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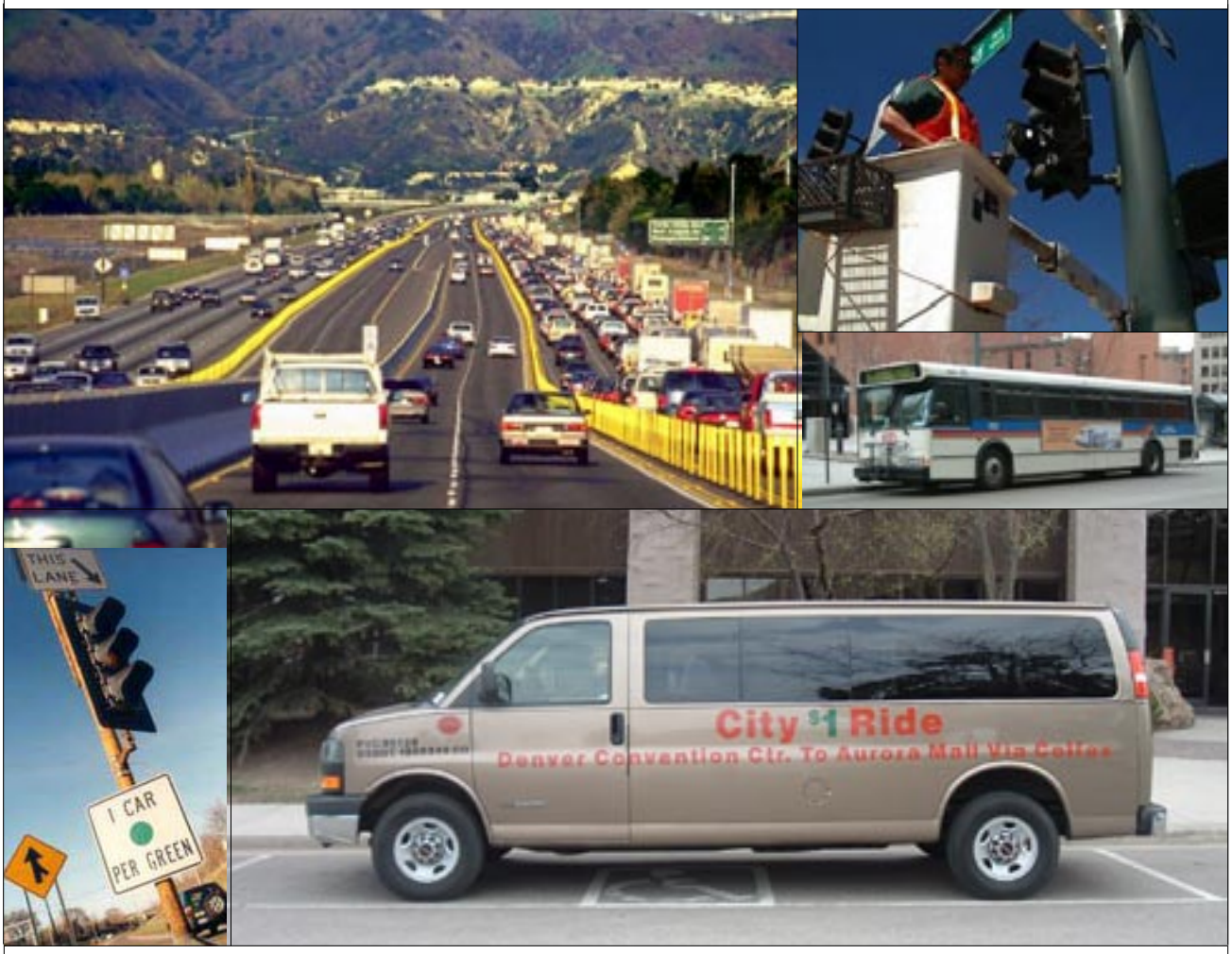
The Mobility Plan for Denver



by Randal O'Toole

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Cover photos, clockwise from upper left: High-occupancy toll lanes in California built and paid for entirely with tolls from low-occupancy vehicles; traffic signal maintainer in Denver; RTD bus suitable for contracting out to private operators; private transit service now being offered between Aurora and downtown Denver; freeway ramp meter. All of these are examples of important parts of the Mobility Plan for Denver.

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Executive Summary

In 2001, Denver was the nation's twentieth-largest urban area, but by most measures it suffered the nation's fourth or fifth worst congestion. The Denver Regional Council of Governments (DRCOG) predicts that, under its 2025 regional transportation plan, the amount of time the average Denver resident wastes sitting in traffic will increase by 73 percent by 2025. RTD's plan to build FasTracks will reduce this only slightly to a 65-percent increase.

Put another way, the average Denver commuter wasted about 50 hours a year sitting in traffic in 2001. DRCOG's 2025 plan would increase this to 87 hours, while the addition of FasTracks would increase it to 83 hours. Neither DRCOG nor RTD have developed or considered a plan that would maintain congestion at or reduce it from current levels. Indeed, the increased congestion contemplated by those plans might lead one to call them "immobility plans."

In contrast, the Independence Institute's Center for the American Dream proposes a true Mobility Plan for Denver that aims to actually relieve per-capita congestion for motorists while at the same time providing better transit service than FasTracks would offer. Moreover, this Mobility Plan for Denver can be implemented without increasing taxes. The plan includes the following components:

1. Insure that projects are cost effective by using a standard measure to evaluate transportation investments, namely the *cost to the taxpayer per hour of reduced delay*. Projects with the lowest cost per hour should be given the highest priority. This may include rail transit, it will certainly include bus-rapid transit, but it will also include more highway projects, especially toll projects.
2. Don't build FasTracks. This will make up to $900 million federal dollars available for activities that can actually reduce congestion, such as items 3, 4, and 6.
3. Coordinate traffic signals throughout the metropolitan area.
4. Build a network of express toll lanes throughout the region.
5. Contract out the 50 percent of transit services that RTD currently operates. This will save tens of millions of dollars per year that can be applied to other transit improvements such as bus-rapid transit.
6. Offer bus-rapid transit along all FasTracks corridors using, whenever possible, express toll lanes. Even where express toll lanes are not available, bus-rapid transit can provide faster, more frequent service than is currently provided in those corridors.
7. Allow private transit operators to provide an expanded range of transit services throughout the metropolitan area.
8. Provide cost-effective bicycle and pedestrian improvements that don't impose unnecessary barriers on auto travel.
9. Provide assistance to low-income families to insure they have the mobility they need to get out of poverty.

The Independence Institute estimates that, taken together, these actions will result in at least a 10-percent reduction in per-capita congestion from current levels. Because much air pollution is congestion related, this will greatly reduce air pollution. The plan will also improve transportation safety and provide significantly better transit service. Yet the total cost of the plan to taxpayers is likely to be well under $1 billion, most of which can be paid by Denver's share of federal transportation dollars.

Denver's Growing Congestion

Denver congestion is severe and growing. Although Denver is ranked as the twentieth largest urban area in America, according to the Texas Transportation Institute's 2003 annual survey of urban mobility (which includes data from 1982 through 2001), Denver is, by most measures, one of the five most congested urban areas in the nation.

