Creating Value ...

... Delivering Solutions

Los Angeles County

Critical Infrastructure Solutions

Mobile LiDAR

Sept 12, 2013

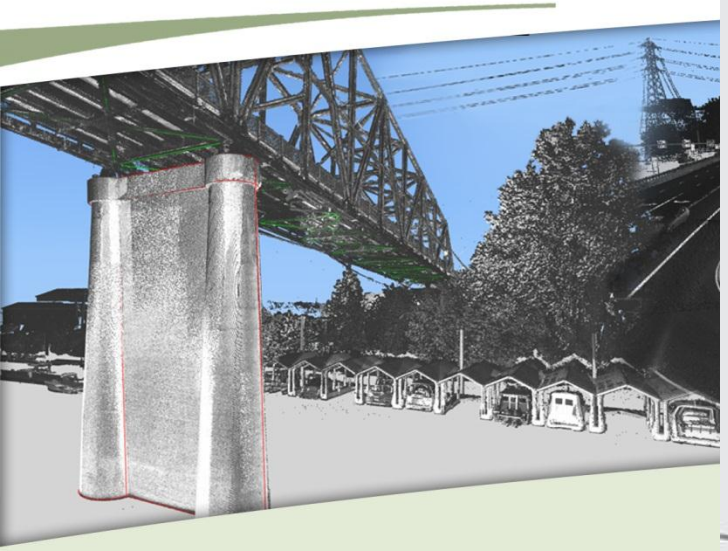
COUNTY OF LOS ANGELES CALIFORNIA

COUNTY OF LOS ANGELES PUBLIC WORKS

RBF CONSULTING A Baker Company

Baker

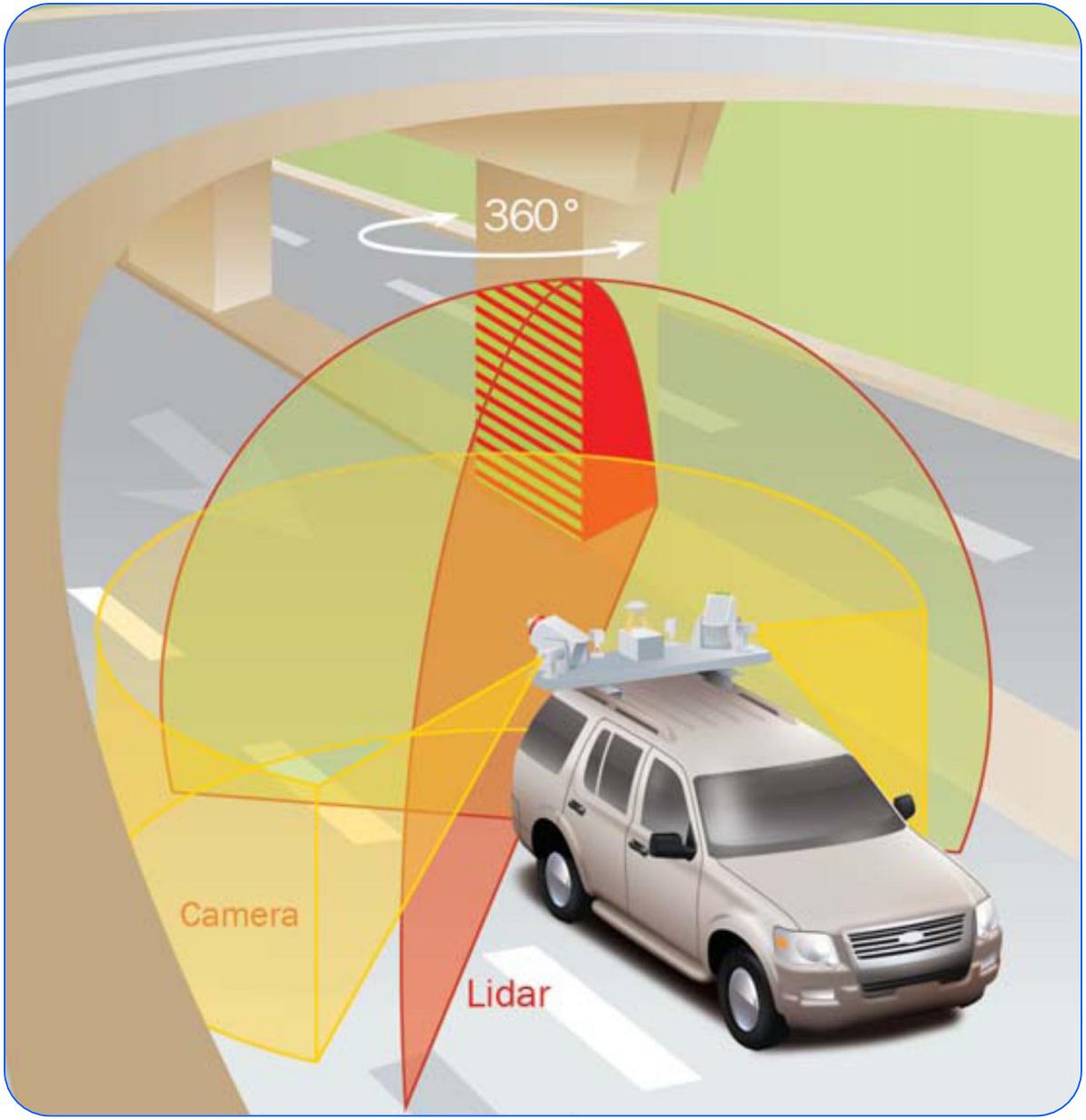
Creating Value ...

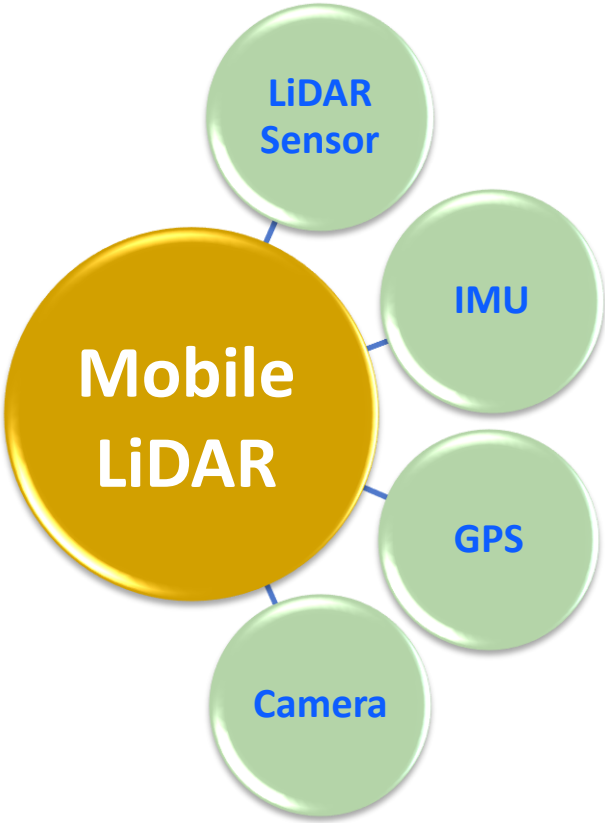


Overview

- Complete Suite of LiDAR Collection
- Background on Mobile LiDAR System
- Accuracy and Potential Uses
- Cost Examples
- Critical Infrastructure Solutions

Mobile LiDAR "Instrument"





Mobile LiDAR "Instrument"

Overview

- **Optech LYNX Mobile Mapper™**

Specifications

- Accuracy: ≤ 0.1’
- Precision: ≤ 7mm
- Range: 200m (corridor varies)
- Field of View: 360°
- Laser rotates: 9-15,000 RPM
- Measurement Rate: 50, 100 or 200 kHz
- Returns per Shot: 4 (1st, 2nd, 3rd, Last)
- Simultaneous LiDAR & imagery capture
- Digital Cameras: 2x - 5 Mega-pixel
- Images Capture: ≤ 3 frames/sec.

Our Mobile LiDAR:

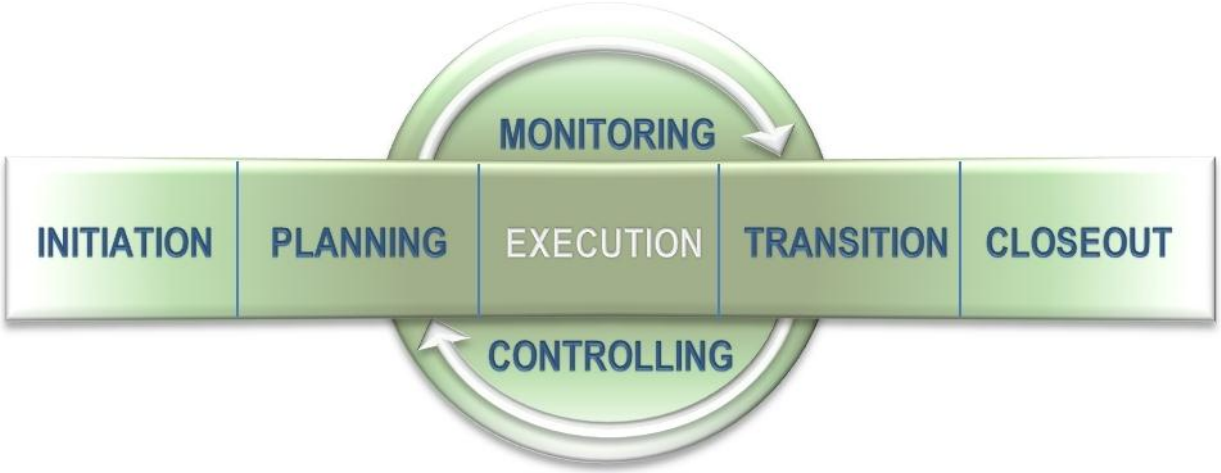
…proven collection via SUV, ATV, Hi-rail, and Boat.

