

# NORTH/WEST PASSAGE



April 2020

DOT Traveler Information Website Crowdsourcing Practices

Project 14.4 – Final

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## 1. INTRODUCTION

The North/West Passage (NWP) pooled fund program focuses on cross-border intelligent transportation systems (ITS) coordination along the I-90 and I-94 corridors through the states of Washington, Idaho, Montana, Wyoming, North Dakota, South Dakota, and Minnesota, as illustrated in Figure 1.



Figure 1: North/West Passage Members

Some state Departments of Transportation (DOT) traveler information websites use crowdsourced data to convey information for road weather conditions, traffic, or incidents, but there are challenges in validating the reports.

Crowdsourcing, as defined by the [Federal Highway Administration \(FHWA\) Every Day Counts-5: Crowdsourcing for Operations](#), turns transportation system users into real-time sensors on system performance by providing low-cost, high-quality data on traffic operations, roadway conditions, and travel platforms. Crowdsourcing enables agency staff to cost-effectively apply proactive strategies to make decisions that lead to safer and more reliable travel.

**This report examines the crowdsourcing practices of several agencies to understand practices around managing crowdsourced data from third-party providers, citizen reporting, and social media on DOT traveler information websites.**

The report is based on interviews and information gathered from the following state DOTs. It is important to note that there are many other states that may utilize crowdsourced data. This report is not meant to be comprehensive, but rather, highlight several crowdsourcing practices focused on traveler information as examples.

- Arizona Department of Transportation (ADOT)
- Arkansas Department of Transportation (ARDOT)
- Delaware Department of Transportation (DelDOT)
- Idaho Transportation Department (ITD)
- Iowa Department of Transportation (Iowa DOT)
- Minnesota Department of Transportation (MnDOT)
- Wyoming Department of Transportation (WYDOT)

Sections of this report include:

- [2. Project Approach](#) – Describes the project tasks to complete this project.
- [3. FHWA Every Day Counts-5 \(EDC-5\): Crowdsourcing for Operations](#) – Provides a high level summary of the EDC-5 Crowdsourcing for Operations effort.
- [4. Key Findings](#) – Highlights key crowdsourcing practices and findings from the seven states interviewed for this project.
- [5. Summary](#) – Presents an overall summary from the key findings.

## 2. PROJECT APPROACH

Three tasks were completed for this project to provide North/West Passage member agencies with an understanding around crowdsourcing practices from third-party providers, citizen reporting, and social media on their traveler information website.

The first task focused on identifying DOTs that utilize crowdsourcing to support traveler information. DOTs were identified by reviewing traveler information websites, coordinating with the EDC-5 Crowdsourcing for Operations program, and gathering input from the North/West Passage members. The outcome was a list of states and a brief description of the crowdsourcing practices they utilize, categorized by their approach – third-party provider, citizen reporting, or social media.

Based on the list, select states were chosen to interview and gather additional information about how data is being managed. The interviews focused on gathering the following information:

- Use of crowdsourced data for traveler information
- Validation of data
- Presentation to travelers
- Lessons learned in managing data quality
- Unique issues with using crowdsourced data

The last task produced this document presenting the information gathered from the interviews.

### 3. FHWA EVERY DAY COUNTS-5: CROWDSOURCING FOR OPERATIONS

As this project began, the North/West Passage states became aware of an effort led by the FHWA: [EDC-5 Program on Crowdsourcing for Operations](#). See Figure 2 for a screenshot of the program website. This program is focused on eight crowdsourcing for operation application areas (traveler information, incident management, arterial traffic management, freeway traffic management, road weather management, work zone management, performance monitoring and reporting, and maintenance). In order to not duplicate efforts, coordination with the program occurred throughout the duration of this project. However, this North/West Passage project limited its use to the areas of traveler information and road weather management if it applied to traveler information. Figure 3, on the following page, provides sample crowdsourcing information for traveler information and road weather management gathered by EDC-5.

The three common techniques for crowdsourcing data for operations that EDC-5 focused on included:

- **Extracted from social media:** Monitoring or scraping information from social media apps like Twitter, Facebook, or Instagram
- **Contracted from third-party providers:** Data passively and actively collected from individuals and packaged by vendors for resale
- **Collected from specially developed apps:** Apps or other tools used to gather information from individuals, where citizen reporting would be categorized

EDC-5 Crowdsourcing for Operations hosted a peer exchange in early December 2019, that was focused on verifying and filtering free crowdsourced data. Nine state DOTs and one tollway participated in the peer exchange and a summary of the gathering was presented to the North/West Passage Steering Committee in January 2020. The peer exchange featured presentations as well as breakout discussions on Waze interface requirements for real-time operator use, initiating and considering continuous validation of crowdsourced data, and strategies for archiving Waze to improve planning and operations. A peer exchange summary was prepared and will be available on the EDC-5 Crowdsourcing for Operations web page.

