



U.S. Department of Transportation
Federal Highway Administration

Integrated Corridor Management (ICM) Event Documentary: How Does ICM Work in Practice?

Webinar

FHWA Office of Operations
July 12, 2021

Webinar Purpose

- Provide an overview of the ICM approach
- Describe an ICM event in real-time
 - Discuss an example step-by-step process before, during, and after an ICM event



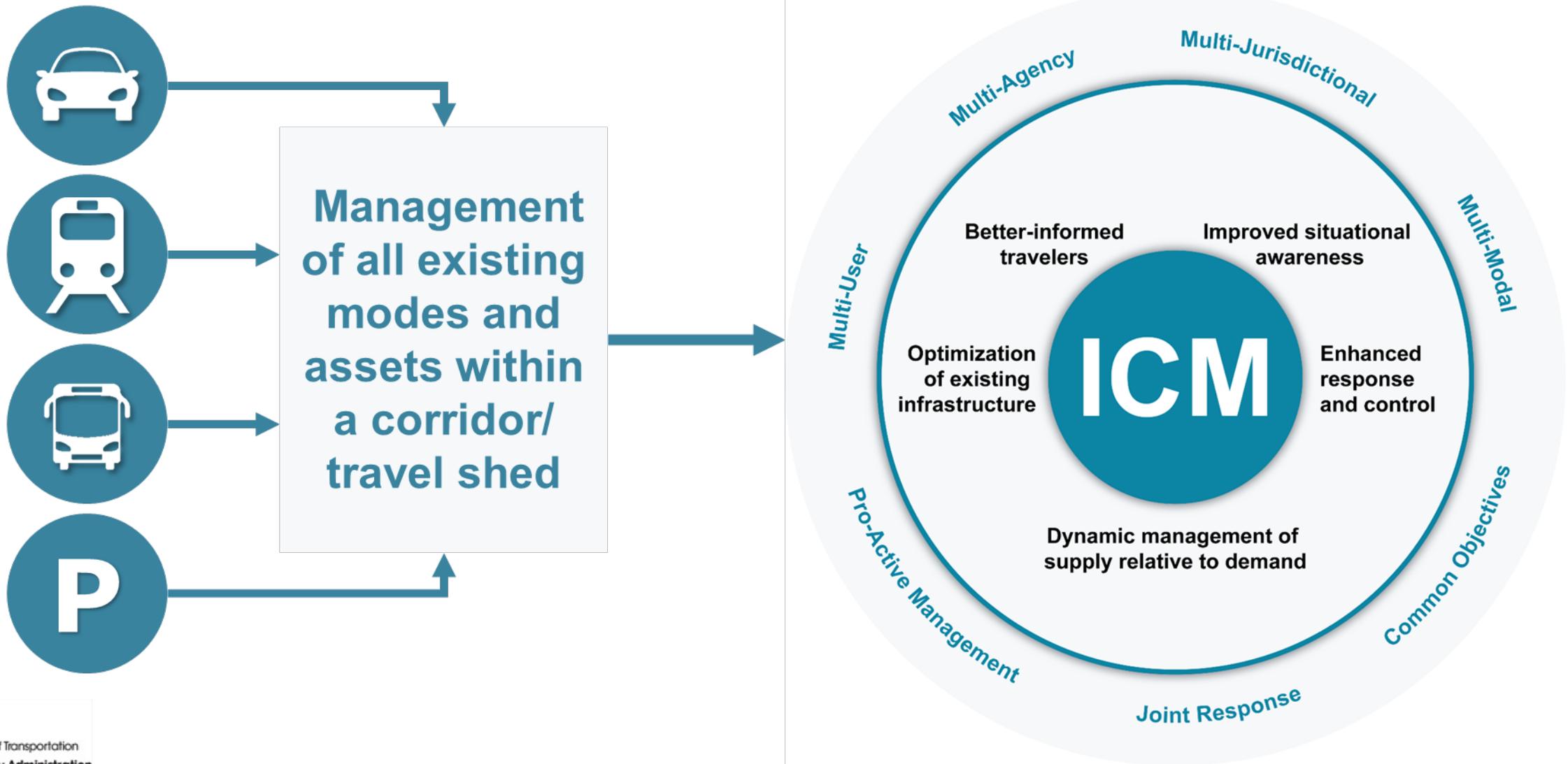
What is Integrated Corridor Management?

Integrated . . . *coordination and collaboration between agencies so as to provide a harmonious, interrelated “whole.”*

Corridor . . . *a travel shed of trips anchored by one or more highway, arterial, or rail line.*

Management . . . *the coordinated management of **all** the travel therein in order to achieve defined objectives.*

Integrated Corridor Management Approach



ICM Pre-Planning: 3 Types of Integration

Institutional

Coordination between various agencies and jurisdictions (e.g., memorandums of agreements, funding arrangements, policies).

Operational

Multi-agency and cross-network operational strategies to manage the total capacity and demand of the system.

Technical

Sharing and distribution of information, and system operations and control functions to support the immediate analysis and response.

ICM Characteristics

ICM is not...	ICM is...
Siloed decisions, optimizing individual agency's systems (freeway management, arterial signal, incident management, or bus operations/dispatching system).	Multi-Agency decisions, via business rules, optimizing corridor as a whole.
Reactive or ad-hoc.	Proactive, planned, or predictive.

ICM Event Documentary

ICM Event Documentary Overview

ICM Pre-Planning

- Engage stakeholders.
- Collect data.
- Identify corridor boundaries, issues, and needs.
- Adopt vision, goals, and objectives.
- Develop business rules and Decision Support System (DSS).

During ICM Event

- Event meets ICM threshold.
- Business rules engine triggered.
- Response suites created for approval.
- Implementation.

Post ICM Event

- Data collection from event.
- Recalibration of underlying traffic simulation models.
- Tweak ICM event thresholds.



ICM Event Documentary Overview (Cont.)

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ICM Pre-Planning

- Identify corridor boundaries and stakeholders.
- Collect data to understand current characteristics of the corridor.
- Identify and prioritize corridor problems and system (user) needs.
- Adopt ICM-centric vision, goals, and measurable objectives.
- Develop business rules, potential strategies, and thresholds for candidate response plans.
- Develop DSS, including regional modeling and simulation tools.

ICM Pre-Planning: Decision Support Systems

ICM is implemented through a **Decision Support System (DSS)**. A DSS is an information system that supports business or organizational decision-making activities, resulting in ranking, sorting, or choosing from among alternatives. A DSS must be programmed to incorporate **business rules** and agreements with relevant entities when making recommendations.

The right information.

To the right stakeholder.

At the right point in the workflow.

Through the right channel.

In the right format.

