Alternative Transportation and Land Use Subcommittee

Status Report to RAQC

November 5, 2010

Alternative Transportation Measures:

1. Subcommittee has completed evaluations (see attached) of the following two Alternative Transportation Measures and will present them to the RAQC board today

- Reducing Speed Limits
- Expanding Transportation Demand Management programs

2. Subcommittee will involve RTD (initial meeting with staff has already occurred) to complete the following evaluations of the following additional Alternative Transportation Measures in November:

- Evaluate RTD fare structure to increase demand
- Promote full build out of FasTracks, including BRT, commuter rail light rail transit and HOV infrastructure
- Strategically manage park and ride facilities to increase demand
- Increase service levels to increase demand
- Expand real time traveler information to increase demand

3. Subcommittee will complete the following evaluations for the remaining Alternative Transportation Measures in November and report to RAQC Board in December:

- Provide additional bike/pedestrian facilities and infrastructure to reduce VMT and encourage commuting via these modes
- Design and implement car sharing programs to reduce VMT
- Design and implement a neighborhood electric vehicle program to reduce emissions

Land Use

1. The subcommittee has spent extensive time discussing how best to evaluate the Land Use Measures for purposes of RAQC planning, and has not yet completed its work.

2. To date, the subcommittee has generally discussed each measure listed in the table presented to the RAQC board a few months ago and determined that, for purposes of completing the preliminary "high level evaluation" it makes the most sense to consolidate the measures into a few, broader strategies and then evaluate them for how they could affect VMT and air quality.

3. The primary reason for this approach is that at this time the land use measures are inter-related and distinguishable from each other as air quality planning tools only by how they might be implemented; not by potential air quality benefits, a preliminary sense of the anticipated costs and economic impacts, ability to take SIP credit, etc. To this end, the subcommittee plans to complete its evaluation and report to the RAQC board in December focusing on what additional analysis would be need understand how various land use measures might be considered for use in developing the ozone SIP.

4. These broader strategies are those designed to:

- Increase cooperative and integrated planning for regional growth, transportation, and land use.
- Increase land use development density, including tools such as urban growth boundaries
- Target growth to urban centers;
- Increase the number of transit oriented communities;
- Use innovative development strategies to promote neighborhood design and connectivity;
- Enhance first/last mile connections; and
- Increase use of urban circulators.

5. As part of its evaluation, the Subcommittee will consider typical land use objectives for reducing not only VMT for air quality purposes, but also congestion and sprawl. These are known as the "5 D's" and considering them will aid in determining how the RAQC might measure progress toward meeting air quality goals and estimate the emission reduction potential .They are:

- Density
- Diversity (mixed uses)
- Destination Accessibility
- Distance to Transit
- Design

6. Finally, the subcommittee also plans to consider the best "tools" or mechanisms for advancing land use measures that might improve air quality. Tools might include: new or modified state planning requirements, new or modified urban growth boundaries, regional transportation plans, comprehensive land use plans, corridor plans, local land use regulations etc.

Preliminary "High-Level" Evaluation Tool for Supporting Initial Prioritization of Ozone Reduction Measures

Land Use/Alternative Transportation Subcommittee
November 5, 2010

Strategies Included In this Packet:

- Expand TDM Programs
- Reduce Speed Limit

(Strategy documents include sub-committee comments/suggestions)

