FEASIBILITY REPORT

I-95 from the Georgia State Line to MM 18 (Exit 18) Interstate Corridor Improvements
Jasper County, South Carolina

Prepared by the South Carolina Department of Transportation
Office of Planning
SCDOT Project I.D. No. P038678 (Planning Phase)

Machael M. Peterson Digitally signed by Machael M. Peterson
Date: 2021.10.07 15:12:04 -04'00'

Machael Peterson, Director of Planning — Date of Approval
Office of Planning
South Carolina Department of Transportation

John D. Boylston 2021.10.11 15:33:36 -04'00'

John Boylston, P.E., Director of Preconstruction — Date of Approval
Preconstruction South Carolina Department of Transportation

Betsy McCall Digitally signed by Betsy McCall
Date: 2021.09.29 10:44:54 -04'00'

Betsy McCall, P.E., Feasibility Report Manager — Date of Completion
Office of Planning
South Carolina Department of Transportation

The following individuals may be contacted for additional information concerning the project:

Mrs. Betsy McCall, P.E.
Feasibility Report Manager
S.C. Department of Transportation
955 Park Street
Columbia, South Carolina 29201
(803) 737-9870

Craig Winn, P.E.
RPG 1 Project Manager
S.C. Department of Transportation
955 Park Street
Columbia, South Carolina 29201
(803) 737-6376

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EXECUTIVE SUMMARY

The mission of the SCDOT is to connect communities and drive our economy through the systematic planning, construction, maintenance and operation of the state highway system and the statewide intermodal transportation and freight system. The Systems Performance Section of the Office of Planning within the SCDOT was tasked with creating a process and developing prioritized ranking for segments of the rural interstate freight network that would benefit freight mobility. The reliable and efficient movement of freight through the roadway system in modern supply chains is a key component in economic development and statewide commerce.

Interstate 95 from mile marker (MM) 0 (six lane section at Georgia State Line) to Exit 18 (Bees Creek Road) was identified as the second highest ranked segment of rural interstate that fit the relevant criteria. Through the Feasibility Report process, the project purpose and need was developed along with associated goals and metrics. Below is the purpose and need statement. Following this is the expanded project need.

Project Purpose and Need Statement:

The purpose of this project is to improve capacity and mobility, provide truck parking, and address operational and structural deficiencies on bridges and interchanges along I-95 from MM 0 (six lane section at Georgie State line) to MM 18.

Project Need:

Operational and structural deficiencies on interchanges and bridges will be addressed within the corridor. In 2045, the mainline will perform between a LOS of D and F. This corridor ranks among the worst of the rural interstates in freight mobility with a score of 0.9 on a 1 scale. Truck parking is lacking in this section of interstate.

	Current Year (2015)		Future Year (2040)		Future Year (2040)	
Location	ADT	LOS (4 lanes)	ADT	LOS (4 lanes) No Build	ADT	LOS (6 lanes)
I-95, MM 0 to Exit 18	53,000	C / D	68,500	C/D	83,500	B/C

Table 1. Existing and Projected ADT and LOS for I-95 MM 0-18

Several alternatives were reviewed. The identified alternative that will be recommended to advance through the planning, environmental, and engineering phase is as follows:

- Six (6) lanes, additional north and south bound lanes widened to inside median
  - Barrier wall with ten foot (10’) inside shoulder for 5.5 miles
  - Grassed w/cable barrier median with ten foot (10’) inside shoulder for 12.5 miles

Three interchanges are along this section of roadway. The alternatives for each are below.

- Exit 5 (US 17/US 321, Hardeeville/Estill)
  - Relocating frontage road to eliminate slip ramp

- Exit 8 (US 278, Beaufort/Hilton Head Island)
    - Reconfiguration
- Exit 18 (Bees Creek Road)
    - Cul-de-sac frontage road to eliminate slip ramp

Risks were discussed and documented and further quantitatively analyzed using a probability and impact matrix for cost and schedule. Those risks that rated as having a probable and significant impact were mitigated for with adjustments to project cost and schedule. The Town of Hardeeville anticipates constructing Exit 3 in 2022. This analysis considered the risks associated with this interchange, but no cost were considered for construction of Exit 3 since it is a separate project.

A cost estimate was developed for the six (6) lane widening alternative which includes recommended interchange alterations. The schedule is expressed in a time frame for the Feasibility Report and will be modified with a starting month and fiscal year once in the Preliminary Engineering (PE) phase of work.

Alternative	Alternative Description	PE Cost Estimate, $	RW Cost Estimate, $	Construction Cost Estimate, $	Total Project Cost	Months to RW	Months to Letting
A7	6 Lanes Widening to Inside	$44 M	$5.5 M	$489 M	$538 M	32	48

Table 2. Alternative Executive Summary with Cost and Schedule

A multi-criteria score for the viable build alternative is included in Table 3 below. Eight (8) criteria with sub-categories were used to determine the score. Each sub-category could be scored between 0 and 5. Several other alternatives were discussed but were not deemed viable. Other alternatives would include adding lanes to the outside, but, for this section of Interstate 95, there was ample room to widen to the inside without having to narrow the inside shoulder. These alternatives would have scored well below the viable build alternative due to increased wetland impacts and overpass impacts.

Alternatives	6 Lanes	No Build
Multi-Criteria Score	51.5	49

Table 3. Multi-Criteria Score for each Alternative

1.0 Feasibility Report Introduction

In an effort to manage expectations of project sponsors and the citizens of South Carolina, the Office of Planning developed the Feasibility Report process. Feasibility Reports (FR) develop the purpose and need, project scope, identify potential impacts and risks, and baseline estimated cost and schedules prior to project development commencing. The FR process provides a living document that outlines project goals and objectives with measureable metrics that are to be accomplished based on the project purpose and need. In addition, the process increases collaboration and facilitates communication across different disciplines within the department; which provides the opportunity to integrate risk management into the planning process. Gathering and evaluating data in the planning phase provides a path for viable and beneficial projects to progress through to the engineering phase of work, expediting project delivery. The FR document is incorporated into the Planning (PL) phase of work and, for interstates, is reviewed by the South Carolina Department of Transportation Steering Committee before the Preliminary Engineering (PE) phase of work can be initiated.

2.0 Strategic Goal Alignment

2.1 Strategic Goal and Objective

The South Carolina Department of Transportation has developed an agency-wide Strategic Plan 2018-2020 that reflects the current priorities and critical goals of the agency. The Strategic Plan identifies five core goals that support SCDOT's vision to rebuild our transportation system over the next decade to provide adequate, safe and efficient transportation services for the movement of people and goods in South Carolina. The plan guides SCDOT's initiatives through the Transportation Asset Management Plan (TAMP) which implements priorities by establishing investment levels and designed targets. Utilizing risk management strategies through initiatives, such as the Feasibility Report process helps us to identify and mitigate potential obstacles to achieving success and alignment with the Strategic Plan. The widening of the I-95 corridor from mile marker (MM) 0 (six lane section from Georgia State Line) to Exit 18 aligns with several goals and objectives outlined in the Strategic Plan 2018-2020.

