

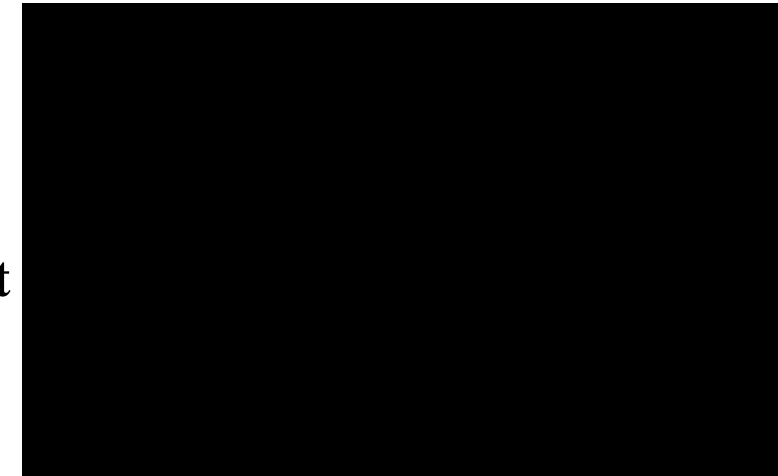
Pathway Services Inc.



Technology's Role in Condition Data

Collect Numerous Data Types in a Single Pass

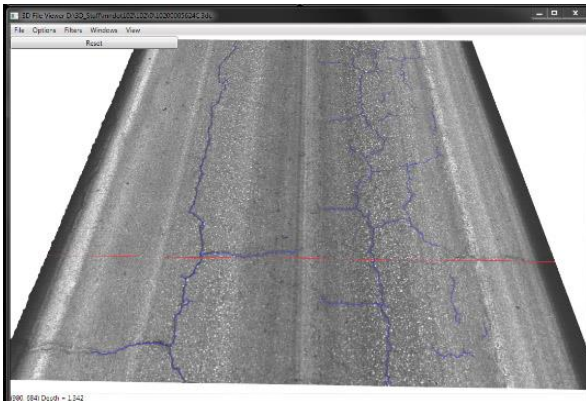
- High Resolution Right-of-Way
- High Resolution Surface Imaging
- Roughness Data
- Rutting Data & Transverse Profile
- Road Geometrics
- Faulting Data
- Vertical Clearance
- Shoulder and Edge Dropoff
- Asset Inventory + Management
- GIS
- GPS
- GPR
- Macro Texture
- Pavement Condition Rating
- 3D Pavement Surface Depths
- LiDAR



Technology's Role in Condition Data

- Huge Advances in recent years of Precision/Data Density (LiDAR, 3D Road Surfaces Systems, etc.)
- Better integration of IMU and GPS subsystems

Automated Crack Detection



Advanced GPS/IMU Data



Pavement Management Toolkit



Multi-Year Cracking Analysis: A Spatial Approach



Pathway Services Inc.



3D Road Surface Data Can Do A Lot!

- Automated Crack Detection (or vastly-improved semi-automated distress rating)
- Continuous Transverse Profiles / Rutting
- Longitudinal Profile
- Highly Accurate Faulting Data
- Macrotexture

3D Data Can Do Even More with Excellent IMU/GPS

- Massively Improved Cross Slope Data in curves/ Supers
- Terrestrial Mapping, Ponding Depths, Volumes
- Spatial-based Data Collection for Maximum repeatability, independent of LRS limitations
- Data Comparisons and Reporting independent of LRS inaccuracies & limitations

LRS Limitations in Collection & Reporting

- A few years ago, one large client was struggling internally to match data collected at different times or by different people
- Multiple LRS were used by different departments
- Some LRS are referential and not distance-based
- LRS were constantly being updated and data had to be reconciled annually

LRS Limitations in Data Collection

- Historically, data collection was based on roadway markers
 - Roads can change names/ownership
 - MP Signs are moving targets



