Enabling the Safe Deployment of V2x Smart Mobility Innovations

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Accelerating Time to Market

- Area X.O is a technology-rich, secure R&D complex for all weather experimentation

- Helping to bring next-gen smart mobility, autonomy and connectivity tech to market faster
  - Develop, test, validate, demonstrate and apply
  - Onsite engineering team
  - Regulator collaboration to accelerate adoption
  - $33+ million in tech investment
- Addressing R&D challenges and opportunities in many sectors:
  - CAVs, unmanned systems and drones, public safety, defense, cyber security, mobility, smart cities, agtech

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JUNIPER NETWORKS

KONGSBERG GEOSPATIAL

MH CORBIN

Microsoft

NOKIA

Pessl INSTRUMENTS

TELESAT

Trimble

Multiple Real-world Test Environments

Test First at our Private Track

- Real-world urban and rural mobility infrastructure including at Grade Rail Crossing and 3 way and four-way traffic intersections
- 16KM track
- 1750 hectare/1850-acre private gated site
- Air and pavement temperature sensors
- DSRC, GPS, LoRA, LTE/4G,WiFi and 5G
- HD Map of entire site
- Localized control of traffic operations and situational awareness systems

Opportunity to move to Public Track

- Established process with City of Ottawa for SMEs to do real world deployments
  Demo Areas: Smart Intersection, Smart Rail Crossing
- Multi-lane use cases, nine traffic intersections (DSRC) with speeds from 40km – 100km
- DSRC, High precision GPS, 4G-LTE and 5G for V2I, V2V, V2p and V2N
- Data, cloud and analytics platform services

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Telesat Satellite Backhaul


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200 M
SPEED BUMP
Railway Crossing
4-WAY TRAFFIC LIGHTS
ONE-WAY TRAFFIC LANE
PEDESTRIAN CROSSWALK
LEFT TURN LANE
PARKING AREA
3-WAY TRAFFIC LIGHTS
4-WAY STOP SIGNS
2-WAY BIKE LANE
320 M
SMART CITY ZONE


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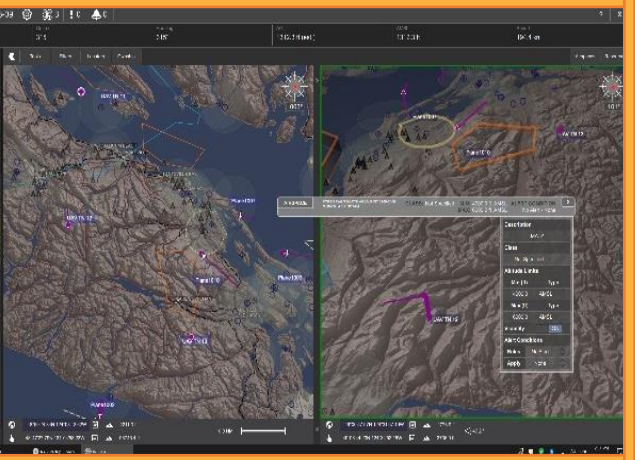


