Value Engineering For Transportation Improvements

State Road 826 (Palmetto Expressway) Managed Lanes PD&E Study



Value Engineering Study Final Report

FM Number: 426905-1-22-01

Fed. Aid Project:

State Road 826 (Palmetto Expressway) Managed Lanes PD&E Project Description:

Study

Study Dates: May 14 - 18, 2012

| Project Development Phase | | | | | | | | udy | / Identifi | cation Nu | ımber |
|---------------------------|-------------------|--|--|--|--|--|--|-----|------------|-----------|-------|
| PD&E | PD&E Design Other | | | | | | | | V | /E Item N | 0. |
| URS Corporation | | | | | | | | | Yr. | Dist. | No. |
| | | | | | | | | | 12 | 006 | 0_ |

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

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Date: August 8, 2012

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1.1 INTRODUCTION

A Value Engineering (VE) Study was held, during May 14 – 18, 2012 using the VE methodology to improve the State Road 826 (Palmetto Expressway) Managed Lanes Project Development & Environment (PD&E) Study Project. The VE study analyzed value improvements for building two 11-ft. managed lanes (ML) and four 11-ft. general use lanes with a variable width median ranging from 12 ft (~57% of project length) down to <4 ft. at certain pinch points like NW 103rd Street. Certain areas have additional lanes for access into the managed lanes and one area indicates two managed lanes and only three general use lanes (NW 103rd St area). Current ML terminus is south of SR 836 with connection to ML system from SR 836 east and west at an area between NW 25th St and NW 36th St. and an intermediate access point north of SR 27 before NW 103rd St. The ML system extends and ends after the I-75 interchange into new system ramps to NB and from SB I-75.

The project length is approximately6 miles. The objective of the study is to add two express lanes in each direction along the center of the corridor. The purpose of these express lanes is to improve mobility, relieve congestion and provide additional travel options along the SR 826 corridor. Improvements to this section of SR 826 are needed in order to relieve congestion and increase capacity. This project will provide continuity with the proposed I-75 express lanes system as envisioned in the emerging South Florida Managed Lanes Network and evaluated in the I-75 PD&E Study.

SR 826 is one of the most traveled transportation corridors in Miami-Dade County. This multi-lane limited access expressway extends south-north from US 1 to NW 154th Street for a distance of approximately 18 miles. The corridor then curves to the east and runs east-west from NW 67th Avenue to Interstate 95 (I-95) at the Golden Glades Interchange for a distance of approximately 7 miles. SR 826 connects southern Miami-Dade County to northern Miami-Dade County and serves as a feeder route to the County's busiest east-west SR 836 corridor. SR 826 also provides system-level connections to I-75, HEFT, SR 924, SR 874 and I-95. SR 826 is part of the Strategic Intermodal System (SIS), Florida Intrastate Highway System (FIHS) and National Highway System (NHS). SR 826 is listed as a local evacuation route in Miami-Dade County.

The project location may be found on the **Figure 1.1 - 1 Project Location Map**. By building this project, the FDOT will be addressing capacity deficiencies resulting from projected future traffic volumes and enhance emergency response times within the County. The project will provide improved connectivity and operations in the region and also improve evacuation routes.

Table 1.1-1 Preliminary Cost Estimate on page 3 shows the preliminary estimated construction costs for the improvements for the alternatives being studied. The proposed improvements are to enhance operation and level of service in the design year.

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 preliminary design concepts.

Several issues and pre-existing conditions were stated during the initial briefing at the beginning of the VE study, the VE team considered the following major project constraints:

- 1. No additional Right of Way
- 2. FTG Natural Gas Mains
- 3. The connections at each end
- 4. No improvements to the interchanges
- 5. NW 103rd Street flyover
- 6. NW 25th Street flyover

7. Aggressive Schedule

The basic project functions are to create additional capacity and improve traffic operations on the regional transportation system. As shown in **Section 5**, the Functional Analysis System Techniques (FAST) Diagram illustrates the functions as determined by the VE team.

