AGENDA

TRANSPORTATION ADVISORY COMMITTEE
Monday, August 27, 2018
1:30 p.m.

1001 17th St.
1st Fl. Aspen Conference Rm. (enter from 17th St. plaza next to Etai's Café)

1. Call to Order

2. Public Comment

3. July 9, 2018 TAC Meeting Summary
(Attachment A)

ACTION ITEMS

4. Discussion on TIP Regional Share Project Review Panel representatives.
(Attachment B) Todd Cottrell

5. Discussion on *Congestion Mitigation and Air Quality Improvement* (CMAQ) targets.
(Attachment C) Beth Doliboa

INFORMATIONAL ITEMS

6. Briefing on potential freight projects for FY 2019-2020 National Highway Freight Program (NHFP).
(Attachment D) Matthew Helfant – Tim Kirby, CDOT

7. Briefing on WALKscope Denver.
(Attachment E) Derrick Webb – City of Denver – WalkDenver

8. Update on Mobility Choice.
(Attachment F) Jacob Riger – Chris Primus, HDR

9. Overview of upcoming *2017 Annual Report on Traffic Congestion in the Denver Region*.
(Attachment G) Robert Spotts

ADMINISTRATIVE ITEMS

10. Member Comment/Other Matters
    - Potential meeting date change in November (from Nov. 19 to Nov. 12)

11. Next Meeting – September 24, 2018

12. Adjournment

Persons in need of auxiliary aids or services, such as interpretation services or assisted listening devices, are asked to contact DRCOG at least 48 hours in advance of the meeting by calling (303) 480-6744.

ATTACH A

ATTACHMENT A

MEETING SUMMARY
TRANSPORTATION ADVISORY COMMITTEE
Monday, July 9, 2018

MEMBERS (OR VOTING ALTERNATES) PRESENT:

Kent Moorman	Adams County-City of Thornton
Jeanne Shreve (Vice Chair)	Adams County
Mac Callison (Alternate)	Arapahoe County-City of Aurora
Travis Greiman	Arapahoe County-City of Centennial
Phil Greenwald (Alternate)	Boulder County-City of Longmont
Sarah Grant (Alternate)	Broomfield, City and County
Gregg Moss	Business
Richard Zamora (Alternate)	Colorado Dept. of Transportation, Reg 1
David Gaspers	Denver, City and County
Ron Papsdorf	Denver Regional Council of Governments
Art Griffith	Douglas County
John Cotten (Chair)	Douglas County-City of Lone Tree
Rick Pilgrim	Environment
Debra Baskett	Jefferson County-City of Westminster
Steve Durian	Jefferson County
Stephen Strohminger	Non-MPO Area
Dawn Sluder (Alternate)	Non-RTD Transit
Ken Lloyd	Regional Air Quality Council
Dawn Sluder	Seniors
Ted Heyd	TDM/Non-motor

OTHERS PRESENT:

Bryan Weimer (Alternate)	Arapahoe County
Tim Kirby (Alternate)	Colorado Dept. of Transportation, DTD
Doug Rex (Alternate)	Denver Regional Council of Governments
Tom Reiff (Alternate)	Douglas County-Town of Castle Rock
Aaron Bustow (Ex-Officio)	Federal Highway Administration

Public: Evan Enarson, Cambridge Systematics; JoAnn Mattson, Danny Herrmann, CDOT Region 1; Eugene Howard, Denver; Holly Buck, Steven Marfitano – Felsburg, Holt & Ullevig; Josie Ortiz, Greenwood Village; Brian Welch, RTD

DRCOG staff: Jacob Riger, Todd Cottrell, Brad Calvert, Beth Doliboa, Emily Lindsey, Robert Spotts, Celeste Stragand, Casey Collins

Public Comment
There was no public comment.

Call to Order
Chair John Cotten called the meeting to order at 1:35 p.m.

ACTION ITEMS

Discussion on amendments to the *FY 2018-2021 Transportation Improvement Program* (TIP)
Todd Cottrell presented the five proposed amendments to the 2018-2021 TIP.

- **1997-084 RTD Preventive Maintenance: Transit Vehicle Overhaul and Maintenance**
  Add funding

- **1999-052 RTD State of Good Repair**
  Add funding
- **2008-111 FasTracks Eagle P-3 Corridors (Gold and East Line)**
  Add and shift funding
- **2012-108 RTD Capital Improvements: Bus and Facilities Funding**
  Add funding
- **2018-014 I-25 Capacity Improvements: Castle Rock to El Paso County Line**
  Temporarily switch state funding sources

Rick Pilgrim asked if the RTD State of Good Repair request (which is for mostly 16th St Mall improvements) is being coordinated with the greater vision plan for the 16th St. Mall. Brian Welch, RTD, answered that this funding, if possible, will be combined with City and County of Denver funding; otherwise, there is another identified purpose that would be smaller in scope.

> Gregg Moss MOVED to recommend to the Regional Transportation Committee amendments to the *2018-2021 Transportation Improvement Plan* (TIP). The motion was seconded and passed unanimously.

Discussion on SB18-001 Multimodal Options Fund

Ron Papsdorf discussed several options on how DRCOG will allocate new revenue anticipated from SB18-001, specifically the Multimodal Transportation Options Fund. Two General Fund transfers will be made to the Multimodal Fund in FY 2018 ($74.25m) and FY 2019 ($22.5m). Of the total amount ($96.75m), 15% will be further distributed to state projects ($14.51m), while 85% will go to local projects ($82.24m).

SB18-001 directs the Transportation Commission to establish a distribution formula based on population and transit ridership to allocate local project funds. Funding recipients must provide a match equal to the amount of award. The Commission is expected to start the allocation process in the fall.

DRCOG is anticipating receiving about 60% of local project Multimodal funds (~$38m in FY18 and $12m in FY19). Staff prepared three options on how to distribute the DRCOG area share of the local project Multimodal funding as described in the memo.

- Mr. Papsdorf reviewed staff's recommendation:
  - To include the Multimodal distribution funds in the 2020-2023 TIP process and split between the Regional (20%) and Subregional shares (80%); and to separate out the process for the non-MPO area of DRCOG (with ~1% taken off-the-top). The recommendation is consistent with 2018-2021 TIP Waiting List Protocol, provides opportunity to leverage Federal TIP funding, and take advantage of synergies with other Regional/Subregional project submittals.

  Regional Share project funding would increase to about $31 million if the Board approves staff's recommendation to wrap the 2020-2023 TIP 20% Regional Share ($21 million) with the anticipated Multimodal funding (~$10 million).
- Mr. Papsdorf also reviewed two other potential options for consideration.
  - To fund eligible projects from the 2018-2021 TIP Waiting List with anticipated FY 2018 Multimodal Local Projects funds and roll over FY 2019 funds to the 2020-2023 TIP (less 1% for non-MPO area)
  - To treat as a new "set-aside" program and run a separate call for projects after the 2020-2023 TIP Process is complete.

There was discussion on the options. Several points were noted: Multimodal funding wouldn't likely be distributed until October/November; and the TIP waiting list of projects is outdated as it was submitted four years ago.

> Art Griffith MOVED to recommend staff's recommendation to the Regional Transportation Committee amending the draft *Policy on Transportation Improvement Program* (TIP) *Preparation, Procedures for Preparing the 2020-2023 TIP* to include anticipated SB18-001 FY 2018 and FY 2019 Multimodal Transportation Options Fund Local Projects resources (less 1% for the DRCOG non-MPO areas) in the regional (20%) and subregional (80%) shares. The motion was seconded and passed with 1 opposed (David Gaspers)

Note: The version of the 2020-2023 TIP action draft to be presented to the August 14 RTC and August 15 Board will be revised to incorporate anticipated SB18-001 FY 2018 and FY 2019 Multimodal Transportation Options Fund Local Projects resources (less 1% for the DRCOG non-MPO areas) in the regional (20%) and subregional (80%) shares.

Discussion on 2020-2023 TIP Policy document

Todd Cottrell presented the final action draft of the 2020-2023 TIP *Policy on Transportation Improvement Program* (TIP) *Preparation, Procedures for Preparing the 2020-2023 TIP*. He reviewed highlights of the document, which guides the new Dual Model TIP process for both Regional and Subregional funding shares. This new TIP process will be incorporated as a pilot program for the next TIP cycle (FY 2020-2023).

A list of comments from FHWA (and DRCOG responses) was handed out to the committee. These comments will be added to the list of comments from City and County of Denver and CDOT already in the document.

If approved, the Regional Share Call for Projects is anticipated to be open from July 30 through September 21, 2018. Projects will be under review from September 2018 through January 2019. The Subregional Share Call for Projects is anticipated to be open from February through June 2019. TIP adoption is anticipated in August 2019.

> Kent Moorman MOVED to recommend to the Regional Transportation Committee the draft *Policy on Transportation Improvement Program* (TIP) *Preparation, Procedures for Preparing the 2020-2023 TIP,* with the addition of the FHWA comments. The motion was seconded and passed unanimously.

Discussion on amending the *FY 2018-2019 Unified Planning Work Program* (UPWP)

Todd Cottrell presented the updates and amendments to the FY 2018-2019 UPWP that was adopted in July 2017. The UPWP is a two-year work program outlining planning and work activities for the MPO and participating entities. Proposed changes are shown in the track-changes version attached in agenda and include:

- Procedural: minor modifications to tasks and activities
- Financial: updates/clarifications to Appendix A finance tables
- Schedule: minor updates to several deliverable completions dates in Activity descriptions and in Appendix B

> Debra Baskett MOVED to recommend to the Board of Directors amendments to the *FY 2018-2019 Unified Planning Work Program*. The motion was seconded and passed unanimously.

INFORMATIONAL ITEMS

Briefing on RTD's Regional Bus Rapid Transit (BRT) Study

Matthew Helfant introduced Holly Buck, project manager with Felsburg Holt & Ullevig, to present an overview of preliminary findings of RTD's Regional Bus Rapid Transit (BRT) Study. RTD has worked with FHU over the last six months to identify and prioritize corridor-based or fixed-guideway BRT projects within RTD's service area. The study will be conducted over an 18-month period, starting in February 2018.

Project website www.rtd-denver.com/BRT-study.shtml

Briefing on 2040 MVRTP *Regional Freight and Goods Movement* component

Matthew Helfant introduced Evan Enarson, project manager with Cambridge Systematics, who is working with CDOT on freight planning efforts (Colorado Freight Plan and the Colorado Freight and Passenger Rail Plan) and will be working with DRCOG, starting in the fall, on updating the *Regional Freight and Goods Movement* component of the DRCOG 2040 MVRTP. Mr. Enarson gave a general briefing on the status of statewide freight planning efforts.

He noted a key task in the DRCOG component will be to develop a priority list of freight projects in the DRCOG region. Although there is limited freight funding available now, this list will help position the region for future funding opportunities. Local jurisdictions will be asked for input into this effort to develop a project priorities list.

