"The Cost of Not Knowing"

Public Safety and Risk Management

A project in conjunction with the Tennessee Department of Transportation

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Introduction

In many transportation agencies, the ability to know all of the risks to your constituency is impossible. Along with regular maintenance, these agencies must also deal with emergency situations and daily incidents that impact their asset health and lifecycle. Another major issue is just the sheer number of assets transportation agencies have to maintain across their road networks.

From hundreds of thousands of traffic signs and thousands of miles of pavement striping designed to keep drivers safe on the roads, these agencies have to send individuals out to monitor and inspect each of these assets for condition. Manpower alone cannot meet the maintenance needs of these agencies to effectively monitor and ensure the condition of these assets.

This is why Cyclomedia, the world's premiere provider of terrestrial LiDAR and imagery, partnered with the Tennessee DOT to solve this problem at a network-wide scale.

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Impact of the Safety Asset Condition

Recently, a new rule was released by the Federal Highway Administration (FHWA) specifically requiring transportation agencies to devise and implement a plan to track the retroreflectivity for pavement striping and traffic signs for their entire road network. Though traffic signs have had retroreflectivity requirements prior to the new rule, pavement striping was not specifically designated with retroreflectivity requirements. This requirement only adds to the maintenance backlog being experienced by transportation agencies across the nation and does not take into account the new infrastructure projects that need to be undertaken from the Infrastructure Investment and Jobs Act (IIJA) passed last year.

Constituents rely on these assets to keep them safe on the roadways. Entities that are not maintaining these assets in the appropriate condition open themselves up to legal problems and an unhappy community.

Pilot Results

Results of the TDOT Pavement Striping and Traffic Sign Condition Pilot

Cyclomedia uses a combination of an RGB visual scoring based upon a trained machine learning (ML) model as well as normalized intensity data from our LiDAR sensor to provide an overall condition score for pavement striping and traffic signs.

This combined scoring system allows Cyclomedia to provide an automated condition assessment of these roadway assets at network-wide scale at an unmatched density when compared to traditional retroreflectivity approaches. Although this is not a true retroreflectivity approach, the combined visual and intensity approach offers a basic condition assessment value—but at a much larger and granular scale than is possible with a handheld reflectometer or night-time drive assessment.

The Condition Assessment tool was applied to 221 miles of Tennessee pavement striping, and 5041 total traffic signs along three chosen traffic corridors.

Graph of the breakdown per condition score for signs and pavement markings.

Condition	Traffic Signs (#)	Pavement Striping (mi)
Excellent	1599	7
Good	2933	41
Fair	490	85
Poor	15	32
Critical	4	56

The image represents a section of pavement markings along a TDOT route.

# cyclomedia
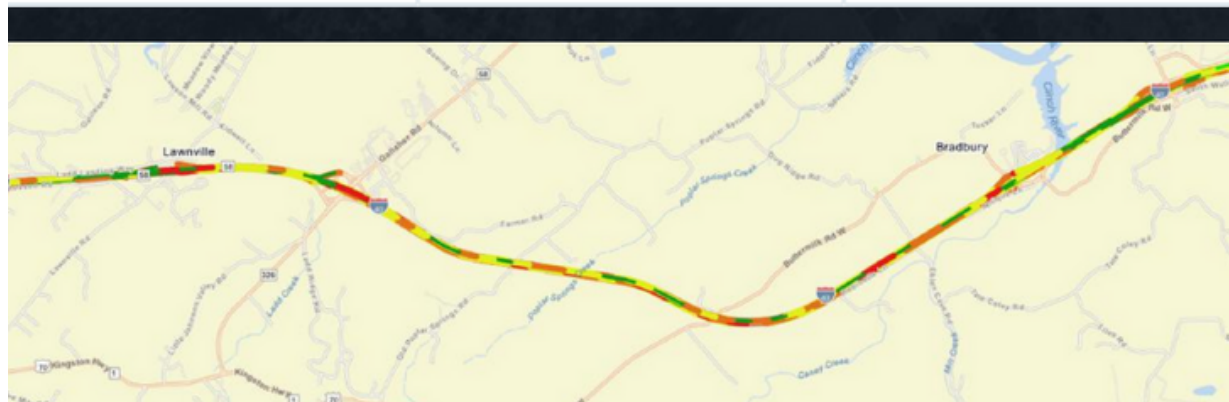
Pilot Validation

Validation of the TDOT Pavement Striping and Traffic Sign Condition Pilot

After reviewing the data with TDOT representatives, we found the results were well received by the groups--the Asset Management section in particular. With the passing of the new retroreflectivity rule as well as the significant labor shortfalls seen by all sectors, the ability to maximize workforce efficiency is paramount to agencies like TDOT.

