regional brief

No. 4

Conquering Traffic Congestion in the Capital City

More Effective Solutions Than Light Rail

Christopher Goff

August 2006

200 W. Morgan, #200
Raleigh, NC 27601
phone: 919-828-3876
fax: 919-821-5117
www.johnlocke.org

Executive Summary

For over fifteen years, the Triangle Transit Authority has pursued a regional rail for North Carolina's capital region, to no avail. At the same time traffic conges tion in the Triangle has worsened, with other viable alternatives largely being ignored. Recognizing this, it is important to under stand the causes of conges tion in order to develop workable solutions to the problem.

Traffic congestion in the Triangle has worsened considerably as viable solutions to the problem have been ignored in the vain pursuit of rail transit.

Expanding the network of transportation services is of prime importance — that is, building more roads and adding more lanes to existing roads. Increasing the efficiency of traffic signals is essential to smoothing the flow of traf fic, as would expanding Traffic Incident Management programs Triangle wide. Toll roads and congestion pricing would help manage the fluctuating demands on trans portation services. Also, Bus Rapid Transit models could improve the efficiency of public busing.

Finally, with telecom muting having grown signifi cantly as a true transporta tion alternative, state and federal governments should take care to avoid poli cies that would discourage, rather than encourage, Internet usage, online business, and telework.

This paper seeks to match the root causes of congestion in the Triangle with real, practical solutions rather than the obviously impractical one of rail transit.

Introduction

The Triangle Transit Authority TTA has pursued its regional rail plan for nearly fifteen years, and after spending $136.4 million[1] in federal, state and local funds, it seems that this quest is coming to an end. U.S. Senators Elizabeth Dole and Richard Burr have told the TTA that they will no longer seek federal money for the project and recommend that TTA "explore other possibilities."[2] President Bush did not include money for TTA's rail in his fiscal year 2007 federal budget.

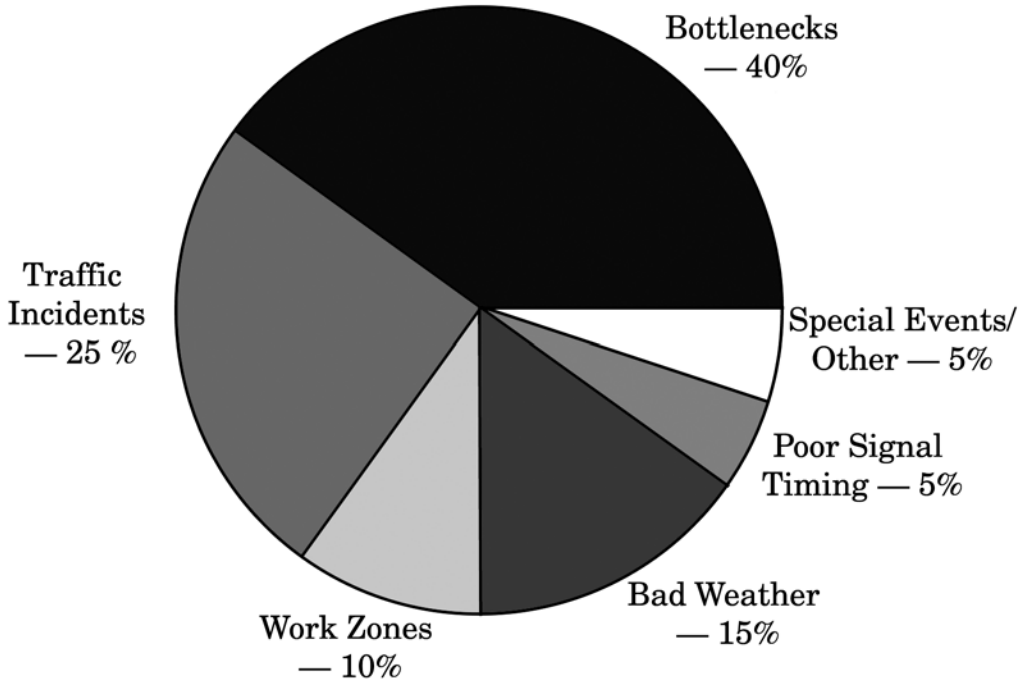
Locally, Tony Gurley, chairman of the Wake County commissioners, and Raleigh city councilman Philip Isley want to con sider new uses for city and county revenues currently flowing to the TTA Regional Rail Project.[3] The Federal Transit Admin istration FTA has given the TTA until September 30 to demonstrate that the rail system would have sufficient ridership to justify federal funding. Given the increased standards by the FTA, the relatively low population densities in the Triangle and the rail project's rather poor cost-effectiveness measures, it seems entirely unlikely that the TTA will be able to succeed as a viable transportation solution for the Triangle area.

