I-77 South Express Lanes Comparative Analysis

Supplemental Report

September 2024

Prepared for NCDOT by Advisors

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Acronyms & Definitions

Alternative Technical Concept (ATC): Suggested changes submitted by proposing teams to the basic configurations, project scope, design or construction criteria provided by the contracting agency.

Automated Vehicle Identification (AVI): A system which transmits signals from an onboard tag or transponder to roadside receivers for uses such as electronic fee collection.

Charlotte Regional Transportation Planning Organization (CRTPO): The federally designated Metropolitan Planning Organization for the Charlotte Urban Area.

Compound Annual Growth Rate (CAGR): The annualized average rate of growth between two given years, assuming growth takes place at an exponentially compounded rate.

Design Build Finance (DBF): Procurement model where a single contract is awarded for the design, construction, and full or partial financing for the upfront cost for the delivery of a facility.

Design Build Finance Operate Maintain (DBFOM): A project delivery method that allows a private sector consortium to design, construct, finance, perform regular maintenance, and rehabilitation of the infrastructure asset over the term of the contract to meet predefined performance specifications.

Environmental Assessment (EA): Determines whether or not a federal action has the potential to cause significant environmental effects.

Electronic Toll Collection (ETC): A technology and toll payment option that allows customers to use a pre-authorized toll account for payments at one or more toll facilities.

Equity: An ownership interest in an asset - in this case, a private ownership interest in an asset such as a project corporation.

Express Lanes: Separate toll lanes operating in parallel with other general purpose travel lanes on a given route and require a price for their use. Traffic in the express lanes may be controlled by access rights, vehicle occupancy, vehicle type, and/or a variable price. Priced express lanes may include discounts or exemptions from certain users, such as high-occupancy vehicles, motorcycles, and transit vehicles.

High Occupancy Vehicle (HOV): A vehicle with two or more occupants.

Mecklenburg - Union Metropolitan Planning Organization (MUMPO): the former name of CRTPO.

North Carolina Department of Transportation (NCDOT): A department of the North Carolina state government.

North Carolina Turnpike Authority (NCTA): A business unit of the North Carolina Department of Transportation created by the Authority Act in 2002.

National Environmental Policy Act (NEPA): Signed into law on January 1, 1970. NEPA requires federal agencies to assess the environmental effects of their proposed actions prior to making decisions.

Operations and Maintenance (O&M): Costs related to the day-to-day operations and maintenance of a roadway.

Public Private Partnership (P3): A P3, is a government service or private business venture funded and operated through a partnership of government and one or more private sector companies. A P3 involves a contract between a public sector authority and a private party, in which the private party provides a public service or project and assumes substantial financial, technical and operational risk in the project.

Private Activity Bonds (PABs): Tax-exempt debt issued for P3s.

Renewal and Replacement (R&R): Costs related to the major repair or reconstruction of roadway assets.

Request for Proposals (RFP): A document that announces a project, describes it, and solicits bids from shortlisted bidding teams.

Request for Qualifications (RFQ): A document asking potential interested bidding teams to provide information about their experience and background in order to provide a specific good or service.

Right of Way (ROW): Land purchased for the construction, operations, and maintenance of a facility.

Strategic Transportation Investments (STI) Law: Passed in 2013, the STI Law established the Strategic Mobility Formula, which allocates available revenues based on data-driven scoring and local input. It is used to develop the State Transportation Improvement Program.

State Transportation Improvement Program (STIP): A 10-year State and Federal-mandated plan that identifies the construction funding for and scheduling of transportation projects throughout the state.

Traffic and Revenue (T&R) Studies:

- **Level 1 T&R Study:** Also referred to as a "Sketch" or "Screening" level study. A Level 1 study utilizes existing data sources and models to screen a project and provide conceptual traffic and revenue forecasts.
- **Level 2 T&R Study:** Utilizes existing travel demand models, but incorporates new traffic counts along with speed and delay studies. A Level 2 study also incorporates a socioeconomic review and the value of time from census statistics. This study results in preliminary traffic and revenue forecasts.
- **Level 3 / Investment Grade T&R Study:** Utilizes a full travel demand model and forecasts. A Level 3 study incorporates new traffic counts, speed and delay studies, toll policy, origin and destination surveys, stated preference surveys and incorporates an independent economic review. A Level 3 study results in "Certified" or "Investment Grade" traffic and revenue forecasts that can be used to satisfy Lender, Investor or Rating Agency requirements.

Transportation Infrastructure Finance and Innovation Act (TIFIA): Act from 1998 which provides credit assistance from USDOT for qualified projects of regional and national significance.

Toll Revenue Bonds (TRBs): Bonds issued against future project or asset-specific revenues that are pledged to pay debt service.

Value of Reliability (VoR): A measure of the consistency, timeliness, predictability, and dependability of a trip.

Value of Time (VoT): The willingness-to-pay to reduce travel time and is derived by understanding the trade-off between time and money.

Comparative Analysis Background

In February 2023, the Charlotte Regional Transportation Planning Organization (CRTPO) approved a motion for the North Carolina Department of Transportation (NCDOT) to complete the following task[1] regarding the I-77 South Express Lanes Project (the "Project"):

- Perform a comparative analysis of a potential Public-Private Partnership (P3) delivery approach (P3 Toll Delivery) versus a traditional public option (Traditional Toll Delivery) delivered through the North Carolina Turnpike Authority (NCTA), including evaluations of risk, financial feasibility, benefit-cost, and value for money.

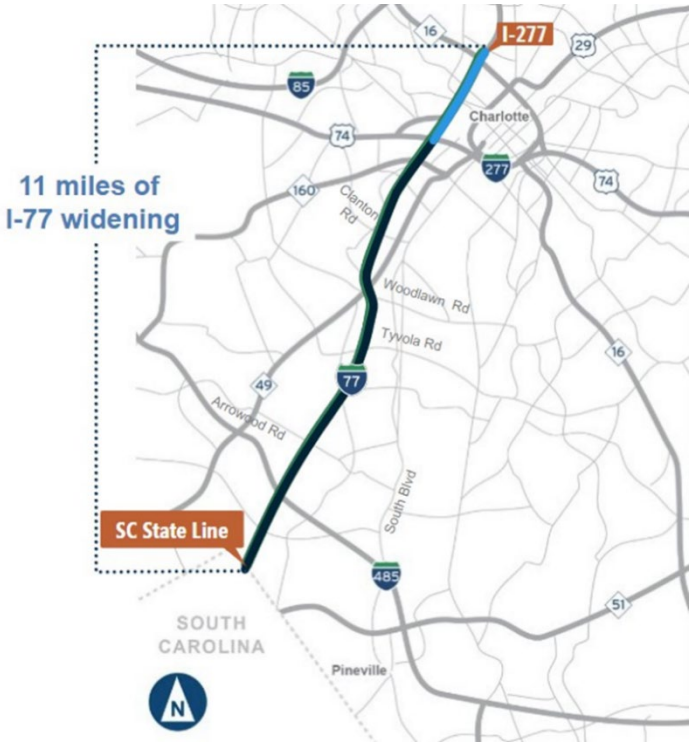
This comparative analysis work was prepared in response to this motion. NCDOT and NCTA are not endorsing a particular delivery method but are instead providing information to assist CRTPO in making an informed decision for the region.

[1] CRTPO's motion also stated that NCDOT should i) perform initial screening of the unsolicited proposal in accordance with the requirements and expectations as defined in NCDOT's P3 Policies & Procedures document; ii) form a working group consisting of NCDOT, NCTA, and CRTPO staff.

Project Overview

Background

The I-77 South Express Lanes Project, State Transportation Improvement Program (STIP) Project I-5718, is located in the Charlotte Metropolitan area and spans approximately 11 miles, from the South Carolina State Line to I-277/NC 16 (Brookshire Freeway). The section from the South Carolina State Line to W. Morehead Street has six lanes (three in each direction), while the segment from W. Morehead Street to I-277/NC 16 has eight lanes (four in each direction). The proposed improvements below are also part of the Project:



- The addition of two express lanes in each direction for the full length of the Project.[2]
- Reconstruction of interchanges and non-interchange bridges.
- Addition of access points and direct connectors to the express lanes.

On I-77 within the Project limits, there are 13 interchanges, four grade separations (including one greenway crossing), and four railroad bridges (three-NSR and one-CSX).

The primary goal of the Project is to improve traffic flow and manage congestion on I-77 from the South Carolina State Line to I-277 (Brookshire Freeway), where the highway is currently nearing or exceeding capacity. Secondary goals include reducing congestion-related crashes, enhancing express lane connectivity based on the Fast Lanes Study recommendations, and supporting anticipated economic growth.

Ongoing Work

NCDOT has initiated the development of an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA). NCDOT currently anticipates that the EA will be completed by mid-2025. NCDOT has also completed a Level 2 Traffic and Revenue (T&R) Study on the I-77 South Express Lanes.

The findings from the environmental work, which provided the foundation for the construction cost estimates, along with the Level 2 T&R Study, support the comparative analysis work.

[2] The traffic and revenue cases with only passenger vehicles and extended vehicles (excluding commercial vehicles) in the express lanes assumed two express lanes in each direction from the South Carolina State Line to I-277 (Belk Freeway) and one express lane in each direction from I-277 (Belk Freeway) to I-277/NC 16 (Brookshire Freeway).

Program Overview

NCDOT is required by federal law to have a fiscally constrained capital program, better known as the STIP, required to be updated every four years. In practice, NCDOT updates the STIP every two years. Current budget availability for new capital projects is approximately $3.2 billion annually with little to no forecasted growth anticipated, in real terms, due to inflation. All projects must compete in a data-driven process during the respective prioritization cycle and are programmed within the forecasted budget and any legislative constraints. The impact of rising construction costs has limited NCDOT's ability to program new projects, especially larger, more complex, statewide projects in recent years.

In 2007, CRTPO (formerly MUMPO), NCDOT, and other agencies launched the Fast Lanes Study, which analyzed express lanes across the Charlotte Metropolitan area. CRTPO first included the I-77 South Express Lanes Project in the 2040 Metropolitan Transportation Plan in 2014. The first STIP that required the data-driven process was the 2016-2025 STIP. The Project was submitted by CRTPO as an express lanes project and subsequently was included in the 2016-2025 STIP with partial funding for right-of-way (ROW) acquisition. The Project's construction cost has more than tripled since its original submittal; it currently surpasses NCDOT's total annual budget of $3.2 billion. State law limits the amount of funds that can be allocated to a single project to 10 percent of the total projected funds for the Statewide Mobility category over any five-year period.

