| ITS SERVICE BOOK | ITS1005 EN ROUTE TRAVELLER INFORMATION |
|---|---|

## Purpose

En Route Traveller Information encompasses a wide variety of information that can be broadcast to travellers through variable message signs (VMS). This may include:

- General traffic conditions
- Maintenance and construction
- Border wait times
- Overheight warning
- Multi-modal travel demand management
- Special events/tourism
- Smoke/fire warning
- Informational campaigns
- General safety

The following traveller information is not part of this Service Book, but is included in separate Service Books focusing on each dedicated system:

- Roadside travel time information
- Smart work zones
- Incident warning
- Queue warning
- Weather warning
- Wildlife warning

The objectives of En Route Traveller Information include:

- **Improve Driver Awareness:** Provide travellers with greater awareness of downstream conditions
- **Provide Relevant Information:** Provide travellers with relevant, local information whether it is related to special events, tourism, or other events
- **Leverage/Utilize Existing VMS Sign Network:** Provide opportunities to utilize VMS for lower priority general safety, informational campaign messages (when there are no higher priority scenarios and in off-peak periods)
- **Improve congestion management - Infer a detour:** Messages related to downstream conditions (e.g. border wait times or multi-modal travel demand)

may help to infer an alternative route (e.g. alternative border crossing) or alternative means of transport (e.g. GO Transit) and help to alleviate/balance congestion

## Considerations for Use

En Route Traveller Information can be considered for many roadway types and applications. The following decision trees provide a reference for selecting En Route Traveller Information systems and associated field equipment.
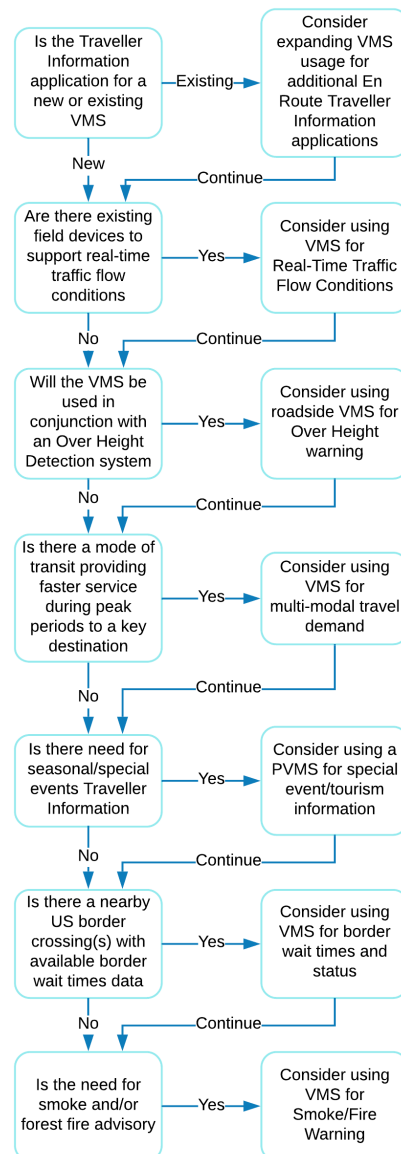
## ITS Service Applicability and Limitations of this Service Book

This Service Book may be used in conjunction with other related MTO ITS Services that may have Service Books associated with them.

- ITS303 – Roadway Maintenance and Construction
- ITS403 – Truck Parking Support
- ITS510 – Amber Alert
- ITS511 – Red Alert
- ITS512 – Silver Alert
- ITS515 – Disaster Traveller Information
- ITS904 – Congestion Balancing on Express/Collectors
- ITS905 – Congestion Balancing Between Parallel Routes
- ITS906 – Roadside Travel Time Information
- ITS907 – Roadside Safety and Non-Traffic Public Service Messaging
- ITS916 - Hazardous Road Condition Warning
- ITS917 – Wildlife Detection and Warning System
- ITS925 – Border Crossing Delay Information
- ITS1001 – Broadcast Traveller Information

### Limitations

While this Service Book will aid in determining the needs and deployment of En Route Traveller Information, it is still recommended that a formal analysis and design take place.

