



To: Staci Nester  
Ramesh Kalvakaalva, PE, CVS

From: Luis Diaz, PE  
Robert Denney, PE

Date: April 10, 2015

Subject: Interstate 4 from West of US 27 to the Polk/Osceola County Line Value Engineering Study  
Recommendation Dispositions

FM: 201210-3

Dear Mr. Kalvakaalva,

Please see below for our management action dispositions for the recommendations found on Table 1.4-1 of the Value Engineering Study Report for I-4 from West of US 27 to the Polk/Osceola County Line.

Recommendation BR-1: The alternate is to provide an at-grade intersection with a partial Continuous Flow Intersection to accommodate US 27 SB left turn at Frontage Road. The alternate is to provide an at-grade intersection which relocates the SB US 27 left turn lane east of NB US 27 lanes. This partial continuous flow intersection will require a crossover signal to allow for the left turn lanes to crossover the NB US 27 lanes. The U-turn lane for SB US 27 to NB US 27 will be eliminated. The I-4 EB exit ramp to NB US 27 connection will be relocated to approximate crossover signal location. The structure for NB US 27, the structure for EB I-4 On Ramp and the EB I-4 to SB US 27 movement are all eliminated. A 780 foot lane will be added for the WB approach to the signal and a receiving lane will be added to accommodate the SB US 27 left turn.

**Not Accepted.** The crossover intersection appears to operate well but the main intersection with US 27 and the EB off-ramp is failing during the PM peak. An at-grade, partial CFI intersection is not recommended at the US 27 and EB Ramps intersection.

Recommendation BR-02: The alternate is to provide an at-grade intersection which relocates the NB US 27 left turn lanes west of SB US 27 lanes. This partial continuous flow intersection will require a crossover signal to allow for the left turn lanes to crossover the SB US 27 lanes. The u-turn lanes and turn out pavement for NB US 27 will be eliminated. The relocation of the NB left turn lanes will require the WB I-4 ramp to SB US 27 to be extended.

**Not Accepted.** The crossover intersection appears to operate well but the NB crossover will require 2 NB left-turn lanes crossing 4 SB thru lanes. Four thru lanes are needed SB at the EB ramps and it is most practical to start this 4<sup>th</sup> lane upstream at the WB ramp intersection. The WB off-ramp will also require a triple bypass right turn. The main intersection with US 27 and the WB off-ramp operates at an LOS C during both peak hours, but requires a triple left turn from the off-ramp.

From a traffic operations perspective the proposed at-grade, partial CFI intersection at the WB Ramps is plausible but would need further evaluation of the required roadway geometry. Given that the CFI is not a viable alternative at the EB Ramps, another alternative is needed, one that will probably require a u-turn at the WB Ramps. Building a CFI at the WB Ramps, however, precludes a u-turn movement, limiting your options at the EB Ramps.

Recommendation BR-04: The alternate design proposes building two single span bridges over Westbound I-4 to North US 27 Ramp and over Burger King access and to connect/plug the bridges with MSE walls.

**Accepted.**

Recommendation BR-05: The alternate design is to shift the alignment of westbound I-4 ramp to US 27 North towards the Burger King access and reduce the bridge length.

**Accepted. Bridge length can be reduced some, but sight distance and clearzone needs to be maintained.**

Recommendation BR-07: The alternate would utilize US 27- Alternative 4 that uses signalized intersections at the US 27 ramp tie ins. The difference to Alt. 4 is that the direct connect express lanes are relocated into the existing ramp entrances and entrances at the south intersection, mitigating the original concern with alternative 4 with the ramp tie ins on the bridge.

**Accepted. The express lane tie ins can be moved to the ramps, and the additional intersection previously shown in the middle of US 27 will be eliminated.**

Recommendation BR-10: The alternate proposes a SPDI at the interchange without loops and an option with or without free flow right turn ramps from US 27 to I-4.

**Not Accepted. There are multiple movements that are failing along with v/c ratios over 1.0.**

Recommendation RD-06: The alternate provides a 4' inside shoulder upon construction of the high speed rail within the center median. In the interim the inside shoulder will be 10' with an inside guard rail. Standard index 400 sheet 15 Detal K states that shoulders 10' or wider 12' is required between edge of travel and the guard rail.

**Not accepted. D1 has requested that the full 10-foot paved shoulder be implemented.**

Recommendation RD-07: Provide typical section to match that of District 1 I-4 Master Plan for consistency throughout corridor.

**Accepted.**

Recommendation RD-09: The alternative suggests considering mitigating techniques to ensure proper direction of travel at the interchange.

**Accepted.**

Recommendation RD-10: The alternative suggest considering reducing the border width as shown for the rest of the project to be consistent and reduce impacts.

Accepted. CPP is uncertain at this time. I-4 will be designed to accommodate the CPP ramps should they occur in the future, however, additional real estate is not being purchased to accommodate CPP as part of the I-4 PD&E project. Border width will remain consistent with the other parts of the I-4 Beyond the Ultimate project.

Recommendation RD-16: In PPM chapter 2.13.1 it states the National Cooperative Highway Research Program (NCHRP) Report 672, Roundabouts: An Informational Guide, is adopted by FHWA and establishes criteria and procedures for the justification, operational and safety analysis of modern roundabouts in the United States. In addition, the Florida Intersection Design Guide contains Florida centric guidelines and requirements for evaluation and design of roundabouts in Florida.

Roundabouts shall be evaluated on new construction, reconstruction and safety improvement projects, as well as any time there are proposed changes in intersection control that will be more restrictive than the existing conditions. Therefore, Consider providing roundabouts on US 27 at Sta. 57 and Sta. 82.

Not Accepted. Roundabouts will not work at these locations. Given the relative lack of roundabouts, particularly large ones, in the US, we assumed that the maximum number of circulatory lanes would be three. A brief summary table is provided below:

US 27 and I-4 EB Ramps					
LOS	US 27 NB	EB Off-Ramp	US 27 SB	Frontage Road	Intersection
AM Peak	B	C	F	D	F
PM Peak	A	A	F	D	F
US 27 and I-4 WB Ramps					
LOS	US 27 NB	Burger King	US 27 SB	WB Off-Ramp	Intersection
AM Peak	F	D	C	B	F
PM Peak	F	D	B	C	F

Recommendation RD-17: The alternative suggests reconcile the cost estimate to better define the alternative.

Accepted. During PD&E ponds sites are identified only. The conveyance system is not designed, therefore the only way to determine drainage cost is to use a percentage of the roadway construction cost. Likewise, the offsite drainage system / conveyance is not designed as part of the PD&E, therefore a percentage of the roadway cost is used. For PD&E level, a square foot bridge cost is applied regardless of whether the bridge is 1-lane, 2-lane or 6-lane. Percentages were also applied to lighting, utility relocations, ITS, etc. since these are not designed during PD&E.

Recommendation DR-01: The alternative suggests maximizing the existing ponds within the I-4/US 27 Interchange for treatment and attenuation. It appears there is more than adequate room within the existing loop ramps, Pond 501B and Pond 503B, to provide additional storage.

**Accepted.** The existing ponds will be expanded and re-graded as needed once the final roadway interchange alternate is chosen.

Recommendation DR-02: This alternative includes providing additional pond storage on the Heller Brothers Packing Corporation parcel east of the Ritchie Brothers parcel to offset the impacts to the stormwater ponds on the Ritchie Brothers property.

**Accepted.** Coordination with the property owner for these ponds is ongoing.

Recommendation DR-03: The alternative is to utilize this existing parcel for stormwater treatment and attenuation.

**Accepted.**

Recommendation DR-04: The alternative proposes to utilize the existing wetland and floodplain areas on the south side of the mainline for floodplain compensation, thereby enhancing the natural communities.

**Accepted.**

Recommendation DR-05: The alternative proposes to construct treatment ponds outside of the proposed residential development and avoid relocation when the CPP Interchange is constructed.

**Accepted.** Pond alternates 505-A1 and 505-A2 have been relocated further west and outside of the proposed development.

Recommendation DR-06: The alternate concept for I-4, CPP, and Grandview Parkway is to consider a regional drainage concept. All three (3) projects will require right of way for roadway, drainage, wetland mitigation, and other transportation related improvements. (utilities, landscaping etc.).

**Accepted.** Further coordination with FDOT District 5, FDOT District 1 and Polk County is needed to determine the feasibility of a regional pond to accommodate all parties.

Recommendation DR-07: The alternative suggests evaluating other Value Engineering options for Basin 100, which extends between CR 54 and CR 532. It appears roadway improvements and Pond 100 are located within the 100-year floodplain and it is unclear if floodplain compensation is provided for Basin 100. This basin overlaps with Segment 1.

**Accepted.**

#### 6.1.1 Basin 100

The Federal Emergency Management Agency (FEMA) has developed Flood Insurance Rate Maps (FIRM) for Polk, Osceola and Orange Counties. A portion of Basin 100 is located within Zone A of the 100-year floodplain. The floodplain elevation is estimated at 115.00 ft. NAVD using five foot contours and the seasonal high water elevation is 113.80 ft. NAVD (per SWFWMD Permit # 43011896.027). The existing ground elevation within the floodplain impact area is approximately 114.0 ft. NAVD. Basin 100

accounts for 2.96 ac-ft of floodplain impacts. The limits of the impacts are from Sta. 602+50 to Sta. 627+00 on both sides of the roadway with a total width of 290 ft. Compensation is being provided in Treatment Pond 100 (existing Pond 7-7) located at Sta. 610+00, RT. The pond provides 5.90 ac-ft. of compensation volume, resulting in a net compensation volume surplus of 2.94 ac-ft.

Recommendation DR-08: The alternative suggests that in lieu of the 100-year floodplain lines, the 120 ft NAVD contour be used for floodplain impact and compensation calculations.

**Accepted. Floodplain impact and compensation calculations will be updated based on elevation 120 ft. NAVD contour line due to inconsistencies with the FEMA floodplain lines.**

Thank You,

A handwritten signature in blue ink, appearing to read 'Luis Diaz', with a stylized flourish at the end.

Luis Diaz, PE  
Project Manager

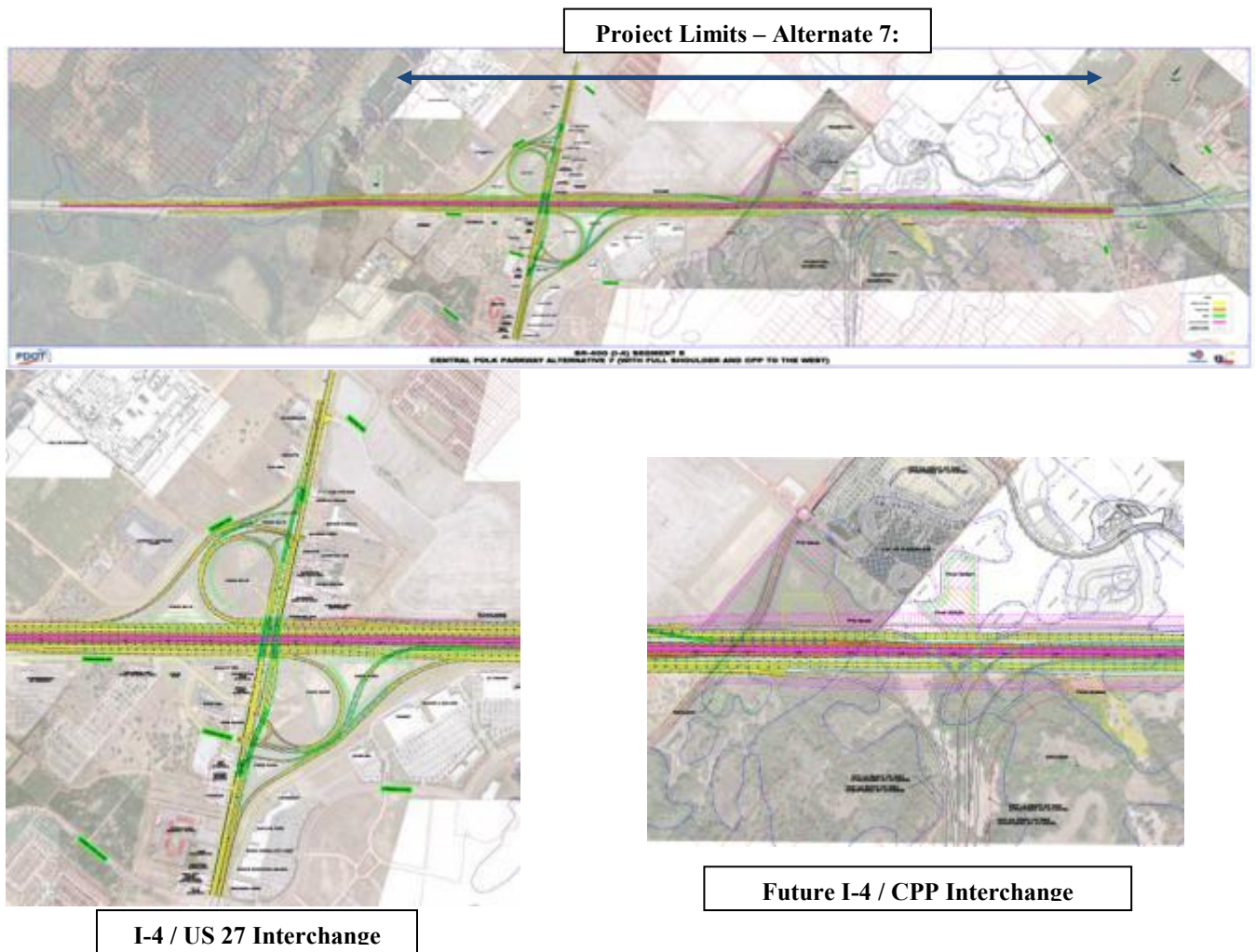


# VALUE ENGINEERING WORKSHOP REPORT

for:

Florida Department of Transportation

## I-4 from West of US 27 to Polk/Osceola County Line FPN #201210-3



December 31, 2014

Designed by:



VE WORKSHOP DATES:  
December 08 – December 12, 2014





December 31, 2014

Mr. Ty Garner  
District 5 Utility/Value Engineering Administrator  
719 S. Woodland Blvd.  
DeLand, FL 32720

**RE: Value Engineering Study Report**  
***I-4 from West of US 27 to Polk/Osceola County Line***  
***FPN #201210-3***

Dear Mr. Garner,

Enclosed is our Value Engineering Report for the above referenced project for distribution.

It's always an honor to apply the Value Engineering methodology to the impressive work of HNTB personnel. The details, time and hard work they have accomplished on this project at this phase of the project were very evident as we analyzed and made recommendations for this project.

This study provides 26 (Twenty Six) Value Engineering Alternatives and Design Suggestions that should assist FDOT and end users in achieving their vision with increased quality and economy. It is important to note that some of these Value Engineering Alternatives/Suggestions are mutually exclusive of each other.

We personally want to thank you for giving the CSI team the opportunity to participate on this Value Engineering project. We hope that our services and performance for the FDOT on this project are meaningful and useful.

Please contact Ramesh Kalvakaalva if you have any questions or concerns regarding these ideas. Should you desire to extend the scope of our project and require us to be present at the final presentation or implementation meeting, we would be happy to oblige. We will be in touch with you to coordinate the time, place and agenda for that working session as appropriate.

Sincerely,

A handwritten signature in blue ink, appearing to read 'R. Kalvakaalva'.

Ramesh Kalvakaalva, PE, CVS  
(SAVEI CVS No. 2011105000)  
VE Facilitator/Project Manager  
Phone No.: 770.312.2014  
Email: [Rameshk@civilservicesinc.com](mailto:Rameshk@civilservicesinc.com)

A handwritten signature in blue ink, appearing to read 'Christopher E. Morse'.

Christopher E. Morse, PE  
QA/QC Manager  
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# Section 1

# Executive Summary

## INTRODUCTION

A Value Engineering (VE) Workshop was facilitated by CSI along with team members from FDOT Districts 5 and 1 in Lake Mary, Florida. This report details the VE workshop activities undertaken during the week of December 8<sup>th</sup> – 12<sup>th</sup>, 2014. The subject of the study was FPN #201210-3 and entitled I-4 from West of US 27 to Polk/Osceola County Line. The first day of the workshop included presentations by the design team and other stakeholders, and followed by a site visit. This was followed by the execution of the six-step VE job plan.

At the time of the VE study, the construction documents being developed by the HNTB Team were at the PD&E stage. The construction cost estimate indicated that the project would be delivered at a cost of approximately \$220 million using Alternative 7 as the baseline.

The VE team was composed of staff members FDOT Districts 5 & 1. The team leadership was provided by Ramesh Kalvakaalva, PE, CVS (CSI).

In the results section of the report, the reader will find documentation of the ideas that were developed and presented on the last day of the workshop. These ideas represent opportunities to:

- Obtain the best return for construction dollars spent
- Assist in identifying the best approach for project delivery
- Reduce the risks associated with project delivery
- Minimize Life Cycle Costs for O & M and of ownership of the finished project
- Enhance the project outcome
- If costs are reduced, do so without compromising vital functions
- Some instances in which additional funds might be expended to avoid future, higher costs of ownership

These developed alternatives should be the subject of an implementation meeting in the near future in order to capitalize on possibilities that they represent.

## PROJECT DESCRIPTION

The project subject to this VE Study is designated as FPN #201210-3 and entitled I-4 from West of US 27 to Polk/Osceola County Line. The project length is along I-4 is approximately 3 miles with the major component of the project being the I-4 / US 27 Interchange. Alternative 7 was the basis of design and used for comparison purposes.

The purpose and need of this project is defined in the “Project Development & Environment (PD&E) Study, Segment 5: SR 400 (I-4) from West of SR 25/US 27 to West of CR 532 (Polk/Osceola County Line)” under FM No. 201210-2-22-01, Dated November 7, 2014, by HNTB Corporation extracts from which are below. The proposed improvements to I-4 include widening the existing six lane divided urban interstate to a ten lane divided highway in order to improve traffic operations, enhance connectivity and improve mobility by providing travel choices to the motoring public. I-4 is an east-west limited access freeway which links the west and east coasts of Florida, from I-275 in Tampa to I-95 in Daytona Beach. I-4 spans across six counties in Central Florida, traversing through the cities of Lakeland, Celebration, Orlando, Altamonte Springs, Sanford and DeLand. I-4 is a critical component of Florida’s Strategic Intermodal System (SIS) which links seaports, rail, airports and other intermodal facilities. This aspect of I-4’s significance is evidenced through connectivity provided by major junctions with I-

275, I-75, SR 429 (Daniel Webster Western Beltway), SR 417 (Central Florida Greenway), SR 528 (Beachline Expressway), SR 91 (Florida's Turnpike), SR 408 (Spessard Lindsay Holland East-West Expressway) and I-95.

The reader can find more information about the project in Section 2 of this report.

## PROJECT CONCERNS AND OBJECTIVES

The kick-off session for the VE Study included a presentation by HNTB and FDOT personnel. As described below:

- 1) The project objectives were: unifying I-4 corridor upgrades across the state to support local industries, and increase mobility.
- 2) The major project concerns included:
  - a. Construction in a phased manner to maintain traffic and accessibility to local businesses at all times.
  - b. Keep the project within budget.
  - c. Maintain consistency with preceding and succeeding segments.
  - d. Ensure acceptable Levels of Service at the I-4 / US-27 Interchange.

## SUMMARY OF RESULTS

During the course of the VE workshop, the team developed 13 Alternatives and 13 Design Suggestions. In addition, 12 alternatives were thoroughly explored and it was found that they were neither cost effective nor technically feasible. At the end of this section is the table entitled, "VALUE ENGINEERING STUDY – SUMMARY OF RESULTS". The cost results for the various alternatives may not be added together as some of the alternatives are mutually exclusive. One of the goals of the VE Team was to identify opportunities through which cost savings might be realized while indicating ways in which the resulting savings might be invested back into the project to realize added value. From reviewing the Summary of Results, it is estimated that between \$70 and \$80 million in cost savings might be reasonable to expect from the implementation of these alternatives. However, the acceptance of such alternatives should be guided by the dictates of the agreements among the stakeholders, the cost to make the necessary changes in the design and, the effect of these changes on the project delivery schedule.

The reader is encouraged to read over the summary table then review Section 3 of this report entitled, "STUDY RESULTS", for a detailed accounting as to how these alternatives were documented. The Design Suggestions can also be as important as the fully developed Alternatives and their consideration should be part of the action taken at the implementation meeting.

## THE WAY FORWARD

The apparent results of a Value Engineering workshop can appear to be dramatic however; these results must be acted upon promptly as they may be quickly overtaken by the forward progress of the engineering design. It is strongly recommended that the decision makers arrange a fairly immediate time for conducting a formal implementation meeting, to make a decision on each of the developed alternatives and the Design Suggestions. The results of that meeting should be converted into instructions to the design engineering team to move these potential actions into realities. This will make it possible to realize the maximum benefit from the VE workshop effort and expense.



**Florida Department of Transportation**  
**I-4 from West of US 27 to Polk/Osceola County Line**  
**FPN #201210-3**  
**Value Engineering Workshop: December 8 - 12, 2014**  
**SUMMARY OF RESULTS**

		VE Team Ranking	Cost Original Design	Cost Alternative	Initial Cost Reduction	Life Cycle Cost Impact	Net Cost Reduction Including LCC
<b>BRIDGE (BR)</b>							
BR1	Provide at-grade intersection US 27 at Frontage Road	5	\$12,148,416	\$1,406,967	\$10,741,449	\$0	\$10,741,449
BR2	Provide at-grade intersection at I-4 WB off ramp/US 27 NB on ramp/Burger King access	5	\$10,497,110	\$288,480	\$10,208,630	\$0	\$10,208,630
BR3	Shift westbound exit ramp from express lanes westward to avoid conflict	ABD	Already Being Done				
BR4	Replace the bridge btw Sta. 78+00 and 86+50 on South US 27 with two single span bridges and MSE Walls	4	\$7,225,920	\$3,115,584	\$4,110,336	\$0	\$4,110,336
BR5	Adjust the alignment of westbound I-4 Ramp to US 27 North to reduce the ramp bridge skew and shorten the bridge length	4	\$2,771,328	\$1,846,656	\$924,672	\$0	\$924,672
BR6	Reduce distance between Lanes at Sta. 515 to Sta. 520 on Mainline	2	Not developed				
BR7	Use US 27 - Alternative 4 with Direct Connect Express Lane Ramps relocated to Southern Interchange Intersection	5	\$117,436,245	\$80,354,688	\$37,081,557	\$0	\$37,081,557
BR8	Reduce westbound Express Lane off ramp requirements by merging into Mainline off ramp	See BR-7	See BR-7				
BR9	Provide Tunnel for eastbound on ramp	2	Not developed				
BR10	Reconfigure US 27/I-4 Interchange utilizing SPD and Ramps to CD system	5	\$54,259,200	\$37,996,800	\$16,262,400	\$0	\$16,262,400
BR11	Provide Tunnel for westbound Express Lane exit	2	Not developed				
<b>ROADWAY (RD)</b>							
RD1	Relocate US 27 northbound left movement for continuous movement	See BR-2	See BR-2				
RD2	Relocate US 27 southbound left movement for continuous movement	See BR-1	See BR-1				
RD3	Bifurcate eastbound and westbound profiles using Retaining Walls	DS	DESIGN SUGGESTION				
RD4	Combine westbound General Use & CD Lanes on I-4 east of US 27	2	Not developed				
RD5	Elevate Express Lanes	1	Not developed				
RD6	Provide 4' inside shoulders for the express lanes along this corridor adjacent to Segment 1 to the east	4	\$14,160,623	\$8,967,106	\$5,193,517	\$0	\$5,193,517
RD7	Provide 10' inside shoulders for the express lanes along this corridor adjacent to District 1 I-4 master plan	4	DESIGN SUGGESTION				
RD8	Provide Full Width (12') Shoulder on the inside in the Interim	ABD	Already Being Done				
RD9	Mitigate potential for Wrong Way Drivers	DS	DESIGN SUGGESTION				
RD10	Reduce Border Width @ Proposed CPP Interchange Connection Location	DS	DESIGN SUGGESTION				
RD11	Verify Railroad Corridor width requirements to be 44'	DS	DESIGN SUGGESTION				
RD12	Reduce Outside Shoulder width to 8' on Express Lanes	2	Not developed				
RD13	Lower Railroad Profile at US 27 Interchange to reduce Bridge Vertical Clearance requirements	ABD	Already Being Done				
RD14	Equalize I-4 eastbound and westbound Profiles to address Grade Separation	DS	DESIGN SUGGESTION				
RD15	Provide 2' Inside Shoulder on Express Lanes	2	Not developed				
RD16	Consider providing roundabouts on US 27 at Sta. 57 and Sta. 82	DS	DESIGN SUGGESTION				
RD17	Reconcile Cost Estimates	DS	DESIGN SUGGESTION				



**Florida Department of Transportation**  
**I-4 from West of US 27 to Polk/Osceola County Line**  
**FPN #201210-3**  
**Value Engineering Workshop: December 8 - 12, 2014**  
**SUMMARY OF RESULTS**

		VE Team Ranking	Cost Original Design	Cost Alternative	Initial Cost Reduction	Life Cycle Cost Impact	Net Cost Reduction Including LCC
<b>DRAINAGE (DR)</b>							
DR1	Maximize existing Ponds within I-4/US 27 interchange	DS	DESIGN SUGGESTION				
DR2	Accommodate impacts to Pond on Ritchie property	4	\$0	\$4,808,514	(\$4,808,514)	\$0	(\$4,808,514)
DR3	Utilize existing Pond E Parcel at Sta. 520+00 (RT)	5	\$1,500,000	\$0	\$1,500,000	\$0	\$1,500,000
DR4	Enhance Existing Wetland with Floodplain Compensation	DS	DESIGN SUGGESTION				
DR5	Update location of proposed Ponds	DS	DESIGN SUGGESTION				
DR6	Develop regional combined options to accommodate I-4, CPP, and Grandview Parkway	DS	DESIGN SUGGESTION				
DR7	Review VE alternatives for Basin 100	DS	DESIGN SUGGESTION				
DR8	Use Contours in lieu of 100-Year FEMA Boundary for Floodplain Calculations	DS	DESIGN SUGGESTION				
<b>GRAND TOTAL</b>			<b>\$219,998,842</b>	<b>\$138,784,795</b>	<b>\$81,214,047</b>	<b>\$0</b>	<b>\$81,214,047</b>

# Section 2

# Project Description

## PROJECT CHARACTERISTICS

The purpose and need of this project is defined in the “Project Development & Environment (PD&E) Study , Segment 5: SR 400 (I-4) from West of SR 25/US 27 to West of CR 532 (Polk/Osceola County Line)” under FM No. 201210-2-22-01, Dated November 7, 2014, by HNTB Corporation and extracts from which are below. The proposed improvements to I-4 include widening the existing six lane divided urban interstate to a ten lane divided highway in order to improve traffic operations, enhance connectivity and improve mobility by providing travel choices to the motoring public. I-4 is an east-west limited access freeway which links the west and east coasts of Florida, from I-275 in Tampa to I-95 in Daytona Beach. I-4 spans across six counties in Central Florida, traversing through the cities of Lakeland, Celebration, Orlando, Altamonte Springs, Sanford and DeLand. I-4 is a critical component of Florida’s Strategic Intermodal System (SIS) which links seaports, rail, airports and other intermodal facilities. This aspect of I-4’s significance is evidenced through connectivity provided by major junctions with I-275, I-75, SR 429 (Daniel Webster Western Beltway), SR 417 (Central Florida Greenway), SR 528 (Beachline Expressway), SR 91 (Florida’s Turnpike), SR 408 (Spessard Lindsay Holland East-West Expressway) and I-95.

I-4 serves as the primary corridor in the movement of people and freight between major population, employment and activity centers in the Central Florida region. When the entire Interstate was fully opened in the early 1960’s, it was designed to serve intrastate and interstate travel by providing a critical link between the east and west coasts of Central Florida. Although this role continues to be a crucial transportation function of I- 4, the highway also serves large volumes of local and commuter traffic with shorter trip distances. Today, the highway serves as the primary link between hotel/resort complexes and tourist attractions such as Walt Disney World, Universal Studios, Sea World, the International Drive Resort Area and downtown Orlando. Since I- 4 is the only north- south limited access facility that is centrally located between the predominant employment centers and the major suburbs to the north, it has become the primary commuting corridor in the Central Florida metropolitan area.

Projections of future population and employment in the region indicate that travel demand will continue to increase well into the future. The ability to accommodate the new travel patterns resulting from growth must be provided to sustain the region’s economy. Without the improvements, extremely congested conditions are expected to occur for extended periods of time in both the morning and evening peak periods. Due to these congested conditions, user travel times will continue to increase, the movement of goods through the urban area will be slower, and the deliveries of goods within the urban area will be forced to other times throughout the day. The need for improvements to I-4 is illustrated by the important transportation roles I-4 serves to the Central Florida region and the State of Florida. If no improvements are made to the Interstate, a loss in mobility for the area’s residents, visitors, and commuters can be expected, resulting in a severe threat to the continued viability of the economy and the quality of life.

This update involves revising the original design concept showing four special use lanes for high occupancy vehicles (HOV)/single occupant through vehicles (SOV), as recommended in the FONSI for SR 400 (I-4) from West of Memorial Boulevard (SR 546) to the Polk/Osceola County Line (FPN 201210,1998), to the current proposed design of four (4) Express Lanes. The express Lanes are tolled lanes and will extend the full length of the project. The access to/from the tolled lanes will be evaluated as part of this effort to determine if changes are needed from the previously approved concept for access to/from the HOV Lanes. The original I-4 PD&E Study involved physical separation between the general use lanes and the HOV lanes on I -4,



with demand management in the HOV lanes. The current proposed express lanes will also be separated from the general use travel lanes by two shoulders with a barrier wall in between the shoulders. The original demand management strategy was to control the use of the lanes by requiring a minimum number of occupants per vehicle to maintain an acceptable level of service (Level of Service D). This update addresses revising the demand management tool to convert the HOV lanes to tolled express lanes. A variable pricing tolling plan is proposed for the express lanes. The tolls will vary by time of day and day of week to maintain acceptable levels of service in the express lanes. The tolls will be collected electronically through existing E-Pass, SunPass and other systems currently in place in the Orlando metropolitan area. The conversion to Express Lanes will maintain the same right of way (ROW) limits as documented previously and will not change the impacts to the social, natural or physical environment.

The current PD&E study is an update to the previously approved PD&E study for I-4 from West of Memorial Boulevard to the Polk/Osceola County Line (FM No. 201210-1-21-01, FONSI - December 16, 1998). The original project followed a multi-level screening process which involved preliminary evaluations of the I-4 corridor with respect to constructability, design speeds and type of physical separation between the special use (HOV in the original design concept and express lanes in the current design concept) and general use lanes. The preliminary evaluations were reviewed with FDOT, and the corridor was analyzed with the following project goals:

- Use the existing infrastructure to the maximum extent possible
- Evaluate a barrier-separated facility
- Refine concept plans to minimize traffic disruptions during construction
- Minimize construction costs and ROW requirements
- Avoid and/or minimize impacts especially for wetlands, floodplains, Section 4(f) properties and Section 106 properties

Since the proposed project is a widening project, no alternative alignments were evaluated.

#### **ALTERNATIVES ANALYSIS FROM PD&E:**

The project objective was to develop and evaluate viable interchange alternatives to enhance the ability of the roadways to meet anticipated traffic demands, improve safety, and serve existing and future land uses along the I-4 corridor. The alternatives analysis focuses primarily on the interchanges and pond sites, since the mainline typical section (three general use lanes and two express lanes in each direction) will be consistent with the approved typical section that is being implemented for the I-4 Ultimate section from SR 435 (Kirkman Road) to SR 434.