ICM Pre-Planning: Business Rules

- What are Business Rules (BR)?
 - Pre-defined and agreed-upon organizational and inter-agency permissions, constraints, or criteria.
 - Define the context and constraints for implementing DSS inter-agency agreements.
 - Bind participating agencies and affect the DSS solutions.
 - Feed into strategies and candidate response developed in coordination with partners.
 - Enhance the backers' buy-in, reduce uncertainties, and boost DSS strategies effectiveness.

ICM Pre-Planning: City Overview

- Alligator City in Okanahatchee County
 - A complex corridor in a hypothetical location along the Gulf Coast.
 - It has significant congestion and mobility issues.



Okanahatchee County



Image Source: Getty

ICM Pre-Planning: City Features

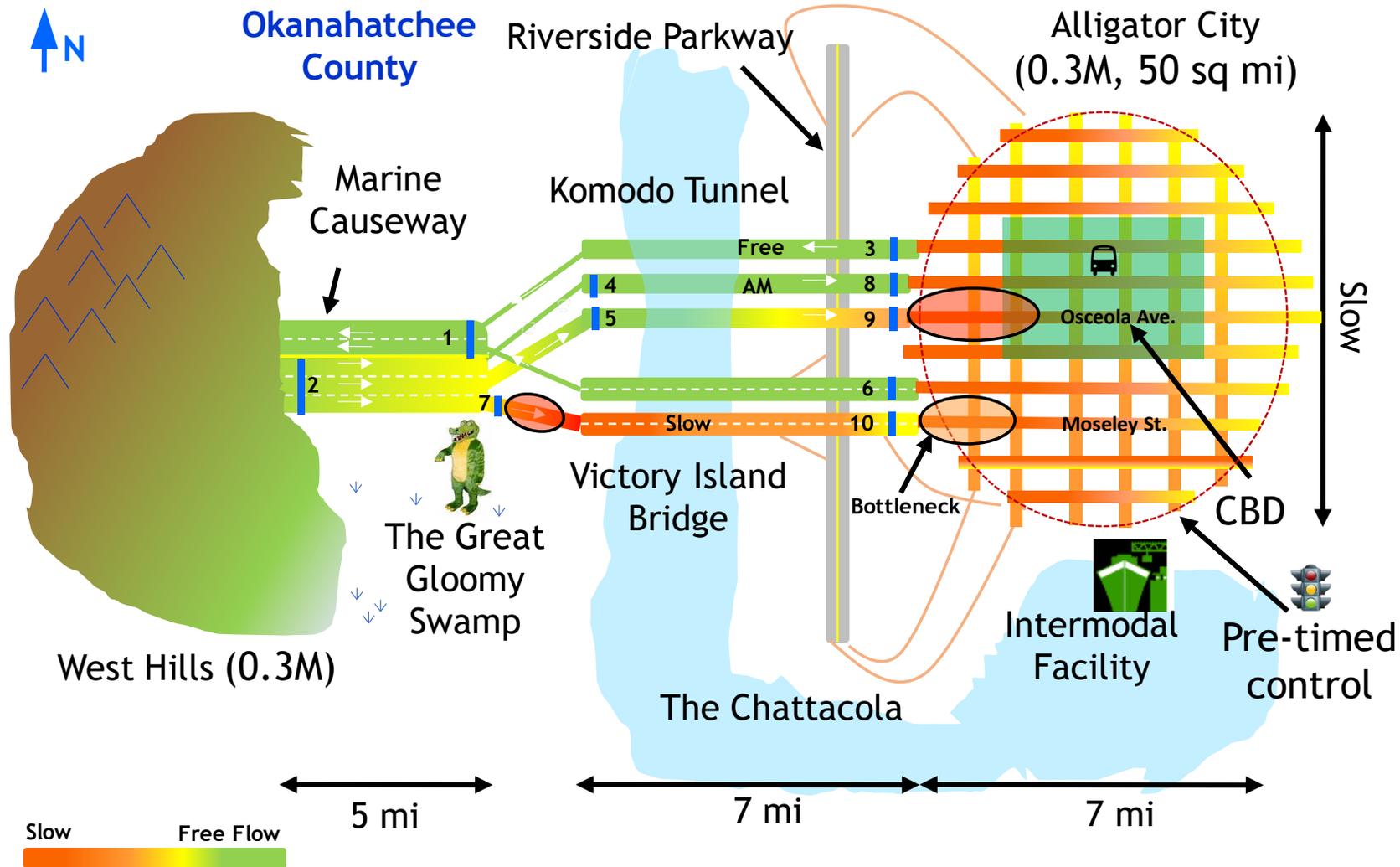


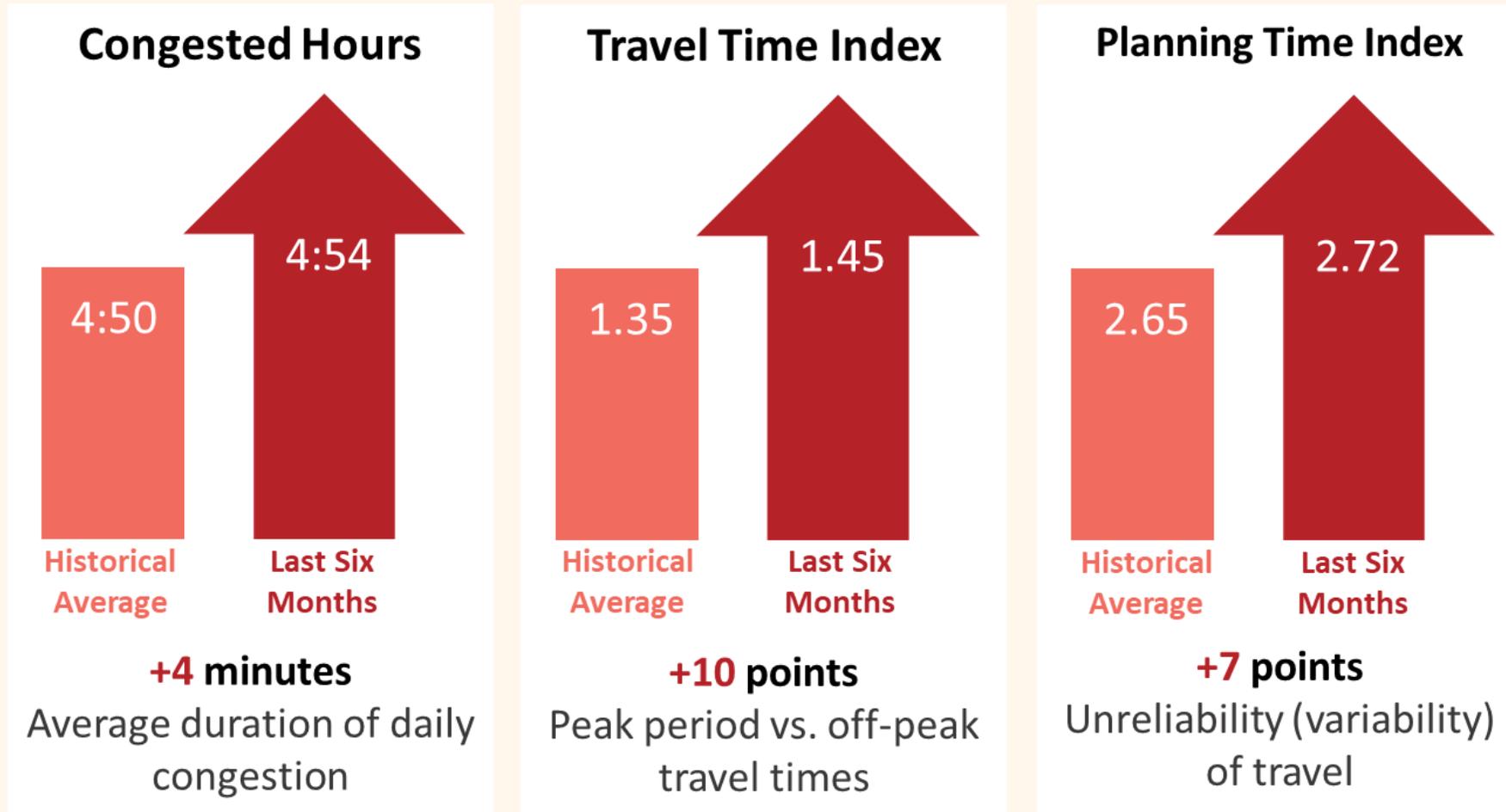
Image Sources: USDOT

ICM Pre-Planning: Corridor Issues

- Alligator City suffers unreliable commutes; e.g., from West Hills to Alligator City.
- There is persistent congestion within Alligator City.
- There are bottlenecks onto Victory Island Bridge and exiting into the central business district (CBD).

ICM Pre-Planning: Corridor Issues (Cont.)