LRS Limitations in Data Collection

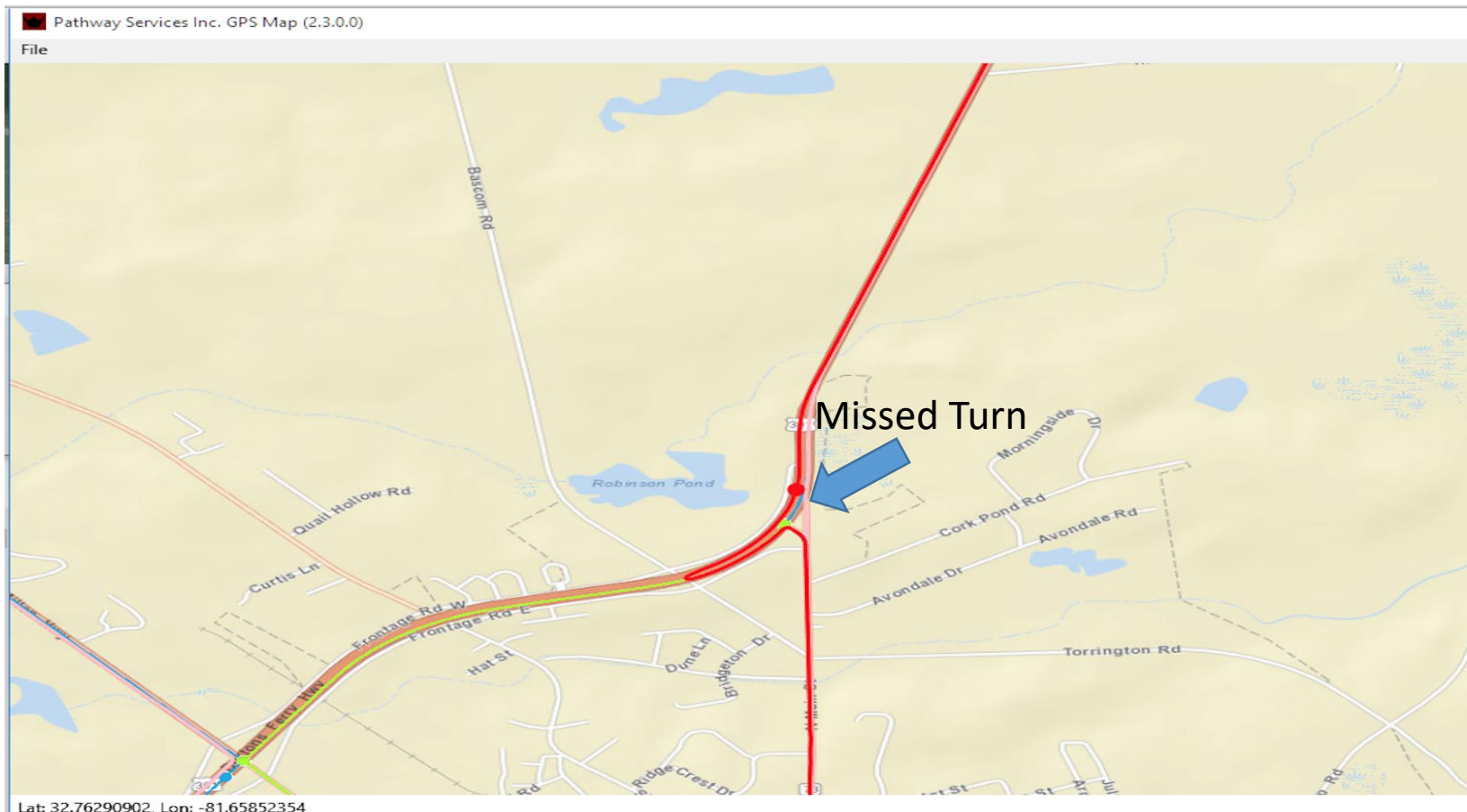
- Historically, data collection was based on roadway markers
 - A. Roads can change names/ownership
 - B. MP Signs are moving targets
 - C. Roads Get Realigned (Offsets/Equations complicate things)
 - D. New Roads don't always fit into our existing systems



Limitations in Data Reporting based solely on LRS

- Not always comparing “Apples to Apples” in tabular (flat) data sets. Different Roads/locations, etc.
- Construction complicates multi-year comparisons
- Different LRS may get different results
- Concurrent routes can complicate integration
- GPS checks were typically only done at the beginning and at the end of a route—no shape checks in between
- QC process is quite lengthy to verify all discovered differences & anomalies

Examples: Data Reporting based solely on LRS



- YOY comparisons show an unexpected difference
- Go to the imaging to see why
- "self healing roads"
- Wrong Road / segment / wrong turns!!