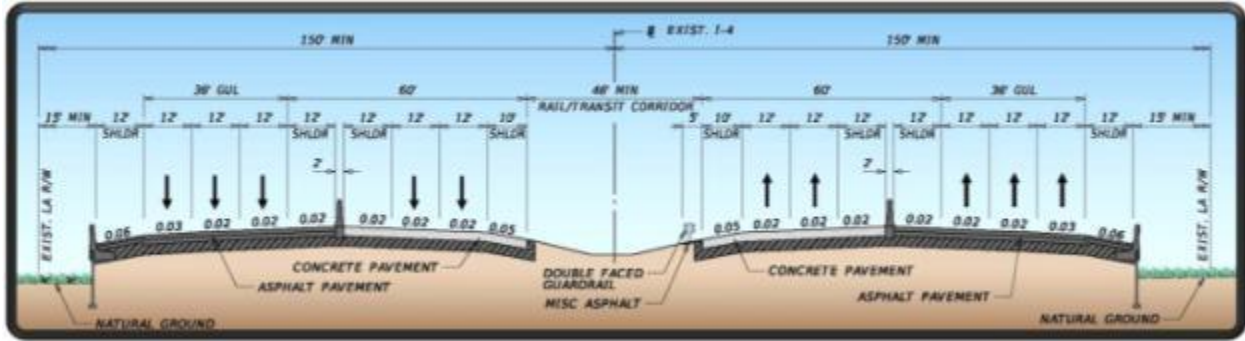
Build alternatives were evaluated for the US 27/SR 25 interchange. The typical section was to be consistent throughout Segment 5 and have six 12-foot general use travel lanes (3 in each direction with 12-foot inside and outside shoulders) and four 12-foot express lanes (2 in each direction with 10-foot inside and outside shoulders). The typical section for this project is shown below.

Eventually Alternative 7 was presented to the VE Team and used as the Baseline for the VE Study. Comparisons of Value Engineered Alternatives (Cost and I-4 / US 27 Interchange Configurations) were based on this Alternative.

**PROJECT LIMITS:**



**TYPICAL SECTION:**



**VALUE ENGINEERING**

The project subject to this Value Engineering Study is designated as FPN #201210-3 and entitled I-4 from West of US 27 to Polk/Osceola County Line. The project length along I-4 is approximately 3 miles with the major component of the project being the I-4 / US 27 Interchange. Alternative 7 was the basis of design and used for comparison purposes.

A critical criteria, and challenge, of the project is the Interchange of I-4 and US 27 and Maintenance of Traffic during construction for continued access to local businesses.

The project construction is expected to cost approximately \$220 million. Currently, the preliminary cost estimate developed by the designers for this stage of design is based on a Rough Order of Magnitude.

# Section 3

# Study Results



## RESULTS

The measurement of the success of a Value Engineering study can be performed in several important ways, mostly depending on the nature of the project under review. In this instance, the results of this study might have been expected to be rather limited due to the constraints, standards of practice and, experience gained from executing similar projects that indicated that the design was on target and achieved the expected goals. However, the VE team was able to identify some creative ideas that are being presented in this section of the report. The workshop resulted in full development of alternatives that offer opportunities for significant first cost savings. These alternatives were selected as being reasonable considerations for incorporation in the design. There were also Design Suggestions that offer measures to simplify construction and provide various means for reducing costs (in these cases these savings are hard to quantify) that may help improve the operational requirements for the finished project, and reduce the construction duration.

The reader will find enclosed a copy of the Summary of Results table that lists the results of the workshop. This table can serve as a “score sheet” for the formal implementation meeting. Following this summary table are documents developed by the VE team that offer the logic behind the developed alternatives and the design suggestions. These are complete with comparisons between the original design and the alternative, sketches, technical calculations, cost estimates and life cycle cost calculations (where applicable) for the original and alternative design components. These documents should be thoroughly evaluated as part of the implementation discussions. The order in which the alternatives are presented is as follows:

***BR – Bridge      RD – Roadway      DR – Drainage***

The cost estimates that are a part of the developed alternatives are intended as general indicators of the cost results should the alternatives be accepted as they are written. Some of the alternatives are mutually exclusive. As a result, it is expected that the identified cost impacts cannot be added and taken as the final, total cost conclusion for the VE workshop.

The Value Engineering team members utilized the rough order of magnitude costs and quantities from the design documents provided by the Design Team wherever possible and used nationwide averages where appropriate (from experience). This was done to make sure that comparisons between original and alternative costs were handled consistently and fairly. When the VE team deviated from this practice by providing their own unit costs or referenced the historic data from the FDOT historic cost records, mostly for alternative materials, it has been clearly noted in the cost calculations that accompany the developed alternatives. Likewise, if there was an uncertainty in using either unit costs or quantities in the supplied estimates, these deviations were clearly annotated in the VE Team's documentation.

If the alternatives and design suggestions are approached in a positive manner, the best results can be obtained from this workshop by reviewing the alternatives with an eye to how best to make use of the alternative in question. Before rejection of a Design Alternative or Design Suggestion, the reviewers should first ask, “if we take this idea and change it to do \_\_\_\_\_, then we can accept it.” This is a positive approach. If the alternative is unacceptable, then a reason or reasons should be clearly recorded for its rejection. The ideas may be mutually exclusive of others being considered. In these instances the cost impact should reside with the alternative that is finally accepted.

Some Design Suggestions are self-explanatory by their titles and did not warrant an elaboration.



**Florida Department of Transportation**  
**I-4 from West of US 27 to Polk/Osceola County Line**  
**FPN #201210-3**  
**Value Engineering Workshop: December 8 - 12, 2014**  
**SUMMARY OF RESULTS**

		VE Team Ranking	Cost Original Design	Cost Alternative	Initial Cost Reduction	Life Cycle Cost Impact	Net Cost Reduction Including LCC
<b>BRIDGE (BR)</b>							
BR1	Provide at-grade intersection US 27 at Frontage Road	5	\$12,148,416	\$1,406,967	\$10,741,449	\$0	\$10,741,449
BR2	Provide at-grade intersection at I-4 WB off ramp/US 27 NB on ramp/Burger King access	5	\$10,497,110	\$288,480	\$10,208,630	\$0	\$10,208,630
BR3	Shift westbound exit ramp from express lanes westward to avoid conflict	ABD	Already Being Done				
BR4	Replace the bridge btw Sta. 78+00 and 86+50 on South US 27 with two single span bridges and MSE Walls	4	\$7,225,920	\$3,115,584	\$4,110,336	\$0	\$4,110,336
BR5	Adjust the alignment of westbound I-4 Ramp to US 27 North to reduce the ramp bridge skew and shorten the bridge length	4	\$2,771,328	\$1,846,656	\$924,672	\$0	\$924,672
BR6	Reduce distance between Lanes at Sta. 515 to Sta. 520 on Mainline	2	Not developed				
BR7	Use US 27 - Alternative 4 with Direct Connect Express Lane Ramps relocated to Southern Interchange Intersection	5	\$117,436,245	\$80,354,688	\$37,081,557	\$0	\$37,081,557
BR8	Reduce westbound Express Lane off ramp requirements by merging into Mainline off ramp	See BR-7	See BR-7				
BR9	Provide Tunnel for eastbound on ramp	2	Not developed				
BR10	Reconfigure US 27/I-4 Interchange utilizing SPD and Ramps to CD system	5	\$54,259,200	\$37,996,800	\$16,262,400	\$0	\$16,262,400
BR11	Provide Tunnel for westbound Express Lane exit	2	Not developed				
<b>ROADWAY (RD)</b>							
RD1	Relocate US 27 northbound left movement for continuous movement	See BR-2	See BR-2				
RD2	Relocate US 27 southbound left movement for continuous movement	See BR-1	See BR-1				
RD3	Bifurcate eastbound and westbound profiles using Retaining Walls	DS	DESIGN SUGGESTION				
RD4	Combine westbound General Use & CD Lanes on I-4 east of US 27	2	Not developed				
RD5	Elevate Express Lanes	1	Not developed				
RD6	Provide 4' inside shoulders for the express lanes along this corridor adjacent to Segment 1 to the east	4	\$14,160,623	\$8,967,106	\$5,193,517	\$0	\$5,193,517
RD7	Provide 10' inside shoulders for the express lanes along this corridor adjacent to District 1 I-4 master plan	4	DESIGN SUGGESTION				
RD8	Provide Full Width (12') Shoulder on the inside in the Interim	ABD	Already Being Done				
RD9	Mitigate potential for Wrong Way Drivers	DS	DESIGN SUGGESTION				
RD10	Reduce Border Width @ Proposed CPP Interchange Connection Location	DS	DESIGN SUGGESTION				
RD11	Verify Railroad Corridor width requirements to be 44'	DS	DESIGN SUGGESTION				
RD12	Reduce Outside Shoulder width to 8' on Express Lanes	2	Not developed				
RD13	Lower Railroad Profile at US 27 Interchange to reduce Bridge Vertical Clearance requirements	ABD	Already Being Done				
RD14	Equalize I-4 eastbound and westbound Profiles to address Grade Separation	DS	DESIGN SUGGESTION				
RD15	Provide 2' Inside Shoulder on Express Lanes	2	Not developed				
RD16	Consider providing roundabouts on US 27 at Sta. 57 and Sta. 82	DS	DESIGN SUGGESTION				
RD17	Reconcile Cost Estimates	DS	DESIGN SUGGESTION				



**Florida Department of Transportation**  
**I-4 from West of US 27 to Polk/Osceola County Line**  
**FPN #201210-3**  
**Value Engineering Workshop: December 8 - 12, 2014**  
**SUMMARY OF RESULTS**

		VE Team Ranking	Cost Original Design	Cost Alternative	Initial Cost Reduction	Life Cycle Cost Impact	Net Cost Reduction Including LCC
<b>DRAINAGE (DR)</b>							
DR1	Maximize existing Ponds within I-4/US 27 interchange	DS	DESIGN SUGGESTION				
DR2	Accommodate impacts to Pond on Ritchie property	4	\$0	\$4,808,514	(\$4,808,514)	\$0	(\$4,808,514)
DR3	Utilize existing Pond E Parcel at Sta. 520+00 (RT)	5	\$1,500,000	\$0	\$1,500,000	\$0	\$1,500,000
DR4	Enhance Existing Wetland with Floodplain Compensation	DS	DESIGN SUGGESTION				
DR5	Update location of proposed Ponds	DS	DESIGN SUGGESTION				
DR6	Develop regional combined options to accommodate I-4, CPP, and Grandview Parkway	DS	DESIGN SUGGESTION				
DR7	Review VE alternatives for Basin 100	DS	DESIGN SUGGESTION				
DR8	Use Contours in lieu of 100-Year FEMA Boundary for Floodplain Calculations	DS	DESIGN SUGGESTION				
<b>GRAND TOTAL</b>			<b>\$219,998,842</b>	<b>\$138,784,795</b>	<b>\$81,214,047</b>	<b>\$0</b>	<b>\$81,214,047</b>



# Value Analysis Design Alternative

PROJECT:	<i>Florida Department of Transportation</i> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:	<b>BR-1 (RD-02)</b>
DESCRIPTION:	<b>Provide at-grade intersection US 27 at Frontage Road</b>	SHEET NO.:	<b>1 of 8</b>

**Original Design:**

The original design includes an 800 foot structure carrying 3 travel lanes with shoulders for NB US 27 and a 500 foot structure carrying 2 travel lanes with shoulders for the I-4 EB on ramp. Beneath the 500 foot structure, a slip ramp is provided for the EB I-4 to SB US 27 movement. In addition, a U-turn lane for SB US 27 to NB US 27 is provided.

**Alternative:**

The alternate is to provide an at-grade intersection with a partial Continuous Flow Intersection to accommodate US 27 SB left turn at Frontage Road. The alternate is to provide an at-grade intersection which relocates the SB US 27 left turn lane east of NB US 27 lanes. This partial continuous flow intersection will require a crossover signal to allow for the left turn lanes to crossover the NB US 27 lanes. The U-turn lane for SB US 27 to NB US 27 will be eliminated. The I-4 EB exit ramp to NB US 27 connection will be relocated to approximate crossover signal location. The structure for NB US 27, the structure for EB I-4 On Ramp and the EB I-4 to SB US 27 movement are all eliminated. A 780 foot lane will be added for the WB approach to the signal and a receiving lane will be added to accommodate the SB US 27 left turn.

**Opportunities:**

- Reduced construction costs
- Provides in and out access to businesses west of US 27 similar to existing access
- Accommodates U-turns at crossover signal

**Risks:**

- Decreases the intersection LOS
- Left turn crossover signal may violate signal spacing criteria for US 27

**Technical Discussion:**

The design of the alternate includes the use of one crossover signal prior to the intersection signal to allow for NB US 27 traffic to stop and allow for SB US 27 left turn traffic to get into the relocated left turn lane. This would require the realignment of the I-4 EB off ramp to NB US 27 to connect to US 27 north of the Frontage Road intersection at approximate Station 65+00. The crossover signal will allow left turns to get into left turn pocket during the signal phase that allows for the east-west movement.

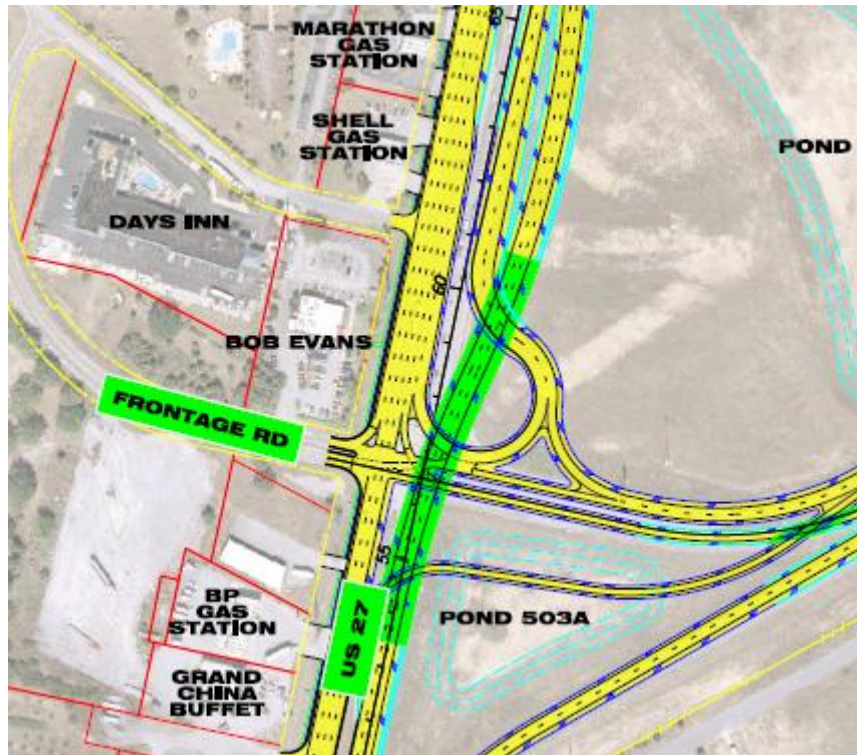
US 27 is an Access Management Class 2 facility. Per Rule Chapter 14-97, Class 2 requires 1320 feet for directional median openings and 2640 feet for full median/signalized openings.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 12,148,416	\$	\$ 12,148,416
ALTERNATIVE	\$ 1,406,967	\$	\$ 1,406,967
SAVINGS	\$ 10,741,449	\$	\$ 10,741,449



## *Illustration*

PROJECT:	<b>Florida Department of Transportation I-4 from West of US 27 to Polk/Osceola County Line FPN #201210-3</b>	ALTERNATIVE NO.:	<b>BR-1 (RD-02)</b>
DESCRIPTION:	<b>Provide at-grade intersection US 27 at Frontage Road</b>	SHEET NO.:	<b>2 of 8</b>



Above is the original design for this intersection.

# Illustration

PROJECT: **Florida Department of Transportation**  
**I-4 from West of US 27 to Polk/Osceola County Line**  
**FPN #201210-3**

ALTERNATIVE NO.:  
**BR-1 (RD-02)**

DESCRIPTION: **Provide at-grade intersection US 27 at Frontage Road**

SHEET NO.: **3 of 8**



While the above image shows a full Continuous Flow Intersection (CFI) at this location a partial CFI is proposed for the NB US 27 left turn traffic at the intersection.

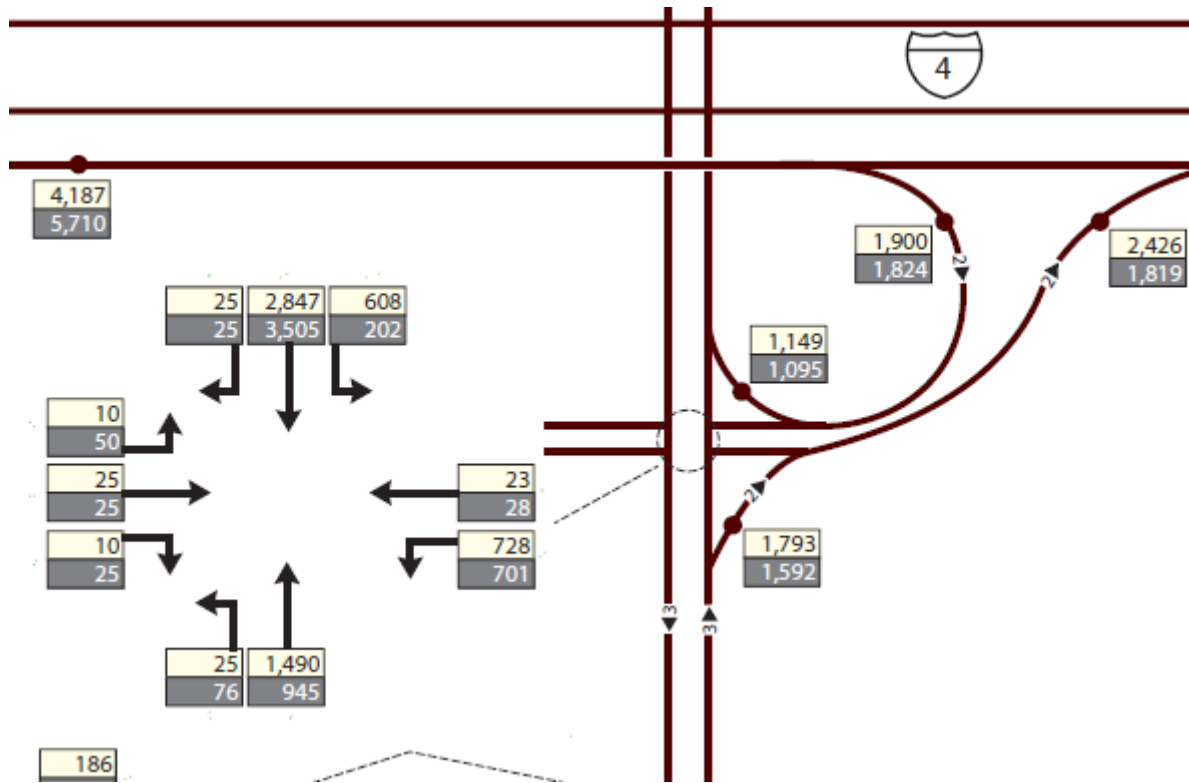
# Illustration

PROJECT: **Florida Department of Transportation  
I-4 from West of US 27 to Polk/Osceola County Line  
FPN #201210-3**

ALTERNATIVE NO.:  
**BR-01 (RD-02)**

DESCRIPTION: **Provide at-grade intersection US 27 at Frontage Road**

SHEET NO.: **4 of 8**



Above are the 2040 build volumes for peak hour traffic. Dark shaded volumes are the PM peak volumes and light shaded volumes are AM peak.

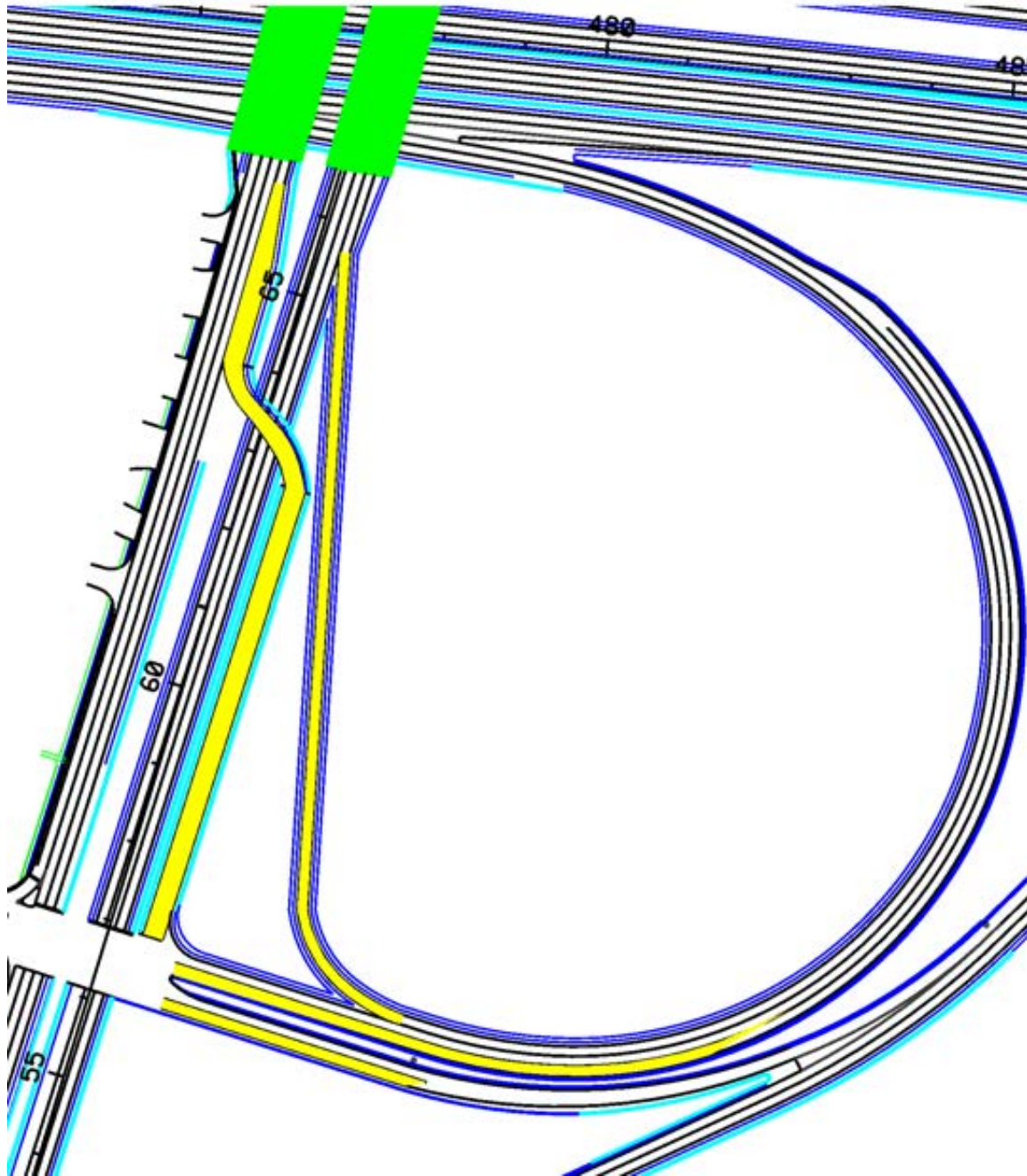
# Illustration

PROJECT: **Florida Department of Transportation**  
**I-4 from West of US 27 to Polk/Osceola County Line**  
**FPN #201210-3**

ALTERNATIVE NO.:  
**BR-01 (RD-02)**

DESCRIPTION: **Provide at-grade intersection US 27 at Frontage Road**

SHEET NO.: **5 of 8**



Above is the conceptual drawing for the proposed at grade intersection. The yellow indicate the added features

# Calculations

PROJECT:	<b>Florida Department of Transportation I-4 from West of US 27 to Polk/Osceola County Line FPN #201210-3</b>	ALTERNATIVE NO.:
		<b>BR-1 (RD-02)</b>
DESCRIPTION:	<b>Provide at-grade intersection US 27 at Frontage Road</b>	SHEET NO.: <b>6 of 8</b>

**Assumptions:**

- 1) Assume SB dual left turn lanes can be merged before the merge on the ramp onto I-4 EB.
- 2) Cost used from PD&E
- 3) Assumed MSE wall cost is 5% of Structure Cost

**Calculations:**

Original Design Includes:

Cost of 800 foot bridge on US 27 with MSE Wall south of I-4 = **TOTAL \$7,856,184**

Structure (46,763 sf) = \$7,482,080 ; MSE wall 5% Structure Cost = \$374,104

Cost of 500 foot bridge with MSE Wall = **TOTAL \$2,267,496**

Structure (13,497 sf) = \$2,159,520 ; MSE wall 5% Structure Cost = \$107,976

Alternative Design:

Cost of signalization including crossover signal = **TOTAL \$150,000**

Since there is already a signal proposed at this intersection, the only additional cost considered is for the crossover signal. Assume \$150,000.

Cost of dual left turn lane relocation = **TOTAL \$0**

This cost is offset because it was simply a relocation of features already proposed.

Cost of 800 foot ramp extension (I-4 EB off ramp to NB US 27) = **TOTAL \$ 628,018**

(Friction Course FC-5) \$117.20

800 feet x 12 foot lane x 1.333 SY/SF x 110 lbs/SY x 1 TN/2000 lbs x .75 in = 528 TN

528 TN x \$117.20 = **\$ 61,882**

(Superpave Traffic D-PG 76-22) \$89.64/TN

800 feet x 12 foot lane x 1.333 SY/SF x 110 lbs/SY x 1 TN/2000 lbs x 2 in = 1,408 TN

1,408 TN x \$89.64 = **\$ 126,213**

(Base Group 12) \$14.02/SY

800 feet x 12 foot lane x 1.333 SY/SF = 12,797 SY

12,797 SY x \$14.02 = **\$179,414**

(Stablization) \$2.90/ SY

12,797 SY x \$2.90 = **\$37,111**

2 Shoulders

(Stablization) \$2.90/ SY

800 feet x 2 x 4 foot shoulders x 1.333 SY/SF = 8,531 SY

8,531 SY x \$2.90 = **\$ 24,740**

(Base Group 6) \$13.69/SY

8,531 SY x \$13.69 = **\$116,789**

(Superpave Traffic B) \$87.28/TN

8,531 SY x 110 lbs/SY x 1 TN/ 2000 lbs x 2 in = 938 TN

938 TN x \$87.28 = **\$81,869**





## Calculations

PROJECT: **Florida Department of Transportation**  
**I-4 from West of US 27 to Polk/Osceola County Line** ALTERNATIVE NO.:  
**FPN #201210-3** **BR-1 (RD-02)**

DESCRIPTION: **Provide at-grade intersection US 27 at Frontage Road** SHEET NO.: **7 of 8**

Cost of additional 780 feet WB approach lane = **TOTAL \$ 394,455**

(Friction Course FC-5) \$117.20

780 feet x 12 foot lane x 1.333 SY/SF x 110 lbs/SY x 1 TN/2000 lbs x .75 in = 515 TN

515 TN X \$117.20 = **\$60,358**

(Superpave Traffic D-PG 76-22) \$89.64/TN

780 feet x 12 foot lane x 1.333 sq yards/sq foot x 110 lbs/SY x 1 TN/2000 lbs x 2 in = 1,372 TN

1,372 TN X \$89.64 = **\$122,986**

(Base Group 12) \$14.02/SY

780 feet x 12 foot lane x 1.333 SY/SF = 12,477 SY

12,477 x \$14.02 = **\$174,928**

(Stabilization) \$2.90/ SY

12,477 SY x \$2.90 = **\$36,183**

Cost of additional receiving lane for SB US 27 left turn = **TOTAL \$0**

This cost is offset by the elimination of the WB I-4 to SB US 27

**Note:** The above figures are conservative approximations favoring the original design. A more detailed analysis will result in additional savings.





# Value Analysis Design Alternative

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:
		<b>BR-02 (RD-01)</b>
DESCRIPTION:	<b>Provide at-grade intersection at I-4 WB off ramp/US 27 NB on ramp/Burger King access</b>	SHEET NO.: 1 of 7

**Original Design:**

The original design includes a 900 foot structure carrying 2 SB US 27 travel lanes with shoulders and an 800 foot bridge for WB I-4 to NB US 27.

**Alternative:**

The alternate is to provide an at-grade intersection which relocates the NB US 27 left turn lanes west of SB US 27 lanes. This partial continuous flow intersection will require a crossover signal to allow for the left turn lanes to crossover the SB US 27 lanes. The u-turn lanes and turn out pavement for NB US 27 will be eliminated. The relocation of the NB left turn lanes will require the WB I-4 ramp to SB US 27 to be extended.

**Opportunities:**

- Reduced construction costs
- Provides in and out access to businesses east of US 27 similar to existing access
- Accommodates U-turns at crossover signal

**Risks:**

- Decreases the intersection LOS
- Left turn crossover signal may violate signal spacing criteria for US 27

**Technical Discussion:**

The design of the alternate includes the use of one crossover signal prior to the intersection signal. This allows for NB US 27 left turn traffic to crossover the SB US 27 lanes during the signal phase that accommodates the east-west movement at the intersection signal.

The Access Management Classification is a 2 and per Rule Chapter 14-97, the directional median opening spacing is 1320 feet and the full/signalized median opening spacing is 2640 feet.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 10,497,110	\$	\$ 10,497,110
ALTERNATIVE	\$ 288,480	\$	\$ 288,480
SAVINGS	\$ 10,208,630	\$	\$ 10,208,630



# Illustration

PROJECT:	<b>Florida Department of Transportation I-4 from West of US 27 to Polk/Osceola County Line FPN #201210-3</b>	ALTERNATIVE NO.:	<b>BR-02 (RD-01)</b>
DESCRIPTION:	<b>Provide at-grade intersection at I-4 WB off ramp/US 27 NB on ramp/Burger King access</b>	SHEET NO.:	<b>2 of 7</b>



Above is the original design for this intersection.

## Illustration

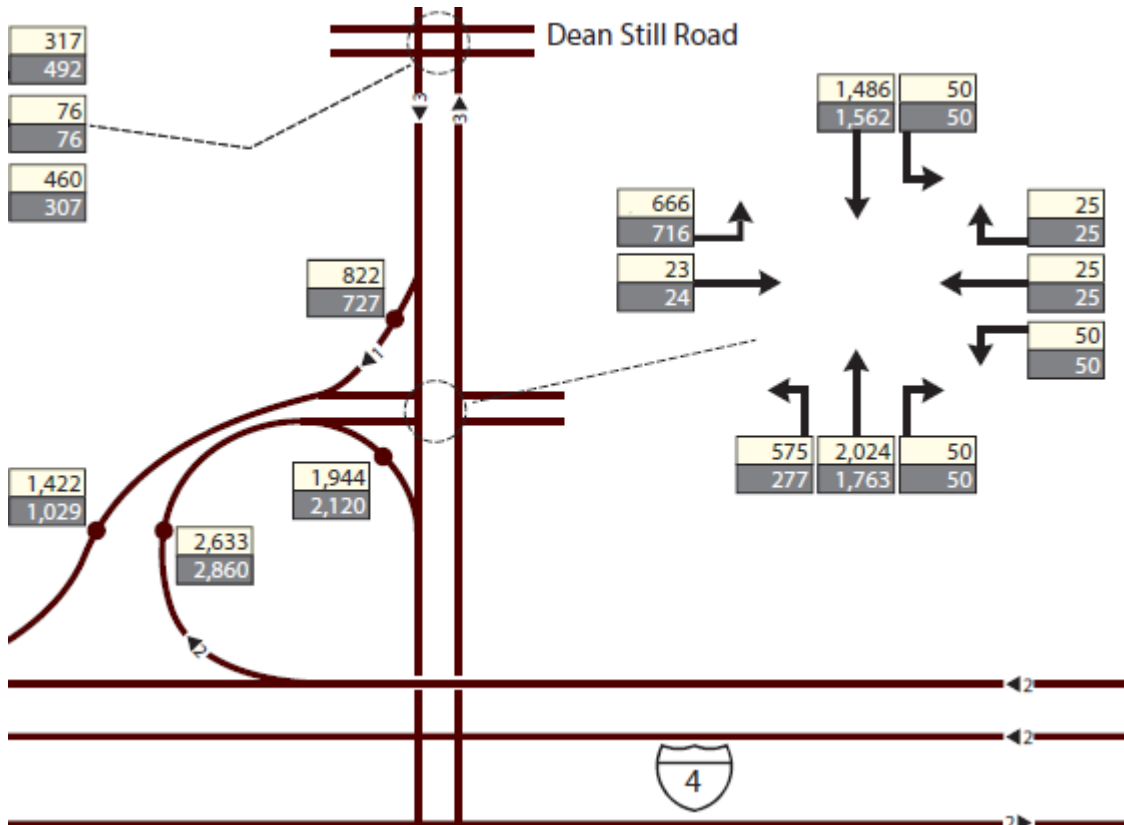
PROJECT:	<b>Florida Department of Transportation I-4 from West of US 27 to Polk/Osceola County Line FPN #201210-3</b>	ALTERNATIVE NO.:	<b>BR-02 (RD-01)</b>
DESCRIPTION:	<b>Provide at-grade intersection at I-4 WB off ramp/US 27 NB on ramp/Burger King access</b>	SHEET NO.:	<b>3 of 7</b>



While the above image shows a full Continuous Flow Intersection (CFI) at this location a partial CFI is proposed for the NB US 27 left turn traffic at the intersection.