Traffic congestion in the Triangle has continued to worsen over the last 15 years. During this time the TTA has successfully diverted the public's and government's attention — and funds — to the regional rail project. Meanwhile, realistic 'anti-con gestion' options with proven track records have been largely ignored. This paper out lines seven workable options to reduce con gestion that policymakers need to consider. In order to solve the congestion problem, one first needs to understand what conges tion is and what its primary causes are.

What Is Congestion?

The Federal Highway Administration (FHWA) simply defines congestion as when demand for transportation services is approaching or even exceeding current available roadway capacity on a portion of roadway at a particular time. Generally this results in reduced speeds, increased air

Six Root Causes of Congestion



Source: www.ops.fhwa.dot.gov/aboutus/opstory.htm.

pollution, and significantly increased time delays and overall travel costs.

It's important to understand the sources of congestion in order to pursue policies for preventing additional conges tion or at least managing current transpor tation venues for optimal efficiency, safety, and security. The FHWA's September 2005 report "Traffic Congestion and Reli ability: Trends and Advanced Strategies for Congestion Mitigation" points to six root causes of congestion as seen above.[4]

Physical bottlenecks represent the largest single source of congestion (40 percent). Bottlenecks are due primarily to excessive demands beyond current avail able roadway capacity. They can also derive from lane restrictions and capacity reduc tions. Traffic incidents and bad weather are responsible for an additional 40 percent. Other sources include work zones (10 per cent), inefficient signal timing (5 percent), and special events (5 percent).

Of course, traffic is a dynamic system wherein any combination of these causes could be at work simultaneously, increas ing congestion and lowering safety levels. Acknowledging the complexity of the con gestion issue, we can now move on to some recommendations for managing capacity and maximizing efficiency.

Option 1

Building Roads and Adding Lanes Reduce Congestion

First and foremost, congestion is reduced by adding more capacity, more roads and adding lanes to existing roads. Unfor tunately, this simple, common-sense approach has become controversial. Crit ics argue that new roads immediately become congested because new drivers are "induced" to use them. Thus, they say, building new roads and adding new lanes is not the solution because they are immedi ately congested.

While some induced congestion occurs (about 8 percent in NC),[5] studies that purport to show significant induced con gestion are flawed. According to Robert Atkinson at the Progressive Policy Insti tute, these studies fail to take into account population growth. As Atkinson notes, "it turns out that adding more lane miles faster than population growth reduces traf fic congestion."[6]

Atkinson quotes a Texas Transporta tion Institute study that came to the same conclusion. "Road construction has been shown to play a key role in holding the line against urban mobility decline."[7] In other words, the way to ward off congestion is by increasing road capacity by building new roads or, more commonly, adding lanes to existing roads reduces congestion.

Where North Carolina has failed to recognize this principle, roads are con gested. A 2003 study by UNC-Charlotte Professor of Transportation Studies David Hartgen shows that during the 1990s, cities that built more freeway capacity, usually by adding lanes to existing right-of-ways, experienced less congestion than cities that did not, with Concord providing the most extreme example of the later. Concord's section of I-85 remained 4 lanes during the decade while population increased nearly 50 percent. Concord's freeway traffic per lane increased by more than two and a half times to 18,649 daily traffic per lane. Hartgen concludes "Only a few large cities nationwide have average traffic per lane greater than 18,000, putting Concord in dubious company."[8]

The fundamental lesson is that the Tri angle's overall road capacity must expand to meet the growing population.