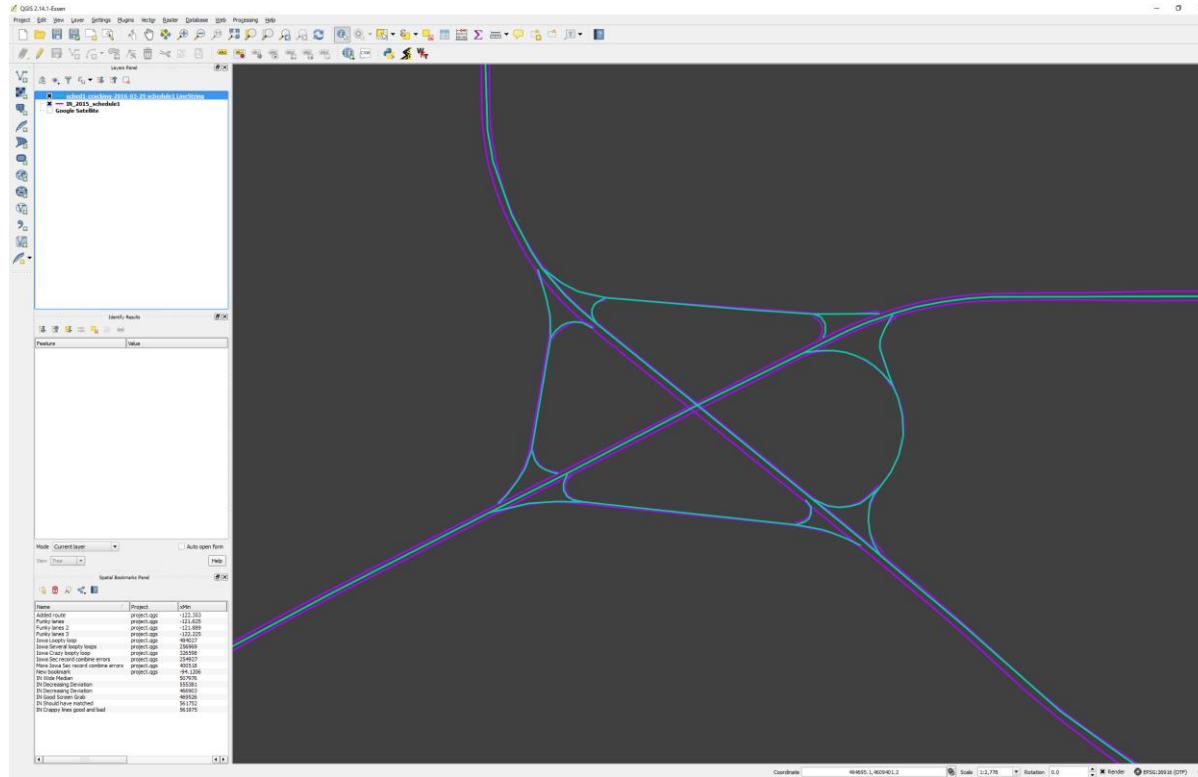
A “Paradigm Shift” started in 2015:

- Change our way of thinking away from Road attributes (Road name, direction, milepoint---anything in a table) and
- Simply focus on getting 100% network coverage with no gaps or overlaps
- Only way to do that is dive into spatial-based data collection and reporting

Advantages of Spatial-Based Data Reporting

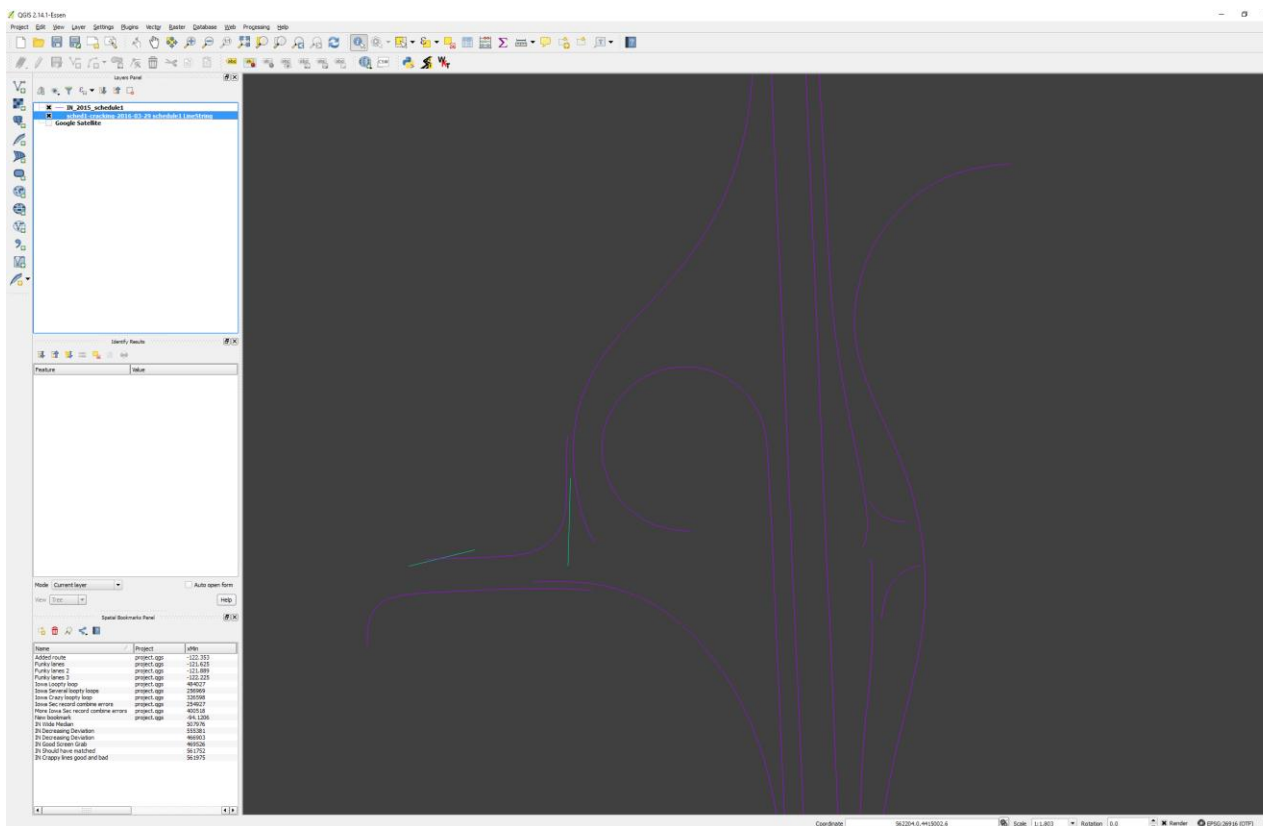
- Data is not only tabular, but graphical
- Reporting is independent of Road name, mile points
- Location checks/joins at more than just the beginning and ending points (we use the whole polyline!)
- Drastically reduced QC effort
- Data joins / Accuracy down to 3-5 feet in many cases