# Illustration

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:
		<b>BR-02 (RD-01)</b>
DESCRIPTION:	<b>Provide at-grade intersection at I-4 WB off ramp/US 27</b> <b>NB on ramp/Burger King access</b>	SHEET NO.: 4 of 7



Above is the 2040 build volumes for peak hour traffic. Dark shaded volumes are the pm peak volumes and light shaded volumes are am peak.

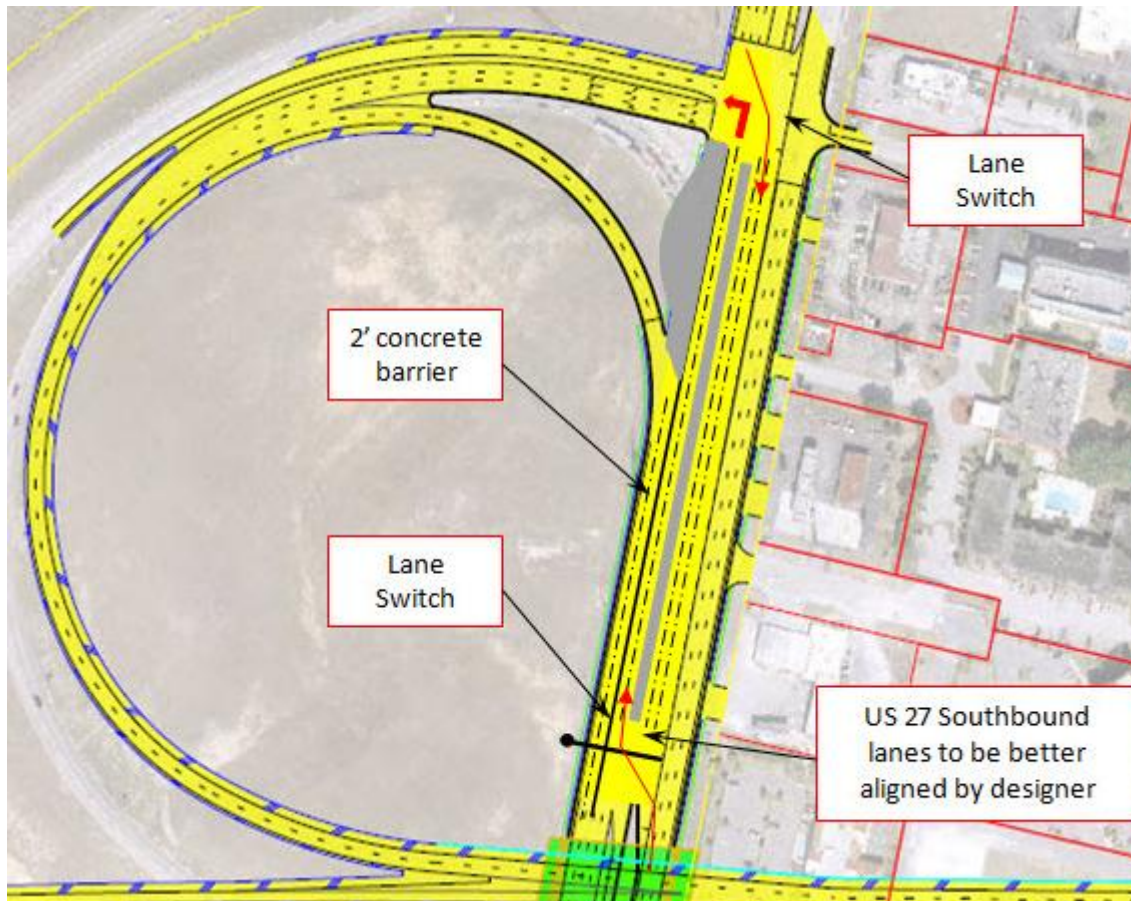
# Illustration

PROJECT: **Florida Department of Transportation  
I-4 from West of US 27 to Polk/Osceola County Line  
FPN #201210-3**

ALTERNATIVE NO.:  
**BR-02 (RD-01)**

DESCRIPTION: **Provide at-grade intersection at I-4 WB off ramp/US 27  
NB on ramp/Burger King access**

SHEET NO.: **5 of 7**



Above is the proposed intersection design concept.

# Calculations

PROJECT:	<b>Florida Department of Transportation I-4 from West of US 27 to Polk/Osceola County Line FPN #201210-3</b>	ALTERNATIVE NO.:
		<b>BR-02 (RD-01)</b>
DESCRIPTION:	<b>Provide at-grade intersection at I-4 WB off ramp/US 27 NB on ramp/Burger King access</b>	SHEET NO.: 6 of 7

**Assumptions:**

- 1) Cost used from PD&E
- 2) Assumed MSE wall cost is 5% of Structure Cost
- 3) Barrier wall will be needed to separate NB US 27 left turn lane from WB I-4 exit ramps.

**Calculations:**

Original Design Includes:

Cost of 900 foot bridge, MSE Wall and u-turn jug handle south of I-4 = **TOTAL \$ 6,322,680**

Structure ( 37,635 sf) = \$ 6,021,600 ; MSE wall 5% Structure Cost = \$ 301,080

Cost of 400 ft bridge, MSE Wall for NB US 27 exit ramp= **TOTAL \$ 2,424,912**

Structure ( 14,434 sf) = \$ 2,309,440 ; MSE wall 5% Structure Cost = \$ 115,472

Alternative Design:

Cost of crossover signalization = **TOTAL \$150,000**

Since the intersection was already going to have a traffic signal this cost is only for the crossover signal.

800 foot concrete barrier wall = **TOTAL \$90,400**

\$113/LF x 800 LF = \$90,400

Cost of additional SB US 27 travel lane = **TOTAL \$0**

The cost of the additional SB travel lane is offset by eliminating the additional exit ramp lane that was intended for u-turn movement to merge onto SB US 27.

**Note:** The above figures are conservative approximations favoring the original design. A more detailed analysis will result in additional savings.





# *Value Analysis Design Alternative*

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:
		<b>BR-04</b>
DESCRIPTION:	<b>Replace the bridge btw Sta. 78+00 and 86+50 on</b> <b>South US 27 with two single span bridges and MSE</b> <b>Walls</b>	SHEET NO.: 1 of 4

**Original Design:**

The original design involves the construction of an 880'+- long bridge over Westbound I-4 to North US 27 Ramp and Burger King access.

**Alternative:**

The alternate design proposes building two single span bridges over Westbound I-4 to North US 27 Ramp and over Burger King access and to connect/plug the bridges with MSE walls.

**Opportunities:**

- Reduced cost
- Reduced construction time
- Reduced structure maintenance

**Risks:**

- Minimal redesign.

**Technical Discussion:**

The design of the alternate includes building one 70' long single span bridge over Westbound I-4 to North US 27 Ramp and one 175' long single span bridge over Burger King access. This alternative will save 635' +- long bridge length compared with 880' bridge in original design.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$7,225,920	\$	\$7,225,920
ALTERNATIVE	\$3,115,584	\$	\$3,115,584
SAVINGS	\$4,110,336	\$	\$4,110,336

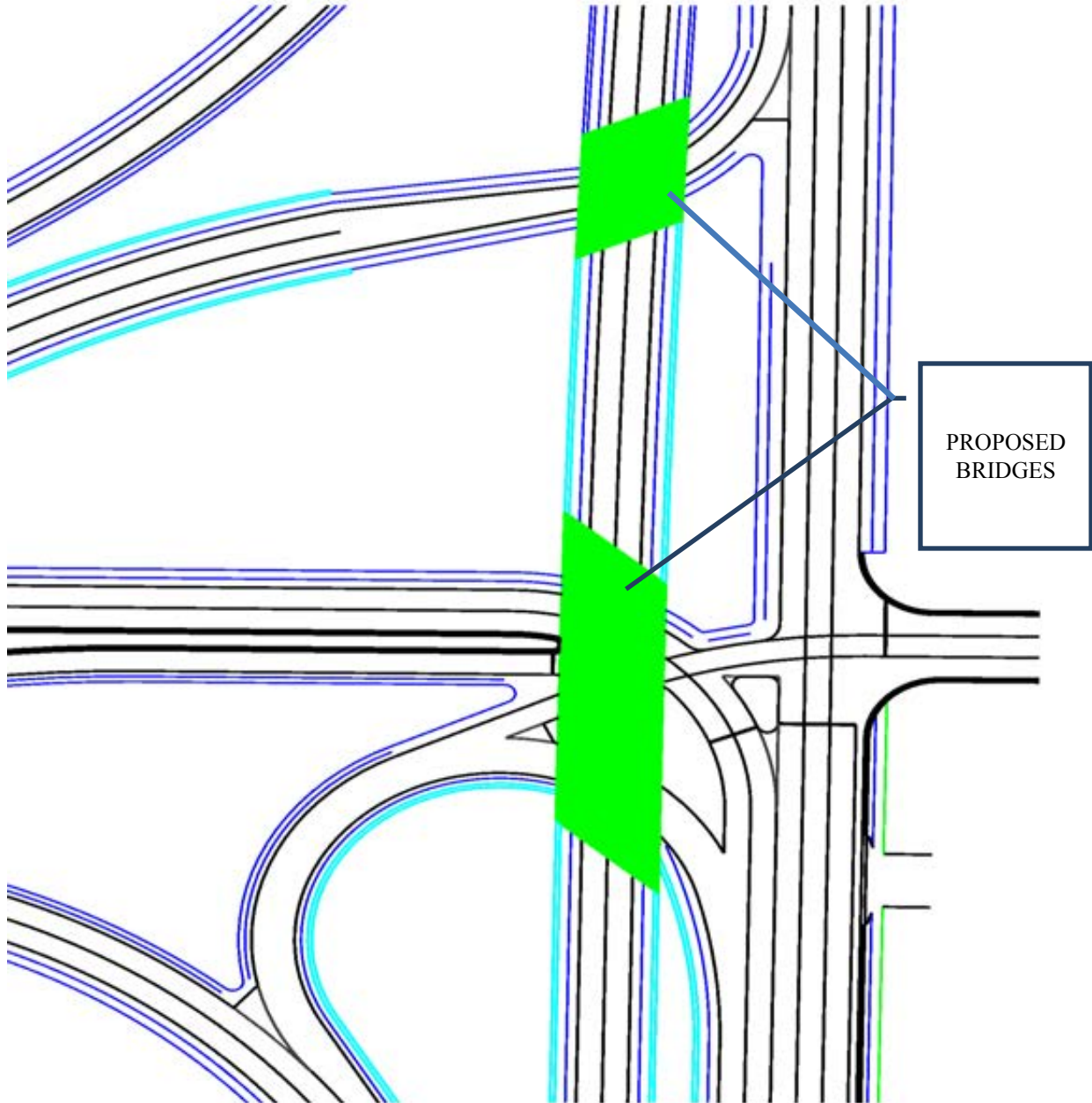
# Illustration

PROJECT: **Florida Department of Transportation**  
**I-4 from West of US 27 to Polk/Osceola County Line**  
**FPN #201210-3**

ALTERNATIVE NO.:  
**BR-04**

DESCRIPTION **Replace the bridge btw Sta. 78+00 and 86+50 on**  
**South US 27 with two single span bridges and MSE**  
**Walls**

SHEET NO.: **2 of 4**





## Calculations

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:
		<b>BR-04</b>
DESCRIPTION:	<b>Replace the bridge btw Sta. 78+00 and 86+50 on</b> <b>South US 27 with two single span bridges and MSE</b> <b>Walls</b>	SHEET NO.: <b>3 of 4</b>

**Assumptions:**

- 1) All bridge costs in original design were provided by consultants to the VE Team.
- 2) Bridge cost was estimated at \$160 SF.
- 3) Permanent MSE wall cost was estimated at \$28 SF.

**Calculations:**

Original Design Includes:

Cost of bridge = \$6,021,600

20% Contingency of bridge = \$1,204,320

Alternative Design:

Cost of bridge = \$2,596,320

20% Contingency of bridge = \$519,264

Total Savings =  $(\$6,021,600 + \$1,204,320) - (\$2,596,320 + \$519,264) = \$4,110,336$

**Note:** The above figures are conservative approximations favoring the original design. A more detailed analysis will result in additional savings.



# Cost Worksheet

PROJECT:	Florida Department of Transportation I-4 from West of US 27 to Polk/Osceola County Line FPN #201210-3	ALTERNATIVE NO.:	<b>BR-04</b>
DESCRIPTION:	Replace the bridge btw Sta. 78+00 and 86+50 on South US 27 with two single span bridges and MSE Walls	SHEET NO.:	4 of 4

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Bridge	SF	37,635	\$ 160.00	\$ 6,021,600	11,782	\$ 160.00	\$ 1,885,120
MSE Wall	SF			\$ -	25,400	\$ 28.00	\$ 711,200
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<b>Sub-total</b>				\$ 6,021,600			\$ 2,596,320
<b>Mark-up at</b>	<b>20.00%</b>			\$ 1,204,320			\$ 519,264
<b>TOTAL</b>				<b>\$ 7,225,920</b>			<b>\$ 3,115,584</b>

Estimated Savings: \$4,110,336



# *Value Analysis Design Alternative*

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:
		<b>BR-05</b>
DESCRIPTION:	<b>Adjust the alignment of westbound I-4 Ramp to US 27 North to reduce the ramp bridge skew and shorten the bridge length.</b>	SHEET NO.: 1 of 4

**Original Design:**

The original design is to construct the westbound I-4 ramp bridge to North US 27 close to the South US 27 access road to westbound I-4.

**Alternative:**

The alternate design is to shift the alignment of westbound I-4 ramp to US 27 North towards the Burger King access and reduce the bridge length.

**Opportunities:**

- Reduced cost
- Reduced construction time
- Reduced structure maintenance

**Risks:**

- Minimal redesign

**Technical Discussion:**

The design of the alternate will reduce the bridge skew and allow to reduce the bridge length from

420' to 255'.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$2,771,328	\$	\$2,771,328
ALTERNATIVE	\$1,846,656	\$	\$1,846,656
SAVINGS	\$924,672	\$	\$924,672

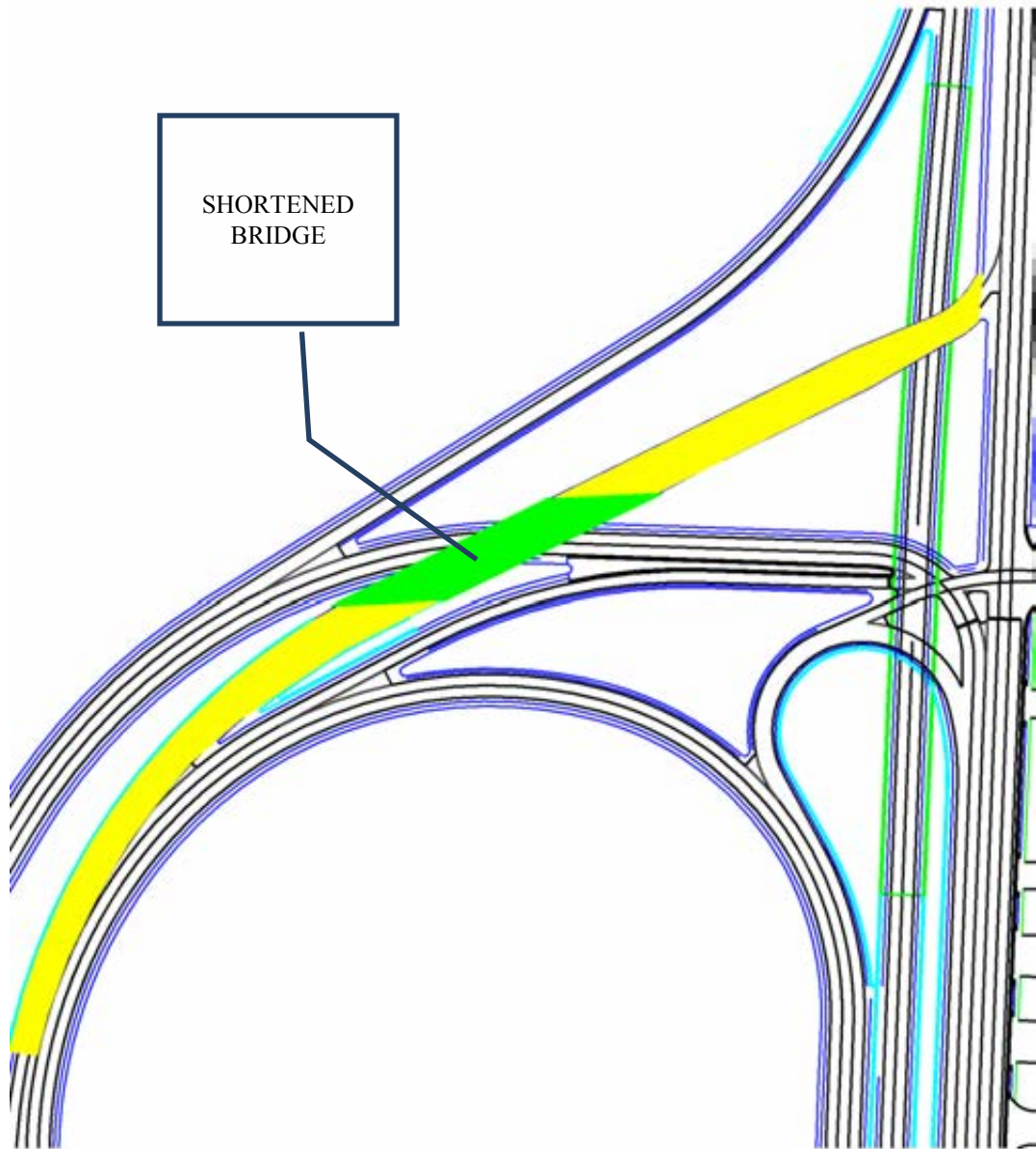
# Illustration

PROJECT: **Florida Department of Transportation**  
**I-4 from West of US 27 to Polk/Osceola County Line**  
**FPN #201210-3**

ALTERNATIVE NO.:  
**BR-05**

DESCRIPTION: **Adjust the alignment of westbound I-4 Ramp to US 27**  
**North to reduce the ramp bridge skew and shorten the**  
**bridge length**

SHEET NO.: **2 of 4**



## Calculations

PROJECT:	<b>Florida Department of Transportation I-4 from West of US 27 to Polk/Osceola County Line FPN #201210-3</b>	ALTERNATIVE NO.:	<b>BR-05</b>
DESCRIPTION:	<b>Adjust the alignment of westbound I-4 Ramp to US 27 North to reduce the ramp bridge skew and shorten the bridge length</b>	SHEET NO.:	<b>3 of 4</b>

### **Assumptions:**

- 1) All bridge costs in original design were provided by consultants to the VE Team.
- 2) Bridge cost was estimated at \$160 SF for bridges.
- 3) Permanent MSE wall cost was estimated at \$28 SF.

### **Calculations:**

Original Design Includes:

Cost of bridge = \$2,309,440

20% Contingency of bridge = \$461,888

Alternative Design:

Cost of bridge = \$1,538,880

20% Contingency of bridge = \$307,776

Total Savings =  $(\$2,309,440 + \$461,888) - (\$1,538,880 + \$307,776) = \$924,672$

**Note:** The above figures are conservative approximations favoring the original design. A more detailed analysis will result in additional savings.



# Cost Worksheet

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:
		<b>BR-05</b>
DESCRIPTION:	<b>Adjust the alignment of westbound I-4 Ramp to US 27</b> <b>North to reduce the ramp bridge skew and shorten the</b> <b>bridge length</b>	SHEET NO.: 4 of 4

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Bridge	SF	14,434	\$ 160.00	\$ 2,309,440	8,925	\$ 160.00	\$ 1,428,000
MSE Wall	SF			\$ -	3,960	\$ 28.00	\$ 110,880
				\$ -			\$ -
				\$ -			\$ -
				\$ -			\$ -
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<b>Sub-total</b>				\$ 2,309,440			\$ 1,538,880
<b>Mark-up at</b>	<b>20.00%</b>			\$ 461,888			\$ 307,776
<b>TOTAL</b>				<b>\$ 2,771,328</b>			<b>\$ 1,846,656</b>

Estimated Savings: \$924,672

# *Value Analysis Design Alternative*

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:  <b>BR-07</b>
DESCRIPTION:	<b>Use US 27 - Alternative 4 with Direct Connect</b> <b>Express Lane Ramps relocated to Southern</b> <b>Interchange Intersection</b>	SHEET NO.: <b>1 of 7</b>

**Original Design:**

The original design/base design is Alternative 7 that utilizes six structures to accommodate movements at ramps, one of which is a braided ramp for the WB Express Lane off ramp to tie into the WB CD system.

**Alternative:**

The alternate would utilize US 27- Alternative 4 that uses signalized intersections at the US 27 ramp tie ins. The difference to Alt. 4 is that the direct connect express lanes are relocated into the existing ramp entrances and entrances at the south intersection, mitigating the original concern with alternative 4 with the ramp tie ins on the bridge.

**Opportunities:**

- Eliminate four structures -Significant structures cost savings
- Eliminate one lane under the US 27 bridges
- Reduce impacts to the Holiday Inn Express and Richey Brothers Parcels
- Eliminate access concerns with Alternative 7 U-turn design
- Significant less impacts for MOT due to reduced number of structures
- Better driver expectancy as compared to base design

**Risks:**

- Weave concern on the ramps to connect SUL to GUL ramps.
- Pond Impacts
- Contingent upon traffic analysis at southern intersection (adding all SUL traffic to intersection)
- Additional structure crossing future Rail Corridor

**Technical Discussion:**

The Base Design utilizes several structures to accommodate the proposed interchange concept. The cost of structures, the impacts to adjacent parcel access and impacts to driver expectancy were reasons for the Value Engineering Team to investigate different alternative interchange options. The Value Engineering Team looked at the previous viable alternatives presented at the alternatives workshop to determine if there were any opportunities to enhance the previous efforts.

Alternative 4 was an alternative that maintained the existing interchange configuration but handled connections to the SUL by a connection directly to the US 27 bridges over I-4. This configuration presented some concerns to the department as it directionalized those ingress and egress movements to the SULs. For example, if exiting the SUL onto US27, the only direction the traffic could travel is Northbound. To resolve the directionalized traffic concern, unconventional U-turn movements were provided at the adjacent intersection. Another concern that was presented was the SUL traffic coming to a 'T' intersection on the bridge. This presents a safety concern for traffic that fails to slow upon entry into the intersection.

**(Technical Discussion Cont'd next page.....)**



# *Value Analysis Design Alternative*

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:
		<b>BR-07</b>
DESCRIPTION:	<b>Use US 27 - Alternative 4 with Direct Connect</b> <b>Express Lane Ramps relocated to Southern</b> <b>Interchange Intersection</b>	SHEET NO.: <b>2 of 7</b>

**Technical Discussion (Cont'd):**

To address these concerns, the VE Team looked to relocate the connections to the SULs to a different location. The option that best suited cost, access and driver expectancy was to relocate the SUL ramps to the existing southern interchange connections. This option requires a bridge to span the EB lanes and the future rail corridor to facilitate the WB SUL exit lanes. While this structure is likely to be costly, compared to the base this would be a significant overall cost savings.

Some additional impact reductions from the base design include ROW minimization on the north side of I-4, particularly avoidance of the Holiday Inn Express Parcel and the Richie Brothers building structure.

Due to the limited time constraints for the VE Team to investigate the different options, the following risks should be evaluated before formal implementation of the option to confirm the validity of the proposal.

The southern intersection as shown in alternative 4 would need to accommodate the additional volumes of the SUL traffic. This could warrant additional intersection improvements. A traffic analysis would be necessary.

The ramp merge for both the on and off ramps to the SULs will need to be evaluated for weave and transitions as this was not fully evaluated in this review.

The alternative maintains the curved rail corridor from the original alternative 4 and 7 options. If the rail alignment must remain tangent in this area, some of the ROW impact reductions reflected in this proposal are no longer valid.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 117,436,245	\$	\$ 117,436,245
ALTERNATIVE	\$ 80,354,688	\$	\$ 80,354,688
SAVINGS	\$ 37,081,557	\$	\$ 37,081,557

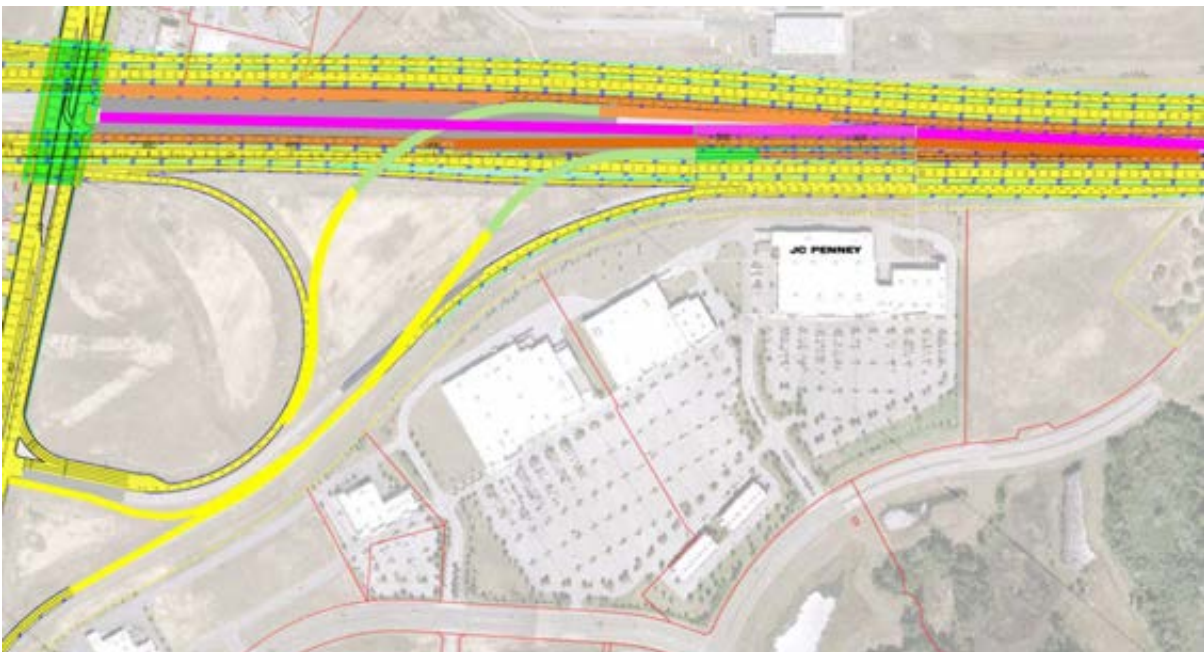
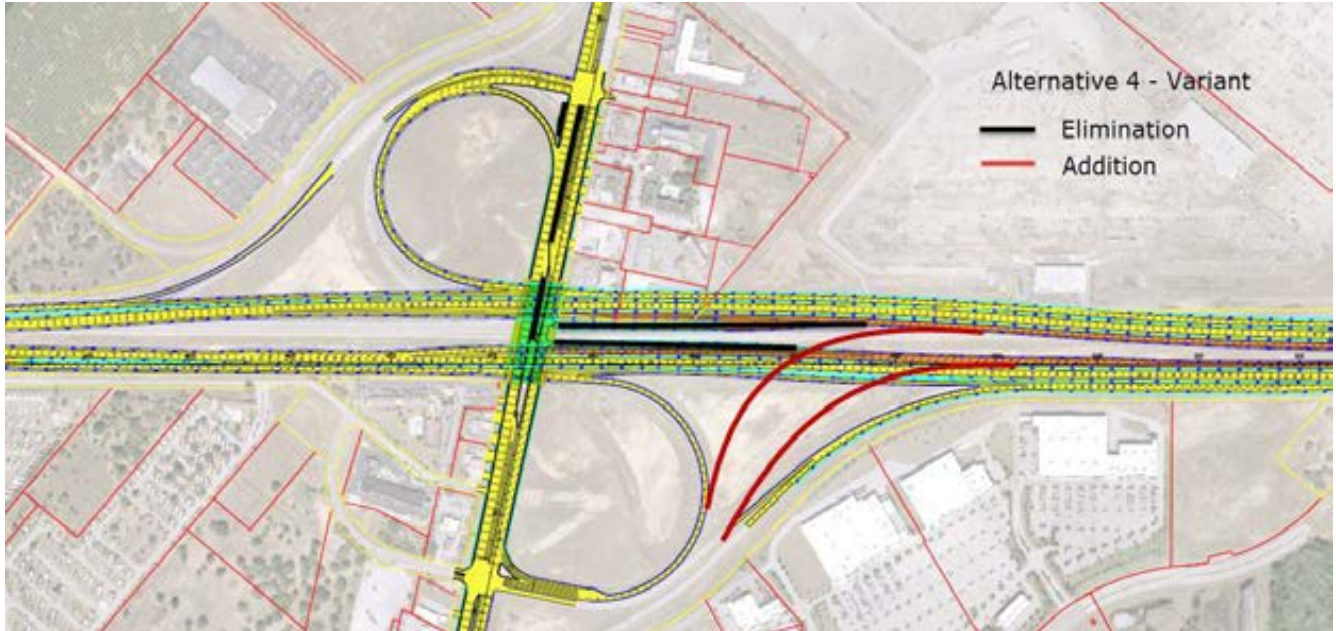
# Illustration

PROJECT: **Florida Department of Transportation  
I-4 from West of US 27 to Polk/Osceola County Line  
FPN #201210-3**

ALTERNATIVE NO.:  
**BR-07**

DESCRIPTION: **Use US 27 - Alternative 4 with Direct Connect Express  
Lane Ramps relocated to Southern Interchange  
Intersection**

SHEET NO.: 3 of 7





# Illustration

PROJECT: **Florida Department of Transportation  
I-4 from West of US 27 to Polk/Osceola County Line  
FPN #201210-3**

ALTERNATIVE NO.:  
**BR-07**

DESCRIPTION: **Use US 27 - Alternative 4 with Direct Connect Express  
Lane Ramps relocated to Southern Interchange  
Intersection**

SHEET NO.: **4 of 7**



Eliminate four structures from 'base design'



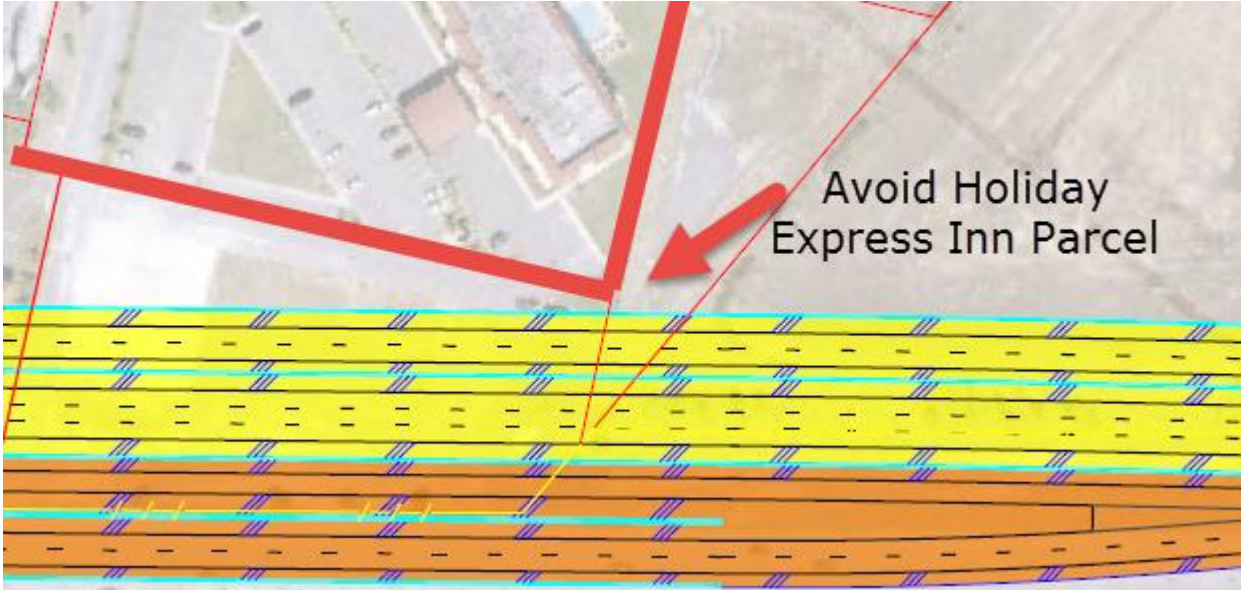
# Illustration

PROJECT: **Florida Department of Transportation  
I-4 from West of US 27 to Polk/Osceola County Line  
FPN #201210-3**

ALTERNATIVE NO.:  
**BR-07**

DESCRIPTION: **Use US 27 - Alternative 4 with Direct Connect Express  
Lane Ramps relocated to Southern Interchange  
Intersection**

SHEET NO.: **5 of 7**



# Calculations

PROJECT:	<b>Florida Department of Transportation I-4 from West of US 27 to Polk/Osceola County Line FPN #201210-3</b>	ALTERNATIVE NO.:	<b>BR-07</b>
DESCRIPTION:	<b>Use US 27 - Alternative 4 with Direct Connect Express Lane Ramps relocated to Southern Interchange Intersection</b>	SHEET NO.:	<b>6 of 7</b>

## Assumptions:

- 1) All Lump Sum costs extracted from cost estimate provided to the VE Team.
- 2) Approach is to use a cost comparison of a modified alternative 4 to the Base design of alternative 7 to determine overall cost savings.
- 3) All structures costs used are based on cost estimate per square foot as shown in the estimate provided. Please note that steel and concrete structures costs are not separated and could affect the estimates as shown.

