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SR 52 Realignment- FDOT Case Study for Data Fusion in Design Surveys

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Project Overview

- SR 52 from East of McKendree Road to East of Fort King Road, FPID #435142-1-32-01, Pasco Co.
- Task Work Order under ACA's D7 Continuing Survey Contract

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Project Overview

- D7 in-house Design SWAT Project, 7 miles
- New corridor alignment for SR 52 extension
- Widening of existing SR 52 and Clinton Ave

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Project Approach

- Mobile LiDAR - ACA
- Aerial LiDAR with Digital Imagery - ACA
- Traditional Survey – ACA, AIM, CivilSurv, Stantec

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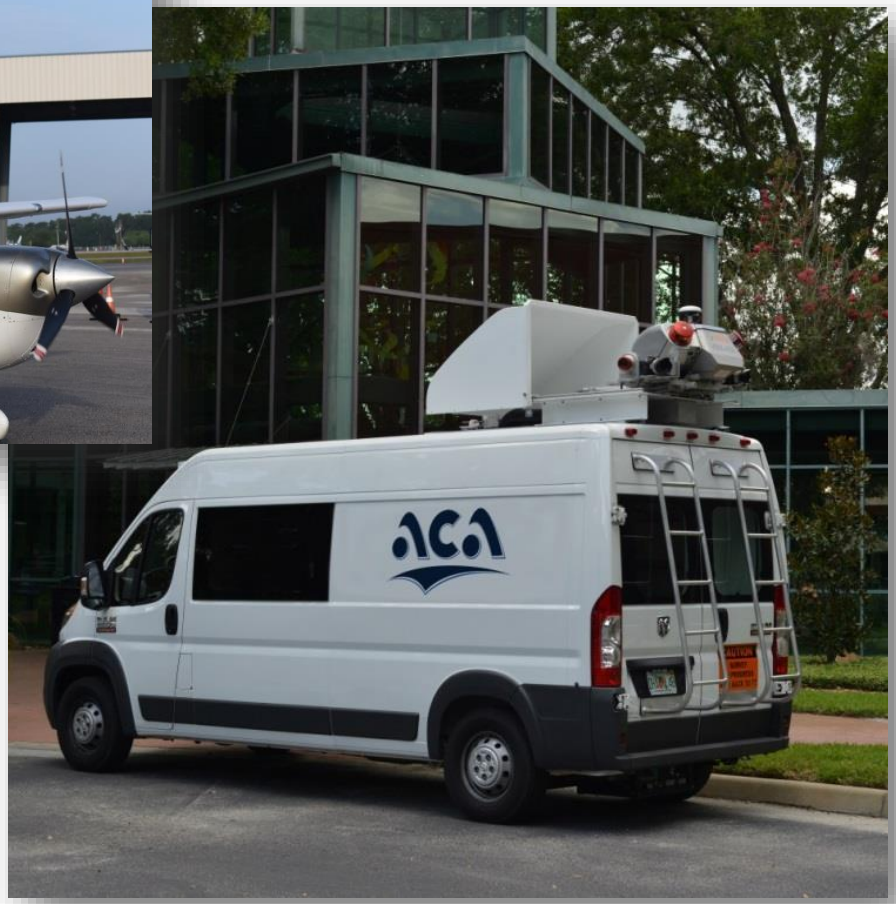
Multiple Platforms Used



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Why Multiple Platforms?

- Full coverage of project area (expanded project width for alignment analysis)
- Mobile LiDAR added high accuracy on the roads
- Aerial imagery required for analysis and public involvement
- Aerial LiDAR provided better penetration within tree areas to limit obscured locations.
- Speed of delivery – SWAT project with in-house design

Potential Challenges

- Misalignment between types of data
- Differences in features collected from different data sets
- Duplicate collection
- Point density differences affecting surface model
- Standing ground water
- SS4 corridor modeling delivery
- File size