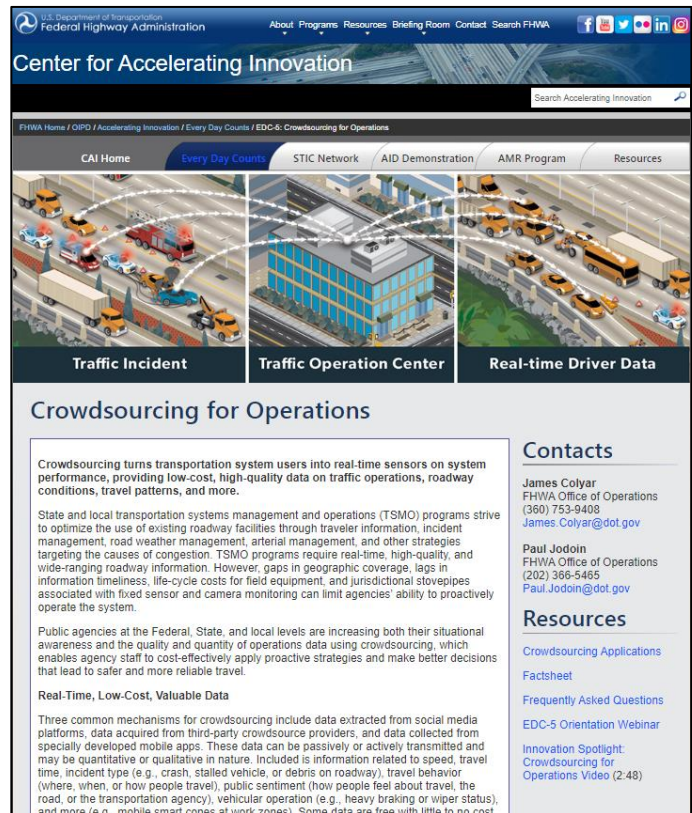


Figure 2: Screenshot (2/12/20) of FHWA's EDC-5 Crowdsourcing for Operations Website

Application Area	What (Application)	Who (Organization)	Where (Location)	Data Source	Brief Description/Benefits
Traveler Information	511 and DMS travel time posts	Michigan Department of Transportation (MDOT)	Statewide	Waze	Crowdsourced data received at traffic operations centers (TOC) is used to update an interactive 511 website, "Mi Drive," and post travel times on dynamic message signs. Items viewed in Mi Drive can be shared on social media platforms (Twitter and Facebook).
Traveler Information	Online 511 information	Oregon Department of Transportation (ODOT)	Statewide	Waze, HERE, ESRI	HERE data is used to validate traffic management sensors for increased accuracy. ODOT plans to eventually create events automatically from Waze data to increase the speed at which traffic incident data is updated on their "TripCheck" traveler information website.
Traveler Information	Online and phone-based 511 information	Georgia Department of Transportation (GDOT)	Statewide	Waze	GDOT partnered with Waze in July 2016 to support the 511 traveler information system. Through this partnership, Waze events have been integrated into GDOT's web-based traffic map.
Traveler Information	Online 511 information	Iowa Department of Transportation (IDOT)	Statewide	Waze	IDOT contracts with Waze to add events to the 511 traveler information system. Users of the system can select a "Waze events" layer to view reported Waze data directly from the Iowa DOT website.
Traveler Information	Online 511 information	Pennsylvania Department of Transportation (PennDOT)	Statewide	Waze	PennDOT uses both crowdsourced and traditional data sources to populate its 511 information website "511PA." This data also powers an emergency text alerting system, "511PA Connect," for delays greater than four hours. Crowdsourced data improves the speed, coverage, and reliability of both data products.
Traveler Information	Online 511 information	Metropolitan Transportation Commission (MTC)	San Francisco	Waze	The MTC provides live traffic monitoring, trip planning, and other 511 services on its website "511.org." By using crowdsourced data, MTC can cover a wider area and provide updates more rapidly to these services.
Traveler Information	Mobile app based 511 information	Delaware Department of Transportation (DelDOT)	Statewide	Waze	DelDOT provides a free mobile app that includes a suite of 511 services including a travel map, weather advisories, and real-time public transit monitoring. Without the use of crowdsourced data, it would not be feasible to provide real-time updates for many of these features.