In addition to the normal budgetary constraints, state law requires the local planning organization to approve any toll project prior to inclusion in the STIP. State law does restrict the number of P3 projects to three statewide (in total). As of August 21, 2024, the I-77 North Express Lanes account for one spot, the Albemarle Rural Planning Organization passed a resolution requesting NCDOT continue the P3 delivery process for the Mid-Currituck Bridge which could secure the second project, thereby leaving one available project slot. For a P3 project to move forward, NCDOT has committed to receiving direction from any impacted local planning organization.

Express Lanes Overview (Rationale and Benefits)

Growth in vehicle miles traveled by motorists in the Charlotte region continues to rank among the top five nationally, for major metro areas, which directly contributes to the increased congestion on Charlotte's already crowded interstates, particularly I-77. In response to growing congestion, MUMPO (CRTPO) adopted in 2010 a resolution supporting the *Charlotte Region Fast Lanes Study*, which identified express lanes as a more reliable and sustainable option for improving travel times in this heavily congested corridor, as experience has shown that simply widening general-purpose lanes provides only a temporary, short-term solution to congestion.

Express lanes can offer significant benefits by providing a more reliable travel option than general-purpose lanes. Express lanes manage demand through variable toll pricing, ensuring that traffic in these lanes remains fluid by encouraging drivers to shift travel times or routes. By diverting a portion of traffic from the general-purpose lanes, express lanes help reduce overall congestion and improve flow for everyone on the road. In contrast, widening general-purpose lanes typically does not offer a reliable solution, as these lanes often fill up quickly due to induced demand, leaving traffic congestion just as bad as before. Additionally, revenue generated from express lanes can help fund project construction, operations, and maintenance costs.

Delivery Options Overview

NCDOT considered two delivery methods for the I-77 South Express Lanes Project: A Traditional Toll Delivery and a Public-Private Partnership (P3) Toll Delivery. Details on the delivery methods can be found below.

Traditional Toll Delivery

The Traditional Toll Delivery approach used by NCDOT and NCTA involves directly managing the design, construction, financing, operations, and maintenance of a project through a design-build model. In this method, the Project, due to its size, would likely be divided into multiple contracts, with various contractors working independently on different segments.

Under this approach, the state bears full responsibility for a project, including all financial risks and rewards. Financing for a Traditional Toll Delivery typically involves a combination of a Transportation Infrastructure Finance and Innovation Act (TIFIA) loan, toll revenue bonds, and state funds. Both a TIFIA loan, which could cover up to 33% of eligible project costs, and toll revenue bonds would be backed by toll revenues. The remaining capital costs would be funded through public contributions from the state, leaving NCDOT responsible for managing and bearing the revenue risks associated with a project.

While this approach allows NCDOT to maintain control over these elements of the process, it also places the financial burden and risks directly on the state and does not provide for a fully integrated approach. This lack of integrated collaboration and incentivization between contractors and advisors can result in missed opportunities for innovation and optimization, potentially leading to less efficient project delivery, less revenue generation, and a longer construction period until a project is built and placed into operations.

Public-Private Partnership (P3) Toll Delivery

The P3 Toll Delivery model is a long-term partnership in which NCDOT would select a private developer to design, build, finance, operate, and maintain a project under a Design, Build, Finance, Operate, and Maintain (DBFOM) agreement. This agreement typically lasts for 50-years, while the state retains ownership of a project throughout its duration. In this model, a private developer assumes significant financial risk and managerial responsibility, overseeing all aspects of a project, including lifecycle costs, revenue risk, and funding. This approach also encourages a developer to innovate and optimize traffic flow and revenue throughout a project's life.

To finance a project, the developer would use a combination of equity and debt, with the debt typically being some combination of the following: federal TIFIA loans, tax-exempt Private Activity Bonds (PABs), taxable bonds, and bank financing. A project may also include public contributions if projected toll revenues are not sufficient to cover the full costs of the project (where the amount of any public contributions are determined through a competitive procurement). A developer would have the right to charge tolls, as provided for and managed in the project agreement, on the express lanes, using dynamic tolling to manage traffic demand and maintain minimum speeds, to ensure consistent and reliable travel times.

This "revenue risk" approach can minimize the fiscal impact on the state, enabling NCDOT to allocate its limited funding to other priority projects while efficiently transferring key risks to a private developer. Additionally, it is anticipated that NCTA would provide the commercial back-office and customer service support to ensure a seamless customer interface, further enhancing the efficiency and effectiveness of the project.

Comparative Analysis

Overview

The comparative analysis evaluation process is shown in the graphic below. Project objectives, constraints, and risks were identified, and objectives were prioritized based on the goals of NCDOT and stakeholders. From there, the Project was evaluated through both qualitative and quantitative analyses. NCDOT engaged multiple advisors to support the comparative analysis for the Project. HNTB serves as program manager, KPMG provided financial structuring for the P3 Toll Delivery scenarios, PFM Financial Advisors (NCTA's financial advisor) provided financial structuring for the Traditional Toll Delivery scenarios, RS&H served as the environmental and design advisor, and Stantec served as the traffic and revenue advisor.

Objectives & Priorities

The following are key objectives of the Project that were identified and considered as priorities in the comparative analysis:

- accelerate project delivery,
- optimize state / regional / local public funding contribution,
- increase driver safety,
- reduce congestion,
- improve travel time reliability,
- optimize toll cost / benefits,
- engage the community and minimize project impact on residents and local businesses, and
- enhance economic competitiveness of the impacted region.

Constraints

Project constraints are driven by external factors that cannot be effectively mitigated or avoided. The primary constraints for Project are linked to statutory restrictions on major projects:

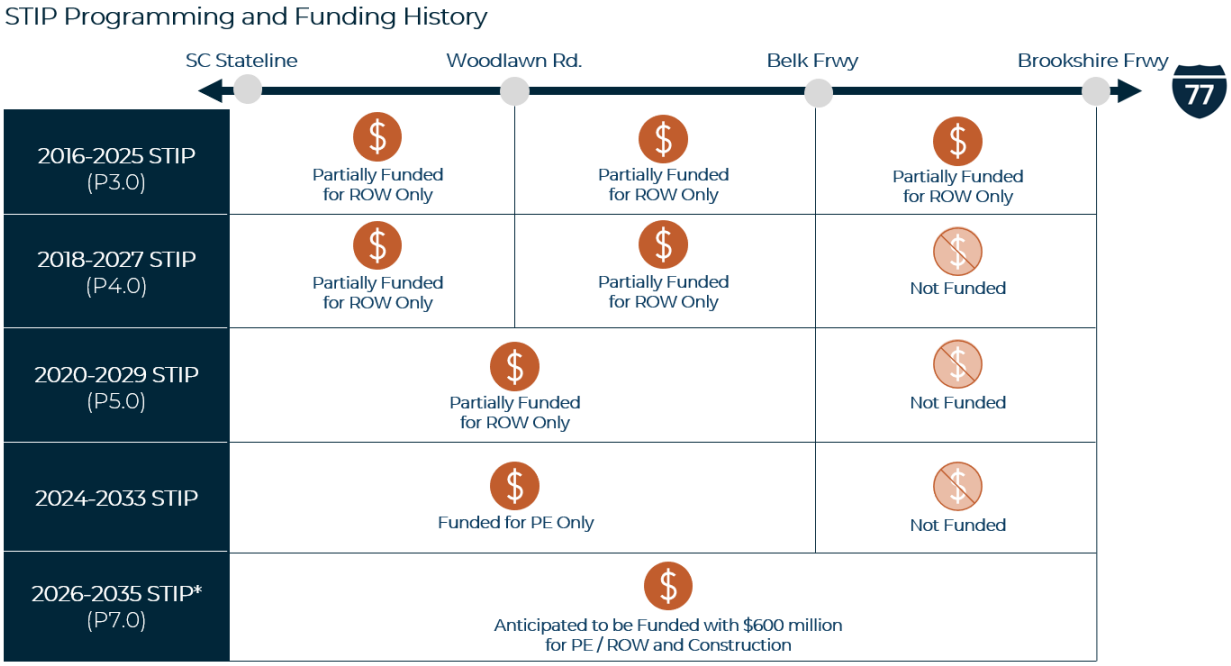
- One constraint involves funding, as state law limits the amount of funds that can be allocated to a single project or group of projects, along the same corridor within the same or adjoining NCDOT Divisions, to 10 percent of the total projected funds for the Statewide Mobility category over any five-year period (*see sections on Program Overview and Public Contribution / Project Funding for additional details*).
- A second key constraint is the availability of funds at the statewide level, with only approximately $1 billion available to be programmed for projects selected in P7.0 for inclusion in the Draft 2026-2035 STIP, while the Project currently costs over three times that amount.
- Another consideration is that North Carolina General Statutes limit the number of P3 projects allowed in the state. The state is currently capped at three P3 projects, and as of August 21, 2024, the I-77

North Express Lanes account for one spot, the Albemarle Rural Planning Organization passed a resolution requesting NCDOT continue the P3 delivery process for the Mid-Currituck Bridge which could secure the second project, thereby leaving one available project slot.

Furthermore, the project timeline is contingent on the completion of the environmental process, which includes gathering stakeholder input.

Public Contribution / Project Funding

In accordance with North Carolina's Strategic Transportation Investments (STI) law, NCDOT uses a data-driven process to prioritize projects for its capital improvement program, as documented in the STIP. The STI law directs that funding be allocated across three major categories: Statewide Mobility (40%), Regional Impact (30%), and Division Needs (30%). Interstate improvements, such as the I-77 South Express Lanes Project, are eligible in the Statewide Mobility category but can compete in other categories if they do not secure funding in the Statewide Mobility category. I-5718 has consistently been included in various NCDOT STIPs and CRTPO transportation improvement plans. Per North Carolina General Statute §136-89.183, prior to the letting of a contract for a toll project, the project must be, "included in any applicable locally adopted comprehensive transportation plans" and "approved by all affected Metropolitan Planning Organizations and Rural Transportation Planning Organizations for tolling." The current STIP, covering 2024-2033, funds a portion of I-5718 for preliminary engineering only, with further phases requiring re-competition in the ongoing P7.0 Prioritization Process. A history of STIP programming and funding for the Project is shown in the graphic below.



**Currently under development*

The P7.0 Prioritization began in 2023 and will inform the STIP for 2026-2035. As of May 2024, approximately $1 billion is available to be programmed at the Statewide Mobility tier. Region E and Division 10, where I-5718 is located, have no additional funding for Regional Impact or Division Needs in this round of prioritization. Preliminary P7.0 results show I-5718 scored well enough to receive an allocation of $600 million in Statewide Mobility funds, though specific funding timelines will be detailed in the draft STIP due January 2025. Additional details on the Project's funding history and constraints are in **Appendix A**.