- In terms of the amount of delay experienced by Denver drivers per capita, Denver ranked fourth after Los Angeles, San Francisco, and Houston;
- In terms of the amount of time it takes to get anywhere during rush hour vs. other times of the day (known as the *travel time index*), Denver tied with Boston and Washington for fourth after Los Angeles, San Francisco, and Chicago;
- In terms of the cost of congestion per capita, Denver was fifth after Los Angeles, San Francisco, Dallas, and Houston;
- In terms of the growth of the delay per capita from 1982 through 2001, Denver was fifth after Los Angeles, Dallas, San Francisco, and San Bernardino.[1]

The Institute's 2004 survey (which adds data for 2002) found that Denver congestion declined slightly from 2001 to 2002, mainly because of a loss of jobs during the recession.[2] When the recession ends, congestion will again grow rapidly.

The reason for the growing congestion is simple: transportation facilities have not expanded to keep up with the growth in travel. In the past twenty years, the miles of driving on freeways and other principle arterials together have increased eight times as much as the lane miles of those roads (table one). While the total miles of roads and streets have grown more, this reflects the many streets built in new neighborhoods for the 50-percent increase in population during that time.

According to the Texas Transportation Institute, the total amount of delay experienced by Denver drivers octupled from about 9 million hours per year in 1982 to 73 million hours per year in 2001.[3] The Denver Regional Council of Governments (DRCOG), Denver's regional planning agency, estimates that congestion wasted about 309,000 hours of people's time in 2001.[4] Since there are about 240 commute days a year, this is approximately the same as the Texas Institute's estimate of 73 million hours per year.

DRCOG expects the Denver metropolitan area to grow from about 2.45 million people in 2001 to 3.58 million people in 2025.[5] DRCOG predicts this 46-percent population increase will be accompanied by a 57-percent increase in the miles of driving in the region.[6]

Table One
Increase in Miles of Roads and Driving in Denver Metro Area, 1982–2002

	Road Miles	Miles of Driving
Freeways	30%	92%
Principle Arterials	1%	72%
Both	10%	82%
All roads	41%	70%

Road miles are lane miles *for freeways and principle arterials,* centerline miles *for all roads.*
Source: David Schrank and Tim Lomax, The 2004 Annual Urban Mobility Report *(College Station, TX: Texas Transportation Institute, 2004), "Mobility Data for Denver-Aurora," "Mobility Data for Boulder."*

If no action is taken to accommodate the increase in driving, congestion will get far worse. DRCOG expects that the number of hours people waste sitting in traffic will nearly triple, increasing from about 309,000 hours per day in 2001[7] to nearly 835,000 hours per day in 2025.[8] This represents an 85-percent increase in per-capita delay. In other words, if you spend a half-hour sitting in traffic today, by 2025 you will spend 55 minutes.

DRCOG's response to these projections is found in its *Metro Vision 2025 Regional Transportation Plan*. This calls for $3.8 billion worth of spending on transit and $3.0 billion on highway improvements between 2002 and 2025.[9] The transit portion includes funds to complete the Southeast (T-Rex) line along with rail lines from downtown Denver to Golden (the West line) and Denver International Airport (the East line). Much of the highway money is already committed to T-Rex and other projects through 2008, leaving only $825 million to be spent relieving congestion after 2008.

DRCOG projects that this plan will reduce travel delay by 7 percent, from 835,000 hours to 779,000 hours. This means the time you waste sitting in traffic will increase by 73 percent instead of 85 percent—not a huge difference.[10] DRCOG did not attempt to find an alternative plan that could maintain per-capita delay at or reduce it from current levels.

On top of the 2025 plan, RTD proposes to add FasTracks, which would spend $4.7 billion[11] building six new rail transit lines (including the East and West lines

in the 2025 plan) and extending the existing and T-Rex lines.[12] This $4.7 billion is in future, inflated dollars, while all dollars in the DRCOG 2025 plan are in 2001 dollars. The cost of FasTracks in 2001 dollars is about $4.0 billion, about $1.1 billion of which is included in the 2025 plan for the East and West lines.

The problem with this solution is that it doesn't solve anything. DRCOG predicts that FasTracks will attract only 72,000 new riders to transit each weekday, taking just 0.6 percent of auto trips and 0.5 percent of vehicle miles off the road.[13] That might be a satisfactory outcome if FasTracks cost 1 or 2 percent of the region's transportation budget, but as shown in table one $4.0 billion is more than 40 percent the funds DRCOG says will be available to spend on transit and highway improvements in the next 22 years.[14]

According to RTD, rush-hour speeds in major corridors—I-25, I-225, I-70, US 36, and US 6—will decline from about 21 miles per hour in 2015 to about 16 miles per hour in 2025.[15] By extrapolation, speeds in those corridors are about 27 miles per hour today. RTD's calculations indicate that FasTracks will make less than a 1-mile-per-hour difference in 2025 corridor speeds.

Based on the studies RTD has done of the FasTracks rail lines not included in the DRCOG 2025 plan, these lines will reduce travel delay by less than 40,000 hours per day to about 740,000 hours per day (see table three below). This is a 64-percent increase in per-capita delay above present levels; a half-hour delay increases to 49 minutes instead of 55 minutes under the no-action plan. It makes little sense to spend $4 billion on a project that will have, at best, an imperceptible effect on congestion when funds available to actually relieve congestion are so inadequate.

Table two is based on table 9 and appendix 2 of the August 20, 2003 update to DRCOG's 2025 transportation plan. The "committed" column includes all projects planned through 2008, including T-Rex. The "2025 Plan" column adds the East and West rail lines plus improvements to sixteen highways, including adding new lanes to portions of I-76, I-270, Santa Fe, Wadsworth, Federal Boulevard, 88th Avenue, 96th Street, 120th Avenue, Buckley Road, and Washington Street.

The "FasTracks" column adds the cost of the other FasTracks routes to the rapid transit program. The $4.0 billion cost of FasTracks is more than 40 percent of the transit-plus-highway budget, and spending on all transit is more than twice spending on highways. Yet transit carries only 2.27 percent of passenger travel in the region today, and DRCOG predicts that in 2025, with FasTracks, this will increase to just 2.85 percent. The transit budget under DRCOG and RTD plans is wildly out of proportion to transit's benefits.

Table Two
DRCOG's 2025 Plan Transportation Improvements
(millions of 2001 dollars)

	Committed	2025 Plan	FasTracks
A. Rapid transit	799.6	1,860.6	4,807.4
B. Non-rapid transit	1,906.5	1,906.5	1,906.5
C. Highway improvements			
C1. State through 2008, 7th Pot	521.5	521.5	521.5
C2. State through 2008, other	602.9	602.9	602.9
C3. Non-state through 2008	79.5	79.5	79.5
C4. State after 2008	0.0	694.5	694.5
C5. Non-state after 2008	0.0	130.3	130.3
D. Pedestrian & bicycle	90.2	90.2	90.2
E. Local roadway improvements	987.8	987.8	987.8
L1. Local street improvements	1,525.0	1,525.0	1,525.0
L3. Private street improvements	7,250.0	7,250.0	7,250.0
Total	13,763.0	15,648.8	17,796.0
Transit (A+B)	2,706.1	3,767.1	6,713.9
Highways (C+E)	2,191.7	3,016.5	3,016.5
Transit+Highways (A, B, C, E)	4,897.8	6,783.6	9,730.4

Lines F through K and L2 are operations and maintenance.

