I-85 Widening
(I-5719, U-5800, & U-6044)
Gaston County NC
Initial Financial Plan

Submitted: December 13, 2024

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

U.S. Department of Transportation
Federal Highway Administration

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LIST OF EXHIBITS

INITIAL FINANCIAL PLAN SUMMARY

This document is the Initial Financial Plan (IFP) for the widening of I-85 (I-5719, U-6044, & U-5800) in Gaston County, NC. It is submitted by the North Carolina Department of Transportation (NCDOT), as required by Section 106 of Title 23 of the United States Code (23 USC §106) and is consistent with guidance issued by FHWA. The latest guidance was issued on December 18, 2014. The IFP contains detailed cost estimates to complete the project as well as estimates of financial resources to fund the project.

The IFP demonstrates the State's commitment to completing the project and to the sound financial planning of Major Projects, as defined by 23 USC §106 and modified by Section 1305(b) of the Transportation Equity Act for the 21st Century (TEA-21), Section 1904 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), and Moving Ahead for Progress in the 21st Century Act (MAP-21) Public Law 112-141.

This IFP creates a record of planned expenditures and funding sources secured for the project and documents sources of funding through project completion. The presentation of this IFP is based upon currently available information and as such, NCDOT is fully prepared to complete the project on schedule and in accordance with the projected funding requirements.

The actual project expenditures data provided herein is current through the last day of the first quarter of State Fiscal Year 2025 (September 30, 2024).

CHAPTER 1 | PROJECT DESCRIPTION

PROJECT OVERVIEW

State Transportation Improvement Program (STIP) Project I-5719, proposes to widen I-85 from US 321 in Gastonia to NC 273 in Belmont/Mt. Holly. Construction phases A, B, and C of Project I-5719 will widen approximately ten miles of I-85 in Gaston County from six lanes to eight lanes and add auxiliary lanes for interchanges. In addition, the structures at seven interchanges, six overpasses, and four railroad bridges will be widened or replaced to accommodate the widening. Construction phase I-5719A will also include I-5719FA and STIP Project U-6044, improvements to Cox Road. Construction phase I-5719B will also include I-5719FB and STIP Project U-5800, improvements to the intersection of NC 7/Main Street and US 29/74. The Project will also add approximately nine miles of sidewalk, bike lanes and multi-use paths crossing over I-85. The widening of I-85 will be delivered in three distinct project phases as shown in Exhibit 1.

Phases I-5719D, I-5719E, I-5719FC and I-5719FD are part of the I-5719 project but were not specifically analyzed in the FHWA Cost and Schedule Risk Assessment (CSRA) because the cost and schedule risks of these phases were determined to be negligible or non-existent. These future phases are also described in the lower section of the table.

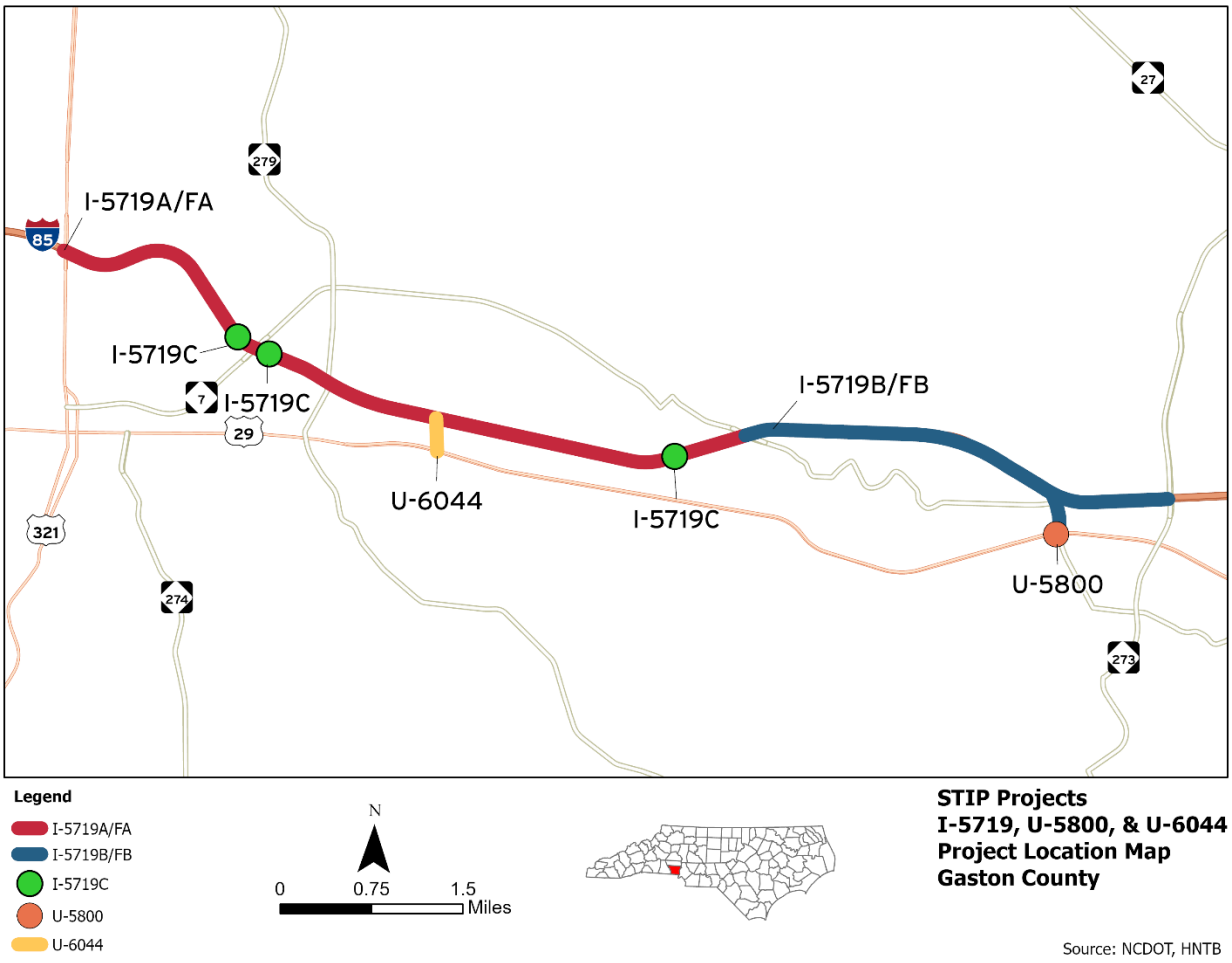
A map illustrating the location of the various project phases is shown in Exhibit 2.

Exhibit 1: Description of Project Phases

Project Number	STIP Projects Included	Location	Work Description
I-5719A (Design-Build)	I-5719A	I-85 from US 321 (Exit 17) to NC 7 (McAdenville Road / North Main Street) (Exit 23)	Widen I-85 to 8 lanes, replace / improve 4 roadway interchanges, replace 4 roadway bridge overpasses, and rehabilitate the US 321 bridge
	I-5719FA		Install Active Traffic Management (Ramp Meters, Variable Speed Limit signs, etc) and Incident Management
	U-6044	Cox Road from I-85 south to US 29/74 intersection	Selective widening and operational improvements to Cox Road (SR 2200).
I-5719B (Design-Build)	I-5719B	I-85 from NC 7 (McAdenville Road / North Main Street) (Exit 23) to east of NC 273 (Beatty Drive) (Exit 27) includes P&N Belmont Spur bridge and associated track	Widen I-85 to 8 lanes, replace / improve 2 roadway interchanges, replace 1 roadway overpass, rehabilitate/widen I-85 bridge over S. Fork Catawba River, replace the P&N Belmont Spur Line Railway bridge, reconstruct 0.7 miles of railway, and rehabilitate the NC 273 bridge
	I-5719FB		Install Active Traffic Management (Ramp Meters, Variable Speed Limit signs, etc) and Incident Management
	U-5800	NC 7 (North Main Street) south of I-85, including the intersection of NC 7 and US 29/74	Improvements to NC 7 (North Main Street) and operational improvements to the intersection with US 29/74
I-5719C (CM/GC)	I-5719C	P&N Railway Bridge, 2 NSR Bridges and Groves Street bridge within the limits of I-5719A	Reconstruction of 3 railway bridges and the Groves Street roadway overpass.
I-5719D, E, FC, & FD	I-5719D (Bid-Build)	Implementation of Flood Risk, Vulnerability Assessment and Flood Warning System from the NC/SC state line to NC 273 along I-85	
	I-5719E (Bid-Build)	Installation of electric vehicle charging ports from the NC/SC state line to NC 273 along I-85	
	I-5719FC (Design-Build)	Installation of broadband from the NC/SC state line to US 74	
	I-5719FD (Bid-Build)	Implementation of ITS Statewide Resilience, Connected Vehicle Technology, and Traveler Information from the SC/NC state line to NC 273 along I-85	

*CM/GC: Construction Manager / General Contractor

Exhibit 2: I-5719 Phases A/FA, B/FB, and C, U-5800, and U-6044 Project Location Map



CHAPTER 2 | SCHEDULE

PROJECT PLANNING AND IMPLEMENTATION SCHEDULE

The environmental planning and preliminary design phase for the I-5719 project began in September 2015, with the project purpose and need being established through a collaborative process. STIP projects I-5719 and U-5800 were combined into a single environmental document, Categorical Exclusion (CE), Type III, which was approved by the Federal Highway Administration (FHWA) on July 1, 2024. STIP Project U-6044 completed the NEPA process with a CE, Type II (B), in May 2024.

The Cost and Schedule Risk Assessment (CSRA) Workshop was held on August 28 to September 2, 2022, and focused on evaluating the widening portion of the project (I-5719A, B, and C). The CSRA was revisited and updated April 24 and April 25, 2024 and again in October 2024 to reflect the most recent project and cost data. The results of the CSRA are discussed in more detail in Chapter 3.

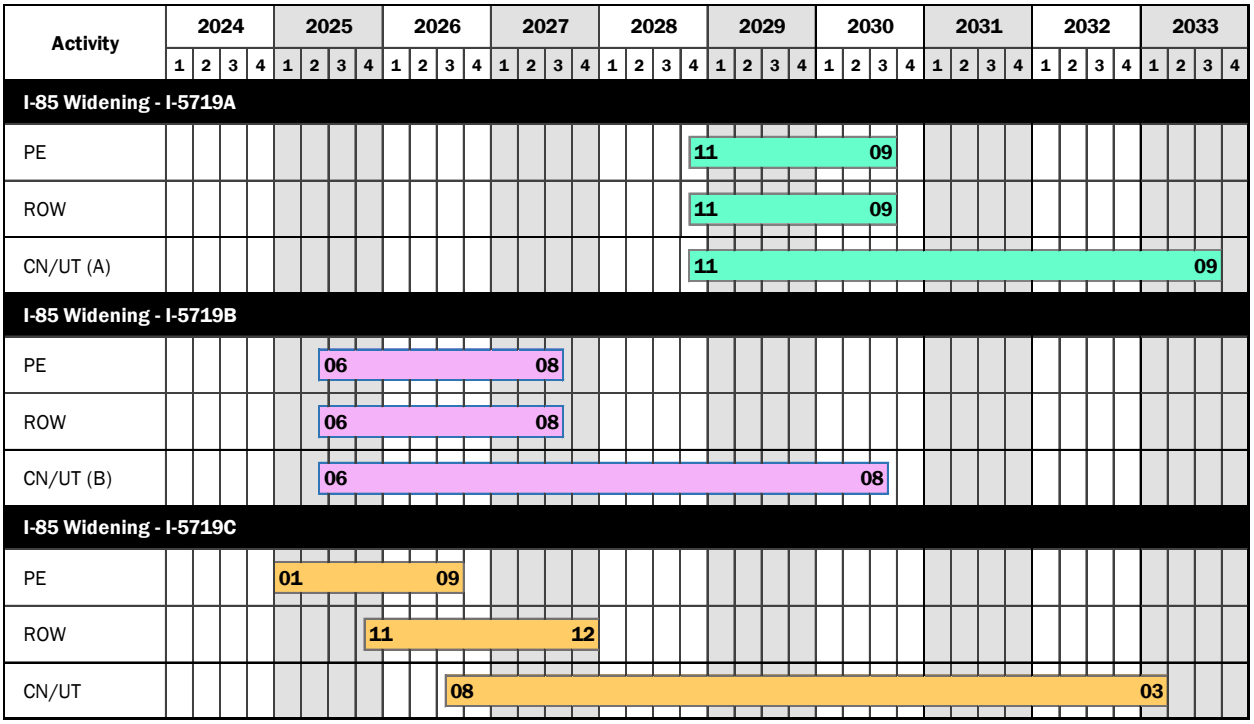
A high-level base project schedule was developed for the October update to the CSRA. The primary purpose of this schedule was to calculate year of expenditure (YOE) costs for use in the CSRA modeling. Using the base project schedule known at the time of the CSRA, a range of completion dates were predicted from November 2033 (10th percentile) to July 2034 (90th percentile) with a 70th percentile completion date of May 2034.

The current NCDOT base project schedule for major project phases is shown in tabular form in Exhibit 3 and graphically in Exhibit 4 and is based on the latest known information. The anticipated completion date for I-5719 is September 2033.

Exhibit 3: Project Implementation Schedule

Milestone	Date
U-6044 CE Type II (B)	May 2024
I-5719 CE Type III Approval	July 2024
Cost and Schedule Risk Assessment - update	November 2024
Begin I-5719B ROW Acquisition	June 2025
Award I-5719B Design-Build Contract	June 2025
Begin I-5719C ROW Acquisition	November 2025
Award I-5719C CM/GC Contract	August 2026
Begin I-5719A ROW Acquisition	November 2028
Award I-5719A Design-Build Contract	November 2028

Exhibit 4: Project Implementation Timeline



Notes:

1. PE phase includes owner design, NEPA, and DB (or CM/GC) procurement.
2. ROW acquisition will be led by the design-builder.
3. CN/UT includes DB (or CM/GC) final design, construction, and utility relocations.

CHAPTER 3 | PROJECT COST

This chapter provides a detailed description of the cost elements of the I-85 widening project (I-5719 A, B, and C) and the latest estimates of those costs. Projects I-5719A (including U-6044 and I-5719FA), I-5719B (including U-5800 and I-5719FB) and I-5719C represent the bulk of work to be accomplished by the I-85 widening project. The cost of these three project phases represents approximately 99 percent of the funding required to complete this project. Project phases I-5719 D, E, FC and FD represent work that will be accomplished in separate contracts for a minimal cost (approximately $15 million) when compared to the total project cost. For this reason, the CSRA Workshop focused on I-5719 A, B, and C and the figures in the following chapter represent anticipated costs for these three project phases. It also summarizes the costs incurred through September 30, 2024, and provides details on key cost-related assumptions.

COST ESTIMATE OVERVIEW

The detailed cost estimate was developed by the NCDOT Estimating Unit with input from various subject matter experts, including consultants. Per FHWA guidance, all cost estimates (as presented in this chapter) are in year-of-expenditure (YOE) dollars to account for inflation.

FHWA recommends that major projects be funded at the 70 percent probability range. The resulting cost estimate, in YOE dollars, as extracted from the model, is $1.812 billion. This estimate represents the total

project cost, and includes prior expenditures, engineering, project administration, construction, reserve funds, and all other project-related costs.

The I-5719 Project is included in NCDOT's current STIP (2024-2033 STIP). A breakdown of the cost estimates for the project are provided in Exhibit 5.

Exhibit 5: Project Cost Estimate (in millions, in YOE $)

STIP Project	Item	70% from CSRA Model
I-5719A	Construction	$ 540,420,351
	ROW Acquisition	$ 50,500,000
	Utilities	$ 38,954,851
	Engineering & CEI	$ 52,682,727
	Reserve Funds	$ 17,560,909
	Base Variability	$ 11,404,171
	Market Conditions	$ 70,357,462
	Risk Register	$ 59,933,539
	I-5719A TOTALS	**$ 841,814,010**
I-5719B	Construction	$ 393,757,165
	ROW Acquisition	$ 23,800,000
	Utilities	$ 56,962,987
	Engineering & CEI	$ 38,416,882
	Reserve Funds	$ 12,805,627
	Base Variability	$ 9,419,763
	Market Conditions	$ 58,114,756
	Risk Register	$ 51,713,812
	I-5719B TOTALS	**$ 644,990,991**
I-5719C	Construction	$ 195,610,340
	ROW Acquisition	$ 3,500,000
	Utilities	$ 5,552,619
	Engineering & CEI	$ 17,440,387
	Reserve Funds	$ 5,813,462
	Base Variability	$ 4,865,066
	Market Conditions	$ 30,014,782
	Risk Register	$ 27,523,650
	I-5719C TOTALS	**$ 290,320,307**
P/E	P/E (expended)	$ 20,891,437
	Remaining P/E (A&B)	$ 3,067,501
	Rem. P/E and Fixed I-5719C	$ 10,829,000
	P/E TOTALS	**$ 34,787,938**
	PROJECT TOTALS	**$ 1,811,913,246**

COST ELEMENTS

Cost estimates for ten major project elements were developed for each segment based on their unique quantities and schedules. These elements are described in more detail below.

PRIOR EXPENDITURES (PLANNING & ENGINEERING)

Planning for STIP Projects I-5719, U-5800, and U-6044 began in 2015, 2016, and 2018, respectively. The planning and engineering work that has occurred since that time includes the environmental studies, preliminary roadway and railroad design, coordination with the public and stakeholders, and numerous other reports and studies needed to complete the NEPA documentation. All costs, from project inception through September 30, 2024, were captured in NCDOT's SAP accounting system, using the identifying WBS numbers 50135.1.FS1, 44372.1.1, and 46986.1.1. The total of these costs through September 30, 2024, is $20.89 million. These expenditures are included in the "Preliminary Engineering (thru 9/24)" row in Exhibit 5 above.

REMAINING PRELIMINARY ENGINEERING

NCDOT will continue to develop the I-5719A and I-5719B phases up to and during the design-build process. Anticipated future expenditures for preliminary engineering and design for these phases total $3.07 million. NCDOT solicited Letters of Interest to serve as the contractor for the Construction Manager/General Contractor (CM/GC) contract type for the I-5719C segment in October 2024. Four contractors were short-listed in November 2024. Selection of the contractor is scheduled for January 2025 following interviews based on the proposals. The estimated cost for additional engineering, constructability reviews, and risk analysis prior to beginning construction of I-5719C is $10.83 million. These costs are shown as "Remaining Preliminary Engineering" and are expected to be expended between now and Fiscal Year 2029.

HIGHWAY CONSTRUCTION

As presented previously, two highway design-build construction contracts and one CM/GC contract will be awarded. The $1.13 billion construction cost estimate resulting from the CSRA workshop is used as the basis of this Initial Financial Plan for project planning and funding. The construction cost estimate is limited to the contractor's costs and does not include NCDOT administrative costs, construction engineering and inspection (CE&I), or reserve funds.

Of the projected $1.81 billion total project cost, construction costs are estimated to be $1.130 billion, or approximately 62 percent of the overall cost.

RIGHT-OF-WAY ACQUISITION

The right-of-way cost estimate includes the total costs to purchase property, including payments to property owners, appraisals, relocations, asbestos abatement, right-of-way agents, administration and management, mediation, and condemnation. Because this project is the widening of an existing interstate highway, the cost of right-of-way acquisition is relatively minor at $77.80 million, or approximately four

percent of the overall project cost. Most of the construction will take place within the existing right of way. There have been no expenditures for advanced right-of-way acquisition as of September 30, 2024.

UTILITY RELOCATION

The estimated cost of utility relocation is relatively small at $101.47 million, or almost six percent of the overall project cost.

ADMINISTRATIVE AND CEI EXPENSES

The cost estimate for administrative expenses and CEI is $108.54 million, as determined during the CSRA Workshop. Administrative expenses include staff labor and expenses, consultant project support, construction engineering and inspection (CEI), and project surcharges within the SAP accounting system.

RESERVE FUNDS

There are certain risks inherent in all large NCDOT construction projects. These risks include construction change orders, contractor claims, diesel fuel, asphalt cement, and steel price adjustments, in addition to general project risks and opportunities. As an agency, NCDOT has elected to take the risk of rising fuel, asphalt cement, and steel prices, rather than having the industry include this risk in their bids. If, during the construction period, prices exceed certain base costs established at the time of award, NCDOT will compensate the contractor for these overages. The converse is also true; if prices drop, then NCDOT would reduce payments to the contractor to reflect the lower price.

A reserve fund budget of $36.18 million is included in the project budget as a separate item, but is included within the construction funding in the STIP.

BASE VARIABILITY

Base uncertainty identifies the amount of variability in the estimate caused by uncertain quantities or unit prices that are inherent in the estimating process. The uncertainty is identified as a range around the estimate value of plus or minus a defined percentage. Base variability for this project totals $25.69 million.

MARKET CONDITIONS

Market conditions at the time of advertisement, bid, and award are modeled to reflect the future competitive bidding environment. Three mutually exclusive scenarios were evaluated including worse than planned, as planned, and better than planned. Each scenario was assigned a likelihood of occurrence and a range of associated costs. In addition to market conditions, anticipated inflation was also modeled and used to project costs to year-of-expenditure dollars. Based on collective experience from the project team, market conditions account for $158.49 million of the recommended project contingency.

RISK REGISTER

Specific risks and mitigation strategies are discussed in Chapter 8. Risks register items identified during the October CSRA total $139.2 million.

FHWA MAJOR PROJECTS COST AND SCHEDULE RISK ASSESSMENT WORKSHOP

The original CSRA Workshop for the subject project was conducted by FHWA Major Projects Cadre Team, along with NCDOT and their consultant, HNTB, from August 28 through September 4, 2022. The report was finalized in November 2022. Two updates to the CSRA, one in April 2024 and the other in October 2024 were conducted by NCDOT's consultant, HNTB, alongside FHWA. The purpose of the CSRA Workshop and subsequent updates was to verify the accuracy and reasonableness of the current project total cost estimate and project schedule, and to develop a probability range for the cost estimate that represents STIP Project I-5719, U-5800, & U-6044's current stages of development.

Together, with subject matter experts from NCDOT and HNTB, the Project Team discussed the design, schedule, and unit prices used to estimate the project costs. Approximately 80 cost and schedule risks and opportunities were identified and quantified. Unit prices, current and anticipated market conditions, and anticipated inflation rates were discussed.

The contingencies used in the STIP Projects I-5719, U-5800, & U-6044 cost were replaced with actual dollar values for uncertainties related to base variability, quantity and unit cost variability, and schedule and market risks. The project team, together with NCDOT subject matter experts, defined and discussed known and probable unknown risk elements. Following FHWA's process, costs were assigned to these risks; a Monte Carlo analysis was then used to model a probability cost range for STIP Projects I-5719, U-5800, & U-6044.

FHWA recommends that NCDOT fund STIP Projects I-5719, U-5800, & U-6044 at the 70 percent probability range. The resulting cost estimate, in YOE dollars, as extracted from the model, is $1.812 billion.

The complete report of the FHWA CSRA update for October 2024 is included as Appendix A.

CHAPTER 4 | PROJECT FUNDS

As described in Chapter 3, based on current estimates and the most up-to-date information on construction costs, STIP Projects I-5719A, I-5719B, and I-5719C will require an estimated $1.812 billion. *(in YOE dollars) to fully fund these phases. This chapter reviews NCDOT's plan of finance for STIP Project* I-5719*, describes in detail the planned sources of funds, and reviews the funding plan in the context of the State's overall transportation program and available resources.*

INITIAL FINANCIAL PLAN

As currently planned, right-of-way acquisition and construction of STIP Project I-5719 will be funded through traditional federal aid, federal grant funding, and State funding. No local funding is expected.

Based on the results of the October CSRA, NCDOT anticipates that approximately $1.812 billion will be needed to complete the STIP Projects I-5719 A, B, and C. This includes the already expended state funding for the environmental studies and preliminary engineering ("Priors" or "P/E Funds"). It is anticipated that approximately $15 million will be needed to complete STIP Projects I-5719 D, E, FC, and FD.

SOURCES OF FUNDS

Funding for STIP Projects I-5719, U-6044, and U-5800 has been programmed into NCDOT's 10-Year STIP. The NCDOT STIP can be found in its entirety at the following website:

https://connect.ncdot.gov/projects/planning/Pages/State-Transportation-Improvement-Program.aspx

The sources and uses for this IFP include prior years' expenditures, programmed funds, and non-programmed funds. A summary table and graph of the proposed funding sources for I-5719 A, B, and C are shown in Exhibits 6 and 8, respectively. Funding sources for I-5719 D, E, FC, and FD are shown in Exhibit 7.

Exhibit 6: Funding Sources Table for I-5719A (including I-5719FA & U-6044), I-5719B (including I-5719FB & U-5800), and I-5719C

Funding Source	IFP $ (M)
STIP FY 2024-2033 Total	
NHPP	$ 464.269
T (State Highway Trust Fund)	$ 302.684
T (State Highway Trust Fund) Matching Funds	$ 22.836
DP (INFRA Grant)	$ 88.064
NHPP-Garvee Bonds, principal	$ 400.000
STBG (incl. State Match)	$ 45.500
STIP FY 2024-2033 Total	**$ 1,323.353**
State Hwy Trust Funds for P/E (expended)	$ 20.891
State Hwy Trust Funds for P/E (remaining)	$ 13.897
Programmatic STIP funds	$ 453.772
Total Expenditures (Priors + Programmed)	**$ 1,811.913**

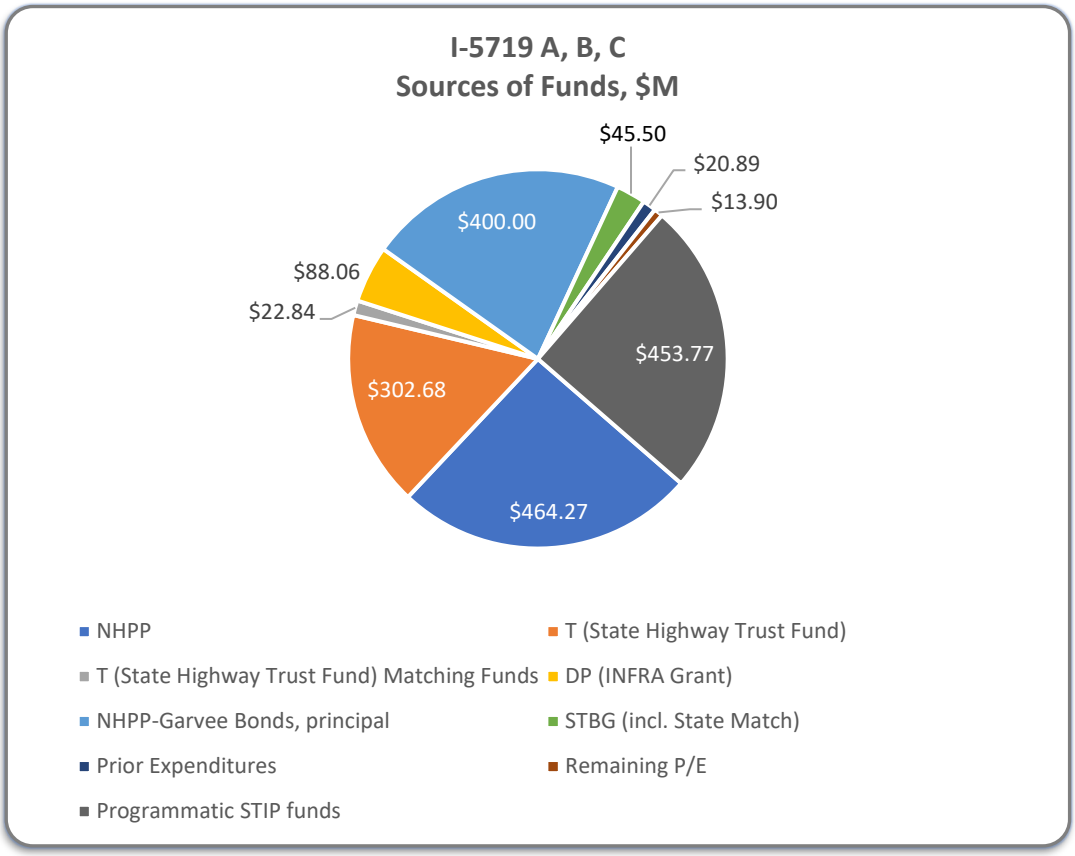
Note: Totals may not add due to internal rounding.

Exhibit 7: Funding Sources Table for I-5719 D, E, FC, FD

Funding Source	IFP $ (M)
STIP FY 2024-2033 Total	
DP (INFRA Grant)	$ 11.936
T (State Highway Trust Fund) Match	$ 2.984
STIP FY 2024-2033 Total	**$ 14.920**
Total Expenditures (Priors + Programmed)	**$ 14.920**

Note: Totals may not add due to internal rounding.

Exhibit 8: Funding Sources Chart for I-5719A (including I-5719FA & U-6044), I-5719B (including I-5719 FB & U-5800), and I-5719C



PROGRAMMED FUNDS

Programmed funds refer to those funds for which there is a commitment but no actual authorization or expenditures (i.e., funding included in NCDOT's 2024-2033 STIP). Programmed funds are financially committed through North Carolina's selection process for transportation capital improvement projects called STI (Strategic Transportation Investments). STI is a data-driven process mandated by law that includes input from Metropolitan Planning Organizations and Rural Planning Organizations.

NCDOT's 10-Year STIP includes state and federal funding for I-5719. The prior years' costs were queried from NCDOT's SAP accounting system to determine STIP Projects I-5719, U-6044, and U-5800 expenditures through September 30, 2024, for inclusion in this IFP.

FEDERAL FUNDING

The Federal Aid Construction Program consists of many apportioned funding categories, including the NHPP (National Highway Performance Program), Surface Transportation Block Grant (STBG) Program, and Bridge Formula Program (BFP) among others. Funding in most of these categories is subject to overall federal budget constraints and federal obligation limitation. Virtually all federal-aid projects require a local or state fund contribution. Most highway and transit programs require a 20 percent local or state

share. NCDOT recently began using toll credits to decrease the amount of matching state or local funds needed for a project. A state that has earned toll credits may use them as matching funds, which allows them to fund up to 100 percent of a project with federal funds. NCDOT intends to use toll credits on I-5719. In addition to the apportioned funds that could potentially be used to construct I-5719, NCDOT was awarded $100 million from the 2022 INFRA Grant Program for the I-5719 project.

Federal funds are a significant source of funding for the project. NCDOT's 10-year STIP has programmed $464.27 million in traditional NHPP funding. Additionally, $609.99 million in NHPP funding will be used to repay GARVEE bonds, $400.00 million in NHPP funding will be required for principal with the remaining $209.99 million being used to pay interest costs. The STIP also has programmed $36.40 million in Surface Transportation Block Grant (STBG) and $100 million in INFRA Grant funding.

STATE FUNDING

Revenues for the State Highway Trust Fund and the State Highway fund are generated from the state motor fuels tax, the use tax on the transfer of vehicles, DMV titles and other fees, sales tax, and interest income. NCDOT's 10-year STIP has programmed $337.60 million in State Highway Trust Funds. $34.92 million of that amount will be used to match federal funds.

PROGRAMMATIC STIP FUNDS

Certain project expenditures are not explicitly programmed in the NCDOT STIP. NCDOT retains a certain percentage of the available funding to cover contractor claims, jury awards for property settlements, price adjustments paid to the contractor for certain volatile commodities (diesel fuel, asphalt binder, and steel), and other expenses on a programmatic basis, without programming these costs to specific projects. For STIP Project I-5719, a portion of the project funding will be from these programmatic funding sources if they are needed. These cost elements are described in further detail in Chapter 3.

Inflation is handled programmatically and is not explicitly factored into cost estimates shown in the STIP. However, before programming projects in the STIP, available funds are reduced to account for future inflation. In the current STIP, 2024-2033, NCDOT used a 3 percent per year inflation factor. The 3 percent was compounded annually for the first five years, then held constant for the last five years. In the first year (2024), ½ of the inflation rate was used (1.5 percent) to ramp up to the 3 percent in Year 2 (2025). This method allows project costs used in the STIP to be shown in current (2024) dollars, while still accounting for future inflation. Approximately $4 billion was reserved for inflation in the 2024-2033 STIP.

USES OF FUNDS

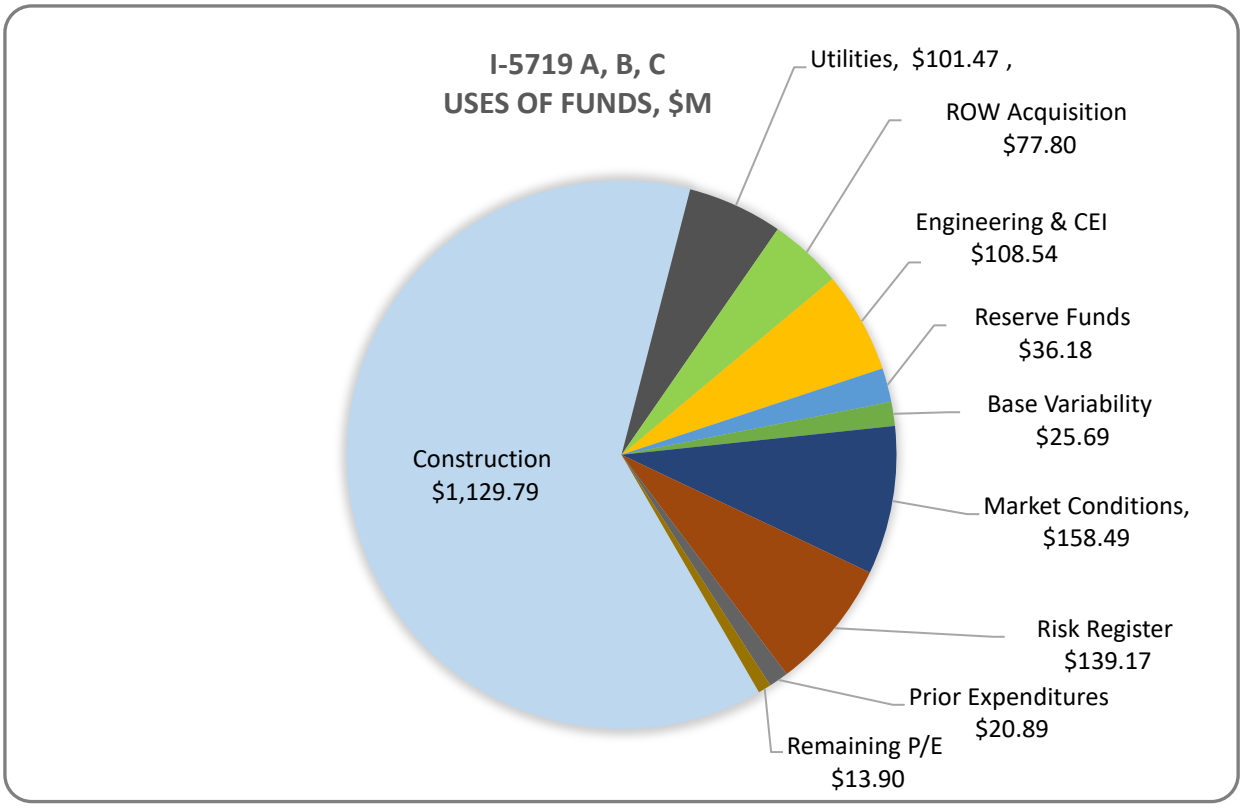
The cost elements described in Chapter 3 make up the uses of the project funds. The uses are illustrated in tabular and graphical format in Exhibits 9 and 10.

Exhibit 9: Funding Uses Table for I-5719A (including I-5719FA & U-6044), I-5719B (including I-5719FB & U-5800), and I-5719C

Funding Use	IFP $ (M)
Construction (I-5719A)	$ 540.420
Construction (I-5719B)	$ 393.757
Construction (I-5719C)	$ 195.610
Right of Way	$ 77.800
Utilities	$ 101.470
Engr. & CEI	$ 108.540
Admin. Reserves	$ 36.180
Base Variability	$ 25.689
Market Conditions	$ 158.487
Risk Register	$ 139.171
Prior Expenditures & P/E	
Prior Expenditures (P/E)	$ 20.891
Remaining P/E	$ 13.896
Totals	**$ 1,811.913**

Note: Totals may not add due to internal rounding.

Exhibit 10: Funding Uses Chart for I-5719A (including I-5719FA & U-6044), I-5719B (including I-5719FB & U-5800), and I-5719C



CHAPTER 5 | FINANCING ISSUES

STIP Project I-5719 is planned to be partially funded with two GARVEE bond issuances. The first issuance of $200 million, scheduled for Fiscal Year 2027, will be used to partially fund I-5719B. Bond repayment will begin in Fiscal Year 2027 and end in Fiscal Year 2041 with debt service costs estimated at $104.96 million. A second issuance of $200 million, scheduled for Fiscal Year 2029, will be used to partially fund I-5719A. Bond repayment will begin in Fiscal Year 2029 and end in Fiscal Year 2043 with debt service costs also estimated at $104.96 million.

POTENTIAL ALTERNATIVE FUNDING APPROACHES

While North Carolina is fully committed to meet its obligations under this plan and based on its current legal authorities, NCDOT recognizes that the circumstances can change and alternative structures may present themselves as superior to the baseline plan, as articulated in this document. Future Annual Updates will account for any such revisions to this IFP and incorporate funding capabilities for STIP Project I-5719.

CHAPTER 6 | CASH FLOW

This chapter provides a summary of the annual cash flow needs of STIP Project I-5719. Specific plans, contract awards, and resulting projections of actual cash outlays will be updated in subsequent Annual Updates to the IFP.

SOURCES AND USES OF FUNDS

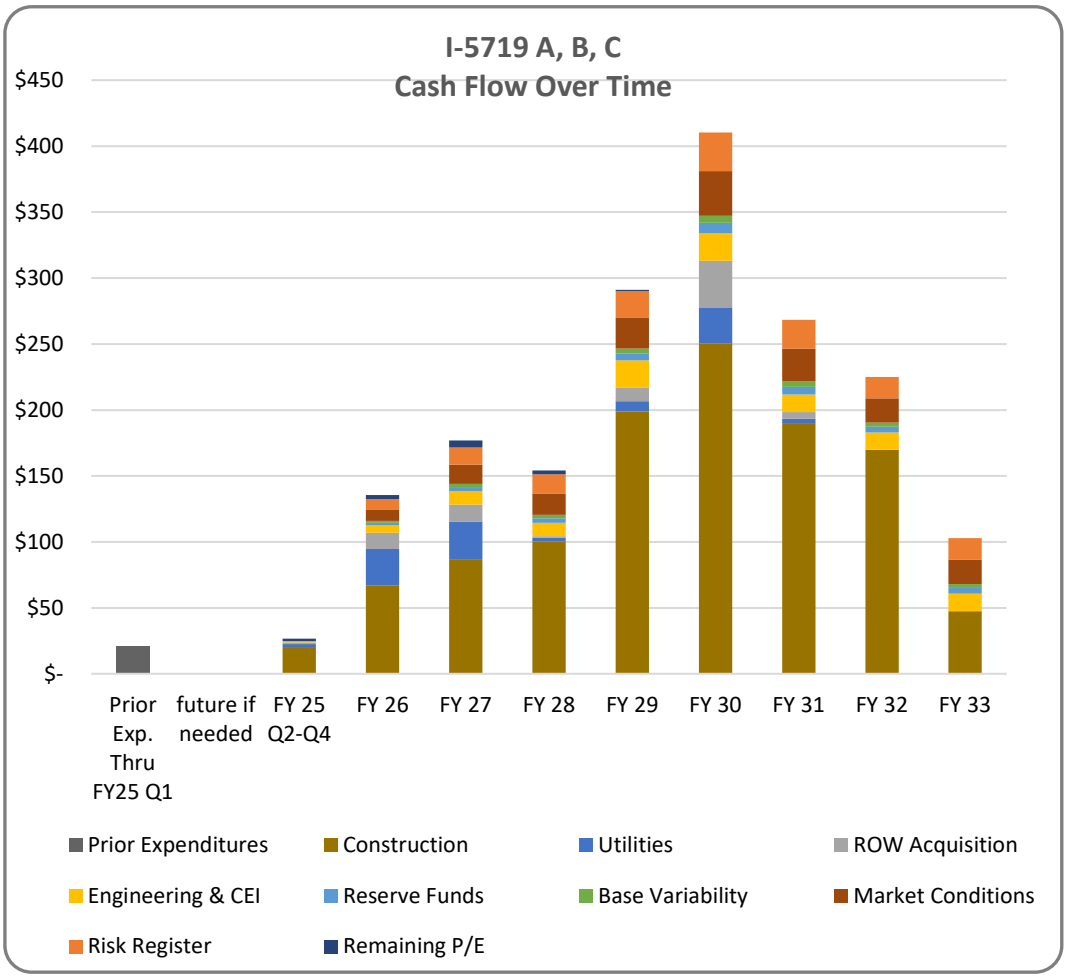
Cash flow projections for financing STIP Project I-5719 are based on the current project cost and schedule.

Exhibits 11 and 12 provide tabular and graphical summaries of the planned uses of funds for STIP Projects I-5719 A, B, C. The graphical summary (Exhibit 12) reflects the cash flow of the project as a whole and does not break out expenditures for each segment.

Exhibit 11: Cash Flow Table, by Segment

	Project Element	Totals	Prior Exp. Thru 9/24	FY 25 Q2-Q4	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33
I-5719A	I-5719A & U-6044 Construction	$ 540.42	$ -	$ -	$ -	$ -	$ -	$ 81.06	$140.51	$140.51	$140.51	$ 37.83
	Utilities (A)	$ 38.95	$ -	$ -	$ -	$ -	$ -	$ 7.79	$ 27.27	$ 3.90	$ -	$ -
	ROW Acquisition (A)	$ 50.50	$ -	$ -	$ -	$ -	$ -	$ 10.10	$ 35.35	$ 5.05	$ -	$ -
	Agency Costs:											
	Engineering & CEI	$ 52.68	$ -	$ -	$ -	$ -	$ -	$ 10.54	$ 10.54	$ 10.54	$ 10.54	$ 10.54
	Reserve Funds	$ 17.56	$ -	$ -	$ -	$ -	$ -	$ 1.76	$ 4.39	$ 4.39	$ 3.51	$ 3.51
	Base Variability	$ 11.40	$ -	$ -	$ -	$ -	$ -	$ 1.14	$ 2.85	$ 2.85	$ 2.28	$ 2.28
	Market Conditions	$ 70.36	$ -	$ -	$ -	$ -	$ -	$ 7.04	$ 17.59	$ 17.59	$ 14.07	$ 14.07
	Risk Register	$ 59.93	$ -	$ -	$ -	$ -	$ -	$ 5.99	$ 14.98	$ 14.98	$ 11.99	$ 11.99
	PROJECT SUB-TOTAL	$ 841.81	$ -	$ -	$ -	$ -	$ -	$125.42	$253.48	$199.81	$182.90	$ 80.22
I-5719B	I-5719B & U-5800 Construction	$ 393.76	$ -	$ 19.69	$ 66.94	$ 66.94	$ 70.88	$ 78.75	$ 70.88	$ 19.69	$ -	$ -
	Utilities (B)	$ 56.96	$ -	$ 2.85	$ 25.63	$ 25.63	$ 2.85	$ -	$ -	$ -	$ -	$ -
	ROW Acquisition (B)	$ 23.80	$ -	$ 1.19	$ 10.71	$ 10.71	$ 1.19	$ -	$ -	$ -	$ -	$ -
	Agency Costs:											
	Engineering & CEI	$ 38.42	$ -	$ 1.15	$ 5.76	$ 8.45	$ 7.68	$ 7.68	$ 7.68	$ -	$ -	$ -
	Reserve Funds	$ 12.81	$ -	$ -	$ 1.92	$ 2.56	$ 2.56	$ 2.56	$ 2.56	$ 0.64	$ -	$ -
	Base Variability	$ 9.42	$ -	$ -	$ 1.41	$ 1.88	$ 1.88	$ 1.88	$ 1.88	$ 0.47	$ -	$ -
	Market Conditions	$ 58.11	$ -	$ -	$ 8.72	$ 11.62	$ 11.62	$ 11.62	$ 11.62	$ 2.91	$ -	$ -
	Risk Register	$ 51.71	$ -	$ -	$ 7.76	$ 10.34	$ 10.34	$ 10.34	$ 10.34	$ 2.59	$ -	$ -
	PROJECT SUB-TOTAL	$ 644.99	$ -	$ 24.88	$128.85	$ 138.14	$109.01	$112.85	$104.97	$ 26.29	$ -	$ -
I-5719C	I-5719C Construction	$ 195.61	$ -	$ -	$ -	$ 19.56	$ 29.34	$ 39.12	$ 39.12	$ 29.34	$ 29.34	$ 9.78
	Utilities (C)	$ 5.55	$ -	$ -	$ 2.22	$ 3.33	$ -	$ -	$ -	$ -	$ -	$ -
	ROW Acquisition (C)	$ 3.50	$ -	$ -	$ 1.40	$ 2.10	$ -	$ -	$ -	$ -	$ -	$ -
	Agency Costs:											
	Engineering & CEI	$ 17.44	$ -	$ -	$ -	$ 1.74	$ 2.62	$ 2.62	$ 2.62	$ 2.62	$ 2.62	$ 2.62
	Reserve Funds	$ 5.81	$ -	$ -	$ -	$ 0.58	$ 0.87	$ 0.87	$ 0.87	$ 0.87	$ 0.87	$ 0.87
	Base Variability	$ 4.87	$ -	$ -	$ -	$ 0.49	$ 0.73	$ 0.73	$ 0.73	$ 0.73	$ 0.73	$ 0.73
	Market Conditions	$ 30.01	$ -	$ -	$ -	$ 3.00	$ 4.50	$ 4.50	$ 4.50	$ 4.50	$ 4.50	$ 4.50
	Risk Register	$ 27.52	$ -	$ -	$ -	$ 2.75	$ 4.13	$ 4.13	$ 4.13	$ 4.13	$ 4.13	$ 4.13
	PROJECT SUB-TOTAL	$ 290.32	$ -	$ -	$ 3.62	$ 33.56	$ 42.19	$ 51.97	$ 51.97	$ 42.19	$ 42.19	$ 22.63
	PROJECT COST	**$ 1,777.13**	**$ -**	**$ 24.88**	**$132.47**	**$ 171.70**	**$151.20**	**$290.23**	**$410.42**	**$268.29**	**$225.09**	**$102.85**
P/E & Fixed	Prior Expenditures (I-5719) thru 9/24	$ 20.89	$ 20.89	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Remaining P/E (A&B)	$ 3.07	$ -	$ 0.15	$ 0.46	$ 0.77	$ 0.92	$ 0.77	$ -	$ -	$ -	$ -
	Remaining P/E and Fixed I-5719C	$ 10.83	$ -	$ 1.62	$ 2.71	$ 4.33	$ 2.17	$ -	$ -	$ -	$ -	$ -
	TOTAL PROJECT COST	**$ 1,811.91**	**$ 20.89**	**$ 26.66**	**$135.64**	**$ 176.80**	**$154.28**	**$291.00**	**$410.42**	**$268.29**	**$225.09**	**$102.85**

Exhibit 12: Cash Flow Graph



CHAPTER 7 | P3 ASSESSMENT

NCDOT completed the FHWA's Public-Private Partnerships (P3) analytical tool, referred to as the P3-SCREEN checklist. Built within Excel, the tool highlights key criteria and questions relevant to assessing the viability of delivering a highway project using a P3 approach. NCDOT evaluated the project over 17 questions pertaining to Legal, Planning & Environmental, Public Support, Organizational Capacity, Project Scope & Complexity, Affordability, Industry Interest, and Other criteria.

