GIS/LiDAR Applications for Railroad/Utility Corridor Development and Third-Party Right-of-Way Mapping

GEOSPATIAL SOLUTIONS

July 15, 2010

Introduction/Purpose

- Light Detection and Ranging (LiDAR) and GIS are decisive and key technologies for corridor planning and third party ROW mapping.
- LiDAR provides high density and high precision X,Y,Z ground coordinates, which can produce highly accurate terrain models/contours for design purposes.

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Introduction/Purpose

- By properly organizing ROW data layers in a GIS, the data can be instantly accessed, viewed, analyzed and printed out as needed.
- When data is stored in a centralized GIS, it can be accessed by multiple disciplines.

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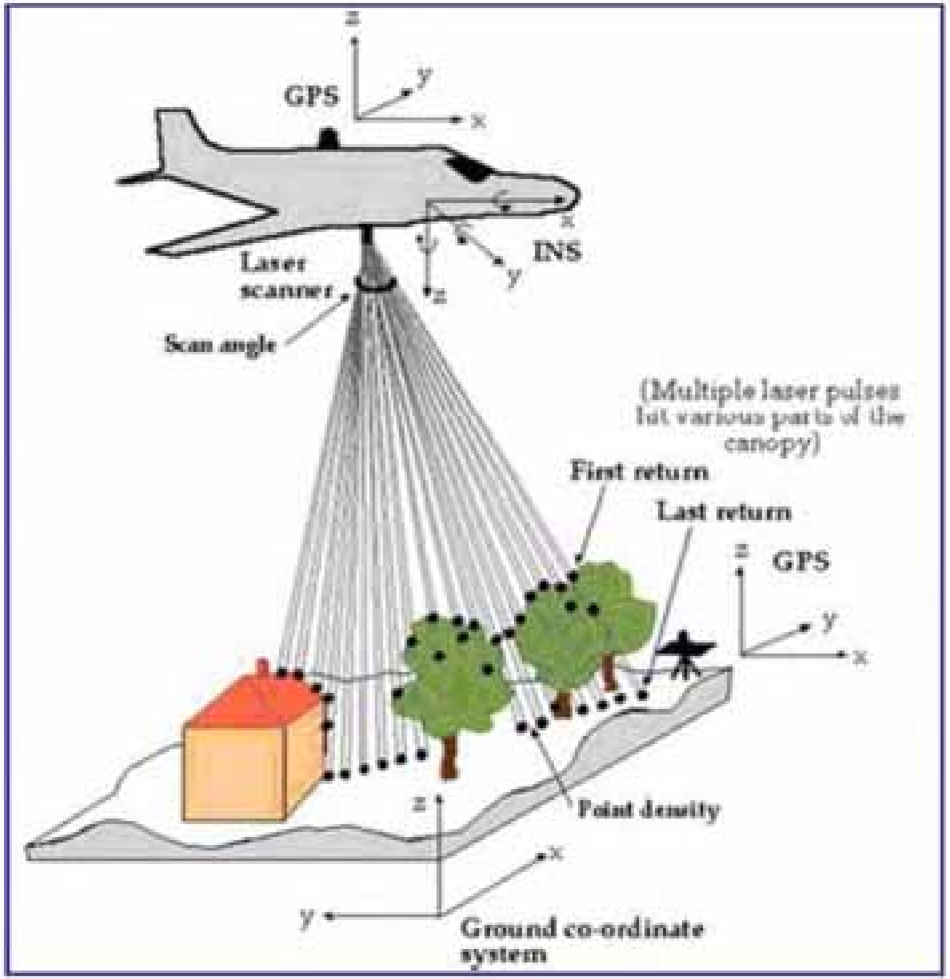
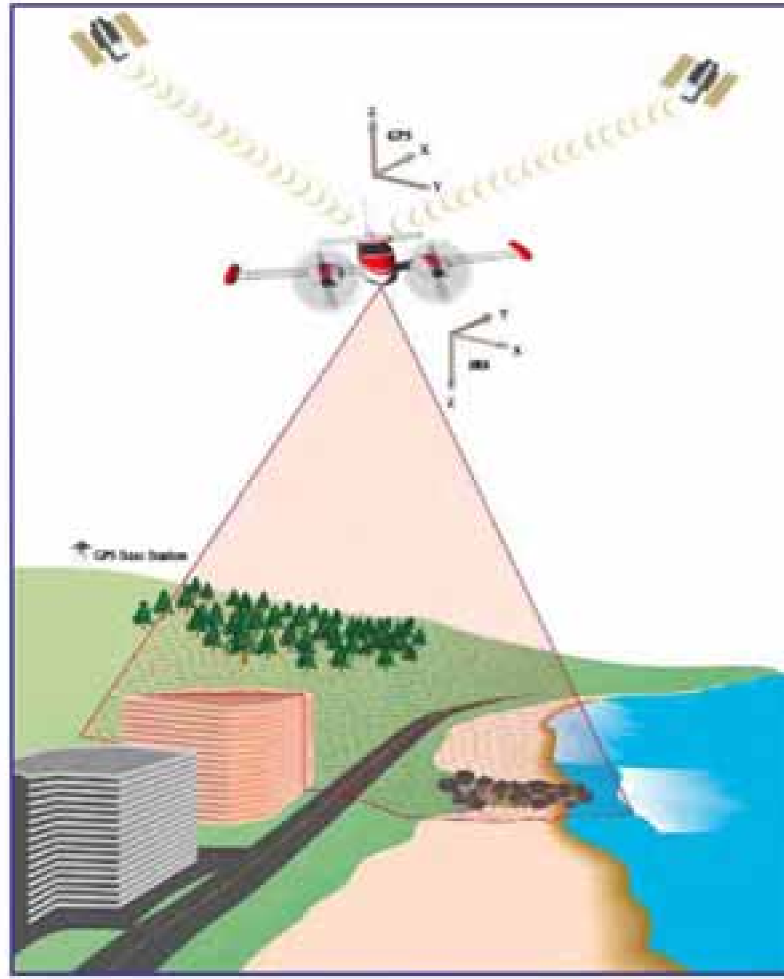
LIDAR





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Methods of LiDAR Collection

Benefits of the different LiDAR Platforms for Corridor Mapping

- Fixed Wing:
  - For large, continuous areas with low GSD (Ground Sample Distance).
  - Ideal for ROW footprint mapping.
- Helicopter:
  - For mapping winding, existing corridors such as rail, road or utility.
  - For areas requiring high GSD for tighter contour generation.
  - Ideal for high precision mapping required for additional corridor track, highway lane widening, utility corridor construction and light corridor feature extraction.
- Ground-Base/Stationary
  - For extremely high GSD with survey-grade accuracy.
  - Ideal for viewshed analysis and extreme feature extraction.

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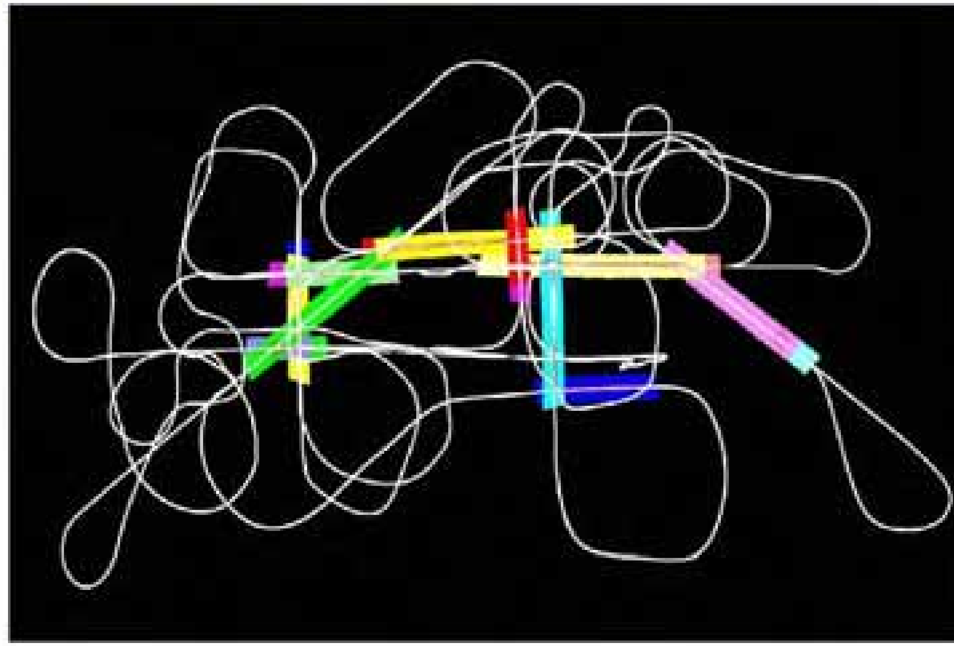
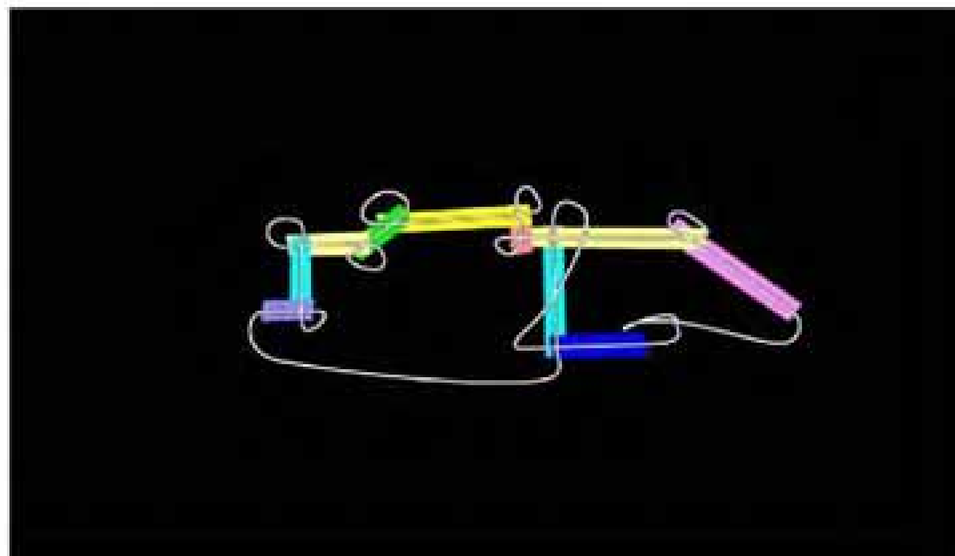
Helicopter Corridor Flight Efficiencies – Less Turns / Smaller Turns

