



ARAPAHOE COUNTY
PUBLIC WORKS & DEVELOPMENT

TRANSPORTATION
2040 MASTER PLAN

TECHNOLOGIES AND FUTURE INITIATIVES

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INTRODUCTION

This memo discusses and evaluates potential technologies and future initiatives that may be incorporated in the Arapahoe County 2040 Transportation Master Plan (TMP). Emerging technologies and initiatives are described with the potential benefits and possible next steps for implementation at the Countywide or project level.

EMERGING TECHNOLOGIES

Connected and Autonomous Vehicles (CAVs)

Preparing for the future of connected and automated vehicles should be aligned with a commitment to improve the safety, reliability, efficiency, and cost-effectiveness of providing mobility to all users. The Federal Highway Administration (FHWA) defines four stages of connected mobility:

- **Connected Drivers:** Connected technologies that are connected to the driver and not the vehicle (e.g., smart phones).
- **Connected Vehicles:** Connected technologies directly tied to the vehicle. Connected vehicle technologies began with GPS and On-Star and evolved to higher satellite and cellular internet connectivity. True connectivity from a transportation perspective will exist when vehicles are able to cooperatively communicate to enhance safety for all roadway users while providing emission reductions and traffic management opportunities.
- **Automated Vehicles:** Automated vehicles have computers that can control various aspects of vehicle operation. FHWA views adaptive cruise control as an automated function (the vehicle automatically speeds up, slows down, or stops in response to other vehicle movements).
- **Autonomous Vehicles:** Vehicles operate with no human intervention or assistance. These vehicles will operate autonomously with or without two-way communication with other vehicles and roadside equipment.

States and local jurisdictions should avoid implementing unnecessary barriers to competition and innovation in the advancement of automated driving and connected vehicle systems. Local jurisdictions should also review existing vehicle codes, traffic laws, and regulations to identify potential regulatory barriers that would prevent the testing and deployment of automated driving and connected vehicle testing systems.



Local governments have jurisdiction over a substantial portion of the nation’s roadway and parking infrastructure with considerable influence over land use via zoning and permitting. The following are ways that local governments can address automation:

- Facilitate safe testing and operation of automated vehicles on local streets.
- Evaluate the potential for automation to address existing problems. Local governments should stay up to date with research and testing efforts to understand the opportunities automation may provide, while staying realistic about the limitations.
- Consider how land use and curb space could be impacted and/or dictate where automation occurs first. The future scenarios will differ depending on shared vs. private automation. Evaluate policies that support one over the other to achieve desired local mobility goals.
- Understand the potential for automation to provide a convenient, low-cost option for single occupant vehicle (SOV) trips that may lead to increased congestion. Evaluate ways to limit the risk for increased congestion through policy implementation.
- Engage citizens to understand their concerns and confirm that automation efforts support local needs.
- Adopt cybersecurity best practices for managing cyber risks associated with the design, integration, testing, and deployment of automated and connected vehicle technologies.

The County should support the installation of connected vehicle technologies along the public street system. These technologies will likely be installed by private manufacturers and vendors along roadsides and in traffic signal infrastructure for demonstration purposes. Installation of these technologies will likely expand as more motor vehicles include connected technologies and as state or federal funding provides the means for system expansion.

Because automated vehicle technology is projected to be largely self-contained in motor vehicles, no special County infrastructure is anticipated. As automation technologies continue to advance and evolve, removing existing barriers and issuing voluntary guidance can help support the ability of these technologies to achieve the desired benefits. Premature regulations and restrictions may increase barriers and have the unintended consequence of limiting innovation.

Existing infrastructure assets should be designed and maintained to support and supplement a connected and automated driving system. Recommendations for accommodating future technologies with County infrastructure include:

- Pavement Markings – Consider wider (6-inch) lane lines on roadways during maintenance and new construction.
- Signing – Standardize signage and prioritize ease of visibility, without blockage, damage, or fading, during maintenance and new construction.
- Traffic Signals – Create space at signal control cabinets for additional future hardware related to CAV technologies.
- Consistency and Standardization – Install and maintain striping, signing, and signals consistent with CAV algorithms and technologies.



- Data Capture and Sharing – Collect and organize data related to CAV algorithms for travel paths, including bridge heights, speed limits, load restrictions, roadway curvature, and other infrastructure characteristics not typically compiled.
- Communication Infrastructure – Continue to build a robust fiber network to improve capacity and reliability for communication with CAVs.
- High-Resolution Mapping – Collect and organize as-built diagrams and survey to help improve and enhance the mapping for an automated driving system.

ITS Applications and Fiber Infrastructure

Intelligent Transportation Systems (ITS) take various technologies and apply them to improve transportation operations and functions. The concept of ITS has been around for over 40 years and was included in visions of the future prior to that time, even if not then identified by the ITS label.

Today, the United States Department of Transportation's (USDOT) National ITS Architecture program defines a product-agnostic framework to provide consistent support for the planning and deployment of various types of ITS devices by jurisdictions and others to the ultimate benefit of the public. The common basis of terminology, service packages, and structure supports a wide variety of community users including transportation practitioners (planners and engineers), system developers, and technology specialists.

The Denver Regional Council of Governments (DRCOG) maintains for its member jurisdictions, including Arapahoe County, a regional ITS architecture that is consistent with the national architecture. DRCOG also published a Regional ITS Strategic Plan to support the ongoing need for coordination in deployment of ITS improvements and administers the federally-funded Regional ITS Pool project program to the benefit of its membership. Through this program, grant funding is available on a regular cycle to support the acquisition and deployment of technology and systems improvements to advance multiple goals, including more reliable and safe transportation operations, typically measured through reductions in travel time and harmful automobile emissions.