Although NCDOT has legislative authority to utilize P3, NCDOT is pursuing the procurement of I-5719 through the Design-Build process (Phases A, FA, B, FB, and FC), Construction Manager / General Contractor (CMGC) process (Phase C), and the traditional Bid-Build process (Phases D, E, and FD).

There is significant interest in these procurement methods in the private sector. NCDOT does not anticipate an advantage through pursuing a P3 delivery over these typical procurement methods for this project.

The checklist concluded "based on the responses and comments in the above assessment, it appears at this time that a P3 delivery may not be appropriate for the project."

CHAPTER 8 | RISK AND RESPONSE STRATEGIES

This chapter addresses several important factors that could affect STIP Project I-5719, and, in particular, the financial plan and schedule for the project. These include cost, schedule, funding risks, and associated mitigation strategies. Market Conditions and Base Variability were modeled as separate risks and are discussed in more detail in Chapter 3. The following is a detailed discussion of the various risks and opportunities and possible mitigation strategies.

RANGE OF PROBABLE COSTS

The FHWA Crystal Ball model of the Monte Carlo simulation resulting from the CSRA indicates that the total project cost is expected to range from $1.618 billion (10th percentile) to $1.887 billion (90th percentile) in year-of-expenditure dollars. The 70th percentile project cost (which is recommended for use in budgeting and is reflected in this IFP) is $1.812 billion, which represents a project contingency of 22.2 percent ($323.3 million) relative to the base project cost without contingency of $1.489 billion.

RANGE OF PROJECT COMPLETION DATES

The anticipated project completion date ranges from November 2033 (10th percentile) to July 2034 (90th percentile), with a 70th percentile completion date of May 2034. The 70th percentile completion date represents roughly a six-month schedule delay relative to the base completion date of October 2033.

IDENTIFIED RISK ITEMS

In general, uncertainties in the estimate can be described as those relating to base variability, market conditions, and cost and schedule risk events (captured on a risk register).

Base variability is a measure of uncertainty applied to the base estimate that represents the inherent randomness associated with the estimating process. Base variability is a function of the project's current level of design and the process used to develop the estimate. Base variability accounted for $25.7 million of the recommended project contingency.

Market conditions at the time of advertisement, bid, and award are modeled to reflect the future competitive bidding environment. Three mutually exclusive scenarios are evaluated including worse than planned, as planned, and better than planned. Each scenario is assigned a likelihood of occurrence and a range of associated costs. In addition to market conditions, anticipated inflation is also modeled and used to project current year dollars to year of expenditure. Market conditions accounted for $158.5 million of the recommended project contingency.

Cost and schedule risk events are captured on a risk register that is developed by interviewing the Project Team and its consultants to define the components of contingency and establish both cost and schedule

risks. The risk register includes the risk event name, a description of the event and a probability measure of the likelihood the event will occur, as well as a probability distribution of cost and/or schedule impacts if the event were to occur. The risk register for Project I-5719 contains approximately 80 entries. The sum of the risks identified on the risk register accounted for $139.2 million of the recommended project contingency.

The CSRA determined that the most significant risks to the Project are:

- Right-of-Way settlement costs
- Quantity overruns
- Inflation above the base estimate assumptions of 4%
- Introduction of additional work zone restrictions by NS Railroad
- Unknown utility conflicts

Based on the CSRA, the recommended actions to be performed by the project sponsor (NCDOT) are:

- Establish a project contingency corresponding to, at minimum, the 70th percentile CSRA cost result of $1.812 billion (YOE). This represents a project contingency of 22.2% ($323.3 million) relative to the base project cost without contingency of $1.489 billion (YOE). This level of contingency is believed to be adequate for the Project based on the estimate development and risks identified.
- Prioritize railroad coordination; Provide information on railroad coordination/agreement expectations in the Design Build RFP.
- Advance critical details and assumptions for Work Zone Traffic Control (WZTC) to validate the expected 66-month construction duration.
- Review WZTC assumptions and concept to confirm major items of work (e.g. shoring, temporary facilities) are adequately represented in the base cost.
- Document any cost and schedule changes going forward.
- Utilize the risk register resulting from this CSRA as a tool to continue managing the project's cost and schedule risks. It is recommended that the project sponsor develop mitigation strategies for each identified risk, including assignment of responsibility and regular status reviews. The risk register can also be used to help inform risk allocation decisions in the DB contract.
- Consider developing a detailed construction schedule to help validate the anticipated construction duration and evaluate DB proposals.

CHAPTER 9 | ANNUAL UPDATE CYCLE

The financial plan presented herein represents the Initial Financial Plan as required by FHWA. NCDOT plans to provide annual updates to this financial plan based on the anniversary method. The anniversary date of this financial plan is December 31. Each annual update will be based on actual data from NCDOT's internal data systems and on budgets and plans using an "as-of" date of December 31. The submittal to FHWA will occur within 90 days of this date (March 31). NCDOT will update and expand upon items as

more current information becomes known. Examples of items that will be expanded upon in the annual updates, based on actual known information and anticipated progress on the project are:

- Updates to the project schedule.
- Updates to the cost estimate based on more detailed design work and/or actual construction prices; and
- Tracking of actual expenditures against projected cash flow needs.

APPENDIX A: FHWA I-5719 CSRA, OCTOBER 2024 UPDATE – FINAL REPORT

I-85 Widening (I-5719, U-5800, U-6044)

Gaston County, North Carolina

FHWA Cost and Schedule Risk Assessment

December 2024

Final Report

Table of Contents

ONE PAGE SUMMARY

I-85 Widening, Gaston County (I-5719, U-5800, U-6044)

October 2024 Cost and Schedule Risk Assessment Update

(Changes from the 2024 April CSRA Update are shown in red text.)

Project Description:

The Project would widen approximately 10 miles of Interstate 85 (I-85) in Gaston County, North Carolina (NC) from the United States (US) 321 interchange (Exit 17) in Gastonia to the NC 273 interchange (Exit 27) in Belmont and Mount Holly. Work would involve widening I-85 in the project area from six to eight lanes, upgrading eight interchanges, and relocating/replacing roadway (six) and railroad (four) bridges. The project scope also includes improvements on NC 7 south of I-85, including the intersection of NC 7 and US 29/74 as well as improvements to SR 2200 (Cox Road) in Gastonia.

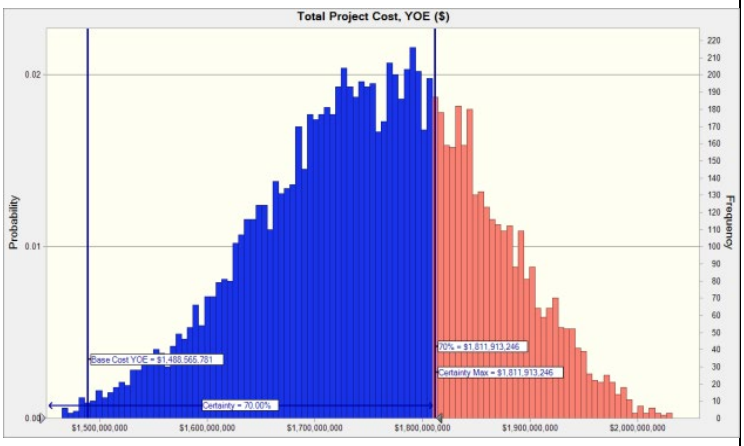
Project Benefits:

- **To increase the capacity** of the regional transportation system.
- **To improve safety** in the Gaston County area.
- **To enhance mobility** along the I-85 corridor and local surface streets.

Financial Fine Print

The October 2024 Monte Carlo simulation forecasted a total project cost ranging from $1.618 billion (10th percentile) to $1.887 billion (90th percentile) in Year of Expenditure (YOE) costs. The 70th percentile Total Project Cost is $1.812 billion (YOE). This represents a project contingency of 22.2% relative to the base project cost without contingency of $1.489 billion (YOE). This level of contingency is believed to be adequate for the project based on the estimate development and risks identified.

October 2024 Cost Range:



October 2024 Project Schedule Range:

Construction Expected: 2025 to 2034

Key Project Risks:

- Right of way settlement/condemnation cost
- Quantity growth during final design
- Inflation rate increases
- Railroad work restrictions
- Unknown utility conflicts

What's Changed from the April 2024 CSRA:

- Phased I-5719 into A, B, C, D, E, FA, FB, FC, and FD
- Revised base cost estimate to capture updated market pricing and inflation
- Increased definition of railroad design

October 2024 Level of Project Design: 20%

NORTH CAROLINA
Department of Transportation

EXECUTIVE SUMMARY

A Review Team consisting of the North Carolina Department of Transportation (NCDOT), NCDOT consultants, and the Federal Highway Administration (FHWA) conducted an update to the Cost and Schedule Risk Assessment (CSRA) workshop held in April 2024 to review the cost and schedule estimates for the Interstate 85 (I-85) Widening Project in Gaston County ("the Project"). The Project includes State Transportation Improvement Program (STIP) projects I-5719, U-5800, and U-6044. Former STIP number U-3608 is now included within the scope of I-5719. A meeting was conducted via Microsoft Teams on October 16, 2024. This evaluation represented an update to the April 2024 update to the CSRA (2022).

PROJECT DESCRIPTION

The Project would improve approximately 10 miles of I-85 in Gaston County, North Carolina (NC) from the United States (US) 321 interchange (Exit 17) in Gastonia to the NC 273 interchange (Exit 27) in Belmont and Mount Holly. Work would include widening I-85 in the project area from six to eight lanes, upgrading eight interchanges, and relocating/replacing roadway and railroad bridges. The project scope also includes improvements on NC 7 (North Main Street) south of I-85, including the intersection of NC 7 and US 29/74.

Since 2022, the Project scope has been adjusted to include selective widening and operational improvements to Cox Road (SR 2200), south of I-85, and US 29/74 intersection. Improvements include addition of selective through lanes and turn lanes, as well as the addition of sidewalk and multiuse path.

Following the April 2024 Update, the combined projects of I-5719, U-5800, and U-6044 were split into multiple phases.

STIP Project No.	Phase	Contracting Mechanism*	Location	Work Description
I-5719	A	DB	I-85 from US 321 (Exit 17) to NC 7 (McAdenville Road / North Main Street) (Exit 23)	Widen I-85 to 8 lanes, replace / improve roadway interchanges (4), replace roadway bridges (4) overpasses, and the rehabilitation of the US 321 bridge. Includes U-6044.
I-5719	FA	DB	I-85 from US 321 (Exit 17) to NC 7 (McAdenville Road / North Main Street) (Exit 23)	As part of I-5719A, install Active Traffic Management (Ramp Meters, Variable Speed Limit signs, etc) and Incident Management.
U-6044		DB	Cox Road from I-85 south to US 29/74 intersection	Selective widening and operational improvements to Cox Road (SR 2200). Included with I-5719A.
I-5719	B	DB	I-85 from NC 7 (McAdenville Road / North Main Street) (Exit 23) to east of NC 273 (Beatty Drive) (Exit 27) includes P&N Belmont Spur bridge and associated track	Widen I-85 to 8 lanes, replace / improve roadway interchanges (2), replace (1) roadway overpass, rehabilitate/widen I-85 bridge over S. Fork Catawba River, replace the P&N Belmont Spur Line Railway bridge, reconstruct 0.7 miles of railway, and rehabilitation of the NC 273 bridge. Includes U-5800.

STIP Project No.	Phase	Contracting Mechanism*	Location	Work Description
I-5719	FB	DB	I-85 from NC 7 (McAdenville Road / North Main Street) (Exit 23) to east of NC 273 (Beatty Dr) (Exit 27)	As part of I-5719B, install Active Traffic Management (Ramp Meters, Variable Speed Limit signs, etc) and Incident Management.
U-5800		DB	NC 7 (North Main Street) south of I-85, including the intersection of NC 7 and US 29/74	Improvements to NC 7 (North Main Street) and operational improvements to the intersection with US 29/74. Included with I-5719B
I-5719	C	CMGC	P&N Railway Bridge (1), NSR Bridges (2) and Groves Street bridge	Reconstruction of the (3) railway bridges and the Groves Street roadway overpass.

*DB – Design Build, CMGC – Construction Manager/General Contractor

CSRA ESTIMATE REVIEW

During the CSRA workshop, the NCDOT base cost estimate was reviewed and updated to reflect comments provided by the subject matter experts (SMEs) representing each key discipline based on consensus of the workshop participants. A comparison of the deterministic pre-CSRA and post-CSRA cost estimates is provided below, along with those of the revised scope of the project (made after the April update). The complete post-CSRA estimate is provided in Appendix C.

Cost Component	Pre-CSRA	CSRA Adjustment	Post-CSRA	Revised Scope
Bid Items	$668.62	16.4	$685.02	$681.30
Design Development Allowances (15% on Str/Utl; 30% on Roadway)	$139.17	0	$139.17	$139.07
Subtotal	$807.79	$16.40	$824.19	$820.37
E & C (16%)	$129.25	$2.66	$131.91	$131.43
Design Build Factor (20%)	$161.56	$29.64	$191.20	$154.60
CMGC Factor (30%)				$53.60
Construction Total	$1,098.60	$48.70	$1,147.30	$1,160.00
Utilities	$60.00	17.8	$77.80	$91.73
Right of Way	$60.30	17.4	$77.70	$77.80

Cost Component	Pre-CSRA	CSRA Adjustment	Post-CSRA	Revised Scope
Total Future Cost	$1,218.90	$83.90	$1,300.43	$1,329.53
Prior and Fixed Costs [1]	22.46	($2.37)	$20.09	$34.79
Total Project Cost (without Contingency)	$1,168.66	$73.46	$1,242.11	$1,236.84
Contingency [2]	$72.70	$8.07	$80.78	$125.11

[1] Fixed costs were adjusted to reflect updated information during the CSRA

[2] Amount of contingency removed from base estimate for CSRA model is 4% of E&C and 5% of DBF amounts

A close-out presentation was provided at the conclusion of the workshop to share preliminary model results with NCDOT (Appendix F).

The results presented in this report represent information available at the time of the CSRA workshop.

COST AND SCHEDULE RISK ASSESSMENT RESULTS

Based on the revised base estimate and the CSRA risk-based probabilistic approach, the Monte Carlo simulation forecasted ranges of total project costs and project completion dates as summarized below:

- Total project cost ranges from $1.618 billion (10th percentile) to $1.887 billion (90th percentile) in YOE dollars. The 70th percentile YOE project cost is $1.812 billion (YOE), which represents a project contingency of 22.2% ($323.3 million) relative to the base project cost without contingency of $1.489 billion (YOE). This level of contingency is also believed to be adequate for the project.
- The anticipated project completion date ranges from November 2033 (10th percentile) to July 2034 (90th percentile), with a 70th percentile completion date of May 2034. The 70th percentile completion date represents roughly a 6-month schedule delay relative to the base completion date of October 2033.

RISK REGISTER

The most significant risks to the Project are listed below :

- Right-of-Way settlement costs
- Quantity overruns
- Inflation above the base estimate assumptions of 4%
- NS Railroad introduces additional work zone restrictions
- Unknown utility conflicts

REVIEW RECOMMENDATIONS

Based on this CSRA, the recommended actions to be performed by the project sponsor (NCDOT) are summarized below:

- Establish a project contingency corresponding to, at minimum, the 70th percentile CSRA cost result of $1.812 billion (YOE). This represents a project contingency of 22.2% ($323.3 million) relative to the base project cost without contingency of $1.489 billion (YOE). This level of contingency is believed to be adequate for the Project based on the estimate development and

risks identified.

- Prioritize railroad coordination; Provide information on railroad coordination/agreement expectations in the Design Build RFP.
- Advance critical details and assumptions for Work Zone Traffic Control (WZTC) to validate the expected 66-month construction duration.
- Review WZTC assumptions and concept to confirm major items of work (e.g. shoring, temporary facilities) are adequately represented in the base cost.
- Document any cost and schedule changes going forward.
- Utilize the risk register resulting from this CSRA as a tool to continue managing the project's cost and schedule risks. It is recommended that the project sponsor develop mitigation strategies for each identified risk, including assignment of responsibility and regular status reviews. The risk register can also be used to help inform risk allocation decisions in the DB contract.
- Consider developing a detailed construction schedule to help validate the anticipated construction duration and evaluate DB proposals.

CHAPTER 1 – REVIEW PROCESS

INTRODUCTION

A Review Team consisting of the North Carolina Department of Transportation (NCDOT), NCDOT consultants, and the Federal Highway Administration (FHWA) conducted an update to the Cost and Schedule Risk Assessment (CSRA) workshop held in April 2024 to review the cost and schedule estimates for the Interstate 85 (I-85) Widening Project in Gaston County ("the Project"). The Project includes State Transportation Improvement Program (STIP) projects I-5719, U-5800, and U-6044. Former STIP number U-3608 is now included within the scope of I-5719. A meeting was conducted via Microsoft Teams on October 16, 2024. This evaluation represented an update to the April 2024 update to the CSRA (2022).

This chapter provides a general overview of the CSRA process along with a discussion of the objective of the review and the methodology used.

REVIEW OBJECTIVE

The CSRA consisted of an unbiased risk-based review to verify the reasonableness of the current total cost estimate to complete the Project in year-of-expenditure (YOE) dollars. Probability ranges for the cost estimate indicating best and worst-case scenarios representative of the current stage of design were presented. The Review Team also reviewed the proposed project schedule to determine potential schedule impacts on the project cost. This process provides the NCDOT with information outlining the potential range of the future cost of the Project to ensure adequate cash flow and details the impacts of inflation and delays on project costs.

BASIS OF REVIEW

23 United States Code 106(h) requires a financial plan for all Federal-aid Major Projects with an estimated total cost of $500 million or greater. The $500 million threshold includes all project costs, such as National Environmental Policy Act (NEPA), engineering, construction, right-of-way (ROW), utilities, construction engineering, and inflation. The FHWA interprets 'reasonable assumptions' to be a risk-based analysis. This CSRA provides the risk-based assessment and is ultimately used in the approval of the Initial Finance Plan (IFP). This is an independent review but does not use an independent FHWA estimate. The Review Team used the estimate as provided by the Project Team. This estimate was reviewed during the workshop by the Review Team and participating subject matter experts (SMEs).

REVIEW TEAM

The Review Team was developed with the intent of having individuals with a strong knowledge of the Project and/or of major project work and expertise in specific disciplines of the Project. This team worked collaboratively throughout the workshop to review the Project. SMEs with specific expertise relative to the Project briefed the Review Team on portions of the Project or estimate development process. The Review Team also discussed the development of the Project cost estimate quantities, unit prices, assumptions, opportunities, and threats. A list of attendees for this review is provided in Appendix B.

The Review Team was comprised of members of the following organizations:

- NCDOT
  - Central Office
  - Division
  - Consultants
    - HNTB (CSRA Facilitator and Modeler, Project Development, and SME)
- FHWA

- North Carolina Division Office

DOCUMENTS REVIEWED

Documents provided by NCDOT and reviewed prior to and during the workshop included:

- Project Cost Estimates
- Project Schedule
- Project overview presentation
- Risk Register
- Project website (https://www.ncdot.gov/projects/i-85-widening-gaston-county/Pages/default.aspx) containing a variety of background materials related to the project, including public meeting presentations.

METHODOLOGY

The methodology for this CSRA is outlined as follows:

- Verify accuracy of cost estimate.
  - Understand project scope and cost estimate development process.
  - Discuss assumptions for contingencies and projected inflation rates.
  - Review major cost elements.
  - Identify threats and opportunities (Risk Register).
- Model uncertainties.
  - Establish base estimate variability.
  - Determine probability of occurrence and schedule and cost impacts for significant project threats and opportunities.
    - These are based on the experience of the Review Team and the SMEs. The team agrees on the impact level of the risk and the probability of it happening. These factors are subsequently entered into the CSRA model template.
  - Model anticipated market conditions at the time of letting.
- Perform Monte Carlo simulation to model base variability, market conditions, and risks and generate the estimated range of project cost and schedule.
- Communicate results.
  - Report methodology and results in a close-out presentation.
  - Document review in a final report (this report) that will be used to inform the public and develop the financial plan.

The following discussion provides more detail about the concepts utilized during the review.

Verify Accuracy of Cost Estimate

The Review Team was provided an overview of the estimation process used to develop the Project's estimate. This overview included understanding the scope of the Project, stage of design, and assumptions used to develop the estimate. The cost estimate was reviewed by the SMEs during the workshop during the individual discipline risk discussions. In some cases, the estimate was updated to reflect the participants' understanding of the scope of work and key assumptions and to reflect current pricing as of the workshop date to the extent possible.

Model Uncertainties

In general, uncertainties in the estimate can be described as those relating to base variability, market risks, and cost and schedule risk events. Each of these are discussed and modeled to reflect the total uncertainty.

Base variability is a measure of uncertainty applied to the base estimate that represents the inherent randomness associated with the estimating process. Base variability is a function of the Project's current level of design and the process used to develop the estimate. This may be demonstrated by the fact that two estimators using the same data sources and following the same general estimate development guidance will likely generate different estimates. Additionally, the lack of details about the Project and assumptions that should be used to develop the estimate would cause more uncertainty and variability in the estimate. This base variation is a function of the system (i.e., assumptions and data sources used to define the estimate). Base variability is applied to the base estimate exclusive of risks. Contingencies that include risks are removed from the base estimate to avoid double counting risks identified in the risk register. Allowances for general design development and expected construction change order costs typically remain in the base estimate.

Market conditions at the time of advertisement, bid, and award are modeled to reflect the future competitive bidding environment. Three mutually exclusive scenarios are evaluated including worse than planned, as planned, and better than planned. Each scenario is assigned a likelihood of occurrence and a range of associated costs. In addition to market conditions, anticipated inflation is also modeled and used to project current year dollars to year of expenditure.

A **risk register** is developed by interviewing the Project Team and its consultants to define the components of contingency and establish both cost and schedule risks. The risk register includes the risk event name, a description of the event and a probability measure of the likelihood the event will occur, as well as a probability distribution of cost and/or schedule impacts if the event were to occur. The register also identifies if the risk event is a threat or opportunity for cost and or schedule. Risk **threats** increase the cost and or schedule while **opportunities** decrease the cost and or schedule. A very important feature of the risk register is to establish the relationship of risk events. Risk events are **independent** if the probability of occurrence is not dependent on any other risk event. Alternatively, **mutually inclusive** means the risk event can only occur if the prior risk event occurs. Conversely, for a risk event to be **mutually exclusive** means that it can only occur if the prior risk event does not occur. Correlation determines how one risk event will sample during the simulation relative to another risk event. Correlation should only be established when there is reason to suspect that a relationship exists and needs to be accounted for in the simulation.

After models are developed for market conditions, base variability, and risk events, the Review Team utilized a Monte Carlo simulation to generate a probability-based estimate of YOE Total Project Costs. A **simulation** is essentially a rigorous extension of a series of "what-if" statements or sensitivity analyses, which uses randomly selected sets of values from the input probability distributions to calculate the uncertainty in the selected outputs. A single iteration within a simulation is the process of sampling from all input distributions and performing a single calculation to produce a deterministic (single value) result. It is important that each iteration represent a scenario or outcome that is logically possible. It is for this reason that the simulation outcomes be reviewed to ensure accuracy. The process of sampling from a probability distribution is repeated until the specified number of computer iterations is completed or until the simulation process converges. Simulation **convergence** is that point at which additional iterations do not significantly change the shape or location of the output distribution. The results of the simulation are arrayed in the form of a distribution covering all possible outcomes. The key benefit of this process is development of defensible probability distributions associated with projected cost and schedule.

Communicate Results

Results of the CSRA review are communicated to the project sponsor by providing a close-out presentation and final report. At the end of the review, the Review Team provides a close-out presentation that summarizes the review findings. The presentation identifies the review objectives and agenda, discusses the methodology, and highlights the results of the review, including the pre/post workshop estimate

results and any estimate adjustments made during the review. The close-out presentation identifies any significant cost and schedule risks and provides a brief overview of the Review Team's recommendations. An email of model results was distributed to Project Team members on October 28, 2024.

The estimate review is a snapshot in time and as additional information becomes available, it is expected that the estimate will change and be updated. The final report communicates all findings of the review to the project sponsor and FHWA Division and serves as the official document for the CSRA. As noted earlier, the review results are ultimately used in the approval process for the IFP. CSRA reports are maintained by the FHWA Office of Infrastructure's Major Projects Team in Washington, D.C.

CHAPTER 2 – REVIEW SUMMARY

PROJECT BACKGROUND

The Project collectively includes STIP projects I-5719, U-5800, and U-6044. STIP Project I-5719, I-85 Widening, would improve approximately 10 miles of I-85 in Gaston County, North Carolina (NC) from the United States (US) 321 interchange (Exit 17) in Gastonia to the NC 273 interchange (Exit 27) in Belmont and Mount Holly. Work includes widening I-85 in the project area from six to eight lanes, upgrading eight interchanges, and relocating, replacing, or improving ten roadway and railroad bridges. STIP U-5800 will provide operational improvements to the intersection of NC 7 (N. Main Street) and US 29/74 (Franklin Boulevard), south of I-85. Similarly, U-6044 will provide selective widening and operational improvements to Cox Road (SR 2200), south of I-85, and US 29/74 intersection. Improvements include addition of selective through lanes and turn lanes, as well as the addition of sidewalk and multiuse path.

Following the April 2024 Update, the combined projects of I-5719, U-5800, and U-6044 were split into multiple phases for construction. Additional I-5719 phases, D, E, FC, and FD were considered as part of the October 2024 update but were not thought to have any significant risks to cost or schedule and were not included in the CSRA.

STIP Project No.	Phase	Contracting Mechanism*	Location	Work Description
I-5719	A	DB	I-85 from US 321 (Exit 17) to NC 7 (McAdenville Road / North Main Street) (Exit 23)	Widen I-85 to 8 lanes, replace / improve roadway interchanges (4), replace roadway bridges (4) overpasses, and the rehabilitation of the US 321 bridge. Includes U-6044.
I-5719	FA	DB	I-85 from US 321 (Exit 17) to NC 7 (McAdenville Road / North Main Street) (Exit 23)	As part of I-5719A, install Active Traffic Management (Ramp Meters, Variable Speed Limit signs, etc) and Incident Management.
U-6044		DB	Cox Road from I-85 south to US 29/74 intersection	Selective widening and operational improvements to Cox Road (SR 2200). Included with I-5719A.
I-5719	B	DB	I-85 from NC 7 (McAdenville Road / North Main Street) (Exit 23) to east of NC 273 (Beatty Drive) (Exit 27) includes P&N Belmont Spur bridge and associated track	Widen I-85 to 8 lanes, replace / improve roadway interchanges (2), replace (1) roadway overpass, rehabilitate/widen I-85 bridge over S. Fork Catawba River, replace the P&N Belmont Spur Line Railway bridge, reconstruct 0.7 miles of railway, and

STIP Project No.	Phase	Contracting Mechanism*	Location	Work Description
				rehabilitation of the NC 273 bridge. Includes U-5800.
I-5719	FB	DB	I-85 from NC 7 (McAdenville Road / North Main Street) (Exit 23) to east of NC 273 (Beatty Dr) (Exit 27)	As part of I-5719B, install Active Traffic Management (Ramp Meters, Variable Speed Limit signs, etc) and Incident Management.
U-5800		DB	NC 7 (North Main Street) south of I-85, including the intersection of NC 7 and US 29/74	Improvements to NC 7 (North Main Street) and operational improvements to the intersection with US 29/74. Included with I-5719B
I-5719	C	CMGC	P&N Railway Bridge (1), NSR Bridges (2) and Groves Street bridge	Reconstruction of the (3) railway bridges and the Groves Street roadway overpass.

*DB – Design Build, CMGC – Construction Manager/General Contractor

The Project location with assumed phase boundaries is illustrated in Figure 1.

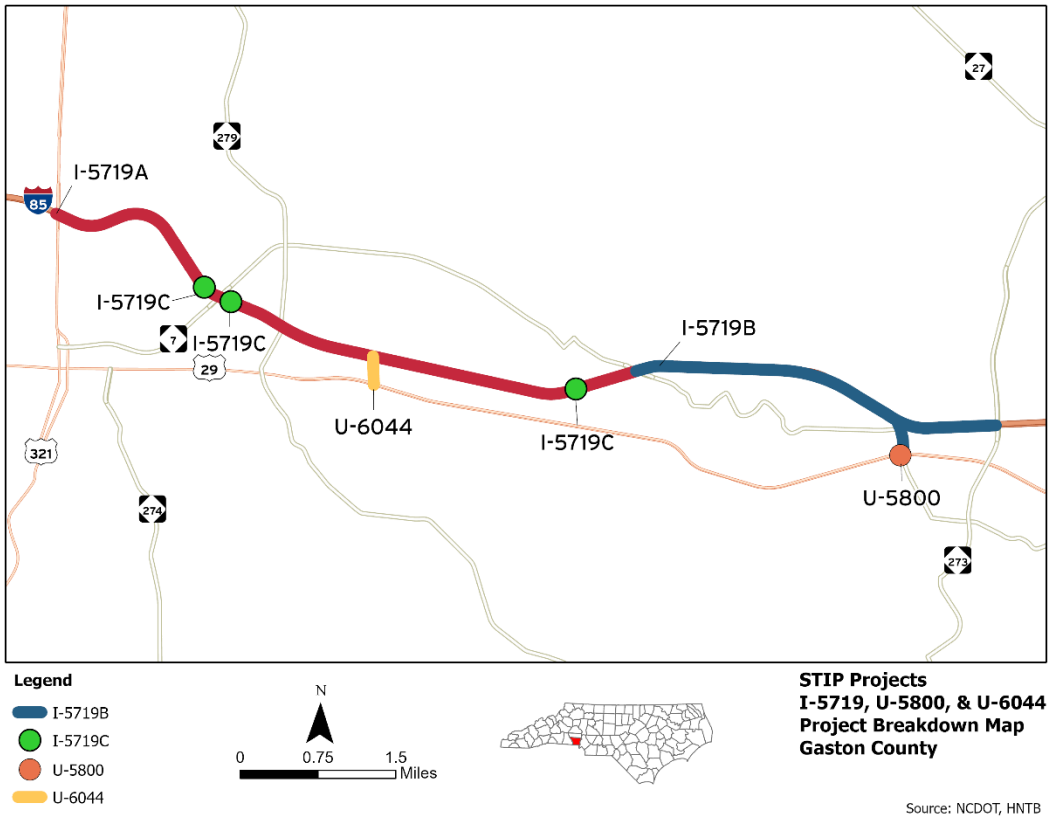


Figure 1: Project map illustrating the STIP project locations.

ENVIRONMENTAL PROCESS

STIP projects I-5719 and U-5800 are combined into a single environmental document, Categorical Exclusion (CE), Type III. The document was completed July 2024. STIP Project U-6044 completed the

NEPA process with a CE, Type II (B), in May 2024.

PROJECT PROCUREMENT

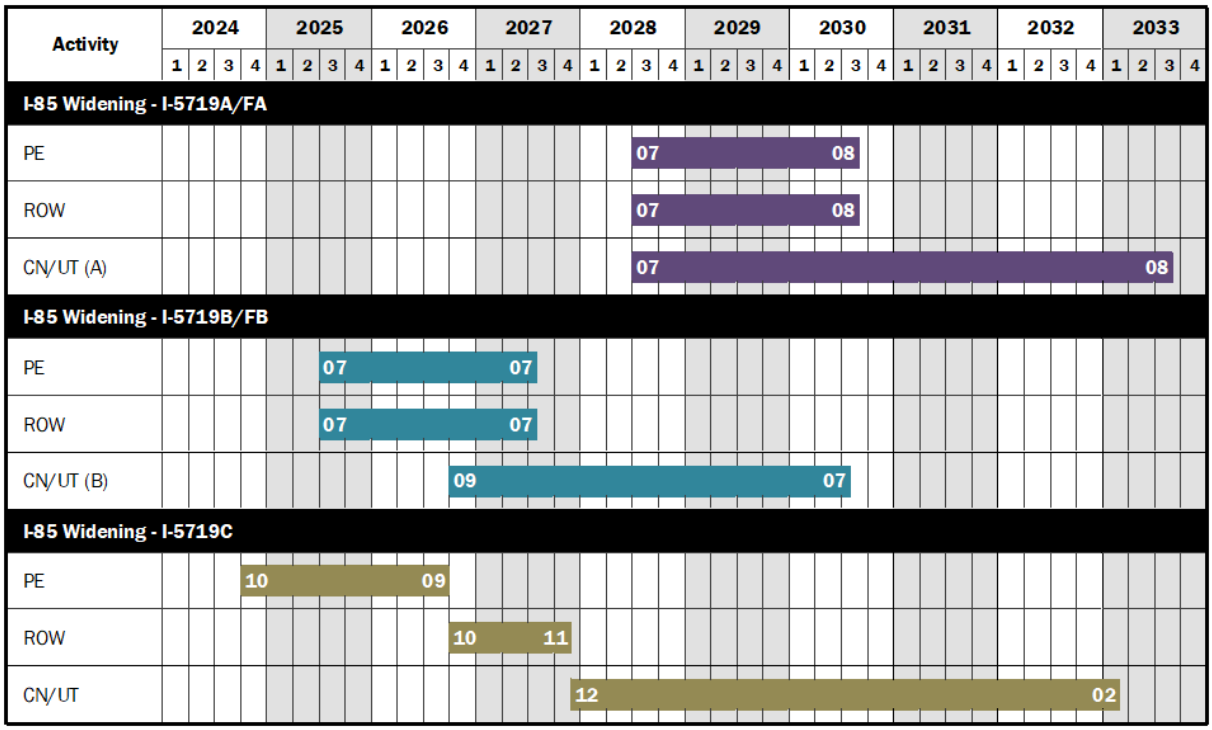
The Project will be delivered through Design Build (DB) and Contract Manager General Contractor (CMGC) methods. I-5719C is being delivered under the CMGC contracting method. The design firm was engaged with Notice to Proceed in September 2024. NCDOT will select a contractor with notice to proceed anticipated January 2025. I-5719B, which includes I-5719FB and U-5800 will be delivered using DB, with notice to proceed anticipated by August 2025.

PREVIOUS CSRA REVIEW

This evaluation represents the third CSRA conducted for this project. Previous CSRAs were completed in April 2024 and August 2022.

PROJECT SCHEDULE

A high-level base project schedule was developed for the October update to the CSRA. The schedule reflects the multi-phase delivery and is divided into three high-level activities: preliminary engineering (PE), ROW acquisition, and construction (CN). Figure 2 provides the assumed base schedule. This simplified schedule is believed to be adequate for the primary purpose of calculating YOE costs for the Project.



Notes:

1. PE phase includes owner design, NEPA, and DB procurement.
2. ROW acquisition will be led by the design-builder.
3. CN/UT includes DB final design, construction, and utility relocations.

Figure 2: Base project schedule

COST ESTIMATE

During the CSRA workshop, the NCDOT base cost estimate was reviewed and updated to reflect comments provided by the SMEs assembled for the workshop based on consensus of the workshop participants. A

comparison of the deterministic pre-CSRA and post-CSRA cost estimates is provided below, along with those of the revised scope of the project (made after the April update). The complete post-CSRA estimate is provided in Appendix C.

Cost Component	Pre-CSRA	CSRA Adjustment	Post-CSRA	Revised Scope
Bid Items	$668.62	16.4	$685.02	$681.30
Design Development Allowances (15% on Str/Utl; 30% on Roadway)	$139.17	0	$139.17	$139.07
Subtotal	$807.79	$16.40	$824.19	$820.37
E & C (16%)	$129.25	$2.66	$131.91	$131.43
Design Build Factor (20%)	$161.56	$29.64	$191.20	$154.60
CMGC Factor (30%)				$53.60
Construction Total	$1,098.60	$48.70	$1,147.30	$1,160.00
Utilities	$60.00	17.8	$77.80	$91.73
Right of Way	$60.30	17.4	$77.70	$77.80
Total Future Cost	$1,218.90	$83.90	$1,300.43	$1,329.53
Prior and Fixed Costs [1]	22.46	($2.37)	$20.09	$34.79
Total Project Cost (without Contingency)	$1,168.66	$73.46	$1,242.11	$1,236.84
Contingency [2]	$72.70	$8.07	$80.78	$125.11

[1] Fixed costs were adjusted to reflect updated information during the CSRA

[2] Amount of contingency removed from base estimate for CSRA model is 4% of E&C and 5% of DBF amounts

REVIEW OBSERVATIONS

Significant review observations from the 2024 CSRA Workshop include:

- The Review Team was comprised of appropriate subject matter experts (SMEs) to vet risks and cost values.
- Detailed estimate at 20 percent stage of design completion status.
- Risk register pre-populated information and background data supported in-depth discussions.
- The Project was split into phases for the purposes of construction and contracting.
- Project will be delivered using DB and CMGC procurement processes.

REVIEW RECOMMENDATIONS

Based on this October 2024 CSRA update, the recommended actions to be performed by the project sponsor (NCDOT) are summarized below:

- Prioritize railroad (specifically Norfolk Southern) coordination. Provide information on railroad coordination/agreement expectations in the DB request for proposals (RFP).
- Advance critical details and assumptions for work zone traffic control (WZTC) to validate the expected construction duration.
- Review WZTC assumptions and concepts to confirm major items of work (i.e. shoring and temporary facilities) are adequately represented in the base cost.

CHAPTER 3 – COST ANALYSIS (MONTE CARLO SIMULATION)

RISK INTRODUCTION

Cost estimates, especially those for Major Projects, contain a degree of uncertainty due to unknowns and risks associated with the level of design completed. For this reason, it is logical to use a probabilistic approach and express the estimate as a range rather than a point value. During the CSRA, uncertainties in the project estimate such as base variability, inflation, market conditions and risk events were modeled to reflect the opinions of the SMEs interviewed. Then a Monte Carlo simulation was used to incorporate the uncertainties into forecast curves that represent a range of costs and completion dates for the Project.

The following results are from the CSRA Monte Carlo simulation forecast for the Project. The results are based on the assumptions at the time of the workshop, along with the base cost estimate, schedule, and risks that were identified and modeled during the CSRA workshop.

PROBABILITY ASSUMPTIONS

The assumptions discussed below describe how the Review Team modeled the risk events, base variability, inflation, and market conditions that served as inputs for the results shown in this section of the report. As discussed in Chapter 1, the Monte Carlo analysis selects random inputs from these distributions to determine discrete values for a given number of iterations. The model runs the simulation through 10,000 iterations and ranks the results to determine the potential range of cost and schedule for the Project.

In a traditional cost estimate, risks are often accounted for using estimates of contingency. This contingency is intended to cover cost associated with risks events that may be realized during the Project. The Review Team identified the contingency amounts in the pre-CSRA estimate and removed them from the base estimate.

Prior to the review, a risk register was created by the Project Team identifying specific risk events for the Project. This risk register was used as the starting point for the risks that were identified for inclusion in the Monte Carlo model and simulation.

The purpose of the risk register is to identify and document significant cost and schedule risks in the estimate. The Team identified and discussed risks to the project in terms of threats and opportunities. For purposes of this review, a threat is a risk event that can add to the cost and/or schedule of the project and an opportunity is an event that can reduce the cost and/or shorten the schedule.

Risk events are quantified by likelihood of occurrence and impact if it occurs. For example, Figure 4 shows a binomial distribution used to model a 75% likelihood of occurrence.

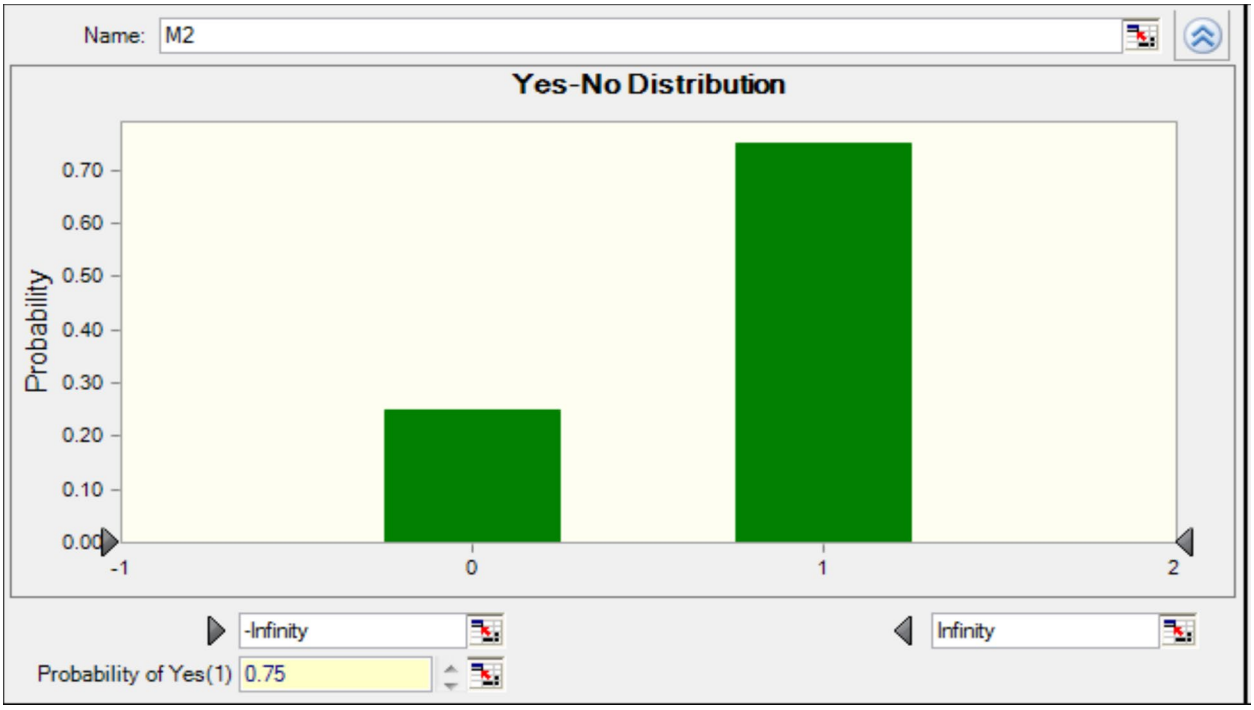


Figure 4: Example of a binomial distribution for a project risk's likelihood of occurrence.

Figure 5 shows a triangular distribution used to define how the cost impact is modeled in the simulation. In this example, the impact varies from $0 to $25 million with the most likely impact of $12.5 million.

