

I-290 Integrated Corridor Management: High Level Concept of Operation

Revision 2

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1. Introduction

Stakeholders in the region are giving consideration to operating I-290 as an integrated corridor. While the details of this system are not solidified, the possible implications to planning and operations in the region are being considered. This document considers several high-level scenarios on I-290 that would benefit from potential Integrated Corridor Management (ICM) strategies.

ICM is described by FHWA as:

“Integrated Corridor Management combines two fundamental concepts: active management and integration. Active management involves monitoring and assessing the performance of the system and dynamically implementing actions in response to fluctuations in demand. In an ICM corridor, all individual facilities must be actively managed so that operational approaches can be altered in real-time in response to an event anywhere on the system.” ([Link](#))

In the following sections, an ICM approach is demonstrated and evaluated for the I-290 Corridor by exploring the consequences of several hypothetical high-impact incidents and events, then outlining the possible response strategies consistent with FHWA’s ICM suggestions. The document frames the potential opportunities and considers the likely operational environments. In the recommendations section, an ICM Working Group is suggested. Part of the Working Group’s mission would be to develop detailed operational scenarios and requirements to be implemented.

Before considering specific scenarios, it is important to note that the ICM process is essentially an extension of the traditional traffic and incident management processes that have been successful in the region to date. Our regional agencies implement traffic management strategies rapidly where existing equipment is in place – typically on an agency-by-agency basis. ICM strategies in the region will expand these principles to consider interagency operations more thoroughly on corridors throughout the region, rather than implementing these strategies locally and individually. The benefits of successful ICM implementations include reduced traffic delay and improved incident monitoring and response across the region.

2. Methodology

The next section explores six hypothetical incidents and events on the study corridor alongside possible corresponding ICM response strategies. The scenarios use the regional traffic signal inventory maintained by CMAP to highlight the potential ICM response strategies that could be implemented. The scenarios each depict likely stakeholders and feasible implementation strategies.

Note that IDOT District One, at the request of the northeastern Illinois counties, is currently evaluating a Regional Arterial Traffic Management Center concept. This TMC project aims to tie Expressway and arterial operations together, working toward an eventual plan for full-service integrated operations that interconnects Expressways, arterials, transit, parking, and traveler information.

The anticipated IDOT operational scenarios for I-290 via the Eisenhower Expressway Project have focused on multiple Active Traffic Management strategies specific to I-290 itself. The Operational Scenarios outlined below demonstrate the types of strategies that support arterial operations near I-

290. Operational roles and responsibilities are estimated for the area's expressway and tollway operators, IDOT arterials, municipal and county arterials, and possible transit operational roles.

In the recommendations section, steps to expand the Concept of Operations and define roles and responsibilities that will drive ITS project development are listed.