The County would benefit from the development of its own Arapahoe County ITS Strategic Plan, to be consistent with the national and regional architectures, and the Regional ITS Strategic Plan. Such a document would provide a framework to define the County's priorities and goals for implementation of and experimentation with both existing and new ITS elements, including identifying the corridors that would benefit most from ITS improvements, based on existing infrastructure, agency ownership/maintenance, continuity, and traveler needs. An ITS Strategic Plan can also be used to support pursuit of funding opportunities for materials procurement and deployments.

As Arapahoe County moves forward with communications upgrades to its existing traffic signal network and other networked infrastructure and facilities, opportunities to provide robust and resilient interconnections for transportation and other technology-based innovations should be explored. Currently, optical fiber communication is the preferred alternative due to its faster speeds, smaller sizes, larger bandwidth capability, and lower interference potential; thus, attention should be paid to documentation of fiber optic specifications and requirements within County documents and standards.



The development of a Fiber Master Plan would help the County create the fiber optic specifications, as well as prioritize the fiber network needs. Opportunities for upgrades and enhancements may occur through planned County capital projects or through development activity, if requirements are established to integrate with these efforts.

As wireless (5G) continues to evolve with the ongoing interest in implementation of small cell sites, policies and requirements should also be maintained to address public or private interest in the installation of these facilities within the County's jurisdiction. The County may be able to explore additional opportunities in these areas through public-private partnerships.

When County documents and standards are drafted, care should be taken to safeguard that other possible future technology options not yet identified are not precluded due to definitions and requirements that are too specific or narrow. An open but measured approach can address both current communications options and the preservation of future choices.

Mobility on Demand

Mobility on Demand (MOD) as defined by the USDOT is a relatively new concept based on the principle that transportation is a commodity where modes have economic values that are distinguishable in terms of cost, journey time, wait time, number of connections, convenience, and attributes. In simple terms, MOD refers to a network of safe, affordable, and reliable transportation options. MOD enables users to access mobility, goods, and services on demand by using shared mobility, delivery services, and public transportation options. The MOD ecosystem of service providers include:

- Public transportation
- Microtransit (shuttles, vans)
- Transportation Network Companies (TNC) (ride-hailing)
- Ridesharing (carpool, vanpool)
- Carsharing / Car rental
- Shared micromobility (bikeshare, scooter share)
- Courier Network Services (food delivery)
- Robotic delivery
- Aerial delivery (drone)

The County should continue to support the interconnectivity, affordability, safety, and reliability of a network that supports MOD. States and local jurisdictions should avoid implementing policies and strategies that are barriers to competition and innovation in the advancement of mobility and accessibility options. Nonetheless, the County's role as a stakeholder includes clear guidance on topics such as policy and regulations, issuing permits, infrastructure management, and improving transportation operations. **Table 1** includes eight common areas of regulation that impact MOD, with a summary of its relationship to MOD, as well as some examples.



Table 1: Mobility on Demand Policies

Policies	MOD Relationship	Examples
Health, Safety & Consumer Protection	State and local governments and other public agencies establish guidelines, regulations, and ordinances that impact MOD vendor operations and use of customer data (Safety, Title 6, ADA)	<ul style="list-style-type: none"> ▪ Helmet laws for bikeshare users ▪ Driver background check and training requirements for TNC vendors ▪ Pricing regulations for TNCs ▪ Ordinances limiting scooter share to the roadway and bike facilities, with use on sidewalks only allowed under special circumstances
Taxation	Unclear definitions and service models for MOD have led to confusion among state and local government regarding taxation	<ul style="list-style-type: none"> ▪ Rental car excise taxes apply to carsharing vendors ▪ Commuter tax breaks apply to some microtransit vendors (e.g., Via)
Insurance	State governments set insurance policies impacting carsharing, bikesharing, ridesharing, and for-hire vehicle services	<ul style="list-style-type: none"> ▪ TNC vendors have three distinct insurance coverage periods: 1) driver has app open, 2) driver en-route for pick-up, 3) rider is in vehicle. ▪ Oregon requires P2P carsharing platforms to insure vehicle while in use; classifies the use as non-commercial
Parking, Right-of-Way, and Curbside Management	State and local governments set policies that impact access to public roads (e.g., HOV lanes on highways), mobility hubs, curb space and parking spaces	<ul style="list-style-type: none"> ▪ Most bikesharing stations are granted access to public land through real estate license, easement, and/or memorandum of understanding. ▪ Cities are implementing curbside management and considering monetizing curb spaces. San Francisco charges a per-stop fee to commuter shuttles accessing designated loading spaces.
Equity and Access	Public agencies have ethical and legal requirements so that transportation services are accessible by everyone (including publicly supported MOD)	<ul style="list-style-type: none"> ▪ Austin prohibits TNC drivers from refusing to serve or charge higher prices to riders with disabilities. ▪ Denver's Scooter and Bike Share program includes the installation of parking stations to prevent crowding of sidewalks, a max of the number of vehicles in an area and at least 30% available in historically underinvested communities, and geofencing technology to slow vehicles on highly trafficked pedestrian areas.
Full and Fair Participation	Public agencies are legally required to engage the public for all federally funded programs under Title VI, Executive Order 12898, the National Environmental Policy Act (NEPA)	<ul style="list-style-type: none"> ▪ New York City's CityBike deployment accompanied by a concerted multi-lingual and multi-media public engagement effort to determine station siting and allow for public feedback
Data Sharing, Privacy, and Standardization	Establishing data standards and facilitating data sharing while protecting consumer privacy allows MOD services interoperability	<ul style="list-style-type: none"> ▪ Cities such as Los Angeles and Denver require micromobility providers to provide data through the Mobility Data Specification (MDS) standard, transmitting real time and historical data for enforcement and planning processes.
Livery Laws	Many municipalities and state governments regulate for-hire vehicle services, such as taxis, TNCs, liveries, and limousines.	<ul style="list-style-type: none"> ▪ Some local authorities have regulated TNCs in terms of provisions, including safety requirements. Very stringent local policies and driver classification (employee/for-hire) policies have been largely overruled by state policies.