URBAN CONGESTION AND RELIABILITY DASHBOARD FOR OKANAHATCHEE COUNTY



ICM Pre-Planning: Stakeholder Group

- The ICM Regional Working Group has multi-agency, multi-modal, and multi-jurisdictional partners.



ICM Pre-Planning: Identify Segments, Performance Measures, & Strategies

- Identified target corridor and 4 critical corridor segments.
- Defined key performance measures on the critical segments, including delay and congestion index.
- Identified business rules, menu of possible ICM strategies, and response plans for DSS.



ICM Pre-Planning: Define Thresholds

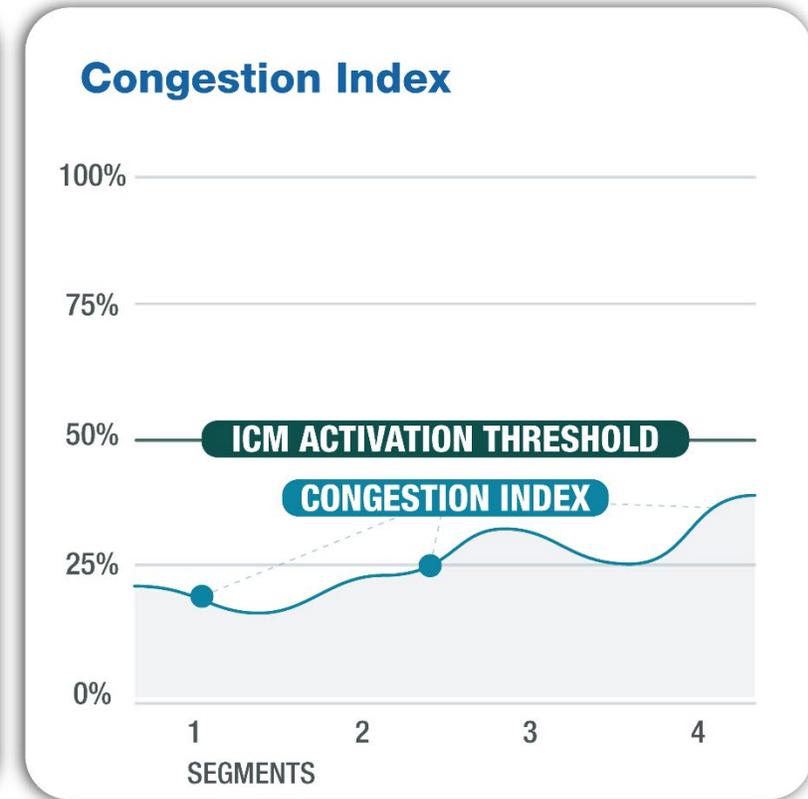
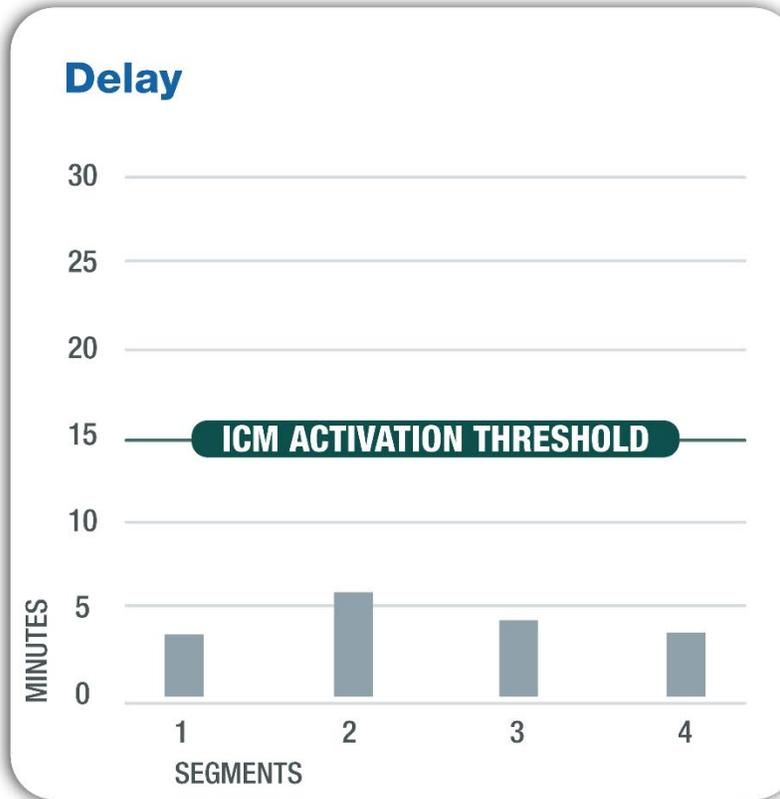
- Define **three** thresholds based on performance characteristics agreed-to by local partners:
 - **Event Trigger Threshold** (ICM Activation) – The level of delay/congestion needed to initiate a DSS response plan/s.
 - **Event Recovery Threshold** (ICM Working) – The level of delay/congestion needed to determine if ICM is improving, worsening, or having no impact on the situation.
 - **Event Termination Threshold** (ICM Termination) – The level of delay/congestion that denotes the end of ICM event and ceases ICM strategy implementation and a return to nominal operation.

