

## Robotic Roadway Marking System

### PennDOT District 6

Highway workers are at risk of being injured or killed by traffic as they perform traffic marking layout work with their boots on the pavement.

Automated recording and marking process allows workers to perform traffic line layout work from the safety of a truck. Workers no longer need to stand on the road surface to layout markings, thereby eliminating the hazard of being struck by vehicles.

- Workers can perform their job safely
- 75% labor reduction
- Reduced traffic impact
- Mistakes eliminated



VS



### Contact

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## Robotic Roadway Marking System

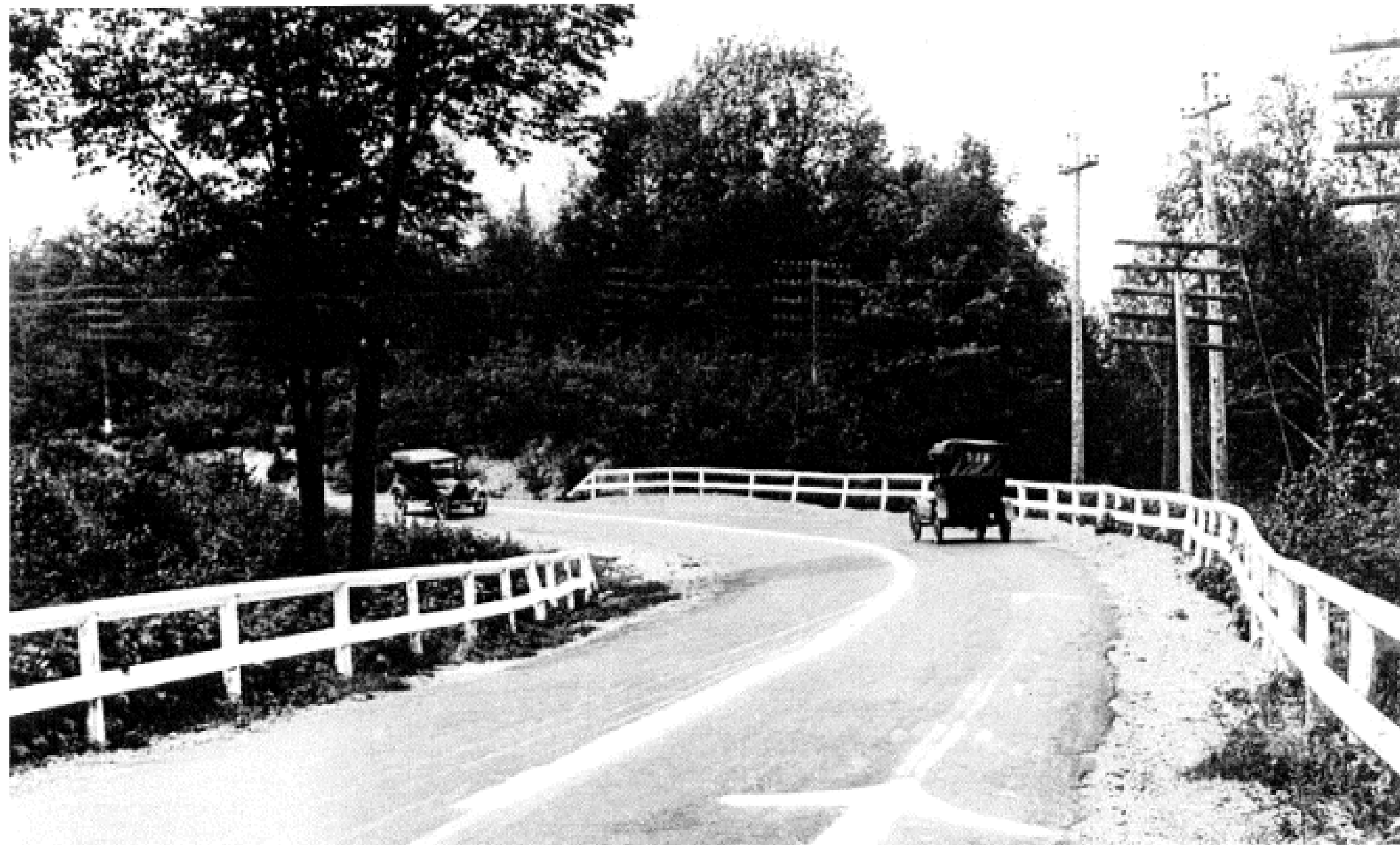
PennDOT District 6



For over 2,000 years, string lines have been used to layout centerlines.