ADMINISTRATIVE ITEMS

Member Comment/Other Matters

- Regarding the contracting status for the STAMP/UC program, Jacob Riger said staff met with FHWA and received agreement to have greater contracting flexibility. Details are still being finalized, but DRCOG anticipates contracting funds with sponsors, while CDOT will still be steward of the funds to meet FHWA requirements. The STAMP/UC call for projects will proceed as soon as possible.
- TAC member Ken Lloyd, longtime executive director of the Regional Air Quality Council announced his retirement is scheduled for the end of July. Ken has served with DRCOG for over 20 years on a variety of DRCOG committees. Chair Cotten and the committee thanked him for his many contributions to TAC, DRCOG and the region.

The meeting adjourned at 2:55 p.m. The next meeting is August 27, 2018.

ATTACH B

ATTACHMENT B

To: Chair and Members of the Transportation Advisory Committee

From: Todd Cottrell, Senior Transportation Planner
(303) 480-6737 or tcottrell@drcog.org

Meeting Date	Agenda Category	Agenda Item #
August 27, 2018	Action	4

SUBJECT

2020-2023 *Transportation Improvement Program* (TIP) Regional Share Project Review Panel.

PROPOSED ACTION/RECOMMENDATIONS

DRCOG staff recommends approval of the representatives to the Regional Share Project Review Panel to review and recommend Regional Share applications for funding in the Regional Share Call for Projects to the 2020-2023 TIP.

ACTION BY OTHERS

N/A

SUMMARY

The adopted 2020-2023 TIP Policy states that a Project Review Panel will be formed to discuss and prioritize all eligible Regional Share project submittals after all projects have been evaluated by DRCOG staff. The panel will consist of one technical staff representative from each of the eight subregions, one CDOT representative, one RTD representative, and up to five regional subject matter experts.

As the subregional forums have met over the past several months, each has indicated or made a recommendation for their review panel representative (and alternate in some cases). These representatives include:

Subregion/CDOT/RTD Representatives		
Adams County	**Kent Moorman**	Regional Transportation Engineer, City of Thornton
Arapahoe County	**Travis Greiman**	Public Works Director, City of Centennial
Boulder County	**Scott McCarey***	Multimodal Division Manager, Boulder County
City/County of Broomfield	**Sarah Grant**	Transportation Manager, City/County of Broomfield
City/County of Denver	**Justin Begley**	Project Manager II, City/County of Denver
Douglas County	**Art Griffith**	Capital Improvements Projects Manager, Douglas County
		Alternate: John Cotten, Public Works Director, City of Lone Tree
Jefferson County	**Steve Durian**	Transportation & Engineering Director, Jefferson County
SW Weld County	**Phil Greenwald**	Transportation Planner, City of Longmont
		Alternate: Dawn Anderson, Development Review Manager, Weld County
CDOT	**Tim Kirby**	Multimodal Planning Branch Manager, CDOT DTD
RTD	**Brian Welch**	Senior Manager, Planning Technical Services, RTD

**subject to August 24 technical sub-committee meeting outcome*

Subject Matter Experts

In addition to a representative from each of the eight subregional forums, CDOT, and RTD, the Project Review Panel will include *up to five* subject matter experts. DRCOG staff is recommending the panel include three subject matter experts to keep the panel at a reasonable size. These experts are to be considered a leader in the Denver region in their field and are not specific to any geographic area or local jurisdiction of the metro region.

Nominees for Subject Matter Expert Representative	
Piep van Heuven	Denver Director, Bicycle Colorado
Tracy Sakaguchi	Director of State Issues & Special Events Coordinator, Colorado Motor Carriers Assn.
Steve McCannon	Mobile Sources Program Director, Regional Air Quality Council
Chris Fasching	Principal, Felsburg, Holt & Ullevig *(suggestion from Arapahoe County forum)*
Maria D'Andrea	Director of Public Works, City of Englewood *(suggestion from Arapahoe County forum)*

DRCOG staff recommends Piep van Heuven, Tracy Sakaguchi, and Steve McCannon as the three subject matter experts to the Project Review Panel.

PREVIOUS DISCUSSIONS/ACTIONS

N/A

PROPOSED MOTION

Move to recommend to the Regional Transportation Committee the list of Regional Share Project Review Panel representatives.

ATTACHMENTS

N/A

ADDITIONAL INFORMATION

If you need additional information, please contact Todd Cottrell, Senior Transportation Planner, Transportation Planning and Operations at 303-480-6737 or tcottrell@drcog.org.

ATTACH C

ATTACHMENT C

To: Chair and Members of the Transportation Advisory Committee

From: Beth Doliboa, Transportation Planner
303-480-5647 or bdoliboa@drcog.org

Meeting Date	Agenda Category	Agenda Item #
August 27, 2018	Action	5

SUBJECT

Total on-road emission reduction targets for projects funded with CMAQ dollars as part of the performance-based planning requirements of the *Fixing America's Surface Transportation* (FAST Act).

PROPOSED ACTION/RECOMMENDATIONS

Staff recommends approval of the targets shown below.

ACTION BY OTHERS

N/A

SUMMARY

The FAST Act requires state DOTs and MPOs to set targets and report on progress towards achieving those targets for several topics in support of a performance- based approach to transportation planning and programming. These topics include safety, infrastructure (pavement and bridge condition), system performance, and transit asset management.

DRCOG must set 2-year and 4-year targets for total emissions reductions for projects funded with CMAQ dollars for four criteria pollutants and precursors: Carbon Monoxide (CO), Nitrogen Oxides (NOx), Volatile Organic Compounds (VOCs), and Particulate Matter (PM-10). DRCOG is the only MPO in Colorado required to set emission reduction targets because of population and air quality thresholds contained in the FAST Act.

It is important to emphasize that unlike other FAST Act performance targets, CMAQ emissions reduction targets are projects-based. Specifically, they are based on projects reported in FHWA's CMAQ Public Access System. This project database shows estimated emissions reductions at the time of federal funding obligation, not project implementation. It also may have incomplete data by pollutant and/or reporting year.

CDOT worked with the Regional Air Quality Council and coordinated with DRCOG to develop 2-year and 4-year statewide targets. Given the data and methodology difficulties and limitations described above, DRCOG staff recommends that DRCOG support the following CDOT statewide targets rather than trying to set separate targets for the DRCOG region:

On-Road Emissions	2-Year Targets (2020)	4-Year Targets (2022)
• Volatile Organic Compound (VOC)	86	105
• Particulate Matter (PM10)	31	152
• Carbon Monoxide (CO)	1,152	1,426
• Nitrogen Oxide (NOx)	86	105

PREVIOUS DISCUSSIONS/ACTIONS

N/A

PROPOSED MOTION

Move to recommend to the Regional Transportation Committee the proposed targets for on-road emission reductions for projects funded by CMAQ funds as part of the performance-based planning requirements of the *Fixing America's Surface Transportation* (FAST Act).

ATTACHMENT

1. CDOT presentation

ADDITIONAL INFORMATION

If you need additional information, please contact Beth Doliboa, Transportation Planner at 303-480-5647 or bdoliboa@drcog.org or Darius Pakbaz, CDOT Performance Data Manager at 303-757-9133 or darius.pakbaz@state.co.us

National Performance Measure Targets

August 2018

Timeline

- May 20, 2017 - Final Rule Published establishing final measures and targets for Infrastructure Condition (PM2) and System Performance (PM3) metrics
- August 31, 2017 - Safety performance targets for 2018 approved
- March-April 2018 - Transportation Commission reviewed and adopted statewide targets for infrastructure condition and system performance metrics
- May 20, 2018 - Official adoption of statewide targets for infrastructure condition and system performance metrics

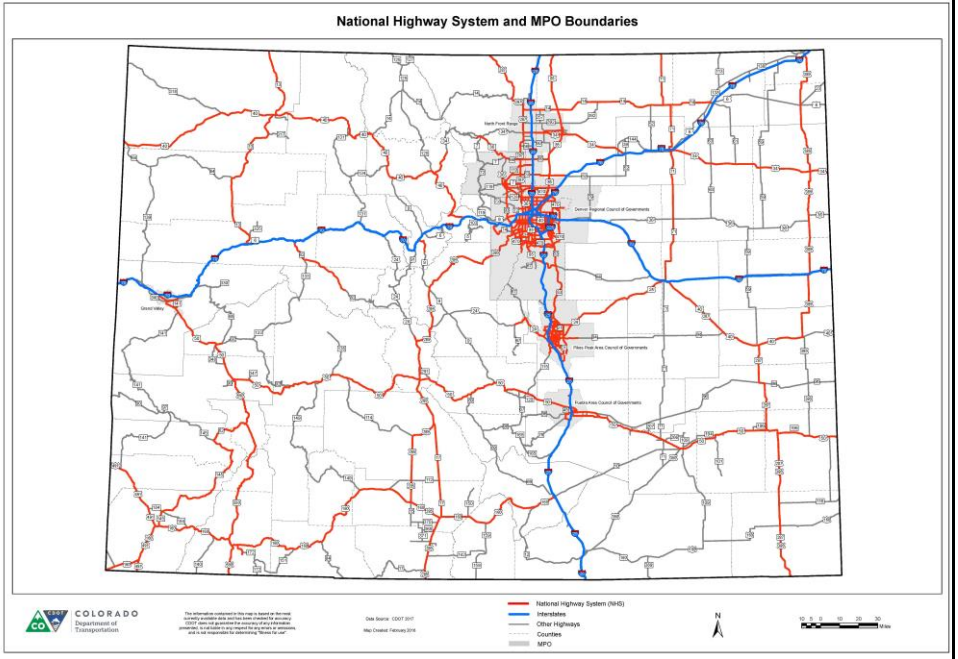
2

Overview of National Highway Performance Program (NHPP)

MAP-21 (2012) and the FAST Act (2015) established provisions for federal performance measures for the Interstate and National Highway System.

