Draft

Bridge Analysis Technical Memorandum

Florida Department of Transportation

Florida's Turnpike Enterprise

Orlando South Ultimate Interchange

Florida's Turnpike (SR 91, MP 254) and

Beachline Expressway (SR 528, MP 4)

Orange County, Florida

Financial Project ID Number: 438547-1-22-01

ETDM Number: 14294

Date: December 2020

"The PD&E Study's support documents were developed in consideration of FTE's Express Lanes Master Plan, which was in effect before October 2019. However, during design phase, the concepts will be updated to Managed Lanes criteria. Managed Lanes plan will not have additional tolls on the facility and will not affect the results of the PD&E study (please see Section A.0 – Project Addendum)."

PROFESSIONAL ENGINEER CERTIFICATION

BRIDGE ANALYSIS TECHNICAL MEMORANDUM

I hereby certify that I am a registered professional engineer in the State of Florida practicing with Hardesty & Hanover, LLC, and that I have prepared or approved the evaluation, findings, opinions, conclusions or technical advice hereby reported for:

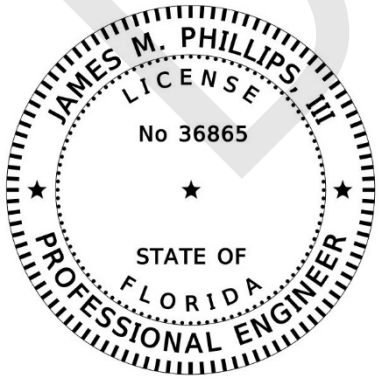
Project: Orlando South Ultimate Interchange

ETDM Number: 14294

Financial Project ID: 438547-1-22-01

Federal Aid Project Number: N/A

This Bridge Analysis Technical Memorandum contains detailed engineering information that fulfills the purpose and need for the Orlando South Ultimate Interchange Project Development & Environment Study at Florida's Turnpike (SR 91) and Beachline Expressway (SR 528) in Orange County, Florida. I acknowledge that the procedures and references used to develop the results contained in this report are standard to the professional practice of transportation engineering as applied through professional judgment and experience.



THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY:

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ON THE DATE ADJACENT TO THE SEAL

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ACRONYMS AND ABBREVIATIONS

ACM	Asbestos-Containing Material
AET	All Electronic Toll
AASHTO	American Association of State Highway and Transportation Officials
ABC	Accelerated Bridge Construction
APE	Area of Potential Effect
BDR	Bridge Development Report
CIP	cast in place
CD	collector-distributor
CR	County Road
CRAS	Cultural Resource Assessment Survey
EB	eastbound
EL	Express Lane
FDOT	Florida Department of Transportation
FDM	Florida Design Manual
FGT	Florida Gas Transmission
FIB	Florida I-Beam
ft/-ft	feet / -foot
FPID	Financial Project Identification
FTE	Florida's Turnpike Enterprise
GTL	General Toll Lane
LOS	Level of Service
LRE	Long Range Estimate
MBC	Metal Based Coatings
MSE	Mechanically Stabilized Earth
MP	milepost
NB	northbound
No.	number
NRHP	National Register of Historic Places
PD&E	Project Development and Environment
SPMT	Self-Propelled Modular Transporter
SPUI	Single Point Urban Interchange
SIS	Strategic Intermodal System
SB	southbound
SDG	Structures Design Guidelines
SDO	Structures Design Office
SR	State Road
TDH	Turnpike Design Handbook
TL	Test Level
WB	westbound

A.0 PROJECT ADDENDUM

The development of alternatives for the Orlando South Ultimate Interchange Project Development & Environment (PD&E) Study was completed in consideration of the Florida's Turnpike Enterprise (FTE's) Express Lane Master Plan in effect at the study Notice to Proceed which included the following:

- Two Express Lanes and three General Toll Lanes in each direction on Florida's Turnpike, separated by a buffer with Express Lane Markers
- One Express Lane and three General Toll Lanes in each direction on the Beachline Expressway, separated by a buffer with Express Lane Markers

Incorporation of the Express Lane Plan is included in the supporting documents and analysis.

In October 2019, FTE elected to change its operational approach and will not implement dynamically tolled express lanes on these facilities. The FTE is now implementing a Managed Lane system that restricts truck usage on selected lanes on its facilities without the additional toll. Revised typical sections for Florida's Turnpike and the Beachline Expressway are shown on **Figures A-1 and A-2**.

Figure A-1
Florida's Turnpike Managed Lane Typical Section

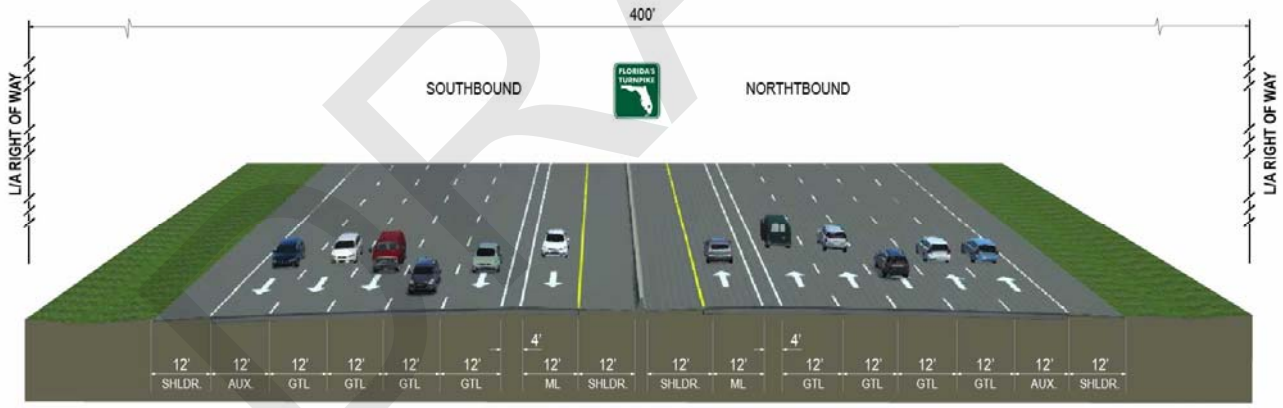
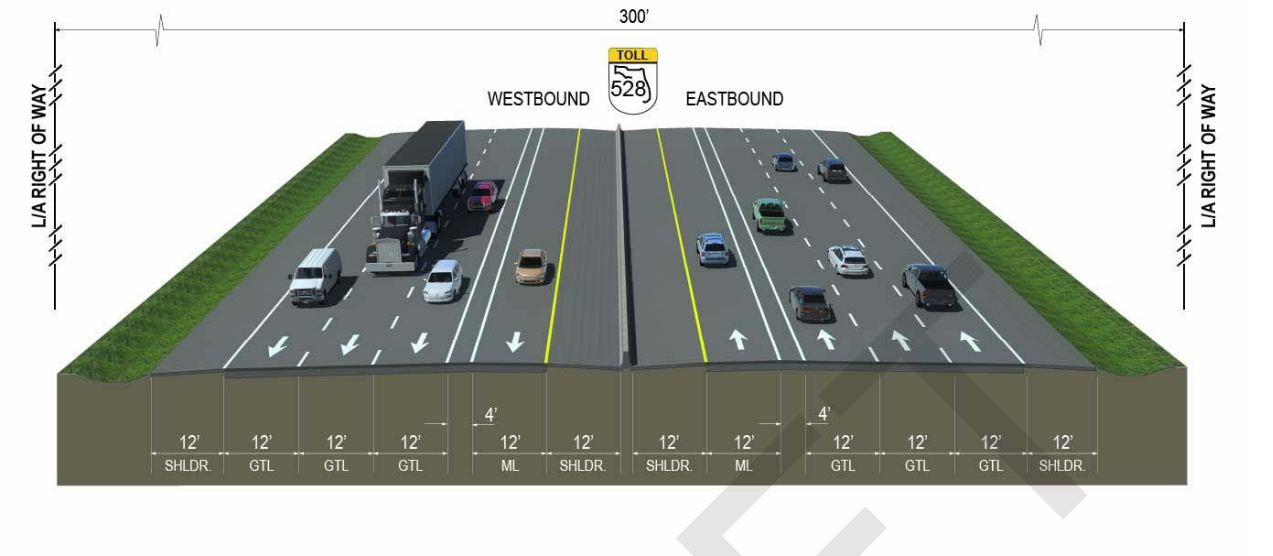


Figure A-2
Beachline Expressway Managed Lane Typical Section



This proposed change will be implemented during final design. The change does not invalidate the results of this study because the proposed footprint of the Florida's Turnpike and the Beachline Expressway is the same as the studied typical section. Therefore, there is no increase in impacts.

1.0 PROJECT SUMMARY

1.1 Project Description

The Florida Department of Transportation (FDOT), Florida's Turnpike Enterprise (FTE) is conducting a Project Development & Environment (PD&E) Study for the Orlando South Ultimate Interchange at Florida's Turnpike (State Road (SR) 91, Milepost (MP) 254) and Beachline Expressway (SR 528, MP 4), in Orange County, Florida. The project limits are shown on **Figure 1-1: Project Location Map**. The specific project limits for the study are:

- Florida's Turnpike from south of Taft Vineland Road to Sand Lake Road (SR 482), and
- Beachline Expressway from John Young Parkway (CR 423) to east of the Beachline West Toll Plaza.

Florida's Turnpike is a limited access facility with four 12-foot (-ft) lanes (two lanes in each direction) south of Taft Vineland Road and eight 12-ft lanes (four lanes in each direction) north of the Beachline Expressway. FTE is currently widening Florida's Turnpike (FPID 411406-1) south of the Beachline Expressway to continue the eight 12-ft lanes typical section. Construction for FPID 411406-1 is expected to be completed by year 2020.

The Beachline Expressway is also a limited access facility with two widening projects under construction within the project limits. Both projects, described below, are expected to be opened to traffic by the summer of 2020

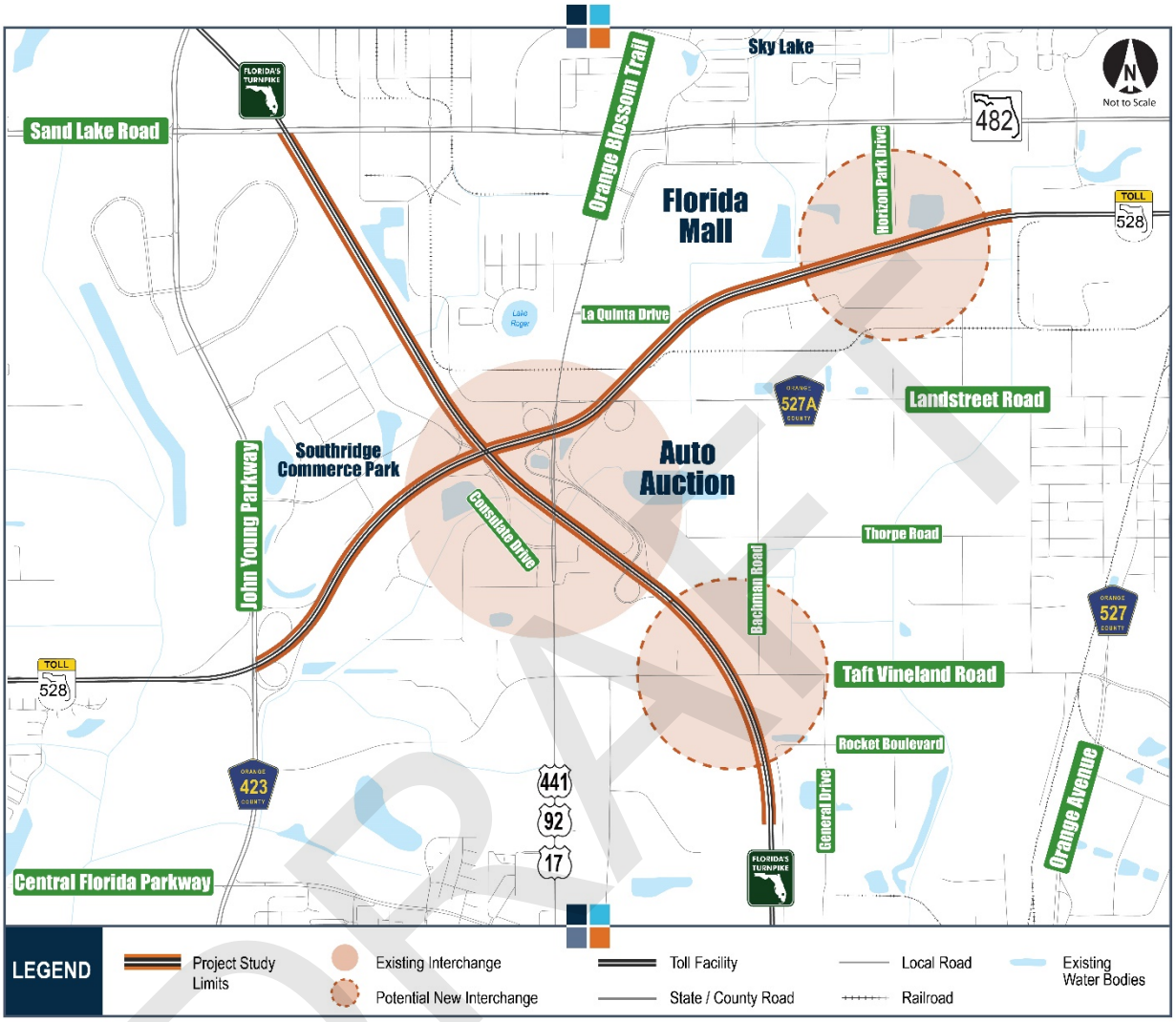
- FPID 406090-5: Widening from four to eight 12-ft lanes with a 4-ft buffer to include two General Toll Lanes (GTLs), two Express Lanes (ELs), and an auxiliary lane in each direction from I-4 (MP 0.0) to Florida's Turnpike (MP 4.3), west of the interchange.
- FPID 437156-1: Widening from six to eight 11.5-ft lanes with a 2-ft buffer to include three GTLs and one EL in each direction from Florida's Turnpike (MP 4.3) to the McCoy Road interchange (MP 8.4), east of the interchange.

Improvements are needed to address traffic needs and optimize safety at Florida's Turnpike and the Beachline Expressway. The alternatives evaluated include:

- New and improved connections between Florida's Turnpike and the Beachline Expressway
- All Electronic Toll (AET)
- Improved connections to local roads to address traffic operations
- Future EL expansion

This PD&E Study will also include analysis of the No-Build Alternative which would result in no additional improvements except those currently programmed.

Figure 1-1
Project Location Map



1.2 Purpose & Need

The purpose of the Orlando South Ultimate Interchange improvement is to accommodate future travel demands expected along Florida's Turnpike and Beachline Expressway due to increased population, freight demands, and employment opportunities expected in Orange County, Florida. The interchange improvements will also provide improved access to tourist centers, Orlando International Airport, Port Canaveral, and the growing industrial region surrounding the project location.

Within the Orlando South interchange, there are 13 ramp connections that directly or indirectly connect between the Beachline Expressway, Florida's Turnpike and Orange Blossom Trail. Although the planned construction of the Florida's Turnpike at Sand Lake Road interchange will alleviate demand at some ramps, in the study area, traffic on all facilities are still expected to

increase over time. In order to maintain an acceptable Level of Service (LOS) (LOS D for Florida's Turnpike mainline and LOS E for ramps), Florida's Turnpike will need to be widened to ten lanes by the year 2038 north of the Orlando South interchange and by the year 2040 to the south of the interchange under the No-Build scenario. Additionally, total freight movements across Orange County are expected to increase by up to 58% by 2040, which will place higher traffic demands on designated Strategic Intermodal System (SIS) corridors like Florida's Turnpike and Beachline Expressway.

The Florida Future Corridors Initiative has recommended improvements be made to Florida's Turnpike and Beachline Expressway near Orlando to accommodate future traffic demands. Currently, the Beachline Expressway is the only limited access roadway that provides a high-speed connection between Orlando and Brevard County. The interchange improvements, along with existing plans to widen Beachline Expressway to eight lanes from I-4 to McCoy Road (Financial Project Identification (FPID) #406090-5 and #437156-1) will address these needs. Currently, this area is home to Southpark Center with over 2.9 million square feet of building space.

Although not directly serviced by the interchange, the Orange County Convention Plaza Overlay District and International Drive (I-Drive) are located approximately four miles to the west of the project location. Universal Orlando has also recently acquired approximately 500 acres of vacant land between the project location and I-Drive, which has been zoned for theme park use and is expected to be developed as such in the future.

These developments will contribute to increasing traffic volumes on the limited access roadways that connect the area with other parts of the state, such as, Florida's Turnpike, Beachline Expressway and I-4. Improvements on interchanges that surround this area of future growth relieve congestion and provide efficient access to new development from multiple limited access facilities.

2.0 BRIDGE ANALYSIS

The Bridge Analysis Technical Memorandum addresses the bridges in the study area for the Orlando South Ultimate Interchange at Florida's Turnpike State Road (SR) 91, and Beachline Expressway (SR 528), in Orange County, Florida. The Technical Memorandum presents the results of the analyses performed on the bridges located within the corridor and identifies necessary bridge improvements for the proposed Orlando South Ultimate Interchange. The analysis was limited to assessments of existing bridge conditions based on field reviews, available plans and data, and proposed bridges based on latest roadway analyses and concept plans. Evaluations were performed by considering bridge geometry, vertical clearance, available load ratings, condition ratings current Florida Department of Transportation (FDOT) and Florida's Turnpike Enterprise (FTE) standards, and implications of associated impacts that the proposed roadway improvements would have on existing and proposed structures.

Section 2 describes the general objectives of the bridge concept development and constructability analysis. **Table 2-1: Existing Bridge Characteristics** summarizes the existing bridge characteristics.

Sections 3, 4 and 5 describe the structural configurations for each of the project bridges, implications of the proposed roadway improvements, recommendations to achieve the desired typical bridge section, and presents probable cost estimates for the proposed bridge improvements.

Bridge analysis was conducted for four alternatives. Only Alternative 3 is presented in detail in this report. Analyses for Alternative 1, Alternative 2 Option 1, and Alternative 2 Option 2 are presented in the Appendices.

2.1 Bridge Analysis Objectives

Bridge analysis was performed in accordance with Florida Design Manual (FDM) Section 121.8. The function of the bridge analysis is to determine general attributes for the bridges under consideration. While bridge alternatives are identified throughout the document, this bridge analysis leaves the determination of specific design attributes for the Bridge Development Report (BDR) phase of final design.

2.1.1 Vertical Clearance

Per FDM Table 260.6.1 Minimum Vertical Clearances for Bridges, maintain a minimum vertical clearance of 16 feet (ft) 6 inches over limited access facilities, arterials and collectors and maintain a minimum vertical clearance of 16 ft 0 inches for construction affecting existing bridges. Per the Turnpike Design Handbook (TDH) Section 260, vertical clearances between 16 ft and 16 ft 6 inches at existing bridges to be widened, will be maintained or increased as needed.