The areas of policy regulation presented above provide examples of how other local jurisdictions are enabling and establishing paths for MOD to move forward. Preserving the operations and maintenance of transportation infrastructure is essential for the ecosystem of MOD providers to operate successfully and advance. Emerging services such as on-demand commercial drone and robotic delivery technologies are still too new for policy recommendations at the local level that balance public interests with being too restrictive. Special attention should be given to the transition between modes and services, as these areas are the most likely to have point of conflicts in terms of jurisdictional boundaries, liabilities, and service concerns. For example, parked micromobility devices on sidewalks have caused significant ADA litigation in cities. Another example is the lack of proper curbside management resulting in delivery vehicles parking in unauthorized locations or blocking street traffic.

Smart Infrastructure

The “Smart” label applies to an expansion of concepts already present in the ITS space, taking them beyond transportation and into a more cohesive global concept for applying technology to solve problems and improve quality of life across multiple spheres of jurisdictional services.

Smart City/County/Community movements have become popular across the country. Arapahoe County is well positioned as a member of the Colorado Smart Cities Alliance, which is a nonprofit statewide alliance of government, business, and allied organizations that may provide additional access and opportunity for the County to participate in technology partnerships, equipment testing and deployment, and solutions development. The Alliance’s values align with the County’s goals and values including sustainability, equity, resilience, and humanism.

Within transportation, the County can continue its ITS efforts and seek out opportunities to work across departmental lines in order to break down silos and provide for a full seamless integration of the Smart concept Countywide. While the needs may be different in the rural versus the urban and transition areas of the County, opportunities for technology deployment and data analytics can exist in all of those areas. Development of a County ITS Strategic Plan will move the County in this direction and can support additional Smart layers and internal and external partnerships for things like CCTV cameras, asset management, and Center-to-Center communications for shared monitoring and controls across jurisdiction boundaries.

As part of both ITS and Smart efforts, the County should consider development of a County or shared Traffic Management or Operations Center (TMC or TOC) to facilitate ease of access for staff. A TMC/TOC can be a physical space or a virtual space, potentially cloud-based.

Smart infrastructure and mobility topics are rapidly evolving areas, with frequent if not constant pressure on jurisdictions from product vendors and developers to deploy the flavor-of-the-week technology, which is often not yet proven. Solutions in search of problems can also be an issue, with big data seen as being of value regardless of content or available staff capability to support collection and analysis in a meaningful way. The County has been a leader in piloting deployments in the transportation arena, including its partnerships with the Cities of Centennial, Lone Tree, and



Greenwood Village to support adaptive traffic signal implementation within the County. Continuing along this path to remain open to and supportive of future opportunities will be beneficial for the County in the Smart arena.

FUTURE INITIATIVES

Trends

There is a stark contrast between rapid development expectations in the eastern part of the County and much more moderate growth expectations in the urbanized western part of the County. **Figure 1** shows the subareas of the County that have been identified for the TMP. **Table 2** provides data and forecasts developed for the TMP for western part of the County (west of E-470 and the Aurora Reservoir, including the Residential West, Four Square Mile, Technology, and Residential West/Central subareas) and the remaining eastern part of the County.

Currently, the western part of the County has 95% of the County's households and 99% of its employment. Future growth forecasts show a different pattern expected with the eastern part of the County forecasted to add 36,500 households, more than tripling the existing population, and to add 31,100 jobs, a 12-fold increase. This growth expected in the eastern part of the County represents more than 40% of the growth in households and more than 20% of the growth in employment in the entire County. The largest concentration of new development in the eastern part of the County is in the area identified as Urban on the subarea map, roughly between E-470 and Watkins Rd and between I-70 and Hampden Avenue. Development in this area includes the major Prosper and Sky Ranch developments. Other areas expect to see significant growth and development are largely along the I-70 corridor, but also scattered throughout the eastern part of the County.

There are several implications of these land use and population trends that affect transportation needs and are being considered in the development of the TMP:

- Several roads that are currently narrow two-lane rural roads, or in some cases are unpaved or not connected, will need upgrades that keep pace with development, including Quincy Avenue, 6th Avenue, and Watkins Road.
- New residential developments that are distant from existing employment and retail should include a mix of uses to provide convenient job, shopping, service, and recreational opportunities for residents without requiring long automobile trips.
- In addition to expansion of the paved road network into developing areas in the eastern part of the County, the TMP includes expansion of the bicycle network and consideration of options to expand public transit service to the east beyond the existing RTD boundary.