Goal 1: Improve safety programs and outcomes in our high-risk areas.

Strategy: Develop and implement a data-driven, rural road safety program

Objective: Reduce fatalities on roads in our rural areas.

Project Alignment: Data driven traffic safety information used to develop the alternatives.

Goal 2: Maintain and preserve our existing transportation infrastructure.

Strategy: Utilize the Transportation Asset Management Plan to drive outcomes on system and asset condition.

Objective: Decrease the number of structurally deficient bridges across the state.

Project Alignment: Bridges with low ratings or other concerns are recommended for replacement.

Goal 3: Improve SCDOT program delivery to increase the efficiency and reliability of our road and bridge network.

Strategy: Target known congested areas.

Objective: Improve the reliability of the movement of people and goods across the major portions of our road network.

Project Alignment: Mobility was addressed in the alternatives for mainline and interchanges.

In the planning phase, no decisions will be made as to the preferred alternative; however, the alternatives that are reasonable and viable will be identified, and some alternatives may be eliminated due to misalignment with critical goals of project purpose and need. Data gathered is intended to aid and inform the National Environmental Protection Agency (NEPA) process in determining the preferred alternative in the Preliminary Engineering phase (PE) of project development.

2.2 SCDOT Ranking

The Office of Planning was directed to review the approximately 2,239 lane miles of rural interstate routes and rank them on a statewide priority basis for freight mobility improvement. The Systems Performance Section ranking of the rural interstates was based on the relevant criteria listed below in Table 4, and weighted based on a percentage of priority in regard to improvement of freight mobility.

Criteria	Description	Weighted Percentage
Truck Travel Time Reliability Index (TTTR)	Numerical value indicating how reliable truck travel times are for a segment of interstate	25%
Freight Density	Measure in tonnage of freight moved across a segment of freight network, indicating importance	20%
Average Annual Daily Truck Traffic (AADTT)	Average annual daily number of trucks carried by a segment of interstate	20%
Truck Crashes	Number of truck crashes per mile along segment of interstate, representing a safety component	10%
Potential for Economic Development	Ranking provided by South Carolina Department of Commerce on existing and projected development adjacent to an interstate segment and contribution to freight movement	10%
Service to the Ports	Ranking provided by South Carolina Ports Authority indicating importance of movement of freight to and from ports in South Carolina	10%
Connectivity	Criterion used to ensure connectivity of six lane sections of rural interstate segments to existing six lane sections	5%

Table 4. Rural Interstate Freight Network Criteria and Prioritization

The top five ranked sections of rural interstate that were identified to best utilize the funding available statewide are listed in Table 5. The SCDOT Commission in October 2018 approved to assign a Planning

Phase of work funded by the Rural Interstate Freight Network Mobility Improvement Program (RIFMP) to perform this Feasibility Report.

	Freight Corridor Designation	Begin	End	Length (miles)	Area Type
2018-1	I-26 M2, N	Old Sandy Run Road / Exit 125	I-95 / Exit 169	44	Rural
2018-2	I-95 A, B	GA State Line	US-17 (Ridgeland) (North) / Exit 33	33	Rural
2018-3	1-26 O	I-95/Exit 169	Ridgeville Rd / Exit 187	18	Rural
2018-4	I-85 A	GA State Line	US-76 / SC-28 / Exit 19	19	Rural
2018-5	I-77 F	SC-9 / Exit 65	US 21 / Exit 77	12	Rural

Table 5. Top Five Ranked Corridors, Rural Interstate Freight Network Mobility Improvement Program

The top five ranked sections listed above equaled 126 miles of rural interstate. These sections were further defined into smaller segments (through collaboration of the Office of Planning, Preconstruction, and FHWA) taking into account average daily traffic (ADT) and percentage of trucks to determine logical termini. The final top three rural interstate improvement projects that were identified to pursue are as follows:

Rank	Project Description / Project Begin & End	Length (miles)	Area Type
1	I-26 Widening, Old Sandy Run Road / Exit 125 to Burke Road / Exit 139	14	Rural
2	I-95 Widening, GA State Line / MM 0 to Bees Creek Road / Exit 18	18	Rural
3	I-95 to I-26 System to System Interchange Improvements / MM 169	N/A	Rural

Table 6. Top Three Ranked Improvement Projects for Rural Interstates and Freight Mobility

Interstate 95 from MM 0 (six lane section at Georgia State Line) to MM 18 (Exit 18) was identified as the number two ranked corridor segment that fit all criteria. The identified section was a combination of two segments that had logical termini – the state line to Exit 8 and Exit 8 to Exit 18. Costs were identified for each segment and it was determined that funding was only available from the state line to Exit 8.

2.3 General Description of Project

This analysis reviews an approximately eighteen (18) mile long section of the I-95 corridor from mile marker (MM) 0 (six lane section at Georgia State Line) to Exit 18 to increase capacity, improve corridor operations and freight mobility on the mainline and to upgrade interchanges and bridges. See Figure 1 for project location of Interstate 95 corridor. Two logical projects were found between the Georgia State line six lane section to Exit 8 and from Exit 8 to Exit 18. Due to funding constraints, the section from the Georgia State line six lane section to Exit 8 will be pursued first.

Exit 3, a Town of Hardeeville proposed project, should be constructed prior to the I-95 project. Dialogues about Exit 3 have been had for several years with the project receiving funding in summer 2020 with an anticipated construction year of 2022. The initial evaluation of this segment of roadway did not consider Exit 3, but later, once the interchange seemed eminent, the risks concerning Exit 3 were recorded.

Figure 1. Project Location I-95 MM 0 to 18, Shown in Pink

3.0 Purpose and Need

The "purpose" is the problem that must be addressed. The "need" is the data that defines the problem and justifies that the problem exists. The purpose and need (P&N) is the foundation for the entire project. Data was gathered by the Project Development Team (PDT) and much discussion was had by the PDT to determine the problem. If there was no supporting data or documentation that a problem existed, it was not added to the P&N. The drivers of the project are specifically discussed in the P&N statement. The need that supports the P&N is below.

Purpose

- The purpose of this project is to improve capacity and mobility, provide truck parking, and address operational and structural deficiencies on bridges and interchanges along I-95 from MM 0 (six lane section at Georgia State Line) to MM 18.

