Increasing Operational Capabilities of Local Agencies

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TSMO Regional and Local Agency Peer Exchange
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• Traffic congestion in the City of Denver and throughout the metropolitan area continues to increase
  • In a 2017 report release by INRIX, Denver is ranked as the 21\textsuperscript{st} most congested city in the United States
• The population in the Metro Denver area has continued to increase
  • Based upon information from the Metro Denver Economic Development Corporation, the Metro Denver area has experienced an average 1.6\% annual population growth since 2010 and the population for the metro area is expected to continue to increase with a projected population of 4,000,000 by 2035
• Although many initiatives and programs have increased the usage of public transit and other forms of transportation it is expected the transportation network’s vehicle hours of delay will continue to rise
Addressing the current and future congestion requires the combined efforts of multiple programs and initiatives which include operations and the application of technology.

Operations involves the ideas that lead to maximizing the performance of the transportation network.

Technology has been integrated into transportation agencies for decades but now there has been significant increase in new and emerging technologies.

The Transportation Operations Division sits at the confluence of operations and technology.
The Transportation Operations Division is a part of the City’s Department of Public Works.

Comprised of the following sections:
- Traffic signal maintenance and construction
- Traffic signs and markings
- Systems operations
- Curbside and Parking
- Utilities Administration

Traditionally references to “operations” in the City have referred to job functions that are in fact considered maintenance.

Although there have been some actions that in alignment with the concepts of TSMO, such as the opening of a traffic management center, there has not been deliberate attempts to adopt both the philosophy and to look for increased operational capabilities.
• Newly stated mission of the Division:

“Supports managing the performance of the transportation infrastructure to improve safety, mobility and reliability of the system for all transportation modes.”

• What does it mean to “manage the performance of the transportation infrastructure”
  • Foundational services
    • Asset management
  • Optimizing the flow of transportation modes
  • Real-time operations
In order to manage the performance of the transportation network the Division is initiating:

- Increasing the operational capabilities of the Denver Traffic Management Center
- Continuing to explore technology deployments
- Formal state of good repair programs
The Denver TMC is responsible for real-time monitoring and management of the City’s transportation network.

Since its creation in the 1990’s the Denver TMC had been an operation with a heavy focus upon traffic signal operations:
- This included managing special events and traffic associated with professional sport teams.

To address current and future traffic issues the City is looking to enhance the operations of the Denver TMC to increase active management of the transportation network.
Core Functions of the Denver TMC

- Operational Readiness
- Situational Awareness
- Information Dissemination
- Data Analysis
- Deployment of Operational Strategies
- Traffic Signal Operations
- Identification of Operational Issues
Implementing New Technologies

- There has been a drastic increase in the availability of new technology that can be leveraged in monitoring and managing the roadway network.
- Recent technological initiatives within the City:
  - Smart Cities
  - Advanced Transportation and Congestion Management Technologies Deployment Program
  - Enterprise Data Management
- Denver TMC staff participate as part of the City’s project team for implementing technology related to transportation:
  - This allows for operational perspectives to be included in the design stages.
Deployment of Transportation Technology
While the ingestion of public safety CAD is not a new concept, the Denver TMC did not have this information.

- Severely impacted situational awareness
- Worked with internal partners to deliver a situational awareness dashboard to be used in the Traffic Management Center that included data regarding crashes
  - Alerts the Denver TMC to traffic incidents on the transportation network
  - Once detected the TMC can verify and then work to understand the impacts
  - Provides increased opportunities for the TMC to actively monitor and manage disruptions to the transportation network
• What are the benefits?
  • Detecting disruptions to the transportation network
    • Historically it has been a challenge to have situational awareness of incidents
  • Actively managing any resulting congestion
    • Temporary changes to signal timing
    • Coordination with other Denver agencies
    • Coordination with external partners
      • Colorado DOT
      • Other local public agencies
Situational Awareness Dashboard

Transportation Technology

Active Traffic Incidents
- Accident No Injury
  - I-25 / W 6th Ave
- Accident No Injury
  - 1119E E 40th Ave
- Accident No Injury
  - W 6th Ave / N Federal Blvd
- Accident No Injury
  - W 6th Ave / N Federal Blvd

Active Traffic Incidents
15

311 Cases Today
No Data

Special Events Today
No Data

Private Venue Events
No Data

Road Closures
484 Active

Road Closures
1st Lane
- 5 PERCE ST to S SHERIDAN BLVD
  - 3/28/2019, 6:00 PM to 4/14/2019, 6:00 PM
- 1st Lane
  - 21ST ST to 22ND ST
  - 4/10/2019, 6:00 PM to 5/9/2019, 6:00 PM
- 1st Lane
  - N YORK ST to N JOSEPHINE ST
  - 5/25/2019, 6:00 PM to 5/27/2019, 6:00 PM

Last update: 2 minutes ago

SATool
A Twitter list by @DenverOEM

Denver Police Dept. @DenverPolice
Hey, Denver — the city is no longer on the other side! But don’t go thinking you can get all crazy on the roads now. Some areas remain icy and we encourage everyone to
Case Studies of the Application of Operational Strategies
Case Studies – Incident Response