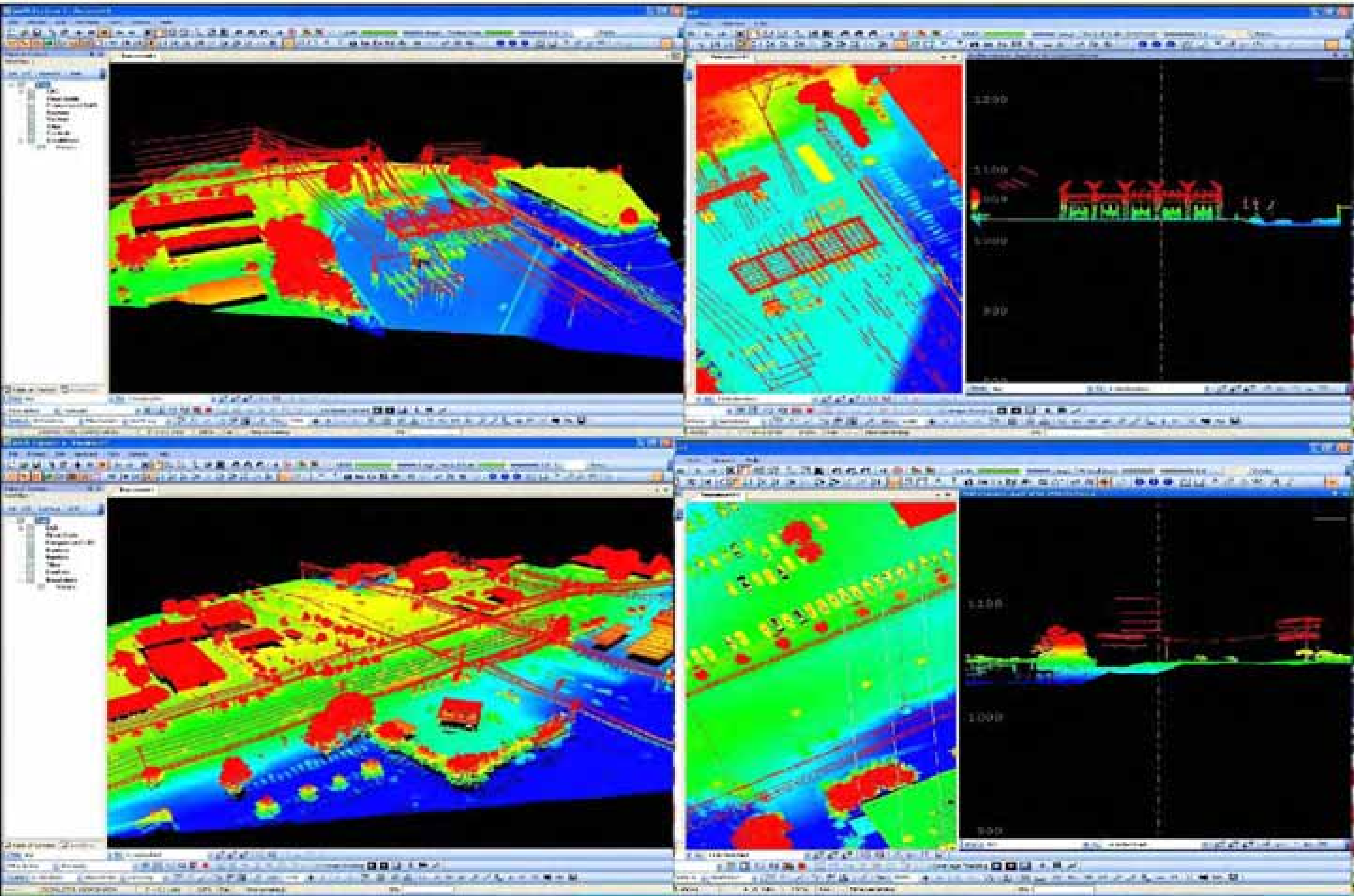
24 mile corridor with 0.5m GSD Requirement

- The 24 mile long corridor must be **flown twice** for data density – 0.5 m GSD
- Turn radiuses = 4-7 miles
- Length of turn track = 9-20 miles
- Turn times = 4 – 8 minutes per turn
- Flight time breakdown:
  - Over target = 0.5 hrs / 15%
  - Flight line turns = 1.8 hrs / 59%
  - Taxiing, takeoff, ascending, descending, landing = 0.8 hrs / 26%
  - **Total = 3.1 hrs**
- Estimated flight time for helicopter = 20 minutes
- This equates to a 9X savings in flight time
- Flight time breakdown:
  - Over target = 0.2 hrs / 61%
  - Flight line turns = 0.1 hrs / 30%
  - Takeoff and landing = 0.03 hrs / 9%
  - **Total = 0.34 hrs**

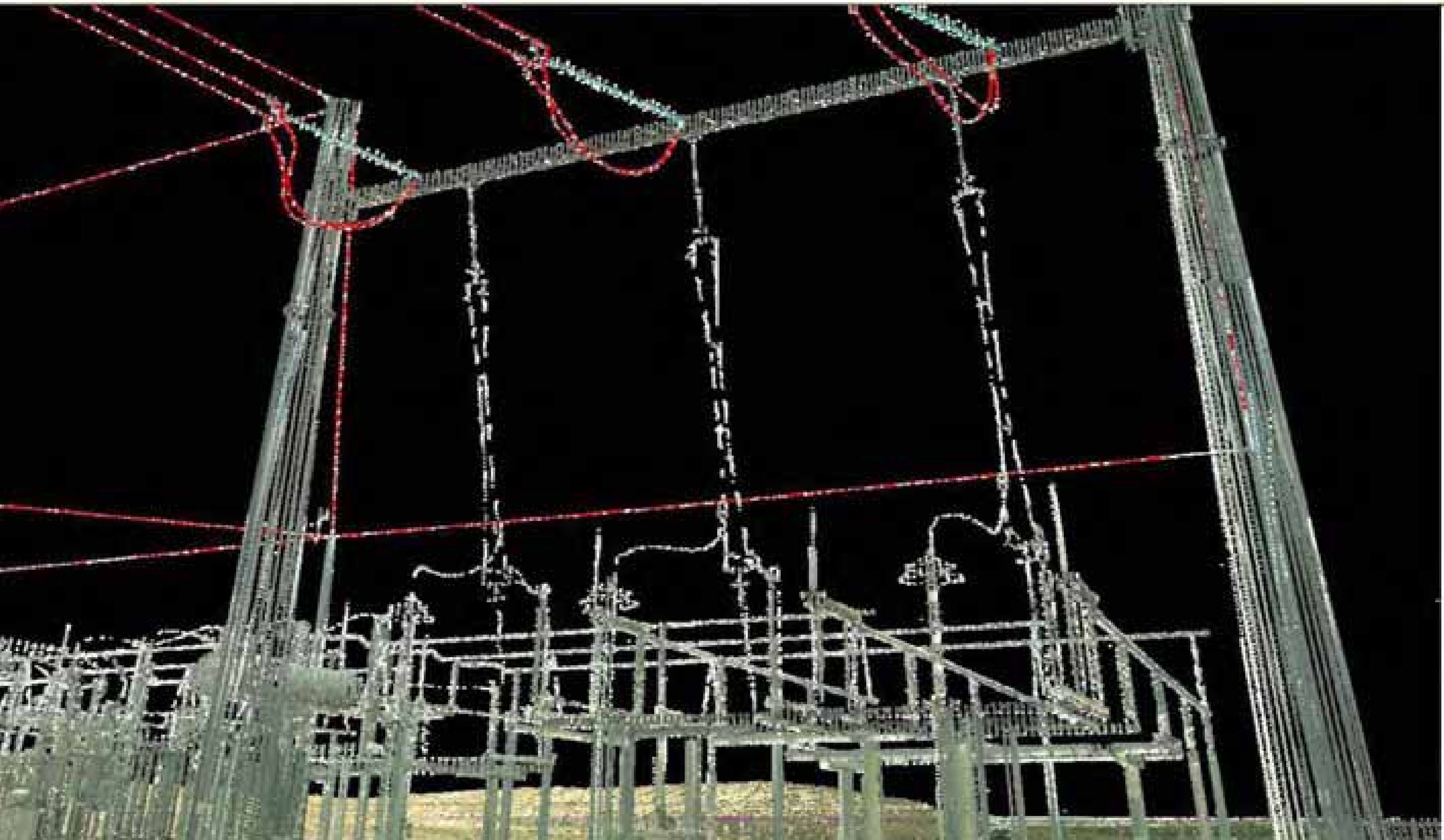




Utility LiDAR



Utility LiDAR



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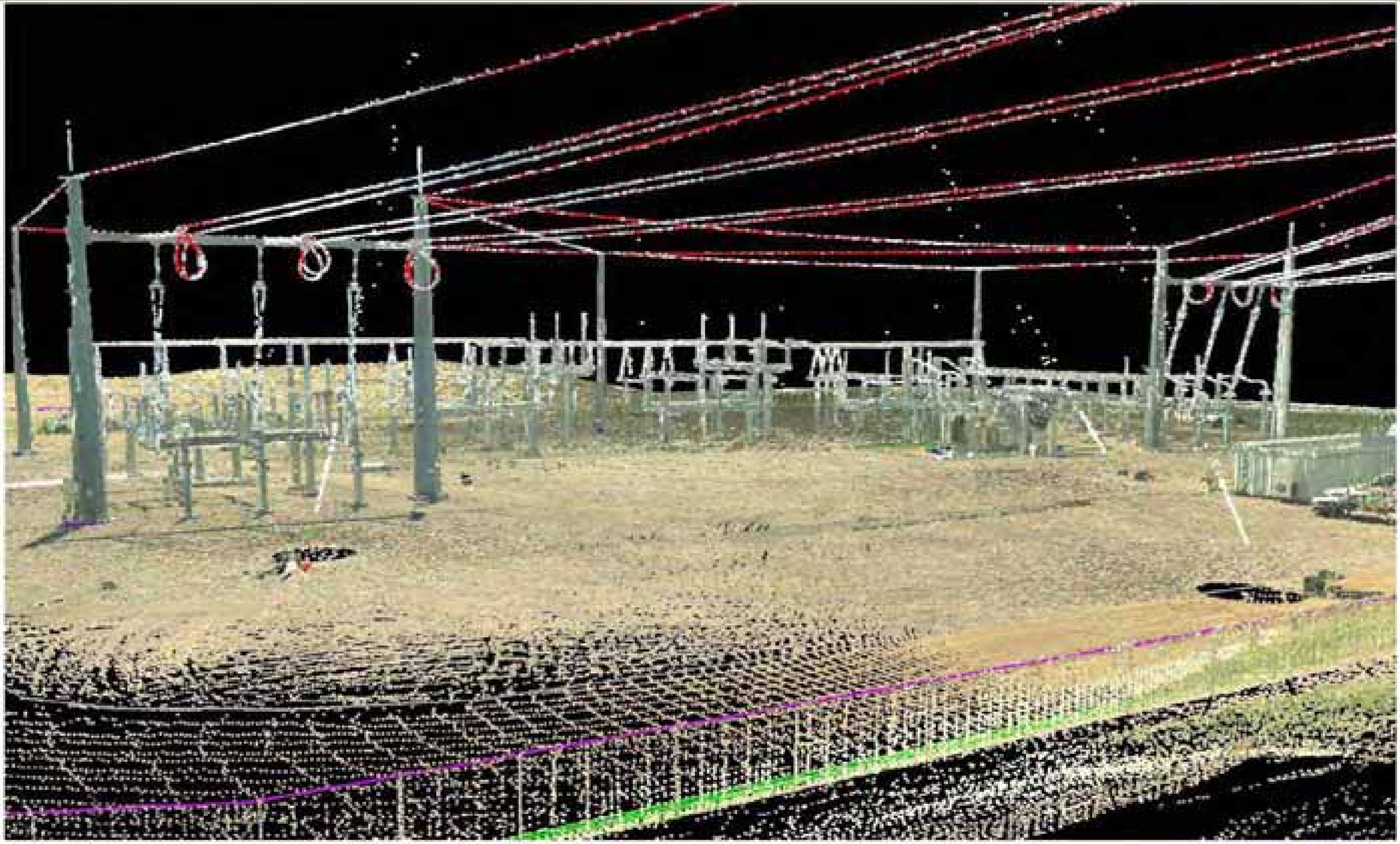
Utility LiDAR