(11) PD&E 924 WEST MDX SR NW 74TH ST. NORTH/SOUTH SR 826 PD&E [27] (HD) **SR 836**

Figure 1.1 – 1 Project Location Map

Table 1.1 – 1
Preliminary Cost Estimate

| CLEARING AND GRUBBING \$20,000.00 1,541,788 | PAY ITEM DESCRIPTION | UNIT PRICE | AMOUNT TOTAL |
|---|---|-------------|--------------|
| EXCAVATION REGULAR EMBARKMENT \$10.77 6.104,506 STABILIZATION TYPE B \$2.37 689,124 BASE OPTIONAL (BASE GROUP 04) S10.45 BASE OPTIONAL (BASE GROUP 11) MILLING EXIST ASPH PAVT (2.25° AVG DEPTH) MILLING EXIST ASPH PAVT (2.25° AVG DEPTH) S1.93 MILLING EXIST ASPH PAVT (2.25° AVG DEPTH) SUPERPAVE ASPHALTIC CONCRETE (TRAFFIC D) SUPERPAVE ASPHALTIC CONCRETE (BULKHEAD) CLASS IV CONCRETE (BULKHEAD) SUPERPAVE ASPHALTIC CONCRETE (TRAFFIC D) CLASS IV CONCRETE (BULKHEAD) SUPERPAVE ASPHALTIC CONCRETE (TRAFFIC D) SUPERPAVE A | CLEARING AND GRUBBING | \$20,000.00 | 1,541,788 |
| STABILIZATION TYPE B S2.37 6,104,506 STABILIZATION TYPE B S2.37 6699,124 | EXISTING BULKHEAD REMOVAL | \$12.42 | 98,466 |
| STABILIZATION TYPE B \$2.37 689,124 | EXCAVATION REGULAR | \$5.17 | 307,714 |
| BASE OPTIONAL (BASE GROUP 04) \$13.045 1,003,763 BASE OPTIONAL (BASE GROUP 11) \$13.91 \$13.91 \$2,614,197 MILLING EXIST ASPH PAVT (2.25" AVG DEPTH) \$1.95 1,080,672 MILLING EXIST ASPH PAVT (1.0" AVG DEPTH) \$1.91 171,547 SUPERPAVE ASPHALTIC CONCRETE (TRAFFIC D) \$79.33 4,669,380 SUPERPAVE ASPHALTIC CONCRETE (TRAFFIC D) \$79.35 4,669,380 SUPERPAVE ASPHALTIC CONCRETE (TRAFFIC D) \$79.15 1,227,280 ASPHALTIC CONCRETE (TRAFFIC B) \$79.15 1,227,280 ASPHALTIC CONCRETE (TRAFFIC B) \$79.15 1,227,280 ASPHALTIC CONCRETE (BULKHEAD) \$0.77 155,501 CLASS IV CONCRETE (BULKHEAD) \$549.06 2,212,746 DITCH BOTTOM INLET TYPE G (<10") \$3,937.24 224,423 BARRIER WALL INLET (<10") \$3,937.24 224,423 BARRIER WALL INLET (<10") \$3,937.24 224,423 BARRIER WALL INLET (TYPE 1 <10") \$4,943.74 439,993 MEDIAN BARRIER WALL INLET (TYPE 2 <10") \$4,943.74 439,993 MEDIAN BARRIER WALL INLET (TYPE 2 <10") \$4,000 29,400 MANHOLE (SPECIAL PARTIAL) \$1,766.24 5,299 18" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$47.00 226,400 24" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$53.52 506,940 30" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$56.37 193,913 36" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$56.37 193,913 36" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$56.37 193,913 36" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$56.37 193,913 36" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$56.37 193,913 36" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$56.89 222,644 42" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$56.93 222,643 48" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$56.93 176,663 FRENCH DRAIN (15" STD.) \$158.25 360,940 48" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$56.93 176,663 FRENCH DRAIN (15" STD.) \$158.25 360,940 GROWN ASSISTAND \$10.94 40.94 GROWN ASSISTAND \$10.94 40.94 GROWN ASSISTAND \$10.94 | EMBANKMENT | \$10.77 | 6,104,506 |
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| MILLING EXIST ASPH PAVT (2.25" AVG DEPTH) \$1.55 1,080,672 | | · | |
| MILLING EXIST ASPH PAVT (1.0" AVG DEPTH) \$1.91 171,547 | | | |
| SUPERPAVE ASPHALTIC CONCRETE (TRAFFIC D) \$79.33 4,669,380 | | | |
| SUPERPAVE ASPHALTIC CONCRETE (TRAFFIC D)(PG 76-22) \$81.10 6,328,511 | | _ | |
| SUPERPAVE ASPHALTIC CONCRETE (TRAFFIC B) S79.15 1,227,280 | | | |
| ASPHALTIC CONCRETE FRICTION COURSE (FC-5) (PG-76-22) \$96.07 | | | |
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| MANHOLE (SPECIAL PARTIAL) \$1,766.24 5,299 | | | |
| 18" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$47.00 \$26,400 | | | , |
| 24" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$53.25 506,940 30" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$56.37 193,913 36" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$56.37 193,913 36" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$94.66 271,201 48" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$94.66 271,201 48" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$111.85 401,542 TRENCH DRAIN (15" STD.) \$158.25 3,880,448 FRENCH DRAIN (24" DIAMETER PIPE) \$67.30 176,663 FRENCH DRAIN (36" DIAMETER PIPE) \$67.30 176,663 FRENCH DRAIN (36" DIAMETER PIPE) \$83.80 118,577 CLASS I CONCRETE (ENDWALLS) \$666.92 113,336 CLASS II CONCRETE (ENDWALLS) \$666.92 113,336 CLASS II CONCRETE (CULVERTS) \$616.47 1,755,707 CLASS II CONCRETE (ENDWALLS) \$668.80 26,752 CLASS II CONCRETE (ENDWALLS) \$668.80 26,752 CLASS II CONCRETE (ENDWALLS) \$668.80 26,752 CLASS II CONCRETE (ENDWALLS) \$688.80 26,752 CLASS II CONCRETE (ENDWALLS) \$658.80 26,752 CLASS II CONCRETE (MISCELLANEOUS) \$0.76 324,672 SHEET PILING STEEL (MISCELLANEOUS) \$0.76 324,672 SHEET PILING STEEL (MISCELLANEOUS) \$17.84 2,995,679 MEDIAN CONCRETE BARRIER WALL \$82.29 4,801,877 CONC. TRAFFIC RAILING BARRIER (32" F-SHAPE) \$123.73 3,480,134 SHOULDER BARRIER WALL CONC (RIGID-RETAINING) \$152.62 2,091,707 BARRIER WALL CONC (RIGID-RETAINING) \$152.62 2,091,707 BARRIER WALL CONC (RIGID-RETAINING) \$152.62 2,091,707 CONCRETE BARRIER WALL CONC (RIGID-RETAINING) \$152.62 2,091,707 CONCRETE BARRIER WALL CONCRETE SERVER WALL CONCRETE SERVER WALL CONCRETE SERVER WALL CONCRETE SERVER WALL CONCRETE SER | | | , |
| 30" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$56.37 193,913 36" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$68.93 222,644 42" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$94.66 271,201 48" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$111.85 401,542 TRENCH DRAIN (15" STD.) \$158.25 3,880,448 FRENCH DRAIN (15" STD.) \$158.25 3,880,448 FRENCH DRAIN (24" DIAMETER PIPE) \$67.30 176,663 FRENCH DRAIN (30" DIAMETER PIPE) \$67.30 176,663 FRENCH DRAIN (30" DIAMETER PIPE) \$83.80 118,577 CLASS I CONCRETE (ENDWALLS) \$666.92 113,336 CLASS II CONCRETE (ENDWALLS) \$666.92 113,336 CLASS II CONCRETE (ENDWALLS) \$668.80 26,752 CLASS II CONCRETE (ENDWALLS) \$668.80 26,752 CLASS II CONCRETE (ENDWALLS) \$668.80 26,752 CLASS II CONCRETE (ENDWALLS) \$67.70 324,672 | | | |
| 42" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$94.66 271,201 48" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$111.85 401,542 TRENCH DRAIN (15" STD.) \$158.25 3,880,448 FRENCH DRAIN (24" DIAMETER PIPE) \$105.03 2,646,336 FRENCH DRAIN (30" DIAMETER PIPE) \$67.30 176,663 FRENCH DRAIN (36" DIAMETER PIPE) \$83.80 118,577 CLASS I CONCRETE (ENDWALLS) \$666.92 113,336 CLASS II CONCRETE (ENDWALLS) \$666.92 113,336 CLASS II CONCRETE (ENDWALLS) \$666.80 26,752 CLASS II CONCRETE (ENDWALLS) \$355.70 186,005 REINFORCING STEEL (MISCELLANEOUS) \$0.76 324,672 SHEET PILING STEEL (F&I) PERMANENT \$17.84 2,995,679 MEDIAN CONCRETE BARRIER WALL \$82.29 4,801,877 CONC. TRAFFIC RAILING BARRIER (32" F-SHAPE) \$123.73 3,480,134 SHOULDER BARRIER WALL CONC (RIGID-RETAINING) \$152.62 2,091,707 BARRIER WALL REMOVAL \$30.95 1,929,023 CONCRETE BARRIER WALL (OPAQUE VISUAL) \$27.85 1,093,614 RETAINING WALL SYSTEM (PERMANENT) \$24.56 12,680,208 DELINEATOR FLEXIBLE TUBULAR \$50.00 379,885 RETRO-REFLECTIVE PAVEMENT MARKER \$3.07 11,662 BRIDGE DEMOLITION \$60.00 3,609,000 BRIDGE SEGMENTAL \$200.00 42,496,400 BRIDGE AASHTO (WIDENING) \$160.00 7,568,480 SUBTOTALS 128,658,570 LIGHTING 18,658,590 ENVIRONMENTAL MITIGATION 1,500,000 UTILITIES 8,300,000 GENURANDENTAL MITIGATION 1,500,000 LANDSCAPE 4,000,000 UTILITIES 8,300,000 SUBTOTALS 171,205,882 CONTAMINATION 2,000,000 MOBILIZATION 10% 17,120,588 | 30" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) | \$56.37 | 193,913 |
| A8" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) \$111.85 401,542 | 36" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) | \$68.93 | 222,644 |
| TRENCH DRAIN (15" STD.) \$158.25 3,880,448 FRENCH DRAIN (24" DIAMETER PIPE) \$105.03 2,646,336 FRENCH DRAIN (30" DIAMETER PIPE) \$67.30 176,663 FRENCH DRAIN (36" DIAMETER PIPE) \$83.80 118,577 CLASS I CONCRETE (ENDWALLS) \$666.92 113,336 CLASS II CONCRETE (ENDWALLS) \$666.92 113,336 CLASS II CONCRETE (ENDWALLS) \$666.80 26,752 CLASS II CONCRETE (ENDWALLS) \$668.80 26,752 CLASS II CONCRETE (ENDWALLS) \$5668.80 26,752 CLASS II CONCRETE (APPR. SLAB) \$355.70 186,005 REINFORCING STEEL (MISCELLANEOUS) \$0.76 324,672 SHEET PILING STEEL (F&I) PERMANENT \$17.84 2,995,679 MEDIAN CONCRETE BARRIER WALL \$82.29 4,801,877 CONC. TRAFFIC RAILING BARRIER (32" F-SHAPE) \$123.73 3,480,134 SHOULDER BARRIER WALL CONC (RIGID-RETAINING) \$152.62 2,091,707 BARRIER WALL REMOVAL \$30.95 1,929,023 CONCRETE BARRIER WALL (OPAQUE VISUAL) \$27.85 1,093,614 RETAINING WALL SYSTEM (PERMANENT) \$24.56 12,680,208 DELINEATOR FLEXIBLE TUBULAR \$50.00 379,885 RETRO-REFLECTIVE PAVEMENT MARKER \$3.07 11,662 BRIDGE DEMOLITION \$60.00 3,609,000 BRIDGE SEGMENTAL \$200.00 42,496,400 BRIDGE AASHTO (WIDENING) \$160.00 7,568,480 SUBTOTALS 128,658,570 LIGHTING 18,658,590 ENVIRONMENTAL MITIGATION 1,500,000 LANDSCAPE 4,000,000 UTILITIES 8,300,000 FIRE SUPRESSION SYSTEM 432,006 SUBTOTALS 171,205,882 CONTAMINATION 2,000,000 MOBILIZATION 10% 17,120,588 | 42" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) | \$94.66 | 271,201 |
| FRENCH DRAIN (24" DIAMETER PIPE) \$105.03 2,646,336 FRENCH DRAIN (30" DIAMETER PIPE) \$67.30 176,663 FRENCH DRAIN (36" DIAMETER PIPE) \$83.80 118,577 CLASS I CONCRETE (ENDWALLS) \$666.92 113,336 CLASS II CONCRETE (ENDWALLS) \$666.92 113,336 CLASS II CONCRETE (ENDWALLS) \$666.92 13,336 CLASS II CONCRETE (ENDWALLS) \$668.80 26,752 CLASS II CONCRETE (ENDWALLS) \$668.80 26,752 CLASS II CONCRETE (APPR. SLAB) \$355.70 186,005 REINFORCING STEEL (MISCELLANEOUS) \$0.76 324,672 SHEET PILING STEEL (F&I) PERMANENT \$17.84 2,995,679 MEDIAN CONCRETE BARRIER WALL \$82.29 4,801,877 CONC. TRAFFIC RAILING BARRIER (32" F-SHAPE) \$123.73 3,480,134 SHOULDER BARRIER WALL CONC (RIGID-RETAINING) \$152.62 2,091,707 BARRIER WALL REMOVAL \$30.95 1,929,023 CONCRETE BARRIER WALL (OPAQUE VISUAL) \$27.85 1,093,614 RETAINING WALL SYSTEM (PERMANENT) \$24.56 12,680,208 DELINEATOR FLEXIBLE TUBULAR \$50.00 379,885 RETRO-REFLECTIVE PAVEMENT MARKER \$3.07 11,662 BRIDGE DEMOLITION \$60.00 3,609,000 BRIDGE SEGMENTAL \$200.00 42,496,400 BRIDGE SEGMENTAL \$200.00 42,496,400 TJS & TOLLING 18,658,570 LIGHTING 800,667 SIGNING & MARKING 4,156,048 NOISE WALL 4,700,000 LANDSCAPE 4,000,000 LANDSCAPE 4,000,000 UTILITIES 8,300,000 FIRE SUPRESSION SYSTEM 432,006 SUBTOTALS 171,205,882 CONTAMINATION 2,000,000 MOBILIZATION 10% 17,120,588 | 48" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) | \$111.85 | 401,542 |
| FRENCH DRAIN (30" DIAMETER PIPE) \$67.30 176,663 FRENCH DRAIN (36" DIAMETER PIPE) \$83.80 118,577 CLASS I CONCRETE (ENDWALLS) \$666.92 113,336 CLASS II CONCRETE (CULVERTS) \$616.47 1,755,707 CLASS II CONCRETE (ENDWALLS) \$668.80 26,752 CLASS II CONCRETE (APPR. SLAB) \$355.70 186,005 REINFORCING STEEL (MISCELLANEOUS) \$0.76 324,672 SHEET PILING STEEL (F&I) PERMANENT \$17.84 2,995,679 MEDIAN CONCRETE BARRIER WALL \$82.29 4,801,877 CONC. TRAFFIC RAILING BARRIER (32" F-SHAPE) \$123.73 3,480,134 SHOULDER BARRIER WALL CONC (RIGID-RETAINING) \$152.62 2,091,707 BARRIER WALL REMOVAL \$30.95 1,929,023 CONCRETE BARRIER WALL (OPAQUE VISUAL) \$27.85 1,093,614 RETAINING WALL SYSTEM (PERMANENT) \$24.56 12,680,208 DELINEATOR FLEXIBLE TUBULAR \$50.00 379,885 RETRO-REFLECTIVE PAVEMENT MARKER \$3.07 11,662 BRIDGE DEMOLITION \$60.00 3,609,000 BRIDGE SEGMENTAL \$200.00 42,496,400 BRIDGE AASHTO (WIDENING) \$160.00 7,568,480 SUBTOTALS 128,658,570 LIGHTING 800,667 SIGNING & MARKING 4,156,048 NOISE WALL 4,700,000 ITS & TOLLING 18,658,590 ENVIRONMENTAL MITIGATION 1,500,000 LANDSCAPE 4,000,000 UTILITIES 8,300,000 FIRE SUPRESSION SYSTEM 432,006 SUBTOTALS 171,205,882 CONTAMINATION 2,000,000 | TRENCH DRAIN (15" STD.) | \$158.25 | 3,880,448 |
| SRINGH DRAIN (36" DIAMETER PIPE) \$83.80 118,577 | · | \$105.03 | 2,646,336 |
| CLASS I CONCRETE (ENDWALLS) \$666.92 113,336 CLASS II CONCRETE (CULVERTS) \$616.47 1,755,707 CLASS II CONCRETE (ENDWALLS) \$668.80 26,752 CLASS II CONCRETE (APPR. SLAB) \$355.70 186,005 REINFORCING STEEL (MISCELLANEOUS) \$0.76 324,672 SHEET PILING STEEL (F&I) PERMANENT \$17.84 2,995,679 MEDIAN CONCRETE BARRIER WALL \$82.29 4,801,877 CONC. TRAFFIC RAILING BARRIER (32" F-SHAPE) \$123.73 3,480,134 SHOULDER BARRIER WALL CONC (RIGID-RETAINING) \$152.62 2,091,707 BARRIER WALL REMOVAL \$30.95 1,929,023 CONCRETE BARRIER WALL (OPAQUE VISUAL) \$27.85 1,093,614 RETAINING WALL SYSTEM (PERMANENT) \$24.56 12,680,208 DELINEATOR FLEXIBLE TUBULAR \$50.00 379,885 RETRO-REFLECTIVE PAVEMENT MARKER \$3.07 11,662 BRIDGE DEMOLITION \$60.00 3,609,000 BRIDGE AASHTO (WIDENING) \$160.00 7,568,480 SUBTOTALS 128,658,570 LIGHTING 4,156,048 <t< td=""><td>·</td><td></td><td></td></t<> | · | | |
| CLASS II CONCRETE (CULVERTS) \$616.47 1,755,707 CLASS II CONCRETE (ENDWALLS) \$668.80 26,752 CLASS II CONCRETE (APPR. SLAB) \$355.70 186,005 REINFORCING STEEL (MISCELLANEOUS) \$0.76 324,672 SHEET PILING STEEL (F&I) PERMANENT \$17.84 2,995,679 MEDIAN CONCRETE BARRIER WALL \$82.29 4,801,877 CONC. TRAFFIC RAILING BARRIER (32" F-SHAPE) \$123.73 3,480,134 SHOULDER BARRIER WALL CONC (RIGID-RETAINING) \$152.62 2,091,707 BARRIER WALL REMOVAL \$30.95 1,929,023 CONCRETE BARRIER WALL (OPAQUE VISUAL) \$27.85 1,093,614 RETAINING WALL SYSTEM (PERMANENT) \$24.56 12,680,208 DELINEATOR FLEXIBLE TUBULAR \$50.00 379,885 RETRO-REFLECTIVE PAVEMENT MARKER \$3.07 11,662 BRIDGE DEMOLITION \$60.00 3,609,000 BRIDGE SEGMENTAL \$200.00 42,496,400 BRIDGE AASHTO (WIDENING) \$160.00 7,568,480 SUBTOTALS 128,658,570 LIGHTING 800,667 S | | | |
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| MEDIAN CONCRETE BARRIER WALL \$82.29 4,801,877 CONC. TRAFFIC RAILING BARRIER (32" F-SHAPE) \$123.73 3,480,134 SHOULDER BARRIER WALL CONC (RIGID-RETAINING) \$152.62 2,091,707 BARRIER WALL REMOVAL \$30.95 1,929,023 CONCRETE BARRIER WALL (OPAQUE VISUAL) \$27.85 1,093,614 RETAINING WALL SYSTEM (PERMANENT) \$24.56 12,680,208 DELINEATOR FLEXIBLE TUBULAR \$50.00 379,885 RETRO-REFLECTIVE PAVEMENT MARKER \$3.07 11,662 BRIDGE DEMOLITION \$60.00 3,609,000 BRIDGE SEGMENTAL \$200.00 42,496,400 BRIDGE AASHTO (WIDENING) \$160.00 7,568,480 SUBTOTALS 128,658,570 LIGHTING 800,667 SIGNING & MARKING 4,156,048 NOISE WALL 4,700,000 ITS & TOLLING 18,658,590 ENVIRONMENTAL MITIGATION 1,500,000 UTILITIES 8,300,000 FIRE SUPRESSION SYSTEM 432,006 SUBTOTALS 171,205,882 CONTAMINATION 2,000 | | | |
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| SHOULDER BARRIER WALL CONC (RIGID-RETAINING) \$152.62 2,091,707 BARRIER WALL REMOVAL \$30.95 1,929,023 CONCRETE BARRIER WALL (OPAQUE VISUAL) \$27.85 1,093,614 RETAINING WALL SYSTEM (PERMANENT) \$24.56 12,680,208 DELINEATOR FLEXIBLE TUBULAR \$50.00 379,885 RETRO-REFLECTIVE PAVEMENT MARKER \$3.07 11,662 BRIDGE DEMOLITION \$60.00 3,609,000 BRIDGE SEGMENTAL \$200.00 42,496,400 BRIDGE AASHTO (WIDENING) \$160.00 7,568,480 SUBTOTALS 128,658,570 LIGHTING 800,667 SIGNING & MARKING 4,156,048 NOISE WALL 4,700,000 ITS & TOLLING 18,658,590 ENVIRONMENTAL MITIGATION 1,500,000 LANDSCAPE 4,000,000 UTILITIES 8,300,000 FIRE SUPRESSION SYSTEM 432,006 SUBTOTALS 171,205,882 CONTAMINATION 2,000,000 MOBILIZATION 10% 17,120,588 | | | |
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| RETRO-REFLECTIVE PAVEMENT MARKER \$3.07 11,662 BRIDGE DEMOLITION \$60.00 3,609,000 BRIDGE SEGMENTAL \$200.00 42,496,400 BRIDGE AASHTO (WIDENING) \$160.00 7,568,480 SUBTOTALS 128,658,570 LIGHTING 800,667 SIGNING & MARKING 4,156,048 NOISE WALL 4,700,000 ITS & TOLLING 18,658,590 ENVIRONMENTAL MITIGATION 1,500,000 LANDSCAPE 4,000,000 UTILITIES 8,300,000 FIRE SUPRESSION SYSTEM 432,006 SUBTOTALS 171,205,882 CONTAMINATION 2,000,000 MOBILIZATION 10% 17,120,588 | RETAINING WALL SYSTEM (PERMANENT) | \$24.56 | 12,680,208 |
| BRIDGE DEMOLITION \$60.00 3,609,000 BRIDGE SEGMENTAL \$200.00 42,496,400 BRIDGE AASHTO (WIDENING) \$160.00 7,568,480 SUBTOTALS 128,658,570 LIGHTING 800,667 SIGNING & MARKING 4,156,048 NOISE WALL 4,700,000 ITS & TOLLING 18,658,590 ENVIRONMENTAL MITIGATION 1,500,000 LANDSCAPE 4,000,000 UTILITIES 8,300,000 FIRE SUPRESSION SYSTEM 432,006 SUBTOTALS 171,205,882 CONTAMINATION 2,000,000 MOBILIZATION 10% 17,120,588 | DELINEATOR FLEXIBLE TUBULAR | \$50.00 | 379,885 |
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| UTILITIES 8,300,000 FIRE SUPRESSION SYSTEM 432,006 SUBTOTALS 171,205,882 CONTAMINATION 2,000,000 MOBILIZATION 10% 17,120,588 | | | |
| FIRE SUPRESSION SYSTEM 432,006 SUBTOTALS 171,205,882 CONTAMINATION 2,000,000 MOBILIZATION 10% 17,120,588 | | | |
| SUBTOTALS 171,205,882 CONTAMINATION 2,000,000 MOBILIZATION 10% 17,120,588 | | | |
| CONTAMINATION 2,000,000 MOBILIZATION 10% 17,120,588 | 1 | | |
| MOBILIZATION 10% 17,120,588 | | | |
| | | 10% | |
| 10,032,04/ | MAINTENANCE OF TRAFFIC | 10% | 18,832,647 |
| CONTINGENCY 20% 41,431,823 | | | |
| CEI 8% 18,380,663 | CEI | 8% | 18,380,663 |
| DB DESIGNING FEE 10% 22,975,829 | DB DESIGNING FEE | 10% | 22,975,829 |
| TOTALS 291,947,433 | TOTALS | | 291,947,433 |

Reference: PD&E Preferred Alternative Preliminary Cost Estimate, prepared URS Corp., dated May 7, 2012

1.3 RESULTS OF THE STUDY

The VE team initially generated 31 ideas and nine were determined to be design suggestions 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 Preferred Alternatives and the individual creative ideas. During this process it was agreed that the team had various ideas for all of the locations, 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 six 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. All of the recommendations can be taken with others, there are no mutually exclusive recommendations.

The recommendations developed by the VE study team will directly affect the existing project design. The recommended alternatives have been presented to FDOT, and no fatal flaws with the proposed recommendations were indicated at the presentation. It is understood that further analysis of these recommendations may be needed in order to make a final decision to accept them. FDOT will determine the acceptability of each recommendation. Each recommendation may be implemented individually or partially.

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 ensure timely resolution of management action.