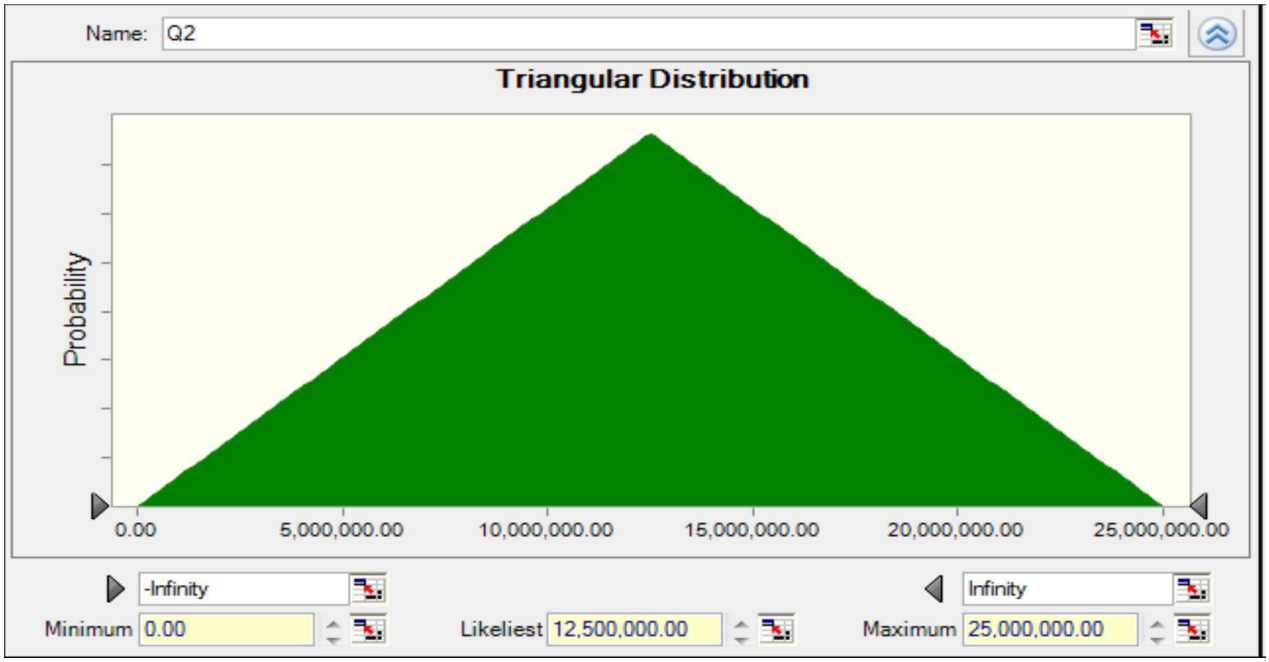


Figure 5: Example of a triangular distribution for a project risk's cost impact.

RISK REGISTER

The risk register used in the October 2024 CSRA analysis was developed from the reviewed and revised

April 2024 Risk Register provided by NCDOT and from discussions with the participating SMEs during the workshop review. To accurately model the risk to each appropriate phase, new phases (I-5719A, I-5719B, and I-5719C) were added to the register. Risks were then applied as appropriate to each phase; therefore, the same risk may apply in one or all three phases. Each risk was reviewed individually during the workshop, and assessments of potential impacts to project cost and schedule, and the likelihood of those impacts occurring, were made by consensus of the workshop participants. The occurrence and impacts for each of these risks were implemented in the CSRA model template according to the assumptions explained in the previous section. The complete risk register, which contains edits made to the NCDOT project risk register made during the workshop, is provided in Appendix D.

A total of 80 risks were individually modeled, including 66 risks to project cost and 22 risks to project schedule, some risks impacted both cost and schedule. To ensure that the workshop discussion focused on the most significant risks to the project, several of the identified risks with relatively low expected (probability weighted) impacts were assessed to be "minor" and thus were not individually modeled. Instead, these risks were collectively modeled through an "aggregate minor risks" item which was defined to approximate the equivalent combined expected value impacts to project cost and schedule of the minor risks.

Figure 6 summarizes the first 10 most significant risks to project cost, in terms of expected value (probability of occurrence multiplied by the mean impact) relative to the base cost estimate in base year dollars. There are 27 risks that equal or exceed $1,000,000 in probable cost impact. The risks are sorted by absolute value from highest to lowest.

Rank	Phase	Project Cost Threat or Opportunity	Probable Cost Impact (2024 $)
1	RW I-5719A	ROW acquisition/relocation costs are higher than estimated	$11,359,250
2	CN I-5719A	Quantity growth during final design	$8,620,500
3	CN I-5719A	Escalation exceeds 4% in the base cost	$7,368,000
4	CN I-5719B	Quantity growth during final design	$6,979,500
5	CN I-5719B	Escalation exceeds 4% in the base cost	$5,965,333
6	RW I-5719B	ROW acquisition/relocation costs are higher than estimated	$5,353,250
7	CN I-5719C	NS Railroad introduces additional work zone restrictions due to heavy rail traffic	$4,500,000
8	CN I-5719B	Pipeline under/parallel to I-85 near Gastonia (Kinder Morgan). Minimal information has been provided by utility owner to date. No opportunity to avoid.	$3,500,000
9	CN I-5719B	As a result of unknown utilities being discovered during construction delays to construction could be encountered.	$3,500,00

Figure 6: Most significant threats and opportunities to project cost (2024).

Figure 7 summarizes the most significant (>= 1.0 month) risks to the project schedule critical path, in terms of expected value (probability of occurrence multiplied by the mean impact) relative to the base schedule. Threats are indicated as positive values; opportunities are expressed as negative values. The risks are

sorted by absolute value from highest to lowest.

Rank	Phase	Project Schedule Threat or Opportunity	Expected Schedule Impact (cal. mon.)
1	CN I-5719C	Discovery of unknown utilities delay to construction	6.0
2	CN I-5719B	Discovery of unknown utilities delay to construction	5.3
3	CN I-5719A	Discovery of unknown utilities delay to construction	5.3
4	RW I-5719C	ROW acquisition/relocation costs are higher than estimated	4.5
5	CN I-5719C	NS Railroad introduces additional work zone restrictions due to heavy rail traffic	3.0
6	CN I-5719C	Utilities within RR row need additional effort/attention/coordination	2.0
7	CN I-5719C	NSR Construction Agreement	1.7
8	CN I-5719A	Submittal reviews take longer than planned, delaying DB (owner or third-party)	1.5
9	CN I-5719B	Submittal reviews take longer than planned, delaying DB (owner or third-party)	1.5
10	CN I-5719C	NSR Right of Entry agreement delay	1.0
11	CN I-5719C	P&N Construction Agreement	1.0

Figure 7: Most significant threats and opportunities to project schedule.

No additional sensitivity analyses were run for the 2024 CSRA Workshop.

OTHER FACTORS AFFECTING PROJECT COSTS

Base Variability

Base variability captures the variability and uncertainty inherently associated with the cost estimating process. Based on the level of project development and feedback from the Project Team and SMEs, the default cost and schedule variability ranges of +/-10% were applied, as shown in Figure 8. No cost variability was applied to the PE phase because a substantial majority of phase costs have already been incurred.

Phase	Cost Variability	Schedule Variability
PE	N/A	+/-10%
ROW	+/-12.5%	+/-10%
CN	+/-12.5%	+/-10%

Figure 8: Base Cost and Schedule Variability for the Monte Carlo analysis.

Market Conditions

The primary reason for modeling market conditions is to reflect the uncertainty associated with the bidding environment at the time of advertisement, considering the potential number of bidders on project contracts. Other factors considered were labor and material availability and the influence of other large infrastructure projects scheduled to be constructed in the same timeframe within the region.

The CSRA team discussed the market conditions and developed the consensus assessments shown below. Market conditions uncertainty is represented in the CSRA modeling as mutually exclusive probability distribution curves representing three possible scenarios: better than planned, as planned, and worse than planned. Each scenario is defined by a probability and percent offset relative to the base estimate. The probability denotes the likelihood of occurrence for each scenario, and the impact denotes the magnitude as a percent offset relative to the base value for the better than planned (less costly than the planned value) and worse than planned (costlier than the planned value) scenarios. The consensus of the Review Team was to vary the market condition assessment by project activities. Because the PE phase consultant design is already under contract, the alternative scenarios for this phase do not apply. For construction activities, the potential cost change magnitude was adjusted to reflect a significantly greater potential for cost increase (vs. decrease) relative to the base estimate in the near term due to concerns regarding availability of contractors to bid for large construction contracts, availability of skilled labor, aggressive DBE goals, high volatility in commodity pricing, etc. The probabilities associated with the better than planned and worse than planned scenarios for ROW were assigned equal values to reflect an equal likelihood of increase or decrease relative to the base ROW estimate and inflation assumptions. Figure 9 summarizes the simulation inputs associated with market conditions.

Phase	Better than Planned Scenario		Worse than Planned Scenario	
	Probability	Percent Offset (Relative to Base)	Probability	Percent Offset (Relative to Base)
PE-Phase	N/A	N/A	N/A	N/A
ROW-Phase	10%	10%	50%	20%
CN-Phase	10%	10%	50%	20%

Figure 9: Market condition simulation inputs for the Monte Carlo analysis.

Inflation

Inflation rates were reviewed during the workshop and established based on consensus of the SMEs based on the following assumptions:

- Because PE costs are either prior or fixed, no annual inflation rate was applied or modelled for the PE activities.
- Because the right of way cost estimate already includes a contingency factor for inflation, no additional right of way inflation was added.
- NCDOT estimates a 4% construction cost inflation for 2024. The potential for deviations from this assumption was assumed to have been adequately addressed via the market conditions scenarios.

FORECAST TOTAL COSTS

Figure 10 shows the results of the simulation for the entire Project in current year (CY) dollars. This result incorporates the base cost (including prior expenditures) along with base variability, market conditions,

and the risks from the risk register.

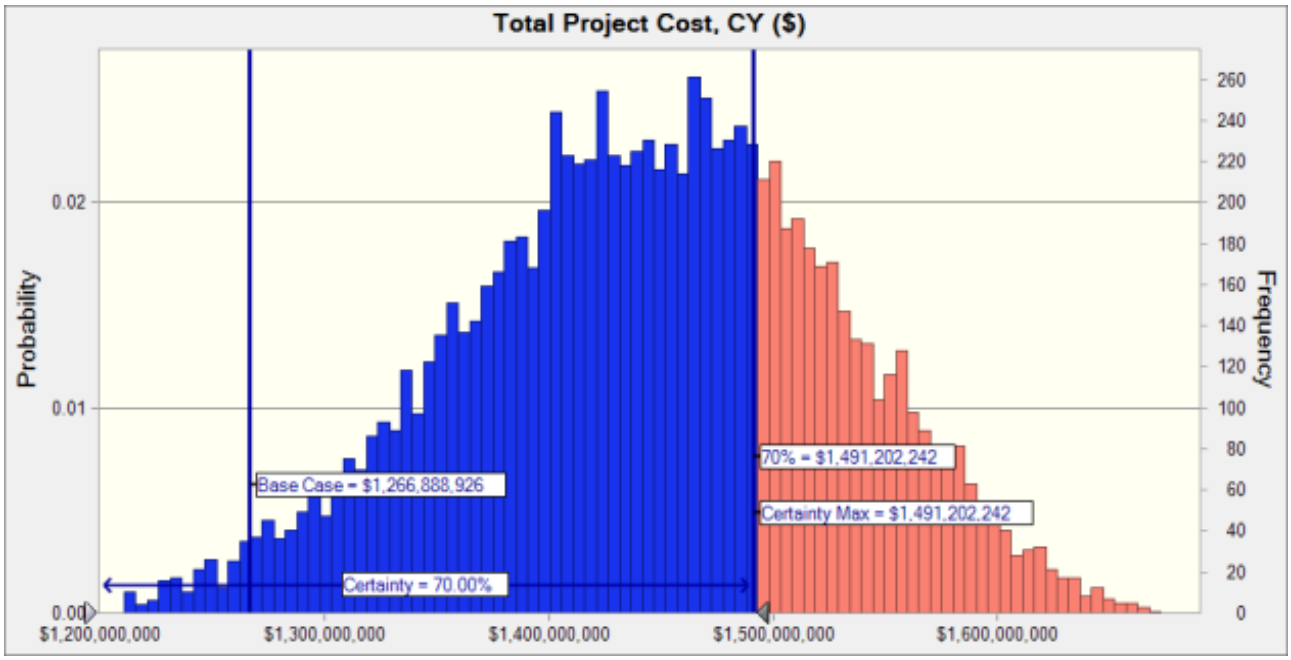


Figure 10: Monte Carlo Forecast for the Project total cost in current year (CY) dollars (Includes prior expenditures)

Figure 11 depicts YOE costs, which were developed in the Monte Carlo risk model by inflating the phase costs to the simulated mid-point of each major activity (considering potential schedule delays) according to the assumed inflation rates. The 70th percentile level of confidence is highlighted. FHWA requires that this value be used as a minimum basis for setting the project's baseline cost in the IFP.

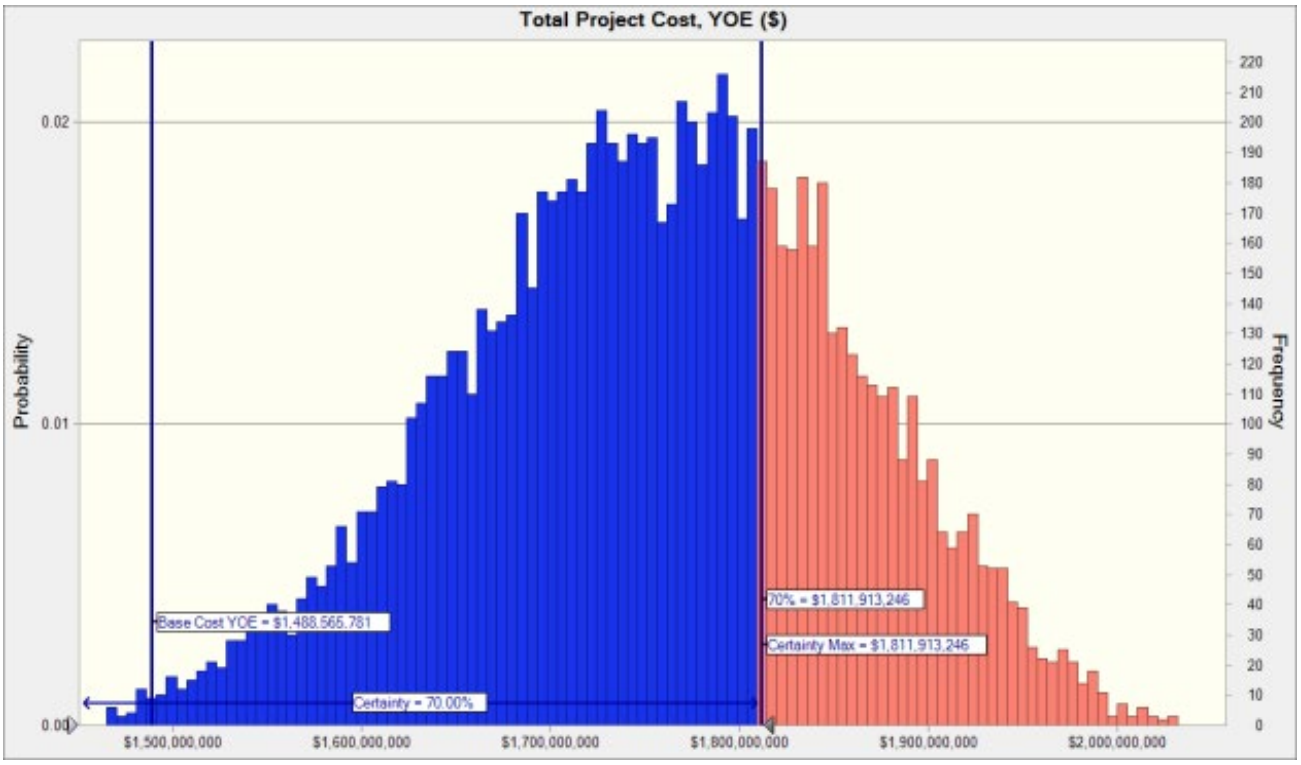


Figure 11: Monte Carlo Forecast for Project total cost in YOE dollars (Includes prior expenditures)

The following table (Figure 12) lists the corresponding percentile values associated with the probability distribution shown in Figures 10 and 11, which represents the entire range of cost results from the Monte Carlo simulation, expressed in both base year and YOE dollars. The analysis indicates an optimistic YOE cost value (10th percentile) of $1.618 billion if opportunities are realized and few threats occur and, and a conservative (90th percentile) value of $1.887 billion if few opportunities and multiple threats, even those with low probability, are realized near their maximum impact.

Percentiles	Forecast Values (Base Year $)	Forecast Values (YOE $)
0%	$1,118,355,161	$1,403,689,227
10%	$1,330,234,654	$1,617,816,279
20%	$1,391,653,466	$1,665,379,110
30%	$1,443,089,344	$1,700,662,067
40%	$1,487,423,433	$1,729,032,317
50%	$1,528,803,159	$1,756,576,450
60%	$1,568,993,948	$1,784,801,049
70%	**$1,609,586,095**	**$1,811,913,246**
80%	$1,651,092,226	$1,842,750,100
90%	$1,696,202,410	$1,886,550,826
100%	$1,845,667,945	$2,065,164,887

Figure 12: Percentile Rankings of the Project Total Cost (Includes Prior Expenditures)

The 70th percentile value of $1.812 billion YOE represents a project contingency of 22.2% ($323.3 million) relative to the base project cost without contingency of $1.489 billion (YOE). The components contributing to this overall contingency are summarized in Figure 13.

Component	Amount ($ YOE)	% Of Contingency	% Of Base YOE Cost
Base Variability	$39,023,000	8%	2.7%
Market Conditions	$202,903,000	44%	14.0%
Risk Register Events	$220,857,000	48%	15.2%
Total	**$462,783,000**	**100%**	**31.9%**

Figure 13: Summary of Project Contingency

FHWA guidance states that additional CSRAs may be conducted to support the approval of the Initial Financial Plan if more than one year has passed since the CSRA was conducted or if significant project changes have occurred during final design. The need for a CSRA update will be assessed and coordinated between FHWA and NCDOT in concert with the IFP development and the project advertisement/letting schedule.

FORECAST PROJECT SCHEDULE

The Monte Carlo simulation also modeled the identified schedule risks (Figure 7) to develop a probability distribution for project completion date (Figure 14). The 70th percentile projected completion date is May 2032, about 10 months later than the expected completion date in the base schedule (August 2031).

The risk ranking tables can be used to help prioritize schedule risk mitigation efforts (see Figure 8).

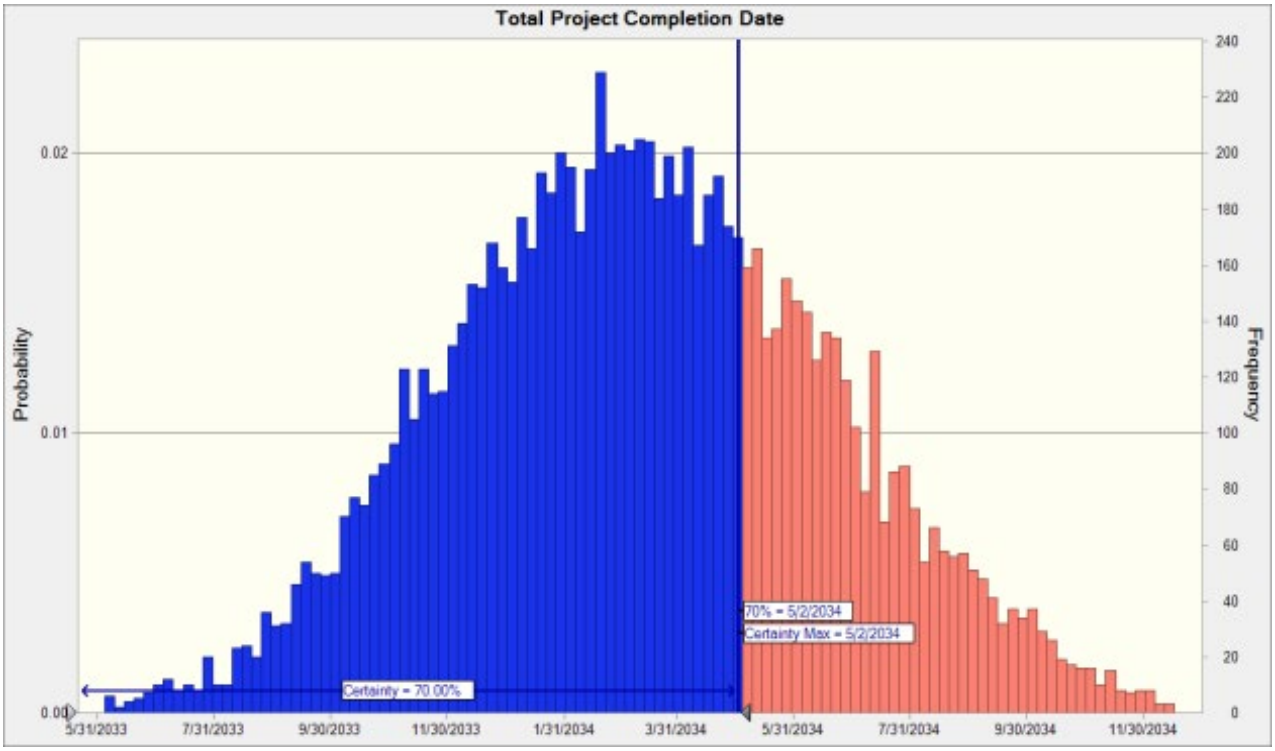


Figure 14: Monte Carlo Schedule Forecast for Project Completion Date

Figure 15 shows the entire range of results from the Monte Carlo simulation. The 80% confidence range (10th to 90th percentiles) for project completion date spans from November 2033 to July 2034.

Percentiles	Forecast Values
	Project Completion
0%	April 2033
10%	Nov 2033
20%	Dec 2033
30%	Jan 2034
40%	Feb 2034
50%	Mar 2034
60%	Apr 2034

Percentiles	Forecast Values
	Project Completion
70%	**May 2034**
80%	June 2034
90%	July 2034
100%	Jan 2035

Figure 15: Percentile Rankings of the completion date for the Project

CONCLUSION

Based on the revised base estimate and the CSRA risk-based probabilistic approach, the Monte Carlo simulation forecasted a range of total project costs for the Project as summarized below:

- Total project cost ranges from $1.618 billion (10th percentile) to $1.887 billion (90th percentile) in YOE dollars. The 70th percentile YOE project cost is $1.812 billion (YOE), which represents a project contingency of 22.2% ($323.3 million) relative to the base project cost without contingency of $1.489 billion (YOE). This level of contingency is also believed to be adequate for the project.
- The anticipated project completion date ranges from April 2033 (10th percentile) to July 2034 (90th percentile), with a 70th percentile completion date of May 2034. The 70th percentile completion date represents roughly a 6-month schedule delay relative to the base completion date of October 2033.

The most significant risks to the Project (including both threats and opportunities) are listed below:

- Right-of-Way settlement costs
- Quantity overruns
- Inflation above the base estimate assumptions of 4%
- NS Railroad introduces additional work zone restrictions
- Unknown utility conflicts

At the time of the review, significant cost escalation is being experienced in the construction industry and future trends are difficult to predict. The cost inflation rates, and market conditions risks developed in the workshop reflect the understanding and professional judgment of the workshop participants based on available information at the time.

This estimate is a snapshot in time as of the CSRA workshop and is expected that, through further development, the estimate will change. Subsequent developments, including Norfolk Southern Railroad approval of yard track relocation, are not reflected in the results documented in this report.

APPENDICES

A – CSRA Meeting

B – Base Cost Estimate Summary

C – Final Project Risk Register

D – Crystal Ball Probability Analysis

E – P3 Evaluation

APPENDICES

A – CSRA Meeting
B – Base Cost Estimate Summary
C – Final Project Risk Register
D – Crystal Ball Probability Analysis
E – P3 Evaluation

APPENDIX A: CSRA MEETING

I-85 Improvements
STIP Project No. I-5719/ U-5800

CSRA Update Agenda
October 16, 2024

AGENDA

Attendees via Teams

Name	Organization	Email
Dale Privette	FHWA	dale.privette@dot.gov
Nora McCann	NCDOT	namccann@ncdot.gov
Hon Yeung	NCDOT	hfyeung@ncdot.gov
Cole Gurley	NCDOT	cgurley@ncdot.gov
Bryan Sowell	NCDOT	bksowell@ncdot.gov
David Wasserman	NCDOT	dswasserman@ncdot.gov
Jim Harris	NCDOT	jbharris@ncdot.gov
Doug Kretchman	NCDOT	dwkretchman@ncdot.gov
Brook Anderson	NCDOT	beanderson1@ncdot.gov
Michelle Berry	NCDOT	mgberry@ncdot.gov
Timothy Mcfadden	NCDOT	ttmcfadden@ncdot.gov
Michael Penney	NCDOT	jmpenney@ncdot.gov
Timothy Ritacco	NCDOT	tjritacco@ncdot.gov
Tamara Njegovan	NCDOT	tmnjegovan@ncdot.gov
Andrew Skuce	NCDOT	askuce@ncdot.gov
Alex Stewart	NCDOT	adstewart2@ncdot.gov
Lamar Hawkins	NCDOT	lthawkins@ncdot.gov
Tadeaus Kelly	NCDOT	tmkelly1@ncdot.gov
Jose Martinez	NCDOT	jgmartinez@ncdot.gov
Saroj Napit	NCDOT	snapit1@ncdot.gov
Richard Zinser	NCDOT	rnzinser@ncdot.gov
Donna Jackson	Mott MacDonald	Donna.Jackson@mottmac.com
Kat Bukowy	HNTB	kbukowy@hntb.com
Christopher Chestnut	HNTB	CChestnut@HNTB.com
Corey Vernier	HNTB	cvernier@HNTB.com
David Hawkins	HNTB	DHawkins@HNTB.com
David Jones	HNTB	davijones@HNTB.com
Doug Wheatley	HNTB	dwheatley@HNTB.com
Leah Tapp	HNTB	ltapp@HNTB.com
Paul Cameron	HNTB	pcameron@HNTB.com
Helen Shyu	HNTB	hshyu@HNTB.com
Will Horton	HNTB	whorton@HNTB.com

I-85 Improvements
STIP Project No. I-5719/ U-5800

CSRA Update Agenda
October 16, 2024

AGENDA

Purpose of the Meeting

- Review and Update the Risk Register for STIP Projects I-5719, U-5800, and U-6044

Discussion of Schedule
Update of Prior and Fixed Costs
Discussion of Contingency
Review of Risks

- Risk Register Reviewed and Verified no change to Structures, WZTC, Broadband, Noise, Hydraulics, Environmental
- Rail
    - Opportunity, splitting P&N Belmont Spur into 2 bridges
- ROW
- Utilities
- Roadway
- Construction

Next steps

APPENDIX B: BASE COST ESTIMATE SUMMARY

I-5719A (Includes U-6044) | **Functional** | County: **Gaston**

I-85 Widening
US-321 to before NC 7
8/10 Lane Barrier Divided Median
(L to 381+00, Y1, Y2, Y3, Y4, Y9, Y10, Y11, Y12, Y13, U-6044)

CONSTR. COST
$427,100,000
Design-Build Cost
$512,500,000

HNTB Date 9/4/2024
NCDOT Date 9/5/2024
Karen Lovering, PE Date 9/18/2024 Updated Util Costs

Sec No.	Description	Quantity	Unit	Price	Amount
	Mobilization	1	LS	$ 38,250,000.00	$ 38,250,000.00
	Construction Surveying	1	LS	$ 5,100,000.00	$ 5,100,000.00
	Clearing and Grubbing	63	Acres	$ 35,000.00	$ 2,205,000.00
	Supplemental Clearing and Grubbing	4	Acres	$ 10,000.00	$ 40,000.00
	Earthwork				
	Unclassified Excavation	727,410	CY	$ 12.00	$ 8,728,920.00
	Borrow Excavation	900	CY	$ 18.00	$ 16,200.00
	Y02 - Bridge Approach Fill (MSE Wall) (86' Wide)	1	LS	$ 91,500.00	$ 91,500.00
	Y03 - Bridge Approach Fill (MSE Wall) (126' Wide)	1	LS	$ 133,700.00	$ 133,700.00
	Y04 - Bridge Approach Fill (MSE Wall) (113.5' Wide)	1	LS	$ 120,500.00	$ 120,500.00
	Y05 - Bridge Approach Fill (MSE Wall) (25.6' Wide)	0	LS	$ 27,500.00	$ -
	Y06 - Bridge Approach Fill (MSE Wall) (99.5' Wide)	0	LS	$ 105,500.00	$ -
	Y07 - Bridge Approach Fill (MSE Wall) (83.5' Wide)	0	LS	$ 88,500.00	$ -
	Y09 - Bridge Approach Fill (MSE Wall) (48' Wide)	1	LS	$ 51,000.00	$ 51,000.00
	Y10 - Bridge Approach Fill (MSE Wall) (53.5' Wide)	1	LS	$ 56,800.00	$ 56,800.00
	Y11 - Bridge Approach Fill (MSE Wall) (53.5' Wide)	1	LS	$ 56,800.00	$ 56,800.00
	Y12 - Bridge Approach Fill (MSE Wall) (50.5' Wide)	1	LS	$ 53,600.00	$ 53,600.00
	Y13 - Bridge Approach Fill (50' Wide)	1	LS	$ 53,500.00	$ 53,500.00
	Y14 - Bridge Approach Fill (45.5' Wide)	0	LS	$ 48,500.00	$ -
	L - Bridge Approach Fill (MSE Wall) (20' Wide)	0	LS	$ 22,000.00	$ -
	Geotechnical	1	LS	$ 6,250,000.00	$ 6,250,000.00
	Undercut Excavation		CY	$ 20.00	$ -
	Select Granular Material, Class III		CY	$ 50.00	$ -
	Select Granular Material		CY	$ 40.00	$ -
	Geotextile for Soil Stabilization		SY	$ 5.00	$ -
	Geotextile for Subgrade Stabilization		SY	$ 4.00	$ -
	Shallow Undercut		CY	$ 22.00	$ -
	Class IV Subgrade Stabilization		TON	$ 50.00	$ -
	6" Perforated Subdrain Pipe		LF	$ 50.00	$ -
	Erosion Control	1	LS	$ 10,400,000.00	$ 10,400,000.00
	Erosion Control	130	Acres		$ -
	U-6044 Erosion Control	3	Acres	$ 50,000.00	$ 150,000.00
	Drainage				
	-L- 8 lane section	5.69	Miles	$ 4,000,000.00	$ 22,760,000.00
	-L- 10 lane section	0.00	Miles		$ -
	Ramp (1 Lane)	1.86	Miles		$ -
	Ramp (2 Lane)	1.21	Miles		$ -
	Loop (1 Lane)	0.22	Miles		$ -
	Loop (2 Lane)	0.15	Miles		$ -
	-Y- 2 lane section (Shld Section)	0.32	Miles	$ 1,000,000.00	$ 320,000.00
	-Y- 2 lane section (C&G Section)	1.01	Miles	$ 1,500,000.00	$ 1,515,000.00
	-Y- 2 lane section (C&G/Shld Section)	0.63	Miles	$ 1,500,000.00	$ 945,000.00
	-Y- 3 lane section (Shld Section)	0.00	Miles	$ 1,000,000.00	$ -
	-Y- 3 lane section (C&G Section)	0.53	Miles	$ 1,500,000.00	$ 795,000.00
	-Y- 4 lane divided section (Shld Section)	0.00	Miles		$ -
	-Y- 4 lane divided section (C&G Section)	0.77	Miles	$ 4,000,000.00	$ 3,080,000.00
	-Y- 4 lane divided section (C&G/Shld Section)	0.27	Miles	$ 4,000,000.00	$ 1,080,000.00
	-Y- 5 lane undivided section (Shld Section)	0.00	Miles		$ -
	-Y- 5 lane undivided section (C&G Section)	0.00	Miles	$ 4,000,000.00	$ -
	-Y- 6 lane section (Shld Section)	0.00	Miles		$ -
	-Y- 6 lane section (C&G Section)	0.73	Miles	$ 4,000,000.00	$ 2,920,000.00
	Fine Grading	1	LS	$ 4,080,000.00	$ 4,080,000.00
	Fine Grading (Main Line)	149,000	SY		$ -
	Fine Grading (Non-main Line)	78,500	SY		$ -
	Pavement				
	Milling	0	SY	$ 8.50	$ -

	Removal of Existing Pavement	37,220	SY	$ 10.00	$ 372,200.00
	Full Depth Asphalt Pavement (Main Line)	148,980	SY	$ 100.00	$ 14,898,000.00
	Resurface Asphalt Pavement (Main Line)	377,770	SY	$ 18.00	$ 6,799,860.00
	Full Depth Asphalt Pavement (Ramp)	39,210	SY	$ 100.00	$ 3,921,000.00
	Resurface Asphalt Pavement (Ramp)	9,330	SY	$ 18.00	$ 167,940.00
	Full Depth Asphalt Pavement (Loop)	2,430	SY	$ 100.00	$ 243,000.00
	Resurface Asphalt Pavement (Loop)	2,350	SY	$ 18.00	$ 42,300.00
	Full Depth Asphalt Pavement (Y Lines)	36,870	SY	$ 75.00	$ 2,765,250.00
	Resurface Asphalt Pavement (Y Lines)	32,240	SY	$ 18.00	$ 580,320.00
	Temp Asphalt Pavement (Y Lines)	0	SY	$ 75.00	$ -
	Resurface Temp Pavement (Y Lines)	0	SY	$ 20.00	$ -
	Driveway Pavement	2,580	SY	$ 68.00	$ 175,440.00
	Subgrade Stabilization (Main Line)	149,000	SY	$ 12.00	$ 1,788,000.00
	Subgrade Stabilization (Non-main Line)	79,700	SY	$ 12.00	$ 956,400.00
	Concrete Expressway Gutter	3,300	LF	$ 45.00	$ 148,500.00
	Shoulder Berm Gutter	15,200	LF	$ 42.00	$ 638,400.00
	8"x18" Concrete Curb	425	LF	$ 45.00	$ 19,125.00
	1'-6" Curb and Gutter	2,375	LF	$ 32.00	$ 76,000.00
	2'-6" Curb and Gutter	25,275	LF	$ 35.00	$ 884,625.00
	4" Concrete Sidewalk	7,275	SY	$ 60.00	$ 436,500.00
	Proposed Multi-use Path	7,200	SY	$ 60.00	$ 432,000.00
	5" Monolithic Island (Surface Mounted)	1,850	SY	$ 100.00	$ 185,000.00
	Curb Ramp	120	Each	$ 2,800.00	$ 336,000.00
	Proposed Variable Depth Concrete Pad (8" Min.)	0	SY	$ 150.00	$ -
	5" Monolithic Island (Keyed In)	3,850	SY	$ 85.00	$ 327,250.00
	Double Faced Concrete Barrier	31,070	LF	$ 200.00	$ 6,214,000.00
	Single Faced Concrete Barrier	4,370	LF	$ 125.00	$ 546,250.00
	CA Fencing	14,000	LF	$ 15.00	$ 210,000.00
	Handrail	605	LF	$ 225.00	$ 136,125.00
	Proposed Guardrail	27,675	LF	$ 30.00	$ 830,250.00
	GREU TL-2 End Unit	9	EA	$ 3,500.00	$ 31,500.00
	GREU TL-3 End Unit	41	EA	$ 4,000.00	$ 164,000.00
	Type B-77 Anchor Unit	25	EA	$ 3,000.00	$ 75,000.00
	Type-III Anchor Unit	23	EA	$ 3,000.00	$ 69,000.00
	CAT-1	30	EA	$ 1,200.00	$ 36,000.00
	AT-1	2	EA	$ 1,200.00	$ 2,400.00
	Impact Attenuator (TL-3)	0	EA	$ 35,000.00	$ -
	Temporary Guardrail	0	LF	$ 18.00	$ -
	Temporary GREU TL-2 End Unit	0	EA	$ 2,500.00	$ -
	Temporary GREU TL-3 End Unit	0	EA	$ 2,800.00	$ -
	Temporary Type B-77 Anchor Unit	0	EA		$ -
	Temporary Type-III Anchor Unit	0	EA	$ 1,800.00	$ -
	Temporary CAT-1	0	EA		$ -
	Pavement Markings	1.00	LS	$ 2,378,000.00	$ 2,378,000.00
	-L- 8 lane section	5.69	Miles		$ -
	-L- 10 lane section	0.00	Miles		$ -
	Ramp (1 Lane)	1.86	Miles		$ -
	Ramp (2 Lane)	1.21	Miles		$ -
	Loop (1 Lane)	0.22	Miles		$ -
	Loop (2 Lane)	0.15	Miles		$ -
	-Y- 2 lane section (Shld Section)	0.32	Miles		$ -
	-Y- 2 lane section (C&G Section)	1.01	Miles		$ -
	-Y- 3 lane section (Shld Section)	0.00	Miles		$ -
	-Y- 3 lane section (C&G Section)	0.53	Miles		$ -
	-Y- 4 lane divided section (Shld Section)	0.00	Miles		$ -
	-Y- 4 lane divided section (C&G Section)	0.77	Miles		$ -
	-Y- 5 lane undivided section (Shld Section)	0.00	Miles		$ -
	-Y- 5 lane undivided section (C&G Section)	0.00	Miles		$ -
	-Y- 6 lane section (Shld Section)	0.00	Miles		$ -
	-Y- 6 lane section (C&G Section)	0.73	Miles		$ -
	Interchange Signing	1.00	LS	$ 3,170,000.00	$ 3,170,000.00
	Overhead Sign Assemblies (Partial Directional with Flyunder)	1	EA		$ -
	Overhead Sign Assemblies (Diamond Interchange)	0	EA		$ -
	Overhead Sign Assemblies (Partial Clover Interchange)	1	EA		$ -
	Overhead Sign Assemblies (Diverging Diamond Interchange)	1	EA		$ -

	Traffic Management	1	LS	$ 16,830,000.00	$ 16,830,000.00
	-L- 8 lane section	5.69	Miles		$ -
	-L- 10 lane section	0.00	Miles		$ -
	Ramp (1 Lane)	1.86	Miles		$ -
	Ramp (2 Lane)	1.21	Miles		$ -
	Loop (1 Lane)	0.22	Miles		$ -
	Loop (2 Lane)	0.15	Miles		$ -
	-Y- 2 lane section (Shld Section)	0.32	Miles		$ -
	-Y- 2 lane section (C&G Section)	1.01	Miles		$ -
	-Y- 3 lane section (Shld Section)	0.00	Miles		$ -
	-Y- 3 lane section (C&G Section)	0.53	Miles		$ -
	-Y- 4 lane divided section (Shld Section)	0.00	Miles		$ -
	-Y- 4 lane divided section (C&G Section)	0.77	Miles		$ -
	-Y- 5 lane undivided section (Shld Section)	0.00	Miles		$ -
	-Y- 5 lane undivided section (C&G Section)	0.00	Miles		$ -
	-Y- 6 lane section (Shld Section)	0.00	Miles		$ -
	-Y- 6 lane section (C&G Section)	0.73	Miles		$ -
	Railroad Main Line	0.00	Miles		$ -
	Traffic Signals and Signals Communication	1	LS	$ 3,910,000.00	$ 3,910,000.00
	New Traffic Signals	5	EA		$ -
	Upgrade Existing Traffic Signals	6	EA		$ -
	Remove Existing Traffic Signals	2	EA		$ -
	ICM - Incident Management	1.00	LS	$ 970,000.00	$ 970,000.00
	TEMPORARY TRAFFIC CONTROL		LS	$ 20,000.00	$ -
	LAW ENFORCEMENT		HR		$ -
	SIGNAL CABLE		LF	$ 3.50	$ -
	VEHICLE SIGNAL HEAD (12", 3-SECTION)		EA	$ 1,100.00	$ -
	VEHICLE SIGNAL HEAD (12", 4-SECTION)		EA	$ 1,200.00	$ -
	VEHICLE SIGNAL HEAD (12", 5-SECTION)		EA	$ 1,500.00	$ -
	UNPAVED TRENCHING (1,2")		LF	$ 20.00	$ -
	DIRECTIONAL DRILL (1,2")		LF	$ 30.00	$ -
	JUNCTION BOX (STANDARD SIZE)		EA	$ 750.00	$ -
	2" RISER WITH WEATHERHEAD		EA	$ 710.00	$ -
	INDUCTIVE LOOP SAWCUT		LF	$ 12.00	$ -
	LEAD-IN CABLE (14-2)		LF	$ 1.80	$ -
	DETECTOR CARD (TYPE 170)		EA	$ 230.00	$ -
	CHANGEABLE TRAILBLAZER		EA	$ 35,000.00	$ -
	CONTROLLER (TYPE 2070LX)		EA		$ -
	ETHERNET EDGE SWITCH		EA		$ -
	DIGITAL CCTV CAMERA ASSEMBLY		EA	$ 6,500.00	$ -
	WORK ZONE SIGNS (STATIONARY)		SF	$ 7.10	$ -
	PORTABLE CHANGEABLE MESSAGE SIGN		EA	$ 15,000.00	$ -
	PORTABLE CCTV CAMERA ASSEMBLY		EA	$ 25,000.00	$ -
	Railroad				
	Retire/Remove wood tie track	0	TF	$ 50.00	$ -
	Construct track, wood ties, 132RE new	0	TF	$ 450.00	$ -
	Construct track, wood ties, 136RE new	0	TF	$ 450.00	$ -
	Cut and throw existing Track	0	TF	$ 200.00	$ -
	Retire/Remove #10 Turnout	0	EA	$ 20,000.00	$ -
	Construct #10 Turnout	0	EA	$ 100,000.00	$ -
	Advance Surfacing - Undercut Track	0	EA	$ 150.00	$ -
	Advance Surfacing - Raise Track	0	EA	$ 100.00	$ -
	Replace Exist. Rail at Grade Crossings with new 132RE	0	TF	$ 300.00	$ -
	Railroad Flagging	0	LS	$ 5,000,000.00	$ -
	Railroad Signal Modifications	0	LS	$ 2,000,000.00	$ -
	Rubber Rail Seal Grade Crossing Surface	0	TF	$ 2,000.00	$ -
	Grade Crossing Signals and Gates	0	EA	$ 500,000.00	$ -
	Construct Double Switch Point Derail	0	EA	$ 50,000.00	$ -
	Belmont Yard Rehab	0	TF	$ 150.00	$ -
	Railroad Grading/Drainage				
	Unclassified Excavation (Railroad)	0	CY	$ 30.00	$ -
	Borrow Excavation (Railroad)	0	CY	$ 30.00	$ -
	Fine Grading (Railroad)	0	SY	$ 6.00	$ -
	Furnish and Install sub-ballast stone	0	TN	$ 75.00	$ -
	Drainage - Railroad Main Line (Single Phase)	0.00	Miles	$ 1,000,000.00	$ -
	Drainage - Railroad Main Line (2 Phases)	0.00	Miles	$ 1,250,000.00	$ -
	Drainage - Railroad Main Line (3 Phases)	0.00	Miles	$ 1,500,000.00	$ -
	Fence	0	LF	$ 15.00	$ -