## En Route Traveller Information Applications

The following applications are considered as part of the En Route Traveller Information:
- Traffic Conditions
- Maintenance and Construction
- Border Wait Times
- Over Height Warning
- Multimodal Travel Demand Management
- Special Events/Tourism
- Smoke/Fire Warning
- Informational Campaigns
- General Safety

This section will detail each of the types of information, listed above, as follows:

- Input Data Sources – what are the data sources required to support this information
- Operations – what are the expectations, requirements to support this information
- Output Messages – how are these messages displayed on the VMS

The type of VMSs that may be used include:

- Portable variable message sign (PVMS)
- Overhead variable message sign
- Pole-mounted variable message sign
- Portable-mounted variable message sign (PMVMS)

### Portable Variable Message Sign

Portable variable message signs (PVMS) provide a quick means of deployment to support temporary applications (e.g. construction or special events). PVMS can also be deployed on a concrete pad to provide a "permanent" application
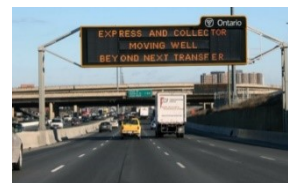


*Advantages*
- Moderate cost
- Large sign face provides an opportunity for detailed messaging

*Disadvantages*
- Low, roadside deployment may limit visibility to drivers across all lanes
- Does not provide clean, permanent aesthetics

### Overhead Variable Message Sign

Typically used for multi-purpose applications such as congestion, safety, and traveller information

*Advantages*

- Large sign face for detailed messaging and very high readability across all lanes

*Disadvantages*

- High cost

### Pole-mounted Variable Message Sign

Permanent, roadside pole-mounted option



*Advantages*

- Great readability across all lanes with a higher mounting height
- Finished design and look compared to other roadside VMS types

*Disadvantages*

- May be prone to limited readability for left-lane drivers due to trucks
- Moderate to high cost

### Portable Mounted Variable Message Sign (PMVMS)

Can be deployed on the median, separator or roadside using a temporary concrete barrier system



*Advantages*

- Best readability in median applications
- Flexibility in deployment location (e.g. median, separator, or roadside)

*Disadvantages*

- Originally designed for temporary applications
- Limited applications for median/separator mounting (e.g. expressway/collectors)

## Traffic Conditions

Systems that monitor traffic conditions provide general information about downstream congestion and traffic flow.

### Input Sources

Real-time traffic conditions are automatically collected and calculate average speeds along zones.

The zone speed is categorized as:

- MOVING WELL (>75 km/h)
- MOVING SLOWLY (40 to 75 km/h)
- VERY SLOW (<40 km/h)

These devices may be deployed as part of a wider traffic management initiative or specifically for traveller information.

### Operations

Conditions can be determined and relayed automatically to the VMS with traffic detectors. Alternatively, operators can opt to manually input messages based on a combination of traffic data, and CCTV camera monitoring and any other available traveller data.

### Message Outputs

*Traffic Flow (on same roadway)*

```
EXPRESS MOVING WELL
COLLECTOR MOVING SLOWLY
BEYOND NEXT TRANSFER
```

```
EXPRESS AND COLLECTOR
MOVING SLOWLY
BEYOND MORNINGSIDE
```
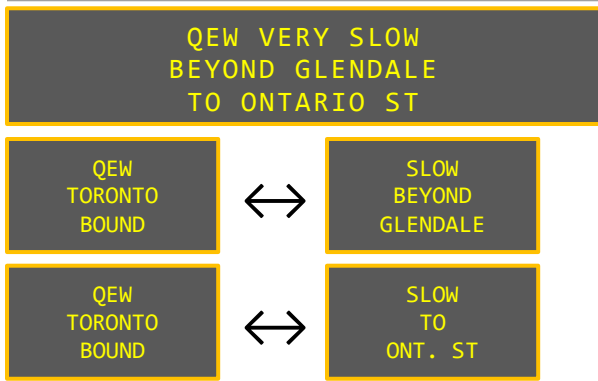
```
QEW VERY SLOW
BEYOND GLENDALE
TO ONTARIO ST
```

```
QEW SLOW
BEYOND
GLENDALE
```

```
QEW SLOW
TO
ONT. ST
```

*Traffic Flow (on connecting roadway)*

```
QEW TORONTO SLOW
BEYOND GLENDALE
TO ONTARIO ST
```

```
QEW VERY SLOW
BEYOND GLENDALE
TO ONTARIO ST
```

```
QEW                SLOW
TORONTO    ⟷    BEYOND
BOUND              GLENDALE
```

```
QEW                SLOW
TORONTO    ⟷    TO
BOUND              ONT. ST
```

## Maintenance and Construction

Planned and unplanned construction and maintenance activities provide awareness of future or ongoing activities that may create delays or added congestion.