## Robotic Roadway Marking System

PennDOT District 6



A century ago, in 1917, string lines were used to layout the first centerline markings in Michigan.

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Layout of markings is still performed using string lines in the 21st Century.



A tight squeeze - workers with boots on the pavement in live traffic is dangerous

## Safe Layout In Traffic With No Boots-on-Pavement

The new, safe way to perform layout. The layout marks are placed behind the truck as it drives down the road. Using GPS with RTK correction and augmented with an inertial navigation system, layout for longitudinal lines is performed safely with the worker in the truck and not exposed to live traffic.



## Four Miles and No Markings



- To layout in live traffic, the monitor shows the truck as a green box next to the red prerecorded line.
- The driver drives the truck so that the carriage is within reach of the red virtual line.
- Once engaged, the robot moves the carriage to accurately place layout marks.

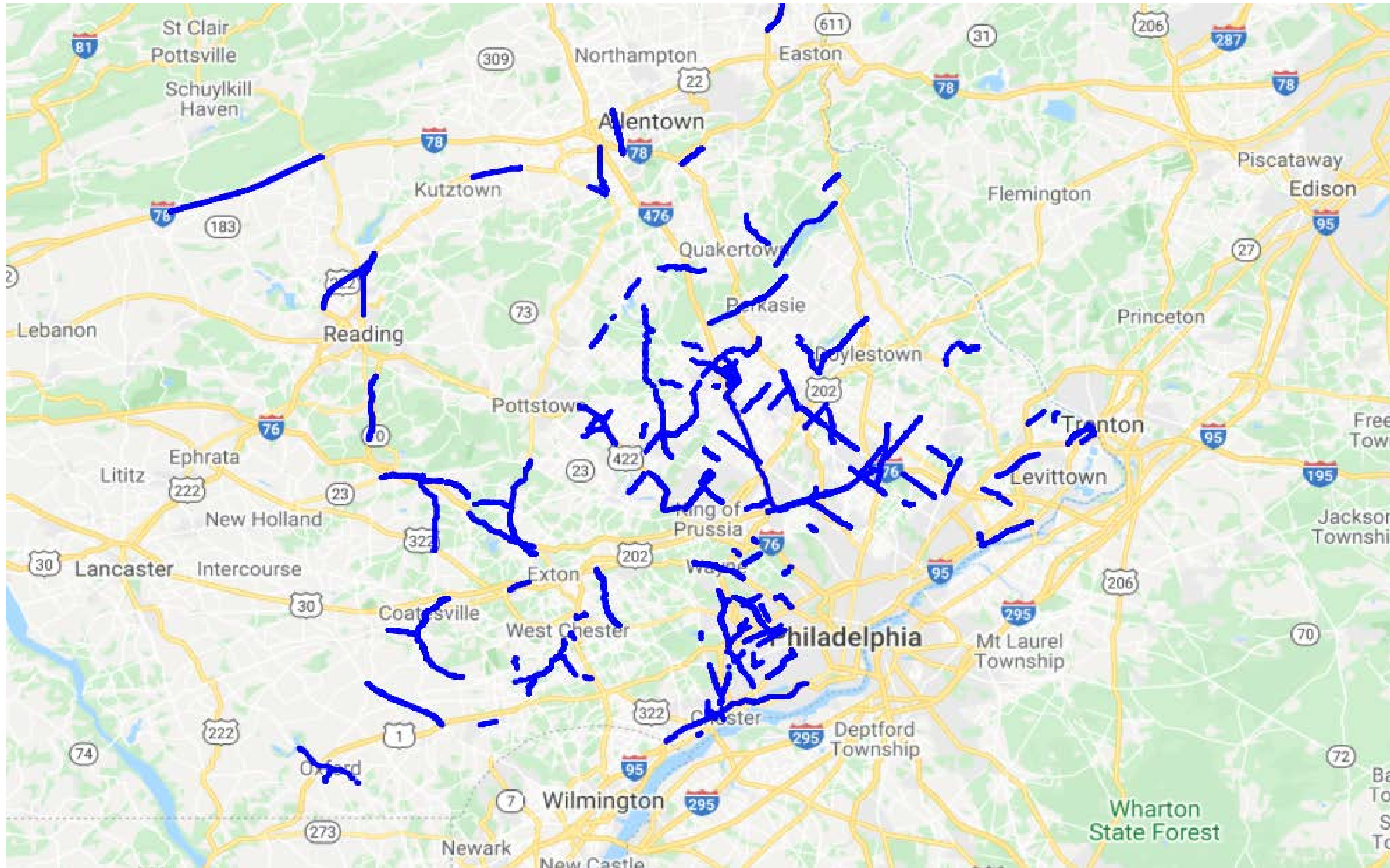


- Using GPS with RTK correction and augmented with an inertial navigation system, layout for longitudinal lines is performed safely with the worker in the truck and not exposed to live traffic.
- The driver glances at the monitor to keep the truck within reach of the red virtual line.



## **Bucks County – State Route 113**

- Temporary painted shadow lines/markings were placed, following the layout provided by the robotic system, on the final top of Bucks County State Route 113.
- The system was used multiple times on this project to also layout lines on the milled and binder surfaces.
- Layout marks are between the double yellow lines as well as the layout marks that were used to place the skip lines and lane lines.

