I-35 Integrated Corridor Management

KDOT + MARC

Project Update

December 6, 2016
Welcome

Project Goal:

Maintain a reliable travel time through the I–35 Corridor
Goal ~ Travel time reliability

What travelers experience... and what they remember

Travel times vary greatly day-to-day

Source: FHWA Travel Time Reliability brochure
Project Overview

Create an Integrated Corridor Management Concept of Operations for I–35 corridor
Project Overview

I-35 Corridor

Project Scope

User Scope
Project Overview

I-35 System Overview

I-35 Northbound Planning Time Index
(Tuesday in 2015)
Project Overview

I–35 System Overview

I-35 Southbound Planning Time Index
(Tuesday in 2015)
Reliability in Real Life
Project Overview

I–35 System Overview

I-35 Northbound Planning Time Index
(Tuesday in 2015)

- 2015 (every Tue) - 5%
- 2015 (every Tue) - 25%
- 2015 (every Tue) - 75%
- 2015 (every Tue) - 95%
Why Planning for Operations?

Sources of Congestion: Over 50% of congestion is directly attributable to large fluctuations in demand (such as special events), poor signal timing, traffic incidents, inclement weather, and work zones.
Project Overview

Incidents

KC Scout Regional Incident Types

I-35 Multi-vehicle Incident Rates

KC Scout data
What is Integrated Corridor Management?

- Integrated – working together as one
- Corridor – a space of movement for people and goods
- Management – monitoring & controlling

- Using and managing all transportation resources in a corridor
  - Highway
  - Transit
  - Arterials
  - ITS
  - Operations managers

“ICM provides the opportunity to proactively improve and maximize the performance of the transportation system by serving as an alternate to traditional major infrastructure investments which may be more expensive or constrained by environmental issues.”

Alex Estrella, ICM Manager, San Diego Association of Governments
ICM Concept

Cross traditional transportation boundaries

http://www.fhwa.dot.gov/ipd/images/revenue/webinars/congestion_pricing_022415/generic_corridor_map.png
Project Overview

ICM Capability Maturity Model

I-35 Integrated Corridor Management Capability Maturity Model Regional Assessment

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silo</td>
<td>Centralized</td>
<td>Partially Integrated</td>
<td>Multimodal Integrated</td>
<td>Multimodal Optimized</td>
</tr>
</tbody>
</table>

- **Inter-agency Cooperation**
  - Level 1: Agencies do not coordinate their operations
  - Level 2: Some agencies share data, but operate their networks independently
  - Level 3: Agencies share data, and some cooperative responses are done
  - Level 4: Agencies share data, and implement multi-modal incident response plans
  - Level 5: Operations are centralized for the corridor with personnel operating the corridor cooperatively

- **Funding**
  - Level 1: Single agency
  - Level 2: MPO tracks funding
  - Level 3: Coordinated funding through MPO
  - Level 4: Cooperatively fund deployment projects
  - Level 5: Cooperatively fund deployment and operations and maintenance of projects

- **Traveler Information**
  - Level 1: Static information on corridor travel modes
  - Level 2: Static trip planning with limited real-time alerts
  - Level 3: Multimodal trip planning and account based alerts
  - Level 4: Location-based, on-journey multimodal information
  - Level 5: Non-based, multimodal proactive alerting

- **Data Fusion**
  - Level 1: Limited or manual
  - Level 2: Near real-time data for multiple modes
  - Level 3: Integrated multi-modal data (one-way)
  - Level 4: Integrated multi-modal data (two-way)
  - Level 5: Multi-source multi-modal data integrated and fused for operations

- **Performance Measures**
  - Level 1: Some ad-hoc performance measure based on historic data
  - Level 2: Periodic performance measures based on historic data
  - Level 3: High-level performance measures using real-time data
  - Level 4: Detailed performance measures in real-time for one or more modes
  - Level 5: Multi-modal performance measures in real-time

- **Decision Support System**
  - Level 1: Manual coordination of response
  - Level 2: Pre-agreed incident response plans
  - Level 3: Tool selection of pre-agreed plans
  - Level 4: Model based selection of pre-agreed plans
  - Level 5: Model based creation of incident response plans

