

**Road Condition Weather Information Systems Automatically Feeds Travellers'  
Road Information Portal at the Ministry of Transportation, Ontario**

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## **Abstract**

The Ontario Ministry of Transportation (MTO) has implemented a comprehensive winter Road Condition Weather Information System (RCWIS) to provide highway maintenance staff with the most up to date road condition information to proactively make the most appropriate winter maintenance decisions. The winter road condition information is also immediately available to the public through the Travellers' Road Information Portal (TRIP). TRIP includes the MTO's Internet website and an Interactive Voice Recognition (IVR) system enabling the public to easily access specific road condition information with basic voice commands through the telephone.

This integrated system has greatly enhanced customer service. Previously 23 phone lines were operated from nine communications centres across the province. Staff from each centre recorded the winter road conditions five times per day for their area. The winter road condition information is now automatically updated as conditions are entered into RCWIS. A single toll free 800 number is available for the public to obtain current road conditions from across the province in both English and French.

With the average time per call dropping from 4.5 to 2 minutes, MTO has significantly reduced its costs while dramatically increasing the accuracy and timeliness of the winter road condition information. Annually, 500,000 telephone customers are serviced by this system which yields a customer satisfaction record over 95%.

The next steps for TRIP is to fully integrate highway construction information with the winter road condition information providing the customer with one complete report for all that the traveller will need in planning their journey. The MTO website will also be upgraded to become more interactive with this complete suite of information. MTO is also testing new software in mobile computers and reviewing other technological opportunities to further increase the timeliness of the road condition data entry into RCWIS.

## **Background**

The Ontario Ministry of Transportation (MTO) manages 16,500 kilometres of highway network across the province. There are 8.5 million drivers and 75,000 commercial carriers transporting \$1.2 trillion in goods each year. Highway 401 through Toronto has up to 16 lanes in some sections and carries over 410,000 vehicles a day making it one of the busiest freeways in North America. Timely and accurate information regarding winter road conditions, road closures and road construction on all provincial highways is critical to maximize the safety and mobility of the commercial carriers and the travelling public.

MTO operated a number of independent systems to manage the provincial highway infrastructure and provide information to the public. Road maintenance service providers use the Road Condition Weather Information System (RCWIS) to track winter road conditions and effectively determine the optimal approach to manage snow and ice. A construction information system was also developed in some areas to track construction related work. MTO INFO, the public information hotline, and the nine MTO communication centres across the province would review the RCWIS data and the construction data, re-enter it into the MTO website and develop voice recordings for the public telephone information systems. This resulted in nine regional systems with 23 phone numbers, all with various levels of service and accessibility.

Public challenges to access timely, accurate data across the province in both official languages lead to the review and integration of the information necessary for the public to make effective decisions regarding their travel plans.