Figure 1: Arapahoe County TMP Subareas

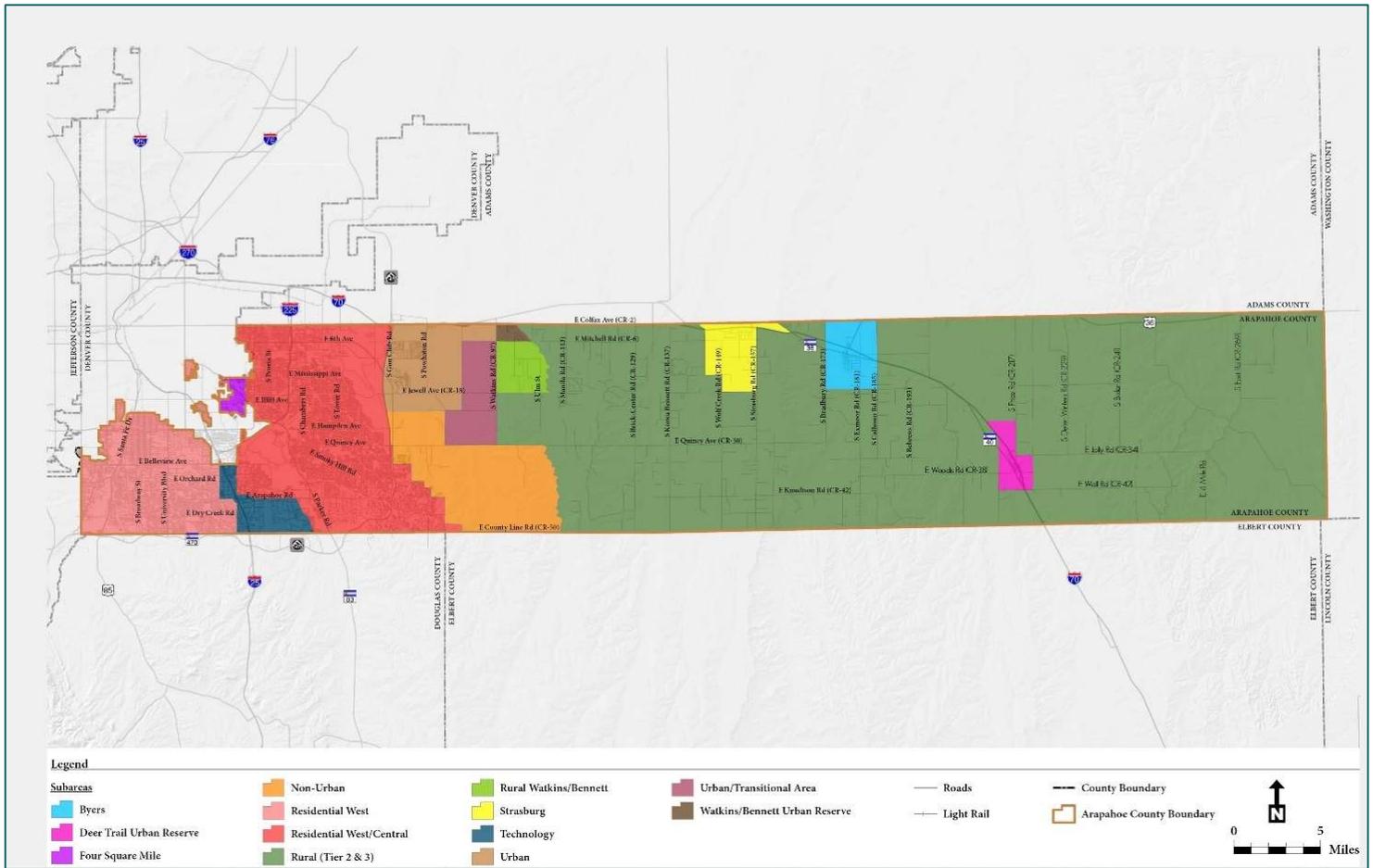


Table 2: Forecasted Arapahoe County Growth Trends

County Areas	Measure	2020	2040	2020-2040 Growth	2020-2040 Growth Percentage
West of E-470/Aurora Reservoir	Households	267,800	320,100	52,300	20%
East of E-470/Aurora Reservoir		14,000	50,500	36,500	262%
Total County		281,800	370,600	88,800	32%
West of E-470/Aurora Reservoir	Employment	369,100	483,400	114,300	31%
East of E-470/Aurora Reservoir		2,500	33,600	31,100	1,244%
Total County		371,600	517,000	145,400	39%



COVID-19 Impacts

The COVID-19 pandemic has had a significant effect on public travel throughout the county, with varying levels of travel restrictions occurring in 2020. Commuting travel was initially reduced as the general public was encouraged to work from home as much as possible. Traffic data collected by the County shows there were substantial reductions in traffic levels and limited congestion across arterial corridors during the early periods of strict travel restrictions in March through May 2020. As travel restrictions gradually eased, traffic volumes and travel times have begun to exceed pre-COVID levels during off-peak hours, and commuting peaks have returned, although not at the same high traffic levels, as many people are opting to still work from home all or some of the time and some people vary their commuting times.

The realization of many employers that having employees work from home does not necessarily reduce production, along with the benefits of working from home experienced by employees, including less time spent commuting, will create an opportunity for a shift in daily travel volumes and patterns centered around telework.

Another aspect of COVID-19 travel impacts has been transit ridership, which declined significantly with the pandemic. RTD responded with significant cuts in service. As communities begin to reopen, it will be important for RTD to resume operations quickly, or risk transit riders switching to driving, creating an increase in SOV travel and peak hour congestion beyond pre-COVID levels.

The timing for the rebound in peak hour traffic volumes, or even higher levels of traffic, is unknown. Monitoring traffic volumes along arterial corridors will remain important for the County to proactively respond to transportation needs.

Current State Initiatives

Air Quality/Greenhouse Gas Emissions

HB 19-1261 passed in 2019 mandates reductions in greenhouse gas (GHG) pollution of 26% by 2025, 50% by 2030, and 90% by 2050 from a 2005 baseline. Following the passing of HB 19-1261, the Governor commissioned the Colorado Greenhouse Gas Pollution Reduction Roadmap, which provides nine strategies to meet GHG targets set for the transportation sector by 2025 and 2030. **Table 3** lists the nine strategies, their current status, and assigned agency.