Performance Area	State Targets Due	MPO Targets Due	Evaluation Period
Safety – TC Approved –	8/31/2017	2/27/2018	Annual
Infrastructure Condition – Pavement and Bridge – TC Approved –	5/20/2018	11/15/2018	Biennial
System Performance – System Reliability, Freight, and CMAQ – TC Approved –	5/20/2018	11/15/2018	Biennial

3



National Performance Measures Targets - Safety

National Performance Measure	Current Condition (2012-2016)	2018 Target
Number of Traffic Fatalities (5-year Average)	519.6	**610**
Traffic Fatalities Per 100M VMT (5-year Average)	1.058	**1.200**
Number of Serious Injuries (5-Year Average)	3,145.8	**3,350.0**
Serious Injuries Per 100M VMT (5-Year Average)	6.439	**6.790**
Number of Non-Motorized Fatalities and Serious Injuries (5-Year Average)	1,162.4	**586.0**

5

National Performance Measures Targets – Infrastructure Condition

	National Performance Measure	Current Condition	2-Year Targets (2020)	4-Year Targets (2022)
Pavement	Percentage of pavements of the Interstate System in Good Condition	45%	**46%**	**47%**
	Percentage of pavements of the Interstate System in Poor Condition	0.31%	**1%**	**1%**
	Percentage of pavements of the non-Interstate NHS in Good Condition	43%	**50%**	**51%**
	Percentage of pavements of the non-Interstate NHS in Poor Condition	0.99%	**1%**	**2%**
Bridge	Percentage of NHS bridges, by deck area, classified in good condition	49%	**45%**	**44%**
	Percentage of NHS bridges, by deck area, classified in poor condition	4%	**4%**	**4%**

6

National Performance Measures Targets – System Performance & CMAQ

	National Performance Measure	Current Condition	2020 Target (2 Year)	2022 Target (4 Year)
System Performance & Freight	Interstate Travel Time Reliability Measure: Percent of person-miles traveled on the Interstate that are reliable	82%	**81%**	**81%**
	Non-Interstate Travel Time Reliability Measure: Percent of person-miles traveled on the non-Interstate NHS that are reliable	64%	**64%**	**64%**
	Freight Reliability Measure: Truck Travel Time Reliability (TTTR) Index	1.50	**1.50**	**1.50**
CMAQ – Traffic Congestion	Peak Hour Excessive Delay (PHED) Measure: Annual Hours of Peak Hour Excessive Delay (PHED) Per Capita	48	**52**	**54**
	Non-Single Occupancy Vehicle Travel (SOV) Measure: Percent of Non-Single Occupancy Vehicle (SOV) Travel	24%	**24%**	**25%**
CMAQ – Air Quality	Emissions Measure: Total Emissions Reduction benefit for Volatile Organic Compounds – VOC (kg/day)	102	**86**	**105**
	Emissions Measure: Total Emissions Reduction benefit for Particulate Matter, 10 micrometers or greater – PM10 (kg/day)	50	**31**	**152**
	Emissions Measure: Total Emissions Reduction benefit for Carbon Monoxide – CO (kg/day)	1,846	**1,152**	**1,426**
	Emissions Measure: Total Emissions Reduction benefit for Nitrogen Oxides – NOx (kg/day)	420	**86**	**105**

Next Steps

- October 1, 2018 - CDOT reports baseline performance for Infrastructure Condition and System Performance to FHWA.
  - Includes CMAQ performance plan for applicable MPOs
- November 15, 2018 - Deadline for MPOs to support the statewide targets or develop their own targets for Infrastructure Condition and System Performance
- 2020 - Mid-year review of the first performance period:
  - Adjustment (if necessary) of the four-year targets
  - CDOT submits mid-year performance report
- 2022 - End of first performance period:
  - Target Setting for next four-year performance period (2022-2026)
  - CDOT submit final performance report and significant progress determination performed.

8

ATTACH D

ATTACHMENT D

To: Chair and Members of the Transportation Advisory Committee

From: Matthew Helfant, Senior Transportation Planner
303-480-6731 or mhelfant@drcog.org

Meeting Date	Agenda Category	Agenda Item #
August 27, 2018	Informational	6

SUBJECT

CDOT project selection process for National Highway Freight Program (NHFP)

PROPOSED ACTION/RECOMMENDATIONS

N/A

ACTION BY OTHERS

N/A

SUMMARY

The NHFP is a formula freight program created under the FAST Act that provides approximately $15 million annually to Colorado. Project selection is managed by CDOT. As CDOT continues to refine and implement a robust project selection process, DRCOG is encouraging CDOT to more closely involve MPOs in the process and to provide local governments with meaningful opportunity to submit priority projects for funding consideration.

At the August TAC meeting, CDOT staff will lead a conversation with TAC about the NHFP project selection process.

PREVIOUS DISCUSSIONS/ACTIONS

N/A

PROPOSED MOTION

N/A

ATTACHMENTS

N/A

ADDITIONAL INFORMATION

If you need additional information, please contact Matthew Helfant, Senior Transportation Planner, at 303-480-6731 or mhelfant@drcog.org; or Tim Kirby, Multimodal Planning Branch Manager, CDOT, at 303-757-9619 or timothy.kirby@state.co.us.

ATTACH E

ATTACHMENT E

To: Chair and Members of the Transportation Advisory Committee

From: Derrick Webb, Planner II, Regional Planning and Development Division
303-480-6728 or dwebb@drcog.org

Meeting Date	Agenda Category	Agenda Item #
August 27, 2018	Informational	7

SUBJECT

Overview of the current WALKscope tool and future opportunities to collect crowd-sourced built environment data.

PROPOSED ACTION/RECOMMENDATIONS

N/A

ACTION BY OTHERS

N/A

SUMMARY

WALKscope allows Denver residents and visitors to record data related to sidewalks, intersections, and pedestrian counts. This information can be used to create an inventory of pedestrian infrastructure condition in Denver, identify gaps, and identify potential enhancements to pedestrian facilities. WalkDenver and PlaceMatters collaborated to develop the original WALKscope tool with grant funding from Mile High Connects.

In 2017, local public health agencies (LPHAs) from throughout the region requested DRCOG's participation in a grant application to build a regional built environment data collection and evaluation tool. The proposal was not selected for funding. However, the collaborative effort to develop the grant application led to region-wide discussions on data tools that can increase physical activity and promote improved health outcomes.

DRCOG's LPHA partners remain interested in tools that can engage local residents and inform built environment policies, projects and plans. Representatives from WalkDenver and Denver's Department of Public Health and Environment will share results from previous efforts and gauge interest from TAC about the potential to scale up WALKscope to become a regional data collection tool and for DRCOG to fund such an effort.

PREVIOUS DISCUSSIONS/ACTIONS

N/A

PROPOSED MOTION

N/A

ATTACHMENT

1. WALKscope overview– WalkDenver and DDPHE representatives

ADDITIONAL INFORMATION

If you need additional information, please contact Derrick Webb, Planner II, at 303-480-6728 or dwebb@drcog.org.

STREETscope Mobility Data Collection Tool

WHAT:

- An online crowdsourcing tool for collecting consistent, comprehensive data
- Evaluates pedestrian, bicycle, and transit infrastructure and usage

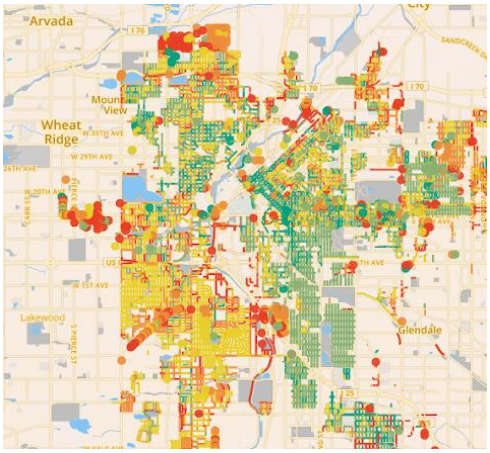
WHY:

1. Engage community members in gathering data about transportation modes other than driving
2. Inform public sector decision-making about transportation and built environments
3. Support and evaluate policies and practices that promote healthy, active transportation

"What gets measured gets done"

What if we collected data about active transportation like we did about cars? More data helps decision-makers and communities accurately assess the quality and availability of non-automobile transportation and prioritize interventions that promote their use - ultimately creating better health, economic, and social outcomes for our communities.

Case Study: WALKscope in Denver



- Empowered diverse range of community members to collect over 25,000 data points about the pedestrian environments where they live and travel daily
- Raised awareness of connection between the built environment, public health, and traffic safety
- Long-term, consistent crowdsourced data collection in an easily and publicly accessible online reporting tool - view at www.walkscope.org
- Identified gaps, resources, walking routes, and more for numerous neighborhood active living plans, Safe Routes to School travel plans, city-wide planning documents, and more.

STREETscope will do all that and more, including:

- Expanding beyond pedestrian environments to other forms of active transportation, including bicycling and public transit
- A Spanish-language version to expand community accessibility
- An updated and regionally expanded base dataset of sidewalks, intersections, transit stops, and street segments
- An Interactive map for exploring and reporting data
- Gamification and incentives to widen reach

"I need this in my community!"

- Contact Jill.Locantore@walkdenver.org or Kayla.Gilbert@denvergov.org to get involved.

ATTACH F

ATTACHMENT F

To: Chair and Members of the Transportation Advisory Committee

From: Jacob Riger, Long Range Transportation Planning Manager
303-480-6751 or jriger@drcog.org

Meeting Date	Agenda Category	Agenda Item #
August 27, 2018	Information	8

SUBJECT

Briefing on the Mobility Choice Blueprint project.

PROPOSED ACTION/RECOMMENDATIONS

N/A

ACTION BY OTHERS

N/A

SUMMARY

The Mobility Choice Blueprint is a collaborative strategy to help the metro Denver region identify how to best prepare for the rapidly changing technology that is revolutionizing transportation mobility. As a reminder, Mobility Choice is a unique planning and funding partnership of CDOT, DRCOG, RTD, and the Denver Metro Chamber. The 2030 Blueprint will analyze travel trends and technologies in the region, explore and evaluate various technologies and their implications for mobility, align transportation investments of multiple public agencies, and create new planning and implementation partnerships.

Since the last Mobility Choice Blueprint briefing to TAC in March, project stakeholders and the consultant team have held several workshops to define 2030 scenarios for testing and analysis, conducted extensive public outreach, hosted global thought leaders and other subject matter experts, and begun to prepare initial content for the 2030 Blueprint plan document. The project also now has a dedicated website: http://www.mobilitychoiceblueprintstudy.com/.

At the August TAC meeting, staff from HDR, the project's lead consultant, will provide an update on the Mobility Choice Blueprint project, process, and schedule. Mobility Choice briefings will continue to be provided at regular intervals throughout the planning process to DRCOG's committees and Board.

PREVIOUS DISCUSSIONS/ACTIONS

March 26, 2018 - TAC

PROPOSED MOTION

N/A

ATTACHMENT

1. Consultant presentation

ADDITIONAL INFORMATION

If you need additional information, please contact Jacob Riger, Long Range Transportation Planning Manager at 303 480-6751 or jriger@drcog.org

MOBILITY CHOICE BLUEPRINT

UNIFIED VISION

A partnership of public and private organizations focused on changing how we move – and making the Denver metro area a better place to work and live.