	Construction Utilities (Per Utilities Unit 09-09-2024)	1	LS	$ 20,412,250.00	$ 20,412,250.00
	U-6044 Utility Construction Costs (Per Utilities Unit 08-23-2023)	1	LS	$ 112,500.00	$ 112,500.00
	Intelligent Transportation Systems	1	LS	$ 2,190,000.00	$ 2,190,000.00
	Structures				
	Site 4 - Extend @ -L- 121+50, 1 @ 9' x 9' RCBC, 70°Skew	165	LF	$ 3,800.00	$ 627,000.00
	Site 5 - New @ -L- 207+50, 1 @ 8' x 9' RCBC, 49°Skew	420	LF	$ 2,500.00	$ 1,050,000.00
	Site 7 - Extend @ -L- 232+50, 2 @ 8' x 9' RCBC, 56°Skew	370	LF	$ 6,700.00	$ 2,479,000.00
	Site 8 - Extend @ -L- 253+50, 2 @ 54" RCP, 85°Skew	85	LF	$ 2,000.00	$ 170,000.00
	Site 8 - Jack and Bore @ -L- 253+50, 2 @ 54" RCP, 85°Skew	265	LF	$ 3,500.00	$ 927,500.00
	Site 10 - Extend @ -L- 276+25, 1 @ 7' x 8' RCBC, 90°Skew	60	LF	$ 3,200.00	$ 192,000.00
	Site 11 - Extend @ -L- 306+25, 1 @ 8' x 8' RCBC, 47°Skew	200	LF	$ 3,500.00	$ 700,000.00
	Site 12 - Extend @ -L- 332+25, 1 @ 8' x 8' RCBC, 105°Skew	80	LF	$ 3,500.00	$ 280,000.00
	U-6044 Extension of existing 2@9'x8' RCBC	20	LF	$ 5,610.00	$ 112,200.00
	Wall 1 (-Y1RPD-) w/ Moment Slab (Avg ht 4.87ft)	5,041	SF	$ 200.00	$ 1,008,160.62
	Wall 2 (-Y2RPB-) (Avg ht 7.03ft)	2,459	SF	$ 200.00	$ 491,784.00
	Wall 3 (-L- & -Y2LPB-) (Avg ht 15.92ft)	9,565	SF	$ 140.00	$ 1,339,113.86
	Wall 4 (-Y2RPD-) (Avg ht 8.23ft)	5,515	SF	$ 140.00	$ 772,067.80
	Wall 5 (-L- LT) (Avg ht 19.71ft)	7,527	SF	$ 140.00	$ 1,053,752.00
	Wall 6 (-L- RT) (Avg ht 16.16ft)	5,848	SF	$ 140.00	$ 818,671.00
	Wall 7 (-Y4RPB-) (Avg ht 7.98ft)	7,576	SF	$ 140.00	$ 1,060,633.35
	Wall 8 (-Y4RPD-) (Avg ht 5.36ft)	2,457	SF	$ 200.00	$ 491,480.00
	Wall 9 (-Y6RPB-) (Avg ht 9.62ft)	0	SF	$ 140.00	$ -
	~~Wall 10 (-Y6RPC-) (DELETED)~~	~~0~~	~~SF~~	~~$ -~~	$ -
	Wall 11 (-Y6- & -Y6RPB-) (Avg ht 7.76ft)	0	SF	$ 200.00	$ -
	Wall 12 (-Y6- & -Y6RPA-) (Avg ht 13.22ft)	0	SF	$ 140.00	$ -
	Wall 13 (-L- RT) (Avg ht 4.77ft)	0	SF	$ 200.00	$ -
	Wall 14 (-Y4- RT) (Avg ht 12.09ft)	3,047	SF	$ 140.00	$ 426,538.98
	~~Wall 15 (-Y4RPC-) w/ Moment Slab (Avg ht 13.34ft) (DELETED)~~	~~0~~	~~SF~~	~~$ 200.00~~	$ -
	U-6044 Retaining Wall (@ Wells-Fargo) (Avg ht 6ft)	600	SF	$ 200.00	$ 120,000.00
	Noise Walls	372,765	SF	$ 55.00	$ 20,502,075.00
	Railroad Coordination	1	LS	$ 125,000.00	$ 125,000.00
	Bridge Rehab #350120	1	LS	$ 2,554,400.00	$ 2,554,400.00
	Bridge Rehab #350137	1	LS	$ 1,601,650.00	$ 1,601,650.00
	Bridge Rehab #350143	0	LS	$ 5,333,745.00	$ -
	Bridge Rehab #350034	0	LS	$ 1,657,570.00	$ -
	~~Y02 - Temporary Bridge (325' x82')~~	~~0~~	~~SF~~	~~$ 250.00~~	$ -
	Y02 - New Phase Const Bridge (275' x 88.58') Tangent 350059 (Steel)	24,475	SF	$ 400.00	$ 9,790,000.00
	Y02 - Approach Slab (2 @ 25' x 86')	4,300	SF	$ 50.00	$ 215,000.00
	Y02 - Bridge Removal	22,115	SF	$ 70.00	$ 1,548,050.00
	Y03 - New Bridge (1@ 200' x 62.58') Tangent 350002	12,516	SF	$ 300.00	$ 3,754,800.00
	Y03 - New Bridge (1@ 200' x 62.58') Tangent 350002	12,516	SF	$ 350.00	$ 4,380,600.00
	Y03 - Approach Slab (2 @ 25' x 120')	6,000	SF	$ 50.00	$ 300,000.00
	Y03 - Bridge Removal	16,934	SF	$ 60.00	$ 1,016,040.00
	~~Y04 - Const Maint & Removal of Temporary Bridge (250' x 92'-6")~~	~~0~~	~~SF~~	~~$ 250.00~~	$ -
	Y04 - New Phase Const Bridge (275' x 113.08) Tangent 350134	31,097	SF	$ 375.00	$ 11,661,375.00
	Y04 - Approach Slab (2 @ 25' x 110'-6")	5,525	SF	$ 50.00	$ 276,250.00
	Y04 - Bridge Removal	19,036	SF	$ 70.00	$ 1,332,520.00
	Y05 -Widen Bridge (11.85' x 256') Tangent 350137	3,034	SF	$ 375.00	$ 1,137,600.00
	Y05 - Approach Slab ((11.85' x12')x2)	284	SF	$ 50.00	$ 14,220.00
	Y06 - New Phase Const Bridge (279' x 99'-6") Tangent	0	SF	$ 375.00	$ -
	~~Y06 - Temp Bridge (279' x 99'-6") Tangent~~	~~0~~	~~SF~~	~~$ 250.00~~	$ -
	Y06 - Approach Slab (2 @ 25' x 96'-6")	0	SF	$ 50.00	$ -
	Y06 - Bridge Removal	0	SF	$ 70.00	$ -
	Y07 - New Bridge (250' x 83.5') Curved 350149 (Steel)	0	SF	$ 400.00	$ -
	Y07 - Approach Slab (2 @ 25' x 80.5')	0	SF	$ 50.00	$ -
	Y07 - Bridge Removal	0	LF	$ 70.00	$ -
	Y09 - New Bridge (333'-8" x 48') Tangent 350125 (Steel)	16,016	SF	$ 375.00	$ 6,006,000.00
	Y09 - Approach Slab (2 @ 25' x 45')	2,250	SF	$ 50.00	$ 112,500.00
	Y09 - Bridge Removal	10,795	SF	$ 90.00	$ 971,550.00
	~~Y10 - Temporary Bridge (248'-4" x 48'-6")~~	~~0~~	~~SF~~	~~$ 250.00~~	$ -
	Y10 - New Phase Const Bridge (251'-9" x 53'-6") Tangent	13,469	SF	$ 375.00	$ 5,050,734.38
	Y10 - Approach Slab (2 @ 25' x 50'-6")	2,525	SF	$ 50.00	$ 126,250.00
	Y10 - Bridge Removal	9,927	SF	$ 70.00	$ 694,864.31
	Y11 - New Bridge (340' x 53.08') Tangent 350133 (Steel)	18,047	SF	$ 375.00	$ 6,767,700.00
	Y11 - Approach Slab (2 @ 25' x 50'-8"')	2,538	SF	$ 50.00	$ 126,875.00
	Y11 - Bridge Removal	8,984	SF	$ 90.00	$ 808,597.67

	~~Y12 - Temporary Bridge (238'-6"'x35')~~	~~0~~	~~SF~~	~~$~~	~~250.00~~	$ -
	Y12 - New Phase Const Bridge (240' x 53.5') Tangent	12,840	SF	$	375.00	$ 4,815,000.00
	Y12 - Approach Slab (2 @ 25' x 50.5')	2,525	SF	$	50.00	$ 126,250.00
	Y12 - Bridge Removal	7,346	SF	$	70.00	$ 514,216.50
	Y13 - New Bridge (242' x 50') Tangent 350142	0	SF	$	300.00	$ -
	Y13 - Approach Slab (2 @ 25' x 47')	0	SF	$	50.00	$ -
	Y13 - Bridge Removal	0	SF	$	60.00	$ -
	Y14 - New Bridge over I-85 (297' x 45'-6") Tangent 350146 (Steel)	0	SF	$	375.00	$ -
	Y14 - Approach Slab (31.07'x42.5) & (30.78"x42.5)	0	SF	$	50.00	$ -
	Y14 - Bridge Removal (Over I-85)	0	SF	$	70.00	$ -
	~~L- Retaining Walls - Highway (DELETED)~~	~~0~~	~~SF~~	~~$~~	~~-~~	$ -
	L - Bridge Widening (NB - 871' x 20'; SB - 921' x 20')	0	SF	$	375.00	$ -
	L - Approach Slab (4 @ 25' x20')	0	SF	$	50.00	$ -
	Railroad Structures					
	RR 350129 - Retaining Walls - Railroad	0	SF	$	250.00	$ -
	RR 350129 - Temporary Shoring - Railroad	0	SF	$	130.00	$ -
	RR 350129 - Temporary Railroad Bridge (312' x 12')	0	SF	$	1,150.00	$ -
	RR 350129 - Railroad Bridge (315' x 22')	0	SF	$	1,050.00	$ -
	RR 350129 - Existing Bridge Removal	0	SF	$	85.00	$ -
	RR 350129 - Temporary Bridge Removal	0	SF	$	80.00	$ -
	RR 350132 - Temporary Shoring - Railroad	0	SF	$	130.00	$ -
	RR 350132 - Railroad Bridge (330' x 50')	0	SF	$	1,050.00	$ -
	RR 350132 - Existing Bridge Removal	0	SF	$	95.00	$ -
	RR 350132 (Option 4A) - Retaining Walls - Railroad (Soil Nail w/2'-6" Reinf. Conc. Face)	0	SF	$	300.00	$ -
	RR 350132 (Option 4A) - Crash Wall - Railroad (3'-6" Thick)	0	SF	$	300.00	$ -
	RR 350132 (Option 4A) - Structure Adjustment - Remove Battered Piles	0	EA	$	15,000.00	$ -
	RR 350142 - Temporary Shoring - Railroad	0	SF	$	130.00	$ -
	RR 350142 - Railroad Bridge (263' x 38') Tangent	0	SF	$	1,050.00	$ -
	RR 350142 - Existing Bridge Removal	0	SF	$	95.00	$ -
	RR 350150 - Railroad Bridge (315' x 22') Tangent	0	SF	$	1,050.00	$ -
	RR 350150 - Pedestrian Bridge (315' x 16') Tangent	0	SF	$	850.00	$ -
	RR 350150 - Existing Bridge Removal	0	SF	$	95.00	$ -
	Retaining Walls - Railroad	0	SF	$	200.00	$ -
	Aesthetics (1%)	1	LS			$ 2,659,000.00
	Miscellaneous (15% Strs&Util)	1	LS			$ 18,475,000.00
	Miscellaneous (30% Roadway)	1	LS			$ 42,831,075.54
Mi.	**Contract Cost** ……	……	……			$ 368,148,000.00
	E. & C. 16% ……	……	……			$ 58,952,000.00
	Construction Cost ……	……	……			**$ 427,100,000.00**
	Design Build Factor (20%)					$ 85,400,000.00
	Design Build Cost					**$ 512,500,000.00**

TIP No.	**I-5719B (Includes U-5800)**	**Functional**		County:	**Gaston**
Route	I-85 Widening				
From	I-85 Before NC 7 to Catawba River				**CONSTR. COST**
Typical Section	8/10 Lane Barrier Divided Median				**$345,900,000**
	(L from 381+00, Y6, Y7, Y8, Y14, U-5800)				**DB Cost**
Prepared By:	HNTB	Date	9/4/2024		**$415,100,000**
Requested By:	NCDOT	Date	9/5/2024		
Priced By:	Karen Lovering, PE	Date	9/18/2024	Updated Util Costs	

Line Item	Des	Sec No.	Description	Quantity	Unit	Price	Amount
			Mobilization	1	LS	$ 33,750,000.00	$ 33,750,000.00
			Construction Surveying	1	LS	$ 4,500,000.00	$ 4,500,000.00
			Clearing and Grubbing	53	Acres	$ 35,000.00	$ 1,855,000.00
			Supplemental Clearing and Grubbing	5	Acres	$ 10,000.00	$ 50,000.00
			Earthwork				
			Unclassified Excavation	483,470	CY	$ 12.00	$ 5,801,640.00
			Borrow Excavation	392,170	CY	$ 18.00	$ 7,059,060.00
			Y02 - Bridge Approach Fill (MSE Wall) (86' Wide)	0	LS	$ 91,500.00	$ -
			Y03 - Bridge Approach Fill (MSE Wall) (126' Wide)	0	LS	$ 133,700.00	$ -
			Y04 - Bridge Approach Fill (MSE Wall) (113.5' Wide)	0	LS	$ 120,500.00	$ -
			Y05 - Bridge Approach Fill (MSE Wall) (25.6' Wide)	1	LS	$ 27,500.00	$ 27,500.00
			Y06 - Bridge Approach Fill (MSE Wall) (99.5' Wide)	1	LS	$ 105,500.00	$ 105,500.00
			Y07 - Bridge Approach Fill (MSE Wall) (83.5' Wide)	1	LS	$ 88,500.00	$ 88,500.00
			Y09 - Bridge Approach Fill (MSE Wall) (48' Wide)	0	LS	$ 51,000.00	$ -
			Y10 - Bridge Approach Fill (MSE Wall) (53.5' Wide)	0	LS	$ 56,800.00	$ -
			Y11 - Bridge Approach Fill (MSE Wall) (53.5' Wide)	0	LS	$ 56,800.00	$ -
			Y12 - Bridge Approach Fill (MSE Wall) (50.5' Wide)	0	LS	$ 53,600.00	$ -
			Y13 - Bridge Approach Fill (50' Wide)	0	LS	$ 53,500.00	$ -
			Y14 - Bridge Approach Fill (45.5' Wide)	1	LS	$ 48,500.00	$ 48,500.00
			L - Bridge Approach Fill (MSE Wall) (20' Wide)	1	LS	$ 22,000.00	$ 22,000.00
			Geotechnical	1	LS	$ 5,512,500.00	$ 5,512,500.00
			Undercut Excavation		CY	$ 20.00	$ -
			Select Granular Material, Class III		CY	$ 50.00	$ -
			Select Granular Material		CY	$ 40.00	$ -
			Geotextile for Soil Stabilization		SY	$ 5.00	$ -
			Geotextile for Subgrade Stabilization		SY	$ 4.00	$ -
			Shallow Undercut		CY	$ 22.00	$ -
			Class IV Subgrade Stabilization		TON	$ 50.00	$ -
			6" Perforated Subdrain Pipe		LF	$ 50.00	$ -
			Erosion Control	1	LS	$ 9,175,000.00	$ 9,175,000.00
			Erosion Control	144	Acres		
			U-6044 Erosion Control	0	Acres	$ 50,000.00	$ -
			Drainage				
			-L- 8 lane section	4.67	Miles	$ 4,000,000.00	$ 18,680,000.00
			-L- 10 lane section	0.00	Miles		
			Ramp (1 Lane)	2.61	Miles		
			Ramp (2 Lane)	0.69	Miles		
			Loop (1 Lane)	0.13	Miles		
			Loop (2 Lane)	0.00	Miles		
			-Y- 2 lane section (Shld Section)	0.68	Miles	$ 1,000,000.00	$ 680,000.00
			-Y- 2 lane section (C&G Section)	0.28	Miles	$ 1,500,000.00	$ 421,500.00
			-Y- 2 lane section (C&G/Shld Section)	0.12	Miles	$ 1,500,000.00	$ 180,000.00
			-Y- 3 lane section (Shld Section)	0.12	Miles	$ 1,000,000.00	$ 120,000.00
			-Y- 3 lane section (C&G Section)	0.22	Miles	$ 1,500,000.00	$ 330,000.00
			-Y- 4 lane divided section (Shld Section)	0.00	Miles		
			-Y- 4 lane divided section (C&G Section)	1.57	Miles	$ 4,000,000.00	$ 6,292,000.00
			-Y- 4 lane divided section (C&G/Shld Section)	0.00	Miles	$ 4,000,000.00	
			-Y- 5 lane undivided section (Shld Section)	0.00	Miles		
			-Y- 5 lane undivided section (C&G Section)	0.23	Miles	$ 4,000,000.00	$ 920,000.00
			-Y- 6 lane section (Shld Section)	0.00	Miles		
			-Y- 6 lane section (C&G Section)	0.50	Miles	$ 4,000,000.00	$ 2,008,000.00
			Fine Grading	1	LS	$ 3,615,000.00	$ 3,615,000.00
			Fine Grading (Main Line)	85,900	SY		
			Fine Grading (Non-main Line)	107,400	SY		
			Pavement				
			Milling	66,580	SY	$ 8.50	$ 565,930.00
			Removal of Existing Pavement	67,740	SY	$ 9.00	$ 609,660.00
			Full Depth Asphalt Pavement (Main Line)	85,820	SY	$ 100.00	$ 8,582,000.00
			Resurface Asphalt Pavement (Main Line)	298,850	SY	$ 18.00	$ 5,379,300.00
			Full Depth Asphalt Pavement (Ramp)	37,740	SY	$ 100.00	$ 3,774,000.00
			Resurface Asphalt Pavement (Ramp)	13,440	SY	$ 18.00	$ 241,920.00

			Full Depth Asphalt Pavement (Loop)	1,380	SY	$	100.00	$ 138,000.00
			Resurface Asphalt Pavement (Loop)	0	SY	$	18.00	$ -
			Full Depth Asphalt Pavement (Y Lines)	68,550	SY	$	75.00	$ 5,141,250.00
			Resurface Asphalt Pavement (Y Lines)	26,540	SY	$	18.00	$ 477,720.00
			Temp Asphalt Pavement (Y Lines)	0	SY	$	75.00	$ -
			Resurface Temp Pavement (Y Lines)	0	SY	$	20.00	$ -
			Driveway Pavement	720	SY	$	68.00	$ 48,960.00
			Subgrade Stabilization (Main Line)	85,900	SY	$	12.00	$ 1,030,800.00
			Subgrade Stabilization (Non-main Line)	107,400	SY	$	12.00	$ 1,288,800.00
			Concrete Expressway Gutter	2,375	LF	$	45.00	$ 106,875.00
			Shoulder Berm Gutter	10,750	LF	$	42.00	$ 451,500.00
			8"x18" Concrete Curb	650	LF	$	45.00	$ 29,250.00
			1'-6" Curb and Gutter	3,775	LF	$	32.00	$ 120,800.00
			2'-6" Curb and Gutter	29,600	LF	$	35.00	$ 1,036,000.00
			4" Concrete Sidewalk	6,290	SY	$	60.00	$ 377,400.00
			Proposed Multi-use Path	11,650	SY	$	60.00	$ 699,000.00
			5" Monolithic Island (Surface Mounted)	0	SY	$	100.00	$ -
			Curb Ramp	160	Each	$	2,800.00	$ 448,000.00
			Proposed Variable Depth Concrete Pad (8" Min.)	1,620	SY	$	150.00	$ 243,000.00
			5" Monolithic Island (Keyed In)	5,150	SY	$	85.00	$ 437,750.00
			Double Faced Concrete Barrier	21,360	LF	$	200.00	$ 4,272,000.00
			Single Faced Concrete Barrier	2,490	LF	$	125.00	$ 311,250.00
			CA Fencing	12,395	LF	$	15.00	$ 185,925.00
			Handrail	425	LF	$	225.00	$ 95,625.00
			Proposed Guardrail	19,200	LF	$	30.00	$ 576,000.00
			GREU TL-2 End Unit	6	EA	$	3,500.00	$ 21,000.00
			GREU TL-3 End Unit	26	EA	$	4,000.00	$ 104,000.00
			Type B-77 Anchor Unit	12	EA	$	3,000.00	$ 36,000.00
			Type-III Anchor Unit	7	EA	$	3,000.00	$ 21,000.00
			CAT-1	23	EA	$	1,200.00	$ 27,600.00
			AT-1	3	EA	$	1,200.00	$ 3,600.00
			Impact Attenuator (TL-3)	0	EA	$	35,000.00	$ -
			Temporary Guardrail	0	LF	$	18.00	$ -
			Temporary GREU TL-2 End Unit	0	EA	$	2,500.00	$ -
			Temporary GREU TL-3 End Unit	0	EA	$	2,800.00	$ -
			Temporary Type B-77 Anchor Unit	0	EA			
			Temporary Type-III Anchor Unit	0	EA	$	1,800.00	$ -
			Temporary CAT-1	0	EA			
			Pavement Markings	1	LS	$	2,097,900.00	$ 2,097,900.00
			-L- 8 lane section	4.67	Miles			
			-L- 10 lane section	0.00	Miles			
			Ramp (1 Lane)	2.61	Miles			
			Ramp (2 Lane)	0.69	Miles			
			Loop (1 Lane)	0.13	Miles			
			Loop (2 Lane)	0.00	Miles			
			-Y- 2 lane section (Shld Section)	0.68	Miles			
			-Y- 2 lane section (C&G Section)	0.28	Miles			
			-Y- 3 lane section (Shld Section)	0.12	Miles			
			-Y- 3 lane section (C&G Section)	0.22	Miles			
			-Y- 4 lane divided section (Shld Section)	0.00	Miles			
			-Y- 4 lane divided section (C&G Section)	1.57	Miles			
			-Y- 5 lane undivided section (Shld Section)	0.00	Miles			
			-Y- 5 lane undivided section (C&G Section)	0.23	Miles			
			-Y- 6 lane section (Shld Section)	0.00	Miles			
			-Y- 6 lane section (C&G Section)	0.50	Miles			
			Interchange Signing	1.00	LS	$	2,797,200.00	$ 2,797,200.00
			Overhead Sign Assemblies (Partial Directional with Flyunder)	0	EA			
			Overhead Sign Assemblies (Diamond Interchange)	0	EA			
			Overhead Sign Assemblies (Partial Clover Interchange)	1	EA			
			Overhead Sign Assemblies (Diverging Diamond Interchange)	0	EA			
			Traffic Management	1	LS	$	14,850,000.00	$ 14,850,000.00
			-L- 8 lane section	4.67	Miles			
			-L- 10 lane section	0.00	Miles			
			Ramp (1 Lane)	2.61	Miles			
			Ramp (2 Lane)	0.69	Miles			
			Loop (1 Lane)	0.13	Miles			
			Loop (2 Lane)	0.00	Miles			
			-Y- 2 lane section (Shld Section)	0.68	Miles			
			-Y- 2 lane section (C&G Section)	0.28	Miles			
			-Y- 3 lane section (Shld Section)	0.12	Miles			

			-Y- 3 lane section (C&G Section)	0.22	Miles			
			-Y- 4 lane divided section (Shld Section)	0.00	Miles			
			-Y- 4 lane divided section (C&G Section)	1.57	Miles			
			-Y- 5 lane undivided section (Shld Section)	0.00	Miles			
			-Y- 5 lane undivided section (C&G Section)	0.23	Miles			
			-Y- 6 lane section (Shld Section)	0.00	Miles			
			-Y- 6 lane section (C&G Section)	0.50	Miles			
			Railroad Main Line	0.00	Miles			
			Traffic Signals and Signals Communication	1	LS	$ 5,030,000.00	$ 5,030,000.00	
			New Traffic Signals	3	EA			
			Upgrade Existing Traffic Signals	2	EA			
			Remove Existing Traffic Signals	5	EA			
			ICM - Incident Management	1.00	LS	$ 854,130.00	$ 854,130.00	
4457000000-N			TEMPORARY TRAFFIC CONTROL		LS	$ 20,000.00	$ -	
4510000000-N			LAW ENFORCEMENT		HR			
7060000000-E			SIGNAL CABLE		LF	$ 3.50	$ -	
7132000000-E			VEHICLE SIGNAL HEAD (12", 3-SECTION)		EA	$ 1,100.00	$ -	
7132000000-E			VEHICLE SIGNAL HEAD (12", 4-SECTION)		EA	$ 1,200.00	$ -	
7132000000-E			VEHICLE SIGNAL HEAD (12", 5-SECTION)		EA	$ 1,500.00	$ -	
7300000000-E			UNPAVED TRENCHING (1,2")		LF	$ 20.00	$ -	
7301000000-E			DIRECTIONAL DRILL (1,2")		LF	$ 30.00	$ -	
7324000000-N			JUNCTION BOX (STANDARD SIZE)		EA	$ 750.00	$ -	
7420000000-E			2" RISER WITH WEATHERHEAD		EA	$ 710.00	$ -	
7444000000-E			INDUCTIVE LOOP SAWCUT		LF	$ 12.00	$ -	
7456000000-E			LEAD-IN CABLE (14-2)		LF	$ 1.80	$ -	
7744000000-N			DETECTOR CARD (TYPE 170)		EA	$ 230.00	$ -	
7985000000-N			CHANGEABLE TRAILBLAZER		EA	$ 35,000.00	$ -	
7980000000-N			CONTROLLER (TYPE 2070LX)		EA			
7980000000-N			ETHERNET EDGE SWITCH		EA			
7980000000-N			DIGITAL CCTV CAMERA ASSEMBLY		EA	$ 6,500.00	$ -	
4400000000-E			WORK ZONE SIGNS (STATIONARY)		SF	$ 7.10	$ -	
4420000000-N			PORTABLE CHANGEABLE MESSAGE SIGN		EA	$ 15,000.00	$ -	
4600000000-N			PORTABLE CCTV CAMERA ASSEMBLY		EA	$ 25,000.00	$ -	
			Railroad					
			Retire/Remove wood tie track	2,750	TF	$ 50.00	$ 137,500.00	
			Construct track, wood ties, 132RE new	2,750	TF	$ 450.00	$ 1,237,500.00	
			Construct track, wood ties, 136RE new	0	TF	$ 450.00	$ -	
			Cut and throw existing Track	0	TF	$ 200.00	$ -	
			Retire/Remove #10 Turnout	0	EA	$ 20,000.00	$ -	
			Construct #10 Turnout	0	EA	$ 100,000.00	$ -	
			Advance Surfacing - Undercut Track	0	EA	$ 150.00	$ -	
			Advance Surfacing - Raise Track	0	EA	$ 100.00	$ -	
			Replace Exist. Rail at Grade Crossings with new 132RE	250	TF	$ 300.00	$ 75,000.00	
			Railroad Flagging	0	LS	$ 5,000,000.00	$ -	
			Railroad Signal Modifications	0	LS	$ 2,000,000.00	$ -	
			Rubber Rail Seal Grade Crossing Surface	410	TF	$ 2,000.00	$ 820,000.00	
			Grade Crossing Signals and Gates	0	EA	$ 500,000.00	$ -	
			Construct Double Switch Point Derail	0	EA	$ 50,000.00	$ -	
			Belmont Yard Rehab	15,800	TF	$ 150.00	$ 2,370,000.00	
			Railroad Grading/Drainage					
			Unclassified Excavation (Railroad)	3,500	CY	$ 30.00	$ 105,000.00	
			Borrow Excavation (Railroad)	0	CY	$ 30.00	$ -	
			Fine Grading (Railroad)	7,200	SY	$ 6.00	$ 43,200.00	
			Furnish and Install sub-ballast stone	1,900	TN	$ 75.00	$ 142,500.00	
			Drainage - Railroad Main Line (Single Phase)	0.39	Miles	$ 1,000,000.00	$ 388,000.00	
			Drainage - Railroad Main Line (2 Phases)	0.00	Miles	$ 1,250,000.00	$ -	
			Drainage - Railroad Main Line (3 Phases)	0.00	Miles	$ 1,500,000.00	$ -	
			Fence	3,300	LF	$ 15.00	$ 49,500.00	
			Construction Utilities (Per Utilities Unit 09-09-2024)	1	LS	$ 5,330,075.00	$ 5,330,075.00	
			U-5800 Construction Utilities (Per Utilities Unit 08-16-2023)	1	LS	$ 689,644.00	$ 689,644.00	
			Intelligent Transportation Systems	1	LS	$ 1,930,500.00	$ 1,930,500.00	
			Structures					
			Site 4 - Extend @ -L- 121+50, 1 @ 9' x 9' RCBC, 70°Skew	0	LF	$ 3,800.00	$ -	
			Site 5 - New @ -L- 207+50, 1 @ 8' x 9' RCBC, 49°Skew	0	LF	$ 2,500.00	$ -	
			Site 7 - Extend @ -L- 232+50, 2 @ 8' x 9' RCBC, 56°Skew	0	LF	$ 6,700.00	$ -	
			Site 8 - Extend @ -L- 253+50, 2 @ 54" RCP, 85°Skew	0	LF	$ 2,000.00	$ -	
			Site 8 - Jack and Bore @ -L- 253+50, 2 @ 54" RCP, 85°Skew	0	LF	$ 3,500.00	$ -	
			Site 10 - Extend @ -L- 276+25, 1 @ 7' x 8' RCBC, 90°Skew	0	LF	$ 3,200.00	$ -	
			Site 11 - Extend @ -L- 306+25, 1 @ 8' x 8' RCBC, 47°Skew	0	LF	$ 3,500.00	$ -	
			Site 12 - Extend @ -L- 332+25, 1 @ 8' x 8' RCBC, 105°Skew	0	LF	$ 3,500.00	$ -	
			U-6044 Extension of existing 2@9'x8' RCBC	0	LF	$ 5,610.00	$ -	

			Wall 1 (-Y1RPD-) w/ Moment Slab (Avg ht 4.87ft)	0	SF	$	200.00	$ -
			Wall 2 (-Y2RPB-) (Avg ht 7.03ft)	0	SF	$	200.00	$ -
			Wall 3 (-L- & -Y2LPB-) (Avg ht 15.92ft)	0	SF	$	140.00	$ -
			Wall 4 (-Y2RPD-) (Avg ht 8.23ft)	0	SF	$	140.00	$ -
			Wall 5 (-L- LT) (Avg ht 19.71ft)	0	SF	$	140.00	$ -
			Wall 6 (-L- RT) (Avg ht 16.16ft)	0	SF	$	140.00	$ -
			Wall 7 (-Y4RPB-) (Avg ht 7.98ft)	0	SF	$	140.00	$ -
			Wall 8 (-Y4RPD-) (Avg ht 5.36ft)	0	SF	$	200.00	$ -
			Wall 9 (-Y6RPB-) (Avg ht 9.62ft)	6,443	SF	$	140.00	$ 902,060.95
			~~Wall 10 (Y6RPC) (DELETED)~~		~~SF~~	~~$~~		~~$~~
			Wall 11 (-Y6- & -Y6RPB-) (Avg ht 7.76ft)	2,784	SF	$	200.00	$ 556,748.25
			Wall 12 (-Y6- & -Y6RPA-) (Avg ht 13.22ft)	8,388	SF	$	140.00	$ 1,174,278.00
			Wall 13 (-L- RT) (Avg ht 4.77ft)	2,584	SF	$	200.00	$ 516,793.88
			Wall 14 (-Y4- RT) (Avg ht 12.09ft)	0	SF	$	140.00	$ -
			~~Wall 15 (Y4RPC) w/ Moment Slab (Avg ht 13.34ft) (DELETED)~~	~~0~~	~~SF~~	~~$~~	~~200.00~~	~~$~~
			U-6044 Retaining Wall (@ Wells-Fargo) (Avg ht 6ft)	0	SF			$ -
			Noise Walls	61,203	SF	$	55.00	$ 3,366,165.00
			Railroad Coordination	1	LS	$	50,000.00	$ 50,000.00
			Bridge Rehab #350120	0	LS	$	2,554,400.00	$ -
			Bridge Rehab #350137	0	LS	$	1,601,650.00	$ -
			Bridge Rehab #350143	1	LS	$	5,333,745.00	$ 5,333,745.00
			Bridge Rehab #350034	1	LS	$	1,657,270.00	$ 1,657,270.00
			~~Y02 - Temporary Bridge (325' x82')~~	~~0~~	~~SF~~	~~$~~	~~250.00~~	~~$~~
			Y02 - New Phase Const Bridge (350' x 88.58') Tangent 350059 (Steel)	0	SF	$	400.00	$ -
			Y02 - Approach Slab (2 @ 25' x 86')	0	SF	$	50.00	$ -
			Y02 - Bridge Removal	0	SF	$	70.00	$ -
			Y03 - New Bridge (1@ 200' x 62.58') Tangent 350002	0	SF	$	300.00	$ -
			Y03 - New Bridge (1@ 200' x 62.58') Tangent 350002	0	SF	$	350.00	$ -
			Y03 - Approach Slab (2 @ 25' x 120')	0	SF	$	50.00	$ -
			Y03 - Bridge Removal	0	SF	$	60.00	$ -
			~~Y04 - Const Maint & Removal of Temporary Bridge (250' x 92'-6")~~	~~0~~	~~SF~~	~~$~~	~~250.00~~	~~$~~
			Y04 - New Phase Const Bridge (275' x 113.08) Tangent 350134	0	SF	$	375.00	$ -
			Y04 - Approach Slab (2 @ 25' x 110'-6")	0	SF	$	50.00	$ -
			Y04 - Bridge Removal	0	SF	$	70.00	$ -
			Y05 -Widen Bridge (11.85' x 256') Tangent 350137	0	SF	$	375.00	$ -
			Y05 - Approach Slab ((11.85' x12')x2)	0	SF	$	50.00	$ -
			Y06 - New Phase Const Bridge (279' x 99'-6") Tangent	27,860	SF	$	375.00	$ 10,447,500.00
			~~Y06 - Temp Bridge (279' x 99'-6") Tangent~~	~~0~~	~~SF~~	~~$~~	~~250.00~~	~~$~~
			Y06 - Approach Slab (2 @ 25' x 96'-6")	4,825	SF	$	50.00	$ 241,250.00
			Y06 - Bridge Removal	25,025	SF	$	70.00	$ 1,751,750.00
			Y07 - New Bridge (250' x 83.5') Curved 350149 (Steel)	20,875	SF	$	400.00	$ 8,350,000.00
			Y07 - Approach Slab (2 @ 25' x 80.5')	4,025	SF	$	50.00	$ 201,250.00
			Y07 - Bridge Removal	17,895	LF	$	70.00	$ 1,252,650.00
			Y09 - New Bridge (333'-8" x 48') Tangent 350125 (Steel)	0	SF	$	375.00	$ -
			Y09 - Approach Slab (2 @ 25' x 45')	0	SF	$	50.00	$ -
			Y09 - Bridge Removal	0	SF	$	90.00	$ -
			~~Y10 - Temporary Bridge (248' 4" x 48' 6")~~	~~0~~	~~SF~~	~~$~~	~~250.00~~	~~$~~
			Y10 - New Phase Const Bridge (251'-9" x 53'-6") Tangent	0	SF	$	375.00	$ -
			Y10 - Approach Slab (2 @ 25' x 50'-6")	0	SF	$	50.00	$ -
			Y10 - Bridge Removal	0	SF	$	70.00	$ -
			Y11 - New Bridge (340' x 53.08') Tangent 350133 (Steel)	0	SF	$	375.00	$ -
			Y11 - Approach Slab (2 @ 25' x 50'-8"')	0	SF	$	50.00	$ -
			Y11 - Bridge Removal	0	SF	$	90.00	$ -
			~~Y12 - Temporary Bridge (238' 6"x35')~~	~~0~~	~~SF~~	~~$~~	~~250.00~~	~~$~~
			Y12 - New Phase Const Bridge (240' x 53.5') Tangent	0	SF	$	375.00	$ -
			Y12 - Approach Slab (2 @ 25' x 50.5')	0	SF	$	50.00	$ -
			Y12 - Bridge Removal	0	SF	$	70.00	$ -
			Y13 - New Bridge (242' x 50') Tangent 350142	0	SF	$	300.00	$ -
			Y13 - Approach Slab (2 @ 25' x 47')	0	SF	$	50.00	$ -
			Y13 - Bridge Removal	0	SF	$	60.00	$ -
			Y14 - New Bridge over I-85 (297' x 45'-6") Tangent 350146 (Steel)	13,514	SF	$	375.00	$ 5,067,750.00
			Y14 - Approach Slab (31.07'x42.5) & (30.78"x42.5)	2,628	SF	$	50.00	$ 131,400.00
			Y14 - Bridge Removal (Over I-85)	8,565	SF	$	70.00	$ 599,524.89
			~~L- Retaining Walls - Highway (DELETED)~~	~~0~~	~~SF~~	~~$~~	-	~~$~~ -
			L - Bridge Widening (NB - 871' x 20'; SB - 921' x 20') 350143	35,840	SF	$	375.00	$ 13,440,000.00
			L - Approach Slab (4 @ 25' x20')	2,000	SF	$	50.00	$ 100,000.00
			Railroad Structures					
			RR 350129 - Retaining Walls - Railroad	0	SF	$	250.00	$ -
			RR 350129 - Temporary Shoring - Railroad	0	SF	$	130.00	$ -
			RR 350129 - Temporary Railroad Bridge (312' x 12')	0	SF	$	1,150.00	$ -
			RR 350129 - Railroad Bridge (315' x 22')	0	SF	$	1,050.00	$ -
			RR 350129 - Existing Bridge Removal	0	SF	$	85.00	$ -
			RR 350129 - Temporary Bridge Removal	0	SF	$	80.00	$ -
			RR 350132 - Temporary Shoring - Railroad	0	SF	$	130.00	$ -

			RR 350132 - Railroad Bridge (330' x 50')	0	SF	$	1,050.00	$ -
			RR 350132 - Existing Bridge Removal	0	SF	$	95.00	$ -
			RR 350132 (Option 4A) - Retaining Walls - Railroad (Soil Nail w/2'-6" Reinf. Conc. Face)	0	SF	$	300.00	$ -
			RR 350132 (Option 4A) - Crash Wall - Railroad (3'-6" Thick)	0	SF	$	300.00	$ -
			RR 350132 (Option 4A) - Structure Adjustment - Remove Battered Piles	0	EA	$	15,000.00	$ -
			RR 350142 - Temporary Shoring - Railroad	0	SF	$	130.00	$ -
			RR 350142 - Railroad Bridge (263' x 38') Tangent	0	SF	$	1,050.00	$ -
			RR 350142 - Existing Bridge Removal	0	SF	$	95.00	$ -
			RR 350150 - Railroad Bridge (315' x 22') Tangent	6,930	SF	$	1,050.00	$ 7,276,500.00
			RR 350150 - Pedestrian Bridge (315' x 16') Tangent	5,040	SF	$	850.00	$ 4,284,000.00
			RR 350150 - Existing Bridge Removal	3,950	SF	$	95.00	$ 375,250.00
			Retaining Walls - Railroad	0	SF	$	200.00	$ -
			Aesthetics (1%)	1	LS			$ 2,104,000.00
			Miscellaneous (15% Strs&Util)	1	LS			$ 11,254,000.00
			Miscellaneous (30% Roadway)	1	LS			$ 40,611,850.03

Lgth	**4.670**	**Mi.**	**Contract Cost** ……..	……..	……..	$ 298,117,000.00
			E. & C. 16% ……..	……..	……..	$ 47,783,000.00
			Construction Cost ……..	……..	……..	**$ 345,900,000.00**
			Design Build Factor (20%)			$ 69,200,000.00
			Design Build Cost			**$ 415,100,000.00**

TIP No.	**I-5719C**	**Functional**		County:	**Gaston**	
Route	I-85 Widening					
From	Rail and Rail/Roadway Only				**CONSTR. COST**	
Typical Section	8/10 Lane Barrier Divided Median				**$178,800,000**	
	(RR Bridges 350129, 350132, 350142, Y13, Y15)				**CMGC Cost**	
Prepared By:	HNTB	Date	9/4/2024		**$232,400,000**	
Requested By:	NCDOT	Date	9/5/2024			
Priced By:	Karen Lovering, PE	Date	9/18/2024	Updated Util Costs		

Line Item	Des	Sec No.	Description	Quantity	Unit	Price	Amount
			Mobilization	1	LS	$ 10,000,000.00	$ 10,000,000.00
			Construction Surveying	1	LS	$ 400,000.00	$ 400,000.00
			Clearing and Grubbing	14	Acres	$ 35,000.00	$ 481,187.62
			Supplemental Clearing and Grubbing	2	Acres	$ 10,000.00	$ 20,000.00
			Earthwork				
			Unclassified Excavation	9,030	CY	$ 18.00	$ 162,540.00
			Borrow Excavation	5,920	CY	$ 35.00	$ 207,200.00
			Y02 - Bridge Approach Fill (MSE Wall) (86' Wide)	0	LS	$ 91,500.00	$ -
			Y03 - Bridge Approach Fill (MSE Wall) (126' Wide)	0	LS	$ 133,700.00	$ -
			Y04 - Bridge Approach Fill (MSE Wall) (113.5' Wide)	0	LS	$ 120,500.00	$ -
			Y05 - Bridge Approach Fill (MSE Wall) (25.6' Wide)	0	LS	$ 27,500.00	$ -
			Y06 - Bridge Approach Fill (MSE Wall) (99.5' Wide)	0	LS	$ 105,500.00	$ -
			Y07 - Bridge Approach Fill (MSE Wall) (83.5' Wide)	0	LS	$ 88,500.00	$ -
			Y09 - Bridge Approach Fill (MSE Wall) (48' Wide)	0	LS	$ 51,000.00	$ -
			Y10 - Bridge Approach Fill (MSE Wall) (53.5' Wide)	0	LS	$ 56,800.00	$ -
			Y11 - Bridge Approach Fill (MSE Wall) (53.5' Wide)	0	LS	$ 56,800.00	$ -
			Y12 - Bridge Approach Fill (MSE Wall) (50.5' Wide)	0	LS	$ 53,600.00	$ -
			Y13 - Bridge Approach Fill (50' Wide)	0	LS	$ 53,500.00	$ -
			Y14 - Bridge Approach Fill (45.5' Wide)	0	LS	$ 48,500.00	$ -
			L - Bridge Approach Fill (MSE Wall) (20' Wide)	0	LS	$ 22,000.00	$ -
			Geotechnical	1	LS	$ 490,000.00	$ 490,000.00
			Undercut Excavation		CY	$ 20.00	
			Select Granular Material, Class III		CY	$ 50.00	
			Select Granular Material		CY	$ 40.00	
			Geotextile for Soil Stabilization		SY	$ 5.00	
			Geotextile for Subgrade Stabilization		SY	$ 4.00	
			Shallow Undercut		CY	$ 22.00	
			Class IV Subgrade Stabilization		TON	$ 50.00	
			6" Perforated Subdrain Pipe		LF	$ 50.00	
			Erosion Control	1	LS	$ 816,000.00	$ 816,000.00
			Erosion Control	23	Acres		
			U-6044 Erosion Control	0	Acres		
			Drainage				
			-L- 8 lane section	0.18	Miles	$ 4,000,000.00	$ 727,272.73
			-L- 10 lane section	0.00	Miles		
			Ramp (1 Lane)	0.00	Miles		
			Ramp (2 Lane)	0.00	Miles		
			Loop (1 Lane)	0.00	Miles		
			Loop (2 Lane)	0.00	Miles		
			-Y- 2 lane section (Shld Section)	0.23	Miles	$ 1,000,000.00	$ 230,000.00
			-Y- 2 lane section (C&G Section)	0.04	Miles	$ 1,500,000.00	$ 60,000.00
			-Y- 2 lane section (C&G/Shld Section)	0.60	Miles	$ 1,500,000.00	$ 900,000.00
			-Y- 3 lane section (Shld Section)	0.00	Miles	$ 1,000,000.00	$ -
			-Y- 3 lane section (C&G Section)	0.00	Miles	$ 1,500,000.00	$ -
			-Y- 4 lane divided section (Shld Section)	0.00	Miles		
			-Y- 4 lane divided section (C&G Section)	0.00	Miles	$ 4,000,000.00	$ -
			-Y- 4 lane divided section (C&G/Shld Section)	0.00	Miles	$ 4,000,000.00	$ -
			-Y- 5 lane undivided section (Shld Section)	0.00	Miles		
			-Y- 5 lane undivided section (C&G Section)	0.00	Miles	$ 4,000,000.00	$ -
			-Y- 6 lane section (Shld Section)	0.00	Miles		
			-Y- 6 lane section (C&G Section)	0.00	Miles	$ 4,000,000.00	$ -
			Fine Grading	1	LS	$ 320,000.00	$ 320,000.00
			Fine Grading (Main Line)	400	SY		
			Fine Grading (Non-main Line)	6,800	SY		
			Pavement				
			Milling	0	SY	$ 8.50	$ -
			Removal of Existing Pavement	7,480	SY	$ 12.00	$ 89,760.00
			Full Depth Asphalt Pavement (Main Line)	400	SY	$ 100.00	$ 40,000.00
			Resurface Asphalt Pavement (Main Line)	0	SY	$ 18.00	$ -
			Full Depth Asphalt Pavement (Ramp)	0	SY	$ 100.00	$ -

