Mobile Mapping Technology

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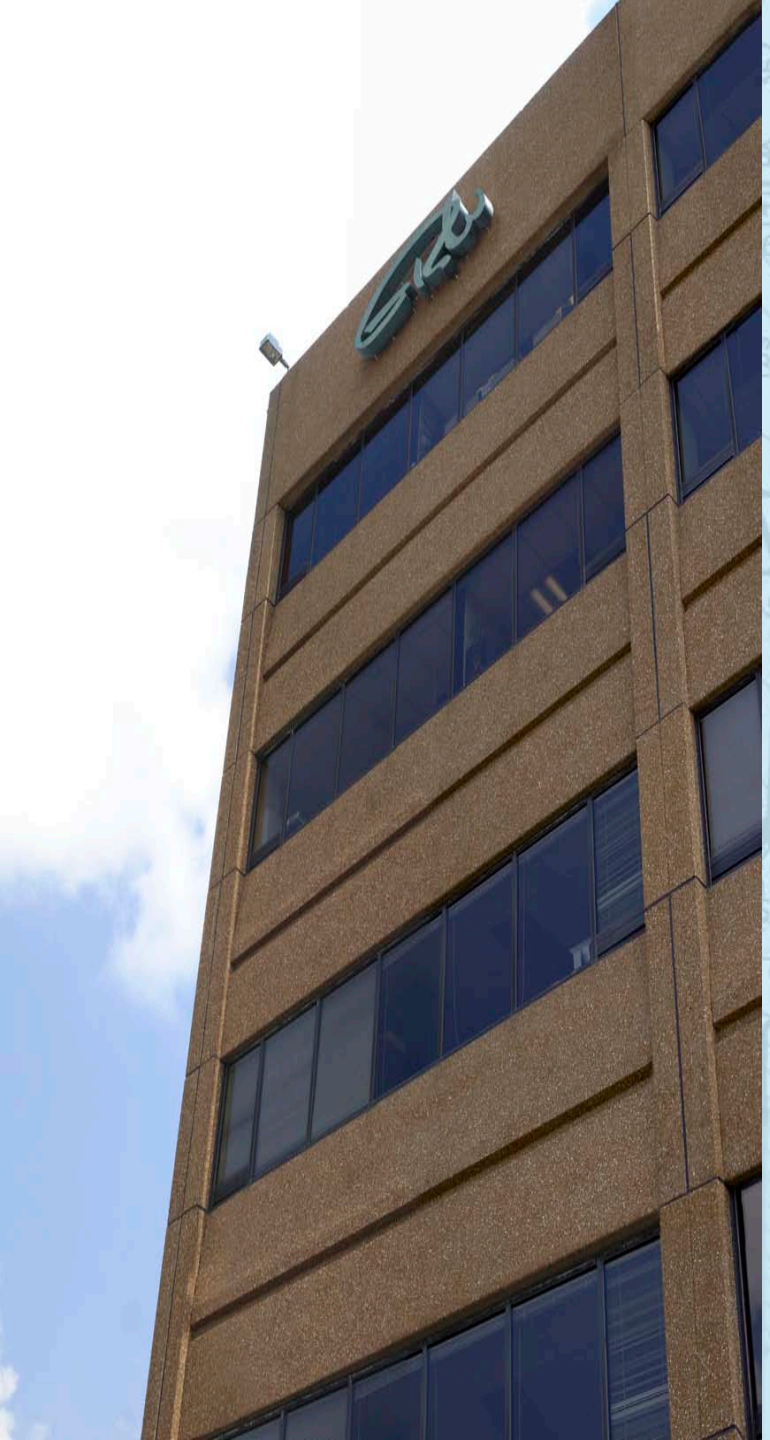


Engineers · Architects · Planners

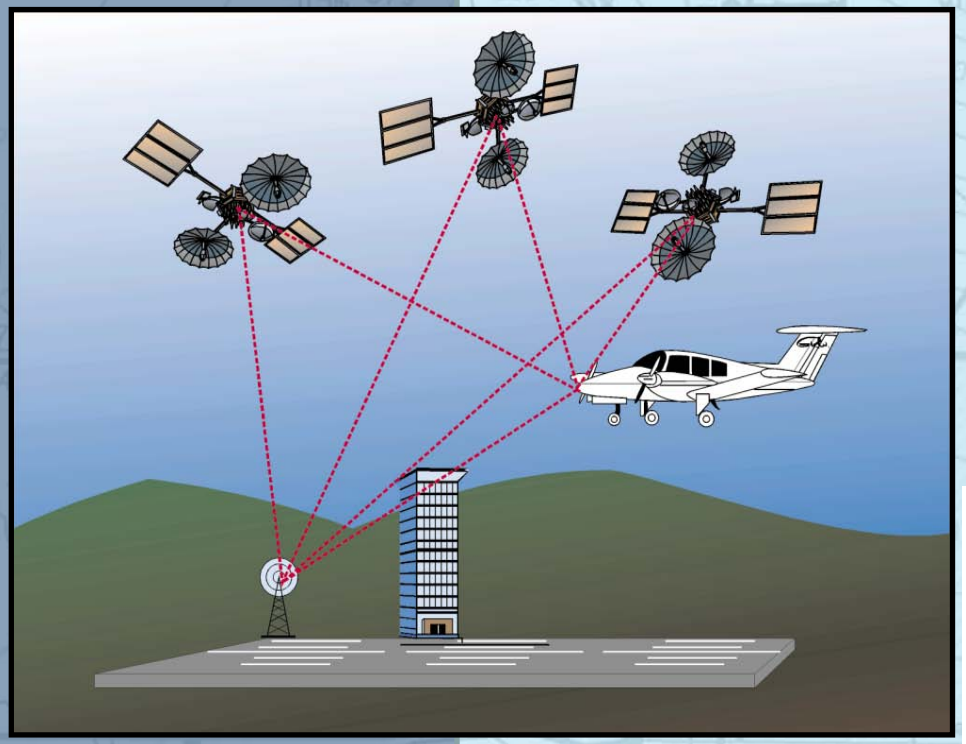
Quick Outline…

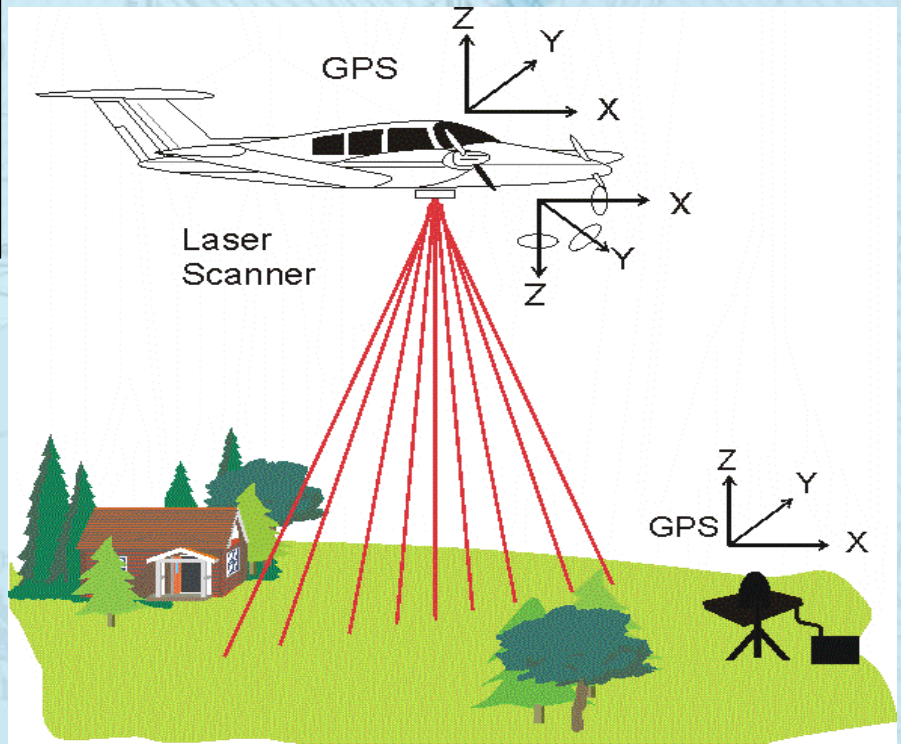
- LiDAR Technology
- 3dLaser Scanning and AirBorne LiDAR Systems
- Mobile Mapping Systems
  - ✓ Advantages
  - ✓ Limitations
  - ✓ Applications
  - ✓ Sample Projects

General LiDAR Systems

- Onboard GPS
  - ½ second
- Inertial Measurement Unit (IMU)
  - 1/200 second
- LiDAR Sensor
  - Intensity
  - Multiple Return
- Ground-based GPS

LiDAR Technology





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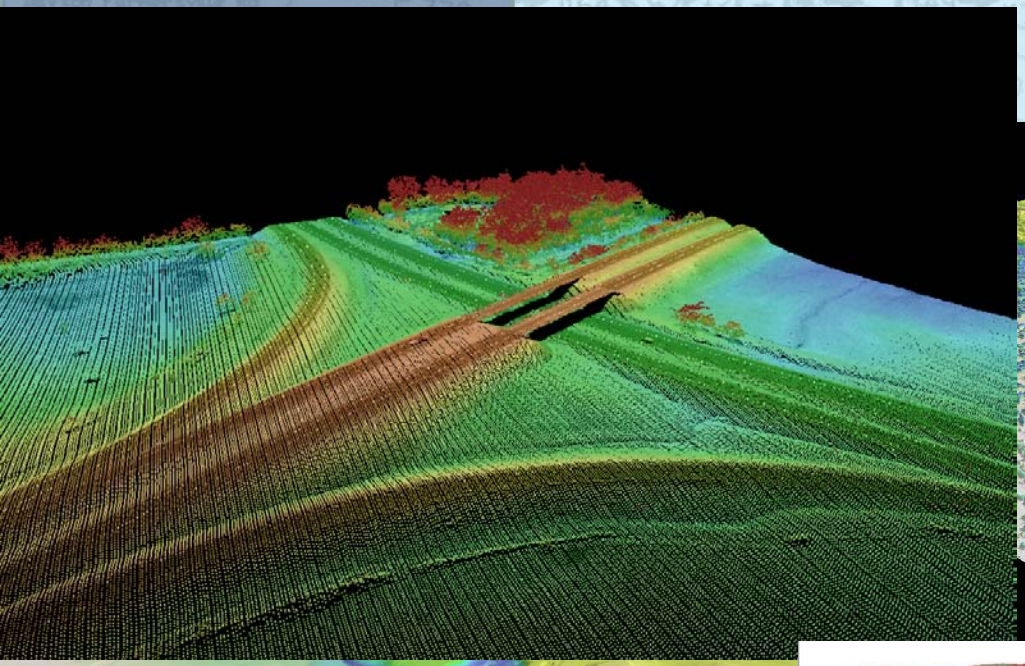
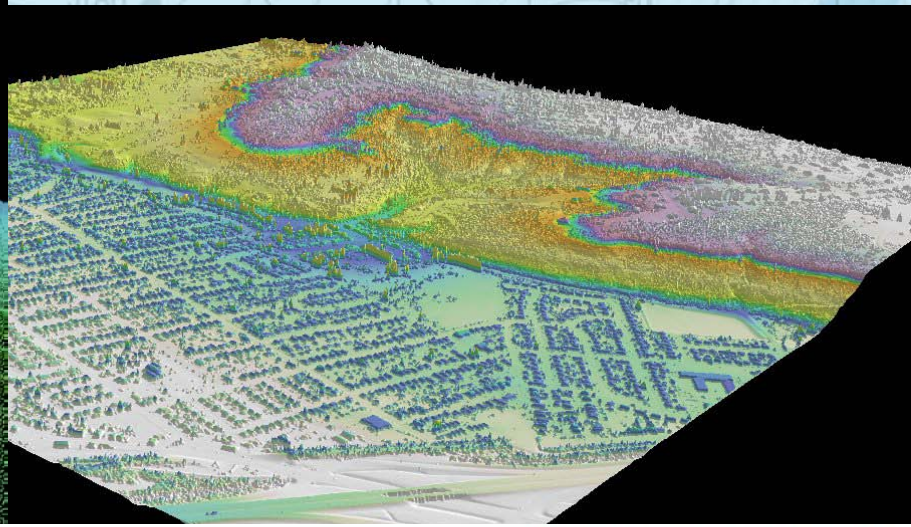
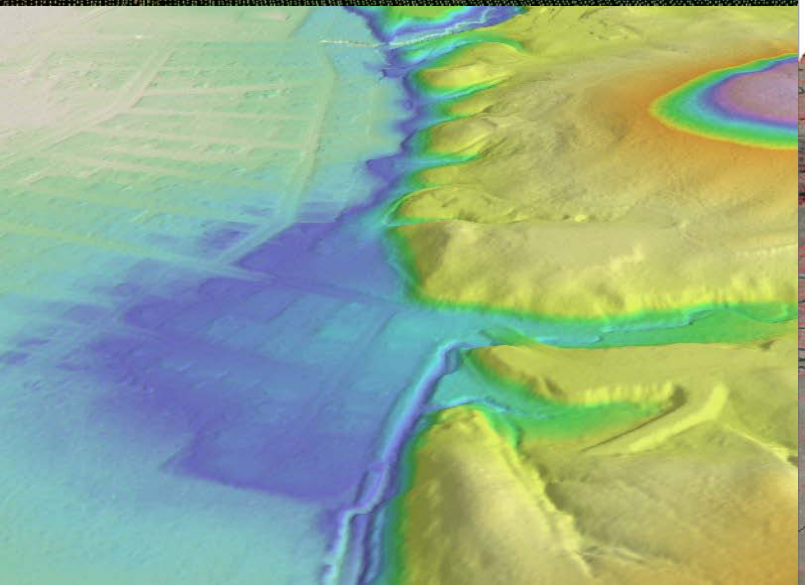
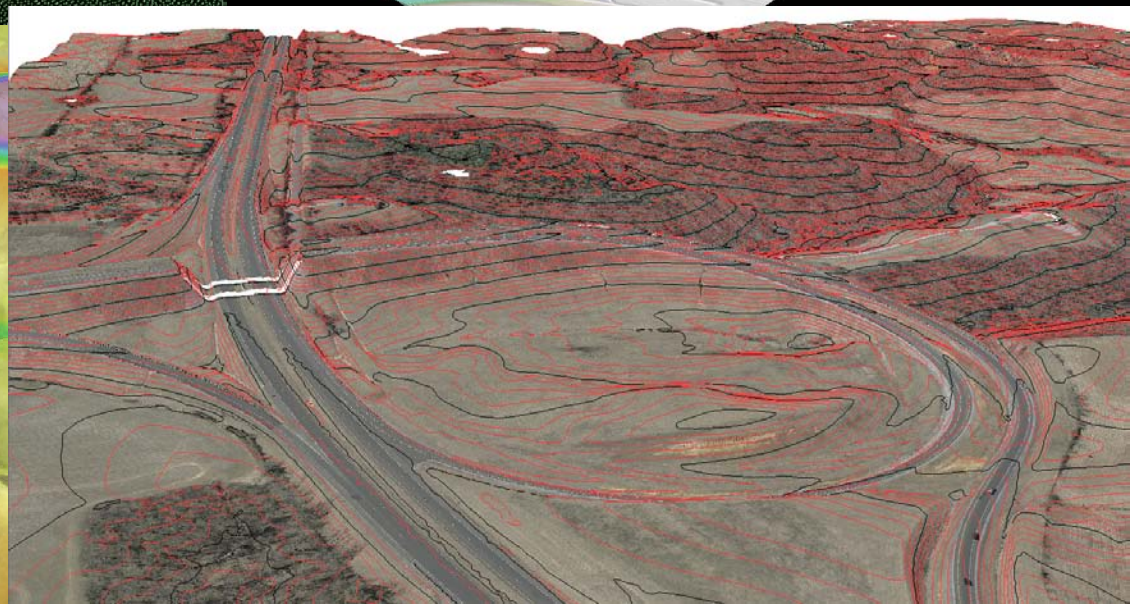
AirBorne LiDAR Scanning