Risks

Key risks of the Project were identified and analyzed across all aspects of the Project including, but not limited to, environmental approvals, ROW acquisition, utility relocation, construction cost and complexity, funding, financing, lifecycle costs, and public acceptance. The identified risks were categorized into three main groups: Financial, Delivery, and Other, and informed the qualitative analysis work for the Project. No financial risk adjustments, besides applying standard design build contingencies, were made under the quantitative analysis. Under the P3 Toll Delivery approach, risk allocation would be in line with recently developed and procured projects in the US market, which have resulted in successful procurements and outcomes for these projects. **Table 1** below lists the various Project risks that were identified. Additional information on these risks along with a description and associated opportunities or mitigation and can found in **Appendix B**.

Table 1: Project Risks

Financial	Delivery	Other
Project Funding Gap	Environmental Approval Delays	Public Perception
Demand Risk *(Lower Toll Revenue)*	Permit Issuance Delays	Potential Litigation
Increased Financing Cost	Complex Construction	Force Majeure Events
Cost Inflation	Unforeseen Field Conditions	Owner Oversight/Capacity
Construction Cost Overruns / Completion Delays	Utility Relocation Delays	
Higher O&M and Toll Costs	Right-of-Way Acquisition Delays	
Fiscal Exposure / State Creditworthiness	Contractor Market Capacity	
	Traffic Management Challenges	
	Railroad Coordination	

Qualitative Analysis

There are important non-quantifiable, financial and non-financial, impacts of each delivery approach to assess when evaluating delivery methods. For instance, the P3 Toll Delivery approach could provide greater budget and schedule certainty compared to the Traditional Toll Delivery approach. However, depending on the terms of any agreement, it could also limit the state's ability to make facility improvements not contemplated at the time of the contract and increase the likelihood of disputes due to the contract's length. Additional information on the qualitative factors, presented in this section, along with their benefits and considerations can be found in **Appendix C**.

Overall, while the qualitative analysis shows that a Traditional Toll Delivery may provide greater program flexibility, a P3 Toll Delivery is likely to provide greater benefits, by promoting innovation and efficient resource allocation while enhancing budget and schedule certainty.

Non-Financial Factors

Table 2 on the following page compares the non-financial impacts of a Traditional Toll Delivery and P3 Toll Delivery, highlighting their effects on various program aspects. The Traditional Toll Delivery approach could be more favorable for competition, program flexibility, and public sentiment, while ensuring adaptability to changing conditions. In contrast, the P3 Toll Delivery approach could promote innovation while enhancing

public agency capacity by consolidating resources and streamlining processes. Both delivery approaches have the potential to positively impact regional economic benefits, with each having distinct advantages depending on the Project's priorities.

Table 2: Qualitative Analysis: Non-Financial Factors

Program Impact	Traditional Toll	P3 Toll	Definitions
Competition	✓		Ability to generate competitive bidder interest and engagement in the Project to ensure best value for the public.
Innovation		✓	Incentivizes and allows innovations to improve operations and maintenance, traffic flows, and revenue.
Program Flexibility	✓		Ability to address changing market needs (i.e., regulation, consumer behavior, etc.)
Public Agency Capacity		✓	Efficient allocation of public resources and time.
Public Sentiment	✓		Degree of approval/willingness of the community to accept the Project.
Regional Economic Benefits	✓	✓	Creates positive impacts on the economic growth to the region.

✓*Indicates possible positive impact vis-a-vis the other approach.*

Financial Factors

Table 3 below identifies the financial factors impacting risk management, project execution, and project funding/cost. The P3 Toll Delivery approach could shift significant risks—such as construction delays, project interface, operations and maintenance, and revenue fluctuations—to the private sector, potentially leading to higher performance standards and greater efficiency in project delivery. The Traditional Toll Delivery approach places more risks on the public sector; however, the contracts (and any potential disputes) are generally less complex compared to a P3 Toll Delivery. This is because they focus only on construction-related matters and thus are concentrated over a shorter duration.

Furthermore, the integrated approach of a P3 Toll Delivery offers advantages in optimizing toll revenue strategies, making it more appealing for projects requiring significant investment and expedited delivery.

Table 3: Qualitative Analysis: Financial Factors

Program Impact	Traditional Toll	P3 Toll	Definitions
Construction Risk		✓	Transfer of risk associated with construction delays, interface, overruns, quality, and unforeseen events.
Contractual Issues *(Disputes, Compensation, etc.)*	✓		Lower probability of disputes (in the long term) and lower financial impact associated with them.
O&M and Lifecycle Risk		✓	Transfers long-term risk and provides more incentive to optimize condition.
Project Delivery		✓	Ability to achieve value through competition, accelerated project delivery, and design/construction risk transfer.
Project Funding & Public Financing Capacity		✓	Ability to attract new funding and financing sources for the project and leverage existing public funding sources.
Revenue Risk		✓	Transfer of risk associated with traffic and revenue underperformance / outperformance.

✓*Indicates possible positive impact vis-a-vis the other approach.*

Quantitative Analysis

The quantitative analysis focuses on how the Project will be funded and financed, including any need for public funds — under both the Traditional Toll Delivery and P3 Toll Delivery approaches.

In a Traditional Toll Delivery, NCDOT, through NCTA, funds at least a portion of design and construction of the Project using toll revenue supported debt, including a federal TIFIA loan and toll revenue-backed bonds. NCDOT, through NCTA, would operate and maintain the Project, with excess net toll revenues (after covering debt service, operations, maintenance, renewal, and replacement costs) staying with NCDOT.

In contrast, under a P3 Toll Delivery, a private developer finances design and construction with a combination of toll revenue supported debt and equity. NCDOT may provide public funds if toll revenues cannot support the full Project costs over the term of the Project agreement. Here, a private developer retains toll revenues in exchange for financing, designing, constructing, operating, and maintaining the Project. In the event that revenues outperform projections, NCDOT may share any in additional revenues.

Building on this analysis, the P3 Toll Delivery approach offers greater funding and financing benefits compared to the Traditional Toll Delivery approach by introducing equity from private developers, which significantly reduces the required public contribution. Additionally, under the P3 Toll Delivery approach, a private developer absorbs more financial risk, allowing the state to lower any funding gap and benefit from more efficient financing and revenue structures freeing-up more programmed funding for other uses.

Forecast Inputs

To assess the financial feasibility between the two delivery approaches, financial forecasts were developed for both the Traditional Toll and P3 Toll options. These forecasts included project schedules, construction costs, operations and maintenance expenses, tolling system costs, as well as renewal and replacement costs, alongside projected traffic and toll revenue forecasts. Additionally, the analysis examined the capital structures of each delivery approach, exploring financing options such as debt capacity for both scenarios and equity for the P3 option to provide a comprehensive comparison of the financial implications of each delivery approach.

Schedule

Schedule assumptions used in the analysis are shown in **Table 4.** The analysis assumed a construction timeline of 75 months and an opening date of April 2033 for both delivery approaches. However, it is likely that a P3 Toll Delivery would result in a shorter timeline than a Traditional Toll Delivery, due to the integrated and streamlined processes afforded by the DMBOM delivery model, managed by a private developer who oversees design, construction, and operations in a coordinated manner. Additionally, a private developer has strong revenue incentives to complete and open a project early, allowing them to start collecting toll revenues sooner, thereby accessing financial returns earlier than if delivered without such incentive.

To ensure consistency for analysis purposes, similar assumptions for both delivery approaches were also used for the operations term, 50-years from when the Project opens to traffic. A P3 Toll delivery typically requires a longer term (around 50 years) to allow for the return of equity, whereas under a traditional toll delivery, financing obligations are generally paid off earlier, resulting in a slightly shorter financial commitment period (typically 35 to 40 years).

Table 4: Project Schedule Assumptions

Schedule / Term Assumptions	Traditional Toll & P3 Toll
Design & Construction Period	Jan 2027-Mar 2033
Design & Construction Term	75 months
Operations Period	Apr 2033 -Mar 2083
Operations Term	50 years

Construction Cost

When assessing the construction cost, it is important to understand that NCDOT will not perform the design and construction of the Project with either delivery approach. Instead, private partners will take on the responsibility for the design and construction work with oversight from NCDOT. The main difference between the two delivery approaches lies in the Project's delivery model and the associated risk transfer.

In a Traditional Toll Delivery approach, NCDOT would directly contract with one or more construction contractor(s) and would retain some elements of the construction risk, therefore, requiring additional funds to be set aside for unexpected costs. This is a standard practice for all design-build projects across the state, not just toll projects. For instance, if unforeseen circumstances arise that increase costs and trigger a change order, NCDOT will have already accounted for this in the budget. This proactive budgeting approach prevents NCDOT from delaying other projects in the region or across the state as a result of cost overruns.

On the other hand, a P3 Toll Delivery approach involves contracting directly with a private developer, who would then manage the contractor and oversee the Project's execution. Here, NCDOT transfers a greater portion of the construction risk, including potential delays to the schedule, to a developer. If unexpected issues arise that lead to a change order, the developer or contractor absorb the additional costs, not NCDOT.

As a result of this risk transfer and other efficiencies, the analysis shows that a P3 Toll Delivery approach led to a lower estimated final project cost of $3.25 billion, compared to $3.71 billion under the Traditional Toll Delivery approach (*see **Table 5***). The approximate $470 million difference can primarily be attributed[3] to the following factors:

Table 5: Construction Cost

Construction Cost ($ millions)	Traditional Toll	P3 Toll
Base Design and Construction Costs *(includes design and construction components such as roadways, bridges, drainage, etc.)*	$2,305	$1,958
Right of Way, Landscaping, & Utility Relocation	$683	$680
Toll Integration	$32	$32
Total Design and Construction Related Cost *(Real 2024 $ millions)*	$3,020	$2,671
Administrative Allowance, & Agency Costs	$140	$91
Total Escalation	$551	$483
Total Project Costs *(YOE $ millions)*	**$3,712**	**$3,245**

- **Base Design and Construction Costs**: Approximately $350 million of the $470 million total cost difference (about 75%) comes from the base design and construction costs. These costs include all design and construction activities, such as building roadways, bridges, drainage systems, fences, signage, and added contingencies. In the Traditional Toll Delivery approach, a standard Engineering & Contingency (E&C) factor of 16% is added to the construction cost to cover engineering and contingency costs[4]. This factor addresses the construction risks that the state takes on under this delivery model. The E&C factor is commonly applied by the state to most design-bid-build and design-build projects and contributes roughly $340 million to the total project cost difference. In addition, the total design and construction related cost includes costs for right-of-way acquisition, landscaping, utility relocation, and toll integration, which are nearly the same for both delivery approaches.

