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16. Abstract
Private investors in toll roads sometimes request restrictive covenants such as non-compete clauses, which could prevent the public sector from adding capacity in the region for the life of the toll agreement. This research project examined 20 case studies of toll agreements in the United States and internationally, and developed a set of best practices, which provide alternatives to non-compete clauses. In addition to this research report, three research products were generated. The first product, 5020-P1, is a detailed set of guidelines on best practices in toll agreements. The second product, 5020-P2, is a brochure summarizing alternatives to non-compete clauses. The third product, 5020-P3, is a PowerPoint presentation and accompanying speaker notes outlining the results of this research. These products provide TxDOT with an effective set of strategies relating to competition between tolled and non-tolled roads, for possible incorporation into future toll project agreements.

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Alternatives to Non-Compete Clauses in Toll Development Agreements

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Products

Product 1 (P1) is included in this report as Chapter 3; Product 2 (P2) is included as Chapter 5.

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Chapter 1. Introduction

1.1 Background

Supporting the construction of toll roads accomplishes at least three objectives for the Texas Department of Transportation (TxDOT):

1) add capacity to the transportation system,
2) reduce dependence on the gas tax,
3) relieve congestion more quickly.

For example, the toll-financed Central Texas Turnpike Project (CTTP) will be completed in 2007, instead of around 2020, the completion date if it had been financed from gas tax revenues [TxDOT, 2002].

Toll development agreements between the public and private sectors may take a variety of forms. The two most common arrangements are build-operate-transfer (BOT) and build-own-operate-transfer (BOOT). Under a BOT agreement, the private sector is responsible for construction and operation of a toll road under lease from the public sector. When the toll agreement ends, operation of the toll facility is transferred to the public sector. Under a BOOT scheme, in addition to being responsible for construction and operation of the toll road, the private sector retains ownership. After expiration of the agreement, the public sector assumes all responsibilities for the road.

Texas Tolling Initiatives: Texas is currently one of the leading states in tolling initiatives. In June 2003 the Texas Legislature passed House Bill 3588, providing TxDOT with an arsenal of new financial tools for supporting the construction of toll roads, including:

- Texas Mobility Fund,
- sale of toll-revenue bonds,
- toll equity,
- pass-through toll agreements (pass-through financing),
- regional mobility authorities (RMA),
- comprehensive development agreements (CDA).

In December 2003 the Texas Transportation Commission directed TxDOT to establish guidelines for evaluating all highway projects "in any phase of development or construction" for potential tolling. TxDOT is developing several toll projects around the state, such as:

- I-635 (LBJ Freeway) re-construction in Dallas, including four high-occupancy toll (HOT) lanes;
- expansion of Katy Freeway in Houston, including conversion of its high-occupancy vehicle (HOV) lanes into high-occupancy toll (HOT) lanes;
- Loop 49 in Tyler;
- Central Texas Turnpike Project, a $3.6 billion project including SH 130, SH 45 Southeast, and SH 45 North;
- The futuristic 4,000-mile Trans Texas Corridor to include truck lanes, passenger lanes, freight, and high-speed rail, and a utility zone. (TxDOT has selected a partner, Cintra, for the first phase paralleling Interstate Highway 35).

Therefore, the proper structuring of toll development agreements is of immediate concern to TxDOT.

Non-Compete Clauses: Repayment of toll road construction debt relies on toll revenue, but in many cases toll roads do not attract enough traffic in the first 5–15 years to cover all expenses [Persad and Bansal, 2004]. Florida recently raised its expectation of when a toll project will be self-sustaining from 15 to 22 years. The risk to investors increases if improvements are made to a competing route. For example, the privately developed Camino Colombia Toll Road in Laredo defaulted on its loan partly because an alternative route was upgraded and projected traffic failed to materialize. Toll bond investors therefore demand guarantees such as a non-compete clause (NCC) in toll project agreements.

California's SR 91 Experience: Non-compete clauses can constrain a state department of transportation (DOT) from making highway improvements in a region. In the case of California's SR 91 (discussed in detail in Chapter 2), the California Department of Transportation (Caltrans) sought to add lanes to the non-tolled portion of SR 91 because of perceived safety problems. The California Private Transportation Company (CPTC), owner of the tolled portion of SR 91, sued Caltrans, claiming the new lanes would violate their NCC. Soon after, the public had to buy out the toll lanes in order to fix freeway bottlenecks, add lanes, and improve interchanges. The SR 91 controversy gained national attention, fueling debate over the role of private investment in public infrastructure. As a result, toll agreements since SR 91 have tried to address the issue of NCCs and the underlying concerns over traffic competition.

1.2 Research Issues

Tolling can be viewed as:

- A way to introduce private sector efficiencies,
- A self-sustaining financing method, or
- A way to borrow against future revenue.

However, the SR 91 experience jeopardized the development of new toll projects in California and elsewhere. Therefore, it is in TxDOT's interest to strike a balance between public expectations of transportation alternatives and private sector needs for viable investments. The primary objective of this research project was to provide TxDOT with an effective set of strategies relating to competition between tolled and non-tolled roads, for possible incorporation into future toll project agreements. In a parallel line of inquiry, this research project addressed the question of whether it is feasible to define a non-compete zone around a toll road. The intent was to develop guidelines for toll agreements between TxDOT, existing Regional Tollway Authorities, newly formed Regional Mobility Authorities, and private sector investors.

Public- and Private-Sector Objectives: The public and private sectors have differing objectives when entering partnerships. For example, TxDOT's mission is to provide a transportation system that moves people and goods safely and efficiently. However, the goal of the private sector is to maximize its return on investment. Conflict between the differing objectives of the public and private sectors can lead to disagreements. A well-designed tolling strategy can allow capacity to be added while addressing investor concerns. The key is to limit the effects of traffic competition between the tolled system and the non-tolled system, by providing proper risk mitigation strategies.

Sharing risk: A major risk for a toll developer is that traffic (and hence toll revenue) would be less than projected, resulting in low returns, losses, or bankruptcy. For DOTs and RMAs the main risks of tolling are over-commitment on guarantees, and public resistance to tolling. The party best able to shoulder a specific risk should continue to bear it [World Bank, 2000]. This study therefore analyzed risks in toll projects and identified opportunities for risk sharing.

Non-tolled alternatives: Providing a non-tolled alternative is primarily a matter of social equity. Lack of alternatives can encourage high toll prices. However, if the network is congested we all pay a toll in delays, fuel, and vehicle wear and tear. Between 1990 and 2000 Texan motorists suffered 2.6 billion hours of delay, at a cost of $45.6 billion [Behrens, 2004]. Tolling makes users more aware of the true cost of transportation. At the same time it can also lead to sub-optimal use of the network; for example, in Hungary, there was a 30% shift of traffic to non-tolled roads when some freeways were tolled. This study addressed the question of traffic competition between tolled and non-tolled facilities, and whether it is feasible to define a service area or non-compete zone for toll roads.

Non-compete agreements: In its lawsuit against Caltrans, CPTC said that non-compete clauses are standard for toll project agreements or else it would be impossible to sell bonds. CPTC quoted the example of the Greenway Toll Road in Virginia, which did not have an NCC and almost went bankrupt when Virginia DOT made improvements to the nearby State Route 7. Still, Caltrans was able to negotiate a much less restrictive NCC for the later Transportation Corridor Agencies (TCA) toll projects (see Chapter 2). The TCA agreement allows improvements to adjacent highways required by the regional mobility plan, but requires compensation for revenue loss. This study examined modifications and alternatives to NCCs that could reduce the traffic/revenue risk and offer both parties greater flexibility.

Complementary clauses: The real concern for investors is project feasibility. For example, in Malaysia the government gave existing connector roads to the operator for tolling, effectively channeling users into the system. The failed Camino Colombia would have benefited from designation as a hazardous cargo route. Such complementary clauses in agreements may be able to mitigate concerns about competing routes. This study therefore investigated variations in toll agreements that could improve investor confidence in project feasibility.

1.3 Research Tasks

Since tolling questions are of urgent concern to TxDOT, the research team completed this project in a one-year time frame, accomplishing the following five tasks:

Task 1. Coordinate research efforts and leverage industry expertise: The objective of this task was to gain insights on partnerships and developments in the toll road industry. To leverage toll industry expertise, an informal panel of experts was assembled. Those experts provided the researchers with access to documents, and personal contacts. Additionally, in order to avoid duplication of efforts in other ongoing TxDOT research the research team held periodic meetings with researchers on other TxDOT toll-related projects to exchange findings on tolling issues.

Task 2. Survey DOTs and toll authorities regarding experience with toll agreements: The objective of this task was to identify the sources of, nature of, and solutions to conflict and cooperation between toll developers and public agencies. The researchers contacted the majority of toll authorities and state departments of transportation in the United States, as well as several foreign agencies. The responses received provided information on over twenty toll experiences in the United States and abroad. The focus of the data collection was on non-compete clauses, but the researchers took the opportunity to investigate other clauses in toll agreements that might aggravate or ameliorate the effects of non-compete clauses.

Task 3. Identify best practices and conduct case studies: The objective of this task was to identify best practices with regard to non-compete and other complementary provisions that would work in the Texas context. From the data collected in Task 2, the research team conducted in-depth case studies to synthesize lessons learned (Chapter 2). Each case was evaluated to determine clauses that could be credited with reducing competition between tolled and non-tolled segments. The results of the case studies were synthesized into a set of best practices (Chapter 3).

Task 4. Identify planning techniques to define toll project service area: The objective of this task was to evaluate the feasibility of defining the service area of a toll project, investigate potential planning techniques, and outline situations of applicability. A broad list of planning techniques for identifying transportation catchment areas was compiled and evaluated for applicability in a toll road context. Additionally, the potential to use existing land use and traffic modeling programs to define toll road service area was also investigated (Chapter 4).

Task 5. Synthesize results and prepare research products: The objective of this task was to synthesize the outputs of Tasks 1–4 into a set of research products. Three research products were generated:

- 5020-P1: Guidelines on examining the service areas for toll roads and freeways, and strategies for addressing conflicts with toll roads in a tax supported network (Chapter 3)
- 5020-P2: Brief summary of key findings to distribute to pertinent stakeholders including the general public (Chapter 5)
- 5020-P3: Power Point presentation with speaker notes that highlights the guidelines and identifies potential strategies (stand-alone document).

Research products 1 and 2 are incorporated in this report, which is the comprehensive documentation of the research performed, and the results and recommendations.

1.4 Report Organization

Chapter 1 provided some background on the subject of non-compete clauses in toll agreements and presented the research issues. Chapter 2 is a comprehensive discussion of case studies from the United States and around the world. In all, twenty case studies are presented. In Chapter 3, public and private sector best practices are synthesized. Best practices are discussed under specific headings, namely: financial, legal, planning, operational, regulatory, and political. Chapter 4 presents a review of current planning techniques and modeling programs, and their potential for defining the service area of a toll road. Finally, Chapter 5 presents conclusions and recommendations. Following Chapter 5, a matrix of best practices is included as an Appendix.

Chapter 2. Case Studies

2.1 Overview of U.S. Toll Road Experience

In this chapter, the recent experience of several U.S. states and foreign countries with toll agreements is examined. Toll roads have served as a component of the United States transportation network since the late 18th century. The nation's first major toll road was the 62-mile Lancaster Pike, a privately owned Philadelphia-to-Lancaster wagon route built in 1792. However, nearly all of the toll road facilities built in that era were financial failures, due to emergence of the American rail system which provided quicker passenger and freight movement than horse-drawn road vehicles [Euritt, Machemehl, Harrison, and Jarrett, 1994].

In the 20th century, spectacular growth of automobile usage created a renewed demand for roads. In the 1940s and '50s major toll facilities were built in Pennsylvania, New York, New Jersey, and Florida, but with public funding for construction of the Interstate Highway System from the 1950s through the '80s, tolling went out of vogue. Since then, maintenance and repair costs on the Interstate System have left states with limited funds for new road construction, stimulating renewed interest in toll financing.

Despite recognition in the United States that tolling is a way to address financial constraints and accommodate growth demands, very few toll roads have been developed over the past decade. Between 1993 and 2003, only about 750 miles of toll roads were constructed in the United States, bringing total mileage to about 4,900 miles, a small fraction of the overall road network ["Toll Roads, Bridges, Tunnels, and Ferries," 2003]. The following case studies represent a review of the recent experience in the United States with toll agreements.

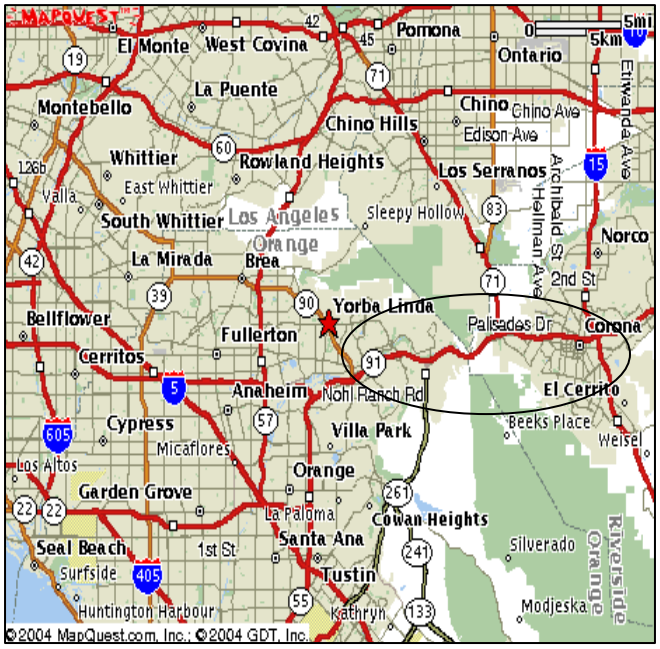
2.1.1 SR 91 in California

Tolling Status: In 1989 California approved Assembly Bill 680 promoting innovative financing for the construction and operation of four privately funded toll roads. State Road 91 Express Lanes (SR 91X) was the first of the four toll roads made operational through a public-private partnership. State Road 91 links the bedroom communities of Riverside County with employment centers in Orange County, California, near Los Angeles (Figure 2.1). The California Private Transportation Company (CPTC) financed and constructed 10 miles of a four-lane toll road in the median of the existing SR 91 at a cost of $135 million. On December 27, 1995, the SR 91X toll lanes opened under a 35-year franchise agreement between Caltrans and CPTC ["AB 680 Private Toll Road Program," n.d.].

After two years of operation of SR 91X, Caltrans made plans to add an outer lane at the entry and exit points of the toll lanes, citing safety concerns due to bottlenecks. CPTC viewed this as an attempt to add capacity to the existing "free" portion of SR 91 and invoked a non-compete clause in the toll agreement ["SR 91 Express Lanes Toll Franchise Is Safe," 1999]. Concurrently, CPTC made an attempt to sell the toll lanes to NewTrac, a non-profit organization created by CPTC. CPTC cited the desire of two of the three private partners to leave the tolling business as the reason for the proposed sale

["91 Express Lanes Refinancing," 2000]. Concerns from the public sector as to the nature of the sale prompted further conflict, resulting in the California state treasurer canceling the sale to NewTrac.

Figure 2.1 California—SR 91



In 1999 Caltrans and CPTC reached a settlement of $12 million, allowing Caltrans to build auxiliary lanes in 2006 [Price, 2001]. As a result of public outcry against the settlement and CPTC's continued desire to sell the franchise, the public bought the express lanes through the Orange County Transportation Authority (OCTA) at a cost of $207.5 million in 2003 ["Clause Puts Pause on Lanes," 2002]. Today OCTA continues to own and operate the toll road.

Development of Toll Agreement: The non-compete clause between CPTC and Caltrans stated that Caltrans could not finance the design, construction, or operation of any public transportation facility within a 1.5-mile radius of the privately funded highway between I-15 and I-5, an "absolute protection zone." However, there were a number of exceptions to this stipulation ["SR 91 Non-compete Clause," 1993]:

a) Any improvements to the State Transportation Facility for the principal purpose of resolving traffic safety problems were allowed within the agreement. Safety improvements resulting in an incidental increase in vehicle capacity would not result in the non-compete clause being invoked.

b) Any improvements to the State Transportation Facility for the sole purpose of expanding free capacity were only allowed on the two innermost lanes of the publicly funded lanes of SR 91. The two innermost lanes were required to become HOV-3 lanes and could not interfere with the operation of the private transportation project.

c) Caltrans was allowed to build any rail passenger system within the "absolute protection zone," but could not build a rail system designed to carry automobiles.

d) Any road improvement or capacity expansion projects were allowed within the "absolute protection zone" as long as the projects did not open prior to the termination of the lease agreement.

To define economic competition within the "absolute protection zone," the toll road agreement made the following designations ["SR 91 Non-compete Clause," 1993]:

- Routes providing economic competition:
  - any road project designed as an expressway in a more or less west-east direction (Note: SR 91 runs in an east-west direction)
  - any north-south expressway route found to facilitate the provision of an alternate west-east route
- Allowed routes:
  - expressways in a more or less north-south direction
  - any route deemed less than expressway grade

Lessons Learned: The SR 91 public-private partnership serves as a premier lesson in non-compete clauses. The conflicts between the public and private sectors in the SR 91 experience received national attention, prompting toll road agreements around the country to apply lessons learned from SR 91 in an effort to avoid the same conflicts. Some of the lessons to be drawn from SR 91 include:

- ***Include consent terms for early termination by either party.***
  - The SR 91 toll agreement did not consider the potential for early termination by either party.
  - Caltrans was unprepared for CPTC's desire to exit the toll industry.
- ***Strive to strike a balance between the private investor maximizing revenues and the public enjoying maximum transportation benefits of new road projects.***
  - CPTC's goal was to maximize revenue.
    - Variable toll pricing was used, with higher toll rates charged during peak traffic periods.
    - Pricing was used to maintain a high level of service on the toll lanes [Price, 2001].
    - Profit maximizing was constrained only by a maximum rate of return prescribed in the toll agreement [Sullivan, 1998].
  - The public sector's expectation was congestion relief.

- Drivers unable to afford or unwilling to pay the higher toll rates during peak traffic conditions were forced to remain on the highly congested "free" lanes, while the adjacent toll lanes operated far below capacity.

- ***Include a prescribed method for identifying the need for improvements in the adjacent network and provide a definition of permitted improvements.***
  - The vagueness of the toll road agreement concerning safety improvements encouraged conflict,
  - During litigation Caltrans was unable to provide empirical evidence, proving the necessity for safety improvements, which resulted in a $12 million settlement with CPTC to allow those improvements.

2.1.2 California—Transportation Corridor Agencies (TCA)

Tolling Status: The Transportation Corridor Agencies (TCAs) were formed in 1986 to plan, finance, construct, and operate a 67-mile public toll road system in Orange County, California (Figure 2.2). The TCAs are made up of two individual joint power agencies. The Foothills/Eastern TCA operates the 241, 261, and 133 toll roads connecting SR 91 with I-5 in south Orange County; the San Joaquin TCA operates the 73 toll road connecting Newport Beach with San Juan Capistrano in southwest Orange County. The mission of the TCA is to "enhance mobility in Orange County and Southern California by developing and operating publicly owned toll facilities as a part of the regional transportation system" ["TCA Annual Report," 2003].

In 1987 California Senate Bill 1413 authorized the construction of the TCA toll roads using bonds backed by future toll revenues and development impact fees. The toll roads were built with virtually no taxpayer dollars; private individuals and institutional investors purchased all of the bonds needed to fund the toll project. In 1997 lower-than-expected traffic volumes and negligible development impact fees forced TCA to refinance the construction bonds. At the same time, a new study was conducted to revise traffic projections, resulting in a toll rate increase on the San Joaquin TCA toll road.

Today, all toll and development impact fee revenues go toward retiring the construction debt, funding additional improvements, and covering the costs of operating the toll roads. The Foothills/Eastern TCA is financially stable; however, the San Joaquin TCA toll road is still below the revised revenue projections issued in 1997 ["Fitch Affirms," 2004]. Currently, plans are being made to extend the 241 toll road to the south.

Figure 2.2 TCA toll road map

Development of Toll Agreement: The TCA toll agreement was developed while the SR 91 problems were beginning and was therefore California's first attempt to address the problems with the SR 91 non-compete clause. The TCA agreement includes a number of modifications from the SR 91 agreement, outlined here [Brown, 2004]:

- A "safety net" is in place, rather than the SR 91 "absolute protection zone." The "safety net" does not identify a specific geographic location where competing routes are forbidden. However, the "safety net" requires that TCA be compensated if construction of a new route leads to a loss in revenue. When the issue of competition comes into question, an independent engineer is asked to make a determination.
- Caltrans is allowed to make improvements included on all previously approved road plans and may undertake future road projects within its congestion management plan.
- TCA has the authority to set the toll rate. Caltrans may step in and change the toll rate, but the change may not adversely affect the revenue-generating potential of the toll road. Again, Caltrans would be responsible for compensating TCA for revenue shortfall.

Lessons Learned: In addressing the problems with the SR 91 non-compete clause, the TCA agreement developed several complementary clauses, some of which have not yet been put to the acid test:

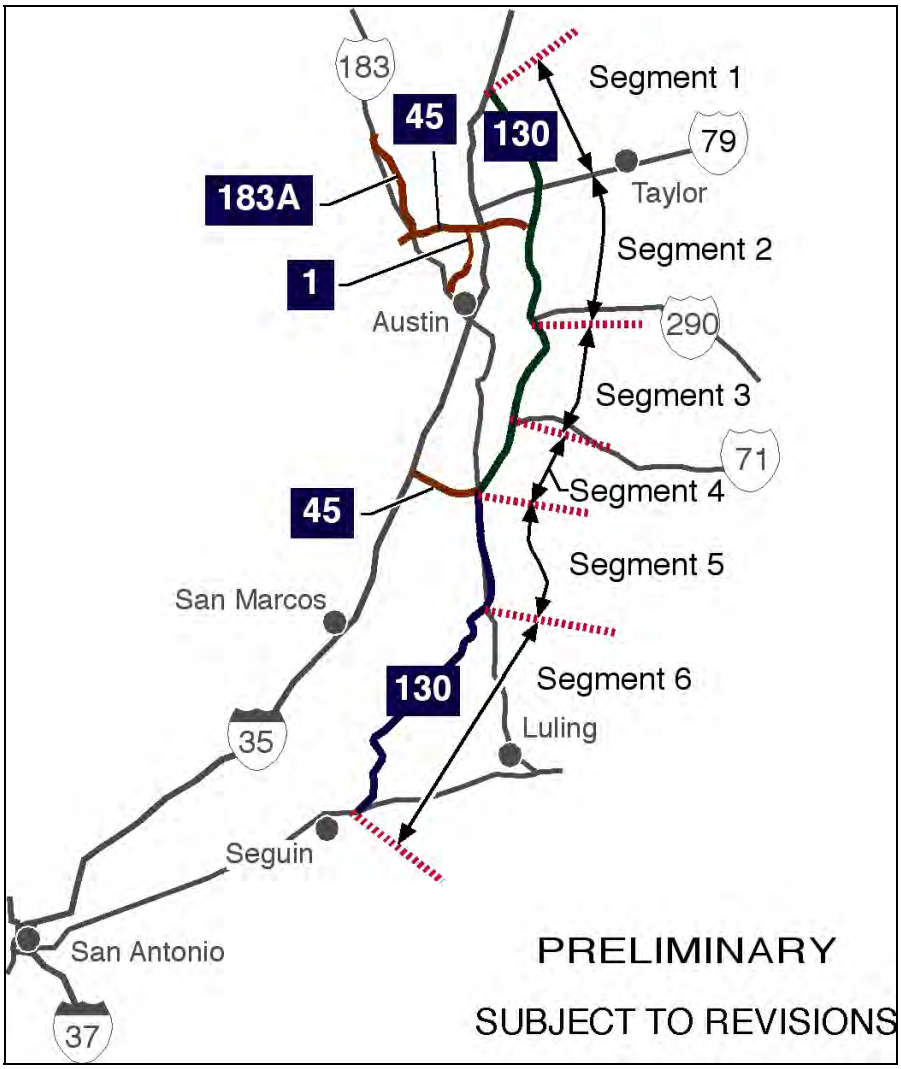
- ***Include regional transportation plans in the agreement.***
  - The investors are fully aware of the future plans in the area and presumably were able to factor those into the investment calculations.
- ***Offer a "safety net" to the private investors.***
  - The public sector offered to compensate the investor for revenue lost if a publicly funded facility was developed in the region and shown to adversely affect toll revenues.
- ***Development impact fees are not a reliable source of revenue for a toll road.***
  - Original plans called for one-time development impact fees assessed to businesses locating along the new highways.
    - Example: The 1998 projection for the San Joaquin TCA claimed that 48.5% of project financing would come from development impact fees ["Toll-Highway Finance in California," 2002]. In 2002 and 2003 only 13.3% of revenues were generated by impact fees [TCA Annual Report, 2003].
  - Toll revenues continue to serve as the primary method for repayment of TCA bond debt.

