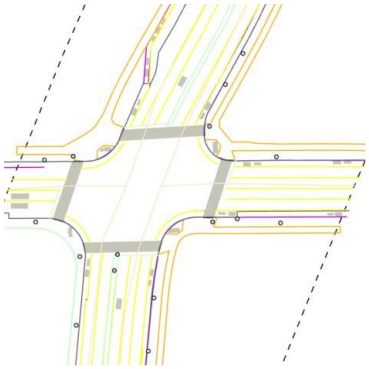
Demonstration Zone

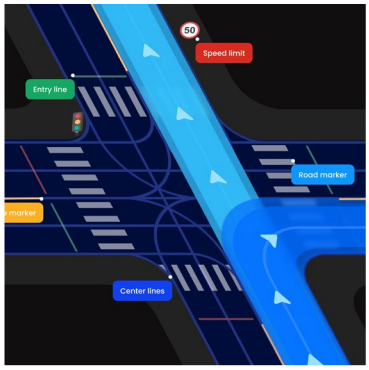
2025

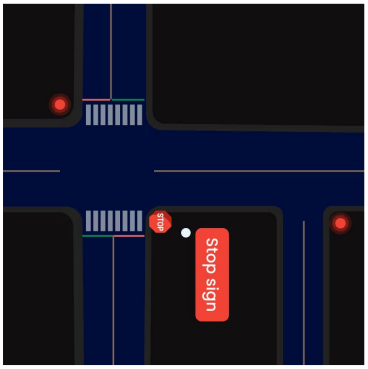
Infrastructure Mapping Innovation

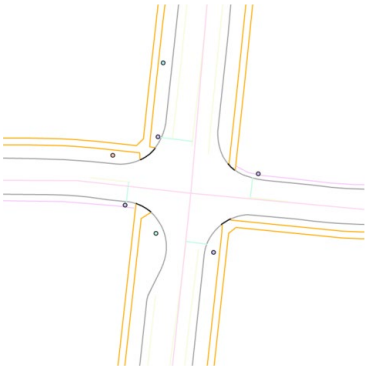
Demonstration Project: AI Infrastructure Inventory & Planning

Innovator: GeoMate Inc.
Product: Aerial Vision Mapping solution
Demonstration Period: June 11 – August 26, 2025









Executive Summary

The City of Vaughan is testing leading-edge technology to evaluate how innovative solutions can address real-world mobility and transportation challenges.

Through the Ontario Vehicle Innovation Network (OVIN) Demonstration Zone, GeoMate tested their Aerial Vision HD Mapping solution to identify infrastructure gaps and take inventory of active transportation assets.

The OVIN Demonstration Zone is an initiative that is part of Vaughan's Transportation Innovation Program (TIP), which aims to test smart mobility solutions in real-world environments. This demonstration was completed in partnership with **Vaughan's Infrastructure Planning and Corporate Asset Management and Transportation and Fleet Management Services (MoveSmart, Traffic Engineering)** teams.

The Innovator

GeoMate Inc. (GeoMate) is a Canadian geospatial technology company specializing in AI-powered mapping solutions. Their platform uses high-resolution aerial imagery and artificial intelligence to autonomously extract data on sidewalks, bike lanes, signage, and pavement markings. GeoMate's technology supports municipal planning, asset management, and accessibility audits. They are dedicated to enhancing urban mobility, providing a more accurate, scalable, and cost-effective alternative to traditional HD mapping methods.

For more than five years, GeoMate has been at the forefront of geospatial innovation, developing an autonomous Geographic Information System (GIS) data extraction system designed to map city transportation networks with unparalleled precision. By integrating high-resolution geospatial imagery with artificial intelligence, GeoMate delivers highly detailed HD maps tailored for autonomous driving (AD), advanced driver-assistance systems (ADAS), and urban planning.

GeoMate's cutting-edge technology can reduce the time and costs associated with map creation but also plays a crucial role in advancing smart mobility. Its solutions support cities and industries in building sustainable, connected, and automated transportation networks – paving the way for the future of mobility.

Demonstration Overview

The purpose of this demonstration was to evaluate the accuracy and effectiveness of using AI-driven tools to identify infrastructure gaps, such as sidewalks and cycling networks, as well as to take inventory of infrastructure such as signage and pavement markings. GeoMate's AI-powered platform processed aerial imagery, and extracted GIS-ready data to identify and classify transportation infrastructure across two selected corridors.

The demonstration focused on two road segments:

1. Confederation Parkway - Rutherford Road to Dufferin Street (2.2km)
2. Millway Avenue - Highway 7 to Courtland Avenue (2.4km)

The City of Vaughan provided GeoMate with aerial images of the road segments, and GeoMate's software solution analyzed the images for key metrics designed for the scope of the project. This included:

- Identifying infrastructure gaps and inconsistencies within the road right of way, including the sidewalks, cycling network, and roadway pavement
- Identifying where infrastructure components exist or don't exist that can be used for planning and design purposes. Infrastructure to be included:
    - Bike lanes, cycle tracks, multi-use pathways, sidewalks, roadways curbs, median islands, lane width, travel lanes, left and right turn lanes
- Identifying accessibility features in sidewalks like tactile plates, curb cuts and ramps (slope from sidewalk to roadway)
- Identifying different types of cycling infrastructure, including:
    - In-boulevard multi-use pathways, on-road bike lanes and in-boulevard cycle tracks
- Taking inventory and quality assessment of infrastructure such as signs, pavement markings, and parking spaces

This demonstration was conducted remotely, with no field installation required. Final data outputs were delivered to the City in shapefile format.

