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# COMPLETE STREETS AND MOBILE MAPPING

A CASE STUDY FOR WHAT'S COMING DOWN THE ROAD

# About Laser Scanning

- Real-time 360° capture of 3D graphical data
- Precision instrument for creating a “cloud” of computer-generated data points with intricate details and true coordinate positioning of every point
- 3D High definition photography with cloud data points attached
- Software tools for converting images into computer-generated 3D models and conventional CAD drawings
- Data can be used in a virtual reality setting to aid in crime investigations as well as courtroom presentations
- High definition presentations as well as video fly-thru’s can be created from collected data



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# About Laser Scanning

## Laser Scanning Capabilities:

- Infrastructure
  - ✓ Safe, cost-effective roadway surveys
- Sites
  - ✓ Capable of capturing small to very large sites up to hundreds
  - ✓ Crime scene data collection without tampering site evidence
- Buildings
  - ✓ Small buildings and tall buildings can be surveyed, both inside and out. Digital photos can be overlaid for added realism
  - ✓ Individual rooms can be scanned for evidence and use in the crime investigation
  - ✓ Such items as bullet trajectory can be mapped in 3D and analyzed



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# About Laser Scanning

## Uses of Scanning:

- Historic Preservation
- Detailed Measurements
- Surveying Hard-to-Reach Areas
- Construction Progress
- Record Exact Data
- Hazard Surveying
- Accident Reconstruction
- Crime Scene Investigations
- Law Enforcement Strategic Planning for large area venues



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# About Laser Scanning

- Time-of-flight (pulsed) measurement



- Phase-based (continuous) measurement



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# About Laser Scanning

## Mobile Laser Scanners:

- Variety of manufactures. (Riegel, Topcon, Leica, MDL, LidarUSA)
- Mobile scanners are available with both TOF and Phase based scanners
- Most utilize GPS observations in combination with Inertia positioning
- Results available real-time or post processed



# About Laser Scanning

## Benefits of Scanning Include:

- Immediate real-time information
- Measurement in inaccessible / unsafe areas
- Significant overall time-savings
- Attainment of 4-6 mm accuracy
- Elimination of traffic outages
- Development of extensive detailed database
- More “bang for the buck”, capturing a large amount of data compared to conventional survey techniques



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# About HDS

## Software Utilized for Scanning and Processing:

- Leica Cyclone
- Leica Cloudworx
- ClearEdge Edgewise
- Point tools
- AutoCAD
- Civil 3d
- MicroStation
- Inroads
- Pointools / Rhino
- Trimble office
- Leica Level pack
- Carlson Software



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# About Laser Scanning

## Scanlook

- Flexible form factor can accommodate a variety of scanner/IMU configurations
- Ability to scan at highway speeds
- Utilizes static scanners which can be used outside the mobile platform
- Flexible mounting options allow for mounting on a variety of platforms
- Maximum scan data of 1.7 million points a second
- Platform agnostic, land sea or aerial vehicle mounting



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# About Laser Scanning

## Variety of Mounting Platforms



# Laser Scanning & Asset Inventory

## Benefits of Scanning for Asset Inventory

- Merging 3D data and imagery produces a visually-rich, 3D environment from which accurate measurements can be made
- Information can be extracted to produce a detailed inventory
- Exported into a user-friendly GIS system
- Data collection of detailed elements can be used in investigations

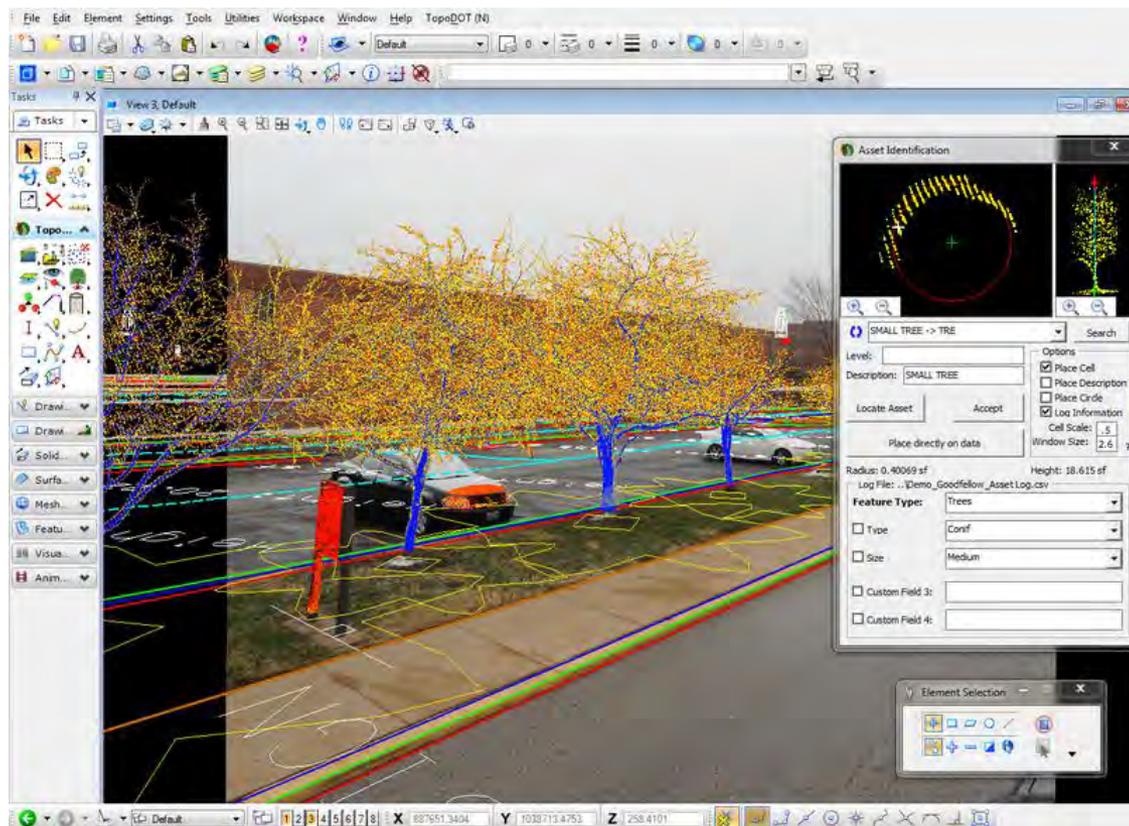


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# Laser Scanning & Asset Inventory

- Features such as vegetation, signage, small/large objects, skid marks, liquid patterns, etc. can be accurately located, analyzed and exported to any end-user mapping platform