[3] Other differences are a result of the cost being calculated from a different base (i.e., costs are calculated as a percentage of the total). These differences are around $12 million in total.
[4] Under the Traditional Toll Delivery approach, the construction cost is $2,129 million while the design cost is $176 million. For the P3 Toll Delivery approach the construction cost is $1,789 million and the design cost is $169 million.

- **Administrative Allowance & Agency Costs**: About $50 million of the $470 million total cost difference (~10%) is attributed to this category. The Traditional Toll Delivery approach requires additional reserves[5]: equal to 0.5% of the construction cost for the engineering reserve fund and 0.88% for the agency reserve fund, which are not necessary under the P3 Toll Delivery approach as a result of the risk being transferred to a private developer.

  Other expenses in this category, such as administrative costs (including public outreach) and funds reserved for change orders, are assumed to be roughly the same between the two delivery approaches.

- **Escalation Costs**: Around $70 million of the $470 million total cost difference (~15%) is due to higher anticipated inflation under the Traditional Toll Delivery approach. The initial costs are calculated in 2024 dollars but must be adjusted for inflation to reflect the year of expenditure. Since inflation is applied to a larger base cost under the Traditional Toll Delivery approach ($3.16 billion vs. $2.76 billion), the total escalation costs are higher.

Additionally, the P3 Toll Delivery approach offers potential cost savings through innovation and design efficiencies. A private developer's integrated approach—covering design, construction, traffic management, operations, lifecycle, and maintenance—can lead to better coordination and optimization throughout the Project. However, at this stage these additional potential savings are not factored into this cost analysis.

Operating Costs

There are three categories of operating costs for the Project: toll operations, routine maintenance, and renewal and replacement. Toll operations and routine maintenance activities occur annually, whereas renewal and replacement activities are assumed at various intervals over the life of the Project. The assumed Operating costs for the analysis are presented below in **Table 6.**

Table 6: Operating Costs

Average Annual Costs *(2033 to 2060, YOE $ millions)*	Traditional Toll	P3 Toll
Toll Operations	$30	$26
Routine Maintenance	$2	$2
Renewal & Replacement	$2	$2
Average Annual Costs	**$34**	**$30**

Annual costs for toll operations are related to a variety of toll collection and customer service activities. These costs include, but are not limited to, operating and maintaining toll collection systems, distributing transponders, printing and mailing invoices, credit card fees, and costs related to the walk-in and call center facilities and staffing. The total annual toll operations costs are calculated based on the number of transponder (ETC) and video toll transactions projected in each year. The costs per transaction are based on historic costs seen on operational toll facilities in North Carolina. The annual toll operations costs between the Traditional Toll Delivery and P3 Toll Delivery differ due to the utilization of separate traffic forecasts and assumed transaction volumes, as discussed in more detail in the subsequent Traffic and Revenue section below.

Routine maintenance costs are related to maintaining a safe facility in sound condition. The same routine maintenance activities and costs for the facility were assumed for both the Traditional Toll Delivery and P3 Toll Delivery approaches (although operational performance requirements are often higher under the P3 Toll Delivery approach). These costs include activities such as maintenance of pavement surfaces, bridges, pavement markings, signage, mowing and landscaping, snow and ice removal, drainage, lighting, and litter removal. Costs associated with these activities are estimated based on maintenance costs seen on various NCDOT and NCTA projects.

[5] Typically, it is one percent of construction cost for the Engineering Reserve Fund and 1.75 percent for the Agency Reserve Fund; however, due to the Project's size the reserves were halved.

Renewal and replacement costs are related to unusual or extraordinary maintenance or repairs not recurring annually, as well as the renewal or replacement of toll collection systems. During the initial years of operations, a new facility should require relatively minor renewal and replacement activities. As many elements are subjected to aging and wear, increasing amounts of maintenance and rehabilitation are required. For the purposes of this analysis, the same renewal and replacement activities and associated costs were assumed for both the Traditional Toll Delivery and P3 Toll Delivery approaches. Examples of these costs include asphalt overlays, sign replacement and toll collection system replacement.

Traffic and Revenue

The traffic and revenue forecasts for both the Traditional Toll Delivery and P3 Toll Delivery approaches uses dynamic tolling to manage volume and maintain minimum speed requirements in the express lanes. The T&R forecasts include passenger cars, extended vehicles, and commercial vehicles, with extended and commercial vehicles paying a higher toll multiplier than passenger cars. Including commercial vehicles, which are currently not permitted in the I-77 North Express Lanes, significantly increases the Project revenues, although it also increases construction costs by around $100 million as a result of differing design standards required to accommodate heavier vehicles. Revenue forecasts from the Level 2 T&R Study are presented below in **Table 7.**

Table 7: Revenue Forecasts

Average Annual Revenue *(2033 to 2060, $ millions)*	**Traditional Toll** *(Base Revenue Case)*	**P3 Toll** *(Developer Revenue Case)*
Passenger and Extended Vehicles Revenues	$121	$238
Commercial Vehicles Revenues	$11	$57
Annual Toll Revenues	**$132**	**$295**

The Traditional Toll Delivery approach is based on the advisor's base case traffic and revenue forecast ("Base Revenue Case"), which assumes population and employment growth rates consistent with a base case revenue model, a motorist value of time aligned with survey results from similar public toll facilities, and a tolling strategy designed to capture 90% of the maximum revenue potential. This approach aligns with lenders' requirements to use acceptable forecasts that typically include more conservative assumptions about key factors such as population growth, regional development, value of time, and travel time reliability. Consequently, these assumptions result in lower revenue estimates as there is less projected growth in the region, lower congestion levels in the corridor and competing facilities over time, and a customer's willingness to pay a toll remains lower than in more optimistic forecasts.

How the Design and Construction Approach Impacts Revenue Generation on Express Lanes

A **P3 Toll Delivery approach** can offer a significant revenue advantage as a DBFOM contract method provides a more integrated, end-to-end perspective on the project. This holistic approach incentivizes the developer to enhance the value proposition of the express lanes by optimizing project configurations, such as access points and strategies, through advanced design and construction techniques, potentially optimizing facility demand and in-turn revenues beyond what the current design envisions.

In contrast, a **Traditional Toll Delivery approach** relies on multiple contractors and vendors at different stages of the project, making it more difficult to realize the design synergies needed to enhance traffic and revenue on the express lane system while introducing interface and traffic management risks which could hurt demand for the facility.

In contrast, the P3 Toll Delivery approach is grounded in the advisor's developer case ("Developer Revenue Case"), which assumes higher socioeconomic growth, increased value of time, and a toll strategy focused on maximizing revenue. These assumptions translate to greater levels of congestion within the analysis and suggest that motorists will accept higher toll rates, leading to increased revenue projections. The inclusion of developer equity enables a developer to take on more risk as well as justify more aggressive assumptions in their traffic and revenue forecasts to lenders, such as higher socioeconomic growth, resulting in higher projected revenues. This trend has been observed across comparable projects with developer's traffic and revenue cases frequently exceeding the state's

traffic and revenue advisor's shadow bid revenue case by two to three times due to project optimization and these kinds of incentives.

Financing Assumptions

When considering financing for the Project, a Traditional Toll Delivery approach and a P3 Toll Delivery approach offer distinct methods with differing risk profiles. A key difference lies in the equity that developers can bring to the table in a P3 Toll Delivery, which is not present in a Traditional Toll Delivery.

Table 8: Financing Assumptions

Financing Assumptions *(in Base Case)*	**Traditional Toll**	**P3 Toll**
Debt - TIFIA Interest Rate	5.0%	5.0%
Debt - TIFIA Tenor	35-years	35-years
Debt - TRB (Traditional Toll) / PABs (P3 Toll) Interest Rate	5.0%	5.5%
Debt - TRB (Traditional Toll) / PABs (P3 Toll) Tenor	40-years	40-years
Equity Pre-Tax IRR	N/A	13.5%

Under the Traditional Toll Delivery approach, the state would finance the Project using a combination of toll revenue supported debt, including a federal TIFIA loan and, where affordable, Toll Revenue Bonds (TRBs), and STI funds. Consistent with other NCTA delivered projects, it is assumed that toll revenue supported debt would be backed by a gross revenue pledge, meaning all toll revenues are pledged to repay debt before covering operating expenses. This approach involves some additional risk to the state, as it assumes responsibility for operations and maintenance should revenues not be sufficient both debt service and operations.

The P3 Toll Delivery approach assumes that a private developer will finance the design and construction of the Project using a combination of non-recourse project debt, primarily through a federal TIFIA loan and, where affordable, tax-exempt Private Activity Bonds (PABs), along with equity. Any remaining gap would need to be funded with STI funds. This financing relies on a net revenue pledge, where toll revenues are used first to cover operating expenses, and only the remaining net revenue is applied to debt repayment. This structure shifts significantly more of the financial risk to a developer, reducing the state's exposure.

Results and Findings

Base Case Results

The base financial case results are derived from inputs and forecasts provided by NCDOT's advisors and are presented below in **Table 9**. These inputs and forecasts are designed to align with more cautious expectations, ensuring that the forecasts are acceptable to lenders and other stakeholders.

Table 9: Base Case Results

Base Case Results Summary ***Sources and Uses ($ Bn)***	**Traditional Toll**	**P3 Toll**
Total Project Cost	**$3.7**	**$3.2**
Debt *(transaction costs netted)*	$1.0	$1.2
Equity	$0.0	$0.7
Total Funding Gap *(without STIP Funding)*	$2.7	$1.3

**Debt plus equity is equivalent to net cash flow from express lane operations*

The base financial case results in the comparative analysis reveal that a P3 Toll Delivery approach could offer cost savings and the introduction of equity would bring additional funding to help reduce required state contribution compared to a Traditional Toll Delivery approach. Specifically, the analysis shows the P3 Toll Delivery approach results in a total project cost of $3.2 billion, which is lower than the $3.7 billion estimated for the Traditional Toll Delivery approach. As discussed above, this cost difference is largely attributed to the efficiencies and innovations introduced by the delivery model, where a private developer, who manages all aspects of the

project under the P3 model. The streamlined processes and risk transfer to the private sector contribute to these savings, allowing for better coordination and cost optimization across all project phases. Additionally, a P3 Toll Delivery approach benefits from a developer's financial incentive to complete the project earlier, further enhancing the overall financial feasibility.

