

Value Engineering For Transportation Improvements

I-95 (SR 9) Interchange at Northlake Boulevard



Value Engineering Study Final Report

FM Number: 435803-1-22-02

Fed. Aid Project: Yes

Project Description: I-95 (SR 9) Interchange at Northlake Boulevard

Study Dates: February 27 – March 3, 2017

Project Development Phase				Study Identification Number		
PD&E	Design	Other		VE Item No.		
Stanley Consultants, Inc.				Yr.	Dist.	No.
				17	004	04

This study has been performed in accordance with current applicable FDOT Value Engineering Procedures and Techniques


Richard L. Johnson, CVS No. 20030201, PE No. 38681

Date: July 7, 2017

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EXECUTIVE SUMMARY

1.1 INTRODUCTION

A Value Engineering (VE) Study was held, during February 27 – March 3, 2017, using the VE methodology to improve the I-95 (SR 9) Interchange at Northlake Boulevard project. The VE study analyzed value improvements for improving the traffic movements in north eastern Palm Beach County. The purpose of this study is to identify short-term and long-term needs and develop design concepts to address traffic spillback onto I-95, improve interchange operations, and reduce congestion, at the study interchange through the 2040 design year.

The interchange is located in the City of Palm Beach Gardens and is situated approximately 1.73 miles south of PGA Boulevard and approximately 1.76 miles north of Blue Heron Boulevard. There are two adjacent signalized intersections on Northlake Boulevard, Keating Drive is on the west and Roan Lane is just east of the interchange.

Commercial retail/office and residential land uses are located adjacent to the interchange. Commercial retail/office uses flank Northlake Boulevard west of I-95 southbound ramps. These developments are accessed via Keating Drive, which intersects Northlake Boulevard approximately 680 feet from the I-95 southbound ramps. Predominantly residential uses are located to the west of Congress Avenue.

Predominantly residential and commercial retail uses are located to the east of I-95. The first signalized intersection to the east of I-95 is Roan Lane, located approximately 430 feet from the I-95 northbound ramps. Roan Lane serves commercial and residential uses to the north. Sunrise Drive/Sandtree Drive is the second intersection to the east, located approximately 670 feet from Roan Lane. Sunrise Drive serves commercial and residential uses to the north of Northlake Boulevard, and Sandtree Drive serves commercial and residential uses to the south of Northlake Boulevard.

The project location may be found on the **Figure 1.1–1 Project Location Map**. The typical sections and plan and profile drawings for the roadway alternatives were shown on the concept drawings included in the Project Development and Environment (PD&E) documents. By building this project, Palm Beach County and Florida Department of Transportation (FDOT) will improve mobility in the region and the level of service for the I-95 mainline and the Northlake Boulevard corridor. The project will provide improved level of service and operations in the area.

Table 1.1–1 Preliminary Cost Estimate on page 4 shows the project preliminary estimated construction costs for the improvements for the alternative being studied. The proposed improvements are to enhance regional mobility and level of service in the design year of 2040.

1.2 GOALS AND OBJECTIVES

The objective of the study was to identify opportunities and recommend concepts that may improve value in terms of capital cost, constructability, maintenance of traffic, and the basic functional requirements of the project. This report documents the value engineering analysis performed to support decisions related to the planned project alternatives. Additionally, it summarizes existing conditions, documents the purpose and need for the project as well as documents other engineering, environmental, and social data related to PD&E concept.

The basic project functions are to improve level of service for the interchange, avoid spillback, improve connectivity and improve traffic operations within the regional transportation system. As shown in **Section 4**, the Functional Analysis System Techniques (FAST) Diagram illustrates the functions as determined by the VE team.

1.3 RESULTS OF THE STUDY

The VE team generated 42 ideas during the Creative Ideas phase of the VE Job Plan. The ideas were then evaluated based on the evaluation criteria for this project. The object of this evaluation was to identify ideas with the most promise to achieve savings while preserving functions or improving operations.

The team began the evaluation process of scoring the PD&E documents concept and the individual creative ideas. During this process it was agreed that we had various ideas, but certain ideas having the greatest potential value improvement were carried forward for further development. The remaining ideas either became design suggestions (many specific to a particular component within the project) or were eliminated as duplicate, not appropriate or improbable for acceptance. The VE team ultimately categorized seven ideas as recommendations for the designers to consider. The developed ideas maintain the required functions while improving overall costs, constructability, minimizing time, minimizing utility conflicts and right-of-way issues, minimizing environmental impacts, as well as addressing regional connectivity issues, aesthetics and drainage. The ideas and how they rated on a weighted scoring evaluation are listed in the table in **Section 6**. Those ideas that were eliminated are shown with strikeout font.

The design suggestions identified by the VE team are shown in **Section 6**. The VE team presents design suggestions for FDOT's consideration. No specific action is normally required to accept or not accept the suggestions, though it is often helpful, for documentation purposes, to formally list those suggestions that will be acted upon by FDOT.

1.4 RECOMMENDED ALTERNATIVES

The recommendations for further consideration are shown in **Table 1.4-1, Summary of Highest Rated Recommendations**. Potential cost savings are shown in present day dollars.

The recommendations in the following table indicate the anticipated initial cost, operation and maintenance cost, future cost and Life Cycle Cost (costs shown indicate initial capital costs as the LCC are similar to the original design) of the proposed recommendations. The Present Worth (PW) Life Cycle Cost also includes the initial cost, and the other above mentioned costs over the anticipated useful life of the facility. Acceptance of these recommendations would improve the value and be incorporated in the design of the facility. These recommendations appear to be the most cost effective way to provide the required functions. Some of the recommendations cannot be taken with others, since some are mutually exclusive recommendations.

1.5 MANAGEMENT ACCEPTANCE & IMPLEMENTATION

Management action on each of the recommendations taken at the subsequent resolution meeting will be included in **Table 1.4 – 1** in the "Management Action" column. The FDOT Project Manager must ensure that all accepted recommendations are implemented and all pending actions are resolved for inclusion in the project design. Close coordination with the District Value Engineer is encouraged to insure timely resolution of management action.

**Figure 1.1 – 1
Project Location Map**

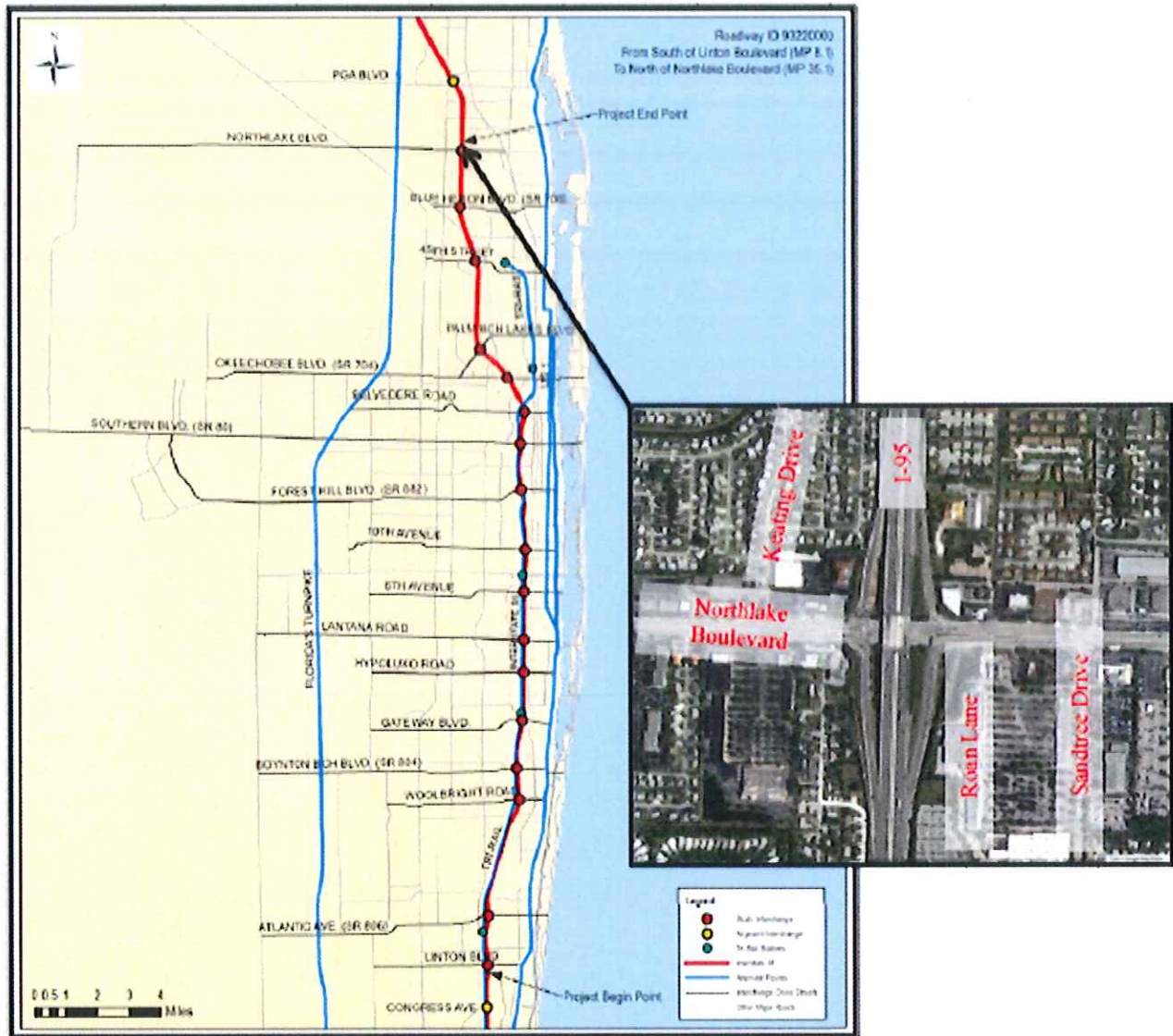


Table 1.1 – 1
Preliminary Cost Estimate
PD&E Alternate 2

Construction Item	Total Costs
Earthwork	\$1,773,999.97
Roadway	\$8,648,434.02
Shoulder	\$1,291,789.10
Median	\$470,474.15
Drainage	\$1,838,572.09
Bridges	\$10,954,753.19
Retaining Walls	\$488,368.00
Signing	\$81,487.98
Lighting	\$882,845.59
Signalization	\$1,932,842.80
ITS	\$65,254.28
Total Construction	\$28,428,821.17
MOT (10%)	\$2,842,882.12
Subtotal	\$31,271,703.29
Mobilization (10%)	\$3,127,170.33
Contingency	\$150,000.00
Subtotal	\$34,530,123.62
Right of Way	\$48,300,000.00
Total	\$82,830,123.62

Reference: Preliminary Cost Estimate prepared by Stanley Consultants, Inc., dated December 7, 2017

<p>TABLE 1.4 – 1</p> <p>SUMMARY OF HIGHEST RATED RECOMMENDATIONS</p>				
		PRESENT WORTH (PW) OF COST (FUTURE COST)		
Rec. No.	Description	Management Action	Comments	Potential Cost Savings (Value Added)
1	Build a partial cloverleaf in the northeast quadrant and widen Northlake Blvd.	NA		\$16,555,000
2	Realign the ramps closer to the mainline	NA		\$30,714,000
3	Create free flow off ramp right turns for Alternative 1	NA		\$29,137,000
8	Build the 35 MPH Diverging Diamond Interchange	NA		\$44,750,000
16	Reduce the 7-ft bike lane and buffer	A		\$726,000
24	Add pedestrian lighting along the walkway for the DDI concept	A		(\$89,000)
26	Construct Alternative No. 1	A		\$29,149,000
33	Do not build the additional dedicated right turn lane northbound Sandtree Drive to eastbound Northlake Blvd. convert the through lane to a shared through and right turn lane	A		\$6,400,000

Management Action Legend: A=Accepted, NA=Not Accepted, FS=Further Study

2.1 GENERAL

This section describes the value analysis procedure used during the VE study. A systematic approach was used in the VE study and the key procedures involved were organized into three distinct parts: 1) pre-study preparations, 2) VE workshop study, and 3) post-study.

2.2 PRE-STUDY PREPARATIONS

Pre-study preparations for the VE effort consisted of scheduling study participants and tasks; reviews of documents; gathering necessary background information on the project; and compiling project data into a cost model. Information relating to the design, construction, and operation of the facility is important as it forms the basis of comparison for the study effort. Information relating to funding, project planning, operating needs, systems evaluations, basis of cost, production scheduling, and construction of the facility was also a part of the analysis.

2.3 VE WORKSHOP STUDY

The VE workshop was a five-day effort. During the workshop, the VE job plan was followed. The job plan guided the search for high value areas in the project and included procedures for developing alternative solutions for consideration while at the same time considering efficiency. It includes these phases:

- Information Gathering Phase
- Function Identification and Cost Analysis Phase
- Creative Phase
- Evaluation Phase
- Development Phase
- Presentation and Reporting Phase

2.3.1 *Information Phase*

At the beginning of the study, the conditions and decisions that have influenced the development of the project must be reviewed and understood. For this reason, the consultant project manager provided design information about the project to the VE team. Following the presentation, the VE team discussed the project using the documents listed in **Section 3.3**.

2.3.2 *Function Identification and Cost Analysis Phase*

Based on the preliminary cost estimate, historical and background data, a cost model was developed for this project organized by major construction elements. It was used to distribute costs by project element in order to serve as a basis for alternative functional categorization. The VE team identified the functions of the various project elements and subsystems and created a Function Analysis System Technique Diagram (FAST) to display the relationships of the functions.

2.3.3 *Creative Phase*

This VE study phase involved the creation and listing of ideas. During this phase, the VE team developed as many ideas as possible to provide a creative atmosphere and to help team members to “think outside the box.” Judgment of the ideas was restricted at this point to insure vocal critics did not inhibit creativity. The VE team was looking for a large quantity of ideas and association of ideas.

FDOT and the design team may wish to review the creative design suggestions that are listed in **Section 6**, because they may contain ideas, which can be further evaluated for potential use in the design.

2.3.4 Evaluation Phase

During this phase of the workshop, the VE team judged the ideas generated during the creative phase. Advantages and disadvantages of each idea were discussed and a matrix developed to help determine the highest-ranking ideas. Ideas found to be irrelevant or not worthy of additional study were discarded. Those that represented the greatest potential for cost savings or improvement to the project were "carried forward" for further development.

The creative listing was re-evaluated frequently during the process of developing ideas. As the relationship between creative ideas became more clearly defined, their importance and ratings may have changed, or they may have been combined into a single idea. For these reasons, some of the originally high-rated ideas may not have been developed.

2.3.5 Development Phase

During the development phase, each highly rated idea was expanded into a workable solution. The development consisted of a description of the idea, life cycle cost comparisons, where applicable, and a descriptive evaluation of the advantages and disadvantages of the proposed ideas. Each idea was written with a brief narrative to compare the original design to the proposed change. Sketches and design calculations, where appropriate, were also prepared in this part of the study. The developed VE ideas are summarized in the section entitled **Section 7 – Recommendations**.

2.4 POST STUDY

The post-study portion of the VE study includes the draft and final preparation of this Value Engineering Study Report and the discussions and resolution meetings with FDOT personnel. The Planning and Environmental Management team should analyze each alternative and prepare a short response, recommending incorporating the idea into the project, offering modifications before implementation, or presenting reasons for rejection. The VE team is available for consultation after the ideas are reviewed. Please do not hesitate to call on us for clarification or further information for considerations to implement any of the presented ideas.

2.4.1 Presentation and Reporting Phase

The final phase of the VE Study began with the presentation of the ideas on the last day of the VE Study. The VE team screened the VE ideas before draft copies of the report were prepared. The initial VE ideas were arranged in the order indicated to facilitate cross-referencing to the final recommendations for revision to the Contract Documents.

2.4.2 Final Report

The acceptance or rejection of ideas described in this report is subject to FDOT's review and approval. The VE team is available to address any final draft report comments for incorporation into the final report.

3.1 PARTICIPANTS

On February 27, 2017, representatives from Stanley Consultants, Inc., presented an overview of the projects in the PD&E documents for the interchange with I-95. The purpose of this meeting was to acquaint the study team with the overall project and what the main areas the VE team needed to focus on during this VE study.

The VE facilitator also reviewed and explained the value engineering improvement study agenda. He acquainted the team with the goals for the study based upon the study methodology that would be applied to improve the project. The study team included the following experts who participated in the study:

Participant Name	Role	Affiliation
Mauricio Micolta, PE,	Roadway Design	FDOT District 4
Donnie Webster	Right of Way	FDOT District 4
Kevin Micocci, PE	Constr./Operations	FDOT District 4
Ruben Rodriguez	Drainage	FDOT District 4
Mel Milford	PLEMO	FDOT District 4
Jamie Polidora, PE	PLEMO	FDOT District 4
Rana Keel, EI	Traffic Design	FDOT District 4
Zach Behring, EI	Structures	FDOT District 4
Francisco Cruz, PE, AVS, RMP,	Assistant Team Leader	FDOT District 4
Tim Brock, PE	District VE Coordinator	FDOT District 4
Rick Johnson, PE, CVS	VE Team Leader	PMA Consultants LLC

3.2 PROJECT INFORMATION

The purpose of the project orientation meeting, on February 27, 2017, in addition to being an integral part of the Information Gathering Phase of the VE study, was to bring the VE team “up-to-speed” regarding the overall project scope.

3.3 LIST OF VE STUDY MATERIAL REVIEWED

1. Preliminary Engineering Report (Pre-Draft) for VE, Project Development And Environment (PD&E) Study for SR 9/I-95 @ Northlake Boulevard Interstate in Palm Beach County, prepared by Stanley Consultants, Inc., dated February 2017
2. Cultural Resources Assessment Survey, Project Development And Environment (PD&E) Study for SR 9/I-95 @ Northlake Boulevard Interstate in Palm Beach County, prepared by Stanley Consultants, Inc., dated February 2017
3. Interchange Modification Report (IMR), Project Development And Environment (PD&E) Study for SR 9/I-95 @ Northlake Boulevard Interstate in Palm Beach County, prepared by Stanley Consultants, Inc., dated February 2017
4. Preliminary Drainage Report Pre-Draft for VE, Project Development And Environment (PD&E) Study for SR 9/I-95 @ Northlake Boulevard Interstate in Palm Beach County, prepared by Stanley Consultants, Inc., dated February 2017
5. Methodology Letter of Understanding (MLOU), Project Development And Environment (PD&E) Study for SR 9/I-95 @ Northlake Boulevard Interstate in Palm Beach County, prepared by Stanley Consultants, Inc., dated October 2015
6. Section 4(f) and 6(f) review for Natural and Social Resources I-95 at Northlake Blvd Interchange PD&E Memorandum, To: Scott Thurman, From: Bill Evans., dated January 25 2017

7. Northlake Boulevard Risk Register, provided February 23, 2017
8. FDOT Long Range Estimates, Alternatives 1, 2, and 3, prepared by Stanley Consultants, Inc., dated December 7, 2016
9. Proposed Structure Typical Section, prepared by Stanley Consultants, Inc., undated
10. Various Exhibit Boards for Alternatives 1, 2, and 3, prepared by Stanley Consultants, Inc., undated
11. Northlake Blvd BlueTOAD Speed Data, prepared by Stanley Consultants, Inc., provided March 2, 2017

3.4 SUMMARY OF GENERAL PROJECT INPUT - OBJECTIVES, POLICIES, DIRECTIVES, CONSTRAINTS, CONDITIONS & CONSIDERATIONS

The following is a summary of general project input, including the goals, objectives, directives, policies, constraints, conditions and considerations presented to the study team. Any “element” specific input is indicated by parentheses around the elements, disciplines and interests (i.e., right-of-way, roadway, environmental). Representatives from FDOT and the design team provided a project background, on the first day of the study.