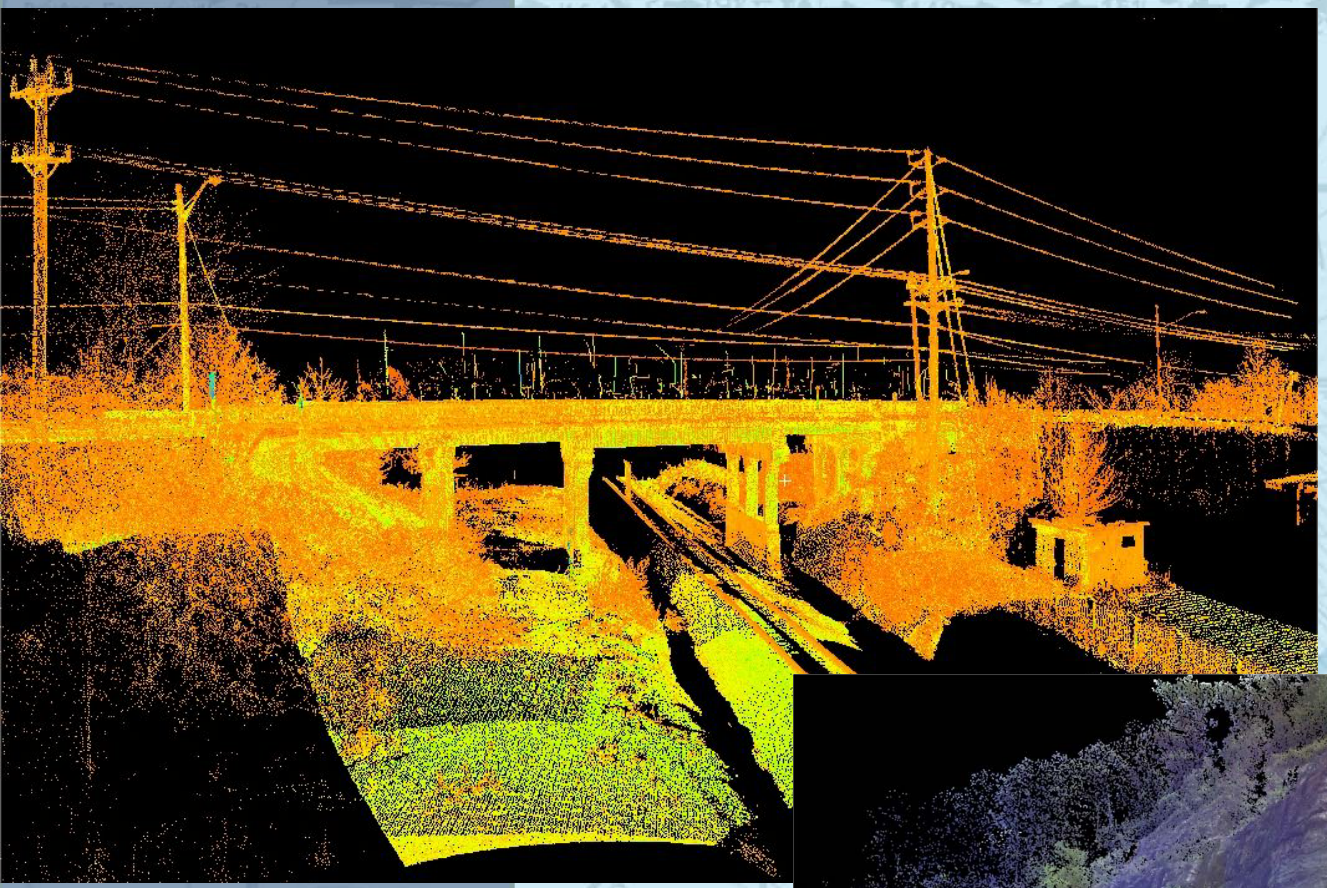


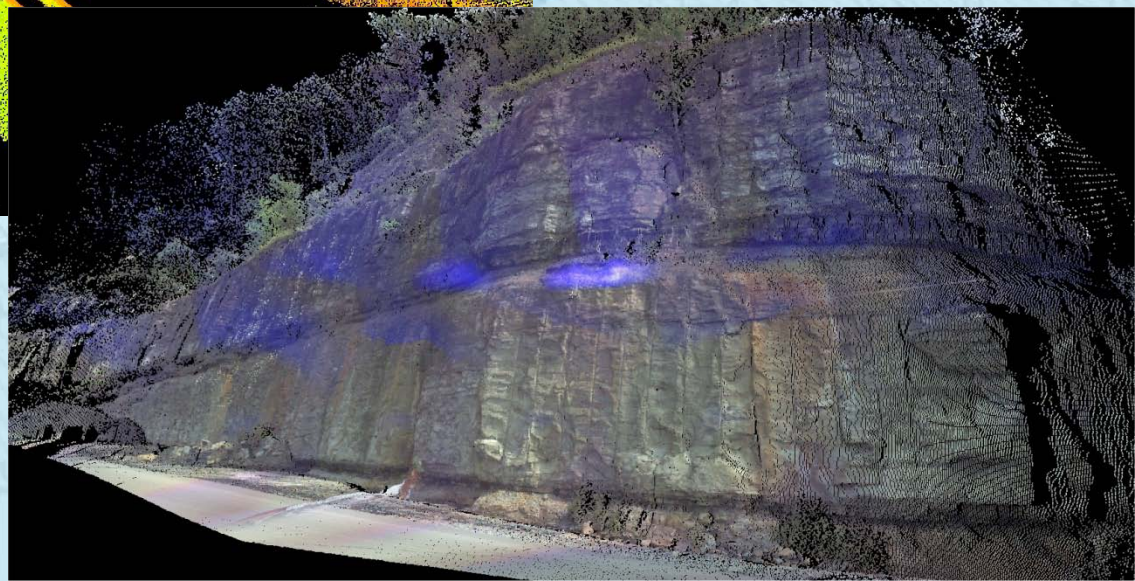






3d Laser Scanner





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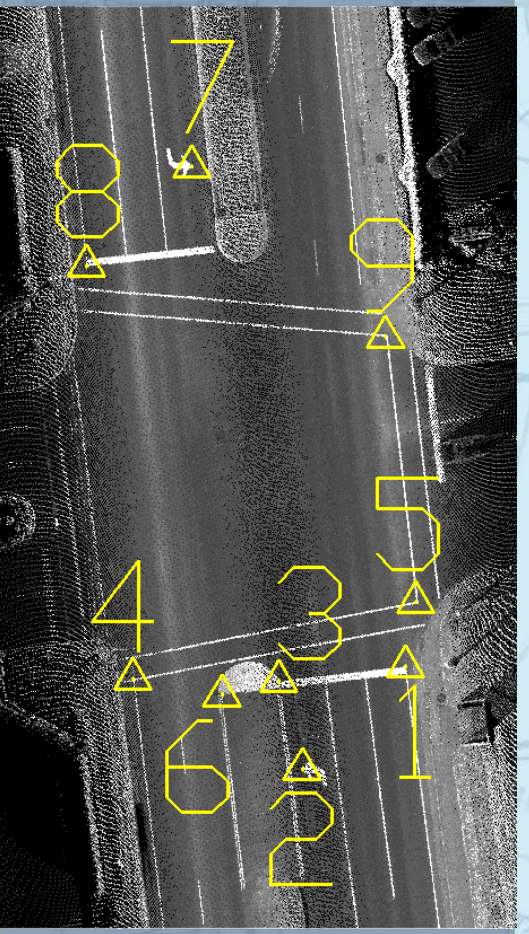
Mobile Mapping System

- 2 GPS units
- IMU
- Distance Measurement Instrument (DMI)
- 2 LiDAR Scanners
  - Each collecting at least 100,000 points per second
  - Mounted to collect all data in a single pass
  - 360 degree field of view

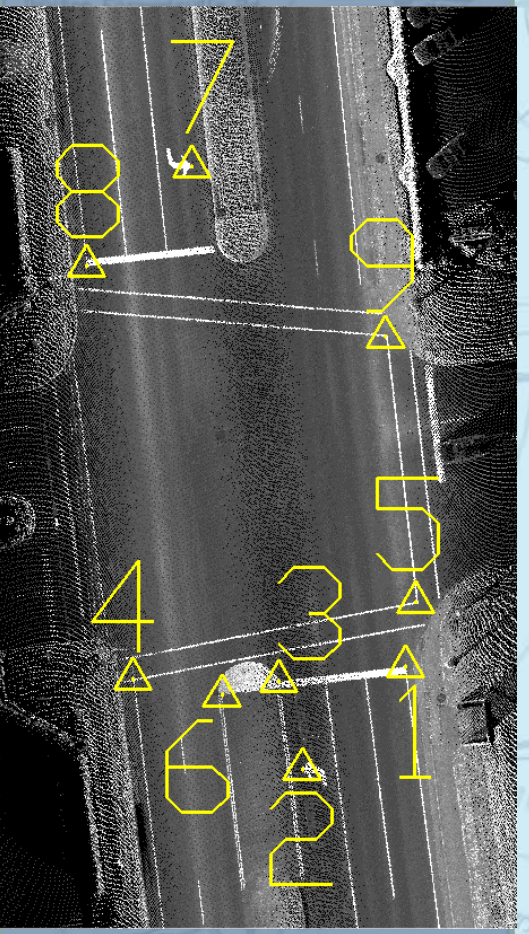
Advantages of Mobile Mapping



- Safety


EXIT 2A
Alameda St
Union Station

Advantages of Mobile Mapping



- Safety
- Flexibility of the System
  - Fast/slow
  - Range of vehicles
    - SUV
    - High Rail
    - Boat