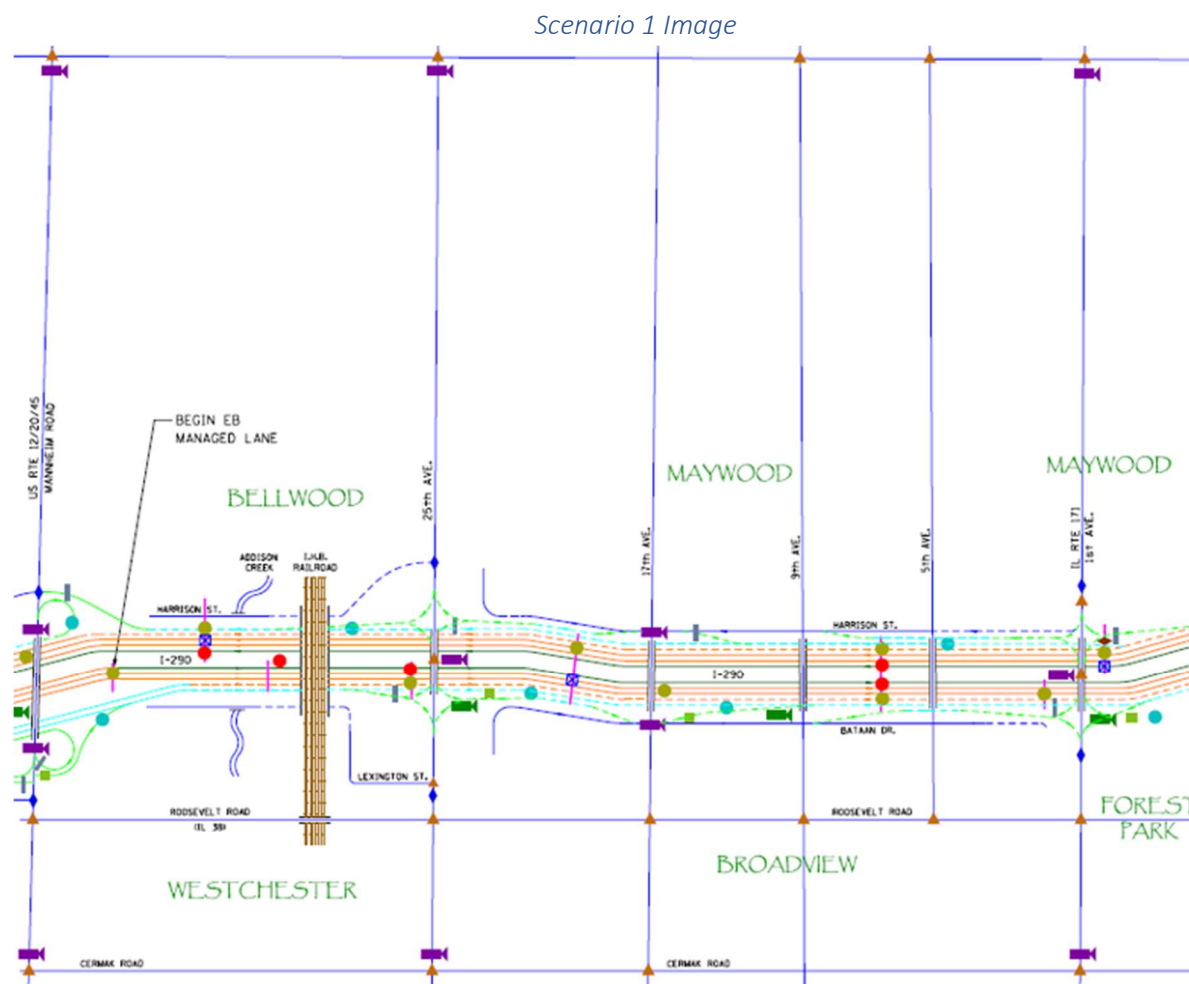
3. Operational Scenarios

Six scenarios are explored in the following subsections:

1. I-290 Eastbound Closure of All Lanes
2. I-290 Eastbound Closure of Two Lanes
3. I-290 Westbound Closure of Three Lanes
4. I-290 Short Term Closure for Head of State
5. Wednesday Before Thanksgiving (Heavy Regional Traffic)
6. White Sox World Series Celebration (Heavy Traffic, Regional Closures)

3.1 Scenario 1: I-290 Eastbound Closure of All Lanes

There is a severe crash on I-290 that blocks all eastbound lanes at 7:45 AM on a typical weekday. The crash occurred downstream (east) of the exit ramp to 1st Avenue. In the Scenario 1 image below, 1st Avenue is the furthest east of the North-South arterials.



Congestion begins to accumulate upstream of the crash and a plan is needed to redirect inbound vehicles on their path to downtown Chicago to temporary detour routes, which could include North. From start to finish, it is estimated that all EB lanes will be closed for approximately 75 minutes, with partial lane closures lasting for an additional three hours – combining for 4.25 hours of full or partial EB closure.

Avenue, Roosevelt Road, and Cermak Road (these are the three East-West arterials shown in the Scenario 1 image above, listed in order from North to South).