Table 2-1
Existing Bridge Characteristics

Bridge ID				Geometrics					Alignment					Structure						Condition				Bridge Alternatives Data					
ID / No.	Bridge Nos.	Location	Year Built Year Widened	Bridge Length (ft-inches)	Bridge Width (ft-inches)	Lanes	Inside Shldr (ft)	Outside Shldr (ft)	Skew Angle (deg)	Lateral Offset (LT) (ft)	Lateral Offset (RT) (ft)	Existing Vertical Clearance *from as-built **from design ***from inspection report (ft-inches)	Bridge Crosses Over	No. Spans	Maximum Span Length (ft-inches)	Super—structure	Exterior Beam Type	Interior Beam Type	Sub-structure Type (inches)	Sufficiency Index	Health Index	Inspection Date	Significant Deficiencies	Scope	Bridge Section	Structure Depth (ft) (not including cross slope)	Construct-ability Issues	Proposed Super-structure Material(s)	Complex Piers; Types
1	750626	SR 91 over OBT	2004	186'-9 1/2"	157'-1"	4 SB, 5 NB	12'	10'	53	16'	16'	16'-5" ***	Highway	1	186'-9.5"	CIP Deck on Steel I-girders	Steel Plate Girder	Steel Plate Girder	24" PSCP	85	99.95	10/2/2017	None No load restrictions, Minor repairs recommended	Develop widening alternatives	6 Widening each side	8.41'	Deck deflection during concrete placement; adjacent culverts	Steel Plate	None
2A	750219	EB SR 528 over SR 91	2007	355'-0 1/2"	60'-2.5"	2	11'	10'	21.12° @ EB1 Varies throughout	2.08'	6.96'	16'-4 7/8" **	Highway	6	78'-10 11/16"	CIP Deck on Prestressed Concrete Girders	AASHTO Type II	AASHTO Type III	Reinforced concrete columns (size varies)	91.8	97.63	9/20/2017	No Restrictions	Evaluate replacement alternatives	NA	NA	NA	NA	NA
2B	750181	EB SR 528 over OBT	1973/2009/ 2018	406.92'	71'-1"	4	10'	10'	Varies	5'	13'	16'-8 3/8" ***	Highway	6	99'-10.25"	CIP Deck on Prestressed Concrete Girders	FIB 45	AASHTO Type IV	18" PSCP	84.9	99.95	11/13/2017	None No load restrictions, Minor repairs recommended	Evaluate replacement alternatives	NA	NA	NA	NA	NA
3	750092	WB SR 528 over SR 91	2007	354'-11 3/4"	60'-2.5"	2	11'	10'	21.12° @ EB1 Varies throughout	2.75'	6.96'	16'-4 7/8" **	Highway	6	78'-11 13/16"	CIP Deck on Prestressed Concrete Girders	AASHTO Type II	AASHTO Type III	Reinforced concrete columns (size varies)	91.8	97.17	9/20/2017	No Restrictions	Evaluate replacement alternatives	NA	NA	NA	NA	NA
4	750093	WB SR 528 over OBT	1973/2009/ 2018	406.55'	91'-1"	5	10'	10'	Varies	5'	13'	16'-9" **	Highway	5	113'-3.19"	CIP Deck on Prestressed Concrete Girders	FIB 45	AASHTO Type IV	18" PSCP	90	99.92	11/13/2017	None No load restrictions, Minor repairs recommended	Evaluate replacement alternatives	NA	NA	NA	NA	NA
5	750221	EB SR 528 over Landstreet Road	1973/2009/ 2018	217'-10 5/8"	71'-1"	4	10'	10'	Varies	26.0'	14.0'	19'-3" ***	Highway	3	97'-0.625"	CIP Deck on Prestressed Concrete Girders	AASHTO Type IV & FIB 36	AASHTO Type IV	18" PSPC & 20" diameter steel pipe piling	91.9	99.64	11/13/2017	None No load restrictions, Minor repairs recommended	Evaluate widening alternatives	5 Widening varies 21'-4" to 21'-8.5"	5.5'	Construction over Landstreet Road; skew	FIB	None
6	750094	WB SR 528 over Landstreet Road	1973/2009/ 2018	217'-8 3/8"	71'-1"	4	10'	10'	Varies	26.0'	14.0'	16'-6" ***	Highway	3	96'-9 7/8"	CIP Deck on Prestressed Concrete Girders	AASHTO Mod Type IV & FIB 36	AASHTO Type IV	18" PSPC & 20" diameter steel pipe piling	91.9	99.83	11/13/2017	None No load restrictions, Minor repairs recommended	Evaluate replacement alternatives	5 Widening varies 21'-9" to 25'-4"	5.5'	Construction over Landstreet; skew	FIB	None

Bridge ID				Geometrics					Alignment					Structure						Condition				Bridge Alternatives Data					
ID / No.	Bridge Nos.	Location	Year Built Year Widened	Bridge Length (ft-inches)	Bridge Width (ft-inches)	Lanes	Inside Shldr (ft)	Outside Shldr (ft)	Skew Angle (deg)	Lateral Offset (LT) (ft)	Lateral Offset (RT) (ft)	Existing Vertical Clearance *from as-built **from design ***from inspection report (ft-inches)	Bridge Crosses Over	No. Spans	Maximum Span Length (ft-inches)	Super—structure	Exterior Beam Type	Interior Beam Type	Sub-structure Type (inches)	Sufficiency Index	Health Index	Inspection Date	Significant Deficiencies	Scope	Bridge Section	Structure Depth (ft) (not including cross slope)	Construct-ability Issues	Proposed Super-structure Material(s)	Complex Piers; Types
7a	750026	SB SR 91 over US 441 (OBT) to SB OBT	1963	163'-4"	44'-1"	1	1'-6"	1'-6"	15º 15'	2.0'	2.0'	16'-3" **	Highway	3	89'-2"	CIP Deck on Prestressed Concrete Girders	AASHTO Type IV	AASHTO Type III and IV	14" and 18" Square Concrete	92.6	98.92	6/4/2018	None No load restrictions, Minor repairs recommended	Evaluate existing to remain	NA	4.58'	Demolition of US 441	NA	NA
7b	750645	SB SR 91 over US 441 (OBT) from SB OBT	2018	160'	43'-1"	2	6'	10'	15º 15'	16'	24'	16'-7 3/8" **	Highway	1	160'	CIP Deck on Prestressed Concrete Girders	FIB 78	FIB 78	Unknown	90.9	99.57	3/30/2018	None No load restrictions,	Evaluate existing to remain	NA	7.5'	Demolition of US 441	NA	NA
8	750641	SR 91 On/Off Ramp over SR 91 (loop to trumpet)	2019	331'-6"	74'-1"	3	6' & 8'	6' & 10"	0	25'	37'	16'-8 1/4" **	Highway	4	136'	CIP Deck on Prestressed Concrete Girders	FIB 54	FIB 54	24' PSPC	95.6	98.31	5/3/2019	None No load restrictions	Evaluate existing to remain	NA	5.5'	Demolition of SR 91	NA	NA
11	754169	WB Taft Vineland Road over SR 91	2019	341'-4"	43'-7 3/4"	2	2'-6"	8'	Varies	37'	40'-6"	16'-6" **	Highway	4	124'-2"	CIP Deck on Prestressed Concrete Girders	FIB 45	FIB 45	24' PSPC	in const	in const	in const	in const	Evaluate existing to remain	NA	4.58'	Existing Bridge to Remain – No Issues	NA	NA
12	754170	EB Taft Vineland Road over SR 91	2019	341'-4"	43'-7 3/4"	2	2'-6"	8'	Varies	37'	40'-6"	16'-6" **	Highway	4	124'-2"	CIP Deck on Prestressed Concrete Girders	FIB 45	FIB 45	24' PSPC	97.7	98.93	9/18/2018	None No load restrictions,	Evaluate existing to remain	NA	4.58'	Existing Bridge to Remain – No Issues	NA	NA
13	750632 – EB on ramp	SR 528 over CSXRR	2009	154'-4.69"	43'-1"	2	6'	10'	Varies	26'-6"	18'-6"	23'-11" ***	RR	2	103'-4"	CIP Deck on Prestressed Concrete Girders	AASHTO Type III & IV	AASHTO Type IV	20" diameter steel pipe piling	98	99.89	11/14/2017	None No load restrictions, Minor repairs recommended	Evaluate existing to remain	NA	5.5'	Demolition over CSXRR	NA	NA
14	750096 – WB	SR 528 over CSXRR	1973/2009	162'	71'-1"'	3	10'	22'	45	9'-11 3/8"	18'-9 1/8"	23'-10 5/8" **	RR	3	54'	CIP Deck on Prestressed Concrete Girders	AASHTO Type II	AASHTO Type II	18" PSPC & 20" diameter steel pipe piling	94	99.5	11/14/2017	None No load restrictions, Minor repairs recommended	Evaluate widening alternatives	5 Widening varies 20'-10.5"	3.83'	Demolition over CSXRR	NA	NA
15	750222 – EB	SR 528 over CSXRR	1973/2009	162'	Varies 73'-11 1/4" to 79'-7 5/8"	3	22'	Varies 12'-8.75" to 18'-5 1/8"	45	9'-11 3/8"	18'-9 1/8"	22'-7" ***	RR	3	54'	CIP Deck on Prestressed Concrete Girders	AASHTO Type II	AASHTO Type II	18" PSPC & 20" diameter steel pipe piling	94	99.63	11/14/2017	None No load restrictions, Minor repairs recommended	Evaluate widening alternatives	5 Widening varies 12'-4.875" to 18'-1.25"	3.83	Demolition over CSXRR	NA	NA

Bridge ID				Geometrics					Alignment					Structure						Condition				Bridge Alternatives Data					
ID / No.	Bridge Nos.	Location	Year Built Year Widened	Bridge Length (ft-inches)	Bridge Width (ft-inches)	Lanes	Inside Shldr (ft)	Outside Shldr (ft)	Skew Angle (deg)	Lateral Offset (LT) (ft)	Lateral Offset (RT) (ft)	Existing Vertical Clearance *from as-built **from design ***from inspection report (ft-inches)	Bridge Crosses Over	No. Spans	Maximum Span Length (ft-inches)	Super—structure	Exterior Beam Type	Interior Beam Type	Sub-structure Type (inches)	Sufficiency Index	Health Index	Inspection Date	Significant Deficiencies	Scope	Bridge Section	Structure Depth (ft) (not including cross slope)	Construct-ability Issues	Proposed Super-structure Material(s)	Complex Piers; Types
E (Ramp 6)	750095 – EB SR 528 On Ramp	Ramps 8 over Landstreet Road, Ramp 19	1973	207.45'	Varies	2	4'	4'	45	26.0'	14.0'	17'-2 1/2" ***	Highway	3 (to match existing bridges)	92.46'	CIP Deck on Prestressed Concrete Girders	AASHTO IV	AASHTO Type III & IV	18" PSCP	81.4	99.81	11/13/2017	None No load restrictions, Minor repairs recommended	Evaluate replacement alternatives	NA	NA	NA	NA	NA
17 Bridge V, Alt. 3 Only	750218	EB SR 528 over JYP	1973/2019	290'	77'-1"	4	12'	10'	Varies	9'-2 7/8"	18'-1 3/8"	19'-8"**	Highway	4	88.3'	CIP Deck on Prestressed Concrete Girders	FIB-36	AASHTO IV, FIB-36	EB: HP12 Steel Piers: 18" PSPC	94.5	97.58	02/27/2019	None No load restrictions, No repairs recommended	Develop widening alternatives	17 Widening on the Right	5.5' plus cross slope (10.5' Total)	Close proximity of Bridge No. 750629	Prestressed Concrete Beams	None

Notes:

OBT = Orange Blossom Trail (US 441/17/92)
SR 528 = Beachline Expressway
SR 91 = Florida's Turnpike
JYP = John Young Parkway (CR 423)
NA = Not applicable

2.1.2 Traffic Railing

For the purpose of establishing initial alternatives, all outside traffic railings are assumed to be 36-inch single slope, Test Level (TL)-4, per Standard Index 521-427 and median barriers 36-inch single slope, TL-4, per Standard Index 521-426, unless otherwise required by the criteria below.

Traffic railing height is addressed in the FDOT Structures Design Guidelines (SDG) Section 6.7.6 regarding when the use of Test Level (TL)-5 and TL-6 traffic railings are warranted, listing three conditions, any one of them grounds for considering a special railing that would trigger a 42-inch-tall railing instead of the standard 36-inch-tall railing:

- The volume of truck traffic is unusually high,
- A vehicle penetrating or overtopping the traffic railing would cause high risk to the public or surrounding facilities, or
- The alignment is sharply curved with moderate to heavy truck traffic.

SDG also states that "Contact the Structures Design Office (SDO) for guidance if a TL-5 or 6 traffic railing is being considered". In the past, a radius of less than 1,200 ft has been used as a threshold to warrant 42-inch-tall TL-5 railings. Several of the proposed bridges involve radii less than 1,200 ft and, therefore, should be candidates for 42-inch-tall TL-5 railings. A meeting with the Turnpike Structures Engineer determined to provide TL-5 railings for the bridges meeting the requirements above and at the discretion of the Project Development and Environment (PD&E) team.

2.1.3 Pier Protection

In addition to shielding bridge piers to protect motorists from a hazard within the clear zone, bridge piers may need protection from damage due to design limitations (i.e., existing piers not designed for vehicular collision forces) or if bridge structures are considered critical or non-critical.

Per SDG Section 2.6, all grade separation bridges carrying interstates or other high-speed limited access roadways are considered critical. The process for determining the appropriate level of pier protection is presented in FDM Figure 215.4.5, Pier Protection Selection Flowchart. Requirements for bridge structures near railroad lines are established by SDG Section 2.6.7. The selected pier protection measure will comply with FDOT Standard Plans Index 521-001 or 521-002 as appropriate.

2.1.4 Estimates of Probable Construction Cost

Costs presented herein are based on BDR cost guidelines provided in FDOT SDG Section 9 with site-specific adjustments based on engineering judgement. The costs are in current dollars and do not reflect projected escalation due to inflation. Costs are for construction only and do not include design or construction inspection.

2.1.5 Bridge Aesthetics

The Orlando South Ultimate Interchange is located in a mostly industrial area. However, it also provides a transportation gateway connecting Orlando International Airport with the Central Florida tourist attractions.

The interchange will involve both complex and conventional structures of a variety of configurations to meet functional operation. The bridges in the interchange will also span over one another, magnifying the visual impact. The project aesthetic objective is to focus on a balance between form, function, color, texture, durability, and cost. Per the FDM Section 121.9.3.3, the levels of aesthetics are described as:

- Level One (1): baseline aesthetic treatment with minor cosmetic improvements such as concrete colors, texturing of surfaces and pleasing shapes for columns and caps. Structures following this criterion generally meet the surface treatment criteria established in Volume 1 of the Florida's Turnpike Supplement to the FDOT Structures Design Manual.
- Level Two (2): Level One plus full integration of efficiency, economy and elegance in all bridge components. This includes consideration of aesthetically enhanced piers shapes (i.e., hammerhead piers and oval columns), concrete texture through form liners, smooth superstructure shapes and transitions, as well as concealing pipes, conduits and any other utilitarian attachments.
- Level Three (3): Level Two plus providing a synergy with environment. This level includes historic or highly urbanized areas where landscaping or unique "neighborhood features" are to be considered.

As described in FDM Chapter 105, aesthetics is an integral part of the transportation design process. Therefore, a draft memorandum was submitted to the FTE with recommended aesthetic levels and surface treatment throughout this project. This draft memorandum can be found in **Appendix D**.

In addition to the recommendation presented in the draft memorandum, the final design will identify appropriate pier shapes, coatings, colors, finishes and textures while maintaining continuity of structure type within a bridge and accounting for practicality and economy. Additional aesthetic details will be further coordinated in conjunction with the PD&E commitments and refined in final design.

2.1.6 Retaining Walls

Wrap-around Mechanically Stabilized Earth (MSE) walls are generally proposed at the begin and end bridge abutments for all new bridges, and in-kind wall extensions for bridge widenings. The MSE walls are generally proposed to turn back along each side of the approach roadway embankment as required to contain the embankment fill. MSE walls are generally the most cost-efficient wall alternative when the exposed surface area of the wall exceeds 1,000 square ft and the wall height is greater than 5 ft.

FDOT SDG limits MSE wall height to 40-ft and recommends a minimum MSE wall strap length of 0.7 x H (0.7 times the mechanical height) of the wall. However, the minimum strap length of the MSE wall or the distance between back to back walls in relation to the mechanical height of the walls depends on, but not limited to, the following criteria: internal stability, groundwater table, loose/soft soil conditions, additional loading imposed on the wall during construction, etc. Since the geotechnical investigation is not available for this conceptual phase, it is recommended to assume a minimum wall strap length between 0.75 x H to 0.8 x H to account for the criteria above and any other unknown adverse conditions.

Applying the above criteria, MSE walls for new single lane ramp structures are limited to maximum heights ranging from 30 to 35 ft for new mainline bridge structures, multi-lane ramps and widenings; the maximum wall heights are limited to 40 ft.

2.2 Bridge Constructability

Key aspects of constructability include geometrical constraints at each bridge site, detours and/or staging to maintain existing movements during construction, and evaluation of erection activities over traffic and their associated impacts on traffic. For the purpose of this analysis, the provisions of FDOT Standard Index 102-600 are used. This includes the requirements that "traffic shall be detoured, shifted, diverted or paced as to not encroach in the area directly below the overhead work operations in accordance with the appropriate index drawing or detailed in the plans." The following construction activities are used to establish and develop structures alternatives:

- Beam, girder, segment, and bent/pier cap placement,
  - A minimum work width of 28-ft to allow for placement of cranes (40-ft desirable),
  - For balanced cantilever segment erection, traffic is not allowed below a segment until the permanent cantilever post tensioning is installed.
- Form and falsework placement and removal,
- Concrete placement,
- Railing construction located at edge of deck, and
- Structure Demolition,
  - Demolition of existing piers in the median of the Florida's Turnpike,
  - Beam Removal

Additional constructability requirements and discussions are provided at each bridge site.

Off-peak detours for overhead superstructure erection over the limited access and arterial roadways (Florida's Turnpike, Beachline Expressway, Orange Blossom Trail, Landstreet Road (CR 527A and Consulate Drive) have been identified and included in a separate construction phasing memorandum. These detours use multilane routes. Similar off-peak detours will be used by impacted ramps to maintain movements during overhead bridge construction activities.

Construction methods for steel or concrete bridges, and their construction duration are negligible in comparison with the overall project schedule. Accelerated Bridge Construction (ABC) techniques should be considered for the main interchange to minimize construction time.

FDM Section 121.19 provides expanded direction for investigating prefabricated bridge alternatives during the BDR phase. This FDM section establishes the process for evaluating whether prefabricated options should be considered based on feasibility questions, and how to develop and select prefabricated options through an assessment matrix.

2.3 Bridge Historical Significance

A Cultural Resource Assessment Survey (CRAS) was conducted as part of the Florida's Turnpike Orlando South Ultimate Interchange PD&E Study. The purpose of the investigation was to locate and identify any archaeological sites or historic resources within the project's Area of Potential Effect (APE), to assess their significance in terms of eligibility for listing in the National Register of Historic Places (NRHP), and to assess any potential effects the proposed project may have on these cultural resources. As a result of this survey, none of the existing bridge structures associated with the proposed project were determined to be historic or eligible for listing in the NRHP.

2.4 Bridge Contamination Assessment

Evaluations for Asbestos-Containing Material (ACM) and Metal Based Coatings (MBC) of the bridges constructed in 2018 and 2019 were not undertaken in the PD&E phase. Other existing bridges with known contaminants have been identified throughout the report. A Contamination Assessment is recommended to be performed for this project during the Design Phase.

3.0 BRIDGES IN THE ORLANDO SOUTH INTERCHANGE

The bridges described in this section correspond to the Orlando South interchange Alternative 3 configuration. Other interchange configuration alternatives studied can be found in the Appendices. The location of the proposed new bridges and widenings are shown on **Figure 3-1: Bridges Location Map**. A summary of the proposed bridge work is listed in **Table 3-1: Alternative 3 – Bridges in the Orlando South Interchange**. Costs of walls and other structures are not included in the bridge costs but are included in the Long-Range Estimate (LRE).