Application Area	What (Application)	Who (Organization)	Where (Location)	Data Source	Brief Description/Benefits
Road Weather Management	Citizen Reporter Program	Utah Department of Transportation (UDOT)	Statewide	In-house mobile app	The UDOT Citizen Reporter Program provides a consistent way for volunteers to report weather and road conditions (including incidents) to UDOT. Unique to this program is the training that citizen reporters receive and an automated tool to balance citizen reports with meteorological data. This program created over 1800 reports during the 2013-2014 winter season, and sampling of the crowdsourced data has found it to be over 99% accurate.
Road Weather Management	Rapid weather and road condition detection	KYTC	Statewide	Waze, HERE	KYTC combines crowdsourced data with TMC data and external datasets to better manage and report the treatment of roadways under snow and ice conditions. The use of Waze data in March 2015 enabled KYTC to quickly dispatch trucks to a sudden storm that would have taken significantly longer to detect and respond to otherwise.
Road Weather Management	Road condition updates in extreme weather conditions	South Carolina Department of Transportation (SCDOT)	Statewide	Waze, ESRI	During Hurricane Florence, SCDOT used Waze data to update weather-related road conditions. This data was bolstered by 350 volunteer map editors that were dedicated solely to hurricane related road updates. SCDOT used this data to identify flooded roads and to update public road condition information far more quickly than it might have otherwise.

Figure 3: Sample Crowdsourcing for Operations Applications (Traveler Information and Road Weather Management) (Source: [EDC-5 Crowdsourcing for Operations: Crowdsourcing Applications](#))

In addition, EDC-5 will facilitate a workshop during Summer 2020 for the North/West Passage members focusing on three to four crowdsourcing topics.

## 4. KEY FINDINGS

This section highlights crowdsourcing practices that were gathered through phone interviews with seven states. The findings are presented according to the three overall approaches to crowdsourcing: third-party providers, citizen reporting, and social media. As stated previously, this project was not meant to be comprehensive, but rather, highlight several crowdsourcing practices as examples.

### 4.1 Third-Party Providers

Crowdsourced data from third-party providers includes information that has been passively or actively gathered and vetted for reuse. This information may be purchased by a DOT and presented on a state traveler information website through an agreement with the provider. Currently, the most common third-party providers are Google and Waze. Agencies who choose to supplement their data with third-party data may opt to use one or more providers.

#### Google

Iowa DOT, ITD, MnDOT, and ARDOT all use the [Google traffic layer](#) to convey traffic speeds on their traveler information websites. Google compiles this information using data gathered from traffic sensors and crowdsourced data gathered anonymously via its mobile navigation app. When location services are enabled by the user, speed and location data are anonymously transmitted to Google. Data quality is achieved by the sheer volume of data and by comparisons with historical data that has been accumulated over time.<sup>1</sup> Iowa DOT staff have informally compared speed data from Google and other providers by observing incidents in their TMC and noting when the incidents would appear on each of the third-party services. Based on their comparison, they chose to continue using data from Google as the most reliable means for reporting speeds.

In addition to using the Google traffic layer to provide speeds, the Condition Acquisition and Reporting System (CARS) used by Iowa, Idaho, and Minnesota developed an approach to also display traffic delay associated with various events on the departments' traveler information websites. Although there was a cost associated with the additional development in CARS, this has been a reliable feature for travelers to understand traffic impacts.

#### Waze

Iowa DOT uses [Waze](#) information on their traveler information website. Waze is owned by Google and provides turn-by-turn navigation and travel times. As illustrated in Figure 4, Waze reports on Iowa DOT's traveler information website are labeled as citizen updates, reported by Waze, on their own layer and in the map legend. Waze has been a valuable resource to Iowa DOT for both traveler information and operations in more populated areas. It may not be as valuable, however, in less populated areas where there are fewer Waze reports available.