Table 3: Transportation Sector Strategies for Reducing Greenhouse Gas Pollution

Strategy	Status
State GHG pollution standards for transportation plans	Underway by CDOT
Trip reduction/transportation demand management (TDM) requirements and encouraging telecommuting for large employers – the Employee Traffic Reduction Program (ETRP)	Underway by the Air Pollution Control Division
Clean trucking (multiple components)	TBD
New revenue to fund infrastructure and incentives to transition to electric vehicles	SB 21-260 pass June 2021
Incentives for land use decisions by local governments to reduce VMT, reduce GHG and other pollutants, and support greater access to housing near jobs	HB 21-1117 (signed May 2021) & HB 21-1271 (awaiting signature)
Indirect source standards for some types of new development	TBD
Expand public transit	Ongoing, particularly through RTD’s FasTracks
Develop an EV Equity study to ensure access to EV’s for all Coloradans	TBD
Provide input into the development of new clean car standards by both the federal government and for state-based standards	TBD

The passing of SB 21-260 has provisions that place requirements on CDOT and MPO plans to meet GHG standards in order to have full flexibility in using multimodal and mitigation options fund. Failure to meet the standards results in only using the funds to achieve compliance. Adding pollution reduction planning to the transportation planning process helps measure the total impact of a plan to determine if it is in compliance (see below).

The two strategies underway – the Employee Traffic Reduction Program (ETRP) and GHG pollution standards for transportation plans – are part of an Air Quality Control Commission (AQCC) rule package for transportation that will be considered for implementation in August of 2021.

The ETRP impacts the County as an employer, as all entities with 100 or more employees at a single site would be responsible for reducing employee SOV trips (some exclusions apply).

A briefing update on Pollution Reduction Planning for Transportation was provided in June 2021 by CDOT. This rule making process, currently in the drafting stage, aims to add pollution reduction planning to the transportation planning process. This effort includes:

- New transportation demand management (TDM) requirements as part of an updated 1601 process for proposed new or modified interchanges (see next section for more information)



- Adding analysis to transportation projects related to fine particulate matter (PM2.5) metrics and induced demand's impact on GHG emissions (capabilities being added to the statewide travel demand model)
- Establishing limits to the amount of projected GHG emissions a transportation plan's set of projects will produce
- Providing guidance on how to "score" the GHG emissions impact of a transportation project and ways to mitigate those impacts

The County should continue to follow the Pollution Reduction Planning for Transportation rulemaking process to understand how a final rule will impact planning for transportation projects. Even though the rule is directed at CDOT and MPOs, the projects in the plans for these agencies either come from local governments or local governments are major stakeholders in the development of the projects. The County will need to account for the new requirements in developing projects or providing input on project development, otherwise the County's interests will not be represented in the state and regional transportation plans. For example, it is possible that County projects would not be funded by the MPO if their projected GHG emissions are too high.

Travel Demand Management

CDOT is seeking ways to preserve its investments in the state highway system and reduce vehicle miles traveled (VMT). To support these goals, as well as the Governor's Green House Gas reduction goals that include the addition of pollution reduction planning to the transportation planning process, CDOT recently updated Policy Directive 1601 regarding the interchange approval process to include TDM requirements. TDM refers to strategies that attempt to change or reduce travel demand on the road network, particularly during peak demand periods. Examples of TDM include strategies aimed at converting private vehicle trips to other modes and changing commute patterns through teleworking or travel in non-peak hours.

Approved on April 2021 by the Transportation Commission, the updated Policy Directive requires TDM strategies to be included for analysis in the System Level Study (SLS) of Type 1 (new) and Type 2 (modified existing) interchange proposals. Type 2a proposals, minor modifications that do not require a SLS, are exempt from TDM requirements. The TDM consideration would involve the following factors:

- Aim to reduce average daily traffic (ADT) volumes of the preferred alternative by at least 3% for interchanges within a MPO boundary or 1% if outside of an MPO.
- The reduction should be analyzed for the "opening day" scenario or within five years of "opening day" if committed TDM strategies are to be phased.
- ADT reductions are to be calculated for the traffic volumes on the interchange ramps.

Guidance for the implementation of the Policy Directive will be provided through an updated Procedural Directive 1601, which has been in development alongside the Policy Directive. The updated Procedural Directive is proceeding through the final stages of review within CDOT, with an approval from CDOT's Executive Director anticipated during the summer of 2021. The Policy Directive and draft Procedural Directive empower the CDOT Chief Engineer with making determinations as to the degree of TDM



requirements needed to be met and can grant waivers to TDM requirements depending on the circumstances of the interchange request. These circumstances include interchanges that are:

- Freight and/or intermodal facility focused
- Sufficiently rural in nature that TDM would not have a practical reduction in demand, and where improvements are primarily focused on safety and resiliency of the transportation system
- Located in an area where TDM is already actively in place and will contribute to a reduction in demand of the interchange

Should TDM be required, the procedural process outlines two steps under which an applicant must evaluate and show TDM is being implemented to an acceptable degree:

- **TDM Scorecard** – Based on the interchange type and characteristics, a TDM strategy score range must be met. CDOT provides a list of common TDM strategies and their associated score. Selected TDM strategies must sum to at least within the defined range that the interchange requires. Should a TDM strategy selected not be on the predefined CDOT list, CDOT will work with the applicant to derive an applicable score.
- **Demand Reduction Goal** – As noted in the Policy Directive, a demand reduction of 3% or 1% is required depending on the location of the interchange. The applicant will need to show a good faith effort in calculating the expected ADT reduction as a result of implementing the selected TDM strategies, and that these reductions meet or exceed the required percent reduction. The Procedural Directive provides a list of expectations related to this calculation process.

Despite the draft status of the Procedural Directive, CDOT is actively looking to apply the approved Policy Directive to new interchange requests. The County should prepare to have discussions with CDOT regarding TDM expectations with any new interchange requests during this time. CDOT staff has offered to participate in scoping meetings to answer any questions about the new process.