Figure 3-1
Bridges Location Map

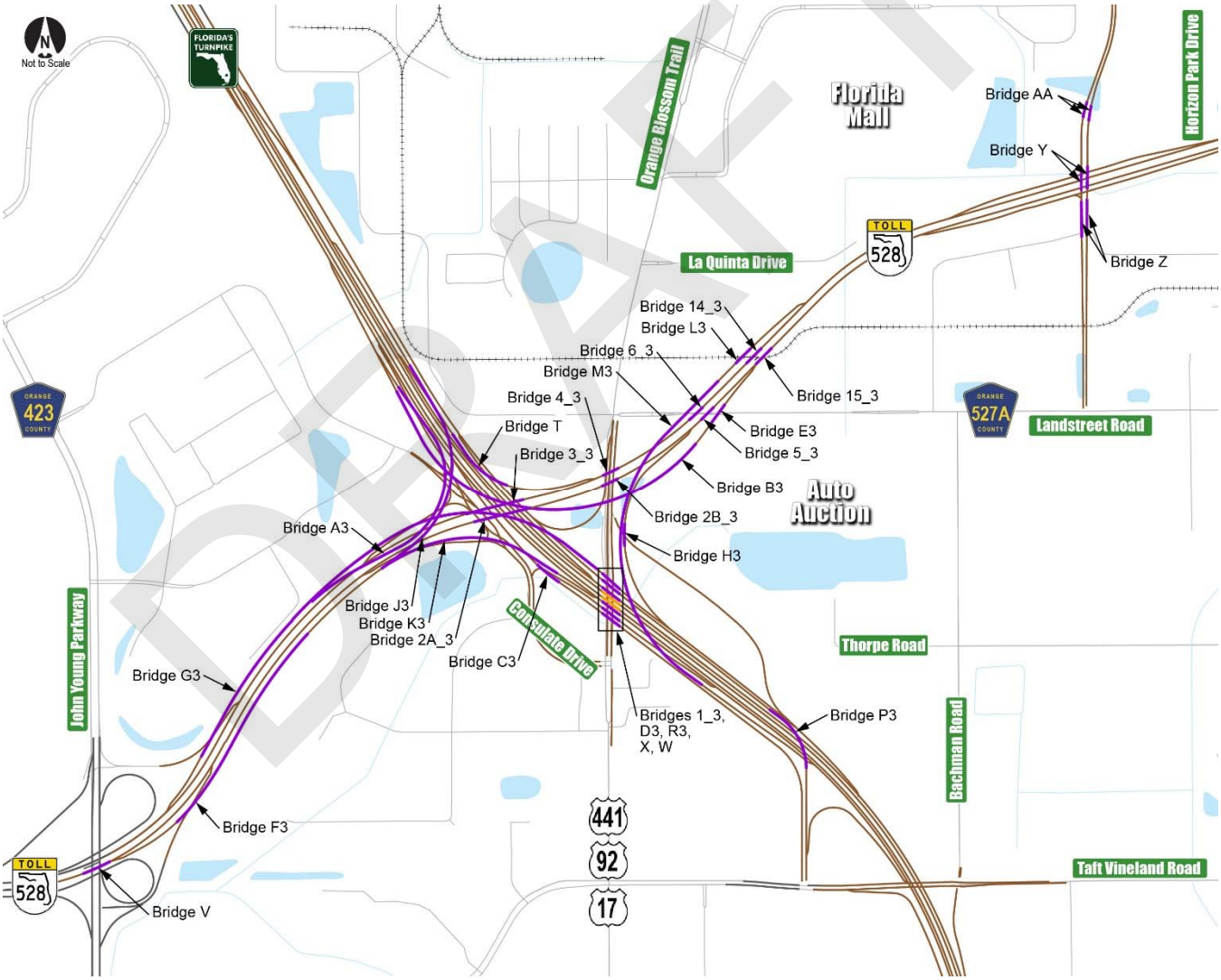


Table 3-1
Alternative 3 – Bridges in the Orlando South Interchange

Bridge Crossing		Existing Bridge				Status	Scope	Bridge Alternative Data								
ID / No.	Description	Bridge Nos. if Existing	Description	Existing Material	Existing Vertical Clearance *from as-built **from design ***from inspection report (ft-inches)			Bridge Section	Bridge Width (ft-inches)	Bridge Length (ft-inches)	No. Spans	Max Span(s) (ft-inches)	Structure Depth (not including cross slope)	Constructability Issues	Proposed Superstructure Material(s)	Complex Piers; Types
1_3	SR 91 over OBT	750626	Structural steel I-girder bridge; single span	Steel Girder	16'-5" ***	Existing bridge	Develop widening alternatives	Widening 33'-1" LT, 21'-1" RT	157'-1" (Existing) 204-8" (Proposed)	186'-9 1/2" (Existing)	1	186'-9½ "	8.458' (Existing) 8.208' (Proposed)	Deck deflection during concrete placement; adjacent culverts	Steel Plate	None,
2A_3	EB SR 528 over Consulate Dr., Ramp 304, SR 91, Ramp 325 & CD Ramp	750219 (SR 91)	Medium Span Prestressed Concrete; 8 span bridge	PS Concrete Beam	16'-4⅞ **	Replace existing bridge	Evaluate replacement alternatives	1 EL, 3 GTL; variable outside shoulder: variable cross slope	Varies 78'-8" Typ. 82-8" Max.	660'-7"	4	275'	11.0'	Construction over SR 91 and OBT; Construction over Consulate Drive DDI	Steel Plate	None
2B_3	EB SR 528 over OBT	750181 (OBT)	Medium Span Prestressed Concrete; 6 span bridge	PS Concrete Beam	16'-8 3/8" ***	Replace existing bridge	Evaluate replacement alternatives	1 Exp. Lane, 3 GP Lanes	82'-8"	214'-6½"	1	214'-6½ "	8.5'	Construction over OBT and Ramp; skew	Steel Plate	None
3_3	WB SR 528 over Consulate Dr., Ramp 304, SR 91, Ramp 325 & CD Ramp	750092	Medium Span Prestressed Concrete; 3 span bridge	PS Concrete Beam	16'-4 7/8" **	Replace existing bridge	Evaluate replacement alternatives	1 EL, 3 GTL	78'-8"	660'-0"	4	275'	11.0'	Construction over SR 91; Construction over Consulate Drive DDI	Steel Plate	None
4_3	WB SR 528 over OBT	750093	Medium Span Prestressed Concrete; 5 span bridge	PS Concrete Beam	16'-9" **	Replace existing bridge	Evaluate replacement alternatives	1 ramp lane; 3 GP lanes; 1 Exp. Lane	90'-8"	214'-0¾"	1	214'-0¾"	8.5'	Construction over OBT and Ramp; skew	Steel Plate	None
5_3	EB SR 528 over Landstreet Road	750221	Medium span prestressed concrete; 3 span bridge	PS Concrete Beam	19'-3" ***	Existing bridge widening	Evaluate widening alternatives	Widen varies 21'-4" to 21'-8½"	Exist. 71'-1" Proposed Varies 88'-8" to 89'-0½"	217'-10⅝" (Existing)	3	97'-0⅝"	5.5'	Construction over Landstreet Road; skew	FIB	None
6_3	WB SR 528 over Landstreet Road	750094	Medium span prestressed concrete; 3 span bridge	PS Concrete Beam	16'-6" ***	Widen existing bridge	Evaluate Widening alternatives	Widen varies 21'-9" to 25'-4"	Proposed Varies 89'-1¾" to 92'-8"	217'-8⅜"	3	96'-9⅞"	5.5'	Construction over Landstreet Road; skew, variable width (gore area)	FIB	None
7a	SR 91 over US 441 (OBT) to OBT	750026	Medium span prestressed concrete; 3 span bridge	PS Concrete Beam	16'-3" **	Existing bridge to be removed in Alternative 3	Evaluate existing	NA	NA	NA	NA	NA	NA	Demolition over OBT	NA	NA

Bridge Crossing		Existing Bridge				Status	Scope	Bridge Alternative Data								
ID / No.	Description	Bridge Nos. if Existing	Description	Existing Material	Existing Vertical Clearance *from as-built **from design ***from inspection report (ft-inches)			Bridge Section	Bridge Width (ft-inches)	Bridge Length (ft-inches)	No. Spans	Max Span(s) (ft-inches)	Structure Depth (not including cross slope)	Constructability Issues	Proposed Superstructure Material(s)	Complex Piers; Types
7b	SR 91 over US 441 (OBT) from OBT	750645	Medium span prestressed concrete; 3 span bridge	PS Concrete Beam	16'-7 3/8 **	Existing bridge to be removed in Alternative 3 (added under FPID 437156-2)	Evaluate existing	NA	NA	NA	NA	NA	NA	Demolition over OBT	NA	NA
8	SR 91 On/Off Ramp over SR 91 (loop to trumpet)	750641	Medium span prestressed concrete; 4 span bridge	PS Concrete Beam	16'-8¼" **	Existing bridge to be removed in Alternative 3	Evaluate existing	NA	NA	NA	NA	NA	NA	Demolition over SR 91	NA	NA
13	SR 528 over CSXRR	750632 – EB on ramp	Medium Span prestressed concrete; 2 span bridge	PS Concrete Beam	23'-11" ***	Existing bridge to be removed in Alternative 3	Evaluate existing	NA	NA	NA	NA	NA	NA	Demolition over CSXRR	NA	NA
14_3	SR 528 over CSXRR	750096 – WB	Medium Span prestressed concrete; 3 span bridge	PS Concrete Beam	23'-10⅝" **	Existing bridge to be widened in Alternative 3	Evaluate existing to remain	20' -10½" Widening	71'-1" (Existing) 88'-8" (Proposed)	162' (Existing)	3	54'	3.83'	Construction over CSXRR; skew	Type II AASHTO	None
15_3	SR 528 over CSXRR	750222 – EB	Medium Span prestressed concrete; 3 span bridge	PS Concrete Beam	22'-7" ***	Existing bridge to be widened in Alternative 3	Evaluate existing to remain	Widening Varies 12-4⅞" to 18'-1¼"	Varies 73'-11¼" to 79'-7 5/8" (Existing) 88'-8" (Proposed)	162' (Existing)	3	54'	3.83' (Existing to Remain) 3.5' (Proposed)	Construction over CSXRR; skew	Mod Type II AASHTO	None
A3 (Ramp 301)	SB SR 91 to WB SR 528 Ramp over Consulate Drive, Ramp 3, Ramp 5, SR 528	NA	NA	NA	NA	Proposed New Bridge; Third Level; Single lane ramp on curve; multi-span; Major Bridge	Develop typical sections, new bridge alternatives	Single lane ramp; Variable cross slope	Varies 30'-0" to 40'-0"	3,075'-7"	16	271.08'	Steel 8.7'+2' (Straddle Pier)	Construction over SR 528, Ramp 303, Bridge B (Ramp 2) & Consulate; 800' R	Steel Box	C-Pier over SR528 and Ramp 303, Straddle pier over SR 528
B3 (Ramp 302)	SB SR 91 to EB SR 528 Ramp over Consulate Drive, SR 528, SR 91, Bridges A3 and J3	NA	NA	NA	NA	Proposed New Steel Bridge Single lane ramp; Fourth level; multi-span on curve	Develop new bridge alternatives	Single lane ramp, Variable cross slope	30'-0"	4273'	18	313.50'	13.5'	Construction over SR 91, Consulate Drive Bridges 2 & 3 (SR 528), Ramp 7 & OBT; Crosses Bridge 2 at sharp skew.	Steel Box	Tall Hammerhead Piers, Hammerhead Pier in median of and with major axis parallel to SR 91;

Bridge Crossing		Existing Bridge				Status	Scope	Bridge Alternative Data								
ID / No.	Description	Bridge Nos. if Existing	Description	Existing Material	Existing Vertical Clearance *from as-built **from design ***from inspection report (ft-inches)			Bridge Section	Bridge Width (ft-inches)	Bridge Length (ft-inches)	No. Spans	Max Span(s) (ft-inches)	Structure Depth (not including cross slope)	Constructability Issues	Proposed Superstructure Material(s)	Complex Piers; Types
C3 (Ramp 304)	SR 91 SB to OBT NB over Ramp 22	NA	NA	NA	NA	Proposed New Steel Bridge; Single Lane Ramp; second level, multi-span on curve	Develop new bridge alternatives	Single lane ramp, Variable cross slope	29'-8"	310'	2	155'	7.0'	Construction over Ramp 322; C-Shaped Pier over Ramp 322	Steel Plate	C-Shaped Pier
D3 (Ramp 304)	SR 91 SB to Taft Vineland Road over OBT	NA	NA	NA	NA	Proposed New Steel Bridge; Second Level Single lane ramp on tangent; single-span;	Develop new bridge alternatives	Single lane ramp; constant cross slope	29'-8"	195'	1	195'	8.0'	Coordinate with Bridge 1 Widening and Bridge R	Steel Plate	None
E3 (Ramp 302)	Ramp 302 over Landstreet Road	750095 – EB SR 528 On Ramp	Medium span prestressed concrete; 3 span bridge	PS Concrete Beam	17'-2 1/2" ***	Existing bridge replacement	Evaluate replacement alternatives	Single lane ramp, constant cross slope	29'-8"	189'-0¾"	1	189'-0¾"	9.0'	Construction over Landstreet Road; Piers adjacent to Landstreet Road; Skew	FIB	None
F3 (Ramp 310)	EB SR 528 to NB/SB SR 91 over JYP on-ramp	NA	NA	NA	NA	Proposed New Steel Bridge spanning single lane ramp on skew	Develop new bridge alternatives	Single lane ramp, Variable cross slope	30'-0"	2585'	11	235'	9.0'	Construction over Ramp 324; Integral Straddle Bent	Steel Box	Straddle Bent over Ramp 324
G3 (Ramp 305)	NB SR 91 to WB SR 528 Ramp over SR 91, SR 528, Consulate Dr.	NA	NA	NA	NA	Proposed new bridge; Third Level; Single lane ramp on Curve; multi-span; major bridge	Develop new bridge alternatives	Single lane ramp, Variable cross slope	Varies 30'-0" to 62'-3 1/4"	5,887'-9"	31	Steel 361'-10" P/S 141'-9"	Steel Box 11.6'+2' (Straddle Pier) P/S 6.7'+2' (Straddle Pier)	Construction on a sharp skew over Ramp 20, SR 528 WB, Bridge 2 (SR 528 EB, SR 91 NB & SB, Construction over Consulate Drive	Steel Box and FIB	Pier in median of SR 91; likely long straddle bents over Ramp 20, SR 528 WB, SR 91 NB, & Bridge 2
H3 (Ramp 306)	NB SR 91 to EB SR 528 over toll plaza area	NA	NA	NA	NA	Proposed new conventional bridge	Develop new bridge alternatives	Single lane ramp, variable cross slope	34'-0"	172'-5 5/8"	1	172'-5 5/8"	7.1'	Construction over Existing ramps and/or Ramp 4	Steel Plate	None

Bridge Crossing		Existing Bridge				Status	Scope	Bridge Alternative Data								
ID / No.	Description	Bridge Nos. if Existing	Description	Existing Material	Existing Vertical Clearance *from as-built **from design ***from inspection report (ft-inches)			Bridge Section	Bridge Width (ft-inches)	Bridge Length (ft-inches)	No. Spans	Max Span(s) (ft-inches)	Structure Depth (not including cross slope)	Constructability Issues	Proposed Superstructure Material(s)	Complex Piers; Types
J3 (Ramp 309)	EB SR 528 to NB SR 91 over SR 528 & SR 91, Ramps 302, 303, 313, Consulate Dr.	NA	NA	NA	NA	Proposed new major bridge; fourth level; single lane; multi-span on curve	Develop new bridge alternatives	Single lane ramp, variable width, variable cross slope	Varies 30'-0" to 60'-11"	2,672'	14	Steel Box 281'-11" Steel I 131'-8"	Steel Box 9.1' +2' (Straddle Pier) Steel-I 4.6'+8' (Straddle Pier)	Construction on skew over SR 528 EB, SR 528 WB, SR 91 NB, & Ramp 9; 1146' R; Gore area with Bridge K	Steel Box and steel plate	Straddle Bent over SR 528 EB; Piers in median of SR 91 and SR 528
K3 (Ramp 310)	EB SR 528 to SB SR 91 over Ramp 311, Consulate Dr., Ramp 4	NA	NA	NA	NA	Proposed new major or conventional bridge; multi-span on curve; single lane ramp	Develop new bridge alternatives	Single lane ramp, variable width, variable cross slope	Varies 30'-0" to 36'-0"	1,874	9	295'	Steel Box 9.4' +2' (Straddle Pier)	Construction over Consulate Drive at sharp skew (parallel in one stretch), Ramp 4 at sharp skew; 1146' R; Gore area with Bridge J	Steel Box	Straddle Bents over Consulate Drive and Ramp 4
L3 (Ramp 314)	WB SR 528 to SB SR 91 over CSXRR	NA	NA	NA	NA	Proposed New Conventional Bridge	Develop new bridge alternatives	Single lane ramp	29'-8"	169'-5⅛"	1	169'-5⅛"	7.5'	Construction over CSXRR	FIB	None
M3 (Ramp 314)	WB SR 528 to SB SR 91 over, Landstreet, SR 528 & SR 91, Ramp 5, 8, & 10	NA	NA	NA	NA	Proposed New Major and/or Conventional Bridge; single lane ramp; third level; multi-span on curve	Develop new bridge alternatives	Single lane ramp, variable width	30'-0"	4,169'	18	324'	Steel Box 10.4'	Construction over Landstreet Road at skew; Construction over SR 528 EB & WB at skew; Construction over Ramp 2; Construction over Ramp 5, OBT & Ramp 10 at skew	Steel Box	Likely Straddle Bents or C-Bents at Ramp 5, SR 91, Ramp 10 crossing
P3 (Ramp 203)	Taft Vineland Road to NB SR 91 over SR 91	NA	NA	NA	NA	Proposed New Steel Bridge; Single lane ramp; Second Level curved;	Develop new bridge alternatives	Single lane ramp, Variable cross slope	30'-0"	780'	3	306'-3"	11.5'	Construction over SR 91	Steel Box	Wall Pier parallel to SR 91, C-Shaped Pier near NB SR 91
R3 (Ramp 322)	Ramp 322 over OBT	NA	NA	NA	NA	Proposed New Steel Bridge; Single lane ramp; Second Level	Develop new bridge alternatives	Single lane ramp; Constant cross slope	29'-8"	195'	1	195'	8.0'	Construction over OBT; Widening of Wall Section and/or new walls adjacent to existing	Steel Plate	None
T (Ramp 313)	WB SR 528 to NB SR 91 over CD, Ramp 325	NA	NA	NA	NA	Proposed New Steel Bridge; Curved single lane ramp; Second Level	Develop new bridge alternatives	Single lane ramp; Variable cross slope	39'-0"	808'	4	202'	8.25'	Construction over SR 91, CD Ramp and Existing Beachline	Steel Box	Hammerhead Pier in median of CD Ramp

Bridge Crossing		Existing Bridge				Status	Scope	Bridge Alternative Data								
ID / No.	Description	Bridge Nos. if Existing	Description	Existing Material	Existing Vertical Clearance *from as-built **from design ***from inspection report (ft-inches)			Bridge Section	Bridge Width (ft-inches)	Bridge Length (ft-inches)	No. Spans	Max Span(s) (ft-inches)	Structure Depth (not including cross slope)	Constructability Issues	Proposed Superstructure Material(s)	Complex Piers; Types
V	EB SR 528 over JYP	750218	Medium Span Prestressed Concrete, 4 Spans	PS Concrete Beam	19'-8" **	Widen existing bridge	Evaluate Widening alternatives	Widening varies 16'-6" to 12'-1¾"	77'-1" (Exist) Varies 84'-4" to 88'-8" (Proposed)	289'-7⅞"	4	88'-4¼"	3.75' (Proposed)	Construction over JYP; Widening near adjacent ramp, retaining wall construction and ties to existing front slope protection	FIB-36	None
W (Ramp 203)	Ramp 203 over OBT	NA	NA	NA	NA	Proposed New Steel Bridge; Single lane ramp	Develop new bridge alternatives	Single lane ramp; Constant cross slope	29'-8"	210'	1	210'	8.75'	Construction over OBT; Widening of Wall Section and/or new walls adjacent to existing	Steel Plate	None
X (Ramp 305)	Ramp 305 over OBT	NA	NA	NA	NA	Proposed New Bridge; Single lane ramp;	Develop new bridge alternatives	Single lane ramp; Constant cross slope	29'-8"	222'	1	222'	9.0"	Construction over OBT; Widening of Wall Section and/or new walls adjacent to existing	Steel Plate	None

Notes:
- OBT = Orange Blossom Trail (US 441/17/92)
- SR 528 = Beachline Expressway
- SR 91 = Florida's Turnpike
- JYP = John Young Parkway
- EL = Express Lane
- GTL = General Toll Lane
- DDI = Directional Diamond Interchange
- NA = Not applicable

3.1 Bridge 1 (Existing 750626) - Florida's Turnpike over Orange Blossom Trail

The existing bridge is a single, simple span bridge with a steel plate girder and cast in place (CIP) concrete deck superstructure, supported on a concrete bent cap substructure founded on precast prestressed concrete piles. The bridge intersects Orange Blossom Trail (US 441/17/92) at a skew angle of 37 degrees from perpendicular. Bridge end bents are fronted by a retaining wall which is sloped at the ends to match the side slopes of the approach embankment. The structure is in good condition with a Sufficiency Rating of 85, no load restrictions and no significant deficiencies. The minimum vertical clearance over Orange Blossom Trail is 16 feet (ft) 5 inches. The existing traffic railings consist of fascia 32 inches F-Shape Florida Department of Transportation (FDOT) Standard Index 700, and a median 32 inches F-Shape FDOT Standard Index 710 (circa 2000). Per the FDOT Structures Design Guidelines (SDG), Table 6.7.4-1, Treatment of Existing Traffic Railings, these traffic railings should be retrofitted or replaced (Index 521-426, 521-427, 521-428 or 521-509), while the median railing can remain in place.