The results gave TDOT a condition assessment within the parameters and at a larger scale than what manual condition assessments of retroreflectometer assessments can provide. It eliminates the human factor in evaluations ensuring consistency across the entire network. Through this process, the data estimates that organizations can decrease the number of onsite inspections and time-based replacements significantly.

As departments seek to become more proactive and constituencies become more demanding around safety issues, knowing what you have and what condition it is in will assist agencies in ensuring resources are used in the most effective manner. This includes funding for replacement signs going to assets that need to be replaced, not just those that have met the seven year mark.

Incidents of accidents caused by deficient signage should decrease and safety numbers should increase across the network.
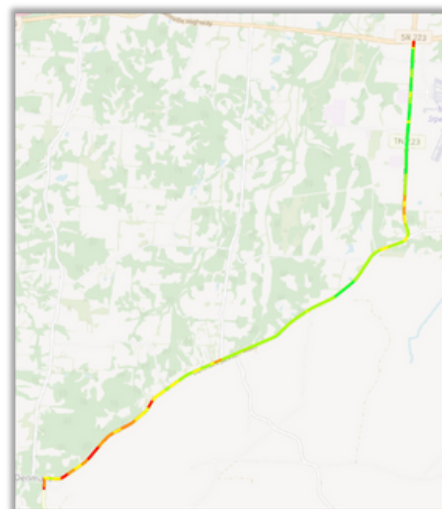
Pavement striping condition route.
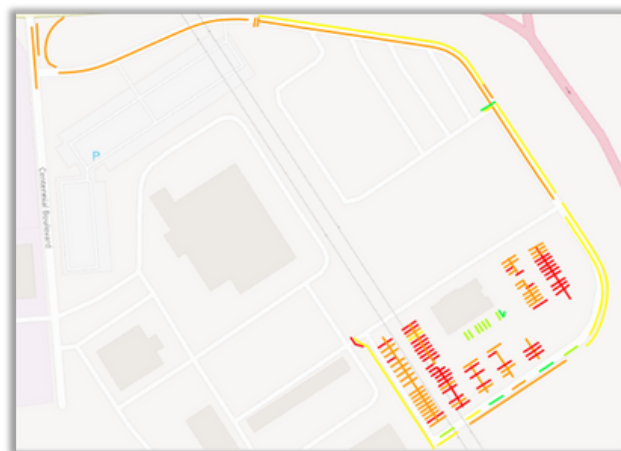
Pavement striping condition.

The Problem with Not Knowing

Cost-effectiveness overtime. A study completed by the Local Road Research Board (LRRB) noted that the estimated service life of a traffic sign ranged from 15-30 years. Replacement cycles are typically 7 years (basic warranty).