Need

- Operational and structural deficiencies on interchanges and bridges will be addressed within the corridor. In 2045, the mainline will perform between a LOS of D and F. This corridor ranks among the worst of the rural interstates in freight mobility with a score of 0.9 on a 1 scale. Truck parking is lacking in this section of interstate.

The freight mobility scores and the state average truck involved crashes data was taken from the Office of Planning rankings list data. Actual data for freight mobility was normalized; therefore, the worst score was a 1. See Appendix System Performance Data for the actual data and the normalized data.

See Appendix Meeting Minutes for the discussions on the purpose and need.

4.0 Goals and Metrics

There are project specific critical and non-critical goals. The critical goals point to the drivers of the project and directly to the P&N. Non-critical goals are items that are of concern and should be addressed, but are not the driving factors of the project. Goals may or may not be achieved. If critical goals are not achieved by an alternative, then the alternative may not be considered viable.

Historically, when a project does not have a properly defined P&N or defined goals, then the project is reworked several times causing delays to project delivery. Project delivery is expedited by clear metrics. Metrics come from the project goals, and must be measurable, reasonable and achievable. Example: 0 crashes is not reasonable or achievable. Qualitative and quantitative metrics are critical in order for the goal to be measurable. The decisions within the FR are based on data driven answers. The metrics being measureable by data allows the PDT to define a viable alternative to move forward into NEPA.

4.1 General Goals for the Department

There are certain goals that the SCDOT will always strive to accomplish: minimize maintenance of traffic issues, minimize environmental and right-of-way impacts, follow design guidelines and policies, construct facilities that are safe and easily maintained; however, there are times when performance based practical design takes precedence. The goals and metrics outlined by the PDT are project specific goals that take into account performance based practical design, context sensitive design, and weighing options for the best approach to the problem at hand. It is not to be assumed that because a goal from the PDT does not address the items listed above that these items are being ignored. The PDT goals are unique to the project.

4.2 Project Specific Goals with Metrics

The PDT developed the following project goals with associated metrics. The metrics need to be measurable in order for the PDT to state whether the goal was met or not. Some goals cannot be

evaluated at the Feasibility Report (FR) level due to their detail oriented nature. The FR uses high level, conceptual plans to evaluate the goals. However, all goals are documented in the FR for consideration in project development. For this project, goal 6 will not be evaluated for the FR due to lacking data for the design. There are three critical/primary goals which are noted with an asterisk (*) and shaded in blue.

Number	Goal	Metric
1*	Improve Capacity	a. LOS C or better
2	Maintain or Improve Truck Travel Time Reliability	a. Truck Travel Time Reliability Index (Retain current index or improve)
3*	Address Interchange Deficiencies	a. LOS C or better
		b. Remove interconnectivity with side roads/frontage roads on ramps
4	Improve Safety	a. Improve crash rates from existing
5*	Address Bridge Deficiencies	a. Improve Condition to 7 or better for all bridges
6	Address Pavement Deficiencies	a. Improve structure number, PQI, and ride-ability from existing

Table 7. Project Specific Goals and Metrics, Critical Goals that tie to P&N are Shaded

See Appendix Meeting Minutes for the detailed discussions on the goals and metrics.

5.0 Scope

The scope is generated from the P&N, goals, and metrics. The scope of the project describes what needs to be addressed, but not how to address it. Items like the problem, goals, and other high level plan issues are stated to aid in discussing alternatives.

In this section, two scopes will be presented: the PDT scope for generating alternatives and the suggested basic scope for project development. Project development will use the suggested basic scope to define and negotiate consultant scopes. The suggested basic scope was developed after the alternatives were identified and reviewed. Alternatives brought forth by the PDT will be discussed in section 6.0.

5.1 Existing Facility Characteristics

The existing I-95 mainline corridor narrows from six (6) lanes to four (4) lanes just south of the Savannah River bridges at the Georgia State Line. The area of concern currently provides four-twelve foot (4-12’) wide lanes with a 48 to 300 foot grassed median and ditches on the outside with cable stay guardrail in the median. The outside shoulder is twelve foot (12’) with ten foot (10’) paved, and the inside shoulder is a ten foot (10’) with two foot (2’) paved. There are three (3) overpasses and three (3) interchanges. All associated structures have proper vertical clearance. There are two bridges being replaced and widened in this section under another contract, SC-46 and Bagshaw Creek. Exit 8, US 278, has operational issues, and the county has requested median islands to address vehicles and trucks crossing the median at numerous locations to access the interchange. This data can be found in Appendices Design Data and Program Manager Data.

5.2 Scope Items Evaluated

The PDT, as part of the FR process, developed the scope below. From this scope, known as the PDT scope, the alternatives were developed.

The PDT scope for I-95 MM 0 (six lane section at Georgia State Line) to Exit 18 is as follows:

- Address mainline geometric issues.
    - Avoid pursuing a design exception at the sag at MM1.5
- Evaluate need for additional truck parking and converting truck weigh station to truck parking. (A QT was approved along this corridor potentially making truck parking a non-issue)
- Expand ITS, WIM sensors
- Review options for increasing capacity
- Replace all bridges on mainline and account for 8 lanes
- Retain all overpasses unless the interchange alteration necessitates replacing or the need for more shoulder width exists
- Do not replace or jack any overpasses
    - Exceptions allowed for identified geometric/operational design change
    - If a bridge is jacked, perform necessary maintenance and rehab on the bridge in this contract.
    - Replacements will account for 8 lane width
- Increase capacity at Exit 8
- Address geometric/operational deficiencies at Exit 5 and Exit 18
- Eliminate ramp access from frontage roads
    - Exit 5, relocate frontage road
    - Exit 18, cul-du-sac frontage road
- All interchange ramps will be improved as necessary and paved based on the May 6, 2010, memo *Resurfacing/Rehabilitation of Interstate Ramps*.
- Improve pavement conditions on existing and new lanes based on Pavement Design from the Lab.
- Pave all truck parking areas, welcome centers, and weigh stations
- All crosslines will be inspected and addressed or redesigned as needed based on the inspection.
- Follow the MASH transition plan in PCDM-14 concerning the existing guardrail
- Replace existing fence damaged due to clear zone tree removal.
- All trees will be removed from the full clear zone based on clear zone charts for mainline.
- All trees will be removed inside of loops and ramps. Tree removal outside of the loops and ramps will follow the clear zone charts.
- Offset the frontage road entrances from the interstate ramps per the ARMS manual for all interchanges.
- Retain/reconstruct the Weigh in Motion sensors in the pavement

The Steering Committee was consulted on the path forward for the project concerning items in the scope. The purpose is to address policy issues for interstates in order for the SCDOT to be consistent for all

interstate projects. They advised the PDT to assume replacement of all bridges for cost and schedule estimates in the planning phase. During project development the bridges and interchanges will be investigated more thoroughly with more detailed data to determine replacement, rehabilitation, or jacking. The NEPA process will aid in making that decision with a thorough investigation of alternatives identified.