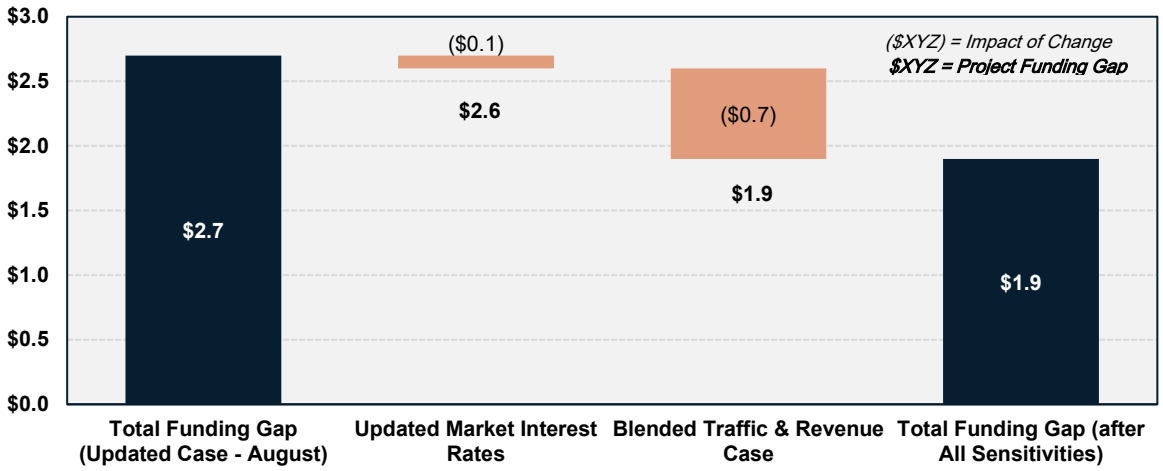
Moreover, the introduction of equity that a private developer could bring allows for a more optimistic traffic and revenue forecast under the P3 model. This approach to forecasting generates a net cash flow of $1.9 billion from toll operations, nearly double the $1.0 billion shown under the Traditional Toll Delivery approach. The significant difference in revenue is attributed to the more aggressive growth assumptions made in the P3 model, which aligns with the advisor's Developer Revenue Case. Consequently, the analysis shows the funding gap for the P3 Toll Delivery approach is significantly less, at $0.7 billion after accounting for STIP funding, compared to $2.1 billion for the Traditional Toll Delivery approach.

Sensitivity Results

The sensitivity results as shown in **Chart 1** are primarily derived from updated market conditions and the analysis of peer projects. These adjustments are intended to reflect more current economic realities and incorporate lessons learned from similar projects, providing a more accurate assessment of the financial feasibility under the different scenarios.

Chart 1: Traditional Toll Delivery Project Funding Gap Sensitivities[6,7]

(Figures presented in $ billions (not including potential STIP funding)



For the Traditional Toll Delivery approach, the sensitivity analysis involved the following updates:

- Market Interest Rates: The interest rates for TIFIA loans were reduced by 0.5%, and the rates for Toll Revenue Bonds were reduced by 0.25% to reflect on-going downward trends in interest rates to-date.
- T&R Case: A blended T&R case was applied using a new revenue forecast. This forecast assumes 60% of the difference between the Base Revenue Case and the Developer Revenue Case, with the latter being the highest likely case the DOT could use for borrowing. Most of the variance in the blended case is due to higher growth assumptions and a revenue maximizing toll rates.

Updating market interest rates reduced the funding gap by approximately $100 million, while the blended traffic and revenue case, which assumed higher toll revenues, decreased the gap by $700 million. With

[6] Updated Market Interest Rates reflect recent rates (August 2024) without a buffer.

[7] Blended Traffic & Revenue case includes commercial vehicles and is based upon a more aggressive public toll financing scenario, assuming revenues that are between the base and high case.

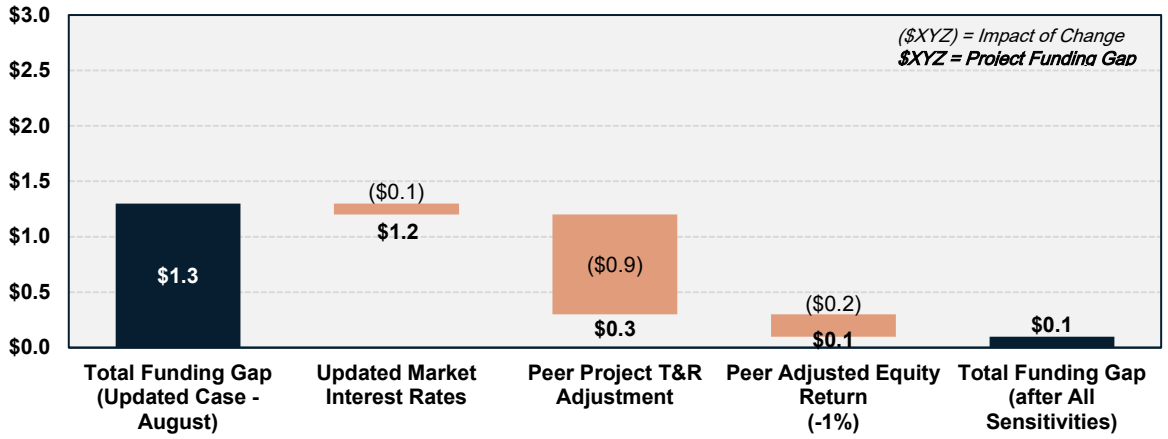
these reductions, the total funding gap was reduced to $1.9 billion, however, this still exceeds the $600 million in potential STIP funds, indicating that a Traditional Toll Delivery approach is likely not financially feasible given existing funding and other constraints.

For the P3 Toll Delivery option, the sensitivity analysis as presented in **Chart 2** included the following updates:

- Market Interest Rates: Similar to the Traditional Toll Delivery approach, interest rates for TIFIA loans were reduced by 0.5%, and rates for Private Activity Bonds were reduced by 0.25%.
- Traffic and Revenue (T&R) Case: T&R forecasts were adjusted based on peer projects such as I-77 in North Carolina, I-66 in Virginia and SH-288 in Texas and reflects an equivalent "equity" T&R forecast that would be presented to lenders by a Developer. The main assumption is that the project would be redesigned through the ATC process and underlying economic assumptions would be maximized to drive traffic and revenue forecasts calibrated with the level of risk a developer would assume.
- Developer's Equity Return: The developer's equity return was reduced by 1% to reflect a potentially lower return expectation should the market further reflect the outperformance of many managed lanes delivered under P3s in Virginia, Texas and the known traffic volumes on the I77 North project.

Chart 2: P3 Toll Delivery Project Funding Gap Sensitivities[8,9,10,11,12]

(Figures presented in $ billions (not including potential STIP funding)



Updating market interest rates reduced the funding gap by $100 million. Aligning traffic and revenue forecasts with those from similar express lane projects further reduced the gap by $900 million. Additionally, lowering the developer's equity return by one percent reduced the gap by another $200 million. Combined, these adjustments brought the total required state contribution to approximately $100 million. Therefore, the analysis indicates that under a P3 Toll Delivery approach, the project could likely be delivered within the $600 million in available STIP funds.

[8] Scenarios do not include ~$102 m in NCDOT retained costs.
[9] Funding gap impacts are sensitive to the sequence of the sensitivities run – a different order would yield slightly different outcomes.
[10] Updated Market Interest Rates reflect recent rates (August 2024) without a buffer.
[11] Peer Project T&R Adjustment includes commercial vehicles and assumes revenue consistent with observations of peer facilities in such as I-95 in VA, SR400 in GA, and I-77N.
[12] Developer Equity Return Adjustment reflects assumed real IRR on recent market transactions.

Comparative Analysis Findings and Potential Next Steps

Comparative Analysis Findings

The comparative analysis indicates that a Traditional Toll Delivery for the I-77 South Express Lanes is not likely financially feasible given the current funding constraints. Even including sensitivities, the analysis reveals a significant projected funding gap of $1.9 billion, which exceeds the potential available STIP funds of $600 million by $1.3 billion.

In contrast, the comparative analysis shows that a P3 Toll Delivery for the Project is likely financially feasible. When adjusting inputs to align with those of similar P3 projects across the United States, the analysis shows that the $600 million in STIP funding would likely cover any necessary public contribution for the Project.

Potential Next Steps

NCDOT is seeking direction from the CRTPO board on the preferred delivery approach for the Project. NCDOT is not endorsing a particular path forward and remains committed to partnering with CRTPO to identify solutions to support mobility throughout the region.

If the CRTPO board opts to proceed with a Traditional Toll Delivery, NCDOT would bring preliminary engineering work for the Project to a logical stopping point and pause work until a viable path forward is identified. Additionally, NCDOT would collaborate with CRTPO in future prioritization submittals to support updating cost and revenue projections.

If the CRTPO board decides to pursue a P3 Toll Delivery, project development could continue as the comparative analysis indicates that the $600 million in STIP funding is likely sufficient to fund any necessary public contribution for the Project. NCDOT would work with CRTPO to define key objectives and priorities that would help inform initial key contract terms. Draft key contract terms would be shared with CRTPO at least 60 days before a Request for Qualifications (“RFQ”) would be advertised, and NCDOT would maintain regular communication with CRTPO throughout the contract development and procurement process.

Appendix A: Funding History and Constraints

In accordance with North Carolina's Strategic Transportation Investments (STI) law (codified in General Statutes §136-189.10 and §136-189.11) decisions about NCDOT's capital improvement program (documented in the STIP are made using a data-driven prioritization process to select projects. The STI law directs that funding be allocated to three major categories: Statewide Mobility (40 percent), Regional Impact (30 percent), and Division Needs (30 percent). Improvements to interstates (such as those proposed in I-5718) are eligible in the Statewide Mobility category. The law also allows a project eligible in the Statewide Mobility category to compete in the Regional Impact and Division Needs categories if it does not secure funding in the Statewide Mobility category.

To maintain a 10-year program, NCDOT periodically refreshes the STIP and adds additional years of funding using a prioritization process. In 2019, NCDOT began work on P6.0 (its sixth round of prioritization). However, in the Summer of 2021 P6.0 was halted after it was determined that due to rising project costs there would be insufficient funds to add new projects to the STIP and that to achieve fiscal balance, a significant number of STIP projects would have to be delayed or have their funding removed entirely. NCDOT subsequently worked with its partners to develop the current STIP that covers the years 2024 through 2033. This document indicates that the portion of I-5718 from the South Carolina line to I-277/US 74 (Belk Freeway) is funded for preliminary engineering only and the portion of the project from I-277/US 74 (Belk Freeway) to I-277/NC 16 (Brookshire Freeway) is not funded. Based on their status in the 2024-2033 STIP, these projects will have to re-compete for funding in the current round of prioritization (P7.0).