Examples: Data Reporting Based On Spatial Location



- 28 Different Road Names (not 2811)
- Ramps on 3 different LRS (one non-distance-based)
- Route names and milepoints applied after the spatial join and heading analysis
- Historically only had GPS on end points of spiral routes
- GPS Matched throughout each polyline to match full route
- Begin/End Descriptions were wrong in the provided database and reported to DOT

Examples: Data Reporting Based On Spatial Location



- New Interchange
- LRS and Line work not provided before data collection
- After collection, data joined to DOT line work
- Anything Missing shown in Green (assigned for recollection)

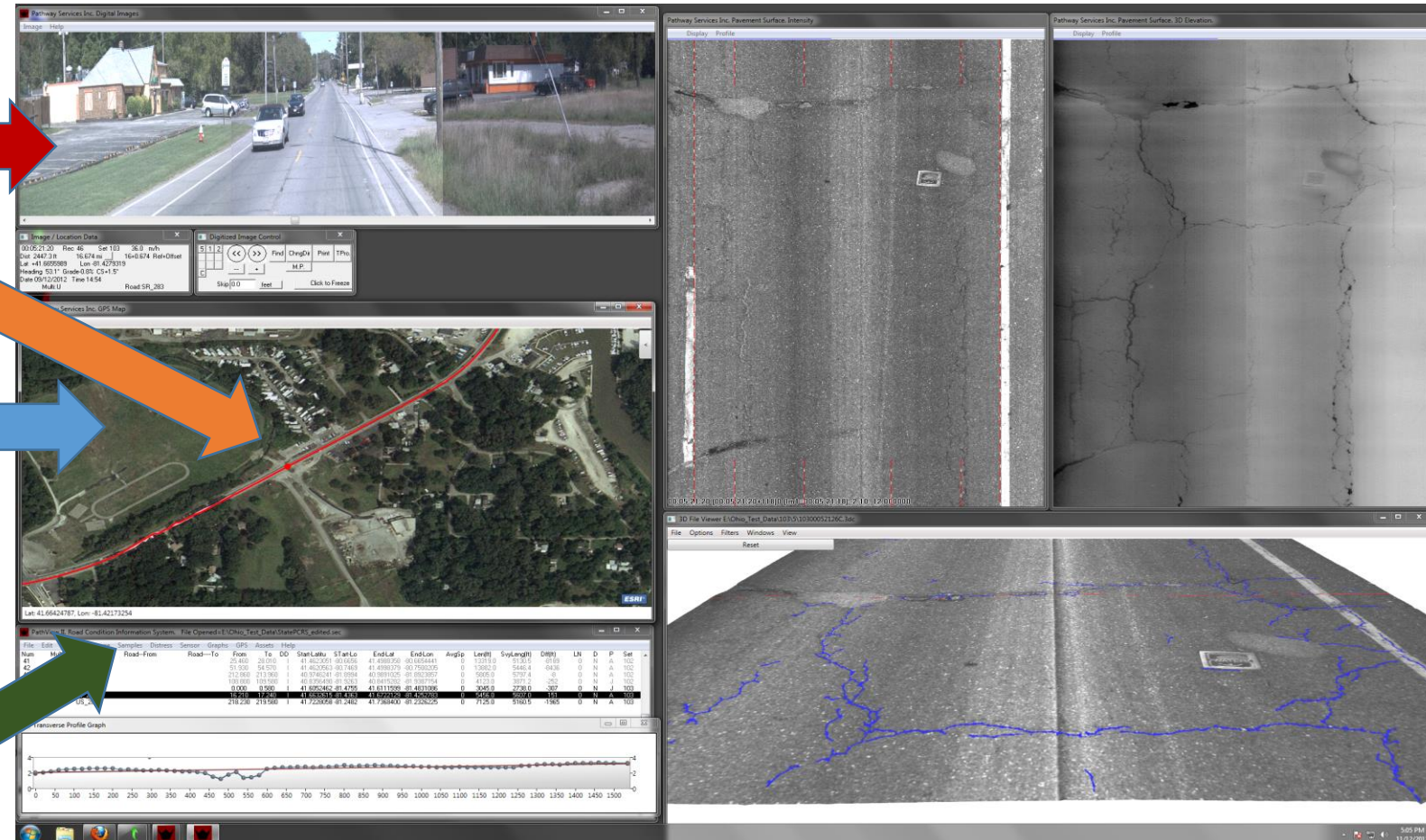
Advantages of Spatial-Based Data Reporting

Spatially-plotted data can be used as navigation to view imaging and extracted roadway assets such as signs, guardrails, ramps, etc.