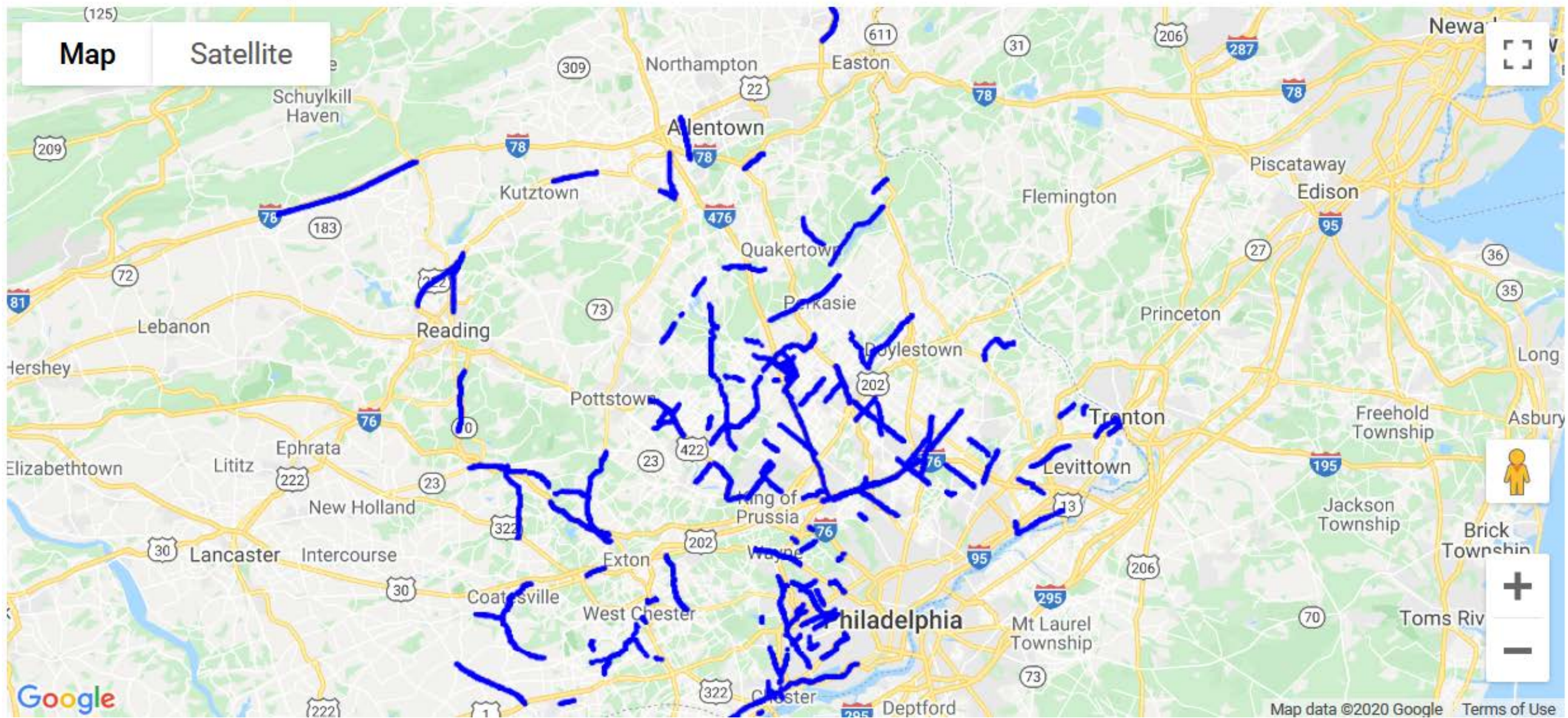


This is a screen shot of PennDOT recorded roads to date. The data is stored in the cloud for access to those vehicles equipped with the state-of-the-art robotics system.

## GUIDEMARK, INC. Administration

Trucks	4
Active Paths	543