Source: DRCOG, 2003 Amendments to the 2025 Interim Regional Transportation Plan*, table 9 and (for lines L1 and L3) appendix 2.*

1. Cost Effectively Reduce Congestion

Various people have endorsed the idea of creating a regional transportation authority that could evaluate and address transportation needs on a corridor-by-corridor basis. But Denver already has a regional transportation planning agency, DRCOG, and while its powers are more-or-less advisory, the 2025 plan it prepared is hardly a testament to the effectiveness of regional planning. DRCOG's 2025 plan would spend 55 percent of the region's transit-plus-highway funds on transit even though it projects that only 2.3 percent of passenger trips will use transit. The result of this imbalanced transportation funding is that per-capita time wasted in traffic increases by 73 percent. Giving DRCOG more power, or giving that power to another agency, will not solve this problem.

Denver is not alone in this imbalanced transportation planning. The regional transportation authority for the San Francisco Bay Area, known as the Metropolitan Transportation Commission, plans to spend 80 percent of the region's transportation capital funds on a transit system that carries just 4 percent of passenger travel. Portland's regional transportation authority, known as Metro, is spending 60 percent of the region's transportation capital funds on a transit system that carries just 2.2 percent of travel. And the Twin Cities' regional transportation authority, known as the Metropolitan Council, is spending 70 percent of its capital funding on a transit system that carries just 1 percent of travel.

Rather than give DRCOG more power, what must be done is to give DRCOG, or whatever agency does the planning, clear direction on how to spend the region's limited transportation funds. That direction should specify that, after safety, the first priority of any transportation plan should be to reduce congestion and improve mobility at a minimal cost to taxpayers.

While the Mobility Plan suggests a number of investments below that are likely to meet this objective, DRCOG should use a standard criterion to evaluate any investment that aims to deal with Denver's congestion. Currently, DRCOG's criteria seem to be purely political, shortchanging auto users because of anti-highway sentiments on the part of some of the region's leaders and promoting rail transit so that every suburb can get its share of transportation pork barrel. While DRCOG would only partially fund actions that are extremely cost-effective at reducing congestion and pollution, such as traffic signal coordination, it proposes to fully fund actions that have a very low cost effectiveness, such as the West rail transit line. This is a prescription for waste and gridlock, and as congestion grows it will contribute to an impression that Denver is anti-growth and anti-business.

What criterion should be used? The Federal Transit Administration (FTA) evaluates transit investments by calculating the *cost per new rider*. A project's capital cost is annualized by amortizing it over the expected life of the project at a specific discount rate (the FTA uses 7 percent). This annualized cost, together with the annual operating cost, is divided by the estimate of the annual number of *new transit riders*, that is, those who would be attracted by the new project over and above those who would ride transit without the new project.

While this is a useful criterion for weighing transit projects, it doesn't apply to road improvements. A consistent measure of congestion is needed to fairly compare transit and road projects. There are several candidates, including *reduction in vehicle miles traveled*, *peak-hour driving speeds*, *travel time index*, and *hours of delay*. The travel time index is the time it takes to get from one point to another at rush hour divided by the time it would take in uncongested conditions.

Of these, the reduction in vehicle miles traveled is unsuitable because, like cost per new rider, it is really a transit measure. The goal of government should not be to reduce people's mobility but to make sure that mobility choices are made as efficiently as possible.

Peak-hour driving speeds and travel time index are both inadequate because they focus on only a portion of the day. This ignores the fact that some investments can yield huge benefits by shorting the number of hours of congestion without significantly affecting the amount of congestion at the peak hour. This can happen because some people respond to congestion by traveling at a different time of day. If something is done to reduce congestion, some of those people will shift back to travel during the peak hour, making it appear that peak-hour congestion is as bad as it was before. Yet the reduction in the number of hours of congestion, not to mention the fact that some people are traveling at times that are more convenient for them, is an enormous benefit.

The appropriate criterion DRCOG should use is the *cost to taxpayers per hour of reduced delay* (or, for short, *cost-per-hour saved*). Unlike the travel time index and driving speeds, this accounts for time saved throughout the day.

For example, suppose one investment costs $15 million plus an annual operating cost of $1 million, has an operating life of ten years, and is projected to

save 3 million delay hours per year. Another investment costs $424 million plus an annual operating cost of $13 million, has an operating life of 30 years, and is projected to save 2.5 million delay hours per year. The first investment has an annualized cost of $2.1 million, or $3.1 million with the operating cost. This works out to about $1 per delay hour. The second investment has an annualized capital cost of $40 million, or $53 million with the operating cost. This works out to $21.20 per delay hour.

Obviously, the first investment is far superior to the second. The numbers in the first investment correspond to DRCOG's traffic signal coordination program over the next six years, while the second investment is the West FasTracks line. (The cost-per-hour saved in table three, below, is lower because it is based on an early estimate of the line's cost.)

After making this calculation for all potential transit and highway investments, DRCOG should rank them using this measure. In general, those with the lowest taxpayer cost-per-hour saved should be implemented first. Those with a very high cost should not be considered. DRCOG should incorporate this methodology into its 2030 Regional Transportation Plan and the transportation improvement planning (TIP) process.

The cost of reduced delay should not be the only criterion used in transportation investments. Some projects may be needed primarily for other goals, such as safety, reducing air pollution, or providing mobility for transit-dependent people. But the cost of reduced delay should be the main criterion for evaluating investments whose primary goal is to deal with congestion. Safety should never be sacrificed, but many of the projects that are most effective at reducing congestion also increase safety. Since air pollution is partly a function of congestion, reducing delay is usually more cost effective at reducing pollution than efforts to reduce vehicle-miles traveled. If carefully designed, projects aimed at helping transit-dependent people should also be compatible with cost effectively reducing delay.

2. Don't Build FasTracks

FasTracks rail lines rank low using the cost-per-hour saved standard. The major investment study for the Southeast (T-Rex) light-rail line calculated a $9.00 cost per delay hour saved for light rail but only $7.05 for bus/HOV lanes. Moreover, after adjusting for inflation, the capital cost of light rail turned out to be 72 percent greater than estimated by the major investment study, so the actual cost is closer to $13 per hour saved.

Major investment studies have been completed for all but one of the FasTracks lines, and all but one found that rail transit required a higher cost-per-hour saved than highway expansions or bus transit (table three). The only exception was the Gold corridor, which did not calculate delay hours for any alternative but rail transit. In that corridor, the cost-per-hour saved for rail transit was also very high.

For the other corridors, rail transit's cost-per-hour saved is two to twenty times greater than the cost of bus/HOV lanes or new general-purpose lanes. In all but one case, rail transit has a higher cost-per-hour saved because it is both more expensive and saves fewer hours of time than bus or highway alternatives. The exception is the West corridor, where bus/HOV lanes are estimated to save only 90 percent as much time as rail, but cost just half as much.

While many of the highway and bus/HOV lane projects cost less than $5 per hour saved, almost all of the rail projects cost more than $10 per hour and some cost as much as $100 or more. No major investment studies have been written for the North Metro rail corridor or the proposed extensions to existing rail lines, but judging from the small number of riders that are expected to ride these lines—only 14 percent of the FasTracks total—they will probably save less than 10,000 hours of delay per day.

While there may be a rail transit project with a low cost-per-hour saved, the FasTracks lines are unacceptably expensive, especially when more cost-effective projects are available in every FasTracks corridor. Not building FasTracks would free up federal funds that can be used for many other projects that are much more cost effective at reducing congestion.