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Where we are now

Where we want to be in five years*

* Some initiatives will be longer because they must be added to the funding program.
### Project Overview

#### Use Cases – How we framed the issues

<table>
<thead>
<tr>
<th>Potential Use-Case</th>
<th>User Info</th>
<th>Traveling From</th>
<th>Traveling To</th>
<th>Purpose</th>
<th>Time of Day</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>Male 18 – 24 years Single</td>
<td>K-7 and W. Santa Fe, Olathe, KS</td>
<td>Johnson County Community College</td>
<td>School</td>
<td>A.M. [non-peak]</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Female 25 – 30 years Single</td>
<td>127th &amp; N Mur–Len, Olathe, KS</td>
<td>KU Medical Center</td>
<td>Work</td>
<td>A.M. [peak]</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>Male 25 – 30 years Married</td>
<td>151st &amp; S. Pflumm, Olathe, KS</td>
<td>Downtown, Kansas City, MO</td>
<td>Work</td>
<td>A.M. [peak]</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Male 30 – 35 years Married w/kids</td>
<td>Downtown Kansas City, KS</td>
<td>Near Johnson County CC</td>
<td>Home/Recreation</td>
<td>P.M. [peak]</td>
</tr>
<tr>
<td><strong>E</strong></td>
<td>Female 40 – 45 years Single w/kids</td>
<td>75th &amp; Antioch Area (near Shawnee Mission Medical Center)</td>
<td>BSNF Intermodal Facility, Edgerton, KS</td>
<td>Work</td>
<td>A.M. [peak]</td>
</tr>
<tr>
<td><strong>F</strong></td>
<td>Male 50 – 55 years Married</td>
<td>BSNF Intermodal Facility, Edgerton, KS</td>
<td>Armourdale Rail Yard, Kansas City, KS</td>
<td>Freight</td>
<td>A.M. [non-peak]</td>
</tr>
<tr>
<td><strong>G</strong></td>
<td>Female 60 – 65 years Widowed</td>
<td>127th &amp; N Mur–Len, Olathe, KS</td>
<td>Shawnee Mission Parkway, Shawnee, KS</td>
<td>Pick up Grandchild from School</td>
<td>P.M. [peak]</td>
</tr>
</tbody>
</table>

Stakeholders selected
Our User

- 29-year old radiologist at KU Med
- Likes country music
- A Roasterie coffee fan
- Owns a townhouse at 127th and Black Bob
- Has a young child
- Plays volleyball on co-ed, evening league

On Tuesday morning, Sarah needs to get to work at KU Medical Center for an 8:45 A.M. patient appointment. She will depart from her townhouse so she can arrive 30 minutes prior to her appointment to turn on her radiology equipment. On the way to work, Sarah drops her child off at her parents’ house at West 61st Street (east of Antioch) in Merriam for day care.
## Project Overview

### Use Cases – How we framed the issues

<table>
<thead>
<tr>
<th></th>
<th>Typical Incident</th>
<th>Planned Construction</th>
<th>One Time Event</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current (2016)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Future (2030)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ICM</strong></td>
<td></td>
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</tr>
</tbody>
</table>
### I-35 ICM Use Case

**Current – Incident**

**Total Travel Time:** 47 mins.

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**Map:**

- **Shawnee Mission Pkwy**
- **Antioch Rd**
- **Rainbow Blvd**
- **119th St**
- **95th St**