The Alternative 3 scope at this site is to widen the existing bridge to the inside by 21 ft 1 inch and to the outside by 33 ft 1 inch. The existing structure is 157 ft 1 inch wide and the widened structure will be 204 ft 8 inches wide. Cross slope on the existing bridge is 2% for the inside lanes and shoulders and 3% for the outside lanes and shoulders. Widening will follow the 3% cross slope. There is no apparent reason to consider materials other than similar plate girders for the widening. Proposed widening could be accomplished by adding new steel plate girders on either side (five total girders) and extending the 9-inch thick CIP concrete deck. The existing deck overhang of 3 ft 3½ inches could be saw cut at the exterior girder and removed along with the existing F-shape traffic barrier to facilitate deck widening. Adding girders with a 9⅝ inch shallower web than the existing would maintain the minimum vertical clearance of 16 ft 5 inches. During the design phase, attention should be paid to the south deck widening to ensure new deck continuity with the deck repairs circa 2006.

The existing end bents will be extended with new caps supported on piles. End walls will need to be removed. Side slopes will be reconstructed within new retaining walls coordinated with the adjacent new bridges (Bridges D3, R3, W and X).

Constructability issues with the above are minimal other than traffic control. However, special consideration should be given to the deck pouring sequence and differential girder camber to avoid excessive deck cracking. The width of the structure also deserves consideration in design of the deck reinforcing for crack control, particularly at the construction joint, and design of bearings for transverse expansion. Setting of new girders will require development and implementation of traffic control phasing and identification of hours for lane closures, night work, and short-term detours of Orange Blossom Trail. Substructure can be primarily constructed from behind the end bents to avoid traffic disruptions. Provisions should be made to require monitoring of the adjacent bridges during construction for any signs of settlement or related damage. Accelerated Bridge

Construction (ABC) techniques, such as off-site superstructure construction followed by transport and placement utilizing a Self-Propelled Modular Transporter (SPMT), could be considered to limit detours and avoid placement of deck concrete over traffic.

Identified Structure Alternative: Inside and outside widening with 3⅝ inch shallower steel plate girders, supported on widened end bents and founded on piles. The span length is 187 ft 9¾ inches.

Estimated Construction Cost: The probable construction cost to widen Bridge 1 is estimated at $1.72 million.

3.2 Beachline Expressway Bridges (SR 528) over Florida's Turnpike (SR 91)

3.2.1 Bridge 2A_3 – Eastbound Beachline Expressway Bridge over Florida's Turnpike

Bridge 2A_3 spans over Consulate Drive, Ramp 304, Florida's Turnpike, Ramp 325, and collector-distributor (CD) ramp.

The typical section for Bridge 2A_3 consists of a 12 ft Express Lane (EL), three 12 ft General Toll Lanes (GTL), one 12 ft inside shoulder and an outside shoulder varying from 12 ft to 16 ft, a 4-ft buffer and two 1-ft 4-inch wide, 36-inch single slope railings. The maximum structure width is 82 ft 8 inches. Bridge 2 cross slope varies from 0 to 5.4%. The bridge length is approximately 667 ft. The primary span length requirements for Bridge 2A are established by the following constraints:

- Over Florida's Turnpike– Bridge 2_3 needs to clear span over Florida's Turnpike

The proposed Alternative 3 structure is a multi-span/simply-supported bridge for Bridge 2A_3, spanning over Florida's Turnpike.

Appropriate superstructure types for Bridge 2A include curved steel girders (box or plate).

Substructure: Pile supported end bents are anticipated with Mechanically Stabilized Earth (MSE) Wall wrapping around the embankments and multi-column intermediate piers with pile supported footings. Piles would be precast prestressed concrete piles or steel piles.

Identified Structure Alternative and Span Layout: Two-span continuous for spans 1 and 2, and two simply supported spans for spans 3 and 4. The average skew is approximately 29 degrees. The anticipated effective structure depth including cross slope is 11 ft in determining profiles and vertical clearances. The approximate span lengths: 131.7 ft, 160 ft, 275 ft, 100 ft.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge 2A_3 is estimated at $8.0 million.

3.2.2 Bridge 3_3 – Westbound Beachline Expressway Bridge over Florida's Turnpike

Bridge 3_3 spans over CD ramp, Ramp 325, Florida's Turnpike, Ramp 304 and Consulate Drive.

The typical section for Bridge 3_3 consists of a 12-ft EL, three 12-ft GTL, two 12-ft shoulders, a 4-ft buffer and two 1-ft 4-inch wide, 36-inch single slope railings. The structure width is 78 ft 8 inches. Bridge 3_3 cross slope varies from 0.0 to 5.4%. The bridge length is approximately 660 ft. The primary span length requirements for Bridge 3 are established by the following constraints:

- Over Florida's Turnpike: Bridge 3_3 needs to clear span Florida's Turnpike

The proposed Alternative 3 structure is a multi-span/simply-supported bridge for Bridge 3, spanning over Florida's Turnpike.

Appropriate superstructure types for Bridge 3 include curved steel girders (box or plate).

Substructure: Pile supported end bents are anticipated with MSE wall wrapping around the embankments and multi-column intermediate piers with pile supported footings. Piles could be precast prestressed concrete piles or steel piles.

Identified Superstructure Alternative and Span Layout: Two-span continuous for spans 1 and 2, and two simply supported spans for spans 3 and 4. The average skew is approximately 29 degrees. The anticipated effective structure depth including cross slope is 11 ft in determining profiles and vertical clearances. The approximate span lengths: 130.5 ft, 160 ft, 275 ft, 94.7 ft.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge 3 is estimated at $7.90 million.

3.2.3 Constructability of Beachline Expressway Bridges over Florida's Turnpike

The identified superstructure and span arrangement were defined by constructability concerns and the preliminary construction sequencing described in this section.

Proximity of the proposed bridges to existing bridges limits the area available to divert the Beachline Expressway traffic and maintain the Florida's Turnpike lanes, while providing room for constructing the flyover ramps crossing over both the Florida's Turnpike and Beachline Expressway. Therefore, Bridges 2A_3 and 3_3 must be phased constructed adjacent to and over traffic. Other constructability key issues include:

- Maintaining 8-lanes on both Florida's Turnpike and the Beachline Expressway and 4-lanes on Consulate Drive during peak hours.
- Provide longer spans to accommodate a planned ten-lane typical section for Florida's Turnpike.
- Permanent realignment of Beachline Expressway to maintain existing traffic on existing bridges during construction.
- The existing 26-ft wide median of the Beachline Expressway is not desirable for construction of nearby ramp flyover piers. Therefore, the new eastbound (EB) Beachline Expressway must be constructed, prior to commencing on the westbound (WB)

alignment. This configuration provides a wider temporary median for construction of ramp flyover piers.

- Superstructure erection will be completed during off-peak hours with detours. This operation must be coordinated with tolls for the temporary suspension of tolls. The Bridge Development Report (BDR) will develop a traffic control phasing scheme and identify appropriate limitations on working hours for lane closures, night work, and short-term detours (for beam placement). ABC techniques, such as off-site superstructure construction followed by transport and placement utilizing a SPMT, could be considered to limit detours and avoid placement of deck concrete over traffic. Use of simple span superstructure units would lend itself well to SPMT construction methods.

3.3 Bridge 4 – Westbound Beachline Expressway over Orange Blossom Trail

3.3.1 Bridge 2B_3 – Eastbound Beachline Expressway Bridge over Orange Blossom Trail

Bridge 2B_3 is a bridge replacement carrying EB Beachline Expressway, three GTL, and one EL over Orange Blossom Trail. The substructure units will be positioned parallel with Orange Blossom Trail skewed at approximately 27.3 and 30.5 degrees on the western and eastern supports respectively. Including the two 1-ft 4-inch wide, 36-inch single slope railings, 12 ft inside and outside shoulders and a 4 ft buffer, the bridge width is 82 ft 8 inches. The bridge length is currently estimated at approximately 214 ft 6½ inches and is on a constant curve with a radius of 3,800 ft.

The median of Orange Blossom Trail is not sufficient to accommodate a center pier, thereby requiring a single span over Orange Blossom Trail. Identified superstructure alternatives include:

- Superstructure Alternative 1: Skewed, simple-span steel plate girder bridge with a maximum anticipated span of 214 ft 6½ inches
  - Steel plate girders would offer the aesthetic advantage of matching the adjacent SR 91 over Orange Blossom Trail bridges
- Superstructure Alternative 2: Simple-span steel plate girder straight bridge (no skew):
  - This alternative would require a maximum 255 ft span require a girder depth that is 2.0 ft larger than the skewed bridge alternative and requires raising the Beachline Expressway Profile

For either superstructure alternative, the substructure would consist of concrete bent caps founded on precast prestressed concrete piles or steel piles. MSE walls would wrap around the approach embankment.

Identified Structure Alternative and Span Layout: Simple-span steel plate superstructure with an estimated effective structure depth including cross slope of 9.50 ft, used in determining profile

and vertical clearances. The superstructure would be supported on skewed end bents founded on piles. The approximate span length: 214 ft 6½ inches.

Estimated Construction Cost: The probable construction cost for Bridge 2B_3, Alternative 3 is estimated at $3.72 million including a 20% increase in cost due to the need for phase construction.

3.3.2 Bridge 4_3 – Westbound Beachline Expressway Bridge over Orange Blossom Trail

Bridge 4_3 is a bridge replacement carrying WB Beachline Expressway, one auxiliary ramp lane, three GTLs, and one EL over Orange Blossom Trail. The substructure units will be positioned parallel with Orange Blossom Trail, skewed at approximately 27.0 and 30.25 degrees on the western and eastern supports, respectively. Including the two 1-ft 4-inch wide, 36-inch single slope railings, 12-ft inside and outside shoulders and a 4-ft buffer, the bridge width is 90 ft 8 inches. The bridge length is currently estimated at approximately 214 ft and is on a constant curve with a radius of 3,820 ft.

The median of Orange Blossom Trail is not sufficient to accommodate a center pier, thereby requiring a single span over Orange Blossom Trail. Identified superstructure alternatives include:

- Superstructure Alternative 1: Skewed, simple-span steel plate girder bridge with a maximum anticipated span of 214 ft 0¾ inch
  - Steel plate girders would offer the aesthetic advantage of matching the adjacent Florida's Turnpike over Orange Blossom Trail bridges
- Superstructure Alternative 2: Simple-span steel plate girder straight bridge (no skew)
  - This alternative would require a maximum 255 ft span require a girder depth that is 2.0 ft larger than the skewed bridge alternative and require raising the Beachline Expressway Profile

For either superstructure alternative, the substructure would consist of concrete bent caps founded on precast prestressed concrete piles or steel piles. MSE walls would wrap around the approach embankment.

Identified Structure Alternative and Span Layout: Simple-span steel superstructure with an estimated effective structure depth including cross slope of 12.50 ft, used in determining profile and vertical clearances. The superstructure would be supported on skewed end bents founded on piles.

Estimated Construction Cost: The probable construction cost for Bridge 4_3, Alternative 3 is estimated at $3.5 million.

3.3.3 Constructability of Beachline Expressway Bridges over Orange Blossom Trail

Constructability issues with the above bridges are traffic control and phasing. Setting of new girders will require development and implementation of traffic control phasing and identification

of hours for lane closures, night work, and short-term detours of Orange Blossom Trail. End bent substructure can be primarily constructed from behind the end bents to avoid traffic disruptions. To maintain Beachline Expressway traffic, the new EB lanes are aligned south of existing EB Beachline Expressway. When the new EB Beachline Expressway lanes are completed and operational, the WB alignment and bridge can be constructed between the existing WB and EB bridges. Constrained space and coordination with the construction of Beachline Expressway over Florida's Turnpike may require the bridges to be phased constructed.

Provisions must be made to require monitoring of the adjacent bridges during construction for any signs of settlement or related damage. ABC techniques, such as off-site superstructure construction followed by transport and placement utilizing an SPMT, could be considered to limit detours and avoid placement of deck concrete over traffic.

3.4 Bridge 5 (Existing 750221) – Eastbound Beachline Expressway over Landstreet Road (CR 527A)

The existing bridge is a three-span bridge with both American Association of State Highway and Transportation Officials (AASHTO) and Florida I-Beam (FIB) girders and CIP concrete deck superstructure, both precast concrete pile and steel pipe pile foundation, with CIP concrete bent cap and pier substructure. The bridge intersects Landstreet Road at a varied skew angle due to the curved Beachline Expressway centerline. Bridge end bents are fronted by concrete slope pavement. In front of the concrete slope pavement on each side are CIP concrete, multi-column piers. The structure is in good condition with a Sufficiency Rating of 91.9, no load restrictions and no significant deficiencies. The minimum vertical clearance over Landstreet Road is 19 ft 3 inches. The existing traffic railings are 32-ft F Shape (FDOT Standard Index 420, circa 2016). Per the FDOT SDG, Table 6.7.4-1, Treatment of Existing Traffic Railings, the inside traffic railings should be replaced (Index 521-427). Outside traffic railings will be replaced as part of the proposed widening.

The suggested action at this site is to widen the existing bridge to the right (outside) a varied amount from 21 ft 8½ inches to 21 ft 4 inches. The existing structure is 71 ft 1 inch wide and the widened structure will vary from 89 ft 0½ inch to 88 ft 8 inches wide. Cross slope on the existing bridge varies as it is within superelevation transition. The bridge widening will follow the existing cross slope. There is no apparent reason to consider materials other than FIB girders, similar to the girders used for the inside widening done in 2018. Proposed widening could be accomplished by adding new FIB girders on the outside (three total girders) and extending with a matching 8-inch thick CIP concrete deck. The existing deck overhang of a varied amount (3 ft 6⅝ inches max) could be saw cut at the exterior girder and removed along with the existing F-shape traffic barrier to facilitate deck widening. Adding three FIB girders of the same depth as the inside widening (FIB-36) would not affect the existing minimum vertical clearance since the widening will be accomplished on the high side of the superelevation.

The existing end bents will be extended with a new cap supported on precast prestressed concrete piles or steel piles. Two additional intermediate piers would be constructed similar to those constructed when this bridge was widened to outside in 2009.

Constructability issues with the above are minimal other than traffic control and phasing. The following construction phasing is anticipated:

- FTE is programming the construction of the Beachline Expressway Reliever interchange in advance of Orlando South Ultimate Interchange improvements. Completion of the new interchange will allow for closure of the Landstreet Road on-ramp to EB Beachline Expressway.
- After this ramp is closed and prior to the demolition of Bridge No. 750095, the existing Florida's Turnpike to EB Beachline Expressway movement on Bridge No. 750095 can be shifted to allow for a partial demolition on the north side of Bridge No. 750095 to provide space for the outside widening of Bridge 5.
- After Bridge 5_3 is widened to the outside, traffic on EB Beachline Expressway is shifted to accommodate the traffic railing replacement on the inside shoulder.

Setting of new girders will require development and implementation of traffic control phasing and identification of hours for lane closures, night work, and short-term detours of Landstreet Road. The end bent substructure can be primarily constructed from behind the end bents to avoid traffic disruptions. Pier construction will require phasing of both pedestrians and traffic on Landstreet Road. Provisions should be made to require monitoring of the adjacent bridges during construction for any signs of settlement or related damage. ABC techniques, such as off-site superstructure construction followed by transport and placement utilizing an SPMT, could be considered to limit detours and avoid placement of deck concrete over traffic.

Identified Structure Alternative: Outside widening with FIB-36 girders, supported on widened end bents and intermediate piers, and founded on piles. An inside traffic railing replacement is required at this site.

Estimated Construction Cost: The probable construction cost to widen Bridge 5_3 is estimated at $0.66 million.

3.5 Bridge 6 (Existing 750094) – Westbound Beachline Expressway over Landstreet Road

The existing bridge is a three-span bridge with both AASHTO, modified AASHTO, and FIB girders and CIP concrete deck superstructure, both precast concrete pile and steel pipe pile foundation, with CIP concrete bent cap and pier substructure. The bridge intersects Landstreet Road at a varied skew angle due to the curved Beachline Expressway centerline. Bridge end bents are fronted by concrete slope pavement. In front of the concrete slope pavement on each side are cast in place concrete, multi-column piers. The structure is in good condition with a Sufficiency Rating of 91.9,

no load restrictions and no significant deficiencies. The minimum vertical clearance over Landstreet Road is 16 ft 6 inches. The existing traffic railings are 32-ft F Shape (FDOT Standard Index 420, circa 2016). Per the FDOT SDG, Table 6.7.4-1, Treatment of Existing Traffic Railings, the inside traffic railings should be replaced (Index 521-427). Outside traffic railings will be replaced as part of the proposed widening.

The suggested action at this site is to widen the existing bridge to the left (outside) a varied amount from 21 ft 9 inches to 25 ft 4 inches. The existing structure is 71 ft 1 inch wide and the widened structure will vary from 89 ft 1¾ inches to 92 ft-8 inches wide. Cross slope on the existing bridge varies as it is within superelevation transition. Widening will follow the existing cross slope. Proposed widening could be accomplished by adding new FIB-36 on the left outside (three total girders) and extending with a matching 8-inch thick CIP concrete deck. The existing deck overhang of a varied amount (3 ft 1½ inch max) could be saw cut at the exterior girder and removed along with the existing F-shape traffic barrier to facilitate deck widening. Adding three FIB-36 will not reduce the existing vertical clearance below 16 ft 6 inches as the controlling low member elevation is controlled by the fourth interior existing AASHTO Type IV beam. According to the calculations for the 2016 widening, the minimum vertical clearance under the Type IV beam is approximately 17 ft 3 inches. Before the 2009 widening, this beam was the exterior beam. The 2009 widening added three non-standard AASHTO Type II beams (36-inch depth). The 36-inch depth did not reduce the existing vertical clearance along this side.