Preliminary Draft for Discussion Only

Regional Air Quality Council

Alternative Transportation/Land Use Subcommittee

Overview of Strategies Analyzed

Measure	Description of Measure	Experience in Colorado/Other Areas	Existing Authority or Needed Approvals	Implementation/SIP Measure Feasibility	Additional Analysis Needed
Expand Transportation Demand Management (TDM) Programs	The expansion of TDM programs would focus on reducing demand for single occupancy vehicle trips by encouraging the use of alternative forms of transportation such as carpooling, vanpooling, bicycling, teleworking, use/expansion of RTD's Eco Pass program, compressed work weeks or any employer-based program that encourages the use of alternative transportation for commuting purposes.	Transportation Demand Management Programs are common throughout the Denver region. Examples of such programs include the Denver Regional Council of Governments' (DRCOG) "RideArrangers" program and Boulder's "Driven to Drive Less" campaign.	Currently being implemented voluntarily	- Unlikely to be included as mandatory program in SIP - Potential as a Voluntary Mobile Emission Source Program (VMEP)	- Analysis of long0term VMT changes from individual programs - Additional analysis of program costs - Better cost/benefit analysis - Analysis of predictive reductions vs. actual reductions
Reduce Speed Limit	This strategy requires lowering of the speed limit through statutory authority for highways in the ozone nonattainment area. We anticipate that the speed limit would be lowered to a maximum of 55 mph in this analysis and that the reduced speed limit could apply equally to trucks and cars, or could be applied differentially	Speed limits are currently used throughout the state of Colorado, but are not adjusted to optimize traffic flow for air quality purposes. Other states (Texas, Tennessee) have used speed limit variations to improve air quality.	The state legislature, CDOT, local authorities have the authority to set speed limits within the state.	- Could be included in SIP - Included in baseline modeling	- Analysis of the emission benefits of speed limit changes (modeling) - Cost analysis associated with changing speed limits - Analysis of safety considerations associated with slower speeds

Preliminary High-Level Evaluation Tool
for Supporting Initial Prioritization of Ozone Reduction Measures
Draft: Not for Distribution
November 5, 2010

Measure type: Alternative Transportation

Measure name and description: Expand Transportation Demand Management (TDM) Programs

Transportation Demand Management Programs are common throughout the Denver region. Examples of such programs include the Denver Regional Council of Governments' (DRCOG) "RideArrangers" program and Boulder's "Driven to Drive Less" campaign. The expansion of such programs would focus on reducing demand for single occupancy vehicle trips by encouraging the use of alternative forms of transportation such as carpooling, vanpooling, bicycling, teleworking, use/expansion of RTD's Eco Pass program, compressed work weeks or any employer-based program that encourages the use of alternative transportation for commuting purposes.

Any single program type would require involvement, commitment and often investment by employers, as well as government agencies, in some cases. Pilot programs are a useful way of testing the effectiveness of select programs in reducing trips, associated VMT and air emissions.

Preliminary sense of anticipated air quality benefits (e.g. NOx/VOC reductions? Potential reduction amount?):

Air quality benefits would be tied primarily to reduced VMT; additional air quality benefits would also accrue from reduced idling, start-ups, and other ancillary emission producing activities associated with single occupancy vehicle use.

VMT reduction estimates vary greatly depending on the level and breadth of TDM program(s) implementation and participation, as well as actual travel behavior change. At a regional scale with aggressive TDM program implementation, VMT reductions could range from .33%[1] to 1.5%[2], with presently un-quantified associated air quality benefits for the Denver region.

Preliminary sense of anticipated costs and economic impacts:
Program costs, associating funding mechanisms and VMT/emission reduction opportunities vary and are not yet fully understood. However, DRCOG's work in this area offers some important insight. Over the past five years, DRCOG has allocated a total of $3.75M to a TDM funding pool for such initiatives as pilot programs designed to advance innovative TDM programs and Transportation Management Organization start-ups. This funding has occurred via the Transportation Improvement Program (TIP) process. Also, during the past five years, DRCOG has provided a total of $9.5M to the RideArrangers program.

DRCOG plans to allocate in the next TIP cycle an additional $11.9M to TDM over a four year time period. Furthermore, DRCOG has made TDM programs eligible to apply for larger amounts of funding through the TIP process Air Quality Improvement (AQI) pool, which includes approximately $14M from 2012 through 2015.

DRCOG has estimated that The RideArrangers program itself reduces approximately 85 million VMT per year. A recent CDOT study estimates that TDM programs cost from $0.01 to $0.05 per VMT reduced[3] , while DRCOG

[1] DRCOG RideArrangers analysis of 2008 numbers by DRCOG staff.

[2] Center for Clean Air Policy. 2008. *Travel, Smart Growth, and Climate Change: Can Portland, Maine be Like Portland, Oregon?* Prepared by Cambridge Systematics.

