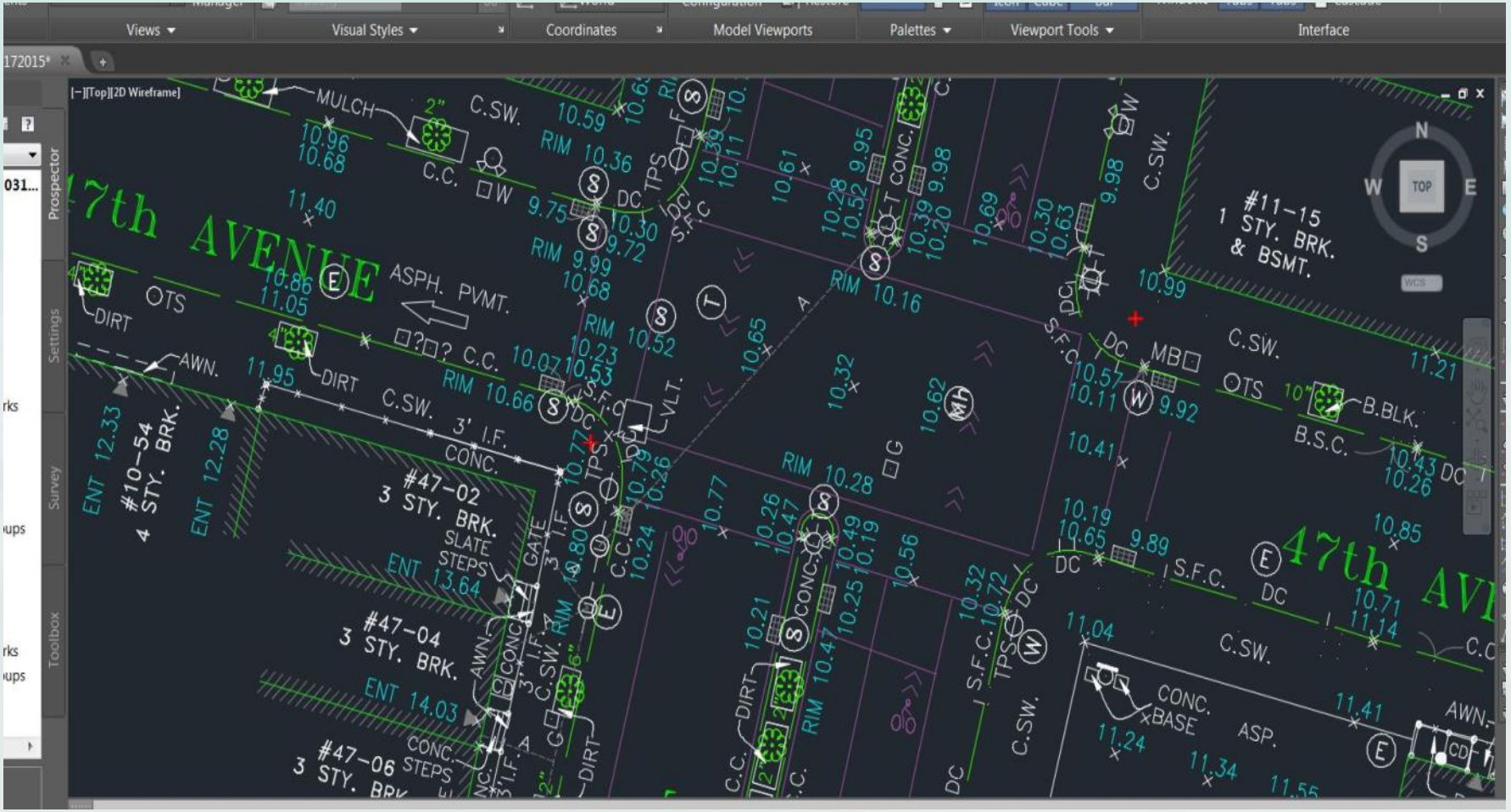
# AutoCAD 2D and 3D As-built Drawings (Cyclone Extraction to Carlson)