# Project Experience

## City of Albany



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# Project Experience

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# Project Experience

## City of Albany

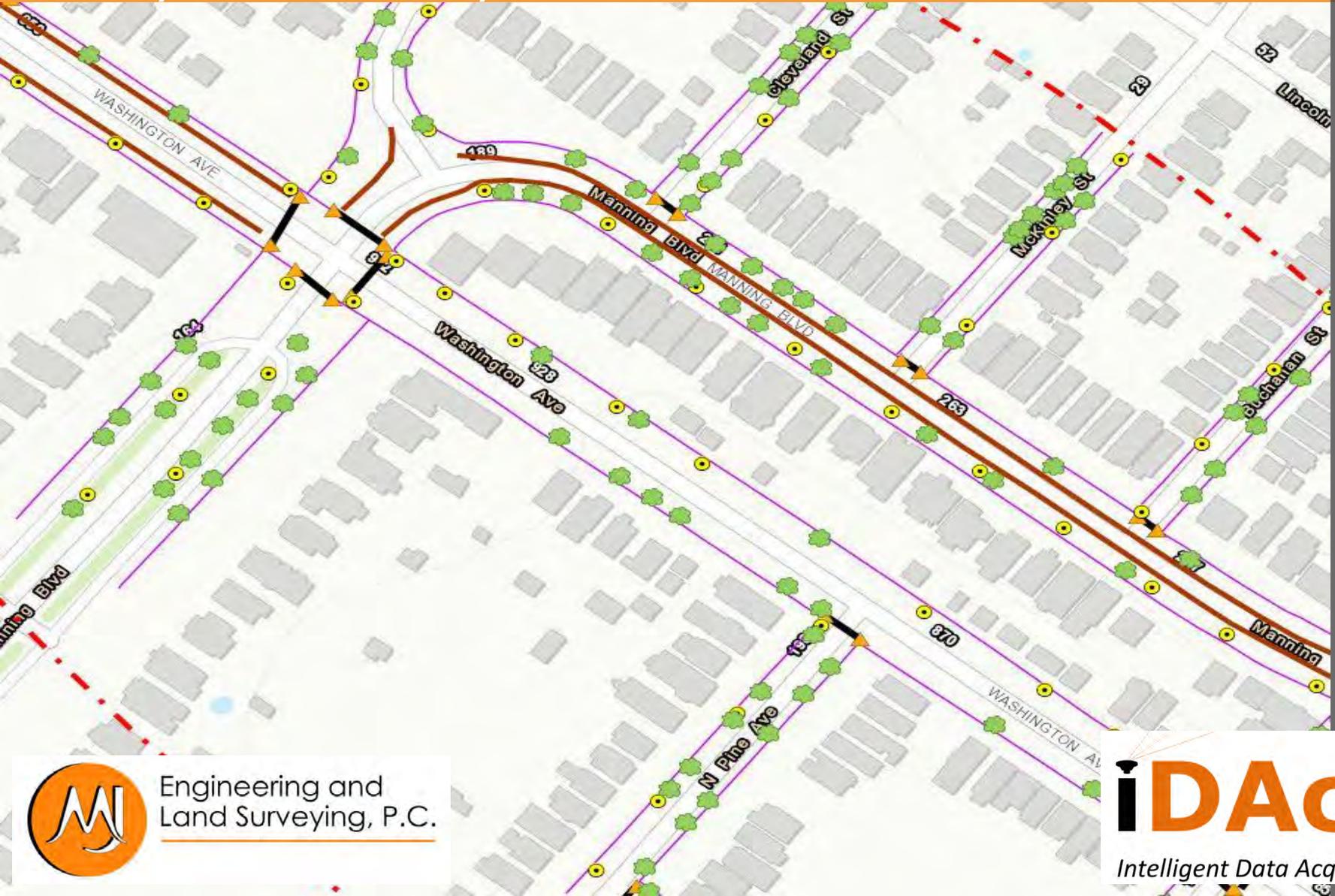


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# Project Experience

## City of Albany

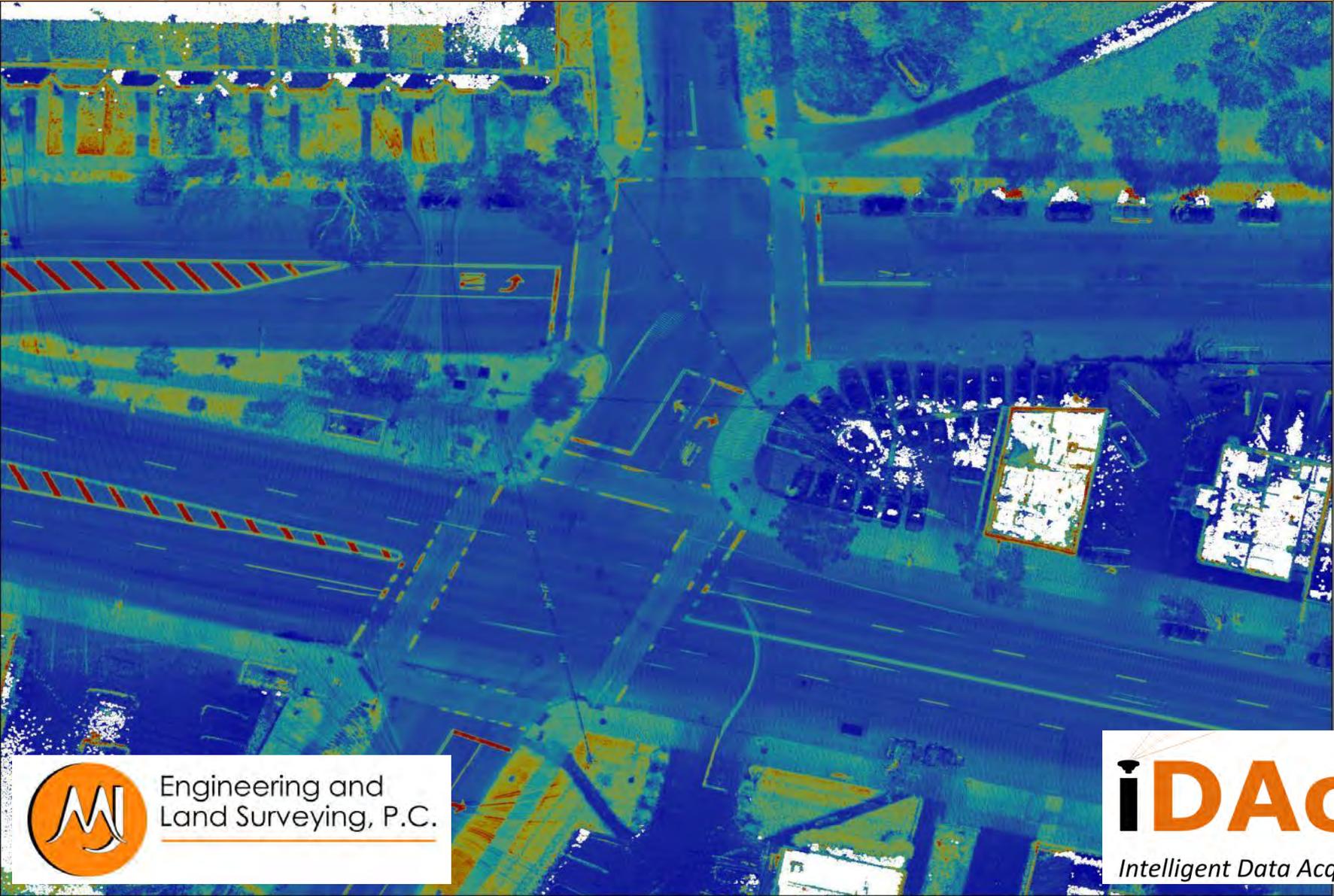


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# Project Experience

## City of Albany

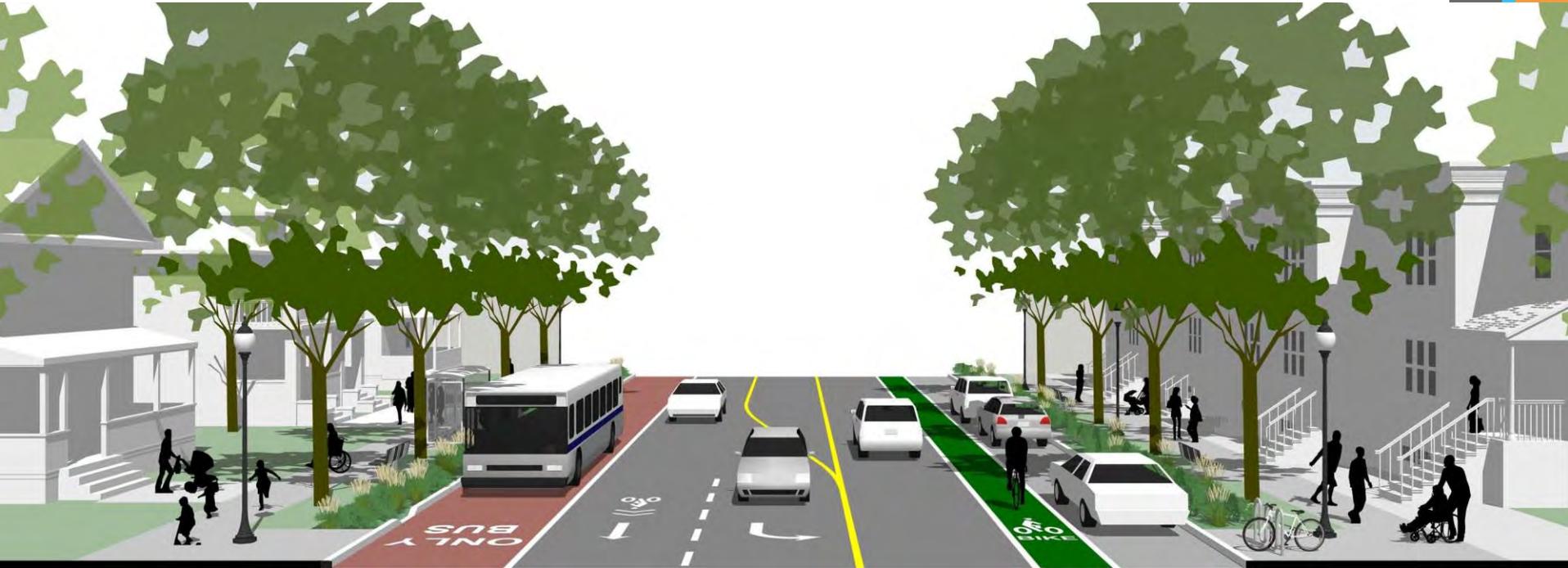


