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

This section will detail each of the types of information, listed above, as follows:
**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
- QEW Toronto slow beyond glendale to ontario st

**Traffic Flow (on connecting roadway)**
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 BOUND 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 RGT LANES CLSD COL: 1 LEFT LANE CLSD

Concurrent Construction Activities (Express/Collector, on connecting roadway)
HWY 401 WEST EXP: 2 RGT LANES CLSD COL: 1 LEFT LANE CLSD

Advance Notification
SUNDAY AT 10 PM COLLECTOR TO BE CLOSED AVENUE RD TO WARDEN

Detour Advisory
404 NORTH HWY401 TO SHEPPARD TO BE CLOSED SUN 9 PM- MON 5 AM

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 CARS VIA TUNNEL ↔ 30-60 MIN CAR DELAY VIA BRIDGE

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

OVER 3 HRS CAR DELAY VIA BRIDGE ↔ CARS TRY 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 0EW: 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*

- NORTH AMERICAN INDIGENOUS GAMES 2017
- 2017 JEUX AUTOCHTONES DE L’AMÉRIQUE DU NORD

- JOIN THE CELEBRATION
- VENEZ CÉLÉBRER!

- OPENING DEC 17
- OUVERTURE 17 DÉC

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

*Ferry Status (Northeastern/Eastern Regions)*

- CHICHEMAUN 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

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.

Northwestern 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

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
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.

<table>
<thead>
<tr>
<th>Element</th>
<th>Cost (2019)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase: Supply and Install</td>
<td></td>
</tr>
<tr>
<td>ATMS Controller Cabinet Site</td>
<td>$30,000</td>
</tr>
<tr>
<td>Civil Provisions (Ducts, F/O, Power)</td>
<td>$150,000 per km</td>
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<tr>
<td>Overhead VMS</td>
<td>$400,000 - $500,000</td>
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<tr>
<td>Pole-Mounted Cabinet</td>
<td>$12,000</td>
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<tr>
<td>Hybrid QWS Sign</td>
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<tr>
<td>Pole-Mounted VMS</td>
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<tr>
<td>Portable Mounted VMS</td>
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<tr>
<td>Portable VMS</td>
<td>$30,000</td>
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<tr>
<td>Flasher Beacons</td>
<td>$1,500</td>
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<tr>
<td>Solar Power Kit</td>
<td>$3,000</td>
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<tr>
<td>Cellular Modem</td>
<td>$1,000</td>
</tr>
<tr>
<td>9.0 m Concrete Pole</td>
<td>$2,800</td>
</tr>
<tr>
<td>Traffic Control (per lane closure)</td>
<td>$4,000</td>
</tr>
</tbody>
</table>

| 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 \times $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

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

Case Studies/Previous Deployments

<table>
<thead>
<tr>
<th>Description</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Border Delay Warning TranBC</td>
<td>• Deployed at various roadways leading up to the various USA border crossings</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic Flow Monitoring Ministry of Transportation Ontario</td>
<td>• Detector-based zones comparing expressway and collector average speeds</td>
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