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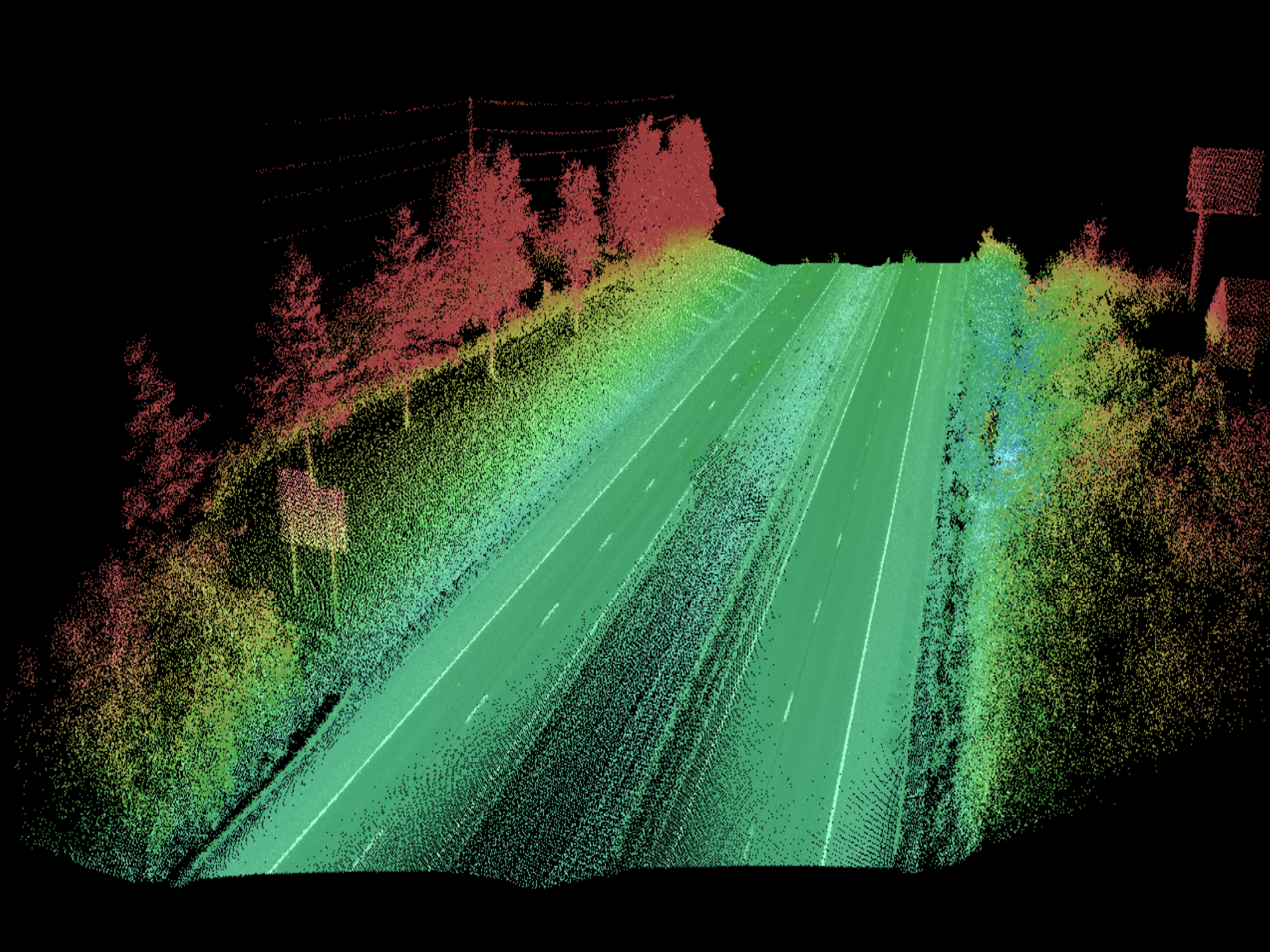
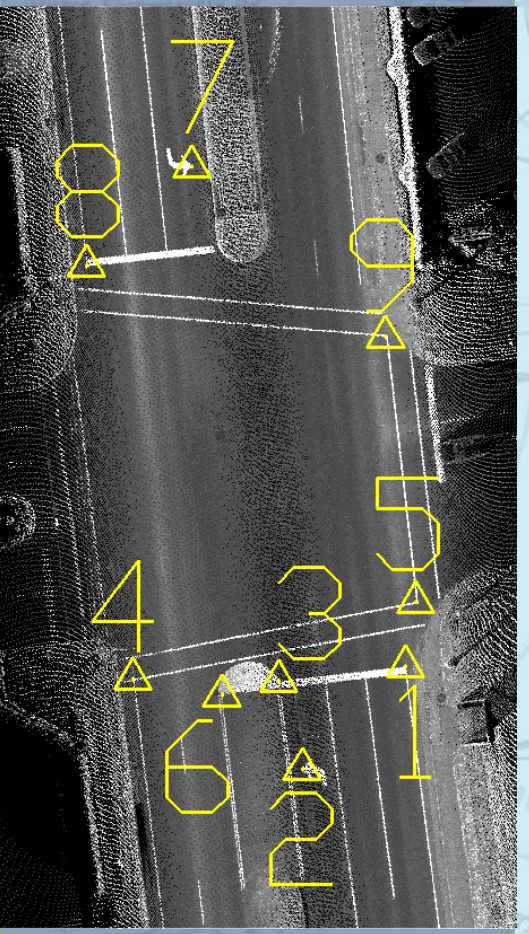



FARMERS

Advantages of Mobile Mapping



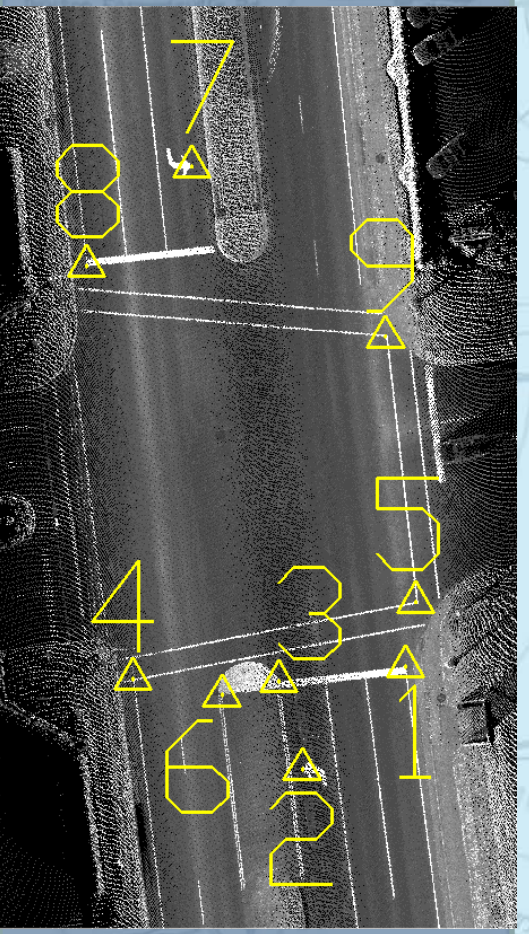
- Safety
- Flexibility of the System
  - Fast/slow
  - Range of vehicles
    - SUV
    - High Rail
    - Boat
- Range of Uses
  - Design Grade Accuracy
  - Planning Grade Accuracy
- Collection of All Features in a Single Pass
- Usage beyond original scope (‘Mine-Ability’)


CONGESTED
AREA
45
M. P. H.
1 Meter


CONGESTED
AREA
45
M. P. H.
10.3'
10.7'


CONGESTED
AREA
45
M. P. H.

Limitations of Mobile Mapping



- Line-of-Sight
  - Traffic

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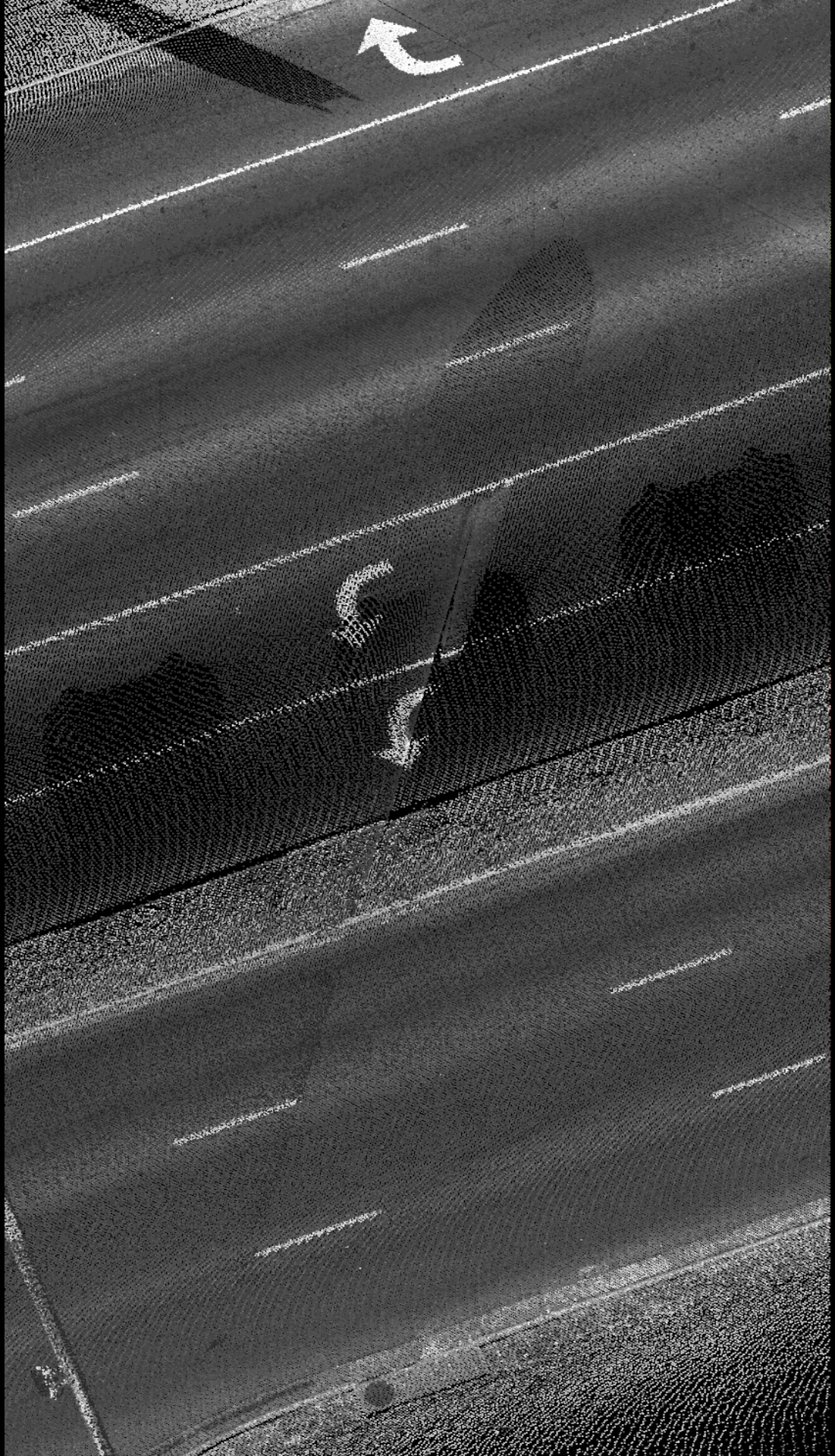
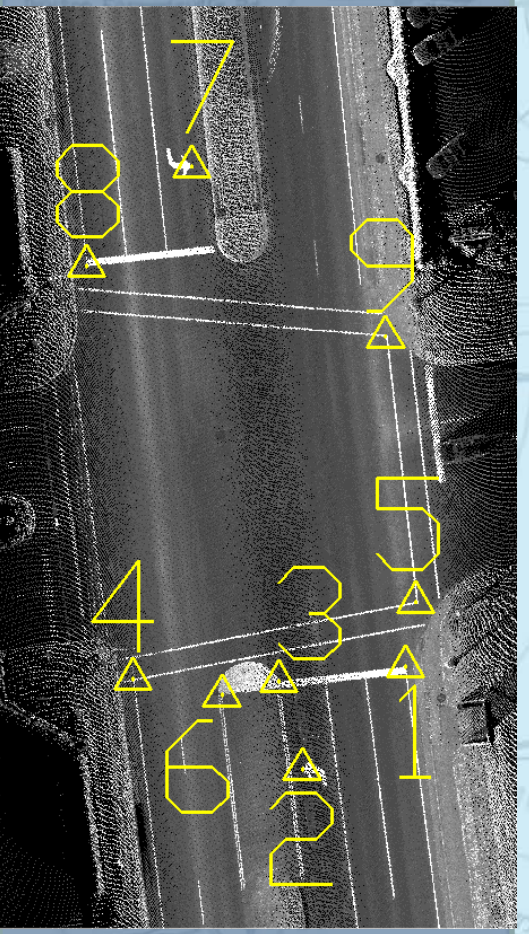


Limitations of Mobile Mapping



- Line-of-Sight
  - Traffic
- Weather Considerations
  - Rain
  - Fog
  - Standing Water
- Sky-line Visibility
  - Urban Canyons
  - Steep Terrain

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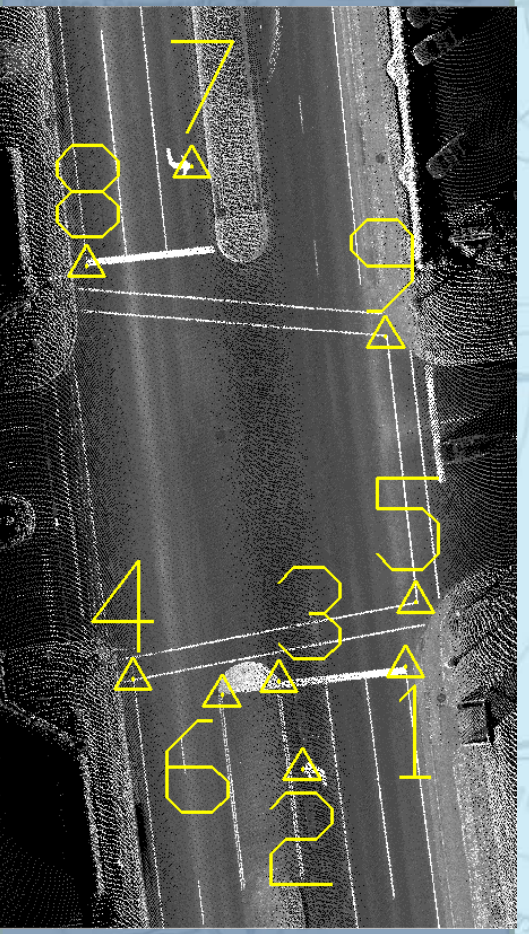
Limitations of Mobile Mapping



- Line-of-Sight
  - Traffic
- Weather Considerations
  - Rain
  - Fog
  - Standing Water
- Sky-line Visibility
  - Urban Canyons
  - Steep Terrain
- Usable Range

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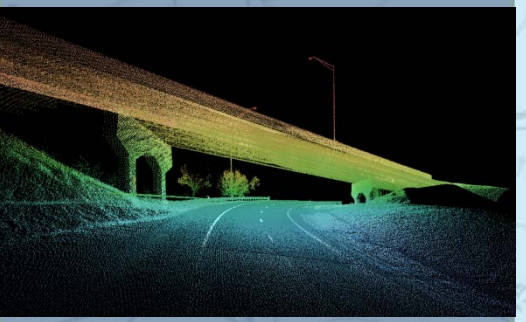

Sample Applications

Design Grade Accuracy

- ✓Engineering topographic surveys
- ✓As-built surveys
- ✓Structures and bridge clearance surveys
- ✓Deformation surveys
- ✓Forensic surveys