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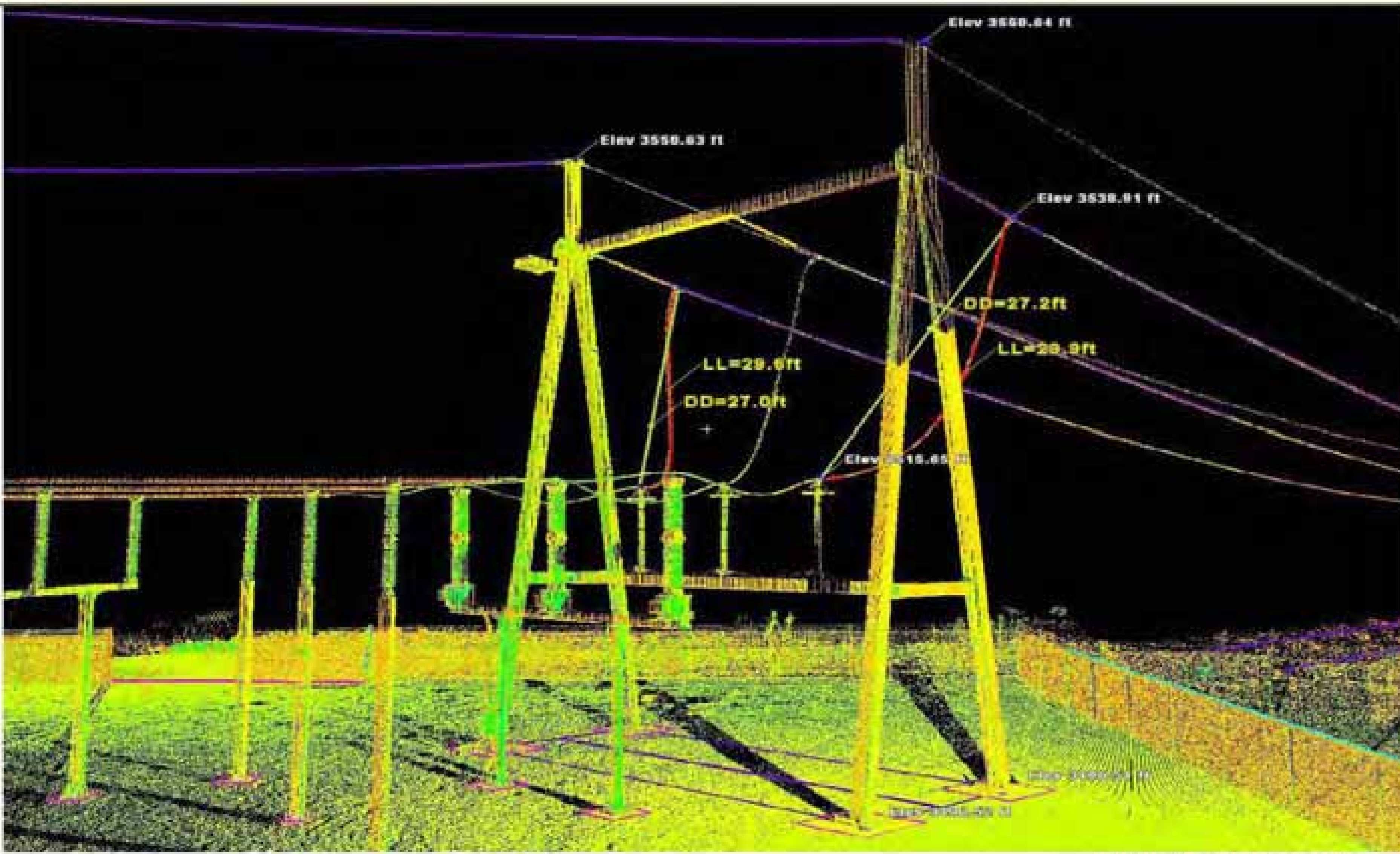
Utility LiDAR



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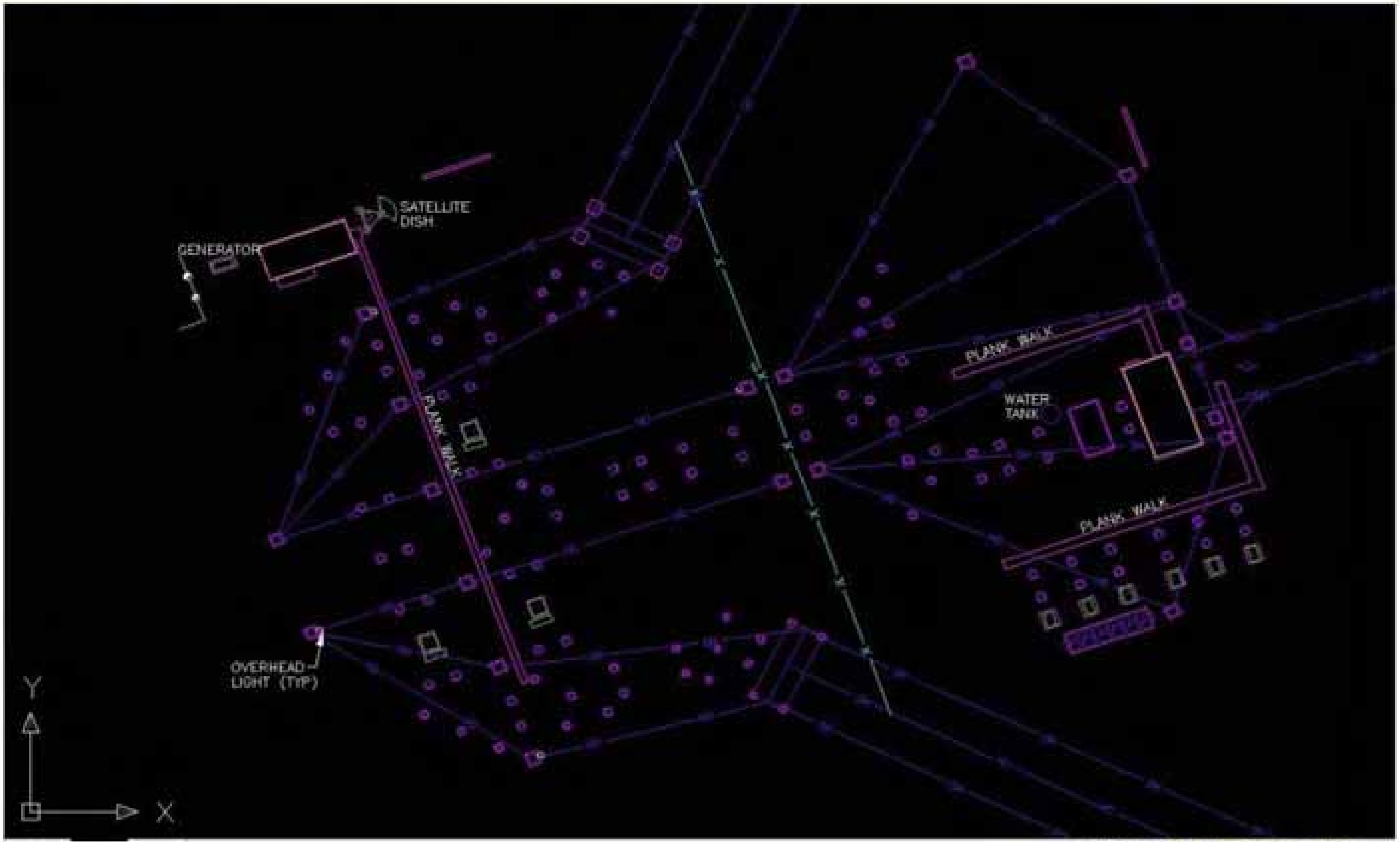
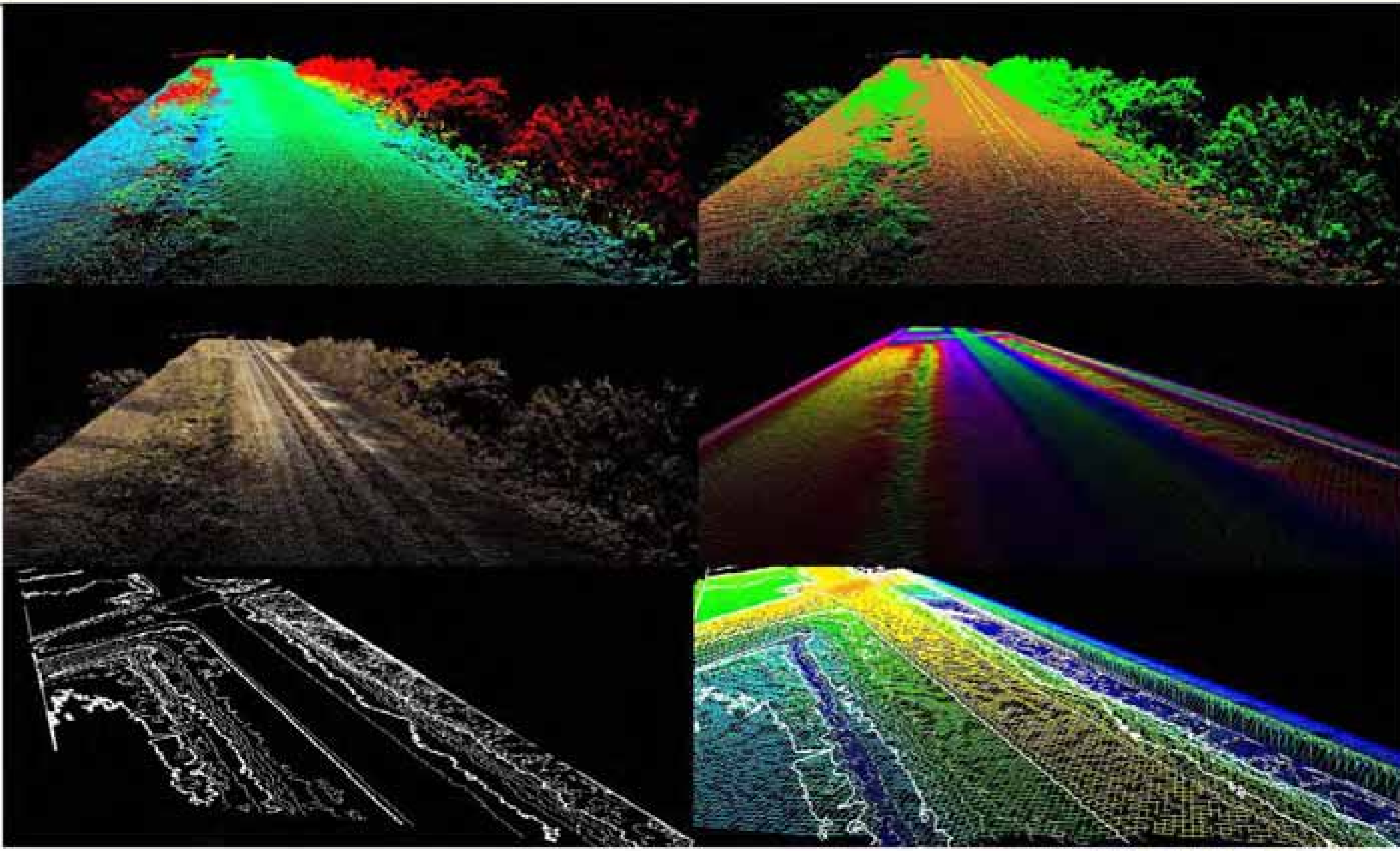
Utility LiDAR