The FasTracks financial plan includes $925 million federal dollars, $815 million of which are "new start" dollars that are supposed to be spent on fixed-guideway transit projects.[16] However, this money has not been authorized or appropriated by Congress, and if Denver wanted to use its share of federal gas tax revenues for express toll lanes instead of rail transit, Congress would certainly approve. The other $110 million includes $60 million in funds for bus projects and $50 million in "flexible" funds that can be spent on any transportation project.[17]

Federal funds would only cover about 20 percent

Table Three

Cost Per Hour of Reduced Delay of Selected Projects

Project	Annualized Cost (millions)	Hours Saved (millions)	Cost/Hour Saved (dollars)
	East Corridor		
New freeway lanes	$46.0	17.2	$2.67
Bus/HOV lanes	48.2	11.7	4.12
Commuter rail	72.7	7.7	9.40
Light rail	86.1	7.9	10.92
	West Corridor		
Bus/HOV	17.1	2.2	7.68
Light rail	33.6	2.5	13.47
	Gold Corridor		
New freeway lanes	23.6		
Bus/HOV lanes	38.2		
Light rail to Ward	49.8	2.3	21.51
Light rail to Golden	60.9		
Commuter rail	14.8		
	US 36 Corridor		
Bus-rapid transit	28.9	1.8	16.23
Commuter rail	52.3	0.3	167.59
Preferred alternative	94.6	4.3	22.18
	I-225 Corridor		
New freeway lanes	2.5	0.6	4.42
Light rail	43.9	0.4	104.86

Notes for Table Three

The major investment studies for the East, West, and I-225 corridors calculated the cost-per-delay saved. The only change in this table has been to adjust for inflation to 2003 dollars as each of the studies used a different year for dollar.

The major investment studies for the Gold and US 36 corridors estimated the costs and delay hours saved per day but did not calculate the cost per delay hour. The numbers here are calculated from the data in those studies and also adjusted to 2003 dollars.

For most of the corridors, capital cost estimates and many of the operating cost estimates have increased by 30 to 70 percent since these major investment studies were done, which would increase the cost-per-hour saved of the FasTracks lines.

Sources

Kimley-Horn & Associates, East Corridor Major Investment Study Final Report *(Denver, CO: DRCOG, 1997), pp. 37, 38, 39.*

BRW, Inc., West Corridor Major Investment Study Final Report *(Denver, CO: RTD, 1997), pp. 108, 110.*

CH2M Hill, I-70 Denver to Golden Major Investment Study Final Report *(Denver, CO: RTD, 2000), pp. 5-17, 5-18, 6-13.*

Carter-Burgess, US 36 Major Investment Study Final Report *(Denver, CO: RTD, 2001), pp. 5-7, 5-9, 6-24, 6-25, 6-26.*

S.R. Beard & Associates, I-225 Major Investment Study Parker Road to Interstate 70: Detailed Evaluation Technical Report *(Denver, CO: RTD, 2001), pp. 19, 20, 27, 32.*

of the cost of FasTracks construction and none of the finance charges or operating costs. Local taxpayers would pay all of the remaining costs. Under the Mobility Plan, local taxpayers would keep their money and all programs would either be self-funding or funded out of some portion of the $925 million federal funds.

If FasTracks is built, the Mobility Plan would still need to be carried out since FasTracks will do so little to relieve congestion. To do so would require at least $410 million in additional federal, state, or local funding. While this is not impossible, it will be much easier to get this funding from Colorado's share of federal highway funds if FasTracks is not competing for those funds.

3. Coordinate Traffic Signals

About half the driving in the Denver metro area is done on major roads (known as *arterials and collectors*) with signalized intersections.[18] One of the most effective ways of reducing congestion is to coordinate traffic signals on these roads. Coordinated signals operate in progression so that traffic can flow at a steady speed without frequently stopping at red lights.

When signals are located at every intersection, as in downtown Denver, they can most easily be coordinated for one direction of travel.[19] That is one reason why most downtown streets were converted to one-way operation in the 1940s and 1950s. Another reason is that one-way streets are safer.[20] In the 1980s, several one-way streets in Denver's central-business district were converted back to two-way operation, leading to an increase in both delay and accidents.[21] Many of these streets should be returned to one-way operation.

When signals on a major road are located further apart than every intersection, and they are fairly evenly spaced, they can often be coordinated to allow smooth-flowing traffic in both directions. However, coordination on the cross streets is difficult.

Early methods of signal coordination required that all signals be set to follow synchronized clocks.[22] If the clock for one signal was a little fast or a little slow, that signal would get out of sync with the rest. Modern methods allow signals to be in contact with one another using wired or wireless communications.

According to DRCOG, the Denver metro area has more than 3,200 intersections with traffic signals, of which about 2,200 are considered "key" intersections.[23] Between 1994 and 2003, DRCOG helped local governments coordinate signals at 1,080 intersections at a cost of something less than $50 million. DRCOG estimates that this reduced delay by more than 41,000 vehicle hours per day and reduced more than 24 tons of air pollution per day.[24]

Compare these outcomes with DRCOG's Metro Vision 2025 plan, with its emphasis on rail transit. The 2025 plan is expected to reduce delay by only 35,000 hours per day, while FasTracks—which costs roughly 100 times as much as the signal coordination project—is expected to reduce air pollution by just 5 tons per day.

DRCOG says that 650 signals at key intersections still have no signal synchronization.[25] At least 240 more are considered unreliable or obsolete, including more than 120 in Denver, 71 in Thornton, and 51 in Westminster. In addition, the number of signals in the region is growing by about 70 per year. This means that between a third and half of the region's key intersections need installation or replacement of coordinated signal systems.

Unfortunately, DRCOG estimates that funds are available to synchronize only about half the intersections that need it.[26] Not building FasTracks would free up $50 million in flexible federal funds, some of which could be spent synchronizing the remaining signals. This could do as much or more to reduce congestion and air pollution as the billions that would be spent on FasTracks.

Other operational improvements may also be cost effective at reducing congestion. These include freeway ramp metering, incident management to quickly remove crashed and stalled vehicles, and signs to warn travelers of congestion and suggesting alternate routes. All of these should be considered using the cost per delay hour saved when weighing transportation investments.

4. Express Toll Lanes

Although limited-access highways make up less than 3 percent of the miles of roads and streets in the Denver metro area, they produce more than 37 percent of the region's roadway travel.[27] They are popular because they potentially provide faster and better service than signaled streets. But that popularity is also their downfall, as so many people use them that they are a major locale for the region's congestion.

Contrary to popular belief, building more freeways does not lead to more driving and congestion. Instead, as pointed out by Brookings economist Anthony Downs, many people respond to congestion by shifting their times, routes, or modes of travel.[28] Increases in highway capacity will lead some of those people to shift back, thus making it appear that congestion sprang out of nowhere when in fact the new congestion merely represents people traveling at times or on routes or modes that are more convenient to them.

Tolls that vary by the amount of congestion can solve this congestion problem. Well over half the traffic on the roads during rush hour is not commuter traffic.[29] Tolls that increase during congested periods will lead people who are not commuters or who have flexible work hours to shift their travel times, thus eliminating congestion.

There is a huge difference between people shifting their travel times in response to congestion and shifting

in response to tolls. Congestion that wastes people's time is a dead-weight loss to society. Allowing people to pay for the opportunity to drive in uncongested traffic generates revenues that can be used to make transportation improvements, thus reducing congestion for everyone, including those who don't pay the tolls.