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<sup>1</sup> "The bright side of sitting in traffic: Crowdsourcing road congestion data." Official Google Blog. Aug. 25, 2009. <https://googleblog.blogspot.com/2009/08/bright-side-of-sitting-in-traffic.html>

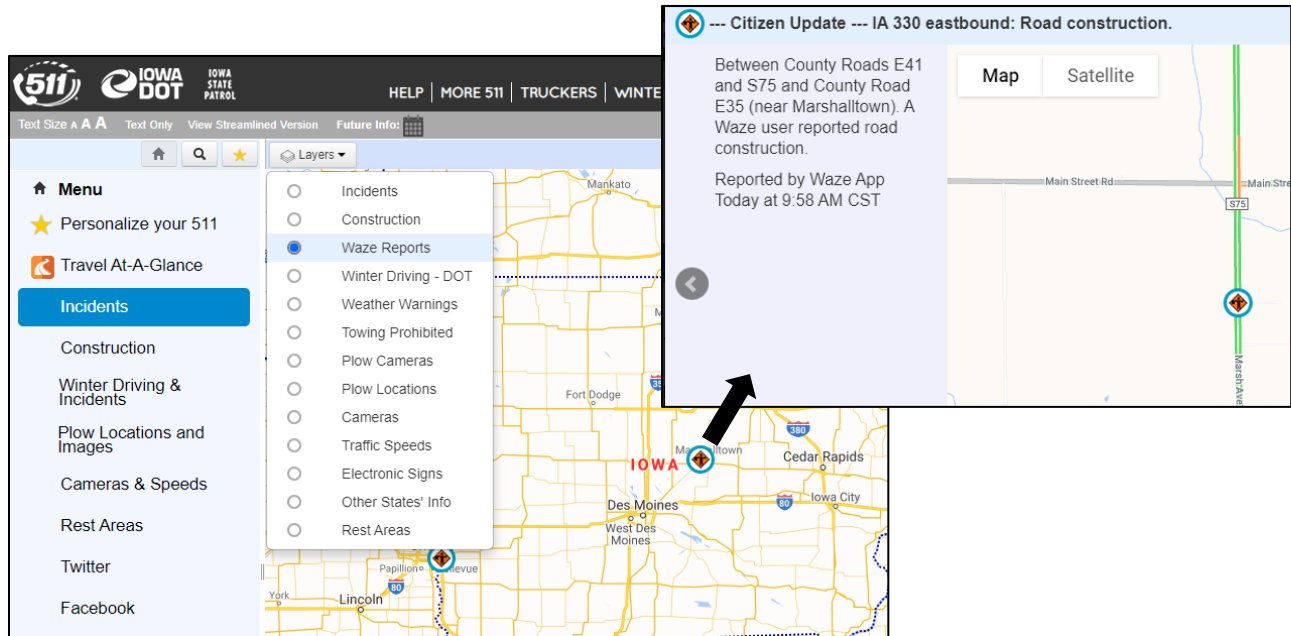


Figure 4: Screenshots (2/12/20) of Waze display on Iowa DOT’s traveler information website

Similar to Iowa DOT, **DeIDOT** displays Waze data in its own layer on the DeIDOT website and traveler information app, so users are clear whether the information comes from Waze or other sources. Data is filtered by age of incident to ensure quality. DeIDOT is unique in that their transportation system has significant detector coverage throughout the state which provides data for validation of citizen reports. DeIDOT is confident in the DOT detector data collected, however, the accuracy of third-party data is not always clear. There is also a risk in a private company discontinuing service, therefore having another source of data such as the detector data is beneficial to DeIDOT.

**ARDOT** uses Waze informally for traffic operations. Staff follow Waze internally and verify Waze incidents using ARDOT camera views. Once verified by staff, ARDOT may post active incidents initially identified via Waze on their traveler information website.

Although **ITD** does not currently integrate Waze information into their traveler information website, they plan to in the future. It is important to ITD to not overcrowd the map display on their traveler information website, so filtering the data and grouping repeat events will be important as Waze data is integrated. Attributing the information as citizen reports from Waze is also important to ITD as a statement of potential data quality and as a way of clarifying that the data did not originate from ITD.



## 4.2 Citizen Reporting

Citizen reporting for traveler information is information obtained from someone who made an intentional effort to contact the DOT with a citizen reporting program and provide, for example, a road condition report. Collecting information from users may occur through an app, website, or phone call to a traffic management center (TMC). Depending on the program, citizens may report on a variety of roadway conditions.

**WYDOT** has used citizen reporting since 2006 but recently stopped accepting volunteers since the number of new volunteers has dropped off dramatically. Though they are no longer promoting their Enhanced Citizen-Assisted Report (ECAR) program, they will continue to accept information from their existing trained volunteers.