ICM Pre- Planning: “Normal” Conditions

- ICM system with DSS continually monitoring traffic conditions in the corridor, detecting anomalies in traffic patterns or significant events.
- Dashboard generated showing initial event creations, but not meeting activation threshold for ICM event.

05:30

T-3 HOURS



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Post ICM Event

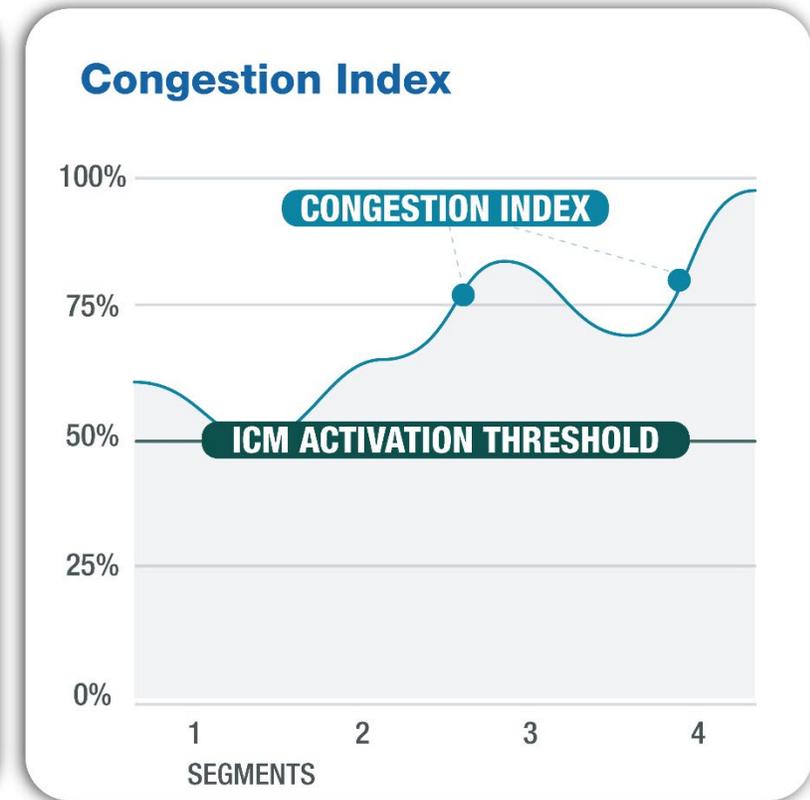
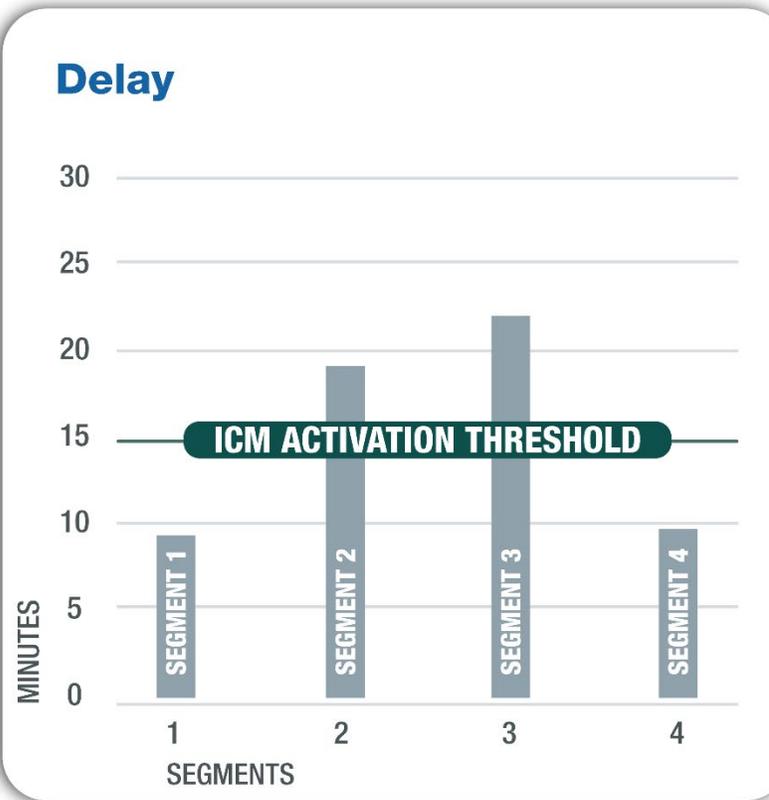
- Data collection from event.
- Recalibration of underlying traffic simulation models.
- Tweak ICM event thresholds.

During Event: Event Meets ICM Threshold

- ICM system monitoring for “atypical” congestion on a corridor detects event triggering that would invoke a DSS response(s).
- Event occurs meeting activation threshold defined in the business rules and performance characteristics agreed to by local partners.