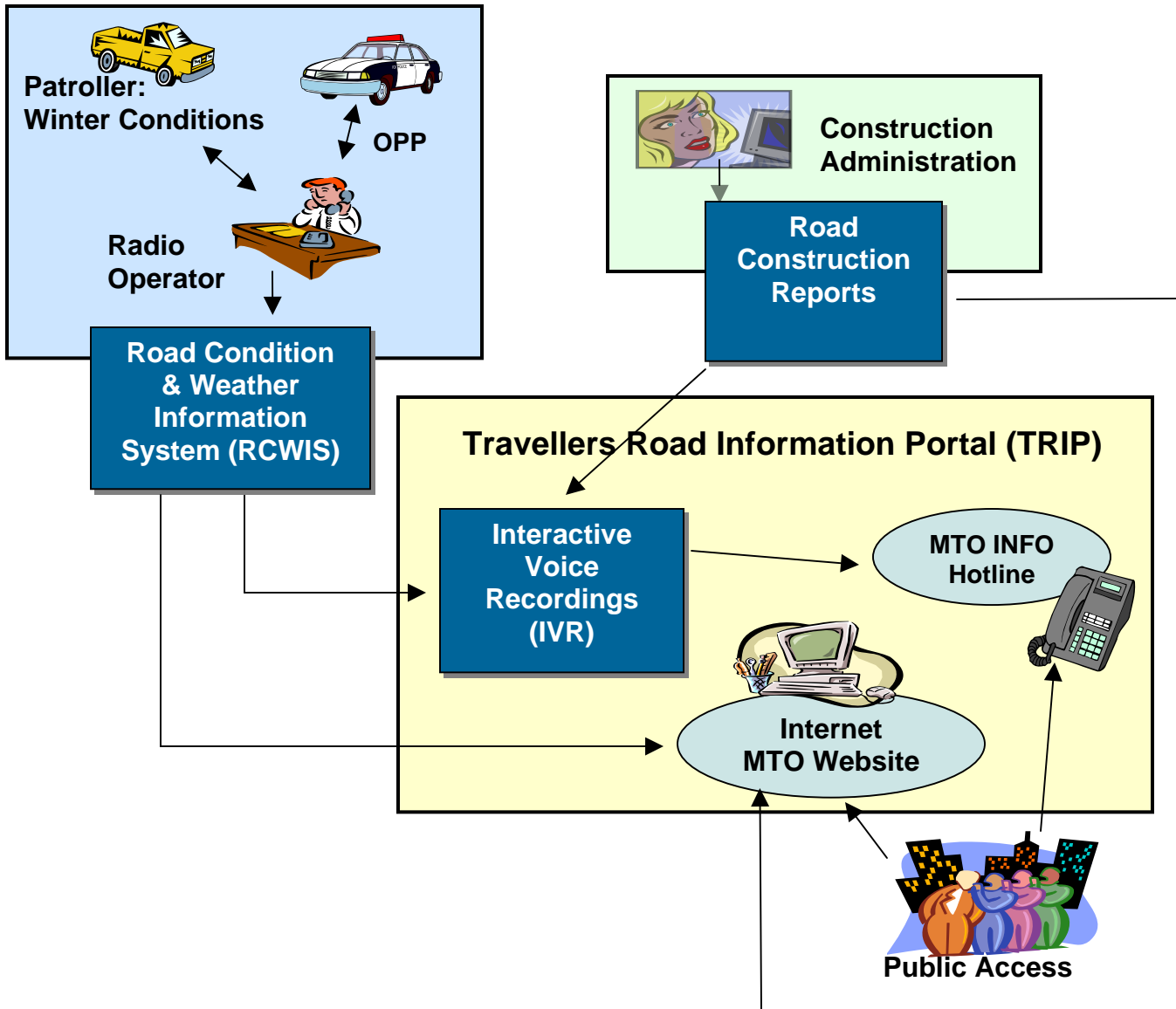
## **Public Access to Road Conditions**

To effectively meet the needs of MTO and deliver this suite of road condition information to the public, a number of key systems were required to share information including (see Figure #1):

- Travellers' Road Information Portal (TRIP)
  - Interactive Voice Recording (IVR) With Enhanced Voice Recognition
  - MTO INFO Telephone Hotline
  - MTO Website
- Road Condition Weather Information System (RCWIS)
- Road Construction Reports

The integration of these systems assist travellers in efficiently accessing key highway information so that they can make informed driving decisions. Knowledgeable drivers improve road user safety, help to manage and reduce traffic congestion, and keep people and goods moving efficiently across Ontario's highways.

**Figure 1 - Public Access to Road Condition and Construction Information**



**Travellers’ Road Information Portal (TRIP)**

The Travellers’ Road Information Portal (TRIP) was developed to enable Ontario’s road users to access winter road conditions, road closures and road construction information for all provincially maintained highways through one 800 telephone hotline or through the MTO Internet website. The data from the RCWIS and the construction system are sent directly to the MTO website for posting, and to the IVR for translation to voice messaging, before being posted on the MTO INFO telephone hotline.

TRIP was developed in three phases. Phase one was delivered in 2003 when MTO amalgamated the 23 regional telephone lines into one 800 telephone hotline. The

winter road condition, road closure and construction information were each sent and independently displayed on the MTO website, with text and graphical displays, as well as to a telephone Interactive Voice Recording (IVR) system converting the text to voice messaging for the telephone hotline. The telephone keypad was used to access information. Phase two, delivered in 2004 / 05, added voice activation to the telephone hotline enabling users to speak a highway number for the road section of interest followed by 'to / from' location details, to obtain the winter road conditions and road closure information. Phase three extended the voice activation to the construction information in 2005.