## Calculations:

Alternative 4 complete estimate is \$67,500,288. Adjustments are needed to account for changes with the alternative.

There are some roadway savings by eliminating the ramps tying into the US 27 bridge, the needed dual left turns and associated U-turn bulbout as shown in alt. 4. These savings are offset by the additional roadway lengths needed for the proposed direct connect ramps. These costs will not be considered and will be assumed as an offset.

### Cost of Bridges:

Alternative 4 includes a single 210 ft. wide span structure. This can be reduced, as the turn lane in the median is no longer needed for the proposed alternative. By removing the 30 ft. median bridge width and going to two separate structures. One lane under the bridge is no longer needed and the bridge length can be reduced by 12 ft.:

210 ft. wide X 12 ft. long = 2,520 sf.

Bridge costs: \$160/sf = \$403,200 (**Cost Reduction**)

30 ft. wide X (500 ft. – 12 ft. {eliminated above}) or 488 ft. long = 14,640 sf.

Bridge costs: \$160/sf. = \$2,342,400 (**Cost Reduction**)

New bridges are necessary for the direct connect ramps

Assume a new single lane bridge width of 39 ft.

Length of EB SUL on ramp Bridge: approx. 1000 ft. (length based on alternate 7 ramp length)

Length of WB SUL off ramp Bridge: approx. 1500 ft. (length assumed with taller structure for rail)

39 ft. wide X 2500 ft. Long = 97,500 sf.

Bridge costs: \$160/ sf. = \$15,600,000 (**Cost Increase**)

# Calculations

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:  <b>BR-07</b>
DESCRIPTION:	<b>Use US 27 - Alternative 4 with Direct Connect</b> <b>Express Lane Ramps relocated to Southern</b> <b>Interchange Intersection</b>	SHEET NO.: <b>7 of 7</b>

**Calculations (Cont'd):**

Alternative Design cost for the interchange  
 Alternative 4 costs – cost reductions + cost increases = alternative design costs  
 $\$67,500,288 - \$403,200 - \$2,342,400 + \$15,600,000 = \$80,354,688$

Cost Savings  
 Base Design (Alternative 7) – Alternative design = Cost Savings  
 $\$117,436,245 - \$80,354,688 = \mathbf{\$37,081,557}$

**Note:** The above figures are conservative approximations favoring the original design. A more detailed analysis will result in additional savings



# *Value Analysis Design Alternative*

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:  <b>BR-10</b>
DESCRIPTION:	<b>Reconfigure US 27/I-4 Interchange utilizing SPDI and Ramps to CD system</b>	SHEET NO.: <b>1 of 6</b>

**Original Design:**

The original design (Alternative 7) proposes utilizing the general concept of the existing interchange (rural design with loops and ramps) and adding bridges and U-turns to separate traffic movements so as to improve the efficiency of the interchange and adjacent intersections. While this design increases free flow of traffic, it increases cost significantly due to the multiple bridges, adds complexity to the interchange, and reduces accessibility to local businesses.

**Alternative:**

The alternate proposes a SPDI at the interchange without loops and an option with or without free flow right turn ramps from US 27 to I-4.

**Opportunities:**

- Reduces amount of bridges
- Simple design, eliminates confusion of multiple ramps, bridges and U-turns
- Improves access to local businesses
- SPDI design is more suitable for an area that will become more urbanized in the future
- Presents opportunity to sell large areas of land for commercial development

**Risks:**

- Requires additional R/W acquisition
- Requires removal of portions of existing sheet pile wall
- Alternative has potential to fail in traffic modeling

**Technical Discussion:**

The design of the alternative includes a Single Point Diamond Interchange (SPDI) with all the movement to and from I-4 located at the US 27 bridge or with an option to utilize some of the existing ramps. This design drastically alters the existing configuration as well as the Alternative 7 design.

The Alternative 7 design generally utilizes the large existed loops and ramps to and from I-4 as well as the ponds located within and between these loops/ramps. Alternative 7 adds bridges to span the two existing signalized intersections for these loops/ramps to increase free flow of traffic. By adding these bridges, vehicles can no longer use the signalized intersections to make left hand turns into the businesses located on the northeast and southwest corners of the interchange. To address this conflict, Alternative 7 includes large U-turn ramps that cross underneath the two bridges spanning the intersections.

This alternative SPDI design eliminates the bridges crossing the two existing signalized intersections on US 27 since the existing ramps/loops are eliminated. This also eliminates the need for large circular U-turn ramps since the two bridges from Alternative 7 are eliminated. With an option to keep the current outside ramps, traffic from US 27 can still access I-4 without stopping at the intersection. Figure 1 on Sheet 3 of 6 illustrates a SPDI intersection at US 27 over I-4. Figure 2 shows the SPDI intersection at SR 436 over I-4 from the I-4 Ultimate project.



# *Value Analysis Design Alternative*

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:  <b>BR-10</b>
DESCRIPTION:	<b>Reconfigure US 27/I-4 Interchange utilizing SPDI and Ramps to CD system</b>	SHEET NO.: <b>2 of 6</b>

The traffic program Synchro was used by the PD&E consultant to analyze the estimated traffic volumes for a No-Build scenario and a SPUI (also known as SPDI) intersection at US 27 and I-4. The SPDI scenario improves operation over a No-Build scenario due to the geometry; however, the SPDI configuration still fails as a result of this analysis. The SPDI intersection was analyzed with all traffic controlled at the SPDI bridge. The results of the analysis and the geometry used are shown on Figure 2 on Sheet 4 of 6. However, by utilizing the existing right turn ramps from US 27 to I-4 the level of service may be improved. Another option would be to build new right turn ramps before the bridge, but closer to the bridge than the current ramps to eliminate wasted space.

Since several of the proposed bridges in Alternative 7 are eliminated in this alternative, the cost would be reduced significantly. Also, access to local businesses is already difficult with the existing configuration. Although Alternative 7 improves free flow throughout the interchange, it hinders access to the local businesses. The SPDI intersection increases accessibility since most of the traffic is controlled directly at the bridge location. The existing signalized intersections where the loop ramps currently enter US 27 could be used for U-turns or left hand turns for local destinations only. Lastly, the current loop ramps take up a considerably large area of land. By eliminating these loops, the current ponds could be reconfigured to increase availability of land for FDOT to sell for commercial use. This could further increase overall value to the SPDI alternative.

The Access Management Classification for this roadway section is Class 2, which requires 2,640 feet for full/signalized median openings and 1,320 feet for directional median openings. This alternative may require a variation.

**Note:** Cost savings that can be realized from the elimination of ramps and other ancillary items have not been included in this analysis. Also, the above figures are conservative approximations favoring the original design. A more detailed analysis will result in additional savings.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
<b>ORIGINAL DESIGN (Bridges only)</b>	<b>\$54,259,200</b>	<b>\$</b>	<b>\$54,259,200</b>
<b>ALTERNATIVE (Bridges, R/W Acquisition &amp; Wall Removal)</b>	<b>\$37,996,800</b>	<b>\$</b>	<b>\$37,996,800</b>
<b>SAVINGS</b>	<b>\$16,262,400</b>	<b>\$</b>	<b>\$16,262,400</b>

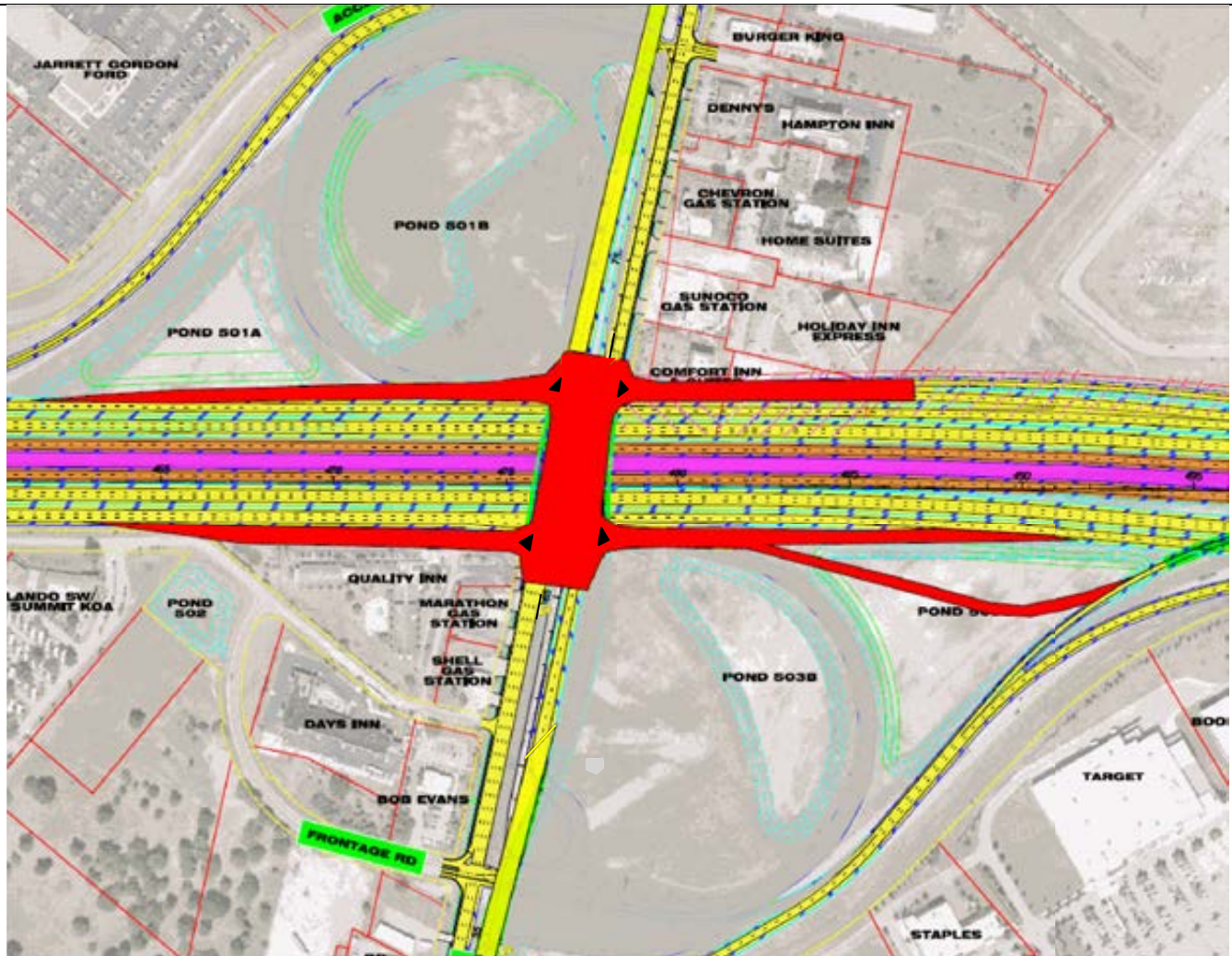
# Illustration

PROJECT: **Florida Department of Transportation  
I-4 from West of US 27 to Polk/Osceola County Line  
FPN #201210-3**

ALTERNATIVE NO.:  
**BR-10**

DESCRIPTION: **Reconfigure US 27/I-4 Interchange utilizing SPDI and  
Ramps to CD system**

SHEET NO.: **3 of 6**



**Figure 1**  
Alternative Plan View



**Figure 2**  
SR 436 Over I-4 SPDI



## Illustration

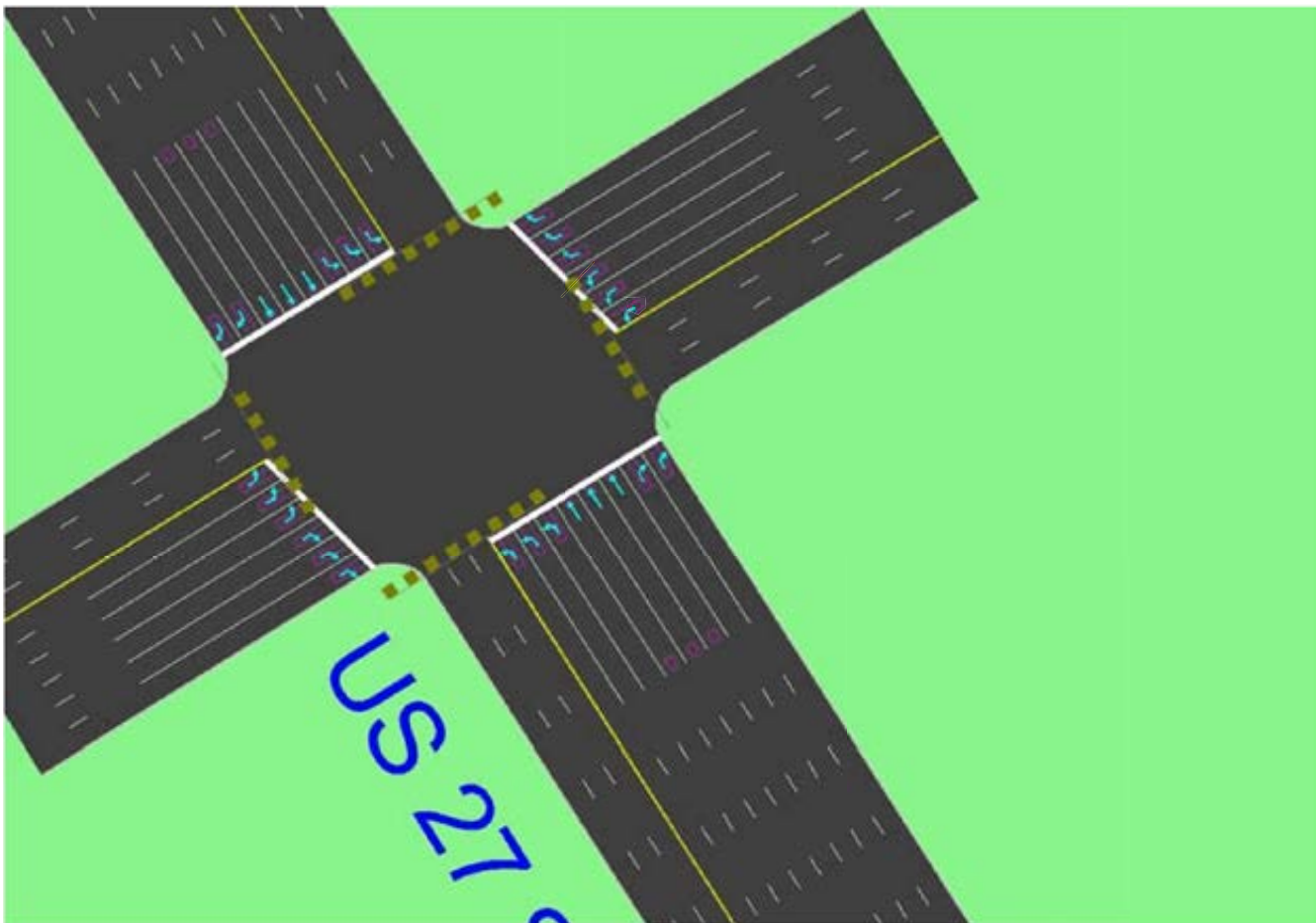
PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:	<b>BR-10</b>
DESCRIPTION:	<b>Reconfigure US 27/I-4 Interchange utilizing SPDI and Ramps to CD system</b>	SHEET NO.:	<b>4 of 6</b>

### US 27 - AM Peak

Intersection	No-Build AM		SPUI AM	
	Delay	LOS	Delay	LOS
US 27 @ I-4 EB Ramps	118.7	F	64.0	E
US 27 & I-4 WB Ramps	97.9	F		

### US 27 - PM Peak

Intersection	No-Build PM		SPUI PM	
	Delay	LOS	Delay	LOS
US 27 @ I-4 EB Ramps	256.3	F	106.7	F
US 27 & I-4 WB Ramps	186.7	F		



**Figure 3**  
Traffic Simulation Using Synchro

## *Calculations*

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:
		<b>BR-10</b>
DESCRIPTION:	<b>Reconfigure US 27/I-4 Interchange utilizing SPDI and Ramps to CD system</b>	SHEET NO.: <b>5 of 6</b>

**Assumptions:**

- 1) Unit cost for the bridges was extracted from the cost estimate provided to the VE team. This unit cost appears to be an average between concrete and steel bridges.
- 2) Unit cost for the sheet pile wall removal was assumed to be \$5 per square foot of wall.
- 3) Cost for right-of-way acquisition was estimated by FDOT 5 ROW personnel.
- 4) Net cost difference between use of high fill and MSE walls in Alternate 7 compared to this alternate design are assumed to be negligible and were not calculated.

**Calculations:**

Original Design (Alternative 7) Includes:

- Cost of 8 total bridges. Includes twin bridges for US 27 over I-4.

Alternative Design Includes:

- Cost of 3 total bridges. Includes single bridge for US 27 over I-4 (140' x 550 = 77,000') and utilizes the two express lane crossover bridges on the east side of US 27 from the Alternative 7 design. The two express lane crossover bridges were estimated as 41,280 square feet and 47,745 square feet in plan area. (Total bridge area = 166,025 sq. ft.)
- Cost of removal for 1,000 linear feet of approx. 20' high existing sheet pile wall (20,000 sq. ft.). This existing wall is located along the south side of the I-4 eastbound lanes as they approach the existing US 27 bridge.
- Cost of additional ROW acquisition for impacts to properties on SW corner of US 27 and I-4 interchange.

**Note:** Cost savings that can be realized from the elimination of ramps and other ancillary items have **not been included** in this analysis. Also, the above figures are conservative approximations favoring the original design. A more detailed analysis will result in additional savings.



## Cost Worksheet

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:	<b>BR-10</b>
DESCRIPTION:	<b>Reconfigure US 27/I-4 Interchange utilizing SPDI and Ramps to CD system</b>	SHEET NO.:	<b>6 of 6</b>

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Bridges	SF	282,600	\$ 160	\$ 45,216,000	166,025	\$ 160.00	\$ 26,564,000
Sheet Pile Wall Removal	SF	0	\$ 5.00	\$ -	20,000	\$ 5.00	\$ 100,000
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<b>Sub-total</b>				\$ 45,216,000			\$ 26,664,000
<b>Mark-up at 20.00%</b>				\$ 9,043,200			\$ 5,332,800
<b>R/W Acquisiton - (Estimate)</b>							\$ 6,000,000
<b>TOTAL</b>				\$ 54,259,200			\$ 37,996,800
Estimated Savings:							\$ 16,262,400





# *Value Analysis Design Alternative*

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:  <b>RD-06</b>
DESCRIPTION:	<b>Provide 4' inside shoulders for the express lanes</b> <b>along this corridor adjacent to Segment 1 to the east</b>	SHEET NO.: <b>1 of 4</b>

**Original Design:**

The original design typical section calls for 10' inside shoulders for the express lanes.

**Alternative:**

The alternate provides a 2' inside shoulder upon construction of the high speed rail within the center median. In the interim the inside shoulder will be 10' with an inside guard rail. Standard index 400 sheet 15 Detal K states that shoulders 10' or wider 12' is required between edge of travel and the guard rail.

**Opportunities:**

- Provides cost savings on the amount of pavement used along this segment of I-4.
- Will align with the adjacent segment.
- Help maintain the required 44' width for the rail/transit corridor.

**Risks:**

- Does not provide clear zone for vehicles that need to clear the travel lanes.
- The express lanes are providing a service that is paid for by drivers to avoid delay. Not providing space for disabled vehicles to exit the travel lanes adds delay and congestion.

**Technical Discussion:**

The design of the alternate includes the removal of 6' of base group 6 and 6' of plain cement concrete pavement, 8".

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$14,160,623	\$	\$14,160,623
ALTERNATIVE	\$8,967,106	\$	\$8,967,106
SAVINGS	\$5,193,518	\$	\$5,193,518



## Calculations

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:
		<b>RD-06</b>
DESCRIPTION:	<b>Provide 4' inside shoulders for the express lanes</b> <b>along this corridor adjacent to Segment 1 to the east</b>	SHEET NO.: <b>3 of 4</b>

**Assumptions:**

- 1) All Lump Sum costs extracted from cost estimate provided to the VE Team are approximate. The pay items examined are base group 6 and plain cement concrete pavement, 8 inches.

**Calculations:**

*Original Design* Includes: Mainline w/full shoulder directional 10' inside shoulders for the express lanes.

**Base group 6:** length of corridor is 23,597 feet x 10 = 23,5970 sq ft / 9 = 26,218 sq yd

26,218 x \$13.69 = \$358,924

**Concrete pavement 8"** for the express lanes unit cost is provided by the Segment 5 cost estimates for the entire project at \$11,441,595.

Cost of 10' inside shoulders for the project is **\$14,160,623**.

*Alternative Design:* Mainline with reduced inside shoulder trumpet 4' shoulder for the express lanes.

**Base group 6:** length of corridor is 23,597 feet x 4 = 94,388 sqft / 9 = 10,555 sqyd

10,555 x \$13.69 = \$144,498

**Concrete pavement 8"** for the express lanes unit cost is provided by the Segment 5 cost estimates for the entire project at \$7,328,090.

Cost of 4' inside shoulders for the project is **\$8,967,106**.

**Note:** The above figures are conservative approximations favoring the original design. A more detailed analysis will result in additional savings.



## Cost Worksheet

PROJECT: **Florida Department of Transportation** ALTERNATIVE NO.: **RD-6**  
**I-4 from West of US 27 to Polk/Osceola County Line**  
**FPN #201210-3**

DESCRIPTION: **Provide 4' inside shoulders for the express lanes along this corridor adjacent to Segment 1 to the east** SHEET NO.: **4 of 4**

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
285 706	SY	26,218	\$ 13.69	\$ 358,924	10,555	\$ 13.69	\$ 144,498
350 1 3	SY	208,029	\$ 55.00	\$ 11,441,595	133,238	\$ 55.00	\$ 7,328,090
<b>Sub-total</b>				\$ 11,800,519			\$ 7,472,588
<b>Mark-up at 20.00%</b>				\$ 2,360,104			\$ 1,494,518
<b>TOTAL</b>				<b>\$ 14,160,623</b>			<b>\$ 8,967,106</b>

Estimated Savings: \$5,193,518

# *Value Analysis Design Suggestion*

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:  <b>RD-07</b>
DESCRIPTION:	<b>Provide 10' inside shoulders for the express lanes along this corridor adjacent to District 1 I-4 master plan</b>	SHEET NO.: <b>1 of 2</b>

**Original Design:**

The original design typical section calls for 10' inside shoulders for HOV lanes. These HOV lanes will be incorporated into express lanes.

**Alternative:**

Provide typical section to match that of District 1 I-4 Master Plan for consistency throughout corridor.

**Opportunities:**

- Provides clear zone for vehicles to exit the travel lanes in the event of an emergency or breakdown.
- Provides enough width for emergency vehicles allowing for the possibility of continuous service, even under constrained conditions.

**Risks:**

- Will not match with the approved District 5 segments of Ultimate and Beyond I-4.

**Technical Discussion:**

The retaining of the 10' inside shoulders for the express lanes will provide conformity to the District 1 I-4 master plan to the west. Yet, this design will not match with District 5's I-4 Ultimate and Beyond plans through metro Orlando into Volusia County.

# Illustration

PROJECT:

**Florida Department of Transportation  
I-4 from West of US 27 to Polk/Osceola County Line  
FPN #201210-3**

ALTERNATIVE NO.:

**RD-7**

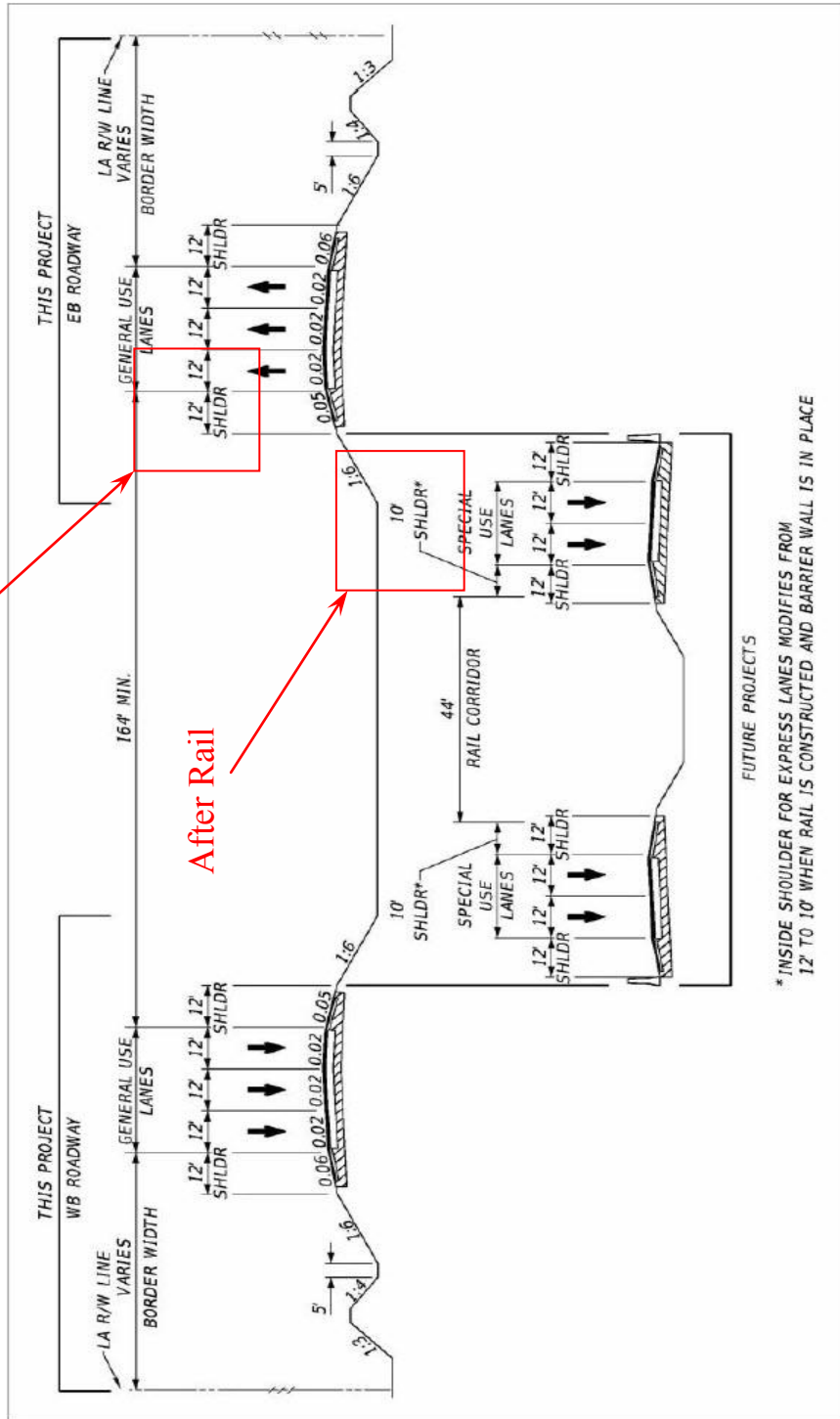
DESCRIPTION:

**Provide 10' inside shoulders for the express lanes along this corridor adjacent to District 1 I-4 master plan**

SHEET NO.: 2 of 2

Interim

After Rail



\* INSIDE SHOULDER FOR EXPRESS LANES MODIFIES FROM 12' TO 10' WHEN RAIL IS CONSTRUCTED AND BARRIER WALL IS IN PLACE



# Value Analysis Design Suggestion

PROJECT: **Florida Department of Transportation**  
**I-4 from West of US 27 to Polk/Osceola County Line**  
**FPN #201210-3**

ALTERNATIVE NO.:  
**RD-09**

DESCRIPTION: **Mitigate potential for Wrong Way drivers**

SHEET NO.: **1 of 3**

## Original Design:

The original design has two intersections at the ramp termini where the direction of travel is not well defined for a driver to ensure proper direction of travel on to the interstate.

## Alternative:

The alternative suggests considering mitigating techniques to ensure proper direction of travel at the interchange.

## Opportunities:

- Reduce wrong way drivers
- Improves safety

## Risks:

- Increase costs to implement mitigating techniques
- Potential adverse effects to operations by widening intersections

## Technical Discussion:

The Department has recently had to address a series of wrong way drivers on the Interstate system. Noting the significant effects of these unfortunate events, the department has started the efforts to identify concerns or potential for future wrong way traffic. One of the areas of concerns is partial clover leaf interchanges, similar to the existing and proposed interchange at US 27, where the entrance and exit ramp termini are in close proximity. The link below is the latest FDOT news story documenting the concerns with wrong way drivers.

<https://fldot.wordpress.com/2014/11/01/preventing-wrong-way-driving/>

## *Illustration*

PROJECT: **Florida Department of Transportation  
I-4 from West of US 27 to Polk/Osceola County Line  
FPN #201210-3**

ALTERNATIVE NO.:  
**RD-09**

DESCRIPTION: **Mitigate potential for Wrong Way drivers**

SHEET NO.: **2 of 3**

Northern Intersection:



The northern intersection has a potential concern from the WB movement from the businesses headed SB on US 27 (or the potential illegal movement to WB I-4) that lead directly into the off ramp of I-4.

The second area of concern is the NB US 27 to WB I-4 movement. The median width between the on and off ramp at this location are spaced in close proximity which could be difficult to negotiate at night, especially under a proposed bridge.