TABLE 1.4 – 1 SUMMARY OF HIGHEST RATED RECOMMENDATIONS PRESENT WORTH (PW) OF COST (FUTURE COST) Rec. Management **Potential Cost Savings Description Comments** Action (Value Added) No. Consider a 4 + 1 with full shoulders on the managed lane in 6 NA each direction \$5,300,000 From NW 36th to NW 58th streets realign the mainline to 13 NA the east along the frontage road (\$1,282,000) At the I-75 interchange the mainline alignment should be 16 A shifted to the west to allow for 10-12 ft. inside shoulders (\$3,428,000)

NA

Α

NA

(\$7,632,000)

\$940,000

(\$1,282,000)

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

Shift the SR 826 southbound alignment further west to

In Section 5 construct the crown and 11-ft striping for our

Add variable speed limits to the General Purpose Lanes

project to avoid milling and resurfacing rework, also extend

provide 10-12 ft. inside shoulders from NW 74th to

the fifth northbound lane further south

19

22

23

Okeechobee Road

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 Design 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 LRE 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 (F.A.S.T.) 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.

The 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** – **Recommended Alternatives**.

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

Representatives from the PD&E consultant presented an overview of the project and the Preferred Alternative on May 14, 2012. 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 |
|-----------------------|-----------------------------------|-----------------------|
| Andy Garganta, PE | Roadway Design | CSA Group |
| Hailing Zhang, PE | Structures | FDOT, District 6 |
| Renato Marrero, PE | Maintenance | FDOT, District 6 |
| John Dovel, PE | Traffic Operations/VE Coordinator | FDOT, District 6 |
| Saud Khan | Maintenance of Traffic | FDOT, District 6 |
| Mikhail Dubrovsky, PE | Construction | FDOT, District 6 |
| Joshua Salazar, PE | D4 Issues/Coordination | HDR Engineering, Inc. |
| Rick Johnson, PE, CVS | VE Team Leader | PMA Consultants LLC |

3.2 PROJECT INFORMATION

The purpose of the project orientation meeting, on May 14, 2012, 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. FDOT Pay Item Historical Costs, provided by URS Corp, undated
- 2. FDOT Typical Section Package, Option 1A, prepared by URS Corp, dated May 14, 2012
- 3. Design Exception for Bridge Width, prepared by URS Corp, dated April 27, 2012
- 4. Request for Design Variation, Shoulder Width (I-75, Outside Shoulder), prepared by URS Corp, dated March 30, 2012
- 5. Request for Design Variation, Border Width, prepared by URS Corp, dated March 30, 2012
- 6. Request for Design Variation, Number of Lanes Sloping in One Direction and Cross Slope, prepared by URS Corp, dated March 30, 2012
- 7. Design Exception for Lane Width and Shoulder Width, prepared by URS Corp, dated April 27, 2012
- 8. Right of way cost estimate file, prepared by URS Corp, updated May 27, 2012
- 9. SR 826 (Palmetto Expressway)/I-75 Proposed Managed Lanes, Stormwater Management Report, Volumes I and II, dated May 2012
- 10. Draft Design Traffic Technical Memorandum, prepared by The Corradino Group, dated February 2012

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 the 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):

| 4 | 3 | | 1 0 | a . |
|---|--------|----------|-----|------------|
| | Mainta | 111 L ev | ലവ | Service |
| | | | | |

2. Improve Operations

3. Reduce Congestion

4. Convey Traffic

5. Increase Capacity

6. Add Lanes

7. Build Project

8. Span Obstacles

9. Support Loads

10. Illuminate Area

11. Maintain Traffic

12. Minimize Impacts

13. Attenuate Noise

14. Retain Earth

15. Design Project

16. Establish Grade

17. Provide Refuge

18. Permit Project

19. Remove Water

20. Convey Water

21. Treat Water

22. Store Water

23. Separate Traffic

24. Control Traffic

25. Convey Traffic

26. Inform Drivers

27. Satisfy Regulations

28. Recommend Alternatives

29. Determine Need

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 projects shall meet economic, engineering design, environmental and social/cultural criteria requirements
 - 2. Meet the goals of the Long Range Transportation Plans for future developments
- 3.4.3 General Project Constraints: (unchangeable project restrictions)
 - 1. No additional Right of Way
 - 2. FTG Natural Gas Mains
 - 3. The connections at each end
 - 4. No improvements to the interchanges
 - 5. NW 103rd Street flyover
 - 6. NW 25th Street flyover
 - 7. Aggressive Schedule
- 3.4.4 General Project Conditions & Considerations:
 - a. Refer to the PD&E documents and backup documentation prepared by URS Corp.
- 3.4.5 Site Review Comments and other observations:
 - 1. The team did not make a site visit because of familiarity with the corridor. We did use Google Earth and the County's Property Assessor's site extensively.

ECONOMIC DATA, COST MODELS AND ESTIMATES 4

4.1 ECONOMIC DATA

The study team used economic criteria for evaluation with information gathered from the PD&E consultant's Long Range Estimate (LRE) that was prepared February 29, 2012. In order to express costs in a meaningful manner the cost comparisons associated with alternatives are presented on the basis of the total life cycle cost and discounted present worth of the work. Project period interest rates are based on the following parameters:

Year of Analysis 2012

Economic Planning Life 30 years starting in 2014

Discount Rate/Interest 5.00% Inflations/Escalation 3.00%

The Preliminary Cost Estimate was used by the team for the major construction elements and was developed by URS and their right of way estimating team. The baseline estimate was determined to be the State Road 826 portion of the project with the connections to the I-75.

Table 4.1 – 1
Preliminary SR 826 Managed Lanes Cost Estimate

| 566,806 290,770 96,054 | 44 7,928 59,519 | 33 0 | LS/AC | 110-1-1 | PAY ITEM DESCRIPTION CLEARING AND GRUBBING | \$20,000.00 | 1,541,788 | |
|--|-----------------------|---------|--------------|----------------------------|---|---------------------|--------------------|--------------------------------|
| 59,519 566,806 290,770 96,054 | | 0 | | | | | 1,341,700 | Estblish Grade |
| 566,806 290,770 96,054 | 59 519 | 0 | LF | 110-73 | EXISTING BULKHEAD REMOVAL | \$12.42 | 98,466 | Estblish Grade |
| 290,770 96,054 | | 0 | CY | 120-1 | EXCAVATION REGULAR | \$5.17 | 307,714 | Estblish Grade |
| 96,054 | 386,989 | 179,817 | CY | 120-6 | EMBANKMENT | \$10.77 | 6,104,506 | Estblish Grade |
| | 181,819 | 108,951 | SY | 160-4 | STABILIZATION TYPE B | \$2.37 | 689,124 | Carry vehicles |
| 40-6 | 69,812 | 26,242 | SY | 285-704 | BASE OPTIONAL (BASE GROUP 04) | \$10.45 | 1,003,763 | Carry vehicles |
| 187,937 | 78,986 | 108,951 | SY | 285-711 | BASE OPTIONAL (BASE GROUP 11) | \$13.91 | 2,614,197 | Carry vehicles |
| 697,208 | 642,757 | 54,451 | SY | 327-70-8 | MILLING EXIST ASPH PAVT (2.25" AVG DEPTH) | \$1.55 | 1,080,672 | Carry vehicles |
| 89,815 | 80,380 | 9,435 | SY | 327-70-1 | MILLING EXIST ASPH PAVT (1.0" AVG DEPTH) | \$1.91 | 171,547 | Carry vehicles |
| | 44,040 | 14,820 | TN | 334-1-14 | SUPERPAVE ASPHALTIC CONCRETE (TRAFFIC D) | \$79.33 | 4,669,380 | Carry vehicles |
| | 61,716 | 16,318 | TN | 334-1-24 | SUPERPAVE ASPHALTIC CONCRETE (TRAFFIC D)(PG 76-22) | \$81.10 | 6,328,511 | Carry vehicles |
| | 12,100 | 3,406 | TN | 334-1-12 | SUPERPAVE ASPHALTIC CONCRETE (TRAFFIC B) | \$79.15 | 1,227,280 | Carry vehicles |
| | 34,273 | 7,864 | TN | 337-7-22 | ASPHALTIC CONCRETE FRICTION COURSE (FC-5) (PG-76-22) | \$96.07 | 4,048,141 | Carry vehicles |
| | 214,937 | 0 | LB | 415-1-8 | REINFORCING STEEL (BULKHEAD) | \$0.77 | 165,501 | Remove Water |
| 4,030 | 4,030 | 0 | CY | 400-4-8 | CLASS IV CONCRETE (BULKHEAD) | \$549.06 | 2,212,746 | Remove Water |
| 57 | 27 | 30 | EA | 425-1-571 | DITCH BOTTOM INLET TYPE G (<10') | \$3,937.24 | 224,423 | Remove Water |
| 330 | 320 | 10 | EA | 425-1-891 | BARRIER WALL INLET (<10') | \$3,562.75 | 1,175,708 | Remove Water |
| 89 | 87 | 2 | EA | 425-1-893 | BARRIER WALL INLET W/J BOTTOM (<10') | \$4,943.74 | 439,993 | Remove Water |
| 11 | 5 | 6 | EA | 425-1-801 | MEDIAN BARRIER WALL INLET (TYPE 1 <10') | \$2,873.38 | 31,607 | Remove Water |
| 7 | 3 | 4 | EA | 425-1-802 | MEDIAN BARRIER WALL INLET (TYPE 2 <10') | \$4,200.00 | 29,400 | Remove Water |
| 3 | 3 | 0 | EA | 425-2-103 | MANHOLE (SPECIAL PARTIAL) | \$1,766.24 | 5,299 | Remove Water |
| | 11,200 | 1,000 | LF LF | 430-175-118 430-175-124 | 18" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) | \$47.00 | 526,400 506,940 | Remove Water Remove Water |
| 9,520 | 8,520 | 800 | LF | | 24" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) | \$53.25 | , | |
| 3,440 | 2,640 | 590 | LF | 430-175-130 | 30" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) 36" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) | \$56.37 | 193,913 | Remove Water |
| 3,230 | 2,640 | 225 | LF | 430-175-136 430-175-142 | 42" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) | \$68.93 | 222,644 | Remove Water Remove Water |
| 2,865 3,590 | 2,640 2,640 | 950 | LF | 430-175-142 | 48" OPTIONAL PIPE (STORM DRAIN AND CROSS DRAIN) | \$94.66 \$111.85 | 271,201 401,542 | Remove Water |
| | 24,521 | 0 | LF | 436-1-1 | TRENCH DRAIN (15" STD.) | \$158.25 | 3,880,448 | Remove Water |
| | 21,166 | 4,030 | LF | 443-70-4 | FRENCH DRAIN (13 STD.) FRENCH DRAIN (24" DIAMETER PIPE) | \$105.03 | 2,646,336 | Remove Water |
| 2,625 | 1,375 | 1,250 | LF | 443-70-4 | FRENCH DRAIN (30" DIAMETER PIPE) | \$67.30 | 176,663 | Remove Water |
| 1,415 | 1,000 | 415 | LF | 443-70-5 | FRENCH DRAIN (36" DIAMETER PIPE) | \$83.80 | 118,577 | Remove Water |
| 170 | 25 | 145 | CY | 400-1-2 | CLASS I CONCRETE (ENDWALLS) | \$666.92 | 113,336 | Remove Water |
| 2,848 | 2,848 | 0 | CY | 400-2-1 | CLASS II CONCRETE (CULVERTS) | \$616.47 | 1,755,707 | Remove Water |
| 40 | 40 | 0 | CY | 400-2-2 | CLASS II CONCRETE (ENDWALLS) | \$668.80 | 26,752 | Remove Water |
| 523 | 523 | 0 | CY | 400-2-10 | CLASS II CONCRETE (APPR. SLAB) | \$355.70 | 186,005 | Remove Water |
| | 427,200 | 0 | LB | 415-1-6 | REINFORCING STEEL (MISCELLANEOUS) | \$0.76 | 324,672 | Remove Water |
| | 167,919 | 0 | SF | 455-133-3 | SHEET PILING STEEL (F&I) PERMANENT | \$17.84 | 2,995,679 | Remove Water |
| | 34,147 | 24,206 | LF | 521-1 | MEDIAN CONCRETE BARRIER WALL | \$82.29 | 4,801,877 | Separate Traffic |
| | 27,003 | 1,124 | LF | 521-8-1 | CONC. TRAFFIC RAILING BARRIER (32" F-SHAPE) | \$123.73 | 3,480,134 | Separate Traffic |
| | 13,705 | 0 | LF | 521-72-4 | SHOULDER BARRIER WALL CONC (RIGID-RETAINING) | \$152.62 | | Provide Refuge |
| 62,327 | 62,327 | 0 | LF | 521-73 | BARRIER WALL REMOVAL | \$30.95 | 1,929,023 | Provide Refuge |
| 39,268 | 15,062 | 24,206 | LF | 539-80-111 | CONCRETE BARRIER WALL (OPAQUE VISUAL) | \$27.85 | 1,093,614 | Provide Refuge |
| 516,295 | 496,625 | 19,670 | SF | 548-12 | RETAINING WALL SYSTEM (PERMANENT) | \$24.56 | 12,680,208 | Provide Refuge |
| 7,598 | 7,598 | 0 | EA | 705-11-1 | DELINEATOR FLEXIBLE TUBULAR | \$50.00 | 379,885 | Guide Traffic |
| 3,799 | 3,039 | 760 | EA | 706-3 | RETRO-REFLECTIVE PAVEMENT MARKER | \$3.07 | 11,662 | Guide Traffic |
| 60,150 | 60,150 | 0 | SF | | BRIDGE DEMOLITION | \$60.00 | 3,609,000 | Span Obstacles |
| | 212,482 | 0 | SF | | BRIDGE SEGMENTAL | \$200.00 | 42,496,400 | Span Obstacles |
| | 47,303 | 0 | SF | | BRIDGE AASHTO (WIDENING) | \$160.00 | 7,568,480 | Span Obstacles |
| ROADWAY | | | | | SUBTOTALS | | 128,658,570 | |
| | | | LS | | LIGHTING | | 800,667 | Illuminate Surroundings |
| | | | LS | | SIGNING & MARKING | | 4,156,048 | Inform Public |
| | | | LS | | NOISE WALL | | 4,700,000 | Abate Noise |
| | | | LS | | ITS & TOLLING | | | Manage Traffic/Collect Revenue |
| | | | LS | | ENVIRONMENTAL MITIGATION | | 1,500,000 | Cure Damage |
| | | | LS | | LANDSCAPE | | 4,000,000 | Improve Aesthetics |
| | | | LS | | UTILITIES | | 8,300,000 | Maintain Utility |
| | | | LS | | FIRE SUPRESSION SYSTEM | | 432,006 | Improve Response |
| | | | | , | SUBTOTALS | | 171,205,882 | |
| | | | LS | | CONTAMINATION | | 2,000,000 | Remediate Site |
| | | | MOBILIZATION | 10% | 17,120,588 | Start Project | | |
| | | | LS | 102-1 | MAINTENANCE OF TRAFFIC | 10% | 18,832,647 | Maintain Traffic |
| | | | | | CONTINGENCY | 20% | 41,431,823 | Manage Unknowns |
| | | | LS | | CEI | 8% | 18,380,663 | Ensure Quality |
| | | | LS | | DB DESIGNING FEE | 10% | 22,975,829 | Prepare Documents |
| PROJECT | | | | | TOTALS | | 291,947,433 | |