3.4.1 Project Functions, Goals & Objectives (what the project should do as determined at the kickoff meeting and subsequent Workshops):

- | | |
|-------------------------|------------------------------------|
| 1. Improve LOS | 20. Connect Roadways |
| 2. Widen Road | 21. Certify Project |
| 3. Build Project | 22. Remove Water |
| 4. Add Lanes | 23. Resolve Disputes |
| 5. Establish Elevations | 24. Separate Traffic |
| 6. Move Vehicles | 25. Recommend Solutions |
| 7. Provide Refuge | 26. Study Alternatives |
| 8. Divide Traffic | 27. Establish Need |
| 9. Remove Water | 28. Anticipate Growth |
| 10. Span Conflicts | 29. Analyze Data |
| 11. Reduce Space | 30. Satisfy Community |
| 12. Inform Motorists | 31. Manage Access |
| 13. Increase Visibility | 32. Minimize Environmental Impacts |
| 14. Control Traffic | 33. Ease Maintenance |
| 15. Manage Traffic | 34. Accommodate Utilities |
| 16. Maintain Traffic | 35. Minimize Costs |
| 17. Start Construction | 36. Accommodate Traffic |
| 18. Address Unforeseen | 37. Anticipate Future Growth |
| 19. Acquire Space | 38. Ease Maintenance |

These functions were used by the VE team to create/brainstorm new ideas for potential improvement to the project.

3.4.2 Project Policies & Directives: (documented things the project must or must not do)

1. The project shall meet economic, engineering design, environmental and social/cultural criteria requirements
2. Meet the goals of the Palm Beach County 2040 Comprehensive Plan and the Long Range Transportation Plans for future developments

3.4.3 General Project Constraints: (unchangeable project restrictions)

1. None were identified

3.4.4 General Project Conditions & Considerations:

1. Refer to the PD&E documents and backup documentation prepared by Stanley Consultants, Inc.

3.4.5 Site Review Comments and other observations:

1. Sunset Drive is dangerous.
2. The northwest and southeast quadrants are all stop movements.
3. Sandtree Drive and Sunrise Drive are simultaneous left turns.
4. The Sandtree Drive and Sunrise Drive skew is extreme.
5. There are lots of access driveways on and off of Northlake Blvd.
6. Can or do we need to fix Sunrise and Sunset Drives?
7. Move the ramps closer to the I-95 mainline.
8. Residents in the northwest quadrant are very close to the noise wall.
9. The team only saw one bicyclist (riding against traffic) and one pedestrian.
10. Can we remove some signals?
11. No roadway lighting was observed.
12. There is no lighting system.
13. There is considerable space within the FDOT right of way.
14. Can we improve ingress/egress for the residents in the southwest quadrant?
15. Are there utility easements within the County right of way?
16. There is a lot of traffic.

3.5 QUALITATIVE RISK ANALYSIS

The team received a copy of the PD&E consultants risk register and prepared a qualitative risk analysis of initial perceived risks that would be addressed during the evaluation and development phases of the study. The risk map below shows what the team believed the occurrence probability might be and the relative impact the risk may have on the project.

The team reviewed six potential threats and one opportunity that were identified and mapped each one based on the anticipated impact and probability, an iterative algorithm was run to rank each of the risks as the team perceived them. That ranking on the following pages identify the risks with the highest level of concern regarding the project.

Figure 3.5 – 1 Threats Map

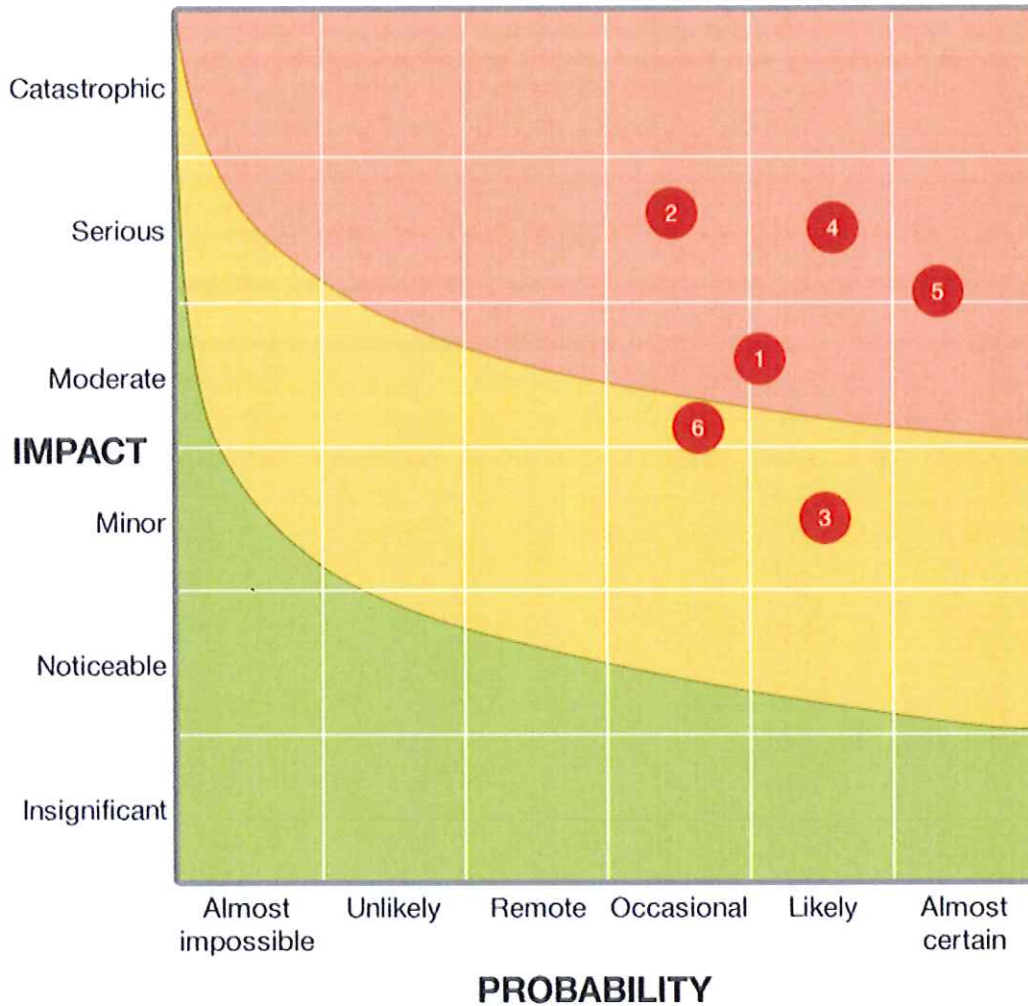


Table 3.5 – 1 Project Threats Ranking

Project Threats List		
Number	Description	Severity
1	Stakeholders may change the level of work	14.6
2	County may time signals to favor Northlake Blvd. or side streets.	15.9
3	Utility easements may exist in Northlake ROW	11.4
4	Right of way business damages may drive up costs.	20.4
5	Reconstructing the I-95 bridge creates MOT issues for the mainline.	21.3
6	Pond siting is unknown and may require high cost ROW.	11.4

Figure 3.5 – 2 Opportunities Map

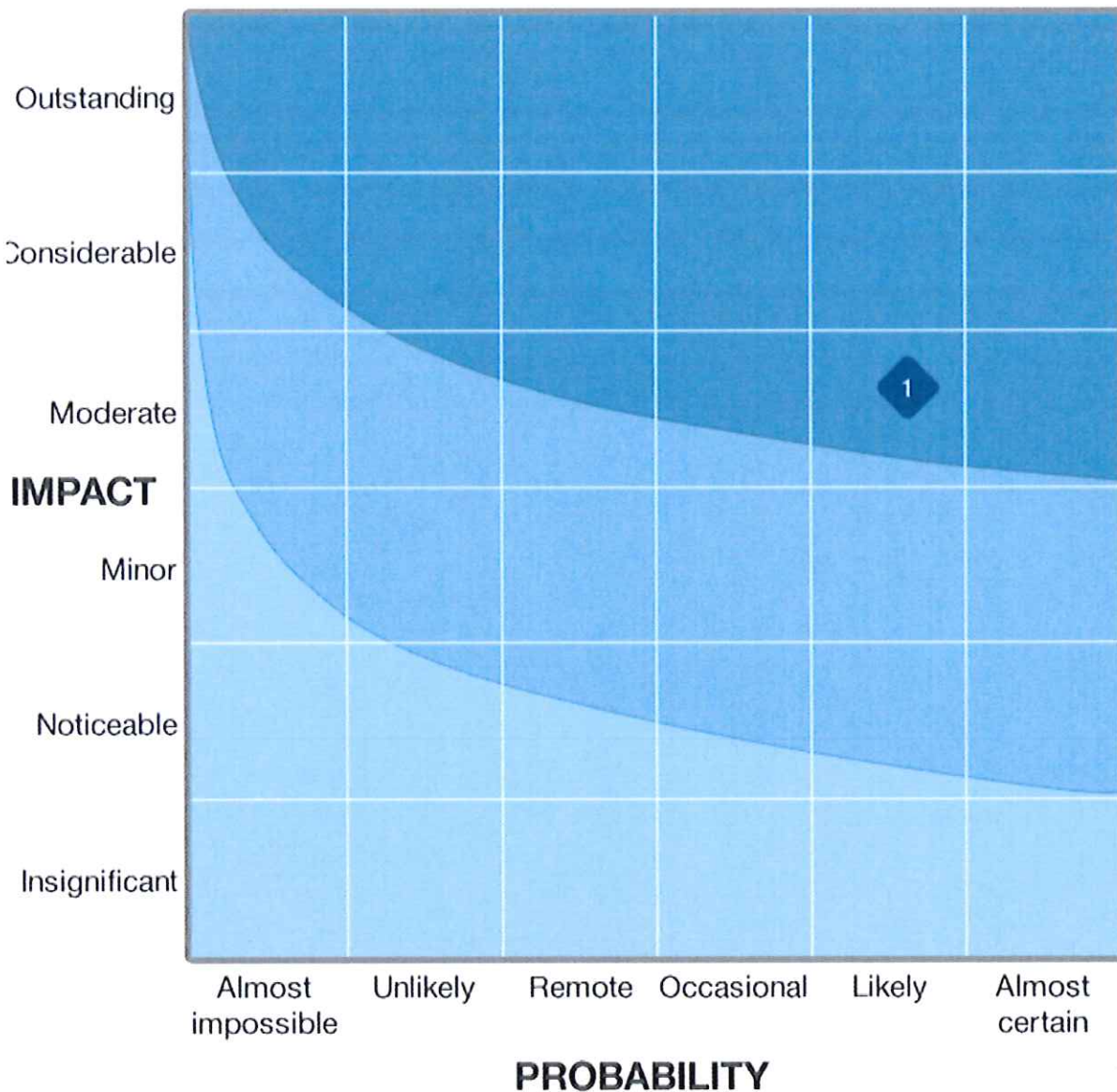


Table 3.5 – 1 Project Opportunities Ranking

Project Opportunity List		
Number	Description	Severity
1	Minimize the right of way acquisitions to lower costs.	16.7

3.5.1 Options Analysis

The options developed by the VE Team can generally be characterized in three categories:

- 1) Concepts that can reduce the footprint (right of way)
- 2) Improvements on Alternative 1 that may minimize costs and satisfy the function to eliminate spillback
- 3) Minimizing business damages

The benefits of reducing the footprint are multifaceted, as the work may be less disruptive to the commercial corridor and residential neighborhoods, will require less roadway reconstruction, has less risk associated with acquiring right of way with contamination issues, and is more cost effective due to the lower level of complexity. The VE team and the current PD&E teams believe there are multiple viable options to limit the right of way needs for the interchange, roadway and the to be determined ponds.

Accordingly, much effort was spent by the VE team evaluating and developing options to improve the Alternative 1 concept. Within those recommendations, some can be considered refinements to the plan, and others more substantive to the final condition and the overall cost, schedule and construction complexity of the work. The goal(s) of the alternatives is to address:

- 1) Eliminate the spillback that negatively effects level of service on the I-95 mainline.
- 2) Minimizing construction work areas at the interchange and the impacts on residents and businesses.
- 3) Improve Northlake Boulevard traffic operations.
- 4) Investigate potential enhancements for the side streets within the project limits.

4.1 ECONOMIC DATA

The study team developed economic criteria used for evaluation with information gathered from the PD&E documents. To express costs in a meaningful manner, the cost comparisons associated with alternatives are presented on the basis of total Life Cycle Cost and discounted present worth. Project period interest rates are based on the following parameters:

Year of Analysis:	2017
Economic Planning Life:	20 years starting in 2020
Discount Rate/Interest:	5.00%
Inflation/Escalation Rate:	3.00%

The Preliminary PD&E Cost Estimate was used by the team for the major construction elements and right of way costs were developed by Stanley Consultants, Inc., and the FDOT Right of Way Estimating team. The VE team had Long Range Estimate (LRE) costs for the Alternative 2, 40-MPH diverging diamond interchange corridor at Northlake Boulevard, provided by the PD&E consultants. The cost for the roadway and interchange improvements is based on a diverging diamond interchange and is \$34,530,123.62 and right of way is estimated at \$48,300,000. Right of way for the ponds right of way has not been estimated at the time of the study, because the pond siting process just began.

Table 4.1 – 1
Preliminary Cost Estimate
PD&E Alternate 1

Construction Item	Sequence 1	Sequence 2	Sequence 3	Sequence 4	Sequence 9	Sequence 10	Sequence 11	Total Costs	Function
Earthwork	\$109,839.06	\$346,884.55	\$69,602.72	\$69,602.72	\$35,147.81	\$67,950.91	\$1,074,972.20	\$1,773,999.97	Establish Elevations
Roadway	\$2,583,442.72	\$2,744,240.14	\$433,967.73	\$429,486.93	\$280,082.87	\$395,376.85	\$1,781,836.78	\$8,648,434.02	Move Vehicles
Shoulder	\$241,031.04	\$282,155.67	\$686,803.51	\$24,636.51	\$12,654.93	\$32,228.31	\$12,279.13	\$1,291,789.10	Provide Refuge
Median	\$120,877.62	\$141,169.60					\$208,426.93	\$470,474.15	Divide Traffic
Drainage	\$457,401.96	\$492,705.29	\$62,660.49	\$122,596.25	\$44,956.78	\$89,132.43	\$569,118.89	\$1,838,572.09	Remove Water
Bridges							\$10,954,753.19	\$10,954,753.19	Span Conflicts
Retaining Walls			\$157,352.00	\$331,016.00				\$488,368.00	Reduce Space
Signing	\$10,786.60	\$11,226.25	\$9,721.46	\$9,721.46	\$7,454.32	\$10,855.03	\$21,722.86	\$81,487.98	Inform Motorists
Lighting	\$223,398.29	\$304,908.16	\$52,662.96	\$70,217.28	\$43,885.80	\$70,217.28	\$117,555.82	\$882,845.59	Increase Visibility
Signalization	\$814,032.39	\$1,118,810.41						\$1,932,842.80	Control Traffic
ITS		\$65,254.28						\$65,254.28	Manage Traffic
Total Construction	\$4,560,809.68	\$5,507,354.35	\$1,472,770.87	\$1,057,277.15	\$424,182.51	\$665,760.81	\$14,740,665.80	\$28,428,821.17	
MOT (10%)	\$456,080.97	\$550,735.44	\$147,277.09	\$105,727.72	\$42,418.25	\$66,576.08	\$1,474,066.58	\$2,842,882.12	Maintain Traffic
Subtotal	\$5,016,890.65	\$6,058,089.79	\$1,620,047.96	\$1,163,004.87	\$466,600.76	\$732,336.89	\$16,214,732.38	\$31,271,703.29	
Mobilization (10%)	\$501,689.06	\$605,808.98	\$162,004.80	\$116,300.49	\$46,660.08	\$73,233.69	\$1,621,473.24	\$3,127,170.33	Start Construction
Contingency	\$18,750.00	\$18,750.00	\$18,750.00	\$18,750.00	\$18,750.00	\$18,750.00	\$18,750.00	\$150,000.00	Address Unforeseen
Subtotal	\$5,537,329.71	\$6,682,648.76	\$1,800,802.75	\$1,298,055.35	\$532,010.84	\$824,320.58	\$17,854,955.62	\$34,530,123.62	
Right of Way								\$48,300,000.00	Acquire Space
Total	\$5,537,329.71	\$6,682,648.76	\$1,800,802.75	\$1,298,055.35	\$532,010.84	\$824,320.58	\$17,854,955.62	\$82,830,123.62	

Reference: Preliminary Cost Estimate, prepared by Stanley Consultants, Inc., dated December 7, 2017

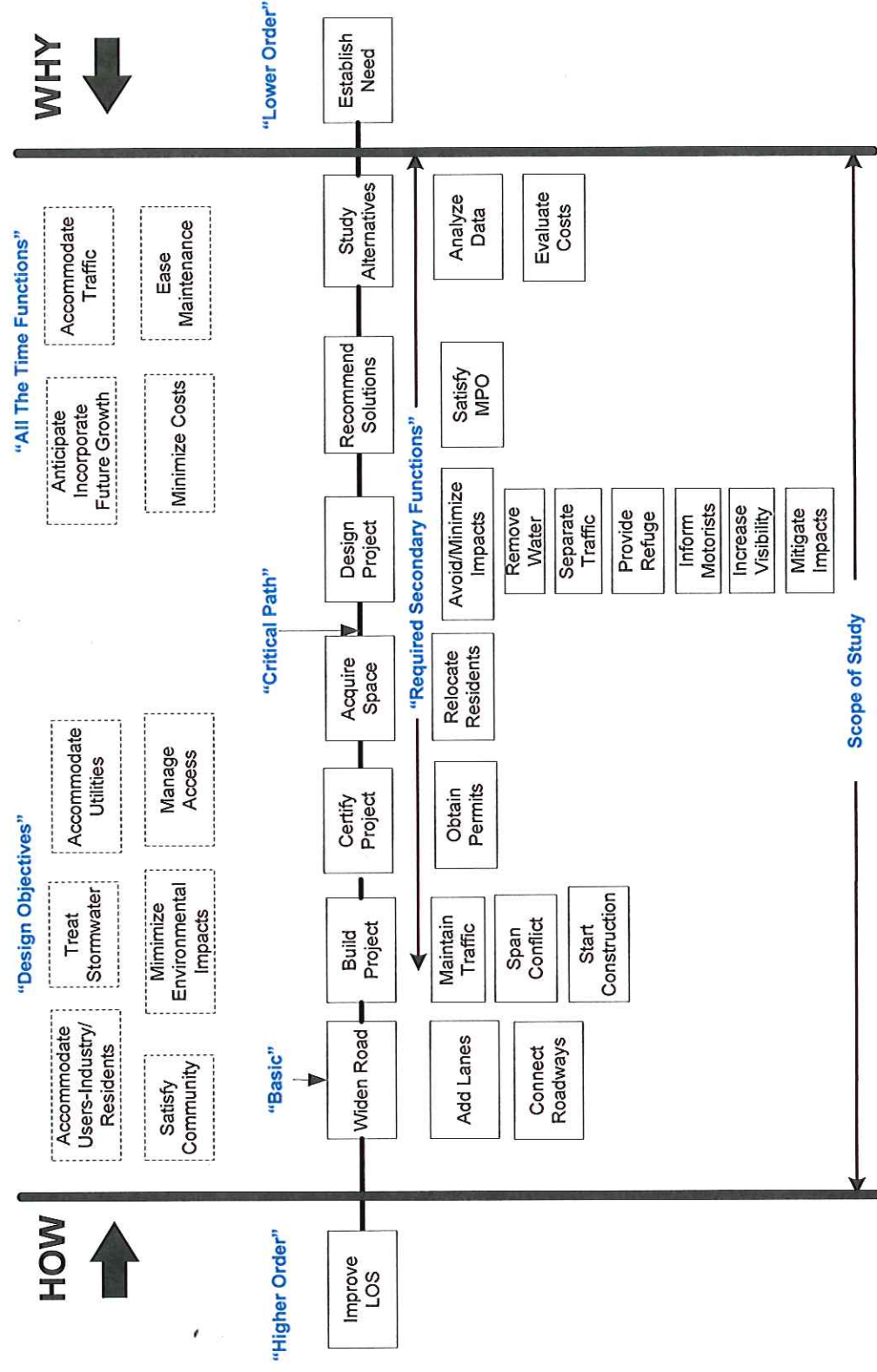
FUNCTION ANALYSIS AND FAST DIAGRAM

This project's function analysis was reviewed and developed by the team to define the requirements for the overall project (and each project element, if required) and to ensure that the VE team had a complete and thorough understanding of the functions (basic and others) needed to satisfy the project requirements. The primary Function Analysis System Technique (FAST) Diagram for the project is included. The development of FAST diagrams help stimulate team members to think in terms of required functions, not just normal solutions, to enhance their creative idea development. The project's primary tasks, the critical path functions, the project's primary basic functions and other required functions that must be satisfied were identified and are indicated in the report.