Currently the road condition, road closure and construction information are all readily available through the website and the telephone voice activation system. However, the construction information needs to be fully integrated with the road information layer, enabling the public to obtain all of the information regarding a road section in one step, without having to request the road condition and the construction information separately.

#### Interactive Voice Recording (IVR) With Enhanced Voice Recognition

IVR was developed to translate the winter road condition, road closure and construction information from the RCWIS and construction databases into both English and French. The IVR translates over 2,500 names and interchanges, along MTO's highway network, from data to voice.

As the IVR was expanded to accept voice commands from the public, 39,000 unique voice recordings covering 18 cultural accents were incorporated into the system to ensure the system would be able to respond to Ontario's culturally diverse population. The system boasts a 92% recognition of English speech and 96% for French.

#### MTO INFO

MTO INFO is the ministry's public information telephone system. MTO INFO can be reached at 1-800-268-4686, 24 hours a day, 7 days a week, 365 days a year for automated information, and during regular business hours for counsellor assistance. All information is provided in both English and French.

MTO INFO services 500,000 calls annually of which 39% (~200,000 calls) are related to winter road conditions and 29% (~150,000 calls) are related to road construction. An average of 3,000 calls are received daily, spiking to 16,000 during major winter storm conditions. The remaining 150,000 calls are general inquiries requiring counsellor assistance.

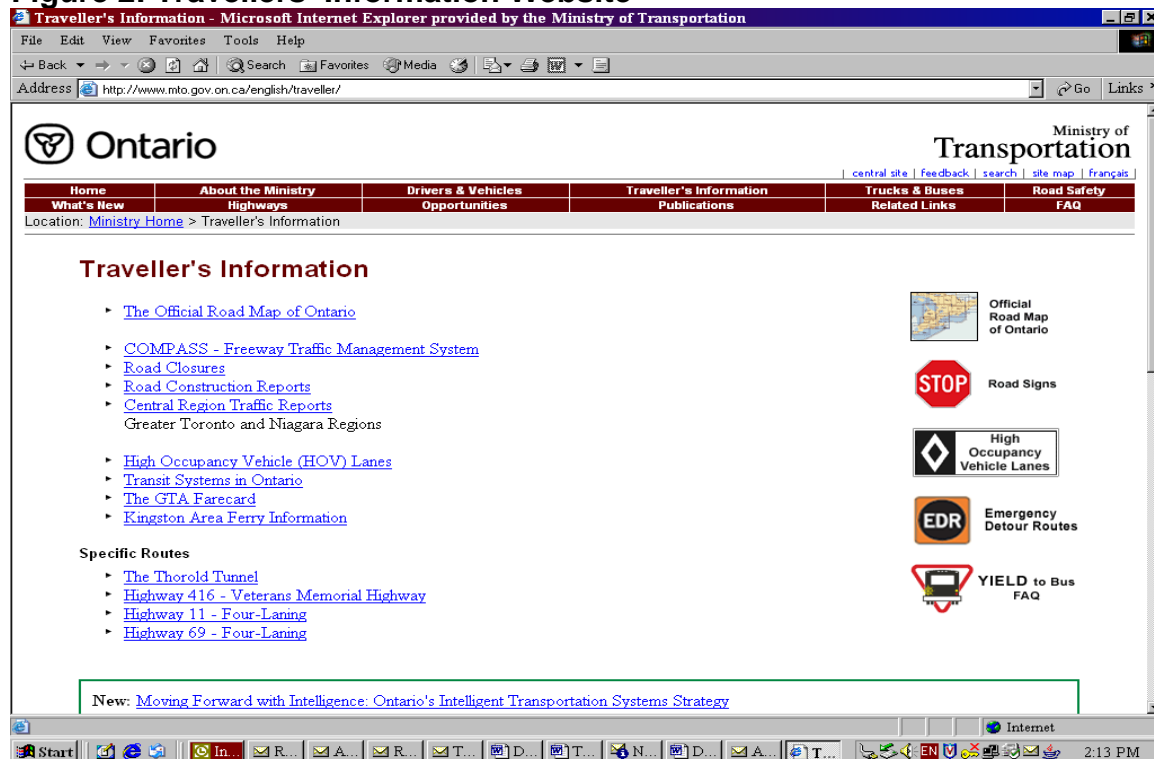
Automating the winter road conditions, road closures and construction project status through IVR greatly enhanced public access to timely and accurate information while

reducing the demand on the counsellors, particularly during significant winter storm events.