### Input Sources

Manual notifications to Maintenance/Construction Management of planned/unplanned activities

### Operations

Operators may determine which construction/maintenance activities warrant notification to the drivers. This may include advance notification of future works or notifications during the works.

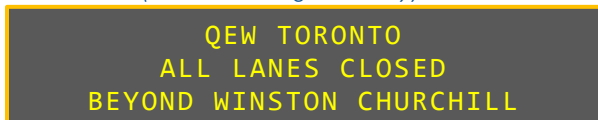Advanced notifications should not exceed nine (9) days.

Operators and or Construction Contractor may operate the signs but must ensure messages are terminated when conditions are no longer present

### Message Outputs

*Full Closure (on same roadway)*

```
ALL LANES CLOSED
BEYOND WINSTON CHURCHILL
```

*Full Closure (on connecting roadway)*

```
QEW TORONTO
ALL LANES CLOSED
BEYOND WINSTON CHURCHILL
```

*Partial Closure (on same roadway)*

```
2 RIGHT LANES CLOSED
IN EXPRESS
BEYOND KEELE
```

*Partial Closure (on connecting roadway)*

```
HWY 401 EAST EXPRESS
2 RIGHT LANES CLOSED
BEYOND KEELE
```

*Concurrent Construction Activities (Express/Collector, on same roadway)*

```
EXP: 2 RGHT LANES CLSD

COL: 1 LEFT LANE CLSD
```

*Concurrent Construction Activities (Express/Collector, on connecting roadway)*

```
HWY 401 WEST
EXP: 2 RGHT LANES CLSD
COL: 1 LEFT LANE CLSD
```

*Advance Notification*

```
SATURDAY AT 10 PM
COLLECTOR TO BE CLOSED
AVENUE RD TO WARDEN
```

```
404 NORTH           TO BE CLOSED
HWY401 TO     ⟷    SUN 9 PM-
SHEPPARD            MON 5 AM
```

*Detour Advisory*

```
404N CLOSED         FOLLOW D-1
HWY401 TO     ⟷    VIA
SHEPPARD            YORK MILLS
```
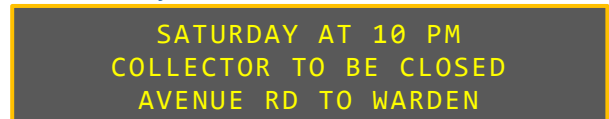
## Border Wait Times

Border status and wait times are provided for various US border crossings

### Input Sources

Canadian Border Services Agency (CBSA) and Niagara International Transportation Technology Coalition (NITTEC provides travel time and border status which is the key source for border wait times and closures

### Operations

TOC Operator shall monitor the CBSA/NITTEC sources for any delays for non-commercial vehicles exceeding 30 minutes

TOC Operator shall ensure messages are terminated/revised as conditions change

### Message Outputs

#### *Border Closures (West Region)*

```
        SARNIA BORDER CLOSED
```

#### *Border Closures (Central Region)*

```
     BORDER CROSSING CLOSED
          AT QUEENSTON
         AND FORT ERIE
```
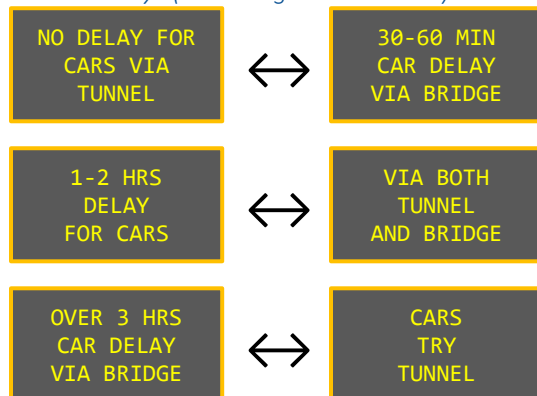
#### *Border Delays (West Region)*

```
    BORDER DELAY FOR CARS
   30 – 60 MIN AT BOTH
     WINDSOR AND SARNIA
```

```
    BORDER DELAY FOR CARS
   WINDSOR: 30 – 60 MIN
     SARNIA: 2 – 3 HRS
```

```
    BORDER DELAY FOR CARS
   WINDSOR: 30 – 60 MIN
        SARNIA: NONE
```