Congestion tolls also have the advantage in that they actually increase the capacity of a highway to carry traffic. At freeway speeds, a typical freeway lane can carry about 2,200 vehicles per hour. When traffic increases above that level, speeds slow, which ironically reduces the capacity of the lane. At 20 miles per hour, a lane can carry only about 1,600 cars per hour; at 10 miles per hour, flows fall to about 1,200 cars per hour.[30]

This means that, once traffic slows, it will not speed up again until flows fall below the lower, low-speed capacity, which can take hours longer than it would take for flows to fall below the high-speed capacity. By increasing tolls to keep flows at, say, 2,000 cars per hour or less, a variable tolled lane can actually carry more traffic over the course of a day than an untolled lane.

Recent research has found that congestion tolls help reduce sprawl. Congestion causes people to move into urban fringes. By providing an alternative to that congestion, congestion tolls "are a very effective tool for reducing urban sprawl," say researchers from the State University of New York. In fact, they are a far more efficient way of reducing sprawl than urban-growth boundaries, because the latter "require massive adjustments and generate a huge deadweight loss" to society in terms of higher land prices and more traffic congestion.[31]

Several different proposals have been made for variable tolling:

- *Express toll lanes* would be new lanes added to existing freeways in which everyone pays a toll.
- *High-occupancy/toll lanes* would be the same as high-occupancy vehicle lanes (carpool lanes), with the addition that low-occupancy vehicles could also use the lanes if they paid a toll. Buses and other high-occupancy vehicles would continue to use the lanes for free, though the definition of "high-occupancy vehicle" would probably be increased from a minimum of two people to three or four people per vehicle.[32]
- *FAIR lanes* would convert all lanes of an existing freeway to toll lanes during congested periods, with some of the revenues used to give low-income commuters toll or transit credits or refunds.[33] "FAIR" stands for *Fast and Intertwined Regular* networks, but the important point is that equity concerns are addressed by reducing or eliminating tolls for low-income people.

Tolling all lanes has the advantage of relieving congestion for everyone. But the Colorado legislature has required that tolls be imposed only on new capacity, not on existing roads. While FAIR lanes deserve an examination, this paper will focus on express toll lanes and HOT lanes.

The Colorado Department of Transportation (CDOT) recently published a preliminary feasibility study that found that new express toll lanes would pay for themselves on I-25 north of downtown Denver, I-70 east of downtown Denver, I-225, I-270, US 36, and the C-470 beltway.[34] I-25 south of downtown Denver was not studied because new capacity is currently being added to that highway. Of the Denver-area toll roads that were studied, only the Northwest Corridor (a continuation of C-470 from I-70 to US 36), which would be an entirely new highway rather than new lanes on an existing highway, could not pay for itself with tolls.

The Denver-Boulder metro area currently has about 1,040 lane miles of freeways, and T-Rex will increase this by about 4 percent. All of the above toll lanes (including the Northwest Corridor) add up to about 400 lane miles, increasing the region's total by about 40 percent. Including several toll roads in Colorado Springs, Pueblo, and the I-70 mountain corridor, they would cost about $3.3 billion to construct, with tolls covering $3.0 billion of the cost. A portion of the $815 million federal new starts money that would otherwise go to FasTracks could be used to pay the remaining $300 million.

Even though the cost is lower than FasTracks, and the cost to taxpayers is far lower than FasTracks, these toll lanes would carry far more people and do far more to relieve congestion than FasTracks. California high-occupancy/toll lanes carry only about half as many vehicle miles over the course of a day as adjacent free lanes, but that is because few people use them when the roads are not congested. During rush hour, they carry more vehicle miles than free lanes because the toll lanes never get congested so traffic can move faster.

People who use toll lanes would benefit by reaching their destinations at any time of the day at non-rush-hour speeds. People who did not use toll lanes would also benefit because the toll lanes would attract a significant number of vehicles out of the existing lanes, thus reducing congestion for everyone.

The Colorado legislature has limited tolling to new roads. However, some high-occupancy vehicle lanes in

the Denver metro area may be used at less than capacity and could benefit from conversion to high-occupancy/toll lanes. The California legislature recently passed a bill authorizing the California Department of Transportation to convert carpool lanes to high-occupancy/toll lanes provided that tolls are high enough to insure that the lanes are never congested.[35] This allows an increase in road capacity without harming the occupants of the carpools already using the lanes. If express toll lanes are successful and high-occupancy vehicle lanes remain under capacity, Colorado should consider similar legislation.

In addition to the express toll lanes contemplated by CDOT, the Mobility Plan proposes express toll lanes along I-70 from Colorado Boulevard west to C-470, on US 6, and along I-76 from I-70 at least to I-270 and, possibly later, to E-470. This would provide a complete network of toll lanes, allowing people to go anywhere in the region without encountering congestion on limited-access highways. An analysis of the cost-per-hour saved might rule out a few of these projects, but most may prove worthwhile.

These express toll lanes would be built in addition to the signaled highway improvements contemplated in DRCOG's 2025 plan. These include new lanes on such roads as Wadsworth, Federal, and Buckley Road, and 96th. DRCOG estimates that funds for all of these roads are available from existing sources. However, the express toll lanes would be built *instead* of the post-2008 freeway improvements contemplated in DRCOG's 2025 plan. This would save $350 million from the cost of that plan that can be allocated to the express toll lane network.

5. Contract Out Transit

In 1988, the Colorado legislature directed RTD to contract out at least 20 percent of its bus routes to private bus operators. The legislature has since increased this to 50 percent. RTD contracts out about 98 percent of its paratransit and 40 percent of its fixed bus routes.

The contractors use RTD-owned buses and maintain the buses themselves. Laidlaw and the other companies handling the contracts have several disadvantages from RTD including older vehicles (because RTD keeps the newest buses for itself) and taxes and other costs that RTD doesn't have to pay.

Despite these disadvantages, buses that are contracted out cost RTD far less than buses that it operates itself. According to 2002 data submitted by RTD to the Federal Transit Administration, fixed-route buses that are contracted out cost 52 percent as much per mile and 47 percent as much per hour to operate and maintain as buses operated by RTD. For paratransit, the numbers are 70 percent per mile and 55 percent per hour, but these numbers are less reliable because RTD operates so few paratransit buses itself.[36]

These numbers suggest that RTD could save close to a quarter of its operating costs by contracting out the other 50 percent of its bus routes. In 2002, RTD spent about $211 million operating fixed-route buses,[37] so contracting out all fixed-route buses could save around $50 million a year. RTD could use this money to purchase buses and operate bus-rapid transit service on all the proposed FasTracks rail routes.

6. Rapid Bus Transit

Bus-rapid transit is a term used to describe a new form of bus service that has been defined as "light rail using buses." Like light rail, bus-rapid transit operates more frequently but stops fewer times than ordinary bus service. Where many RTD bus routes operate every half hour during rush hour and hourly the rest of the day, bus-rapid transit can operate as frequently as every two minutes. Where many RTD bus routes stop five or six times per mile, bus-rapid transit typically stops only once per mile to once every four or five miles.

Bus-rapid transit differs from the *express bus* services that RTD operates in that the former operates more frequently. Most RTD express bus routes operate only a three to five trips each morning and evening rush hour, and all but two express bus routes operate only on weekdays. By comparison, bus-rapid transit would operate all day, every day. A true express bus service has no intermediate stops between major end points, though it may circulate to several stops at each end.