RTD | CDOT | drcog | DENVER METRO CHAMBER OF COMMERCE

MOBILITY CHOICE BLUEPRINT

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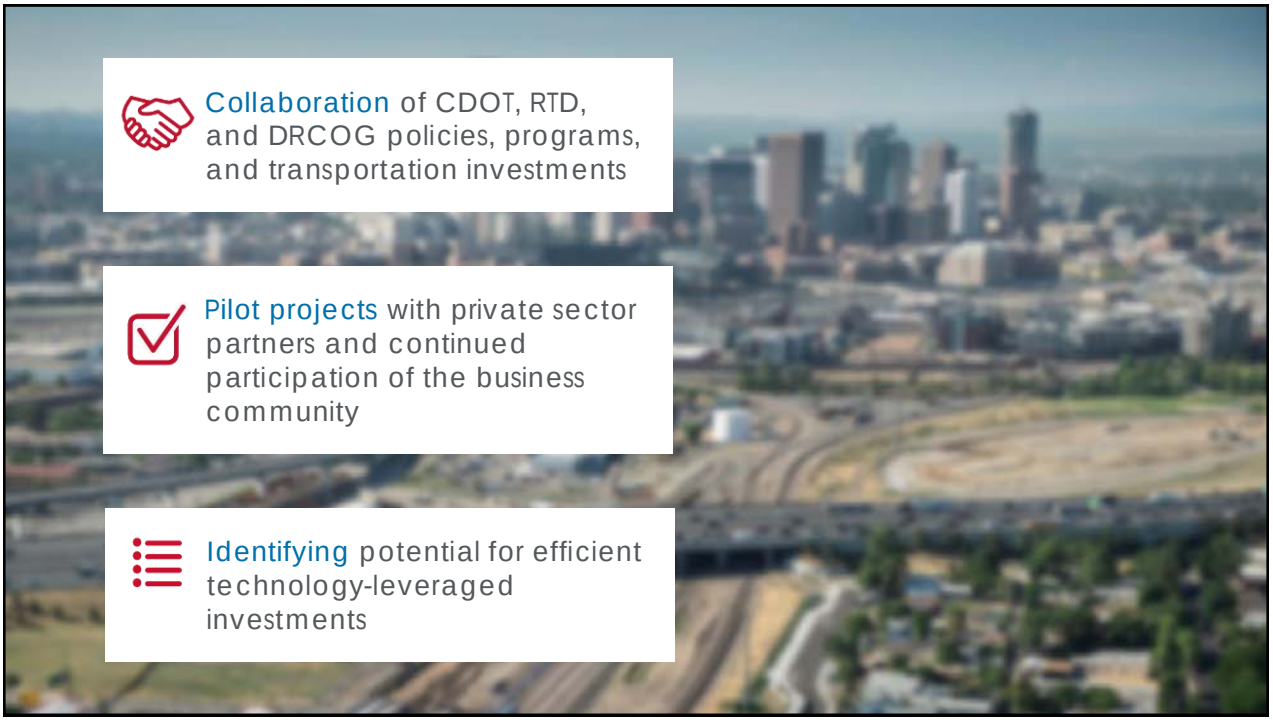

MCB PROCESS OVERVIEW

Input
- Community Engagement
- Research
  - Existing Programs
  - Peer Cities
  - Transformational Technologies

Blueprint Framework
- Vision, Mission
- Themes, Problems, Outcomes
- Workshop Results
- Emerging Mobility Systems

Scenario Evaluation
- 2030 RTP
- 2030 Status Quo/ Trends
- 2030 Evolution
- 2030 Revolution

Preliminary & Final Recommendations
- Policy Changes
- Mobility Programs
- Funding Sources
- Governance Models
- Pilot Projects
- Next Steps

Spring | Summer | Fall

MOBILITY CHOICE BLUEPRINT

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MOBILITY CHOICE BLUEPRINT VISION

Our metropolitan region employs a full array of flexible technology and services to maximize access to mobility choices connecting people of all ages, incomes and abilities to jobs, recreation, healthcare, amenities and other daily activities, enhancing and protecting our quality of life now and in the future.

MOBILITY CHOICE BLUEPRINT MISSION

The metropolitan agencies will collaborate, in partnership with community, nonprofit, and private sector leaders, to carefully consider a range of effective and efficient solutions to the challenges and opportunities presented by emerging mobility technologies. We will provide recommendations to encourage the most effective technologies and approaches, maximizing mobility to meet our long-term goals of enhanced quality of life and increased economic vitality across the metropolitan region.

THEMES, PROBLEMS & OUTCOMES

Theme	Problem Statement	Outcome
Safety	Sanctity of life and safety from personal injury and property damage must remain the primary force for new technology operational designs.	Connected, autonomous, shared and electric mobility operate safely.
Sustainable Mobility	Technology enables a much more diverse set of mobility options for consumers resulting in different kinds of pressures for private-sector and public-sector services, facilities and infrastructure.	Emerging technology transportation options sustain the system long-term.
Infrastructure	New approaches and designs are needed to flexibly and proactively integrate technologies into transportation infrastructure.	New mobility systems integrate with existing and future infrastructure. New mobility systems cost no more than anticipated.

THEMES, PROBLEMS & OUTCOMES

Theme	Problem Statement	Outcome
Human Experience	A disconnect could result between the human experience and transportation technology applications that left unchecked, could further disenfranchise mobility challenged populations and could disrupt our livable spaces.	Mobility systems improve community livability and quality of life.
Governance	A forum is lacking to plan for and implement regional infrastructure that supports technology advances.	Regional transportation agencies, the private sector, and nongovernmental organizations develop policies, programs, and pilot projects to deliver a preferred mobility future for the metropolitan region.

THEMES, PROBLEMS & OUTCOMES

Theme	Problem Statement	Outcome
System Efficiency	The regional network of transportation services and facilities is based on the travel demands and trip-making decisions of a different economic environment that began more than 50 years ago. The existing system must be made more efficient through reasonable and coordinated integration of appropriate technologies.	Technology integration improves reliability, lowers costs and reduces travel times.

MOBILITY CHOICE BLUEPRINT

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THEMES, PROBLEMS & OUTCOMES

Theme	Problem Statement	Outcome
Funding and Finance	Travel options enabled by technology will further increase the gap between needs and available funds.	New funding and financing of mobility systems improves equity and use of public resources.
Data	Definition of the "right data" that can be utilized to optimize system operations and performance is important to all public sector and private sector entities. Management and security of that data, and the ability to share information among suppliers of facilities and services to enhance and optimize transportation system performance is a critical need.	Sources and uses of data that enable, monitor, manage and modify mobility systems are protected, shared and preserved across all modes of travel and throughout all parts of the region and state.

MOBILITY CHOICE BLUEPRINT

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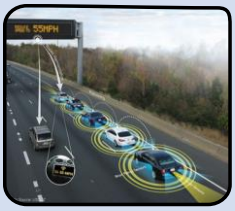
EMERGING MOBILITY SYSTEMS





On-Demand Mobility
- Ridehailing
- Microtransit
- Car Sharing
- Bike sharing
- Mobility as a Service

Traveler Information and Payment
- Mobile Transit App
- Intermodal Trip Planner App
- Mobile Travel Incentives App

Transportation Systems Optimization
- V2X
- Active Travel Demand Management
- Integrated Corridor Management
- Smart Parking

Freight and Delivery
- Courier Services
- Driverless Delivery
- Drone Delivery
- 3D Printing

Personal Vehicles
- Autonomous Vehicles Levels 1-5
- Electric

MOBILITY CHOICE BLUEPRINT

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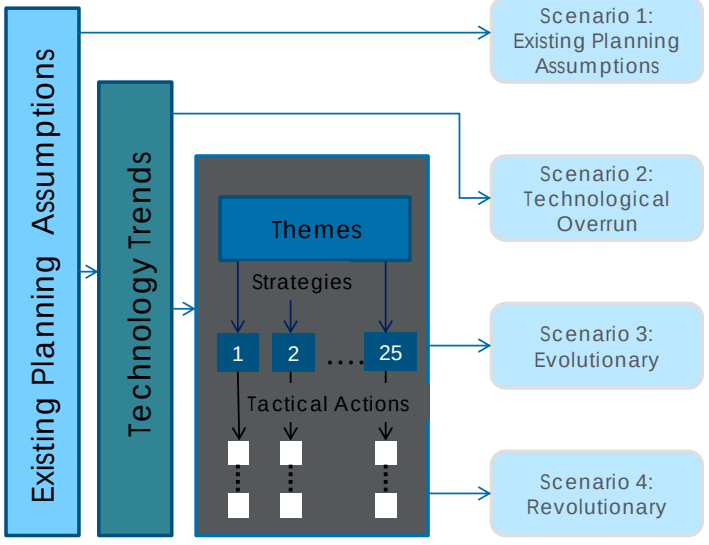
PROCESS FLOW FOR THE DEVELOPMENT OF SCENARIOS



MOBILITY CHOICE BLUEPRINT

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MOBILITY CHOICE
BLUEPRINT
Thank You
Questions

ATTACH G

ATTACHMENT G

To: Chair and Members of the Transportation Advisory Committee

From: Robert Spotts, Senior Transportation Planner
303-480-5626 or rspotts@drcog.org

Meeting Date	Agenda Category	Agenda Item #
August 27, 2018	Information	9

SUBJECT

Presentation on Congestion Management Process and preliminary results of the 2017 Annual Report.

PROPOSED ACTION/RECOMMENDATIONS

N/A

ACTION BY OTHERS

N/A

SUMMARY

DRCOG maintains a federally-required congestion management process (CMP). One component of the process is the calculation of congestion measurements for roadways in the DRCOG region, and presentation within an annual report on traffic congestion. The annual reports have been prepared since 2006.

Staff will present to the TAC a draft version of the *2017 Annual Report on Roadway Traffic Congestion in the Denver Region*, including topics such as vehicle miles traveled in the region, the impacts of economic growth on congestion, results and benefits of past mitigation projects, and the potential impacts of emerging vehicle, roadway, and mobility service technologies.

PREVIOUS DISCUSSIONS/ACTIONS

N/A

PROPOSED MOTION

N/A

ATTACHMENT

1. Draft *2017 Annual Report on Roadway Traffic Congestion in the Denver Region*
2. Table 1 – Summary of Projects

ADDITIONAL INFORMATION

If you need additional information, please contact Robert Spotts, Senior Transportation Planner, at 303-480-5626 or rspotts@drcog.org.