Issues such as the ramps, fence, clear zone, frontage road access, and guardrail are questions that normally arise during design. They are addressed here to provide a clear path for project development to move forward. The Steering Committee addressed these issues as SCDOT policy decisions. In other words, these scope items are not project specific, but the policy that the SCDOT is following at this time to address these issues on all of our interstates.

See Appendix Meeting Minutes for detailed discussions on the scope.

5.3 Proposed Typical Sections

The typical sections discussed during alternative analysis, and shown in the alternatives provided, are six (6) twelve foot (12') lanes with a ten foot (10') inside shoulder. For 5.5 miles there will be barrier wall, and the remaining 12.5 miles will be grassed median. The proposed widening sections are proposed to be cable median barrier between MM 0.0 to MM 5.0 and MM 8.5 to MM 16.0 and barrier wall between MM 5.0 to 8.5 and MM 16.0 to MM 18.0 with a transition guard rail between these sections. All overpasses have at least sixteen feet (16') of vertical clearance and ample horizontal clearance to add lanes of traffic; therefore, all overpasses will be retained. All mainline bridges will be replaced to minimize constructability issues.

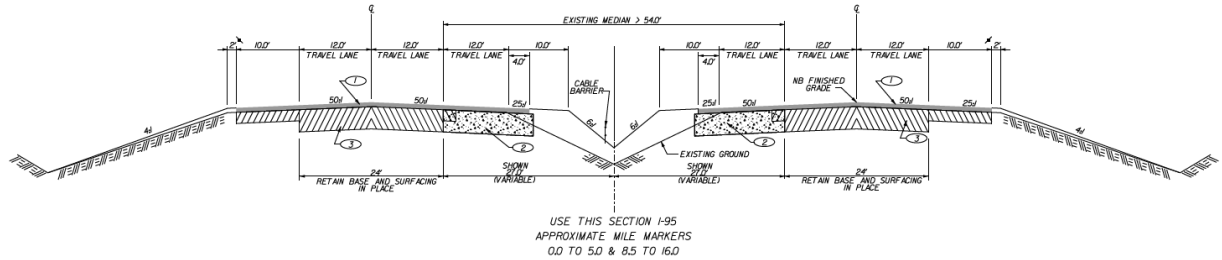

Figure 2. Interstate 95 – Proposed Widening Six (6) Lane Cross Section w/Cable Median Barrier, MM 0.0 to MM 5.0 and MM 8.5 to MM 16.0

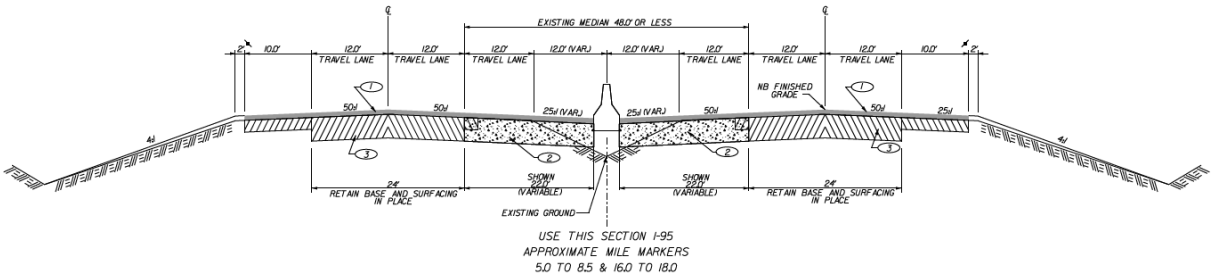

Figure 3. Interstate 95 – Proposed Widening Six (6) Lane Cross Section w/Barrier Wall, MM 5.0 to MM 8.5 and MM 16.0 to MM 18.0

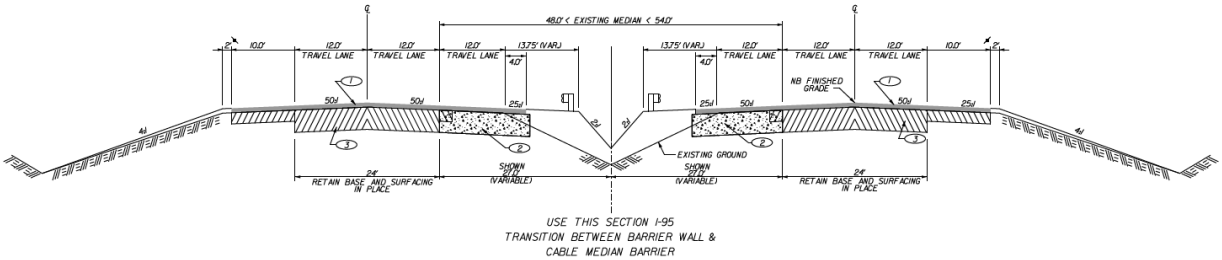

Figure 4. Interstate 95 – Proposed Widening Six (6) Lane Cross Section Transition between Cable Median Barrier and Barrier Wall

See Appendices Design Data and Meeting Minutes and see the Design Considerations section below for detailed discussions on these alternatives.

5.4 Logical Termini

There are some locations where interchange improvements affect the footprint of the interchange. Logical termini will be determined by the extent of these improvements.

Logical termini for mainline will be from the end of the current six (6) lane section just south of the Savannah River bridges at mile marker 0 (six lane section at GA State Line) to Exit 18 (Bees Creek Road) ramps. Bees Creek Road and US278 (Exit 8) were both chosen as logical termini based on ADT at the different interchanges. FHWA reviewed and agreed with the chosen logical termini locations for this study. Cost estimates were calculated for both termini. It was determined by SCDOT that the funding supported that the first project end at Exit 8.

5.5 Suggested Basic Scope

After consideration of the alternative analysis and the safety data, the key scope elements of the suggested basic scope are six (6) lanes of traffic, replacement of all bridges on mainline I-95, retain all bridge crossings over I-95, replace one interchange, and retain two interchanges.