Planning Grade Accuracy

- ✓Corridor study and planning surveys
- ✓Asset inventory and management
- ✓Environmental Surveys
- ✓Sight distance analysis
- ✓Earthwork Surveys
- ✓Urban mapping
- ✓Coastal zone erosion analysis

From CalTrans Surveys Manual
http://www.dot.ca.gov/hq/row/landsurveys/SurveysManual/11_Surveys.pdf

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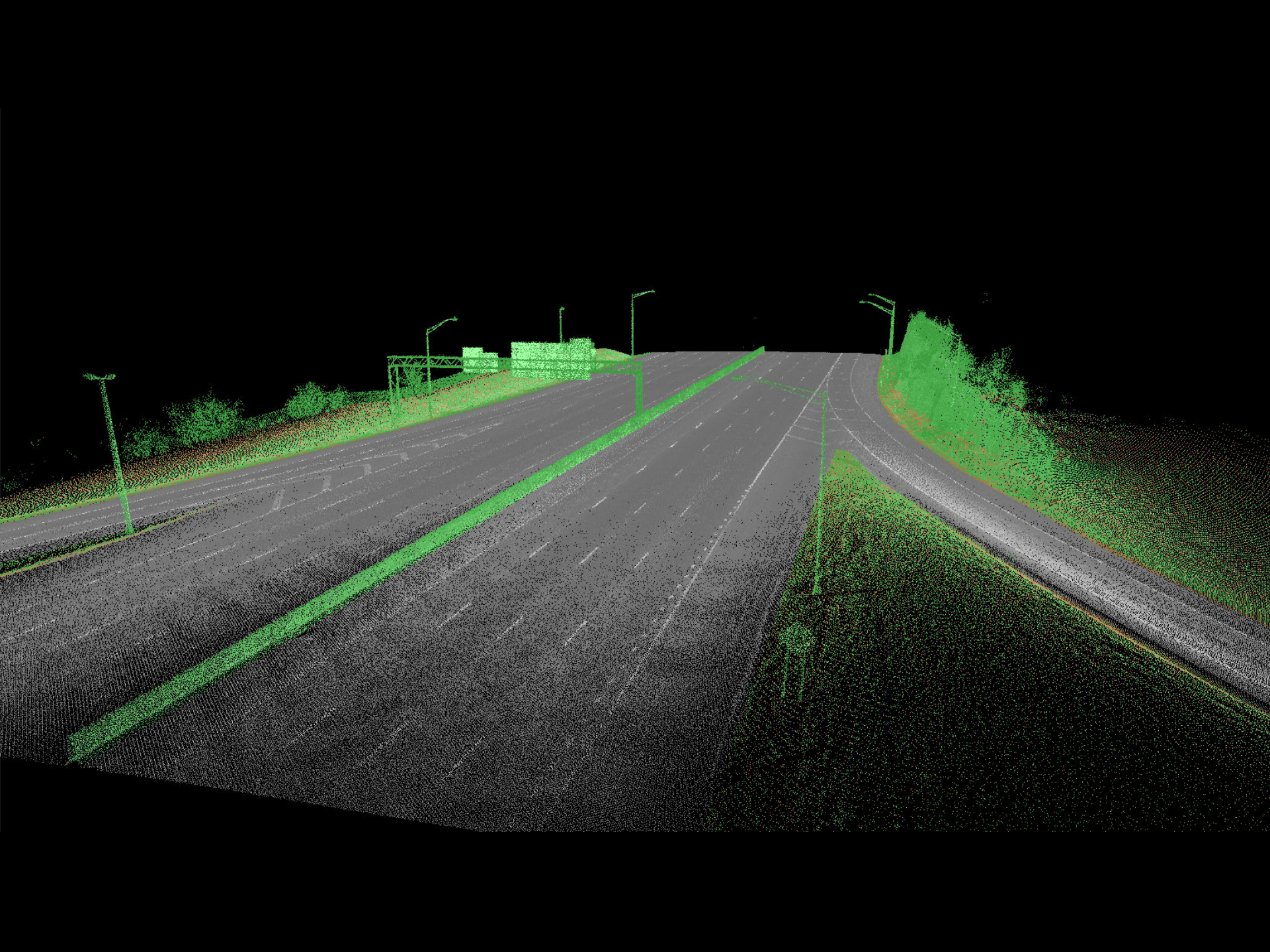
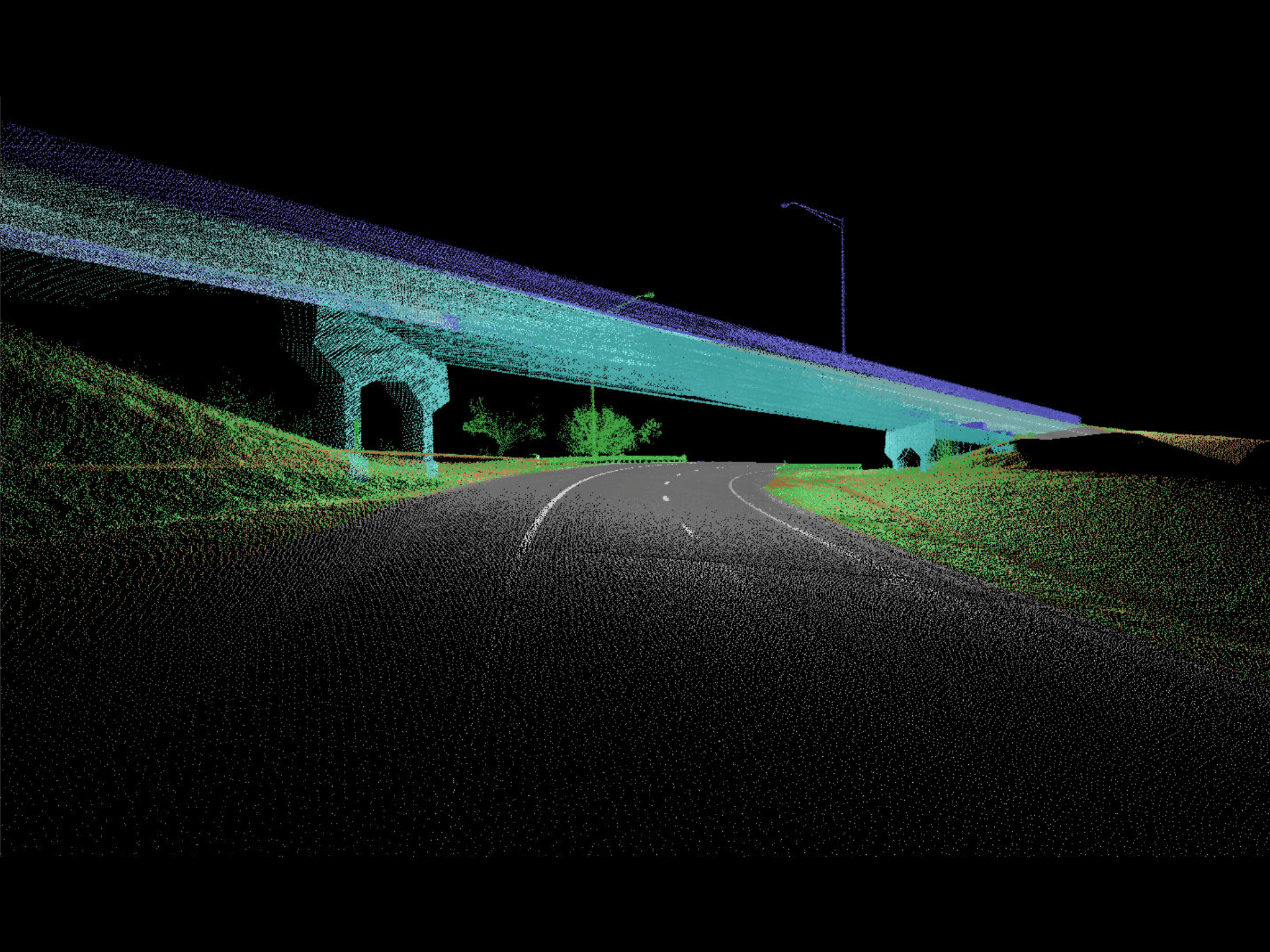
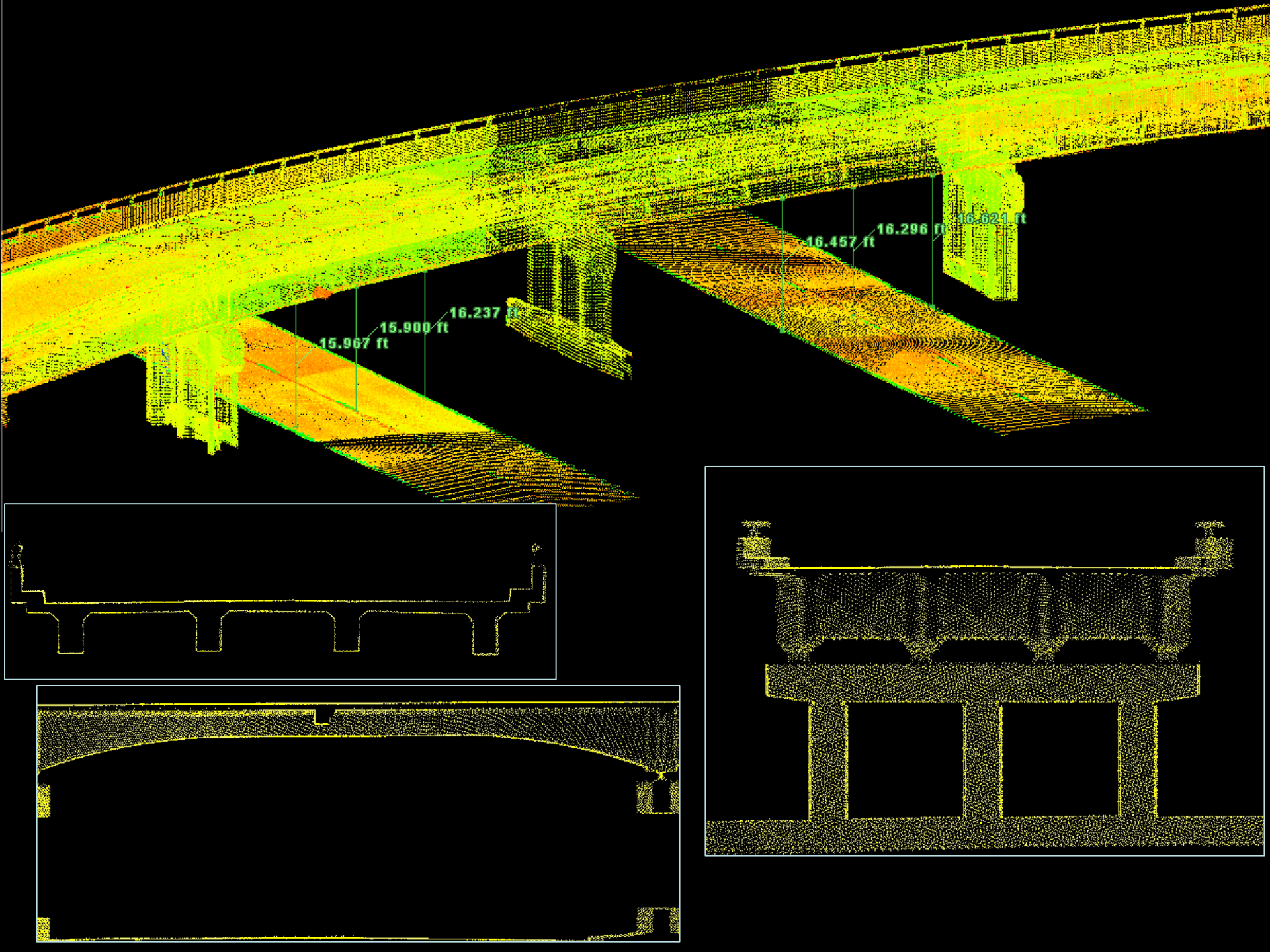
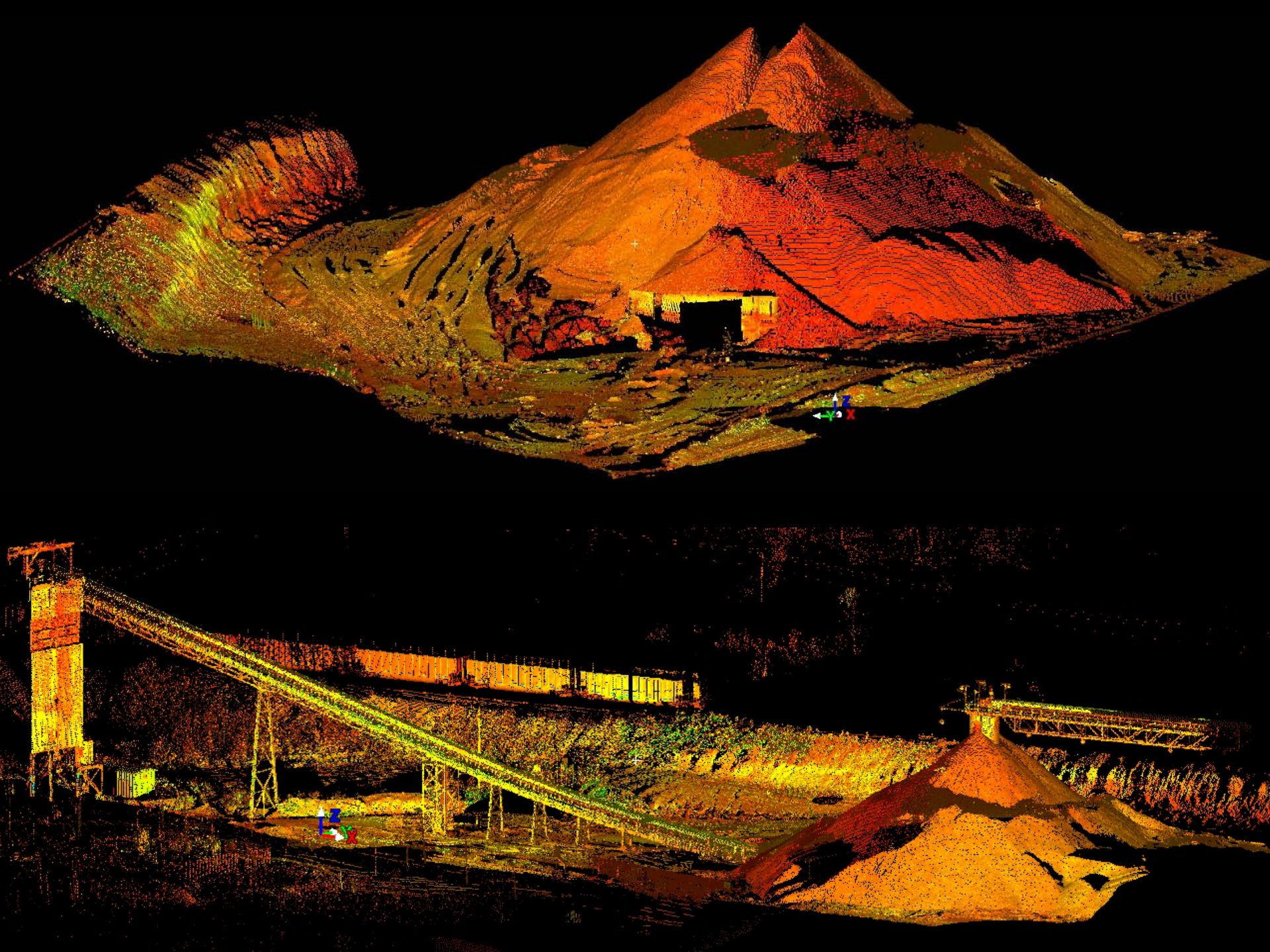