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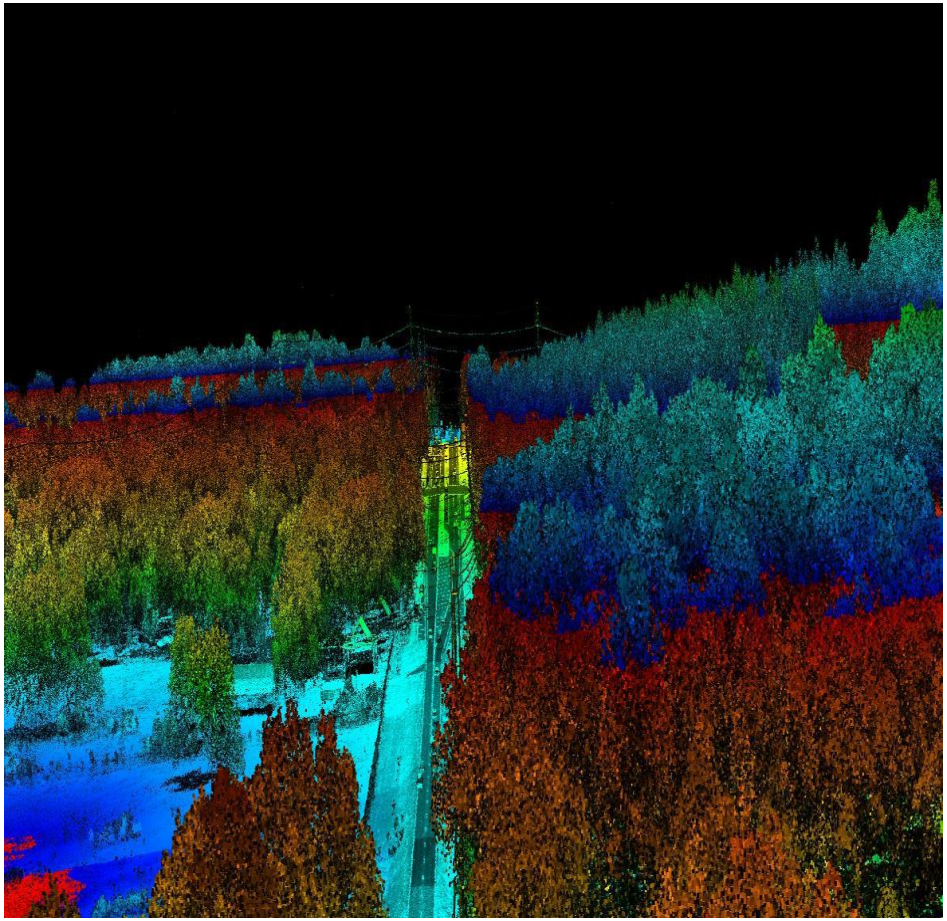
Advantages

- Speed of data collection
- Safety
- Volume of extractable information
- Project coverage
- Cost Effective
- Limited disruption to property owners
- Data Integration / Seamless Delivery