## *Illustration*

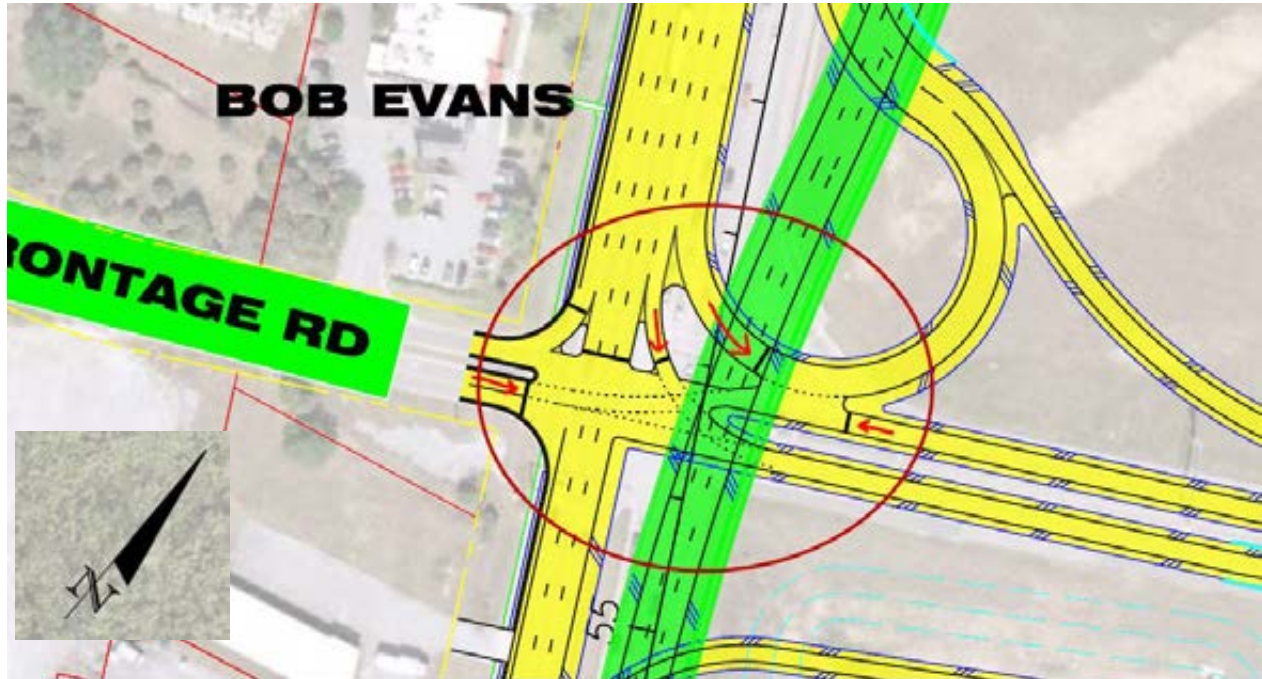
PROJECT: **Florida Department of Transportation  
I-4 from West of US 27 to Polk/Osceola County Line  
FPN #201210-3**

ALTERNATIVE NO.:  
**RD-09**

DESCRIPTION: **Mitigate potential for Wrong Way drivers**

SHEET NO.: **3 of 3**

Southern Intersection:



The southern intersection has a potential concern from the SB to NB U-turn movement on US 27. There is an opening that leads to the off ramp from I-4.

The second concern is from the EB movement from Frontage Rd. headed NB on US 27. This movement also has the potential for access to the exit lane from I-4.

# Value Analysis Design Suggestion

PROJECT:	<b>Florida Department of Transportation I-4 from West of US 27 to Polk/Osceola County Line FPN #201210-3</b>	ALTERNATIVE NO.:	<b>RD-10</b>
DESCRIPTION:	<b>Reduce Border Width @ Proposed CPP Interchange Connection Location</b>	SHEET NO.:	<b>1 of 2</b>

### Original Design:

The original design has full border width for the proposed Limited Access ROW which incurs additional impacts.

### Alternative:

The alternative suggest considering reducing the border width as shown for the rest of the project to be consistent and reduce impacts.

### Opportunities:

- Minimize ROW impacts
- Minimize Floodplain impacts

### Risks:

- Tighter areas for Maintenance
- May require walls in lieu of fill slopes

### Technical Discussion:

Border width is defined in the Florida Department of Transportation's Plans Preparations Manual (Volume II, Chapter 2, 2.8.1) as 94 feet. The adjacent projects on I-4 and the other portions of this project outside of the CPP connection identify a 15 foot Border Width. 15 feet is sufficient for a maintenance vehicle to traverse between a barrier and the LA fence for any necessary maintenance needs.

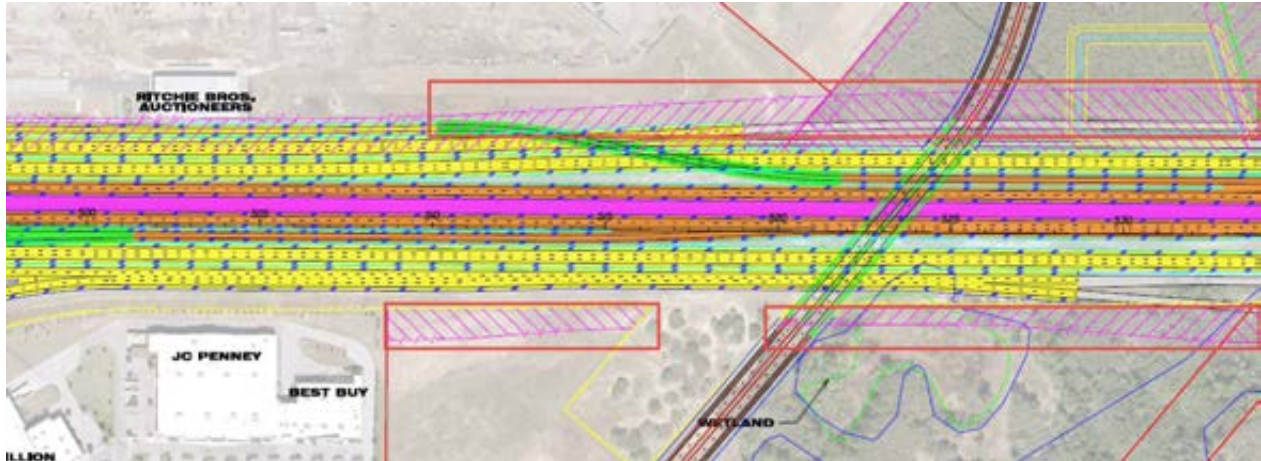
# Illustration

PROJECT: **Florida Department of Transportation  
I-4 from West of US 27 to Polk/Osceola County Line  
FPN #201210-3**

ALTERNATIVE NO.:  
**RD-10**

DESCRIPTION: **Reduce Border Width @ Proposed CPP Interchange  
Connection Location**

SHEET NO.: **2 of 2**



The 'Red' boxed in areas are areas of potential impact due to greater Border Width.



## *Value Analysis Design Suggestion*

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.: <b>RD-16</b>
DESCRIPTION:	<b>Consider providing roundabouts on US 27 at Sta. 57 and Sta. 82</b>	SHEET NO.: 1 of 2

**Original Design:**

The original design shows no signalization at either intersection. All traffic entering or exiting US 27 at I-4 is free flow and has no requirement to stop.

**Alternative:**

In PPM chapter 2.13.1 it states the *National Cooperative Highway Research Program (NCHRP) Report 672, Roundabouts: An Informational Guide*, is adopted by FHWA and establishes criteria and procedures for the justification, operational and safety analysis of modern roundabouts in the United States. In addition, the *Florida Intersection Design Guide* contains Florida centric guidelines and requirements for evaluation and design of roundabouts in Florida.

Roundabouts shall be evaluated on new construction, reconstruction and safety improvement projects, as well as any time there are proposed changes in intersection control that will be more restrictive than the existing conditions.

Therefore, Consider providing roundabouts on US 27 at Sta. 57 and Sta. 82.

**Opportunities:**

- Provides traffic calming techniques while providing access to local businesses.
- Eliminates bridges by keeping all ingress and egress from I-4 and US 27 at grade.

**Risks:**

- Studies will be required to determine feasibility of the system for the volume of traffic.

**Technical Discussion:**

Roundabouts have been used successfully in some cases to eliminate or defer the need to widen bridges. Roundabouts can have two different shapes or configurations. The first is a conventional one with circular central islands. This type of configuration is recommended when it is desirable to allow U-turns at each roundabout or to provide access to legs other than the cross street and ramps.

## *Illustration*

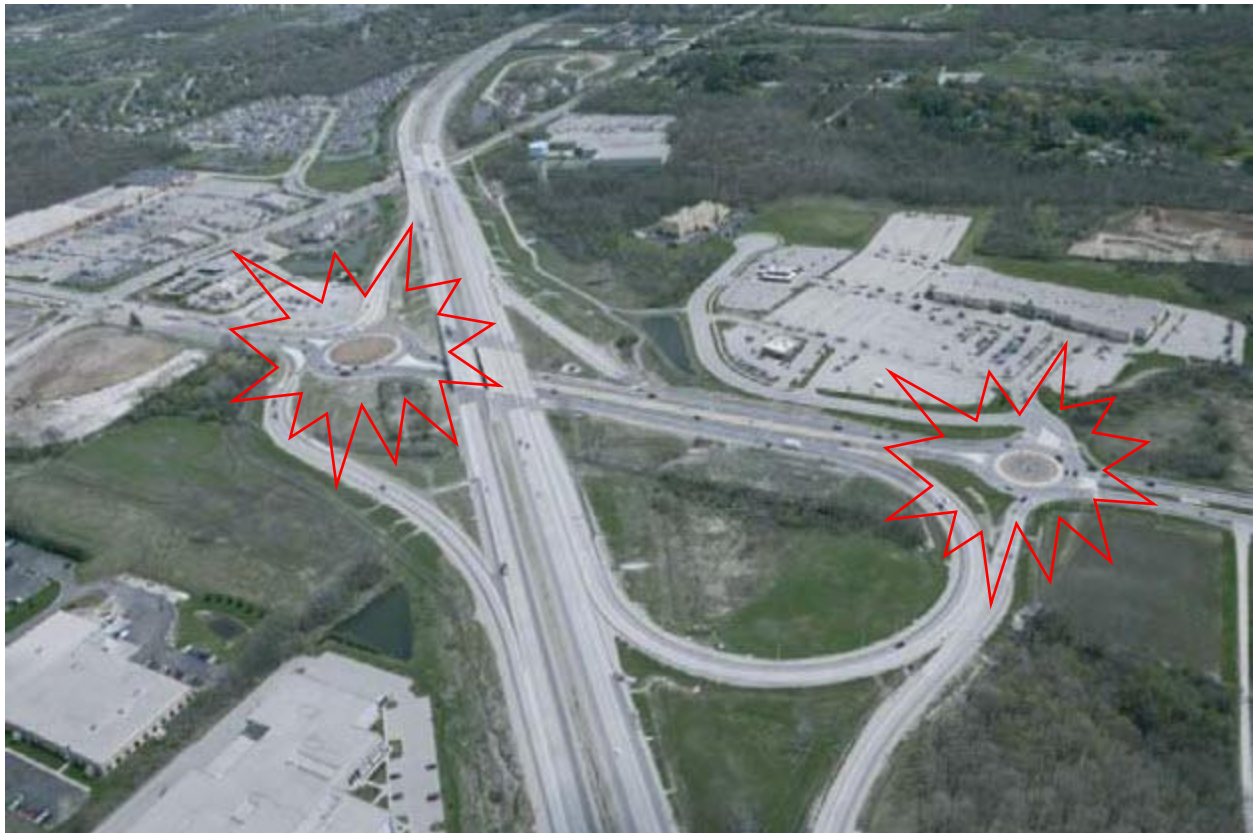
PROJECT: **Florida Department of Transportation  
I-4 from West of US 27 to Polk/Osceola County Line  
FPN #201210-3**

ALTERNATIVE NO.:  
**RD-16**

DESCRIPTION: **Consider providing roundabouts on US 27 at Sta. 57  
and Sta. 82**

SHEET NO.: **2 of 2**

Example from application in Wisconsin.





# *Value Analysis Design Suggestion*

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.: <b>RD-17</b>
DESCRIPTION:	<b>Reconcile Cost Estimate</b>	SHEET NO.: <b>1</b> of <b>1</b>

**Original Design:**

The original design cost estimate appears to have some contradictions with respect to the original design alternative.

**Alternative:**

The alternative suggests reconcile the cost estimate to better define the alternative.

**Opportunities:**

- Better Cost Estimate
- Better Budgets

**Risks:**

- Additional design effort

**Technical Discussion:**

While the VE Team was conducting their review and analysis of the alternatives, there were some discrepancies identified that could affect the costs analysis comparison.

Some of the items that the VE team recommends to be looked at include:

Bridge costs – 1) Some of the bridge costs were calculated using roadway width and not the full width of the bridge which resulted in a reduced ‘base design’ cost. 2) Some of the bridge costs were calculated with single lane widths, while the base design shows two lanes. 3) The cost of the bridges were all assumed to be concrete with a \$/sf calculation. The length and geometry of some of the bridges proposed will likely result in steel spans with a typically higher cost.

ROW costs – The ‘base design’ ROW costs did not match or reflect the updated ‘base design.

General costs – There are several line item costs that are based only on percentages. Any changes to these items are difficult for a VE Team to calculate a specific cost savings or value added.

# *Value Analysis Design Suggestion*

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.: <b>DR-01</b>
DESCRIPTION:	<b>Maximize Existing Ponds within I-4/US 27 Interchange</b>	SHEET NO.: <b>1</b> of <b>2</b>

**Original Design:**

Under the Alternative 7 original design, impacts to Pond 501A, Pond 501B, Pond 501C, Pond 503A, and Pond 503C are proposed. These ponds were permitted under SWFWMD No. 44-011896.024 and 44-011896.029 and were sized for the ultimate 10 lane typical section for I-4.

**Alternative:**

The alternative suggests maximizing the existing ponds within the I-4/US 27 Interchange for treatment and attenuation. It appears there is more than adequate room within the existing loop ramps, Pond 501B and Pond 503B, to provide additional storage.

**Opportunities:**

- Improve water quality
- Limit risk of flooding within the interchange
- Reduce need for additional right-of-way acquisition
- Provide additional fill
- Limited T&E and archaeological concerns
- No wetland impacts

**Risks:**

- Less area for bold landscaping
- Less flexibility with future interchange improvements to loop ramps

**Technical Discussion:**

Pond 501B and Pond 503B only occupy approximately 50% of the area within the existing interchange loop ramps. The remaining area within the loop ramp is in high fill. When the preferred interchange is selected, it is recommended to evaluate expanding the existing ponds within the interchange to accommodate additional treatment and/or attenuation.

Basin 501 is a closed basin which does not discharge outside of the interchange. Any additional storage provided will help improve water quality, lower design high water levels and limit the risk of flooding within the interchange.

Basin 503 ultimately discharges to the east to the existing floodplain located at 530+00 and ultimately to Horseshoe Creek. The interchange ponds are located in the upstream portion of this basin. In addition to improving water quality, any additional storage will help attenuate runoff discharging to the existing floodplain.

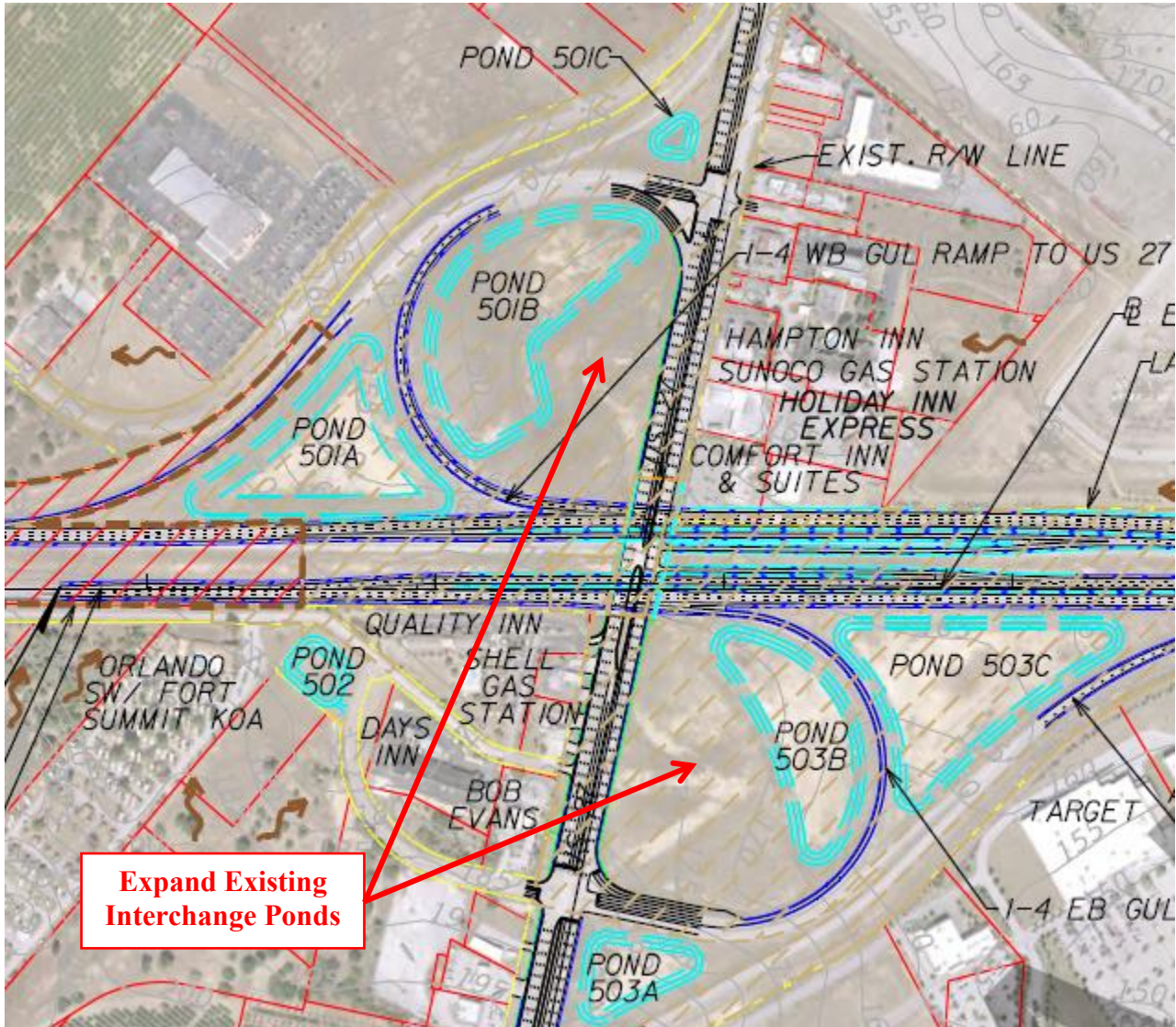
# Illustration

PROJECT: **Florida Department of Transportation  
I-4 from West of US 27 to Polk/Osceola County Line  
FPN #201210-3**

ALTERNATIVE NO.:  
**DR-01**

DESCRIPTION: **Maximize Existing Ponds within I-4/US 27 Interchange**

SHEET NO.: **2 of 2**





# Value Analysis Design Alternative

PROJECT:	<b>Florida Department of Transportation I-4 from West of US 27 to Polk/Osceola County Line FPN #201210-3</b>	ALTERNATIVE NO.:	<b>DR-02</b>
DESCRIPTION:	<b>Accommodate Impacts to Pond on Ritchie Property</b>	SHEET NO.:	<b>1 of 6</b>

### Original Design:

The original design proposes right-of-way acquisition along the Ritchie Brothers property. The right-of-way take involves acquiring 9.18 acres from the Ritchie Brothers property owners. This right-of-way acquisition involves impacts to the existing building, associated parking, and a portion of the existing on-site stormwater management system (Pond 2, Pond 3, and Pond 4), per SWFWMD Permit No. 43-022407.003. These ponds were designed to fully retain the 100-year/24-hour storm event. There is an emergency outfall from Pond 4 to the FDOT right-of-way.

### Alternative:

This alternative includes providing additional pond storage on the Heller Brothers Packing Corporation parcel east of the Ritchie Brothers parcel to offset the impacts to the stormwater ponds on the Ritchie Brothers property.

### Opportunities:

- Reduce property owners Ritchie Brothers property
- Potential regional stormwater option on Heller Brothers Packing Corporation parcel
- Limit coordination with Ritchie Brothers property owners to negotiate right-of-way concerns once for both Express Lanes and Grandview Pkwy

### Risks:

- Requires additional right-of-way and construction costs
- Additional maintenance costs



# *Value Analysis Design Alternative*

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:
		<b>DR-02</b>
DESCRIPTION:	<b>Accommodate Impacts to Pond on Ritchie Property</b>	SHEET NO.: <b>2 of 6</b>

**Technical Discussion:**

The current design includes the acquisition of 9.18 acres of right-of-way. It is estimated that 8.6 acres includes impacts to the existing three (3) on-site stormwater ponds.

Per House Bill 599, “in association with right-of-way acquisition for state transportation projects, the Department of Transportation is responsible for providing stormwater treatment and attenuation for the acquired right-of-way but is not responsible for modifying permits for adjacent lands affected by right-of-way acquisition when it is not the permittee.” Although the FDOT is not required to modify the Ritchie Brothers permit for the lost pond storage associated with the Alternative 7 design, there is a potential that the impacts to the on-site stormwater ponds may not be able to be accommodated on-site without additional impacts to their business.

The emergency outfall to the FDOT right-of-way will need to be accommodated by the proposed roadside conveyance system.

If compensatory storage is required, the potential pond sites should be designed to retain the impacted 100-year/24-hour volume. Two ponds were selected adjacent to the Ritchie Brothers property on the Heller Brothers Packing Corporation parcel. The proposed alignment of the Grandview Parkway will run between the two ponds. This location was selected in part because of the proximity to the Ritchie Brothers property and because the Heller Brothers Packing Corporation parcel is already being impacted with the Grandview Parkway. There is a potential that the entire parcel could be acquired and used as a regional stormwater option for both the I-4 Express Lanes and the Grandview Parkway.

There is also a potential to reduce the amount of required storage volume if a positive outfall from the stormwater ponds is utilized. Although this appears in a Value Addition, in our opinion, it will be beneficial to the overall outcome of the project.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
<b>ORIGINAL DESIGN</b>	<b>\$0.00</b>	<b>\$</b>	<b>\$0.00</b>
<b>ALTERNATIVE</b>	<b>(\$4,808,514)</b>	<b>\$</b>	<b>(\$4,808,514)</b>
<b>SAVINGS</b>	<b>(\$4,808,514)</b>	<b>\$</b>	<b>(\$4,808,514)</b>



# Illustration

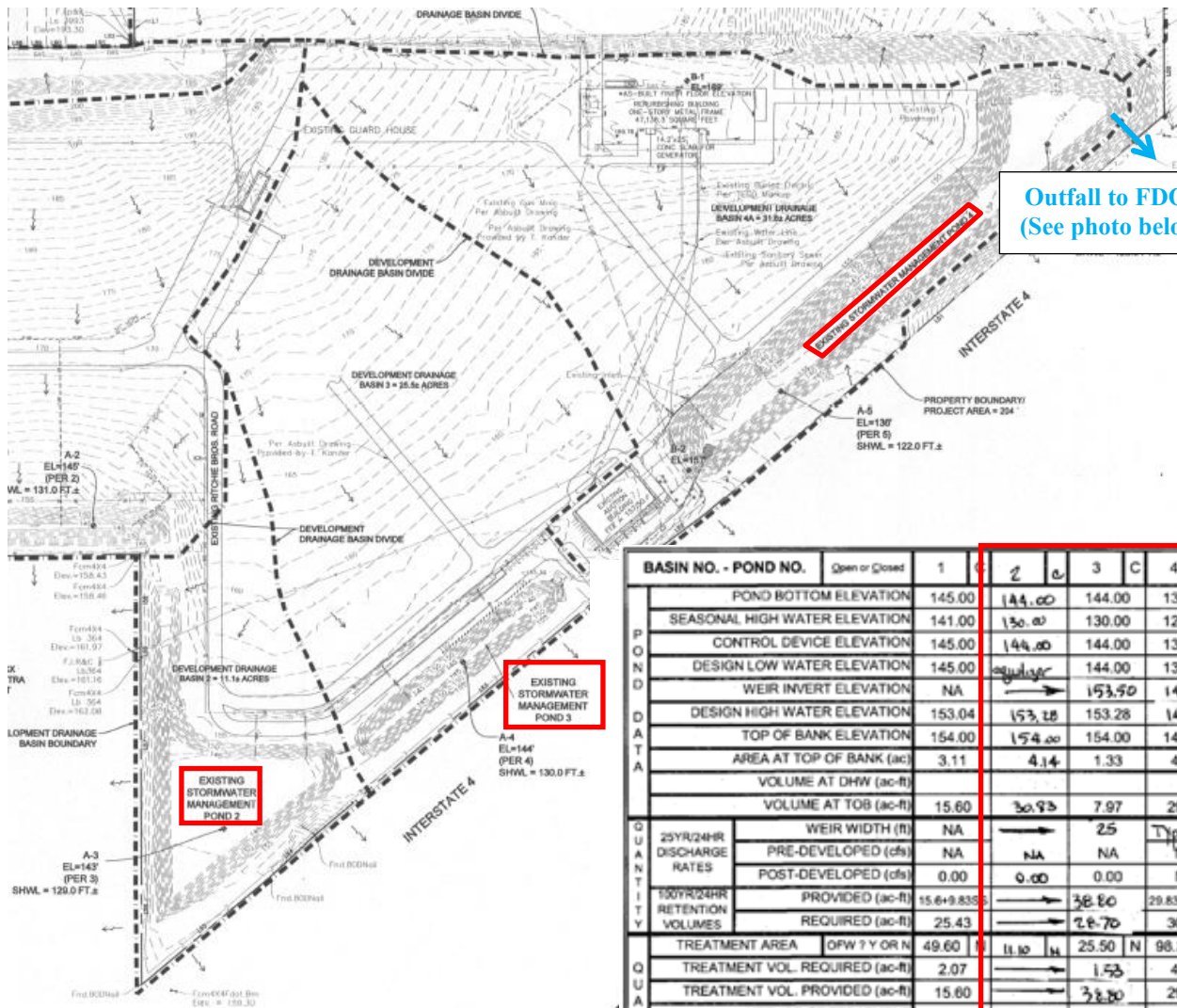
PROJECT: **Florida Department of Transportation  
I-4 from West of US 27 to Polk/Osceola County Line  
FPN #201210-3**

ALTERNATIVE NO.:  
**DR-02**

DESCRIPTION: **Accommodate Impacts to Pond on Ritchie Property**

SHEET NO.: **3 of 6**

## Current Ritchie Brothers Stormwater Management System:



**Outfall to FDOT  
(See photo below)**

BASIN NO. - POND NO.		Open or Closed	1	2	3	4
POND BOTTOM ELEVATION			145.00	144.00	144.00	135.00
SEASONAL HIGH WATER ELEVATION			141.00	130.00	130.00	122.00
CONTROL DEVICE ELEVATION			145.00	144.00	144.00	135.00
DESIGN LOW WATER ELEVATION			145.00	144.00	144.00	135.00
WEIR INVERT ELEVATION			NA	153.50	143.60	
DESIGN HIGH WATER ELEVATION			153.04	153.28	153.28	143.98
TOP OF BANK ELEVATION			154.00	154.00	154.00	144.00
AREA AT TOP OF BANK (ac)			3.11	4.14	1.33	4.41
VOLUME AT DHW (ac-ft)			15.60	30.93	7.97	29.83
VOLUME AT TOB (ac-ft)			15.60	30.93	7.97	29.83
Q U A L I T Y	25YR/24HR DISCHARGE RATES		NA	25	Type C	
	PRE-DEVELOPED (cfs)		NA	NA	NA	NA
	POST-DEVELOPED (cfs)		0.00	0.00	0.00	NA
T I M E	100YR/24HR RETENTION PROVIDED (ac-ft)		15.6+9.835	38.80	29.83-0.2983	
	REQUIRED (ac-ft)		25.43	28.70	30.12	
Q U A L I T Y	TREATMENT AREA	OPW ? Y OR N	49.60	11.80	25.50	98.30
	TREATMENT VOL. REQUIRED (ac-ft)		2.07		1.53	4.10
	TREATMENT VOL. PROVIDED (ac-ft)		15.60		38.80	29.83
METHOD OF TREATMENT			retention	retention	retention	
CONTROL DEVICE TYPE			NI	NI	NI	NI
CONTROL DEVICE DIMENSIONS			K0=25ft/day	K0=20ft/day	K0=20ft/day	K0=20ft/day
RECOVERY TIME (hrs)			<36	>	<36	<36



Emergency outfall from Ritchie Brothers Pond 4 to FDOT Right-of-way

# Illustration

PROJECT:	<b>Florida Department of Transportation I-4 from West of US 27 to Polk/Osceola County Line FPN #201210-3</b>	ALTERNATIVE NO.:	<b>DR-02</b>
DESCRIPTION:	<b>Accommodate Impacts to Pond on Ritchie Property</b>	SHEET NO.:	<b>4 of 6</b>

Alternative Design for Compensatory Storage for Ritchie Property Stormwater Impacts:





# Calculations

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-2</b>	ALTERNATIVE NO.:  <b>DR-02</b>
DESCRIPTION:	<b>Accommodate Impacts to Pond on Ritchie Property</b>	SHEET NO.: <b>5 of 6</b>

**Assumptions:**

- 1) All unit item costs are extracted from the cost estimate provided to the VE Team. If unit costs are not included for the particular pay item, the unit costs provided in the FDOT Listing of Master Pay items, dated 8/28/2014 were utilized.

**Calculations:**

The Original Design did not include compensatory storage for impacts to Ritchie Brothers property.

Alternative Design:

Pond Excavation = Area of Parcels x 90% = 8.6 ac x 0.90 = 7.74 acres

Assume 10-foot depth (to match Ritchie Ponds 2, 3, & 4) for excavation calculations

$$7.74 \text{ ac} * 10 \text{ ft} * \left( \frac{43560 \text{ ft}^2}{1 \text{ ac}} \right) \left( \frac{1 \text{ CY}}{27 \text{ ft}^3} \right) = 124,872 \text{ CY}$$

Assume connection to Ritchie Brothers property and interconnection between the two (2) ponds via 36-inch culvert and four (4) mitered end sections.

The cost of right-of-way acquisition for the Heller Brothers packing Corporation parcel is \$6,000,000 for the 8.6 acres. Under other VE Alternatives, it is recommended to acquire the entire parcel for a regional storm water option. The whole take would accommodate impacts to the Pond(s) on Ritchie property as well as I-4 and Grandview Parkway proposed impacts to Heller Brothers property.

**Note:** The above figures are conservative approximations favoring the original design. A more detailed analysis may result in additional savings.



# Cost Worksheet

PROJECT: **Florida Department of Transportation** ALTERNATIVE NO.: **DR-02**  
**I-4 from West of US 27 to Polk/Osceola County Line**  
**FPN #201210-3**

DESCRIPTION: **Accommodate Impacts to Pond on Ritchie Property** SHEET NO.: **6 of 6**

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Clearing and Grubbing	AC	1	\$ -	\$ -	9	\$ 7,724.00	\$ 66,426
Excavation	CY			\$ -	124,872	\$ 4.61	\$ 575,660
36-inch Pipe Culvert	LF			\$ -	250	\$ 100.60	\$ 25,150
36-inch MES	EA			\$ -	3	\$ 2,175.00	\$ 6,525
				\$ -			\$ -
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				\$ -			\$ -
				\$ -			\$ -
<b>Sub-total</b>				\$ -			\$ 673,761
<b>Mark-up at 20.00%</b>				\$ -			\$ 134,752
							\$ 4,000,000
<b>TOTAL</b>				\$ -			<b>\$ 4,808,514</b>

Estimated Savings: \$(4,808,514)



# Value Analysis Design Alternative

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:
		<b>DR-03</b>
DESCRIPTION:	<b>Utilize Existing Pond E Parcel at Sta. 520+00 (RT)</b>	SHEET NO.: 1 of 4

**Original Design:**

The original design does not include any proposed impacts or modifications to the existing Pond E parcel located at Station 520+00, adjacent to the eastbound general purpose lanes.