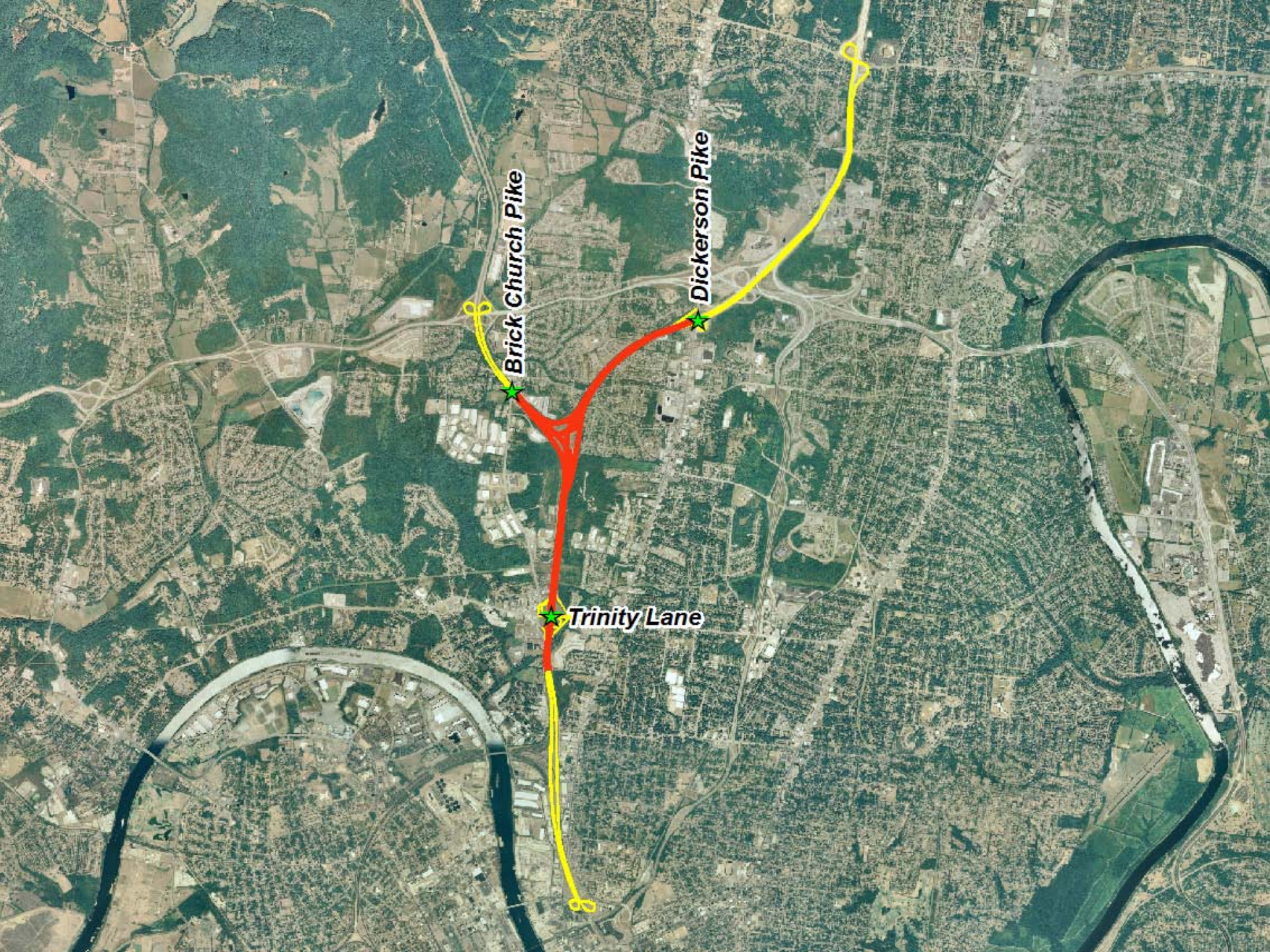


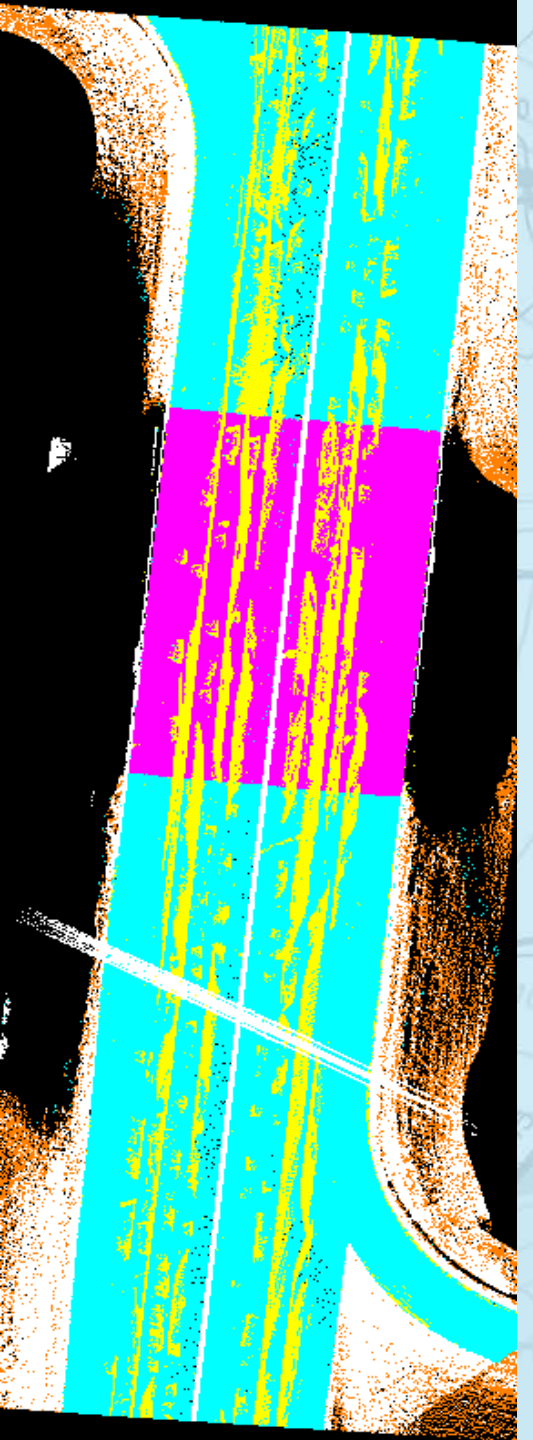

15.967 ft
15.900 ft
16.237 ft
16.457 ft
16.296 ft
16.621 ft



MMS Project Planning

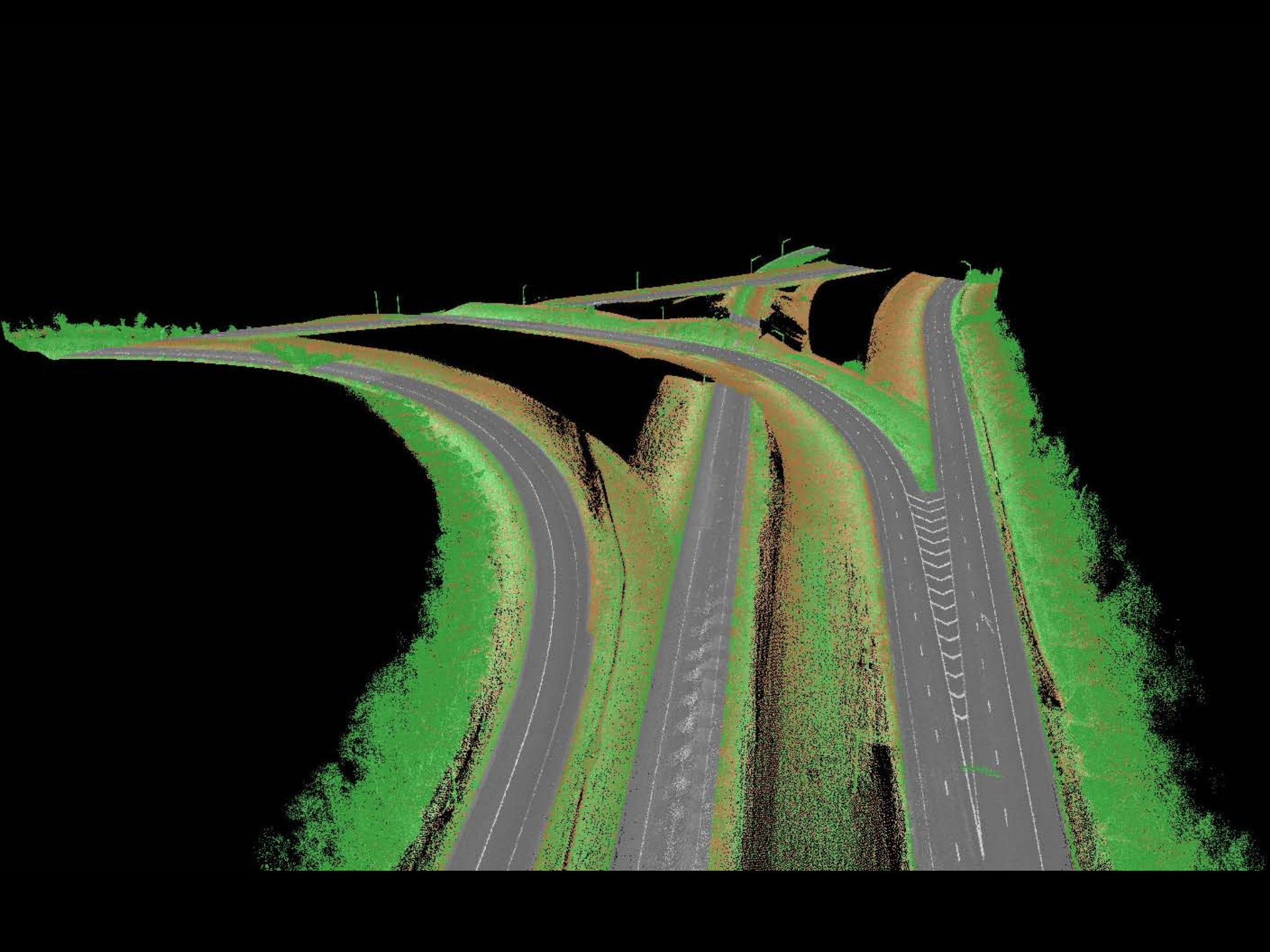
- Purpose?
- Drive Paths
  - Travel every lane
  - Maximize Redundancy
  - Eliminate effects of traffic on road
- Control Needs
  - RTK for Horizontal
  - Digital Leveling for Vertical (shoulders)
- Pre-Acquisition Checklist
  - Special Traffic considerations
  - PDOP
  - K-Index