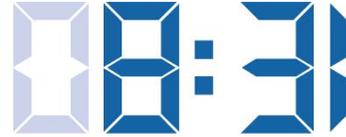
08:30

T=0 MINUTES

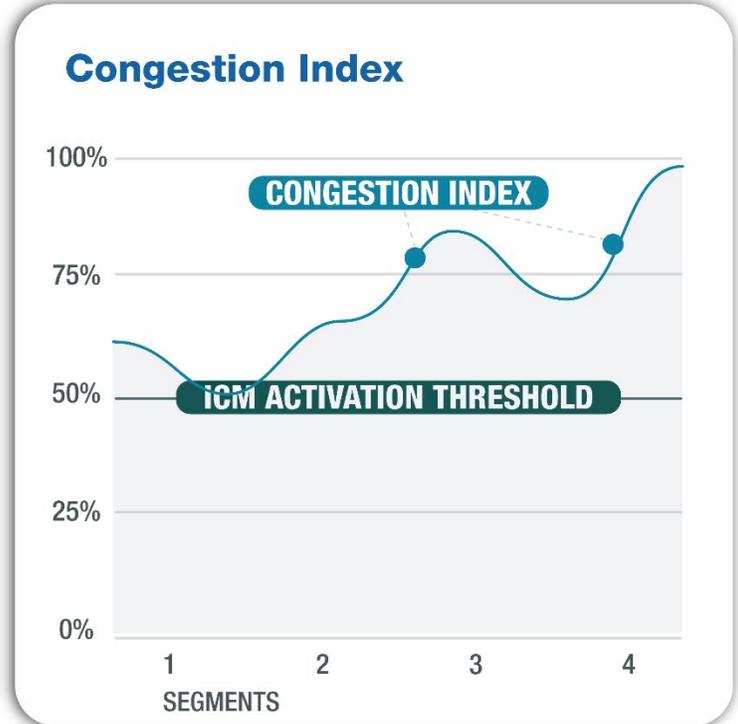
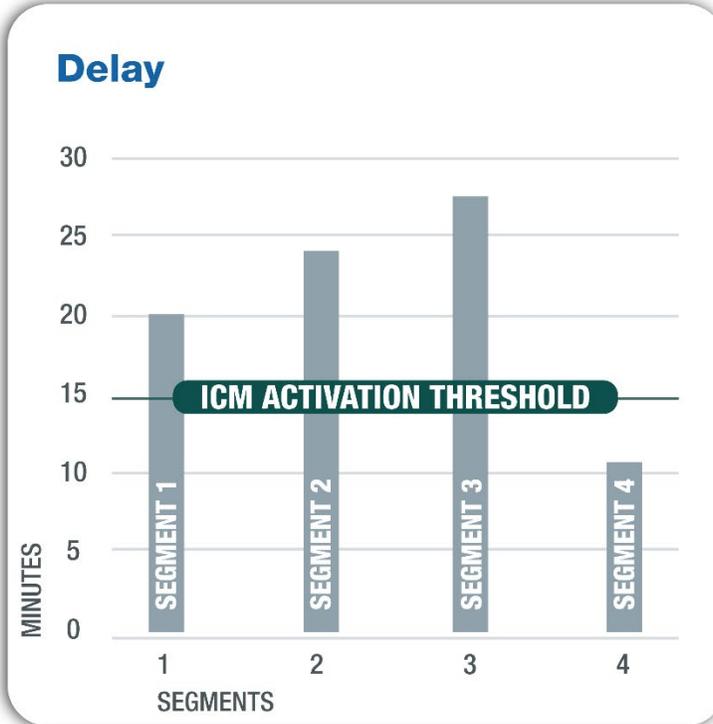


During Event: Business Rules Engine Triggered

- DSS models one or more alternative solutions (composed of multiple strategies that stakeholders have agreed could be implemented by the different agencies) as compared to the “do nothing” alternative.
- Response plan with the best outcome (highest score) is recommended for approval by all local agencies.



T+1 MINUTE



Option 1
77%
IMPROVEMENT

Option 2
61%
IMPROVEMENT

Option 3
53%
IMPROVEMENT

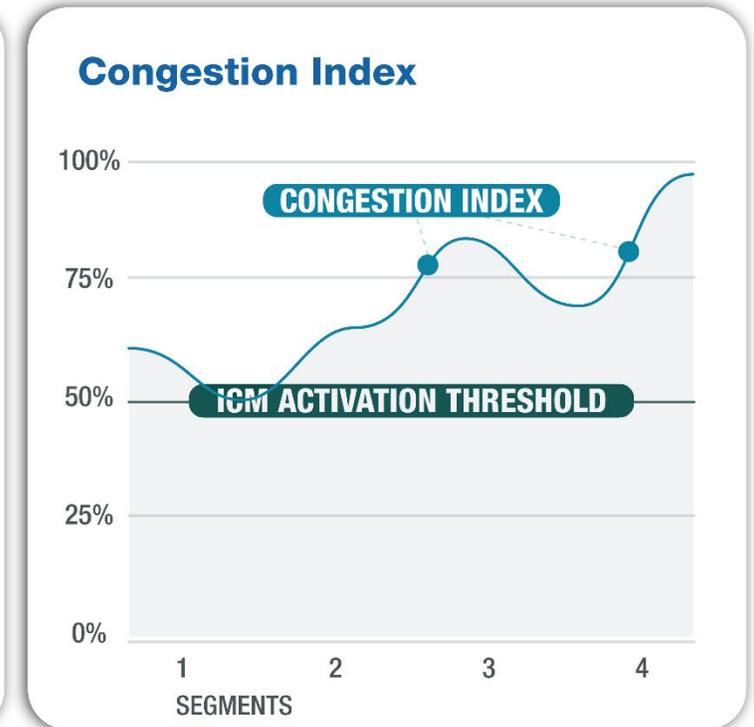
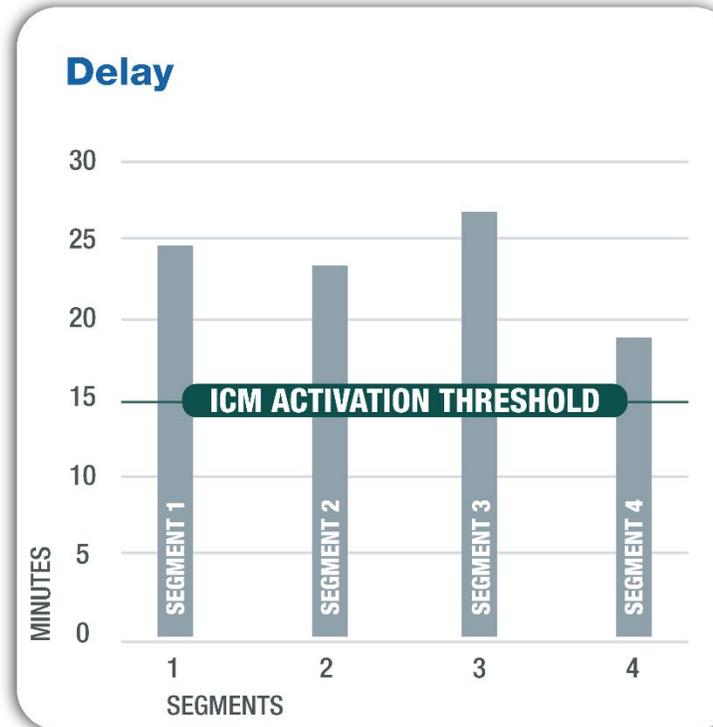
Option 4
DO NOTHING
25%
DETERIORATION

During Event: Response Suites

08:36

T+6 MINUTES

- ICM system provides candidate response plans, including proposed assets to be used and locations (e.g. current ramp metering rate and proposed rate).
- System pauses for five minutes as local agencies review and approve recommended response plan.