The existing end bents will be extended with a new cap supported on precast prestressed concrete piles or steel piles. Two additional intermediate piers would be constructed similar to those constructed when this bridge was widened to this side in 2009.

Constructability issues with the above are minimal other than traffic control and phasing. Setting of new girders will require development and implementation of traffic control phasing and identification of hours for lane closures, night work, and short-term detours of Landstreet Road. The end bent substructure can be primarily constructed from behind the end bents to avoid traffic disruptions. Pier construction will require phasing of both pedestrians and traffic on Landstreet Road. After Bridge 6_3 is widened to the outside, traffic on WB Beachline Expressway is shifted to accommodate the traffic railing replacement on the inside shoulder.

Provisions should be made to require monitoring of the adjacent bridges during construction for any signs of settlement or related damage. ABC techniques, such as off-site superstructure construction followed by transport and placement utilizing an SPMT, could be considered to limit detours and avoid placement of deck concrete over traffic.

Identified Structure Alternative: Outside widening with FIB-36 girders, supported on widened end bents and intermediate piers, and founded on piles. An inside traffic railing replacement is required at this site.

Estimated Construction Cost: The probable construction cost to widen Bridge 6 is estimated at $0.72 million

3.6 Bridge 7a (Existing 750026) – Northbound and Southbound Florida's Turnpike to Orange Blossom Trail Southbound over Orange Blossom Trail

Bridge 7a (No. 750026) is no longer needed in Alternative 3. This movement is replaced with the construction of Ramp 303 to Consulate Drive, and NB exit to the Taft Vineland Reliever interchange with access to OBT SB via Taft Vineland Road.

Estimated Construction Cost: The probable construction cost for Alternative 3 for demolition of Bridge 7a is estimated at $0.36 million.

3.7 Bridge 7b (Existing 750645) – Southbound Orange Blossom Trail to Florida's Turnpike over Orange Blossom Trail

Bridge 7b (No. 750645) is no longer needed in Alternative 3. This movement is replaced with the construction of Ramp 322 that connects Consulate Drive to Southbound (SB) Florida's Turnpike, the flyover that connects WB Beachline Expressway to SB Florida's Turnpike, and Ramp 313 that connects WB Beachline to northbound (NB) Florida's Turnpike.

Estimated Construction Cost: The probable construction cost for Alternative 3 for demolition of Bridge 7b is estimated at $0.34 million.

3.8 Bridge 8 (Existing 750641) – Southbound Florida's Turnpike Entry/Exit over Florida's Turnpike (Loop to Trumpet)

Bridge 8 (No. 750641) connects SB Florida's Turnpike to and from Orange Blossom Trail. This bridge is no longer needed in Alternative 3. The SB Florida's Turnpike movements to and from SB Orange Blossom Trail are replaced with Ramps 303 and 322, and others as described in Bridges 7a and 7b. The NB Orange Blossom Trail to SB Florida's Turnpike movement is replaced by the construction of the reliever interchange at Taft Vineland Road. These movements correspond to the final configuration of the Orlando South interchange. Their disturbance during demolition will require an asbestos abatement plan per the specifications.

Estimated Construction Cost: The probable construction cost for Alternative 3 for demolition of Bridge 8 is estimated at $1.23 million.

3.9 Bridge 13 (Existing 750632) – Beachline Expressway Eastbound Entrance Ramp over CSX Railroad

Bridge 13 (No. 750632) currently serves movements from Landstreet Road and NB/SB Florida's Turnpike to the EB Beachline Expressway. These ramps are being replaced by the new Beachline Expressway Reliever interchange to the east and new direct connections from NB/SB Florida's Turnpike. Phased demolition of this structure is required because it must carry existing traffic from

NB/SB Florida's Turnpike to EB Beachline Expressway while Bridge 15 is being widened. The cost is the demolition of the existing bridge.

Provisions should be made to require monitoring of the adjacent bridges during construction for any signs of settlement or related damage.

Estimated Construction Cost: The probable construction cost for Alternative 3 for demolition of Bridge 13 is estimated at $0.53 million.

3.10 Bridge 14 (Existing 750096) – Westbound Beachline Expressway over CSX Railroad

The existing bridge (Bridge No. 750096) is a three-span bridge with AASHTO girders and CIP concrete deck superstructure, both precast concrete pile and steel pipe pile foundations, with CIP concrete bent cap substructure. The bridge intersects CSX railroad at an approximately 45-degree skew angle. Bridge end bents are fronted by sloped sand cement riprap. In front of the sand cement riprap on each side are cast in place concrete, intermediate bent caps and crash walls. The structure is in good condition with a Sufficiency Rating of 94, no load restrictions and no significant deficiencies. The minimum vertical clearance over CSX railroad is 23 ft 10⅝ inches. The existing traffic railings are 32-inch F Shape (FDOT Standard Index 420, circa 2009). Per the FDOT SDG, Table 6.7.4-1, Treatment of Existing Traffic Railings, the inside traffic railings should be replaced (Index 521-427). Outside traffic railings will be replaced as part of the proposed widening.

The suggested action at this site is to widen the existing bridge to the outside 20 ft 10½ inches. The existing structure is 71 ft 1 inch wide and the widened structure will be 88 ft 8 inches wide. Cross slope on the existing bridge is 2.0%. Widening will follow the existing cross slope. Proposed widening could be accomplished by adding standard height Type II AASHTO girders (same as existing outside girders used for the 2009 widening) on the outside (three girders) and extending with a matching 8-inch thick CIP concrete deck. The existing deck overhang of 3 ft 1 inch could be saw cut at the exterior girder and removed along with the existing F-shape traffic barrier to facilitate deck widening. Adding three Type II AASHTO girders will reduce the existing minimum vertical clearance to approximately 23 ft 6¼ inches exceeding the minimum of 23 ft 6 inches.

The existing end bents will be extended with a new cap supported on precast prestressed concrete piles or steel piles. Two additional intermediate bents with 12-ft tall crash walls would be constructed similar to those constructed when this bridge was widened to this side in 2009. Since the horizontal clearance from the track centerline to the piers is less than 12 ft (9 ft 11⅜ inches), the crash wall height will match the existing at 12 ft.

Constructability issues with the above are minimal outside of the coordination with CSX train traffic. Setting of new girders and intermediate bent cap/crash wall construction will require close communication with CSX. The end bent and intermediate bent/crash wall construction can be primarily constructed from behind the end bents to minimize disruption to CSX. Bridge 14_3 is

widened to the outside, traffic on WB Beachline Expressway is shifted to accommodate the traffic railing replacement on the inside shoulder.

Provisions should be made to require monitoring of the adjacent bridges during construction for any signs of settlement or related damage. ABC techniques, such as off-site superstructure construction followed by transport and placement utilizing an SPMT, could be considered to limit disruption to CSX traffic and avoid placement of deck concrete over railroad traffic.

Identified Structure Alternative: Outside widening with AASHTO Type-II girders, supported on widened end bents and intermediate piers, and founded on piles. An inside traffic railing replacement and 12 ft crash wall are required at this site.

Estimated Construction Cost: The probable construction cost to widen Bridge 14_3 is estimated at $0.69 million. This includes the additional cost to construct the crash walls at the intermediate bents in conjunction with the intermediate bent widenings.

3.11 Bridge 15 (Existing 750222) – Eastbound Beachline Expressway over CSX Railroad

The existing bridge is a three-span bridge with AASHTO girders and CIP concrete deck superstructure, both precast concrete pile and steel pipe pile foundation, with CIP concrete bent cap substructure. The bridge intersects CSX railroad at an approximately 45-degree skew angle. Bridge end bents are fronted by sloped sand cement riprap. In front of the sand cement riprap on each side are CIP concrete, intermediate bent caps and crash walls. The structure is in good condition with a Sufficiency Rating of 94, no load restrictions and no significant deficiencies. The minimum vertical clearance over CSX railroad is 22 ft 7 inches. The existing traffic railings are 32-inch F Shape (FDOT Standard Index 420, circa 2009). Per the FDOT SDG, Table 6.7.4-1, Treatment of Existing Traffic Railings, the inside traffic railings should be retrofitted or replaced (Index 521-427). Outside traffic railings will be replaced as part of the proposed widening.

The suggested action at this site is to widen the existing bridge to the outside a varied amount from 12 ft 4⅞ inches to 18 ft 1¼ inches. The existing structure varies in width from 73 ft-11¼ inches to 79 ft 7⅝ inches and the widened structure will be 88 ft 8 inches wide. Cross slope on the existing bridge is 2.0%. Widening will follow the existing cross slope. Proposed widening could be accomplished by adding reduced height (modified) Type II AASHTO girders on the outside (two girders) and extending with a matching 8-inch thick CIP concrete deck. The existing deck overhang of 3 ft 2 inches could be saw cut at the exterior girder and removed along with the existing F-shape traffic barrier to facilitate deck widening. At a meeting with the Turnpike Structures Engineer, the modified Type II AASHTO was discussed resulting in a verbal "No Objection" to this structural approach. A custom box girder was suggested as an alternative solution to investigate during the design phase.

Utilizing the reduced height Type II AASHTO girders will not reduce the existing minimum vertical clearance of 22 ft 4½ inches. At a meeting with CSX held in November 2019, CSX representatives took no exception with the existing sub-standard vertical clearance. A formal response from CSX stating "No Objection" to as-is condition is pending. A Design Exception for vertical clearance will be required during the design phase.

The existing end bents will be extended with a new cap supported on precast prestressed concrete piles or steel piles. Two additional intermediate bents with 12-ft tall crash walls would be constructed similar to those constructed when this bridge was widened to this side in 2009. Since the horizontal clearance from the track centerline to the piers is less than 12 ft (9 ft-11⅜ inches), the crash wall height will match the existing at 12 ft. The crash wall for the easternmost intermediate bent will need to kink back away from the centerline of the railroad tracks due to the curve in the tracks.

Constructability issues for the above are minimal outside of the coordination with CSX train traffic and phasing. Setting of new girders and intermediate bent cap/crash wall construction will require close communication with CSX. The end bent and intermediate bent/crash wall construction can be primarily constructed from behind the end bents to minimize disruption to CSX. Provisions should be made to require vibration and settlement monitoring of the adjacent bridges during construction. Adjacent Ramp Bridge 13 must be partially removed prior to Bridge 15 widening. Prior to the partial demolition of Bridge 13, the Voltaire Drive Reliever interchange east of this site must be constructed, as it would accommodate the traffic from Landstreet Road on to EB Beachline Expressway. After Bridge 15 is widened to the outside, traffic on EB Beachline Expressway is shifted to accommodate the traffic railing replacement on the inside shoulder.

Identified Structure Alternative: Outside widening with Modified AASHTO Type-II girders, supported on widened end bents and intermediate piers, and founded on piles. An inside traffic railing replacement and 12-ft crash wall are required at this site.

Estimated Construction Cost: The probable construction cost to widen Bridge 15_3 is estimated at $0.60 million. This includes the additional cost to construct the crash walls at the intermediate bents in conjunction with the intermediate bent widenings.

3.12 Bridge A3 – Ramp 301 (Southbound Florida's Turnpike to Westbound Beachline Expressway)

Ramp 301 connects SB Florida's Turnpike to WB Beachline Expressway. Ramp 301 starts at a grade-level gore (on a retaining wall supported embankment) then the profile slopes up and over Ramp 303 twice, then crosses under Bridge B3. Bridge A3 then spans over Ramp 320, Consulate Drive and the Beachline Expressway twice. After crossing the Beachline Expressway, Bridge A3 ties with Bridge G3 at the gore area.

The typical section for Bridge A3 consists of a single 15-ft lane and a 6-ft shoulders outside and an inside shoulder that varies from 6-ft to 16-ft, and two 1-ft 6-inch wide, 42-inch single slope railings (TL-5) per Index 521-428. The maximum structure width is 40 ft 0 inches for the main spans. Bridge A3 cross slope varies up to 9.8% at full superelevation. The bridge length is approximately 3,076 ft. The majority of the bridge is in a constant horizontal curve with a radius of 800 ft with a portion that has a curve with a radius of 970 ft. The primary span length requirements for Bridge A3 are established by the following constraints:

- **Over Existing Ramp 303:** Bridge A3 crosses existing Ramp 3, at skews approximately 59 degrees from normal. The crossing is achieved with use of a Straddle/Cantilever Pier. Ramp 303 also overpasses a proposed new toll site. The constraints on geometry requires that Ramp 301 clear the proposed toll site with 5 ft of clearance over the gantry. Under this scheme the fuel tank for the standby generator will be relocated out from under the bridge.
- **Over WB Beachline Expressway:** Bridge A3 crosses over WB Beachline Expressway at approximate skew of 67 degrees from normal with a required span length of approximately 271 ft.
- **Back over WB Beachline Expressway:** Bridge A3 crosses back over the WB Beachline Expressway at an approximate skew of 81.5 degrees from normal with the use of two Straddle/Cantilever Piers.

Appropriate superstructure types for Bridge A3 include curved steel girders (box or plate) and segmental concrete box girders. Both of these types are adaptable to the bridge curvature and capable of the necessary span lengths. Given the variation in expected span lengths a variable depth superstructure would be more economical than a constant depth. However, from an aesthetic viewpoint a constant depth would be better.

Substructure: At the end of Bridge A3, this bridge will share a common multi column pier with Bridge G3 at the gore area. At the beginning of the bridge, a pile supported end bent is anticipated with MSE wall wrapping around the embankments. The intermediate piers will consist of hammerhead piers with pile supported footings. Cantilevered piers are anticipated at Piers 1, 3, 5, 14, and 15 while a straddle pier is anticipated at Pier 2. Piles would be precast prestressed concrete piles or steel piles.

Constructability Concerns: Phasing and traffic control for construction of Bridge A3 over the Beachline Expressway is dependent upon the superstructure type. Curved steel girder erection typically involves dividing the structure into sections that can be erected and temporarily stabilized until adjacent sections can be placed and connected by field splices. Temporary falsework in the form of temporary towers are generally required in addition to the permanent piers or bents. Outside the limits of the Beachline Expressway there is adequate space for temporary towers. Median space however is limited. In these locations, pier brackets (steel

members temporarily secured to a pier to "fix" a superstructure element during erection in lieu of a prop) or other means that require less real estate from the travel lanes may need to be employed. A segmental concrete box girder bridge could be constructed in balanced cantilever, progressive cantilever, or a combination using an overhead gantry. This would limit impacts on traffic to night-time lane closures.

Identified Structure Alternative and Span Layout: Twin steel box girders with constant web throughout the entire length of the bridge. For the maximum anticipated span length of 271 ft, the estimated effective structure depth, including cross slope is 12.6 ft in determining profiles and vertical clearances. The superstructure would be supported on end bents and intermediate hammerhead and C-Shaped piers, and a straddle pier and founded on piles.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge A3 is estimated at $25.90 million.

3.13 Bridge B3 – Ramp 302, Southbound Florida's Turnpike to Eastbound Beachline Expressway

Ramp 302 connects SB Florida's Turnpike to EB Beachline Expressway. Ramp 302 branches out of Ramp 301 at a gore then the profile slopes up to span over multiple ramps and roadways. Bridge B3 begins as the ramp curves to the left. The bridge spans over A3, J3, Florida's Turnpike and Beachline Expressway. Ramp 302 crosses the current pond in the infield of the existing Florida's Turnpike to SB Orange Blossom Trail loop, then spans over Ramp 321 and Orange Blossom Trail. Ramp 310 then then crosses below Bridge M3 and spans over Ramp 306, before transitioning to a retaining wall and embankment.

The typical section for Bridge B3 consists of a single 15-ft lane and 6-ft shoulders inside and out, and two 1-ft 6-inch wide, 42-inch traffic railings (TL-5) per Index 521-428. The total structure width is 30 ft 0 inches throughout the whole bridge except on Span 1 where the lane varies from 22 ft 6 inches to 15 ft resulting in the total bridge width varying from 37 ft 6 inches to 30 ft. Bridge B3 cross slope varies from 2% to 6.8% at full superelevation. The bridge length is approximately 4,273 ft. The majority of the bridge is on a constant curve with a radius of 2,111.73 ft, with a portion that has a curve with a radius of 1,528.78 ft. The primary span length requirements for Bridge B3 are established by the following constraints:

- **Over Bridges A, J and Existing Ramps:** Bridge B3 crosses Bridges A3 and J3 and Consulate Drive exit at skews approximately 50 degrees and 35 degrees from normal, respectively. The crossing is achieved with a span of approximately 244 ft.
- **Over SB Florida's Turnpike and SB Florida's Turnpike Exit Ramp 304:** Bridge B3 crosses over SB Florida's Turnpike and SB Florida's Turnpike Exit Ramp 304 at approximate skew of 67 degrees with a required maximum span length of approximately 313 ft 6 in.

- **Over NB Florida's Turnpike Mainline and WB Beachline Expressway:** Bridge B3 crosses over WB Beachline Expressway where WB Beachline Expressway crosses over Florida's Turnpike. The combined footprint of the two roads underneath, and their skew to each other and Bridge B3, results in a required span length of approximately 255 ft 6 in.
- **Over EB Beachline Expressway:** Bridge B3 crosses NB Florida's Turnpike exit ramps at a skew of approximately 70 degrees from normal resulting in a required span length on the order of 260 ft.
- **Over Orange Blossom Trail:** Bridge B3 crosses Orange Blossom Trail at a skew of approximately 20 degrees from normal. Minimum span lengths of approximately 223 ft are required.
- **Over Ramp 306:** Bridge B3 crosses Ramp 306 at a skew of approximately 46 degrees from normal. Minimum span lengths of approximately 223 ft are required.

Appropriate superstructure types for Bridge B3 include curved steel girders (box or plate) and segmental concrete box girders. Both of these types are adaptable to the bridge curvature and capable of the necessary span lengths. Given the variation in expected span lengths a variable depth superstructure would be slightly more economical than a constant depth one. However, from an aesthetic viewpoint a constant depth would be better. Identified superstructure alternatives include:

- Superstructure Alternative 1: Eighteen-spans curved steel box girders bridge with a maximum anticipated of 313 ft 6 inches.
  - This alternative provides a structural advantage for curved bridges over other alternatives.
- Superstructure Alternative 2: Eighteen-spans curved steel plate girders bridge with a maximum anticipated span of 313 ft 6 inches.
  - This alternative would not provide aesthetic continuity with adjacent curved steel box bridges.
- Superstructure Alternative 3: Eighteen-span curved segmental concrete box girder bridge with a maximum anticipated span of 313 ft 6 inches.
  - This alternative would not provide aesthetic continuity with adjacent curved steel box bridges but would provide a similar box section look or would match other segmental concrete boxes on the project, if a segmental concrete solution were selected for most of the curved ramp bridges.

Substructure would consist of concrete end bent caps and intermediate hammerhead piers founded on prestressed concrete piles or steel piles. Pier 8 columns needs to be oriented with major axes not coinciding with its cap direction, to accommodate space between barrier walls or

meet lateral offset requirements at adjacent roadway. MSE walls would wrap around the approach embankment. The north end of the bridge would share a common MSE wall with Bridge A3. Piles would be precast prestressed concrete piles or steel piles.

Phasing and traffic control for construction of Bridge B3 over Florida's Turnpike and Beachline Expressway is dependent upon the superstructure type. Curved steel girder erection typically involves dividing the structure into sections that can be erected and temporarily stabilized until adjacent sections can be placed and connected by field splices. Temporary falsework in the form of temporary towers are generally required in addition to the permanent piers or bents. Outside the limits of Florida's Turnpike there is adequate space for temporary towers. Median space however is limited. In this location pier brackets (steel members temporarily secured to a pier to "fix" a superstructure element during erection in lieu of a prop) or other means that require less real estate from the travel lanes may need to be employed. A segmental concrete box girder bridge could be constructed in balanced cantilever, progressive cantilever, or a combination using an overhead gantry. This would limit impacts on traffic to night-time lane closures.