A function analysis was prepared to determine the basic function of the overall project and each area shown in the cost model. Functional Analysis is a means of evaluating the functions of each element to see if the expenditures for each of those elements actually provide the requirements of the process, or if there are disproportionate amounts of money being proposed to be spent for support functions. These elements add cost to the final product, but have a relatively low worth to the basic function. This creates a high cost-to-worth ratio.

A FAST diagram was developed to identify and display the critical functions path for the overall project. The basic and supporting secondary functions are illustrated on the following FAST Diagram.

**Figure 5.1-1 – FAST Diagram
I-95 (SR 9) Interchange at Northlake Boulevard**



EVALUATION

During the creative phase numerous ideas, alternative proposals and/or recommendations were generated for each required function using conventional brainstorming techniques and are recorded on the following pages. These ideas were discussed and evaluation criteria were determined. The VE team identified nine weighted evaluation criteria that included Level of Service, Capital Cost, Environmental Impacts, Stakeholder Expectance, Right of Way Impacts, Constructability, Future Maintenance, Access Management, and Pedestrian Friendliness. The evaluation criteria were assigned a weighted value from 1 to 9 based on a VE team consensus on the importance of each item. Criteria with the most importance received a 9-weight and the least important received a 1-weight. The ideas were then individually discussed and given a score, on a scale of 1 to 5 with 1 being the least beneficial and 5 most beneficial. The score for each item is multiplied by the weighted criteria value and each multiplication product is added to obtain a total score for the idea.

Table 6.1 – 1 includes a list of ideas that were generated during the creative phase and each idea's score. **Table 6.1 – 2** illustrates the weighted values for the evaluation criteria and **Table 6.1 – 3** shows the evaluation matrix for idea ranking total scores for all ideas carried forward. The ideas that scored equal to or greater than the original design concept total score were sufficiently rated for further development. The ideas in the table with strike-throughs were not developed because they were combined with other ideas, not feasible, or were eliminated from consideration for other reasons.

There were a total of 42 creative ideas and 22 that were evaluated and scored. The VE team discussed each of the evaluated ideas with the PD&E project manager during a mid-point review meeting on Wednesday, March 1, 2017. The VE team and the project manager discussed each idea before developing the final group of ideas for final development and analysis.

The write-ups for the developed ideas are in **Section 7**. The tables that follow show the original 42 ideas and those that scored high enough for development that emerged during the mid-point review, with the ideas that survived the evaluation, analysis and development phases of the study becoming viable recommendations for value improvements. Seven ideas were analyzed and developed as viable recommendations for value improvements. During the evaluation process the VE team identified eight creative ideas as design suggestions for the consultants to consider. Ideas that became design suggestions or design questions are designated as "DS" on the evaluation worksheets. The major design suggestions identified by the VE team are:

- DS-1 Remove the intermittent signals
- DS-2 Close off Roan Lane ingress and egress
- DS-3 Shift the DDI to the north to avoid right of way takes to the south
- DS-4 Construct a turbine interchange
- DS-5 Add a lighting system under the bridge
- DS-6 Build to the ultimate width for the interstate
- DS-7 When rebuilding the bridge construct full height retaining wall and create additional space for drainage storage
- DS-8 Put ponds in all green space within the DDI and build a boardwalk down the median

No specific action is normally required to accept or not accept the suggestions, though it is often helpful, for documentation purposes, to formally list those suggestions that will be acted upon by the FDOT. Readers are encouraged to review the Creative Idea Listing and Evaluation Worksheets that follow, since they may suggest additional ideas that can be applied to the design or construction.

TABLE 6.1-1
Value Engineering Study Ideas

Idea No.	I d e a s	LOS	Capital Costs	Environ. Impacts	Stakeholder Acceptance	Construct-ability	Right of Way Impacts	Future Maintenance	Access Management	Pedestrian Friendliness
	Original Concept									
	PD&E Diverging Diamond Interchange Alternative	3	3	3	3	3	3	3	3	3
	I-95 Ramps/Operation (Convey Traffic)									
	Build a partial cloverleaf in the northeast quadrant and widen Northlake Blvd.	2	3.5	4	4	4	3	3.25	3.5	2
1	Realign the ramps closer to the mainline	1.5	4	4	4	4	5	2	3.5	2
2	Create free flow off ramp right turns for Alternative 1	2	4	4	4	4	4	3.5	3.5	1.75
3	Consider quad left turns									
4	Build flyover off ramps to Northlake Blvd.	3	1	2	3	1.5	1	2	2.5	2
5	Construct Texas U-turn style ramps to eliminate left turns and make them right turns	3	1	4	3.5	1	4	1.5	3.5	2
6	Construct Texas U-turn style ramp to eliminate left turns eastbound from I-95 Southbound and a partial cloverleaf in the northeast quadrant	3	1	4	4	3	3	1.5	3.5	2
7										
	Northlake Boulevard (Convey Traffic)									
	Build the 35 MPH Diverging Diamond Interchange	2.75	4	3	3	3.5	4	3	3	3
8	Drop the profile of I-95 to ground level and grade separate the DDI over I-95 to remove two DDI signalized intersections	4	1	3	2	1	3	1.5	1	1
9	Build Alternative-1 with roundabouts at Keating Drive and Sandtree Drive	2.5	3.5	4	4	4	1	4	4	2
10	Remove the intermittent signals									
DS-1	Close off Roan Lane ingress and egress									
DS-2	Create frontage roads along Northlake Blvd.	3	4	3	0.5	4	0.5	3.5	4	4
13	Build a single point urban interchange	3	4	4	3	4.5	4.5	3.5	3.5	3
14	Shift the DDI to the north to avoid right of way takes to the south									
DS-3	Reduce the 7-ft bike lane and buffer	3	3.25	3.25	2.75	3	3.5	3	3	3
16	Reduce the lane sizes from 14 ft to 12 ft	2.75	3.25	3.25	3	3	3.5	3	3	3
17	Move the bike lanes to the median on the DDI	3	3.5	3.5	3.5	3	4	3	3	4
18	Construct a turbine interchange									
DS-4	Construct roundabouts at the ramps									
20	Add a lighting system for the interchange									
21	Add high-emphasis crosswalks									
22	Add a lighting system under the bridge									
DS-5	Add pedestrian lighting along the walkway for the DDI concept	3	2.9	3	3.5	3	3	2.5	3	5
24	With the 35-MPH DDI reduce the bike lanes to 4 ft									
25	Construct Alternative No. 1	2.25	4	4	4	4	4.5	3.5	4	2
26	Construct Alternative No. 1 with 4 left turn lanes in the southeast quadrant only									
27										
	Keating Drive (Carry Traffic)									
	Construct Alternative No. 1 and separate grade at Keating Drive for continuous flow east and west									
28	Close the north side and make it a "T" intersection at Keating Drive and install a single turbo-lane									
29	Close the intersection at Keating Drive and shift the plaza entrance/exit to the existing entrance at the west end of the parking area									
30										

TABLE 6.1-1
Value Engineering Study Ideas

Idea No.	Ideas	LOS	Capital Costs	Environ. Impacts	Stakeholder Acceptance	Construct-ability	Right of Way Impacts	Future Maintenance	Access Management	Pedestrian Friendliness
	Original Concept									
	PD&E Diverging Diamond Interchange Alternative	3	3	3	3	3	3	3	3	3
	Roan Lane (Carry Traffic)									
31	Construct a cul-de-sac at Roan Lane eliminating ingress/egress	3	3	3	2	3	2.5	3	3.5	3.25
32	Leave the right turn lane and access to Roan Lane but eliminate the right lane egress to I-95 northbound	3	3	3	2.5	3	2.5	3	3	3
	Sandtree Drive (Carry Traffic)									
	Do not build the additional dedicated right turn lane northbound Sandtree Drive to eastbound Northlake Blvd. convert the through lane to a shared through and right turn lane	3	3.5	3.25	3	3.25	4.5	3.25	3	3.25
34	Designalize Sandtree Drive and improve Constellation Blvd. and Burma Road									
	Bridge (Span Obstacles)									
DS-6	Build to the ultimate width for the interstate									
DS-7	When rebuilding the bridge construct full height retaining wall and create additional space for drainage storage	3	2.5	3.25	3	2.75	3.5	3.25	3	3
	Intersections (Connect Roadways)									
37	At Sunset Drive provide access to I-95 from the southern part of the residential neighborhood									
	Drainage (Remove Water)									
DS-8	Put ponds in all green space within the DDI and build a boardwalk down the median									
39	Whole take the Crunch Fitness and Shell Station and locate ponds there									
	Other									
40	Pipe the canal and provide ingress/egress through the adjacent neighborhood on Sunset Drive									
41	In the southeast quadrant provide a free flow lane to Sandtree Drive	2.75	4	4	4	4	2.5	3.5	4	2
42	Pipe the canal and provide ingress/egress through the adjacent neighborhood on Sunset Drive; terminate Sunset Dr. at the property line for the Attorneys allowing only right turn in off of Northlake Blvd. and Exit through Duffy's parking	3.5	2	2.75	3.5	2	1	2.5	3.5	3.25

TABLE 6.1 –2
Value Engineering Study Weighted Values

LOS	Capital Costs	Environ. Impacts	Stakeholder Acceptance	Construct-ability	Right of Way Impacts	Future Maintenance	Access Management	Pedestrian Friendliness
8	6	1	9	5	7	3	4	2

TABLE 6.1 –3
Value Engineering Study Evaluation Scores

Idea No.	Ideas	LOS	Capital Costs	Environ. Impacts	Stakeholder Acceptance	Construct-ability	Right of Way Impacts	Future Maintenance	Access Management	Pedestrian Friendliness	TOTAL
Original Concept											
	PD&E Diverging Diamond Interchange Alternative	24	18	3	27	15	21	9	12	6	135
I-95 Ramps/Operation (Convey Traffic)											
1	Build a partial cloverleaf in the northeast quadrant and widen Northlake Blvd.	16	21	4	36	20	21	9.75	14	4	145.75
2	Realign the ramps closer to the mainline	12	24	4	36	20	35	6	14	4	155
3	Create free flow off ramp right turns for Alternative 1	16	24	4	36	20	28	10.5	14	3.5	156
5	Build flyover off ramps to Northlake Blvd.	24	6	2	27	7.5	7	6	10	4	93.5
6	Construct Texas U-turn style ramps to eliminate left turns and make them right turns	24	6	4	31.5	5	28	4.5	14	4	121
7	Construct Texas U-turn style ramp to eliminate left turns eastbound from I-95 Southbound and a partial cloverleaf in the northeast quadrant	24	6	4	36	15	21	4.5	14	4	128.5
Northlake Boulevard (Convey Traffic)											
8	Build the 35 MPH Diverging Diamond Interchange	22	24	3	27	17.5	28	9	12	6	148.5
	Drop the profile of I-95 to ground level and grade separate the DDI over										
9	I-95 to remove two DDI signalized intersections	32	6	3	18	5	21	4.5	4	2	95.5
	Build Alternative 1 with roundabouts at Keating Drive and Sandtree Drive										
10	Create frontage roads along Northlake Blvd.	20	21	4	36	20	7	12	16	4	140
13	Build a single-point urban interchange	24	24	3	4.5	20	3.5	10.5	16	8	113.5
14	Reduce the 7-ft bike lane and buffer	24	24	4	27	22.5	31.5	10.5	14	6	163.5
16	Reduce the lane sizes from 14-ft to 12-ft	24	19.5	3.25	24.75	15	24.5	9	12	6	138
17	Move the bike lanes to the median on the DDI	22	19.5	3.25	27	15	24.5	9	12	6	138.25
24	Add pedestrian lighting along the walkway for the DDI concept	24	21	3.5	31.5	15	28	9	12	8	152
26	Construct Alternative No. 1	18	24	4	36	20	31.5	10.5	16	4	164

TABLE 6.1 -3
Value Engineering Study Evaluation Scores

Idea No.	Ideas	LOS	Capital Costs	Environ. Impacts	Stakeholder Acceptance	Construct-ability	Right of Way Impacts	Future Maintenance	Access Management	Pedestrian Friendliness	TOTAL
	Original Concept										
	PD&E Diverging Diamond Interchange Alternative	24	18	3	27	15	21	9	12	6	135
	Roan Lane (Carry Traffic)										
31	Construct a cul-du-sac at Roan Lane eliminating ingress/egress	24	18	3	18	15	17.5	9	14	6.5	125
32	Leave the right turn lane and access to Roan Lane but eliminate the right lane egress to I-95 northbound	24	18	3	22.5	15	17.5	9	12	6	127
	Sandtree Drive (Carry Traffic)										
	Do not build the additional dedicated right turn lane northbound										
33	Sandtree Drive to eastbound Northlake Blvd. convert the through lane to a shared through and right turn lane	24	21	3.25	27	16.25	31.5	9.75	12	6.5	151.25
	Bridge (Span Obstacles)										
	When rebuilding the bridge construct full height retaining wall and create additional space for drainage storage	24	15	3.25	27	13.75	24.5	9.75	12	6	135.25
	Other										
41	In the southeast quadrant provide a free flow lane to Sandtree Drive	22	24	4	36	20	17.5	10.5	16	4	154
42	Pipe the canal and provide ingress/egress through the adjacent neighborhood on Sunset Drive; terminate Sunset Dr. at the property line for the Attorneys allowing only right turn in off of Northlake Blvd. and Exit through Duffy's parking	28	12	2.75	31.5	10	7	7.5	14	6.5	119.25

RECOMMENDATIONS

The results of this VE study are shown as individual recommendations developed for each area of the project. These recommendations include a comparison between the VE team's proposal and the designer's original concept. Each proposal consists of a summary of the original design, a description of the proposed change, and a descriptive evaluation of the advantages and disadvantages of the proposed recommendation. Sketches and calculations are shown, if appropriate. The estimated cost comparisons reflect unit prices and quantities on a comparative basis. Value improvement is the primary basis for comparison of competing ideas. To ensure that costs are comparable within the ideas proposed by the VE team, the FDOT Long Range Estimating System cost estimates were used as the pricing basis.

7.1 EVALUATION OF RECOMMENDATIONS

Some of the VE recommendations potential savings are interrelated, if one is accepted another one may or may not need to be added, or acceptance of one may mutually exclude another. The VE team identified potential savings as shown on **Table 1.4 – 1, Summary of Highest Rated Recommendations**. The write-ups for the individual developed ideas are included in this section and are shown in numerical order.

The FDOT and the design team should evaluate and determine whether to accept or not accept each recommendation. The recommendations that are accepted should be identified and listed for documentation purposes. For each idea that will not be accepted, the design team normally documents, in writing, the reason or reasons for the non-acceptance. The design suggestions are for consideration by FDOT and the designers. No specific action is normally required to accept or not accept the suggestions, though it is often helpful, for documentation purposes, to formally list those suggestions that will be incorporated by the designers.

7.2 CONSIDERATIONS AND ASSUMPTIONS

In the preparation of this report and the alternatives that follow, the study team made some assumptions with respect to conditions that may occur in the future. In addition, the study team reviewed the listed project documentation, relying solely upon the information provided by the designer and owner, and relying on that information as being true, complete and accurate. This value analysis and report are based on the following considerations, assumptions and conditions:

- The recommendations rendered herein are as of the date of this report. The study team or leaders assume no duty to monitor events after the date, or to advise or incorporate into any of the alternatives, any new, previously unknown technology.
- The study team or leaders assume that there are no material documents affecting the design or construction costs that the team has not seen. The existence of any such documents will necessarily alter the alternatives contained herein.

The study team or leaders do not warrant the feasibility of these recommendations or the advisability of their implementation. It is solely the responsibility of the designer in accordance with the owner, to explore the technical feasibility and make the determination for implementation.

RECOMMENDATION No. 1: Build Alternative No. 1 with a Partial Cloverleaf in the Northeast Quadrant.

Proposed Alternative:

The PD&E Documents show a Diverging Diamond Interchange (DDI) as Alternative No. 2.

VE Alternative:

Construct PD&E Alternative No. 1 with a partial cloverleaf in the northeast quadrant and do not widen the southeast off-ramp.

Advantages :

- Lower construction cost without needing to reconstruct the I-95 mainline bridge
- Lower cost of right of way acquisition
- Construction is less complicated and shorter in duration due to the avoidance of reconstructing the I-95 mainline bridge
- Decreases the delay time for the northbound to westbound traffic, which had a failing LOS in the original design
- Less environmental impacts due to avoidance of impacts to existing surface waters and contamination sites at the two gas stations to the west
- Greater level of stakeholder acceptance anticipated
- Less maintenance required
- Less impacts in respect to access management
- Can use infield areas of the loop for drainage storage, eliminating the need to purchase additional right of way for drainage purposes
- Meets the main goals of the project through design year 2040

Disadvantages:

- Lower LOS for Northlake for the southbound off-ramp than experienced in Alternative 2
- Longer queues from the off-ramps compared to the DDI
- Pedestrians are impacted by having to cross a free-flow ramp
- Need to widen I-95 Northbound to accommodate the off-ramp
- Need to close Roan Lane and reroute traffic to Sunrise Drive
- Most likely requires the acquisition of the property of a nearby church
- The loop and ramp will be low speed (30 mph) due to local right of way constraints

Analysis:

This interchange was considered by the VE team to be an urban interstate facility. With that in mind, one of our goals with the design of this recommendation was to limit the superelevation rate of the off-ramp. However, the loop ramp designed to a superelevation rate of $e_{\max} = 5\%$ creates severe issues in the adjacent neighborhood by blocking access to the alley north of Edwin Watts Golf Store, which is needed after the closure of the Roan Lane access to Northlake. The table below shows that with the 5% superelevation rate and a degree of curvature of 20 degrees, a radius of 286 feet is needed. A higher superelevation rate, $e_{\max} = 10\%$, was also investigated. The second table shows that with the superelevation rate and a degree of curvature of 24 degrees, a radius of 239 feet is needed. Using the values from the 10% e_{\max} table, the on-ramp can be designed to maintain access to the aforementioned paved alley. It is recommended to further refine the proposed design to determine what the lowest superelevation rate can be used while not blocking access to the alley or severely impacting the Edwin Watts Golf Store, which currently

RECOMMENDATION No. 1: Build Alternative No. 1 with a Partial Cloverleaf in the Northeast Quadrant.

remains undisturbed. It is also recommended to optimize the westbound to northbound on-ramp configuration to determine if there is a way to avoid such significant impacts to the church.

The preliminary traffic modeling showed that the design year condition of the northbound to westbound off-ramp movement was improved. However, other impacts from this change will need to be investigated, such as its effect on the signalized or free flow movements of the northbound to eastbound right turn movement.

Table 2.9.2 Superelevation Rates for Urban Highways and High Speed Urban Streets ($e_{max} = 0.05$)

Degree of Curve D	Radius R (ft.)	TABULATED VALUES				
		DESIGN SPEED (mph)				
		30	35	40	45	50
2° 00'	2,865	NC	NC	NC	NC	NC
2° 15'	2,545					RC
2° 45'	2,083				NC	
3° 00'	1,910				RC	
3° 45'	1,528			NC		
4° 00'	1,432			RC		
4° 45'	1,205					RC
5° 00'	1,145		NC			0.023
5° 15'	1,091		RC			0.027
5° 30'	1,042					0.030
5° 45'	996					0.035
6° 00'	955				RC	0.040
6° 15'	917				0.022	0.045
6° 30'	881				0.024	0.050
6° 45'	849				0.027	Dmax = 6° 30'
7° 00'	819	NC			0.030	
7° 15'	790	RC			0.033	
7° 30'	764				0.037	
7° 45'	739				0.041	
8° 00'	716			RC	0.045	
8° 15'	694			0.022	0.050	
8° 30'	674			0.025	Dmax = 8° 15'	
8° 45'	655			0.027		
9° 00'	637			0.030		
9° 30'	603			0.034		
10° 00'	573			0.040		
10° 30'	546		RC	0.047		
11° 00'	521		0.023	Dmax = 10° 45'		
11° 30'	498		0.026			
12° 00'	477		0.030			
13° 00'	441		0.036			
14° 00'	409	RC	0.045			
15° 00'	382	0.023	Dmax = 14° 15'			
16° 00'	358	0.027				
17° 00'	337	0.032				
18° 00'	318	0.038				
19° 00'	302	0.043				
20° 00'	286	0.050				
		Dmax = 20° 00'				

NC = Normal Crown (-0.02)

RC = Reverse Crown (+0.02)

RECOMMENDATION No. 1: Build Alternative No. 1 with a Partial Cloverleaf in the Northeast Quadrant.