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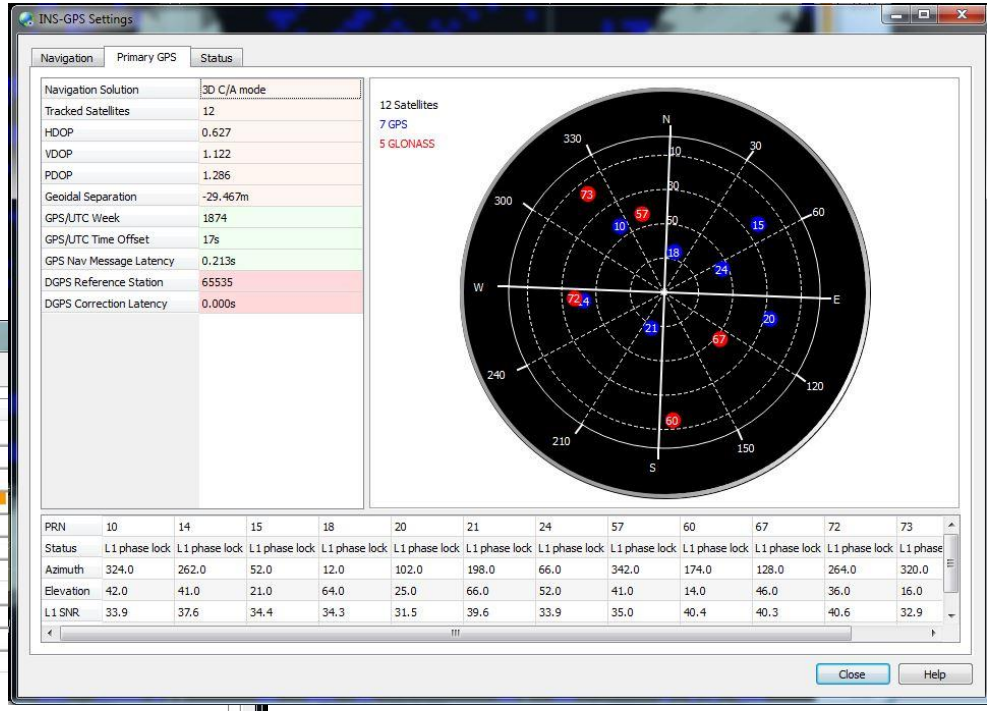
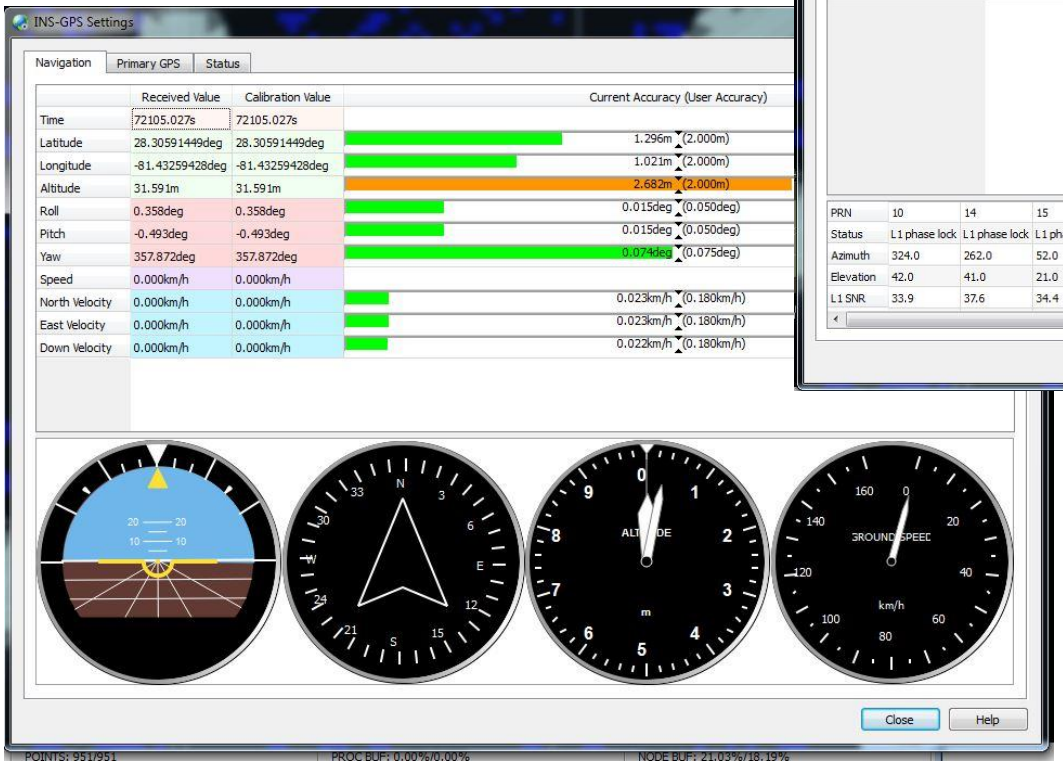
Detailed Mission Planning & Execution