Option 2

Traffic Signal Optimization

When traffic signals are working efficiently and are properly timed, traffic flows more smoothly, thereby reducing congestion levels. In fact, a 1994 report by the federal Government Accountability Office (GAO) stated that:

> Studies by states, local governments, and the traffic industry have consis tently reported substantial benefits when localities have installed new traffic control signal systems and upgraded or changed the timing of existing systems. These benefits include reducing accidents, conges tion, travel time, fuel consumption, and air pollutants.[9]

Unfortunately, most of the nation's traffic signals are not working efficiently to reduce congestion. The National Transpor tation Operations Coalition (NTOC), an alliance of national associations, practitio ners, and public and private sector groups encompassing state, local, and regional levels, in their April 2005 *Report Card* gave the nation's traffic signals a grade of "D."

This report states that the overall poor quality and inefficiency of traffic signals is a major contributor to congestion. Addi tionally, the report argues that relatively small investments in upkeep, management, and coordinated traffic systems produce a very high rate of return. It states that the United States could achieve a grade of "A" with an investment of only 1 percent of current transportation spending.[10] The report finds that because so many of the nation's 265,000 traffic signals are in disre pair, spending on new signal designs com bined with proper planning and managing of intersections could substantially reduce congestion at a relatively low cost.

The City of Raleigh is currently imple menting plans to upgrade Raleigh's 500-plus traffic signals.

Option 3

Traffic Incident Management and Emergency Management Assistance

According to the FHWA, traffic incidents are "events that disrupt the normal flow of traffic, usually by physical impedance in the

travel lanes."[11] Those include events such as roadway debris, vehicular crashes, disabled vehicles, and other impediments that can slow or stop traffic. Traffic incidents also have the secondary effect of a gapers block or rubbernecking, where drivers slow to look at an accident or other incident on the road. According to John Corbin and Patricia Noyes, traffic incidents "account for as much as 60 percent of congestion-related delay in urban areas and up to 100 percent of delay in rural areas."[12]

Clearing the roadway and getting traffic flowing normally again is the job of traf fic incident management (TIM). Agencies that have developed TIM plans can clear roadways faster and significantly reduce congestion. Unfortunately, TIM usage, according to the FHWA, has only begun to gain momentum over the last decade or so. North Carolina's Department of Transpor tation (DOT) has created Incident Man agement Assistance Patrols (IMAP) that currently patrol

> ... over 200 miles of I-40, I-77 and I-85 in the Raleigh/Durham, Greens boro, Winston-Salem, Charlotte and Haywood County areas. These spe cially trained patrols assist disabled motorists by offering such services as changing flat tires, providing gas and assisting stranded travelers in making towing arrangements. They also direct traffic around incidents and assist in clearing debris out of the roadway. These patrols make over 45,000 stops per year to assist travel ers in North Carolina.[13]

Across the country, the introduction of comprehensive incident management systems has reaped significant benefits. In Atlanta, the maximum time between incident verification and the clearance of travel lanes reduced from 6.25 hours to 1.5 hours during the first three weeks of ser vice. Additionally, Brooklyn, New York, saw a decrease of 66 percent in average time (from 90 minutes to 31 minutes) to clear any type of incident after the installation of its system. After San Francisco established its Freeway Service Patrol, hydrocarbon emissions were reduced by 32kg/day, carbon monoxide by 322kg/day, and nitrous oxides by 798kg/day from 1992 to 2000. Lastly, in San Antonio, Texas, total accidents were reduced by 35 percent, secondary incidents were reduced by 30 percent and the aver age reduction in fuel consumption per incident was 2,600 gallons.[14]

Recognizing the potential gains from incident management, an appropriate move in reducing congestion would be to expand TIM to all major roadways and highways. For the Triangle specifically, it would be an efficient use of transportation funds to expand these services to I-540, I-440 beltline, US1, US401, I-70, and I-64. What better a way to reduce prolonged travel time delays, overall congestion, and improve safety, than to extend a service that is already in place? As the Associa tion of State Highway and Transportation Officials (AASHTO), the Intelligent Trans portation Society of American, and the FHWA recommended in March 2002, state and local agencies need to "integrate traffic incident management needs into highway planning and design."[15]

Option 4
Intersection Channelization and Widening

Improving the flow of traffic through intersections is the purpose of intersection channelization. This means designing new or reconstructing old intersections to offer improved traffic flow through the use of better corner radius designs, traffic islands, design and angle elements, horizontal and vertical alignment, right- and left-turn lane warrants, and median designs.