RTD's current service between Boulder and Denver qualifies as bus-rapid transit and was used as an example of bus-rapid transit in a 2001 General Accounting Office study.[38] RTD runs the Boulder-to-Denver two to four times per hour with four to nine intermediate stops between the two end cities. It also operates one to two times per hour on weekends and holidays.

RTD estimates that this service already carries 16 percent of travelers in the corridor. The FasTracks

proposal to add rail service to the corridor would increase this to just 19 percent, which makes it the least cost-effective rail line in the FasTracks package.

Bus-rapid transit speeds and frequencies compare favorably with rail. The one bus-rapid transit route included in FasTracks is a Boulder-to-Denver route that would operate every two to four minutes at average speeds of 51 miles per hour, including stops. By comparison, FasTracks commuter trains would average 41 miles per hour but operate only every 15 to 30 minutes, while light-rail trains would average just 24 miles per hour every 5 to 15 minutes.

RTD currently has a bus route that connects Denver to Longmont in as little as 64 minutes. The proposed Denver-to-Longmont FasTracks route would take 61 minutes, which is not much of a savings.

One mistaken belief about bus-rapid transit is that it can only operate on dedicated bus or high-occupancy vehicle lanes. While such lanes will certainly give it speed superiority over rail lines, bus-rapid transit can still be competitive with rail on ordinary highway lanes. Even without dedicated lanes, it can operate faster than rail most of the day, nearly as fast or faster during rush hours, and more frequently during all hours. When express toll lanes become available, they will give bus-rapid transit speed superiority over any rail line in FasTracks.

The flexibility of buses to operate on any roadway gives them an enormous operating cost advantage over rail transit. RTD's three-car light-rail trains operate from end-to-end all day long, insuring that the rail cars are largely empty much of the time (in 2002, the average occupancy in RTD's 64-seat rail cars was 15). By comparison, bus routes can branch to different destinations or end points, making it possible to locate outlying stations closer to more neighborhoods while still providing frequent service to intermediate stops.

Bus-rapid transit costs far less to start than rail transit. While it costs hundreds of millions of dollars to put a rail line in service and each rail car costs $2.8 to $3.6 million, a bus costs just $300,000 to $400,000 and can operate on existing roads. Rail cars admittedly last longer than buses, but the bus cost per seat mile is still far lower than for rails.

RTD plans to buy 159 rail cars for FasTracks. RTD claims that one rail car can carry as many people as 7.5 buses. That, however, is an exaggeration; in actual practice, RTD's average light-rail cars carried less than twice as many people as RTD's average bus in 2002 (15.0 passenger miles per light-rail vehicle revenue mile vs. 8.7 passenger miles per bus revenue mile).[39]

Bus-rapid transit also costs less to operate than rail transit. RTD estimates that the FasTracks rail lines would cost $1.50 to nearly $6 per rider to operate, while the Boulder-Denver bus-rapid transit line in FasTracks will cost only $1.11 per rider.[40] Although one bus driver may move fewer passengers than one train driver, the cost of operating rail lines is much greater than just the cost of the driver: it includes the cost of maintaining vehicles, right-of-way, rails, and, in the case of light rail, power facilities.

For about $120 million, RTD could buy 300 luxury, long-distance buses that would provide attractive bus-rapid transit service on all FasTracks routes. If desired, these buses could be powered by natural gas, making them less polluting than Diesel buses or, for that matter, the Diesel-powered commuter trains that RTD wants to run as a part of FasTracks.

Half of that $120 million could come from the $60 million in federal bus grants that RTD planned to use for FasTracks, and the other half could come from some of the operational savings from contracting out its bus operations. Purchasing the buses over three years, with half the first year, one-third the second, and the remainder the third, would provide an increasing share of the operational savings for operating the bus-rapid transit lines. In this way, RTD could provide fast, frequent transit services five to nine years sooner than under FasTracks.

7. Private Transit

Bus-rapid transit works well in major corridors, but the real problem for transit is that most people don't live on a major corridor. According to DRCOG, the urbanized portion of the Denver metropolitan area covers about 500 square miles.[41] Yet, if FasTracks is approved and completed, only about 15 square miles, or 3 percent, of this area will be within a quarter mile of a rail station.

Studies show that no more than 10 to 15 percent of transit riders in most U.S. communities are willing to walk more than a quarter mile to or from their transit stop.[42] This makes FasTracks very inconvenient for the roughly 97 percent of Denver-area residents who will not be living near a station, which helps explain why FasTracks is expected to attract so few new transit riders.

A different form of transit service known as *jitneys* can provide something closer to the door-to-door service that can compete with automobiles. Jitneys may follow

regular routes, but they can deviate from those routes slightly to pick up or drop off individual passengers. Jitneys tend to be smaller than full-sized buses, often using 15-passenger vans or even smaller vehicles such as minivans.

Privately operated jitneys provide superior transit service in many parts of the world. In South America, private transit services called *colectivos* provide custom service to transit-dependent people. In Atlantic City, privately owned jitneys provide one of the few remaining for-profit transit services in the U.S. Most U.S. cities limit private transit to picking people up or dropping them off at airports. More than two-dozen such private transit services serve Denver International Airport, including Blue Sky, Golden West, Peak Transit, Ride Provide, and Super Shuttle.

In 2004, two Aurora entrepreneurs obtained permission from the Colorado Public Utilities Commission to operate an Aurora-to-Denver transit service on east Colfax. They purchased a 15-passenger van and charge a dollar a ride for trips that are typically faster than RTD's conventional bus operating the same route. They have asked permission to extend this service to West Colfax and on Colorado Boulevard but face opposition from taxi companies.

While private transit may compete with taxis in some areas, fewer than 750 Denver-area residents in the 2000 census regularly use taxis to get to work.[43] Allowing private transit services to operate and grow could significantly expand the options for Denver-area commuters at virtually no cost to taxpayers.

8. Bicycle/Pedestrian Ways

According to the 2000 census, about 26,000 Denver-area residents cycle or walk to work. While this number is small compared with the number who drive, an effective system of cycle/pedestrian paths and routes can be a cost-effective way of providing people with alternatives to driving. Where FasTracks might cost $12,000 per year to get one commuter to switch from driving to transit, attracting commuters onto bike routes might cost only a few hundred dollars per year.

A major barrier to effective bike/walking routes is that few transportation planners seem to understand bicycle and pedestrian needs. While they talk about *pedestrian-friendly design*, their plans often make neighborhoods more dangerous for cyclists and pedestrians. While Denver has built a few excellent bike/pedestrian paths, too many paths are primarily designed for recreationists and are unsuitable for commuting.

Bicycle commuters want the same things that auto commuters want: Fast routes with gentle grades and curves and few obstacles such as stop lights or pedestrian hazards. Denver's bicycle/pedestrian program consists of four major parts, each of which partly or wholly fails to meet these needs:

- Construction of several premiere bike/walking paths, such as the Cherry Creek Trail and the Clear Creek Trail;
- Striping of bike lanes on various secondary arterial and collector streets;
- Designation of other collector or local streets as bike routes; and
- Installation of bump-outs, islands, and other so-called traffic calming measures.