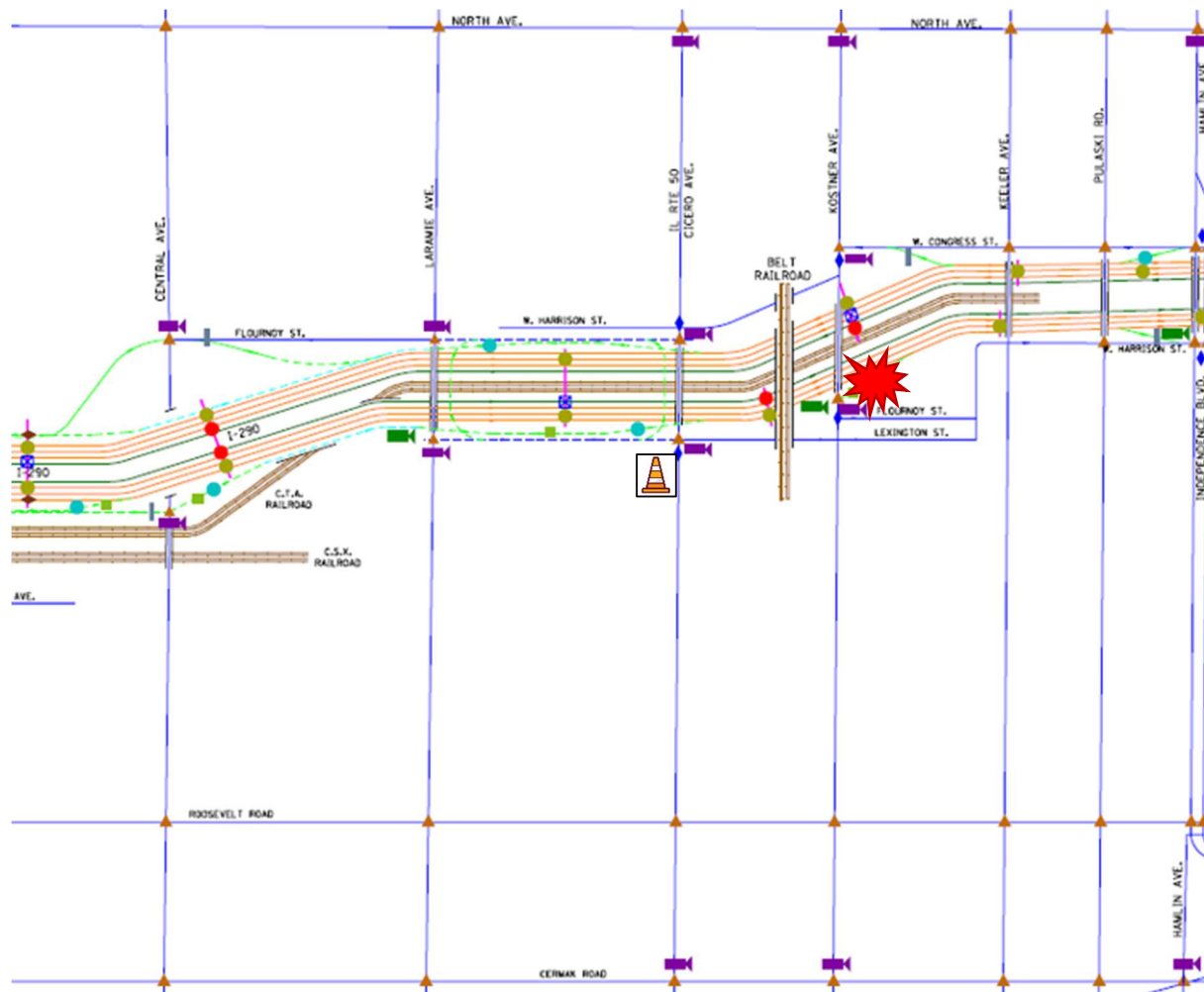
The crash adversely impacts roadway elements and operations across multiple agencies. Some likely impacts are summarized below, with the impacted agencies indicated:

- Eastbound expressway capacity reduced to zero, all vehicles must exit (*IDOT*).
- Increased vehicular demand on local arterials will cause excess delay along these signalized corridors. To accommodate the high volume of eastbound vehicles traveling to Chicago, special-event signal timing plans will likely need to be implemented along these corridors: North, Roosevelt, Cermak, Mannheim, 25th Avenue, and 17th Avenue. (*IDOT, potentially local agency*)
- The agencies and TMCs enacting any special-event plans include IDOT TSC, Illinois Tollway TIMS, and the local agencies of Maywood, Broadview, Forest Park, and Bellwood.
- Coordination with local transit agencies is required: buses using these arterials will encounter unexpected delays and detours, while the train system is likely to experience higher ridership as travelers who would typically use the expressway decide to train into the city instead (*Pace, CTA*).

3.2 Scenario 2: I-290 Eastbound Closure of Two Lanes

There is a crash on I-290 at Kostner Avenue that causes two eastbound lanes to close at 8:30 PM on a typical weekday. There is also ongoing construction in the area. The exit ramp to Cicero Avenue, which would be the first EB exit upstream of the crash, is temporarily closed. The arterial traffic signals affiliated with the expressway entrances and exits are also under construction, likely reducing the capacity along some arterials in the area that could act as detour routes.

Scenario 2 Image



Eastbound traffic backing up on I-290 are encouraged to exit at Central Avenue about 1 mile west of the ramp closure and 1.5 miles from the crash. After taking the exit ramp to Central Avenue, a potential detour could include Roosevelt Road and then getting back on I-290 at the entrance ramp at Kostner Avenue past the incident.