Perhaps the single most important channelization improvement is to increase left-turn capacity. Traffic capacity can be gained using efficient designs that allow for

flexibility and changes in the flow of trans portation. According to the FHWA, inter section channelization is one of the most critical and complicated elements in high way design. Furthermore, they stated that, "the efficiency, safety, speed, cost of opera tion, and capacity of the highway system depend on the design of its intersections."[16]

Nearly all states now use or are experi menting with many of the intersection channelization techniques stated above. When properly designed, they can reduce accidents, injuries, fatalities, and be sig nificantly cheaper in comparison to regular signal intersections.[17] Also, many of those techniques have a better record for pedes trian safety. While effectively increasing capacity levels, they can also meet the growing demands for capacity in the Tri angle area.

The City of Raleigh is currently work ing on multiple projects, including the Falls of Neuse Road realignment, Rock Quarry Road, Leesville Road, and Tryon Road wid ening, and the Six Forks Road/Millbrook Road Intersection improvements.

Option 5

Toll Roads and Congestion Pricing

Toll roads and toll bridges have been a common feature on the American land scape since colonial days. From the Turn pikes, to the plank roads, to the toll roads of the western United States, America has had a long history of both private and pub lic tolls.[18]

When tolls are mentioned today, most people think of not only paying to use the road but also the inconvenient tollbooth. Current technology has largely done away with the tollbooth, however. Modern urban tolls use "smart cards" — electronic cards placed inside the front windshield read by an electronic scanner upon the car's entering a toll road or lane and resulting in a monthly bill sent to the driver without the hassle of cash exchanging hands. This technological advancement has largely done away with the hassles and slow downs associated with the use of tolls.

Tolls are a useful congestion-manage ment approach for several key reasons. Tolls require individuals to bear the full price of using the roadways, and in so doing they increase capacity as more drivers opt for surface streets, bus transit, carpooling and other alternatives. Tolls also help speed the building of new road networks by mak ing road construction more politically and fiscally feasible — roads are able to pay for themselves; their costs are borne by users themselves, not the taxpayers at large.

Creating toll lanes on existing freeways offers benefits similar to toll roads. Drivers using non-toll lanes benefit from additional capacity, leading to reduced travel times and better air quality.

Toll roads' benefits to non-toll drivers for Orange County, California's SR-91 were documented by Edward Sullivan, professor at California Polytechnic State University. He found that "average peak-period speeds in the adjacent [non-toll] lanes increased from 15mph to 32 mph and that peak-period congestion has dropped from four hours to less than three."[19]

Construction of the southern half of I-540 has long been delayed due to lack of funds. Currently, the N.C. Turnpike Authority is considering constructing the 29-mile section of the I-540 Outer Loop as North Carolina's first toll road. Mak ing the 12-mile Western Wake Express way from RTP to Holly Springs and the 17-mile Southern Wake Expressway (Holly Springs to I-40) stretches into toll roads would be a useful way to speed construc tion and ease congestion in Wake County.[20] In August of 2005, Governor Mike Easley signed a bill permitting the state to triple the number of potential toll-road projects it can build to nine. With this new ability, the state is already making plans for four new toll roads, including the Triangle Park way through Research Triangle. Overall, toll roads can be even more effective and

efficient at reducing congestion if they use congestion pricing.

Congestion pricing or value pricing can produce dramatic reductions in urban con gestion. Aligning transportation demand to the supply of roadway capacity would let drivers effectively determine the quan tity of transportation services they desire based on time preference, road quality, and varying congestion levels. Higher tolls are charged during morning and afternoon rush hours, when more drivers want to drive on the limited road capacity. Driv ers use their own evaluations of time, road quality and expected traffic congestion to decide whether to pay the toll, or forgo the toll and drive on alternative surface streets. Either way, individuals are incurring the full costs of congestion, making the roadways better able to meet transportation needs and peak time demands.