ATTACHMENT 1

TAC DRAFT 1.0 For Discussion

2017 Annual Report on Roadway Traffic Congestion in the Denver Region

1. Introduction

On an average weekday in the Denver Region in 2017:

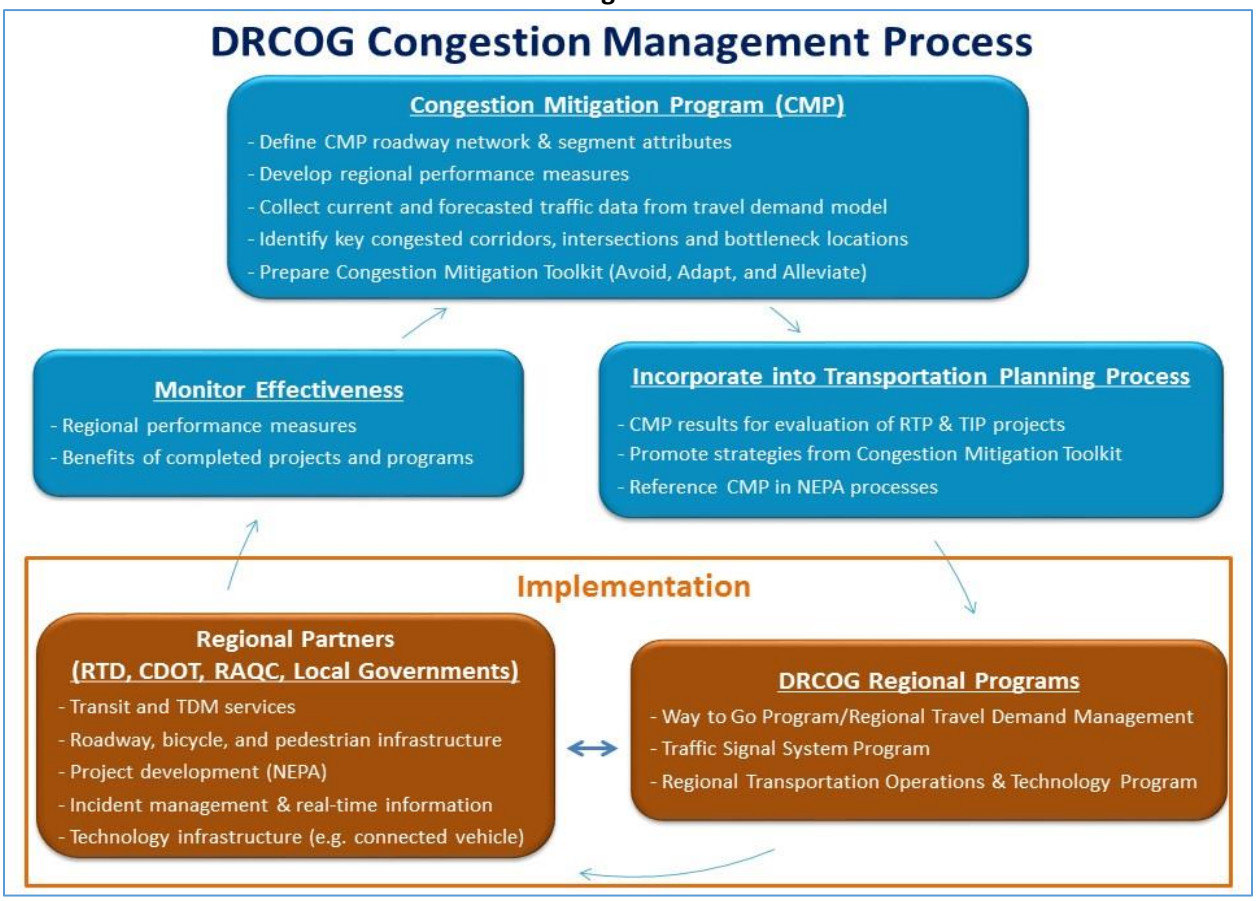
- 15 million total person trips were made (traveling 110 million person miles).
- 13 million person trips were made in motor vehicles (cars, trucks, buses).
- 9 million vehicle trips were made, traveling 83 million miles on our streets and highways.
- Drivers, passengers and goods faced more than 400,000 hours of extra congestion delay per day.

Each of these measures is expected to increase significantly by 2040 with population and employment growth in the region. It is important that DRCOG work with its partners to improve travel time reliability on the region's transportation system and **provide multiple mobility choices**.

DRCOG administers a federally required congestion management process (CMP) depicted in **Figure 1** with three key themes for improving mobility for people and businesses in the region:

- Help people Adapt to congestion
- Help people Avoid congestion, and
- Alleviate congestion with capacity and operational projects, crash reduction efforts, and improved incident management.

Figure 1



The CMP includes the following activities to enable the effective management and operation of the region's transportation system:

- Maintain and update a database containing traffic volumes, capacity information, and congestion measures for the DRCOG designated Regional Roadway System (RRS)
- Coordinate the acquisition of traffic count, VMT and multimodal facility use data
- Identify measures used to evaluate proposed and completed roadway and multimodal projects
- Report regional performance measure results for congestion, travel delay and travel time reliability
- Identify key congested locations including roadway corridors, intersections and freeway bottlenecks
- Monitor and compile privately provided congestion, delay and reliability measures (e.g. INRIX data)
- Use the CMP as a basis for defining a congestion-related purpose and need for corridor and project studies evaluated through the NEPA process
- Establish a toolkit of construction, demand management, real-time information and operational strategies to address congestion, to be implemented by state, regional and local agencies, and
- Monitor TIP funded projects to evaluate and summarize effectiveness in reducing congestion or providing travel options.

The CMP toolkit contains three categories of congestion mitigation strategies to address recurring and non-recurring congestion: active roadway management, travel demand management (TDM) and physical roadway capacity strategies. Each category contains 8 types of strategies (see **Figure 2**) which are still applicable today. Some specific types of projects within each strategy have evolved since the toolkit was published, especially in relation to new technology projects and services. DRCOG and its planning partners will closely monitor technological advances and legislative actions related to connected vehicles, infrastructure and autonomous vehicles.

Figure 2

Congestion Mitigation Toolkit Summary

(click here for the full toolkit)

1. Active Roadway Management
A. Traffic signal timing/coordination/equipment
B. Ramp meters
C. Access management
D. Incident management & response
E. Traveler information mechanisms
F. Electronic toll collection (ETC)
G. Roadway signage
H. Communication connections and surveillance

2. TDM/Non-SOV Travel Options
A. Transit service and facility expansion
B. Transit queue-jump lanes and signal priority
C. Parking and curbside management
D. Telework and flexible work schedules
E. Ridesharing services
F. Off-street multi-use trails (pedestrian and bicycle)
G. On-street bicycle treatments
H. Efficient land use and development practices

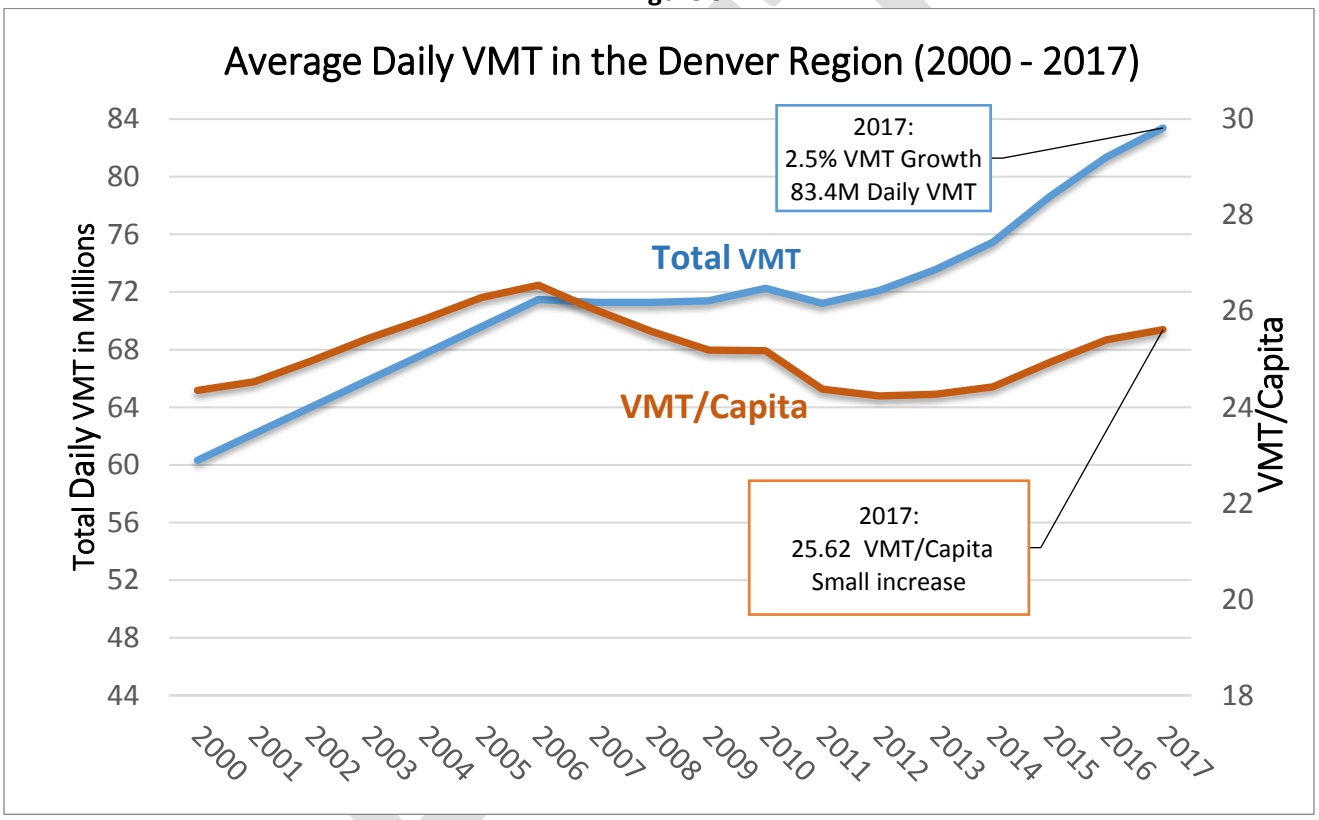
3. Physical Roadway Capacity
A. Intersection turn lanes
B. Acceleration/deceleration lanes
C. Hill-climbing lanes
D. Grade-separated railroad crossings
E. Interchange re-designs
F. Roundabout intersections
G. Managed lanes (toll express, HOV, etc.)
H. New travel lanes (widening), new roadways

2. Travel and VMT on a Typical Weekday

Quality of life in the Denver region depends greatly on mobility, or the ease with which people and goods move from place to place. Reliable access to jobs, services, education and recreation by a variety of travel options is very important to people across the region. Rapid household and economic growth poses a challenge to providing adequate mobility.

Every year, DRCOG staff estimates the annual change in the total vehicle miles traveled (VMT) per day on all Denver region roadways to gain a better understanding of vehicle travel and congestion. Staff consolidates data from Federal Highway Administration annual reports, automated traffic recorders, the Colorado Department of Transportation's Highway Performance Monitoring System and local agency and toll highway traffic counts. **Figure 3** depicts average weekday VMT by all types of motor vehicles for the Denver region during the past 17 years.