The crash adversely impacts roadway elements and operations across multiple agencies. Some likely impacts are summarized below, with the impacted agencies indicated:

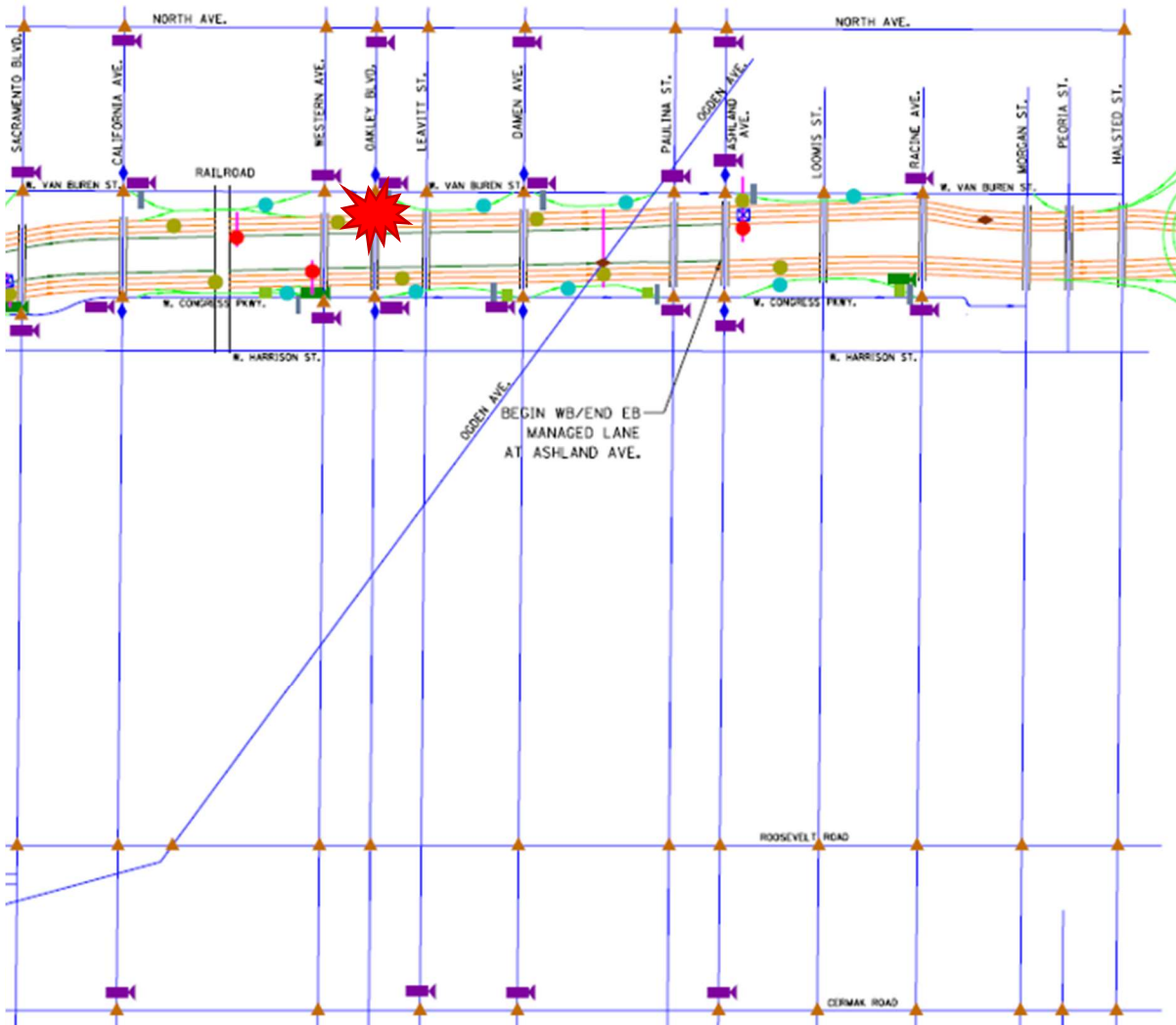
- Eastbound expressway capacity partially reduced, with heavy congestion upstream (*IDOT*).

- Increased demand on local arterials will cause excess delay along these signalized corridors. To accommodate the high volume of eastbound vehicles traveling to Chicago, special-event signal timing plans will likely need to be implemented along these corridors: North, Roosevelt, Cermak, Mannheim, 25th Avenue, and 17th Avenue. (*IDOT, CDOT east of Cicero*)
- The agencies and TMCs enacting any special-event plans include IDOT TSC, Illinois Tollway TIMS, and the responsible City of Chicago agencies (*CDOT, DEO, OEMC*).
- Special consideration must be given to the construction workers and agencies performing the work, and these will depend on the status and scope of the project and closures, among other factors
- Coordination with local transit agencies is not required for this scenario. Local transit is not expected to be heavily affected by the increase in vehicles on local roads since this is an off-peak crash.