The Cherry Creek Trail and the South Platte River Trail are both very good to excellent for bicycle commuting. But other trails in the region, such as the Clear Creek Trail and Bear Creek Trail, are built more as recreation paths. Their circuitous routes, passage through or children's play areas, and sometimes-poor construction makes them unsuitable for commuting.

Striped bike lanes can help give cyclists assurance that they can use streets safely. But the assurance is more psychological than real. Studies show that at least half of all bike-auto collisions take place at intersections, while only 4 to 9 percent result from an auto overtaking a bicycle in the same direction of travel.[44] The stripes therefore are protecting from a menace that is only minor, yet they disappear before reaching most major intersections, giving cyclists no protection when they need it most.

Both the striped bike lanes and other designated bike routes suffer when they reach major intersections. Denver traffic signals often cannot detect bicycles at these intersections, so if there is no car to trip the detector, the cyclist must either wait or violate the red light. Even where the signals operate, they often give the main avenue of travel several minutes of green and only a few seconds of green to the secondary route. Four-way stop signs are also discouraging to cyclists.

Traffic calming is, despite its name, actually anti-cycling and often anti-pedestrian. Most traffic calming devices narrow the lane of travel, making cyclists more vulnerable to being hit by autos. Some traffic calming techniques, such as turning one-way streets to two-way, are also more dangerous for pedestrians.

Specific actions to attract more people to cycling and walking include:

- The Associated Railroad route that FasTracks would turn into the West light-rail line should instead be paved over as a bike/pedestrian path. This route would be far superior to the existing Thirteenth Avenue bike route and, even if it attracted only a few dozen commuters out of their cars, would cost less per commuter than light rail.
- DRCOG's traffic signal synchronization program should incorporate detectors that can detect bicycles, especially at intersections on designated bike routes.
- Striped bike routes should offer cyclists clear paths at major intersections.
- Four-way stops, speed humps, curb extensions, and other impediments to cycling should be removed from all bike routes and other streets where they are not absolutely needed to protect neighborhood residents.

Finally, it should be noted that new freeway or express toll lanes are one of the most pedestrian-friendly devices a region can build because they attract cars off of city streets and onto roads where they are separated from bikes and pedestrians.

9. Mobility for Low-Income Families

FasTracks supporters say that rail transit will provide middle-class suburbanites with another travel "choice." They never explain why suburbanites with two cars in the garage, another in the driveway, and fairly decent bus service need one more choice.

Denver's real mobility problem is that more than 60,000 households in the Denver-Boulder urban areas have no cars at all. In most cases this is because they are too poor to afford one, as suggested by the fact that more than three-fourths of households without vehicles are renters.[45]

Owning a motor vehicle is an important step to getting out of poverty. A Portland State University researcher found that an adult with no high school diploma but a car was 80 percent more likely to have a job and, if they had a job, earned an average of $275 more per week than someone without a car. In fact, the research found that owning a car was more important to gaining and keeping a job than getting a high school diploma.[46]

More than 90 percent of white families own an automobile, but only three out of four black families own one.[47] Researchers at the University of California found that closing the black-white auto ownership gap would reduce the black-white employment gap by nearly half.[48]

Helping low-income people get out of poverty should be a higher social goal than giving wealthy people another transportation choice. For less than the cost of one FasTracks rail line, Denver could buy new cars for every single family in the region that doesn't have one. While giving new cars to low-income families is not necessarily the best policy, this paper proposes that Denver initiate a program to help low-income families purchase their first cars through low-interest loans and other programs.

Such a program has been started by Portland's Metropolitan Family Services. Titled *Ways to Work*, the program uses $400,000 in grants from the U.S. Department of Transportation and private foundations to offer low-interest auto loans to low-income families who need cars to get to work.[49]

When this idea has been proposed in debates with FasTracks supporters, they argue that helping low-income families obtain cars would only add to congestion. It is sad that well-intentioned people seriously think that keeping people in poverty is an appropriate response to congestion.

For people who remain transit-dependent, the Mobility Plan supports the idea of transit vouchers. People who are unable to drive for physical or economic reasons would be issued, say, $100 worth of vouchers per month, enough for round trips each workday at $2 per trip. They could apply these to any public or private transit service. The transit provider could then turn the vouchers in for cash. In this way, transit subsidies will support transit riders, not transit bureaucracies, and insure that people who need transit mobility the most will have it.

Financing the Mobility Plan for Denver

Construction of FasTracks is expected to cost $4.72 billion ($4.0 billion in 2003 dollars). Financing the bonds used to help pay for construction is expected to cost another $3.65 billion, for a total cost of nearly $8.4 billion. The federal government would pay for approximately 11 percent of this, local governments 1 percent, and the sale tax increase that is on the ballot this November would cover the remaining 88 percent.

The Mobility Plan for Denver would allow taxpayers to keep the sales taxes they would have to pay for FasTracks and local governments to keep the $95 million RTD wants as a local share for FasTracks. Instead, it would use the savings from contracting out RTD bus services and the federal dollars that would otherwise go towards FasTracks as leverage to significantly reduce congestion and improve mobility in the Denver metropolitan area.

The total cost of the Mobility Plan will be close to $4 billion, or roughly the same as the construction cost of FasTracks. The difference is that users will pay most of the costs of the Mobility Plan, while people who get no benefit from rail transit would pay most of the costs of FasTracks. FasTracks is expected to carry only about 2 percent of travel in the metropolitan area, and that 2 percent would be heavily subsidized by the other 98 percent. Such subsidies are minimized by the Mobility Plan, which nevertheless results in better transit service and less congestion.

The most costly item in the Mobility Plan is the proposed network of express toll lanes. The lanes in the CDOT study were estimated to cost less than $3 billion. Adding more lanes to I-70 and US 6, as proposed in the Mobility Plan, would increase this to less than $4 billion even if those additional lanes cost twice as much as the lanes in the CDOT study. In 2003 dollars, this is roughly the cost of FasTracks.

Unlike FasTracks, the express toll network would be 100 percent paid for out of user fees, either the tolls themselves or federal gasoline taxes where needed to supplement the tolls. The express toll lane network contemplated by CDOT was estimated to cost $3.3 billion, of which $3.0 billion would be paid out of tolls—and part of that cost was for roads in Colorado Springs, Pueblo, and the I-70 mountain corridor. Adding express toll lanes to I-70 west of Colorado Boulevard, I-76, and US 6 should add no more than about $800 million to the total, even if express toll lanes on 70 and 6 cost twice as much as elsewhere in the system, and part of this cost will be covered by tolls. Thus, the portion of the total express toll lane network that is not covered by tolls will cost around $500 million to, at the very most, $1 billion.

DRCOG has programmed $350 million of gasoline tax revenues to the addition of general-purpose lanes to I-70, I-76, I-270, and C-470 after 2008. This money should be reprogrammed to the construction of express toll lanes. Thus, it is likely that no more than $150 to $600 million of the $815 million in federal funds that RTD would dedicate to FasTracks would be needed to build the express toll lane network.