WYDOT's mobile app for traveler information provides citizens with the ability to submit an image when they are not driving. See Figure 5 for a screenshot of the mobile app with the option to select "Submit an Image". Citizens are required to use location services when submitting photos in order for WYDOT to verify each submittal with the location, date, and time using photo metadata. Travelers may not know if they have changed roads, so the metadata allows WYDOT to quickly and accurately verify locations. WYDOT may further verify the photos with agency cameras and field staff. WYDOT may discard the photo if it is not valid, use the photo internally, or post validated photos on the incident layer of WYDOT's traveler information map as a camera icon. Citizens mostly use the "Submit an Image" option during inclement weather or stopped traffic. The ability for citizens to submit photos in a rural environment is helpful, however in an urban environment it may clutter the map and be a burden for staff to validate the increased number of photos received.

**ITD** implemented a citizen road condition reporting system in 2013 that was modeled after the WYDOT program and allowed authorized citizens to report road conditions through a web interface. ITD discontinued the citizen reporting program because there were too few volunteers who enrolled and there were challenges with recruiting additional volunteers. ITD more recently provided travelers with the option to confirm or dispute some information such as road or lane closures or reductions and incidents. However, ITD removed this capability due to issues with ITD validated reports being disputed by travelers. For example, an ITD report might indicate that a segment of road is snow covered. Meanwhile, a citizen might view a camera in the vicinity and report the road is dry, while just outside view of the camera, there are wintery conditions. Disconnects between ITD information and travelers made it difficult to control quality and maintain trust in the quality of other information reported.

**MnDOT** and **Iowa DOT** launched similar citizen reporting efforts in 2014 to enhance road reports, especially in rural areas. The programs only allowed citizens to report from a desktop application so, by the time entries were occurring the report had often changed. The programs were both discontinued due



Figure 5: Screenshot (2/12/20) of WYDOT's road condition and traffic information app

to the delay in reporting conditions and the monthly fee associated with the application from their 511 vendor.

**DeIDOT** collects roadway conditions from citizens in the “report an issue” function of their traveler information app. This includes conditions that should be addressed immediately, such as traffic signal malfunctions, sign damage, debris in the roadway, or an improperly set up work zone. DeIDOT collects and geolocates the information and shares relevant reports with their districts.

**ARDOT** has focused their citizen reporting efforts on incorporating reporting from other agencies by partnering with some local governments on a pilot project to allow cities to post their own traveler information on ARDOT’s traveler information website. For example, the City of Rogers posts accidents and winter weather road conditions for their city streets and the City of Conway posts winter weather road conditions for their city streets. The logo of the posting agency is included with their reports. Other cities and counties have expressed interest in exploring a similar partnership.

### 4.3 Social Media

Increasingly states are providing information to the public through social media accounts such as Twitter and Facebook. Some agencies are also actively monitoring and engaging in social media exchanges to identify transportation related information.

Since 2009, **MnDOT** has had a Twitter feed that automatically grabs and posts events from their traveler information reporting system. Additionally, closures, construction, and newsworthy events are posted through the MnDOT Twitter account using a manual process. The number of MnDOT’s Twitter impressions continues to increase each year as shown in Figure 6. MnDOT’s