Railroad Corridor LiDAR



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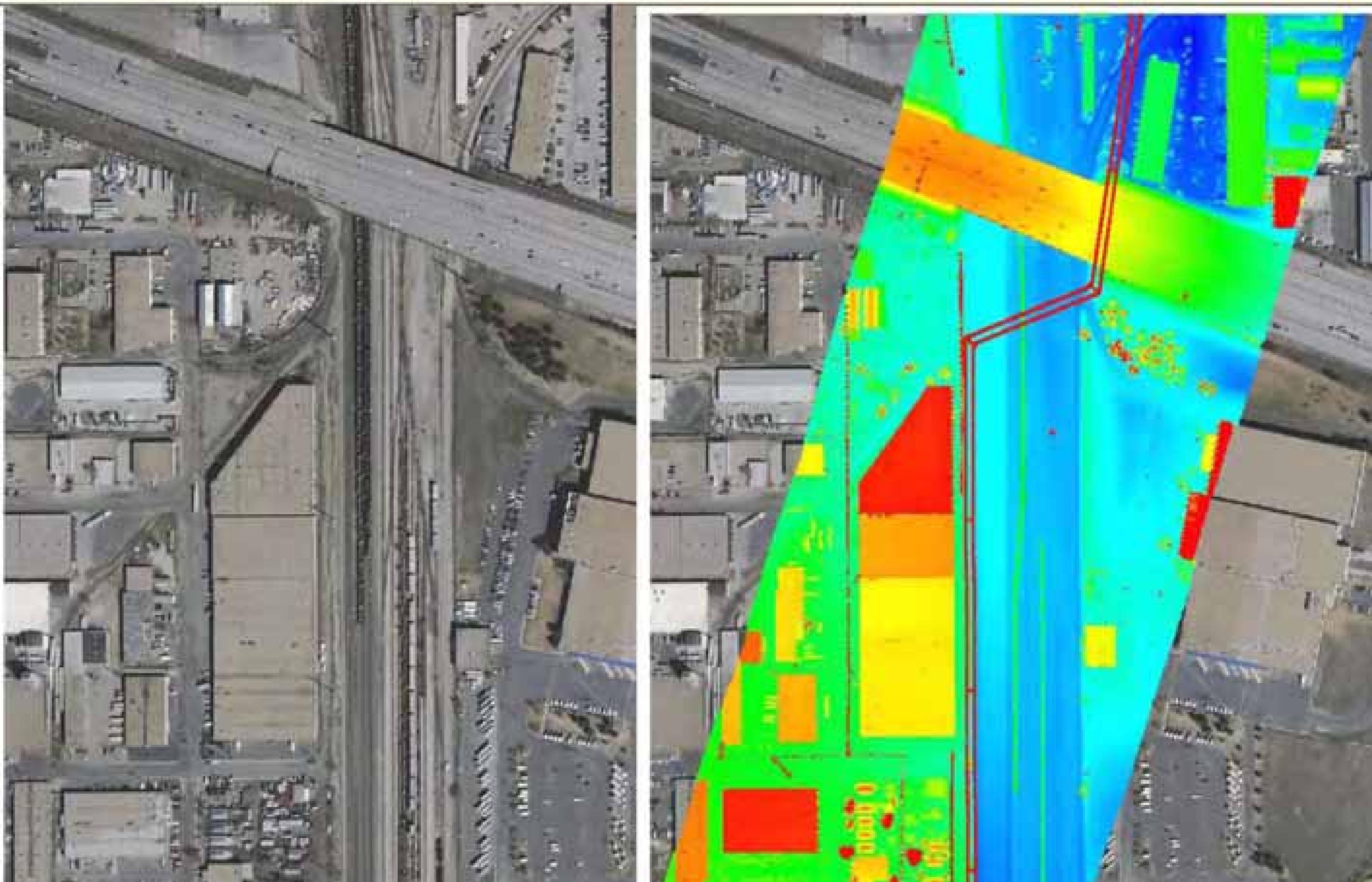
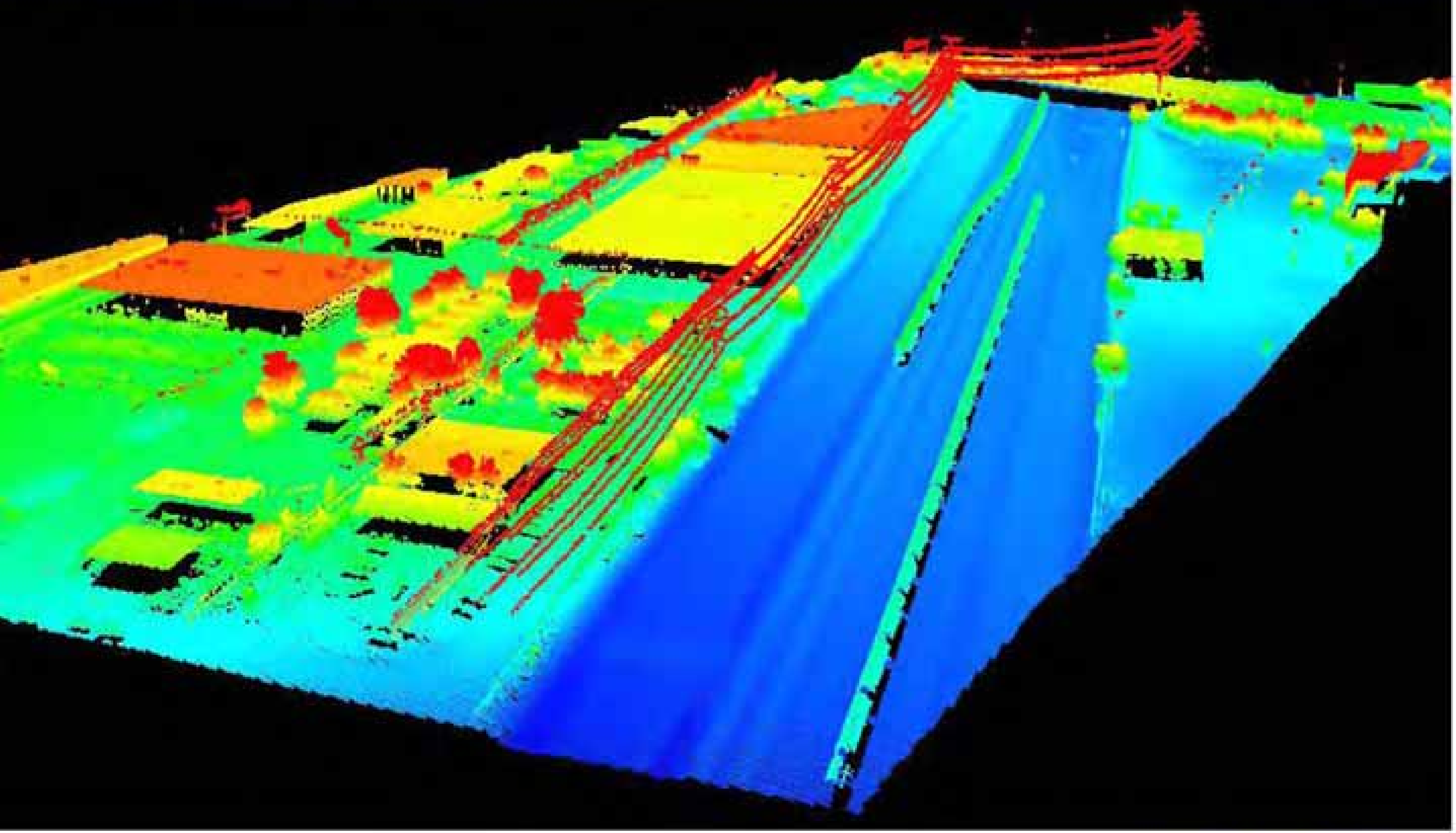
Railroad Corridor LiDAR