Identified Structure Alternative and Span Layout: Twin steel box girders with constant web throughout the entire length of the bridge. For the maximum anticipated spans of 315 ft 6 in, the estimated effective structure depth, including cross slope, is 13 ft and used in determining profiles and vertical clearances. The superstructure would be supported on end bents and intermediate hammerhead piers founded on piles. This arrangement uses a total of 18 spans, in the following order and approximate span lengths: four span of 249 ft 6 inches, one span of 244 ft, one span of 195 ft, one span of 313 ft 6 inches, one span of 255 ft 6 inches, one span of 260 ft and nine spans of 223 ft.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge B3 is estimated at $33.6 million.

3.14 Bridge C3 – Ramp 304, Southbound Florida's Turnpike to Taft Vineland Road Interchange over Ramp 322

Ramp 304 connects exiting SB Florida's Turnpike to Taft Vineland Road. For Alternative 3, Bridge C3 carries Ramp 304 over Ramp 322. For Alternative 3 the typical section consists of a single 15 ft lane, 6 ft outside and inside shoulders, and two 1-ft 4-inch wide, 36-inch single slope railings, for a total structure width of 29 ft 8 inches. Total length of the bridge is approximately 310 ft. The cross section has a constant cross-slope of 4.8%. The majority of the bridge is curved with radius of 2,340 ft. Bridge C3 crosses Ramp 322 at skew up to 83 degrees from normal. Appropriate superstructure types for Bridge C3 are curved steel girders (box or plate sections) and precast concrete FIB girders. Identified superstructure alternatives include:

- Superstructure Alternative 1: Two-span continuous steel plate girders bridge with a maximum anticipated span of 155 ft.

- Superstructure Alternative 2: Two-span precast FIB beams (simple-spans with continuous deck) with a maximum anticipated span of 155 ft.
  - This alternative would not provide aesthetic continuity with adjacent steel bridges and would potentially increase dead loads on the proposed foundations.
- Superstructure Alternative 3: Simple span steel twin box girders bridge.
  - This alternative would require raising the profile on Ramp 304 which would adversely affect the profile of Ramp 310 and the toll site T6 location.

Substructure would consist of concrete end bent caps and integral straddle bent (steel or concrete) or C-shaped pier over Ramp 322 and founded on precast prestressed concrete piles or steel piles. The C-shaped pier may have an advantage of a stiffer support point and simpler construction over an integral straddle bent, but it requires additional structural depth over Ramp 322. MSE walls would wrap around the approach embankment.

Phasing and traffic control for construction of Bridge C3 over Ramp 322 is dependent upon order of construction. It is anticipated that the bridge is constructed prior to the ramp. In this case there is ample space available for construction of intermediate pier and placement of any necessary temporary supports and without impacting traffic.

Identified Structure Alternative and Span Layout: Two-span continuous steel plate girder superstructure with an estimated effective structure depth including cross slope of 8.1 ft, used in determining profile and vertical clearances. The superstructure would be supported on end bents and an intermediate C-shaped pier founded on piles. The approximate span lengths: two spans of 155 ft.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge C3 is estimated at $2.17 million.

3.15 Bridge D3 – Ramp 304, Southbound Florida's Turnpike to Taft Vineland Road Interchange over Orange Blossom Trail

For Alternative 3, Bridge D3 carries Ramp 304 over Orange Blossom Trail. For Alternative 3, the typical section consists of a single 15 ft lane, 6 ft wide inside and outside shoulders and two 1-ft 4-inch wide, 36-inch single slope railings, for a total structure width of 29 ft 8 inches. The cross section is a constant 2%. Bridge D3 crosses Orange Blossom Trail at a skew of 35 degrees from normal requiring a minimum span of approximately 195 ft. There is no provision for an intermediate pier in the cross section of Orange Blossom Trail.

The superstructure for Bridge D3 could be steel plate girders or precast, prestressed concrete FIB girders. Identified superstructure alternatives include:

- Superstructure Alternative 1: Skewed, simple-span steel plate girder bridge with a maximum anticipated span of 195 ft

  - Steel plate girders would offer the aesthetic advantage of matching the adjacent bridges.
- Superstructure Alternative 2: Skewed, simple-span precast FIB beams bridge with a maximum anticipated span of 195 ft.
  - This alternative would not provide aesthetic continuity with adjacent steel bridges and would potentially increase dead loads on the proposed foundations.
  - Requires FIB 96 closely-spaced.
- Superstructure Alternative 3: Simple-span steel plate girder bridge (no skew).
  - This alternative would require a maximum 215 ft span with a girder depth that is 1.0 ft deeper than the skewed bridge alternative.

Substructure would consist of concrete bent caps on precast prestressed concrete piles or steel piles. For either superstructure, the substructure and accompanying retaining walls will need to be coordinated with construction of adjacent Bridges 1 and R3.

Constructability for Bridge D3 are similar to other Orange Blossom Trail crossings, including the need to develop and implement traffic control phasing and identification of hours for lane closures, night work, and short-term detours of Orange Blossom Trail. ABC techniques, such as off-site superstructure construction followed by transport and placement utilizing a SPMT, could be considered to limit detours and avoid placement of deck concrete over traffic.

Identified Structure Alternative and Span Layout: Simple-span steel plate superstructure with an estimated effective structure depth including cross slope of 8.447 ft, used in determining profile and vertical clearances. The superstructure would be supported on skewed end bents founded on piles. The approximate span length: 195 ft.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge D3 is estimated at $0.87 million.

3.16 Bridge E3 – Ramp 302, Southbound Florida's Turnpike to Eastbound Beachline Expressway over Landstreet Road

Bridge E3 is a new bridge to carry Ramp 302 (SB Florida's Turnpike to EB Beachline Expressway) over Landstreet Road. Bridge E3 runs skewed with and to the east of Bridge 5 (Existing Bridge No. 750221). The typical section of Bridge E3 includes a 15-ft lane, two 1-ft 4-inch wide, 36-inch single slope railings, 6-ft inside and outside shoulders for a total bridge width of 29 ft 8 inches. Cross slope is a constant 2%. Bridge E3 will cross Landstreet Road with a single span with an approximate length of 190 ft. The estimated skew angles of the proposed bridge are at 36.25 and 37.6 degrees on the western and eastern supports, respectively.

The superstructure for Bridge E3 is anticipated to be precast prestressed concrete FIB girders or steel plate girders. Identified superstructure alternatives include:

- Superstructure Alternative 1: Skewed, simple-span precast FIB-96 beams bridge with a maximum anticipated span of 189 ft 0¾ inches.
- Superstructure Alternative 2: Skewed, three-span precast FIB beams bridge with a maximum anticipated total bridge length of 189 ft 0¾ inches.
- Superstructure Alternative 3: Skewed simple-span steel plate girder bridge with a maximum anticipated span of 189 ft 0¾ inches.

Substructure would consist of concrete bent caps on precast prestressed concrete piles or steel piles. Bridge end bents are fronted by concrete slope protection/pavement similar to adjacent Bridge 5. Constructability issues for Bridge E3 are similar to Bridge 5 widening. Since the existing EB Beachline Expressway entrance ramp (Bridge No. 750095) is in the way of widening, the demolition of this bridge must be completed prior to new construction. Prior to demolition work, the Beachline Expressway Reliever interchange must be constructed; and the new NB Florida's Turnpike to EB Beachline Expressway ramp must be constructed, eliminating the need for Bridge No. 750095.

Setting of the new girders will require development and implementation of traffic control phasing and identification of hours for lane closures, night work, and short-term detours of Landstreet Road. The end bent substructure can be primarily constructed from behind the end bents to avoid traffic disruptions. Pier construction will require phasing of both pedestrians and traffic on Landstreet Road. Provisions should be made to require monitoring of the adjacent bridges during construction for any signs of settlement or related damage. ABC techniques, such as off-site superstructure construction followed by transport and placement utilizing a SPMT, could be considered to limit detours and avoid placement of deck concrete over traffic.

Identified Structure Alternative and Span Layout: Simple-span precast FIB-96 beams with an estimated effective structure depth including cross slope of 9.15 ft was used in determining profile and vertical clearances. The superstructure would be supported on skewed end bents founded on piles. The approximate span length: 189 ft 0¾ inches.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge E3 is estimated at $0.8 million.

3.17 Bridge F3 – Ramp 310, Eastbound Beachline Expressway to Northbound and Southbound Florida's Turnpike over Ramp 324

Bridge F3 carries Ramp 310 over Ramp 324. Ramp 310 connects EB Beachline Expressway traffic to NB and SB Florida's Turnpike. Ramp 324 is an on ramp from John Young Parkway (CR 423) to EB Beachline Expressway. The typical section for Bridge F3 consists of a single 15-ft lane and 6-ft inside and outside shoulders, and two 1-ft 6-inch wide, 42-inch single slope railings (TL-5), for a total width of 30 ft 0 inches. The bridge is on a curved alignment consisting of a 1,975 ft radius for a length of 275 ft 7 inches, followed by a 3,947 ft radius for a length of 641 ft 5 inches, a 386

ft 11¼ inches in tangent and a 5,285 ft radius for a length of 1,280 ft. Cross slope on the bridge is variable with maximum 5.5% in full superelevation. Bridge F3 crosses Ramp 324 at a skew of approximately 73 degrees from normal. The vertical curve for Ramp 310 follows the vertical profile of the Beachline Expressway up to east of John Young Parkway interchange where it converts into a sag curve near Station 1061+00. This sag curve and a subsequent crest curve allow for the bridge structure to clear Ramp 324. Due to the vertical curve rate of change requirements per Florida Design Manual (FDM) Section 211, the development of the crest curve extends about 2,797 ft beyond the limits of Ramp 324. This vertical curve requirements combined with the retaining wall height constraints, result in a 2,585 ft-long curved bridge structure. Appropriate superstructure types for Bridge F3 are curved steel girders (box or plate sections) and segmental concrete box girders. Identified superstructure alternatives include:

- Superstructure Alternative 1: Eleven-span curved steel plate girders bridge with a maximum anticipated span of 235 ft.
- Superstructure Alternative 2: Eleven-span curved steel box girders bridge with a maximum anticipated span of 235 ft.
    - This alternative provides a structural advantage for curved bridges over other alternatives.
- Superstructure Alternative 3: Eleven-span curved segmental concrete box girder bridge with a maximum anticipated span of 235 ft.

Substructure would consist of concrete end bent caps, an integral straddle pier (concrete or steel) or C-shaped pier over Ramp 324 and intermediate hammerhead piers founded on precast prestressed concrete piles or steel piles. MSE walls would wrap around the approach embankment. At Pier 2, the C-shaped pier cap would overhang Ramp 324 by approximately 33 ft, thus requiring a deeper cap and most likely post-tensioning. The integral straddle pier offers more suitable solution at this location. MSE walls would wrap around the approach embankment.

Phasing and traffic control for construction of Bridge F3 over Ramp 324 is dependent upon the superstructure type. Curved steel girder erection typically involves dividing the structure into sections that can be erected and temporarily stabilized until adjacent sections can be placed and connected by field splices. Temporary falsework in the form of temporary towers are generally required in addition to the permanent piers or bents. There is ample space to temporarily divert Ramp 324 around the bridge footprint such that the bridge can be erected without impacting ramp traffic.

Identified Structure Alternative and Span Layout: Twin steel box girders with constant web depth throughout the entire length of the bridge. For the maximum anticipated spans of 235 ft, the estimated effective structure depth, including cross slope, is 10 ft 2 inches and is used in determining profiles and vertical clearances. The superstructure would be supported on end bents,

an integral straddle pier (concrete or steel) and intermediate hammerhead piers founded on piles. This arrangement uses a total of 11 spans with constant and approximate span lengths of 235 ft.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge F3 is estimated at $18.0 million.

3.18 Bridge G3 – Ramp 305, Northbound Florida's Turnpike to WB Beachline Expressway

Ramp 305 connects NB Florida's Turnpike to WB Beachline Expressway. Ramp 305 starts with a MSE wall then the profile slopes up and over Florida's Turnpike and Beachline Expressway then down over Bridges A3 and J3 and Ramp 320. Bridge G3 then continues over Ramp 312 and back to grade level.

The typical section for Bridge G3 consists of a single 15-ft lane and 6-ft shoulders inside and out, and two 1-ft 6-inch wide, 42-inch traffic railings (TL-5) per Index 521-428. The maximum structure width is 30 ft 0 inches for the majority of the main spans except at the gore area where Bridges G3 and A3 connect. Bridge G3 cross slope varies up to 6.5% at full superelevation. The bridge length is approximately 5,888 ft. The majority of the bridge is in a constant curve with a radius of 1,685 ft. The primary span length requirements for Bridge G3 are established by the following constraints:

- **Over Ramps 203 and 307:** Bridge G3 crosses ramps 203 and 307, at skews approximately 79 degrees from normal. The crossing is achieved with use of a Straddle/Cantilever Pier.
- **Over Florida's Turnpike and Ramp 304:** Bridge G3 crosses over Florida's Turnpike at an approximate skew of 70 degrees from normal with a required span length of approximately 228 ft over NB Florida's Turnpike and 319 ft over SB Florida's Turnpike and Ramp 304.
- **Over Beachline Expressway:** Bridge G3 crosses over Beachline Expressway at an approximate skew of 71 degrees from normal with a required span length of approximately 319 ft and 362 ft.
- **Over Bridges A3 and J3:** Bridge G3 crosses Bridges A3 and J3 at a skew of approximately 54.5 degrees from normal with a required span length of approximately 329 ft.
- **Over Ramp 320:** Bridge G3 crosses Ramp 320 at a skew of approximately 85.5 degrees from normal with a required span length of approximately 300 ft.
- **Over Ramp 312:** Bridge G3 crosses Ramp 312 at a skew of approximately 82.5 degrees from normal with the use of three Straddle/Cantilever Piers.

Appropriate superstructure types for Bridge G3 include curved steel girders (box or plate) and segmental concrete box girders. Both of these types are adaptable to the bridge curvature and capable of the necessary span lengths. Given the variation in expected span lengths, a variable depth superstructure would be more economical than a constant depth. However, from an aesthetic viewpoint a constant depth would be better.

Substructure: Pile supported end bents are anticipated with MSE wall wrapping around the embankments, and intermediate hammerhead piers. Cantilevered piers are anticipated at Piers 4, 29, and 30 while a straddle pier is anticipated at Pier 31. Bridge G3 will also share a common multi column pier with Bridge A3 at the gore area. Piles would be precast prestressed concrete piles or steel piles.

Constructability concerns: Phasing and traffic control for construction of Bridge G3 over Florida's Turnpike and Beachline Expressway is dependent upon the superstructure type. Curved steel girder erection typically involves dividing the structure into sections that can be erected and temporarily stabilized until adjacent sections can be placed and connected by field splices. Temporary falsework in the form of temporary towers are generally required in addition to the permanent piers or bents. Outside the limits of Florida's Turnpike there is adequate space for temporary towers. Median space however is limited. In these locations, pier brackets (steel members temporarily secured to a pier to "fix" a superstructure element during erection in lieu of a prop) or other means that require less real estate from the travel lanes may need to be employed. A segmental concrete box girder bridge could be constructed in balanced cantilever, progressive cantilever, or a combination using an overhead gantry. This would limit impacts on traffic to night-time lane closures.

Identified Structure Alternative and Span Layout: twin steel box girders with constant web will be used up to the gore area where Bridge G3 ties in with Bridge A3. For the maximum anticipated span length of 360 ft, the estimated effective structure depth, including cross slope is 13.5 ft in determining profiles and vertical clearances. FIB's can be used for the shorter spans starting after the gore area and the estimated effective structure depth, including cross slope is 7.1 ft in determining profiles and vertical clearances. The superstructure would be supported on end bents, intermediate hammerhead and straddle piers, founded on piles.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge G3 is estimated at $39.4 million.

3.19 Bridge H3 – Ramp 306, Northbound Florida's Turnpike to Eastbound Beachline Expressway over Ramp 308

Bridge H3 is a new bridge to carry a single 15-ft lane of Ramp 306 over Ramp 308 approximately 173 ft long. Including the two 1-ft 6-inch wide, 42-inch traffic railings (TL-5), 10-ft inside and 6-ft outside shoulders; the bridge width is 34 ft. Cross slope varies with maximum slope of 7.61%. The

bridge is on a curve with a radius of 1,310 ft. Bridge H3 crosses Ramp 308 at a skew angle of approximately 55 degrees from perpendicular. Ramp 308 geometry prohibits this bridge from having a center pier therefore a single span bridge provides a feasible solution to maintain the required roadway clearances.

The superstructure for Bridge H3 could be steel plate or box girders or precast, prestressed concrete FIB girders. Identified superstructure alternatives include:

- Superstructure Alternative 1: Skewed, simple-span steel plate girder bridge with a maximum anticipated span of 172 ft 5⅝ inches
- Superstructure Alternative 2: Skewed, simple-span precast FIB 78 or 84 beams bridge with a maximum anticipated span of 172 ft 5⅝ inches.
  - This alternative would not provide aesthetic continuity with adjacent steel bridges and would potentially increase dead loads on the proposed foundations.
- Superstructure Alternative 3: Skewed, simple span steel twin box girders bridge.
  - This alternative would provide an enhanced aesthetic level by matching the structure type of adjacent Level 3 bridge.

Substructure would consist of concrete bent caps on precast prestressed concrete piles or steel piles. MSE walls would wrap around the approach embankment.

Constructability issues for Bridge H3 include the need to develop and implement a traffic control phasing and identification of hours for lane closures, night work, and short-term detours of Ramp 308. ABC techniques, such as off-site superstructure construction followed by transport and placement utilizing a SPMT, could be considered to limit detours and avoid placement of deck concrete over traffic.

Identified Structure Alternative and Span Layout: Simple-span steel superstructure with an estimated effective structure depth including cross slope of 8.0 ft, was used in determining profile and vertical clearances. The superstructure would be supported on skewed end bents founded on piles. The approximate span length: 172 ft 5⅝ inches.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge H3 is estimated at $0.93 million.

3.20 Bridge J3 – Ramp 309, Eastbound Beachline Expressway to Northbound Florida's Turnpike

Ramp 309 connects EB Beachline Expressway to NB Florida's Turnpike. Ramp 309 starts with a MSE wall and then the profile slopes up to a gore area at which point Bridge J3 and Bridge K3 begin. Bridge J3 spans over Ramp 311 and the Beachline Expressway, then crosses under Bridge G3. Bridge J3 then spans over Consulate Drive and under Bridge B3 and over Florida's Turnpike and Ramp 313 as the profile slope decreases to grade level.

The typical section for Bridge J3 consists of a single 15-ft lane and a 6-ft shoulder outside and an inside shoulder that varies from 6 ft to 12 ft, and two 1-ft 6-inch wide, 42-inch traffic railings (TL-5) per Index 521-428. The maximum structure width is 36 ft 0 inches for the majority of the main spans except at the gore area where Bridges J3 and K3 connect. Bridge J3 cross slope varies up to 8.3% at full superelevation. The bridge length is approximately 2,672 ft. The majority of the bridge is in a constant curve with a radius of 1,146 ft. The primary span length requirements for Bridge J3 are established by the following constraints:

- **Over Existing Ramp 311:** Bridge J3 crosses over Ramp 311, at skews approximately 82 degrees from normal. The crossing is achieved with use of a straddle pier over Beachline Expressway and Ramp 311.
- **Over EB and WB Beachline Expressway:** Bridge J3 crosses over EB and WB Beachline Expressway at an approximate skew of 82 degrees from normal with required span length of approximately 191 ft and 193 ft respectively and using a straddle pier over EB Beachline Expressway.
- **Over SB and NB Florida's Turnpike:** Bridge J3 crosses over SB and NB Florida's Turnpike at an approximate skew of 58 degrees from normal with required span lengths of 197 ft and 261 ft, respectively.
- **Over Ramp 313:** Bridge J3 crosses Ramp 313 at a skew of approximately 87 degrees from normal with the use of two Straddle/Cantilever Piers.