## MTO Website

MTO has an extensive website at [www.MTO.gov.on.ca](http://www.MTO.gov.on.ca) for both English and French languages. The Traveller's Information link (Figure 2) provides the public with direct access to winter road conditions, road closures and road construction reports. All information is provided in written and graphical formats.

**Figure 2: Travellers' Information Website**

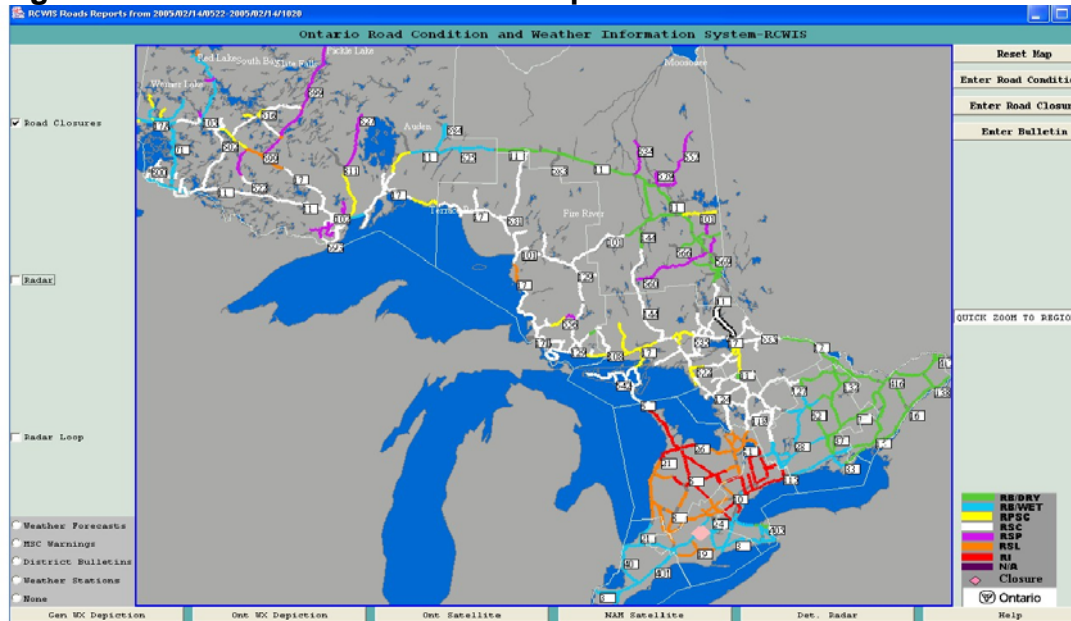


## **Road Condition Weather Information System (RCWIS)**

MTO's Maintenance Office retains a private sector company to provide the Road Condition Weather Information System (RCWIS) to manage the road condition information and produce winter forecasts for all of Ontario's climatic zones. RCWIS is a web-based system that is accessible to each of the nine strategically located MTO communications centres across the province, and is operational 24/7 from October 1<sup>st</sup> to April 30<sup>th</sup>. Patrollers out on the road, monitor highway conditions and report road conditions and road closures to the communications centres five times a day and when conditions change. The Ontario Provincial Police (OPP) also contact the MTO communications centres with road closures as appropriate.

The communications centre operator enters the road condition and road closure data into the RCWIS database. The information is sent to the MTO Website where the public can view the road conditions on line in either a tabular or map based format (see Figure 3). The information is also forwarded to the Interactive Voice Recording System (IVR) where it is converted to voice messaging for the public to access via the MTO telephone hotline. Information is transferred from RCWIS to the MTO Website and IVR every 15 minutes ensuring that the public always has access to the most current road condition and road closure information available.