Table 2.9.1 Superelevation Rates for Rural Highways, Urban Freeways and High Speed Urban Highways ($e_{max}=0.10$)

TABULATED VALUES										
Degree of Curve D	Radius R (ft.)	DESIGN SPEED (mph)								
		30	35	40	45	50	55	60	65	70
0° 15'	22,918	NC	NC	NC	NC	NC	NC	NC	NC	NC
0° 30'	11,459	NC	NC	NC	NC	NC	NC	NC	NC	NC
0° 45'	7,639	NC	NC	NC	NC	RC	RC	0.023	0.025	0.028
1° 00'	5,730	NC	NC	NC	RC	0.021	0.025	0.030	0.033	0.037
1° 15'	4,584	NC	NC	RC	0.022	0.026	0.031	0.036	0.041	0.046
1° 30'	3,820	NC	RC	0.021	0.026	0.031	0.037	0.043	0.048	0.054
	¹ R _{NC}									
2° 00'	2,865	RC	0.022	0.028	0.034	0.040	0.046	0.055	0.062	0.070
	¹ R _{RC}									
2° 30'	2,292	0.021	0.028	0.034	0.041	0.049	0.058	0.067	0.075	0.085
3° 00'	1,910	0.025	0.032	0.040	0.049	0.057	0.067	0.077	0.087	0.098
3° 30'	1,637	0.029	0.037	0.046	0.055	0.065	0.075	0.086	0.095	0.100
4° 00'	1,432	0.033	0.042	0.051	0.061	0.072	0.083	0.093	0.099	Dmax = 3° 30'
5° 00'	1,148	0.040	0.050	0.061	0.072	0.083	0.094	0.098	Dmax = 4° 15'	
6° 00'	955	0.048	0.058	0.070	0.082	0.092	0.099	Dmax = 5° 15'		
7° 00'	819	0.053	0.065	0.078	0.089	0.098	Dmax = 6° 30'			
8° 00'	716	0.058	0.071	0.084	0.095	0.100	Dmax = 8° 15'			
9° 00'	637	0.063	0.077	0.089	0.098					
10° 00'	573	0.068	0.082	0.094	0.100					
11° 00'	521	0.072	0.088	0.097	Dmax = 10° 15'					
12° 00'	477	0.076	0.090	0.099						
13° 00'	441	0.080	0.093	0.100						
14° 00'	409	0.083	0.098	Dmax = 13° 15'						
15° 00'	382	0.086	0.099							
16° 00'	356	0.089	0.099							
18° 00'	318	0.093	Dmax = 17° 45'							
20° 00'	286	0.097								
22° 00'	260	0.099								
24° 00'	239	0.100								
		Dmax = 24° 45'								
* NC/RC and RC/e Break Points (Radius in feet)										
Break Points	DESIGN SPEED (mph)									
	30	35	40	45	50	55	60	65	70	
R _{NC}	3349	4384	5560	6878	8337	9949	11709	13164	14714	
R _{RC}	2471	3238	4110	5087	6171	7372	8686	9783	10955	
e = NC # R ≥ R _{NC} e = RC # R < R _{NC} and R ≥ R _{RC}										

Potential Cost Savings: **\$16,555,000**

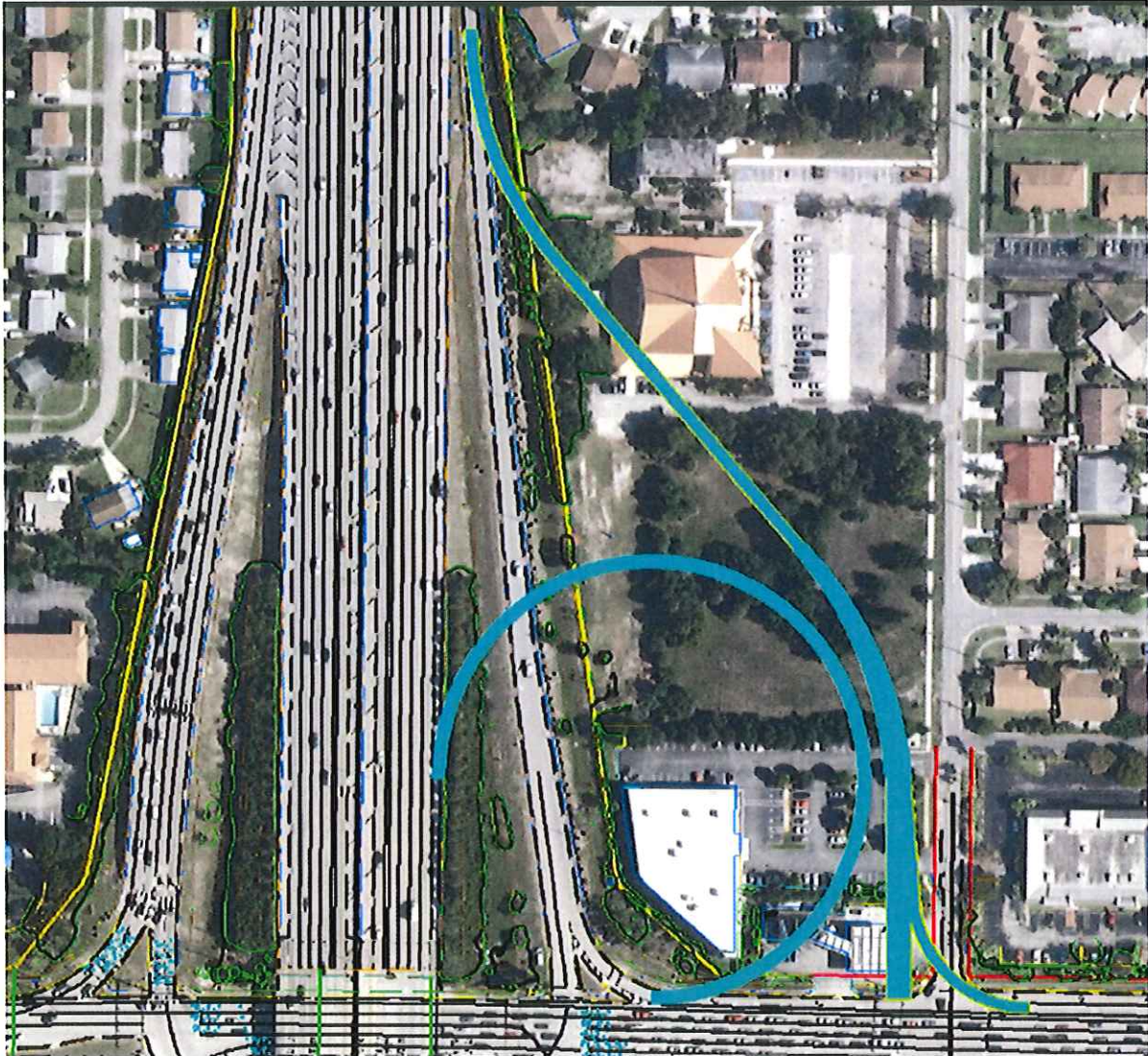
RECOMMENDATION No. 1: Build Alternative No. 1 with a Partial Cloverleaf in the Northeast Quadrant.

Calculations:

Description	Quantity	Unit	Unit Price	Extended Amount
Ramp A1 - One lane off-ramp	1	EA	\$177,064	\$177,064
Ramp B - One lane loop off-ramp	1	EA	\$2,314,674	\$2,314,674
Ramp C - One lane portion of on-ramp	1	EA	\$451,050	\$451,050
Ramp E - Two lane portion of on-ramp	1	EA	\$149,355.94	\$149,356
Sequence 1 - Widen Northlake E of I-95	1	EA	(\$70,118)	(\$70,118)
Sequence 2 - Widen Northlake W of I-95	1	EA	(\$346,262)	(\$346,262)
Sequence 3 - Widen SB Off Ramp	1	EA	\$563,478	\$563,478
Sequence 4 - Widen NB Off Ramp	1	EA	(\$129,055)	(\$129,055)
Sequence 7 - Widen NB I-95	1	EA	\$5,020,578	\$5,020,578
Sequence 9 - Widen SB On Ramp	1	EA	(\$532,920)	(\$532,920)
Sequence 10 - Widen NB On Ramp	1	EA	(\$824,321)	(\$824,321)
Sequence 11 - Construct New Bridge	1	EA	(\$17,854,956)	(\$17,854,956)
Subtotal				(\$11,081,432)
MOT (10%)				(\$997,329)
Mobilization (8%)				(\$886,515)
			CONSTRUCTION TOTAL	(\$12,965,275)

Right of Way Savings = \$16,554,673

RECOMMENDATION No. 1: Build Alternative No. 1 with a Partial Cloverleaf in the Northeast Quadrant.



RECOMMENDATION No. 2: Realign the ramps closer to the mainline

Proposed Alternative:

The PD&E Documents show a Diverging Diamond Interchange (DDI) as Alternative No. 2.

VE Alternative:

Construct Alternative No. 1 and re-align exit ramp "D" closer to the mainline highway. Add one restrictive free-flow lane.

Advantages :

- Lower Capital Costs
- Less right of way and environmental impacts by avoiding widening the exit ramp into the noise wall and affecting the residences directly behind the noise wall on I-95
- Higher chance of stakeholder acceptance than the DDI
- Better constructability

Disadvantages:

- Lower LOS
- Future maintenance-potentially will make widening I-95 more difficult in the future
- Less pedestrian friendly than the DDI
- Reduces storage

Potential Cost Savings: \$30,714,000

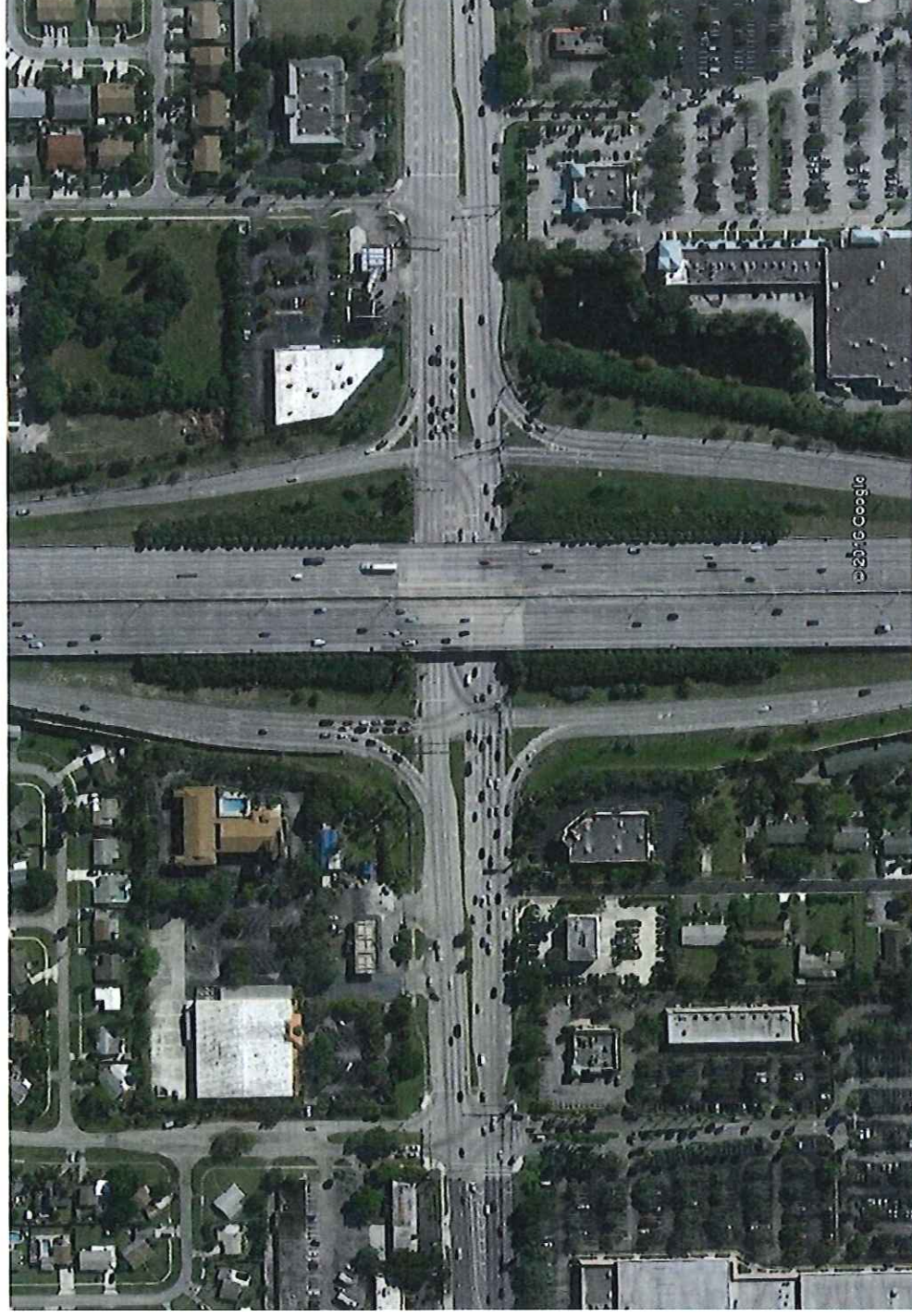
Calculations:

Description	Quantity	Unit	Unit Price	Extended Amount
Base Course	3,327	SY	\$23.18	\$77,120
Stabilization	8,094	SY	\$7.88	\$63,781
Structural Course	534	TN	\$114.47	\$61,127
Friction Course	130	TN	\$154.02	\$20,023
Alternative 2 minus Alt. 1	-1	LS	\$6,500,000.00	(\$6,500,000)
Subtotal				(\$6,277,950)
MOT (10%)				(\$565,015)
Mobilization (10%)				(\$627,795)
		CONSTRUCTION TOTAL		(\$7,470,760)

Right of Way Savings = \$23,244,000

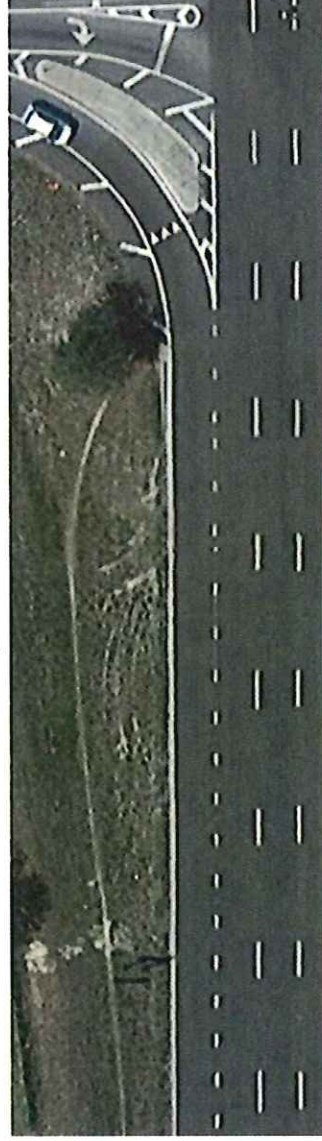
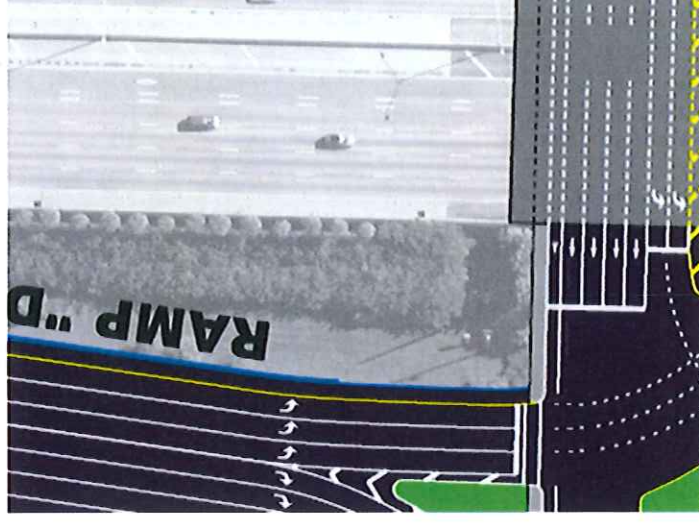
RECOMMENDATION No. 2: Realign the ramps closer to the mainline

EXISTING CONFIGURATION



RECOMMENDATION No. 2: Realign the ramps closer to the mainline

PROPOSED RAMP CHANGES



RECOMMENDATION No. 3: Create free flow off ramp right turns for Alternative 1

Proposed Alternative:

To construct “Alternative 2 (Diverging Diamond Interchange DDI)” as described in the PD&E documents at I-95 and Northlake Blvd. The recommended build Alternative No. 2 offers several advantages compared to the No-Build Alternative including the following:

Reduced Travel Time and Delays: All the approaches as well as the turning movements for I-95 ramp terminals will operate at LOS C or better during both the AM and PM peak periods for the 2040 design years compared to LOS F for the No-Build Alternative. For the Northlake Boulevard ramp terminal approaches, the southbound off-ramp approach will experience 85% and 86% reduction in delays whereas the northbound off-ramp approach will experience 92% and 89% reduction in delays compared to the No-Build Alternative for the AM and PM peak periods respectively.

No Queue Spillback onto I-95 Mainline: Alternative 2 results in 61% and 53% reduction in queue length at the I-95 southbound and northbound ramp terminals respectively compared to the No-Build Alternative. In addition, Build Alternatives 2 can accommodate the 2040 design year queues within the existing off ramps without any additional right of way impacts to the residential properties in the northwest quadrant of the interchange. The No-Build alternative will exceed the existing ramp storage by 8% and 65% at the northbound and southbound off-ramps respectively.

Enhanced Safety & Aesthetics: The proposed diverging diamond configuration will result in fewer conflict points compared to the existing conventional tight diamond interchange configuration (14 for DDI, 26 for conventional). Crash data from previous studies indicate a 60% reduction in collisions compared to the conventional tight diamond interchange configuration due to reduced conflict points, improved mobility and better sight distance at turns. In addition, the diverging diamond configuration provides opportunity for visual enhancements such as landscaping.

Build Alternative 2 meets the overall project objectives of this PD&E study as well as the purpose and need for this project. However when this alternative was presented to the public and elected officials, the turnout was not in favor of it.

VE Alternative:

To build “Alternative 1” as described in the PD&E documents at I-95 and Northlake Blvd, and construct free flow off-ramps for the right turns. This Alternative encompass almost the same improvements as proposed for Alternative 1 in the PD&E documents. The differentiating factor is the proposed free flow off-ramps for the right turn movements out of I-95 merging into Northlake Blvd. Therefore all the design concepts developed to address traffic spillback onto I-95, improve interchange operation, reduce congestion, and enhance safety through the year 2040 will be met and further enhanced. Table 1 illustrates the future conditions with the No-Build Alternative in year 2040.