Option 1
77%
IMPROVEMENT

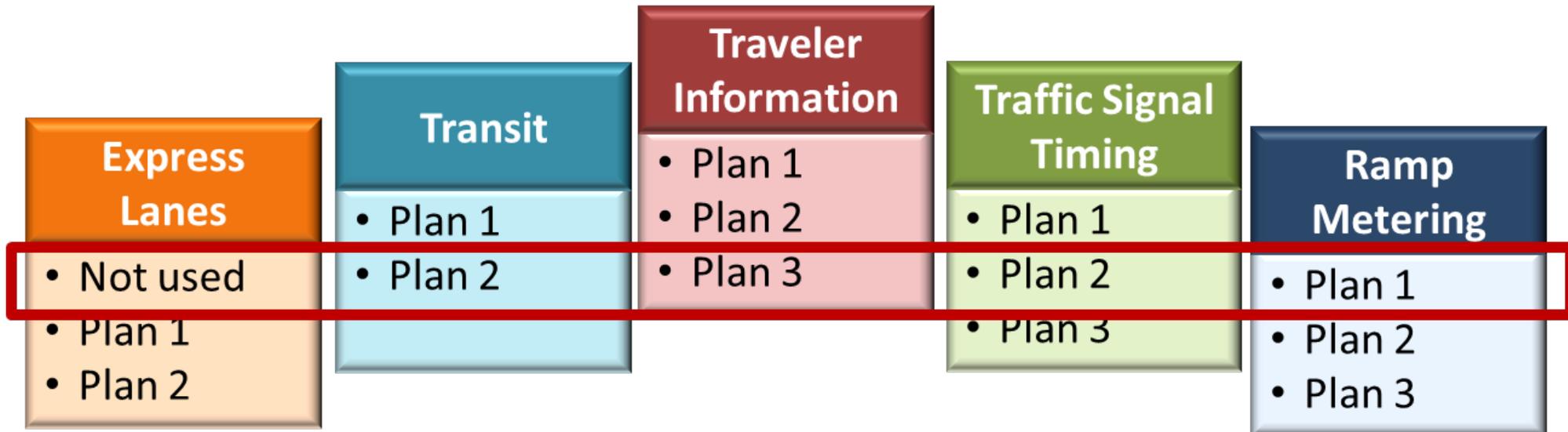
Option 2
61%
IMPROVEMENT

Option 3
53%
IMPROVEMENT

Option 4
DO NOTHING
25%
DETERIORATION

During Event: Implementation

- Acceptance by all partners then initiates the pre-agreed business rules amongst the varying agencies.
- Multimodal response plan (Option #1) implemented.

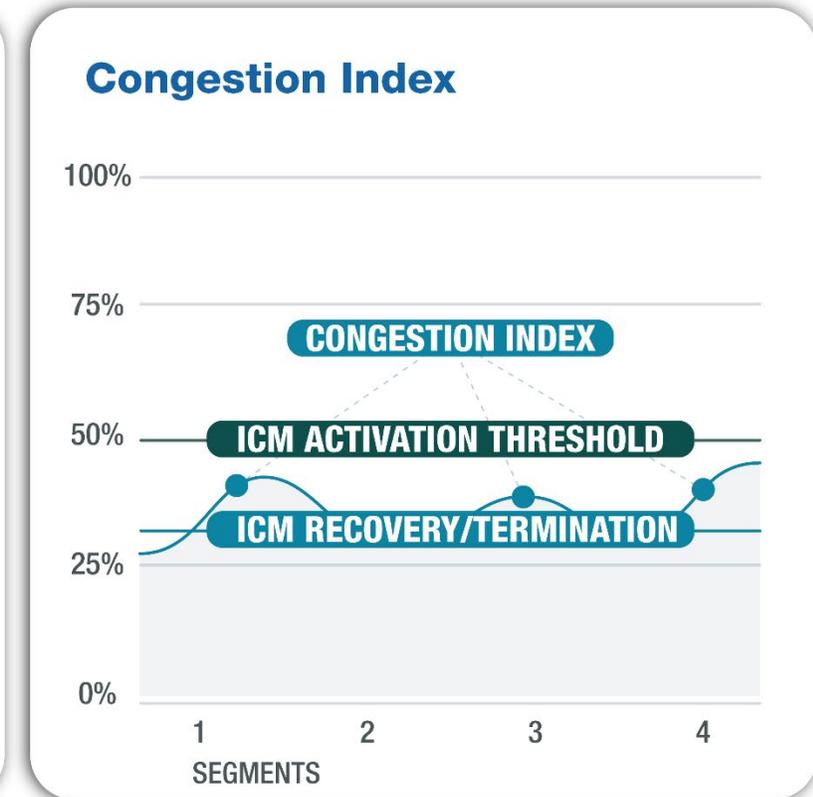
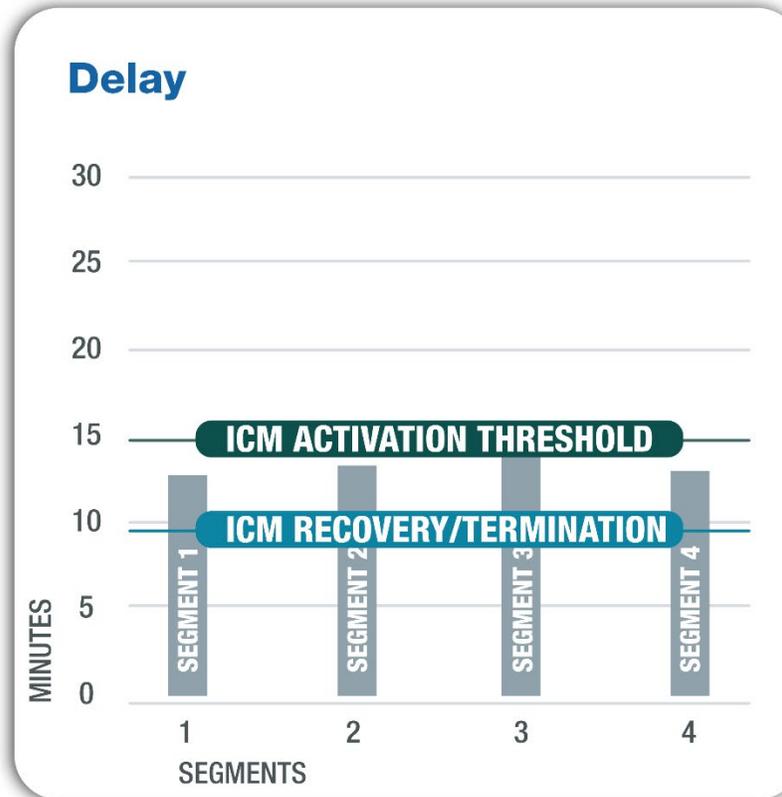


During Event: Monitor

- After implementing the response plan, ICM system monitors impact against pre-agreed recovery threshold.
 - Determine if the response plan is improving, worsening, or having no impact on the corridor conditions.
- For T+30 minutes, between activation and recovery/termination threshold.

