

AREA X.O | **ZONE X.O**

Ottawa Automated Shuttle Trial

Area X.O operated by Invest Ottawa

Key Partners

Anchor partners | Partenaires piliers



Founding partners | Partenaires fondateurs



Sponsor | Commanditaire

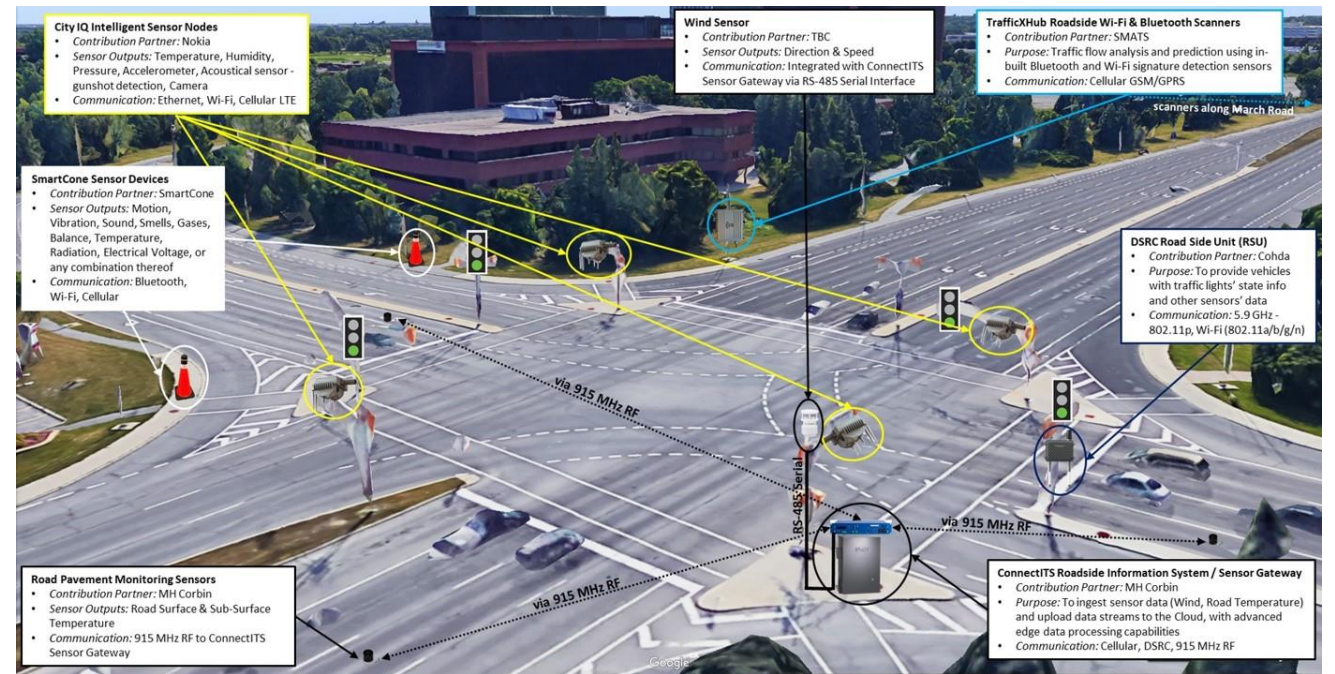


Research partners | Partenaires de recherche



Ecosystem partners
Partenaires écosystème





AREA X.O

Public and Private Testing Facilities



Craig Henry Park

Cha

Drones & UAV Testing

- Video, Thermal, LiDAR, Hyper-Spectral Imaging Cameras
- GeoMapping – soil metrics, yield, elevation
- Automated pre-programmed missions or real-time control

Communications Tower 'C'

Connected Railway Level Crossing

- Masts, Gate mechanisms, Flashing Lights
- Bungalow – Train Detection, Controller, Batteries
- Ericsson 5G mmWave – n257 band**
 - 28 GHz frequency – 50, 100 MHz bandwidth
 - Antenna-integrated radios – 1 coverage sector
- Kapsch C-V2X/DSRC - 5.9 GHz**
 - V2X integration with Railway Controller to broadcast crossing timing information to CAVs