**Alternative:**

The alternative is to utilize this existing parcel for stormwater treatment and attenuation.

**Opportunities:**

- No right-of-way acquisition required
- Reduce mobilization costs
- Reduce conveyance costs

**Risks:**

- May require jack and bore under existing mainline
- Additional coordination with Grandview Parkway
- T&E concerns

**Technical Discussion:**

Under the SWFWMD Permit modification 44-011896.029 in 2003, the Pond E design was removed from the permit as it was not necessary to provide stormwater treatment or attenuation for the interchange improvements; however, the parcel had already been acquired by FDOT. The treatment and attenuation for the impervious area needed for the 6-lane design through Basin E was provided in Pond 503C (Pond C3); however the additional impervious area for the ultimate 10-lane design was not provided.

The design alternative includes using the previously designed 3.60 acre Pond E to treat and attenuate 24.16 acres of impervious with a total basin area of 38.81 acres. The previously designed Pond E basin limits are not applicable under existing conditions since Pond 503B (Pond C3) has been constructed. Under the previous design, runoff from US 27 to Station 520+00 was conveyed via roadside ditches and a 36-inch jack and bore culvert under the mainline at Station 518+00. The required and provided treatment volume was 2.01 ac-ft. The design high water elevation for this Pond E was 126.58 ft (25-year) and 127.25 ft (100-year). In reviewing the existing grade of I-4 mainline from the 2003 design, after Station 520+00, the profile of the mainline falls off to elevation 130.00 ft approximately 500 feet to the east. The original design assumes 3 feet of fill. It is unclear what the basin limits for the new Pond E could be given a proposed roadway profile has not been developed. In any case, there is an available 2.01 ac-ft of treatment volume on this site, which could be utilized given the proposed roadway profile.

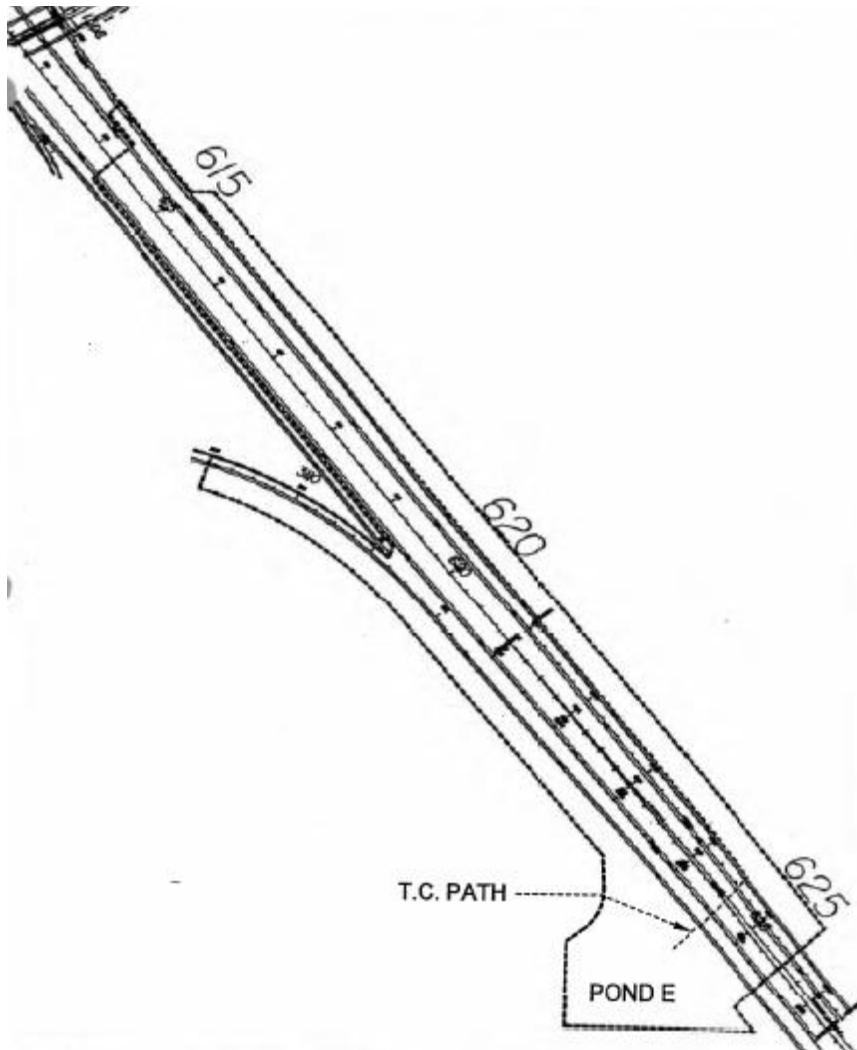
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$1,500,000	\$	\$1,500,000
ALTERNATIVE	\$0.00	\$	\$0.00
SAVINGS	\$1,500,000	\$	\$1,500,000



# Illustration

PROJECT:	<b>Florida Department of Transportation I-4 from West of US 27 to Polk/Osceola County Line FPN #201210-3</b>	ALTERNATIVE NO.:	<b>DR-03</b>
DESCRIPTION:	<b>Utilize Existing Pond E Parcel at Sta. 520+00 (RT)</b>	SHEET NO.:	<b>3 of 4</b>

2003 Pond E Basin Design:



# Calculations

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:
		<b>DR-03</b>
DESCRIPTION:	<b>Accommodate Impacts to Pond on Ritchie Property</b>	SHEET NO.: <b>4 of 4</b>

**Assumptions:**

- 1) All unit item costs are extracted from the cost estimate provided to the VE Team. If unit costs are not included for the particular pay item, the unit costs provided in the FDOT Listing of Master Payitems, dated 8/28/2014 were utilized.
- 2) The original design does not include any modifications to the Pond E parcel. The original design assumed that the stormwater treatment and attenuation would be handled off-site.
- 3) The cost comparison for DR-02 only applies to the difference in right-of-way acquisition for a similar 3.60 acre parcel since it is assumed the original design construction costs would be similar for the DR-02 alternative design construction costs.

**Calculations:**

The right-of-way costs for a 3.60 acre parcel are approximately \$1,500,000.

**Note:** The above figures are conservative approximations favoring the original design. A more detailed analysis will result in additional savings.





# Value Analysis Design Suggestion

PROJECT: **Florida Department of Transportation**  
**I-4 from West of US 27 to Polk/Osceola County Line**  
**FPN #201210-3** ALTERNATIVE NO.:  
**DR-04**

DESCRIPTION: **Enhance Existing Wetland with Floodplain**  
**Compensation** SHEET NO.: **1 of 2**

### Original Design:

The original design proposed floodplain compensation ponds on the north side of the mainline.

### Alternative:

The alternative proposes to utilize the existing wetland and floodplain areas on the south side of the mainline for floodplain compensation, thereby enhancing the natural communities.

### Opportunities:

- Environmental value added to enhanced wetlands
- Reduce maintenance costs
- Leave opportunity for frontage to Grandview Parkway
- Leave opportunity for stormwater treatment area within Heller Brothers Packing Corporation parcel
- Avoid cultural resources issues

### Risks:

- T&E concerns
- Limited suitable fill

### Technical Discussion:

The original design included two (2) alternative locations for floodplain compensation ponds on the north side of the mainline. FPC500A is proposed directly adjacent to the proposed Grandview Parkway alignment. Approximately fifty percent of FPC500B is within the limits of the proposed right-of-way acquisition. Both of these locations are located on the Heller Brothers Packing Corporation parcel. This parcel has the potential to provide joint use options for regional stormwater treatment for the I-4 Express Lanes, Grandview Parkway, and Central Polk Parkway.

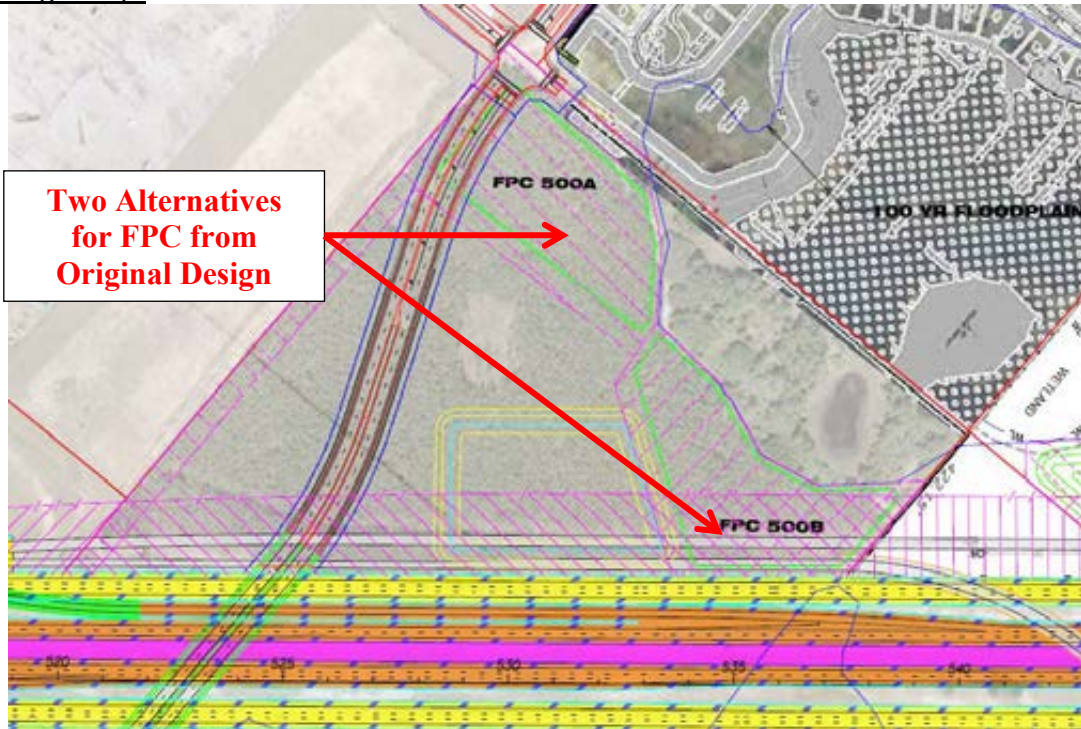
In order to maintain the natural community within the area, as well as not waste frontage area or regional stormwater treatment area options, it is recommended to construct the floodplain compensation ponds on the south side of the mainline, adjacent to the existing floodplain and wetlands. The area of floodplain compensation is consistent with the original design floodplain compensation areas. The size of each alternative is approximately 3 acres. After excavating the required storage volume, the intent of these floodplain compensation ponds is to allow the area to return to its natural vegetation; thereby reducing the need for future maintenance costs for these areas.

The construction costs of the original floodplain ponds is expected to be similar to the construction costs of the alternative floodplain pond locations since the pond acreage is roughly the same and off-site right-of-way would need to be acquired.

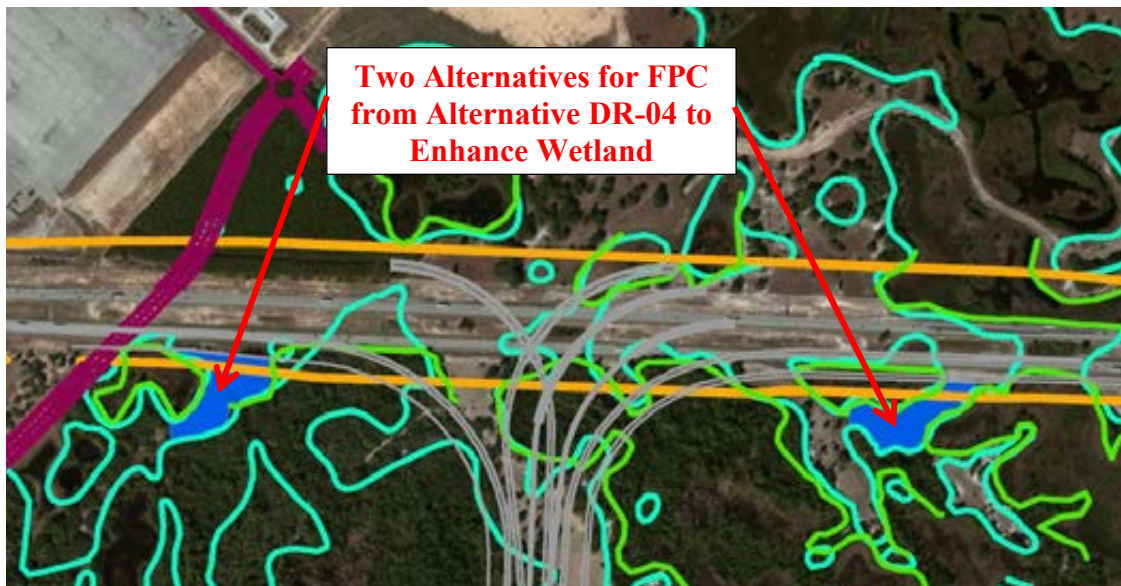
# Illustration

PROJECT:	<b>Florida Department of Transportation I-4 from West of US 27 to Polk/Osceola County Line FPN #201210-3</b>	ALTERNATIVE NO.:	<b>DR-04</b>
DESCRIPTION:	<b>Enhance Existing Wetland with Floodplain Compensation</b>	SHEET NO.:	<b>2 of 2</b>

PSR Drainage Map:



Alternative Drainage Map:





# Value Analysis Design Suggestion

PROJECT:	<b>Florida Department of Transportation I-4 from West of US 27 to Polk/Osceola County Line FPN #201210-3</b>	ALTERNATIVE NO.:	<b>DR-05</b>
DESCRIPTION:	<b>Update Location of Proposed Ponds (P-505-A1 &amp; P-505-A2)</b>	SHEET NO.:	<b>1 of 2</b>

## Original Design:

The original design proposed treatment ponds on the north side of the mainline which conflict with the proposed Meadows residential development (currently under construction, permitted under SWFWMD No. 43029630.004) and potential Central Polk Parkway (CPP) Interchange.

## Alternative:

The alternative proposes to construct treatment ponds outside of the proposed residential development and avoid relocation when the CPP Interchange is constructed.

## Opportunities:

- Reduce impacts to proposed site development
- Avoid cultural resources issues
- Avoid additional property owners in right-of-way acquisition (Heller Brothers property owners are scheduled to be impacted by Grandview Parkway).

## Risks:

- Potential T&E concerns

## Technical Discussion:

The original design proposed two (2) alternative locations for treatment stormwater ponds. One alternative included Pond 505-A1 located on the north side of the mainline. This 6.25 acre pond is located directly north of the proposed CPP Interchange and within the Meadows residential development. Although this area of the development has not been permitted, other phases of the development are already undergoing construction. In addition, Pond 505-A1 is within a previously recorded archaeological site; however, it is the opinion of the Cultural Resource Assessment Survey of Proposed Improvements to Segment 5 that the previously recorded site remains ineligible for NRHP.

The other alternative as part of the original design included Pond 505-A2 and Pond 505-B2. Pond 505-A2 is roughly in the same location of Pond 505-A1; however, it is smaller (3.73 acres) and outside of the archaeological concerns. Pond 505-B2 is located on the south side of the mainline, east of the proposed CPP interchange, adjacent to wetlands and floodplain.

The alternative is to consider a treatment pond location within the Heller Brothers Packing Corporation parcel in lieu of the Pond 505-A1 and Pond 505-A2 options. This parcel has the potential to provide joint use options for regional stormwater treatment for the I-4 Express Lanes, Grandview Parkway, and CPP. The alternative proposed pond, in lieu of the Pond 505-A2, will still require the treatment provided by Pond 505-B2.

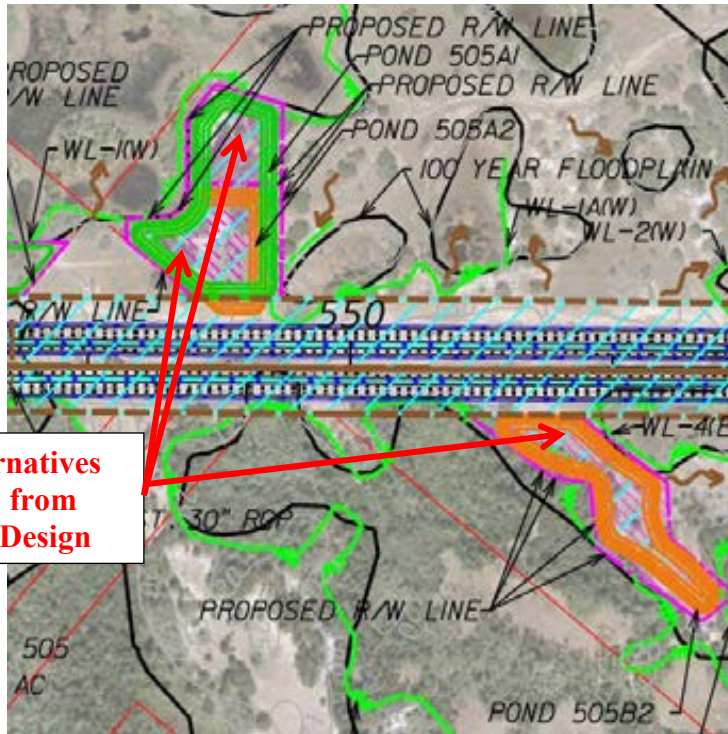
The construction costs of the original treatment ponds is expected to be similar to the construction costs of the alternative treatment pond locations since the pond acreage is roughly the same and off-site right-of-way would need to be acquired.



# Illustration

PROJECT:	<b>Florida Department of Transportation I-4 from West of US 27 to Polk/Osceola County Line FPN #201210-3</b>	ALTERNATIVE NO.:	<b>DR-05</b>
DESCRIPTION:	<b>Update Location of Proposed Ponds (P-505-A1 &amp; P-505-A2)</b>	SHEET NO.:	<b>2 of 2</b>

PSR Drainage Map:



**Two Alternatives for FPC from Original Design**

Alternative Drainage Map:



**Two Alternatives for Treatment Ponds**

# *Value Analysis Design Suggestion*

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.:
		<b>DR-06</b>
DESCRIPTION:	<b>Develop regional combined options to accommodate I-4, CPP, and Grandview Parkway</b>	SHEET NO.: 1 of 2

**Original Design:**

The original design for the Express Lanes does not incorporate the stormwater facilities required for proposed Central Polk Parkway (CPP) interchange and the Polk County Grandview Parkway overpass improvement which crosses over the I-4 mainline. The Express Lanes and the CPP are in the PD&E Phase coordinated through FDOT District 1. The Grandview Parkway is under design and coordinated through Polk County.

**Alternative:**

The alternate concept for I-4, CPP, and Grandview Parkway is to consider a regional drainage concept. All three (3) projects will require right of way for roadway, drainage, wetland mitigation, and other transportation related improvements. (utilities, landscaping etc.).

**Opportunities:**

- Reduced construction cost by constructing the ponds (outside of the Interchange) and floodplain improvements for both projects at one time
- Reduced right of way cost by impacting the owners once for both projects
- Reflect FDOT Bold Approach to regional planning of the joint projects
- Joint Planning with Polk County to adopt the regional planning of the project

**Risks:**

- Funding not in place to implement the regional concept
- Requires additional coordination and approval by the permit agencies
- Stakeholder cooperation required

**Technical Discussion:**

The design of the alternate includes defining the right of way needed to accommodate the proposed improvements for I-4, CPP, and Grandview into one regional concept for all projects.

To accommodate the Express Lanes and CPP, the alternative recommends placing the treatment ponds and floodplain compensation ponds on the south side of I-4. The alternative recommends using the infield areas of the proposed CPP Interchange for treatment. For floodplain compensation, it is recommended to remove the isolated pockets of uplands and create an enhanced environmental system around the interchange and along I-4.

To accommodate the Express Lanes, Grandview Parkway, and the impacts to the Ritchie Brothers stormwater ponds, a regional pond is recommended on the Heller Brothers Packing Corporation parcel, located to the east of the Ritchie Brothers Property and north of the I-4 mainline. By providing an outfall to the existing wetlands and floodplain, the runoff storage requirement is not as significant as the original permitted design for the Ritchie Brothers property. This volume could be combined with roadway runoff for treatment on the Heller Brothers Packing Corporation parcel. Right-of-way will already need to be acquired for the Grandview Parkway improvements.



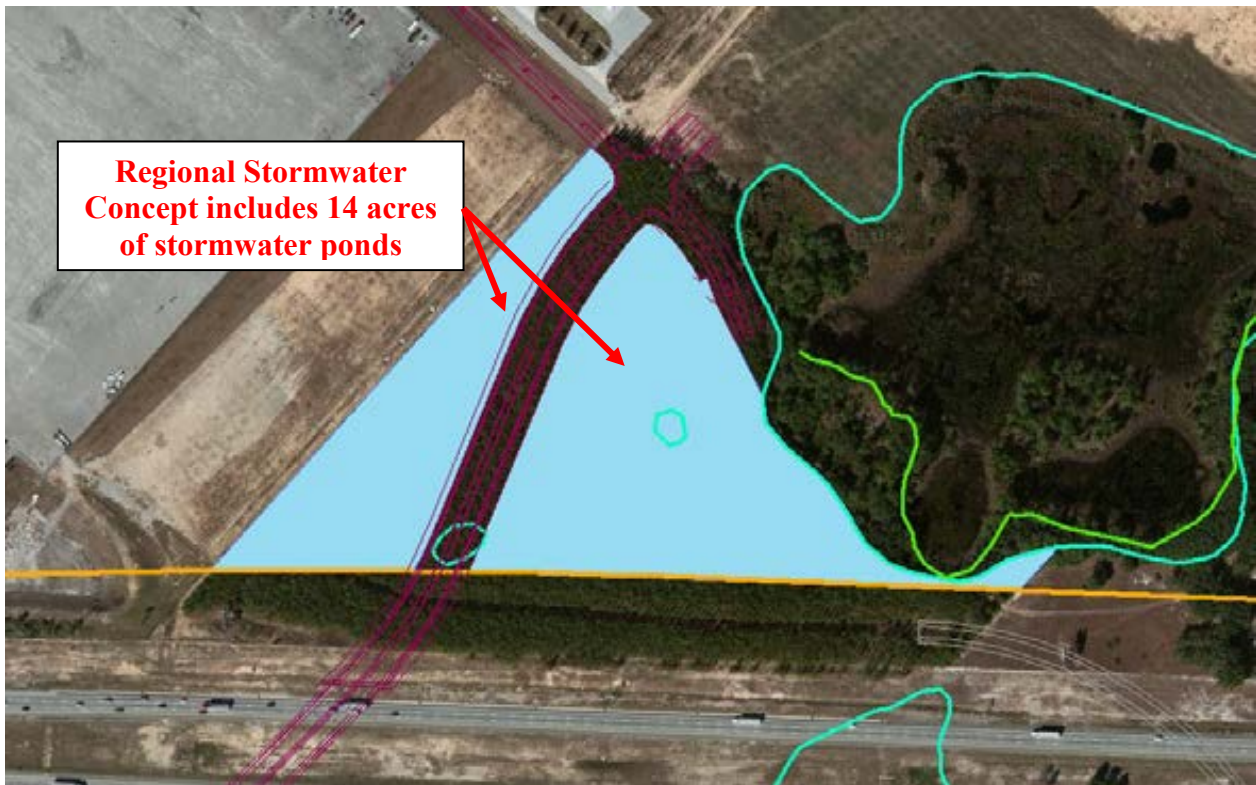
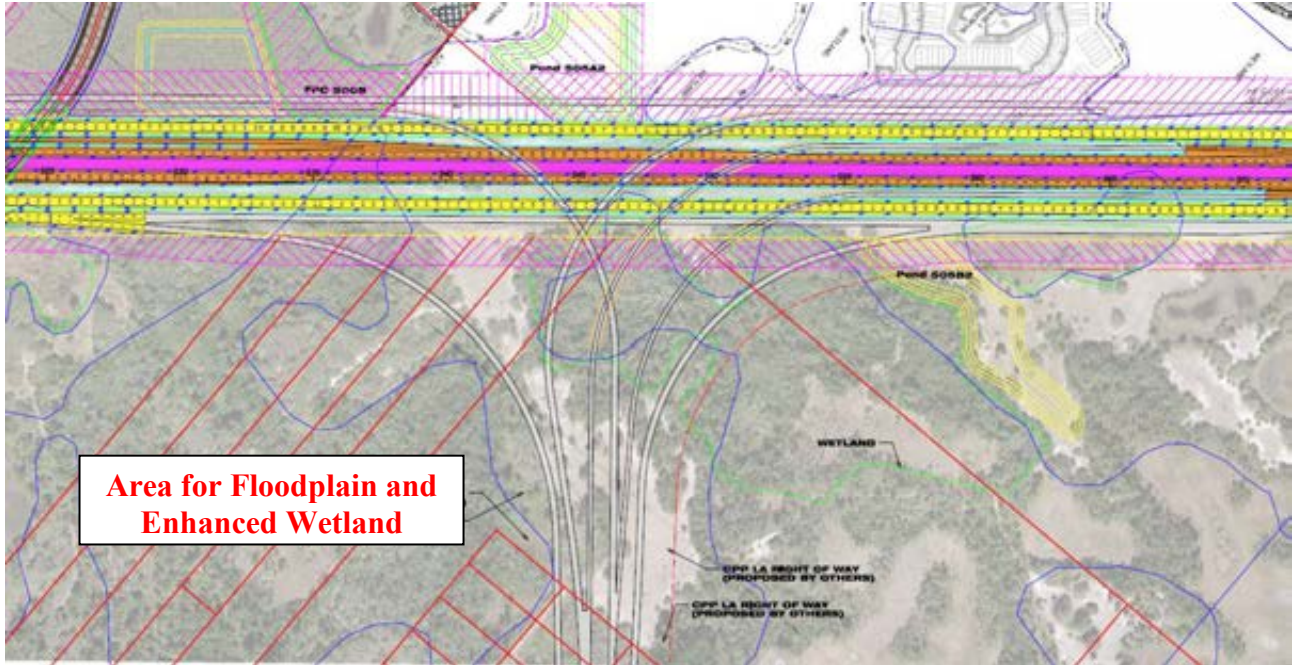
# Illustration

PROJECT: **Florida Department of Transportation  
I-4 from West of US 27 to Polk/Osceola County Line  
FPN #201210-3**

ALTERNATIVE NO.:  
**DR-06**

DESCRIPTION: **Develop regional combined options to accommodate  
I-4, CPP, and Grandview Parkway**

SHEET NO.: **2 of 2**







# Value Analysis Design Suggestion

PROJECT: **Florida Department of Transportation**  
**I-4 from West of US 27 to Polk/Osceola County Line**  
**FPN #201210-3**

ALTERNATIVE NO.:  
**DR-07**

DESCRIPTION: **Review VE alternatives for Basin 100**

SHEET NO.: **1 of 2**

## Original Design:

The original PSR includes Pond 100 which provides treatment and attenuation for Basin 100. It utilizes the existing Pond 7-7 from SWFWMD Permit No. 43011896.027. No floodplain compensation calculations were included in this VE evaluation.

## Alternative:

The alternative suggests evaluating other Value Engineering options for Basin 100, which extends between CR 54 and CR 532. It appears roadway improvements and Pond 100 are located within the 100-year floodplain and it is unclear if floodplain compensation is provided for Basin 100. This basin overlaps with Segment 1.

## Opportunities:

- Evaluate Basin 100 design for cost savings and value added options
- Reflect FDOT Bold Approach to regional planning of the joint projects

## Risks:

- Additional time outside of VE Study
- Funding not in place to implement the regional concept
- Requires additional coordination between the design segments and stakeholders

## Technical Discussion:

Pond 100 is discussed in the PSR for Segment 5. It serves Basin 100 which extends from south of CR 54 (Station 590+00) to northeast of the Osceola/Polk County line (Station 622+00). From the PSR Drainage Maps, the roadway improvements and Pond 100 appear to be within the limits of the 100-year FEMA floodplain boundaries. In the PSR for Segment 5, there is no discussion of floodplain impacts or compensation for Basin 100.

As part of the scope of the VE Study for Segment 5, this area is not included in the VE Team evaluation. At the time of the VE for Segment 1, the full impact of the needed roadway improvements in this area was unknown. This area was not specifically reviewed for cost savings or value added options under the Segment 1. It is unclear if any cost savings or value added options are available for Basin 100; however, it is recommended that the area be evaluated since information is split between the two design segments. There could be a potential to combine floodplain compensation and treatment options.

# Illustration

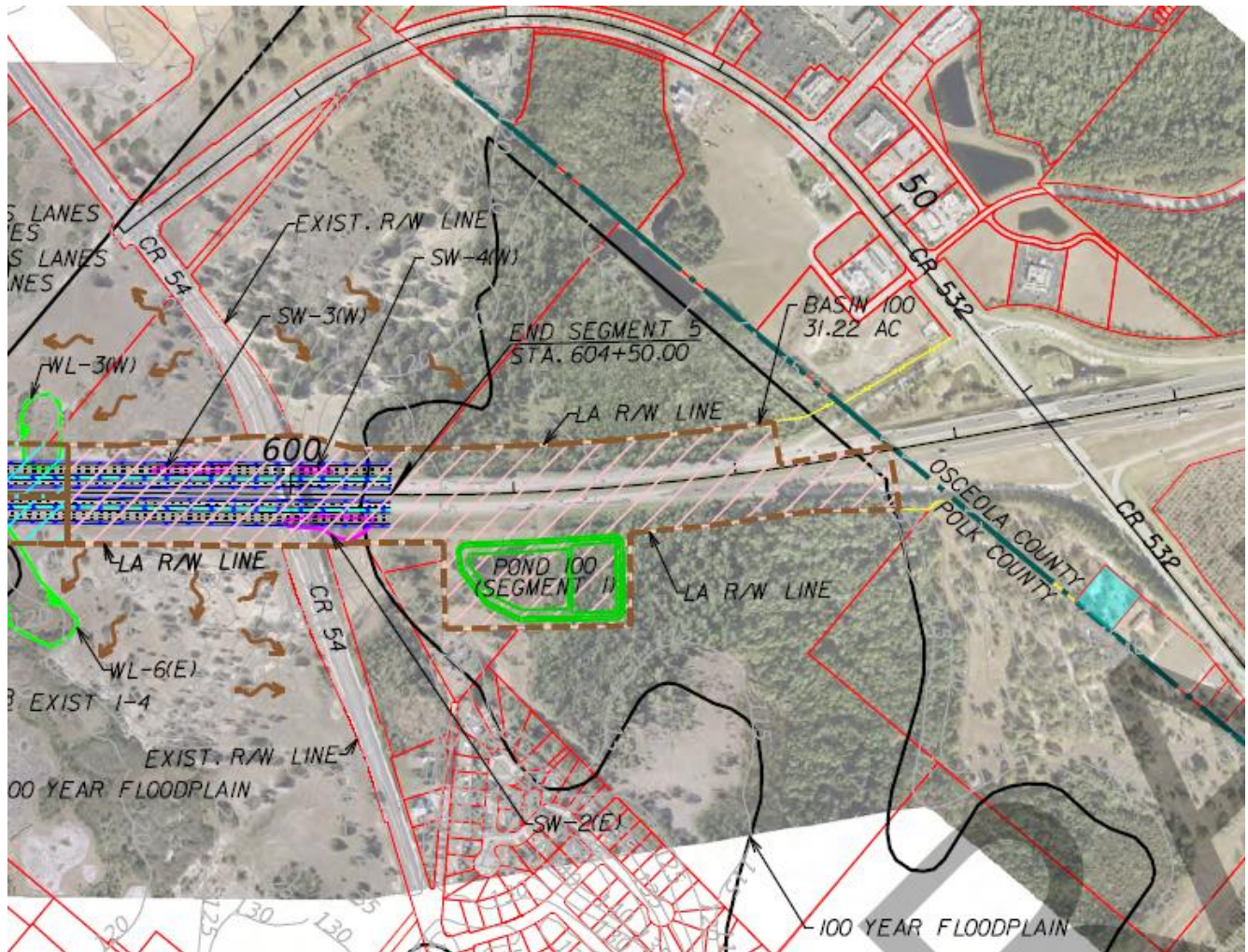
PROJECT: **Florida Department of Transportation  
I-4 from West of US 27 to Polk/Osceola County Line  
FPN #201210-3**

ALTERNATIVE NO.:  
**DR-07**

DESCRIPTION: **Review VE alternatives for Basin 100**

SHEET NO.: **2 of 2**

PSR Drainage Map:



# *Value Analysis Design Suggestion*

PROJECT:	<b>Florida Department of Transportation</b> <b>I-4 from West of US 27 to Polk/Osceola County Line</b> <b>FPN #201210-3</b>	ALTERNATIVE NO.: <b>DR-08</b>
DESCRIPTION:	<b>Use Contours in lieu of 100-Year FEMA Boundary for Floodplain Calculations</b>	SHEET NO.: <b>1</b> of <b>2</b>

**Original Design:**

The original floodplain calculations appear to follow the 100-year FEMA floodplain boundaries. From review of the Pond Siting Report (PSR) drainage maps, it appears these boundaries are inconsistent with 2014 aerial imagery or wetland boundaries.