Data Falls on your network where it should, not dependent on matching route name/LRS

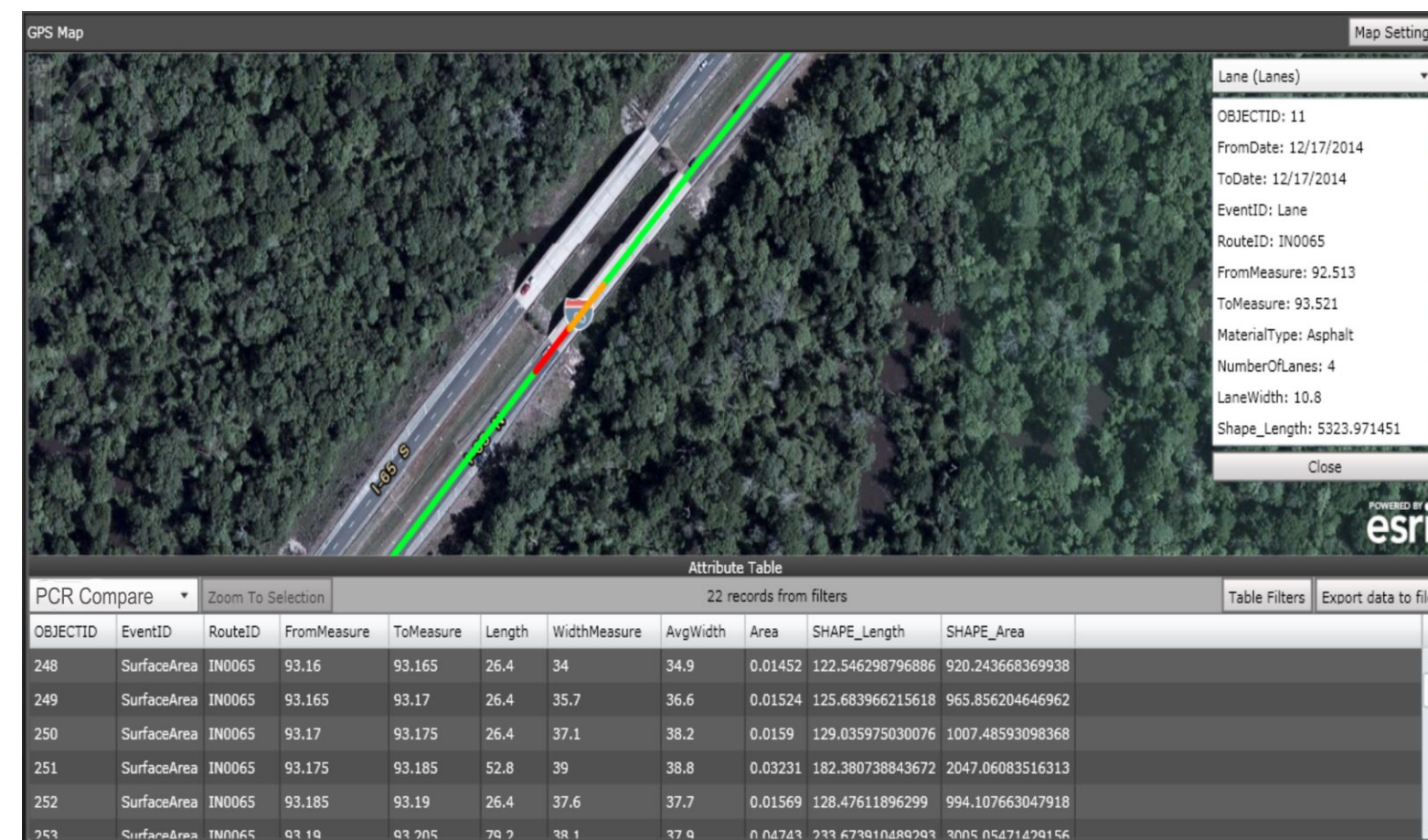
Line work can be color coded by index. Multiple years plotted simultaneously. Multiple LRS can be viewed as layers too!

Every Asset is stored in a spatial database for plotting and navigation. Including cracking!