Proven Experience

- **90+ Project Locations**
  - 100,000 miles of travel
  - 10 Different Transportation Agencies (Spanning 30+ Projects)
  - 3 International Airports (Atlanta, Pittsburgh, Philadelphia)
  - 10 State, Local/Municipal Agencies

Project Execution

- **Increased Safety**
- **No Interruptions to Operations**
- **Shortened Delivery Cycle**
- **Cost-Savings**
- **Minimize/Eliminate Rights-of-Entry Issues**
- **Re-usable Engineering-grade Data**



Safety

- **Reduce unsafe conditions for field staff**
- **Eliminate Lane Closures**

VS.

Don't play "chicken" with traffic

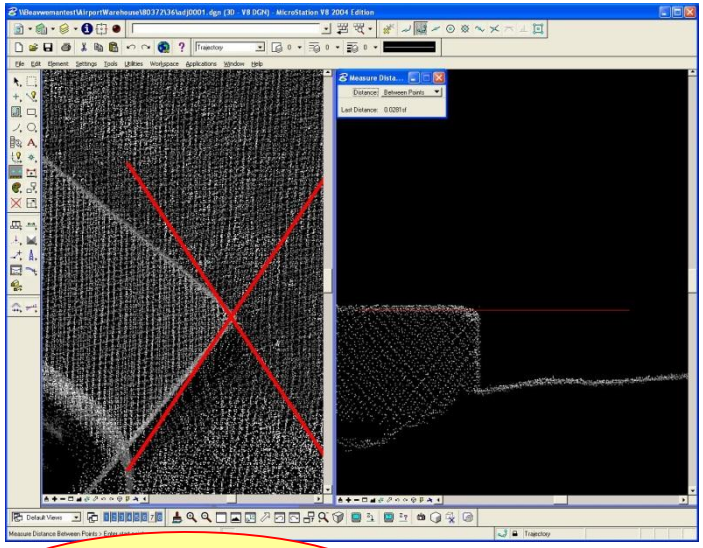
Our Mobile LiDAR:

...Has never recorded an accident or safety incident

Mobile LiDAR Accuracy Results

Z (Control)	Z (LiDAR)	ΔZ	ΔZ²
15.907	15.971	-0.064	0.004096
15.793	15.857	-0.064	0.004096
16.269	16.305	-0.036	0.001296
16.844	16.843	0.001	1E-06
17.094	17.118	-0.024	0.000576
17.361	17.343	0.018	0.000324
17.369	17.426	-0.057	0.003249
17.557	17.585	-0.028	0.000784
17.53	17.526	0.004	1.6E-05
17.552	17.551	0.001	1E-06
17.733	17.725	0.008	6.4E-05
17.754	17.708	0.046	0.002116
17.567	17.558	0.009	8.1E-05
17.113	17.149	-0.036	0.001296
17.511	17.501	0.01	1E-04
17.449	17.427	0.022	0.000484
17.537	17.526	0.011	0.000121
17.594	17.576	0.018	0.000324
17.656	17.636	0.02	0.0004
17.732	17.718	0.014	0.000196
		Sum	0.019621
		Average (ft)	**0.025**
		RMSEr	0.031321718
		Accuracy per NSSDA (Vertical Error at 95% Confidence in ft)	**0.061**

- **162 Check-Points**
- **Average ΔZ based on all checkpoints.**
- **NSSDA Accuracy based on 20 random points.**



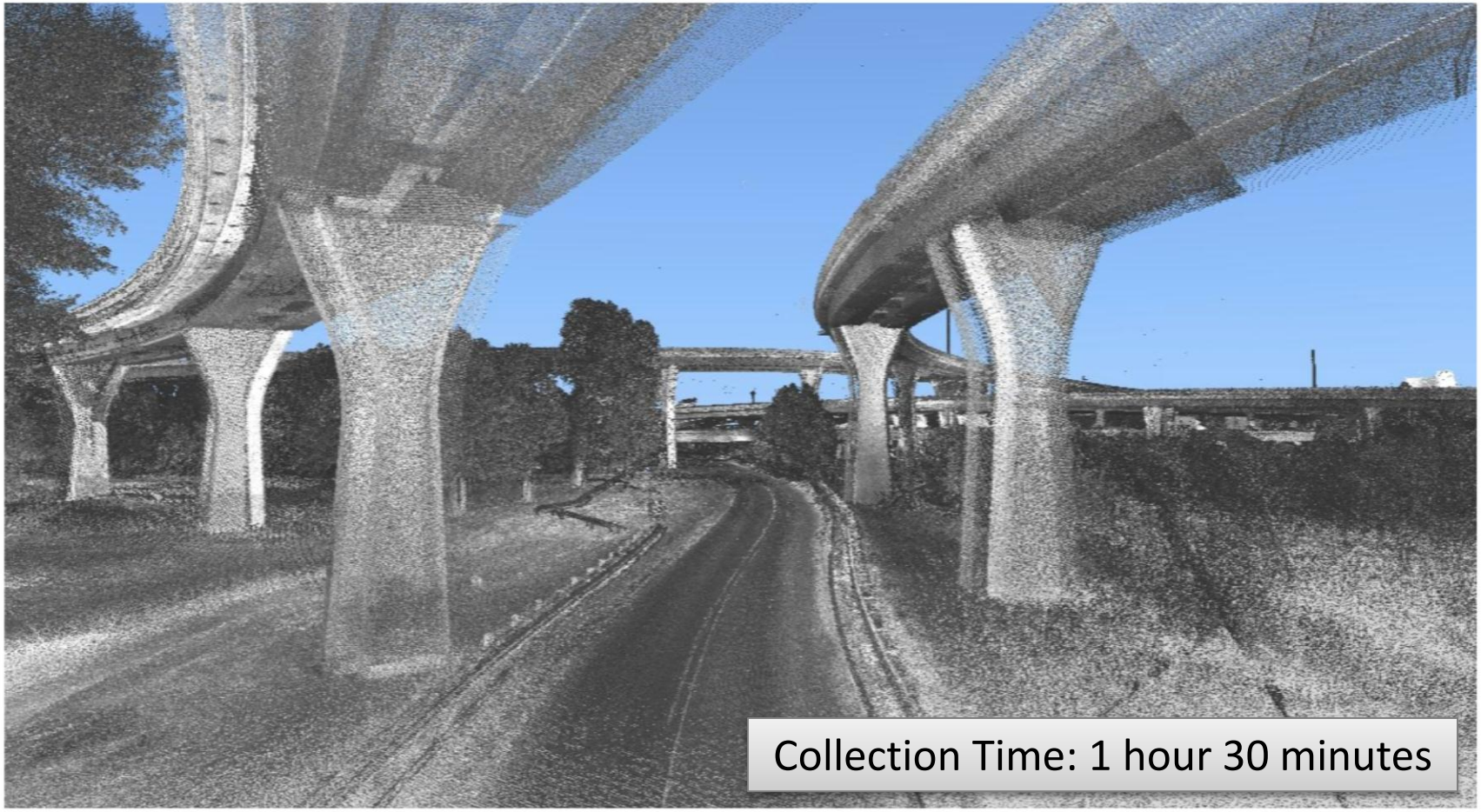
.3" = .76cm

.73" = 1.8cm

ur Mobile LiDAR:

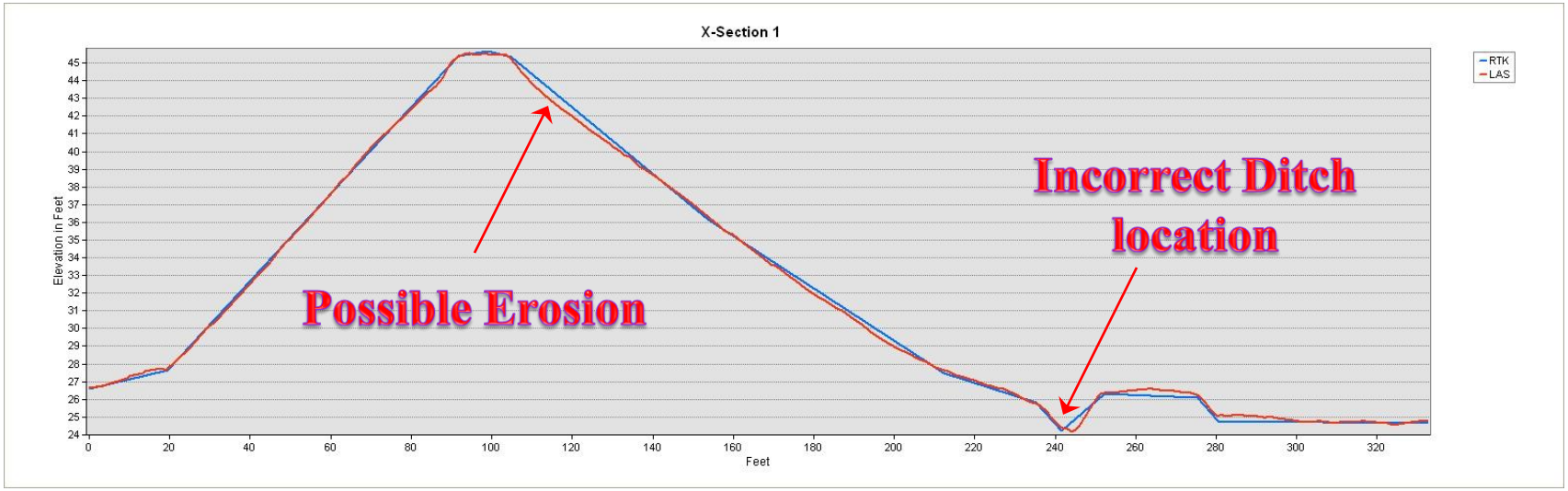
Repeatable and Defensible Accuracy Results