- ***Invest in high-quality toll collection systems.***
    - Original toll enforcement cameras relied on visible light, capturing only 70% of license plate images due to extreme sunlight or drivers switching lanes, resulting in a blurred image ["Infrared Images Boost Revenues," 2004].
    - Toll road users became aware of the system's shortcomings and began to take advantage of the system in increasing numbers.
    - Ineffective cameras resulted in a loss of $3 million per year.
    - TCA upgraded its system to infrared cameras at a cost of $1.2 million.
    - Under the new system, toll violation revenue increased to $10 million in 2004, compared with $2 million per year pre-upgrade.

2.1.3 Texas—Central Texas Turnpike Project

Tolling Status: Interstate Highway (IH) 35 serves as the primary north-south route through Austin, Texas. A high growth rate in Austin coupled with an increase in international truck traffic due to the North American Free Trade Agreement (NAFTA) has caused major traffic delays along the route, an increase in the number of accidents, and steady degradation in the level of service (LOS). Due to financial and spatial constraints, the Austin segment of IH 35 is unable to increase capacity to meet user demand. To relieve congestion along the corridor, the Central Texas Turnpike Project (CTTP) is now underway (Figure 2.3). The CTTP, located in the east, north, and south Austin metropolitan area, consists of three road projects, totaling 67.5 miles of toll facilities. The primary element is SH 130, paralleling IH-35 for 50 miles on the east edge of Austin. Portions of SH 130, SH 45 N, and the Loop 1 extension are scheduled to open in September 2007. The entire project is expected to open to traffic on December 1, 2007 [TxDOT CTTP Bond Proposal, 2002].

Figure 2.3 Map of CTTP



Development of Toll Agreement: As a relative newcomer in the tolling business, the State of Texas has been able to draw upon lessons learned from toll experiences in other states when structuring toll agreements. Specifically, lessons learned from the California examples of SR 91 and TCA have provided a foundation for the CTTP toll agreement. Beyond applying the lessons learned in California, TxDOT is experimenting with a new contracting arrangement called an exclusive development agreement (EDA). TxDOT will use a revised version of the EDA, called a comprehensive development agreement (CDA), on future toll projects.

The CTTP toll agreement includes a non-compete clause, which states:

> the Commission (note: five appointees of the Governor) agrees to use its best efforts to further the economic viability of the System and to refrain from initiating, supporting, or approving any Capital Project on the State Highway System that would have the purpose or reasonable foreseeable effect of materially adversely affecting the ability of the Commission to comply with its covenants in the Indenture, particularly the Rate Covenant and its covenant to

pay when due the principal of and interest on all Series 2002 Obligations (bonds). [TxDOT CTTP Bond Proposal, 2002]

Similar to the TCA toll agreement, the CTTP agreement offers exceptions to the non-compete clause, including:

- any state highway improvements necessary for improved safety, maintenance, or operational purposes
- any intercity, intra-city, commuter, urban, high-speed rail projects or any combination of the foregoing supported by the state and/or others
- any high-occupancy vehicle (HOV) exclusive lanes operationally required by environmental regulatory agencies
- any projects within the Capital Area Metropolitan Planning Organization's "CAMPO 2025 Transportation Plan"

Should the commission breach the provisions of the non-compete clause, independent traffic consultants will be used to report the annual effects on revenue of the toll project. If it is found that revenues are below projections as a result of that breach, the commission is required to compensate the investors for the loss in revenue [TxDOT CTTP Bond Proposal, 2002].

To develop the traffic and revenue forecasts necessary to determine the financial feasibility of the roadway as well as to establish a benchmark for determining the effects of a competing route, two independent traffic consultants (Vollmer Associates and URS Corporation) were used. In establishing the toll revenue forecasts, the following assumptions were made:

1. The forecasting model made a differentiation between weekday and weekend traffic. Weekend traffic was assumed to be half that of weekday traffic volumes.
2. It will take 5 years for the toll road to achieve 100% of its projected traffic.
3. The construction of major connector facilities within certain time constraints is assumed.
4. Transponder users will receive a 10% discount off the toll rate. Transponder use will range from 25–40% at startup to 50–75% by 2025.
5. The Violation Enforcement System (VES) will be unable to detect approximately 40% of all violations. Of those detected, an estimate of only 10% of violators will pay the $100 citation fee and toll.
6. Traffic reductions in fiscal years 2016, 2026, and 2036 were assumed in reaction to the impacts of periodic toll increases for those years.
7. Motor fuel prices will not exceed at any point $2.50/gallon [TxDOT CTTP Bond Proposal, 2002].

The CTTP toll agreement is the first toll agreement in Texas to use an EDA. The overriding goal of the EDA is to build highway projects faster than is possible under normal procedures. A consortium of designers and construction contractors performs the tasks of design, construction, operation, maintenance, or partial financing of a transportation project. Under the EDA, TxDOT is able to hire one consortium to do all aspects of work on a project rather than entering into agreements with several contractors. The EDA also allows for highway construction to begin while design work and right-of-way acquisition continues on other segments of a project. Within the CTTP the toll developer is responsible for design, construction, maintenance, and part of the financing for the project. The EDA is in some respects similar to a BOT contract.

Lessons Learned: The agreement for the CTTP mirrors the agreement used on the California TCA toll roads with only minor alterations. The incorporated aspects of the TCA agreement are intended to mitigate concerns over the non-compete clause. Those key aspects include:

- ***Allow projects within a comprehensive transportation plan.***
- ***Pay toll developer for the effect of construction of a competing route.***
- ***Use an independent consultant to develop traffic and revenue projections.***
    - Consideration of variables, such as toll violation recovery rate and an adjustment for a five-year ramp-up period, should further improve the accuracy of the revenue projections.
    - Should toll revenues not achieve projections, debt payment may become a problem for the private sector developer, and the public sector must be aware of this possibility and be prepared with a plan for how to react.
- ***Encourage users to establish electronic accounts.***
    - Factoring in the loss of toll revenue due to the inability to collect on over 10% of toll violations provides a conservative revenue projection for the toll road, but this is not acceptable from an operational standpoint. In other toll road experiences, the inability to collect on toll violations is at times the difference between positive and negative financial stability.

Red Flags: Based on findings presented elsewhere in this report, there are some potential causes for concern with the CTTP agreement:

- ***The EDA is a new approach in Texas, and any negative publicity could affect the public's opinion on tolling.***
    - The success of the EDA is dependent upon the ability to expedite the delivery of transportation projects.
    - Cost or schedule overruns could result in waning public and political support. For example, delays in right-of-way acquisition may delay construction or increase costs.
- ***Regulatory power rests entirely with the public sector.***

- The Transportation Commission is empowered to resolve disputes, creating the possibility for conflict or litigation. A separate regulatory body or arbitration panel independent of both parties may be able to resolve future differences more easily.

2.1.4 Colorado

Tolling Status: In Colorado the use of tolling to finance road projects is a relatively new concept. At this time, the only two toll roads operating in Colorado are Extension 470 (E-470) and Northwest Tollway in Denver. Recent state legislation has authorized the Colorado Department of Transportation (CDOT) to enter into public-private ventures, and cities and counties are now allowed to form regional entities, known as public highway authorities (PHA). In 2002 the Colorado General Assembly passed legislation creating the Colorado Tolling Enterprise (CTE), a government-owned nonprofit business that operates as a division of CDOT. In 2004 CTE released survey results of twelve potential toll corridors throughout the state. Eight corridors were identified where the use of tolling would be able to cover the cost of building new toll facilities as well as costs associated with connecting to the existing system ["Tolling Enterprise Board Identifies Potential Toll System of Highways," 2004].

Development of Toll Agreement: The E-470 toll road, operated by the E-470 Public Highway Authority, opened in 1991, providing the eastern portion of a ring road around Denver. As an innovative approach to financing the construction of the toll road, an intergovernmental agreement amongst cities and counties in the region was formed, and a $10 vehicle registration fee was imposed on all vehicles in the region. Once the vehicle registration fees meet the debt service required to pay off the bonds, the fees will be removed [Salek, 2003].

The Northwest Parkway began toll operations in November 2003, providing another segment of Denver's incomplete ring road. The private sector provided the $415 million financing for the toll road and is being paid back by toll revenues. The Northwest Parkway Authority, a conglomerate of cities, counties, and regional transportation districts, operates the toll road.

Lessons Learned: Despite lacking major toll road experience, Colorado has taken positive steps to ensure the potential to develop a successful toll network:

- ***Create a non-profit toll enterprise.***
  - The non-profit toll enterprise is able to sell tax-free bonds, a saving of about 2 percentage points on interest charges.
  - The enterprise may serve as a semi-independent regulatory body with oversight of toll projects throughout the state.
- ***Identify financially feasible toll corridors.***
  - Colorado is focusing on tolling only financially feasible corridors.
- ***Back toll revenues with other reliable funding sources.***

- Vehicle registration fees are coupled with toll revenue to ensure the financial stability of the toll road.

2.1.5 Florida

Tolling Status: Florida opened its first toll road in 1957, a 110-mile stretch from Golden Glades to Fort Pierce known as the Sunshine State Parkway (Figure 2.4). Still among the cheapest toll rates in the nation, tolls in Florida were recently raised from six cents to seven and a half cents per mile. Today, the Florida Turnpike Enterprise (FTE), operating as a division of the Florida Department of Transportation (FDOT), manages roughly 600 miles of limited-access toll highways, 80% of the toll roads in Florida. The cities of Orlando, Tampa, and Miami account for the remaining 20%. Most notably, the Orlando toll network consists of 100 miles managed by the publicly owned and operated Orlando-Orange County Expressway Authority (OOCEA). Currently, Orlando, Tampa, and Miami all have plans to extend their toll networks.

Figure 2.4 Sunshine State Parkway in Florida

Source: http://www.dot.state.fl.us

Development of Toll Agreement: Toll agreements in Florida have avoided the issue of competition between the public and private sectors, because toll roads were the first freeways in Florida and were developed by the public sector. The Florida Turnpike Enterprise operates as a division of the FDOT. Additionally, tolled routes are built to complement rather than compete with "free" roads. In Orlando, for example, once a successful toll road has paid off its debt and is generating a profit, the excess revenue is used toward building additional capacity [Winn, n.d.]. Under these circumstances, Florida has been able to avoid many of the potential conflicts that other states must address in toll agreements.

Lessons Learned: Florida's toll network began in 1957 before construction of the Interstate Highway System, providing a different set of lessons learned from those of recently developed toll roads.

- ***Several Florida toll roads were built before the Interstate Highway System and occupy the most desirable routes.***
  - Many Florida toll roads have already paid for themselves, so competition is not a concern.
- ***Use surpluses to support less profitable routes.***

- Toll revenues consistently exceed expenses, providing excess revenues to either extend the toll network or support the non-tolled system.

- ***Use a non-profit model.***
  - The Florida model of FDOT managing the FTE has been an example of a successful method for public sector-backed toll implementation.

2.1.6 New York/New Jersey

Tolling Status: Similar to Florida, the states of New York and New Jersey operate mature toll networks. In New Jersey the Garden State Parkway (1957) and New Jersey Turnpike (1951) are two of the oldest operating toll roads in the United States. Due to a similarity in service offered and opportunity for financial savings, the Garden State Parkway and New Jersey Turnpike were recently consolidated into one authority, the New Jersey Turnpike Authority (NJTA). The third toll road in New Jersey, the Atlantic City Expressway, remains independent of the NJTA. With relatively low toll rates, traffic has continually increased on New Jersey toll roads, affecting operations and generating calls for added capacity. As congestion continues to be an issue, New Jersey will be forced to make changes to the road network.

In New York the Tappan Zee Bridge currently operates as a publicly owned toll bridge and is in need of $1 billion in repairs. Private sector funding is being considered to address the need for repairs. The private sector developer's proposal includes a non-compete clause stating that any bridge built within 24 miles of the Tappan Zee Bridge must be tolled and the proceeds must go to the developer. The project remains in the initial planning stages at this time ["Bear Mountain Bridge," 2004].

Development of Toll Agreement: Due to the maturity of the toll networks in New York and New Jersey, the issue of competition has not been a concern in either state and has not been a part of toll agreements. As states including New York and New Jersey confront increasing demand on the transportation infrastructure coupled with inadequate public financing, private sector involvement increasingly will be sought. The existing public sector infrastructure will present competition for privately developed projects. The Tappan Zee Bridge repair project in New York provides an early example of how the private sector may try to address these concerns in states with a mature network of publicly owned roads.

Lessons Learned:

- ***Increase toll rates to keep up with inflation.***
  - Low toll rates have encouraged demand, but revenues have not been sufficient to add capacity.

- ***Continue expanding system to handle demand.***
  - Shortsightedness in assuming that the original project was the solution has allowed congestion to overtake the system.

- ***Consolidate tolling operations.***

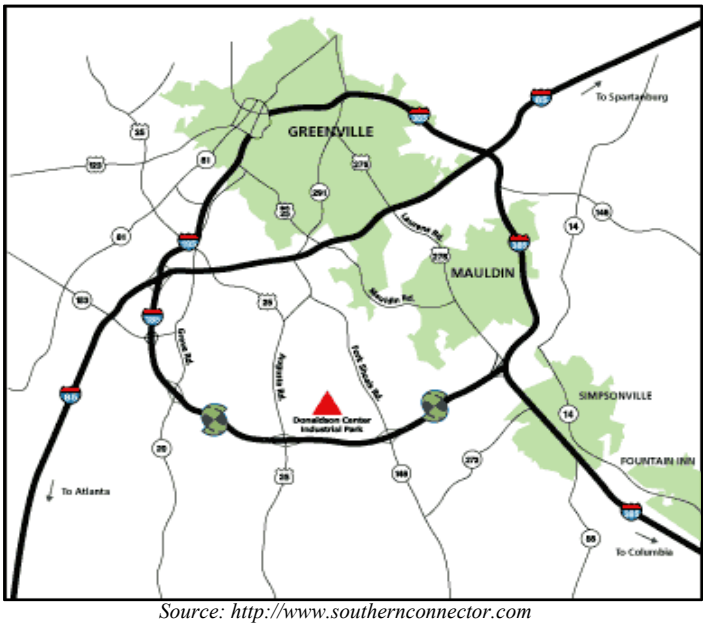
- Creation of the NJTA has minimized the operation costs of the toll network in New Jersey.
- States should consider developing toll roads as a part of a statewide network under one prevailing jurisdiction, rather than developing a number of individually owned and operated toll roads.

2.1.7 South Carolina

Tolling Status: Among U.S. states, South Carolina has the lowest allocation of federal highway funding per mile ["South Carolina Highway Facts," n.d.]. At the same time, South Carolina has the nation's fourth largest state-maintained highway system: the national average for percentage of highways under state control is 20%; however, in South Carolina that figure jumps to 65%. As funding constraints continue to exert pressure on maintaining and expanding the state road network, South Carolina will need to look for innovative ways to finance road projects. Currently, the privately funded Southern Connector in Greenville and Cross Island Parkway at Hilton Head are the only existing toll roads in South Carolina (Figure 2.5). Recent state legislation has authorized the South Carolina Department of Transportation (SCDOT) to enter into public-private partnerships, presenting an opportunity for tolling to play a larger role in financing South Carolina's road network in the future.

Development of Toll Agreement: In 1967 city planners made the suggestion that a southern bypass route was needed to connect I-85 and I-385 in Greenville. Over the next twenty years public funding was sought unsuccessfully for construction of the bypass route. Finally, in 1995 SCDOT accepted proposals for the planning, design, financing, and construction of the Southern Connector, awarding the contract to the Interwest Carolina Transportation Group the following year. In 2001 the Southern Connector opened as a privately funded but publicly owned toll road. The toll agreement did not include use of a non-compete clause. Today, toll revenues are sufficient to pay the construction bond debt as well as the maintenance of the roadway ["Southern Connector," 2001].

Figure 2.5 Southern Connector Map



Source: http://www.southernconnector.com

Lessons Learned: The main lesson learned from South Carolina is the following:

- ***Public support is an essential component of a state's tolling strategy.***
    - Originally, the public objected to the idea of developing the Southern Connector as a toll road. The South Carolina Supreme Court ruled that the public could not challenge the Southern Connector through referendum, because no public funds were used to build the road. However, there is still public resistance. Currently, a widening project planned for a potentially "competing" interstate route could hinder the financial feasibility of the Southern Connector.

2.1.8 Virginia

Tolling Status: The Virginia DOT has a history of rejecting non-compete clauses for privately funded toll projects. Currently, the Dulles Greenway and the Pocahontas Parkway comprise the two existing toll routes in the state. Under consideration for tolling is a proposed expansion of Interstate Highway 81.

The Dulles Greenway opened in 1995 following state legislation allowing the private sector to develop toll roads. Constructed with funds from the private sector, the Dulles Greenway provides a four-lane, 14-mile connection between the Dulles International Airport and Leesburg, Virginia (Figure 2.6). A year after the toll road opened, the Virginia Department of Transportation (VDOT) made improvements to the existing State Road 7, providing competition for the toll route. The Dulles Greenway was forced to refinance its debt and today operates with a positive cash flow, but it has never made a profit for its investors.

Figure 2.6 Dulles Greenway

Source: http://wwwdullesgreenway.com

The 325-mile Interstate Highway 81 in Virginia currently operates at LOS B, and it is projected that by 2010 30% of the corridor will operate at LOS D. VDOT is considering a variety of scenarios for financing the required capacity increase, including tolling all vehicles that use the route or tolling only commercial trucks on IH-81. Both proposals have been stalled by pressure from lobbyists and concerns that truckers will use other inadequate routes. A private investor has proposed funding the road project, but the proposal has been rejected due to a non-compete clause proposed by the private investors. The project remains in the planning stages, pending financing.

Development of Toll Agreement: In Virginia toll agreements do not entertain non-compete clauses due to resistance from the public sector. While the potential for competition between tolled and non-tolled routes is recognized, the private sector is forced to accept all of the risk associated with a toll project.

Lessons Learned:

- ***Without providing risk-sharing alternatives to NCCs, DOTs have difficulty in attracting PPPs.***
    - Lack of cooperation between the public and private sectors resulted in the near bankruptcy of the Dulles Greenway.
    - The reluctance of Virginia to enter into non-compete clauses has and will continue to discourage the use of private funds to build roads throughout the state.

2.1.9 Washington

Tolling Status: The use of toll collection to financially support transportation projects is not a new concept for the state of Washington. In fact, 14 bridges in the state of Washington have been financed with bonds paid back through tolls. However, the state of Washington has yet to use tolling as a way to fund longer segments of roadway. In 2002 Senate Bill 6140 established regional transportation improvement districts (RTIDs) and allowed RTIDs to include the use of tolling in long-range transportation plans requiring the approval of voters. Currently, only the Tacoma Narrows Bridge is being built as a toll project. Other projects under consideration for tolling include the Alaskan Way viaduct replacement, Trans–Lake Washington (SR-520) improvements, and Interstate 405 widening ["Technical Summary of Toll Analysis," 2002].

Development of Toll Agreement: The Tacoma Narrows Bridge project includes $800 million in tax-exempt bonds to help finance the $849 million project. To pay back the bonds, an estimated $45 million will be collected annually from toll revenues [Washington State Department of Transportation, n.d.]. Since the demand for the new Tacoma Narrows Bridge is great, there is little concern that the bridge will have any problem paying off the bond debt and the potential for competition is a non-issue. At present, the state of Washington is only beginning to consider tolling as a way to finance road projects. As tolling becomes a more accepted form of financing in the state, Washington will begin to analyze how open road toll agreements should be structured.

Lessons Learned:

- ***Allow voters to approve/disapprove toll plans.***
    - RTIDs are allowed to vote on toll plans.
    - Public opposition has caused several toll proposals to be shelved, with the investors losing the funds expended on planning and design.
    - In the current political climate, tolling is not being considered as a primary transportation financing method in the state of Washington.
- ***Non-profit agencies can sell tax-exempt bonds, saving on interest.***
    - Tax-exempt bonds have been used to deliver projects, such as the Tacoma Narrows Bridge.

2.1.10 Summary of U.S. Case Studies

The primary reason toll investors request non-compete clauses is to protect themselves from revenue risk. Nine case studies from the United States have been presented. California learned a harsh lesson from the SR 91 project and has adjusted its approach for the TCA projects. Currently Texas is perhaps the most active state in tolling, and many of the personnel who worked on the California projects are now advising or managing Texas efforts. States with mature toll networks have not had to deal with concerns over competition. Other states have either rejected NCC or scaled down their tolling initiatives in the face of public opposition. Still, many states are considering tolling as a way to deliver transportation projects. The lessons learned from recent toll agreements in the United States, along with the international case studies presented next, will be synthesized into a set of best practices in Chapter 3.

2.2 Overview of International Toll Road Experience

Only a handful of countries around the world have actively pursued toll strategies for their transportation networks. In these countries, the tolled network typically comprises less than 5% of the entire road network. In most cases, recently developed toll roads have been constructed under a build-operate-transfer (BOT) concession. In this section, international case studies from North and South America, Europe, and Asia are examined. Each country has a different philosophy on the use of private-sector financing and the structuring of toll agreements based on political, cultural, and financial conditions unique to each nation.

2.2.1 Australia

Tolling Status: Under Australia's constitution, states and territories are largely responsible for regulating their own transportation networks, resulting in distinct variations in policies. Two of Australia's eight states and territories, Victoria and New South Wales, are involved in tolling.

In Victoria the Melbourne City Link project, constructed between 1996 and 2000, is a 22-kilometer (13.7-mile) toll facility with two long tunnels, a major bridge over the Yarra River, and an elevated roadway through Melbourne's western suburbs (Figure 2.7). The City Link project costs were eight times higher than the previously most expensive road project in Melbourne at a cost of $1.5 billion AUD ($1.1 billion USD) [Daley, 2004]. The innovative project is one of the world's first and largest fully electronic toll roads. The Melbourne City Link is Victoria's first toll facility since the West Gate Bridge tolls from 1978 through 1985, breaking new ground for project financing in the region.

Figure 2.7 Melbourne CityLink

Source: http://www.labyrinth.net.au

The WestLink M7 Motorway in Sydney, New South Wales, is currently under construction and expected to open by August 2006. The WestLink will provide a 40-kilometer (24.9-mile), four-lane toll facility, completed as the western link of the Sydney

Orbital Freeway and Motorway Circuit. The estimated design and construction cost is $1.54 billion AUD ($1.14 billion USD), and the total project cost (including financing costs and improvements to connector roads) is $2.23 billion AUD ($1.69 billion USD). Because a portion of the project is replacing a link in the National Highway Network, the commonwealth government is providing about $360 million AUD ($273 million USD) in funding support [New South Wales Road and Traffic Authority, 2003]. Like the City Link project, toll collection will be fully electronic.