CDOT will provide training on the updated policy and procedure later in 2021. The County should follow developments regarding the Procedural Directive 1601 updates and associated training to ensure future SLSs are scoped and budgeted correctly to meet the new TDM requirements.

Vehicle Electrification

Electric vehicles (EVs) have the potential to result in significant air quality benefits (when accompanied by carbon-free or low-carbon electricity generation) with economic benefits resulting from cost savings to EV drivers. Barriers to EV adoption continue to include lack of public charging infrastructure, lack of product diversity and range anxiety.

Wide adoption of electric vehicles will also place greater demands on electricity generation. Time of day rates and smart charging programs can help encourage electric vehicles owners to charge vehicles during off-peak demand periods, particularly avoiding early evening high electrical demand hours. The State of Colorado and Xcel Energy are anticipated to take the lead in researching and developing smart



charging strategies and programs. The County could coordinate with Xcel Energy through its new Transportation Electrification Plan for guidance and processes for optimizing locations, installing and funding charging stations.

Proposed strategies to increase the use of electric vehicles include:

- Support the use of EVs by taxi and TNC fleets
- Convert public fleets (e.g., county fleet vehicles)
- Subsidize the purchase and use of EVs through tax exemptions, energy credits or finance programs
- Install EV charging infrastructure

On January 17, 2019, executive order B 2019 002 was signed by the Governor of Colorado outlining a series of initiatives and strategies to support the transition to zero emission vehicles and to establish a goal of 940,000 EVs on the road by 2030. Colorado's EV goals are outlined in the Colorado Electric Vehicle Plan 2020.

EV charging infrastructure will be necessary to support these vehicles. Electric vehicle charging infrastructure supplies electricity for recharging electric vehicles. Charging stations can be developed with differing modes (slow or fast charging), with infrastructure that supports varying vehicle connection cases, and with varying plug types. Having varying plug types at a charging station is an important consideration since different EV manufacturers require different plug types. For example, American vehicle manufacturers support one plug type, while foreign manufacturers support another. Lastly, Tesla charging systems can only be used on Tesla vehicles. Standardization of charging infrastructure can best be addressed at the national level. The County could require adapters or plugs for different charger types at public chargers within the County.

Arapahoe County can facilitate the installation of EV charging stations in projects and support charging stations in development projects. These projects should include a combination of charging station options so that County residents can avail themselves of charging opportunities without restrictions dictated by vehicle manufacturers.

EV charging stations shall not be installed within the public right-of-way; rather, installed only on private property. County projects may install EV charging stations on County properties such as at County buildings, parks, and maintenance facilities. Location elements to consider during the planning stage of charging station installation include:

- Proximity to electrical power
- Proximity to building entrances
- Signing/wayfinding
- Charging levels
- Parking space dimensions
- Maintenance access
- ADA accessibility
- Lighting
- Vehicle access



Electric vehicle charging infrastructure supplies electricity for recharging electric vehicles. There is currently competition focused on charging plug types. One standard is used by Nissan, Mitsubishi and Toyota, while FCA, GM, Ford, Volkswagen and BMW back the other standard charging plug. Both systems provide similar charging speeds, however the two systems are completely incompatible.

Costs for the installation of an EV charging station can vary considerably based on hardware and material costs, labor costs, electrical transformer and power source installations, and permitting costs. Funding support for installations in Colorado is available from such organizations as the Regional Air Quality Council (RAQC) and the Colorado Energy Office (CEO).

For many years Colorado EV owners paid a \$50 annual registration fee; \$20 of the fee going to the Electric Vehicle Grant Fund to provide grants for EV charging infrastructure and \$30 to the Highway Users Tax Fund. The passing of SB 21-260, as noted in the air quality/GHG section, provides nearly \$5 billion in new funding for transportation in Colorado. SB 21-260 indexes the \$50 registration fee to the national highway construction cost index (NHCCI) to account for inflation and created a schedule for increasing fees over the next 10 years:

- "Battery Electric Vehicle Fee" - \$4 annual fee beginning in 2022 and increasing to \$96 by 2031
- "Plug-in Hybrid Electric Vehicle Fee" - \$3 annual fee beginning in 2022 and increasing to \$27 by 2031

SB 21-260 also creates the following enterprises supporting transportation electrification:

- Creates a Community Access Enterprise within CEO to support widespread adoption of EVs
 - The enterprise is authorized to impose a community access retail delivery fee to fund its operations
- Creates a Clean Fleet Enterprise within Colorado Department of Public Health and Environment (CDPHE) to support the use of EVs in private and government fleets
 - The enterprise is authorized to impose a clean fleet fee on retail deliveries and rides provided by TNCs
 - The enterprise is also authorized to issue grants, loans, and rebates to incentivize the adoption of EVs in fleets
- Creates a Clean Transit Enterprise within CDOT to support public transit electrification
 - The enterprise is authorized to impose a clean fleet fee on retail deliveries and rides provided by TNCs
 - The enterprise is also authorized to issue grants, loans, and rebates to support electrification of public transit
- Creates a Nonattainment Area Air Pollution Mitigation Enterprise within CDOT to mitigate transportation related emissions in ozone non-attainment areas
 - The enterprise is authorized to impose an air pollution mitigation fee on retail deliveries and rides provided by TNCs



Advanced Mobility Workgroups

CDOT facilitates a variety of workgroups on a number of topics including autonomous vehicles and electrification. An efficient way to learn about these workgroups and be a part of a workgroup specific to the Denver region is to attend DRCOG Advanced Mobility Partnership (AMP) Working Group meetings. The meetings are held the first Tuesday of each month and are attended by representatives from CDOT, DRCOG, DRCOG member agencies including other Denver-area counties, RTD, and other stakeholders in the Denver region. According to the AMP's website, the Working Group "identifies technical and policy issues, researches or solicits solutions, identifies priorities, prepares recommendations, coordinates activities, and tracks progress" related to the implementation of the region's Mobility Choice Blueprint, and is often presented with input/information from other working groups.