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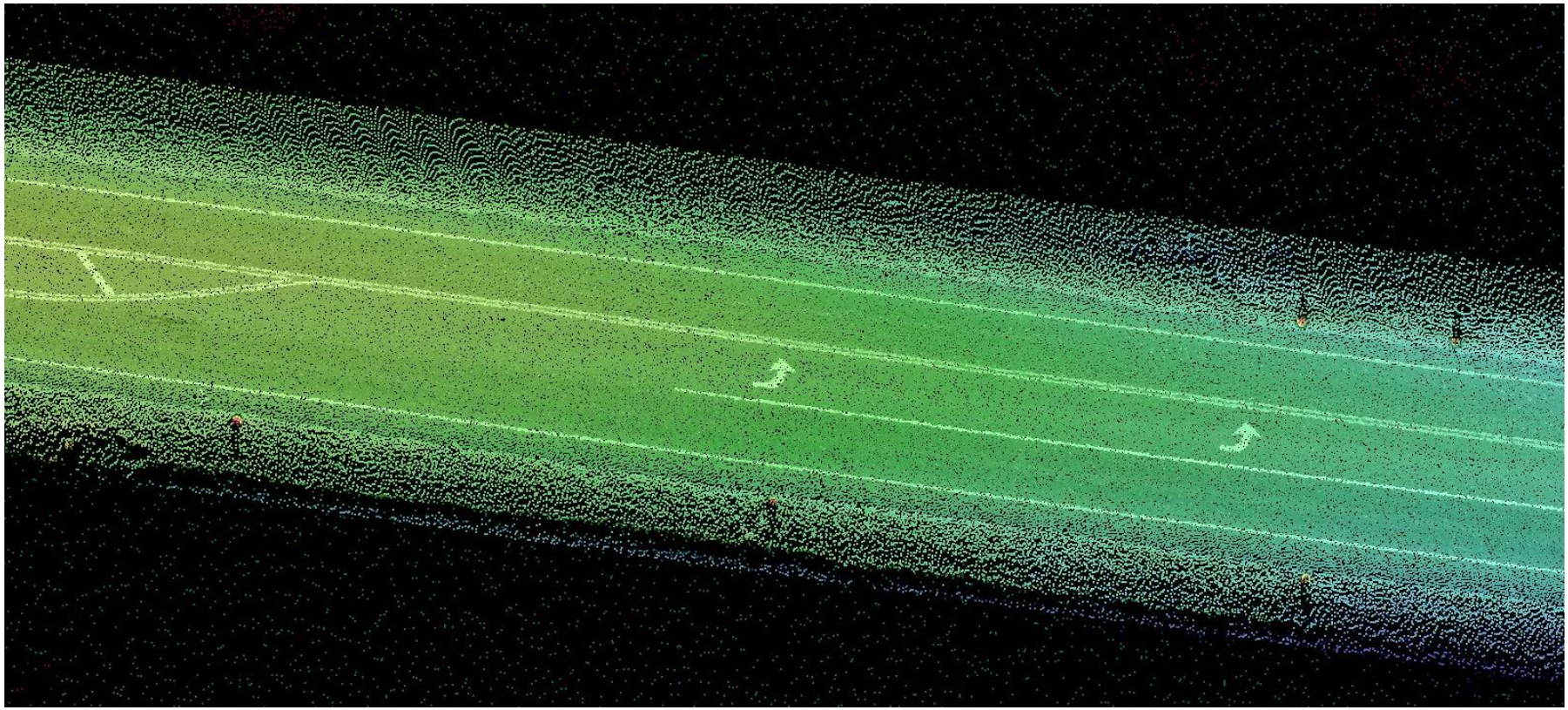
Data Integration

Point Density Difference



Mobile LiDAR: 500+ ppsm

vs.