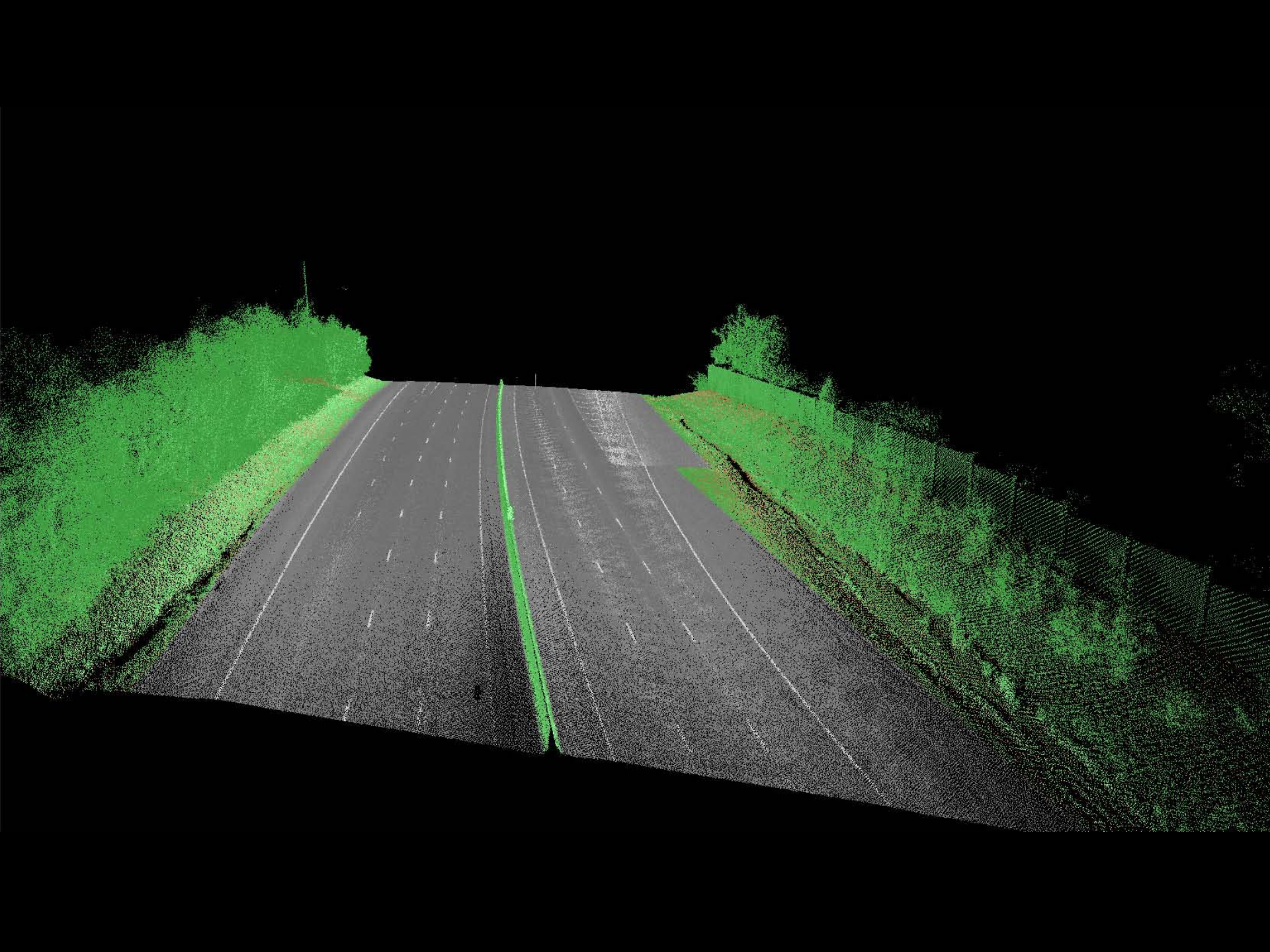

Brick Church Pike
Dickerson Pike
Trinity Lane



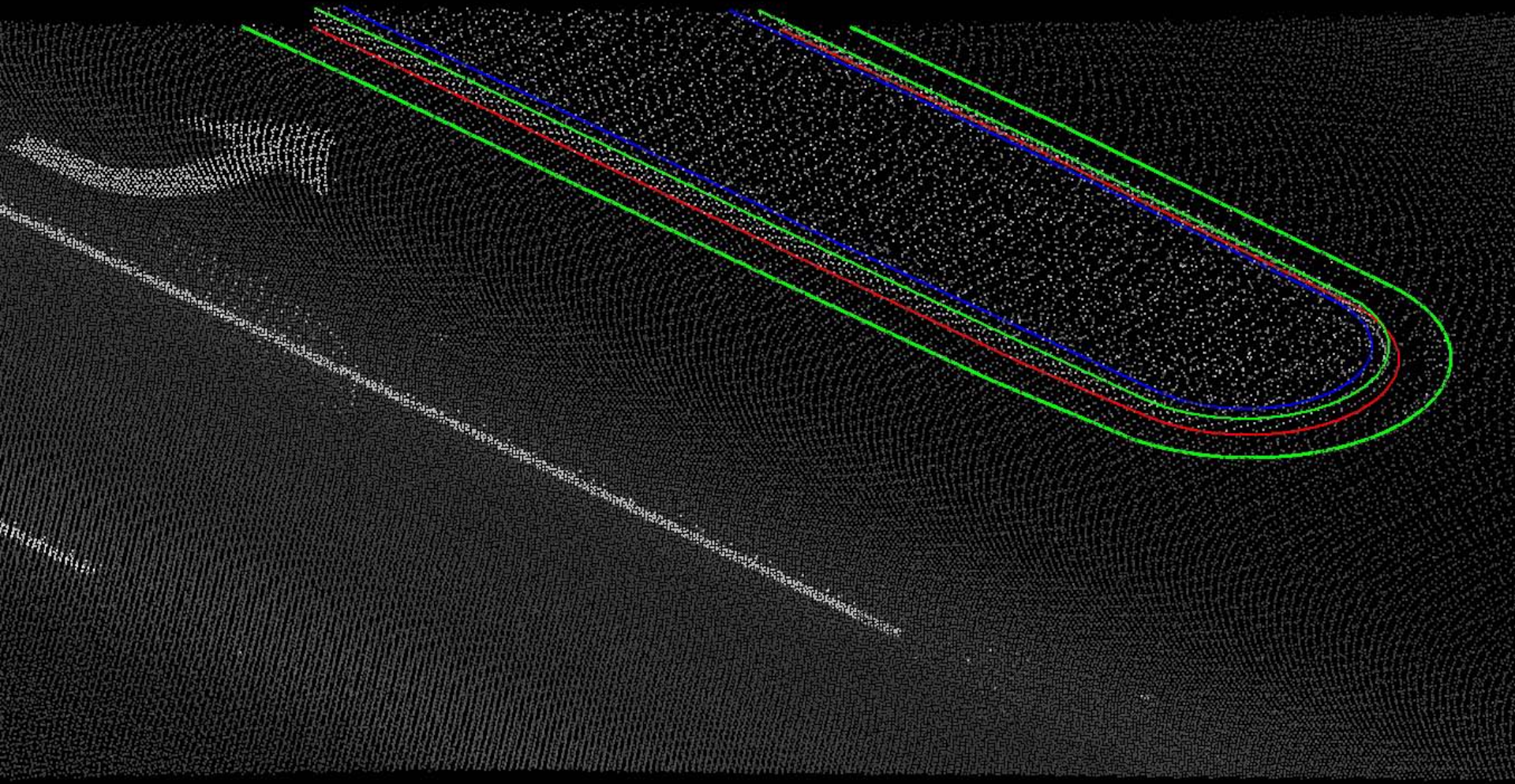
Mobile Mapping Processing

- Data Calibration
- Point Cloud Edits
  - Elimination of redundant data
    - Collected while vehicle is stopped
    - Multiple drive paths
  - Elimination of road ‘noise’
    - Primarily vehicles
  - Classification of Roads/Bridges
- Feature Collection
  - Linear features (lane lines, edge of pavement, guardrails, etc)
  - Point features (signage, poles, manholes, etc)

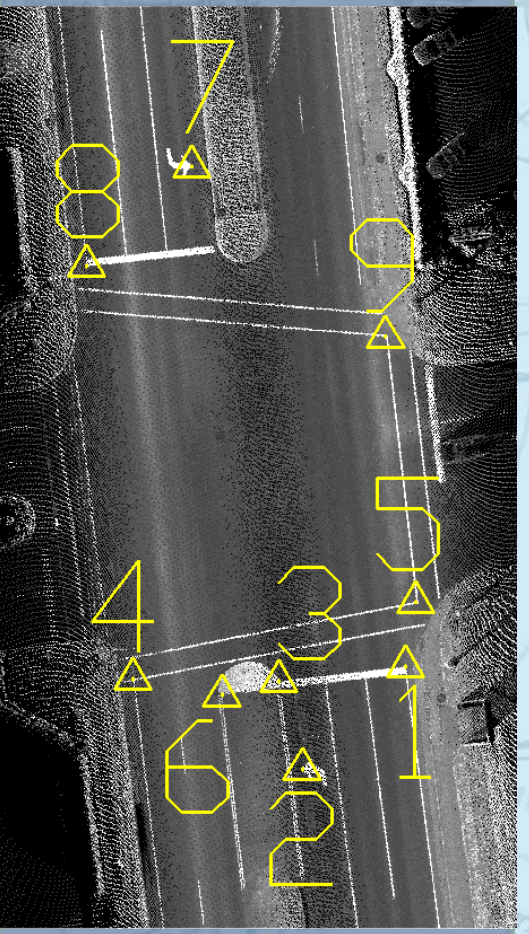





SSMH
SSMH
SSMH
SSMH
EXIST RR TRAFFIC SIGNAL POLE Radius 0.3031
SP
1 CATENARY LINE
SIGN
SIGN
8 CATENARY LINES
EXIST RR TRAFFIC SIGNAL POLE Radius 0.3992 ' Height 20.6625 '
SP
SSMH
SIGN
SIGN
EXISTING T
SP
JB



US 31W - Summary of Project



- Project Details
  - Total corridor 9.5 miles
  - US31W from Elizabethtown to Radcliff
  - Promised better then 0.1’ accuracy
  - Deliverables include SelectCad and MicroStation formats
- Mobile Mapping
  - Data collected in four swaths (2 Southbound / 2 Northbound)
  - 650 Million Discrete XYZ locations
- Field Surveys
  - 101 LiDAR-identifiable control points
  - RTK Horizontal Values
  - Digital Leveling for vertical component