Smart Farming Demonstration Zones

Communications Tower 'A'

Nokia 5G (sub-6 GHz) – n78 band

- 3.4 GHz frequency – 75 MHz bandwidth
- Antenna-integrated radios – 3 coverage sectors

Nokia 4G / P-LTE

- Band 14 – 700 MHz, 2 coverage sectors
- Band 43 – 3.65 GHz, 2 coverage sectors

High Precision GPS / GNSS Positioning

- Novatel RTK data access – LOS & NLOS
 - 400 MHz, 900 MHz, Cellular
- Swift Navigation & Trimble RTK/GNSS Correction

Television White Space (TVWS) Station – 6Harmonics

- TV channels 14 to 51

Outdoor Wi-Fi Access Point

Single mode f/ber backhaul to IT server room
Power supply: 120/240 VAC, 12 VDC

SMART FARM FIELD 1

SMART FARM FIELD 2

LoRaWAN Gateway

- 902 – 928 MHz frequency band
- CloudGate Device Gateway, Azure-ready
- ~ 1000 sensor endpoints per server node

Nokia 5G mmWave – n260 band

- 39 GHz frequency – 50, 100 MHz bandwidth
- Antenna-integrated radios – (2) 180 degrees sector coverage

Communications Tower 'B'

Ericsson 5G mmWave – n257 band

- 28 GHz frequency – 50, 100 MHz bandwidth
- Antenna-integrated radios – 2 coverage sectors

AREA.X.O OPERATIONS BUILDING

CROPS

SENSORS & IMAGERY

IoT & BIG DATA

AI DECISION

AUTOMATION

Precision Sowing, Field Management Zones

Remote & Proximal Sensing, GIS Mapping & Imaging

Device Management, Contextualized Sensor Data

Advanced Analytics, Decision Support Systems

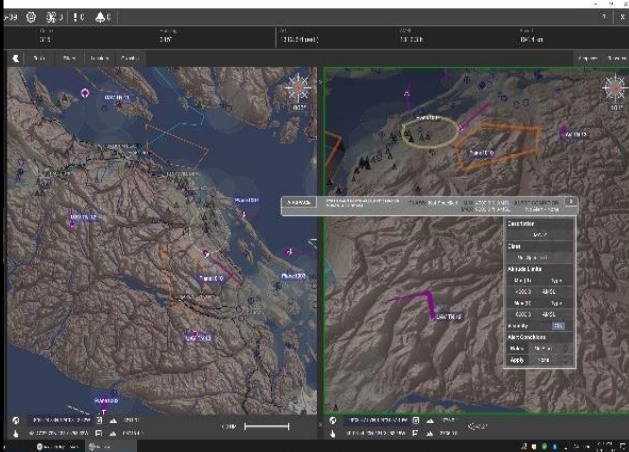
Guidance Technology, Variable Rate Applications

Available Cloud Platforms:



Microsoft Azure IoT Platform





Ottawa LSAS Testing and Trials



<https://www.youtube.com/watch?v=Y0ehHwgpiNU>



AREAX.O | **ZONE**X.O

LSAS Testing and Trials



EasyMile Shuttle

EasyMile

- EasyMile manufactures the Gen 2 EZ10 and will be responsible for:
 - Insurance, compliance, and regulatory filings
 - Safety assessment of the route and safety management plan for testing
 - Making go-/no-go decisions and providing associated rationale at key points during staged testing
 - Working with first responders to ensure they are equipped with relevant information to respond to a collision or other incident safely
 - Supporting track and on-road pilot testing with engineers on site for the duration of testing
 - Operating and maintaining the LSAS throughout the project with a shuttle operator and shuttle ambassador on-board at all times during on-road pilot testing

Key Features of Gen 2 EasyMile EZ10

- 15 Seat Electric Automated Shuttle (x 2)
- 40 km/h top speed, but on-road pilot test speeds will be 15km/h
- Capable of SAE Level 5 automation, but can also be driven manually with controller
- Shuttle builds on technology from the Gen 1 EZ10, the first iteration of this current shuttle