The current round of prioritization (P7.0) began in 2023 and is scheduled to be completed in early 2025. Results from P7.0 will guide the development of the STIP that covers the years 2026 through 2035. Cost increases continue to hinder NCDOT's ability to keep projects on schedule and add new projects; however, not to the degree experienced in the P6.0 round of prioritization. In May 2024, NCDOT released the funding availability for select projects in P7.0 and indicated that approximately $1 billion was available for Statewide Mobility, Region E (where I-5718 is located) has no regional funding available, and Division 10 (where I-5718 is located) has no division needs funding available. Across the state, three out of seven regions had regional impact funding available, and six out of 14 divisions had division needs funding available as of May 2024. If project cost increases continue above projections, the funding availability will decrease as a result.

In May 2024, NCDOT released the results of the P7.0 Statewide Mobility programming exercise. The results indicated that $600 million of funding was included for project I-5718. However, these preliminary results do not indicate when the funding will be available; this information will be available when the draft STIP is released in January 2025.

Per North Carolina General Statute §136-89.183, prior to the letting of a contract for a toll project, the project must be, "included in any applicable locally adopted comprehensive transportation plans" and "approved by all affected Metropolitan Planning Organizations and Rural Transportation Planning Organizations for tolling."

CRTPO included the I-77 South Express Lanes project in the 2040 Metropolitan Transportation Plan (MTP) adopted in 2014, the 2045 MTP adopted in 2018, and the 2050 MTP adopted in 2022. In 2014, CRTPO submitted the I-77 South Express Lanes project for funding consideration in the 2016-2025 STIP. The Project (I-5718) was subsequently selected for inclusion in the 2016-2025 STIP and was also included in CRTPO's TIP. NCDOT has included project I-5718 in all subsequent STIPs (2018-2027, 2020-2029, and 2024-2033) and CRTPO has included the project in their TIPs.

Appendix B: Risks & Opportunities/Mitigation

Risks	Description	Opportunities/Mitigation
Financial		
Project Funding Gap	The project is more expensive than initially estimated, leading to a shortfall in required funding.	• Explore alternative federal, state, and local funding sources. • Reduce the public contribution requirements by utilizing mechanisms like minimum revenue guarantees or Developer Ratio Adjustment Mechanism facilities.
Demand Risk *(Lower Toll Revenue)*	Toll revenue projections may be overly optimistic, leading to lower-than-expected income.	• Maintain adequate cash reserves. • Identify and secure secondary revenue streams. • Shift demand risk to the private sector.
Increased Financing Cost	Rising interest rates and financing costs could significantly increase the overall cost of the project.	• Utilize TIFIA and tax-exempt bond financing to minimize costs. • Implement non-recourse financing to limit public liability for the project.
Cost Inflation	Construction costs are rising faster than expected, potentially leading to budget overruns.	• Explore ways to expedite project completion by leveraging available funding opportunities. • Evaluate alternative delivery methods that offer a comprehensive, life-cycle perspective to maximize the project's Net Present Value (NPV). • Implement a competitive delivery strategy to foster innovation (e.g., through Alternative Technical Concepts) and drive cost reduction.
Construction Cost/Schedule Overruns	The project may take longer and cost more than planned due to unforeseen issues during construction.	• Effective risk allocation and involving contractors early in the procurement process can help prevent changes during the construction phase.
Higher O&M and Toll Costs	Operational and maintenance costs, as well as toll collection expenses, could exceed initial projections.	• Lock in costs with long-term, fixed-price agreements. • Reward contractors for staying within budget while maintaining quality. • Conduct periodic reviews to identify and address potential cost overruns.
Delivery		
Environmental Approval Delays	Delays in obtaining environmental approvals could push back the project timeline.	• Engage early with environmental agencies and with contractor(s) during preliminary design to identify potential hurdles. • Conduct preliminary studies to expedite the approval process.
Permit Issuance Delays	Obtaining necessary permits might take longer than expected, delaying the construction schedule.	• Engage permitting agencies early, like the US Corps for Section 404 permits, to address environmental concerns while keeping design flexible and avoiding schedule delays. • Develop a detailed permitting plan, understand approval requirements from other government agencies, and allocate risks appropriately.

Complex Construction	The complexity of the project, including environmental and regulatory challenges, may lead to higher costs and delays.	• Utilize experienced project managers and contractors to navigate regulatory challenges effectively. • Pursue a more progressive procurement and delivery approach, allowing early contractor involvement in design (and possibly alternatives selection), can help manage complexity risks. For publicly funded projects, this could be through progressive design-build, and for P3 projects, a pre-development agreement.
Unforeseen Field Conditions	Unexpected site conditions could impact construction and design, leading to delays and additional costs.	• Conduct thorough site investigations before construction to identify potential issues. • Set aside contingency funds to address unexpected conditions quickly.
Utility Relocation Delays	Delays in relocating utilities may impact the overall construction schedule.	• Identify impacted utilities early and advance the schedule of any long lead time items. • Coordinate with utility companies early in the project to schedule relocations. • Develop alternative construction plans that allow work to proceed in unaffected areas.
Right-of-Way Acquisition Delays	Delays in acquiring necessary properties could stall the project.	• Identify total take parcels and required relocations and advance those parcels upon completion of NEPA. • Identify opportunities for early involvement of contractor to minimize ROW footprint. • Allocate funds for ROW cost increases or transfer risk when appropriate to private sector.
Contractor Market Capacity	The project could strain the local contractor market, especially if other major projects are ongoing.	• Assess the local contractor market early to understand capacity constraints. • Consider staggered project timelines to avoid overloading the market.
Traffic Management Challenges	Potential disruptions to traffic flow during construction works, leading to delays, safety hazards, and increased project costs if not properly managed.	• Develop a comprehensive traffic management plan to minimize disruptions. • Communicate with the public about expected impacts and alternative routes.
Railroad Coordination	Coordination with railroads might be challenging, causing delays in the project timeline.	• Engage with railroad companies early in the planning process to align schedules. • Explore alternative construction methods that minimize disruption to rail operations.
Other		
Public Perception	Local communities may oppose the project, leading to potential delays or changes in scope.	• Hold community meetings to inform and involve local residents in the project. • Establish early in a transparent way the toll rates. • Use other funds (state / local / federal) to fill any gap if additional funding is eventually required.
Potential Litigation	Legal challenges from competing projects or stakeholders could delay or alter the project.	• Conduct thorough legal reviews to minimize the risk of lawsuits. • Engage stakeholders early to address concerns before they escalate to legal action.

Appendix C: Qualitative Analysis Factors

Non-Financial Factors – Benefits and Considerations

- **Competition** - While the project size is likely to limit the competitive landscape under both scenarios, I-77 Mobility Partners' operation of the I-77 North Express Lanes could also impact interest in the project. Noting this, from a soft market sounding, several other developers have expressed interest in the I-77 South Express Lanes project.
- **Innovation -** The P3 approach attempts to maximize innovation by integrating design, construction, and T&R under the developer, enhancing project value, and reducing costs through a streamlined Alternative Technical Concept (ATC) process. While P3s also incentivize new standards and technologies, the Traditional approach using NCTA's experience can likely achieve similar results outside of the ATC process.
- **Program Flexibility -** Over the term of a P3, it is expected that there would be significant changes in regulation, market conditions, consumer behavior, advancements in technology, and changes in climate. The state would have less flexibility under a P3 Toll Delivery approach to address changing market needs during the comprehensive agreement's term.
- **Public Agency Capacity** - A P3 Toll Delivery model consolidates the development, construction, and O&M into a single long-term contract that streamlines oversight and optimizes the allocation of state resources without significantly jeopardizing other state priorities.
- **Public Sentiment -** A Traditional Toll Delivery approach, as long as revenue is performing according to forecasts, offers the advantage of balancing throughput and revenue more effectively, as it allows for flexibility in adjusting toll rates based on operational needs and regional impacts. The toll difference is typically most pronounced during off-peak hours.

Financial Factors – Benefits and Considerations

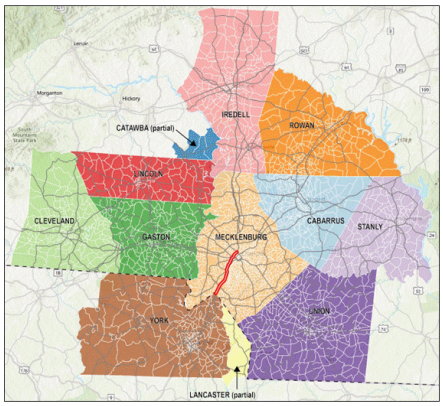
- **Construction Risk** - Under a Traditional Toll Delivery approach, this risk is typically shared between NCDOT and the design-build Contractor. In a P3 Toll Delivery model, the private sector assumes more construction and interface risk, with a Developer bearing responsibility for potential project delays, cost overruns, quality issues, and scheduling challenges.
- **Contractual Issues (Disputes, Compensation, etc.)** - P3s are more complex to manage than traditional contracts and are typically longer in nature (50 plus years). Disputes also tend to be larger and more expensive under a P3 structure.
- **Operations & Maintenance Lifecycle Risk** - P3s permit the transfer of O&M and lifecycle risk to the private sector. Generally, this comes with a Developer being held to higher performance standards.
- **Project Delivery** - Under both the P3 Toll Delivery and the Traditional Toll Delivery approaches, there is an incentive to explore various design-build concepts to reduce costs and accelerate delivery. However, under a P3 approach, a developer has greater incentive to expedite project delivery due to the need to recoup investments, fund operations, and repay lenders through toll revenue collection.
- **Project Funding & Public Financing Capacity** - Although most funding sources are similar under both the P3 Toll Delivery and Traditional Toll Delivery approaches, a developer can also leverage private equity as a source of financing. A P3 Toll Delivery is likely to generate greater toll revenue as a developer will optimize the project's design (access point locations, etc.) and the tolling strategy to maximize revenues.
- **Revenue Risk** - A P3 Toll Delivery model transfers traffic and revenue risk to the private sector. This means the state is not "on-the-hook" for revenue underperformance. Noting this, revenue upside is also transferred though a revenue share structure and can rebalance this.