Railroad Corridor LiDAR



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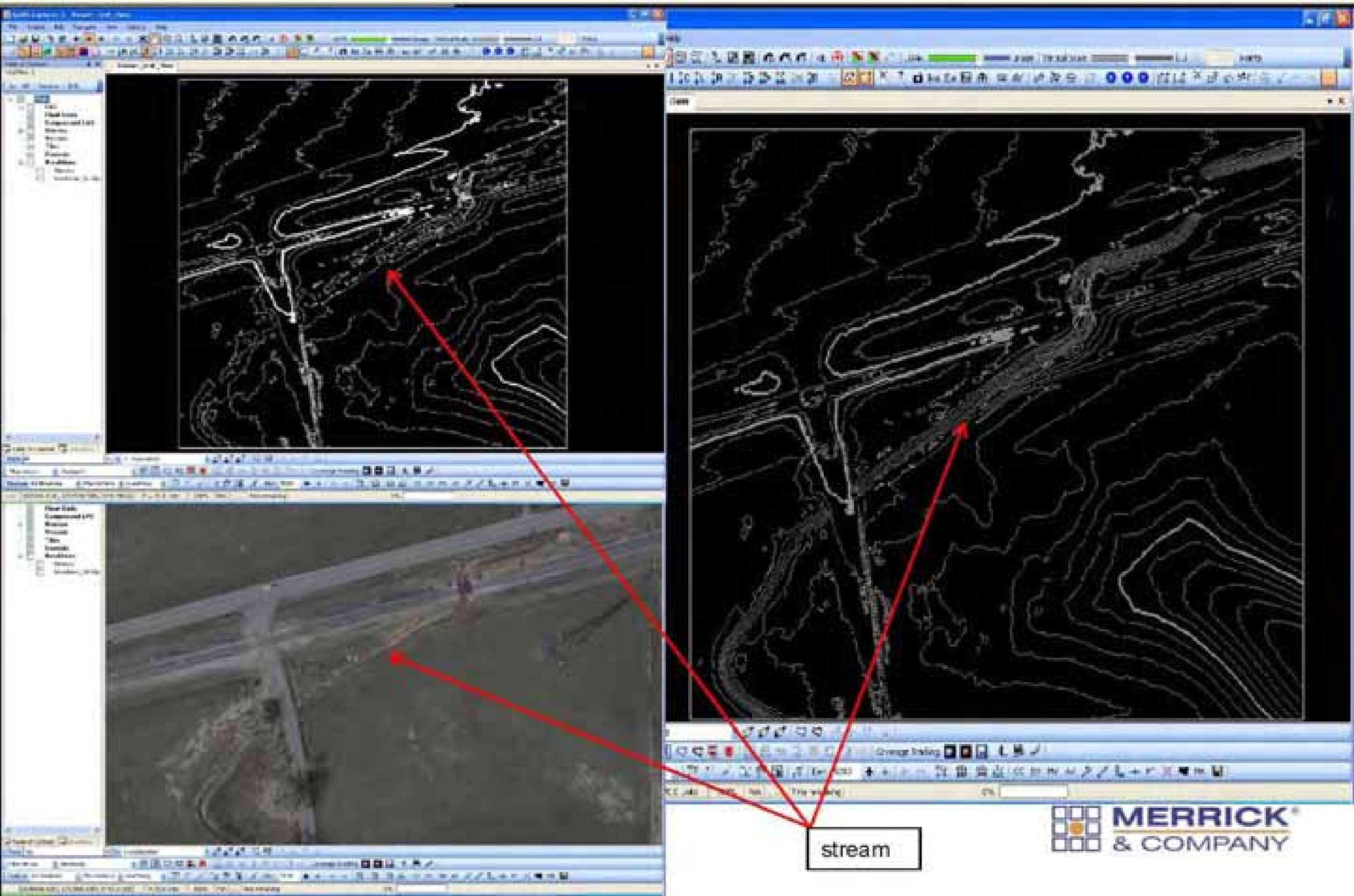
Railroad Corridor LiDAR - Breaklines



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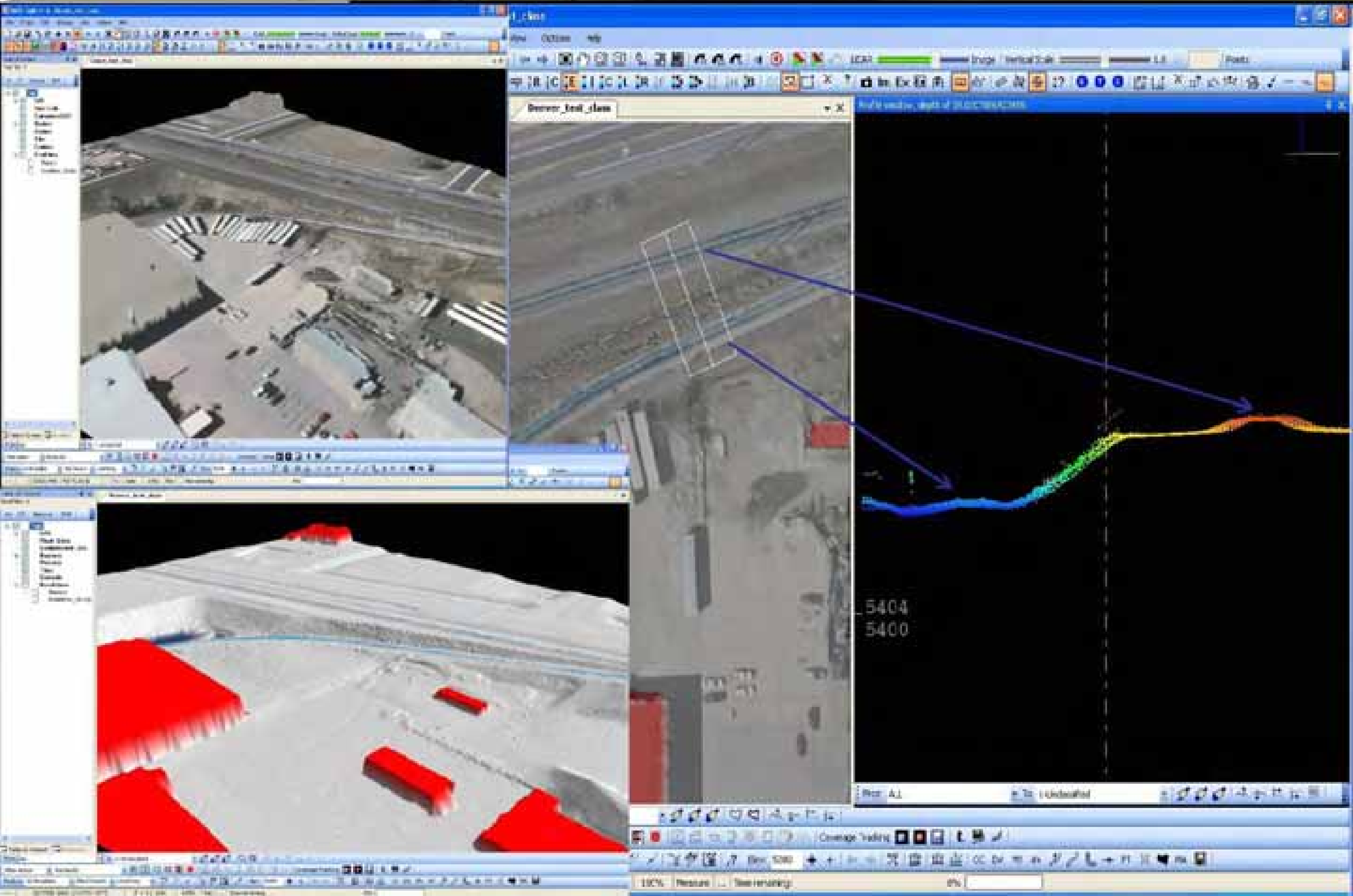
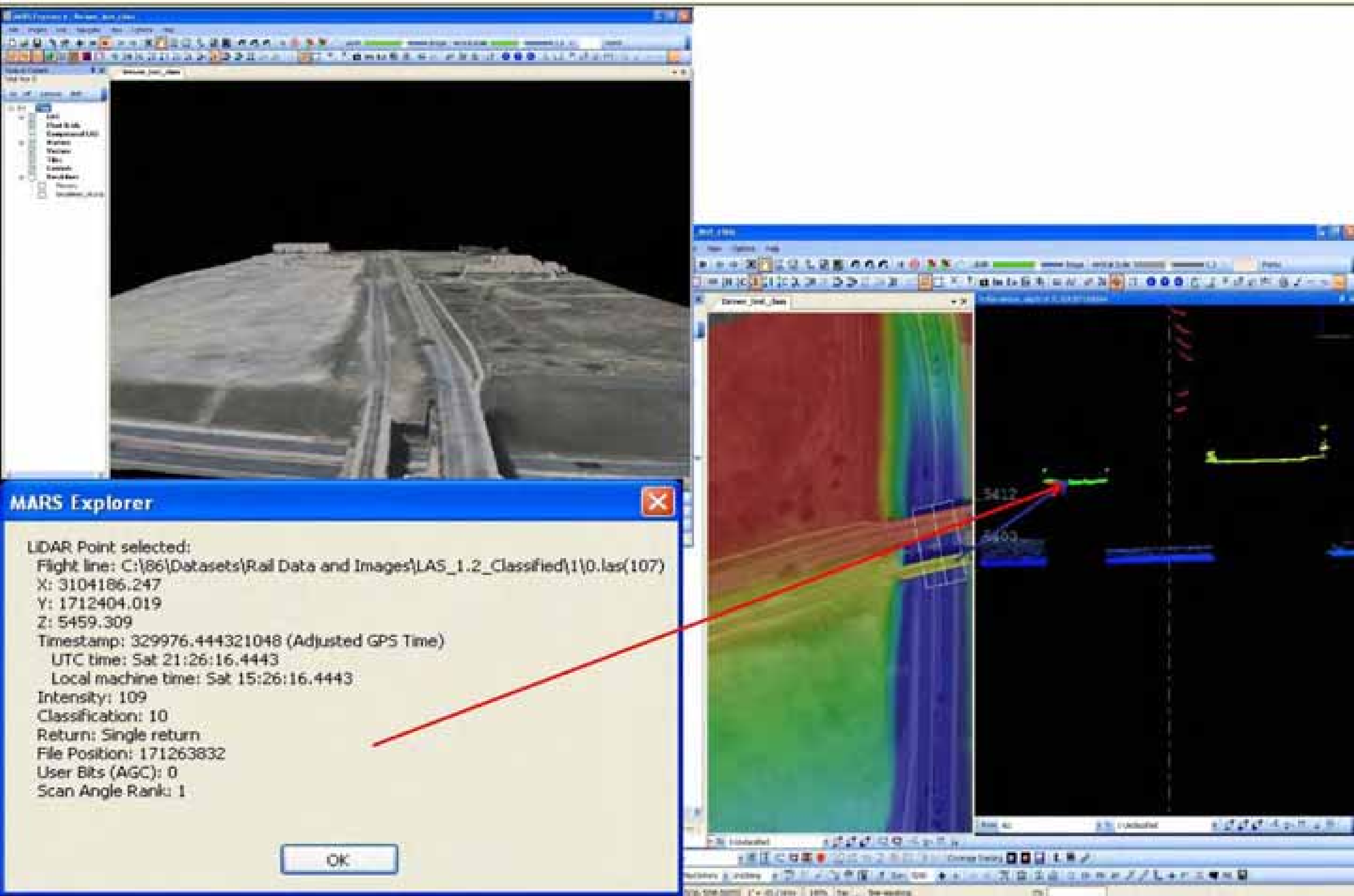
Railroad Corridor LiDAR – Grade Analysis



Railroad Corridor LiDAR – Bridge Analysis



Corridor Third Party Right-of-Way Mapping

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Inputting Features and Attribute Information – 2 Step Process

- STEP 1 – Coordinating with state utility one-call systems. Data from respondents is imported into GIS.
- STEP 2 - Boundaries of proposed route are handed over to land-men who research title information and government records. Information is then imported into GIS.