			Resurface Asphalt Pavement (Ramp)	0	SY	$	18.00	$ -
			Full Depth Asphalt Pavement (Loop)	0	SY	$	100.00	$ -
			Resurface Asphalt Pavement (Loop)	0	SY	$	18.00	$ -
			Full Depth Asphalt Pavement (Y Lines)	6,090	SY	$	100.00	$ 609,000.00
			Resurface Asphalt Pavement (Y Lines)	7,320	SY	$	26.00	$ 190,320.00
			Temp Asphalt Pavement (Y Lines)	0	SY	$	75.00	$ -
			Resurface Temp Pavement (Y Lines)	0	SY	$	20.00	$ -
			Driveway Pavement	710	SY	$	100.00	$ 71,000.00
			Subgrade Stabilization (Main Line)	400	SY	$	18.00	$ 7,200.00
			Subgrade Stabilization (Non-main Line)	6,800	SY	$	18.00	$ 122,400.00
			Concrete Expressway Gutter	0	LF	$	45.00	$ -
			Shoulder Berm Gutter	0	LF	$	42.00	$ -
			8"x18" Concrete Curb	0	LF	$	45.00	$ -
			1'-6" Curb and Gutter	0	LF	$	32.00	$ -
			2'-6" Curb and Gutter	3,250	LF	$	35.00	$ 113,750.00
			4" Concrete Sidewalk	700	SY	$	75.00	$ 52,500.00
			Proposed Multi-use Path	0	SY	$	60.00	$ -
			5" Monolithic Island (Surface Mounted)	0	SY	$	100.00	$ -
			Curb Ramp	0	Each	$	2,800.00	$ -
			Proposed Variable Depth Concrete Pad (8" Min.)	0	SY	$	150.00	$ -
			5" Monolithic Island (Keyed In)	0	SY	$	85.00	$ -
			Double Faced Concrete Barrier	0	LF	$	200.00	$ -
			Single Faced Concrete Barrier	0	LF	$	125.00	$ -
			CA Fencing	0	LF	$	15.00	$ -
			Handrail	0	LF	$	225.00	$ -
			Proposed Guardrail	400	LF	$	30.00	$ 12,000.00
			GREU TL-2 End Unit	3	EA	$	3,500.00	$ 10,500.00
			GREU TL-3 End Unit	0	EA	$	4,000.00	$ -
			Type B-77 Anchor Unit	0	EA	$	3,000.00	$ -
			Type-III Anchor Unit	4	EA	$	3,000.00	$ 12,000.00
			CAT-1	0	EA	$	1,200.00	$ -
			AT-1	1	EA	$	1,200.00	$ 1,200.00
			Impact Attenuator (TL-3)	0	EA	$	35,000.00	$ -
			Temporary Guardrail	0	LF	$	18.00	$ -
			Temporary GREU TL-2 End Unit	0	EA	$	2,500.00	$ -
			Temporary GREU TL-3 End Unit	0	EA	$	2,800.00	$ -
			Temporary Type B-77 Anchor Unit	0	EA			
			Temporary Type-III Anchor Unit	0	EA	$	1,800.00	$ -
			Temporary CAT-1	0	EA			
			Pavement Markings	1.00	LS	$	186,480.00	$ 186,480.00
			-L- 8 lane section	0.00	Miles			
			-L- 10 lane section	0.00	Miles			
			Ramp (1 Lane)	0.00	Miles			
			Ramp (2 Lane)	0.00	Miles			
			Loop (1 Lane)	0.00	Miles			
			Loop (2 Lane)	0.00	Miles			
			-Y- 2 lane section (Shld Section)	0.23	Miles			
			-Y- 2 lane section (C&G Section)	0.04	Miles			
			-Y- 3 lane section (Shld Section)	0.00	Miles			
			-Y- 3 lane section (C&G Section)	0.00	Miles			
			-Y- 4 lane divided section (Shld Section)	0.00	Miles			
			-Y- 4 lane divided section (C&G Section)	0.00	Miles			
			-Y- 5 lane undivided section (Shld Section)	0.00	Miles			
			-Y- 5 lane undivided section (C&G Section)	0.00	Miles			
			-Y- 6 lane section (Shld Section)	0.00	Miles			
			-Y- 6 lane section (C&G Section)	0.00	Miles			
			Interchange Signing	1.00	LS	$	248,640.00	$ 248,640.00
			Overhead Sign Assemblies (Partial Directional with Flyunder)	0	EA			
			Overhead Sign Assemblies (Diamond Interchange)	0	EA			
			Overhead Sign Assemblies (Partial Clover Interchange)	0	EA			
			Overhead Sign Assemblies (Diverging Diamond Interchange)	0	EA			
			Traffic Management	1	LS	$	1,320,000.00	$ 1,320,000.00
			-L- 8 lane section	0.00	Miles			
			-L- 10 lane section	0.00	Miles			
			Ramp (1 Lane)	0.00	Miles			
			Ramp (2 Lane)	0.00	Miles			
			Loop (1 Lane)	0.00	Miles			
			Loop (2 Lane)	0.00	Miles			
			-Y- 2 lane section (Shld Section)	0.23	Miles			

			-Y- 2 lane section (C&G Section)	0.04	Miles		
			-Y- 3 lane section (Shld Section)	0.00	Miles		
			-Y- 3 lane section (C&G Section)	0.00	Miles		
			-Y- 4 lane divided section (Shld Section)	0.00	Miles		
			-Y- 4 lane divided section (C&G Section)	0.00	Miles		
			-Y- 5 lane undivided section (Shld Section)	0.00	Miles		
			-Y- 5 lane undivided section (C&G Section)	0.00	Miles		
			-Y- 6 lane section (Shld Section)	0.00	Miles		
			-Y- 6 lane section (C&G Section)	0.00	Miles		
			Railroad Main Line	0.00	Miles		
			Traffic Signals and Signals Communication	1	LS	$ 306,280.00	$ 306,280.00
			New Traffic Signals	0	EA		
			Upgrade Existing Traffic Signals	0	EA		
			Remove Existing Traffic Signals	0	EA		
			ICM - Incident Management	1.00	LS	$ 75,925.00	$ 75,925.00
4457000000-N			TEMPORARY TRAFFIC CONTROL		LS	$ 20,000.00	
4510000000-N			LAW ENFORCEMENT		HR		
7060000000-E			SIGNAL CABLE		LF	$ 3.50	
7132000000-E			VEHICLE SIGNAL HEAD (12", 3-SECTION)		EA	$ 1,100.00	
7132000000-E			VEHICLE SIGNAL HEAD (12", 4-SECTION)		EA	$ 1,200.00	
7132000000-E			VEHICLE SIGNAL HEAD (12", 5-SECTION)		EA	$ 1,500.00	
7300000000-E			UNPAVED TRENCHING (1,2")		LF	$ 20.00	
7301000000-E			DIRECTIONAL DRILL (1,2")		LF	$ 30.00	
7324000000-N			JUNCTION BOX (STANDARD SIZE)		EA	$ 750.00	
7420000000-E			2" RISER WITH WEATHERHEAD		EA	$ 710.00	
7444000000-E			INDUCTIVE LOOP SAWCUT		LF	$ 12.00	
7456000000-E			LEAD-IN CABLE (14-2)		LF	$ 1.80	
7744000000-N			DETECTOR CARD (TYPE 170)		EA	$ 230.00	
7985000000-N			CHANGEABLE TRAILBLAZER		EA	$ 35,000.00	
7980000000-N			CONTROLLER (TYPE 2070LX)		EA		
7980000000-N			ETHERNET EDGE SWITCH		EA		
7980000000-N			DIGITAL CCTV CAMERA ASSEMBLY		EA	$ 6,500.00	
4400000000-E			WORK ZONE SIGNS (STATIONARY)		SF	$ 7.10	
4420000000-N			PORTABLE CHANGEABLE MESSAGE SIGN		EA	$ 15,000.00	
4600000000-N			PORTABLE CCTV CAMERA ASSEMBLY		EA	$ 25,000.00	
			Railroad				
			Retire/Remove wood tie track	27,050	TF	$ 50.00	$ 1,352,500.00
			Construct track, wood ties, 132RE new	2,400	TF	$ 450.00	$ 1,080,000.00
			Construct track, wood ties, 136RE new	19,800	TF	$ 450.00	$ 8,910,000.00
			Cut and throw existing Track	14,920	TF	$ 200.00	$ 2,984,000.00
			Retire/Remove #10 Turnout	4	EA	$ 20,000.00	$ 80,000.00
			Construct #10 Turnout	4	EA	$ 100,000.00	$ 400,000.00
			Advance Surfacing - Undercut Track	1,265	EA	$ 150.00	$ 189,750.00
			Advance Surfacing - Raise Track	1,350	EA	$ 100.00	$ 135,000.00
			Replace Exist. Rail at Grade Crossings with new 132RE	0	TF	$ 300.00	$ -
			Railroad Flagging	4	LS	$ 5,000,000.00	$ 20,000,000.00
			Railroad Signal Modifications	2	LS	$ 2,000,000.00	$ 4,000,000.00
			Rubber Rail Seal Grade Crossing Surface	56	TF	$ 2,000.00	$ 112,000.00
			Grade Crossing Signals and Gates	2	EA	$ 500,000.00	$ 1,000,000.00
			Construct Double Switch Point Derail	2	EA	$ 50,000.00	$ 100,000.00
			Belmont Yard Rehab	0	TF	$ 150.00	$ -
			Railroad Grading/Drainage				
			Unclassified Excavation (Railroad)	18,900	CY	$ 30.00	$ 567,000.00
			Borrow Excavation (Railroad)	25,100	CY	$ 30.00	$ 753,000.00
			Fine Grading (Railroad)	41,660	SY	$ 6.00	$ 249,960.00
			Furnish and Install sub-ballast stone	21,335	TN	$ 75.00	$ 1,600,125.00
			Drainage - Railroad Main Line (Single Phase)	1.10	Miles	$ 1,000,000.00	$ 1,097,000.00
			Drainage - Railroad Main Line (2 Phases)	0.49	Miles	$ 1,250,000.00	$ 615,000.00
			Drainage - Railroad Main Line (3 Phases)	1.42	Miles	$ 1,500,000.00	$ 2,133,000.00
			Fence	0	LF	$ 15.00	$ -
			Construction Utilities (Per Utilities Unit 09-09-2024)	1	LS	$ 3,337,275.00	$ 3,337,275.00
			Intelligent Transportation Systems	1	LS	$ 172,000.00	$ 172,000.00
			Structures				
			Site 4 - Extend @ -L- 121+50, 1 @ 9' x 9' RCBC, 70°Skew	0	LF	$ 3,800.00	
			Site 5 - New @ -L- 207+50, 1 @ 8' x 9' RCBC, 49°Skew	0	LF	$ 2,500.00	
			Site 7 - Extend @ -L- 232+50, 2 @ 8' x 9' RCBC, 56°Skew	0	LF	$ 6,700.00	
			Site 8 - Extend @ -L- 253+50, 2 @ 54" RCP, 85°Skew	0	LF	$ 2,000.00	
			Site 8 - Jack and Bore @ -L- 253+50, 2 @ 54" RCP, 85°Skew	0	LF	$ 3,500.00	
			Site 10 - Extend @ -L- 276+25, 1 @ 7' x 8' RCBC, 90°Skew	0	LF	$ 3,200.00	
			Site 11 - Extend @ -L- 306+25, 1 @ 8' x 8' RCBC, 47°Skew	0	LF	$ 3,500.00	

			Site 12 - Extend @ -L- 332+25, 1 @ 8' x 8' RCBC, 105°Skew	0	LF	$ 3,500.00	
			U-6044 Extension of existing 2@9'x8' RCBC	0	LF		
			Wall 1 (-Y1RPD-) w/ Moment Slab (Avg ht 4.87ft)	0	SF	$ 200.00	
			Wall 2 (-Y2RPB-) (Avg ht 7.03ft)	0	SF	$ 200.00	
			Wall 3 (-L- & -Y2LPB-) (Avg ht 15.92ft)	0	SF	$ 140.00	
			Wall 4 (-Y2RPD-) (Avg ht 8.23ft)	0	SF	$ 140.00	
			Wall 5 (-L- LT) (Avg ht 19.71ft)	0	SF	$ 140.00	
			Wall 6 (-L- RT) (Avg ht 16.16ft)	0	SF	$ 140.00	
			Wall 7 (-Y4RPB-) (Avg ht 7.98ft)	0	SF	$ 140.00	
			Wall 8 (-Y4RPD-) (Avg ht 5.36ft)	0	SF	$ 200.00	
			Wall 9 (-Y6RPB-) (Avg ht 9.62ft)	0	SF	$ 140.00	
			~~Wall 10 (Y6RPC) (DELETED)~~	~~0~~	~~SF~~	~~$ -~~	
			Wall 11 (-Y6- & -Y6RPB-) (Avg ht 7.76ft)	0	SF	$ 200.00	
			Wall 12 (-Y6- & -Y6RPA-) (Avg ht 13.22ft)	0	SF	$ 140.00	
			Wall 13 (-L- RT) (Avg ht 4.77ft)	0	SF	$ 200.00	
			Wall 14 (-Y4- RT) (Avg ht 12.09ft)	0	SF	$ 140.00	
			~~Wall 15 (Y4RPC) w/ Moment Slab (Avg ht 13.34ft) (DELETED)~~	~~0~~	~~SF~~	~~$ 200.00~~	
			U-6044 Retaining Wall (@ Wells-Fargo) (Avg ht 6ft)	0	SF		
			Noise Walls	0	SF	$ 55.00	
			Railroad Coordination	1	LS	$ 5,300,000.00	$ 5,300,000.00
			Bridge Rehab #350120	0	LS	$ 2,554,400.00	
			Bridge Rehab #350137	0	LS	$ 1,601,650.00	
			Bridge Rehab #350143	0	LS	$ 5,333,745.00	
			Bridge Rehab #350034	0	LS	$ 1,657,570.00	
			Y02 - Temporary Bridge (325' x82')	0	SF	~~$ 250.00~~	
			Y02 - New Bridge (350' x 88.58') Tangent 350059 (Steel)	0	SF	$ 400.00	
			Y02 - Approach Slab (2 @ 25' x 86')	0	SF	$ 50.00	
			Y02 - Bridge Removal	0	SF	$ 70.00	
			Y03 - New Bridge (1@ 200' x 62.58') Tangent 350002	0	SF	$ 300.00	
			Y03 - New Bridge (1@ 200' x 62.58') Tangent 350002	0	SF	$ 350.00	
			Y03 - Approach Slab (2 @ 25' x 120')	0	SF	$ 50.00	
			Y03 - Bridge Removal	0	SF	$ 60.00	
			Y04 - Const Maint & Removal of Temporary Bridge (250' x 92'-6")	0	SF	~~$ 250.00~~	
			Y04 - New Bridge (275' x 113.08) Tangent 350134	0	SF	$ 375.00	
			Y04 - Approach Slab (2 @ 25' x 110'-6")	0	SF	$ 50.00	
			Y04 - Bridge Removal	0	SF	$ 70.00	
			Y05 -Widen Bridge (11.85' x 256') Tangent 350137	0	SF	$ 375.00	
			Y05 - Approach Slab ((11.85' x12')x2)	0	SF	$ 50.00	
			Y06 - New Bridge (279' x 99'-6") Tangent 350073 (Steel)	0	SF	$ 375.00	
			Y06 - Temp Bridge (279' x 99'-6") Tangent	0	SF	~~$ 250.00~~	
			Y06 - Approach Slab (2 @ 25' x 96'-6")	0	SF	$ 50.00	
			Y06 - Bridge Removal	0	SF	$ 70.00	
			Y07 - New Bridge (250' x 83.5') Curved 350149 (Steel)	0	SF	$ 400.00	
			Y07 - Approach Slab (2 @ 25' x 80.5')	0	SF	$ 50.00	
			Y07 - Bridge Removal	0	LF	$ 70.00	
			Y09 - New Bridge (333'-8" x 48') Tangent 350125 (Steel)	0	SF	$ 375.00	
			Y09 - Approach Slab (2 @ 25' x 45')	0	SF	$ 50.00	
			Y09 - Bridge Removal	0	SF	$ 90.00	
			Y10 - Temporary Bridge (248'-4" x 48'-6")	0	SF	~~$ 250.00~~	
			Y10 - New Bridge (251'-9" x 53'-6") Tangent 350126	0	SF	$ 375.00	
			Y10 - Approach Slab (2 @ 25' x 50'-6")	0	SF	$ 50.00	
			Y10 - Bridge Removal	0	SF	$ 70.00	
			Y11 - New Bridge (340' x 53.08') Tangent 350133 (Steel)	0	SF	$ 375.00	
			Y11 - Approach Slab (2 @ 25' x 50'-8"')	0	SF	$ 50.00	
			Y11 - Bridge Removal	0	SF	$ 90.00	
			Y12 - Temporary Bridge (238'-6' x 35')	0	SF	~~$ 250.00~~	
			Y12 - New Bridge (250' x 53.08) Tangent 350136	0	SF	$ 375.00	
			Y12 - Approach Slab (2 @ 25' x 50.5')	0	SF	$ 50.00	
			Y12 - Bridge Removal	0	SF	$ 70.00	
			Y13 - New Bridge (242' x 50') Tangent 350142	12,100	SF	$ 300.00	$ 3,630,000.00
			Y13 - Approach Slab (2 @ 25' x 47')	2,350	SF	$ 50.00	$ 117,500.00
			Y13 - Bridge Removal	12,788	SF	$ 60.00	$ 767,307.60
			Y14 - New Bridge over I-85 (297' x 45'-6") Tangent 350146 (Steel)	0	SF	$ 375.00	
			Y14 - Approach Slab (31.07'x42.5) & (30.78"x42.5)	0	SF	$ 50.00	
			Y14 - Bridge Removal (Over I-85)	0	SF	$ 70.00	
			~~L- Retaining Walls - Highway (DELETED)~~	~~0~~	~~SF~~	~~$ -~~	
			L - Bridge Widening (NB - 871' x 20'; SB - 921' x 20') 350143	0	SF	$ 375.00	
			L - Approach Slab (4 @ 25' x20')	0	SF	$ 50.00	
			Railroad Structures				
			RR 350129 - Retaining Walls - Railroad	1,520	SF	$ 250.00	$ 380,000.00
			RR 350129 - Temporary Shoring - Railroad	7,000	SF	$ 130.00	$ 910,000.00
			RR 350129 - Temporary Railroad Bridge (312' x 12')	3,744	SF	$ 1,150.00	$ 4,305,600.00

			RR 350129 - Railroad Bridge (315' x 22')	6,930	SF	$ 1,050.00	$ 7,276,500.00
			RR 350129 - Existing Bridge Removal	4,310	SF	$ 85.00	$ 366,350.00
			RR 350129 - Temporary Bridge Removal	3,744	SF	$ 80.00	$ 299,520.00
			RR 350132 - Temporary Shoring - Railroad	7,500	SF	$ 130.00	$ 975,000.00
			RR 350132 - Railroad Bridge (328' x 50')	16,400	SF	$ 1,050.00	$ 17,220,000.00
			RR 350132 - Existing Bridge Removal	13,600	SF	$ 95.00	$ 1,292,000.00
			RR 350132 (Option 4A) - Retaining Walls - Railroad (Soil Nail w/2'-6" Reinf. Conc. Face)	6,000	SF	$ 300.00	$ 1,800,000.00
			RR 350132 (Option 4A) - Crash Wall - Railroad (3'-6" Thick)	1,200	SF	$ 300.00	$ 360,000.00
			RR 350132 (Option 4A) - Structure Adjustment - Remove Battered Piles	4	EA	$ 15,000.00	$ 60,000.00
			RR 350142 - Temporary Shoring - Railroad	4,740	SF	$ 130.00	$ 616,200.00
			RR 350142 - Railroad Bridge (263' x 38') Tangent	9,994	SF	$ 1,050.00	$ 10,493,700.00
			RR 350142 - Existing Bridge Removal	6,900	SF	$ 95.00	$ 655,500.00
			RR 350150 - Railroad Bridge (315' x 22') Tangent	0	SF	$ 1,050.00	
			RR 350150 - Pedestrian Bridge (315' x 16') Tangent	0	SF	$ 850.00	
			RR 350150 - Existing Bridge Removal	0	SF	$ 95.00	
			Retaining Walls - Railroad	5,300	SF	$ 200.00	$ 1,060,000.00
			Aesthetics (1%)	1	LS		$ 1,170,000.00
			Miscellaneous (15% Strs&Util)	1	LS		$ 9,209,000.00
			Miscellaneous (30% Roadway)	1	LS		$ 16,693,057.05

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Contract Cost ……..	……..	……..	$ 154,108,000.00
E. & C. 16% ……..	……..	……..	$ 24,692,000.00
Construction Cost ……..	……..	……..	**$ 178,800,000.00**
CMGC Factor (30%)			$ 53,600,000.00
Design Build Cost			**$ 232,400,000.00**

APPENDIX C: FINAL PROJECT RISK REGISTER

Risk Identification						Risk Assessment						
						Probability, (%)	Cost Impact ($)			Time Impact		
ID	Type	Category	Risk Event Name	Detailed Description of Risk Event	Risk Response	(Likelihood of occurrence)	Low	Most Likely	High	Low2	Most Likely2	High2
1	Threat	STR	Noise Wall	Determine noise wall locations early to help with ROW/Design	Noise walls due to residential areas	50%	$ 150,000.00	$ 150,000.00	$ 250,000.00	2	3	4
2	Threat	ENV	Additional Mitigation	Potential for additional community mitigation associated with closure of Groves Street and NS Rail at-grade crossing.		50%	$ 100,000.00	$ 250,000.00	$ 1,000,000.00			
3		ENV	Environmental Impacts	Additional environmental impacts due to design creep	Stay within study area and obey start/stop points; consider environmental risk if expanding footprint							
4	Threat	ENV	Sims Legion Park Landfill (1)	Settlement from additional fill placed on landfill, other utilities/drainage may encounter landfill materials (Geo-environmental)	Retaining Walls @ US 321/I-85 interchange (Sims Le gion Park)	10%						
5	Threat	ENV	Landfill	Sims Legion Park Landfill impact and unknown soil contamination waste.	Waste will be encountered. Amount depends on design. Disposal or dynamic compaction viable engineering options.	10%	$ 100,000.00	$ 100,000.00	$ 200,000.00			
6		ROW	ROW Delays (A)	Delayed parcel acquisitions or relocations impact construction schedule.	includes abatement, relocations, court delays for ROE, etc. Can't work around	10%				1	3	5
7		ROW	ROW Delays (B)	Delayed parcel acquisitions or relocations impact construction schedule.	includes abatement, relocations, court delays for ROE, etc. Can't work around	10%				1	3	5
8	Threat	ROW	ROW Costs (A)	ROW acquisition/relocation costs are higher than estimated e.g., due to condemnation, redevelopment, etc. 30% contingency removed from base estimate and replaced with this risk statement.	base includes 9 potential residential relocations; 5 potential business relocations	75%	$ 6,491,000.00	$ 12,982,000.00	$ 25,964,000.00			
9	Threat	ROW	ROW Costs (B)	ROW acquisition/relocation costs are higher than estimated e.g., due to condemnation, redevelopment, etc. 30% contingency removed from base estimate and replaced with this risk statement.	base includes 9 potential residential relocations; 5 potential business relocations	75%	$ 3,059,000.00	$ 6,118,000.00	$ 12,236,000.00			
10	Threat	ROW	ROW Costs (C)	ROW acquisition/relocation costs are higher than estimated e.g., due to condemnation, redevelopment, etc. 30% contingency removed from base estimate and replaced with this risk statement.	base includes 9 potential residential relocations; 5 potential business relocations	75%	$ 450,000.00	$ 900,000.00	$ 1,800,000.00	4	8	12
11	Threat	ROW	Additional ROW (A)	e.g., for access, temp easements, etc.	e.g., total take due to access impacts, etc. NCDOT attempts to avoid acquisitions wherever possible. Temp/permanent drainage easements have not been designed. up to 10 maybe residential ($300k each); 6-8 commercial with access changes - may get damages ($750k ea.); easements $500k. Includes for drainage. Coordination with signage,	50%	$ 1,298,000.00	$ 2,596,000.00	$ 5,193,000.00			
12	Threat	ROW	Additional ROW (B)	e.g., for access, temp easements, etc.	e.g., total take due to access impacts, etc. NCDOT attempts to avoid acquisitions wherever possible. Temp/permanent drainage easements have not been designed. up to 10 maybe residential ($300k each); 6-8 commercial with access changes - may get damages ($750k ea.); easements $500k. Includes for drainage. Coordination with signage,	50%	$ 612,000.00	$ 1,224,000.00	$ 2,447,000.00			
13	Threat	ROW	Additional ROW (C)	e.g., for access, temp easements, etc.	e.g., total take due to access impacts, etc. NCDOT attempts to avoid acquisitions wherever possible. Temp/permanent drainage easements have not been designed. up to 10 maybe residential ($300k each); 6-8 commercial with access changes - may get damages ($750k ea.); easements $500k. Includes for drainage. Coordination with signage, etc.	50%	$ 90,000.00	$ 180,000.00	$ 360,000.00			
14	Threat	ROW	Additional Abatement (A)	asbestos, lead paint, potential USTs for gas/fuel, etc. 3 hazardous waste sites (landfill - elsewhere), 2 USTs		50%	$ 162,000.00	$ 325,000.00	$ 649,000.00			
15	Threat	ROW	Additional Abatement (B)	asbestos, lead paint, potential USTs for gas/fuel, etc. 3 hazardous waste sites (landfill - elsewhere), 2 USTs		50%	$ 76,000.00	$ 153,000.00	$ 306,000.00			
16	Threat	ROW	Additional Abatement (C)	asbestos, lead paint, potential USTs for gas/fuel, etc. 3 hazardous waste sites (landfill - elsewhere), 2 USTs		50%	$ 12,000.00	$ 22,000.00	$ 45,000.00			
17		HYD	Flooding	Increased flooding of upstream buildings may be created by the causeway.	Conduct 2D analysis							
18		HYD	Drainage Impacts	Drainage impacts during construction; includes potential design changes and/or compensation for damages.								
19		HYD	Hydraulic Spread	There is 1 location where 6 lanes plus two 14ft shoulders (100ft) are draining to the median barrier near a sag location.	Hydraulic spread will be analyzed and considered during design.							
20	Threat	HYD	Small Cross Culverts (A)	Existing cross culverts (minor crossings < 30 sf opening) may require replacement (jack and bore) based on condition. Costs believed to be captured in base estimate (per mile), but some additional cost may be required.		25%	$ 112,000.00	$ 449,000.00	$ 673,000.00			
21	Threat	HYD	Small Cross Culverts (B)	Existing cross culverts (minor crossings < 30 sf opening) may require replacement (jack and bore) based on condition. Costs believed to be captured in base estimate (per mile), but some additional cost may be required.		25%	$ 91,000.00	$ 363,000.00	$ 545,000.00			
22	Threat	HYD	Small Cross Culverts (C)	Existing cross culverts (minor crossings < 30 sf opening) may require replacement (jack and bore) based on condition. Costs believed to be captured in base estimate (per mile), but some additional cost may be required.		25%	$ 47,000.00	$ 188,000.00	$ 282,000.00			
23	Threat	HYD	Culverts	Larger and/or additional culverts identified during final design	One location (Site 8 near Cox Road, Y-4/Y-11) has identified as requiring improvements to need design criteria (currently 54"; 300' at $400/lf). Design already accounts for 100 year level of service. Water quality criteria won't change and costs covered in base.	10%	$ 100,000.00	$ 250,000.00	$ 500,000.00			
24		HYD	Floodplain	Duharts Creek included in in FEMA study; impacts to Duharts Creek due to widening of Cox Rd could cause a CLOMR and adverse impacts to Commercial Properties	Completing preliminary modeling; Design Build Scope will request a drainage design that doesn't create a rise on any structures.							
25	Threat	HYD	Large Culverts	Existing Culvert Under Bridges @ 217 +/- Risk - Interference with foundations	Maybe run drainage parallel to I-85 to better crossin g point further upstream	80%	$ 2,000,000.00	$ 5,000,000.00	$ 10,000,000.00			
26	Threat	UTI	Colonial Pipeline	Colonial Pipeline may not have the staff to design/relocate the pipeline along NC 7 and under I-85. Potential opportunity to avoid impacts to Colonial Pipeline (primarily on east side).	Close coordination with Colonial Pipeline will be needed and has begun	30%	$ 3,000,000.00	$ 6,500,000.00	$ 10,000,000.00			
27	Threat	UTI	Kinder Morgan	Pipeline under/parallel to I-85 near Gastonia (Kinder Morgan). Minimal information has been provided by utility owner to date. No opportunity to avoid.	Close coordination with pipeline owner will be required.	50%	$ 5,000,000.00	$ 7,000,000.00	$ 9,000,000.00			
28	Threat	UTI	Material/Crews	Materials for water, sewer and utility lines (power, communication).	Larger scale items are not readily available. Ductile iron pipe has been difficult to obtain. Contractor's risk for material. Includes junction boxes, conduit, fiber, etc.	50%	$ 750,000.00	$ 1,000,000.00	$ 2,000,000.00	6	9	12

Risk Identification						Risk Assessment						
						Probability, (%)	Cost Impact ($)			Time Impact		
ID	Type	Category	Risk Event Name	Detailed Description of Risk Event	Risk Response	(Likelihood of occurrence)	Low	Most Likely	High	Low2	Most Likely2	High2
29	Threat	UTI	Unknown Utilities (A)	As a result of unknown utilities being discovered during construction delays to construction could be encountered.	Early identification and begin coordination with railroad.	75%	$ 1,000,000.00	$ 2,000,000.00	$ 4,000,000.00	3	6	12
30	Threat	UTI	Unknown Utilities (B)	As a result of unknown utilities being discovered during construction delays to construction could be encountered.	Early identification .	75%	$ 2,000,000.00	$ 4,000,000.00	$ 8,000,000.00	3	6	12
31	Threat	UTI	Unknown Utilities (C)	As a result of unknown utilities being discovered during construction delays to construction could be encountered.	Early identification and begin coordination with railroad.	75%	$ 250,000.00	$ 500,000.00	$ 1,000,000.00	3	9	12
32	Threat	SIG	ITS	The current Broadband fiber project is slated to install fiber through this corridor sometime in mid 2025 to mid 2026. The broadband project schedule has changed substantially and will likely change more in the future. Depending of the timing of I-5719 and the Broadband fiber project there is substantial risk to the schedule for both projects if they are not coordinated well. This opens the department up to potential construction delay costs from both projects as well as a substantial compensation event to the operations and maintenance contractor (OMC) that is maintaining and commercializing the Broadband fiber and conduit.	Close coordination with the Broadband Project Design-build team should be required of the I-5719 team to ensure that the conduit and fiber can be installed with no delay to either project. It must also be required of the I-5719 team that if the broadband fiber is installed before their construction starts or during their construction the conduit and fiber must remain operational and uncut for the duration of the project. If unforeseen conflicts come up during construction the I-5719 team must install new conduit and fiber and splice it over before removing the conflicting sections.	90%	$ 100,000.00	$ 2,500,000.00	$ 45,000,000.00	1	3	12
33		SIG	Broadband Late (B)	Broadband fiber project may be completed late, impacting the DB Contractor		30%				1	1	3
34		SIG	Broadband Late (C)	Broadband fiber project may be completed late, impacting the Contractor		30%				1	1	3
35	Threat	SIG	Broadband Damage (A)	Contractor damages Broadband fiber		10%	$ 45,000.00	$ 135,000.00	$ 449,000.00			
36	Threat	SIG	Broadband Damage (B)	Contractor damages Broadband fiber		10%	$ 36,000.00	$ 109,000.00	$ 363,000.00			
37	Threat	SIG	Broadband Damage (C)	Contractor damages Broadband fiber		10%	$ 19,000.00	$ 56,000.00	$ 188,000.00			
38	Threat	SIG	Contractor Caused Outage (A)	DB Contractor causes an outage of the Broadband fiber		15%	$ 449,000.00	$ 1,346,000.00	$ 2,244,000.00			
39	Threat	SIG	Contractor Caused Outage (B)	DB Contractor causes an outage of the Broadband fiber		15%	$ 363,000.00	$ 1,090,000.00	$ 1,817,000.00			
40	Threat	SIG	Contractor Caused Outage (C)	Contractor causes an outage of the Broadband fiber		15%	$ 188,000.00	$ 564,000.00	$ 939,000.00			
41	Threat	SIG	Lighting	base adjustment								
42	Threat	RDWY	Betterments (A)	Additional cost due to betterments following completion of community agreements (in addition to the 1% allowance included in the base estimate).	Will depend on municipality ability to fund. Division Engineer can request up to another 0.5%	30%	$ 553,000.00	$ 829,000.00	$ 1,382,000.00			
43	Threat	RDWY	Betterments (B)	Additional cost due to betterments following completion of community agreements (in addition to the 1% allowance included in the base estimate).	Will depend on municipality ability to fund. Division Engineer can request up to another 0.5%	30%	$ 447,000.00	$ 671,000.00	$ 1,118,000.00			
44		RDWY	Design Exceptions	All roadway designs are currently full standard with the exception for the rail road median piers encroaching into I-85 median shoulder. Design Exception Package is being prepared so that DB will need to meet or exceed.								
45		RDWY	Redesign	Delayed design completion due to need for redesign (e.g., due to the specific issues identified elsewhere).	Traffic analysis complete, IAR in works, sensitivity analysis completed,							
46	Threat	RDWY	Lowering of I-85 (A)	I-85 lowering assumed 1.5'; may need to lower up to 2.5'-3.0' to allow permanent bridge built at current elevation	Rail to allow DB Team to apply for ATC to leave new bridge with existing 16' clearance.	20%	$ 705,000.00	$ 1,762,000.00	$ 3,525,000.00			
47	Threat	RDWY	Lowering of I-85 (B)	I-85 lowering assumed 1.5'; may need to lower up to 2.5'-3.0' to allow permanent bridge built at current elevation	Rail to allow Team to apply for ATC to leave new bridge with existing 16' clearance.	20%	$ 295,000.00	$ 738,000.00	$ 1,475,000.00			
48		RDWY	Intersection Rollover	The current designs do not meet the current standard rollover for signalized intersections. The maximum allowed under the current Roadway Design Manual (RDM) is 3 percent for signalized intersections. The maximum allowable rollover in the I-5719/U-5800 design profile for all intersections was 5 percent. The quantities, ROW & costs could be impacted for the following intersections/interchanges: -Y7- Belmont Mt Holly Rd signal with -Y7RPB- -Y7- Belmont Mt Holly Rd freeflow right with -Y7RPC- (unsignalized but could change to signalized in the future) Both of these ramps are very long with max grades and max 5% rollovers currently. Revising to 3% will lengthen the ramps, raise the grades and push out slopes and easements.								
49	Threat	WZTC	Additional Temp Widening (A)	Additional temporary widening may be needed along I-85 to maintain traffic - especially in areas with even small grade changes.	Part of Final WZTC Designs.	100%	$ 898,000.00	$ 2,244,000.00	$ 3,590,000.00			
50	Threat	WZTC	Additional Temp Widening (B)	Additional temporary widening may be needed along I-85 to maintain traffic - especially in areas with even small grade changes.	Part of Final WZTC Designs.	100%	$ 727,000.00	$ 1,817,000.00	$ 2,907,000.00			
51	Threat	WZTC	Additional Temp Widening (C)	Additional temporary widening may be needed along I-85 to maintain traffic - especially in areas with even small grade changes.	Part of Final WZTC Designs.	100%	$ 375,000.00	$ 939,000.00	$ 1,503,000.00			
52	Threat	WZTC	Additional Temp Shoring (A)	Temporary shoring needs will be significant for constructing proposed bridges adjacent to existing structures and for partially constructing embankments and walls.	Part of Final WZTC Designs.	100%	$ 337,000.00	$ 673,000.00	$ 898,000.00			
53	Threat	WZTC	Additional Temp Shoring (B)	Temporary shoring needs will be significant for constructing proposed bridges adjacent to existing structures and for partially constructing embankments and walls.	Part of Final WZTC Designs.	100%	$ 273,000.00	$ 545,000.00	$ 727,000.00			
54	Threat	WZTC	Additional Temp Shoring (C)	Temporary shoring needs will be significant for constructing proposed bridges adjacent to existing structures and for partially constructing embankments and walls.	Part of Final WZTC Designs.	100%	$ 140,000.00	$ 282,000.00	$ 375,000.00			
55	Threat	WZTC	Y3/SR 279	Y3 (US 279) high level WZ complexity with DDI installation and staged bridge construction & removal.	Part of Final WZTC Designs.	100%	$ 300,000.00	$ 600,000.00	$ 800,000.00			
56	Threat	WZTC	Groves St. (A)	a) As a result of grade requirements under existing railroad bridge at Groves Street and required lowering of existing interstate pavement, work zone traffic control will be complex. b) Available area to temporarily shift traffic is restricted by existing piers (RR bridge at Groves Street). MOT Design will require exceptions to standard and preferred offsets to concrete barriers (PCB).	a) Ensure project access requirements are communicated clearly in project documents. b) Minimize length of minimal offsets. Coordination with WZTC Unit required for acceptance.	50%	$ 282,000.00	$ 352,000.00	$ 529,000.00			
57	Threat	WZTC	Groves St. (C)	a) As a result of grade requirements under existing railroad bridge at Groves Street and required lowering of existing interstate pavement, work zone traffic control will be complex. b) Available area to temporarily shift traffic is restricted by existing piers (RR bridge at Groves Street). MOT Design will require exceptions to standard and preferred offsets to concrete barriers (PCB).	a) Ensure project access requirements are communicated clearly in project documents. b) Minimize length of minimal offsets. Coordination with WZTC Unit required for acceptance.	50%	$ 118,000.00	$ 148,000.00	$ 221,000.00			
58	Threat	WZTC	Additional Temp Ramps (A)	Temporary ramps or ramp ties will be required at each on-site detour with ramps. Installing and/or removing may require ramp closures with off-site detours. Temporary ramps are likely to require a combination of temporary pavement, shoring and additional ROW / TCE.	Part of Final WZTC Designs.	100%	$ 955,000.00	$ 2,228,000.00	$ 4,456,000.00			

Risk Identification						Risk Assessment						
						Probability, (%)	Cost Impact ($)			Time Impact		
ID	Type	Category	Risk Event Name	Detailed Description of Risk Event	Risk Response	(Likelihood of occurrence)	Low	Most Likely	High	Low2	Most Likely2	High2
59	Threat	WZTC	Additional Temp Ramps (B)	Temporary ramps or ramp ties will be required at each on-site detour with ramps. Installing and/or removing may require ramp closures with off-site detours. Temporary ramps are likely to require a combination of temporary pavement, shoring and additional ROW / TCE.	Part of Final WZTC Designs.	100%	$ 545,000.00	$ 1,272,000.00	$ 2,544,000.00			
60	Threat	WZTC	Additional Temp Ramps (C)	Temporary ramps or ramp ties will be required at each on-site detour with ramps. Installing and/or removing may require ramp closures with off-site detours. Temporary ramps are likely to require a combination of temporary pavement, shoring and additional ROW / TCE.	Part of Final WZTC Designs.	100%						
61	Threat	WZTC	Y1/Y2/Y3 ramps	a) Ozark ramps undercut pavement so onsite MOT is extremely difficult. May need offsite. b) Ramp and loop closures may be required for construction at Y2. c) Y3 (US 279) closure required for reversing traffic. d) Ramp and loop closures will be required for construction at Y3.	a) Y2 - undercuts existing pavement - minimal offsite may be needed. May require full depth replacement for ramps only; offsite detour for ramps, etc. b) Part of Final WZTC Designs. c) Part of Final WZTC Designs. d) Part of Final WZTC Designs.	100%	$ 500,000.00	$ 750,000.00	$ 1,000,000.00			
62	Threat	WZTC	State Patrol (A)	State patrol support during construction to assist with traffic control / work zone safety enforcement. Roughly $70-$80/hr.	Primarily during offsite detours, lane closures, girder placement activities, etc. Should be covered in cost per mile. Risk of additional cost beyond per mile cost assumptions.	60%	$ 45,000.00	$ 135,000.00	$ 224,000.00			
63	Threat	WZTC	State Patrol (B)	State patrol support during construction to assist with traffic control / work zone safety enforcement. Roughly $70-$80/hr.	Primarily during offsite detours, lane closures, girder placement activities, etc. Should be covered in cost per mile. Risk of additional cost beyond per mile cost assumptions.	60%	$ 36,000.00	$ 109,000.00	$ 182,000.00			
64	Threat	WZTC	State Patrol (C)	State patrol support during construction to assist with traffic control / work zone safety enforcement. Roughly $70-$80/hr.	Primarily during offsite detours, lane closures, girder placement activities, etc. Should be covered in cost per mile. Risk of additional cost beyond per mile cost assumptions.	60%	$ 19,000.00	$ 56,000.00	$ 94,000.00			
65	Threat	STR	Additional Noise Walls (A)	Quantity of noise walls changing between TNR and DNR	Quantities are based on the TNR analysis. Assumed $60.00/SF. Risk has been reduced by modeling TNR to DNR standards. Risk could be further reduced by early identification of utility conflicts and whether noise walls are feasible to construct.	80%	$ 1,934,000.00	$ 2,763,000.00	$ 4,421,000.00			
66	Threat	STR	Additional Noise Walls (B)	Quantity of noise walls changing between TNR and DNR	Quantities are based on the TNR analysis. Assumed $60.00/SF. Risk has been reduced by modeling TNR to DNR standards. Risk could be further reduced by early identification of utility conflicts and whether noise walls are feasible to construct.	80%	$ 1,566,000.00	$ 2,237,000.00	$ 3,579,000.00			
67	Threat	STR	New bridge @ 240 EB	New Bridge @ Sta 240 +/- EB is in conflict with existing culvert	lengthen the span	10%	$ 100,000.00	$ 200,000.00	$ 300,000.00			
68	Threat	STR	RR bridge at 377+50	RR Bridge at Sta 377+50 +/- Keep or Replace								
69	Threat	STR	Deep Foundations	Additional stability for the Ozark railroad bridge	RR requirements for deep foundations as needed	50%	$ 100,000.00	$ 250,000.00	$ 500,000.00			
70	Threat	STR	Retaining Walls	Retaining Walls @ 179+40 +/-	Coordination for RR requirements to determine wal l types	75%	$ 50,000.00	$ 100,000.00	$ 150,000.00			
71	Threat	STR	Multi-use Paths	Multiuse Paths @ 217 +/-	At grade or subterranean	30%	$ 100,000.00	$ 150,000.00	$ 300,000.00			
72	Threat	STR	Bridge Rehab	Potential for additional bridge rehabilitation		25%	$ 500,000.00	$ 1,000,000.00	$ 2,000,000.00			
73	Threat	RAIL	NSR ROE	NSR right of entry agreement delay	Coordinate with NSR	50%	$ 1,500,000.00	$ 3,000,000.00	$ 4,500,000.00	1	2	3
74	Threat	RAIL	NSR Construction Agreement	If agreement with NSR is not reached on the design of the E. Ozark Ave railroad bridge, associated trackwork, and roles/responsibilities of the railroad, NCDOT and CMGC team the project may be delayed.	Coordination with NSR is ongoing to reach agreement on proposed design.	25%	$ 3,000,000.00	$ 9,000,000.00	$ 18,000,000.00	2	6	12
75	Threat	RAIL	P&N ROE	P&N right of entry agrement delay	Coordinate with P&N	25%	$ 750,000.00	$ 1,500,000.00	$ 3,000,000.00	0.5	1	2
76	Threat	RAIL	P&N Construction Agreement	If agreement with P&N is not reached on the impacts of bridge construction to P&N operations, the project may be delayed.	Coordination with P&N will be initiated to reach agreement on operational impacts.	15%	$ 3,000,000.00	$ 9,000,000.00	$ 18,000,000.00	2	6	12
77	Threat	RAIL	Railroad Work Restrictions	Railroad introduces additional work zone restrictions due to heavy rail traffic		50%	$ 4,500,000.00	$ 9,000,000.00	$ 13,500,000.00	3	6	9
78	Threat	RAIL	Railroad Staged Bridge Construction <combine with above>	As a result of partial existing railroad bridge demolition and staged bridge construction adjacent to active track, additional railroad review could occur leading to delay during the design process.	Coordination with the railroad at the NS at E. Ozark Ave location should occur to ensure requirements related to partial demolition, staged construction and requirements for construction related to active track are considered during design and captured in the project documents	80%	$ 150,000.00	$ 300,000.00	$ 450,000.00	1	2	3
79	Threat	RAIL	NSR Approval	NSR Approval of yard track relocation concept (East of E. Ozark)	Develop alternatives and provide to NSR review.	30%	$ 100,000.00	$ 200,000.00	$ 300,000.00	2	4	6
80	Opportunity	RAIL	Railroad	NCDOT possibly design the two NSR bridges to reduce risk.	Pursue this option with NSR after they have provided comments on the eastern bridge location (Groves St.)	10%	$ 50,000.00	$ 100,000.00	$ 150,000.00	3	6	9
81	Opportunity	RAIL	Railroad Crossing (1)	If at-grade crossing is closed NCDOT would not need to build a new at-grade crossing, saving money and improving safety.	NCDOT Rail EC&S branch to initiate crossing closure process to determine viability.	10%	$ -	$ 300,000.00	$ 500,000.00	0	3	6
82	Threat	RAIL	Railroad Crossing (2)	If at-grade crossing is left open NCDOT builds a new at-grade crossing	NCDOT Rail EC&S branch to initiate crossing closure process to determine viability.	90%	$ -	$ 400,000.00	$ 600,000.00	0	3	6
83	Threat	RAIL	Railroad Agreements	Getting agreements on concepts by March 2023 before it goes to Design Build.	Project Team is coordinating with Norfolk Southern, P&N to reach agreement on concepts by December 2022.	50%	$ 100,000.00	$ 200,000.00	$ 300,000.00	2	4	6
84		RAIL	Delayed Completion	If RR construction is delayed, could delay the viaduct construction, delaying bridge construction	Additional coordination with the RR is needed to understand the timeframes needed by the RR							
85	Threat	RAIL	Ozark Railyard	The existing Ozark rail yard will be relocated at project cost. The ultimate location has not been decided and a detailed cost estimate has not yet been developed.		75%	$ 500,000.00	$ 1,000,000.00	$ 2,000,000.00			
86	Opportunity	RAIL	Belmont Ped/Rail Structures	Base assumes combined structure at $700/sf. May be able to build separate structures for trail and rail (trolley)		65%	$ 1,500,000.00	$ 2,200,000.00	$ 3,000,000.00			