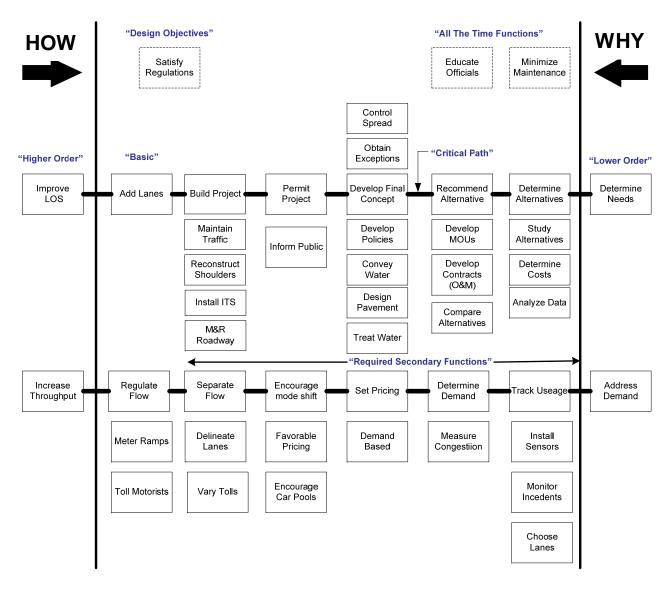
Reference: PD&E Preferred Alternative Preliminary Cost Estimate, prepared URS Corp., dated May 7, 2012

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 Functional 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 – FAST Diagram SR 826 Managed Lanes PD&E Study



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 Capital Cost, Ease of Construction, Future Maintenance, Schedule Impacts, Traffic Operations, Maintenance of Traffic, Requires Variation or Exception, Meets Future Needs, and Public Buy-in. 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 31 creative ideas and 11 that were evaluated and scored. The write-ups for the developed ideas are in **Section 7**. The tables that follow show the original 31 ideas, with the ideas that survived the evaluation, analysis and development phases of the study becoming viable recommendations for value improvements. During the evaluation process the VE team redefined some of the creative ideas as questions for the designers or design suggestions. Ideas that became design suggestions or design questions for the mid-point review are designated as "DS" on the evaluation worksheets. The major design suggestions identified by the VE team are listed below:

| DS-1 | Minimize the features that require maintenance along the median (i. e., lights, inlets, etc.) |
|------|---|
| DS-2 | Use tilt-up wall with flowable fill to widen roadway |
| DS-3 | At the northbound exit for 74th Street the ramp may require improvements in order to |
| | provide for the proper gore cross slopes and ramp longitudinal grades. This will occur on |
| | all ramps where the widening will require relocation of the gores. |
| DS-4 | Ask for a shoulder exception at NW 36th St northbound to maintain the existing bridges |
| DS-5 | Determine an alternative to replace the trench drain with better technology or geometry |
| | that requires less maintenance |
| DS-6 | Consider the stability of the proposed retaining walls where the existing French drains are |
| | close by (ex. East side of SR 826 between the Metro Rail and CSX RR) |
| DS-7 | Approach pinch point property owners to determine if they are willing sellers for early |
| | acquisition |
| DS-8 | Acquire a small piece of R/W at NW 56th St southbound Palmetto to eliminate the pinch |
| | point. RFP to be advertised without the R/W acquisition and once acquired issue a change |
| | order to the concessionaire. |
| DS-9 | Design ITS and sign gantries for an ultimate typical section that does not require any |
| | design variations or exceptions |

The VE team presents design suggestions for the design consultant and 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 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 | Capital Costs | Ease of Construction | Future Maintenance | Schedule Impacts | Traffic Operations | MOT | Requires Variation or Exception | Meets Future Needs | Public Buy-in |
|-------------|---|------------------|----------------------|-----------------------|---------------------|-----------------------|-----|---------------------------------------|--------------------------|------------------|
| | Original Concept | | | | | | | | | |
| | PD&E Documents | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| | Managed Lanes | | | | | | | | | |
| 1 | Relocate the north managed lanes entrance and exits to north of NW 103rd St. and move the gore for the southbound exit ramp at NW 103rd St. further north | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 4 |
| DS-1 | Minimize the features that require maintenance (i. e., lights, inlets, etc.) | | | | | | | | | |
| 3 | Put tolling equipment on existing bridges instead of adding- gantries that span the roadway Retrofit the existing sign structures to accept the signing | | | | | | | | | |
| | and tolling equipment | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| | | | | - | | | | 4 | | |
| | Carry three GP lanes under SR 836 and one managed lane Consider a 4 + 1 with full shoulders on the managed lane in | 4 | 4 | 4 | 4 | 2.5 | 4 | 4 | 2 | 3 |
| | each direction | 5 | 5 | 2 | 4 | 1 | 5 | 5 | 2 | 3 |
| | Mainline Improvements | | | | | | | | | |
| 7 | Do a partial friction course in the SR 836 Interchange area and let our contractor finish with striping Realign all lanes in areas of proposed 4-ft shoulders in order- | | | | | | | | | |
| | to increase shoulder width Realign all lanes in areas of proposed 4-ft shoulders in order- | | | | | | | | | <u> </u> |
| | to maintain a 12-ft inside median shoulder | | | | | | | | | |
| 10 | Re-evaluate the shoulder taper length to provide for a longer- length of wider shoulder | | | | | | | | | |
| | Consider not providing a shoulder transition downstream from the pinch point at 20:1 shoulder transition to provide a minimum 10-ft. shoulder | | | | | | | | | |
| | Convert the canal south of NW 25th St to culvert on the east side | | | | | | | | | |
| | From NW 36th to NW 58th streets realign the northbound mainline to the east along the frontage road | 2 | 3 | 4 | 2.5 | 3.5 | 2 | 4 | 3 | 3 |

TABLE 6.1 –1 Value Engineering Study Ideas

| Idea No. | I d e a s | Capital Costs | Ease of Construction | Future Maintenance | Schedule Impacts | Traffic Operations | MOT | Requires Variation or Exception | | Public Buy-in |
|-------------|---|------------------|----------------------|-----------------------|---------------------|-----------------------|-----|---------------------------------------|---|------------------|
| | Original Concept | | | | | | | | | |
| | PD&E Documents | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 14 | Eliminate road widening of less than 4 ft. where we have MSE walls or bridges | | | | | | | | | |
| DS-2 | Use tilt-up wall with flowable fill to widen roadway | | | | | | | | | |
| | At the I-75 interchange the mainline alignment should be | | | | | | | | | |
| 16 | modified to allow for 10-12 ft. inside shoulders | 3 | 3 | 3.5 | 3 | 3.5 | 3 | 4 | 3 | 3 |
| | Realign southbound Palmetto to allow for 8-12 ft. shoulder on the northbound managed lanes between NW 58th and NW 74th St. | | | | | | | | | |
| | At the northbound exit for 74th Street the ramp may require improvements in order to provide for the proper gore cross slopes and ramp longitudinal grades. This will occur on all ramps where the widening will require relocation of the gores. | | | | | | | | | |
| | Shift the SR 826 southbound alignment further west to provide 10-12 ft. inside shoulders from NW 74th to Okeechobee Road | 2.5 | 4 | 3.5 | 2 | 3.5 | 3 | 4 | 3 | 3 |
| 20 | Use (Styrefoam) wall with flowable fill to widen roadway | | | | _ | | | | | - |
| | Ask for a shoulder exception at NW 36th St northbound to maintain the existing bridges | | | | | | | | | |
| | In Section 5 construct the crown and 11-ft striping for our project to avoid milling and resurfacing rework, also extend the fifth northbound lane further south | 4 | 4 | 3 | 4 | 3 | 4 | 3 | 3 | 4 |
| 23 | Add variable speed limits to the General Purpose Lanes | 2 | 2.5 | 2.5 | 3 | 4 | 4 | 3 | 3 | 3 |
| | Information/Tolling Equipment Consider a one lane toll in each direction instead of two | | | | | | | | | |
| 24 | lanes | | | | | | | | | |
| 25 | Increase the number of telling points and number of lanes covered | | | | | | | | | |

TABLE 6.1 –1 Value Engineering Study Ideas

| Idea No. | I d e a s | Capital Costs | Ease of Construction | Future Maintenance | Schedule Impacts | Traffic Operations | МОТ | Requires Variation or Exception | Meets Future Needs | Public Buy-in |
|-------------|---|------------------|----------------------|-----------------------|---------------------|-----------------------|-----|---------------------------------------|--------------------------|------------------|
| | Original Concept | | | | | | | | | |
| | PD&E Documents | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| | Drainage | | | | | | | | | |
| | Determine an alternative to replace the trench drain with better technology or geometry that requires less maintenance | | | | | | | | | |
| | Consider the stability of the proposed retaining walls where the existing French drains are close by (ex. East side of SR 826 between the Metro Rail and CSX RR) | | | | | | | | | |
| | Right of Way | | | | | | | | | |
| | Approach pinch point property owners to determine if they are willing sellers for early acquisition | | | | | | | | | |
| DS-8 | Acquire a small piece of R/W at NW 56th St southbound Palmetto to eliminate the pinch point. RFP to be advertised without the R/W acquisition and once acquired issue a change order to the concessionaire. | 3 | 3 | 4 | 3 | 3 | 3 | 4 | 3 | 3 |
| | Between NW 74th St and Okeechobee Road widen southbound to the west to provide for 12 ft. inside shoulder by either realigning the entrance ramp or purchasing a small amount of right of way | 1 | 1 | 4 | 2 | 4 | 2 | 4 | 3.5 | 3 |
| | Design ITS and sign gantries for an ultimate typical section that does not require any design variations or exceptions | 1 | ı | 7 | | 7 | | 7 | 5.5 | <u> </u> |

TABLE 6.1 –2 Value Engineering Study Weighted Values

| Capital Costs | Ease of Construction | Future Maintenance | Schedule Impacts | Traffic Operations | MOT | Requires Variation or Exception | Meets Future Needs | Public Buy-in |
|---------------|-------------------------|-----------------------|---------------------|-----------------------|-----|---------------------------------------|--------------------------|---------------|
| 6 | 1 | 4 | 3 | 9 | 2 | 5 | 7 | 8 |

TABLE 6.1 –3
Value Engineering Study Evaluation Scores

| | | Capital | Ease of | Future | Schedule | Traffic | МОТ | Requires | Meets | Public | | | | | | |
|----------|---|---------|--------------|-------------|-----------|------------|---------------|--------------|--|---------|-------------|--|--------------|--------------|--|----------|
| Idea | | Costs | Construction | Maintenance | Impacts | Operations | WICT | Variation or | Future | Buy-in | | | | | | |
| No. | l d e a s | CUSIS | Construction | Wantenance | illipacis | Operations | | Exception | Needs | Buy-III | | | | | | |
| 140. | | | | | | | | Exception | Nocus | | TOTAL | | FH | IWA CATEGORI | IES | |
| | Original Concept | | | | | | | | | | | Safety | Construction | Operations | Environment | Other |
| | PD&E Documents | - 10 | | 40 | | | | | - 04 | 0.4 | 405 | Salety | Construction | Operations | Environment | Other |
| | PD&E Documents | 18 | 3 | 12 | 9 | 27 | 6 | 15 | 21 | 24 | 135 | | | | | |
| | | | | | | | | | | | | | | | <u> </u> | |
| | Increase Capacity | | | | | | | | | | | | | | ĺ | |
| | Relocate the north managed lanes entrance and exits to north of | | | | | | | | | | | | | | | |
| | NW 103rd St. and move the gore for the southbound exit ramp at | | | | | | | | | | | | | | ĺ | |
| 1 | NW 103rd St. further north | 12 | 3 | 12 | 9 | 18 | 6 | 15 | 21 | 32 | 128 | | | | İ | |
| | Minimize the features that require maintenance (i. e., lights, inlets, | | | | | | | | | | | | | | ĺ | |
| DS-1 | etc.) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | <u> </u> | |
| | Retrofit the existing sign structures to accept the signing and | | | | | | | | | | | | | | ĺ | |
| 4 | tolling equipment | 12 | 2 | 12 | 9 | 27 | 6 | 15 | | 24 | 121 | | | | | |
| 5 | Carry three GP lanes under SR 836 and one managed lane | 24 | 4 | 16 | 12 | 22.5 | 8 | 20 | 14 | 24 | 144.5 | | | | <u> </u> | |
| | Consider a 4 + 1 with full shoulders on the managed lane in each | | | | | | | | | | | | | | ĺ | |
| 6 | direction | 30 | 5 | 8 | 12 | 9 | 10 | 25 | 14 | 24 | 137 | | Х | | X | |
| <u></u> | | | | | | | | <u> </u> | <u></u> | | | | <u> </u> | <u> </u> | <u> </u> | |
| | Mainline Improvements | | | | | | | | | | | | | | 1 | |
| | From NW 36th to NW 58th streets realign the northbound mainline | | | | | i | | i – | | | i | | | | | |
| 13 | to the east along the frontage road | 12 | 3 | 16 | 7.5 | 31.5 | 4 | 20 | 21 | 24 | 139 | х | | х | 1 | |
| DS-2 | Use tilt-up wall with flowable fill to widen roadway | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | |
| | At the I-75 interchange the mainline alignment should be modified | | - v | | | | <u> </u> | | - | - | | | | | | + |
| 16 | to allow for 10-12 ft. inside shoulders | 18 | 3 | 14 | 9 | 31.5 | 6 | 20 | 21 | 24 | 146.5 | х | x | x | İ | |
| | At the northbound exit for 74th Street the ramp may require | | | | | | | | | | | | | | | \vdash |
| | improvements in order to provide for the proper gore cross slopes | | | | | | | | | | | | | | ĺ | |
| | and ramp longitudinal grades. This will occur on all ramps where | | | | | | | | | | | | | | ĺ | |
| DS-3 | the widening will require relocation of the gores. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | ĺ | |
| | Shift the SR 826 southbound alignment further west to provide 10- | | | | | | | | | | | | | | | |
| 19 | 12 ft. inside shoulders from NW 74th to Okeechobee Road | 15 | 4 | 14 | 6 | 31.5 | 6 | 20 | 21 | 24 | 141.5 | Х | | X | <u> </u> | |
| | In Section 5 construct the crown and 11-ft striping for our project to | | | | | | | | | | | | | | ĺ | |
| | avoid milling and resurfacing rework, also extend the fifth | | | | | | | | | | | | | | ĺ | |
| | northbound lane further south | 24 | | 12 | 12 | | | 15 | | 32 | 155 | | Х | Х | | |
| 23 | Add variable speed limits to the General Purpose Lanes | 12 | 2.5 | 10 | 9 | 36 | 8 | 15 | 21 | 24 | 137.5 | Х | | X | <u> </u> | |
| | | | | | | | | | | | | | | | ĺ | |
| | Drainage | | | | | | | | | | | | | | | |
| - | Determine an alternative to replace the trench drain with better | | | | | | | | | | | | | | | + |
| DS-5 | technology or geometry that requires less maintenance | 0 | 0 | 0 | ا ا | 0 | | ه ا | 0 | 0 | ١ ، | | | | ĺ | |
| | Consider the stability of the proposed retaining walls where the | | _ | | | | l | 1 | <u> </u> | | | | | | | + |
| | existing French drains are close by (ex. East side of SR 826 | | | | | | | | | | | | | | ĺ | |
| DS-6 | between the Metro Rail and CSX RR) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | l о | | | | ĺ | |
| | | | | | | 1 | | | | | | 1 | | | ſ | |
| - | Right of Way | | | | | | | | | | | 1 | | | <u> </u> | + |
| | Approach pinch point property owners to determine if they are | | | | | | | | | | | | - | | | ++ |
| DC 7 | willing sellers for early acquisition | _ | | _ | _ | | _ | | _ | _ | ا ا | | | | 1 | |
| D3-7 | Acquire a small piece of R/W at NW 56th St southbound Palmetto | U | - · | 0 | U | 1 | 1 | 1 0 | 1 | - 0 | | | | | \vdash | +-+ |
| | to eliminate the pinch point. RFP to be advertised without the R/W | | | | | 1 | | | | | | | | | 1 | |
| | acquisition and once acquired issue a change order to the | | | | | 1 | | | | | | | | | 1 | |
| DS-8 | concessionaire. | 18 | 3 | 16 | q | 27 | 6 | 20 | 21 | 24 | 144 | х | | x | 1 | |
| | Between NW 74th St and Okeechobee Road widen southbound to- | - 10 | | 10 | l – – | <u> </u> | ⊢ | 1 20 | - - | | | - | | | <u> </u> | +1 |
| | the west to provide for 12 ft. inside shoulder by either realigning the | | | | | 1 | | | | | | | | | 1 | |
| 30 | entrance ramp or purchasing a small amount of right of way | 6 | 1 | 16 | 6 | 36 | 4 | 20 | 24.5 | 24 | 137.5 | | | | 1 | |
| | Design ITS and sign gantries for an ultimate typical section that | | | | | | i e | | 1 | | | | | | | \vdash |
| DS-9 | does not require any design variations or exceptions | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |] | | 1 | |
| | | | | | • | | | | | | | | | | | |