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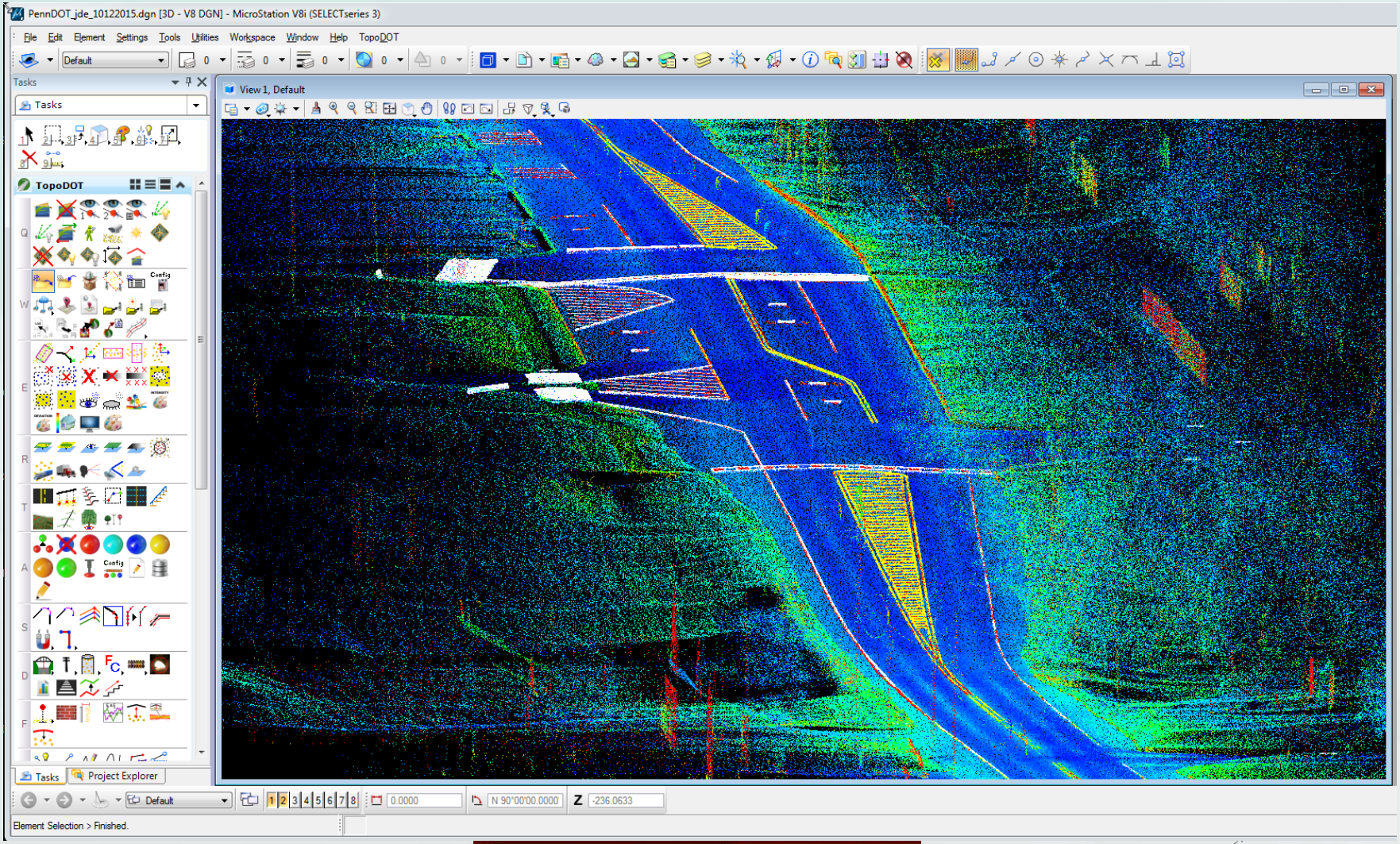
# Microstation