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# Project Experience

## City of Albany

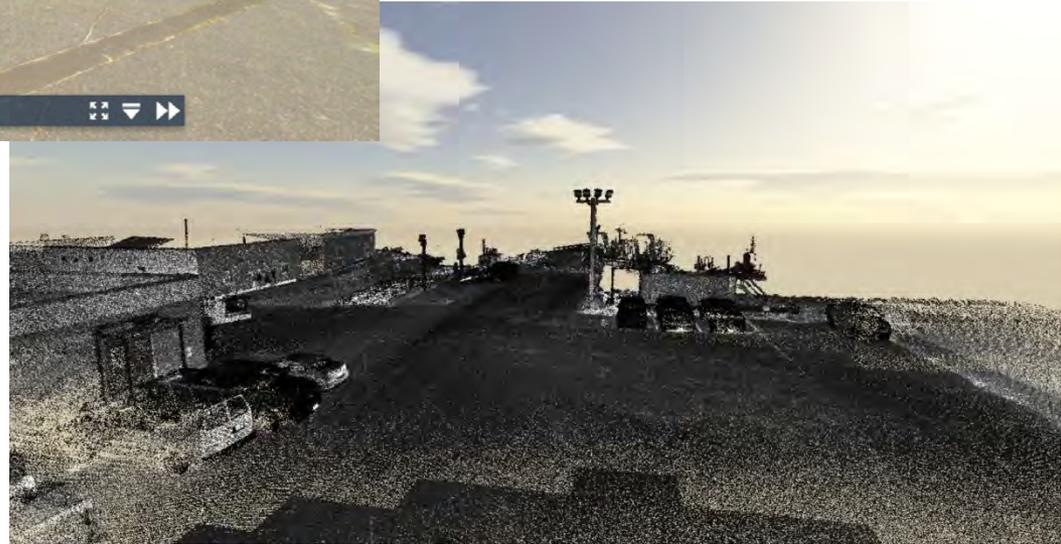


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# Project Experience

## USCG Facility New Haven CT

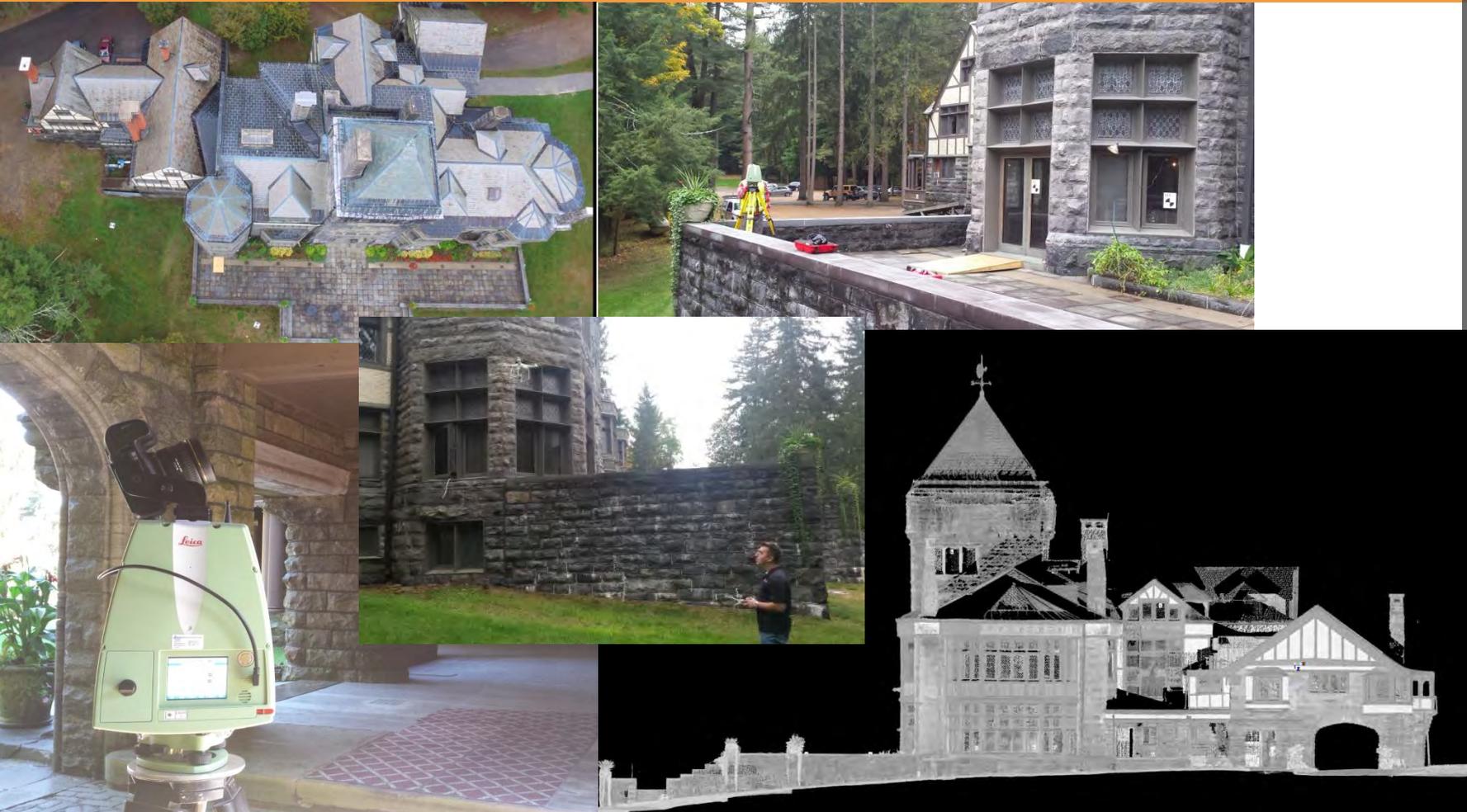


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# Project Experience

## Architectural Preservation Yaddo



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# Project Experience

## Whiteface Memorial Highway

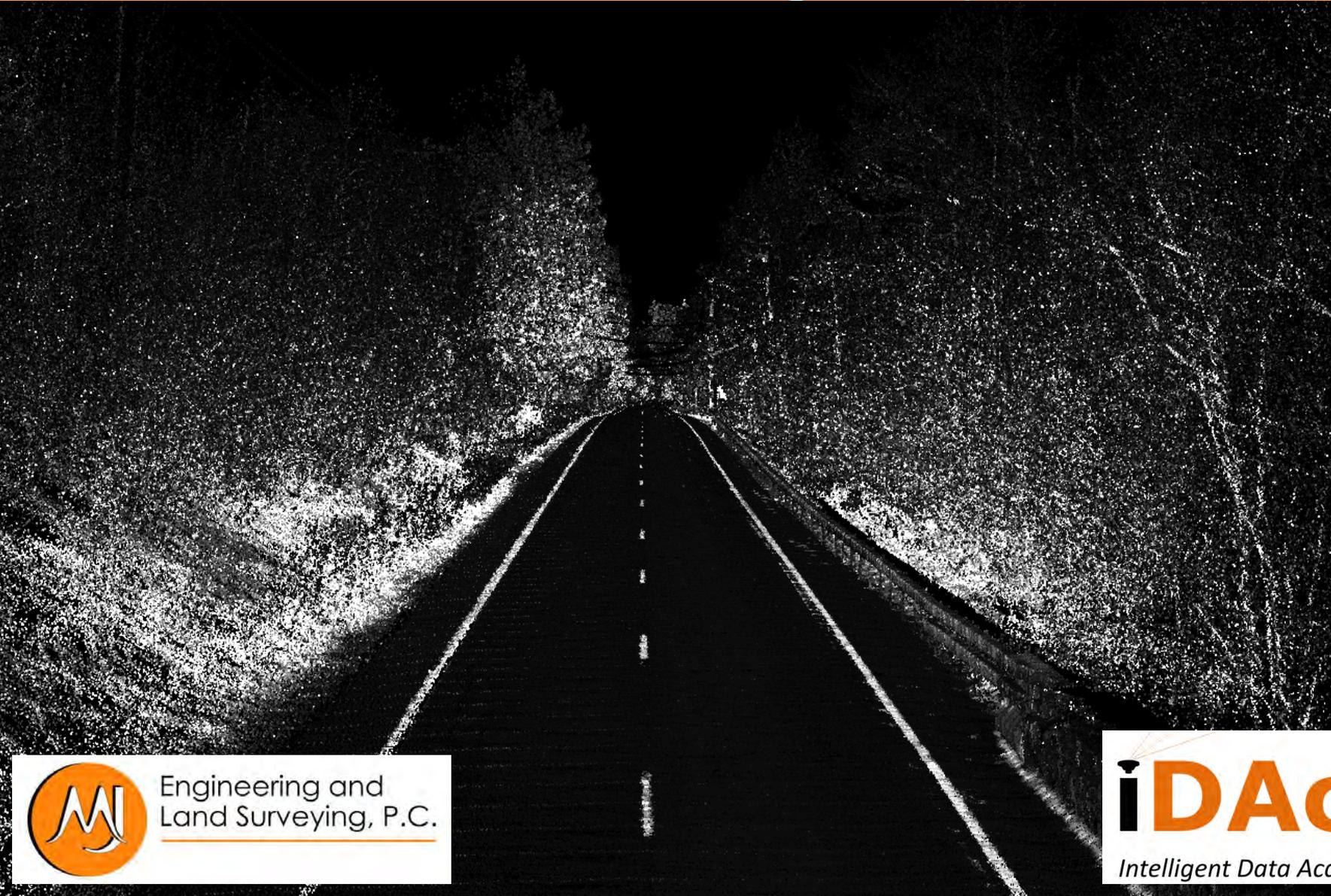


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# Project Experience