Some workgroups are more focused on the application of autonomous vehicles and new technologies, such as the Autonomous Mobility Task Force which reviews applications to test autonomous technologies that do not meet current state and federal requirements. Other workgroups may be more planning and policy related. Participation in the AMP Working Group will help expose the County to these workgroups, some of which may change their role over time as new technologies become more established, and help the County be aware of changes and policies related to new technologies. It will also give the County an avenue to hear experiences from peer agencies and establish new regional relationships.

Vision Zero

DRCOG adopted the Regional Vision Zero – Safety Streets for Metro Denver plan in 2020 outlining strategies for the Denver region to move towards zero deaths from crashes. Vision Zero is a national movement which views no deaths as being an acceptable price for mobility. The Regional Vision Zero plan is founded on six overarching principles:

- Reframes traffic deaths as preventable
- Integrates human error into the approach
- Focuses on preventing fatal and severe crashes rather than eliminating all crashes
- Aims to establish safe systems prioritizing human life first and foremost when designing a road network
- Applies data driven decisions making
- Establishes road safety as a social equity issue

With the adoption of the plan, DRCOG has established a Regional Vision Zero Working Group which meets monthly to share information and experience on Vision Zero actions. Arapahoe County along with other regional counties, municipalities, and regional/state agencies has signed a Vision Zero Pledge and participates in Working Group meetings and related activities.



Other Potential Initiatives

The following sections provide discussions of other relevant initiatives and strategies the County may consider.

Telework

As communication and workflow technologies continue to improve and access to high-speed internet continues to increase, the ability and desire to work from home – telework – has also continued to increase. Teleworking, even just a portion of a week, can help reduce commuter traffic. The COVID-19 pandemic forced teleworking to become a more normal practice, as it enabled many businesses to continue operations during stay-at-home orders.

Teleworking is more than an employee making the decision to work from home. There are numerous elements that need to be in place to facilitate telework for both employees and employers. Elements the County can assist with include the following.

Provide Telework Resources

Teleworking enables employees to conduct the same tasks at home as they otherwise would at their place of work. However, how this occurs can be fundamentally different than when on-site. Telework programs and training materials help employers effectively implement teleworking by establishing processes, policies, and support materials to ensure employees understand employer expectations for teleworking and how teleworking will operate.

To promote telework and assist employers with establishing a telework program, the County could establish a telework webpage as part of the County's website. This webpage could promote the benefits of teleworking and provide a list of resources for interested employers to consult, including:

- **DRCOG's Telework Tomorrow** – This initiative provides free one-on-one assistance to employers to develop a telework program, establish telework policies, and provide activation materials to announce the program. DRCOG also supplies templates for training webinars and other tools for implementing a telework program, including a downloadable telework toolkit.
- **Denver South Transportation Management Association (TMA)** – Covering a portion of the County along the South I-25 corridor through the Denver Tech Center, the Denver South TMA is charged with implementing TDM strategies. Similar to DRCOG, the Denver South TMA provides links to telework resources and example telework policies.
- **Colorado State University (CSU) Global's Remote Work Certification Programs** – CSU Global has teamed with the Colorado Workforce Development Council to offer telework training programs for workers and supervisors/leadership. The programs provide guidance on how to telework efficiently and effectively. Certificates are issued to validate completion.

Remote-Work Technologies

Most businesses need additional remote-work technologies in order to facilitate a telework program. Items such as remote-access software, servers, video-conferencing services, and employee laptops



enable employees to carry out their duties from home by providing access to the same tools and resources they would otherwise have in an office.

To help businesses in implementing the necessary remote-work technologies, the County could provide a grant program to aid in the purchase of these technologies. Montgomery County, Maryland outside Washington D.C. provided multiple rounds of such a grant to help local small businesses purchase telework technologies during the COVID-19 pandemic. In Colorado, CDOT provided a telework grant program (CanDo Community Telework Program) targeted towards local governments, transportation organizations, and other transportation non-profits to help with implementing TDM initiatives that promoted social distancing during the COVID-19 pandemic.

Although both of the above examples were temporary, each was seen as extremely successful, resulting in second releases of each grant. It is possible that the implementation of a regularly available remote-work technology grant program could aid in maintaining the increased telework trend that was experienced during the COVID-19 pandemic, subsequently reducing traffic in the long-term.

High-Speed Internet Access

High-speed broadband internet access is required on both the employer and employee ends to allow for effective teleworking. The Federal Communications Commission (FCC) suggests a minimum download speed for teleworkers of 5-25 Mbps are required for teleworking; however, other sources suggest speeds of up to 100 Mbps or even higher could be required, depending on the demands of the work type and overall household internet usage.

The Governor's Colorado Broadband Office tracks high-speed broadband internet access throughout Colorado. The County could team up with the office and local internet providers to ensure developed portions of the County have sufficient broadband infrastructure to support teleworking, and that new development will be served as well. The County could also provide financial assistance and information resources to residents who cannot afford broadband internet access through a human services program and/or the Arapahoe/Douglas Works! Workforce Center, which assists job-seekers and businesses.

Teleworking Spaces

Some employees might want to work remotely on occasion, but do not have a suitable space at home. Shared workspaces – known as coworking spaces – can serve as an alternative location to work from, where employees rent/reserve workspace on an as-needed basis. A commute trip would still occur; however, for a much shorter distance and possibly on routes not normally congested from commuting traffic. These spaces can exist as dedicated coworking buildings that are privately operated or as additions to other building types.