Table 1

Alternative	I-95 SB Ramp Terminal Approach			I-95 NB Ramp Terminal Approach		
	LOS (AM/PM)	Max. Queue Length	Storage Deficiency	LOS (AM/PM)	Max. Queue Length	Storage Deficiency
No-Build Alternative	F/F	1733	Yes (57%)	F/F	1210	Yes (8%)

RECOMMENDATION No. 3: Create free flow off ramp right turns for Alternative 1

This VE alternative encompasses the construction of triple lefts, one controlled right and one free flow right at ramp terminal exits. Given the simulations performed during the refined build alternatives phase of the study (please refer to Table 2) using SYNCHRO and SIMTRAFFIC for the LOS analysis and microsimulation for the queue length analysis, respectively. Based on field observations on similar interchanges like I-95 and Commercial Blvd., we assumed that by changing the proposed configuration of the right turn movements from Alternative 1 and replacing the triple right turns for one controlled, and one free flow right, the queues along the off-ramps will be improved.

Table 2

Alternative	I-95 SB Ramp Terminal Approach			I-95 NB Ramp Terminal Approach		
	LOS (AM/PM)	Max. Queue Length	Storage Deficiency	LOS (AM/PM)	Max. Queue Length	Storage Deficiency
Alternative 1 - Modified CDR	D/D	1077	No	D/D	1022	No

We presumed an improvement in the evaluation results provided in Table 2 for Alternative 1. Therefore acceptable level of service for all of the ramp terminal approaches are expected. Nonetheless the northbound left turn movement at the NB ramp terminal for the 2040 design year results in a LOS E. Similarly this build alternative will provide adequate storage to accommodate the queues along the ramps without backup into the I-95 mainline compared to the No-Build condition. However, this alternative will require realignment and extension of the existing northbound and southbound off-ramps to accommodate the 2040 design year queues. This results in right of way impacts to the residential properties in the northwest quadrant of the interchange.

Another suggestion is the construction of traffic delineators for a certain extent along the free flow right turn for the I-95 NB merging into Northlake Blvd. eastbound. This could improve the operation of the intersection at Northlake Blvd., and Sandtree Dr. by reducing the weaving movements of vehicles that want to make a left turn going north into Sunrise Dr., and forcing them to make a U turn at the eastern intersection on Silverthorne Dr.

Advantages when compared :

- Less construction cost
- Less right-of-way cost
- No impact to I-95 mainline (no bridge reconstruction)
- Easier to construct.
- Grater public acceptance
- This alternatives will provide acceptable LOS for all of the ramp terminal approaches.
- Less impact to access from business and side streets connecting to Northlake Blvd.
- The overall queue lengths could be improved from 0.38%, and 0.16% to greater percentages as to be determined by new traffic simulations in the I-95 southbound off-ramp, and in the I-95 northbound off-ramp respectively.

Disadvantages:

- The LOS will be improved so there is no backup into the I-95 mainline. However the northbound left turn movement at the northbound ramp terminal for the 2040 design year results in a LOS E.

RECOMMENDATION No. 3: Create free flow off ramp right turns for Alternative 1

- The overall queue lengths are improved 0.38% in the I-95 southbound off-ramp, and 0.16% in the I-95 northbound off-ramp. So compared with Alternative 2 this alternative provides 0.23% less queue length in the I-95 southbound off-ramp, and 0.37% less queue length in the I-95 northbound off-ramp.

Potential Cost Savings: \$ 29,137,000

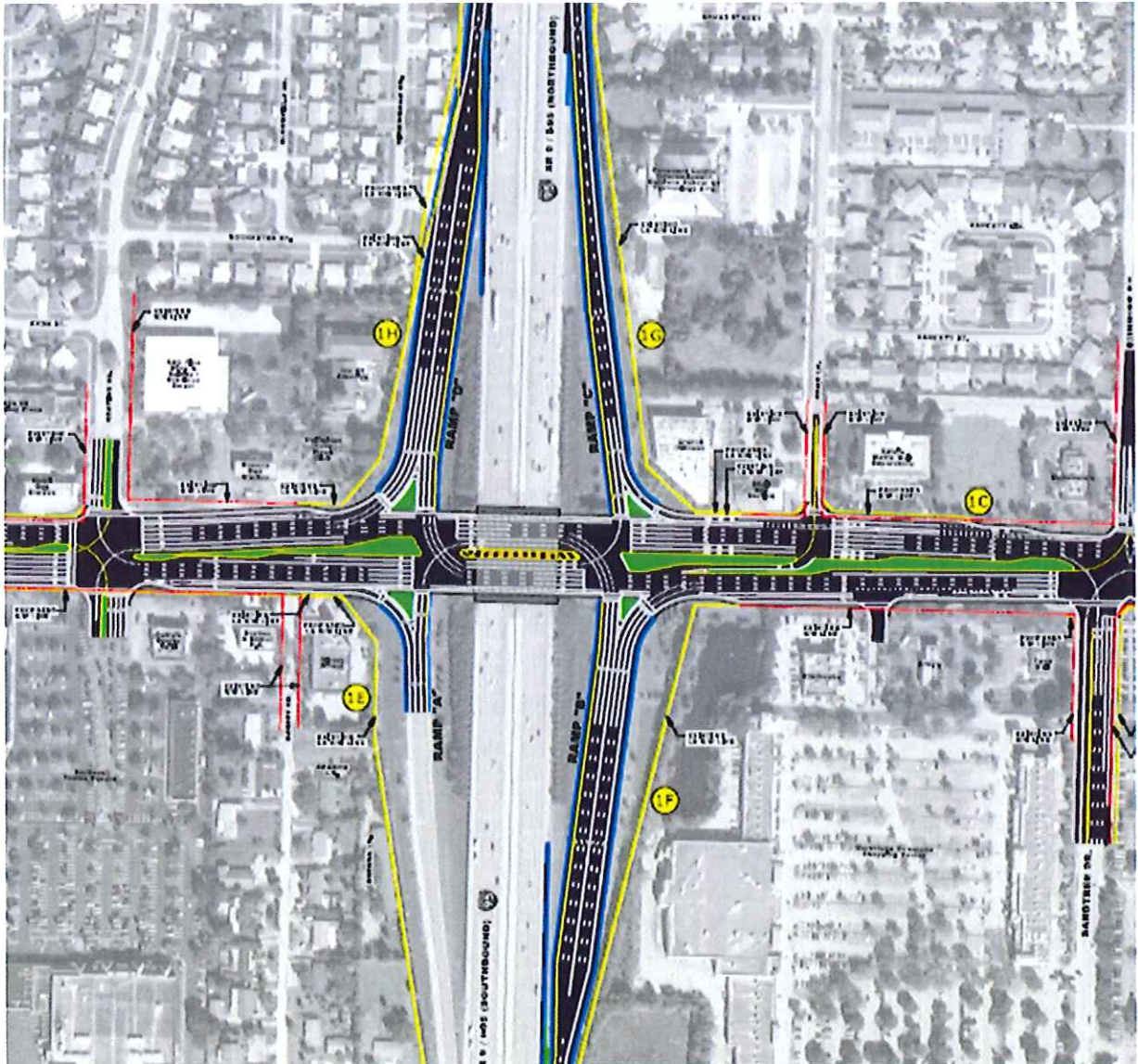
Calculations:

	Recommendation 3	Alternative 2	
Construction Item	Total Costs	Total Costs	Cost Differential
Earthwork	\$951,824.44	\$1,773,999.97	(\$822,175.53)
Roadway	\$10,041,121.06	\$8,648,434.02	\$1,392,687.04
Shoulder	\$2,921,355.49	\$1,291,789.10	\$1,629,566.39
Median	\$252,851.10	\$470,474.15	(\$217,623.05)
Drainage	\$2,760,353.21	\$1,838,572.09	\$921,781.12
Bridges	\$0.00	\$10,954,753.19	(\$10,954,753.19)
Retaining Walls	\$3,497,918.00	\$488,368.00	\$3,009,550.00
Signing	\$132,523.36	\$81,487.98	\$51,035.38
Lighting	\$472,600.02	\$882,845.59	(\$410,245.57)
Signalization	\$1,932,842.80	\$1,932,842.80	\$0.00
ITS	\$65,254.28	\$65,254.28	\$0.00
Total Construction	\$23,016,787.76	\$28,428,821.17	
MOT (10%)	\$2,301,678.78	\$2,842,882.12	(\$541,203.34)
Subtotal	\$25,318,466.54	\$31,271,703.29	
Mobilization (10%)	\$2,531,846.65	\$3,127,170.33	(\$595,323.68)
Contingency	\$150,000.00	\$150,000.00	\$0.00
Subtotal	\$28,000,313.19	\$34,548,873.62	(\$6,536,704.43)

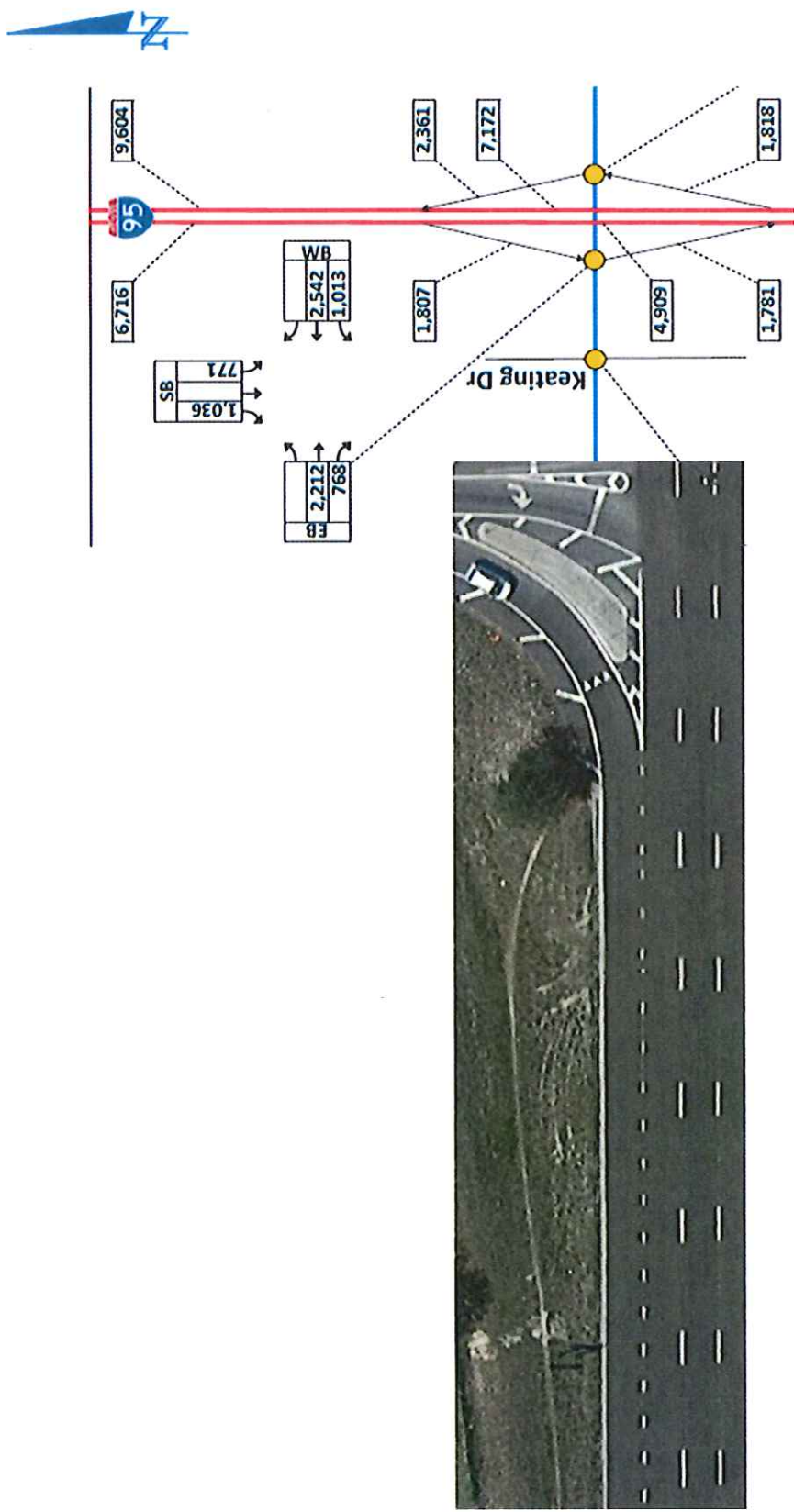
Right of Way Savings = \$ 22,600,000

RECOMMENDATION No. 3: Create free flow off ramp right turns for Alternative 1

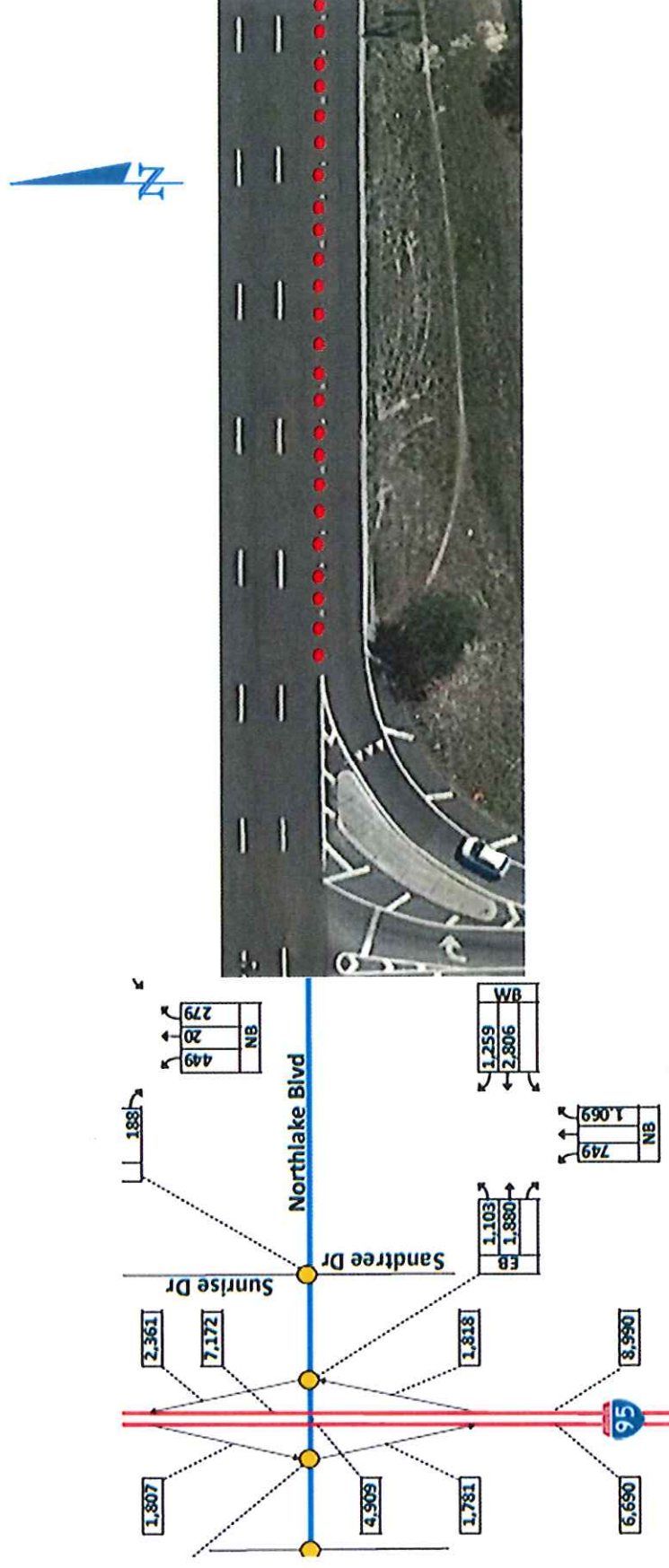
ALTERNATIVE 1



RECOMMENDATION No. 3: Create free flow off ramp right turns for Alternative 1



RECOMMENDATION No. 3: Create free flow off ramp right turns for Alternative 1



RECOMMENDATION No. 8: Build the 35 MPH Diverging Diamond Interchange

Proposed Alternative:

The PD&E Documents show a 40 MPH Diverging Diamond Interchange (DDI). The plan includes lengthening the bridge structure over I-95, and extensive right of way takes along Northlake Boulevard. The plan provides the greatest level of service compared with the other alternatives.

VE Alternative:

Construct a DDI at a lower speed limit, in place of the proposed Alt No. 2. This proposal does not require the I-95 bridge structure to be lengthened and requires less right of way to be acquired. The reduced cost of this construction provides the same level of service as the 40 MPH DDI, but is not as intrusive on the neighboring properties.

Advantages:

- Lower capital costs
- Less required new right of way
- Reduces delays on the I-95 ramps
- No change in environment impact
- Stakeholder acceptance does not change
- Constructability is better
- Future maintenance is similar
- Pedestrian amenities remain the same
- No lengthening of I-95 bridge structure

Disadvantages:

- Throughput is lower
- Could cause issues with driver expectations due to reduced speed

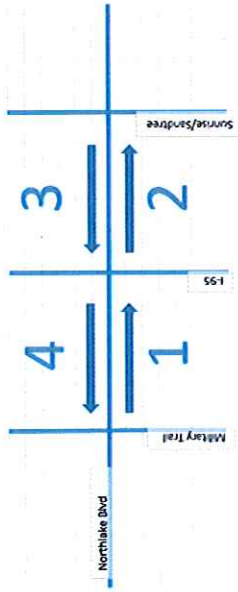
Potential Cost Savings: \$44,750,000

Calculations:

Description	Quantity	Unit	Unit Price	Extended Amount
Sequence 11 (Bridge)	-1	Bridge	\$17,854,955.00	(\$17,854,955)
				\$0
				\$0
				\$0
Subtotal				(\$17,854,955)
MOT (10%)				(\$1,606,946)
Mobilization (10%)				(\$1,785,496)
		CONSTRUCTION TOTAL		(\$21,247,396)

Right of Way Savings = \$23,500,000

RECOMMENDATION No. 8: Build the 35 MPH Diverging Diamond Interchange



	1	2	3	4
3-Day (72 hour) Average Speed	32.5	31.4	33.3	28.7
3-Day (72 hour) Max Speed	30.8	40.3	34.8	48.3
3-Day (72 hour) Min Speed	7.1	21	11.3	12.3
3-Day Average AM Peak Hour Speed	24.8	30.1	28.9	24.8
3-Day Average AM Peak Hour Speed	13.2	31.3	17.8	15.2



RECOMMENDATION No. 16: Reduce the 7-foot bike lanes and buffer to 4-foot bike lanes and buffer.

Proposed Alternative:

The PD&E Documents shows a Diverging Diamond Interchange (DDI). (Alternative 2)

VE Alternative:

For all alternative options, reduce the 7-foot bike lane and buffer to 4 feet, saving 3 feet on each side.

Advantages :

- Keeps the same LOS as DDI
- Decreased capital costs
- Decreased environmental impacts
- Decreased right of way impacts along Northlake Blvd.