• Integration of technology allows the Denver TMC to increase its operational capabilities and to conduct active traffic management

• As an example the Denver TMC is **responding to incidents on the transportation network** by monitoring and actively managing the disrupted traffic flow
  
  • Roadways under the purview of the City and County of Denver
  • Colorado DOT roadways with impacts to the Denver network

• Three incidents where the Denver TMC actively managed and as a result, congestion was decreased
  
  • Full closure of a major arterial due to a water main break
  • Full closure of the Interstate due to a crash involving a tanker
  • Lanes closures of a major arterial due to a crash involving a bus
On Friday, May 4, 2018 an incident that involved a full closure of a major arterial was detected

- Efforts were taken to determine the de facto diversion routes
- The active management included making changes to the traffic signal timing to accommodate the change in volume seen on the diversion route
- In order to navigate around the closures diverted vehicles used a left-turn bay at a downstream intersection
  - This resulted in an overflow of vehicles into the thru lanes which then cascaded to other lanes
- Changes to traffic signal timing were made in an iterative process by continuing to actively monitor and manage the network
- The Denver TMC was able to visually notice improvements to the roadway once traffic signal timing changes were implemented
Case Study – Incident Response

NBLT Santa Fe at Florida - Incident Comparison

Vehicles (15-minute interval)

12:00 AM  6:00 AM  12:00 PM  6:00 PM  12:00 AM

Friday Average  5/4/2018
Case Studies – Incident Response

**Denver Traffic Management Center**

**Traffic Incident Response Summary—Interstate 25**
Thursday, June 14, 2018

**Incident Background**
- Multiple vehicle crash on northbound Interstate 25 just south of Interstate 70
- Crash occurred during the morning rush hour
- Involved a commercial vehicle hauling hazardous materials which had turned onto its side and required extensive recovery efforts
- The northbound lanes of I-25 were completely closed for 2.5 hours before the HOV lane was opened for NB traffic
  - Allowed for NB traffic to flow; however, vehicles were required to merge into 1 lane—under normal conditions there are 5 lanes available
  - The Interstate fully opened approximately 8 hours after the incident occurred

**Traffic Impacts**
- Interstate
  - During 2.5 hour full closure of NB Interstate 25 traffic was diverted onto NB Speer Boulevard which is a City of Denver roadway
- City of Denver Roadways
  - Federal Boulevard became a primary diversion route
  - Travel times increased **up to 419%** when compared to normal conditions
  - Traffic volumes increased up to 130% during the incident

**Denver TMC Response**
- Once alerted to the Interstate closure, the Denver TMC began analyzing the impacts on the City’s transportation network
- The closure point of the Interstate along with the main diversion route was identified
  - Located the most significant bottleneck location at Federal and I-70
- Changes were made to traffic signal timing from the Denver TMC to locations on Federal Boulevard
- Activated Interstate closure messages on Denver variable message signs

**Active Management by the Denver TMC Mitigated Congestion on the Diversion Route**
- Travel times on Federal Boulevard increased to **over 400% of average** prior to Denver TMC actions
- Travel volumes on Federal Boulevard increased up to **130% of average**
- Travel times seen on Federal Boulevard during the incident decreased by **67%** due to the response of the Denver TMC
Case Studies – Incident Response

Traffic Incident Response Summary—Santa Fe Drive
Tuesday, December 11, 2018

Incident Background
- Vehicle crash at the intersection of Santa Fe Drive at Mississippi Avenue that blocked 3 lanes of southbound Santa Fe
- Crash occurred at the beginning of the afternoon rush hour
- Involved a public transit bus
- The southbound lanes of Santa Fe Drive were blocked for 1.5 hours which reduced capacity by 25 to 75%
- One lane of eastbound Mississippi Avenue was also blocked

Traffic Impacts
- Interstate
  - During the lane blockage of Santa Fe Drive queuing was observed on Interstate 25
- City of Denver Roadways
  - Travel times on Santa Fe Drive increased up to 330% when compared to normal conditions
  - Traffic flow decreased by 75% during the incident

Denver TMC Response
- Once alerted by CAD alerts on the Situational Awareness dashboard, the Denver TMC began analyzing the impacts on the City’s transportation network
- Changes were made to traffic signal timing from the Denver TMC to the Intersection of Santa Fe Drive and Mississippi Avenue
- Those changes to signal timing provided two benefits:
  - Decreased congestion on southbound Santa Fe Drive without significant impacts to Mississippi Avenue
  - Decreased the recovery time after lanes were opened and the incident was cleared
- Notified the CDOT TMC

Travel times on Santa Fe Drive increased to over 330% of average prior to Denver TMC actions

Travel flows volumes on Santa Fe Drive decreased by 75%

Congestion seen on Santa Fe Drive during the incident decreased by 66% due to the response of the Denver TMC

Active Management by the Denver TMC Mitigated Congestion on the Diversion Route
Thank You

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