3.3 Scenario 3: I-290 Westbound Closure (of Three Lanes)

There is a crash on I-290 near Western Avenue that causes three westbound I-290 lanes to close at 2:45 PM on a typical weekday. This occurs during the school year and local schools all release students at 2:45 PM, which causes a significant reduction in the available capacity along local arterials.

Scenario 3 Image



The crash location is in Chicago immediately upstream of the exit ramp to Western Avenue, preventing vehicles from accessing that ramp. In this scenario, the frontage roads of Van Buren and Harrison allow for efficient rerouting of almost all westbound vehicles without adding congestion around the local schools.

The crash adversely impacts roadway elements and operations across multiple agencies. Some likely impacts are summarized below, with the impacted agencies indicated:

- Westbound expressway capacity partially reduced, most vehicles rerouted to next downstream entrance (IDOT, CDOT)

- Arterial signal networks will be needed to adjust signal timings
- Increased demand at the following intersections may require a special-event signal timing adjustment to flush westbound vehicles (*IDOT, CDOT*):
 - Van Buren and Oakley
 - Harrison and Oakley
 - Van Buren and Western
 - Harrison and Western
- The agencies and TMCs enacting any special-event plans include IDOT TSC and the responsible City of Chicago agencies (*CDOT, DEO, OEMC*).
- Coordination with local transit agencies will most likely be needed since many students rely on it to get home from school, increasing ridership and pedestrians in the area (*CTA, Pace*)
- Coordination with local schools to ensure students can safely leave school and get home using any travel mode while avoiding the areas with elevated traffic volumes. (*Schools, CDOT*)

3.4 Scenario 4: I-290 Short Term Closure for Head of State

In this scenario, the President of the United States is visiting Chicago for an important event. He/she will be using I-290 to travel from O'Hare Airport to downtown Chicago and back, causing a dynamic disruption to traffic conditions that lasts two hours across the corridor, but only disrupts local conditions at a given location for five to ten minutes at a time. The large caravan of vehicles will be making the two trips both during off-peak hours, between 10AM and 1PM.

Impacts to local assets include:

- Freeway capacity partially and momentarily reduced
- Expressway capacity in both directions reduced to zero as the caravan progresses through the corridor in either direction (*IDOT, CDOT, Local Agencies, Police, Fire*).
- Increased demand on local arterials will cause excess delay along these signalized corridors. Special-event signal timing plans may be needed in the more congested areas along local arterials. However, since this is an off-peak event with brief localized impacts, these decisions will not be coordinated and are left to the individual operating agencies in the area (*CDOT, IDOT, Local Agencies*).
- The agencies and TMCs facilitating the closures and any special-event plans include IDOT TSC and the responsible City of Chicago agencies (*CDOT, DEO, OEMC*).
- Coordination with the CTA may be needed for security reasons (*CTA Blue Line from O'Hare*).

3.5 Scenario 5: Wednesday before Thanksgiving (Heavy Regional Traffic)

The Wednesday before Thanksgiving is one of the top traveling days in the US every year. This is a day-long scenario that causes extremely high volumes across I-290, the local arterials, and the transit system. This is a massive operational challenge, but the consistency from year-to-year makes the historical trends useful to consider. With these, agencies try to predict what conditions will be like throughout the day.

Typically, volumes increase significantly Wednesday evening as most people are done working and begin their travels. Using time- and location-specific historical data to make projections, combined with real-time data about the current travel and roadway conditions, the local agencies can plan ahead and then adjust in real-time to coordinate traffic and minimize delay along the corridor.

Impacts to local assets include:

- Freeway in both directions is at capacity or near capacity for most of the day (*IDOT, CDOT, ISTHA*).
- Increased demand on local arterials will cause excess delay along these signalized corridors. However, the excess demand in this scenario is not directional or specific to a small area – the entire region and all directions of travel will experience high volumes and delay. Agencies will deploy their signal timing plans best suited to heavy traffic in all locations (*IDOT, CDOT, Local agencies*).
- The agencies and TMCs monitoring the live conditions, implementing their own plans, and coordinating as necessary include IDOT TSC, Illinois Tollway TIMS, and the responsible City of Chicago agencies (*CDOT, DEO, OEMC*).
- Coordination with local transit agencies may be required (*Pace, CTA*).

3.6 Scenario 6: White Sox World Series Celebration (Heavy Inbound Traffic, Closures)

The White Sox won the World Series Championship and the celebration and parade are happening downtown Chicago in Grant Park. Up to 3 million attendees are anticipated, many of them traveling from the west suburbs of Chicago using I-290. Large crowds are expected to gather throughout downtown Chicago all morning. The parade and celebration begin at 11:00 AM will cause several roads downtown Chicago to be closed to vehicles.