## Whiteface Memorial Highway



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# Project Experience

## Whiteface Memorial Highway



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# Project Experience

## Fonda Bypass



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# Project Experience

## Fonda Bypass

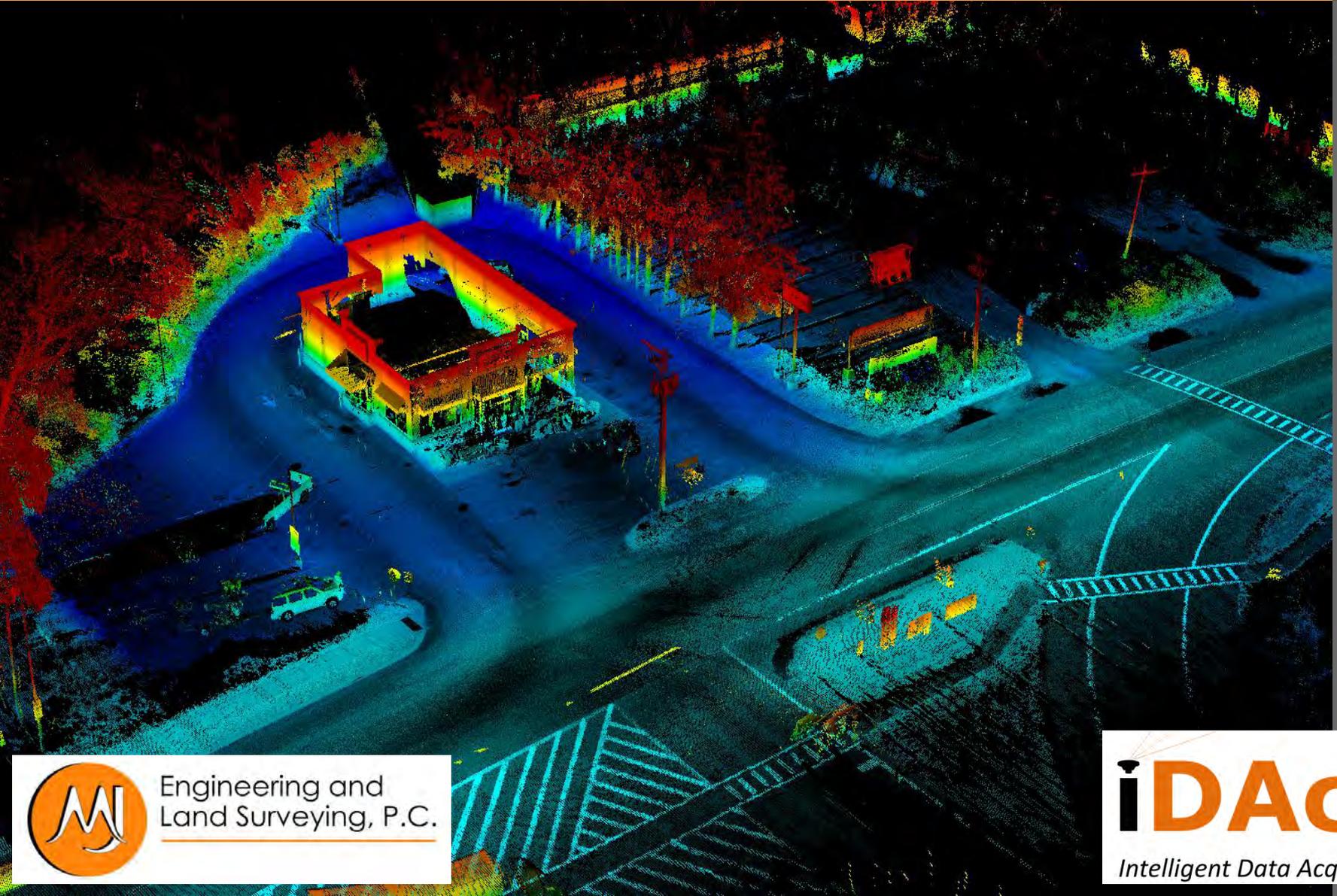


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# Project Experience

## Fonda Bypass



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# Project Experience