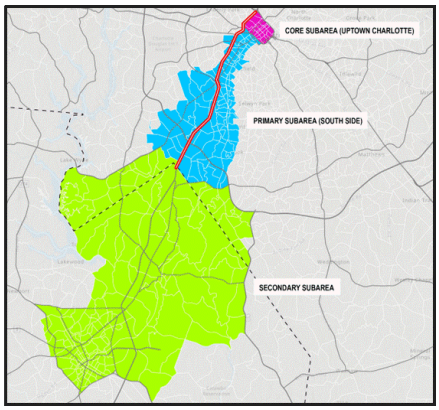
Appendix D: Quantitative Analysis – T&R Assumptions

Attribute	Base Revenue Case	Developer Revenue Case
Eligible Vehicles	All Vehicles	Same
Toll Discounts	No Discounts	Same
Toll Factors for Extended Vehicles	Off-Peak 2x; Peak 3x	Same
Toll Factors for Commercial Vehicles	Off-Peak 4x; Peak 6x	Same
Exempt Vehicles	Active Military, Emergency, Maintenance and Transit vehicles do not pay a toll	Same
Minimum Toll Rate by Year	Minimum toll of $0.40 per gantry in $2023 (assumed to grow with inflation)	Minimum toll of $0.50 per gantry in $2023 (assumed to grow with inflation)
Maximum Tolls	None	Same
Toll policy	Optimal tolls (approximately 90% of Maximum Revenue)	Maximizing Revenue
Toll Collection Methodology	Transponder or Bill-by-Mail	Same
Non-transponder Toll Rates Factor/Multiplier	Transponder rates are discounted by 33% from BBM rates	Same
ETC Penetration	The transponder share in the lanes starts at about 60% in the opening year and grows slightly over time to 70%	Same
ETC Revenue Leakage	0.38% (based on info from existing NCTA facilities)	Same
Image-Based (and other types of payment) Revenue Leakage	Approximately 31% (based on info from existing NCTA facilities)	Same
Future Model Years	2035 and 2050	Same
Network Assumptions	The CRTPO LRTP as verified in the MRM networks (change US 74 Express Lanes project between Uptown and Idlewild to open in 2035, extended to I-485 in 2045)	Same
Land Use and Socioeconomic Assumptions	See following section on Socioeconomic Forecasts	See following section on Socioeconomic Forecasts
Ramp-Up (% of potential years 1-4)	80/90/100 for transactions, 75/85/100 for revenue	90/95/100 for transactions, 85/90/100 for revenue
Transaction Annualization	302 (Based on transaction data from I-77 North)	Same
Revenue Annualization	268 (Based on transaction data from I-77 North)	Same
Hours of Operation	24 hours a day, 7 days a week, all year	Same
Weighted Avg. Value of Time (VOT)	$13.39 to $19.69 depending on trip purpose for all years	$18.06 to $26.56 in 2023. 6% Higher in 2035 and 14.5% in 2050 (assumes VOT grows by 0.5% per year)
Commercial Vehicle VOT	$20.68 to $49.63 depending on size for all years	$27.88 to $66.93 in 2023. 6% Higher in 2035 and 14.5% in 2050 (assumes VOT grows by 0.5% per year)
Off-Peak and Mid-day Period Toll Rates	No cap	Same

Socioeconomic Forecasts

Stantec worked with an independent socio-economic subconsultant, who worked off the MRM inputs to estimate future population and employment.





Population

Subarea	2023	2035		2050	
	Base	Base	Developer	Base	Developer
Core	17,548	25,361	27,389	28,736	33,992
Primary	81,497	106,477	111,590	124,188	137,130
Secondary	227,260	293,129	293,129	374,186	374,186
Total	**326,305**	**424,967**	**432,109**	**527,110**	**545,308**
		23-35 CAGR		35-50 CAGR	
Core		3.1%	3.8%	0.8%	1.5%
Primary		2.3%	2.7%	1.0%	1.4%
Secondary		2.1%	2.1%	1.6%	1.6%
Total		**2.2%**	**2.4%**	**1.4%**	**1.6%**

- 2023-2035 Compound Annual Growth Rates (CAGRs) are about 17-21% higher in the Developer Revenue Case than in the Base Revenue Case for Core and Primary subareas.
- 2035-2050 Developer Revenue Case CAGRs are 73% higher for the Core subarea and 34% higher in the Primary subarea than the Base Revenue Case CAGRs.
- The secondary subarea has no population difference between the Base and Developer Revenue Cases.

Employment

Subarea	2023	2035		2050	
	Base	Base	Developer	Base	Developer
Core	111,306	155,012	182,524	201,469	250,806
Primary	135,021	189,417	189,417	245,373	245,373
Secondary	125,293	151,114	151,114	181,337	181,337
Total	**371,620**	**495,543**	**523,055**	**628,179**	**667,516**
		23-35 CAGR		35-50 CAGR	
Core		2.8%	4.2%	1.8%	2.1%
Primary		2.9%	2.9%	1.7%	1.7%
Secondary		1.6%	1.6%	1.2%	1.2%
Total		**2.4%**	**2.9%**	**1.6%**	**1.7%**

- 2023-2035 CAGR is about 50% higher in the Developer Revenue Case than in the Base Revenue Case for the Core. It's about 20% higher for 2035-2050.
- The secondary and primary subareas have no employment differences between the Base and Developer Revenue Case.

Appendix E: Quantitative Analysis – T&R Results

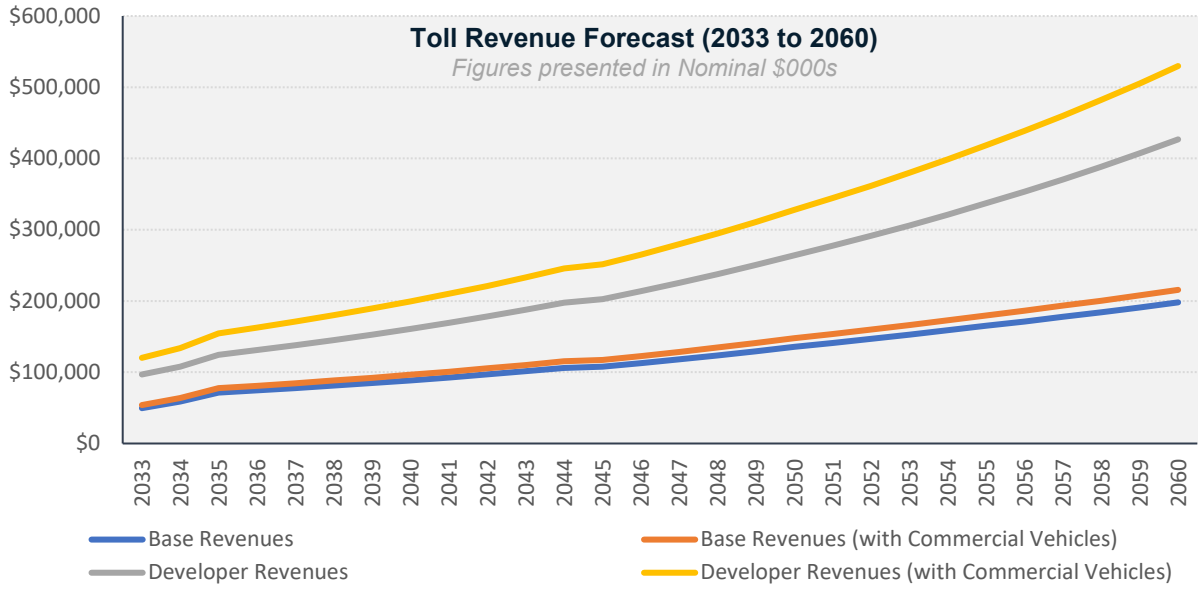
Note: Toll revenue is influenced by two main factors: the number of vehicles using the express lanes (transactions) and the toll rates charged. Express lanes have a capacity limit, typically around 2,000 vehicles per hour for a single lane, which restricts the volume of traffic they can handle. Additionally, express lanes must maintain free-flowing traffic conditions, usually defined as speeds between 45 and 55 mph. To achieve this, especially during peak hours, toll rates must be set high enough to prevent congestion, delays, and not compromise speed.

Another key factor in setting toll rates is how much drivers are willing to pay, which depends on the time saved, the reliability of the route, and other factors such as traffic conditions, personal income levels, urgency of travel, and alternative route availability. When toll rates increase, the number of transactions typically decreases. However, if the toll hike only slightly reduces traffic, higher rates can still lead to increased revenue.

For a multi-billion-dollar project to remain financially viable, toll rates must be set high enough to generate enough revenue to cover most of the project's costs. If toll rates are significantly lowered, despite drivers generally being willing to pay, the funding gap would grow considerably, making the project less financially sustainable. This issue becomes even more critical if toll rates are significantly reduced during peak hours, as these times typically generate 70 to 80 percent of the revenue from express lanes.

It is also important to note that the different revenue forecasts (Base versus Developer Revenue Cases) don't account for variations in highway design. A developer might consider an alternative design that could handle more traffic to better support its business case.

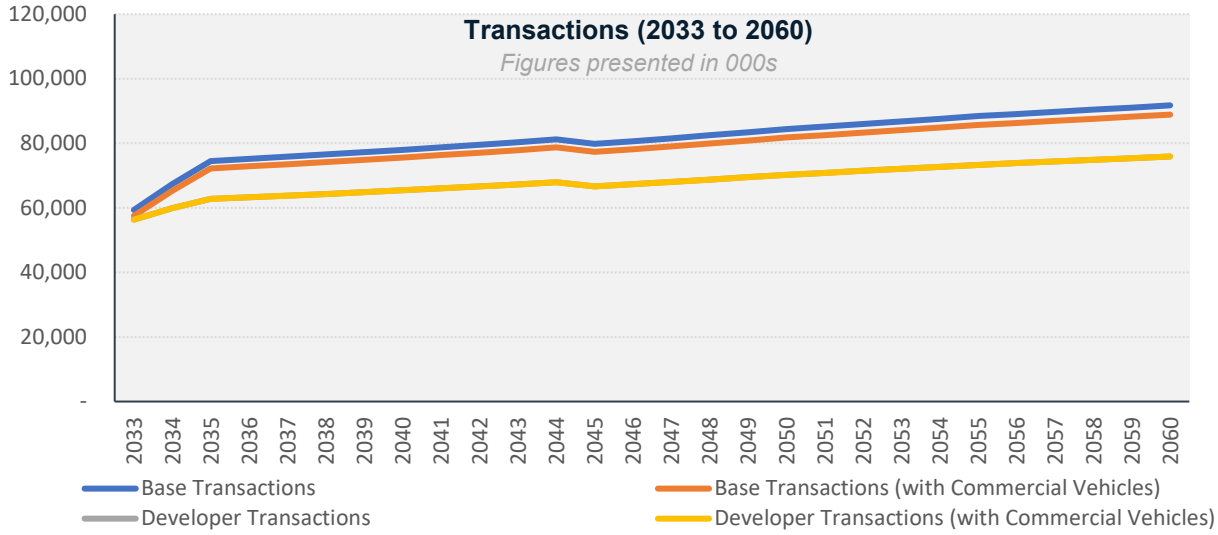
Toll Revenue Forecasts



- Through 2060 the Developer Revenue Case forecast (without Commercial Vehicles) is 96% higher than the Base Revenue Case forecast (without Commercial Vehicles) on average.
- Including Commercial Vehicles to the Base Revenue Case increases its revenues by 9% while adding Commercial Vehicles to the Developer Revenue Case increases its revenues by 24%.