RECOMMENDATIONS 7

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 PD&E Preferred Alternative costs and LPA Group preliminary 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. 6: Consider a 4 + 1 with full shoulders on the managed lane in each direction

Preferred Alternative:

The PD&E Documents Alternative shows two 11-ft. managed lanes (ML) and four 11-ft. general use lanes with a variable width median ranging from 12 ft. (~57% of project length) down to <4 ft. at certain pinch points like NW 103rd Street. Certain areas have additional lanes for access into the managed lanes and one area indicates two managed lanes and only three general use lanes (NW 103rd St area). Current ML terminus is south of SR 836 with connection to ML system from SR 836 east and west at an area between NW 25th St and NW 36th St. and an intermediate access point north of SR 27 before NW 103rd St. The ML system extends and ends after the I-75 interchange into new system ramps to NB and from SB I-75.

VE Alternative:

As an interim phase the District could implement a single 11-ft. managed lane and continuous 12-ft. shoulder from SR 836 to north of the I-75 interchange. No widening is required for this phase that only requires painting, delineators and tolling infrastructure.

Advantages:

- Low initial cost
- Immediate implementation prior to Concessionaire construction activities.
- Less operational impacts in separating speed differential and vehicular types (i.e., no trucks)
- Provides for ML introduction to Palmetto Expressway
- Provides an early revenue stream (four months after Notice to Proceed)
- Reduces impacts to I-75 ramp construction area by isolating through trips on heaviest movements (East West SR 826 movements 22,000 SR 826 vs. 13,000 I-75 Volumes)
- Utilizes existing infrastructure/lanes in manner originally intended.
- Consistent shoulder width for incident management (could actually increase shoulder to 12 ft.
- Provides approximately same level of service as current I-95 managed lanes (51,000 AADT 4 lanes vs. 22,000 AADT est. two lanes)

Disadvantages:

- Possible concerns over slower moving traffic impacting stream ("Sunday Driver")
- Single managed lane has not been implemented before in Florida. (Risk)
- Maintenance of delineators is problematic

FHWA CATEGORIES

| X_Safety | _XOperations | Environment | _XConstruction | Other |
|--------------|-----------------------|-------------|----------------|-------|
| Potential Re | venue: \$5 36 million | ı (minimum) | | |

RECOMMENDATION No. 6: Consider a 4+1 with full shoulders on the managed lane in each direction

Potential Revenue: \$5.36 million (minimum)

Calculations:

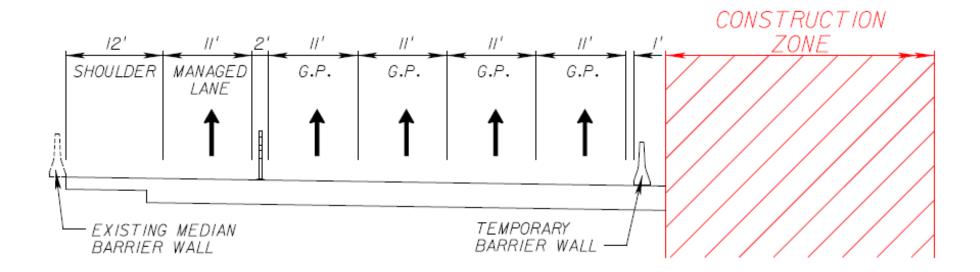
| Facility | Volume ADT | # of Lanes | Rate/ mile | Length | Revenue/trip |
|-----------------|-------------------|------------|----------------|-----------|-----------------|
| I-95 | 51,000 | 4 | \$0.12 | | |
| SR 826 | 22,000 | 2 | \$0.07/ \$0.12 | 9.6 miles | \$.67 or \$1.15 |
| | | | | | |

Revenue based on:

5/7 (weekdays) * (30 days /month) * 40 month duration (44 months – 4 months implementation)* Volume ADT * Revenue / trip=>

\$12.634 million @ .67/ trip \$ 21.million@ \$1.15/trip

Assuming "Bluetooth" hits minimum 7,600 ADT → \$3.126 million (@ 0.67) \$ 5.36 million (@ 1.15)



RECOMMENDATION No. 13: From NW 36th to NW 58th streets realign the northbound mainline to the east along the frontage road

Preferred Alternative:

The PD&E Document Alternative shows minor widening of SR-826 in both the NB and SB direction from NW 36th ST to NW 58th ST due to right-of-way (R/W) constraints on both sides. The local road to the east appears to be County-owned. Title searches are currently being conducted to determine exact ownership and location/limits. The area located to the west is mostly grass and privately owned. The R/W constraints will reduce the distance available to widen the road to gain 10- to 12-foot shoulders along the managed lanes. The PD&E alternative shows a 6-ft inside shoulder in the SB direction and an 8-ft shoulder in the NB direction. Near the NB exit to NW 58th ST, a building structure will minimize the ability to widen to ideal shoulder widths.

VE Alternative:

If the Department determines the R/W is not private along the east side of NB SR-826, the centerline alignment can be shifted about 6 feet to the east in order to gain 12-ft inside shoulders in the SB direction. The NB outside barrier wall proposed in the PD&E will be shifted another 10 feet to the east, which will accommodate the 6-ft centerline alignment shift, plus another 4-ft, to also increase the NB inside shoulder to 12-ft. The existing perimeter road will be slightly reduced since most of the 10 feet realignment will fall over the existing grassed area. The existing median wall will have to be removed and replaced with a variable-height median wall. Twenty-three light poles and two sign structures (one span along SB and one hammerhead) located along the median will be impacted by the centerline shift. New poles will be placed along the outside. The span sign-structure was also impacted in the PD&E option.

Advantages:

- Significantly increases the inside shoulder widths to 12 feet in both direction of traffic
- Traffic Operations (flow and speeds) will greatly improve
- Emergency response will significantly improve
- Exceptions/Variations are eliminated for shoulder width in this area
- Express Lanes will be closed less frequently
- Additional revenues will be collected
- Shoulder mounted poles will be easier to maintain

Disadvantages:

- Increased construction cost, construction time and maintenance of traffic.
- Reconstruction of median barrier wall for 4,000 ft. to the east
- Slight modification to the local road to accommodate widening
- Reconstruction of median wall will introduce two additional MOT shifts (sub-phases).

FHWA CATEGORIES

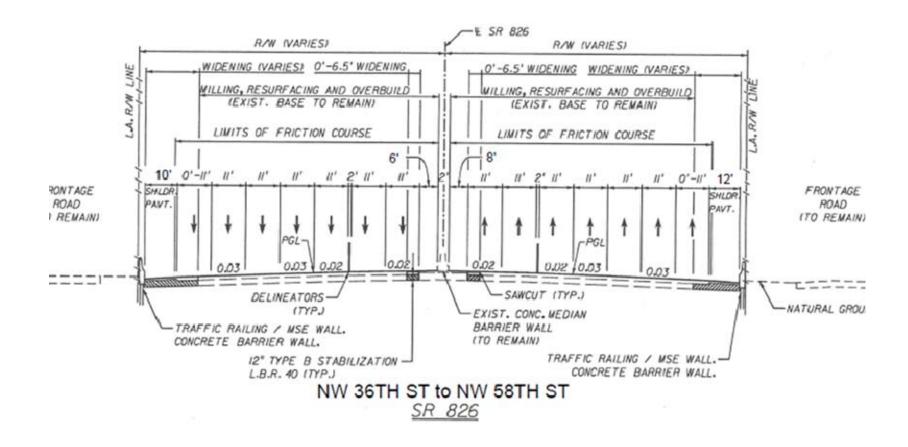
| X Safety | X Operations | Environment | Construction | Other |
|----------|--------------|-------------|--------------|-------|
| | | | | |

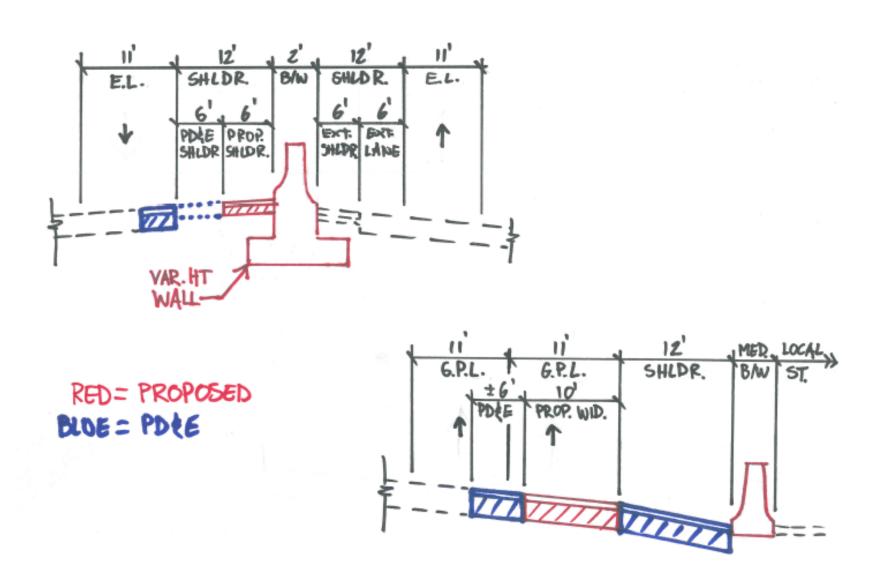
$RECOMMENDATION\ No.\ 13: From\ NW\ 36th\ to\ NW\ 58th\ streets\ realign\ the\ northbound\ mainline\ to\ the\ east\ along\ the\ frontage\ road$

Potential Value Added: (\$1,282,000)

Calculations:

| Description | Quantity | Unit | Unit Price | Extended Amount |
|---|----------|-------|---------------|-----------------|
| CLEARING AND GRUBBING | 1.469 | LS/AC | \$20,000.00 | \$29,385 |
| EMBANKMENT | 1,333 | CY | \$10.77 | \$14,360 |
| STABILIZATION TYPE B | 7,111 | SY | \$2.37 | \$16,853 |
| BASE OPTIONAL (BASE GROUP 04) | 2,667 | SY | \$10.45 | \$27,867 |
| BASE OPTIONAL (BASE GROUP 11) | 4,444 | SY | \$13.91 | \$61,822 |
| SUPERPAVE ASPHALTIC CONCRETE (TRAFFIC D)(PG 76-22) | 1,100 | TN | \$81.10 | \$89,210 |
| SUPERPAVE ASPHALTIC CONCRETE (TRAFFIC B) | 367 | TN | \$79.15 | \$29,022 |
| ASPHALTIC CONCRETE FRICTION COURSE (FC-5) (PG-76-22) | 183 | TN | \$96.07 | \$17,613 |
| MEDIAN CONCRETE BARRIER WALL | 8,000 | LF | \$82.29 | \$658,320 |
| SHOULDER BARRIER WALL CONC (RIGID-RETAINING) | -4,000 | LF | \$152.62 | (\$610,480) |
| BARRIER WALL REMOVAL | 4,000 | LF | \$30.95 | \$123,800 |
| SHOULDER MOUNTED LIGHT POLES | 30 | EA | \$4,000.00 | \$120,000 |
| MEDIAN LIGHT POLE REMOVAL | 23 | EA | \$275.00 | \$6,325 |
| LIGHTING CONDUIT (UNDERGROUND) | 4,000 | LF | \$2.50 | \$10,000 |
| LIGHTING CONDUIT (UNDER PAVEMENT) | 500 | LF | \$7.50 | \$3,750 |
| LIGHTING CONDUCTOR | 13,500 | LF | \$1.50 | \$20,250 |
| SERVICE POINT | 1 | EA | \$5,000.00 | \$5,000 |
| OVERHEAD HAMMERHEAD SIGN STRUCTURE | 1 | EA | \$50,000.00 | \$50,000 |
| OVERHEAD HAMMERHEAD SIGN STRUCTURE (REMOVE) | 1 | EA | \$1,700.00 | \$1,700 |
| FIBER RELOCATION | 4,000 | LF | \$10.00 | \$40,000 |
| BRIDGE AASHTO (WIDENING) | 260 | SF | \$160.00 | \$41,600 |
| Subtotal | | | | \$756,396 |
| MOT (10%) | | | | \$75,640 |
| Mobilization (10%) | | | | \$83,204 |
| Subtotal | | | | \$915,240 |
| Project Unknowns (20%) | | | | \$183,048 |
| CEI (8%) | | | | \$81,812 |
| DB Designing Fee (10%) | | | | \$102,265 |
| , , | | CONST | RUCTION TOTAL | \$1,282,364 |





RECOMMENDATION No. 16: At the I-75 interchange the mainline alignment should be modified to allow for 10-12 ft. inside shoulders

Preferred Alternative:

The PD&E Document Alternative shows significant construction at the SR-826 and I-75 Interchange. A two-lane flyover from I-75 to SR-826 SB and NB (one lane in each direction) is proposed along with the reconstruction of SR-826 SB. In order to fit all the movements and gores associated with this interchange, the SB alignment was shifted to the west. This new SB alignment places several SB lanes over the existing canal. In order not to impact the existing perimeter road, the canal will be narrowed and a bulk head wall will be added along the two banks of the canal. The ultimate result of the new I-75 flyover along the SR-826 median reduces the width of the inside shoulders in both directions to just 4 feet.