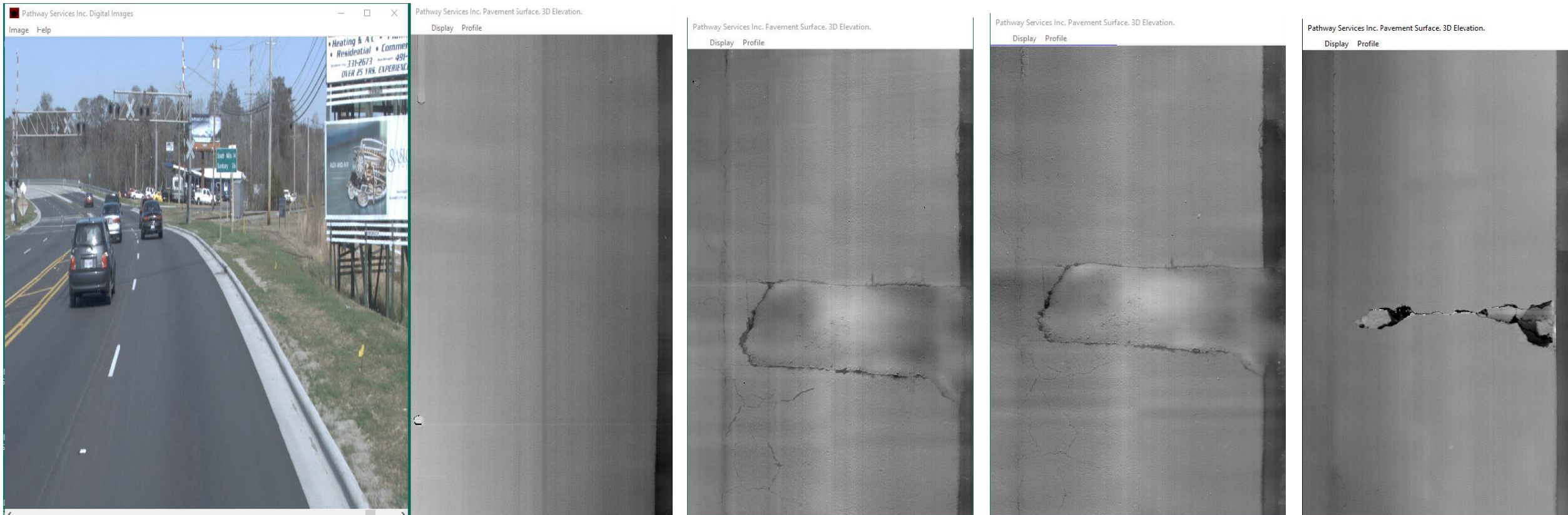
Multi-Year Cracking Analysis: A Spatial Approach