Disadvantages:

- Stakeholder acceptance may be less

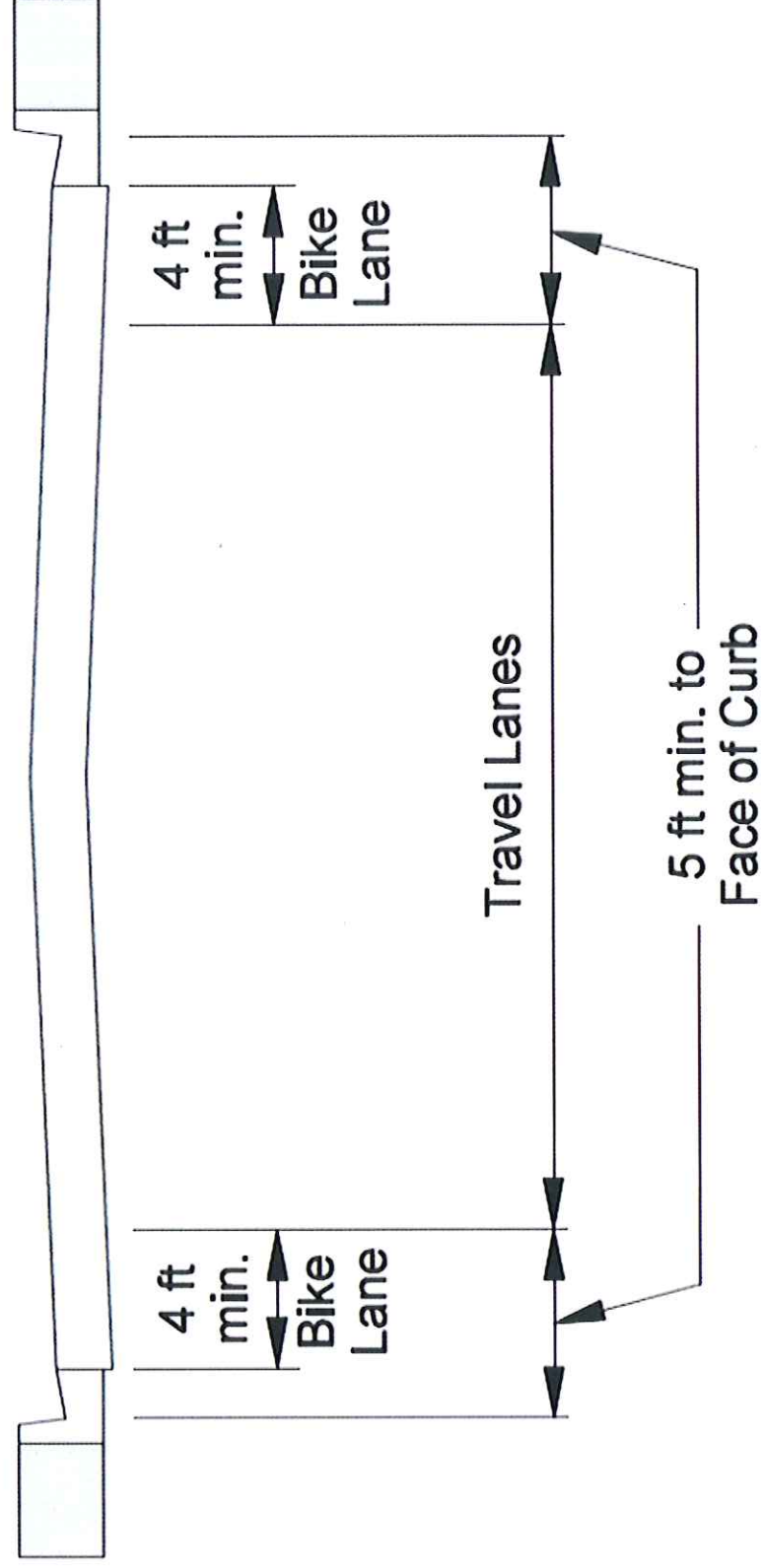
Potential Cost Savings: \$726,000

Calculations:

Description	Quantity	Unit	Unit Price	Extended Amount
Base Course	-2,344	SY	\$23.18	(\$54,334)
Stabilization	-14,784	SY	\$7.88	(\$116,498)
Structural Course	-349	TN	\$114.47	(\$39,893)
Friction Course	-85	TN	\$154.02	(\$13,092)
Subtotal				(\$223,816)
MOT (10%)				(\$20,143)
Mobilization (10%)				(\$22,382)
		CONSTRUCTION TOTAL		(\$266,341)

Right of Way Savings = \$460,000

a) Curbed Street without Parking



RECOMMENDATION No. 24 Add pedestrian lighting along the walkway for the DDI concept

Proposed Alternative:

The PD&E Documents show no lighting on Northlake Boulevard under the I-95 bridge overpass for either westbound or eastbound direction for either traffic or pedestrian walkways.

VE Alternative:

The VE Team recommends the introduction of lights for pedestrians; either bridge mounted or pole mounted (decorative) for improved visibility.

Advantages:

- Improved illumination.
- Decorative enhancement along the corridor

Disadvantages:

- Increased cost

Potential Value Added: (\$89,000)

Calculations:

Description	Quantity	Unit	Unit Price	Extended Amount
Pedestrian Lights	5	EA	\$15,000.00	\$75,000
				\$0
				\$0
				\$0
Subtotal				\$75,000
MOT (10%)				\$6,750
Mobilization (10%)				\$7,500
		CONSTRUCTION TOTAL		\$89,250

RECOMMENDATION No. 24 Add pedestrian lighting along the walkway for the DDI concept



RECOMMENDATION No. 26: Construct Alternative No. 1

Proposed Alternative:

To construct “Alternative 2 (Diverging Diamond Interchange DDI)” as described in the PD&E documents at I-95 and North Lake Blvd. The Recommended Build Alternative 2 offers several advantages compared to the No-Build Alternative including the following:

Reduced Travel Time and Delays: All the approaches as well as the turning movements for I-95 ramp terminals will operate at LOS C or better during both the AM and PM peak periods for the 2040 design years compared to LOS F for the No-Build Alternative. For the Northlake Boulevard ramp terminal approaches, the southbound off-ramp approach will experience 85% and 86% reduction in delays whereas the northbound off-ramp approach will experience 92% and 89% reduction in delays compared to the No-Build Alternative for the AM and PM peak periods respectively.

No Queue Spillback onto I-95 Mainline: Alternative 2 results in 61% and 53% reduction in queue length at the I-95 SB and NB ramp terminals respectively compared to the No-Build Alternative. In addition, Build Alternatives 2 can accommodate the 2040 design year queues within the existing off ramps without any additional right of way impacts to the residential properties in the northwest quadrant of the interchange. The No-Build alternative will exceed the existing ramp storage by 8% and 65% at the NB and SB off-ramps respectively.

Enhanced Safety & Aesthetics: The proposed diverging diamond configuration will result in fewer conflict points compared to the existing conventional tight diamond interchange configuration (14 for DDI, 26 for conventional). Crash data from previous studies indicate a 60% reduction in collisions compared to the conventional tight diamond interchange configuration due to reduced conflict points, improved mobility and better sight distance at turns. In addition, the diverging diamond configuration provides opportunity for visual enhancements such as landscaping.

Build Alternative 2 meets the overall project objectives of this PD&E study as well as the purpose and need for this project. However when this alternative was presented to the public and elected officials, the turnout was not in favor of it.

VE Alternative:

To construct “Alternative 1” as described in the PD&E documents at I-95 and North Lake Blvd. The purpose of this PD&E study was to develop design concepts to address traffic spillback onto I-95, improve interchange operation, reduce congestion, and enhance safety through the year 2040. Since conditions along Northlake Boulevard are anticipated to deteriorate below acceptable LOS standards if no improvements occur by 2040 (Please refer to Table 1); the interchange will have insufficient capacity to accommodate the projected travel demand. Therefore the need for the project is based primarily on capacity/transportation demand and growth management.

Table 1.

Alternative	I-95 SB Ramp Terminal Approach			I-95 NB Ramp Terminal Approach		
	LOS (AM/PM)	Max. Queue Length	Storage Deficiency	LOS (AM/PM)	Max. Queue Length	Storage Deficiency
No-Build Alternative	F/F	1733	Yes (57%)	F/F	1210	Yes (8%)

RECOMMENDATION No. 26: Construct Alternative No. 1

Alternative 1 encompass the construction of triple lefts and triple rights at ramp terminal exits. During the refined build alternatives phase of the study SYNCHRO and SIMTRAFFIC were used for the LOS analysis and microsimulation for the queue length analysis respectively, and the findings are shown in Table 2.

Table 2.

Alternative	I-95 SB Ramp Terminal Approach			I-95 NB Ramp Terminal Approach		
	LOS (AM/PM)	Max. Queue Length	Storage Deficiency	LOS (AM/PM)	Max. Queue Length	Storage Deficiency
Alternative 1 - Modified CDR	D/D	1077	No	D/D	1022	No

Based on the evaluation results, this alternatives will provide acceptable level of service for all of the ramp terminal approaches. However the northbound left turn movement at the northbound ramp terminal for the 2040 design year results in a LOS E.

A comparison of the queue lengths at the ramp terminal approaches indicate that build alternative 1 provide adequate storage to accommodate the queues along the ramps without backup into the I-95 mainline compared to the No-Build condition. However, Build Alternative 1 will require realignment and extension of the existing northbound and southbound off-ramps to accommodate the 2040 design year queues. This results in right of way impacts to the residential properties in the northwest quadrant of the interchange.

Advantages:

- Less construction cost
- Less right-of-way cost
- No impact to I-95 mainline
- Easier to construct.
- Grater public acceptance
- This alternatives will provide acceptable LOS for all of the ramp terminal approaches.
- Less impact to access from business and side streets connecting to Northlake Blvd.

Disadvantages:

- The LOS will be improved so there is no backup into the I-95 mainline, However the northbound left turn movement at the northbound ramp terminal for the 2040 design year results in a LOS E.
- The overall queue lengths are improved 0.38% in the I-95 southbound off-ramp, and 0.16% in the I-95 northbound off-ramp. So compared with Alternative 2 this alternative provide 0.23% less queue length in the I-95 southbound off-ramp, and 0.37% 0.23% less queue length in the I-95 northbound off-ramp.

Potential Cost Savings: **\$29,149,000**

RECOMMENDATION No. 26: Construct Alternative No. 1

Calculations:

	Alternative 1	Alternative 2	
Construction Item	Total Costs	Total Costs	Cost Differential
Earthwork	\$951,824.44	\$1,773,999.97	(\$822,175.53)
Roadway	\$10,029,265.06	\$8,648,434.02	\$1,380,831.04
Shoulder	\$2,921,355.49	\$1,291,789.10	\$1,629,566.39
Median	\$252,851.10	\$470,474.15	(\$217,623.05)
Drainage	\$2,760,353.21	\$1,838,572.09	\$921,781.12
Bridges	\$0.00	\$10,954,753.19	(\$10,954,753.19)
Retaining Walls	\$3,497,918.00	\$488,368.00	\$3,009,550.00
Signing	\$132,523.36	\$81,487.98	\$51,035.38
Lighting	\$472,600.02	\$882,845.59	(\$410,245.57)
Signalization	\$1,932,842.80	\$1,932,842.80	\$0.00
ITS	\$65,254.28	\$65,254.28	\$0.00
Total Construction	\$23,016,787.76	\$28,428,821.17	
MOT (10%)	\$2,301,678.78	\$2,842,882.12	(\$541,203.34)
Subtotal	\$25,318,466.54	\$31,271,703.29	
Mobilization (10%)	\$2,531,846.65	\$3,127,170.33	(\$595,323.68)
Contingency	\$150,000.00	\$150,000.00	\$0.00
Subtotal	\$28,000,313.19	\$34,548,873.62	(\$6,548,560.43)

Right of Way Savings = \$22,600,000

RECOMMENDATION No. 33: Do not build the additional dedicated right turn lane northbound Sandtree Drive to eastbound Northlake Blvd. convert the through lane to a shared through and right turn lane

Proposed Alternative:

The PD&E documents show Alternative No. 2 – Diverging Diamond Interchange (Northlake Blvd) as the Preferred Alternative.

VE Alternative:

Do not build the additional dedicated right turn lane northbound Sandtree Drive to eastbound Northlake Blvd. and convert the through lane to a shared through/right turn lane. The through movement only has 20 vehicles during the peak hour flow.

Advantages:

- Less cost
- No impact on Schumacher car dealership

Disadvantages:

- None apparent

Potential Cost Savings: \$6,400,000

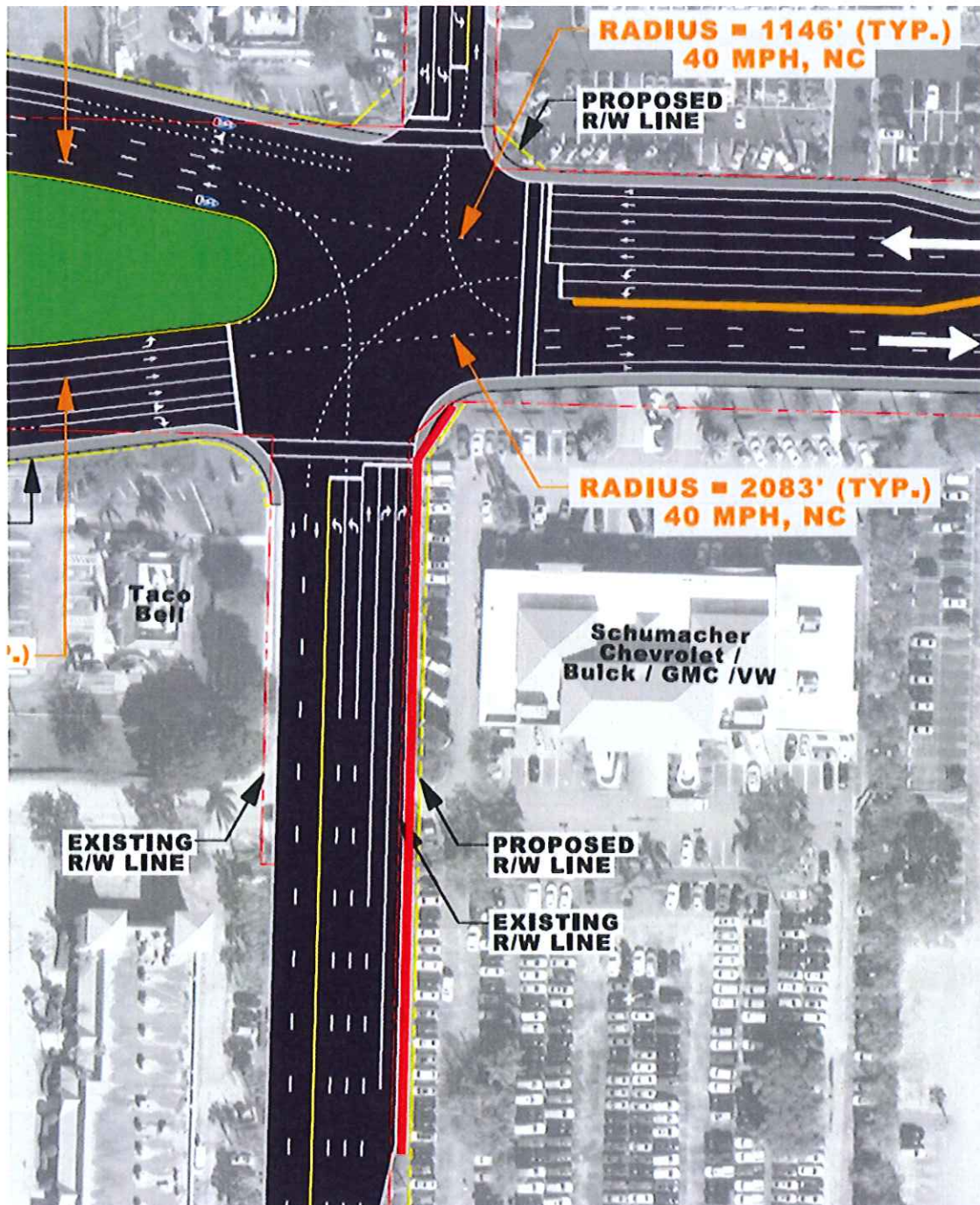
Calculations:

Description	Quantity	Unit	Unit Price	Extended Amount
Pavement	-5,700	SF	\$29.00	(\$165,300)
Subtotal				(\$165,300)
MOT (10%)				(\$14,877)
Mobilization (10%)				(\$16,530)
		CONSTRUCTION TOTAL		(\$196,707)

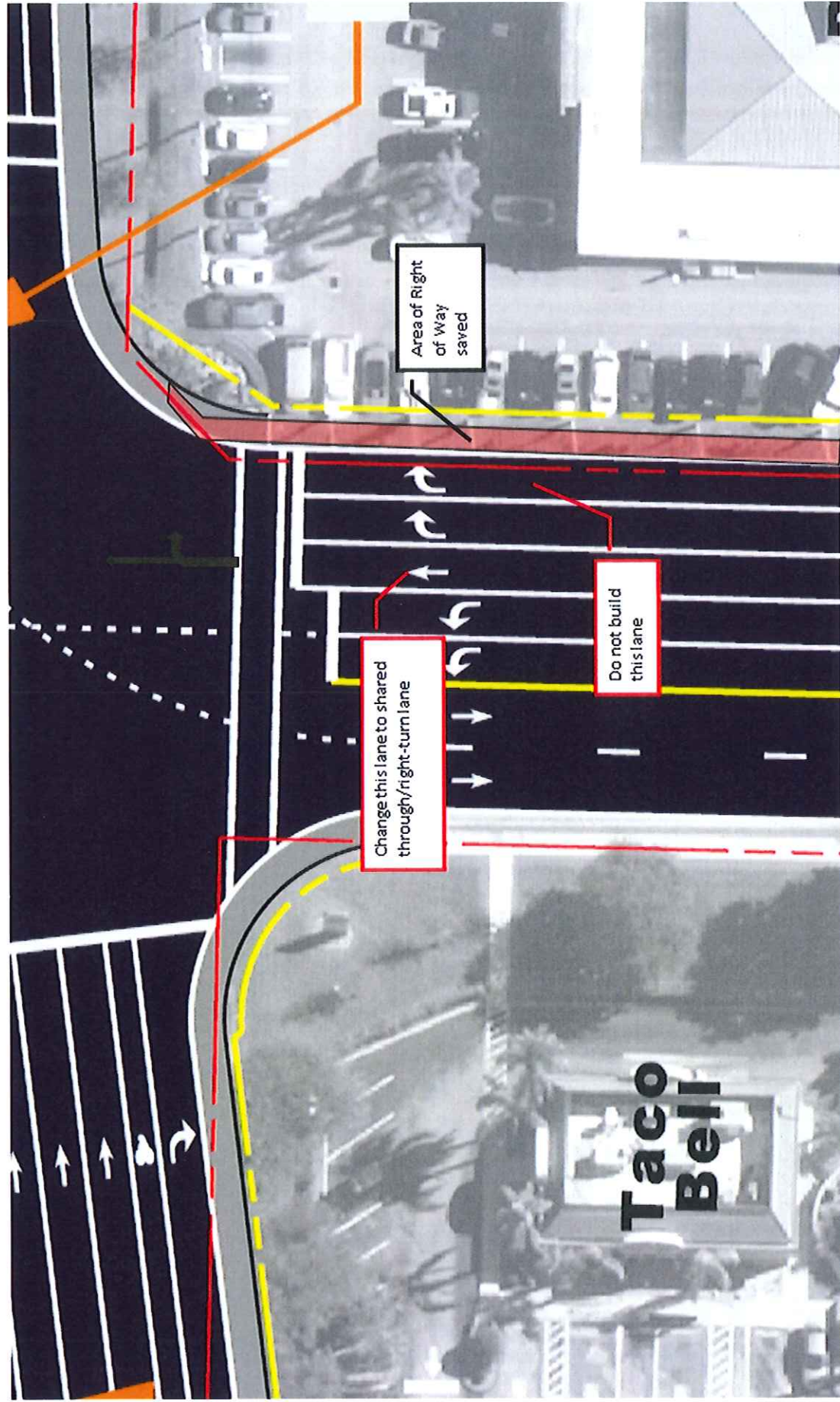
Right of Way Savings = \$6,202,953

RECOMMENDATION No. 33: Do not build the additional dedicated right turn lane northbound Sandtree Drive to eastbound Northlake Blvd. convert the through lane to a shared through and right turn lane

PROPOSED ADDITIONAL RIGHT TURN LANE



RECOMMENDATION No. 33: Do not build the additional dedicated right turn lane northbound Sandtree Drive to eastbound Northlake Blvd. convert the through lane to a shared through and right turn lane