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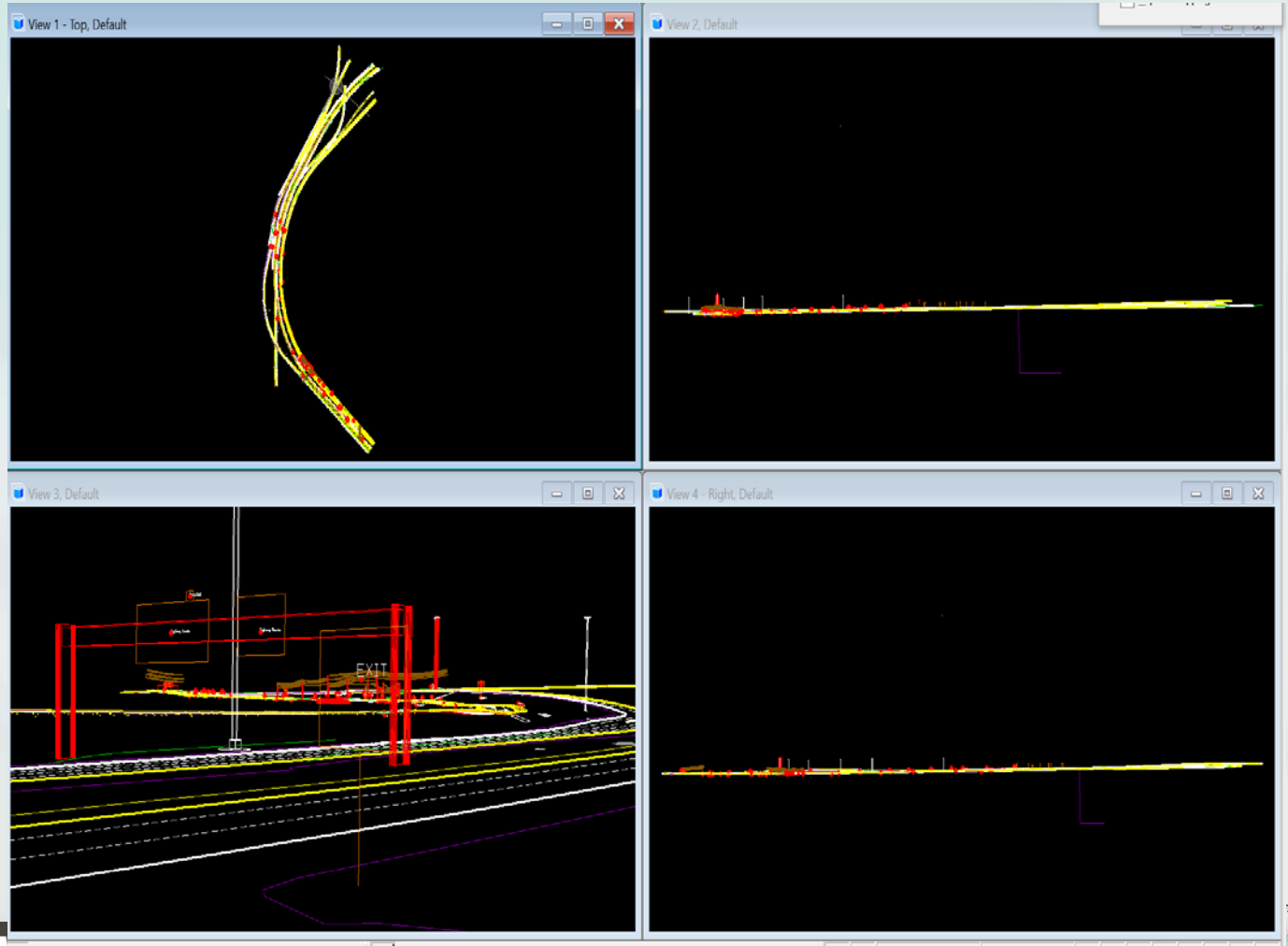
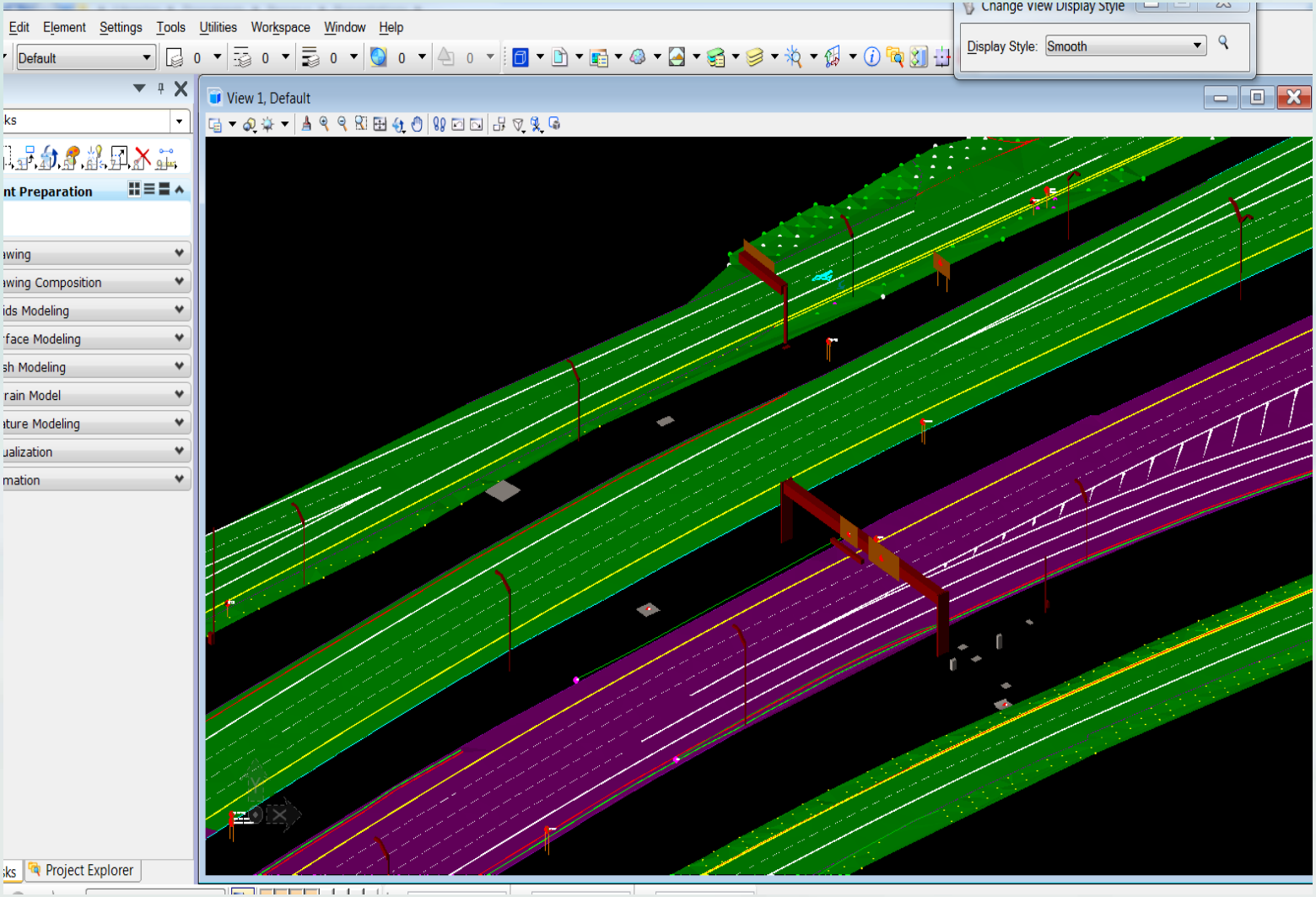