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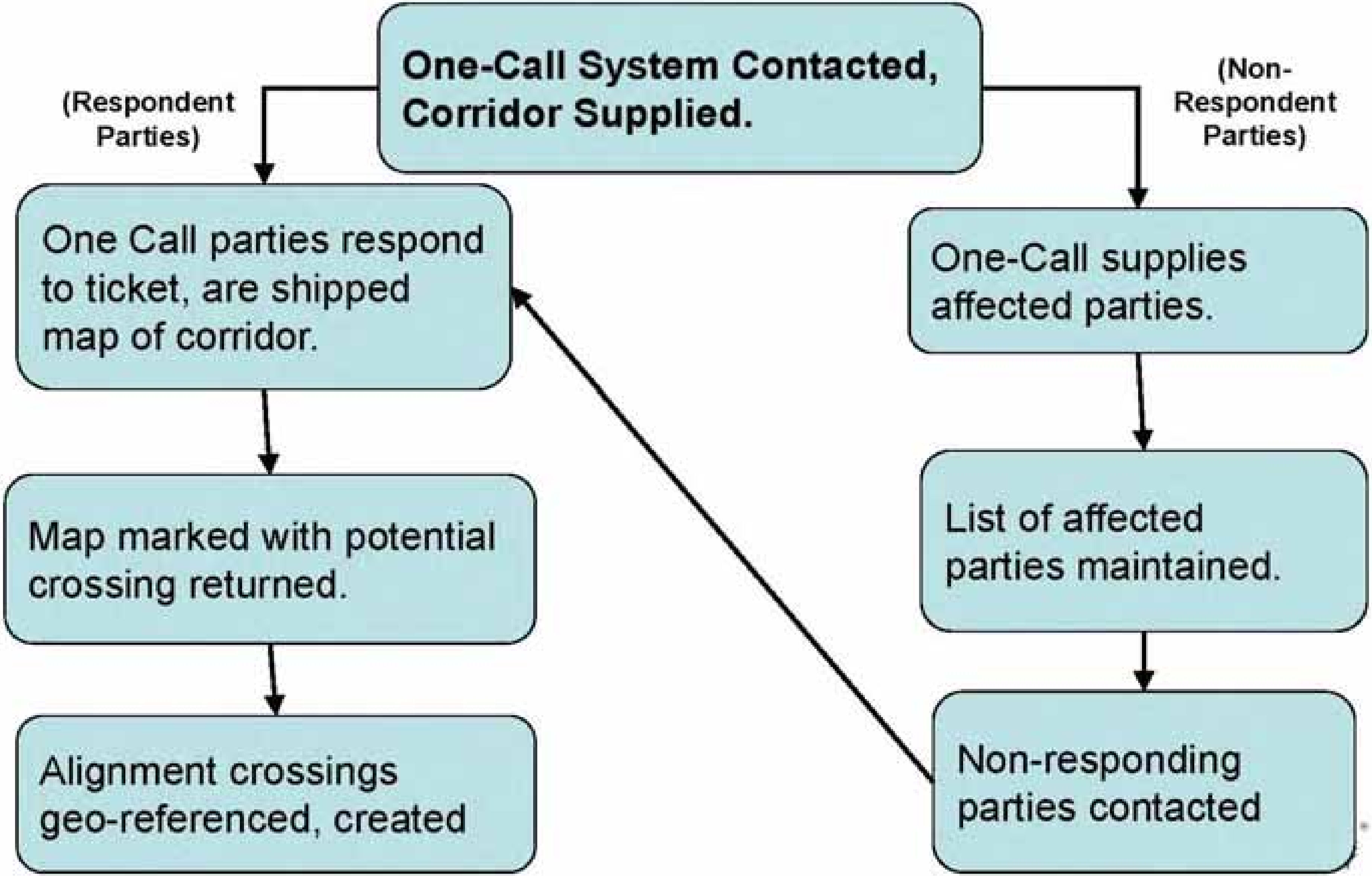
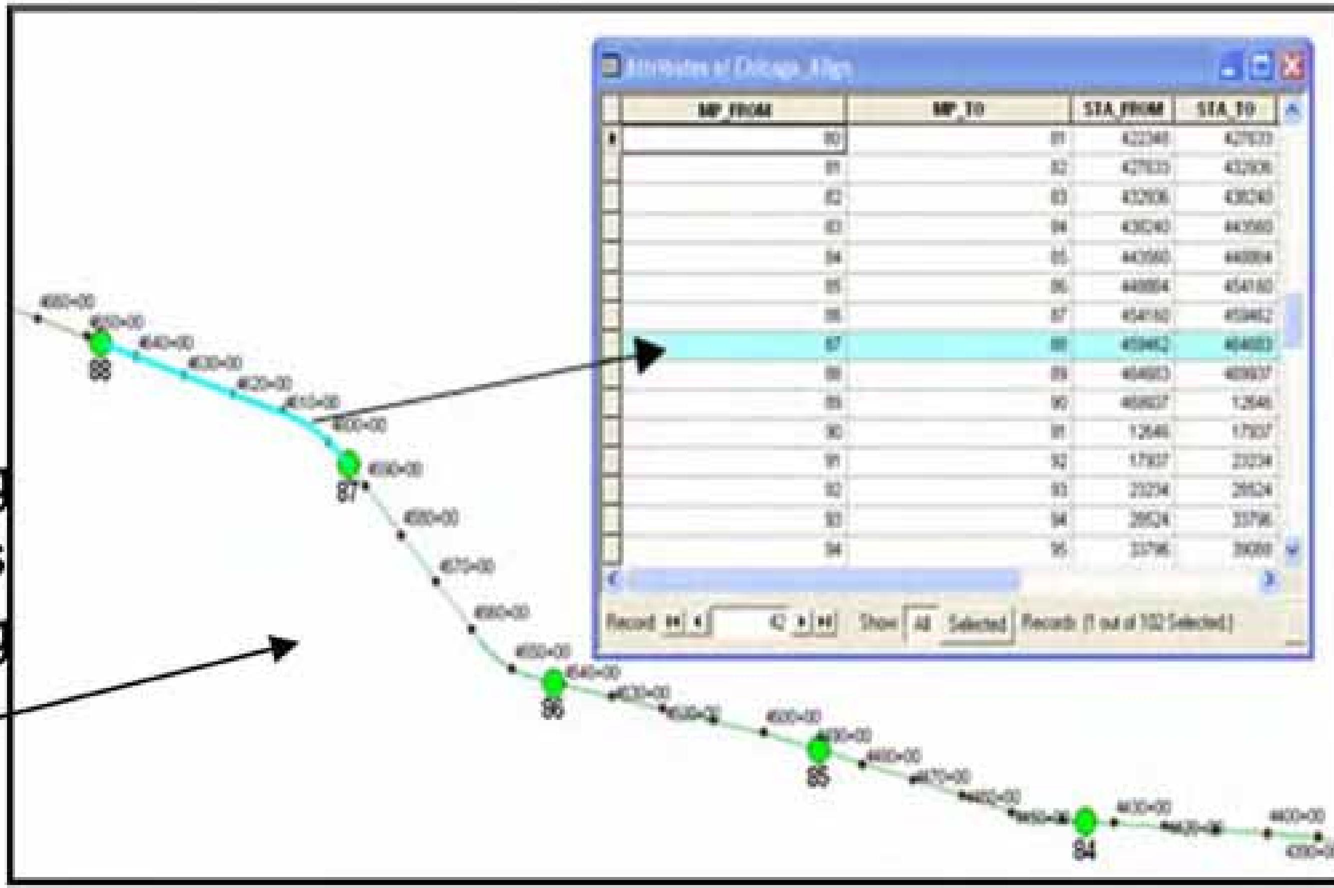
Inputting Features and Attribute Information



Integrating Distance Dynamics

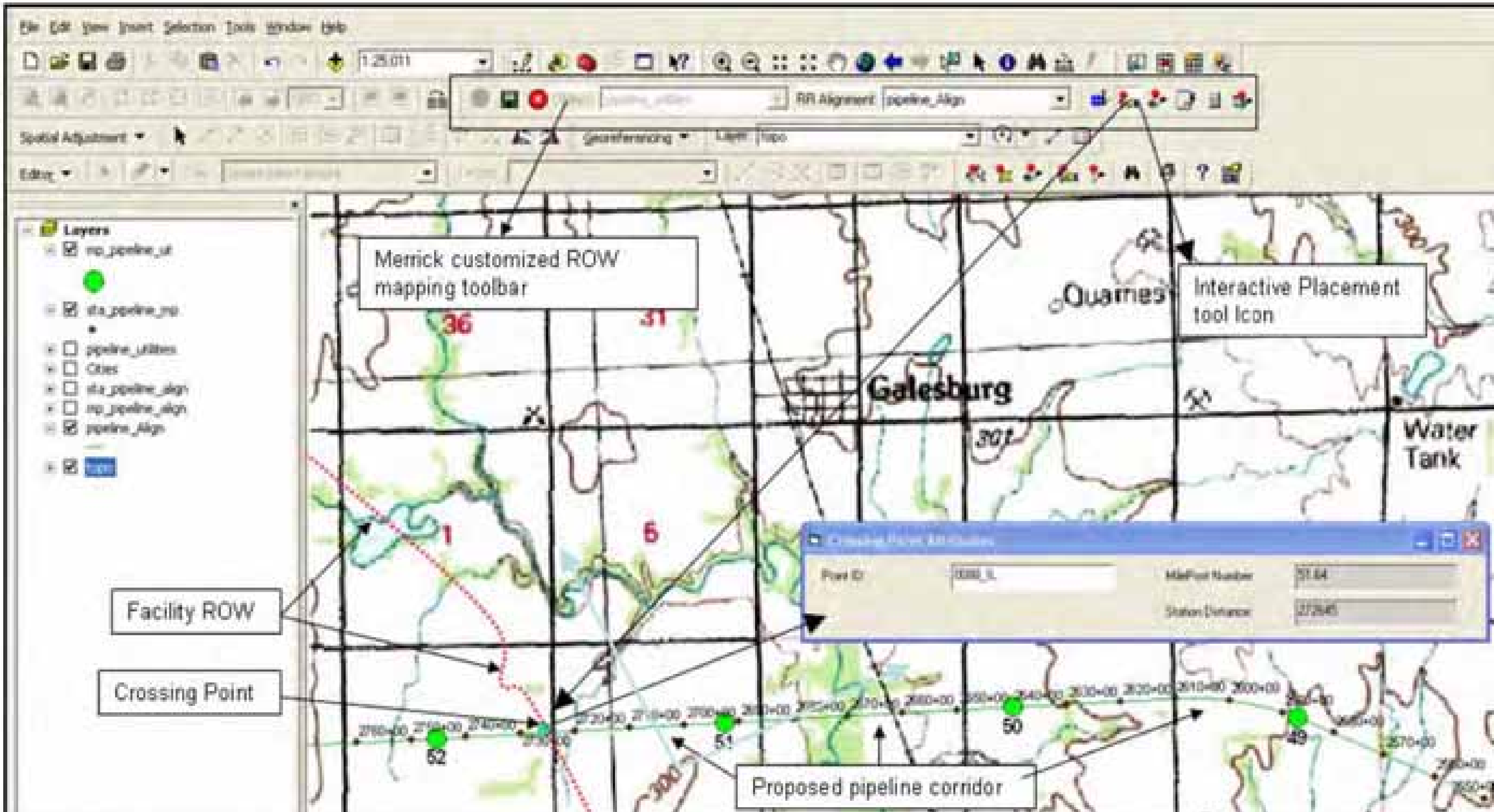
Customized GIS routine makes the line dynamic to calculate milepost and/or stationing for any given point on the line.