Attendees are anticipated to be using I-290 eastbound from 9AM-12PM, and the public transit system is also expected to see very high inbound ridership. The event will conclude around 1PM, and westbound volumes along I-290 are expected to be elevated all afternoon as attendees return home.

Impacts to local assets include:

- Westbound expressway is at capacity or near capacity from 9AM-12PM and eastbound expressway will have elevated volumes from 1PM-4PM (*IDOT, CDOT, ISTHA*).
- Increased demand on local arterials will cause excess delay along these signalized corridors. To accommodate the high volume of vehicles traveling to Chicago, special-event signal timing plans may be needed along select arterial corridors.
- The agencies and TMCs monitoring the live conditions and coordinating as necessary include IDOT TSC, Illinois Tollway TIMS, and the responsible City of Chicago agencies (*CDOT, DEO, OEMC*).
- Coordination with local transit agencies is required: buses using these arterials will encounter unexpected delays and detours, while the train system is likely to experience higher ridership as travelers who would typically use the expressway decide to train into the city instead (*Metra, Pace, CTA*).

4. Conceptual Sequence of Operations

4.1 Potential Sequence of Operations: Scenarios 1 – 3 (Severe Incidents on I-290)

1. The incident is identified, emergency response teams and IL Tollway are notified, IL Tollway notifies affected DOTs/TMCs.
2. Assuming a regional TMC is in place (and the accompanying infrastructure) and emergency procedures for such events have been established, the procedure could be:
 - a. Real-time traffic is analyzed on Tollway and local arterials, while DMS signs warn travelers of the incident ahead.
 - b. Service providers such as Google Maps and Waze notify travelers of the incident and begin to redirect those going toward it.
 - c. Once regional TMC identifies which arterials can best accommodate the additional traffic from the Tollway, DMS signs notify travelers of the detour being implemented.
 - i. Traffic signals are adjusted to promote westbound/eastbound traffic (depending on the location of the incident).
 1. A predetermined emergency signal timing plan would likely be in place already (along with AM, PM, and off-peak plans typically in place).
 - ii. Local TMCs are notified so that local businesses, schools, and other impacted assets can plan accordingly for the changes in traffic patterns.
 1. This should also include agencies with ongoing construction projects on any impacted roadways.
 - iii. The CTA and Pace are notified so they can respond accordingly.
3. Lanes for eastbound I-290 traffic open as incident is cleared. Eventually DMS signs will stop redirecting traffic off the Tollway and traffic returns to normal.
4. Regional TMC and other agencies conduct a post implementation analysis

4.2 Potential Sequence of Operations: Scenarios 4 – 6 (Planned Closures or Congestion)

1. Upcoming planned disruptions to typical traffic conditions are “scheduled” with impacted agencies.
 - a. For scenario 4 (POTUS visit), agencies are notified of when and where the disruptions will be.
 - b. For scenarios 5 and 6 (Wednesday before Thanksgiving and White Sox World Series, respectively) historical traffic data can be studied to make projections about the upcoming events.
2. Assuming a regional TMC is in place (and the accompanying infrastructure) and emergency procedures for such events have been established, the procedure could be:
 - a. Real-time traffic is analyzed on tollway and local arterials, DMS signs can be used as needed to manage traffic on the Tollway.
 - b. Service providers such as Google Maps and Waze notify travelers of upcoming events so they can plan accordingly.
 - c. Based on the type of event and its duration, the public might be encouraged (or even incentivized) to use public transport (particularly for scenario 6 – White Sox World Series).

- d. Once regional TMC identifies which arterials can best accommodate the additionally traffic from the Tollway, DMS signs notify travelers of the detour, if one is implemented at any point.
 - i. Traffic signals are adjusted to efficiently move traffic.
 - 1. A predetermined signal timing plan would already be in place to accommodate the specific special event (in addition to AM, PM, and off-peak plans typically in place).
 - ii. Local TMCs are notified so that local businesses, schools, and other impacted assets can plan accordingly for the influx of traffic.
 - 1. This should also include agencies with ongoing construction projects on any impacted roadways.
 - iii. The CTA and Pace are notified so they can respond accordingly.
- 3. After the event, Regional TMC and other agencies conduct a post implementation analysis

5. Current Alternative recommendation for I-290

Below is the published IDOT position on alternative lane use. This remained IDOTs official position as of this submittal, per reference via https://www.eisenhowerexpressway.com/about/study_process.aspx.