Development of Toll Agreement for Melbourne City Link: The project has been designed, built, and operated by the private sector through a highly structured build-own-operate-transfer (BOOT) method. Under the BOOT scheme, the government of Victoria granted a private consortium, Transurban, the concession to design, construct, operate, and levy tolls on City Link for a period of 34 years, at which time the facility will be transferred back to the state ["Melbourne CityLink Concession Deed," n.d.].

Prior to committing to the project, the Transurban consortium faced the difficult task of evaluating the risks associated with the construction, operations, and financing of the road project. Ultimately, the agreement between Transurban and the State of Victoria contained detailed risk allocation provisions. The State of Victoria accepted the risk of land acquisition contamination caused by the state, changes to the road network adversely affecting City Link, and changes in law, while Transurban accepted the risk of project costs, traffic flow, and toll revenues.

In the City Link concession deed, the State of Victoria acknowledges that the tollway is intended to be a part of the regional freeway network and agrees to promote use of the toll route by providing and improving connectors. This statement provides further assurance to Transurban that the Victoria government is committed to the success of the toll road.

Development of Toll Agreement for Sydney WestLink M7 Motorway: Several benefits are expected from the Sydney WestLink M7 Motorway:

- Provide safer and more efficient road transport for passenger vehicles and freight.
- Provide better access to employment opportunities in western Sydney.
- Encourage economic growth in western Sydney.
- Reduce the number of heavy vehicles using the road.
- Reduce noise and improve air quality in key residential areas.
- Improve travel times between key western Sydney suburbs [NSW Roads and Traffic Authority, 2003].

To achieve these benefits, the government of New South Wales entered into a 34-year BOOT concession agreement with the WestLink Motorway consortium on February 14, 2003, granting operation, maintenance, and repair rights to the concessionaire. The project deed requires that the motorway be completed by August 13, 2006. Upon termination of the agreement, the toll facility will be turned over to the state.

The non-compete clause between the WestLink Motorway consortium and the government presents a new method for dealing with potentially competing routes.

- The Roads and Traffic Authority (RTA) of New South Wales (NSW) and the NSW government are not restricted from future development of the NSW road network.
- Rather than repaying the private investor for loss of revenue resulting from development of a competing route, the government will renegotiate the agreement with the investor.

The concession deed requires that, when necessary, the WestLink consortium and RTA negotiate in good faith with the aim of achieving a series of specified objectives and resolutions.

In the concession deed a "competing road project" is defined as any new road or widening and upgrading of an existing road between two roads which connect with the M7 Motorway or within an exclusion zone surrounding the M7 Motorway. Not deemed to be a competitor is a proposed bus-only transitway that falls within the exclusion zone. Any initiation of new public transportation beyond the proposed bus-only transitway within the exclusion zone would be grounds for renegotiation.

If the WestLink consortium experiences adverse consequences as a result of a competing road project, they must provide a full, detailed analysis to the RTA of the competing project's effects on the M7 project. The RTA and WestLink must then enter into good faith negotiations within 20 business days of the notice to restore the ability of the consortium to repay the project's debt financiers, as outlined in the debt financing agreement, with "principal payment levels not exceeding those envisaged in the private sector participants' base case financial model." If the consortium had not been able to repay its debts at the rate outlined in the finance agreement before the competing project began, the negotiations must aim to restore the consortium's payment abilities prior to commencement of the competing project [NSW Roads and Traffic Authority, 2003].

Lessons Learned: Victoria and New South Wales have taken slightly different paths in structuring toll agreements with the private sector, providing a diverse range of lessons learned.

<u>Melbourne City Link Project</u>

- ***The public sector must compensate the private sector when a competing route is developed and the development results in a loss in revenue for the operator relative to the "base case financial model."***
  - This agreement reassures Transurban that a competing route will only be built in extreme circumstances, due to financial accountability placed on the government.
- ***The state is free to manage and change Melbourne's transportation network to facilitate efficient movement throughout the city.***
  - The City Link toll road benefits from improvements in the overall network that increase accessibility to the toll road creating a seemingly synergistic relationship between the public and private sector.

- Toll agreements should consider how the toll route will fit into the overall transportation network of the region, promoting connectivity between routes.

- ***The private sector still undertakes a high level of financial risk.***
  - Transurban remains responsible for meeting traffic and revenue projections and does not have government financial backing if there is a revenue shortfall from an inaccurate projection.
  - Despite private sector involvement, toll roads are public goods and must be treated as such. If the toll road defaults, the government will inevitably be required to present a financial solution. To avoid this situation, governments should set minimum and maximum revenue levels that the private sector may obtain. The government should compensate the concessionaire when the minimum is not met or receive revenues when the maximum is exceeded.

Red Flags: As with several other approaches to managing traffic competition, the Australian toll agreements have not yet faced serious conflicts. However, based on findings presented elsewhere in this report, there is cause for concern with some aspects of these agreements.

Sydney WestLink M7 Motorway

- ***Renegotiate when a competing facility has an effect on revenues.***
  - It is not clear which terms will be renegotiated or what would constitute an acceptable settlement.
  - With such uncertainties, both parties are exposed to unknown risks.

2.2.2 Canada—ETR 407 in Toronto

Tolling Status: As the largest city in Canada, Toronto has a history of highly congested roads. At eighteen lanes wide and carrying more than 400,000 vehicles per workday, Highway 401 is the most congested road in the metropolitan area. On the drawing board since the late 1950s, the express toll route (ETR-407) is a 68-mile all-electronic open-access toll highway in northern Toronto designed as a bypass to Highway 401 (Figure 2.8). Prior to construction, the Highway 407 Act set up legal procedures and definitions for the toll road, including transfer agreement, management, and liability. Additionally, a new law denying renewal of Ontario license plates for those refusing to pay the tolls provided assurance to toll investors.

Plans materialized in 1993 to create ETR-407 as a private toll concession when the provincial government of Ontario requested proposals based on two pre-qualifying initial value-engineering studies. After reviewing the proposals, the Ontario government decided to accept two proposals, using one for the highway design and the other for the tolling system.

In June 1997 ETR-407 opened as a freeway at a construction cost of $1 billion USD. The freeway was developed as a design-build-operate system, with the contractor responsible for the operations. The final configuration of the roadway varies in width from 4–6 lanes and may ultimately reach 8–10 lanes. In October 1997 ETR-407 began operations as a toll road.

Figure 2.8 ETR 407

Source: http://www.407etr.com

In an interesting twist, the Ontario government recently sold the toll road to the private sector international consortium Cintra-Macquarie (C-M) for $2.1 billion USD (Cintra is also a partner in the venture selected for the TTC-35 project in Texas). The sale to C-M is reportedly the single largest privatization of a government-held asset. The consortium operates a 99-year lease. Shortly after the sale of the toll road, there was a shift in power in Ontario's government. The Liberal Party now in charge does not favor privatization of the toll road and has sued C-M over toll rates, congestion fees, and license plate denial. The courts have ruled in favor of Cintra-Macquarie on a number of occasions, but the political battle continues.

Development of Toll Agreement: The purpose of the Highway 407 Act was to relieve congestion on Highway 401. Seven years after opening, ETR-407 is carrying nearly as much traffic as Highway 401. The sale agreement between the province of Ontario and Cintra-Macquarie included several articles relating to congestion relief and expansion that aim to address fairness and equity between the public and private sectors ("ETR 407 Sale Agreement," 2002). Following are brief descriptions of the articles.

Congestion Relief: The congestion relief article requires payment to the province if toll rates are increased beyond limits based on a projected 2% incremental toll increase and traffic growth rates. The intent of the article is to maintain toll rates that are acceptable to the public and promote congestion relief. As toll rates have increased over the years, citizens have become increasingly resentful of the private toll company. Despite distrust, ETR-407 continues to experience high traffic volumes.

Expansion: The expansion article states that any segment with high traffic volumes should be expanded by adding lanes up to the total design capacity. Instead of competition from the public sector developing a new parallel "free route," the design includes expansion capabilities for ETR-407, actually encouraging additional investment in the toll road. The expansion capability of ETR-407 perhaps explains why there is no non-compete clause in the toll road agreement. Once predetermined traffic volumes have been met, the toll operator has two years to complete the road expansion project.

Lessons Learned:

- ***Having expansion capability can reduce the likelihood of competition.***
- ***Congestion relief projects have lower traffic risk than economic development projects.***
    - ETR-407 has continued to attract traffic because of the existing congestion in the region.

Red Flags:

- ***Public and political opposition remains a central issue.***
    - Change in government has increased litigation.
    - The public has opposed toll rate increases.
    - The 99-year concession period is a concern.
    - The concessionaire should undertake a public relations and marketing effort to assure the public that its interests are being served.

2.2.3 Chile

Tolling Status: During the final decades of the twentieth century, Chilean infrastructure spending was failed to keep pace with economic growth, creating bottlenecks for producers who use the roads, airports, and seaports to market their goods. With the re-establishment of democracy in the 1990s, a top priority for the new government became the development of the country's infrastructure. To gather the large sums required to develop Chile's infrastructure, the government decided to turn to public-private partnerships by offering long-term concession agreements [Constance, n.d.].

In 1994 officials from Chile's Ministry of Public Works began to put together a legal and regulatory framework for infrastructure concessions. The rules of the concession agreement were carefully drawn to ensure that the concession program would be fair and beneficial for both the public and private parties. In the mid-1990s the Chilean government launched the concession program with the initial goal of rebuilding the "backbone" of Chile's highway program, the 1,500-kilometer Ruta 5 from La Serena to Puerto Montt (Figure 2.9). In all, eight individual concession agreements were granted along the route, with a total investment of over US $2.3 billion.

Figure 2.9 Northern Stretch of Chile's 1,500 km Ruta 5 Toll Road

Source: http://www.iadb.org

To date, PPPs in Chile have allowed for improvement of over 2,000 kilometers of roadway at a cost of US $3.3 billion [Lorenzen, Cruz, Barrientos, and Babbar,, n.d.]. Despite the presence of competition from non-tolled facilities, all of the toll projects in

Chile have met or exceeded their revenue targets. Chile's successful use of PPPs has made that country a leading innovator in toll concession programs.

Development of Toll Agreement: A series of amendments to legislation in the 1990s governing the construction, rehabilitation, maintenance, and operation of public works projects has been instrumental in attracting private investment to rebuild Chile's infrastructure. The amended laws, known as the "concession laws," have established a competitive bidding process, provided conflict resolution procedures, and allowed the government to offer incentives and subsidies for private investment.

In addition to legislative changes, the Chilean government formulated a process for accepting and evaluating project bids. The government required that a competitive process be undertaken on all potential projects, with both public and private sector proposals receiving consideration. Once projects were placed out to bid, the government agreed to make a decision to award the project within a year [Lorenzen, Cruz, Barrientos, and Babbar, n.d.].

The revised process for evaluating project bids considers the following criteria:

- rate structure and level
- concession period
- subsidy to be received from the state
- payments to be made by the concessionaire for the use of preexisting infrastructure and other goods and services
- minimum revenue levels guaranteed by the state
- distribution of risks between the state and the proponent during and after construction

The criteria for evaluating project bids is primarily concerned with the risks and costs associated with a project. Throughout the process of developing toll agreements, the Chilean government offers concessionaires financial options to help ensure revenue success, including:

- ***Ability to set and adjust toll rates within minimum and maximum levels established by the government***
    - Minimum and maximum levels are established by the government each year based on the consumer price index.
- ***Opportunity to achieve a predetermined revenue projection based on net present value, rather than operating within the limitations of a set concession period***
    - This reduces the importance of accurate traffic forecasts.
- ***Compensation for concessionaires that are unable to meet yearly revenue projections***
    - Concessionaires that do not meet 80% of yearly revenue projections are compensated by the government.

- Concessionaires exceeding yearly projections are required to compensate the government with 50% of excess revenues.

To ensure that concession agreements avoid conflict, a conciliation commission is created when the concession agreement is signed. The conciliation commission consists of three representatives, one each from the concessionaire and public sector, and the third a mutually chosen representative. If a conflict occurs between the concessionaire and the government, the conciliation commission has thirty days to attempt to resolve the conflict. If the conflict is not resolved, both parties go into arbitration.

Lessons Learned: The experience gained during the implementation stage of the Chilean toll program has yielded several lessons learned for the benefit of future Chilean and foreign toll programs.

- ***Toll road development is a long process.***
  - Of the 12 concession agreements established in Chile, on average 8 months were spent in the planning and bidding process.
  - An additional 8 months were required to sort out administrative issues between the concessionaire and government.
  - Time to construct and open the toll road was between 33–45 months.
- ***Innovative financial arrangements help to minimize public financial contributions.***
  - Investors were allowed to achieve a predetermined financial return rather than offer a franchise for a set time period.
  - In cases where franchise agreements included a set time frame, franchise period extensions were allowed if the investors did not meet their financial goals or debt payment schedule by the end of the franchise.
- ***Minimum revenue guarantees are a key factor in providing comfort to investors and financers.***
  - Banks viewed the minimum revenue guarantee as crucial to mitigating risks, creating an easier process for concessionaires to secure loans through lending institutions.
- ***Free parallel routes do not necessarily compete with toll roads.***
  - Tolls are viewed in Chile as one item in the total cost of transportation.
  - Non-tolled routes remain available at a reduced level of service.
- ***Innovations are needed to deal with international economic downturns.***
  - The economic crisis in East Asia in the early 1990s caused Chilean interest rates to increase, but the negative effects were offset by the availability of cheap labor due to a slowdown in construction.
  - Approval of an exchange rate guarantee mechanism enabled foreign financers to become involved in construction projects.

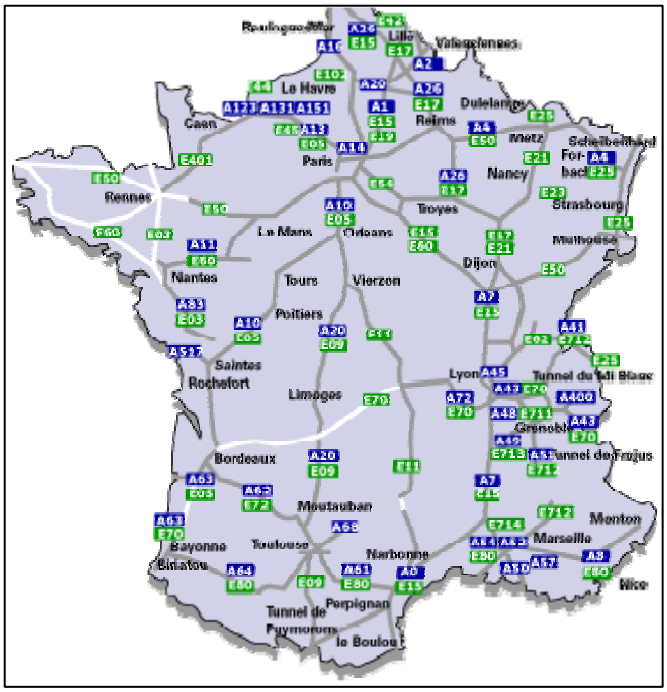
- ***Conciliation commissions must have flexibility.***
  - The commission does not operate as intended due to the inability of the government representative to act as an uninhibited commission member making objective decisions.

2.2.4 France

Tolling Status: Following World War II, French infrastructure was in disarray. In 1955 the French government created the Toll Act to spur infrastructure development. The Toll Act authorized the creation of state-owned toll road companies and granted the right to levy tolls to finance the construction, maintenance, and operation of highways in France [Biscayne, 2003].

As a result of this move, toll roads presently account for 8,000 of the 10,000 kilometers of national highways in the country (Figures 2.10 and 2.11). The Association des Societies Francaises d'Autoroutes (ASFA) oversees the concession of the toll network to eleven publicly and privately owned companies. In 2004 new legislation provided the legal mechanism required to form public-private partnerships on highway projects. The aim of the new legislation is to overcome concerns that many of the remaining road projects offer low revenue-generating potential that cannot be offset through toll charges. A major project underway that is benefiting from the new legislation is the construction of a $2 billion toll tunnel to complete the missing link in the A86 Paris ring road [Reason Public Policy Institute, 2004].

Figure 2.10 Map of French Road Network



Toll roads in gray

Source: http://www.bpplus.com

Figure 2.11 French toll road

Source: http://www.autoroutes.fr

Development of Toll Agreement: With 50 years of tolling experience, France has a well-established process for developing toll agreements. First, the government makes the decision to build a road following preliminary impact studies and consultation with regional authorities. Next, the government enters into discussions with the public, dealing with their concerns over the proposed route. Once public concerns are resolved, the government obtains right of way for the road and awards a concession agreement

following a competitive bidding process. The chosen concessionaire has the responsibility for financing, construction, operation, and maintenance of the roadway for a specified period. The concessionaire generates revenues through tolls and does not generally receive any funds from the government [Autoroutes, n.d.].

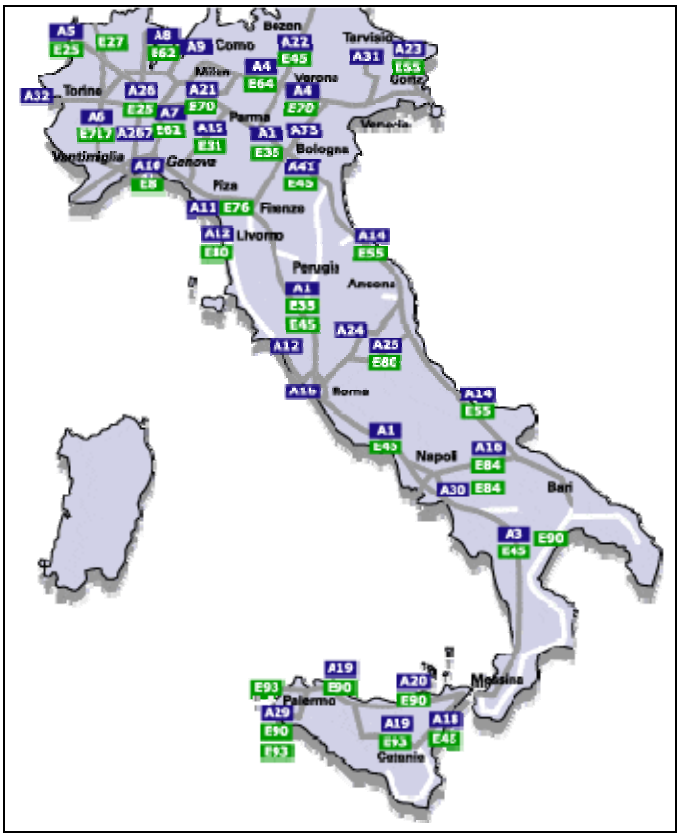
Lessons Learned:

- ***France's concession strategy encourages cooperation rather than competition between the public and private sectors.***
  - The government effectively identifies the best routes and resolves all issues before turning the responsibilities over to the private sector.
  - The French government decides if a route will be tolled using private financing to allow concessionaires to compete with each other rather than with publicly funded projects, creating a level playing field for the private sector.
  - The public and private sectors understand and respect the roles that each side plays in developing transportation projects, contributing to the success of the French road network.
- ***Future road projects may require subsidies from the government.***
  - Only low-revenue-producing roads are left to be developed, requiring government subsidies for the roads to get built.
  - There is a potential for public backlash over "double-taxation."

2.2.5 Italy

Tolling Status: In 1956 a concession agreement was signed between Societa Autostrade and the Italian government for the construction and management of the main north–south artery on the Italian peninsula, the 800-kilometer Milan-to-Naples route. Due to the success of the arrangement, the Italian government continued to enter into concession agreements with Autostrade over the next few decades. By 1982 Autostrade was responsible for over 2,600 kilometers of roadway throughout Italy (Figures 2.12 and 2.13). Later in the decade, Societa Autostrade evolved into a publicly traded company on the Italian Stock Exchange as the Autostrade Group [Autostrade, n.d.].

Figure 2.12 Map of Italian Road Network



Toll roads in gray

Source: http://www.bpplus.com

Figure 2.13 Italian toll road

Source: http://www.autostrade.it

In 1990 Autostrade introduced the world's first dynamic toll payment system, Telepass, on the Italian toll network. The Telepass system operates on more than two dozen toll motorways in Italy and has been marketed to other toll ventures throughout the world. In addition, Autostrade has been heavily involved in development, construction, and financing for a number of toll projects outside of Italy, including the Dulles Greenway in Virginia, the M6 Toll Road in Birmingham, United Kingdom, and the Europass in Vienna, Austria. As the decade drew to a close in 1999, the Italian government made the decision to privatize the Autostrade Group for $6.7 billion USD.

Today, the Autostrade Group is responsible for overseeing the construction and management of Italy's 3,408 kilometers of toll roads provided by smaller concessionaire companies. Autostrade is the largest toll concessionaire in Europe. On average, four million people, equal to 8% of the Italian population, use the toll network every day. The Autostrade Group and the government have worked hand in hand for nearly fifty years to establish tolling in Italy and appear poised to continue their prosperous relationship into the future [Autostrade, n.d.].

Development of Toll Agreement: The privatization of the Autostrade Group in 1999 represents the great deal of confidence that the Italian government has in the company's ability to provide effective transportation solutions throughout the country. The focus of the Autostrade Group is to ensure maximum performance of the motorway network and constant improvements in safety and service offered to customers by increasing the level of innovative services. Autostrade takes this focus into account in each of its agreements with subcontractors that supply construction, operation, and maintenance services on the national toll network. Since privatization, the company has the primary responsibility for ensuring the success of the toll network. Toll agreements are between private sector parties, so the issue of competition between the public and private sectors is non-existent in Italy.

Lessons Learned:

- ***Connectivity of the toll network has been a key contributor to the success of tolling in Italy.***
  - Similar in operation to the U.S. Interstate System, the Italian toll network provides efficient movement within the country.
  - As part of a connected system rather than individual segments, each new road project relies on the existing network for success.
- ***Innovations in electronic toll collection have encouraged use of the toll network.***
  - The Telepass electronic payment system is used on the entire toll network, allowing for improved traffic flow on all segments.
  - Electronic tolling systems improve drivers' perception of the road network, increasing use and support for the system by the public sector.
  - New road projects should be built using electronic toll collection systems as a means of generating improved traffic flow and improved public perception. Existing toll networks should consider going to an electronic toll collection system.

2.2.6 China—Jihe Expressway in Shenzhen

Tolling Status: On July 1, 1997, Hong Kong reverted from British colonial rule back to that of communist China. As a key gateway between Hong Kong and mainland China, the city of Shenzhen faced increased traffic volumes. To help alleviate traffic congestion in the region, the six-lane, 44.6-kilometer Jihe Expressway was constructed in

the late 1990s at a cost of RMB 2.18 billion ($263 million USD). The privately operated Shenzhen Expressway Company (SEC) has the concession rights for the operation and management of the Jihe Expressway. Additionally, SEC is the only enterprise allowed to operate and manage toll highways within the jurisdiction of the Shenzhen Municipal Government (SMG) [Shenzhen Expressway Company, n.d.]. Currently, the company operates six toll roads and has ten more under construction in the region. The Jihe Expressway has been the most successful toll road for the SEC, with a 28.6% increase in traffic volume in the last year alone [Lam, 2005].

Development of Toll Agreement: The concession agreement between the Shenzhen Municipal Government (SMG) and Shenzhen Expressway Company (SEC) at first glance appears to be a genuine attempt at a pure public-private partnership in a communist political system. After further review, it appears that this is not entirely the case. SEC is 30.03% controlled by parent company Shenzhen International Holdings (SIH). SIH is in turn 40.26% controlled by SMG. Additionally, SMG has a 20.99% direct holding in SEC ["The Shenzhen Connection," 2003]. Thus, it comes as no surprise that SEC has sole concession rights for the development of toll roads within the jurisdiction of the SMG. Current and future toll road agreements between SEC and SMG will inevitably reflect the desires of the local government authorities.