Appropriate superstructure types for Bridge J3 include curved steel girders (box or plate) and segmental concrete box girders. Both of these types are adaptable to the bridge curvature and capable of the necessary span lengths. Given the variation in expected span lengths a variable depth superstructure would be more economical than a constant depth. However, from an aesthetic viewpoint a constant depth would be better.

Substructure: Pile supported end bents are anticipated with MSE wall wrapping around the embankments, and intermediate hammerhead piers with pile supported footings. Straddle piers are anticipated at Piers 3, 4, and 12 while a cantilevered pier is anticipated at Pier 13. Bridge J3 will also share a common straddle pier (Pier 3) with Bridge K3 at the gore area. Piles would be precast prestressed concrete piles or steel piles.

Constructability Concerns: Phasing and traffic control for construction of Bridge J3 over Florida's Turnpike and Beachline Expressway is dependent upon the superstructure type. Curved steel girder erection typically involves dividing the structure into sections that can be erected and temporarily stabilized until adjacent sections can be placed and connected by field splices. Temporary falsework in the form of temporary towers are generally required in addition to the permanent piers or bents. Outside the limits of Florida's Turnpike there is adequate space for temporary towers. Median space however is limited. In these locations, pier brackets (steel

members temporarily secured to a pier to "fix" a superstructure element during erection in lieu of a prop) or other means that require less real estate from the travel lanes may need to be employed. A segmental concrete box girder bridge could be constructed in balanced cantilever, progressive cantilever, or a combination using an overhead gantry. This would limit impacts on traffic to night-time lane closures.

Identified Structure Alternative and Span Layout: Steel plate girders will be used in the first two shorter spans up to the gore area where Bridge J3 ties in with Bridge K3. The estimated effective structure depth, including cross slope is 7.6 ft in determining profiles and vertical clearances. Twin steel box girders with constant web will be used for the rest of the bridge. For the maximum anticipated span length of 284 ft, the estimated effective structure depth, including cross slope is 12.1 ft in determining profiles and vertical clearances. The superstructure would be supported on end bents, intermediate hammerhead piers and straddle piers, and founded on piles.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge J3 is estimated at $22.08 million.

3.21 Bridge K3 – Ramp 310, Eastbound Beachline Expressway to Southbound Florida's Turnpike

Ramp 310 connects EB Beachline Expressway to SB Florida's Turnpike. Bridge K3 starts at the gore section of Bridge J3 and then the profile slopes up and spans over Ramp 311, then the profile slopes down as it spans over Consulate Drive and Ramp 304 and returns to grade level.

The typical section for Bridge K3 consists of a single 15-ft lane and a 6-ft shoulder outside and an inside shoulder that varies from 6 ft to 12 ft, and two 1-ft 6-inch wide, 42-inch traffic railings (TL-5) per Index 521-428. The maximum structure width is 36 ft 0 inches for the main spans. Bridge K3 cross slope varies up to 8.3% at full superelevation. The bridge length is approximately 1,874 ft. The majority of the bridge is in a constant curve with a radius of 1,637 ft. The primary span length requirements for Bridge K3 are established by the following constraints:

- **Over Ramp 311:** Bridge K3 crosses over Ramp 311, at skews approximately 80 degrees from normal. The crossing is achieved with use of two Straddle/Cantilever Piers over Ramp 311.
- **Over Consulate Drive:** Bridge K3 crosses over Consulate Drive, at skews approximately 51 degrees from normal with a required span length of approximately 293 ft.

Appropriate superstructure types for Bridge K3 include curved steel girders (box or plate) and segmental concrete box girders. Both of these bridge types are adaptable to the bridge curvature and capable of the necessary span lengths. Given the variation in expected span lengths a variable depth superstructure would be more economical than a constant depth. However, from an aesthetic viewpoint a constant depth would be better.

Substructure: At the beginning of Bridge K3, this bridge will share a common straddle pier with Bridge J3 at the gore area. At the end of the bridge, a pile supported end bent is anticipated with MSE wall wrapping around the embankments. The intermediate piers will consist of hammerhead piers with pile supported footings. A cantilevered pier and a straddle pier are anticipated at Piers 1 and 2 respectively. Piles would be precast prestressed concrete piles or steel piles.

Constructability Concerns: Phasing and traffic control for construction of Bridge K3 over Consulate Drive is dependent upon the superstructure type. Curved steel girder erection typically involves dividing the structure into sections that can be erected and temporarily stabilized until adjacent sections can be placed and connected by field splices. Temporary falsework in the form of temporary towers are generally required in addition to the permanent piers or bents. Outside the limits of Consulate Drive there is adequate space for temporary towers. Median space however is limited. In these locations, pier brackets (steel members temporarily secured to a pier to "fix" a superstructure element during erection in lieu of a prop) or other means that require less real estate from the travel lanes may need to be employed. A segmental concrete box girder bridge could be constructed in balanced cantilever, progressive cantilever, or a combination using an overhead gantry. This would limit impacts on traffic to night-time lane closures.

Identified Structure Alternative and Span Layout: Twin steel box girders with constant web throughout the entire length of the bridge. For the maximum anticipated span length of 295 ft, the estimated effective structure depth, including cross slope is 12.5 ft in determining profiles and vertical clearances. The superstructure would be supported on end bents, intermediate hammerhead and C-Shaped piers, and straddle piers, and founded on piles.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge K3 is estimated at $14.6 million.

3.22 Bridge L3 – Ramp 314, Westbound Beachline Expressway to Southbound Florida's Turnpike over CSX Railroad

Bridge L3 is a new bridge to carry a single 15-ft lane of Ramp 314 over the CSX railroad and is approximately 169 ft 6 inches long. Including the two 1-ft 4-inch wide, 36-inch single slope railings, 6-ft inside and 6-ft outside shoulders, the bridge width is 29 ft 8 inches. Cross slope will be 2.0% as the bridge is within a very flat radius curve. Bridge L3 crosses CSX railroad at a skew angle of approximately 45 degrees from perpendicular.

The superstructure for Bridge L3 is likely to be a single span and could be steel plate girders or precast, prestressed concrete FIB girders. Identified superstructure alternatives include:

- Superstructure Alternative 1: Skewed, simple-span precast FIB-78 beams bridge with a maximum anticipated span of 169 ft 5⅛ inches.
- Superstructure Alternative 2: Skewed, simple-span steel plate girders bridge with a maximum anticipated span of 169 ft 5⅛ inches.

Substructure likely will consist of concrete bent caps on precast prestressed concrete piles or steel piles. Concrete slope protection/pavement would front the end bents and protect the embankment similar to adjacent Bridge 6.

Constructability issues with the above are minimal outside of the coordination with CSX train traffic. Setting of new girders will require close communication with CSX. The end bent wall construction can be primarily constructed from behind the end bents to minimize disruption to CSX. Provisions should be made to require monitoring of the adjacent bridges during construction for any signs of settlement or related damage. ABC techniques, such as off-site superstructure construction followed by transport and placement utilizing an SPMT, could be considered to limit disruption to CSX traffic and avoid placement of deck concrete over railroad traffic.

Identified Structure Alternative and Span Layout: Simple-span precast FIB-78 beams. For the maximum anticipated span length of 169 ft 5⅛ inches, the estimated effective structure depth, including cross slope is 7.65 ft in determining profiles and vertical clearances. The superstructure would be supported on skewed end bents founded on piles and fronted by concrete sloped protection.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge L3 is estimated at $0.75 million.

3.23 Bridge M3 – Ramp 314, Westbound Beachline Expressway to Southbound Florida's Turnpike

Ramp 314 connects WB Beachline Expressway to SB Florida's Turnpike. Ramp 314 starts with MSE wall and then the profile slopes up and spans over Landstreet Road, the Beachline Expressway, Bridge B3 and Ramp 308, then profile slopes down as it spans over Ramp 305, Ramp 203, Florida's Turnpike and Ramp 322. Bridge M3 ends with MSE wall.

The typical section for Bridge M3 consists of a single 15-ft lane and 6-ft shoulders outside and inside, and two 1-ft 6-inch wide, 42-inch traffic railings (TL-5) per Index 521-428. The maximum structure width is 30 ft 0 inches. Bridge M3 cross slope varies up to 6.0% at full superelevation. The bridge length is approximately 4,168 ft. The majority of the bridge is in a constant curve with a radius of 1,790 ft. The primary span length requirements for Bridge M3 are established by the following constraints:

- **Over Beachline Expressway:** Bridge M3 crosses over Beachline Expressway, at skews approximately 79 degrees from normal. The crossing is achieved with use of one cantilever pier over Beachline Expressway and approximate spans of 325 ft and 214 ft.
- **Over Florida's Turnpike:** Bridge M3 crosses over Florida's Turnpike, at skews approximately 79 degrees from normal. The crossing is achieved with approximate spans of 296 ft and 318 ft.

Appropriate superstructure types for Bridge M3 include curved steel girders (box or plate) and segmental concrete box girders. Both of these bridge types are adaptable to the bridge curvature and capable of the necessary span lengths. Given the variation in expected span lengths, a variable depth superstructure would be more economical than a constant depth. However, from an aesthetic viewpoint a constant depth would be better.

Substructure: Pile supported end bents are anticipated with MSE wall wrapping around the embankments, and hammerhead intermediate piers with pile supported footings. A cantilevered pier is anticipated at Pier 15.

Constructability Concerns: Phasing and traffic control for construction of Bridge M3 over the Beachline Expressway is dependent upon the superstructure type. Curved steel girder erection typically involves dividing the structure into sections that can be erected and temporarily stabilized until adjacent sections can be placed and connected by field splices. Temporary falsework in the form of temporary towers are generally required in addition to the permanent piers or bents. Outside the limits of Beachline Expressway there is adequate space for temporary towers. Median space however is limited. In these locations, pier brackets (steel members temporarily secured to a pier to "fix" a superstructure element during erection in lieu of a prop) or other means that require less real estate from the travel lanes may need to be employed. A segmental concrete box girder bridge could be constructed in balanced cantilever, progressive cantilever, or a combination using an overhead gantry. This would limit impacts on traffic to night-time lane closures.

Identified Structure Alternative and Span Layout: Twin steel box girders with constant web throughout the entire length of the bridge. For the maximum anticipated span length of 324 ft, the estimated effective structure depth, including cross slope is 12.2 ft in determining profiles and vertical clearances. The superstructure would be supported on end bents, intermediate hammerhead and C-Shaped piers, and founded on piles.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge M3 is estimated at $30.0 million.

3.24 Bridge P3 – Ramp 203, Taft Vineland to Northbound Florida's Turnpike

Bridge P3 carries Ramp 203 over Florida's Turnpike. Ramp 203 connects Taft Vineland Road with the NB lanes of Florida's Turnpike. The typical section for Bridge P3 consists of a single 15-ft lane and 6-ft inside and outside shoulders, and two 1-ft 6-inch wide, 42-inch single slope railings (TL-5) per Index 521-428, for a total width of 30 ft 0 inches. Majority of the bridge (627.5 ft) has a constant curvature with a radius of 716 ft, followed by an approximate 152-ft 6-inches straight section to a total of 780-ft. Bridge P3 can be constructed as a twin box steel structure or segmental concrete box.

The primary span length requirements for Bridge P3 are established by the following constraints:

- **Over SB Florida's Turnpike:** Bridge P3 crosses SB Florida's Turnpike at a skew of approximately 51 degrees from normal. Span length on the order of 214 ft is required for this span.
- **Over NB Florida's Turnpike:** Bridge P3 crosses NB Florida's Turnpike at a skew of approximately 55 degrees from normal. Span length on the order of 306 ft is required for this span.
- **Over NB Florida's Turnpike Shoulders:** Bridge P3 completes NB Florida's Turnpike crossing at severe skew align of nearly parallel with Florida's Turnpike. Span length on the order of 260 ft is required for this span.

Variable structural depth would allow for more efficient structure, constant structural depth would be more aesthetically advantageous. Identified superstructure alternatives include:

- Superstructure Alternative 1: Three-span continuous twin box girder bridge with a maximum anticipated span of 306 ft 3 inches.
  - This alternative provides a structural advantage on curved alignment over other structures type.
- Superstructure Alternative 2: Three-span continuous steel plate girder bridge with a maximum anticipated span of 306 ft 3 inches.
  - This alternative would not provide aesthetic continuity with adjacent steel bridges.
- Superstructure Alternative 3: Three-span curved segmental concrete box girder bridge with a maximum anticipated span of 306 ft 3 inches.

Substructure would consist of concrete end bent caps and intermediate wall or hammerhead piers founded on precast prestressed concrete piles or steel piles. Pier 2 (in the Florida's Turnpike median) can be a hammerhead or wall pier with the long axis oriented parallel to the Florida's Turnpike. Pier 3 can also be hammerhead or C-shape pier adjacent to NB Florida's Turnpike lanes, positioned close to the barrier wall. Both locations require sufficient vertical clearance for the pier caps. An alternative substructure solution such as integral pier caps may be employed to minimize vertical clearance encroachments. An integral straddle bent over NB and SB Florida's Turnpike lanes is not feasible at this location. MSE walls would wrap around the approach embankment.

Phasing and traffic control for construction of Bridge P3 over Florida's Turnpike is dependent upon the superstructure type. Curved steel girder erection typically involves dividing the structure into sections that can be erected and temporarily stabilized until adjacent sections can be placed and connected by field splices. Temporary falsework in the form of temporary towers are generally required in addition to the permanent piers or bents. Outside the limits of Florida's Turnpike there is adequate space for temporary towers. Space within the median however, is limited. In this location pier brackets or other means that require less real estate from the travel lanes may need

to be employed. A segmental concrete box girder bridge could be constructed in balanced cantilever, progressive cantilever, or a combination using an overhead gantry. This would limit impacts on traffic to night-time lane closures.

Identified Superstructure Alternative and Span Layout: Three-span continuous twin steel box superstructure with an estimated effective structure depth including cross slope of 13 ft 2 inches, used in determining profile and vertical clearances. The superstructure would be supported on end bents, a pier wall along the Florida's Turnpike median and a hammerhead pier and founded on piles. The approximate span lengths: 213 ft 9 inches, 306 ft 3 inches, 260 ft.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge P3 is estimated at $5.52 million.

3.25 Bridge R3 – Ramp 322, Consulate Drive Exit Ramp to Southbound Florida's Turnpike over Orange Blossom Trail

Bridge R3 is a new bridge to carry a single 15-ft lane of Ramp 322 over Orange Blossom Trail. Bridge R3 runs parallel and to the west of Bridge 1 (Existing No. 750626) and east of Bridge D3. Including the 1-ft 4-inch traffic railings and 6-ft inside and outside shoulders, the bridge width is 29 ft 8 inches. Cross slope is a constant 2%. There is no provision in the cross section of Orange Blossom Trail for an intermediate pier so, like Bridge 1, Bridge R3 will be a single, simple span bridge with a minimum span length of approximately 195 ft. Also, like Bridge 1 and D3, Bridge R3 crosses Orange Blossom Trail at a skew angle of 35 degrees from perpendicular.

The superstructure for Bridge R3 could be steel plate girders like Bridge 1 or precast, prestressed concrete FIB girders. Identified superstructure alternatives include:

- Superstructure Alternative 1: Skewed, simple-span steel plate girder bridge with a maximum anticipated span of 195 ft.
  - Steel plate girders would offer the aesthetic advantage of matching the adjacent bridges.
- Superstructure Alternative 2: Skewed, simple-span precast FIB beams bridge with a maximum anticipated span of 195 ft.
  - This alternative would not provide aesthetic continuity with adjacent steel bridges and would potentially increase dead loads on the proposed foundations.
  - Requires FIB 96 with tighter spacing.
- Superstructure Alternative 3: Simple-span steel plate girder bridge (no skew).
  - This alternative would require a maximum 215-ft span, requiring a girder depth that is 1-ft larger than the skewed bridge alternative.

Substructure would consist of concrete bent caps on precast prestressed concrete piles or steel piles. For either superstructure, the substructure and accompanying retaining walls will need to

be coordinated with the widening of Bridge 1 and the construction of Bridge D3 to the west of Bridge R3.

Constructability issue for Bridge R3 are similar to Bridge 1 widening regarding the need to develop and implement traffic control phasing and identification of hours for lane closures, night work, and short-term, off-peak hour, detours of Orange Blossom Trail. ABC techniques, such as off-site superstructure construction followed by transport and placement utilizing an SPMT, could be considered to limit detours and avoid placement of deck concrete over traffic.

Identified Structure Alternative and Span Layout: Simple-span steel plate superstructure with an estimated effective structure depth including cross slope of 8.447 ft, used in determining profile and vertical clearances. The superstructure would be supported on skewed end bents founded on piles. The approximate span length: 195 ft.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge R3 is estimated at $0.87 million.

3.26 Bridge T – Ramp 313, Westbound Beachline Expressway to Northbound Florida's Turnpike

Bridge T is a new bridge to carry single-lane Ramp 313 connecting WB Beachline Expressway to NB Florida's Turnpike. It spans over NB collector-distributor (CD) Ramp, Ramp 325 and partially sweeps over part of the right NB Florida's Turnpike lane and shoulders to reach a touchdown point. Bridge T consists of a single 150ft lane, 15-ft and 6-ft inside and outside shoulders respectively, and two 1-ft 6-inch wide, 42-inch traffic railings (TL-5) per Index 521-428 for a total width of 39 ft. The cross section is a single slope with variable superelevation, up to 9.2%. Majority of the bridge (604 ft 1¼ inches) has a constant horizontal curvature with a radius of approximately 1,000 ft, followed by an approximate 203-ft 10¾-inch straight section for a total length of 808 ft. Bridge T can be constructed as a two-box steel structure or segmental concrete box.

The primary span length requirements for Bridge T are established by the following constraints:

- **Over CD Ramp:** Bridge T crosses NB CD Ramp at a skew of approximately 68 degrees from normal. Span length on the order of 202 ft is required for this span.
- **Over Ramp 325:** Bridge T crosses Ramp 325 at a skew of approximately 70 degrees from normal. Minimum span length on the order of 202 ft is required for this span. However, span can be extended to match following spans more efficiently.
- **Over NB Florida's Turnpike Lane and Shoulders:** Bridge T completes crossing Ramp 325 and is aligned nearly parallel with Florida's Turnpike. Two spans of approximately 202-ft are required to reach a touchdown point.

Variable structural depth would allow for more efficient structure, constant structural depth would be more aesthetically advantageous. Identified Superstructure alternatives include:

- Superstructure Alternative 1: Four-span twin box girders bridge with a maximum anticipated span of 202 ft.
  - This alternative provides a structural advantage on curved alignment over other structures type.
- Superstructure Alternative 2: Four-span steel plate girders bridge with a maximum anticipated span of 202 ft.
  - This alternative would not provide aesthetic continuity with adjacent steel bridges.
- Superstructure Alternative 3: Four-span curved segmental concrete box girder bridge with a maximum anticipated span of 202 ft.

Substructure would consist of concrete end bent caps and intermediate hammerhead piers founded on precast prestressed concrete piles or steel piles. An alternative substructure solution such as integral pier caps may be employed to minimize vertical clearance encroachments. Integral straddle bents over NB and SB Florida's Turnpike lanes or between Ramp 325 and CD ramp are not feasible for this structure. MSE walls would wrap around the approach embankment.

Bridge T should be constructed prior to the new CD ramp and Ramp 313. Construction phasing of the section over Florida's Turnpike is dependent upon the superstructure type. Curved steel girder erection typically involves dividing the structure into sections that can be erected and temporarily stabilized until adjacent sections can be placed and connected by field splices. Temporary falsework in the form of temporary towers are generally required in addition to the permanent piers or bents. There appears to be adequate space for the temporary towers outside of Florida's Turnpike limits.