"In June of 2017 a Final Environmental Impact Statement (FEIS) and a Record of Decision (ROD) was signed by the FHWA that identified the HOT 3+ & EXP & HCT Alternative (also referred to as Alternative HOT 3+) as the Selected Alternative. This alternative consisted of adding one High Occupancy Toll (HOT) 3+ lane (three or more occupants per vehicle required for non-tolled use, or one/two occupants per vehicle paying a toll) in each direction between 25th Avenue and Austin Boulevard; conversion of one existing general purpose lane in each direction west of 25th Avenue and east of Austin Boulevard to HOT 3+ use; and provisions for express bus service and a high capacity transit extension. Based on an FHWA project Cost Estimate Review in June of 2017, the construction cost of the Selected Alternative was estimated at \$3.2 billion.

As the proposed improvement is not currently included in Department's FY 2019-2024 Proposed Highway Improvement Program and continues to be one of several regional expressway corridors competing for limited available state and federal funding, the Department must now consider more sustainable solutions for addressing the reconstruction needs of this facility. Supplemental alternatives analysis and environmental studies for the I-290 corridor will be performed to evaluate additional tolling and lane management alternatives while utilizing the same general geometry and footprint as the previously identified HOT 3+ alternative. The study will develop and evaluate additional toll and congestion priced alternatives, along with the HOT 3+ alternative, with the goal of identifying a preferred alternative that meets the transportation needs while minimizing the impacts to the environment.

As with the original I-290 study, the public outreach program will be extensive and will follow the Department's Context Sensitive Solutions (CSS) policy. This policy provides an interdisciplinary approach that seeks effective, multi-modal transportation solutions by working with stakeholders to develop, build, and maintain cost effective transportation facilities that fit into and reflect the project's surroundings - its "context."

Public involvement activities will include public meetings and numerous smaller engagements with the stakeholders. All stakeholder input will be considered in shaping a sustainable solution that meets the

various transportation needs and initiatives in the corridor. A Corridor Advisory Group (CAG), like the one convened for the previous I-290 study, will be reestablished and consist of the Mayors/Presidents from communities, officials from Cook and DuPage Counties, and other transportation agencies. As before, the CAG will serve an important advisory role to consider, discuss and provide valuable input into the identification and evaluation of alternatives.”

The current study and design efforts are focused on the operation of I-290 itself. As movement toward ICM concepts sampled in this document will warrant, the additional coordinated business rules and strategies would be logically added.

6. Reference Data

Through the IDOT District 1 Arterial TMC Project, several national implementations of broad arterial management approaches have been reviewed. These Implementations serve as inputs to detailed operational strategies for I-290 and the surrounding transportation network.

This section introduces four agencies with robust arterial management programs, and offers some key lessons learned from the Arterial TMC Project interviews with each agency:

- Regional Transportation Commission (RTC) of Southern Nevada: FAST Program
- Maricopa County Department of Transportation: AZTech Program
- Kansas City, Missouri: Mid-America Regional Council’s (MARC) Operation Green Light Program
- Los Angeles County Public Works and Los Angeles Metro Traffic Management

Regional Transportation Commission (RTC) of Southern Nevada: FAST Program

The RTC of Southern Nevada is responsible for approximately 1500 traffic signals and 12,000 expressway ITS devices. The RTC first became administrator of the Freeway and Arterial System of Transportation (FAST) in 2004. Accordingly, this is a mature program with policies and partnerships in place that serve as excellent lessons for newer programs. The FAST website is provided below:

<https://www.rtcnv.com/traffic-cams/about-traffic-management/>

Keys to their continued success include:

- Widespread participation and buy-in from local stakeholders across the region, facilitated in part by a tiered set of member committees.
- Opportunistic deployments of ITS as part of larger roadway projects.
- Continuously pursuing grant money, which is the responsibility of one of the member committees.
- Maintaining and expanding a robust fiber network while also increasing deployment of and expertise in wireless communication technologies.

Maricopa County DOT: AZTech Program

The Maricopa County Department of Transportation began its AZTech Program in 1996. In the 24 years since, the County has deployed a robust communication network across the region. The focus and goal of this program is to ensure seamless operation across the transportation system, including many unincorporated areas. See the link to the AZTech website below:

<http://www.aztech.org/>

This system is made-up of nine individual, local TMCs across the region; there is no centralized TMC. Each of the involved agencies has one representative, and thus one vote, when major decisions are being considered.

The AZTech team has found that while the decentralized architecture can be challenging from a system perspective, one advantage this offers is that each local agency has the best understanding of local needs and challenges. They also emphasized the importance of cohesion and a lasting, strong coalition that accounts for the periodic turnover of critical members.