The County can promote the building of such operations through land use planning and advocating for their construction in new developments, particularly those on the edges of the metro area. Additionally, the County could commit to providing coworking spaces in new or remodeled public buildings, such as County libraries.



The County could also promote local businesses that are friendly towards hosting teleworkers. Places like coffee shops, cafes, breweries, and other retail businesses may choose to provide teleworking amenities such as seating space, power outlets, and free wifi to attract teleworkers as customers. Creating a list and interactive map on the County's website would help promote local businesses and the benefits of teleworking.

Advancing a Multimodal System

The following initiatives focus on improving connectivity and/or availability of alternative modes.

Development TDM Requirement

The City and County of Denver (CCD) recently enacted a TDM requirement for new development over a certain size. Similar in design to CDOT's TDM requirement for the 1601 process, CCD requires different levels of TDM implementation metrics be met based on the type and size of the development. The developer can choose from a list of TDM strategies with predetermined reduction values and other associated metrics using a spreadsheet tool provided by CCD.

Subsidizing RTD EcoPass

RTD offers EcoPass programs for employers and neighborhoods within the District. An EcoPass is a allows the pass holder to take unlimited trips for a flat annual fee. In an effort to promote transit ridership, Boulder County offers several approaches to fund the start of an EcoPass program for businesses, neighborhoods, and communities within Boulder County, after which the entity must fund themselves to continue. For businesses and neighborhoods (qualifying conditions apply), Boulder County subsidizes 100% of the cost of a new program spread over two or three years (50% in Years 1 and 2 or 60%/30%/10% in Years 1-3). Boulder County also fully subsidizes EcoPasses for most Boulder County Housing Authority sites, and has provided financial assistance in starting EcoPass subsidy programs for the Town of Lyons and Town of Nederland within the County. Boulder County currently splits EcoPass costs evenly with Lyons, slowly decreasing their portion as time goes on. Any Lyons resident can obtain an EcoPass through the Town for a heavily discounted fee that varies depending on age and income status. For the Town of Nederland, any resident can obtain a free EcoPass through the Town. Boulder County fully subsidized the pilot year of this program, after which the Town funds through a mill levy.

Arapahoe County could consider funding a similar subsidy program for EcoPasses for employers and neighborhoods within the County. Such a program could be for the entire County, possibly with financial assistance from municipalities within the County, or only for the unincorporated County. In the case of applying only to the unincorporated County, the County could also choose to help County municipalities setup and even manage their own EcoPass subsidy programs, with financial assistance to start their programs. Subsidizing EcoPasses would also bolster the TDM score of new or modified interchanges under the new 1601 process. To implement, the County should consult with Boulder County to learn from their implementation and coordinate with RTD.

As noted above, CCD requires TDM to be addressed as part of development plans. Subsidizing EcoPasses is one of the available strategies for developers to choose, with the option to provide



ongoing subsidies of either 50% or 100%. The County could provide a similar strategy, with the same or different required percentages of subsidy, if a development TDM program was instituted. Alternatively, the County could institute an incentives-based program instead, granting developers variances such as reduced parking requirements or increased density allowances for providing EcoPass subsidies.

CDOT Bustang Outrider Bus Service

CDOT's Bustang Outrider service is a relatively new (started in 2018) interregional transit service that provides essential bus service to rural areas of Colorado. According to CDOT's Statewide Transit Plan, the service is planned to be significantly expanded in 2021 and beyond, but none of the planned routes would serve eastern Arapahoe County. The nearest planned route, with no defined implementation year or stops in between at this point, would be between Sterling and Denver via I-76.

The Eastern Transportation Planning Region (EA TPR), which includes counties east of Arapahoe County, lists two essential bus service projects to/from Denver along I-70 within its Coordinated Public Transit & Human Services Transportation Plan: one to/from Burlington (3 days/week) and one to/from Limon (2 days/week). However, these routes are not listed in the Statewide Transit Plan. Currently the East Central Council of Governments (ECCOG) provides limited demand-response service to/from Denver and eastern counties via I-70 and may be the operator most likely to run the proposed fixed routes, though limited resources may prohibit such services.

Should the County, and possibly the City of Aurora, be interested in limited weekday transit service in the eastern portion of the County, a partnership with ECCOG could be beneficial to all entities. Bringing such a service to eastern Arapahoe County would also assist in meeting new TDM goals within the updated 1601 process for any planned new or modified interchanges along I-70. The County should coordinate with CDOT, City of Aurora, and ECCOG to determine the viability of providing service along eastern I-70 and potential cost sharing and operational arrangements that could support such a service.

Promoting Area Mobility Hubs

Mobility hubs are locations developed to create a seamless connection between a variety of modes and demonstrates the development of infrastructure in a way that supports a multimodal transportation system. Mobility hubs should include place-making strategies that make the location an activity center focused on facilitating first and last mile connections. Several mobility hubs were proposed within the City of Aurora as part of the Northeast Aurora Transportation Study (NEATS) that are near the City's boundary with unincorporated Arapahoe County, including:

- Jewell Avenue at Gun Club Road
- Jewell Avenue at Watkins Road
- 6th Avenue at Watkins Road
- Colfax Avenue at Quail Run Road

The City of Centennial is also considering proposed mobility hub locations.



There are several ways the County can promote and support the development of these mobility hubs:

- Prioritize projects that improve connectivity to existing or planned mobility hubs, particularly projects with non-motorized connections
- Promote land use growth on corridors that connect to existing or planned mobility hubs
- Offer grants to the development of mobility hubs with varying funding levels depending on the mobility hub type, scale, and location