EasyMile EZ10 Specifications

- Length: 4050mm, Width: 1892mm, Height: 2871mm
- SAE Level 5 Automation
- Occupants: 15
- Accessibility: Wheelchair ramp equipped
- Battery: 30.72kWh
- Range: 16 hours
- Uses advanced LIDAR tech



AREA X.O | **ZONE X.O**

The project was executed in four phases;

Phase 1: Project preparation including permits, approvals, insurance and stakeholder workshop

Phase 2: Technical Orientation to Automated Shuttle Operation

Phase 3: Closed-track testing at AreaX.O to evaluate safe interactions with other road users

Phase 4: On-road trial without passengers, then with passengers (Proposed Location: Tunney's Pasture)





Phase 1: Project preparation

Planning

Task 1: Detailed route analysis and draft track and on-road test plans including draft safety management plan and safety assessment of the test vehicle

Task 2: Delivery of LSAS and on-road pilot approvals and documentation (Schedule 7, Ontario license, Ontario AV Program registration, insurance)

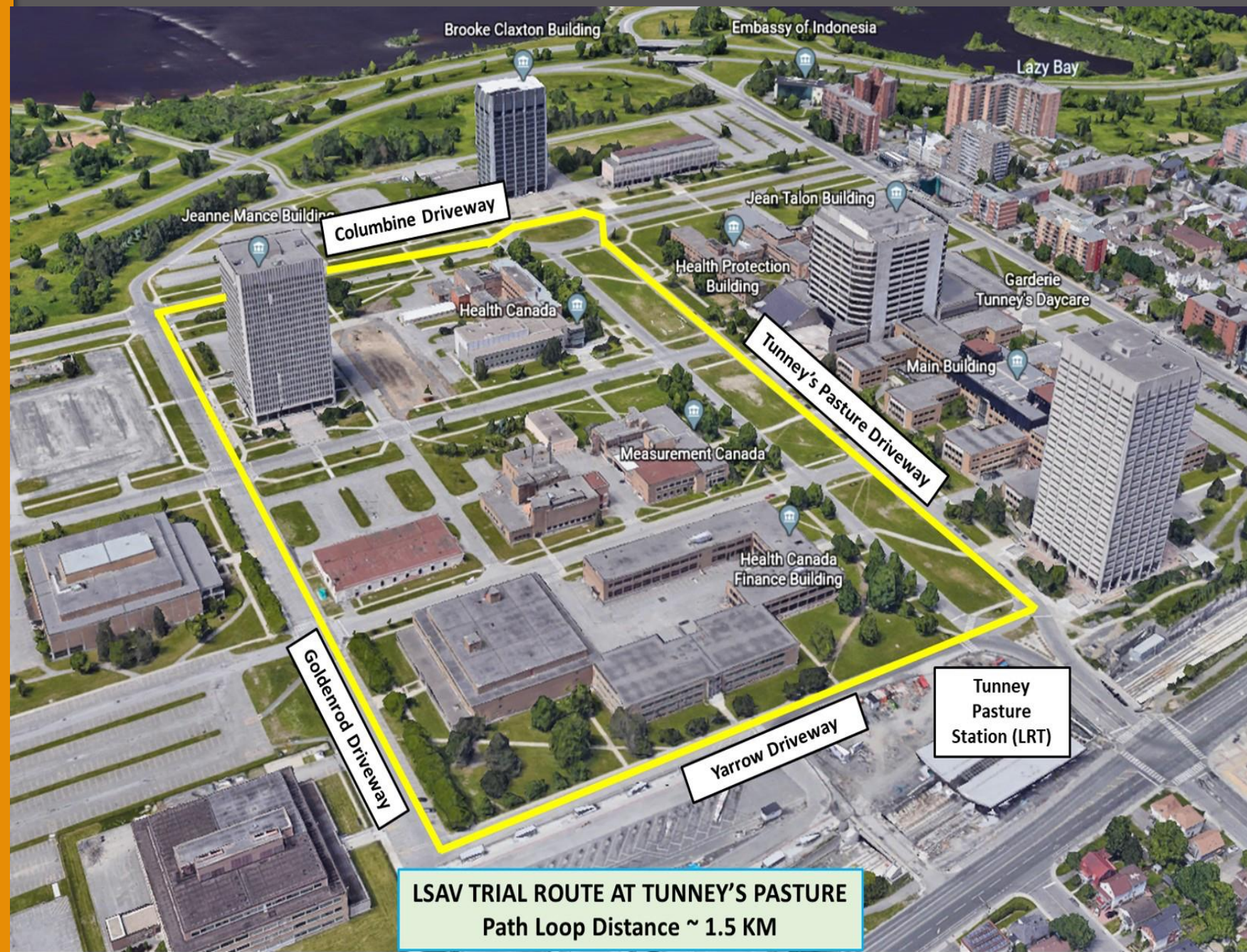
Task 3: Stakeholder workshop to present test plan, safety management plan, and safety assessment