Lessons Learned:

- ***In China the communist political system allows for rapid development of infrastructure projects, including those providing transportation solutions in fast-growing areas, such as Shenzhen.***

Tolling is being pursued as an effective means for funding road projects in the region and is poised to provide funding into the future as traffic volumes continue to grow between Hong Kong and the Chinese mainland. Opportunities for private sector involvement may continue to be allowed, but under the current Chinese system, the opportunities may not be purely private in nature.

2.2.7 Ireland

Tolling Status: Recent emergence of a thriving Irish economy combined with a steady population growth rate has given rise to the need for an improved transportation infrastructure. To meet the needs of Irish citizens, the National Development Plan (NDP) was instituted in 2000 providing, €52 million ($53.5 million) to fund major public works projects over a six-year span [National Toll Roads in Ireland, n.d.]. Included within the NDP are provisions for development of a national roads network.

Oversight and implementation of the planned road network fall under the responsibility of the National Roads Authority (NRA). To develop the ambitious roads program, the NRA has begun to enter into public-private partnerships. It is estimated that through public-private partnerships, an additional €2.4 billion ($2.47 billion) from the private sector will be used to develop national roads [National Toll Roads in Ireland, n.d.]. In all, eleven road schemes have been identified as potential public-private partnerships. Three public-private partnerships in particular, the N8 Rathcormac-Fermoy

Bypass, N1/M1 Dundalk Western Bypass, and the N4 Kilcock-Kinnegad route are in the construction phases and will operate as toll roads upon completion.

Development of Toll Agreement: The NRA has identified a number of key principles that must be addressed when a public-private partnership is created:

1) No delay should occur in building roads as a result of a PPP.
2) An alternative toll-free route is required but need not provide the same level of service.
3) Toll roads must be spread across the national network to create an equitable distribution of user charges.
4) Road projects must be of sufficient size to be considered for a PPP.
5) The public will consider subsidizing private investors for large toll projects.

These principles apply to all three toll roads currently under construction. However, each toll project has different levels of risk allocation between the public and private sectors.

N1/M1 Dundalk Western Bypass: The N1/M1 Dundalk Western Bypass will become an 11-kilometer bypass around Dundalk as a part of the national primary route N1/M1 from Dublin to Northern Ireland. The Celtic Roads Group (CRG) was awarded the contract to enter into a PPP in 2004. In the PPP, CRG accepts the responsibility of design, construction, financing, operation, re-investment, and maintenance of the road for a concession period of 30 years. CRG also is given the operation and maintenance contract for 43 kilometers of existing roadway within the Dundalk region. Finally, CRG is expected to convert all existing toll facilities to electronic tolling and is required to invest in the 54 kilometers of roads prior to expiration of the concession agreement. When the road is transferred back to the public sector, the road must remain in satisfactory condition for a 10-year span. In this agreement, the public sector covers the cost of right of way, but makes no other financial commitments. In addition, toll revenues above specified traffic volumes will be paid to the NRA to prevent windfall profits to CRG if revenue exceeds traffic projections [National Toll Roads in Ireland, n.d.].

N8 Ratcormac-Fermoy Bypass The N8 Rathcormac-Fermoy Bypass is an 18-kilometer stretch of roadway on the N8 national road from Cork to Dublin. The Direct Route Ltd. consortium accepted the responsibility for design, construction, maintenance, operation, re-investment, and financing over the length of the 30-year concession agreement starting in 2004. Similar to the Dundalk Western Bypass agreement, Direct Route Ltd. is required to ensure that the road will be in satisfactory condition for 10 years after the agreement expires and must compensate the NRA if toll revenues exceed projections. However, in this example the NRA has agreed to make fixed and consistent payments totaling €80 million ($82.4 million) during the period of construction and €40 million ($41.2 million) during the period of operation [National Toll Roads in Ireland, n.d.].

N4 Kilcock-Kinnegad Route: The N4 Kilcock-Kinnegad Route involves the construction of 39 kilometers of roadway between Kinnegad and Kilcock along the N4/N6 Galway to Dublin route. In 2003 the concessionaire company EuroLink entered

into a PPP with the Irish government. EuroLink accepted the responsibility for design, construction, maintenance, operation, re-investment, and financing under a 30-year concessionaire agreement. In this agreement the NRA will compensate EuroLink €146 million ($150 million) during construction and €6 million ($6.18 million) during operations. EuroLink agrees to share toll revenues above fixed projections and is responsible for guaranteeing a 10-year life span on the road upon termination of the concession agreement [National Toll Roads in Ireland, n.d.].

Lessons Learned: As a newcomer in tolling, Ireland has the opportunity to apply lessons learned from tolling experiences around the world.

- ***Each of the three toll agreements applies different levels of risk allocation based on the varying financial feasibilities of each toll route.***

Once the roads become operational, the Irish government will be able to determine which strategies provide the best opportunity for success within the country.

2.2.8 Mexico

Tolling Status: In the 1980s Mexico's massive highway system consisted of approximately 333,000 kilometers of national and local roads that were in dire need of maintenance. Due to a lack of available public funds, the Mexican government turned to the implementation of toll roads. In the mid-1980s the government began to develop toll roads overseen by the Secretariat of Communications and Transportation (SCT). As a result of an escalation in toll road development, Mexico's private toll road program more than doubled the national road network, from 4,500 kilometers in 1989 to 9,900 kilometers in 1994 (Figure 2.14). Operation of the expanded toll network became the responsibility of 53 concessionaires overseen by SCT [Gomez-Ibanez, 1997].

Figure 2.14 Mexican toll road

Source: http://www.sct.gob.mx

Resulting from poor management by SCT combined with a national economic crisis, the government was forced to step in and take over the toll road program in 1997. Since the debacle, toll road agreements and financing methods have been restructured to ensure stability of the toll road program. Today, the government remains in control of the

toll road program and is working toward developing financial solutions to pay back the construction debt.

Development of Toll Agreement: Toll agreements in Mexico in the 1980s failed to provide security for the public and private sectors. Originally, SCT took the responsibility for developing the toll road program using the following requirements as a guide:

- SCT would select the routes to be offered for concession.
- A parallel free route would be made available to road users.
- SCT would provide the bidders with preliminary plans, specifications, and traffic projections.
- Concessions would be awarded to the bidders offering the shortest concession period (not to exceed 15 years).

While some governments have found success using a government entity to oversee all aspects of toll road implementation, in Mexico that was not the case. Often preliminary plans and projections provided by SCT were inaccurate or incomplete, and the requirement of a "free" parallel route kept road users off of the tolled system. The requirement that concessions be offered to the lowest bidder forced bidders to state concession periods that they could not achieve in order to win the project bid ["New Model for the Concession of Toll Roads," 2004].

Lessons Learned: The failure of the original toll program taught the Mexican government a variety of lessons that have been applied to rebuilding the national toll program.

- ***Shortcomings existed in the bidding process and concession design.***
  - The standards for bidders submitting a concession proposal did not require a detailed financial plan.
  - The project award criteria favored local construction companies that were not interested in the long-term financial viability of a project
  - High-priority segments were never concessioned, creating poor connectivity of the entire road system
- ***Financial shortcomings***
  - Projects were financed under a loose cost-plus construction arrangement or none at all
  - Commercial banks were used for construction loans with the expectation that upon project completion debt service would shift to local banks. Revenue shortfalls kept this from happening, forcing loans to be restructured, and interest rates were driven up.
  - Liquidity dried up in the market as a result of early projects being unable to meet debt service requirements, making it impossible for banks to be able to refinance loans

- Independent engineers rarely were used to assess project costs

- ***Governmental shortcomings***
  - Understaffed SCT led to lengthy permit approval process and poor enforcement of concession requirements.
  - There were shortcomings in traffic studies conducted by SCT due to lack of expertise within the department.
  - Frequent change orders from SCT resulted in cost and time overruns of projects.
  - There were poorly defined procedures and bureaucratic delays.

From this experience the Mexican government has learned that future toll agreements need to provide for the encouragement and room for maneuverability that the private sector needs, while minimizing the government's exposure to a host of commercial and financial risks. Lessons learned from the failure of the Mexican toll network serve as a guide for the future of toll financing in Mexico.

2.2.9 South Africa

Tolling Status: To address a funding shortfall for road projects, South Africa turned to tolling in the 1980s. To date, South Africa has 2,500 kilometers of toll roads (Figure 2.15). The network of toll roads is split between 1,200 kilometers of publicly owned toll roads and 1,300 kilometers of toll roads owned by private concessions under a build-operate-transfer (BOT) scheme [Pienaar, 2002]. With strong political backing, tolling continues to be the preferred method of delivering road projects in South Africa. In all, six road projects covering 1,250 kilometers are being considered as future toll projects involving the private sector. At the top of the list is the creation of a tolled loop around Cape Town.

Figure 2.15 South African toll road

Source: http://www.roadtraffic

Development of Toll Agreement: Initially, when a toll road was developed in South Africa, road authorities were required to provide and maintain an alternate route for those wishing to avoid the toll facility. The alternate non-tolled facility did not have to be built to the same standard as the toll road. The legislation that created this regulation has since been amended, and in many cases the toll route has become the only option for road users. With a growing number of toll roads owned by the private sector, the South African government has been willing to entertain non-compete clauses. A typical agreement between the government and the concessionaires in South Africa on the issue of competing roads is as follows [Harmse, n.d.]:

- If the Agency or any authority other than the Agency increases the capacity of any competing roads resulting in a material adverse economic impact on the Concessionaire, as determined by the Independent Engineer after claim is made by the Concessionaire, then the Agency will ensure that the Concessionaire is placed in the same overall economic position that it would have been otherwise.
- The Agency ensures the economic viability of the concession by allowing an increase in the toll rate, the construction of additional toll plazas, an extension of the concession period and/or other means.
- No amount is owed to the concessionaire if during the original 12 months of operation from a competing road, the Concessionaire receives more than 20% of forecasted gross toll revenues.
- "Increase in capacity" only pertains to an increase in the number of lanes, excluding the construction of standard width hard shoulders.

Lessons Learned:

- ***Capacity increase is defined in the toll agreement.***
  - The state is free to authorize capacity addition.
- ***Instead of compensation for the effects of a competing route, alternative financial incentives are provided.***
  - The South African government allows the private concessionaires to raise toll rates, add toll plazas, or extend the concession period.
  - Financial burden is lifted from the public sector, assuming that the private sector is able to recover revenues losses through these measures.
- ***A geographic zone identifying the location of competing routes is not provided.***
  - Independent engineers are left to make the determination of where a competing route may exist.

2.2.10 Spain

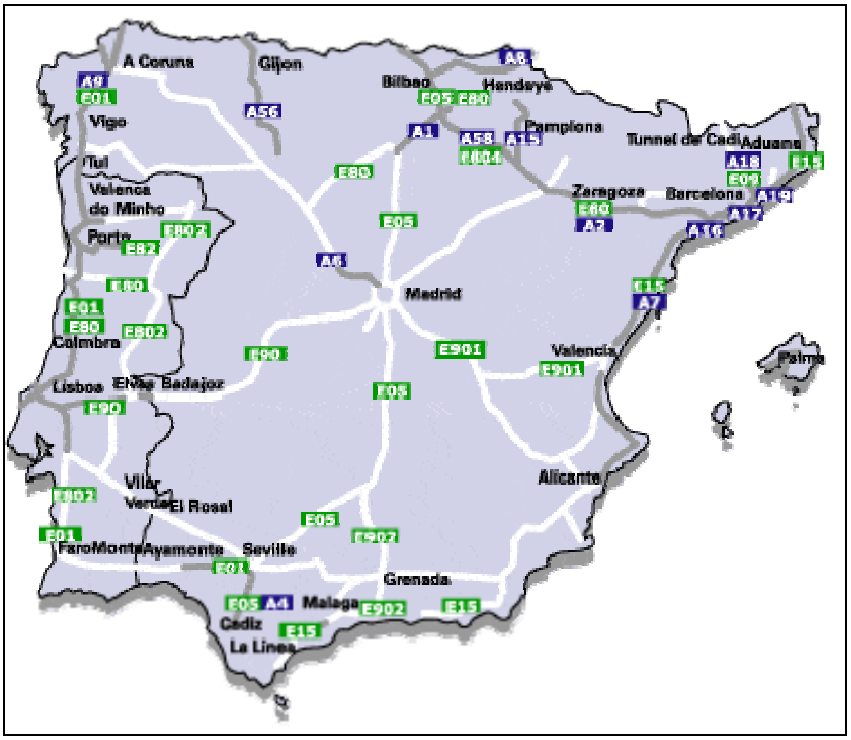
Tolling Status: Toll roads have been an integral part of the Spanish road network since the 1960s in response to demands placed on the network by a booming tourist industry. Due to the lack of available public funds, the government turned to toll financing to construct the National Roads Programme. In October 1972 legislation was passed authorizing the state to establish standards, technical considerations, and financing structures for toll roads. In the same decade, failed concession agreements resulted in the nationalization of three of the eleven concession holders (14% of the road network) into the state-owned Empresa Nacional de Autopistas (ENA) [Rebollo and Remiro, n.d.].

In 1996 the Conservative Party gained control of the government, granting priority for private infrastructure investment within the newly established National Infrastructure Plan 1996–2007. The National Infrastructure Plan called for an expenditure

of €112 million ($115 million) on various public works projects, €33 million ($34 million; 30% of total investment) coming from private funds. In addition to an increase in the use of private funds for developing the road network, the federal government has passed a number of the responsibilities for planning and managing roads onto regional and local governments.

In 2003 the Spanish government privatized a major portion of its state-owned toll road sector, reaping $1.8 billion in exchange for concessionaire companies operating the existing toll road system for terms ranging from 34 to 75 years [Reason Public Policy Institute, 2004]. Today, there are over 2,200 kilometers of toll roads (gray-lined in Figure 2.16) throughout the country, owned and operated by either the state or one of the twenty-seven private consortiums represented by the Associacion de Sociedades Espanolas Concesionarias de Autopistas, Tuneles, Puentes y Vias de Peaje (ASETA).

Figure 2.16 Map of Spanish Road Network



Toll roads in gray

Source: http://www.bpplus.com

Development of Toll Agreement: Most of the Spanish toll network has been built using the concessionaire model. Under this model, toll motorway companies are responsible for financing, construction, maintenance, and operation of a toll road for a fixed time period. The following stipulations apply on toll agreements between the government and concessionaires in Spain [Vasallo, 2004]:

- At the end of the fixed concession term, all responsibilities for the toll facility return to the state.
- Risk involved with the construction and operation of a toll facility rests solely with the private company, with the exception that the public agency may cover damages from unforeseen circumstances.
- Concessionaires achieve revenues either through the commonly used toll charges or the occasionally used shadow tolling, where the government pays the concessionaire over a set period of time upon project completion.

Lessons Learned: The recently replaced Spanish government favored privatization of the toll network. Following in the footsteps of Italy, Spain privatized a major portion of the state-owned toll sector in 2003. Unlike Italy and more like France, the Spanish government deals with a number of concession companies to operate and maintain the national road network. Considering this, the Spanish government must be conscious of ensuring that an efficient and connected road network is created and maintained between the concessionaires. As Spain continues to favor privatization, complete privatization of the entire road network under one concessionaire could ensure that an efficient and connected system is provided.

2.2.11 United Kingdom

Tolling Status: Compared with other developed countries, the United Kingdom has been a latecomer in the implementation of tolling. The United Kingdom's first major toll road, the M6 Motorway in Birmingham, opened on December 2003 after twenty years of planning and legal issues (Figure 2.17). The M6 Motorway is a £900 million (~$1.7 billion) project spanning 27 miles with 3 lanes in each direction. The private sector toll concessionaire of the M6 Motorway is Midland Expressway Limited, which includes Macquarie Bank of Australia and Autostrada of Italy. The concessionaire has a 53-year agreement with the government.

Figure 2.17 M6 in Birmingham

Source: http://www.m6toll.co.uk

Development of Toll Agreement: The original concept of building a highway to alleviate congestion on the old M6 began in 1980 in the form of a proposal for a new publicly funded motorway. In 1989, after years of consultation and public inquiry on the publicly funded scheme, the government announced that the road would be built by the private sector, and attention turned to devising a toll agreement. In 1991 the New Roads and Streetworks Act provided the government power to toll new infrastructure and control how tolls would be levied on the M6 Motorway. To construct the motorway, a BOT scheme was used. After a competitive bidding process, Midland Expressway Limited (MEL) was awarded a 53-year concession agreement. The agreement did not, however, include a non-compete clause. Due to extreme congestion along this heavily

traveled route, another parallel toll route is being planned. The new toll route will provide a third route to facilitate traffic movement in northeastern Birmingham, potentially undermining the revenue-generating potential of the existing M6 Motorway.

Lessons Learned: As the first major toll road in the United Kingdom, lessons learned from the M6 Motorway experience should be applied to all future toll agreements in the country. These lessons may also be applied in states such as Texas where tolling is a relatively new concept. The major lessons learned from the M6 Motorway include:

- ***Put legislation in place and address public concerns before developing toll plans.***
  - Development of the M6 Toll Road became a twenty-year process due to public opposition and a lack of enabling legislation.
- ***Consider long-term demand in planning capacity additions.***
  - Without a non-compete clause a parallel route is already being developed within the region of the M6 Toll Road.
- ***Establish a process for changing toll rates.***
  - The government controls how tolls are charged along the M6 Motorway, but the toll rate is the responsibility of the toll concessionaire MEL.
  - MEL must consider more than profits when setting toll rates. Speculative toll rates along the route have received media attention and public dissent. A Macquarie executive was quoted as saying that they could charge "whatever they like" along the toll road, resulting in his resignation ["The M6 Toll Road Case Study Revisited," 2004].

2.2.12 Summary of International Case Studies

Eleven international case studies have been presented. These examples provide different approaches to toll agreements that address many of the underlying risks. Several countries are successfully experimenting with innovative approaches. Canada was able to build a new toll road in the Toronto region, where there are two non-tolled parallel routes, and then lease it to a private operator for a substantial sum. Australia is widely acclaimed as a forerunner in building and operating toll roads in regions similar to Texas. Chile is perhaps the leader in innovation regarding toll agreements. France, Italy, and Spain are using a regional franchise approach that treats the toll system as a public utility and regulates it under managed competition. In Chapter 3 best practices from these countries and from the previously presented U.S. case studies are discussed.

Chapter 3. Best Practices

3.1 Introduction

Synthesizing the results of the case studies of Chapter 2, this chapter presents best practices in toll development agreements for both the public and private sectors. As states continue to grapple with diminishing public funds to meet the demands for a new and improved transportation infrastructure, public-private partnerships (PPPs) have been increasingly sought by state departments of transportation (DOTs). In most cases, PPPs provide the opportunity to build projects more quickly and at a lower cost. Such partnerships require risk sharing, which must begin with an evaluation of each party's objectives and respective ability to bear risks. The objectives and associated risks in transportation investments are outlined below.

Public Sector Objectives: The objectives of DOTs include:

- add network capacity (increase mobility; reduce congestion) more quickly than by traditional tax-funded means
- move to a self-sustaining transportation financing mechanism
- borrow against future revenue
- assist the economic development of a region
- encourage more efficient use of transportation infrastructure
- support a legislative or political initiative

All of these objectives may not be explicitly considered when a DOT contemplates tolling. The associated risks include:

- added costs for project acceleration and oversight of the private sector
- possibility of revenues not meeting commitments
- development/traffic growth not occurring where or when forecasted
- suppression or displacement of economic activity
- public opposition to tolling
- loss of political support

Private Sector Objectives: Private sector objectives include:

- bring private-sector efficiencies to transportation provision
- create investment opportunities for private capital
- create employment for construction resources
- make a reasonable profit on investment

Again, not all of these objectives may apply to a project or an investor. Associated risks include:

- inability to translate efficiencies into revenue
- competition
- low or negative return, especially in early years
- changes to the contract

Risks should be assigned to the party best able to mitigate them [World Bank, 2000]. The key to successful PPP is the ability to strike a balance in the allocation of risks between the public and private sectors, while allowing both parties the opportunity to achieve their respective objectives. In this chapter, the risks faced in transportation investments will be discussed under financial, legal, planning, operational, regulatory, and political headings.

Financial Issues Investment banks require a projected annual revenue/expense ratio of 1.25 to 1.30 to consider a project as viable and for it to earn an AAA bond rating [Standard and Poors, 2004]. Weaker bond ratings force up the lending interest rate, while tax-exempt bonds attract favorable lower rates. So-called 63-20 corporations are non-profit enterprises able to sell tax-free bonds and operate toll franchises. Development rights and concessions can add to revenues. A simple rule for bond capacity of a toll project is

(Net Annual Revenues Estimated for Years 10–15)/(Interest Rate)

To hedge against low revenue in the early years, bond companies often require a reserve fund of 20–25% of the bond amount. A guarantee to cover bond payments or expenses can reduce the amount borrowed. For example, TxDOT will cover maintenance costs for SH 130 of approximately $800 million over 35 years. Financing of new projects can be affected by debt refinancing rules.

Legal Issues: TxDOT has many options for toll agreements, ranging from build-own-operate (BOT) to pass-through tolls. Utilizing the most appropriate contract type can reduce the need for a non-compete clause. For example, if the desire is to get the project built as soon as possible, then a shadow tolling arrangement can speed up project financing. Terms of contract termination are also critical; generally a toll facility reverts to public ownership when bond debt is retired. The period of concession could be affected by revenue performance, whereas profitability could bring calls for buyout. Another major concern for investors is the possibility of changes in law over the typical 35-year life of a toll agreement.

Planning Issues: A toll facility attracts traffic if users save time, experience low congestion, have a reliable travel time, perceive greater safety, and/or have a comfortable trip. Toll prices, lack of access from origins to destinations, and inconvenience are factors that discourage users. For example, an early conflict on SH 130 was over the location (western/near route versus eastern/far route). Decisions on regional transportation plans should remain in the public sector.

Toll agreements should explicitly define thresholds for adding capacity to the system, including ramps and connections. Safety-related projects must be exempt from non-compete clauses. However, certain other projects could create disputes, for example, signal synchronization projects on alternate routes. Defining acceptable improvements to alternate routes can reduce conflicts over competition.

Operations Issues: Operational issues are of concern to the DOT in managing the non-tolled system. Signing, both on the tolled system and on the adjacent accesses, must conform to standards. Interoperability among multiple toll operations is desirable. Toll projects can create congestion at entrance and exit segments, causing conflicts over connections. Diversion of toll evaders to local streets can be a problem. Maintenance and safety management are additional areas of concern. For shadow tolling contracts, lane availability is a source of dispute. Operational agreements between DOT and toll operator can have significant effects on traffic share.

Regulatory Issues: Public support for tolling depends on the ability to regulate the operator's activities. Examples include environmental stewardship, advertising controls, users' privacy concerns, and toll rates. Gradual toll escalation over time is more acceptable to motorists than sudden significant increases. While these factors may only marginally impact competition, they directly affect project revenues.

Political Issues: One source of uncertainty in long-term investments such as toll projects is political support. Each risk mentioned is increased or decreased depending on the political climate. An exit strategy is essential in the event of total contract breakdown. It is therefore necessary to include clauses that may protect investors from political interference.

3.2 Best Practices for the Public Sector

Public sector initiatives are intended to improve quality of life at a reasonable cost. Transportation solutions can improve quality of life for the public, by providing congestion relief or by creating economic development opportunities. Toll projects allow elected officials to increase road capacity in a timely manner without raising taxes. Tolling is therefore being viewed by DOTs as a solution for shortfalls in financing.