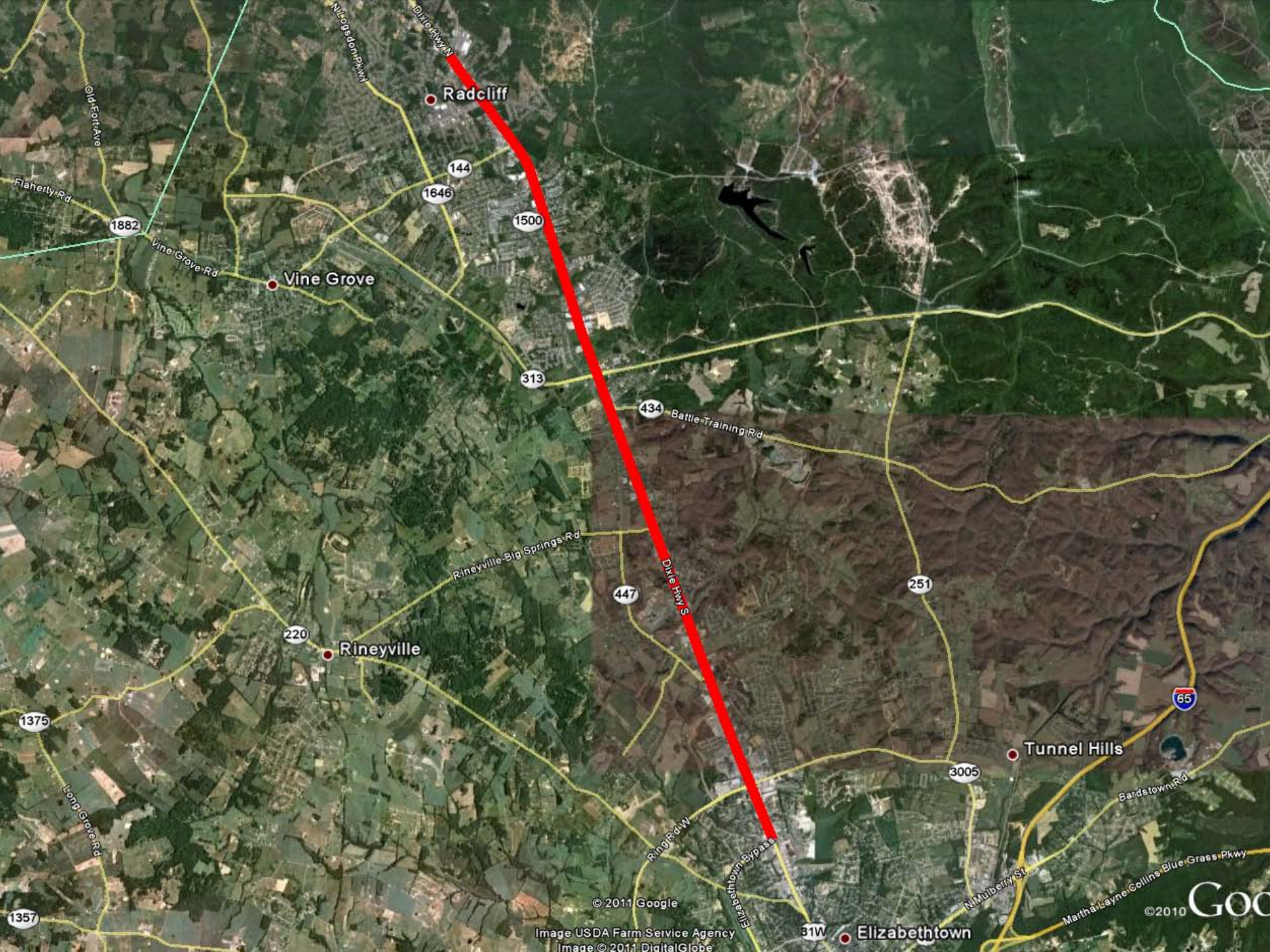

Radcliff
Vine Grove
Rineyville
Tunnel Hills
Elizabethtown
Dixie Hwy S
Dixie Hwy N
Nolin Parkway
Old Fort Ave
Flaherty Rd
Vine Grove Rd
Rineyville-Big Springs Rd
Battle Training Rd
Ring Rd W
Elizabethtown Bypass
N Mulberry St
Bardstown Rd
Martha Layne Collins Blue Grass Pkwy
Long Grove Rd
144
1646
1500
1882
313
434
447
251
220
1375
1357
3005
65
31W
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Image USDA Farm Service Agency
Image © 2011 DigitalGlobe
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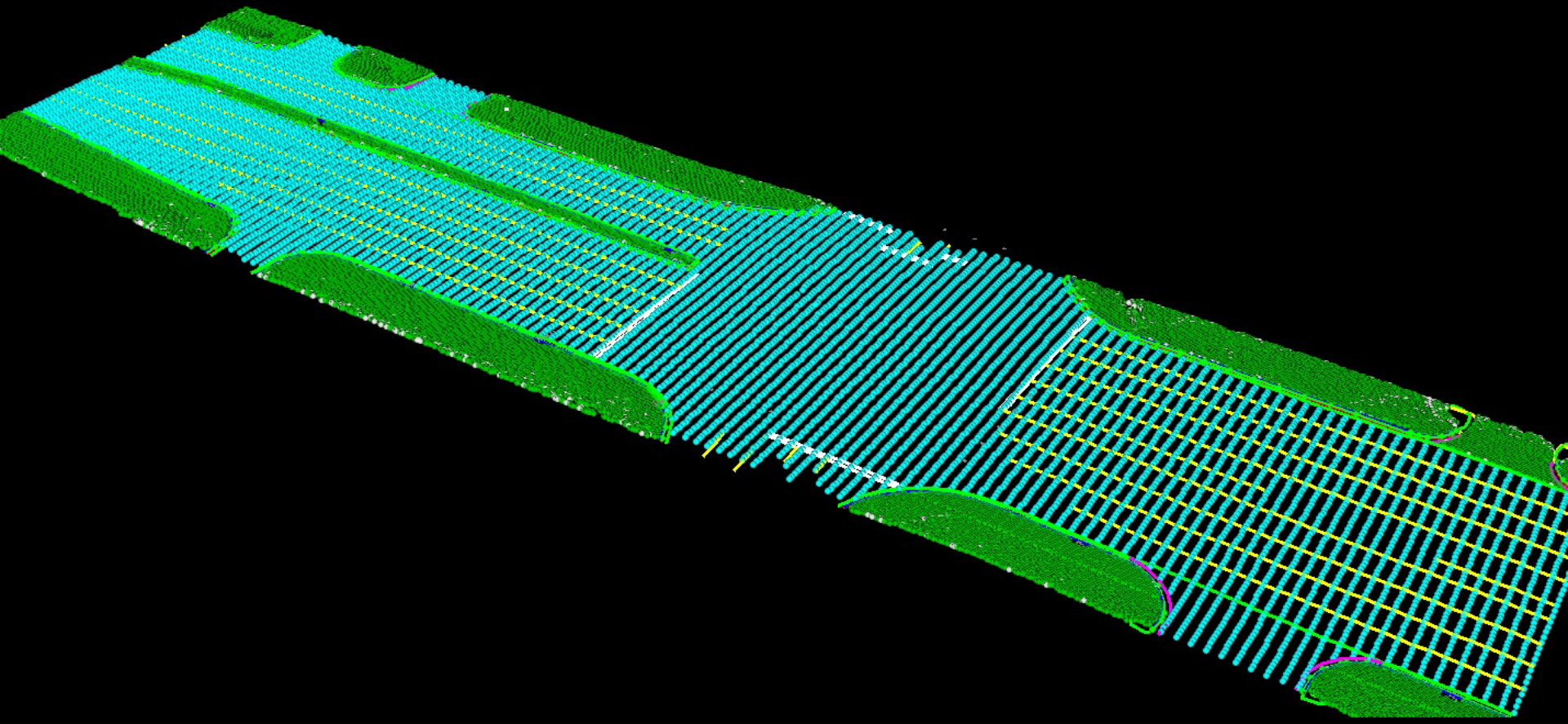
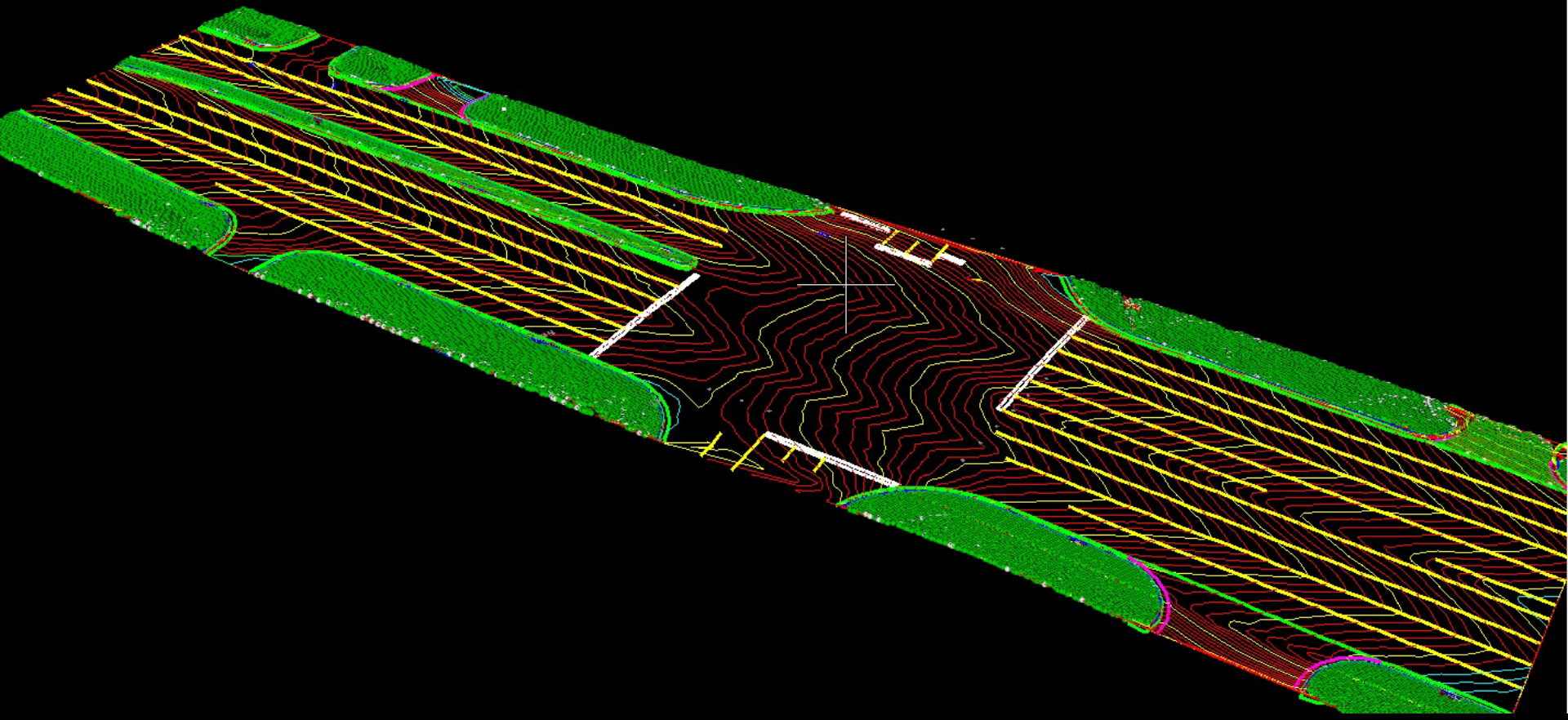
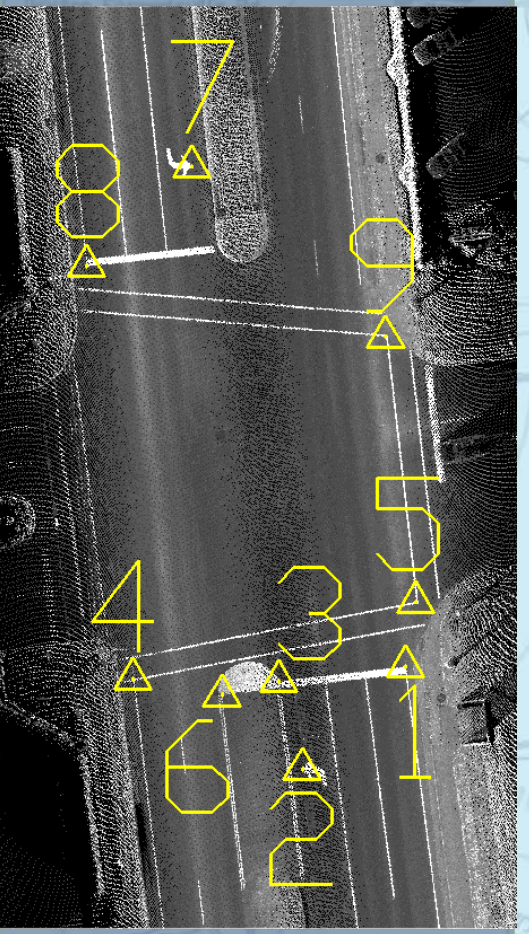




I65/I24 - Summary of Project



- Project Details
  - Total corridor ~4 miles
  - I65/I24 Interchange, Nashville
  - Shoulder-to-Shoulder Survey
  - Promised better then 0.1’ accuracy
- Site Details
  - Six to Eight lanes of traffic
  - Three Underpasses
  - Four Ramps
  - Median Barrier for ~60% of project length
  - Very High Volume of Traffic
- Deliverables include Tennessee DOT specification

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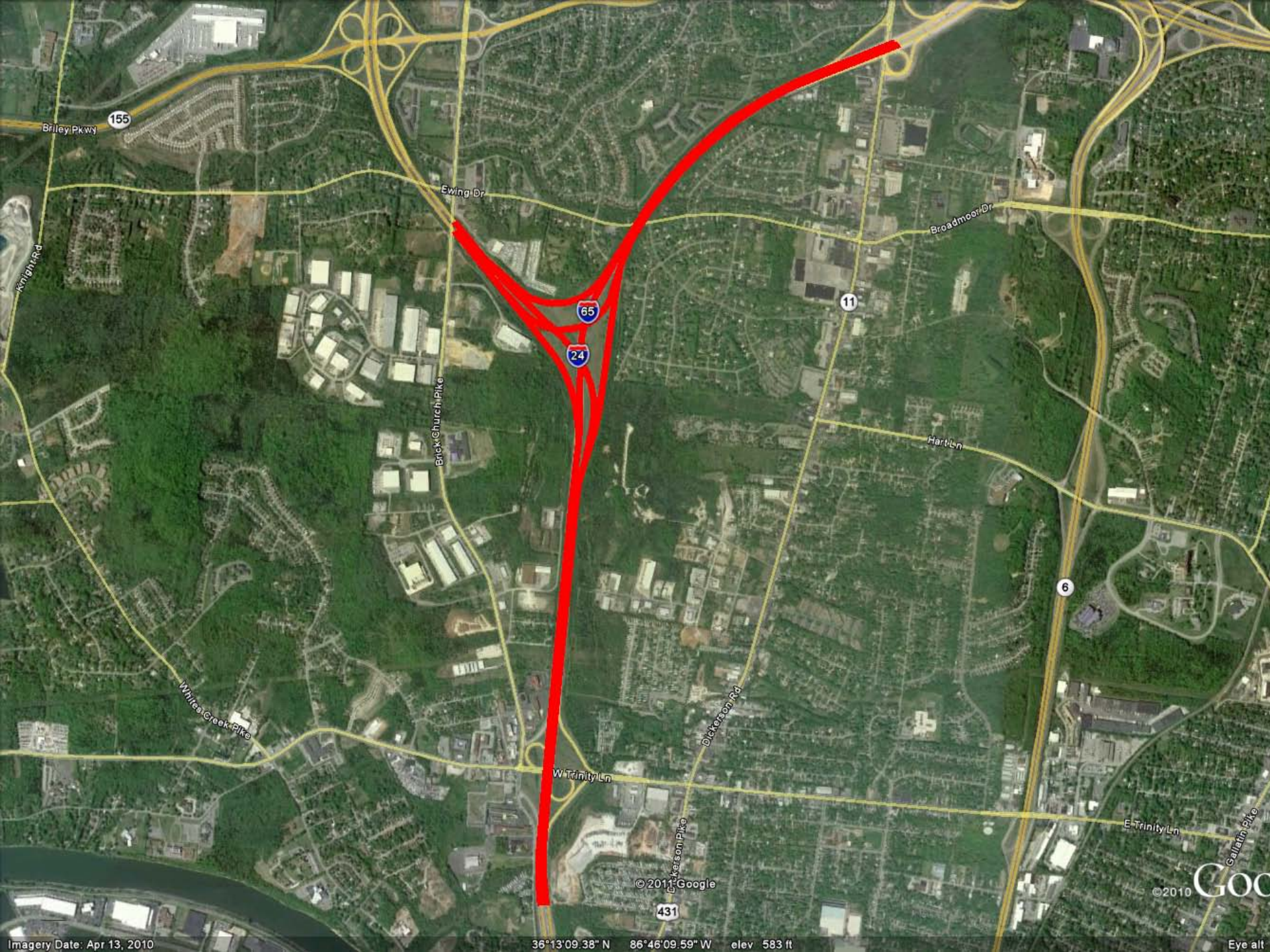
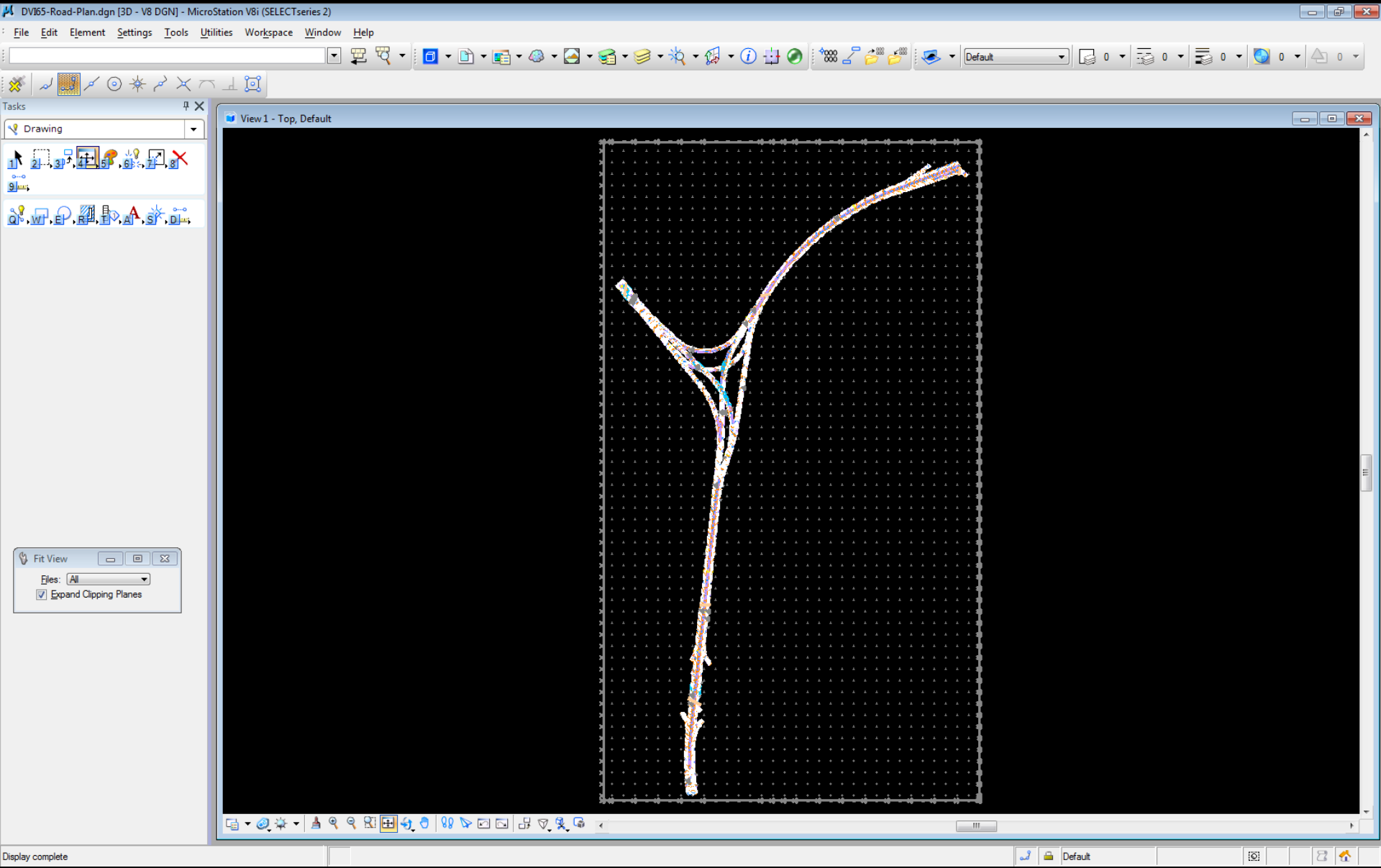