# Microstation Inroads 3D Modeling (TopoDOT Extraction)



# Surfaces

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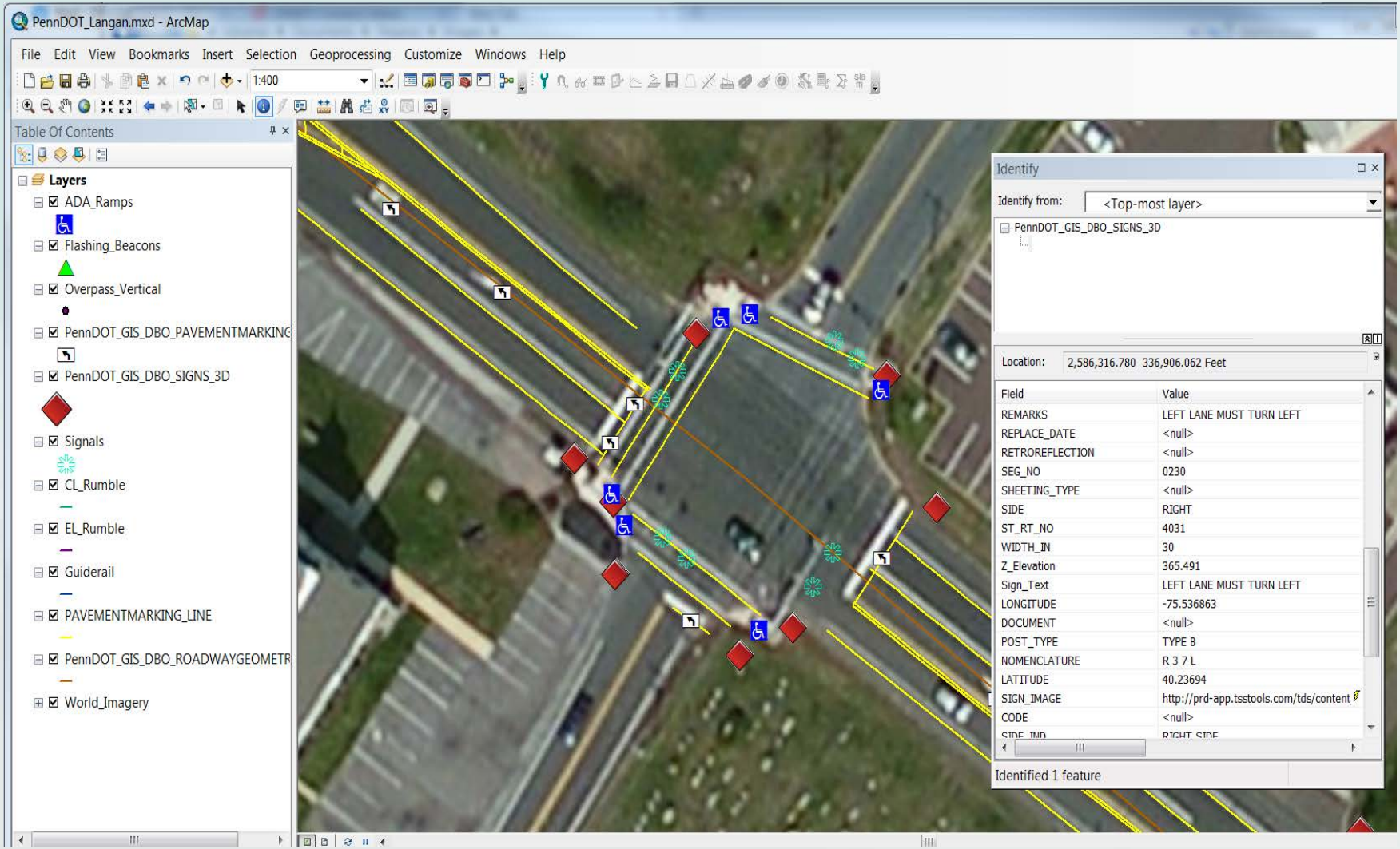
# ArcGIS Features

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