In May 2003, a GAO study found that "congestion pricing can potentially reduce congestion by providing incentives for drivers to shift trips to off-peak periods, use less congested routes, or use alternative modes, thereby spreading out demand for available transportation infrastructure."[21] Additionally, San Diego's I-15, with its toll charges changing every six minutes based on fluctuations in demand, is quite suc cessful, safe and popular and has effectively mitigated its congestion levels.[22]

Combining toll roads with peak pric ing in a whole network of premium lanes will certainly produce significant results in reducing congestion levels in the Triangle.

Option 6

Bus Rapid Transit (BRT)

Bus Rapid Transit (BRT), as the name suggests, is intended to mimic rail transit — typically operating high-capacity buses traveling on specially designated roadways. Compared with rail transit, BRT offers greater flexibility, faster operating speeds, greater service reliability, increased com fort, rapid boarding, lower capital costs, and energy efficiency — all at a lower cost.[23]

When BRT uses a separate right-of-way, it increases the capacity on both urban and rural roadways and serves to provide increased safety at a lower price. BRT has also been incorporated in many high-occu pancy toll (HOT) lane networks (lanes reserved for high-occupancy vehicles that are open to single-passenger vehicles upon payment of a toll and even on regular road ways and freeways.

Since November 7, 2005, the Capital Area Transit CAT has been running its own BRT. The *Brier Creek Express Service* runs a non stop route between Crabtree Valley Mall and the Brier Creek area. Expanding BRT service further, either with a separate corridor (busway), a toll lane or HOT network, or an arterial street, could be a successful, cost-effective way to reduce congestion and travel times.

Option 7

Telecommuting

Telecommuting (also called "telework") reduces congestion by taking commuters off the roads entirely, and it is an option growing in popularity. According to Ted Balaker, "telecommuting is the only com mute mode to gain market share since 1980,"[24] other than individuals driving alone. In fact, telecommuters "outnumber commuters by more than two to one in places like Raleigh-Durham."[25] The Triangle is at the center of this increasingly popular transportation alternative, and businesses, legislators, and policymakers need to be aware of it.

Not only does telecommuting reduce commute trips and travel costs, but also it can significantly reduce congestion, pollu tion, and parking costs.[26] Lastly, "although they effectively receive no public subsidies, telecommuters actually outnumber [bus and rail] transit commuters in a majority (27) of the 50 most populous metropolitan areas."[27]

Telecommuting appears to be the most

cost-effective approach of them all, the most environmentally friendly, the safest, the most reliable, and the most efficient, while also posing potentially significant benefits in travel costs and reductions in congestion levels.

Currently there are three main barriers to a widespread adoption of telecommut ing: technology, productivity perceptions, and political barriers. The first two barriers continue to erode through technological advances and more research affirming sig nificant gains in productivity from tele work. The political barrier is the most sub stantial, but could be overcome by relaxing or repealing laws in several areas. For exam ple, zoning codes that often restrict or pro hibit home-based work should be changed. Current minimum parking requirements for workplaces should be eliminated.

Other political impediments should be avoided, such as Internet access taxes and the push to tax Internet sales, both of which would discourage Internet usage, online business, and telework. Also, the Occupational Safety and Health Adminis tration (OSHA) is continuing to expand its authority into home offices, an imposition that curbs the efficiency, effectiveness and productivity gains of telecommuting in the United States.

Conclusion

The solution to the Triangle's congestion problems will not be found in the TTA's light rail system. Nationally, light rail's record for reducing congestion is abysmal. The Triangle region is marked with low population density and growing "suburban ization," neither of which makes rail transit feasible.

Transportation in the Triangle should not be about TTA's grandiose visions of changing the way people work, shop, and live. It should be about moving the greatest number of people as fast and safely as pos sible at the lowest possible cost. It should be about respecting people's choices, not trying to force them to make different ones.

The dynamic congestion solutions discussed here are practical, workable options. They are cost-effective and more easily modified for the Triangle's popula tion growth, changes in density, regional mobility, and peak-time travel fluctuations. A strategy based on building more roads in combination with the other congestion management techniques such as congestion pricing, intersection channelization, signal optimization, and incident management will reduce congestion for current and future citizens in North Carolina's Capital City.