Cracking Year-Over-Year

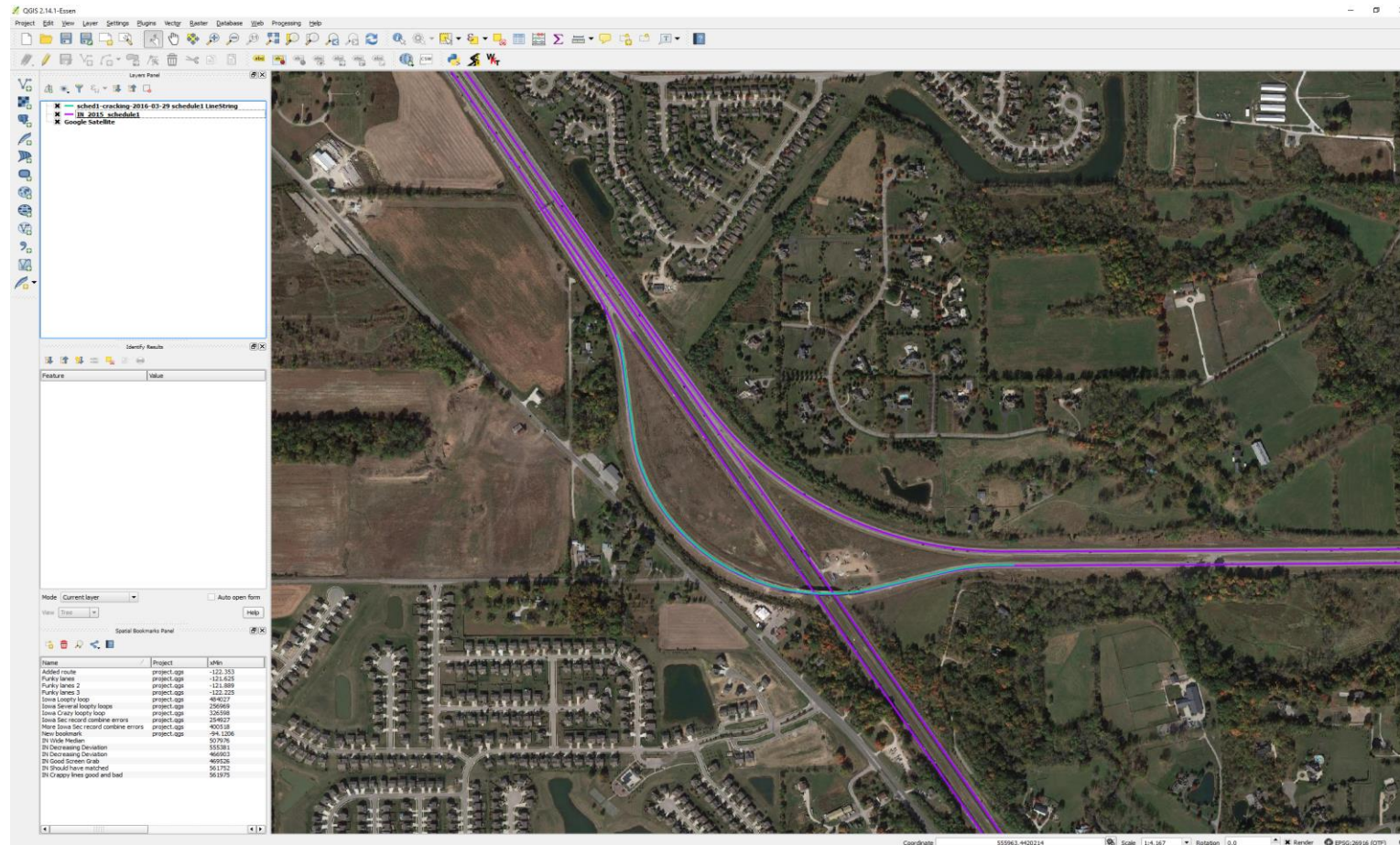


- We are comparing Apples to Apples—only what can be joined is compared.
- Data Layers are Graphical (YOY PCR shown)
- Differences can be color-coded