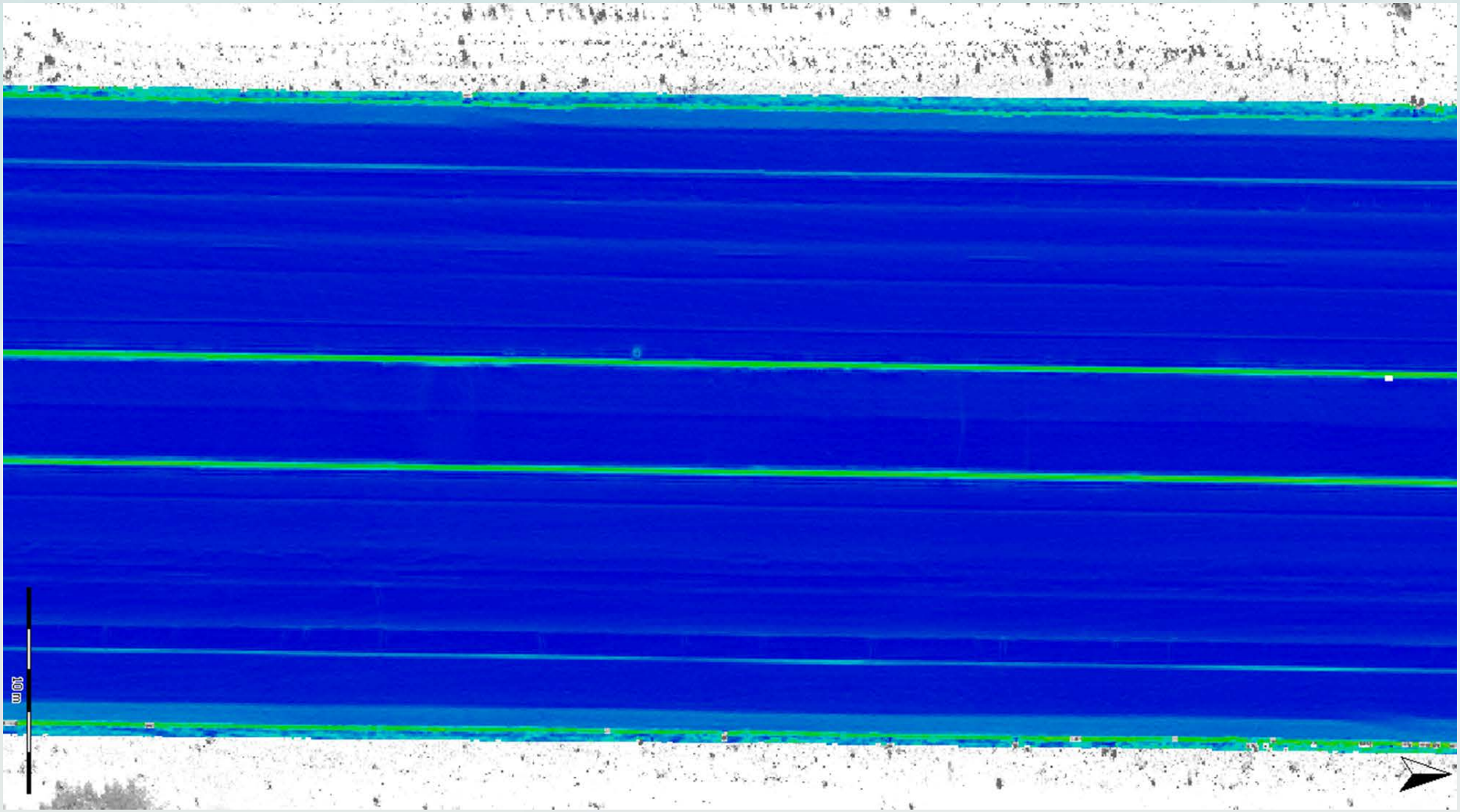
# Pavement Slope Analysis

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