Aerial LiDAR: 15 ppsm

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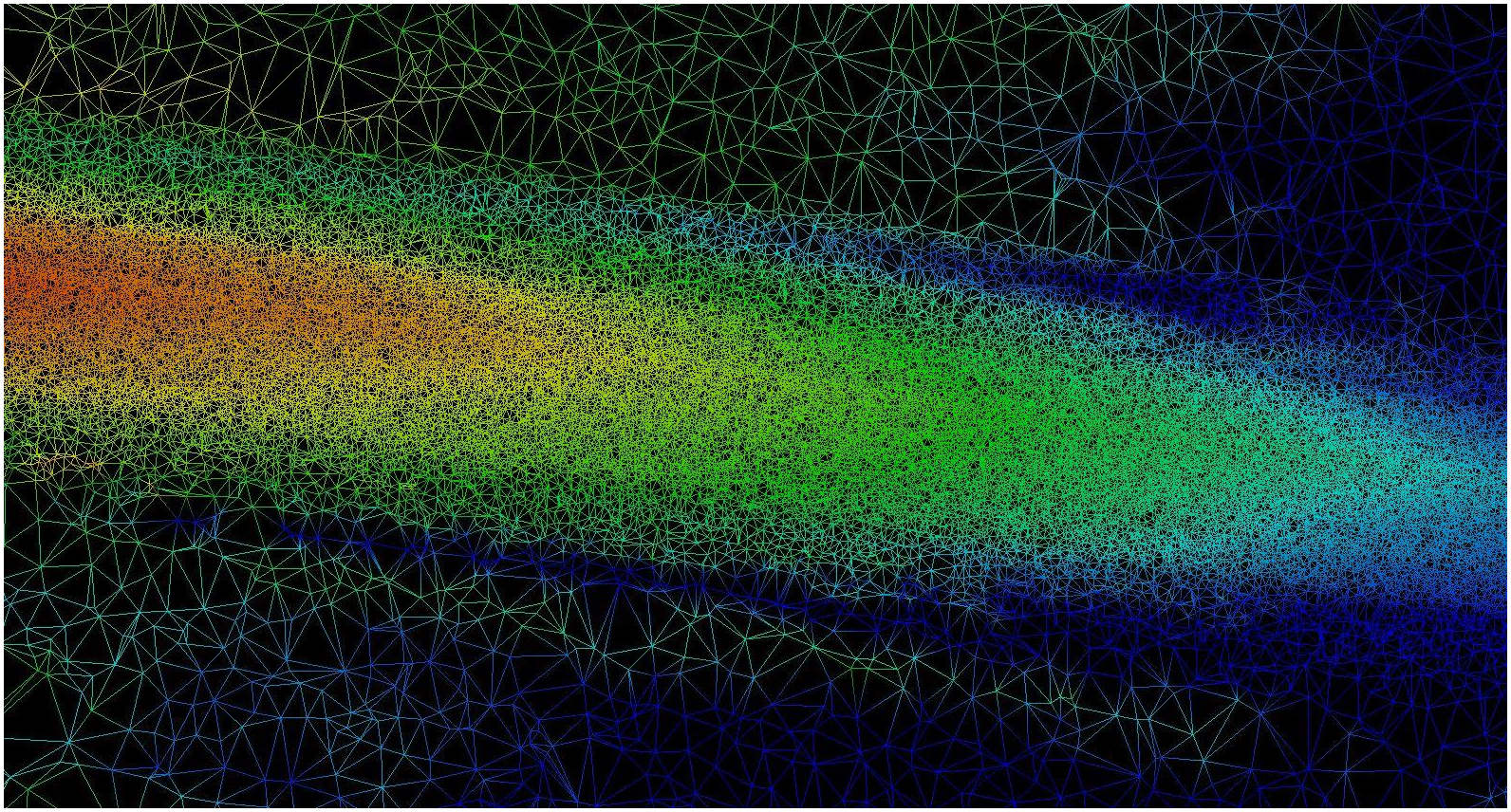
DEM Density Difference