Archived Paths	323
Proposed Paths	337

### Total Path Overlay:













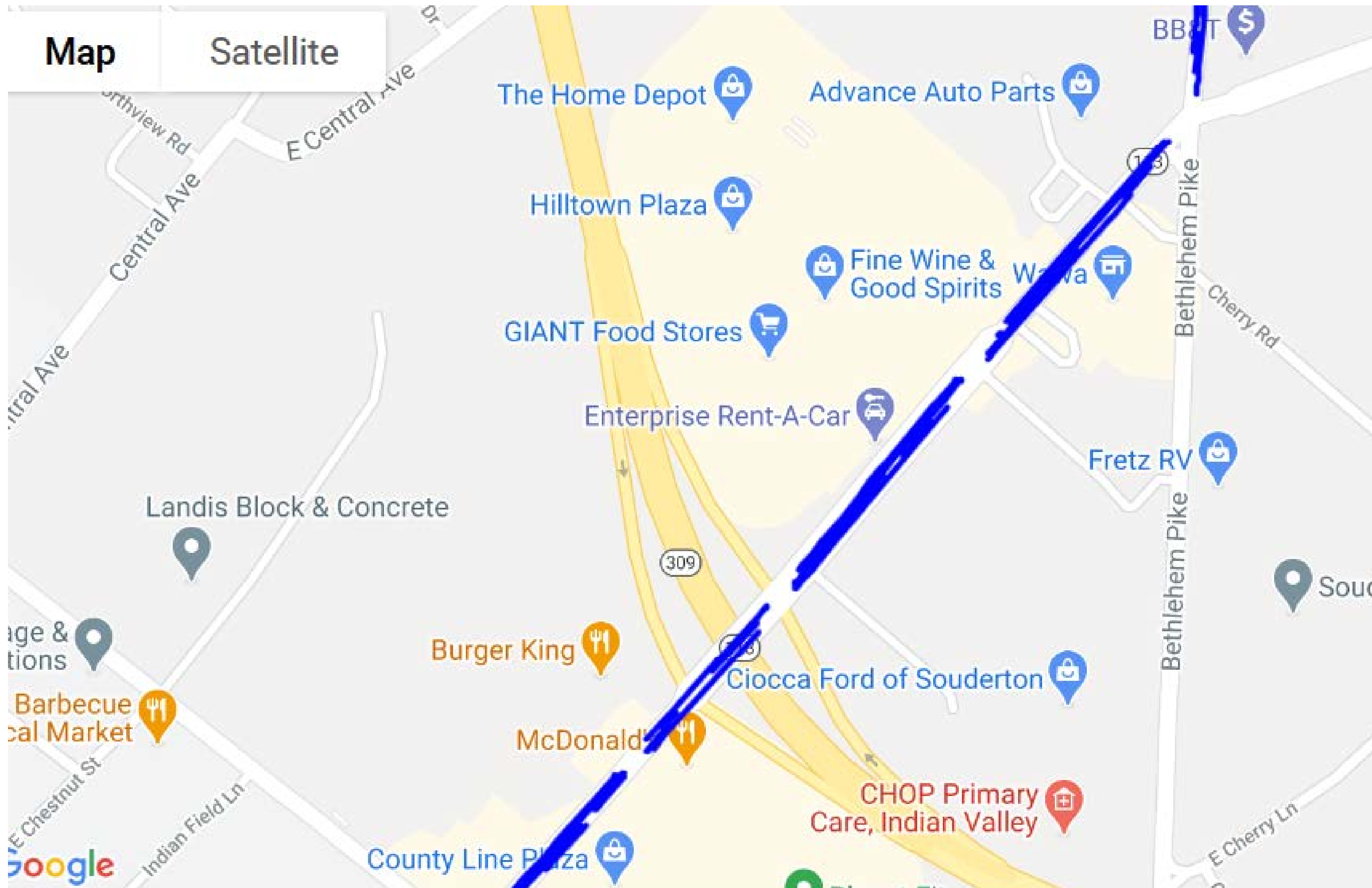
A cloud-based administration webpage is used to manage road recording quality and project progress. Each robot can download roads to layout as needed in the field.