The suggested basic scope for I-95 MM 0 (six lane section at Georgia State Line) to Exit 18 is as follows:

- Address mainline geometric issues
- Evaluate need for additional truck parking and converting truck weigh station to truck parking. (A QT was approved along this corridor potentially making truck parking a non-issue)
- Expand ITS, WIM sensors
- Add an additional lane in each direction for a total of 6 lanes of travel
- Replace all bridges on mainline and account for 8 lanes
- Retain all overpass structures
- Interchange Approach
    - Replace

        - US278, Exit 8
    - Retain
        - US17/US321, Exit 5
        - Bees Creek Road, Exit 18
- Address geometric/operational deficiencies at Exit 5 and Exit 18
- Eliminate ramp access from frontage roads
- All interchange ramps will be improved as necessary and paved based on the May 6, 2010, memo *Resurfacing/Rehabilitation of Interstate Ramps*.
- Improve pavement conditions on existing and new lanes based on Pavement Design from the Lab.
- Pave all truck parking areas, welcome centers, and weigh stations
- All crosslines will be inspected and addressed or redesigned as needed based on the inspection.
- Follow the MASH transition plan in PCDM-14 concerning the existing guardrail
- Replace existing fence damaged due to clear zone tree removal.
- All trees will be removed from the full clear zone based on clear zone charts for mainline.
- All trees will be removed inside of loops and ramps. Tree removal outside of the loops and ramps will follow the clear zone charts.
- Offset the frontage road entrances from the interstate ramps per the ARMS manual for all interchanges.
- Retain/reconstruct the Weigh in Motion sensors in the pavement

6.0 Design Considerations

Alternatives are the potential solutions to the problem. The P&N, goals, metrics, and scope aid in developing the alternatives in order for the problem to be addressed.

6.1 Potential Alternatives from the PDT

- Mainline Corridor Widening (MM 0 to Exit 18)

  A1. Managed Lanes - Eliminated
    i. High Truck Percentage
    ii. Tourists more than commuters during the summer
    iii. Not conducive to rural interstates
    iv. Issues with enforcements of managed lanes
    v. SC law prohibits tolling interstates

  A2. 8 Lanes – Eliminated
    i. Since the goal was to obtain LOS C or higher on the mainline, 6 lanes meets that criteria with two sections of B and the majority of the sections as C. 8 Lanes was LOS B for all sections.
    ii. There is not enough median width for 8 lanes, therefore, all interchanges would have to be replaced and new right-of-way purchased

  A3. Transit – Eliminated
    i. High Truck Percentage
    ii. Capacity issues are driven by tourists and not commuters

  A4. 6 Lanes – Widening both north and south bound lanes to the east – Eliminated
    i. Excessive environmental and right-of-way impacts

  A5. 6 Lanes – Widening both north and south bound lanes to the west - Eliminated
    i. Excessive environmental and right-of-way impacts

  A6. 6 Lanes – Widening both north and south bound lanes to the outside - Eliminated
    i. Excessive environmental and right-of-way impacts

  A7. 6 Lanes – Widening both north and south bound lanes to the median

  A8. No Build

- Interchanges
  b. Exit 5
    i. Only address deficiencies
      1. Frontage road connecting to the ramp. Relocate Frontage Road.
  c. Exit 8
    i. The alternatives will be traffic driven.
  d. Exit 18
    i. Cul-du-sac S13 to eliminate a side road from accessing a ramp

- Overpasses
  - Retain overpasses due to ample horizontal and vertical clearance.

Preconstruction reevaluated Alternatives 4, 5, and 6 after the PDT Scoping meeting and eliminated them due to excessive environmental and right-of-way impacts. Alternatives 7 and 8 were the only alternatives discussed in the Final PDT meeting. See the Design Variances/Exceptions section below for more detail.

Below Table 8 shows a description of each alternative, and Table 9 shows which metrics were met for each alternative. Some metrics could not be evaluated based on the limited data obtained at the planning level; therefore, not applicable (N/A) is included in these cells. Y and N are included in the cells that could be evaluated with Y being yes, it met the metric, and N being no, it did not meet the metric. Shaded goals and metrics tie directly to the P&N and are considered critical.

Note that preliminary traffic studies were performed for the interchanges. The volumes used for Exit 8 seem low. Once the project is in PE, traffic counts will be ordered which may alter the design provided by Traffic Engineering for the FR.

Description of Alternatives		
A1	Eliminated	Managed Lanes
A2	Eliminated	8 Lanes
A3	Eliminated	Transit
A4	Eliminated	6 lanes, widening of north and south bound lanes to the east
A5	Eliminated	6 lanes, widening of north and south bound lanes to the west
A6	Eliminated	6 lanes, widening of north and south bound lanes to the outside
A7	Alternative 7	6 lanes, widening of north and south bound lanes to the median
A8	Alternative 8	No Build
Interchange	Exit 5	Only address deficiencies, relocate frontage road
Interchange	Exit 8	Alternatives shall be traffic driven
Interchange	Exit 18	Cul-de-sac at S-13 to eliminate side road access to ramp

Table 8. Alternative Descriptions

Alternative	Improve Capacity	Truck Travel Time Reliability	Address Interchange Deficiencies		Improve Safety	Address Bridge Deficiencies	Address Pavement Deficiencies
	LOS C or Better	TTTR 1.30 or Better	LOS C or Better	Remove interconnectivity with side roads and frontage roads on ramps	Improve crash rates from existing	Sufficiency Rating of 7 or better	Improve structure number, PQI and rideability from existing
A7	Y	N/A	Y	Y	Y	Y	N/A
No Build	N	N	N	N	N	N	N
Exit 5	Y	N/A	N	Y	N/A	N	N/A
Exit 8	Y	N/A	Y	Y	N/A	N	N/A
Exit 18	Y	N/A	N	N/A	N/A	N	N/A

Table 9. Alternatives Project Goals and Metrics Matrix, Shaded Indicates Critical Goals

Safety Improvements is noted as Y above for Alternative 7. The crash data supports some minor improvements for the six (6) lane section with a grassed median and cable barrier. The six (6) lane section with barrier wall and the no build alternative have essentially the same number of crashes. The barrier wall section actually has a slightly higher crash rate than the no build, but statistically speaking, they have

the same crash rate. The grassed median section is a much greater length than the barrier wall section; therefore, for Table 9, Y was chosen for Alternative 7 for Improve Safety.

See Appendices Design Data and Meeting Minutes for detailed discussion on the alternatives.

6.2 Design Variances / Exceptions

Several different mainline alternatives were initially considered for this project, giving different options for widening of the mainline corridor. A large portion of the corridor is located within wetlands and crosses many streams and the Savannah River creating large impacts for the environment and right-of-way. Alternative 7, widening to the inside, has the least impacts in regard to environmental permitting and the project footprint. The existing median width is wide enough to accommodate the widening to the inside but will require cable barrier. Approximately 5.5 miles of the alignment would require barrier wall and closed drainage. Alternatives 4, 5 and 6 would not require barrier wall and a closed drainage system.