Note that each segment has its starting and ending milepost as well as starting and ending stationing.



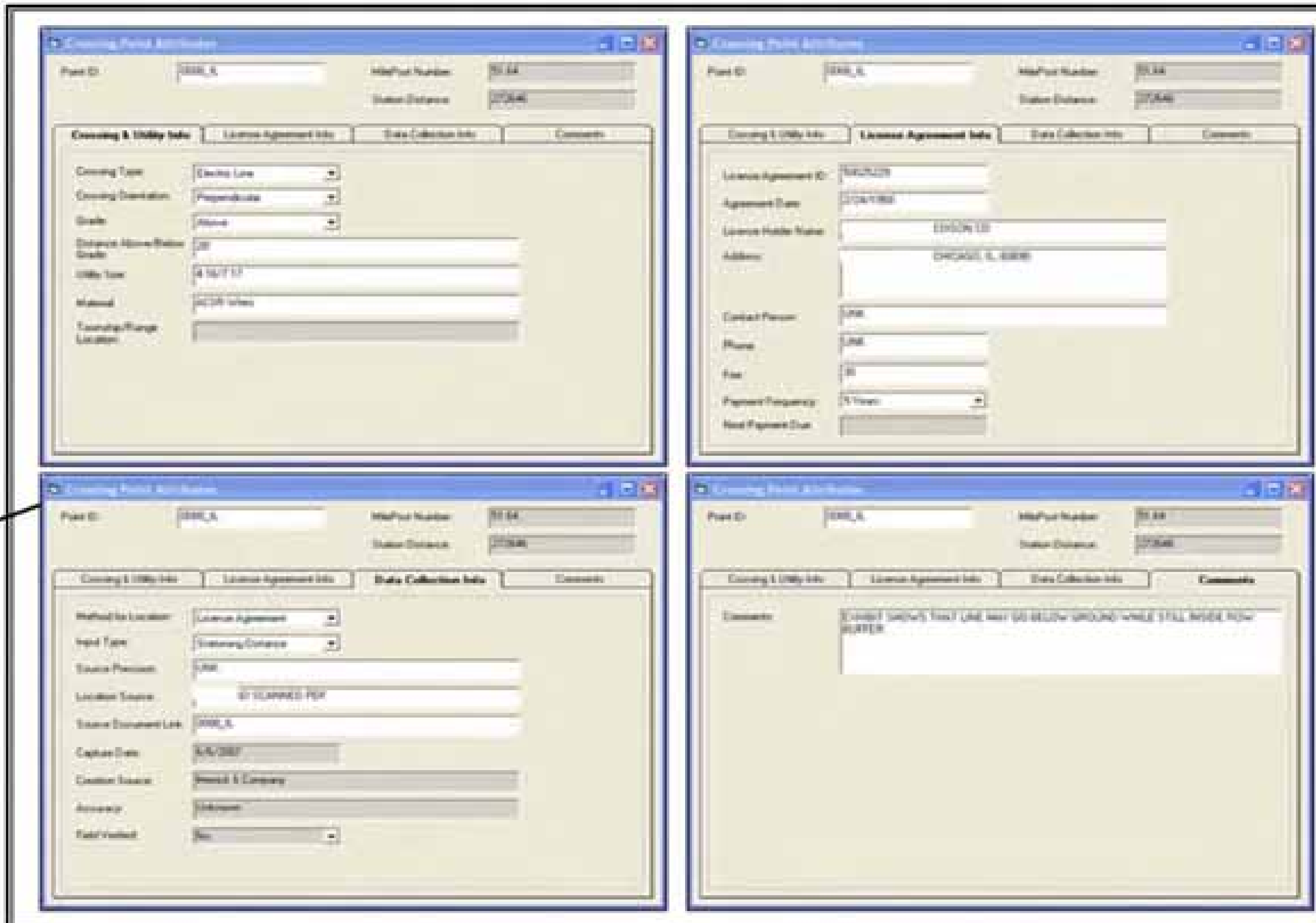
Inputting Features and Attribute Information

Inputting the Data into GIS



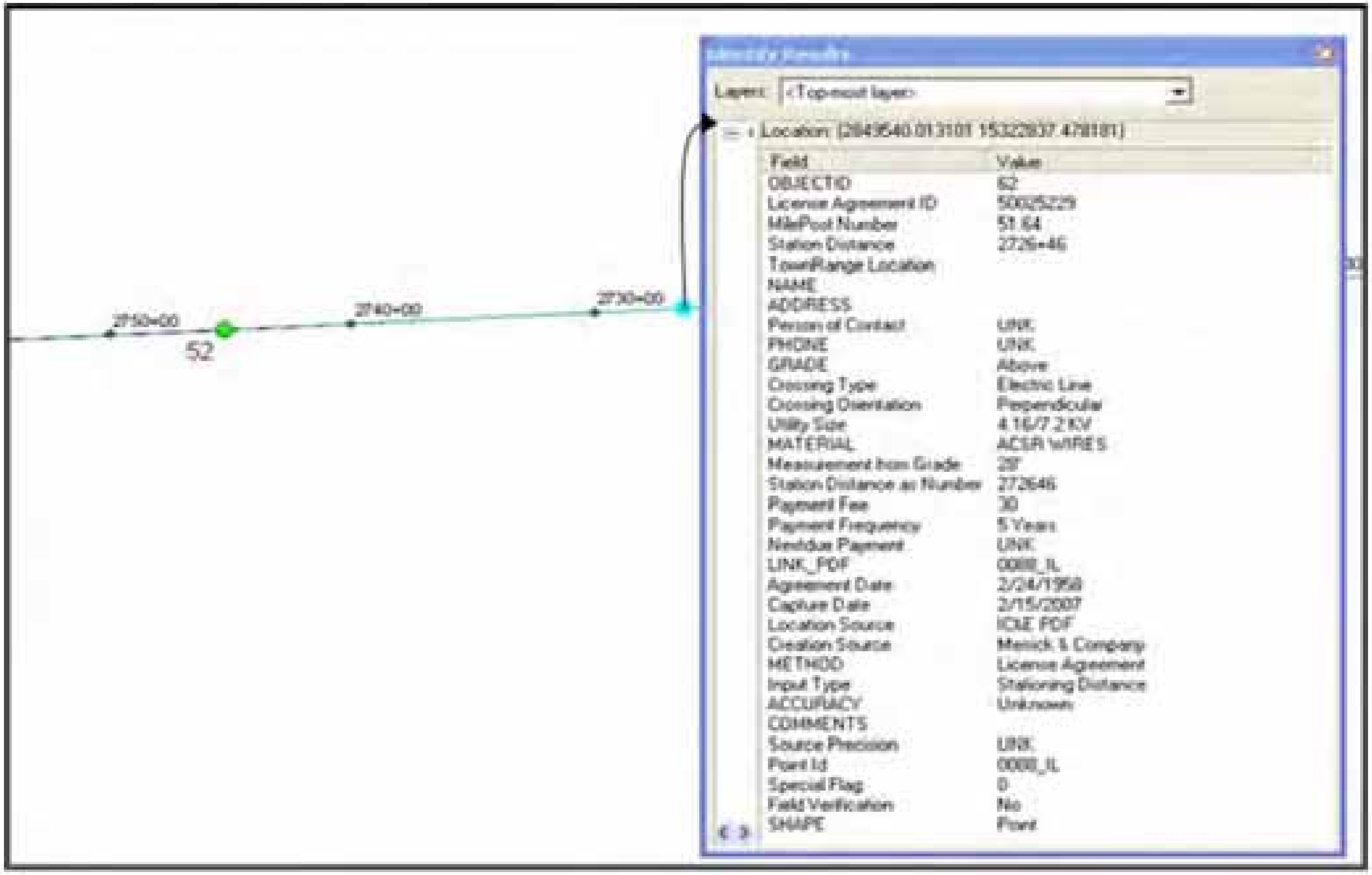
Inputting the Data into GIS (cont.)