APPENDICES

Agenda
Sign In Sheets
Resolution Memorandum
Slide Presentation

Agenda
I-95 at Northlake Boulevard
February 27 – March 3, 2017

Day One (D4 Auditorium)	Kickoff Intro by VE Team Leader	8:30 am – 8:45 am
	Designer Orientation	8:45 am – 9:45 am
	Questions for Designers	9:45 am – 10:30 am
	Travel to Site	10:30 am – 12:00 pm
	Lunch	12:00 pm – 1:00 pm
	Site Review	1:00 pm – 2:45pm
	Return to FTL	2:45 pm – 4:00 pm
	Summarize Site Review & Constraints	4:00 pm – 5:00 pm
Day Two (Comfort Inn)	Cost Model & Function Analysis	8:00 am – 9:00 am
	FAST Diagram	9:00 am – 9:30 am
	Intro to Creative Thinking	10:00 am – 10:15 am
	Creative Idea Listing/Function	10:15 am – 12:00 pm
	Lunch	12:00 pm – 1:00 pm
	Creative/Evaluation/Function	1:00 pm – 5:00 pm
Day Three (Comfort Inn)	Evaluation Phase	8:00 am – 12:00 pm
	Lunch	12:00 pm – 1:00 pm
	Mid-point review and determine economic factors	1:00 pm – 2:00 pm
	Begin Development Phase	2:00 pm – 5:00 pm
Day Four (Comfort Inn)	Continue Development	8:00 am – 5:00 pm
Day Five (D4 Auditorium)	Finish Development/Prepare Oral Presentation	8:00 am – 10:00 pm
	Oral Presentation to FDOT/others	10:00 am – 12:00 pm
	Begin Draft Value Engineering Report	1:00 pm – 5:00 pm

FLORIDA DEPARTMENT OF TRANSPORTATION

VALUE ENGINEERING KICKOFF

I-95 at Northlake Boulevard

February 27, 2017

SIGN IN SHEET

Name	Representing	Phone Number	Email Address
Mary Ellen (Mel) Milford	FDOT	954-777-4471	mary.milford@dot.state.fl.us
Jamie Polidora	FDOT	954-777-4633	jami.polidora@dot.state.fl.us
Ann Broadwell	FDOT	954-777-4325	ann.broadwell@dot.state.fl.us
Zachary Behring	FDOT structures	954-777-4637	Zachary.Behring@dot.state.fl.us
Kerth Krieger	Stanley	561 389 1075	kriegerkerth@stanleygroup.com
Donnie Webster	FDOT	954-777-4235	donnie.webster@dot.state.fl.us
Godfrey Lamprey	GOAC	786 600 3350	godfrey.lamprey@goneng.com
Lexi Johnson	Stanley Consultants	561 584 8742	johnsonlexi@stanleygroup.com
Renard Olivier	Stanley Consultants	561 584 8739	olivierrenard@stanleygroup.com
Predrag Milosavljevic	Stanley Consultants	361-716-8747	milosavljevicpredrag@stanleygroup.com
Rana Keel	FDOT	954-777-4157	Rana.Keel@dot.state.fl.us
Francisco Cruz	PMA-VE	813-290-8040	fcruz@pmaconsultants.com
Ruben Rodriguez	Foot Drainage	917 774 461	ruben.rodriguez@dot.state.fl.us
Kevin Micocci	FDOT construction	561-719-7793	kevin.micocci@dot.state.fl.us
Tim Brock	FDOT V.E.	954-777-4125	tim.brock@dot.state.fl.us

FLORIDA DEPARTMENT OF TRANSPORTATION

VALUE ENGINEERING MID-POINT REVIEW

I-95 at Northlake Boulevard

March 1, 2017

SIGN IN SHEET

Name	Representing	Phone Number	Email Address
Dawn Webster	FDOT ROW	954-777-4235	dawn.webster@dot.state.fl.us
Rana Keel	FDOT Traffic Design	954-777-4157	Rana.Keel@dot.state.fl.us
Zachary Behring	FDOT Structures	954-777-4637	Zachary.Behring@dot.state.fl.us
Bill Evans	STANLEY CONSULTANTS	561-352-5662	EVANS.BILL@STANLEYGROUP.COM
Tim Brack	FDOT-VE	954-777-4125	Tim.Brack@dot.state.fl.us
Tamara Pellicora	FDOT-PEMCO	954-777-4633	jamie.pellicora@dot.state.fl.us
Francisco Cruz	PMA-VE	813-290-8040	forz2@pmaconsultants.com
Kevin Micucci	FDOT-CONSTRUCTION	(561) 719-7793	Kevin.Micucci@dot.state.fl.us
Mauricio Micosta	FDOT-Design	954-777-4424	mauricio.micosta@dot.state.fl.us
Scott Thurman	FDOT PM	954-777-4135	Scott.Thurman@dot.state.fl.us
Mary Ellen (Mel) Milford	FDOT-PEMCO	954-777-4471	Mary.Milford@dot.state.fl.us
Ruben Rodriguez	FDOT-Drainage	954-777-4466	rober.rodriguez@dot.state.fl.us
Rick Johnson	PMA	324-217-5182	rjohnson@pmaconsultants.com

FLORIDA DEPARTMENT OF TRANSPORTATION

VALUE ENGINEERING STUDY PRESENTATION

I-95 at Northlake Boulevard

March 3, 2017

SIGN IN SHEET

Name	Representing	Phone Number	Email Address
Rana Keel	FDOT Traffic Design	954-777-4157	Rana.Keel@dot.state.fl.us
Mary Ellen ("Mel") Milford	FDOT PLEMO	954-777-4471	Mary.Milford@dot.state.fl.us
Kevin Micocca	FDOT Construction	561-715-7753	Kevin.Micocca@dot.state.fl.us
Mauricio Nicolson	FDOT Design	954-777-4434	Mauricio.Nicolson@dot.state.fl.us
Donnie Nease	FDOT ROW	954-777-4235	Donnie.Nease@dot.state.fl.us
Tim Brock	FDOT - VE	954-777-4125	Tim.Brock@dot.state.fl.us
Francine Cruz	PMA - VE	913-290-8040	Francine@PMAConsultants.com
Duben-Rodriguez	FDOT Drainage	917-777-4461	Duben.Rodriguez@dot.state.fl.us
Bill Evans	STANLEY CONSULTANTS	561-752-5612	EVANS.Bill@StanleyGroup.com
RENAUD OLIVIER	STANLEY CONSULTANTS	561-689-7441	olivier.renaud@stanleygroup.com
Steve Fisher	FDOT R/W Admin	954-777-4246	Stephen.Fisher@dot.state.fl.us
Scott Thumann	FDOT PMA	954-777-4135	Scott.Thumann@dot.state.fl.us
Keith Krieser	Stanley	561-689-7444	Krieser.Keith@stanleygroup.com
Rick Johnson	PMA	321-217-5192	RJohnson@PMA-a2.com

FLORIDA DEPARTMENT OF TRANSPORTATION

VALUE ENGINEERING STUDY PRESENTATION

I-95 at Northlake Boulevard

March 3, 2017

SIGN IN SHEET

Name	Representing	Phone Number	Email Address
KADIAN McLEAN	FDOT UTILITIES	954-777-4128	KADIAN.McLEAN@DOT.STATE.FL.US
TAVISTO GARCIA	CM/DESIGN	954-777-4466	TAVISTO.GARCIA@DOT.STATE.FL.US
Susan Day	FDOT R/W	954-777-4290	susan.day@dot.state.fl.us
ANGELITO B. RAMOS	FOOT DRAPAGE	954 777 4453	ANGELITO.B. RAMOS @ DOT. STATE. FL. US
Victor Ramos	FOOT R/W	954 777 4257	VICTOR.RAMOS@DOT.STATE.FL.US
GERAY O'LEARY	DA	773 944 11	
Cesar Martinez	DA	777-4653	cesar.martinez@dot.state.fl.us
Jonas Ouse	DESIGN	777-4452	Jonas.Ouse@DOT.
Eugene Khoshper	FDOT DUD	954-777-4128	eugene.khoshper@DOT.
Mortez Alai	DMD	4449	Mortez.alai@DOT.
Juliet Ashbourne	UTILITIES	954 777 4126	Juliet.Ashbourne@DOT.STATE.FL.US
Tony Cordell	R/W	954-777-4471	Tony.Cordell@DOT.STATE.FL.US
BLA Sals	DESIGN	24166	BLA.Sals
JOE WILLIAMS	DESIGN	954-777-4684	joe.williams@dot.state.fl.us

FLORIDA DEPARTMENT OF TRANSPORTATION

VALUE ENGINEERING STUDY PRESENTATION

I-95 at Northlake Boulevard

March 3, 2017

SIGN IN SHEET

Name	Representing	Phone Number	Email Address
Godfrey Lamprey	GOAL	726 600 3350	godfrey.lamprey@goalleng.com
James Ford	HNTB	954 654 5972	jeford@HNTB.com
Ron Koreiva	FDOT	Ext 4441	ronald.koreiva@dot.state.fl.us
Tom Stepp	FDOT	4230	thomas.stepp@dot.state.fl.us
Brian Bassant	FDOT	4146	brian.bassant@dot.state.fl.us
Tau Lamprey	FDOT	4368	tau.lamprey@dot.state.fl.us
Georgi Calusnik		PLMNO	
Scott Clark	FDOT PLMNO	4342	Scott.Clark@dot.state.fl.us
Margaret Rushmore	FDOT	4339	Margaret.Rushmore@dot.state.fl.us
James Poole	"	4204	James.poole@
Hui Shi	"	4557	Hui.Shi@
Vandana Nargole	FDOT	4221	
Richard Crand	FDOT	4428	richard.crand@
Damara Williams	FDOT	4675	

Stacy Miller
Ext. 4429

I-95 at Northlake Boulevard

March 3, 2017

[illegible]



Florida Department of Transportation


**RICK SCOTT
GOVERNOR**

3400 West Commercial Boulevard
Fort Lauderdale, FL 33309

**MIKE DEW
SECRETARY**

Date: June 28, 2017

To: Tim Brock, P.E. District Value Engineer

From: Stacy L. Miller, P.E. Director of Transportation Development 

Copies: Steve Braun, P.E., John Olson, P.E., Scott Thurman, P.E.,
VE Team Members

Subject: **Value Engineering Study Responses**
SR-9/I-95 at Northlake Boulevard Interchange
Palm Beach County, Florida
Financial Management ID Number: 435803-1-22-02
Efficient Transportation Decision Making Number: 14182

This memorandum is in response to the subject Value Engineering (VE) review conducted during the week of February 27, 2017 through March 3, 2017. We would like to thank the VE Team for their review of the project and their recommendations. Only the recommendations that were detailed in the Development Phase of the VE Report provided are discussed here. The VE Team generated 42 ideas during the Creative Ideas phase of the VE Job Plan and concluded with seven (7) VE Recommendations and eight (8) VE Design Suggestions, as described below. The recommended Alternative Diverging Diamond (DDI) was changed to Alternative 1 Modify Concept after the VE Study Workshop.

VE Recommendation Number 1:

VE Recommended Change: Construct PD&E Alternative No. 1 with a partial cloverleaf in the northeast quadrant and do not widen the southeast off-ramp. Potential cost savings \$16,555,000 when compared to the PD&E Proposed Alternative 2 Diverging Diamond Interchange (DDI) cost, however it will increase the cost of Alternative 1 Modify Concept with additional right of way and construction costs.

PD&E Proposed: Construct Alternative 2 DDI

PD&E Design Response: Not Accepted

There are geometric, operational and right of way concerns with the introduction of low-speed loop exit ramp directly from high-speed interstate facility. The VE recommendation utilizes the smallest possible ramp radius, lowest design speed (30 mph) and maximum super elevation rates ($e = 0.10$) to move this high volume interstate ramp traffic onto the arterial within a relatively short distance (350 ft.) before stopping at the next traffic signal. This tight geometry requires additional R/W acquisition of three business and potential impacts to a school/church facility. The free-flow ramp traffic creates new conflict points with the pedestrians and bicyclists. VE recommendation to close Roan Lane at Northlake Blvd. would reroute all neighborhood traffic down a local minor street connection to Sunrise Drive.

VE Recommendation Number 2:

VE Recommended Change: Construct Alternative 1 Modified Concept and re-align exit ramp D (SB Exit) closer to the mainline interstate. Add one restrictive free-flow lane. Potential cost savings is \$30,714,000 when compared to Alternative 2 DDI cost.

PD&E Proposed: Construct Alternative 2 Diverging Diamond Interchange (DDI).

PD&E Design Response: Not Accepted

As suggested by the VE recommendation, to move the ramp closer to the mainline requires available width. However, the ramp's geometric constraint is near the interstate ramp gore area where the PD&E alternative proposes right of way acquisition, not at the ramp terminal signal where there is available right of way. The PD&E proposed alternative has the ramp lanes, ramp shoulder, MSE wall, mainline shoulder and mainline lanes, tightly fitting without any allowable width for adjustments. Although there is green space between the ramp and the mainline MSE wall at the ramp traffic signal, right of way acquisition is not required at this location, therefore moving the ramp at the signal will not reduce right of way or costs.

The exit-ramp will be widened to provide triple-lefts and triple-rights. The VE free-flow right turn effectiveness would be negated by the queuing vehicles at the Keating Drive signal located 380 ft. from the right turn lane. The PD&E proposed right turn lane at Keating Drive would not function due to the volume of ramp traffic free-flowing onto Northlake Blvd, therefore the right turn lane at Keating Drive would be eliminated. Keating Drive is the only neighborhood access from Northlake Blvd. and the right turn lane at Keating Drive is needed. The free flow turn creates new conflicts with the pedestrians and bicyclists.

VE Recommendation Number 3:

VE Recommended Change: Create free flow off ramp right turns for Alternative 1 Modified Concept Potential cost savings of \$29,137,000 when compared to Alternative 2 DDI cost.

PD&E Proposed: Construct Alternative 2 Diverging Diamond Interchange (DDI) with triple left and triple right turn lanes operating under signal control.

PD&E Design Response: Not Accepted

The Alternative 2 DDI operates at LOS C with the best reduction in ramp queue lengths, free flow right turns are not required.

There are geometric, operational and right of way concerns with the introduction of a northbound to eastbound free flow right turn into Alternative 1 Modified Concept. To operate effectively the right turn lane at the shopping center should be closed, thereby rerouting all shopping center traffic to Sandtree Drive. The distance to Sandtree Drive is 700 feet. However, the 2040 Build queue length for the westbound right turn at Sandtree Drive is 389 feet which leaves 311 feet for the traffic weaving distance. The weaving distance is inadequate to handle the left merge and right merge prior to the outside lane becoming right turn only at Sandtree Drive. FDOT eliminated the free flow right turn condition at the exit ramp signal in prior intersection projects to improve operations and safety conditions.

VE Recommendation Number 8:

VE Recommended Change: Construct a DDI at a lower speed limit (35 mph), in place of the proposed Alt 2. This proposal does not require the I-95 bridge structure to be lengthened and requires less right of way to be acquired. The reduced cost of this construction provides the same level of service as the 40 MPH DDI, but is not as intrusive on the neighboring properties. The potential cost savings is \$44,750,000 when compared to PD&E Alternative 2 DDI.

PD&E Proposed: The PD&E Documents show a 40 MPH Diverging Diamond Interchange (DDI). The plan includes lengthening the bridge structure over I-95, and extensive right of way acquisition along Northlake Boulevard. The plan provides the greatest level of service compared with the other alternatives.

PD&E Design Response: Not Accepted

Reducing the 45 mph posted to a 35 mph design speed is not acceptable to District 4 at this time.

VE Recommendation Number 16:

VE Recommended Change: For all alternative options, reduce the 7-foot bike lane and buffer to 4 feet, saving 3 feet on each side. Potential cost savings \$726,000 for all alternatives.

PD&E Proposed: All alternatives proposed 7 foot buffered bike lanes.

PD&E Design Response: Accepted

After the VE Study, the PD&E project team obtained approval from Palm Beach County Engineering to utilize a 4 feet wide bike lane.

VE Recommendation Number 24:

VE Recommended Change: Add pedestrian lighting along the walkways of the DDI. Potential cost increase (value added) is \$89,250.

PD&E Proposed: Standard highway lighting.

PD&E Design Response: Accepted

Consider enhanced pedestrian lighting under I-95 bridge structure. Based on discussions with FDOT Directors and staff, Build Alternative 1 Modified Concept was selected as the recommended alternative due to the reduced R/W impact compared to Build Alternative 2 DDI. However, to improve night time pedestrian and bicyclist safety, underdeck lighting below the I-95 bridge should be considered in the design phase. Potential value added \$89,250.

VE Recommendation Number 26:

VE Recommended Change: Construct Alternative 1 Modified Concept. Potential cost savings \$29,149,000.

PD&E Proposed: Construct Alternative 2 Diverging Diamond Interchange (DDI)

PD&E Design Response: Accepted

Accepted, Alternative 1 Modified Concept was selected as the Recommended Alternative and will advance to the public hearing.

VE Recommendation Number 33:

VE Recommended Change: Do not build the additional dedicated northbound to eastbound right turn lane at Sandtree Drive. Convert the through lane to a shared through/right turn lane. The through movement only has 20 vehicles during the peak hour flow. Potential construction cost savings is \$6,400,000 when compared to Alternative 2, DDI cost.

PD&E Proposed: Construct dual northbound to eastbound right turn lanes.

PD&E Design Response: Accepted

The proposed VE recommendation will eliminate the R/W impacts to the car dealership on the southeast side of the intersection. Traffic operational analysis was performed with the proposed VE configuration that indicates the northbound approach will operate at LOS E for both the AM and PM peak periods while the overall intersection will operate at LOS E and LOS F during the AM and PM peak periods, respectively. These results are similar to the LOS previously obtained; as such, the VE recommendations is not anticipated to result in significant difference in operations than the PD&E proposed alternative while resulting in positive cost savings for the project and reduction to business impacts.

VE DESIGN SUGGESTIONS**VE Design Suggestion DS-1:** Remove the intermittent signals**PD&E Design Response: Accepted**

During the review of Roan Lane access and operational conditions, the eastbound median left turn lane and median opening were closed and the traffic signal removed at Roan Lane. DS-1 is incorporated into Alternative 1 Modified Concept.

VE Design Suggestion DS-2: Closure of Roan Lane ingress and egress**PD&E Design Response: Not accepted**

Closure of ingress and egress at Roan Lane would shift all traffic to Sunrise Drive and require all vehicles to use the minor street connection behind the golf business and fast food restaurant.

VE Design Suggestion DS-3: Shift the DDI to the north to avoid right of way takes to the south**PD&E Design Response: Not accepted**

Alternative 2, the DDI alternative was replaced by Alternative 1 Modified Concept alternative.

VE Design Suggestion DS-4: Construct a turbine interchange

PD&E Design Response: Consider in the Design Phase: Any alternative identified in design that has lower costs and impacts than Alternative 1 Modified Concept and operates as good as or better than Alternative 1 Modified Concept could be considered. Conduct a PD&E Reevaluation for any major design changes prior to design.

VE Design Suggestion DS-5: Add a lighting system under the bridge

PD&E Design Response: Consider in the Design phase. See VE Recommendation 24 discussion.

VE Design Suggestion DS-6: Build to the ultimate width for the interstate

PD&E Design Response: Consider in the Design phase: Depending on the timing and programming of the I-95 Express PD&E Study, opportunities for cost savings may occur. Currently, the I-95 Express PD&E Study is further behind the I-95 Northlake Study. Designers should take note that Alternative 1 Modified Concept does include additional auxiliary and ramp lanes for improved operations during mainline construction.

VE Design Suggestion DS-7: When rebuilding the bridge construct full height retaining wall and create additional space for drainage.

PD&E Design Response: Consider during the design phase: Using full height retaining wall along the interchange infield areas may increase drainage storage area.