Christopher Goff is an N.C. State graduate in economics and a former research intern at the John Locke Foundation.

Notes

1. Bruce Siceloff, "Feds Demand Reality of Rail," *The News and Observer* (Raleigh), Feb. 8, 2006.

2. Letter from Sens. Elizabeth Dole and Richard Burr to Carter Worthy, chairwoman of the Triangle Transit board of trustees, published in *The News and Observer*, Dec. 15, 2005.

3. The five-percent rental car tax and $5 vehicle registration fee.

4. Prepared for the Federal Highway Administration (FHWA), "Traffic Congestion and Reliability: Trends and Advances Strategies for Congestion Mitigation," by Cambridge Systematics with Texas Transportation Institute, Sept. 1, 2005.

5. Prof. David T. Hartgen, "Highways and Sprawl in North Carolina," John Locke Foundation report, Sept. 24, 2003, p. 31, www.johnlocke.org/policy_reports/display_story.html?id=41.

6. Robert Atkinson, "Mapping Our Way out of Gridlock," Progressive Policy Institute, Sept. 1, 2000, p. 2, www.ppionline.org.

7. *Ibid*.

8. Hartgen, p. 32.

9. Government Accountability Office (GAO), "Transportation Infrastructure: The Benefits of Traffic Control Systems Are Not Being Fully Realized," 1994.

10. National Transportation Operations Coalition (NTOC), "National Traffic Signal Report Card," April 2005.

11. Prepared for the FHWA, "Traffic Congestion and Reliability: Trends and Advances Strategies for Congestion Mitigation," by Cambridge Systematics with Texas Transportation Institute, Sept. 1, 2005.

12. John Corbin and Patricia Noyes, "Traffic Incident Management Planning: The Case for Mainstreaming," *ITE Journal*, Feb. 2003, p. 38.

13. North Carolina Divison of Transportation web site, ncdot.org (the original link has expired, but the page is archived at web.archive.org/web/20050305034207/www.ncdot.org/faq .

14. United States Department of Transportation (U.S. DOT), Intelligent Transportation Systems Division, "Incident Management Successful Practices: A Cross-Cutting Study," April 2000.

15. Corbin and Noyes, p. 38.

16. U.S. DOT, Federal Highway Administration, "Flexibility in Highway Design," www.fhwa.dot.gov/ENVIRONMENT/flex/index.htm.

17. Ruth W. Stidger, "Can America Handle Roundabouts?" *Better Roads Magazine*, May 2003.

18. Daniel Klein and John Majewski, "Turnpikes and Toll Roads in Nineteenth-Century America," *EH.Net Encyclopedia*, edited by Robert Whaples. Aug. 12, 2004.

19. Katie Nees and Pamela Bailey-Campbell, "The HOTter the better" *TME Magazine*, Oct. 2005, Vol. 10, No. 4.

20. Bruce Siceloff, "Tolls will be considered to speed work on I-540," *The News and Observer*, Dec. 15, 2005.

21. GAO, "Reducing Congestion: Congestion Pricing Has Promise for Improving Use of Transportation Infrastructure," May 6, 2003 (GAO-03-75T).

22. Thomas F. Golob, "Joint Models of Attitudes and Behavior in Evaluation of the San Diego I-15 Congestion Pricing Project," ITS *Working Paper* WP-99-7, Nov. 30, 1999; Kenneth A. Small, "Road Pricing and Public Transport," prepared for consideration as a chapter in Santos, Georgina, *Road Pricing, Theory and Practice*, Elsevier, April 24, 2003.

23. Ted Balaker, "Past Performance vs. Future Hopes: Will Urban Rail Improve Mobility in North Carolina?" Reason Public Policy Institute, June 2004; GAO, "Bus Rapid Transit Shows Promise," Washington, D.C., GAO Report 01-948, September 2001.

24. Ted Balaker, "The Quiet Success: Telecommuting's Impact on Transportation and Beyond," Reason Foundation, November 2005.

25. *Ibid*.

26. Victorian Transport Policy Institute, "Telework," *TDM Encyclopedia*, February 2006.

26. Balaker, "The Quiet Success."