Customized tool for inputting ROW crossing feature data



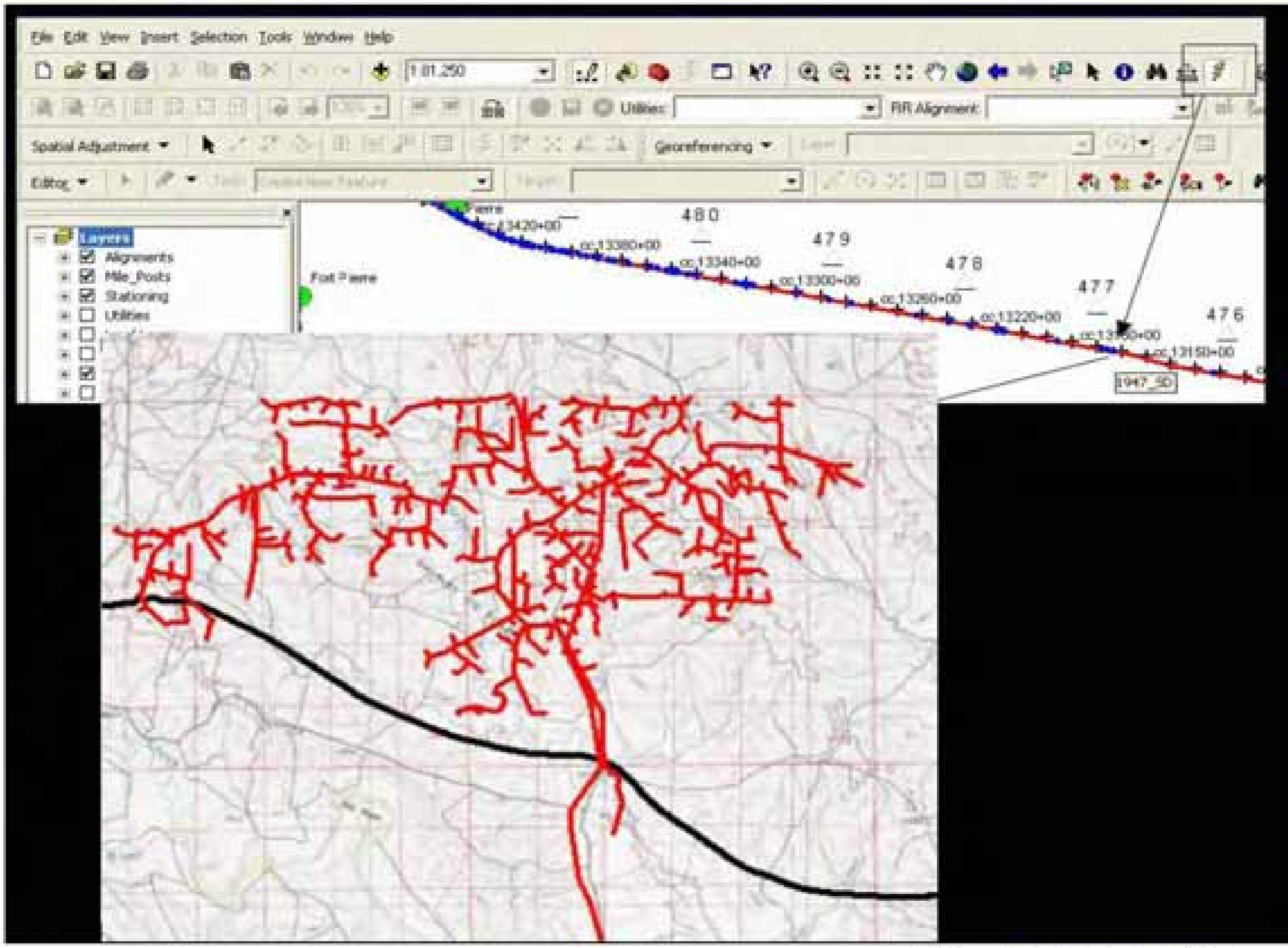
Inputting the Data into GIS (cont.)

Detailed attribute window of inputted ROW crossing feature.



Hyperlinking

Hyperlinking with the feature on the GIS interface allows the actual scanned document to be viewed.



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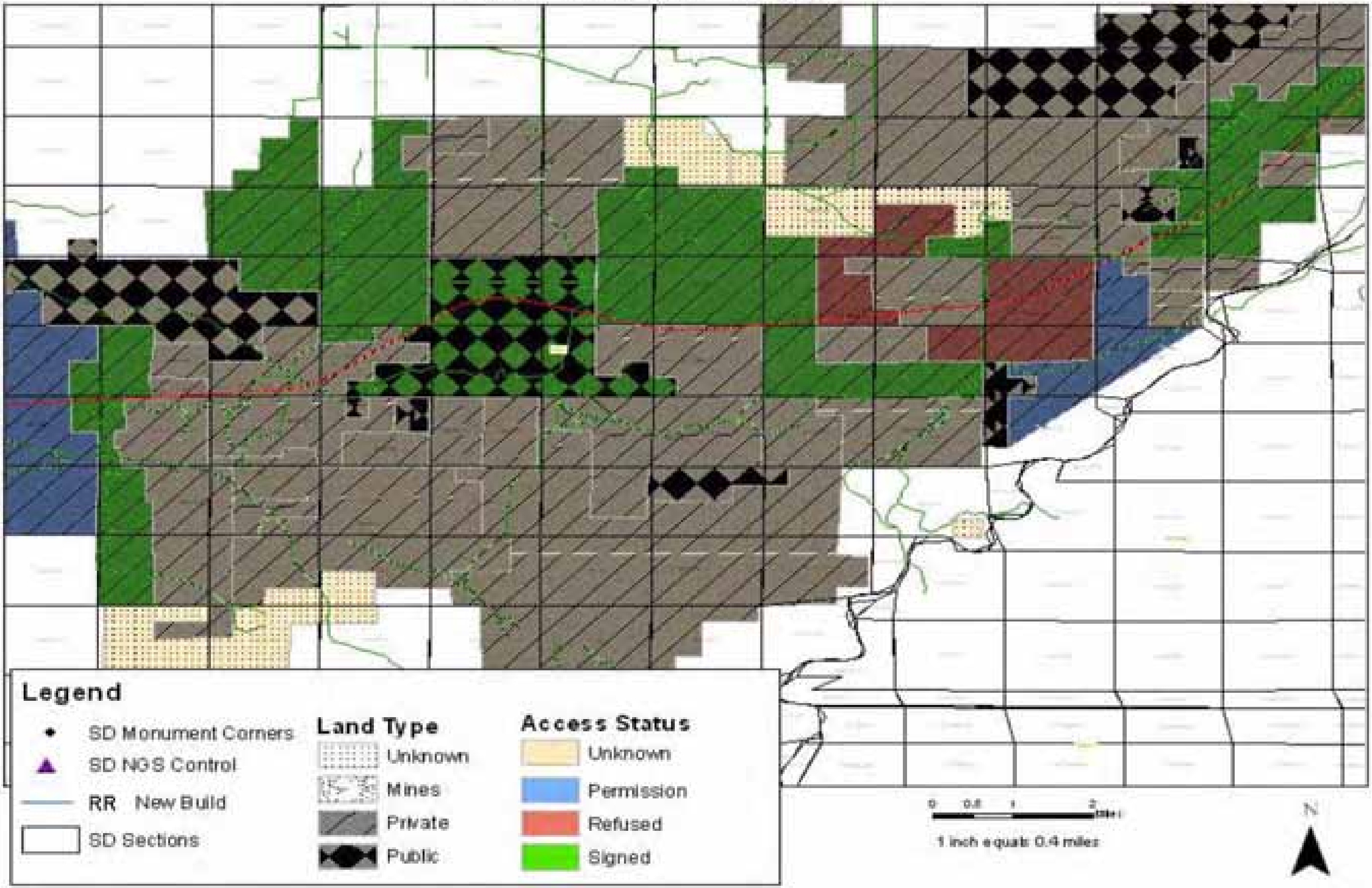
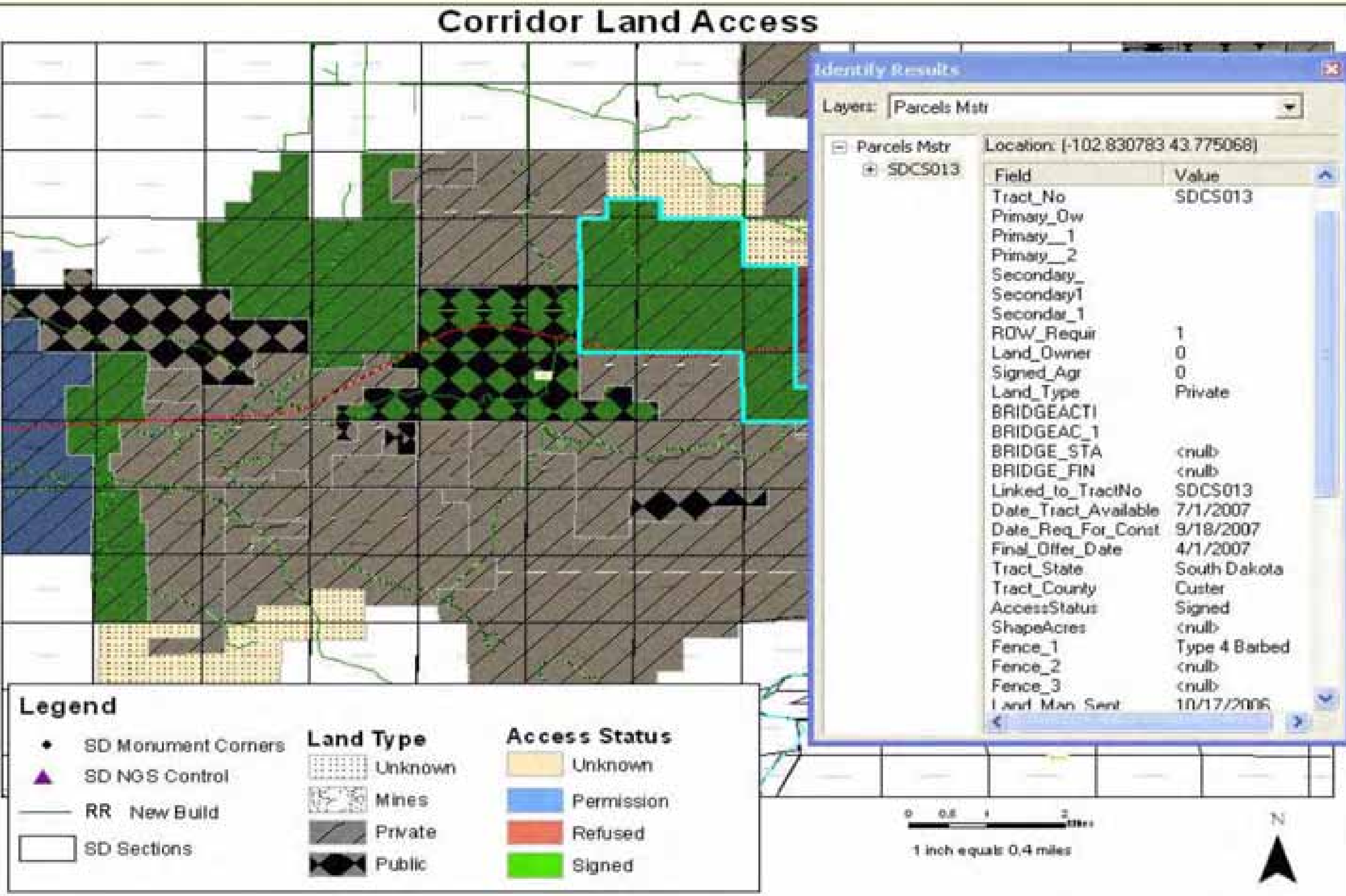
Land Acquisition Data

Corridor Land Access



Land Acquisition Data



Review

1. Determine/Map Alignment with LiDAR.
2. Make Alignment Dynamic.
3. Coordinate With State-One-Call Systems to Determine ROW Crossings.
4. Input Data From One-Call Respondents.
5. Coordinate with Land Acquisition, Input Land Acquisition Data.

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Conclusion

- GIS/LiDAR are important tools for effective and efficient ROW Corridor planning and third party ROW crossings when planning any corridor route.
- Methods and tools described provide a high precision topographic layout and convenient centralized data depot for all information pertaining to third party property and impacting feature ROW crossings that a user can utilize for a variety of consulting purposes.

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Questions?

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