09:00

T+30 MINUTES

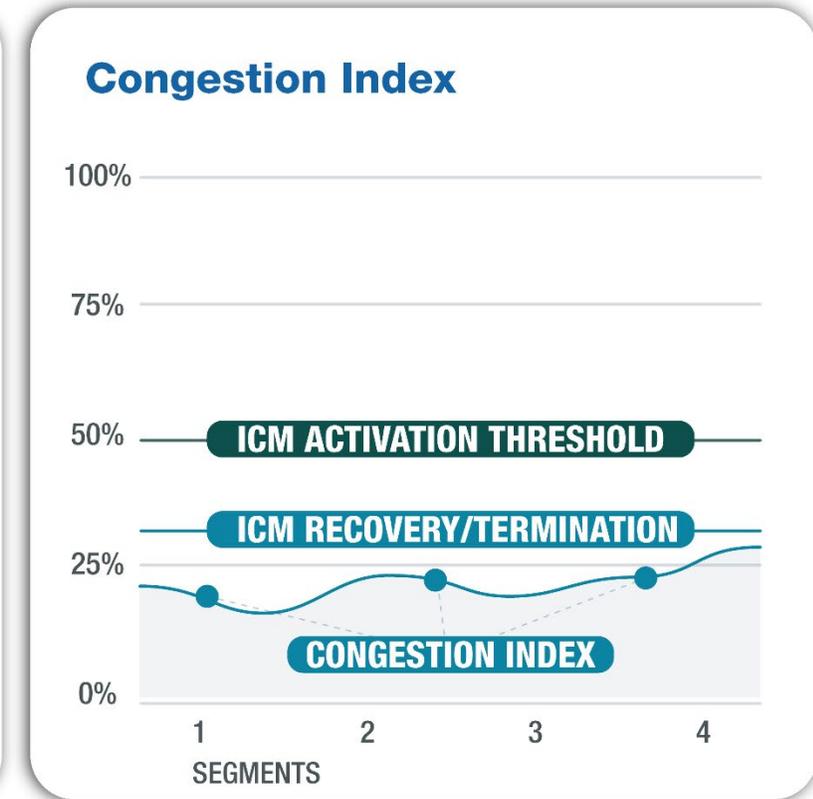
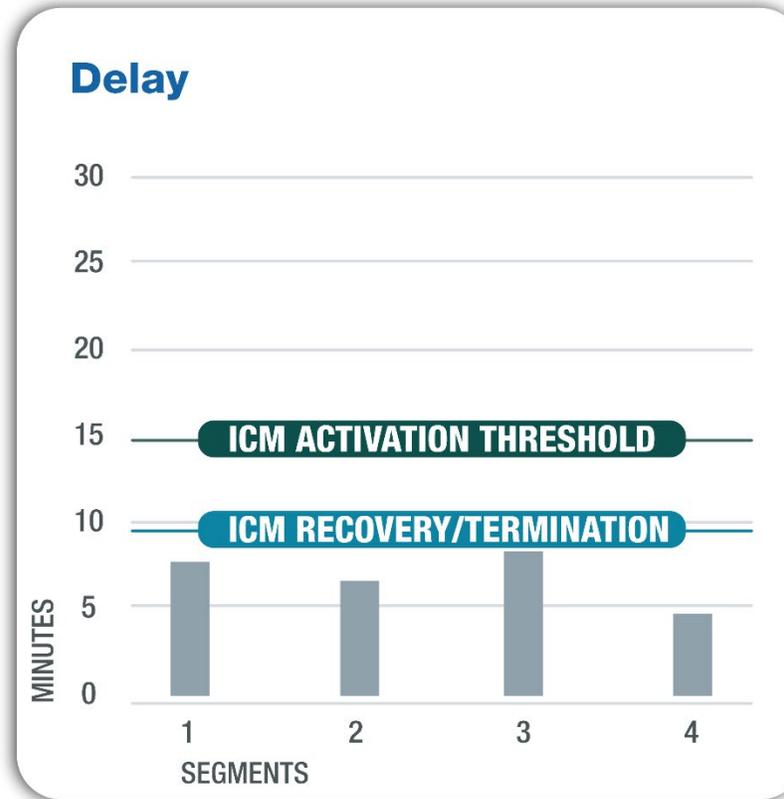


During Event: ICM Event Conclusion

- DSS continues to monitor network conditions after the response plan is implemented to determine if it is working or further adjustments are needed.
- System continues to produce response plans until “normal” performance detected.

09:30

T+60 MINUTES



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Post Event: Data Collection and Recalibration

- Coordinate with local partners and contractors to gather data from each event.
- Continually recalibrate underlying traffic simulation models and tweaking ICM event thresholds.
- Use continuous improvement cycle over time to build smart and steady towards a shared ICM vision.



Resources

Office of Operations’ “Corridor Traffic Management” website.

The screenshot shows the FHWA Office of Operations website. At the top, there is a navigation bar with the U.S. Department of Transportation logo, the text "U.S. Department of Transportation Federal Highway Administration", and links for "FHWA Home" and "Feedback". Below this is a red banner with "OFFICE OF OPERATIONS" on the left and a "Drop Down Menu: Program Areas" on the right. A horizontal strip of images follows, including a traffic jam, a tunnel, a highway sign for congestion, and a road construction site. Below the banner is a search bar labeled "Search Operations:" with a "Go" button. To the left of the main content is a vertical navigation menu with links for "Home", "About Us", "Programs", "Publications", "Resources", "Contact Us", and "A-Z Subject Index". The main content area features the heading "Corridor Traffic Management" with a breadcrumb trail "Program Areas > Reducing Recurring Congestion". The text describes how congestion on one roadway impacts others and lists various management strategies. A small image of a tunnel is shown to the right. Below the text are sections for "Related Effort" and "Integrated Corridor Management", each with a list of links to related documents and reports.

U.S. Department of Transportation
Federal Highway Administration

FHWA Home | Feedback

OFFICE OF OPERATIONS

Drop Down Menu: Program Areas

21ST CENTURY OPERATIONS USING 21ST CENTURY TECHNOLOGIES

Search Operations:
Go

Home
About Us
Programs
Publications
Resources
Contact Us
A-Z Subject Index

Corridor Traffic Management

[Program Areas](#) > [Reducing Recurring Congestion](#)

When congested traffic conditions occur on one roadway, traffic on adjoining roadways or freeway interchanges in the corridor, are also impacted. Typically, as congestion occurs on one roadway, travelers respond in a variety of ways: finding an alternate route, selecting a different roadway (freeway versus surface street), adjusting their trip to another time of day, or remaining on their current route and enduring the significant delays. These disruptions range in scale, frequency, predictability, duration, and have the potential to impact a number of facilities or modes. A number of promising approaches may enhance how we currently operate the surface transportation system. The proactive use of managed lane strategies, alternate routing of traffic, and proactively managing and controlling traffic within freeway corridors offer are a few useful approaches. These strategies have the potential to achieve significantly greater levels of utilization of the existing roadway capacity, improve travel times, enhance safety, and reliability of travel.