**Alternative:**

The alternative suggests that in lieu of the 100-year floodplain lines, the 120 ft NAVD contour be used for floodplain impact and compensation calculations.

**Opportunities:**

- Better estimate of floodplain calculations

**Risks:**

- 100-year floodplain elevation is an estimate
- Contours are based on USGS 5-ft contours

**Technical Discussion:**

The PSR states that the 100-year floodplain boundaries are based on the FEMA boundaries. The FEMA boundaries for the project limits were last updated in 2000 and are classified as Zone A, which means the area is within the 100-year floodplain, but no Base Flood Elevation has been established. The subsequent Flood Insurance Studies were performed in 2003 and 2012, but no updates were made in this area. It is assumed the FEMA boundaries in this location are based on USGS contour information.

The PSR determined that the floodplain elevation is approximately 120 feet NAVD per SWFWMD Permit No. 43011896.027. This is also consistent with SWFWMD Permit No. 43029630.004 for the Meadows residential development currently under construction north of the mainline from Station 537+00 to Station 590+00. The 100-year floodplain elevation for the floodplain at Station 570+00 (LT) is 119.93 ft NAVD.

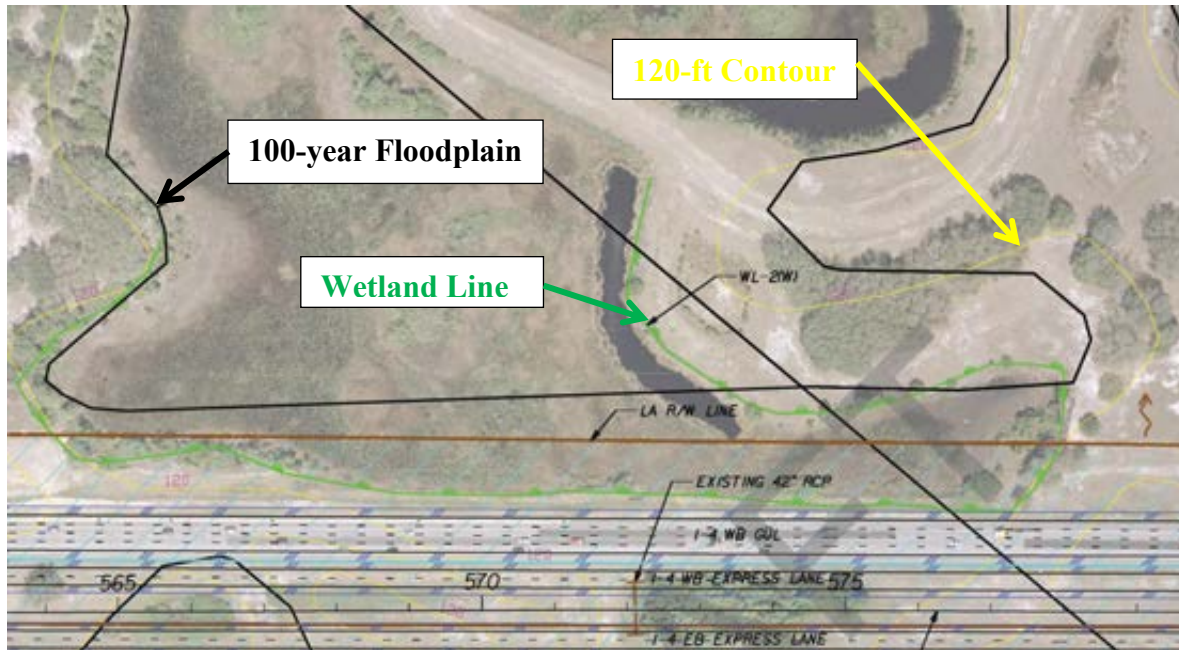
The alternative suggests that in lieu of using the FEMA boundaries for impact and compensation calculations, the USGS 120-foot contour be used for floodplain calculations. This 120-foot contour aligns with 2014 aerial imagery and the wetland boundaries. Because this contour appears to match existing conditions, it is assumed this boundary will provide more accurate estimates for the floodplain impacts and compensation.



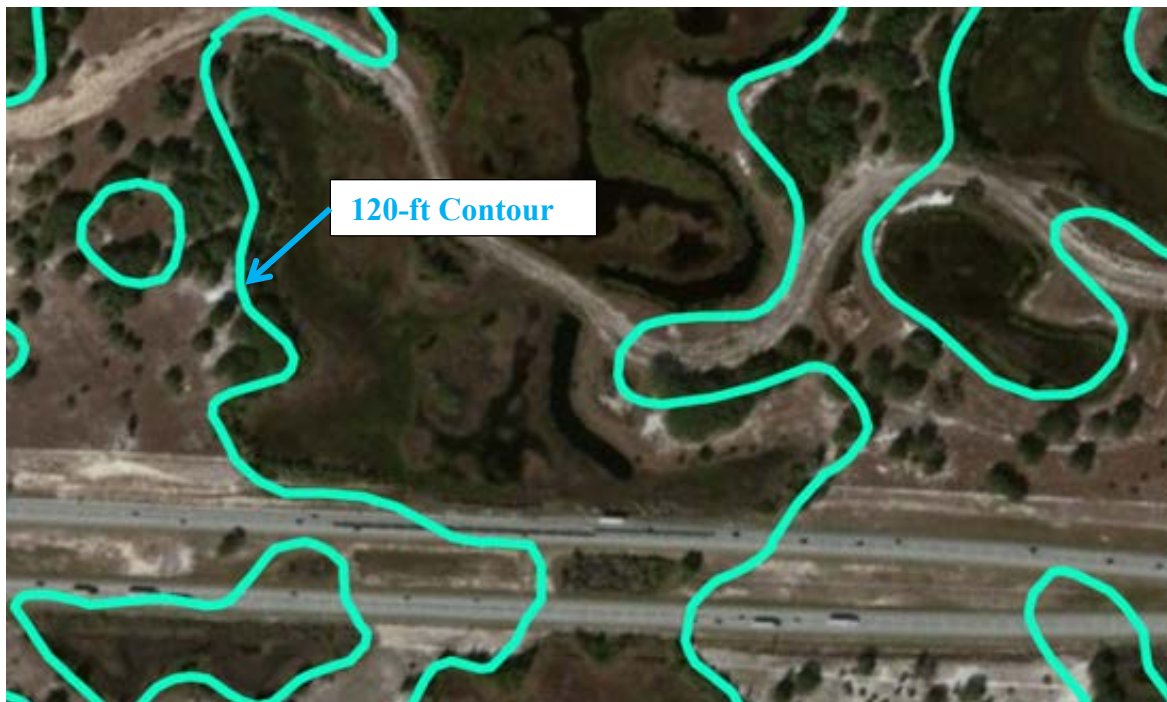
# Illustration

PROJECT:	<b>Florida Department of Transportation I-4 from West of US 27 to Polk/Osceola County Line FPN #201210-2</b>	ALTERNATIVE NO.:	<b>DR-08</b>
DESCRIPTION:	<b>Use Contours in lieu of 100-Year FEMA Boundary for Floodplain Calculations</b>	SHEET NO.:	<b>2 of 2</b>

PSR Drainage Exhibit:



Design Suggestion Exhibit:



## **Section 4**

# **Value Engineering Process**

## THE VALUE ENGINEERING TEAM

The Value Engineering workshop team leadership was provided by CSI with team members from FDOT District 5 and FDOT District 1. This team consisted of the following:

Ramesh Kalvakaalva	VE Facilitator	CSI
Jennifer Nunn	Drainage	Balmoral Group
Kevin Hayden	Geotechnical	FDOT D5
Isaac Naziru	Project Management	FDOT D5
Michael Dollery	Right of Way	FDOT D5
Haosu Sun	Structures	FDOT D5
David Mixon	Traffic Operations	FDOT D5
Amy Perez	Maintenance	FDOT D1
Joe Lauk	Project Manager	FDOT D1

## THE SIX-STEP VALUE ENGINEERING JOB PLAN

The Value Engineering team followed the six step Value Engineering job plan as promulgated by SAVE International. This six step job plan included the following:

- I. Information Phase**
  - II. Function Analysis Phase**
  - III. Speculation/Creative Phase**
  - IV. Evaluation Phase**
  - V. Development Phase**
  - VI. Presentation Phase**
- **Information Phase** – during this phase of the team’s work, the team received a briefing from the HNTB design team and representatives of the FDOT District 5. This briefing included discussions of the design intent behind the project, the cost concerns, and was followed by a general discussion and Q & A session for all the participants. Following the presentation the team took time to drive through the project and noted the potential high cost items that should be carefully reviewed during the course of the workshop. The VE team leader also made it clear that it was not the full intent of the study to cut costs for the project – that there is a great significance to be attached to alternatives that add value to the project, even if the alternative adds cost to the project. The sign-in sheet for the attendance during this phase can be found at the end of the section.
  - **Function Analysis Phase** – during this phase the team reviewed the project from the simplest perspective by asking questions such as, “What is the project supposed to do?”, and “How is it supposed to accomplish this purpose?”. In the Value Engineering vernacular the answers to these questions are cast in the form of active verbs and measurable nouns. These verb/noun pairs form the basis of the function analysis that distinguishes a Value Engineering effort from a potentially damaging cost cutting exercise. As will be seen later, the team performed a random function analysis and then developed a Function Analysis System Technique (FAST) diagram. This diagram is used to identify the key functions in the project. These key functions form the basis for purpose and need for the project. The FAST diagram is included at the end of this section.



- **Creative/Brainstorming Phase** – The VE team performed a brainstorming session to identify ideas that might help meet the team objectives for the workshop:
  - Reduce the construction and life cycle costs without reducing the quality and functionality of the currently planned project.
  - Meet project constraints such as challenges with the soil conditions, constructability, accessibility, project phasing, funding, etc.
  - Adherence to FDOT and AASHTO/FHWA design guidelines.
  - Reduce the construction duration.
  - Respect environmental and other accepted constraints.
  - Clarify and help mitigate risks and take advantage of opportunities for the project.

This brainstorming session initially identified numerous ideas that were then evaluated in the next phase. The reader will find the creative ideas worksheets enclosed. These same worksheets were also used to record the results of the Judgment or Evaluation Phase.

- **Judgment or Evaluation Phase** – Once the team identified the various creative ideas, it was necessary to decide which alternatives should be carried forward for further consideration. This is the work of the Judgment or Evaluation Phase. The team reflected back to the project constraints and objectives shared with the team by the project delivery team members in their briefing at the kick-off meeting. From that guidance the VE team settled on the following values to make the decisions on the merit of each of the ideas:
  - Ability to implement the alternative (is it workable and doable).
  - Does the idea support the environmental objectives for the project?
  - Construction cost savings.
  - Does the idea add value to the project?
  - Will the idea help to reduce the construction duration?
  - Does the idea respect the several constraints for the project?

Based on these and other measurement yardsticks, the VE team evaluated the alternatives and graded them using the following factor:

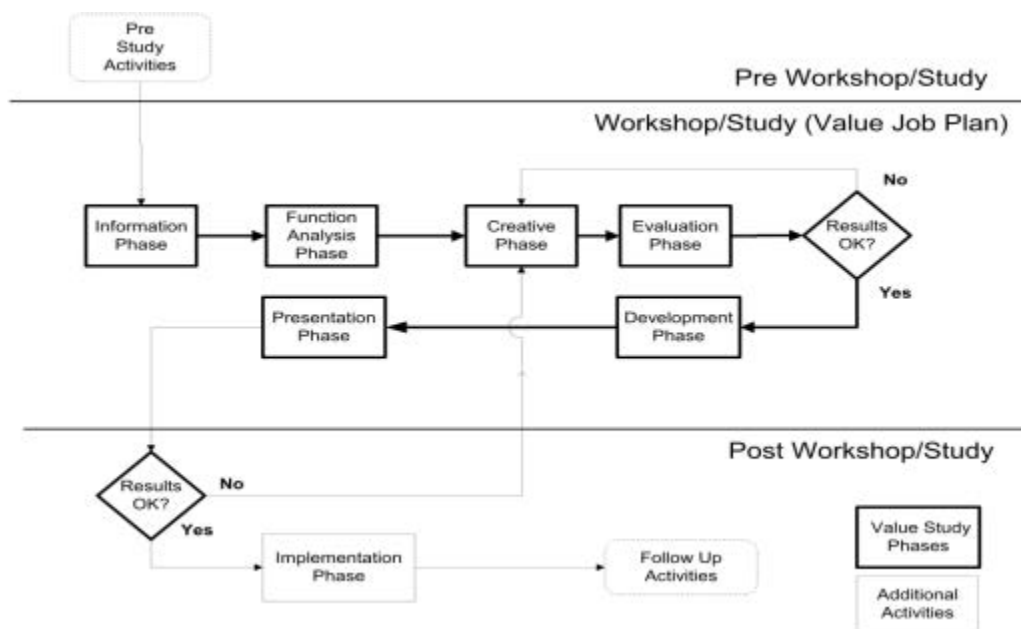
**Evaluation Factors:** The VE team used the performance metrics perspectives to decide on whether the alternatives should be carried forward. With each of the approximately 38 (Thirty Eight) creative ideas, the VE team rated them with the following ratings:

5	Excellent Idea
4	Good Idea
3	Marginal but it may offer some interest in the event there are budget problems.
2 and 1	Not to be carried forward
ABD	Already Being Done
DS	Design Suggestion

The complete list of Creative Ideas along with ratings is included at the end of this section.

- **Development Phase** – This phase calls for a thorough documentation of the alternatives to be carried forward. The worksheets provide a description of the changes to be made from the original design, sketches are prepared, Rough Order of Magnitude cost estimates, calculations, and technical discussions are provided. All of these are intended to assist the decision makers in deciding on the merits of the alternatives. Some of the ideas are documented in the form of Design Suggestions, which is a less detailed manner of providing guidance and suggestions for aspects of the project as it moves forward to construction.
- **Presentation Phase** – As noted earlier, the team made a final, informal presentation on the last day of the workshop. This presentation was designed to inform the project delivery team and stakeholders as to the initial findings of the VE workshop. This written report is intended to formalize those findings. The sign-in sheet for the attendance during this phase can be found at the end of the section.

The following flow chart that represents the work done prior to, during, and after the VE workshop is completed on site:



**Value Engineering Job Plan (Source: SAVE International)**

## STUDY AGENDA

The agenda for this VE workshop follows this narrative. There is a need to explain some of the activities that occurred during the workshop but are not identified in the agenda since the agenda was prepared prior to the start of the study.

On Monday, December 8, the VE Team performed a drive through site visit of the project subsequent to the presentation by the design team at Orlando, Florida. The drive through was assisted by HNTB personnel. On Tuesday morning, December 9, and Wednesday

afternoon, December 10, HNTB personnel updated and provided the VE Team with revised documents including the updated cost estimates. This was since the project design was still evolving.

**AGENDA**

**VALUE ENGINEERING WORKSHOP – December 8 – 12, 2014**  
**Value Engineering Study of “I-4 from West of US 27 to Polk/Osceola County Line”**  
**Project FPN# 201210-3**

<b>Sunday – 7 Dec 2014</b>	VE Facilitator Travels to Lake Mary, FL	Location – Homewood Suites, Lake Mary
<b>Monday – 8 Dec 2014</b>		
8:00 am – 8:30 am	VE Team Assembles for Information Session	Homewood Suites, Lake Mary
8:30 am – 10:30 am	Designers Presentation	VE and Project Delivery Team, Designers
11:00 am – 12:00 pm	Q&A Session & Travel to Site (Optional)	VE and Project Delivery Team; Designers
12:00 pm – 1:00 pm	Lunch	
1:00 pm – 2:30 pm	VE Team Information Phase / Site Review	VE and Project Delivery Team; Designers
2:30 pm – 5:00 pm	VE Team Information Phase / Site Review Discussions	VE Team
<b>Tuesday – 9 Dec 2014</b>		
8:00 am – 10:00 pm	Function/Cost Analysis Phase	VE Team
10:00 am – 12:00 pm	VE Team Creative Phase	VE Team
12:00 pm – 1:00 pm	Lunch	
1:00 pm – 2:30 pm	VE Team Creative/Evaluation Phase	VE Team
2:30 pm – 5:00 pm	VE Team Development of Alternatives	VE Team
4:00 pm – 5:00 pm	Informal Progress Review	VE and Project Delivery Team Leadership
<b>Wednesday – 10 Dec 2014</b>		
8:00 am – 5:00 pm	Development of Alternatives	VE Team
<b>Thursday – 11 Dec 2014</b>		
8:00 am – 3:00 pm	Development of Alternatives	VE Team
3:00 pm – 5:00 pm	Preparation for Presentation	VE Team
<b>Friday – 12 Dec 2014</b>		
8:00 am – 10:00 am	Brief Presentation of Findings	FDOT D5 HQ, DeLand
10:00 am – 5:00 pm	Draft VE Report Preparation	VE Team Leader

**CONSTRUCTION COST ESTIMATE**

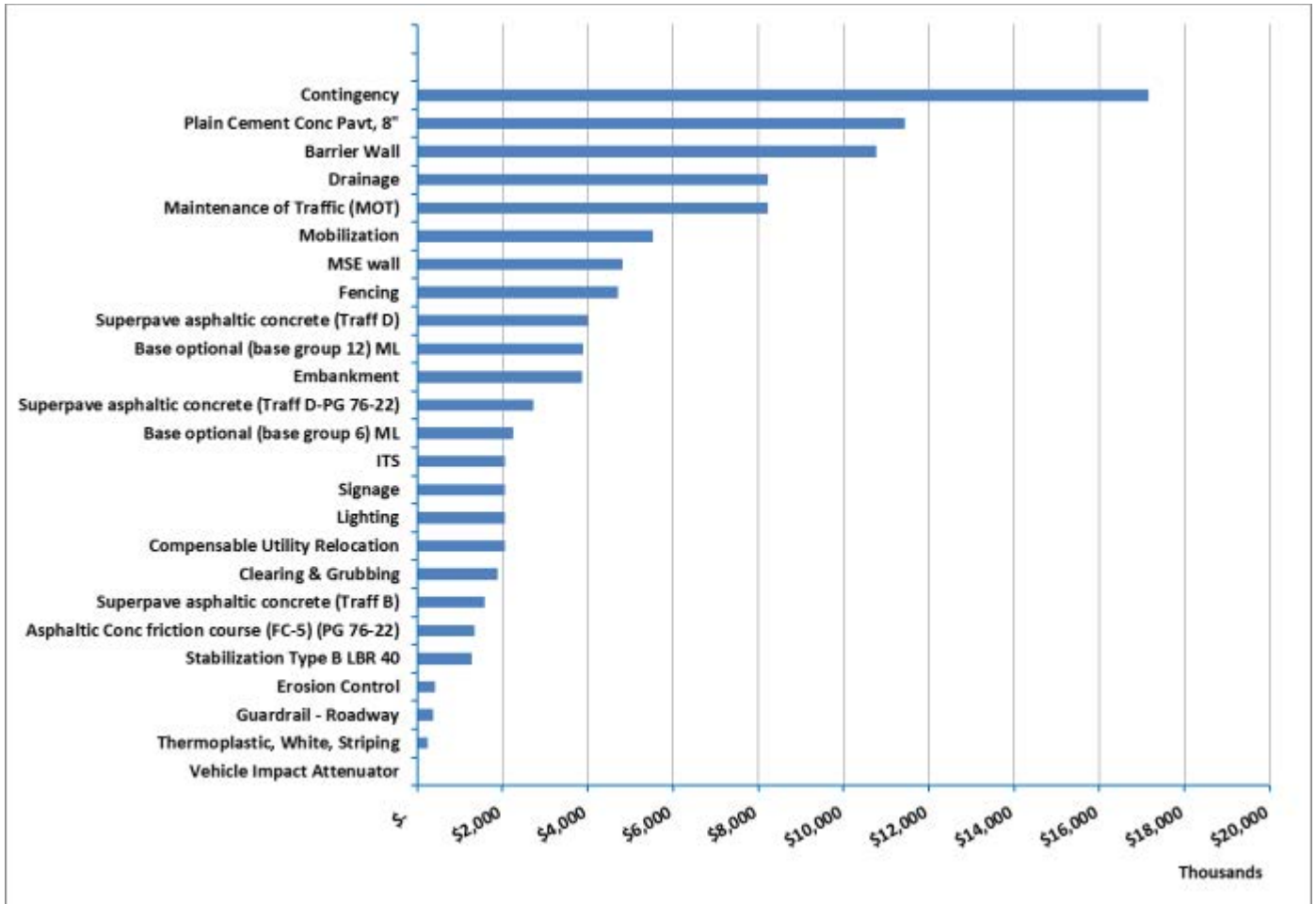
Since the project was in the preliminary (PD&E) stage of design, costs were of the Rough Order of Magnitude. Alternate 7 presented to the VE Team was used as the Baseline for comparison. Below are the cost estimates for the Mainline Section and the Interchange of I-4 / US 27. Where applicable, the VE Team made an attempt to itemize components of the Value Engineering Ideas to provide a Rough Order of Magnitude savings in costs or Value Addition keeping along the same levels of estimation for consistency.

In general, the plans call for the Phased construction along the existing route. This estimate totals approximately \$220 million.

Following each of the cost estimates is a cost model that helps to detail the distribution of the costs visually. This chart is done in what is called the Pareto style chart, i.e., emphasizing in a visual way the higher cost elements. This Pareto chart was utilized by the VE team to help them understand where their focus should be during the progression of the work of the VE workshop.

SEGMENT 5 MAINLINE WITH FULL SHOULDER DIRECTIONAL			
(Mainline I-4) STA 368+50 TO 604+47.49			
Item	Description	Total Cost	Remarks
0110 3	Vehicle Impact Attenuator	\$ 36,655	Area of existing bridges
160 4	Thermoplastic, White, Striping	\$ 241,173	Total Area of section
285 706	Guardrail - Roadway	\$ 374,248.42	Total Shldr area
285 712	Erosion Control	\$ 410,869	Total Roadway area
334 1 12	Stabilization Type B LBR 40	\$ 1,280,499	Used 110 lb /sy*inch lift (2" thk) - Shoulder
334 1 14	Asphaltic Conc friction course (FC-5) (PG 76-22)	\$ 1,339,927	Used 110 lb /sy*inch lift (3" thk) - Roadway
334 1 24	Superpave asphaltic concrete (Traff B)	\$ 1,578,296	Used 110 lb /sy*inch lift (2" thk) - Roadway
337 7 22	Clearing & Grubbing	\$ 1,882,836	Used 110 lb /sy*inch lift (0.75" thk) - Roadway
350 1 3	Compensable Utility Relocation	\$ 2,054,344	Express lanes only
521 1	Lighting	\$ 2,054,344	
536 1 1	Signage	\$ 2,054,344	
	ITS	\$ 2,054,344	EOP and lane lines
	Base optional (base group 6) ML	\$ 2,250,528	At gores
	Superpave asphaltic concrete (Traff D-PG 76-22)	\$ 2,732,902	LA R/W fence
	Embankment	\$ 3,858,508	Assume 3' over entire roadway area
	Base optional (base group 12) ML	\$ 3,885,774	Roadway raised 3' x length of section x 2 sides
	Superpave asphaltic concrete (Traff D)	\$ 3,988,226	
	Fencing	\$ 4,707,787	Assume 5% of Construction Subtotal Cost
	MSE wall	\$ 4,813,788	Assume 10% of Construction Subtotal Cost
	Mobilization	\$ 5,518,159	Assume 20% of Construction Subtotal Cost
	Maintenance of Traffic (MOT)	\$ 8,217,375	Assume 5% of Construction Subtotal Cost
	Drainage	\$ 8,217,375	Assume 5% of Construction Subtotal Cost
	Barrier Wall	\$ 10,768,844	Assume 20% of Construction Subtotal Cost
	Plain Cement Conc Pavt, 8"	\$ 11,441,595	Assume 5% of Construction Subtotal Cost
	Contingency	\$ 17,152,548	Assume 1% of Construction Subtotal Cost
			Assume 20% of Construction Subtotal
	<b>Grand Total</b>	<b>\$ 102,915,287</b>	

PARETO CHART FOR SEGMENT 5 MAINLINE WITH FULL SHOULDER DIRECTIONAL

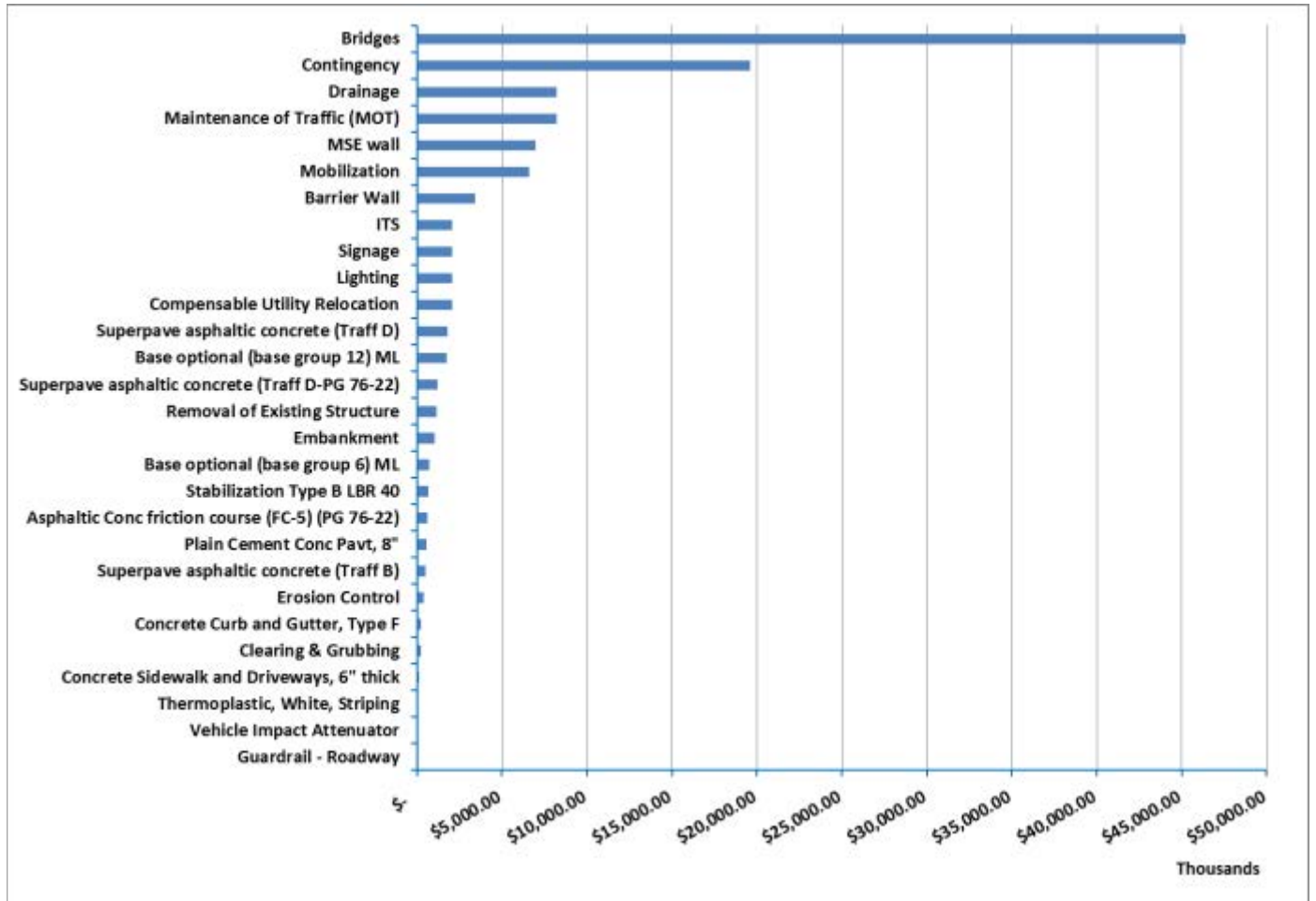


**I-4 from West of US 27 to Polk/Osceola County Line  
FPN #201210-3**

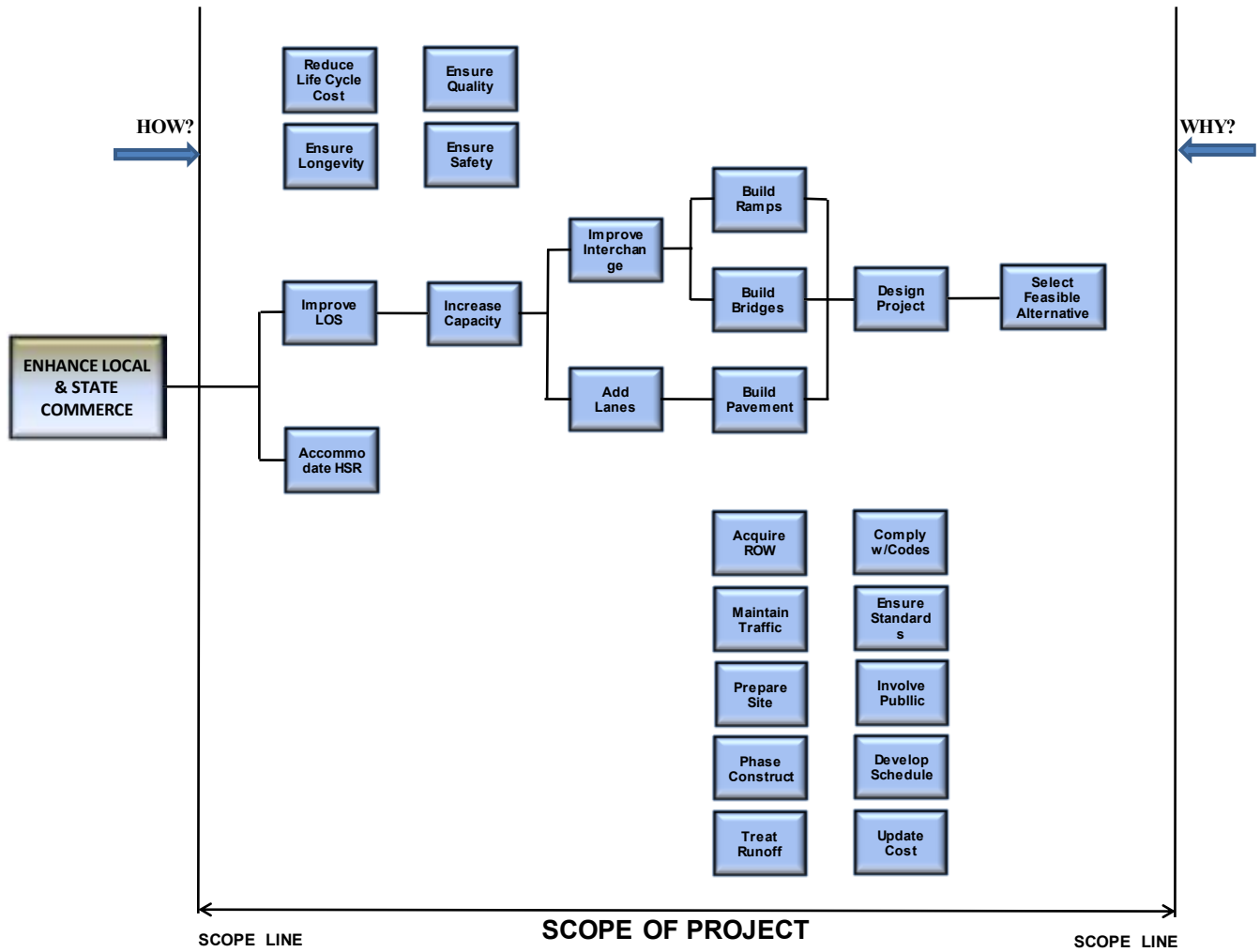
<b>US 27 ALT. 7 - GRADE SEPARATED INTERCHANGES AND RAMPS</b>			
<b>(US 27) STA 38+10.73 TO 101+32.73</b>			
<b>Item</b>	<b>Description</b>	<b>Total Cost</b>	<b>Remarks</b>
0110 1 1	Guardrail - Roadway	\$ 15,860.00	Total Area of section - R/W to R/W
0110 3	Vehicle Impact Attenuator	\$ 36,655	Area of existing bridges
160 4	Thermoplastic, White, Striping	\$ 91,840	Total Area of section
285 706	Concrete Sidewalk and Driveways, 6" thick	\$ 98,869	Total Shldr area
285 712	Clearing & Grubbing	\$ 224,196	Total Roadway area
334 1 12	Concrete Curb and Gutter, Type F	\$ 254,104	Used 110 lb /sy*inch lift (2" thk) - Shoulder
334 1 14	Erosion Control	\$ 410,869	Used 110 lb /sy*inch lift (3" thk) - Roadway
334 1 24	Superpave asphaltic concrete (Traff B)	\$ 499,955	Used 110 lb /sy*inch lift (2" thk) - Roadway
337 7 22	Plain Cement Conc Pavt, 8"	\$ 533,830	Used 110 lb /sy*inch lift (0.75" thk) - Roadway
350 1 3	Asphaltic Conc friction course (FC-5) (PG 76-22)	\$ 594,457	Express lanes only
520 1 10	Stabilization Type B LBR 40	\$ 658,619	
522 2 40	Base optional (base group 6) ML	\$ 712,898	
521 1	Embankment	\$ 1,024,991	
536 1 1	Removal of Existing Structure	\$ 1,140,304	
	Superpave asphaltic concrete (Traff D-PG 76-22)	\$ 1,212,448	EOP and lane lines
	Base optional (base group 12) ML	\$ 1,723,918	At gores
	Superpave asphaltic concrete (Traff D)	\$ 1,769,371	
	Compensable Utility Relocation	\$ 2,054,344	
	Lighting	\$ 2,054,344	Concrete
	Signage	\$ 2,054,344	Assume 5% of Construction Subtotal Cost
	ITS	\$ 2,054,344	Assume 10% of Construction Subtotal Cost
	Barrier Wall	\$ 3,393,729	Assume 20% of Construction Subtotal Cost
	Mobilization	\$ 6,618,231	Assume 5% of Construction Subtotal Cost
	MSE wall	\$ 6,980,268	Assume 5% of Construction Subtotal Cost
	Maintenance of Traffic (MOT)	\$ 8,217,375	Assume 20% of Construction Subtotal Cost
	Drainage	\$ 8,217,375	Assume 5% of Construction Subtotal Cost
	Contingency	\$ 19,572,707	Assume 1% of Construction Subtotal Cost
	Bridges	\$ 45,216,000	Assume 20% of Construction Subtotal
	<b>Grand Total</b>	<b>\$ 117,420,385</b>	
		<b>\$ 220,335,671</b>	