Mobile LiDAR: 500+ ppsm

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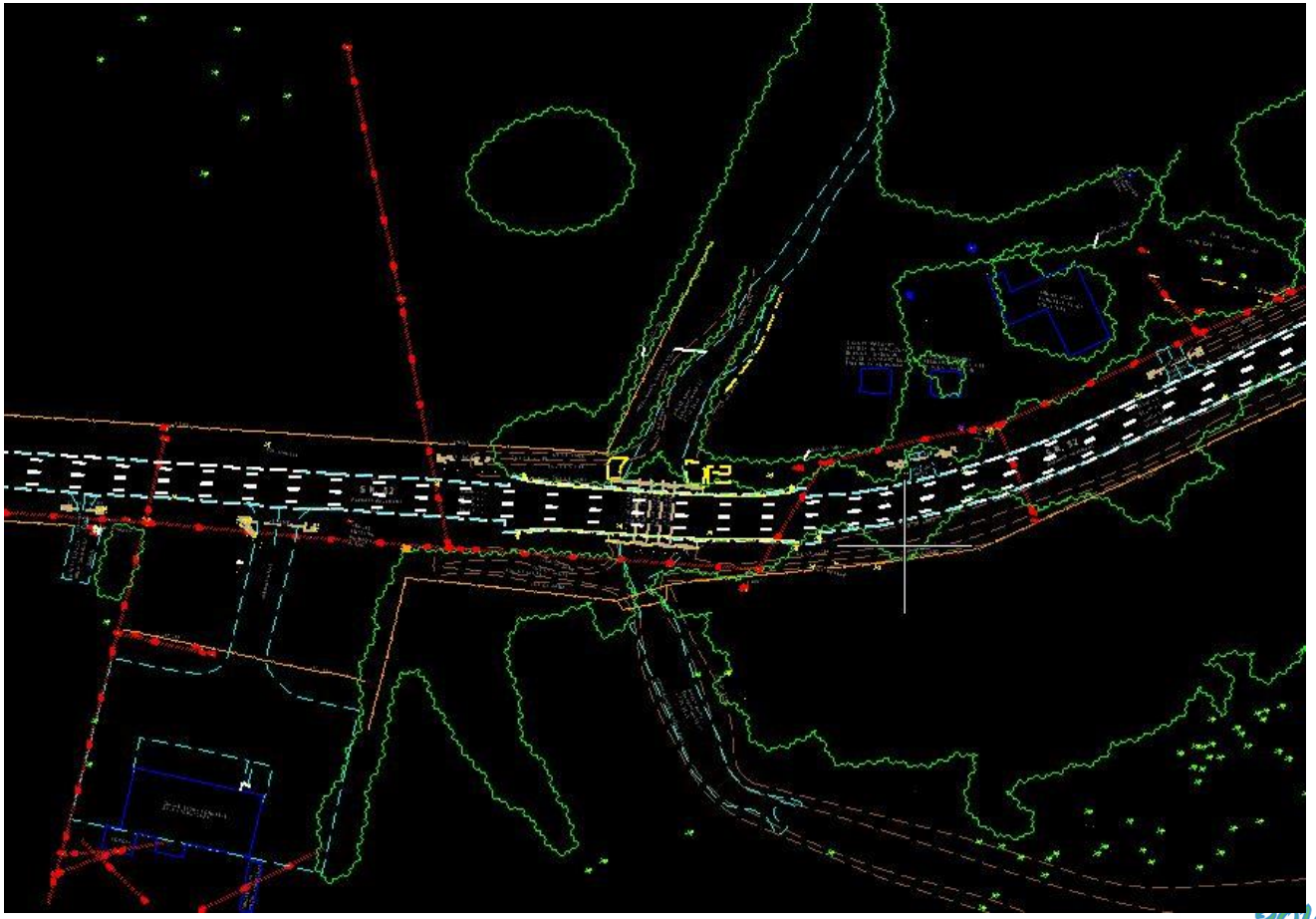
Extracted Features from Multiple Sources