The following discussion of public sector best practices with regard to toll development agreements focuses on the public's desire for transportation improvements at minimum cost and shortest time of delivery. Not all the practices discussed will directly relate to the issue of non-compete clauses, but in stressing financial outcomes, they all address the underlying issue of financial exposure. Each best practice is accompanied by a header showing the nature of the risk and whether the best practice provides a potential alternative to a non-compete clause. Additionally, a matrix of best practices is provided in Appendix A of this report.

3.2.1 Public Sector Best Practices in Financial Issues:

- ***Require a competitive bidding process and establish a defined set of tools for evaluating bids.***

Nature of Risk	Alternative to NCC?
Project cost: PPP could be more expensive than publicly funded projects (costs of administration, legal, borrowing, interest, profit).	No

PPP projects could cost the public sector more than publicly funded projects because of administrative and legal costs coupled with the costs of borrowing and interest payments, as well as the profit margin required by the investor. Moreover, if the contractors are aware of the revenue estimates for the project, they may bid up to that level. The public sector must have a competitive bidding process and must establish a set of tools for evaluating bids. Evaluation must include both technical and financial aspects of bids and a way to compare the value of each. Competitive bidding at project inception is not an alternative to a non-compete clause.

- ***Estimate the value of Real Options in calculating project feasibility.***

Nature of Risk	Alternative to NCC?
Project value: ultimate value of franchise not properly calculated	Yes

Most projects ultimately are built out larger than originally planned. This expansion results from taking advantage of opportunities as demand changes or grows. Thus the Florida system has continued to expand as development and traffic patterns change. Each expansion resulted in increased revenue, and thus better project feasibility [Persad and Bansal, 2004]. Real Options is a technique for estimating the value of flexibility to alter the configuration of a project at any point in its life. The technique requires evaluation of multiple expansion scenarios and associated probabilities based on potential traffic growth. In most instances, Real Options increases the net present value (NPV) of a project [Brandao, 2004]. Explicitly itemizing potential expansions in a toll agreement would allow the investor to do his own estimate of potential additional revenues and could be an effective alternative to a non-compete clause. (Note: The Center for Transportation Research is conducting research on the value of the Real Options for toll projects, and preliminary results for SH 130 [forthcoming] indicate that the NPV would increase by over 20% under highly probable expansion scenarios.)

- ***Establish minimum and maximum guarantees.***

Nature of Risk	Alternative to NCC?
Guarantees/subsidies: greater than expected; over-commitment; effect on other commitments	Yes

In its zeal to attract private investors, the public sector may over-commit on contributions, guarantees, or subsidies. In many cases the public sector offers to contribute the cost of right of way for toll projects. In some cases responsibility for maintenance is assumed by the state. It was seen in the Chilean case study that offering a guaranteed minimum revenue is an effective means for reassuring investors. However,

sometimes subsidies may be higher than anticipated, becoming a drag on the state's ability to support other projects. In conjunction with its minimum revenue guarantee, Chile also established a maximum rate of return. In instances where revenue exceeds specified levels, a portion of the excess goes to the state. As a best practice, the public sector should not only offer minimum revenue guarantees, but also prescribe maximum annual rate of return, allowing the public sector to benefit from profitable routes. As a risk-sharing arrangement, this provision is an alternative to a non-compete clause.

- ***Set standards and define categories for expenditures if guaranteeing minimum return.***

Nature of Risk	**Alternative to NCC?**
Private monopoly: guaranteed return on investment, so unnecessary expenditures	Yes

Instead of offering a minimum revenue guarantee, some public agencies offer a guaranteed minimum rate of return. A potential downside to this guarantee is the possibility of investors inflating expenditures. As with cost-plus contracts, the public sector must avoid overpayments by setting accounting standards and defining acceptable expenditures. With appropriate safeguards, guaranteeing minimum rate of return is an alternative to a non-compete clause.

3.2.2 Public Sector Best Practices in Legal Issues

- ***Require the construction contractor to obtain adequate performance bonds.***

Nature of Risk	**Alternative to NCC?**
Non-completion: default during construction; DOT has to complete project with other funds.	No

As in the construction of any project there is the potential for the contractor to default, leaving the project incomplete. In such a situation, the DOT would face exposure to additional costs in finishing the project. While it is standard practice to have a performance bond in a construction contract, the unique schedule and cost characteristics of toll projects require that the amount of bonding be carefully considered, as has been the case in the Texas EDA. This best practice is not an alternative to a non-compete clause.

- ***Include a re-bidding process at the end of a defined stage.***

Nature of Risk	**Alternative to NCC?**
Franchise entrenchment: Franchise becomes powerful, prevents competitors from entering.	Yes

In situations similar to European toll agreements where the public sector offers a toll road developer a franchise agreement, there is potential for franchise entrenchment to occur. As the franchise expands, competing developers may find it hard to enter the marketplace. A re-bidding process at defined stages in the agreement may result in the public sector being able to garner a higher price for the franchise. Paradoxically, this provision, in creating competition among potential franchisees, may actually reduce the need for a non-compete clause.

3.2.3 Public Sector Best Practices in Planning Issues

- ***Use innovative approaches to get less attractive segments completed.***

Nature of Risk	**Alternative to NCC?**
Project selection: Only financially attractive projects may be selected. Economically beneficial projects or necessary connections may not be built.	Yes

As seen in the Colorado case study, only financially attractive projects are likely to be chosen by private investors. However, to achieve connectivity or to provide benefits to smaller communities, lower-feasibility segments must also be built. For example, to ensure corridor completion, TxDOT sought bids for the entire TTC-35 corridor. Alternatively, surplus revenue from more profitable segments could be used to subsidize less trafficked segments, as in Florida. In Ireland the support incentives offered by the government are matched to the feasibility of a route. All of these approaches implicitly bind the public sector to the private sector in ensuring a successful outcome to the toll project, and are therefore viable alternatives to a non-compete clause.

- ***Require privately funded projects to use the same standards as publicly funded projects with design review conducted by the state DOT.***

Nature of Risk	**Alternative to NCC?**
Minimal designs that reduce capital outlay, e.g., build in median, no overpasses, etc., resulting in no crossings, safety problems, difficulty with upgrades	No

To maximize return on investment, privately funded projects may use designs that minimize capital costs but create long-term upgrade problems. For example, SR 91X was built in the median, meaning that entry and exit was difficult and expansion would require conversion of existing lanes. Since the public sector will ultimately own the project, it must ensure that privately funded projects incorporate the same standards as publicly funded projects. This provision is not an alternative to a non-compete clause.

- ***If non-compete clause is necessary, require exceptions for safety projects or projects in an approved long-range transportation plan.***

Nature of Risk	Alternative to NCC?
Non-compete agreement: inability to add capacity or modify adjacent system	No

The primary concern of this research was the use of non-compete clauses in toll road agreements. Non-compete clauses restrict the ability of the public sector to add capacity or modify segments of the road network, but in some circumstances they may be the only way to bring in the private sector. As a minimum, the public sector should require exceptions for safety projects or projects in an approved long-range transportation plan. Responding to the political and public backlash surrounding the SR 91 agreement, the TCA agreement included an allowance for safety-related projects and projects within a congestion management plan. Following in TCA's footsteps, the CTTP agreement includes a similar arrangement. This provision is an amendment to non-compete clauses.

3.2.4 Public Sector Best Practices in Operational Issues

- ***Define maintenance schedule or take responsibility for maintenance.***

Nature of Risk	Alternative to NCC?
Maintenance: Near end of franchise/transfer of ownership, operator may neglect maintenance or stop investing in newer technologies.	No

During the life of the toll agreement it is in the operator's interest to ensure that the facility is well-maintained in order to attract users. However, nearing the end of the franchise, it is likely that the operator will skimp on major maintenance and at the end turn over a barely acceptable facility. To avoid major spending soon after takeover, the public sector should establish a schedule for rehabilitation of pavement and bridges. For example, in Ireland the private operator must ensure a 10-year maintenance-free period from the time the road is transferred to the government. Alternatively, the public sector can accept responsibility for maintenance, as in the case of the CTTP. A similar scenario applies to toll collection technology, with investment likely to peter out in the later years. The public sector must ensure that the technology it takes over is not outdated or incompatible with other systems. These provisions do not mitigate concerns over a non-compete clause but ensure the public's interest in the investment.

3.2.5 Public Sector Best Practices in Regulatory Issues

- ***Establish a schedule of toll rates and future increases; require capacity improvements if demand exceeds defined level.***

Nature of Risk	Alternative to NCC?
Profiteering: Operator charges higher tolls in response to demand.	Yes

If the private sector is fully responsible for pricing, then in the quasi-monopoly situation of a toll road it is conceivable that the operator may charge whatever the market will bear (as suggested by an executive of the M6 Toll Road in Britain), restricted only by the elasticity of demand. The Ontario public and government have reacted negatively to the perception that this is the case with the Toronto ETR 407. The toll agreement should either establish a schedule of rates and scheduled increases that are reasonable or submit all disputes over toll rates to a regulatory panel.

In response to demand SR 91X used variable pricing to maintain time savings on the toll road, closely monitoring volumes and raising toll rates when congestion threatened. This strategy, even though effective and profitable, created a lot of public anger. Instead, a metering system might have achieved the same operational goal (but not the revenue). In Canada the operator is supposed to add capacity if demand consistently exceeds specified levels. Such a provision would give the driving public the mobility it desires without the appearance that it is being gouged. It would also lessen the likelihood that competing routes would be upgraded and is therefore an alternative to a non-compete clause.

3.2.6 Public Sector Best Practices in Political Issues

- ***Separate funding obligations by category and make information readily available to the public.***

Nature of Risk	**Alternative to NCC?**
Public opposition: mixing public funds with private; perception that public money is being given away	No

When public and private funds are used jointly to build a toll road, the public may have the perception that public funds are being given away to the private sector. Public officials must work diligently to demonstrate that the public funds are being used to leverage private capital so that the public can receive transportation benefits sooner. Such an arrangement is not very different from local governments offering incentives to attract businesses. To avoid the appearance of giveaways, funding obligations should be separated out by category. For example, the public sector might pay for all right of way, or maintenance. The information on the project financing should be made readily available to the public in a way that is easy to understand. This provision is not an alternative to a non-compete clause.

- ***Define projects and selection process in advance,***

Nature of Risk	**Alternative to NCC?**
Cronyism: Well-connected developers get projects.	No

When the public and private sectors enter into an agreement, there is the potential for a perception that favoritism plays into decisions. Politically influential developers may lobby for contracts. To avoid any suggestion of cronyism, the public sector must

operate a transparent and above-board selection process. A prequalification process should include minimum requirements for submitting a bid. The basis for final selection should also be published.

- ***Rebate the gas tax or discount toll by an equivalent.***

Nature of Risk	**Alternative to NCC?**
Double taxation: having to pay a toll plus gas taxes	No

A common source of public opposition to tolling is the claim of double taxation: paying a gas tax as well as a toll. The gas tax amounts to about 40 cents per gallon or about 2 cents per mile, far less than typical tolls of 10 to 25 cents per mile. To counter the double-taxation argument, a discount of 2 cents per mile off the toll rate can be offered as a rebate of the gas tax. On the other hand, it is not as easy to dispose of the argument that the public paid gas taxes over a period with the expectation that a specific improvement would be made with the money. A counterpoint would be that tolling is a more effective way of keeping the user fees for reinvestment within the region. These actions are not an alternative to a non-compete clause.

- ***Provide an income-related toll discount.***

Nature of Risk	**Alternative to NCC?**
Inequity: I can't afford the toll, but I need to use the road.	No

Another concern for public officials is inequalities created by toll roads. Low-income residents may be unable to afford tolls, but need to use the roads due to a lack of available transportation options (limited mode choice). Since toll road charges are the same for each user, they have a higher impact on low-income users. A potential solution is to provide an income-related toll discount, similar to cell phone plan discounts for government and military employees.

- ***Provide non-tolled alternate route.***

Nature of Risk	**Alternative to NCC?**
Fairness: My road is tolled but not other routes.	No

In a network where there are already a number of "free" roads, commuters may react negatively to their road being tolled while other roads are not. To address this issue, many agencies require a non-tolled alternate route. However, some states do not. In Chile the Supreme Court ruled that the public is not entitled to a non-tolled alternative. South Africa has moved away from providing toll-free alternatives. Elsewhere, what constitutes a viable alternate route has not been settled. In the original SR 91 agreement, only roads of freeway standard or those likely to funnel traffic to other freeways were considered competing facilities. In the United States, because of the extensive nature of the non-

tolled network, most commuters have an existing non-tolled alternative, albeit not one comparable to a toll road. Obviously, providing a toll-free alternative route is not a solution to a non-compete clause.

- ***Maximize throughput to provide congestion relief.***

Nature of Risk	Alternative to NCC?
Revenue maximization: congestion on other routes	No

In the SR 91 case study the operator's objective of maximizing revenue did not translate into congestion relief for the public. Commuters crawling along on the non-tolled SR 91 lanes could see "Lexus lane" users zipping by at 65 mph on a road that appeared to be empty most of the time. HOV lanes have elicited similar reactions. A strategy that maximizes the throughput is likely to meet less opposition from the public. However, the solution will have to be continuously tuned, depending on demand. While it appears that variable pricing is an effective strategy, the public perceives it as gouging. Alternative solutions are needed that maximize throughput to provide congestion relief on parallel routes. However, provisions for maximizing throughput may not lessen the private sector's desire for a non-compete clause.

3.3 Best Practices for the Private Sector

In the business world the goal is to achieve profits. Without the potential for profit, the private sector is not likely to invest in toll roads. Thus, best practices in toll agreements for the private sector are aimed at improving the profit-making potential of toll road endeavors. This section focuses primarily on the goals of the private sector and does not necessarily represent provisions that may be in the best interest of the public sector.

3.3.1 Private Sector Best Practices in Financial Issues

- ***Establish a minimum percentage of project cost assigned to each party.***

Nature of Risk	Alternative to NCC?
Investment equity: disagreement over investor contribution versus public contribution	Yes

Due to the volatility of traffic and revenue projections, investors face a number of financial risks on toll road projects. One concern in a public-private partnership is the balance of investment equity contributed by the public and private sectors. Without a reasonable stake by both parties in the successful outcome of the project, there is a high risk of breach of agreement. Toll road agreements should establish a minimum percentage of project costs assigned to each party (e.g., one party pays for right of way, other for pavement, etc.). Such delineation of cost responsibility allows each party to manage its risk and control its costs. In Texas the SH 130 project uses public funds to pay

for right-of-way acquisition and private investment to pay for construction. This provision may negate the need for a non-compete clause.

- ***Tax-free bonding is desirable for toll projects.***

Nature of Risk	Alternative to NCC?
Tax exemption for bonds, if not allowed, can lead to disadvantageous borrowing rates.	Yes

Tax-free bonds sell at a lower interest rate, as much as 2 percentage points, and therefore can support projects with lower rates of return. In the already risky climate of toll road development, bond interest rate may be the difference between the investors breaking even or entering into bankruptcy. Current legislation does not allow private investors to secure tax-exempt bonds. Within a few years of the opening of SR 91, CPTC attempted to sell the toll lanes to NewTrac, a non-profit company. Had the sale gone through, NewTrac would have been able to secure tax-exempt bonds to finance the transaction. Allowing tax-free bonding capabilities to both publicly and privately funded toll projects places both parties on an equal playing field, providing a potential alternative to the need for a non-compete clause.

- ***Leave the franchise period open, allowing the opportunity to achieve a predetermined return on investment, and determine a value at transfer.***

Nature of Risk	Alternative to NCC?
Franchise period: insufficient return at end of predefined franchise period	Yes

Perhaps the greatest financial concern for investors is loss on the investment due to either lower-than-projected traffic and revenue, or insufficient return at the end of the agreement period. Chile provides innovative solutions to both scenarios. Rather than setting a fixed franchise period, Chilean toll road agreements remain in effect until the investor has recovered a predetermined return on investment. The Chilean technique requires agreement on the net present value of the project and an agreed discount rate for future revenues. As toll revenues and other governmental payments come in, they are discounted accordingly and applied to the account. At any point in the agreement, both parties are aware of the current value of the balance should the public sector desire to purchase the facility from the investors. As methods for providing financial security to investors, both practices provide excellent alternatives to a non-compete clause.

- ***Secure a minimum guaranteed revenue subsidy from the public sector.***

Nature of Risk	Alternative to NCC?
Revenue shortfall: inability to make payments to debtors	Yes

The most crucial stage of a toll project for the private sector is the first few years of operation. During this period, toll roads typically struggle to attract traffic. To avoid missing payments to debtors, it is in the interest of the private investor to secure a minimum revenue guarantee from the public sector. In Britain, shadow tolling has been used: the public sector pays a "rent" to the investor based on the amount of traffic using the road, with low volumes being paid at a high rate per unit and higher volumes being paid at progressively lower rates up to a cap on total payment. In an alternate approach Chilean toll agreements offer compensation to concessionaires if they are unable to meet 80% of their yearly revenue projections. The deal is not one sided, however. The agreements also require the concessionaires exceeding revenue projections to rebate 50% of the excess revenue to the government. As an insurance policy for private investment, the minimum revenue guarantee is an effective means for avoiding default on debt and provides investors with another alternative to a non-compete clause.

- ***Transfer revenues from lucrative to struggling segments.***

Nature of Risk	**Alternative to NCC?**
Uneven demand in corridor or region	Yes

Not all segments of the transportation network have similar demand, so some toll roads are likely to be more lucrative than others. The Chilean government is experimenting with revenue transfer in which high-demand segments are allowed to charge higher toll rates, but the concessionaire's income is capped, and the excess is transferred to less lucrative routes. In a similar fashion, Florida uses excess revenues from the existing toll roads to support newer toll roads. In fact, Florida's expectation is that newer toll roads will take 22 years to be self-sustaining (i.e., to collect enough revenue to meet debt payments). Prior to that time, the state subsidizes debt payments with surplus revenue from other segments. This provision is an effective alternative to a non-compete clause, since it reassures investors that low-traffic toll roads will have financial support.

- ***Establish bonuses to be awarded when specific public objectives are met.***

Nature of Risk	**Alternative to NCC?**
Rate of return cap: returns limited—no return in early years, no incentives in later years	Yes

Besides seeking to improve mobility, the public sector also has other transportation objectives, such as environmental targets. To those ends, many regions establish goals for carpooling, air quality, etc. On the other hand, toll investors may want to see as many cars as possible on the road. Some toll agreements place a cap on the investors' rate of return to prevent them from working at cross-purposes with the public sector. However, as a partner with the public sector in providing transportation solutions, investors should seek bonuses when public objectives are met. For example, if a specified percentage of the users of the toll road are carpools, then a bonus might be awarded. With

such provisions, not only will the investors receive a financial reward when they help meet public goals, they may also see improved public acceptance of privately funded toll projects.

- ***Seek opportunities to take advantage of tax benefits.***

Nature of Risk	Alternative to NCC?
Limited tax benefits: none in early years, e.g., depreciation allowed only if profit earned	Yes

Current tax law allows depreciation tax benefits on an asset only when profit is earned and restricts depreciation deductions only to the early years of the life of an asset. Since toll roads seldom earn profits in their early years, toll investors rarely are able to take advantage of depreciation tax benefits. On the other hand, leases are tax deductible. Thus, toll road operators should look for opportunities to take advantage of tax benefits. A number of DOTs have created semi-public toll agencies to avail public-private partnerships of tax benefit opportunities.

- ***Negotiate in advance a share of potential non-toll revenues.***

Nature of Risk	Alternative to NCC?
Loss of non-toll revenues: e.g., windfall tax revenues, concession rights, development rights, impact fees	Yes

Toll roads also generate non-toll revenue, which may end up in the pockets of others. For example, nearby property values generally increase, especially at intersections. Businesses enjoy improved access to markets, generating greater profits, greater employment, and more sales taxes. Those added revenues could accrue to non-partners. Similar to the way major investors seek incentives from local governments to relocate, toll investors may be able to negotiate an up-front "incentive package" or a share of the increased tax revenues. Another potential source of revenue is user information gathered through electronic tolling, for example, the number of vehicles traveling from specific origins and to specific destinations. Such information may be valuable for a variety of marketing opportunities. These alternative financial sources could offset the need for a non-compete clause.

3.3.2 Private Sector Best Practices in Legal Issues

- ***Include a grandfather clause in the agreement or try to obtain payback in the shortest period possible.***

Nature of Risk	Alternative to NCC?
Agreement non-binding on future government; laws and/or terms of agreement can be changed.	No

Since toll agreements typically span 30 years or more, a major unknown for the private sector is the ways in which public and political factions will respond to the terms of the agreement years down the road. In Ontario, when a different political party came to power replacing the one that had originally supported the development of ETR-407 in Toronto, unfavorable sentiment toward tolling spurred litigation. Even though the ETR-407 investors have been successful so far in court, and traffic levels remain high, the conflicts could discourage future projects. The SR 91 project faced similar political opposition and litigation. As a best practice for the private sector, the toll road agreement should include a grandfather clause that protects the agreement against changes in political regime. Alternatively, in countries with unstable governmental/legal structures, the private sector should strive to obtain payback in the shortest period possible to avoid financial consequences resulting from attempts to change the terms of the agreement by future governments.

- ***Utilize a monthly reimbursement schedule.***

Nature of Risk	**Alternative to NCC?**
Contract cancellation: loss of investment up to that point.	No

Breach of agreement by the public sector or cancellation of the contract is another hazard for investors. Contract cancellation can result in the loss of all the money invested in the project to that point. A frequent reimbursement schedule, such as monthly, would reduce investor exposure, especially in unstable countries.

- ***Specify a buyout valuation process and terms.***

Nature of Risk	**Alternative to NCC?**
Buyout by government: inadequate compensation.	Yes

Instead of contract cancellation, the government may seek to take ownership of the toll road but offer inadequate compensation. Toll road agreements should specify a buyout valuation process and terms. In Chile toll road agreements establish an initial NPV of the toll project and a running valuation based on compensation received to date.

- ***Establish debt assumption rules.***

Nature of Risk	**Alternative to NCC?**
Bankruptcy: inability to repay debtors.	No

As with any investment, there is a potential for a toll road venture to go bankrupt. Examples include the failure of the Camino Colombia toll road in Texas and the financial debacle of the Mexican toll road program. In many other cases toll investors have had to refinance their debt, sometimes at higher interest rates, in order to satisfy creditors. Since a road has intrinsic value to the public, and it is not in the public interest to see it closed

because of bankruptcy, rules and mechanisms for assumption of debt by the public sector or another third party should be defined in the toll agreement.

3.3.3 Private Sector Best Practices in Planning Issues

- ***Seek congestion relief projects over economic development goals.***

Nature of Risk	**Alternative to NCC?**
Project location/market: distance from population centers; circuity Regional changes—land use patterns; development may not occur as expected. Economic activity: Population and employment growth may not occur.	Yes

Toll roads located far from population and employment centers often do not meet traffic and revenue projections. Projects built to stimulate economic development, such as the TCA San Joaquin toll road in California, or with the expectation of development, such as the Camino Colombia in Texas, have struggled financially. On the other hand, the most lucrative toll roads, such as SR 91 in California, ETR-407 in Canada, and the M6 in the United Kingdom, are located in highly congested urban areas. Toll roads that serve primarily as congestion relief projects instead of economic development ventures are less likely to be affected by competing routes.