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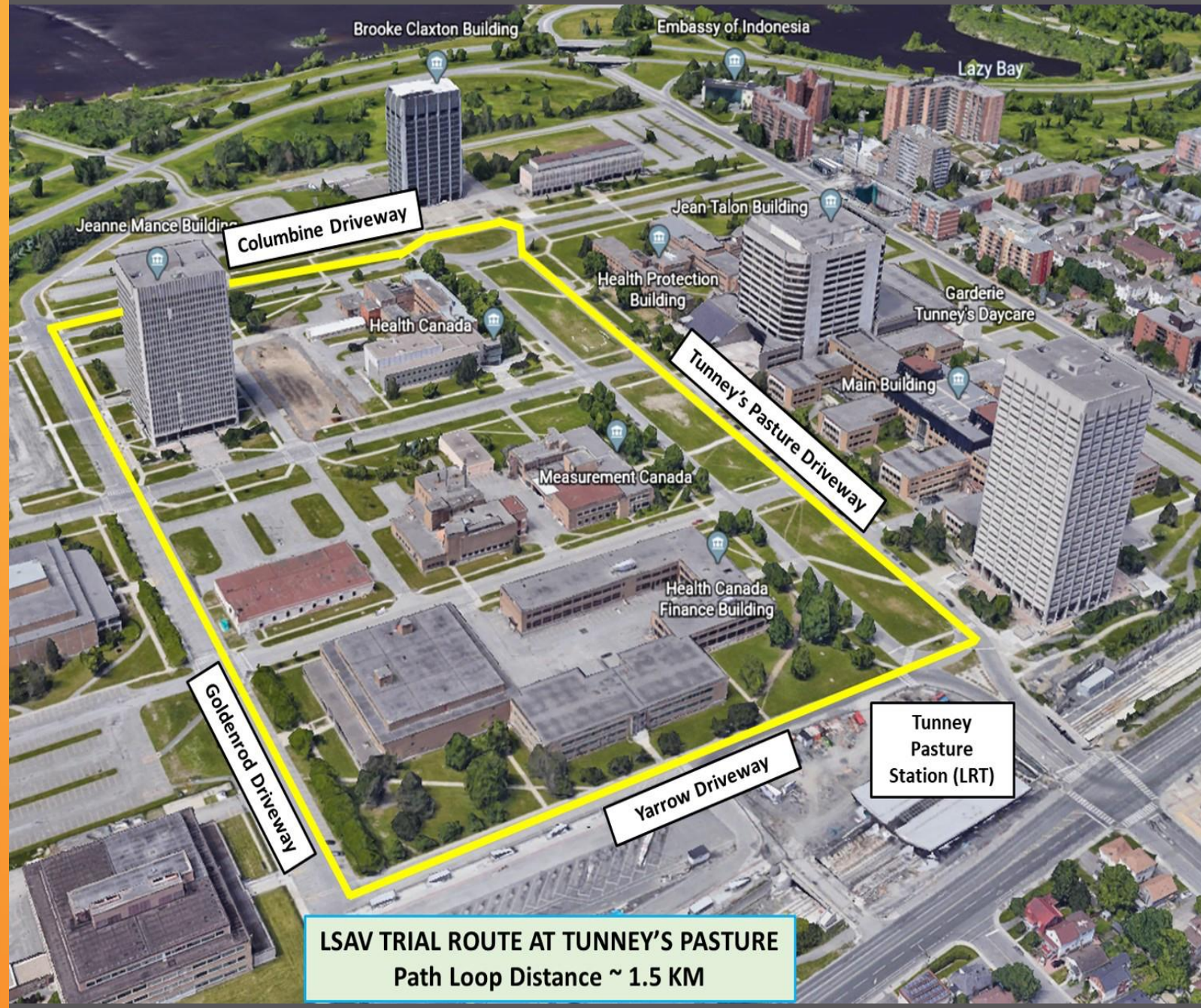
EASY MILE

Ottawa was the first municipality to provide real time traffic information to a CAV

Using DSRC and V2X communication

Transport Canada – Developed Framework for LSAS Testing and Trials

- Executed first LSAS trial on public roads in Ontario
- 1,500m loop around a federal campus (shown in yellow)
- Four stops with access to LRT station and key buildings
- Travelling at 15km/h; 20 seconds per stop; 9 campus loops per hour
- Connection to public transit and several highly frequented destinations
- Possibilities for many low-speed interactions with other road users
- Proximity to secure overnight storage with electric charging



Transport Canada: Smart Safe Intersections that Protect Vulnerable Road Users

- Executing complex test scenarios in a four-season climate - adoption of the WEF Safe DI testing framework
- Assessing the design, testing and integration of emerging CAV, V2X and smart mobility tech in intersections and safety for vulnerable road users
- Move to real world intersection “Kanata Smart Intersection”
- Accelerating tech development, time to market, and future adoption (policy)

Transport Canada: Safe Smart Rail Crossings - *Project under consideration with TC*

- City of Ottawa is home to 67 at-grade rail crossings, many of which are located on high-speed (60 km or greater) roads.
- Connected infrastructure, sensors, communications, and vehicle technology have the potential to prevent or significantly reduce the impact of vehicular and rail accidents.
- Deploy a suite of machine visions sensors at Public at Grade Crossings to collect real time data
- Technology and solutions to improve safety at high-speed rail crossing will be tested at AreaX.O and City may choose to deploy at public crossing.
- enabling SCMS certified safety messages be sent over multiple communication modes 5G/ LTE/ DSRC to connected vehicles, including a connected snowplow.