#### *Border Delays (West Region – Windsor)*

```
  NO DELAY FOR            30-60 MIN
  CARS VIA       ⟷       CAR DELAY
   TUNNEL                VIA BRIDGE
```

```
  1-2 HRS                VIA BOTH
  DELAY          ⟷        TUNNEL
  FOR CARS               AND BRIDGE
```

```
  OVER 3 HRS               CARS
  CAR DELAY      ⟷          TRY
  VIA BRIDGE              TUNNEL
```

#### *Border Delays (Central Region)*

```
        MAJOR DELAYS
        AT QUEENSTON
   BORDER CROSSING TO USA
```

```
   CAR      405:  1-2 HRS
   DELAY    420:  30-60 MINS
   TO USA   QEW:  1-2 HRS
```

### Overheight Warning

Overheight warning systems utilize detectors to determine if a vehicle is above the height restrictions for a downstream tunnel, bridge, or overpass and warns the driver accordingly. Warnings may be in the form of flasher beacons, audible signals, or a VMS.

#### Input Sources

Overheight detectors utilize non-intrusive technology (e.g. infrared beams) to determine if a travelling vehicle exceeds the height parameters based on the downstream restrictions of the structure/tunnel/bridge, etc.

#### Operations

This system can work autonomously using contact closures output to the sign. Remote monitoring and event log access may be available through the network.

#### Message Outputs
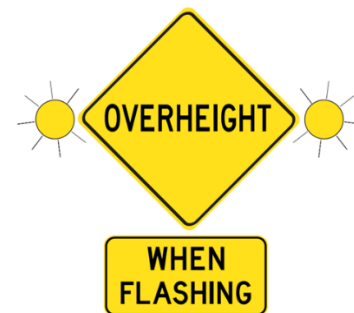


### Multi-Modal Travel Demand Management

Multi-modal travel demand management allows for the comparative travel time of two different modes of travel.

In this case, regional rail (GO Transit) scheduling is compared to the travel times on the mainline route

to an end destination (e.g. downtown Toronto via QEW)

## Input Sources

Travel time data sources on the mainline roadway are needed to determine the mainline travel time.

Scheduling data along with an estimate of travel, parking, walking, and buffer time to/within the GO Station (~10 minutes)

## Operations

This system can work autonomously using a comparative travel time algorithm to determine the travel times for display between the highway and the alternative mode.

## Message Outputs

### *Primary Mode is Preferred Route*

| | |
|---|---|
| TO AVOID TRAFFIC AND PARKING | ⟷ TAKE GO TO DOWNTOWN AT APPLEBY |

### *Alternative Mode Preferred Route by 10 minutes+*

| | |
|---|---|
| UNION STN GO 55 MINS HWY 73 MINS | ⟷ FASTER BY TRAIN AT APPLEBY GO |

### *Off-Peak Messages*

| | |
|---|---|
| GIVE YOUR CAR THE NIGHT OFF | ⟷ TAKE THE TRAIN GO TRANSIT |
| TO ATTEND DOWNTOWN EVENTS | ⟷ TAKE THE TRAIN GO TRANSIT |
| REMOVE THE RAGE FROM THE ROAD | ⟷ TAKE THE TRAIN GO TRANSIT |
| UNLOCK GRIDLOCK | ⟷ TAKE THE TRAIN GO TRANSIT |

## Special Events/Tourism

Special events/tourism-related messages help to inform drivers of any impacts to popular sites and/or changes to events.

## Input Sources

Input sources may include information from the Ministry of Tourism, Culture, and Sport and/or local events/tourism destinations. Messages may be related to promoting events or providing awareness of potential impacts on traffic and mobility.

## Operations

Special event messages are typically provided with a lower priority when compared to incidents, congestion, queue warning, travel times and other mobility messages. Special event messages can be scheduled to be displayed during off-peak conditions.

## Message Outputs

### *Special Events*



MAY 26 – BIKE TO WORK DAY
LEAVE THE HIGHWAY BEHIND
AND RIDE SAFELY

### *Ferry Status (Northeastern/Eastern Regions)*

| | |
|---|---|
| CHICHEEMAUN FERRY CLOSED | ⟷ INFO AT (800) 265-3163 |

## Smoke/Fire Warning

The smoke warning provides advisory messages to drivers of downstream conditions. The warnings may originate from controlled burns (e.g. agriculture) or uncontrolled burns such as forest fires
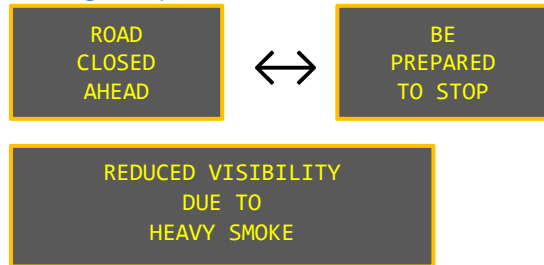
### Input Sources

Sources may include the Ministry of Natural Resources (MNR) who manage fire permits and monitor forest fires.