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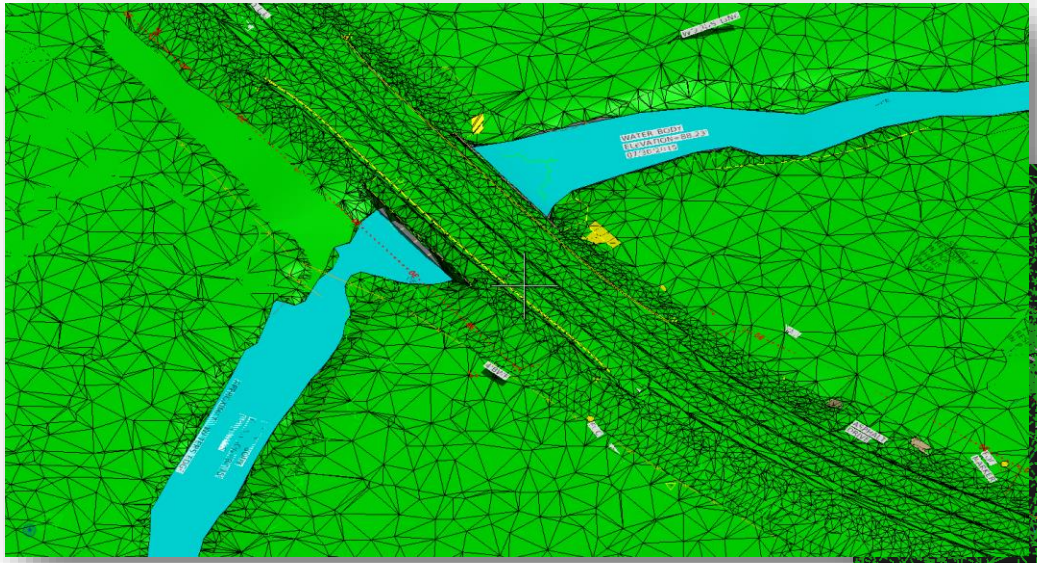
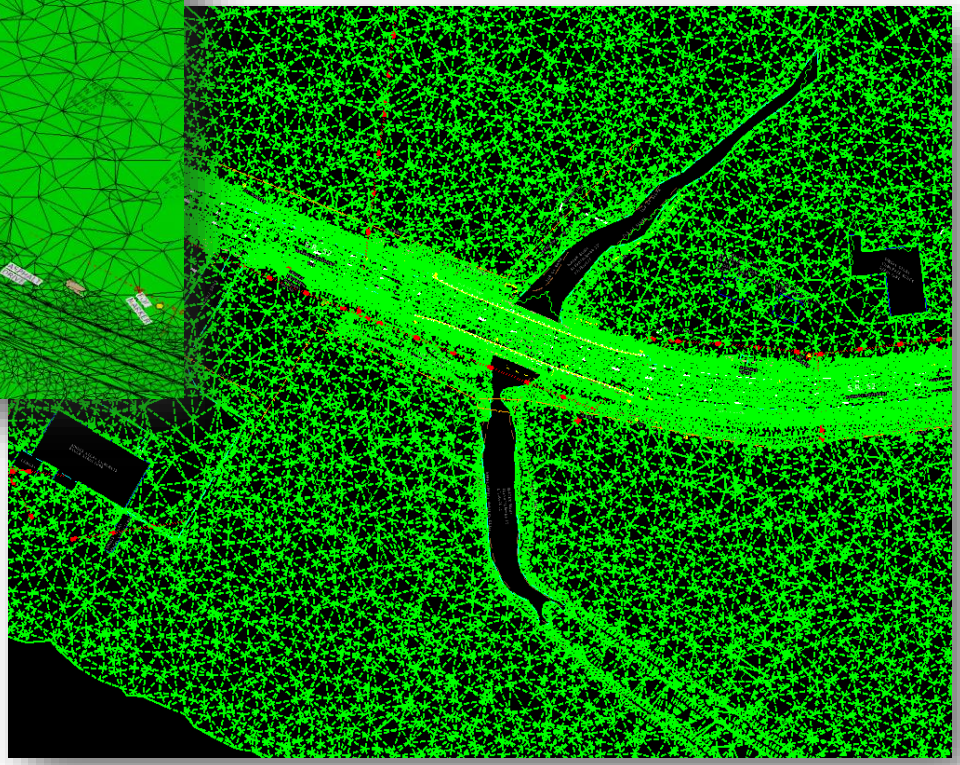
Digital Terrain Model