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<table>
<thead>
<tr>
<th>Ref #</th>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7:30 AM</td>
<td><strong>Leave home</strong></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td><strong>Enter I-35 at 119th Street</strong></td>
</tr>
<tr>
<td>3</td>
<td>7:47 AM</td>
<td><strong>Arrive at day care</strong></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td><strong>Decide to stay on route</strong></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td><strong>Exit Shawnee Msn Pkwy</strong></td>
</tr>
<tr>
<td>6</td>
<td>7:54 AM</td>
<td><strong>Check map app – sees incident on I-35 north of Antioch</strong></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td><strong>See traffic back up at Antioch entrance to I-35</strong></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td><strong>Drop off child</strong></td>
</tr>
<tr>
<td>9</td>
<td>8:08 AM</td>
<td><strong>Decide to take alternative route – SMPW east toward Rainbow Blvd</strong></td>
</tr>
<tr>
<td>10</td>
<td>8:17 AM</td>
<td><strong>Take SMPW to Rainbow Blvd Left onto Rainbow</strong></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td><strong>Begin Route – Head south on Antioch to SMPW</strong></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td><strong>Arrive KU Med Parking (red lot)</strong></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td><strong>Arrive at work</strong></td>
</tr>
</tbody>
</table>

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**Notes:**

- Crash symbol at intersection 7, 10
- Map shows routes and references

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*12/6/2016*
I-35 ICM Use Case
Future – Incident
Total Travel Time: 52 mins.

Ref # | Time       | Activity                                             
-----|------------|------------------------------------------------------
 17  | 8:07 AM    | Arrive at work                                       
 16  | 7:58 AM    | Walk from parking to work                            
 15  | 7:58 AM    | Arrive KU Med Parking (red lot)                      
 14  |            | Exit I-35 to Southwest Blvd                         
 13  |            | Take SMPW to Metcalf – Enter I-35 from Metcalf       
 12  |            | Begin route – Head south on Antioch to SMPW          
 11  |            | Decide to take alternate route shown                 
 10  |            | Map app – shows reroute option of SMPW to Metcalf to I-35 
  9  | 7:42 AM    | In-vehicle notification of incident on I-35 north of Antioch 
  8  |            | Drop off child                                       
  7  | 7:35 AM    | Arrive at day care                                   
  6  |            | Decide to stay on route                              
  5  |            | Exit Shawnee Msn Pkwy                                
  4  |            | Decide to stay on route                              
  3  |            | Check DMS at 95th Street                             
  2  |            | Enter I-35 at 95th Street                            
  1  | 7:15 AM    | Leave home                                            

12/6/2016
## ICM Strategies

**Implemented on I–35**

<table>
<thead>
<tr>
<th>Strategy</th>
<th>ICM Category</th>
<th>Notes</th>
<th>Initiative Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial Signal Control from One TMC</td>
<td>Arterial Management</td>
<td>OGL+TMCs (Olathe, OP, KC...) Consider virtual connect</td>
<td>Arterial Integration</td>
</tr>
<tr>
<td>Arterial DMS</td>
<td>Arterial Management</td>
<td>Used in Overland Park</td>
<td>Arterial Integration</td>
</tr>
<tr>
<td>Truck Parking location and status app</td>
<td>Freight</td>
<td>Coming in 2018</td>
<td>Transitional Technology + Multi-modal</td>
</tr>
<tr>
<td>Ramp Metering/Adaptive Ramp Metering</td>
<td>Operations</td>
<td>In progress on I–35</td>
<td>Travel Demand Management</td>
</tr>
<tr>
<td>Ride Sharing (Carpool, Vanpool)</td>
<td>Ride Sharing</td>
<td>In KC already</td>
<td>Travel Demand Management</td>
</tr>
<tr>
<td>Bus On Shoulder</td>
<td>Transit</td>
<td>Already on I–35</td>
<td>Multi–modal</td>
</tr>
<tr>
<td>Transit Express Routes</td>
<td>Transit</td>
<td>Already on I–35</td>
<td>Multi–modal</td>
</tr>
<tr>
<td>Transit Queue Jumping</td>
<td>Transit</td>
<td>Testing ongoing in KC</td>
<td>Multi–modal</td>
</tr>
<tr>
<td>Post Travel Times on DMS and Alert Media</td>
<td>Traveler Information System</td>
<td>Already on I–35</td>
<td>Travel Demand Management</td>
</tr>
</tbody>
</table>
## ICM Strategies – Select and Prioritize