Enhancing safety and unified situational awareness at rail crossings

Using cooperative perception and trusted V2X communication

Ottawa Smart Farm

Mission: To promote sustainability and profitability in agriculture through innovation and knowledge transfer

- Support testing and demonstration (virtual workshops)
- Match-making with industry, government and post secondaries
- Enables SME commercialization and R&D around BMP’s and technology
- Supports sharing data, learnings and insights
- Aims to increase ROI for producers

Areas of Focus

- Field Baseline Data, Analytics, Modeling
- Innovative Crop Planting
- Environmental Sustainability N2O emissions
- Soil Health and Crop Productivity
- CAVehicles in Agriculture
- Aerial Imaging: Satellite and Drones
- Sensor Monitoring and Effectiveness across different regions in Canada
- Data: Common Infrastructure Platforms
- Communication Infrastructure and Rural Connectivity

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2021 4R Field Scale Trials

1. Conventional Full Tillage With Broadcast Fertilizer Applied
2. Two Types Of Strip Tillage Practices:
   a) Fertile-Stripping With Fertilizer blended in the Strips (coulter strip till)
   b) Conventional Strip-till Fertilizer Applied at bottom of strip (shank strip till)
3. Vertical Tillage With Broadcast Fertilizer Applied
4. No Tillage With Broadcast Fertilizer Applied

Equipment

- The **coulter strip till** was done with a down plurbis.
- The **shank strip till** was done with a Krouse gladiator.
  - The fertilizer on the strip till units was using a Flexi-coil air cart with two tanks that can independently meter fertilizer.
- The conventional tillage was performed using a roto tiller.

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N20 EMISSION FLUX SAMPLE MEASUREMENTS