Key Outcomes

GeoMate's aerial mapping solution successfully mapped key transportation infrastructure across two corridors in Vaughan. Using high-resolution aerial imagery and AI-powered analytics, the GeoMate platform was able to accurately identify the location, size, and length of various roadway assets, including sidewalks, bike lanes, signage, and pavement markings.

This data supports condition assessments and the development of a comprehensive inventory, enabling City staff to prioritize maintenance activities and identify gaps in the active transportation network – ultimately enhancing accessibility, safety, and connectivity for Vaughan residents.

Key outcomes include:

- GeoMate's Aerial Vision Mapping solution provided a detailed set of GIS layers capturing the presence and condition of critical transportation infrastructure of 2.2 km and 2.4 km road segments at 98% location accuracy.
- GeoMate's AI-powered analytics successfully mapped project infrastructure assets such as sidewalks, bike lanes, road signs, and pavement markings to help visualize infrastructure gaps
- GeoMate's team was adaptive and collaborative, and provided additional data formats such as PDF maps and CAD files to improve usability across departments
- The Project Advisory Team provided GeoMate with references to help their software system train and identify unique municipal infrastructure assets
- The Project Advisory Team provided insights to GeoMate on specific municipal standards and best practices for product improvement
- The demonstration provided the City with insights on how software analysis for infrastructure assets could be potentially incorporated into operations, and allowed for an understanding about how it affects our best practices

In addition to analyzing the images for infrastructure gaps and infrastructure assets, the AI-powered mapping solution assessed the quality of pavement markings.

GeoMate provided the City with shapefiles of the identified infrastructure and screenshots of digitally mapped intersections.

Exclusions

Demonstration projects through the OVIN Demonstration Zone are temporary and limited in scope and duration due to the time constraints of the OVIN Demonstration Zone program. The project evaluated key features of GeoMate's solution, as determined by the Project Advisory Team.

The demonstration project did not evaluate all features and inventories of the Aerial Vision Mapping solution due to time constraints of the OVIN Demonstration Zone program, but a prioritized set of assets was determined as key metrics from the Project Advisory Team to showcase the potential effectiveness of the technology. The following assets were not evaluated with the data and parameters of the project: catch basins, tactile plates, and some road signs.

Obstacles

GeoMate's AI mapping workflow is designed for speed and efficiency, especially when ground control points are available to enhance georeferencing. While the available ground control point data was not suitable for referencing aerial imagery through the City or Region during the demonstration, GeoMate adapted quickly and revised its outputs to meet project needs. The collaborative process ensured the final deliverables aligned with Vaughan's planning and asset management goals.

In addition to assessing the quality of pavement markings, GeoMate provided the City with shapefiles of the identified infrastructure and screenshots of digitally mapped intersections. They worked collaboratively with the City of Vaughan on the demonstration project, were adaptive, and efficiently provided alternative formats of the analysis to align with the practices for the Project Advisory Team, consisting of staff members across multiple departments.

Conclusions and Recommendations

The demonstration confirmed the strong potential of GeoMate's AI-powered HD mapping solution to support data-informed planning and infrastructure management in Vaughan. City staff recognized the value of the data, particularly for building a condition-based inventory of pavement markings and active transportation assets.

To improve usability, City staff recommended that future data deliveries from GeoMate include additional formats – such as PDF maps – alongside GIS files, since not all staff have access to specialized software.

GeoMate's team demonstrated flexibility and a strong willingness to adapt, revising outputs based on feedback and tailoring their solution to meet Vaughan's specific needs. Some features were intentionally excluded from the demonstration to reduce the burden on City resources, but would be valuable to evaluate if expansion opportunities were presented. The demonstration with Vaughan showed value in their HD mapping solution with limited and foundational features of their product. Expanding the scope to include additional asset types and refining data presentation methods would further enhance the impact in the future.

This data from GeoMate's aerial mapping solution could support infrastructure condition assessments and the development of a comprehensive inventory, enabling City staff to potentially prioritize maintenance activities and identify gaps in the active transportation network. This type of technology has the potential to provide insights for future planning, which could ultimately enhance accessibility, safety, and connectivity for Vaughan residents and road users.

GeoMate's technology aligns well with Vaughan's active transportation goals and has the potential to maximize its benefits. The demonstration also provided opportunities to refine data presentation methods and expand asset types captured for the Aerial Vision Mapping solution. Further demonstrations or evaluations would be required to assess the effectiveness of the full scope of features for GeoMate's mapping solutions and evaluate the readiness of GeoMate's design-ready outputs regarding the City's infrastructure planning practices.

Demonstration Zone Project Profiles: www.vaughanbusiness.ca/demozone/projects