Bus-rapid transit costs would be covered by the operational savings from contracting out RTD's bus services and the $60 million in federal grant funds that RTD wants to use for FasTracks buses. The $50 million of flexible federal funds that RTD wants to spend on FasTracks would accelerate the program of coordinating traffic signals along with other operational improvements. DRCOG already plans to spend $90 million on bicycle/pedestrian facilities; under the Mobility Plan, these

Table Four
Financing the Mobility Plan for Denver
(millions of dollars)

Source	Amount	Mobility Plan
Savings from contracting out RTD buses	$50/yr	Buying & operating BRT
Federal funds for FasTracks buses	$60	Buy buses for BRT
Federal flexible funds for FasTracks	$50	Traffic signal coordination
Post-2008 expansion of I-70, I-76, I-270, C-470	$350	Express toll lanes
Post-2008 funding of arterials & collectors	$475	Arterials & collectors
Federal new-start funds for FasTracks	$815	Express toll lanes as needed
Toll revenues	$3,000+	Express toll lanes
Private funds	Unknown	Private transit
Bicycle/pedestrian paths	$90	Bicycle/pedestrian paths
Federal & private grants	$5	Low-income mobility

funds would be spent more intelligently on those same types of facilities.

User fees and private operators would pay for private transit services. Federal grants and private funds would be obtained for mobility assistance to low-income families.

Effects of the Mobility Plan for Denver

At a negligible cost to taxpayers, the Mobility Plan for Denver will result in far greater benefits than the 2025 plan or FasTracks:

- Less freeway congestion—Express toll lanes will offer people the opportunity to get from one end of Denver to another without congestion any time of the day. The toll lanes will also take enough traffic off of free lanes to significantly reduce the congestion on those lanes.
- Less arterial congestion—Traffic signal coordination will save people tens of thousands of hours per year.
- Cleaner air—The traffic signal coordination plan alone could do more to reduce air pollution than all of FasTracks. Relieving freeway congestion will also significantly reduce pollution.
- Safer transportation—Light-rail and commuter-rail transit tend to be far more dangerous than buses or urban freeways. New express toll lanes will attract vehicles off of streets, making those streets safer for bicycles and pedestrians. Removal of traffic calming measures and conversion of some two-way streets to one-way couplets will smooth traffic flows and improve pedestrian safety.
- Better transit—Bus-rapid transit will provide better service than FasTracks. Private transit will supplement RTD's service, both for existing transit users and a whole new class of transit users who are not served by RTD's fixed-route services.
- More equitable transportation—Rather than using a regressive sales tax to give heavily subsidized train rides to a few middle-class suburban commuters, the Mobility Plan aims to help everyone have the mobility they need to work and live in Denver financed largely, though not entirely, through user fees. Most subsidies are targeted to low-income and transit-dependent people rather than rather than people who can easily afford mobility.

DRCOG's transportation planning model has many flaws, but it does offer a way to compare the effects of individual projects and overall alternatives on congestion and traffic delay. Without access to that model, which is time-consuming to set up and (because it uses proprietary software), expensive to run, the Independence Institute cannot precisely estimate the effects of the Mobility Plan on congestion. However, we can make some estimates.

Express toll lanes should save more time than a similar number of new general-purpose lanes. This is because the people using the lanes will save all the time that they would have otherwise wasted in traffic, while the people using the free lanes would also save a considerable amount of time because of the diversion of traffic to the express toll lanes. Since the tolls would vary to insure no congestion on the express lanes, these lanes will actually carry more traffic during rush hour than the free lanes. The passenger miles on the express lanes may be especially high where bus-rapid transit is heavily used.

If the 430 miles of proposed express toll lanes carry 1,800 vehicles per hour just four hours per day, they will carry about 3.1 million vehicle miles and 3.7 million passenger miles of travel per day. By comparison, RTD's high estimate for FasTracks is 1.3 million passenger miles per weekday. Because many of these people would ride transit even without FasTracks, DRCOG estimates this represents only 474,000 vehicle miles off the road per weekday. New express toll lanes can thus be expected to take more than six times as many vehicle miles off of existing roads as FasTracks.

If the people driving 3.1 million miles on the express toll lanes are able to average 70 miles per hour rather than 20 miles per hour on congested lanes, they will save a total of 110,000 hours per day. Since the express toll lanes take six times as many vehicle miles off the roads as FasTracks, we conservatively estimate that the toll lanes will save users of the free lanes three times as much time as FasTracks would save them, or about 225,000 hours per day. The total savings is thus 335,000 hours per day. Coordinating traffic signals should add at least 40,000 hours to this total.

If the people driving 3.6 million miles on the express toll lanes are able to average 65 miles per hour rather than 20 miles per hour on congested lanes, they will save a total of 125,000 hours per day. Since the express toll lanes take seven times as many vehicle miles off the roads as FasTracks, we conservatively estimate that the toll lanes will save users of the free lanes three times as much time as FasTracks would save them, or about 225,000 hours per day. The total savings is thus 350,000 hours per day. Coordinating traffic signals should add at

least 25,000 hours to this total.

A 375,000-hour reduction in delay from 835,000 hours per day to 510,000 hours still represents an increase from 2001's level of 309,000 hours. Accounting for the increased population, however, the per-capita delay declines by about 12 percent. This is a huge improvement over the 73-percent increase in per-capita delay contemplated by DRCOG's 2025 plan.

In sum, lower costs, real congestion relief, cleaner air, and no new taxes make the Mobility Plan for Denver far superior to FasTracks. The Mobility Plan also provides far more congestion relief than DRCOG's *Metro Vision 2025 Plan* through the use of such innovative techniques as express toll lanes and private transit.

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Center for the American Dream

of mobility and home ownership

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About the Center for the American Dream

The Independence Institute's Center for the American Dream is working to give people freedom of choice in land use and transportation while protecting urban livability and environmental quality. The "dream" of the Center for the American Dream is affordable homeownership, mobility, a clean and livable environment, and personal freedom for all Americans, not just an elite few.

The Center for the American Dream does not advocate that people drive everywhere or take public transit, live in low-density suburbs or high-density urban centers. All of these are legitimate lifestyles. The Center does oppose coercive planning efforts that attempt to engineer lifestyles through subsidies, regulation, and limits on personal and economic freedom.

Randal O'Toole, the author of this report, is also the director of the Center for the American Dream. As the author of *Reforming the Forest Service* and *The Vanishing Automobile and Other Urban Myths*, Mr. O'Toole has a national reputation in environmental policy analysis. In addition to doing research on a variety of urban and rural environmental issues, Mr. O'Toole has taught at Yale, the University of California at Berkeley, and Utah State University.

About the Mobility Plan for Denver

Denver is one of the most congested urban areas in the nation, yet regional leaders are doing little to solve the problem. In 2001, the average commuter spent 50 hours a year sitting in traffic. Rather than reduce this waste, plans prepared by the Denver Regional Council of Governments and Denver's Regional Transit District are expected to increase the time commuters waste in traffic to more than 80 hours per year by 2025. These agencies made no effort to find a plan that would reduce per-capita congestion.

The Center for the American Dream proposes an alternative Mobility Plan for Denver that will reduce the amount of time the average resident wastes in traffic, provide better transit service, and help low-income people achieve greater mobility. The plan includes a combination of:

- Operational improvements, including better coordination of traffic signals;
- Transit improvements, including bus-rapid transit and private transit options;
- Highway improvements, including a network of more than 400 lane miles of express toll lanes; and
- Planning improvements, including a requirement that most transportation investments be funded only if they cost effectively reduce the amount of time people waste sitting in traffic.

The Center for the American Dream estimates that the Mobility Plan will reduce per-capita delay by 12 percent, so that the average commuter will spend less than 45 hours per year sitting in traffic in 2025. The Mobility Plan will also reduce air pollution, improve transportation safety, and provide greater mobility for low-income and transit-dependent people.