Risk Identification						Risk Assessment						
						Probability, (%)	Cost Impact ($)			Time Impact		
ID	Type	Category	Risk Event Name	Detailed Description of Risk Event	Risk Response	(Likelihood of occurrence)	Low	Most Likely	High	Low2	Most Likely2	High2
87	Threat	RAIL	Railroad Bridge Demolition	As a result of large existing railroad bridge foundations and unknown subsurface conditions, delays in removal of existing foundations or impacts to adjacent proposed foundations could occur and delay construction.	Consideration of existing bridge foundations should occur when proposed bridge spans and layouts are undertaken. Avoid placing new foundations adjacent to old ones. Additional borings may be considered to evaluate subsurface conditions.	20%	$ 100,000.00	$ 300,000.00	$ 400,000.00	1	2	3
88	Threat	RAIL	RR Shoring	As a result of variable subsurface geotechnical conditions in the project area, difficulty with shoring installation could occur that result in construction delays.	Additional borings could be considered in the limits of temporary railroad shoring to inform shoring selection and design. 3 locations will require temporary shoring (not P&N at Belmont).	20%	$ 100,000.00	$ 300,000.00	$ 400,000.00	1	2	3
89		RAIL	NSR Groves St.	Comments received that alter the design		30%				1	2	3
90		CON	Steel	Includes structural steel for bridges, rail/ties, overhead sign steel structures, sign sheeting, etc.		60%				0	1	3
91		CON	Labor	Crew availability, including for utility companies, have been difficult to find for HDD and aerial work.		30%				0	1	3
92		CON	Weather	TBD								
93		CON	Owner Changes	in the base								
94		CON	Work Restrictions	Unanticipated restrictions on construction activities (e.g., noise, vibration, allowable working hours)								
95	Threat	CON	Aggregate Minor Risks	Aggregate minor risks (based on specific quantified risks elsewhere in risk register that were not individually modeled).		50%		$ 2,500,000.00	$ 5,000,000.00	0	0	2
96		CON	Buy America	Impacts from pending Buy American provisions which will be adopted by FHWA in the coming months. Includes steel, iron, and manufactured products.								
97		CON	CEI Staff	Limited availability of construction inspectors to staff the project. Contract out to consultants. 10% carried for CE in the base estimate.								
98	Threat	CON	Construction Delays	Indirect cost of construction delays including compensable payments to the contractor and extended state construction engineering.		65%		$ 5,775,000.00	$ 33,000,000.00			
99	Threat	CON	Y7 Trail Ped Trail	Y7 Trail Ped Trail (at grade or subterranean; conflict with culvert)		10%	$ 50,000.00	$ 100,000.00	$ 150,000.00			
100		CON	Geotech investigation	GEU or PMU managed Consultants	GEU is more versed on managing geotechnical item s needed							
101	Threat	CON	Rock Obstructions	Bore and Jack may encounter rock	Existing Drainage Pipe Survey – Entire Project	40%	$ 100,000.00	$ 150,000.00	$ 300,000.00	2	3	4
102	Threat	CON	Subsurface	If adverse subsurface conditions are found there could be cost increases and delays. Include rock obstructions during jack and bore, etc.	Additional borings are planned to evaluate subsurface conditions	50%	$ 250,000.00	$ 500,000.00	$ 1,000,000.00	1	2	6
103		CON	DB Procurement	Delays to award of DB contract.	Procurement process has been extended from 6 months to 9 months (RFQ to NTP). Shortlist and issue first industry draft. First/second/final with addenda likely. This project is not abnormally complex. RFQ needed June 2023 to meet March 2024 NTP.							
104		CON	Misc Delays	Miscellaneous delays to contract award (e.g., due to discretionary DOT delays, funding, etc.).		10%				0	1	3
105	Threat	CON	Trucking (A)	Trucking cost increases		40%	$ 2,244,000.00	$ 5,386,000.00	$ 8,976,000.00			
106	Threat	CON	Trucking (B)	Trucking cost increases		40%	$ 1,817,000.00	$ 4,361,000.00	$ 7,268,000.00			
107	Threat	CON	Trucking (C)	Trucking cost increases		40%	$ 939,000.00	$ 2,253,000.00	$ 3,756,000.00			
108	Threat	CON	Bonding (A)	Bonding costs increase due to length of job		10%	$ 13,464,000.00	$ 17,952,000.00	$ 22,440,000.00			
109	Threat	CON	Bonding (B)	Bonding costs increase due to length of job		10%	$ 10,902,000.00	$ 14,536,000.00	$ 18,170,000.00			
110	Threat	CON	Bonding (C)	Bonding costs increase due to length of job		10%	$ 5,634,000.00	$ 7,512,000.00	$ 9,390,000.00			
111	Threat	CON	Inflation (A)	Escalation exceeds 4% in the base		50%	$ 8,289,000.00	$ 11,052,000.00	$ 24,867,000.00			
112	Threat	CON	Inflation (B)	Escalation exceeds 4% in the base		50%	$ 6,711,000.00	$ 8,948,000.00	$ 20,133,000.00			
113	Threat	CON	Inflation (C)	Escalation exceeds 4% in the base		25%	$ 5,000,000.00	$ 10,000,000.00	$ 15,000,000.00			
114	Threat	CON	Quantities (A)	Quantity growth during final design		90%	$ 4,973,000.00	$ 9,947,000.00	$ 13,815,000.00			
115	Threat	CON	Quantities (B)	Quantity growth during final design		90%	$ 4,027,000.00	$ 8,053,000.00	$ 11,185,000.00			
116	Threat	CON	Quantities (C)	Quantity growth during final design		25%	$ 1,000,000.00	$ 2,000,000.00	$ 5,000,000.00			
117	Threat	CON	External Factors (A)	External factors (e.g., events, environmental) require additional restrictions on DB work schedule		10%				1	2	3
118	Threat	CON	External Factors (B)	External factors (e.g., events, environmental) require additional restrictions on DB work schedule		10%				1	2	3
119	Threat	CON	External Factors (C)	External factors (e.g., events, environmental) require additional restrictions on work schedule		10%				1	2	3
120	Threat	CON	Submittal Reviews (A)	Submittal reviews take longer than planned, delaying DB (owner or third-party)		50%				1	2	6
121	Threat	CON	Submittal Reviews (B)	Submittal reviews take longer than planned, delaying DB (owner or third-party)		50%				1	2	6
122	Threat	CON	Poor Soils (A)	Bridge/wall foundations increase due to poor/unsuitable soils		40%	$ 449,000.00	$ 1,346,000.00	$ 2,693,000.00			
123	Threat	CON	Poor Soils (B)	Bridge/wall foundations increase due to poor/unsuitable soils		40%	$ 363,000.00	$ 1,090,000.00	$ 2,180,000.00			
124	Threat	CON	Poor Soils (C)	Bridge/wall foundations increase due to poor/unsuitable soils		40%	$ 188,000.00	$ 564,000.00	$ 1,127,000.00			
125	Threat	CON	RR Utilities	Utilities within RR row need additional effort/attention/coordination		50%	$ 1,000,000.00	$ 2,000,000.00	$ 3,000,000.00	2	4	6
126	Opportunity	CON	Span Re-Use	P&N Bridge - re-use spans on another structure								

APPENDIX D: CRYSTAL BALL PROBABILITY ANALYSIS

Crystal Ball Report - Full
Simulation started on 10/28/2024 at 8:59 AM
Simulation stopped on 10/28/2024 at 9:01 AM

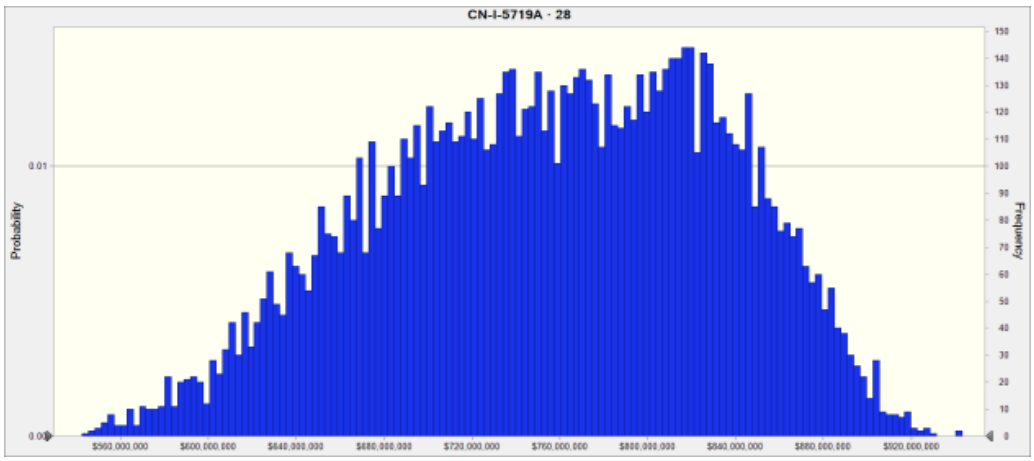
Run preferences:	
Number of trials run	10,000
Monte Carlo	
Random seed	
Precision control on	
Confidence level	95.00%
Run statistics:	
Total running time (sec)	87.42
Trials/second (average)	114
Random numbers per sec	10,752
Crystal Ball data:	
Assumptions	94
Correlations	0
Correlation matrices	0
Decision variables	0
Forecasts	25

Forecasts

Worksheet: [CSRAv71.3.0 NCDOT I-85 Revised Scope.xlsm]YOE

Forecast: CN-I-5719A · 28 **Cell: AD34**

Summary:
Entire range is from $530,789,430 to $943,174,311
Base case is $668,039,172
After 10,000 trials, the std. error of the mean is $770,511



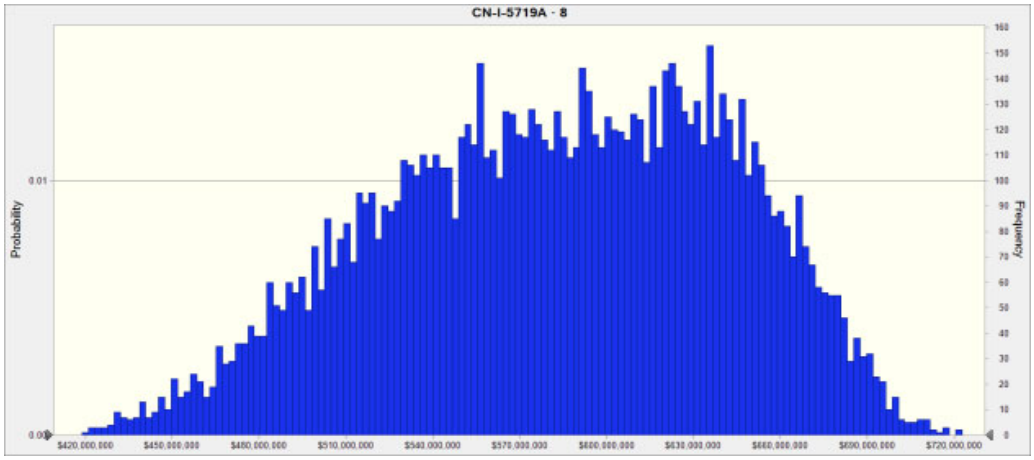
Statistics:	Forecast values
Trials	10,000
Base Case	$668,039,172
Mean	$755,293,710
Median	$759,671,334
Mode	---
Standard Deviation	$77,051,061
Variance	$5,936,866,049,119,460
Skewness	-0.2207
Kurtosis	2.30
Coeff. of Variation	0.1020
Minimum	$530,789,430
Maximum	$943,174,311
Range Width	$412,384,881
Mean Std. Error	$770,511

Forecast: CN-I-5719A · 28 (cont'd) **Cell: AD34**

Percentiles:	Forecast values
0%	$530,789,430
10%	$649,397,739
20%	$683,967,223
30%	$710,923,172
40%	$736,036,470
50%	$759,666,192
60%	$782,698,213
70%	$806,140,725
80%	$827,745,819
90%	$853,526,360
100%	$943,174,311

Forecast: CN-I-5719A · 8 **Cell: J34**

Summary:
Entire range is from $413,758,042 to $722,737,400
Base case is $519,403,257
After 10,000 trials, the std. error of the mean is $593,052



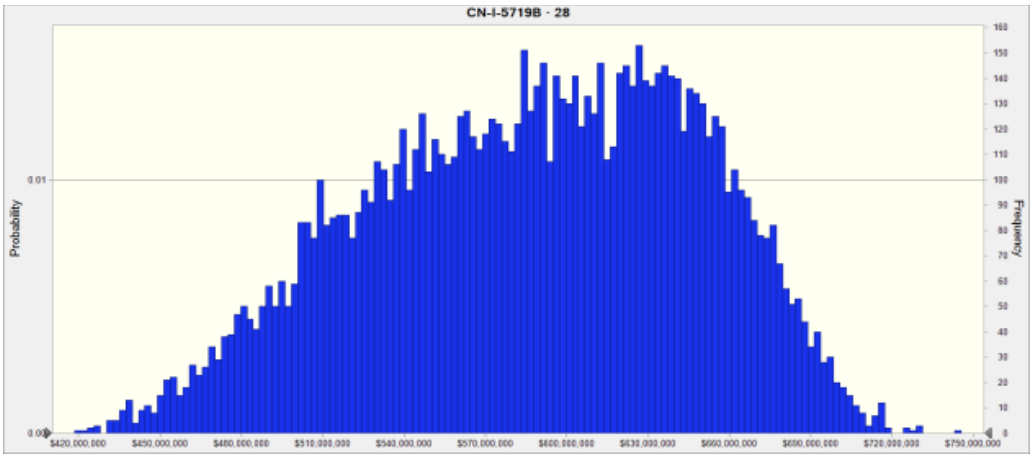
Statistics:	Forecast values
Trials	10,000
Base Case	$519,403,257
Mean	$582,719,485
Median	$586,123,767
Mode	---
Standard Deviation	$59,305,199
Variance	$3,517,106,574,354,590
Skewness	-0.2250
Kurtosis	2.30
Coeff. of Variation	0.1018
Minimum	$413,758,042
Maximum	$722,737,400
Range Width	$308,979,358
Mean Std. Error	$593,052

Forecast: CN-I-5719A · 8 (cont'd) **Cell: J34**

Percentiles:	Forecast values
0%	$413,758,042
10%	$501,218,499
20%	$527,947,520
30%	$549,190,835
40%	$567,893,992
50%	$586,101,728
60%	$604,081,089
70%	$621,850,720
80%	$638,684,783
90%	$658,311,950
100%	$722,737,400

Forecast: CN-I-5719B · 28 **Cell: AD36**

Summary:
Entire range is from $418,285,405 to $745,558,281
Base case is $516,175,550
After 10,000 trials, the std. error of the mean is $602,603



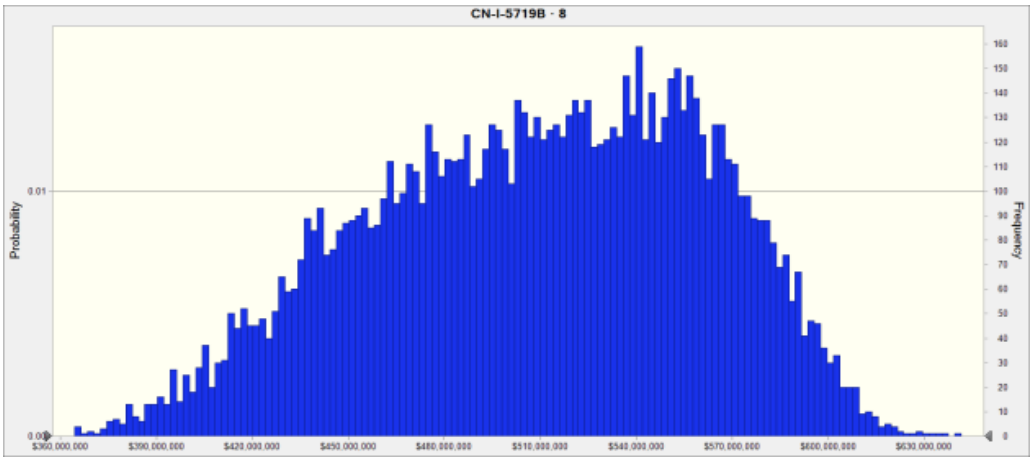
Statistics:	Forecast values
Trials	10,000
Base Case	$516,175,550
Mean	$587,308,047
Median	$591,273,038
Mode	---
Standard Deviation	$60,260,347
Variance	$3,631,309,409,155,800
Skewness	-0.2329
Kurtosis	2.28
Coeff. of Variation	0.1026
Minimum	$418,285,405
Maximum	$745,558,281
Range Width	$327,272,876
Mean Std. Error	$602,603

Forecast: CN-I-5719B · 28 (cont'd) **Cell: AD36**

Percentiles:	Forecast values
0%	$418,285,405
10%	$504,147,352
20%	$530,880,605
30%	$552,541,043
40%	$572,814,166
50%	$591,266,094
60%	$609,290,939
70%	$626,914,589
80%	$644,051,061
90%	$663,616,943
100%	$745,558,281

Forecast: CN-I-5719B · 8 **Cell: J36**

Summary:
Entire range is from $364,488,910 to $641,485,923
Base case is $449,967,080
After 10,000 trials, the std. error of the mean is $520,821



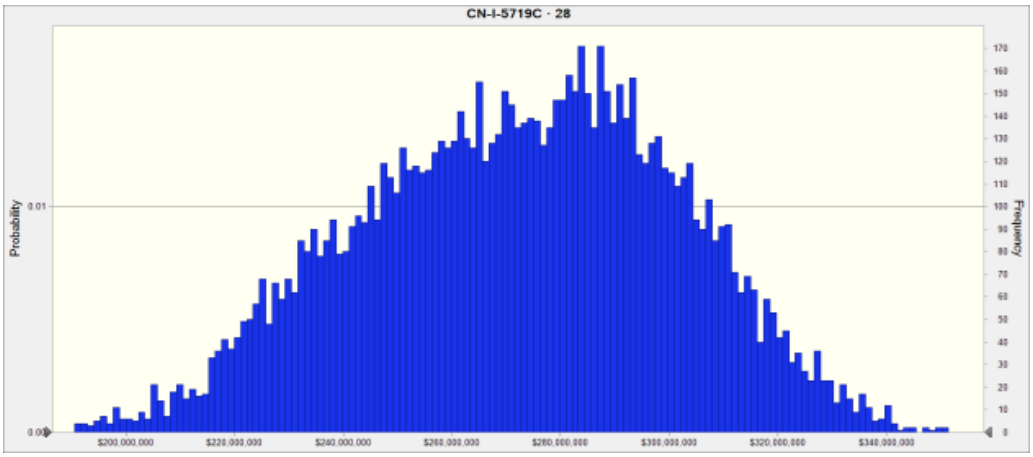
Statistics:	Forecast values
Trials	10,000
Base Case	$449,967,080
Mean	$508,834,305
Median	$512,637,201
Mode	---
Standard Deviation	$52,082,089
Variance	$2,712,544,022,742,300
Skewness	-0.2380
Kurtosis	2.28
Coeff. of Variation	0.1024
Minimum	$364,488,910
Maximum	$641,485,923
Range Width	$276,997,013
Mean Std. Error	$520,821

Forecast: CN-I-5719B · 8 (cont'd) **Cell: J36**

Percentiles:	Forecast values
0%	$364,488,910
10%	$436,735,083
20%	$460,100,960
30%	$478,800,781
40%	$496,369,809
50%	$512,628,061
60%	$527,979,106
70%	$543,096,445
80%	$557,726,286
90%	$574,980,404
100%	$641,485,923

Forecast: CN-I-5719C · 28 **Cell: AD38**

Summary:
Entire range is from $181,787,738 to $362,081,104
Base case is $230,780,293
After 10,000 trials, the std. error of the mean is $291,262



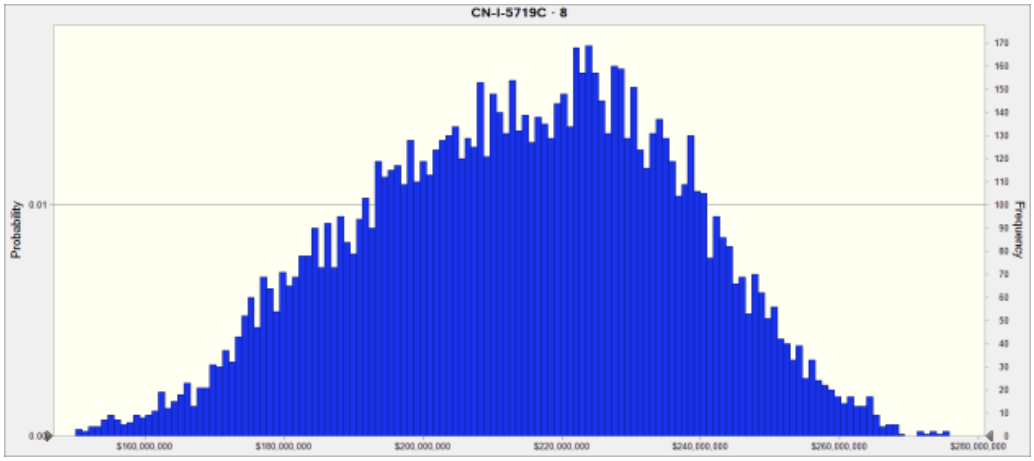
Statistics:	Forecast values
Trials	10,000
Base Case	$230,780,293
Mean	$272,132,455
Median	$273,718,834
Mode	---
Standard Deviation	$29,126,209
Variance	$848,336,067,881,021
Skewness	-0.1496
Kurtosis	2.50
Coeff. of Variation	0.1070
Minimum	$181,787,738
Maximum	$362,081,104
Range Width	$180,293,366
Mean Std. Error	$291,262

Forecast: CN-I-5719C · 28 (cont'd) **Cell: AD38**

Percentiles:	Forecast values
0%	$181,787,738
10%	$232,442,460
20%	$245,682,438
30%	$255,968,716
40%	$264,975,649
50%	$273,716,815
60%	$281,947,214
70%	$289,609,136
80%	$298,114,640
90%	$309,219,134
100%	$362,081,104

Forecast: CN-I-5719C · 8 **Cell: J38**

Summary:
Entire range is from $143,200,688 to $284,293,503
Base case is $182,986,112
After 10,000 trials, the std. error of the mean is $227,776



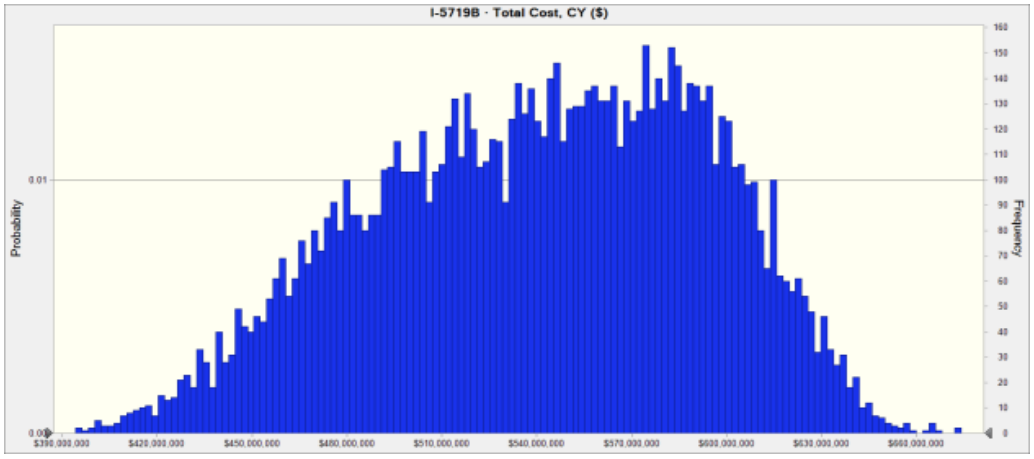
Statistics:	Forecast values
Trials	10,000
Base Case	$182,986,112
Mean	$213,838,008
Median	$214,983,977
Mode	---
Standard Deviation	$22,777,603
Variance	$518,819,198,136,097
Skewness	-0.1575
Kurtosis	2.48
Coeff. of Variation	0.1065
Minimum	$143,200,688
Maximum	$284,293,503
Range Width	$141,092,815
Mean Std. Error	$227,776

Forecast: CN-I-5719C · 8 (cont'd) **Cell: J38**

Percentiles:	Forecast values
0%	$143,200,688
10%	$182,682,456
20%	$193,280,605
30%	$201,175,875
40%	$208,343,331
50%	$214,981,524
60%	$221,666,334
70%	$227,642,207
80%	$234,280,283
90%	$242,718,258
100%	$284,293,503

Forecast: I-5719B · Total Cost, CY ($) **Cell: D46**

Summary:
Entire range is from $389,678,965 to $674,099,544
Base case is $474,362,082
After 10,000 trials, the std. error of the mean is $522,947



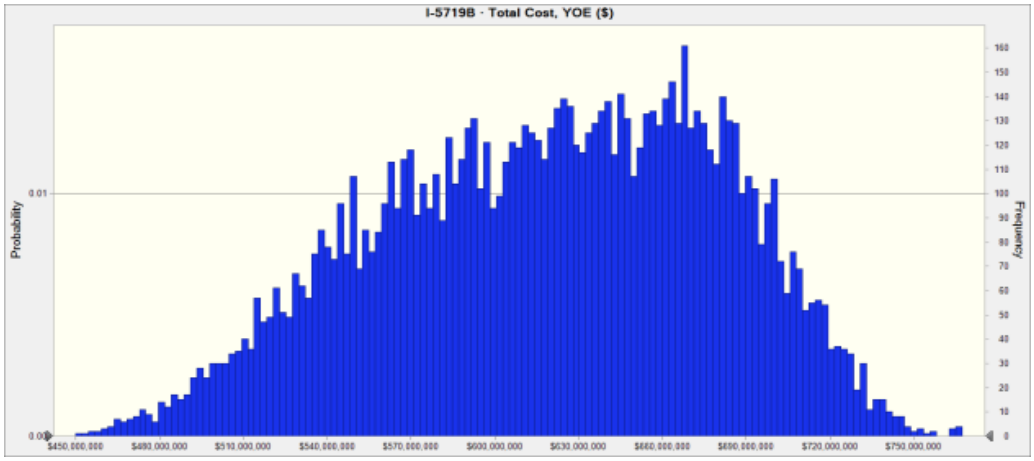
Statistics:	Forecast values
Trials	10,000
Base Case	$474,362,082
Mean	$540,689,334
Median	$544,559,269
Mode	---
Standard Deviation	$52,294,731
Variance	$2,734,738,842,291,690
Skewness	-0.2316
Kurtosis	2.29
Coeff. of Variation	0.0967
Minimum	$389,678,965
Maximum	$674,099,544
Range Width	$284,420,579
Mean Std. Error	$522,947

Forecast: I-5719B · Total Cost, CY ($) (cont'd) **Cell: D46**

Percentiles:	Forecast values
0%	$389,678,965
10%	$468,282,066
20%	$491,792,525
30%	$511,019,561
40%	$528,262,964
50%	$544,547,875
60%	$559,686,818
70%	$575,223,605
80%	$589,784,325
90%	$606,678,334
100%	$674,099,544

Forecast: I-5719B · Total Cost, YOE ($) **Cell: L46**

Summary:
Entire range is from $447,230,265 to $767,229,618
Base case is $540,570,552
After 10,000 trials, the std. error of the mean is $604,465



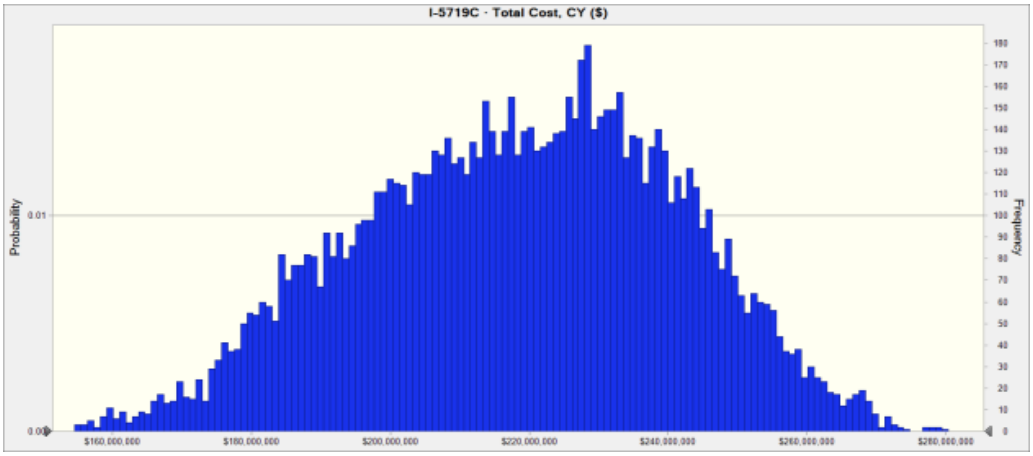
Statistics:	Forecast values
Trials	10,000
Base Case	$540,570,552
Mean	$619,163,077
Median	$623,418,016
Mode	---
Standard Deviation	$60,446,490
Variance	$3,653,778,135,894,200
Skewness	-0.2276
Kurtosis	2.29
Coeff. of Variation	0.0976
Minimum	$447,230,265
Maximum	$767,229,618
Range Width	$319,999,353
Mean Std. Error	$604,465

Forecast: I-5719B · Total Cost, YOE ($) (cont'd) **Cell: L46**

Percentiles:	Forecast values
0%	$447,230,265
10%	$535,828,306
20%	$562,675,887
30%	$584,497,943
40%	$604,995,261
50%	$623,412,561
60%	$641,206,338
70%	$659,083,749
80%	$675,738,695
90%	$695,798,374
100%	$767,229,618

Forecast: I-5719C · Total Cost, CY ($) **Cell: D47**

Summary:
Entire range is from $147,835,142 to $287,935,370
Base case is $186,573,613
After 10,000 trials, the std. error of the mean is $227,943



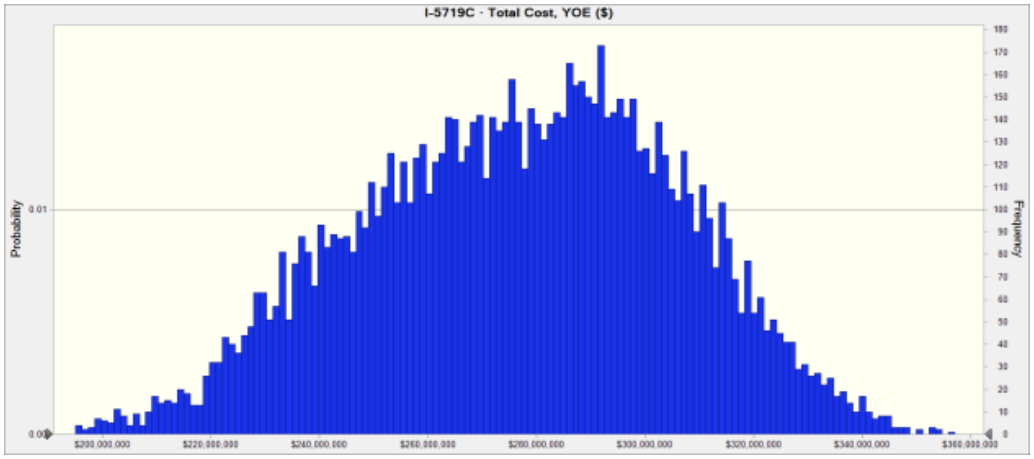
Statistics:	Forecast values
Trials	10,000
Base Case	$186,573,613
Mean	$218,340,968
Median	$219,540,910
Mode	---
Standard Deviation	$22,794,321
Variance	$519,581,090,721,722
Skewness	-0.1572
Kurtosis	2.48
Coeff. of Variation	0.1044
Minimum	$147,835,142
Maximum	$287,935,370
Range Width	$140,100,229
Mean Std. Error	$227,943

Forecast: I-5719C · Total Cost, CY ($) (cont'd) **Cell: D47**

Percentiles:	Forecast values
0%	$147,835,142
10%	$187,014,584
20%	$197,700,903
30%	$205,702,321
40%	$212,955,673
50%	$219,540,341
60%	$226,120,011
70%	$232,083,851
80%	$238,796,952
90%	$247,245,959
100%	$287,935,370

Forecast: I-5719C · Total Cost, YOE ($) **Cell: L47**

Summary:
Entire range is from $186,422,192 to $365,722,971
Base case is $234,367,794
After 10,000 trials, the std. error of the mean is $291,412



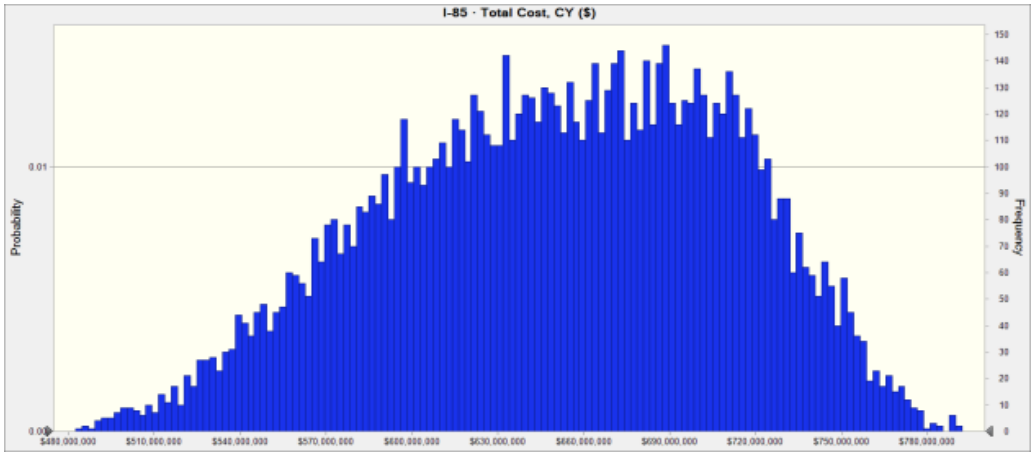
Statistics:	Forecast values
Trials	10,000
Base Case	$234,367,794
Mean	$276,635,415
Median	$278,157,313
Mode	---
Standard Deviation	$29,141,191
Variance	$849,209,001,909,876
Skewness	-0.1494
Kurtosis	2.49
Coeff. of Variation	0.1053
Minimum	$186,422,192
Maximum	$365,722,971
Range Width	$179,300,780
Mean Std. Error	$291,412

Forecast: I-5719C · Total Cost, YOE ($) (cont'd) **Cell: L47**

Percentiles:	Forecast values
0%	$186,422,192
10%	$236,972,420
20%	$250,127,598
30%	$260,521,349
40%	$269,541,165
50%	$278,149,715
60%	$286,405,200
70%	$294,090,225
80%	$302,694,577
90%	$313,739,369
100%	$365,722,971

Forecast: I-85 · Total Cost, CY ($) **Cell: D45**

Summary:
Entire range is from $469,344,651 to $792,091,359
Base case is $571,165,759
After 10,000 trials, the std. error of the mean is $600,416



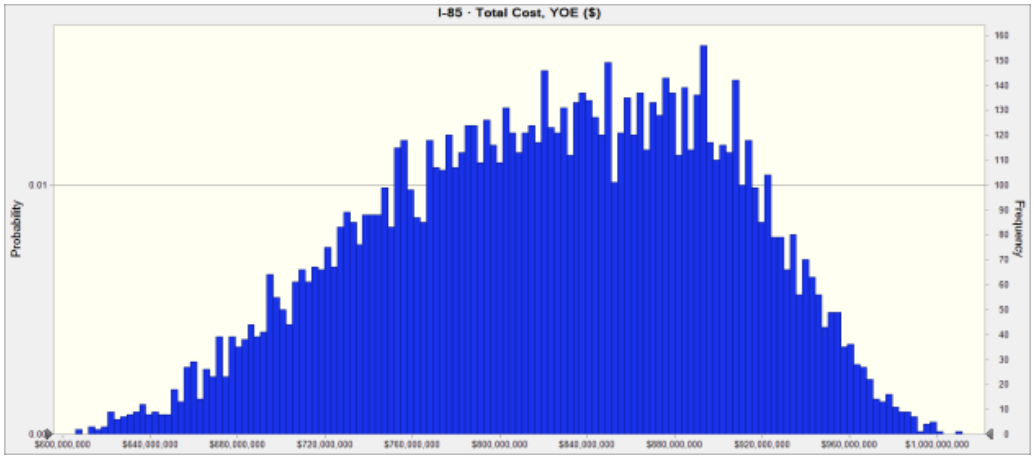
Statistics:	Forecast values
Trials	10,000
Base Case	$571,165,759
Mean	$650,638,456
Median	$654,137,702
Mode	---
Standard Deviation	$60,041,629
Variance	$3,604,997,187,760,540
Skewness	-0.2211
Kurtosis	2.34
Coeff. of Variation	0.0923
Minimum	$469,344,651
Maximum	$792,091,359
Range Width	$322,746,708
Mean Std. Error	$600,416

Forecast: I-85 · Total Cost, CY ($) (cont'd) **Cell: D45**

Percentiles:	Forecast values
0%	$469,344,651
10%	$567,785,063
20%	$595,567,856
30%	$616,876,128
40%	$635,876,057
50%	$654,132,836
60%	$671,830,131
70%	$689,109,793
80%	$706,989,556
90%	$726,552,405
100%	$792,091,359

Forecast: I-85 · Total Cost, YOE ($) **Cell: L45**

Summary:
Entire range is from $592,122,604 to $1,011,481,271
Base case is $719,801,674
After 10,000 trials, the std. error of the mean is $776,183



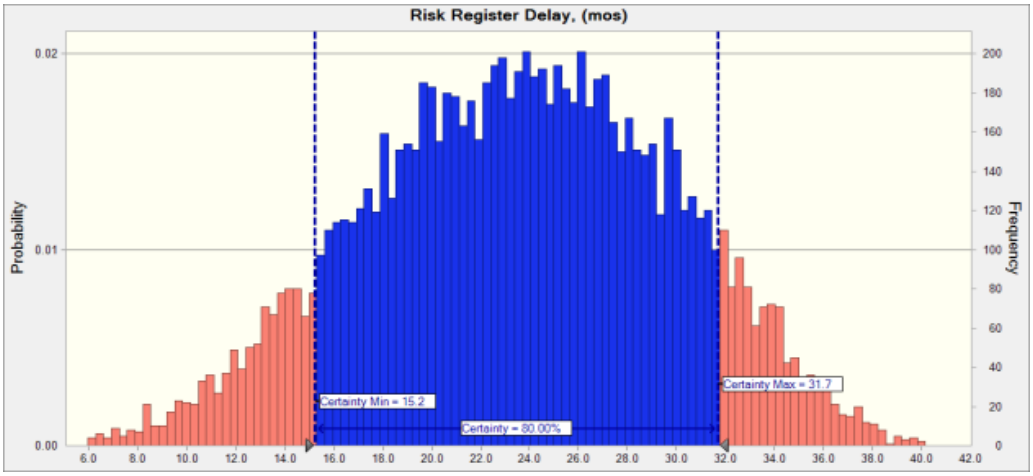
Statistics:	Forecast values
Trials	10,000
Base Case	$719,801,674
Mean	$823,212,681
Median	$827,702,800
Mode	---
Standard Deviation	$77,618,335
Variance	$6,024,605,979,270,680
Skewness	-0.2189
Kurtosis	2.33
Coeff. of Variation	0.0943
Minimum	$592,122,604
Maximum	$1,011,481,271
Range Width	$419,358,667
Mean Std. Error	$776,183

Forecast: I-85 · Total Cost, YOE ($) (cont'd) **Cell: L45**

Percentiles:	Forecast values
0%	$592,122,604
10%	$716,336,602
20%	$751,830,331
30%	$779,185,731
40%	$803,999,215
50%	$827,684,974
60%	$850,167,397
70%	$873,666,566
80%	$895,345,230
90%	$921,868,573
100%	$1,011,481,271

Forecast: Risk Register Delay, (mos) **Cell: C13**

Summary:
Certainty level is 80.00%
Certainty range is from 15.2 to 31.7
Entire range is from 1.4 to 42.5
Base case is 6.8
After 10,000 trials, the std. error of the mean is 0.1



Statistics:	Forecast values
Trials	10,000
Base Case	6.8
Mean	23.5
Median	23.7
Mode	---
Standard Deviation	6.3
Variance	39.5
Skewness	-0.1198
Kurtosis	2.57
Coeff. of Variation	0.2669
Minimum	1.4
Maximum	42.5
Range Width	41.1
Mean Std. Error	0.1

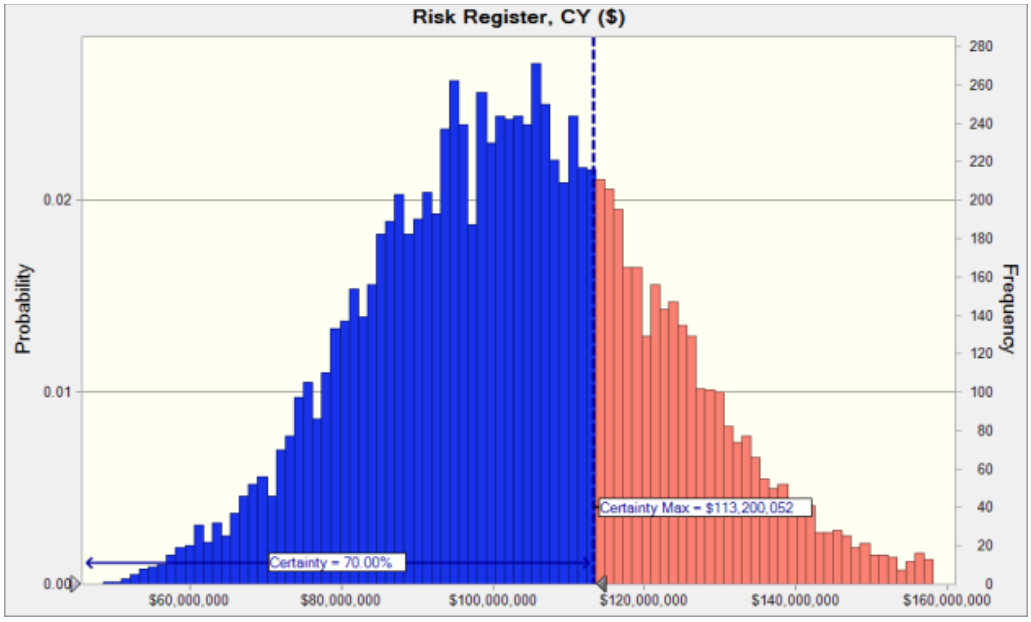
Forecast: Risk Register Delay, (mos) (cont'd) **Cell: C13**

Percentiles:	Forecast values
0%	1.4
10%	15.2
20%	18.0
30%	20.0
40%	22.0
50%	23.7
60%	25.4
70%	27.2
80%	29.2
90%	31.7
100%	42.5

Forecast: Risk Register, CY ($) **Cell: C15**

Current Year: Cost Risks

Summary:
Certainty level is 70.00%
Certainty range is from -∞ to $113,200,052
Entire range is from $31,574,943 to $172,831,177
Base case is $36
After 10,000 trials, the std. error of the mean is $195,928



Statistics:	Forecast values
Trials	10,000
Base Case	$36
Mean	$103,326,690
Median	$102,953,164
Mode	---
Standard Deviation	$19,592,819
Variance	$383,878,555,975,170
Skewness	0.1617
Kurtosis	2.98
Coeff. of Variation	0.1896
Minimum	$31,574,943
Maximum	$172,831,177
Range Width	$141,256,234
Mean Std. Error	$195,928