PA Bucks SR 0032 Bridge St WB Yellow	Bridge St SR 32 from Bedford Place to Lincoln Hwy SR 1 Right onto Bridge St to SR 1 Express way Double Yellow and Gores	April 1, 2019, 3:41 p.m.		<input type="checkbox"/>
PA Bucks SR 0113 Souderton Rd EB White	Souderton Rd SR 113 from County Line Rd to Bethlehem Pike Skips and Lane Lines	Aug. 26, 2020, 6:24 p.m.		<input type="checkbox"/>
PA Bucks SR 0113 Souderton Rd EB Yellow	Souderton Rd SR 113 from County Line Rd to Bethlehem Pike Double Yellow and Gores and Center Turn Lanes	Aug. 26, 2020, 5:47 p.m.		<input type="checkbox"/>
PA Bucks SR 0113 Souderton Rd WB White	Souderton Rd SR 113 from Bethlehem Pike to County Line Rd Skips and Lane Lines	Aug. 26, 2020, 6:54 p.m.		<input type="checkbox"/>
PA Bucks SR 0113 Souderton Rd WB White	Souderton Rd SR 113 from Bethlehem Pike to County Line Rd Skips and Lane Lines	Aug. 26, 2020, 6:47 p.m.		<input type="checkbox"/>
PA Bucks SR 0113 Souderton Rd WB Yellow	Souderton Rd SR 113 from Bethlehem Pike to County Line Rd Double Yellow and Gores and Center Turn Lanes	Aug. 26, 2020, 6:07 p.m.		<input type="checkbox"/>
PA Bucks SR 0152 Limekiln Pike NB Yellow	Limekiln Pk SR 152 from E Butler Ave to Mill Rd Double Yellow and Gores	April 10, 2018, 12:27 p.m.		<input type="checkbox"/>
PA Bucks SR 0152 Limekiln Pike SB Yellow	Limekiln Pk SR 152 from Mill Rd to E Butler Ave Double Yellow and Gores	April 10, 2018, 1:03 p.m.		<input type="checkbox"/>
PA Bucks SR 0413 Lincoln Hwy NB LL	Lincoln Hwy SR 413 Left Turn Lane for Lowes	Jan. 22, 2019, 5:59 p.m.		<input type="checkbox"/>
PA Bucks SR 0413 Lincoln Hwy NB LL	Lincoln Hwy SR 413 Left Turn for TD Bank	Jan. 22, 2019, 5:59 p.m.		<input type="checkbox"/>