Briley Pkwy
155
Ewing Dr
Broadmoor Dr
Knight Rd
65
24
11
Brick Church Pike
Hart Ln
6
Whites Creek Pike
Dickerson Rd
W Trinity Ln
E Trinity Ln
Dickerson Pike
Gallatin Pike
© 2011 Google
431
©2010 Goo
Imagery Date: Apr 13, 2010
36°13'09.38" N
86°46'09.59" W
elev 583 ft
Eye alt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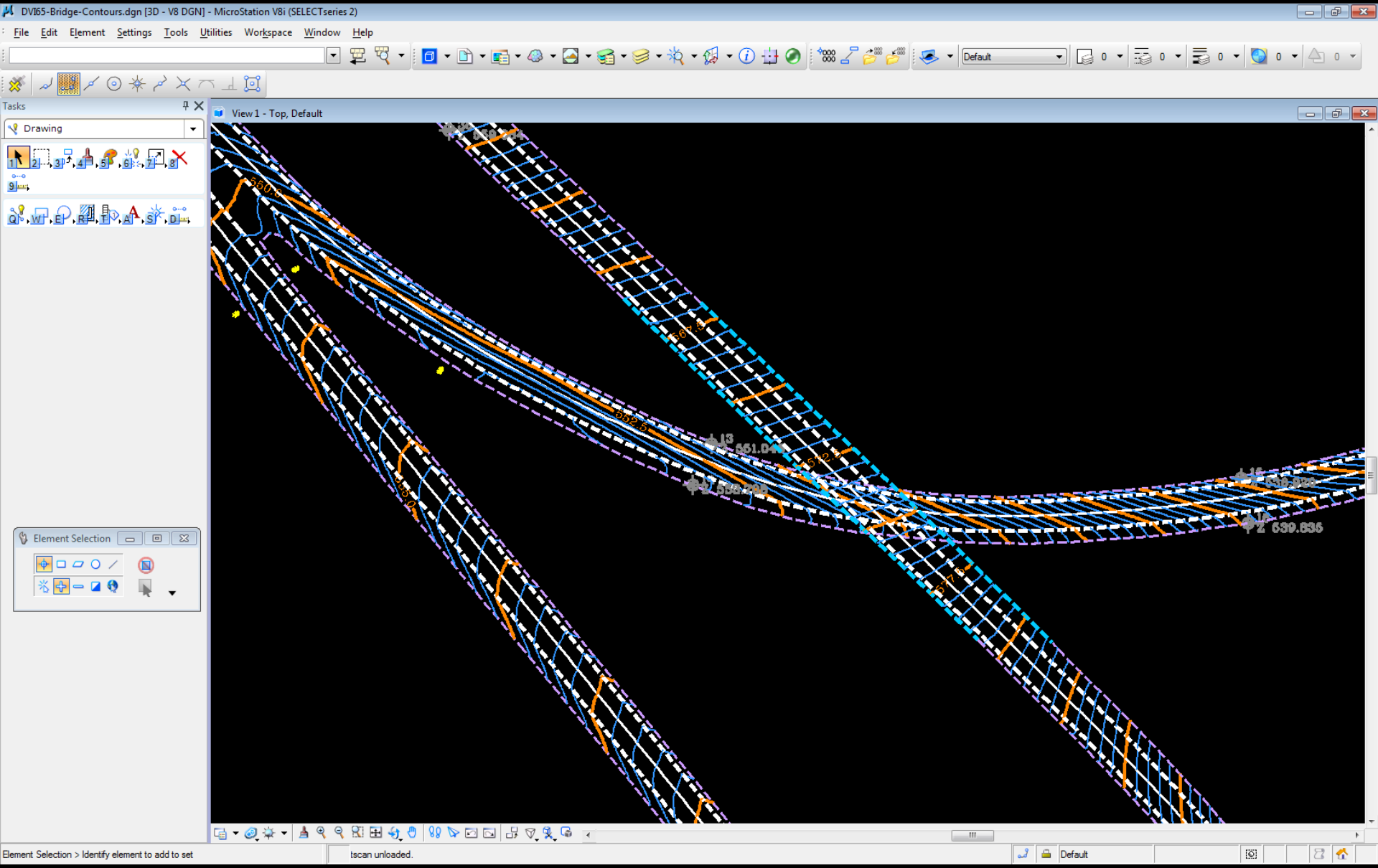
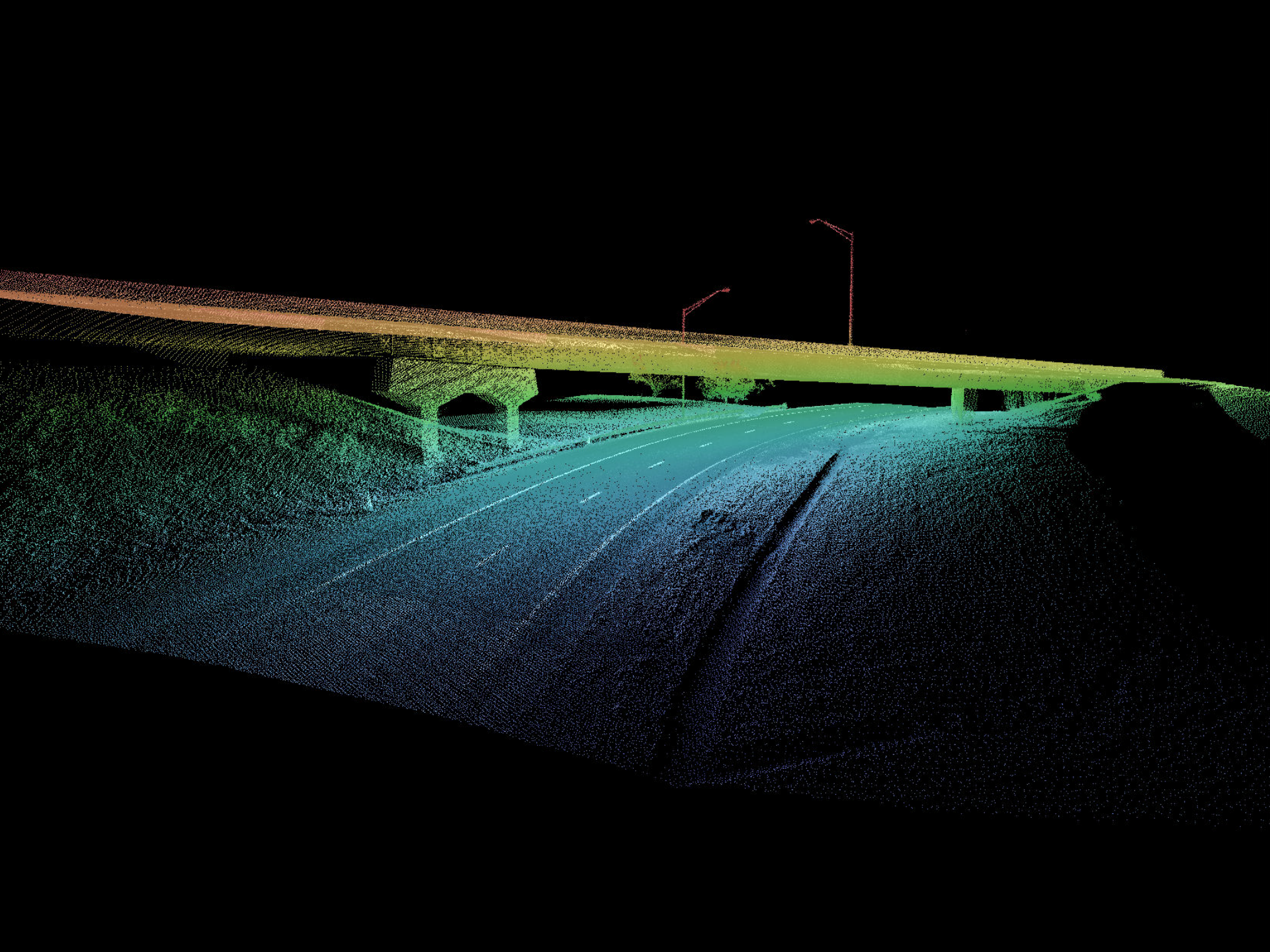
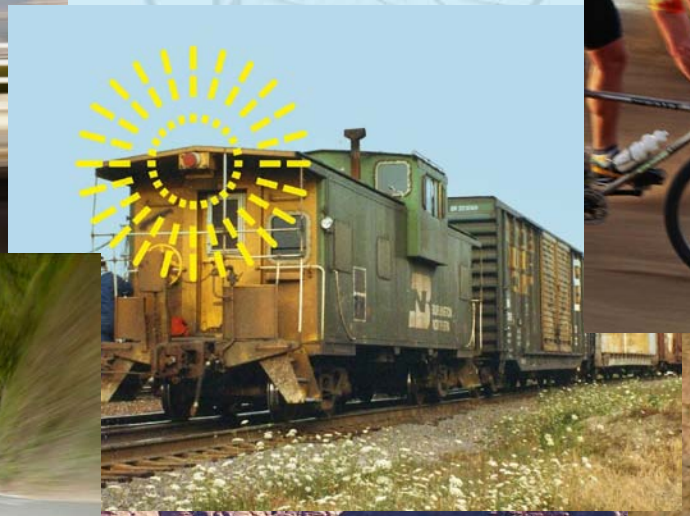
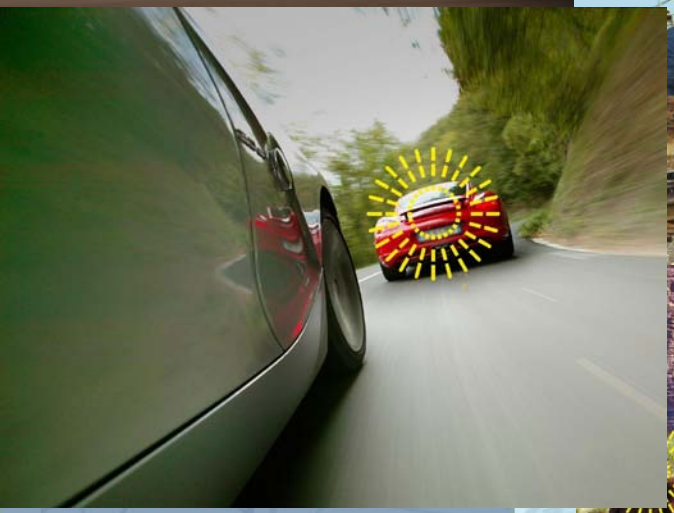
File Edit Element Settings Tools Utilities Workspace Window Help
Default
Tasks
Drawing
View 1 - Top, Default
Fit View
Files: All
Expand Clipping Planes
Display complete
Default


DVI65-Bridge-Contours.dgn [3D - V8 DGN] - MicroStation V8i (SELECTseries 2)
File Edit Element Settings Tools Utilities Workspace Window Help
Tasks
Drawing
View 1 - Top, Default
Element Selection
560.0
550.0
J3
551.04
639.836
Element Selection > Identify element to add to set
tscan unloaded.
Default



Questions and Answers





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