expressed in Kilograms per Hectare

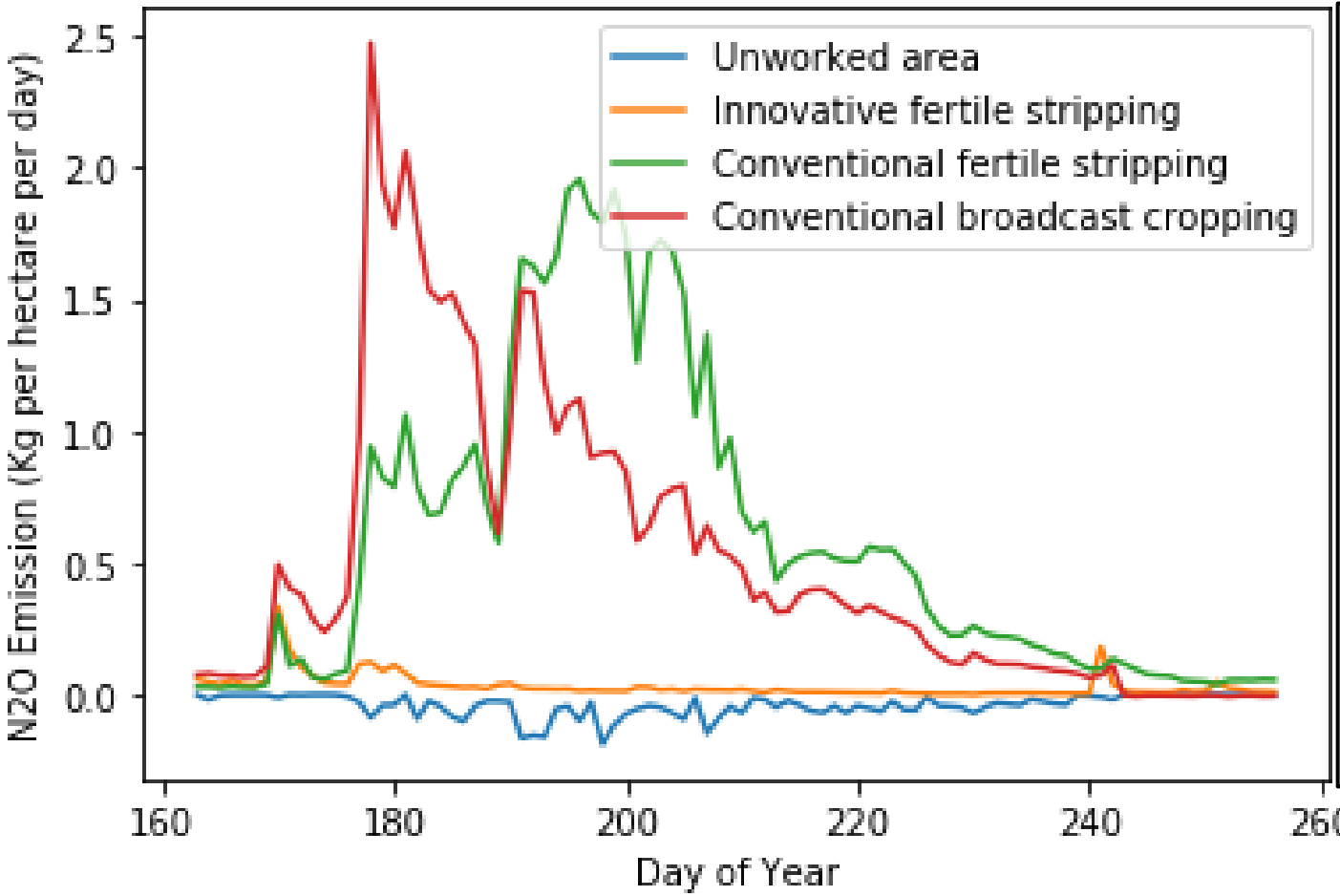

Figure Shows the average amount of Kg N_2O-N ha^{-1} day^{-1} starting on the 160 day of the year and ending on the 260 day of the year.

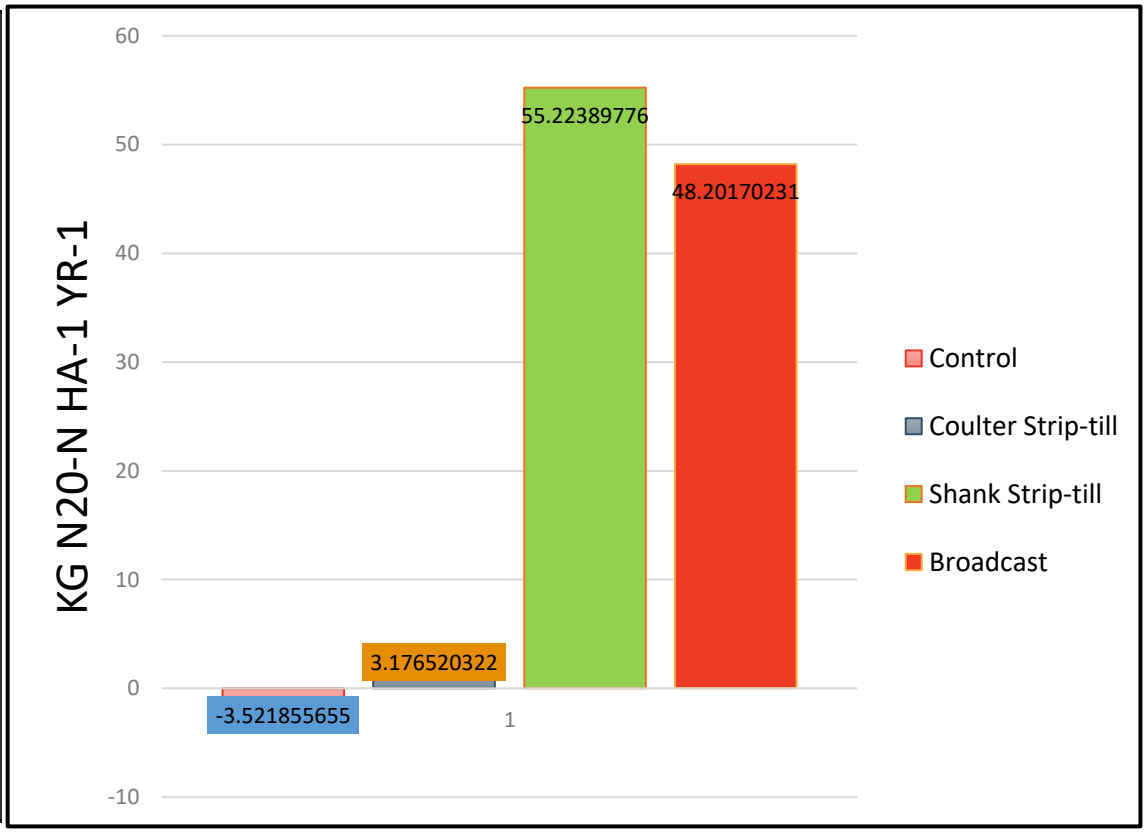

Figure Shows the total Kg of N20-N Ha-1 measured over 93 days during the growing season. Measurements were taken using Licor Sensors every half an hour. The measurements were

Corn yield using Different Farming Techniques

Innovative Fertile Stripping
Fertilizer applied 150kg/ha
Mass: 345g
Yield: 9194 kg/ha