- ***Allow construction of projects within a regional transportation plan, but require compensation for their impacts on toll revenue.***

Nature of Risk	**Alternative to NCC?**
Regional plans: may include traffic competitors; development of, increase in capacity, or upgrading of, alternate routes	Yes

Beginning with the TCA toll road agreement, a number of agreements now include non-compete clauses with exceptions for road projects included in regional transportation plans. Allowing regional transportation plans gives the private sector a clear idea of potentially competing projects in the region, while leaving the public sector the flexibility to continue developing the road network, with or without toll projects. The TCA agreement includes a commitment by the public sector to compensate the investors if a competing route affects revenue. This stipulation is also included in the CTTP agreement and the Melbourne City Link agreement in Australia.

Considering that the public sector may have to pay if its non-tolled projects harm toll revenues, the likelihood of building non-essential projects is remote. However, given that conflicts may arise over the definition of a competing route and to ensure that claims of competition are fairly judged, it is in the best interest of the private sector to require that an independent traffic engineer be used to assess the impact of a potentially competing route. The private sector must also make sure that the terms of reimbursement

are included in the agreement. Even though this provision is sometimes an addendum to a non-compete clause, in other cases it is a replacement for it.

- ***Provide better service as a way to attract users.***

Nature of Risk	Alternative to NCC?
Competition: Traffic uses alternate routes; traffic on tolled route is less than projected.	Yes

It is ironic that the private sector should seek to avoid competition. In the business world the response to competition is not to seek a monopoly but instead to differentiate from the competition by providing better products. Some toll roads struggle because the operators fail to market the benefits of their facility. Possibilities for marketing include guaranteeing travel time (or your money back!), separating trucks from other vehicles, providing discounts for regular users (frequent user miles!), or selling monthly passes. These actions will receive more positive response than a non-compete clause.

- ***Ensure that the capacity of connectors to the toll road is upgraded early.***

Nature of Risk	Alternative to NCC?
Capacity of connectors: ability to funnel traffic in and out	Yes

The capacity and location of connectors and their ability to funnel traffic into or out of the toll road is critically important to the success of a toll project**.** Whether their upgrading is part of toll financing or is done separately by the state, connectors should be explicitly addressed in the toll agreement. The private sector must also require that connectors receive proper maintenance and improvements over the life of the toll agreement. Ensuring effective connectors is an alternative to a non-compete clause.

- ***Establish standards for ramp spacing.***

Nature of Risk	Alternative to NCC?
Access: demands for more access	No

Location and frequency of access points are critical in the success of a toll road. A limited number of accesses may lead to bottlenecks at entry and exit ramps that decrease time savings and discourage use of the route, while too many access points may degrade the operation of the roadway, as has occurred on many urban freeways. Businesses and politicians will lobby for access ramps, but toll investors should establish standards for ramp spacing and carefully consider demands for additional accesses.

- ***Design for expansion and define thresholds for adding capacity based on v/c ratios or LOS.***

Nature of Risk	Alternative to NCC?
Travel demand may not grow as projected; may shift to other modes; may be stifled by costs, e.g., gas prices. Congestion can worsen on alternate routes.	Yes

The central issue of SR 91 litigation was the public's desire to add lanes at the entry and exit points of the tollway to relieve safety concerns. As an alternative to a non-compete clause, investors should design the toll road for easy addition of new phases or expansion of capacity, and define thresholds for adding capacity based on v/c ratios or LOS in the adjacent network. This strategy would lessen financial exposure in instances where travel demand does not grow as projected yet would provide flexibility to add capacity to the toll road if the non-tolled network were to become congested. Establishing thresholds for capacity addition allows the private sector to be the responder of first choice if the adjacent network becomes congested.

3.3.4 Private Sector Best Practices in Operational Issues

- ***Use standard signing conventions.***

Nature of Risk	Alternative to NCC?
Signing: No leader signs on non-tolled system.	Yes

Poor signage may result in driver confusion and the loss of potential toll road users. Toll investors must ensure that users are informed of toll choices in advance by proper signage along non-tolled portions leading to the toll route. To promote interconnectivity between the tolled and non-tolled network, toll investors should use standard signing conventions.

- ***Provide proper detour information.***

Nature of Risk	Alternative to NCC?
Lane availability: closed for repairs	No

To paraphrase the Southwest Airlines credo, toll roads only make money when vehicles are moving. When lanes are closed or under repair, customers are delayed. Since customers are paying to save time, toll roads should provide proper information on lane closures, delays, and detours. To shorten downtime, rapid repairs systems such as pre-cast slabs and beams should be used.

- ***Contract with public agency providers for safety management along the toll route.***

Nature of Risk	Alternative to NCC?
Safety management could be sub-standard.	No

Some toll operators have failed to contract with public agencies for providing safety management, such as fire services, emergency medical services, or police presence. In the event of an emergency, those agencies may not be able to intervene, resulting in negative public reaction. Similar situations may apply to violation enforcement, resulting in a loss of revenues. It is in the best interest of toll investors to contract with public agency providers to ensure that safety concerns are adequately addressed.

- ***Be prepared to upgrade technology.***

Nature of Risk	Alternative to NCC?
Interoperability: incompatibility with other tolling programs	No

Lack of compatibility with other tolling programs may discourage use of a toll route. For example, until recently in Texas toll transponders in Dallas and Houston could not be used on both systems. In the future all Texas toll roads will be interoperable using the TxTAG. Currently open road tolling is being adopted in Houston toll roads and elsewhere. Private investors should be prepared to upgrade technology to ensure interoperability and seamless connections between tolled and non-tolled routes.

3.3.5 Private Sector Best Practices in Regulatory Issues

- ***Negotiate environmental requirements.***

Nature of Risk	Alternative to NCC?
Environmental: pollution management	No

Air pollution caused by automobiles and increased vehicle miles traveled (VMT) has created a greater awareness of environmental concerns associated with road projects. To address these concerns it is best for investors to negotiate environmental requirements with the public sector in advance of construction. Being seen as environmentally sensitive is one way to reduce opposition from regulators and the public.

- ***Use DOT standards for roadside signs.***

Nature of Risk	Alternative to NCC?
Advertising: clutter/eyesores	No

During construction of the SH 130 project in Austin, billboard companies have jumped at the opportunity to advertise along the route. At many locations, billboards have been placed even before construction began. In response, state legislators have enacted

legislation to ban billboards along the route. Toll investors must be careful to use DOT standards with regard to billboards and other eyesores.

- ***Remove specific identification from any information obtained about road users.***

Nature of Risk	Alternative to NCC?
User privacy: use of user records	No

Americans are becoming increasingly concerned about the privacy of their personal information. Electronic toll facilities allow for a wealth of information to be obtained about road users. To avoid public concerns over the use of road user information, toll operators should remove individual identification from any information obtained about road users. Failure to do so could result in a major public backlash.

- ***Require that new regulations are only enforceable if they are also implemented on most public facilities.***

Nature of Risk	Alternative to NCC?
Changes in regulations: Standards and requirements may change.	Yes

Standards and regulations are likely to change over the life of a toll agreement. For example, new standards may emerge for roadside safety appurtenances. Regulators may try to hold private sector projects to a higher standard than public sector ones, incurring unexpected costs for investors. Thus, a stipulation that new regulations are only enforceable if they are also implemented on most public facilities should be included in the toll agreement, to ensure a level playing field.

3.3.6 Private Sector Best Practices in Political Issues

- ***Use industry ranges and increase toll rates regularly to match inflation.***

Nature of Risk	Alternative to NCC?
Public opposition: toll rate too high; steep increases; claims of gouging	Yes

The most common source of public opposition to tolling is the complaint that the toll rate is too high and that users are being gouged. On the ETR-407 in Toronto, the operator has increased toll rates to the maximum permitted in the agreement, spurring public and political opposition. Toll road operators should use industry ranges for toll rates. Concomitantly, toll rates should be increased regularly to match inflation, instead of large increases at lengthy intervals. Resistance to gas tax increases and the resulting shortfalls in public funding for transportation can be attributed in part to failure to gradually increase the gas tax over the years. Similarly, toll road operators that raise their rates at infrequent intervals are always vilified. As a way to increase financial viability,

pegging toll rates to inflation is a complementary provision that reduces the need for a non-compete clause.

3.4 Summary

The best practices presented in this chapter were separated according to the objectives of the public or private sectors respectively. With each proposed toll road a different set of obstacles and opportunities exists for the use of public-private partnerships. Each toll road agreement must therefore draw upon a different combination of the public and private sectors' best practices to achieve the objectives of both parties. In most cases, the public sector is not likely to spend money to upgrade alternate routes unless there is a pressing need. It therefore makes sense for the private sector to seek flexibility in toll contracts to be the responder of first choice, since it has the resources to more nimbly respond to needs. Ultimately, a commitment by both parties to ensure public acceptance and support for the project is the most important component of its financial success.

Chapter 4. Service Area

4.1 Introduction

One underlying concern of this research project is what defines a competing route for a toll road, and hence, how to delineate a zone or service area around a toll road where added capacity would hurt toll revenue. In this chapter the approaches used by various planning techniques to identify the service area of a road will be reviewed, and the feasibility of defining the service area of a toll road will be discussed.

Defining service area: The service area of a road is not a well-defined term in transportation engineering. Since the objective of this research project is to investigate the issue of non-compete clauses, and a fundamental feature of an NCC is the delineation of a non-compete zone, the following discussion makes the assumption that service area represents the geographic locations from which the majority of the road users originate.

Identifying competing routes: In the standard context a competing route is an alternative route that motorists can use for the same trip purpose. However, route choice depends on the comparative cost between routes, among other factors. A tolled route must provide premium service and significant time savings. In a study of Mexican toll roads, it was found that commuters are more likely to choose a toll road when trip distance is greater than 60 miles or drive time is greater than 60 minutes [Orozco, 1998].

Estimating traffic share: Techniques for estimating traffic share for a toll road include:

1) Toll traffic share is a function of the ratios of travel time, distance, and user costs between the toll route and an alternate route [Orozco, 1998].
2) Convert toll to equivalent time penalty and analyze travel times in network and resulting distribution [Hall, 1999].
3) Network modeling: Several programs have been developed to model the effect of pricing on networks and resulting traffic diversion. For example, DYNASMART-P (reviewed later in this chapter) produces traffic characteristics such as volume, speeds, densities, etc., over time for each link in the network.

Toll feasibility: Toll project feasibility analysis is typically a three-stage process: sketch level, intermediate, and investment grade. TxDOT's Turnpike Authority Division (TTA) splits the sketch level into screening and conceptual levels, and the intermediate level into project-specific and detailed analysis levels. A road is considered toll-feasible if toll diversion models show it pulling 10–15% of corridor traffic passing defined screen lines.

However, a track record of inaccurate traffic and revenue projections on a number of toll projects has made investors risk-averse, resulting in demands for non-compete clauses. For example, a 2004 Standard and Poors report evaluated the accuracy of year-

one traffic projections on 87 toll projects and found that, on average, traffic forecasts were overestimated by 20–30% [Bain, 2004]. Thus, there is a need for better understanding of traffic distribution between tolled and non-tolled roads.

Value of time: The value of time (VOT) for different classes of users is a key factor in toll diversion. Upper-income drivers generally have a higher VOT and hence are more likely to use toll roads. Urban and rural populations tend to have different VOTs. VOT can vary even for an individual, depending on trip purpose. It is necessary to recognize the demographics of potential users of a toll road to judge the market area for a toll road.

Pricing: VOT affects what toll rates can be charged. Revenue can be maximized at two tolling levels: a high rate that discourages traffic and hurts long-term prospects, or a low rate that attracts traffic but hurts short-term revenues. Low toll rates benefit regional mobility but may require subsidies in the early years. Some toll roads initially have been operated toll-free to attract traffic. It is important to consider the effect of toll rates on traffic share and its effect on the toll road user market.

4.2 Current Planning Techniques

Transportation planners seek to understand the economic impact of transportation projects and the markets they serve.

4.2.1 Highway Impact Analysis

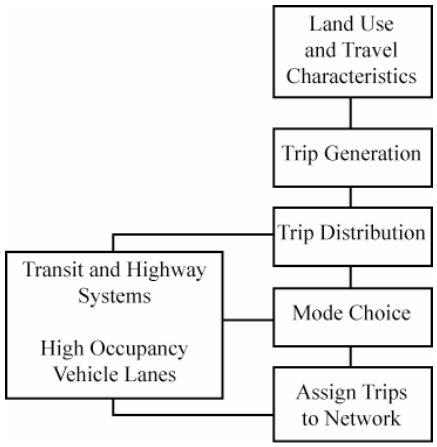
Highway impact studies are used to support general observations about the economic impact on land adjacent to highway projects. Most studies focus on describing the nature and magnitude of the impact as a means for determining whether or not the benefits of a new highway outweigh the costs. In determining the impact of a highway project, impact studies contribute to the service area concept by identifying the specific geographic zones affected by the project. In 1977 a USDOT study titled "The Influence on Rural Communities of Interurban Transportation Systems" identified three primary methodologies for undertaking highway impact studies:

- **Before-and-after technique:** This technique documents the value of characteristics in a specified area before and after a road improvement. Areas exhibiting a change in value are considered the area of influence of the road project. This technique cannot relate the measured effect to any specific cause.
- **Survey control area technique:** This is the most commonly used technique to isolate highway impact. It studies the effect on land values in a survey area adjacent to a road project and in a control area away from a road project. The technique assumes that survey and control areas are identical before a road project. It does not give information about the spatial distribution of impact, since the study areas are specified before the impact is assessed.
- **Multiple regression analysis**: This technique requires a great deal of information about non-highway-related factors. The dependent variable is the land area adjacent to the road project, while independent variables are all factors contributing to the effect. It is impossible to identify every independent variable [Walton et al., 1977].

4.2.2 Traffic Analysis Techniques

Transportation planners are not usually concerned with the individual travel patterns of road users. The primary goal for transportation planners has been first to determine the origins and destinations of road users and then to assign the users to the road network in order to determine required improvements. In essence, transportation planners define the service area of roads within a network. The most common method for determining travel patterns is the basic four-step modeling process [Gazis, 2002] illustrated in Figure 4.1:

Figure 4.1 The Four-Step Modeling Process [Garber and Hoel, 2002]



1. Trip generation: This step determines how many trips each activity will produce or attract. Activities result from identification of trip origins (households) and destinations (trip attractions—jobs, schools, shopping malls, etc.). Travel demand studies using census data provide origin and destination information.

2. Trip distribution: This is the process by which trips generated in one zone are allocated to the other zones in a study area. The amount of activity at specific destinations and the difficulty in getting to these destinations are addressed through modeling techniques:

- *Growth factor model*: This model creates a set of origin-destination choices compatible with the growth of trips originating in various zones and the growth of attractions to other zones. It divides predicted future trips by observed present trips, but ignores changes in travel times and travel costs resulting from growth.
- *Gravity model*: This model takes into account the degree of attraction between zones. Trips between zones are directly proportional to the total number of trips originating in one zone and the number of trips terminating in other zones combined with a cost function ("friction").
- *Intervening opportunity model*: In this model, for every trip originating at a particular zone, every appropriate destination zone is ordered on the basis of the travel times from the zone, in order of increasing travel times. It assumes a constant probability that a site is accepted as a trip end. This model is more widely used to address location of new construction.

3. Mode choice: This step determines the number of trips between zones that will be made by either the automobile or transit service. Identification of mode choice requires complex analysis of factors, including automobile ownership, availability of transit service, traveler's income, and the relative advantages of each mode.

4. Traffic assignment: This step determines which route on the transportation network will be used when making a trip. It combines trip distribution figures with a set of criteria by which motorists and transit users select a route and then applies this information to the available highway and transit routes. Various modeling techniques may be applied to the traffic assignment step.

- *Discrete choice model*: This model evaluates the decision-making steps of individual road users:
    i. Determine available options: Probabilistic models predict the probability of each feasible route choice being selected.
    ii. Estimate benefits and costs of options (different for each user): The decision is based on out-of-pocket costs divided by the income of decision maker.
    iii. Apply a decision: The decision is based on evaluation of route attributes or utility.
- Random utility model: This model assumes that the decision maker has perfect discriminating capability, but the analyst actually has incomplete information regarding the decision-making choice. Uncertainty is addressed by assigning the attributes or utility of a route as a random variable. The decision maker chooses the alternative with the highest utility.
- *Space model*: This model assumes that drivers exhibit rational behavior. Trips are only demanded when the utility exceeds costs. Routes offering the minimum cost (a function of time and money) are chosen.

Traffic assignment models follow the principles presented by Wardrop in 1952:

1) The journey times on all routes actually used are equal to or less than those which would be experienced by a single vehicle on any unused route.
2) The average journey time (for all users) is minimum [Gazis, 2002].

Simply stated, drivers will follow the shortest route available, but are only generally knowledgeable about one or two alternate routes. Additionally, optimization of the entire road network is assumed. However, complete optimization of the road network is currently unobtainable. Advancements in intelligent transportation systems (ITS) and traveler information continue to provide greater opportunities to optimize use of the road network.

The four-step modeling process is not without flaws. In the model, home-based and non-home-based trips are evaluated separately, rather than as part of a single trip with multiple destinations. The model may choose different modes for each trip. In reality, as part of one multiple-destination trip, the same mode would be used. The various modeling techniques used during the traffic assignment step of the model are effective at assigning traffic to the road network, but in the process fail to save

information addressing the area directly served by a specific road. One final flaw is that trip scheduling is not a consideration of the model.

The four-step modeling process has been applied to a variety of traffic analysis studies (see Figure 4.2). In TxDOT research project 0-4637, "The Role of Toll Projects in Enhancing Texas Transportation," researchers combined the four-step model with socio-economic data and the TransCAD traffic modeling program to assess the traffic, land use, economic, and welfare impacts of toll roads scenarios in Austin, Dallas, and El Paso. The objective of that study was to gain an understanding of how toll road impacts vary across a region. The research team compared impacts at one- and five-mile bands around toll roads in each city. The results noted significant impacts at a one-mile distance and only minimal impacts at a five-mile distance (Figure 4.3 and Table 4.1). Through use of the four-step model, the research project was able to convey a specified geographic region of impact. Thus, elements of toll road service area may be obtained by combining the four-step modeling process with other methods.

Figure 4.2 Use of the Four-Step Model

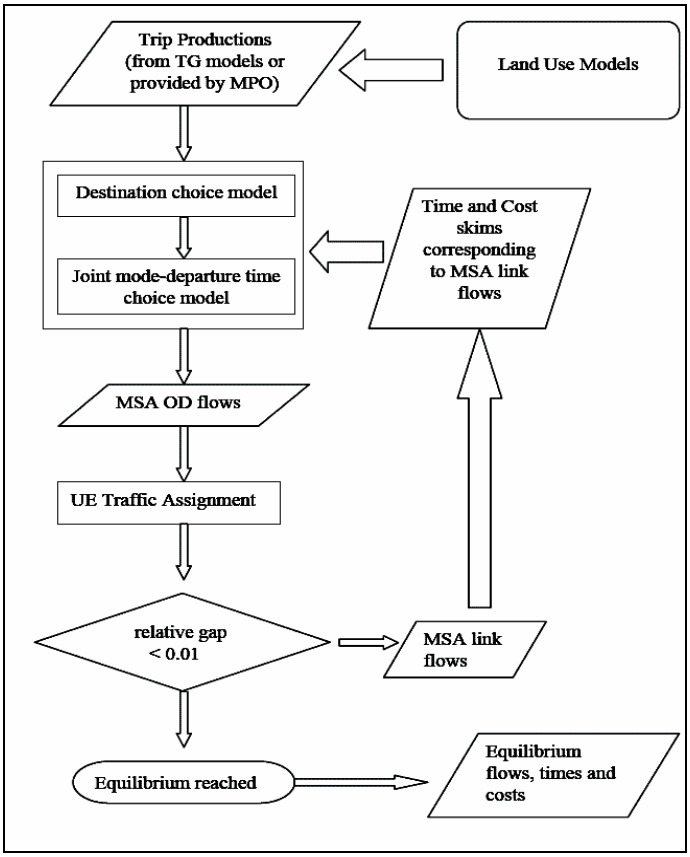


Figure 4.3 Contour Map of Austin Toll Roads

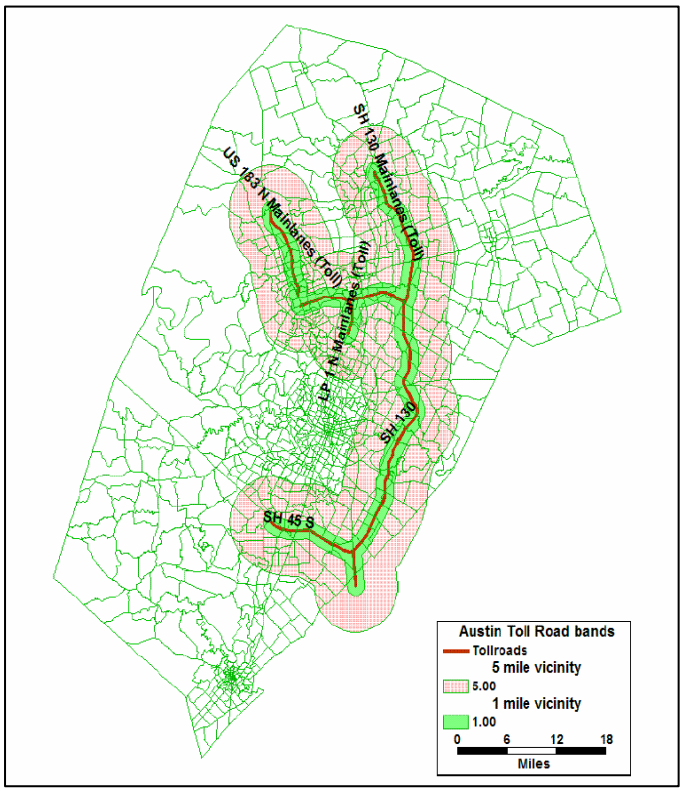


Table 4.1 Toll Road Impacts at 1- and 5-Mile Distances

Variations of toll road impacts on a region

	% changes							
	El Paso		Austin		Dallas		Average	
Impacts	1 mile	5 miles	1 mile	5 miles	1 mile	5 miles	1 mile	5 miles
Drop in V/C ratios	27.0%	7.0%	25.0%	10.0%	5.1%	3.8%	19.0%	6.9%
Increase in VMT	4.8%	-0.3%	3.3%	0.0%	24.4%	0.3%	10.8%	0.0%

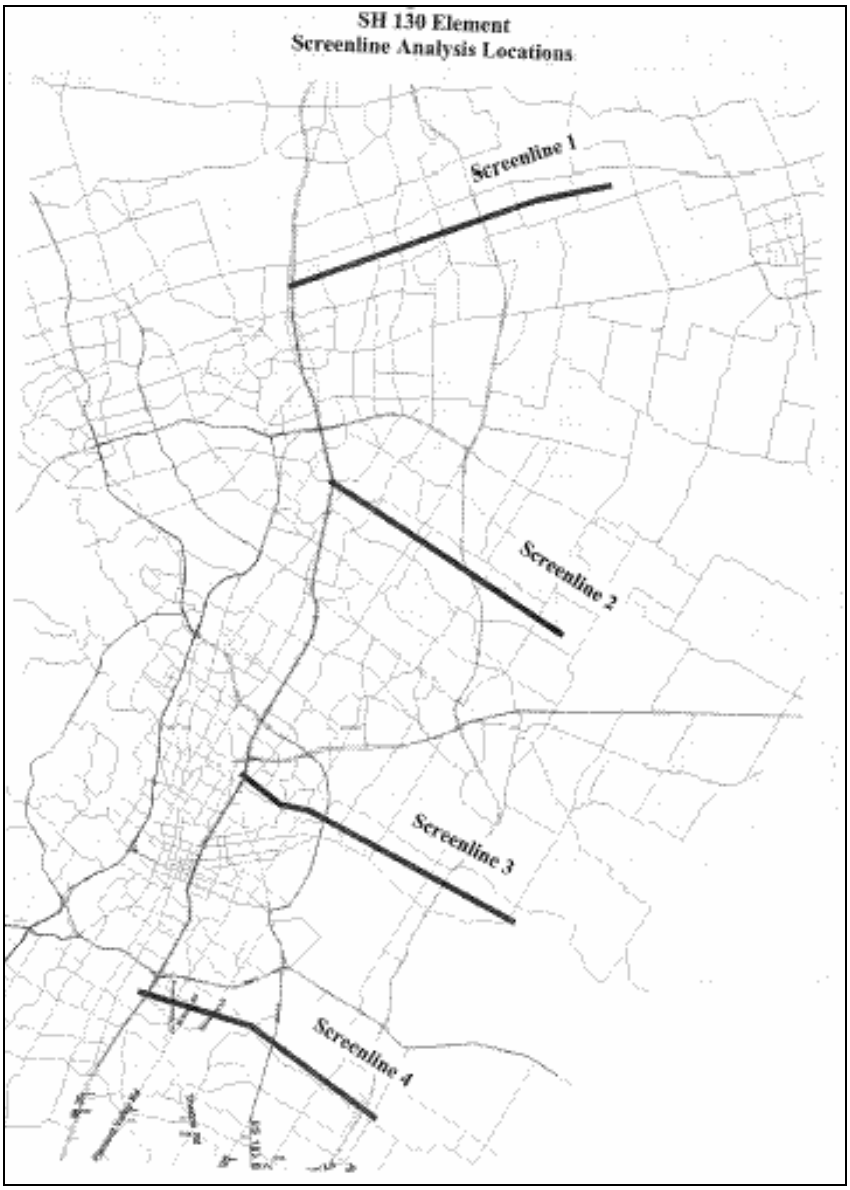
Source: Figure 4.2, Figure 4.3, and Table 4.1 from TxDOT research project 0-4637, "The Role of Toll Projects in Enhancing Texas Transportation"

4.2.3 Traffic Projection Techniques

A third planning technique is the screenline method used in most traffic projections, including those for the SH 130 project in Austin. The screenline method is used to capture growth in specified sub-regions of a city, under the assumption that certain areas contribute traffic to specific routes. A screenline is a boundary, either a river or arbitrary line, across which only a limited number of routes traverse. These routes are considered as competing corridors for traffic in the region. In Austin the Colorado River serves as the primary screenline. Screenlines are used by traffic engineers to measure and analyze changes in volume over a period of time with respect to competing routes and

shifts in traffic. For the SH 130 project traffic engineers used population, employment, and median household income data from the Capital Area Metropolitan Planning Organization (CAMPO) to assign a percentage of traffic volumes in a screenline to specific routes (Figure 4.4). The CAMPO data were adjusted for the SH 130 project based upon aerial photographs that help in analyzing the potential for future growth within the screenlines [TxDOT CTTP Bond Proposal, 2002].