<table>
<thead>
<tr>
<th>Integration Area</th>
<th>Initiative Theme</th>
<th>Spokesperson(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Gear" /></td>
<td>Arterial Integration</td>
<td>Ray Webb &amp; Mark Sommerhauser</td>
</tr>
<tr>
<td><img src="image" alt="DVD" /></td>
<td>Transitional Technology</td>
<td>Dave Schwartz</td>
</tr>
<tr>
<td><img src="image" alt="DVD" /></td>
<td>Multi-modal</td>
<td>Laura Machala</td>
</tr>
<tr>
<td><img src="image" alt="Government" /></td>
<td>Travel Demand Management</td>
<td>Jenny O’Brien</td>
</tr>
<tr>
<td><img src="image" alt="Government" /></td>
<td>Institutional Support for Transportation Systems Management &amp; Operations</td>
<td>Ron Achelpohl &amp; Jim Hubbell</td>
</tr>
</tbody>
</table>

= Institutional  
= Operational  
= Technical
ICM Strategies

Arterial Integration

Use of OGL and Potential Arterial Diversion Routing

SB I-35 BETWEEN 20TH STREET AND 23RD STREET TFWY

Arterial DMS approaching I-35
ICM Strategies
Transitional Technology

Connected vehicles

Autonomous vehicles

Managed Lanes
Source: Adam Froehlig
ICM Strategies
Multimodal
ICM Strategies

Multimodal – Mobility Hubs
ICM Strategies

Multimodal – Near Term Fixed Route Additions

• 39th Street (Fast and Frequent—15 minute service)
  • KU Med to VA Hospital
  • Peak hour 15 minute service now—planned increase to 15 minute service all day
  • Hub at Rainbow Blvd.

• Linwood (30 minute service) *New*
  • From KU Med to Blue Ridge Crossing

• I–435 (Express, 30 minute service during peak) *New*
  • I–435 and I–35 in Overland Park to Downtown Lee’s Summit
ICM Strategies

Multimodal – Transportation Information

Real-time traffic information

Google Maps – Real-time traffic information and trip planning for car, transit, bike, walk and ride hailing

Ride-matching for carpools, plus transit routes, bikeshare, carshare, park-and-ride lots and bike lanes, plus incentives and challenges
ICM Strategies

Multimodal – Transportation Information

Transportation Dashboard/Public Display

- Multi-modal options
- Real-time data
- Site specific

Photo credit Transit Screen iGo Mosaic
Employer policies such as telework, flextime and a compressed work week reduce peak hour congestion.
ICM Strategies

Institutional Support for TSM&O

- Transportation Systems Management & Operations (TSM&O) Committee
ICM Strategies

Institutional Support for TSM&O

- Traffic Incident Management (TIM)

**Kansas Motorist Assist**

![Traffic Management Equipment]

**TIM Training**

Source: Houston–Galveston Area Council

**Crash Investigation Sites**

![Crash Scene Investigation]

Source: Houston–Galveston Area Council
ICM Strategies

Institutional Support for TSM&O

- Champion?
Current sources of incident detection

Incident Detection on Kansas City Metropolitan Area Freeways

- Emergency Response Operators: 35%
- TMC Operators: 19%
- Police Departments: 11%
- First Responder Agency Scanners: 9%
- Event Receiver: 5%
- Highway Patrol: 4%
- Customer Service: 4%
- MoDOT: 4%
- Media: 4%
- Public: 3%
- Other: 2%

12/6/2016
Integrated TMS&O Example
Phoenix Metro TSM&O

<table>
<thead>
<tr>
<th>Transportation</th>
<th>Emergency Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Universities</td>
<td>2 Municipalities</td>
</tr>
<tr>
<td>2</td>
<td>16</td>
</tr>
</tbody>
</table>
What is Integrated Corridor Management?

- Multi-modal
- Pro-active
- Max use of existing capacity
- System-wide perspective
- Increase reliability
- Efficient flow
- Cooperative
Project Overview

Review – What is ICM?

The Electronic Highway: How 1960s Visionaries Presaged Today’s Autonomous Vehicles

By Evan Ackerman (/author/ackerman-evan-)
Posted 2 Aug 2016 | 17:00 GMT

Photo: The Ohio State University