Conventional Fertile Stripping
Fertilizer applied 225kg/ha
Mass: 235g
Yield: 7315 kg/ha

Conventional Broadcast Cropping
Fertilizer applied 225 kg/ha
Mass: 190g
Yield: 6923 kg/ha

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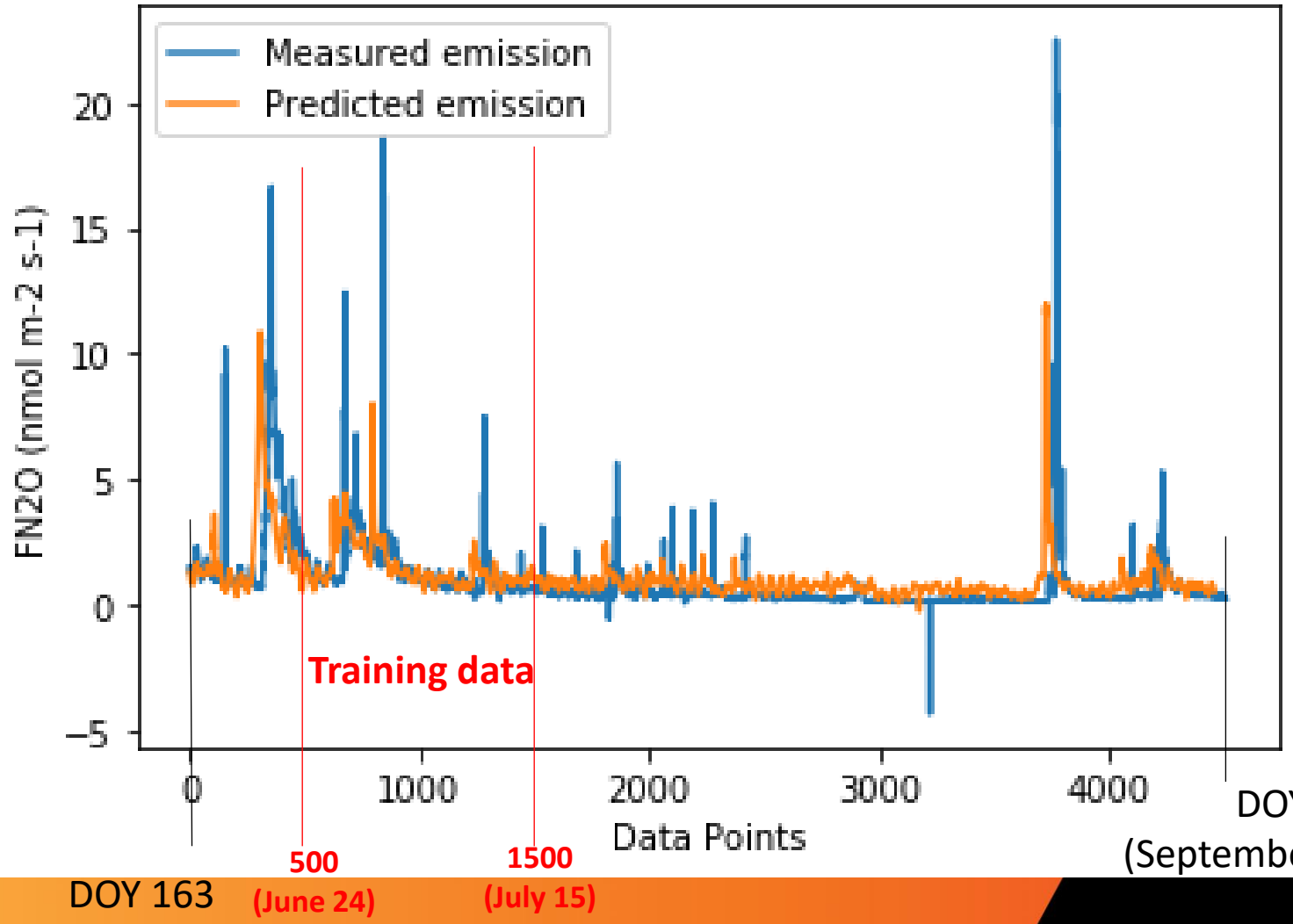
Creating an Algorithm to predict N2O emissions



Model after just one year of data – minimal inputs required (soil makeup, rainfall, ambient temperature, type of planting and dates and rates of inputs ie. Fertilizer)
*more data from across Canada and automate input of variables

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