August 2019: Ottawa Autonomous Shuttle Trial



Route Selection

- 1500m loop around Tunney's Pasture, a federal government campus on crown land (shown in yellow).
- Four planned stops with access to LRT station and key buildings in the area
- Travelling at 15km/h, each stop taking approximately 20 seconds, the LSAS will make 9 loops per hour
- The site has optimal qualities for LSAS testing
 - Low motor vehicle speed limits
 - Connection to public transit and several highly frequented destinations
 - Possibilities for a variety of low speed interactions with other road users, and proximity to secure overnight storage with electric charging



Task 2: Delivery of LSAS and on-road pilot approvals and documentation

(Schedule 7, Ontario license, Ontario AV Program registration, insurance)



Task 3: Stakeholder workshop to present test plan, safety management plan, and safety assessment

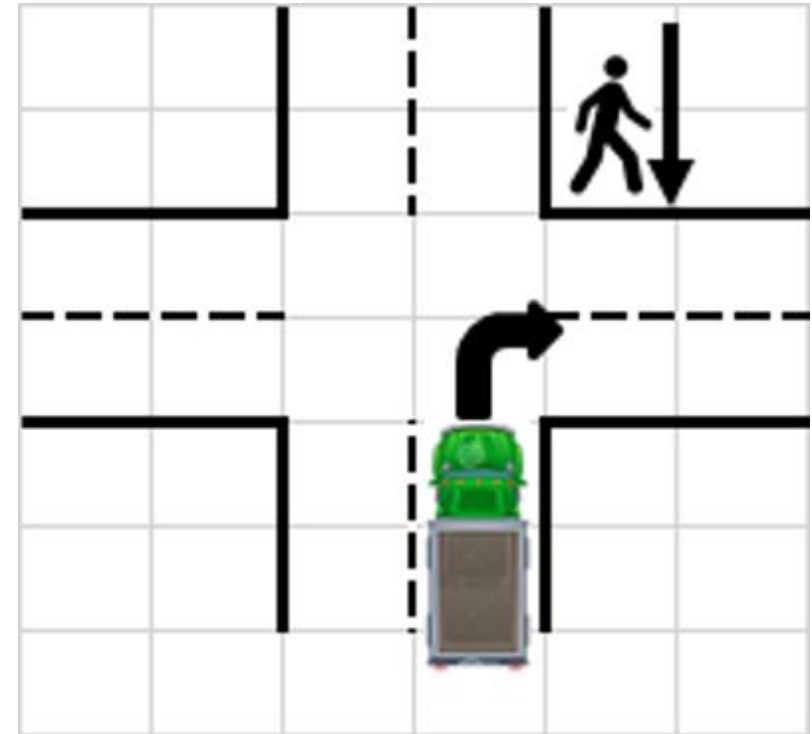
- **Safety Assessment Report**
- **Closed Test Track TestPlan**
- **Stakeholder Feedback – Go/No Go**

**Phase 2:
Technical Orientation to
Automated Shuttle
Operation**

Technical Orientation and Workshops

Task 1: Technical Hands-on Workshop

- Key stakeholders and Emergency Responders



Task 2: Finalize AreaX.O Test Plan



Phase 3: Closed-track Testing at Area X.O

Testing

Task 1: Setup site and equipment for LSAS testing at Ottawa L5

Task 2: Track testing (ISO 22737/Euro NCAP and additional test scenarios specific to Tunney's Pasture route) to evaluate:

- safe interactions with vulnerable road users
- navigation capabilities in terms of lateral deviations from the mapped path
- loss of battery power and minimal risk maneuvers
- reaction to a non-responsive shuttle operator during driver take-over transition

Task 3: Report on shuttle track test performance

Task 4: Project leadership meeting to present results and go/no-go decision with rationale from EasyMile

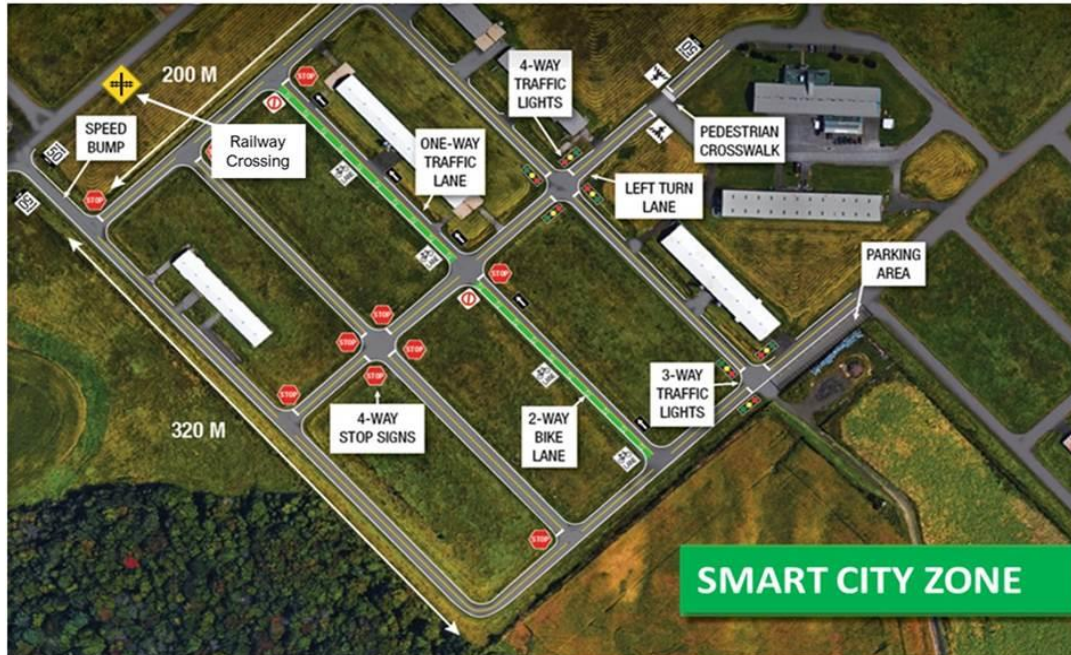
Task 5: Final on-road pilot test plan and safety management plan



Key Assets Used for Testing and Trial



AREA.X.O | ZONE.X.O



Ottawa Ride Match

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Phase 4: On-Road Public Trial

On-Road Trial Tunney's Pasture (Nov 2 –13)

Task 1: Execute the on-road pilot testing (no passengers), including meetings to discuss go-/no-go decisions as per the test plan, and weekly data summary reports.

Tasks 2 and 3: Draft and final reports of on-road testing, including results and analysis and incorporating stakeholder feedback in the final report.

Task 4: Wrap-up including decommissioning the EasyMileEZ10 shuttles and organizing a project meeting close-out with key stakeholders



COVID Implications

- COVID-19 mitigation strategy that adheres to Ottawa Public Health recommendations
 - Physical distancing
 - PPE
 - Disinfecting between trips
 - Reservation software
 - Contact tracing
- Metro and “bubble ride” shuttle
- RideShark – OttawaRideMatch.com allowed us to pre-scheduled trips, manage time between rides and enabled contact tracing

Lessons Learned



For More Information

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Other Links

If you are considering a LSAS trial Transport Canada has a number of reports to inform the development of their testing and deployment policies and regulations.

- [Canadian Jurisdictional Guidelines for the Safe Testing and Deployment of Highly Automated Vehicles](#) [Testing Highly Automated Vehicles in Canada](#)