## Mohawk River & Twin Bridges



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# Project Experience

## Mohawk River & Twin Bridges



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# Project Experience

## Mohawk River & Twin Bridges

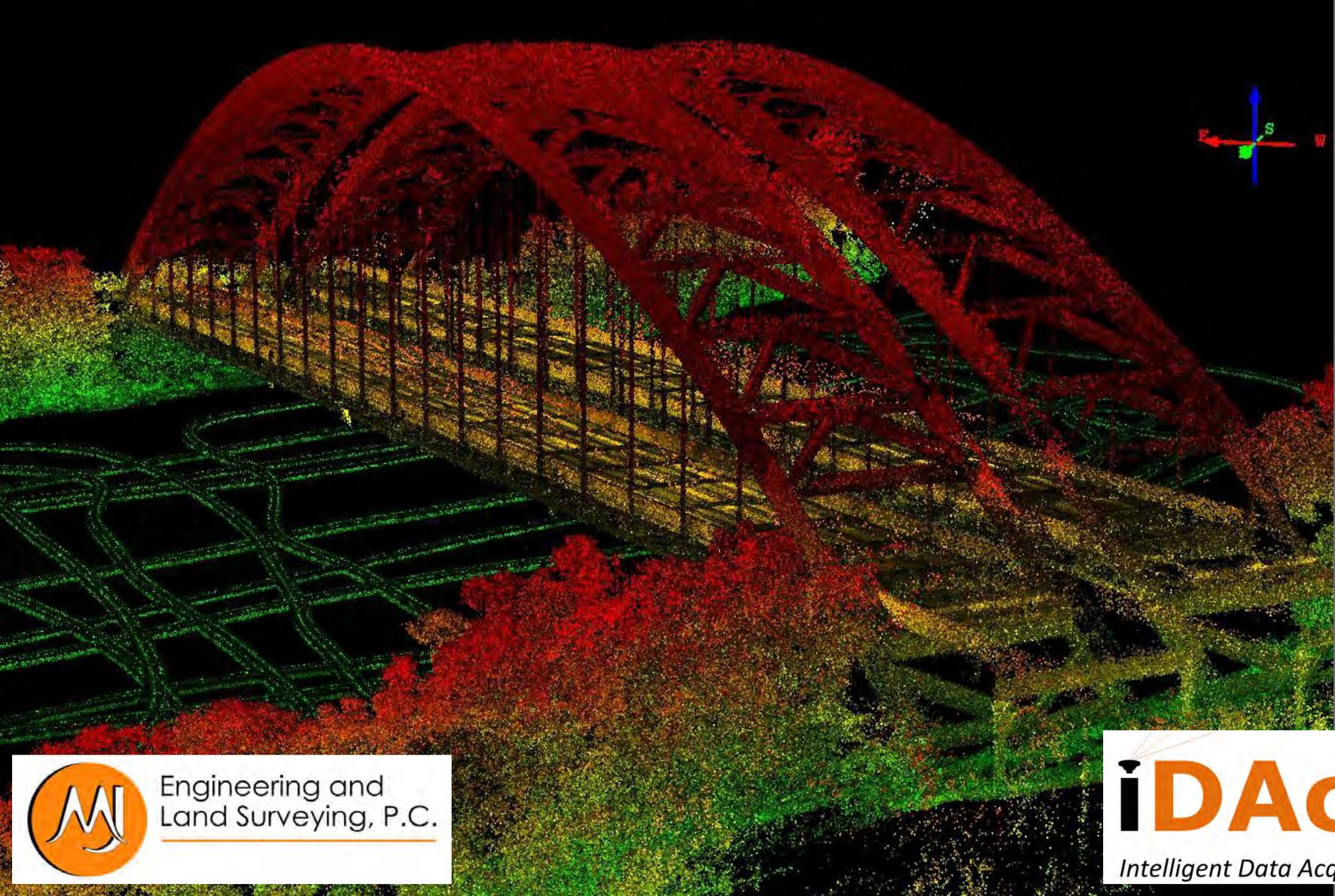


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# Project Experience

## Mohawk River & Twin Bridges



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# Project Experience

## Campus Mapping – Emma Willard

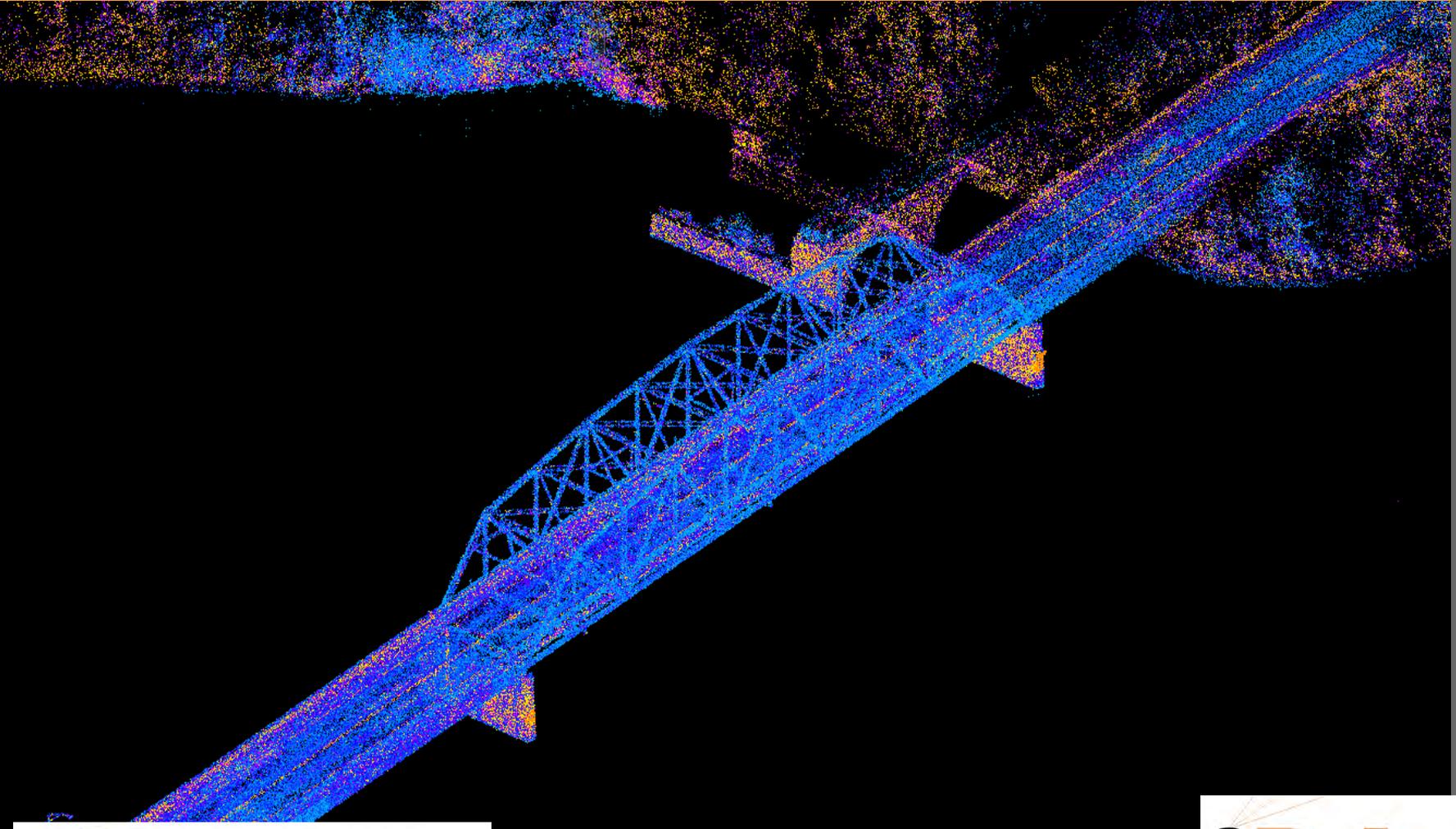