DTM

DEM



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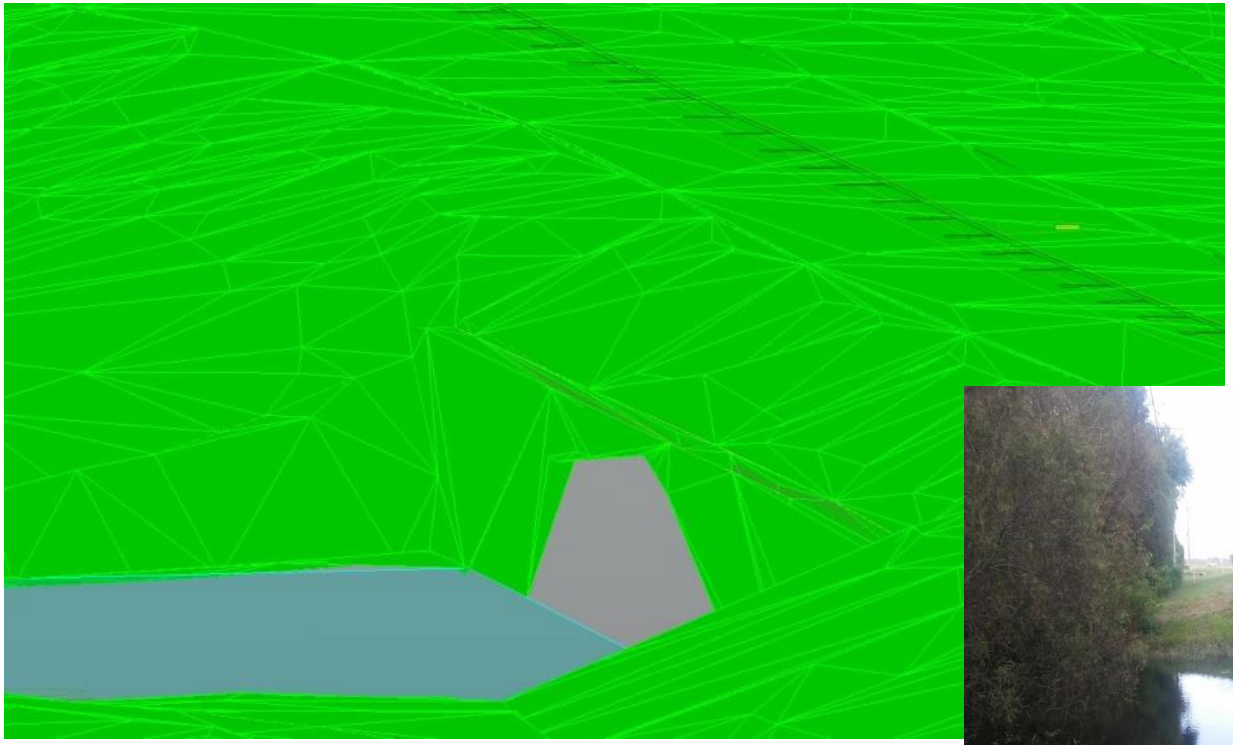
Highly Detailed DTM



- Connecting survey chains from multiple sources

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Unique Delivery Requirements

- File Size constraints
  - Use model key points to thin out data
  - Separated the project into 4 segments
- SS4 format
  - Integrate LiDAR information into Field Books
  - Merge extracted chains with survey chains
  - Multiple data sources into the DTM
  - SURVRD01 compliancy

Accuracies

	Aerial LiDAR (Feet)	Mobile LiDAR (Feet)
Average dz	0.000	0.009
Minimum dz	-0.370	-0.040
Maximum dz	0.280	0.155
Average magnitude	0.047	0.012
Root mean square	0.066	0.024
Std deviation	0.066	0.022

- 20 Aerial Targets
- 195 Mobile LiDAR Targets

- Statistics Are Relative to Target Control Values
- Differential Leveling
- Redundant GPS Procedures

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Summary

- Advantages of using multiple platforms usually outweigh potential challenges
- Most problems can be avoided or minimized with strong mission planning and good acquisition coordination
- High accuracy and seamless delivery
- Increased point density aids in design

Questions?

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