The existing overpasses currently meet the minimum vertical clearance with room for additional overlay. The median beneath the overpass will accommodate widening to the inside if a twelve foot (12') inside shoulder is not maintained. An inside shoulder of four foot (4') or more could be maintained. It was not recommended by the PDT during the Bridge Replacement Alternatives Analysis that the existing overpasses should be replaced during this project. Alternatives 4, 5, and 6 do not provide enough width beneath the overpasses to accommodate widening to the outside.

Mainline bridges will be replaced with wider structures instead of widening the existing structures. Currently I-95 north and south bound bridges, just north of Exit 5 at SC-46, are being replaced with a single bridge and is within this project boundary. The remaining bridges on the mainline within MM 0 (six lane section at Georgia State Line) to Exit 18 on I-95 currently have enough room in the median to use a similar approach of replacement with a single structure with Alternative 7. Alternatives 4, 5 and 6 would likely require two new separate bridges.

Based on the findings during the Feasibility Report process it was recommended by Preconstruction that Alternative 7 was the most reasonable alternative. Environmental and right-of-way impacts are greatly reduced with a smaller project footprint, while also supporting the mainline bridges being replaced with a single bridge to carry both the north and south bound lanes. Overpasses will not need to be replaced to accommodate the additional inside lanes. The requirement of closed drainage and barrier wall is a minimal impact when compared to the overall reduction of environmental and right-of-way impacts and construction for overpass bridges.

See Appendix Design Data for more discussion on the elimination of alternatives.

6.3 Constructability Review

This section of roadway did not have any complicated construction issues identified that may necessitate a constructability review. One could be requested during project development if an unexpected concern arises. The current SC-46 and Bagshaw Creek bridge staging plans were used to aid in making determinations on this project as to how best to handle mainline bridge replacements.

7.0 Compilation of Data

7.1 Risks and Mitigation

Identifying and anticipating risks for the project is critical to the Feasibility Report success. At the planning stage little is known about the details of the site; therefore, definitive answers cannot be formed concerning the project design, footprint, public opinion, or impacts. Desktop decisions will be made to define the path forward. Each of these decisions are made with assumptions due to uncertainties and variabilities which can be defined as risks.

According to the Project Management Institute, risk is an uncertain event or condition that, if it occurs, can have a positive or negative effect on a project's objectives. In addition to what are commonly considered risks, things like uncertainties, constraints, and assumptions are all additional forms of risk.

Likelihood of Occurrence Table	
Level	Likelihood, %
Almost Certain	81-100
Probable	61-80
Possible	41-60 (Maybe/IDK)
Rare	21-40
Exceptionally Rare	0-20

Table 10. Likelihood of Risk

Risks were determined in the Final PDT meeting. Each alternative was assessed and the risks are summarized in Tables 15 and 16. Each risk was given a value that defines the likelihood of its occurrence and the consequence of its occurrence. Some risks affect the cost more than the schedule and vice versa, but some risks affect both cost and schedule. Each risk was assessed for its effect on both cost and schedule.

The values used by the PDT to determine the risk level are displayed in Appendix Meeting Minutes.

Consequence to Cost Table	
Level	Likelihood, %
Severe	80-100
High	60-79
Moderate	40-59 (Maybe/IDK)
Low	20-39
Very Low	0-19

Table 11. Consequence to Cost

For the risk, the PDT assigned a likelihood of its occurrence, expressed in a percentage on how likely they felt that risk was to take place, see Table 10. The values range from 1 to 5 or Exceptionally Rare to Almost Certain.

For cost, the PDT assigned a percent increase in cost over what would normally be expected for the activity/issue being discussed. These can be seen in Table 11. The range is from 0% to 100% of an increase or Very Low to Severe.

Consequence (Duration) to Schedule Table	
Level	Range
Significant	31 MONTHS+
Very High	21-30 MONTHS
High	15-20 (Maybe/IDK)
Moderate	11-14 MONTHS
Low	6-10 MONTHS
Very Low	0-5 MONTHS

Table 12. Consequence to Schedule

For schedule, The PDT determined the additional number of months that it would take to complete the activity being discussed. These can be seen in Table 12. The range is from 0 Months to 31+ Months or Very Low to Significant.

Table 13 is the risk matrix for cost and Table 14 is the risk matrix for schedule. The colors for Tables 15 and 16 correspond to the colors in Tables 13 and 14, respectively.

Risk Matrix for Cost							
		Values	Risk Scores				
Likelihood	Almost Certain	5	5	100	200	300	400
	Probable	4	4	80	160	240	320
	Possible	3	3	60	120	180	240
	Rare	2	2	40	80	120	160
	Exceptionally Rare	1	1	20	40	60	80
			Values				
			1	20	40	60	80
			Very Low	Low	Moderate	High	Severe
			CONSEQUENCE				

Table 13. Risk Matrix for Cost

Risk Matrix for Schedule								
		Values	Risk Scores					
Likelihood	Almost Certain	5	5	40	65	85	115	180
	Probable	4	4	32	52	68	92	144
	Possible	3	3	24	39	51	69	108
	Rare	2	2	16	26	34	46	72
	Exceptionally Rare	1	1	8	13	17	23	36
			Values					
			1	8	13	17	23	36
			Very Low	Low	Moderate	High	Very High	Significant
			CONSEQUENCE					

Table 14. Risk Matrix for Schedule

Risk ID	Risk	Opportunity or Threat	Likelihood of Occurrence Value	Consequence Value	Cost Risk Value
R 002	Full Reconstruction of Pavement from MM 4 – 18	T	Exceptionally Rare	Moderate	40
R 003	7" Overlay	O	Almost Certain	Moderate	200
R 004	Railroad Crossing	T	Almost Certain	Very Low	5
R 005	Stateline Bridge, Replacement	T	Rare	Moderate	80
R 006	Stateline Bridge, Coordination	T	Probable	Very Low	4

R 007	Noise Walls in Hardeeville	T	Possible	Very Low	3
R 008	Additional MOT at Weight Station (If Exit 3 is built before the I-95 project)	T	Almost Certain	Very Low	5
R 009	Ultimate buildout at the Railroad bridge is not accomplished with the Exit 3 project	T	Rare	Very Low	2
R 010	Contractual risks if construction with Exit 3 and I-95 overlap	T	Rare	Very Low	2
R 011	Ensure Exit 3 Railroad bridge plans have the proper buildout width for the I-95 project	O	Almost Certain	Moderate	200
R 012	Ensure contract addresses MOT, NOI, and prime contractor delays if construction overlaps between Exit 3 and I-95	O	Almost Certain	Moderate	200
R001 Exit 5	Development with Hardeeville / Jasper County	T	Possible	Low	60
R002 Exit 5	R/W to relocate frontage road or buy out business on slip ramp	T	Almost Certain	Low	100
R 003 Exit 5	Minor to major improvements to Exit 5 due to elimination of Exit 3	T	Rare	Moderate	200
R 001 Exit 8	Major interchange improvements including r/w and environmental	T	Probably	Moderate	160
R 001 Exit 18	Active / potential business at slip ramp	T	Possible	Low	60