VE Alternative:

Convert the canal to a culvert and shift the realignment of the SB lanes over the culvert to the west in order to increase the inside shoulders to 10-12 feet. This shift will not impact the existing perimeter road. The 800 ft. bulkhead wall along the two banks of the canal proposed in the PD&E will be removed and 1,600 ft. of culvert will be installed. The shift will also allow the NB inside and outside shoulders to be increased to 10-12 feet. Further coordination with DERM/SFWMD will be required.

Advantages:

- Increases the shoulder widths (from 4 feet to 10 − 12 feet) in all direction of traffic and for each type of lane
- Traffic Operations (flow and speeds) will greatly improve
- Exceptions are eliminated for shoulder width
- Emergency response will significantly improve
- Express Lanes will be closed less frequently
- Additional revenues will be collected
- Improves hydraulics

Disadvantages:

- Will increase construction cost,
- Increases construction time
- Requires maintenance of a long culvert
- May effect permitting (needs to be coordinated with the permitting agency)

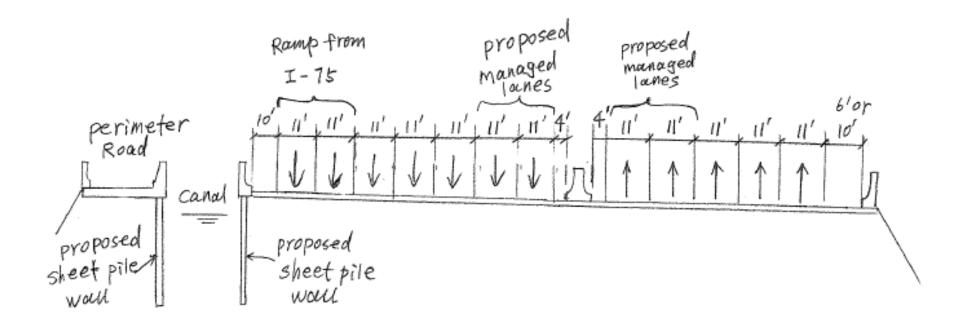
FHWA CATEGORIES

| X Safety | X Operations | Environment | X Construction | Other |
|--------------|----------------------|-------------|----------------|-------|
| Potential Va | alue Added: (\$3,428 | 3,000) | | |

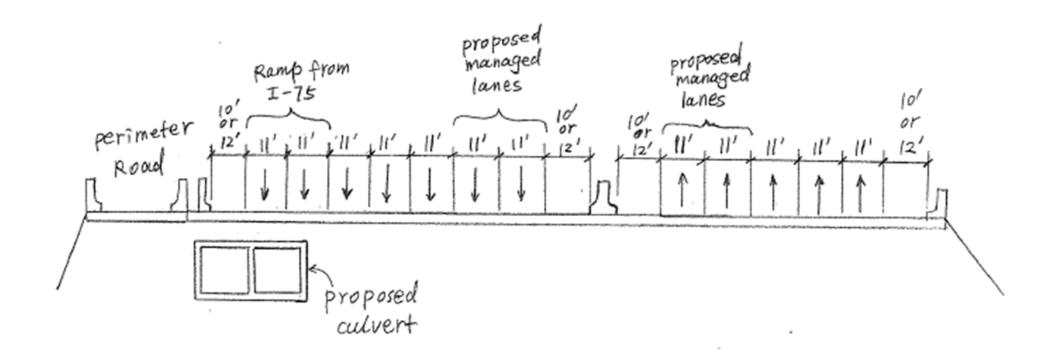
Calculations:

| Description | Quantity | Unit | Unit Price | Extended Amount |
|-------------------------------|----------|--------|---------------|-----------------|
| Embankment | 593 | CY | \$10.77 | \$6,387 |
| Sheet pile wall | -32,800 | SF | \$17.84 | (\$585,152) |
| Concrete Class II (Culvert)* | 4,148 | CY | \$616.47 | \$2,557,118 |
| Class I Concrete (End Walls) | 25 | CY | \$666.92 | \$16,673 |
| Class II Concrete (End Walls) | 40 | CY | \$668.80 | \$26,752 |
| Subtotal | | | | \$2,021,777 |
| MOT (10%) | | | | \$202,178 |
| Mobilization (10%) | | | | \$222,395 |
| Subtotal | | | | \$2,446,350 |
| Project Unknowns (20%) | | | | \$489,270 |
| CEI (8%) | | | | \$218,675 |
| DB Designing Fee (10%) | | | | \$273,344 |
| | | CONSTR | RUCTION TOTAL | \$3,427,640 |

^{*}Potential for greater savings if a metal culvert is considered instead of Class II Concrete



PD & E proposed Typical section at Palmetto near I-75 Ramp



VE proposed Typical section at Palmetto near I-75 Ramp

RECOMMENDATION No. 19: Between NW 74th St and Okeechobee Road widen southbound lanes to the west to provide for 12 ft. inside shoulder by either realigning the entrance ramp at Rd Okeechobee or purchasing a small amount of right of way

Preferred Alternative:

The PD&E Documents Alternative shows a 4-ft. inside shoulder for the southbound managed lane from North of NW 74 St to South of Okeechobee Rd.

VE Alternative:

Widen 8 ft. to the west in order to provide a 12-ft. inside shoulder. The on ramp at Okeechobee Rd to SR 826 SB will need to be modified as shown on the graphic. (If we have an adjacent willing seller the modification will not be required)

Advantages:

- Increase the inside shoulder width from 4-ft. to 12-ft.
- Allows for disabled vehicles to enter the shoulder without disrupting the managed lane operation
- The 12-ft. shoulder provides a better condition than the 4-ft.

Disadvantages:

- Increased cost
- Increased maintenance of traffic during construction

FHWA CATEGORIES

X Safety X Operations Environment Construction Other

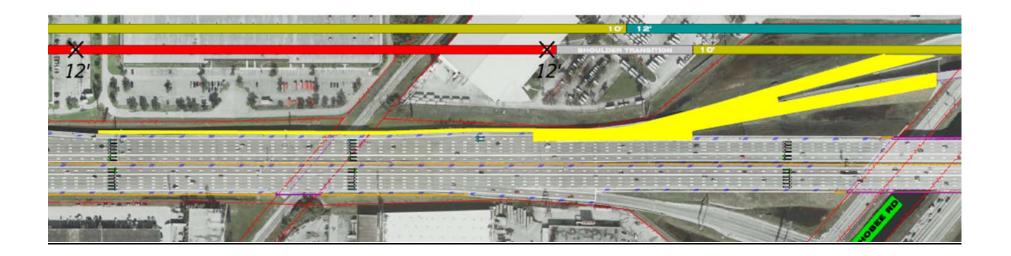
Potential Value Added: (\$ 7,632,000)

RECOMMENDATION No. 19: Between NW 74th St and Okeechobee Road widen southbound lanes to the west to provide for 12 ft. inside shoulder by either realigning the entrance ramp at Rd Okeechobee or purchasing a small amount of right of way

Calculations:

| Description Description | Quantity | Unit | Unit Price | Extended Amount |
|---|----------|-------|---------------|-----------------|
| CLEARING AND GRUBBING | 1 | LS/AC | \$4,000.00 | \$4,000 |
| EMBANKMENT | 47,500 | CY | \$10.77 | \$511,575 |
| STABILIZATION TYPE B | 7,250 | SY | \$2.37 | \$17,183 |
| BASE OPTIONAL (BASE GROUP 11) | 7,250 | SY | \$13.91 | \$100,848 |
| SUPERPAVE ASPHALTIC CONCRETE (TRAFFIC D)(PG 76-22) | 1,990 | TN | \$81.10 | \$161,389 |
| ASPHALTIC CONCRETE FRICTION COURSE (FC-5) (PG-76-22) | 299 | TN | \$96.07 | \$28,725 |
| BARRIER WALL INLET (<10') | 20 | EA | \$3,562.75 | \$71,255 |
| AND CROSS DRAIN) | 1,000 | LF | \$53.25 | \$53,250 |
| PIPE) | 300 | LF | \$105.03 | \$31,509 |
| CLASS I CONCRETE (ENDWALLS) | 28 | CY | \$666.92 | \$18,674 |
| CLASS II CONCRETE (APPR. SLAB) | 36 | CY | \$355.70 | \$12,805 |
| (MISCELLANEOUS) | 1,100 | LB | \$0.76 | \$836 |
| (32" F-SHAPE) | 2,850 | LF | \$123.73 | \$352,631 |
| (PERMANENT) | 101,500 | SF | \$24.56 | \$2,492,840 |
| BRIDGE DEMOLITION | 600 | SF | \$60.00 | \$36,000 |
| BRIDGE AASHTO (WIDENING) | 2,240 | SF | \$160.00 | \$358,400 |
| LIGHTING | 1 | LS | \$50,000.00 | \$50,000 |
| SIGNING & MARKING | 1 | LS | \$200,000.00 | \$200,000 |
| Subtotal | | | | \$4,501,918 |
| MOT (10%) | | | | \$450,192 |
| Mobilization (10%) | | | | \$495,211 |
| Subtotal | | | | \$5,447,321 |
| Project Unknowns (20%) | | | | \$1,089,464 |
| CEI (8%) | | | | \$486,927 |
| DB Designing Fee (10%) | | | | \$608,659 |
| | | CONST | RUCTION TOTAL | \$7,632,372 |

RECOMMENDATION No. 19: Between NW 74th St and Okeechobee Road widen southbound lanes to the west to provide for 12 ft. inside shoulder by either realigning the entrance ramp at Rd Okeechobee or purchasing a small amount of right of way



RECOMMENDATION No. 22: In Section 5 construct the crown and 11-ft striping for our project to avoid milling and resurfacing rework, also extend the fifth northbound lane further south

Preferred Alternative:

The limits of this project show an overlap with ongoing construction project FIN # 24958115201 – SR 826 Section 5. The overlap is between NW 7th Street and NW 25th Street on SR 826.

The Department is presently negotiating with the Joint Venture Team to revise the scope of work along SR 826 to modify the shoulder pavement and drainage for the future Managed Lane project. This modification does not include changes to friction course and signing & pavement markings.

The concessionaire will have to mill and resurface friction course and install new pavement markings with paint and thermoplastic for the managed lanes delineation on the recently completed Section 5. Managed lane construction will also have to change location of NB & SB roadway crowns in locations where they fall within wheel paths.

VE Alternative:

The Section 5 Joint Venture Team will construct friction course, change crown locations and stripe SR 826 between NW 7th Street and NW 25th Street to match final configuration of the managed lanes project. Friction and striping for the additional managed lanes will be delineated in the interim by gore pavement markings. During construction of managed lanes, friction course and final striping of additional lane and shoulder will be completed by the concessionaire.

Consideration should be given to installation of managed lane sign structures by the Section 5 Joint Venture Team.

Advantages:

- Less overall cost due to eliminating rework.
- Less negative public opinion with apparent wasteful construction and additional traffic impact.

Disadvantages:

- Shifts the cost of work to the current Section 5 project
- Re-design effort for Section 5

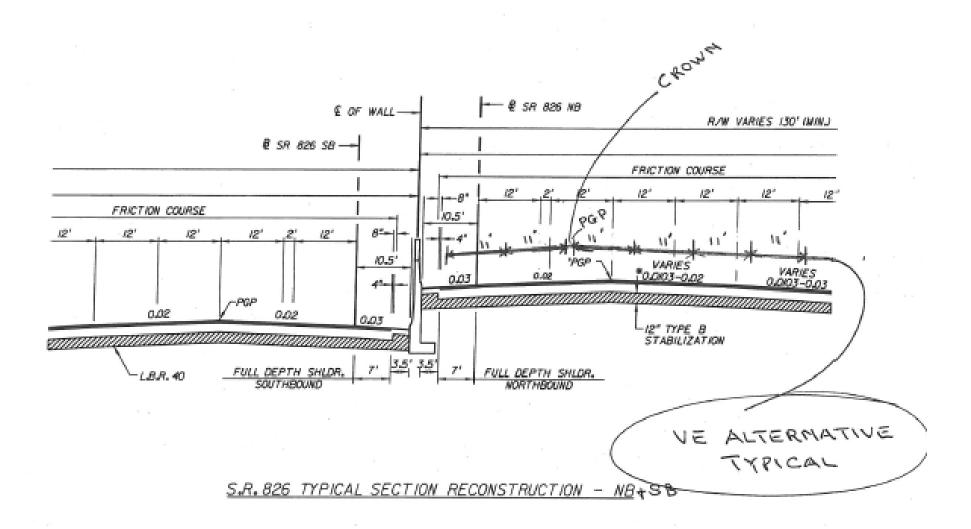
FHWA CATEGORIES

| Safety | Operations | Environment | _XConstruction | Other |
|--------------|-----------------------|-------------|----------------|-------|
| Potential Co | ost Savings: \$940,00 | 0 | | |

RECOMMENDATION No. 22: In Section 5 construct the crown and 11-ft striping for our project to avoid milling and resurfacing rework, also extend the fifth northbound lane further south

Calculations:

| Description | Quantity | Unit | Unit Price | Extended Amount |
|-------------------------|----------|--------------------|------------|-----------------|
| Milling 1" Depth | -96,000 | SY | \$1.91 | (\$183,360) |
| Friction Course FC-5 | -3,600 | TN | \$95.00 | (\$342,000) |
| Paint Striping 6" Solid | -4.5 | NM | \$650.00 | (\$2,925) |
| Paint Striping 6" Skip | -9.0 | GM | \$138.00 | (\$1,242) |
| Paint Striping 6" Solid | -4.5 | NM | \$3,720.00 | (\$16,740) |
| Paint Striping 6" Skip | -9.0 | GM | \$937.00 | (\$8,433) |
| | | | | |
| Subtotal | | | | (\$554,700) |
| MOT (10%) | | | | (\$55,470) |
| Mobilization (10%) | | | | (\$61,017) |
| Subtotal | | | | (\$671,187) |
| Project Unknowns (20%) | | | | (\$134,237) |
| CEI (8%) | | | | (\$59,996) |
| DB Designing Fee (10%) | | | | (\$74,995) |
| | | CONSTRUCTION TOTAL | | (\$940,416) |



RECOMMENDATION No. 23: Add variable speed limits to the General Purpose Lanes

Preferred Alternative:

The PD&E Documents Alternative shows variably tolled managed lanes at 60 mph design speed (55 mph posted speed), and 60 mph general purpose design speed (55 mph posted speed).

VE Alternative:

Utilize variable speed limits (or advisory speeds when enforcement is not anticipated) for general purpose lanes to better manage the flow of traffic in the general purpose lanes. It is recommended to install variable speed limit signs before entering the managed lanes segment (2 signs) and in between each interchange in each direction (16 signs). Other states have initiated use of variable speed signs to better transition vehicles through congested segments of highways improving throughput and safer travel during periods of congestion, incidents, inclement weather and other non-reoccurring events. Missouri DOT has illustrated the benefits of variable speeds (varying between 10 mph and 60 mph) on I-270/I-255 around St. Louis on their website with the

"Imagine the highway as a funnel. Now, imagine the traffic which has to travel along the highway during a certain time as a container of rice. If you pour all the rice into the funnel at the same time, it gets congested at the bottom of the funnel and takes some time to work through the funnel. Now, if you slowly pour the rice into the funnel – keeping it at a steady pace – the rice moves through the funnel evenly and doesn't cause congestion. In fact, even though the rice is entering the funnel slower, all the rice gets through the funnel (to its destination) faster."