[3] Colorado Department of Transportation. 2010. *Transportation Demand Management Project Evaluation and Funding Methods in the Denver Region.* Prepared by Cambridge Systematics and Sprinkle Consulting.

reported in 2008 that its TDM programs cost from $0.03 to $3.83 per VMT reduced with a total average of $0.12 per VMT reduced.[4]

Additional technical analysis needed to refine benefits/costs estimates:

- Determine the most appropriate method for quantifying the air quality benefits from a (or several distinct) TDM programs in the nonattainment area, building on what has been done for air quality planning purposes elsewhere in the Country (via voluntary programs. See Below).
- Analyze air quality benefits associated with individual programs that reduce VMT, since benefits likely will be realized differently in different areas within the nonattainment area (provided an appropriate method for doing so can be developed).
- Analyze the long-term VMT changes from individual TDM programs that exist within the nonattainment area, since most estimates do not include long-term behavior change estimates.
- Update emissions estimates using EPA's new emissions model (MOVES) before considering TDM programs as a possible SIP measure. **NOTE:** DRCOG has indicated that it could include the use of TDM programs in baseline modeling, provided that commute mode share estimates can be obtained. A further literature review would likely provide needed information.
- Evaluate the overall benefit (predictive and actual) and enforceability of TDM programs for SIP purposes and the relative benefits of mandatory vs voluntary programs (using information from Atlanta and Dallas (see below)
- Further analyze associated TDM program costs and cost effectiveness.

Implementation feasibility (e.g. Who has authority? Who needs it? Who implements the measure?):

Very feasible as a voluntary measure. DROCG, RTD, local governments, TMO/TMAs, employers and other organizations have the authority to offer voluntary TDM programs, and do. The Ride Arrangers program offered by DRCOG is currently offered region-wide and targets employers. The North Front Range MPO offers the Smart Trips program for northern Colorado.

As a mandatory measure, TDM program implementation feasibility is unknown since to our knowledge there are no mandatory TDM programs in existence in the US.

Demonstrated ability to take "SIP Credit" for the measure:

To date, TDM programs have been only applied on a voluntary basis. Credit for them can be taken in the SIP via EPA's "Voluntary Mobile Emission Source Program (VMEP), or they could be included in baseline modeling. Both Atlanta and Dallas/Fort Worth trip reduction programs take advantage of EPA's VMEP guidance and take credit for these voluntary programs in their respective ozone SIPs.[5] EPA only allows credit to be obtained for SIP purposes if proper information is provided in technical support documents. Such information includes projected emissions reductions, program monitoring/reporting and a commitment to reach forecasted emissions reductions by program implementers. TDM programs are not currently included in RAQC/DRCOG baseline emission modeling, but they could be with additional resources for doing so.

Likelihood that measure could be in place in time for SIP inclusion (approx 2015); and, if later, how much later (e.g. 2 years? 10 years, etc?):

Emission reductions associated with DRCOG's RideArrangers program could be in place in time for SIP inclusion since this program is already functioning and has current funding through the TIP process through present day to 2015. An expanded RideArrangers program could also be in place in time for SIP inclusion, provided that

[4] Per DRCOG staff Sept. 2010.

[5] **Atlanta:** 2001 8-hour ozone SIP http://www.gaepd.org/Files_PDF/plans/sip_narrative.pdf. **Dallas/Fort Worth:** 2005 8-hour ozone SIP. Federal Register / Vol. 70, No. 165 / Friday, August 26, 2005.

expansion efforts and associated EPA required analysis of the program occurs in a timely manner. Any new TDM programs selected through the next TIP cycle will begin in 2012 and results should be ready in time for SIP implementation as well.

Preliminary Assessment of Co-benefits (e.g. other air quality, economic, quality of life, transportation etc):

- Greenhouse gas emission benefits through reduced VMT, congestion and fuel usage.
- Increased quality of life benefits may also be realized, such as more enjoyable commute time and less stress as a result of driving in a congested area.
- Decreased quality of life could result if alternative mode choice is found to be less enjoyable than driving alone.
- Cost savings for parking infrastructure.
    - According to a recent study of a parking structure by the University of Colorado-Boulder, it costs 2.5 times as much to accommodate an additional person in the parking structure than to shift one person from driving to an alternative mode. The total annual savings, compared to providing 350 net new parking spaces, was approximately $550,000 or $1,570 per space.[6]