Constituent safety is among the top concerns for Transportation agencies. Poor or critical safety infrastructure can increase possible liability for accidents and decrease constituent safety.
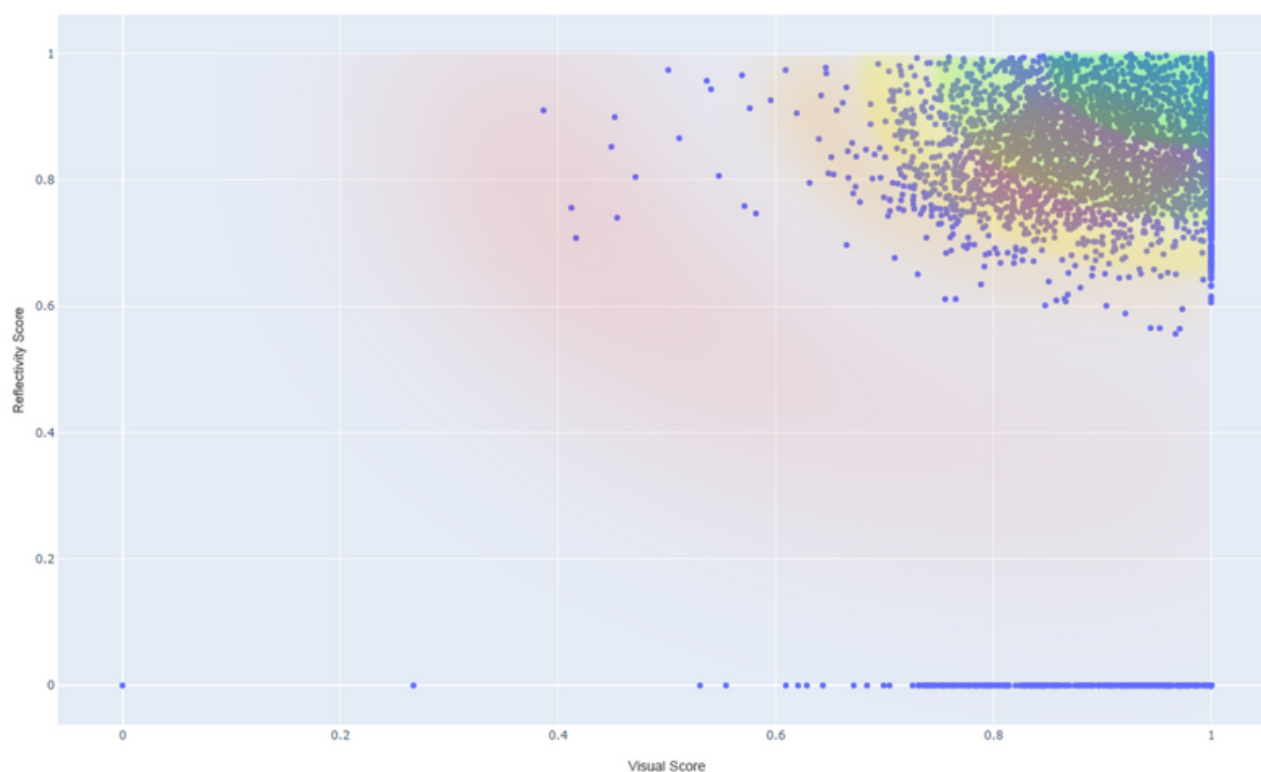

Identification of what you have and in what condition allows you to create a maintenance and replacement schedule that positively impacts your organization for the long term and provides a plan to effectively create a safe and reliable road network for your constituency.

Limiting Factors

When considering the use of imagery and LiDAR to ascertain the condition of your reflective safety assets, certain limitations are inherent to the technology.

The condition assessment discussed here does not deliver true retroreflectivity, as it also includes visual condition in the overall scoring criteria. The intensity of the LiDAR does provide an intensity score of the reflectivity and can be used as a tool in conjunction with other methods outlined in the FHWA 'Methods to Maintain Pavement Markings and Traffic Signs' guidance.

Example of a reflectivity score chart.

The Cost of Not Knowing

Many organizations operate as though not being aware a problem exists absolves the organization of responsibility. Sometimes it can seem like a good idea because with the decrease in manpower, the ability to complete all the necessary maintenance is impossible, but in this case, knowledge is power.

Identification of what you have and in what condition allows you to create a maintenance and replacement schedule that positively impacts your organization for the long term and provides a plan to effectively create a safe and reliable road network for your constituency.

- The partnership between TDOT and Cyclomedia resulted in proving that a network wide condition assessment of Traffic Signs and Pavement Striping can be delivered in months, not years.
- Recurring yearly collection schedules allow transportation agencies to review change detection of their asset condition overtime and report condition levels as required by regulations.
- Maintenance staff are able to plan and schedule required maintenance on the most critical areas instead of on a time based cycle, ensuring effective use of resources and increased safety for the constituency.

If you would like more information on Cyclomedia's Condition Assessment for Pavement Striping and Traffic Signs solution, please visit our website at www.cyclomedia.com/us.