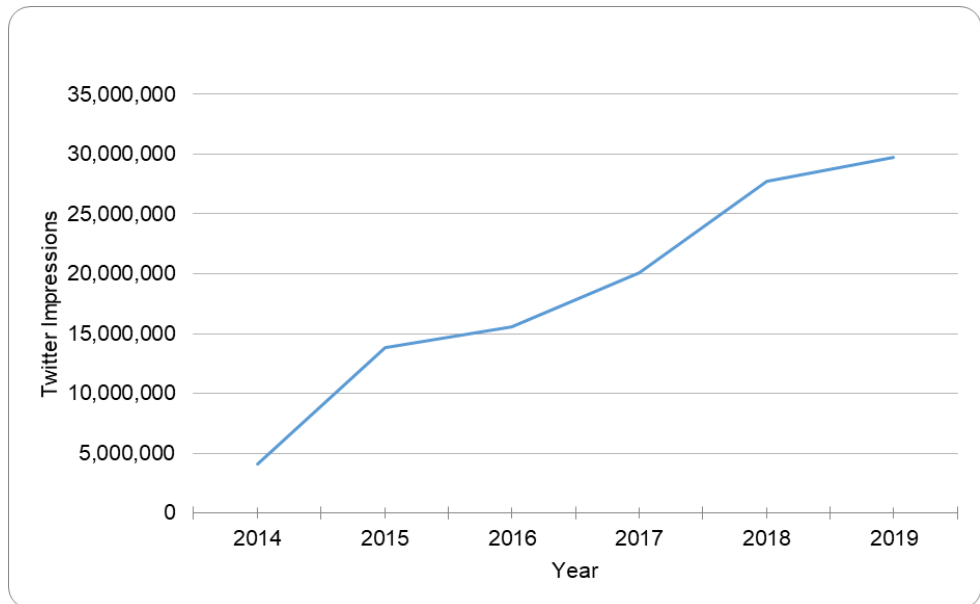


Figure 6: @mndottraffic Twitter Impressions by Year

Central Office also updates a Facebook page that communications staff use to share closures and construction information. Real-time traveler information is not posted by MnDOT through Facebook.

**ITD** utilizes a Twitter approach similar to that of Minnesota including automatically capturing and posting events from the ITD traveler information system and manually posting closures, construction, and incidents.

**ARDOT** actively posts on Twitter but manages their tweets through Hootsuite, a social media management platform that allows them to monitor other hashtags and schedule tweets in advance to be more

intentional about posting traveler information. For example, ARDOT can schedule a tweet ahead of time to post the day a construction project begins or on a day that a high traffic event is scheduled. ARDOT has recently added staff to monitor their Twitter account 24/7 and tweet about issues such as lane closures and incidents as they become aware of them.

Iowa DOT uses geofences to generate an automatic feed from their traveler information reporting system to Twitter. Traffic alerts with links to actual events via Twitter are available statewide, by metro area, or by region. Iowa DOT has statewide and regional Facebook pages that receive automatic posts that include links to actual events. See Figure 7. Iowa DOT uses Meltwater to manage social media engagement 24/7 through their Strategic Communications social media team during business hours and TMC staff outside of business hours. Manual traveler information posts are also frequently planned and scheduled, depending on content.