Other Considerations/Comments (e.g. Employed elsewhere, particular challenges/opportunities etc?):

- TDM programs are prevalent throughout the country as voluntary programs. Program costs/benefits vary greatly based on amount of funding and the success of the program.
- The two aforementioned programs in Atlanta and Dallas/Fort Worth are included as VMEPs in their respective SIPs.
- There is an interest in using funds obtained from tolls to pay for TDM programs; however CDOT has indicated this is unlikely to occur because funding is typically used to repay bonds used to build the roads.
- CDOT also noted that in addition to the difficulty in using tolls to support TDM, there would also be a need for public support for this approach, which is an unknown until there is a system in place to test.

[6] U.S. Department of Transportation, 2009. *A Compendium of Sustainable Community Transportation Strategies.* Prepared by CALSTART.

Preliminary "High-Level Evaluation" Tool
for Supporting Initial Prioritization of Ozone Reduction Measures
DRAFT: For Use By RAQC Subcommittees
November 5, 2010

Measure type: Alternative Transportation

Measure name and description: Reduce Speed Limit

This strategy requires lowering of the speed limit on highways within the ozone nonattainment area via legislative action (see below). For purposes of this evaluation, we assume lowering the speed limit to a maximum of 55 mph and applying the reduced speed limit evenly to trucks and cars. Another option could be to apply different speed limits to trucks and cars and/or consider other speed limit variations.

Preliminary sense of anticipated air quality benefits (e.g. NOx/VOC reductions? Potential reduction amount?):

The primary anticipated air quality emissions benefit is NOx reduction due to lower combustion temperatures, which occur at lower speeds. Some CO reduction would also occur. A very preliminary, rough, "one-run analysis" by CDPHE and RAQC staff without the aid of DRCOG's travel model data, indicates approximately 4.6 to 6.8 tpd of NOx reduction in 2010 (approximately 4% to 6% of the mobile source NOx emissions), with a speed limit change to 55 mph for all on-road vehicles. However, the NOx reductions that would occur for one on-road large diesel truck is estimated to be approximately 7 to 10 times greater than reductions from one individual passenger truck or car. This measure is significantly more effective for large diesel trucks.

Preliminary sense of anticipated costs

While not yet quantified, cost estimates for this measure would need to consider new speed limit signage, enforcement, public education, longer transport time for delivered goods.

Additional technical analysis needed to refine benefits/costs estimates:

- Fine tuning the emission benefit estimates by running DRCOG regional travel models and the MOVES mobile sources emissions model.
- Conducting photochemical modeling to determine the impact of the estimated emissions reductions on air quality in the nonattainment area.
- Run DRCOG's regional travel model to evaluate the benefits of varying reduced speed limit levels. Free flow speeds (varying by facility type and area type) form a set of basic model input parameters. Adjusting speeds downward and re-running the model may result in shifts in travel such as:
    - Reductions in overall vehicle miles traveled (VMT), as longer travel times will result in people choosing destinations closer to home;
    - Shifts to rail transit, as this mode is not affected by roadway speeds;
    - And lower average speeds overall.
- Evaluate the cost associated with varying speed limits
- Analyze safety considerations associated with slower speeds in some areas (see below).

Implementation feasibility (e.g. Who has authority? Who needs it? Who implements the measure?):

Implementation feasibility will likely be a challenge, since legislation would be needed to set a lower speed-limit within the state of Colorado for air quality planning purposes. At this time:

- The state legislature has the statutory authority (CRS 42-4-1101) to set speed limits within the state.
- CDOT and local authorities (CRS 42-4-1102) also have the statutory authority to alter speed limits based on traffic investigations and surveys. CRS 42-4-111 authorizes local jurisdictions to reduce speed limits with respect to streets and highways within their jurisdiction.
- Colorado law does not specifically state whether different highway speed limits may be established for different types of vehicles, for various weather conditions or for different times of the day. However, the law provides that signs may be erected directing traffic to use certain lanes, (42-4-1007(1)(c)). This provision can be used to limit the speed of certain vehicles (e.g., trucks) on specific highway lanes.
- State and local agencies would be responsible for new signage and for enforcing the new speed limits.