Advantages:

- Improve operations and actively manage flow on general purpose lanes
- Improved throughput anticipated due to smoothed variation in speeds
- Provides a more consistent speed

Disadvantages:

- Increased capital costs and on-going maintenance for the dynamic signs
- New concept to the region & public acceptance

FHWA CATEGORIES

| _X_Safety | _X_Operations | Environment | Construction | Other |
|--------------|------------------------|---------------------|--------------|-------|
| Potential Va | llue Added: (\$2,000,0 | 000 to \$5,000,000) | | |

Potential savings related to potential reductions to congestion related incidents are not considered in the added value cost. Research and monitoring of national and international facilities with variable speeds report up to 30 percent reduction in congestion related incidents.

Calculations:

Combined Speed Limit and Dynamic Message Signs are proposed used to display Variable Speed Limits and estimated as a portion of Dynamic Message Sign Statewide Average Costs only for the dynamic sign area. (Estimated 1/3 Speed Limit sign area for dynamic message portion)

48-inch x 60-inch Speed Limit Signs for Freeways = 30 SF/3 = 10 SF Dynamic Message area.

RECOMMENDATION No. 23: Add variable speed limits to the General Purpose Lanes

Speed Limit Sign area (R2-1) for freeways = 25 SF

Pay Item 781-41-111 included Statewide Average Costs for DMS signs at \$127, 610 per sign.

Variable Speed Limit Sign Estimate (10 SF/25 SF) X \$127,610 = \$51,044 per Variable Speed Limit Sign

Dynamic Message Sign Support Structures are estimated separately with Statewide Average Cost. DMS Support Structure Pay Item 781-5-141 included Statewide Average Costs for DMS multi-sign support and was recognized as the best available fit for the estimate of the appropriate Pay Item 781-5-130, at \$127,610 per structure.

| Description | Quantity | Unit | Unit Price | Extended Amount |
|--|----------|--------|---------------|-----------------|
| Variable Speed Limit | 18 | EA | \$51,044.00 | \$918,792 |
| Variable Speed Limit Sign Support Structure* | 18 | EA | \$127,610.00 | \$2,296,980 |
| Subtotal | | | | \$3,215,772 |
| MOT (10%) | | | | \$321,577 |
| Mobilization (10%) | | | | \$353,735 |
| Subtotal | | | | \$3,891,084 |
| Project Unknowns (20%) | | | | \$778,217 |
| CEI (8%) | | | | \$347,818 |
| DB Designing Fee (10%) | | | | \$434,772 |
| | | CONSTR | RUCTION TOTAL | \$5,451,891 |

^{*}Variable Speed support structures could be combined with tolling gantries.

Additional Background Information on Variable Speed Limits: Missouri DOT – Variable Speed Limits http://www.modot.mo.gov/stlouis/links/VariableSpeedLimits.htm

Washington DOT – Variable Speed Limits http://www.wsdot.wa.gov/projects/lkwamgt/lkwaatm/

APPENDICES

Agenda Sign In Sheets Presentation Slides

Tentative Agenda May 14 – 18, 2012

| Day One | Kickoff Intro by VE Team Leader | 8:00 am – 8:15 am |
|-----------|--|---------------------|
| | Team Review and Discussions of Documents | 8:15 am – 9:15 am |
| | Designer Orientation | 9:15 am – 10:00 am |
| | Questions for Designers | 10:00 am – 10:30 am |
| | Cost Model & Function Analysis | 10:30 am – 12:00 pm |
| | Lunch | 12:00 pm – 1:00 pm |
| | Intro to Creative Thinking | 1:00 pm – 1:45 pm |
| | Creative Idea Listing/Function | 1:45 pm – 5:00 m |
| Day Two | Continue Brainstorming | 8:00 am – 10:00 am |
| | Begin Evaluation | 10:00 am – 12:00 pm |
| | Lunch | 12:00 pm – 1:00 pm |
| | Evaluation Phase | 1:00 pm – 5:00 pm |
| Day Three | Mid-point review with design team | 8:00 am – 9:00 am |
| | Begin Development Phase | 9:00 am – 12:00 pm |
| | Lunch | 12:00 pm – 1:00 pm |
| | Continue Development | 1:00 pm – 5:00 pm |
| Day Four | Finish Development/Presentation | 8:00 am – 5:00 pm |
| Day Five | Finish Development/Prepare Oral Presentation | 8:00 am – 8:30 am |
| | Oral Presentation to FDOT/others | 8:30 am – 10:00 am |
| | Begin Draft Value Engineering Report | 10:00 am – 5:00 pm |

VALUE ENGINEERING KICKOFF

State Road 826 Managed Lanes

May 14, 2012

SIGN IN SHEET

| Name | Representing | Phone Number | Email Address | FDOT User ID |
|--------------------|--------------|----------------|------------------------------|--------------|
| Michael Colucci | CORRADINO | 305-594-0735 | m colucci @ corradina, com | |
| SAUS KHULL | FUOT/TOUS | 305-470-5344 | Saud Khano dod shee W | .05. |
| ANDN Garganta | CSA | 305 461-5484 | - agaeganta ecsago | oup com |
| Reparto Marrero | FDOT | (7)3500020 | verato. marros e dot. | . ` |
| MIKE CISCAR | COLPADINO | 305-586-7/07 | MCISCAR@CORRADINO, COL | |
| Carlos Zea | URS | 305 262 7466 | carlos.zea @ ws.com | |
| CARLOS GARCITA | URS | 3055142412 | carlos, garcia Quis. es | 7 |
| Julio Bouche | URS | 305.514.2419 | Julio. Bouche QUES. cor | 7 |
| John Dove | FOOTVE | 305 470-5342 | John. Dove @ DOT. STATE. | Y.us |
| Hailing Zhang | FDOT | 305 4705484 | hailing zhang@dot. sta | te.fl.us |
| Mikkail Debroisley | 11 | | miklail. Lybrosky ! - | |
| Teannine Gastonale | FOOT | 305-470 5208 | Jeannine Goodonde DOOT State | f1.05. |
| RICK JOHNSON | | 73 321-217-518 | 2 | |
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FLORIDA DEPARTMENT OF TRANSPORTATION

VALUE ENGINEERING STUDY MID-POINT REVIEW

State Road 826 Managed Lanes May 16, 2012

SIGN IN SHEET

| Name | Representing | Phone Number | Email Address |
|-----------------|-----------------|----------------|--------------------------|
| LARUS GARCIA | URS | 3055142412 | carlos garciagous. |
| Fuzy Solewa Go. | gilly FDOT - DG | (305) 470-520 | 7 Jupy solaine Do |
| John Dave " | FOOT DOVE | | John Dovo/Odot, STATE: 1 |
| Carlos Zea | URS | (305) 262 7466 | carlos.zea@ ws.com |
| Kenato Marren | FDOT | (7) 350 0020 | renato. marren e dot |
| Ausees Gargane | CSA GOVP | 305 461 5484 | agarganta @ CSAGOVP. |
| Swo Kun | FOOT TOPS | 305 781 3360 | Soud When O doll the Min |
| Hailing Zhang | FPOT | 305 470 5484 | hailing, zhang@dotstat |
| Joshua Saluzar | HDR | 305-725-7434 | Jahun Salazer Chance con |
| MIKE CISCAR | CORRADINO | | MCISCARE CORRADING, COL |
| RICK JOHNSON | PMA | 321-418-818 | 7 rjchnson @pna-a2.E |
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FLORIDA DEPARTMENT OF TRANSPORTATION

VALUE ENGINEERING STUDY PRESENTATION

State Road 826 Managed Lanes May 18, 2012

SIGN IN SHEET

| Name | Representing | Phone Number | Email Address | FDOT User ID |
|-----------------------|--------------|---------------|-------------------------------------|--------------|
| Toresa Alvarez | FROT | 305-470-528 | Teresita. Alvareze | |
| Judy SolauN. Consales | FDOT De | | JUDY SO GUN @ DOT . STATE. | E1.05 |
| GUS PEGO | FDOT | 305-470-5197 | Gus. Pegoc DOT. STATE. FL. US | |
| Omar Meitin | FDOT | (305)470-5335 | omes weitin 2 dot state ful | |
| Rengto Marrero | FDOT | (7)3500020 | renato. mawero edo | |
| Hailing Zhang | FDOT | 305 470 5484 | hailing zhang @dot | |
| John Dous | FOOT | 305420-5342 | John Dovel Dot - | |
| Anser Garant | CSA Group | 305 461-5484 | agazganta acsa | (000 - COW |
| DAT HUYNH | FDOT | 305 470-5217 | dat. hugh a dot state . Pl. us | , |
| Felix Gernandez | FOOT | 305-470-5274 | Pelix. Hernandez @ dot. Stat. Pla | s |
| JORGE A, RODRIGUEZ | FD07 | 305-470-5444 | Jorge rodriguez c lot. stete fl. us | |
| Carlos Zea | URS | 305.262 7466 | corlos. zea @ urs.com | |
| Julio Boucle | UES | 305 514. 2419 | Sutro. Boucle eurs. com | |
| JAVIEL Rodei guét | FDOT | 305 470 -5757 | JAVIER. Rockigueze doc- Some | PL. US |
| BARY SANGONA | For | 4 16 | rory sartania | 4 8 |
| Hopen Boucle | FDOT | 305-470-520 | I aileen bouclee " - | |

FLORIDA DEPARTMENT OF TRANSPORTATION

VALUE ENGINEERING STUDY PRESENTATION

State Road 826 Managed Lanes May 18, 2012

SIGN IN SHEET

| Name | Representing | Phone Number | Email Address | FDOT User ID |
|----------------------|--------------|--------------|--------------------------------------|--------------|
| CARLOS GARGETT | URS | 3055142412 | Meidi, So lavn@dot, State, fl. 45 | |
| Heidi Solaun-Domingo | 2 FDOT | 3054705282 | heidi, solavn@dot, State, fl. 45 | |
| KICK JOHNSON | PMA | 321-418-8187 | richnson @ pra-a2 con | |
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SLIDE PRESENTATION

State Road 826 Managed Lanes PD&E

VE Study Recommendations

Conducted May 14 – 18, 2012

State Road 826 Managed Lanes Team Members:



- realli Mellibers.
- Renato Marrero, PE, Maintenance
- Andy Garganta, PE, Roadway Design
- Hailing Zhang, PhD, PE, Structures
- Mikhail Dubrovsky, PE, Construction
- Saud Khan, MOT
- John Dovel, PE, Traffic/VE Coordinator
- Rick Johnson, PE, CVS, Team Leader
- Joshua Salazar, PE, District 4 Issues

SAVE International and FDOT Job Plan



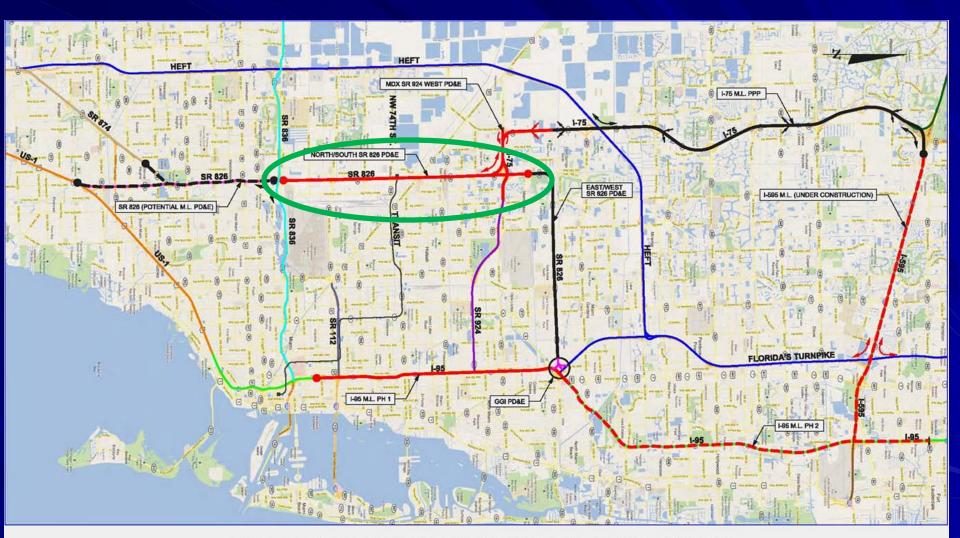
- Information
- Function
- **Creative Brainstorming**
- Evaluation/Development
- Recommendation/Presentation/
- Report

Information



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

Project Location



SOUTH FLORIDA MANAGED LANES NETWORK

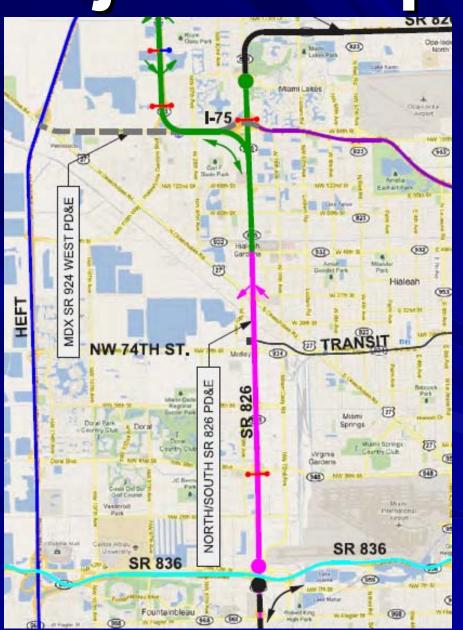
Project Scope



Expedite the implementation of managed lanes on SR 826 and I-75 and develop an RFP package for a Public-Private-Partnership (P3) to be released in January 2013. Widen within the existing roadway to provide four general purpose lanes and two managed lanes in the median in both directions. Delineators will separate the managed lanes from the general purpose lanes.