### Operations

Operations should coordinate with MNR and be aware of any activities that may directly impact drivers such as reduced visibility and where closures may be warranted.

### Message Outputs

```
ROAD          ⟷          BE
CLOSED                PREPARED
AHEAD                 TO STOP
```

```
REDUCED VISIBILITY
DUE TO
HEAVY SMOKE
```

## Informational Campaigns

Safety messages as part of broader safety campaigns help to maximize reach and impact. Previous themes include:

March: Truck Safety, Emergency Vehicles, Driver Courtesy

April: Seatbelts, Child Seat Safety, Work Zone Safety

Weekends: Don't Drink and Drive

### Input Sources

A master schedule is maintained by Central Region, and other Regions can use it or modify it accordingly to suit local needs. The schedule will detail the message theme and type of message to be initiated.

### Operations

Messages are initiated and terminated through a time of day schedule, while still subject to message priority guidelines.
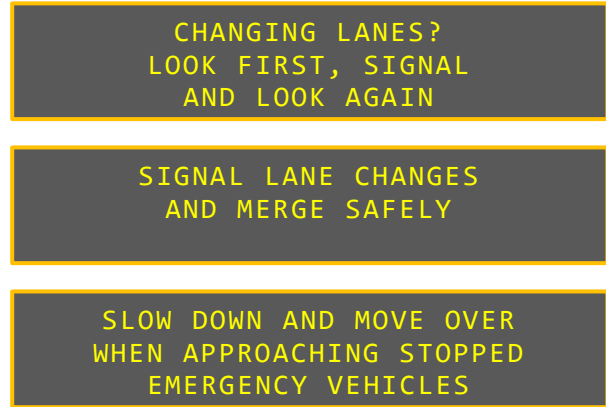
Northwestesn Region only displays safety messages when there is no traffic condition information available downstream.

Northeastern Region typically uses messages focused on OPP safety campaigns and wildlife.

Eastern Region messages are based on OPP requests during long weekends.

Central Region typically defaults to safety messages when no higher priority conditions are prevalent.

### Message Outputs

```
CHANGING LANES?
LOOK FIRST, SIGNAL
AND LOOK AGAIN
```

```
SIGNAL LANE CHANGES
AND MERGE SAFELY
```

```
SLOW DOWN AND MOVE OVER
WHEN APPROACHING STOPPED
EMERGENCY VEHICLES
```

## General Safety

General safety messages may be a subset of those from Informational Campaigns but may not necessarily be tied to a campaign schedule. They may provide information relevant to the local conditions or general safety messages.
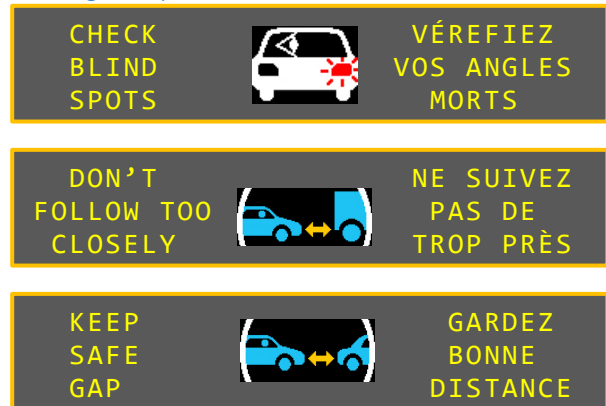
### Input Sources

Pre-defined messages are developed and selected for display.

### Operations

Messages may be displayed upon request from external parties (e.g. OPP), scheduled, or automatically through an assigned message priority.

### Message Outputs

```
CHECK              VÉREFIEZ
BLIND              VOS ANGLES
SPOTS              MORTS
```

```
DON'T              NE SUIVEZ
FOLLOW TOO         PAS DE
CLOSELY            TROP PRÈS
```

```
KEEP               GARDEZ
SAFE               BONNE
GAP                DISTANCE
```

## Architecture

The message category significantly determines the message input and output sources along with the extent of manual and automated interactions. A high-level architecture can be envisioned by reviewing the Input Sources, Operations, and Message Outputs in the previous section.