Figure 4.4 SH 130 Screenline Map



In the SH 130 study area, IH 35 serves as a competing route on the western edge of the screenline. Four additional east-west screenlines represent the location of planned toll booths along the route. The eastern screenline boundaries vary depending upon the existence and location of competing north-south routes within each screenline segment. In the traffic and revenue projections SH 130 originally is estimated to carry a minimal

percentage of traffic within the screenlines in the early years, maxing out between 6–14% within each screenline by 2025.

4.2.4 Use of Traveler Information

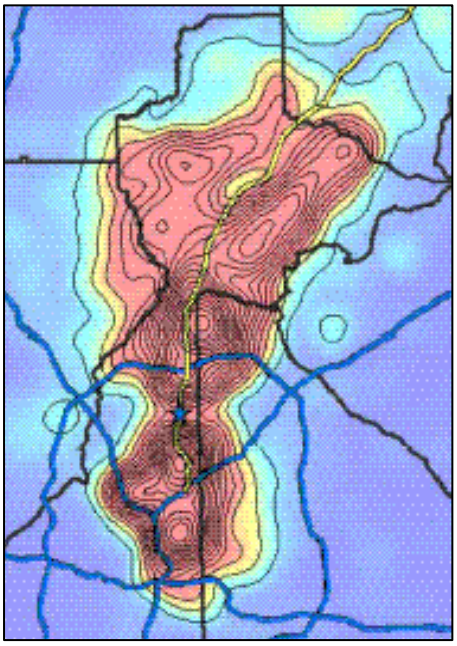
In Georgia, information about users of the Georgia 400 toll road has been applied to identify the service area of the toll facility. Opened in 1993, the Georgia 400 provides a vital link between Atlanta's northern suburbs and the central business district (Figure 4.5). Carrying over 120,000 vehicles per day, the toll road has been highly successful and has generated excess revenues for the state. Concerns have mounted over how the excess revenues are being used. Toll road users fear that excess revenues are not being used for their direct benefit. In response to this concern, the governor of Georgia required that the State Road and Tollway Authority (SRTA) define policies and procedures for use of tollway funds along the Georgia 400 corridor. To determine where toll revenues should be applied, the SRTA sought to define a methodology for determining the geographic service area of the toll road [Bachman, 2004].

Figure 4.5 Georgia 400 Map

Source: Bachman (2004)

The SRTA decided that the best method for defining the Georgia 400 service area involved the evaluation of electronic user ("cruise card") accounts. The SRTA combined the geographic distribution of cruise card billing addresses, frequency of toll road use by billing address with network analysis using socio-demographic variables, and a highway travel demand model to produce a contour map of toll road users (Figure 4.6). Cruise cards on Georgia 400 account for 37% of toll revenues. SRTA maintained that while cruise card account billing addresses did not necessarily represent trip origins or destinations, they did provide a geographic distribution of revenue sources. The limitations of cruise card analysis were offset by identification of origin-destination

Figure 4.6 Origins of Cruise Card Revenues



Source: Bachman (2004)

pairs with regional network analysis. While this technique can identify actual users of a toll road, it is not of use in predicting the service area beforehand. The SRTA has requested that further testing and refinement of data be undertaken before the results are implemented in providing a solution to the question of where to apply excess revenues from the toll road [Bachman, 2004].

4.2.5 Summary of Planning Techniques

Current planning techniques are unable to handle the complex issue of defining the service area of a toll road. A common simplification is to draw a line halfway between two roads and assume that users split off along that line. In the context of toll roads with complex interactions of value of time and willingness to pay, defining the service area is a much more difficult endeavor. Many of the existing techniques use the origins and destinations of road users as an input to the process of estimating traffic on roads. No current techniques were found that use the volume of traffic on each road to estimate the region that each services. The next section describes how available transportation modeling programs tackle the issue of service area.

4.3 Transportation Modeling Programs

Since the 1980s a number of transportation modeling programs have been created offering improved traffic analysis capabilities. Among the list of programs, a select few have emerged as the most widely used and accepted programs in the marketplace. In our analysis of transportation modeling programs, the most common and cutting-edge programs were examined. The programs were separated into two categories:

Land Use & Economic Impacts	**Traffic Analysis**
TRANUS	**TransCAD**
REMI	**DYNASMART**
RUBMRIO	**CORSIM & VISSIM**
	VISTA

In all, eight programs were examined. The capabilities and limitations of each program were uncovered, leading into the potential for each program to achieve the objective of defining the service area of a toll road.

4.3.1 Land Use & Economic Impact Modeling Programs

TRANUS

Program Description: TRANUS was developed in 1982 as an integrated land use and transportation modeling package. Since 1982 the program has been used to simulate the probable effects of differing projects and policies on land use in cities and regions from economic, financial, and environmental points of view. To determine the effects on land use patterns, the TRANUS program uses results from a sample of household preference surveys to calibrate the integrated model. The TRANUS model is an integration of spatial analysis, gravity, entropy, input-output, discrete, and random

utility models. TRANUS has been applied in Latin America, the United States, Europe, and Japan ("TRANUS: General Description," n.d.).

Outputs: Considering a number of cost factors associated with trip making, the TRANUS model estimates trip generation to produce a traffic flow matrices. Elasticity in trip generation is assumed to accurately project traffic flow. For example, during peak traffic conditions the number of compulsive or service-related trips is assumed to be lower than the number of trips during non-peak conditions. This allows for traffic flow matrices to be produced as matrices of time, such as peak hour or total day. The traffic flow matrices also account for modal split, identifying public transportation use ("TRANUS General Description," n.d.). Figure 4.7 depicts an example of network flows produced by the TRANUS program.

Figure 4.7 TRANUS Road Network Output

Source: http://www.modelistica.com/tranus_english.htm

Red = Automobiles
Green = Transit

Limitations: Due to variations in land use regulations between regions and use of household preference surveys, a high level of input data is required to generate outputs with the TRANUS program. Also, while TRANUS has been applied in the United States, the model's basic structure is more readily applicable to land use and transportation scenarios in Europe. Thus, the TRANUS program has been only minimally used in the United States.

Potential: The TRANUS program could potentially be used to describe the service area of a toll road. However, a substantial investment of time and money would be required to effectively apply the model.

Regional Economic Models Inc. (REMI)

Program Description: Introduced in 1980, the Regional Economic Models Inc. (REMI) model predicts the economic and demographic effects of policy initiatives and generates long-term forecasts. The REMI model incorporates input/output, general equilibrium, and econometric and economic geography methodologies to provide economic analysis. Coupled with REMI TranSight travel demand models, the REMI model is capable of evaluating the economic impact of transportation improvements, describing cause and effect relationships in the economy. The REMI model has been used in the United States by national, regional, state, and city governments as well as universities, non-profit organizations, public utilities, and private consulting firms. The model has also been used in Europe by national and regional government agencies, consulting firms, universities, and private institutions ("REMI Brochure," n.d.).

Outputs: The REMI TranSight travel demand models provide a wealth of economic data concerning transportation improvement projects. The TranSight model factors in vehicle miles traveled, vehicle hours traveled, emissions, safety, and fuel demand to provide data for the following categories ("REMI Brochure," n.d.):

- employment by industry
- output by industry
- wage rates and personal income
- population by demographic growth
- gross regional product

These categories help planners identify the number of jobs generated due to a highway expansion project, total economic impact of transportation projects in a state, and whether expanding transit or improving roads would have a greater impact on a city's or region's economy.

Limitations: Most toll roads in the United States have been built to provide a bypass route either through or around a city. As a model used to predict economic activity at a regional level, the REMI model does not consider the level of geographic detail necessary to evaluate the service area of most toll roads. Additionally, the REMI model states economic impacts on road projects along a corridor, but does not specifically identify economic impacts at points along the corridor.

Potential: In order for the REMI model to serve as a tool for defining service area, the model would need to be integrated with a travel demand package that could provide information at the corridor level.

Random Utility-Based Multiregional Input-Output-Model (RUBMRIO)

Program Description: Designed to capture the interaction between transportation network performance and economic activity, the random utility-based multiregional input-output (RUBMRIO) model is the brainchild of Dr. Kara Kockelman at The University of Texas at Austin. RUBMRIO is used to model trade flows from major ports or entry points statewide to meet "final demand" at various zones, typically done at an inter-county level. To model trade flows, foreign and domestic export demands, population, available floor space, transportation networks, and congestions levels are all considered. From trade flow models, personal and freight travel behaviors may be identified. To determine personal trip making, the RUBMRIO model looks at expenditure surveys to gain an understanding of how much households spend each year on shopping. That figure is then divided by the number of shopping trips the average household makes, to get a sense of shopping trip distribution (sensitivity to distance/travel costs). Most notably, the RUBMRIO model has been applied to a study of the Trans-Texas Corridor [Kockelman, 2005].

Outputs: Analysis of trade flows using the RUBMRIO model provides a wealth of data concerning the following categories:

- commercial and personal trip making
- inter-county trade flows
- production and jobs per county, by industry
- wage rates and floor space rent
- population distribution

Limitations: Similar to the REMI model, the RUBMRIO model is intended for macroeconomic analysis on a regional or multi-regional scale. Once the model is used at a finer than regional level of spatial detail, the discreteness of industrial facilities and zoning, amongst other variables, start to have a strong effect on allocation of production and trade flows [Kockelman, 2005].

Potential: The RUBMRIO model has been applied to the Trans-Texas Corridor but would not be applicable to most toll road scenarios.

4.3.2 Traffic Analysis Modeling Programs

TransCAD

Program Description: TransCAD was the first transportation modeling program to apply geographic information system (GIS) software to store, display, manage, and analyze transportation data. By embracing the capabilities of GIS, the TransCAD program gives transportation planners a tool for increasing the accuracy and efficiency of transportation models. TransCAD is also able to determine how the shape of the road network will affect network distance and travel times. Further, TransCAD allows transportation planners to measure geographic accessibility as different modeling equations may be applied within regions with varying geographic sub-areas. TransCAD is perhaps the most widely used and recognized transportation modeling program in the United States ["TransCAD Overview," n.d.].

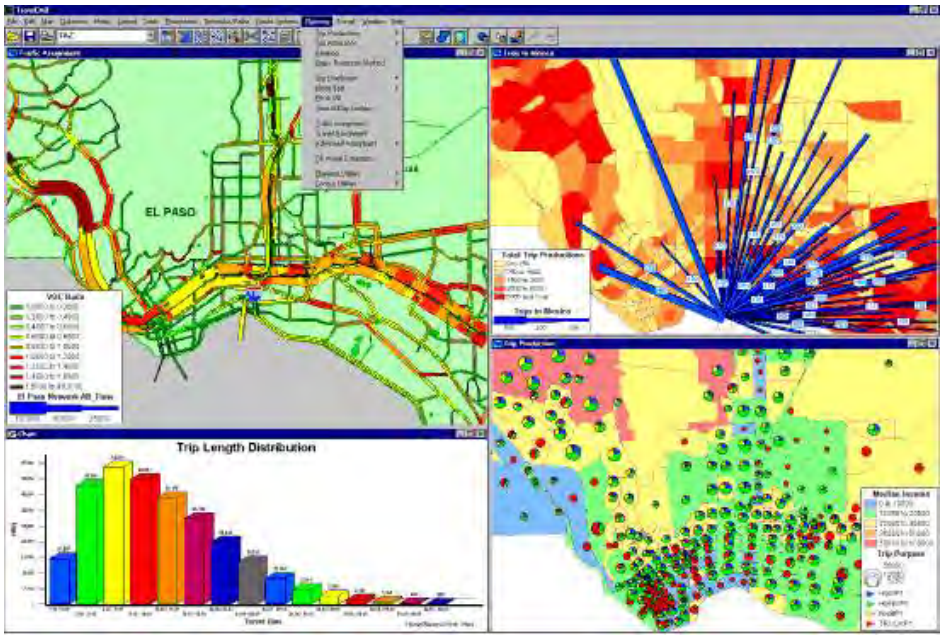
Outputs: The TransCAD program incorporates the capabilities of GIS to create traffic demand models. TransCAD traffic demand models include the following objects:

- Transportation Networks
  - Specialized data structures that govern flow over the network
- Matrices
  - Contain data such as distance, travel times, and origin-destination flows
- Route and Route Systems
  - Indicate paths taken by trucks, rail, cars, buses or individuals including tools to create, display, edit, and manipulate routes
- Linear-Referenced Data
  - Identify the location of transportation features as a distance from a fixed point along a route

To create traffic demand models, TransCAD uses demographic variables from census data. Next, TransCAD identifies trip generation, trip distribution, and mode split to create traffic assignment on the road network. In addition, TransCAD has the capability to generate advanced highway assignment using procedures for generalized-cost traffic assignment, HOV assignment, multimode vehicle assignment, multiple user class traffic assignment, combined trip distribution and assignment with volume-dependent turning delays, and signal optimization ["TransCAD Overview," n.d.].

TransCAD traffic demand models are presented in a variety of map forms, including pattern coded, dot-density, scaled-symbol, and integrated pie charts. Individual data points are also represented in tabular form for reference. Figure 4.8 gives examples of maps produced with TransCAD:

Figure 4.8 TransCAD Network Map Outputs



Source: http://www.caliper.com/TransCAD/Mapping.htm

Limitations: As a tool for identifying the service area of a toll road, the TransCAD program has two major limitations [Kalmanje, 2004]:

1) TransCAD identifies origin and destination totals for each traffic zone, but is unable to determine the specific traffic zone or zones contributing to each destination zone total. Thus, TransCAD fails to provide disaggregate information at a sub-zonal level. When traffic assignment occurs, individualized trip origins are lost.

2) As a static traffic assignment program, TransCAD is unable to produce dynamic traffic assignment. TransCAD takes a snapshot of the road network at a set time of the day, lacking the capability to consider ongoing traffic conditions before the traffic assignment step.

Potential: With the addition of add-on code tagging each of the users on the road network, trip origin and destination data could be retained when traffic assignment occurs [Kalmanje, 2004]. However, TransCAD's limitations as a static traffic assignment program make it a poor alternative to programs offering dynamic traffic assignment features. Thus, TransCAD is an ineffective tool for evaluating toll road service area.

DYNASMART

Program Description: DYNASMART is a state-of-the-art dynamic network analysis and evaluation tool for intelligent transportation network design, planning, evaluation, and traffic simulation. DYNASMART is capable of modeling the evolution of traffic flows in a traffic network that result from the travel decisions of individual network users. The program also has the ability to consider how impedance to network links (construction, congestion, etc.) affects route choice ["DYNASMART-P," n.d.].

Outputs: The DYNASMART program goes beyond the limitations of traditional static traffic assignment models offering the following features [Mahmassani, 2003]:

- Detailed representation of traffic networks with different link types such as freeways, highways, and arterial networks; micro-simulation of individual trip-making decisions, particularly route choice
- Efficient hybrid traffic simulation-assignment approach, which moves individual vehicles according to robust macroscopic traffic flow relations
- Representation of multiple vehicle types (trucks, cars, buses, etc.)
- Detailed output statistics at both the aggregate and the disaggregate levels
    - Example: DYNASMART produces the various traffic characteristics over time of each link in the network such as volume, speeds, densities, queues, etc. It also produces the trajectory of each vehicle in the network, from origin to destination, including intermediate activity stops. Statistics such as average travel times, average stopped times, and the overall number of vehicles in the network are also given at varying levels of aggregation.

The graphical user interface (GUI) feature of the DYNASMART-P program allows users to easily change some of the frequently used inputs. The input and output files may also be conveniently viewed in the program. Example input and output files are given in Figures 4.9 to 4.11 [Wang, 2004].

Limitations: Due to the complexity of the DYNASMART program and number of input variables, traffic models require major effort. Additionally, the level of geographic detail is limited by the fact that no more than 300 traffic zones may be analyzed in order for the computer to be able to produce traffic models for a metropolitan area [Wang, 2004].

Figure 4.9 Dynasmart Input/Output Data Manager Window

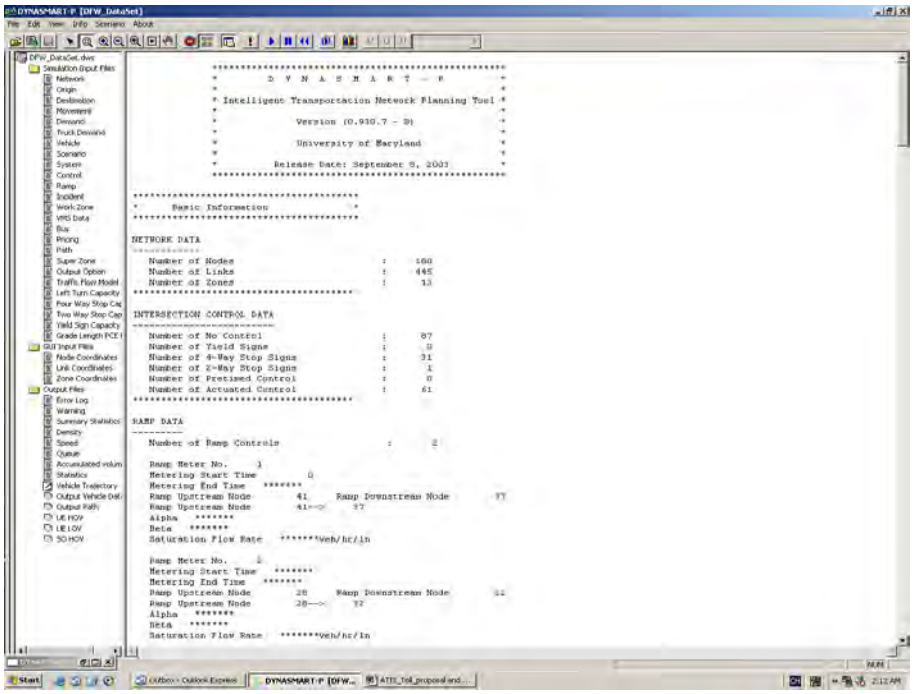


Figure 4.10 Dynasmart Simulation Interface

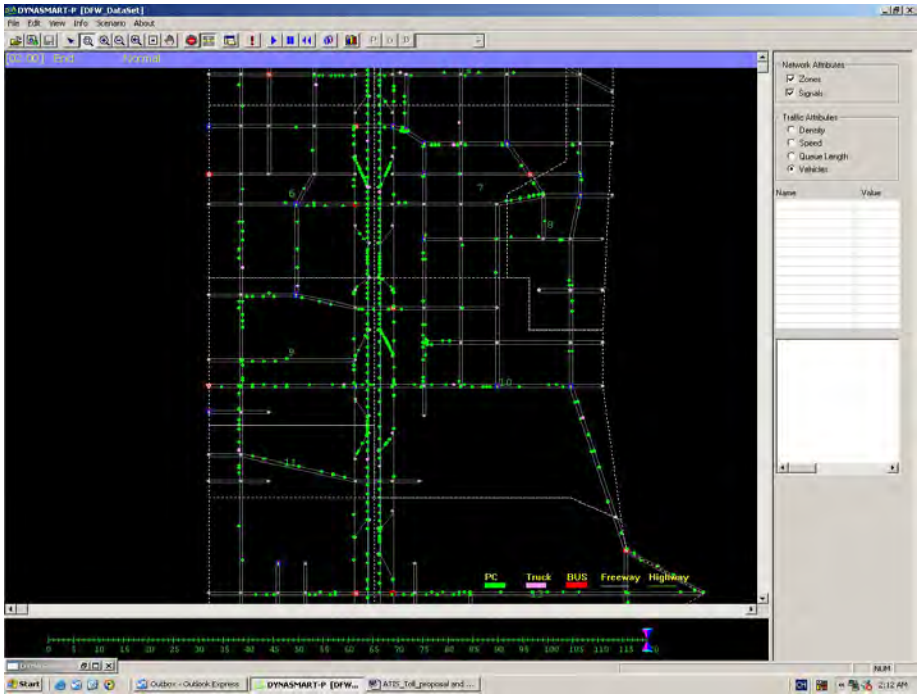
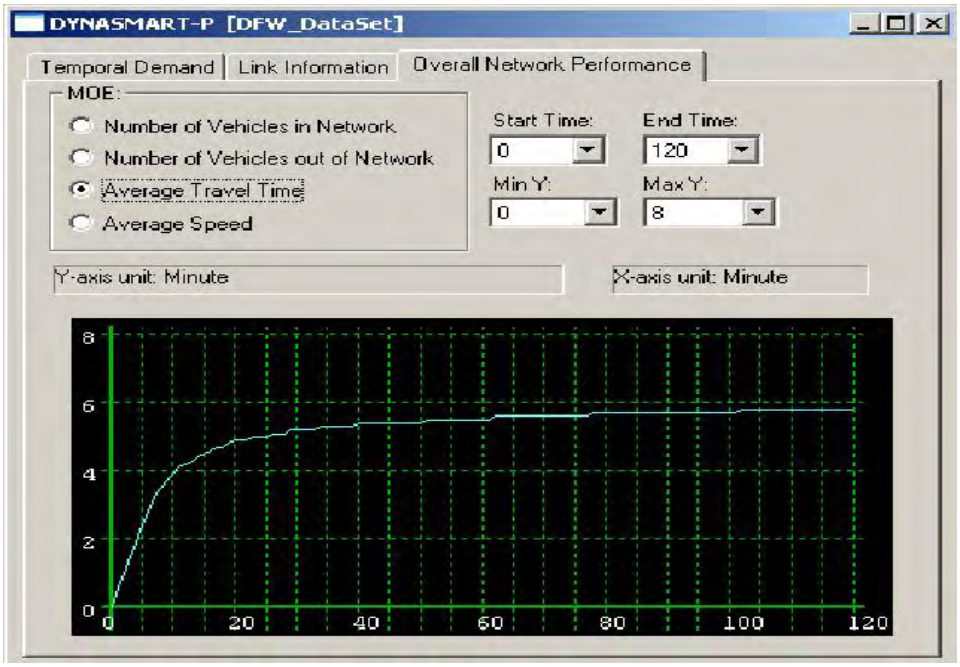


Figure 4.11 Dynasmart Plot Window



Potential: The DYNASMART program is currently under review by the Federal Highway Administration (FHWA) and may become a more widely used and recognized program in the future. However, add-on code would be required to retain the trip origin and destination data needed to accurately project the service area of a toll road. The additional code would serve as an added strain on producing output data in the program. DYNASMART could prove to be an effective tool for determining toll road service area, but a great deal of effort would be required for the program to achieve the desired results.