Kansas City, Missouri: Mid-America Regional Council's (MARC) Operation Green Light Program

MARC's Operation Green Light Program began in the late 1990's and is now made up of 27 agencies in the Kansas City area. The focus of this program is to facilitate operational cohesion across the region's traffic signals. The project website link is provided below:

<https://www.marc.org/Transportation/Programs/Operation-Green-Light/About-UGL>

The more modest scope of this effort compared to some of the other agencies interviewed, with an annual budget between \$1.0 Million and \$1.4 Million, offers a thorough yet reasonable model for a potential I-290 deployment.

The involved agencies meet frequently, and each receives one or two votes on internal decisions depending on the number of operating signals in their jurisdiction. Signal timings evaluation and retiming is mostly outsourced. Synchro outputs are provided to the Council, and the system ingests the synchro data directly to implement any changes.

MARC owns all the system data, which is collected by the individual agencies and stored on MARC servers. The agencies can access and view the data but are unable to download it.

Los Angeles County Public Works and Los Angeles Metro Traffic Management

The Los Angeles area's regional Active Traffic Management is provided through a joint venture between the LA County Public Works and the LA Metro. Over the last few decades, the region developed a customized internal system capable of handling all external signal systems included across the region – for example, this single internal system can ingest information from TransSuite, Centrac, and Adaptive Signal Control vendors simultaneously. The websites for the LA County Public Works Transportation Division and the LA Metro are provided below, respectively.

<https://dpw.lacounty.gov/landing/transportation.cfm>

<https://www.metro.net/>

The robust, custom system developed for the LA area is likely not a paradigm that will be pursued as part of initial ICM efforts in Illinois. However, it is noteworthy that the largest metro area in the US, featuring a critical portion of the nation's transportation network, has chosen to design this internally facing system responsible for handling its traffic signal and transportation data. As cybersecurity matures into the future, it is possible more agencies move toward these types of solutions.

7. Next Steps and Recommendations

To implement ICM, several major steps are required.

1) Stakeholders must develop and define a regional approach.

The Statewide ITS Architecture and Strategic Plan Update indicates that stakeholders welcome these approaches. The IDOT District 1 Regional Arterial TMC Study outreach confirms the interest and understanding of needs and benefits. It is also assumed that final selection of the I-290 Operational Alternative is or will be declared complete as additional steps move forward.

2) ICM Operational Procedures must be developed.

The use of detailed scenarios and collaborative workshops among the stakeholders will be required. These operational approaches will consider multiple parameters.

- a) Development of Business Rules - criteria and requirements for ICM responses
 - a. Response activation triggers
 - b. Response sequencing
 - c. Activation monitoring and escalation
 - d. Response Plan update strategies
 - e. Definitions of roles and responsibilities.

3) Identification of resources that are required to implement ICM Operational Procedures.

- a) Existing and required ITS and traffic signal equipment
- b) Existing and required communications networks
- c) Existing and required staffing options
- d) Existing and required real-time data, forecasting methods, and performance measurement methods
- e) Existing and required control strategies and algorithms.

4) Identification of gaps in the required ICM resources.

For ICM to be implemented the programming of multiple projects through multiple stakeholders will be necessary.

These efforts will require a relatively large overarching schedule and a commitment to the programming of projects. It is anticipated that the IDOT Regional Arterial TMC Study will be a major element within the project programming process.

Recommendations

Given the stated commitments of stakeholders to regional operational concepts, the following actions are recommended.

- 1) Via the Regional Transportation Operations Committee, select one scenario and utilize a full workshop to explore and document:
 - a. Anticipated business rules for the scenario
 - b. Detailed inventory – stakeholders, equipment, systems, operational environment
 - c. Define the challenges and potential policy considerations that need to be addressed
 - d. Create an ICM Working Group based on the single scenario outcome.
- 2) Commission the ICM Working Group to:
 - a. Define stakeholders
 - b. Gain concurrence for the ICM Working Group from the leadership of each stakeholder organization
 - c. Develop a mission statement
 - d. Set a schedule
 - e. Define a Work Plan – using the major next steps stated above as a framework
 - f. Provide regular updates to all regional stakeholders via ATTF/ROTC meetings
 - g. Visit, coordinate, and share with other existing and emerging ICM corridors.

Given the disruption COVID-19 has created in 2020 and beyond, it is more important than ever that solutions are flexible and not explicitly tied to one way of operating. The adaptability of each piece will be critical to future success, including personnel, equipment, associated measurements, and operational strategies.

Appendices

I-290 Corridor Jurisdiction Map with Traffic Signals

Map of the Greater Chicago area, displaying cities' limits. The following map also displays major arterial roads and those intersections' traffic signals, for the regions covered by the scenarios previously presented on this document.