Identified Superstructure Alternative and Span Layout: Four-span twin steel box superstructure with an estimated effective structure depth including cross slope of 10 ft 8⅝ inches, used in determining profile and vertical clearances. The superstructure would be supported on end bents, and intermediate hammerhead piers and founded on piles. The approximate span lengths: Four at 203 ft.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge P3 is estimated at $7.25 million.

3.27 Bridge V (Existing 750218) – Eastbound Beachline Expressway over John Young Parkway

The existing EB Beachline Expressway over John Young Parkway bridge is a four-span structure with a concrete AASHTO Type IV and FIB-36 beams (original and widened portions, respectively) and CIP concrete deck superstructure. The bridge carries one EL and three GTLs. The substructure are precast concrete piles, CIP concrete bent cap and intermediate piers. The bridge intersects John Young Parkway on a curved alignment at a skew angle of approximately 22 degrees from perpendicular. Total length 289 ft 7⅞ inches (measured along the Baseline). The structure has no

load restrictions and no significant deficiencies. The minimum vertical clearance of the EB bridge over John Young Parkway is 19 ft 8 inches. The existing traffic railings are 32-inch F Shape (FDOT Standard Index 700, circa 2000). Per the FDOT SDG, Table 6.7.4-1, Treatment of Existing Traffic Railings, these traffic railings will remain in place as the back to back separation is less than the 2.0 ft required

The Alternative 3 scope at this site is to widen the existing EB bridge to the outside by a variable amount, approximately from 11 ft 3 inches to 15 ft 4 inches. The existing structure has a variable width from 33 ft 3⅛ inches to 33 ft 9¾ inches the widened structure will be approximately 84 ft 4 inches to 88 ft 8 inches wide. The existing bridge has constant cross-slope superelevation of 8%. Widening will follow the existing cross slope. There is no apparent reason to consider materials other than prestressed concrete beam for the widening. Proposed widening could be accomplished by adding new FIB-36 girders (one or two additional beams per span) and extending the 8 inches thick CIP concrete deck. The existing variable deck overhang could be saw cut at the exterior girder and removed along with the existing traffic barrier to facilitate deck widening. The widening is on the high side of the bridge, so matching exterior beam type will maintain current vertical clearance.

Superstructure span arrangement should match the existing bridge: 56.21 ft, 87.03 ft, 88.35 ft, 58.06 ft measured along the baseline, with beams placed parallel to the existing exterior beams. Actual support beam spans may vary due to the horizontal curvature effect.

The existing end bents could be extended with new cap supported on precast prestressed concrete piles or steel piles. New hammerhead pier can be placed parallel to the existing piers. End walls would need to be removed.

The most significant constructability issue is the limited horizontal clearance between Bridge V and the adjacent EB Beachline Expressway exit ramp bridge (Bridge No. 750629). The clearance between the proposed widened coping on Bridge V and the adjacent ramp bridge is less than a foot. Other constructability issues include traffic control and interfacing with the adjacent bridge. Setting of new beams and deck pouring will require development and implementation of traffic control phasing and identification of hours for lane closures, night-work, and short-term detours of John Young Parkway. Since the adjacent ramp is 1.5 to 2 ft higher than the widened section, deck may need to be hand finished rather than machine screed. End bent substructure can be primarily constructed from behind the end bents to avoid traffic disruptions. Piers can be constructed using temporary work zone lanes. Provisions should be made to require monitoring of the adjacent bridges during construction for any signs of settlement or related damage. ABC techniques, such as off-site superstructure construction followed by transport and placement utilizing a SPMT, could be considered to limit detours and avoid placement of deck concrete over traffic.

Additional measures are required prior to construction to mitigate impacts to the identified roost of bats near the bridge substructure and in compliance with the FDOT Specifications and Guidelines for Endangered Species.

Identified Structure Alternative: Outside widening with one or two FIB-36 girders, supported on widened end bents and independent intermediate piers, and founded on piles. The approximate span lengths are: 56.21 ft, 87.03 ft, 88.35 ft, 58.06 ft.

Estimated Construction Cost: The probable construction cost to widen Bridge V is estimated at $0.61 million.

3.28 Bridge W – Ramp 203, Taft Vineland Road to Northbound Florida's Turnpike over Orange Blossom Trail

Bridge W is a new bridge to carry one lane of Ramp 203 over Orange Blossom Trail. Bridge W runs parallel and to the east of Bridge 1 (Existing No. 750626) and west of Bridge X. Including traffic railings, 6 ft inside and outside shoulders and two 1-ft 4-inch wide, 36-inch traffic railings per Index 521-427, the total bridge width is 29 ft 8 inches. Cross slope is a constant 2%. There is no provision in the cross section of Orange Blossom Trail for an intermediate pier therefore like Bridge 1, Bridge W will be a single, simple span bridge with a span length of approximately 210 ft. Also, like Bridge 1, Bridge W crosses Orange Blossom Trail at skew angles of 40 and 35 degrees from perpendicular on the north and south respectively.

The superstructure for Bridge W could be steel plate girders like Bridge 1 or steel box girders. Identified Superstructure alternatives include:

- Superstructure Alternative 1: Skewed, simple-span steel plate girders skewed bridge with a maximum anticipated span of 210 ft.
  - Steel plate girders would offer the aesthetic advantage of matching the adjacent bridges.
- Superstructure Alternative 2: Skewed, simple-span steel box girders skewed bridge with a maximum anticipated span of 210 ft.
  - This alternative would not provide aesthetic continuity with adjacent steel bridges.
- Superstructure Alternative 3: Simple-span steel plate girder bridge (no skew).
  - This alternative would require a 240-ft span, requiring a girder depth that is 1.0 ft larger than the skewed bridge alternative.

Substructure would consist of concrete bent caps on precast prestressed concrete piles or steel piles. A further advantage of a steel plate girder superstructure may be that the substructure is more similar in proportion and pile size to adjacent steel bridges. For either superstructure, the substructure and accompanying retaining walls will need to be coordinated with the widening of Bridge 1 and the construction of Bridge X to the east of Bridge W.

Constructability issue for Bridge W are similar to Bridge 1 widening regarding the need to develop and implement traffic control phasing and identification of hours for lane closures, night-work, and short-term detours of Orange Blossom Trail. ABC techniques, such as off-site superstructure construction followed by transport and placement utilizing an SPMT, could be considered to limit detours and avoid placement of deck concrete over traffic.

Identified Structure Alternative and Span Layout: Simple-span steel superstructure with an estimated effective structure depth including cross slope of 9.2 ft, used in determining profile and vertical clearances. The superstructure would be supported on skewed end bents founded on piles. The approximate span length: 210 ft.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge W is estimated at $0.94 million.

3.29 Bridge X – Ramp 305, Northbound Florida's Turnpike to Westbound Beachline Expressway over Orange Blossom Trail

In Alternative 3, Bridge X Ramp 305 (connection from NB Florida's Turnpike to WB Beachline Expressway) over Orange Blossom Trail. Bridge X is a new bridge to carry one 15-ft lane of Ramp 305 and one lane of Ramp 305 over Orange Blossom Trail. Bridge X runs parallel and to the east of Bridge 1 (Bridge No. 750626). Including the 1-ft 4-inch single slope railings per Index 521-427, 6 ft inside and outside shoulders for a total bridge width of 29 ft 8 inches. Cross slope is a constant 2%. There is no provision in the cross section of Orange Blossom Trail for an intermediate pier so, like Bridge 1, Bridge X will be a single, simple span bridge with a span length of approximately 200 ft. Bridge X crosses Orange Blossom Trail at skew angle of 43 degrees from perpendicular.

The superstructure for Bridge X could be steel plate girders like Bridge 1 or steel box girders. Identified superstructure alternatives include:

- Superstructure Alternative 1: Skewed, simple-span steel plate girders bridge with an anticipated span of 222 ft.
  - Steel plate girders would offer the aesthetic advantage of matching the adjacent bridges.
- Superstructure Alternative 2: Skewed, simple-span steel box girders bridge with an anticipated span of 222 ft.
  - This alternative would not provide aesthetic continuity with adjacent steel bridges.
- Superstructure Alternative 3: Simple-span steel plate girder bridge (no skew)
  - This alternative would require a 250-ft span with a girder depth that is 1-ft 2-inch larger than the skewed bridge alternative.

Substructure would consist of concrete bent caps on precast prestressed concrete piles or steel piles. A further advantage of a steel plate girder superstructure may be that the substructure is more similar in proportion and pile size to the adjacent steel bridges. For either superstructure, the substructure and accompanying retaining walls will need to be coordinated with the widening of Bridge 1 and W.

Constructability issue for Bridge X are similar to Bridge 1 widening regarding the need to develop and implement of traffic control phasing and identification of hours for lane closures, night-work, and short-term detours of Orange Blossom Trail. ABC techniques, such as off-site superstructure construction followed by transport and placement utilizing a SPMT, could be considered to limit detours and avoid placement of deck concrete over traffic.

Identified Structure Alternative and Span Layout: Simple-span steel plate superstructure with an estimated effective structure depth including cross slope of 9.5 ft, used in determining profile and vertical clearances. The superstructure would be supported on skewed end bents founded on piles. The approximate span length: 222 ft.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge X is estimated at $0.99 million.

4.0 BRIDGES IN THE FLORIDA'S TURNPIKE RELIEVER INTERCHANGE

4.1 Bridge 11 (Existing 754169) – Westbound Taft Vineland Road over Florida's Turnpike

Bridge 11 (No. 754169) is still needed and will remain in this alternative and will serve as an integral part of the reliever interchange to the south.

Estimated Construction Cost: The probable construction cost for the Alternative 3 for Bridge 11 is $0.0 million since the bridge will remain.

4.2 Bridge 12 (Existing 754170) – Eastbound Taft Vineland Road over Florida's Turnpike

Bridge 12 (No. 754170) is still needed and will remain in this alternative and will serve as an integral part of the reliever interchange to the south.

Estimated Construction Cost: The probable construction cost for the Alternative 3 for Bridge 12 is $0.0 million since the bridge will remain.

Table 4-1
Alternative 3 – Bridges in the Florida's Turnpike Reliever Interchange

Bridge Crossing		Existing Bridge				Status	Scope	Bridge Alternative Data								
ID / No.	Description	Bridge Nos. if Existing	Description	Existing Material	Existing Vertical Clearance (ft-inches)			Bridge Section	Bridge Width (ft-inches)	Bridge Length (ft-inches)	No. Spans	Max Span(s) (ft-inches)	Structure Depth (not including cross slope)	Constructability Issues	Proposed Superstructure Material(s)	Complex Piers; Types
11	WB Taft Vineland Road over SR 91	754169	Medium span prestressed concrete; 4 span bridge	PS Concrete Beam	16'-6"	Existing bridge replaced under Project FPID 411406 with Bridge No. 754170 EB & 754169 WB	Evaluate existing to remain	NA	43'-7 3/4"	341'-4"	4	124'-2"	4.75'	NA - bridge to remain	NA	None
12	EB Taft Vineland Road over SR 91	754170	Medium span prestressed concrete; 4 span bridge	PS Concrete Beam	16'-6"	Existing bridge replaced under Project FPID 411406 with Bridge No. 754170 EB & 754169 WB	Evaluate existing to remain	NA	43'-7 3/4"	341'-4"	4	124'-2"	4.75'	NA - bridge to remain	NA	None

Notes:
SR 91 = Florida's Turnpike
NA = Not applicable

5.0 BRIDGES IN THE BEACHLINE EXPRESSWAY RELIEVER INTERCHANGE

5.1 Bridge Y – Voltaire Drive Extension over Beachline Expressway

Bridge Y is a new bridge to carry eight lanes of Voltaire Drive Extension over the Beachline Expressway. This bridge was originally supposed to carry the Beachline Expressway over Voltaire Drive Extension as mentioned in Alternative 2, Options 1 and 2 for Bridge 16. Including traffic railings, two 6-ft sidewalks, two 7-ft shoulders/bicycle lanes, and a 4-ft traffic separator, the bridge width is 122 ft 2 inches. Cross slope is a constant 2%. Bridge Y will be a two simple span bridge with span lengths of approximately 87 ft for a total bridge length of approximately 174 ft. The superstructure for Bridge Y could be prestressed concrete Florida I-Beam (FIB)-36 girders.

Substructure: Pile supported end bents are anticipated with MSE wall embankments that will also support the on and off ramps of the Beachline Expressway Eastbound (EB) and Westbound (WB), and an intermediate multi-column pier with piles supported footings. Piles would be precast prestressed concrete piles or steel piles.

Constructability issue for Bridge Y include the need to develop and implement a traffic control phasing and identification of hours for lane closures, night-work, and short-term detours of Beachline Expressway. Other constructability issues include driving piles for Pier 2 through the existing box culvert that spans under the Beachline Expressway at a 45-degree skew; and construction of a replacement culvert prior to intermediate pier pile driving. ABC techniques, such as off-site superstructure construction followed by transport and placement utilizing an SPMT, could be considered to limit detours and avoid placement of deck concrete over traffic.

Identified Structure Alternative and Span Layout: FIB-36 girders with 2 spans of equal lengths. The average skew is approximately 16 degrees. For the maximum anticipated span length of 87 ft, the estimated effective structure depth, including cross slope is 5.2 ft in determining profiles and vertical clearances. The superstructure is supported on end bents and intermediate pier founded on piles.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge Y is estimated at $3.15 million

5.2 Bridge Z – Voltaire Drive Extension over Gills Drive

Bridge Z is a new bridge to carry a maximum of seven lanes of Voltaire Drive Extension over Gills Drive and drainage pond. Including traffic railings, two 6-ft sidewalks, two 7-ft shoulders/bicycle lanes, and a variable width traffic separator, the bridge width varies from approximately 125 ft 10 inches to approximately 130 ft 6 inches. Cross slope is a constant 2%. Bridge Z will be a three simple span bridge with span lengths of approximately 128.6 ft for a total bridge length of 385.7 ft. The superstructure for Bridge Z could be prestressed concrete FIB-54 girders.

Substructure: Pile supported end bents are anticipated with MSE wall embankments that will also support the on and off ramps of the Beachline Expressway EB, and intermediate multi-column piers with pile supported footings. Piles would be precast prestressed concrete piles or steel piles.

Identified Structure Alternative and Span Layout: FIB-54 girders with 3 spans of equal lengths. The average skew is approximately 24 degrees. For the maximum anticipated span length of 128.6 ft, the estimated effective structure depth, including cross slope is 6.7 ft in determining profiles and vertical clearances. The superstructure is supported on end bents and intermediate pier founded on piles.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge Z is estimated at $7.1 million.

5.3 Bridge AA – Voltaire Drive Extension over Skylake Canal

Bridge AA is a new bridge to carry four lanes of Voltaire Drive Extension over Skylake Canal. Including traffic railings, two 6-ft sidewalks, two 7-ft shoulders/bicycle lanes, and a variable width separator, the bridge width varies from approximately 108 ft 3 inches to approximately 120 ft 4 inches. Cross slope is a constant 2%. Bridge AA will be a three simple span bridge with maximum span length of approximately 76.14 ft for a total bridge length of 209 ft. The superstructure for Bridge AA could be prestressed concrete FIB-36 girders.

The primary span length requirements for Bridge AA are established by the following constraints:

- **Over Skylake Canal:** Bridge AA crosses over Skylake Canal, at skews approximately 32 degrees from normal. It was assumed that the canal will require two 20-ft berms with 12 ft minimum vertical clearance under spans 1 and 3 for a maintenance vehicle. The main span length was established assuming intermediate piers are located in the canal banks.

Substructure: Pile supported end bents are anticipated with spill through slopes, and intermediate multi-column piers with pile supported footings. Piles would be precast prestressed concrete piles or steel piles.

Identified Structure Alternative and Span Layout: FIB-36 girders with 3 spans (preliminary span lengths: 67.6 ft, 76.14 ft, 65.3 ft. For the maximum anticipated span length of 76.14 ft, the estimated effective structure depth, including cross slope is 5.1 ft in determining profiles and vertical clearances. The superstructure is supported on end bents and intermediate pier founded on piles.

Estimated Construction Cost: The probable construction cost for Alternative 3 for Bridge AA is estimated at $3.5 million.

Table 5-1

Alternative 3 – Bridges in the Beachline Expressway Reliever Interchange

Bridge Crossing		Existing Bridge				Status	Scope	Bridge Alternative Data								
ID / No.	Description	Bridge Nos. if Existing	Description	Existing Material	Existing Vertical Clearance (ft-inches)			Bridge Section	Bridge Width (ft-inches)	Bridge Length (ft-inches)	No. Spans	Max Span(s) (ft-inches)	Structure Depth (not including cross slope)	Constructability Issues	Proposed Superstructure Material(s)	Complex Piers; Types
Y	Voltaire Drive Extension over SR 528	NA	NA	NA	NA	Proposed New Bridge	Develop new bridge alternatives	NA	122'-2"	174'-4"	2	61'-1"	4.0'	Construction over SR 528	FIB	none
Z	Voltaire Drive Extension over Gills Drive and Pond	NA	NA	NA	NA	Proposed New Bridge;	Develop new bridge alternatives	NA	Varies 125'-10" to 130'-5"	385'-8½"	3	128'-6¾"	5.5'	none	FIB	none
AA	Voltaire Drive Extension over Skylake Canal	NA	NA	NA	NA	Proposed New Bridge;	Develop new bridge alternatives	N/A	Varies 108-3" to 120'-4"	209'	3	76'-1⅝"	4.00'	none	FIB	none

Notes:

SR 528 = Beachline Expressway

APPENDICES

Appendix A Alternative 3 Figures

Appendix B Alternatives 1 and 2 Bridge Analysis

Appendix C Alternatives 1 and 2 Figures

Appendix D Draft Bridge Aesthetics Memorandum

Appendix E Existing Bridge Plans

Appendix F Bridge Inspection Reports

Appendix G Load Rating Summary Forms

APPENDIX A
Alternative 3 Figures

1-Bridge General Plan & Elevations - Alternative 3

2-Roadway Plans – Alternative 3

APPENDIX B
Alternatives 1 and 2 Bridge Analysis

1-Alternative 1 and 2 Bridge Analysis

APPENDIX C
Alternatives 1 and 2 Figures

1-Bridge Typical Sections - Alternatives 1 and 2

2-Alternative 1 Plan Sheets

3-Alternative 2, Option 1 Plan Sheets

4-Alternative 2, Option 2 Plan Sheets

APPENDIX D
DRAFT AESTHETIC MEMORANDUM

APPENDIX E
Existing Bridge Plans

750026 As-Builts Reduced

750063 As-Builts Reduced

750092 As-Builts Reduced

750093 As-Builts Reduced

750094 As-Builts Reduced

750095 As-Builts Reduced

750096 As-Builts Reduced

750181 As-Builts Reduced

750218 As-Builts Reduced

750219 As-Builts Reduced

750221 As-Builts Reduced

750222 As-Builts Reduced

750626 As-Builts Reduced

750632 As-Builts Reduced

750641 As-Builts Reduced

750645 As-Builts Reduced

754169 As-Builts Reduced

754170 As-Builts Reduced

APPENDIX F
Bridge Inspection Reports

750026 20180604 Interim

750063 20170906 Routine

750092 20170920 Routine

750093 20171113 Routine

750094 20171113 Routine

750095 20171113 Routine

750096 20171114 Routine

750181 20171113 Routine

750218 20190227 Post Rehab

750219 20170920 Routine

750221 20171113 Routine

750222 20171114 Routine

750626 20171002 Routine

750632 20171114 Routine

APPENDIX G
Load Rating Summary Forms

1-Existing Bridge Load Rating Summary Table