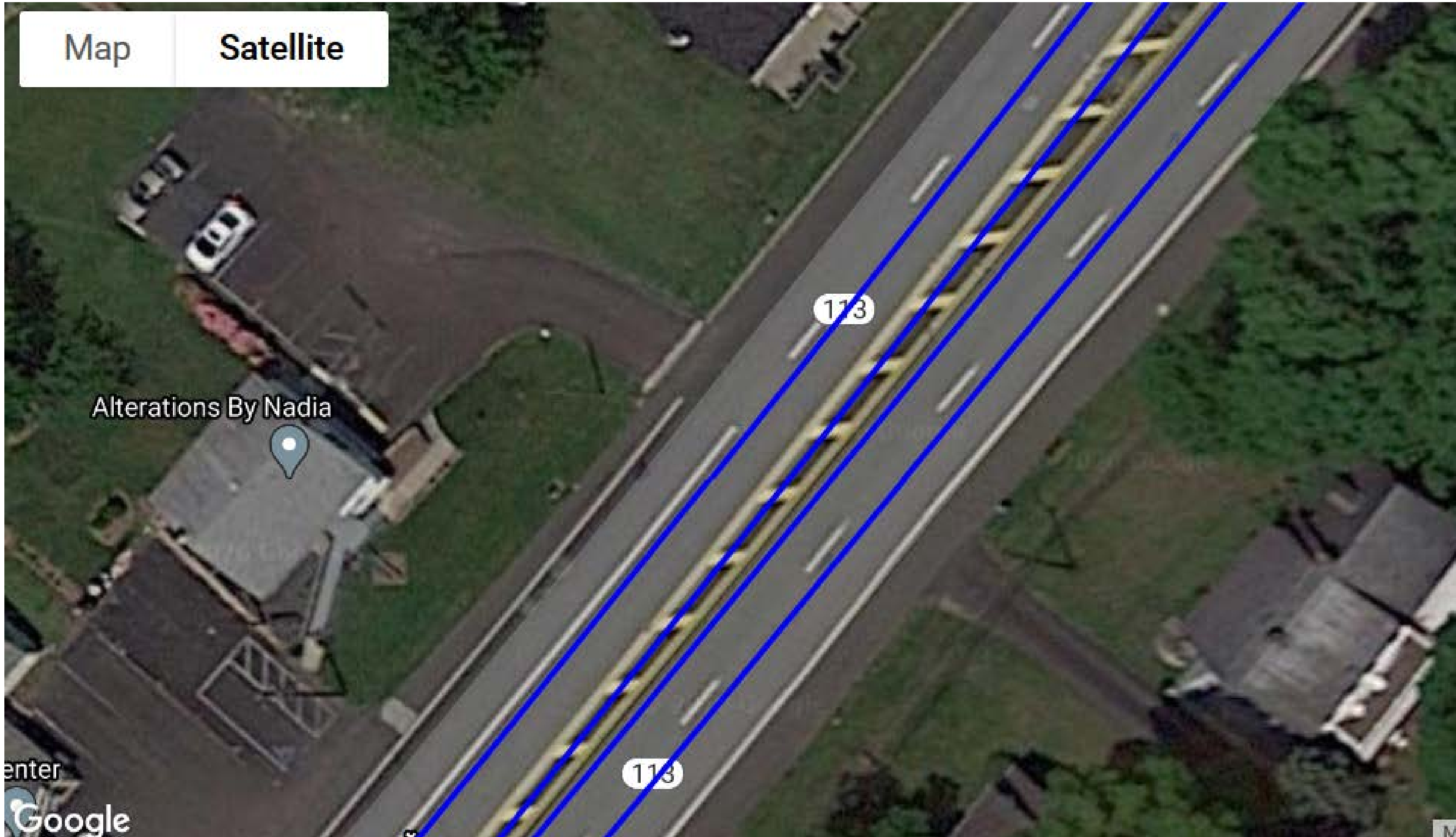
A sample of recorded roads available for viewing on the administration page.

This is a specific recorded path for one of the yellow lines on Bucks County State Route 113. Notice that a record of the date and time it was recorded is available.

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- Drilling further down in the administration page, a view of the lines recorded is available.
- This is a map view of selected road: Bucks County State Route 113



Satellite map view  
of selected road:  
Bucks County State  
Route 113



Satellite map view of specific double yellow line on Bucks County State Route 113



## Chester County – State Route 400

- First use of the automated robotic system on a real project in 2017
- After the layout was completed, the paint truck turned around and painted the double yellow lines.
- The recording, layout and striping were accomplished with the workers, at all times, safely in the truck, never setting their feet on the pavement.



Robotic Layout being performed in live traffic in Montgomery County on Sandy Hill Road, Plymouth Township.



A paint truck equipped with robotic layout system.



- The autonomous robotic system can be used on all types of vehicles.
- Twenty-four systems in operation in North America