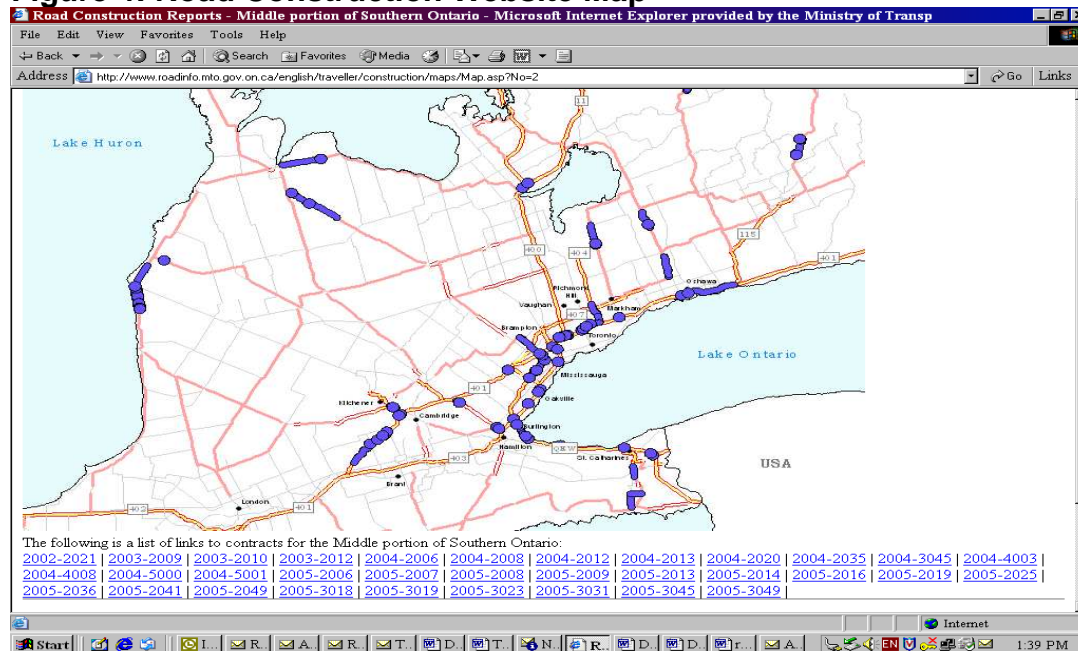
**Figure 3: RCWIS Road Conditions Map**



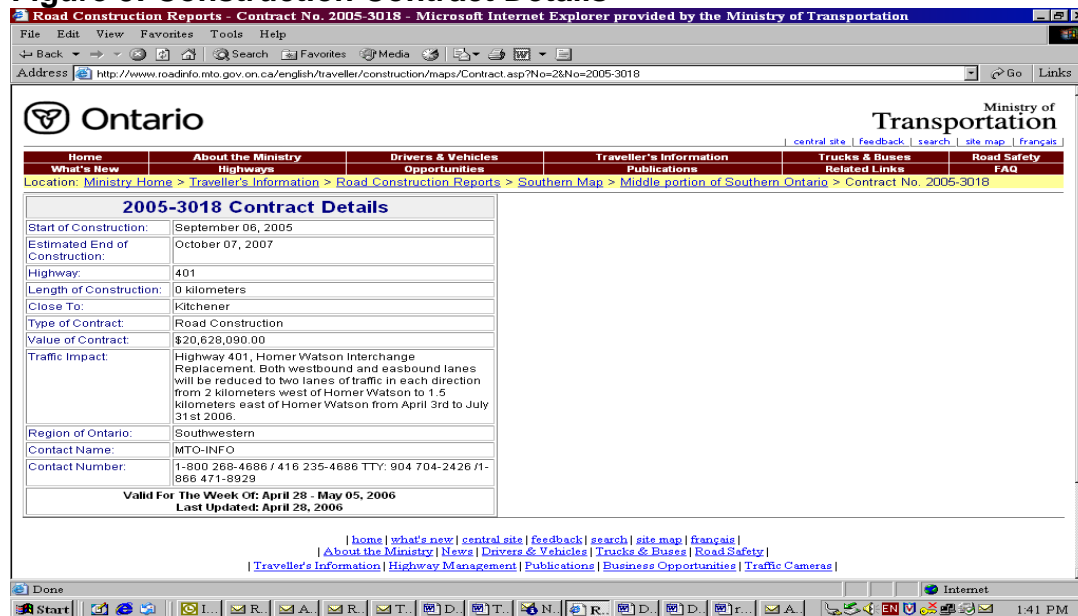
### Road Construction Reports

MTO's Regional Contracts Offices enter construction project status and lane closure information into a highway construction information database on a weekly basis, along with updates as necessary. This system is operational throughout the year and is fed to the MTO Website and the IVR system for public access. Figure 4 below illustrates one of the map areas for Southern Ontario. The public can click on any dot representing where the construction work is taking place on the highway network, or click on the construction contract number, to obtain the contract details shown in Figure 5.

**Figure 4: Road Construction Website Map**



**Figure 5: Construction Contract Details**



**Benefits**

TRIP has greatly enhanced MTO's customer service to the public while reducing operating costs.



Previously the winter road conditions and road closure information was entered into RCWIS, re-keyed into the website and finally voice recorded at each of the local offices across the province. This process took four to six hours. The automation of this data transfer and voice recording updates the information every 15 minutes, significantly increasing the timeliness and accuracy of the data while reducing staff time.

Centralized and automated services have eliminated discrepancies by providing standardized reporting, quality and timeliness of information throughout the province. Consistent quality service is now provided in both English and French. This is an increase in French service levels of 60%.

The increase in self-serve access to MTO road condition information has reduced calls to the counsellors and call times have decreased from an average of 4.5 minutes per call to 2 minutes. Callers rarely experience busy signals as the system manages 99% of the calls. Public response to the system has been very positive with over 95% of callers rating the service as good or very good. Call centre complaints regarding road information have decreased, telephone system operational costs have decreased and counsellor demand has decreased.

It is expected that the system implementation cost of \$470,000 will pay for itself in 3.5 years.

### **Next Steps**

TRIP has been built to enable continuous improvement in technology, integration and expansion to other public service information systems.