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# Project Experience

## Rexford Bridge



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# Project Experience

## Superstorm Sandy Recovery - NYCT



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# Project Experience

## Superstorm Sandy Recovery - NYCT

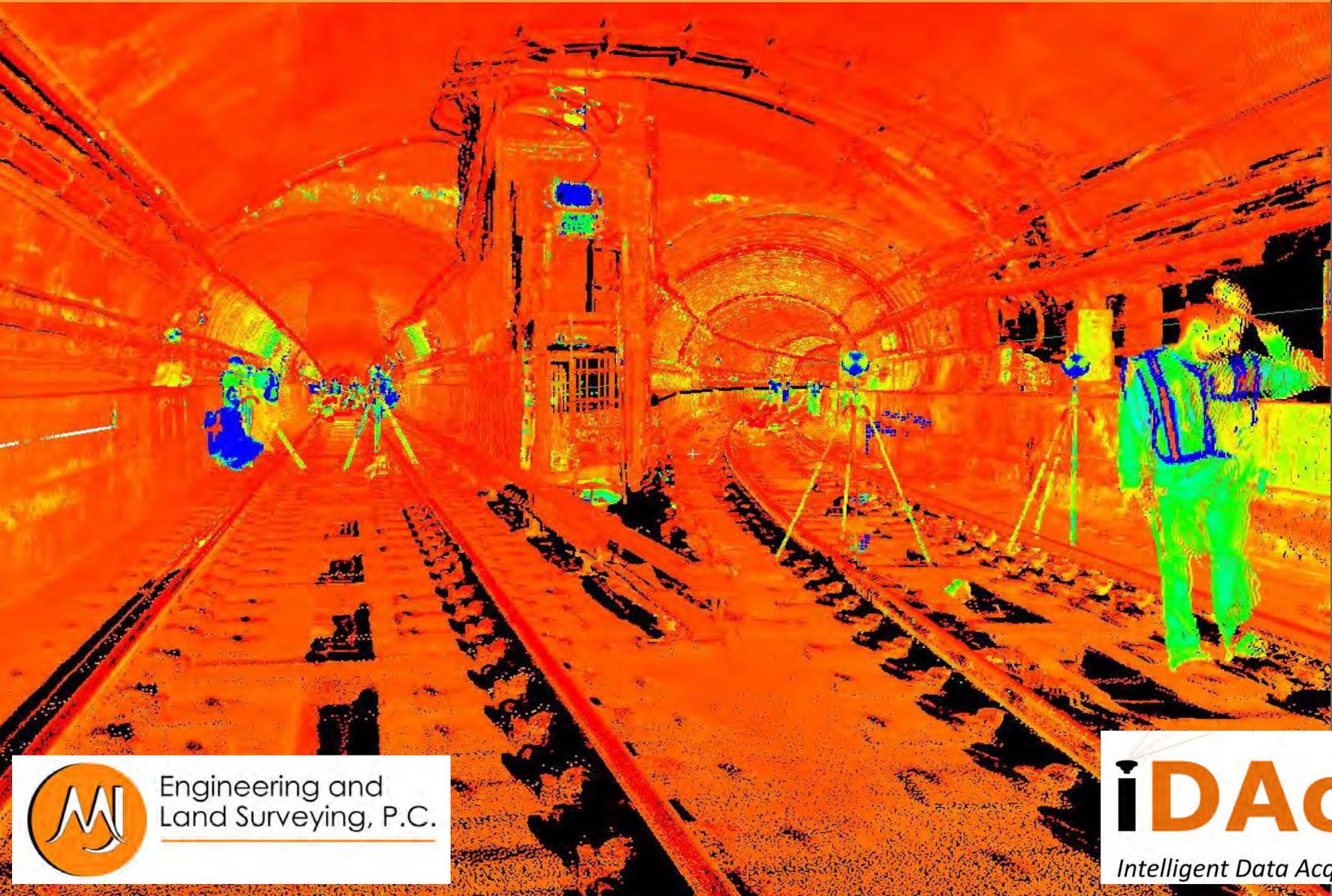


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# Project Experience

## Superstorm Sandy Recovery - NYCT



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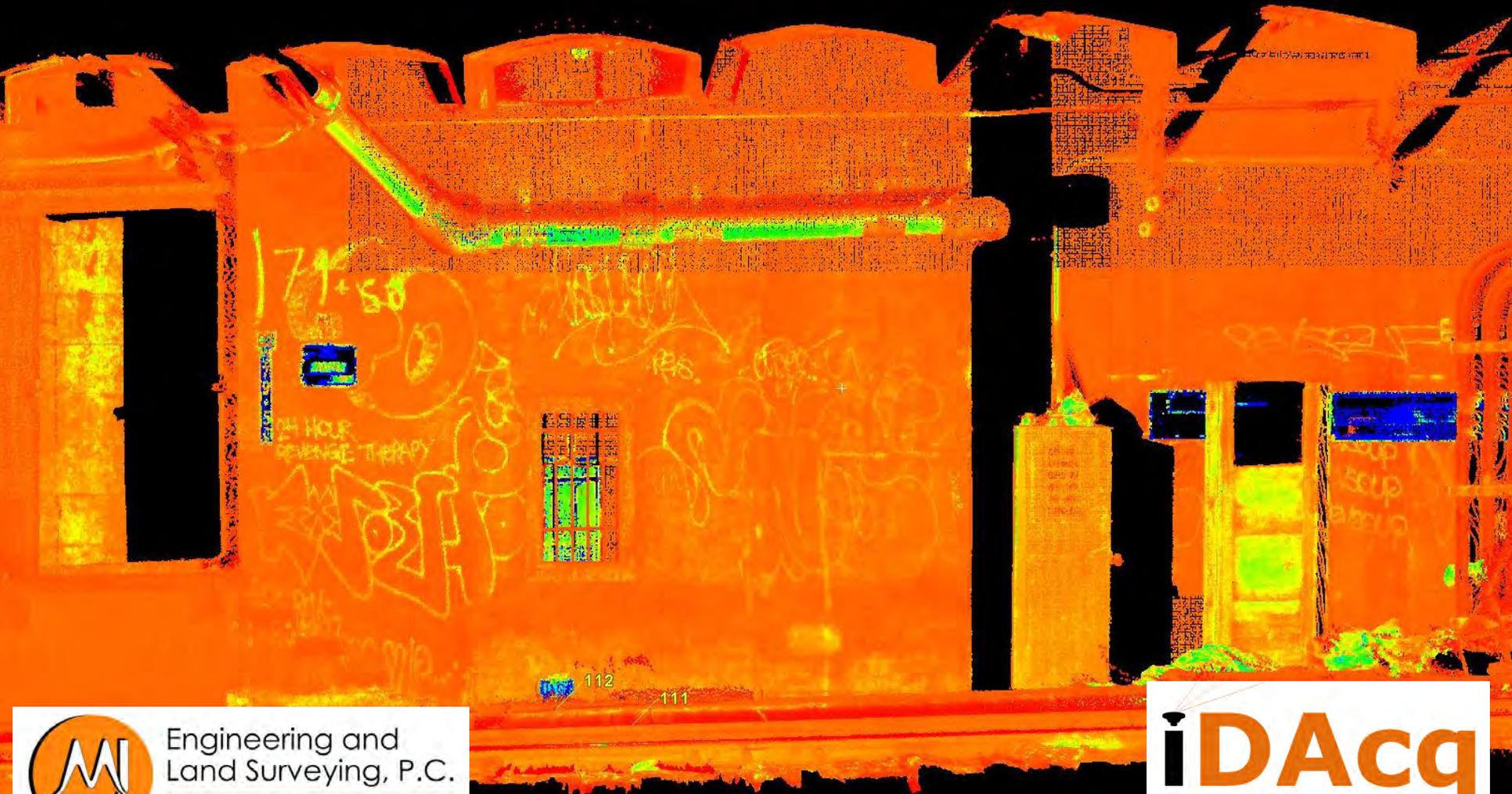