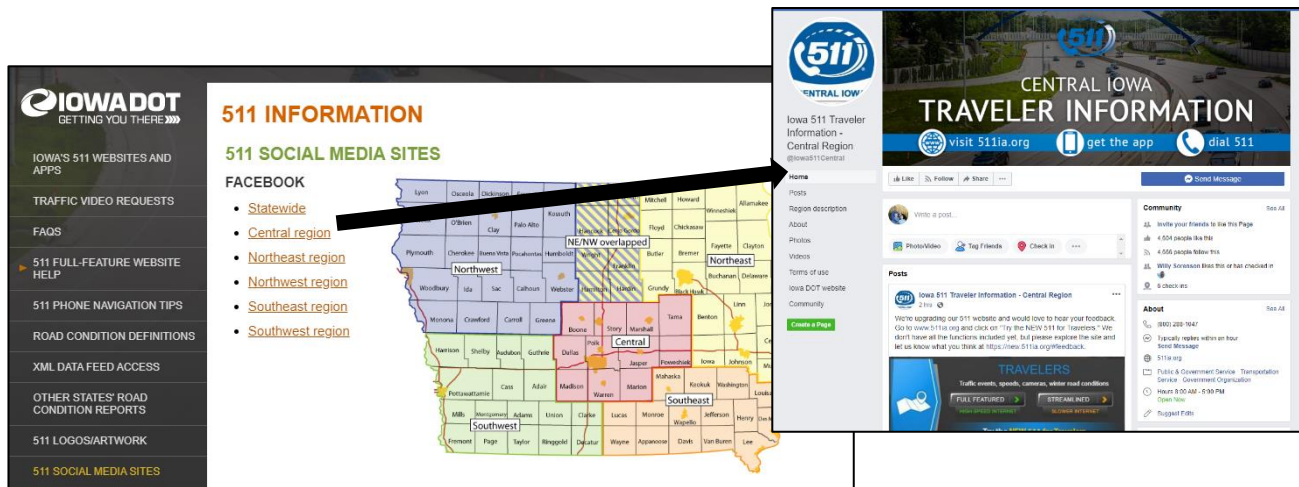


Figure 7: Screenshot (2/12/20) of Iowa DOT's Facebook page

ADOT began using Twitter to communicate traveler information in 2008. The importance of this social media outlet became evident in 2012 when the department's traveler information website became overloaded and crashed, leaving Twitter as one of the only ways for ADOT to communicate traveler information. Currently, ADOT has 240,000 Twitter and nearly 100,000 Facebook followers and the department uses two-way social media communication to exchange information with the public. Five (5) Public Information Officers (PIOs) monitor ADOT's social media accounts 24/7 by reviewing and responding to posts and direct messages. ADOT validates social media information by viewing the location on traffic cameras, contacting a trooper in the area for urgent issues, sending an incident response unit to verify the information between 5 am and 8 pm, or requesting ADOT Maintenance staff to check on the situation. Most social media posts are then forwarded to Traffic Operations for disbursement on the traveler information website. An example of ADOT's tweets on traveler information is shown in Figure 8.

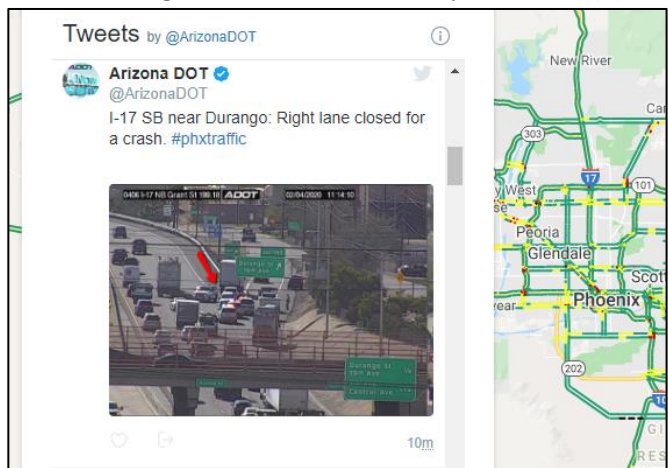


Figure 8: Screenshot of ADOT Tweet

## 5. SUMMARY

State DOTs strive to provide comprehensive and accurate traveler information with enough detail to allow motorists to make sound travel decisions. Crowdsourcing can be an important part of providing that information, but it is difficult to know how to effectively gather and verify information from other sources. Following are key highlights from the three areas of crowdsourcing and quality control that this project gathered information on.

### Third-Party Providers

- Data quality for the Google traffic layer used by Iowa DOT, ITD, MnDOT and ARDOT is achieved through the volume of data gathered by Google and then compared with historical data accumulated over time.
- Waze information is integrated in Iowa DOT and DeIDOT's traveler information websites as its own layer on the map and it is labeled as Waze data, both to acknowledge and clarify the data source and associated quality.
- Some states informally utilize Waze data internally to identify incidents and then verify the incidents with other agency resources before reporting them.
- Attributing whether an event comes from the DOT or a third-party provider is critical in displaying information.
- Filtering and grouping crowdsourced data is important to reduce duplicate reports and decrease clutter on maps, especially in urban areas.
- There is a risk that information provided by third parties could go away at any time and as such agencies should factor that risk into the overall quality of the data they provide.

### Citizen Reporting

- WYDOT, MnDOT, Iowa DOT, and ITD discontinued their citizen reporting programs because of challenges with recruiting and retaining volunteers and challenges with conflicting and outdated reports.
- WYDOT still allows citizens to submit an image of road conditions via their traveler information mobile app when they are not driving. Timeliness and accuracy of images is managed using the location, date, and time metadata attached to images by the device.
- DeIDOT collects information on roadway conditions from citizens and then geolocates and shares relevant reports with their districts.
- Through a pilot project, ARDOT incorporates information from some local government agencies on the ARDOT traveler information website.

### Social Media

- Twitter is the most commonly used social media mechanism for providing real-time traveler information.
- Many states post traveler information in an automated fashion directly from their reporting systems but do not have dedicated staff to engage in social media exchanges. Iowa DOT does engage with their social media accounts 24/7 using Strategic Communications and TMC staff and ARDOT has recently added staff to monitor their Twitter account 24/7 and tweet about issues as

they become aware of them. ADOT employs dedicated staff who actively respond to their social media accounts.

- ARDOT and Iowa DOT use social media platforms to schedule tweets in advance and assist with posting intentional and timely traveler information.

Crowdsourced data is a viable tool for agencies to enhance their ability to provide more comprehensive, timely, and accurate traveler information. It does, admittedly, come with some risks around data quality and availability, both of which can be mitigated with the strategies highlighted in this report.