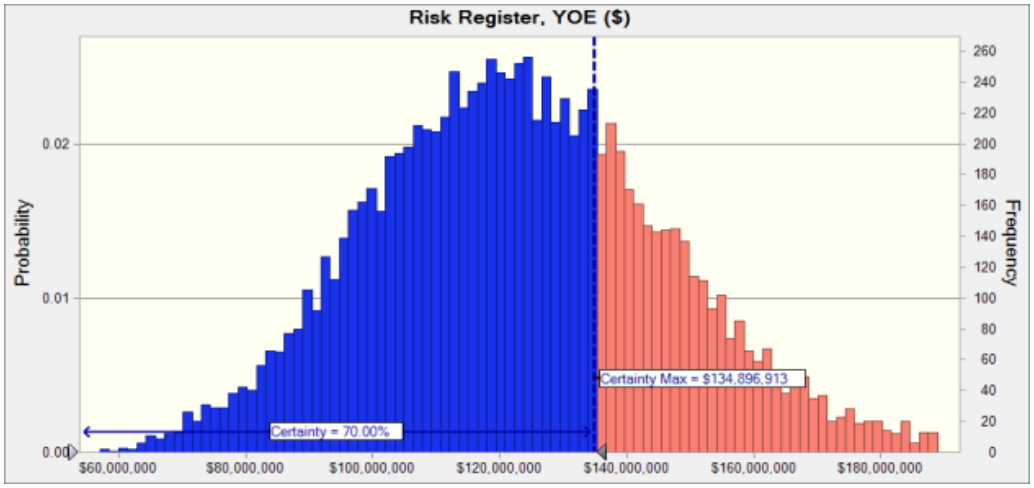
Forecast: Risk Register, CY ($) (cont'd) **Cell: C15**

Percentiles:	Forecast values
0%	$31,574,943
10%	$78,677,785
20%	$86,484,072
30%	$92,736,409
40%	$97,962,215
50%	$102,950,953
60%	$107,698,106
70%	$113,200,052
80%	$119,518,612
90%	$128,586,574
100%	$172,831,177

Forecast: Risk Register, YOE ($) **Cell: C18**

YOE: Cost Risks

Summary:
Certainty level is 70.00%
Certainty range is from -∞ to $134,896,913
Entire range is from $38,908,392 to $207,951,529
Base case is $44
After 10,000 trials, the std. error of the mean is $235,368



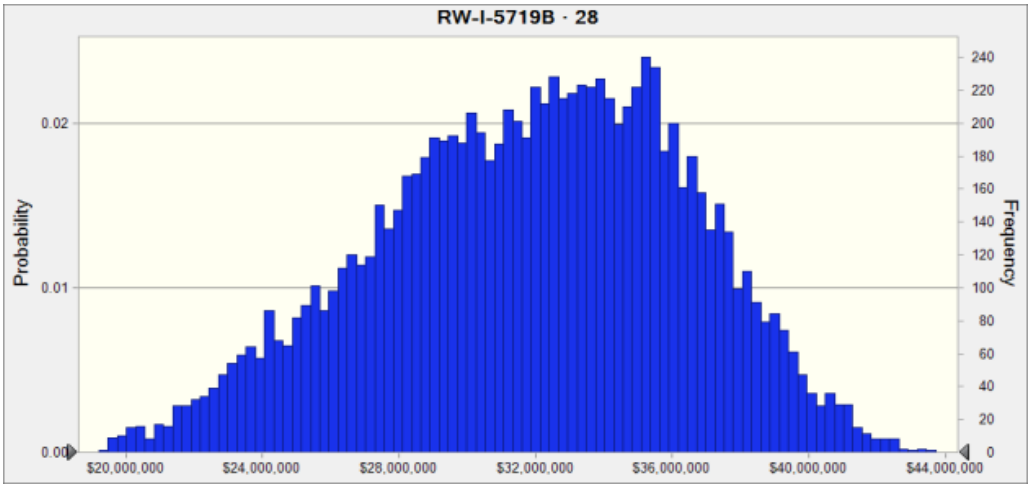
Statistics:	Forecast values
Trials	10,000
Base Case	$44
Mean	$123,051,961
Median	$122,282,307
Mode	---
Standard Deviation	$23,536,802
Variance	$553,981,033,213,127
Skewness	0.2019
Kurtosis	3.00
Coeff. of Variation	0.1913
Minimum	$38,908,392
Maximum	$207,951,529
Range Width	$169,043,137
Mean Std. Error	$235,368

Forecast: Risk Register, YOE ($) (cont'd) **Cell: C18**

Percentiles:	Forecast values
0%	$38,908,392
10%	$93,463,272
20%	$102,858,680
30%	$110,066,955
40%	$116,386,473
50%	$122,280,130
60%	$128,300,068
70%	$134,896,913
80%	$142,488,517
90%	$153,433,686
100%	$207,951,529

Forecast: RW-I-5719B · 28 **Cell: AD35**

Summary:
Entire range is from $18,834,049 to $43,718,642
Base case is $24,395,001
After 10,000 trials, the std. error of the mean is $45,138



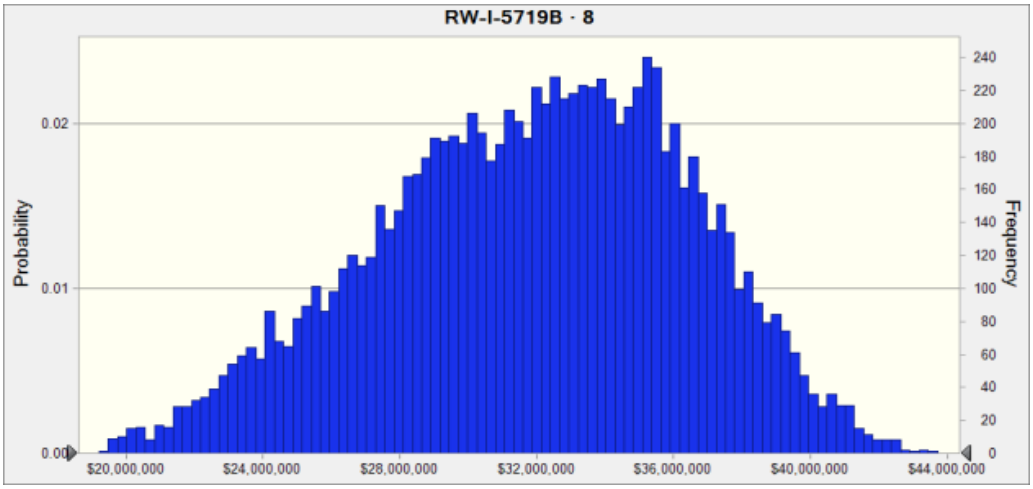
Statistics:	Forecast values
Trials	10,000
Base Case	$24,395,001
Mean	$31,855,029
Median	$32,167,121
Mode	---
Standard Deviation	$4,513,778
Variance	$20,374,190,280,887
Skewness	-0.2423
Kurtosis	2.52
Coeff. of Variation	0.1417
Minimum	$18,834,049
Maximum	$43,718,642
Range Width	$24,884,593
Mean Std. Error	$45,138

Forecast: RW-I-5719B · 28 (cont'd) **Cell: AD35**

Percentiles:	Forecast values
0%	$18,834,049
10%	$25,588,967
20%	$27,902,077
30%	$29,438,591
40%	$30,827,536
50%	$32,166,839
60%	$33,401,440
70%	$34,644,802
80%	$35,874,392
90%	$37,508,506
100%	$43,718,642

Forecast: RW-I-5719B · 8 **Cell: J35**

Summary:
Entire range is from $18,834,049 to $43,718,642
Base case is $24,395,001
After 10,000 trials, the std. error of the mean is $45,138



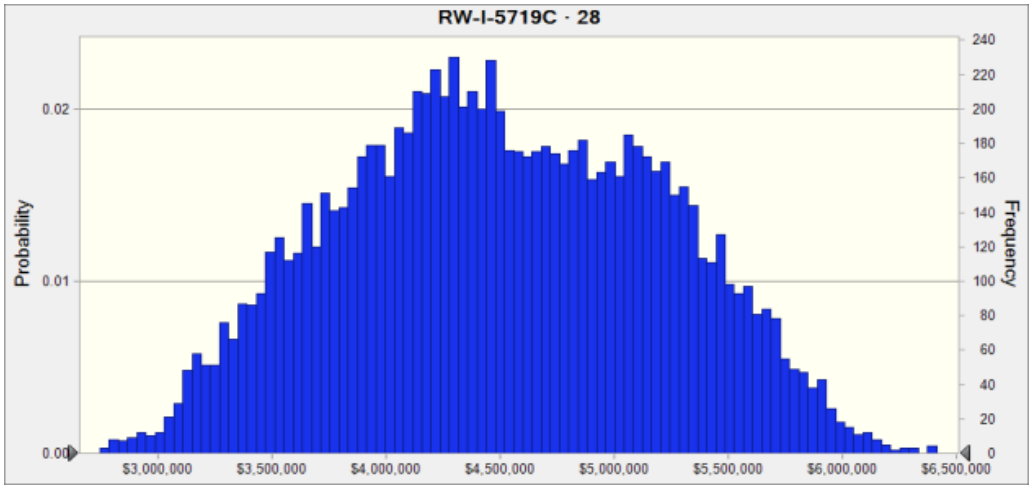
Statistics:	Forecast values
Trials	10,000
Base Case	$24,395,001
Mean	$31,855,029
Median	$32,167,121
Mode	---
Standard Deviation	$4,513,778
Variance	$20,374,190,280,887
Skewness	-0.2423
Kurtosis	2.52
Coeff. of Variation	0.1417
Minimum	$18,834,049
Maximum	$43,718,642
Range Width	$24,884,593
Mean Std. Error	$45,138

Forecast: RW-I-5719B · 8 (cont'd) **Cell: J35**

Percentiles:	Forecast values
0%	$18,834,049
10%	$25,588,967
20%	$27,902,077
30%	$29,438,591
40%	$30,827,536
50%	$32,166,839
60%	$33,401,440
70%	$34,644,802
80%	$35,874,392
90%	$37,508,506
100%	$43,718,642

Forecast: RW-I-5719C · 28 **Cell: AD37**

Summary:
Entire range is from $2,747,588 to $6,414,167
Base case is $3,587,501
After 10,000 trials, the std. error of the mean is $6,997



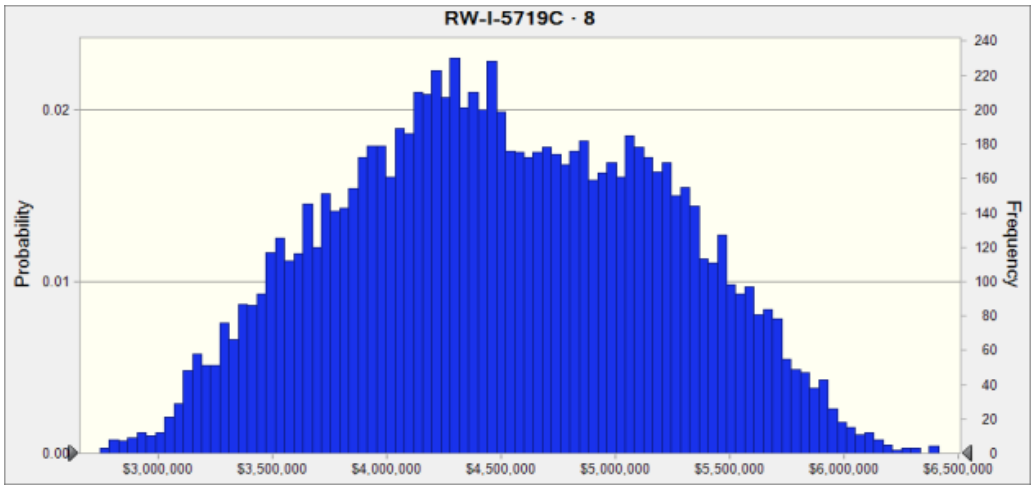
Statistics:	Forecast values
Trials	10,000
Base Case	$3,587,501
Mean	$4,502,960
Median	$4,473,920
Mode	---
Standard Deviation	$699,680
Variance	$489,552,685,011
Skewness	0.0318
Kurtosis	2.27
Coeff. of Variation	0.1554
Minimum	$2,747,588
Maximum	$6,414,167
Range Width	$3,666,579
Mean Std. Error	$6,997

Forecast: RW-I-5719C · 28 (cont'd) **Cell: AD37**

Percentiles:	Forecast values
0%	$2,747,588
10%	$3,562,524
20%	$3,864,419
30%	$4,092,745
40%	$4,284,797
50%	$4,473,853
60%	$4,701,142
70%	$4,930,954
80%	$5,165,452
90%	$5,445,672
100%	$6,414,167

Forecast: RW-I-5719C · 8 **Cell: J37**

Summary:
Entire range is from $2,747,588 to $6,414,167
Base case is $3,587,501
After 10,000 trials, the std. error of the mean is $6,997



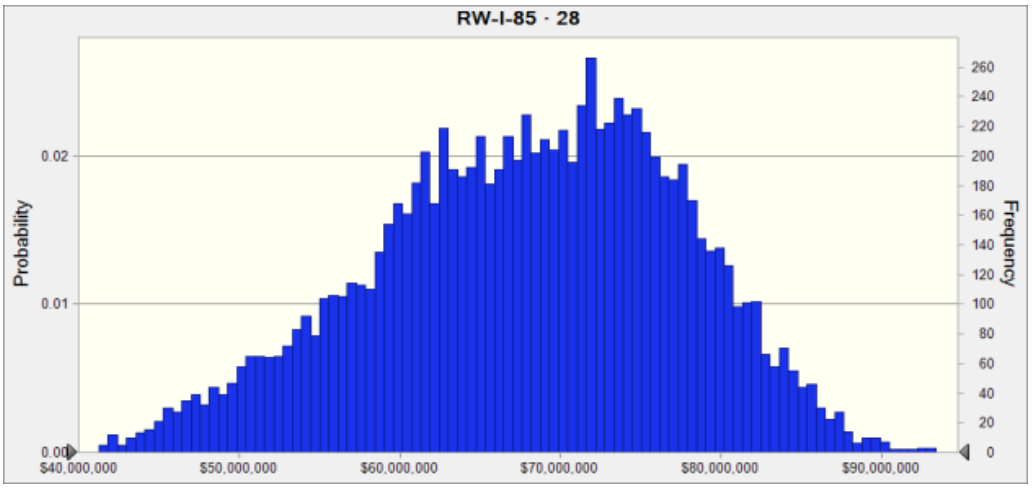
Statistics:	Forecast values
Trials	10,000
Base Case	$3,587,501
Mean	$4,502,960
Median	$4,473,920
Mode	---
Standard Deviation	$699,680
Variance	$489,552,685,011
Skewness	0.0318
Kurtosis	2.27
Coeff. of Variation	0.1554
Minimum	$2,747,588
Maximum	$6,414,167
Range Width	$3,666,579
Mean Std. Error	$6,997

Forecast: RW-I-5719C · 8 (cont'd) **Cell: J37**

Percentiles:	Forecast values
0%	$2,747,588
10%	$3,562,524
20%	$3,864,419
30%	$4,092,745
40%	$4,284,797
50%	$4,473,853
60%	$4,701,142
70%	$4,930,954
80%	$5,165,452
90%	$5,445,672
100%	$6,414,167

Forecast: RW-I-85 · 28 **Cell: AD33**

Summary:
Entire range is from $39,825,380 to $93,391,943
Base case is $51,762,501
After 10,000 trials, the std. error of the mean is $95,219



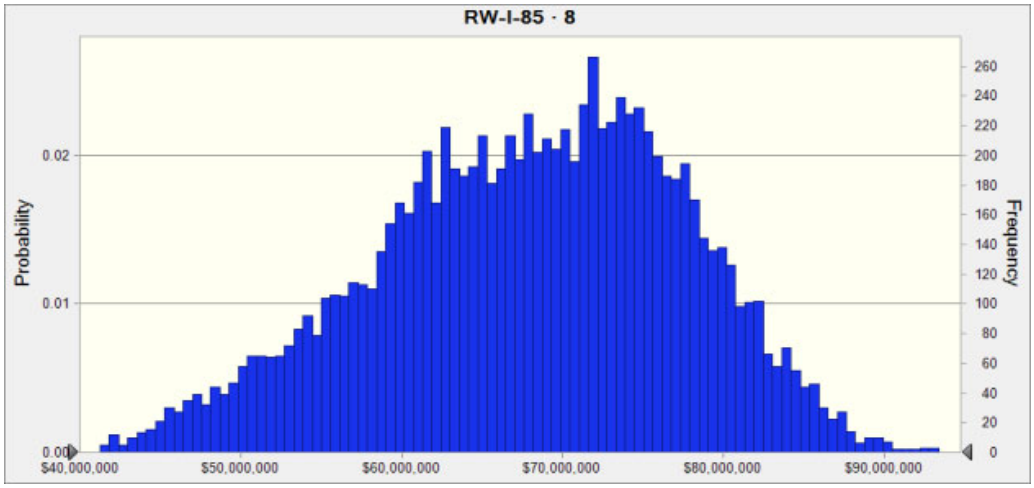
Statistics:	Forecast values
Trials	10,000
Base Case	$51,762,501
Mean	$67,918,972
Median	$68,585,058
Mode	---
Standard Deviation	$9,521,857
Variance	$90,665,757,905,552
Skewness	-0.2671
Kurtosis	2.58
Coeff. of Variation	0.1402
Minimum	$39,825,380
Maximum	$93,391,943
Range Width	$53,566,563
Mean Std. Error	$95,219

Forecast: RW-I-85 · 28 (cont'd) **Cell: AD33**

Percentiles:	Forecast values
0%	$39,825,380
10%	$54,842,165
20%	$59,705,365
30%	$62,866,995
40%	$65,828,179
50%	$68,578,074
60%	$71,337,463
70%	$73,737,810
80%	$76,383,710
90%	$79,819,744
100%	$93,391,943

Forecast: RW-I-85 · 8 **Cell: J33**

Summary:
Entire range is from $39,825,380 to $93,391,943
Base case is $51,762,501
After 10,000 trials, the std. error of the mean is $95,219



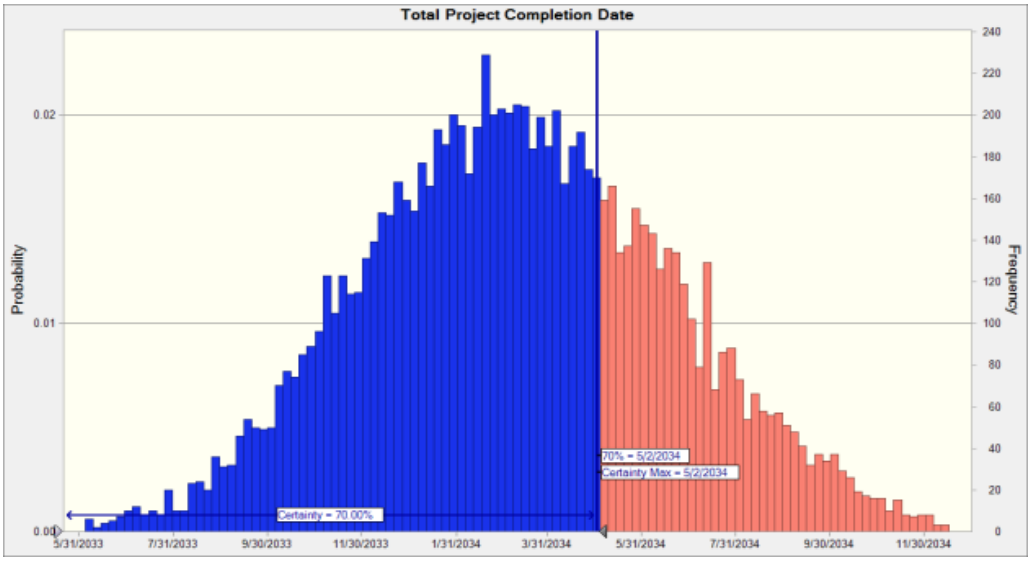
Statistics:	Forecast values
Trials	10,000
Base Case	$51,762,501
Mean	$67,918,972
Median	$68,585,058
Mode	---
Standard Deviation	$9,521,857
Variance	$90,665,757,905,552
Skewness	-0.2671
Kurtosis	2.58
Coeff. of Variation	0.1402
Minimum	$39,825,380
Maximum	$93,391,943
Range Width	$53,566,563
Mean Std. Error	$95,219

Forecast: RW-I-85 · 8 (cont'd) **Cell: J33**

Percentiles:	Forecast values
0%	$39,825,380
10%	$54,842,165
20%	$59,705,365
30%	$62,866,995
40%	$65,828,179
50%	$68,578,074
60%	$71,337,463
70%	$73,737,810
80%	$76,383,710
90%	$79,819,744
100%	$93,391,943

Forecast: Total Project Completion Date **Cell: C20**

Summary:
Certainty level is 70.00%
Certainty range is from -∞ to 5/2/2034
Entire range is from 4/8/2033 to 1/18/2035
Base case is 10/25/2033
After 10,000 trials, the std. error of the mean is 1.00



Statistics:	Forecast values
Trials	10,000
Base Case	10/25/2033
Mean	3/11/2034
Median	3/8/2034
Mode	---
Standard Deviation	100.12
Variance	10,024.74
Skewness	0.0551
Kurtosis	2.78
Coeff. of Variation	0.0020
Minimum	4/8/2033
Maximum	1/18/2035
Range Width	649.97
Mean Std. Error	1.00

Forecast: Total Project Completion Date (cont'd) **Cell: C20**

Percentiles:	Forecast values
0%	4/8/2033
10%	11/3/2033
20%	12/15/2033
30%	1/16/2034
40%	2/12/2034
50%	3/8/2034
60%	4/4/2034
70%	5/2/2034
80%	6/5/2034
90%	7/21/2034
100%	1/18/2035

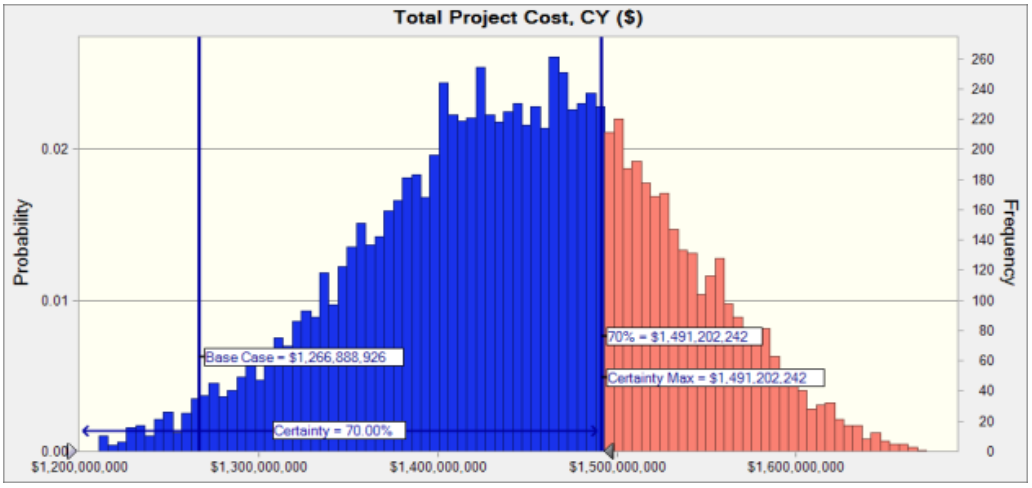
Forecast: Total Project Cost, CY ($) **Cell: C16**

Current Year: Base Variability + Market Conditions+Risks+Prior+Fixed

Note: Includes base costs, prior costs, fixed costs, and risks

Summary:

Certainty level is 70.00%
Certainty range is from -∞ to $1,491,202,242
Entire range is from $1,155,032,359 to $1,709,089,408
Base case is $1,266,888,926
After 10,000 trials, the std. error of the mean is $834,083



Statistics:	Forecast values
Trials	10,000
Base Case	$1,266,888,926
Mean	$1,444,456,231
Median	$1,446,924,851
Mode	---
Standard Deviation	$83,408,290
Variance	$6,956,942,860,678,930
Skewness	-0.1637
Kurtosis	2.76
Coeff. of Variation	0.0577
Minimum	$1,155,032,359
Maximum	$1,709,089,408
Range Width	$554,057,048
Mean Std. Error	$834,083

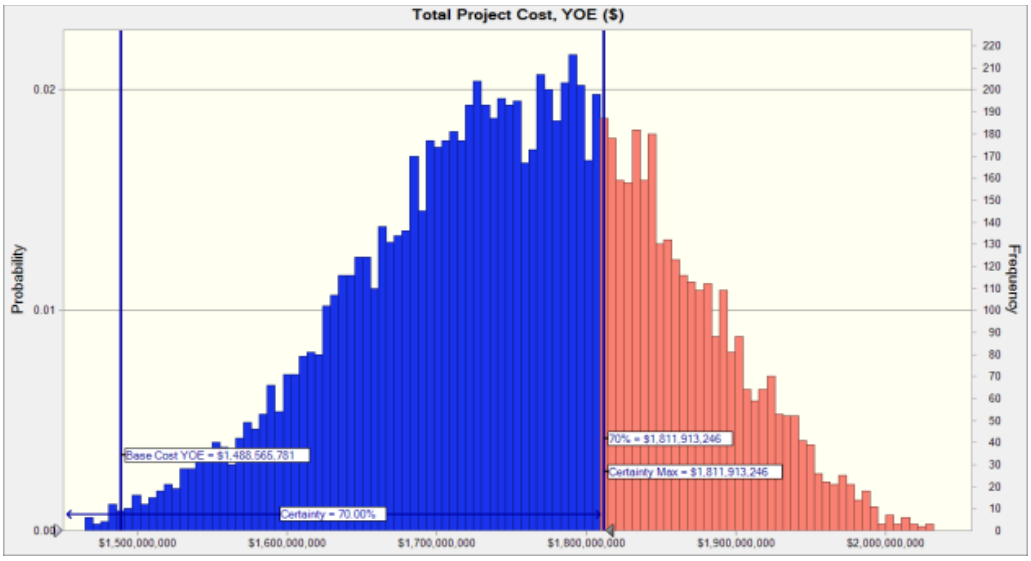
Forecast: Total Project Cost, CY ($) (cont'd) **Cell: C16**

Percentiles:	Forecast values
0%	$1,155,032,359
10%	$1,334,695,716
20%	$1,373,815,895
30%	$1,401,725,133
40%	$1,424,074,461
50%	$1,446,919,192
60%	$1,468,952,791
70%	$1,491,202,242
80%	$1,516,614,214
90%	$1,552,031,131
100%	$1,709,089,408

Forecast: Total Project Cost, YOE ($) **Cell: C21**

YOE: Base Variability + Market Conditions+Risks+Prior+Fixed
Note: Base Cost YOE on Crystal Ball chart is now automatically updated with new value.
Note: Includes base costs, prior costs, fixed costs, and YOE Costs (base costs adjusted for market conditions and risks) inflated to YOE.

Summary:
Certainty level is 70.00%
Certainty range is from -∞ to $1,811,913,246
Entire range is from $1,403,689,227 to $2,065,164,887
Base case is $1,529,527,492
After 10,000 trials, the std. error of the mean is $1,031,903



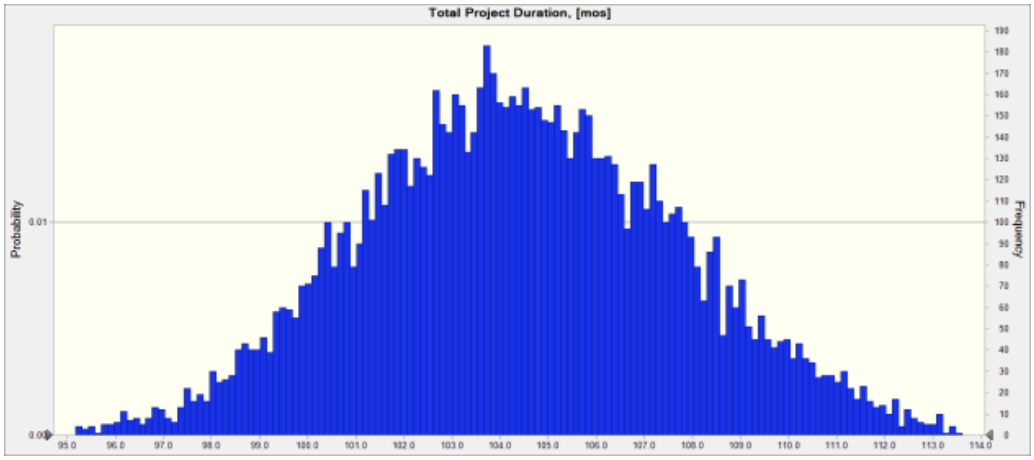
Statistics:	Forecast values
Trials	10,000
Base Case	$1,529,527,492
Mean	$1,753,798,645
Median	$1,756,577,137
Mode	---
Standard Deviation	$103,190,296
Variance	$10,648,237,224,360,500
Skewness	-0.1650
Kurtosis	2.73
Coeff. of Variation	0.0588
Minimum	$1,403,689,227
Maximum	$2,065,164,887
Range Width	$661,475,660
Mean Std. Error	$1,031,903

Forecast: Total Project Cost, YOE ($) (cont'd) **Cell: C21**

Percentiles:	Forecast values
0%	$1,403,689,227
10%	$1,617,816,279
20%	$1,665,379,110
30%	$1,700,662,067
40%	$1,729,032,317
50%	$1,756,576,450
60%	$1,784,801,049
70%	$1,811,913,246
80%	$1,842,750,100
90%	$1,886,550,826
100%	$2,065,164,887

Forecast: Total Project Duration, [mos] **Cell: C19**

Summary:
Entire range is from 93.3 to 114.7
Base case is 99.9
After 10,000 trials, the std. error of the mean is 0.0



Statistics:	Forecast values
Trials	10,000
Base Case	99.9
Mean	104.4
Median	104.3
Mode	---
Standard Deviation	3.3
Variance	10.8
Skewness	0.0551
Kurtosis	2.78
Coeff. of Variation	0.0315
Minimum	93.3
Maximum	114.7
Range Width	21.4
Mean Std. Error	0.0

Forecast: Total Project Duration, [mos] (cont'd) **Cell: C19**

Percentiles:	Forecast values
0%	93.3
10%	100.2
20%	101.6
30%	102.6
40%	103.5
50%	104.3
60%	105.2
70%	106.1
80%	107.2
90%	108.7
100%	114.7

End of Forecasts

Assumptions

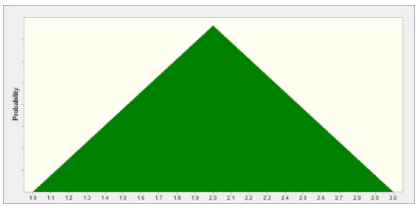
Worksheet: [CSRAv71.3.0 NCDOT I-85 Revised Scope.xlsm]Risk Register

Assumption: **Cell: Z1**

use CB copy function in toolbar to paste assumption curve to cells in risk register.
==========
This feature would is desirable when you need to establish relationships between risks using correlations, or would like to see a Tornado diagram or utilize initial seed value when running a simulation.

Triangular distribution with parameters:

Minimum	1.0	(=W1)
Likeliest	2.0	(=X1)
Maximum	3.0	(=Y1)

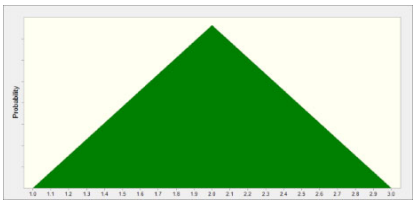


Assumption: **Cell: S1**

use CB copy function in toolbar to paste assumption curve to cells in risk register.
==========
This feature would is desirable when you need to establish relationships between risks using correlations, or would like to see a Tornado diagram or utilize initial seed value when running a simulation.

Triangular distribution with parameters:

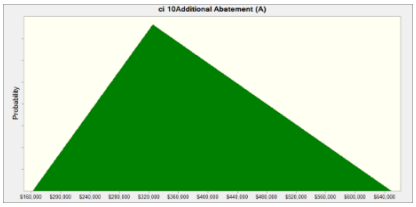
Minimum	1.0	(=P1)
Likeliest	2.0	(=Q1)
Maximum	3.0	(=R1)



Assumption: ci 10Additional Abatement (A) **Cell: S14**

Triangular distribution with parameters:

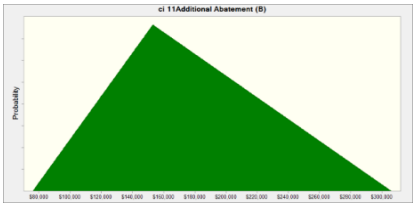
Minimum	$162,000	(=P14)
Likeliest	$325,000	(=Q14)
Maximum	$649,000	(=R14)



Assumption: ci 11Additional Abatement (B) **Cell: S15**

Triangular distribution with parameters:

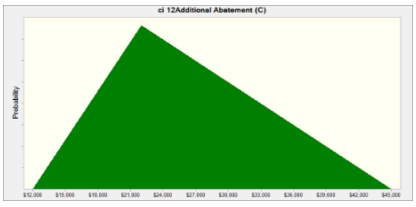
Minimum	$76,000	(=P15)
Likeliest	$153,000	(=Q15)
Maximum	$306,000	(=R15)



Assumption: ci 12Additional Abatement (C) **Cell: S16**

Triangular distribution with parameters:

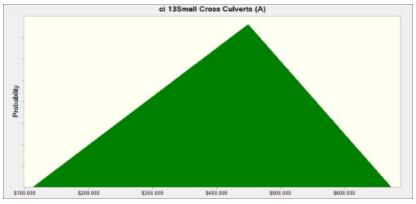
Minimum	$12,000	(=P16)
Likeliest	$22,000	(=Q16)
Maximum	$45,000	(=R16)



Assumption: ci 13Small Cross Culverts (A) **Cell: S17**

Triangular distribution with parameters:

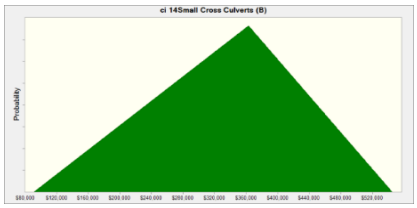
Minimum	$112,000	(=P17)
Likeliest	$449,000	(=Q17)
Maximum	$673,000	(=R17)



Assumption: ci 14Small Cross Culverts (B) **Cell: S18**

Triangular distribution with parameters:

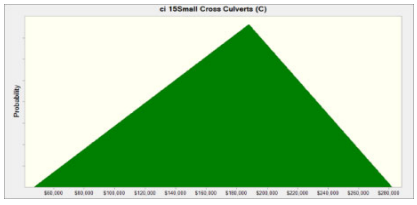
Minimum	$91,000	(=P18)
Likeliest	$363,000	(=Q18)
Maximum	$545,000	(=R18)



Assumption: ci 15Small Cross Culverts (C) **Cell: S19**

Triangular distribution with parameters:

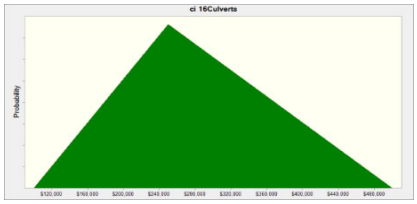
Minimum	$47,000	(=P19)
Likeliest	$188,000	(=Q19)
Maximum	$282,000	(=R19)



Assumption: ci 16Culverts **Cell: S20**

Triangular distribution with parameters:

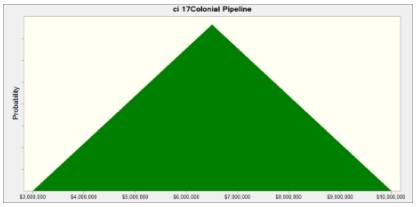
Minimum	$100,000	(=P20)
Likeliest	$250,000	(=Q20)
Maximum	$500,000	(=R20)



Assumption: ci 17Colonial Pipeline **Cell: S21**

Triangular distribution with parameters:

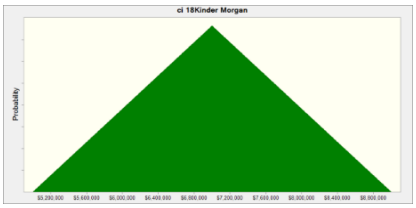
Minimum	$3,000,000	(=P21)
Likeliest	$6,500,000	(=Q21)
Maximum	$10,000,000	(=R21)



Assumption: ci 18Kinder Morgan **Cell: S22**

Triangular distribution with parameters:

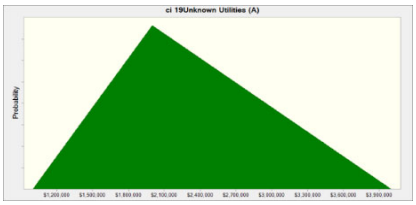
Minimum	$5,000,000	(=P22)
Likeliest	$7,000,000	(=Q22)
Maximum	$9,000,000	(=R22)



Assumption: ci 19Unknown Utilities (A) **Cell: S23**

Triangular distribution with parameters:

Minimum	$1,000,000	(=P23)
Likeliest	$2,000,000	(=Q23)
Maximum	$4,000,000	(=R23)



Assumption: ci 1Landfill **Cell: S5**

Triangular distribution with parameters:

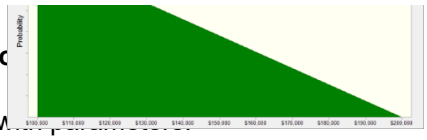
Minimum	$100,000	(=P5)
Likeliest	$100,000	(=Q5)
Maximum	$200,000	(=R5)

Assumption: ci 20Unknown Utilities (B) **Cell: S24**

Triangular distribution with parameters:

Minimum	$2,000,000	(=P24)
Likeliest	$4,000,000	(=Q24)
Maximum	$8,000,000	(=R24)

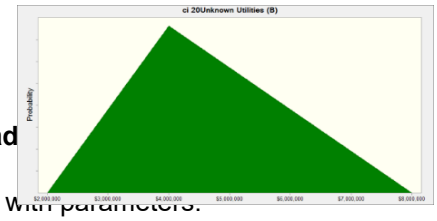
Assumption: ci 21Unkno



Cell: S25

Triangular distribution w

Minimum	$250,000	(=P25)
Likeliest	$500,000	(=Q25)
Maximum	$1,000,000	(=R25)

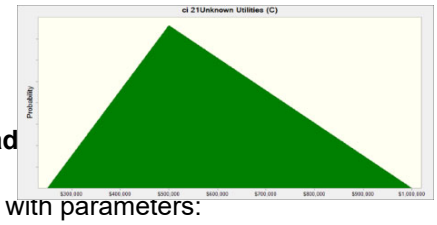


Assumption: ci 24Broad

Cell: S28

Triangular distribution w

Minimum	$45,000	(=P28)
Likeliest	$135,000	(=Q28)
Maximum	$449,000	(=R28)

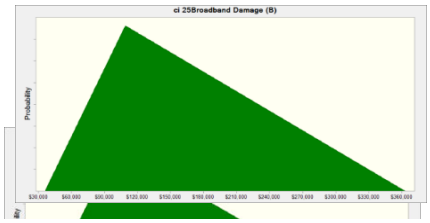


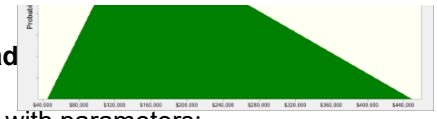
Assumption: ci 25Broad

Cell: S29

Triangular distribution with parameters:

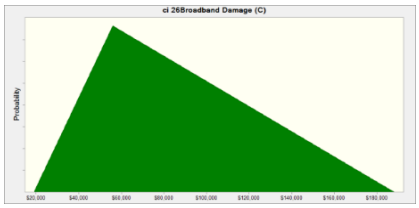
Minimum	$36,000	(=P29)
Likeliest	$109,000	(=Q29)
Maximum	$363,000	(=R29)



Assumption: ci 26Broad  **Cell: S30**

Triangular distribution with parameters:

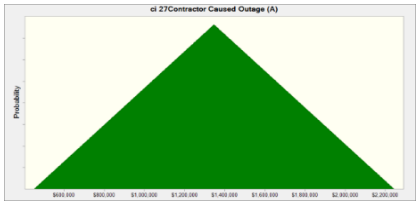
Minimum	$19,000	(=P30)
Likeliest	$56,000	(=Q30)
Maximum	$188,000	(=R30)



Assumption: ci 27Contractor Caused Outage (A) **Cell: S31**

Triangular distribution with parameters:

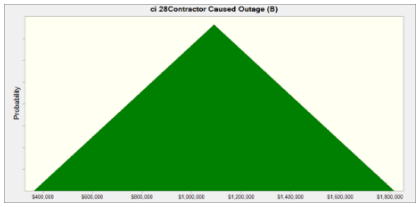
Minimum	$449,000	(=P31)
Likeliest	$1,346,000	(=Q31)
Maximum	$2,244,000	(=R31)



Assumption: ci 28Contractor Caused Outage (B) **Cell: S32**

Triangular distribution with parameters:

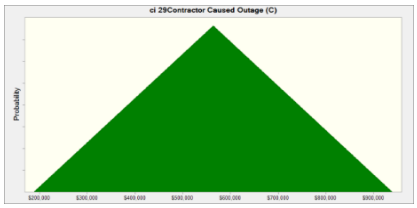
Minimum	$363,000	(=P32)
Likeliest	$1,090,000	(=Q32)
Maximum	$1,817,000	(=R32)



Assumption: ci 29Contractor Caused Outage (C) **Cell: S33**

Triangular distribution with parameters:

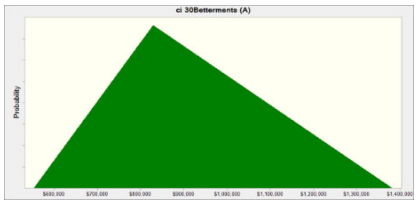
Minimum	$188,000	(=P33)
Likeliest	$564,000	(=Q33)
Maximum	$939,000	(=R33)



Assumption: ci 30Betterments (A) **Cell: S34**

Triangular distribution with parameters:

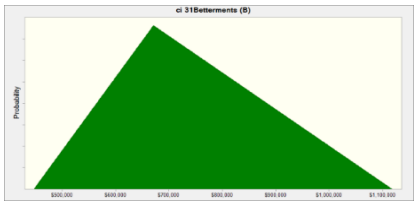
Minimum	$553,000	(=P34)
Likeliest	$829,000	(=Q34)
Maximum	$1,382,000	(=R34)



Assumption: ci 31Betterments (B) **Cell: S35**

Triangular distribution with parameters:

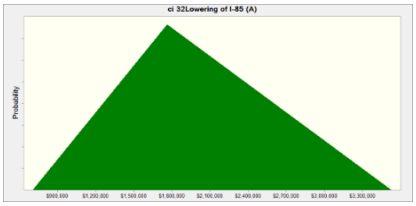
Minimum	$447,000	(=P35)
Likeliest	$671,000	(=Q35)
Maximum	$1,118,000	(=R35)



Assumption: ci 32Lowering of I-85 (A) **Cell: S36**

Triangular distribution with parameters:

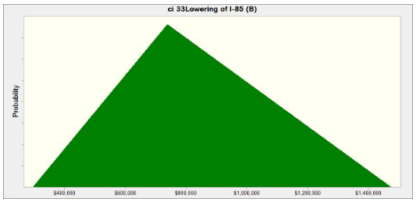
Minimum	$705,000	(=P36)
Likeliest	$1,762,000	(=Q36)
Maximum	$3,525,000	(=R36)



Assumption: ci 33Lowering of I-85 (B) **Cell: S37**

Triangular distribution with parameters:

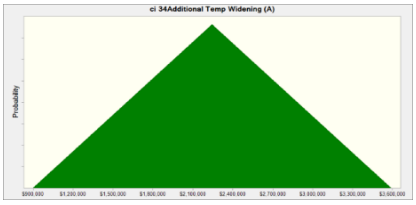
Minimum	$295,000	(=P37)
Likeliest	$738,000	(=Q37)
Maximum	$1,475,000	(=R37)



Assumption: ci 34Additional Temp Widening (A) **Cell: S38**

Triangular distribution with parameters:

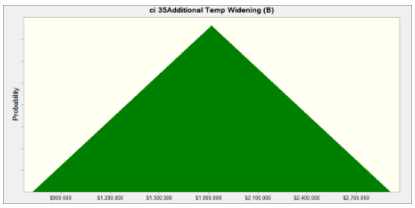
Minimum	$898,000	(=P38)
Likeliest	$2,244,000	(=Q38)
Maximum	$3,590,000	(=R38)



Assumption: ci 35Additional Temp Widening (B) **Cell: S39**

Triangular distribution with parameters:

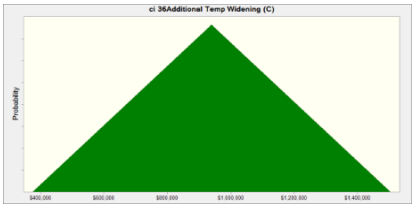
Minimum	$727,000	(=P39)
Likeliest	$1,817,000	(=Q39)
Maximum	$2,907,000	(=R39)



Assumption: ci 36Additional Temp Widening (C) **Cell: S40**

Triangular distribution with parameters:

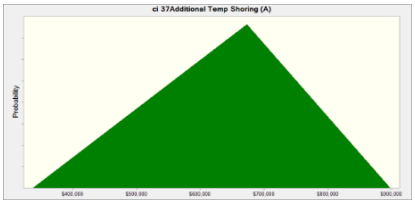
Minimum	$375,000	(=P40)
Likeliest	$939,000	(=Q40)
Maximum	$1,503,000	(=R40)