Figure 3

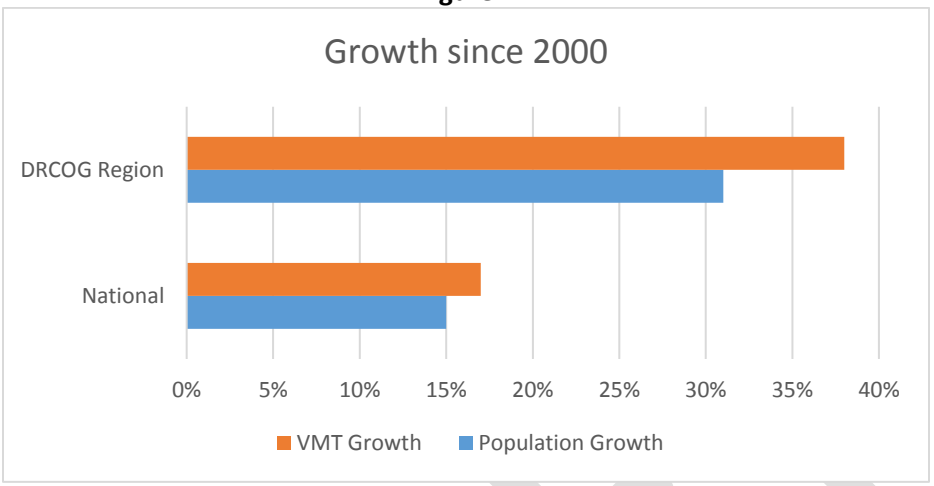


It is estimated VMT increased by 2.5% in 2017, the fifth year in a row with substantial growth in VMT. In 2017, the Denver region's roadways carried about two million more vehicle miles every day than they did in 2016. This is also the third year in a row where VMT clearly outpaced population growth, leading to an increase in VMT per capita. In 2017, the average resident of the Denver region drove about as much as they did in 2008, or about one mile less per day than in 2006. Much of the increased VMT in the Denver Region is related to economic growth. VMT implications of economic growth include:

- More people working
- Skyrocketing housing prices- force more people to live further from workplaces
- More package deliveries, and
- Construction activity: workers, equipment, and materials to job sites.

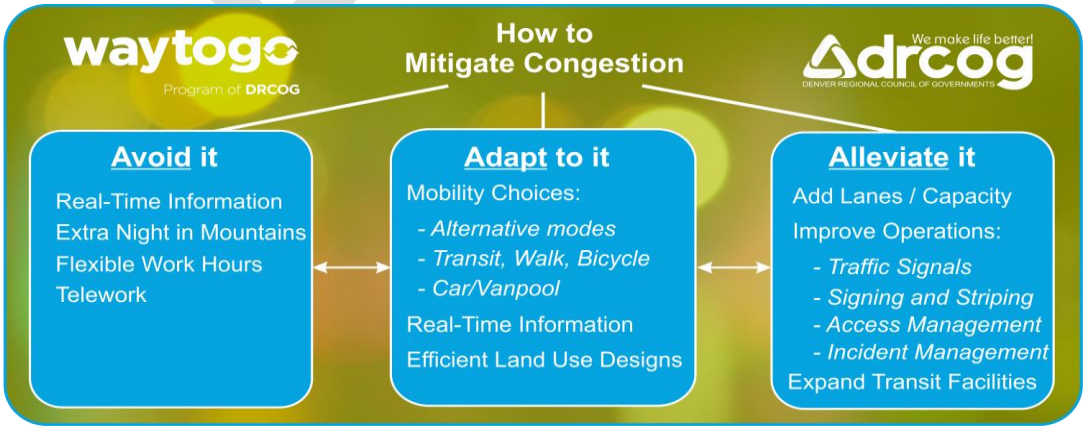
A similar trend has occurred throughout the nation, with VMT growth stalling through the late-2000s followed by a return to historical growth levels. The Denver region's historic population and VMT growth level however, have far exceeding the national average (see **Figure 4**).

Figure 4



The thriving economy makes the Denver region one of the most exciting places to live in the country, but also present a great challenge to curb VMT growth and corresponding congestion. DRCOG's travel model forecasts VMT will increase to 111 million per day by 2040, 33 percent more than 2017. However, to meet the Metro Vision goal of a 10% reduction in VMT per capita, the 2040 VMT should not exceed 99 million. Technology, economics, and demographics traits have unpredictable implications for the future of vehicle travel and congestion. DRCOG and its partners should continue to help people avoid and adapt to congestion:

- provide and encourage viable **mobility choices** (transit, walk, bicycle)
- create opportunities for **shorter trips** (such as via mixed land use patterns)
- facilitate **carpool and vanpool** options (pre-organized and real time)
- encourage **teleworking** and flexible work hours
- support and use the **transportation demand management services** of DRCOG (waytogo.org) and its partner transportation management associations
- implement projects and strategies to **reduce crashes** and associated congestion, and
- improve **real-time traveler information** regarding major incidents on roadways or rail transit, and regarding optional travel modes.



3. Future Regional Performance Targets

Establishing future targets associated with regional performance measures provides direction and focus for DRCOG and the Federal Highway Administration (FHWA). DRCOG's Metro Vision Plan, adopted in 2017, identifies several regionwide "Foundational Measures" and long range targets. Several targets are directly related to traffic congestion and mobility.

Metro Vision 2040 Targets:

- Number of annual traffic fatalities: fewer than 100 *(272 in 2017)*
- Daily VMT per capita (DRCOG RRS): ~23 miles *(10% decrease from 25.5)*
- Percent non-single-occupant vehicle (SOV) mode share (to work per US Census): 35% *(24% in 2018)*
- Daily person travel delay per capita (RRS): < 10 minutes *(6 min. in 2017), and*
- Average peak/off-peak travel time variation (RRS): < 1.30 *(1.22 in 2017).*

The federal transportation bill, Fixing America's Surface Transportation (FAST) Act also requires several short-range safety and system performance measures. Adopted Federal Highway Administration (FHWA) rules require that "Metropolitan Planning Organizations (MPOs) shall establish targets . . . and report progress toward the achievement of their targets." FHWA rules define the schedule for target setting, calculation methods, short range target year, and dates for the subsequent review of progress to be conducted by the FHWA.

FHWA target values approved by DRCOG:

Transportation Management Area 2018 Targets:

- Number of fatalities: 259 *(was 267 in 2017)*
- Fatalities per million VMT: 0.91 *(was 0.96 in 2017)*
- Number of serious injuries: 1,931 *(was 1,932 in 2017)*
- Serious injuries per million VMT: 6.75 *(was 6.94 in 2017), and*
- Number of pedestrian and bicyclist fatalities and serious injuries: 339 *(was 342 in 2017).*

Denver-Aurora Urbanized Area 2018 and 2020 Targets:

- Percent of non-SOV travel mode share to work: 24% in 2018; 25% in 2020 *(was 23.8 in 2016)*
- Annual hours of peak hour of excessive delay per capita on designated National Highway System: 52 in 2018; 54 in 2020 *(was 47.7 in 2016)*

FHWA targets under development:

Transportation Management Area 2020 and 2022 Targets:

- Interstate system level of travel time reliability: to be determined
- Non-interstate NHS: to be determined
- Interstate system truck travel time reliability: to be determined

4. Performance of Recent Projects Completed

More than 200 individual projects addressing traffic congestion impacts and providing mobility options have been completed through the DRCOG TIP in the past 10 years. **Table 1** presents a summary of specific projects and programs (which contained many sub-projects) completed from 2008 through 2017 and the benefits derived. The table does not include every single project, or the extremely important day-to-day operation and maintenance efforts of the transportation system throughout the region by CDOT, RTD, and our local governments.

Though regional measures of traffic congestion appear to indicate a moderate worsening from 2008, conditions are certainly much less severe than if the projects referenced in Table 1 were not completed. In the past 10 years, it must also be noted the population, employment, and VMT of the booming Denver region each increased by nearly 20%.

Table 1 – (see separate file)

5. Traffic Congestion on Major Roadways

DRCOG maintains a database to monitor traffic congestion and performance measures for the 2,400-mile designated RRS (**Figure 5**). The RRS includes major streets, highways, freeways, and tollways. It does not represent the entire roadway system. The congestion database identifies key attributes associated with roadway capacity, traffic volume and person volume for each segment of the system.

Table 2 displays several measures for the RRS, with 2040 estimates based on forecasts from the DRCOG regional travel demand model. The model assumes that an additional 1 million people will live in the Denver region by 2040, a 32 percent increase from 2017. The model incorporates the future demographic make-up of the population and future transportation facilities, transit lines and employment concentrations. However, it does not at this time include speculative factors related to emerging technologies of vehicles, travel ways, and mobility services. See the discussion in upcoming section of this report.

ATTACHMENT 1

Table 2
Current and Future Congestion on Regional Roadway System (Freeways and Arterials)

Vehicle Measures:	2017		2040 (RTP)		% Change between 2017 and 2040
	Average Weekday	Annual Total Estimate (1)	Average Weekday	Annual Total Estimate (1)	
Vehicle Miles of Travel	64,394,000	21,765,052,000	86,546,000	29,252,653,000	34%
Vehicle Hours of Travel	1,448,000	489,414,000	2,084,000	704,494,000	44%
Vehicle Hours of Delay	236,000	79,736,000	483,000	163,261,000	105%
Travel Delay Per Driven Registered Vehicle (2)	7 minutes	42 hours	11 minutes	62 hours	48%
Travel Delay Per Household	11 minutes	61 hours	16 minutes	89 hours	45%
Person Measures:					
Person Miles of Travel	88,490,000	29,909,740,000	119,598,000	40,423,963,000	35%
Person Hours of Travel	1,994,000	673,928,000	2,831,000	956,815,000	42%
Person Hours of Delay	326,000	110,053,000	663,000	224,003,000	104%
Travel Delay Per Resident	6 minutes	34 hours	9.2 minutes	52 hours	54%
Other:					
Percent of Travel Time in Delayed Conditions	16%	n.a.	23%	n.a.	43%
Travel Time Variation (peak vs. off peak)	1.22	n.a.	1.37	n.a.	12%
Lane Miles of Roads Congested for 3 + Hours	1,547	n.a.	2,820	n.a.	82%
(Percent of total Lane Miles)	22%	n.a.	38%	n.a.	n.a.
Economic Travel Delay Costs:					
Commercial Vehicles (3)	$1,600,000	$541,100,000	$2,700,000	$909,900,000	68%
Passenger Vehicle Persons (3)	$3,300,000	$1,099,400,000	$5,600,000	$1,900,800,000	73%
Total Cost of Delay	$4,800,000	$1,640,500,000	$8,300,000	$2,810,700,000	71%
Transit and Other Regionwide Measures:					
Total RTD Transit Boardings	337,000	n.a.	603,000	n.a.	79%
Rail Transit Boardings	101,500	n.a.	218,000	n.a.	115%
RTD Park n Ride Parking Space Utilization (out of 31,225 spaces)	65%	n.a.	n.a.	n.a.	n.a
Modeled Bicycle and Pedestrian Trips	1,182,000	n.a.	1,642,000	n.a.	39%
Population	3,255,000	n.a.	4,304,000	n.a.	32%
Employment	1,769,000	n.a.	2,384,000	n.a.	35%
Traffic Crashes (2015)	223	75,214	n.a.	n.a.	n.a.

Sources: DRCOG CMP Database, RTD Ridership Statistics, 2040 RTP

Technical Notes:

(1) Annual Total Estimate is "Average Weekday" total * 338

(2) Assumption of 1,895,700 driven registered vehicles in 2017 and 2,616,100 in 2040

(3) Cost calculations incoporate $12 per hour per adult in car, $48.30 per hour per light commercial vehicle operator, and $71 per hour for heavy commercial.