Demonstrated ability to take "SIP Credit" for the measure:

This measure could provide quantifiable and verifiable credit in the SIP through the use of the appropriate transportation models and the MOVES emissions model.

Likelihood that measure could be in place in time for SIP inclusion (approx 2015); and, if later, how much later (e.g. 2 years? 10 years, etc?):

Very likely that this measure could be in place within a one-two year time frame, provided legislative support exists. However, the likelihood of legislative support for such a measure is unknown at this time.

Preliminary Assessment of Co-benefits (e.g. other air quality, economic, quality of life, transportation etc):

- GHG benefits.
- Energy conservation benefits. Research indicates that lower speed limits do not necessarily increase highway safety. While it can be said that highway accidents occurring at lower speeds result in less severe injuries, it is more difficult to conclude that lower speeds lead to fewer accidents.
- Highway safety experts in US and Europe have also studied this matter and concluded that increases in travel speeds lead to more deaths and decreases in travel speeds result in fewer deaths.[7, 8] Research by the Insurance Institute for Highway Safety (IIHS) found that when speed limits were raised by many states in 1996, travel speeds increased and motor vehicle fatalities went up approximately 15 percent on Interstate highways in those states.
- Results of analysis at 58 experimental sites in 22 US states where speed limits were lowered revealed that accidents were affected as follows: a reduction in accidents of 11 percent to an increase of 26 percent at a 95 percent confidence limit.[9]
- CDOT experience with lowering/raising speed limits has been as follows[10]:
    - Speed does play a role in accident severity.
    - Engineering speed studies show that speed limits cannot be effectively enforced without the consent and voluntary compliance of the public. Investigations prove that people will drive the roadway as they perceive the conditions and will ignore a speed limit that is unrealistically too low or too high (as happened along portions of I 25 after T Rex was completed).
    - Reducing speed limits may benefit air quality; however, the challenge will be public compliance and enforcement.

[7] Friedman Lee S, Hedeker D, Richter ED. "Increased Fatalities and Injuries Following the Repeal of the National Maximum Speed Limit in the U.S." EPUB, American Journal of Public Health.
[8] Wim van Beek et al, The Effects of Speed Measures on Air Pollution and Traffic Safety, (Netherlands)

[9] US DOT. 1992. *Effects of Raising and Lowering Speed Limits.* U.S. Department of Transportation Federal Highway Administration, Report No. FHWA-RD-92-084, October 1992
[10] CDOT. 2010. Correspondence from Sandi Kohrs, Colorado DOT, Branch Manager, Planning and Performance Measures

Other Considerations/Comments (e.g. Employed elsewhere, particular challenges/opportunities etc?):

- This measure is currently employed as an air quality strategy in Texas and Tennessee and a number of European countries The Texas Commission on Environmental Quality (TCEQ) adopted a speed limit reduction strategy in the state SIP, setting speed limits to 5 mph below the previously posted limits where speeds were 65 mph or higher before May 1, 2002. The strategy became effective May 1, 2002 in the Dallas-Fort Worth (DFW) area and on May 1, 2005 in the Houston-Galveston-Brazoria (HGB) area. NOx emissions reductions were estimated at approximately 5 tpd in the DFW area and 2 tpd in the HGB area. In addition, the counties surrounding the NAA of DFW were included in the speed limit reduction strategy due to modeled evidence of local "transport" of emissions into the NAA.
- In 2003, Tennessee analyzed reducing the speed on rural interstates in the 9 county Knoxville area from 70 mph to 55 mph for trucks and from 70 to 65 mph for all other vehicles as a SIP measure for Knoxville area. The estimated NOx reduction from only trucks was 5.8 TPD while from trucks and cars it was 6.0 tpd (approximately a 4% reduction in total NOx emissions). A negligible VOC increase was noted in both cases.
- In 2001 the Netherlands modeled reductions in NOx emissions of 5% on freeways from an approximate speed reduction of 12 mph (from approximately 62 MPH to 50 MPH).
- During the energy crisis of the 1970's the US federal government mandated a national 55 mph speed limit which resulted in a reduction in gasoline usage by more than 5%.