Assumption: ci 37Additional Temp Shoring (A) **Cell: S41**

Triangular distribution with parameters:

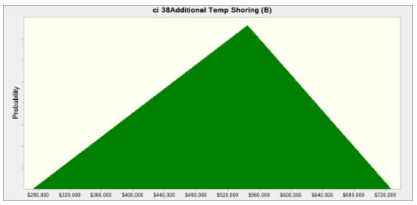
Minimum	$337,000	(=P41)
Likeliest	$673,000	(=Q41)
Maximum	$898,000	(=R41)



Assumption: ci 38Additional Temp Shoring (B) **Cell: S42**

Triangular distribution with parameters:

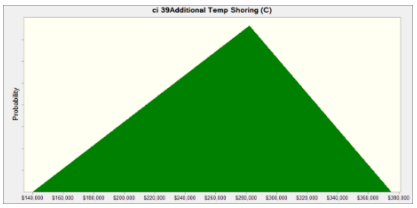
Minimum	$273,000	(=P42)
Likeliest	$545,000	(=Q42)
Maximum	$727,000	(=R42)



Assumption: ci 39Additional Temp Shoring (C) **Cell: S43**

Triangular distribution with parameters:

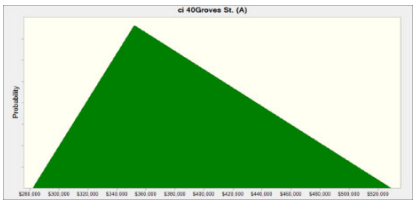
Minimum	$140,000	(=P43)
Likeliest	$282,000	(=Q43)
Maximum	$375,000	(=R43)



Assumption: ci 40Groves St. (A) **Cell: S44**

Triangular distribution with parameters:

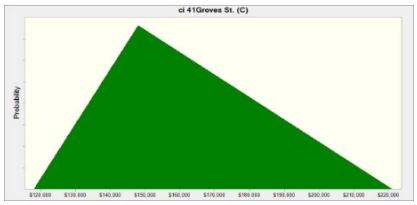
Minimum	$282,000	(=P44)
Likeliest	$352,000	(=Q44)
Maximum	$529,000	(=R44)



Assumption: ci 41Groves St. (C) **Cell: S45**

Triangular distribution with parameters:

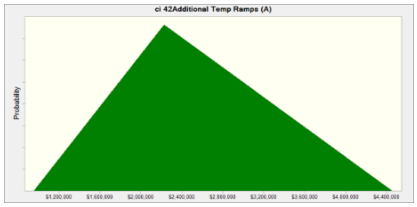
Minimum	$118,000	(=P45)
Likeliest	$148,000	(=Q45)
Maximum	$221,000	(=R45)



Assumption: ci 42Additional Temp Ramps (A) **Cell: S46**

Triangular distribution with parameters:

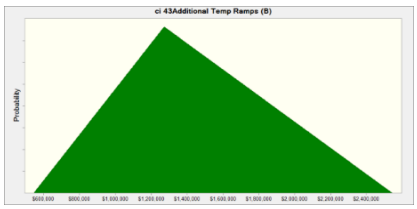
Minimum	$955,000	(=P46)
Likeliest	$2,228,000	(=Q46)
Maximum	$4,456,000	(=R46)



Assumption: ci 43Additional Temp Ramps (B) **Cell: S47**

Triangular distribution with parameters:

Minimum	$545,000	(=P47)
Likeliest	$1,272,000	(=Q47)
Maximum	$2,544,000	(=R47)



Assumption: ci 44State Patrol (A) **Cell: S48**

Triangular distribution with parameters:

Minimum	$45,000	(=P48)
Likeliest	$135,000	(=Q48)
Maximum	$224,000	(=R48)

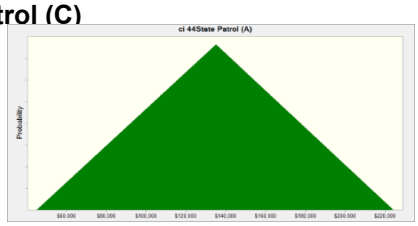
Assumption: ci 45State Patrol (B) **Cell: S49**

Triangular distribution with parameters:

Minimum	$36,000	(=P49)
Likeliest	$109,000	(=Q49)
Maximum	$182,000	(=R49)

Assumption: ci 46State Patrol (C) **Cell: S50**

Triangular distribution with

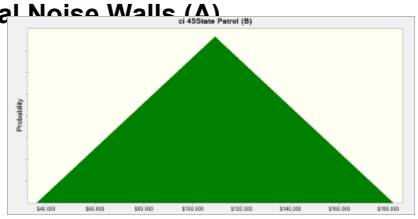


Minimum		(=P50)
Likeliest		(=Q50)
Maximum		(=R50)

Assumption: ci 47Additional Noise Walls (A) **Cell: S51**

Triangular distribution with

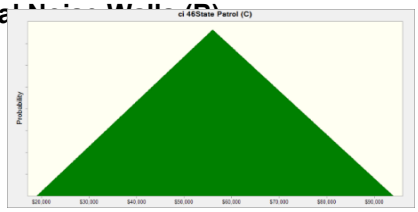
Minimum		(=P51)
Likeliest		(=Q51)
Maximum		(=R51)



Assumption: ci 48Additional Noise Walls (B) **Cell: S52**

Triangular distribution with

Minimum		(=P52)
Likeliest		(=Q52)
Maximum		(=R52)



Assumption: ci 49Deep Foundations **Cell: S53**

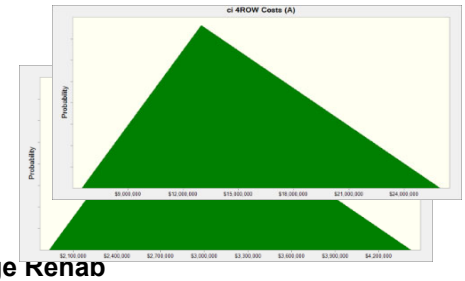
Triangular distribution with parameters:

Minimum	$100,000	(=P53)
Likeliest	$250,000	(=Q53)
Maximum	$500,000	(=R53)

Assumption: ci 4ROW Costs (A) **Cell: S8**

Triangular distribution with parameters:

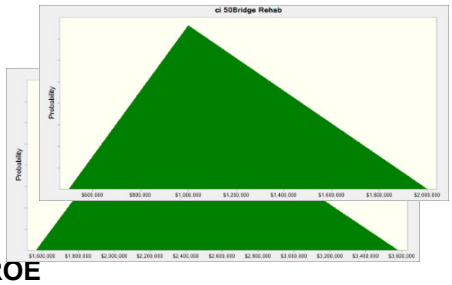
Minimum	$6,491,000	(=P8)
Likeliest	$12,982,000	(=Q8)
Maximum	$25,964,000	(=R8)



Assumption: ci 50Bridge Rehab **Cell: S54**

Triangular distribution with parameters:

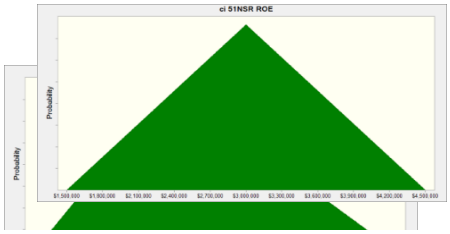
Minimum	$500,000	(=P54)
Likeliest	$1,000,000	(=Q54)
Maximum	$2,000,000	(=R54)



Assumption: ci 51NSR ROE **Cell: S55**

Triangular distribution with parameters:

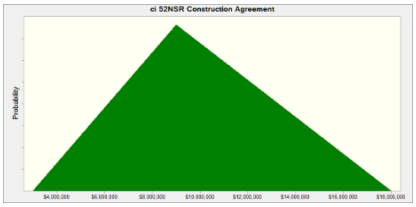
Minimum	$1,500,000	(=P55)
Likeliest	$3,000,000	(=Q55)
Maximum	$4,500,000	(=R55)



Assumption: ci 52NSR Construction Agreement **Cell: S56**

Triangular distribution with parameters:

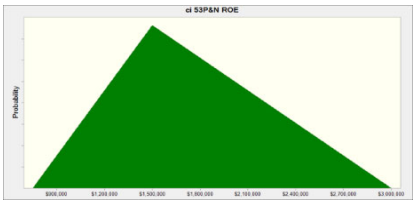
Minimum	$3,000,000	(=P56)
Likeliest	$9,000,000	(=Q56)
Maximum	$18,000,000	(=R56)



Assumption: ci 53P&N ROE **Cell: S57**

Triangular distribution with parameters:

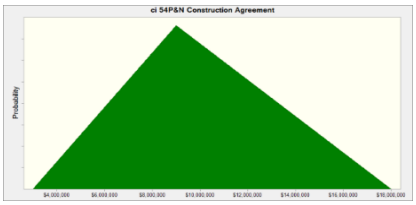
Minimum	$750,000	(=P57)
Likeliest	$1,500,000	(=Q57)
Maximum	$3,000,000	(=R57)



Assumption: ci 54P&N Construction Agreement **Cell: S58**

Triangular distribution with parameters:

Minimum	$3,000,000	(=P58)
Likeliest	$9,000,000	(=Q58)
Maximum	$18,000,000	(=R58)



Assumption: ci 55Railroad Work Restrictions **Cell: S59**

Triangular distribution with parameters:

Minimum	$4,500,000	(=P59)
Likeliest	$9,000,000	(=Q59)
Maximum	$13,500,000	(=R59)

Assumption: ci 56Ozark Railyard **Cell: S60**

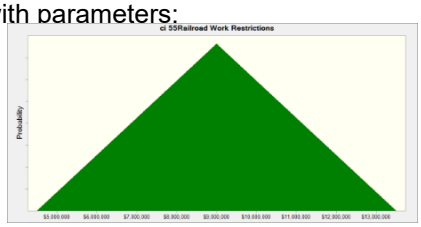
Triangular distribution with parameters:

Minimum	$500,000	(=P60)
Likeliest	$1,000,000	(=Q60)
Maximum	$2,000,000	(=R60)

Assumption: ci 57Railroad Bridge Demolition **Cell: S61**

Triangular distribution with parameters:

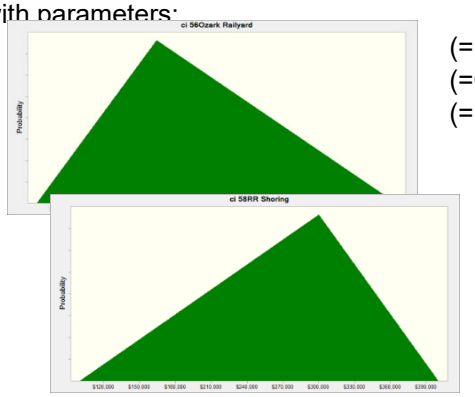
Minimum		(=P61)
Likeliest		(=Q61)
Maximum		(=R61)



Assumption: ci 58RR Shoring **Cell: S62**

Triangular distribution with parameters:

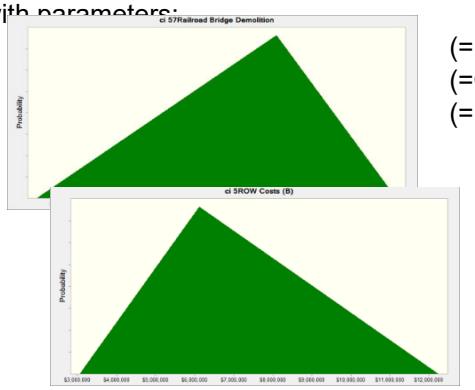
Minimum		(=P62)
Likeliest		(=Q62)
Maximum		(=R62)



Assumption: ci 5ROW Costs (B) **Cell: S9**

Triangular distribution with parameters:

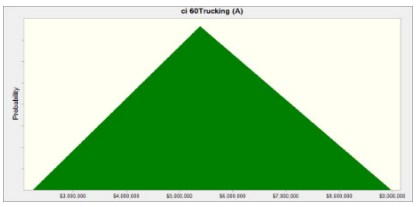
Minimum		(=P9)
Likeliest		(=Q9)
Maximum		(=R9)



Assumption: ci 60Trucking (A) **Cell: S64**

Triangular distribution with parameters:

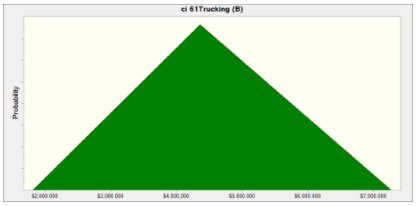
Minimum	$2,244,000	(=P64)
Likeliest	$5,386,000	(=Q64)
Maximum	$8,976,000	(=R64)



Assumption: ci 61Trucking (B) **Cell: S65**

Triangular distribution with parameters:

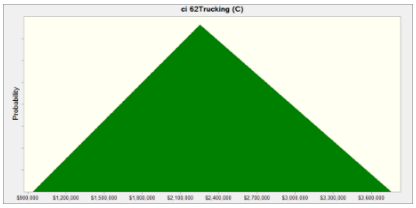
Minimum	$1,817,000	(=P65)
Likeliest	$4,361,000	(=Q65)
Maximum	$7,268,000	(=R65)



Assumption: ci 62Trucking (C) **Cell: S66**

Triangular distribution with parameters:

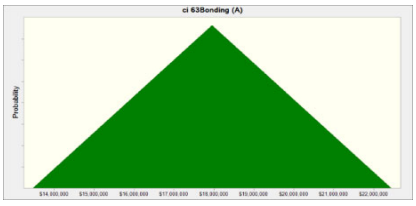
Minimum	$939,000	(=P66)
Likeliest	$2,253,000	(=Q66)
Maximum	$3,756,000	(=R66)



Assumption: ci 63Bonding (A) **Cell: S67**

Triangular distribution with parameters:

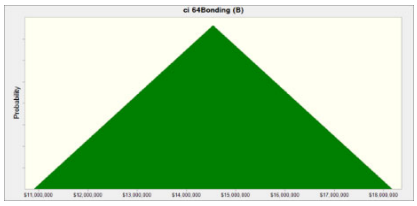
Minimum	$13,464,000	(=P67)
Likeliest	$17,952,000	(=Q67)
Maximum	$22,440,000	(=R67)



Assumption: ci 64Bonding (B) **Cell: S68**

Triangular distribution with parameters:

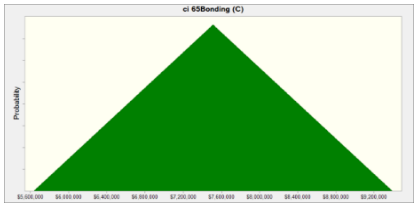
Minimum	$10,902,000	(=P68)
Likeliest	$14,536,000	(=Q68)
Maximum	$18,170,000	(=R68)



Assumption: ci 65Bonding (C) **Cell: S69**

Triangular distribution with parameters:

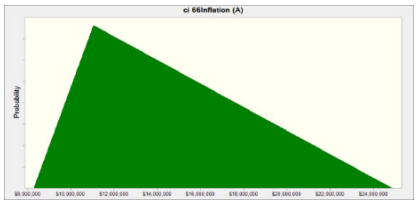
Minimum	$5,634,000	(=P69)
Likeliest	$7,512,000	(=Q69)
Maximum	$9,390,000	(=R69)



Assumption: ci 66Inflation (A) **Cell: S70**

Triangular distribution with parameters:

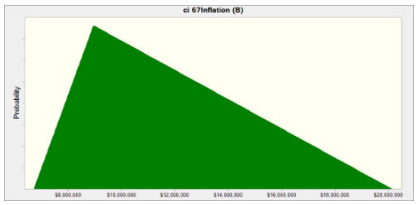
Minimum	$8,289,000	(=P70)
Likeliest	$11,052,000	(=Q70)
Maximum	$24,867,000	(=R70)



Assumption: ci 67Inflation (B) **Cell: S71**

Triangular distribution with parameters:

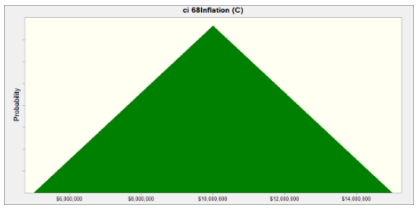
Minimum	$6,711,000	(=P71)
Likeliest	$8,948,000	(=Q71)
Maximum	$20,133,000	(=R71)



Assumption: ci 68Inflation (C) **Cell: S72**

Triangular distribution with parameters:

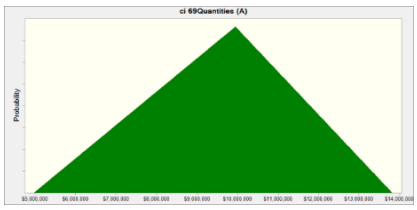
Minimum	$5,000,000	(=P72)
Likeliest	$10,000,000	(=Q72)
Maximum	$15,000,000	(=R72)



Assumption: ci 69Quantities (A) **Cell: S73**

Triangular distribution with parameters:

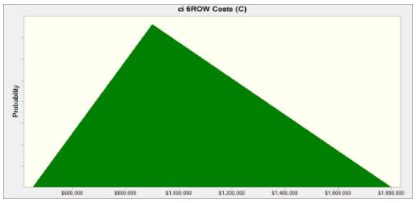
Minimum	$4,973,000	(=P73)
Likeliest	$9,947,000	(=Q73)
Maximum	$13,815,000	(=R73)



Assumption: ci 6ROW Costs (C) **Cell: S10**

Triangular distribution with parameters:

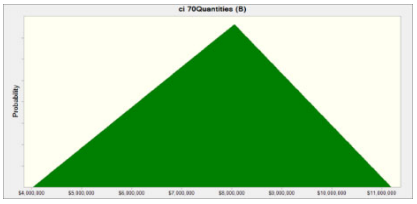
Minimum	$450,000	(=P10)
Likeliest	$900,000	(=Q10)
Maximum	$1,800,000	(=R10)



Assumption: ci 70Quantities (B) **Cell: S74**

Triangular distribution with parameters:

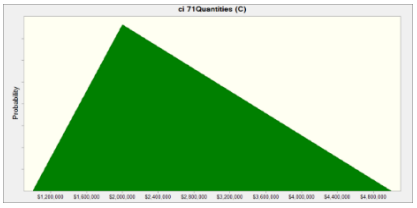
Minimum	$4,027,000	(=P74)
Likeliest	$8,053,000	(=Q74)
Maximum	$11,185,000	(=R74)



Assumption: ci 71Quantities (C) **Cell: S75**

Triangular distribution with parameters:

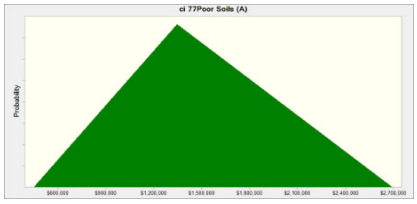
Minimum	$1,000,000	(=P75)
Likeliest	$2,000,000	(=Q75)
Maximum	$5,000,000	(=R75)



Assumption: ci 77Poor Soils (A) **Cell: S81**

Triangular distribution with parameters:

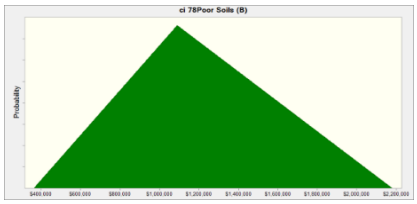
Minimum	$449,000	(=P81)
Likeliest	$1,346,000	(=Q81)
Maximum	$2,693,000	(=R81)



Assumption: ci 78Poor Soils (B) **Cell: S82**

Triangular distribution with parameters:

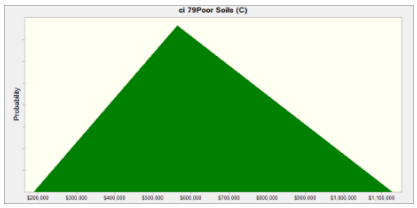
Minimum	$363,000	(=P82)
Likeliest	$1,090,000	(=Q82)
Maximum	$2,180,000	(=R82)



Assumption: ci 79Poor Soils (C) **Cell: S83**

Triangular distribution with parameters:

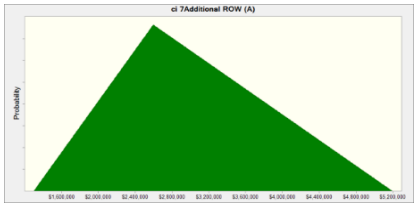
Minimum	$188,000	(=P83)
Likeliest	$564,000	(=Q83)
Maximum	$1,127,000	(=R83)



Assumption: ci 7Additional ROW (A) **Cell: S11**

Triangular distribution with parameters:

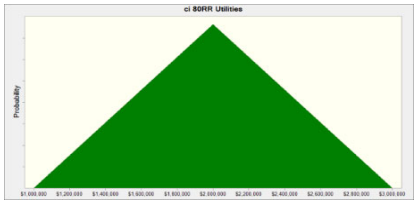
Minimum	$1,298,000	(=P11)
Likeliest	$2,596,000	(=Q11)
Maximum	$5,193,000	(=R11)



Assumption: ci 80RR Utilities **Cell: S84**

Triangular distribution with parameters:

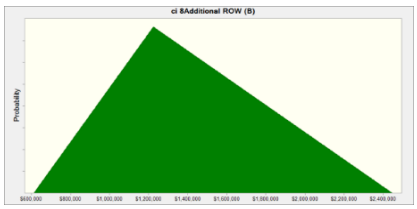
Minimum	$1,000,000	(=P84)
Likeliest	$2,000,000	(=Q84)
Maximum	$3,000,000	(=R84)



Assumption: ci 8Additional ROW (B) **Cell: S12**

Triangular distribution with parameters:

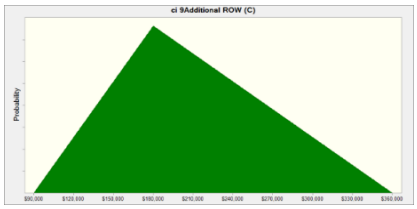
Minimum	$612,000	(=P12)
Likeliest	$1,224,000	(=Q12)
Maximum	$2,447,000	(=R12)



Assumption: ci 9Additional ROW (C) **Cell: S13**

Triangular distribution with parameters:

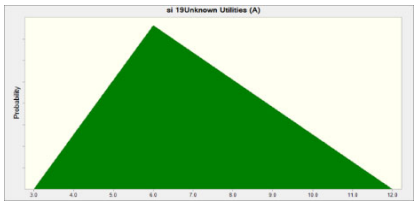
Minimum	$90,000	(=P13)
Likeliest	$180,000	(=Q13)
Maximum	$360,000	(=R13)



Assumption: si 19Unknown Utilities (A) **Cell: Z23**

Triangular distribution with parameters:

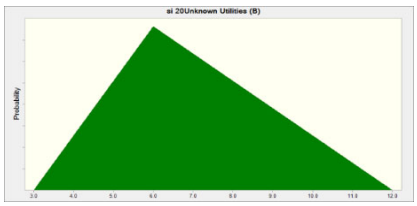
Minimum	3.0	(=W23)
Likeliest	6.0	(=X23)
Maximum	12.0	(=Y23)



Assumption: si 20Unknown Utilities (B) **Cell: Z24**

Triangular distribution with parameters:

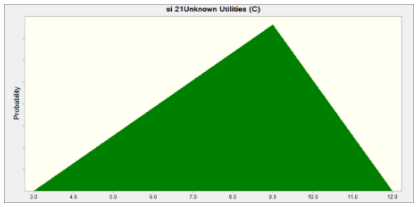
Minimum	3.0	(=W24)
Likeliest	6.0	(=X24)
Maximum	12.0	(=Y24)



Assumption: si 21Unknown Utilities (C) **Cell: Z25**

Triangular distribution with parameters:

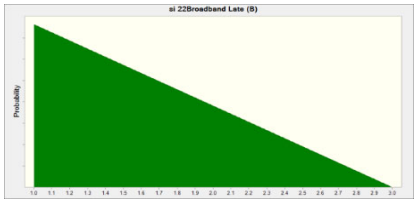
Minimum	3.0	(=W25)
Likeliest	9.0	(=X25)
Maximum	12.0	(=Y25)



Assumption: si 22Broadband Late (B) **Cell: Z26**

Triangular distribution with parameters:

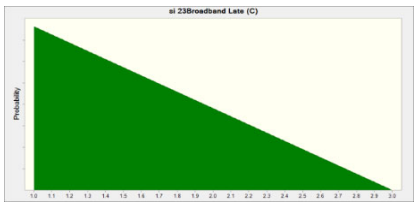
Minimum	1.0	(=W26)
Likeliest	1.0	(=X26)
Maximum	3.0	(=Y26)



Assumption: si 23Broadband Late (C) **Cell: Z27**

Triangular distribution with parameters:

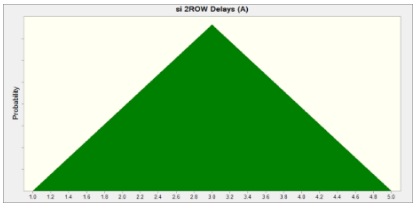
Minimum	1.0	(=W27)
Likeliest	1.0	(=X27)
Maximum	3.0	(=Y27)



Assumption: si 2ROW Delays (A) **Cell: Z6**

Triangular distribution with parameters:

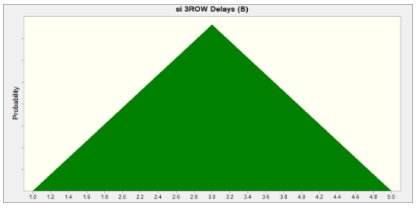
Minimum	1.0	(=W6)
Likeliest	3.0	(=X6)
Maximum	5.0	(=Y6)



Assumption: si 3ROW Delays (B) **Cell: Z7**

Triangular distribution with parameters:

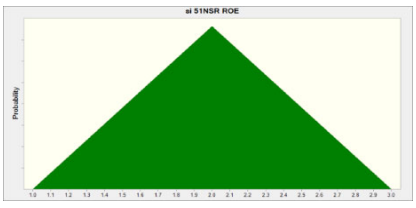
Minimum	1.0	(=W7)
Likeliest	3.0	(=X7)
Maximum	5.0	(=Y7)



Assumption: si 51NSR ROE **Cell: Z55**

Triangular distribution with parameters:

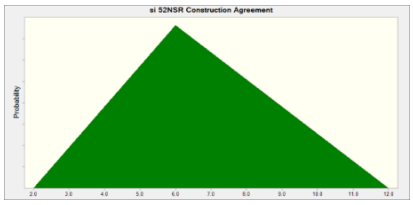
Minimum	1.0	(=W55)
Likeliest	2.0	(=X55)
Maximum	3.0	(=Y55)



Assumption: si 52NSR Construction Agreement **Cell: Z56**

Triangular distribution with parameters:

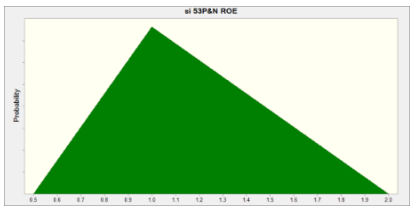
Minimum	2.0	(=W56)
Likeliest	6.0	(=X56)
Maximum	12.0	(=Y56)



Assumption: si 53P&N ROE **Cell: Z57**

Triangular distribution with parameters:

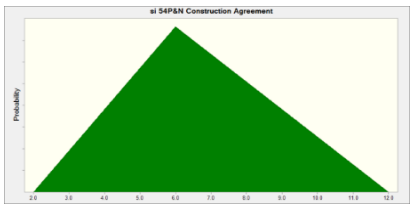
Minimum	0.5	(=W57)
Likeliest	1.0	(=X57)
Maximum	2.0	(=Y57)



Assumption: si 54P&N Construction Agreement **Cell: Z58**

Triangular distribution with parameters:

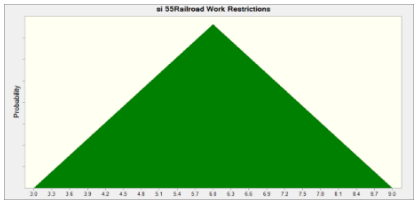
Minimum	2.0	(=W58)
Likeliest	6.0	(=X58)
Maximum	12.0	(=Y58)



Assumption: si 55Railroad Work Restrictions **Cell: Z59**

Triangular distribution with parameters:

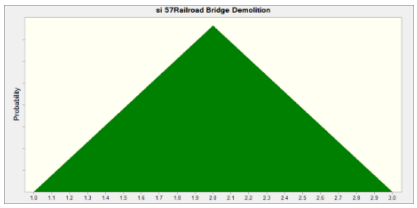
Minimum	3.0	(=W59)
Likeliest	6.0	(=X59)
Maximum	9.0	(=Y59)



Assumption: si 57Railroad Bridge Demolition **Cell: Z61**

Triangular distribution with parameters:

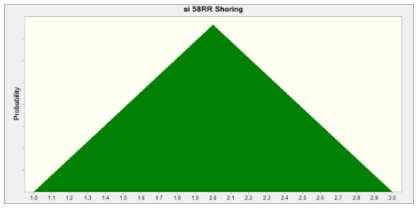
Minimum	1.0	(=W61)
Likeliest	2.0	(=X61)
Maximum	3.0	(=Y61)



Assumption: si 58RR Shoring **Cell: Z62**

Triangular distribution with parameters:

Minimum	1.0	(=W62)
Likeliest	2.0	(=X62)
Maximum	3.0	(=Y62)



Assumption: si 59NSR Groves St. **Cell: Z63**

Triangular distribution with parameters:

Minimum	1.0	(=W63)
Likeliest	2.0	(=X63)
Maximum	3.0	(=Y63)

Assumption: si 6ROW Costs (C) **Cell: Z10**

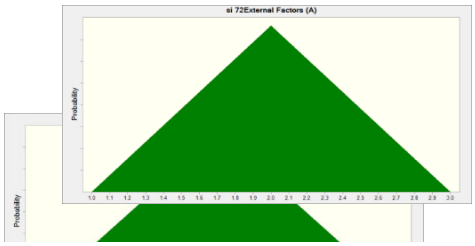
Triangular distribution with parameters:

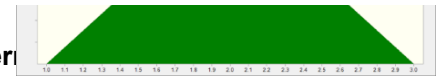
Minimum	4.0	(=W10)
Likeliest	8.0	(=X10)
Maximum	12.0	(=Y10)

Assumption: si 72External Factors (A) **Cell: Z76**

Triangular distribution with parameters:

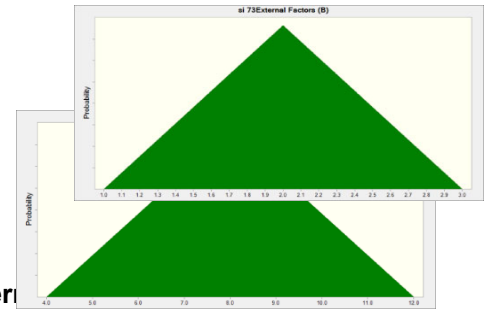
Minimum	1.0	(=W76)
Likeliest	2.0	(=X76)
Maximum	3.0	(=Y76)



Assumption: si 73Exter  **Cell: Z77**

Triangular distribution with parameters:

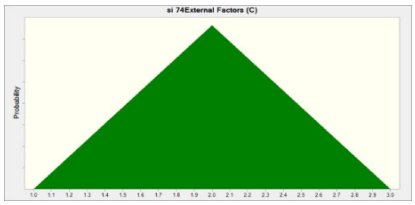
Minimum	1.0	(=W77)
Likeliest	2.0	(=X77)
Maximum	3.0	(=Y77)



Assumption: si 74Exter **Cell: Z78**

Triangular distribution with parameters:

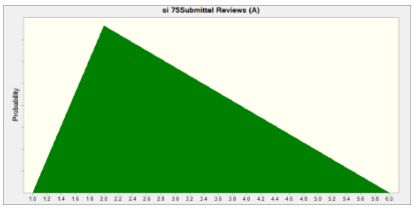
Minimum	1.0	(=W78)
Likeliest	2.0	(=X78)
Maximum	3.0	(=Y78)



Assumption: si 75Submittal Reviews (A) **Cell: Z79**

Triangular distribution with parameters:

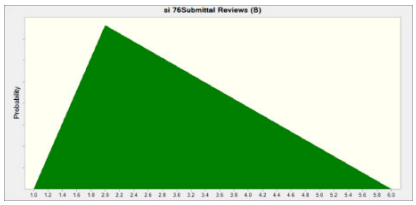
Minimum	1.0	(=W79)
Likeliest	2.0	(=X79)
Maximum	6.0	(=Y79)



Assumption: si 76Submittal Reviews (B) **Cell: Z80**

Triangular distribution with parameters:

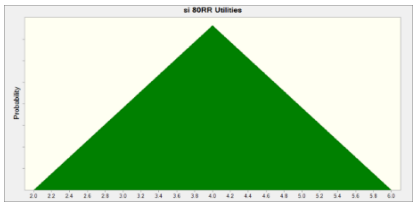
Minimum	1.0	(=W80)
Likeliest	2.0	(=X80)
Maximum	6.0	(=Y80)



Assumption: si 80RR Utilities **Cell: Z84**

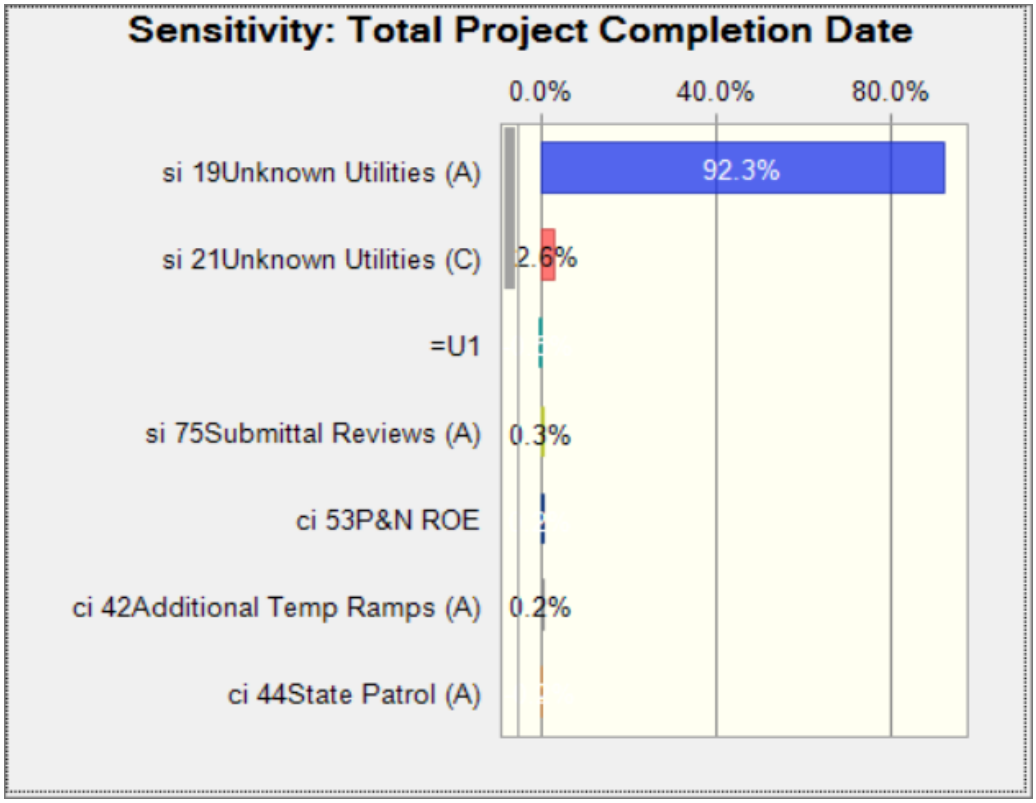
Triangular distribution with parameters:

Minimum	2.0	(=W84)
Likeliest	4.0	(=X84)
Maximum	6.0	(=Y84)



End of Assumptions

Sensitivity Charts



End of Sensitivity Charts

APPENDIX E: P3 EVALUATION

P3-SCREEN

Public-Private Partnerships (P3) Delivery Options Screening Checklist

U.S. Department of Transportation
Federal Highway Administration

Project Name I-5719/U-5800/U-6044 **Date** 7/11/2024

Name of Assessor Kat Bukowy **Title of Assessor** Project Manager

Criteria	Evaluation Question	Response (drop-down menu)	Comment/Mitigation
Legal			
Sponsor Authority	Does the project sponsor have legal authority to pursue delivery of the project as a P3?	Yes	
Planning and Environmental			
Long Range Planning	Is the project consistent with the project sponsor's and regional long-term transportation goals?	Yes	
Environmental Review	Will the required NEPA decision document be completed within 2 - 3 years?	Yes	
Public Support			
Local Support	Is there consensus among local and regional stakeholders to pursue the project?	Yes	
Political Support	Is there political support for delivering the project?	Yes	
Organizational Capacity			
Technical Capacity	Does the sponsor have access to sufficient internal and external technical resources to successfully manage all phases of the P3 delivery option (development, procurement, negotiation and long-term contract oversight) in the public interest?	Yes	
Policy Guidelines	Has the project sponsor established guidelines and regulations for procuring and managing P3 projects?	Yes	
Project Scope & Complexity			
Size	Is the project size and scope suitable for delivery via P3 (generally costing more than $100 million) ?	Yes	
Risk	Have project risks been identified?	Yes	
Risk Allocation	Is there potential to allocate risks to the party more capable of managing those risks by delivering the project as a P3?	Yes	
Innovation	Is there potential to derive benefits from technological or other types of innovation through private sector delivery of the project?	Yes	
Efficiency	Is there potential to achieve cost/schedule savings by delivering the project as a P3?	Yes	
Quality	Is there potential for higher quality product/service delivery with a P3?	Yes	
Life-Cycle Costs	Have the life-cycle costs of the proposed project been determined?	Yes	
Affordability			
Near and Long Term Financial Capacity	Does the project sponsor have the financial capacity to meet the project's lifecycle costs using conventional public funding and financing sources?	Yes	
Revenue Potential	Does the project have the revenue generation potential to repay any or all of the project costs?	No	This is not a toll facility, however the State has annual state and federal funding for road rehabilitation, maintenance, and construction.
Industry Interest			
Industry Capacity	Do three or more private sector firms have the capability to deliver the project as a P3?	Yes	
Industry Interest	Have three or more private entities demonstrated interest in the project to suggest the opportunity exists for a competitive process?	No	There is much contractor interest, but none have approached the Department regarding a P3.
Other			
Land Acquisition (example)	*Are land acquisition issues likely to threaten the project?*		
Summary Analysis:	**The NCDOT has chosen to use a Design Summary Analysis: Build procurement.**		

Conclusion	Based on the responses and comments in the above assessment, it appears at this time that a P3 delivery may not be appropriate for the project.

APPENDIX B: FHWA I-5719, U-6044, & U-5800 INITIAL FINANCIAL PLAN CHECKLIST

FINANCIAL PLAN CHECKLIST

Project Name: I-85 Widening Project (I-5719, U-5800, & U-6044)

1. **Project Description**
   - ■a. Narrative description of project scope
   - ■b. Map
   - ■c. Date of NEPA Decision Document(s) (month/year)
   - ❑d. Documentation of Operationally Independent and Non-Concurrent Construction (OINCC) determinations, if applicable
   - ❑e. If a phasing plan is presented, include detail description of the funded phase
2. **Schedule**
   - ■a. Present current schedule including major milestones
   - ❑b. Compare with Initial Financial Plan (IFP) and prior Annual Update (AU) schedule
   - ■c. Clearly identify estimated completion date (Month/Year)
   - ❑d. If a phasing plan is presented, include anticipated schedule (Month/Year) for the funded phase
3. **Project Cost**
   - ■a. Provide a total cost estimate for the full project
   - ■b. Provide a breakdown of cost by project component (contract, section, phase, etc.)
   - ■c. Provide a breakdown of cost by activity (feasibility studies, preliminary engineering, environmental assessment, right-of-way acquisition, construction, construction engineering and inspection, project management, contingencies, ITS activities, etc.)
   - ■d. All costs should be expressed on a year-of-expenditure basis and should include a narrative describing assumptions used to arrive at such estimates
   - ■e. IFP cost should equal at least the 70% percentile cost amount from the most recent Cost Estimate Review (CER)
   - ❑f. Compare current estimated cost with IFP and prior AU estimated cost
   - ❑g. If a phasing plan is presented, include the cost estimate and breakdown of cost the funded phase
4. **Project Funds**
   - ■a. Provide all funding sources
   - ■b. Show dedicated and anticipated funds separately
   - ■c. Identify project listing in TIP/STIP and fiscally constrained Metropolitan Long Range Transportation Plan
   - ■d. Show Federal funds and State and/or local funds separately
   - ■e. Address potential unanticipated changes in expected funding
   - ❑f. Include information for special funding techniques such as advance construction, if applicable
   - ❑g. If a phasing plan is presented, funding should only be shown for the funded phase
5. **Financing Issues**
   - ■a. Identify the type of financing proposed
   - ❑b. Estimate interest rates and associated fees
   - ■c. Estimate the total financing costs associated with the project
   - ❑d. If a phasing plan is presented, financing costs should only be shown for the funded phase

6. **Cash Flow**
   - ■a. Show fund availability versus expenditures by fiscal year (FY) (cash in versus cash out)
   - ❑b. Compare cash flow displayed in IFP to updated cash flow
   - ❑c. Discuss changes in estimated timing of fund availability (cash in) and/or expenditures (cash out) since IFP
   - ❑d. If a phasing plan is presented, cash flow should only be shown for the funded phase

7. **Public-Private Partnership (P3) Assessment**
   - ■a. Cite legislative authority
   - ❑b. Identify internal P3 structure
   - ❑c. Comparison of benefits
   - ❑d. Summarize Risk allocation analysis
   - ❑e. Identify market conditions
   - ❑f. If a phasing plan is presented and additional portions of the project are added to the financial plan, a P3 assessment should be provided

8. **Risk and Response Strategies**
   - ■a. Summarize risks identified during the CER and update as appropriate
   - ■b. Add risks that were not included or known during the CER
   - ■c. Provide a response strategy (ies) for each risk
   - ❑d. Update (add, modify, or retire) risks in each AU as project progresses

9. **Annual Update Cycle**
   - ■a. Define the annual reporting period for the data reported in the Annual Update to the Financial Plan
   - ■b. State the due date (90 days after the end of the annual reporting period) for the next Annual Update to the Project
   - ❑c. If necessary, provide any reason this date has changed from the last financial plan.

10. **Summary of Cost Changes Since Last Year's Financial Plan**
   - ❑a. Provide an explanation of the change in total cost from last year's financial plan (amount and main contributing factor(s))
   - ❑b. Document actions taken to monitor and control cost growth

11. **Cost and Funding Trends since Initial Financial Plan**
   - ❑a. Discuss trends impacting project costs and funding

12. **Summary of Schedule Changes Since Last Year's Financial Plan**
   - ❑a. Provide an explanation of the change in the estimated completion date from last year's financial plan (number of months and main contributing factor(s))
   - ❑ b. Document actions taken to monitor and control schedule growth

13. **Schedule Trends since Initial Financial Plan**
   - ❑a. Discuss trends impacting project schedule

Reviewer: Signed by: Van Argabright 12/4/2024

Reviewer: DocuSigned by: 12/4/2024

APPENDIX C: I-5719, U-6044, & U-5800 INITIAL FINANCIAL PLAN LETTER OF CERTIFICATION

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

J.R. "JOEY" HOPKINS
SECRETARY

Certificate as to Accuracy and Reasonableness of Initial Financial Plan

The North Carolina Department of Transportation (NCDOT) has developed the Initial Financial Plan for the I-85 Widening Project in Gaston County, NC (I-5719, U-5800, and U-6044) in accordance with the requirements of Title 23, United States Code, Section 106, and the Financial Plan guidance issued by the Federal Highway Administration. The plan provides detailed cost estimates to complete the project and the estimates of financial resources to be utilized to fully fund the Project.

The cost data in the Initial Financial Plan provides an accurate accounting of costs incurred as of September 30, 2024, and includes a realistic estimate of future costs based on the engineers' estimates and contingency factors. While the estimates of financial resources rely upon assumptions regarding future economic conditions and demographic variables, they represent realistic estimates of resources available to fund the project as described.

The NCDOT believe the Initial Financial Plan provides an accurate basis upon which to schedule and fund the I-85 Widening Project. The Department will review and update the Financial Plan on an annual basis through project completion.

The Initial Financial Plan submitted herewith, fairly and accurately presents the financial position of the I-85 Widening Project. We believe that the assumptions which underlie the Initial Financial Plan are reasonable and appropriate. Further, we have made available all significant information that we believe is relevant to the Initial Financial Plan and, to the best of our knowledge, the documents and records supporting the assumptions are appropriate.

DocuSigned by:
leigh wing
8847D8CD1A084ED...

12/4/2024

Leigh M. Wing, P.E., Director, Division of Planning and Programming Date

Mailing Address:
NC DEPARTMENT OF TRANSPORTATION
1534 MAIL SERVICE CENTER
RALEIGH, NC 27699-1534

Telephone: (919) 707-4622
Fax: (919) 715-8718

Website: www.ncdot.gov

Location:
1 SOUTH WILMINGTON STREET
RALEIGH, NC 27601