Figure 5 shows key severely congested locations in the Denver region and highlights congested corridors in 2017 and 2040. The data comes from DRCOG's congestion database which integrates travel speeds from INRIX, hundreds of new traffic counts, crash data and updated roadway attributes to estimate congestion on the RRS. The diverse types of roadways on the RRS have daily traffic counts ranging from over 250,000 vehicles (350,000 people) on segments of freeways like I-25 to under 3,000 vehicles per day (4,200 people) on rural connecting highways such as SH-79 north of Bennett and the Peak-to-Peak Highway (SH-119).

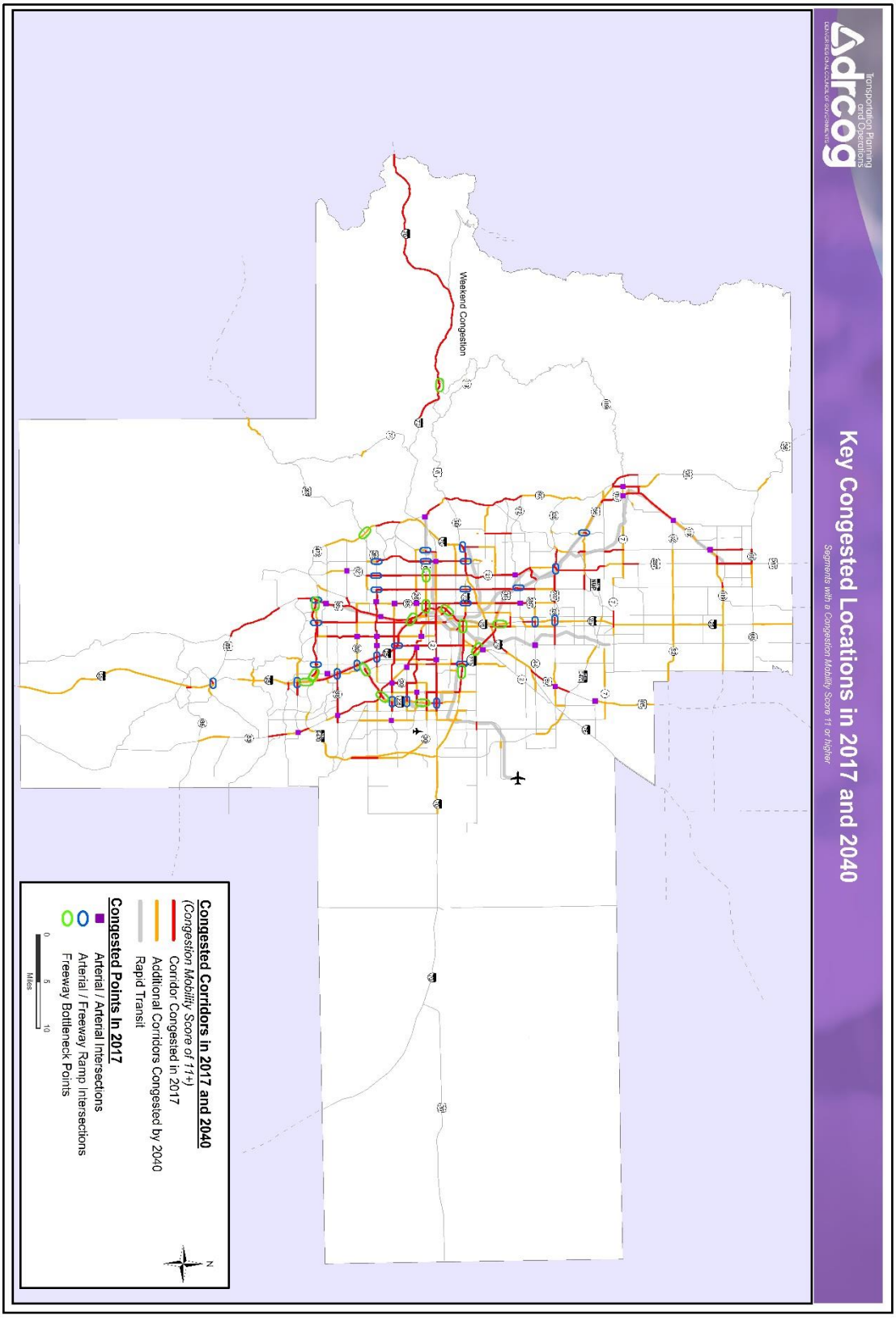
The congested corridors were identified based on a congestion mobility score for each segment. The score is calculated by DRCOG staff and includes the combination of four metrics:

- Severity – How bad does congestion get on the roadway during rush hour?
- Duration - How many hours per day is the roadway congested?
- Magnitude - How many people (traffic volume) are impacted by congestion on the roadway?
- Reliability - How often do crashes or incidents occur on the roadway?

Scores from the four categories are tallied to a final total. Roads with a total congestion mobility score of 11 or higher in 2017 or 2040 are highlighted on the map.

ATTACHMENT 1

Figure 5



6. What Will Transportation Be Like in 2040?

Add 22 to your current age. That is how old you will be in 2040. On one hand it seems far off, on the other, it may seem just around the corner. One certainty is that our overall transportation system will operate much differently than today. The future will include additional travel modes and services greatly impacted by emerging and new technologies. Such technologies will spawn a multitude of innovative services and applications to improve mobility for people and goods. The DRCOG Metro Vision plan clearly alludes to this as an important component of our connected multimodal region of the future:

> **DRCOG Metro Vision: Embrace new technologies and innovations.** Carshare, rideshare and bikeshare programs are already significant travel options within the region. Emerging transportation innovations, such as connected and driverless cars, have the potential to dramatically influence future personal mobility. Broader use of technology and other innovations (such as broadband, smartphones and trip-planning tools) has the potential to connect multimodal transportation system users to the information they need in order to manage travel, avoid and reduce congestion; optimizing available capacity.

Technology-based strategies offer great promise for reducing traffic congestion in the region as well as increasing personal mobility. Private, public and non-profit organizations are developing applications to make choosing an efficient mode of travel more feasible. Travelers and freight shippers can make better decisions with real-time information about how they travel (mode), when they travel (time), where and whether they travel (location), and which route they choose (path). Additionally, travel planning applications are incorporating multimodal options and payment capabilities.

Beyond these applications, emerging technologies associated with connected vehicles (CVs) and autonomous vehicles (AVs) will undoubtedly change the way people and freight get around the region. Entrepreneurial companies are conceptualizing autonomous circulating vans or shuttles that could move people throughout the region quite efficiently, at least in theory. While it is difficult to predict which specific technologies or providers will prevail, there is a great deal of interest and momentum in the region to capitalize on these opportunities. DRCOG will continue to support and facilitate deployment of technology-related infrastructure and services that benefit the region and mitigate traffic congestion.

CVs and AVs are unique and have differing types of benefits and considerations. A key aspect, however, is that more advanced AVs will require most of the infrastructure components related to CV implementation.

Connected Vehicles (CVs) include a set of technologies that allow a host of applications based on sharing data:

- Information between is vehicles known as vehicle to vehicle (V2V). For example, a vehicle far ahead of you which is skidding, has turned on its wipers or fog lights, or has deployed its airbag in a crash can send a message to your vehicle.

- Information shared between vehicles and the roadway or traffic management centers is known as vehicle to infrastructure (V2I). For example, your car can receive an alert of a tight curve, stopped traffic, or bad weather conditions ahead. Your vehicle can be alerted ahead of time if a pedestrian has pushed the walk signal button.

Federal research has demonstrated safety, mobility and environmental benefits of CVs. Results of this research, especially the prospect of crash reduction, has prompted the National Highway Traffic Safety Administration (NHTSA) to propose rules requiring vehicle-to-vehicle communications capabilities in new vehicles. This will provide the foundation for applications that assist drivers in avoiding crashes. Auto manufacturers already include many of these applications in current vehicles.

Autonomous Vehicles (AVs) include the capability to operate a vehicle with varying levels of participation from a human operator, all the way to full automation with no in-vehicle human involvement. Facilities on which AVs can operate range from typical general-purpose roadway lanes to fixed guideways which only permit AVs. A key consideration in the future will be how to accommodate the varying levels of AVs in mixed traffic with non-AVs. Many new vehicles already come equipped with automation assistance features such as lane-deviation steering, and advanced braking.

The auto, transit and truck industries, along with federal regulations, will facilitate the deployment of connected vehicles and autonomous vehicles. It does represent a great opportunity for local governments, CDOT and other transportation system operators. Vehicles equipped to communicate with each other can also communicate with the infrastructure. This means such vehicles will serve as another source of probe data and, in select cases, the network and vehicle operations can automatically react to roadway conditions. This will require the deployment of an extensive connected vehicle environment, including on-site field devices, communications infrastructure and backend data collection, management and monitoring services.

DRCOG has administered a Regional Transportation Operations Working Group for the past 30 plus years. The original core purpose of the group was to coordinate the implementation of connected traffic signal systems across the region. A growing activity of the group has been to coordinate and prioritize the implementation of major intelligent transportation system (ITS) technology projects. Such projects (including fiber installation, communication devices, and transportation management centers) are implemented by CDOT, RTD, local governments and other agencies. Technologic applications have changed dramatically in the past few years. Smartphone apps, car/bicycle/scooter sharing services, and management of huge amounts of data obtained via roadside units are relatively new considerations, but are set to expand greatly in the future. The working group will expand its efforts as well, and must also coordinate with many other new initiatives in the region addressing the benefits, implications, considerations, and implementation of new technologies.

Both CDOT and the City and County of Denver have made commitments to develop a connected vehicle environment and implement suitable applications that benefit the traveling public. Primarily, these will include applications related to safety and mobility. This will help current and future cars, trucks, buses, bicyclists, and pedestrians talk to each other (V2V) and to roadways (V2I). Applications will be implemented through such programs as CDOT's RoadX, and Smart Mobility Plan, as well as Denver's Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) grant from the U.S. Department of Transportation.

Mobility Choice Blueprint

In 2017 the Mobility Choice Blueprint Initiative partnership funded through DRCOG, CDOT, RTD and the Denver Metro Chamber Leadership Foundation was started. Its mission is "to create a mobility vision for metro Denver driven by public and private sectors by developing key strategies to leverage our current assets using new technologies and provide an integrated system of the future for all."

The key activities for the Mobility Choice Blueprint are to:

- **Target options for connected mobility** such as transit, personal vehicles, for-profit mobility services, car sharing, ridesharing, bicycling and walking creating choice and moving the region to a convenient, integrated system. Maximizing the investment in the region's rail transit system is a top priority.
- **Identify public-private pilot projects**, cost estimates and joint-funding partnership opportunities.
- **Improve roadway reliability by using new technology** to support active traffic management, including express toll lanes, signal coordination, ramp metering, variable speed limits and lane control.
- **Implement public-private pilot projects,** demonstrating proof of concept, cost estimates and joint-funding partnerships.

- **Hand-off implementation** of identified strategies to transportation agencies.