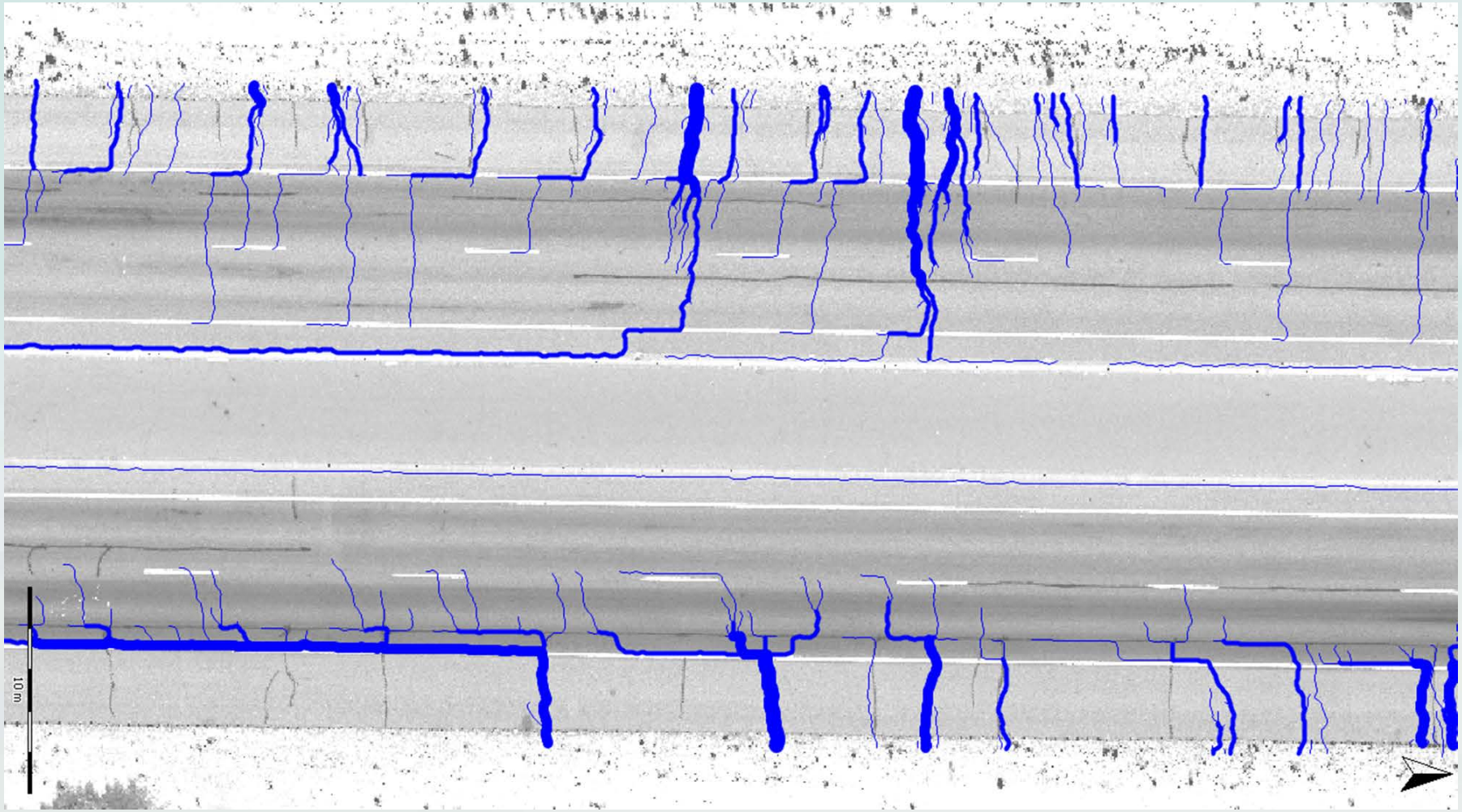
# Flow Aspect Model



# Thank You

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