- [About Corridor Traffic Management](#)

Related Effort

- [About Integrated Corridor Management](#)

Integrated Corridor Management

- [What is Integrated Corridor Management](#) (Flyer)
- [Integrated Corridor Management \(ICM\) Program: Major Achievements, Key Findings, and Outlook](#) (Document)
- [Integrated Corridor Management \(ICM\) – Mainstreaming ICM: An Executive Level Primer](#) (Document)
- [Integrated Corridor Management \(ICM\) Ten Attributes Of A Successful ICM Site](#) (Flyer)
- [Elements of Business Rules and Decision Support Systems within Integrated Corridor Management: Understanding the Intersection of These Three Components](#) (Document)

Resources (continued)

Integrated
Corridor
Management
Executive Video.



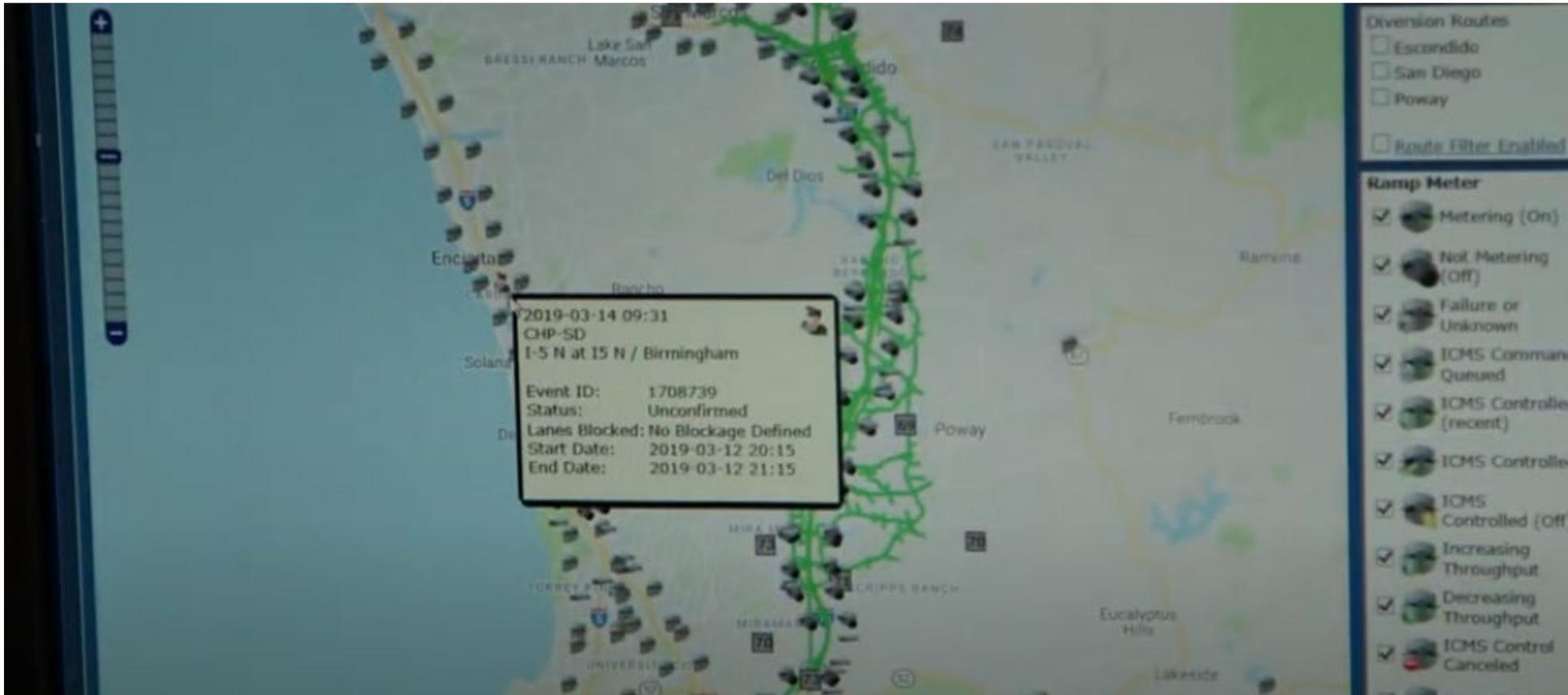
<https://www.youtube.com/watch?v=xWPyzgFlf7w&t=191s>

ICM Video



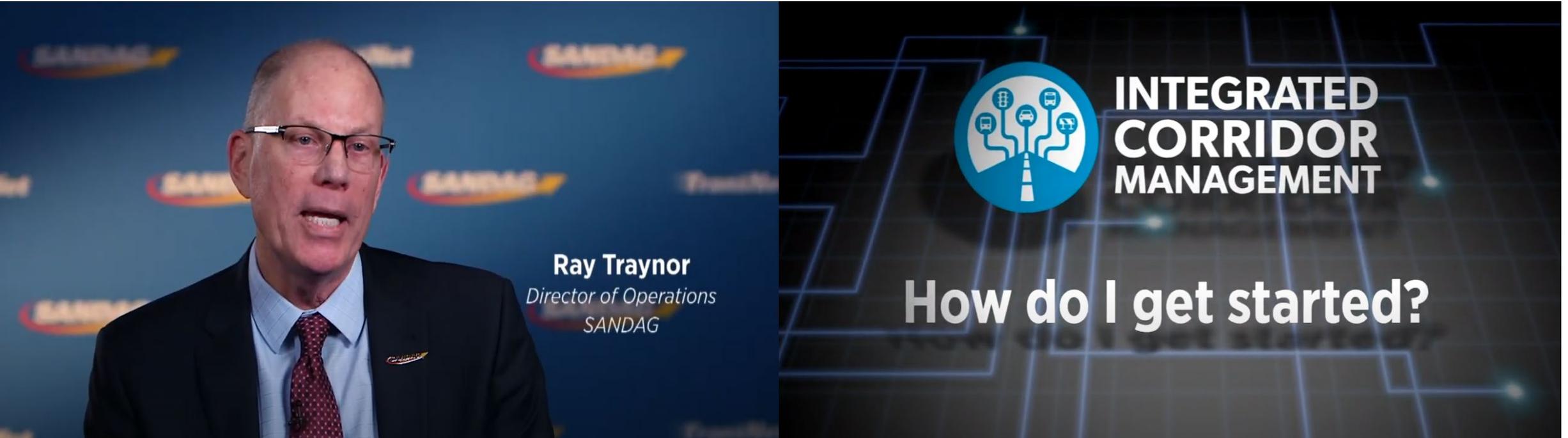
“All assets need to be involved to resolve the issue and get traffic moving again”

ICM Video



“ICM uses a highly advanced computer driven system called a Decision Support System, or DSS”

ICM Video



“ICM was thought of for us a means to be able to better manage this asset and try to squeeze out the most capacity we could”

Questions



Contact Information

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Website

[https://ops.fhwa.dot.gov/program_areas/
corridor_traffic_mgmt.htm](https://ops.fhwa.dot.gov/program_areas/corridor_traffic_mgmt.htm)