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# Project Experience

## Superstorm Sandy Recovery - NYCT

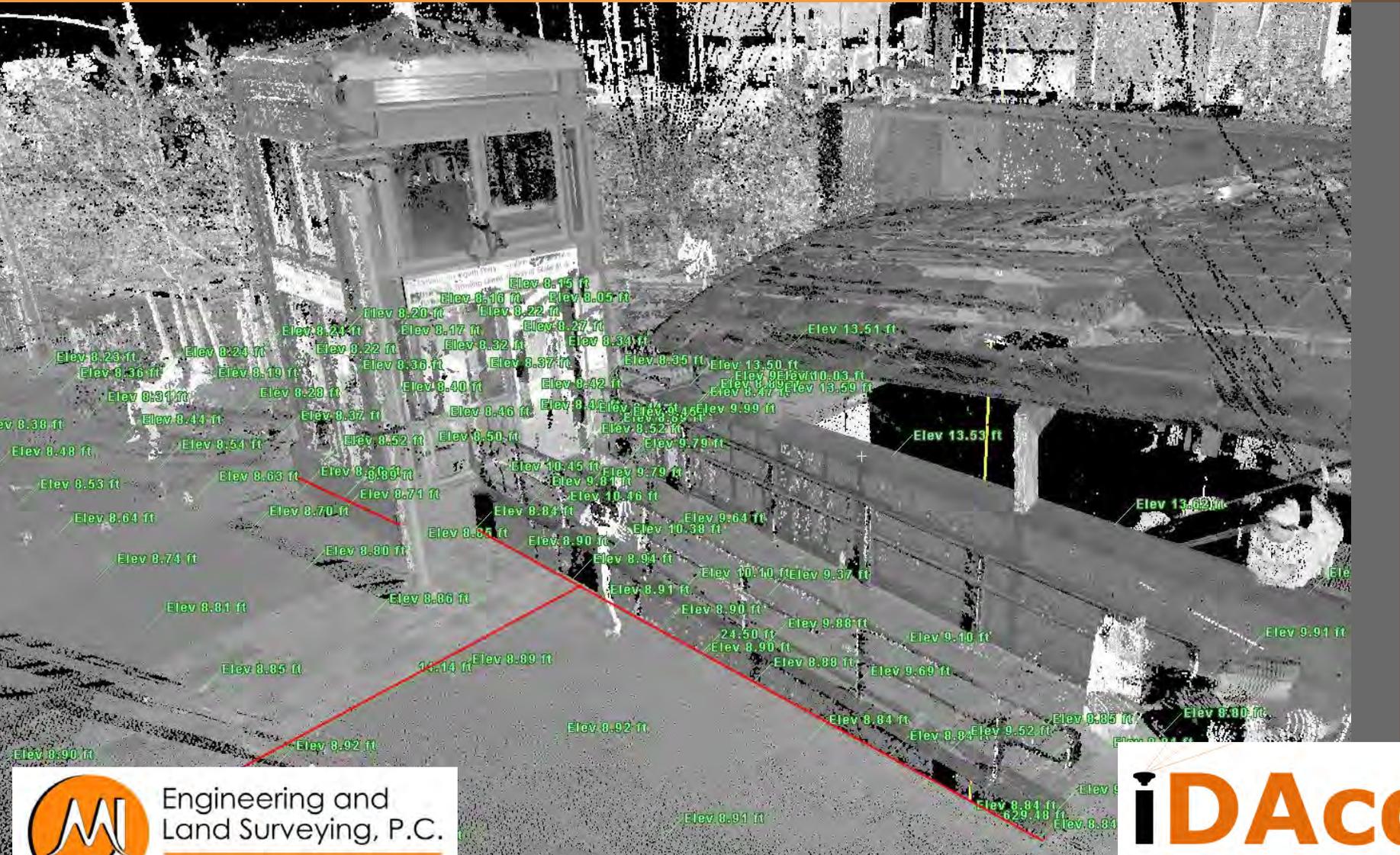


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# Project Experience

## Superstorm Sandy Recovery - NYCT



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# Project Experience

## 3D Modeling of New Tappan Zee Bridge



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# Project Experience

## 3D Modeling for the New Tappan Zee



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## GLOBALFOUNDRIES Chip Fab Plant