CORSIM and VISSIM

Program Description: CORSIM and VISSIM are comprehensive microscopic traffic simulation programs. Using driver behavior models, the programs simulate traffic on surface streets, freeways, and integrated networks with a complete selection of control devices (stop/yield signs, traffic signals, etc.), as shown in Figure 4.12. Highly complex traffic conditions may be visualized by either program in fine detail including simulations of either automobile or transit service ["CORSIM Overview," n.d., and "VISSIM," n.d.]. The major difference between the two programs is that CORSIM offers 2D simulation, while VISSIM offers 3D simulation [Machemehl, 2005]. The programs have been applied in over 70 countries worldwide.

Figure 4.12 VISSIM Simulation

Source: http://www.english.ptv.de/cgi-bin/traffic/traf_vissim.pl

Outputs: Both programs provide visual animation of traffic flows at intersections, transit interchanges, toll plazas, traffic calming areas, and border or bridge facilities. The programs offer a comparison of vehicle delays in Microsoft Excel through network and capacity analysis with alternative route choice using dynamic traffic assignment.

Limitations: The CORSIM and VISSIM programs are used to simulate demand not predict it [Machemehl, 2005]. In order to define service area it is necessary to predict demand along a specified route. However, CORSIM and VISSIM require that traffic demand in the form of an OD (origin-destination) matrix be known.

Potential: CORSIM and VISSIM cannot be applied to define service area due to their inability to predict traffic demand along a specified route.

VISTA

Program Description: VISTA is an innovative network-enabled framework that integrates data and models for a wide range of transportation applications—planning, engineering, and operational. The core of VISTA is an advanced dynamic traffic assignment simulation that computes the path choices of all network users and simulates their movement through the road network, while accounting for myriad details, such as traffic signal transitions, detours, lane/street closures, variable message sign use, ramp metering, and tolls. The basic structure of VISTA is shown in Figure 4.13. VISTA has been used by the Ohio, New Jersey, and Illinois DOT, the Chicago Regional Transportation Authority, and the US ARMY Corps of Engineers.

Outputs: The VISTA program includes the performance of basic GIS operations and may be accessed by either a cross-platform Java client or Web page. Using RouteSIM, the traffic simulation function includes individual driver and transit route designation, freeway operations, commercial vehicle operations, and signal optimization. The resulting traffic patterns, toll collection, and travel times are assembled for visual inspection as well as database analysis. An example of a visual representation of network flow using the VISTA program is shown in Figure 4.14.

Figure 4.13 VISTA Program Structure

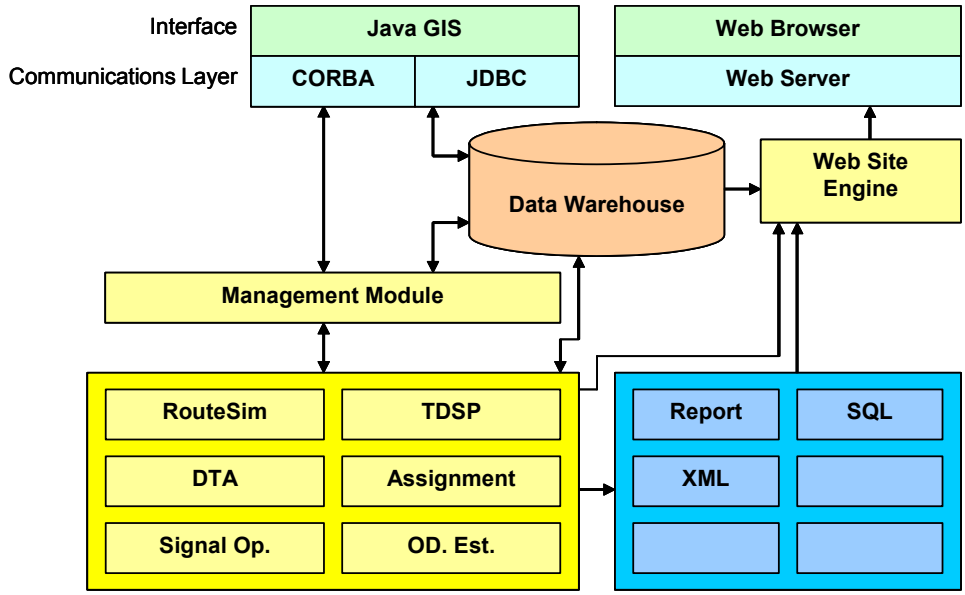
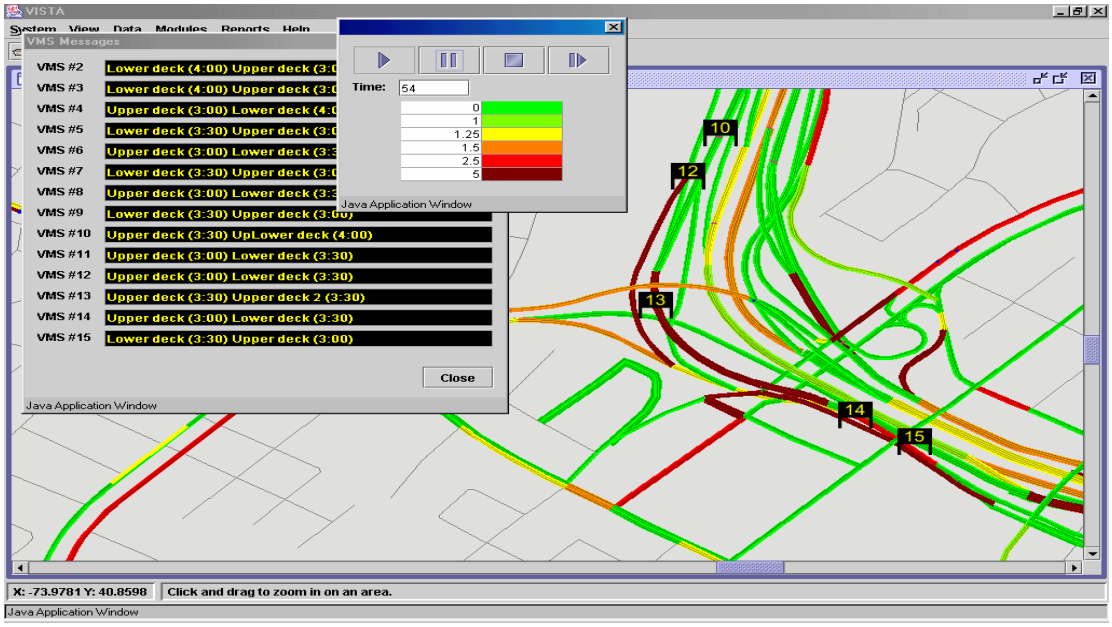


Figure 4.14 VISTA Network Flow Diagram



Limitations: The main limitation of VISTA is that it does not account for lane changing behavior in the simulation module, and the program does not consider a variety of toll scenarios and dynamic pricing considerations.

Potential: Of all the software programs reviewed by the research team for applicability to define toll project service area, VISTA is considered the best candidate. Only minor adaptations to the existing software would be required to achieve the desired results. The necessary adaptations include:

- Development of graphical interfaces for different route flows resulting from different tolling scenarios
- Changes in least cost path algorithms to support class-specific route choice (not all users view system costs the same way)
- Alterations to support dynamic pricing considerations
- Development of an output interface for service area

Such adaptations can be easily made by The University of Texas at Austin researchers who have the VISTA source code readily available. Coupling the adaptations with a complete network representation, including typical planning and operations data describing the network structure/topology and link capacities of a specific region, a useful representation of service area could be created within one year.

4.4 Summary

Defining a non-compete zone on a pure geographical basis, such as a five-mile separation, is overly simplistic. Instead, it is necessary to analyze traffic zones to various levels of aggregation and to determine likely toll road users in those regions. Current planning techniques use as an input the geographic location of the origins and destinations of users, and end with the traffic demand on regional roads. Typically, no attempt is made to do the reverse, that is, take the known volumes of traffic on specific routes and model their origins and destinations. In the context of toll roads, users tend to be a market segment (income level, value of time, willingness to pay), and it was seen that estimation models tend to overstate likely toll traffic and revenue.

In addition, alternative routes must be analyzed for competitiveness in travel distance and time. Socioeconomic forecasts are needed to predict traffic growth patterns. Traffic distribution must be simulated through network modeling. Traffic modeling programs are now taking a new approach to the issue using dynamic traffic assignment, user value of time, and cost penalties, but these applications require a great deal of effort to achieve any pertinent and valuable results. The need for all of these complex analyses explains why traffic forecasting for a toll road requires 2–3 years of effort by a team of traffic consultants. In fact, there are only a handful of consultants in the world whose traffic and revenue forecasts are acceptable to major investment banks and bond rating agencies.

Ultimately, undertaking the effort required to define the service area around a toll road might not provide useful information because of the dynamic (and often unpredictable) nature of development around roads. Instead, flexibility in the contractual terms would allow both parties to respond to changing conditions and thus increase public acceptance. Risk sharing and cooperation between the public and private sectors are more likely to lead to toll project success than restrictive covenants would.

Chapter 5. Conclusion and Recommendations

5.1 Summary of Report

The primary objective of this research was to provide TxDOT with guidelines for toll agreements that would reduce the need for, or the negative effects of, non-compete clauses. For this purpose toll experiences in the United States, Canada, Mexico, South America, Europe, Africa, and Asia were investigated. Twenty case studies are presented in this report (Chapter 2). Lessons learned from the case studies were synthesized into a set of best practices (Chapter 3), providing a number of alternatives to non-compete clauses for both the public and private sectors.

This research also addressed the question of whether it is feasible to define a non-compete zone around a toll road. A broad list of planning techniques for identifying transportation catchment areas was compiled and evaluated for applicability in a toll road context. Additionally, the potential to use existing land use and traffic modeling programs to define toll road service area was investigated. Results from the analysis of planning techniques and modeling programs were summarized in Chapter 4. Appendix A is a matrix of best practices in toll agreements organized according to the risks faced by the public and private sector respectively.

5.2 Conclusions

Case Studies: The primary reason toll investors request non-compete clauses is to protect themselves from revenue risk. In the U.S. case studies, California learned a harsh lesson from the SR 91 project and adjusted its approach for the TCA projects. States with mature toll networks, such as Florida, New York, and New Jersey, have not had to deal with concerns over competition. Other states have either rejected NCC or scaled down their tolling initiatives in the face of public opposition. Still, many states are considering tolling as a viable way to deliver transportation projects. Currently Texas is perhaps the most active state in tolling, and many of the personnel who worked on the California projects are now advising or managing Texas efforts. Texas is therefore benefiting from the lessons learned in California.

Though only a handful of countries have experience with tolling, the international case studies provided a variety of alternatives in toll agreements to address many of the underlying risks. Several countries are successfully experimenting with innovative approaches. Canada was able to build a new toll road in the Toronto region, where there are two non-tolled parallel routes, and then to lease it to a private operator for a substantial sum. Australia is widely acclaimed as a forerunner in building and operating toll roads in regions similar to Texas. Chile is perhaps the leader in innovation regarding toll agreements and has used innovative strategies to build a national toll road network. France, Italy, and Spain are using a franchise approach that treats the toll system as a public utility regulated under managed competition. Best practices from these case studies have been extracted and organized under financial, legal, planning, operational, regulatory, and political headings.

Best Practices: Best practices in toll agreements reflect the very different objectives of the public and private sectors. The public sector is primarily concerned with

enhancing quality of life by improving mobility or supporting economic development. Toll projects offer the public sector a way to add transportation infrastructure rapidly without raising taxes. The private sector, with a primary objective of achieving profits, will not undertake toll projects unless the investment is at least as safe as riskless ventures such as Treasury Bonds.

Forty-four best practices were developed in this research. Of the 17 found relevant to the public sector, 4 were financial, 2 were legal, 3 were planning-related, 1 was operational, 1 was regulatory, and 6 were politics-related. Of the 27 that apply to the private sector, 8 were financial, 4 were legal, 6 were planning, 4 were operational, 4 were regulatory, and 1 was political-related. These numbers hint at the relative importance of each group of issues to each sector.

Each proposed toll project presents a different set of obstacles and opportunities for use of public-private partnerships. Each toll agreement will thus draw upon a different mix of public and private sector best practices to achieve the objectives of both parties.

Service Area: The service area of a road is not a well-defined concept in transportation engineering. Since the objective of this research project was to investigate the issue of non-compete clauses, and a fundamental feature of an NCC is the delineation of a non-compete zone, the assumption was made that service area represents the geographic locations from which the majority of the road users originate. Current planning techniques use as an input the geographic location of the origins and destinations of users, and end with the traffic demand on regional roads. Typically, no attempt is made to do the reverse, that is, to take the known volumes of traffic on specific routes and model their origins and destinations. It was found that defining a non-compete zone on a purely geographical basis, such as a five-mile separation, is overly simplistic. Instead, it is necessary to analyze the origins and destinations of commuters in the region and to research toll road choice likelihood. Toll road users tend to be a market segment (income level, value of time, willingness to pay) rather than a geographic area. Current models tend to overestimate likely toll traffic and revenue.

Definition of the characteristics of competing routes is also vague. Routes must be analyzed for competitiveness in travel distance, time, and generalized cost to users. Socioeconomic forecasts are needed to predict traffic growth patterns. Traffic distribution must be simulated through network modeling. Traffic modeling programs are now taking a new approach to the issue using dynamic traffic assignment, user value of time, and cost penalties, but these applications require a great deal of effort to achieve usable results. Traffic forecasting for a toll road requires 2–3 years of effort by a team of traffic consultants. In fact, there are only a handful of consultants in the world whose traffic and revenue forecasts are acceptable to major investment banks and bond rating agencies.

Ultimately, defining a non-compete zone around a toll road may not be a beneficial exercise because of the dynamic (and often unpredictable) nature of development around roads. Restricting development may actually hurt the long-term prospects of the toll road. Instead, flexibility in the contractual terms would allow both parties to respond to changing conditions and thus increase public acceptance. Risk sharing and cooperation between the public and private sectors are more likely to lead to toll project success than restrictive covenants would.

5.3 Recommendations

Competition is inevitable in the mixed toll and non-tolled system that is prevalent throughout the United States. In many U.S. toll experiences, toll revenues have not been sufficient to pay for the road. Rather than ignoring competition by accepting non-compete clauses, the public sector should undertake strategies that allocate risk between the public and private sector according to each sector's ability to mitigate that risk. Generally, the public sector is not likely to spend money to upgrade alternate non-tolled routes unless there is a pressing need. Since the private sector has the resources to more nimbly respond to needs, it should seek flexibility in the contract to be the responder of first choice when the public demands improvements. Ultimately, a commitment by both parties to ensure public acceptance and support for toll projects is the most important ingredient in their financial success. Using best practices laid out in this report, toll agreements can be tailored so that public benefits may be realized at the same time that the use of private capital is encouraged.

The best practices presented in Chapter 3 have been submitted as a stand-alone research product P1. The summary of best practices in Appendix A has been submitted as product P2. In addition, the research team has developed a PowerPoint presentation complete with speaker notes, submitted as research product P3, which summarizes the case studies and lessons learned. This report and the research products should be made available to TxDOT planners throughout the state. The findings presented in this report could serve to further TxDOT's efforts in adopting win-win strategies as the department explores the use of tolling on future road projects.

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Appendix A:
Matrix of Best Practices

Tables A1 and A2 illustrate the sources of risks on toll projects and potential mitigation for the public and private sectors respectively. Also included is a check on whether the mitigation would reduce concerns over competition from tax-supported roads and thus contribute as an alternative to a non-compete clause.

Table A1: Public Sector Best Practices in Toll Agreements

Public Sector Best Practices in Financial Issues

Nature of Risk	**Potential Mitigation**	**Alternative to NCC?**
Project cost: PPP could be more expensive than publicly funded projects (costs of administration, legal, borrowing/interest, profit)	Require competitive bidding; establish defined set of tool for evaluating bids	No
Project value: Ultimate value of franchise not properly calculated	Place a value on Real Options	Yes
Guarantees/subsidies greater than expected; over-commitment; effect on other commitments	Establish minimum and maximum guarantees linked to rate of return	Yes
Private monopoly; Guaranteed return on investment, so unnecessary expenditures	Set standards and defined categories for expenditures	Yes

Public Sector Best Practices in Legal Issues

Nature of Risk	**Potential Mitigation**	**Alternative to NCC?**
Non-completion: default during construction; DOT has to complete project with other funds	Require adequate performance bond	No
Franchise entrenchment: Franchise becomes powerful, prevents competitors from entering	Include sunset provisions; re-bid at defined stage	Yes

Public Sector Best Practices in Planning Issues

Nature of Risk	**Potential Mitigation**	**Alternative to NCC?**
Project selection: Only financially attractive projects may be selected. Economically beneficial projects or necessary connections may not be built.	Package entire corridor as single project; use surpluses to subsidize low-traffic segments; match incentives	Yes

	to project feasibility	
Minimal designs that reduce capital outlay, e.g., build in median, no overpasses, etc., resulting in no crossings, safety problems, difficulty with upgrades	Require same standards as public projects; design review by DOT	No
Non-compete agreement: Inability to add capacity or modify adjacent system	Require exceptions to NCC for safety or projects in an approved plan	~

Public Sector Best Practices in Operational Issues

Nature of Risk	**Potential Mitigation**	**Alternative to NCC?**
Maintenance: Near end of franchise/ transfer of ownership, operator may neglect maintenance or stop investing in newer technologies	Define maintenance schedule, or DOT take responsibility for maintenance	No

Public Sector Best Practices in Regulatory Issues

Nature of Risk	**Potential Mitigation**	**Alternative to NCC?**
Profiteering: Operator charges higher tolls in response to demand	Regulate toll rates; require capacity improvements if demand exceeds defined level	Yes

Public Sector Best Practices in Political Issues

Nature of Risk	**Potential Mitigation**	**Alternative to NCC?**
Public opposition: Mixing public funds with private: perception that public money is being given away	Separate funding obligations/ make information available to public	No
Cronyism: Well-connected developers get projects	Define projects and selection process in advance	No
Double taxation: having to pay a toll plus gas taxes	Rebate gas tax or discount toll by equivalent	No
Inequity: I can't afford the toll but I need to use the road	Provide income-related toll discount	No
Fairness: My road is tolled but not other routes	Provide non-tolled alternate route	No
Revenue maximization: Congestion on other routes	Maximize throughput	No

Table A2: Private Sector Best Practices in Toll Agreements

Private Sector Best Practices in Financial Issues

Nature of Risk	Potential Mitigation	Alternative to NCC?
Investment equity: Disagreement over investor contribution versus public contribution	Establish a minimum % of project cost assigned to each party; segregate equity by asset, e.g., one party pays for ROW, other for pavement.	Yes
Tax exemption for bonds, if not allowed, can lead to disadvantageous borrowing rates	Try to obtain tax-free bonds	Yes
Franchise period: Insufficient return at end of predefined franchise period	Leave franchise period open; determine a value at transfer based on returns to date = cap on PV of total return	Yes
Revenue shortfall: Inability to make payments to debtors	Minimum guaranteed revenue or subsidies, e.g., shadow tolls (= rent)	Yes
Uneven demand in corridor or region	Transfer revenues from lucrative segments	Yes
Rate of return cap: Returns limited—no return in early years, no incentives in later years	Extra points when public objectives met, e.g., carpooling targets, level-of-service (LOS), etc.	Yes
Limited tax benefits: None in early years, e.g., depreciation allowed only if profit earned	Take advantage of tax benefits	Yes
Loss of non-toll revenues: e.g., windfall tax revenues, concession rights, development rights, impact fees	Negotiate in advance, e.g., share of taxes; sale of traffic information.	Yes

Private Sector Best Practices in Legal Issues

Nature of Risk	Potential Mitigation	Alternative to NCC?
Agreement non-binding on future government; laws and/or terms of agreement can be changed	Use "grandfather" clause or try to obtain payback in shortest period possible	No
Contract cancellation: Loss of investment up to that point	Utilize a monthly reimbursement schedule	No
Buyout by government: Inadequate compensation	Establish buyout valuation process/terms	Yes
Bankruptcy: Inability to repay debtors	Establish debt assumption rules	No

Private Sector Best Practices in Planning Issues

Nature of Risk	Potential Mitigation	Alternative to NCC?
Project location/market: Distance from population centers; circuity Regional changes—land use patterns: Development may not occur as expected Economic activity: Population and employment growth may not occur	Seek congestion relief projects over economic development goals	Yes
Regional plans: may include traffic competitors. Development of, increase in capacity, or upgrading of, alternate routes.	Allow projects in approved plan but require compensation for revenue impacts	Yes
Competition: Traffic uses alternate routes; traffic on tolled route is less than projected	Provide better service (guaranteed travel time, separation from trucks, etc.)	Yes
Capacity of connectors: Ability to funnel traffic in and out	Include upgrading of connectors in agreement	Yes
Access: Demands for more access	Establish standards for ramp spacing	No
Travel demand: May not grow as projected; May shift to other modes; May be stifled by costs, e.g., gas prices Congestion: Can worsen on alternate routes	Design project for easy phasing/expansion; Define thresholds for adding capacity based on v/c ratios or LOS	Yes

Private Sector Best Practices in Operational Issues

Nature of Risk	Potential Mitigation	Alternative to NCC?
Signing: No leader signs on non-tolled system	Use standard signing conventions	Yes
Lane availability: Closed for repairs	Use rapid repair systems; provide proper detour information	No
Safety management: Could be sub-standard	Contract with public agency providers	No
Interoperability: Incompatibility with other tolling programs	Be prepared to upgrade technology	No

Private Sector Best Practices in Regulatory Issues

Nature of Risk	**Potential Mitigation**	**Alternative to NCC?**
Environmental: Pollution management	Negotiate environmental requirements	No
Advertising: Clutter/eyesores	Use DOT standards for roadside advertising	No
User privacy: Use of user records	Remove identifiers	No
Changes in regulations: Standards and requirements may change	Agree that regulations are only enforceable if implemented on most public facilities	Yes

Private Sector Best Practices in Political Issues

Nature of Risk	**Potential Mitigation**	**Alternative to NCC?**
Public opposition: Toll rate too high; steep increases; claims of gouging	Use industry ranges; increase regularly to match inflation	Yes