Table 15. Cost Risk Register, Alternative 7

Risk ID	Risk	Opportunity or Threat	Likelihood of Occurrence Value	Consequence Value	Cost Risk Value
R 002	Full Reconstruction of Pavement from MM 4 – 18	T	Exceptionally Rare	High	17
R 003	7" Overlay	O			
R 004	Railroad Crossing	T	Almost Certain	Low	40
R 005	Stateline Bridge, Replacement	T	Rare	Low	16
R 006	Stateline Bridge, Coordination	T	Probable	Low	32
R 007	Noise Walls in Hardeeville	T	Possible	Very Low	3
R 010	Contractual risks if construction overlaps between Exit 3 and I-95	T	Rare	Low	16
R 001 Exit 5	Development with Hardeeville / Jasper County	T	Possible	Moderate	39
R 002 Exit 5	R/W to relocate frontage road or buy out business on slip ramp	T	Almost Certain	Low	40
R 003 Exit 5	Minor to major improvements to Exit 5 due to elimination of Exit 3	T	Rare	Low	16
R 001 Exit 8	Major interchange improvements including r/w and environmental	T	Probable	Moderate	52
R 001 Exit 18	Active / potential business at slip ramp	T	Possible	Low	24

Table 16. Schedule Risk Register, Alternative 7

Mitigation was discussed for red risks that are threats. These have the greatest consequence to the cost and/or schedule. For the mainline, the pavement design with seven inch (7") overlay was the only red risk. The mitigation plan was to have Pavement Design to evaluate the costs between total reconstruction of the roadway by removing the concrete section, or retaining the concrete section with an overlay. To avoid creating a vertical clearance issue, seven inches (7") was the maximum asphalt depth allowed with a Stone Mastic Asphalt (SMA) surface. The cost would be considerably cheaper with the overlay, but the overlay may not be structurally sufficient for the loads.

Exit 8 also had a red risk that was a threat for right-of-way and environmental impacts. These impacts would be minimized as much as possible during NEPA, but in order to address the issues with the interchange, these impacts may be accepted.

Realization strategies were discussed for red risks that are opportunities. The two opportunities both relate to the construction of Exit 3. Part of the Exit 3 construction will involve widening of the railroad bridges just south of the interchange. The I-95 widening will require additional width to the outside where the Exit 3 ramp will merge onto I-95. This additional width must be realized during the Exit 3 plan review conducted by the SCDOT.

As Exit 3 should be completed prior to I-95 construction beginning, numerous issues with the Exit 3 construction could arise and an overlap in construction could occur. As I-95 nears letting, project

development must coordinate with the Exit 3 construction staff to realize the need for contract language to address maintenance of traffic (MOT), Notice of Intent permit (NOI), or other issues that could delay the prime contractor for the I-95 project.

Mitigation nor realization was discussed for the yellow or green risks. A multiplier will be added to the cost or schedule to account for the risks that are threats.

The risks and mitigation/realization strategies are documented for use during project development and for use to determine the cost and schedule calculated in the next section.

7.2 Costs and Schedule

Each viable alternative has a cost and schedule shown below. Both the cost and schedule take into account the risks and mitigation strategies discussed above. This information is used for input into the STIP. These are planning level estimates and time frames so they will be refined as the project moves through development.

The costs were based on Alternative 7, widening the mainline I-95 corridor from MM 0 to MM 18 to the median. Mainline bridges will be replaced with a single bridge that can accommodate the inside median and reduce constructability issues. Typical section will be six (6) twelve foot (12') lanes with 5.5 miles of barrier wall and closed drainage, and 12.5 miles of grassed median with cable median barrier.

Note that the schedule is expressed as a time frame. Once the project moves forward, project development will determine the starting month and fiscal year for the Preliminary Engineering (PE). Then based on the PE time frames, the Right-of-Way (RW) and the Construction (C) dates will be calculated. If there is a lag between this report and the initiation of PE, then the parties involved in determining the cost and schedule will reassess the values.

A summary of Alternative 7 and the associated cost and schedule is below in Table 17 for the current year (2019). See Table 18 for a comparison of current year and a future cost of year of construction, which is to aid the sponsor in budgeting their money. The yearly increase rate of 1% was used by the Office of Planning.

Detailed information concerning the costs and schedules are in Appendix Cost and Schedule Data.

Alternative	Alternative Description	PE Cost Estimate, $	RW Cost Estimate, $	Construction Cost Estimate, $	Months to RW	Months to Letting
COSTS FROM MM 0 TO MM 18 (Exit 18)						
Alternative 7	6 lane widening to inside	$43,564,935.60	$5,500,000.00	$488,692,450.00	32	48
COSTS FROM MM 0 TO MM 8 (Exit 8)						
Alternative 7	6 lane widening to inside	$25,495,603.60	$5,000,000	$284,040,950	26	40

Table 17. Alternative Summary with Cost and Schedule

EXISTING COSTS (2019) MM 0 to MM 18 (Exit 18)				
Alternative 7	PE Cost Estimate ($)	RW Cost Estimate ($)	Construction Cost Estimate ($)	Total Project Cost 2019
Widening to Inside	$43,564,935.60	$5,500,000.00	$488,692,450.00	$537,757,385.60
COSTS IN YEAR OF CONSTRUCTION (2023)				
Alternative 7	PE Cost Estimate ($)	RW Cost Estimate ($)	Construction Cost Estimate ($)	Total Project Cost 2023
Widening to Inside	$45,500,000	$5,700,000	$511,000,000	$562,000,000
EXISTING COSTS (2019) MM 0 to MM 8 (Exit 8)				
Alternative 7	PE Cost Estimate ($)	RW Cost Estimate ($)	Construction Cost Estimate ($)	Total Project Cost 2019
Widening to Inside	$25,495,603.60	$5,000,000	$284,040,950.00	$314,536,553.60
COSTS IN YEAR OF CONSTRUCTION (2023)				
Alternative 7	PE Cost Estimate ($)	RW Cost Estimate ($)	Construction Cost Estimate ($)	Total Project Cost 2023
Widening to Inside	$26,600,000	$5,200,000	$297,000,000	$328,000,000

Table 18. Existing and Future Project Costs for MM 0 to 18 and MM 0 to 8

7.3 Multi-Criteria Alternative Scoring

Each viable alternative has benefits. In order to compare the benefits between the alternatives a multi-criteria scoring system was developed by the SCDOT. The criteria below is specific to an interstate widening with interchange modifications with numerous impacts.