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# GLOBALFOUNDRIES

## GLOBALFOUNDRIES Clean Room

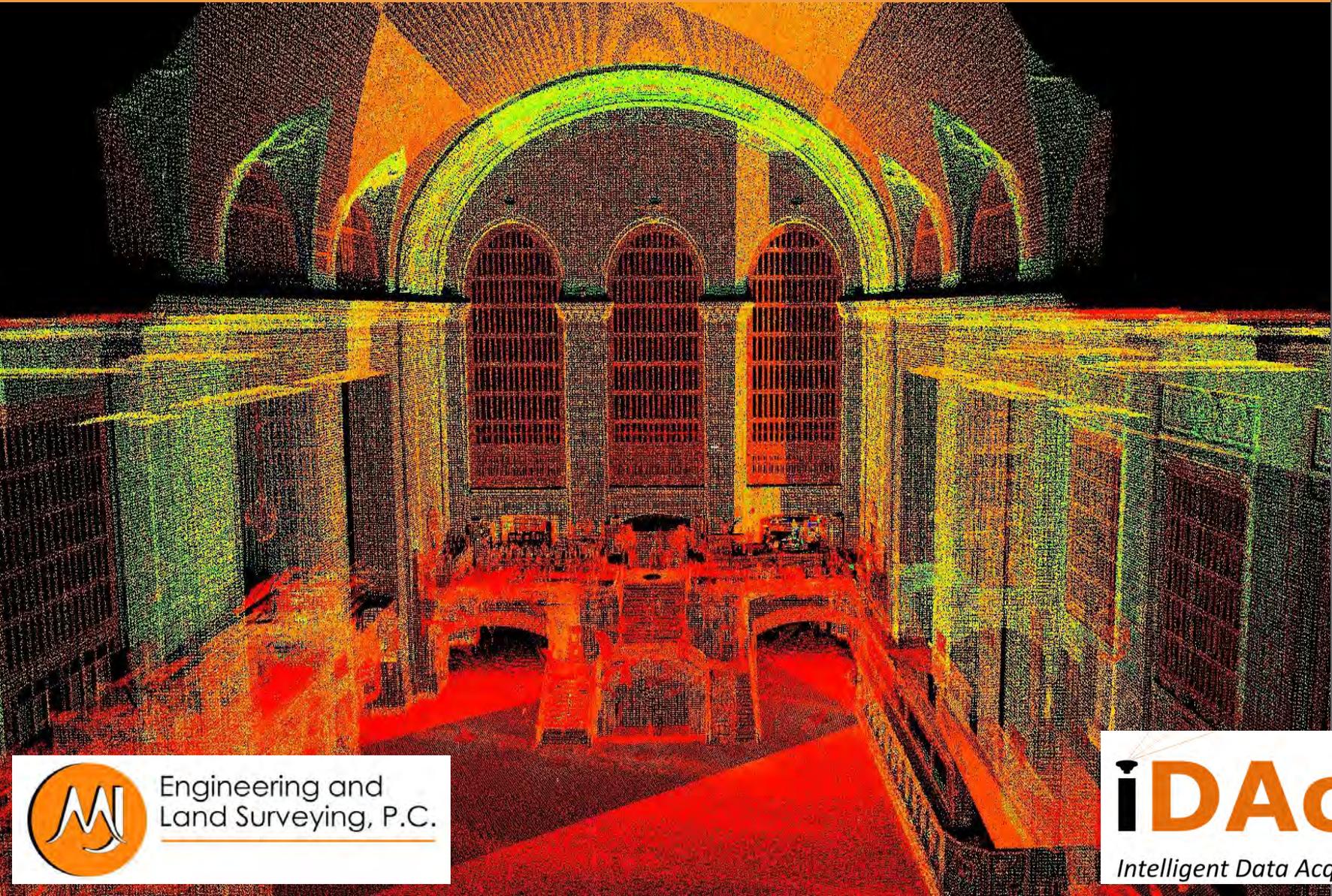


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# Project Experience

## Grand Central Station



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# Project Experience

## Destruction from Hurricane Irene



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# Project Experience

## Destruction from Hurricane Irene



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# Project Experience

## World Trade Center



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# Project Experience

## Denver International Airport

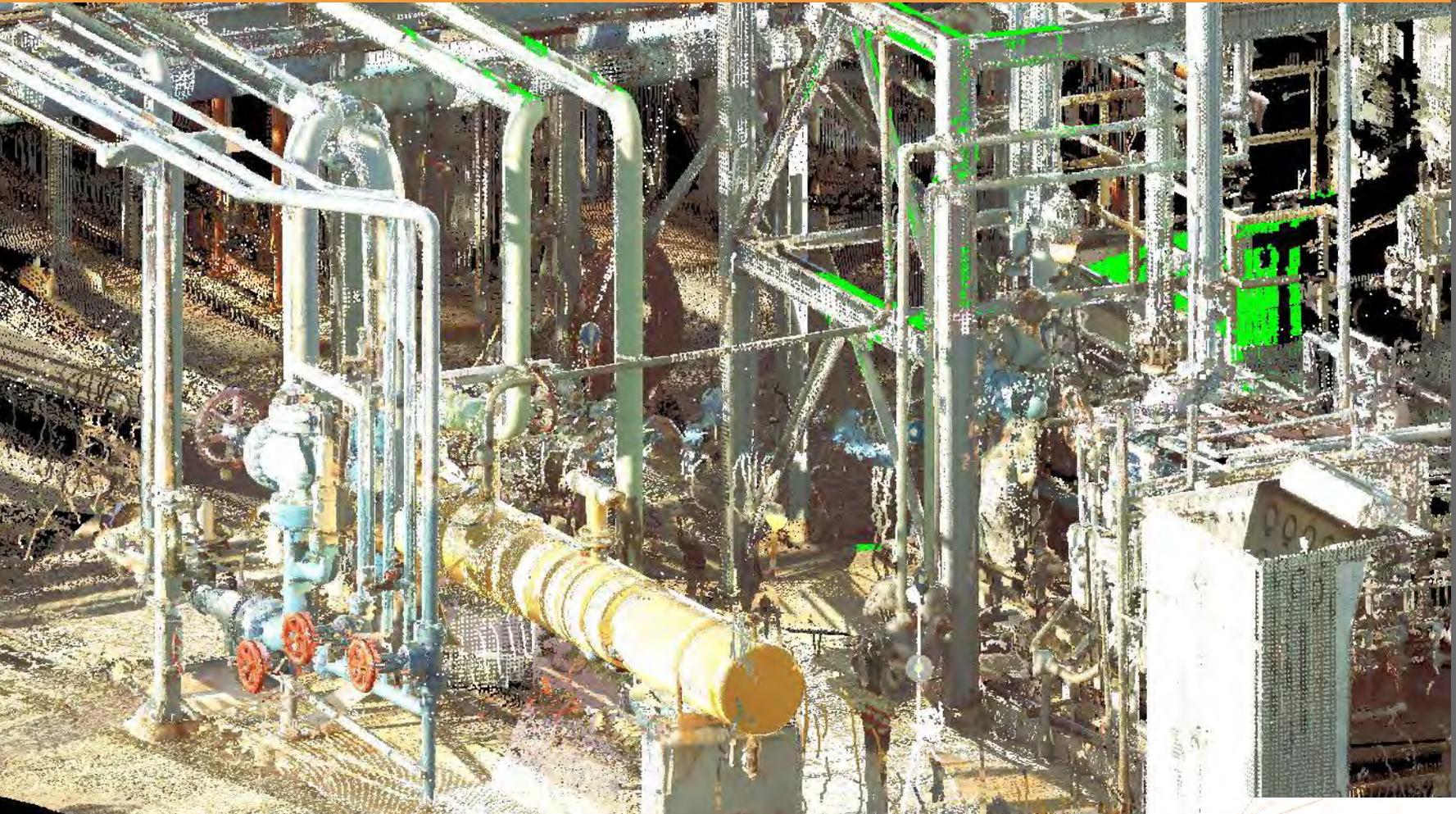


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# Project Experience

## Con Ed



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# Summary of Topics

- What are the primary types of scanners?
  - Time of flight versus phase based, mobile versus static
- Some additional benefits of having 3D data available:
  - Visualization, coordination, simulation and optimization from 3D, 4D and BIM computer technologies
- Scheduling/coordination Issues that can be addressed
  - Scan team is an independent element, can work on their own without need for specialized access or support
- Benefit to technical teams (field/office)
  - Software available for the engineer to immediately utilize the data



# Summary of Topics

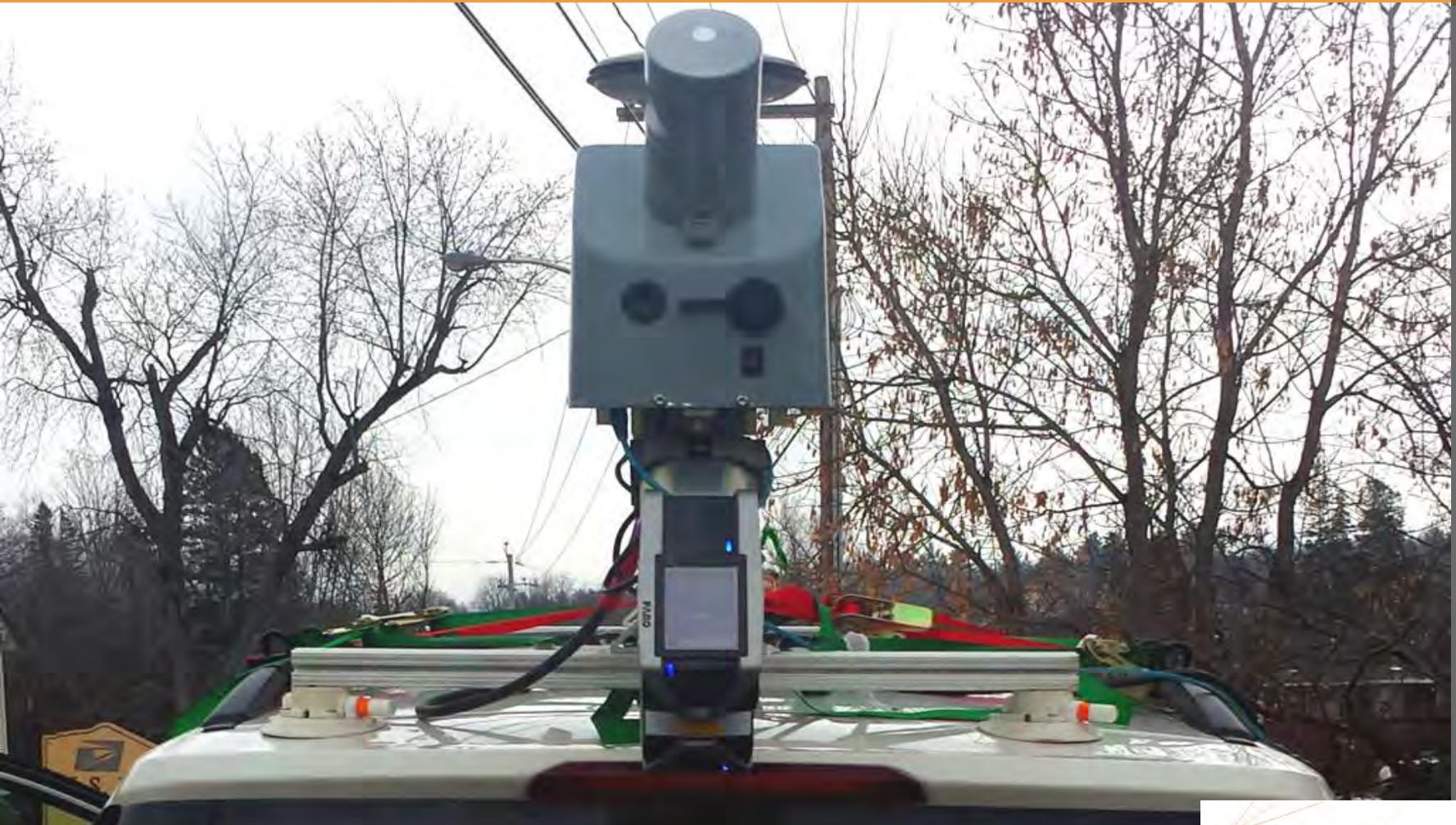
- Logistical concerns when using the scanner
  - Temperature/climate impacts on the data
- Why compare data sets to design models
  - Quantity verifications
- Why compare “Computer generated” versus as-built
  - conflicts can be addressed
- When to deploy static or mobile scanning?
  - Level of accuracy and resolution required, time allotted
- Cost/benefit of utilizing scanning over more traditional survey methods
  - Speed of data collection, obtaining a digital site record



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# Questions?



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