There is little question that personal mobility and travel options will be improved via CVs and AVs. However, much speculation surrounds research on the benefits of CVs and AVs on reducing traffic congestion.

- How can drivers of CVs or partially automated AVs be discouraged from becoming less alert and "too dependent" on the technology?
- Will more advanced AVs within mixed travel lanes operate with shorter gaps between vehicles (increasing roadway vehicle capacity) or with longer gaps due to regulatory safety standards (decreasing capacity)?
- If the capacity for carrying more vehicles on our roadways increases, will there be latent or induced travel demand to increase VMT and fill the roads back up with vehicles?
- How can multi-passenger (shared rides and transit) travel options be increased via AVs?

Regardless of the range of predictions, transportation systems operators and planners must be nimble to implement such rapidly changing technologies while also thoroughly considering longer term impacts, benefits, system requirements, maintenance and overall costs.

For further reference, see the FHWA website: https://www.its.dot.gov/cv_basics/index.htm

ATTACHMENT 1

DRAFT Table 1

Ten Years of Traffic Congestion Mitigation - DRCOG Region TIP Projects
Congestion Avoidance, Adaptation, and Alleviation 2008 - 2017

Congestion Toolkit Categories

	TIP ID	Years	Sponsor	Project Description	Traffic Congestion Benefits	Other Notes
1. Active Roadway Management Projects ($50 million +)						
DRCOG Traffic Signal System Improvement Program	1997-045	2008-ongoing	Multiple	Traffic signal system improvements for >20 communities and CDOT. Implemented traffic signal coordination timing plans along 150 arterial street corridors. (>2,000 intersections)	For a typical weekday, saved an average of 700 hours of person travel delay and 260 gallons of fuel per corridor.	Reduced fuel consumption by about 1,000 gallons per corridor per day. Reduced air pollutant emissions due to less stop-and-go traffic.
Regional ITS "Pool"	2005-026	2008-2015	Multiple	Major expansion of communication infrastructure (fiber, DSRC, ….). Traffic and Transportation Control Centers; Cameras and Monitors; Message Signs; Travel Time, Bicycle and Bus Detection	Timely information provided from traffic centers via multiple methods to public to make decisions about when and where to travel. More efficient traffic signal operation.	Communication infrastructure will provide backbone for future connected vehicle implementation
Regional Transportation Operations "Pool"	2016-004	2016-ongoing	Multiple			
2. TDM/Non-SOV Travel Choice Projects						
Transit ($3 billion +)**:**	**TIP ID**	**Years**	**Sponsor**	**Project Description**	**Traffic Congestion Benefits**	**Other Notes**
FasTracks Rail and BRT Corridors; Union Station	multiple	2008-ongoing	RTD	W-Line; B-Line; A-Line; and US-36 BRT operating; G-Line, N-Line, and SE Extension nearing completion	The new FasTracks services provide a significant increase in reliable transit service, attracting former SOV drivers and stimulating higher density mixed-use developments adjacent to rapid transit stations	~50,000 Boardings per day
DRCOG "First Commitment" to FasTracks	2007-004		RTD	Funding to RTD for FasTracks		
DRCOG "Second Commitment" to FasTracks	2012-010	2010-ongoing	Multiple	Local government and partner agency projects (~20) to support FasTracks in all corridors		
BOLT and STAMPEDE Bus Service Expansion in Boulder County	2012-016 2012-018	2012-ongoing	Boulder County	Provided more service (shorter headways) and extended Stamped route length	Significant increase in ridership	~3,050 Boardings per day
Enhanced Bus Service - Lyons	2012-017	2012-ongoing	Boulder County	Provided enhanced weekday and weekend service between Lyons and Boulder/Longmont	Significant increase in ridership on Boulder-Lyons leg	Cancelled the Lyons to Longmont service due to low ridership ??
S.Thornton, West Adams Co., Broomfield, and Belleview Station call-n-Rides	2007-039 2012-014/019 2016-014	2008-ongoing	Multiple	New call-n-Ride RTD service for the three communities, and around the Bellewiew Station	Moderate increase in ridership for Broomfield. Significant for others - RTD continuing service	~250 Boardings per day
Golden Circulator Bus to W-Line	2012-015	2013-ongoing	Golden	New bus service between the West Corridor end-of-line station and central Golden	Significant increase in ridership	~280 Boardings per day
MetroRide Service Expansion	2016-009	2016-ongoing	RTD	Expanded the service hours and bus frequency for the Metro Ride route	Significant increase in ridership	~2,150 Boardings per day
Travel Demand Management (~$40 mil.)**:**						
RideArrangers TDM Program	1997-004	2008-2011	DRCOG	Programs: Carpool; Schoolpool; Vanpool; Bike to Work Day; Guaranteed Ride Home; other events	Encourage and support travel by non-single occupant vehicles (SOVs)	Healthy and active transportation modes of travel
Way to Go TDM Program	2012-064	2012-ongoing				
Regional TDM Program "Pool"	1999-097	2008-ongoing	Multiple	50+ marketing/program projects; Support for 7 partner transportation management agencies; 4 small infrastructure projects	Encourage and support travel by non-single occupant vehicles (SOVs)	Healthy and active transportation modes of travel
Bicycle and/or Pedestrian (~$75 million)**:**						
Bicycle & Pedestrian Travelway Facilities	multiple	2008-ongoing	Multiple	40+ projects: Off-street multi-use trails, bike lanes, sidewalks	More than 20,000 non-SOV trips per day made on these facilities	Healthy and active transportation modes of travel
Bicycle & Pedestrian Underpass/Overpasses	multiple	2008-ongoing	Multiple	7 projects: Bridges over highways, tunnels under streets, access to transit stations	More than 5,000 non-SOV trips per day made on these facilities; transit station bridges enabled additional transit trips.	Provide safer/comfortable alternative to crossing busy streets or railroad tracks
3. Roadway Lanes and Interchanges						
Freeways/Toll Managed Lanes ($800 mil. +)**:**	**TIP ID**	**Year Opened**	**Sponsor**	**Project Description**	**Traffic Congestion Benefits**	**Other Notes**
US-36 Toll Express/BRT	2008-114	2015	CDOT	Added managed express lanes, auxiliary lanes, and BRT stations in each direction	Major reduction in peak travel times (10-15% per INRIX). Less stop-n-go. Greater reliability for express lane users and bus riders.	Significant increase in transit use. Constructed 17-mile US-36 Bikeway.
N. I-25 Interim Managed Lanes, US-36 to 120th Ave.	2012-073	2016	CDOT	Added interim managed express lanes in each direction	Minor reduction in peak travel times (~5% per INRIX). Less stop-n-go. Greater reliability for express lane users and bus riders.	Evaluating further project modifications to improve safety
I-25, Ridgegate Pkwy. to County Line Road	2012-096	2015	CDOT	Added travel lane in each direction to balance lanes end-to-end	Moderate reduction in peak travel times (5-10% per INRIX). Less stop-n-go.	
I-225 widening Parker Road to 2nd Avenue	1999-006	2014	CDOT	Widened the remaining 4-lane section to 6-lanes	Major reductions in peak travel times (30-40% per INRIX). Less stop-n-go.	
I-70 Mountain Eastbound Peak Period Shoulder Lane	n/a	2015	CDOT	Added EB shoulder managed lane that operated in limited peak periods	Major reduction in peak and weekend travel times (30-40% per INRIX). Less stop-n-go. Greater reliability for express lane users	
I-225 westbound approach to I-25 reconfiguration	n/a	2017	CDOT	Installed barrier to prevent traffic from weaving from Tamarac St. ramp to SB I-25	Major reduction in peak and off peak travel times (15-20% per INRIX). Less turbulence.	Low cost operational action
I-70, Kipling St. to Wadsworth Blvd. reconfiguration	n/a	2017	CDOT	Restriped to add eastbound auxiliary lane	Moderate reduction in peak travel times (5-10% per INRIX). Less turbulence.	Low cost operational action
Arterial Streets ($200 mil. +)**:**						
Arapahoe Road at I-25 (& at Yosemite St.)	2012-043 2012-087	2017	Arapahoe Co.	Reconstructed interchange, added turn lanes & through lanes	Post-project results not yet available	Reduced off-ramp queue back-ups onto southbound I-25
Colfax/17th Avenues at I-225	2003-071	2011	Aurora	Added 17th Street ramps and access to/from Anschutz/Fitzsimons campus	Reduced average peak period delay by ~20%	Reduced off-ramp queue back-ups onto southbound I-225
Federal Blvd. at 92nd Ave.	2012-072	2016	Westminster	Turn lane and operational improvements	Reduced average peak period delay by ~20%	
Foothills Pkwy. (SH-157), Valmont Rd. to SH-119	2012-040	2015	Boulder	Turn lane and operational improvements	Reduced average peak period delay by ~20%	
Belleview Ave. at Quebec St. Intersection	2012-038	2015	Greenwood V.	Turn lane and operational improvements	Reduced average peak period delay by ~20%	
120th Ave. at Federal Blvd. Intersection	2012-041	2015	Westminster	Turn lane and operational improvements	Reduced average peak period delay by ~20%	
19th Street at US-6 interchange	n/a	2017	Golden	Constructed grade separated bridge/interchange, added turn lanes	Eliminated stops and congestion delay for vehicles on US-6	Included park space on the bridge structure/cover
Parker Road at Arapahoe Road interchange	2005-044	2011	Arapahoe Co.	Constructed grade separated bridge/interchange, added turn lanes	Eliminated stops and congestion delay for vehicles on Parker Road (SH-83). Reduced overall delays on Arapahoe Rd.	
32nd Ave. at Youngfield Road intersection area	2012-042	2015	Wheat Ridge	Turn lane and operational improvements	Reduced average peak period delay by ~30%	
University Ave. at Arapahoe Road intersection	2001-162	2008	Centennial	Turn lane and operational improvements	Reduced average peak period delay by ~40%	
Railroad Crossings ($120 million)**:**						
Pecos Street Grade Sep. over RR	2005-009	2011	Adams Co.	Constructed roadway bridge and sidewalks over BNSF, UP, and G/B-Line railroad tracks	Eliminated railroad crossing crashes and ~15 freight RR traffic stoppages per day on Pecos St.	Will eliminate RR crossing closures from G and B Line trains. Included multi-use sidewalk.
Peoria Street Grade Sep. over RR/Smith Rd.	2012-044	2015	Denver	Constructed roadway bridge and sidewalks over UP and A-Line railroad tracks	Eliminated railroad crossing crashes and ~5 freight RR traffic stoppages on Peoria St. per day. Eliminates >140 A-Line RR traffic stoppages per day.	Included multi-use sidewalk.
Wadsworth Blvd. Grade Sep. under RR/Grandview	2003-004	2008	Arvada	Constructed roadway bridge and sidewalks under Grandview Ave. and BNSF and G-Line railroad tracks	Eliminated railroad crossing crashes and ~6 freight RR traffic stoppages on Wadsworth Blvd. per day	Will eliminate RR crossing closures from G Line trains. Included multi-use sidewalk.