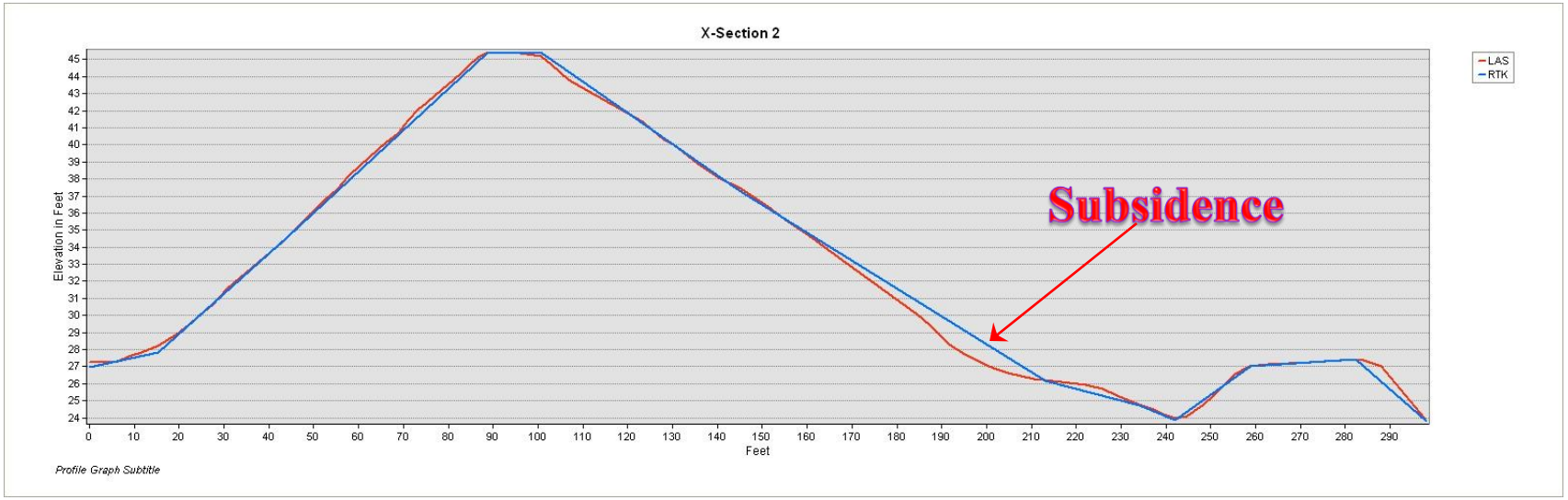
High Level of Detail



Density of scan allows for definition of objects & conditions not capable with traditional methods

High Resolution / Detail

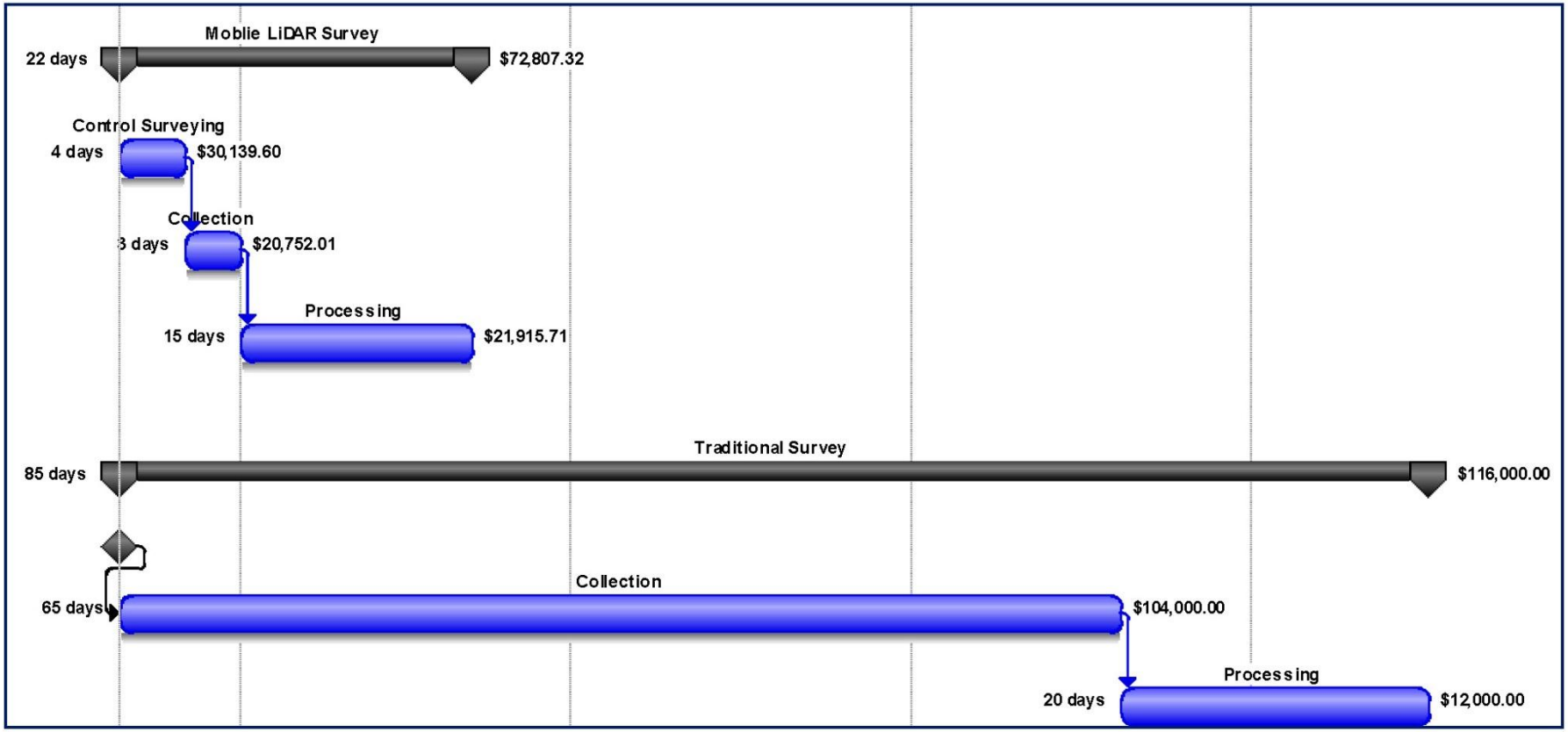




GPS (RTK) Mobile LiDAR

Project Comparison

Time and Cost Comparison: Mobile LiDAR vs. Traditional Survey



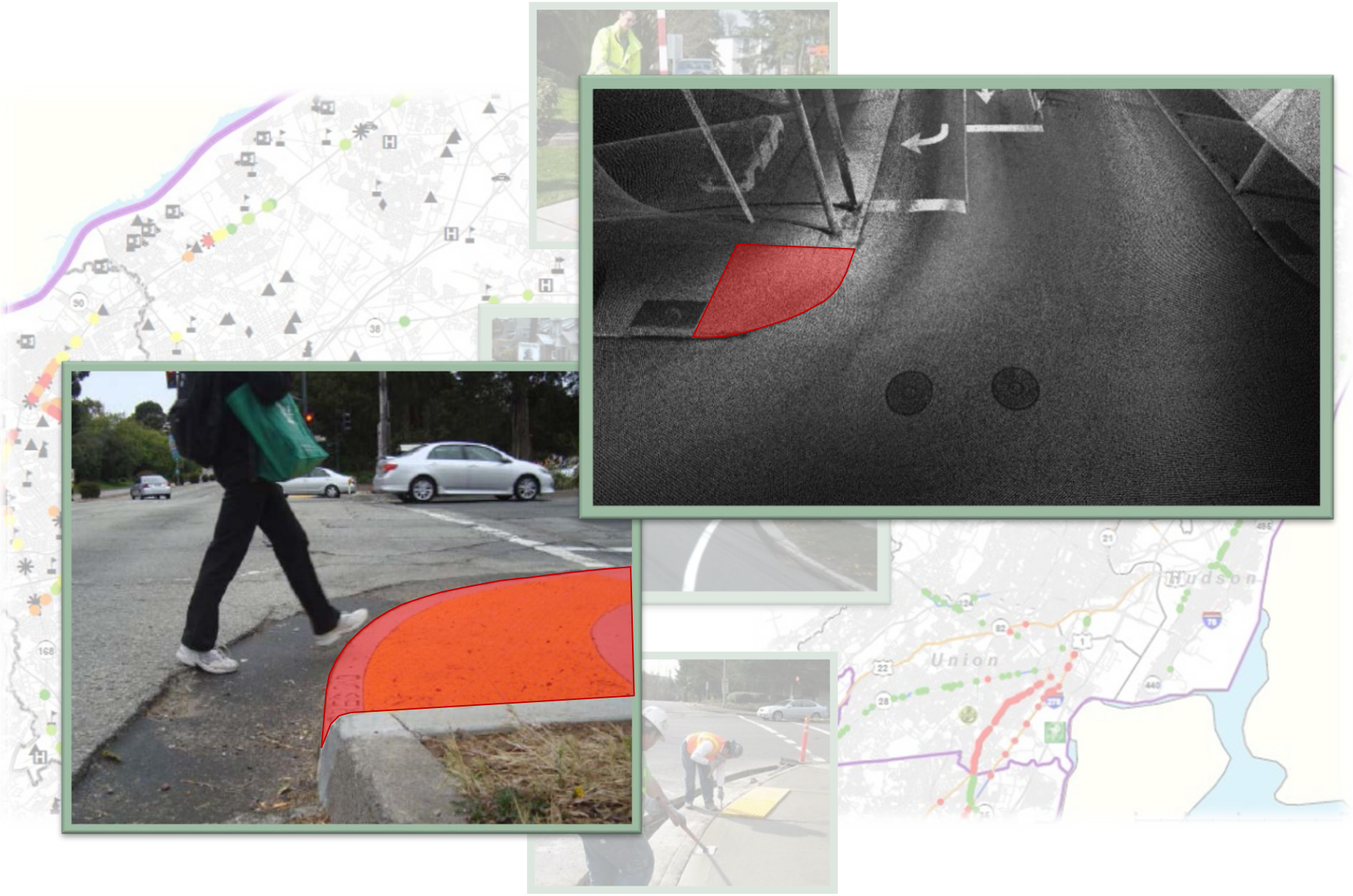
- 24 Centerline Miles
- Survey-grade accuracy
- Complete 3D Roadway Planimetric Extraction

- DTM with 25' grid
- 1' Minor and 5' Major Contours
- Completed in 3 weeks from NTP

Our Mobile LiDAR:

Typically yields 40% cost savings over traditional methods

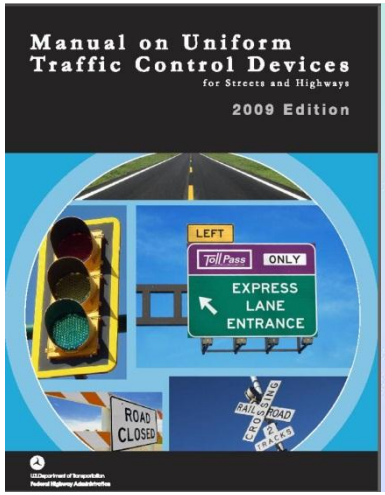
ADA Compliance



MUTCD Inventory / Compliance

Manual on Uniform Traffic Control Devices - FHWA

- **Sign Inventory**
  - Size, Location, Classification
- **MUTCD Compliance**
  - Design, Orientation, Condition
- **Ordinance Compliance**
  - Billboard / Sign Placement, Size, etc.