Construction: \$291.9M

Project Scope



Constraints



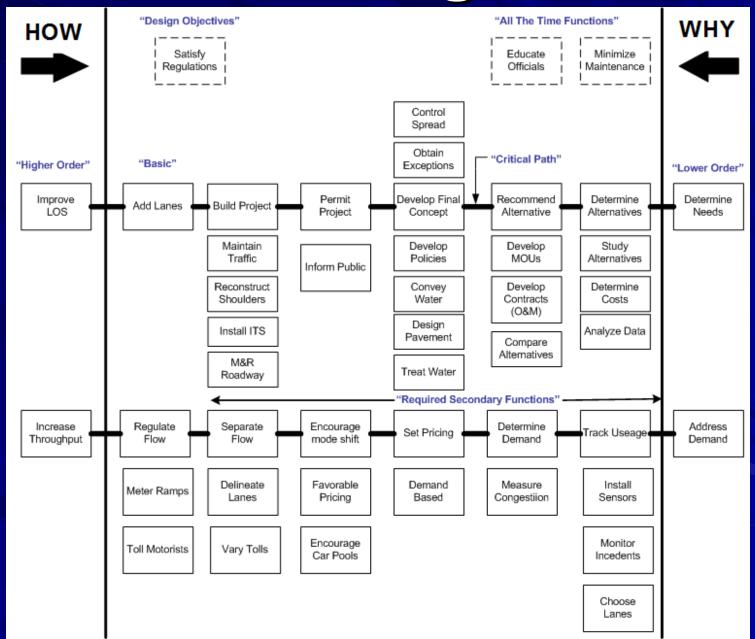
- No additional Right of Way
- FTG Natural Gas Mains
- The connections at each end
- No improvements to the interchanges
- NW 103rd Street flyover
- NW 25th Street flyover
- Aggressive Schedule

Function Analysis

DEPARTMENT OF TRANSPORT

- **■Improve LOS**
- Add Lanes
- Build Project
- **■Increase Throughput**
- **■Regulate Flow**
- **■**Separate Flow
- **■**Encourage Mode Shift
- **■Set Pricing**
- Determine Needs

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 31 Ideas and Identified Weighted Criteria
- Ideas that Improved the PD&E Alternative were Developed
- **Compare the PD&E Alternative**to the VE Alternative
- List Advantages and Disadvantages

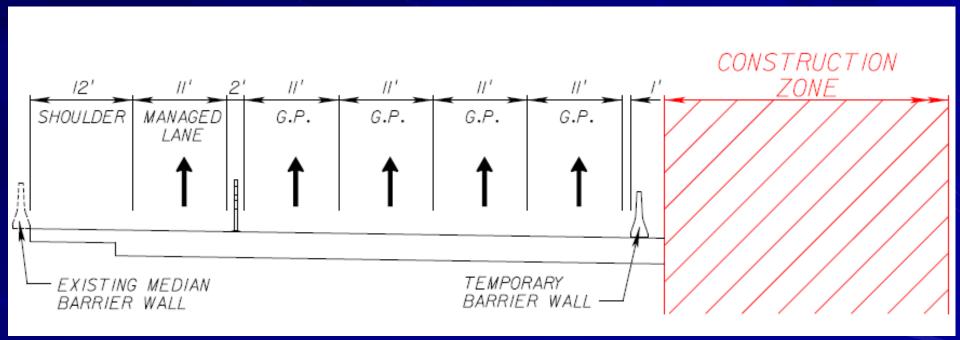


PD&E Alternative: The PD&E Documents Alternative shows widening within the existing roadway to provide four general purpose lanes and two managed lanes in the median in both directions. Delineators will separate the managed lanes from the general purpose lanes. The ML system extends and ends after the I-75 interchange.



■VE Alternative: As an interim phase the District could implement a single 11ft. managed lane and continuous 12-ft. shoulder from SR 836 to north of the I-75 interchange. No widening is required for this phase that only requires painting, delineators and tolling infrastructure.







Advantages:

- Low initial cost
- Early implementation
- Utilizes existing infrastructure/lanes
- Early revenue stream

Disadvantages:

Maintenance of delineators is problematic

■ Potential Revenue: \$5,600,000

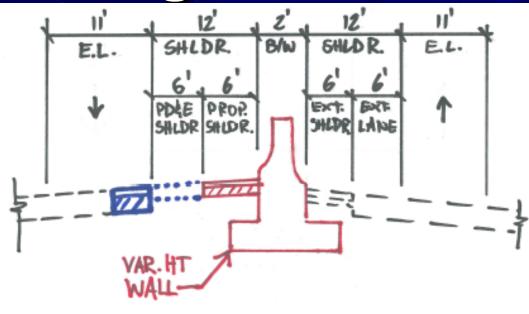


PD&E Alternative: The PD&E Documents Alternative shows minor widening of SR-826 in both the NB and SB direction from NW 36th ST to NW 58th ST due to right-of-way (R/W) constraints on both sides. The local road to the east of these limits appears to be County-owned.

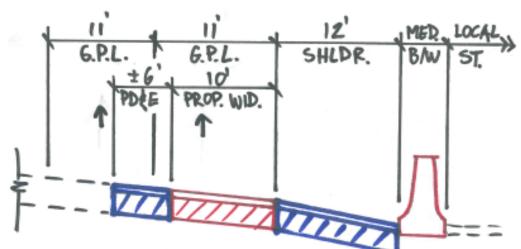


VE Alternative: The centerline alignment can be shifted about 6 feet to the east to gain 12-ft inside shoulders in the SB direction. The NB outside barrier wall proposed in the PD&E will be shifted another 10 feet to the east, which will accommodate the 6-ft centerline alignment shift, plus another 4-ft, to also increase the NB inside shoulder to 12-ft.

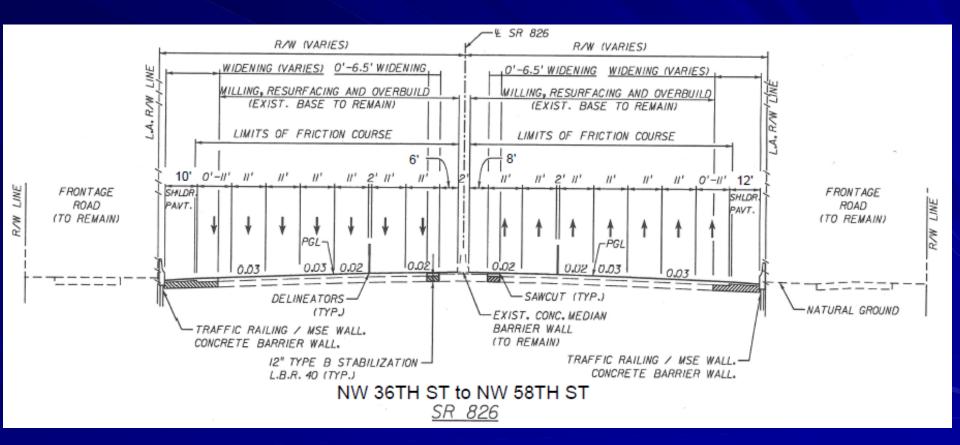




RED= PROPOSED BLOE = PDEE









- Advantages:
 - Wider shoulder
 - Eliminates a 4,000 ft. shoulder exception/variation
 - Less frequent closures
- Disadvantages:
 - Adds cost
 - May impact the schedule
 - Impacts to MOT
- Potential Value Added: (\$1,282,000)

Realign SB lanes between NW 103rd and I-75



PD&D Alternative: The PD&E **Documents Alternative shows signi**ficant construction at the SR-826 and I-75 Interchange. A two-lane flyover from I-75 to SR-826 SB and NB (one lane in each direction) is proposed along with the reconstruction of SR-826 SB. In order to fit all the movements and gores associated with this interchange, the SB alignment was shifted to the west.

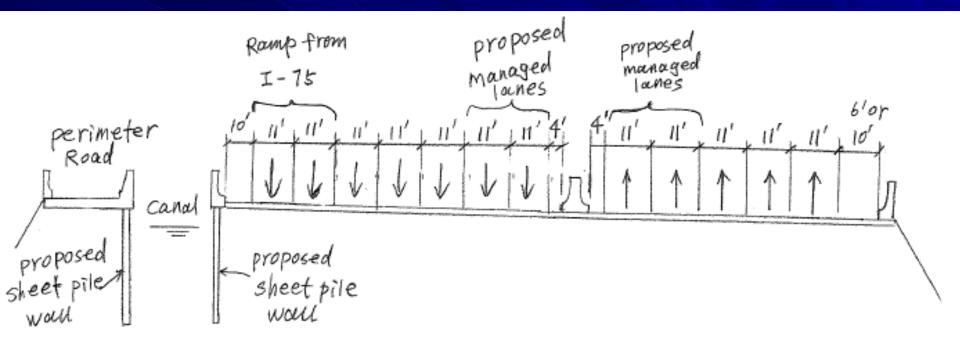
Realign SB lanes between NW 103rd and I-75



■VE Alternative: Convert the canal to a culvert and shift the realignment of the SB lanes over the culvert to the west in order to increase the inside shoulders to 10 – 12 feet. This shift will not impact the existing perimeter road. The 800 ft. bulkhead wall along the two banks of the canal proposed in the PD&E will be removed and 1,600 ft. of culvert will be installed.

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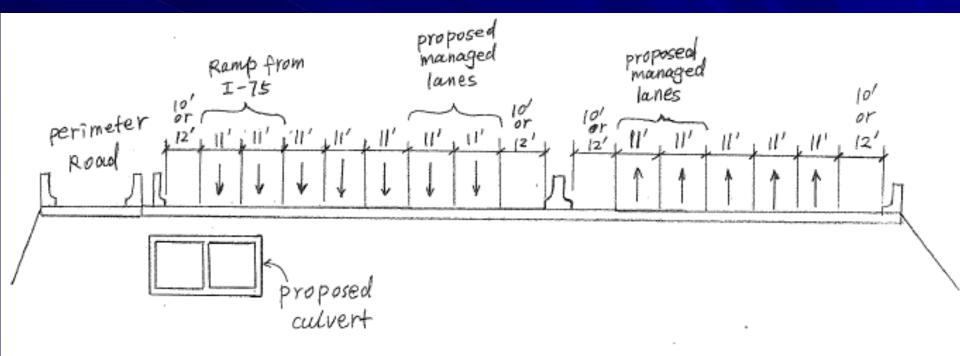




PD & E proposed Typical section at Palmetto near I-75 Ramp

Realign SB lanes between NW 103rd and I-75





VE proposed Typical section at Palmetto near I-75 Ramp

Realign SB lanes between NW 103rd and I-75



- **Advantages:**
 - Increases shoulder from 4 ft. to 10-12 ft.
 - Improves traffic operations
 - Eliminates a design exception
- Disadvantages:
 - Maintenance on a long culvert
 - Adds cost

■ Potential Value Added: (\$3,428,000)



■PD&E Alternative: The PD&E
Documents Alternative shows a 4-ft.
inside shoulder for the southbound
managed lane from North of NW 74 St to
South of Okeechobee Rd.



WE Alternative: Widen 8 ft. to the west in order to provide a 12-ft. inside shoulder. The on ramp at Okeechobee Rd to SR 826 SB will need to be modified as shown on the graphic. (If we have an adjacent willing seller the modification will not be required)







- Advantages:
 - Increases shoulder from 4 ft. to 12 ft.
 - Improves traffic operations
 - Eliminates a design exception
- Disadvantages:
 - Adds cost
 - Increased MOT during construction

Potential Value Added: (\$7,630,000)

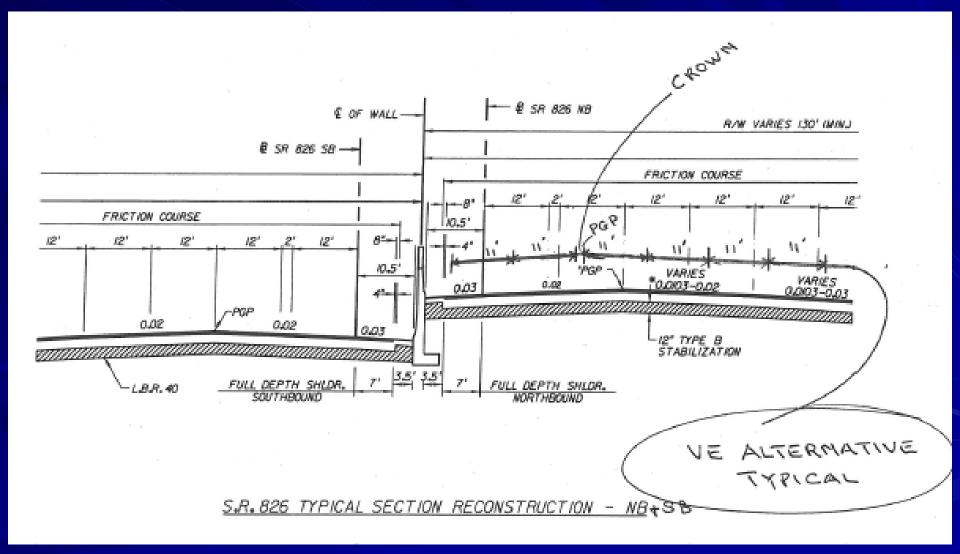


Preferred Alternative: The PD&E Documents Alternative shows the limits of this project will overlap with ongoing construction project FIN # 24958115201 – SR 826 Section 5. The overlap is between NW 7th Street and NW 25th Street on SR 826.



VE Alternative: Construct friction course, change crown locations and stripe SR 826 between NW 7th Street and NW 25th Street to match final configuration of the managed lanes project as part of ongoing Section 5 project.







- Advantages:
 - Less cost
 - Less negative public opinion
- Disadvantages:
 - Shifts the cost of work to the Section 5 project

Potential Cost Savings: \$940,000

Add variable speed limits to the General Purpose Lanes



Preferred Alternative: The PD&E Documents Alternative shows variably tolled managed lanes at 60 mph design speed (55 mph posted speed), and 60 mph general purpose design speed (55 mph posted speed).

Add variable speed limits to the General Purpose Lanes



Imits (or advisory speeds when enforcement is not anticipated) for general purpose lanes to better manage the flow of traffic in the general purpose lanes.

Add variable speed limits to the General Purpose Lanes



- Advantages:
 - Improve operations and actively manage flow
 - Improves throughput Less
- Disadvantages:
 - Adds cost
 - New concept

Potential Value Added: (\$2,000,000)

Design Suggestions

Analyze widening of the mainline bridge over NW 36th St. only, so that the existing ramp bridges are not impacted

■ Consider the stability of the proposed retaining walls where the existing French drains are close by (ex. East side of SR 826 between the Metro Rail and CSX RR)

Design Suggestions

Acquire a small piece of R/W at NW 56th St southbound Palmetto to eliminate the pinch point. RFP to be advertised without the R/W acquisition and once acquired issue a change order to the concessionaire.

Design ITS and sign gantries for an ultimate typical section that does not require any design variations or exceptions

Savings Summary

| Recommendation | Savings | Maximum Savings |
|--|---------------|------------------------|
| Consider 4+1 with full shoulders | \$5,300,000 | |
| NW 36th to NW 58th streets realign the NB | | |
| mainline | (\$1,282,000) | |
| Realign SB lanes between NW 103rd and I- | | |
| 75 | (\$3,428,000) | |
| Shift the SR 826 SB lanes from NW 74th to | | |
| US 27 | (\$7,632,000) | |
| In Section 5 construct the crown and 11-ft | | |
| striping | \$940,000 | \$940,000 |
| Add variable speed limits to the General | | |
| Purpose Lanes | (\$2,000,000) | |
| | | \$940,000 |

Action Plan



- Receive Draft VE Report 6/1/12
- Draft Report Routed for Comments
- Receive and Incorporate D6

 Comments and Revisions 6/22/12
- Resolution Meeting
- ■Issue Final VE Report 7/6/12

Questions