Back-up Forecasts

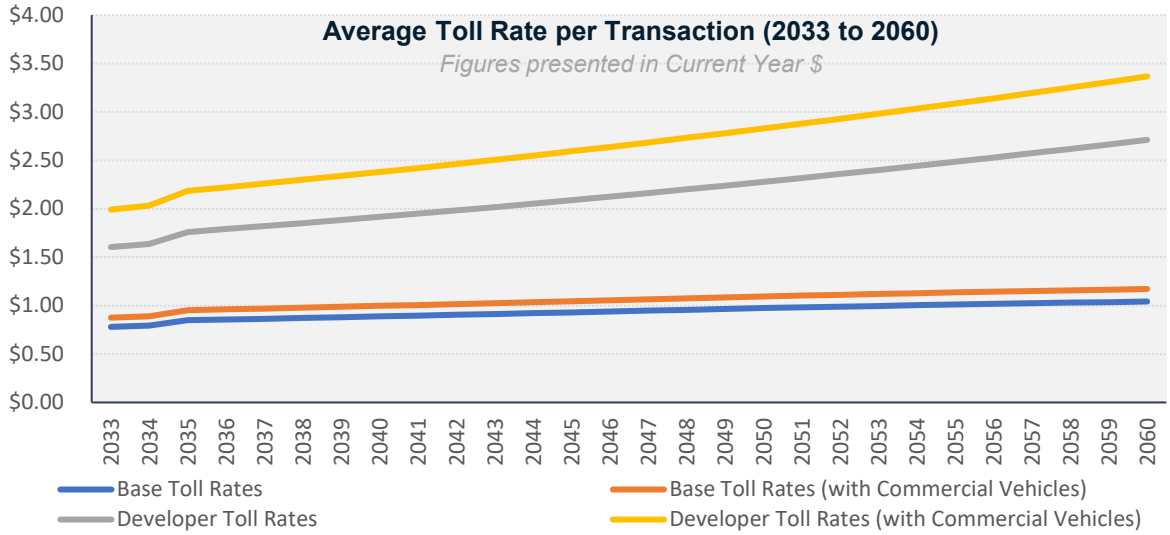
Transactions



- Over the same time period, the Base Revenue Case traffic (number of transactions) forecast (without Commercial Vehicles) is on average 20% higher than the Developer Revenue Case traffic forecast (without Commercial Vehicles).
- Adding Commercial Vehicles to the Base Revenue Case decreases its transactions by 3% while for the Developer Revenue Case the transactions forecasted are the same with and without Commercial Vehicles.

Note: Out-of-state traffic is anticipated to make up ~43% of all transactions on the I-77 South Express Lanes.

Toll Rates



- The average toll rate in the Developer Revenue Case (without Commercial Vehicles) is initially 105% higher than the Base Revenue Case toll rate and increases to 160% by 2060.
- Adding Commercial Vehicles to the Base Revenue Case increases its average toll rate by 12% while for the Developer Revenue Case the average increases by 24%. The increase in the average toll rate is because Commercial Vehicles are expected to pay higher rates than passenger cars (i.e., the passenger car rate does not change).

Note: The strategy of maximizing toll rates accounts for only a small portion of the difference between the toll rates in the Base Revenue Case and the Developer Revenue Case. Most of the difference is due to the more conservative assumptions, such as socioeconomic growth and value of time (VoT), in the Base Revenue Case, which are necessary to meet public debt financing requirements. In reality, future socioeconomic growth and VoT will be the same regardless of the delivery method.

Appendix F: P3 Market & Competition

P3 Market Dynamics

Given the competitive nature of the P3 DBFOM market, there are several developers positioned to compete for the Project. For instance, ACS operates the SH288 Express Lanes in Texas, while Transurban manages both the I-495 and I-95 express lanes in Virginia, highlighting the strong presence of diverse developers in this space. Recent procurements such as the I-10 Calcasieu River Bridge (a toll bridge project procured in 2023) in Louisiana and SR400 (an express lanes project procured in 2024) in Georgia demonstrate that a variety of consortiums can successfully bid for and win major infrastructure projects with consortiums comprising Plenary, Acciona, and Sacyr in Louisiana and Meridiam, ACS, and Acciona in Georgia. These outcomes underscore the capability and competitiveness of multiple developers in this space.

The list of active developers[13] in the U.S. P3 express lane market is extensive and includes some of the most established names in infrastructure development globally; all of which have demonstrated the ability to deliver large-scale, complex projects, often collaborating in consortiums that leverage their combined strengths *(see list of firms in the graphic to the right).*

Regarding a competitive process for the I-77 Express Lane Project, there is every indication that the bidding will be highly competitive. Given the strong interest expressed by multiple developers, as evidenced by the active engagement of firms reaching out to NCDOT, a robust bidding process would be anticipated. The diversity and strength of the firms listed, many of whom have successfully completed similar projects, further reinforce the likelihood of a competitive and dynamic selection process. The breadth of competition makes it difficult to predict a clear winner at this stage.

[13] Market consists of three distinct Developer types.

- **Vertically Integrated Groups:** Entities that can manage all (or nearly all) aspects of the project, including design, construction, financing, operations, and maintenance and have an in-house Contractor with whom they typically work.
- **Industrial Groups:** Entities that can manage / develop the project and are particularly adapt in financing, operations and maintenance but do not have an in-house Contractor.
- **Financially Focused Funds:** Entities that provide capital funding and financial and development expertise while typically taking a minority or co-control position in the company.

Competitive Procurement

If a P3 Toll Delivery were pursued, to foster a competitive environment and maintain high levels of interest from potential developers, NCDOT would engage with the developer market before procurement begins. This includes:

- Establishing a data room with comprehensive project-related information before procurement, ensuring all potential bidders have equal access to key project details and ample time to refine their views on the Project. Developers have indicated this is key to ensuring a level playing field.
- Hosting pre-bid conferences and Q&A sessions to clarify project expectations and address potential concerns.
- Advertising the procurement notice through multiple channels to ensure that all qualified developers are aware of the Project and have sufficient time to respond.

These steps would help ensure that all qualified developers are informed and have ample time to prepare competitive bids.

NCDOT's commitment to a transparent and fair procurement process for the I-77 South Express Lanes project would also help encourage strong competition among bidders. To this end, NCDOT would implement a consistent evaluation and selection procedure, ensuring all potential bidders have an equal opportunity. An expert evaluation team would assess proposals based on clear criteria, such as technical capability, financial viability, and relevant experience. Each step of the process would be documented and ensuring a level playing field for the selection of the best partner for the Project.

Appendix G: Toll Algorithm

What kind of algorithm would be used in a Traditional Toll vs. P3 Toll express lanes project?

The private sector approaches the pricing of managed lanes with a different mindset, primarily due to higher expectations of drivers' willingness to pay for express lanes. This leads to higher revenue projections and the use of distinct pricing algorithms compared to the public sector. That said, nothing would preclude a public agency from pursuing a similar pricing algorithm, however the absence of equity in the Traditional Toll Delivery model limits the ability of the public sector to fund against the more aggressive assumptions.

Why is this the case?

Studies of driver behavior on express lanes have shown that drivers' willingness to pay often exceeds initial expectations, making it difficult to model with traditional methods. Careful observers note that managed lanes offer both congestion relief and significant, though hard-to-quantify, soft benefits. These soft benefits significantly contribute to a driver's willingness to pay but are often overlooked by the public sector in pricing strategies.

Despite a consensus that drivers are more willing to pay than anticipated, there is no agreement on the exact amount. Many express lanes with high tolls continue to raise prices beyond inflation and operational needs. The private sector interprets this as an indication that the true willingness to pay for a fast, comfortable, and convenient trip on the express lanes is higher than current models suggest, indicating greater revenue potential.

In other words, if both sectors had aligned expectations for demand, growth, congestion, and travel time reliability, the private sector believes drivers would be willing to pay more than the public sector estimates.

This discrepancy is evident when comparing developer and publicly operated express lanes. Without a statutory maximum toll, both sectors price peak periods would likely be similar. For example, during the busiest morning rush hours into Washington, DC, both the privately operated I-395 Express Lanes and the DOT-operated I-66 Inside the Beltway Express Lanes charge between $2 to 4 per mile, depending on daily conditions. Both sectors recognize these rates are necessary to prevent overcrowding in express lanes compared to free alternatives.

However, differences in strategy emerge during off-peak times when alternative routes have little congestion. During these periods, express lanes offer minimal time savings or travel time reliability. Yet, many drivers choose express lanes for reasons such as lower traffic volumes, better maintenance, cleanliness, and safety. The private sector acknowledges this behavior by adjusting their pricing algorithms to charge higher rates when time savings are minimal, understanding that many drivers are willing to pay a modest amount for a comfortable, albeit not much faster, trip on the express lanes.

Appendix H: Past Presentations

- https://crtpo.org/PDFs/I-77/2023_08_I-77_South_Express_Lanes_Update.pdf
- Key Project Facts and Benefits (November 23) - https://crtpo.org/PDFs/I-77/2023_November_CRTPOBoard_I-77_North_Express_Lanes_Responses.pdf
- I-77 Corridor Update (February 21, 2024) - https://crtpo.org/PDFs/I-77/2024_02_I-77_Corridor_Update.pdf
- I-77 Corridor Update (April 24, 2024) - https://crtpo.org/PDFs/I-77/2024_04_I-77_Corridor_Update.pdf
- North Carolina Turnpike Authority Education Session (May 15, 2024) https://crtpo.org/PDFs/I-77/2024_05_Education_Session_NC_Turnpike_Authority.pdf
- Charlotte Regional Transportation Planning Organization (Re)Introduction to Priced Express Lanes June 26, 2024 https://crtpo.org/PDFs/I-77/2024_06_EducationSession_Re-Introduction_to_Priced_Express_Lanes.pdf
- I-77 South Express Lanes (June 26, 2024) https://crtpo.org/PDFs/I-77/2024_06_I-77_South_Express_Lanes.pdf
- Charlotte Regional Transportation Planning Organization – Why Consider a P3? (July 17, 2024) https://crtpo.org/PDFs/I-77/2024_07_EducationSession_Why_Consider_A_P3.pdf
- I-77 South Express Lanes (August 21, 2024) https://crtpo.org/PDFs/I-77/2024_08_I-77_South_Express_Lanes.pdf