The multi-criteria score was calculated for the two (2) viable build alternatives. The criteria, grouped by area of concern, is described briefly below. More detail can be found in Appendix Multi-Criteria Alternative Scoring.

Criterion Area	Criteria	Description
ROW	Driveway/Access Relocations	Number of drives/accesses impacted by the project in comparison to the total number of drives. Fewer impacts score higher.
	Residential Relocations	Number of residential relocations in comparison to the total number of residences in the project limits. Fewer impacts score higher.
Interchanges	Interchange Modifications	Number of modified, replaced, and retained interchanges in comparison to the total number of interchanges. Fewer impacts score higher.
Permitting	Stream Impacts	Based on the risks identified by the Environmental Services Office. Fewer impacts score higher.
	Wetland Impacts	Based on the risks identified by the Environmental Services Office. Fewer impacts score higher.
	Mitigation Bank	Based on availability of bank credits in the area. Greater bank coverage scores higher.
NEPA	Document Type	Based on the risks and input by the Environmental Services Office. More simplistic types score higher.
	Title VI	Based on the risks identified by the Environmental Services Office. No impacts are scored highest.
	4(f) Impacts	Based on the risks identified by the Environmental Services Office. No impacts scored highest.
Project Goals	Critical Goals	Number of critical goals met in comparison to the total number of critical goals. More goals met score higher.
	Non-Critical Goals	Number of non-critical goals met in comparison to the total number of non-critical goals. More goals met score higher.
Bridges	Overpass Impacts	Number of overpasses impacted by the project compared to the total number of overpasses. Fewer impacts score higher.
Safety	Crashes	Number of crashes/mile/year for the project in comparison to the existing crashes/mile/year. Fewer crashes score higher.
Capacity/Mobility	Congestion/LOS	Change in LOS from the project in comparison to the existing. Greater change scored higher.

Table 19. Multi-Criteria Description

	Criteria	A7	No Build
RW	Driveway/Access Relocations 1	10/12	0/12
		1	5
	Residential Relocations 1	0/0	0/0
		5	5
Interchanges	Interchange Modifications 2	2/1/0/3	0/0/3/3
		3	5
Permitting	Stream Impacts	Low	None
		3	4
	Wetland Impacts	Low	None
		3	4
	Mitigation Bank	Yes	Not Needed
		5	5
NEPA	Document Type	EA	Not Needed
		3	5
	Title VI Impacts	No	No
		5	5
	4(f) Impacts	No	No
		5	5
Project Goals	Critical Goals 3	4/4	0/4
		5	0
	Non-critical Goals 3	1/1	0/1
		5	0
Bridges	Overpass Impacts 1	1/6	0/6
		5	5
Safety	Crashes 4	11.6/11.37 Wall 10.61/11.37 Grass	11.37/11.37
		0.5	0
Capacity	Congestion/LOS 5	C/E	E/E
		3	1
	Total Score	**51.5**	**49**

Table 20. Mainline Alternative Scores (See Table 8 for Alternative Descriptions)

Table 20 lays out each criteria for each viable mainline build alternative. Alternative A7 has the widening to the inside for twelve and a half (12.5) miles with a grassed median and for five and a half (5.5) miles with a median barrier wall.

Several other build alternatives were discussed but were not deemed viable. Other alternatives would have scored well below the viable build alternative due to increased wetland impacts and overpass impacts.

Below in Table 21 is a synopsis of the data for the alternatives. Operations and maintenance (O&M) will be the same on a daily basis regardless of the number of lanes, but will deviate based on pavement type.

Stone matrix asphalt (SMA), the assumed pavement type from the pavement analysis, is replaced every 20 years. Construction completion is 2026. Using a 20 year analysis period, the O&M costs for that 20 year period is zero (0) for the build but a significant amount every ten (10) years for the No Build.

Alternative	Total Project Costs (2019)	O&M (2019)	Score
No Build	0	25,500,000	N/A
A7 – 6 Lanes	$537,757,385.60	0	51.5

Table 21. Mainline Alternative Data Synopsis

Detailed information concerning the multi-criteria scoring system and O&M costs can be found in Appendix Multi-Criteria Alternative Scoring.

8.0 Conclusion

In order to address projects goals, constraints and risks, it is assumed an additional lane will be provided in each direction of Interstate 95 mainline from MM 0 (six lanes at Georgia State Line) to Exit 18 (Bees Creek Road). Overpass bridges over I-95 will not be replaced as the existing bridges have enough room to accommodate the additional inside lanes. Design exceptions in spot locations for horizontal clearances can be pursued during the NEPA process. If interchange bridges require replacement, a future 8-lane interstate facility will be assumed. All interchanges will be improved to address safety or operational concerns. Exit 8 is the only interchange that will have major modifications due to operations. Frontage roads will be addressed to eliminate slip ramps at Exits 5 and 18. Maintenance of traffic plans need to account for maintaining Truck Travel Time Reliability (TTTR) during construction.

Risks associated with the Town of Hardeeville proposed Exit 3 were recorded. No portion of Exit 3 is included in this cost or schedule, but some risk opportunities exist that should be pursued in order to reduce conflicts between the two projects if Exit 3 is delayed. At this time Exit 3 is anticipated to be constructed prior to commencing construction on I-95.

Many different alternatives were evaluated to determine the best location for the additional lanes. The alternatives are listed in Table 8. The ultimate goal of the FR is to develop costs and schedules for viable alternatives. Part of this process is to eliminate alternatives that do not meet the metrics or do not seem viable. There can be an unlimited number of alternatives to evaluate, and it is the job of the PDT to determine which ones have merit and are worth spending effort to develop a cost and schedule.

After review and consideration of the project goals, existing conditions, cost and benefits, the Project Development Team identified that Alternative 7 was reasonable and viable and should be investigated further in project development during the PE phase. The data gathered thus far is intended to inform NEPA in order to determine the preferred alternative.

A cost estimate and schedule was developed for Alternative 7. The schedule takes into account time for the Interchange Modification Report (IMR) and for the environmental assessment (EA) document.

The basic findings of this Feasibility Report are that 6 lanes are needed, replace all bridge structures on mainline, retain all bridge crossings over I-95, replace the US278 interchange, and retain the US17/US321 and Bees Creek Road interchanges.

After costs were reviewed for the entire segment, it was decided that funding was only available to Exit 8, a logical termini location based on ADT.

To conclude, the Feasibility Report is the initial step in the planning process which describes the project purpose and need, costs, schedule and identifies risks that require consideration in the future planning and design phases. The alternative brought forward through the Feasibility Report process and the PDT is listed in Table 21 along with their multi-criteria scores and total cost. All data to support the findings in this report that have brought the PDT to the alternates and corresponding costs and schedules can be found in the appendices for those desiring more detail.

Appendices