Cracking Year-Over-Year

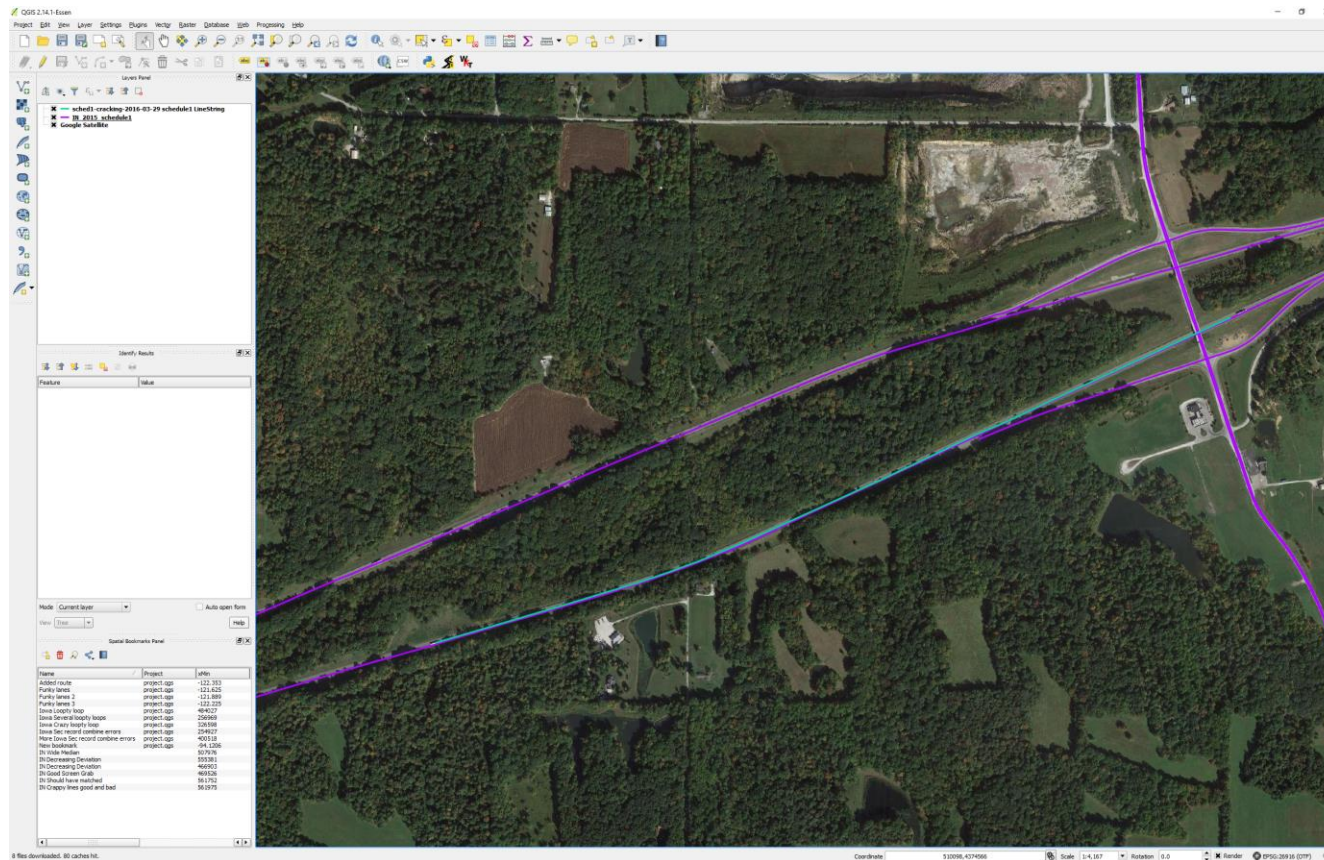


Challenges: Data Reporting Based On Spatial Location



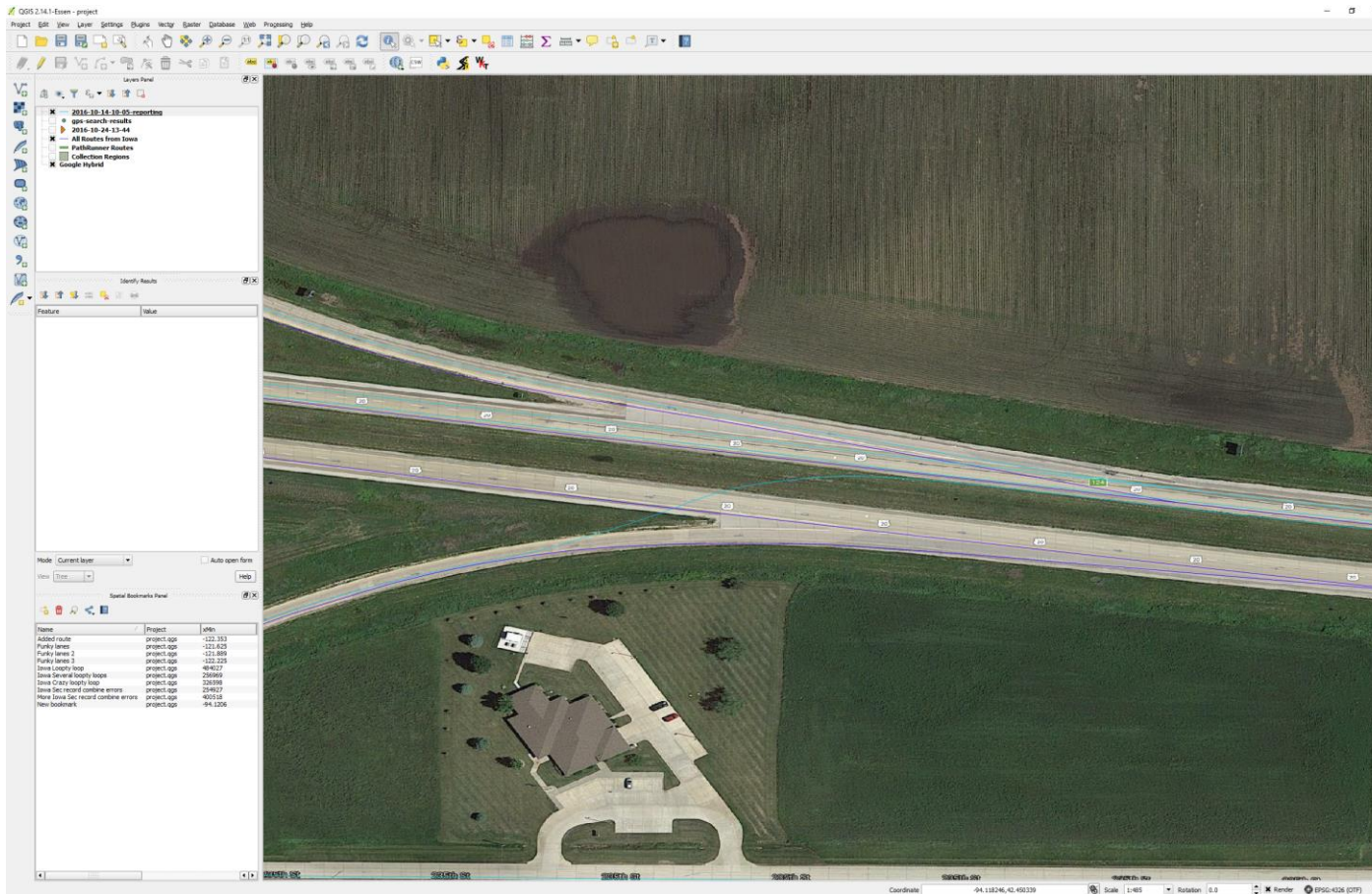
- Line work provided may not always be bidirectional
- Many clients may only provide line work in “inventory direction” and joins for decreasing routes need tolerance adjustments

Challenges: Data Reporting Based On Spatial Location



- Line work provided may be based on centerlines
- Large medians and multi-lane segments take some complicated logic to join effectively

Challenges: Data Reporting Based On Spatial Location



- Line work provided may not include new roads
- Large medians and multi-lane segments take some complicated logic to join effectively

General Summary After Completing Several Spatial-Only Projects

- With Good line work, most of your network can be joined and reported within a few feet, independent of road name or LRS values
- LRS values can be assigned during import or later in a spatial join
- "Self-Healing" roads have reduced by 70% on our first 12 statewide projects using fully spatial reporting
- Roads not joined are logged and reported separately--typically the original DOT line work needs to be updated. Average about 100-200 Miles for large networks annually

Limitations / Future Desired Improvements

- Your reporting is only as good as your line work
- Line work changes throughout the year as network improvements are conducted, but collection based on a “snap shot” from project kickoff.
- “Subscription” to edited line work?
- Access to maintenance schedules? Field crews also often know about construction before the PME—we could provide feedback immediately

Questions?

SCOTT MATHISON
vp operations

t. 918.259.9883 | f. 918.259.9912
smathison@pathwayservices.com



Pathway Services Inc.

AUTOMATED ROAD AND PAVEMENT CONDITION SURVEYS

P.O. Box 472105

Tulsa, OK 74147

www.pathwayservices.com



Pathway Services Inc.