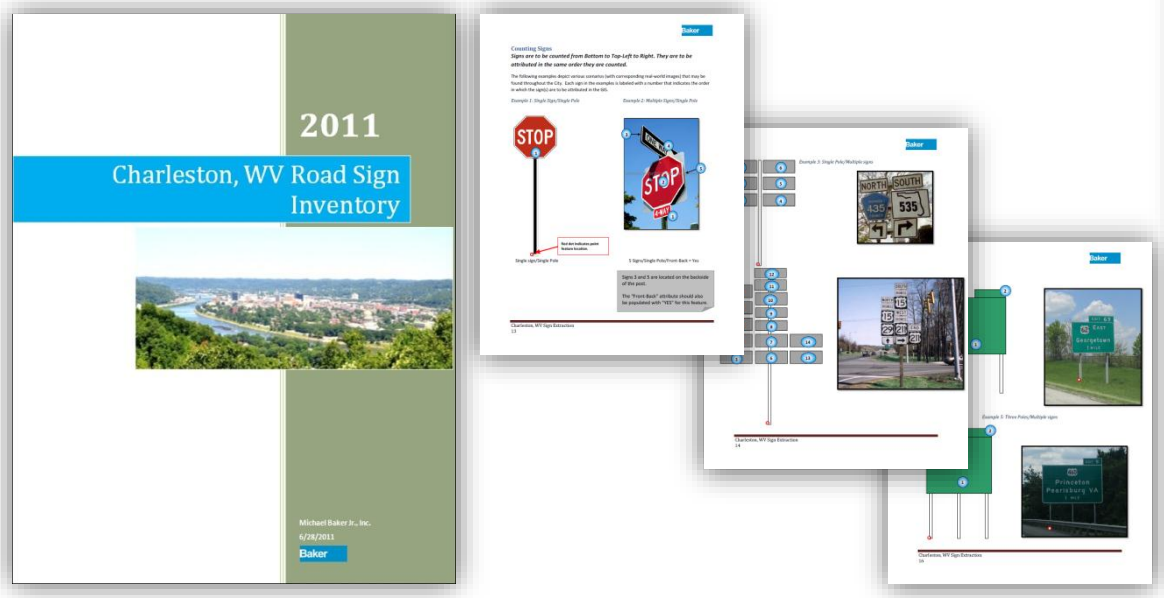


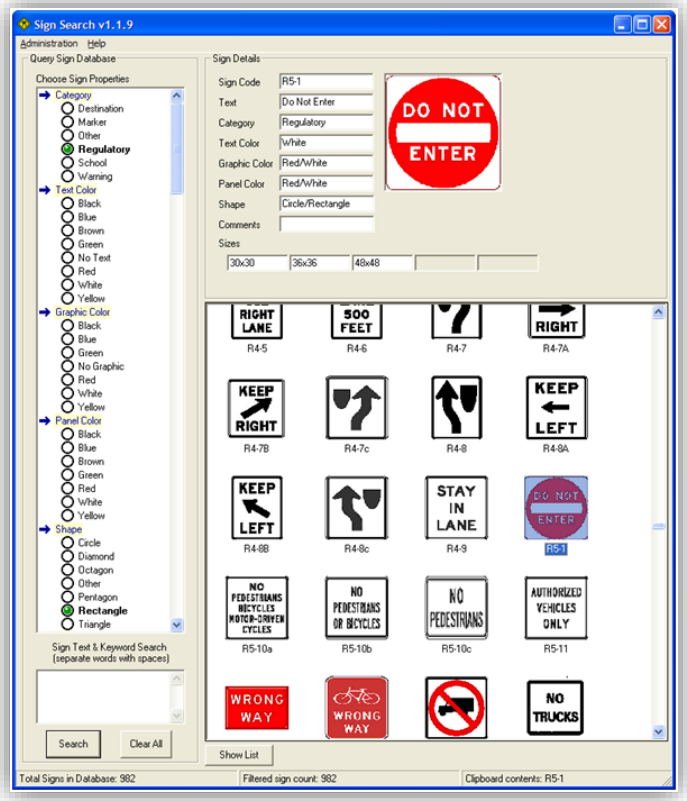
Non-Compliant Design:

2009 MUTCD Compliant Design:

MUTCD Inventory / Compliance

- **Sign Search Application**
- **Comprehensive Project-Specific Training**





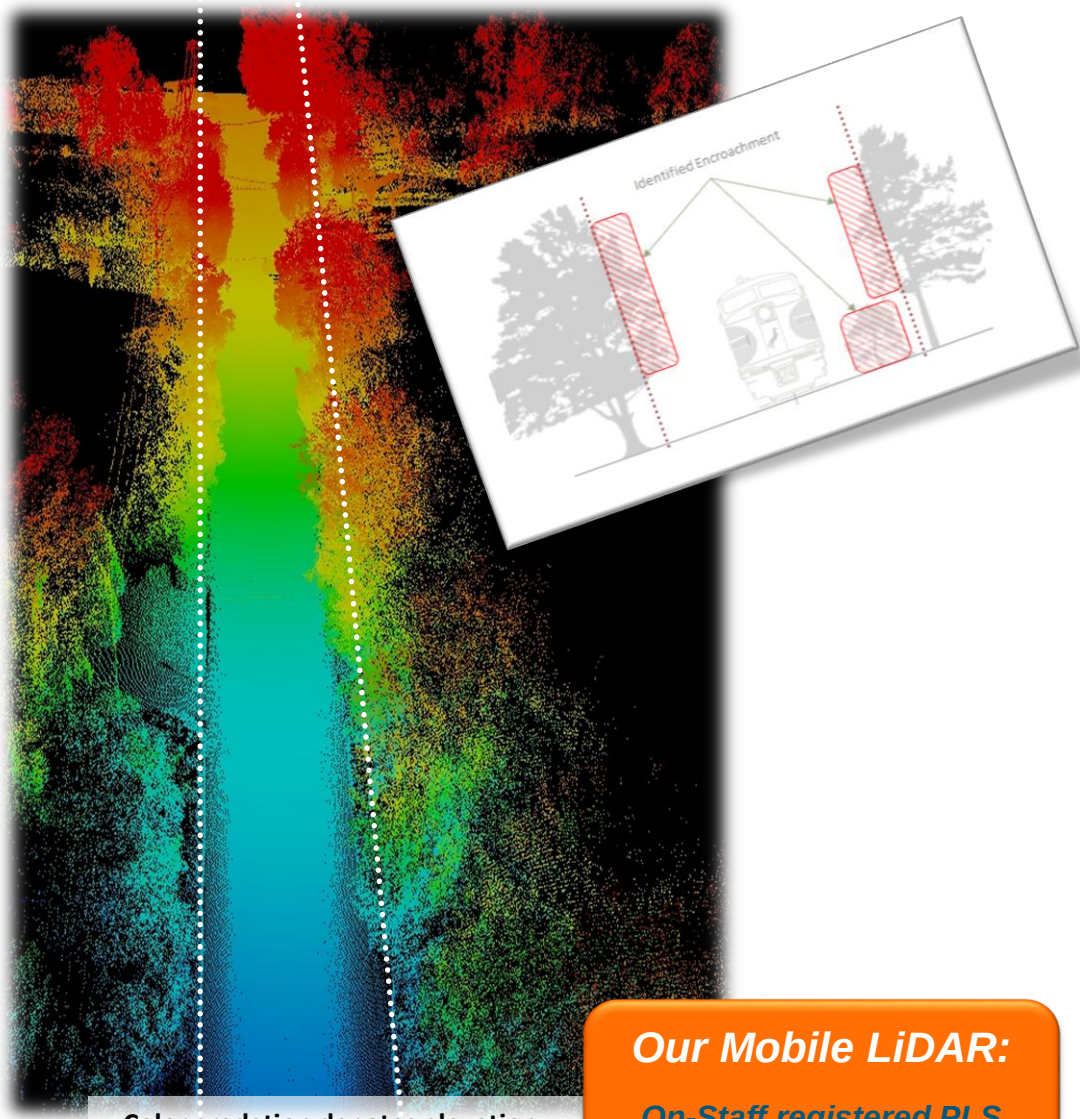
Mobile Asset Management

Municipal Analysis

- **Re-Purpose the Cloud**
  - **Collect Once, Reuse Many Times**

Encroachment Analysis

- **Vegetation Encroachment**
  - Identify problematic areas
  - Strategically schedule for eradication
  - Pinpoint herbicidal placement
- **Site Analysis**
  - Facility Relocation
  - 3D Visualizations
  - Fly-through animations



- Color gradation denotes elevation
- Dashed lines depict Track corridor

Our Mobile LiDAR:

On-Staff registered PLS oversee all field work

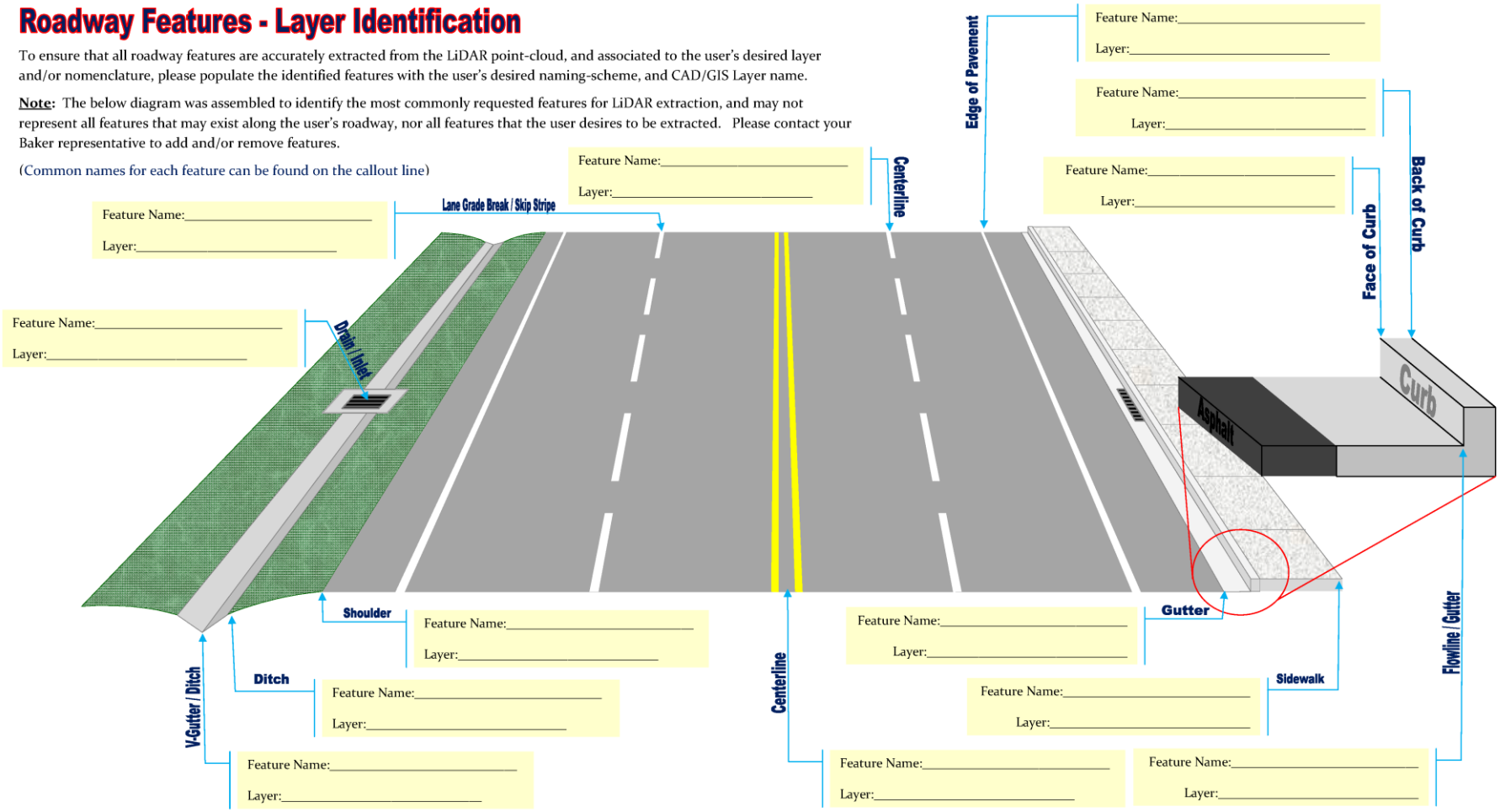
Processing & Extraction

Roadway Features - Layer Identification

To ensure that all roadway features are accurately extracted from the LiDAR point-cloud, and associated to the user's desired layer and/or nomenclature, please populate the identified features with the user's desired naming-scheme, and CAD/GIS Layer name.

Note: The below diagram was assembled to identify the most commonly requested features for LiDAR extraction, and may not represent all features that may exist along the user's roadway, nor all features that the user desires to be extracted. Please contact your Baker representative to add and/or remove features.

(Common names for each feature can be found on the callout line)



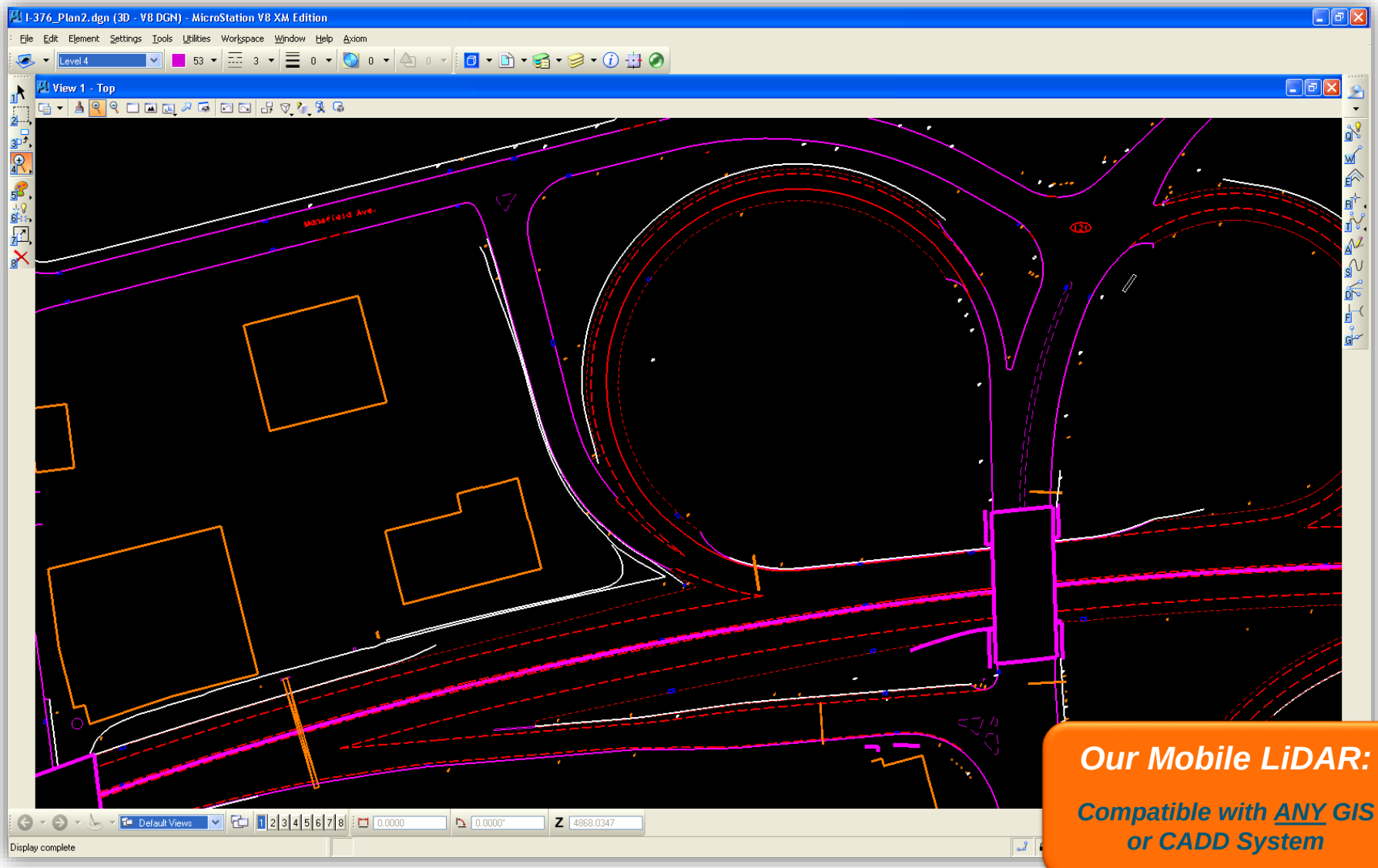
Indicate on each of the above paint-striping examples, the location at which the linear feature should be extracted (i.e. left-edge, right-edge, or center).
The user may draw a line on each example to indicate the desired location.

Our Mobile LiDAR:

ONLY ISO 9001:2008 Certified Operation

Asset Management

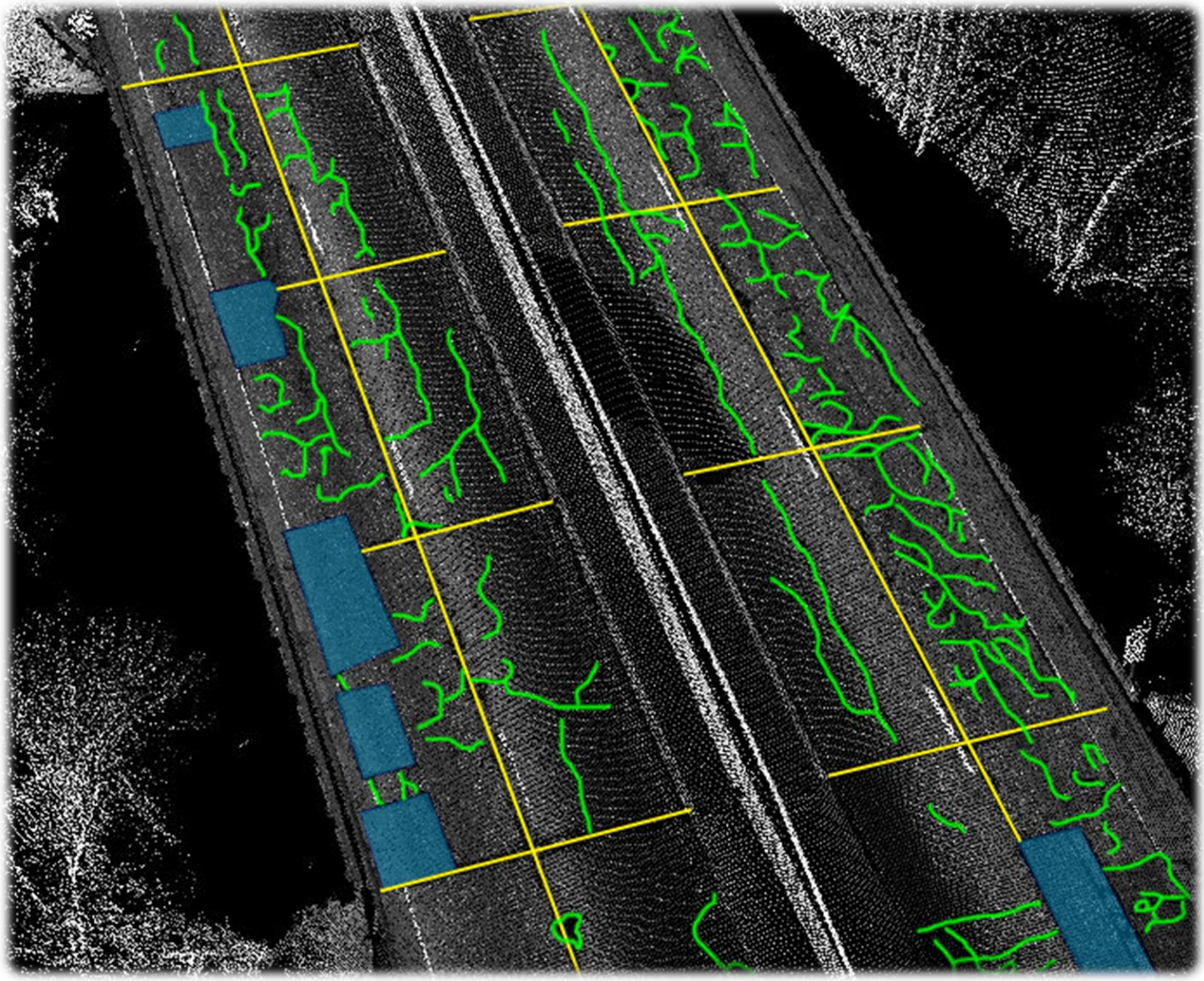
Planimetrics



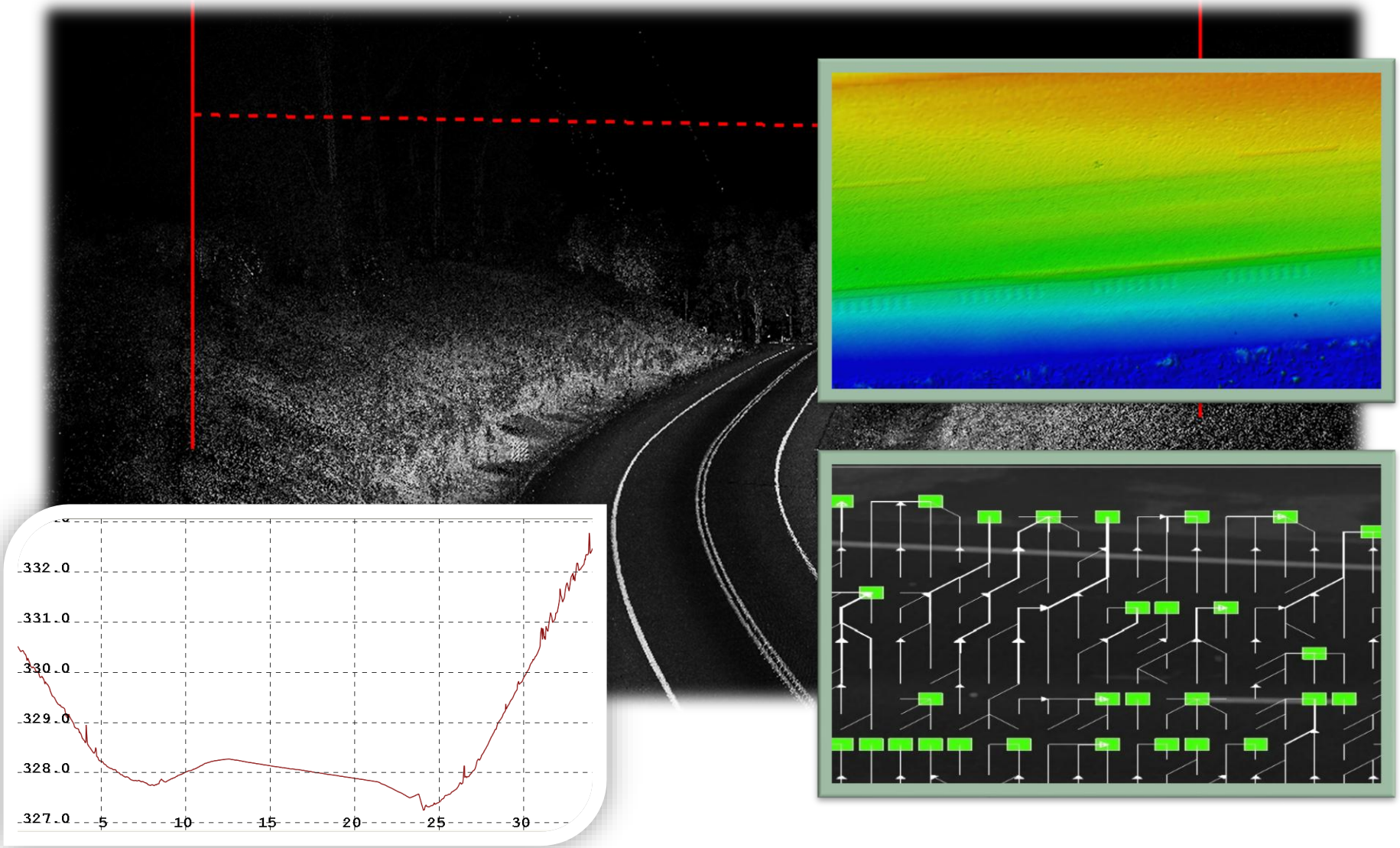
Our Mobile LiDAR:

Compatible with ANY GIS or CADD System

Roadway Stress/Alligator Cracking



Slope / Rutting Analysis

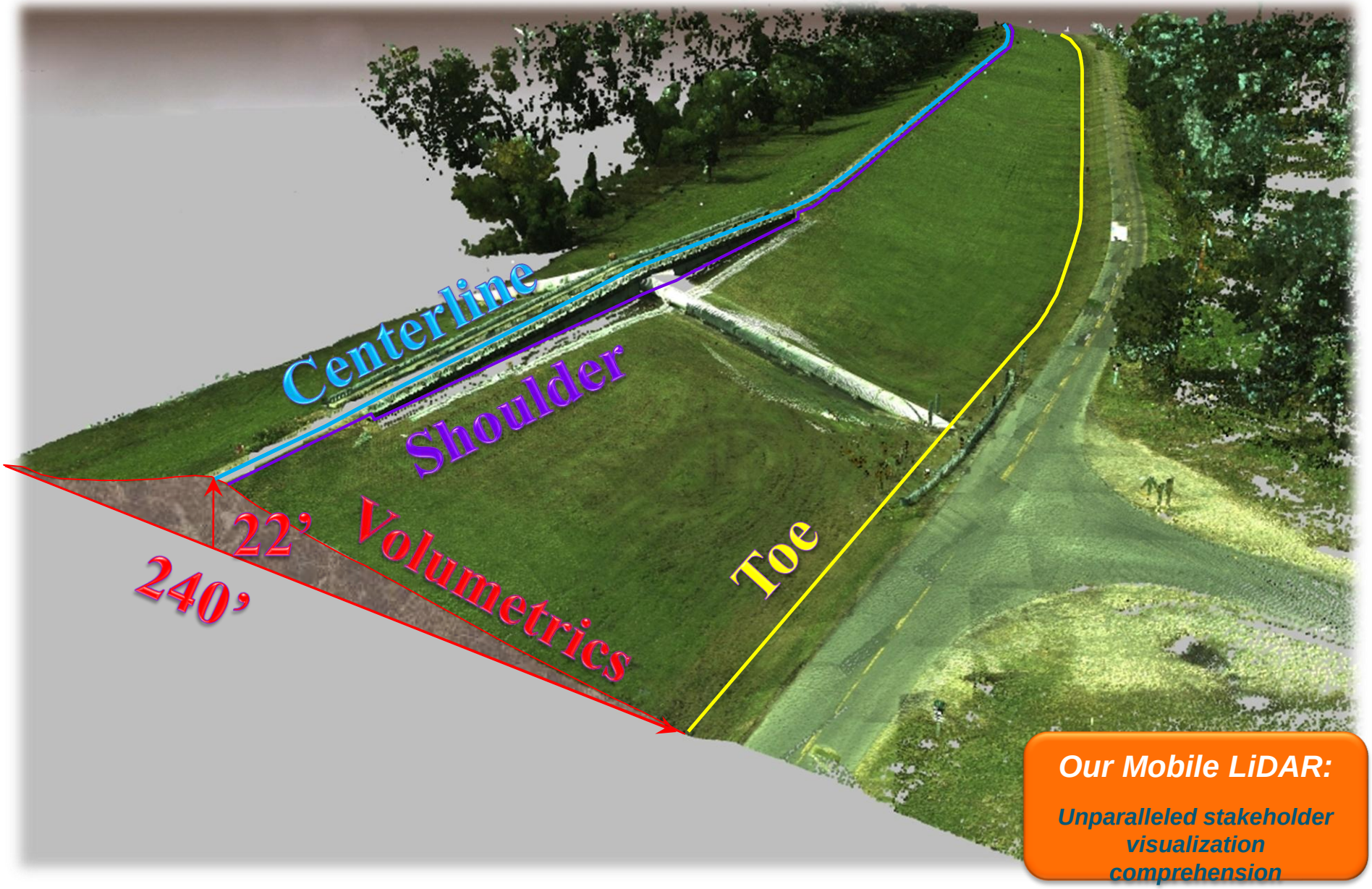


Stormwater Infrastructure

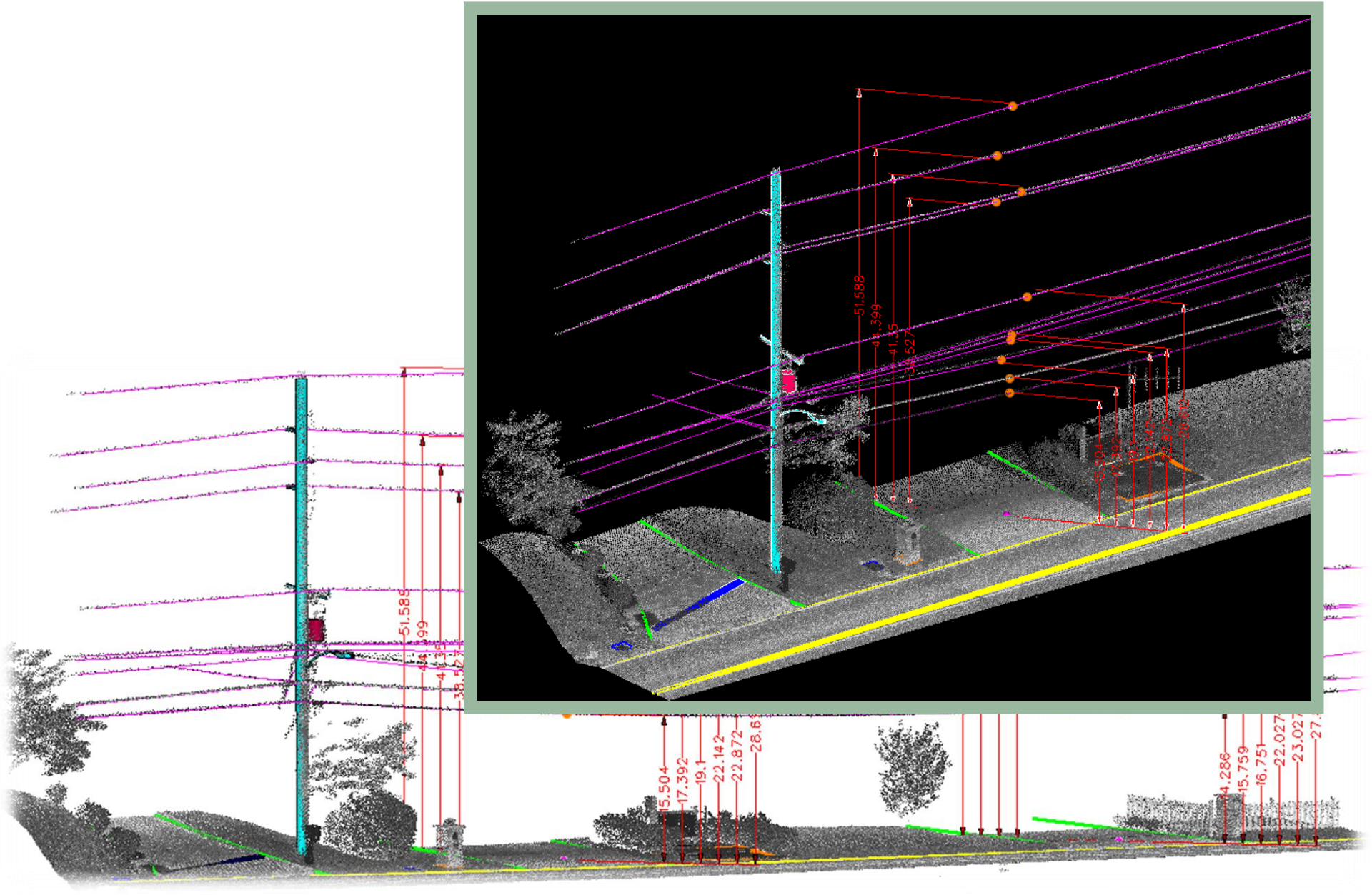
Our Mobile LiDAR:

Repurpose Point-Cloud for Numerous Projects

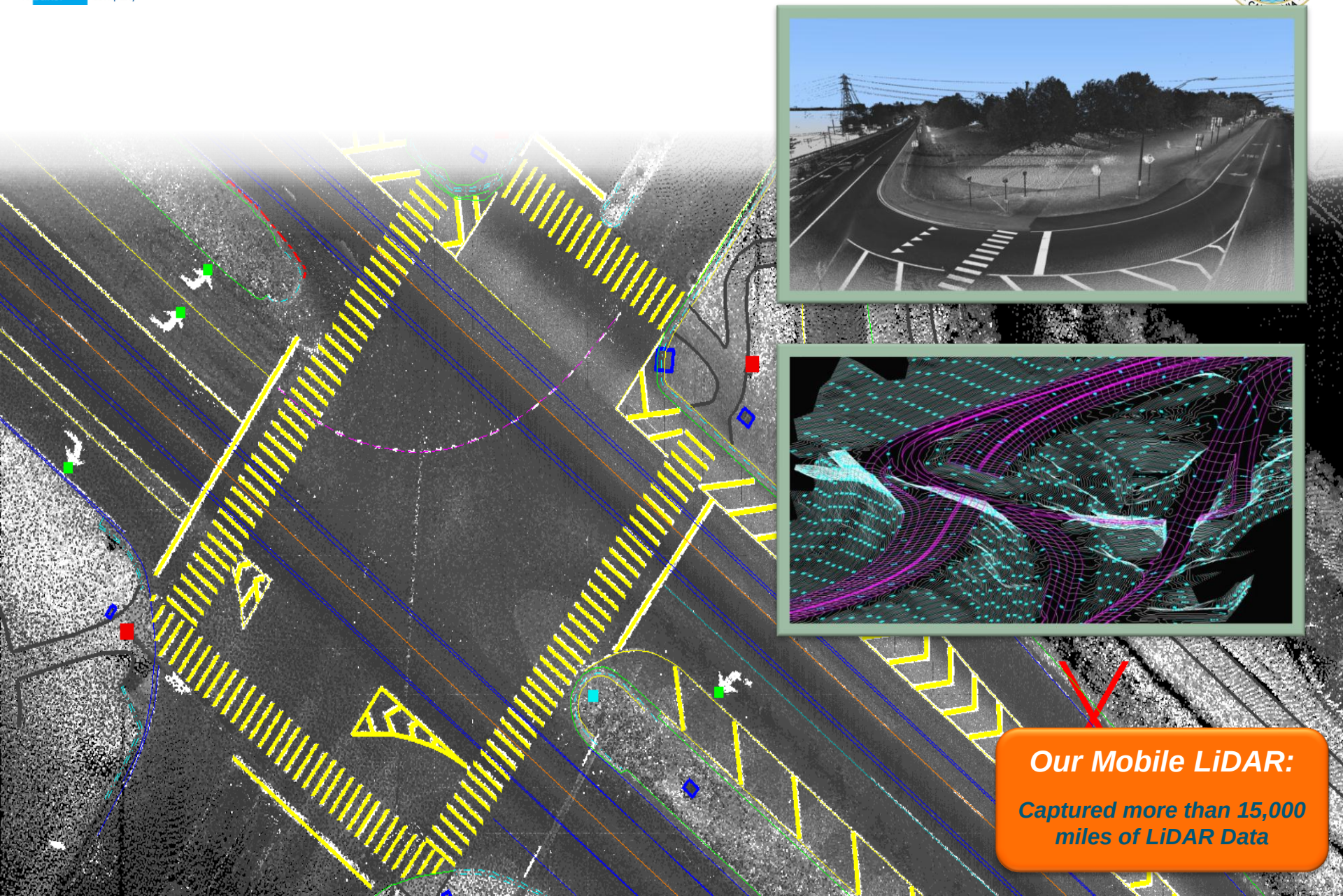
Flood Structures / BFE's



Utility Crossings



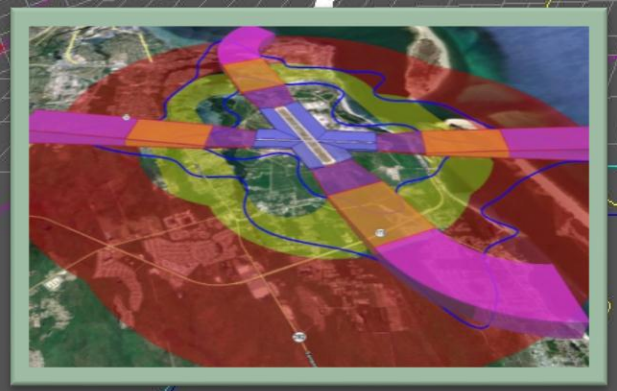
Construction / As-built Surveys



Our Mobile LiDAR:

Captured more than 15,000 miles of LiDAR Data

Aviation

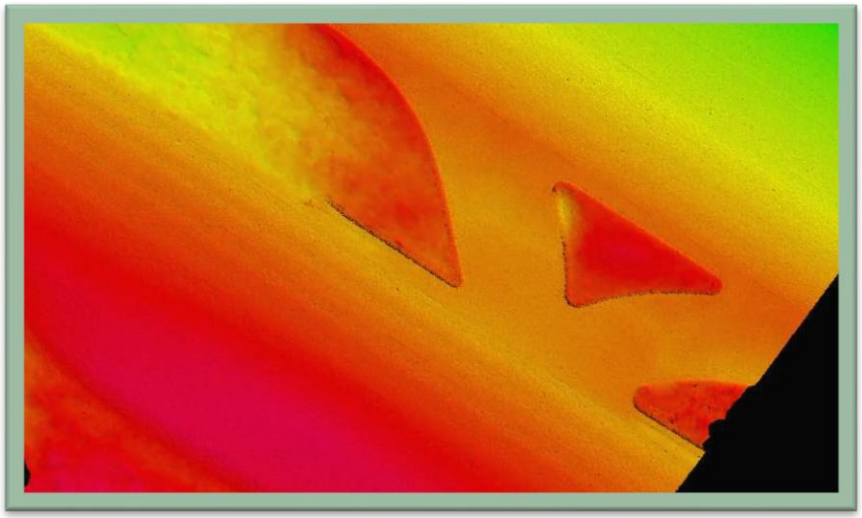


Our Mobile LiDAR:

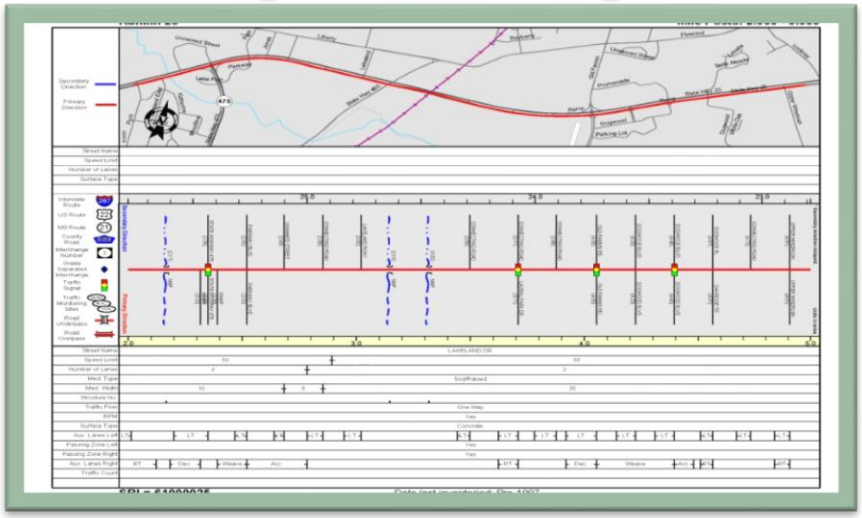
Performs surveys at highway speeds

Alternate Products

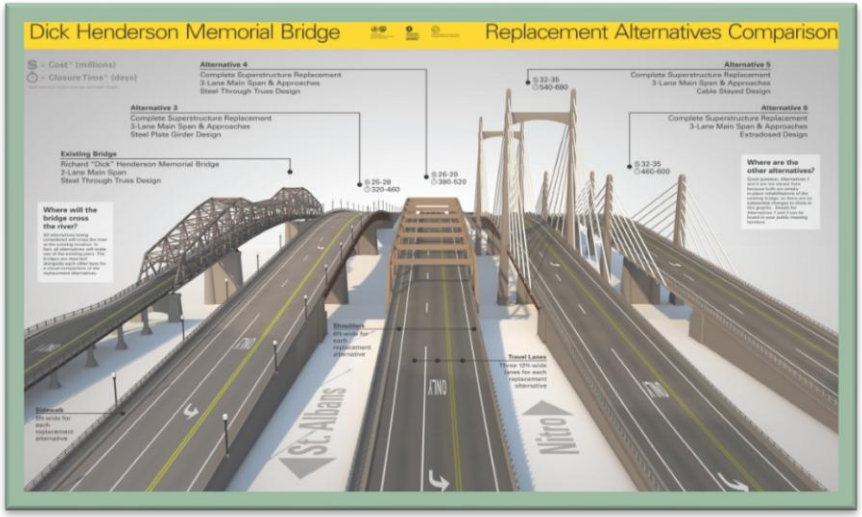
Pavement Assessments



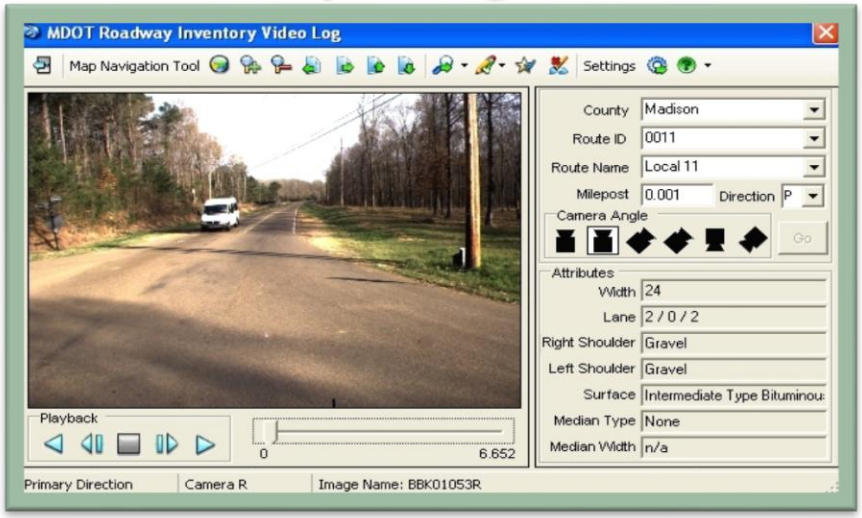
Straight Line Diagrams



3D Renderings



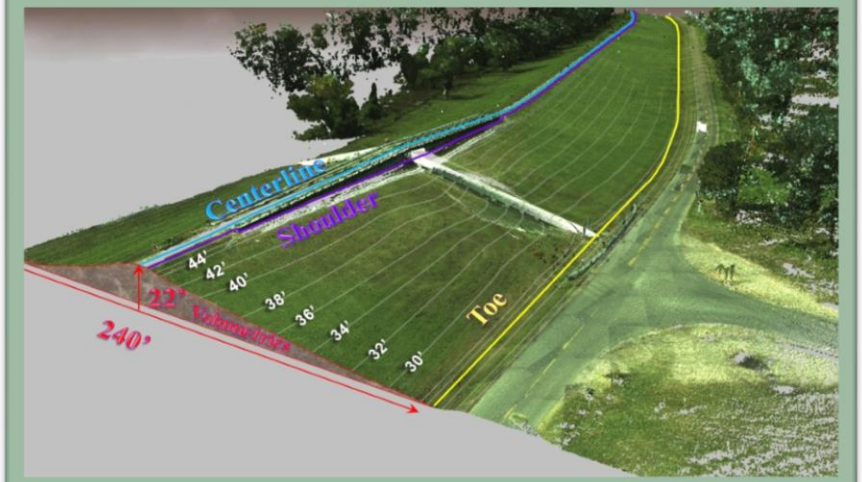
Roadway Image-Viewer



Alternate Products

Disaster Assessment

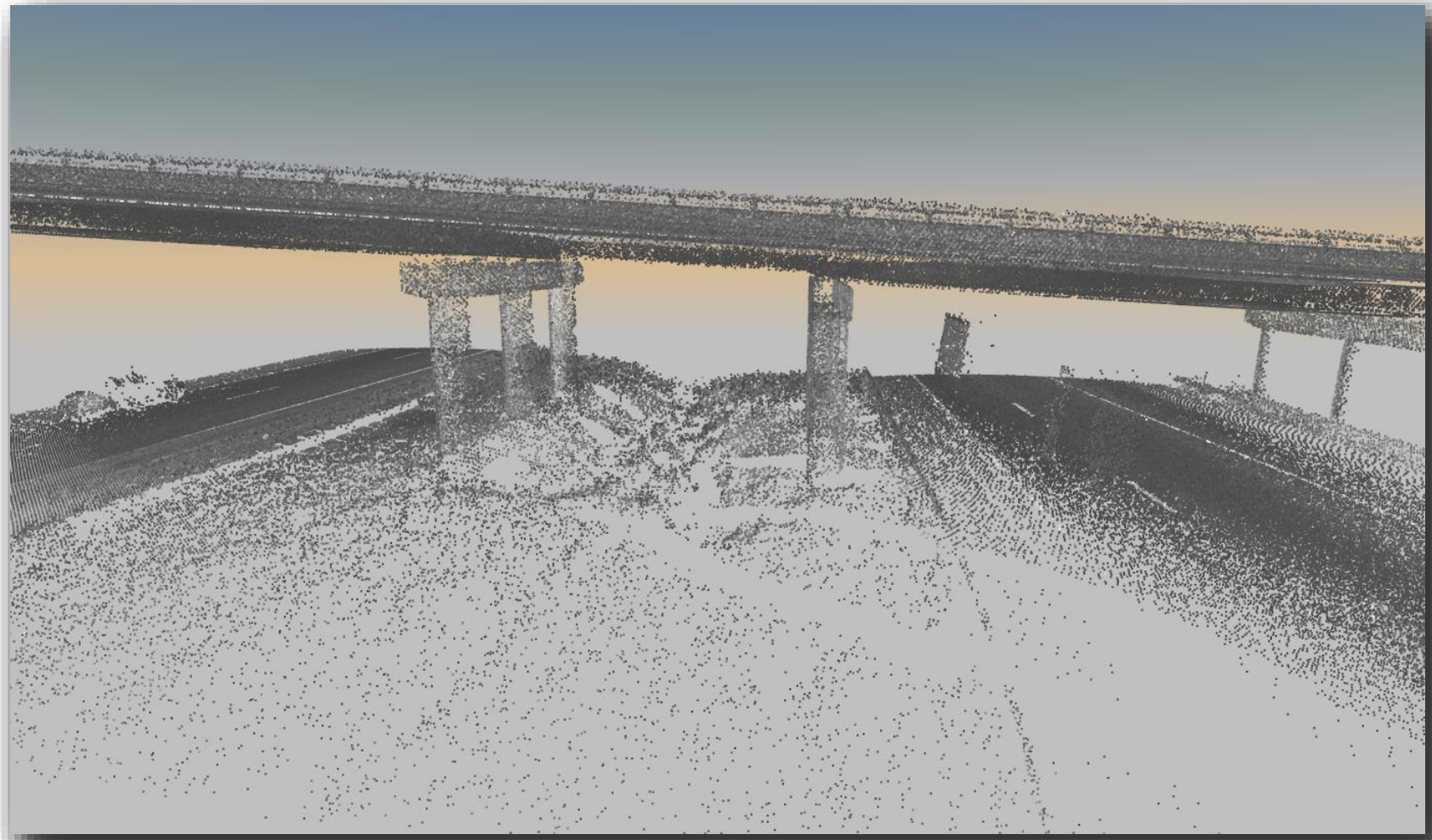
Volumetric Analysis



3D Visualizations

Colorized Point-Cloud

Modeling Process



Wireframe of Modeled Object Point Cloud

Mobile LiDAR Contacts

- **For Questions:**
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