PARETO CHART FOR US 27 ALT. 7 - GRADE SEPARATED INTERCHANGES AND RAMPS



FUNCTION ANALYSIS SYSTEM TECHNIQUE (FAST) DIAGRAM







PROJECT: **FLORIDA DEPARTMENT OF TRANSPORTATION  
I-4 from West of US 27 to Polk/Osceola County Line  
FPN #201210-3** SHEET No.: **2 of 3**

NO.	IDEA DESCRIPTION	RATING
<b>ROADWAY (RD)</b>		
RD1	Relocate US 27 northbound left movement for continuous movement	See BR-2
RD2	Relocate US 27 southbound left movement for continuous movement	See BR-1
RD3	Bifurcate eastbound and westbound profiles using Retaining Walls	DS
RD4	Combine westbound General Use & CD Lanes on I-4 east of US 27	2
RD5	Elevate Express Lanes	1
RD6	Provide 4' inside shoulders for the express lanes along this corridor adjacent to Segment 1 to the east	4
RD7	Provide 10' inside shoulders for the express lanes along this corridor adjacent to District 1 I-4 master plan	4
RD8	Provide Full Width (12') Shoulder on the inside in the Interim	ABD
RD9	Mitigate potential for Wrong Way Drivers	DS
RD10	Reduce Border Width @ Proposed CPP Interchange Connection Location	DS
RD11	Verify Railroad Corridor width requirements to be 44'	DS
RD12	Reduce Outside Shoulder width to 8' on Express Lanes	2
RD13	Lower Railroad Profile at US 27 Interchange to reduce Bridge Vertical Clearance requirements	ABD
RD14	Equalize I-4 eastbound and westbound Profiles to address Grade Separation	DS
RD15	Provide 2' Inside Shoulder on Express Lanes	2
RD16	Consider providing roundabouts on US 27 at Sta. 57 and Sta. 82	DS
RD17	Reconcile Cost Estimates	DS

Rating: 1→2 = Not to be Developed; 3 = Varying Degrees of Development Potential; 4→5 = Most likely to be Developed;  
DS = Design Suggestion; ABD = Already Being Done





**Florida Department of Transportation**  
**Value Engineering Study of:**  
**I-4 from West of US 27 to Polk/Osceola County Line**  
**FPN #201210-3**

***Attendance Sheet – Kick-off Meeting***

<b>Name</b>	<b>Title</b>	<b>Organization</b>	<b>E-Mail</b>	<b>Telephone</b>
Ty Garner	VE Administrator	Florida DOT	Ty.Garner@dot.state.fl.us	386-943-5254
Staci Nester	Snr. Utility Proj. Manager	Florida DOT	Staci.Nester@dot.state.fl.us	386-943-5250
Ramesh Kalvakaalva	VE Facilitator	CSI	Rameshk@civilservicesinc.com	770-312-2014
Jennifer Nunn	VE Team - Drainage	Balmoral Group	Jnunn@balmoralgroup.us	407-629-2185
Kevin Hayden	VE Team - Geotechnical	Florida DOT	Kevin.Hayden@dot.state.fl.us	386-740-3498
Isaac Naziru	VE Team – Proj. Mgmt.	Florida DOT	Isaac.Naziru@dot.state.fl.us	386-943-5547
Michael Dollery	VE Team - ROW	Florida DOT	Michael.Dollery@dot.state.fl.us	386-943-5093
Haosu Sun	VE Team - Structures	Florida DOT	Haosu.Sun@dot.state.fl.us	386-943-5000





Florida Department of Transportation  
Value Engineering Study of:  
I-4 from West of US 27 to Polk/Osceola County Line  
FPN #201210-3

***Attendance Sheet – Kick-off Meeting***

Name	Title	Organization	E-Mail	Telephone
Amy Perez	VE Team – D1 Maint.	Florida DOT	Amy.Perez@dot.state.fl.us	863-519-2316
Joe Lauk	VE Team – D1 PM	Florida DOT	Joe.Lauk@dot.state.fl.us	863-519-2251
David Mixon	VE Team – Traffic Ops.	Florida DOT	Dave.Mixon@dot.state.fl.us	386-943-5178
Beata Stys-Palasz	Project Manager	Florida DOT	Beata.Stys-Palasz@dot.state.fl.us	386-943-5418
Luis Diaz	Project Manager	HNTB	Ldiaz@HNTB.com	407-805-0355
Robert Denney	Design Engineer	HNTB	RDenney@HNTB.com	407-805-0355
Sanam Rai	Drainage Engineer	HNTB	SRai@HNTB.com	407-805-0355



**Florida Department of Transportation**  
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***Attendance Sheet – Mid-point Meeting***

<b>Name</b>	<b>Title</b>	<b>Organization</b>	<b>E-Mail</b>	<b>Telephone</b>
Staci Nester	Snr. Utility Proj. Manager	Florida DOT	Staci.Nester@dot.state.fl.us	386-943-5250
Ramesh Kalvakaalva	VE Facilitator	CSI	Rameshk@civilservicesinc.com	770-312-2014
Jennifer Nunn	VE Team - Drainage	Balmoral Group	Jnunn@balmoralgroup.us	407-629-2185
Kevin Hayden	VE Team - Geotechnical	Florida DOT	Kevin.Hayden@dot.state.fl.us	386-740-3498
Isaac Naziru	VE Team – Proj. Mgmt.	Florida DOT	Isaac.Naziru@dot.state.fl.us	386-943-5547
Michael Dollery	VE Team - ROW	Florida DOT	Michael.Dollery@dot.state.fl.us	386-943-5093
Haosu Sun	VE Team - Structures	Florida DOT	Haosu.Sun@dot.state.fl.us	386-943-5000
David Mixon	VE Team – Traffic Ops.	Florida DOT	Dave.Mixon@dot.state.fl.us	386-943-5178



**Florida Department of Transportation**  
**Value Engineering Study of:**  
**I-4 from West of US 27 to Polk/Osceola County Line**  
**FPN #201210-3**

***Attendance Sheet – Mid-point Meeting***

<b>Name</b>	<b>Title</b>	<b>Organization</b>	<b>E-Mail</b>	<b>Telephone</b>
Amy Perez	VE Team – D1 Maint.	Florida DOT	Amy.Perez@dot.state.fl.us	863-519-2316
Joe Lauk	VE Team – D1 PM	Florida DOT	Joe.Lauk@dot.state.fl.us	863-519-2251
Luis Diaz	Project Manager	HNTB	Ldiaz@HNTB.com	407-805-0355
Robert Denney	Design Engineer	HNTB	RDenney@HNTB.com	407-805-0355
Sanam Rai	Drainage Engineer	HNTB	SRai@HNTB.com	407-805-0355



*Florida Department of Transportation  
719 South Woodland Boulevard  
Deland, FL 32720*

## Sign In - Sheet

FPN#: 201210 3 I-4 From US 27 to Polk/Osceola County Line  
 DATE: Friday December 12, 2014  
 TIME: 8:00 a.m. - 10:00 a.m.  
 LOCATION: FDOT Deland District Office (Cypress Conference Room)  
 Video Conference Bridge phone number is 850-414-3101 (Video Conference Bridge 01).  
 SUBJECT: VE Final Presentation to FDOT Management

<u>Initials</u>	<u>First Name</u>	<u>Last Name</u>	<u>REPRESENTING</u>	<u>PHONE</u>	<u>EMAIL</u>
	Jack	Adkins	Right of Way	(386) 943-5072	<a href="mailto:Jack.Adkins@dot.state.fl.us">Jack.Adkins@dot.state.fl.us</a>
X	George	Borchik	Design	(386) 943-5163	<a href="mailto:george.borchik@dot.state.fl.us">george.borchik@dot.state.fl.us</a>
✓	Annette	Brennan	Design	(386) 943-5543	<a href="mailto:annette.brennan@dot.state.fl.us">annette.brennan@dot.state.fl.us</a>
✓	Jeff	Cicerello	Technical Support	(386) 943-5416	<a href="mailto:jeffrey.cicerello@dot.state.fl.us">jeffrey.cicerello@dot.state.fl.us</a>
✓	Robert	Denney	HNTB (PD&E Consultant)	(407) 547-3034	<a href="mailto:rdenney@hntb.com">rdenney@hntb.com</a>
✓	Luis	Diaz	HNTB (PD&E Consultant)	(407) 805-0355	<a href="mailto:ldiaz@hntb.com">ldiaz@hntb.com</a>
MJD	Michael	Dollery	Right of Way	(386) 943-5093	<a href="mailto:michael.dollery@dot.state.fl.us">michael.dollery@dot.state.fl.us</a>
	Noranne	Downs	Secretary	(386) 943-5474	<a href="mailto:noranne.downs@dot.state.fl.us">noranne.downs@dot.state.fl.us</a>
✓	Mark	Garcia	District Maintenance	(386) 943-5277	<a href="mailto:mark.garcia@dot.state.fl.us">mark.garcia@dot.state.fl.us</a>
ey	Ty	Garner	VE & Utilities	(386) 943-5254	<a href="mailto:ty.garner@dot.state.fl.us">ty.garner@dot.state.fl.us</a>
	Kathy	Gray	Geotechnical	(386) 740-3501	<a href="mailto:kathy.gray@dot.state.fl.us">kathy.gray@dot.state.fl.us</a>
	John	Hatfield	Materials & Research	(386) 740-3469	<a href="mailto:john.hatfield@dot.state.fl.us">john.hatfield@dot.state.fl.us</a>



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KJH	Kevin	Hayden	Geotechnical	(386) 740-3498	<a href="mailto:kevin.hayden@dot.state.fl.us">kevin.hayden@dot.state.fl.us</a>
✓	Ferrell	Hickson	Drainage	(386) 943-5433	<a href="mailto:ferrell.hickson@dot.state.fl.us">ferrell.hickson@dot.state.fl.us</a>
<del>AKH</del>	Alan	Hyman	Operations	(386) 943-5477	<a href="mailto:alan.hyman@dot.state.fl.us">alan.hyman@dot.state.fl.us</a>
RK	Ramesh	Kalvakaalva	VE Team Leader (CSI)	(770) 312-2014	<a href="mailto:rameshk@civilservicesinc.com">rameshk@civilservicesinc.com</a>
	Neil	Kenis	Structures	(386) 943-5419	<a href="mailto:neil.kenis@dot.state.fl.us">neil.kenis@dot.state.fl.us</a>
JML	Joe	Lauk	D1 Project Management	(863) 519-2251	<a href="mailto:joe.lauk@dot.state.fl.us">joe.lauk@dot.state.fl.us</a>
	Mike	McPhail	Right of Way	(386) 943-5071	<a href="mailto:michael.mcphail@dot.state.fl.us">michael.mcphail@dot.state.fl.us</a>
	Ron	Meade	Deland Maintenance	(386) 740-3450	<a href="mailto:ron.meade@dot.state.fl.us">ron.meade@dot.state.fl.us</a>
DM	Dave	Mixon	Traffic Operations	(386) 943-5178	<a href="mailto:dave.mixon@dot.state.fl.us">dave.mixon@dot.state.fl.us</a>
	Rick	Morrow	Traffic Operations	(386) 943-5309	<a href="mailto:rick.morrow@dot.state.fl.us">rick.morrow@dot.state.fl.us</a>
	Debbie	Mott	Surveying & Mapping	(386) 943-5116	<a href="mailto:deborah.Mott@dot.state.fl.us">deborah.Mott@dot.state.fl.us</a>
IN	Isaac	Naziru	Project Management	(386) 943-5547	<a href="mailto:Naziru.Isaac@dot.state.fl.us">Naziru.Isaac@dot.state.fl.us</a>





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<u>Initials</u>	<u>First Name</u>	<u>Last Name</u>	<u>REPRESENTING</u>	<u>PHONE</u>	<u>EMAIL</u>
<i>sun</i>	Staci	Nester	Utilities	(386) 943-5250	<a href="mailto:staci.nester@dot.state.fl.us">staci.nester@dot.state.fl.us</a>
<i>JN</i>	Jennifer	Nunn	Balmoral Group (Drainage)	<i>(907) 629-2185</i>	<a href="mailto:jnunn@balmoralgroup.us">jnunn@balmoralgroup.us</a>
<i>@</i>	Frank	O'Dea	Transportation Development	(386) 943-5476	<a href="mailto:frank.odea@dot.state.fl.us">frank.odea@dot.state.fl.us</a>
	Amy	Perez	D1 Operations	(863) 519-2316	<a href="mailto:amarilys.Perez@dot.state.fl.us">amarilys.Perez@dot.state.fl.us</a>
	Suzanne	Phillips	Project Management	(386) 943-5141	<a href="mailto:suzanne.phillips@dot.state.fl.us">suzanne.phillips@dot.state.fl.us</a>
<i>✓</i>	Mark	Robinson	Design/Constructability	(386) 943-5727	<a href="mailto:mark.robinson@dot.state.fl.us">mark.robinson@dot.state.fl.us</a>
	Gary	Roche	Surveying & Mapping	(386) 943-5264	<a href="mailto:gary.roche@dot.state.fl.us">gary.roche@dot.state.fl.us</a>
<i>✓</i>	Amy	Sirmans	PD&E	(386) 943-5404	<a href="mailto:amy.sirmans@dot.state.fl.us">amy.sirmans@dot.state.fl.us</a>
	Brian	Stanger	PD&E	(386) 943-5391	<a href="mailto:brian.stanger@dot.state.fl.us">brian.stanger@dot.state.fl.us</a>
<i>BMP</i>	Beata	Stys-Palasz	Project Management	(386) 943-5418	<a href="mailto:beata.stys-palasz@dot.state.fl.us">beata.stys-palasz@dot.state.fl.us</a>
<i>HS</i>	Haosu	Sun	Structure Design	(386) 943-5237	<a href="mailto:haosu.sun@dot.state.fl.us">haosu.sun@dot.state.fl.us</a>
<i>✓</i>	John	Tyler	Construction	(386) 943-5344	<a href="mailto:john.tyler@dot.state.fl.us">john.tyler@dot.state.fl.us</a>



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Initials	First Name	Last Name	REPRESENTING	PHONE	EMAIL
	Robert	Denney	HNTB	407-805-0355	rdenney@hntb.com
	LUIS	DIAS	HNTB	407-805-0355	LDIAS@HNTB.COM
	<del>Alan</del>	Hyman	FDDP	386-943-5477	slan-hyman@dot.state.fl.us
	John	CLAPHAM	FDOT	386-943-5373	JOHN.CLAPHAM@DOT.STATE.FL.US
	Ferrell	Hickson	FDOT	5433	ferrell.hickson@dot.state.fl.us
	Heather	Johnstone	FDOT	5540	heather.johnstone@dot.state.fl.us
	GARY	SKOTRONICH	FDOT	5424	GARY.SKOTRONICK@dot.state.fl.us
	CHRIS	DABSON	FDOT	5227	CHRIS.DABSON@dot.state.fl.us
	John	Tyler	FDOT	5344	john.tyler@dot.state.fl.us
	MARIC	GARCIA	"	5477	mark.garcia@dot.state.fl.us
	Thomas	LaCorte	FDOT	506559	thomas.lacorte@dot.state.fl.us
	Kara	Smyth	FDOT	386-943-5434	Kara.Smyth@dot.state.fl.us

# APPENDIX A

## PRESENTATION OF VALUE ENGINEERING FINDINGS



**Value Engineering Workshop  
January 08 – 12, 2014**

**I-4 from West of US 27 to Polk/Osceola  
County Line  
FPN #201210-3**

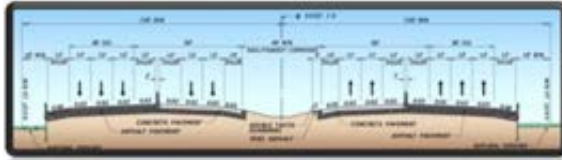


## **SIX STEP JOB PLAN**

- \* **INFORMATION PHASE**
- \* **FUNCTION ANALYSIS PHASE**
- \* **CREATIVE PHASE**
- \* **EVALUATION PHASE**
- \* **DEVELOPMENT PHASE**
- \* **PRESENTATION PHASE**

## INFORMATION PHASE

- \* DESIGNER PROVIDED INFORMATION
- \* PD&E DOCUMENTS (HNTB)



## INFORMATION PHASE

- \* Reconstruct and widen I-4 as part of the I-4 Ultimate concept.
- \* Segments in Polk, Osceola, Orange, Seminole and Volusia Counties.
- \* Addition of two new express lanes in each direction (total of ten dedicated lanes).
- \* Project limits for Segment 5: approximately 3-miles from west of SR 25/US 27 to west of CR 532 (Polk/Osceola County Line)
- \* Includes one interchange, I-4 at US 27



# INFORMATION PHASE



# INFORMATION PHASE

\* SITE VISIT – Monday, December 8, 2014



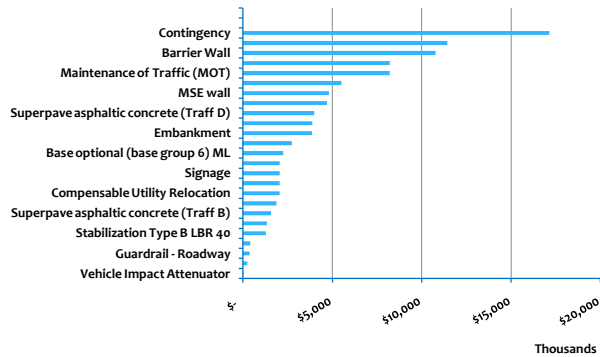
# INFORMATION PHASE

**\* COST ESTIMATE**

- \* SEGMENT 5 MAINLINE WITH FULL SHOULDER DIRECTIONAL - \$102,915,287
- \* US 27 ALT. 7 - GRADE SEPARATED INTERCHANGES AND RAMPS - \$117,420,385
- \* TOTAL FOR SEGMENT 5 - \$220,335,671

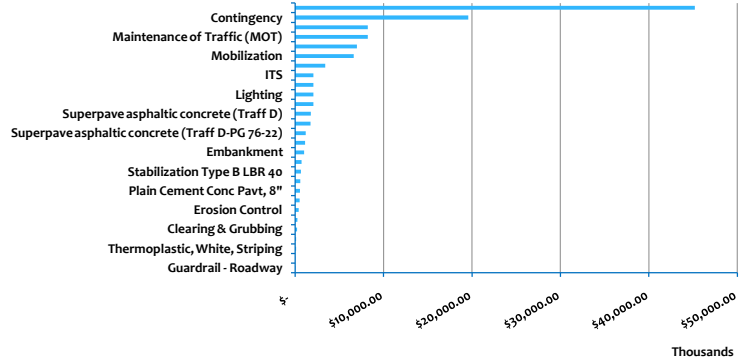
# INFORMATION PHASE

**\* PARETO CHART - MAINLINE**



# INFORMATION PHASE

## \* PARETO CHART – I-4 / US 27 INTERCHANGE

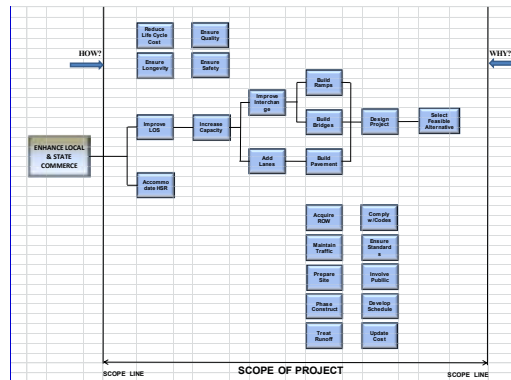


# FUNCTION ANALYSIS PHASE



# FUNCTION ANALYSIS PHASE

## \* FUNCTION ANALYSIS SYSTEM TECHNIQUE (FAST) DIAGRAM



# CREATIVE PHASE

- \* BRAINSTORMING SESSION
- \* THINK "OUTSIDE THE BOX"
- \* IGNORED CONSTRAINTS
- \* LISTED 36 CREATIVE IDEAS
- \* BASED ON INFORMATION PROVIDED

## EVALUATION PHASE

- \* CAN IT BE DONE?
- \* IS IT APPLICABLE TO THE PROJECT?
- \* DOES IT COMPLY WITH STANDARDS?
- \* ANY ADVERSE IMPACTS?
- \* IS IT BENEFICIAL TO THE PROJECT?
- \* RANKING ON A SCALE OF 1-5
- \* DESIGN SUGGESTION WHEN NOT QUANTIFIABLE BUT BENEFICIAL TO THE PROJECT
- \* STUDY RESULTS:
  - \* 13 ALTERNATIVES
  - \* 13 DESIGN SUGGESTIONS

## DEVELOPMENT PHASE

- \* SUMMARY OF RESULTS
- \* TOTAL SAVINGS FROM MUTUALLY EXCLUSIVE IDEAS:
  - \* APPROXIMATELY \$75 Million

PLEASE REFER TO HANDOUTS



# PRESENTATION PHASE BR-01

- \* Provide at-grade intersection US 27 at Frontage Road
- \* ORIGINAL DESIGN: \$12,148,416
- \* ALTERNATIVE: \$1,406,967
- \* SAVINGS: \$ 10,741,449

# PRESENTATION PHASE BR-01



## PRESENTATION PHASE BR-01


Illustration


**PROJECT:** 14th Street West of US 27 in PublicWorks County Line (PH-000001-1)  
**ALTERNATE NO.:** BR-01 (RD-02)  
**DATE:** 1.2015

**DESCRIPTION:** Provide at grade intersection US 27 at Frontage Road



While the above design shows a full Continuous Flow Intersection (CFI) at this location a partial CFI is proposed for the BR 02 US 27 full size traffic at the intersection.

## PRESENTATION PHASE BR-01


Illustration


**PROJECT:** 14th Street West of US 27 in PublicWorks County Line (PH-000001-1)  
**ALTERNATE NO.:** BR-01 (RD-02)  
**DATE:** 1.2015

**DESCRIPTION:** Provide at grade intersection US 27 at Frontage Road



Above are the 200' (200') reference for good flow traffic. Dark shaded reference are the 100' (100') reference and light shaded reference are 50' (50').

## PRESENTATION PHASE BR-01

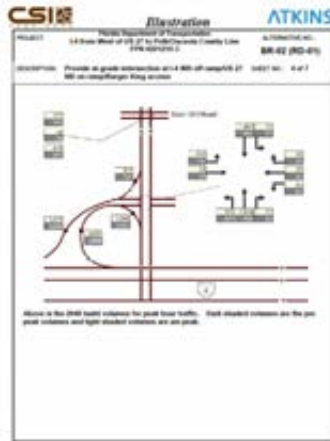


## PRESENTATION PHASE BR-02

- \* Provide at-grade intersection at I-4 WB off ramp/US 27 NB on ramp/Burger King access
- \* ORIGINAL DESIGN: \$ 10,497,110
- \* ALTERNATIVE: \$ 288,480
- \* SAVINGS: \$ 10,208,630



# PRESENTATION PHASE BR-02



# PRESENTATION PHASE BR-02



## PRESENTATION PHASE BR-04

- \* Replace the bridge btw Sta. 78+00 and 86+50 on South US 27 with two single span bridges and MSE Walls
- \* ORIGINAL DESIGN: \$ 7,225,920
- \* ALTERNATIVE: \$ 3,115,584
- \* SAVINGS: \$ 4,110,336

## PRESENTATION PHASE BR-04





## PRESENTATION PHASE BR-05

- \* Adjust the alignment of westbound I-4 Ramp to US 27 North to reduce the ramp bridge skew and shorten the bridge length
- \* ORIGINAL DESIGN: \$ 2,771,328
- \* ALTERNATIVE: \$ 1,846,656
- \* SAVINGS: \$ 924,672

## PRESENTATION PHASE BR-05



## PRESENTATION PHASE BR-07

- \* Use US 27 - Alternative 4 with Direct Connect Express Lane Ramps relocated to Southern Interchange Intersection
- \* ORIGINAL DESIGN: \$ 117,436,245
- \* ALTERNATIVE: \$ 80,354,68
- \* SAVINGS: \$ 37,081,557

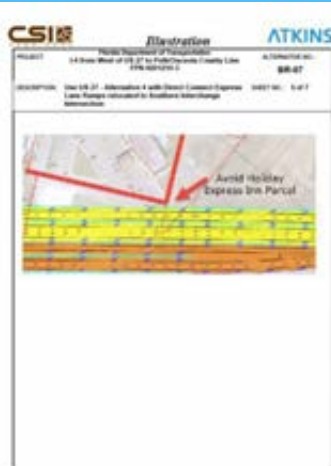
## PRESENTATION PHASE BR-07



# PRESENTATION PHASE BR-07



# PRESENTATION PHASE BR-07



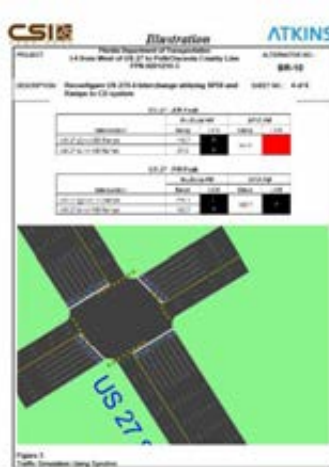
## PRESENTATION PHASE BR-10

- \* Reconfigure US 27/I-4 Interchange utilizing SPDI and Ramps to CD system
- \* ORIGINAL DESIGN: \$ 54,259,200
- \* ALTERNATIVE: \$ 36,996,800
- \* SAVINGS: \$ 17,262,400

## PRESENTATION PHASE BR-10



## PRESENTATION PHASE BR-10



## PRESENTATION PHASE RD-06

- \* Provide 4' inside shoulders for the express lanes along this corridor adjacent to Segment 1 to the east
- \* ORIGINAL DESIGN: \$ 14,160,623
- \* ALTERNATIVE: \$ 8,967,106
- \* SAVINGS: \$ 5,193,518

## PRESENTATION PHASE RD-06



## PRESENTATION PHASE RD-07 (DESIGN SUGGESTION)

- \* Provide 10' inside shoulders for the express lanes along this corridor adjacent to District 1 I-4 master plan



## PRESENTATION PHASE RD-07 (DESIGN SUGGESTION)



## PRESENTATION PHASE RD-09 (DESIGN SUGGESTION)

- \* Mitigate potential for Wrong Way drivers



# PRESENTATION PHASE RD-10 (DESIGN SUGGESTION)

- \* Reduce Border Width @ Proposed CPP Interchange Connection Location

# PRESENTATION PHASE RD-10 (DESIGN SUGGESTION)



## PRESENTATION PHASE RD-16 (DESIGN SUGGESTION)

- \* Consider providing roundabouts on US 27 at Sta. 57 and Sta. 82

## PRESENTATION PHASE RD-16 (DESIGN SUGGESTION)



# PRESENTATION PHASE DR-01 (DESIGN SUGGESTION)

- \* Maximize Existing Ponds within I-4/US 27 Interchange

# PRESENTATION PHASE DR-01 (DESIGN SUGGESTION)











# PRESENTATION PHASE DR-04 (DESIGN SUGGESTION)

- \* Enhance Existing Wetland with Floodplain Compensation

# PRESENTATION PHASE DR-04 (DESIGN SUGGESTION)



# PRESENTATION PHASE DR-05 (DESIGN SUGGESTION)

- \* Update Location of Proposed Ponds (P-505-A1 & P-505-A2)

# PRESENTATION PHASE DR-05 (DESIGN SUGGESTION)



# PRESENTATION PHASE DR-06 (DESIGN SUGGESTION)

- \* Develop regional combined options to accommodate I-4, CPP, and Grandview Parkway

# PRESENTATION PHASE DR-06 (DESIGN SUGGESTION)



# PRESENTATION PHASE DR-07 (DESIGN SUGGESTION)

- \* Review VE alternatives for Basin 100

# PRESENTATION PHASE DR-07 (DESIGN SUGGESTION)





# PRESENTATION PHASE DR-08 (DESIGN SUGGESTION)

- \* Use Contours in lieu of 100-Year FEMA Boundary for Floodplain Calculations

# PRESENTATION PHASE DR-08 (DESIGN SUGGESTION)



## NEXT STEPS

- \* SUBMISSION OF DRAFT VE REPORT
- \* IMPLEMENTATION MEETING WITH DESIGNERS/STAKEHOLDERS
- \* SUBMISSION OF FINAL VE REPORT

THANK YOU!  
ANY QUESTIONS?