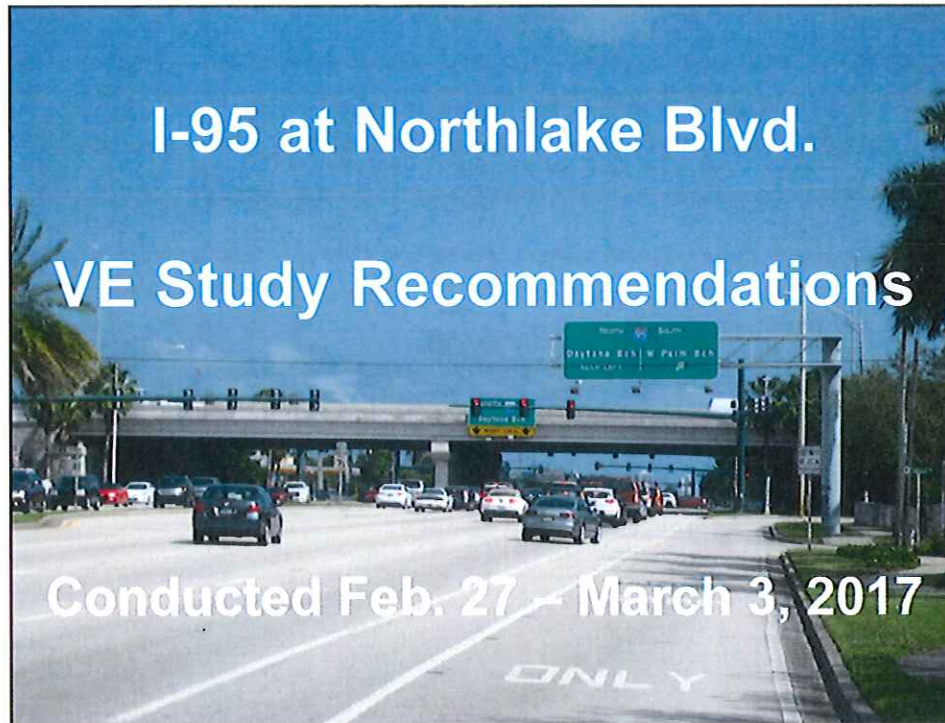
VE Design Suggestion DS-8: Put ponds in all green space within the DDI and build a boardwalk down the median

PD&E Design Response: Not applicable due to the recommended alternative becoming Alternative 1 Modified Concept.

SUMMARY

The accepted VE recommendations are 16, 24, 26 and 33. These four recommendations create a potential cost avoidance of \$36,185,750. VE Design suggestion DS-1 is accepted and incorporated into PD&E Alternative 1 Modified Concept. VE Design Suggestions 4, 5, 6 and 7 have merit to consider during the design phase.

SLIDE PRESENTATION



I-95 at Northlake Blvd.

Team Members:

- **Mauricio Micolta, PE, Roadway Design**
- **Donnie Webster, Right of Way**
- **Kevin Micocci, PE, Constr./Operations**
- **Ruben Rodriguez, Drainage**
- **Mel Milford, PLEMO**
- **Francisco Cruz, PE, AVS, RMP, SMP, Assistant Team Leader**



I-95 at Northlake Blvd.

Team Members:

- Jamie Polidora, PE, PLEMO
- Rana Keel, EI, Traffic Design
- Zach Behring, EI, Structures
- Rick Johnson, PE, CVS, Team Leader
- Tim Brock, PE, VE Coordinator



SAVE International and FDOT Job Plan

- Information
- Function
- Creative Brainstorming
- Evaluation/Development
- Recommendation/Presentation/
- Report

Information



- Information Gathering
- Reviewed Project Information
- Site Visit
- Verified Constraints
- Identified Functions

Project Location



Project Limits



Project Scope



The proposed project consists of addressing traffic spillback onto I-95, improving interchange operations, and reducing congestion at the interchange through 2040.

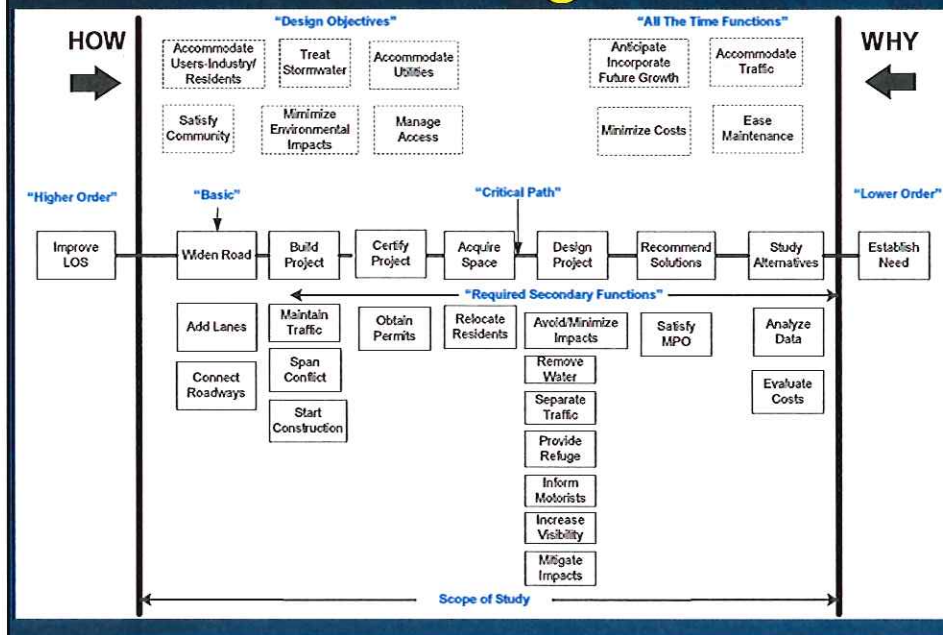
Construction:	\$34.53 M
Right of way:	\$48.30 M
Ponds R/W:	TBD

Function Analysis



- Improve LOS
- Widen Road
- Add Lanes
- Build Project
- Certify Project
- Acquire Space
- Recommend Solutions
- Study Alternatives
- Establish Need

FAST Diagram





Creative Brainstorming

- Generated Ideas in Major Disciplines and for Each Function
- Ideas Were Consolidated by the VE Team for Further Development

Evaluation/Development

- Generated 42 Ideas and Identified Weighted Criteria
- Ideas That Improved the Base Alternative Were Developed
- Compare the Base Alternative to the VE Alternative
- List Advantages and Disadvantages

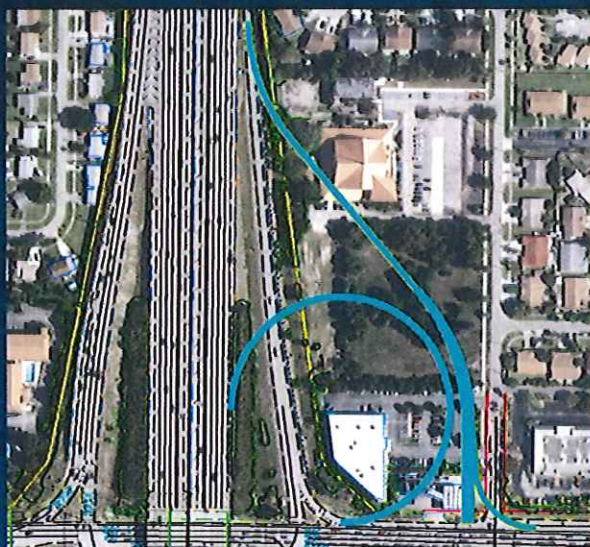
Build a partial cloverleaf in the northeast quadrant

- **PD&E Concept:** The PD&E documents show a Diverging Diamond Interchange (DDI) as Alternative No. 2.

Build a partial cloverleaf in the northeast quadrant

- **VE Idea No. 1:** PD&E Alternative No. 1 with a partial cloverleaf in the northeast quadrant and do not widen the southeast off-ramp.

Build a partial cloverleaf in the northeast quadrant



Build a partial cloverleaf in the northeast quadrant



■ Advantages:

- Less cost
- Less right of way
- Stakeholder acceptance

■ Disadvantages:

- Lower LOS on Northlake Blvd.
- Peds have to cross a free-flow ramp

■ Potential Cost Savings: **\$16,555,000**

Realign the ramps closer to the mainline

- **VE Idea No. 2:** Construct Alternative No. 1 and re-align exit ramp “D” closer to the mainline highway. Add one restrictive free-flow lane.

Realign the ramps closer to the mainline



Realign the ramps closer to the mainline



Realign the ramps closer to the mainline

■ Advantages:

- Less cost
- Less right of way
- Avoids residential relocations

■ Disadvantages:

- Lower LOS

■ Potential Cost Savings: **\$30,714,000**

Create free flow off ramp right turns for Alternative 1



- **VE Idea No. 3:** Construct Alternative 1 as described in the PD&E documents at I-95 and North Lake Blvd, and construct free flow off-ramps for the right turns.

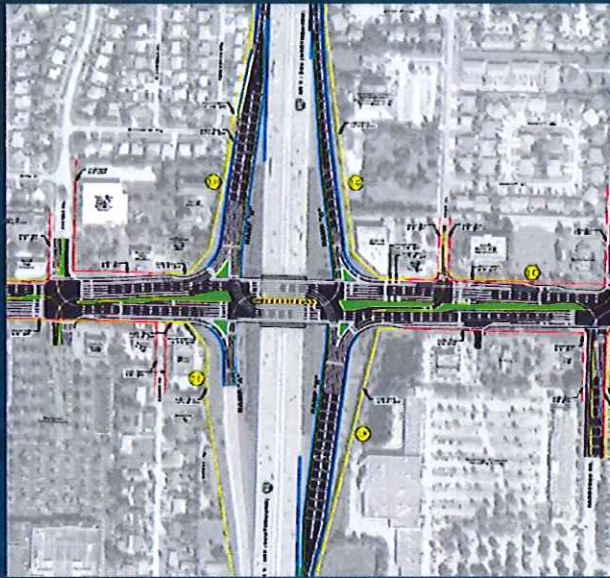
Create free flow off ramp right turns for Alternative 1



EXISTING CONDITION



Create free flow off ramp right turns for Alternative 1



Create free flow off ramp right turns for Alternative 1



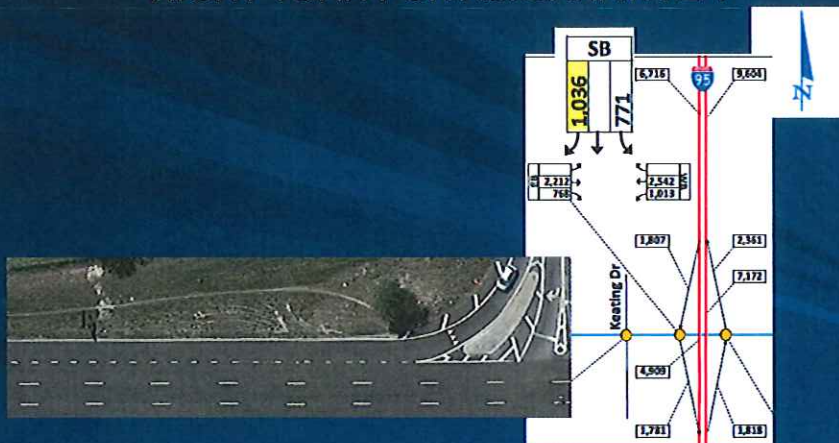
CREATE FREE FLOW OFF-RAMP
RIGHT TURNS FOR ALTERNATIVE 1



Create free flow off ramp right turns for Alternative 1



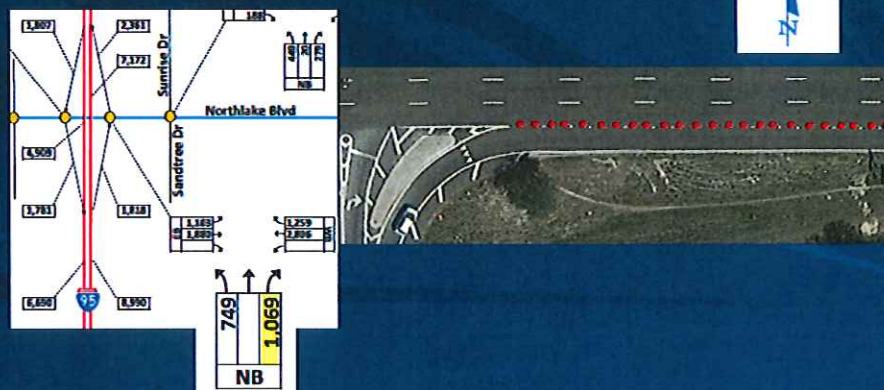
FREE FLOW OFF-RAMP
RIGHT TURN FOR ALTERNATIVE 1



Create free flow off ramp right turns for Alternative 1



RESTRICTED FREE FLOW OFF-RAMP
RIGHT TURN FOR ALTERNATIVE 1



Create free flow off ramp right turns for Alternative 1



■ Advantages:

- Less cost
- Less right of way
- Easier to construct

■ Disadvantages:

- Slight compromise to LOS

■ Potential Cost Savings: **\$29,137,000**

Build the 35 MPH Diverging Diamond Interchange



- **PD&E Concept:** The PD&E documents show a 40 MPH Diverging Diamond Interchange (DDI). The plan includes lengthening the bridge structure over I-95, and extensive right of way takes along Northlake Boulevard.

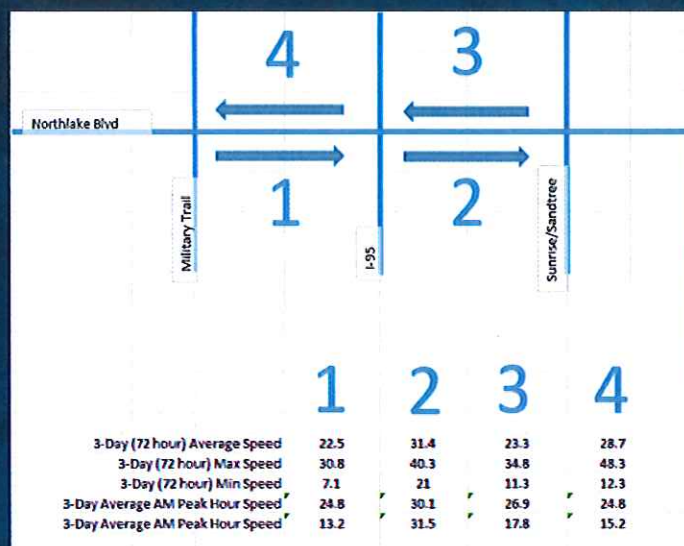
Build the 35 MPH Diverging Diamond Interchange

- **VE Idea No. 8:** Construct a DDI at a lower speed limit, in place of the proposed Alt No. 2. This proposal does not require the I-95 bridge structure to be lengthened and requires less right of way to be acquired. The reduced cost of this construction provides the same level of service as the 40 MPH DDI, but is not as intrusive on the neighboring properties.

Build the 35 MPH Diverging Diamond Interchange



Build the 35 MPH Diverging Diamond Interchange



Build the 35 MPH Diverging Diamond Interchange

■ Advantages:

- Less cost
- Less right of way
- Keeps the existing I-95 Bridge

■ Disadvantages:

- None apparent

■ Potential Cost Savings: **\$44,750,000**

Reduce the 7-ft bike lane and buffer

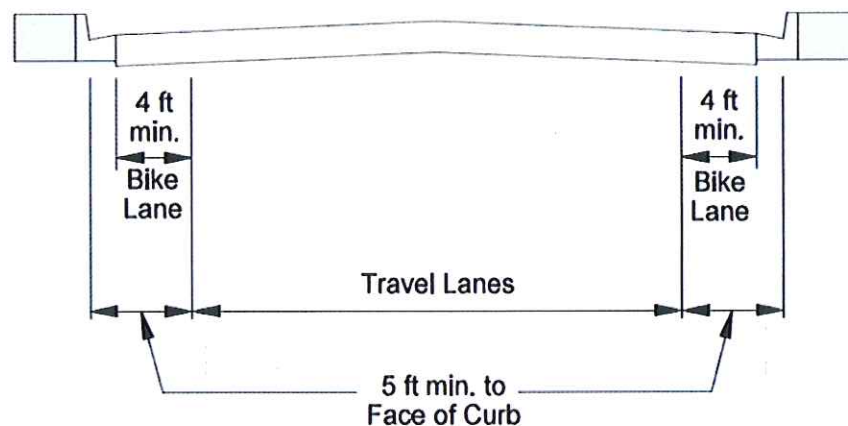


- **VE Idea No. 16:** For all alternatives, reduce the 7-foot bike lane and buffer to 4 feet, per Palm Beach County standards, saving 3 feet on each side for a total reduction of 6 feet of roadway.

Reduce the 7-ft bike lane and buffer



a) Curbed Street without Parking



Reduce the 7-ft bike lane and buffer



■ Advantages:

- Less cost
- Less right of way
- Same LOS

■ Disadvantages:

- Stakeholder acceptance may be less

■ Potential Cost Savings: **\$726,000**

Add pedestrian lighting along the DDI walkway



- **PD&E Concept:** The PD&E documents show no lighting on Northlake Boulevard under the I-95 bridge overpass for either westbound or eastbound direction for either traffic or pedestrian walkways.

Add pedestrian lighting along the DDI walkway



- **VE Idea No. 24:** The VE Team recommend the introduction of lights for pedestrian either bridge mounted or pole mounted (decorative).

Add pedestrian lighting along the DDI walkway



Add pedestrian lighting along the DDI walkway



■ Advantages:

- Improves visibility
- Enhances aesthetics

■ Disadvantages:

- Adds cost

■ Potential Value Added: **(\$89,000)**

Don't build the additional right turn lane at Sandtree



- **VE Idea No. 33:** Do not build the additional dedicated right turn lane northbound Sandtree Drive to eastbound Northlake Blvd. and convert the through lane to a shared through/right turn lane.

Don't build the additional right turn lane at Sandtree



Don't build the additional right turn lane at Sandtree



Don't build the additional right turn lane at Sandtree



■ Advantages:

- Less cost
- Avoids right of way take

■ Disadvantages:

- None apparent

■ Potential Cost Savings: **\$6,400,000**

Savings Summary

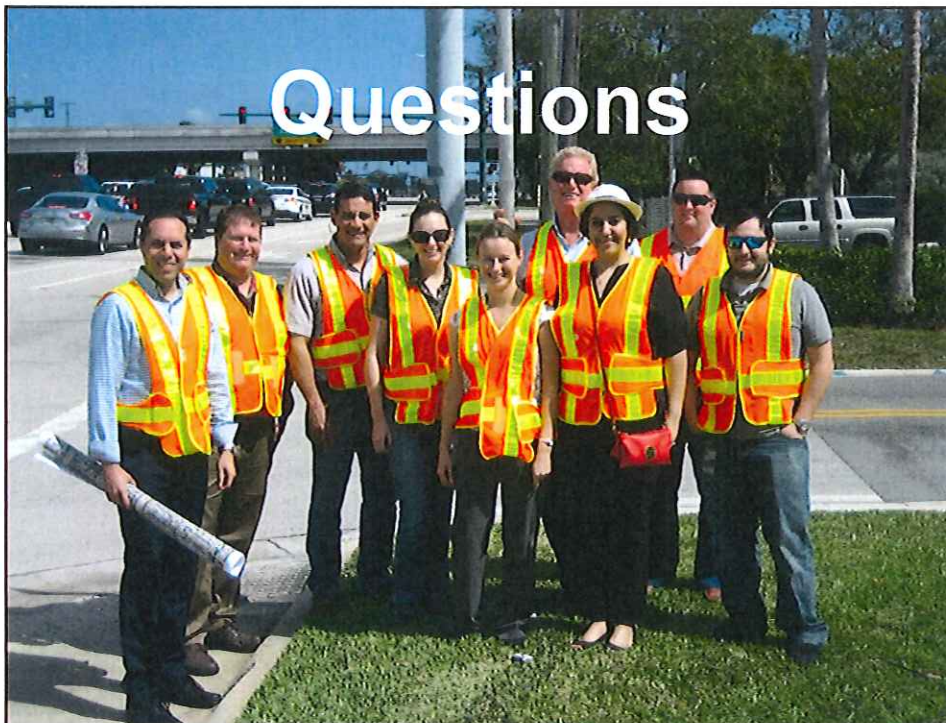
Recommendation	Savings	Maximum Savings
Build a partial cloverleaf in the northeast quadrant	\$16,555,000	
Realign the ramps closer to the mainline	\$30,714,000	
Create free flow off ramp right turns for Alternative 1	\$29,137,000	
Build the 35 MPH Diverging Diamond Interchange	\$44,750,000	\$44,750,000
Reduce the 7-ft bike lane and buffer	\$726,000	\$726,000
Add pedestrian lighting along the DDI walkway	(\$89,000)	
Don't build the additional right turn lane at Sandtree	\$6,400,000	\$6,400,000
Total		\$51,876,000

Action Plan



- Receive Draft VE Report 3/17/17
- Draft Report Routed for Comments
- Receive and Incorporate D4 Comments and Revisions 4/7/17
- Resolution Meeting
- Issue Final VE Report 4/21/17

Questions



Constraints



- None identified