The RCWIS project team continues to evaluate new technology to further enhance the timeliness and quality of the road condition data. Video cameras used at Road Weather Information System (RWIS) stations and remote sensors are being tested to automatically identify the road condition from the electronic images. Once operational, this data can be transferred in real time to RCWIS and TRIP. MTO is developing electronic patrol diaries that use Automatic Vehicle Location (AVL) technology plus a new road condition software module to enable road patrollers to enter road conditions on the fly and have the location and road condition information automatically uploaded, in real time, to RCWIS, and then to TRIP.

The construction road information will be integrated directly with the winter road condition information so the public can access all of the information for the road in question, in one layer on the website maps and tables, and in one stream on the MTO INFO hotline.

MTO has ensured that the system is expandable for additional applications such as boarder crossing information and future 511 services. The system functionality can also be used to assist other government agencies in effectively providing information to the public.

## **Summary**

The Ministry of Transportation has automated the flow of winter road condition and road closure information from the source to the public enabling quick and easy access to information for trip planning through The Travellers' Road Information Portal (TRIP). Highway construction project information has also been connected to the TRIP system providing one stop shopping for all road condition information on the provincial highway network either through the MTO website or through the MTO INFO telephone hotline.

The timeliness and accuracy of the information available to the public has been greatly enhanced while demands on staff resource have been reduced. Customer feedback has been overwhelming with over 95% of respondents ranking the system as good or very good.

MTO will continue to pursue technological solutions to automate the road condition data capture to feed RCWIS and TRIP. MTO is working to integrate the RCWIS and the construction information to further streamline TRIP and enhance public ease of use. MTO will also assess opportunities to incorporate new systems to further benefit the public such as border crossing information and 511 systems.

Advances such as TRIP enables the public to easily undertake route planning initiatives maximizing the safety and mobility of all Ontario's travellers.