## Deployment Considerations

The following are some deployment considerations:

- Consider local terrain and clear zone requirements to assess the placement of detectors and information signs. Existing poles may be used for detectors if they are in appropriate locations.

- Permanent power options should be used for permanent applications (i.e. if used, solar should sustain system operations throughout the year)

- Deployments in Northern / rural locations should consider and ensure adequate cellular coverage

- Ensure message priorities are followed to ensure the most impactful/relevant message is shown

## Costs and Procurement Strategy

Budgetary costs are provided below for system components. A sum of the costs for required components can help to provide an estimate for a specific application.

However, there may be additional costs to integrate the En Route Traveller Information applications to MTO's TMC/TOC Operations and associated systems.

Refer to HiCo for additional details and regional estimates.

| Element | Cost (2019) |
|---|---|
| **Purchase: Supply and Install** | |
| Non-Intrusive Traffic Sensor | $10,000 |
| Bluetooth Detector | $7,000 |
| Over Height Detection System | $50,000 |

| Element | Cost (2019) |
|---|---|
| **Purchase: Supply and Install** | |
| ATMS Controller Cabinet Site | $30,000 |
| Civil Provisions (Ducts, F/O, Power) | $150,000 per km |
| Overhead VMS | $400,000 - $500,000 |
| Pole-Mounted Cabinet | $12,000 |
| Hybrid QWS Sign | $7,000 |
| Pole-Mounted VMS | $100,000 |
| Portable Mounted VMS | $75,000 |
| Portable VMS | $30,000 |
| Flasher Beacons | $1,500 |
| Solar Power Kit | $3,000 |
| Cellular Modem | $1,000 |
| 9.0 m Concrete Pole | $2,800 |
| Traffic Control (per lane closure) | $4,000 |
| **Operations and Maintenance** | |
| Cellular Fees (if applicable) | $75 per month |
| Hosted Data Processing and Maintenance of Bluetooth Detectors and Modems | $125 - $175 per month per detector |
| Maintenance of signs, cabinets, solar power systems, etc. | ~10% of capital/year |

### Sample Cost Deployment

An example of an En Route Traveller Information system for the purposes of the Border Wait Times may consist of:

- One (1) overhead VMS strategically placed in advance of the border crossing

  1 x $500,000 = $500,000

- Miscellaneous Civil Provisions (power and fibre plant already deployed)

  $50,000

- CBSA Data Access - Complementary

- Total Deployment: $550,000

## System Life Cycle

The expected life cycle of a Traveller Information system may range from 5 to 15 years depending on the configuration.

The mean time between failures (MTBF) of relevant equipment for planning, and rehabilitation purposes:

- ATMS Controller – 15 years+
- Bluetooth Detectors – 5 years
- CCTV Camera – 5 years
- Cellular Modem – 5 years
- Civil Provisions – 25+ years
- Controller Cabinet – 25+ years
- F/O Cable – 25+ years
- Hybrid Queue Warning Sign – 15 years
- Network Switch – 15 years+
- Non-intrusive Traffic Sensor – 5 years
- Overhead VMS – 15 years
- Pole-Mounted VMS – 15 years
- Poles – 25 years+
- Portable Mounted VMS – 5 years
- Portable VMS – 5 years

## Case Studies/Previous Deployments

| Description | Components |
| --- | --- |
| **Border Delay Warning**<br>TranBC | - Deployed at various roadways leading up to the various USA border crossings |



| Description | Components |
| --- | --- |
| **Traffic Flow Monitoring**<br>Ministry of Transportation Ontario | - Detector-based zones comparing expressway and collector average speeds |



## Performance Measures

- Reduce the average buffer index along main and connecting routes
- Reduce average travel time during events
- Increase number of users taking transit as a mode of travel during peak and off-peak periods
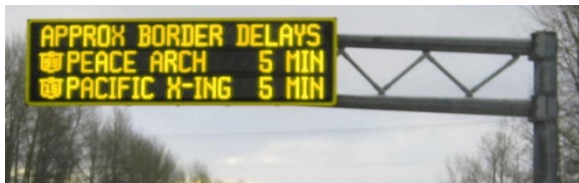
## Emerging/Alternative Technologies

This section details emerging technologies and/or alternative technologies not currently supported by the MTO.

- Upcoming connected vehicle applications provide the ability to disseminate infrastructure-to-vehicle (I2V) En Route Traveller Information and provide an option to provide messages for areas without a VMS